6G AI-Native Integrated RAN-Core Networks

Deliverable D6.2

Dissemination, Standardisation and Exploitation activity report Y1

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0.2	16.12.2025	6GARROW WP6	Contributions from project members
0.3	18.12.2025	6GARROW WP6	Draft for internal review
0.4	30.12.2025	6GARROW WP6	Final version

Abstract

The 6GARROW deliverable D6.2 reports the dissemination, standardisation, and communication activities during the first year of the project and evaluates the progress in relation to the deliverable D6.1 – Dissemination, standardisation and communication plans, and project website.

This document provides insight into project website engagement, social media outreach, event participation, academic publications, demonstrations and system proofs of concept, standardisation and regulation, including the project's EU-Korea collaboration activities. The deliverable showcases the achievements and the quantitative progress towards the dissemination and communication of key performance indicators, reporting the work and impact throughout the project.

Keywords

6GARROW, Communication, Strategy, Media, Dissemination, Demonstrations, Proof-of-Concepts, Key Exploitable Results, Standardisation, Regulation, Objectives, Impact, Collaboration, European Union, Korea, Horizon Europe, SNS JU

Executive Summary

The Deliverable D6.2 – Dissemination, Standardisation and Exploitation activity report Y1 serves as an intermediate update on the dissemination, communication, standardisation and exploitation activities of the 6GARROW project. It provides a status report on the activities outlined in Deliverable D6.1 – Dissemination, standardisation and communication plans, and project website.

The document focuses on the progress, key achievements, and adjustments to the initial plans. The purpose of this document is to keep the project's stakeholders informed about the ongoing activities and guide the whole project consortium to achieve the project's objectives. The deliverable D6.2 provides practical information about target audiences, communication channels and platforms, and strategies for utilizing them.

The key achievements can be summarised as follows:

- Website development and engagement
- Social media outreach
- Newsletters and media
- Event participation and organisation
- Publications, open access publishing and books
- Skills and educational training
- Demonstrations and proof-of-Concepts
- Standardisation and regulation activities
- Innovation management
- Advisory board
- EU-KR cooperation

This document ensures that 6GARROW's dissemination, standardisation and exploitation efforts are on track, and effectively support the project's goals.

List of Tables

List of Figures

Acronyms and abbreviations

Term	Description
3GPP	3rd Generation Partnership Project
5GS	5G System
6G-IA	6G Smart Networks and Services Industry Association
AB	Advisory Board
AI	Artificial Intelligence
AI-RAN	Artificial Intelligence Radio Access Network
AINA	AI Network Alliance
AIML_App	Stage 2 of Application enablement for AI/ML services
AIML_MT	AI/ML model transfer in 5GS
AIMLsys	(Stage 2 for AIML) System Support for AI/ML-based Services
B2B	Business-to-Business
B5G	Beyond 5G
CEA	French Alternative Energies and Atomic Energy Commission
CQI	Channel Quality Indicator
CSI	Channel State Information
CT	Core Network and Terminals
DESCA	Development of a Simplified Consortium Agreement
ETSI	European Telecommunications Standards Institute
EU	European Union
EuCNC	European Conference on Networks and Communications
FhG	Fraunhofer-Gesellschaft
FS_AI4Media	Study on AI and ML for Media

FS_AIML	Study on security and privacy of Artificial Intelligence/Machine Learning (AI/ML)-based services and applications in 5G
FS_AIML_CAL	Study on 3GPP AI/ML Consistency Alignment
FS_AIML_CN	Study on Core Network Enhanced Support for AI/ML
FS_AIML_MGMT	Study on AI/ML management
FS_AIML_MT	Study on traffic characteristics and performance requirements for AI/ML model transfer in 5GS
FS_AIMLsys	Study on 5G System Support for AI/ML-based Services
FS_NR_AIML_NG RAN_SEC	Study on the security aspects of AI/ML for the Next Generation Radio Access Network
GEM	Grenoble Ecole de Management
GHz	Gigahertz
gNBs	Next Generation Node B
GRU	Gated Recurrent Unit
GmbH	Gesellschaft mit beschränkter Haftung
HPE	Hewlett Packard Enterprise
IEEE GLOBECOM	IEEE Global Communications Conference
IEEE ICC	IEEE International Conference on Communications
IEEE ICNC	IEEE International Conference on Computing, Networking and Communications
IEEE MeditCom	IEEE International Mediterranean Conference on Communications and Networking
IIPR	Intellectual Property Rights
IITP	Institute for Information & Communications Technology Promotion
IP	Internet Protocol
KPI	Key Performance Indicator
KR	Republic of Korea
KVI	Key Value Indicator
LGE	LG Electronics
M	Month
MAC	Media Access Control
ML	Machine Learning
MMSE	Minimum Mean Square Error
MSIT	Ministry of Science and ICT
multi-RAT	Multiple Radio Access Technology

NG-RAN	Next Generation Radio Access Network
NOMA	Non-Orthogonal Multiple Access
NR	New Radio
NR_AIML_air_Ph 2	AIML for NR air interface Phase 2
NR_AIML_NGRA N	Study on the security aspects of Artificial Intelligence AI/ML for the Next Generation Radio Access Network
NWDAF	Network Data Analytics Function
O-DU	Open RAN Distributed Unit
O-RU	Open Radio Unit
OAM	Operations, Administration, and Maintenance
OFDM	Orthogonal Frequency Division Multiplexing
PCT	Patent Cooperation Treaty
PDCP	Packet Data Convergence Protocol
Ph	Phase
PHY	Physical layer
PoC	Proof-of-Concept
PU	Public
RAN	Radio Access Network
RF	Radio Frequency
RIS	Reconfigurable Intelligent Surface
RRC	Radio Resource Control
SA	System Aspect
SID	Service Identification
SI	Study Item
SNS JU	Smart Networks and Services Joint Undertaking
SPAWC	Signal Processing Advances in Wireless Communications
SUTD	Singapore University of Technology and Design
TR	Technical Report

1 Introduction

Consistent communication, dissemination, standardisation, and exploitation activities are essential for maximising the impact of a project. This deliverable, D6.2 – Dissemination, Standardisation and Exploitation Activity Report Y1, reports on the activities carried out during the first year of the 6GARROW project and assesses progress against the plans and targets defined in Deliverable D6.1.

The document provides an overview of the activities and milestones implemented during the first year of the project, including media outreach, scientific publications, demonstrations and proofs of concept, event participation and organisation, and more.

During the first reporting period, communication and dissemination activities were implemented largely as planned, with performance indicators fulfilling and even exceeding the expectations.

The project also initiated demonstration and proof-of-concept activities, establishing the technical foundations for future validation of key concepts related to AI-native, integrated RAN–core networks. Standardisation and regulatory engagement also progressed, with several consortium partners actively participating and monitoring the relevant 3GPP Technical Specification Groups and Working Groups on both the European and Republic of Korea sides.

Cooperation remains a core pillar of the project. Close collaboration between European Union and Republic of Korea partners has been fostered through joint events, coordinated dissemination activities, and the preparation of intercontinental proofs of concept, reinforcing the project's global perspective on AI-native technologies for future 6G networks.

2 Communication and Dissemination

During its first year, 6GARROW project has carried out several communication and dissemination activities both virtually, and in person. These actions have established a growing following on social media. The number of views and followers on these platforms align with the expectations during this first year, and the awareness on 6GARROW's efforts is gaining momentum. It's to be mentioned, that YouTube is only used as a video repository and is not actively promoted as a social media channel. In this chapter, we report on all the communication activities in relation to the communication goals defined in the communication plan D6.1.

2.1 Communication goals

6GARROW's communication plan is defined in Deliverable D6.1. The document outlines the project's dissemination, standardisation, and communication strategy, and establishes a structured framework to maximise visibility, impact, and engagement with a diverse set of stakeholders, each with distinct interests and priorities. These target groups include telecom operators and vendors, service providers over telecommunication networks, the general public, the research and academic community, standards bodies, policymakers, governments, and regulatory agencies, and finally, 6G-IA and related European fora.

Through selected platforms and activities, the project aims to provide a clear view of its work on advancing Radio Access Networks and pioneering integrated device–network approaches in the development of future AI-native radio access networks. In addition, 6GARROW will actively promote collaboration between the European Union and the Republic of Korea both online through our website and social media platforms, as well as different scientific events.

The quantified communication goals of the 6GARROW project are outlined in the table below.

Table 1: 6GARROW communication goals

Communication mean	Quantified goal	Minimum per year
Posts on social media	>30	10
Press releases	>6	2
Organization of technical workshops, special sessions, tutorials etc.	>3	1

2.2 Overall Achievements

This section presents the overall achievements of the project's dissemination and communication activities with respect to the targets defined in the project plan.

By the end of the first year, the project's communication activities are progressing as anticipated. The goals have been achieved and exceeded, especially with project's social media presence. The table below shows the current status of the communication goals.

