ARTES 4.0 Generic Programme Line Business Applications - Space Solutions

DIGITAL SUPPLY CHAIN

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Table of ACRONYMS

AI	Artificial Intelligence
APQ	Activity Pitch Questionnaire
AoF	Authorisation of Funding
ARTES	Advanced Research in Telecommunications Systems
BASS	Business Applications and Space Solutions
DG	Director General
ESA	European Space Agency
FP	Full Proposal
GPL	Generic Programme Line
GSK	GlaxoSmithKline
IoT	Internet of Things
ML	Machine Learning
OP	Outline Proposal
SME	Small and Medium sized Enterprise
TIA	Directorate of Telecommunications and Integrated Applications
URW	Unibail-Rodamco-Westfield
WWF	World Wide Fund for Nature

1. OVERVIEW

This document presents an overview of the “Digital Supply Chain” Thematic Call issued under the ARTES BASS Programme line. The call offers the opportunity to companies to bring forward their business propositions, which shall leverage on space and advanced digital technologies for delivering sustainable solutions.

2. BACKGROUND AND RATIONALE

This call targets the development of services and products for supporting the digital transformation of the traditional supply chains, particularly in relation to sensitive goods transport. Among these, pharmaceuticals goods, vaccines, medical equipment, as well as perishable or dangerous goods which impose specific logistics challenges.

During the last years, key supply chain systems have suffered severed disruptions and unprecedented stress due to the pandemic as well as other situations, like the Suez Canal Evergreen ship blockage[1]. COVID-19 has brought to light previously unseen vulnerabilities in the supply chain management systems, particularly in the case of goods with high requirements in terms of tracking, conservation, and in-time delivery. At the core of the challenge is not only organizing the services that carry the sensitive goods, but rather making sure that every part of the supply chain is running, to avoid losses throughout the system and prevent delays that could damage the goods due to unstable temperatures.

In the aftermath of severe disruption from the COVID-19 pandemic, enterprises will plan their supply chain strategies to become more resilient, collaborative, and networked with customers,

[1] https://www.cnbc.com/2021/03/29/suez-canal-is-moving-but-the-supply-chain-impact-could-last-months.html

suppliers, and other stakeholders[2]. To do that, they will increase investment in supply chain technologies like AI and robotic process automation while retraining workers.

At the same time, the pandemic has focused attention on how dependent we all are on what happens in other parts of the world for the products we use every day. COVID-19 has increased sensitivity of public opinion towards responsible businesses and sustainability certification. In May 2020, CEOs from 155 global brands, including Mars, Nestlé and Unilever, set out their commitments to invest in recovery and resilience for a systemic socio-economic transformation. Specific attention is placed on food supply chains, pushed by the need to make global food systems more transparent, traceable, and accountable so that diseases are less likely to jump undetected from animal to human[3].

The novelty of this call consists in addressing these challenges that would set the groundwork for a new era of supply chain management, leveraging on space and digital tools to provide end-to-end visibility, traceability, flexibility, responsiveness, and agility with the potential for reshaping and digitally transforming the face of the freight logistics. To fully address the needs of today's stakeholders in every part of the value chain and to provide the expected end-to-end visibility and traceability of the goods, it is required to invest in opportunities that create supply chain value using digitalization, analytics, automation, increasing the exposure on the digital impact, identify the vulnerabilities and capitalize on new digital and technological solutions.

For the purpose of gathering user requirements for this call, the Agency has initiated dialogues with a set of user and prospective customers, each interested in specific innovation on the supply chain.

The interested stakeholders are a broad group including government and municipalities, regulatory bodies, different participants in the supply chain as manufactures, distributors, logistics suppliers, retailers and others. Specific use cases and requirements have been provided by ENEL, WWF and Unibail-Rodamco-Westfield and 22@ Network. These uses are

[2] https://www.ey.com/en_gl/supply-chain/how-covid-19-impacted-supply-chains-and-what-comes-next

[3] https://www.economist.com/leaders/2020/05/09/the-global-food-supply-chain-is-passing-a-severe-test

provided in Annex A. Those stakeholders have expressed their interest in exploring the benefits of space based solutions addressing their identified challenges and evaluating solutions that would be established through the subject thematic call.

The needs of the stakeholders call for the utilization of innovative digital solutions such as big data analytics and machine learning to produce insights for decision making, problem solving, manage movements from supplier nodes through distribution routes and automating supply chain process execution. Such solutions need to rely on a wealth of data relayed through ubiquitous and seamless 5G communications, integrated with data from satellite imagery.

These stakeholders, with their own perspective and mandate, are interested in services providing:

- **Traceability**: the proliferation of IoT devices that produce real-time data allows for accurate traceability, monitoring and interventions. For example, the temperature of sensitive goods can be tracked in real-time to detect any issues and enable responsiveness against disruptions.

- **Sustainability**: the availability of digital data and cloud computing enables the automation of processes and the optimization of resources leading to sustainable solutions, and increasing resilience, transparency and accountability

- **Security**: in coordination with cybersecurity strategies, digital technologies such as blockchain can enable secure data-sharing and hinder tampering (i.e. counterfeiting, theft, and illegal diversion of goods) along the supply chain. Given the high levels of sensitive information that will be stored and shared through this system, it is essential to have a strong cybersecurity layer protecting its integrity and confidentiality.

- **Risk mitigation**: particularly relevant for the insurance companies to significantly mitigate supply chain risks by enabling users to either take actions to prevent disasters or to respond to disruption by activating backup plans.

