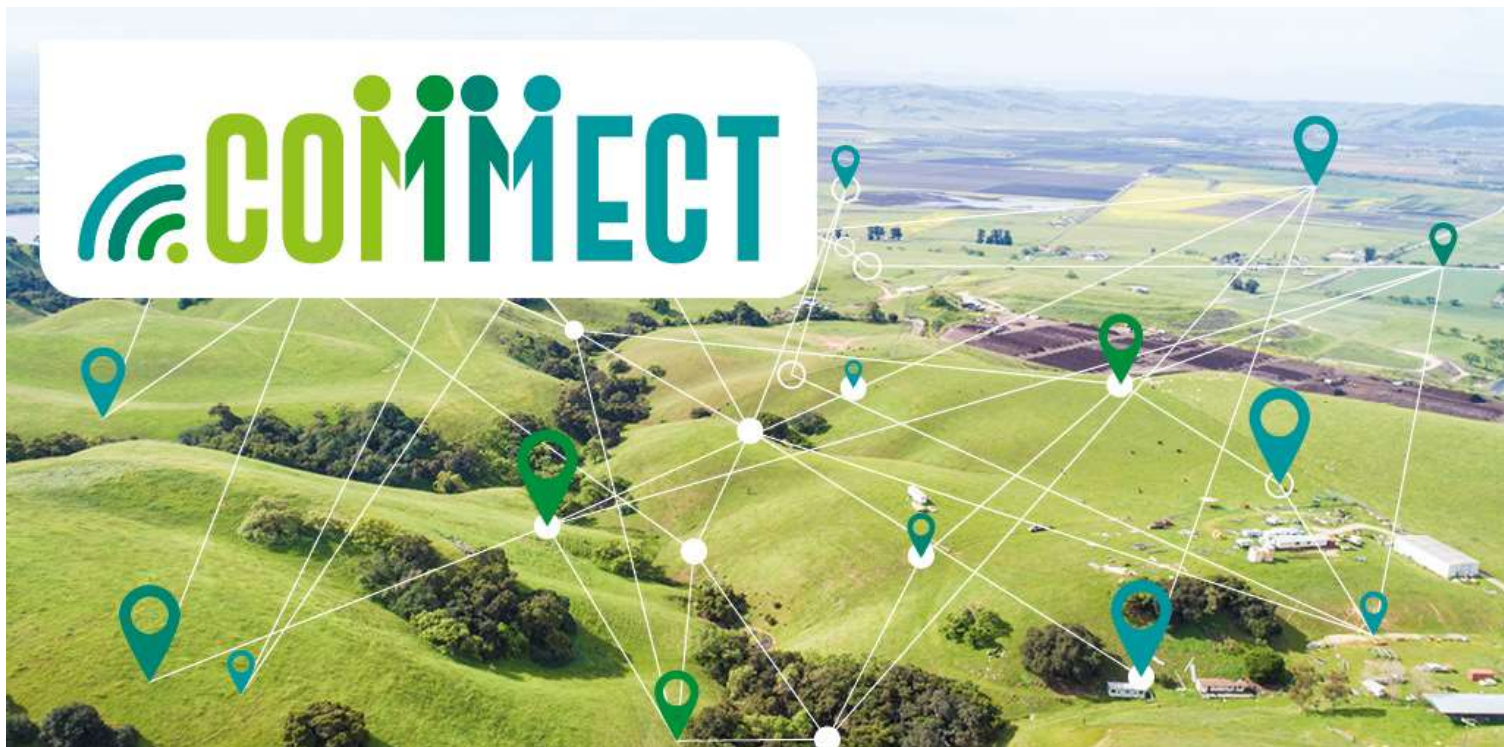


**Bridging the digital divide and addressing  
the need of Rural Communities with  
Cost-effective and Environmental-Friendly Connectivity Solutions**



**Deliverable 6.4**

**Report on Technical Exploitation and Standardisation**

**Version 1**

**February 2024**

**PUBLIC**



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WP6 Dissemination, Exploitation and Standardisation

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## COMMECT Project Abstract



Over the last few years, the importance and need for broadband and high-speed connectivity have constantly increased. The Covid-19 pandemic has even accelerated this process towards a more connected society. But this holds mainly true for urban communities. In Europe, a 13% lack of access persists and mainly concerns the most rural and remote areas. Those are the most challenging to address since they are the least commercially attractive. COMMECT aims to bridge the digital divide by providing quality, reliable, and secure access for all in rural and remote areas. The **goal of extending broadband connectivity in rural and remote areas** will be achieved by *integrating Non-Terrestrial Networks with terrestrial cellular XG networks, and low-cost Internet of Things (IoT). Artificial intelligence, edge, and network automation will reduce energy consumption both at the connectivity and computing levels.*

A **participatory approach** with end-users and ICT experts working together on development challenges will be the key to **the sector's digitalisation**. To ensure the rich exchange of best-practice and technical knowledge among the actors of the agro-forest value chain, COMMECT will set up five Living Labs across and outside Europe, where end-users' *"pain" and (connectivity) "gains" will be largely discussed, from different perspectives.*