Table 2 6GARROW Communication goals and current status

Communication mean	Quantified goal	Minimum per year	Current status
Posts on social media	>30	10	50
Press releases	>6	2	3
Organization of technical workshops, special sessions, tutorials etc.	>3	1	2

The following subsections provide a more detailed analysis of the projects communication efforts, organised according to the respective media outlets and platforms.

2.2.1 Published Deliverables

Deliverables are a key element of 6GARROW's dissemination efforts. During the project, each work package will produce a number of deliverables, most of which will be publicly available on the project website.

The table below lists the public and non-public deliverables that have been successfully submitted to the project funder, the European Commission, in accordance with the agreed schedule during the first year of the project.

Table 3: 6GARROW published deliverables

Deliverable Title	Delivery Date
D1.1 – Quality plan	31 March 2025
D1.2 – Data management plan	31 March 2025
D6.1 – Dissemination, standardisation and communication plans, and project website	31 March 2025
D2.1 – 6GARROW Scenarios, Use Cases and related KPIs/KVIs	31 August 2025
D2.2 – 6GARROW Initial System Architecture	31 October 2025
D3.1 – State of the art and challenges for AI/ML Enhanced Device Performance	31 October 2025
D4.1 – State of the art on AI/ML Solutions for RAN and Core Optimisation	31 October 2025
D1.3 – First periodic report	31 December 2025
D6.2 – Dissemination, standardisation and exploitation activity report Y1	31 December 2025

2.2.2 Website

The 6GARROW website is the primary platform for sharing the project's concepts, results, and achievements with its audience. It serves as the main communication and promotion tool for the project and was launched in January 2025 at the start of the project. This section details some common performance indicators related to the website.

During the first year, the website itself has been updated regularly with new deliverables, news highlights, events, newsletters, and media mentions, ensuring a steady flow of traffic to the website and strong visibility on search engines.

Overall, the website analytics are well aligned with the expectations. The table below showcases some key metrics of the website analytics.

Table 4: Selected performance indicators related to the 6GARROW website

Performance indicator	Status	Verification
Unique website visitors per month	197	Google Analytics
Website page views per month	522	Google Analytics
Web visits in total	3,600	Google Analytics
Pages / sessions in the website	1.77	Google Analytics
Website average session time	2m	Google Analytics

Since its launch in January 2025, the 6GARROW website has gathered both traffic and engagement, with numbers growing as expected at this stage. In particular, the average session duration, referring to the time spent on the website is a metric worth highlighting. According to benchmark data provided by Databox, the median average session duration for B2B companies is 77.61 seconds. For the 6GARROW website, it is more than 1.5 times that. (Source: https://databox.com/average-session-duration-benchmark)

2.2.3 Social Media

This chapter outlines the project's social media outreach on the selected platforms, X and LinkedIn. The project also maintains a YouTube channel, which functions primarily as a video repository rather than a social media platform. These channels were established in January 2025, in conjunction with the project kick-off and website launch.

Through the collaborative efforts of the entire consortium, 6GARROW aims to engage with its target audience and effectively disseminate project activities and results via the selected platforms.

By the end of the first year of the project, 6GARROW has published 25 posts on both LinkedIn and X, totalling to 50 posts — five times the promised amount. These posts have driven traffic to the website and helped the project build a following on both platforms to effectively disseminate the project's progress and results. Especially the 6GARROW LinkedIn page has begun building a solid following, following the recent trend of LinkedIn outperforming X for academics, researchers and

universities. A more detailed overview of the project's social media presence is provided in the table below.

Table 5: Recognized performance indicators and status on 6GARROW's social media platforms

Performance indicator	Current	Verification
Followers in X	25	X Analytics
Posts on X	25	X Analytics
Impressions on X	1135	X Analytics
Followers in LinkedIn	162	LinkedIn analytics
Posts on LinkedIn	25	LinkedIn analytics
Impressions on LinkedIn	7739	LinkedIn analytics

2.2.4 Media

In addition to social media, 6GARROW produces promotional materials for traditional media outlets, including press releases, newsletters, and printed materials. This chapter outlines the results achieved through these channels.

6GARROW launched its newsletter in September 2025 to promote its first research deliverables and the upcoming workshop at Globecom in December. After the workshop, the second newsletter was published, wrapping up the first year of the project.

During its first year, 6GARROW also published two press releases on the project website, which were then distributed both through social media and the consortium members' own communication channels. This resulted in mentions on other news platforms, such as SNS JU Project News and 6G Flagship news. Other notable media highlights include articles in SNS-JU Journal 2025, Nature Reviews Electrical Engineering, 6G Waves Magazine issue 9, and 6G Waves Magazine issue 11. The two press releases fulfilled the 6GARROW annual goal. By the end of the project, 6GARROW will publish six press releases in total.

For the IEEE Globecom 2025 and other upcoming events, 6GARROW also produced a roll-up, and a general brochure to advertise the project.

2.2.5 Events

By actively participating in a range of events, 6GARROW has strengthened its visibility, established credibility, and built valuable relationships with industry leaders and experts. This chapter outlines the project's activities in event participation and organization.

2.2.5.1 Participation

During its first year, the 6GARROW project was represented at several major conferences and events. The most notable were the ETSI AI Conference in February, the EuCNC & 6G Summit in June, Mobile KOREA in October, and IEEE Globecom in December, where the project also organized a workshop. More details are provided in Section 2.2.7.5.

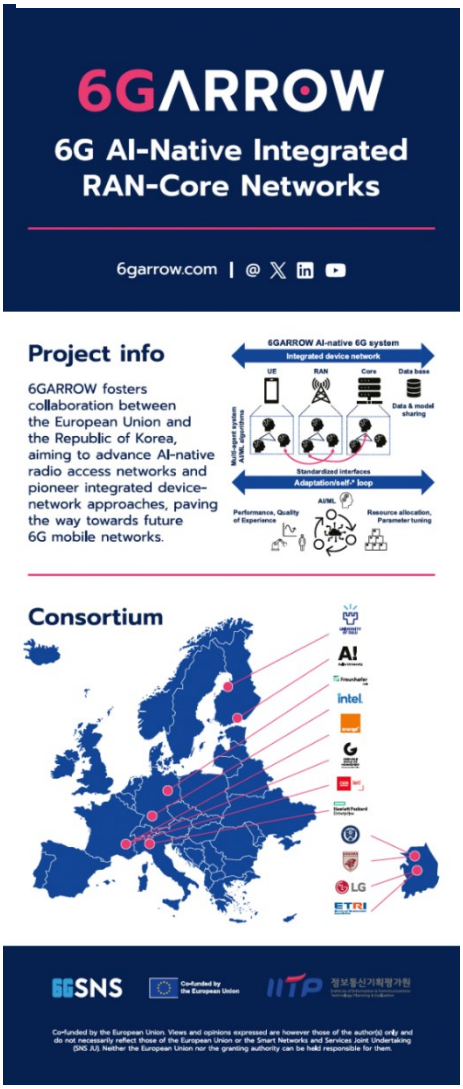
2.2.5.2 Organization

6GARROW's kick-off meeting took place in Grenoble on January 15th and 16th, 2025. The meeting brought together 26 representatives from the European Union and the Republic of Korea, who discussed the roadmap, milestones, and collaboration strategies for the next three years.

The second face-to-face meeting took place in Yonsei University, Seoul on December 3rd and 4th. Meeting in person once more allowed partners to engage in detailed and highly constructive discussions, particularly on use cases and system architecture.

In conjunction with the meeting in Seoul, 6GARROW also organized a workshop on AI-RAN on December 5th, bringing together both consortium members and invited experts. Discussions highlighted significant progress across 6GARROW's technical domains, including network

Figure 1. 6GARROW roll-up



architecture design, machine learning for radio access and core network optimization, device-level intelligence, and performance validation. More details on the workshop are provided in Section 2.2.7.4.1.

Finally, on December 12th, 2025, the 6GARROW project organized an international workshop on AI-Native Communication Systems, with SNS phase 2 projects 6G-DISAC and 6G-GOALS. The workshop was organized in conjunction with IEEE Globecom 2025 in Taipei, Taiwan. More information about the workshop is described in Section 2.2.7.4.2.

This achievement fulfils the project's annual objective of organizing at least one technical workshop, special session, tutorial, or comparable event, as defined in the communications plan. In total, 6GARROW will organize at least three such events by the end of the project.

2.2.6 Dissemination

To maximize the impact of the project, 6GARROW is committed to sharing its project knowledge and achievements on a global scale by targeting leading conferences, journals, and events. The dissemination strategy and goals were defined in the previous deliverable of the series, D.6.1. This section showcases those goals, and the current status in comparison.

2.2.7 Dissemination goals and achievements

The 6GARROW consortium members have agreed to disseminate their work through multiple channels, including international conferences, workshops, and peer-reviewed journals. In addition, the members will also contribute to the standardization process by providing inputs where applicable to Standards Development Organizations like 3GPP and ETSI and actively participate in relevant sessions to advocate for their interests and alliances such as AI-RAN alliance. Additionally, the partners plan to collaborate on joint publications in leading global conferences and prestigious journals.

