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COVER NOTE

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To:	Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of the European Union
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Subject:	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT Accompanying the document Proposal for a Council Regulation on establishing the European High Performance Computing Joint Undertaking

Delegations will find attached document SWD(2018) 6 final - Part 3/4.

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EUROPEAN
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Brussels, 11.1.2018
SWD(2018) 6 final

PART 3/4

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the document

Proposal for a Council Regulation

on establishing the European High Performance Computing Joint Undertaking

{COM(2018) 8 final} - {SWD(2018) 5 final}

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Annex 2 (Part 1)

Analysis of the responses received to the targeted Consultation on the HPC Initiative in Europe and on the EuroHPC Inception Impact Assessment

1. Objective, scope and context of the consultation

The Commission is looking into the needs and most efficient options for establishing a future EU-wide initiative on High Performance Computing (HPC), the EuroHPC. The purpose is to coordinate EU and Member States activities and, together with private actors, pool efficiently resources in this area.

The targeted consultation with stakeholders aimed at contributing to the definition by the end of 2017 of a legal instrument that provides a procurement framework for HPC, in line with the Digital Single Market mid-term review Communication.[1] Specifically, this consultation provided input to guide the Commission in the design of this new legal and financial instrument which implements the goals of EuroHPC in the most effective, efficient and transparent manner.

2. Identification of Key Stakeholders

The levels of interest and knowledge determine the appropriate consultation method and tools. Considering the highly specialised domain of HPC, the Commission set-up a targeted consultation that addressed specifically those institutions and individual experts that have on one hand a deep involvement in HPC development and usage and on the other hand a practical experience in engaging in EU-wide projects in this area.[2]

Views were sought from the following type of stakeholders considered to represent to the best reasonable extent the European HPC community:
- National and EU-funded projects on HPC (*Projects*),
- Scientific user communities of HPC infrastructures (the 29 large ESFRI research infrastructures and the PRACE scientific users, each reaching hundreds of actors, EUDAT, EGI, etc.) *(Scientific Users)*,
- Public-private partnerships on HPC and Big Data (*PPPs*),
- Centres of excellence for supercomputing applications, supercomputing centres, service providers, access providers (*Intermediaries*),
- HPC research & industry associations (*Associations*),

The goal was to reach all identified stakeholders and elicit their contributions on time with respect to the further process of the planned development of the EuroHPC Regulation.

The on-line consultation was conducted through the DSM website of the European Commission between 3 August and 5 September 2017[3] (all inputs received until 08 September were considered in this analysis too).

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[1] COM(2017) 228 final

[2] https://ec.europa.eu/digital-single-market/en/news/targeted-consultation-high-performance-computing-initiative-europe

[3] https://ec.europa.eu/eusurvey/runner/Eurohpc

This consultation represented only the last step in a wider series of workshops and meetings with stakeholders that started in 2016 in which the European HPC strategy was already presented and discussed according to its status at that time (see below Section 4).

3. Consultation activities, formats & tools

The Commission informed the HPC community about the consultation via personalized e-mails, social media, a newsflash, intermediary organisations serving hundreds of stakeholders, and also via Commission contacts in the Member States.

The online consultation was performed via a web-based questionnaire developed for this specific purpose. Apart from general questions on the identification of respondents, it consisted of 18 technical questions covering the spectrum from the identification of the problems, the European added value, the objectives of a future EU initiative on HPC, the options to reach its objectives and its expected impacts.

Due to its common usage in the HPC sector, the consultation was performed in the English language only.

4. Time & resources

- Email invitation of stakeholders to participate in the consultation: 27/07/2017
- Start of consultation: 03/08/2017
- End of consultation: 05/09/2017
- Start of evaluation: 05/09/2017
- End of evaluation: 11/09/2017

5. Previous Consultations

A number of activities to engage with these stakeholders had already taken place, each covering a wide range of the relevant stakeholders (see Section 2):