COMMECT aims to contribute to a balanced territorial development of the EU's rural areas and their communities by making smart agriculture and forest services accessible to all. COMMECT will facilitate that by developing a decision-making support tool that is able to advise on the best connectivity solution according to technical, socio-economic, and environmental considerations. This tool, incorporating collaborative business models, will be *a key enabler for jobs, business, and investment in rural areas and for improving the quality of life in areas such as healthcare, education, and e-government, among others.*

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## Executive Summary

The COMMECT project aims to empower rural communities using innovative services leveraging on sustainable communication solutions. The goal of extending broadband connectivity in rural and remote areas will be achieved by integrating different cellular XG networks and low-cost Internet of Things (IoT). Artificial intelligence, edge, and network automation will reduce energy consumption at both the connectivity and computing levels. The exploitation and standardisation approaches are built upon the main activities carried in all work packages, from WP1 to WP5. Each COMMECT partner has its business planning processes for exploiting the COMMECT results. COMMECT will explore and engage in different activities to accelerate the exploitation of results. All these COMMECT's activities will be planned and implemented in the Living Labs (LLs) involving academic, industry, and stakeholder partners.

The second purpose of this document is to present the current standardisation and other alliance activities to identify the potential services, products or tools. The exploitation plan also includes activities or results to be carried out after or beyond the scope of the project.

This report constitutes deliverable D6.4 of the COMMECT project. It presents the results of T6.3 'Exploitation and Standardisation (M1-M36)' task activities according to the D6.2 'Dissemination, Communication and Exploitation Plan'.

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## Glossary of Terms

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<b>3GPP</b>	Third Generation Partnership Project
<b>AIOTI</b>	The Alliance for the Internet of Things Innovation.
<b>DST</b>	Decision-Making Support Tool
<b>ETSI</b>	European Telecommunications Standards Institute
<b>ICP</b>	Intelligent Connectivity Platform
<b>ITU</b>	International Telecommunication Union
<b>ITU-T</b>	ITU - Telecommunication Standardisation Sector
<b>LL</b>	Living Lab
<b>NES</b>	Network Energy Saving
<b>NGMN</b>	Next Generation Mobile Networks
<b>NTN</b>	Non-Terrestrial Network
<b>RAN</b>	Radio Access Network
<b>SNS-JU WG</b>	Smart Network and Services Joint Undertaking Working Group
<b>TDoc</b>	Temporary Document
<b>TMForum</b>	TeleManagement Forum
<b>ZSM</b>	Zero-touch network and Service Management



## 1. Introduction

This deliverable aims to share the results of activity T6.3, 'Exploitation and Standardisation (M1-M36)', during the first 18 months of the COMMECT project, in line with the exploitation plan presented at M6 in Deliverable D6.2 "Dissemination, Communication and Exploitation Plan". The first version of the technical exploitation and standardisation deliverable reports the activities in targeted standardisation bodies and industries to influence standards development.

For all projects funded by the European Commission under the Horizon Europe program, beneficiaries are requested to engage in dissemination and exploitation activities, which extend the reach of the research carried out during the project to encompass the whole society. In this respect, dissemination is the public diffusion of the results by appropriate means, other than resulting from protecting or exploiting the results, including by publications and COMMECT dissemination activities are presented in D6.3 'Report on Dissemination and Communication Activities' deliverable. Exploitation is expected to take measures for direct or indirect usage of results for commercial purposes or in public policymaking by performing further research activities, developing, or marketing products or processes, creating services and contributing to standardisation.

One of the objectives of T6.3, 'Exploitation and Standardisation (M1-M36)', is to ensure that the approach adopted by COMMECT is applicable to a service to be placed on the market. For this purpose, it is essential that the proposed COMMECT results are presented into the relevant standardisation bodies and industry fora.

## 2. Standardisation Activities

The primary purpose of the standardisation activities in COMMECT is to support the use, adaptation, and impact of standards contribution of the project. COMMECT partners have been contributing as members of various standardisation bodies by promoting the insights and results to achieve COMMECT standardisation objectives defined in D6.2 “Dissemination, Communication and Exploitation Plan” deliverable [1]. These activities promote the COMMECT outcomes to targeted standardisation development organisations and industry in order to influence the development of standards.

COMMECT aims to facilitate decision-making in selecting the most appropriate Internet connectivity. One of the most critical points is to ensure that the approach adopted by COMMECT is applicable to a service or a product to be placed on the market. It is expected that COMMECT will provide contributions to SDOs and alliances like the 3rd Generation Partnership Project ([3GPP](#)) and the Next Generation Mobile Networks ([NGMN](#)). This section identifies the alliances’ area of interest, and the current state of the standardisation contributions by the COMMECT project.

### 2.1 3GPP

3GPP unites seven telecommunications standard development organisations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as organisational partners providing their members with a stable environment to produce the reports and specifications that define 3GPP technologies. 3GPP specifications cover cellular telecommunications technologies, including radio access, core network and service capabilities, which provide a complete system description for mobile telecommunications.

The COMMECT project utilises a variety of existing and evolving access technologies, including 2G, 3G, 4G, 5G, and NTN (airborne and space-borne) to ensure connectivity (accessibility) everywhere. The solutions developed by COMMECT meets the standards set by the 3GPP. These solutions relate to NTN mobility enhancements, NTN-TN and NTN-NTN service continuity enhancements and network energy savings Release 18 work or study items. 3GPP Release 18 network energy saving functionalities aim to improve the energy efficiency at the base station in the area of low or zero carried load. After the first version of NTN with Release 17, NTN mobility studies continue in Release 18.