- **Efficiency of the delivery:** making sure that the goods are delivered on time by an improved collaboration amongst the different actors of the supply chain with the use of

digital platforms and data visualization from digital technologies such as augmented reality and digital twin.

3. OBJECTIVES OF THE CALL

The objectives of the Call are to:

- Develop and facilitate the adoption of innovative digital technology integrated with space and non-space solutions to boost transformation of the supply chain;
- Promote the development of sustainable integrated downstream services in the domain of the supply chain;
- Build partnerships with champions, early adopters and anchor users to foster development and utilisation of downstream solutions complemented by advanced technologies and space resources;
- Reach out to non-space communities that are active in the supply chain and facilitate networking with space and new-space actors and pursue international collaborations to support global adoption and interoperability;
- Provide pre-operational demonstrations to the prospective users and customers of the proposed services show-casing the benefits deriving from the utilization of space.

4. THEMATIC AREAS

In alignment with the objectives of this call, five thematic areas have been identified following discussion with stakeholders, representing the most relevant priorities in the supply chain domain.

The thematic areas are:

1. **Connected supply chain of sensitive goods**;
2. **Predicted demand in the supply chain**;
3. **Automation of operations**;
4. **Monitor the goods**;
5. **Managing the Risks**.

The Proposals by the Industry can cover multiple themes and also one or multiple phases of the life cycle of the supply chain activities.

Additional themes can be proposed by the Industry if deemed commercially relevant and supported by customers / users involved in the study by the Industry (support to be evidenced in letter of support).

4.1. Connected supply chain of sensitive goods

Digital technologies contribute to improve the connection amongst all actors of the supply chain with increased visibility, responsiveness, and resiliency across the entire ecosystem. Artificial Intelligence and Machine Learning algorithms can predict time of goods in motion and between transport modes and nodes and keep the related parties informed. Indoor-outdoor PNT can provide instant updates where the cargo is in transit. Real-time tracking data can input into a platform used to estimate the transportation performance, any delay in the delivery routes across all supply chain actors. IoT sensors network can detect supply chain disruptions or quality issues and address the issue or adapt production flows in real-time with minimal human intervention. Position and timing, combined with the status of the container and the cargo as well as with RFID tags, can be transmitted to logistic operators and their customers improving the efficiency and effectiveness of transport activities, as well as managing emergencies if anything goes wrong.

4.2. Predicted demand in the supply chain

Traditionally the methods of demand forecasting are based on historical data, that may not reflect the current demand environment and the evolved consumers habits. In particular, the pandemic has accelerated the e-commerce orders and this requires the warehouse to be more responsive to the demand and flexible. IoT combined with predictive analytics and AI/ML can monitor, collect and report information from the environment and reliably predict demand, recognize patterns, anticipate changes and optimize supply chain processes including distribution and warehouse planning.

4.3. Automation of operations

Leveraging space data and digital technologies such as AI, ML, AR/VR and robotics can lower the operational costs of delivering goods and provide more reliable forecasts, analysis of trend data and better services to customers. Trucking plays a vital role in how a supply chain functions and automation can take the entire transportation process and streamline it by cutting down on delivery costs. Instead of staff spending time figuring out the optimal way to pack a truck, plan the most efficient route, report transit status to customers and connect the right truckers to the right shipments, supply chain automation can streamline it all. Blockchain can facilitate smooth and direct payment for products and services between parties, minimizing the need for intermediaries and banks for transaction settlements and fund transfers, including cross border activities. The time consumed for processing payments, especially for cross-border payment processes, can be drastically reduced with end to end visibility supply chain management. These examples of automated supply chain operations are illustrative of the substantial benefits of digitized automated supply chain management.

4.4. Monitor the goods

By receiving real-time location and condition data from sensors on sensitive goods shipments en route, it is possible to continuously run data analytics monitoring sensitive parameters such as temperature and tilt, and other dynamic intelligence to manage and optimize distribution flows. Supply chain management backed by automated operations and blockchain technology has another important use case in the form of tracking and reducing counterfeit goods. IoT and blockchain methods have helped in identifying about four trillion of counterfeit/pirated goods that have impacted the global economy negatively. Workflow monitors, end-to-end logs of suppliers, and other digital supply chain management techniques can arrest the entry of counterfeit goods in the system. For example, RFID can be logged into blockchain ledgers for more accurate tracking of individual products as they move across the supply chain.

4.5. Managing the Risks

The digital supply chain, in particular of sensitive goods, needs to be able to respond to risks ranging from weather and natural disasters, to theft and counterfeiting, traffic and port congestion, and others. In addition, digital transformation and growing connectivity can increase supply chain cyber risks. By leveraging space and digital technologies and capabilities, such as sensors, robotics, automation and predictive analytics, the transparency and communications throughout the entire supply chain can increase. Satellite Earth Observation data integrated with tracking data can strengthen traceability systems to show where products originate and how they move through the supply chain so that sustainability risks can be continuously identified, and investments made to address them. This interconnectivity among multiple actors of supply chain partners improves the efficiency and resiliency of the flow of goods and information across the end-to-end supply chain.

5. SPACE ASSETS

The deployment of digital solutions integrated with terrestrial and space technologies, particularly 5G, indoor/outdoor PNT and AI is the opportunity to innovate the overall structure of the supply chain, moving towards digitally integrated supply chain services.

Satellite Earth Observation can be used for Monitoring changes in weather and atmospheric conditions; Advanced GIS for spatial information management, including utilization of Satellite EO data to monitor risks along the supply chain such as environmental risks.

