THE NATIONAL PLAN FOR RESEARCH, DEVELOPMENT AND INNOVATION 2022-2027, NP IV

Partnerships for Innovation Program,
Partnerships for competitiveness subprogramme

Experimental Demonstrative Project
2024 Call for proposals

Evaluator's Guide

www.uefiscdi.gov.ro

Content

Ministry of Research, Innovation and Digitalization and its Executive Agency, UEFISCDI, welcome you as a scientific evaluator for the Experimental Demonstrative Project Call 2024 (PED 2024). This document specifies in detail the evaluation process, its inputs and outputs, and defines the responsibilities of the participants in the process.

1. General Information of the call

The major goal of this call is to support the development and testing of demonstrative models (functional/experimental) for new or significantly improved products, technologies, methods, systems or services in national smart specialization fields or addressing challenges from the Strategic Research Agenda (see Annex 1).

The national intelligent specialization fields (DSIN) or targeting challenges from the Strategic Research Agenda (ASC) are:

1. *Digitization, Industry and Space (ASC); Digital Economy and Space Technologies (DSIN); Advanced Functional Materials (DSIN); Advanced Manufacturing (DSIN)*
2. *Climate, energy and mobility (ASC); Energy and Mobility (DSIN)*
3. *Food, bioeconomy, natural resources, biodiversity, agriculture and environment (ASC); Bioeconomy (DSIN); Environment and Eco-technologies (DSIN)*
4. *Health (ASC); Health - prevention, diagnosis and advanced treatment (DSIN)*
5. *Culture, creativity and inclusive society (ASC)*
6. *Civil security for society (ASC).*

Details of

- ✓ The maximum funding granted for a project, with duration between 12 - 24 months, is 750.000 lei (about 150 K EUR).
- ✓ The budget allocated to this call for proposals, for the entire implementation period, is 53.000.000 lei (about 100.60 million EUR).

The selection of the project proposals for funding is based strictly on their merits, assessed through peer review evaluation performed by experts in the field, with excellence as the sole criterion.

2. Estimated results

By financing this type of projects, the following aspects are pursued:

- using of knowledge generated by basic research for developing a higher level of technological maturity (demonstrator, laboratory-validated technology);
- increasing the research organizations capacity to generate laboratory-validated solutions for new or significantly improved products/technologies/services and to provide them to the enterprises.

3. Project proposals

Project proposals should address one of the following situations (please see Chapter 9 of this document for the definitions related to “Technology Readiness Level – TRL”):

- start from a TRL 2/3 (concept formulated by technology / laboratory experimental demonstrator) and focus on TRL 3/TRL4 (laboratory experimental demonstrator/ laboratory validated technology);

- ✓ The project proposals are submitted by a research organization (public or private), project coordinator, in partnership with an enterprise with research - development as part of their activity.

4. Governance of the call

Advisory Board for Research-Development and Innovation (CCCDI) is an advisory body of Ministry of Research, Innovation and Digitization (MCID). The CCCDI consists of representatives of national RDI system (academia, national research institutes, Romanian Academy, private sector), having a scientific profile internationally recognized. The CCCDI is the scientific coordinator of the call.

***The Executive Agency for Higher Education, Research, Development and Innovation Funding*, UEFISCDI,** is the main research public funding agency. It organizes project calls and subsequently monitors the implementation of research projects accepted for funding.

The expert evaluators are internationally recognized independent experts who meet the selection criteria according to the call document. They are responsible for the scientific evaluation of the submitted proposals according to the evaluation criteria.
The experts perform the work in a personal capacity and must not represent any organization.
During the evaluation process an expert could receive the task of **Rapporteur** (may act as both evaluator and Rapporteur for a number of allocated projects), having the mission to facilitate and mediate the achievement of consensus between the individual evaluations of the experts and may participate in the panel meetings.
Each expert evaluator involved in the evaluation process will receive a user name and an individual access password via e-mail which can a*uthenticate/Log in* on the on-line evaluation platform, www.uefiscdi-direct.ro. A guideline for using evaluation platform PED 2024 is available in the "Useful docs" section.

