M-era.Net

Results of M-ERA.NET Calls 2016-2020

October 2021

Table of Content

IMPRINT

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M-ERA.NET 2 has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 685451.

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Summary

M-ERA.NET 2 - ERA-NET for materials research and innovation (March 2016 – February 2022) aims at coordinating the research efforts of the participating EU Member States, Associated States and Regions as well as of selected global partners in materials research and innovation. M-ERA.NET 2 was designed to provide a thematic umbrella structure to support emerging topics, including materials for low carbon energy technologies and related production technologies, in a flexible manner. Through this approach, M-ERA.NET 2 addresses the needs of the research community while taking into account national and regional as well as European priorities and trends.

A central activity of this large network of 43 national and regional funding organisations is the implementation of joint calls to fund excellent innovative transnational RTD cooperation, including one call for proposals with EU co-funding and additional non-cofunded calls. These calls support the whole innovation chain, clarifying for each topic the appropriate Technology Readiness Levels (TRLs) to be addressed through the transnational RTD projects.

Throughout the lifetime of M-ERA.NET 2, five annual joint calls were carried out from 2016 to 2020 addressing a thematic scope which covered modelling for materials engineering and processing, high performance composites; functional materials; materials for additive manufacturing, innovative surfaces, coatings and interfaces, and new strategies for advanced material-based technologies in health applications.

Call	submitted proposals	funded projects	funded applicants	total funding volume	total project costs
2016	233	46	220	32.2 M€ (incl. 10.2 M€ EU top-up)	42.2 M€
2017	91	20	97	15.8 M€	21.7 M€
2018	166	27	116	18.2 M€	25.5 M€
2019	233	37	156	26.9 M€	33.7 M€
2020	236	42	174	32.3 M€	41.8 M€
total	959	172	763	125.4 M€	164.9 M€

Table 1: Summary of joint calls 2016-2020 implemented by M-ERA.NET

From 2016 to 2020, altogether 959 proposals were received and 172 transnational projects were funded, as shown in table 1. Combined national, regional and European funding of 125 mio. € was mobilised to support 763 research groups across Europe and beyond.

These results demonstrate that M-ERA.NET is a powerful network providing substantial public funding for transnational RTD projects in materials research and innovation.

This report contains detailed results and statistics for each call. Project abstracts of funded projects are provided in the annex.

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Call statistics 2016-2020

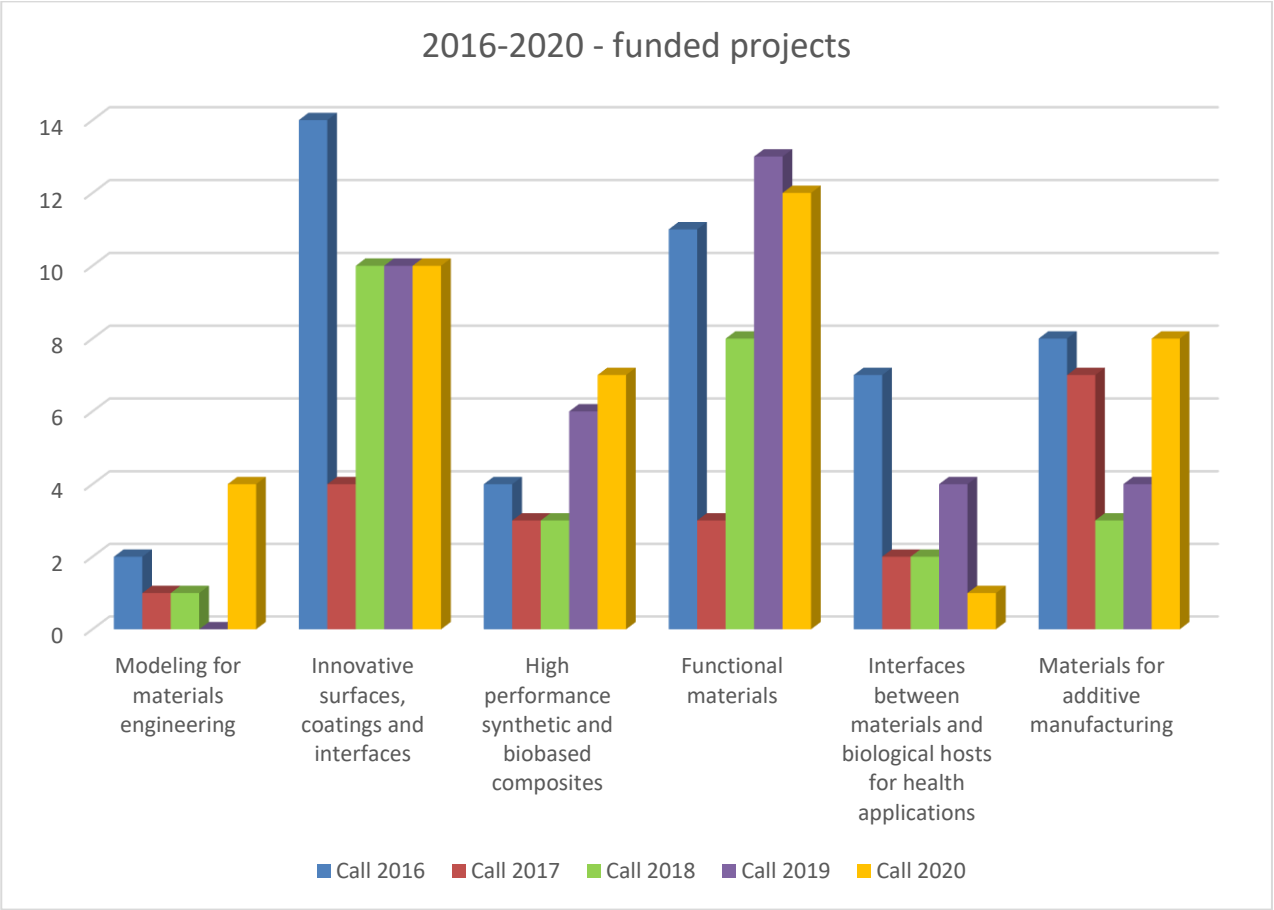

Figure 1: number of funded projects per topic for each call.

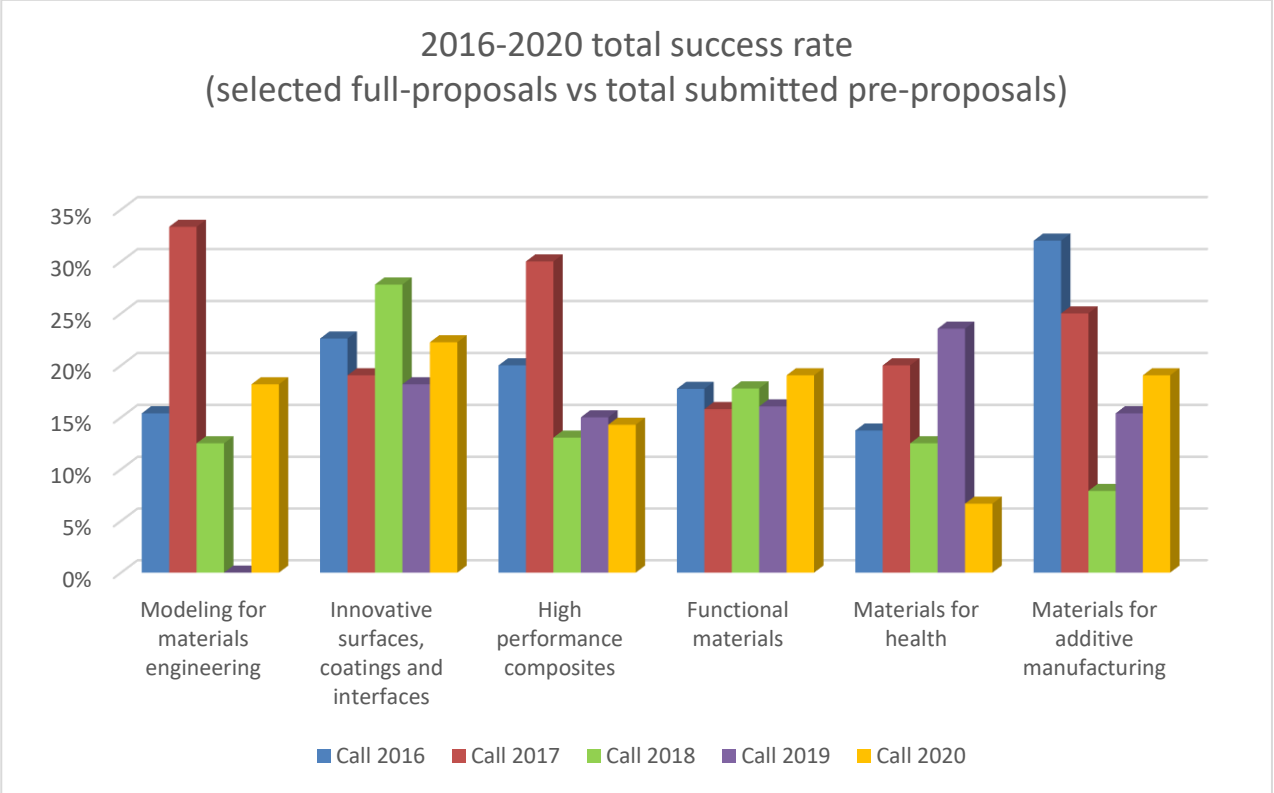

Figure 2: success rates (selected full-proposals vs total submitted pre-proposals) for different call topics for each call.

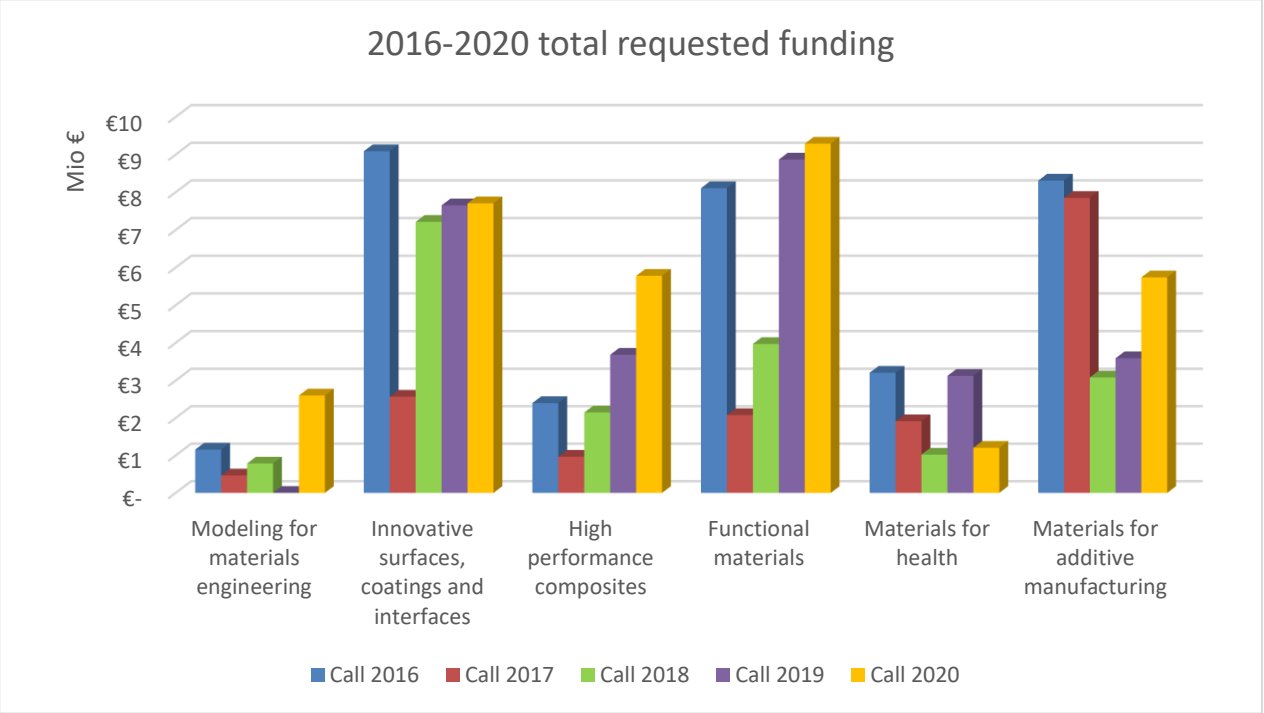

Figure 3: total funding requested by funded projects for different call topics per call.

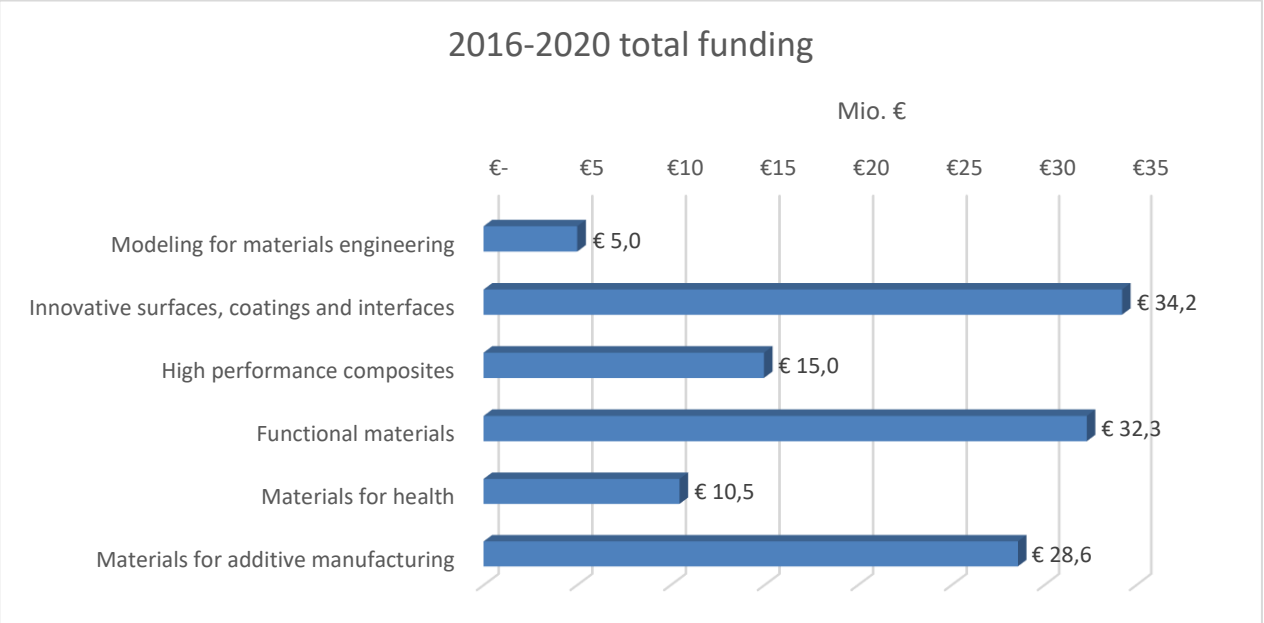

Figure 4: total funding (Calls 2016-2020) requested by funded projects for different call topics.

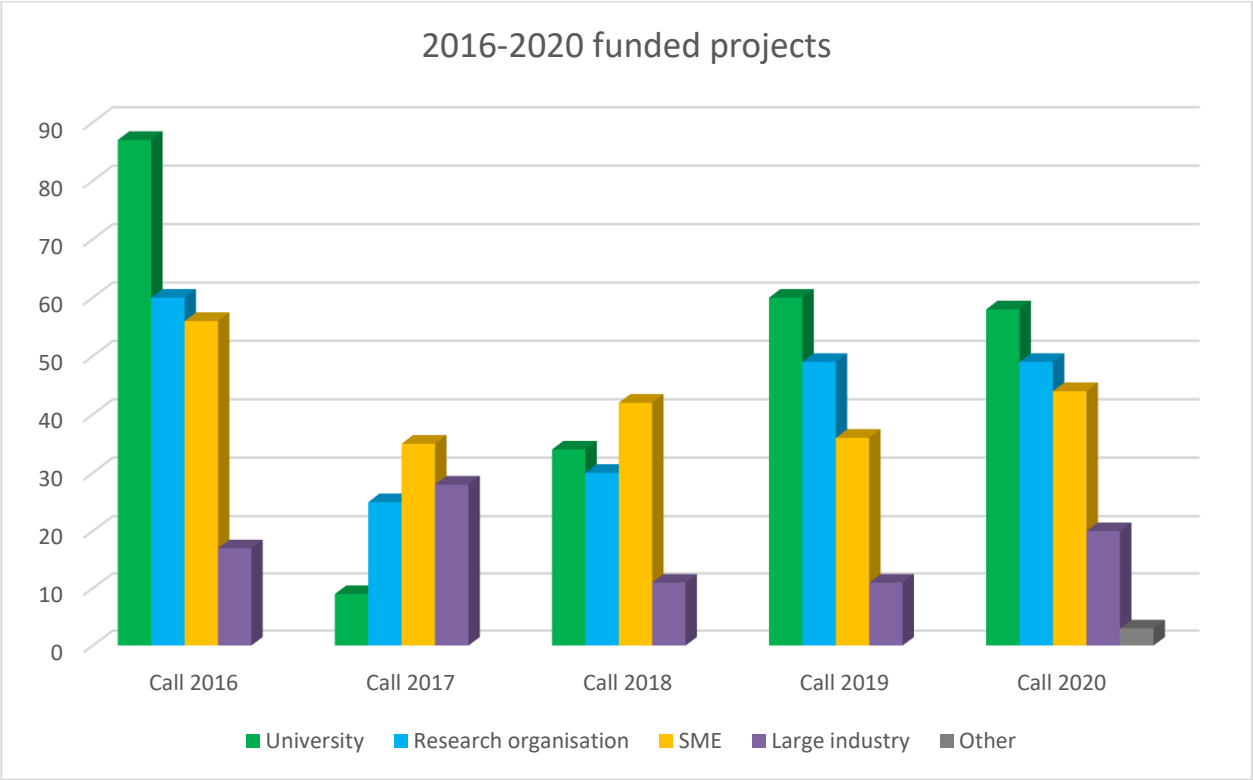

Figure 5: total participations for different organisation types in funded projects for each call.

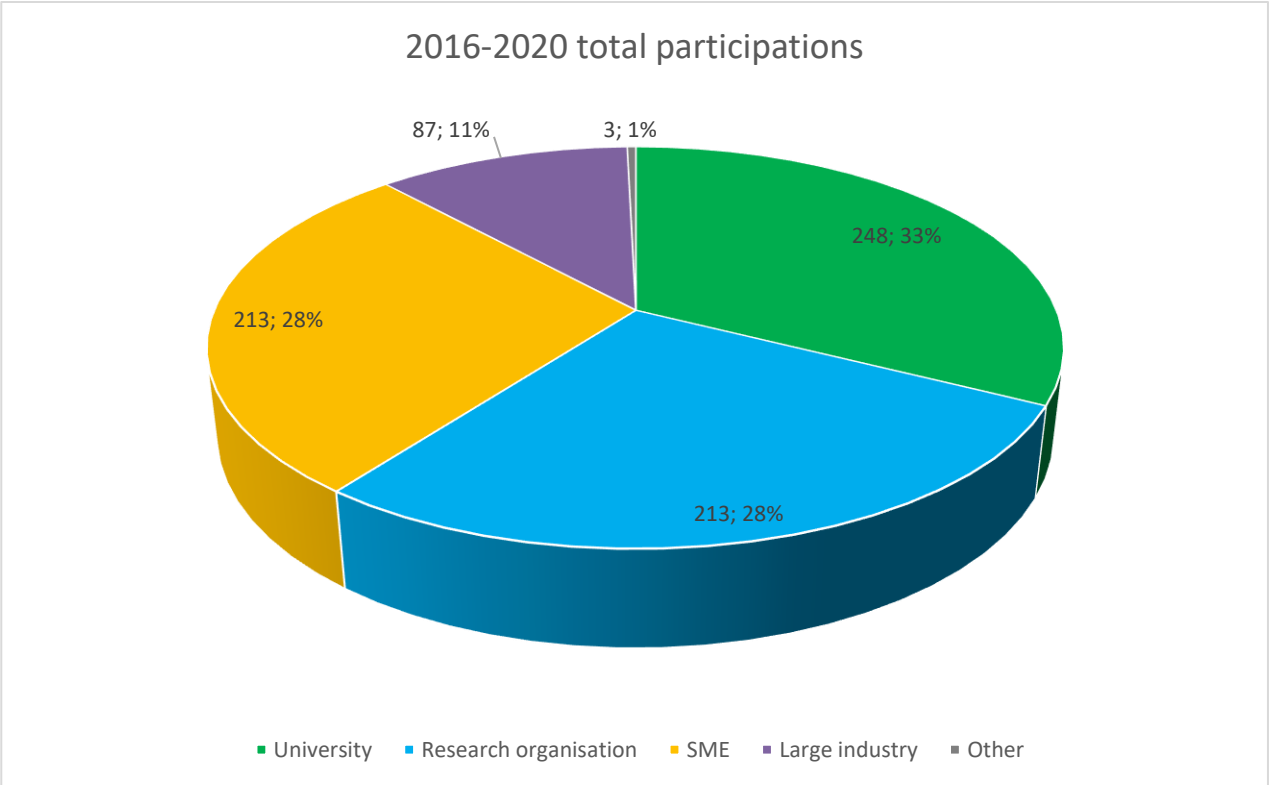

Figure 6: total participations (Calls 2016-2020) for different organisation types in funded projects

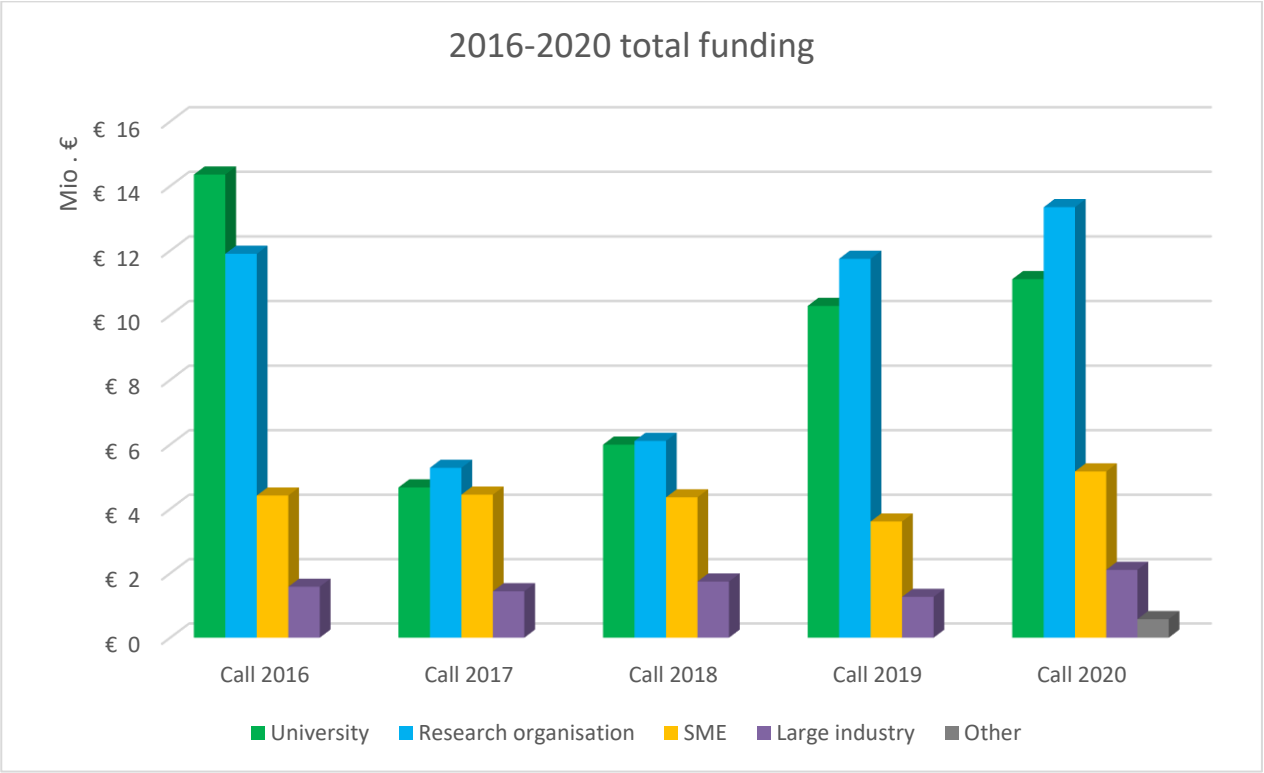

Figure 7: total requested funding for different organisation types in funded projects for each call.

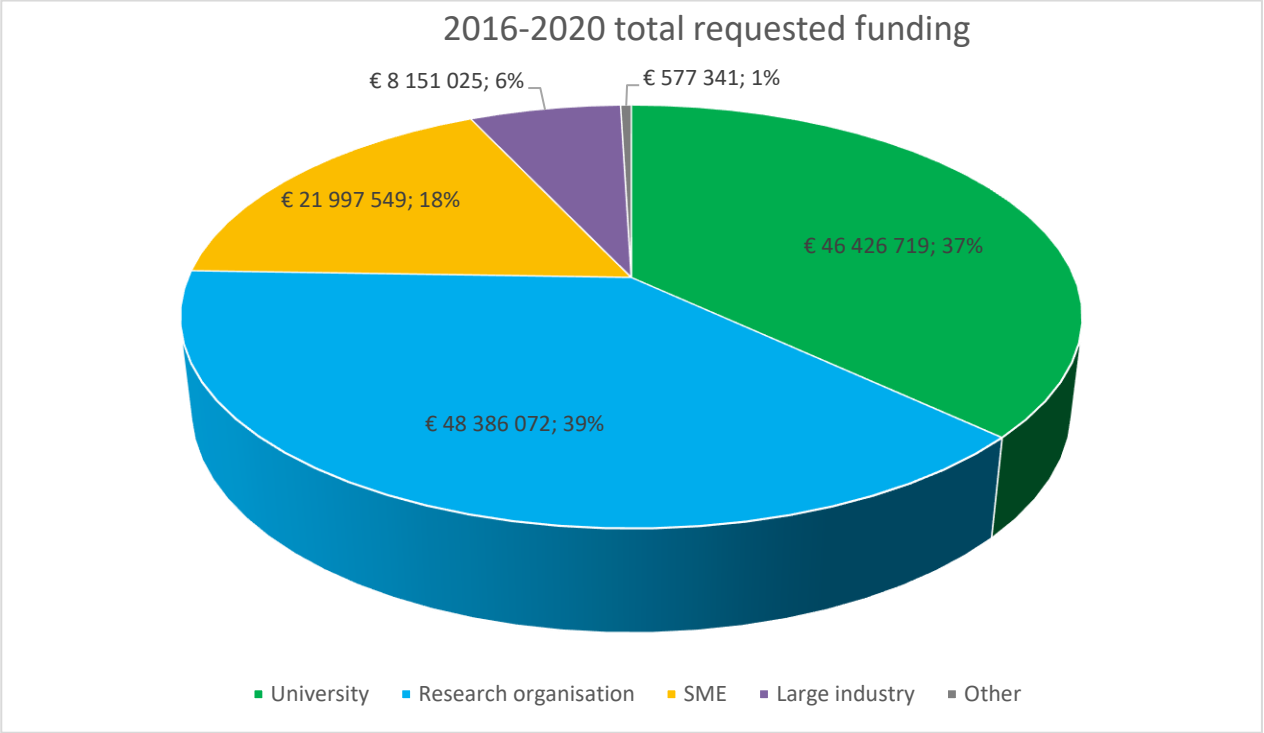

Figure 8: total requested funding (Calls 2016-2020) for different organisation types in funded projects

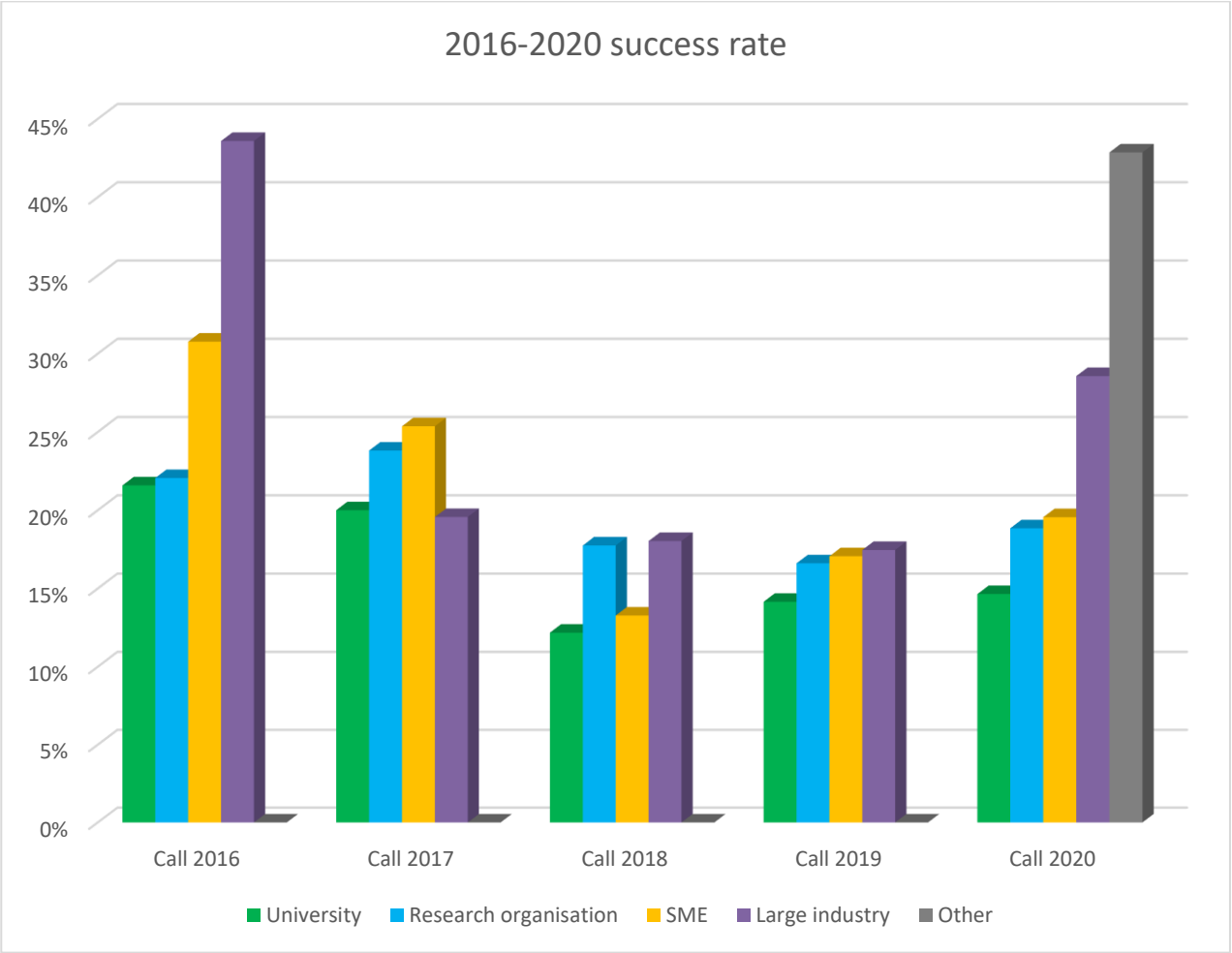

Figure 9: success rates for different organisation types for each call.

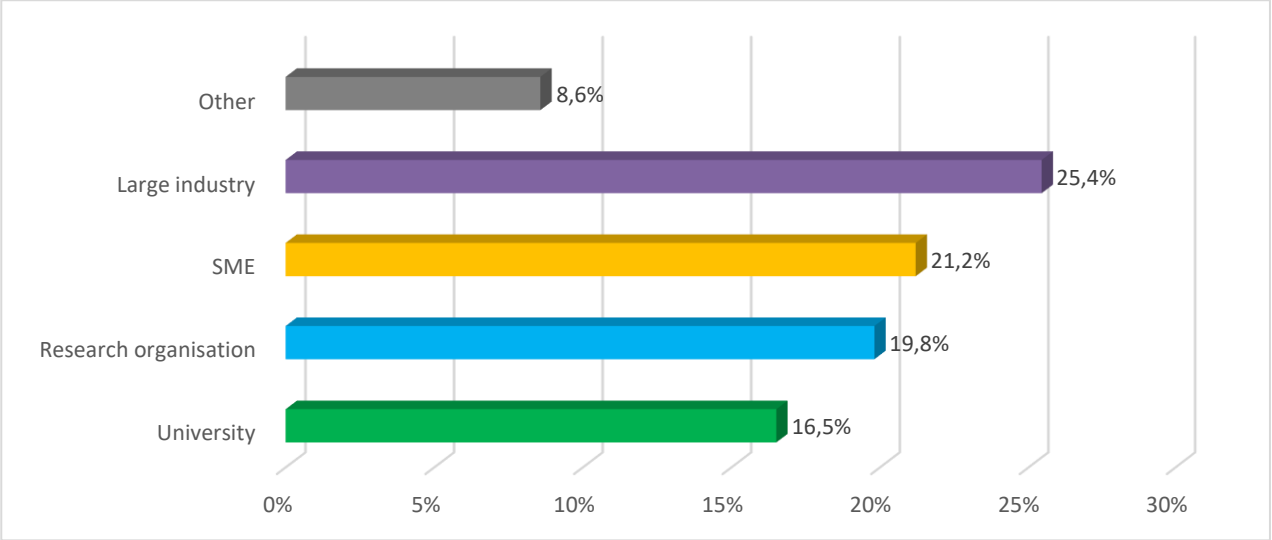

Figure 10: Average overall success rates (Calls 2016-2020) for different organisation types (selected full-proposals vs total submitted pre-proposals).

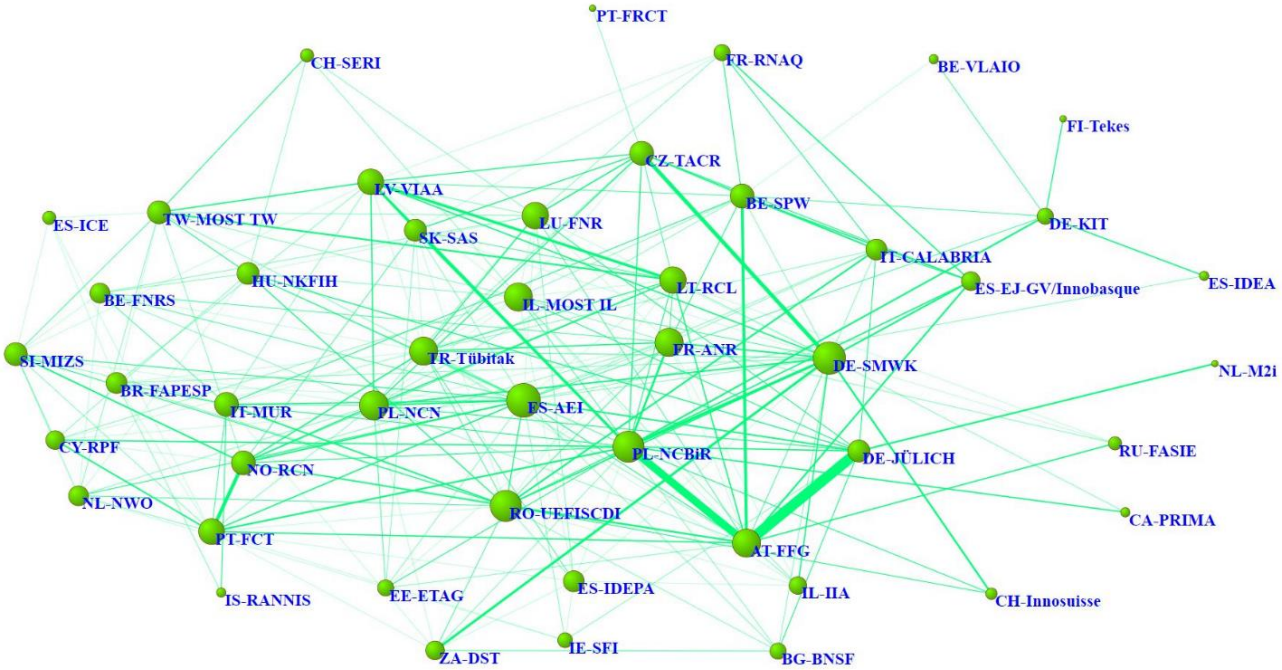

Figure 11: network analysis of transnational cooperation visualized via project participations. The size of the country/region corresponds to the total number of participations while the line thickness corresponds to the cooperation between countries/regions.

Success Stories

Projects funded by M-ERA.NET are targeting ambitious breakthroughs in materials research and innovation. A selection of successfully completed projects is published on the M-ERA.NET website to illustrate what the funded consortia have achieved. In a continuous effort, further success stories will be identified and prepared for publication. To date, two booklets with success stories from the Calls 2012–2017 have been published. Each success story presents the involved research groups and summarises the innovative results achieved in the project. For further information, a list of publications originating from the project work is included as well as contact details of the project coordinator. Further booklets are under preparation.

Published booklets as well as individual online versions of all success stories are available on the M-ERA.NET website: https://m-era.net/success-stories

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Detailed analysis per call

M-ERA.NET Call 2016

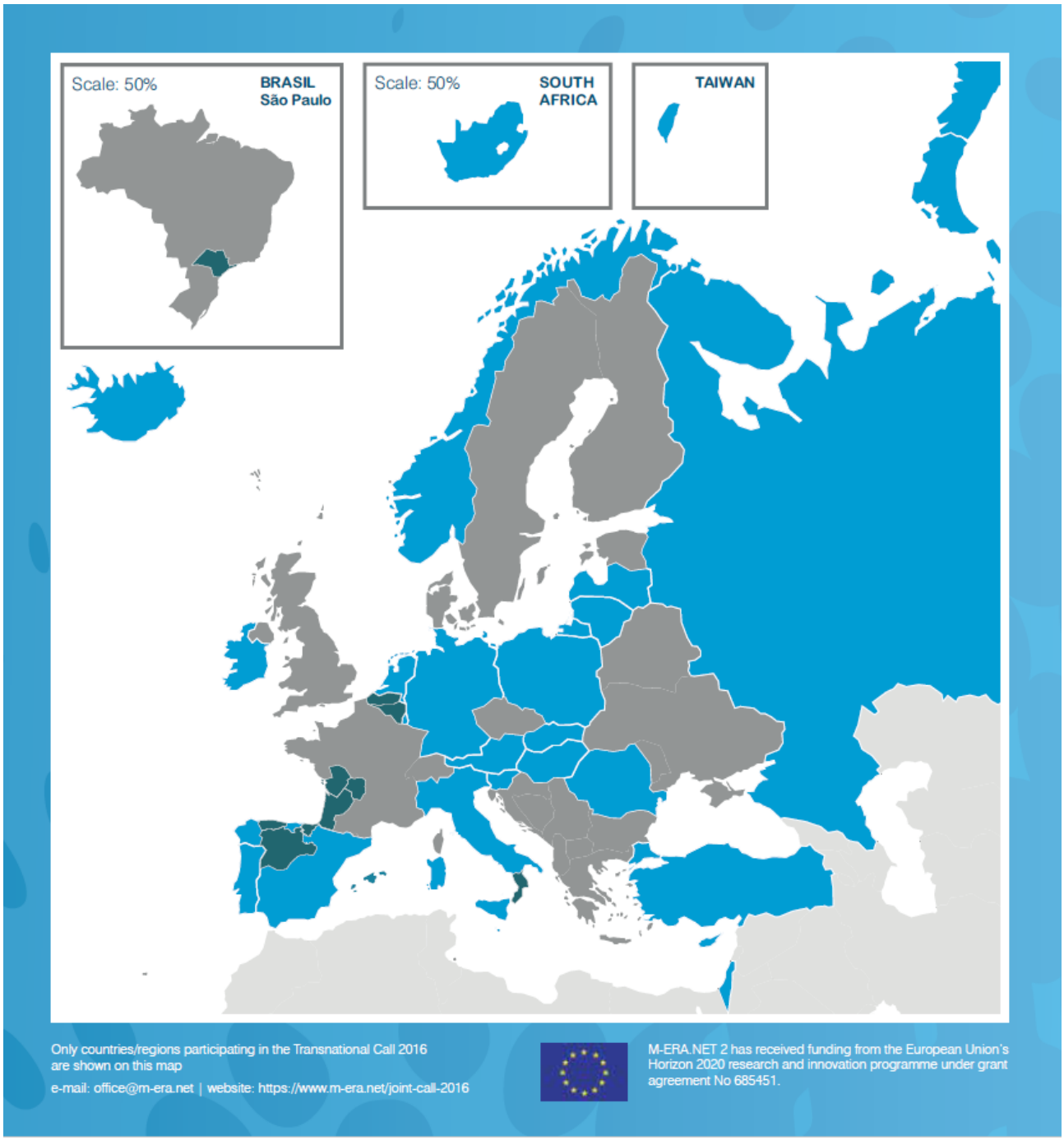

Figure 12: The M-ERA.NET Call 2016 was launched on 15 March 2016 with 35 participating funding organisations from 26 countries and a preliminary total budget of around 40 million €, including an EU contribution.

Results of M-ERA.NET Call 2016

233 pre-proposals were submitted, requesting 194 Mio EUR funding in total.

91 pre-proposals were recommended for a full-proposal submission. 89 full-proposals were submitted.

68 full-proposals passed the full-proposal evaluation, requesting around 48.8 Mio EUR funding.

Depending on national/regional budgets and rules the national/regional funding organisations finally **selected 46 full-proposals for funding** corresponding to requested funding of 30.5 Mio EUR.

These projects are allocated to the call topics as follows:

- Integrated computational materials engineering (ICME): 2 funded projects
- Innovative surfaces, coatings and interfaces: 14 funded projects
- High performance synthetic and biobased composites: 4 funded projects
- Functional materials: 11 funded projects
- Interfaces between materials and biological hosts for health applications: 7 funded projects
- Materials for additive manufacturing: 8 funded projects

The total success rate (selected full-proposals vs total submitted pre-proposals) is 19.7 % (Fig. 13). For the different topics the rates of success vary:

Integrated computational materials engineering (ICME)	3.2%
Innovative surfaces, coatings and interfaces	70.0%
High performance synthetic and biobased composites	6.5%
Functional materials	84.6%
Interfaces between materials and biological hosts for health applications	13.7%
Materials for additive manufacturing	32.0%

The success rate for the second stage (selected full-proposals vs. total submitted full-proposals) is 51.7%.

Integrated computational materials engineering (ICME)	40,0%
Innovative surfaces, coatings and interfaces	53,8%
High performance synthetic and biobased composites	80,0%
Functional materials	50,0%
Interfaces between materials and biological hosts for health applications	43,8%
Materials for additive manufacturing	57,1%

The success rates (selected full-proposals vs total submitted pre-proposals) per organisation type are shown in Fig. 14. The success rate for research organisation is 22.1%, for SMEs 30.8%, for universities 21.6% and for large companies 43.6%.

The success rates per individual national/regional funding organisation (number of selected full-proposals vs number of submitted proposals) are shown in Fig. 15.

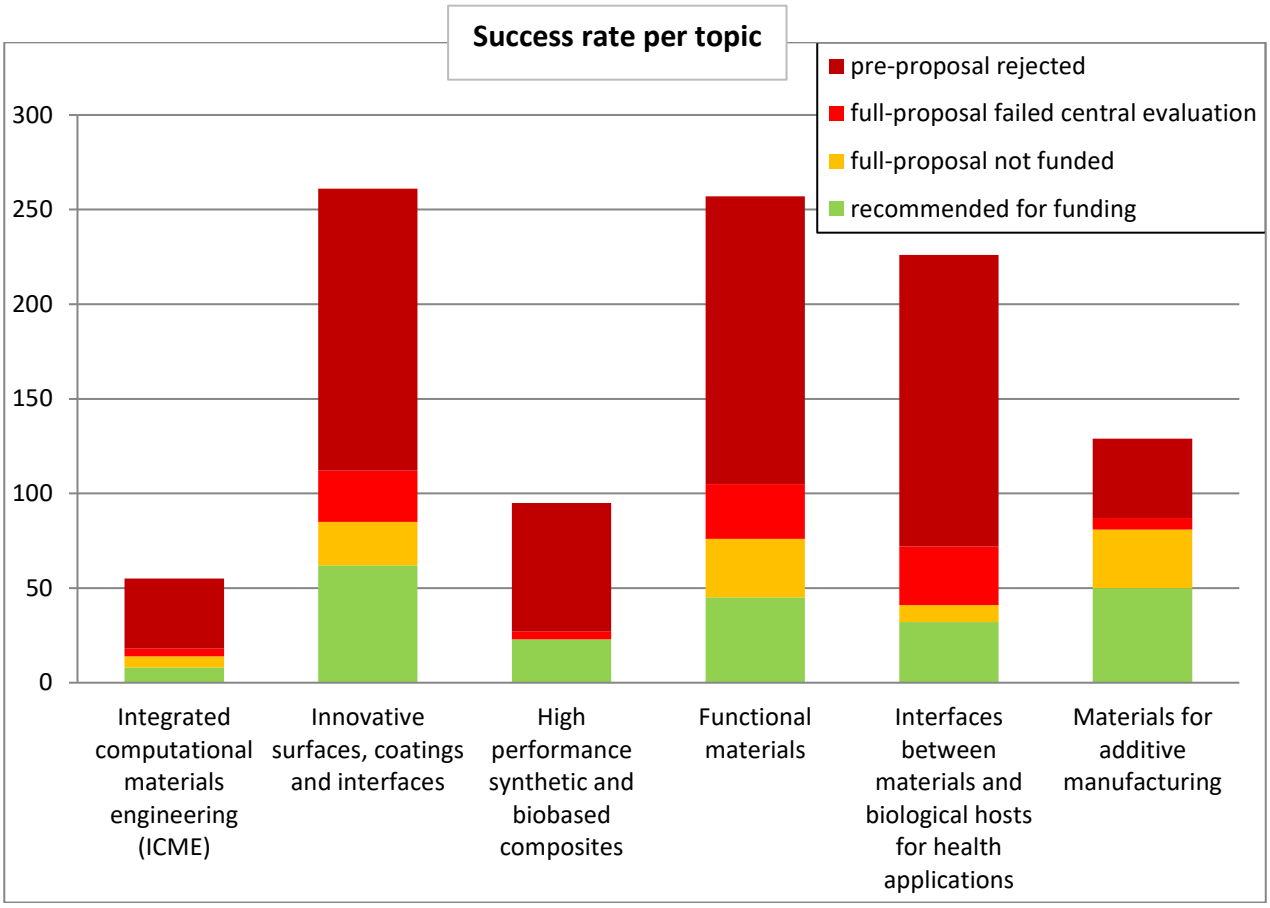

Figure 13: Number of participations: selected full-proposals compared to rejected pre-proposals for all six call topics.

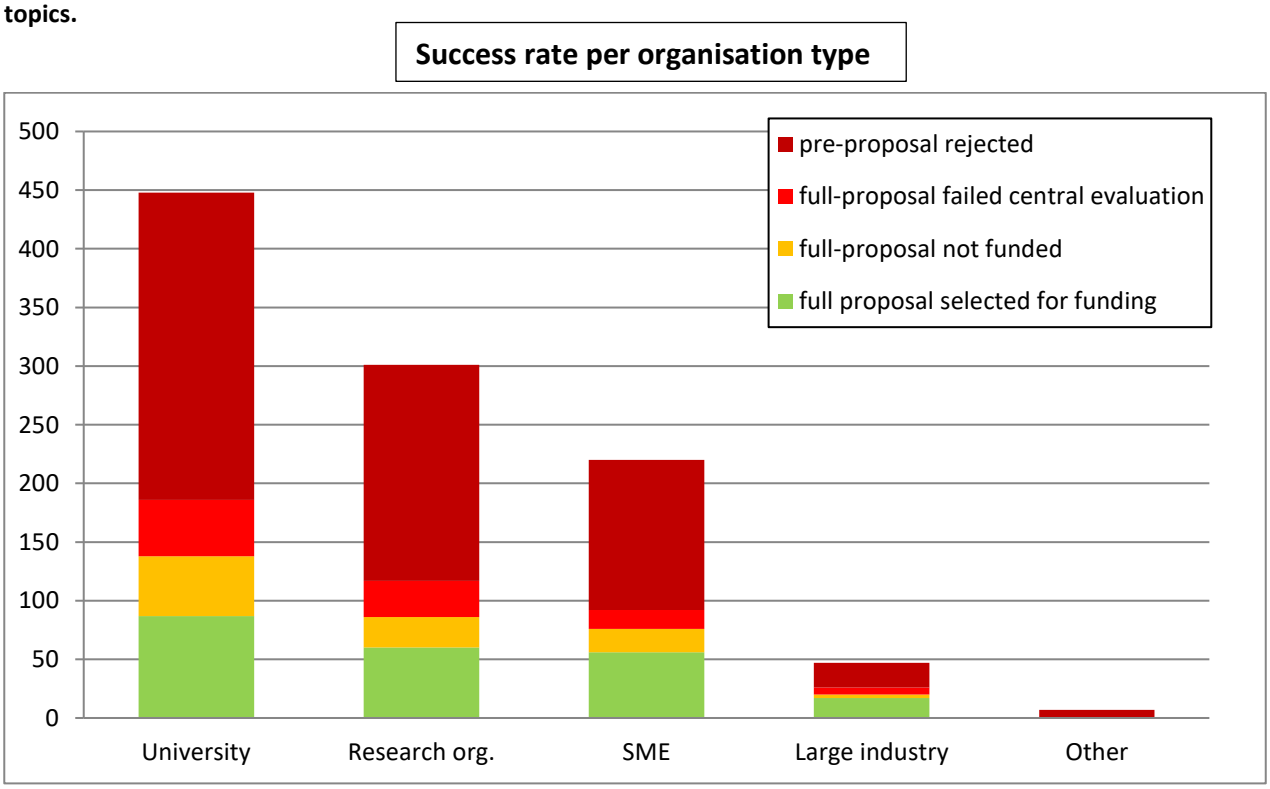

Figure 14: Number of participations: selected full-proposals compared to rejected proposals for all organisation types.

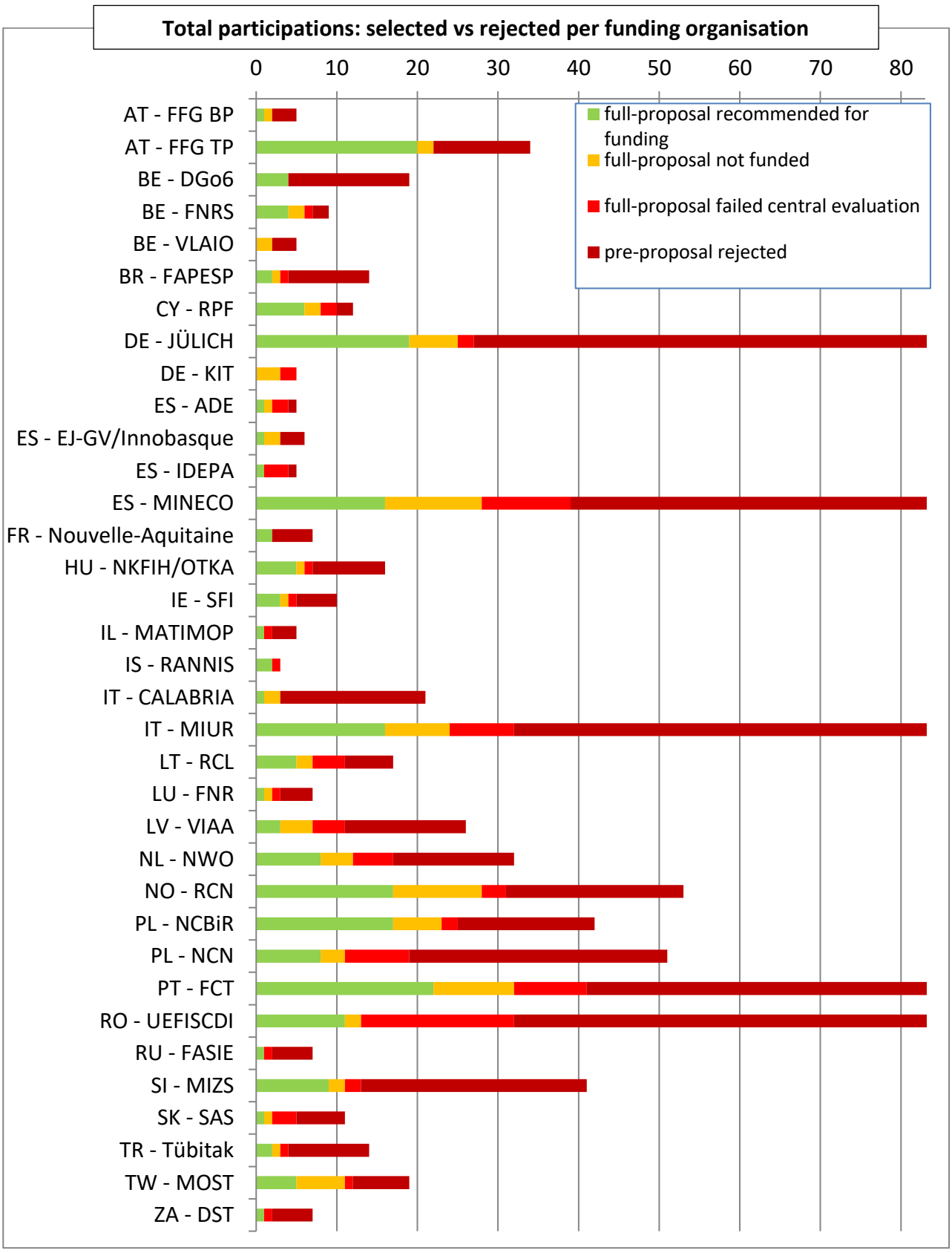

Figure 15: Total number of participations: success rate from pre-proposal phase to selected full-proposals.

