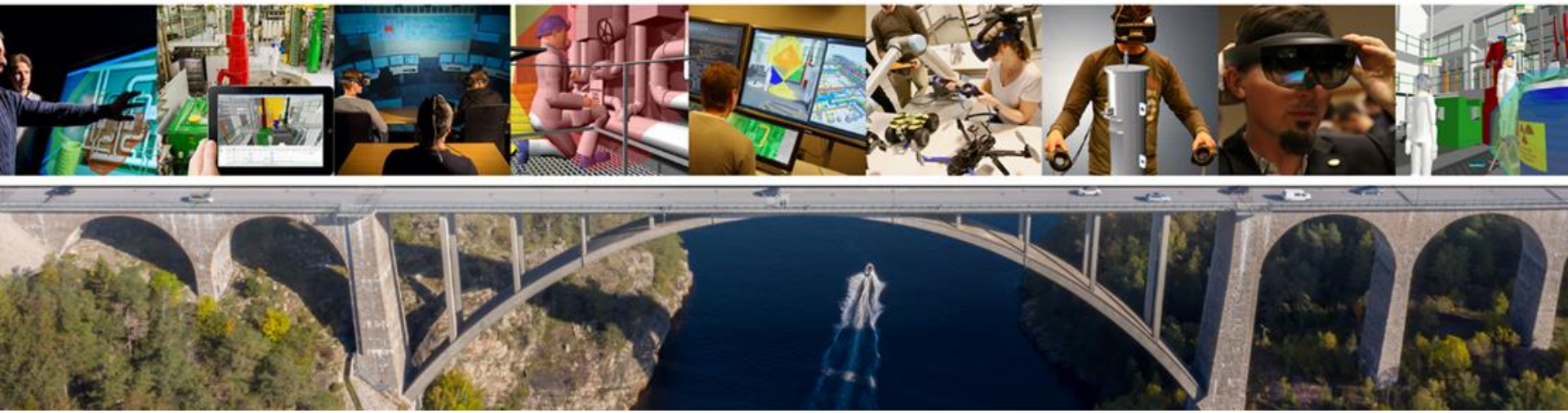
DigiDecom 2021 – DIGITAL

Online international workshop focusing on digital transformation, robotics and other game changing trends in nuclear decommissioning



SHARE

A roadmap for research in Decommissioning

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nº 847626.

SHARE

A roadmap for research in Decommissioning

General presentation of EU-H2020-SHARE Decommissioning

23 March 2021

https://share-h2020.eu/
linkedin.share-h2020-project
linkedin/group SHARE Road map for Decommissioning

Christine GEORGES, CEA

christine.georges@cea.fr

cea efficient innovation enresa IFE Institute for Energy Technology European Commission Joint Research Centre KIT Karlsruher Institut für Technologie LEI NATIONAL NUCLEAR LABORATORY sckcen SOGIN VTT

CHALLENGES AND ECONOMICAL STAKES IN DECOMMISSIONING

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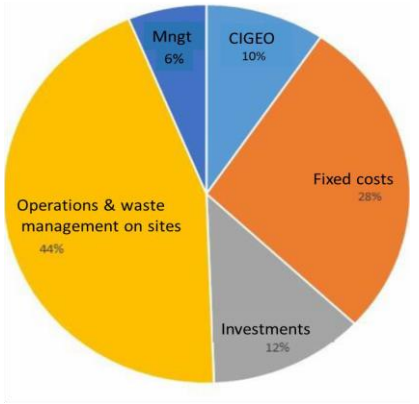
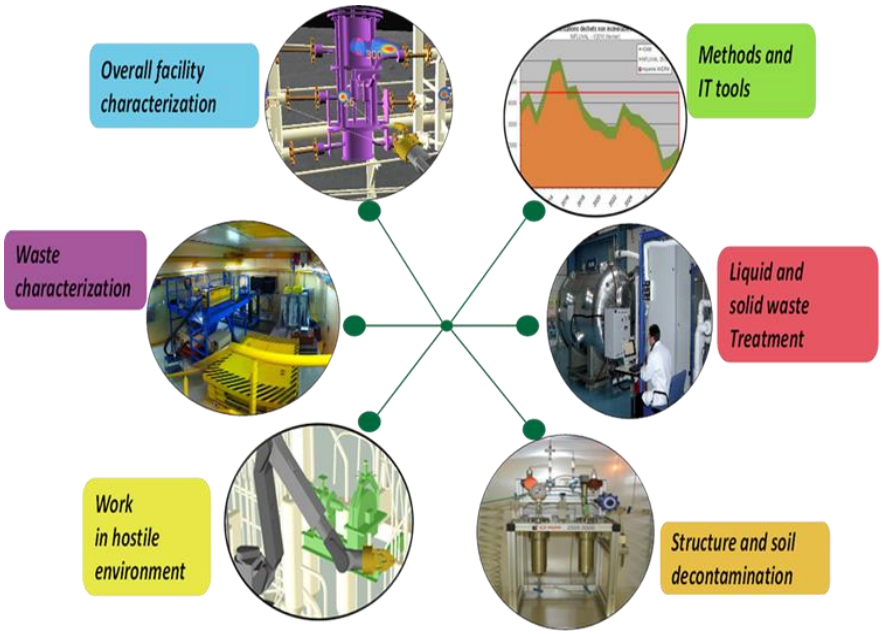
A certain level of industrial maturity for Decommissioning of rather 'standard' nuclear facilities relying mostly upon proven processes and technologies, and with series effect, e.g. for PWR

- **Dissemination, guidance and even standardization + use of advanced technologies for technical and economical optimization (digital tools, laser cutting, waste management solutions, etc.)**



But still technical issues on complex operations, e.g. graphite reactors, fuel cycle back end facilities with associated legacy waste, etc.

- **Research targeted to the actual needs of end users, in a "waste- led approach", e.g qualification of new technologies, new treatment options for non packaged waste, etc.**



Also, non-technological issues,

- **Education and training, Competence maintenance, Project management, Contracting, Dialogue with society, regulators, industrial profitability, etc.**

EU ADDED VALUE / RESEARCH FOR DECOMMISSIONING

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Impulse needed to use on sites results of Research and to promote and organize at international level the co-financing of developments and demonstrators

On one hand:

- Increasing difficulties for Individual countries to justify expenditures on new developments that can require more than 10 years to be qualified
- Reluctance on sites to use innovative technologies and search for approved technologies to minimize risks (safety, unknown, failure, etc.)
- Industrials need confidence in markets and associated business plans before investing in industrialization.

On the other hand

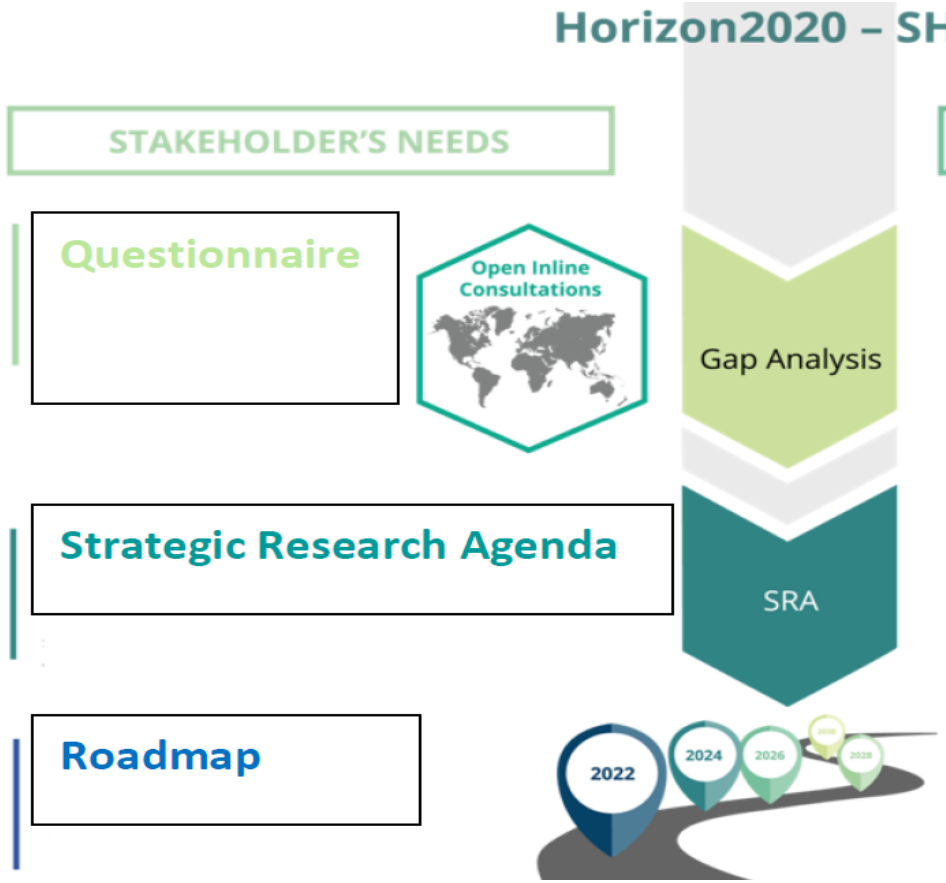
- Significant redundancy and duplication in current Research programmes for Decommissioning in different countries
- Already lot of cooperation (IAEA, NEA, etc.) , but… few real projects in common in 2016

Euratom research and training programme H2020 NFRP-2018-5: coordination and Support Action to the European Commission

«SHARE » = STAKEHOLDERS-BASED ANALYSIS OF RESEARCH* FOR DECOMMISSIONING

June 2019 / November 2021

“Development of a roadmap for decommissioning Research aiming* at safety improvement, environmental impact minimisation and cost reduction”



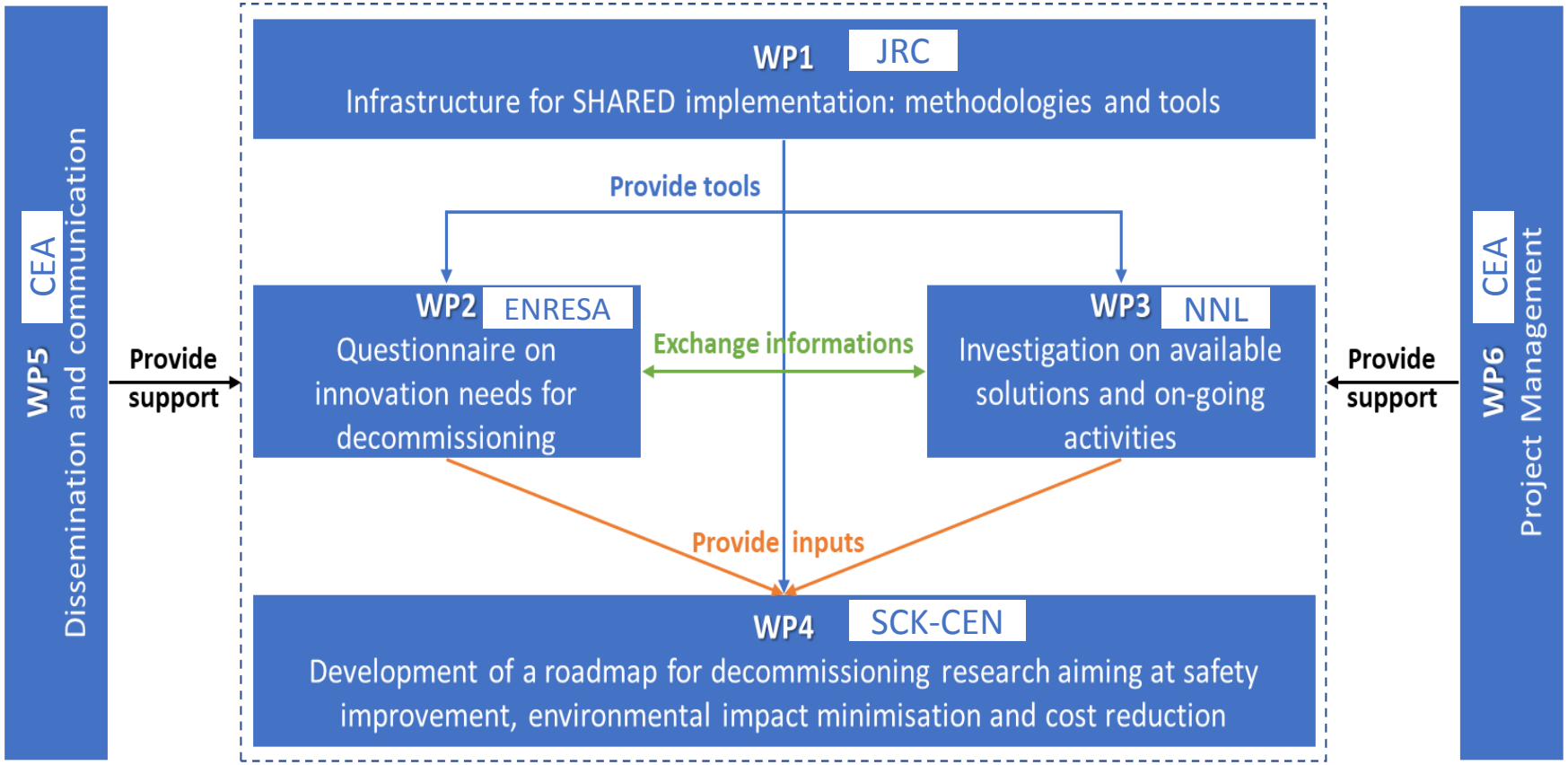
(*): “Research”= R&D, R&I, methodologies, standardization, etc. in technical and non technical areas

«SHARE » = STAKEHOLDERS-BASED ANALYSIS OF RESEARCH* FOR DECOMMISSIONING

June 2019 / November 2021

Project focused on a Wide Decommissioning community, along the value chain.

WORK PACKAGES



POINT OF SITUATION

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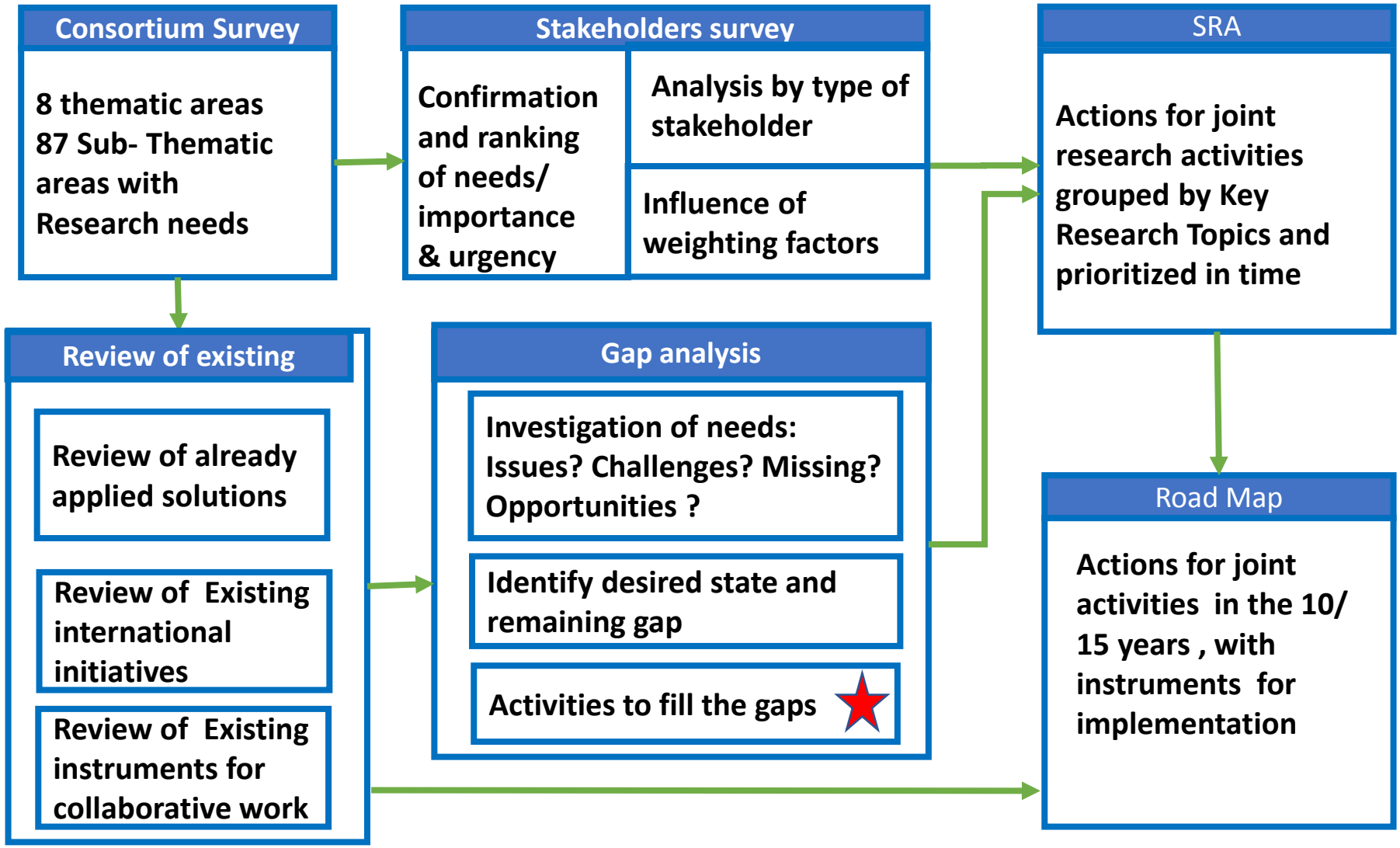