5. Conflict of Interest

Any details of the evaluation process and its outcomes, or about any proposals submitted for evaluation **must be treated as confidential and must not be disclosed**. Experts indicate electronically, during the evaluation process, that confidentiality of any documents or electronic files provided to them is maintained. All confidential documents or files must be returned, erased or destroyed upon completion of the evaluation, unless otherwise instructed. The online discussions or from the panel meetings must be kept confidential.
Experts must declare that they can carry out the evaluation of a proposal with total confidentiality, impartiality and competence. They must not find themselves in situations where their impartiality might be questioned, or that could raise suspicion on their recommendations being affected by elements that lie outside the scope of the evaluation.

A disqualifying conflict of interest exists if an evaluator:

- was involved in the preparation of the proposal;
- is involved as principal investigator or as member of research team in the current call (PED 2024);

- stands to benefit directly should the proposal be accepted;
- has a close family relationship with principal investigator;
- is a director, trustee or partner of an applicant organizations (Project Coordinator or Project Partner);
- is employed by one of the applicant organizations (Project Coordinator or Project Partner) in a proposal;
- is in any other situation that compromises his or her ability to evaluate the proposal impartially.

A potential conflict of interest may be considered, even in cases not covered by above disqualifying conflicts, if an evaluator:

- was employed by the organization that has applied a proposal within the previous 3 years;
- is involved in a research collaboration or contract of principal investigator, or had been so in the previous 3 years;
- is in any other situation that could cast doubt on his or her ability to evaluate the proposal impartially, or that could reasonably appear to do so in the eyes of an external third party.

Before starting the assessment of proposals allocated to them, the evaluators will need to login at the Evaluation platform, www.uefiscdi-direct.ro. Upon login, the evaluators get access to the Consortium information and the proposal's summary of the respective allocated proposals. This will allow the experts to check their potential conflict of interest and directly inform the UEFISCDI staff if such conflicts are identified. Full access to the proposal is given after the expert has confirmed that there is no conflict of interest.

The experts must notify UEFISCDI, via email/in writing, at any moment during the evaluation process, if they become aware that either one of these conditions is not satisfied or that they are in conflict of interest. When a potential conflict of interest is reported by an expert or brought to the attention of UEFISCDI by other means, UEFISCDI will analyse the circumstances and decide on a case-by-case basis whether the conflict is real. In the latter case, the expert will be excluded from the evaluation of the respective proposal.

Once an expert has confirmed that he/she does not have a conflict of interest, they are given full access to proposals.

6. Contractual agreement

The relationship between UEFISCDI and the expert evaluators is defined by a contractual agreement written and signed by both parties. By signing this agreement, the expert evaluators accept the conditions regarding the evaluation tasks, the confidentiality, the conflict of interest, and the use of personal data by UEFISCDI, according to the provisions of the Regulation (EU) 2016/679 (GDPR) and to the Law 190/2018 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data. UEFISCDI cannot allocate proposals to an expert who has not been officially appointed (i.e., the expert has signed the contractual agreement and, in doing so, has agreed to the terms laid down in it, including, in particular, confidentiality and conflict of interest aspects).

An expert must sign the "Contractual Agreement" with all its appendixes, and uploads these documents on the evaluation platform (in the dedicated section).

Omission to upload the „Contractual Agreement" and its appendixes, in due time, to the dedicated section of the online evaluation platform, will lead to delay of payment for the activity as expert evaluator/Rapporteur!

The following expenses will be covered by the call:

- 60 € (54 € net amount) evaluation fee per one individual evaluation;
- 60 € (54 € net amount) additional fee per Consensus Report made by Rapporteur;
- 295 € (265.5 € net amount) fee per day for participation in panel meeting.

The evaluators will be remunerated for their activities after the finalization of the evaluation process.

7. Evaluation process

The evaluation process is described in the Call document available here: https://uefiscdi.gov.ro/resource-867648-PEDEN2024.pdf.

The evaluation process consists of following steps:

- **Step 1** - **The eligibility check** is made by UEFISCDI staff. If, during or after completion of the evaluation phase, a non-compliance with any of eligibility criteria is found, the project proposal will be declared ineligible and will be excluded from the competition.