The following 3GPP Release 18 Temporary documents (Tdocs) related to the network energy savings and non-terrestrial network mobility from the COMMECT consortium are prepared for 3GPP RAN WG2 meetings: R2-2304155 [2] and R2-2308054 [3]. The first meeting [2] is related to the conditional handover in case the source/target cell is in network energy saving mode. The second meeting [3] discusses the issues related to the cell reselection between non-terrestrial network and terrestrial one.

3GPP Release 18 has focused primarily on radio resource control connected, user-specific signals and channels, while enhancements related to radio resource control idle or inactive state are not considered in Release 18 work item. Further improvements in network energy saving are expected in Release 19 which started in June 2024 and will be finalised in December 2025. The objectives attained in the 3GPP RAN Plenary #102 meeting in December 2023 cover the procedures and signalling methods to support on-demand synchronization signal block for secondary cell operation of UEs in connected mode configured with intra-band and inter-band carrier aggregation. In addition to synchronization

signal block for secondary cell operation, 3GPP works on demand system information block 1 for UEs in idle/inactive mode and common signal transmissions through channels in Release 19. The COMMECT project partners will target the agenda items related to the scopes defined in D6.2 “Dissemination, Communication and Exploitation Plan” deliverable [1].

Standardisation activities, where TNO has contributed, are the standardisation groups like 3GPP RAN2, RAN3, SA1, SA2 and NGMN. TNOR is part of the 3GPP RAN and 3GPP SA plenaries and uses its position to coordinate with other operators and main industry players to have a stronger voice and contribution to 3GPP standardisation activities.

## 2.2 NGMN

The Next Generation Mobile Networks (NGMN) alliance is a forum founded by world-leading mobile network operators and open to all partners in the mobile industry. Its goal is to ensure that next generation network infrastructure, service platforms and devices will meet the requirements of operators and will ultimately satisfy end user demand and expectations.

The COMMECT project partners TNO and TCELL work together for [NGMN](#)'s publications. NGMN network energy efficiency phase 3A publication aims to tackle the recent energy price spike challenges confronting the telecoms industry, exacerbating the need to improve network energy efficiency. NGMN network energy efficiency Phase 2 publication expands upon NGMN's first network energy efficiency report, which reviewed where energy is consumed in a typical mobile network and highlighted opportunities and challenges for the industry to improve network energy efficiency. Joint contribution from TNO and TCELL continues for NGMN Network Energy Efficiency Phase 3B. Most of the COMMECT's LLs are energy dependent and not connected the national grid.

## 2.3 6G-IA

The 6G Smart Networks and Services Industry Association (6G-IA) is authoritative organization of European Industry and Research for next-generation networks and services. Its primary objective is to contribute to Europe's leadership in 5G, 5G evolution and SNS/6G research. The 6G-IA pre-standardisation Working Group (WG) aims to facilitate impact creation by running research projects, particularly towards relevant standardisation bodies. TCELL attends the 6G-IA pre-standardisation WG regular meeting on behalf of the COMMECT project. The pre-standardisation WG tracks the Horizon Europe project contributions.

TNOR is vice chair of the 6G-IA Vision WG which is responsible for technological and socio-economic vision for Smart Networks and Services Joint Undertaking (SNS-JU) research projects. This WG is responsible for maintaining a high-level technology roadmap and engages experts within running SNS JU research projects and other organisations like AIOTI. Furthermore, this WG works on the socio-economic interactions between the actual technological system and the ecosystem. Business Validation, Models and Ecosystem (BVME) is one of Vision's sub-groups which is led by TNOR; it studies the impact of new technologies on the economic aspects within the current business ecosystem. COMMECT's D3.1 'Socio-economic impact and environmental sustainability assessment' [4] where we studied the impact of new technologies on rural communities, and is a good fit for BVME SG. TNOR can share and promote the findings from COMMECT into SNS JU research projects.

## 2.4 AIOTI

The Alliance for IoT and Edge Computing Innovation ([AIOTI](#)) aims to lead, promote, bridge and collaborate in IoT and Edge Computing and other converging technologies research, as well as innovation, standardisation and ecosystem building, providing IoT and Edge Computing deployment for European businesses and creating benefits for European society. AIOTI cooperates with other global regions, promising to remove barriers for development of the IoT and Edge Computing market, while preserving European values, including privacy and consumer protection.

DNET being an AIOTI Management Board member and HWDU being the chair of the AIOTI WG standardisation and the AIOTI ICT for Co2 reduction Methodologies (ICM) WG, will be able to jointly support the preparation and submission of COMMECT contributions towards AIOTI.

Thus, this subsection focuses on the COMMECT's targeted future contribution to the Alliance for IoT and edge computing Innovation ([AIOTI](#)).

COMMECT is designing and implementing a DST that will support the selection and implementation of connectivity solutions incorporating: (i) information about the rural area, user needs and the intended application; (ii) available solutions to extend coverage; (iii) socio-economic and environmental impact and reference business models.

An important standardisation challenge related to the commercial success of the DST is the support of data interoperability.