Stakeholder engagement activity	Scientific Users	EU Member States	Projects	PPPs	Interme-diaries	Associ-ations
Workshop on the European micro-processor on 18 January 2017 in Brussels					🟩	🟩
General assembly of ETP4HPC on 21 March 2017 in Munich	🟩			🟩		
Digital Day of 23 March 2017 in Rome in the presence of 250 HPC stakeholders		🟩		🟩	🟩	🟩
Workshop on EuroHPC governance in Rome on 23 March 2017 with 50 participants	🟩	🟩		🟩	🟩	🟩
PRACE days on 15-18 May 2017 in Barcelona, gathering the whole HPC community	🟩		🟩	🟩	🟩	🟩
Eleven meetings with the Sherpas of the EU Member States		🟩				
European Open Science Cloud summit on 12 June 2017 in Brussels	🟩	🟩	🟩	🟩	🟩	🟩
Multiple meetings with key stakeholders (PRACE, ETP4HPC, visits to supercomputing centres, international conferences…)	🟩	🟩	🟩	🟩	🟩	🟩

6.   Summary of the Results of the Targeted On-line Consultation

As questions were optional, the percentages in this document refer to the number of respondents per group that actually answered the particular question. The contributions of stakeholders who consented to publication[4] are available online.[5]

This analysis does not represent the official position of the Commission and its services, and does not bind the Commission in any way.

6.1   Geographical coverage

The consultation received a total of **92 replies** from stakeholders from a wide geographical coverage[6]: as Figure 1 shows, respondents originated from organisations situated in 17 out of the 28 EU Member States and in 4 from outside the EU[7]:
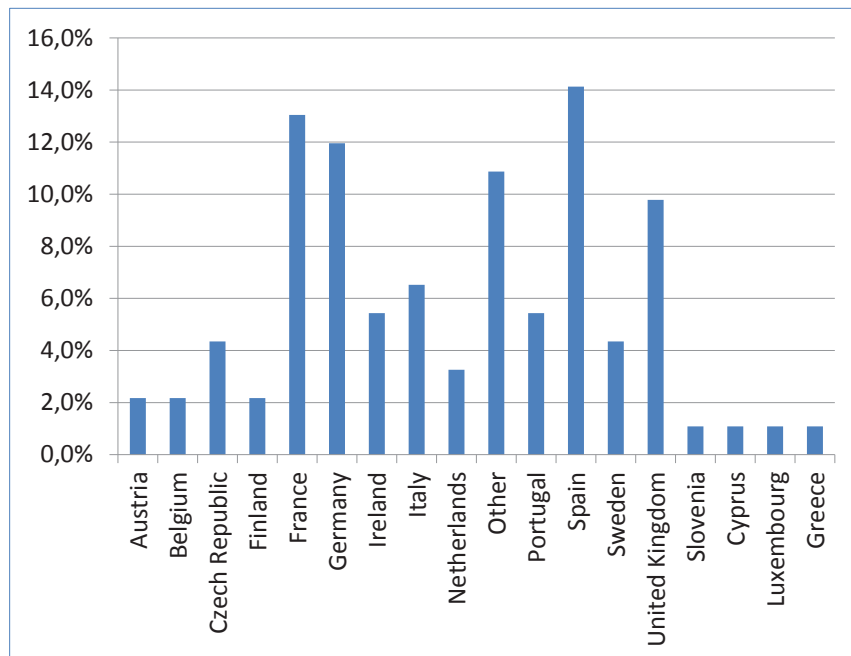

Figure 1 – Country of respondent's origin

The feedback has to be seen against the background of rather strict time constraints for the preparation of the entire EuroHPC file and the consequential need to place the consultation in the European summer holidays period.

The largest number of responses came from Spain (14.1%), France (13%), Germany (12%), UK (9.8%) and Italy (6.5%), totalling ~55% of responses. However, not only these larger

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[4]   41% agreed that their contribution can be published anonymously, 59% agreed to publication of the full information.

[5]   https://ec.europa.eu/digital-single-market/news-redirect/608647

[6]   Status as of 7 September 2017 – end of business

[7]   Israel, Norway, Switzerland, USA.

Member States expressed an active interest in EuroHPC, but also smaller Member States[8], totalling ~34% of responses).

In summary, despite time pressure and resulting need to place the targeted consultation in the summer period, there is a representative European feedback including even around 10% feedback received from non EU countries.