IDENTIFICATION OF 8 THEMATIC AREAS WITH NEEDS

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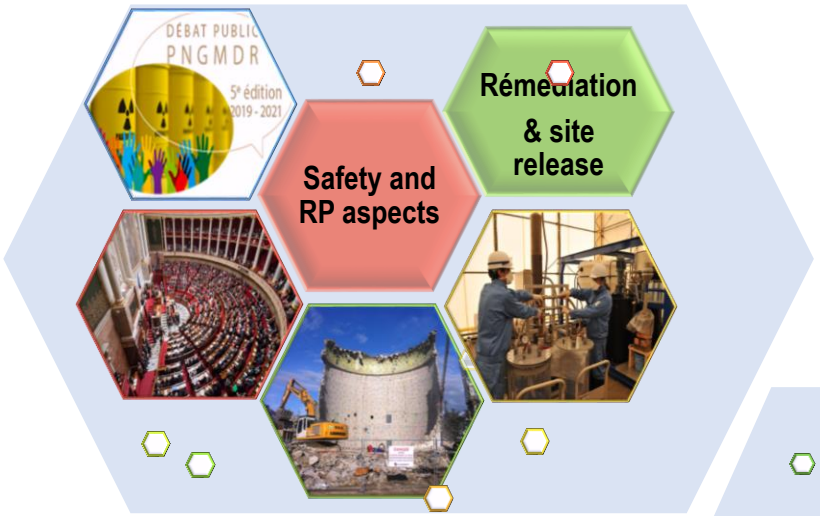
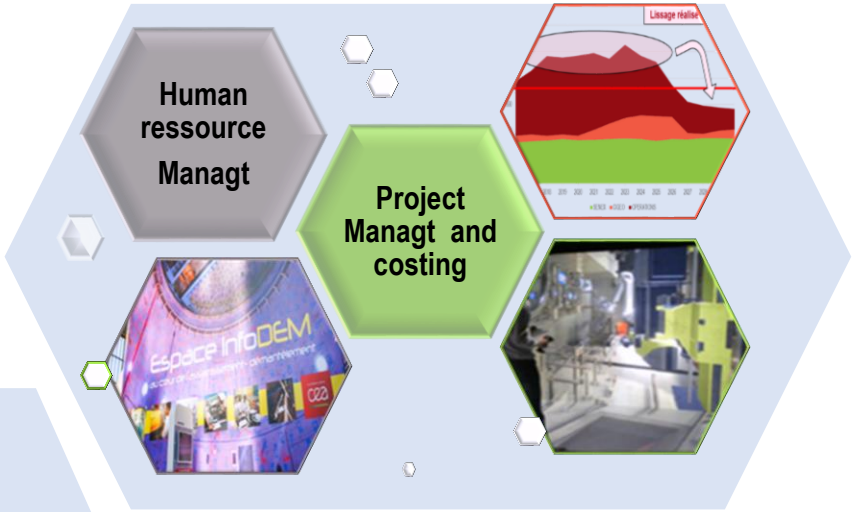
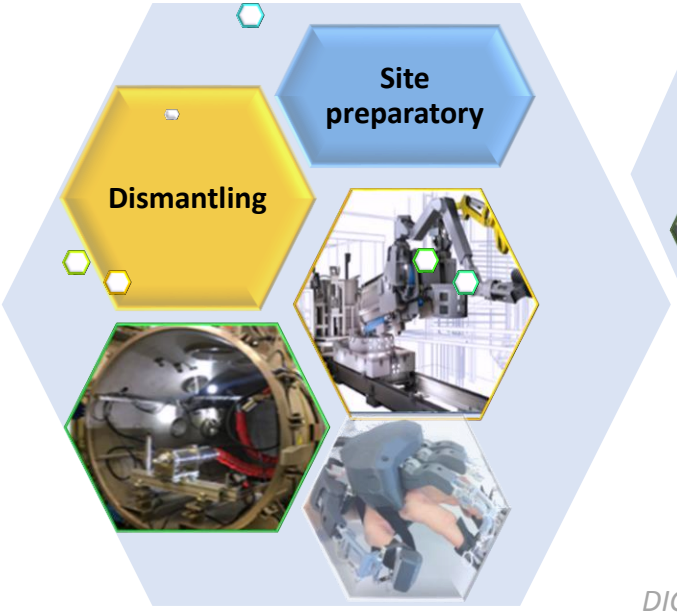
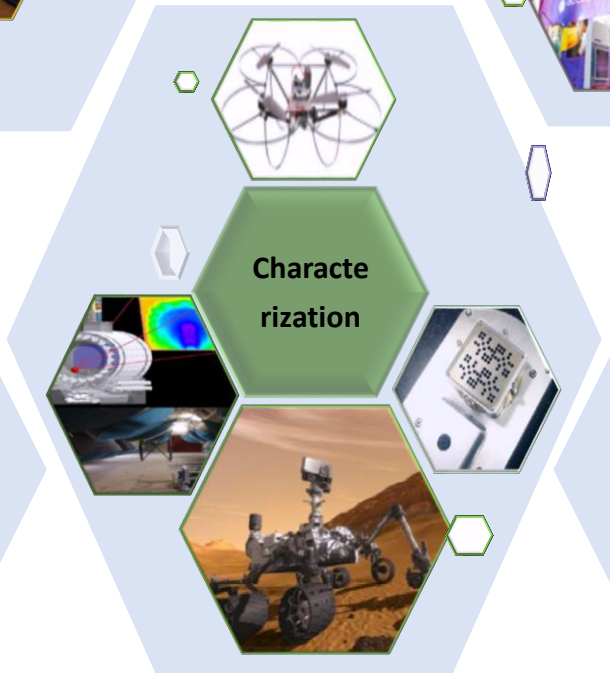
Divided into 71 sub-thematic areas









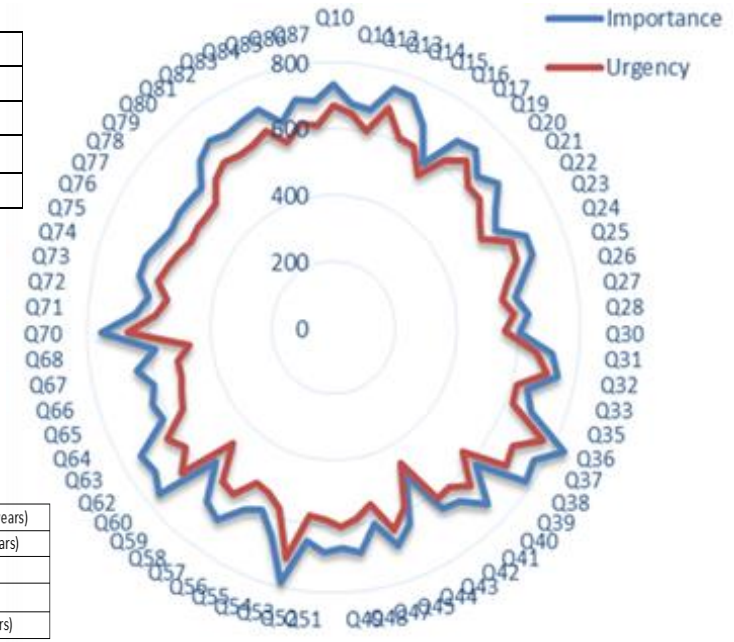
FULL ANSWERS FROM 224 STAKEHOLDERS WORLDWIDE

Next presentation

- Survey sent to 650 stakeholders from across the decommissioning value chain
- Were asked to score each of the sub-thematic areas with respect to the importance and urgency of 'the need for research', using a Likert scale 0 to 5.
- Scores given by stakeholders (224) for each sub-thematic areas were totalled, showing few differences in the scoring in terms of importance or in terms of urgency.

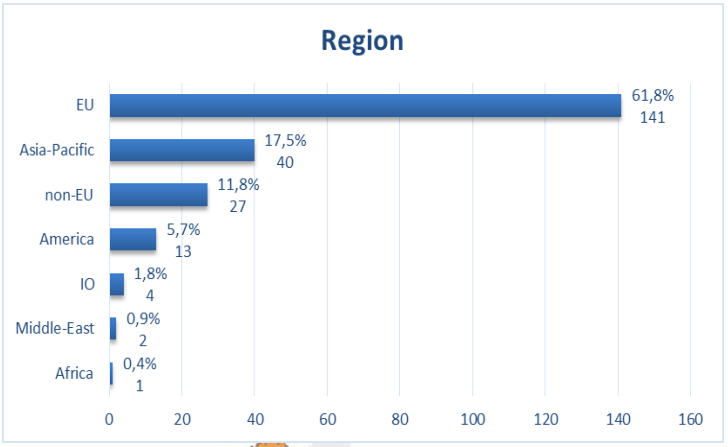
For importance of needs:

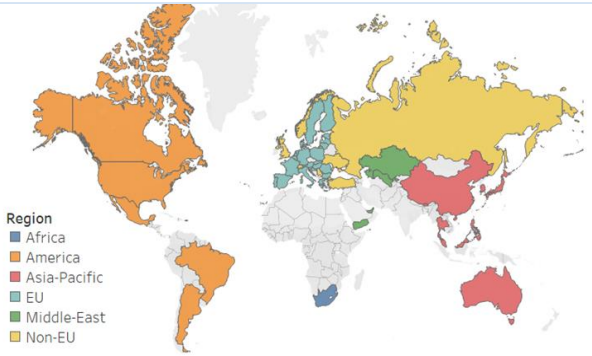
Between 0 (no need) and 1 (very low need)
Between 1 (very low need) and 2 (low need)
Between 2 (low need) and 3 (medium need)
Between 3 (medium need) and 4 (High need)
Between 4 (High need) and 5 (Very High need)



For Urgency of needs

Between 0 (no urgency) and 1 (beyond 15years)
Between 1 (beyond 15 years) and 2 (15 years)
Between 2 (15 years) and 3 (10 years)
Between 3 (10 years) and 4 (5 years)
Between 4 (5 years) and 5 (less than 5 years)





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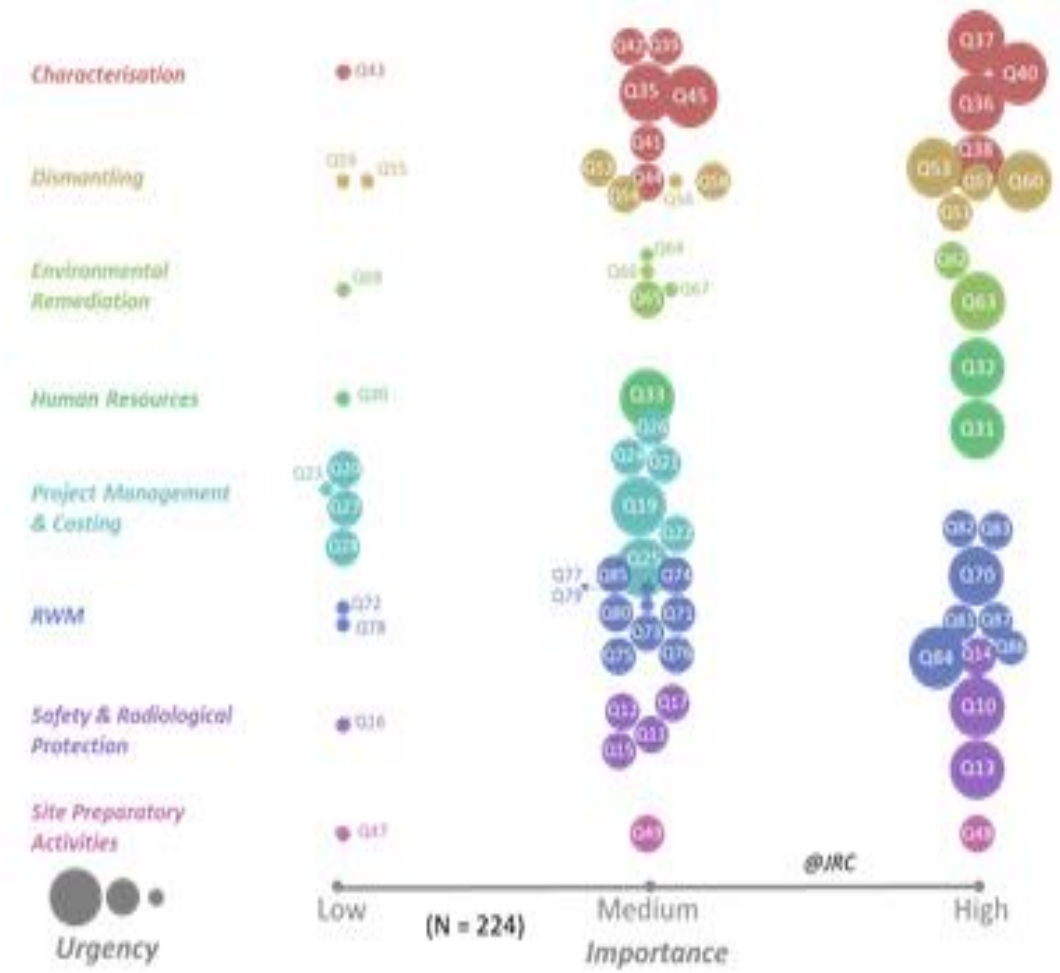
Next presentation

This first global analysis confirmed the need for Research in all eight thematic areas, with top-scoring needs in sub-thematic areas:



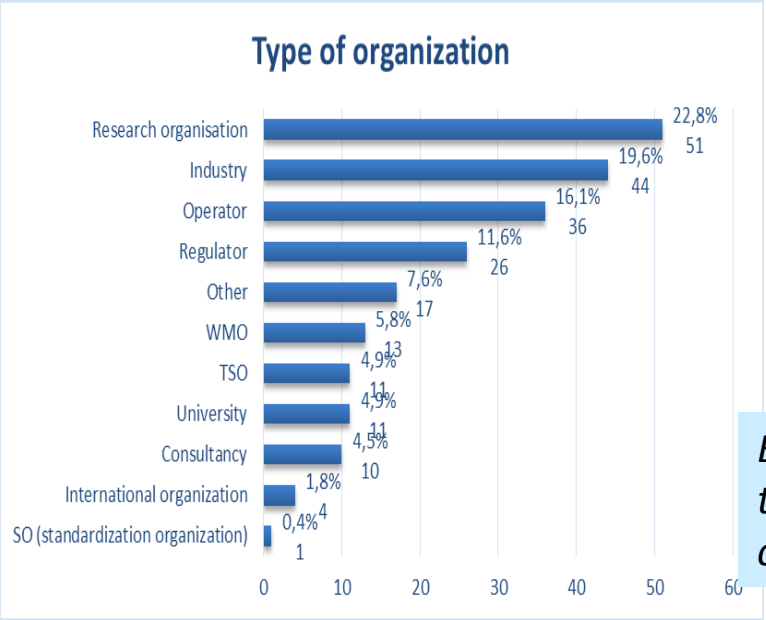
TOP SCORED SUB-THEMATIC AREAS	SCORING
36 - INVENTORY ASSESMENT (RADIOLOGICAL AND NON-RADIO.)	836
53 - IN SITU RADIOACTIVE WASTE CHARACTERIZATION	787
38 - CHARACTERIZATION OF CONCRETE ACTIVATED COMPONENTS	779
37 - CHARACTERIZATION OF METALLIC ACTIVATED COMPONENTS	762
60 - ROBOTS AND REMOTE CONTROL TOOLS FOR DISMANTLING	757
70 - MANAGEMENT ROUTES FOR MATERIALS INCLUDING RADIOACTIVE WASTE STREAMS	756
13 - DEVELOPMENT FOR NATIONAL REGULATORY GUIDANCE FOR CLEARANCE OF STRUCTURES AND MATERIALS	748
14 - DEVELOPMENT FOR NATIONAL REGULATORY GUIDANCE FOR FINAL SITE RELEASE)	743
32 - GENERAL EDUCATION FOR DECOMMISSIONING	742
63 – CHARACTERIZATION METHODS AND TECHNOLOGIES TO IDENTIFY SUBURFACE CONTAMINATION	734
40 - TECHNOLOGIES FOR HARD TO ACCESS AREAS	732
62 – CLEARANCE OF SURFACES AND STRUCTURES (INTERIOR AND EXTERIOR)	723

