M-ERA.NET Call 2023

Guide for Proposers

Main document

Version 1.2

22 March 2023

Content:

1. Introduction to M-ERA.NET

What is M-ERA.NET ?

M-ERA.NET is a strong European network of public funding organisations supporting and increasing coordination and convergence of national and regional funding programmes on research and innovation related to materials and battery technologies to support the European Green Deal.

M-ERA.NET Mission

Technological innovation is a key dimension in efforts to achieve the environmental and growth objectives set in the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) by the general assembly of the United Nations. In that respect, there needs to be more research and development in high-tech products that dominate the manufacturing productions to increase efficiency (material use, recyclability, energy efficiency) and more progress needs to be made regarding integrating renewable energy and its storage into end-use applications in buildings, transport and industry. The development and manufacturing of high-performance, reliable, safe and low-cost energy generating and storing elements is a key to a sustainable mobility and energy supply. The numerous fields of application lead to an increased use of these elements and thus to an increased consumption of resources. Measures must be taken to conserve resources and increase the efficiency of their exploitation.

New materials are crucial for finding solutions for reducing weight and enhancing durability. They must be part of resilient supply chains, improve the performance in terms of energy generation (efficiency, stability) and storage (energy density, power delivery, ultrafast charge, cyclability), cost and safety. In addition to this, new materials will also enable the ‘recyclable by design’ concept, thanks to which the environmental impact of the manufacturing process and the associated greenhouse gas emissions and carbon footprint can be minimized. This will be possible by substituting hazardous and/or minimally recyclable materials for counterparts that are easier to process and recycle.

Transnational RTD projects funded by M-ERA.NET will combine materials research with industrial needs by stimulating new products and production processes, and by developing synergies that can be very effective in achieving industrial symbiosis, in particular with the aim of preventing by-products from becoming waste.

M-ERA.NET Consortium

M-ERA.NET started in 2012 under FP7 with 37 partners from 25 European countries. It continued as M-ERA.NET 2 from 2016 to 2022 with 43 partners from 29 countries and is now running in its third phase as M-ERA.NET 3 until 2026 under the Horizon 2020 ERA-NET COFUND scheme with currently 49 public funding organisations from 35 countries. The diverse and experienced network comprises national and regional funding programmes from 25 EU member states and 5 associated countries and includes 5 non-European organisations.

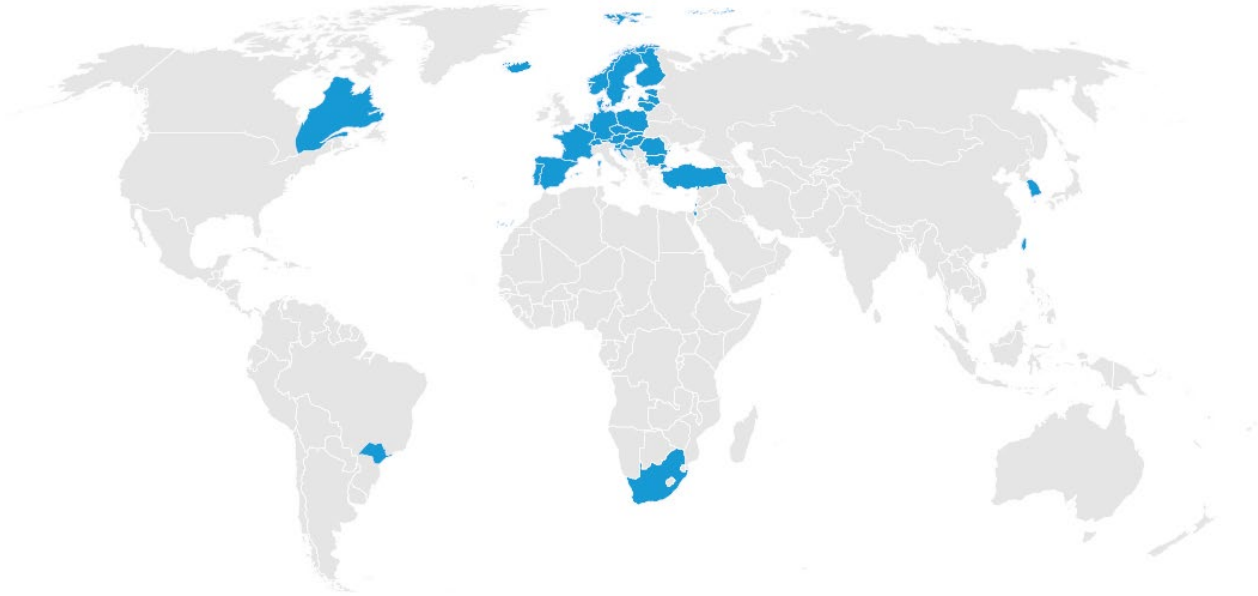

Figure 1: Participating countries and regions of the M-ERA.NET 3 consortium, see also https://www.m-era.net/about/m-consortium

2. Structure of the M-ERA.NET Call 2023

The objective of the M-ERA.NET Call 2023 is to enable transnational R&D projects between partners receiving funding from regional/national programmes.

Fig. 2 shows the schematic workflow of the Call 2023. Benefits are combined in one approach: On the one hand the regional/national funding organisations apply their own well-established funding rules and procedures known to their applicants, and on the other hand M-ERA.NET provides transnational coordination expertise:

- The call is organised as a 2-step application (Pre- and Full-Proposal).The eligibility of applicants applying for funding will be checked by national/regional funding organisations according to the rules defined by their respective funding programmes.
- The centralised evaluation of pre-proposals and full-proposals will be carried out by independent international evaluators resulting in a ranking list for each stage.
- In stage 1 the M-ERA.NET call consortium will agree on a list of Pre-Proposals invited to submit a Full-Proposal. The decision is based on the ranking list of evaluated Pre-Proposals and available national/regional budgets.
- In stage 2 the M-ERA.NET call consortium will agree on a joint selection list based on the ranking list of evaluated Full-Proposals.
- The final funding decisions will be made by the national/regional funding organisations.

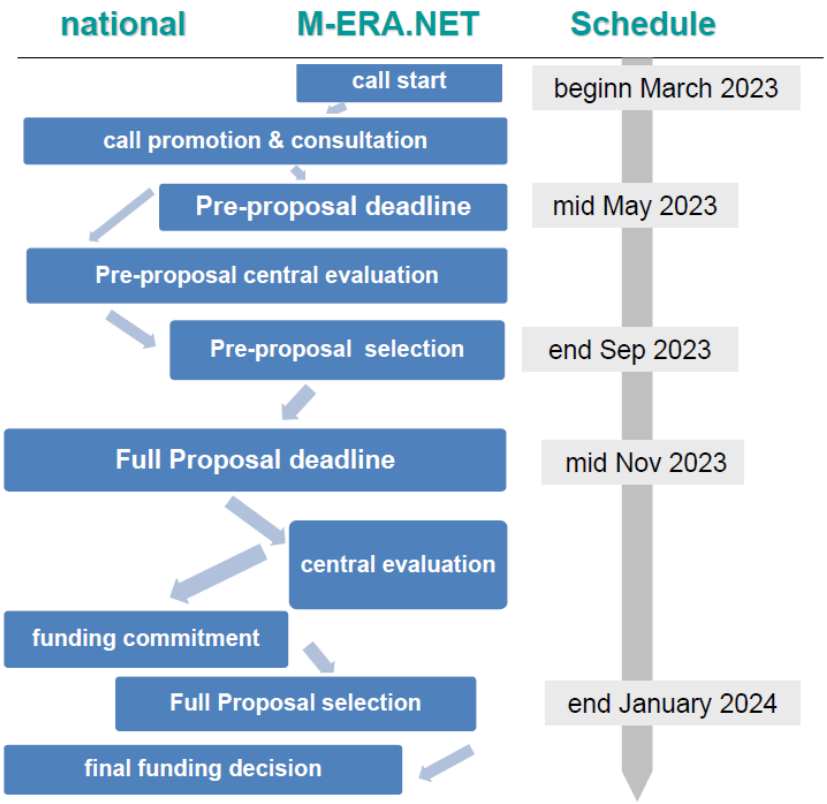

Figure 2: Workflow of the Call 2023

3. Call Announcement

3.1. Objectives and Topics

The aim is to fund ambitious transnational RTD projects addressing materials research and innovation including materials for batteries and low carbon energy technologies.

Horizontal objectives for the Call 2023

Support the European Green Deal by increasing attention to clean energy technologies and future batteries:
M-ERA.NET aims to strengthen the contribution of materials RTD for clean energy-related applications, energy generation and harvesting, energy storage (battery technologies), electrolysers and fuel cells. M-ERA.NET will support the transition towards circular economy by addressing aspects like eco-design, design for recycling, durability of products, process efficiency with reduced energy and materials consumption, resulting e.g. in light-weight products.

Support the achievement of the United Nations' Sustainable Development Goals (SDG):
M-ERA.NET will contribute to a wider public debate on the impact of materials research and its potential to achieve the SDGs. In particular, M-ERA.NET will support SDG 3 ("Ensure healthy lives and promote well-being for all at all ages"), SDG 7 ("Affordable and clean energy") through fostering research on sustainable energy storage technology, SDG 9 ("Industrial innovation and infrastructure") by upgrading the technological capabilities of industrial sectors, and SDG 12 ("Ensure sustainable consumption and production patterns") through an environmentally sound management of natural resources and reduced waste generation.

Socio-ecological benefits in the context of Responsible Research and Innovation (RRI):
M-ERA.NET calls will address EU areas of socio-ecological relevance, illustrating the leveraging effects materials research and innovation have on areas that reflect meaningful societal needs. M-ERA.NET will develop responsible research and innovation processes to systematically address socio-ecological, ethical and political dimensions of material research, development and use. As part of this, M-ERA.NET requires that funded researchers engage with the social, ethical, political, environmental or cultural dimensions of their proposed research.

In support of the two points above, please refer to the M-ERA.NET guidelines for Responsible Research and Innovation (RRI) in the context of materials science (Annex 5) and the specific section "Sustainability and RRI requirements" in each topic.

Support for the Innovation chain:

Making best use of the interdisciplinary network the calls in M-ERA.NET will facilitate the generation of knowledge along the innovation chain, from excellent science and research to innovative industrial applications.