6.2   Type of organisation responding

Regarding type of organisation responding, Figure 2 shows that 60% responded as representative of an academia / research organisation, 24% as of business, 6% as of the public sector and 3% as of industry associations.
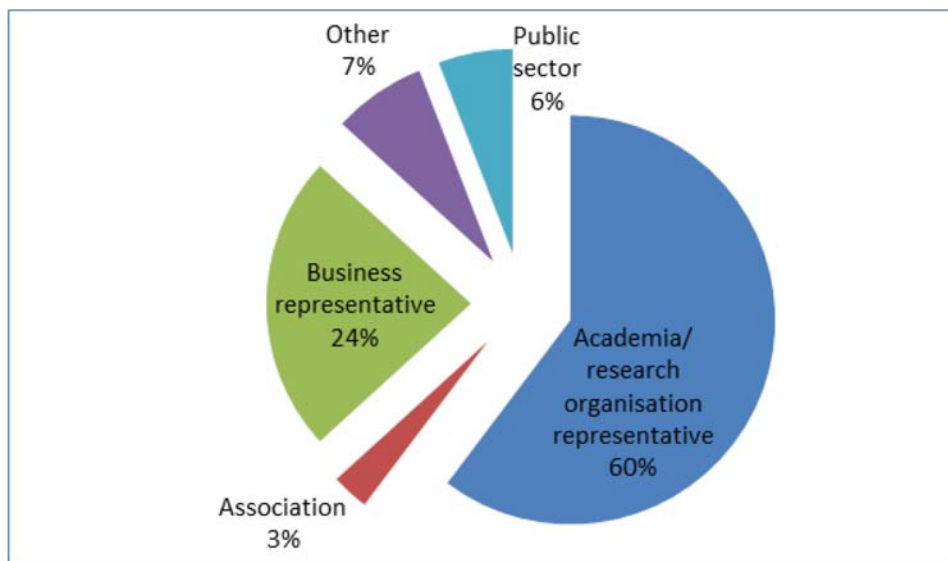

Figure 2 – Type of organisation of respondents

This result confirms the already great awareness that European science & research actors have on HPC. It also gives an indication on the future potential of HPC for European industry, including SMEs. The latter aspect is confirmed by the fact that 45% of business representative respondents originate from small, medium and micro sized enterprises which do not constitute a traditional group of HPC users (see Figure 3).

More than 80% (82.6%) of respondents have already applied for funding in HPC related activities under Horizon 2020 or previous EU Research Framework Programmes, which confirms that indeed specifically those institutions and individual experts that have a deep involvement in HPC and practical experience in engaging in EU-wide HPC projects have responded.

In addition, the fact that the respondents that have not yet done so represent a sizeable group (17.4%) confirms that interest in the EuroHPC initiative is not limited to stakeholders experienced with EU funding programmes but attracts also new constituencies.

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[8]   Portugal, Sweden, Czech Republic, Netherlands, Ireland, Austria, Belgium, Finland, Slovenia, Cyprus, Luxembourg, Greece.
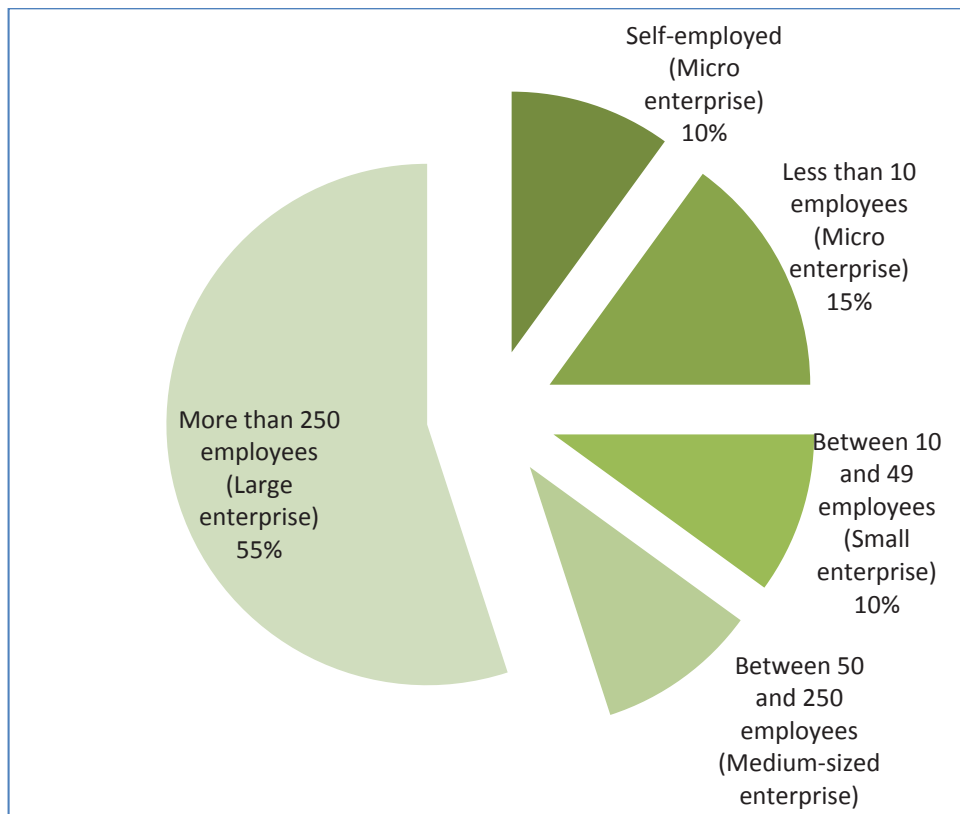
Figure 3 – Breakdown of Business representatives