In the Table 6 below, quantified dissemination goals are presented in comparison to the current status.

Table 6. Quantified dissemination goals for 6GARROW

Dissemination mean	Quantified goal	Current status
Publications	>50	16
Organization of technical workshops, special sessions, tutorials etc.	>3	2
Industrial exhibitions and demonstrations	2	0
Conference to the general public	1	0

2.2.7.1 Publications

6GARROW focused on disseminating its research findings through conferences such as IEEE Globecom, SPAWC and journals and magazines, with particular emphasis on the esteemed IEEE Transactions Series, IEEE Letters, and IEEE Magazines. Over the course of the project, 6GARROW aims to publish a minimum of 50 scientific papers. The table below lists the publications of 6GARROW in the first year which are in published or accepted state.

Table 7. List of accepted 6GARROW publications

	Publication title	Conference/Journal title	Authors
1	Information age-based task splitting scheme for edge computing-enabled networks	IEEE Wireless Communications Letters	Jinwoong Kim, Jemin Lee
2	Fast batch gradient descent in quantum neural networks	Electronics Letters	Joo Yong Shim, Joongheon Kim
3	Hierarchical Scheduling for Oil Spill SAR Image Detection in Space-Air-Ground Integrated Networks	IEEE Transactions on Vehicular Technology	Seok Bin Son, Soohyun Park
4	AI-Native 6G Networks: The 6GARROW Integrated Device-Network Approach	2025 Joint European Conference on Networks and Communications & 6G Summit (EuCNC/6G Summit)	Emilio Calvanese Strinati et al.
5	Compacting Semantic Matryoshka Representations with Product Quantization	IEEE GLOBECOM 2025 Workshops	Leonardo Roque; Quentin Lampin; Louis-Adrien Dufrène; Guillaume Larue; Grégoire Lefebvre; Mohamad Assaad
6	End-to-end Learning of Probabilistic and Geometric Constellation Shaping with Iterative Receivers	IEEE GLOBECOM 2025 Workshops	Harindu Jayarathne; Dileepa Madhubhashana Marasinghe; Premanandana Rajatheva; Matti Latva-aho
7	Semantic Waveforms for AI-Native 6G Networks	IEEE GLOBECOM 2025 Workshops	Nour Hello; Mohamed Amine Hamoura; Francois Rivet; Emilio Calvanese Strinati
8	Toward Semantic Translation in Network Slicing: LLM-Based Network Slice Configuration	IEEE GLOBECOM 2025 Workshops	Doyoung Lee; Tae-Yeon Kim
9	Semantic Channel Equalization Strategies for Deep Joint Source-Channel Coding	IEEE GLOBECOM 2025 Workshops	Lorenzo Pannacci; Simone Fiorellino; Mario Edoardo Pandolfo; Emilio Calvanese Strinati; Paolo Di Lorenzo
10	Vector Quantization-Based Opportunistic Semantic Communication for Object Detection	IEEE GLOBECOM 2025 Workshops	Hyeseong Yun; Seungeun Oh; Seong-Lyun Kim
11	Finding a Path from 1-bit Quantizer: State Estimation with 1-Bit Observations and Imperfect Models	Asilomar Conference on Signals, Systems, and Computers 2025	Chaehyun Jung, TaeJun Ha, Hyunuk Kim, and Jeonghun Park
12	Attention-Aided MMSE for OFDM Channel Estimation	Asilomar Conference on Signals, Systems, and Computers 2025	TaeJun Ha, Jeonghun Park
13	Deadline-Aware Bandwidth Allocation for Semantic Generative Communication with Diffusion Models	IEEE SPAWC 2025	Jinhyuk Choi, Jihong Park, Seungeun Oh, and Seong-Lyun Kim

14	Quantum Infidelity Codistillation for Fast and Accurate Distributed Quantum Machine Learning	Journal of Supercomputing	Seungeun Oh, Jinhyuk Kim, Jihong Park, Hankyul Baek, Hyunsoo Lee, Joongheon Kim, Seong-Lyun Kim
15	Conditional Denoising Diffusion Autoencoders for Wireless Semantic Communications	The 39th Annual Conference on Neural Information Processing Systems (NeurIPS 2025) Workshops	Mehdi Letafati, Samad Ali, Matti Latva-aho
16	Data-Free Quantization of Neural Receivers: When 4-Bit Succeeds, Why 6-Bit Matters for 6G	The 39th Annual Conference on Neural Information Processing Systems (NeurIPS 2025) Workshops	SaiKrishna S. Yellapragada, Esa Ollila, Mário Costa

Additionally, the following publications associated with project work are under review in the submitted state or not accepted which are being revised for resubmission.

Table 8. List of 6GARROW publications under review

	Publication title	Conference/Journal title	Authors
1	State Estimation with 1-Bit Observations and Imperfect Models: Bussgang Meets Kalman in Neural Networks	IEEE Transactions on Signal Processing (Under review)	Chaehyun Jung, TaeJun Ha, Hyunuk Kim, and Jeonghun Park
2	Attention-Aided MMSE for OFDM Channel Estimation: Learning Linear Filters with Attention	IEEE Journal on Selected Areas in Communications (Under review)	TaeJun Ha, Chaehyun Jung, Hyeonuk Kim, Jeongwoo Park, and Jeonghun Park
3	GRU-based Channel Prediction for Energy-Efficient Active Mobile User Uplink Power Control in RIS-Enabled TDD Communication Systems	IEEE ICC 2026 (Under review)	Seungcheol Oh, Taewoo Park, Arman Ahmadian, Sean Kwon, Seong-Lyun Kim, and Joongheon Kim.
4	Deep Learning Based Packet Detection with Adaptive Thresholding	IEEE WCNC 2026 (Under review) (Submitted, Not accepted)	Amalia Eka Rakhmania, Kalle Ruttik, Riku Jäntti
5	Throughput Optimization of 1-bit RIS-NOMA Networks Using Deep Reinforcement Learning	IEEE GLOBECOM 2025 Workshops (Submitted, Not accepted)	A. Ahmadian, Seong-Lyun Kim
6	Communication-Efficient Semantic Image Transmission via Importance-Aware Selection	IEEE GLOBECOM 2025 Workshops (Submitted,Not accepted)	Hyeseong Yun, Seungeun Oh, and Seong-Lyun Kim

2.2.7.2 Open access publishing

The scientific publications of 6GARROW will be publicly available through the project's Zenodo repository. To make the publication process as smooth as possible, a procedure and an internal guide were created, and added to the project's intranet on SharePoint, along with a link to the 6GARROW Zenodo community: https://zenodo.org/communities/6garrow/records

During the first year of the project, seven publications were added to Zenodo. In addition, several accepted publications do not yet have a DOI; these will be added at a later stage. As the technical

work within the project intensifies, the number of publications is expected to grow more rapidly and shared openly.

2.2.7.3 Book on Digital Sustainability

As part of its broader dissemination and impact activities, the 6GARROW project contributed to the book Digital Sustainability: Legislations, Standards, Solutions and Related Case Studies, edited by Christophe Gaie and Markus Mueck (Innovation Manager of 6GARROW) and to be published by Springer Nature. The book provides a comprehensive overview of initiatives addressing sustainability challenges in the digital age, covering perspectives from policy makers, industry, academia, and research institutions.

The volume comprises thirteen chapters addressing key topics including the European Green Deal, ecodesign and energy labelling regulations, the role of standardisation, digital architectures for sustainability, synergies between cybersecurity and sustainability, ethical considerations, governance and decision-making frameworks, and multiple case studies. These include dedicated chapters on sustainability in the context of 6G mobile communication systems, artificial intelligence, and ambient-powered IoT, as well as a global perspective on digital sustainability beyond Europe.

Contributors from the 6GARROW project include Dr. Emilio Calvanese Strinati (Université Grenoble Alpes, CEA-Leti, France), Prof. Dr. Riku Jäntti (Aalto University, Finland), Davide Montagno Bozzone (Hewlett Packard Italiana SRL), and Dr. Markus Dominik Mueck (Intel Deutschland GmbH; Chair of the Board of ETSI).