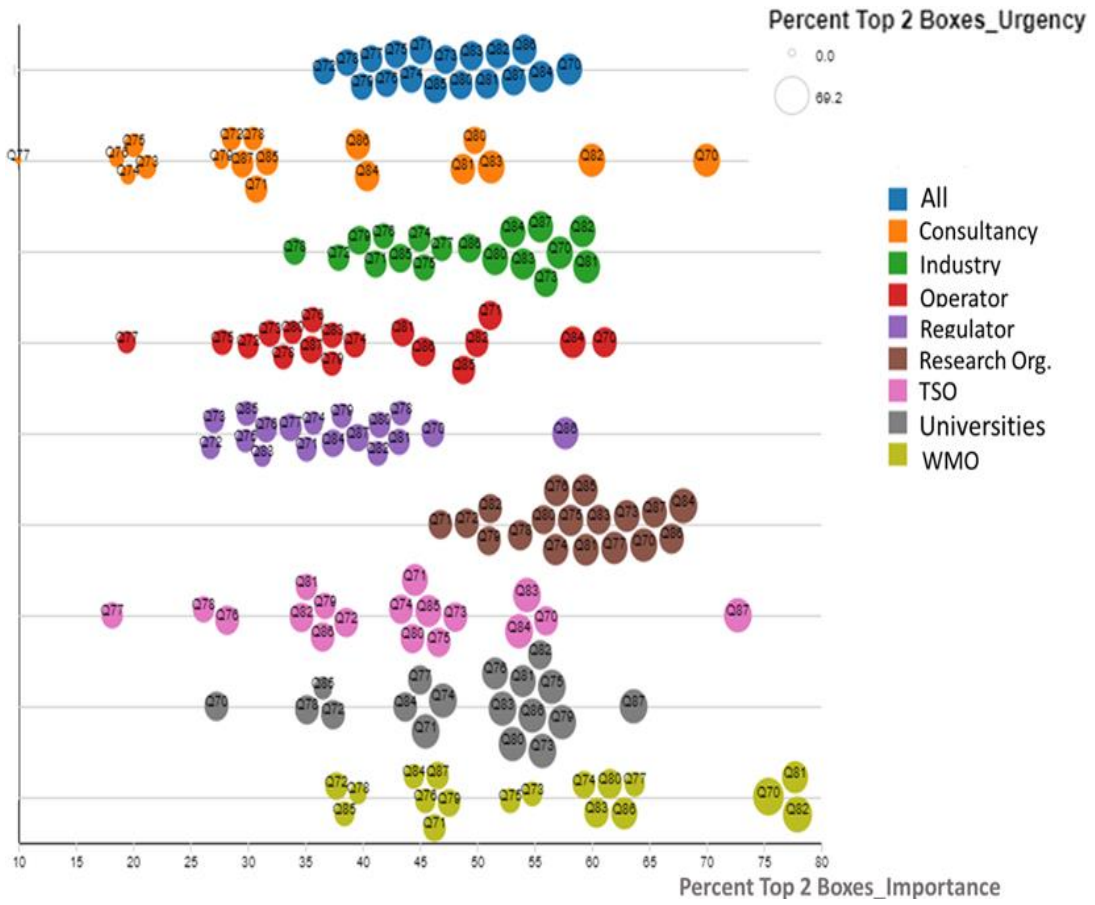
DETAILED ANALYSIS (next presentation)

By type of stakeholders, by country and by type of facility

Example within the RWM thematic area among vs stakeholders types

- Comparison on the basis of the percentage of stakeholders having scored “4” (high) or “5” (very high) for the importance of needs in Research for each sub-thematic area.



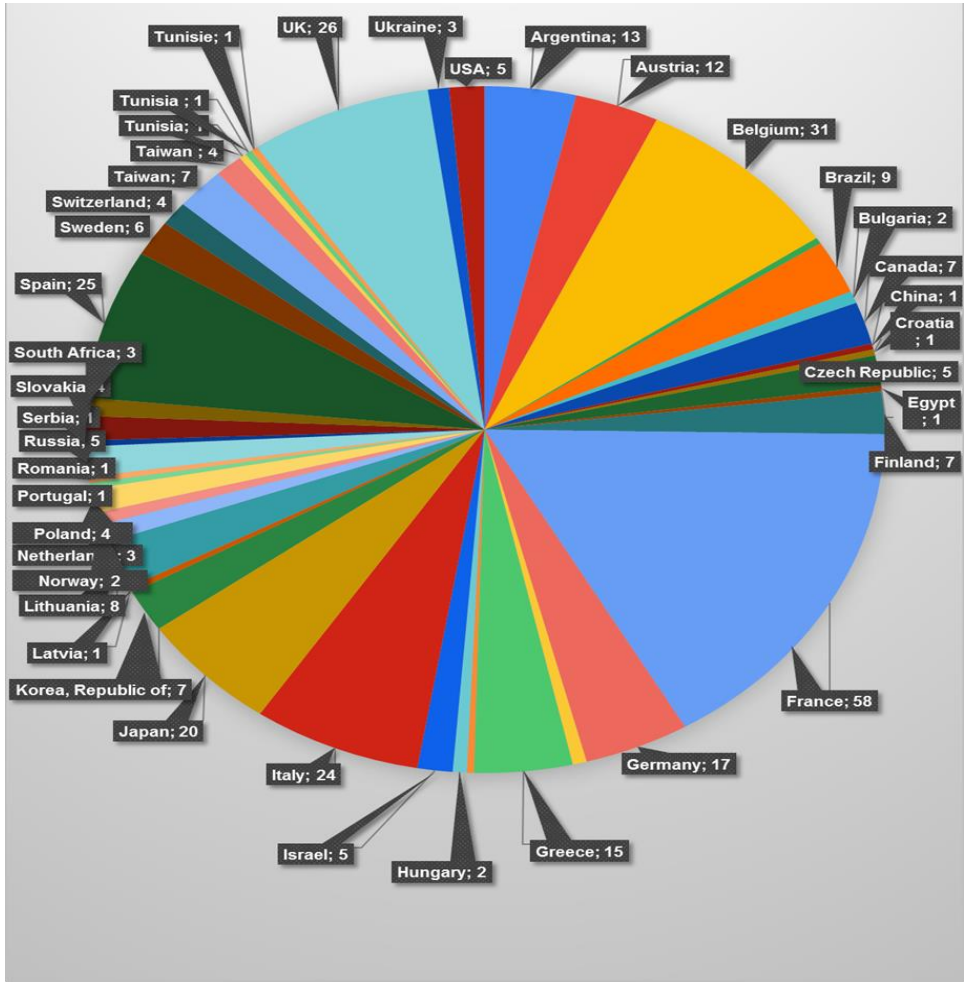


Each circle represents a sub-thematic area and color indicates the stakeholder type. The urgency is given by the size of the colored circles, on same principle.

STAKEHOLDERS INVOLVEMENT

2 public workshops organized end of 2020:

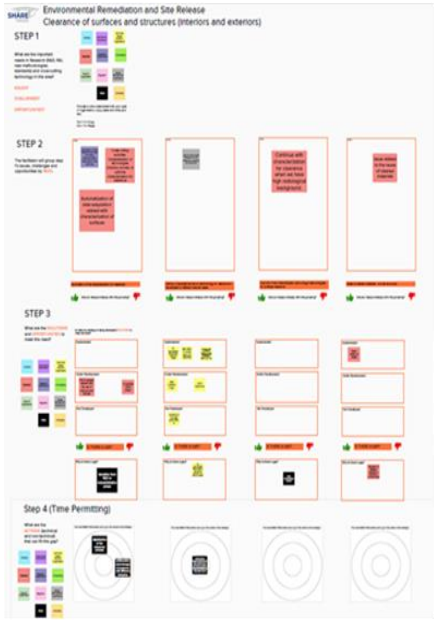
- To share the first results of the project
- To receive feedback from stakeholders
- To hear from other on-going international initiatives and to hear stakeholders' voices



INVESTIGATION WITH STAKEHOLDERS

On issues, challenges and opportunities & existing solutions/on-going developments

- Methodology with on-line brainstorm/virtual post-it sessions,
- Data collected during December 2020 workshop were analysed to complete results of the survey and were used in the gap analysis (see specific presentations).



2 of the 71 Mural sessions

COORDINATION WITH OTHER INTERNATIONAL INITIATIVES

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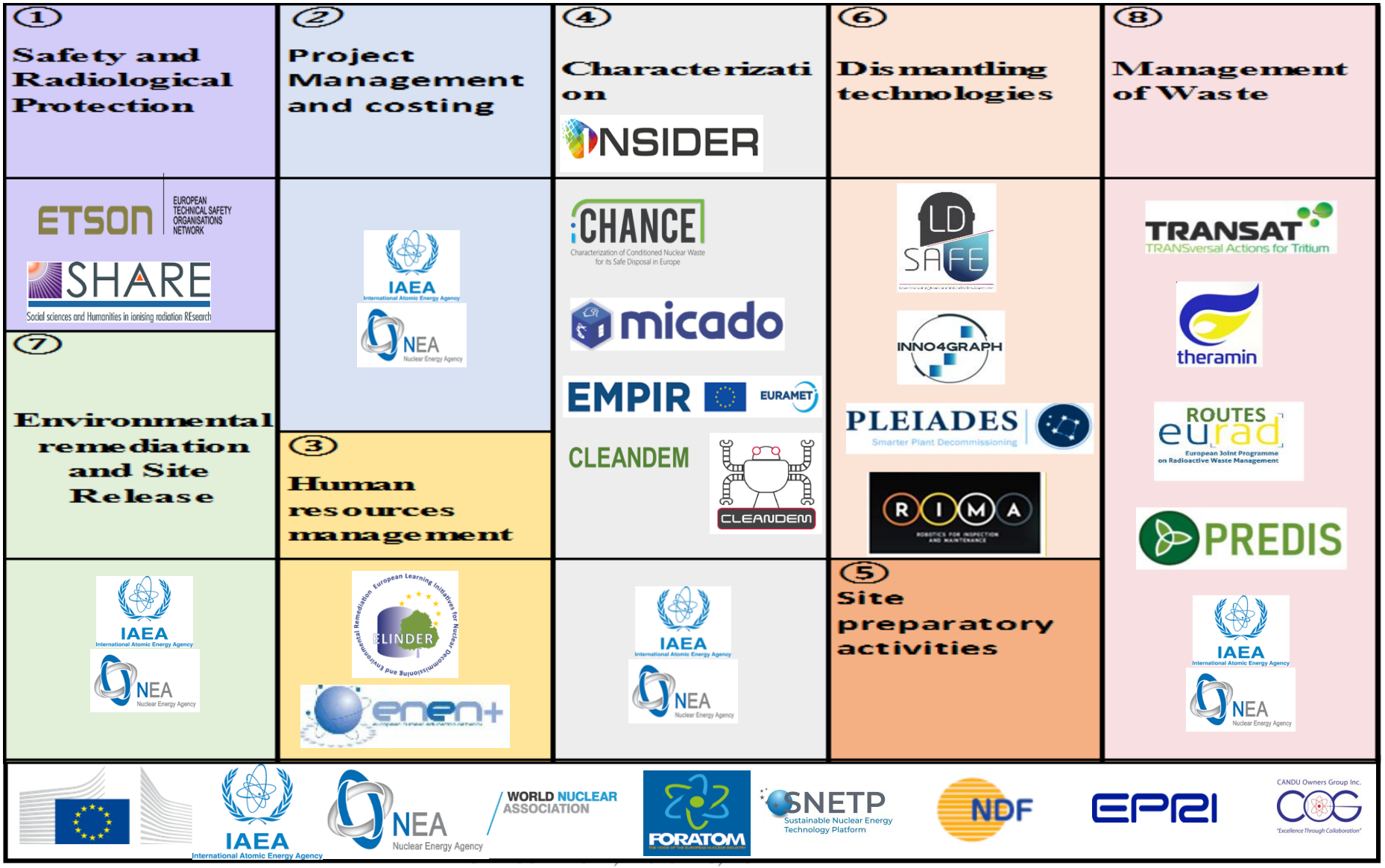
To avoid duplication of work



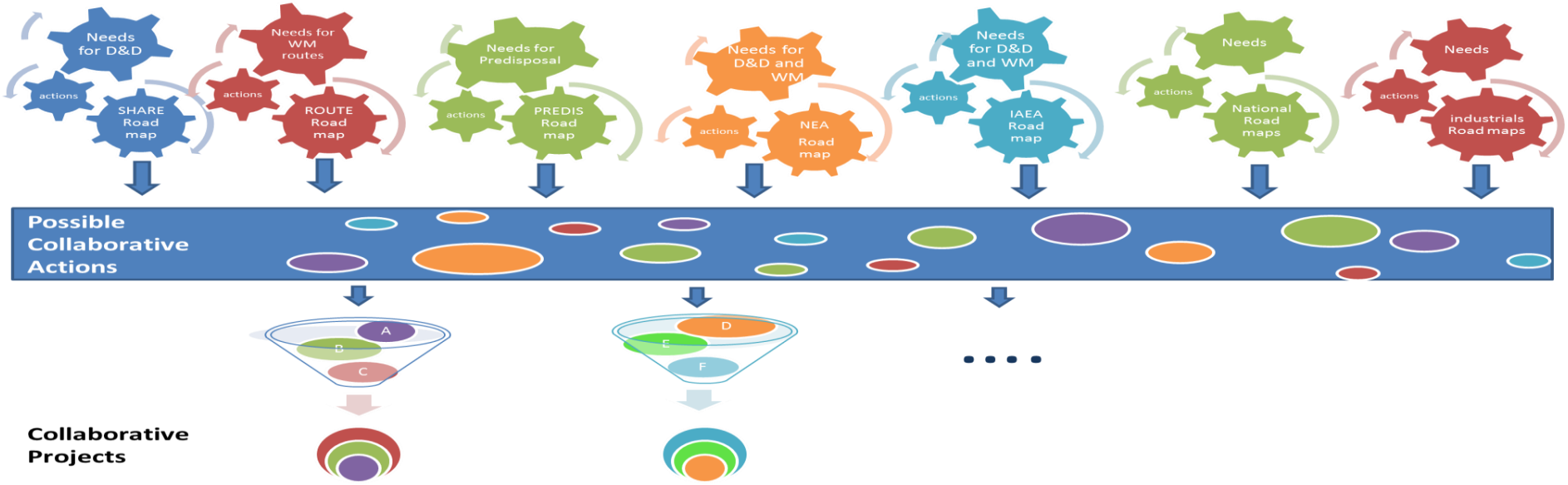
EVENTS 2021

WM SYMPOSIA
EDUCATION & OPPORTUNITY IN RADWASTE MANAGEMENT
A NON-PROFIT ORGANIZATION
Beginning March 8, 2021 – Virtual WM2021

+ more information to be followed through emails and medias:
[linkedin/group SHARE Road map for Decommissioning]
[https://share-h2020.eu/]
[linkedin.share-h2020-project]

CONCLUSIONS

- Main benefits and contribution: opinion of the global stakeholders decommissioning community
- Waiting forwards for your feedback on gap analysis
- By the end of 2021, strategic research agenda and road map to support policymakers in their choice of focus areas for investment
- Towards more collaborative projects and better harmonization of technological and non-technological approaches in Decommissioning.



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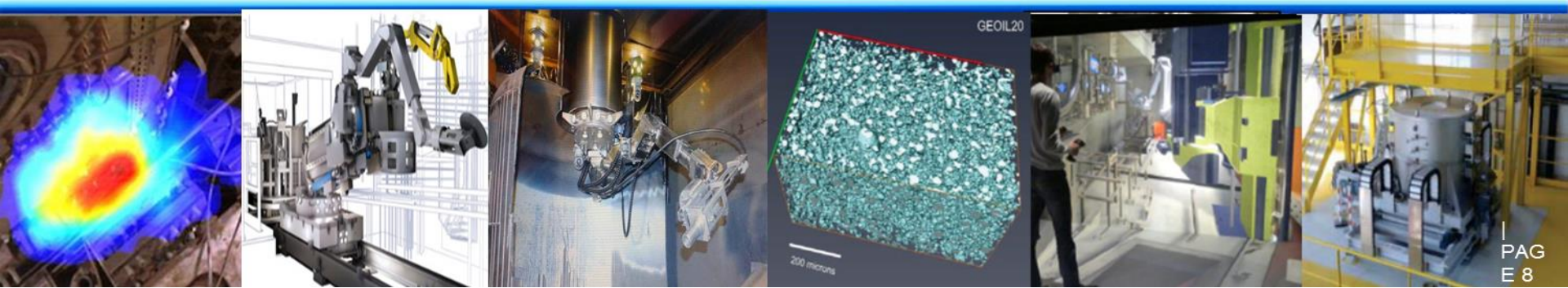
Thanks for your attention!

linkedin/group SHARE Road map for Decommissioning
https://share-h2020.eu/
linkedin.share-h2020-project



EU-H2020- SHARE-Decommissioning
DigiDECOM 2021, March 23-25, 2021

SHARE Survey

Main Results

Laura Aldave de las Heras – JRC
Gintautas Poškas – LEI

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nº 847626.