In the remainder of the document, when analysing the breakdown of respondents by type of organisation, we have grouped the respondents as follows:

- Scientific users,
- Industrial users,
- Technology supply industry,
- Computing centres.

As shown in Figure 4, the widest geographical coverage has been reached by the computing centres covering 15 EU countries plus Switzerland (Other), followed by the scientific users covering 11 EU countries plus Switzerland (Other). The technology supply industry and the industrial users received each response from 4 EU countries plus Switzerland, USA, Norway, and Israel.
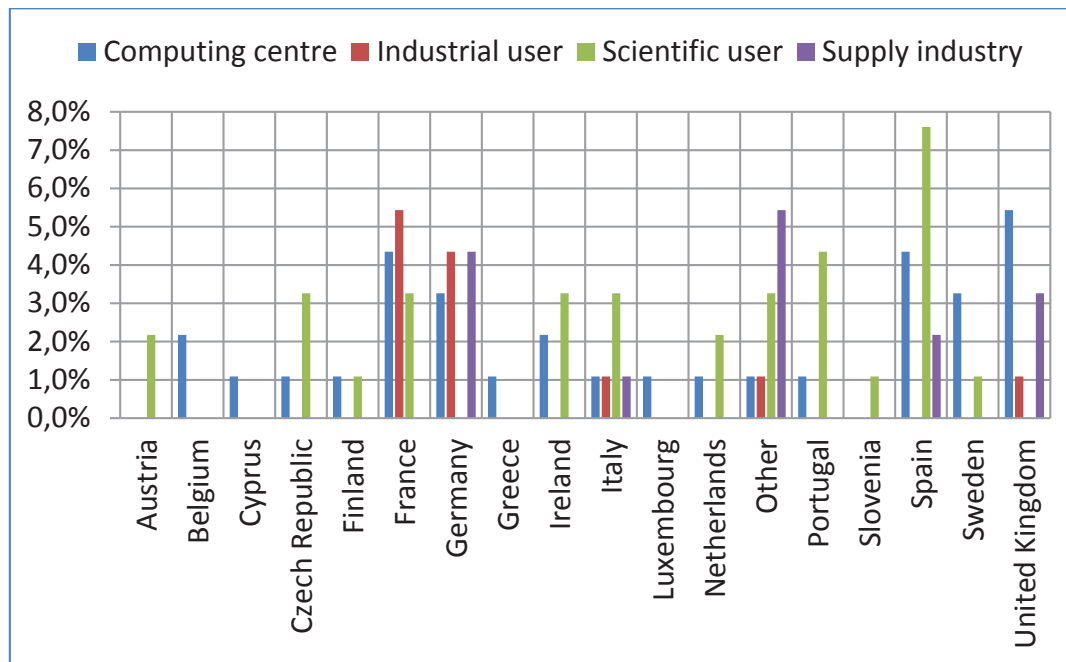
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Figure 4 – Geographical split by type of respondents

In summary the EU's computing centres have obtained the widest geographical coverage in the consultation reflecting the pan-European involvement of this group in HPC. The industrial users were represented by large Member States like France (5.4%), Germany (4.3%), the UK (1.1%), and Italy (1.1%), who already make rather extensive use of HPC, plus Switzerland (1.1%).

