FIT-4-NMP

REPORT

ON UNDERREPRESENTED REGIONS

AND TALENTED NEWCOMERS

IN H2020 NMP RESEARCH

2021

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EXECUTIVE SUMMARY

This study was implemented in the frame of the H2020 FIT-4-NMP project funded by the European Commission to increase the participation of talented newcomers from regions underrepresented in Horizon Europe research in nanotechnologies, advanced materials and new manufacturing processes (NMP) as compared to Horizon 2020. In line with the FIT-4-NMP definitions:

- Underrepresented regions are regions with low participation in H2020 NMP projects but with untapped NMP potential.

- Talented newcomers are organisations – companies and especially SMEs, universities, research institutes or other organisations – that have not participated in the H2020 NMP projects but are considered promising innovators based on their R&D activities, projects, patents and/or innovations.

The first objective of this study was to **identify and prioritise underrepresented regions in H2020 NMP research**. To prepare a background for this activity, an analysis of the regional (NUTS2 level or equivalent) participation in H2020 NMP research was performed using openly available data on H2020 projects funded under the NMP-relevant topics and confidential data on H2020 proposals submitted to the same topics that the European Commission provided particularly for the purposes of this study. The analysis covered 44 countries – 27 EU Member States, the UK, and H2020 Associated Countries (AC).

The analysis revealed a considerable disparity between the EU-15, EU-13 and AC in H2020 NMP research at national and regional levels. Absolute numbers of H2020 NMP project participations, proposal applications, organisations engaged and so on for EU-15, EU-13, and AC countries and regions differ by orders of magnitude. However, at the same time, the relative numbers associated with the size of the research and innovation (R&I) systems expressed via the human resources in science and technology (HRST) do not differ that dramatically. Indeed, the majority of high- and moderate-participating regions belong to the EU-15 countries, but there are few in the EU-13 countries that compete successfully at the European level. Among AC, Iceland, Norway, Switzerland, and Israel perform similarly to EU-15 and have high-, moderate- and low-participating regions, while other AC regions are low-participating ones.

Following the analysis, three key conclusions were made by the FIT-4-NMP consortium:

1. None of the EU-13, EU-15 and AC demonstrate homogenous participation in H2020 NMP research on a regional level. Thus, it is essential to look for underrepresented regions across all country groups – EU-13, EU-15 and AC.
2. Compared to EU-15 counterparts, EU-13 actors demonstrate a high motivation to join collaborative NMP research, but require additional support to apply more actively and successfully for NMP funding from the Horizon Europe programme.

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3. Among AC, support is particularly needed for upper-middle-income and low-middle-income countries included in the H2020 Widening country list to tackle low participation barriers and to help exploit the available talent pool for mutual socio-economic benefit.

These conclusions stimulated the FIT-4-NMP consortium to develop and follow **a pragmatic approach – combining policy considerations and data-driven considerations** – while preparing a priority list of regions underrepresented in H2020 NMP research. The **policy considerations** were mainly associated with the strength and maturity of the national R&I support systems in the different country groups. The **data-driven considerations** helped analyse the regions' involvement in H2020 NMP research in conjunction with other factors that define the regions' capacities in the NMP field.

To apply the FIT-4-NMP approach, various data on the regions – (i) positioning in the H2020 NMP programme, (ii) achievements in NMP research and (iii) strategic interest in NMP research and funding - were collected from different sources such as the eCorda database, Eurostat database, European Patent Office database, and Smart Specialisation Platform. As a result of this data processing, 92 regions were prioritised as underrepresented in H2020 NMP research – 47 regions from EU-13, 22 regions from EU-15 and 23 regions from Associated Countries. These regions will be the focus of the FIT-4-NMP support activities during the period of 2021-2023.

The second objective of this study was to identify talented newcomers from the prioritised underrepresented regions and engage them in the FIT-4-NMP support environment. At the time of completing this report, 67 organisations – including 28 companies, 15 universities, 23 research institutions and 1 cluster – from 36 regions and 18 countries have been included in the FIT-4-NMP talented newcomer register based on their expression of interest in the FIT-4-NMP support measures. The newcomer identification and engagement activities will further continue during the whole project implementation to support as many talented organisations as possible from the regions underrepresented in H2020 NMP research.

All organisations included in the FIT-4-NMP newcomer register will be actively supported by the FIT-4-NMP consortium in their intention and attempts to join Horizon Europe NMP research and to contribute to the sustainability and leadership of European industry. It will increase the number and quality of applications from underrepresented regions identified as the primary constraints to efficient participation in H2020 NMP research.

1. INTRODUCTION

FIT-4-NMP project is a support action funded by Horizon 2020 to increase the participation of talented newcomers from underrepresented regions in Horizon Europe research in the fields of nanotechnologies, advanced materials and new manufacturing processes (NMP) as compared to Horizon 2020.

The **FIT-4-NMP project's focus on newcomer engagement** is motivated by the observations of several high-level studies regarding the implementation of the H2020 programme. For example, the Horizon 2020 interim evaluation report[1] published by the European Commission in 2017 states that "improvements in programme implementation are needed to attract new participants to projects", notwithstanding that more than half (52 %) of H2020 participants were newcomers. In parallel, the Horizon 2020 Advisory Group for Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing[2] highlighted that only 38.4 % of European beneficiaries were newcomers in the NMBP programme under Horizon 2020 as of November 2018. The Advisory Group's report paid particular attention to actions that might help to reach out to new players in the NMBP field.

Another **FIT-4-NMP project focus is underrepresented regions**, i.e. regions with low participation in H2020 NMP projects but with untapped NMP potential. Since FP5, there have been many studies published regarding the general underperformance of the EU Member States that joined the EU in or after 2004 (referred to as the EU-13) in the EU Framework Programmes compared to the EU Member States that joined before 2004 (referred to as the EU-15). However, the recent European Parliamentary Research Service's report[3] clearly demonstrates that both EU-13 and EU-15 country groups are not homogeneous concerning their participation, success rate, and funding received from the Horizon 2020 budget. Moreover, analysis of regional embeddedness of research and innovation activities funded – particularly under the FP7 NMBP programme[4] – was performed in 2016 on demand of the European Commission. The results demonstrated that there are underperforming regions across all EU Member States for which the actual participation rate does not correspond to the "potentially expected participation rate" determined using a set of socio-economic, R&D and technological criteria.

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[1] Interim evaluation of Horizon 2020, European Commission, 2017

[2] Outreach to Newcomers and Societal Engagement in Industrial Technologies, Horizon 2020 NMBP Advisory Group Report, November 2018

[3] Exploring the performance gap in EU Framework Programmes between EU13 and EU15 Member States, European Parliamentary Research Study, June 2020

[4] Mapping the regional embeddedness of the NMP programme, European Commission, 2016

Thus, the **FIT-4-NMP project will engage and support talented newcomers – especially SMEs – from underrepresented regions from EU-13 Member States, EU-15 Member States and H2020 Associated Countries**. It will enable more efficient exploitation of NMP capacities and talents from across the EU and Associated Countries. In this way, the FIT-4-NMP project will initiate positive changes across European NMP research and innovation chains and contribute to developing new product and process innovations essential for EU industry competitiveness and EU citizen wellbeing.

To prepare the background for the FIT-4-NMP support activities, this analytical study about underrepresented regions and talented newcomers was planned and implemented by the FIT-4-NMP consortium with two specific objectives:

- Objective 1: Identify and prioritise underrepresented regions in the H2020 NMP research.
- Objective 2: Identify talented newcomers from the prioritised underrepresented regions.

The report below presents the results of the following main activities:

- Section 2: Analysis of regional participation in H2020 NMP research based on H2020 data about proposals submitted and projects funded under NMP calls and topics.
- Section 3: Development and realisation of methodology to prepare a priority list of regions underrepresented in H2020 NMP research.
- Section 4: Identification and engagement of talented newcomers from prioritised underrepresented regions.

2. ANALYSIS OF REGIONAL PARTICIPATION IN H2020 NMP RESEARCH

2.1 CONTEXT

In line with the overall project approach to identify underrepresented regions in EU-13 Member States, EU-15 Member States and H2020 Associated Countries (AC), the FIT-4-NMP analysis covered 44 countries. For statistical purposes, the UK was kept within the EU Member States (MS) group since UK entities were eligible to receive EU funds until the end of the Horizon 2020 programme as defined in the EU-UK Withdrawal Agreement.

To move the FIT-4-NMP analysis from a country level to a regional one, the NUTS (Nomenclature of Territorial Units for Statistics) classification was used to define the regions in the MS and some AC (Albania, Bosnia and Herzegovina, Iceland, Montenegro, Norway, Serbia, Switzerland, The Republic of North Macedonia, Turkey). For other AC (Armenia, Israel, Faroe Islands, Georgia, Moldova, Tunisia, Ukraine) not covered by the NUTS classification, the NUTS 2 equivalent regions were defined following the national administrative division at the level that met NUTS 2 region size range from 800,000 to 3,000,000 people. As a result, Armenia, Faroe Islands, Georgia and Moldova were treated as a single NUTS 2 equivalent region; Israel and Tunisia were divided into 6 NUTS 2 equivalent regions each; and Ukraine represented by 25 NUTS 2 equivalent regions. The total number of regions under analysis is shown in Table 1.

Table 1 – Number of regions under analysis (NUTS 2 or equivalent)

EU-15	EU-13	AC	Total
220 regions	61 regions	93 regions	374 regions

Being focused on the Horizon 2020 NMBP programme analysis, the FIT-4-NMP project plans its activities for the sake of newcomer engagement in Horizon Europe NMP research focused on (i) advanced materials, (ii) manufacturing technologies and (iii) circular industries and clean industries. These priorities encompass the H2020 NMBP thematics of nanotechnologies, advanced materials, advanced manufacturing and processing (NMP) that will be funded within Cluster 4 "Digital, Industry and Space" under Pillar 2 "Global Challenges and European Industrial Competitiveness" of Horizon Europe. Meanwhile, the H2020 NMBP thematic biotechnology – which constituted a smaller share of the H2020 NMBP programme budget (~10%) – will be integrated into Cluster 6 "Food, Bioeconomy, Natural Resources, Agriculture and Environment".

Given that the FIT-4-NMP project has finite resources, it is essential not to spread them too thinly but to focus strategically on achieving tangible results in a limited set of priorities. Thus, FIT-4-NMP will primarily support talented newcomers to participate in the NMP research under the Horizon Europe Pillar 2 Cluster 4 Destinations "Climate Neutral, Circular and Digitised Production" and "Increased Autonomy in Key Strategic Value Chains for Resilient Industry".

In line with this strategy, some H2020 NMBP programme topics were excluded from the FIT-4-NMP analysis as non-relevant to the NMP project focus. They are 26 BIOTECH topics oriented on biotechnology research; 6 FoF topics focused purely on information and communication technologies; and 5 CIRC topics related to climate action, environment, resource efficiency and raw materials or food security, sustainable agriculture and forestry, marine and maritime and inland water research. Also, one Green Deal topic under the H2020 NMBP Work Programme 2018-2020 was not covered by the analysis due to the results being unavailable since the call deadline was only in January 2021. Exclusion of these topics from the FIT-4-NMP analysis explains the deviations that might be identified while comparing the data presented within this study with the data available at the H2020 Funded Projects Dashboard for "Advanced Materials", "Advanced Manufacturing and Processing", and "Nanotechnologies, Advanced Materials and Production" priorities.