The Survey – Research Needs

Worldwide

Stakeholders

8 **Thematic Areas**

71 **Sub-thematic Areas**

5 POINT SCALE

Close Questions

Open Questions

Urgency

Importance

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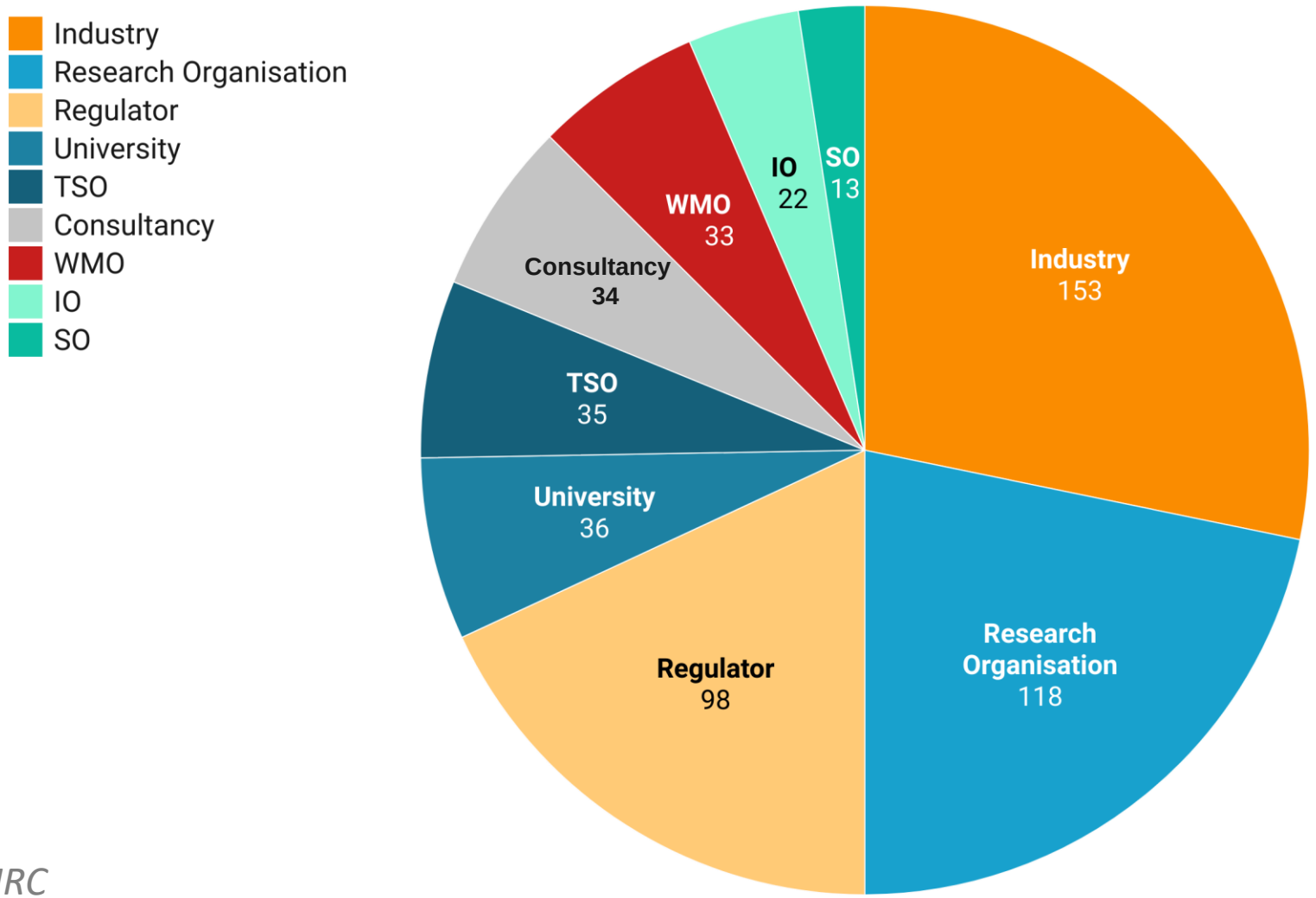
Target Population

[Target Population by Type of Stakeholder]



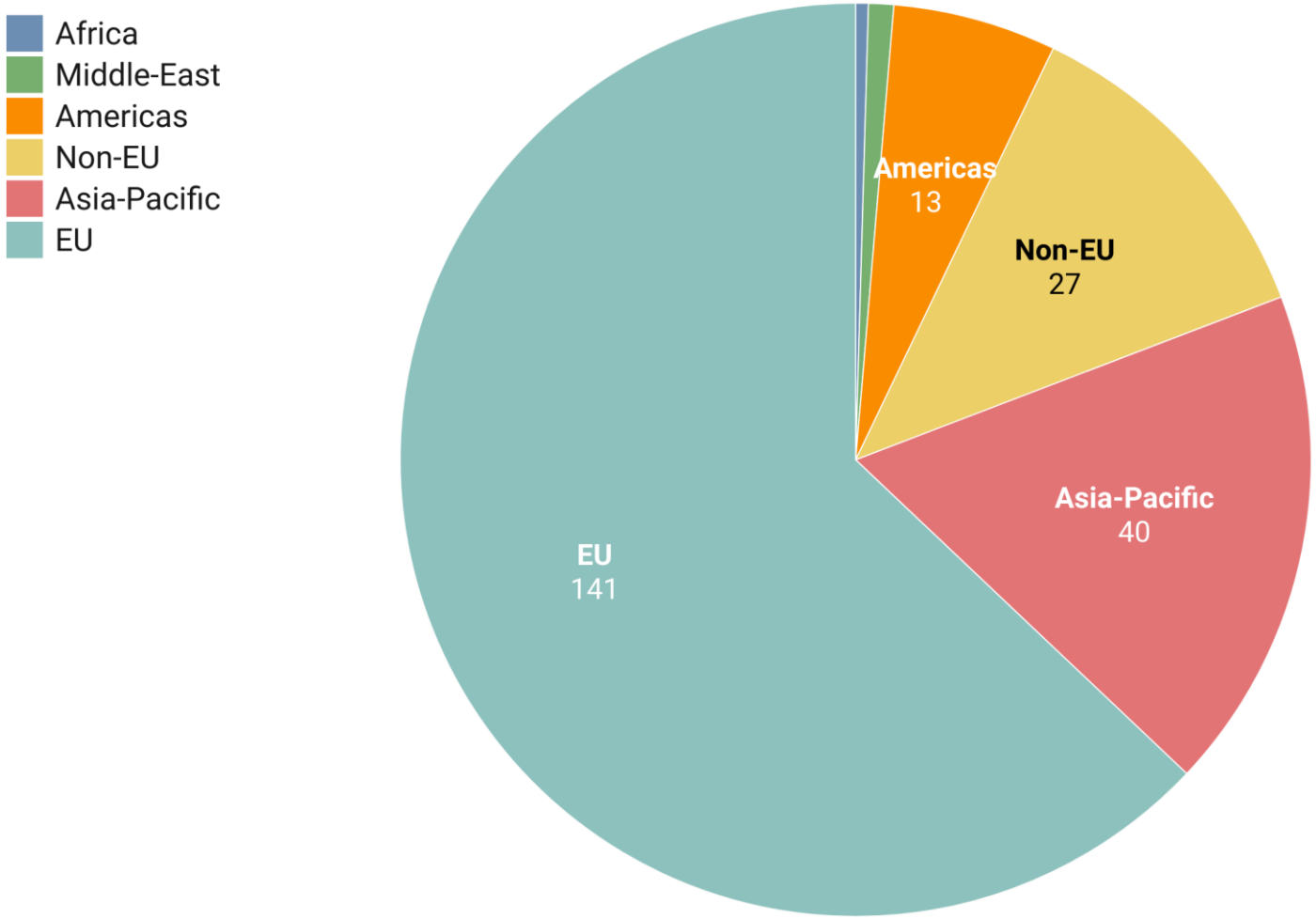
456

Regions
5

Countries
>50

Survey Demographics

[Number of Respondents by Region]



224

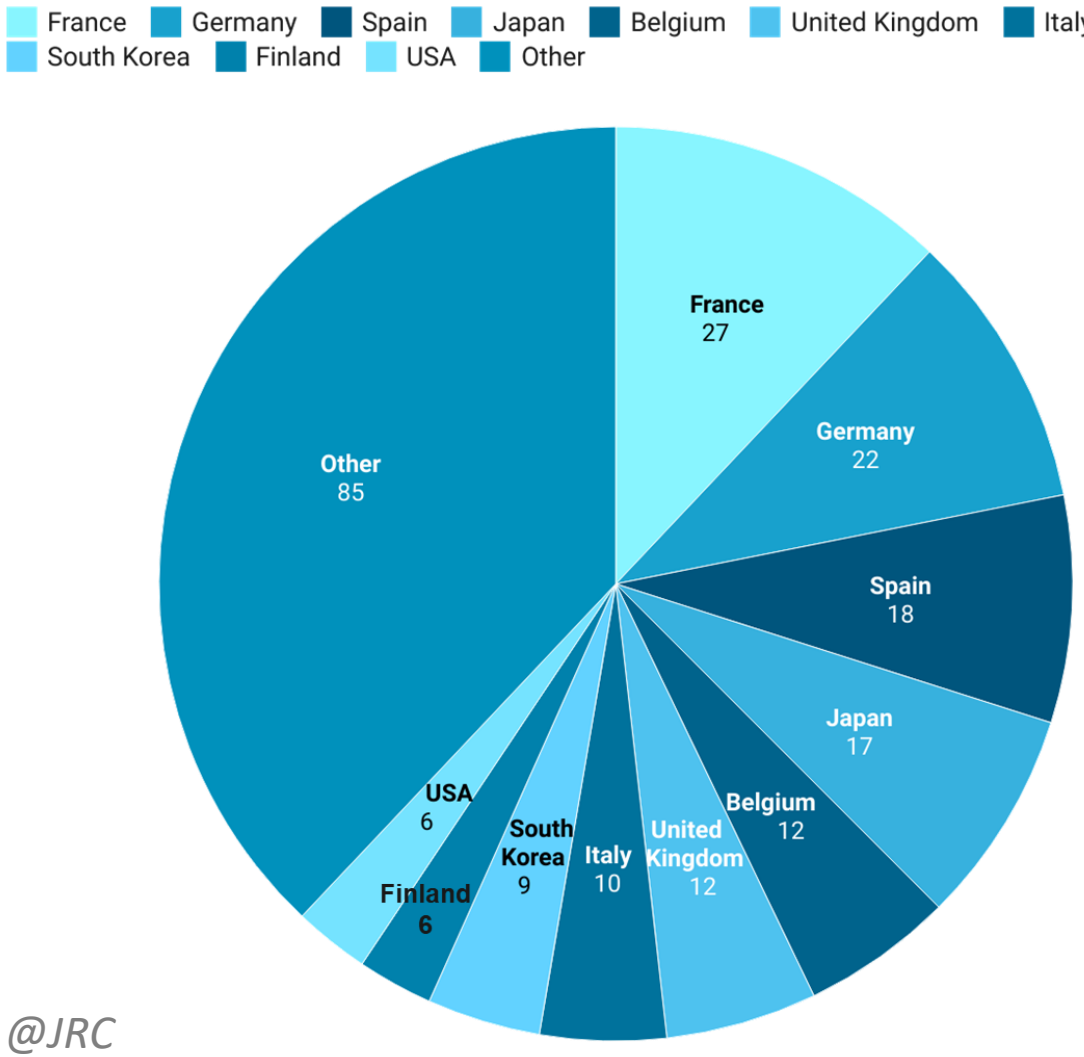
Response Rate

34.5 %

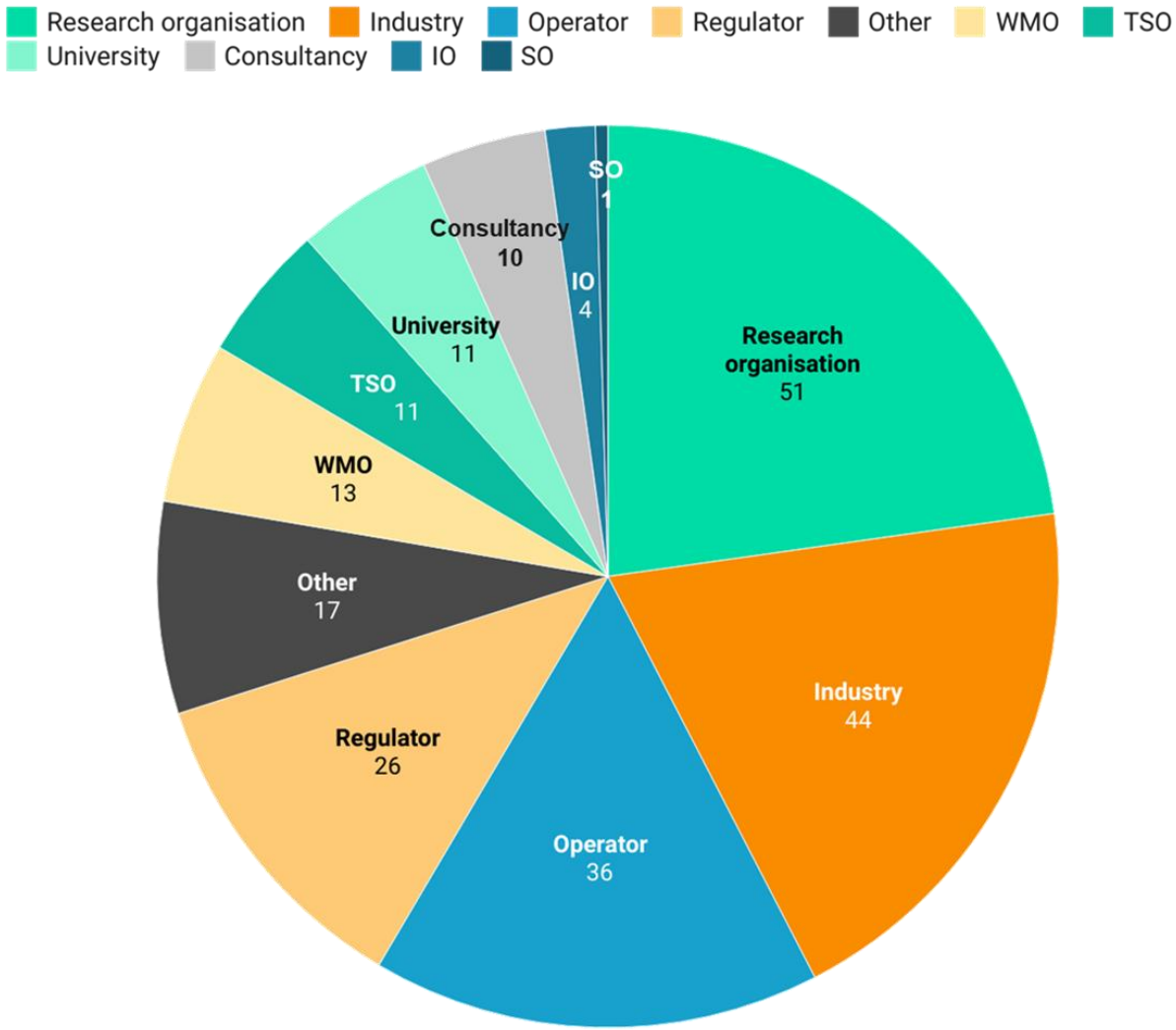
75 %

Survey Demographics

[Number of Respondents by Country]

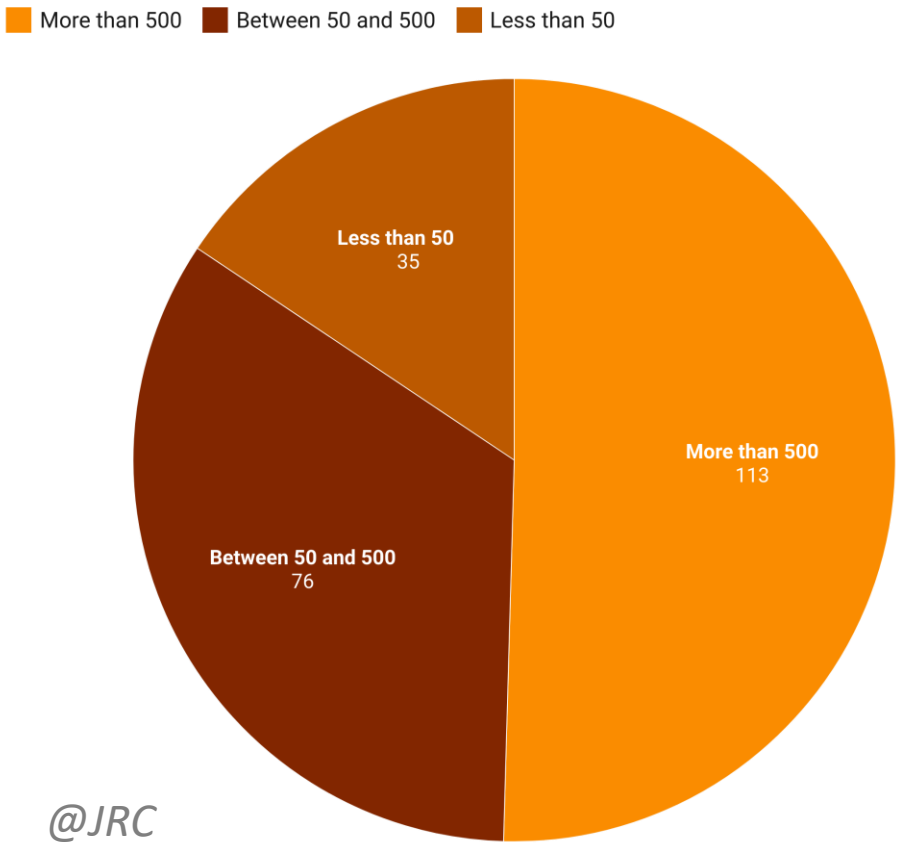


[Survey Population by Type of Organisation]

