



COLLABORATIVE PROJECTS

METABUILDING GROW/HARVEST CALL (2nd round): Guide for applicants

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Table of contents

1. About METABUILDING	3
Project partners	4
Project facts	4
Project contact details	4
2. Objectives of the GROW/HARVEST call	5
3. Eligibility criteria for applicants	5
4. Application Conditions	7
Scope of the GROW/HARVEST call and supported type of activities	8
Cross sectoral challenges	8
GROW/HARVEST service providers.....	9
Eligible costs and maximum funding	9
5. Overview - from application to end of project	10
6. Submission of application	11
Application procedure	11
Application documents	11
First round - timeline	11
7. Evaluation criteria.....	12
8. Funding decision and financial provisions	13
9. Reporting requirements	13
10. Questions and contacts	13
11. Additional information and conditions for GROW/HARVEST grant winners.....	14
Data management.....	14
ANNEXE 1: Supported activities grouped by TRL.....	16
ANNEXE 2: Description of GROW/HARVEST challenges	17
1. THE ICT CHALLENGE FOR THE CONSTRUCTION SECTOR	17
2. THE NATURE-BASED SOLUTIONS CHALLENGE FOR THE CONSTRUCTION SECTOR	19
3. THE CIRCULAR ECONOMY & RECYCLING CHALLENGE FOR THE CONSTRUCTION SECTOR.....	21
4. THE 3D PRINTING CHALLENGE FOR THE CONSTRUCTION SECTOR	23
ANNEXE 3: Application form for GROW/HARVEST proposals	25
ANNEXE 4: Work plan and budget.....	29
ANNEXE 5: Declaration of Honour and legal obligations	32
ANNEXE 6: Ethic Issue declaration	33

1. About METABUILDING

The modernization of the construction sector is especially important as the construction industry plays an essential role in the European economy. It generates 9% of the GDP of the European Union and provides 18 million jobs, which represents 31% of all industrial employment. Unfortunately, the Construction sector has significant deficits in terms of innovation investment and productivity growth at all levels, but notably where small and medium-sized enterprises (SMEs) are involved, which represent 99,9% of the companies in the sector, producing up to 80% of its economic output.

METABUILDING is an Innovation Action launched in June 2020, funded by the European Commission as part of the INNOSUP Programme of the Horizon 2020 Framework Programme.

The overall objective of the METABUILDING project is to bring innovation to the “traditional” value chain of the Construction sector and at the same time systematically expand that value chain to other industrial sectors to create an Enlarged Built Environment sector.

Construction sector SMEs are in the centre of attention and the project aims at integrating them in the innovation process in order to help them increase their productivity and competitiveness through collaboration with SMEs from more innovative, emerging industrial sectors. Furthermore, METABUILDING wants to contribute to the structuring of the construction sector to enhance collaboration between EU countries and regions. It provides innovation support to SMEs from 5 industrial sectors: Construction, Digital Industry, Additive Manufacturing, Nature-Based Solutions and Circularity & Recycling and 6 target countries: Austria, France, Hungary, Italy, Portugal and Spain.

METABUILDING will work to elaborate a joint roadmap of an enlarged Built Environment value chain in a bottom-up approach, fostering the integration of different innovation stakeholders and experts, especially from regional clusters, and taking into account in particular the innovation needs and barriers of SMEs. Furthermore, the METABUILDING Open Innovation digital platform will be developed facilitating the identification of potential partners, innovative technologies, innovation support, funding opportunities and new markets.

METABUILDING Impact

- Provide direct financial and non-financial innovation support for SMEs.
- Increase competitiveness of SMEs through international collaboration.
- Support SMEs to come out of the COVID-19 crisis through innovation.
- Stimulate the innovation potential of the Construction sector through cross-sectoral and cross-border collaboration.
- Create and expand a Digital Platform facilitating collaboration and innovation in an enlarged Built Environment Sector.

Project partners

	Name	Short name	Org. Type	Country
1	NOBATEK/INEF4 (coordinator)	NBK	RTO	France
2	EUROPEAN CONSTRUCTION, BUILT ENVIRONMENT AND ENERGY EFFICIENT BUILDINGS TECHNOLOGY PLATFORM	ECTP	ASSO	Belgium
3	EUROPAISCHE FODERATION BAUWERKSBEGRUNGINGSVERBANDE	EFB	ASSO	Austria
4	FUNDACION IDONIAL	IDO	RTO	Spain
5	FUNDACION PLATAFORMA TECNOLOGICA ESPAÑOLA DE LA CONSTRUCCION	PTEC	ASSO	Spain
6	PLATAFORMA TECNOLÓGICA PORTUGUESA DA CONSTRUÇÃO – ASSOCIAÇÃO	PTPC	ASSO	Portugal
7	FONDS DE DOTATION CERCLE PROMODUL/INEF4	PROM	ASSO	France
8	FEDERAZIONE DELLE COSTRUZIONI	FEDCO	ASSO	Italy
9	PANNON BUSINESS NETWORK NONPROFIT KFT.	PBN	ASSO	Hungary
10	INDRA SOLUCIONES TECNOLOGIAS DE LA INFORMACION SL	MIN	LE	Spain
11	GRUNSTATGRAU FORSCHUNGS- UND INNOVATIONS-GMBH	GSG	SME	Austria
12	EKODENGE MUHENDISLIK MIMARLIK DANISMANLIK TICARET ANONIM SIRKETI	EKO	SME	Turkey
13	STEINBEIS INNOVATION GMBH	SEZ	RTO	Germany
14	OCTOPUSSY AGENCE POUR LA CREATION ET LA DIFFUSION D'ACTIVITES CULTURELLES ARTISTIQUES TECHNOLOGIQUES SCIENTIFIQUES	OPY	ASSO	France
15	EUROPEAN RECYCLING INDUSTRY CONFEDERATION	EURIC	ASSO	Belgium

Project facts

Project Acronym: METABUILDING

Project Title: METAclustering for cross-sectoral and cross-border innovation ecosystem BUILDING for the European Construction, Additive Manufacturing and Nature-Based Solutions industrial sectors' SMEs

Project Reference: Grant Agreement No. 873964

Call Identifier: H2020- INNOSUP-01-2018-2020

Project Type: Cluster facilitated projects for new industrial value chains

Project Duration: 36 months from 01.06.2020 to 31.05.2023

Budget: 5,0 M€ (EC Funding)

Website: www.metabuilding-project.eu

Project contact details

For any enquiries regarding the METABUILDING project please contact:

E-Mail: info@metabuilding-project.eu

2. Objectives of the GROW/HARVEST call

The GROW/HARVEST call aims at stimulating the cross-sectoral collaboration of SMEs in the framework of innovative projects. The collaborative projects should serve as a basis to help SMEs to learn from what is going on in other sectors and use knowledge, expertise and technology assets from other sectors to increase their performance and productivity.

Furthermore, the GROW/HARVEST call intends to stimulate EU-wide collaboration of SMEs to allow them to detect market opportunities and establish partnerships that they are not naturally prone to look for. The evaluation criteria of the call therefore require proposals with a cross-border approach.

Although, SMEs are clearly in the centre of attention and the money is directed towards them, the collaborative projects can include consortium partners that contribute to the project without receiving funding (large enterprises, RTOs, universities, etc.). This mechanism will help SMEs to integrate their developments in a bigger value chain and give them access to a larger network and extended market.

Finally, beyond the direct support to SMEs, the GROW/HARVEST call aims at creating a cross-sectoral/cross border value chain of the Built Environment sector at European level and at bringing innovation to the Construction sector through inspiration from and collaboration with other more innovative sectors.

3. Eligibility criteria for applicants

The GROW and HARVEST collaborative projects are open to SMEs meeting the following criteria:

- The financial support is reserved to SMEs (Small and Medium-size Enterprise) according to the EU definition¹ and - in case of doubt – they are requested to do an SME self-assessment². As a summary, the criteria which define an SME are:
 - Staff headcount less or equal to 250
 - Annual turnover less or equal to €50 million OR annual balance sheet total less or equal to €43 million
- The applicant must be a consortium of two or more SMEs from at least two eligible sectors (one of them construction). A specific module in the METABUILDING platform – “Find a partner” module – is available to facilitate the partner search³.
- The members of the consortium need to be active in one of the following eligible sectors:
 - Construction
 - Digital Industry
 - Additive Manufacturing
 - Nature-Based Solutions
 - Circularity & Recycling

¹https://ec.europa.eu/growth/smes/sme-definition_en

²[https://ec.europa.eu/growth/tools-databases/SME-](https://ec.europa.eu/growth/tools-databases/SME-Wizard/smeq.do;SME_SESSION_ID=5HEBVDufACO_FWLtBn97Zg6Cq2_lougiskyFLCBW6E6gE1pm1Qu!2141392090?execution=e1s1)

[Wizard/smeq.do;SME_SESSION_ID=5HEBVDufACO_FWLtBn97Zg6Cq2_lougiskyFLCBW6E6gE1pm1Qu!2141392090?execution=e1s1](https://ec.europa.eu/growth/tools-databases/SME-Wizard/smeq.do;SME_SESSION_ID=5HEBVDufACO_FWLtBn97Zg6Cq2_lougiskyFLCBW6E6gE1pm1Qu!2141392090?execution=e1s1)

³<https://www.metabuilding.com/digital-tools/>

- At least one SME in the consortium has to be established in one of the following six METABUILDING target countries:
 - Austria
 - France
 - Hungary
 - Italy
 - Portugal
 - Spain

or be a direct member, or a member of an organisation which is a member, of the EURIC⁴, AM⁵, EFB⁶, ECTP⁷ platforms. A proof of the membership has to be provided with the application.

