European
Innovation
Council

PATHFINDER CHALLENGE

Towards autonomous robot collectives delivering collaborative tasks in dynamic unstructured construction environments

EIC Work Programme reference: HORIZON-EIC-2025-PATHFINDERCHALLENGES-01-03
Call deadline date: 29/10/2025
EIC Programme Manager: Franc MOUWEN

EIC will hold an Info Session on this Pathfinder Challenge topic in spring 2025. You will be able to find the information about the Info day, when it is available, at Events - European Commission. **Participation in the meeting, although encouraged, is optional and is not required for the submission of an application. A recording of this Info Session will be made available on** EIC Pathfinder Challenges 2025 - European Commission**.**

Table of Contents

Challenge Guide – Towards autonomous robot collectives delivering collaborative tasks in dynamic unstructured construction environments

1.   About this document

The Challenge Guide serves as guidance and background for the common understanding, participation rules and obligations for the EIC beneficiaries that are involved in the Challenge Portfolio. Contractual Obligations are further detailed in the EIC Work Programme 2025.

The Challenge Guide is a guidance document accompanying a topic of the Pathfinder Challenge call for proposals to provide further information about how portfolio considerations will be considered in the evaluation of proposals for that topic.

The Challenge Guide is prepared by and under the responsibility of the relevant EIC Programme Manager (information about the EIC Programme Managers is available on the EIC Website (https://eic.ec.europa.eu/eic-communities/eic-programme-managers_en). It complements the Scope, Specific Objectives, Expected Outcomes and Impacts, and Specific Conditions set out in the EIC Work Programme by a description of the additional categories and the portfolio considerations that will be used in portfolio building and explains how a portfolio will be built. Please note that in no case does the Challenge Guide contradict or supplant the Work Programme text.

Following the selection of a proposals to be funded under the Challenge, the Programme Manager will work together with the consortia of the selected projects to develop a strategic plan for the Challenge, including a common roadmap. This strategy plan will integrate the activities and milestones of the individual projects into a shared set of objectives and activities across and beyond the projects. It serves as a common basis for the project portfolio and may affect the project implementation - including possible adjustments, reorientations, or additional support to projects. The strategic plan will be updated in light of emerging results or issues during the implementation.

2   Scope and objectives of the Challenge as defined in the Work Programme

This section is a copy of the Challenge call in the EIC work programme text. Proposals to this Challenge are expected to explain how they relate to and intend to go beyond the state of the art, and how they interpret and contribute to the objectives of the Challenge.

Background and scope

Robotic automation offers significant advantages to several sectors, yet on-site construction robotics is amongst the most challenging and least understood fields in robotics. The unstructured, dynamic environment with human presence makes navigation and automation of the many concurrent construction tasks deeply challenging. Further, the current state-of-the-art solutions focus on adding higher degrees of automation to legacy tools, such as heavy equipment designed for diesel engines and human operators.

Radical innovations are essential for the sector to address the unprecedented wave of building growth, especially in the context of labour shortages, a productivity gap between the construction and other industries, rising expectations for occupational health and safety, and the need for healthier and more affordable living environments.

Challenge Guide – Towards autonomous robot collectives delivering collaborative tasks in dynamic unstructured construction environments

Through the collaboration of multiple agents (both humans and machines) construction processes can be accelerated, enabling more complex processes with multiple tasks to be performed simultaneously and collaboratively. Multi-robotic collaboration, where robotic agents support and complement each other's tasks and skill sets within the same workspace, may unlock entirely new processes that are not possible using single robotic machines. This approach could involve multiple distributed "swarms" of collaborative robots using distributed control algorithms and robot learning systems, which may be better suited to large, spatially distributed tasks and can adapt to unpredictable environments. Doing so while also supporting the electrification of the (legacy suite of) construction equipment, will help break with the need to go for ever larger machines and facilitate the development of novel technologies that enable efficient accurate and reliable control, and the adoption of collaborative robots that are suitable for commercial on-site construction environments.

Realising the disruptive potential of novel emerging technology paradigms that reconsider construction processes from the fundamentals can help supplant and substitute the legacy suite of tools with novel autonomous collaborative construction robots in an integrated, "designed-for-robotics" digital production and assembly chain.