- **Step 2** - **The individual evaluation**
  Each project proposal declared eligible is evaluated, from the quality point of view, independently, online, by three expert evaluators. Each expert prepares an Individual Evaluation Report (IER).

- **Step 3** – **Intermediate consensus**
  The Intermediary Consensus Report (ICR) is elaborated by the rapporteur based on the IER, on discussions between the experts.

- **Step 4** – **Rebuttal**
  The applicants receive the invitation to submit a rebuttal on the comments expressed in the Intermediary Consensus Report. This step is not mandatory and the absence of rebuttal must not affect the evaluation of the project.

- **Step 5 - Reaching consensus (after Rebuttal)** - The Consensus Report (CR) is elaborated by the rapporteur, based on the ICR, on discussions between the experts and the rebuttal (if any).

- **Step 6 - Evaluation Panel Meeting** – The proposals without consensus are discussed in the panel meeting (one for each scientific domain).

7.1. General principles of evaluation (for individual/consensus/panel steps)

- ✓ The experts must assess the proposals by themselves – do not delegate this task to anybody else.
- ✓ The expert should evaluate the proposal as it is, not as it could be or as the expert would like it to be, and without giving any recommendations or suggestions.
- ✓ Each criterion/sub criterion must contain the Strengths/Weaknesses of the respective criterion/sub criterion. General comments or comments that describe parts of the proposal are not acceptable.
- ✓ Each argument should be placed under the specific criterion, with great care of not mixing criteria (e.g., comments about the activities and deliverables will not be placed under "Project objectives and scope" or comments about the state of the art should not be placed under "Project implementation").
- ✓ All comments should be clear statements, based on facts presented in the proposal and not on opinions of the experts (e.g. comments as "*I think that", "My impression is", "It seems that", "The applicant should", "It may be better"*, etc. must be avoided).
- ✓ All facts relevant to the current proposal should be accounted for, regardless of the section of the proposal where these are presented.
- ✓ Any comment referring to inexistent or irrelevant criteria for the present competition is considered a procedural mistake which may lead to a successful redress and justify a re-evaluation of the proposal. Never penalize a proposal based on information that the applicant was not expected to provide.
- ✓ The comments should assess the quality of the described criterion under evaluation and not summarise it or suggest improvements.
- ✓ A weakness should be addressed only once so that double penalization does not occur.
- ✓ The expert must treat all proposals equally and evaluate them impartially on their merits. Comments that hint, indicate or refer to names, numbers, gender, institutions, nationality, and age are strictly forbidden.
- ✓ Scores must reflect the overall assessment of a criterion and the experts must use the full range of scores to appropriately highlight the quality of the proposal (*E.g., it is not correct to have a score of 4.5 for a criterion where only positive comments are listed, without any shortcomings; equally wrong is to find a major weakness, as, e.g.: The methodology does not support the proposed solution and scoring it with 4.0*);
- ✓ The panel members will analyse with objectivity the proposals (with no consensus reached) and will carefully prepare the final report which will be sent to the Principal Investigator. The report should be based on facts and solely on proposal content.
- ✓ The experts should keep in mind that they are evaluating a project proposal and not a research paper. The comments should assess the quality of the described criterion under evaluation and not summarise it or suggest improvements.

A personal touch: Please, **evaluate the proposal as you would like it to be evaluated if it were yours: be objective, dispassionate, unbiased, fair and polite.**

7.2 Proposal evaluation stages

According to the Call Document, the Funding Application uses Times New Roman font type, 11 font size, 1 line spacing and 2 cm margins. Any modification to these parameters (excepting the tables, figures or their captions) is forbidden. **The pages exceeding the established limits (section B2 – max. 10 pages (except the project budget section) and section C – max. 1 page) will not be taken into consideration in the evaluation process.**

7.2.1. Individual Evaluation

Each eligible proposal is evaluated independently, online, by 3 experts, using the platform www.uefiscdi-direct.ro.

Each of the three evaluators prepares an Individual Evaluation Report **(IER),** awarding individual scores for each criterion according to the evaluation criteria. Given scores for each criterion are necessarily to be justified by comments. The comments must be accurate, complete and consistent, highlighting strengths and weaknesses.