- The other SME(s) in the consortium need(s) to be located in any of the EU or Horizon 2020 associated countries⁸.
- It is mandatory that the consortium consist of a minimum of two SMEs from two different countries and one of the SMEs must be registered in one of the six target countries (see above for details).
- The consortium of SMEs can be completed by a non-SME partner, that is contributing to the project, but is not receiving money from the METABUILDING project and paying its activities in the project with its proper funds. This allows for example the integration of large enterprises as end users that are interested to be beta-testers.

⁴<https://www.euric-aisbl.eu/members-euric/affiliated-members>

⁵<https://www.rm-platform.com/am-platform/members>

⁶<https://efb-greenroof.eu/>

⁷<http://www.ectp.org/organization-database-list/>

⁸ https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cp/h2020-hi-list-ac_en.pdf

4. Application Conditions

The specific conditions for the second GROW/HARVEST call are detailed below.

Funding category	GROW	HARVEST
Supported Activities	<p>Co-creation projects: Development of technologies in response to the specific cross-sectoral challenges defined in the call. The technology readiness level (TRL) of the proposed outcome has to be between 3 and 5.</p>	<p>In-sourcing projects: Integration/uptake of existing or underexploited technologies/solutions or technological assets for their reuse/application in the Construction sector in response to the specific cross-sectoral challenges. The technology readiness level (TRL) of the proposed outcome has to be between 6 and 9.</p>
Type of instrument	Collaborative project	
Targeted SMEs for collaborative projects	Group of at least 2 SMEs from 2 different eligible sectors (one of them construction) and two different eligible countries. At least 1 SME from one of the six target countries. A consortium can be completed by a non-SME partner participating with its own funds	
Conditions	The submitted proposal must include a description of the work, a budget and given the case a valid offer/quote of a service provider registered as Innovation Stakeholder in the METABUILDING platform.	
Form of Financial Support	50% of the project budget as upfront pre-financing payment and a final payment of the remaining 50% after submission of the implementation report and other reporting requirements by the consortium.	
Grant approval	Based on the eligibility criteria and an evaluation procedure organised in separate parts corresponding to each of the four GROW/HARVEST call challenges and leading to a separate ranked list per challenge.	
Type of call and application process	Second call for applications with 24 projects funded in this call. 4 cross-sectoral challenges	
Deadline for completion of the projects	No later than 6 months after signature of the grant contract.	
Funding conditions	<p>Maximum 60 k€ lump sum per project. Total amount received per SME in all METABUILDING calls combined must not exceed 60 k€.</p> <p>Up to 75 % of the budget can be used to pay a service provider that is registered in the Innovation Stakeholder Pool.</p>	
Total number of supported SMEs	At least 48.	
Total funding	1.44 Mio €	

Scope of the GROW/HARVEST call and supported type of activities

The GROW/HARVEST call aims at supporting cross-sectoral/cross border collaboration of SMEs. The collaborative projects answering to the call should focus on the co-development and/or demonstration of technologies. They can be based on existing technology assets coming from another sector (i.e. Digital Industry, Additive Manufacturing, Nature-Based Solutions, Circularity & Recycling), for example results from European projects⁹, that can be applied in the construction sector and need further development steps to be brought to the market.

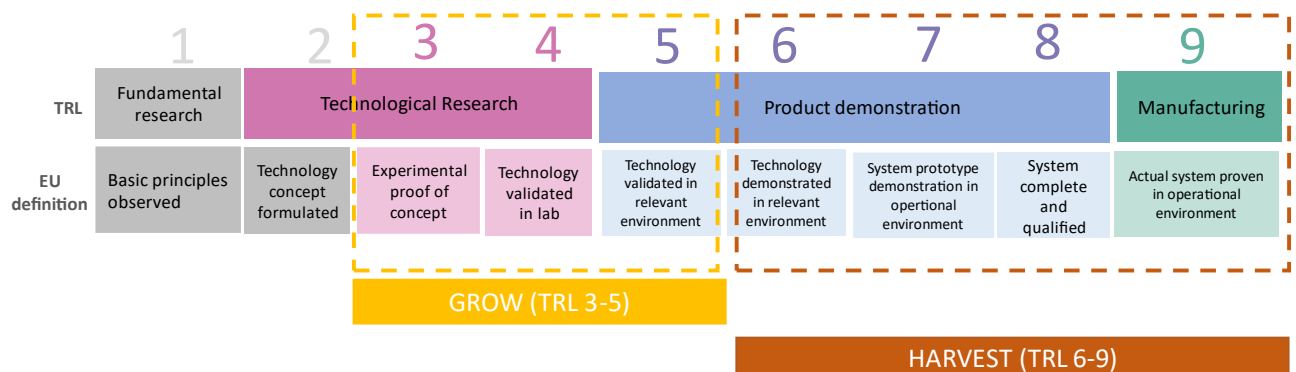
In order to qualify for funding, collaborative projects have to focus on activities belonging to technology readiness levels (TRLs) between 3 and 9 leading to **one** of the following outcomes:

GROW (TRL3 – TRL5)

- TRL3: Concept proofed in experiment
- TRL4: Technology validated in lab
- TRL5: Technology validated in relevant environment

HARVEST (TRL6 – TRL9)

- TRL6: Technology demonstrated in relevant environment
- TRL7: System prototype demonstrated in operational environment
- TRL8: System completed and qualified
- TRL9: System proofed in operational environment



For examples of innovation activities related to the construction sector and belonging to each TRL please consult Annexe 1.

Cross sectoral challenges

The GROW/HARVEST call is challenge based. The cross-sectoral challenges were defined based on the needs of SMEs and the different sectors which have been identified and confirmed during bottom-up collaborative workshops in each of the 6 target countries bringing together SMEs, regional clusters and other innovation stakeholders.

The 4 cross-sectoral challenges have 2 topics each:

⁹ <https://www.metabuilding.com/technology-assets/>

1. **Construction-ICT**
 - 1.1. Monitoring and managing energy consumption/comfort/health performance in buildings
 - 1.2. New BIM and digital tools for SMEs
2. **Construction-Nature-Based solutions (NBS)**
 - 2.1. NBS system for renovation
 - 2.2. Digitization of care, maintenance and monitoring for NBS
3. **Construction-Recycling and circular economy**
 - 3.1. New recycled building and/or urban infrastructure materials
 - 3.2. Digital solutions for the Circularity approach in the construction sector
4. **Construction-Additive manufacturing**
 - 4.1. Waste reuse through integration into large 3D printing processes for the construction sector
 - 4.2. Integration of new functionalities in construction components by means of 3D printing

The detailed description of the challenges and topics can be found in Annexe 2 of this document.

Applications that don't respond to one of the topics are not eligible.

GROW/HARVEST service providers

The consortium may work with service providers for the implementation of their GROW or HARVEST project. The services that the consortium would like to subcontract must be detailed in the application. Furthermore, the consortium needs to justify and explain the reasons for selecting a specific service provider and detail the services requested.

The GROW/HARVEST service providers are research and technology organizations, universities, companies or consultants providing innovation support, etc. located in one of the six target countries with proven expertise and high-quality knowledge and well situated to help SMEs to successfully implement their projects. In order to be eligible service providers must belong to the Innovation Stakeholder Group of the METABUILDING project. The Innovation Stakeholder's Directory can be found on <https://www.metabuilding.com/innovation-stakeholder-directory/>.

A service provider can apply to become Innovation Stakeholder by contacting the national helpdesks, if judged eligible the service provider needs to sign an Innovation Stakeholder Charter, sign-up as users to the METABUILDING platform, provide a list of offered services and nominate a dedicated contact person for the exchange with SMEs for all activities in the framework of the METABUILDING project.

Eligible costs and maximum funding

In total, 1.44 Mio € will be distributed to support SMEs for this second GROW/HARVEST call.

Successful applications will be awarded a GROW or HARVEST project grant of max. 60,000 € as lump sum. Cost exceeding this amount will not be covered by the grant but can be covered by the SMEs or a non-SME partner with their own funds.