2.2 ANALYSIS

In total, 215 NMP topics opened under the H2020 NMBP programme during 2014-2020 were analysed regarding the projects selected for funding based on the eCorda grants data as of 06 April 2021. For these 215 NMP topics, there were 557 projects selected for funding. The funded projects engaged 8,699 participants, among which 4,227 are unique

As shown in Figure 1, the EU-15 countries heavily dominate in H2020 NMP research with top-5 countries (Spain, Germany, Italy, France and UK) covering more than 58% of project participations and 62% of project coordinators. Cumulative figures for the three country groups of interest under this study – EU-13, EU-15 and AC – also demonstrate a huge disparity in H2020 NMP project participations and coordinators for different country groups (see Figure 2). Among 8,699 participations, there were only 546 participations (6.3%) from EU-13. Moreover, among 557 funded projects, only 8 projects were coordinated by organisations located in the EU-13. When it comes to the level of funding, the EU-13 beneficiaries received only 4.7% of the total H2020 NMP funding compared to 88.7% granted to the project participants from the EU-15. As for the AC group, it has to be noted that 82% of participations and 96% of coordinators belong cumulatively to Switzerland, Norway and Israel. In contrast, other AC countries have just a few participations. In overall, these NMP participation figures are very similar to overall performances of the country groups in the H2020 programme reported in the EC statistics and relevant studies.
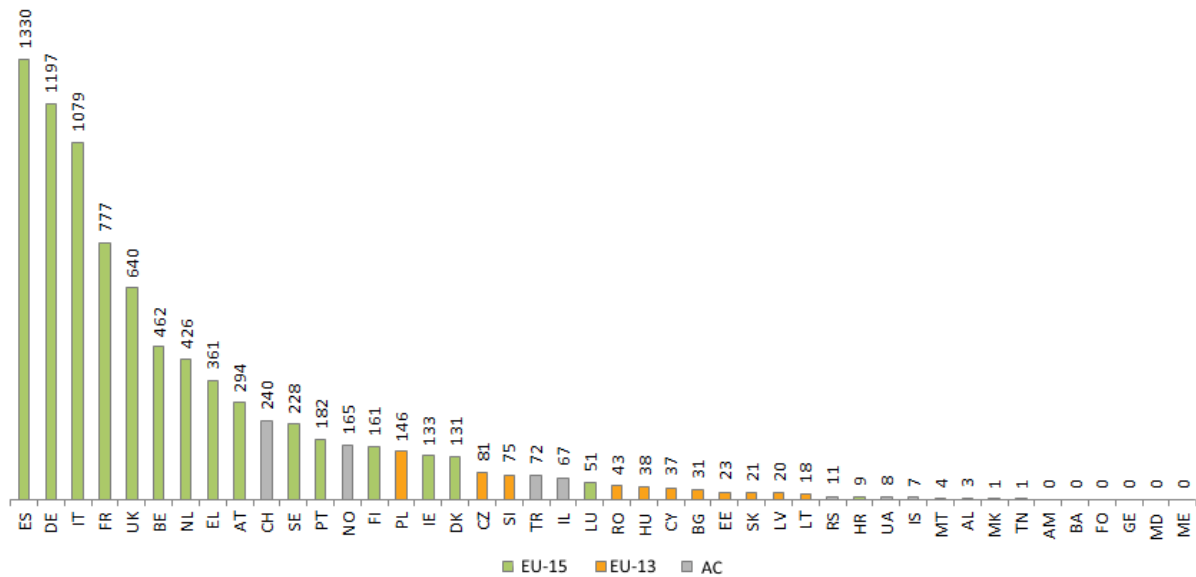
Figure 1 – Number of participations in H2020 NMP projects
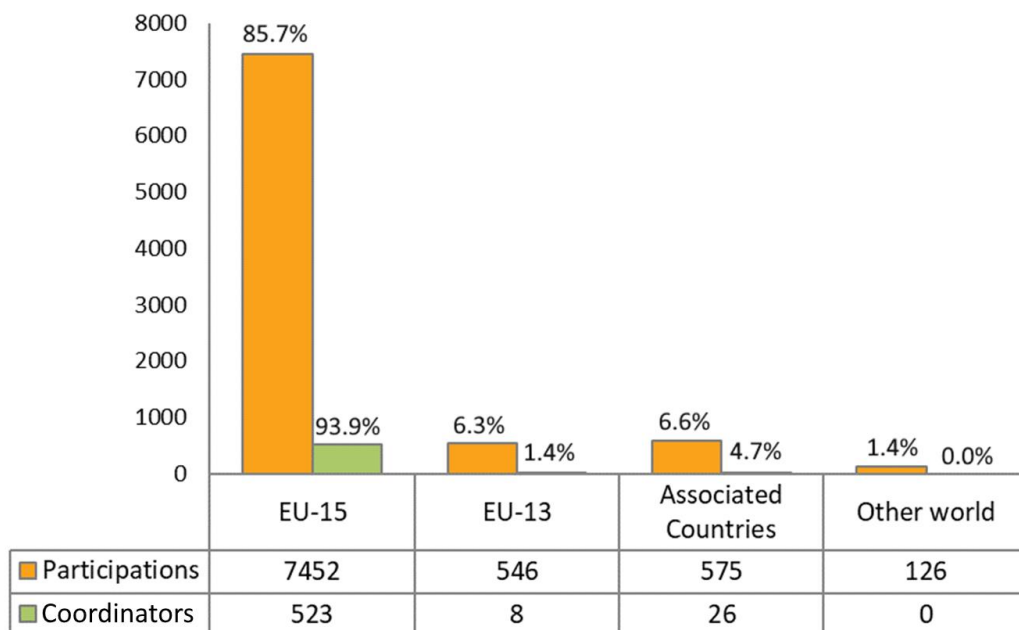
Figure 2 – Comparison of funded project participations and coordinators
for different country groups

Additional analysis of involvement of different country groups in H2020 NMP project of various types – Research and Innovation Actions (RIA), Innovation Actions (IA) and Coordination and Support Actions (CSA) – has not revealed significant imbalances (see Figure 3). However, an active participation of EU-13 entities in Innovation Actions (52 % of all participations) may be treated as a positive sign of industry/business innovativeness and interest in collaborative developments under the EU funding programmes.

EU-15	EU-13	AC

Figure 3 – Analysis of participations in H2020 NMP projects of various types

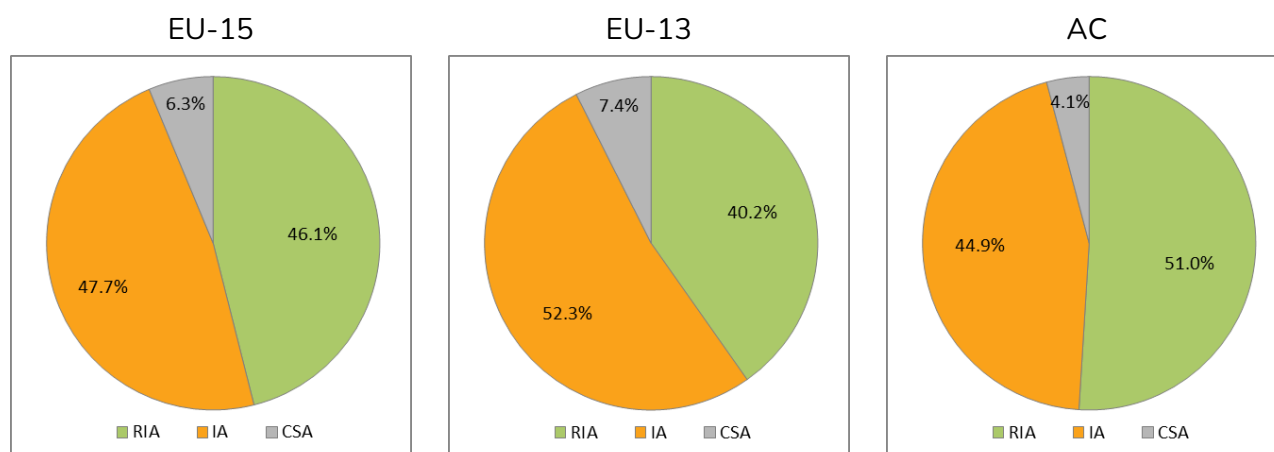Switching from country-level analysis to regional one, we see an even greater disparity of H2020 NMP project participation between the EU and AC countries (see Figure 4). Among 374 regions under analysis, 90 regions (24.1 %) were uninvolved in H2020 NMP research (i.e. having zero projects); 91 regions (24.3 %) had from 1 to 5 projects; 112 regions (29.9 %) had from 6 to 25 projects; and 81 regions (21.7 %) participated in more than 25 projects during 2014-2020 period. At the same time, some regions performed much better than the average. For example, Table 2 presents the top 20 regions that altogether cover 41.9% of all NMP project participations.

Table 2 – Top-20 regions in terms of participations in H2020 NMP projects

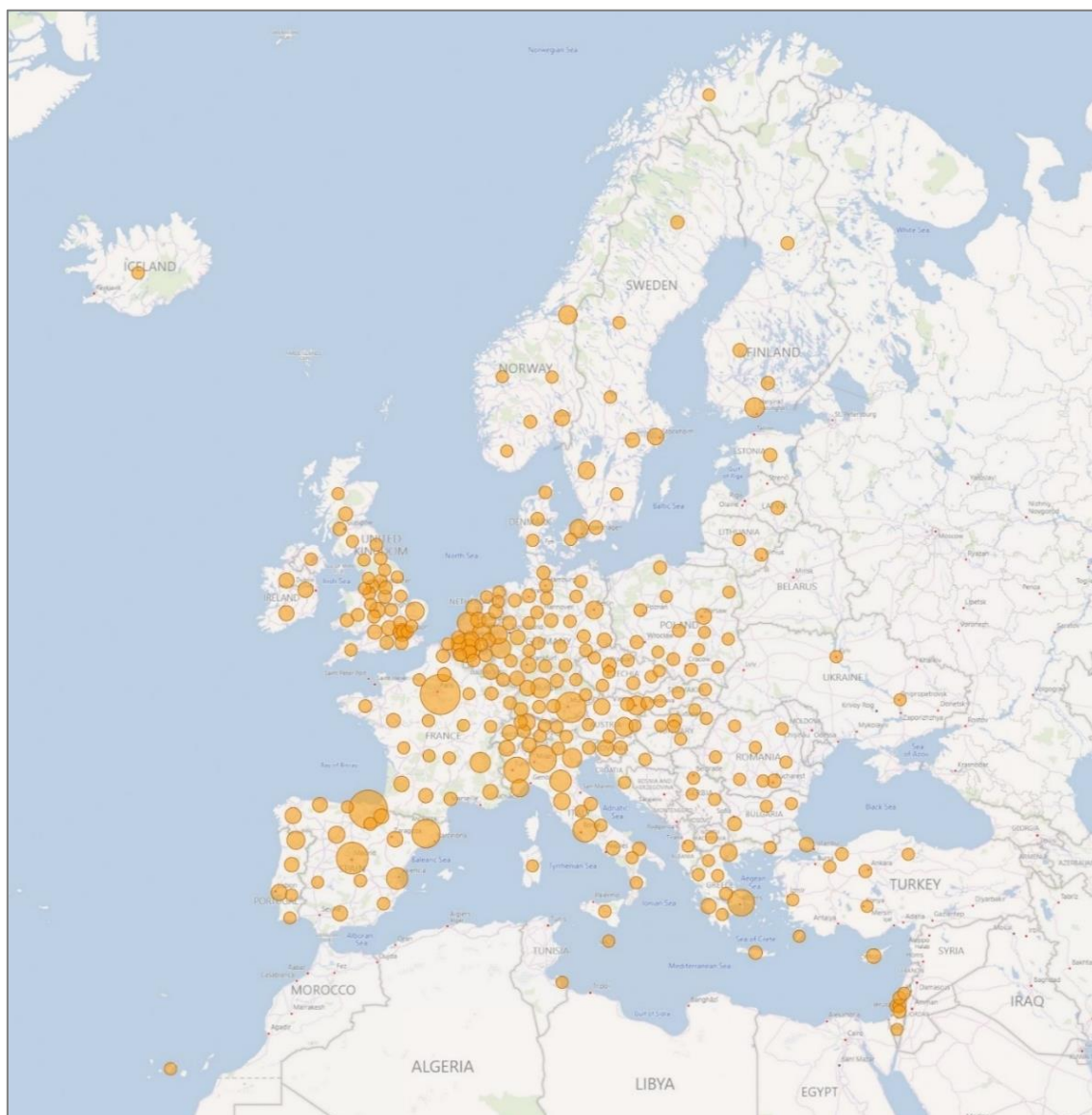| #	Region	Number of participations	#	Region	Number of participations
1	FR10, Ile-de-France	388	11	NL33, Zuid-Holland	135
2	ES21, País Vasco	366	12	ITH5, Emilia-Romagna	133
3	ES30, Comunidad de Madrid	274	13	ES52, Comunidad Valenciana	130
4	DE21, Oberbayern	255	14	FRK2, Rhône-Alpes	115
5	BE10, Région de Bruxelles-Capitale	236	15	DE11, Stuttgart	112
6	ES51, Cataluña	228	16	DEA2, Köln	110
7	ITC4, Lombardia	210	17	ITH3, Veneto	102
8	EL30, Attiki	201	18	FI1B, Helsinki-Uusimaa	101
9	ITC1, Piemonte	192	19	AT13, Wien	96
10	ITI4, Lazio	165	20	DEA1, Düsseldorf	93

Figure 4 – Number of NMP project participations per region

However, to compare the different regional performances adequately, it is important to consider the regions' socio-economic characteristics, particularly human resources engaged in R&I activities and/or internal R&D expenditures. Therefore, for the purposes of this study, the Eurostat data on human resources in science and technology (HRST)[5] were used as metrics of the research and innovation (R&I) size of a region, country or group of countries.