- ✓ **Information found in pages that exceed the maximum limit for each section will be disregarded!**

When all IERs have been submitted for a proposal, the experts will have access to each other's scores and comments and may adjust their own scores/remarks within 3 working days.

7.2.2. The Intermediate Consensus Report (ICR)

Each project proposal will have an appointed rapporteur, randomly selected from among the three experts. The role of rapporteur is to prepare the Intermediary Consensus Report (ICR), based on individual assessments and discussions with the other two evaluators, through the 'forum' interface available in the evaluation platform.

The other two reviewers are invited to express their opinion on the ICR (vote "agree" or vote "disagree").

If the ICR has a unanimous "I agree" vote, consensus is considered to have been reached.

No consensus is considered to have been reached if there is a "disagree" vote.

In this situation, an online meeting of the three experts is organized for discussions and final decision. Following this meeting, for the project proposals for which consensus is not reached, will be evaluated by a fourth evaluator who completes the individual evaluation sheet. After the additional evaluator has individually assessed and given his own score, he will have access to the comments and scores originally given by the first three experts and will be able to adjust own comments and scores given. After the completion of the individual evaluation, the additional evaluator takes over the role of rapporteur and will draw up another Intermediary Consensus Report, following discussions with the other evaluators. The report will be made available to the principal investigator for the formulation of a point of view.

7.2.3. Rebuttal

The ICR is sent to the principal investigators, with the invitation to submit a rebuttal on the evaluation within 3 working days. The rebuttal written in English is limited to 4.000 characters (including spaces) and consists in counterarguments strictly regarding the criticism formulated in ICR. The principal investigator should not include in the rebuttal any supplementary information**.** ***New facts or***

information that appear in the rebuttal but have not been described in the proposal shall be disregarded. The experts should carefully read the responses of the applicant and assess whether, after checking with the proposal, they maintain their opinion.
The answer of the principal investigator (rebuttal) is not compulsory, and its absence will not affect the next stage of the evaluation process.

7.2.4. The Consensus Report (CR)
After rebuttals are received from the applicants, the evaluation process enters the consensus phase, under the coordination of the Rapporteur.
The rapporteur may modify the Intermediary Consensus Report by drafting the Consensus Report. Afterwards, the other evaluators will be asked through the platform to express their opinion on the Consensus Report (vote "agree" or "disagree"). If the Consensus Report has unanimous "I agree" vote, it is considered that the consensus has been reached, and it becomes the Final Evaluation Report.
The rapporteur, by completing the Consensus Report and submitting it to the vote, implicitly gives a positive vote to the report.
If one of the evaluators votes "disagree" or does not express own vote on the Intermediary Consensus Report, for the project in question it is considered that consensus has not been reached.
If the consensus is not reached, the expert(s) who has (have) voted “disagree” will be asked to detail the reasons for disagreeing with the CR for any particular criterion.

7.2.5 Evaluation Panel Meeting
Proposals for which no consensus has been reached will be analysed/discussed in the panel meetings. At the level of the competition, 6 panels will be constituted, each panel covering a main research area, according to Annex I.
The research area panel is constituted of rapporteurs and evaluators. The size of each panel will be correlated with the number of projects without consensus reached. Depending on the size of the panel, more plenary sessions can be organized.
Each panel member, prior to the panel meeting, will have access to the project proposals, the IERs, CRs and the rebuttals (if any) for all projects allocated to the panel.
Within the panel meetings, every project proposal which has at least a “disagree” vote or lacks a vote to CR is presented and analysed in the panel. For each project, the panel establishes the final score and writes the Final evaluation report.
The panel meetings are coordinated by a chair /co-chair. These are chosen from the call data base and they will moderate the panel discussion, without interfering in decision making.
The final score will be decided by the present majority and will take into account the scores and comments from previous evaluation stages and also the discussions from the panel. The major changes of scores will be motivated for each modified criterion.
After the discussions, for each proposal, a member of panel will be appointed by chair/co-chair and will prepare the Final Report, in accordance with those established during the panel meeting.
The Final Report may contain parts from the IER or the CR, agreed by the panel.