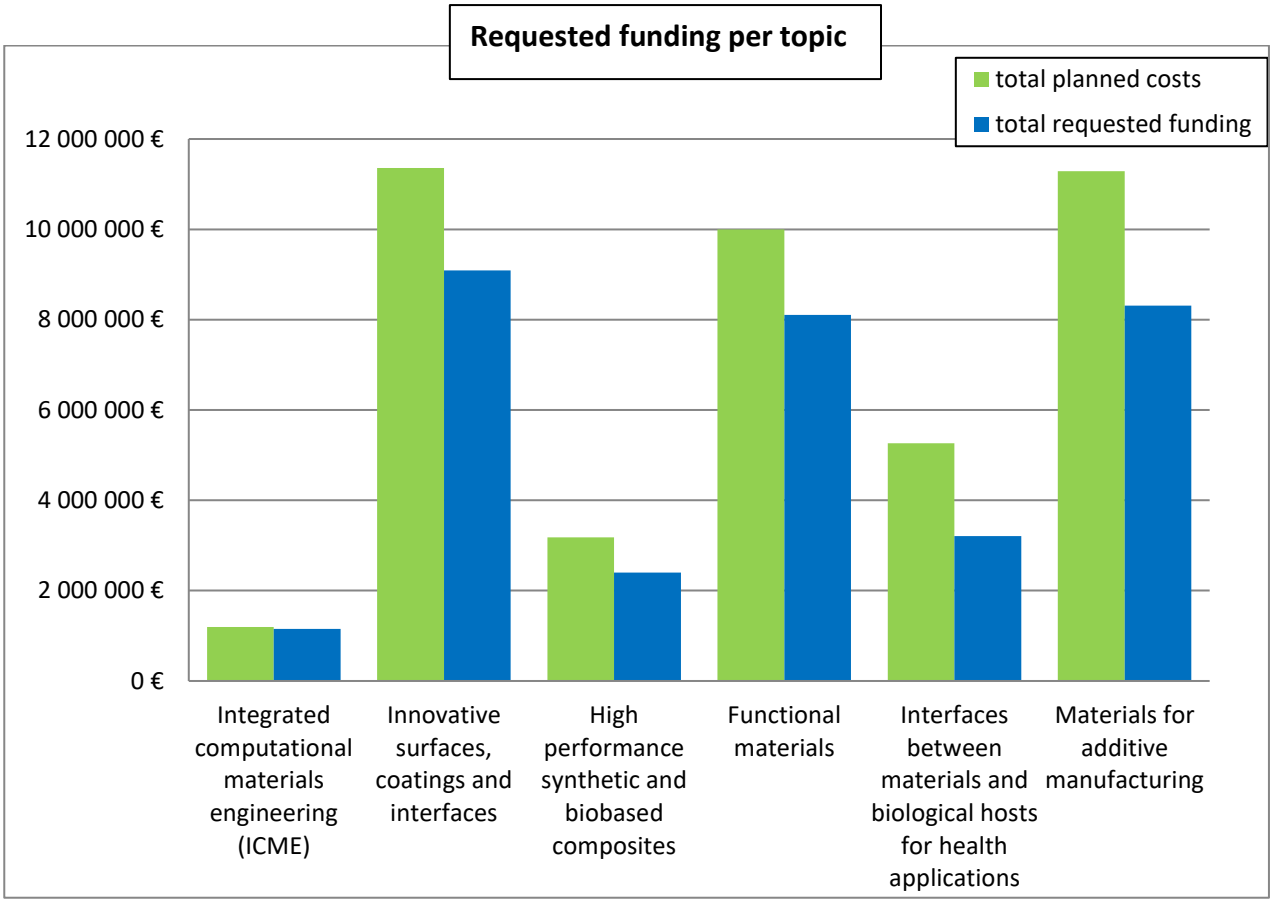

Figure 16: Selected full-proposals: total project volumes and requested funding (EUR) per call topic.

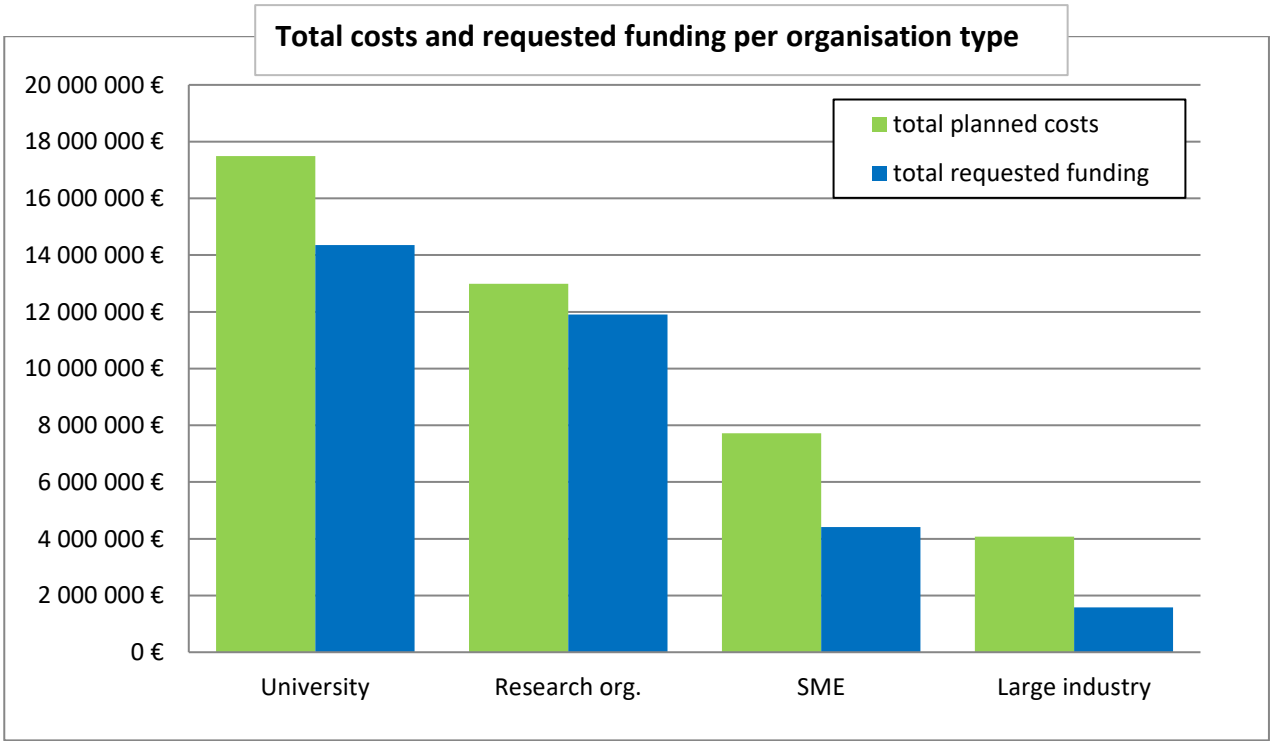

Figure 17: Selected full-proposals: total requested funding and total planned costs (EUR) per organisation type.

For selected full-proposals the total project volumes and requested funding per call topic are shown in Fig. 16. For the topics “Innovative surfaces, coatings and interfaces” and “Materials for additive manufacturing”“Functional materials” 9.1 Mio EUR and 8.3 Mio EUR and 8.1 Mio EUR funding are requested.

In the selected full-proposals 14.4 Mio EUR funding are requested by universities, 11.9 Mio EUR funding by research organisations, 4.4 Mio EUR funding by SMEs and 1.6 Mio EUR funding by large industry (Fig. 17).

20 projects are coordinated by research institutions, 24 by universities and 2 by SMEs. There is no selected project coordinated by large industry (Fig. 18).

The projects start from Technology Readiness Level (TRL) 1 (basic principles observed) to TRL 5 (technology validated in relevant environment) (Fig. 19).Most of them start with TRL 2(technology concept formulated). The TRL which is targeted on the end of the project is between TRL 2 and TRL 8 (system complete and qualified) (Fig. 20). Most projects indicate an End-TRL of 4 (technology validated in lab).

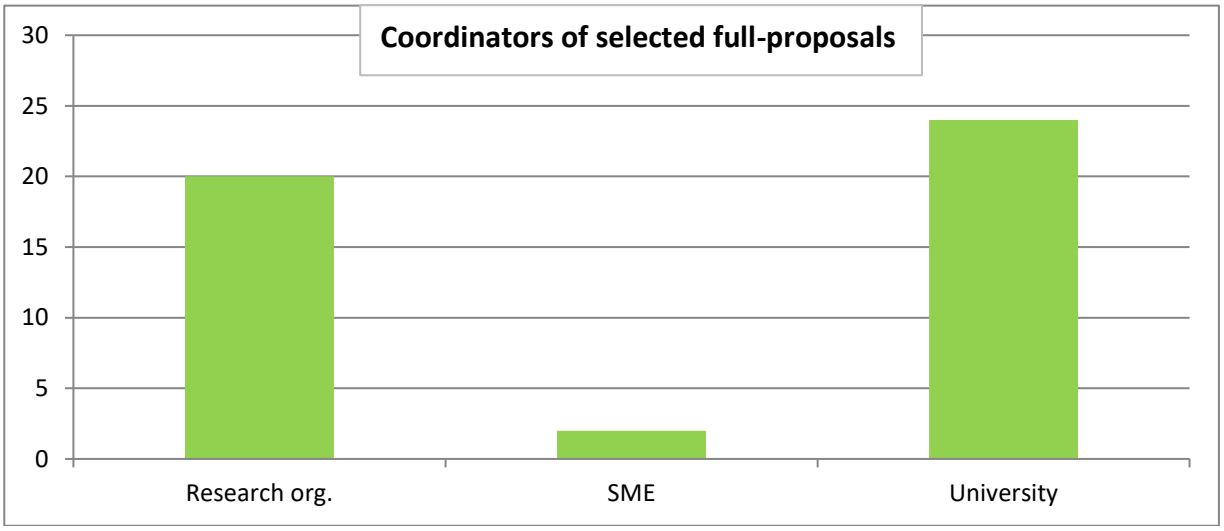

Figure 18: Selected full-proposals: number of coordinators per organisation type.

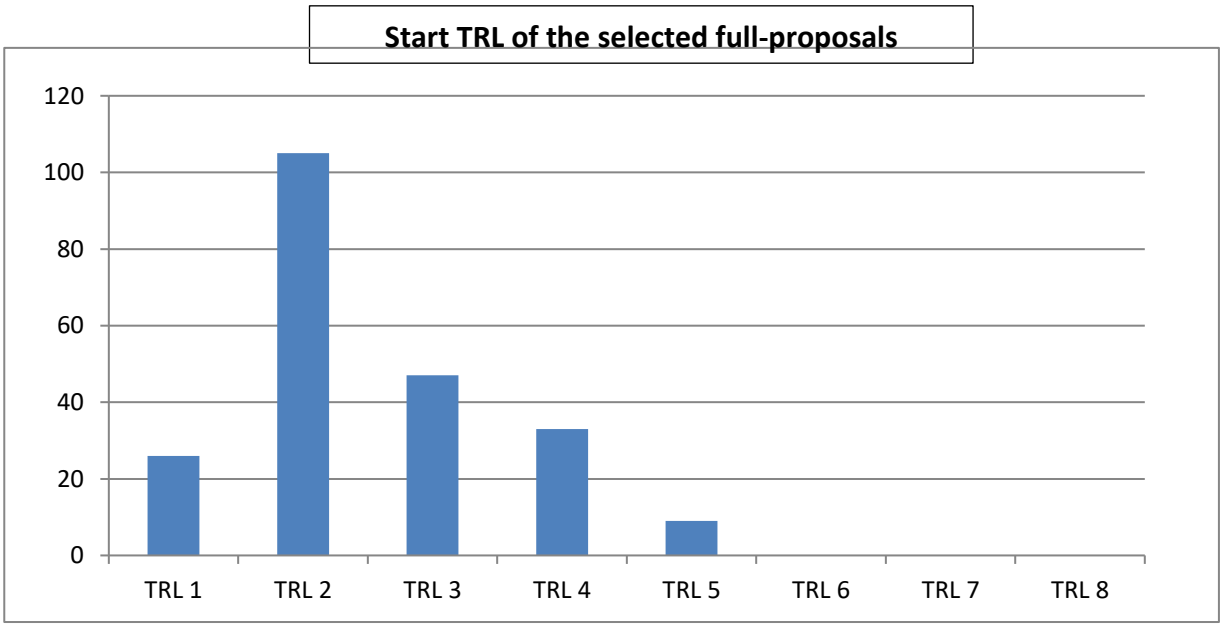

Figure 19: Selected full-proposals: number of applicants per start Technology Readiness Level.

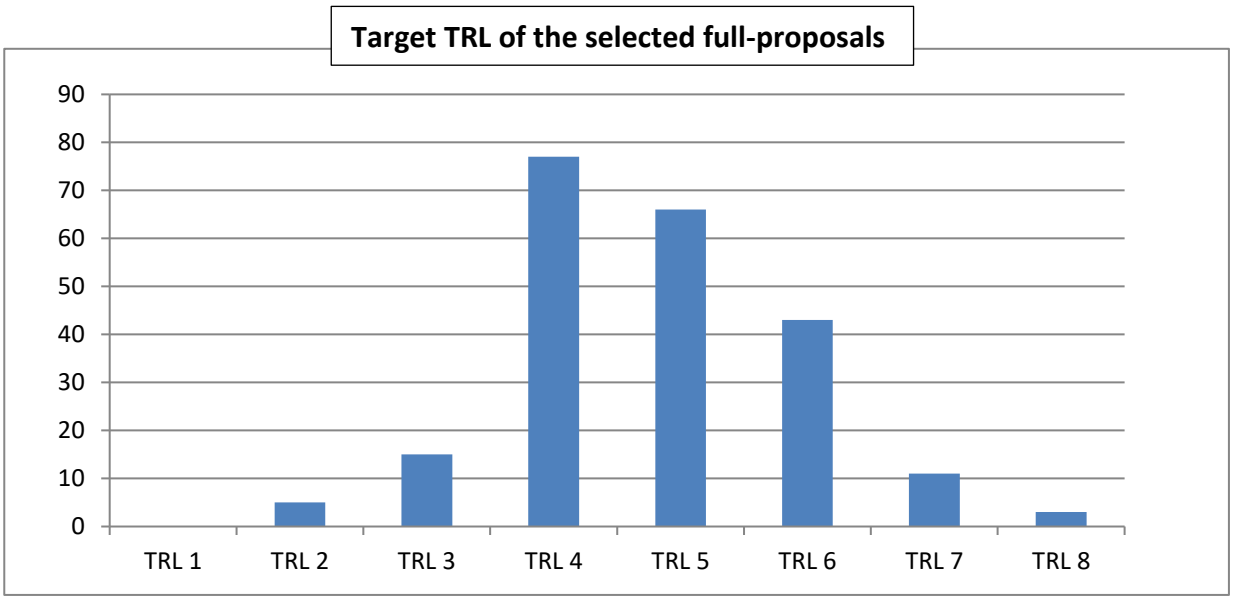

Figure 20: Selected full-proposals: number of applicants per target Technology Readiness Level

More than 50% of the total funding will be granted to proposals that address issues related to low carbon energy technologies (fig. 21).

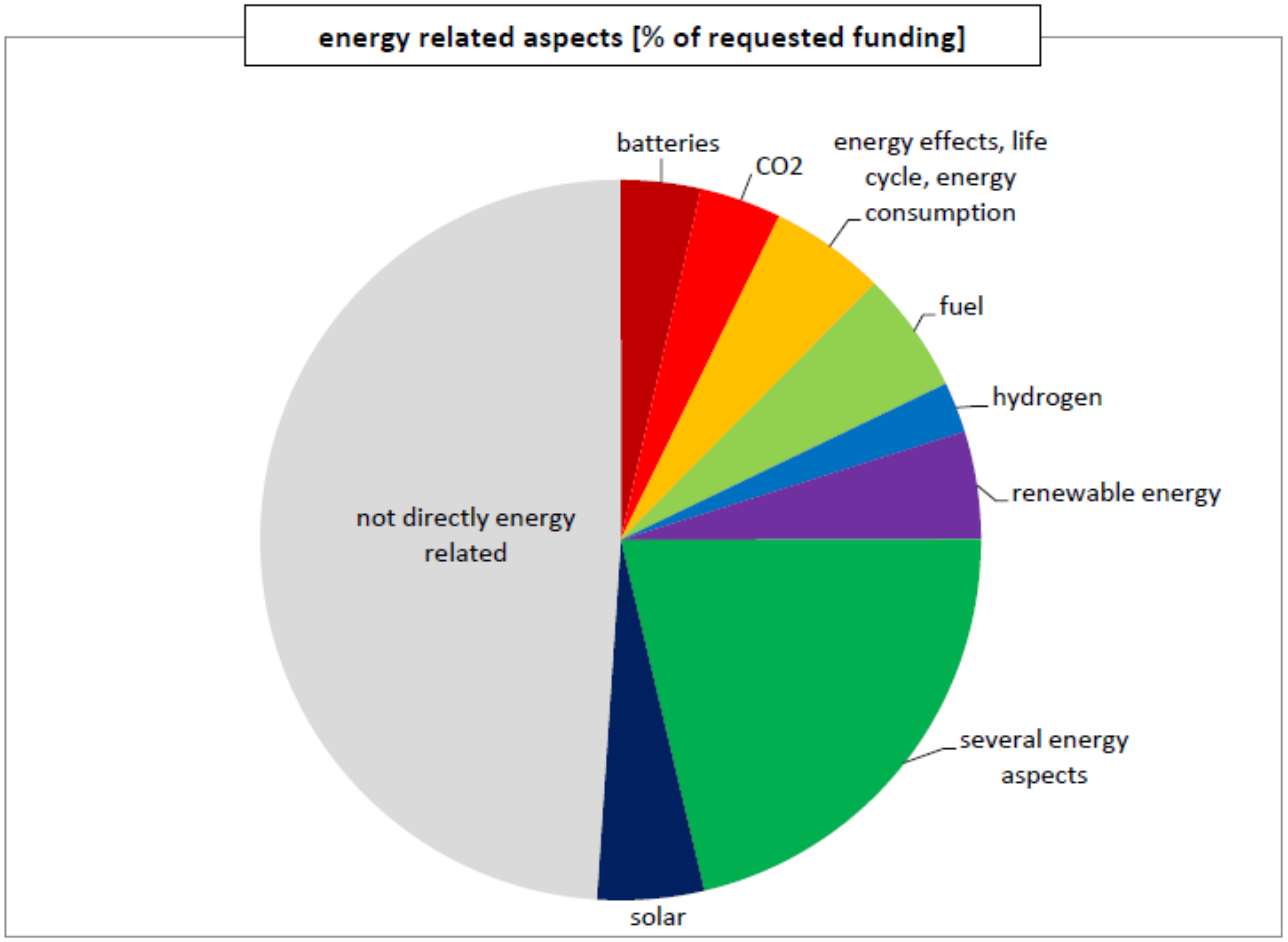

Figure 21: Selected full-proposals: analysis of energy related aspects

The requested funding of selected full-proposals per funding organisation is illustrated in Fig. 22.

Fig. 23 and Fig. 24 shows the distribution of applicants of successful proposals per topic and per country.

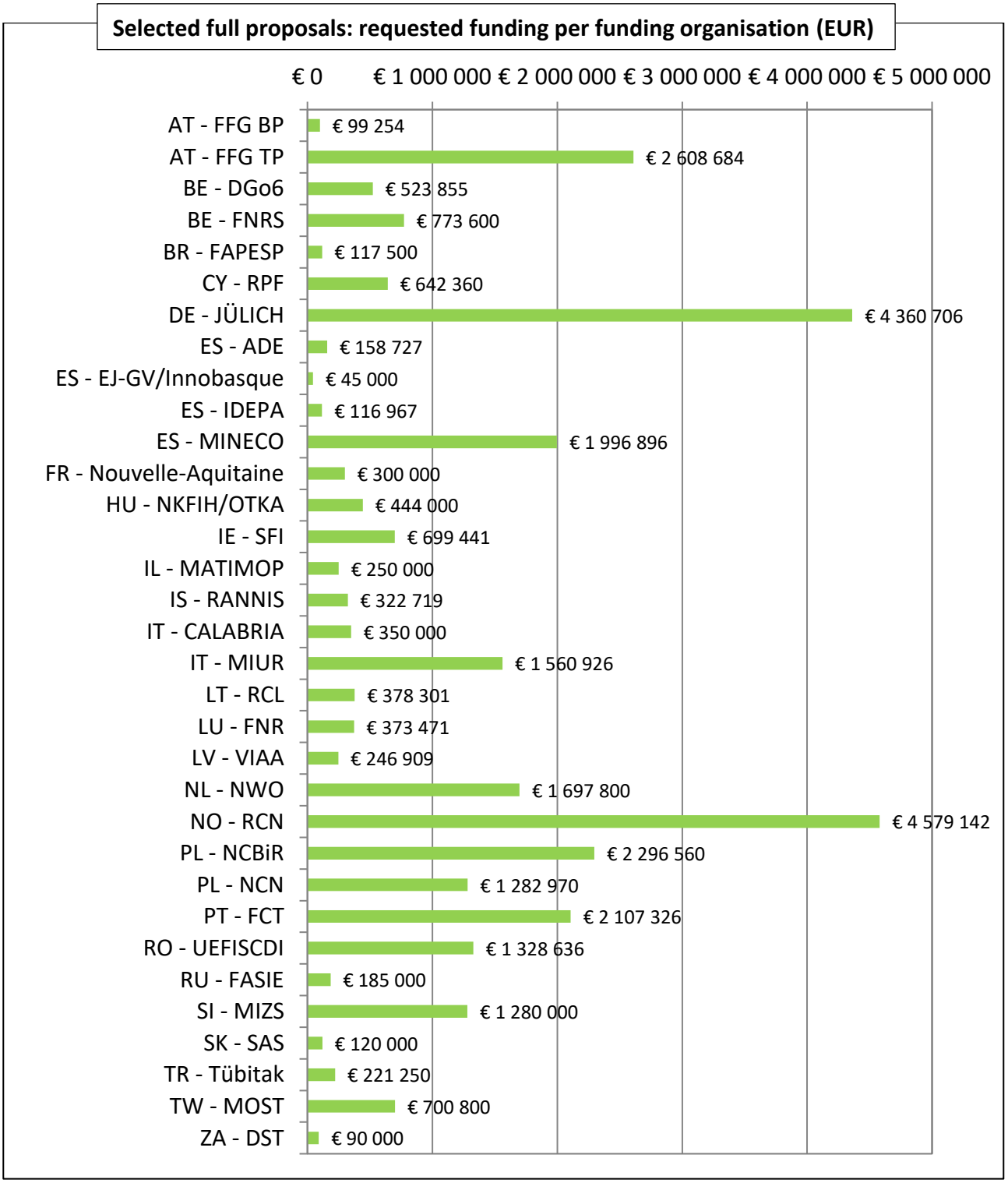

Figure 22: Selected full-proposals: requested funding per funding organisation (EUR).

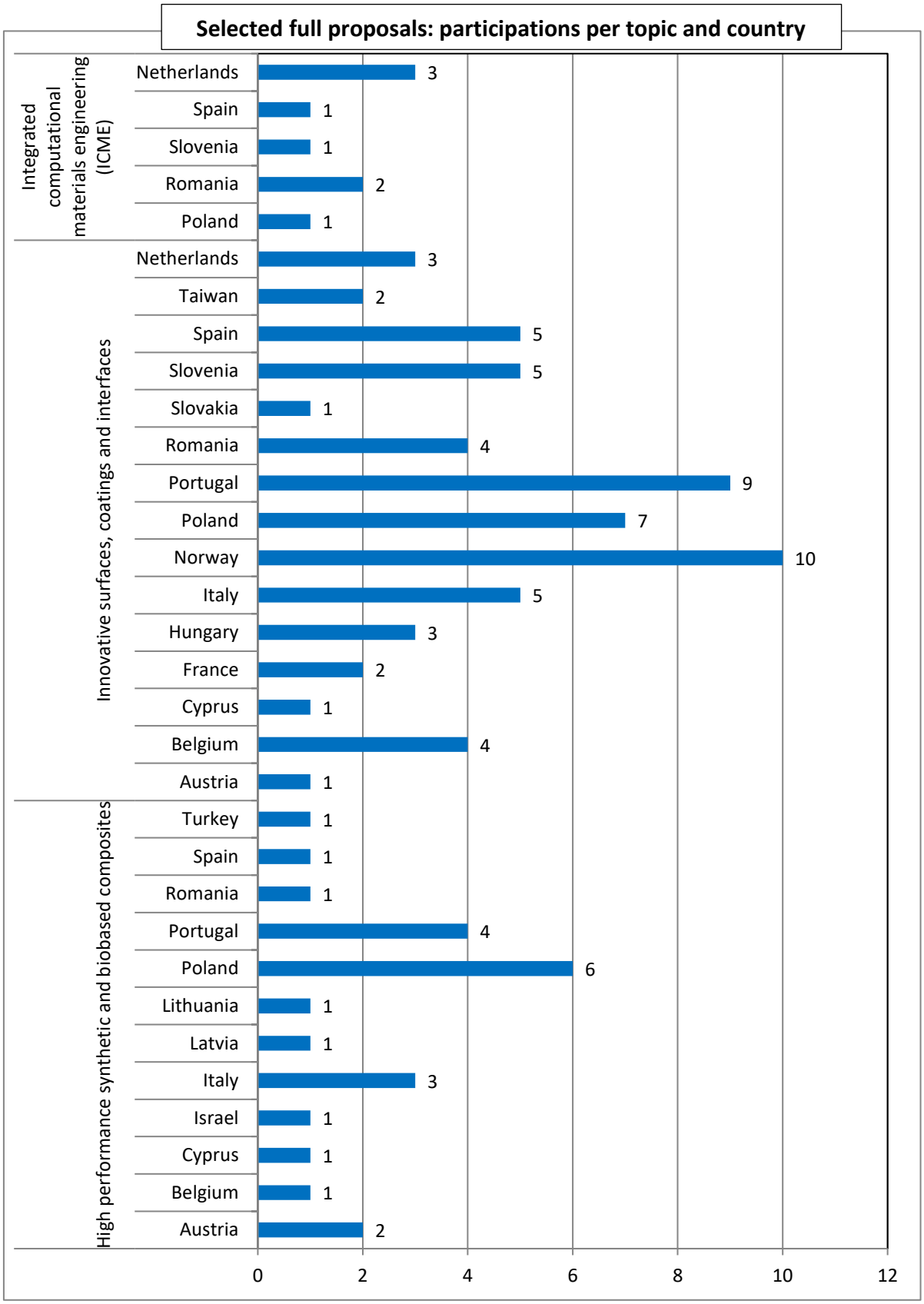

Figure 23: Number of applicants in selected full-proposals per topic and country

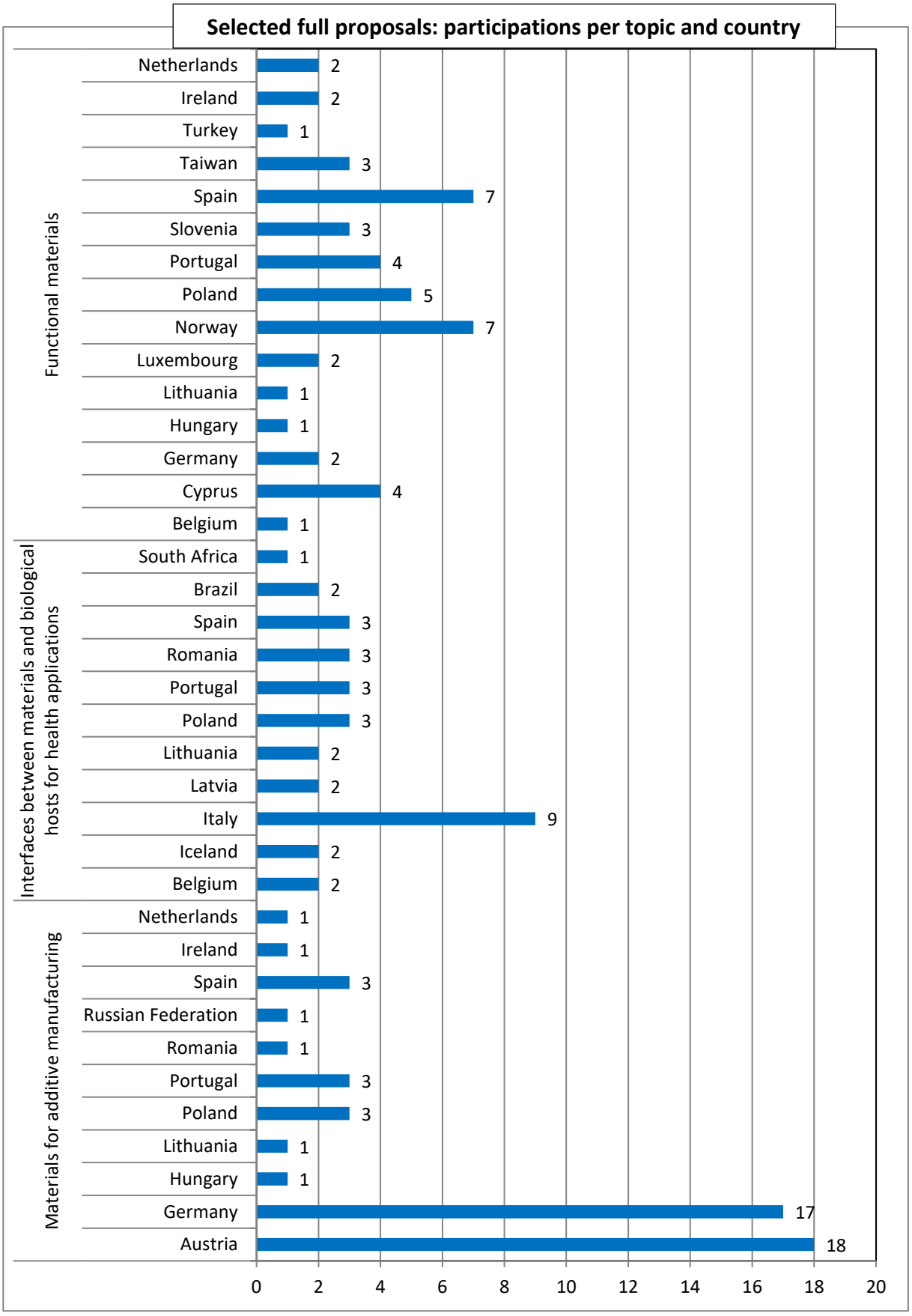

Figure 24: Number of applicants in selected full-proposals per topic and country

Network analysis Call 2016

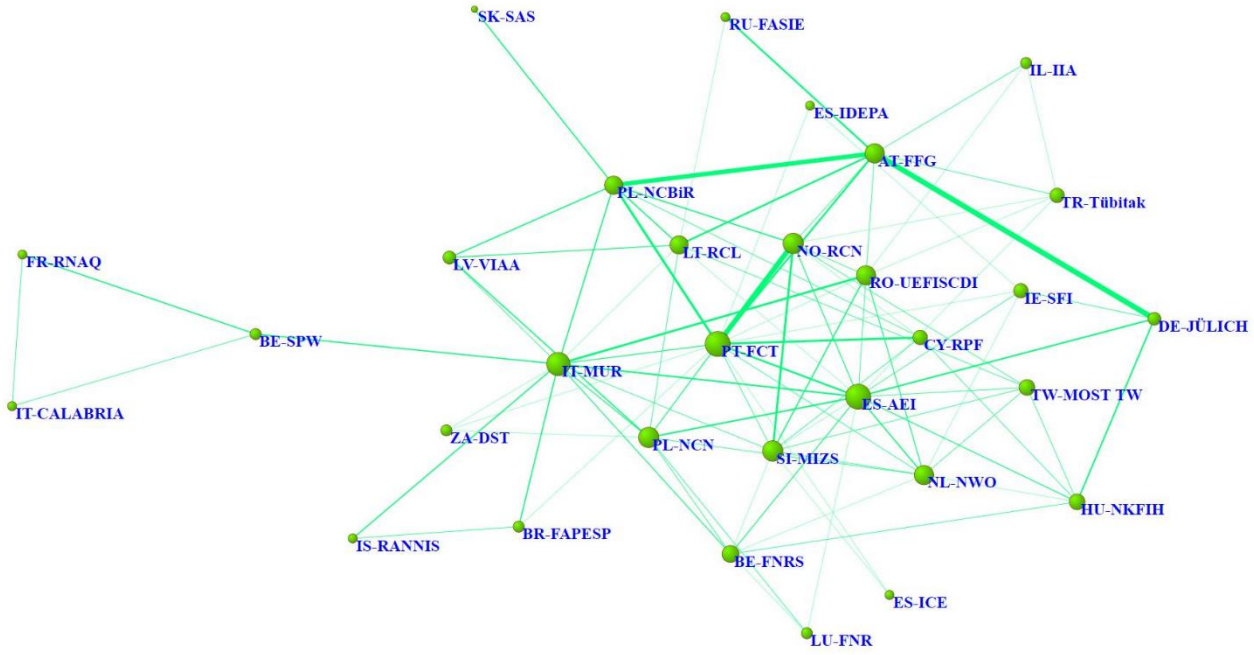

Figure 25: network analysis of transnational cooperation visualized via project participations. The size of the country/region corresponds to the total number of participations while the line thickness corresponds to the cooperation between countries/regions.

M-ERA.NET Call 2017

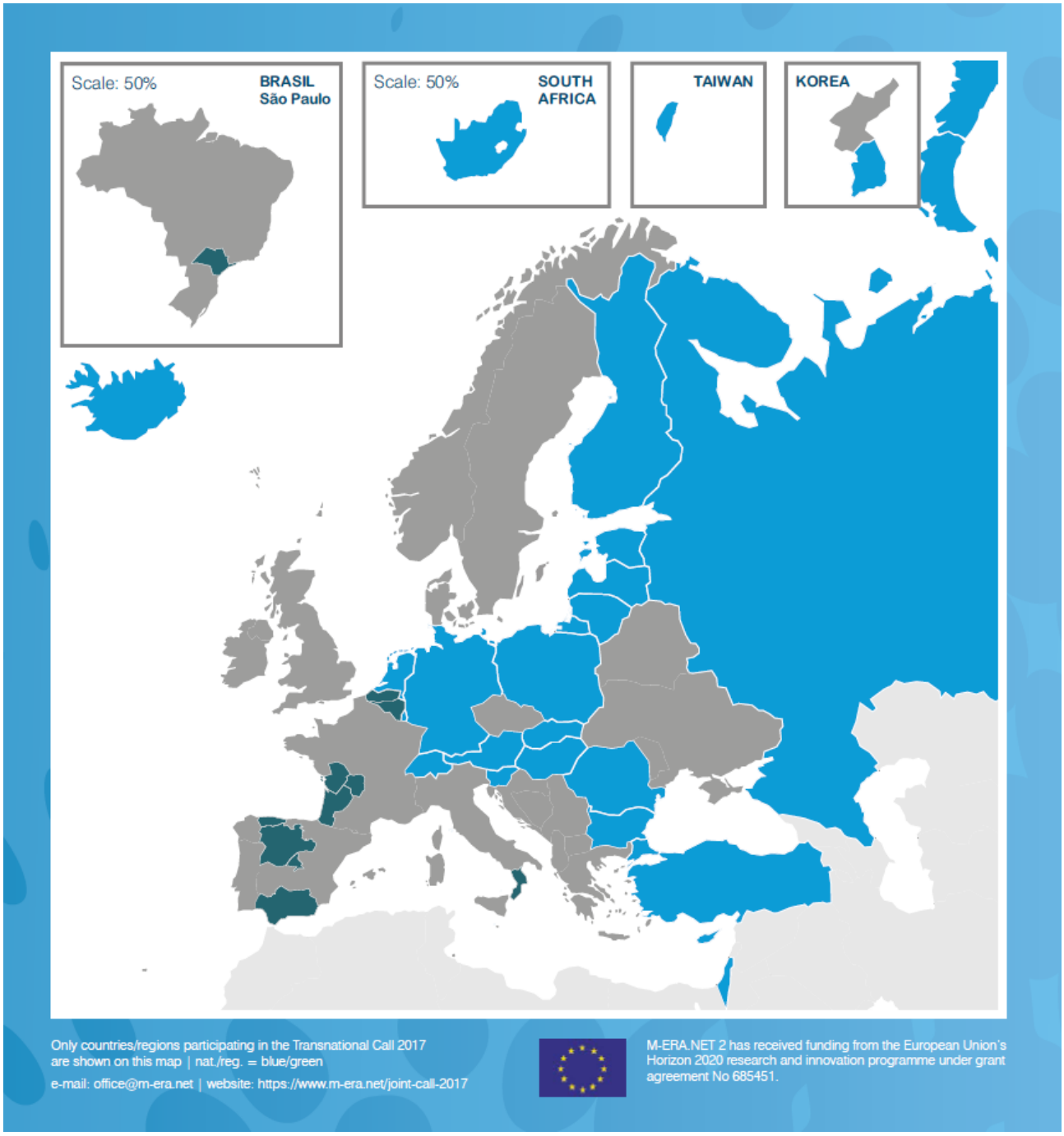

Figure 26: The M-ERA.NET Call 2017 was launched on the 14 March 2017. 31 funding agencies from 27 countries participate with a preliminary total budget of more than 25 million € national/regional funding.

Results of M-ERA.NET Call 2017

92 pre-proposals were submitted, requesting 67 Mio EUR funding in total.

53 pre-proposals were recommended for a full-proposal submission. 48 full-proposals were submitted.

37 full-proposals passed the full-proposal evaluation, requesting around 27 Mio EUR funding.

Depending on national/regional budgets and rules the national/regional funding organisations finally **selected 20 full-proposals for funding** corresponding to requested funding of 15.8 Mio EUR.

These projects are allocated to the call topics as follows:

- Integrated Computational Materials Engineering (ICME): **1** funded projects
- Innovative surfaces, coatings and interfaces: **4** funded projects
- High performance composites: **3** funded projects
- Multifunctional materials: **3** funded projects
- New strategies for advanced material-based technologies in health applications: **2** funded projects
- Materials for Additive Manufacturing: **7** funded projects

The total success rate (selected full-proposals vs total submitted pre-proposals) is 21.7 % (Fig. 27). For thedifferent topics the rates of success vary:

Integrated Computational Materials Engineering (ICME)	33.3%
Innovative surfaces, coatings and interfaces	19.0%
High performance composites	27.3%
Multifunctional materials	15.8%
New strategies for advanced material-based technologies in health applications	20.0%
Materials for Additive Manufacturing	25.0%

The success rate for the second stage (selected full-proposals vs. total submitted full-proposals) is 41.7%.

Integrated Computational Materials Engineering (ICME)	50.0%
Innovative surfaces, coatings and interfaces	28.6%
High performance composites	60.0%
Multifunctional materials	30.0%
New strategies for advanced material-based technologies in health applications	20.0%
Materials for Additive Manufacturing	58.3%

Eight selected full-proposals with a total funding volume of almost 5 Mio EUR address issues related to low carbon energy technologies.

The success rates (selected full-proposals vs total submitted pre-proposals) per organisation type are shown in Fig. 28. The success rate for universities is 20.0%, for research organisation is 23.8%, for SMEs 25.4%, and for large companies 19.6%.

The success rates per individual national/regional funding organisation (number of selected full-proposalsvs number of submitted proposals) are shown in Fig. 29.

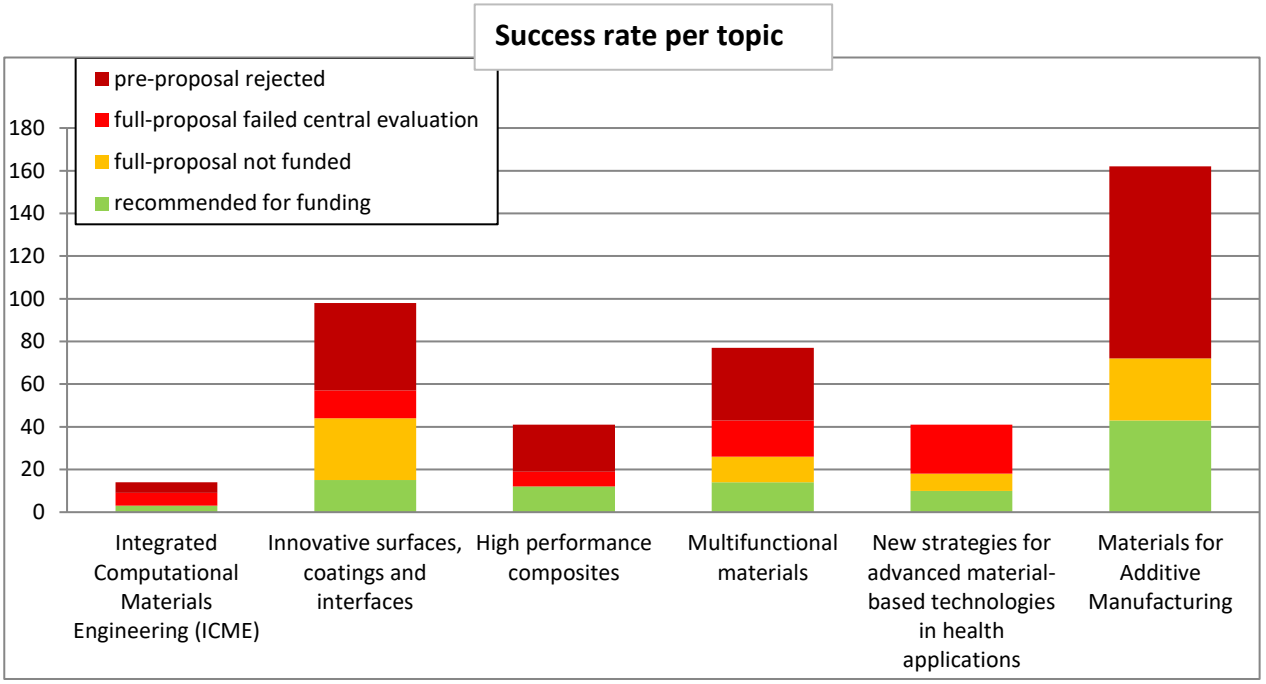

Figure 27: Number of participations: selected full-proposals compared to rejected pre-proposals for all six call topics.

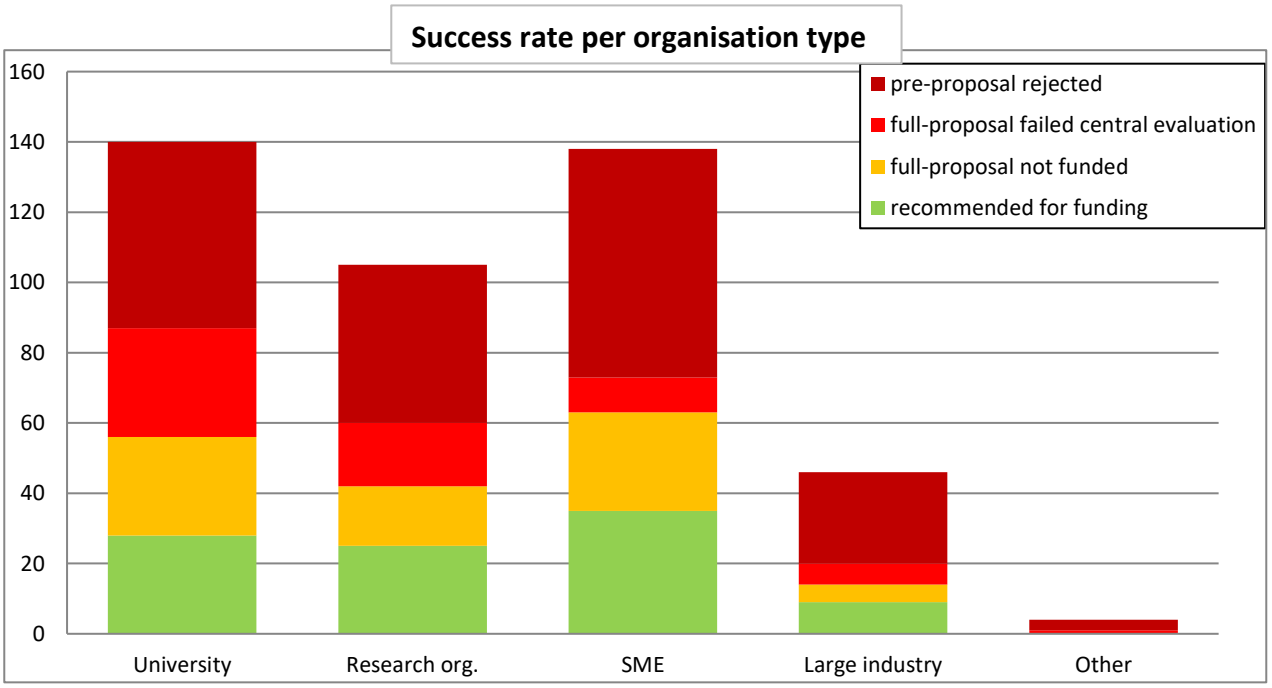

Figure 28: Figure 14: Number of participations: selected full-proposals compared to rejected proposals for all organisation types.

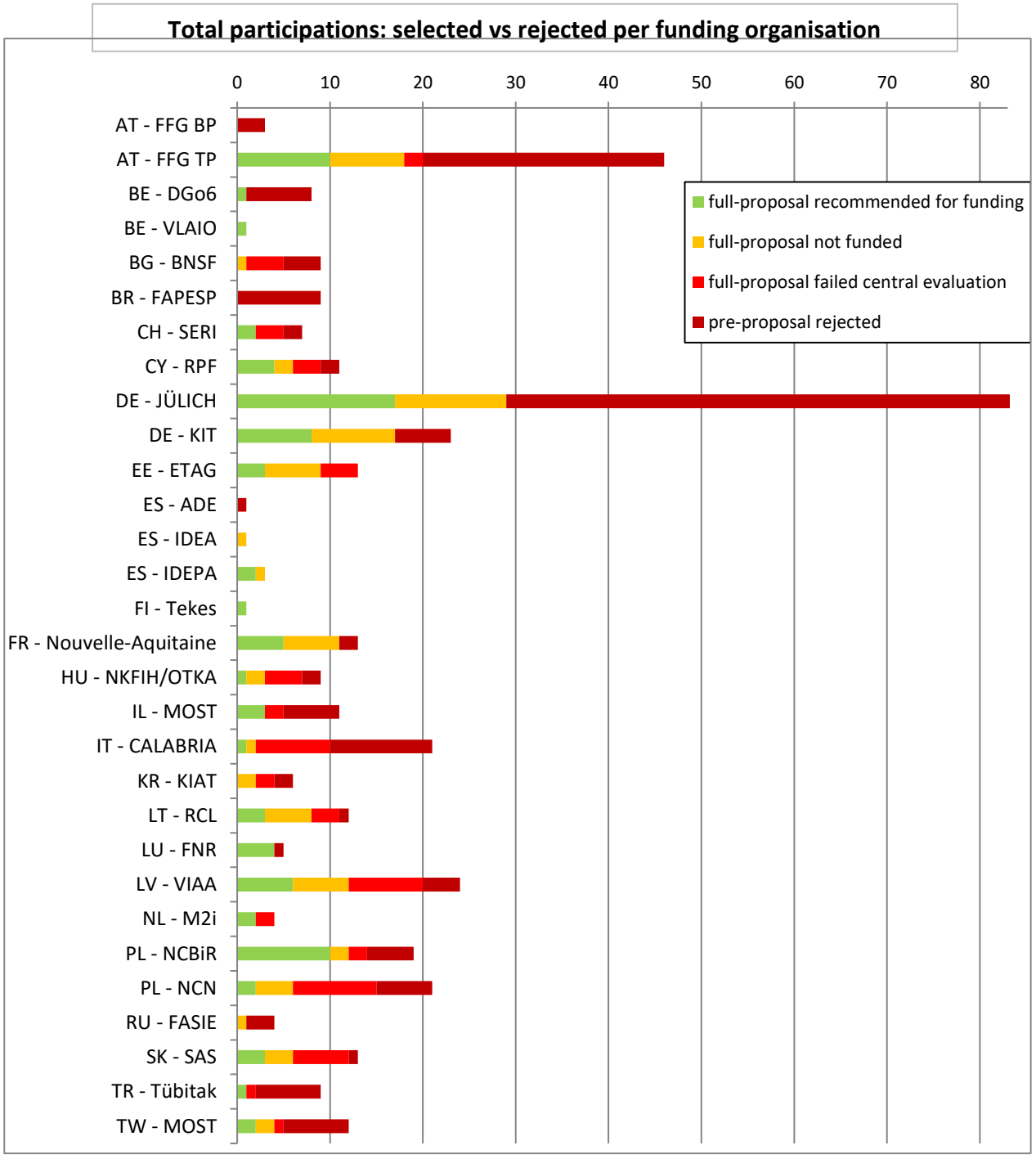

Figure 29: Total number of participations: success rate from pre-proposal phase to selected full-proposals.

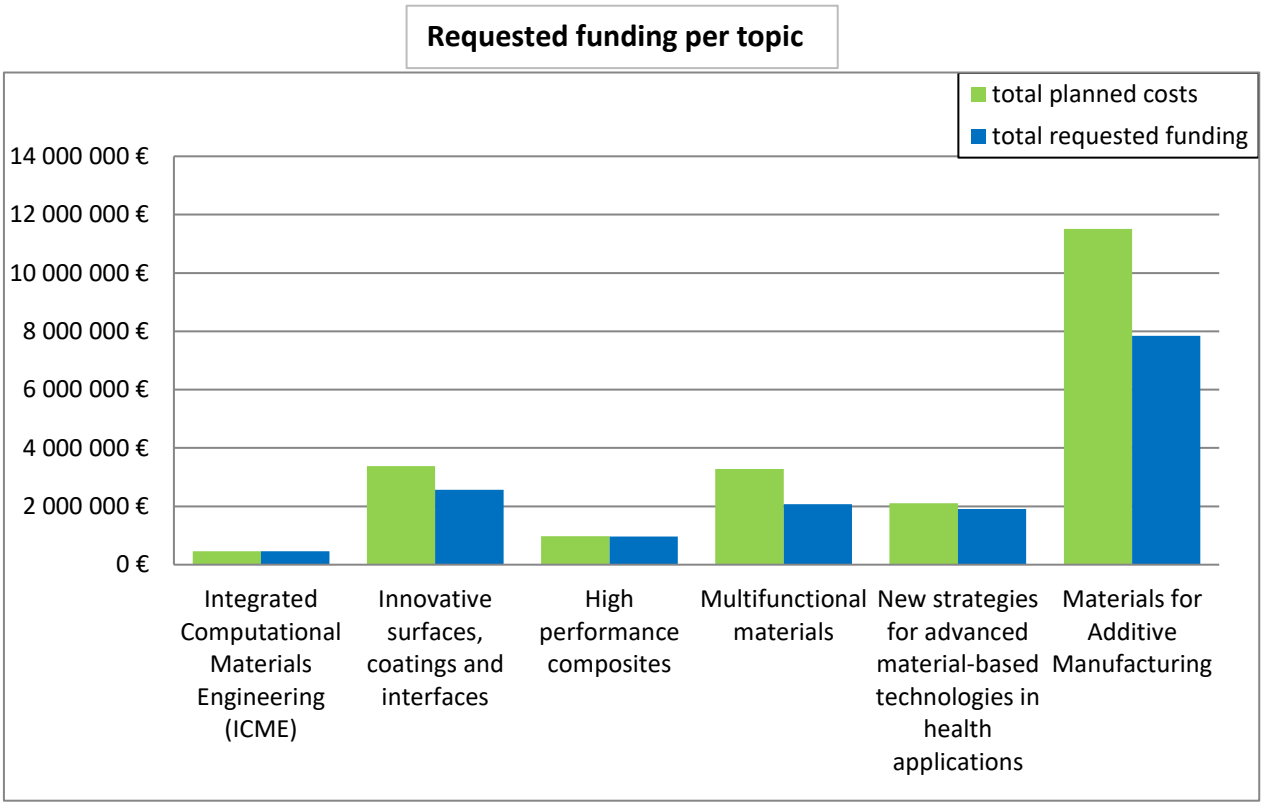

Figure 30: Selected full-proposals: total project volumes and requested funding (EUR) per call topic.