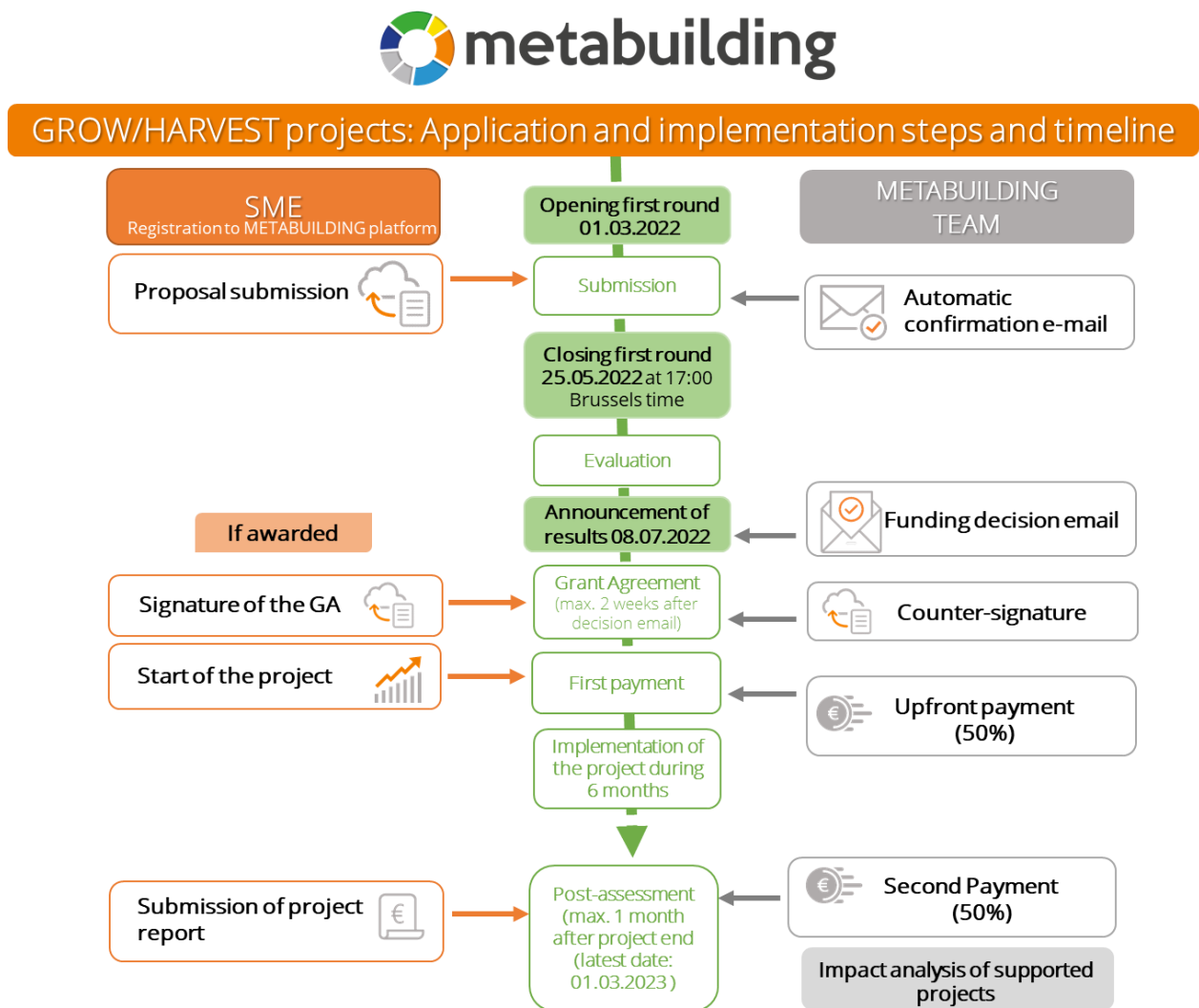
The grants can be used to pay an external service to a service provider belonging to the Innovation Stakeholder's Pool, but these costs may not exceed 75% of the budget.

At least 25% of the budget must be used by the SMEs to cover their own implementation costs including: personnel costs, travel costs and/or consumables (if necessary, for the implementation of

the project as stated and justified in the application). Only costs generated during the lifetime of the project are eligible.

After the signature of a grant agreement, the national contact point(s)¹⁰ will make a 50% upfront pre-financing payment to each of the funded SMEs. The second instalment (50%) will be transferred from the national contact point(s) to the funded SMEs upon successful approval of the final report including communication elements to be submitted by the representative of the consortium and after completion of the post-assessment questionnaire by each of the funded SMEs.

5. Overview - from application to end of project



¹⁰ National contact points assigned depending on the national origin of the funded SMEs

6. Submission of application

Application procedure

Main steps of the application procedure for the GROW/HARVEST call applications:

1. All SMEs sign-up as users on www.metabuilding.com.
2. Confirm compliance with eligibility criteria for participating in the open call by reading the applicant guide and check on the absence of conflict of interest.
3. If you are looking for a consortium partner, would like to use an existing technology asset to build your project upon or need help for the project implementation from a service provider¹¹ please use the tools provided on the METABUILDING platform.
4. Login to the METABUILDING platform and prepare and submit the application through Good Grants (automatic redirect from www.metabuilding.com).
5. The **application must be completed in English**, applications submitted in other languages will not be eligible.
6. After the submission of the proposal the main applicant will receive an automatically generated acknowledgement of receipt. This acknowledgement of receipt does not imply that the proposal is eligible for funding nor has been accepted.
7. A message will be sent out informing about the closure of the call.

No additions or changes of the application are accepted after the call has been closed.

Application documents

The application has to be done online on www.metabuilding.com.

The complete application consists of the following elements:

- a. GROW/HARVEST application form
- b. Work plan and budget in requested format
- c. If applicable, quotation of the service provider
- d. Declaration of Honour signed by each applicant
- e. Ethic Issues Table signed by each applicant

Second round - timeline

Publication date	15.02.2022
Call opening	01.03.2022
Call closing	25.05.2022 at 17:00 (Brussels time)
Information on results	08.07.2022

¹¹ The service provider must be registered in the METABUILDING Innovation Stakeholder's Pool.

7. Evaluation criteria

Applications for the GROW/HARVEST collaborative projects will be evaluated by groups of independent experts in the field of the respective challenge. The evaluation process is organised in separate parts corresponding to each of the four GROW/HARVEST call challenges and will lead to a separate ranked list per challenge.

Please note that consortia must consist of SMEs from at least two different countries and respond to one of the four METABUILDING challenges.

The evaluation is based on the following criteria:

Criteria	Weight	Max. score	Description
Excellence	30%	5	<ul style="list-style-type: none"> • Alignment with METABUILDING objectives defined in the different topics of the challenges • Strong cross-border and cross-sector dimension • Significant innovation potential compared to the technologies and/or solutions available on the market • The description of the proposed development is realistic.
Impact	40%	5	<ul style="list-style-type: none"> • Significant impact on the construction sector at national and European level and potential for development of new industrial value chains • Impact on the SMEs participating in the consortium (turn-over, new markets, etc.) • Added value provided to targeted users or customers • Steps and methods to bring the project results to the market are clearly described
Implementation	30%	5	<ul style="list-style-type: none"> • Cross-sectoral and cross-border consortium and role of each partner sufficiently described • Comprehensive description of activities • Budget in line with described project activities • Realistic timeframe of implementation
Total	100%	15	

Interpretation of the score:

Each criterion can be rated between 1 and 5. Half-point scores are not given. For each criterion the score values will indicate the following assessments:

0- The application fails to address the criterion or cannot be assessed due to missing or incomplete information.

1- Poor. The criterion is inadequately addressed, or there are serious inherent weaknesses.

2- Fair. The application broadly addresses the criterion, but there are significant weaknesses.

3- Good. The application addresses the criterion well, but a number of shortcomings are present.

4- Very good. The application addresses the criterion very well, but a small number of shortcomings are present.

5- Excellent. The application successfully addresses all relevant aspects of the criterion. Any shortcomings are minor.

The threshold for being eligible is as score of 3/5 for each of the criteria.

8. Funding decision and financial provisions

- The applicants will receive a funding decision from the Grant Secretariat on July 8th, 2022, at the latest.
- An SME can submit only one application for the same call.
- Maximum amount of € 60,000 in form of a project grant.
- The combined maximum financial support for one SME from different METABUILDING calls is limited to € 60,000.

9. Reporting requirements

In order to receive the second payment, the awardees have to complete and submit a post-assessment report within one month after the end of the project containing pre-defined KPIs which help to measure and compare the impact of the supported activities and provide elements to create visibility and promote the awarded SMEs and the project results. These KPIs have to be defined for each development at the moment of the application. Please check Annexe 3.

10. Questions and contacts

A Frequently Asked Questions (FAQ) section will be available on <https://www.metabuilding.com/grow-harvest-faq/> listing common questions and answers concerning the GROW/HARVEST call.