7.3 Tasks of expert evaluators

The expert evaluators are required to:

- read the “Call document” and the “Guide for Experts”;
- inform UEFISCDI about a disqualifying or a potential conflict of interest;
- read and objectively evaluate the assigned project proposals;
- meet all deadlines of the evaluation process;
- fill in and submit the evaluation sheet for each assigned project proposal, providing comprehensive comments that evaluate the proposal in a critical way, addressing all the evaluation criteria for each point, avoiding summarizing and advising on improvements, clearly highlighting the strengths and weaknesses of the proposal as it was submitted by the applicant and not its potential;
- read the rebuttal (if any);
- actively participating in consensus discussions regarding all assigned project proposals, by using the "forum" type interface available on the online evaluation platform; comments at the consensus stage are compulsory; express the agreement or disagreement (vote) for the consensus report;
- express the agreement/disagreement (vote) for the ICR and CR;
- participate in online meetings for the project proposals where the consensus is not reached, organized between the rapporteur and the expert evaluators, to discuss and reach a final decision;
- not disclose the proposals assigned to third parties;
- communicate with the assigned Technical Officer from UEFISCDI for any issue that might appear during the evaluation process.

7.4 Tasks of Rapporteurs

- read the Individual Evaluation Reports and draw the expert evaluators' attention to: possible contradictions (e.g. the same aspect is considered both a weakness and a strength); inadequate comments (e.g., comments placed under the wrong criterion or comments about irrelevant issues which are not required by the call; comments referring to other complex project proposal); any comments which are not subject of the criteria from the evaluation sheet; possible non-compliance with the Individual Evaluation Reports format, which must contain the comments organized in the form of "strengths" and "weaknesses" and not "copy-paste" type information taken from projects;
- elaborate the ICR based on the individual evaluations and the discussions with expert evaluators and ultimately agree on the scores for each evaluation criterion that fully reflects the agreed comments; may contact the experts to ask for clarifications, to highlight/identify potential conflicting statements or inappropriate/incorrect statements. All such communication will be carried out exclusively in the online evaluation platform.
- participate in online meetings where consensus is not reached, organized between the rapporteur and the expert evaluators, to discuss and reach a final decision;
- elaborate the CR based on the discussions with expert evaluators and on Rebuttal (if any).
- not disclose the assigned/evaluated proposals to third parties;

- communicate with the assigned contact from UEFISCDI about issues that might appear during the evaluation process;
- participate in the panel meeting and draw the Final Evaluation Report (if is case).

7.3.6 Evaluation Sheet

Make your judgment against the official evaluation criteria, as stated in the Evaluation Sheet, and nothing else. For all the projects accepted for evaluation, the evaluator has to be sure that the whole rating scale is used for each criterion.

The comments must be in accordance with the scores and be accurate, complete and consistent.

Organizing comments on each criterion:

Comments should take the form of a statement reflecting the overall quality of the proposal, in the light of the above-mentioned criteria. In particular, the following guidelines should be followed:

- make sure that the TRL is clearly argued at the beginning of the project and the TRL reached after the project implementation is well determined on TRL scale;
- make sure that each argument is put under the right criterion and comments are confined only to the criterion concerned;
- make sure that you reach all the aspects raised by the questions listed under each criterion;
- give comments and scores for all evaluation criteria; the scores must match the comments;
- make sure that the level of criticism in the comments agrees with the score that is provide (e.g., do not give low score and the comments are only appreciative);
- do not apply a penalty twice to a proposal for the same weak point; a basic underlying fault in a proposal could impact more than one criterion, make clear that these are different and distinct problems;
- never apply a penalty to a proposal based on information that the applicant was not expected to provide;
- avoid references to the applicant age, nationality, gender, or personal matters;
- avoid making references to scores in the comments;
- avoid any direct comparison with any other proposals under current call;
- critical comments should be constructive and not offensive.