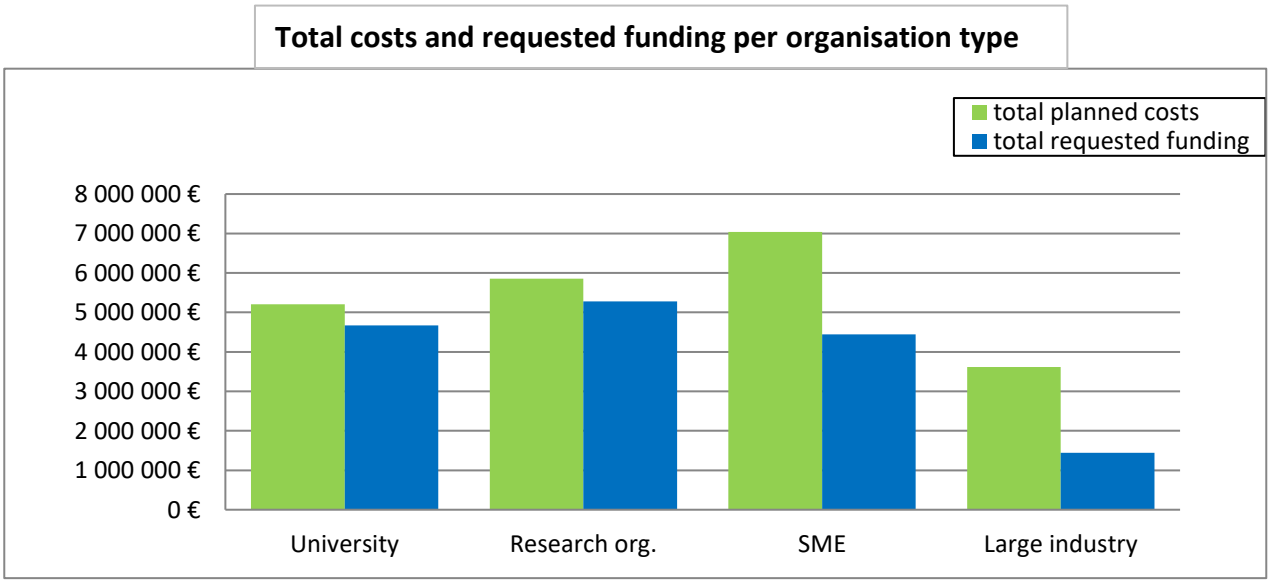

Figure 31: Selected full-proposals: total requested funding and total planned costs (EUR) per organisation type.

For selected full-proposals the total project volumes and requested funding per call topic are shown in Fig. 30. The topic with the highest amount of requested funding is “Materials for Additive Manufacturing” with 7.8 Mio EUR. This is followed by the topics “Innovative surfaces, coatings and interfaces” and “Multifunctional materials” with 2.6 and 2.1 Mio EUR. For the topics “New strategies for advanced material-based technologies in health applications”, “High performance composites” and “Integrated Computational Materials Engineering (ICME)” 1.9 Mio EUR and 1.0 Mio EUR and 0.5 Mio EUR funding are requested.

In the selected full-proposals 4.7 Mio EUR funding are requested by universities, 5.3 Mio EUR funding by research organisations, 4.4 Mio EUR funding by SMEs and 1.4 Mio EUR funding by large industry (Fig. 31).

Ten projects are coordinated by research institutions, seven by universities, two by SMEs and one project is coordinated by a large company (Fig. 32).

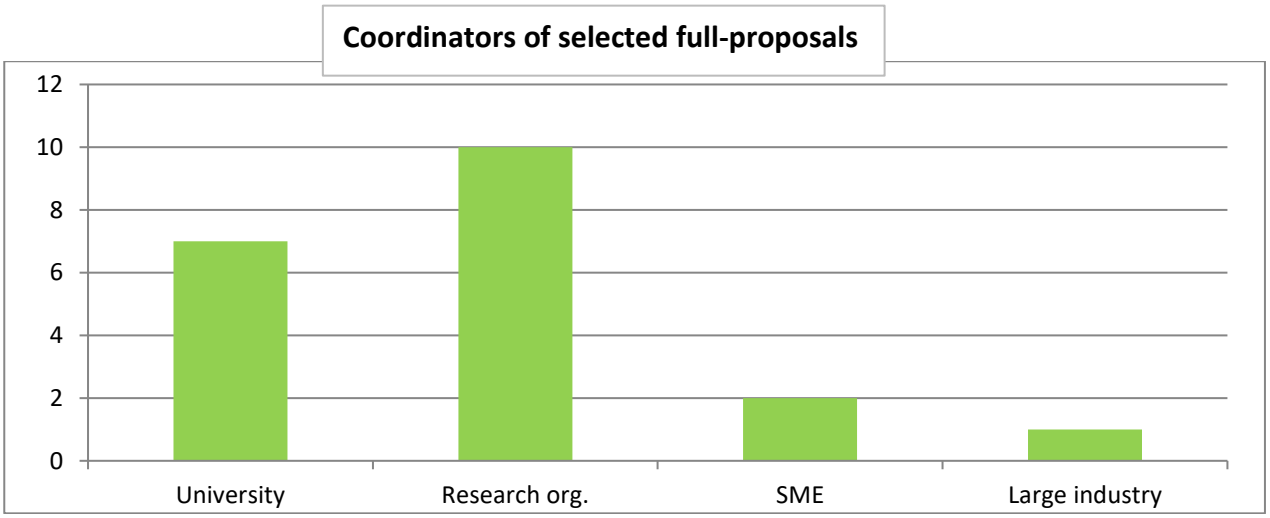

Figure 32: Selected full-proposals: number of coordinators per organisation type.

The projects start from Technology Readiness Level (TRL) 2 (technology concept formulated) to TRL 5 (technology validated in relevant environment) (Fig. 33).Most of them start with TRL 3 (experimental proof of concept). The TRL which is targeted on the end of the project is between TRL 3 and TRL 8 (system complete and qualified) (Fig. 34). Most projects indicate an End-TRL of 6 (technology demonstrated in relevant environment). The average TRL of projects recommended for funding are higher compared to the Call 2016. In 2016 the average TRL at the project start was 2.5 compared to 3.0 in 2017. The target TRL of funded project in 2016 was in average 4.8 and now increased in the 2017 Call to 5.2.

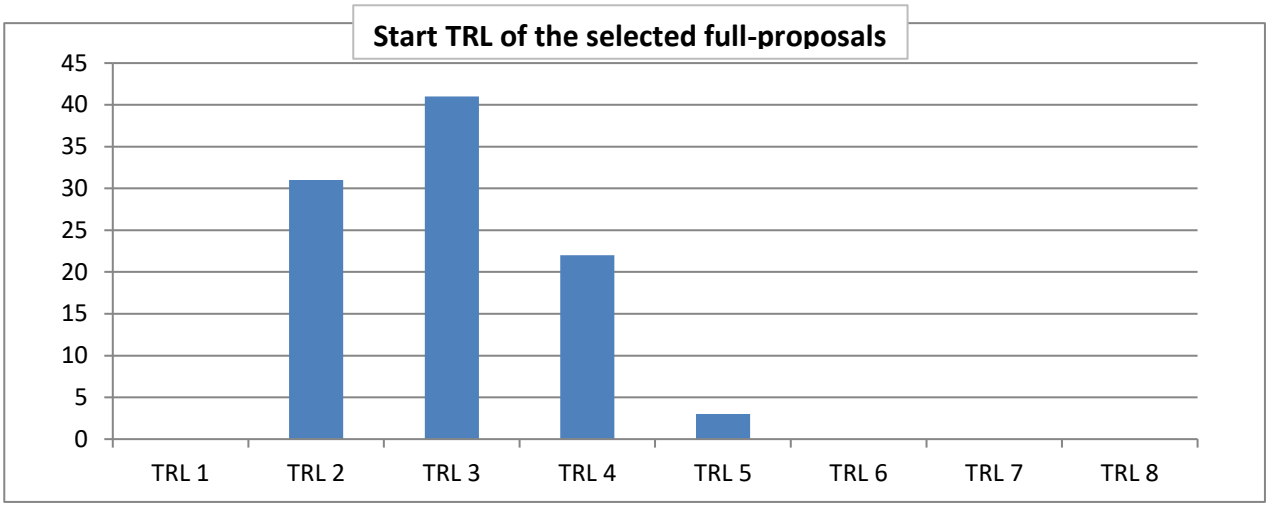

Figure 33: Selected full-proposals: number of applicants per start Technology Readiness Level.

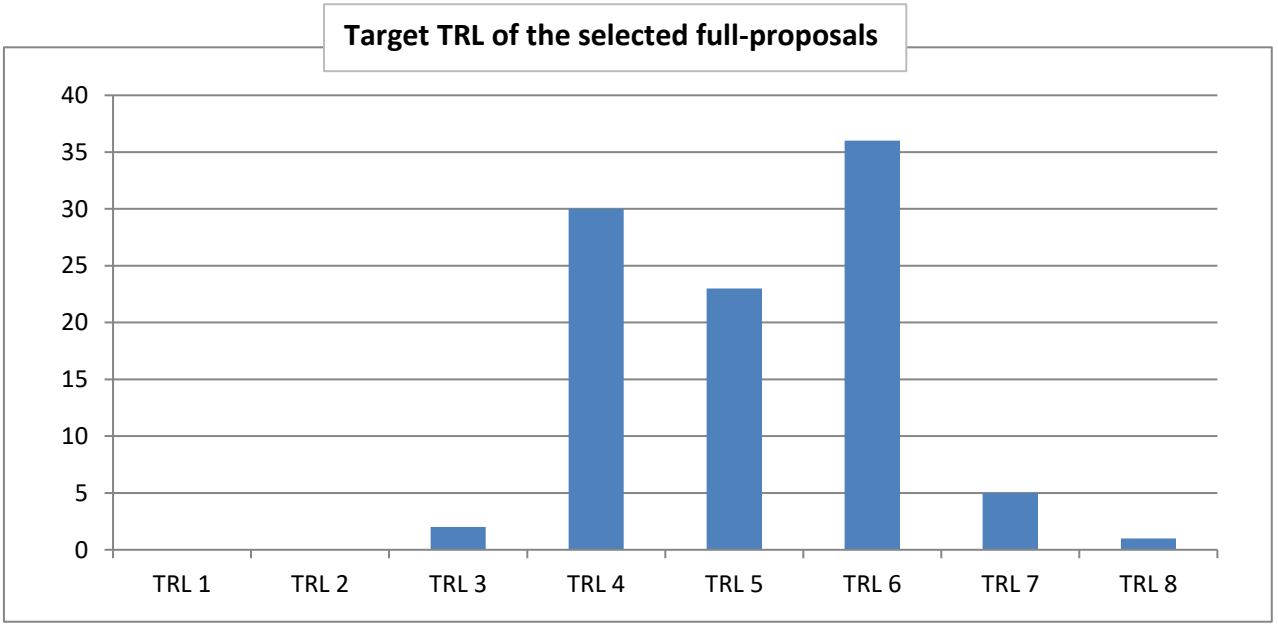

Figure 34: Selected full-proposals: number of applicants per target Technology Readiness Level

The requested funding of selected full-proposals per funding organisation is illustrated in Fig. 35.

Fig. 36 shows the distribution of applicants of successful proposals per topic and per country.

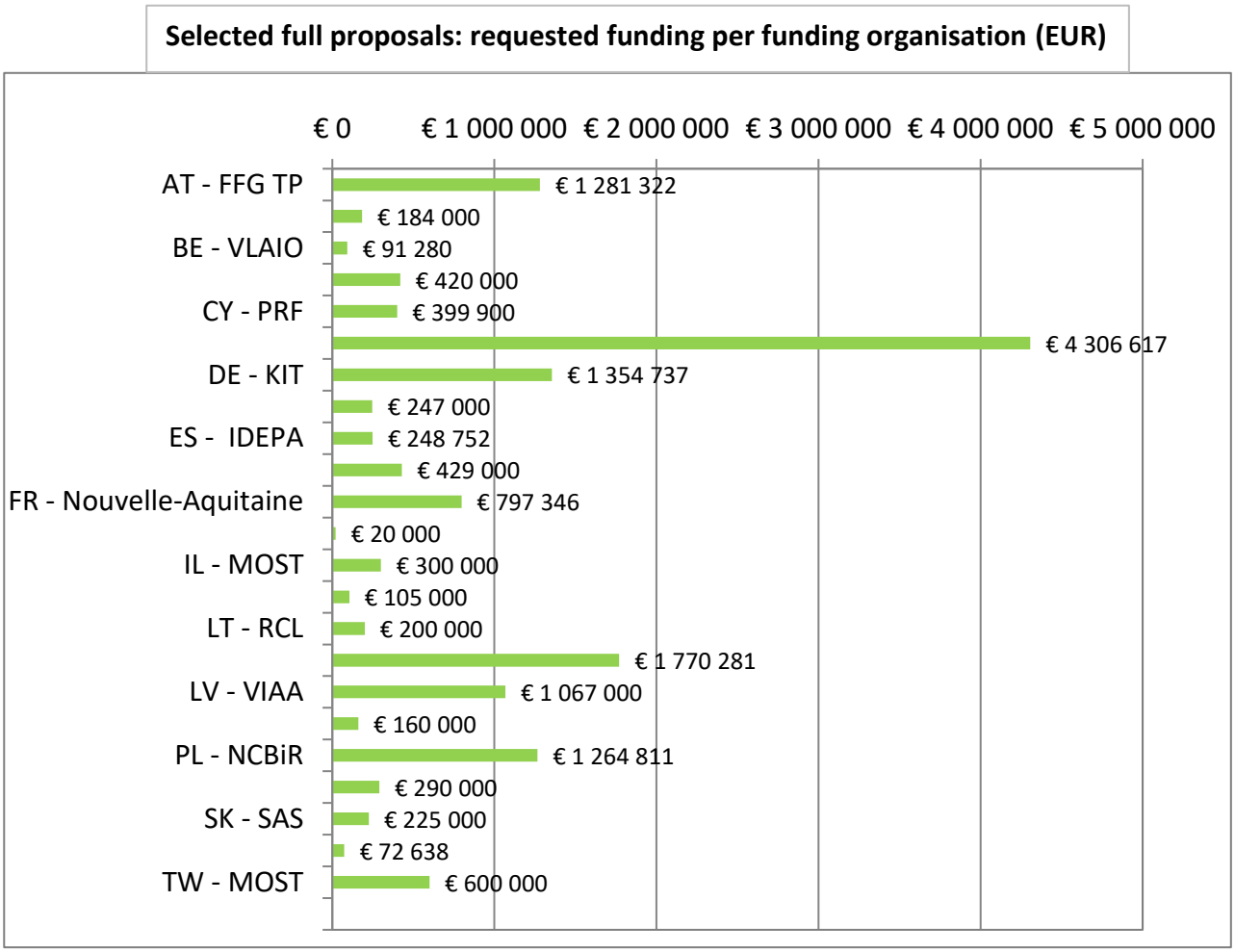

Figure 35: Selected full-proposals: requested funding per funding organisation (EUR)

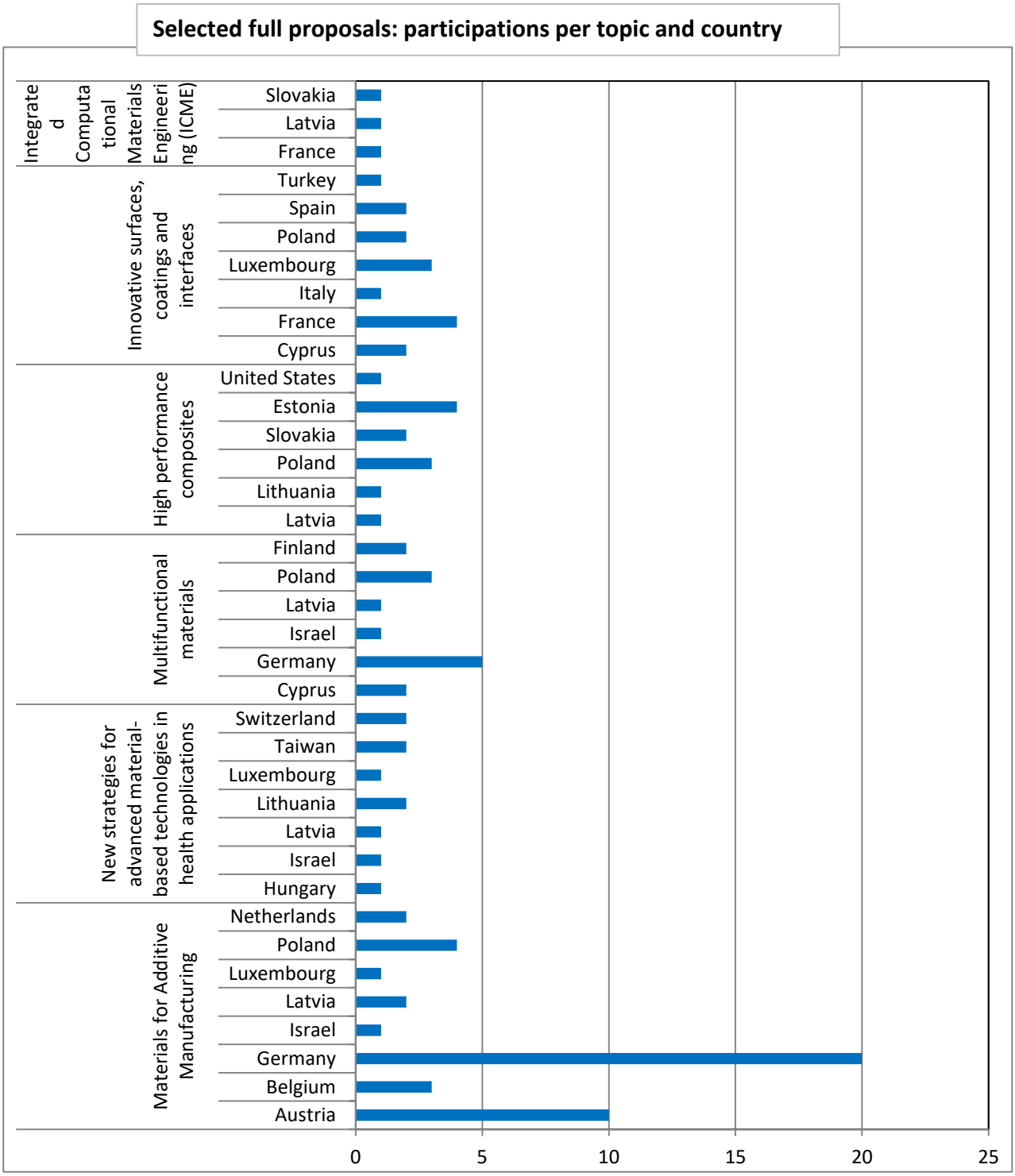

Figure 36: Number of applicants in selected full-proposals per topic and country

Network analysis Call 2017

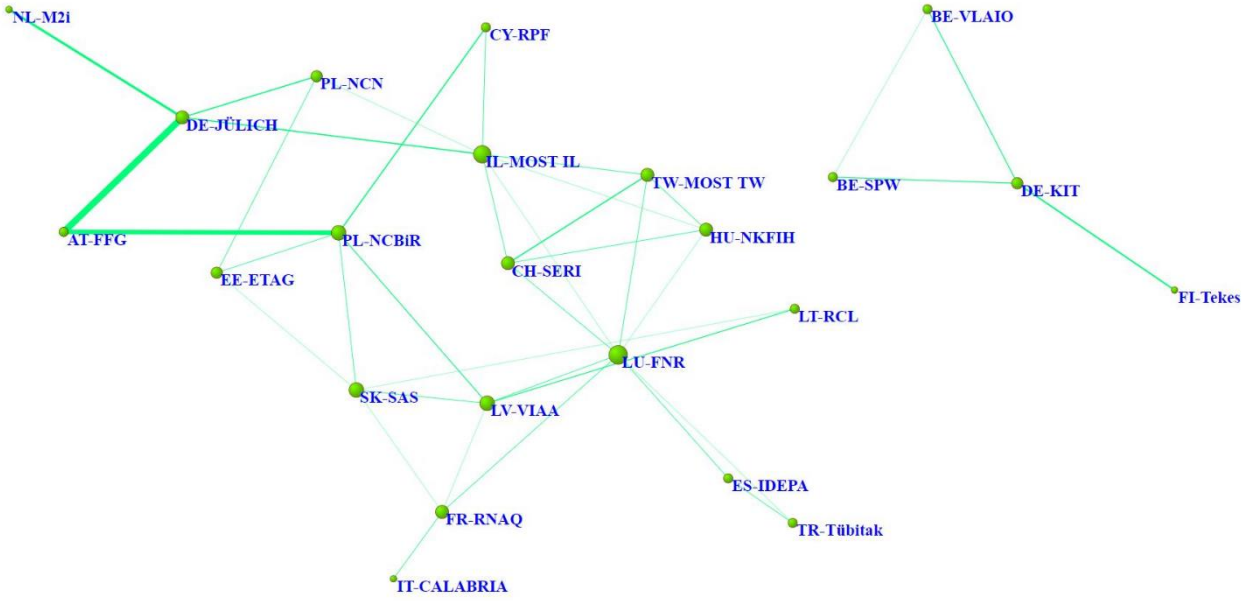

Figure 37: network analysis of transnational cooperation visualized via project participations. The size of the country/region corresponds to the total number of participations while the line thickness corresponds to the cooperation between countries/regions.

M-ERA.NET Call 2018

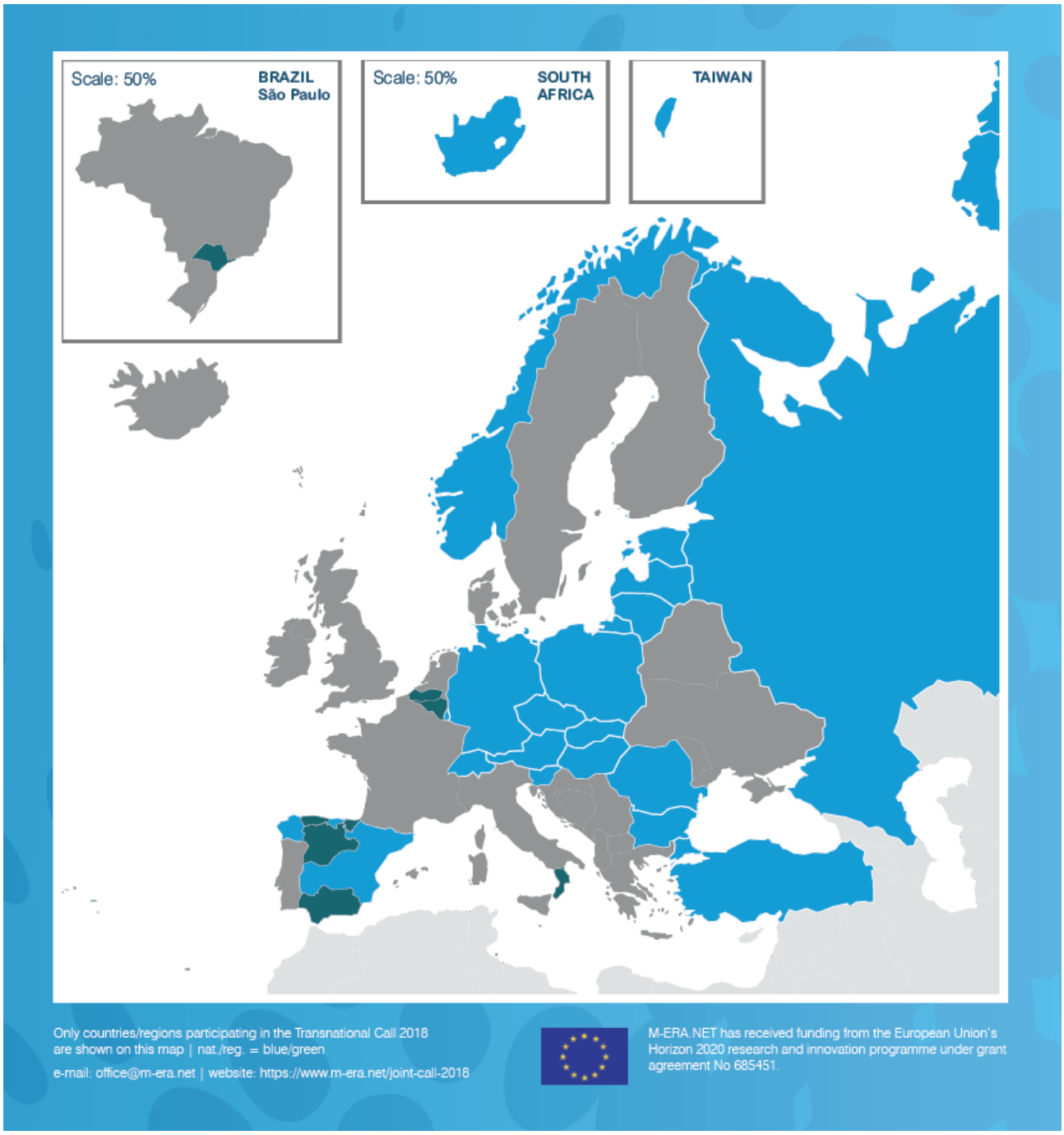

Figure 38: The M-ERA.NET Call 2018 was launched on the 13 March 2018. 33 funding agencies from 24 countries participate with a total budget of more than 23 million € national/regional funding.

Results of M-ERA.NET Call 2018

166 pre-proposals were submitted, requesting 114 Mio EUR funding in total.

94 pre-proposals were recommended for a full-proposal submission.

90 full-proposals were submitted and sent to central evaluation.

74 full-proposals passed the full-proposal evaluation, requesting around 48 Mio EUR funding.

Depending on national/regional budgets and rules the national/regional funding organisations finally **selected 27 full-proposals for funding** corresponding to requested funding of 18.2 Mio EUR.

These projects are allocated to the call topics as follows:

- Multiscale modeling for materials engineering and processing: **1** funded project
- Innovative surfaces, coatings and interfaces: **10** funded projects
- High performance composites: **3** funded projects
- Functional materials: **8** funded projects
- New strategies for advanced material-based technologies in health applications: **2** funded projects
- Materials for Additive Manufacturing: **3** funded projects

The total success rate (selected full-proposals vs total submitted pre-proposals) is 15.2 % (Fig. 39). For the different topics, the rates of success vary:

Multiscale modeling for materials engineering and processing	12.5%
Innovative surfaces, coatings and interfaces	27.8%
High performance composites	13.0%
Functional materials	17.8%
New strategies for advanced material-based technologies in health applications	12.5%
Materials for additive manufacturing	7.9%

The success rate for the second stage (selected full-proposals vs. total submitted full-proposals) is 29.3%.

Multiscale modeling for materials engineering and processing	33.3%
Innovative surfaces, coatings and interfaces	43.5%
High performance composites	25.0%
Functional materials	24.2%
New strategies for advanced material-based technologies in health applications	20.0%
Materials for additive manufacturing	30.0%

The success rates (selected full-proposals vs total submitted pre-proposals) per organisation type are shown in Fig. 40. The success rate for universities is 12.5%, for research organisation is 18.2%, for SMEs 13.3%, andfor large companies 18.0%.

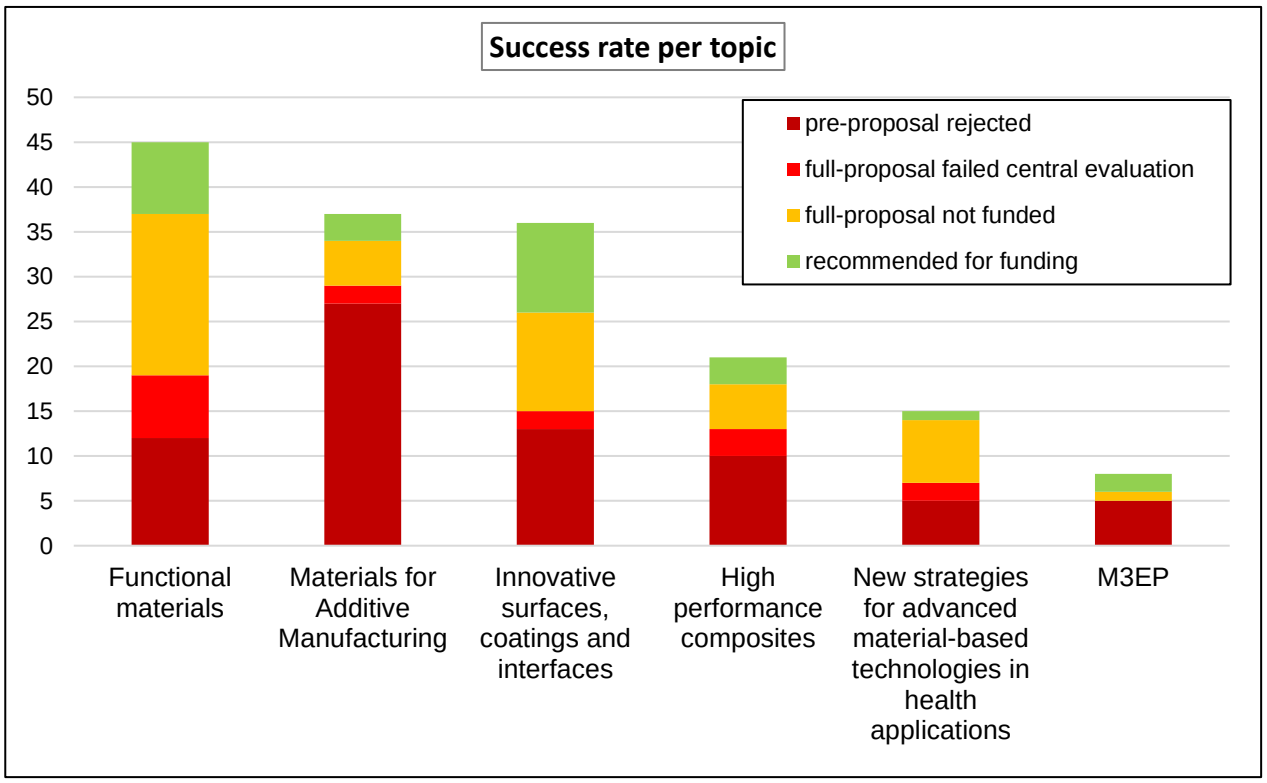

Figure 39: Number of participations: selected full-proposals compared to rejected pre-proposals for all six call topics.

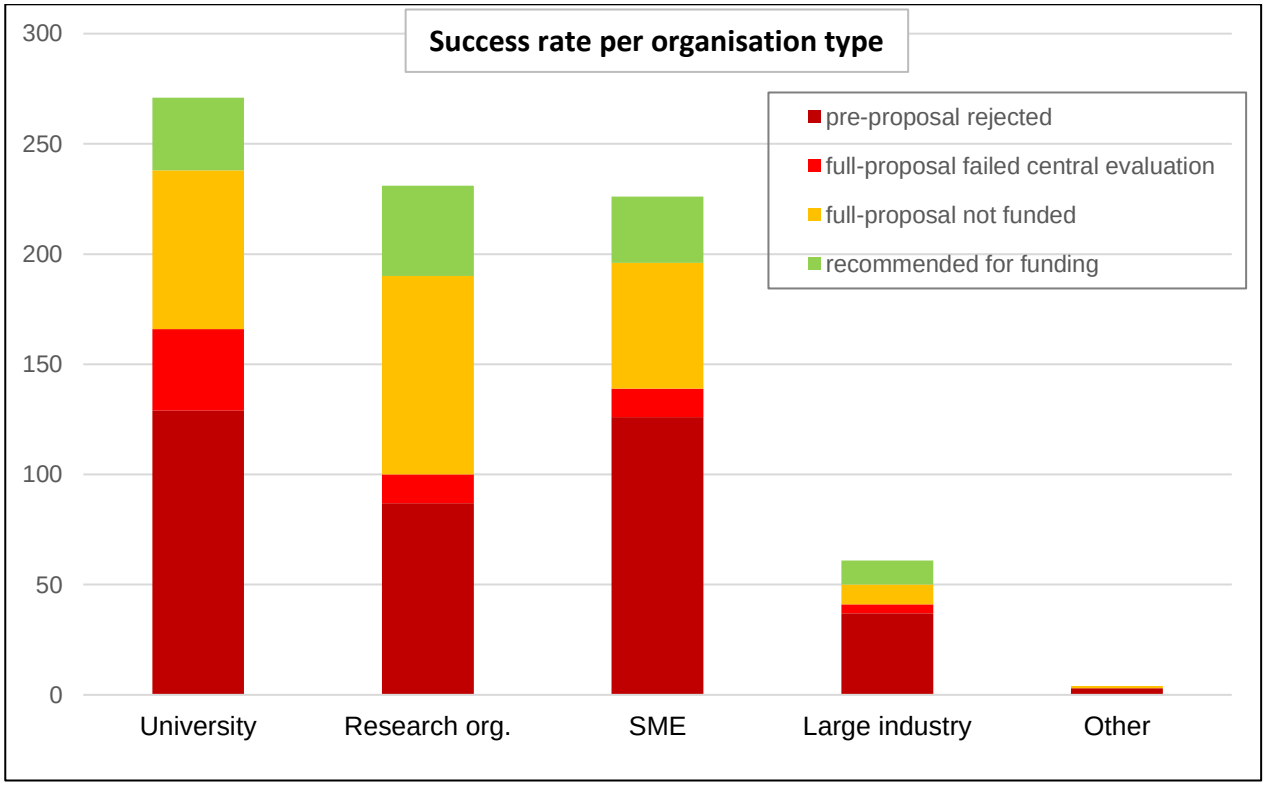

Figure 40: Number of participations: selected full-proposals compared to rejected proposals for all organisation types.

The success rates per individual national/regional funding organisation (number of selected full-proposals vs number of submitted proposals) are shown in Fig. 41.

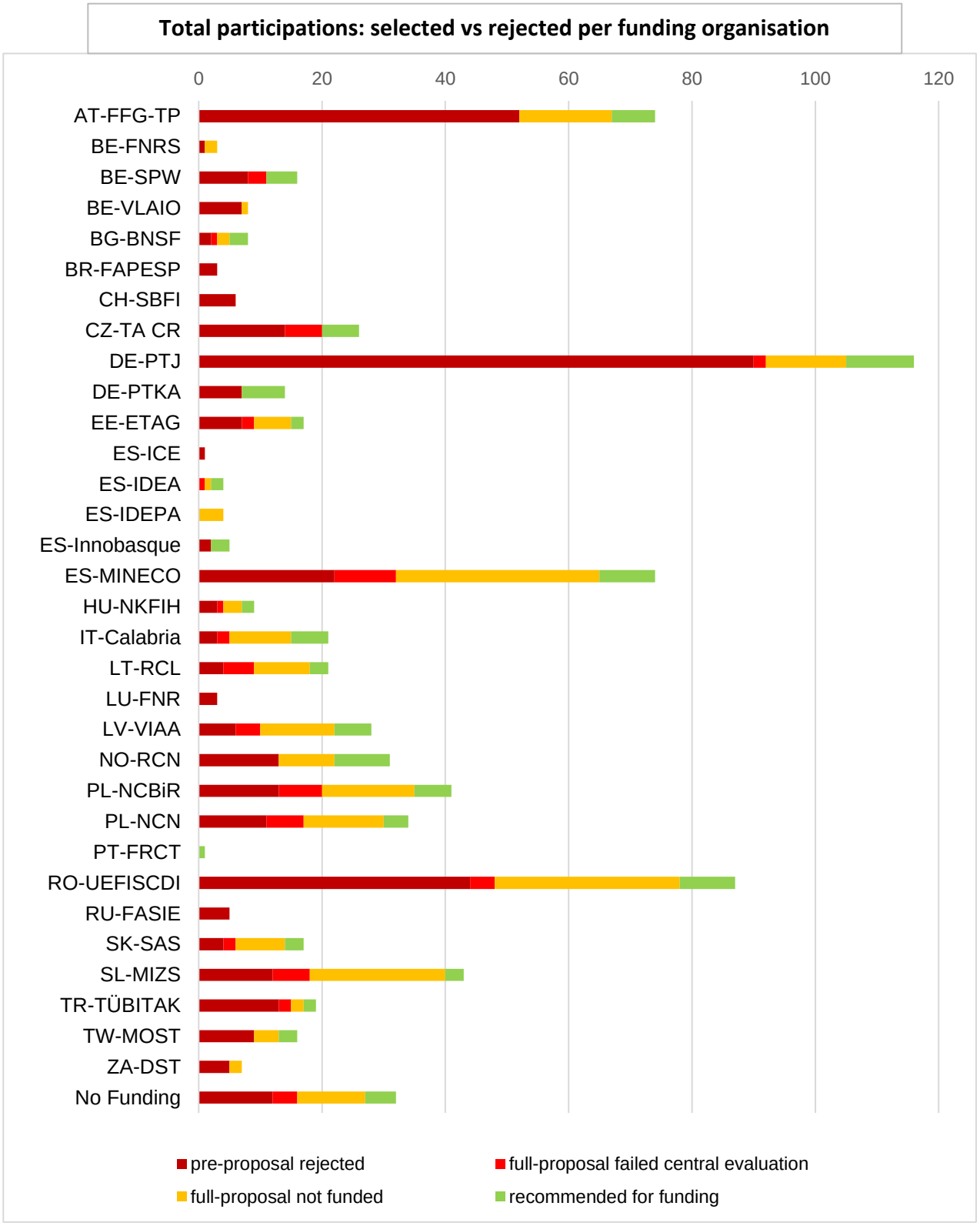

Figure 41: Total number of participations: success rate from pre-proposal phase to selected full-proposals.

The total project volumes and corresponding requested funding per call topic are shown in Fig. 42.

The topic with the highest amount of requested funding is “Innovative surfaces, coatings and interfaces” with 7.2 Mio EUR. This is followed by the topics “Functional materials” and “Materials for additive manufacturing” with 3.9 and 3.2 Mio EUR. For the topics “High performance composites”, “New strategies for advanced material-based technologies in health applications”, “High performance composites” and “Multiscale modelling for materials engineering and processing” 2.1 Mio EUR and 1.0 Mio EUR and 0.8 Mio EUR funding are requested.

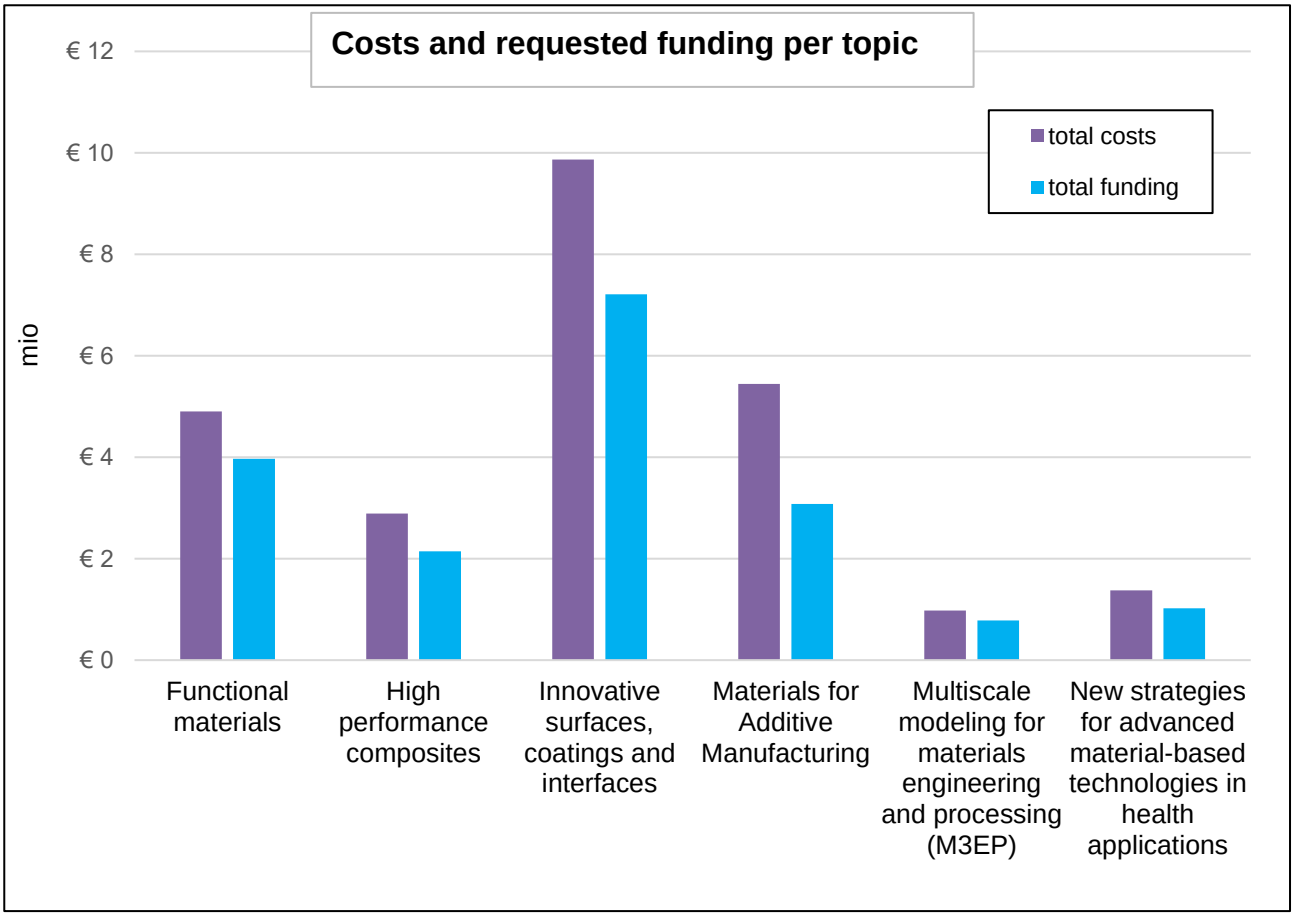

Figure 42: Selected full-proposals: total project volumes and requested funding (EUR) per call topic.

The distribution of total project costs and requested funding per organisation type is shown in Fig 43.

In the selected full-proposals research organisations (6.2 Mio EUR) and universities (6.0 Mio EUR) request the highest amount of funding. Around one third of the total funding is requested by enterprises: 4.4 Mio EURfunding by SMEs and 1.7 Mio EUR funding by large enterprises.

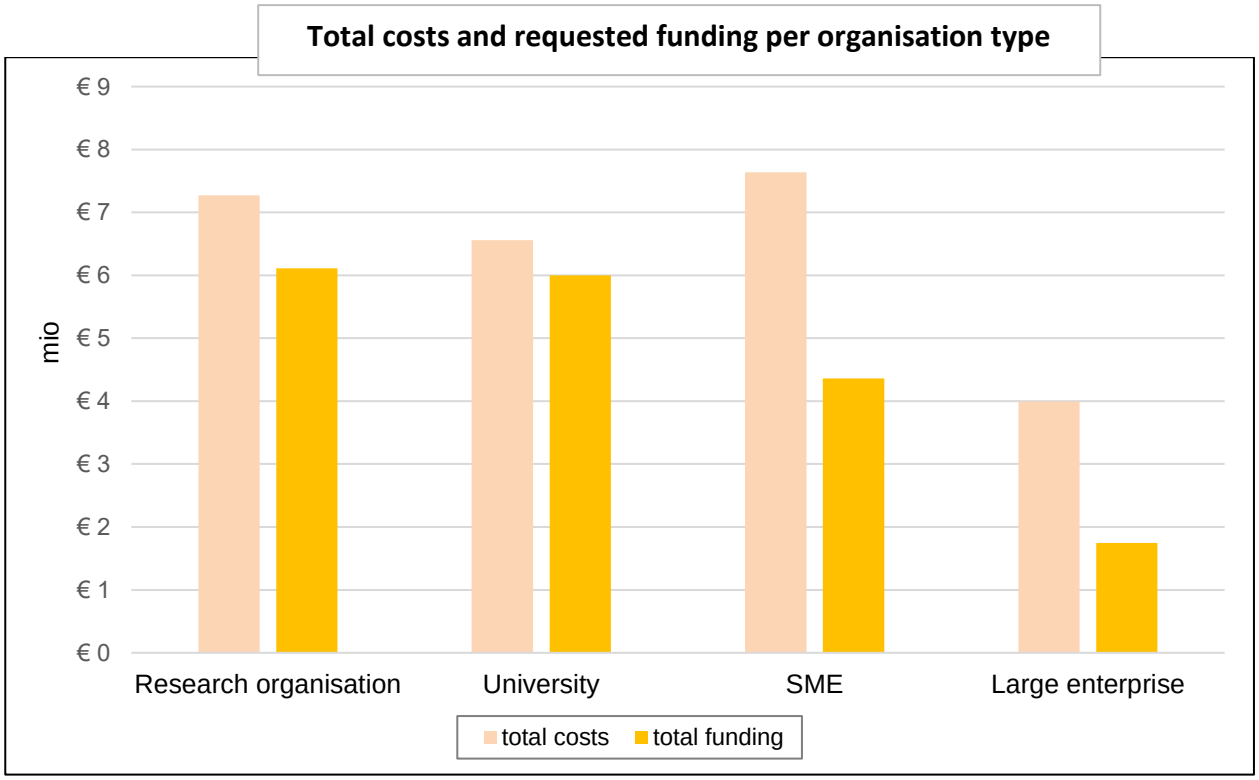

Figure 43: Selected full-proposals: total requested funding and total planned costs (EUR) per organisation type.

Out of 27 recommended projects research institutions (12 projects) coordinate the majority.

Nine projects are coordinated by universities, four by SMEs and two projects by a large enterprise (Fig. 44).

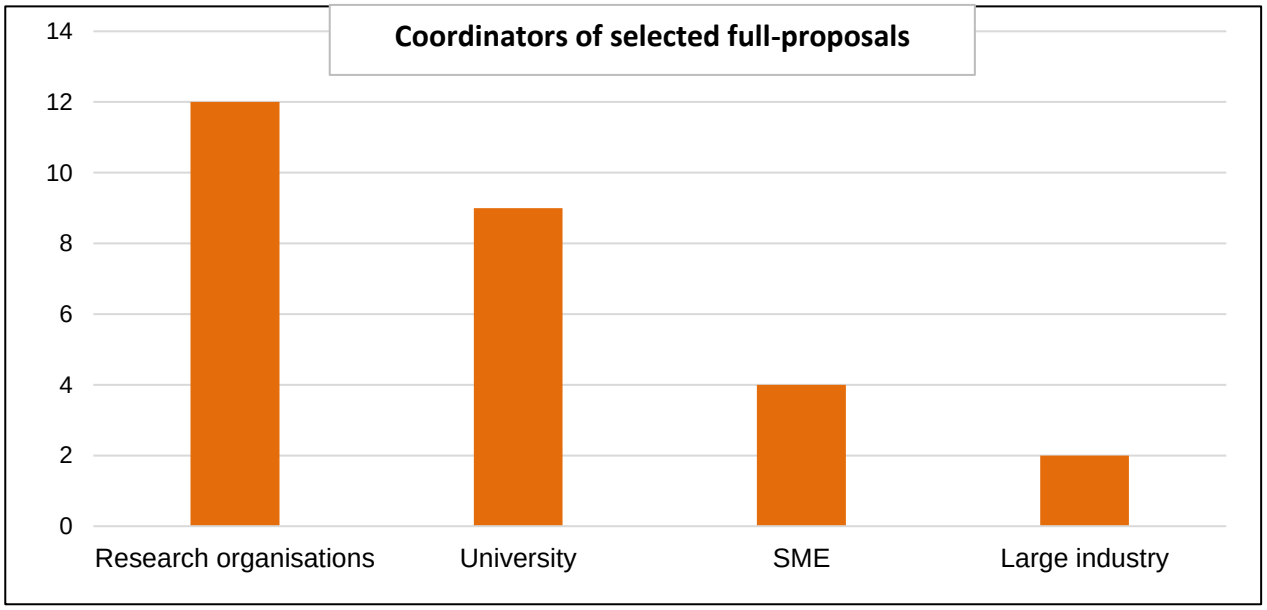

Figure 44: Selected full-proposals: number of coordinators per organisation type

The projects start from Technology Readiness Level (TRL) 1 (basic principles observed) to TRL 4 (technology validated in lab) (Fig. 45).

Most of them start with TRL 2 (technology concept formulated).

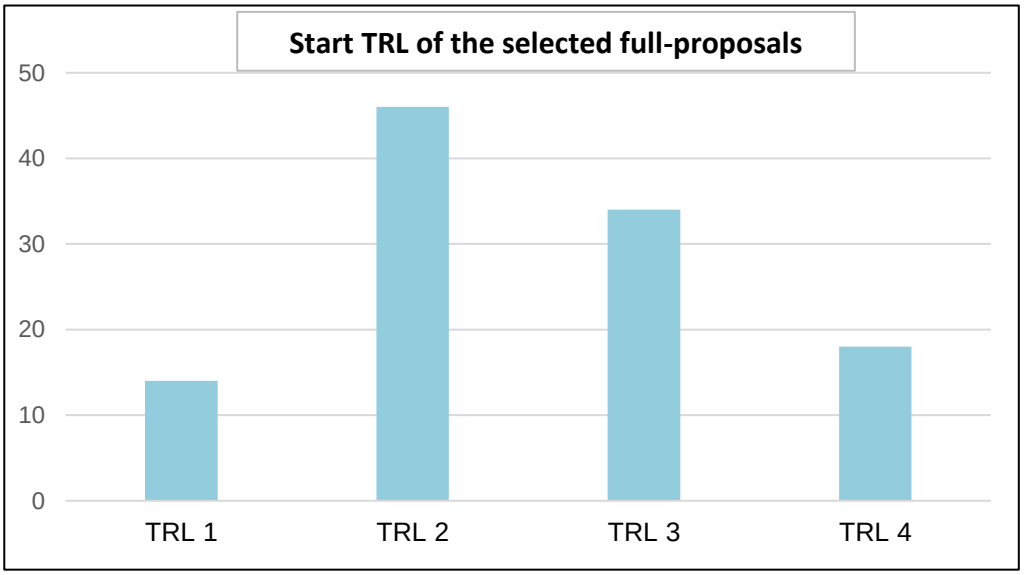

Figure 45: Selected full-proposals: number of applicants per start Technology Readiness Level.

The TRL, which is targeted on the end of the project, is between TRL 2 and TRL 7 (system prototype demonstration in operational environment) (Fig. 46).

Most projects indicate an end between TRL 4 and TRL 6 (technology demonstrated in relevant environment).