The book leverages the expertise from multiple European Commission funded research projects. It demonstrates how 6GARROW engages in close collaborations and open dialogues across project boundaries. Specifically, the following research projects are contributing to the book:

- *The Smart Networks and Services Joint Undertaking (SNS JU) project 6GARROW under the European Union's Horizon program, Grant Agreement Number 10119219 and under the Institute for Information & Communications Technology Promotion (IITP) grant funded by the Korean government (MSIT) (No. RS-2024-00435652);*
- *The Smart Networks and Services Joint Undertaking (SNS JU) project 6G-GOALS under the European Union's Horizon program, Grant Agreement Number 101139232;*
- *The Smart Networks and Services Joint Undertaking (SNS JU) project 6G-DISAC under the European Union's Horizon program, Grant Agreement Number 101139130;*
- *The Smart Networks and Services Joint Undertaking (SNS JU) project SUSTAIN-6G under the European Union's Horizon program, Grant Agreement Number 101191936;*
- *The Smart Networks and Services Joint Undertaking (SNS JU) project Ambient-6G under the European Union's Horizon program, Grant Agreement Number 101192113;*
- *The Smart Networks and Services Joint Undertaking (SNS JU) project 6G-XR under the European Union's Horizon program, Grant Agreement Number 101096838.*

2.2.7.4 Organization of workshops, special sessions, participation in invited talks and related events at key conferences

During the first reporting period, the 6GARROW consortium actively contributed to the co-organisation of high-profile workshops and special sessions, as well as to participation in major international conferences, and invited talks. These activities supported the dissemination of project objectives and intermediate results, strengthened engagement with the global research, industrial, and policy communities, and positioned 6GARROW within key international discussions on AI-native networking, semantic communications, and the evolution of 6G systems.

2.2.7.4.1 AI-RAN Workshop and AI-RAN Summit 2025, Seoul, Republic of Korea

On 5th December 2025, the 6GARROW consortium co-organised the AI-RAN Summit in Seoul, Republic of Korea, hosted at Yonsei University. The summit was jointly organised by the Ministry of Science and ICT (MSIT), the AI Network Alliance (AINA), Yonsei University, and participating research projects, including 6GARROW, and aimed to foster global industry–academia–research cooperation on AI-RAN as a core technology for AI-native and 6G networks.

Figure 2. AI-RAN Summit 2025

The event brought together a wide range of stakeholders from industry, academia, and research organisations to discuss global 6G trends, AI-driven network transformation, AI-RAN architectures, semantic communications, and digital twins. Executive-level representatives from leading global companies and internationally recognised academic institutions participated, alongside Korean telecommunications operators and vendors. Dedicated sessions addressed industry perspectives on AI-RAN readiness and infrastructure transformation, while academic sessions examined emerging research directions in semantic communication and AI-native networking.

The workshop and summit also highlighted ongoing Korea–Europe collaboration in AI-RAN research, including the 6GARROW project, and contributed to discussions on standardisation, ecosystem development, and the role of AI-native networks as critical infrastructure for future AI-driven services. Figure 2 depicts a photo of physical participants captured at the workshop.

2.2.7.4.2 6GARROW Workshop at IEEE GLOBECOM 2025

The 6GARROW consortium co-organised a full-day workshop at IEEE GLOBECOM 2025 on 12th December 2025, entitled “AI-Native Communications Systems: Towards Integrated, Intelligent and Highly Efficient Networks.” The workshop focused on AI-native and semantic communication systems as key enablers for future 6G networks.

The technical program committee included several members of the 6GARROW project. In total, 35 papers were submitted to the workshop, of which 12 were accepted following a rigorous peer-review process conducted in accordance with IEEE conference guidelines.

Figure 3. Workshop at IEEE GLOBECOM 2025

The technical programme combined keynote presentations, peer-reviewed paper sessions, a regulatory tutorial, a live project demonstration, and a panel discussion. Topics addressed included AI-enabled radio access networks, semantic representation and communication, diffusion-based channel estimation, energy-efficient network optimisation, cooperative resource management, and end-to-end learning techniques for wireless systems.

In addition to the technical contributions, the workshop featured a tutorial on innovation opportunities related to the European Artificial Intelligence Act, providing regulatory context relevant to AI-enabled communication technologies. A live demonstration showcased selected 6GARROW results on the integration of AI and semantic communication capabilities into future 6G systems. The workshop concluded with a panel discussion on exploiting AI- and machine-learning-enabled wireless communications while meeting sustainability objectives, reinforcing the project's focus on energy-aware and responsible 6G network design.

Through these co-organised events, 6GARROW enhanced its visibility at leading international forums, disseminated project results to a broad audience, and actively contributed to shaping global discussions on AI-native 6G network architectures.

2.2.7.5 Participation in invited talks and related events at key conferences

6GARROW project members have been participating in numerous activities where results and insights from the 6GARROW project have been disseminated in activities such as invited talks. Table 9 summarizes such events occurred in the first year of the project.

Table 9. List of the events 6GARROW participated in

Date	Event	Member/person	Type of Activity	Event detail	Location
16 October 2024	ICTC 2024	Seong-Lyun Kim (Yonsei University)	Conference	Industry, business partners, research communities	Jeju Island, Korea
10 February 2025	ETSI AI Conference	Emilio Calvanese Strinati (CEA-Leti)	Invited Talk and Panel	Industry, business partners	Sophia Antipolis, France
12 February 2025	KICS 6G Technology Workshop- – 6G Vision, Standardization & Enabling Technologies	Seong-Lyun Kim (Yonsei University)	Seminar Presentation at National R&D Workshop	Research communities	Korea
12 February 2025	Hexa-2 Online Workshop	Emilio Calvanese Strinati (CEA-Leti)	Workshop	Research communities, industry, business partners	Online
17 February 2025	Project presentation to the SNS JU community	Nicolas Cassiau (CEA-Leti)	Event	Research communities	Online
17 February 2025	IEEE ICNC	Emilio Calvanese Strinati (CEA-Leti)	Invited Talk	Industry, business partners, research communities	Honolulu, USA (remote participation)
27 March 2025	TITANS 6G Summit	Emilio Calvanese Strinati (CEA-Leti)	Conference participation	Participation in 6G ecosystem discussions	Cambridge, UK
1 April 2025	European Commission Meeting (EU–Asia Cooperation)	Emilio Calvanese Strinati (CEA-Leti)	Policy / coordination meeting	Participation representing EU–Asia research cooperation	Online / Brussels
16 April 2025	6G Forge at EURECOM Sophia Antipolis	Emilio Calvanese Strinati (CEA-Leti)	Conference participation	Participation in 6G research and policy discussions	Nice, France
8 July 2025	IEEE SPAWC 2025	Emilio Calvanese Strinati (CEA-Leti)	Conference keynote	Keynote on semantic communications	Surrey, UK.
17 October 2025	3rd RESTART Tech Camp on 5G and Open RAN	Dileepa Marasinghe (University of Oulu)	Workshop	Research communities	Palermo, Italy
27 October 2025	Mobile KOREA – Technical Session #2	Jaehoon Chung (LG Electronics)	Invited talk + panel	Talk and participation in panel discussions	Seoul, Republic of Korea

28 October 2025	Mobile KOREA – Technical Session #4	Thomas Haustein (Fraunhofer HHI)	Invited talk	Talk on 6G-related research topics	Seoul, Republic of Korea
28 October 2025	Mobile KOREA – Technical Session #4	Matti Latva-aho (University of Oulu)	Invited talk	6G Resilience: The Foundation of Future Connectivity	Seoul, Republic of Korea
28 October 2025	Mobile KOREA – Technical Session #5	Seong-Lyun Kim (Yonsei University)	Invited talk	Hybrid Inference LLM for Robot Manipulation over 5G-A/O-RAN	Seoul, Republic of Korea
28 October 2025	Mobile KOREA – Technical Session #5	Emilio Calvanese Strinati (CEA-Leti)	Invited talk	Secrets of Semantic Communications in the Era of 6G Networked Intelligence	Seoul, Republic of Korea
11 November 2025	IEEE Future Networks World Forum 2025	Dileepa Marasinghe (University of Oulu)	Conference	Research communities	Bangalore, India
21 November 2025	Numérique Libre Construire les Territoires	Markus Mueck (Intel)	Conference	Invited talk	Montferrat, France
25 November 2025	AIOTI Webinar	Valerio Frascolla (Intel)	Webinar-Collaboration with EU projects	Presentation of the White Paper "Edge IoT Industrial Immersive and Spatial Computing Applications"	Online
20 December 2025	4th International Conference on 6G Networking	Emilio Calvanese Strinati (CEA-Leti)	Conference keynote	Keynote on “The Secret of Semantic Communications”	Paris, France

Furthermore, as part of the 6GARROW project’s dissemination and engagement activities, a dedicated panel session was organised at IEEE MeditCom 2025 on 10 July 2025. The panel, entitled *“AI-Assisted (6G) Communications – European Digital Legislations and Sustainability Challenges,”* was organised and moderated by Dr. Markus Mueck (Intel Deutschland GmbH), 6GARROW Innovation Manager.

The session addressed the impact of key European digital regulations, including the AI Act, Cyber Resilience Act, and Radio Equipment Directive, on the development and deployment of AI-assisted 6G networks. Discussions focused on defining compliance metrics, balancing AI-driven innovation with sustainability objectives, and addressing ethical and societal considerations associated with AI-enabled communication systems. The panel featured expert contributions from representatives of ETSI, industry, and academia, and contributed to raising awareness of regulatory and sustainability challenges relevant to future 6G ecosystems.