Structure of evaluation sheet:

I. Project objectives and scope (30%)

The criterion relates to Project Application Form – Part B.2.1

Evaluate to what extent:

- *The project scope is clearly presented, describing explicitly the demonstration model (product, technology, method, system or service) to be developed and tested/ validated?*
- *Are the results innovative and relevant in relation to the national and international state of the art?*
- *Are the project objectives correlated with the outcome of the project?*

II. Presentation of the technology / product concept or the existing lab product (30%)

The criterion relates to Project Application Form – Part B.2.2

Evaluate to what extent:

- *Is the TRL level clearly argued at beginning of the project, and is the level reached after project implementation well determined on the TRL scale?*
- *Are the preliminary results significant on the date of submitting the proposal: publications, patents and research projects that led to basic concept of the project?*

III. Project implementation (40%)

The criterion relates to Project Application Form – Part B.2.3

Evaluate to what extent:

- *Is the expertise level of experienced researchers and postdoctoral researchers nominated in the project team at high quality? Are their expertise and results well-correlated with their contribution in the project and appropriate for the project implementation?*
- *Are the proposed activities and deliverables well structured? Are the deliverables well-correlated to the proposed activities?*
- *Is the budget and timetable of the project well justified (resources / time / results)?*
- *Is the research infrastructure adequate for the project implementation?*
- *Is each team member's role and team project partner well described?*
- *Is the impact and dissemination of project results well described? Is the sharing of project intellectual property rights between partners clearly addressed?*
- *Are the risks associated with project implementation activities identified and their mitigation measures well described?*
- *Is the project plan effective in reaching the TRL level required at the end of the project*

NOTES:

1. Each Criterion will be scored from 0 to 5. Scores with a resolution of decimal place may be awarded.
2. The final score will be calculated as a sum of the marks for each criterion multiplied by the appropriate percentage and multiplied by 20 (final score is between 0 and 100).

*Final grade = (s.1*30/100 + s.2*30/100 + s.3*40/100)*20, where s.i is the score for criterion i.*

3. Experts should make sure that their comments on each criterion are:
   - *Concrete* i.e., they are explicitly referring to the information in the proposal
   - *Complete* i.e., they address all the facets specified by the criterion
   - *Consistent* i.e., they match the score, according to the scoring table and are not contradictory
   - *Inoffensive* i.e., they do not contain discriminatory, offensive statements or adjectives
   - *Explanatory* i.e., it is clear what makes a comment a weakness or a strength. Examples of poor comments "*The methodology is described*" (is it enough? insufficient? excellent? new? obsolete?), "*The novelty is not good*" (why? what is missing?) "*The team is not appropriate*" (what competency is missing?), etc.
4. The project proposals under the score of 80 points will not be considered for funding.

7.3.7 Assessment against the Evaluation Criteria

The Evaluators/Rapporteurs propose a score **only after written comments (accurate, concrete**, **complete** (i.e., address all questions) and **consistent** with the semantics of each score, namely:

0	**Insufficient**	The proposal does not address this criterion, thus it cannot be assessed due to missing or incomplete information
1	**Poor**	Addressing criterion is done improperly, or there are *serious weaknesses*
2	**Fair**	The proposal *broadly addresses* the criterion, but there are *significant weaknesses*
3	**GOOD**	The proposal addresses the criterion *well*, although *improvements would be necessary.*
4	**VERY GOOD**	The proposal addresses the criterion very well, although *certain improvements are still possible.*
5	**EXCELLENT**	The proposal successfully addresses all relevant aspects of the criterion. *Any shortcomings are minor appeared.*

The scores must reflect the strengths and weaknesses and they must be in line with the comments. **Scores below 5 (i.e., also 4 or 4.5) must fully reflect the identified shortcomings/weaknesses, which should be clearly indicated** in the Consensus Report.

8. Transparency

The list of the expert evaluators who participated in the evaluation process will be published on the UEFISCDI's website, after the end of the competition. The list will not identify the expert evaluators assigned for each project proposal.

9. TRL Definition

All the TRL definitions are presented below, but **the project proposals must start from a TRL 2/3 (concept formulated by technology / laboratory experimental demonstrator) and focus on TRL 3/TRL4 (laboratory experimental demonstrator/ laboratory validated technology);**

TRL Definition & Description[1]:

Technology Readiness Level	TRL Definition	Description
TRL 1	Initial scientific research begins. Examples include studies on basic material properties.	Basic principles are observed. Focus is on fundamental understanding of a material or process.