Satellite Navigation can be used Geo-referencing sensor data related; Ubiquitous high accuracy PNT technologies and to support accurate and seamless indoor-outdoor positioning provided by GNSS and 5G and other complementary terrestrial and on-board systems.

Satellite Communications can be used Enabling M2M communication / IoT communication for in-situ sensors, Provide communication for other imagery platforms, such as RPAS.
In order to achieve the objectives and address the above use cases, the proposed services shall also rely on innovative space technologies and data, such as:

- Hybrid 5G space/terrestrial communication networks.
- As part of this activity, during the implementation process of the technical solution, the selected companies will be given the opportunity to come and test their applications in the ESA-ECSAT 5G/6G Hub. Based at ESA's European Centre for Space Applications and Telecommunications (ECSAT) in Oxfordshire, UK, the centre provides a converged satellite and 5G terrestrial network and state-of-the-art equipment. The Hub is a centre of excellence supporting the digital transformation of business with integration of satellite with terrestrial telecom networks. The use of the Hub shall be requested in the proposal and duly justified. More details about the Hub are in the Annex B, https://artes.esa.int/esa-5g6g-hub.
- Implementation of digital technologies, such as IoT devices, cloud computing, digital twins and discrete-event simulations to analyse "what if" scenarios, blockchain

combined with integrated positioning, navigation and timing (PNT) technologies and utilizing 5G assets to provide the desired traceability.

- Blockchain to drive innovations in the supply chain by increasing supply chain transparency, reducing risk, and improving efficiency and overall supply chain management.
- Utilization of data analytics based on EO data and tracking data processing through AI and machine learning.
- Usage of advanced robotics, the application of advanced analytics of big data in supply chain management by placing sensors in everything, creating networks everywhere, automating anything, and analysing everything can significantly improve the traceability, accuracy and the flexibility.
- AI/ML technology brings unique opportunities to Satcom; processes acceleration, resources optimisation, risk reduction and faster decision making in Operations.
- Cloud & Virtualisation technology is significantly changing business models in Satcom; allowing HW commoditisation, closer interaction with end users, higher data processing and creating the foundation for sovereign infrastructures.

6. SCOPE OF THE CALL

The proposals under this Call for Proposal shall address the Digital Supply Chain domain with innovative user-driven integrated downstream services which rely on advanced technologies and space data.

The Bidder shall involve in the project representatives from users communities, which shall take part in the pilot. The Bidder shall either address the use cases of one or more stakeholders (WWF, Unibail-Rodamco-Westfield and 22@ Network, ENEL) involved by ESA and included in Annex A or address other use cases and requirements related to the supply chain provided by other customers / users directly involved by the Bidder. In the latter case, support of those

potential customers (other than WWF, Unibail-Rodamco-Westfield and 22@ Network, ENEL) shall be evidenced in letters of interest to be attached to the Outline Proposal.

Annex A includes:

1. Annex A.1: Use case provided by WWF, Germany
2. Annex A.2: Use case provided by Unibail-Rodamco-Westfield and 22@ Network
3. Annex A.3: Use case provided by ENEL, Italy

The service provider shall be identified and possibly be part of the bidding team to ensure the commercial operational roll-out of the proposed service following completion of the project.

This Announcement of Opportunity covers two types of activities:

1. **Feasibility Studies**, which provide the preparatory framework to identify, analyse and define new potentially sustainable services.

The applications and/or services covered by the proposed Feasibility Studies have to:

- Be customer/user driven and present a strong sustainability potential.
- Propose a service demonstrating the benefits of the utilisation of integrated space assets
- Include a viability analysis
- Aim to evolve the targeted applications and services to marketability and operational roll-out, potentially through a Demonstration Project after successful completion of the feasibility study.
- Address at least one of the thematic areas described in section 4 or other(s) defined by the Bidder.
- The Bidder shall either address the use cases of one or more stakeholders (WWF, Unibail-Rodamco-Westfield and 22@ Network, ENEL) involved by ESA and included in Annex A or address other use cases and requirements related to the supply chain provided by other customers / users directly involved by the Bidder. In the latter case, support of those potential customers (other than WWF, Unibail-Rodamco-Westfield and 22@ Network, ENEL) shall be evidenced in letters of interest to be attached to the Outline Proposal.

2. **Demonstration Projects**, dedicated to the implementation and demonstration of pre-operational services.

The applications and/or services covered by the proposed Demonstration Projects have to:

- Be customer/user driven (including user involvement and active participation in the project).
- Propose a service demonstrating the benefits from the utilisation of space assets with clear potential to become sustainable.
- Address at least one amongst the thematic areas described in section 3, covering one or more of the mentioned applications or other(s) defined by the Bidder.
- Provide a measurable socio-economic impact.
- The Bidder shall involve in the project representatives from users communities, which shall take part in the pilot.
- The Bidder shall either address the use cases of one or more stakeholders (WWF, Unibail-Rodamco-Westfield and 22@ Network, ENEL) involved by ESA and included in Annex A or address other use cases and requirements related to the supply chain provided by other customers / users directly involved by the Bidder. In the latter case, support of those potential customers (other than WWF, Unibail-Rodamco-Westfield and 22@ Network, ENEL) shall be evidenced in letters of interest to be attached to the Outline Proposal.

7. PROCUREMENT APPROACH

The proposals submitted in reply to the call shall be implemented in the context of ESA BASS GPL in coordination with National Delegations. The proposals submitted in reply to the call shall be implemented in the context of ESA BASS GPL or the 5G SPL of ARTES, depending on the relevance of 5G in the activity.