Such developments could also further enhance an emerging paradigm shift from today's complex mix of on-site construction tasks, towards a future of off-site fabrication and on-site assembly. Off-site fabrication offers industrial economic advantages of producing modularized building elements at scale in a controlled, digitalized and automated factory environment. For the construction sector this paradigm shift can deliver demand-side emissions reductions, by implementing strategies of digitalized structural efficiency and novel materials, as well as of zero-emission construction sites through electrification.

This Pathfinder Challenge aims to address all construction tasks typically required for site preparation, substructure, and superstructure, as well as the coordination between these tasks to support a transition towards building with autonomous electrified construction equipment. It includes the role of human agents in construction processes, as even high degrees of multi-robotic autonomy with low degrees of supervision will require a collaborative connection between human and robotic agents, ensuring they can safely collaborate and share the same workspace.

Specific objectives

The overall objective of this Challenge is the development of breakthrough technologies in the domain of autonomous collaborative on-site construction robots for an integrated, designed-for-robotics, digital production and assembly chain.

The Challenge is open to the 3 main construction tasks applied to the 2 main construction segments of buildings and infrastructure. Innovative application in adjacent construction segments (for example coastal protection foundations for energy infrastructure) also fall within scope.

Each funded project shall deliver the following 3 specific objectives:

Objective 1:

Development of a simplified structural, load-bearing, material-robot building system to assemble a representative and future-relevant structure (pavilion) using a multitude of discrete modules (elements, segments, blocks, voussoirs). This system must demonstrate TRL4 (validation in laboratory

environment) of the autonomous collaborative multirobotic assembly. The structure can represent an infrastructure (for example a bridge, tunnel, culvert, conduit), a building (for example a tower, vault, dome, arch, multi-story skeleton, wall) or other construction elements (for example a foundation, secant wall, barrier, sea wall). The building system can also integrate unprocessed and pre-processed in-situ building materials (rocks, sand, natural materials, demolition materials, disassembled elements). Projects are expected to demonstrate the technologies at least at a relevant human scale in terms of volume, mass and moment of inertia, and ideally at a larger real-world architectural scale, rather than at a laboratory desktop scale.

Solutions are expected to incorporate "design-for-robotic-assembly" aspects, such as the robot-material interfaces, module interfaces and connectors, and may include innovative approaches such as embedded sensing in the modules.

A virtual simulation of the disassembled state, various intermediate assembly stages (including temporary (robotic) support measures if necessary) and final assembled state is expected to be part of the systems development process. The project should include a documented validation of key design decisions (for example materials used or configurations that simulate scaled behaviour) against the minimal requirements of the TRL4 demonstration objectives of the autonomous mobile multi-robotic collaborative platform.

Objective 2:

Development of an autonomous mobile multi-robotic collaborative platform using at least two, preferably more, mutually aware collaborative robotic systems specifically designed for the assembly tasks outlined in Objective 1. This objective requires a structured systems engineering approach to conduct a thorough functional system analysis and to allocate system-level functions between humans and machines within the target autonomous mobile multi-robotic collaborative platform.

The design should include the definition of system states and modes, along with the transitions between them, to ensure safe autonomous operations and effective demonstration of robot-robot and human-robot collaborations and interactions (passive, active, adaptive) at TRL4.

The project should also describe how the proposed technology can be scaled to meet the full dimensions of the intended commercial application in future.

Utilizing existing industrial robots or modifying suitable existing construction tools is allowed. However, these approaches may face workspace limitations when scaled to full commercial dimensions. Conversely, novel relative multi-robotic platforms could make full use of the opportunities of the material-robot system independent of scaling limitations in future.

Objective 3:

Achieve a TRL4 demonstration of an autonomous assembly sequence using the demonstration building system developed in Objective 1, executed by the autonomous mobile multi-robotic collaborative platform developed in Objective 2. The demonstration of a subsequent disassembly sequence is optional but encouraged if the building system is designed for disassembly. The demonstration will

take place in a laboratory environment, including tests that explore the system's resilience and limits under controlled unstructured real-world conditions (for example fault tolerance, granular uneven surfaces, environmental obstacles). These tests aim to identify key weaknesses and recommend future technology developments.

The specific objective of this challenge is to advance the digitalized chain of off-site modular production with on-site autonomous mobile multi-robotic collaborative assembly. Therefore, on-site 3D-printing of cementitious materials or polymers as a primary construction task is outside the scope of this challenge.