For further questions and assistance regarding the open call, the preparation of the project proposal, eligibility criteria, evaluation criteria, or in case of any technical problem concerning the submission of a proposal via the online portal, please contact the **corresponding national helpdesks**:

Austria	Contact Person: Susanne Formanek E-mail: helpdesk-austria@metabuilding.com
France	Contact Person: Marlène Gallet E-mail: helpdesk-france@metabuilding.com
Hungary	Contact Person: Robert Németh E-mail: helpdesk-hungary@metabuilding.com
Italy	Contact Person: Maria Luisa Colella E-mail: helpdesk-italy@metabuilding.com
Portugal	Contact Person: Filipe Ribeiro E-mail: helpdesk-portugal@metabuilding.com
Spain	Contact Person: Paula Menéndez E-mail: helpdesk-spain@metabuilding.com
Technical support	mbsupport@ekodenge.com

When contacting a helpdesk or the support for technical problems related to the use of the platform, please include the following information:

- a) Your username, telephone number and email address.
- b) Detailed description of the specific problem.

- c) If possible, screenshots of the problem.

You can as well contact the **METABUILDING Grant Secretariat** (communication only in English): grant-secretariat@metabuilding.com

11. Additional information and conditions for GROW/HARVEST grant winners

Data management

Personal data and information are provided in the application form for the immediate purpose of allowing a full and successful evaluation of applicants and for providing additional innovation support to SMEs. This includes:

- Name of the applicant and contact details of the applicant (telephone number, postal address, country, internet site)
- Name and details of the contact person (e-mail, telephone number)
- VAT Registration Number of the company
- Financial information of the company (number of employees, annual turnover or balance)

In case that a GROW/HARVEST grant is awarded, the following additional information of all awardees are required:

- Bank account reference (IBAN and BIC codes);
- Information about the grant recipient's representative: Name and Surname, Position, Telephone number, Mail address, Signature

Data concerning the service provider is delivered in the application form and in the final reports with the purpose of permitting the evaluation of the action.

Any personal data will be processed by the 'data controller' of the Coordinator or the Consortium Partners serving as national help desks with the purposes of implementing, managing and monitoring the action or protecting the financial interests of the EU.

The persons whose personal data is processed have the right to access and correct their own personal data. For this purpose, they must send any queries about the processing of their personal data to the following email address grant-secretariat@metabuilding.com.

Personal data will be processed in compliance with applicable EU and national law on data protection

Financial Audits and Controls

The Coordinator, the European Innovation Council and SMEs Executive Agency (EISMEA) or the Commission will — during the implementation of the action or afterwards — check the proper implementation of the action and compliance with the obligations under the Agreement, including assessing reports. The Coordinator or the Commission may also request additional information. Information provided must be accurate, precise and complete and in the format requested

The Coordinator, EISMEA or the Commission may — during the implementation of the action or afterwards — carry out reviews and audits on the proper implementation of the action. This will be

formally notified to the awardees and will be considered to have started on the date of the formal notification.

Under Regulations No 883/2013 and No 2185/96 (and in accordance with their provisions and procedures), the European Anti-Fraud Office (OLAF) may — at any moment during implementation of the action or afterwards — carry out investigations, including on-the-spot checks and inspections, to establish whether there has been fraud, corruption or any other illegal activity affecting the financial interests of the EU.

The European Court of Auditors (ECA) may — at any moment during implementation of the action or afterwards — carry out audits. The ECA has the right of access for the purpose of checks and audits.

Evaluation of the impact of the action

The Coordinator (may be assisted by external persons or bodies), the European Innovation Council and SMEs Executive Agency (EISMEA) or the Commission may carry out interim and final evaluations of the impact of the action measured against the objectives of the METABUILDING project. Evaluations may be started during implementation of the action and up to three years after the payment of the balance. The evaluation is considered to start on the date of the formal notification to the awardees.

The awardees must provide any information relevant to evaluate the impact of the action, including information in electronic format

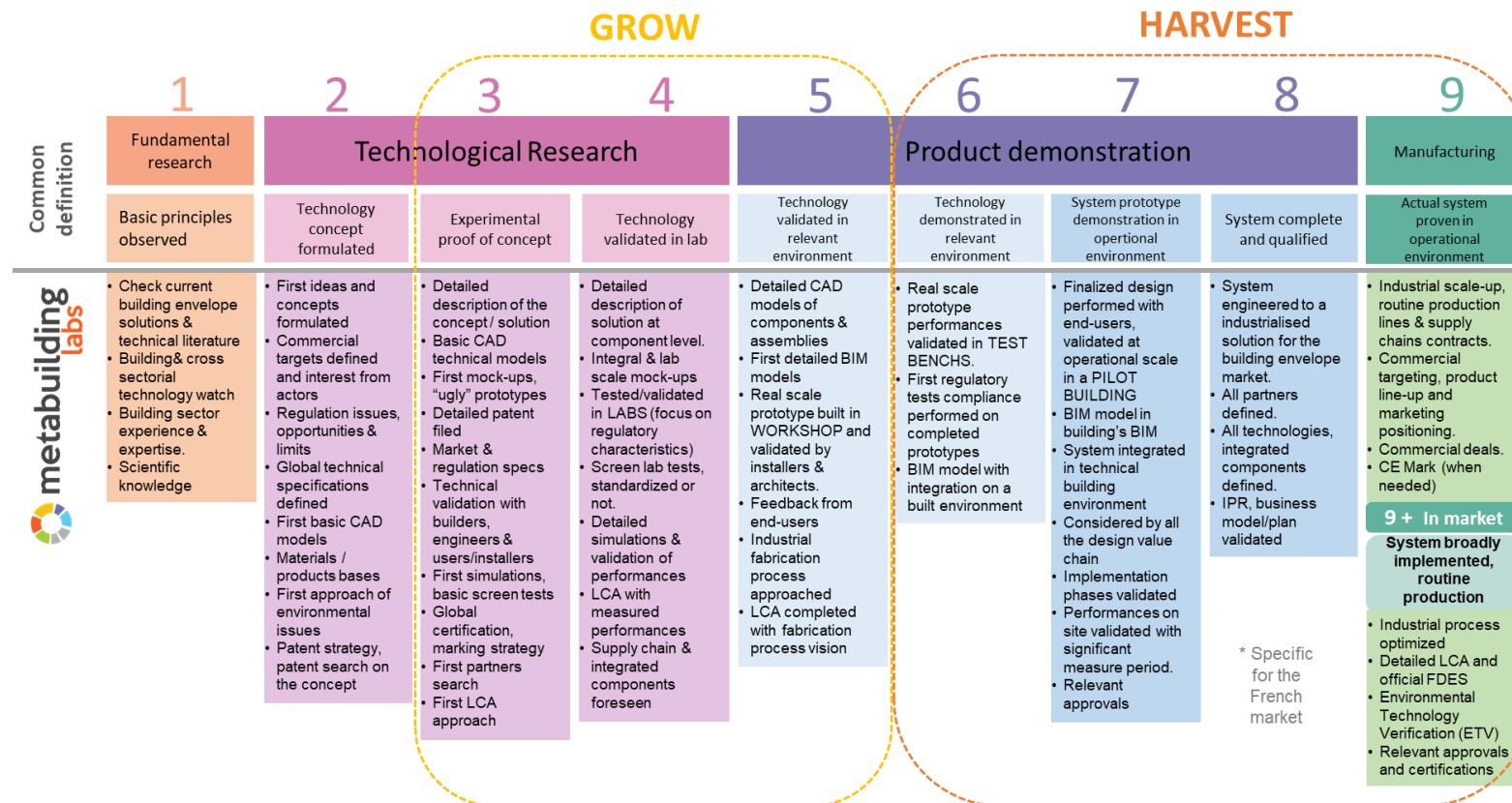
Further obligations

Further obligations of the grant recipient are the following:

- Avoiding conflicts of interest
- Maintaining confidentiality
- Promoting the action and give visibility to the EU funding
- Liability for damage



ANNEXE 1: Supported activities grouped by TRL





ANNEXE 2: Description of GROW/HARVEST challenges

1. THE ICT CHALLENGE FOR THE CONSTRUCTION SECTOR

The entire construction process & the production of the built environment need to be digitalised¹²

The digitalisation of the construction sector is increasingly recognised as a potential game changer. The European Commission has supported, promoted and developed several policies and initiatives to foster the digitalisation in the construction sector (Strategy for the sustainable competitiveness of the construction sector and its enterprises (2012), EU BIM Task Group and EU Digital Construction platform (upcoming)).

Building Information Modelling (BIM) is a frontrunner in regard to digital innovation aiming at facilitating information exchange in a highly fragmented industry. Its use in construction projects is promoted by the EU directive on Public Procurement (2014), and indeed, several Member States have already made BIM compulsory in public procurements, which has been a main driver for BIM implementation. However, the adoption of BIM by the construction industry remains limited, showing a gap between policy and practice, between big construction firms and small and medium companies. Indeed, significant performance gains in terms of productivity, quality of the construction, and optimization of operation would be enabled by a full deployment of BIM and, in the longer term, (dynamic) Digital Twins; by automation and robotics; and more generally by data-based tools and services (which make use of the latest advances in Internet of Things (IoT) and embedded sensors, cloud computing, massive processing of Big Data, and Artificial Intelligence). Furthermore, all key enabling digital technologies and IT infrastructures need to be integrated in a dynamic way and to be used to support the achievement of societal and climate change goals. The inclusiveness of this transformation (i.e. embark all actors of the construction ecosystem, in particular SMEs, and be accepted by all EU citizens) is a prerequisite to ensure the success of digitalization and maximise its positive impact on the value chain and the Built Environment of EU citizens as a whole.