In this context, COMMECT provided input into section 1.2.5 of the AIOTI report [5]. The main objective of this AIOTI report was to briefly present the EU funded projects focusing on IoT and edge computing, which can be used to: 1) leverage on existing IoT and edge computing research and innovation activities in Europe, and 2) provide input to IoT and edge computing standardisation gap analysis activities. The COMMECT contribution towards this AIOTI report was a collaboration between HWDU, HWIE and TCELL and focused on the description of the COMMECT project, as well as the description of the COMMECT activities related to dissemination and COMMECT's impact on standards.

In addition to this contribution, it is expected that in 2024, brief descriptions of the COMMECT use cases (described in deliverable D1.1 'Report on end-users' needs and relevant use cases' [6]), will be contributed to the update of the AIOTI report [7], which determines the specific requirements they impose on the underlying (Beyond) 5G network infrastructure. These use cases and requirements are then contributed towards Standards Developing Organisations (SDOs), such as 3GPP, ITU-T, ISO, and IEEE as requirements for automation in vertical domains focusing on critical communications.

DNET, TCEL, HWIE and HWDU submitted within a COMMECT engagement on describing the key objectives of the COMMECT project, including standardisation objectives towards an in-progress joint AIOTI – 6G-IA report "White Paper the role of 6G in agriculture".

AIOTI is associated with an online AIOTI Ontology Landscape Portfolio platform, which is a Catalogue of Ontologies for Semantic Interoperability [8]. In particular, it is expected that COMMECT will provide semantic interoperability concepts and ontologies contributions, e.g., AIM (Agriculture Information Model), towards [8].

In the context of contributing to the climate change mitigation and increasing the resilience and sustainability of rural communities, it is expected that COMMECT could contribute to define the applicable environmental sustainability indicators and related calculation models, finally applying them to the existing connectivity solutions.

In order to meet this objective, it is expected that brief descriptions of the environmental assessment scopes for the Living Labs, provided in COMMECT D3.1 deliverable [4], will contribute to the update of the AIOTI report [9]. The final target for AIOTI is to applicate parts of the mentioned AIOTI reports onto the ongoing work of ETSI TC EE and ITU-T SG5 by revising/updating the [L.1480](#) specification.

## 2.5 TM Forum

TM Forum is a global alliance of telco and tech companies, which is in charge of leading the industry to define the building blocks for new operating models, impactful new partnerships, and advanced software platforms for the telco industry via open collaboration and co-innovation.

The contribution of COMMECT's work to the TM Forum collaboration projects and fora is twofold, focusing on architecture and practical use cases.

Firstly, COMMECT's architectural framework, as elaborated in the COMMECT D1.3 'Socio-economic impact and environmental sustainability assessment' deliverable, will be presented in the TM Forum's Autonomous Networks project. This presentation is important as it shows how COMMECT's architecture can exploit existing TM Forum standards, such as the TMF921 Intent Management interface. Integrating COMMECT's insights into the AN project fosters a broader understanding of the potential for XG technologies in agroforestry contexts. The COMMECT architecture presentation (see Figures in D1.3 'Socio-economic impact and environmental sustainability assessment'), which depicts detailed models and strategies, will provide a comprehensive overview of the project's framework, emphasizing its adaptability and efficiency in various connectivity scenarios.

Secondly, a follow-up contribution is planned concerning the practical application of the DST/ICP (Decision-making Support Tool/Integrated Connectivity Platform) scenarios and architecture (high level use case details not covering sensitive information will be contributed). This contribution is proposed for integration of the TM Forum's Generative AI for Autonomous Networks project guides, set for release in 2024. Notably, the DST/ICP LLM use case is pivotal, as it demonstrates the real-world application and effectiveness of Gen AI. By detailing the implementation and outcomes of the LLMs in a Living Lab setting, the guide will offer tangible evidence of how COMMECT's approach can be applied to enhance connectivity solutions in agroforestry sectors, particularly in the scope of AI-driven autonomous networks.

Essentially, through these contributions to the TM Forum, COMMECT aims to align with existing standards and enrich them by providing innovative perspectives and practical solutions. This aligns with the overarching vision of COMMECT to harness the power of connectivity, AI, automation, and XG technologies to foster sustainable, resilient, and advanced agricultural, forestry, and rural communities.

### 3. Exploitation Activities

The COMMECT project partners updated their plans to exploit project results, which were initially prepared for the deliverable D6.2 'Dissemination, Communication and Exploitation Plan'. These deliverable overviews the exploitation methodology, expected impacts, and foreseen joint exploitation activities.

The COMMECT partners are classified based on their roles in the project ecosystem: academia, industry, and stakeholders. The following subsections presents the details of the partner's actual activities in exploitation.

#### 3.1 STAKEHOLDER

##### 3.1.1. PTC

Padborg Transport Center (PTC) has a vision of being a leading organisation in the promotion of technology in the transport industry for the benefit of the industry, animal welfare and the environment. With connections among transport companies, tech suppliers (TNOR, SES) and research institutions (TNO, Viveris, AAU and AU), PTC will play a key role in driving innovation and development.