2.2.7.6 Skills and educational training

As part of its skills development and educational activities, the 6GARROW project organised targeted training initiatives to increase awareness and understanding of key regulatory, legal, and standardisation aspects relevant to next-generation communication systems. These activities aimed

to equip project participants and external stakeholders with the knowledge required to account for the evolving European regulatory framework in the design and deployment of 6G technologies.

2.2.7.6.1 Internal Tutorial on EU Regulations

An internal online tutorial on EU regulations was conducted for 6GARROW project participants on Friday, 14 March 2025. The tutorial was delivered by Markus Muck and aimed to provide background information on the European regulatory framework to support its consideration and integration within the 6G-ARROW project. The session covered key EU regulations relevant to next-generation communication systems, including the AI Act, the Cyber Resilience Act, and the Data Act. The tutorial helped ensure a shared understanding among project participants of the regulatory context, supporting informed technical and strategic decisions within the project

2.2.7.6.2 Workshop on EU Regulations (AI Act, Cyber Resilience Act, Data Act) at GEM, Grenoble, France

As part of the activities carried out within the 6GARROW project, a workshop on the European regulatory landscape relevant to digital infrastructure and 6G was held at Grenoble Ecole de Management (GEM) on 25 November 2025. The workshop was delivered by Dr. Markus Mueck (Intel, ETSI and 6GARROW) and provided an overview of key European regulations, their timelines, and their relevance to future 6G systems.

The workshop covered recent and upcoming EU legislation, including the Radio Equipment Directive (RED), with a focus on new articles addressing cybersecurity and privacy, the EU Cyber Resilience Act, the AI Act, and the Data Act. Particular emphasis was placed on the role of European Standardisation Organisations in supporting the effective and harmonised implementation of these regulations. The session contributed to a better understanding of the regulatory and standardisation context shaping the development, deployment, and governance of next-generation communication technologies.

3 Exploitation

3.1 Demonstrations and Proof-of-Concepts

Emphasizing demonstrations and proof of concept (PoC) is a vital component of the 6GARROW exploitation plan. These elements serve as tangible evidence of the project's innovations and their practical applications, making them powerful tools for engaging stakeholders and showcasing the project's potential.

AI/ML functionalities are commonly limited to individual signal processing modules that are used locally to solve specific needs or added on top of the networking stack. These implemented models are usually standalone and lack an online end-to-end optimization process. To advance beyond the current state of the art, 6GARROW will showcase key architectural innovations and validate novel AI/ML solutions for improved device performance and optimized RAN and Core. These platforms will also enable an open interface for customer-driven application development, implementation, integration, and testing of testbeds for functional demonstrations. Four demonstrations have been planned as part of the project, specifically:

- **Demonstration 1:** “Semantic-aware device-edge co-inference" [FhG]
- **Demonstration 2:** “6G cross-domain network intelligence framework” [ETRI]
- **Demonstration 3:** “Physical layer AI/ML techniques” [ROK]
- **Demonstration 4:** “AI/ML based CSI and CQI compression” [CEA]

The planned activities will serve to demonstrate key aspects of the 6GARROW architecture jointly developed in WP2 and WP5. The focus will be on the framework for edge learning and inference on RAN, which includes aspects of semantic-enabled RAN, inference orchestration and model management. The objective is to incorporate several functional requirements that stem from the key

challenges associated with edge learning and inference, such as, e.g., resource constraints, scalability and heterogeneity, orchestration of intelligence, and decentralized learning.

EU-KOR collaborative effort is centered around a PoC demonstrator, which is intended to showcase the successful integration and implementation of the innovative 6G and AI technologies developed throughout the project. The demonstrator builds on the joint efforts, knowledge, and expertise of the European and Korean partners, reflecting the strong collaboration and synergy achieved within 6GARROW. Following the initial definition of this vision in D6.1, the work has now progressed toward concrete technical planning and early coordination activities for an intercontinental Private 5G PoC. The current status of the planned proof of concept, including its architectural design, connectivity approach, and implementation roadmap, is presented in Sections 4.1.1 and 4.1.2.

3.2 Standardisation and regulation activities

Several partners of the 6GARROW project consortium are actively contributing to the 3GPP standardisation process towards 6G. Within 3GPP, Study Items (SIs) and Work Items (WIs) are being conducted to systematically establish the normative foundations for a first 6G specification release, currently targeted for the mid to end of 2029 timeframe.

On the European side, the 6GARROW partners actively participating in 3GPP include Fraunhofer, Orange, Intel, and HPE, while on the Korean side, LG Electronics (LGE) and ETRI are engaged in relevant standardisation activities. Through their involvement across multiple Technical Specification Groups and Working Groups, these partners contribute directly to shaping the technical direction of future 6G systems.

Within the 3GPP 6G standardisation effort, different working groups address complementary aspects of “AI for networks” and “networks for AI”, both of which are highly relevant to the objectives of the 6GARROW project. AI-related studies and work items are distributed across the Service and System Aspects (SA), Radio Access Network (RAN), and Core Network and Terminals (CT) Technical Specification Groups, reflecting the increasingly cross-domain role of AI/ML in future mobile systems.

3.2.1 Overview of AI/ML Activities Across 3GPP Working Groups

Across 3GPP, AI/ML has evolved from supporting a limited number of isolated use cases—such as NWDAF-based analytics in the core network or AI-assisted beam management in the RAN—into a multi-layer, cross-domain capability. Today, AI/ML spans system architecture, radio optimisation, model lifecycle management, service exposure mechanisms, and protocol support, forming a central pillar of future network evolution.

The 5G and 5G-Advanced agenda items (Releases 17 to 20) primarily focus on integrating AI/ML into the existing 5G System (5GS) architecture. These activities enhance NR behaviour and introduce standardised mechanisms for model transport, management, and analytics, while maintaining compatibility with the established 5G design principles. As such, AI/ML is incorporated as an enabling capability that augments, rather than fundamentally restructures, the 5G system.

In contrast, the 6G-oriented agenda items (Releases 19 and 20) extend these developments towards a more AI-native system design. This includes cross-domain AI integration across network and application layers, consistency alignment of AI/ML concepts and terminology across working groups, AI-assisted mobility and slicing, integration of sensing functions, direct AI-based positioning, application-layer AI enablers, and explicit support for federated learning. These efforts collectively aim to move beyond incremental enhancements and instead prepare a system architecture in which AI is a native and pervasive component. The following sections provide a structured overview of the

relevant AI/ML-related study and work items across the 3GPP working groups, highlighting the distinction between 5G/5G-Advanced evolution and the foundational activities shaping future 6G systems.

3.2.1.1 TSG SA – Service & System Aspects

3.2.1.1.1 SA1 – Service Requirements

In SA1, the 5G and 5G-Advanced work focuses on defining service-level requirements for AI/ML model transfer and usage within the 5G System. Studies such as FS_AIML_MT and its subsequent normative work item AIML_MT establish requirements for transferring models, gradients, and inference-related data within 5GS, as documented in TR 22.874. Phase-2 studies further refine these requirements by considering distributed and federated learning models and by characterising KPI and traffic impacts relevant to Release-19 use cases.

For 6G-oriented work, SA1 shifts towards system-wide consistency and long-term alignment. The FS_AIML_CAL study (TR 22.850) addresses AI/ML consistency alignment across 3GPP working groups. Its objective is not to introduce new 5G features, but to harmonise terminology, architectural assumptions, and functional AI/ML models, thereby establishing coherent requirements baseline suitable for AI-native 6G systems.

3.2.1.1.2 SA2 – System Architecture

Within SA2, 5G and 5G-Advanced activities concentrate on architectural enablers that allow AI/ML-based services to operate over the existing 5GS. The FS_AIMLsys study and the subsequent AIMLsys work item define how AI/ML services interact with the core network through application functions, data paths, QoS handling, and service exposure mechanisms. These efforts are reflected in TR 23.700-80 and result in enhancements to core specifications such as TS 23.501, TS 23.502, and TS 23.288, particularly with respect to model distribution, data acquisition, and NWDAF integration.

The 6G-oriented architectural work in SA2 moves beyond incremental enhancements. Studies such as FS_AIML_CN (TR 23.700-84) and the AIMLAPP series (TR 23.700-82 and TR 23.700-83) explore architectures that support cross-domain AI coordination, vertical federated learning, and AI-native service behaviour. These activities also introduce concepts such as application-layer AI/ML fabrics, direct AI-based positioning, and multi-entity, model-driven control loops, all of which are considered essential building blocks for future 6G systems.

3.2.1.1.3 SA3 – Security & Privacy

SA3 addresses the security implications of introducing AI/ML into 5GS. For 5G and 5G-Advanced, studies such as *FS_AIML* (TR 33.898) and *FS_NR_AIML_NGRAN_SEC* (TR 33.877) analyse threat models related to AI/ML-based services and RAN-embedded intelligence. These studies cover aspects such as data confidentiality, model integrity, inference privacy, and robustness against adversarial behaviour.