Strengthen interdisciplinarity:
M-ERA.NET is the platform for an integrative approach across disciplines and across application fields, making the initiative an attractive and efficient tool for transnational joint projects that were unlikely to be realised before.

Thematic priorities

The following six topics are defined for the Call 2023

1: Sustainable advanced materials for energy
2: Innovative surfaces, coatings and interfaces
3: High performance composites
4: Functional materials
5: Advanced materials and technologies for health applications
6: Next generation materials for advanced electronics

M-ERA.NET will support the research and innovation chain described through Technology Readiness Levels (TRL). **A more detailed description of the topics is available in Annex 1. A description of the TRLs can be found in Annex 2.** In addition, individual national/regional thematic programme focus and funding rules (see chapter 3.2.) must be taken into account.

General considerations

- In general, a special focus on materials science, processing, and engineering that contributes to the implementation of the SDGs and the Green Deal is strongly recommended. Sustainability aspects of the targeted solutions and/or materials must be addressed in the proposal. Proposals should avoid as far as possible the use of hazardous compounds and demonstrate that the materials and processes involved in the research will be safe and will have a minimum impact on the environment.
- Unless expressly justified, proposals should comply with the open data science directive from the EC. It is expected that proposals include intellectual property rights management and proper knowledge transfer and exploitation strategy. It is expected that part of the deliverables of the project include open-source codes, data management and curation methodology, and/or demonstrative examples of the technologies proposed.
- Issues of societal concerns should be addressed in a systematic way, and following the **M-ERA.NET RRI guidelines** (Annex 5).

- Measures to ensure gender balance in the project consortia should also be considered**.**

3.2. Funding rules

Each project partner has to apply individually for regional/national funding. For each project partner the funding rules of the respective regional/national programmes apply. **This means that depending on the respective national/regional funding rules some project partners have to submit additional national/regional proposals or information on national/regional level.**

To obtain detailed information about the specific funding rules and programme priorities we strongly recommend contacting the respective national/regional funding organisations (see Annex 3 for details).

3.3. Eligible project structure and application

- Project consortia must consist of at least 3 partners (all requesting funding from a funding organisation listed in Annex 3) from at least 3 different countries (at least 2 EU member state or associated country[1]) participating in the M-ERA.NET Call 2023. In addition to the minimum consortium the participation of further partners is possible.
- The total effort of one single applicant cannot exceed 60% of the total project efforts (measured in person months) in the proposal.
- The total effort of applicants from one country cannot exceed 70% of the total project efforts (measured in person months) in the proposal.
- Coordinator is eligible and requests funding from a funding organisation listed in Annex 3.
- Proposal must address appropriate TRLs for selected M-ERA.NET Call 2023 topics.
- Mandatory proposal forms must be used (provided for download at https://www.m-era.net/joint-call-2023).
- Proposal must be written in English.
- Maximum project duration is 36 months.
- Proposal must be recommended for Full-Proposal submission by M-ERA.NET after Pre-Proposal stage.
- Proposers (SMEs, large companies, academic research groups, universities, public research organisations or other research organisations) must be eligible for funding

[1] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/list-3rd-country-participation_horizon-euratom_en.pdf

according to their national/regional regulations (to be checked with funding organisations listed in Annex 3).

- Proposers must provide their respective PIC[2]-numbers in the proposal; proposers without a validated PIC will be able to use a temporary PIC for submission.
- Conflict of Interest: the following individuals are not eligible for proposal submission: M-ERA.NET Steering Board members, researchers affiliated to Russian entities and/or exercising in Russia and researchers from participating Funding Organisations[3]. In addition, proposers cannot act as evaluators of the M-ERA.NET Call 2023.

Typically, small to medium sized consortia (3-5 partners on average per proposal) are expected. However, there is no upper limit and consortia may involve as many partners as necessary for a convincing proposal, ensuring that all participants have a valid role. Each partner within the consortium should clearly add value to the objectives of the proposed project. Depending on the nature of the project, each partner in the consortium must demonstrate how he / she will exploit the expected results.

National/regional funding rules apply. Therefore, in some cases only certain topics, TRLs or types of organisations are eligible (e.g., some national/regional programmes fund only industrial but no academic partners, low/high TRLs). It is highly recommended to contact the respective national/regional funding organisation before proposal submission (see Annex 3 for details).

A consortium agreement between the project partners is recommended for funded projects based on national/regional funding rules. However, the principles of the agreement should already be clear when submitting the proposal. The purpose of the consortium agreement is to clarify:

- the responsibilities of the partners;
- decision processes inside the project;
- management of any change of partners;
- how to exploit and/or commercialise the results (for each partner);
- IPR issues.

[2] Participant Identification Code: If you want to participate in a project proposal your organisation needs to be registered and have a 9-digit Participant Identification Code (PIC). Please find details here: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/participant-register

[3] As an exception, Forschungszentrum Jülich GmbH (JÜLICH) is eligible to apply since measures were already established to avoid any possible conflict of interest with Project Management Jülich as a beneficiary of M-ERA.NET 3, which is a largely independent unit within the research centre Forschungszentrum Jülich GmbH (JÜLICH).

A template for the consortium agreement can be found at: http://www.desca-agreement.eu/

3.4. Project budget

No overall limits have been defined on M-ERA.NET level but national/regional limits regarding the available funding will apply. Budget shares in project consortia have to be in line with eligibility criteria (chapter 5.1.1. and 5.2.1.).

3.5. Project duration

The maximum project duration must not exceed 36 months. National/regional limits regarding the duration of projects will apply.

3.6. Dates and deadlines

Date	Step	Place
1 March 2023	Launch of the Call 2023	
16 May 2023 12:00 noon Brussels time	Deadline for submission of: a) Pre-Proposals and b) National/regional Funding Applications, if necessary*	a) Online (via IT tool) b) National/Regional funding organisations
End September 2023	Feedback to applicants	
21 November 2023 12:00 noon Brussels time	Deadline for submission of: a) Full-Proposals and b) National/regional Funding Applications, if necessary*	a) Online (via IT tool) b) National/Regional funding organisation
Early February 2024	Tentative communication of selection of Full-Proposals recommended for funding	a) Online (via IT tool) b) National/Regional funding organisation
February 2024	Contract negotiations for selected proposals on national/regional level	National/Regional funding organisations
March - September 2024	Start of funded projects	

** Please contact your national/regional funding organisation*

4. Application process

The M-ERA.NET application process is implemented as a 2-step procedure: Pre-Proposal and Full-Proposal.

1. Before submitting a proposal, all project partners must contact their respective national/regional programme funding organisations in order to discuss the project line-up and the funding conditions.
2. **In stage 1, a Pre-Proposal is mandatory**. It has to be submitted by the coordinator through the M-ERA.NET submission tool until 16 May 2023, 12:00 C.E.S.T. The mandatory Pre-Proposal form available at https://www.m-era.net/joint-call-2023 has to be used. At the same time national/regional funding applications must be submitted to each of the involved funding organisation according to their specific rules (if applicable).
3. National/regional funding organisations will carry out eligibility checks of the Pre-Proposals. Eligible Pre-Proposals are sent to central evaluation, organised by the M-ERA.NET call secretariat. The online central evaluation is performed by independent international evaluators, resulting in the M-ERA.NET ranking list of proposals. The Pre-Proposal stage will be used to ensure that only high-quality proposals which are in line with national requirements are invited to the Full-Proposal stage. Applicants will be provided with feedback emails after the M-ERA.NET Pre-Proposal selection meeting, including a recommendation to submit (or not) a Full-Proposal.
4. A proposal has to be recommended for Full-Proposal submission by M-ERA.NET to be eligible for stage 2.
5. **In stage 2, a Full-Proposal and an Annex 1 to the Full-Proposal are mandatory**. They must be submitted by the project coordinator through the M-ERA.NET submission tool until 21 November 2023, 12:00 C.E.T. The mandatory Full-Proposal form and the mandatory Annex 1 to Full-Proposal form available at https://www.m-era.net/joint-call-2023 have to be used. According to the specific rules of the involved funding organisations, a submission of a national / regional application may be required. Please check with your funding organisation.
6. Only eligible Full-Proposals are sent to central evaluation, organised by the M-ERA.NET call secretariat. The online central evaluation is performed by independent international evaluators, resulting in the M-ERA.NET ranking list of proposals.
7. At the M-ERA.NET Full-Proposal selection meeting proposals will be selected for funding based on the M-ERA.NET ranking list and available national/regional funding.
8. M-ERA.NET recommends selected projects for funding to the involved funding organisations. The regional/national funding organisations take the final funding decision.

4.1. Stage 1: M-ERA.NET Pre-Proposal

A Pre-Proposal submission is mandatory using the M-ERA.NET proposal template. The mandatory Pre-Proposal must be submitted by the project coordinator through the M-ERA.NET submission tool until deadline,16 May 2023, 12:00 noon Brussels time. M-ERA.NET Pre-Proposal templates of the Call 2023 must be used.

At the same time national/regional funding applications must be submitted to each of the involved funding organisation according to their specific rules (if applicable). Applicants are requested to contact the involved funding organisations before Pre-Proposal submission. To receive funding, the national/regional parts of the project must fulfil their national/regional criteria. This may create different submission and financing situations for partners from different countries.

4.2. Stage 2: M-ERA.NET Full-Proposal

Only Pre-Proposals invited to Full-Proposal submission are allowed to participate in stage 2. A mandatory Full-Proposal and a mandatory Annex1 to the Full-Proposal must be submitted by the project coordinator through the M-ERA.NET submission tool until deadline 21 November 2023, 12:00 noon Brussels time. M-ERA.NET proposal templates of the Call 2023 must be used.

At the same time national/regional funding applications must be submitted to each of the involved funding organisation according to their specific rules (if applicable).

Changes from Pre- to Full-Proposal

- *Project objectives stated in the Pre-Proposal cannot be changed.*
- *Changes in the consortium should be avoided. Modifications of the consortium are restricted to applicants from countries already part of the Pre-Proposal consortium. It is not accepted to introduce new countries into the existing consortium.*
- *In general, changes from Pre- to Full-Proposal should be avoided. In any case changes from Pre- to Full-Proposal stage have to be coordinated by the consortium leader with all involved funding organisations.*

  This means that major changes regarding content, project duration, costs, funding or consortium have to be communicated and approved by all involved funding organisations at least 2 weeks before Full-Proposal deadline. The consortium leader is responsible to coordinate and ensure the acceptance of these changes by all involved project partners, funding organisations.and the call secretariat.