The Bidder shall submit first an Activity Pitch Questionnaire, and following evaluation, may be invited to submit the Outline and Full Proposal. The Activity Pitch Questionnaire (APQ) template provided by ESA shall be used. This is considered as entry point for companies to submit their idea, providing a simplified and single point of access to the ESA ARTES framework.

The price of activities carried out in a given State are charged against the contribution of that State in the programme. Letter of Authorisation of Funding (AoF) from the relevant National Delegation is therefore required as part of the Full Proposal. The Bidder is however advised to inform the relevant National Delegation(s) when submitting the Pitch. The coordinates of the National Delegates can be found here: https://artes.esa.int/national-delegations.

The Agency will admit for evaluation only proposals from a bidding team composed of an economic operator - being a Prime or Subcontractor - residing in any of those States that have subscribed to BASS GPL.
To date, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom have subscribed to BASS GPL.

8. PROCESS AND SCHEDULE

It is planned for the Announcement of Opportunity to be opened on 04 March 2022 for a period of 6 months organised in two main batches as presented below.

8.2 Timeline and Procedure

The Thematic Call is open for a period of 6 months, where the Bidders can respond by submission of Pitches. The timeline is illustrated below.

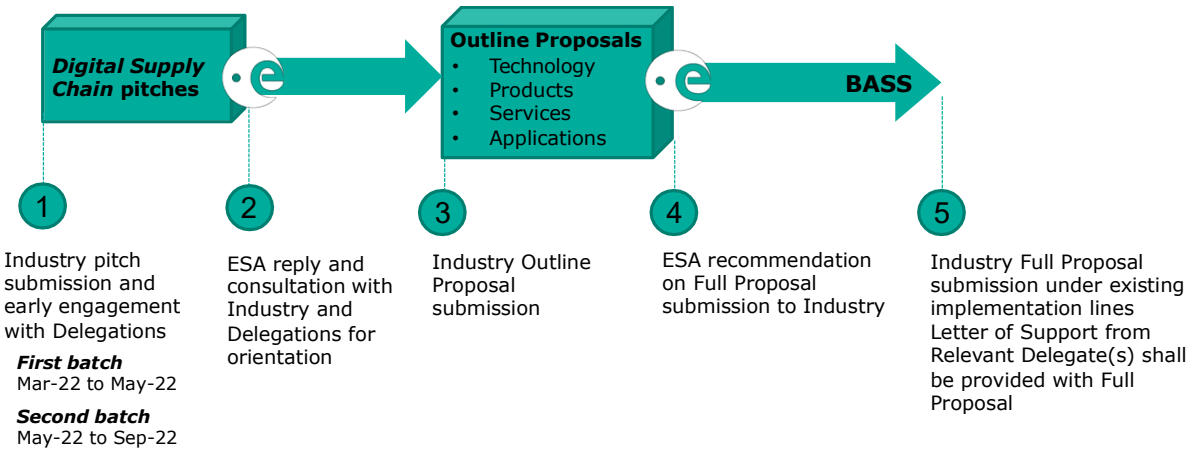


Figure 5: Procurement Approach and Timeline of the Thematic Call

The Call is planned to be implemented according to the following stepwise approach:
In **Step 1**, the interested Bidders are requested to submit their proposal(s) based on a short Pitch template made available by ESA that can be downloaded from the Thematic Call website. The pitch should provide the initial idea of what the Bidder would like to propose, elaborated on the basis of the thematic areas and either the use cases proposed in Annex A or others selected by the Bidder.

Should the bidder wish to cooperate with ENEL, and/or WWF, and/or Unibail-Rodamco-Westfield, he shall give to the Agency the authorisation to distribute the activity pitch questionnaire to these stakeholders by explicitly stating it in the Activity Pitch Questionnaire. Subject to such authorisation, the Agency will follow up distributing the APQ to the bidder's authorised stakeholder(s) and liaise with them to facilitate interactions with the Bidder.
The Bidder shall NOT involve any of the above -mentioned stakeholders in the bidding consortium neither as subcontractor nor as external service (including consultancy).
Should the Bidder propose to address other use cases from other stakeholders, support of the stakeholders should be evidenced by a LoS attached to the OP.
The completed Activity Pitch Questionnaire (APQ) shall uploaded using the online web submitter:

https://business.esa.int/apq-submit

The name of the APQ file must be *APQ_SupplyChain_Projectname* (the words SupplyChain shall not removed).
Multiple Pitches can be submitted.
Pitches can be submitted within two batches (time-windows):

- **First batch lasting from March 2022 to May 2022**
- **Second batch lasting from May 2022 to September 2022.**

It is strongly recommended that the interested Bidder liaises since the beginning with the relevant ESA Member States Delegates.
In **Step 2**, following an assessment of the Pitch by ESA, ESA will provide feedback to the company, aiming to provide a reply within 10 working days following the deadline for submission of the Pitch.
It is recognised that some interactions with the Bidder may be required and ESA may therefore consult with the Bidder and may offer support in providing further clarifications, aimed at better shaping the Outline Proposal(s). Dialogue sessions may be organised individually with potential partners prior to Step 3.
ESA might also consult when necessary, with the relevant National Delegation(s) for orientation and will provide key information (e.g. title, cost, price, subcontractor) to the relevant National Delegation(s).