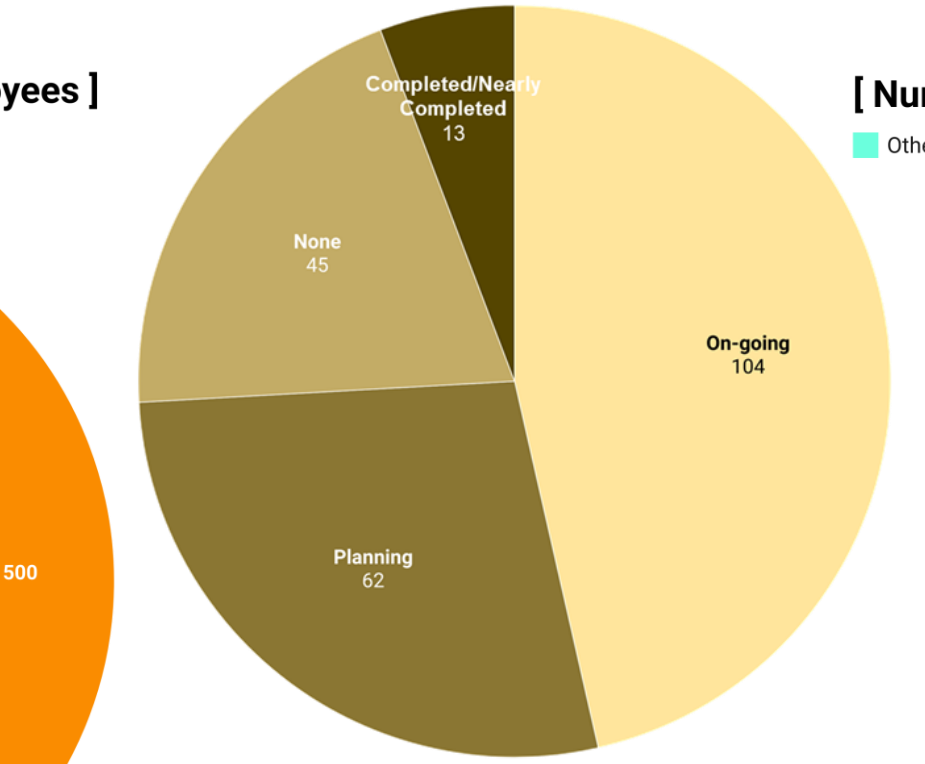


Survey Demographics - Others

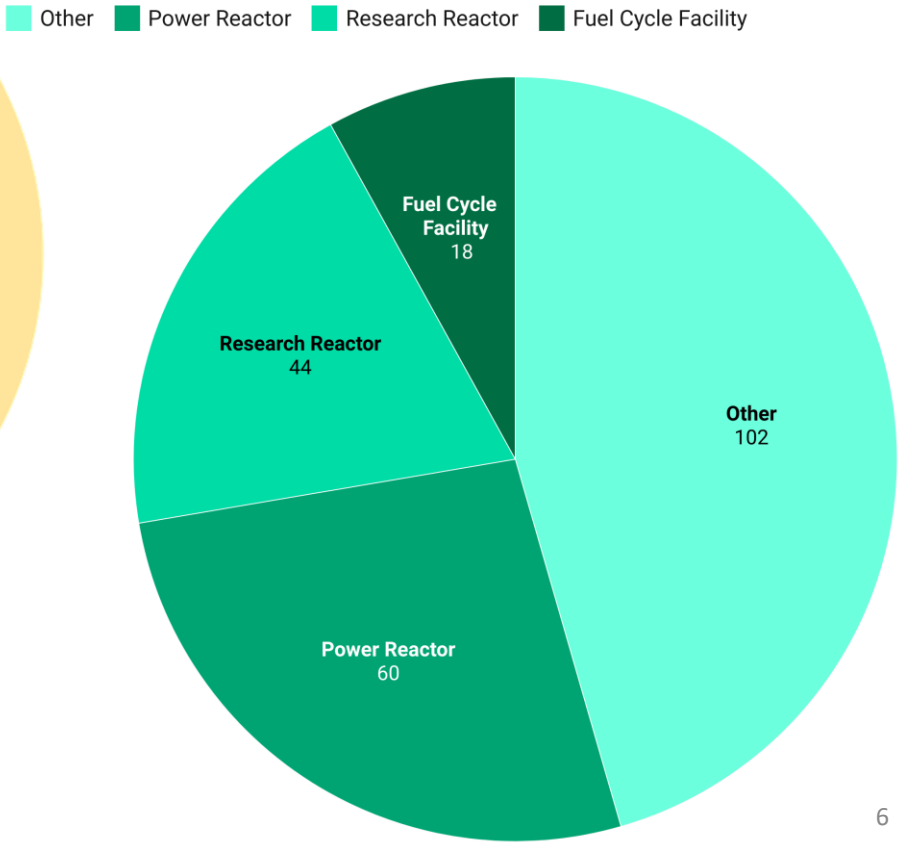
[Number of Respondents by Number of Employees]



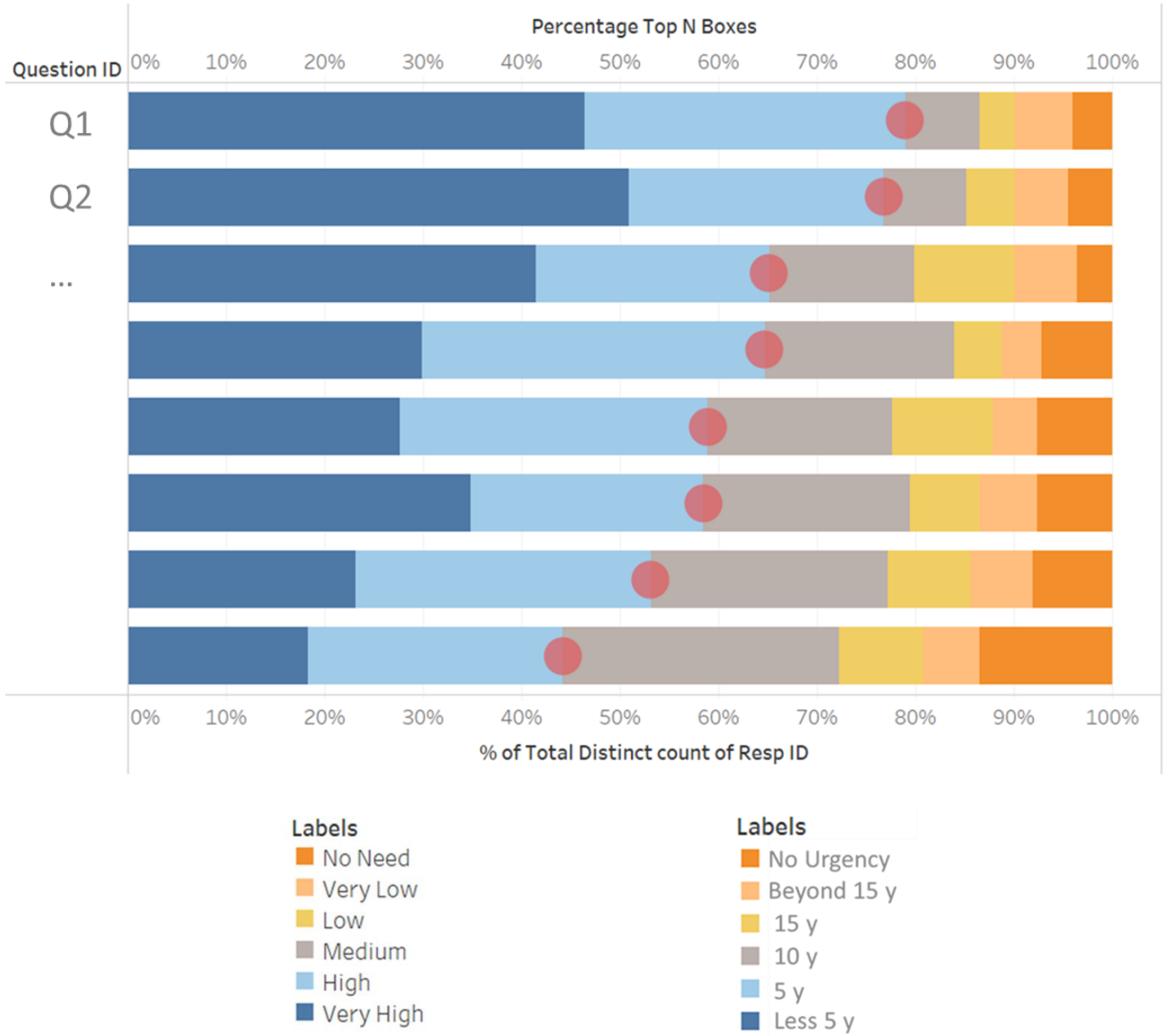
[Number of Respondents Status of Decommissioning Project]



[Number of Respondents by Type of Facility]

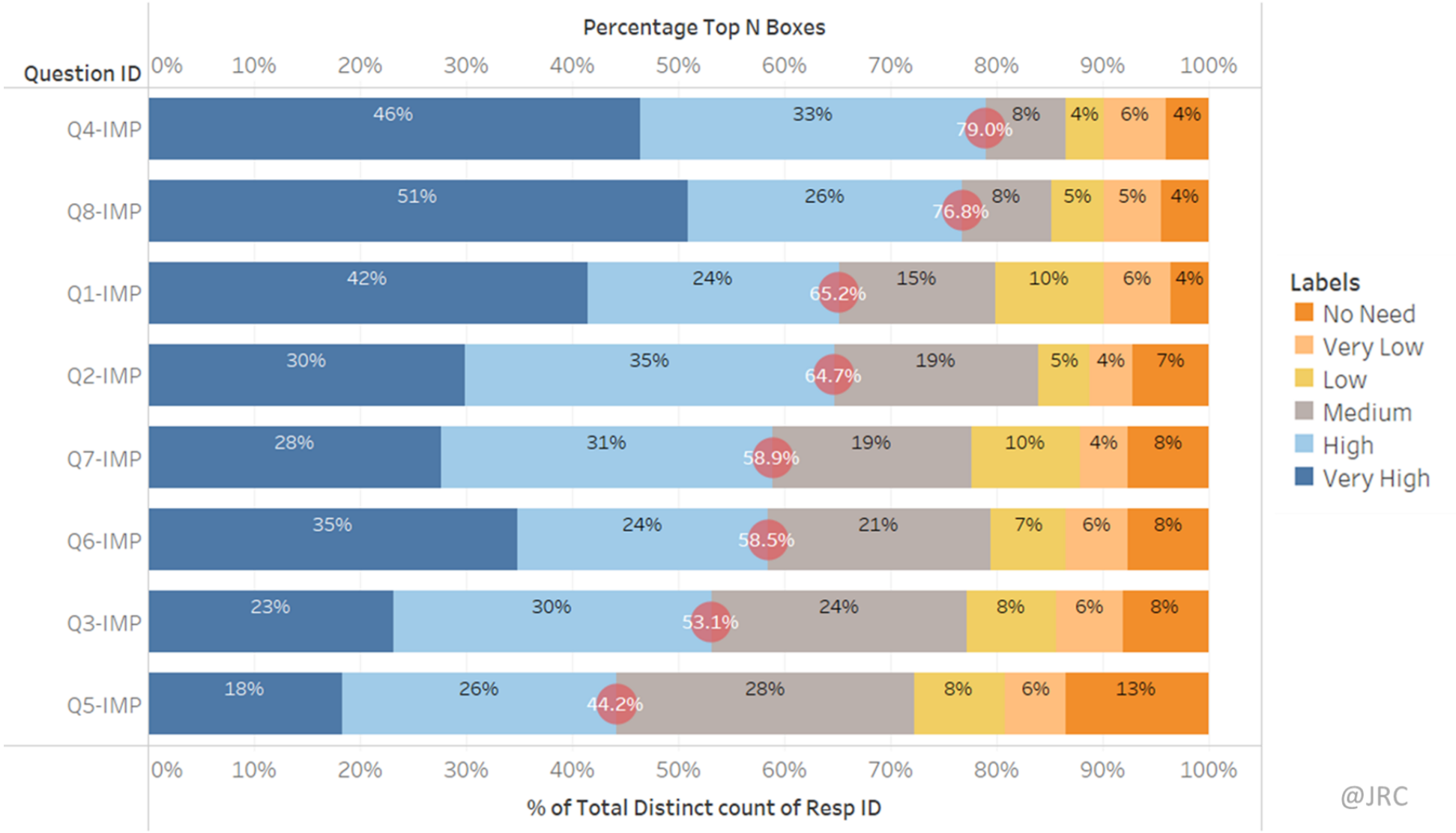


Survey Analytics



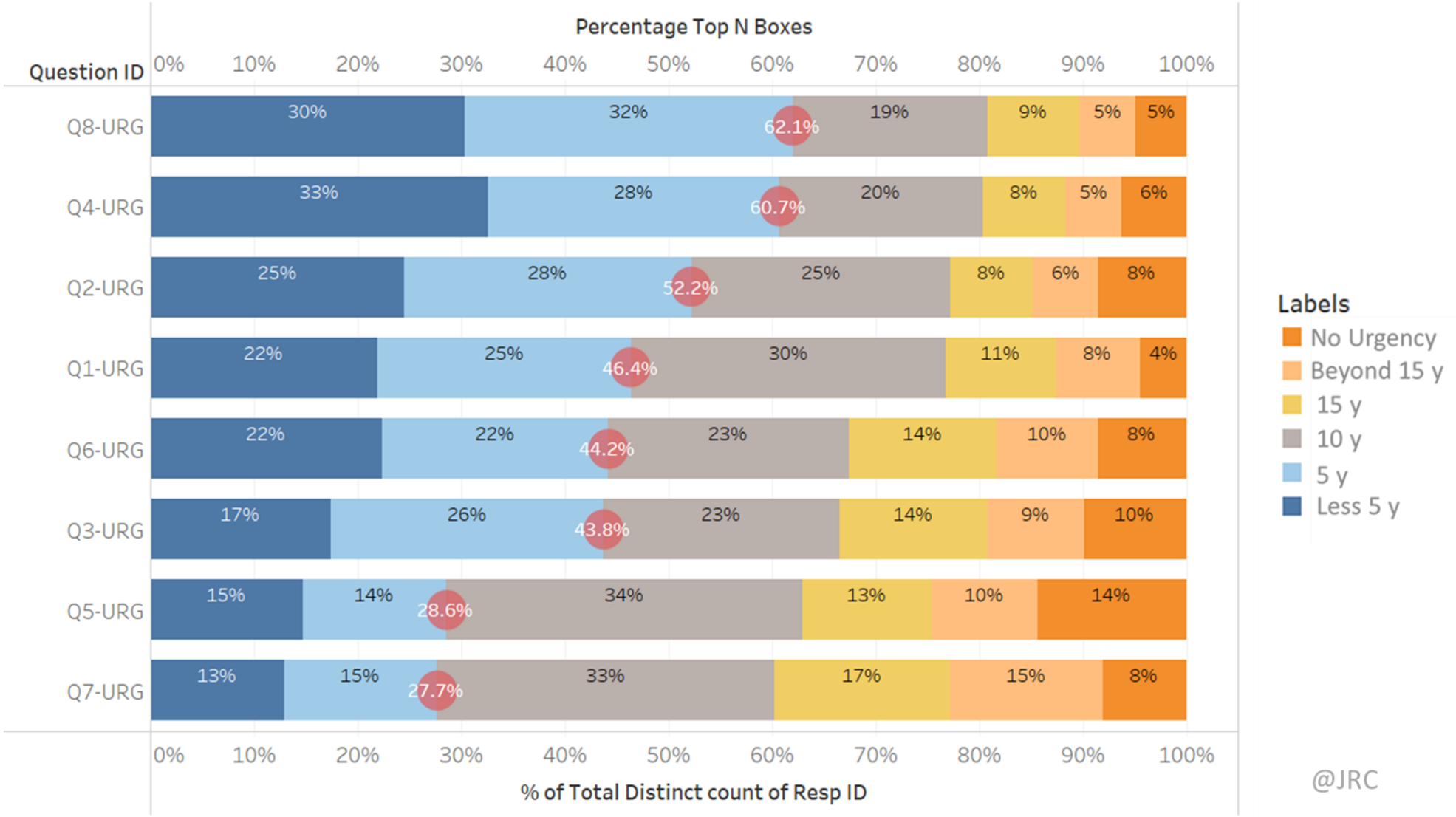
- **5-point scale** for Importance & Urgency
  - No answer = No Need/No Urgency
- Number of respondents (%) for each point in the scale (Stacked Bar chart)
- **Top N 2 Boxes**: Percentage of respondent's positive answers (red cercle)
- Unweighted analysis