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[5] Human resources in science and technology (HRST) as a share of the active population in the age group 15-74 at the regional NUTS 2 level. The data shows the active population in the age group 15-74 that is classified as HRST (i.e. having successfully completed an education at the third level or being employed in science and technology) as a percentage of total active population aged 15-74.

The average participation rate in H2020 NMP projects calculated for the EU-28 country group is equal to 74.2 participations per million HRST. For EU-15 and EU-13 groups separately, this participation rate corresponds to 82.9 and 30.4 participations per million HRST, respectively. It means that EU-13 scientists and innovators participated in H2020 NMP projects 2.7 times less often than their counterparts from EU-15.

To see how individual regions perform within these groups, we divided all the regions into three categories:

- **High-participating regions** with participation rate above 120 % of the EU-28 average;
- **Moderate-participating regions** with participation rate between 120 % and 70 % of the EU-28 average;
- **Low-participating regions** with participation rate below 70 % of the EU-28 average.

The results presented in Figure 5 below demonstrate that neither EU-15 nor EU-13 country groups are homogenous that is completely in line with the conclusions of the previous studies (e.g., Exploring the performance gap in EU Framework Programmes between EU13 and EU15 Member States, European Parliamentary Research Study, June 2020). Despite the high average participation rate of the EU-15 country group, there are 59 % of low-participating regions. At the same time, there are three regions (Cyprus (CY00), Zahodna Slovenija (SI04), Vzhodna Slovenija (SI03)) among the EU-13 country group that belong to the high-participating category. For Associated Countries (except Iceland, Norway and Switzerland included in the Eurostat statistics), it is impossible to perform the same exercise precisely due to the absence of national and regional data equal to or close to the Eurostat HRST definition. However, comparative analysis of the regional participation data and the overall regional population made it possible to
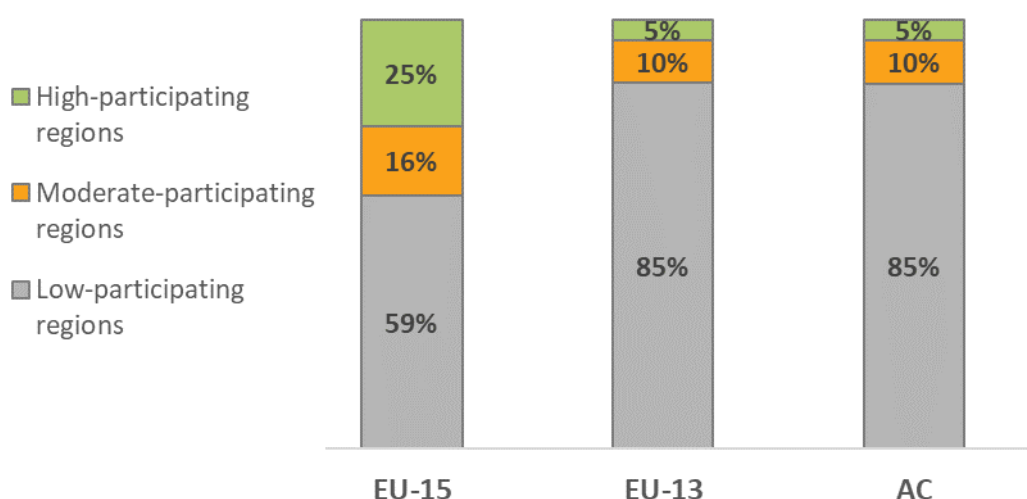

Figure 5 – Share of high-, moderate and low-participating regions in EU-15, EU-13 and AC country groups

infer that only some Israel regions belonged to the moderate-participating group. All regions from Associated Countries included in the H2020 Widening list[6] belong to the low-participating regions category. As for Iceland, Israel, Norway and Switzerland, their performance at the regional level is similar to the EU-15 country group, i.e., there is a combination of high-participating, moderate-participating and low-participating regions.

In parallel with the H2020 NMP project participation analysis, the same 215 NMP topics were analysed in terms of proposals submitted for evaluation based on the confidential data set provided by the EC for the FIT-4-NMP analysis purposes. These data cover eligible proposals in stages 0 and 2, where "0" means proposals submitted to one-stage calls and "2" means proposals submitted to the 2nd stage of two-stage calls.

> **In total, there were 2,893 proposals submitted to 215 NMP topics under analysis during the 2014-2020 period, including 2,316 proposals to one-stage calls and 577 proposals to the 2nd stage of two-stage calls. These proposals involve 36,216 applicants and 12,669 unique organisations. Among these organisations, 8,838 were not selected for funding[7].**

As for H2020 NMP applications, the performance trends for EU-15, EU-13 and AC country group (see Figure 6) are similar to ones identified during the participation analysis. However, more detailed comparison between the project data and proposal data reveals the EU-13 entities to be motivated but in a weak position.

On average, EU-28 regions submitted 310.2 applications per million HRST. The EU-13 application rate (160.1 applications per million HRST) was 2.1 times lower than the EU-15 rate (340.1 applications per million HRST). Meanwhile, a comparison of the participation rate per million HRST revealed the EU-13 rate to be 2.7 times lower than the EU-15 rate.

When participating as consortium partners, the EU-15 entities' success rate was equal to 24.4%, while the EU-13 entities' success rate was 19%. As for consortium coordination, the EU-13 organisations' likelihood of success was only 6.8% compared to the 19.8% for the EU-15 organisations.

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[6] Albania, Armenia, Bosnia and Herzegovina, Faroe Islands, Georgia, Moldova, Montenegro, Serbia, Tunisia, Turkey, The Republic of North Macedonia, Ukraine.

[7] There is a deviation between the numbers of unique organisations in the funded projects calculated on the basis of the figures presented in this paragraph (3,831 organisations) and discussed previously (4,227 organisations). This deviation is less than 5% and caused by multiple reasons like changing of the participant identification code (PIC) at the grant preparation stage or as a result of organisation restructurings during the project implementation period; involvement of new entities to funded projects due to partner termination or other reasons; etc.
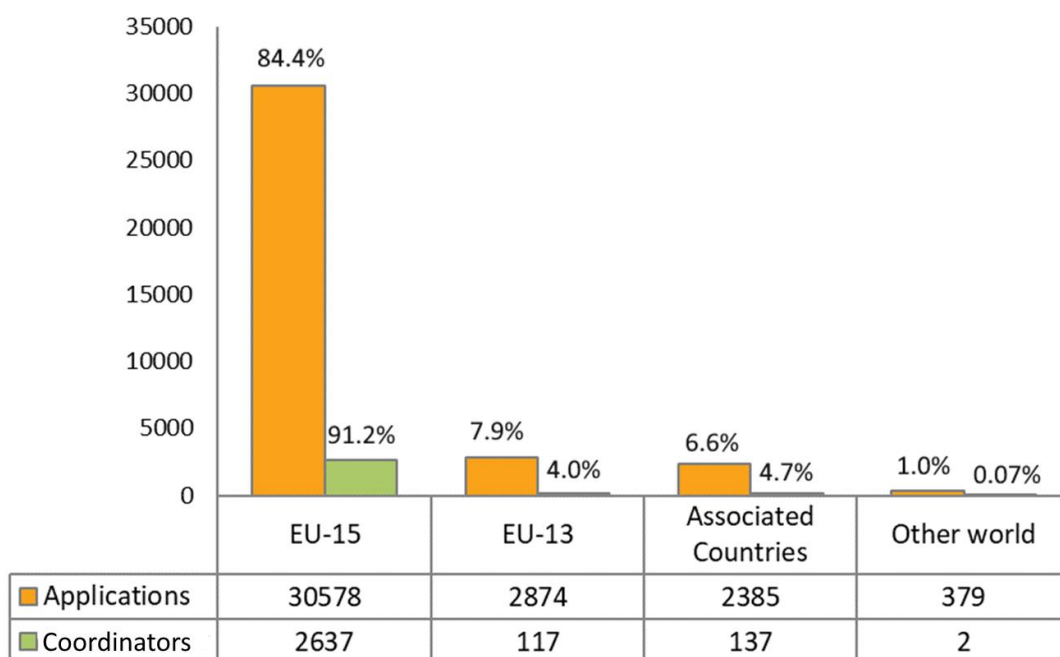
Figure 6 – Comparison of proposal participations and coordinators for different country groups

It is also interesting to compare the amount of funding requested by applicants of eligible proposals with the gross expenditure on research and development (GERD) for a particular region, country or group of countries. Assessed as an "importance of H2020 NMP funding in R&I funding", this value is equal to 5% for EU-15 countries and 7.6% for EU-13 countries, i.e. the H2020 NMP funding is 52% more important for EU-13 entities than EU-15 entities.

Finally, the interest of this study was to understand the dynamics of newcomer engagement in H2020 NMP research across the different country groups and organisation types. For this purpose, a comparison was made between the participant lists for the 215 H2020 NMP topics, FP7 NMP projects, and FP7 projects, in order to identify and count:

- H2020 newcomers, i.e., organisations that have not participated in any FP7 project;
- H2020 NMP newcomers, i.e., organisations that have not participated in FP7 NMP projects;
- Experienced organisations, i.e., organisations that have earlier participated in FP7 NMP projects.

Out of 4,227 unique participants of the 215 H2020 NMP topics, 2,034 organisations (48.1%) were H2020 newcomers and 2,862 organisations (67.7%) were H2020 NMP newcomers. Furthermore, out of 3,852 unique EU-based participants of the 215 H2020 NMP topics, 1,841 organisations (47.8%) were H2020 newcomers and 2,594 organisations (67.3%) were H2020 NMP newcomers.

These figures demonstrate significant progress in newcomer engagement in NMP research compared to the data presented in the Advisory Group report "Outreach to Newcomers and Societal Engagement in Industrial Technologies". In November 2018, the study reported that only 38.4% of European beneficiaries were newcomers in the NMBP programme under Horizon 2020 i.e., without previous experience in FP7. Despite the progress in newcomer engagement (from 38.4% in November 2018 to 47.8% at the end of the H2020 programme), there is still room for actions to increase the share of Horizon Europe newcomers in NMP projects to at least 50%, as the European Commission requested in the H2020 NMBP-37-2020 "Incentivising newcomers" call.

In the context of different county groups, there were no significant differences in the share of H2020 NMP newcomers among the unique participants. The newcomers' share was 69% for EU-13, 67.2% for EU-15 and 66.4% for AC. Meanwhile, with respect to human resources in science and technology (HRST), the number of H2020 NMP newcomers in EU-13 countries (14.2 per million HRST) was 1.8 times lower than in EU-15 countries (26.0 per million HRST). However, the EU-13 newcomers were more active compared to the EU-15 newcomers when we analyse the share of H2020 NMP newcomer participations among all the NMP project participations. In relative figures, 56.4% of NMP project participations in EU-13 countries involved H2020 NMP newcomers. For EU-15 and AC, these indicators were equal to 41.5% and 41%, respectively.