Expected outcomes and impacts

This Challenge contributes to the European Green Deal[1] ([The European Green Deal - European Commission (europa.eu)](#)), the European AI Strategy[2] ([European approach to artificial intelligence | Shaping Europe's digital future (europa.eu)](#)), and the key strategic orientations of Horizon Europe[3] ([Strategic plan - European Commission (europa.eu)](#)) for the digital and green transitions of the construction sector.

The anticipated impacts of this Challenge include addressing likely shortages and competition in the labour markets, enhancing productivity and competitiveness within the construction industry, and improving worker safety. It will facilitate a shift towards offsite industrial fabrication coupled with onsite assembly and disassembly, reducing emissions from on-site construction activities, and lowering costs and mitigating risks associated with construction projects. This Challenge will also serve as a lighthouse for industrialization in important policy areas, such as affordable housing, the renovation wave, circular construction, and infrastructure development.

The field of mobile construction robotics, in particular heterogeneous collaborative robots assembling discrete building elements, is challenging and multi-disciplinary. Given the nascent state of the enabling technologies, the cumulative impact of the portfolio of Pathfinder projects is expected to surpass that of individual projects. Consortia will benefit from mutual learning and the exchange of approaches and expertise in areas such as mapping, navigating, and building awareness of unstructured environments, force-aware manipulation, swarm collectives, as well as commercialisation pathways.

Furthermore, consortia will be encouraged to collaborate on developing performance metrics and communicate their outputs to the broader public with a view to accelerating the adoption of these radical innovations by the sector. Such valuable joint portfolio activities are anticipated to be discussed and agreed upon by the funded projects.

The portfolio of projects selected will aim to cover a complementary set of projects that span the "application" and "approach" fields specified below and combinations thereof:
  - Applications fields (super-structure, sub-structure, site-preparation, building, infrastructure, other construction, target type of environment).

---

[1] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/story-von-der-leyen-commission/european-green-deal_en

[2] https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence

[3] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/strategic-plan_en

- Approach (type of robot, number of agents, coordination strategy, level of autonomy, strategy for stability during assembly sequence, multi-modal sensors, resilience strategy for environmental variability, type of discrete building elements and fixations, level of integration of material-robot system).

3 Portfolio considerations for the evaluation of applications to the Challenge

This section describes how portfolio considerations will be considered in the second evaluation step. For more details of the full evaluation process please refer to the EIC Work Programme 2025 pages 28-35.

After the submission of your proposal, it will be evaluated in two steps:

1. The EIC expert evaluators will assess each proposal separately against the award criteria and the EIC evaluation committee will ensure consistency across scores.
2. The EIC evaluation committee, consisting of EIC expert evaluators and an EIC Programme Manager will map all the proposals above the threshold in a number of categories, sub-categories and elements stemming from the overall goal and specific objectives of the Challenge. Examples of possible categories are building blocks or subsystems, technical areas and/or competing technologies, platforms, applications areas, risk level and stage of technology readiness level, size, etc.

Following this mapping of proposals against categories, a suitable portfolio of proposals will be selected by the evaluation committee by applying portfolio considerations to propose for funding a coherent set of projects that will achieve the expected outcomes and impacts of the Challenge and maximise their impact.

Categories

The projects in a portfolio are expected to mutually benefit from each other, complement each other, share certain components with each other, as well have challenges in common. For example, a project on a breakthrough enabling technology may both be beneficial to and be validated by other portfolio projects. Also, joint understanding of policies, standards, industry supply chains, and sector stakeholders will benefit all projects towards the future commercialization of their technologies.

For this Challenge, the two major categories, sub-categories and domains within the sub-categories are depicted in the table below. The categorization aims to provide guidance and considerations for the evaluation committee and is non-exhaustive.

Portfolio categories, sub-categories, domains	
Category: Application Fields	
Sub-categories	**Domains**
Super-structure: building	Pavilion, tower, arch, slab-beam-column, vault, shell, space frame, etc.

Super-structure: infrastructure	Bridge, tunnel, culvert, road, channel, etc.
Sub-structure	Anchoring, piling, footing, slabs, walls, etc.
Site-preparation	Surveying, earthmoving, scraping, scooping, trenching, stabilization, demolition, etc.
Other construction	Coastal erosion protection, energy infrastructure, emergency shelter, desertification mitigation, etc.