Subject to a positive evaluation of the Pitch and the Bidder having informed the National Delegation(s), the Bidder will be notified by ESA and invited to submit an Outline Proposal.
In **Step 3**, the Bidder will submit the Outline Proposal, based on a template provided by ESA, with letter(s) of interest from users/stakeholders. The Outline Proposal is expanding the Pitch with a more extensive level of details.
In **Step 4**, subject to a positive assessment from ESA and in-principle support from the National Delegations, the Bidder will be invited to submit a Full Proposal in accordance with BASS programme line.
In **Step 5**, the Bidder will submit a Full Proposal with the Authorisation of Funding (AoF) from the relevant National Delegation(s). Following a positive assessment by ESA the proposed activity will be approved for implementation.

8.1. Evaluation Criteria

The evaluation process is non-competitive, as each proposal will be assessed individually on its own merits, according to the evaluation criteria applicable for CALL FOR PROPOSALS FOR DOWNSTREAM APPLICATIONS IN ARTES 4.0 (esa star ref.: 1-10494).

9. GENERAL CONDITIONS

The submissions and all correspondence relating to it shall be in English.
The tender shall not contain any Classified Information, whether in the Pitch, Outline Proposal or in the Full Proposal.
To avoid any confusion with Classified security markings, the unclassified protective marking used by the Tenderer in the proposal shall not contain the terms: "Restricted", "Confidential", or "Secret".
However, should the Tenderer consider necessary to include Classified Information in the tender, the Tenderer shall inform beforehand the ESA Security Officer.
The Tenderers are informed that Classified Information can be shared with ESA only in compliance with the Project Security Instruction (PSI) duly established by the Agency beforehand and subject to the approval by the ESA Member States.

The Agency will treat commercially sensitive or proprietary information confidentially and solely for the purpose of the assessment of the response.
Expenses incurred in the preparation and dispatch of the response to the announcement will not be reimbursed. This includes any expenses connected with a potential dialogue phase.
The announcement does not bind the Agency in any way to place a contract. The Agency reserves the right to issue amendments to the announcement.

10. ANNEX A: USE CASES

For the purpose of this activity, the Agency has established contacts with several stakeholders who have expressed their interest in being involved in the activity, providing feedback and contribute with inputs towards successful development and implementation of the project(s). Requirements and use cases have been collected from the following stakeholders:

1. WWF
2. Unibail-Rodamco-Westfield and 22@ Network
3. ENEL

10.1. WWF Use Case

Theme: "Monitoring the impacts of agricultural practices and sustainability standards in cotton production at the landscape level (with the use of earth observation tools)"
How can EO tools be used to monitor and evaluate the impact of sustainable practices in the cotton production sector and how do these practices affect the landscape?

Cotton is grown in subtropical and seasonally dry tropical areas in both hemispheres, but most of the world's production takes place north of the equator. India, China, the United States, Brazil, and Pakistan account for more than three-quarters of global production [1]. Cotton is estimated to employ between 100 and 150 million people globally. In other words, around 2% of the world's population depend on cotton for their cash incomes [2]. Cotton also accounts for roughly 25% of the global fibre supply of humanity's apparel and singlehandedly consumes approximately 3% of the world's water [3,4].
Globally, cotton land area is projected to expand by 1% by 2030 while yields are projected to increase by 10% compared to 2020 [1]. While the crop itself is not overly water demanding, the combination of large production volumes and considerable use of pesticides/fertilizers imply enormous impacts on ecosystems. Given the sector's predicted increase in the coming decade, it is important to understand the impact of different agricultural practices on the landscape and ecosystems and how they can support the fight against global challenges, such as climate change, freshwater depletion and biodiversity loss.
Cotton has been a priority area for WWF's work over the past 20 years, with the main goal of helping farmers in India, Pakistan and Turkey increase their productivity while reducing the environmental impacts and protecting ecosystems through the introduction of better agricultural practices (in some cases with the implementation of international standards). While WWF's impact on livelihoods is confirmed, year after year, by an increasing number of farmers joining the projects, its impact on landscapes is not clearly measured. This, coupled with the apparel industry pushing farmers from Better Cotton to Organic and Organic to Regenerative, highlights one of the biggest challenges WWF have observed so far: the need for consistent methods to evaluate the impact of different agricultural approaches.

The use of Earth Observation (EO) tools would enable the assessment of whether and to what extent actions implemented on the ground to achieve sustainable production and better environmental conditions are really having such effects. EO coupled with new technologies (e.g. data mining, AI, machine learning) may help overcome the lack of historical data and consistent methods for the creation of baseline studies, traceability issues and cumulative impacts at basin level, and also provide useful comparisons between the impacts of different agricultural practices at the landscape level (i.e. conventional, Better Cotton, organic, regenerative, etc.). EO can also be used to improve best practices, by providing farmers with near real-time information on crop needs. Addressing these challenges would help us to provide answers to the key questions regarding best practices for cotton production in the fashion industry, and how to ensure that cotton production is not at odds with international agreements such as the 2030 Agenda and the Paris Agreement.