However, the construction sector is the economic sector with the lowest digital intensity index in the EU and although many of the enterprises in the sector have already initiated their digitalization, in many cases they are still in the 1st level of the Digital Transformation. In general, ICT tools have been adopted to develop specific and isolated tasks, but these tools have no impact on the business processes of the companies. Digital transformation will make its way sooner or later, nevertheless the construction sector should actively foster it and to ensure that it takes place in a fair and inclusive way (i.e. involving all actors, from construction SMEs to end-users) to maximise its benefits for all.

ICT challenges in METABUILDING

To contribute to the strategic challenge above, the European construction sector needs to bring to its value chain digital solutions adapted to all its stakeholders. Digitalisation has become pervasive in our everyday lives and there is no reason to believe that it cannot reach even the smallest of the construction sector SMEs. Digital tools need therefore to be adapted to the required tasks and targeted end-users. The use of standards and open formats like Industry Foundation Classes (IFC) can help reaching out to a large public and reducing the costs of basic services and tools. Concrete actions should focus on the progressive uptake of digital tools by construction companies, in particular SMEs.

Moreover, the digitalisation of the construction sector will also contribute to a transition to clean energy and more sustainable living. Thanks to digital technologies and data economy, buildings and infrastructures will become an active part of the energy system. Data storage, protection and accessibility are other focal points, which need to be addressed carefully.

¹² This introductory section is based upon the ECTP's *Strategic Research & Innovation Agenda, 2021-2027*, November 2019. The ECTP SRIA 2030 objective is that in Europe, all construction companies, including SMEs, adopt digital tools in a common and open framework, to deliver smart-ready buildings and infrastructures.

TOPICS OF THE ICT challenge:

1.1. Monitoring and managing energy consumption/comfort/health performance in buildings

This topic aims at exploring new possibilities (i) in order to monitor energy performance, comfort and indoor air quality performance of buildings, (ii) to implement a health monitoring of construction materials used in a given building, (iii) to perform a traceability of components in relation with Digital Twin technology: from the design to the exploitation phase, (iv) to explore the use of Radio-frequency identification (RFID) sensors, IoT, and connected materials/components as a source for gathering data from the living environment and its external/internal conditions at any given moment.

A specific subsector of the above: Development of open source tools. Different digital open-source platforms are being developed for managing data (BIMserver¹³, BEMServer¹⁴, etc.) are available offering in a marketplace open frameworks as a basis for the development of new applications/services for the monitoring and control of energy performance, for indoor comfort/health management of buildings or for BIM enabled projects. Based on this approach, developers of applications can focus on their expertise/development without having to deal with data collection or the connection and/or interaction with other applications.

- **Expected Outcomes/Impacts:**

The challenge here aims at empowering the building sector stakeholders and the building (new or renovation) process via innovative digital services that enhance energy efficiency, comfort, health and wellbeing in buildings by bringing new solutions based on the use of new, affordable, and ubiquitous hardware devices, new uses of untapped existing devices possibilities (like IoT or home servers, smart appliances, edge computing, cheap sensors, etc.), open-source platforms and Digital Twins implementation over the full life-cycle of buildings, among other possibilities.

1.2. New BIM and digital tools for SMEs

The European construction sector is not a homogeneous one. Big companies performing big scale, high complexity, high-tech building or renovation projects coexist with the remaining 92% of the sector (SMEs contractors with less than 10 employees) dealing with small scale, low-tech construction projects mostly for the private sector, working directly for end-users or as subcontractors in big operations. Although economically these SMEs represent up to 80% of the output of the whole construction sector, they are dramatically lagging behind in the digital transformation, including BIM deployment and implementation. Considering that financial investments and trainings are the main barriers to a successful adoption by SMEs, adapted, intuitive and affordable tools for the digitalisation process are needed. Those tools should tackle specific tasks and expertise: for example BIM-based energy audits, fast detection of asbestos, issue detection for the installation of HVAC systems... The tools can be based on different technologies, from 3D scanning, cloud points, augmented reality hardware/software, to simplified, affordable/open-source BIM software or construction management platforms.

- **Expected Outcomes/Impacts:**

Digital technologies that provide clear and measurable benefits for applications and markets, with resulting technology applications that are tailored to SMEs; simplified BIM/digital tools targeting the SMEs of the construction sector and supporting them in their day-to-day activities to get higher quality works, better organisation and coordination with other contributors possibilities, for instance in order to increase the construction quality and reduce the disorders resulting in bad performances, optimise the time span of construction but also support the facility management activities as well as the deconstruction activities using BIM-based tools. Here the SMEs involved in the construction and exploitation phases are targeted with a clear objective to maximise the benefits of a BIM-based approach over the entire lifespan of a construction project.

¹³ BIMserver is an open source development and has been a leader in the openBIM world for more than 10 years. The Building Information Model server (short: BIMserver) enables to store and manage the information of a construction (or other building related) project, data being stored in the open data standard IFC as objects. <https://github.com/opensourceBIM/BIMserver/>

¹⁴ BEMserver is the world's premier Open Source Building Energy Management Platform and has been developed in the framework of the Horizon 2020 project HIT2GAP. It is an open source solution to deploy a modular, scalable and secure Building Energy Management System, allowing building managers to install applications that answer to their specific needs, instead of being confined to a monolithic, rigid solution. Every software developer can contribute in augmenting the functionalities of the energy management solution, and make the overall community benefit from it. <https://www.bemserver.org/>

2. THE NATURE-BASED SOLUTIONS CHALLENGE FOR THE CONSTRUCTION SECTOR

Nature-Based Solutions (NBS) are technologies and concepts which are inspired and supported by nature and address societal challenges (e.g., climate change, food and water security, natural disasters, air pollution or loss of biodiversity), while simultaneously providing benefits to human well-being and the environment. Among others, important aims include maintaining biological and cultural diversity and the ability of ecosystems to evolve over time recognising the trade-offs between the production of a few immediate economic benefits, and future opportunities in line with a broader range of ecosystems services.¹⁵ NBS include green roofs and walls, green and blue corridors, dedicated biodiversity areas, waste management practices like composting, urban food production and many more. Thinking in terms of NBS means supporting new approaches for the planning, construction and management of cities inspired and supported by nature and its harmonious, elegant and resource-efficient solutions.

Nature-Based Solutions and the Built Environment

The modern built environment generates CO₂ emissions and various environmental impacts. These environmental impacts are especially prevalent in cities and increasingly threaten the quality of life for many European citizens. Extensive ground sealing and the use of heat-absorbing materials like glass or asphalt prevent the natural cooling of urban environments and contribute to the "Urban Heat Island" effect. Climatic stress will aggravate this problem in the future, leading to an increase in heat-related health issues. Ground sealing caused by construction activities also leads to increased water runoff, which already brings the sewerage systems of many cities close to their capacities in the event of heavy rainfall. These heavy rainfalls are also expected to occur more often in the future. The field of Nature-Based Solutions looks at more natural ways of water retention and drainage (e.g., green roofs, green spaces) that allow more water to go through its natural cycles.

Further urban challenges include the loss of biodiversity and the disconnection of humanity from its natural origins, as we live in increasingly artificial and inanimate environments. Several studies have shown the effect of plants and green spaces on psychological and physical wellbeing, indicating what a lack of these imply for the majority of today's city dwellers. With NBS, the aim is to converge back to more natural environments, based on nature's solutions and ecosystem designs. The result should be buildings and cities that have high quality of life, are climate-resilient, require little resources to build and operate and allow a wide spectrum of flora and fauna to exist within and around it.

NBS challenges in METABUILDING

To tackle the above-mentioned issues, the European construction sector needs to challenge its usual practices and innovate at a higher pace than ever before. Considering the application of the NBS paradigm to the built environment, from buildings, to urban space and cities, several challenges have emerged from the METABUILDING stakeholder workshops.

¹⁵ Cohen-Shacham, E., Walters, G., Janzen, C. and Maginnis, S. (eds.) (2016). Nature-based Solutions to address global societal challenges. Gland, Switzerland: IUCN. xiii + 97pp.

TOPICS OF THE NBS CHALLENGE:

2.1 NBS system for renovation

NBS system for renovation that can be easily implemented during the refurbishment of buildings. The proposed solutions shall increase the energy efficiency of the building and serve other building optimization functions (cooling, shading, insulation, building protection, etc.). Ideally, they are aesthetically pleasing at the same time. Solutions could include pre-fabricated “plug & play” greening modules, green roof modules, “building botany” applications or other concepts that allow an easy integration of greening in the existing building structure during the renovation process. As an additional cross-sectoral challenge, such a solution could also include 3D-printed components for NBS (*greenable* surfaces, increased functionality, new kinds of solutions made possible by additive manufacturing, etc.). Multifunctionality of parts/systems is highly valued in this challenge, e.g., a combination of insulation and greening, the possibility to easily install and mount PV panels (solar green roof) or other energy generation technologies that are combined with greening modules. Frugal innovation approaches will likely be important in order to find scalable solutions.