Category: Approach	
Sub-categories:	**Domains:**
Type of robot	Adopted legacy mobile equipment, absolute (robot separate of building kinematic chain), relative (robot part of building kinematic chain, etc.), ground-based, climbing, cable-driven, aerial, industrial, and end-effectors (grippers, twist locks, magnetic, vacuum, mechanical, etc.
Number of agents	Dyad, triad, quartet, team, cluster, swarm, uniform general-purpose agents, pluriform task-specific agents, integration of human agents, etc.
Coordination, communication, localization, goal setting strategy	Centralized (global, top-down, direct), decentralized (distributed, bottom-up, indirect, stigmergy), hybrid (combinations, extended stigmergy), level of autonomy (1-5) and integration of humans, blueprint goals, functional goals
Stability during assembly sequence and construction	Use of temporary support elements, self-stable, counterbalancing, etc.), resilience strategy for environmental variability and unstructured conditions
Type of multi-modal sensors	Camera, motion, force, sonic, range, magnetic, sensors embedded in building elements, passive, active, global, local, etc.), protection against (future) harsh environments
Type of discrete building elements	Blocks, voussoirs, modules, beams, piles, tiles, cages, wires, fibers, fabric, panels, frames, node-and-strut, etc.
Type of discrete building element fixation	Connectors, fasteners, topologically interlocking, adhesive, cementitious, composite, etc.
Target type of environment	Benign on-site, disaster scenario, hostile environment, existing building, etc.
Level of integration of material-robot system, "design-for-robotic-assembly"	None, added functionality, critically integrated, etc.

Portfolio considerations

For building the portfolio of projects to be funded, the evaluation committee will apply the following portfolio considerations:

The objectives of all proposals will be mapped according to the two categories (application fields and approach), sub-categories, and sub-category domains. Each proposal has an application field and an approach. A proposal can cover multiple domains.

In the **application field category**, the selection from the five sub-categories is prioritized towards the first sub-category "Super-structure: building", complemented with at least one project from the second sub-category "Super-structure: infrastructure", complemented with maximum one project from both "Sub-structure" or "Site-preparation", complemented with maximum one project from "Other construction" if applicable. For example, in a notional portfolio of 7 projects, the distribution over the five sub-categories could be 4-1-0-1-1, or 4-2-0-0-1, or 3-2-1-0-1, or 4-3-0-0-0, rather than 1-4-1-0-1, etc. Next to this, a distribution rather than overlapping of domains will be prioritized. These prioritizations can be overruled if other compositions result in more portfolio synergy and value. It is not expected that the portfolio of projects will cover all domains.

In the **approach category**, each proposal will be mapped according to all the sub-categories and domains within each sub-category. The portfolio of projects selected under this Pathfinder Challenge will prioritize covering a variety of approaches rather than overlapping or identical approaches. In the sub-category "Type of robot" the portfolio will ideally include at least one "relative robot". In the sub-category "number of agents" the portfolio will ideally include at least one "cluster" or "swarm". In the sub-category "Coordination, communication, localization, goal setting strategy" the portfolio will ideally include at least one project applying "stigmergy". In the sub-category "Type of multi-modal sensors" the portfolio will ideally include at least one project implementing "Sensors embedded in building elements". These prioritizations can be overruled if other compositions result in more portfolio synergy and value. It is not expected that the portfolio of projects will cover all domains.

Starting from the highest ranked proposal, a portfolio of proposals will be selected based on shared components/complementarities, while ensuring diversity among the selected proposals and coverage and preferred balance over the (sub-) categories. This implies that if the evaluation committee considers that a highly ranked proposal does not have a shared component/complementarity with other proposals, it may not be selected for the portfolio. To ensure diversification, proposals which the evaluation committee considers to be very similar to a proposal already included in the portfolio may not be selected.

Consequently, this means that the portfolio of projects selected for funding after the second step is expected to differ from the ranking list established in the first step (score-based ranking after assessment of each proposal separately).

Within the composition of the portfolio, the evaluation committee may also apply portfolio "subsets", where each subset contains multiple projects adding collaborative value. Considerations to do so could be shared components, competing approaches, diversification, complementary approaches, sequentially complementarity approaches (the output from one project becomes the input for another

project), overarching approaches enabling or supporting other projects (simulation, training data, computation).

4   Implementation of the Challenge portfolio

Once funded, projects will be expected and obliged to work collectively during the implementation of their projects under the guidance of an EIC Programme Manager. This section summarises some of the key aspects of this pro-active management which applicants should take into account in preparing their proposals.