Global Survey Results – Thematic Areas Importance



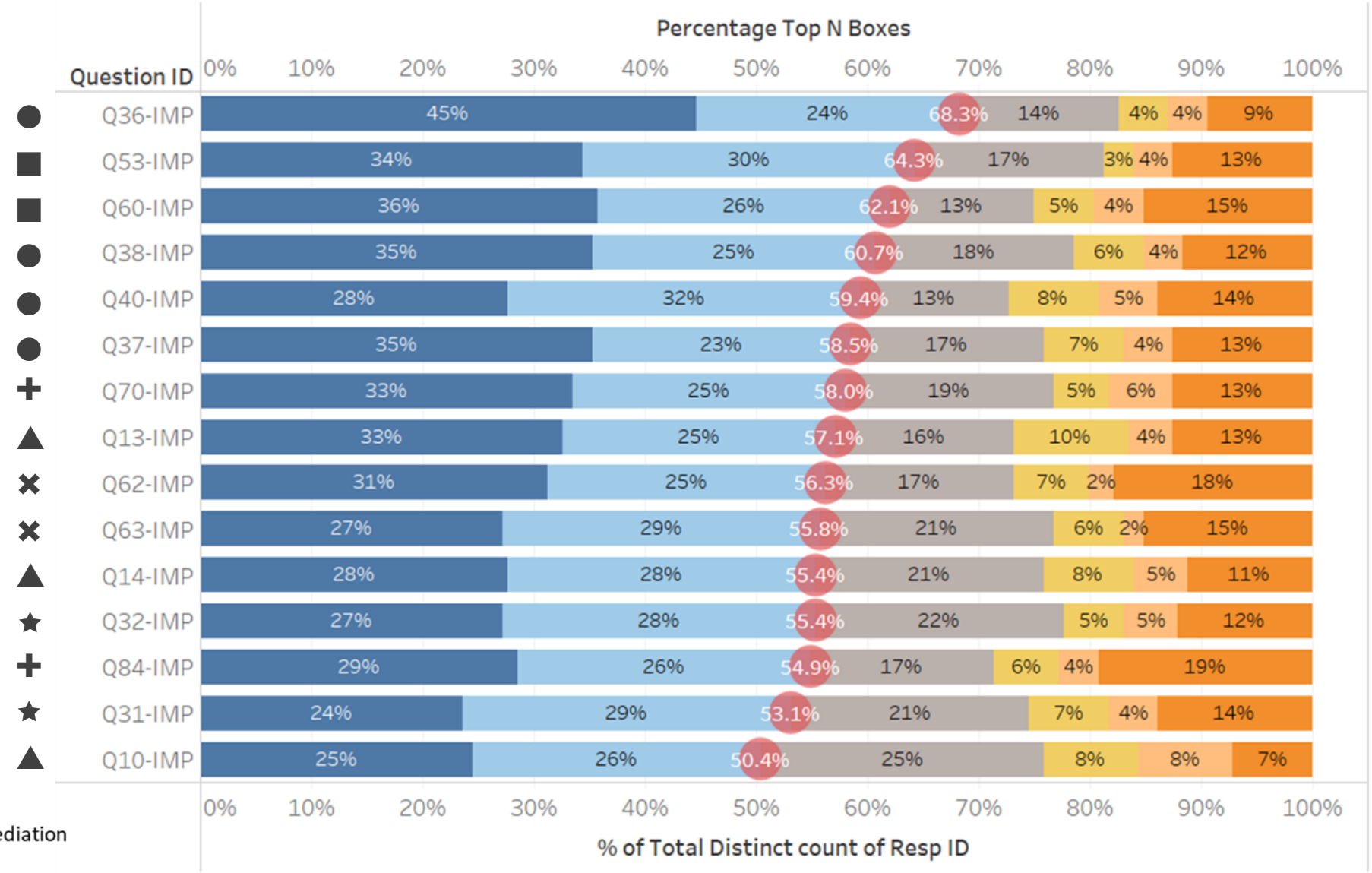
@JRC

Global Survey Results – Thematic Areas Urgency



@JRC

Global Results – Top 15 Sub Thematic Importance



● Characterisation
■ Dismantling
✖ Environmental remediation
★ Human Resources
✚ RWM
▲ Safety & Radiological Protection

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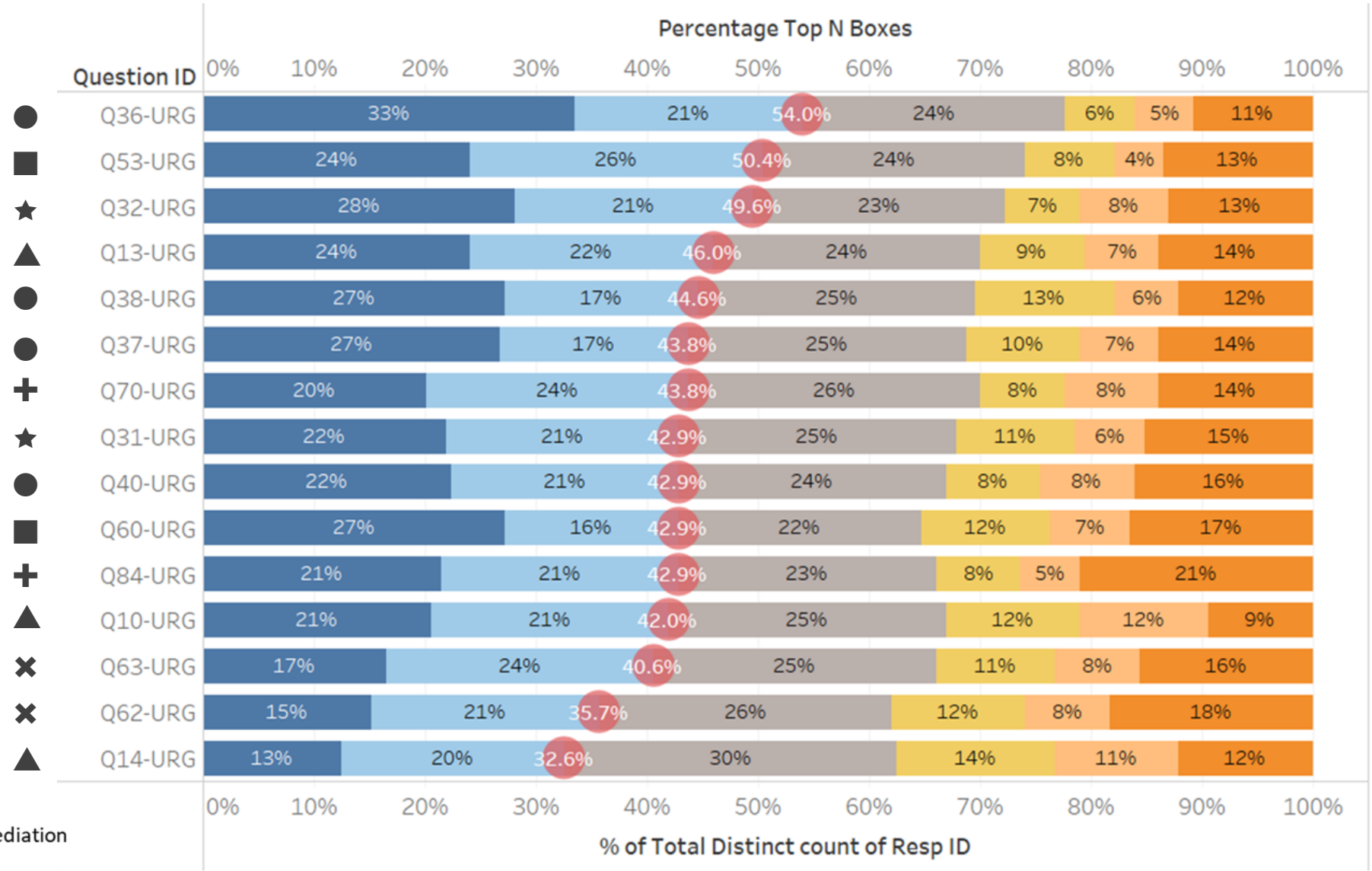
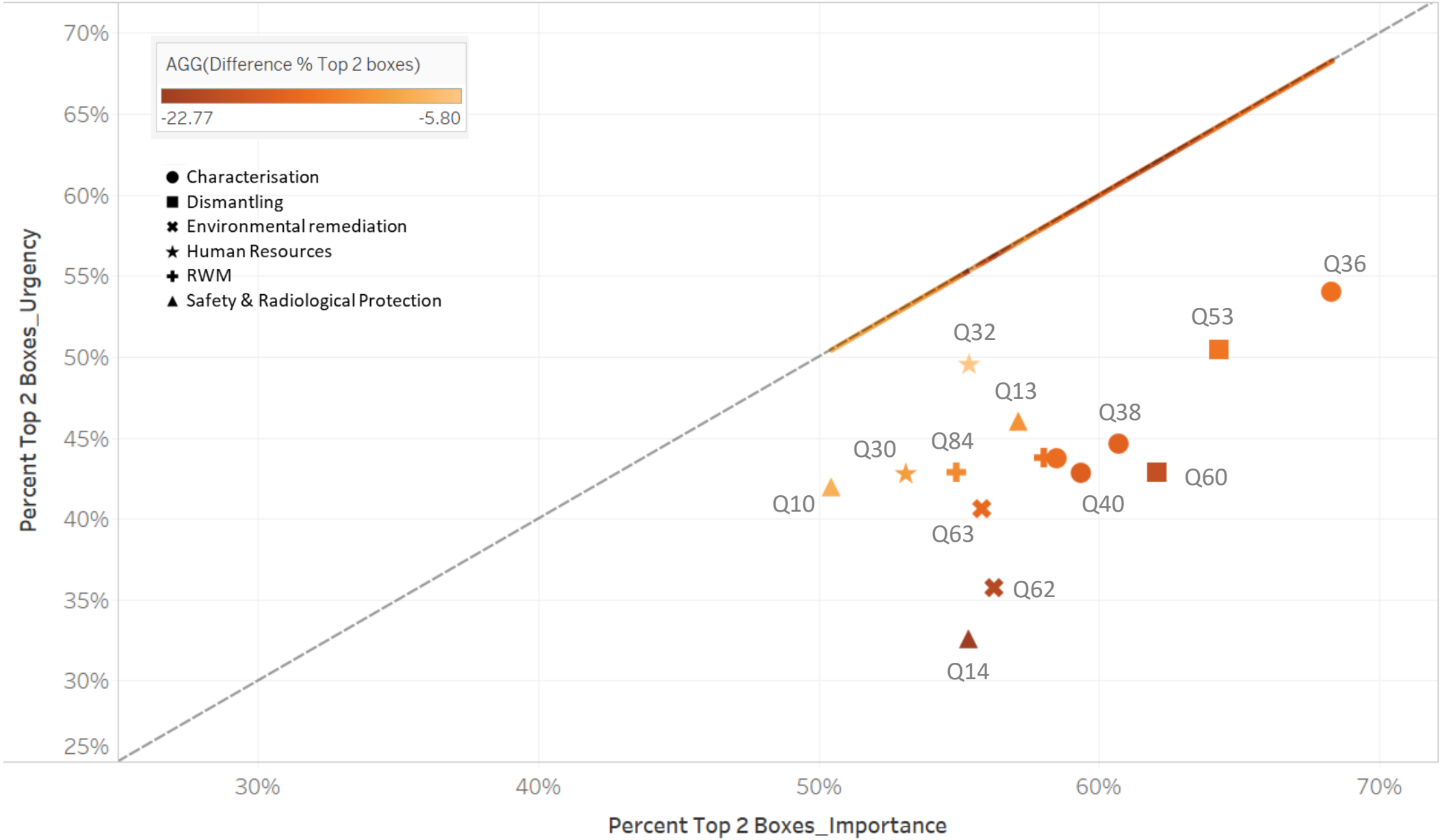
Global Results – Top 15 Sub Thematic Urgency



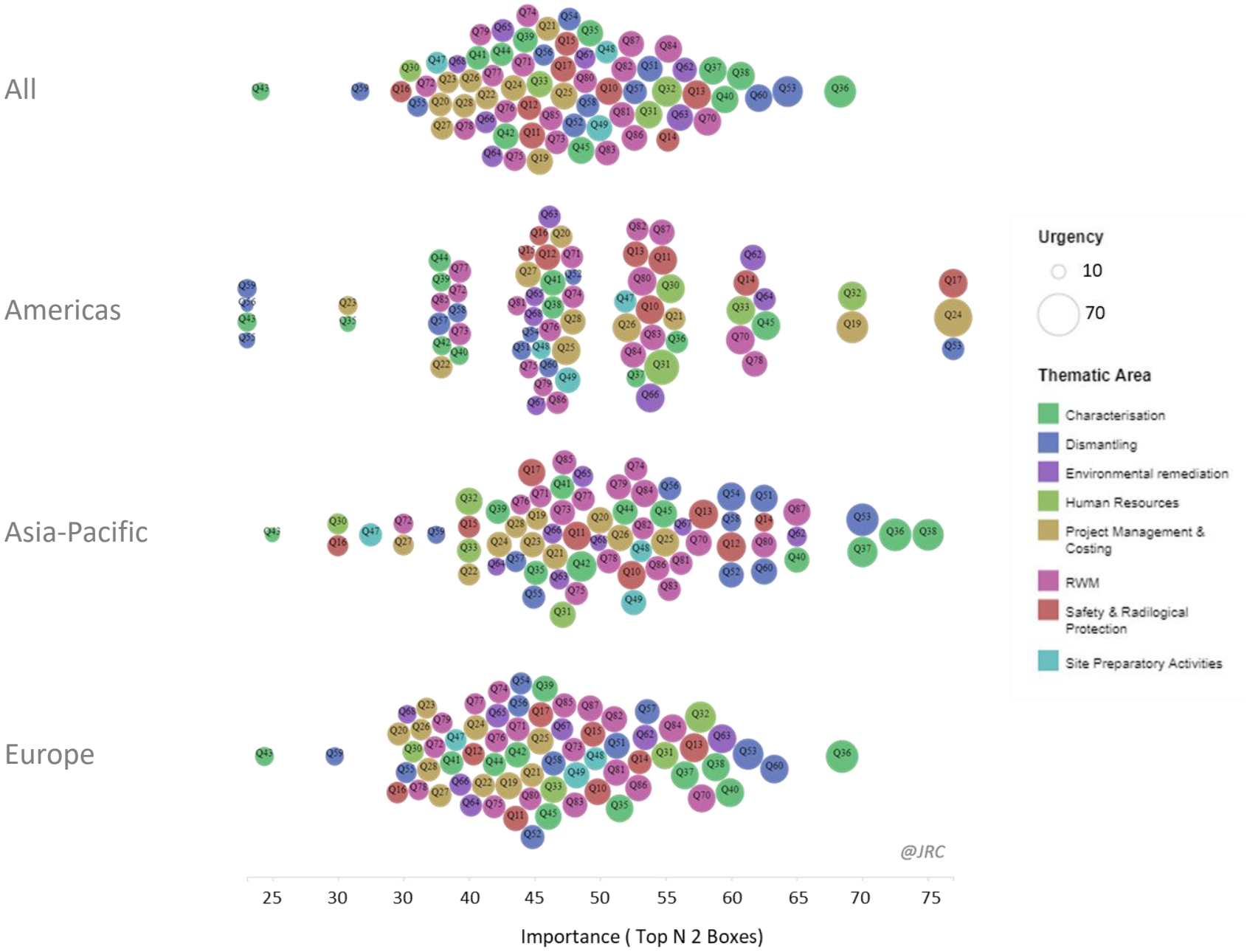
- ● Characterisation
- ■ Dismantling
- ✖ Environmental remediation
- ★ Human Resources
- ✚ RWM
- ▲ Safety & Radiological Protection