[1] H2020 – Work Programme 2018-2020, General Annexes – pg. 27
http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-ga_en.pdf
Technology Readiness Assessment Guide - Department of Energy, U.S, pg. 9-10/34
https://www.directives.doe.gov/directives-documents/400-series/0413.3-EGuide-04/@@images/file;
Technology Readiness Levels definitions and descriptions
https://www.dst.defence.gov.au/sites/default/files/basic_pages/documents/TRL%20Explanations_1.pdf

Technology Readiness Level	TRL Definition	Description
	Principles are qualitatively postulated and observed.	
TRL 2	Technology concept and/or application formulated. Initial practical applications are identified. Potential of material or process to satisfy a technology need is confirmed.	Once basic principles are observed, practical applications can be identified. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are still limited to analytic studies. Supporting information includes publications or other references that outline the application being considered and that provide analysis to support the concept. The step up from TRL 1 to TRL 2 moves the ideas from basic to applied research. Most of the work is analytical or paper studies with the emphasis on understanding the science better. Experimental work is designed to corroborate the basic scientific observations made during TRL 1 work.
TRL 3	Analytical and experimental critical function and/or characteristic proof of concept. Applied research continues and early-stage development begins. Includes studies and initial laboratory measurements to validate analytical predictions of separate elements of the technology.	Analytical studies and laboratory-scale studies are designed to physically validate the predictions of separate elements of the technology. Supporting information includes results of laboratory tests performed to measure parameters of interest and comparison to analytical predictions for critical components. At TRL 3 experimental work is intended to verify that the concept works as expected. Components of the technology are validated, but there is no strong attempt to integrate the components into a complete system. Modelling and simulation may be used to complement physical experiments.
TRL 4	Laboratory Testing/Validation of Alpha Prototype Component/Process. Design, development and lab testing of technological components are performed. Results provide evidence that applicable component/process performance targets may be attainable based on projected or modelled systems.	The basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared with the eventual system. Supporting information includes the results of the integrated experiments and estimates of how the experimental components and experimental test results differ from the expected system performance goals. TRL 4-6 represent the bridge from scientific research to engineering, from development to demonstration. TRL 4 is the first step in determining whether the individual components will work together as a system. The goal of TRL 4 should be the narrowing of possible options in the complete system.
TRL 5	Laboratory Testing of Integrated/Semi-Integrated System. Component and/or	The basic technological components are integrated so that the system configuration is similar to (matches) the final application in almost all respects. Supporting

Technology Readiness Level	TRL Definition	Description
	process validation in relevant environment- (Beta prototype component level).	information includes results from the laboratory scale testing, analysis of the differences between the laboratory and eventual operating system/environment, and analysis of what the experimental results mean for the eventual operating system/environment. The major difference between TRL 4 and 5 is the increase in the fidelity of the system and environment to the actual application. The system tested is almost prototypical. Scientific risk should be retired at the end of TRL 5. Results presented should be statistically relevant.
TRL 6	Prototype System Verified. System/process prototype demonstration in an operational environment- (Beta prototype system level).	Engineering-scale models or prototypes are tested in a relevant environment. This represents a major step up in a technology's demonstrated readiness. Examples include fabrication of the device on an engineering pilot line. Supporting information includes results from the engineering scale testing and analysis of the differences between the engineering scale, prototypical system/environment, and analysis of what the experimental results mean for the eventual operating system/environment. TRL 6 begins true engineering development of the technology as an operational system. The major difference between TRL 5 and 6 is the step up from laboratory scale to engineering scale and the determination of scaling factors that will enable design of the final system. The engineering pilot scale demonstration should be capable of performing all the functions that will be required of a full manufacturing system. The operating environment for the testing should closely represent the actual operating environment. Refinement of the cost model is expected at this stage based on new learning from the pilot line. The goal while in TRL 6 is to reduce engineering risk. Results presented should be statistically relevant.
TRL 7	Integrated Pilot System Demonstrated. System/process prototype demonstration in an operational environment- (integrated pilot system level).	This represents a major step up from TRL 6, requiring demonstration of an actual system prototype in a relevant environment. Final design is virtually complete. The goal of this stage is to retire engineering and manufacturing risk. To credibly achieve this goal and exit TRL 7, scale is required as many significant engineering and manufacturing issues can surface during the transition between TRL 6 and 7.
TRL 8	System Incorporated in Commercial Design. Actual	The technology has been proven to work in its final form and under expected conditions. In almost all cases, this