At present, there are no dedicated 6G-specific AI/ML SIDs or WIDs in SA3. Nevertheless, the security and privacy considerations developed in these studies directly support 6G-oriented work emerging in SA1, SA2, and RAN, particularly where AI-native architectures and cross-domain learning are envisaged.

3.2.1.1.4 SA4 – Codecs & Media

In SA4, AI/ML-related work for 5G and 5G-Advanced is exemplified by the FS_AI4Media study (TR 26.944 family). This work focuses on interoperability requirements for AI-based media coding, upscaling, enhancement, and quality-of-experience optimisation within the 5G media frame-work.

Although there is no explicitly branded 6G AI/ML study in SA4, the concepts developed for AI-assisted media processing provide important input to broader 6G application-layer discussions, particularly those addressing immersive and data-intensive services.

3.2.1.1.5 SA5 – Management, Orchestration & Analytics

SA5 plays a central role in operationalising AI/ML within 5GS. For 5G and 5G-Advanced, the FS_AIML_MGMT study (TR 28.908) and the AIML_MGMT work item (TS 28.105) define management services for the AI/ML model lifecycle, including model registration, validation, deployment, and monitoring. These capabilities are closely integrated with NWDAF and model-driven analytics frameworks.

The 6G-oriented evolution of this work is captured in FS_AIML_MGMT_Ph2 (TR 28.858) and TR 28.882, which extend AI/ML lifecycle management across RAN, core network, OAM, and application domains. These studies introduce management support for federated learning, sustainability and efficiency metrics, and multi-actor AI lifecycle flows, representing a key stepping stone towards AI-native automation architectures envisioned for 6G.

3.2.1.1.6 SA6 – Application Enablers

For 5G and 5G-Advanced, SA6 primarily focuses on traditional vertical application layer (VAL) and XR-related enablers, without a dedicated AI-only work item.

In contrast, the 6G-oriented agenda introduces explicit AI/ML application enablers through FS_AIMLAPP and AIMLAPP Phase-2. These studies define mechanisms for exposing AI/ML services to applications and third parties, as well as for managing the lifecycle of application-embedded AI clients. This enables distributed inference and training scenarios that align with the service and deployment models anticipated for 6G.

3.2.1.2 TSG RAN – Radio Access Network

3.2.1.2.1 RAN1 – Physical Layer

In RAN1, 5G and 5G-Advanced activities focus on AI/ML support at the physical layer, as captured in FS_NR_AIML_air (TR 38.843). This work addresses AI-assisted CSI feedback, beam management, and positioning, and defines PHY-level data structures and processing chains suitable for training and inference.

The 6G-oriented continuation of this work is addressed in NR_AIML_air_Ph2 (Rel-19). This phase expands the scope to multi-actor AI involving both UEs and gNBs, richer CSI compression models, and enhanced AI-driven mobility and sensing. These developments are widely viewed as foundational elements for AI-native 6G air-interface designs.

3.2.1.2.2 RAN2 – Radio Protocols & Mobility

RAN2 contributes to 5G and 5G-Advanced AI/ML work by analysing the signalling implications of AI-assisted air-interface operation. This includes RRC and PDCP procedures for data collection, reporting, configuration, and AI model activation, largely in support of the RAN1 studies.

For 6G-oriented work, RAN2 leads the study on AI/ML for mobility in NR (TR 38.744). This work explores AI-based handover, cell selection, and mobility prediction, and identifies candidate mechanisms that could support autonomous mobility management in future 6G systems.

3.2.1.2.3 RAN3 – Architecture & Interfaces

RAN3 establishes the architectural framework for RAN intelligence. In 5G and 5G-Advanced, this is formalised through NR_AIML_NGRAN (TR 37.817) and the associated normative updates to XnAP, E1, and F1 interfaces. These specifications define functional entities such as data collection functions, inference engines, and actors, along with standardised information exchange procedures across NG-RAN interfaces.

The 6G-oriented enhancements to this framework focus on extending AI/ML support to slicing, coverage and capacity optimisation, and multi-RAT coordination. These efforts aim to prepare the NG-RAN architecture for AI-native behaviour, including multi-entity coordination and dynamic cross-layer optimisation.

3.2.1.2.4 RAN4 – RF, Performance & Test Specifications

In RAN4, 5G and 5G-Advanced work addresses the performance evaluation and conformance testing of AI-based PHY and RF features, particularly those associated with CSI processing, beam selection, and positioning. This includes test methodologies, robustness requirements, and data-collection specifications.

For 6G-oriented studies, RAN4 contributes to NR_AIML_air_Ph2 and the mobility-AI work in TR 38.744, while also addressing emerging AI-enhanced sensing and non-terrestrial network scenarios. These efforts help define performance requirements that support the transition towards 6G RAN capabilities.

3.2.1.3 TSG CT – Core Network & Protocols

TSG CT does not initiate standalone AI/ML studies or work items. Instead, CT1 to CT4 ensure that core network and transport protocols support the requirements defined in SA and RAN groups.

For 5G and 5G-Advanced, this includes protocol updates triggered by AIMLsys, AIML_MGMT, and NR_AIML_NGRAN-Core, affecting NAS, service-based interfaces, OAM protocols, and transport mechanisms to support model transfer, analytics, management, and service exposure.

For 6G-oriented work, CT discussions have begun on protocol support for application-layer AI/ML enablers and federated learning interfaces, as well as extended data-transport models. These discussions aim to ensure protocol-level alignment with the cross-domain AI control loops envisioned in future 6G architectures.

3.2.2 Summary

The evolution of AI/ML within 3GPP follows a clear and structured trajectory. 5G and 5G-Advanced enhance the existing 5G System with AI-friendly capabilities, including model transfer and management, RAN intelligence frameworks, AI-assisted mobility optimisation, and media-related AI support.

In parallel, 6G-oriented activities introduce cross-domain AI frameworks, unified architectural principles, federated learning support, application-layer AI fabrics, and advanced AI-enabled PHY and MAC functions. Together, these efforts extend the 5G ecosystem while simultaneously laying the technical and architectural foundations for AI-native 6G systems.

3.3 Innovation Management

Innovation management in the 6GARROW project is implemented in full alignment with the Consortium Agreement and the Horizon Europe Grant Agreement, providing a structured, transparent, and legally sound framework for the creation, protection, dissemination, and exploitation of results. The Consortium Agreement, negotiated and signed by all parties, defines clear rules governing ownership of results, joint ownership, access rights, and the exploitation and dissemination of foreground and background, thereby safeguarding the legitimate interests of all

partners while enabling effective collaboration. The project's intellectual property rights (IPR) strategy is designed to balance openness and protection: it prioritises open innovation to promote collaboration, knowledge sharing, and co-creation among partners and relevant external stakeholders, while ensuring that key inventions and commercially relevant developments are appropriately protected through patenting. Innovation-related decisions, including those concerning results management, dissemination, and exploitation pathways, are coordinated through the established project governance bodies, in particular the General Assembly. Publication and dissemination procedures are applied to ensure scientific openness while protecting confidential information and patentable results through prior notification and objection mechanisms. The strategy further foresees licensing of project results to support technology transfer, the use of appropriate copyright and software licensing models, and, where relevant, material transfer agreements to regulate the use of research materials. Collectively, this framework ensures that innovations generated within the project are systematically managed from conception to exploitation, supporting both scientific impact and potential industrial uptake while remaining fully compliant with the contractual obligations of the consortium.

3.3.1 Consortium agreement

The *6GARROW Consortium Agreement* establishes the contractual framework governing the collaboration among the project partners for the Horizon Europe Research and Innovation Action "6G AI-Native Integrated RAN-Core Networks (6GARROW)". Based on the DESCA model consortium agreement, it defines the organisation of work, governance structure, decision-making procedures, financial arrangements, intellectual property rights, access rights, dissemination rules, confidentiality obligations, liability, and dispute resolution mechanisms, in alignment with the Horizon Europe Regulation and the Grant Agreement. The agreement designates CEA as the Coordinator and sets the General Assembly as the highest decision-making body, while clearly allocating responsibilities and rights among beneficiaries and associated partners.

The Consortium Agreement entered into force on the project start date and has been formally signed by all parties, with the signature process completed on 12 December 2025, thereby ensuring a legally binding basis for the effective implementation and management of the 6GARROW project.

3.3.2 Open-Source Code contribution from Orange

Towards the open access strategies of 6GARROW, the code of the paper "Compacting Semantic Matryoshka Representations with Product Quantization", accepted at the 2025 IEEE Globecom Workshops on AI native Communications Systems-towards Integrated Intelligent and Highly Efficient Communications Systems has been open-sourced by Orange and available at: https://github.com/Orange-OpenSource/MRL_with_PQ

3.3.3 Intellectual Property Rights (IPR)

During the first reporting period, the majority of intellectual property results generated within the 6GARROW project originated from the Korean partner(s). These outcomes reflect research contributions in advanced wireless communication techniques and security mechanisms and demonstrate the potential for further exploitation beyond the project duration.