4.3. Confidentiality

Proposals and any information relating to them (including the names of the evaluators) will be kept confidential and only be accessible to the funding organisations participating in the M-ERA.NET Call 2023. Proposals will not be used for any purpose other than the evaluation of the applications, making funding decisions and monitoring of the project. International experts are required to sign a confidentiality agreement prior to evaluating proposals.

5. Evaluation

The M-ERA.NET selection process will be a 2-step procedure: Pre-Proposal and Full-Proposal. M-ERA.NET aims at providing a transparent, fast and straight forward assessment of the submitted proposals.

5.1. Pre-Proposal

5.1.1 Eligibility check

At M-ERA.NET level:

- requested M-ERA.NET Pre-Proposal form in English is uploaded to the M-ERA.NET submission tool until submission deadline 16 May 2023, 12:00 noon Brussels time.
- maximum project duration is 36 months
- minimum of 3 applicants (all requesting funding from a funding organisation listed in the Guide for Proposers) from at least 3 different countries (at least 2 EU member states or associated countries[4]) participating in the Call 2023; applicants not asking for funding can participate in addition to the minimum consortium of 3 applicants from 3 different countries
- project coordinator is eligible and requests funding (from a funding organisation listed in the Annex 3)
- total effort of one single applicant cannot exceed 60% of the total project efforts (measured in person months) in the proposal
- total effort of applicants from one country cannot exceed 70% of the total project efforts (measured in person months) in the proposal

[4] http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf

- Pre-Proposal is recommended for Full-Proposal submission by a minimum of 3 funding organisations from 3 different countries of the M-ERA.NET call consortium

At national/regional level:

- presence of requested national/regional Pre-Proposal forms (if applicable)
- minimum number of eligible, independent applicants (if applicable, criteria of involved funding programmes apply)
- relevance to funding programme (if applicable, criteria of involved funding programmes apply)
- national/regional thematic priorities going beyond, or more in details than, the M-ERA.NET Call 2023 topics and associated TRL
- financial status of applicants, especially industrial applicants

5.1.2. Central evaluation of Pre-Proposals

Only eligible Pre-Proposals are sent to central evaluation carried out by independent international evaluators according to the EC rules for ERA-NET Cofund (see Figure 3):

- Individual written assessments: 3 individual and independent written assessments for each Pre-Proposal provided by selected and agreed experts. There is no scoring for the individual assessment reports.
- 1 peer review report (PRR): 3 individual assessments are compiled by one of the 3 experts (= rapporteur). The compilation consists of peer review report and a scoring.
- Pre-Proposal evaluation criteria, scoring and thresholds (described in Annex 4.1).
- Quality check of the peer review report by the M-ERA.NET call secretariat
- Ranking list of recommended projects is based on the scoring
- Involved funding organisations meet for a Pre-Proposal selection meeting to assemble and commit themselves to the list of Pre-Proposals to be invited to submit a Full-Proposal. The selection is based on the M-ERA.NET ranking list, national/regional priorities (if applicable) and available national/regional budgets.
- Pre-Proposals with one or more not recommended project partners are not invited to Full-Proposal stage if the total effort of the not recommended partner(s) exceed 15% of the person months.

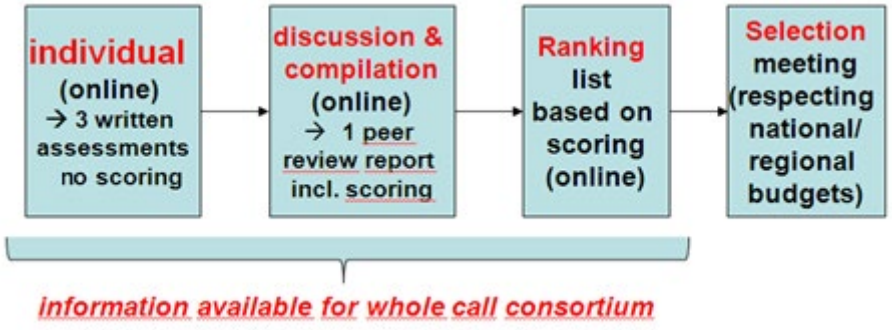

Figure 3:

Procedure of the centra evaluation applied for the Pre-Proposal and Full-Proposal stage

5.1.3. Result of Pre-Proposal phase

After the Pre-Proposal selection meeting of the involved funding organisations, the selection of Pre-Proposal results in one of the recommendations, to be communicated to the applicants:

- *Recommended for submitting the Full-Proposal*
- *Not recommended*

The results of the Pre-Proposals stage will be provided with feedback emails sent by the call secretariat after the Pre-Proposal selection meeting to the project coordinators and all applicants.

5.2. Full-Proposal

Full-Proposals will be selected by the following steps:

5.2.1 Eligibility check

Eligibility checks of Full-Proposals are performed before the central evaluation.

At M-ERA.NET level:

- requested M-ERA.NET Full-Proposal form and Annex1 to the Full-Proposal form in English is uploaded to the M-ERA.NET submission tool until submission deadline 21 November 2023, 12:00 C.E.T.
- maximum project duration of 36 months
- minimum of 3 applicants (all requesting funding from a funding organisation listed in the Guide for Proposers) from at least 3 different countries (at least 2 EU member states or associated countries[5]) participating in the Call 2023; applicants not asking for funding

[5] http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf

can participate in addition to the minimum consortium of 3 applicants from 3 different countries

- project coordinator is eligible and requests funding (from a funding organisation listed in the Annex 3)
- total effort of one single applicant cannot exceed 60% of the total project efforts (measured in person months) in the proposal
- total effort of applicants from one country cannot exceed 70% of the total project efforts (measured in person months) in the proposal;

At National/regional level:

- programme regulations observed if applicable (e.g. presence of requested nat/reg proposal forms, financial standing of industrial applicants, etc.)

5.2.2. Central evaluation of Full-Proposal

Only eligible Full-Proposals are sent to central evaluation carried out by independent international evaluators according to the EC rules for ERA-NET Cofund (see Figure 3).

The M-ERA.NET Call 2023 Evaluation Procedure:

- Individual written assessments: 3 individual and independent written assessments for each Full-Proposal provided by selected and agreed experts. There is no scoring for the individual assessment reports.
- 1 peer review report (PRR): 3 individual assessments are compiled by one of the 3 experts (= rapporteur). The compilation consists of peer review report and a scoring.
- Full-Proposal evaluation criteria, scoring and thresholds (described in Annex 4.2).
- Quality check of the peer review report by the M-ERA.NET call secretariat
- Ranking list of recommended projects is based on the scoring
- Involved funding organisations meet for a selection meeting to assemble and commit themselves to the final list of selected proposals (= selection list). The selection is based on the M-ERA.NET ranking list and the available national/regional budgets.

5.2.3. Result of Full-Proposal phase

As a result of the M-ERA.NET central evaluation Full-Proposals will either be:

- Recommended for funding *or*
- Not recommended for funding

The results of the Full-Proposals stage including a compiled peer review report (anonymised result of central international peer review process excl. scoring) will be provided by the call secretariat via feedback emails to the project coordinators and all applicants.

6. Decision and funding procedure

6.1. Decision process

The M-ERA.NET Full-Proposal selection meeting results in the M-ERA.NET recommendation for funding decisions at national/regional level. The recommended selection list will be forwarded to the involved programme owners who will be in charge of the final funding decisions.

Applicants may submit a complaint to the M-ERA.NET coordinator (office@m-era.net) until one week after the communication of the Full-Proposals assessment if any procedural error may be perceived to exist.

6.2. Funding

6.2.1. Contract

Funding contracts are signed directly between the project partners and their national/regional funding organisations.

6.2.2. Start of projects

Depending on the national/regional regulations, a pre-condition might be the existence of a consortium agreement that also includes IPR related issues.

It is highly recommended that the project start and end dates are synchronised for all project parties.

7. Monitoring

7.1. National/regional project review

The progress of each individual contract will be monitored by the respective national/regional funding organisation through specific project review processes.

7.2. Reporting to M-ERA.NET

Apart from the national/regional project review, the transnational cooperation aspects will be monitored at M-ERA.NET level, e.g. by using online questionnaires. This will also facilitate the identification of potential success stories.

A final project report must be submitted to M-ERA.NET by the project coordinator using the M-ERA.NET reporting templates. The reporting templates we will available on the Call 2023 web page.

7.3. Change in active projects

Any substantial change in an on-going project must be reported immediately to the involved funding organisations and the call secretariat. The project partners should be aware that changes may affect their funding.

8. Communication and dissemination

Funded projects will be displayed on the M-ERA.NET website. The project consortium is invited to enhance their project communication activities by this means, see Guideline for Materipedia[6].

A reference to M-ERA.NET is requested in publications, exhibitions, lectures, success stories and press information concerning results of the projects.

9. Support

Frequently Asked Questions (FAQ) are listed in the call website https://www.m-era.net/joint-call-2023. In addition, all funding organisations participating in the call will provide assistance to project proposers in the case of any questions.