Together with Aalborg University (AAU) and Aarhus University (AU), PTC will ensure that we understand through interviews the entire value chain for the transport of live animals and identify the relevant use cases. In addition, PTC will be responsible for ensuring that Aalborg University (AAU) and the transport company DTL carry out the necessary measurements.

PTC will help organize and participate in the workshops to gather data and relevant information on the stakeholders' business modules as well as the social, economic, and environmental impacts, and discuss potential relevant IoT solutions that can support use cases in the short term and help transport companies find solutions in the long term.

Throughout the project, PTC will participate in meetings with relevant stakeholders to ensure that the selected use cases in LL Denmark remain relevant. PTC will also make sure that relevant stakeholders in the transport industry would be aware of the opportunities that can be found in IoT through its network.

In addition, PTC will, through its network both in the Danish Telecom industry forum under The Danish Agency for Data Supply and Infrastructure, and by industry associations like Danish Industry (Digital and Transport divisions), The Danish Chamber of Commerce (digital infrastructure division), business associations for the professional hauler, transport and logistics companies, and the Danish association for livestock trading, disseminate knowledge of COMMECT and LL Denmark's research results and proposed solutions. In doing so, PTC has intentions to influence the development of telecommunications and mobile network coverage in the EU on the benefits of the transport and trading sectors.

##### 3.1.2. TOB

TOB aims to systematically gather agricultural data for olive producers by employing a transparent solution, which includes the pre-processing analysis of this data. The initiative seeks to enhance the management of natural resources through the deployment of COMMECT's Decision-making Support Tool (DST). TOB will participate in the LL Türkiye activities and organize workshops and training for the association members, other farmers, and refugees in the region.



TOB will exploit the experience collected from the COMMECT project and conduct training programs for local communities, foresters, and refugees in the Izmir and Mersin regions. This initiative specifically targets the integration of refugees originating from Syria, Iraq, and Afghanistan into the social and economic fabric of Türkiye, their engagement with the labour market. The overarching objective of TOB in the project is to enhance the socio-economic conditions of rural communities and refugees through the advancement of the olive sector towards green and digital methodologies in Türkiye. We support living in rural areas olive farmers and the refugees. Our support focused on empowering these stakeholders to manage natural resources more efficiently in olive cultivation, thereby achieving superior harvests with reduced consumption of natural resources via DST.

TOB will collaborate with TCELL to continue promoting digital solutions in the region.

### 3.1.3. ZZSA

With the COMMECT project activities, ZZSA aims to become more familiar with the capabilities of digitalized solutions for farming and the financial implications of their deployment, as well as the learn-how to use selected digital solutions and promote the benefits of such practices among its members and the wider community. ZZSA will participate in the LL Serbia activities and organize workshops and training for the association members and other farmers in the region.

We expect to increase the use of digital solutions, driving enhanced efficiency, motivating association members to contribute to increased yields in a sustainable manner.

ZZSA will collaborate with DNET to promote further the adoption of digital solutions in the region.

## 3.2 ACADEMIA

### 3.2.1. LIST

Apart from research activities dedicated to standardising IoT solutions, LIST actively participates the workshops and other agricultural events, to engage the partners in further discussions for on-demand exploitation of advanced technologies, while timely gathering specific user needs from stakeholders. Notably, LIST focuses on the development of IoT protocols, related applications, as well as the integration of IoT with UAV or satellite communication.

With practical activities on agricultural development and exploitation, LIST deepens the collaboration with SES to provide high-capacity, on-demand telecom services in the Living Lab Luxembourg. Also, the expertise that LIST has achieved during COMMECT's project activities allow them to build or expand the collaboration with other space companies in and outside Luxembourg. In addition, LIST reinforces the cross collaboration with several co-developing viticultural groups and stakeholders. This tightened collaboration potentially contributes to the future standardisations in agricultural 4.0, providing more comprehensive, digitalized solutions towards common agricultural challenges in EU.

### 3.2.2. AU

The active involvement of farmers, livestock trading companies, livestock trailer and IoT manufacturer and authorities is one of the key exploitation activities of AU, as they will play a key role in providing inputs in the initial phases of the project as well as throughout the assessment process. AU will seek closer links to farmer community, veterinarians, and livestock trading companies and animal science research networks to better understand

different realities through the value chain. The exploitation plans also include the applicability and the potential of communication technologies in complex and interconnected agri-forestry systems. Through a multidisciplinary approach, AU will exploit the environmental and economic benefits for utilization of communication technologies under different IoT scenarios in agri-forestry, with special emphasis on trading and transport of livestock in EU. The exploitation activities involve questionnaires and surveys, multi-actor innovation workshops and tailored end users' material and presentations of project results.

AU will participate in specific targeted activities, such as participation in events and conferences related to IoT in agro-forestry. AU will support a broad social media marketing strategy and presence in the local/regional press which will be conducted during the project in order to engage and attract potential new stakeholders and identify organisations interested in IoT for the livestock trading and transport sector.

AU will foster synergies with other relevant national and EU initiatives and stakeholders, capitalising on existing dissemination channels and networks to ensure efficient communication and understanding of the COMMECT and project results. AU will adapt basic and applied research agenda and get engaged into relevant based new R&I projects fitting farmer's, livestock trading companies, OEMs and suppliers of equipment and services for the transport sector, as well as authorities involved in livestock trading and transport. AU will exploit and valorise the COMMECT results and data into new research initiatives, commercial solutions and scientific papers, and increase general knowledge on good agricultural practices and sustainable livestock transport management.