As for 8,838 organisations not selected for funding in the analysed 215 H2020 NMP topics, there were 1036 unsuccessful H2020 NMP newcomers (57.7 per million HRST) from the EU-13 countries and 6908 unsuccessful H2020 NMP newcomers (76.8 per million HRST) from the EU-15 countries. Although the absolute numbers differed significantly, the relative values differed by only 1.3 times. Moreover, similar to successful newcomers, unsuccessful EU-13 newcomers were also more active than their EU-15 counterparts. They were responsible for 49.7% of all NMP applications in their country group, while EU-15 and AC unsuccessful newcomers were engaged in 31.8% and 40% of NMP applications, respectively. Despite these facts, only one in four EU-13 organisations received H2020 funding compared to one in three EU-15 organisations.

In terms of organisation types, the ratio of newcomers was not balanced (see Figure 7 and Figure 8 below). For example, the shares of newcomers among higher or secondary education establishments (HES) and research organisations (REC) were relatively low (31.2% and 41.8%, respectively) due to, in general, long-term engagement of R&D organisations in the EU Framework Programmes. As a result, HES and REC multi-team entities participated, on average, in 3.4 to 4.4 projects. On the other hand, there was a high share of newcomers (76.8 %) among private for-profit entities (PRC), including SMEs. Furthermore, analysis of PRC participation revealed that 77.2% of entities participate in one funded project only, thus joining the H2020 NMP research with a particular business interest. However, there was a sizeable and successful minority of PRC entities (22.7% of all PRC participants) deeply involved in collaborative NMP research who represented 50% of all PRC participation in the 215 H2020 NMP topics under analysis. As for public bodies (PUB) and other entities (OTH), newcomers prevailed over experienced organisations (63.1% and 77.7%, respectively) and, in most cases, joined consortia on an ad hoc basis.
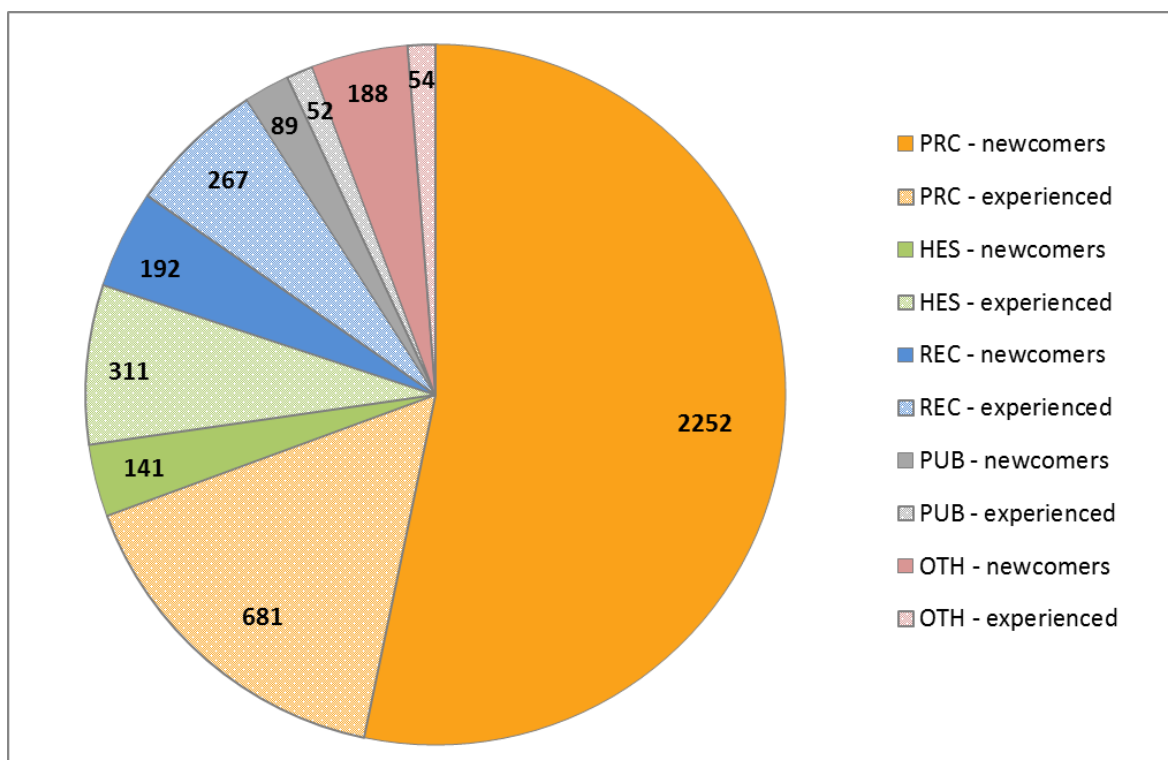
Figure 7 – Analysis of 4 227 unique participants of 215 NMP topics

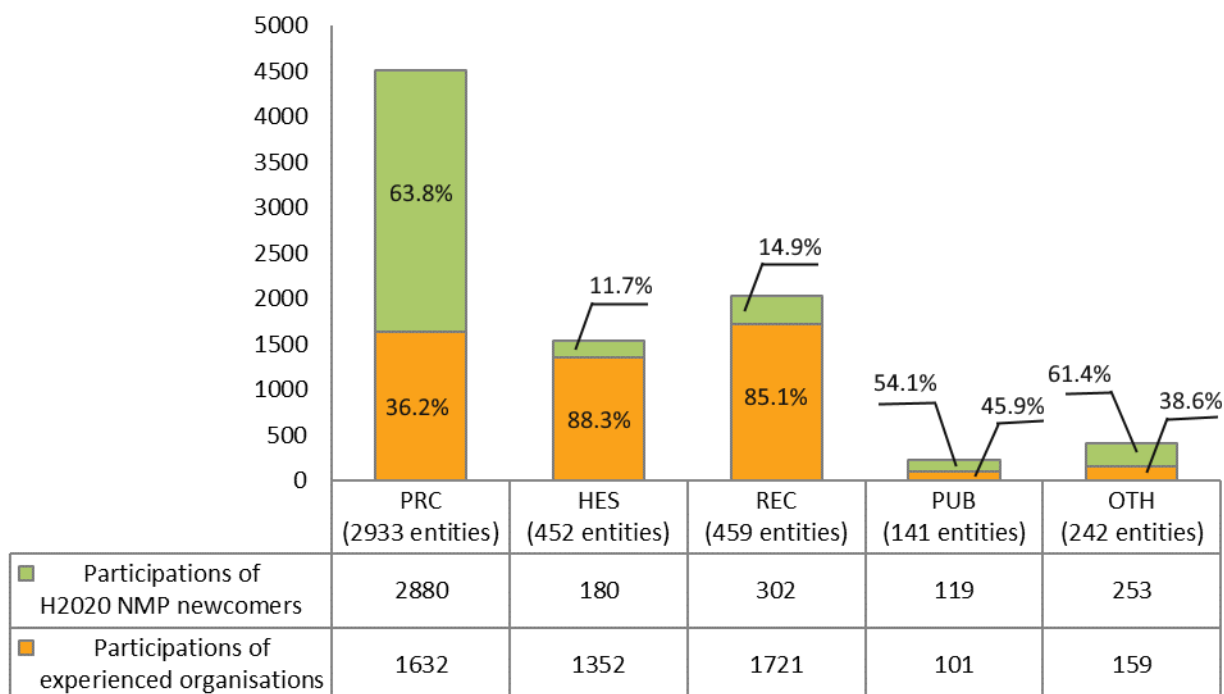|	PRC (2933 entities)	HES (452 entities)	REC (459 entities)	PUB (141 entities)	OTH (242 entities)
Participations of H2020 NMP newcomers	2880	180	302	119	253
Participations of experienced organisations	1632	1352	1721	101	159

Figure 8 – Analysis of participations of experienced organisations and
H2020 NMP newcomers for different organisation types

2.3 DISCUSSION

The data and graphs presented in the preceding analysis sub-section reveal considerable disparity between the EU-13, EU-15 and AC in H2020 NMP research at a national level. We would like now to summarise and discuss these findings separately for the EU Member States and Associated Countries.

Nevertheless, there is also a common important feature across all the country groups: none of the EU-13, EU-15 and AC demonstrate homogenous participation in H2020 NMP research on a regional level (except countries represented by a single region). This is why **it is essential to look for underrepresented regions across all country groups – EU-13, EU-15 and AC.**

EU Member States

While absolute numbers of H2020 NMP project participations, proposal applications, organisations engaged and so on for EU-15 and EU-13 countries differ by orders of magnitude, the relative numbers associated with the size of the R&I systems of these country groups do not differ that dramatically (see Table 3).

Table 3 – Comparison of EU-28, EU-15 and EU-13 average performances

Indicator	EU-28 average	EU-15 average	EU-13 average
NMP project participations per million HRST	74.2	82.9	30.4
NMP proposal applications per million HRST	310.2	340.1	160.1
Success rate	23.9%	24.4%	19%
Importance of H2020 NMP funding	5.1%	5%	7.6%
Number of H2020 NMP newcomers per million HRST	24.1	26.0	14.2
Number of unsuccessful H2020 NMP newcomers per million HRST	73.7	76.8	57.7
Share of H2020 NMP newcomer participations in all NMP project participations	42.5%	41.5%	56.4%
Share of unsuccessful H2020 NMP newcomer applications in all NMP proposal applications	33.3%	31.8%	49.7%

Indeed, EU-13 actors apply 2.1 times less often than EU-15 colleagues. This may be due to several reasons, including less advanced R&I activities, but also lower visibility at EU and international levels, weaker connections with H2020 top participants, absence of previous positive experience in EU FP programmes, etc. Furthermore, EU-13 applicants are 28% less

successful in their attempts to receive H2020 NMP funding as consortium partners due to the lower quality of their submitted proposals or the lower confidence of the evaluators in the maturity and operational capacity of consortiums involving EU-13 actors. Comparison between the numbers of successful and unsuccessful H2020 NMP newcomers demonstrated that only one in four EU-13 organisations received H2020 funding compared to one in three EU-15 organisations. Altogether, this leads to EU-13 organisations participating 2.7 times less often in H020 NMP projects selected for funding.

Nevertheless, comparison of the amount of funding requested in eligible proposals by EU-13 and EU-15 applicants with the gross expenditure on research and development (GERD) of EU-13 and EU-15 countries demonstrated that H2020 NMP funding is 52% more important for EU-13 organisations. Moreover, EU-13 countries have more dynamic NMP communities considering that 56.4% of NMP project participations in the EU-13 countries are due to H2020 NMP newcomers, and this share is 36% higher than in the EU-15 countries. There is also a sufficient reserve of new EU-13 actors to be engaged in NMP research under the Horizon Europe programme taking into account that unsuccessful H2020 NMP newcomers were responsible for 49.7% of all NMP applications in the EU-13 countries, which is 56% higher than in the EU-15 countries.

Summarising the above, **EU-13 actors demonstrate a high motivation to join collaborative NMP research but require additional support to apply more actively and successfully for NMP funding from the Horizon Europe programme**.

Associated Countries

As for Associated Countries, it is necessary to differentiate between two separate sub-groups:

- High-income countries[8] – Switzerland, Norway, Iceland and Israel – that are actively engaged in H2020 NMP research at a level equal to or higher than the EU-28 average. The mature R&I systems and significant R&I investments in these countries help research and innovation actors to stay competitive in their fields and actively collaborate with international and European counterparts.
- Upper-middle-income and low-middle-income countries[8] – Albania, Armenia, Bosnia and Herzegovina, Faroe Islands, Georgia, Moldova, Montenegro, Serbia, Tunisia, Turkey, The Republic of North Macedonia, Ukraine – that have very limited engagement in H2020 NMP research (only 1.1 % of all participations in H2020 215 NMP topics) despite their strategic focus on international R&I cooperation and H2020 Associated Status.

Among these two sub-groups, **support is particularly needed for upper-middle-income and low-middle-income countries included in the H2020 Widening country list** to tackle low participation barriers and to help exploit the available talent pool for mutual socio-economic benefit.

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[8] According to the World Bank classification for 2021.

3. PRIORITISATION OF REGIONS UNDERREPRESENTED IN H2020 NMP RESEARCH

The first objective of this study was to identify and prioritise regions underrepresented in H2020 NMP research, i.e. regions with low participation in H2020 NMP projects but with untapped NMP potential. For this purpose, the H2020 data about projects funded and proposals submitted under the 215 NMP topics were analysed in conjunction with other factors that define the regions' capacities in the NMP field.