[6] available in May 2023 on the M-ERA.NET website

Annex 1: Thematic priorities for the M-ERA.NET Call 2023

Topic 1: **Sustainable advanced materials for energy**

Topic 2: **Innovative surfaces, coatings and interfaces**

Topic 3: **High performance composites**

Topic 4: **Functional materials**

Topic 5: **Advanced materials and technologies for health applications**

Topic 6: **Next generation materials for advanced electronics**

Topic 1: Sustainable advanced materials for energy

Technical Content and Scope

The EU commitment to mitigate climate change is rooted in the way we use energy and the decarbonisation strategies we take. It is a main objective of M-ERA.NET to support SDG 7 “Affordable and clean energy”. The development of advanced materials can play a key role in resolving these issues, enabling new and cleaner energy production, storage, conversion, efficiency and utilisation. To be effective, sustainable advanced materials development with social impact should address one, but preferably several of the following aspects: circularity, end of life treatment, recyclability, Life Cycle Assessment (LCA), Techno-Economic Analysis (TEA) and RRI. Furthermore, methodologies supported by digitalisation (computational modelling, artificial intelligence, etc.) are needed for accelerated materials design and optimisation for energy applications. These methodologies are expected to save time and cost in the materials discovery and design process versus traditional trial and error approaches

Objectives and Transversal aspects

The proposals shall address at least one of the following items:

- Multiscale modelling and artificial intelligence for accelerated energy materials development and optimisation based on understanding material behaviour..
- Digitalisation of manufacturing processes of material components for energy devices.
- Materials ensuring safety in energy storage and conversion devices, i.e. batteries, fuel cells and electrolysers
- Novel materials for H2 production,storage, combustion, conversion and power to X.
- Development of sustainable and advanced catalysts to improve fuel cell and electrolyser efficiency based on computation and experiments
- Improved active materials and electrolytes for Generation 4 and 5 batteries for mobility (i.e. solid state Li-ion batteries and beyond Li-ion batteries)
- Photovoltaics: new concepts and architectures for solar cell materials and efficient photovoltaic cells.
- Materials for short, medium and long-term thermal storage over a wide temperature range.
- Advanced materials for wind turbines low in critical elements, low degradation and increased recyclability of the blades.
- Development of by design recyclable advanced materials for energy and the corresponding processes.

In addition to the topics above, the project proposal may also include materials processing, reduced energy consumption through light-weight materials, and/or flexible design for repurposing and recycling. Such integration could be further enhanced by fostering

collaboration between universities, civil society andindustry, to strengthen the whole innovation chain.

Sustainability and RRI requirements

M-ERA.NET requires that all proposers explain how their projects demonstrate a commitment to RRI by investigating and addressing the environmental, social, ethical, political, or cultural dimensions of the proposed research.

All proposals should provide a preliminary assessment of the targeted material regarding (but not limited to):

- Resources: the use of resources overall, the environmental properties of the materials, the use of critical raw materials, energy, water, etc.
- The production process: use of solvents, toxic elements, etc.
- Use phase: the sustainability of the conditions under which the material can be used (continuous energy use, releases to the environment, life span, etc.)
- End of life: the entry of the material into the circular economy, including re-use, re-manufacturing or recycling considerations.

Describe any potential trade-offs between sustainability burdens and benefits.

The proposal should include an activity where such aspects (relevant to the proposal) are further investigated, potentially with corresponding impacts on the design of the material(s).

Expected impact

The proposal shall address how it will contribute to the expected impact of the topic, defined as follows:

- It is expected that the proposed research will lead to energy conversion and storage systems with higher efficiency, improved overall performance and lower cost.
- Improved overall performance includes, amongst others and not limited to, energy and power characteristics, safety, cyclability, volumetric and gravimetric energy density, capacity.
- To increase the impact of research activities, open access raw data and metadata should be made available. This will facilitate comparison between project results and provoke cooperation between related research groups.
- In proposals including modelling activities, the developed software should be reusable and interoperable with pre-existing software solutions.

All proposals should clearly state the TRL at the project start and at the project end (see 1.3.). The proposals should include a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end date). Establishing an industrial advisory board or the participation of one or more companies in the project consortium is encouraged. In proposals targeting TRL 5, industrial partners and at least one project partner specialised on customer or end-user demands should be involved in the project consortium.

Target groups
This topic is targeted at all groups: disruptive research, applied research, industrial research and development.

Keywords
Multiscale modelling; artificial intelligence; materials processing; efficient electrodes thermochemical materials; photovoltaic materials; generation 4 batteries; generation 5 batteries; thermoelectric materials; light weighting, photovoltaics, energy storage, safety; batteries: active materials; batteries: inactive materials; wind turbines; thermal resistance materials; advanced catalysts; energy efficiency; Na-ion; Li-ion, Flow batteries; Power to X; electrolytes; fuel cells; energy conversion; electrolysers; hydrogen

Indicative targeted TRL: 1-6

Topic 2: Innovative surfaces, coatings and interfaces

Technical Content and Scope

Surface and coating technology is a key enabler for new solutions in numerous industrial sectors worldwide. This call will stimulate application driven development of innovative surfaces, thin films, coatings, interfaces and related process technologies, including a broad spectrum of applications in various fields as specified in objectives and transversal aspects. The proposals should consider the energy efficient development, processing or production aspects including modelling and circular economy. Sustainable use of materials in an environmentally friendly manner with special attention to Critical Raw Materials (CRM) should be considered.

Objectives and Transversal aspects

The proposals shall address at least one of the following items:

- Development of innovative surfaces, thin films, coatings and/or interfaces.
- Smart and multifunctional coatings, thin films or interfaces.
- Development or improvement of process technologies considering circular economy and energy efficiency to enable deposition of new coatings and/or surface modification.
- Development of optimised interfaces and interphases.
- Development of new materials and processing for long-time stable antipathogen coatings.
- Development of environmentally friendly interfaces in battery cells or innovative battery-or electrolyser- or fuel cell components, including post Li-ion battery.
- Development of thin films and coatings for sensing applications, including biosensing and gas sensing.
- Multiscale modelling and/or new characterisation techniques of innovative surfaces, thin films, coatings and/or interfaces.
- Engineered functional interfaces between electronics and biological systems.

Project proposals should

- Consider aspects such as fundamental understanding of the mechanisms, experimental assessment and where applicable prototyping, up-scaling, manufacturing and validation demonstrating prototype in an operational environment with a view to final customer applications.
- Address complementary characterisation techniques and/or where relevant modelling techniques and/or how to rationalise data for future use in modelling processes (data base)
- Address how coatings and/or thin films will impact the recyclability of core material
- Ensure relevance for different partners in the value chain by stating clear concepts for application(s) in targeted industrial sector(s).

Sustainability and RRI requirements

M-ERA.NET requires that all proposers explain how their projects demonstrate a commitment to RRI by investigating and addressing the environmental, social, ethical, political, or cultural dimensions of the proposed research.

All proposals should provide a preliminary assessment of the targeted material regarding (but not limited to):

- Resources: the use of resources overall, the environmental properties of the materials, the use of critical raw materials, energy, water, etc.
- The production process: use of solvents, toxic elements, etc.
- Use phase: the sustainability of the conditions under which the material can be used (continuous energy use, releases to the environment, life span, etc.)
- End of life: the entry of the material into the circular economy, including re-use, re-manufacturing or recycling considerations.

Describe any potential trade-offs between sustainability burdens and benefits.

The proposal should include an activity where such aspects (relevant to the proposal) are further investigated, potentially with corresponding impacts on the design of the material(s).

Expected impact

- Innovative energy efficient process technologies related to interface optimisation, coating development and application as well as surface modification
- Availability of high-end components, products with tailored properties or functionalities by innovative surfaces, coatings and interfaces. All addressed technologies and/or products should ensure having a minimal negative impact on health and safety.
- Achieving a positive ecological and energy impact by developing processes, coating materials, and thin film technologies following a circular economy and CRM strategies in accordance to SDG 7 (affordable and clean energy).
- Innovative products or technologies with tailored properties or functionalities by innovative surfaces, coatings and interfaces enabling positive societal impacts, on e.g. safety, economics, employment, life quality and avoid the release of toxic substances.
- Increasing synergy between industry and academia after the end of the project

All proposals should address environmental aspects, including re-use, re-manufacturing or recycling considerations, and broader social or ethical impacts when relevant. All proposals should clearly state the TRL at the project start and at the project end (see 1.3.). The proposals should include a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end date). Establishing an industrial advisory board or the participation of one or more companies in the project consortium is encouraged. For proposals aiming at TRL 4 or higher, industrial partners and at least one project partner, specialised on customer demands, should be involved in the project consortium.

Target groups

This topic is targeted at all groups in the innovation chain: basic research, applied research, industrial research as well as at the end-user industry. The topic is particularly suitable for the establishment of a strong collaboration between research entities and industry including Small and Medium Enterprises (SMEs). Participation of large enterprises may be considered due to their powerful research units or as potential end users of the technology or of the product proposed. Interdisciplinary/transdisciplinary projects along the value chain are encouraged and should enable a broader cross-sectorial use.

Keywords

Innovative surfaces, multifunctional coatings, sensing surfaces, nano-engineered coatings, antipathogen coatings, bio-interfaces, thin films, interfaces, interphases, advanced coatings, functionalisation, surface technologies, modelling, surface characterisation techniques, structured surfaces, textured surfaces.

Indicative targeted TRL: 2-6

Topic 3: High performance composites

Technical Content and Scope

Within the scope of this call, composites are defined as engineered materials (incl. hybrids) composed of ≥2 constituents (ex. a polymer, metallic or ceramic matrix reinforced by a fibre, particle, container or a filler) that meet requirements which cannot be fulfilled by a single material. The constituents can be metallic, ceramic, mineral, synthetic or from biological sources, and may possess one or more nanoscale dimensions.

Objectives and Transversal aspects

This call topic is aimed at high performance composites having functional properties for engineering applications (ex. transportation, construction, light-weighting, packaging). Applications in energy, health and electronics can also be considered, but should not be the sole focus; in such cases please refer to Topics 1, 5 or 6.

Regarding materials properties, composites should combine at least two of the following:

- High strength and stiffness to weight-ratio.
- Durability (e.g. good resistance to creep, fatigue, humidity, etc.).
- Tailored thermal, electrical and/or mechanical properties.
- Self-healing functionalities or self-monitoring properties.
- Thermal management properties (e.g. phase change materials).
- Electronic and/or ionic conductivity.
- Electrochemical energy storage properties.
- Biocompatible or anti-microbial properties.
- Biodegradable and/or compostable properties.
- Sustainability-by-design.
- Fire retardant properties with environmentally friendly substances.
- Long-term stability and safety.

Proposals should also address one or more of the following issues:

- Modelling and simulation including data driven approaches.
- Molecular design, functionalisation and characterisation for improved interfaces.
- Elimination of substances of concern.
- New bio-based (renewable) constituents.
- Resource optimisation, incl. use of recycled/waste materials and lifetime extension.
- Methods and tools for design optimisation (e.g. for additive manufacturing).
- Determination of long-term properties (e.g. creep, fatigue, ageing, etc.).
- Understanding of failure and prediction of failure.
- Disassembly / constituent separation / repair / reuse / recycling strategies (incl. design-for-repair, -recycling).
- New scalable, high throughput and rapid manufacturing techniques, e.g. fast curing, low viscosity resins, extrusion, thermoforming, and roll-to-roll processing.