Technology Readiness Level	TRL Definition	Description
	system/process completed and qualified through test and demonstration (pre-commercial demonstration).	TRL represents the end of true system development. Examples include full scale volume manufacturing of commercial end product. True manufacturing costs will be determined and deltas to models will need to be highlighted and plans developed to address them. Product performance delta to plan needs to be highlighted and plans to close the gap will need to be developed.
TRL 9	System Proven and Ready for Full Commercial Deployment. Actual system proven through successful operations in operating environment, and ready for full commercial deployment.	The technology is in its final form and operated under the full range of operating conditions. Examples include steady state 24/7 manufacturing meeting cost, yield, and output targets. Emphasis shifts toward statistical process control.

10. References:

In creating this guide, we adopted several guidelines and principles from the following sources:

1. H2020-MSCA, EJD Manual for experts, 2019
2. ESF - *European Peer Review Guide. Integrating Policies and Practices into Coherent Procedures*, 2011: http://www.esf.org/activities/mo-fora/publications.html
3. ERC - *ERC Grant Schemes Guide for Peer Reviewers*, 2011: http://erc.europa.eu/sites/default/files/document/file/GuideForERCPeerReviewers_2012%20_20092011.pdf
4. http://ec.europa.eu/research/pdf/workshop_igb/rtd_evaluation_process.pdf

No. domain/ Thematic area	Name of domain/thematic area
1	**Digitilisation, Industry and Space (ASC); Digital Economy and Space Technologies (DSIN); Advanced Functional Materials (DSIN); Advanced Manufacturing (DSIN)**
1.1	Open strategic autonomy in digital and emerging technologies with a Human-Centric Focus
1.2	An Attractive, Secure, Dynamic, Data-Agile, Regional and Global Economy
1.3	Clean industry, circular economy, and guaranteed supply of raw materials
1.4	Strategic autonomy in the development, deployment and use of global space infrastructures, services, applications, and data
2	**Climate, energy and mobility (ASC); Energy and Mobility (DSIN)**
2.1	Transition of the energy sector towards climate neutrality and resilience
2.2	Accessibility, supply and efficient use of energy
2.3	Towards a neutral, climate-resilient and environment friendly mobility
2.4	Systems for smart mobility
2.5	Behavioral transformations to reduce climate footprint
3	**Food, bioeconomy, natural resources, biodiversity, agriculture and environment (ASC); Bioeconomy (DSIN); Environment and Eco-technologies (DSIN)**
3.1	Increasing the relevance of forests in reducing pollution
3.2	Agriculture's contribution to climate neutrality and resilience
3.3	Biodiversity recovery, conservation and sustainable restoration of ecosystems and ecosystem services
3.4	Circular bioeconomy
3.5	Water resource management and sustainable development of fisheries and aquaculture
3.6	Food and nutritional security
3.7	Sustainable, balanced and inclusive development of urban, rural and coastal areas
3.8	Innovative governance models that foster sustainability and resilience
4	**Health (ASC); Health - prevention, diagnosis, and advanced treatment (DSIN)**
4.1	A healthy life in a rapidly changing society
4.2	Living and working in a health-promoting environment
4.3	Managing disease and reducing its burden
4.4	Access to innovative, sustainable and high-quality healthcare
4.5	New tools, technologies and digital solutions for a healthy society
4.6	Developing an innovative, sustainable and competitive healthcare industry
5	**Culture, creativity, and inclusive society (ASC)**
5.1	Consolidated democratic governance
5.2	Development of cultural heritage, arts and cultural and creative sectors
5.3	Social and economic resilience
5.4	Inclusive growth and reducing vulnerabilities
6	**Civil security for society (ASC)**
6.1	Reducing losses caused by natural, accidental and man-made calamities
6.2	Facilitating the mobility of passengers and the legal transport of goods, as well as the prevention of illicit trade, piracy and other criminal acts
6.3	Managing crime and terrorism more effectively and improving the resilience and autonomy of physical and digital infrastructures
6.4	Increasing cyber security and maintaining a safer online environment