Considering the data analysed and discussed in the previous section, the **FT-4-NMP project developed a pragmatic approach – combining** *policy considerations* **and** *data-driven considerations* **– to prepare a priority list of regions underrepresented in H2020 NMP research**.

3.1 METHODOLOGY

Policy considerations:

1. The FIT-4-NMP project analysis should focus on the following countries and regions:

- EU-13 countries: select about 75% of regions (i.e. about 46 out 61 NUTS 2 regions).
- EU-15 countries: select about 10% of regions (i.e. about 22 out 220 NUTS 2 regions).
- H2020 Associated Countries included in the H2020 Widening list: select about 35% of regions (i.e. about 25 out 71[9] NUTS 2 or equivalent regions).

In total, it is expected to prioritise and support about 93 out of the 374 regions in the EU-13, EU-15 and H2020 Associated Countries (i.e. about 25% of all regions).

2. The FIT-4-NMP project should prioritise and support at least one region from the EU-13, EU-15 and H2020 Associated Countries included in the H2020 Widening list.

Data-driven considerations:

1. The FIT-4-NMP methodology should classify all the regions under analysis into three categories (see Figure 9):

- **High Participation Regions** – regions for which the level of NMP project participations per million HRST was above 120% of the EU average value.
- **Moderate Participation-Moderate Application Regions** – regions for which the level of NMP project participations per million HRST was below 120% of EU average value, but

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[9] This number does not include Switzerland, Norway, Iceland and Israel regions

the level of NMP project applications per million HRST was above 70% of the EU average value.

- **Low Application Regions** – regions for which the level of NMP project applications per million HRST was below 70% of the EU average value.
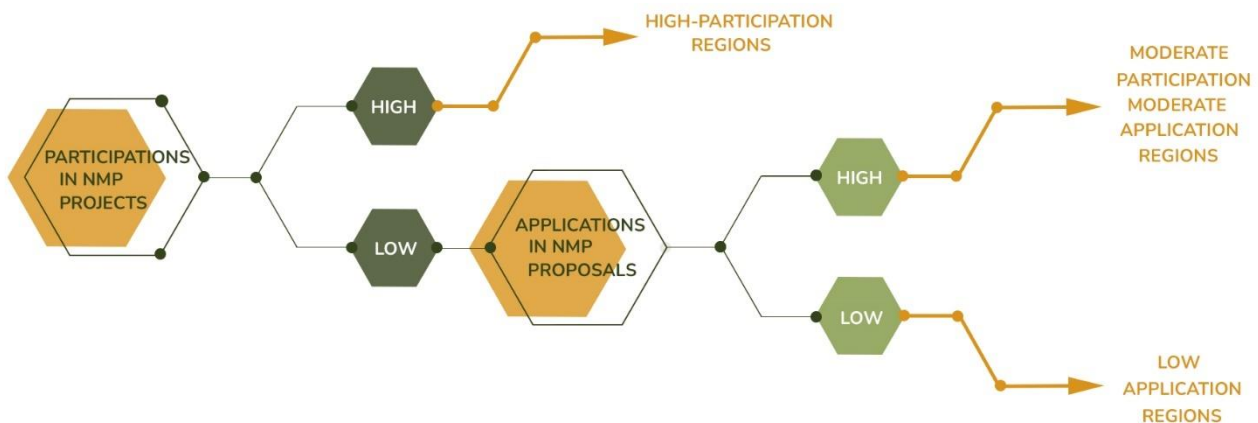
Figure 9 – FIT-4-NMP classification of regions under analysis

2. For these three categories, the **FIT-4-NMP support policy** is the following (see Table 4):

- **No Support** to High Participation Regions and Moderate Participation-Moderate Application Regions from EU-15.
- **Automatic Support** to Moderate Participation-Moderate Application Regions from EU-13 and AC.
- **Further Assessment** of NMP capacities in the Low Application Regions from EU-13, EU-15 and AC.

Table 4 – FIT-4-NMP support policy for different region categories

	EU-15	**EU-13**	**AC included in Widening list**
High Participation Regions	No Support	No Support	No Support
Moderate Participation-Moderate Application Regions	No Support	Automatic support	Automatic support
Low Application Regions	Further Assessment	Further Assessment	Further Assessment

Note: Priority was given to ensure that at least one region was selected from each country (EU-13, EU-15, AC). If there were no candidates meeting this criterion among the Low Application Regions, analysis and prioritisation was made on the next higher level.

3. **Further assessment of NMP capacities in Low Application Regions from EU-13 and EU-15** should answer whether the regions under review have untapped NMP potential that might be exploited efficiently for the benefit of Horizon Europe Cluster 4 NMP research. For this purpose, three groups of quantitative and qualitative indicators were analysed:

- **Group #1: Region's positioning in H2020 NMP programme**:
    o Engagement of newcomers in H2020 NMP research assessed via the number of newcomers in H2020 NMP projects per million HRST (quantitative).
    o Strength of H2020 NMP applications assessed via the region's success rate (quantitative).
    o Reserve of potential newcomers for Horizon Europe NMP research assessed via the number of unsuccessful H2020 NMP newcomers per million HRST (quantitative).

- **Group #2: Region's achievements in NMP research**:
    o Number of region's participations in the H2020 NMP-relevant projects per million HRST (quantitative).
    o Number of NMP patent applications per million HRST (quantitative).
    o Domination of NMP KETS among technology specialisation sectors of H2020 funding (qualitative).
    o Domination of NMP KETS among technology specialisation sectors of ERDF funding (qualitative).

- **Group #3: Region's strategic interest in NMP research and funding**:
    o Interest in NMP funding assessed via the requested H2020 NMP funding as a share of region's GERD (quantitative).
    o Policy focus on NMP research assessed via the number of NMP KETS priorities claimed in the region's Smart Specialisation Strategy (qualitative).

Each quantitative indicator was compared with a relevant threshold (different values are used for EU-15 and EU-13 country groups – see Table 3). If a region's value was higher than the threshold, 1 point was given to the region in a specific indicator group. For qualitative indicators, 1 point was provided if 2 or 3 NMP KETS were prioritised, while prioritisation of only 1 NMP KET was treated as "occasional". Regions with at least 3 points were prioritised for FIT-4-NMP support, provided that a strong position (2 points or more) for Group #2 "Region's achievements in NMP research" was demonstrated.

4. **As for Associated Countries included in the H2020 Widening list**, it should be mentioned that all regions were classified as Low Application Regions. Key quantitative indicators discussed above (number of newcomers in H2020, reserve of newcomers for Horizon Europe, number of NMP patents) were negligible for the AC regions. At the same time, some qualitative indicators (technology specialisation sectors relevant to ERDF funding, number of NMP KETS priorities in the Smart Specialisation Strategy) do not exist for some AC. Therefore, it was impossible to apply the same data-driven analysis to the AC regions as proposed for the Low Application Regions in EU-15 and EU-13.

Therefore, an expert assessment of the AC regions' NMP capacities was performed by the FIT-4-NMP consortium partners. For large countries (Ukraine and Turkey), particular support from the H2020 NMP National Contact Points (NCP) was requested to complement the desktop analysis. As a result, if untapped NMP capacities were identified during the expert assessment, the AC region was prioritised for FIT-4-NMP support to promote the identified NMP capacities and reveal ones not yet "visible" at the European level.

3.2 DATA COLLECTED AND RESULTS OBTAINED

To perform an analysis in line with the developed methodology, the following regional data were collected using different sources and, where needed, calculated:

1. Basic socio-economic data to take into account the region's R&I system size and maturity (Eurostat database):

- Human resources in science and technology (HRST)
- Intramural R&D expenditure (GERD)

2. Data on regional participation in H2020 NMP projects (eCorda grants database as of 06/04/2021):

- Total number of participations
- Number of participations per million HRST
- Total number of H2020 NMP newcomers
- Number of H2020 NMP newcomers per million HRST

3. Data on regional applications to H2020 NMP topics (confidential data set provided by the EC):

- Total number of applications
- Number of applications per million HRST
- Total number of unsuccessful H2020 NMP newcomers
- Number of unsuccessful H2020 NMP newcomers per million HRST
- Requested EU contribution, Euro
- Requested EU contribution as a share of GERD, %

4. Data on regional participation in H2020 NMP-relevant projects funded under H2020 non-thematic funding mechanisms and programmes (eCorda grants database as of 06/04/2021):

- Total number of participations in H2020 NMP-relevant projects
- Number of participations in H2020 NMP-relevant projects per million HRS

The following non-thematic mechanisms and programmes were analysed: (i) SME Instrument phase 1 and phase 2 projects under the "Innovation in SMEs" programmes that support innovations in SMEs; (ii) Teaming, Twinning and ERA-Chairs projects under H2020 Widening Programme that develop capacities in the underperforming countries; (iii) RISE projects under the H2020 MSCA programme that stimulate knowledge exchange and collaborative R&D via staff secondments; (iv) FET OPEN topics under the "Future and Emerging Technologies" programme that support the creation of breakthrough innovations. In total, identified 754 NMP-relevant projects included 2,504 applicants and 1,579 unique organisations, 680 of which have not participated in the H2020 NMP funded project or submitted proposals.

5. PCT patent application relevant for 3 NMP KETs - Nanotechnology, Advanced Materials, and Advanced Manufacturing Technologies (EPO database):

- Total number of NMP patents
- Number of NMP patents per million HRST

The analysis was performed by the FIT-4-NMP project partner TC-CAS using the European Patent Office (EPO) database in line with the IPC code list presented in the "Production and trade in KETs-based products: The EU position in global value chains and specialisation patterns within the EU", 2013.

6. Policy and funding prioritisation data to assess the importance of NMP research for a region:

- Number of NMP KETs (E.37 - Advanced manufacturing systems, E.38 - Advanced materials, E.41 – Nanotechnology) prioritised in the region's Smart Specialisation Strategy (S3).
- Location Quotients (LQ) that quantify how H2020 and ERDF public funding is concentrated in particular KETs (Nanotechnologies, Advanced Materials, Advanced Manufacturing and Processing) for the region as compared to all European regions.

Data concerning a region's Smart Specialisation Strategy priorities were collected using the Eye@RIS3 tool "Innovation Priorities in Europe" at the Smart Specialisation Platform (https://s3platform.jrc.ec.europa.eu/en/map)

LQ data regarding H2020 and ERDF funding were obtained using technological specialisation indicators of the R&I Regional Viewer tool available at the Smart Specialisation Platform (https://s3platform.jrc.ec.europa.eu/synergies-tool).

All these data were processed in line with the developed methodology and supplemented with the expert assessment of Low Application Regions from Associated Countries. The key outcomes of the regional analysis are presented below:

- Regional classification as high participation, moderate participation-moderate application and low application regions (Figure 10);
- Regions prioritised by the FIT-4-NMP project as regions underrepresented in H2020 NMP research (Figure 11 and Table 5).

In total, 92 regions were prioritised as underrepresented in H2020 NMP research – 47 regions from EU-13, 22 regions from EU-15 and 23 regions from Associated Countries. These regions will be in the focus of the FIT-4-NMP support activities during the 2021-2023 period.