3.3.3.1 Domestic Patent Applications (Republic of Korea)

1. Wireless Resource Optimization Algorithm Based on Conditional Probability Injection Timing in Diffusion Models

- Inventors : Seong-Lyun Kim, Jinhyuk Choi
- Application No.: 10-2024-0199950
- Filing Date: 27 December 2024

2. Adversarial Attack Defense Method for Semantic Communication Systems

- Inventors: Seong-Lyun Kim, Mingyu Jin
- Application No.: 10-2024-0173823
- Filing Date: 28 November 2024

3.3.3.2 International Patent Application (PCT)

1. Wireless Resource Optimization Algorithm Based on Conditional Probability Injection Timing in Diffusion Models
- Inventors: Seong-Lyun Kim, Jinhyuk Choi
- Application No.: PCT/KR2024/021411
- Filing Date: 27 December 2024

3.4 Advisory board

3.4.1.1 Inaugurating Strategic Guidance

In the inaugural year of the 6GARROW project, we have assembled a distinguished Advisory Board (AB) comprising external experts from pivotal sectors. The AB includes:

- AI Manufacturing: Mr. Kuntal Chowdhury, NVIDIA
- Telecommunications: Mrs. Yaning Zou, Nokia
- Standardization: Mrs. Muriel Deschanel, ETSI
- Academia: Mr. Tony Quek, Singapore University of Technology and Design (SUTD)

Notably, the AB upholds gender parity, reflecting our commitment to diversity and inclusion.

The AB convened for its first virtual meeting on September 22, 2025. During this session, the management team was introduced, and the project's objectives, expected impact, and the AB's role were outlined. The AB's responsibilities include:

- Strategic Guidance: Steering the project's direction to align with scientific, technological, industrial, and societal priorities.
- Expert Feedback: Providing insights on key activities, results, or challenges presented during meetings.
- Trend Analysis: Sharing perspectives on emerging trends and opportunities to maximize the project's impact.
- Advocacy: Acting as ambassadors to foster connections with relevant communities, initiatives, and stakeholders.

The project has delivered a summary of its first-year results, consolidating the key findings from the initial technical deliverables. This document provides an accessible overview of the defined use cases, initial architecture, and research directions for AI/ML-driven enhancements across devices, RAN, and Core networks. It serves as an important communication tool to engage the AB and external stakeholders, ensuring that early outcomes are clearly presented and that feedback can be incorporated into the next phases of the project.

3.4.1.2 Engagement and Interaction

The 6GARROW project and the AB will interact through annual or biannual meetings, focusing on:

- Reviewing key results or demonstrators
- Ensuring project outcomes align with industry, academic, and standardization trends
- Discussing upcoming challenges and opportunities

3.4.1.3 Expected Contributions

Throughout the project, the AB is expected to:

- Identify dissemination opportunities (conferences, workshops, policy initiatives)

- Optionally, provide concise written input for strategic sections of public deliverables or white papers

By collaborating with the Advisory Board, the 6GARROW project seeks to harness expertise from diverse industries and sectors. This engagement ensures that the project's direction, results, and potential impact are in sync with industry best practices, standards, and regulatory requirements, driving meaningful progress and innovation.

4 International cooperation

The 6GARROW project is committed to fostering strong international collaboration to accelerate advancements in 6G AI-native networks. By leveraging cross-continental partnerships, the project ensures a global perspective on next-generation wireless technologies, integrating expertise from both the EU and ROK. This collaboration is built upon the success of previous EU-ROK research initiatives and extends their impact through joint research, technology validation, and standardization efforts. A key focus of the project is to enhance interoperability, scalability, and AI-driven optimization in future wireless networks through coordinated activities, including joint Proof-of-Concept (PoC) demonstrations, data-sharing frameworks, and participation in high-profile international events. The following subsections outline the specific EU-ROK cooperation initiatives and the project's role in global knowledge dissemination through key industry and academic events.

4.1 EU-KR cooperation

The 6GARROW project follows an innovative four-phase methodology, as shown in the figure below, designed to address problems identification and the demonstration of solutions while fostering international cooperation between EU and ROK in phase 4, starting at M19. Whereas this report was issued at M12, the cooperation has already started and produced results.

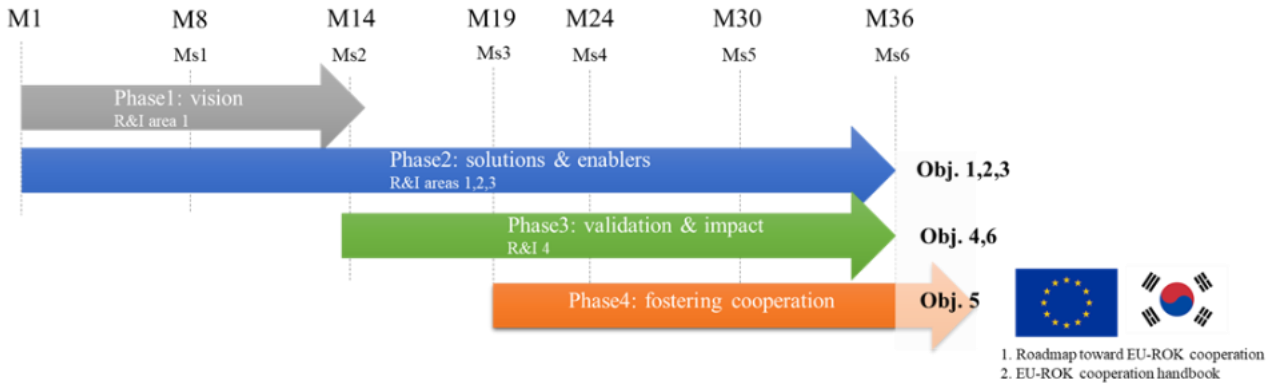


Figure 5. 6GARROW's four-phase methodology.

The project's Objective 5, which focuses on fostering collaboration between EU and ROK, ensures that this international partnership remains a central priority throughout the project's implementation. The status of this objective (Expected Results – ERs) is as follows:

ER5.1: Exchange of best practice and lesson learned in European and Korean prototyping, lab trials and proof of concept (PoC).

We have initiated the PoC work and exchanged details on the test-network configurations.

ER5.3: Establishment of mutual understanding and trust among European and Korean academics, industry, telecom operators to promote future collaborations in 6G and future networks markets.

- 6GARROW gathers four partners from ROK – two academics, one research center and one industrialist – and eight partners from EU – three academics, two research centers and three industrialists.
- From its earliest stages, the project was shaped through joint efforts by ROK and EU partners. The Description of Work (Part B) is the result of a closely coordinated effort between EU and ROK partners, whose combined contributions ensure a coherent intercontinental project.
- To strengthen this joint effort, an EU-ROK Coordination Agreement is now being prepared.
- Regular WP meetings brought together participants from both continents, supporting the project's goal of building trust and shared understanding among European and Korean stakeholders.
- The project's kick-off meeting in Grenoble and the second face-to-face meeting in Seoul provided valuable in-person exchanges, reinforcing collaboration and confidence between EU and ROK teams.
- The project organized a workshop at GLOBECOM 2025 featuring speakers and committee members from both Europe and Korea, further reinforcing its collaborative and intercontinental dimension.
- Industrial partners within the consortium actively exchanged their perspectives and jointly discussed the future of B5G networks, strengthening the project's shared vision and roadmap.

ER5.4: Joint EU-ROK publications in international journals and conferences.

A joint EU–Republic of Korea paper entitled "AI-Native 6G Networks: The 6GARROW Integrated Device-Network Approach" was published at the 2025 Joint European Conference on Networks and Communications & 6G Summit (EuCNC/6G Summit). The paper presents the 6GARROW vision and system architecture for AI-native 6G networks, highlighting the integration of device- and network-level intelligence, AI-native radio access networks, and semantic communication. It also outlines key technological enablers, demonstration activities, and the European regulatory and market context relevant to AI-enabled 6G systems, showcasing the collaborative research outcomes of the EU–ROK partnership within the project.

Further possibilities of joint publications were discussed at the plenary meeting in Seoul in December.

ER5.5: Publication in social media and dedicated website.

6GARROW's communication efforts aim to actively promote collaboration between the European Union and the Republic of Korea, both online through our website and social media platforms, as well as at various scientific events. By providing regular updates, insights, and opportunities for collaboration, the project aims to build a strong network of support and drive impact within the global 6G ecosystem.

The communication goals set for the 6GARROW project in Deliverable D6.1 – Dissemination, standardisation and communication plans, and project website were as follows:

- 30 posts on social media, minimum 10 per year
- 6 press releases, minimum 2 per year
- Organisation of 3 technical workshops, special sessions, tutorials, etc., minimum 1 per year

By the end of the first year of the project, 6GARROW has published over 25 posts on both LinkedIn and X, totalling over 50 posts — five times the promised amount. These posts have driven traffic to the website and helped the project build a following on both platforms to effectively disseminate the project's progress and results. In addition, the website itself has been updated regularly with new deliverables, news highlights, events, newsletters, and media mentions, ensuring a steady flow of traffic to the website and strong visibility on search engines.