Reference:

[1] - OECD-FAO AGRICULTURAL OUTLOOK 2021-2030. Available at: OECD-FAO Agricultural Outlook 2021-2030

[2] – Cotton: a case study of misinformation – a report on building critical data consumption in fashion (2021)

[3] – Textile Exchange (2021) Preferred Fiber & Materials Market Report 2021. Available online: https://textileexchange.org/wp-content/uploads/2021/08/Textile-Exchange_Preferred-Fiber-and-Materials-Market-Report_2021.pdf

[4] – Chapagain, et al. (2005) The Water Footprint of Cotton Consumption https://www.researchgate.net/publication/222826979_The_Water_Footprint_of_Cotton_Consumption_An_Assessment_of_the_Impact_of_Worldwide_Consumption_of_Cotton_Products_on_the_Water_Resources_in_the_Cotton_Producing_Countries

10.2. Unibail-Rodamco-Westfield and 22@ Network Stakeholders Use Case

Unibail-Rodamco-Westfield

Background

Unibail-Rodamco-Westfield is the premier global developer and operator of flagship destinations, with a portfolio valued at €55.0 Bn as of June 30, 2021, of which 86% is in retail, 7% in offices, 5% in convention and exhibition venues and 2% in services. Currently, we own and operate 86 shopping centres, including 53 flagships in the most dynamic cities in Europe and the United States. The Group is present in 2 continents and in 12 countries. We have a development pipeline of €3.8 Bn as of June 30, 2021. With the support of our 2,900 professionals and an unparalleled track-record and know-how, we are ideally positioned to generate superior value and develop world-class projects.

We distinguish ourselves by our Better Places 2030 agenda, that sets our ambition to create better places that respect the highest environmental standards and contribute to better cities.

Motivation to support the Digital Supply Chains Call

We choose innovation as our way to stay ahead and transform an ever-evolving industry. The rise of new technology, combined with changing consumer expectations, have set the scene for a new era and we are exploiting this to create unprecedented opportunities. Unibail-Rodamco-Westfield was the first real estate company to create a hub for innovation with the launch of URW Lab in 2012 and URW Link in 2015.

We innovate, seizing external opportunities brought by technology to explore new business models, create value, generate growth, and stay ahead of the curve. We anticipate trends before anyone else to live up to customer expectations. We understand that the best ideas also come from outside the Group. Our open innovation platform allows us to connect with leading experts, build partnerships, and share our enthusiasm for new ideas and solutions.

We are interested to explore what future will bring to us in particular with respect to urban air mobility, digital supply chains and other solutions that can be applicable to our business. We know that we must anticipate the market in order to maintain our leadership. The following use-cases were identified as of specific interest for URW (Unibail-Rodamco-Westfield)

22@ Network

Background

22@ Network BCN (Barcelona) is an enterprise and institution association that gathers the major organizations of 22@ [4] District, the innovation district of Barcelona. It gathers large companies, institutions, universities, research centers, and a large network of SMEs and startups with activity in the 22@ District, the first innovation district in the world.

Motivation to support the Digital Supply Chains Call

Since 2004, 22@ Network BCN has been the association of the innovative, technological, and creative sector of the city of Barcelona. With 219 associates, we are responsible for the consolidation of the 22@ District as a dynamic, transformative, and an advanced technological space. The 22@Network BCN promotes the innovation in between their associates and facilitates the integration of entrepreneurial organizations and professionals to the dynamics of 22@ by facilitating the networking and interaction between the associates.

Use-Cases

Drone Deliveries of Food from Restaurants Situated in Shopping Centres

Around 20% of the revenue of the restaurants in shopping centers are made through delivery. We are interested in understanding the entire operational process, technical and user needs for solutions transforming this process using drone technology. This encompasses identification of the operational challenges and associated possible solutions relating to the

[4] 22@, also known as 22@Barcelona and Districte de la innovació (innovation district) is the corporate name given to an urban renewal area in Barcelona. Its aim is to transform this region into the city's technological and innovation district, as well as to increase leisure and residential spaces.

spatial requirements for drone take-off and landing, coordination, operational process for pick-up of goods, queuing and coordination/optimisation if there are multiple orders for a single restaurant or across multiple, and associated safety and security challenges should also be evaluated.

Further to this, additional interests include tracking of drone flights and status, identification of the potential obstacles and risks in the surrounding areas and flightpaths, calculation of carbon footprint of the services and in particular to showcase the comparative impact on the environment with respect to the prior, traditional delivery mechanisms. Essential business KPIs (Key Performance Indicators) for candidate services should include *cost* and *time* reduction with respect to traditional delivery means, risks and capabilities in delivering to various sites effectively (office buildings, private apartments, others as required…), and the requirements surrounding access to charging/technical facilities (locations, accessibility, economics, necessary partnerships…) and their integration into the relevant shopping mall in order to make the operational services viable.

Logistics and Supply Chain Optimisation

Optimization of loading and unloading and efficient, sustainable integration of last-mile distribution in cities are some of the main challenges we face for the future. We are able to offer three shopping centers in Barcelona (Westfield Glòries, Westfield La Maquinista and Splau) as possible testbeds in order to showcase more sustainable and efficient distribution options to the operators of our shopping malls and to Barcelona city center.
In addition, we have further interests in:

- How we can use physical space such as parking areas to transform them into logistics platforms to facilitate last-mile distribution through sustainable means of transport, whether land- or air-based.
- How we can optimize logistics chains through tracking and usage of space technology to maintain a dynamic picture of the journey of goods, analytics to reduce returns due to customer absence, and carbon footprint of our services.

Other

Solutions related to smart and sustainable mobility, and safety and security as pertains to digital supply chains.

Support Offered to Prospective Bidders Addressing these Use-Cases

- Access to local authorities to help to obtain necessary permissions for demonstrations and tests (e.g. with respect to drone flights).
- URW Shopping Centres as testbeds (Westfield Glòries, Westfield La Maquinista and Splau), which includes common areas of the malls, parking areas, rooftops and vacancy units.
- Press coverage of the initiative / project.
- Collaboration with local authorities and local associations that could be interested in test, finance or supporting the work undertaken in the project.
- Possibility to develop and demonstrate solutions with retailers in our malls. For example, local restaurants for food delivery with drones.