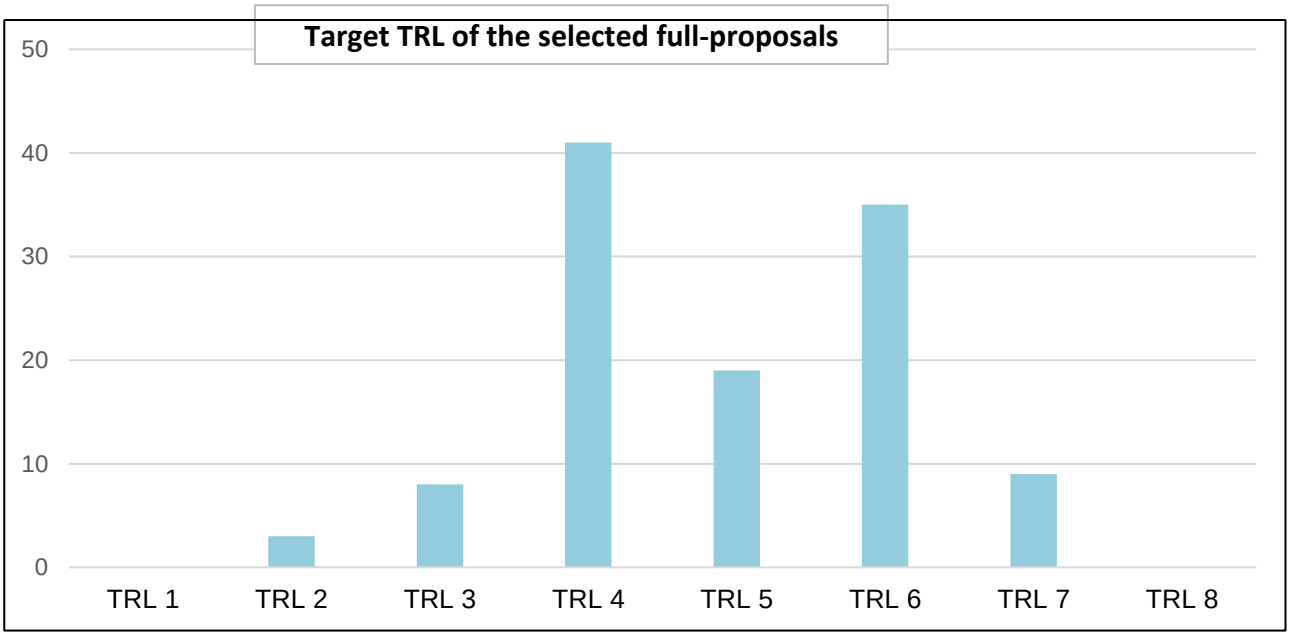

Figure 46: Selected full-proposals: number of applicants per target Technology Readiness Level.

The requested funding of selected full-proposals per funding organisation is illustrated in Fig. 47.

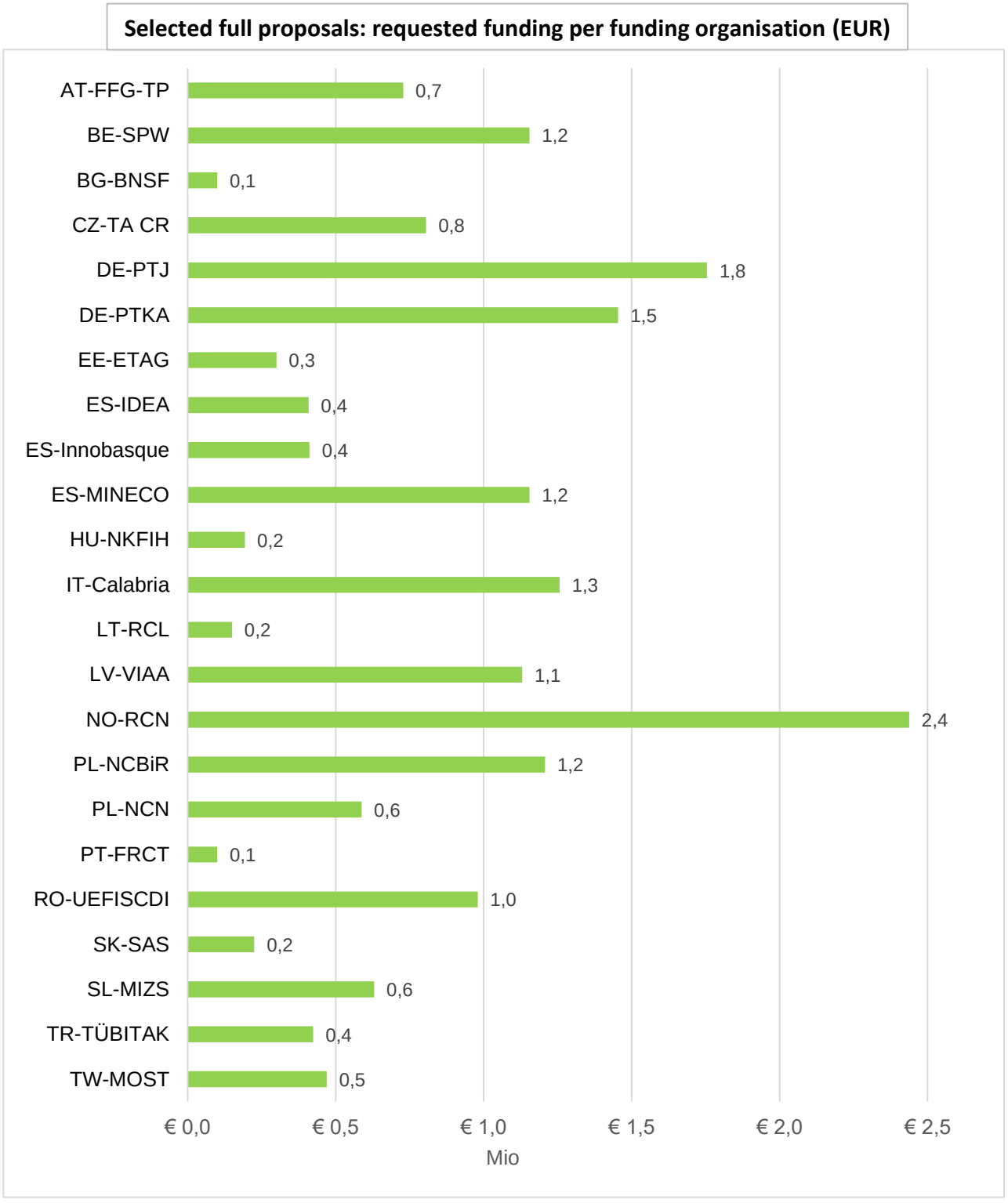

Figure 47: Selected full-proposals: requested funding per funding organisation (EUR).

The distribution of applicants of successful proposals per topic and per country is shown in Fig. 48.

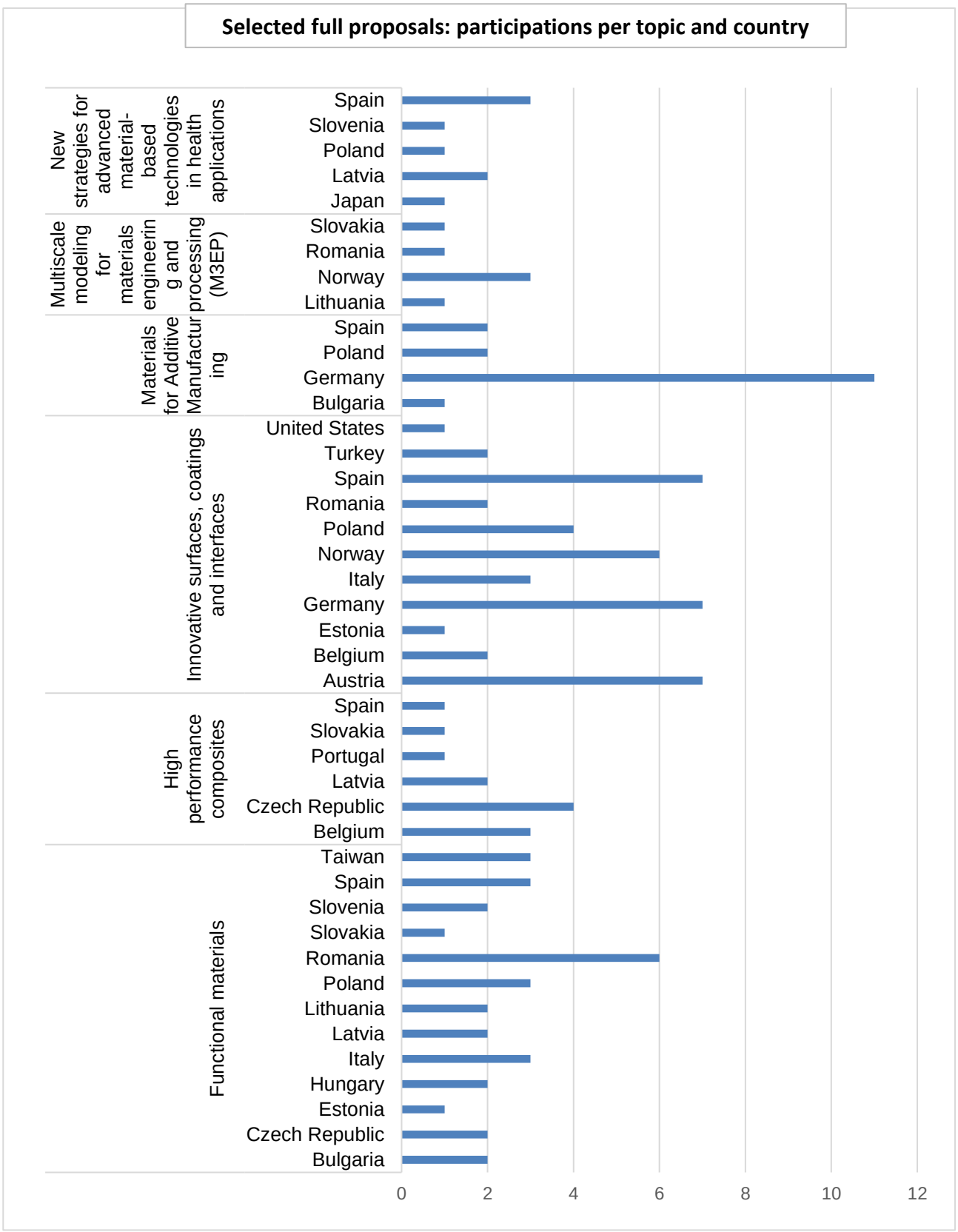

Figure 48: Number of applicants in selected full-proposals per topic and country

Network analysis Call 2018

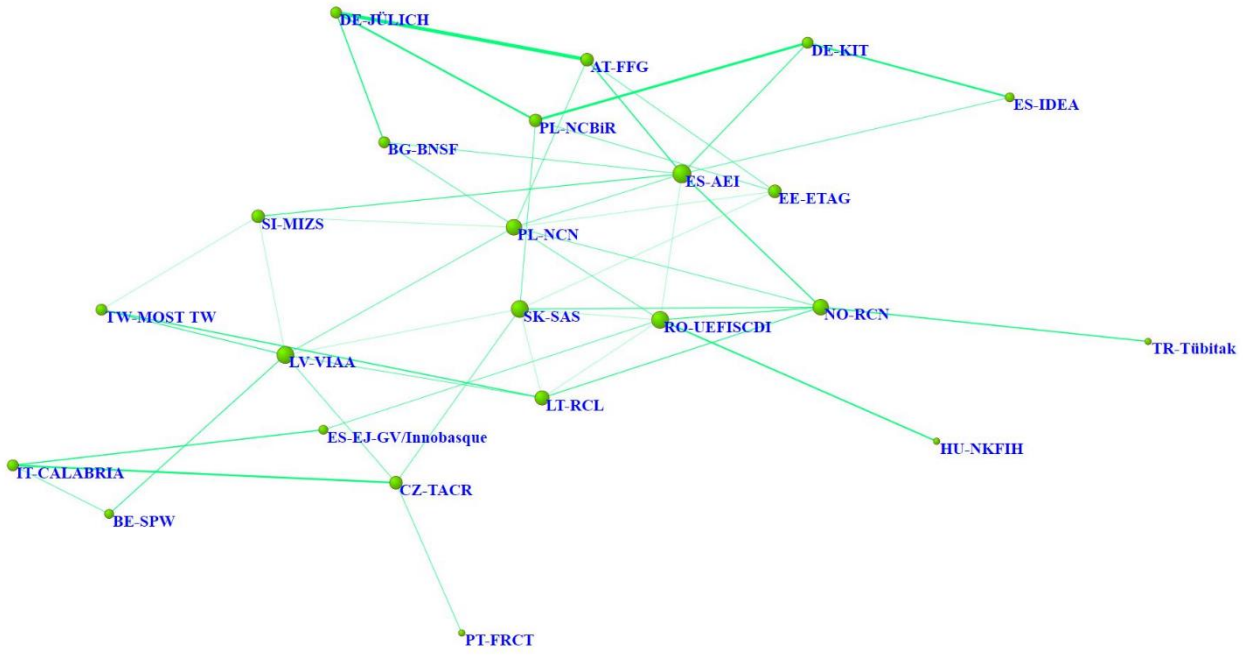

Figure 49: network analysis of transnational cooperation visualized via project participations. The size of the country/region corresponds to the total number of participations while the line thickness corresponds to the cooperation between countries/regions.

M-ERA.NET Call 2019

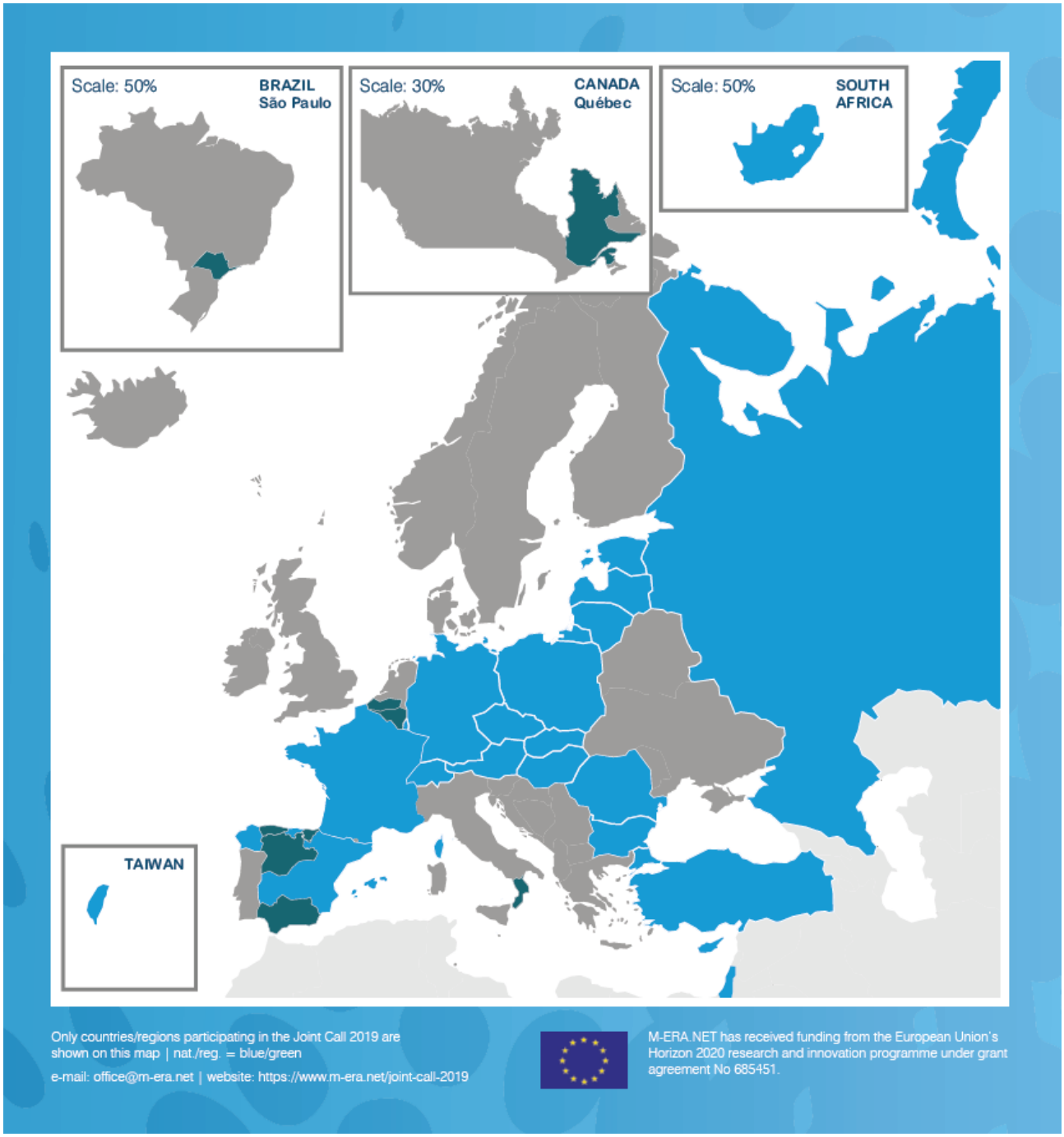

Figure 50: The M-ERA.NET Call 2019 was launched on the 19 March 2019. 35 funding agencies from 26 countries participate with a total budget of more than 24 million € national/regional funding.

Results of M-ERA.NET Call 2019

233 pre-proposals were submitted, requesting 145 Mio EUR funding in total.

126 pre-proposals were recommended for a full-proposal submission. 123 full-proposals were submitted.

101 full-proposals passed the full-proposal evaluation, requesting around 65 Mio EUR funding.

Depending on national/regional budgets and rules the national/regional funding organisations finally **selected 37 full-proposals for funding** corresponding to requested funding of 26.9 Mio EUR. This is the highest amount of selected full-proposals for funding M-ERA.NET has ever achieved in a non-cofunded call.

These projects are allocated to the call topics as follows:

- Functional materials: **13** funded projects
- High performance composites: **6** funded projects
- Innovative surfaces, coatings and interfaces: **10** funded projects
- Materials for Additive Manufacturing: **4** funded projects
- Modeling for materials engineering and processing: no project to be funded
- New strategies for advanced material-based technologies in health applications: **4** funded projects

The total success rate (selected full-proposals vs total submitted pre-proposals) is 15.9 % (Fig. 51). For the different topics the rates of success vary:

Functional materials	16,0%
High performance composites	15,0%
Innovative surfaces, coatings and interfaces	18,2%
Materials for Additive Manufacturing	15,4%
Modeling for materials engineering and processing	0%
New strategies for advanced material-based technologies in health applications	23,5%

The success rate for the second stage (selected full-proposals vs. total submitted full-proposals) is 30.1 %.

Functional materials	32,5%
High performance composites	31,6%
Innovative surfaces, coatings and interfaces	31,3%
Materials for Additive Manufacturing	23,5%
Modeling for materials engineering and processing	0%
New strategies for advanced material-based technologies in health applications	44,4%

The success rates (selected full-proposals vs total submitted pre-proposals) per organisation type are shown in Fig. 52. The success rate for universities is 14.2%, for research organisation is 16.6%, for SMEs17.1%, and for large companies 17.5%.

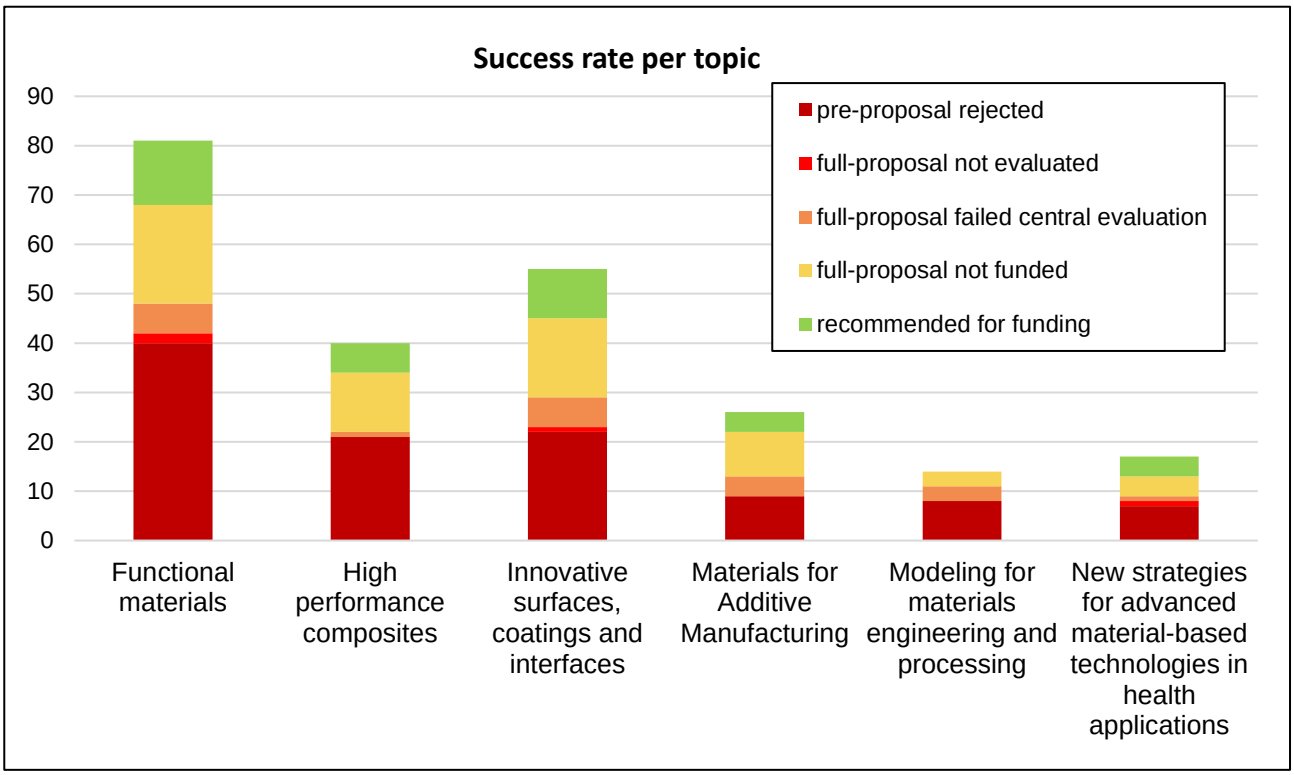

Figure 51: Number of participations: selected full-proposals compared to rejected pre-proposals for all six call topics.

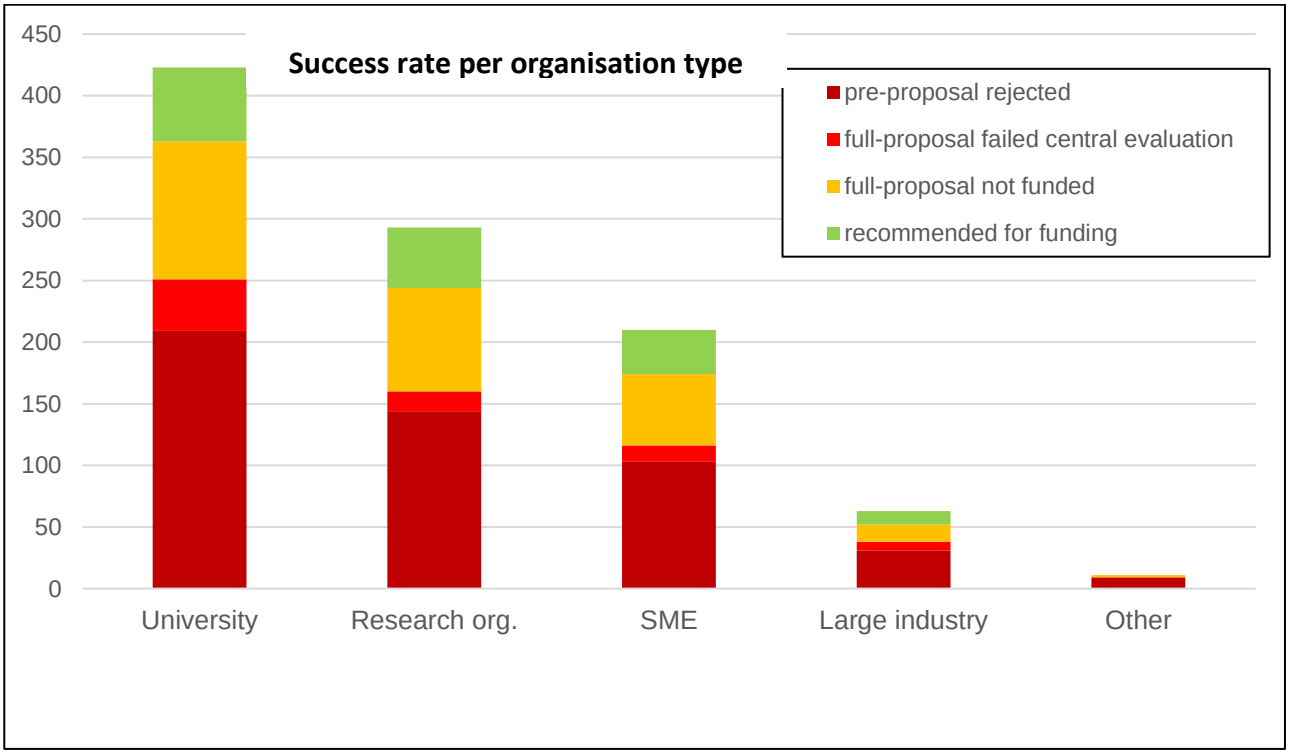

Figure 52: Number of participations: selected full-proposals compared to rejected proposals for all organisation types.

The success rates per individual national/regional funding organisation (number of selected full-proposals vs number of submitted proposals) are shown in Fig. 53.

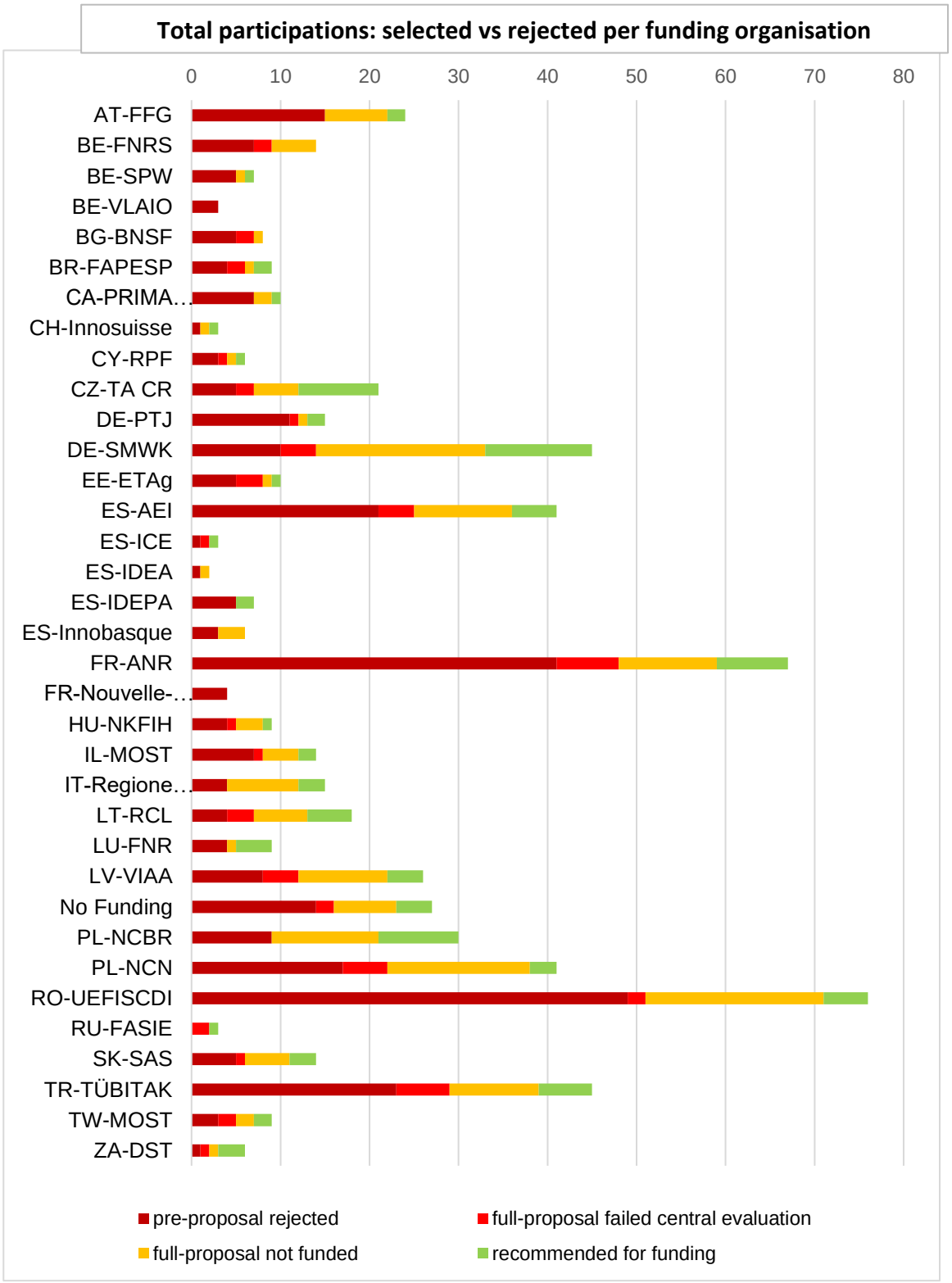

Figure 53: Total number of participations: success rate from pre-proposal phase to selected full-proposals.

The total project volumes and corresponding requested funding per call topic are shown in Fig. 54.

The topic with the highest amount of requested funding is “functional materials” with 8.9 Mio EUR. This is followed by the topic “innovative surfaces, coatings and interfaces” with 7.7 Mio EUR. For the topics “High performance composites”, “Materials for Additive Manufacturing” and “New strategies for advanced material-based technologies in health applications” 3.7 Mio EUR, 3.6 Mio EUR and 3.1 Mio EUR funding are requested, respectively. Unfortunately not a single project could be funded in the topic “Multiscale modelling for materials engineering and processing.

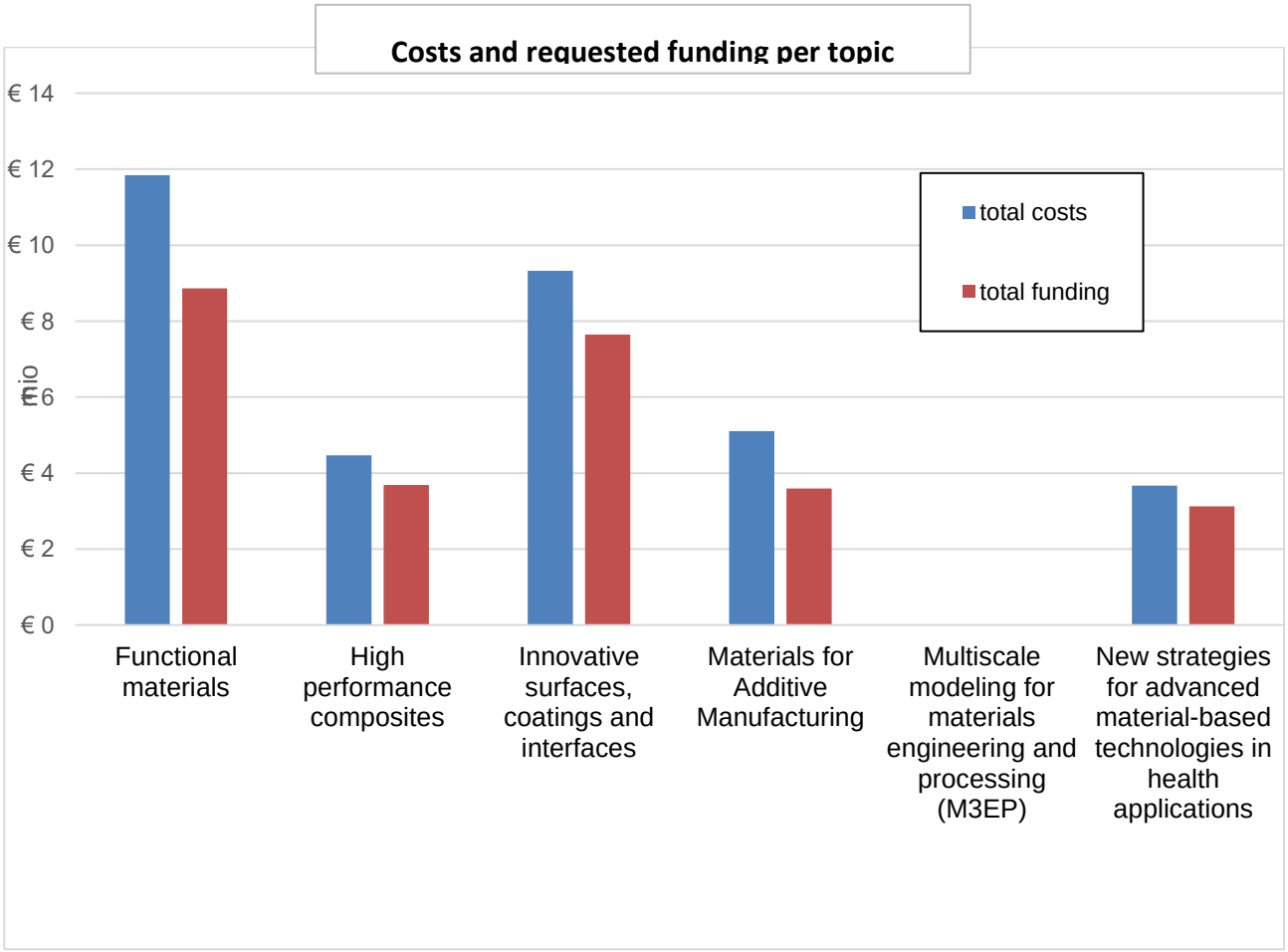

Figure 54: Selected full-proposals: total project volumes and requested funding (EUR) per call topic.

The distribution of total project costs and requested funding per organisation type is shown in Fig 55.

In the selected full-proposals research organisations (11.8 Mio EUR) and universities (10.3 Mio EUR)request the highest amount of funding. A small ratio of 18 % of the total funding is requested by enterprises: 3.6 Mio EUR funding by SMEs and 1.3 Mio EUR funding by large enterprises.

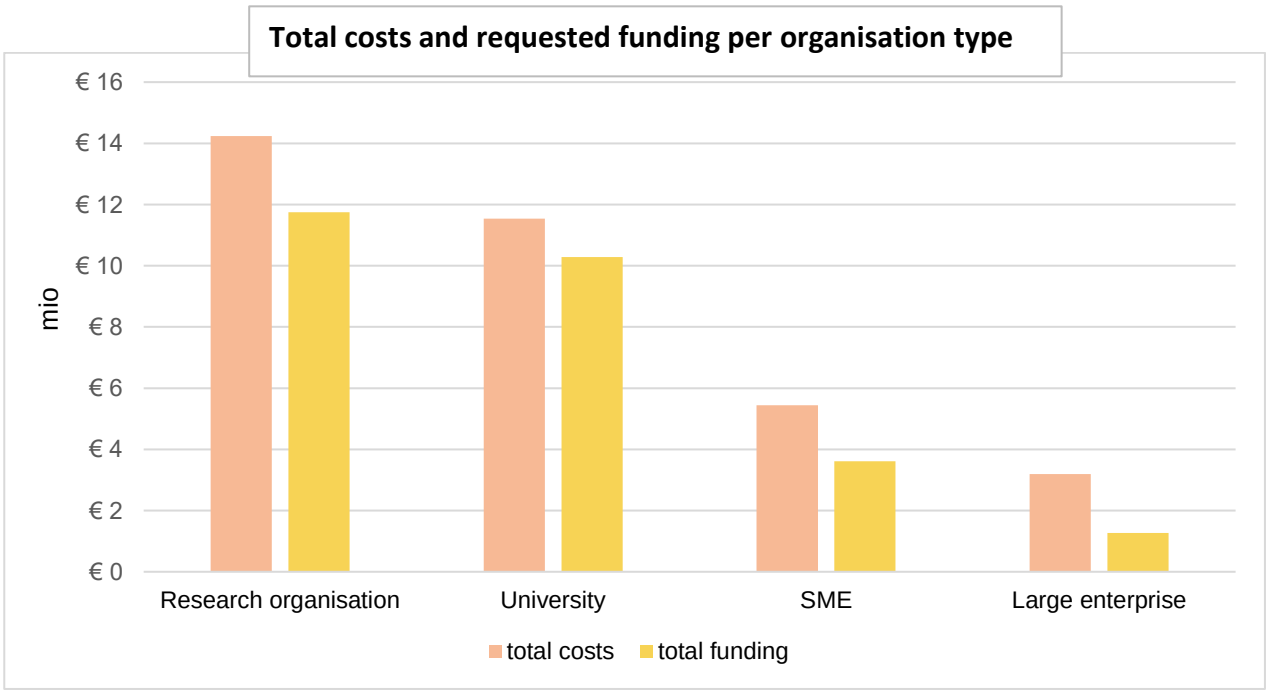

Figure 55: Selected full-proposals: total requested funding and total planned costs (EUR) per organisation type.

Out of 37 recommended projects, the majority of the coordinators are from research organisations (16projects) and universities (16 projects). Four projects are coordinated by SMEs and one project is coordinated by a large company (Fig. 56).

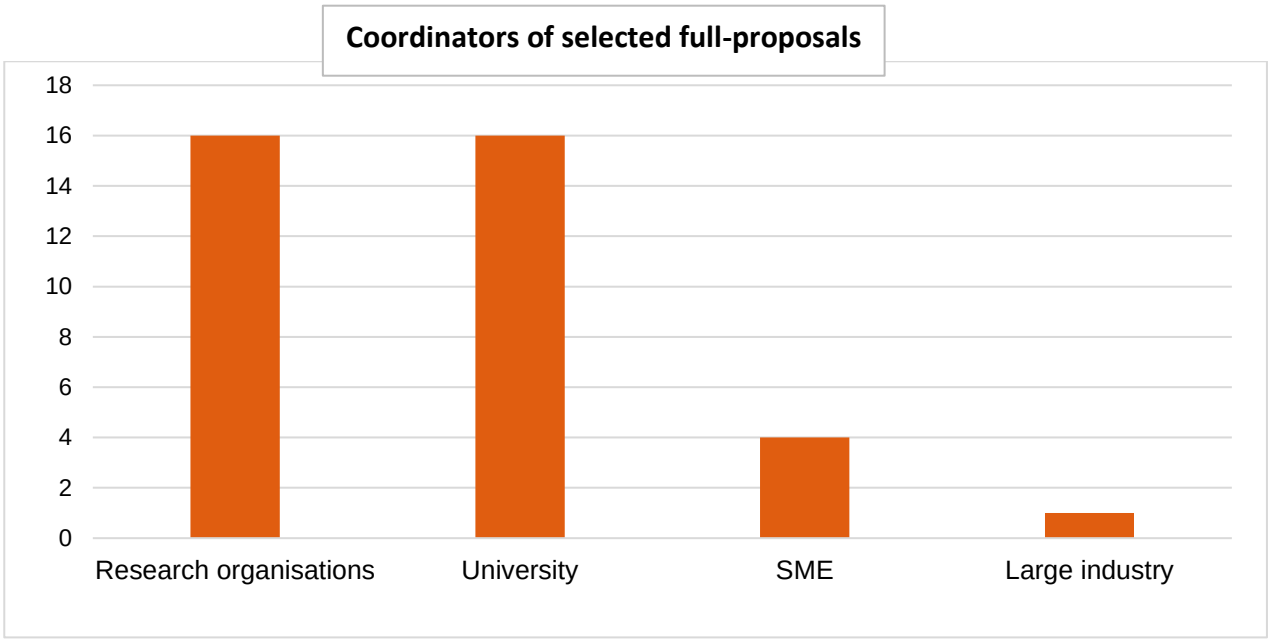

Figure 56: Selected full-proposals: number of coordinators per organisation type.

The selected projects start from Technology Readiness Level (TRL) 1 (basic principles observed) to TRL 5 (technology validated in relevant environment) (Fig. 57).

Most of them start with TRL 2 (technology concept formulated) or TRL 3 (experimental proof of concept).

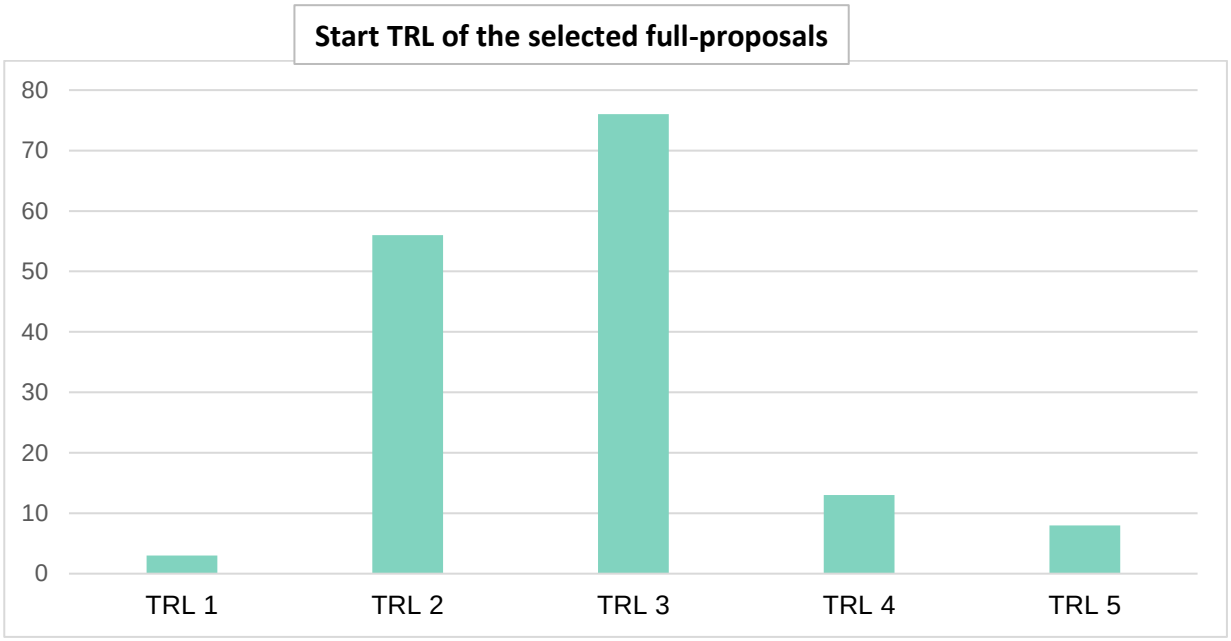

Figure 57: Selected full-proposals: number of applicants per start Technology Readiness Level.

The TRL targeted on the end of the project are between TRL 3 and TRL 7 (system prototype demonstration in operational environment), see Fig. 58.

Most projects indicate a two or three step advance of the TRL, resulting in a broad distribution of the End-TRL of between TRL 4 (Technology validated in lab) and TRL 6 (technology demonstrated in relevant environment).

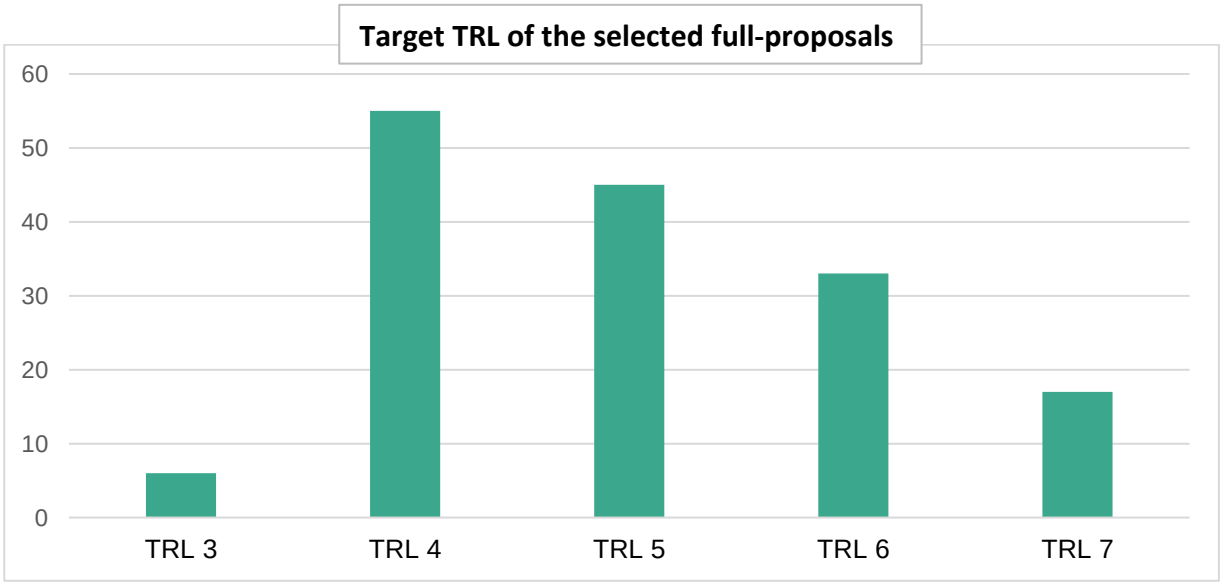

Figure 58: Selected full-proposals: number of applicants per target Technology Readiness Level.

The requested funding of selected full-proposals per funding organisation is illustrated in Fig. 59.

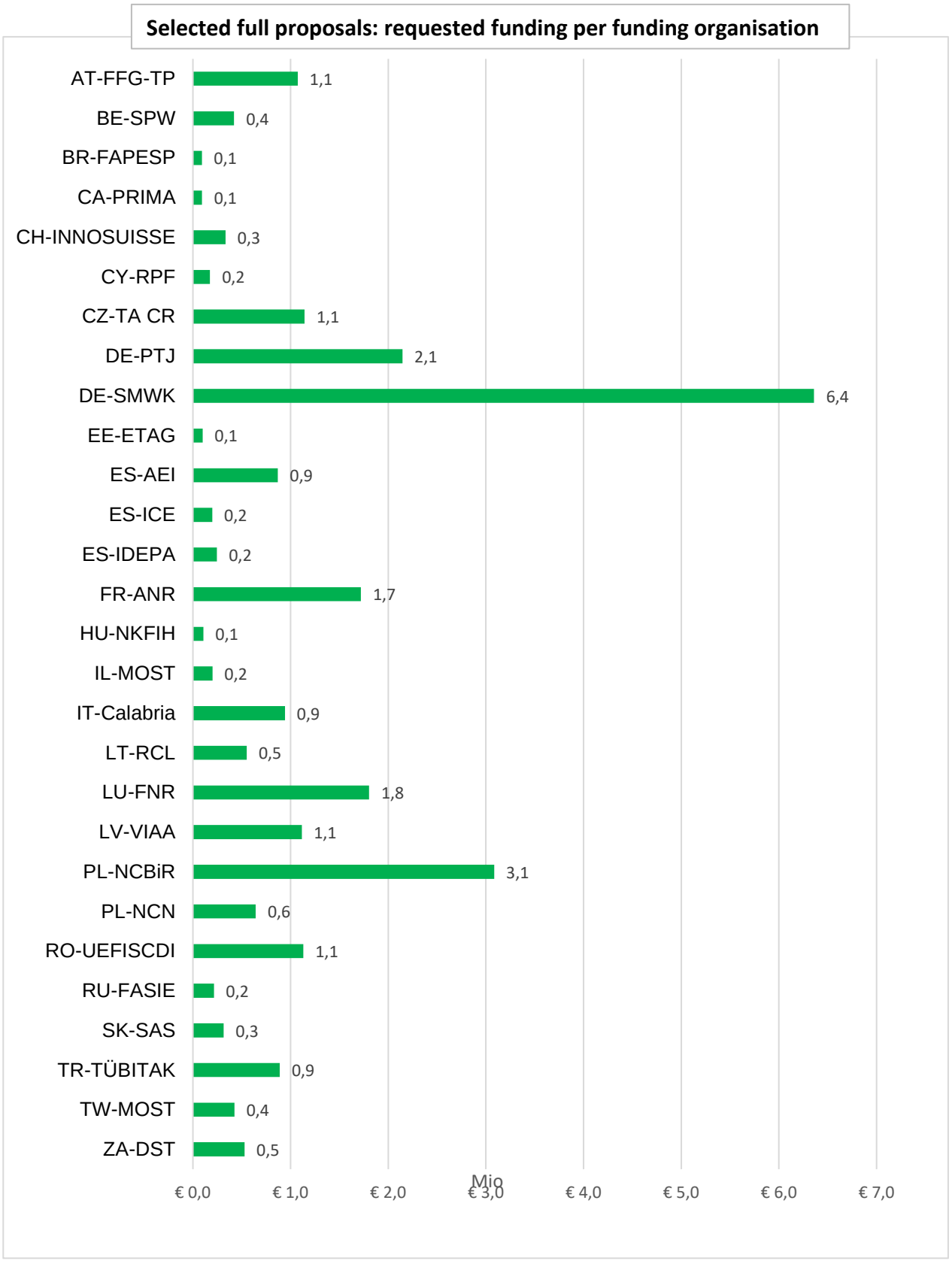

Figure 59: Selected full-proposals: requested funding per funding organisation (EUR).

Fig. 60 shows the distribution of applicants of successful proposals per topic and per country.

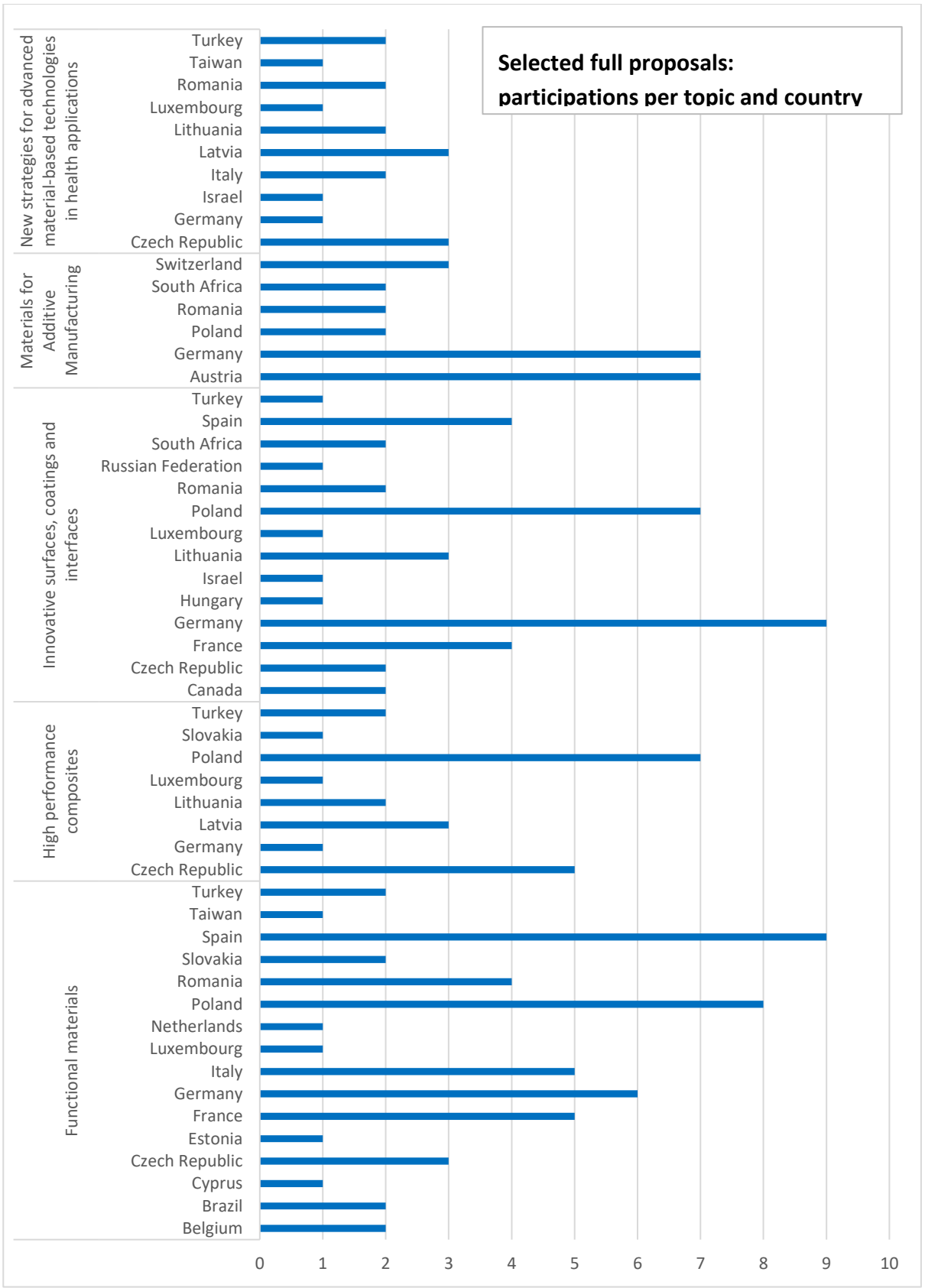

Figure 60: Number of applicants in selected full-proposals per topic and country

Network analysis Call 2019

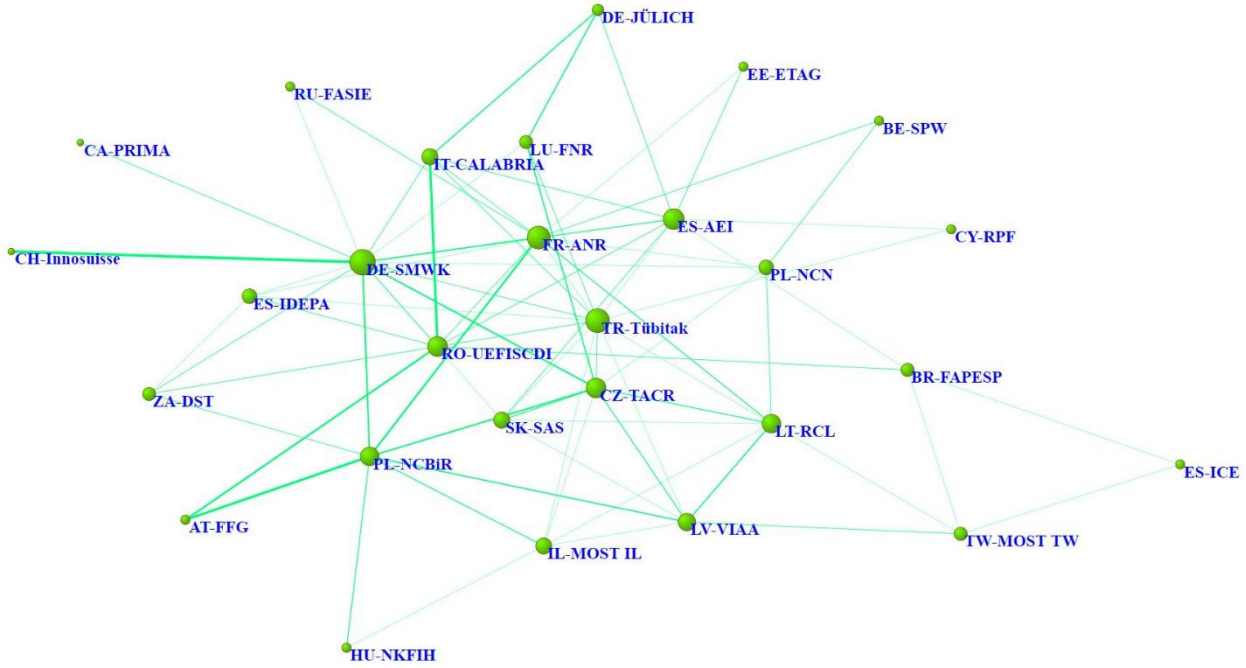

Figure 61: network analysis of transnational cooperation visualized via project participations. The size of the country/region corresponds to the total number of participations while the line thickness corresponds to the cooperation between countries/regions.