@JRC

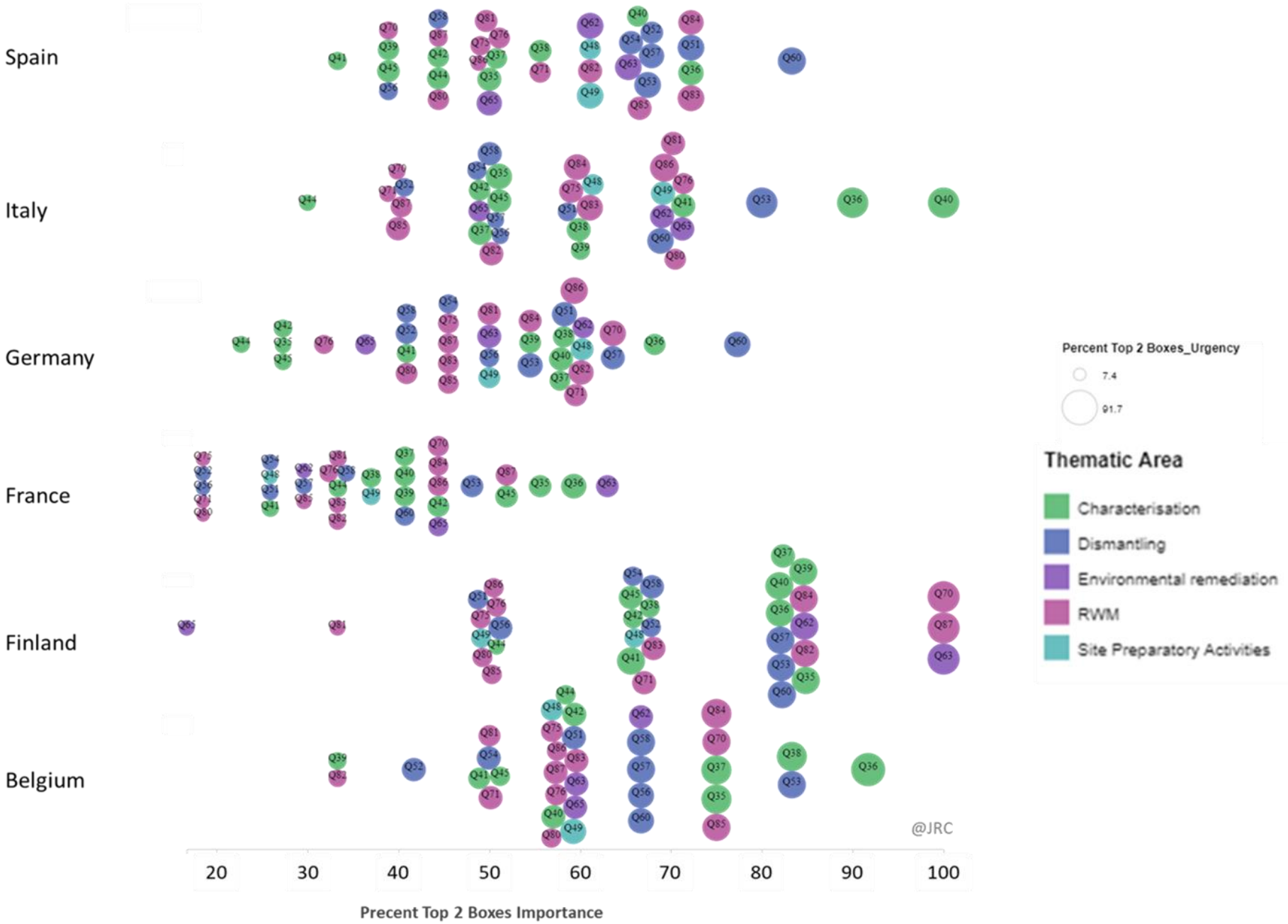
Top 15 - Importance *versus* Urgency



Survey Results – Regions



Survey Results – Country – Technical Areas

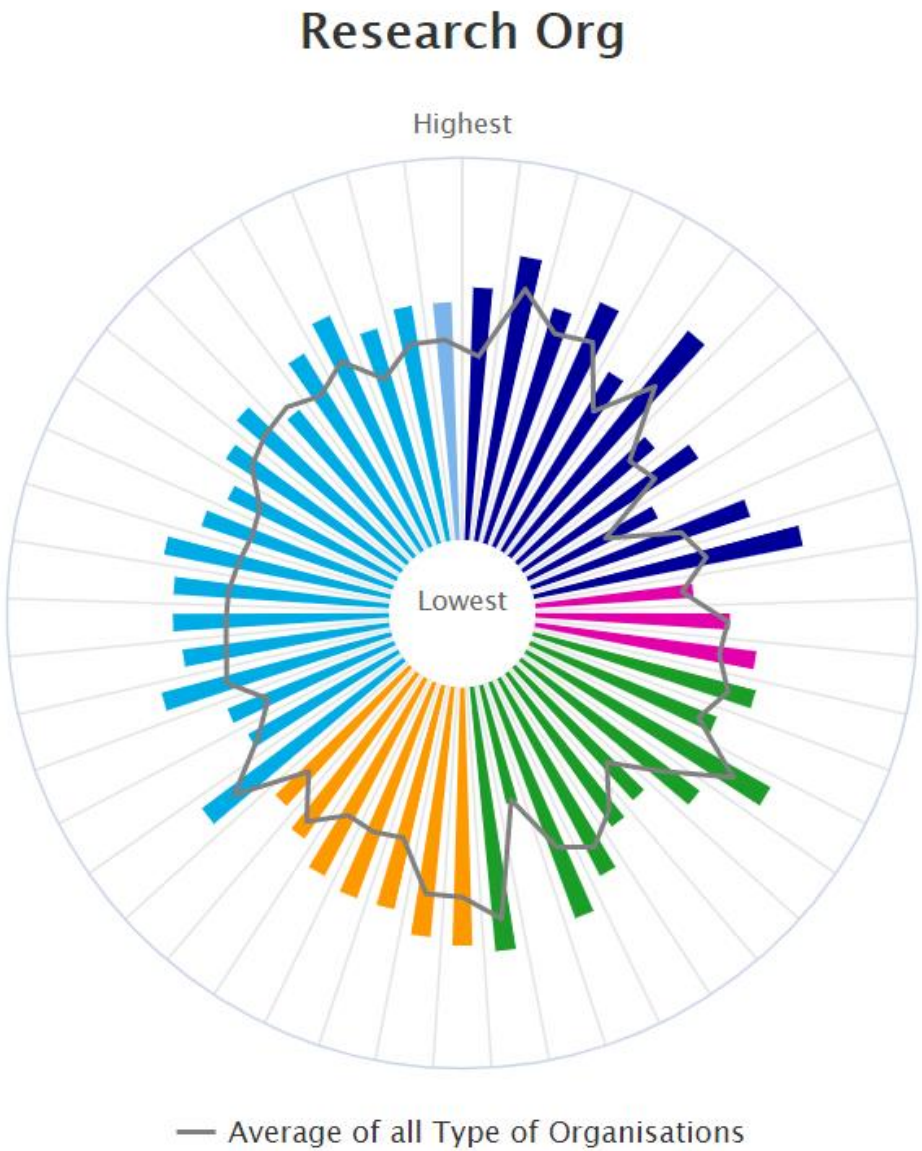


Survey Results – Type Organisation

Importance-Research Org

Thematic Areas:

Characterisation
Site Preparatory Activities
Dismantling
Environmental Remediation
Radioactive Waste Management



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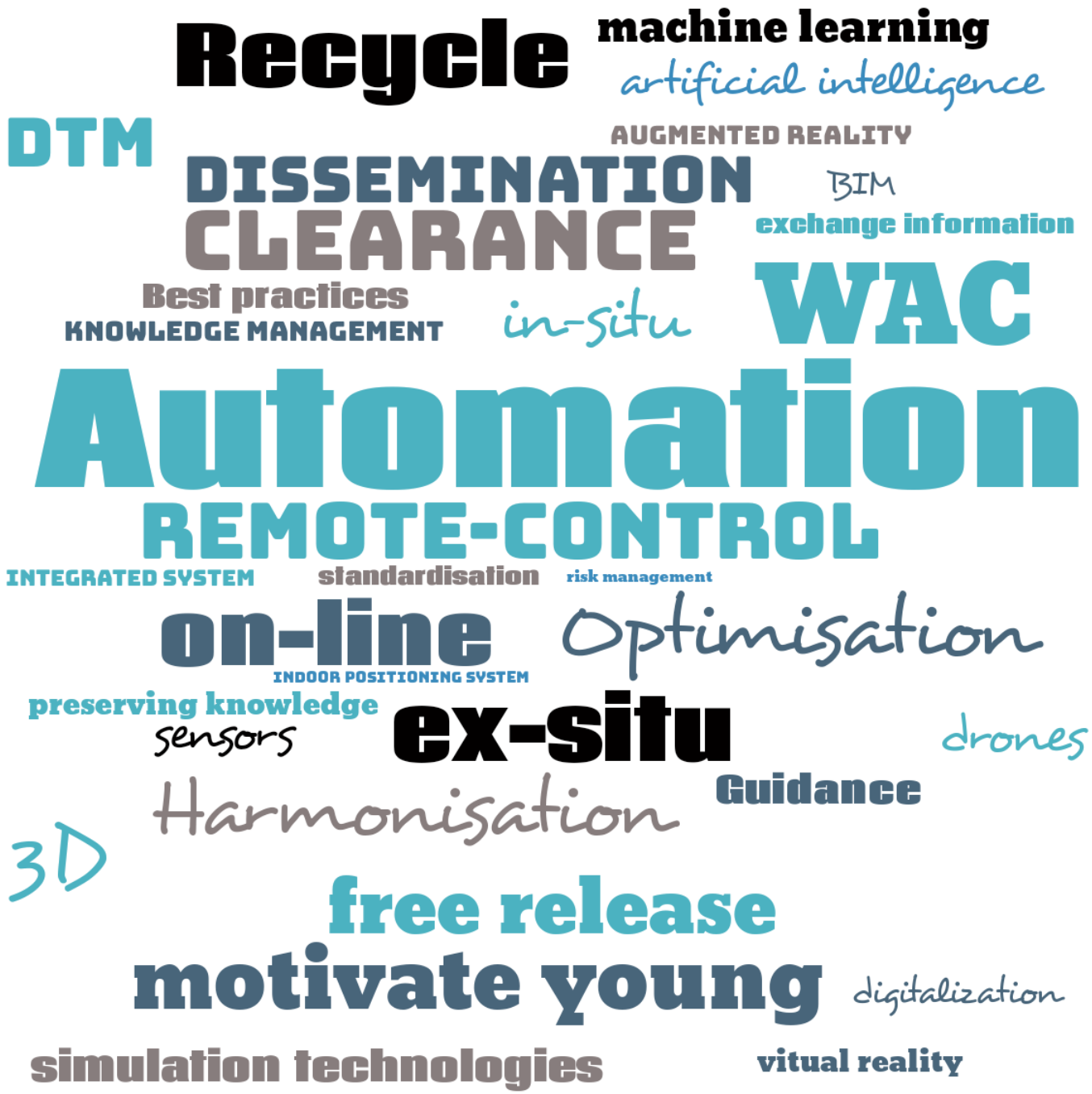
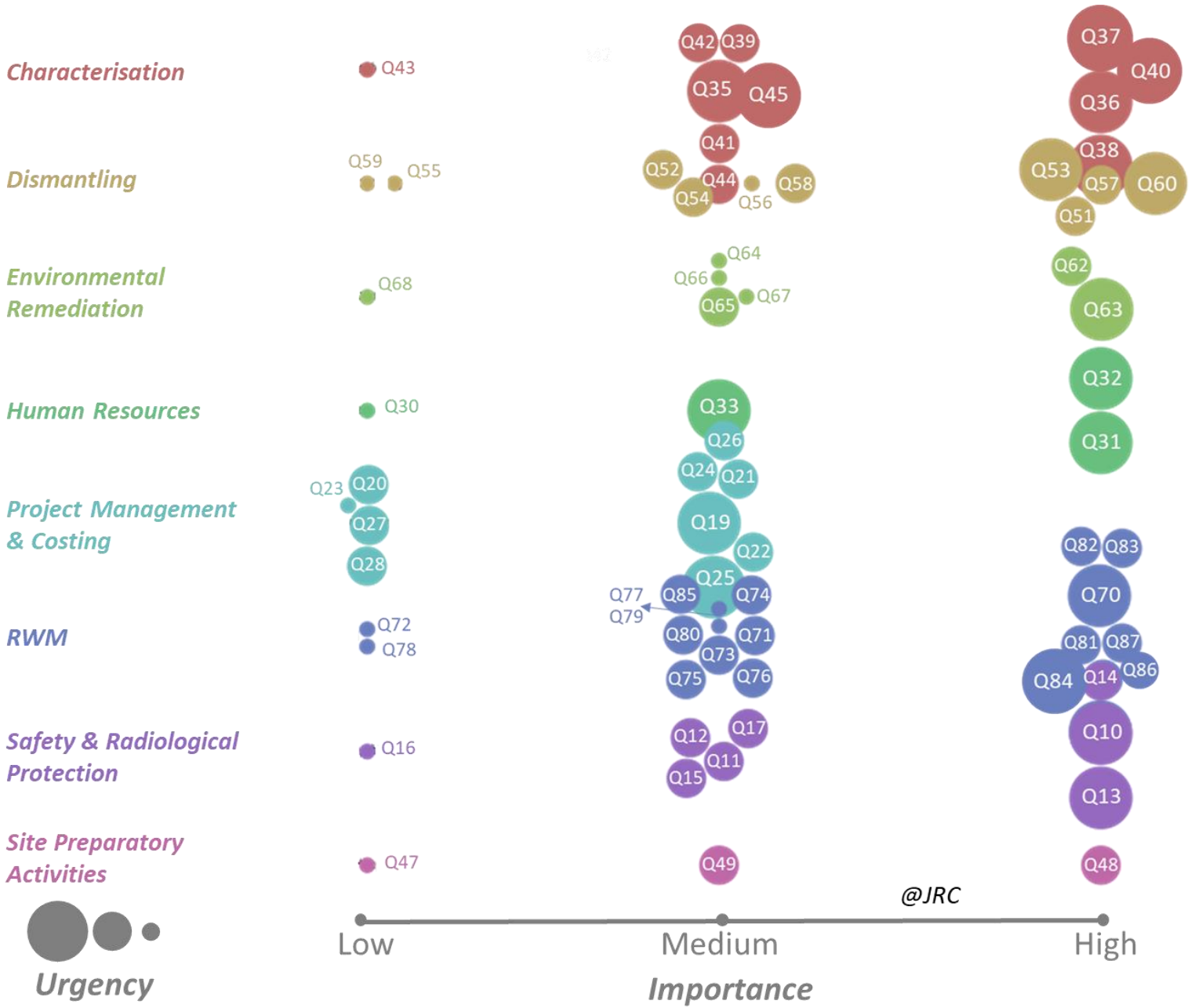
Open Questions