All details about the prioritised regions are available at the interactive maps at the FIT-4-NMP project website: https://www.fit-4-nmp.eu/regions-analysis.
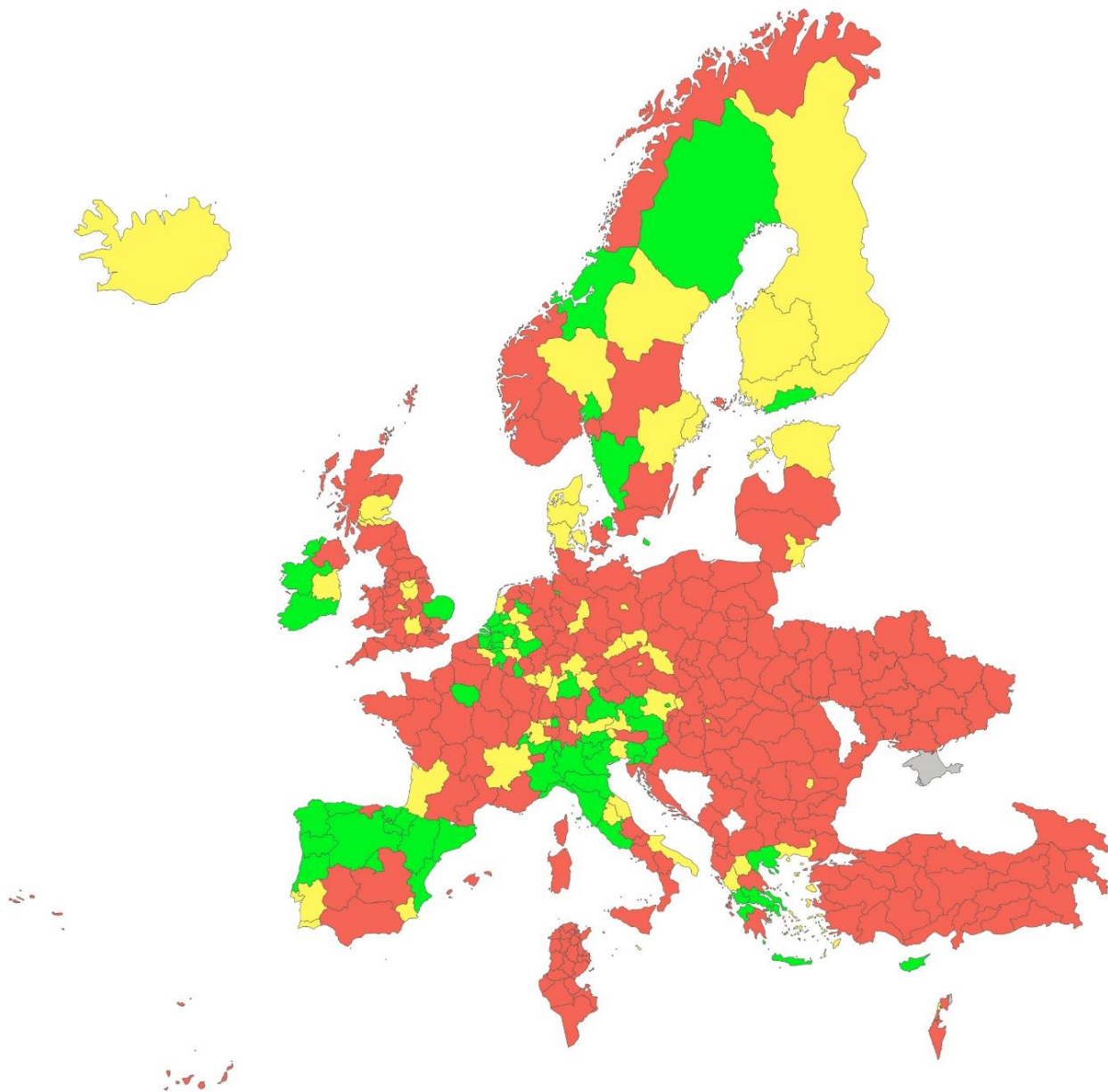
Figure 10 – Region classification into three categories: (1) High Participation Regions (Green); (2) Moderate Participation-Moderate Application Regions (Yellow); (3) Low Application Regions (Red)
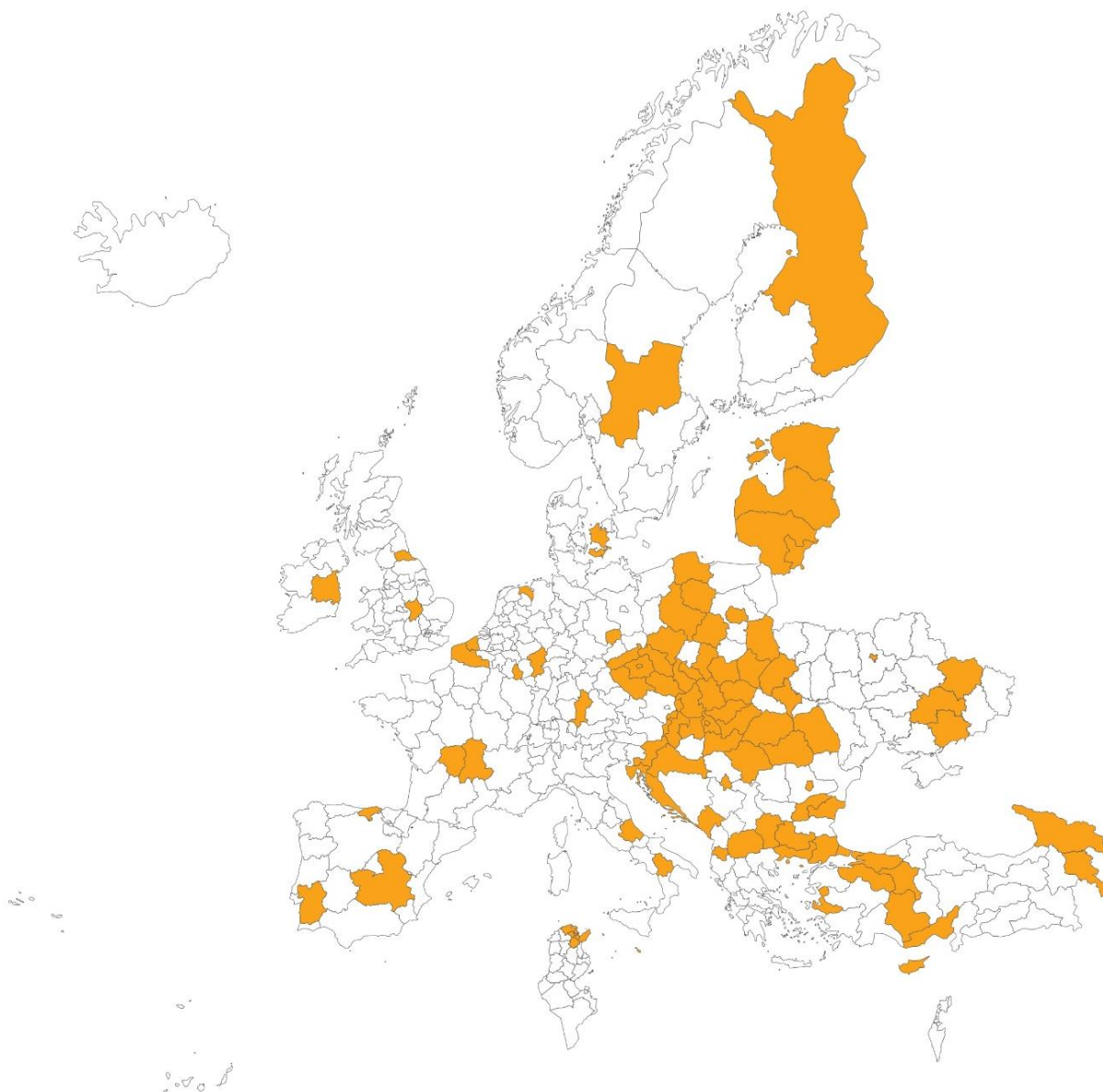
Figure 11 – Regions prioritised as underrepresented in H2020 NMP research

Table 5 – Regions prioritised as underrepresented in H2020 NMP research

EU-13			EU-15		
BG	BG32	Severen Tsentralen	AT	AT11	Burgenland
BG	BG33	Severoiztochen	BE	BE25	Prov. West-Vlaanderen
BG	BG41	Yugozapaden	DE	DE27	Schwaben
BG	BG42	Yuzhen Tsentralen	DE	DEB1	Koblenz
CY	CY00	Kypros	DE	DED5	Leipzig
CZ	CZ01	Praha	DK	DK02	Sjælland
CZ	CZ02	Střední Čechy	EL	EL51	Anatoliki Makedonia, Thraki
CZ	CZ03	Jihozápad	ES	ES13	Cantabria
CZ	CZ04	Severozápad	ES	ES42	Castilla-La Mancha
CZ	CZ05	Severovýchod	FI	FI1D	Pohjois- ja Itä-Suomi
CZ	CZ06	Jihovýchod	FR	FRE1	Nord-Pas de Calais
CZ	CZ07	Střední Morava	FR	FRI2	Limousin
CZ	CZ08	Moravskoslezsko	FR	FRK1	Auvergne
EE	EE00	Eesti	IE	IE06	Eastern and Midland
HR	HR03	Jadranska Hrvatska	IT	ITF1	Abruzzo
HR	HR04	Kontinentalna Hrvatska	IT	ITF5	Basilicata
HU	HU11	Budapest	LU	LU00	Luxembourg
HU	HU12	Pest	NL	NL11	Groningen
HU	HU21	Közép-Dunántúl	PT	PT18	Alentejo
HU	HU22	Nyugat-Dunántúl	SE	SE31	Norra Mellansverige
HU	HU31	Észak-Magyarország	UK	UKC1	Tees Valley and Durham
HU	HU32	Észak-Alföld	UK	UKF2	Leicestershire, Rutland and Northamptonshire
HU	HU33	Dél-Alföld	Associated Countries		
LT	LT01	Sostinės regionas	AL	AL02	Qender
LT	LT02	Vidurio ir vakarų Lietuvos regionas	AM	AM00	Armenia
LV	LV00	Latvija	BA	BA00	Bosnia and Herzegovina
MT	MT00	Malta	GE	GE00	Georgia
PL	PL21	Małopolskie	MD	MD00	Moldova
PL	PL22	Śląskie	ME	ME00	Crna Gora
PL	PL41	Wielkopolskie	MK	MK00	Severna Makedonija
PL	PL51	Dolnośląskie	RS	RS11	Beogradski region
PL	PL61	Kujawsko-pomorskie	TN	TN01	North-East
PL	PL63	Pomorskie	TR	TR10	Istanbul
PL	PL71	Łódzkie	TR	TR21	Tekirdag, Edirne, Kirklareli
PL	PL81	Lubelskie	TR	TR31	Izmir
PL	PL82	Podkarpackie	TR	TR41	Bursa, Eskisehir, Bilecik
PL	PL91	Warszawski stołeczny	TR	TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova
RO	RO11	Nord-Vest	TR	TR51	Ankara
RO	RO12	Centru	TR	TR52	Konya, Karaman
RO	RO21	Nord-Est	TR	TR62	Adana, Mersin
RO	RO32	Bucureşti - Ilfov	UA	UA04	Dnipropetrovska oblast
RO	RO42	Vest	UA	UA08	Zaporizka oblast
SI	SI03	Vzhodna Slovenija	UA	UA09	Ivano-Frankivska oblast
SK	SK01	Bratislavský kraj	UA	UA13	Lvivska oblast
SK	SK02	Západné Slovensko	UA	UA20	Kharkivska oblast
SK	SK03	Stredné Slovensko	UA	UA26	Kyiv
SK	SK04	Východné Slovensko			

4. TALENTED NEWCOMERS FROM UNDERREPRESENTED REGIONS

The second objective of this study was to identify talented newcomers from the prioritised underrepresented regions and engage them in the FIT-4-NMP support environment. In line with the FIT-4-NMP definition, talented newcomers are organisations – companies and especially SMEs, universities, research institutes or other organisations – that have not participated in the H2020 NMP projects, but are considered promising innovators based on their R&D activities, projects, patents and/or innovations.

To identify talented newcomers, the FIT-4-NMP partners used their knowledge and collaboration experience (especially in their home countries) as well as analysed various sources of information about NMP research and innovations, individual actors and professional communities (the list below is non-exhaustive):

- International/national/regional databases and reports on NMP research, development and innovations
- National/regional NMP-relevant funding applicants and winners
- Members of NMP-relevant associations, clusters, communities, etc.
- EEN SME database, EU Innovation Radar data, NMP-relevant COST actions participants
- NMP publication and patent registers
- Professional news and media resources

During April-June 2021, a desktop exercise was conducted that identified 750+ organisations – that meet the FIT-4-NMP definition of talented newcomers – from all 92 prioritised underrepresented regions. The majority of these organisations are companies (33.1%) and SMEs (36.4%). However, there were also many universities and research organisations identified from EU-13 and Associated countries; some of them have a previous positive experience in FP7 NMP projects, but have not succeeded with H2020 NMP applications.