### 3.2.3. AAU

AAU will mainly concentrate on the following activities within the COMMECT project.

Participation in conferences and events: AAU will actively engage in conferences and events, showcasing the scientific results obtained throughout the project. This can be achieved through the submission of papers or conducting tutorials.

Scientific publications: AAU will contribute to the dissemination of knowledge by submitting scientific publications to open-access journals, ensuring abroad accessibility to the project's findings.

Academic events: The project will be presented at various academic events, including technical content regarding the Danish LL. This includes summer school or research group meetings, facilitating the knowledge exchange and collaboration with the academic community.

Presentation of connectivity solutions: AAU will present the connectivity solutions developed and the results obtained to the different stakeholders of the Danish LL. This may include presentations to different actors in the logistics industry as well, providing insights and potentially benefiting a broader audience beyond the project's scope.

### 3.2.4. INN

The scientists of INN provide the COMMECT consortium and several actors (partners, end users, stakeholders, local communities) with up-to-date project information and added values of digitalization and extensive connectivity both from academic perspective and at a business level. More specifically, as a public research institute, INN takes advantage of its experiences of research-oriented analysis, while contributing to the evaluation of COMMECT's impact in the targeted regions, actively guiding and adjusting the current deployment stages towards highly efficient and cost-effective digital solutions.



Furthermore, as WP6 leader, INN is engaged in disseminating COMMECT findings in research activities and publications, to boost the project's influence in several domains such as economics, geography, management, and marketing. In general, INN assures that the existing digital solutions of COMMECT is practical and feasible to employ, with the potential to benefit the local communities, making these solutions worthy of stakeholders' attention for further commercialization.

### 3.2.5. TNO

From the Danish LL use case perspective, TNO aims at having stakeholders of the agriculture sector seek TNO's expertise and support for devising connectivity solutions for their business and achieving the know-how and visibility to further continue our research in subsequent research projects (EU and national). To obtain our objectives, we focus on three major activities:

Applied research activities where we test the feasibility of private 5G networks in the context of livestock trading in a farm in the south of the Netherlands.

Reach-out activities, where we inform (potential) partners in the Netherlands and internationally on our technical achievements, such as at the Synergy Days, with frequent contacts to the farmers' association in the Netherlands (HEIHOF), via scientific publications, etc.

TNO expects to build significant knowledge in the creation of 5G private networks in rural areas, their capabilities, and limitations, and potentially the requirements for interconnection with NTN networks. We expect to be able to use this knowledge to expand our Beyond 5G testbed; disseminate our findings in research papers, white papers, standards contributions; acquire new research projects and attract contract research.

From the business models perspective, TNO intends to support the Living Labs in ideating and designing business models which help to support the realization of connectivity solutions in practice (rural areas) and foster the creation of sustainable impact. Through collaboration with the Living Labs, the expected contributions are twofold: On the one hand, TNO expects to develop a generic business model framework to support the ideation and design of business models for rural deployment of connectivity solutions (validated through interactions with the LLs), which should further the academic discourse on digital/connectivity business models and enable the dissemination of findings in research. On the other hand, the set of developed business models per Living Lab offer valuable (generalizable) insights to the (beneficial) deployment of connectivity solutions in other rural areas (learnings, best practices), which can help the scaling and widespread adoption of connectivity solutions in rural areas (contributing to the creation of societal and environmental impact). These learnings can help TNO to support the development / acquisition of projects which intend to do so (beyond COMMECT). TNO plans to conduct joint exploitation activities with TCELL in standardisation (e.g. 3GPP RAN2 group) and further joint exploitation activities with TCELL and TNOR in the form of scientific publications.

TNO will work together with partners with an interest in business development and innovation (e.g., KI, INN, TNOR, LIST, SeAMK) to communicate and disseminate the generated findings (through scientific publications), connecting business models towards innovation management, socio-economic as well as environmental impact objectives.

### 3.2.6. SeAMK

Utilizing COMMECT, SeAMK aims to advance the climate-wise farming, focusing on gathering and project information and results within Finnish rural communities, particularly in South Ostrobothnia.

Exploitation efforts will emphasize integrating results into education and research, development, and innovation activities.

SeAMK's activities target diverse audiences, employing communication channels, collaborating with farmer associations and organisations, preparing dissemination material, and engaging stakeholders through workshops and meetings. This inclusive approach aims to maximize the impact of project results.

### 3.2.7. IBLA

IBLA will mainly concentrate on dissemination activities within the COMMECT project. IBLA organizes workshops and courses for the winegrowers, in order to present the results of the COMMECT Project.

The implementation of the first Use Case (LL Luxembourg) by the installation of new weather stations and leaf wetness sensors give more opportunities to prevent the downy mildew in the wine region. IBLA will provide information to the winegrowers about how to use the results of the forecast.

IBLA stays in touch with many stakeholders in the region in order to develop a business model for both use cases.