- Automation, robotisation, cost-efficient and/or sustainable manufacturing.
- Novel composite architectures and constituent designs (e.g. thin tapes), and novel means of generating them (e.g. additive manufacturing).
- Joining, assembly and interface optimisation between dissimilar materials.

It is strongly recommended that the proposal covers materials, processing, applications, and recycling. Such integration may be further enhanced by collaborations between universities, institutes and industry, and by a consortium covering the whole value chain, as well as by providing an objective and meaningful assessment of sustainability.

Expected impact

Proposals shall address contributions to expected impact, defined as follows:

- High performance composites with reduced resource consumption using advanced design and manufacturing concepts (esp. avoiding substances of concern).
- Addressing SDG 7 ”Affordable Clean Energy” and/or SDG 9 ”Industry Innovation and Infrastructure”.
- More competitive industrial products and processes.
- Socioeconomic, ecological and/or ethical benefits of composites with enhanced functionality and/or reduced impact on human health / the environment
- Improved knowledge sharing and the reinforcing of scientific and technological platforms within the international composites community.

All proposals should clearly state the TRL range covered during the project (see 1.3.) and include a plan for the transition to higher TRLs beyond the project end date.
Establishing an industrial advisory board or implicating one or more companies in the consortium is encouraged; the inclusion of a societal stakeholder should also be considered. When aiming above TRL 4, the consortium should involve industrial partners.

Sustainability and RRI requirements

M-ERA.NET requires that all proposers explain how their projects demonstrate a commitment to RRI by investigating and addressing the environmental, social, ethical, political, or cultural dimensions of the proposed research.
Proposals should provide a preliminary assessment regarding (but not limited to):

- Resources: the use of resources overall, the environmental properties of the materials, the use of critical raw materials, energy, water, etc.
- Production process: use of solvents, toxic elements, substances of concern, etc.
- Use phase: the sustainability of the conditions under which the material can be used (releases to the environment, life span, etc.)
- End-of-life: the entry of the material into the circular economy, including re-use, re-manufacturing or recycling considerations.

Describe any potential trade-offs between sustainability burdens and benefits.

The proposal should include an activity where relevant aspects are further investigated, potentially with corresponding impacts on the design of the material(s).

Target groups
This topic is targeted at all groups in the innovation chain: disruptive, applied research, industrial research and development. Collaboration between research entities and industrial partners is encouraged also at low (<4) TRL levels.

Keywords
Modelling, simulation, understanding failure, synthetic composites, hybrid material systems, polymer matrix, metal matrix, ceramic matrix, bio-based / renewable composites, additive manufacturing, functional properties, in-service behaviour, design methodology, process technology, recycling, long-term properties, flame retardancy, safety of advanced materials, sustainable manufacturing

Indicative targeted TRL: 1-6

Topic 4: Functional materials

Technical Content and Scope

Advanced functional materials are an important economic and employment generator in Europe. Functional materials and their interfaces are the key enabler, transversal and bottleneck for almost all technologies. Material systems are expected to contribute to reducing our dependence on fossil fuels, toxic substances, and critical raw materials, as well as favouring recycling and long-term stability and safety. Design, simulation, synthesis and appropriate processing of novel materials and microstructures with improved tailored properties are needed to achieve high performance in industrial applications. European product innovation relies strongly on deep theoretical knowledge on functional materials together with AI/machine learning, state-of-the-art characterization techniques, and more efficient technologies for ground-breaking applications or with a significantly enhanced performance.

Functional materials specifically targeting only one application among energy, electronics or health applications should be submitted to the corresponding call topic.

Objectives and Transversal aspects

Proposals within the scope of this topic should target the development of advanced functional materials or materials systems in at least one of the following areas:

- Materials for sensing and actuation e.g. smart materials, functional textiles, stretchable materials and others.
- Functional structures, e.g. metamaterials, 2D-layers, topological structures, self-healing materials and others.
- Materials for emerging quantum technologies
- Materials for smart and zero-energy buildings: thermal insulation systems and efficient heat radiation or cooling solutions involving rare earth and ecological materials
- Materials for greenhouse gas capture/conversion.
- Materials for energy-efficient separation, liquid/gas purification and process intensification.
- Waste-energy harvesting materials: new designs and architectures for increased energy efficiency and solutions
- Safe and sustainable fabrication routes for materials.
- Safe and sustainable by design and bio-based materials.
- New strategies to replace toxic or critical raw materials in commercial products

To strengthen the whole innovation chain, it is strongly recommended that the project proposal covers materials, processing, application, and recycling and make use of new development strategies such as modelling, artificial intelligence, high-throughput, in robotics and additive manufacturing. Such integration could be further enhanced by fostering

collaboration between universities and industry, and by a consortium covering the whole circular value chain and LCA.

Expected impact

- Support the future European circular and sustainable industry through technological development based on novel functional materials and their production processes.
- Support the European strategic policy targets in terms of greenhouse gas emission reduction and carbon (CO2) capture and sequestration.
- Improved competitiveness and strengthened industrial leadership.
- Strengthened innovation excellence of the European academia and research institutes.

All proposals should clearly state the TRL at the project start and at the project end. The proposals based on original and innovative approaches may start with TRL 1. The proposals should include a plan for the transition to higher TRLs at a later stage (i.e., beyond the project end date). Establishing an industrial and stakeholder advisory board or the participation of one or more companies in the project consortium is encouraged. For proposals aiming at TRL 4 or higher, industrial partners should be involved in the project consortium.

Sustainability and RRI requirements

M-ERA.NET requires that all proposers explain how their projects demonstrate a commitment to RRI by investigating and addressing the environmental, social, ethical, political, or cultural dimensions of the proposed research.

All proposals should provide a preliminary assessment of the targeted material regarding (but not limited to):

- Resources: the use of resources overall, the environmental properties of the materials, the use of critical raw materials, energy, water, etc.
- The production process: use of solvents, toxic elements, etc.
- Use phase: the sustainability of the conditions under which the material can be used (continuous energy use, releases to the environment, life span, etc.)
- End of life: the entry of the material into the circular economy, including re-use, re-manufacturing or recycling considerations.

Describe any potential trade-offs between sustainability burdens and benefits.

The proposal should include an activity where such aspects (relevant to the proposal) are further investigated, potentially with corresponding impacts on the design of the material(s).

Target groups

This topic is targeted at all groups: disruptive research, applied research, industrial research and development.

Keywords
2D materials, bio-based materials, building facades, catalysts; chiral nanostructures, clean energy production; CO2 conversion, eco-design, electrochromic materials, green concrete, flexible devices, greenhouse gas capture; greenhouse gas conversion; magnetic properties; materials synthesised by energy efficient processes; materials for process intensification, metamaterials, mechanical properties, nanoparticles, optical properties; photonic properties; photochromic material, waste energy harvesting materials; photocatalyst, piezoelectricity; plasmonics, processing technologies membranes, quantum technologies, redox materials; reusable and recyclable materials; safe and sustainable process, self-healing materials sensors, Smart materials; smart windows, structural material, thermal properties; thermoelectric properties, topological structure, triboelectric properties; tribological properties

Indicative targeted TRL: 1-7

Topic 5: Advanced materials and technologies for health applications

Technical Content and Scope

Societal challenges related to health and wellbeing of the global population require new or improved solutions. Many of these solutions will come from the development of new advanced materials as key components of diagnostics, clinical or surgical treatments and therapeutics (e.g. medical devices, drug delivery systems, implants, regenerative and reparative medicine, cell and gene therapies, real-time monitoring *in vivo* sensors, and others). These materials will be in contact with the human body at different levels. In addition, engineered matrices might provide solutions to deepen our understanding of how tissue-specific cells sense and respond to key biophysical properties of the surrounding substrates. *In vitro* recapitulation of the homeostatic renewal of tissues, tissue or organ morphogenesis during the development and pathogenesis of many disorders is critical for the development of organ-on-chip devices.

The purpose of this call topic is to provide opportunities to build critical knowledge of advanced materials and technologies towards applications in health. This action is aligned with societal challenges related to health as articulated by the SDGs. This call topic is also in agreement with the recognition of advanced materials as a Key Enabling Technology for strengthening the competitiveness of the European industry.

Objectives and Transversal aspects

The objective is to develop engineered materials for implants, drug delivery systems, real-time monitoring *in vivo* biosensors and scaffolds. Developed solutions are aimed at replacing, restoring, and regenerating physiological functions, tissues and organs, as well as leading to new diagnostic and therapeutic interventions. These materials can be tailored for applications in organ-on-chips (e.g. spheroids/organoids), medical phantoms and bioinks. The investigated engineered materials should target at least one clinical indication. Such materials may include functionalised, adaptable or stimuli-responsive elements, hierarchical structures to modulate 3D cell growth and structural or topographic modifications to direct specific cell responses. The development of the materials with properties-by-design can be supported/designed by *in silico* techniques. Proposals can be supported by big data/artificial intelligence approaches.

Proposals should address the following points:

- Interactions between the newly developed materials and the biological environment/surrounding tissues, such as biodegradation, biological performances, toxicity, and inflammatory/immune response at the short, medium and long term.
- Mechanical, physical, and chemical properties of the materials relevant for the foreseen application.

Proposals are expected to consider the following:

- The potential market and exploitation routes including a robust risk and contingency plan and the overall scalability, sustainability and relevant regulatory issues.
- When appropriate, the *in vitro* testing and/or assays in animals must be conducted following the national ethical rules of each relevant partner involved.
- Where relevant, alternatives to animal testing (methods and models) need to be incorporated into the study design.
- If the proposal requires animal or human subjects, gender aspects in research study design need to be accounted for.

Moreover, the proposals are strongly encouraged to consider relevant, cross-disciplinary collaboration between material scientists, engineers, biologists, clinicians, immunologists, regulatory scientists, standardisation bodies, toxicologists, social scientists, patient organisations, and/or industrial partners.

RRI and sustainability requirements

M-ERA.NET requires that all proposers explain how their projects demonstrate a commitment to RRI by investigating and addressing the proposed research's environmental, social, ethical, political, or cultural dimensions of the proposed research.

All proposals should provide a preliminary assessment of the targeted material regarding (but not limited to):

- Resources: the use of resources overall, the environmental properties of the materials, the use of critical raw materials, energy, water, etc.
- The production process: use of solvents, toxic elements, etc.