Talented newcomers identification
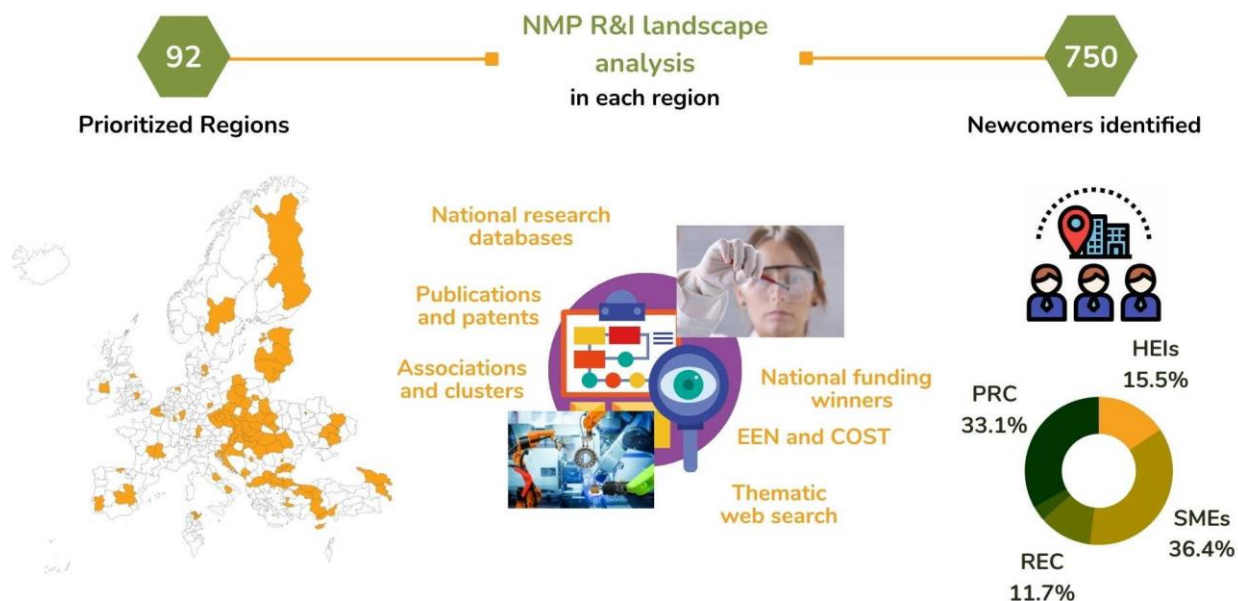
The FIT-4-NMP partners have directly contacted all the identified organisations to inform them about the FIT-4-NMP opportunities and support. The organisations have been invited to complete the FIT-4-NMP Newcomer Identification Form (NIF) with information about the organisations' NMP-relevant business and R&D activities, national and international projects. Completion of an NIF is also treated as an organisations' expression of interest in FIT-4-NMP's support and upcoming activities for talented newcomers.

Table 6 below presents an initial list of talented newcomers identified and engaged in the FIT-4-NMP support environment as of June 2021. The FIT-4-NMP team will continue with the newcomer identification and engagement activities during the whole project to support as many talented organisations as possible from the regions underrepresented in H2020 NMP research. In December 2022, the final list of talented newcomers will be presented in the updated version of this report.

Table 6 – Initial list of talented newcomers (as of June 2021, listed alphabetically)

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
1	PL	PL91	Air Force Institute of Technology	REC	Composites manufacturing and structural health monitoring by non-destructive testing of structures and objects.
2	SK	SK02	Alexander Dubcek University of Trencin – Faculty of Industrial Technologies in Puchov	HES	Research and development of metals, polymers, silicate materials and textiles, combined with the focus on computational modelling and simulation, environmental engineering and industrial design.
3	RO	RO32	Apel Laser SRL	PRC	Lasers and laser-based systems manufacturer; non-conventional laser machining manufacturing process, thin films deposition, nanosensing and non-conventional laser machining, manufacturing process.
4	LU	LU00	Artec3D	PRC	3D scanning solutions, Computer Vision and Machine Learning, Robotics
5	TR	TR51	Bilkent University - Nanotechnology Research Center (NANOTAM)	REC	Photonic crystals, plasmonic and left-handed materials, electromagnetism, photonic crystals and metamaterials.
6	UA	UA20	B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine	REC	Nanophysics and nanotechnologies, supercondacting resonator, quantum and cryocrystals; nanostructured superconductors; quantum sensors.
7	LU	LU00	Carbon Process and	PRC	The KOMBISORBON® process for the removal of Mercury, Cadmium and

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
			Plantt Engineering S.A. (CPPE S.A.)		Dioxins from gaseous media, and the SULFACID® process for the conversion of Sox (Sulphur oxides) into H2SO4 (Sulphuric acid).
8	LU	LU00	Cleancarb sarl	PRC	Energy storage, battery pack applications, development of materials for lithium batteries, supercapacitors, fuel cells and solar panels of the future. Research on materials for storage of carbon dioxide and other gases for propulsion systems and carbon footprint reduction.
9	CZ	CZ05	Clutex - klastr technické textilie, z.s.	OTH	Cluster focused on nanotechnology in textiles, (multi)functional textiles, personal protective textiles, design of customized textile structures, biotechnology and bio-based resources. Represents 36 members.
10	TR	TR41	Dogu Pres	PRC	Manufacturing of fine blanked parts (shims, washer and covers, flanges and plates) and precision-machined parts (rotors and housing, spacers, valves and nozzles, pump and injector bodies) for automotive industry. Industry 4.0.
11	CZ	CZ01	Eaton European Innovation Center (branch of Eaton Elektrotechnika s.r.o.)	PRC	The Center specializes in electrical, hydraulic and mechanical engineering to develop innovations in the fields of vehicle powertrains, industrial automation, power distribution, hydraulics, electronics and IT.
12	UA	UA26	E.O. Paton Electric Welding Institute of the National Academy of Sciences of Ukraine	REC	Advanced technologies in welding and material joining. Strength, reliability and longevity of welded structures. Surfacing, coating deposition and surface treatment technologies. Technical diagnostics and non-destructive testing. Automation of welding and related technologies. Nano-structural systems, nanotechnologies and nanomaterials.
13	PL	PL91	Electronic Software	PRC	Electronic devices manufacturing from recycled materials. Will to replace ABS,

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
			Control Systems Sp. z o.o.		plastic packages, plans to build Printed Circuit Board factory with recovery metal materials like gold, copper etc. Interested in collaboration on silicon recycling/
14	TN	TN01	Enameled technology industry	PRC	Manufacturing of enamelling tanks, metal structures and parts. R&D on uniform and controlled deposits of enamel over flat metal surfaces using spray coating to show the feasibility of the enamel coating process in industrial scale, to improve the ability to control costs and product quality, solve environmental issues, limiting scrap and raw materials.
15	TR	TR10	Enwair Energy Technologies Corp.	PRC	Lithium-rich NMC cathodes, silicon anodes, conductive/flexible polymers, self-healing anodes - all processes starting from active material development and synthesis, preparation of electrodes to preparation and testing of coin-cell and pouch-cell.
16	SK	SK01	FIRST WELDING COMPANY, Inc.	PRC	Modern technologies for welding, cutting and surface treatment of materials using laser, electron beam, arc sources and plasma.
17	TR	TR62	Gramis Plastic Industry	PRC	Manufacturer of polyethylene granules, packages, gloves with the use of recycled material. Interested to be an end-user in projects related to industry circularity, industrial symbiosis, advanced manufacturing, digital solutions for industry, energy efficiency, environmental protection, renewable energy.
18	TR	TR42	HKTM	PRC	Motion and Control Systems, Robotic Systems, hydromechanics systems, automation systems, Factory Automation.
19	CY	CY00	Hystore Tech, Ltd.	PRC	Production and characterisation of metal hydrides, hydrogen storage units and systems, materials production and testing, hydrogen production by water

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
					electrolysis, utilising renewable energy sources such as photovoltaics and wind-turbines, metal hydride-based air conditioning systems (heat and cool), training on hydrogen storage materials, water purification/treatment.
20	RO	RO32	ICPE SA	PRC	Special electric Machines, Robotics, Additive manufacturing, Smart materials, Circular economy, E-mobility, Space, Industry 4.0, Renewable Energy, Industrial automation, Electric Apparatus, Special electric Cables
21	GE	GE00	Ilia State University	HES	Structural and electronic properties of low-dimensional systems, nanostructures and atomic clusters. Computer modelling of boron nitride nanostructures and low-dimensional boron systems, their electronic and scale-dependent structural properties.
22	UA	UA26	Institute of Pulse Processes and Technologies of the National Academy of Sciences of Ukraine	REC	Applied materials science, the development of scientific bases for the method of porous materials structure change and processes of powerful electric current pulses interaction with condensed matter. Powder metallurgy, preparation of initial powder and consolidation of powders.
23	UA	UA26	Institute for Problem of Strength of the National Academy of Sciences of Ukraine	REC	Investigation of vibration characteristics of materials and structural elements, Surface hardening techniques for aeronautical engineering components: Vacuum thermocyclic nitriding in plasma; PVD.
24	MD	MD00	Institute of Applied Physics	REC	Physics and physico-chemistry of condensed matter: crystalline, noncrystalline and nanostructured materials; electronics and quantum optics, design of multifunctional electronic, optoelectronic and photonic devices. Theoretical

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
					study of quantum technologies in artificial or real atomic and opto/nanomechanical systems.
25	SK	SK01	Institute of Construction and Architecture, Slovak Academy of Sciences	REC	Modelling of multi-physical phenomena in composite materials, development of advanced multiscale continuum mathematical-physical models, development of advanced computational methods for smart materials, complex research of silicate composites, development of advanced inorganic binders based on multicomponent cements containing admixtures, geopolymers and phosphate ceramics binders.
26	LV	LV00	Institute of Electronics and Computer Science	REC	R&D&I in the field of advanced manufacturing - sensors and sensor systems, IoT, I-IoT, robotics, Artificial Intelligence, Machine Learning, Computer vision, signal and image processing, automation, mobile agents, wearables, etc.
27	UA	UA26	Institute of General and Inorganic Chemistry of the National Academy of Sciences of Ukraine	REC	Nanochemistry, nanomaterials, science-intensive nanotechnologies of functional inorganic substances, materials, and coatings.
28	SK	SK01	Institute of Materials and Machine Mechanics, Slovak Academy of Sciences	REC	Research of new materials (composites, metallic foams, PM materials, intermetallics) and manufacturing technologies (gas pressure infiltration, diffusion bonding, powder metallurgy, directional solidification, additive manufacturing, metal foaming).
29	PL	PL41	Institute of Molecular Physics, Polish Academy of Sciences	REC	Research of simple and multifunctional dielectric materials in solid and liquid phases and advanced materials for molecular electronics, experimental and theoretical research of magnetic materials (both solid and thin layers) and

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
					organic multifunctional materials, research on metamaterials with properties resulting from their structure.
30	RO	RO32	International Centre of Biodynamics	REC	Development of nanomaterials-based electrochemical sensors, catalytic nano- and micro-motors, template-assisted, electrochemical synthesis of hybrid (e.g., polymeric and metal) nanorods.
31	HR	HR03	Istrian University of Applied Sciences	HES	Research on advanced nanocomposite materials, study of the influence of CNT on thermal properties, development of cost effective and industrial scale technologies for the production of nanocomposites, testing and optimisation of materials and process parameters as well as the verification of the nanocomposite performance in pilot line settings.
32	LV	LV00	KEPP EU, Ltd.	PRC	Development of alternative technology for production of semiconductor silicon rods mostly for power rectifiers, with target to organise production of Si Single crystal by FZ method with diameter 300 mm (12") comparing to current 8" as theoretical maximum by known technology.
33	UA	UA26	Kyiv Polytechnic Institute	HES	Advanced materials, diffusion and structural phase transitions in micro-, meso- and nanoscaled materials and systems, as well as the development of technologies for new materials creation with predefined advanced properties.
34	UA	UA03	Lutsk National Technical University	HES	Development of technologies for processing machinery waste, technology of production of biocomposite and environmentally friendly materials. R&D in the field of Tools and Techniques of IoT for Automated Management Systems and Smart Industry 4.0 Technologies. R&D in new materials - polymer composites, ceramics, biocomposite and powder materials, protective coatings, etc.