### 3.2.8. KI

KI has the role of Innovation Manager in the project and does a lot of work on commercialisation in general. Through exploitation KI hopes to contribute towards growth and improved efficiency in the forest industry with the intention of exploiting the knowledge and work done in the Living Lab over to other industries as well. More specifically KI will through the use of its existing and now grown network within the forest industry be able to follow up on the actual benefits and results from COMMECT through dialogue and collaboration on other future projects with the existing stakeholders and end users. Based on the information provided KI will through internal meetings see what opportunities arise through the multiple industries and companies that KI works with especially in agriculture and forestry.

## 3.3 INDUSTRY

### 3.3.1. SES

The satellites could expand service availability in areas which cannot be covered or are difficult to cover with a terrestrial network. Hence, SES aims at exploiting the results of COMMECT to leverage COMMECT developments to bridge the digital divide, by providing quality, reliable, and secure connectivity access for all in rural and remote areas. SES increases and customises its service offering for commercially attractive IoT use cases for farmers, foresters, and other rural community actors as well as for other multiple market verticals, such as Fixed Data, Aero, Maritime, Energy, Government, Cloud, and Video.

An analysis, focusing on both business and technical aspects, will be performed to determine if the objectives have been met.

In this project, SES is exploiting the Smart IoT Gateway, which was developed in the H2020 iNGENIOUS project. SES has adapted its Smart IoT Gateway to the context of smart agriculture, and it could open new opportunities and help SES to increase its services to new market verticals.

In addition, the knowledge gained from the conducted R&D work within the COMMECT project is intellectual property that SES will exploit as background knowledge in bidding for and

acquiring additional innovation related contracts. Moreover, it allows SES to acquire the necessary skills and know-how to proceed to potential future investments as necessary. Finally, SES will continue participating in commercial and standardisation activities to promote the role of satellites in the next generation network and their adaptation to IoT communications.

### 3.3.2. TNOR

TNOR aims to utilize COMMECT to extend the 5G VINNI infrastructure to 5G-VINNI NEXT for forestry and agriculture use-cases in Norway. It will involve the implementation of new technologies like Open RAN, that will help cut the existing RAN cost for cost effective utilization of resources and energy efficiency. TNOR will use these results for similar deployments in other sectors/vertical use cases.

5G-VINNI provides an end-to-end 5G facility aiming at demonstrating that the key 5G PPP network KPIs can be met, and that can be accessed and used by vertical industries to set up research trials of innovative use cases, to further validate core 5G KPIs in the context of concurrent usages by multiple users. The aim of the Connected Forest Living Lab in Norway is to support the forest industry in Norway with efficient and environmentally friendly connectivity-based solutions for their operations. TNOR is assessing a potential exploitation of these two connectivity-based solutions supporting the challenges addressed from participating in the Connected Forreest Living Lab. Currently, multiple business models and ecosystem positions are assessed in relation to exploitation of the solutions together with partners from the forest industry. Applying these solutions for the agricultural domain will also be assessed. This is relevant for the Norwegian market, and potentially also for the Nordic market where TNOR is present with its mobile and consumer operations. In parallel with the commercial development, deploying and validating communication technologies is also addressed.

In addition, in order to support COMMECT's forest use cases with mobile solutions in areas with limited network connectivity, TNOR has developed a movable/portable 5G private network solution that can be deployed instantly (Network on Wheels, NoW) to provide network coverage in rural areas. NOW serves as a self-contained entity and offers an on-demand coverage with assured Quality of Service (QoS), has edge computing capabilities and capability to establish connections with partner's edge infrastructure. Moreover, it includes robust security measures and durability and offers rapid deployment and user-friendly operation. The deployment of the use case solutions will be performed step wise as the technology readiness level is maturing, starting with proof-of-concept solutions on TNOR locations, following deployments into rural areas with the NoW.

### 3.3.3. TCELL

TCELL has played a vital role in developing the telecommunications sector in Türkiye by leveraging the newest technologies, services and products that can create economic and social value for all relevant stakeholders. TCELL is ambitious to sustain its leadership in the region by pioneering the deployment of its operated XG networks. It will have a wide range of applications across vertical sectors thanks to the unparalleled experience and performance levels to be offered through COMMECT's solutions and set of technologies. Energy-efficient and flexible TCELL XG access network technologies can enable improved battery capacity and extend coverage for different types of IoT sensors.

TCELL wants to create more service-oriented subscribers, improve the feasibility of the solution for commercial deployment and decrease energy costs in the proposed solutions to become more profitable and competitive.

An analysis with a business focus will be used for the operational expenses. It specifies the potential COMMECT services to assess how effective the new solution is in decreasing the operational expenses in comparison to the existing solutions on the market. Technical studies were carried out to validate that the COMMECT XG connectivity can extend its coverage with the same or lower energy consumption.

New market penetration will be possible with improved coverage and energy performance in the XG network of TCELL. The current subscribers' experience and potential acquisition of new subscribers in the currently underserved regions will be targeted. Green future network energy efficiency project activities continue with TNO in Next Generation Mobile Networks (NGMN) Alliance. Radio Access Network (RAN) Working Group (WG) 2 activities with HWDU, HWIE and TNO were started for Third Generation Partnership Project (3GPP) standard development organization.