They should describe any potential trade-offs between sustainability burdens and benefits.

Expected impact

The proposal shall address how it will contribute to the expected impact of the topic, defined as follows:

- Understanding the complexity of material/biology interfaces over time;
- Achievement of new or improved materials performance for at least one clinical target;
- Higher competitiveness of the European health industry through more reliable products, scalable and reproducible processes, and awareness of the standardised and regulatory protocols;
- Increased collaborations between material science RTD performers, patient organisations, industrial and medical stakeholders in the health sector.

All proposals should clearly state the TRL at the project start and end (see 1.3.). At the end of the project, the addressed technology is expected to reach at least TRL 3. The proposals should outline a plan for the transition to higher TRLs at a later stage (i.e. beyond the project end date). The participation of one or more companies in the project

consortium is encouraged. Establishing a multi-stakeholder advisory board (e.g. clinicians, patient organisations, and industrial experts) is recommended.

Target groups
This topic is targeted at all groups in the innovation chain: disruptive, applied and industrial research. Collaboration between research entities including clinical centres and industrial partners is encouraged.

Keywords
Biocompatibility, biodegradation, bioink, biointerfaces, biomaterials, drug delivery systems, implants, *in vivo* biosensors, medical device, medical phantoms, organ-on-chip, real-time monitoring scaffolds, regenerative medicine, regulatory science, toxicology

Indicative TRL: 1-4

Topic 6: Next generation materials for advanced electronics

Technical Content and Scope

Advanced materials provide solutions for tomorrow's challenges of micro/nano electronics because of its cross-cutting and presence in every tangible form of our daily life working as an accelerator for the challenges we have concerning the Internet of Things (IoT), Industry 4.0 and the need for digital interconnectivity. To turn European heritage in RTD into benefits for a sustainable Europe, materials-based innovation and system solution needs to be expanded. As a founding element of Pan-European innovation and prosperity and to lead to a newly committed European electronic industry, fully connected with deep tech green technologies and products, able to build the transition towards the next generation of hyper-trends, research needs to be carried out on multifunctional materials for sensing and electronics, chip-less integrated systems, beyond silicon, ultra-low power electronic systems, flexible and/or printed electronics among others. With this we aim to address the challenges of our collective future where the aim is to preserve the European life quality and living standards by integrating co-creation and citizen involvement, with circularity and a sustainable supply chain.

The topic supports proposals on material research and its application, with special focus on physical properties of electronic and magnetic materials, spintronics, materials design and architecture for nano-electronics and chipless electronics, device physics and engineering, micro- and nano-electro(-opto) mechanical systems and organic and inorganic electronic devices and their integration.

Objectives and Transversal aspects

Proposals shall address at least one of the following items:

- Advanced eco-sustainable materials in electronics. Materials for ultralow power sensors, transductors, power electronics, thermoelectrics.
- Smart advanced materials for thermal management in electronics. Coating, aggressive environments, Electromagnetic compatibility (EMC), self-cleaning, etc.
- Wearable, flexible, stretchable low-cost materials for green electronics. Substrates, 3D printed components and devices. Reliability, self-healing, hybrid integration, assembly and bonding/soldering of heterogeneous components. Disposable materials for electronics: ink materials, polymers, cellulose, etc.
- Advanced materials for optoelectronic applications: Light Emitting Diodes (LEDs), optical communications, other materials.
- Materials for chipless applications, new strategies for materials beyond silicon.
- New high throughput manufacturing approaches for electronic components: Printing technologies, additive manufacturing techniques, patterned coatings.
- Next generation of materials for integrated electronics for energy storage and harvesting
- Low dimensional and magnetic materials for advanced electronics. .

- Electronics materials wich are safe and sustainable by design.

Proposals including and considering modelling and artificial intelligence approaches are welcome. Green and sustainable materials should be prioritized. Increasing the efficiency of the devices and reduce the power consumption and new improvements for circular economy are also encouraged.
M-ERA.NET requires that all proposers explain how their projects demonstrate a commitment to RRI by investigating and addressing the environmental (re-use, recycling, avoidance of critical materials, design for enhancing life-time use…), social, ethical, political, or cultural dimensions of the proposed research.

Expected impact
The proposal shall address how it will contribute to the expected impact of the topic, defined as follows:

- Improvement of the existing electronic devices with more versatility, better efficiency, strongly reduced power consumption and added functionality.
- Development of new materials for wearables and flexible electronics
- Breakthrough in implementing technologies based on low dimensional materials.
- Substitution of toxic and hazardous materials with greener technology materials. Reduction of the carbon footprint of developed technologies.
- Multidisciplinary teams (materials, electronics, and security) potentially involving co-creation and citizen involvement are encouraged.

All proposals should clearly state the TRL at the project start and at the project end. The proposals based on original and innovative approaches may start with TRL 1. The proposals should include a plan for the transition to higher TRLs at a later stage (i.e., beyond the project end date). Establishing an industrial and stakeholder advisory board or the participation of one or more companies in the project consortium is encouraged. For proposals aiming at TRL 5 or higher, industrial partners should be involved in the project consortium.

Sustainability and RRI requirements
M-ERA.NET requires that all proposers explain how their projects demonstrate a commitment to RRI by investigating and addressing the environmental, social, ethical, political, or cultural dimensions of the proposed research. All proposals should provide a preliminary assessment of the targeted material regarding (but not limited to):

- Resources: the use of resources overall, the environmental properties of the materials, the use of critical raw materials, energy, water, etc.
- The production process: use of solvents, toxic elements, etc.
- Use phase: the sustainability of the conditions under which the material can be used (continuous energy use, releases to the environment, life span, etc.)

- End of life: the entry of the material into the circular economy, including re-use, re-manufacturing or recycling considerations

The proposal should describe any potential trade-offs between sustainability burdens and benefits.
The proposal should include an activity where such aspects (relevant to the proposal) are further investigated, potentially with corresponding impacts on the design of the material(s).

Target groups
This topic is targeted to academic research groups, SMEs, or large companies that develop innovative disruptive, applied, and industrial focused investigations.

Keywords
Wearable materials, flexible and stretchable materials, smart packaging, low-dimensional materials, optoelectronics, multifunctional materials for electronics, sensors, transductors, actuators, low cost electronics, printed electronics, new materials for communication electronics, carbon footprint reduction.

Indicative targeted TRL: 1-6

Annex 2: Technology Readiness Level

All proposals should clearly state and motivate at what level on the Technology Readiness Level (TRL) scale the project is situated at the beginning and after the project is finished. In order to increase the potential for new business opportunities and commercial exploitation of the results:

- Proposals aiming at TRL below 4 should include a plan for the transition to higher TRL's at a later stage (i.e. beyond the project end date) and demonstrate industrial involvement. This can be realised by establishing an industrial or end user advisory board (or alternatively by the participation of one or more companies in the project consortium when feasible).
- For proposals aiming at TRL above 4, industrial partners should be involved in the project consortium.

Where the topic description refers to the concept of **"Technology Readiness Level"** (TRL), the following definition in accordance with H2020[7] applies:

TRL 1 – basic principles observed
TRL 2 – technology concept formulated
TRL 3 – experimental proof of concept
TRL 4 – technology validated in lab
TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 7 – system prototype demonstration in operational environment
TRL 8 – system complete and qualified
TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Project proposal should clearly indicate the TRL position at the beginning of the project and after the project is finished.

Topic	TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9
Topic 1: Sustainable advanced materials for energy									
Topic 2: Innovative surfaces, coatings and interfaces									
Topic 3: High performance composites									
Topic 4: Functional materials									
Topic 5: Advanced materials and technologies for health applications									
Topic 6: Next Generation Materials for Advance Electronics									

[7] https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-g-trl_en.pdf

Annex 3: Funding organisations participating in the M-ERA.NET Call 2023

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**) to be confirmed*

#) formal approval pending

Commitment per funding organisation:

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Thematic restrictions	Indicative call budget (Mio €)
	Sustainable advanced materials for energy	**Innovative surfaces, coatings and interfaces**	**High performance composites**	**Functional materials**	**Advanced materials and technologies for health applications**	**Next generation materials for advanced electronics**		
Austria: FFG (Produktion)		X		X		X	No	1.00
Austria: FFG (Mobilität)	X	X	X	X			Yes, see note 1	0.50
Belgium (Flanders): HERMESFUND / VLAIO	X	X	X	X	X	X	No	1.00
Belgium (French Speaking Community): F.R.S.- FNRS	X	X	X	X	X	X	No	0.20
Belgium (Wallonia): SPW	X	X	X	X	X	X	No	1.00
* Brazil (Sao Paulo): FAPESP	X	X	X	X	X	X	No	0.40
Bulgaria: BNSF	X	X	X	X	X	X	No	0.38
Canada (Québec): PRIMA	X	X	X	X	X	X	No	0.70
Croatia: MSE	X	X	X	X	X	X	No	0.15

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Thematic restrictions	Indicative call budget (Mio €)
Czech Republic: TA CR	X	X	X	X	X	X	No	1.50
Denmark: IFD	X	X	X	X		X	Yes, see note 1	1.00
Estonia: ETAG	X	X	X	X	X	X	No	0.15
Finland: AKA	X	X	X	X	X	X	No	1.25
Finland: Business Finland	X	X	X	X	X	X	No	1.00
France: ANR	X			X		X	No	1.00
France (Novelle-Aquitaine): RNAQ	X	X	X	X	X	X	No	0.50
Germany (Saxony): SMWK	X	X	X	X	X	X	No	3.00
* Germany: BMBF / PtJ	X	X	X	X			Yes, see note 2	5.00
# Hungary: NKFIH	X	X	X	X	X	X	No	0.30
Italy (Calabria): Regione Calabria	X	X	X	X	X	X	No	0.50
Israel: IIA	X	X	X	X	X	X	No	0.50
Israel: MOST	X	X	X	X	X	X	No	0.50

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Thematic restrictions	Indicative call budget (Mio €)
Latvia: LZP	X	X	X	X	X	X	No	1.20
Lithuania: LMT	X	X	X	X	X	X	No	0.30
Luxembourg: FNR	X	X	X	X	X	X	No	0.50
Norway: RCN	X	X	X	X	X	X	No	2.40
Poland: NCBR	X	X	X	X	X	X	No	2.00
Poland: NCN	X	X	X	X	X	X	No	1.20
Romania: UEFISCDI	X	X	X	X	X	X	No	1.00
Slovak Republic SAS	X	X	X	X	X	X	No	0.36
Slovenia MVZI	X	X	X	X	X	X	No	1.20
South Africa: DSI	X	X	X	X	X	X	No	0.40
South Korea KIAT	X	X	X	X	X	X	No	1.00
Spain AEI / FECYT	X	X	X	X	X	X	No	1.00
Spain (Asturias): IDEPA	X	X	X	X	X	X0	No	0.30

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Thematic restrictions	Indicative call budget (Mio €)
Spain (Basque Country): EJ-GV	X	X	X	X	X	X	Yes see note 1	0.50
Sweden: VINNOVA	X	X	X	X			No	0.90
Taiwan: NSTC	X	X	X	X	X	X	No	0.75
Turkey: TÜBITAK	X	X	X	X	X	X	No	1.00

**) to be confirmed*
#) formal approval pending

Note 1: For topical restrictions, please refer to Annex A – national / regional regulations.
Note 2: Indicated proposal topics are restricted to "inactive materials and components for battery cells" and "alternative battery systems".