Proposal preparation and Grant negotiations

Applicants may be requested to make amendments to their proposed project to enhance the portfolio. Such changes may for instance include additional tasks to undertake common/ joint activities (workshops, data exchanges, joint research, etc) with other projects in the portfolio.

Based on first experience, it is proposed that applicants foresee in their proposal a dedicated work package for portfolio activities and allocate at least 10 person-months (see below for the purpose and examples of such activities).

If you fail to do this during proposal time, your proposal will not be scored lower during the evaluation, but in case your proposal is selected for grant agreement preparation, you will be requested to add the portfolio work package to your grant agreement. Please be aware that in that case the maximum grant you receive will not change, and you will need to find the resources for portfolio activities within the foreseen project budget.

It is also proposed that in your proposal you make a self-assessment of how your proposal maps to the categories, sub-categories and domains used for portfolio building. The evaluation committee will confirm or update this self-assessment and use it in the step 2 of the evaluation.

Portfolio activities

The aims of the portfolio activities are:

1. Enhancing the development potential of each individual project, as a result of its active participation in the portfolio activities: Ensuring that portfolio members, can access a much higher number of relevant partnerships.
2. Enhancing the commercialisation potential of each individual project, as a result of its active participation in the portfolio activities: Ensuring that portfolio members, can access the right industry partners to explore key partnerships.

In order to accomplish the above the Programme Manager will guide the projects to develop and agree on a strategic plan for the portfolio.

Portfolio Strategic Plan

Following the selection of a proposals to be funded under the Challenge, the Programme Manager will work together the consortia of the selected projects to develop a common strategy plan/roadmap for the Challenge. This plan will integrate the activities and milestones of the individual projects into a

shared set of specific objectives and activities across and beyond the projects. The roadmap serves as a common basis for the project implementation - including possible adjustments, reorientations, or additional support to projects. The roadmap will be updated in light of emerging results or issues during the implementation. The objectives can be revised, for instance based on projects' unexpected achievements, new technology trends, external inputs (other projects, new calls…).

In particular, the Challenge roadmap/ strategy plan will include activities on the transition to innovation and commercialisation, and to stimulate business opportunities. These activities may be reinforced during the implementation with additional funding and expertise through pro-active management. Non-exhaustive examples of activities towards the above-mentioned aims are:

Non-exhaustive examples of activities towards the above-mentioned aims are:

Technology:

- Comparing performance of technologies, developing common benchmarks and standards.

- One project may use the results of another project, building future value chains.

- Providing access to Open Innovation Test Beds and other research infrastructure to validate the technology.

Regulatory:

- Portfolio activities that support, inform, participate in discussions around, or identify gaps in on-going legislative processes.

Transition of technology to innovation

- Portfolio activities developing techno-economic views on the future implementation, adoption, and scaling potential of the various technologies in realistic real-world conditions.

- Market analysis: Map the targeted players in a market and exchange the market research analysis results with other the portfolio projects to identify specific players with which the entire portfolio can establish partnership(s) of much higher impact as opposed to that of the individual project.
- Discussions on IP, licensing and business models and commercialisation strategy.
- Discussions with early stage private and corporate investors focused on relevant fields.

- Providing access to new markets through multipliers like Enterprise Europe Network.

Ethics

- Discussing the relevant for the Challenge ethics issues, especially when within the portfolio there are projects, subject to ethics reviews.

- Perform activities that support, inform, and participate in discussions around the process of putting forward relevant ethical principles and discussing the appropriate approaches for compliance.

Communication and dissemination:

- Effectively communication of any key outcome of the research work of the portfolio members collectively and/or an individual project, to early stage private and corporate investors

focused on the same field. Such communication might also be addressed to the general public to increase social acceptance for proposed solutions, or to other researchers and stakeholders through common dissemination activities at scientific conferences or trade fairs.

- Organising joint conferences, workshops, summers schools, etc.

These tasks require the active participation of portfolio members to a series of meetings called for and steered by the Programme Manager. Portfolio projects will be expected to exchange information on the proposed research methodologies, experimental tests, techno-economic input data and relevant results achieved, to collectively use the available resources. This exchange of data between portfolio members can enhance the potential of individual projects, use of results originating from the analysis of common databases, as well as their chances to establish key partnerships.

The exchange of information for the purpose of EIC portfolio activities will fall under the conditions and non-disclosure obligations as specified in the EIC Work Programme 2025 (Annex 6, section 2).