Conclusions – Global Full Visualization- Unweighted

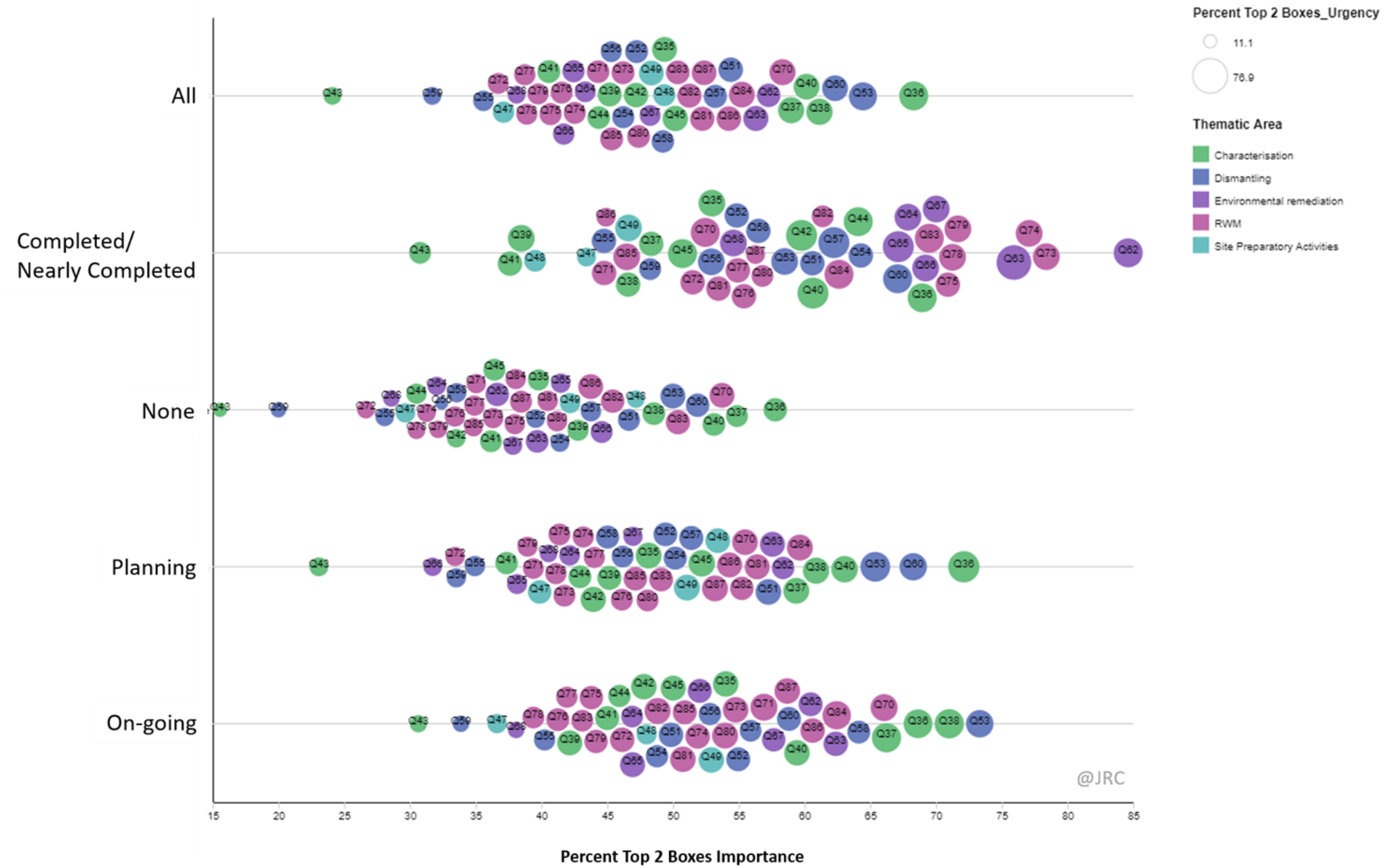


Percentage of respondents' positive answers

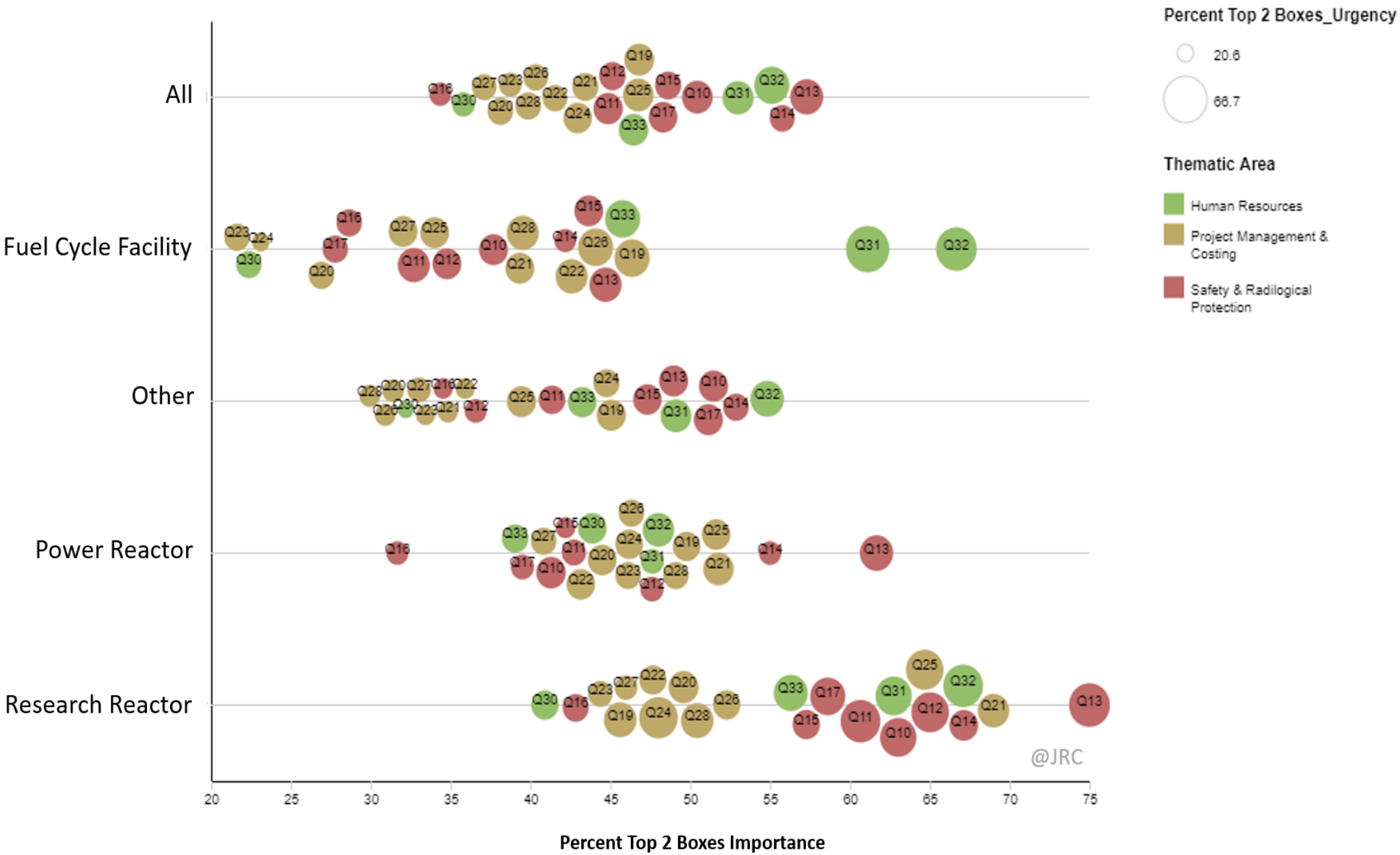
	Importance	Urgency
High	70 - 50	55 - 40
Medium	50 - 40	40 - 30
Low	40 - 30	30 - 20

Thank you

Survey Results – Status of Decommissioning Project



Survey Results – Type of Facility – Non-Technical Areas



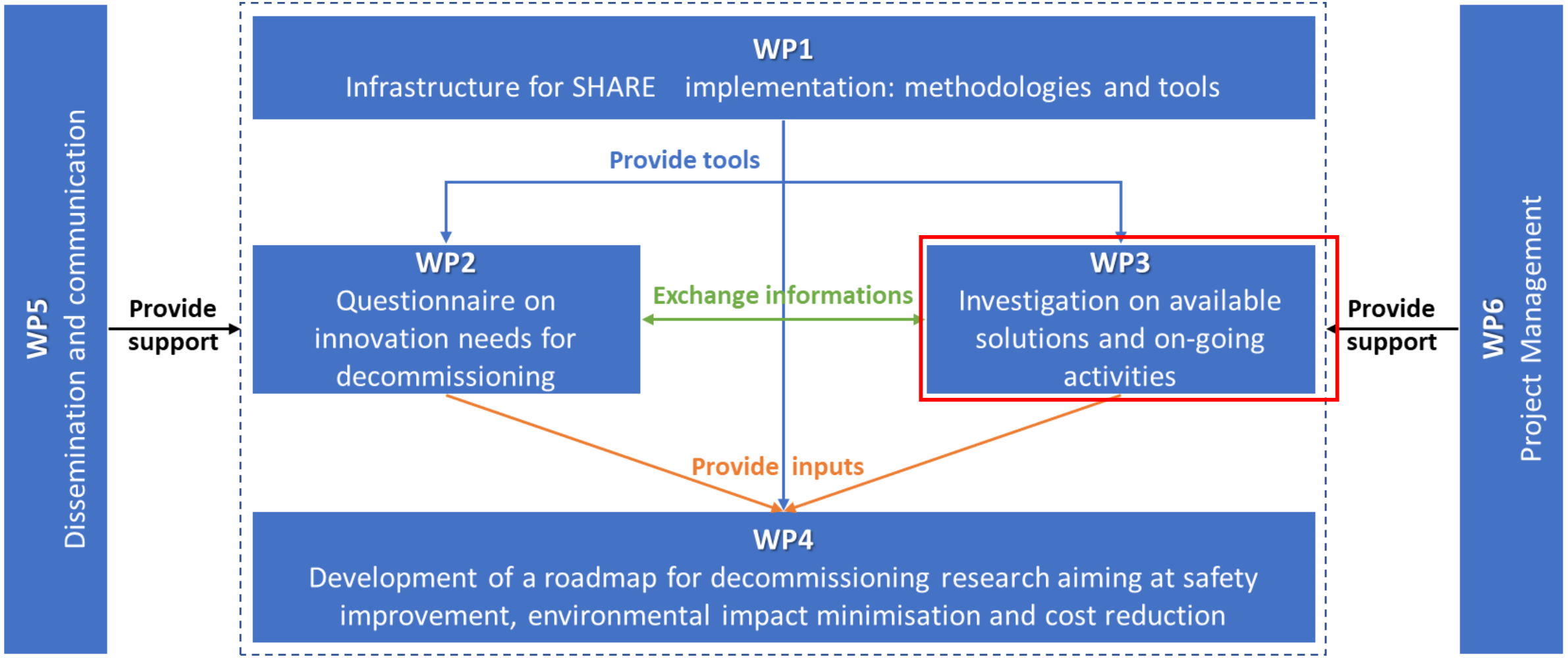
EU-H2020- SHARE-Decommissioning
DigiDecom March 2021

SHARE - WP3 Introduction

WP Leader : NNL (UK)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nº 847626.

WP3 in the PERT chart



WP3 Tasks

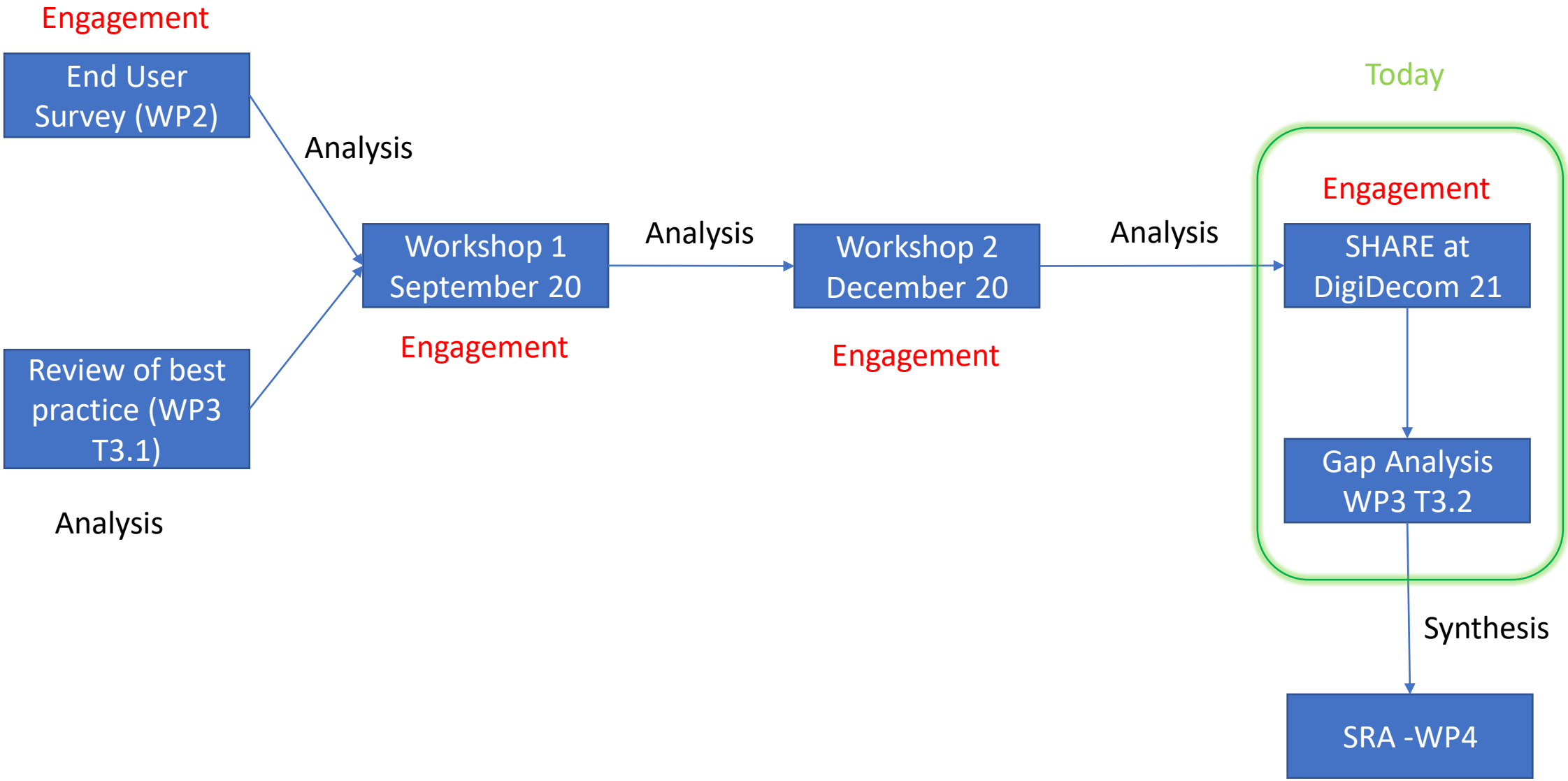
SHARE

- **Task 1 :** Review of international best practice and advanced technologies in radioactive waste management, environmental remediation and decommissioning
  - Task Leader Sogin

- **Task 2 :** Assessment and comparison of technology/ work practices – GAP Analysis/ Benchmark
  - Task Leader KIT

- **Task 3 :** International collaborative technology development initiatives
  - Task Leader NNL

Route map to today



Strategic overview (Example)

Sub-thematic area	What are the NEEDS in R&D, new methodologies, standards, and cross-cutting technologies?	Comment (clarification on the need/ cluster made)	Desired state/ available solutions (Are they implemented or under development)	Review from D 3.1	What is the Gap?
Q60. Robots and remote controlled tools for dismantling	Remote cutting systems	- Heavy gauge stainless steel cutting capability	- Sellafield have size reduced a dissolver vessel with laser snake (Implemented) - Sellafield have 3 active demonstrators for remote cutting of large metal items using robots and lasers 6 months from active testing (Under development) - RPV internals cut remotely by multiple vendors for many years now (Implemented)	A lot of initiatives linked to remote cutting technologies (Ni2050) as well as experiences written in 6.1 chapter regarding RPV internals cutting remotely.	No gap regarding the technology as many new projects and initiatives are already working.
	Simplistic database of existing robotics and technologies with evaluation to specific tasks.		- Cogetus database available - US DOE has robot list, but it is not relational.	IDN Wiki: a Web based tool to support information sharing among its members. Large part is dealing with remote systems and associated lessons learned.	Gap is related to have an interactive database that performs evaluation as well.

Gap analysis outcomes

SHARE
A roadmap for research in Decommissioning

	A	B	C	D	E	L	M	N
1	**SHARE - Identification of Gaps**							
2	**Environmental Remediation and Site Release**							
3		**Cluster**	**Needs, Challenges, Problems, missing**	**Objectives**	**Desired state**	**Type of action proposed**	**Impact/ reason/ outcome of proposed action on:**	**Global ranking of sub-hematic from survey Importance/ Urgency)**
19	Q64 Modelling and statistical tools to analyse contaminant transport in subsurface soil and groundwater	improve accuracy of predictive modelling	need for improved models to determine how radionuclides behave over the long term, suring site stewardship	improvemnets in the predictive modeling to determine contaminant transport and radionuclide behaviour in longer term	Research and developments required to facilitate the predictive modeling for contaminant transport and radionuclide behaviour in longer term	Research and development	of digital tools to facilitate the predictive modeling for contaminant transport, radionuclide behaviour in longer term and underground contamination	56/58
20			need for modelling and statistical tools to analyse contaminant transport and also related to management plans					
21			combination between deterministic model and probabilistic approach (geostatistics)					
22			Optimize iterative borehole sampling					
23			Lack of good predictive (deepness of contamination) methodology for concrete and soils contamination					
24		exchange experiences among different countries in different situations for the model building and for long time follow-up	exchange of experiences to validate models	Experience exchange among the stakeholders to validate the models used	Database that provides the experince exchange on different models implemented in the projects	Dissemination	of experience exchange among the stakeholders on models used	
25			Database on practical experiences on following historical model results along time after remediation					
26		develop a multi criteria analysis to optimise the decision making process	Overall optimisation taking into account costs, end state and protection of the natural habitats (remediation is not always good for environment protection). Need for multi criteria analysis.	To develop a multi criteria analysis considering cost, end state and environmental protection for soil remediation	Development of multi criteria analysis to optimise the decision making for choosing technologies	Guidance and development	of multi criteria analysis to optimise the decision making towards soil remediation technologies	

Discussion of outcomes by thematic area in break out groups

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DO YOU AGREE with the PROPOSALS, CAN YOU think of ANY OTHER ACTION?

Source: SLIDO

Thanks for your attention

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