Annex 4.1: Pre-Proposal evaluation criteria, scoring, thresholds

Evaluation criteria:

Criteria for Pre-Proposal evaluation are predefined by the EC for ERA-NET Cofund:

(a) Excellence
(b) Impact
(c) Implementation

Sub-criteria, scoring and thresholds are defined by the call consortium.

Pre-Proposal evaluation criteria

Main Criteria	***Sub Criteria***	***Score (points)***
Excellence	Clarity and pertinence of research objectives and hypotheses	*max. 1.5*
	Novelty, originality, position of concepts and approaches in relation to the state of the art (ambition, innovation potential, ground-breaking objectives)	*max. 2.0*
	Appropriateness of the methodology, credibility of the proposed approach and soundness of the concept, including approach to RRI	*max. 1.5*
Impact	Ability of the project to address the research issues covered by the chosen research theme: relevance to the topic addressed by the call	*max. 2.0*
	Contribution at the European or international level to the expected impacts listed in the Guide for Proposers under the relevant topic	*max. 2.0*
	Engagement of the proposed research with circularity, environmental as well as ethical, political, social and/or cultural dimensions	*max. 1.0*
Implementation	Competences, experience and complementarity of each of the consortium members and the consortium as a whole (including complementarity, balance, inter- or transdisciplinarity)	*max. 2.0*
	Quality of the collaboration (added value of the transnational cooperation)	
	Quality and effectiveness of the work plan (work packages and tasks distribution among partners)	*max. 2.0*
	Organisation and overall management of the project	
	Overall appropriateness of the budget and other resources to be committed	*max. 1.0*

Ethical issues: Pre-Proposal includes Horizon Europe“Ethical Issues Table”, adapted to M-ERA.NET specifications. In case ethical issues apply (applicants mark respective issues in the table)

M-ERA.NET recommends that the national/regional organisations observe these issues (e.g. post-evaluation review) for their respective funded projects.

Scoring and Thresholds

Individual assessment report (IAR): The indivdual evaluators will provide written statements for each of the subcriterion. Scores are not provided for the IAR.

Peer review report (PRR): The rapporteur will compile a peer review report, to be accepted by all 3 evaluators. PRR will include scoring of each sub-criterion to be provided by the rapporteur and agreed by all evaluators. Each criterion will be scored between 0.0 and 5.0 in multiples of 0.5 points.

Threshold: The threshold for individual criteria will be 3.0; the overall threshold, applying to the sum of the individual scores will be 10.0.

Ranking: In case of equal overall scores, proposals can be sorted by:

- comparing individual main criteria (compare scores of “Excellence” criterion, if still equal compare scores of “Impact” criterion, if still equal compare scores of “Implementation” criterion)
- available national/regional budgets

Annex 4.2: Full-Proposal evaluation criteria, scoring, thresholds

Evaluation criteria:

Criteria for Full-Proposal evaluation are predefined by the EC for ERA-NET Cofund:

(a) Excellence
(b) Impact
(c) Implementation

Sub-criteria, scoring and thresholds are defined by the call consortium.

Full-Proposal evaluation criteria

Main Criteria	***Sub Criteria***	***Score (points)***
Excellence	Clarity and pertinence of research objectives and hypotheses	*max. 1.5*
	Credibility of the proposed approach and soundness of the concept. including approach to RRI	*max. 2.0*
	Extent that proposed work is ambitious, has innovation potential, and is beyond the state of the art (e.g. ground-breaking objectives, novel concepts and approaches)	*max. 1.5*
Impact	Contribution at the European or international level to the expected impacts listed in the Guide for Proposers under the relevant topic	*max. 1.5*
	Enhancing innovation capacity and integration of new knowledge	*max. 1.0*

	Strengthening the competitiveness and growth of companies by developing innovations meeting the needs and values of European and global markets; and, where relevant, by delivering such innovations to the markets	
	Engagement of the proposed research with circularity, environmental as well as ethical, political, social and/or cultural dimensions	*max. 1.0*
	Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, engage with stakeholders and user groups, and to manage research data where relevant	*max. 1.5*
Implementation	Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall.	*max. 1.0*
	Appropriateness of the management structures and procedures	*max. 1.0*
	Quality and relevant experience of the individual participants	*max. 1.0*
	Quality of the consortium as a whole including complementarity, balance, inter- or transdiciplinarity	*max. 1.0*
	Appropriate of the allocation of tasks, ensuring that all participants have a valid role and allocation and justification of the resources to fulfil that role	*max. 1.0*

Ethical issues: Full-proposal includes Horizon Europe"Ethical Issues Table", adapted to M-ERA.NET specifications. In case ethical issues apply (applicants mark respective issues in the table) M-ERA.NET recommends that the national/regional organisations observe these issues (e.g. post-evaluation review) for their respective funded projects.

Scoring and Thresholds

Individual assessment report (IAR): The individual evaluators will provide written statements for each of the subcriterion. Scores are not provided for the IAR.

Peer review report (PRR): The rapporteur will compile a peer review report, to be accepted by all 3 evaluators. PRR will include scoring of each sub-criterion to be provided by the rapporteur and agreed by all evaluators. Each criterion will be scored between 0.0 and 5.0 in multiples of 0.5 points.

Threshold: The threshold for individual criteria will be 3.0; the overall threshold, applying to the sum of the individual scores will be 10.0.

Ranking: In case of equal overall scores, proposals can be sorted by:

- comparing individual main criteria (compare scores of "Excellence" criterion, if still equal compare scores of "Impact" criterion, if still equal compare scores of "Implementation" criterion)
- available national/regional budgets
- if possible, each funding organisation should fund at least one proposal

Annex 5: RRI Guidelines (v1.1)

M-ERA.NET guidelines for Responsible Research and Innovation (RRI) in the context of materials science

Update 1.1 placed more emphasis on sustainability dimensions as an integral part of responsible research and innovation, based on recommendations of the 2022 Strategic Expert Group.

1. What is RRI and why do we need it?

We need innovations that leave the world in a better place than they have done previously. This means we need researchers able to balance tensions between economic growth, public benefit and environmental sustainability. This is hard because harms and benefits are slow to accrue, occur unexpectedly and will be distributed unevenly. Inventions are created gradually by teams and networks of investors, scientists and policy makers, meaning that ultimate responsibility is collective and distributed over time. It is also often hard to correct the downsides of innovations once their use has become widespread.

Acknowledging that science is separate neither from society nor the environment but part of them confers a social responsibility on science. It is important, therefore, that funders, researchers and other key groups involved in the development of science, technology and innovation think about: (i) the potential directions of research being taken; (ii) who might benefit and who might not from new inventions; and (iii) how consideration of the potential social, environmental and ethical issues can be considered *throughout* the science and innovation process. Responsible research and innovation (RRI) is not about adjudicating what is 'good 'or 'bad', 'positive 'or 'negative', or 'responsible 'or 'irresponsible'. Instead, RRI offers techniques, tools and frameworks to think about questions of social responsibility and ensure scientists, funders and technologies don't lose sight of the context in which they do science, technology and innovation.

2. M-ERA.NET's approach to RRI

M-ERA.NET's approach to RRI builds on previous frameworks published by the UK's EPSRC, the Research Council of Norway, the European Commission and funding programmes such as ERA CoBioTech and ERA EuroNanoMed III. It recognises that the materials resulting from the programme need to be designed for a *sustainable* society in the near to medium future rather than the one we have today. It highlights the need to address the social, environmental, political, cultural or ethical dimensions of the proposed research and offers four dimensions that researchers, funders and technologists should engage with to maintain focus on the social context of their work:

- ***Anticipation*** suggests that actors should map the plausible intended and unintended effects of their work. Anticipation is not about exhaustively predicting all outcomes but about building a sense of preparedness so that potential downsides can be addressed as they are foreseen and arise.
- ***Inclusion*** encourages researchers, funders and developers to engage with future users, interest groups or potentially concerned groups to gain insights about the application contexts

and what desirable trajectories would be. Engagement here should move beyond dissemination or outreach to pursue a two-way exchange of information, with the understanding that knowledge that is not‘ scientific ’in the traditional sense of the word might still be valuable.

- ***Reflexivity*** asks researchers, funders and developers to create specific opportunities to consider the underlying assumptions and values driving their funding programmes and projects.
- ***Responsiveness*** reminds us that science and innovation are processes of exploration and learning. It urges scientists, funders and developers to change course if any of the above dimensions (anticipation, inclusion or reflexivity) generate new knowledge, identify public concerns, or reveal potential harms.

As the involvement of societal groups is essential in RRI it is often connected to co-creation, co-design and co-production – methodologies in which R&I projects are structured to include stakeholders from the beginning (e.g. users or interest groups) – and is related to the general Open Science agenda, prominent in Horizon Europe. Additionally, M-ERA.NET has fundamental commitments to sustainability in line with frameworks such as the UN Sustainable Development Goals, and the European Green Deal. This means that methods analysing the current or future ecological impacts of materials and their supply chains are appropriate. In sum RRI provides a framework to ask *how* research and innovation should be carried out in order to ensure that we achieve the sustainability goals in an open and inclusive way.