10.3. ENEL Use Case

Image recognition software for the monitoring of construction advancement

Context Information

Enel Green Power (EGP) is a multinational renewable energy company and one of the world's leading integrated electricity operators, with more than 43 GW of managed installed capacity, nearly 1.200 power plants in 5 continents and more than 100 TWh of renewable energy production per year. Solar is one of the five technologies in the EGP portfolio (along with Hydro, Wind, Geothermal and Biomass), with more than 4000 MW installed in 193 plants, located in 13 different Countries. EGP's Engineering & Construction (E&C) unit constructs nearly 1000 MW of new Solar capacity per year.

To monitor the progress of the activities on site, EGP personnel and external contractors need to check the progress of the installation daily. The collection of these data is necessary to produce a weekly report that represents the official statement of the Site Manager (SM) towards Project Manager (PM) and the Management of the company.

How does the process work today?

Up to now, the monitoring of construction progress in photovoltaic (PV) power plants has been carried out via manual and visual checks, involving EGP personnel and suppliers.

1. For each construction activity, one or more teams are assigned by suppliers
2. One reference person (RP) per team or multiple teams is appointed to report the progress of their activities
3. Each supplier collects information received by its own RPs and prepares a standard daily report according to a format requested by EGP
4. EGP collects standard daily reports from all suppliers and makes a unique daily report
5. EGP personnel conduct frequent site surveys to verify the correspondence of information provided by suppliers.
6. EGP and suppliers organize daily meetings to check and correct possible incorrect values.
7. EGP's Site Managers upload data to a common and digital repository through a dedicated tool.
8. EGP issues every week an official report, called the Weekly Report (WR).

The process implemented today needs to involve many people to collect, verify, elaborate and share information and it requires all parties to spend many hours to execute it.
Furthermore, many EGP PV plants are large scale power plants, that occupy a large area (over 100 hectares), and this forces EGP personnel to reduce the percentage of spot site surveys to countercheck information provided by suppliers or to increase the work hours spent to do it. Sometimes to make a survey of all power plant is almost impossible with standard means because it requests all day or more time.

How can the process be improved?

EGP is introducing the weekly acquisition of VHR (Very High Resolution) satellite images to obtain updated information from the construction site. The improvement would be to use AI algorithm, applied to multispectral satellite images, to obtain automatically an estimate the progress of construction activities.
We wish to reduce the time required for periodical reporting as well as the precision of the reports. This project aims to reduce the workhours spent for monitoring, ensure the possibility to cover all the PV plant surface (100 MW can cover approximately 200 hectares), increase the construction quality and the level of supervision over suppliers. If remote inspections were possible, fewer plant visits would be required, reducing travel costs and interference with construction site operations.

What is the target process?

The target process is construction advancement reporting. Each week, the site manager must prepare a report summarizing the number of specific technical objects which are installed each work period, specifically:

1. Trenches: These are usually dug at the side of roads and cables are laid inside them;
2. Piles: Vertical piles that are pushed into the ground and act as basic structures ;
3. Structures: The frames on which solar panels are placed. On some sites where solar panels move with the sun, there are additional axes (Tracker) provide the movement for the panels;
4. Panels/Modules: The final mechanical component which is attached to the support structure and the main power generation components of the plant;

5. Surface preparation/ leveling (square meter): Classification of three class of land (uncultivated / scraped / leveled);
6. Site Logistic: Monitoring pallet positioning of tracker assembly parts and MV cables in the bloks (subfield).

The future process that should be implemented consists of monitoring the plant construction using satellite images, following this sequence of steps:

Initial steps by EGP, not included in challenge:

1. Uploading of most recent multispectral satellite images to an EGP server;

Main activity included in challenge:

2. Algorithm analyzes available data and provides the status of the plant's construction and installation of each plant element (e.g. element installed / not installed) for selected subset areas chosen by the user

Next steps (out of scope of challenge):

3. Automatic transmission of the output files to the EGP Server.
4. On a weekly basis EGP issues an official report (WR).

Requirements

PRIMARY REQUIREMENTS - MUST HAVE

The progress analysis will have to evaluate the progress of all the areas worked with respect to the overall work area and will have to be automatically processed in a maximum time of about 24 hours. In the initial phase of the POC (the first month) the supplier can be granted a longer time for the data processing in order to perform an appropriate training of the AI algorithms, anyway not more than 3 days starting from the availability of images on cloud.

Expected Metrics are the following:

1. Mechanical Works:
    - 1.1. Metal piles: number, percentage.
    - 1.2. Trackers structure: number, percentage.
    - 1.3. PV modules: number and percentage.
2. Electrical Works:
    - 2.1. Trenching: Length, Percentage

2.2. Trenching Backfill: Length, Percentage

2.3. Conversion Unit (Cabin which host the inverters in charge of the DC to AC conversion): done/not done, percentage

2.4. Transformer CU: done/not done, percentage (if transformer is installed outside the CU)

3. Site Works:

3.1. Conversion Unit (Standard foundation):

3.1.1. Excavation of Foundation, Lean concrete & Grounding System: percentage, done/not done

3.1.2. Lean Concrete: done/not done

3.1.3. Reinforcing bars: done/not done

3.1.4. Pouring: done/not done

3.1.5. Backfilling & Grounding Finishing: done/not done

3.2. Drainage system and retention/sediment basins: percentage

3.3. Roads: length of roads (polyline)

3.4. Road Clearing: Length

3.5. Road Excavation and Fill: Length

3.6. Road Execution: Length

3.7. Road Drainages: Length

3.8. Surface preparation: Hectares/percentage

3.9. Site Fence: Length of installed fence and gates

4. Site Logistic:

4.1. Pallet positioning: number/sub area

4.2. Coil medium voltage cable: number per sub area

ADVANCED REQUIREMENTS - NICE TO HAVE

Providers will be positively evaluated if able to provide reporting on some additional metrics, which are:

1. Site Works:

1.1. Conversion Unit (precast foundation):

1.1.1. precast foundation: done/not done

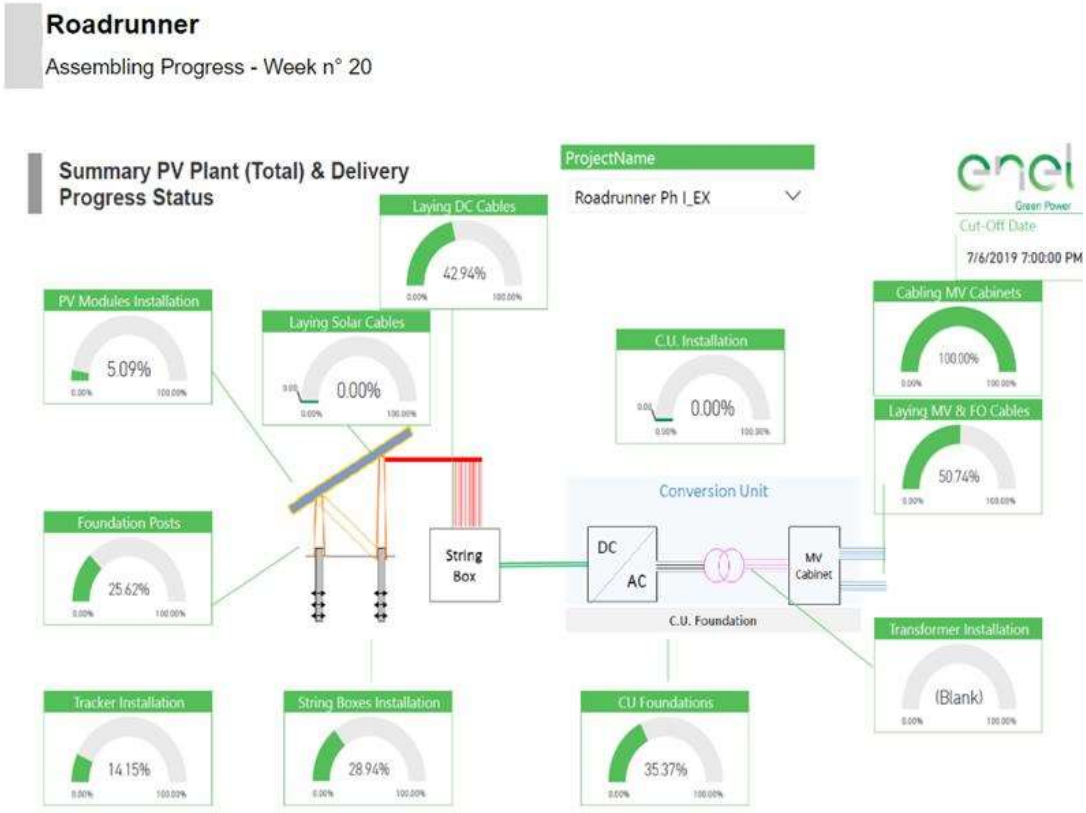
2. Storage of delivered material:
   2.1. Metal piles: number of containers with poles (containers not applicable, we should do number of stockpiles or bundles)
   2.2. Trackers: number of containers with trackers (containers not applicable, we should do number of stockpiles or bundles)
   2.3. PV Modules: number of containers with PV modules (number of pallets)

Other metrics on the substation (MPT foundation, concrete foundations, steel installation / dead ends / bus support, CCTV / VT / CT installation, control building, fence and gates), interconnection points and transmission lines are all to be considered as further requests whose feasibility will be analyzed together with the supplier during development activities.

The technical feasibility of implementing the new metrics will be carefully analyzed during the development phase, verifying the quality and reliability of the estimated results.

The Key Performance Indicators are inserted in Annex 1

Example of dashboard with weekly metrics for a PV plant:



ANNEX 1 – Key Performance Indicators

KPI	Unit of Measure
Ratio of recognized poles over installed poles (per sub-batch and survey)	%
Ratio of falsely recognized poles over not already installed poles (per sub-batch and survey)	%
Ratio of recognized tracker over installed tracker (for sub-batch and survey)	%
Ratio of falsely recognized tracker over not already installed tracker (for sub-batch and survey)	%
Ratio of recognized PV modules over installed PV modules (for sub-batch and survey)	%
Ratio of falsely recognized PV modules over not already installed PV modules (for sub-batch and survey)	%
Ratio of recognized CU over installed CU (whole site)	%
Ratio between the number of pallets present in the subfield and the expected number (if possible)	%
Ratio of the leveled area to the expected surface	%
Ratio of falsely recognized CU over not already installed CU (whole site)	%
Ratio of length of recognized aerial cables over installed aerial cables length (if possible)	%
Length of falsely recognized aerial cables over not already installed aerial cables length (if possible)	%
Computation time on assigned infrastructure (for sub-batch and survey)	min
Computation time on reference architecture (for sub-batch and survey)	min