Noteworthy is also the participation of the technology supply industry from Spain, the UK, and Germany, respectively amounting to 15%, 33%, and 36% of their respondents, confirming a strong presence of technology supply industry from those EU countries.

Interestingly, the participation of the technology supply industry from non-EU countries (Other) amounts to 50% of their respondents, which is the largest fraction per country. This rather large presence shows the great interest of non-EU technology supply industry for the European HPC market.

Without surprise, the non-EU technology supply industry respondents are located in the USA (40%), in Israel (40%), and in Norway (20%). Quite remarkably, the USA alone has the largest fraction of technology supply industry respondents per country, confirming once more the strategic interest of the USA for the European HPC market.

6.3   Identification of the problems

As a key result, 85% of respondents found that there is a problem with the current state of HPC in Europe; only 2% saw no problem, while 13% were undecided.

From those who saw a problem with the current state of HPC in Europe, the majority of respondents identified the following three issues as the most relevant problems:

- The *interaction between industry and academia* on the exploitation of high-end computing systems, application codes and services is limited, especially regarding the use of HPC for industrial and service innovation (55.6%);

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- There is *large fragmentation of HPC programmes and efforts in Europe* and the non-coordinated activities and the lack of a common procurement framework lead to a waste of precious resources (55.6%);

- *Europe's supercomputing capabilities depend on non-EU suppliers* for critical technologies and systems (47.8%).

In addition to *lack of sufficient resources* and *insufficient access to HPC resources for science*, a recurring issue in responses was the perception that *too little emphasis is currently given on software developments*, especially against the background of a recognised world leading role of Europe in HPC applications.

When looking into a breakdown by type of respondents, the following issues were identified as the most relevant problems to each group:

GROUP	MOST RELEVANT PROBLEM (% relative to the group)
Computing centres	There is large fragmentation of HPC programmes and efforts in Europe and the non-coordinated activities and the lack of a common procurement framework lead to a waste of precious resources (69%)
Scientific users	There is large fragmentation of HPC programmes and efforts in Europe and the non-coordinated activities and the lack of a common procurement framework lead to a waste of precious resources (58%)
Industrial users	Europe's supercomputing capabilities depend on non-EU suppliers for critical technologies and systems (75%)
Technology Supply industry	The interaction between industry and academia on the exploitation of high-end computing systems, application codes and services is limited, especially regarding the use of HPC for industrial and service innovation (67%)

The following issues were identified as the second most relevant problems to each group:

GROUP	SECOND MOST RELEVANT PROBLEM (% relative to the group)
Computing centres	The scientific communities in Europe do not have access to the level of supercomputing performance they need for their research purposes (63%)
Scientific users	The interaction between industry and academia on the exploitation of high-end computing systems, application codes and services is limited, especially regarding the use of HPC for industrial and service innovation (52%)
Industrial users	The interaction between industry and academia on the exploitation of high-end computing systems, application codes and services is limited, especially regarding the use of HPC for industrial and service innovation (75%)
Technology supply industry	The EU does not have the supercomputing power that corresponds to its economic weight because it spends substantially less than other regions on acquiring high-end computing systems (60%)

As it can be seen from the above tables, the interaction between industry and academia was identified by all stakeholder groups as being among the most pressing problems, followed by the fragmentation of efforts and resources.

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Noteworthy is the response from the industrial users, whose main concern is the dependence on non-EU technology. This clearly shows their awareness of the risks related to the dependence of a foreign technology supply-chain for a resource that is a critical for their competitiveness on a global market.