M-ERA.NET Call 2020

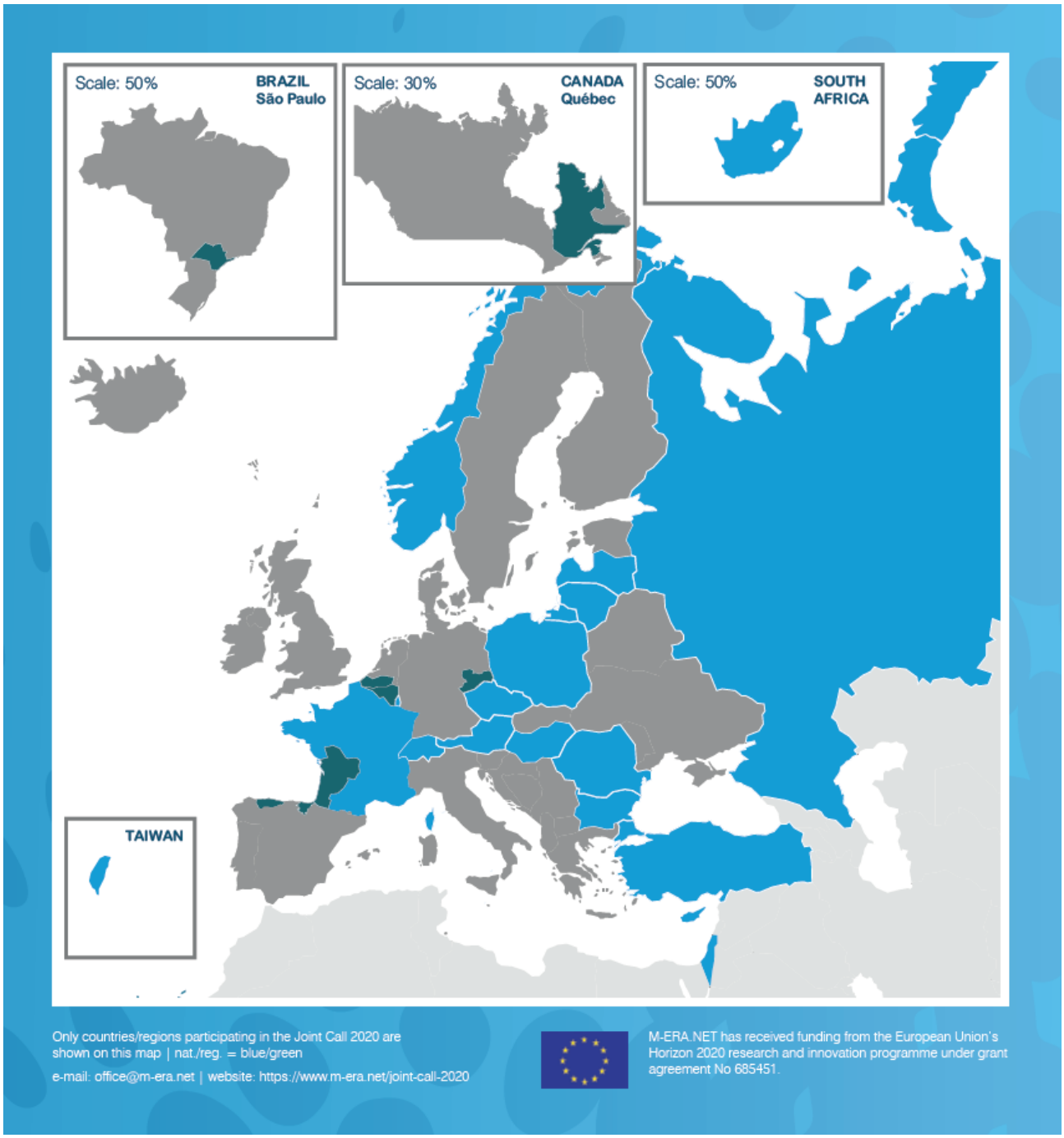

Figure 62: The M-ERA.NET Call 2020 was launched on 17 March 2020. 28 funding agencies from 22 countries participate with a total budget of more than 20 million € national/regional funding.

Results of M-ERA.NET Call 2020

236 pre-proposals were submitted, requesting 153 Mio EUR funding in total.

146 pre-proposals were recommended for a full-proposal submission. 144 full-proposals were submitted.

119 full-proposals passed the full-proposal evaluation, requesting around 86 Mio EUR funding.

Depending on national/regional budgets and rules the national/regional funding organisations finally **selected 42 full-proposals for funding** corresponding to requested funding of 32.3 Mio EUR. This is the highest amount of selected full-proposals for funding M-ERA.NET has ever achieved in a non-cofunded call.

These projects are allocated to the call topics as follows:

- Functional materials: **12** funded projects
- High performance composites: **7** funded projects
- Innovative surfaces, coatings and interfaces: **10** funded projects
- Materials for Additive Manufacturing: **8** funded projects
- Modeling for materials engineering and processing: **4** funded projects
- New strategies for advanced material-based technologies in health applications: **1** funded project

The total success rate (selected full-proposals vs total submitted pre-proposals) is 16.6 % (Fig. 63). For the different topics the rates of success vary:

Functional materials	19.0%
High performance composites	14.3%
Innovative surfaces, coatings and interfaces	22.2%
Materials for Additive Manufacturing	19.0%
Modeling for materials engineering and processing	18.2%
New strategies for advanced material-based technologies in health applications	6.7%

The success rate for the second stage (selected full-proposals vs. total submitted full-proposals) is 28.4 %.

Functional materials	30.0%
High performance composites	22.6%
Innovative surfaces, coatings and interfaces	38.5%
Materials for Additive Manufacturing	29.6%
Modeling for materials engineering and processing	25.0%
New strategies for advanced material-based technologies in health applications	25.0%

The success rates (selected full-proposals vs total submitted pre-proposals) per organisation type are shown in Fig. 64. The success rate for universities is 14.6%, for research organisation is 18.8%, for SMEs19.6%, and for large companies 28.2%.

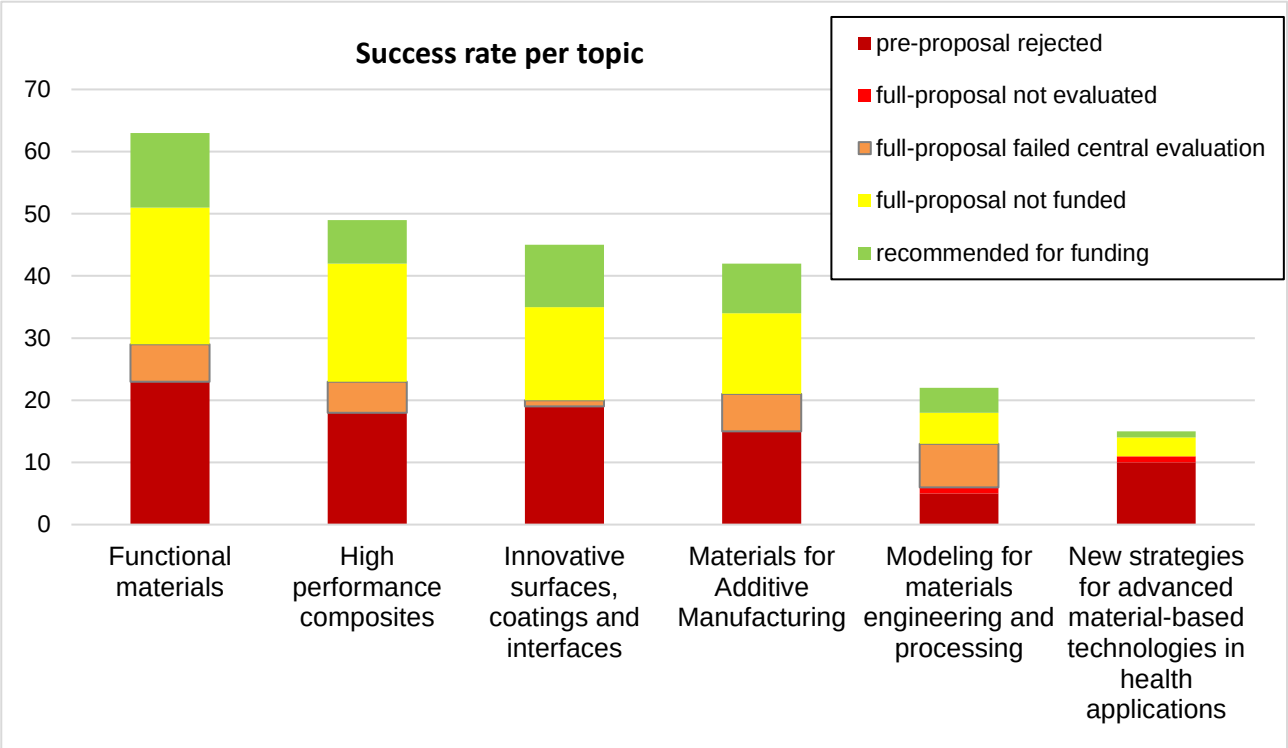

Figure 63: Number of participations: selected full-proposals compared to rejected pre-proposals for all six call topics.

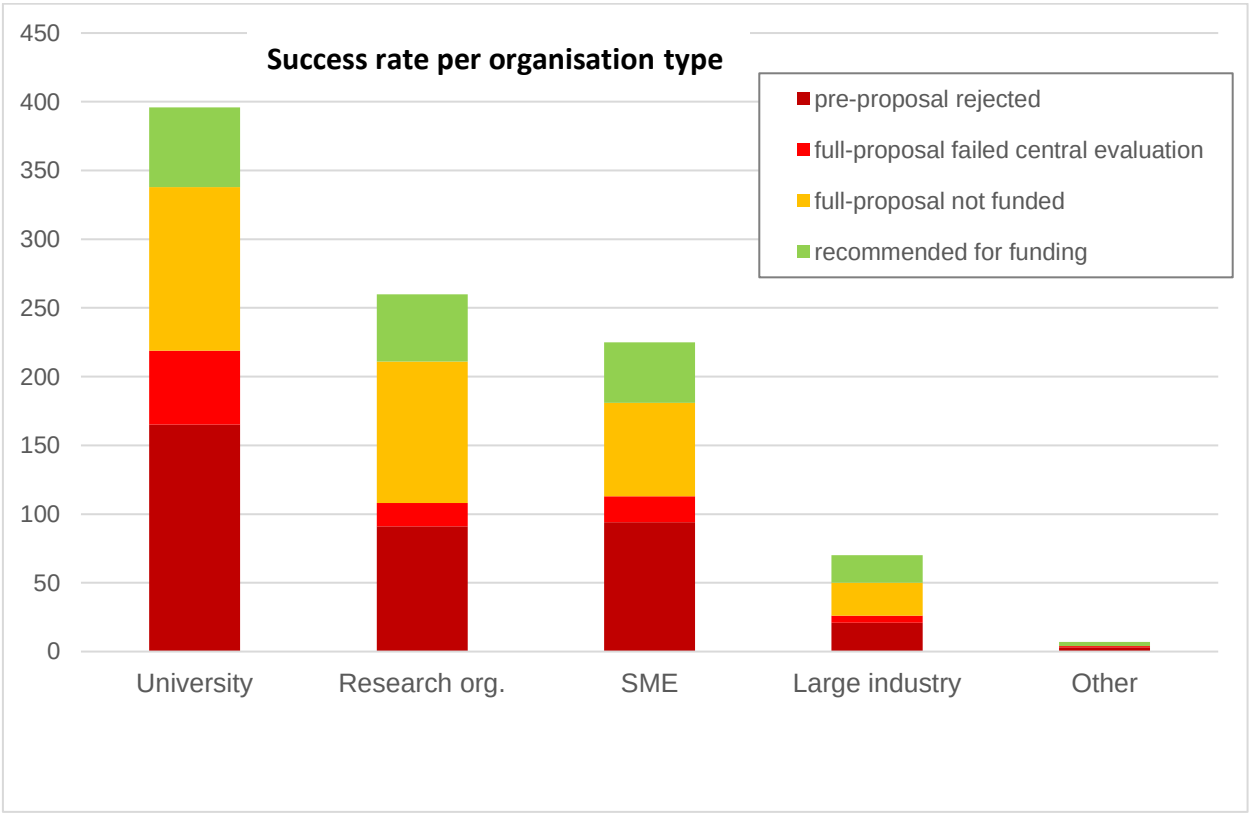

Figure 64: Number of participations: selected full-proposals compared to rejected proposals for all organisation types.

The success rates per individual national/regional funding organisation (number of selected full-proposals vs number of submitted proposals) are shown in Fig. 65.

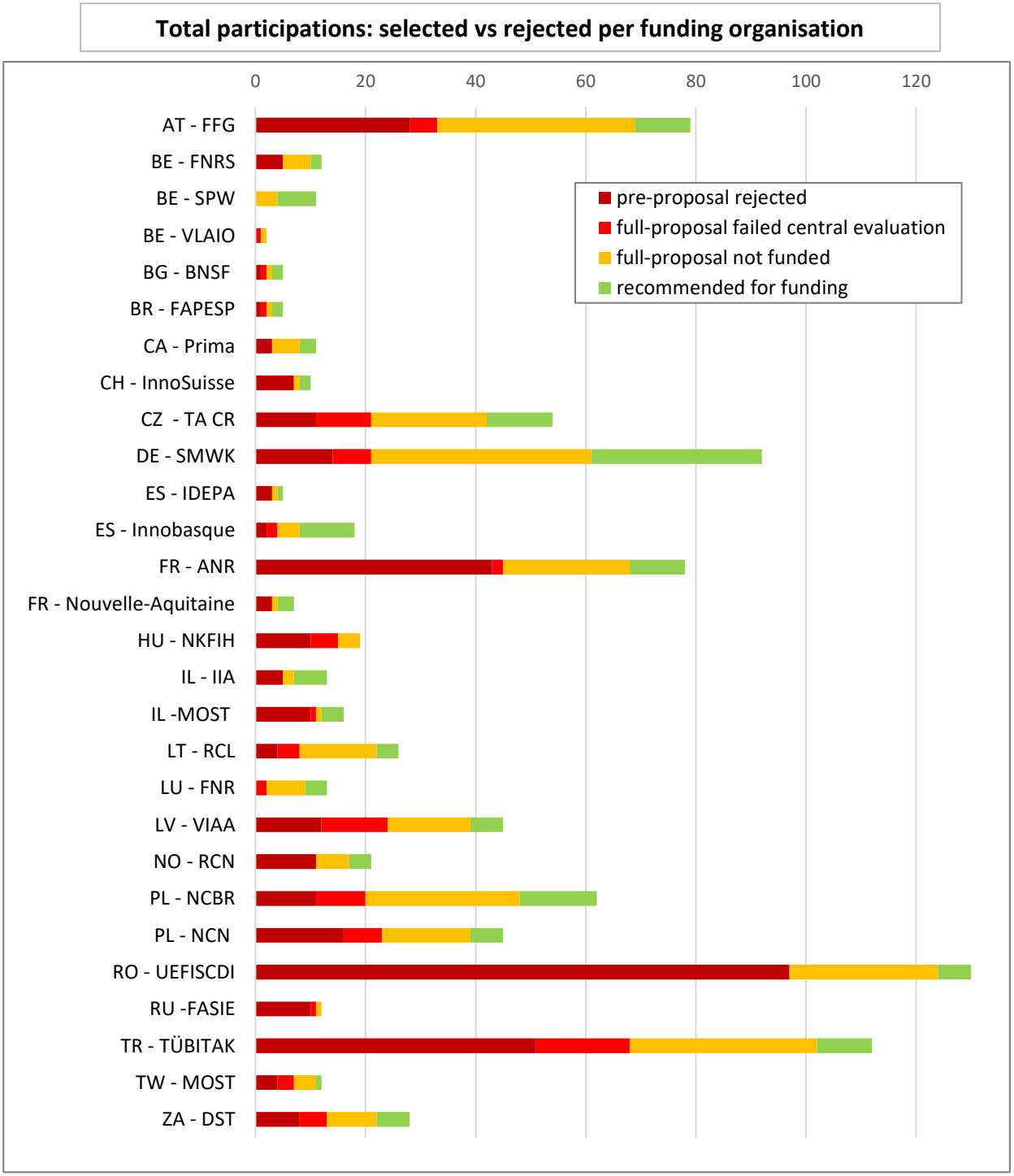

Figure 65: Total number of participations: success rate from pre-proposal phase to selected full-proposals.

The total project volumes and corresponding requested funding per call topic are shown in Fig. 66.

The topic with the highest amount of requested funding is “functional materials” with 9.3 Mio EUR. This is followed by the topic “Innovative surfaces, coatings and interfaces” with 7.7 Mio EUR. For the topics “High performance composites”, “Materials for Additive Manufacturing”, “Multiscale modelling for materials engineering and processing Multiscale modelling for materials engineering and processing” and “New strategies for advanced material-based technologies in health applications” 5.5 Mio EUR, 5.7 Mio EUR, 2.6 Mio EUR and 1.2 Mio EUR funding are requested, respectively.

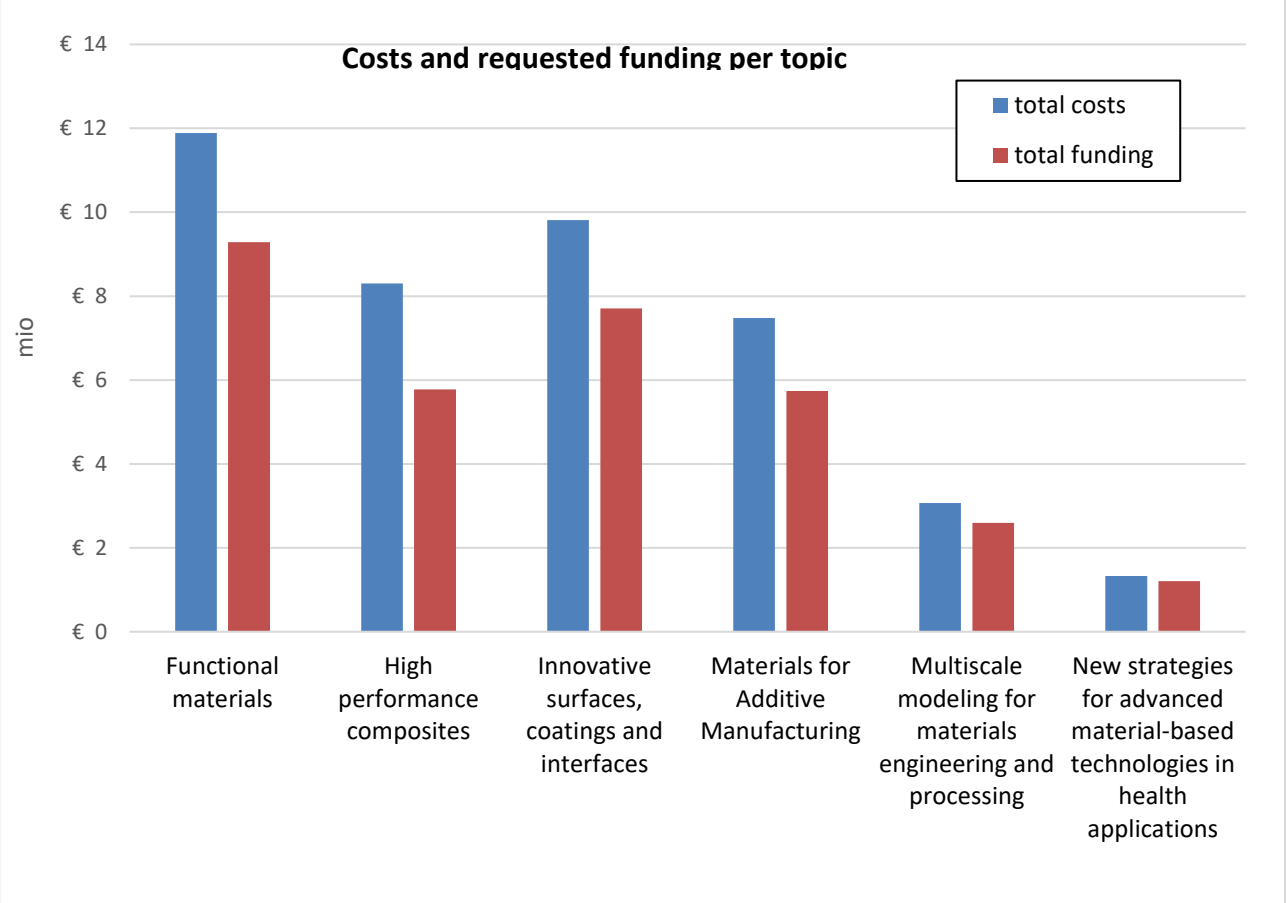

Figure 66: Selected full-proposals: total project volumes and requested funding (EUR) per call topic.

The distribution of total project costs and requested funding per organisation type is shown in Fig 67.

In the selected full-proposals research organisations (13.3 Mio EUR) and universities (11.1 Mio EUR)request the highest amount of funding. A small ratio of 24 % of the total funding is requested by enterprises and other organisations: 16,0 Mio EUR funding by SMEs, 6.5 Mio EUR funding by large enterprises and 0.6 Mio EUR funding by others.

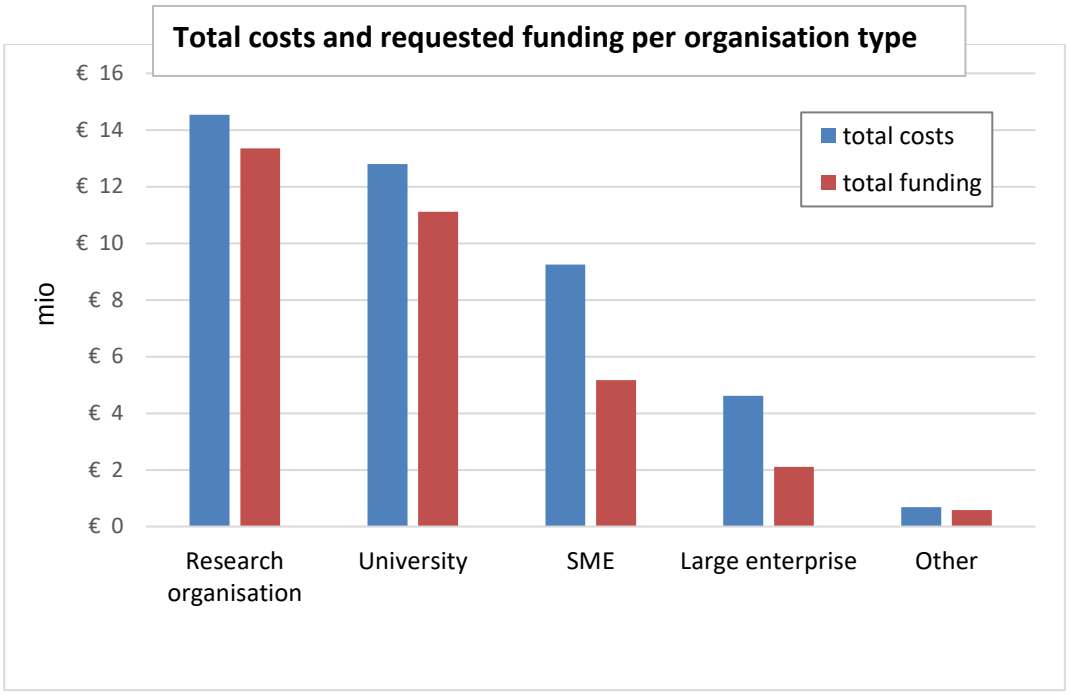

Figure 67: Selected full-proposals: total requested funding and total planned costs (EUR) per organisation type.

Out of 42 recommended projects, the majority of the coordinators are from research organisations (21projects) and universities (15 projects). Three projects are coordinated by SMEs and three projects are coordinated by a large company (Fig. 68).

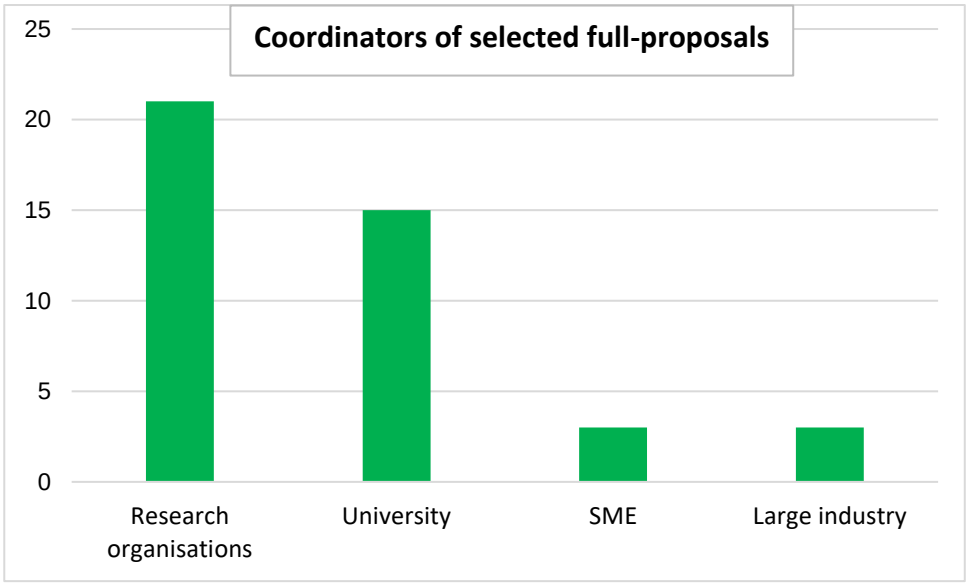

Figure 68: Selected full-proposals: number of coordinators per organisation type.

The selected projects start from Technology Readiness Level (TRL) 1 (basic principles observed) to some extent TRL 6 (technology validated in relevant environment) (Fig. 69).

Most of them start with TRL 2 (technology concept formulated) or TRL 3 (experimental proof of concept).

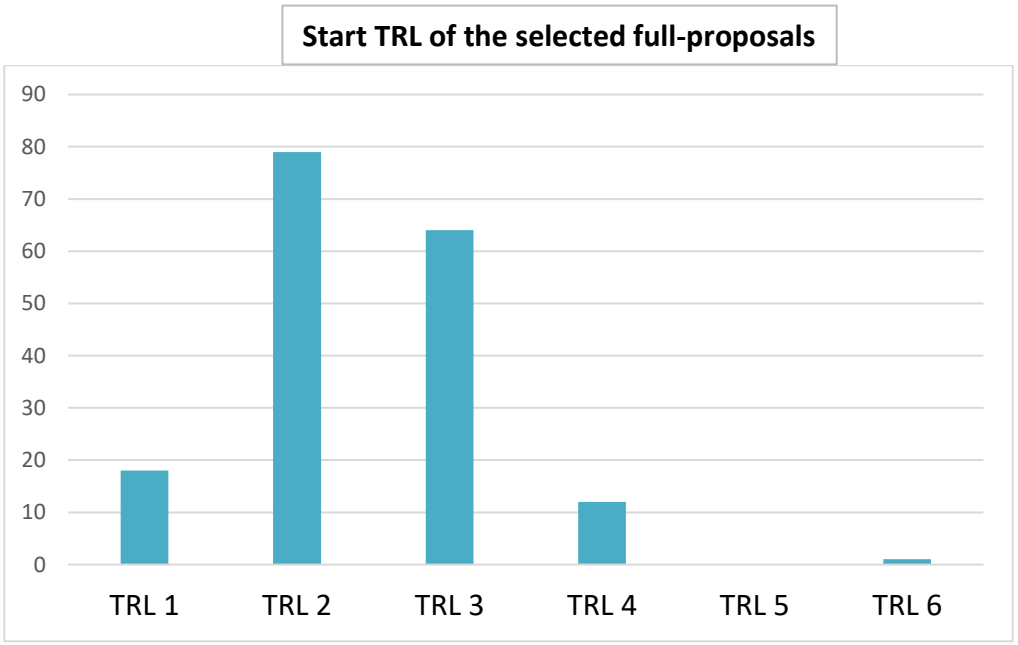

Figure 69: Selected full-proposals: number of applicants per start Technology Readiness Level.

The TRL targeted on the end of the project are between TRL 3 and TRL 7 (system prototype demonstration in operational environment), see Fig. 70.

Most projects indicate a two or three step advance of the TRL, resulting in a broad distribution of the end-TRL between TRL 4 (Technology validated in lab) and TRL 6 (technology demonstrated in relevant environment).

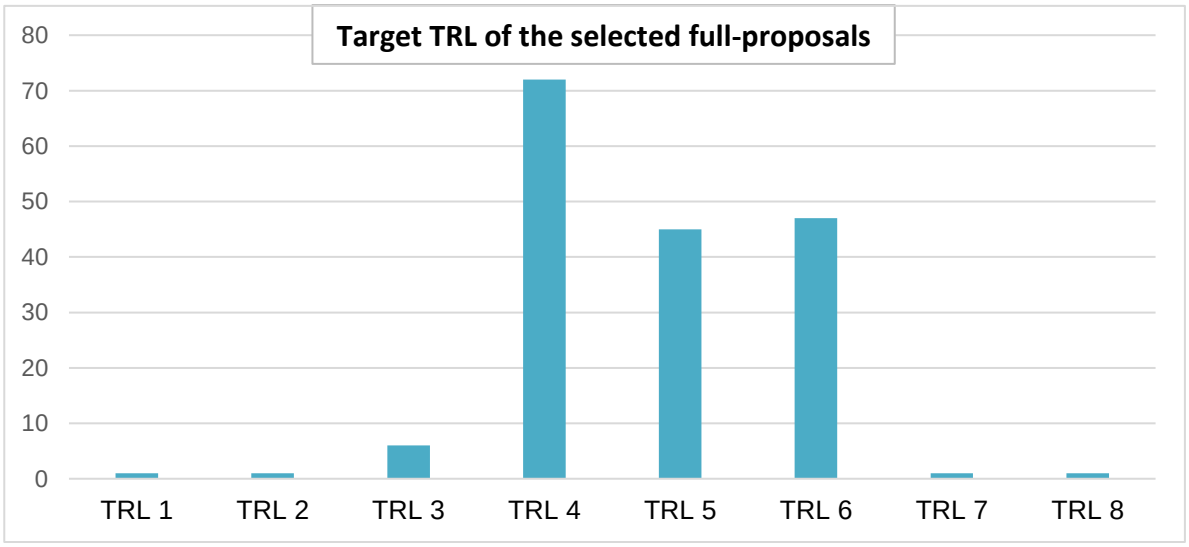

Figure 70: Selected full-proposals: number of applicants per target Technology Readiness Level.

The requested funding of selected full-proposals per funding organisation is illustrated in Fig. 71.

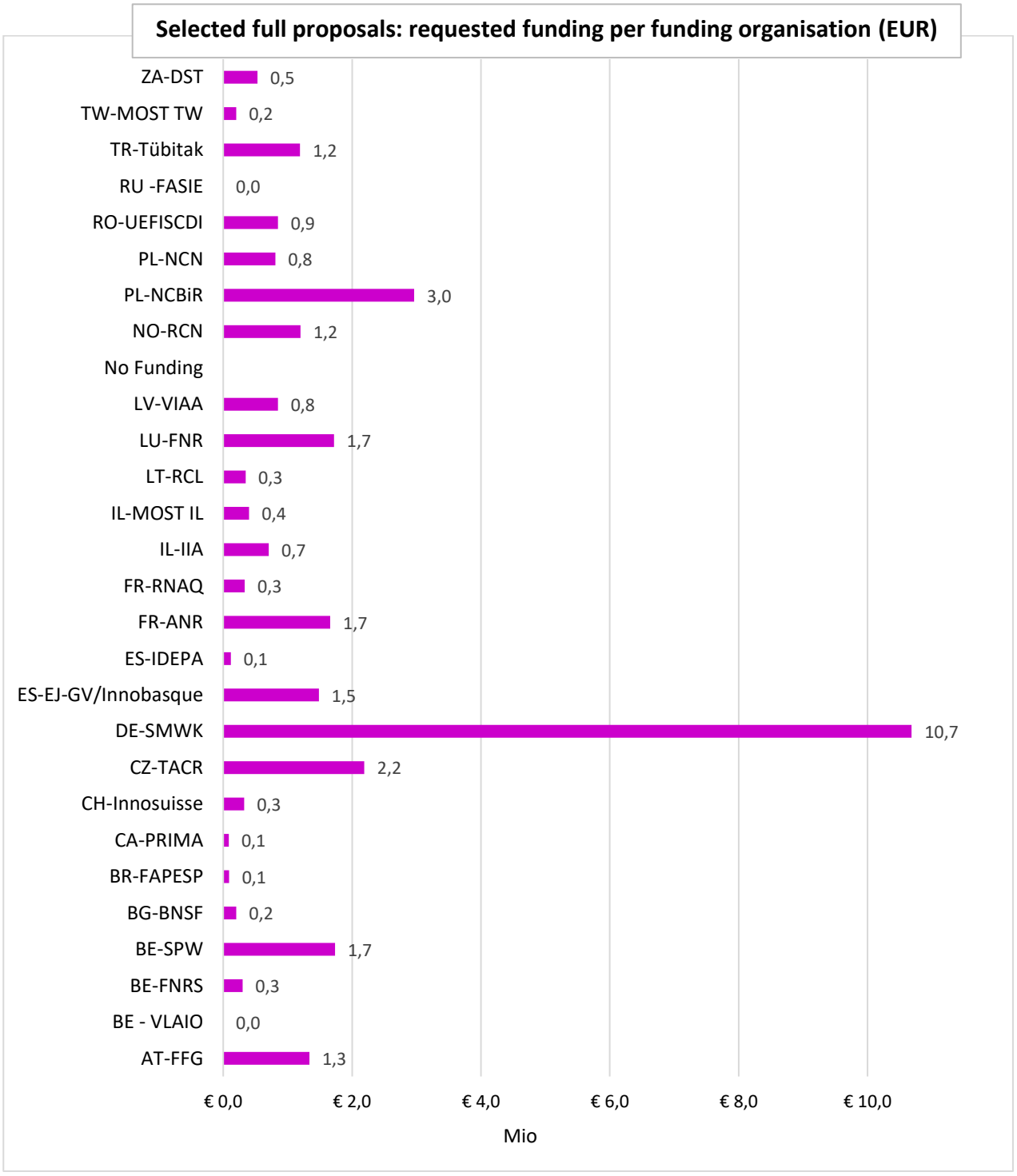

Figure 71: Selected full-proposals: requested funding per funding organisation (EUR).

Fig. 72 shows the distribution of applicants of successful full-proposals per topic and per country.

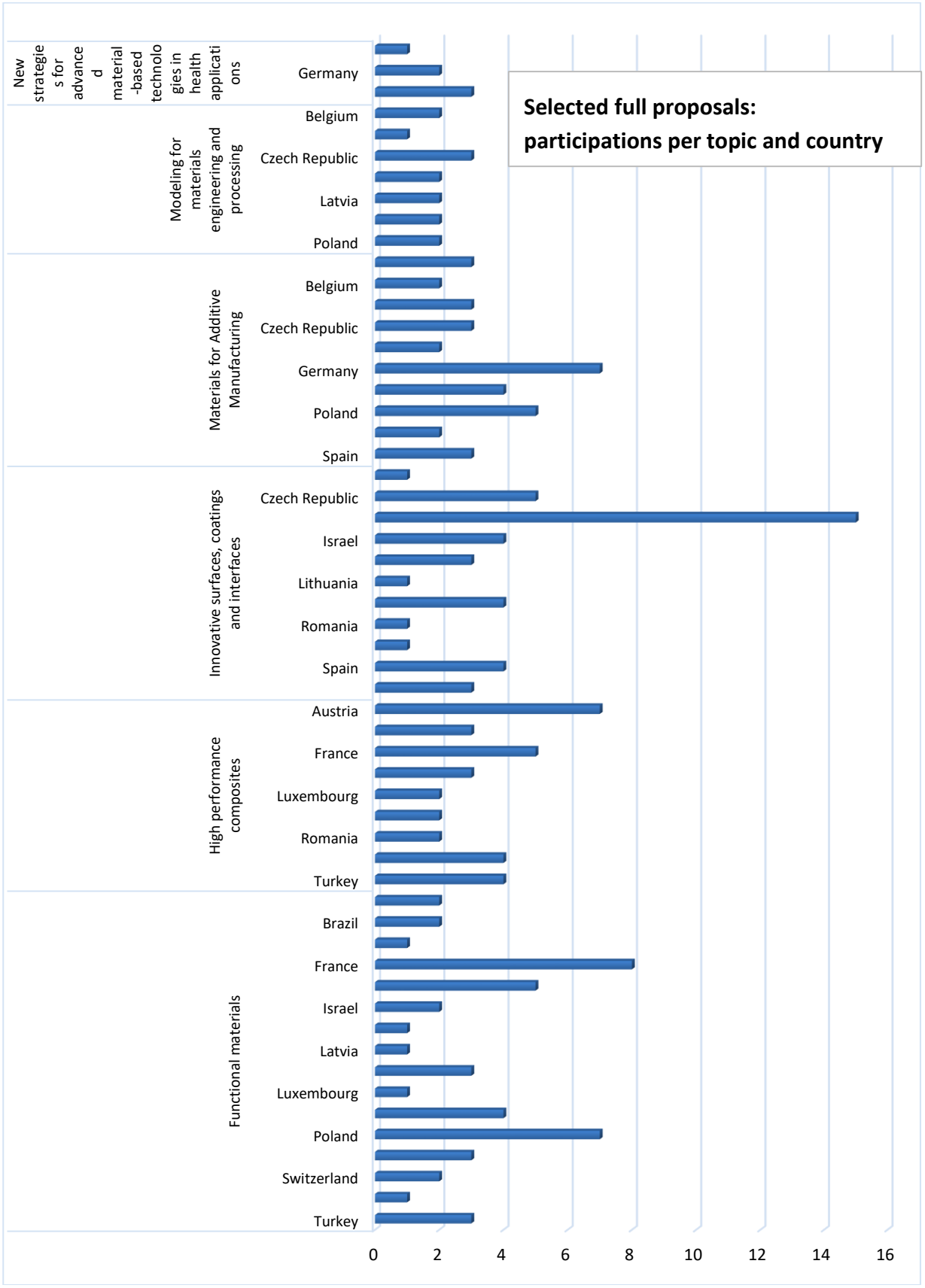

Figure 72: Number of applicants in selected full-proposals per topic and country

Network analysis Call 2020

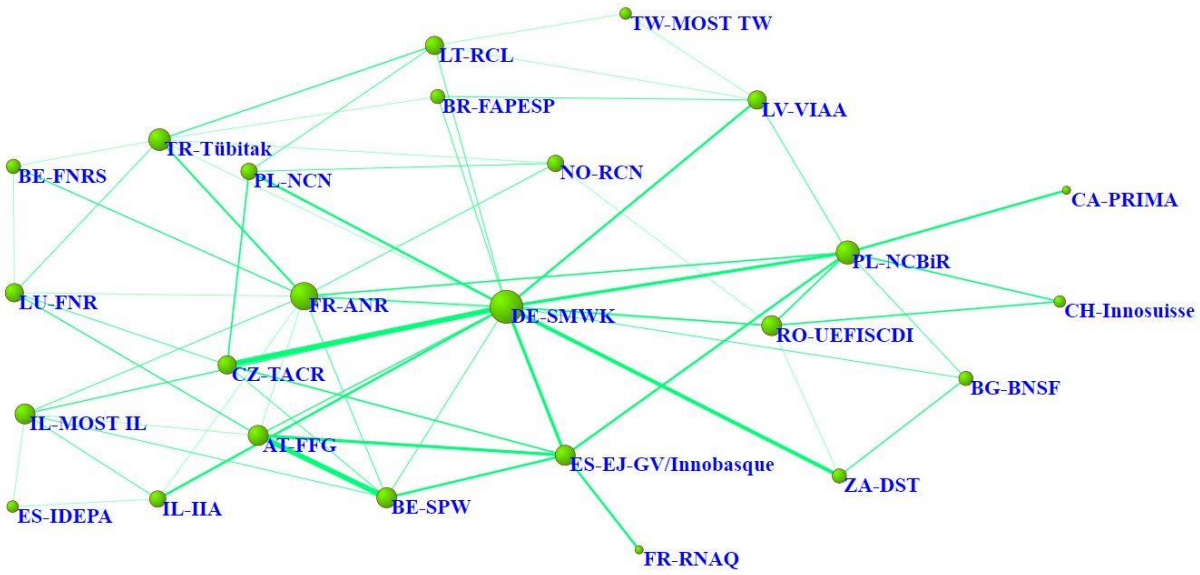

Figure 73: network analysis of transnational cooperation visualized via project participations. The size of the country/region corresponds to the total number of participations while the line thickness corresponds to the cooperation between countries/regions.

M-era.Net

Annex

M-ERA.NET Call 2016: Funded projects

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Integrated computational materials engineering (ICME)	HEAMODELL	High entropy alloys with predictable mechanical propertiesby computational modelling	4	NWO (Netherlands), UEFISCDI (Romania), MIZS (Slovenia)
Integrated computational materials engineering (ICME)	MuMo4PEC	Multiscale Modeling and Design of Photo-Electrochemical Interfaces	4	NOW (Netherlands), MINECO (Spain), NCN (Poland)
Innovative surfaces, coatingsand interfaces	ALD4MAX	Atomic Layer Deposition For tailored bottom-top growth of MAX and MXene films	5	FCT (Portugal), EJ-GV/Innobasque (Spain), MINECO (Spain), NWO (Netherlands), NCN (Poland),
Innovative surfaces, coatingsand interfaces	CellColor	Fabricating cellulose nanocomposites for structural coloration	7	RCN (Norway), FCT (Portugal)
Innovative surfaces, coatingsand interfaces	CLEARPV	Transparent Perovskite Solar Cell	4	MOST TW (Taiwan), NKFIH/OTKA (Hungary), NWO (Netherlands)
Innovative surfaces, coatingsand interfaces	GRAFOOD	Active GRAphene based FOOD packaging systems for a modern society	6	UEFISCDI (Romania), MIUR (Italy), MIZS (Slovenia), MINECO (Spain)
Innovative surfaces, coatingsand interfaces	GreenCOAT	Green high-performance and low-friction interfaces tailored by the reactivity of novel DLC coatings and ionic liquids	3	MIZS (Slovenia), FCT (Portugal), RCN (Norway)
Innovative surfaces, coatingsand interfaces	HEI-Coat	Hard Eco Innovative Coatings	5	CALABRIA (Italy), Region ALPC (France), DGo6 (Belgium)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Innovative surfaces, coatingsand interfaces	INSURFCAST	Innovative Surfaces for Superalloys Casting Processes	4	MIUR (Italy), NCBiR (Poland),
Innovative surfaces, coatingsand interfaces	MaSNEC	Material Synthesis in Non-Equilibrium Conditions	4	FNRS (Belgium), NKFIH/OTKA (Hungary), MINECO (Spain)
Innovative surfaces, coatingsand interfaces	NESSIE	New Structured Substrates for Downstream Processing of Complex Biopharmaceuticals	5	RCN (Norway), FCT (Portugal), FFGBP (Austria)
Innovative surfaces, coatingsand interfaces	NICRRE	Innovative Ni-Cr-Re coatings with enhanced corrosion and erosion resistance for high temperature applications in power generation industry	5	NCBiR (Poland), SAS (Slovakia)
Innovative surfaces, coatingsand interfaces	SIOX	Engineering of silicon-oxide interface using the pulsed-laser deposition technique	3	MIZS (Slovenia), NWO (Netherlands),FNRS (Belgium)
Innovative surfaces, coatingsand interfaces	TANDEM	Bactericidal hybrid surfaces against Gram-negative and Gram-positive pathogenic bacteria: Smart Tools for Wastewater Purification	3	UEFISCDI (Romania), RCN (Norway)
Innovative surfaces, coatingsand interfaces	UltraGraf	Harnessing third-harmonic generation in graphene-coated optics - new devices for ultrafast pulse measurement and frequency upconversion	4	FCT (Portugal), MINECO (Spain)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Innovative surfaces, coatingsand interfaces	WABASELCOAT	WAter BAsed SELective COATingsfor intelligent façade collectors	4	MIZS (Slovenia), RCN (Norway), RPF (Cyprus)
High performance synthetic and biobased composites	BIOFOODPACK	Biocomposite Packaging for Active Preservation of Food	7	FCT (Portugal), NCBiR (Poland), RPF (Cyprus), No Funding (Portugal)
High performance synthetic and biobased composites	COMPIO	Eco-friendly nanoclay, nanocellulose and MIP composites for microbial formulations	5	FFG TP (Austria), Tübitak (Turkey), UEFISCDI (Romania), MATIMOP (Israel)
High performance synthetic and biobased composites	HyBiCo	High performance short-fibre biobased hybrid composites for injection moulding	6	NCBiR (Poland), VIAA (Latvia), RCL (Lithuania),
High performance synthetic and biobased composites	POLYMAGIC	Biodegradable PLA composites reinforced with micro and nano Mg particles: optimisation of processing and design, and scale-up of temporary implants	5	MINECO (Spain), MIUR (Italy), FNRS (Belgium)
Functional materials	CCSRender	Energy efficient nanomodified renders with CO2-storage potential	3	RPF (Cyprus), NKFIH/OTKA (Hungary)
Functional materials	CTB Basics	CleanTechBlock - Sustainable Multi-functional Building Block Basics	3	MIZS (Slovenia), FNR (Luxembourg),ADE (Spain), FCT (Portugal)
Functional materials	GoPHy MiCO	Governing Principlesin Hydration of Mixed Conducting Oxides	4	RCN (Norway), MINECO (Spain), NCN (Poland)
Functional materials	HyMatSiRen	Hybrid materials for Si surface passivation and battery applications	3	RCN (Norway), MINECO (Spain), Tübitak (Turkey)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Functional materials	MOCO3	Novel molten carbonate/ceramic composite materials for sustainable energy technologies with CO2 capture and utilization	5	RCN (Norway), NCBiR (Poland), FCT (Portugal)
Functional materials	NanoElMem	Designing new renewable nanostructured electrodeand membrane materials for direct alkaline ethanol fuel cell	5	MIZS (Slovenia), RCN (Norway), MOST TW (Taiwan)
Functional materials	NEILLSBAT	Nanostructured Electrodes and Ionic Liquid Electrolytes for Ultra High Energy Density Lithium Sulfur Batteries	4	SFI (Ireland), JÜLICH (Germany),No Funding (Netherlands)
Functional materials	PLARASBAT	Planar architecture all solid state batteries	4	MINECO (Spain), RCL (Lithuania), MOST TW (Taiwan)
Functional materials	PNANO4BONE	Nanovectors engineered for plasma enhanced theranostics in regenerative medicine	6	FNR (Luxembourg), FNRS (Belgium), MINECO (Spain), NCN (Poland), No Funding (Luxembourg)
Functional materials	RATOCAT	Rational design of highly effective photocatalysts with atomic-level control	4	SFI (Ireland), NWO (Netherlands), MINECO (Spain)
Functional materials	THERMOSS	Sustainable Thermoelectric Modules based on Non-toxic Silicides and Sulphides for Recovery of Waste Heat to Power Generation	4	RPF (Cyprus), FCT (Portugal)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Interfaces between materials and biological hosts for health applications	BIOMB	Advanced biodegradable materials based on MgB2 resistant to microbial colonization	4	UEFISCDI (Romania), MIUR (Italy)
Interfaces between materials and biological hosts for health applications	BIOMEMBRANE	Bioengineered in vitro model of retinal pigmented epithelium of human eye	5	MIUR (Italy), FCT (Portugal), DST (South Africa), NCN (Poland), No Funding (Spain)
Interfaces between materials and biological hosts for health applications	INCIPIT	INtegrated Conductive and biomimetic polymericInterfaces able to serve as micro-nanostructured Patches for myocardial regeneraTion	4	MIUR (Italy), FCT (Portugal), FAPESP (Brazil)
Interfaces between materials and biological hosts for health applications	MagicCELLGene	Localized MAGnetIC hyperthermia CELL-based GENE therapy for immune modulation	3	MINECO (Spain), FCT (Portugal)
Interfaces between materials and biological hosts for health applications	NAT4MORE	NATural molecules on the surface of bioactive materials FOR MOdulating the host REsponse toimplants	5	MIUR (Italy), RANNIS (Iceland), FAPESP (Brazil)
Interfaces between materials and biological hosts for health applications	Pelargodont	Engineering and functionalization of delivery system with Pelargonium sidoides biologically active substance on periodontal inflamed surface area	7	RCL (Lithuania), VIAA (Latvia), NCN (Poland), MIUR (Italy)
Interfaces between materials and biological hosts for health applications	SmartHyCAR	Smart multifunctional Hyaluronic Acid-Carnosine based bandages for wound care and regenerative therapy.	4	MIUR (Italy), DGo6 (Belgium)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Materials for additive manufacturing	3D-CFRP	Additive Manufacturing of Continuous Fibers Reinforced Polymer Composite Materials for High Performance Structural Applications	8	FFG TP (Austria), FASIE (Russian Federation), RCL (Lithuania),
Materials for additive manufacturing	AddiZwerk	Additive Manufacturing of Cutting Tools	8	FFG TP (Austria), JÜLICH (Germany),
Materials for additive manufacturing	BauProAddi	New construction materials and product design for additive manufacturing processes in the construction industry	7	JÜLICH (Germany), FFG TP (Austria)
Materials for additive manufacturing	BiogenInk	Biogenic Inks combining marine collagen and ionic-doped calcium phosphates for bone tissue engineering	4	FCT (Portugal), UEFISCDI (Romania), NWO (Netherlands), MINECO (Spain)
Materials for additive manufacturing	Dressing4scars	New 4D printing dressing to treat skinscars	3	FCT (Portugal), SFI (Ireland), IDEPA (Spain)
Materials for additive manufacturing	ELAM	Ultrafine eutectics by laser additive manufacturing	7	JÜLICH (Germany), MINECO (Spain), NKFIH/OTKA (Hungary)
Materials for additive manufacturing	HiPA^{2}I	High Performance Additive manufacturing of Aluminium alloys	5	FFG TP (Austria), FCT (Portugal)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Materials for additive manufacturing	jawIMPLANT	Patient-specific bioactive, antimicrobial PLA- PGA/titanium implantsfor large jawbone defects after tumour resection	8	FFG TP (Austria), NCBiR (Poland),

Abstracts (please note that these abstracts were submitted with the proposals):

HEAMODELL

High entropy alloys (HEA) are recently developed metallic materials, composed of five or more principal elements, which feature high mechanical and oxidation resistance properties at elevated temperatures. The complexity of HEA inherent to the large number of possible elemental combinationsrepresents a serious challenge for industrial implementation. HEAMODELL project is proposing to establish new thermodynamic and kinetic criteria based on composition-solidification-heat treatment- structure correlations, making use of electronic, atomistic and macro-scale modelling techniques, coupled with a focused experimental and characterisation approach. The integrated multiscale model for HEA design is validated at laboratory level including alloy synthesis/processing at pilot scale.