#### 3.3.4. DNET

DNET expands its smart farming portfolio with features addressing the community of farmers instead of individual ones, particularly from the (data, infrastructure resources) sharing perspective, as well as to add features related to more autonomous work of the system when deployed in the field using edge processing and local connectivity. DNET validates a combined solar trailer plus edge equipment in a production environment and gathers feedback from the farmers. DNET enhances our solution portfolio with an LLM-based decision support tool specialized in selected domains.

DNET will obtain its objectives by implementing COMMECT DST for rural regions, validating and obtaining feedback. This will be the foundation for creating similar DSTs specialized in selected agriculture domains as well as domains not related to agriculture.

DNET increases company profile on Internet leveraging COMMECT project activities as a channel to reaching out to potential customers.

Digital solutions for farming are an ecosystem play. We will seek opportunities for collaborative exploitation with mobile operators in the consortium (TNOR, TCELL). We will also look into potential collaboration with the partners representing end users (Luxembourg, Denmark).

#### 3.3.5. HWIE

HWIE has used the project research activities to advance the autonomous networks vision across 5G and hybrid networks.

HWIE has enhanced the knowledge of the application of Generative AI and large language models within communication networks. This technical knowledge will be of great benefit when expanding our product portfolio to include these capabilities, which we consider mandatory for higher level of autonomy in the telecommunication networks.

The development of LLM-based agents that can autonomously provision, operate or maintain a network or a service is of great interest as is the area where we will exploit the learnings and results from the COMMECT project.

#### 3.3.6. LXS

LXS is continuously improving the instant-as-built platform, which is involved in the implementation of UC 2 in LL 1. While the platform is currently mainly used to produce short documentation datasets, LXS tries to extend its applicability to agricultural contexts. For these applications, a few adaptations need to take place: connectivity solutions need to be identified and implemented to enable rapid upload of videos, the natively handheld system is mounted

on a tractor to provide coverage of larger areas, the app itself needs to be adjusted to handle rapid throughput of large datasets.

As LXS sees a large potential for the use of data products with very high geometric detail in agriculture in general and viticulture in particular, all of these technical adaptations will be exploited by further improving our operational product instant-as-built and tailoring it to more specific use cases such as viticulture, producing promotional material generated using data acquired during the project, acquiring future research projects in the field of agriculture.

### 3.3.7. VITECH

From a technical/knowledge point of view, VITECH aims to enlarge its expertise in different domains in the integration of new satellite constellations with XG and IoT networks, in terms of multi-connectivity, smart routing and allocation of network resources. VITECH will acquire knowledge about the use and development of AI technologies (including Machine Learning) and LLM-based models. This will allow VITECH to propose and develop new services for its clients (satellite operators, satellite access providers, manufacturers, etc.).

From a commercial point of view, VITECH wishes to develop contacts with different European stakeholders and partners composing the consortium. We identify possible evolutions on the satellite emulator OpenSAND and the testbench OpenBACH (both open-source platforms maintained by VITECH) and provide support to COMMECT partners to help them use/exploit them in lab conditions. Both axes could provide future businesses for VITECH.

VITECH research activity is focused on proposing and testing multi-connectivity strategies between XG and satellite networks under lab and real conditions. We target the Denmark LL use cases to improve the livestock transport services together with the other LL partners (such as AAU and TNO). We will seek opportunities to exploit the research results with these partners, but also with our current clients, offering improved connectivity conditions thanks to the integration of terrestrial and NTN networks: for both broadband and narrowband services.

VITECH development activity is focused on the integration and validation of the DST tool and the (Intelligent Connectivity Platform) ICP tool, developed by DNET and HWIE respectively. We are helping them interface both LLM-based tools to work as a sole and more efficient decision-support tool for COMMECT. This collaboration could open new opportunities for VITECH, in terms of AI-based technologies, in terms of new clients and new domains such as agroforestry. The knowledge gained during this work will be exploited as background to propose and develop new features/services for future projects and/or clients.

We also support partners involved in Luxembourg LL to deploy/configure and use the OpenSAND emulator, and other partners that need satellite expertise.

## 4. Conclusions

The COMMECT project aims to bridge the digital divide by providing quality, reliable, and secure access for all in rural and remote areas, with enhanced connectivity solutions. The deliverable D6.4 presents the exploitation and standardisation work executed in the first 18 months of the project by the COMMECT partners. Academic partners actively participated mainly in several dissemination activities, as described in deliverable D6.3 [10]. Industry partners engaged in discussion with different stakeholders (within and outside the project consortium), for creating possible future exploitation opportunities.

The members of the consortium closely followed the activities carried in several SDOs and alliances like NGMN, 3GPP, AIOTI and TM Forum, with the aim of ensuring that COMMECT solutions are fully in line with current standardisation developments. The connectivity solutions proposed in the five LLs are based on standardized and interoperable protocols. COMMECT actively contributes to the definition of IoT protocol optimisations for integration with NTN. Such solutions could be promoted within 3GPP, or IETF LPWAN. Similarly, the work done on IoT, edge, and assessment of environmental impact of ICT solution, will be promoted within AIOTI.

As described in deliverable D7.3 [11], the partners are working together in the five LLs toward the development of innovative solutions which are expected to have high potential for exploitation.

The second version of this deliverable, D6.8, due by M36, will expand the current scope, present concrete contributions to the standardisation, and draw the plan for exploitation, after the end of the project.

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