6.4 European added value

While only ~2.2% of respondents found that no action at all should be taken at EU level to improve the current state of HPC in Europe and 15% were satisfied with the level of the current EU actions, a clear majority of 83% confirmed the need for action at EU level that goes beyond the current actions (see Figure 5).
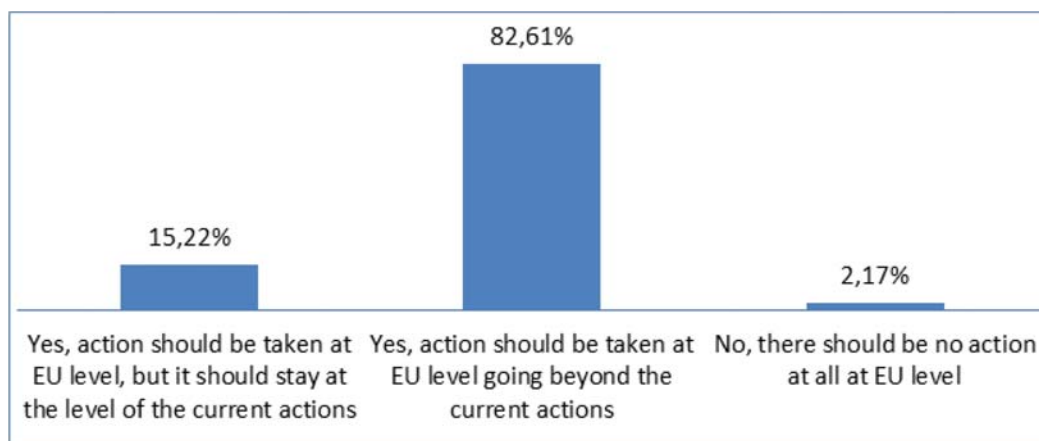

Figure 5 – Should action be taken at EU level?

Those who stated that action should be taken at EU level going beyond the current actions justified their responses on the basis of two main arguments:

- The level of EU-wide coordination and cooperation of HPC initiatives is currently insufficient in a qualitative and quantitative sense, resulting in a strong fragmentation of individual efforts across Member States, across different stakeholders (e.g. industry/science) as well as across current EU-wide initiatives.[9]

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[9] Examples:

"Europe supercomputing power is not comparable to its economic weight mainly because national efforts, even if integrated in PRACE framework, cannot attain the world top level. As a result the scientific communities do not have access to the required computing power for leading edge simulations".

"Present actions are rather fragmented and non-coordinated contributions of the EU are channelled through supercomputing centres with diverse missions as they observe the national interests of the countries in which they reside. Actions are mostly managed at the supercomputing centres with very limited or non- existent engagement of the broader scientific and industrial community. A coordinated action in Europe with leadership from leading scientists, knowledgeable of HPC, is necessary."

"Action should be taken at EU level, in order to increase the amount of resources … and to assure a clear and fair model to fund them and access them. Important economies of scale could be obtained, making it less expensive to Member States to access advanced computing resources. PRACE needs a qualitative improvement in its organisation model."

"On the European level, HPC access is currently through PRACE and this should continue, but more resources are required as there is a great demand for these resources by European scientists. In order that European scientists remain competitive, an increase in European HPC infrastructure is required".

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- Continuing in the current mode of fragmented and insufficient efforts, the EU is relegated against its global competitors (USA, China) in a field as strategic as supercomputing.[10]

This result is also confirmed by the top priority[11] identification by respondents of the need to set-up a coordinated approach for developing a leading HPC and big data ecosystem (hardware, software, applications, skills, services and interconnections) for the benefit of Europe's science and industry.

As can be seen in Figure 6, the position of the technology supply industry (93%), scientific users (91%), and computing centres (78%) is strongly in favour of taking measures at EU level going beyond the current actions. The position of industrial users, although also supporting action to be taken at EU level going beyond current actions (58%), is instead more moderate. This is consistent with the fact that 50% of industrial users have never applied for funding in Horizon 2020 or previous EU Research Framework Programmes (see section 8.2).