Project results will contribute to the improvement of ICME predictive power for high temperature alloysfor jet engines and to shorter time-to-market for innovative materials with high market impact.

MuMo4PEC

We propose an innovative, multi-scale modeling and simulation approach in order to investigate photo-electrochemical (PEC) interfaces. This will pave the way towards targeted design and fabrication of PEC interfaces with advanced properties and performance. It is the first time that four levels of theory from atomistic to continuum level are combined for PEC interfaces and that electrochemical data will be simulated that can be directly compared to experimental data. Hence, we bridge theory and experiment. The kinetic parameters (intrinsic and extrinsic) as well as the structure and the dynamics of the solid-liquid interface will be determined. This will result in the identification of the limiting reaction steps at the interface which will allow for tailored design of photoelectrodes. We focus on the Fe2O3– water system due to its abundance, costs, and PEC properties, but also because of its benchmark character. The approach can be transferred to other electrochemical interfaces.

ALD4MAX

ALD4MAX will tackle the deposition of MAX phases and MXenes by Atomic Layer Deposition (ALD). MAX phases are ternary carbides and nitrides with specific stoichiometry and layered structure which show very interesting properties. MXenes are 2D systems equivalent to graphene which result from the elimination of the element ‘A’ from the MAX phase.

There is no simple approach to deposit MAX phases on conventional substrates; e.g. heating at high temperatures is needed, which is inviable in many cases. Moreover, MXenes are only prepared in bulkform by chemical etching of the MAX phase, but the deposition of individual MXene is not reported.

In ALD4MAX we will take benefit of the layer-by-layer growth characteristic of ALD to deposit MAX phases

and MXenes with high control, and also ‘mixed’ MAX phases by stacking different types of MAX phases. ALD4MAX will generate a high impact, since not only a new class of materials will beprepared, but also new possibilities for ALD will be proven.

CellColor

The aim of the project is to develop original, environmentally friendly, nano-structured surfaces and coatings with engineered optical functionality for coloration and reflection of light. The surfaces and coatings will be fabricated from cost effective natural materials like cellulose, and will allow for environmentally friendly energy control and improved energy efficiency, thus providing innovative technology for future delsign or architecture, beyond the lifetime of the project. The project is coordinated from the Norwegian University of Science and Technology (NTNU) in Trondheim Norway,and the partners representing the various academic and industrial areas are: In Norway: Institute for Energy Technology (IFE) in Kjeller, the SME Giamag Technologies, the large industrial company Borregaard AS, and the design and architectural firm Snøhetta Oslo AS. From Portugal the partners are: NOVA.id:FCT and Instituto Superior Tecnico (IST-ID), both in Lisbon.

CLEARPV

We are proposing to develop large-area semi-transparent 6 inch durable perovskite photovoltaic modules with power conversion efficiency (PCE) over 13%. The modules can be directly used as building units. Moreover, they can be stacked with silicon solar cells for an expected PCE over 18%and approaching 25%. The program considers the materials and processing aspects of the new perovskite PV technology aiming for energy efficient process approach of low temperature.

GRAFOOD

GRAFOOD aims to develop a pilot-scale prototype of active food package based on paper and polylactic acid (PLA) film respectively, modified with graphene oxide activated by probiotics and by nano-Ag-TiO2, respectively. Specific objectives: ● characterize the packages currently used for cheese and meat storage; ● design, characterize and validate the prototype of active packages; ● start the procedure to homologate the most efficient PLA and paper based active package and to obtain the Romanian and European patents. The result is a pilot-scale prototype of active package based on paper and PLA film, respectively. The project has multi-lateral impact for academic research teams and their universities, environment and society. Economic benefits: ● reducing the costs for the processing of unsold goods; ● diminishing the amount of the food waste and the costs for their processing, thus increasing the financial profit. The evolution of TRL during the GRAFOOD proposal isfrom TRL 1 to TRL 7.

GreenCOAT

The GreenCOAT project will design a new type of green, DLC-coated interface based on an innovativeDLC-deposition technology, tailored for operation with harmless ionic liquids (IL) lubrication. This will comply with restrictions relating to greenhouse-gas emissions that will soon be demanded for all heavily loaded, lubricated mechanical components in transportation and industrial systems. Current UN, EU and national emission legislation already restricted the use of today’s key lubricants, for which there are no acceptable alternatives available. This means that if a new green interface lubrication is not developed in near future, the performance of machinery will rapidly deteriorate, leading to massive technical, economic and social consequences.

The GreenCOAT project is about developing innovative “green” DLC-IL interface, which will be full-scale validated for heavy-duty fluid-power hydraulics systems.

HEI-Coat

Hard Chrome (HC) coatings for anticorrosion and anti-wear applications cover a wide market share ranging from automotive to aerospace. To date, HC electrolytic plating, used for more than seventy years for engineering applications, has dominated the wear coatings market, because of its simple andcheap coating method.

Unfortunately, hexavalent Cr(VI) in the electrolytic baths is toxic and carcinogenic, and the overall deposition process itself is highly risky for both workers' health and environment. For that reason, according to the Regulation (EC) No 1907/2006, by 2017 the production of HC with Cr(VI) baths willbe banned. It is then mandatory to find alternative materials and/or methodologies of deposition.

The HEI-Coat project aims at developing innovative coatings deposited by the environmental friendlyCold Gas Spray technique or by the more conventional Electroplating Technology, with functional properties similar or better to the ones presented by HC.

INSURFCAST

INSURFCAST aims at finding new solutions for precision investment casting processes of complex- shaped superalloy blades, through the understanding of the solid-liquid phenomena occurring at the alloy-mould interface leading to the design, engineering and application of innovative mould surfaces. The innovation objective is the reduction of expensive operations of finishing after casting, and blades rejections or failure. Successfully meeting these objectives involves Italian and Polish research laboratories using advanced experimental and theoretical methods, in strict synergy and interaction with the metal casting industry. These innovative results will be obtained through specific wetting tests,microstructural and microchemical characterization of surfaces and interfaces as well as by thermodynamic modelling of the reactivity in selected alloy-ceramic coating systems. Technological trials and post-processing analysis of castings and moulds will lead to optimized casting processes.

MaSNEC

The MaSNEC project aims to grow innovative surfaces and control their properties via material synthesis in non-equilibrium conditions. The innovation will be to obtain solid material by precipitation reactions performed within diffusive gradients of concentration and convective flows due to injection of one reactant into the other. We will provide new protocols taking advantage of imposed out-of- equilibrium constraints to synthesize thermodynamically unstable solid polymorphs, manufacture nanoparticles and structured surfaces, composite coatings and multilayered tubes. By defining an innovative procedure to structure and create new solid materials, this project proposes a paradigmatic shift in surface and coating technology to produce innovative materials with targeted relationships between their micro and macrostructures. The novel concept will impact material sciences and providenew routes to synthetize materials for societal and environmental applications.

NESSIE

Virus-like particles (VLPs) and viral vectors (VVs) are revolutionizing medicine by offering targetedvaccines. Production of VLPs and VVs is costly and time consuming because purification by chromatography, the state-of-the-art technique, has drawbacks that limit its performance.

We will develop novel targeted surface-modified chromatographic materials for purification of these complex biopharmaceuticals. Structured monoliths will be produced by post-modification of shapes produced by additive manufacturing (AM). We will use ceramic-based AM techniques with ~150 $\cdot$m resolution to produce mechanically stable isoreticular monoliths for downstream processing of clarified bioreaction bulks of adenoviruses and retro-VLPs as model cases. With new materials and using AM

techniques applied also to design the flow distributors, we aim to precisely control the purification unit.We will also design novel continuous chromatographic methods to reduce time lags and thus production cost.

NICRRE

The main objective of the NICRRE project is to develop new coatings for steel combustion boilers in power generation plants and to identify technically suitable and cost effective techniques of their deposition. These coatings should mitigate corrosion and erosion in boiler's piping and increase its operating temperature. Two innovative material solutions are proposed: NiCrRe and NiCrRe/Al2O3 coatings to be deposited by plasma spraying, high velocity oxygen fuel spraying, and direct laser deposition. The project will encompass coatings development, characterization of microstructure and properties, modelling, fabrication and testing of demonstrators in a real combustion boiler. The most important innovation originating from this project will be a new thin coating technology for boilers (target thickness of 1 mm). It will result in an extension of boiler's inter-haul intervals, cost reduction ofregular inspections, increase of electric energy and heat production.

SIOX

SIOX aims to exploit the rich functionalities of oxides and their heterostructures, which show great promise within the emerging field of oxide electronics. For their implementation, epitaxial integration of oxides with silicon platforms using industrially appropriate technology is urgently needed, and its development represents the main goal of SIOX. However, such succesfull integration is extremelly delicate due to materials` intrinsic incompatibility. This challange will be addrressed by collaboration between three research groups, with experties in theoretical modelling, atomically-controlled growth and materials` applications. The project has two objectives: to prepare high-quality oxides on silicon byunderstanding corresponding interface phenomena, and to functionalize as-prepared layers with functional heterostructures. Protocol for successful integration represents the main result of the project, which is heralded as the next step in the development of forthcoming electronics.

TANDEM

After major efforts for hygienize the wastewaters, the presence of pathogenic bacteria is still detected in the water, soils and even crops, causing public and environmental hazards. This issue is of high concern as most pathogens responsible for waterborne diseases originate from faecal or food waste contamination caused by insufficient- or not treated wastewater. As a result, TANDEM project focuseson developing innovative and efficient bactericidal hybrid surfaces for Gram-negative and Gram- positive bacteria that can be transposed into special building blocks (i.e. "smart tools") for creating more efficient bio-tanks and sustainable wastewater purification technologies with regard to pathogenic bacteria removal. The project consortium is well-balanced having aside two renowned R&TD entities from Romania and Norway that will guaranty the successful implementation of the project. In addition, one medium enterprise from Romania is entrusted with prototyping/testing the tandem bio-tank.

UltraGraf

Ultrafast lasers have many important applications in physics, materials processing, chemistry, biologyand medicine. Their pulses are among the shortest events ever produced, with durations reaching thefew femtosecond regime (1 fs = 10-15 s). Nevertheless, the lack of adequate temporal measurement and control tools has hampered their migration out of the laboratory and into mainstream applications.This project directly addresses these challenges by developing and demonstrating a new and universal ultrafast pulse measurement and control device, where the dispersion-scan technique is combined with the exceptionally broad bandwidth and high conversion efficiency of nonlinear third- harmonic generation (THG) in graphene coatings. This technology is highly performing, easy to use and applicable to an

unprecedentedly wide range of laser systems, which should enable new scientific, industrial and medical applications of ultrafast lasers and contribute to the growth of the ultrafast market.

WABASELCOAT

Solar absorbers incorporated in façades systems become a reality in the modern architecture, although they do not fulfil completely the demands of costumers. In this respect coloured spectrally selective paint coatings are required. Water-borne thickness insensitive spectrally selective coatings with anti-soiling effect are one of the optimal choices since they offers the possibility of achieving high solar to thermal conversion efficiency, longevity and high aesthetic demands of architects. At present, the practical use is faced with three major problems: i) nonselective coatings are used for increase theabsorptivity, ii) coatings are made by solvent-borne resins, high volatile organic solvents (VOC)emission and iii) the dust and dirt are collected on the absorber surface resulting in decreased efficiency. The effectiveness can be improved using black or coloured spectrally selective inorganic and metallic pigments incorporated in water-borne resins with low thermal emittance result.

BIOFOODPACK

BIOFOODPACK aims to develop a sustainable biocomposite food packaging material to actively interact with foodstuffs, leading to improved food safety with minimal processing, reducing food lossand waste. Antimicrobial and antioxidant properties of natural resources are combined with differentfillers to achieve water resistant materials with enhanced mechanical and gas barrier properties andelectrically conductive for in-pack sterilization by pulsed electric fields.

BIOFOODPACK will provide a food packaging material based on abundant recyclable and biodegradable biopolymers,, which will actively protect food with reduction of food waste, a huge nowadays problem. The implementation of packaged food sterilized at low temperature will extend shelf-life, maintaining organoleptic and nutritional characteristics of fresh food. A multidisciplinary teamwill work interactively to generate innovation and market exploitable products.

COMPIO

In COMPIO we will develop both synthetic and biobased high performance composites for microbial formulations:

- Based on molecularly imprinted polymers (MIPs)
- Based on nanoclay
- Implementing nano crystalline cellulose as carrier, natural filler and dispersion agent

The integration of these types of composites will

- provide clearly enhanced water vapour and O2 barrier properties
- significantly improve mechanical strength and reduce abrasion
- protect beneficial microbes from UV-radiation damage
- enhance shelf life

This project will make its principal impact in development of sustainable materials and processes forthe highly requested field of biocontrol addressing the market of large-scale plant cultures (maize, tomato sunflower).

COMPIO is expected to support current research efforts of the consortium (AIT, PPIMC, AGLYCON, Simbiyotek, Melodea) and generate strong input for the company partners opening up new business segments and application fields.

HyBiCo

The project aims at developing novel highly biobased short-fibre hybrid composites for injection moulding applications meeting a demand for high-performance lightweight materials. In order to achieve high specific mechanical properties PP and bio-PE matrices will be reinforced with man-madecellulose and r-PET/bio-PET fibres. Their hybridisation and tailoring of their fibre-matrix interfaces will provide excellence in impact behaviour. To reduce costs, as well as to increase of biobased content ahybridisation with wood flour and lignocellulose microfibres obtained from grain husks will be applied. The synergistic effects, which have already been observed, will be used to attain the relatively high mechanical performance of these hybrids. Manufacturing by one-step compounding will provide high efficiency at possibly lowest cost. The project will open the possibility to implement developed short- fibre hybrid composites in small and medium enterprises in plastic industry.

POLYMAGIC

The project proposes the optimisation and scaling-up of biodegradable and bioabsorbable compositesfor osteosynthesis based on a polylactic acid (PLA) matrix loaded with Mg particles in the nano and micrometric range, and processed by thermoplastic methods. Other innovative objectives are related to their processing by a colloidal suspension route to increase homogeneity and particle-matrix bonding, as well as by additive manufacture and electrospinning. The project also considers the sustainability of the whole life cycle of the proposed materials and processing. Potential benefits are related to better mechanical properties, increased bioactivity and antibacterial resistance, and possibility of tailoring degradability of implants by controlling shape and volume fraction of Mg (nano)filler. These temporary implants would improve life quality of patients, especially paediatric, andwould open new business opportunities, guaranteed by the two participating SMEs.

CCSRender

This proposal aims at producing novel, environmentally-friendly, lime-based renders with the ability to master CO2 sequestration via in situ mineral carbonation. This will be achieved through the addition of suitable ophiolitic/volcanic materials (including quarry wastes) in nano-scale to the aforementioned composites, following the application of ball milling. These additives have significant CO2 uptake potential and will thus (i) contribute to the mitigation of CO2 concentrations in the atmosphere, and (ii) accelerate the carbonation reaction kinetics, thus improving the physico-mechanical properties of the end-products. It is anticipated that this proposal will succeed at producing innovative prototype building materials, which will be suitable for renovation/conservation and contemporary sustainable architectural projects. The outcomes of the project will lead to concrete solutions to real-life problems that will generate economic, environmental and societal benefits.

CTB Basics

CleanTechBlock (CTB) is a multifunctional, sandwich-block solution with integrated thermal insulation. The CTB concept improves the superior insulation material – foam glass –, and combines it with the durability of traditional masonry. CTB results in great environmental and economic benefits, originating from a decrease in CO2 emissions and energy required for production and transportation, the large amounts of waste materials used in the production, the prolonged service life, minimal use of cement, faster construction, and the full recyclability of CTB components. The objectives of the proposed project are to develop and experimentally validate a model of the heat-transfer in order to identify further possibilities to decrease the thermal conductivity of foam glass, to prepare a model of heat andmoisture transfer for optimization of the CTB structure, and to perform a life cycle assessment of the CTB solution in order to reveal and quantify the sustainability of the CTB concept.

GoPHy MiCO

GoPHy MiCO addresses one of the main challenges in the development of new efficient energy systems based on Proton Ceramic Fuel Cells and Electrolysers, namely the identification of ceramics with mixed protonic and electronic conductivity. These are essential for the oxygen/steam electrodes, but only few and mediocre ones are identified. By systematically studying a set of double perovskites with different cations on distinguishable A-sites, and by systematic substitutions of these and also the B-site cation, trends in structures, oxidation, and hydration behaviour and conductivity will be established. The project outcome will potentially bring significant contributions to the ongoing implementation of hydrogen energy systems. Methodology to be employed comprises Neutron PowderDiffraction, electrochemical methods impedance spectroscopy, thermogravimetry, and ab initio atomistic modelling. Partners are UiO and IFE (NO), GUT (PL) and ITQ/CSIC (ES).

HyMatSiRen

Hybridization of organic and inorganic compounds allows to tune functionality of materials. Main focus of the project is synthesis and characterization of new hybrid materials obtained by incorporating inorganic nanomaterials into polymers. Functionality of the material will be tuned for applications in photovoltaics and Li-ion batteries. This is a multidisciplinary project combining expertize of specialists from different fields such as materials science and nanotechnology, photovoltaic technology, Li-ion batteries, physicists, chemists, and engineers. The consortium consists of experts from an education- and basic research-oriented University from Spain, an applied research Institution from Norway, and a small & medium enterprise from Turkey. It will form the platform for further enhancing the ongoing collaboration, provide training of young scientists, exchange of infrastructure, new ideas, competence and impact in applications. An increase in TRL from 3 to 5 is foreseen.

MOCO3

The MOCO3 project focuses on the development of novel composite materials consisting of molten carbonates infiltrated in a solid matrix as functional materials in intermediate temperature fuel cells and CO2 selective membranes. MOCO3 addresses performance and lifetime of these systems by focusingon materials engineering at all length scales (atomistic, micro- and macroscopic) guided by synergetic combination of experimental research and advanced numerical simulations for driving materials design. The MOCO3 project will last 3 years, starting at TRL3 and ending at TRL4. It is coordinated bySINTEF in collaboration with University of Oslo (NO), Warsaw University of Technology (PL), one

high-tech SME CIM-mes Projekt (PL) and University of Aveiro (PT). The project will educate 2 PhD and train 3 post-doctoral candidates. It fosters intensive dissemination by various academic and popular channels and involves an advisory board with materials suppliers, technology developers andend-users.

NanoElMem

The increased demand for energy, coupled with concerns about environmental pollution and growing fossil fuel costs have created a great need for clean and efficient power sources. Fuel cells directly convert chemical energy stored in fuels into electrical energy through electrochemical reactions, and have been identified as one of the most promising technologies for the clean energy industry of the future. The overall concept of the NanoElMem project relates to developing novel stable and highly effective materials for the direct alkaline ethanol fuel cell (DAEFC), which directly converts ethanol to electric power. The enhancement of the performance of DAEFCs is based on the development of platinum (Pt)-free electrode catalysts and nano-composite membranes by using environmental-friendlyinorganic and polysaccharide materials and technologies. The enormous technical and scientific potential of graphene will be explored in producing of new graphene-polysaccharide membranes.

NEILLSBAT

The proposal seeks to overcome the limitations of Lithium sulfur batteries (LSB) through the development of safe high-capacity anodes based on silicon and germanium nanowire heterostructurearrays and specifically designed high-capacity MOF-S (Metal Organic Frameworks with sulphur in pores) cathodes in addition to safe non-flammable ionic liquid electrolytes. The ultimate goal of the research is to produce a full LSB based on these components with a specific energy of 600 Wh/kg forat least 100 cycles. In this approach, aimed at Topic 4 Functional Materials section 4 Energy Storage,we intend not just to synthesise these high performance electrode materials, but also to achieve a detailed understanding of their structural and chemical evolution during battery cycling, with a view to their further modification and optimisation. The developments the partners have carried out to-date in these areas are at TRL 4 and at the end of the project the developments will be at TRL6.

PLARASBAT

The all-solid-state lithium ion batteries is a long-sought target. They will have a wider operating temperature range and are safer than liquid electrolyte based counterparts. A large area sheet-like all solid state batteries (ASSB) innovative architecture is proposed. The “electrolyte supported” architecture thick-film battery is based on controlled deposition of electrodes onto a solid electrolyte thick film. Impact is expected as the batteries will be lighter, slightly flexible and compatible with large area electronics and flexible electronics devices. ASSBs can be used in wider temperature range, opening their use in harsh environments. The innovative ASSB architecture will provide quality energystorage in applications still no envisaged opening new markets. New knowledge will be produced in solid state electrochemistry and ceramic technology. The societal benefits are many, they do not usepollutant organic electrolytes, use less metals and are safer.

PNANO4BONE

Current scaffolds for regenerative medicine are facing several drawbacks, which are the low proliferation of living cells seeded in the implant, the short duration of drug delivery when drugs areembedded in the scaffold and the impossibility to easily follow the regenerative processes once thescaffold is implanted.

The objective of the project is to solve the above mentioned drawbacks by embedding specifically designed nanovectors in the scaffold. The interaction of these nanovectors with tissue-tolerable plasma (ionized gas) will allow promoting the living cell proliferation through the generation of reactivespecies. The inorganic core of the nanovectors will allow the drug release over weeks/months. The probes loaded in the nanovectors will allow monitoring the regenerative process with non-invasive imaging technologies. If successful in the context of bone regeneration, this approach could be easily adapted to the regeneration of other tissues and lead to lower therapies' costs.

RATOCAT

Using the sun’s energy to generate hydrogen from water is probably the cleanest and most sustainable source of fuel that we can envisage. Unfortunately, catalysts that do this are currently too expensive to be commercially viable. The RATOCAT project aims to develop improved photocatalyst materials, along with the processes for their production. The catalytic performance of cheap TiO2 and C3N4 powders will be improved by tailoring their surface with nanostructured oxides as co-catalysts ofhighly-controlled composition, nanoarchitecture, size and chemical state. First principles simulations will be used to design the optimum nanostructures, which will then be deposited onto powders with therequired precision using atomic layer deposition, again supported by simulation. Lab-scale tests of photocatalytic activity will provide feedback for the optimisation of the material and process, before themost promising materials are tested in the field on both pure water and wastewater.

THERMOSS

The core concept of this proposal is to develop and deliver new energy harvesting thermoelectric materials and modules based on n-Mg2X(X:Si,Sn) and p-Cu12-x(Co,Ni,Zn)xSb4S13-zSez systems. These systems are advantageous, exhibiting many attractive characteristics, such as: (i) high ZT (≥1.0), (ii) operational in a medium temperature range, important for waste heat recovery, (iii) made from widely-available pure materials with large EU supply chains, (iv) low raw material cost, (v) are nontoxic. Focus will be put on the materials/modules design/synthesis, optimization, properties and characterization as well as the investigation of possible applications. Specific research objectives are

(a) optimized synthesis of cost-effective highly efficient TE materials with ZT ≥1.0 at 350˚C; (b) modeling of modules and development of a prototype; (d) explore potential applications (cementindustry and automotive).

BIOMB

The innovation of this project consists in the evaluation for the first time of the MgB2 potential for bio-medical applications, although it is currently produced for superconductivity devices. Expectations areto generate new MgB2-based composite multifunctional biomaterials with antimicrobial/antifouling properties, and an increased biocompatibility at interfaces between the material and the biological media. The MgB2 powders, coatings and bulks could be used in biodegradable implants or drug delivery systems, handles and surgical tools, catheters, wound dressings and so on. The mechanicaland physico-chemical properties of the proposed materials will be investigated by a comprehensive approach, and bio-evaluation will include in vitro and in vivo assays. The MgB2 materials are viewedas solutions for space- and time-scale controlled variation of the functional properties required for different bio-applications.

BIOMEMBRANE

Age-Related Macular Degeneration (AMD) is the leading cause of blindness in the elderly worldwide: although it does not cause total blindness, there is a progressive loss of high-acuity vision attributable to degenerative and neovascular changes in the macula. Currently, there is neither a cure nor a means to prevent AMD. The main objective of BIOMEMBRANE project is the design and fabrication ofan alternative and smart in vitro model of retinal pigmented epithelium interfaced to the choroidal vascular network with an engineered Bruch's membrane (the blood-retinal barrier) to boost the discovery of new therapeutic strategies for AMD. BIOMEMBRANE project will have an important impact on health care costs and will render the European biomaterials, pharmaceutical and biotechnological industries more productive and dynamic, developing an economic in vitro testing system, which will be compliant with regulatory issues and with stringent pre-clinical testing requirements.

INCIPIT

The leading cause of death for cardiovascular disease is coronary heart disease. Current therapies donot restore the functionality of damaged myocardial tissue. The only effective therapeutic intervention is an approach able to stimulate the autonomous regeneration of myocardium. Recently, we developed bioartificial scaffolds with the potential to serve as acellular patches for in vivo cardiac regeneration. Herein, the patch will be implemented with electroconductive polymers in order to improve cardiac commitment. The protection against ventricular remodelling and recruitment of stem cells in situ will be pursued through the use of advanced nanotechnologies. The therapeutic product will be validated in vitro using stem and precursor cells, induced pluripotent stem cells, organotypic heart cultures and in vivo using a small animal model. The INCIPIT cardiac patch technology will movethis material-based product closer to the market of smart therapies in the cardiovascular field.

MagicCELLGene

The goal of MagicCELLGene is to develop a novel, universal and highly efficient methodology for transfection triggered by magnetic hyperthermia, with potential clinical applications in cell-based gene therapy. Our innovative approach is to induce a controlled and localized heating of the cellular membrane (hotspots) using magnetic nanoparticles covalently immobilized onto cell membranes via bioorthogonal chemistry; the reversible changes of the cell membrane permeability/fluidity will be usedto promote the artificial delivery of nucleic acids into cells. Efforts will be especially focused on hard-to-transfect cells (primary cells), thus clearly addressing an unmet need of the transfection market.

Expected results going beyond the state-of-the-art in transfection are: i) the development of a universal transfection tool and ii) its application to systems where standard transfection methods haveseveral bottlenecks using as a model immune system modulation.

NAT4MORE

Innovation objective: physiological healing of bone implants (modulation of host response).Unmet need: inadequate long-term outcome and infections of implants. Specific objectives: scientific understanding of the implant-tissue interface (inflammation, osteoblast/osteoclast balanced activity, biofilm formation); bioinspired surface functionalization; industrial processing (stability of grafted biomolecules after packaging, sterilization and storage). Expected results: up-scaled protocols of extraction and selection of natural biomolecules (polyphenols,chitin derivatives), optimized functionalization processes of bioactive glasses, hydroxyapatite, titanium alloy with biomolecules in active state and proper amount (quality control), assessment of post- processing steps.

Impact and benefits: exploitation of granted patents, enhanced functionality of implants, benefits for patients health, new commercial products and markets for the involved SMEs, reduction of hospitalization time/costs.

Pelargodont

Periodontitis treatment include use of antibiotics and synthetic antiseptics that is accompanied by systemic side effects and increased bacterial resistance. Such strategy is not suitable for prolonged orrepeatable treatment and fails to stop disease remission and further progression. This creates a demand for local delivery devices with multiple antibacterials of mild action. The aim of the project is toengineer a biodegradable mucoadhesive drug delivery system of local action with natural active substance for periodontitis treatment. The system will be designed to release optimized levels of multiple antibacterials from Pelargonium sidoides root extract in the disease-affected area for a sustained period of time aiming for both ease of use and high patient acceptance. The project will deliver an innovative product that will help to avoid or delay surgical treatment, prevent side effects, bacterial resistance, reduce the number of severe cases and decrease societal medical costs.

SmartHyCAR

An emerging approach for care and regenerative therapy of chronic wounds, which have an increased incidence in elderly, diabetics, immuno-suppressed and immobilised people, uses smart hydrogels for a spatio-temporally triggerred repair process. Hyaluronic acid (HyA)-based dressings are already safely used, e.g., in treating diabetic foot ulcer. The novel multifunctional HyA-CAR(GHK)-Cu dressing,deposited via an atmospheric plasma technology ad hoc designed and developed, starts from HyA conjugated with a dipeptide (carnosine, CAR) and/or a tripeptide (GHK), exhibiting inhibitory effects against carnosinase as well as antioxidant and anti-inflammatory properties. The scaffold is further implemented by the incorporation of copper, which has angiogenic and antibacterial properties, as wellas SOD-like activity in the CAR-Cu and GHK-Cu complexes. The HyA-CAR(GHK)-Cu hydrogels will provide a novel unique synergic activity in the modulation of the wound healing and scar repair actions.

3D-CFRP

The ambition of the proposed research is to bring together two important aspects of lightweight designand manufacturing: fused filament fabrication based additive manufacturing, and continuous fiber reinforced polymers for structural applications. In this way, the inherent advantages of the two components of the value chain (material and manufacturing) can be combined in order to obtain competitive structural components even lower production costs, in a flexible digital environment that allows rapid design changes in accordance with the requirements of a more and more dynamic market. The project aims to address all aspects and stages of the composite 3D printed material development, starting with the compatibility between the fiber and polymer matrix constituents, manufacturing and optimization of the input filament to the 3D printer, development and optimization ofthe specialized 3D printer head and whole 3D printer system, process simulation, , material and structural testing.

AddiZwerk

Manufacturers of cutting tools are facing challenges to develop more efficient tools. Their efforts are hampered by traditional production methods and technologies. Traditional technologies (e.g. milling) follow a line of sight principle and face restrictions concerning geometry features, especially in terms of internal geometries. Additionally, these methods require elaborate setup processes to produce small batch sizes and cutting tool prototypes, which leads to an increasing time to market. An approach to overcome these impediments is the application of additive manufacturing (AM). AddiZwerk aims at enabling AM of cutting tools by qualifying cemented carbide and ceramic materials for additive processes and by developing innovative tool features that take advantage of AM's freeform fabrication approach. By additively generating cutting tools and applying them in machining experiments, the qualification of AM tools in comparison to traditional cutting tools will be determined.

BauProAddi

The project aims development of innovative, printable building materials for enhanced quality and a fast production process, which can be applied for additive manufacturing in construction practices. Amaterial- and requirement-related new process technology for processing the materials is provided. Through cooperation between companies, universities and research institutes throughout the value chain, an innovative automated, fast, flexible and precise material and technology for 3D printing in construction is created, which significantly stands out from the state of the art. However, the current advances in 3D printing are not practical in construction industry because of the compatibility limitations of traditional building materials such as rheology, setting and hardening with 3D printing process. Thus, new construction materials will be developed and tested with customized additive manufacturing processes and demonstrators in the order of 1-2 m^3 will be produced.

BiogenInk

BiogenInk aims the development of bioinspired and bioresorbable inks for additive manufacturing, composed of marine collagen and ionic-doped calcium phosphates, as building blocks for the production of advanced scaffolds towards bone regeneration, promoting innovation in health sector, mainly on orthopaedic therapies. It is pretended to establish a sustainable and eco-friendly raw materials pipeline, including the production of a novel biological collagen crosslinker from a combined bioremediation strategy, which specific formulations mimics bone tissue composition. These printing materials will be further used to develop functional scaffolds, based in real clinical cases, recapitulatingthe complexity of bone structures obtained through a reverse engineering approach. A simple and standardized procedure from acquisition of imaging data to the production of patient case-specific biomaterials by 3D printing will be established, with potential to be successfully translated into clinics.

Dressing4scars

Additive manufacturing (AM) has been highlighted as a key technology with huge potential in different sectors. While AM technologies have been considering only the initial state of the printed object, assuming that it is static and inanimate, a new concept, 4D bioprinting, in which “time” is integrated asthe fourth dimension has recently emerged. Time is not related to the duration of the printing, but rather to the fact that the printed products continue to evolve over time acting as smart responsive scaffolds.

The development of new customized dressings capable of responding to skin wound biomechanics represents a major challenge but also a disruptive approach to treat scars and minimize scarring during healing. Thus, Dressing4scars aims to cover that niche by following a “4D printing” approach to develop smart responsive skin dressings that are capable of changing “shape/mechanical cues” whilenew skin is being formed, counteracting the pro-scarring mechanical forces.

ELAM

The proposed project aims at developing new high strength eutectic alloys by laser-based additive layer manufacturing (ALM) using selective laser melting and laser metal deposition based on Ti-TiFe and Fe-Fe2Ti eutectics. These laser-based ALM methods possess inherently high cooling rates and are, thus, ideal for processing ultrafine eutectics and hierarchically structured near-eutectic alloys including Ti-Fe-Sn-Nb, Ti-Fe-Co, Fe-Ti-Si, Fe-Ti-Zr-B and other eutectic alloys. Although being the subject of research for decades and showing remarkable mechanical properties, none of these alloys is currently relevant for industrial applications since no economically and technically viable processingroute exists. This proposal represents the first attempt to produce ultrafine Ti- and Fe-eutectics by ALM, spanning activities along the entire manufacturing chain from fundamental materials development, powder production, ALM process and post-treatment developments to demonstrator testing.

HiPA²l

The proposed project focuses on the design of new Aluminium alloys purpose-made for Additive Manufacturing (AM) processes, especially in kind of welding wires for building parts and components layer by layer. Within HiPA²l innovative Aluminium alloys designed for use in wire-based AM processes shall be developed. The novelty shall include a beneficial set of superior properties in strength, elongation and corrosion resistance. Since these material will build up the whole generated parts, any weaknesses in Aluminium welding will be reduced. The outlook on reduced costs for AM parts is mainly based on the high deposition rates of wire based welding processes. The novelty wouldbe an AM custom made wire! The expected impact includes new wires developed to enhance performance, efficiency and productivity including an in-depth understanding of metallurgical evolution of alloys from feedstock to parts.

jawIMPLANT

Surgical excision of maxillofacial (jaw) tumours generally leads for annually ~5500 patients in EU28 to scarred, mangled facial appearance and the loss of mastication and speaking functions. Current gold standard for reconstruction of the large bone defects is transplantation of autologous vascularized bone, being still strongly constrictive by limited transplantable bone, low surgical accuracy and risk of tissue necrosis in subsequent high-dose anti-cancer chemo-/radiotherapy.

Consequently, our focus is an alternative treatment, separating immediate reconstruction after tumour resection for such high-dose anti-cancer therapy (ongoing R&D), and final reconstruction by patient-specific manufactured maxillofacial implants (R&D target of this project). Planned unique implant features are a durable metal core for tooth crowns and jaw-joint fixation and an anti-bacterial coated biodegradable polymer shell, being replaced by new bone due to local drug-delivery within ~12 months.

M-ERA.NET Call 2017: Funded projects

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Integrated Computational Materials Engineering (ICME)	FMF	Flexible magnetics filaments:properties and applications	3	Nouvelle-Aquitaine (France); SAS (Slovakia); VIAA (Latvia)
Innovative surfaces, coatings and interfaces	BioElectroCathode	Utilization of CO2 through novel BioElectroCathode systems for production of biofuels (CH4 andethanol)	4	RPF (Cyprus); NCBiR (Poland)
Innovative surfaces, coatings and interfaces	ENVALGRA	Development of a new generation of environmentally friendly microalgal oil-based functional fluids modified with graphene family nanomaterials (GFNs)	4	IDEPA (Spain); FNR (Luxembourg); TÜBITAK (Turkey)
Innovative surfaces, coatings and interfaces	ISIBHY	Increase of Strength of Interface Between liner and composite in HYdrogen tank	3	Calabria (Italy); Nouvelle-Aquitaine (France)
Innovative surfaces, coatings and interfaces	PLACOATAM	Functional surfaces on AM objects with a low cost atmospheric pressure micro PLAsmaCOAT instrument integrated on a 3D printing equipment	4	FNR (Luxembourg); Nouvelle-Aquitaine (France)
High performance composites	Boron-Basalt fibers	Development of boron-infused basalt-fiber reinforced concrete for nuclear and radioactive waste management applications	5	ETAG(Estonia); NCN(Poland)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
High performance composites	DURACER	Durable ceramic composites with superhard particles for wear-resistant cutting tools	4	ETAG (Estonia); SAS (Slovakia); NCBiR (Poland)
High performance composites	NANO2COM	ADVANCED POLYMER COMPOSITES FILLED WITH NOVEL 2D NANOPARTICLES	3	RCL (Lithuania); SAS (Slovakia); VIAA (Latvia)
Multifunctional materials	Bio4Cryo	Development of Biobased Cryogenic Insulation Modified with Nanocrystalline Cellulose	4	VIAA (Latvia); NCBiR (Poland)
Multifunctional materials	DryProTex	Dry Processing of functional materials into semi-finished Textiles fornext-generation energy storage	7	Business Finland (Finland); KIT (Germany)
Multifunctional materials	MarTEnergy	Sustainable and Affordable Half-Heusler based Thermoelectric Converters for Utilizationof Waste Heat into Electrical Power in Maritime Applications	3	MOST (Israel); RPF (Cyprus)
New strategiesfor advanced material-based technologies in health applications	DD-scaff	Drug delivering 3D printed scaffold strategy brings human body implants to the next levelof personalization	3	RCL (Lithuania); VIAA (Latvia)
New strategiesfor advanced material-based technologies in health applications	nanoPD	Development of a novel organs-on-a-chip platform for nanodrug delivery and functionalitytesting to treat Parkinson's disease	7	MOST (Israel); MOST (Taiwan); NKFIH/OTKA (Hungary); FNR (Luxembourg); SERI (Switzerland)
Materials for Additive Manufacturing	3DPrintInn	3D Printable Innovative Biobased Materials for Wood Mimics	3	FNR (Luxembourg); VIAA (Latvia)
Materials for Additive Manufacturing	4DbloodROT	4 Dimensional Single Piece Miniaturized BloodRotor	8	FFG-TP (Austria); NCBiR (Poland);

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Materials for Additive Manufacturing	ECOPRINT	New Composite Materials for Additive Manufacturing	7	FFG-TP (Austria); JÜLICH (Germany)
Materials for Additive Manufacturing	MatLaMeD	Development of New H-type Tool Steel Materialsvia Wire- and Powder- based Laser Metal Deposition for Toughness and Hardness Enhancement	5	VLAIO (Belgium); SPW(Belgium); KIT (Germany)
Materials for Additive Manufacturing	NADEA	Nano-scale duplex high entropy alloys producedby additive manufacturing	7	MOST (Israel); NCN (Poland); JÜLICH (Germany)
Materials for Additive Manufacturing	Reliable GF-3D	Enhancement of reliability of 3d printed fibre reinforced polymerparts via material modelling and insitu 3d X-Ray inspection technology	6	JÜLICH (Germany); M2i (Netherlands)
Materials for Additive Manufacturing	SYMPA	Stereolithography materials, production and plasma-postprocessing for durable automotive applications	7	FFG-TP (Austria); JÜLICH (Germany)

Abstracts (please note that these abstracts were submitted with the proposals):

3DPrintInn

The overreaching objective of the present 3DPrintInn project is to utilize non-woody biomasssuch as crop residues, plant biomass side streams to develop novel renewable biobased 3Dprintable polymeric UV-curable inks that mimic wood properties. The developed biobased polymeric inks will have the potential to replace presently oil-based raw components and implement smart manufacturing through the use of additive manufacturing (AM) and thus efficiently contributing to the burgeoning a bio- and circular economy. This novel concept willbe validated and tested (performance service life durability stability mechanical properties) for the prototypes of wood based industry and plastic product sector. Such ambitious objective requires the establishment of a consortium with key knowledge and competences covering different aspects of chemical engineering, nanofibres and nanoparticles, wood- based products, 3D printing and industrial manufacturing, which is established in the presentproject.

Bio4Cryo

The Bio4Cryo project aims to develop multi-layer polyurethane cryogenic insulation with a thermoreflective coating, using sustainable resources from agricultural & forest industry. TheBio4Cryo will focus on

industrially feasible and up-scalable technologies while taking into account sustainability of developed products & technologies. Cryogenic insulation is only produced from petrochemicals. Biobased cryogenic insulation materials are innovation on global level. A big concern for Europe is dependence on fossil feedstock in chemical & energy production due to economic considerations but also due to broader perspective of sustainability. The Bio4Cryo project aims to focus Europe's common efforts towards a sustainable, high value biobased economy using European origin biobased feedstock and toimprove Europe's industrial competitiveness, sustainability and strengthen the industrial leadership.

BioElectroCathode

BioElectroCathode project aims to bring innovation on biological electrosynthesis biocatalysts through: a) the manufacture of novel cathodes, b) the manufacture of a 3D biological electrosynthesis baffle reactor that can transform CO2 to CH4 and/or CO2 to ethanol. The project starts from a TRL between 2-3 and by the end of the project aims toreach TRL 5.

BioElectroCathode project will help in solving three main challenges of the contemporary energy systems: power storage, grid stability and CO2 emissions. Electricity can be suppliedfor the power of the cathode in the Microbial Electrosynthesis Baffle Reactor and it can convert CO2 into CH4 and/or CO2 into ethanol. The methane-rich biogas (biomethane) or ethanol can be stored, distributed and utilized as a fuel in vehicles compatible to natural gas.The proposed technology can be used in biogas plants (in Europe there are more than 12,400 biogas plants) or in industries that generate high amounts of CO2.

Boron-Basalt fibers

The aim of the project is to develop a novel composite material – fiber-reinforced concrete with basalt-boron fiber. It improves mechanical and enhances radiation-shielding properties,it could be used with various neutron sources, including nuclear and fusion reactors. This composite material increases substantially operation safety of radioactive sources and consequently better public acceptance of nuclear energy.

Expected result include modelled of shielding properties for gamma-ray and neutron radiation; developed methodology for production of basalt-boron fiber for industrial conditions; performance testing of the fiber in laboratory conditions; mechanical performancetesting of the fiber-reinforced concrete; experimental validation of shielding properties for neutron radiation.

Development of this fiber-concrete is expected to have a considerable economic and environmental impact due to increased concrete durability and improved safety in operationof radioactive sources.

DD-scaff

Project DD-SCAFF includes: design, development, testing, biological evaluation and fabrication of novel skeletal implants with unique synergy of properties – high mechanical strength and bone regenerative effect combined with antibiotic delivery to reduce the risk ofmanifestation of secondary infections. The implant shape and antibiotic drug release profilefrom the implant will be tailored to meet the personalised therapeutic needs of the patient. The project aims to create an innovative biomaterial-based strategy providing prolonged antimicrobial protection at the site of implant application.

The personalized product will combine a titanium implant with porous scaffold parts that are interpenetrated with calcium phosphate bone cement and gentamicin loaded PLA microcapsules which will ensure pre-programmed local delivery of the antibiotic to surrounding tissues, thus minimizing systemic toxicity effects and possible interactions withother drugs used by the patient.

DryProTex

Aim of the project is to establish a new solvent-free Dryfilm technology for the production of freestanding, flexible, multi-functional, semi-finished textile films with broad applicability, e.g.as filter mats, catalyst layers etc.

The application area of the project addresses battery electrode manufacturing for two kinds of next-generation energy storage devices: Li-S and Na-battery cells and SoA MnO2 cells forenhanced energy density at reduced costs.

Conventional coating processes with expensive drying steps will be replaced by our technology with huge economic and ecologic benefits. A European consortium has been setup along the value chain, covering material, process, equipment and battery cell development.

As a main outcome equipment will be designed and implemented in the process line at IWSfor demonstrating the potential of this disruptive technology. Our aim is strengthening Europe's future position in multifunctional materials, equipment design and battery cell production.

DURACER

The aim of the DURACER project is to utilize the remarkable beneficial properties of cubic boron nitride (cBN) to obtain a new generation of Spark Plasma Sintered (SPS) tool materials and to use these materials to create high-performance cutting tools. The modification of alumina-based matrix with cBN particles will improve hardness, fracture toughness and wear resistance of DURACER composites. Comprehensive tribological studies and industrial machining tests will demonstrate the performance of the material in the industrially relevant environment. The cutting tools made of DURACER composites could substitute a large portion of tools made of sintered carbides (because of better performance at elevated temperatures), ceramics (because of higher hardness and fracture toughness) and superhard materials (because of better wear resistance-to-cost ratio). Potential consumers of the project results are mainly manufacturers of tools and tools users.

4DbloodROT

Heart failure is an epidemic of the 21st century and occurs in 33% of the population above 55years, with a 30-days-mortality of >11%. Heart transplantation is gold standard for end-stage heart insufficiency, but donor hearts cover only <0.5% of the demand. Alternatives are mechanical heart assist systems (e.g. ventricular assist devices, LVADs) during the drug- supported regeneration phase of the patient's heart.

However, LVADs struggle with device-induced thrombus formation due to inadequate blood flow dynamics of the blood pump rotor, leading to the definition of the 4DbloodROT project. Focus is the R&D on stereolithography-based additive manufacturing, novel hemocompatiblematerials and surface functionalization, all-together strongly extending the freedom for blood-flow-compatible design of rotors with novel exceptional biomimetic complexity (in 3D-shape &stiffness (=4D)). Final result is an in vitro optimized rotor design as basis for extended in vivo and clinical testing.

ECOPRINT

Efficiency and reliability of power-electronics strongly depends on temperature. Growing demands on miniaturization of electronic components while ensuring efficient cooling and keeping production costs low, raises a need for new materials and technologies. The ECOPRINT project addresses this need by developing new metal-polymer and hybrid metal-organic composites suitable for Additive Manufacturing (AM) processes. The main development steps are functionalization of metallic and ceramic filler particles by Atmospheric Pressure Plasma or wet chemical processes, compounding functionalized particles with high-strength polymer matrices, optimization of filaments, modification of 3D printing machines and

investigation of new material concept for high temperature stability.

The ultimate goal of the project is to use the newly developed materials in an AM process todesign low-cost, highly thermal-efficient heat-sinks or cooling pipes of complex shape or on-demand cooling solutions.

ENVALGRA

ENVALGRA aims at the developing of innovative, environmentally friendly microalgae oil- based functional fluids modified with graphene nanosheets (GNS). Different research studieshave proven that critical tribological performance influencing properties are higher in chemically modified microalgae oil as compared to vegetable oil. The addition of graphene will provide impressive lubrication and mechanical properties resulting in excellent wearresistance under a wide range of test conditions. Furthermore, in order to reduce environmental risks and accelerate its future commercialization, graphene will be synthesized from alternative sources such as pyrolyzed waste tire.

The main innovation of ENVALGRA project is that it will entail developing functional fluids with enhanced tribological properties compared to existing ones based on water or vegetableor mineral oil, more sustainable and environmentally friendly and with lower risk of occupational exposure.

FMF

Different technologies for synthesis of flexible magnetic filaments are developed. These include linking magnetic micro-particles by DNA, attaching magnetic nanoparticles to polyelectrolyte bundles, extraction of magnetosomes from magnetotactic bacteria and other. Flexible magnetic filaments are interesting for applications as self-propelling microdevices (for targeted transport), micro-mixers (for microfluidics), different sensors (micro rheology). Numerical algorithms for predicting their behavior in magnetic fields of different configurations will be developed, including algorithms based on curve dynamics, lattice Boltzmann method, Brownian dynamics. Obtained numerical results will be compared with experimental results of measurement of flows fields around magnetic filaments, their bucklinginstabilities. As a result new technology will be developed for DLS measurements giving access to characteristics of translation and rotational motion of string like magnetic micro- objects.

ISIBHY

The use of hydrogen as an alternative to fossil fuels is an increasingly popular solution to cope with global warming and meet the goals of reducing CO2 emissions. However, hydrogen tanks have limited performance due to the early detachment of the liner with the composite. The project aims at improving the durability of the wound tank and to delay the optimum use time. The rupture of the interface between the liner and the composite may leadto a situation in which the tank does not longer assure its functionality as a reservoir. The ISIBHY project aims to increase the liner-composite assembly performances by improving the adhesive formulation and performing specific thermomechanical tests to understand the mechanisms at stake in explosive decompression process. Through testing and simulations of interfacial failure, the results are ultimately expected to enable the design of the next generation materials able to sustain the effect of explosive decompression.

MarTEnergy

The main objective of the proposed research is to develop highly efficient half-Heusler (HH) based prototype thermoelectric (TE) converter consisting of non-volatile cost-effective elements for operating temperatures ranging up to 700oC (n-type ANiSn and p-type ACoSb (A=Ti, Zr, Hf)), covering most of the potential applications conditions, including maritime gasoline engines. Overall, the objectives of the MarTEnergy are: (a) Synthesis of cost- effective highly efficient HH based compositions (b) Development of highly durable, compatible and stable joining techniques between the TE semiconductors and the involved

metallic joints (c) Integration of the entire components into practical devices (d) Finite element analysis on the prototype converter performance prediction in the maritime shipping industry to improve competitiveness and strengthen the maritime sector leadership. TRLlevels start from 2 (technology concept formulated) to 4 (technology validation in lab).

MatLaMeD

∫ (Materials Tech + Laser Tech + Production Tech)dt= Fatigue Life

MatLaMeD offers a unique opportunity to focus at a transnational level on those technologiesthat have a significant impact on the fatigue life of hot forging dies and, ultimately, on the economics of production technology. Life of dies is limited by thermo-mechanical fatigue which degrade the quality of die surfaces and finished parts. Hence, the innovative objectivesof the project are defined to address the above issues: the development of new types of hot- work tool steel by wire- and powder-based laser metal deposition as well as the developmentof casting process to produce a laser cladding wire with specific chemical composition. The new hot-work tool steel materials will possess higher toughness and hardness and, ultimately, guarantee a positive impact on the fatigue life of dies. The project has a huge potential to encompass key European industries such as advanced materials, laser additive manufacturing and PLM.

NADEA

NADEA will develop a nano-scale duplex material starting from a Co-free high entropy alloy while taking advantage of a unique phase transformation pathway via spinodal decomposition of the primary BCC-phase and concomitant FCC-formation. The novel material shall out-pass duplex or super-duplex steels and provide a significant strength increase and good corrosion resistance for centrifugal pump impellers. AM-manufacturing of impellers is envisaged by Laser Metal Deposition (LMD) and Selective Laser Melting (SLM). They both offer extraordinary means to tailor the primary grain size throughout the component, thus improving the material’s resistance to cleavage fracture. The entire processchain from powder production to demonstrator manufacturing and testing will be developed from TRL2 to TRL4 including alloy design, microstructure modelling, process development and the analysis of mechanical and corrosion properties.

NANO2COM

NANO2COM is aimed to development of advanced high-performance composites with outstanding mechanical and electrical properties by addition of novel MXene nanosheets andgraphene into epoxy matrixes. The project will firstly go forward to the rational design and systematic exploration of hybrid MXene/graphene-based polymer nanocomposites for flexible electronics and advanced construction components. It will be achieved by establishing the research cooperation among the consortium members and the industrial advisory board for the development and assessment of the novel materials. The scientific results of NANO2COM include comprehensive assessment of mechanical and electrical properties of hybrid MXene/graphene-filled polymers, and the development and validation of two lab-scale demonstrators, advanced FRP filled by hybrid nanofiller, in potential applicationfields. Testing of the demonstrators will be realized in laboratories and in supporting industries in relevant environment.

nanoPD

The proposed project intends to establish the usage of on-chip-solutions, with integratedsensors, for in vitro disease modeling and to study the ability of the newly-designed nanodrug delivery systems (NDDSs) to deliver therapeutic agents to midbrain-organoids using membrane-integrated microfluidic devices. A particular focus is aiming at developing an organs-on-a-chip device for Parkinson’s disease (PD) that should address the effect of biological barriers for disease onset and treatment and elucidate the drug inhibiting

mechanisms. The success of this project would not only provide insights on the mechanismsand principles on designing these NDDSs, but also drastically reduce the use of animal models for drugs and therapy testing. Moreover, it will highlight the development of a novel screening platform with patient specific induced pluripotent stem cells (iPSC) for advanced personalized medicine.

PLACOATAM

PLACOATAM will design, process an innovative atmospheric pressure plasma enhanced chemical vapor deposition solution (AP-PACVD) based on a micro plasma jet that can be integrated on 3D printing equipment and able to perform metallic and inorganic films. As thedeposition processing will need to be done on complex surfaces and on thermal sensitive materials, a new type of High voltage nanopulse generator will have to be developed for giving to this AP-PACVD device, the possibility to generate “homogeneous plasma” (less filament discharge) in a very small volume and a relatively extended plasma plume with a limitation of the gas temperature. During the second part, PLACOATAM will propose for the first time, “3+2D printing” concept for a rapid manufacturing of finished functional products where two highly efficient material processes are associated: 3D printing technology and anatmospheric pressure plasma 2D surface deposition process.