→ All solutions regarding the *building envelope* will be of special importance for this call (NBS applications regarding façades, roofs like insulating or structural materials). The building envelope is a key area for the energy performance of buildings, new and refurbished, and one that is at the centre of particular public policy efforts to boost a massive and much needed “renovation wave” in order to effectively tackle climate change.

- **Expected Outcomes/Impacts:**

- Development of “renovation packages” that include greening solutions and are (to a certain degree) standardised, scalable and therefore cost-efficient
- Simplification of the greening process during refurbishment processes
- Extension of building envelope lifespan
- Increased energy efficiency and internal comfort of buildings and CO₂ reduction
- Reduction of material consumption through multifunctionality

2.2. Digitization of care, maintenance and monitoring for NBS.

The operating cost of green facades and roofs is an important factor for competitive future innovations in the greening industry. Maintenance and care can be expensive – depending on the type of greening solution – requiring adequate planning, equipment and personnel. Creating systems that minimize the necessity for maintenance and finding more cost-efficient ways to check and monitor this need are therefore crucial for the widespread greening of urban environments.

The challenge here is to develop digital technologies, tools and concepts for monitoring, maintenance and care of NBS. This can include sensors, AI, AR, VR, cameras, irrigation systems, robotics and other approaches. Ideally, these systems have a digital interface with existing building operation systems (heating, ventilation, cooling, sanitary, electrics) and can be part of the Building Information Modelling (BIM) as BIM Objects.

Moreover, an intelligent use of sensors can enable the measurement of data that is important for ecosystem functions. Ecosystem services are positive externalities, their overall usefulness is hard to quantify, as it reaches far beyond the utility of the building itself. Showing the positive financial impact of NBS in an ecosystem is very challenging and data that can be used to monitor, understand, visualize and communicate the effectiveness of a green building (presence of insects/birds, cooling, humification, reduction of air pollution, rating of aesthetics by urban walkers, etc.) to a wider pool of stakeholders, increasing general awareness and interest in NBS is of outmost importance for the acceptance and uptake of NBS.

- **Expected Outcomes/Impacts:**

- Reducing operating cost of greening systems
- Enabling more precise monitoring and care
- Ensure longevity and quality of greening systems
- Gathering data that can be used for demonstrating (financial) impact on ecosystem
- Might include social acceptance, participation tools and/or gamification aspects to address and include local residents

3. THE CIRCULAR ECONOMY & RECYCLING CHALLENGE FOR THE CONSTRUCTION SECTOR

An ambitious new *Circular Economy Package* - which is one of the main building blocks of Europe's new agenda for sustainable growth (*EU Green Deal*) - has been recently adopted by the European Commission (EC) with the objective of helping European businesses and consumers in their way to the necessary transition to a more circular economy. This is a policy response that puts circularity as a key framework that can contribute to address systemic crises such as climate change, pollution, waste generation, and the reduction of biodiversity. In a concerning landscape of increasing global consumption and ever-growing pressure on natural resources – due to population growth - it is widely accepted that one key solution is to decouple economic growth from the excessive exploitation of natural resources. This would pave the way to a fast transition to climate-neutral solutions and a circular use of resources. Another related position from the EC is that Europe needs to increase its resilience concerning the supply of critical raw materials and the security of its value chains.¹⁶

Circularity and the built environment¹⁷

The built environment¹⁸ generates CO₂ emissions and is currently responsible for the use of many resources, many of which are produced or derived through processes which impact our natural world (biodiversity loss). It should be mentioned that the aforementioned impacts are generated during the whole life cycle of the built environment and not only during the construction and operation stages. Thus, impacts from “cradle to grave” (and even “cradle to cradle”) must be accounted for, from the extraction of the raw materials to the end of life and re-use.

A Life Cycle Approach should systematically be implemented in order to assess and then reduce the environmental impact of any construction project, throughout all its phases. To that end, methods and tools to perform Life Cycle analyses in construction projects should be both reliable and replicable. Issues to be considered include, among others, the impact of design on future energy consumption, the embodied energy of material used, durability and reuse of materials (e.g., “circular by design”). Urban mining for instance should become a key component of the supply chain in order to privilege secondary raw materials and distress natural resources. Completing the scope of Circularity of the Built Environment, solutions for the revegetation, urban food production, water reuse and the provision of ecosystem services by buildings and infrastructure should also be integrated, contributing to climate resilient, re-natured cities¹⁹.

Circularity challenges in METABUILDING

To tackle the above issues, the European construction sector needs to challenge its usual practices and innovate at a higher pace than ever before. Considering the application of the Circularity paradigm to the built environment production, from buildings, to urban space and cities, several challenges have emerged from the METABUILDING stakeholder workshops.

¹⁶ From EC, Horizon 2020 Work Programme 2018-2020, Climate & Energy Cross-cutting activities, 09/2020.

¹⁷ From ECTP *Strategic Research & Innovation Agenda*, 2021-2027, 11/2019.

¹⁸ The human-transformed environment for shelter and other human activities, as opposed to the “natural” environment, so mainly concerning cities, buildings and infrastructures.

¹⁹ See other METABUILDING Grow & Harvest challenges launched in parallel with this one, *notably Nature-Based Solutions Challenges for the Construction Sector*.

TOPICS OF THE CIRCULARITY CHALLENGE:

3.1. New recycled building and/or urban infrastructure materials, products and building systems with high performances in terms of circularity (frugality in the use of resources, reusability/recyclability, clear *Design for Disassembling*(DfD) approach, *Building Information Modelling*(BIM) implementation). This includes as well an increased recycling, recovery and integration of secondary raw materials (SRM) from end-of-life products in new construction products or components. SRM to be integrated can come from all sectors (any kind of waste stream apart from hazardous waste). Recycled products can be totally new or existing products in which natural resources are in a significant proportion replaced by SRM.

➔ Of particular interest for this call is the use of SRM in materials or components for the building envelope (façades, roofs, and insulating or structural materials used in the building envelope. Indeed, the building envelope is a key area for the energy performance of buildings, new and refurbished, and one that is at the centre of particular public policy efforts to boost a massive and much needed “renovation wave” in order to urgently tackle climate change which is a result of environmental degradation.

- **Expected Outcomes/Impacts:**

- New SRM-based materials.
- New fully SRM-based building components or building components integrating SRM (notably for the building envelope).
- New methods and tools that push the boundaries to achieve a generalised use of LCA for recycling materials/components in buildings.
- New methods and tools integrating DfD in BIM enabled design processes.

3.2. Digital solutions for the Circularity approach in the construction sector that answer one or more of the following challenges:

➔ Develop and/or bring closer to the market concepts, tools and technologies to promote the use of *material passports* and *smart materials*. Projects on material passports should consider ongoing developments in Europe and ensure correspondence/synergy with other initiatives. As smart materials are reconsidered materials that can provide components/tracing information (being installed) during the life span of the products/building, with active or passive solutions.

➔ Develop intelligent (AI for automatic identification and measures), easy to use, and cost-effective digitalization tools of existing buildings and products, associated to back-office programs (e.g., integrating Scan to BIM) to facilitate building technical audit works, selective deconstruction, value estimation of waste and scenarios, to finally improve reuse and recycling of deconstruction products/waste in new or existing buildings.

- **Expected Outcomes/Impacts:**

- Material Passports data & structure propositions including relevant ICT tools and testing/implementation roadmaps for concrete application areas / target groups.
- Proof of concept for material passports in the building sector.
- Implementation of smart materials in the construction (new and/or refurbishment) value chain including supply chain, off-site manufacturing and on the construction site, handover and lifespan of the building its components until and after deconstruction (from cradle to cradle).
- Digital tools and software developments to handle deconstruction/demolition works in existing buildings to enable circularity of components.

4. THE 3D PRINTING CHALLENGE FOR THE CONSTRUCTION SECTOR

Additive manufacturing²⁰ (AM) technologies have been identified among the most innovative manufacturing solutions of the last decade, as one of the most promising production technologies at global level. They are considered to empower the transition from mass production to “mass customization” in several leading sectors.

The adoption of AM technologies by the European industry can reduce the negative environmental impact of manufacturing, based on its capability to process only the material which constitutes a specific element and to avoid the generation of waste in the form of chips (e.g., subtracting technologies like CNC milling). AM technologies allow as well the creation of efficient designs as it permits designers to put material only where needed. Moreover, freeform fabrication is expected to provide energy-efficient tooling to industries working on injection moulds.

Unlike conventional fabrication processes, AM substantially reduce the interface between machines and workers since machines operate most of the time autonomously. For instance, the global introduction of AM in production chains will shift workers tasks from assembly operations to support, inspect and control tasks reducing the potential risks of accidents at the work place. Moreover, once the AM technologies are widely implanted in factories as a standard manufacturing process, new venues for shifting from mass-customization towards the mass-production of customized products will be opened, enhancing our quality of life.