Tools though which projects can receive additional support

Projects in the portfolio may be offered additional support, either individually or collectively, in order to reinforce portfolio activities or explore the transition to innovation. Such additional support includes:

- Booster grants of up to €50k (see Annex 5 of the EIC Work Programme).
- Access to additional EIC Business Acceleration Services (see https://eic.ec.europa.eu/eic-funding-opportunities/business-acceleration-services_en)
- Access to the Fast Track to the EIC Accelerator, which would follow a project review (see Annex 3 of the EIC Work Programme).
- The possibility to apply for EIC Transition if your Pathfinder project resulted in an experimental proof of concept (TRL 3), or a technology validated in the lab (TRL 4)
- Access to the EIC Market Place, once operational, to connect with innovators, investors and other selected partners.
- Interactions with relevant projects and initiatives outside the portfolio, including other EU funding initiatives as well as those supported by national, regional or other international bodies.

5. Annex 1: Template work package portfolio activities

WPX PORTFOLIO MANAGEMENT
Start Month 1, End Month (full project duration)
Objectives
Explore synergies and collaborations among the projects of the portfolio, to maximize the achievement of the scientific results, the exploitation potentials, the outreach opportunities with key stakeholders, the identification and overcoming of major barriers to introduce the innovation to the market.

Specific objectives:

- **Contribute to the elaboration of the strategic plan** of portfolio and sub-portfolio activities, which is composed by a list of the specific **techno-scientific joint collaborations** between two or more portfolio projects, with the respective timeline and expected achievements. Potential synergies identified by a comprehensive in-depth analysis of shared components and

complementarities amongst the portfolio members is expected to unlock additional value for each portfolio member.

- Developing a common understanding within the portfolio members of the existing and developing **regulatory environment** in view of the future implementation of the technologies that are developed by the portfolio members. By identifying regulatory barriers for innovation, the portfolio of projects can jointly contribute to potential improvements and further development of the regulatory framework. Through common communication activities addressed at policy makers and other relevant stakeholders such as dissemination at scientific conferences or trade-fairs, social acceptance for proposed solutions can be increased, and regulatory barriers for innovation can be highlighted.

- **Sharing life cycle analysis and life cycle thinking and developing novel/common metrics or ways of benchmarking** the potential impact associated with each solution is expected to contribute to the acceptance and future implementation of the technologies developed by the portfolio members.

- **Define common scenarios and strategies for commercialization and exploitation.** Identify key stakeholders such as relevant end-users, investors, supply-chain actors. Effectively communicate key outcomes of the research work of the portfolio members collectively and/or as individual project to early stage private and corporate investors focused on the same field to attract early feedback. Exchanging such techno-economic insights and commercialization scenarios with other portfolio members is expected to have more impact than individual projects can achieve and may also trigger new partnership(s). Also, collective understanding of IP strategies and IP management is expected to add portfolio value to each project.

Description

Task X.1: Portfolio management and governance This task will require regular meetings and exchanges among the portfolio projects, to identify collaborations on specific technical aspects and exchange of information, best practices, strategies, etc. A steering committee where each project is represented will be set up and steered by the Programme Manager. It will include the kick off meeting and the annual portfolio meeting in presence, and additional regular online meetings. Four Working Groups (WG's) will be set up to organize and implement activities as follows: WG1: Technological synergies; WG2: Regulatory environment, outreach events and awareness practices; WG3: LCA activities, and WG4: Commercialization, exploitation, IP protection. Each consortium will nominate a representative for each WG. A chair will be nominated from among them. The chair will be responsible to prepare meeting agendas, links to the meeting and minutes of the meetings. WG Meetings are expected to be online and to be scheduled approximately every 3 months. The exchange of information for the purpose of EIC portfolio activities will fall under the conditions and non-disclosure obligations as specified in the EIC Work Programme 2023 (Annex 6, section 2.2).

Task X.2: Portfolio actions to foster collaboration towards innovation. This task will create opportunities to nurture innovations arising from portfolio collaboration, for example: common understanding of license agreements, EIC Business Acceleration Services, access to coaching and mentoring, European IP Helpdesk services, access to additional funding opportunities such as the EIC Booster grant. To stimulate innovation opportunities, the projects shall be involved in actions aimed at strengthening the EU research community. Therefore, this task can also include: the mapping and categorization of all the stakeholders and potential establishment of key partnership(s), the sharing of best practices, the exchange of researchers, access to research facilities, etc.