Except from a small minority among computing centres (6%), no one believes there should be no action at all at EU level.
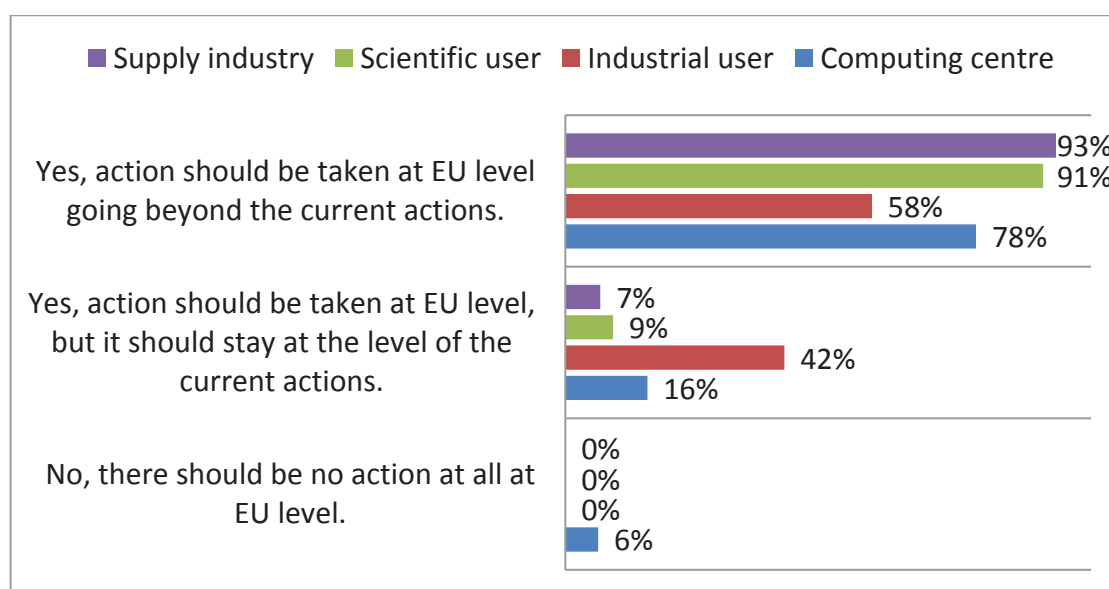

Figure 6 –Breakdown per group of respondents

6.5   Objectives of a future EU initiative on HPC

Respondents confirmed that the following actions rank among the main (>50% of responses) objectives of a future EU initiative on HPC:

- Establish a world-class HPC and Big Data ecosystem (79.3%);

- Support education and training in order to increase HPC skills in Europe (77.2%)

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[10]   Example: "Focused operational and research high performance computing (as oppose to general computing) is one of the key tools of technological progress. US, Japan and China appreciate this quite well and invest heavily in all aspects of HPC. An organised holistic change in the European approach to, and funding of, HPC is required in order to stay competitive worldwide. Europe should aim at the HPC programme as seriously as at the satellite observing programme."

[11]   Rate 4.4 on a scale between 1 (lowest importance) and 5 (highest importance)

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- Stimulate the development and use of the best HPC and data intensive codes in today's and future most innovative scientific and industrial applications (76.1%);

- Set-up a coordinated research and innovation agenda for developing the next generation of HPC technologies and systems (75%);

- Deploy innovative, usable HPC services and competitive solutions satisfying the demands of users from science, industry (incl. SMEs) and the public sector (60.9%);

- Procure world class HPC and data infrastructures and make them widely accessible and available across Europe (56.5%).

This set of objectives – coordination of efforts, education & training, applications, HPC services to all stakeholders, widely accessible infrastructure – corresponds to the goals of the EuroHPC initiative.

When looking at the breakdown by group of respondents it appears that the following actions should be among the main objectives of a future EU initiative on HPC:

GROUP	MOST RELEVANT ACTION (% relative to the group)
Computing centres	Establish in Europe a world-class HPC and Big Data ecosystem (hardware, software, applications, skills, services and interconnections) (87.5%)
Scientific users	Stimulate the development and use of the best HPC and data intensive codes in today's and future most innovative scientific and industrial applications (78.8%)
Industrial users	Stimulate the development and use of the best HPC and data intensive codes in today's and future most innovative scientific and industrial applications (83.3%)
Technology supply industry	Establish in Europe a world-class HPC and Big Data ecosystem (hardware, software, applications, skills, services and interconnections) (86.7%)

The second most relevant actions identified by the groups of respondents are the following actions:

GROUP	SECOND MOST RELEVANT ACTION (% relative to the group)
Computing centres	Support education and training to increase HPC skills in Europe (84.4%)
Scientific users	Support education and training to increase HPC skills in Europe (75.8%)
Industrial users	Establish in Europe a world-class HPC and Big Data ecosystem (hardware, software, applications, skills, services and interconnections) (83.3%)
Technology supply industry	Support education and training to increase HPC skills in Europe (80%)

For all respondents, establishing a world-calls HPC ecosystem is among the most relevant objectives for a European HPC initiative, except for the scientific users. For the latter the development and use of applications and skills are more important. For most the education and training aspects are also among the top priorities.