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
					Strategic environmental assessment of facilities, territories, programs,
35	TR	TR51	METU MEMS Centre	PRC	Microsensors and components, including piezoresistive and capacitive pressure sensors, low-cost CMOS infrared detectors, accelerometers, gyroscopes, humidity sensors, temperature sensors, frost sensors, micro power generators, and various RF MEMS components.
36	IE	IE06	MNA INNOVATION LIMITED	PRC	Design and manufacturing of freeform components and structured functional surfaces on a variety of materials for medical devices, bio-implants, optics, ICT, energy, etc. Precision and ultra-precision machining capabilities for high quality moulds for applications such as microfluidic chips and optical components, ultra-precision metrology and process chain development.
37	UA	UA20	National Aerospace University "KhAI"	HES	Technologies and equipment for Cold spraying of protective and restorative coatings and plasma-ion coatings. Gas-Detonation and HVOF Spraying of Powder Coatings. Innovative methods and processes of composite structures manufacturing: hybrid joining technologies, optimised automated lay-up of large composite structures, manufacturing of smart composite structures with integrated sensors and metal parts, composite structures with increased thermal and electric conductivity.
38	RO	RO32	National Institute for Laser, Plasma and Radiation Physics	REC	Functional coatings, new materials as thin films and nanostructures for applications in sensors, clean energy generation; characterisation. Laser material processing; Thin films and heterostructures growth by laser-based techniques, i.e. radiofrequency assisted pulsed laser deposition (RF-PLD), matrix assisted pulsed laser evaporation (MAPLE), first demonstration of

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
					functional surface acoustic wave sensors coated by laser-induced forward transfer (LIFT).
39	RO	RO32	National Institute for R&D in Electrical Engineering ICPE-CA	REC	Advanced materials, systems and applications in electrical engineering - 3d graphene photovoltaic cells, processing of polymeric materials, nanostructured materials.
40	RO	RO11	National Institute for R&D of Isotopic and Molecular Technologies	REC	Composite nanostructures with controlled properties for medical applications. Nanostructured materials for environmental applications. Functionalised hybrid nanostructures for applications in pharmaceutical industry and cosmetics. Composite nanostructures.
41	EE	EE00	National Institute of Chemical Physics and Biophysics, Laboratory of Environmental Toxicology	REC	Development and safety assessment of nanotechnology-based materials, including antimicrobial, metal-chitosan nanocomposites, development of water purification systems and new industry-relevant nanomaterials for different applications.
42	RO	RO32	National Institute of Materials Physics	REC	Advanced materials for micro-, opto- and nanoelectronics applications and sensors for health, security and environment applications: films and multi-layered structures with nanocrystals embedded in dielectric matrices photosensitive in short-wave infrared range (SWIR), with ferroelectric and charge storage properties. 2D-TMD based materials and heterojunctions with electro-optic properties for health and environment applications - development of demonstrators up to TRL 5.
43	TR	TR10	Ozyegin University	HES	Optimisation of industrial production, Industry 4.0, industrial 6G, human-robot

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
					collaboration, Quantum technologies, material science.
44	CZ	CZ07	Palacký University Olomouc – Czech Advanced Technology and Research Institute (CATRIN)	HES	Interdisciplinary research in the field of emerging nanotechnologies, biotechnologies and biomedicine with the aim to develop new technologies for clean energy and sustainable environment.
45	RO	RO32	POLITEHNICA University of Bucharest	HES	Synthesis of a large range of advanced nanomaterials, including carbon-based nanomaterials, metal and alloy nanostructures, oxide nanopowders, etc. involving different techniques such as: pulse laser deposition (PLD), electrochemical synthesis, etc.; morphological, structural and electronic characterisation in real space and 3D at atomic and nanometric scale; design and macro-, micro-, nano-sensors and nano-device prototypes using nanoparticles and nano-objects. Carbon nanomaterials applied in environmental analytical chemistry.
46	SK	SK01	Polymer Institute, Slovak Academy of Sciences	REC	Electrically conductive composites and nanocomposites, sensors for determining deformation, multifunctional composites, stable hybrid electrodes, materials for 3D printing, new types of nanofibers prepared by electrospinning, synthesis of inorganic (nano) particles and hybrids, preparation of nanofiber materials, computer simulations, surfaces modifications, structural transitions.
47	SK	SK03	Research Centre of the University of Žilina	REC	Testing and evaluation of degradation mechanisms (corrosion, fatigue), surface and volume analyses and surface treatments of modern and light alloys mainly applicable in the automotive industry.

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
48	RO	RO11	Research Institute for Analytical Instrumentation ICIA	REC	R&D in obtaining renewable fuels (biodiesel, bioethanol, and biogas), from biomass and inclusively by-products; realisation of technologies and installation for the renewable fuels (biodiesel, bioethanol and biogas) production, and development of advanced processes for the biomass conversion to electricity and heat.
49	RO	RO32	RODAX IMPEX SRL	PRC	Design of packaging equipment: extensible packaging equipment, packaging equipment with heat-shrinkable and heat-insulating foil for any type of product. Technologies: high precision lathe, hydraulic press, guillotine, bending machine, rolling machine, polishing machine, electric welding machine, argon welding machine, plasma cutting machine.
50	RO	RO32	Romanian Standards Association - ASRO	PRC	Coordination of national and facilitation of international standardisation activities related to NMP, development of standards or other standardisation documents (like CWA).
51	RO	RO12	ROSEAL S.A.	PRC	Technologies for micro-pilot scale production for various nanomaterials, like magnetic nanoparticles, magnetic nanoparticle clusters, magnetic nanofluids, nano-micro structured composite magnetisable fluids.
52	PL	PL71	S.Z.T.K. "TAPS" - Maciej Kowalski	PRC	GFRP system for production of seat components, compatible with idea of circular and clean industries (increased biodegradability, reduced production waste, eco-friendly raw materials).
53	SK	SK02	SEMIKRON, s.r.o.	PRC	Manufacturer of power electronic modules and systems primarily in the medium output range (approx. 2 kW up to 10 MW), power semiconductor modules, soldering/sintering processes.

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
54	RO	RO32	SIS SA	PRC	Strong practical experience in process control and manufacturing systems., expertise in process analysis and advanced control, safety design, asset management and maintenance instrumentation, control strategy implementation, IoT smart sensors and actuators, communication networks.
55	TR	TR10	SYGTECH	PRC	Fatigue sensor technology that senses material fatigue with no need of battery and ability to work for 10's of years at a given location. Trying to adapt technology to sensing fatigue in composites. Solar energy technology that has potential to generate high temperatures for industrial applications, an enabler for material processing and industrial applications that require heat and can be used for solar rejuvenation/charging of depleted Boron cartridges.
56	HU	HU22	Széchenyi István University - Logistics and Forwarding Department	REC	Research on the field of adaptive on-demand storage location assignment algorithms, adaptive production line feeding systems, computer simulation-based logistics system development.
57	UA	UA26	Taras Shevchenko National University of Kyiv	HES	Spintron devices for detecting and collecting energy of microwave signals, Corrugated Magnetic Nanoshells, functional nanomaterials.
58	PL	PL82	THE BATTERIES SP ZOO	PRC	Cost effective and scalable approach to solid-state thin-film rechargeable batteries using vacuum evaporation enhanced by high-density plasma. Developing a new type of plasma evaporation vacuum manufacturing equipment.
59	UA	UA26	Gas Institute of the	PRC	Increasing of natural gas and alternative heat carriers effectiveness use as

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
			National Academy of Sciences of Ukraine		basis for new energy- and resource saving technologies creation. Research in applied combustion theory, thermodynamic, interface heat- and mass exchange and new heat- and technological processes and equipment development on this basis. Nanotechnologies and nanomaterials. R&D in production and use of nanofluids to increase the safety and efficiency of power equipment.
60	RO	RO12	Transilvania University of Brasov	HES	Development, optimisation and testing of novel materials and systems for solar energy conversion to thermal energy (coloured solar-thermal collectors) and to electrical energy (thin film photovoltaics). Novel photocatalytic materials based on metal oxide semiconductor thin films.
61	BA	BA00	University of East Sarajevo	HES	Production of composites filled with pure metal powders; Electrochemical deposition and dissolution of metals and alloys; Electrochemical deposition of metal powders; Synthesis and characterisation of smart nanocomposite materials.
62	HR	HR03	University of Rijeka	HES	Micro and nano sciences and nanotechnologies, synthesis and characterisation of advanced materials (Thin Films, Colloids, Polyelectrolyte, novel materials based on photoactive ceramic thin films with controllable inorganic film thickness and well-defined porous structures), Modelling and simulation of materials.
63	HR	HR04	University of Zagreb – Faculty of Mechanical Engineering and Naval	HES	Polymer materials and polymer processing, advanced additive manufacturing, wood-plastic composite materials.

#	Country	Region	Org. name	Org. type	Brief description of R&D and business focus
			Architecture		
64	UA	UA26	V. Lashkaryov Institute of Semiconductor Physics of the National Academy of Sciences of Ukraine	HES	Optics and photoelectronics of semiconductors, semiconductor materials science, physics of low-dimensional structures, opto-, micro- and nanoelectronics.
65	UA	UA09	Vasyl Stefanyk Precarpathian National University	REC	Development of new materials and nanomaterials for renewable energy (thermoelectricity, photoelectricity). Materials and devices for energy storage (carbon nanostructures and ultrafine oxide materials for electrochemical capacitors and supercapacitors). Inorganic composite sorbents based on metal oxides and magnetic ferrite spinels.
66	HU	HU11	V-Chiller	PRC	New refrigeration technology, 20X faster than vapor compression, High efficiency, Coefficient of performance (COP) 2, totally eco-friendly (zero GWP /ODP)
67	IT	ITF1	Ventiseidieci srl	PRC	Research and development of new solutions in the fields of advanced materials (patented material made by microcapsules of natural polymers containing a magnetophoretic ink, patented nanocarriers), advanced manufacturing (nanomaterials, mechatronics and photonics)

5. WHAT NEXT

The FIT-4-NMP project is explicitly designed to support talented newcomers from underrepresented regions in their intention and attempts to join Horizon Europe NMP research and contribute to the sustainability and leadership of the European industry. The pool of the FIT-4-NMP support measures includes:

- **Innovation workshops between talented newcomers and European NMP Top Innovators** to stimulate networking and matchmaking, thus increasing the newcomers' chances to join strong consortia preparing proposals for the Horizon Europe Cluster 4 calls. Six innovation workshops will be organised in the premises of Fraunhofer, CEA, VTT, TU Delft and TU Dresden during the 2021-2023 period in connection with Horizon Europe Cluster 4 calls thematics and schedule.

- **Networking and promotion of talented newcomers** at major European events, conferences as well as regional brokerage events to enlarge the newcomers' connections within the European and international NMP community and facilitate knowledge and ideas exchange. More than 20 networking events will be organised across underrepresented regions with the participation of key experts from NMP Top Innovators. Also, 100+ travel grants will be awarded to talented newcomers to visit NMP-relevant European events.

- **Training for talented newcomers** on technology transfer, proposal writing, and use of European networking portals to reinforce the newcomers' knowledge on primary collaboration schemes and mechanisms, as well as opportunities available for self-promotion and collaboration establishment. Six training workshops will be organised bi-yearly by the FIT-4-NMP consortium and will be opened for talented newcomers from prioritised underrepresented regions.

- **Hands-on support to talented newcomers in NMP proposals preparation** for Horizon Europe Cluster 4 calls, as the primary source of opportunities for funding NMP collaborative projects, as well as for Horizon Europe Pillar 1 (MSCA RISE and ITNs), Horizon Europe Pillar 3 (EIC Accelerator and EIC Fast Track to Innovation) and ERA-NETs (M-ERA.NET and Manunet). Hands-on support foresees screening of proposal concepts, seeking NMP Top Innovators for consortia, expertly reviewing draft proposals to increase the proposals quality and newcomers' chances to get the EC funding. In total, the preparation of 20+ proposals will be supported.

Altogether, these support measures will work to increase the number and quality of applications from underrepresented regions identified as the main limits to efficient participation in the H2020 NMP research.

FIT-4-NMP

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