Sustainability and RRI in the M-ERA.NET calls

The specific requirements for each topic in the current call are detailed in a section labelled ‘sustainability and RRI requirements’.

However, RRI is not a one-size-fits-all approach but must be adapted to the actual social, environmental and ethical issues raised by the R&I activities funded in the programme. Foundational, exploratory research will require a different approach to applied, high-TRL research. Disruptive, pathbreaking research may require a more substantive approach to RRI than tentative, incremental research. And the specific issues raised by the biological sciences differ to those raised by the physical sciences. This means that *the commitment* to RRI is clear and fixed in the programme, but there is an openness about the issues addressed and the specific ways to practice responsibility – these must be adapted to each project.

3. How can you include RRI in your proposal?

Recalling the above explanation, the diversity of material science and the range of local contexts engaged within M-ERA.NET means that there cannot be a one size fits all approach. The text below therefore provides overall ideas and advice but cannot give a recipe that all potential applicants may use. In general, your approach to RRI should be proportionate to your proposal – disruptive, ground-breaking or high-TRL work is likely to require a more substantive engagement with RRI. If the research is exploratory then RRI components can also be exploratory – teasing out the potential visions, goals and end uses of a project. Overall, the goal is to demonstrate that you have engaged and seriously considered the tensions associated with materials science.

While RRI may focus on broadly recognised issues, the approach taken should be specific to the project. Nevertheless, these three points provide general principles from which to develop your approach to RRI:

1. M-ERA.NET's philosophy is to have **RRI as an integrated part of the project** involving all project participants.
2. Developing a **shared understanding of the project's RRI aspects** as early as possible is important. With 'RRI aspects 'we mean implications or characteristics of your research that touch upon environmental, societal and ethical values. This implies having conversations about their importance and potential actions to address RRI aspects. Such understanding will evolve in a learning process that should be encouraged throughout the project.
3. Considering RRI-related issues and acting upon them, must be done as a cross-cutting part of the project or a separate work package. RRI in the project needs to be **coordinated** and should have a **lead**.

Web resources for including RRI in your project:

www.rri-tools.eu provide numerous resources for practical RRI.

https://thinkingtool.eu/ The Societal Readiness Thinking Tool guides you through the steps of including RRI in a project.

The Digital Life Centre has also compiled a range of resources that may help develop your approach.

Further examples specific to material science will in the future be provided on the RRI webpage

The following list provides examples of different RRI perspectives applicable for materials science research projects. Please be aware that these guidelines and reflections neither represent the only RRI approach nor a complete list of examples of measures when implementing RRI in materials proposals. You should identify the points relevant for your project.

1. Address **environmental impacts and sustainable solutions**, in line with the **Do No Significant Harm principle**[8]**,** by including, for example:
    a. lifecycle analysis (LCA)
    b. ecotoxicology studies
    c. recyclable by design methodologies
2. Involve **relevant stakeholders in the project at the earliest stage as possible**, and provide opportunities for them to contribute to your work.
    a. Co-design methodologies are important to generate trust and **allow stakeholders to contribute knowledge** of the social, environmental or commercial problem you are trying to address in your project.
    b. Think also about the appropriate **timing** of different stakeholders 'inclusion: certain kinds of knowledge may be more useful than others at different points of your project.
    c. It will likely be valuable (but not obligatory) to include **expertise beyond the natural and physical sciences** – such as lawyers, social scientists or philosophers – to provide anticipatory and reflective methodologies or to address key challenges.

[8] For more information on this principle see Horizon Europe's Programme Guide, page 37: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf

   d. Think about **how** the involvement of such researchers and their knowledge can be formalised within your project. Are they best placed as scientific collaborators, as members of an advisory board, or as consultants to deliver only specific tasks? Please check if your approach is in line with the national/regional funding rules before designing your proposal.
3. **Create good deliberative spaces** for a range of partners, stakeholders and participants to anticipate, discuss and reflect on the social, political, ethical or environmental context of your research. RRI experts may be able to help you with this in project design and implementation. A number of different approaches are possible, e.g.:
   a. Focusing on your day-to-day research work ("philosopher in the lab approach")
   b. At bi-annual/annual consortium meetings
   c. By using stage-gate approaches where explicit decisions about technological choices are taken.
4. Consider **who will benefit** and who may experience new risks from your project.
   a. Does your project address a specific societal or environmental problem or need?
   b. Does your framing of the problem fit with other people's understanding of it? Can you gain access to these alternative framings?
   c. In addition to societal benefits, also consider benefits to the research community through the generation of knowledge, access to infrastructure, the creation of networks and funding.
   d. Reflect on the most the appropriate form of intellectual property (IP) to suit your project goals. Do classical IP strategies deliver the broadest benefit? Can new strategies (e.g. Open Material Transfer Agreements) be adopted at certain points of the research process?
   e. Could commercial or non-commercial organisations benefit from your research? How?
   f. Consider also the risks and ways that these can be ameliorated. For instance, what are the risks of potential risks of data being released? How can you take care to ensure these data are interpreted appropriately?
5. Reflect on/consider adapting **your choice of research methods** regarding, for example:
   a. ethical issues,
   b. in vivo/in vitro experiments,
   c. use of new approaches such as "Safe(r) by Design".
   d. Are there ways that your project can advance common practices on these issues?
6. Engage with important aspects of **your research environment** such as:
   a. gender, ethnicity and intersectional equality, diversity and inclusivity
   b. Open Science and other publication practices
   c. career progression and precarity
   d. equity between partners in your research consortium
7. Show how the project (and product) satisfy requirements for **production safety** and efficiency.

4. How does M-ERA.NET support and evaluate RRI?

RRI requires a multi-level approach that pays attention to the different sites of research and innovation (e.g. universities, companies, policy arenas), different stages of research (i.e. across the

TRL spectrum) and different research cultures. Responsibility must be shared, and RRI is therefore a cross-cutting issue for M-ERA.NET. It is considered in development of the annual work programme and the resulting funding calls. The programme will also facilitate a dialogue among stakeholders in materials research about the sustainable development goals, circular economy perspectives, and RRI.

At the level of research projects, ***M-ERA.NET requires that all proposers explain how their projects demonstrate a commitment to investigating and addressing the social, environmental, ethical, political or cultural dimensions of the proposed research***. Integration of RRI should lead to an improved awareness of the possible benefits, risks, and uncertainties of material science across a broad cross-section of society. This may include (but is not limited to) any of the approaches described in the above section.

RRI should not be thought of as 'distinct from the science', but central to it. ***RRI components will therefore be evaluated by experts as integral components within the scope of all evaluation criteria (Excellence, Impact, and Implementation)***. RRI does not detract from the overall scoring but contributes to it: Proposals that explicitly aim to advance processes of anticipation, reflection, inclusion and responsiveness by developing new analyses or methodologies will be rewarded in the review process and the scores will be adjusted accordingly. The kinds of questions the reviewers will ask regarding RRI are:

- Is the approach proportionate to the content of the scientific proposal?
- Is there appropriate RRI expertise in the project?
- Is RRI work adequately resourced? Is it clear *how* the objectives will be achieved?
- Does RRI extend across the lifespan of the project? (e.g. as a sub-project, an advisory board or to be considered in annual meetings)
- Is it clear how the work is organised? (e.g. as a WP, a cross-cutting issue, outsourced etc.)
- Is it clear who is doing the work?
- Are there clear opportunities for the RRI work to shape scientific trajectories?
- Does the work advance RRI scholarship or generate new knowledge of the social, political, ethical or environmental dimensions of material science?

Annex 6: Checklist for Proposers

The proposal conforms to the call guidelines.	☐
Every project partner has been in direct contact with his/her national/regional funding agency and has checked that their collaboration and their project contributions are eligible for funding.	☐
All project partners have checked the national/regional programme procedures and regulations. All project partners are aware of documents requested by the national/regional funding organisations. ***IMPORTANT REMINDER: All consortium partners must check if applications (at Pre-Proposal and/or Full-Proposal stage) have to be submitted also to their national/regional funding organisations.***	☐
All partners who are not eligible for 100% funding are able to provide financial resources for their own contribution.	☐
A PIC[9] is available for all project partners.	☐
The consortium is aware that a duly signed and stamped consortium agreement (CA) between the project partners is recommended for funded projects based on national/regional funding rules, including agreements on intellectual property rights (IPR) and agreements on scientific publications. At the time of proposal submission it is recommended to provide the principles ruling the CA but not the CA itself.	☐

Please go https://www.m-era.net/joint-call-2023 to submit the:

1. **Pre-Proposal form online.**
   Deadline for submission: 16 May 2023, 12:00 noon Brussels time
2. **Full-Proposal form + Annex 1 to the Full-Proposal form online.**
   Deadline for submission: 21 November 2023, 12:00 noon Brussels time

For further information on M-ERA.NET please go to: http://www.m-era.net

[9] Participant Identification Code: If you want to participate in a project proposal your organisation needs to be registered and have a 9-digit Participant Identification Code (PIC). Please find details here: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/participant-register

Abbreviations and Clarifications:

CRM - Critical Raw Materials

IoT - Internet of Things

LCA - Life Cycle Assessment

PIC – Participant Identification Code

RTD - Research and Technological Development;

RRI - Responsible Research and Innovation

SDGs - Sustainable Development Goals;

SMEs - Small and Medium Enterprises

TEA - Techno-Economic Analysis

TRL - Technology Readiness Level

"*Disruptive research"* also encompasses "*basic and fundamental research*"

Important notice:

The national / regional regulations are provided in the **Annex A** as a separate document on the Call 2023 webpage.

Amendments

In version 1.1:

- page 39 and 46: participation of Brazil (Sao Paolo) has the status: to be confirmed
- page 43 and page 44: Poland / NCN and South Korea / KIAT with new contact person
- page 47 and 49: Germany / BMBF: new footnote on topical restriction
- page 48: Poland / NCN budget corrected to 1.2 Mio. Euro
- page 49: Sweden / VINNOVA supports proposals in topic 1,2,3 and 4 only
- page 50 and 51: typos concerning pre- / full-proposal corrected

In version 1.2:

- page 39; 44: typo in email-address (VIAIO); telephone number included (IDEPA)
- page 45 and 49: Hungary / NKFIH: disclaimer "formal approval pending"