Additive Manufacturing and the built environment

The European Additive Manufacturing Platform, in the framework of the AM-motion project, has very recently elaborated its roadmap identifying challenges and opportunities for the AM development and successful market uptake in different target sectors, including construction.

The built environment sector is one of the sectors that consumes²¹ the most natural resources (aggregates, cements, etc.) and at the same time has one of the highest global impacts on economy and society²². Today it faces challenges such as lack of digitization, need to increase efficiency, improve safety or reduce environmental impact.

The application of AM technologies can importantly contribute to overcome the above-mentioned challenges by reducing the use of natural resources to the strict minimum and allowing freedom of forms for the creation of unconventional building components. This will help to reduce the material costs and contribute to a diversification in building design.

Furthermore, AM technologies have an important role to play in the reuse and valorisation of waste in the construction process and the fabrication of high value and intelligent building components. This will greatly contribute to achieve an improved life cycle of materials and to improve building energy management through the use of integrated sensors resulting in a better energy performance of buildings.

Moreover, there is a clear cost-based opportunity to save time and materials by reducing waste and the need for formwork/mould making. The increased use of automated construction will increase the efficiency of the construction process and lead to new and more qualified jobs for the workers in the construction sector.

And last but not least, the possibility to come up with innovative designs and personalized creations responding to the individual needs of end-users will contribute to an improvement of living conditions with a non negligible societal impact.

3D Printing challenges in METABUILDING

To tackle the above issues, the European construction sector needs to challenge its usual practices and innovate at a higher pace than ever before. Based on the improvement of productivity and sustainability or the development of elements with high added value for the construction sector, several challenges have emerged from the METABUILDING stakeholder workshops.

²⁰ <https://www.am-motion.eu/>

²¹ <https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/file-strategy-for-a-sustainable-built-environment>

²² <https://www2.deloitte.com/content/dam/Deloitte/at/Documents/presse/Deloitte-Global-Powers-of-Construction-2019.pdf>

TOPICS FOR THE ADDITIVE MANUFACTURING CHALLENGE:

4.1. Waste reuse through integration into large 3D printing processes for the construction sector

One of the characteristics of the construction processes is the large dimensions of the components. This type of large-scale elements implies a high consumption of material resources. This high consumption of materials could turn into an opportunity if the materials were recycled from waste from the construction sector itself or other sectors.

The main challenge here is to develop a printing process for construction elements that allows the incorporation of waste materials (secondary raw materials or SRM) in order to combine the advantages of 3D printing (personalization, security, speed, etc. ...) with circular economy principles, leading to a reduction of the environmental impact. Supported activities could focus on the identification of different waste streams that are compatible with construction applications, their evaluation and the analysis of the integration of these SRM in a 3D printing process for construction and the identification of main applications where to integrate printed materials with a load of SRM. Proposals are requested to design and develop technologies that allow 3D printing with some percentage of recycled materials, to create components for the construction industry. Depending on the starting point of the development (starting TRL²³) the project could integrate a validation in testbeds or pilot buildings of using recycled/waste material in a particular 3D construction process.

Expected Outcomes/Impacts:

- New 3D printed construction components integrating SRM as main component in the base material.
- Reduce construction waste through its reincorporation into the process.
- Reduce the impact of other industries by integrating their waste into the construction process.
- Reduce the consumption of natural resources by the construction industry through replacing part of conventional material (cement, aggregate, etc.) with recycled waste.
- Reduce the general carbon footprint of construction processes.

4.2. Integration of new functionalities in construction components by means of 3D printing

One of the fundamental advantages of additive manufacturing is its ability to develop high value-added elements or elements with advanced functionalities. Thus layer-by-layer manufacturing processes provide opportunities that conventional technology cannot achieve.

This topic focuses on the development of printed construction elements that, in addition to fulfil their usual function, provide improved functionalities to a traditional building component. The elements needed for achieving the enhanced capabilities will be integrated during the 3D printing process. A proposed solution could for example focus on printed elements that incorporate insulation systems (thermal, acoustic, others); "smart" elements that allow the measurement of key variables or parameters in their field of application and permit integration into Industry 4.0.; elements that integrate measurement devices/sensors that ensure the quality of the process and/or connect the building with its energy management systems; design and development of advanced/intelligent components or even 3D printed components for green façades integrating plants (green walls or roofs).

Of particular interest for this topic is the development of *3D printed components for the building envelope* (e.g., prefabricated 3D printed panels with embedded functions for façades or roofs) as the building envelope is key for the energy performance of buildings, new and/or refurbished, and in the centre of public policy efforts to boost a massive and much needed "renovation wave" in order to urgently tackle climate change.

Expected Outcomes/Impacts:

- New 3D printed construction components integrating embedded functionalities.
- Industrialised, prefabricated 3D printed modules or components integrating embedded sensors/actuators connected with the Building Energy Management (BEM) system.
- Increased efficiency and productivity during the construction process.
- Improve construction quality through the integration of Industry 4.0 concepts.
- Smart building envelope components" connected to Internet of Things (IoT)/BIM/Digital Twins
- Increased energy performance of buildings.

²³ Technology Readiness Level, see Annexe 1

ANNEXE 3: Application form for GROW/HARVEST proposals

This form should be fill in online and submitted in English on www.metabuilding.com

1) General Information

Project Title: *[Please provide a short project title]*

Applicant SME 1 (representative of the consortium)	
Official legal name of company	
Legal form	
Main field of activity/ sectors	
Website	
Name of contact person	
E-mail address of contact person	
Telephone number of contact person	
Official address of company	
VAT registration number	
Country	
Membership proof (for SMEs located in another than of the 6 target countries, indicate link to EURIC ²⁴ , AM ²⁵ , EFB ²⁶ , ECTP ²⁷ platforms and upload a proof as pdf)	

Applicant SME 2	
Official legal name of company	
Legal form	
Main field of activity/sectors	
Website	
Name of contact person	
E-mail address of contact person	
Telephone number of contact person	
Official address of company	
VAT registration number	
Country	
Membership proof (for SMEs located in another than of the 6 target countries, indicate link to EURIC ²⁸ , AM ²⁹ , EFB ³⁰ , ECTP ³¹ platforms and upload a proof as pdf)	

²⁴<https://www.euric-aisbl.eu/members-euric/affiliated-members>

²⁵<https://www.rm-platform.com/am-platform/members>

²⁶<https://platform.think-nature.eu/>

²⁷<http://www.ectp.org/organization-database-list/>

²⁸<https://www.euric-aisbl.eu/members-euric/affiliated-members>

²⁹<https://www.rm-platform.com/am-platform/members>

³⁰<https://efb-greenroof.eu/>

³¹<http://www.ectp.org/organization-database-list/>

Other consortium partners without funding (e.g. large enterprises, RTOs)	
Type of participant	
Official legal name of company	
Main field of activity/sector	
Country	
Reason of participation in the project and its contributions	

2) Industry sectors and cross-sectoral challenges

Related Industry sectors

The project has to concern the **construction sector** and at least one other of following industrial sectors

(please select at least one)

- Digital Industry
- Additive Manufacturing
- Nature-Based Solutions and
- Circularity & Recycling

Cross-sectoral challenges covered

The project will cover the following cross-sectoral challenge and topic

(please select ONLY one challenge and one topic)

- 1. Construction-ICT**
 - 1.1. Monitoring and managing energy consumption/comfort/health performance in buildings
 - 1.2. New BIM and digital tools for SMEs
- 2. Construction-Nature-based solution**
 - 2.1. NBS system for renovation
 - 2.2. Digitization of care, maintenance and monitoring for NBS
- 3. Construction-Recycling and circular economy**
 - 3.1. New recycled building and/or urban infrastructure materials
 - 3.2. Digital solutions for the Circularity approach in the construction sector
- 4. Construction-Additive Manufacturing**
 - 4.1. Waste reuse through integration into large 3D printing processes for the construction sector
 - 4.2. Integration of new functionalities in construction components by means of 3D printing

Outcomes of collaborative projects:

Please indicate the type of outcome of your collaborative project³²

- GROW: TRL 3 to 5
 - TRL3: Concept proofed in experiment
 - TRL4: Technology validated in lab
 - TRL5: Technology validated in relevant environment
- HARVEST: TRL 6 to 9
 - TRL6: Technology demonstrated in relevant environment
 - TRL7: System prototype demonstrated in operational environment

³² See Annexe 1

- TRL8: System completed and qualified
- TRL 9: System proofed in operational environment

2) About the project proposal

PROJECT SUMMARY AND MAIN OBJECTIVES (max. 300 words)

Please provide a summary of the project and its general and specific objectives

PROJECT EXCELLENCE

- a. Description of the current situation and the problem to be solved (max. 300 words)
 - Please provide a description of what is the current situation (e.g. technological and market state-of-the art, current available solutions)
 - Why is it a relevant problem to be solved in the chosen sectors?

- b. Description of the challenges to be tackled and your approach (max. 500 words)
 - Please describe how you will address the challenge and what is unique in your approach?
 - Please describe the cross-sectoral character of the project idea/innovation opportunity. If applicable, please describe the cross-border character?
 - Please describe the competitive advantage/unique selling point of the final solution/product? How would the solution/product compare with other available solutions, practices or products already available on the market?