ER5.6: Press releases.

During its first year, 6GARROW published two press releases on the project website, which resulted in mentions on other news platforms, such as SNS JU Project News. Other notable media highlights include articles in SNS-JU Journal 2025, Nature Reviews Electrical Engineering, 6G Waves Magazine issue 9, and 6G Waves Magazine issue 11.

ER5.7: EU-ROK co-organization of workshops and schools.

- The project organized a full-day workshop at GLOBECOM 2025 (Taipei, December) featuring speakers and committee members from both Europe and Korea, further reinforcing its collaborative and intercontinental dimension.
- On 5 December 2025, the 6GARROW consortium co-organised the AI-RAN Summit in Seoul, Republic of Korea, hosted at Yonsei University, held in conjunction with the face-to-face meeting in Seoul. The summit was jointly organised by the Ministry of Science and ICT (MSIT), the AI Network Alliance (AINA), Yonsei University, and participating research projects, including 6GARROW, and aimed to foster global industry–academia–research cooperation on AI-RAN as a core technology for AI-native and 6G networks.

4.1.1 Intercontinental PoC between EU and ROK partners: Joint testbed system and experimental evaluation of the key AI/ML concepts

At the conclusion of the project, a joint intercontinental Proof-of-Concept (PoC) demonstrator will be realized through collaboration between European Union (EU) and Republic of Korea (ROK) partners. The PoC will be based on a demonstrator that brings together selected technical results developed during the project, with the objective of illustrating their joint implementation and operation.

The demonstrator will reflect the combined contributions, expertise, and coordinated efforts of EU and ROK partners, highlighting the collaborative nature of the project. It will serve as a common platform to present the integration of the 6G- and AI-related technologies developed within the project, as implemented by the participating partners.

The PoC will provide a tangible outcome of the EU–ROK collaboration achieved during the project and will act as a joint demonstration of the project results at its final stage.

4.1.2 Status of the Planned Proof of Concept

Aalto University (Finland) and Yonsei University (Republic of Korea) have initiated technical discussions and early coordination work to realize an international Private 5G proof-of-concept (PoC). The planned PoC aims to interconnect experimental infrastructures across Europe and Korea and to serve as a foundation for future research on AI-Native RAN and Core network architectures.

The envisaged PoC architecture is based on a 3GPP-compliant O-RAN deployment, comprising a Nokia O-DU, Samji O-RU, and a CMC/Yberg 5G Core, operating in the n79 band (4.7 GHz) for Private 5G use. The initial target is to interconnect the Korean and Finnish sites to demonstrate cross-border Private 5G operation.

From a connectivity perspective, the partners have explored alternative approaches for inter-site integration, including the use of secured VPN-based connectivity and conventional IP networking over public research and education networks between Seoul and Helsinki. As a first step, a WireGuard-based VPN tunnel between Aalto University and Yonsei University is under preparation. This setup is intended to support early functional testing scenarios, including local breakout configurations, where the 5G Core is hosted at Yonsei University while user equipment (UE) is connected to a gNB located at Aalto University, with User Plane Function (UPF) allocation at the Finnish site. In parallel to these activities, the final PoC will demonstrate central aspects of the

architectural framework for edge learning and inference developed in WP2 and WP5, by integrating key functionalities from **Demonstration 1-4**, in collaboration with FhG, ETRI ROK and CEA, as discussed in Section 3.1.

At the time of reporting, the activity remains at the preparatory and design stage, focusing on architectural alignment, interface feasibility, security considerations, and regulatory constraints for international spectrum use and cross-border user-plane handling. No public demonstrations or performance evaluations have yet been conducted. The PoC is planned as a stepping stone toward more advanced experimentation on AI-assisted core functions and distributed intelligence within the EU–ROK 6G research framework.

The technical implementation details, experimental results, and validation outcomes of the PoC will be documented and reported in the upcoming WP5 technical deliverables.

4.2 International events

In line with its dissemination objectives, the 6GARROW project actively participated in high-profile international events to present project activities and intermediate results and to engage with the global scientific and industrial community. Beyond the co-organised AI-RAN Workshop and the 6GARROW Workshop at IEEE GLOBECOM 2025 (described in Sections 2.2.7.4.1 and 2.2.7.4.2), the consortium also contributed to industry-focused innovation events to ensure broad visibility of project outcomes. In addition, 6GARROW was promoted at the Yonsei University booth during IEEE GLOBECOM 2025, further increasing the project's visibility among conference participants and facilitating direct interaction with the international research community.

In particular, 6GARROW was represented at Orange OpenTech 2025, held on 18–20 November, which featured three days of technology-focused activities including research and innovation demonstrations, keynotes, and technical talks delivered by Orange and its partners. Contributors from Orange involved in 6GARROW delivered a Deep Dive talk on Semantic Communications and Agentic AI, highlighting the project's research directions and their relevance for future AI-native and 6G communication systems.

5 Conclusion

This document presents an overview of the dissemination, communication, standardisation, and exploitation activities carried out by the 6GARROW project during its first reporting period. It summarises the main achievements across key areas, including stakeholder engagement, scientific and technical dissemination, event participation and organisation, standardisation-related activities, and international cooperation, thereby providing an indication of the project's initial reach and visibility within the European and global 6G research and innovation ecosystem.

Furthermore, the document includes a preliminary evaluation of the dissemination and communication key performance indicators, using the reported quantitative results as a reference baseline against the targets defined in Deliverable D6.1. The outcomes demonstrate that the project is progressing in line with the planned objectives, while also identifying aspects that will require continued monitoring and coordination by the consortium to ensure that dissemination, communication, and standardisation activities remain effective and aligned with the overall project goals throughout the project lifetime.

References

[6GWAVES9] 6G Waves Magazine, Issue 9 “University of Oulu expands 6G collaboration with South Korea”, Accessed on 27/11/2025 [Online] Available: https://oulurepo.oulu.fi/bitstream/handle/10024/53098/nbnfioulu-202412097125.pdf

[6GWAVES11] 6G Waves Magazine, Issue 11 “AI”,-RAN momentum builds and it might be time to pay attention”, Accessed on 18/12/2025 [Online] Available: https://oulurepo.oulu.fi/bitstream/handle/10024/59464/nbnfioulu-202511216857.pdf

[BROCHURE] 6GARROW brochure on 6GARROW website, Accessed on 28/11/2025 [Online] Available: https://6garrow.com/wp-content/uploads/2025/11/6garrow-brochure-a5-web.pdf

[DATABOX] The Databox Blog “Average Session Duration: Industry Benchmarks & 10 Pro Tips on How to Improve It”, Accessed on 27/11/2025 [Online] Available: https://databox.com/average-session-duration-benchmark

[LINKEDIN] 6GARROW LinkedIn page, Accessed on 27/11/2025 [Online] Available: https://www.linkedin.com/company/106012296/

[NEWSLETTER1] 6GARROW Newsletter #1, Accessed on 18/12/2025 [Online] Available: https://sh1.sendinblue.com/vtr4rtzlxpfe.html?t=1758701824253

[NEWSLETTER2] 6GARROW Newsletter #2, Accessed on 18/12/2025 [Online] Available: https://sh1.sendinblue.com/w26jftzlxpfe.html?t=1766047751202

[NREE] Nature Reviews Electrical Engineering “AI network-related research and education at Yonsei University”, Accessed on 27/11/2025 [Online] Available: https://www.nature.com/articles/s44287-025-00219-w

[PRESS1] 6GARROW press release “6GARROW Advances Towards AI-Native 6G Networks with Release of First Technical Deliverables”, Accessed on 27/11/2025 [Online] Available: https://6garrow.com/wp-content/uploads/2025/11/6GARROW-press-release-051125.pdf

[PRESS2] 6GARROW press release “A High-Momentum End to the Year for 6GARROW”, Accessed on 28/12/2025 [Online] Available: https://6garrow.com/wp-content/uploads/2025/12/6GARROW-press-release-171225.pdf

[SNSJOURNAL25] SNS JU Journal 2025 article “6GARROW”, Accessed on 27/11/2025 [Online] Available: https://smart-networks.europa.eu/sns-journal-2025/#sns-journal-2025-catalogue/206/

[SNSJUNEWS] SNS JU Project News, 12 November 2025 “6GARROW Project Publishes First Technical Deliverables – Advancing AI-Native, Energy-Aware 6G Networks”, Accessed on 27/11/2025 [Online] Available: https://smart-networks.europa.eu/6garrow-project-publishes-first-technical-deliverables-advancing-ai-native-energy-aware-6g-networks/

[X] 6GARROW X page, Accessed on 27/11/2025 [Online] Available: https://x.com/6GARROW/

[ZENODO] 6GARROW Zenodo community records, Accessed on 27/11/2025 [Online] Available: https://zenodo.org/communities/6garrow/records