Reliable GF-3D

The main objective of the project is to enhance the reliability of Fused Filament Fabrication FFF parts to enable their use as real, loadable parts, e.g. for use as spare parts for automobiles or machines, personal protection equipment or even for repair of thermoplastic structures etc. where highly flexible and customized manufacturing processes are strongly recommended. Therefore, also fibre reinforced (short fibre and continuous fibre) polymers, which provide better mechanical performance, are in the focus of the investigations. This shall be achieved via scientific approved qualification of 3D-printed objects made by the FFFtechnology on portal and also robot based printing systems. For a deep understanding of thecorrelation between material composition, process parameters and the mechanical performance of 3D printed parts and 3D X-Ray insitu inspection method shall be developed.

SYMPA

Project SYMPA aims at developing new raw materials and post-processing technologies for durable Stereolithography (SLA) products with a focus on automotive applications. By overcoming the weaknesses of current SLA materials such as low mechanical properties andUV stability, this AM technology enables the production of individualized products specificallydesigned for customer needs. The innovation objectives include the development of a new photosensitive polymer with increased thermal and mechanical properties, the fibre reinforcement of the polymer and surface modification technologies to further improve the environmental resistance of products. The German/Austrian project consortium is set up along the entire value chain of SLA technology including material developers, machine producers, research institutes and end users. All developed technologies will be demonstrated on the basis of real automotive structures considering the requirements onindustrial production processes.

M-ERA.NET Call 2018: Funded projects

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Multiscale modeling for materials engineering and processing (M3EP)	TESTIMONIES	Theoretical and Experimental Study of TransItion Metal Oxyhydride NanomaterIals for supErconductivity and photocatalysiS	6	RCN (Norway); UEFISCDI (Romania); RCL (Lithuania); SAS (Slovakia)
Innovative surfaces, coatings and interfaces	CORR-PROOF	Graphene-based Environmentally-Friendly Corrosion Protective Coating forAeronautics Industry	4	RCN (Norway); Tübitak (Turkey)
Innovative surfaces, coatings and interfaces	FunKeyCat	Functional grading by Key doping in Catalytic electrodes forProton Ceramic Cells	4	RCN (Norway); NCN (Poland); AEI (Spain)
Innovative surfaces, coatings and interfaces	HOTselflub	SELF-LUBRICATING SYSTEMSFOR HIGH TEMPERATURE TRIBO-APPLICATIONS	4	ETAG (Estonia); FFG TP (Austria); NCN (Poland)
Innovative surfaces, coatings and interfaces	HyprSTEP	Development of novel hybrid process based on graphene modified smart textile filters andpolymer membranes for advanced wastewater treatment	5	PTJ (Germany);
Innovative surfaces, coatings and interfaces	INCOMARC	Innovative coating materials forarc resistant electric contacts	3	CALABRIA (Italy); SPW (Belgium)
Innovative surfaces, coatings and interfaces	ISOS	Multi-functional icephobic, robust, lightweight and transparent coatings for windowsand lenses	3	RCN (Norway); AEI (Spain)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Innovative surfaces, coatings and interfaces	MARWEL	MAteRials for Wind farm componEnts Life improvement	4	EJ-GV / Innobasque (Spain); CALABRIA (Italy)
Innovative surfaces, coatings and interfaces	Smart RESCyou	Personal protection through sensor surfaces on smart highperformance fibres	7	PTJ (Germany); FFG TP (Austria)
Innovative surfaces, coatings and interfaces	StressLIC	Addressing the stress-related functional limitations of thin-filmLi-ion components for energy- intensive applications	5	FFG TP (Austria); MINECO (Spain)
Innovative surfaces, coatings and interfaces	TriboHEA	High entropy alloy coatings fortribological applications	3	EJ-GV / Innobasque (Spain); UEFISCDI (Romania)
High performance composites	CompoRail	Fibre-reinforced composite roadguardrails	4	SPW (Belgium); VIAA (Latvia)
High performance composites	ECOPLACKAGING	Vegetal fibres-reinforced PLAantimicrobial composites for packaging applications	4	FRCT (Portugal); TA CR (Czech Republic)
High performance composites	EPIC	European Partnership forImproved Composites	4	VIAA (Latvia); SAS (Slovakia); TA CR (Czech Republic)
Functional materials	2D-SPIN-MEM	Functional 2D materials and heterostructures for hybrid spintronic-memristive devices	4	AEI (Spain); UEFISCDI (Romania); BNSF (Bulgaria)
Functional materials	BioValue	Advanced Membranes for biogasupgrading and high added value compounds recovery	5	CALABRIA (Italy); TA CR (Czech Republic)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Functional materials	CATALEAST	Holistic design of fuel cell electrocatalysts for the leastpower applications	4	UEFISCDI (Romania); NKFIH (Hungary)
Functional materials	En-ActivETICS	Energy Activated External Thermal Insulation Composite System - integration of thermal storage and photovoltaics for energy-efficient buildings.	4	SAS (Slovakia); ETAG (Estonia); NCBR (Poland)
Functional materials	NOEL	Innovative Nanostructured Electrodes for Energy StorageConcepts	3	AEI (Spain); MIZS (Slovenia); NCN (Poland)
Functional materials	SunToChem	Engineering of perovskite photocatalysts for sunlight-drivenhydrogen evolution from water splitting	3	MIZS (Slovenia); MOST (Taiwan) VIAA (Latvia)
Functional materials	VOC-DETECT	Smart Portable System for VOCsdetection	4	UEFISCDI (Romania); NKFIH (Hungary)
Functional materials	ZMOMUVS	ZnMgO materials with tunableband gap for solar-blind UV sensors	5	VIAA (Latvia) RCL (Lithuania); MOST (Taiwan)
New strategies foradvanced material- based technologiesin health applications	BIOMAG	Advanced magnetic nanoparticles for detection and quantification of biomarkers in biological fluids	4	AEI (Spain); MIZS (Slovenia)
New strategies foradvanced material- based technologies in health applications	NanoTENDO	Nanoparticle Transfer ThroughEndothelial Barrier	4	VIAA (Latvia);NCN (Poland)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Materials for Additive Manufacturing	AluNanoCore	High strength nano reinforced aluminium powder cored wire forarc based ALM	5	PTJ (Germany); BNSF (Bulgaria)
Materials for Additive Manufacturing	AM-Crash	Additive Manufacturing Technologies for Crash loadedstructural Components	6	PTKA (Germany); NCBR (Poland)
Materials for Additive Manufacturing	A-MELIUS	Additive Manufacturing of functional and Effective LIghtUse-caseS	5	PTKA (Germany); IDEA (Spain)

Abstracts (please note that these abstracts were submitted with the proposals):

TESTIMONIES

During the last three decades it was established that theoretical modelling plays an important role not only in fundamental research, but also has strong impact on engineering disciplines and technical challenges. The main focus of the project is multiscale modelling of transition metal oxyhydrides – an emerging class of materials - combined with experimental verification of the theoretically predicted material properties and evaluate applications in superconductivity, energy saving, and photocatalysis for breakdown of contaminants in water. This is a multidisciplinary project combining expertize of specialists in materials science, environmental technologies, physicists, chemists, and engineers. The consortium consists of experts from education- and basic research-oriented Institutions, an applied research Institution, and SMEs. It will form a platform for enhancing the ongoing collaboration, provide training of young scientists, exchange of infrastructure, new ideas, and competence.

CORR-PROOF

European companies are about to abandon widely used corrosion-protective treatments containing hazardous substances such as Cr6+ according to REACH regulations of EU. The aim of CORR-PROOF Project is to develop a novel concept involving anti-corrosive coating formulations with low environmental impacts to European industry, beginning with the aerospace industry. The focus will be on developing corrosion-resistant coatings for aluminium aircraft components by combining (i) graphene derivatives with high barrier properties, (ii) derivatives of POSS for adhesion and self-healing, (iii) environmentally low impact material and solvents, and (iv) by implementing responsible research and innovation (RRI) by conducting HSE impact assessments in a ‘safe by design’ approach. A transnational consortium including a nanotechnology-based SME, two well- known research institutes and a leading aerospace corporation came together to realize the objectives and come closer to commercialize the technology.

FunKeyCat

Functional Grading by Key doping in Catalytic electrodes for Proton Ceramic Cells (FunKeyCat) is an effort to bridge the gap between fundamental science and applied research for a leap towards highly efficient electrochemical cells by understanding the effects of functional and mechanical properties of the

constituent materials on the efficiency of the electrochemical cells. Challenges such as cell resistance and catalytic properties of the electrodes will be overcome through studies of how doping of key elements affects ionic and electronic transport in the electrode materials, and how the balancing between these correlates with chemical and thermal expansion. Functional grading will increase mechanical robustness, minimise cell resistance and maximise electrochemical functionality. FunKeyCat will also explore a new concept of using electric potential for exsolution and regeneration of oxide nano catalysts to enhance cell durability and performance.

HOTselflub

Many high temperature manufacturing processes run with uncontrolled friction conditions resulting in high energy consumption and high wear. The only solution available to control friction at temperatures over 300°C is to rely on solid lubricants. However, they come with limitations such as added costs, need to clean the parts and environmental concerns. The aim of HOTselflub is to develop novel self-lubricating (self-lub) concepts to control friction in the range of 300°C to 1000°C. These concepts will be implemented as bulk and as coatings using several deposition techniques on novel additive-manufactured ceramic-based composites to obtain superior high temperature properties, besides self-lubrication. In those applications where the use of solid lubricants is inevitable due to severe contact conditions , the developed self-lubricating surfaces will be tailored to have synergy with solid lubricants, enabling the use of more environmentally friendly compounds.

HyprSTEP

The transmission of antibiotics and antibiotic-resistant bacteria in the hydrological cycle is one of the most critical issues for the global water security. Among others, ineffective wastewater treatment processes in sewage plants are responsible for contamination of water. To overcome these challenges, “HyprSTEP” project focuses on the development of a novel hybrid process based on a treatment of wastewater utilizing smart textile filters combined with membrane bioreactor (MBR). Important innovation steps are adsorptive and biocidal graphene-based coatings, which are applied on tailor-made textile filters and polymer membrane surfaces. The application of graphene will lead to the development of smart textile filter with self-cleaning properties. The optimization of polymer membranes and the tailor-made engineering of the MBR plant are also necessary. The project strives to demonstrate a strong increase in efficacy as well as profitability of the novel wastewater treatment processes.

INCOMARC

The INCOMARC project aims to develop new materials for Electrical Contacts (EC), i.e., the current carrying part of the contactor. The requirements for EC materials are: low resistivity; resistance to electric arc erosion; resistance to corrosion, to prevent formation of insulating oxides. State of the art materials contains potential hazardous materials, which use is restricted, as in the case of Ag/CdO.

The project will focus on new materials for EC, and on innovative deposition technologies. Metal Matrix Composites, constituted by hard ceramic phases dispersed in a conductive matrix, will be investigated. Constituent phases will be selected by an accurate material design; the use of nanoparticles will be considered. EC materials will be deposited by Cold Gas Spray and Laser Cladding, which allow to process materials not obtainable by more conventional techniques.

The developed innovative coatings and the know-how obtained in the project can address to a wide range of applications.

ISOS

Ice on window/lens surfaces cause operational difficulties in optical sensors and windshields. We propose a passive, environmentally friendly method to prevent or delay ice formation without the application of energy while preserving the surface optical properties. This solution overcomes the limits of the active methods currently employed that are costly, energy consuming, environmentally harmful and dangerous for lens/window integrity. Two families of innovative materials (functionalized graphene and selflubricating liquid water layer) will be synthesised, characterised, and tested at lab level for multifunctional coatings (TRL4), with icephobic, robust, lightweight and transparent properties. The proposed approach is flexible, cost-effective and scalable in production, allowing a fast integration at industrial scale. The performances of the coatings for industrial application in the optical sensor market sector will be assessed and validated with the industrial advisory board.

MARWEL

Bearings, the most critical components of Wind Turbine drivetrains, show high incidence of unexpected failure with high maintenance costs. MARWEL Project aims at extending the service life of bearings Wind Turbine in rotors, generators and gearbox, developing protective solutions against wear and corrosion of such critical elements i) via Innovative Graded Coatings deposited by Cold Gas Spray and High Velocity Oxy Fuel, and ii) by the optimization of the induction hardening on bulk steel. The analysis of the vibration signals from bearings on Wind Turbine and signals from lab vibration monitoring system and new testing procedures will guide the optimization process. The vibrational data analyses will provide technical-statistical information for better comprehension of phenomena involved in bearings failure modes. The optimized solution will be evaluated to better address the O&M management plan from a technical-financial point of view with the aim of lowering costs.

Smart RESCyou

This research proposal focusses on the development of a digitally controlled metallisation of high performance fibres in order to integrate innovative sensors into multipurpose personal protective equipment (PPE). With this innovation, the research consortium is developing solutions to push PPE into the new era of digitally supported PPE.

The global PPE market is expected to reach 59.5 Billion Euro in the next five years and increases by 7 % per year in the fields of textiles. This development still is triggered by an increased need for work safety. The demands on functionality combined with light weight material have been growing steadily over the last decades. While the changes to more fashionable workwear led to growth in the last ten years, smart work wear and digital interconnection will be the new challenges for the European textile industry in order to keep their market share. The research proposal therefore focusses on the integration of smart textiles into PPE.

StressLIC

For electric cars to compete with traditional cars and complete an industrial transition required for global sustainability, we need Li-ion batteries (LIBs) with energy density 500% higher than current technology permits. Such a disruptive innovation is only feasible if we understand how mechanical stress gradients degrade battery performance on the nanoscale, and take remedial action. The StressLIC consortium will characterize and propose remedies for the stress-related limitations of current LIBs, by combining cutting-edge thin film measurement and simulation techniques from several disciplines. StressLIC is committed to improving battery performance in terms of capacity, power, lifetime and safety. The consortium includes three leading EU Labs specialized in nanoscale materials science, an expert in LIBs from Sandia National Lab, and a large battery-analysis EU company.

TriboHEA

The main objective of the TriboHEA project is to develop novel HEA (High Entropy Alloy) coating technology for applications requiring medium-to- high friction and wear resistant surfaces. Coatings with such tribological characteristics are especially desirable by machine and automotive industry for improving the performances and the life time of friction components, such as clutch plates. The projects will focus on the technology development for synthesis of mm-thick HEA coatings to engineer the friction surfaces of clutch plates, subject on which the end-user partner is very interested. The project is planning to advance the coating technology from TRL 3 to TRL 6 by demonstrating the coating performances in the end-user's clutch test rig. To realize that, the TriboHEA Consortium combines one research institution from Romania, one SME from Romania, and the end-user industrial partner from the Basque Country (Spain).

CompoRail

The objective is to design, manufacture and test an innovative road restraint system whose guardrail is made of a thermoplastic composite material. The partners will propose a material, a modelling methodology, a structural design and a manufacturing technology adapted to the application. The development will be based on physical and virtual prototypes. The objective is to reach TRL 6, starting from TRL 2. Composite material is a good solution for replacing concrete and steel barriers that can damage cars a lot in case of light impact, and that are expensive and subjected to corrosion. The partners will put their expertise together: University of Latvia for the selection and testing of the composite material, GDTech for the simulation of crash, for modelling composite structures and for its knowledge of the safety barriers context for certification and standardisation, Desami for the design and installation of the barrier and soil testing and Sobelcomp as producer of the plastic beam.

ECOPLACKAGING

The development of bio-based antimicrobial packaging polymers is in great demand in order to overcome the huge environmental impact of conventional fossil-based plastic materials and guarantee food protection against physical, chemical, and microbiological effects that is why bio- based materials have attracted extensive interest in the packaging field. Poly(lactic acid) (PLA) is the ideal choice to achieve these goals because it is compostable and can be produced from renewable resources, however, pure PLA materials also have some shortcomings, such as poor hydrophilicity, poor mechanical properties and lack of antimicrobial functionality, which limit their range of application. In order to overcome these limitations ECOPLACKAGING aims to develop a fully biodegradable bioplastic composite consisting of a PLA matrix reinforced with: 1) vegetal fibres obtained from plant waste, namely island invasive plant species and 2) low-cost and environmentally-friendly antimicrobial glasses.

EPIC

The objective of European Partnership for Improved Composites (EPIC) is research, development and manufacturing of new hybrid composite materials based on epoxy/carbon fiber composites combined with certain types of special structured molecules and/or with the use of carbon or inorganic nanostructures.

Better compatibility and interconnection of polymeric system with carrying carbon matrix will be achieved by suitable chemical modification of primary materials. New types of organically modified nanostructured composites will significantly decrease delamination and crack propagation in epoxy carbon composites. If necessary, functionalization of carbon fibers will be carried out enabling resulting chemical bond with carrying polymeric system.

Expected result is a composite design which can be applied in more challenging applications in terms of mechanical strain and durability.

Systems intended for the transport industry (aviation, automotive, shipbuilding) and for the construction industry (concrete structures reinforcement) will be aimed to focus on the industrial implementation.

2D-SPIN-MEM

Magnetic memories (MRAM) and memristors are amongst the most promising technologies for emerging nonvolatile memories. MRAM implement concepts developed within spintronics, which uses spin –rather than electrons– to transfer and store information. In this project we will explore hybrid spintronic-memristor devices in graphene-based heterostructures comprising 2D transition metal dichalcogenides (TMDs) and less explored group-IV monochalcogenides (IV-MCs) materials. We will perform the first ever evaluation of the potential of 2D IV-MCs as memristors and implement graphene-based heterostructures with enhanced spin-orbit coupling using both TMDs and IV-MCs. With these heterostructures we aim at controlling graphene's spin properties by changing the memristive setting of the chalcogenides. They will be made and characterized such that new multifunctional 2D systems are generated for applications in ultradense and ultralow power nonvolatile memories and neuromorphic computer architectures.

BioValue

Bio-digester gas streams contain valuable products such as bio-methane and VFA whose recovery has important advantages for the environment protection, energy saving and waste valorization. BIOVALUE focuses on the development of a membrane-based innovative process for the treatment of biogas produced by a real bio-digester. Advanced membrane units will valorize the biogas by separating its various components, i.e., bio-methane, VFA, water, etc. Membrane operations are nano-based key enabling technologies, based on advanced functional materials, capable to selectively separate small molecules. This confers to the membrane a specific functionality that, coupled to its configuration (very thin layer), leads to continuous separations operated in steady state. BIOVALUE project will use membranes - advanced nano-structured functional materials- for driving environmental-friendly and little energivorous novel separation processes valorizing waste as required by circular economy dictates.

CATALEAST

Polymer Electrolyte Membrane Fuel Cells (PEMFCs) comprise the most important fuel cell type for mobile and portable electricity generation. Currently used PEMFC electrodes based on Pt/C electrocatalysts have stability issues resulting in limited lifetime and high price. Project CATALEAST, a consortium with complementary expertise in catalyst development and PEMFC design, proposes development of new types of composite-based corrosion resistant catalysts with improved stability and decreased Pt content; integration of these materials into Membrane Electrode Assemblies (MEAs); and building of PEMFC cells and stacks from these MEAs for laboratory tests and application in new portable devices. The novel generation of electrocatalysts and the completed small PEMFCs with MEAs built on these catalysts as the outcomes of the proposed work will contribute to the deployment of hydrogen fuel cells, one of the key technologies towards a sustainable, decarbonised and more efficient energy system.

En-ActivETICS

The main goal of En-ActivETICS project is to develop Energy Activated External Thermal Insulation Composite System for smart building envelope, by combination of traditional low thermal conductivity insulation system ETICS with high heat capacity phase change material (PCM) and flexible photovoltaic (FPV) system generating electrical power. The proposed solution is a new step in development of building facade technology allowing to achieve a component classified to the group of functional material. The innovative character of the project arises due to the research and technological challenge which is the development of novel, cost and energy effective building component, examination of its thermal and mechanical properties as well as validation and demonstration of the proposed solution in relevant

environment. The final result of the project will be comprehensively tested En-ActivETICS, revealing the capability to adjust its physical properties for better building performance.

NOEL

Energy storage systems will play a fundamental role in reducing fossil fuel consumption and greenhouse gas emissions by providing solutions to store energy produced from renewable sources and to implement electrical vehicles.

Graphite is the traditional material used in standard rechargeable batteries or supercapacitors, but presents limitations because of its limited intrinsic capacity, lithium-ion insertion capacity, and specific capacitance. Moreover, graphite, but also lithium and cobalt, all standard materials for supercapacitors and lithium-ion batteries, are limited resources, and Europe is dependent on external supply.

To solve these shortcomings, NOEL aims at developing new low cost environmentally friendly layered semiconductor-carbon composites for their use as innovative electrodes for next generation batteries or supercapacitors, looking for improved performance, low price, high material availability, locally produced in Europe, and eco-friendly properties.

SunToChem

In SunToChem the latest knowledge in density functional theory (DFT), particle crystallization mechanisms, and reactor design are combined to promote the understanding of key parameters in photocatalytic water splitting and provide guidelines for preparation of MTiO3 (M=Sr, Ba, Ti) perovskite photocatalyst particles by design. This concept includes enhancement of photocatalytic activity of defined-shape perovskite particles through improvement of the spatial separation of photogenerated charges on the same particle by means of ferroelectricity/flexoelectricity or different polarity of the facets due to different orientation/termination, and improvement of solar light absorption by doping. The main objectives of the project include band gap and crystal facet engineering by DFT to guide the development of the perovskite particles with defined size, shape, exposed facets, and terminations and evaluation of the particles for the H2 generation from photocatalytic water splitting reaction.

VOC-DETECT

Most human environments are characterised by the presence of a large number of chemical substances which mainly belong to the group of volatile organic compounds (VOC). Numerous studies revealed the toxic and carcinogenic effects of these VOCs which usually can be found in indoor air, but the tools for the detection of VOCs are still not very precise and too expensive. The project will develop new sensors based on nano MOX and CNT materials for VOC detection, integrated into a smart portable system providing quantitative information about the concentration of Formaldehyde and Benzene in indoor air.

The results will be:

- Technology demonstrator and Smart, portable system prototype and new formaldehyde and benzene sensors;
- Technology for thin sensitive films deposition and integration in the microtechnology steps flow for sensors fabrication on silicon – Demonstration;
- E-Nose1 system, including sensor array, data processing algorithms and software for VOCs accurate detection.

ZMOMUVS

Deep UV photon sensors based on wide bandgap semiconductors can be used as biological and chemical sensors for ozone detection, detectors for water purification, determination of pollution levels in any

biological agent. The concept of this project is to use the ZnO-MgO pseudobinary system, which has tunable bandgap from 3.3 eV to 7.8 eV, thus significantly enhancing the ability of the sensor to detect signals at different energies simultaneously. Our recent results indicated that the limitation of ZnO and MgO mutual solubilities can be broken by stablizing the high MgO-content wurtzite Zn1-xMgxO and high ZnO-content rocksalt Zn1-xMgxO epilayers by using low lattice mismatch substrates such as ScAlMgO4, MgO and Cu2O. The international consortium includes five partners: Partner 1 & 5 (Taiwan) will be responsible for the growth of single crystal substrate and epitaxial growth of ultra-wide bandgap Zn1-xMgxO epilayers/heterostructures. Partners 2-4 (Latvia & Lithuania) study opto- electrical properties, and provide feedback of the optimal growth parameters. Besides Partner 2 fulfills computer modelling of the material structure, providing the theoretical support of the project. Participation in this project will help to increase technology readiness level of all partners: up to TRL 4 in Taiwan and TRL 3 in Latvia and Lithuania. We believe this project will bring benefits for each partner and provide new contributions to the European society.

BIOMAG

An ever-increasing number of medical applications is adopting nanotechnology to go beyond the current state-of-the-art. BioMag aims to provide a quick, sensitive, reliable and low-cost in vitro diagnostic methodology based on functionalised magnetic nanoparticles (F-MNPs) for detection of biomarkers present in bodily fluids. The project aims to 1) design F-MNPs with recognition ligands that specifically interact with cardiac biomarkers related to myocardial infarction and MNP surface engineering to minimize unspecific interactions with off target biomolecules present in blood samples; 2) monitor changes of AC hysteresis loops of F-MNPs after specific interaction with biomarkers; 3) develop numerical simulations to model the variation of the AC hysteresis loops for quantifying the biomarker amount present in the studied sample. The BioMag consortium gathers excellent and multidisciplinary research teams for approaching material science fundamentals towards market applications.

NanoTENDO

The controlled delivery of drugs to the brain remains a challenge in the effective treatment of neurodegenerative diseases due to the role played by the endothelial barrier. The endothelial barrier is an important part of the body. It consists of the layer of the special cells organized in a complex system. This barrier surrounds our vessels and protects the body tissues from unwanted visitors: microbes and toxic substances. However, the fact that this barrier recognizes all substances as intruding species causes a huge medical problem in treatment for many severe brain diseases, among them the Alzheimer disease. Our project aims to develop the nanoformulations based on dendrimers, dendrons or gold nanoparticles which will overcome the endothelial barrier resulting in the effective and specific delivery of therapeutic substances.

AluNanoCore

Cost effective wire arc-based additive manufacturing (ALM) processes have the potential to deliver high build-up rates for large volume components. However, for the production of lightweight components, there exist currently only a limited range of low strength standard solid wires. The project objective is to develop a carbon nanostructure reinforced aluminium cored wire (AluNanoCore), which represents a fundamentally new type of filler material for wire arc ALM. The main technological goal of the development is a strength increase of three times compared to conventional AlSi-based materials. Due to this significant increase in strength, lightweight components with reduced wall thicknesses and cross sections can be produced. A new class of Al material will be available for the additive production of lightweight components, which has a superior strength-to-density ratio. The validation and demonstration of the project results will be carried out on at least two demonstrators.

AM-Crash

Metal-based laser additive manufacturing (LAM) technologies are able to create high performance parts featuring enormous geometrical complexity. The here proposed AM-Crash project will develop this technique for the automotive sector for highly dynamically loaded applications. Therefore, an adaptable 3D-manufacturing concept for different crash-loaded applications in automotive Body-in-White (BIW)-structures regarding to strength and ductility requirements will be educed.

The aim of AM-Crash is to achieve equivalent mechanical properties of LAM components compared to standard deep-drawn parts. This will create significant cost and lead-time benefits using LAM parts for prototype vehicles during car development for crash tests, for small batch series components and for spare parts.

The identical structural behaviour of LAM components and deep-drawn sheet metal will be achieved by a multifactorial approach combining a specific LAM processing with suitable post treatment and joining/integration technologies. Numerical simulations to predict final part properties will accompany the entire process chain.

A-MELIUS

The nature of the project is to improve the performance of AM Additive Manufactured optimized aerospace parts, having an impact in their Efficiency by means of a LIght weight design, enhanced surface quality by laser processing, and therefore mechanical performance, together with the possibility of functionalizing ad-hoc surfaces and improving corrosion resistance. The target technologies will be proved in a dedicated series of Use-caseS from different aerospace platforms. The main benefits are the combination of materials and laser technology for enhancing the properties of manufactured components. These aspects will allow extending the applicability of AM beyond the current state-of-art and break new ground for the application of AM in aerospace. The foremost economic benefits for the envisioned aerospace use-cases are the possibility of saving raw materials and weight, improving surface or mechanical properties, adding desired functionalities, or reducing sub-components number.

M-ERA.NET Call 2019: Funded projects

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Inovative surfaces, coatings and interfaces	AnBaCo	Antibacterial Coatings Containing Carbon Nanoparticles Obtained by Sol-Gel Method	3	NCBR (Poland); TACR (Czech Republic);
Inovative surfaces, coatings and interfaces	cladHEA+	Laser cladding as resource efficient manufacturing route for high temperature corrosionand wear resistant coatings based on High Entropy Alloys (HEA)	4	SMWK (Germany); ANR (France);FASIE (Russia)
Inovative surfaces, coatings and interfaces	ENZ4IFACES	Innovative enzymatic coatingsfor electrochemical interfaces	4	UEFISCDI Romania); IDEPA (Spain);DST (South Africa)
Inovative surfaces, coatings and interfaces	interBATT	Key enabling interface engineering and characterization for nextgeneration batteries	5	PtJ (Germany); FNR (Luxembourg)
Inovative surfaces, coatings and interfaces	IsoWire	Drug eluting coating with ultra-low friction interface for urological guide wire to reducetrauma during surgical removalof renal stones.	3	NCBR (Poland) DST (South Africa)
Inovative surfaces, coatings and interfaces	LaMoFlo	High-rate laser surface texturing of 3D injection molds to fabricate functionalized easy-flow polymeric containers	3	SMWK (Germany); Prima(Canada)
Inovative surfaces, coatings and interfaces	MiDICoat	Microstructure Design of Innovative Interfaces in CVDHard Coatings	3	SMWK (Germany); TACR (Czech Republic)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Inovative surfaces, coatings and interfaces	MiLaCo	New optical Components based on nanostructured dielectric thin films designs forapplication in MicroLasers	6	RCL (Lithuania); ANR (France);
Inovative surfaces, coatings and interfaces	OxyGaN	Efficiency enhancement in GaN-based blue to blue-violetLDs by engineered nitride- oxide ohmic contacts	5	NCBR (Poland); NKFIH (Hungary); MOST (Israel)
Inovative surfaces, coatings and interfaces	SensCoat	Smart Nano-bio-coating for Manufacturing of Biosensorsfor Point of Care Molecular Genetic Diagnosis	4	TUBITAK (Turkey); IDEPA(Spain); SMWK (Germany)
High performance composites	AMCSS	Additive manufactured composite smart structureswith embedded fibre Bragggrating sensors	3	NCN (Poland); RCL (Lithuania)
High performance composites	HEMP4NZEB	Manufacturing technology ofbuilding products made of ecological high performancefibre composites with encapsulated PCM for the NZEB application	4	VIAA (Latvia); NCBR (Poland)
High performance composites	Hybrid_beams	Composite reinforcement in alight stainless steel bus structure	4	TAČR (Czech Republic); NCBR (Poland)
High performance composites	MERF	Matrix for carbon reinforced epoxy laminates with reducedflammability	5	TAČR (Czech Republic); RCL (Lithuania); VIAA (Latvia); SAS (Slovak Republic)
High performance composites	NATALINA	Natural fibers reinforced composite: an affordable andsustainable new material/ design/ manufacturing approach	3	FNR (Luxembourg); TUBITAK (Turkey)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
High performance composites	NovCom	Novel high performance diamond based composites	3	NCBR (Poland); SMWK (Germany)
Functional materials	3D-Photocat	Multifunctional 3D photocatalytic systems forenvironmentally friendly sustainable technologies	4	AEI (Spain); FAPESP (Brazil); UEFISCDI (Romania)
Functional materials	CENTAUR	Ceramics with sensing capabilities for high temperature applications	3	SMWK (Germany); FNR (Luxembourg); TACR (Czech Republic)
Functional materials	C-MOF.cell	Novel materials as electrode and electrolyte components infuel cell technology	4	AEI (Spain); ETag (Estonia); ANR (France)
Functional materials	COSMAG	From the Cosmos to the Lab: Development of the L10-FeNi Phase as a Disruptive Permanent Magnet Alternative	4	AEI (Spain); SMWK (Germany); SAS(Slovak Republic);
Functional materials	GADEIRE	Gas Absorption sensors Development for Environmentbased on novel mid-InfraRed hollow fibers with Enhanced functional design	4	ANR (France); NCN (Poland); SPW (Belgium)
Functional materials	HYSUCAP	Synthesis and characterizationof novel 2D hybrid materials for supercapacitors	3	SMWK (Germany); TACR(Czech Republic); NCN (Poland)
Functional materials	INNENERMAT	Innovative nanostructured materials and smart textile electrodes for new generationof batteries and supercapacitors	6	AEI (Spain); PtJ (Germany); Regione Callabria (Italy)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Functional materials	LiBASED	Li-ion BAttery-SupErcapacitorHybrid Device	3	TACR (Czech Republic); SAS(Slovak Republic); TUBITAK (Turkey)
Functional materials	NANOPOL	Low density NANOnanocellular POLymers for thermal insulation in buildings. Basic heat transfer mechanisms and LCA	3	ICE (Spain); MOST (Taiwan); FAPESP (Brazil)
Functional materials	NewILUMIS	NEW VERSATILE PLATFORM FOR ILLUMINATION AND SENSING	5	NCBR (Poland); ANR (France); SMWK (Germany);
Functional materials	SALMOS	Sensor Arrays using Luminescent Metal-Organic Frameworks for the Optical Detection of Explosive Vapoursand Toxic Substances	5	AEI (Spain); CRIF (Cyprus); TUBITAK (Turkey)
Functional materials	SmartMatter	Core integration of novel functional, adaptive materialsinto a smart, highly sensitive analytical system for point of need environmental applications	5	UEFISCDI (Romania); REGIONE CALABRIA (Italy); ANR (France)
Functional materials	TRAVEL	A Novel Transparent Electrodes for VCSELs	4	NCBR (Poland); ANR (France)
New strategiesfor advanced material-based technologies in health applications	Eco-OLED	Enabling a Commercially Viable Long Lifespan and High-Efficiency Omni-Friendly OLED Lighting Source with G2and G3 Emitters	4	MOST (Taiwan); RCL (Lithuania); VIAA(Latvia);

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
New strategies for advanced material-based technologies in health applications	INJECT-BIO	Bioactive injectable hydrogelsfor soft tissue regeneration after reconstructive maxillofacial surgeries	5	VIAA (Latvia); RCL (Lithuania); TÜBITAK (Turkey); TAČR (Czech Republic); MOST (Israel)
New strategies for advanced material-based technologies in health applications	ISIDE	Innovative Strategies for bIoactive/antibacterial advanceD prosthEses	6	REGIONE CALABRIA (Italy); SMWK (Germany); UEFISCDI (Romania); TÜBİTAK (Turkey)
New strategies for advanced material-based technologies in health applications	LIGNP4WOUND	Antibacterial breathable wounddressing based on polymer electrospun nanofibers	3	TAČR (Czech Republic); FNR (Luxembourg)
Materials for additive manufacturing	fingerIMPLANT	Patient-specific, anti-microbial bioactive finger implants for durable functional reconstruction after amputation	6	FFG (Austria); NCBR (Poland)
Materials for additive manufacturing	MultiMat3	Multi-Material Additive Manufacturing	6	SMWK (Germany); DST(South Africa)
Materials for additive manufacturing	RIPE4TEC	Reactive Inkjet Printing of Epoxy Thermoset Composites	5	FFG (Austria); UEFISCDI (Romania)
Materials for additive manufacturing	SEAM-PP	Material and process development for the productionof large-sized polypropylene components in the novel high- speed 3D printing process SEAM	6	SMWK (Germany); Innosuisse (Switzerland)

Abstracts (please note that these abstracts were submitted with the proposals):

3D-Photocat

The main goal of 3D-Photocat is the development of highly extended 3D carbonaceous@TiO2 heterojunctions with improved photocatalytic performance for environmentally friendly reactions. High-surface area activated carbons modified with graphene (or graphene derivatives) will be used as 3D platforms to grow a thin TiO2 nanofilm so that the final composite will give rise to an optimal photocatalytic performance based on the Z- scheme heterojunction model. These composites will be designed to take advantage of the excellent photocatalytic performance of TiO2 and graphene, and the superior conversion of light in the confined nanospace of activated carbon materials. The development of a controlled porous network and a well-defined surface chemistry (including a well-dispersed TiO2 nanofilm) will provide a bifunctional system able to adsorb and convert simultaneously or in pulsed-mode i) CO2 into value-added chemicals, and ii) water pollutants into harmless compounds.

AMCSS

The project specific innovation objectives and results are related to the development of high performance composites – additive manufactured (AM) carbon/ glass fibre reinforced polymers (CFRP/ GFRP) with embedded fibre Bragg grating (FBG) sensors. FBG sensors advantages (small dimensions and weight, high multiplexing capabilities) allow to embed them into structures without influence on the material durability. It allows development of structural health monitoring (SHM) system increasing the safety of AM structures recently very popular in many industrial branches. Impact and potential benefits are related to developing method of manufacturing high strength performance composite materials with embedded FBG sensors. Such approach combines in one advantages of AM (limited waste, elements with complex shape) and SHM system (safety, information about real loading conditions). Such method can be applied for manufacturing of different elements in e.g. marine, civil engineering structures.

AnBaCo

The aim of the project is to obtain, by sol-gel method, nanocarbon-containing coatings with high antibacterial properties and low toxicity, for various applications. Particularly, in the first step of the project, known technology of sol-gel layers deposition will be further developed in order to substitute toxic metal compounds with non-toxic carbon nanoparticles (CNPs). This will result in elaborated technology of coating with modified CNP-layers possessing adequate physical properties. CNPs will be chemically modified to render enhanced antimicrobial properties. Antibacterial activity of the sterilized layers will be proved by microbiological experiments with selected strains of bacteria, moreover, safety of the products will be confirmed. The technology will be adopted to automatic process with utilization of designed and manufactured, Portable Laboratory Stand. Undertaken works will result in the market product of validated antibacterial composite coating.

CENTAUR

CENTAUR aims to develop a family of functional materials based on oxide ceramic matrix composites (CMC) that are reinforced with oxide ceramic fibres and carbon nanostructures. The new material is provided with integrated sensing capabilities and can be produced by 3D printing methods, which enables inline continuous reinforcement while controlling fibre’s orientation. The thermo-mechanical and durability properties are improved (fracture tough, thermal shock resistant, quasiductil, corrosion-resistant), with a lower density (e.g. than Ni superalloys). The material can be used as primary structure in high temperature applications (withstanding temperatures up to 1350°C) for online and non-invasive process inspections, such as structural health monitoring. Two functional prototypes for the aerospace and automotive sectors will be produced and validated at TRL4, including an improved software for modelling the mechanical properties and further optimize mechanical and sensing performance.

cladHEA+

The main ambition of cladHEA+ is to be pioneer in the material science of High Entropy Alloys (HEA) while at the same time contributing significantly for their introduction in the industrial field as innovative substitutes for state-of-the-art coatings used under severe conditions currently based on critical materials. The attraction but also the challenge of HEA lies in its enormous range of possible combinations in terms of type, number and amount of elements, and resulting properties. Supported by modelling and simulation programs, the HEA systems will be systematically selected, studied and characterized within this project. This innovative approach, based on in-situ alloying by laser cladding, implemented by an international Consortium working in a complementary manner, significantly shortens the development and transfer time of the HEA systems to industry (resource efficient screening). Within cladHEA+ an Open-Source Database on HEA will be created for further R&D advantage.

C-MOF.cell

Global concern over climate change related with the emission of hazardous chemical species together with high global demand for energy have led to an increase in the development of technologies related with renewable energy sources. In this scenario, it urges the development of new materials/technologies for the sustainable production and storage of energy, improving their efficiency, durability and environmental compatibility while decreasing their cost. The C-MOF.cell project aims to develop novel functional advanced materials for proton-exchange membrane fuel cells that are efficient, affordable and robust in a broader range of operating conditions than can be achieved with current materials. Specifically: novel non-precious metal catalysts for oxygen reduction reaction will be prepared to replace costly Pt in the cathode, while proton-conductive membranes based on Metal-Organic Frameworks will be developed as highly stable electrolyte. C-MOF.cell has the potential to significantly influence EU's energy system (from availability to energy consumption), potentially decarbonising EU and facing the climate change effects.

COSMAG

COSMAG aims at the development of a next-generation permanent magnet (PM), with no content of critical raw elements, that can be found naturally only in some meteorites: L10-ordered FeNi. Theoretical predictions show its potential to compete with the best PMs used in current technology: rare earth (RE)-based NdDyFeB. The primary objective will be to increase the atomic mobility of Fe and Ni using non-equilibrium methods, thus forming L10-FeNi on industrial time scales. COSMAG will address the problematic that Europe is facing to achieve a sustainable technological development with no bottleneck risk originated from the lack of resources and the monopoly by Asia on REs. The project will count with the joint effort of research institutes (IMDEA, IFW, IPSAS) and industry (IMA, UMBRA). The proposed RE-free PM alternative will impact straightforward on technology development (electromobility, renewable energy technologies…) and patents in Europe, and will propel EU SMEs and strength LEs.

Eco-OLED

We invented the first natural light-style OLED with the incorporation of a nano-layer of carrier modulation material between two sunlight complementary emission layers. It could be a cure to melancholy or even suicidal tendencies that arise due to the lack of sunlight during the long winters in northern countries. However, the difficulty in a simultaneous control of the chromaticity and luminance has prevented this invention from further commercialization for many years. We have eventually been able to devise some new approaches to generate natural-style emission that is not only color temperature and luminance tunable, but also relatively high in the obtainable brightness and light quality. Specifically, we plan to achieve an omni-friendly OLED with a color temperature tunable from 1,400 K to 5,500 K, an SRI of > 95, a lifetime > 60,000 hours, a power efficacy of 140 lm/W, and a commercially viable prototype of OLED panel with an emitting area of 5 x 15 cm2 or 10 x10 cm2.

ENZ4IFACES

Stability is paramount in biocatalytic coatings. Maximising stability relies on using highly stable enzymes from extremophiles as catalysts. Enz4ifaces proposes high-performing, innovative enzyme coatings for sensor devices, answering the need for rapid and low-cost on-site analysis in the agro-food sector. Innovation is mainly directed at obtaining stable, highly active, and environmentally-friendly inks based on a novel aldehyde dehydrogenase from a hyperthermophilic archaeon. The coatings are applied on electrochemical interfaces by industrial manufacturing methods. The coated interfaces will be validated for (1) the detection of dithiocarbamate fungicides in grapes and tomatoes and (2) the detection of acetaldehyde in wines, relevant for the agro-food sector. The project starts at TRL 2 and reaches TRL 5, rallying partners from Romania, Spain, and South Africa aiming to increased competitiveness, scientific visibility and profit and enhanced Europe - South Africa collaboration

fingerIMPLANT

Finger amputation is final surgery after traumatic injury, if replantation fails due to severe tissue damage. However, absence of even a single finger and thumb (~15.000 patients/year in EU) results in major disability (precise grasping, grip power) and strongly impacts life of frequently young victims. Currently, toe-to-hand transfer is only available microsurgical reconstruction. Closing this gap is aim of our R&D group by combining (1) patient- tailored finger bone & joint implants (fingerIMPLANT target) and (2) nerve grafts during soft tissue reconstruction to retrieve sensation. fingerIMPLANT joins scientific and industrial specialists in advanced “3D-printing” of high-elastic metals (beta-titanium) and non-wearing ceramics without ossification (Al2O3-ZrO2) for implants, in anti-microbial hydroxyapatite coatings for their optimized integration into bone, and in microsurgery for creating templates for future straightforward implant construction from CT images prior to 3D-printing.

GADEIRE

Mid-InfraRed light can be used to detect a wide range of molecular species (e.g. to identify, hazardous air pollutants in the environment or explosive materials), and is an eye safe wavelength region for users. Mid-IR optical fibers could have a very high impact on the monitoring and safety of both our life and nature, through their employment within compact, flexible devices, immune to radiation interference. Silica based optical fibers have superior mechanical resistance and reliability properties but their possible exploitation is today limited by their poor performance in the mid-IR. The GADEIRE project is about the development of a new generation of hollow core fibers that will allow using silica based optical fibers up to a wavelength of 7 m. They will be used in combination with optical sources with an extended mid-IR bandwidth and laser-based gas sensing techniques, allowing simultaneous detection of a broad range of gases hazardous for the environment and human life.

HEMP4NZEB

The project’s goal is to promote development of the nearly zero-energy buildings (NZEB) industry and EU state’s bio-economics by development of manufacturing technology of the new building products made of high performance ecological fibre composites. These composites consist of a non- organic binding matrix reinforced by natural fibre, incorporated with microencapsulated phase change materials (PCM) which will increase thermal mass of the building product. Storage concept applied to new building products has been classified as passive thermal energy storage (TES) systems that can enhance effectively utilization of the naturally available heat and cold sources in order to maintain the comfortable conditions and wellbeing in buildings and minimize the use of traditional heating or cooling systems. For demonstration purposes it is planned to design prototypes of envelope elements (multi-layered panels and building blocks/bricks) with layered structure with microencapsulated PCM.

Hybrid_beams

The project focuses on the development and testing of a hybrid bus structure parts that will be a combination of CFRP, foam and stainless steel. Special intention is focussed to lower the structure mass and increase stiffness resistance to crash and fatigue damage. The new bus structure concept with the addition of carbon fibre and foam, use as local reinforced, makes the new light structure more useful and effective to electric buses, hydrogen buses and CNG buses. The behaviour of the real hybrid structure will be demonstarted by tests and FEM calculation on a part of bus structure.

HYSUCAP

This project aims at demonstrating the application of novel two-dimensional (2D) hybrids as high-performance electrode materials for supercapacitors (SCs). A series of 2D hybrids will be designed and fabricated based on 2D MXenes and 2D black phosphorous (BP). With the assistance of multi- scale materials characterization techniques and advanced data analysis algorithms, new knowledge will be generated to provide fundamental understanding in the efficient design of 2D hybrids for high-performance SCs. Based on the developed 2D hybrids, two kinds of SC devices, including thin-film SCs and microsupercapacitors, will be built. These advanced SCs will demonstrate the great potentials as power source for emerging portable and micro- electronics. The success of this project will promote the efficient utilization of renewable energy sources and meet the European strategic policy targets in terms of greenhouse gas emission reduction and development of affordable sustainable energy sources.

INJECT-BIO

Oral soft tissue regeneration after ablative surgery or trauma is still a challenging goal in today's clinical routine. Currently available biomaterials in the market act as soft tissue fillers, but cannot ensure the bioactive response and/or ingrowth of gum-derived cells. In INJECT-BIO project, the development of advanced biomaterials and drug delivery systems for oral soft tissue regeneration will be investigated by applying Halomanas levan and bacterial cellulose-based injectable hydrogels containing IGF-1 and cannabis extract/cannabidiol liposomal simultaneous delivery systems. The project consortium unites the expertise, complementary skills and infrastructure of researchers and professionals from 5 countries – Latvia, Lithuania, Israel, Turkey and Czech Republic. The INJECT-BIO project will generate advanced know-how and knowledge of hydrogel-cell interactions leading the product till TRL4, giving a great potential for INJECT-BIO results to be transferred in the market.

INNENERMAT

The project will be focused on the development of novel active materials for competitive energy storage devices: batteries and supercapacitors (SC) with a focus on the main components: active material, electrolyte and design of the device. It is planned to design structurally and chemically advanced functional carbon materials, smart textiles, metal oxides and hybrid materials to make a substantial advance in performance. Besides, improvements in the electrolytes through developing new polymers and gels will also be considered. Finally, due to the multidisciplinary consortium, it will be also possible to design flexible concepts for storage devices, with special emphasis in textile-based technologies. The participation of the industrial partners will allow to integrate easily all the new developments and to perform a proof-of-concept for different applications, allowing to reach TRL6 for flexible batteries and supercapacitors at the end of the project.

interBATT

In the context of the energy transition, batteries are a key technology to address the transformation of the energy system. However, Li-ion batteries are still facing safety issues and despite continuous progress,

performance improvements are mainly incremental due to materials and interface constraints. interBATT targets the development of material solutions for the engineering of critical interfaces to enable implementation of the high capacity anodes silicon and lithium to increase energy density, while ensuring cycle life, safety and rate capability. Ultimately this will unlock a technological path towards Li-based next-generation batteries. Interfaces will be engineered with industrially relevant nano-coating techniques. The most promising solutions will be integrated in a scaled-up prototype pouch-cell representative of an industrial environment. interBATT will contribute to the establishment of an European value-chain, covering all aspects from fundamentals to battery cells.

ISIDE

ISIDE aims at reducing the implant failure risk due to bacterial infection and/or poor osteointegration and/or fit, while avoiding any second surgery. The new implants' generation will be highly customised and made of a resorbable metal: Magnesium (Mg). The implants will be produced using innovative processes, no more based on the subtractive approach: sheet metal forming processes like Superplastic Forming and Incremental Forming will be used. Mg custom implants will be improved by means of bioactive biofunctionalization aimed to (i) boost the bone formation; (ii) reduce the bacterial infections during healing; (iii) manage the corrosion/degradation time according to the region where the prosthesis is implanted. Potential benefits are mainly related to the improvement of patients' life quality, due to the reduction of the hospitalization time (only 1 surgery and fast production process) and to the improvement of the implants performances (aesthetical and mechanical requirements).

IsoWire

The essence of IsoWire project is combination of a urological guide wire with active coating to avoid pre-stenting during kidney surgery. IsoWire is a urological guide wire with bio-compatible hydrogel coating capable of rapidly eluting vasoactive substance like Isoprenaline to affect muscular tone of the smooth muscles in the wall of mammalian ureter. The use of active-hydrogel surface would reduce incidence of iatrogenic ureteric trauma associated with such instruments insertion. The benefits of such novel device will be realized without changing or significantly modifying current practice that involves insertion of a plain (non drug eluting) guide wire. The impact of such device if proven to be effective and beneficial in reducing cost of treatment due to reduction in pre-stenting requirements. Hence patient stent related symptoms and associated with them absenteeism will be reduced. Furthermore, cost to health funders and medical waste production will be significantly decreased.

LaMoFlo

The easy emptying of waste containers through non-stick, self-emptying containers would be a welcome innovation with a large environmental gain. Our research team from McGill University, École de Technologie Supérieure and Mittweida University of Applied Sciences has teamed up with a bulk and food-packaging manufacturer, IPL Inc., and a manufacturer of polymer injection molds, Moulexpert Inc., to develop an industrially viable process to laser texture molds for the fabrication of functional polymer sur-faces. The objective is to revolutionize the packaging sector by producing multi- scale textures on oblique sur-faces needed for damage-free demolding of 3D polymer parts. Thereby, high-power lasers with ultrafast scan systems will be used for energy-efficient and flexible 3D high-rate machining. This will ensure easy recycling of the monolithic containers, less food wasted, and easier compost handling that will reduce landfill waste and protect the environment lead to business growth."

LiBASED

A battery-supercapacitor hybrid systems combine the advantages of high energy battery electrodes and high power capacitors. LiBASED consortium is aiming the development of the new and efficient Li-ion

battery-supercapacitor hybrid (LIH) device with high power and energy density simultaneously, along with good cyclability. The project proposes a novel hybrid device configuration based on different 3D nanostructured carbon based cathodes and electrospun titanate-based free-standing (anode) electrodes. By using this configuration, the LIH device is expected having high energy density (>20 Wh/kg) and power density (>5 KW/kg) with a specific capacity retention >92% over 10,000 cycles. Afterwards, the consortium will design and fabricate mini-hybrid device (prototype) with mentioned outputs. The assembled LIH devices can be applied in long-run, lightweight and cost-effective unmanned air/ground vehicles (UAVs, UGVs) which will to lead positive effect on both environmental and economic issues

LIGNP4WOUND

An increasing number of persons show difficulties for wound healing and the resistance of an increased number of pathogens to antibiotics or other drugs also makes the skin wound healing process more complicated. In parallel, more care is given to the cytotoxicity of biocides or compounds used in medical implants or dressings and the impact on the environment after their disposal. The LIGNP4WOUND addresses all these problems by adding natural biocides (lignin and chitosan) and bioactive molecules to the biodegradable nanofibrous mats made by electrospinning. Besides, solid lipid particles loaded with antibiotics will be tested as another option. The proposed wound dressings are composite materials and their performance will strongly depend on the adhesion and cohesion of the various composite parts. Thus, one of the project objectives is to use environmentally friendly plasma chemical technologies to achieve the desired stability of the final composite material.

MERF

The project deals with the development of new flame retardants for carbon fiber reinforced epoxy laminates. These retardants should be more environmentally friendly than most so far used flame retardants. Newly developed compounds will be based on cyclic or polymeric phosphazenes, or other usable derivatives of phosphorus oxytrichloride. At the same time the project should contribute to knowledge of the relationship between structure and properties. Legal protection of the resulting composite is assumed a utility model or a functional sample.

MiDICoat

In this project, chemical vapour deposited (CVD) Ti(C,N)/Al2O3 coatings with new interface architecture are developed. Protective coatings based on the Ti(C,N)/Al2O3 stack are currently used in high-speed turning applications. They combine a high wear resistance of the titanium carbonitride with the excellent high-temperature oxidation resistance of aluminium oxide. However, the CVD Ti(C,N)/Al2O3 coatings are still suffering from an insufficient adhesion at the Ti(C,N)/Al2O3 interface and from the formation of voids between the Al2O3 grains. The aim of the project is to improve the interface cohesion via interface design that includes tailoring of the phase composition and morphology of the interfaces, modification of the grain size and adjustment of the ideal preferred orientation of crystallites. Our approach is based on specific alloying of the main components that will improve the heteropitaxy between adjacent phases, stabilize metastable phases and produce desired lattice strains.