Task X.3: Implementation of portfolio dissemination and communication activities Design and participate in outreach events (e.g., stakeholder matchmaking, industry trade fairs) at the portfolio level to facilitate connection with stakeholders and to showcase the technologies under development. Meetings could be restricted to portfolio beneficiaries (e.g., to discuss the progress of

the portfolio as a whole) or could involve external participants (e.g., to facilitate successful completion of shared objectives by interaction with regulatory entities). Early-on common and continuous engagement with strategic AEC sector stakeholders to raise awareness of the possibility to reduce emissions by reducing and changing traditional build materials with computational design and digitalized fabrication is foreseen.

Task X.4: Techno-economic benchmark and comparative assessment Compare LCA practices and metrics of the different projects and analyse the performance of the proposed solution with the other portfolio technologies using common agreed metrics and KPI and produce a portfolio report on competitiveness, business potentials in different market segments and key barriers towards innovation of the portfolio technologies in comparison to benchmark.

Task X.5: Implementation of portfolio protection and exploitation activities Mapping, landscaping, categorization, and analysis of patents and include if needed the establishment of key partnership. Early on and continuous engagement with strategic partners and stakeholders (e.g., investors and corporations) with the aim to catalyse potential R&D opportunities and to commonly tackle investment barriers. Design and participate in events at the portfolio level to facilitate connection with stakeholders or fundraising with private stakeholders (e.g., corporates or financial investors). Exchange of the market research analysis results in between the portfolio projects.

Task X.6: Portfolio Strategic plan and other common documents: Elaboration of the portfolio strategic plan under the guidance of the Programme Manager and updated on a yearly basis. It will contain details of the techno-scientific collaborations and synergies of the portfolio projects (could be only one or more projects). It contains the actions already carried out, but also an overview of upcoming actions in the form of a roadmap. It will specify the common documents that the projects will deliver because of the other tasks specified in this work-package. Individual projects do not need to add these documents as a deliverable, they explain the contribution that they made to this report in their corresponding annual deliverable "Report on portfolio activities". A public version of the strategic plan will be published on the EIC website at year 1 and updated annually afterwards.

Deliverable X.1: Contribution to the Portfolio Strategic Plan (single deliverable)
This deliverable is the initial project's contribution to the Portfolio Strategic Plan. It will be integrated with the other projects' contributions in the overall Portfolio Strategic Plan under the guidance of the EIC Programme Manager.
Type: R: Document, report (excluding the periodic and final reports)
Dissemination level: SEN – Sensitive, limited under the conditions of the Grant Agreement
Due date: month 6.

Deliverable X.2.i: Report on portfolio activities (i=number of each implementation year. One deliverable per year; 3 deliverables for a 36-months project and 4 deliverables for a 48-months project)
The report will present the portfolio activities that have been carried out in each reporting period and contain relevant material (e.g., PowerPoint presentations, minutes of meetings, etc.). It also explains how the portfolio activities and the EIC proactive project management approach contribute to the achievement of the project objectives and help the transition to market.
Type: R: Document, report (excluding the periodic and final reports)
Dissemination level: SEN – Sensitive, limited under the conditions of the Grant Agreement
Due date: The report on portfolio activities will be submitted every 12 months.

Final considerations

- Effort to be allocated to this work package: **10 p.m.**

- In Month 1 the project should set up an operational internal **governance** to cover the following three main roles (with at least two distinct persons that are not necessarily from the coordinator) and with responsibilities in the four aforementioned WGs under Task X.1:

    1) **Portfolio manager**, in charge of:
        - Coordination of the portfolio activities (including the writing of the task's reports and deliverables).
        - Identification and establishment of synergies, shared components and collaboration opportunities with one or more projects in the portfolio.
        - Assessment of the competitiveness of the proposed technologies for different applications.
        - Participation in data collection for monitoring the technology development.

    2) **Innovation manager**, in charge of:
        - Elaboration of the exploitation strategies and set-up of the project exploitation plan (including the IPR strategy).
        - Identification of market needs, coordination of market analysis, identification of business opportunities and fundraising options.
        - Assessment of the key stakeholders, analysis of the value chain.

    3) **Communication manager** with the following roles and tasks:
        - Defines the portfolio communication strategy.
        - Implements the portfolio communication and dissemination activities.
        - Manages a common database for events and a shared database of scientific instruments.