PROJECT IMPACT

- a. Description of the project outcome/result (max. 500 words)
 - Please provide a description of the outcome/result of the project

- b. Description of the impact of the final product/solution (max. 500 words)
 - Please describe the technological and economic (i.e., added value, competition in the market, how to access to the market) impact of the final product/solution
 - Please describe in how far the construction sector will be impacted by the final product/solution

- c. Estimation of key performance indicators (please complete with estimated change in percent (%))

Estimation of project results after project completion

	Number of new ____
Products/processes developed	
Software-based marketing methods	
Organisational methods	

Estimation of the positive environmental impact provided by the products/solutions

	State of performance at submission		Estimation 2 years after project completion (% reduction)
	Value per year	Unit	
Water consumption			
Greenhouse gas emissions			
Energy consumption			

Building material waste			
Environmental noise pollution			

Estimation of the economic impact on the SMEs (to be completed for each of the SMEs)

	State of performance at submission		Estimation 2 years after project completion (% improvement)
	Value per year	Unit	
Turnover		€	
Profit		€	
Productivity		%	
Costs reduction		€	

PROJECT IMPLEMENTATION

- a. Quality of the project team and organisation (*max. 500 words*)
 - *Please provide a short description of the participating SMEs (including eventual partners not receiving funding)*
 - *Please explain the role that each partner will have in the project and its importance*
- b. Quality of the overall implementation approach and work plan (*max. 500 words*)
 - *Please outline in short, the overall implementation approach, the structure of the work plan and the project budget using the tables provided in Annexe 4.*

2) About the service providers

The following service provider has been chosen to implement the service:

Selected service provider	
Name	
Address	
Country	
VAT registration numbers	

- The selected service provider is part of the METABUILDING Innovation Stakeholder's Directory

Description of the requested service

Please provide a brief description of the service explaining its objectives, time scale and its relevance for the project implementation. (500 characters)

Description of the selection of the service provider

Please explain briefly the criteria for selecting the service provider. Please describe the experience of the services provider, with respect to the specific expertise sought-after. (500 characters)

- Quotation of the service provider is uploaded

ANNEXE 4: Work plan and budget

b.1 Overall implementation approach and work plan

Please outline in short, the overall implementation approach and the structure of the work plan using the template below. Add tables as necessary for each task.

Task [No]	Start [month]	End [month]
Description of the work	[Please complete]	
Contribution and working days needed for each involved partner	[Please complete]	
Results of this task	[Please complete]	
Additional information (e.g., graphics, figures)		

Task [No]	Start [month]	End [month]
Description of the work	[Please complete]	
Contribution and working days needed for each involved partner	[Please complete]	
Results of this task	[Please complete]	
Additional information (e.g., graphics, figures)		

The applicants confirm that they have seen and approved the work plan. (All applicants need to sign, if needed add columns).

Place and date:	
Signature of the SME1:	
Signature of SME2:	

b.2 Project Budget

- **Budget SME partners receiving METABUILDING grant**

	Task 1	Task 2	Task 3	Task 4	Task 5	Total per SME partner (EUR)	Please indicate the amount (EUR) of the total used to pay the service provider (max 75%)
Partner SME1							
Partner SME2							
Partner SME3							
Partner SME4							
Total per project						Total:	Total amount service provider:

- **Budget additional partners without funding (if applicable) or self-financed part of budget**

	Task 1	Task 2	Task 3	Task 4	Task 5	
Additional partner 1						
Additional partner 2						
Total per project						Total:

Total project (funding + if applicable budget of additional partners)	EUR
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The applicants confirm that the information provided is correct (All applicants need to sign, if needed add columns).

Place and date:	
Signature of the SME1:	
Signature of SME2:	

ANNEXE 5: Declaration of Honour and legal obligations

By signing this document, the SME understands and agrees the following conditions (please select all boxes)

METABUILDING GROW/HARVEST Call terms and conditions

- I agree with the METABUILDING terms and conditions specified in the guide for applicants (www.metabuilding.com)
- I confirm that my company is an SME according to the definition of the European Union. This means:
 - The staff headcount is less or equal to 250
 - The annual turnover is less or equal to €50 million OR the annual balance sheet total of my company is less or equal to €43 million
- I confirm that my company is active in one of the sectors specified in this proposal.
 - I confirm that my company will submit a project implementation report and the necessary elements for the post-assessment including measurement of KPIs.

Financial declarations

- I confirm to be aware that the GROW/HARVEST project grant is limited to a maximum of EUR 60.000 per project. I confirm being in the financial position to cover for the project cost which might exceed the financial support and to assume the costs for the project until the payment of the balance of the project grant.
- I'm aware that only SMEs partners of the consortium are directly financed by METABUILDING grants.
- I understand that the submission of all the requested information in the application form is mandatory.

Funding decision

- I confirm to be aware that funding decisions are made based on the defined evaluation criteria that I have taken notice of.
- I confirm that my company will accept the funding decision made by the evaluators and waives its right to engage in a redress against this decision.

Data management

- I acknowledge and agree:
 - that grants will be submitted and evaluated electronically.
 - to the use of the electronic grant application system Good Grants.
 - to the collection of personal data by the funding body being subject to the privacy statement according to EU general data protection regulation 2016/679 (GDPR).
 - that data will be used in the framework of the METABUILDING project and to provide additional innovation support, if applicable.
 - that data can be transmitted to the European Commission, the European Innovation Council and SMEs Executive Agency (EISMEA) and auditors for reporting reasons, impact measurement and in the case of an audit.

Accuracy of information provided and obligations

- I declare the accuracy of all the statements made above.
- I confirm that my company is aware that administrative or financial penalties may be imposed on the grant recipient in case of :
 - misrepresentation or failure in supplying the information required by the Grant Management of the METABUILDING project as a condition of participation in the grant award procedure.
 - failure in fulfilling the obligations and conditions agreed upon.

Ethics issue

- I confirm that my company encloses the ethics issue table.

ANNEXE 6: Ethic Issue declaration

Please indicate (x) in the corresponding box if the given statement applies or not.

This table has been developed and is based upon the Horizon 2020 Ethics Appraisal Procedure. For further information please refer to the [Horizon 2020 Ethics Self-Assessment Guide](#).

Human embryos / fetuses	YES	NO
Does your research involve human Embryonic Stem Cells (hESCs)?		
Will they be directly derived from embryos within this project?		
Are they previously established cells lines?		
Does your research involve the use of human embryos?		
Does your research involve the use of human foetal tissues / cells?		
Humans	YES	NO
Does your research involve human participants?		
Are they volunteers for experiments in social or human sciences research?		
Are they persons unable to give informed consent?		
Are they vulnerable individuals or groups?		
Are they children/minors?		
Are they patients?		
Are they healthy volunteers for medical studies?		
Does your research involve physical interventions on the study participants?		
Does it involve invasive techniques?		
Does it involve collection of biological samples?		
Human cells / tissues	YES	NO
Does your research involve human cells or tissues?		
Are they available commercially?		
Are they obtained within this project?		
Are they obtained within another project?		
Are they deposited in a biobank?		
Protection of personal data	YES	NO
Does your research involve personal data collection and/or processing?		
Does it involve the collection and/or processing of sensitive personal data (e.g.: health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?		
Does it involve processing of genetic information?		
Does it involve tracking or observation of participants?		
Does your research involve further processing of previously collected personal data (secondary use)?		
Animals	YES	NO
Does your research involve animals?		
Are they vertebrates?		
Are they non-human primates?		
Are they genetically modified? iv (directive - regulation)		
Are they cloned farm animals?		
Are they endangered species?		
<i>If yes, please indicate the species involved:</i>		

Non- EU countries	YES	NO
Does your research involve non-EU countries?		
<i>If yes, which countries?</i>		
Do you plan to use local resources (e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.)?		
Do you plan to import any material - including personal data - from non-EU countries into the EU?		
<i>If yes, specify material and countries involved:</i>		
Do you plan to export any material - including personal data - from the EU to non-EU countries?		
<i>If yes, specify material and countries involved:</i>		
If your research involves low and/or lower middle-income countries, are benefits-sharing measures foreseen?		
Could the situation in the country put the individuals taking part in the research at risk?		
Environmental protection	YES	NO
Does your research involve the use of elements that may cause harm to the environment, to animals or plants?		
Does your research deal with endangered fauna and/or flora and/or protected areas?		
Does your research involve the use of elements that may cause harm to humans, including research staff?		
Dual use	YES	NO
Does your research have the potential for military applications?		
Misuse	YES	NO
Does your research have the potential for malevolent/criminal/terrorist abuse?		
Other ethics issues	YES	NO
Are there any other ethics issues that should be taken into consideration?		
<i>If yes, please specify:</i>		

I confirm that I have taken into account all ethics issues described above.

(Double-click on the tick box and choose "activate" to set an "x")

Place and date:	
Signature of the applicant:	