MiLaCo

The project MiLaCo addresses the development of novel optical components based on nanostructured thin films for the advanced micro laser systems and laser micro resonators. The main objectives of the work are to fully investigate and develop GLAD method for manufacturing zero angle polarizers and spatial filters using nano-engineered multilayer coatings. Optical components with polarisation control and spatial filtering functionalities will improve the performance of the micro lasers by one order of magnitude. The proposed technology will enable crucial advancements in micro laser systems and will become a key method for the new market of micro lasers.

MultiMat3

The core innovation objectives for MultiMat3 are the development and optimisation of new polymer material compounds, and new polymer material combinations for Additive Manufacturing (AM). Specifically, these materials are for use in Fused Filament Fabrication (FFF) and the droplet-based ARBURG Plastic Freeforming (APF). The focus will be on the following materials due to their innovative potential:

- Layered Double Hydroxide (LDH) based nanocomposites for improved dimensional precision and mechanical properties
- Semi-crystalline polymer compounds, such as polyamides (PA), for high temperature applications
- Thermoplastic Elastomers (TPE) applied in hard-soft material combinations
- Polycarbonate (PC) for optical parts

MultiMat3 has the potential for significant scientific and commercial impact, for all involved partners, through the generation of valuable intellectual property (IP) guided by a clear plan for the exploitation and dissemination of project results.

NANOPOL

Nanocellular polymers (cells in the nanoscale) represent a breakthrough in the field of thermal insulation of buildings due to the combination of ultra- low thermal conductivity (≤ 12 mW/mK) and low cost (≤10 €/m2), which are not achievable with current materials. However, density of these materials (≥200 kg/m3) is still too high to have ultra-low thermal conductivity, which is the main bottleneck identified towards reaching a TRL 4. NANOPOL project aims at exploring innovative strategies in the field of nanocellular foams to reduce density, such as forming external layers reinforced with nanoparticles and creating a bimodal cellular structure in the inner core. In addition, a new heat transfer model and a LCA will be developed, which will help to identify key aspects to reduce further thermal conductivity and to quantify the key environmental impacts of these revolutionary materials: cutting down the energy consumed in buildings and reducing raw material consumption and GHG emissions.

NATALINA

The use of natural fibre reinforced composites is in a constant expansion particularly in automotive industries due to their low cost, low density and good mechanical, and thus low environmental impact and recyclability. One of the barriers to the uptake of this class of composites is the perceived uncontrolled variability in properties, low productivity and cost associated with the manufacturing of finished parts. NATALINA aims to answer these major drawbacks through the development of an innovative processing technology and by reuse of prepreg off-cut waste as discontinuous flakes and suppress organosheet & stamping wastes. At the end of the project, this concept will be validated on a semi-pilot line scale and a representative demonstrator at TRL5. An industrial board will be associated to the project, from the product specificity until the demonstration in order to reduce time-to-market of project's result.

NewILUMIS

NewILUMIS project aims at developing a novel functional material based on a layered ceramic, associated to a surface plasmon resonance (SPR) structure and a mesoporous topcoat as an innovative photonic component for lighting/sensing. The target areas will be environmental protection and security, medical diagnostics, biosensing and chemical compound detection. The core of the lightning structure will be a rare earth doped (RE3+) ceramic (YAG). Its layered construction will allow tailoring the spectral and spatial characteristics of the light source under LED excitation. The ceramic composition (active dopants, scattering phase material, etc.) will be modified to obtain the desired colour rendering index and a high efficiency of the resulting source. This light source will be used for sensing when combined to SPR and functionalized

mesoporous coatings.

Packaging issues will also be considered to produce a demonstrator whose performance will be tested in relevant industrial applications.

NovCom

The NovCom aims at development of Cobalt free enhanced Tungsten Carbide based diamond composites produced with use of pulse plasma compaction (PPC) technology. The NovCom composites will enable long lasting tools for hard to machine materials like Nickel alloys or fiber based polymer composites addressing the need in high performance cutting applications in EV, wind turbines manufacturing and aerospace. The NovCom Cobalt free composites will be characterized by:

1. High hardness, strength and fracture toughness due to enhanced interface design of Me-WC and Diamond (≥ 30 Vol-%)
2. Tailored thermal properties - incorporation of diamond particles with different size and different volume fraction
3. Durability: Life time of the composites will be increased by increasing the thickness of the cutting layer. PPC enables composites with reinforcing phase in its entire volume.
4. Recyclability features such as the possibility of resharpening of the tool and near net shape manufacturing.

OxyGaN

The objective of the project is to increase the efficiency of GaN blue to blue-violet laser diodes by introducing a novel contact scheme utilizing a bandgap-engineered transparent conducting oxide, ZnMgO:Al with contact interface engineering. Overcoming the standing issues related to contact formation to vertical GaN-based opto/electronic devices, contact structures will be developed, raising the device efficiency by forming stable ohmic contacts to both n- and p-type surfaces, acting as both the metallization and waveguide for p-GaN, fabricated using means taking into account a simplified process integration and resource management. The technology steps developed in the project will be finally integrated in a packaged laser diode demonstrator and the technology will be prepared for implementation on the production line of one of the partners, enabling resource- sustainable, more energy-efficient diodes for automotive, display, welding and patterning industries at lowered costs.

RIPE4TEC

The core technology to be developed in the project is reactive inkjet printing as a technology to enable the additive manufacturing of novel thermoset composites based on epoxy-polyamine resins. The technology will allow not only for printing parts of complex shape without the need for casting or subsequent processing, but also the control of the microstructure. We will pioneer heterogeneous epoxies, composed from hard and soft microscale subdomains, with contrast and spatial distribution, which will be designed by modelling such to enhance the overall material toughness, without compromising its strength and modulus. Functionalized nanoparticles will be introduced at specific sites to either produce reinforcement or to enhance energy dissipation. The work will greatly broaden the range of applications of epoxies, will lead to a new thermoset printing technology and will introduce new material design concepts with diverse applications.

SALMOS

Protecting the society from hazardous gases and explosive materials is an important need that may be addressed if versatile, cheap and user-friendly detection devices are developed. The project SALMOS aims at the development of optical sensors based on photoluminescent metal-organic frameworks (LMOFs)

processed into films and distributed arrays for the detection of explosives and toxic substances in the gas phase. Enhanced sensing performance will be achieved by using improved approaches for the immobilization or direct growing of the MOF crystals into specific substrates like polymeric matrix membranes or nanostructured metal oxide films. The combination of selected sensitive MOFs assembled into arrays or groups of sensors will enable for selective analyte recognition exploiting their (multi)luminescent response spanning across the visible spectral range. SALMOS will focus on explosive vapours (nitroaromatics, TATP), toxic gases (NO2, SO2) and other toxic volatile organic compounds.

SEAM-PP

PP/PE plastics are very interesting for a wide range of applications. This project focuses on large-sized parts (volume 0.03 to 1,5 m^3) available on the market in medium-sized quantities (< 5'000 pcs/year). Existing production processes are expensive; therefore, 3D printing of such parts is of great interest. However, established 3D printing processes are unprofitable for such parts, because of limited building space. Very long process times and high material prices lead to high costs. SEAM (Screw Extrusion Additive Manufacturing) of Fraunhofer IWU has enough space, high printing speed and uses standard plastic granules. This could solve the current problems, but the technology is only tested with the much easier to process material PA CF. Further development of processing technology, PP/PE material modifications, design rules for the parts and process simulation are worked out in a consortium of German and Swiss partners.

SensCoat

This proposal is focused on the development of innovative coatings and functional surfaces for Point of Care (PoC) medical diagnosis. A novel device, depending on a multiple layers of high technology surface coatings and surface modification will be developed and validated for a specific final application: differential diagnosis of viral respiratory tract infections, to help containing the outbreak of antimicrobial resistance (AMR) by reducing unnecessary prescription of antibiotics. Developing such a device to be available as a PoC diagnostic system will not only have a national, but a global impact; where WHO emphasizes that greater innovation and investment are required in research and development of new antimicrobial medicines, vaccines, and diagnostic tools to fight with AMR, globally. By optimising surfaces via optimising precise surface coating procedures, in this project, a high technology product that is capable of specifically detecting microorganisms is being developed. This project will start from a TRL 2-3 level and targeting a TRL 6 by the end of the project.

SmartMatter

SmartMatter proposes novel functional materials featuring magneto-plasmonic properties and validated capability for boosting sensitivity to environmentally relevant analytes. Adaptive 3D-nanoplatforms will enhance the analytic response of (magneto)optical waveguides sensing chips encompassing analyte specific interaction sites. SmartMatter sensors become active, dynamic amplifiers of the target specific reactions that modulate their structure. Nanoparticle/dynameric conjugates are set to play a double role: as framework for optical waveguide and as sites for interaction with the analytes. SmartMatter monitoring and interconnectivity capabilities will support reduction of greenhouse gas emission by providing a flexible network of sentinel sensors. Wider impact is foreseeable for energy field where the novel materials warrants enhanced catalytic power, improved sensitivity, specificity and compatibility with portable formats strengthening European innovation and industrial leadership.

TRAVEL

The project involves functional materials applied to semiconductor vertical-cavity surface-emitting lasers (VCSELs) that are the smallest coherent light sources, widely used in very fast-growing photonics industry

including LIDARs, time-of-flight sensors, autonomous vehicles, robots and drones. The product will benefit from considerably lower electrical power consumption and higher performance compared to the existing solutions. As VCSELs sector is developing dynamically with lasers' production expected to double in the next five years, the Proposal has the potential to significantly contribute to the reduction of lasers' global energy consumption and to the decrease of harmful and hard-to-obtain materials required in their production. We expect that proposed transparent electrode will outperform existing solutions for electroluminescent diodes, detectors, solar cells and interactive optoelectronics. This project is expected to trigger further works focused on development and applications of transparent electrodes for other photonic devices.

M-ERA.NET Call 2020: Funded projects

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Modeling for materials engineering and processing	DeeMa	Design and Optimisation Open Innovation HUB for CompositesModeling and Design	4	FNR (Luxembourg) TACR (Czech Republic)
Modeling for materials engineering and processing	EMMA	Exploring Multi-Method Analysisof composite structures and joints under consideration of uncertainties during engineeringand processing	4	FAPESP (Brazil, Sao Paulo) SMWK (Germany, Saxony) VIAA (Latvia)
Modeling for materials engineering and processing	MIST	MultI-Scale Simulation Toolbox	3	SPW (Belgium, Wallonia) TACR (Czech Republic)
Modeling for materials engineering and processing	NanoBainControl	Accelerated nanobainitic transformation in low-alloy steels processed by incremental forging.	3	SMWK (Germany, Saxony) NCN (Poland)
Innovative surfaces, coatings and interfaces	ADVENTURE	Advanced coating substrate preparation by shifted and ultrafast laser texturing	4	TACR (Czech Republic) SMWK (Germany, Saxony)
Innovative surfaces, coatings and interfaces	ANSOLCO	ANti-SOiLing COating forheliostats	3	IDEPA (Spain)IIA (Israel) MOST (Israel)
Innovative surfaces, coatings and interfaces	AntiPathCoat	New generation copper basedcoatings of improved antimicrobial resistance to pathogens	3	NCBiR (Poland) BNSF (Bulgaria)
Innovative surfaces, coatings and interfaces	BioAFC	Biotechnological Anti FreezingCoating	4	Tübitak (Turkey) RCL (Lithuania)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Innovative surfaces, coatings andinterfaces	CaFeOx	Earth abundant Ca-Fe-oxide- based materials with tailored antimicrobial functionalities for diverse applications on surface,in water and membranes	3	VIAA (Latvia) SMWK (Germany, Saxony)
Innovative surfaces, coatings andinterfaces	HybbiStent	Hybrid biodegradable coating forone-wire peripheral nitinol stent for prevention of restenosis and plaque formation	5	SMWK (Germany, Saxony) NCBiR (Poland) NCBiR (Poland) SMWK (Germany, Saxony) VIAA (Latvia)
Innovative surfaces, coatings andinterfaces	LUBRICOAT	Simulation-aided design of solidlubricant coatings	7	CZ-TACR SMWK (Germany, Saxony) EJ-GV/Innobasque (Spain, Basque Country)
Innovative surfaces, coatings andinterfaces	NiWRe-Alloys	Electroplating NiW and NiRe alloys as functional alternativecoatings	6	SMWK (Germany, Saxony) UEFISCDI (Romania) DST (South Africa)
Innovative surfaces, coatings andinterfaces	proTool	Oxide-resistant tungsten carbidehigh-temperature forming tools by innovative coatings and mechanical interface manipulation	3	SMWK (Germany, Saxony) EJ-GV/Innobasque (Spain, Basque Country
Innovative surfaces, coatings andinterfaces	SLIM-FIT	Stable and safe Lithium-Metal /Sulfur Batteries enabled by carbon felt current collectors and advanced interface technologies	4	SMWK (Germany, Saxony) IIA (Israel)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
High performance composites	CARBOBRAKE	Development of a Thick-walledCarbon Fiber Reinforced BrakeCaliper for High Performance Automotive Applications	9	SPW (Belgium, Wallonia) FFG (Austria) GV/Innobasque (Spain, Basque Country)
High performance composites	COM®TRANS	Composites based on compositionally complex alloysfor transportation industry	4	SMWK (Germany, Saxony) UEFISCDI (Romania)
High performance composites	CORE-PV	COmposite materials and multifunctional coatings with improved performance and REcyclability for integrated PVapplications	6	GV/Innobasque (Spain, Basque Country) RNAQ (France, Nouvelle Aquitaine)
High performance composites	LITAPROP	Light-weight composite structures with tailored mechanical, electrical andthermal properties	3	SMWK (Germany, Saxony) NCBiR (Poland)
High performance composites	MOFAC2CAP	Development of Novel MOF Aerogel Composites to CAPtureCO2	3	ANR (France) Tübitak (Turkey)
High performance composites	PlasmaComp	Plasma-polymerized functionalbio-based composite coatings	4	FFG (Austria) FNR (Luxembourg)
High performance composites	SAFFIA	Sustainable and thermally Amplified Felts and Foams. Innovative Application of reactively extruded biobased nanocomposites	3	Tübitak (Turkey) FNR (Luxembourg)
Functional materials	AMAZE	Advanced Manufacturing of Zn electrodes for Rechargeable Zn-air Batteries	3	RCN (Norway) ANR (France) Tübitak (Turkey)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Functional materials	CatWatSplit	Multiscale computer modelling, synthesis and rational design of photo(electro)catalysts for efficient visible-light-driven seawater splitting	3	VIAA (Latvia) MOST (Taiwan) RCL (Lithuania)
Functional materials	INSTEAD	Study of InNovative compoSite Thin films based on metallic nanowire nEtworks and functional oxides for application in smArt winDows	4	ANR (France) Tübitak (Turkey) FNRS (Belgium, French Speaking Community)
Functional materials	LaSensA	2D regular nanostructures for lasing and sensing applications	5	RCL (Lithuania) SMWK (Germany, Saxony) NCN (Poland)
Functional materials	MOGLiS	MOF@rGO-based cathodes for Li-S Batteries	3	NCN (Poland) RCN (Norway)
Functional materials	SLiCE	Development of novel single Li- ion conducting polymer electrolytes for flexible and safe solid-state batteries	3	IIA (Israel) ANR (France)MOST (Israel)
Functional materials	SmartEnergy	Piezoelectric Energy Source for Smart Factory Applications	6	UEFISCDI (Romania) NCBiR (Poland) Innosuisse (Switzerland)
Functional materials	SmartHouB	Smart lightweight functionalized materials for Housing of Batteries	4	SMWK (Germany, Saxony) Tübitak (Turkey) FAPESP (Brazil, Sao Paulo)
Functional materials	SMICE-Li	Stabilising Conversion Anodes with Solid Molecular Ionic Composite Electolytes for SolidState Lithium Ion Batteries	3	RCN (Norway) UEFISCDI (Romania) ANR (France)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Functional materials	SWIPE	Spectroscopy of Spin Waves InPerovskite Excited states	3	FNRS (Belgium, French Speaking Community) FNR (Luxembourg) ANR (France)
Functional materials	TAGGED	Research, Development and characterization of a TunAble Graphene liGht Emitting hybridMOEMS Device	4	SMWK (Germany, Saxony) CZ-TACR NCN (Poland)
Functional materials	ULTCC6G_EPac	Ultra-Low Temperature Co-firedCeramics for 6th Generation Electronic Packaging	5	SMWK (Germany, Saxony) NCBiR (Poland) ANR (France)
New strategiesfor advanced material-based technologies in health applications	3D4D2	3D polymer matrix device for dual drug delivery and simultaneous treatment of acutemalaria and malaria transmission	6	SMWK (Germany, Saxony) BNSF (Bulgaria) DST (South Africa)
Materials for Additive Manufacturing	ALF3	Additive Manufacturing of Aluminium by Means of FusedFilament Fabrication	3	FFG (Austria) SMWK (Germany, Saxony)
Materials for Additive Manufacturing	DePriSS	Development of “3D print-thermal spray” systems for applications with dynamic andimpact loading	5	CZ-TACR SMWK (Germany, Saxony) NCN (Poland)
Materials for Additive Manufacturing	Glass3D	Shaping Glass in the 21st Century: Additive Manufacturingof Transparent Glass Objects	3	SMWK (Germany, Saxony) MOST (Israel)
Materials for Additive Manufacturing	NovMat-AM	Novel metallic materials, feedstock and fabrication processes for high-performance additive manufactured goods	3	SMWK (Germany, Saxony) SPW (Belgium, Wallonia)
Materials for Additive Manufacturing	RePoParts	Additive manufacturing Partsand Coatings using RecycledPowder from waste	6	NCBiR (Poland) GV/Innobasque (Spain, Basque Country)

Call topic	Acronym	Full Title	# Part-ner	Funding organisations
Materials for Additive Manufacturing	SEBM-WC-Co	Additive Manufacturing of HardMetals by SEBM	3	DST (South Africa) SMWK (Germany, Saxony)
Materials for Additive Manufacturing	ShapeAM	On-the-fly laser beam shapingfor Laser Metal Deposition of crack-sensitive Al-Ti alloys	3	SMWK (Germany, Saxony) IIA (Israel)
Materials for Additive Manufacturing	WReMo	Powder feedstock production and 3D printing of refractory metals and alloys for aerospace applications	5	NCBiR (Poland) PRIMA (Canada, Québec)

Abstracts (please note that these abstracts were submitted with the proposals):

3D4D2

3D polymer matrix device for dual drug delivery and simultaneous treatment of acute malaria and malaria transmission

Malaria causes millions of deaths and poses significant economic challenges worldwide. There is an urgent need to improve malaria treatment by simplifying the administration of drugs and to make it patient friendly to the malaria-affected population, especially for people in poverty-associated regions. The current proposal aims to develop a novel injectable 3D polymer scaffold with controlled dual-drug release to sustainably provide therapeutic antimalarial drugs needed to treat acute malaria disease as well as to block the transmission of the malaria parasite to the vector mosquitoes. The device will be applied only once via an intradermal injection and will release two different drugs, each one encapsulated in a custom-made nanoparticle delivery system. This will enable a significant progress in the application of functional systems able to release concomitantly two drugs with different release profiles, making at the same time their uptake patient friendly and easily applicable.

ADVENTURE

Advanced coating substrate preparation by shifted and ultrafast laser texturing

Thermal spray (TS) coating technology enables creation of functional surfaces with excellent properties for wide range of applications and products. Currently, grit blasting is standard for TS substrate preparation, but it is limited by low reproducibility, residues causing functional failure, substrate materials and production of dust. The ADVENTURE project aims to strengthen the TS technology by introducing laser surface texturing (LST) for substrate preparation as clean, flexible and reproducible method. The goals are up-scaling of LST method, development of innovative coating-substrate interfaces and functional testing in TS. Potential applications of the project results are in high added-value components, i.e., for space, aircraft, medical or power industry. Project´s impact will be high productivity and reliability of LST, improved adhesion, lifetime and reliability of coated parts, new coating possibilities and reduced dust pollution and grit material consumption.

ALF3

Additive Manufacturing of Aluminium by Means of Fused Filament Fabrication

The primary goal of the project AlF3 is to develop Fused Filament Fabrication – FFF technique for the additive manufacturing of aluminium parts (Al-FFF). This eliminates the drawbacks of existing routes for additive manufacturing of aluminium like SLM (e.g. high cost, handling of powder) and opens new design options as the production of closed cavities and multi-material parts, for e.g. the combination of wear resistant and tough aluminium alloys. Further, high- performance alloys (precipitation hardening alloys, Metal Matrix Composites – MMC) can be employed. A new feedstock is developed integrating the requirements of the whole process chain together with the related printing, debinding and sintering processes. On the base of concrete use cases the feasibility of the new process is investigated and proven. The whole project and especially the use cases are supervised by the Advisory Board, which should secure the later transfer of the project results into innovations.

AMAZE

Advanced Manufacturing of Zn electrodes for Rechargeable Zn-air Batteries

Zinc-air batteries (ZABs) have significant advantages compared to state-of-the-art Li-ion batteries (LIBs) due to high theoretical specific energy (1086 Wh kg- 1), low cost, low toxicity, safe operation, and more sustainable nature owing to abundancy and recyclability. For ZABs to become viable alternatives to LIBs for stationary storage their cycling stability, and energy storage capacity needs to be significantly improved. The primary objective of the AMAZE project is to develop scalable and techno-economically viable methods for the manufacturing of porous Zn electrodes with excellent electrochemical performance and cycling stability in an alkaline rechargeable ZAB configuration with carbon-free bifunctional air electrode (BAE). AMAZE will contribute to reducing our dependence on oil, gas, and coal, as the intermittent energy from renewable sources, e.g., solar, can be stored in the developed next-generation ZABs, with long-term stability.

ANSOLCO

ANti-SOiLing COating for heliostats

One of the main problems of CSP plants located in arid areas with lack of water is soiling, which drastically decreases the mirror reflectance. The optical performance of the heliostats is a key factor to achieving low electricity costs: a 1% decrease in reflectance directly leads to 1% increase in the cost of electricity generated. Moreover, cleaning heliostats uses 10% of the water consumption in a CSP plant.

ANSOLCO project aims to develop a low cost and durable anti-soiling coating based on sol-gel for heliostats, with the objective of reducing the water consumption and number of maintenance operations, and increasing the electricity production of the plant. The ANSOLCO coatings will reduce the need for cleaning by 40% and increase the average reflectance by 4% in locations with major soiling problems. The water consumption for cleaning at CSP plants is expected to drop by 45% with the anti-soiling coatings, with reduction in both of cleaning operations frequency and labour costs.

AntiPathCoat

New generation copper based coatings of improved antimicrobial resistance to pathogens

AntiPathCoat aims at finding new copper based coatings of enhanced functional properties, which by reducing the number of bacterial and viral infections cases responding to global trend of illnesses prevention instead of their medical treatment. The innovation objective is the diminishing viability of pathogens on the coated surfaces, obtained in relatively easy to be implemented plating technology with

the use of environmentally friendly reagents. Successfully meeting these objectives involves Polish and Bulgarian research laboratories using three plating technologies: electroless-, electro- and selective- plating to produce copper and copper based coatings with TiO2 and ZnO particles. In strict synergy with the industrial partner, designed coatings will cover the surgical and laboratory tools. Outcomes of the AntiPathCoat project can find implementation in production of variety of items, commonly touched by people, which is an effective barrier to pathogens infection spread.

BioAFC

Biotechnological Anti Freezing Coating

Ice formation on industrial machinery is one of the inevitable occurrences,which challenge the system performance and efficiency. Ice formation on working surfaces hinders energy efficiency and safety in many applications. BioAFC aims to employ natural occurring anti-freezing proteins (AFPs) to protect various industrial surfaces. Potential application could be mentioned as wings (aviation, pavements (transportation, and evaporators (refrigeration-the target of this project). The goal is to upscale from TRL2 to TRL5. We aim to use the genetically produced AFPs and characterize the anti-icing activities, to develop a facile coating method, and to optimize the coating process via novel acoustic surface monitoring technique. BioAFC will result in economic benefit for costumers and relevant industries and will offer 5% reduction in energy consumption (105K tons/yr of CO2 emission reduction). The output is new generation of biologically coating to accelerate the energy efficiency globally.

CaFeOx

Earth abundant Ca-Fe-oxide-based materials with tailored antimicrobial functionalities for diverse applications on surface, in water and membranes

Due to the increase in microbial resistance and survival after biocide treatments, there is a strong interest in nanomaterials exhibiting antimicrobial activity in coatings and membrane filtration. Currently, the highest recognizability is seen in various photocatalytic materials that require light irradiation to be efficient. The Ca-Fe oxide nanopowders synthesized within CaFeOx exhibit very high antimicrobial activity in dark by using much cheaper, earth-abundant, non-toxic materials synthesized by more straightforward scalable approaches. Apart from synthesis and further improvement in the antimicrobial efficiency through doping and well controlled non-stoichimetry, the nanopowders will be applied and evaluated for water disinfection, as well as for coatings on polymer membranes to prevent fouling. The efficiency and biofouling potential will be tested in laboratory scale pilot systems, validated at an industrial level and assessed for their commercialization potential.

CARBOBRAKE

Development of a Thick-walled Carbon Fiber Reinforced Brake Caliper for High Performance Automotive Applications

Carbon Fibre Reinforced Polymer CFRP materials have the potential to meet high structure-mechanical and complex functional requirements, improving efficiency of lightweight structures. However:

- Thick-walled composite components are required but exhibit manufacturing defects;
- Complex components limit the possibilities for a cost-efficient manufacturing;
- Recycled high performance CFRP is a need for environment and society;
- Loading conditions (thermomechanics, acoustics) are complex.

This project develops an integrated computational approach to optimise the process and design of thick-walled composite components, by

- Combining high pressure SMC process and autoclave curing for cost efficiency;
- Developing a process simulation tool dedicated to thick-walled components;
- Developing data-driven stochastic multi-scale simulation tools for complex components;
- Implementing a comprehensive life cycle analysis to drive the selections;
- Considering a composite brake calliper as demonstrator

CatWatSplit

Multiscale computer modelling, synthesis and rational design of photo(electro)catalysts for efficient visible-light-driven seawater splitting

In this project main focus is given to performance of the photo(electro)catalysts in chlorine containing solutions in order to approach the conditions of photoelectrochemical splitting of sea water, a subject which has been little explored so far. The project aims at development of a set of techniques starting from synthesis of catalytic materials based on atomistic modeling to fabrication of seawater splitting device prototype. The experimental investigations will be based on the computer modeling of hydrogen, oxygen, and chlorine evolution reactions and theoretical characterizations of the photo(electro)catalysts.

Benefiting from strong synergies with contemporary research efforts in photocatalysis, electrocatalysis, and computational materials science this project will result in improvements in efficiency, durability, and, consequently, in the cost of photoelectrochemical reactors allowing efficient production of hydrogen and chlorine-based disinfectants from sea water.

COM®TRANS

Composites based on compositionally complex alloys for transportation industry

The goal of the project is the development of new metal matrix composites based on light weight compositionally complex alloys (CCA) and ceramic particle reinforcement for brake systems in transportation industry. The new matrix alloy will provide increased strength and higher temperature operation for the developed composite material. The technology based on the new composites will provide solutions for the replacement of conventional methods by addressing main issues: maximize the operation efficiency, lower the fabrication costs and lower the polluting emissions. The newly developed materials will present high strength and stiffness to weight-ratio and will be easily recyclable. The project will cover TRL 3 and TRL 4 activities and will end with a validated laboratory technology.

CORE-PV

COmposite materials and multifunctional coatings with improved performance and REcyclability for integrated PV applications

Energy consumption sustainability goals require the development of alternative technologies and the use of increasingly recyclable materials to minimise environmental impact. CORE-PV (COmposite materials and multifunctional coatings with improved performance and REcyclability for integrated PV applications) aims to develop technologies for the generation of distributed clean energy, using highly recyclable materials through highly competitive manufacturing processes.

Solar photovoltaic (PV) will lead the spectrum of renewable energy in the short-medium future. So, the incorporation of PV elements in buildings to replace traditional construction materials, in the envelope of electric vehicles, or in urban furniture components, are examples where innovative solutions are necessary.

CORE-PV will develop innovative solutions in:

- Raw materials development
- Manufacturing processes
- Durability, longer life cycle and enhanced performance of the developed products
- Reciclability techniques

DeeMa

Design and Optimisation Open Innovation HUB for Composites Modeling and Design

Objectives: The project will develop a data-driven computational approach and open innovation platform for composite materials modelling and simulation. At the heart of DeeMa project are the concepts of i) integration of materials knowledge (ontologies), ii) automating routine design activities (interoperability), iii) integration of physical and data driven models (digital twin), iv) Design (inverse problems) and uncertainty and sensitivity analysis (Bayesian approach) and v) Develop a constitutive manifolds to accelerate material design.

Potential applications: The outcome of this project is expected to extend research scope in both mechanics and data sciences and demonstrate the prototype of a platform enabling integrated design of novel composite materials.

Impact and potential benefits: The tangible benefits of the DeeMa ecosystem and platform will be captured by the industry and especially Small and Medium- sized Enterprises (SMEs).

DePriSS

Development of “3D print-thermal spray” systems for applications with dynamic and impact loading

Additive technologies have potential to produce light and complex-shaped components. However, required service life and reliability under different load modes has to be ensured. Cyclic and dynamic loading can be considered critical. Components surface needs to be protected against wear and corrosion. For various reasons fatigue strength and service life may be reduced. Main objective is the development of 3D print-thermal spray systems resistant against wear and corrosion. Optimization of coatings composition and process parameters will be done. Methodologies for evaluating the response to cyclic and dynamic loads of 3D printed components, coatings themselves and their combinations will be developed and validated. Such combination enables to exploit advantages of 3D printing with benefits provided by thermal spraying. The results will have an impact on extension of both additive technologies into wider range of application, including power, aerospace, automotive, civil engineering etc.

EMMA

Exploring Multi-Method Analysis of composite structures and joints under consideration of uncertainties during engineering and processing

The main objective and innovation of EMMA project is the exploration of a multi-method approach for analysis of composite structures and joints under consideration of uncertainties during engineering and manufacturing. In particular, classical finite element simulation methods are accompanied by the new Peridynamics method for inherently capturing failure mechanisms without additional engineering assumptions. Constitutive material models are implemented to accurately represent the material behaviour, fatigue failure and crack propagation effects on composite structures and joints. This enables more reliable prediction and virtual testing of structures under consideration of tolerances and uncertainties, as demanded by certification authorities. Moreover, the implementation of affordable production quality assurance systems for composite structures will be established.

Glass3D

Shaping Glass in the 21st Century: Additive Manufacturing of Transparent Glass Objects

The fabrication of glass objects having complex shapes with advanced functionalities such as adaptors and connectors for optical circuit boards is not realized due to materials and technological limitations, and there is an unmet need for new fabrication processes for making functional glass objects. The most innovative and modern shaping technology of the 21st century is the additive manufacturing. The 3D printing of glassy objects, specifically for optical applications, is still very challenging. Thus, fundamental materials research and technological development will provide advances in 3D fabrication methods.

The major goal in the project is to provide 3D printed glassy demonstrator objects with high optical transparency as well as reduced amount of bubbles and interfaces for potential future applications as optical components, e.g. light guide structures, miniaturized lenses and mirrors, and optical computing.

HybbiStent

Hybrid biodegradable coating for one-wire peripheral nitinol stent for prevention of restenosis and plaque formation

Peripheral arterial disease (PAD) is caused by atherosclerosis of major vessels supplying the lower extremities and lead to the limited walking ability and reduced quality of life. Self-expanding stents from nitinol revolutionized the treatment of PAD. In spite of significant progress of this technology in the last years, complications, such as in-stent restenosis and re-occlusion rates, are still results of stent implantations. The proposed project HybbiStent aims to develop an unique double-layer coating technology for one-wire peripheral nitinol stent, aimed to minimize the risks of in-stent restenosis and plaque formation due to the use of chemically modified biomimetic lipophilic nanoparticles, carbon-coated iron nanoparticles and detonation nanodiamonds, imitating the structure of natural lipoproteins as anti-restenosis agents. The successful implementation of the project will lead to a competitive product in interventional cardiology with high public value and commercialization.

INSTEAD

Study of InNovative compoSite Thin films based on metallic nanowire nEtworks and functional oxides for application in smArt winDows

Functional materials are key components for industrial development. Smart windows create climate adaptive building shells and play a prevailing role for energy consumption reduction within buildings. There is a clear need to conceive and fabricate functional low-cost and abundant raw material based thin layers with the aim of integrating them in smart windows. INSTEAD proposes an interdisciplinary approach for modelling and fabricating innovative eco- friendly functional materials for efficient, low-cost and stable thermo- and electrochromic devices. The fabrication and optimization of both indium-free transparent electrodes (based on metallic nanowire nanocomposites) and active oxide layers will be thoroughly investigated. Innovative routes will be explored to assess new composites and/or hybrid materials. Specific attention will be devoted to their integration in thermo- and electrochromic devices with the goals of increasing stability and efficiency, and lowering cost.

LaSensA

2D regular nanostructures for lasing and sensing applications

The aim of this collaborative research project is to study the collective optical behaviour of self-assembled nanoparticle arrays and their internal photophysical processes, and to explore their feasibility for plasmon nanolasers and biosensors. The following objectives are planned to be solved: (1) to study how the pattern

and symmetry of nanoparticle‘s (NPs) arrays impact the surface lattice resonance (SLR) and introduce methods to enable active tuning of the SLR wavelength; (2) to study the internal photophysical processes of SLRs by comparing NP in arrays versus NPs in solution; (3) to use the SLRs of these self- assembled NP arrays to create a surface plasmon nanolaser; (4) to use 2D plasmonic structures for biosensing applications; (5) to develop alternatives to classical lithographic techniques, employing controlled wrinkling in combination with soft lithography that can be up-scaled to macroscopic areas and is compatible with continuous roll-to-roll processing.

LITAPROP

Light-weight composite structures with tailored mechanical, electrical and thermal properties

Alongside their excellent specific mechanical properties, fibre-reinforced thermoplastics (FRT) bear the potential to reduce manufacturing costs due to their high volume production capability while also being well recyclable at a low energy level. The areas of application, however, are still limited concerning thermal and electrical properties. The LITAPROP project addresses these limitations by developing novel nano and micro filler veils and strips (NMFVS) while also taking process chains and the development process itself into account. The NMFVS enable users to tailor the properties of a composite layup to their specific thermal and electrical needs without a negative effect on the mechanical properties. With the development of this technology and a suitable design methodology, FRT can be used in important mass-critical applications like battery, controller, or drivetrain housings for electromobility.

LUBRICOAT

Simulation-aided design of solid lubricant coatings

The proposed project combines atomistic simulations with new deposition technologies to design a new class of superhard solid lubricant coatings based on molybdenum disulphide combined with carbon. We employ molecular dynamics to identify composition and structure with the optimum mechanical and tribological properties and use two novel methods to prepare such coatings at an industrial scale. Optimized coatings will be tested both in laboratories and in industry-driven field tests. The main goal is to harvest fundamental research to advance the coating technology from TRL 2 to TRL 6 by demonstrating the solid lubricant coating production on an industrial scale.

MIST

MultI-Scale Simulation Toolbox

SiO2 is one of the most used coating deposited by Physical Vapor Deposition for various applications. Magnetron sputtering is popular in industry but then only thin layers are possible. An alternative is Plasma-Enhanced Chemical Vapor Deposition (PECVD) process based on hollow cathode source (HC).

Deposition is possible at high rate for many days of continuous operation. Unfortunately, coating composition, uniformity and quality vary strongly with not well mastered process parameters. The aim of this project is to build an off-line digital twin of a HC PECVD process with advanced physical and chemical numerical models to simulate plasma, coating growth and predict film properties. The simulation framework will be a general toolbox with numerous possible applications of PECVD in solar, window film, glass, textile, and packaging industries. Here, it will be validated by experimental data obtained by one of the industrial partner in an industrial size HC source.

MOFAC2CAP

Development of Novel MOF Aerogel Composites to CAPture CO2

What if we were able to utilize environmentally friendly multifunctional nanostructured porous materials with prominent unique characteristics to tackle the challenging reduction in CO2 emissions induced by

industrial operations? MOFAC2CAP philosophy is routed on academic, technological and industrial diversity by collaboration of universities and industrial partner (oil and gas) from two countries. It aims at the development of highly efficient and innovative hierarchically porous composites to foster carbon capture technologies matching with end user's needs. More than 90% CO2 capture rate, large CO2 uptake capacity and high CO2 selectivity of developed materials in a multicomponent gas at TRL4 serve as effective indicators for the reliable solution. This promising novelty on the composite material development, contributing to mitigate the negative effects on the climate change, will be further broadened in other carbon-intensive sectors as cement, steel and fertilizer.

MOGLiS

MOF@rGO-based cathodes for Li-S Batteries

Publishable abstract Lithium-sulfur (Li-S) batteries are attractive next generation energy storage devices in sectors like transportation due to their higher theoretical capacity and energy density. The lack of high-performance cathodes that can overcome the decay in cell capacity with cycling hinders the current market realization of Li-S batteries. The MOGLiS project aims at fabricating high performance cathode materials using novel MOF@rGO architectures with MOF decorated graphene-based nanosheets at nanoscale engineering cathodes carefully from the crafted chemistry and architecture with superior electrical properties and efficient immobilization of sulfur. Such flexible Li-S cathodes will be designed and demonstrated at TRL 4 for a high initial capacity >1300 mAh.g-1 and a reversible capacity, after 20 cycles, superior to 1200 mAh.g-1, but also a high cyclability with demonstrations >100 cycles with a capacity loss of less than 0.010% per cycle, for a sulfur loading in the cathode superior to 75%.

NanoBainControl

Accelerated nanobainitic transformation in low-alloy steels processed by incremental forging.

New methods based on fuzzy logic, measurement techniques and model calculations for cost-effective parameterization of incremental forging operations, especially for innovative carbide free bainitic steels are being developed in this project. If material costs play the most important role in manufacturing of the forged component, the optimization of material consumption should be considered. Our know-how and technology can help to use cost efficient materials in a wider range. Integrated forging equipment with measuring system gives large flexibility in processing chain development and obtaining good quality products. The decisive factors for obtaining good quality products are: fatigue strength, wear and tear and strength of the manufactured components. These are the most important component features today. To benefit from the new material concept, the technology design must take into account the development of the material microstructure.

NiWRe-Alloys

Electroplating NiW and NiRe alloys as functional alternative coatings

- Objectives:
  - The main objective is the development of new electrolytes for the electrochemical deposition of Nickel-Tungsten (NiW) and Nickel-Rhenium (NiRe) functional layers.
- Potential applications:
  - The layers will be able to substitute hazardous Chromium (VI) electrolytes widely employed for corrosion and wear resistance.
  - The filling of polymer microstructures will enable the substitution of expensive gold as X-ray absorbing material in medical imaging and non-destructive testing.

- Impact and benefits:
    - The introduction of NiW and NiRe as X-ray absorbing material will have a huge impact for the market introduction of a new medical imaging modality called dark-field imaging through which e.g. diseases related to the degradation of lung alveoli such as chronic obstructary pulmonary disease can be made detectable in an early stage through classic radiography. The substitution of chrome (VI) contributes significantly to environmental protection and better working condition for employee.

NovMat-AM

Novel metallic materials, feedstock and fabrication processes for high-performance additive manufactured goods

High Entropy Alloys (HEAs) can enable high-performance products through not only extraordinary levels of properties but also unique combinations of properties. However, the industrial application of HEAs faces considerable challenges. It is the objective of NovMat-AM to explore and design novel metallic materials and feedstock based on HEAs and to develop processes for the Additive Manufacturing (AM) of such materials for future applications in aerospace, power generation and tooling industry. The main impact of NovMat-AM will be to provide novel low cost and low density HEAs which exhibit high strength, corrosion and wear resistance and are suitable for the AM of parts in an industrial environment. Furthermore, the development of feedstock (filaments and granules) for the processing of advanced metals by emerging material extrusion methods and the development of hybrid DED to enable crack- and segregation-free manufacturing of complex alloyed materials are addressed.

PlasmaComp

Plasma-polymerized functional bio-based composite coatings

Functional coatings are traditionally made from low recyclable synthetic feedstock and wet chemistry approaches, potentially associated to longer processing times and higher material consumption. The PlasmaComp project addresses these aspects with the development of bio-based high-performance composite coatings reinforced with sustainable fillers using an atmospheric pressure plasma deposition method. The functional composite coatings will be deposited on cellulose-based materials in order to improve technological, mechanical and antimicrobial properties for applications in the packaging and sport goods industry. The interdisciplinary, transnational consortium of research and industry will enable the development of functional, eco-friendly composite coatings combined with flexible, material and energy-saving plasma techniques to deliver innovative products to the market with economic and ecological impact.

proTool

Oxide-resistant tungsten carbide high-temperature forming tools by innovative coatings and mechanical interface manipulation

The project “proTool" is focussed the development of solutions for an increased wear resistance of high-temperature-applications forming tools by creation of a competent and efficient European network of universities, institutes, and industrial partners. The developments aim for innovative surfaces, coatings and interfaces.

The process restrictions of forming technologies can be traced back to overloads of allowed forming tool strains. Therefore, the performance of the forming tools are determining the productive application of forming technologies. The technological limits, especially in warm and hot forming, are set by thermal tool strain and complex tribological conditions. Through the application of new carbide grades, innovative substrate pre- and post-treatment and the advanced development of coating technologies a performance increase of warm and hot forming tools is expected to be achieved.

RePoParts

Additive manufacturing Parts and Coatings using Recycled Powder from waste

The development of new materials for European and world industry is of paramount importance. However, it requires eco-friendly new production technologies to protect the natural environment, preserve critical natural resources, and to reduce CO2 emission. Classic methods of producing advanced engineering materials often involve high CO2 emission and degrade the natural environment due to the need for raw materials in the production process. The objective of the “RePoParts” project is to use metallic scraps containing highly valuable elements such as: Cr, Ni, Mo, V to produce powder for additive manufacturing (AM) technologies (i.e. LMD, SLM) and for coating deposition (i.e. HVOF). The powder obtained in the project will have a wide range of applications in High- Speed AM and thermal spray technologies. It will be used to produce new types of materials and new smooth and thin coatings for innovative components with a low carbon footprint.

SAFFIA

Sustainable and thermally Amplified Felts and Foams. Innovative Application of reactively extruded biobased nanocomposites

The European transport market calls for multi-functional parts having lightweight benefits based on sustainable raw materials. Insulating foams and felts have come to a limit in their thermal insulating performances developments. In addition, these parts are mainly based on polyurethanes which originate from crude oil and imply toxic isocyanates use.

To solve these issues, SAFFIA will develop enhanced thermal insulating parts with environmental and process health benefits. The proposed holistic approach will develop an in situ polymerized nanocomposites composed of biobased non-isocyanate polyurethanes and insulating low density silica-aerogel nanoparticles. Polymerizations and compatibilizations will be conducted in an extruder allowing operating conditions versatility and control over nanoparticle dispersion. The two industrial partners include an automotive producer which will ensure efficient developments from products specifications to TRL6 demonstrators.

SEBM-WC-Co

Additive Manufacturing of Hard Metals by SEBM

Additive manufacturing via powder bed fusion is commercially available, but the choice of high-performance materials is limited. Using a novel approach to powder metallurgy and electron beam melting WC-Co parts will be produced. The objective is to develop a viable AM route for WC-Co cemented carbides. The AM process chosen is PBF by electron beam. Critical objectives for success in this project, include: Feedstock preparation exhibiting good flow properties, spheroidised for even bed filling; the SEBM parameters must be optimised; and finally the components will be field tested and performance compared to conventionally manufactured parts. Bar peeling inserts will be field tested. However, other industry sectors such as metal working have niche tooling requirements that are ideally suited to AM manufacture. The benefits will be increased knowledge and potential industrialisation of the process. Making niche market items that could not otherwise be manufactured or small batch items.

ShapeAM

On-the-fly laser beam shaping for Laser Metal Deposition of crack-sensitive Al-Ti alloys

The objective is to use a novel CBC OPA fiber laser for AM. The CBC OPA fiber will create unlimited beam shapes and scanning patterns.This fast laser beam shaping tool enables unprecedented modifiable intensity distributions for enhanced control of melt pool shape, size and dynamics that will improve processing:

reduction of cracking, a distortion-low and near net shape build-up process, reduced part surface roughness and the capability to process critical and new materials. Potential applications are numerous and in all branches (medicine, energy but especially aerospace and space). A model will be developed on how fast laser beam shaping can be translated into manufacturing strategies.CBC OPA fiber laser will be used in an experimental approach to demonstrate how beam shaping is able to improve the AM process.LMD with testing on critical materials like crack-sensitive Al and Ti alloys is the focus. A novel printer will be designed and constructed. As a result, ShapeAM will reach TRL4

SLiCE

Development of novel single Li-ion conducting polymer electrolytes for flexible and safe solid-state batteries

Solid-state Li-ion batteries (SSLIB) are a key development for energy storage as a safer alternative to current solution containing flammable liquid electrolytes. However, the performance of commercial SSLiB in terms of ion-mobility, capacity and fast charge remains inferior to their liquid counterpart. The objective of the SLiCE project is to develop novel single-ion polymer electrolytes (SICP) and therefrom solid polymer electrolytes (SPE), with improved conductivity and cycling performance as part of NMC-Li/Cu solid state battery. SLiCE project finds its application in an undeniably growing market of high-capacity rechargeable batteries that target electric vehicles (EV), energy grid storage, IoT, and more. Offering novel SPE materials with improved ion-conductivity, stability, and safety, SLiCE project has a direct impact on SSLiB technology and an active role in reaching EU's goals of reducing greenhouse gas emissions by empowering vehicles with alternative energy.

SLIM-FIT

Stable and safe Lithium-Metal / Sulfur Batteries enabled by carbon felt current collectors and advanced interface technologies

Rationale / Needs to be addressed

A rapid market growth for battery electric vehicles (BEV) is observed and new market opportunities are expected to emerge, such as emission-free aviation requiring batteries with improved and tailored performance criteria.

- Objectives
    - Main objective of "SLIM-FIT" is to establish an advanced battery cell design based on innovative, interpenetrating electrode and separator coatings aiming for a new generation of stable and safe Lithium-Sulfur batteries.
- Potential applications
    - Improved batteries for vehicle and drone applications are targeted and will be supported by prototype demonstration.
- Impact and potential benefits
    - The electrification of the mobility sector and especially, the development of improved batteries is an emerging market opportunity and companies along the value chain can profit from this growth sector. "SLIM-FIT" is aiming bring innovations to this market und thus, to contribute to a sustainable future and economic growth.

SmartEnergy

Piezoelectric Energy Source for Smart Factory Applications

SmartEnergy aims to develop an integrated, miniaturized, highly energy efficient, maintenance-free and environmentally-friendly energy source, with extensive scalability and reconfigurability. The system integrates a MEMS piezoelectric energy harvester, a rectifier circuit and a supercapacitor, and shows a great promise to replace conventional energy sources and significantly reduce the environmental impact.

The proposal covers a new technology based on advanced multifunctional materials, including highly efficient piezoelectric materials and carbon nanotubes, with optimized nanostructured metal oxides and gel electrolytes.

The project will start from TRL 3 and will reach TRL 5. The development is largely industry-driven, with Renault as the end-user that is looking to upgrade factory processes monitoring through low power autonomous sensor nodes. Thus, SmartEnergy has a great potential to drive down cost, while making smart factory and IoT applications greener and more robust.

SmartHouB

Smart lightweight functionalized materials for Housing of Batteries

In SmartHouB a novel, functional, smart battery packaging technology is developed combining printed electronics with lightweight structural composite and metal layers. Especially, temperature sensors are crucial for battery safety and energy management. Carbonaceous polymer nanocomposites based on CNTs, doped CNTs, graphene, and metal nanoparticles will achieve sensors with high temperature sensitivity as well as interconnects with a significantly low resistivity. The novel laminate system will offer several advantages, such as a high strength-to-weight ratio, high temperature resistance and mechanical strength. In addition, friction stir welding processes in combination with adhesive bonding to join the hybrid laminates will allow the use in many applications such as electromobility. The overall performance of the battery housing will be investigated according to international standards for batteries by developing a representative model on a laboratory basis and validating it at TRL 4

SMICE-Li

Stabilising Conversion Anodes with Solid Molecular Ionic Composite Electolytes for Solid State Lithium Ion Batteries

Solid State Batteries (SSBs) represent the most promising "next-gen" chemistry for Li-based batteries, as they combine the substantially increased energy density (>450Wh/kg) and improved safety that is needed to accelerate a societal shift from fossil fuels. Their development is currently stalled however, by challenges related to electrolyte performance at lower temperatures, and by problems controlling the efficient deposition and stripping of metallic lithium anodes. The SMICE-Li project proposes a new and entirely novel approach to address these problems, by combining high capacity conversion-type anode materials (CAMs) with a new class of solid state Li-ion electrolyte: A Solid Molecular Ionic Composite Electrolyte (SMICE). SMICE-Li will combine predictive modelling with fundamental interphase studies to tailor and match materials for best performance, with the objective of demonstrating the potential of an entirely new class of SSB that addresses the problems limiting current SSBs

SWIPE

Spectroscopy of Spin Waves In Perovskite Excited states

Today’s best spin-based computing devices are still plagued by large power consumption because charge currents are needed to modify magnetic states. To fully exploit spintronics, we need to process, transport

and store information without using charge currents. The SWIPE project will pioneer a new route using spin waves (magnons) to carry signals over long distances. We will focus on antiferromagnetic (AFM) spin waves, which are fast and impervious to perturbations, but harder to control. Our key proposal is to use lattice vibrations (phonons) to control AFM magnons: Acoustic phonons can generate and propagate signals. Optical waves can couple to electronic and magnetic excitations, and modify the magnon properties. The key advantage of spin waves is their interface with nonvolatile magnetic states, which enables ultralow power information and communication technology. A second important front is sensors and actuators, made exquisitely sensitive and efficient with magnonic devices.

TAGGED

Research, Development and characterization of a TunAble Graphene liGht Emitting hybrid MOEMS Device

High performance solid-sate light sources are critical components in many MOEMS and have been the subject of much research in recent years. With the advent of graphene and thanks to its superior physical properties, a new field of research has been opened up for exploiting graphene properties for various applications. We aim to employ light emission properties of graphene when it is electrically biased, coupled with an electrostatically actuated substrate to develop a light source with tunable wavelength and intensity. A graphene layer is suspended over a substrate that can be positioned, allowing fine adjustment of its distance to the graphene layer, hence tuning the reflected light and its interferences with respect to wavelength and intensity. Such precisely engineered tunable light sources can provide a broad optical bandwidth and advance the spectral resolution in a variety of domains including spectroscopic measurements to investigate wavelength-dependent properties of materials.

ULTCC6G_EPac

Ultra-Low Temperature Co-fired Ceramics for 6th Generation Electronic Packaging
Information and communication technologies for 5G and 6G are today one of the most vital areas to address demand for energy efficiency, sustainability, environmental friendliness, low manufacturing cost, and circular economy. There is a great need for new or upgraded materials with specific properties and relevant technologies. The ULTCC6G-EPac will design, implement, validate, and demonstrate ultra-low temperature co-fired ceramics (ULTCC) fabricated at 400-700 °C, destined for multilayer high frequency (GHz-THz) devices. It implements new functional materials, facile ceramic tapes, and upgraded ULTCC packages (RoHS and REACH compliant) useful for 6th generation devices in telecommunication K band and D band. Structural, microwave and mmWave dielectric, thermal and mechanical materials properties will be studied. Consortium will develop new materials (IKTS,DE), characterize (L-IMiF, QWED,PL), design, prototype and test the product in industrial environment (CEA Leti & INOVEOS, FR).

WReMo

Powder feedstock production and 3D printing of refractory metals and alloys for aerospace applications

Additive manufacturing (AM) is currently the fastest developing production method. One of the AM's problems is limited availability of feedstock powders, especially visible in the case of refractory metals. Refractory metal powder feedstock for AM is produced by plasma spheroidization or plasma atomization methods. In the scope of the project, W-Re and Mo-Re alloys will be developed, using both of those methods. Generic LPBF processing parameters for new feedstock material will be developed and demonstrative elements –rocket engine parts– will be manufactured. The new powders will be also developed with the use of material recovered from waste/scrap, which is especially important in case of materials regarded as Critical Raw Materials (CRM).The results of the project will form a basis of introduction of new products to the market and the project will help in gaining new knowledge on W-Re and Mo-Re alloys, as well as their behaviour during processing in plasma flame and LPBF processes.