The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

Deliverable 7

Grant Agreement number:	19NET03 supportBSS
Status:	JNP
Project short name:	supportBSS
Deliverable title:	**“Initial plan for a joint and sustainable European metrology infrastructure underpinning radiation protection regulation needed for the future EMN”**
Lead Partner:	PTB
Deliverable due date:	May 2021
Submission date:	May 2021

This project 19NET03 supportBSS has received funding from the EMPIR programme co-financed by the Participating States and from the European Union's Horizon 2020 research and innovation programme.

19NET03 supportBSS denotes the EMPIR project reference.

Contents

List of figures

List of tables

Abbreviations

EMN	European Metrology Network
RP	Radiation Protection
IR	Ionising Radiation

1 Introduction

In order to develop and establish a sustainable European metrology infrastructure that underpins the radiation protection regulation, the metrological capabilities and regulations must first be defined and then the necessary programs for the exchange of knowledge and capacity building must be set up. The combination of these two developments enables the supportBSS project and the European metrology network (EMN) in the future to draw up an initial plan to build such a common and sustainable European metrology infrastructure.

For this purpose and in the first step within the scope of Tasks 5.1-2, the list of the identified existing infrastructure and the available regulations for radiation protection metrology were created. These databases are given in the form of Excel tools (see Annexes 2 and 3). In the second step and in the context of Task 4.2, the current activities for knowledge-sharing and capacity building in the field of radiation protection metrology were identified. The resulting early actions are planned in Task 4.3.

In this document and in the context of Task 5.3, an initial plan is drawn up that takes into account the development of a joint and sustainable European metrology infrastructure in the field of radiation protection. Figure 1 shows the workflow that is considered in preparation for this task.

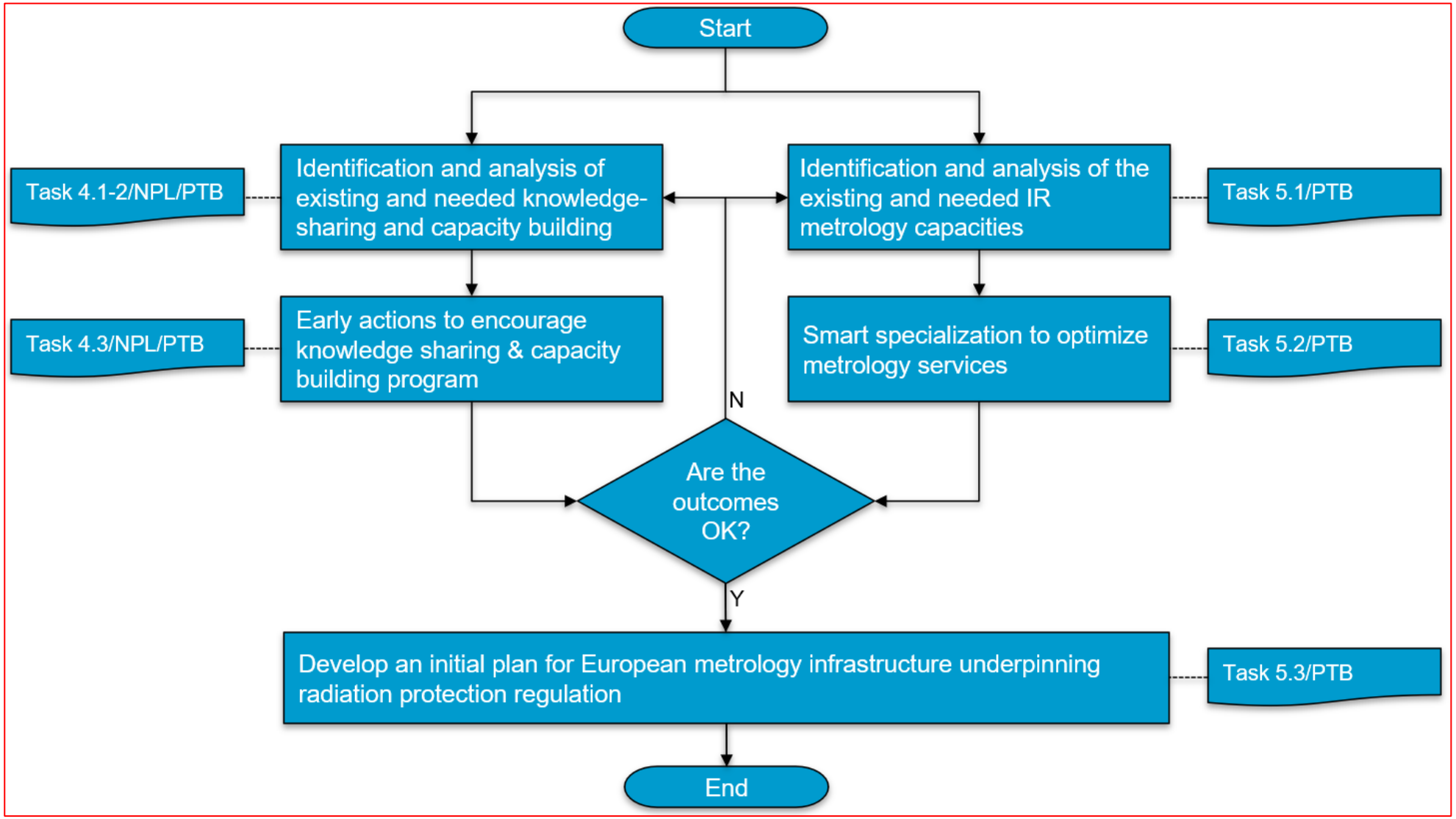

Figure 1 The workflow for developing an initial plan for a joint and sustainable European metrology infrastructure underpinning radiation protection regulation

2 Develop a plan for a joint and sustainable European metrology infrastructure underpinning radiation protection regulation

As a first step towards developing a sustainable European metrology infrastructure, the existing IR metrology capabilities must be identified and analyzed (see Figure 1).

This can be done in the following activities:

- Identification of the existing IR metrology infrastructures
- Identification of the IR regulations
- Gap-analysis of the IR metrology infrastructures
- Mapping and prioritization of the existing and needed IR metrology infrastructures

The corresponding metrology services can be optimized and improved through the smart specialization of these capabilities. The procedure for carrying out these activities and the smart specialization of the IR metrology capabilities were discussed and agreed at the first meeting of WP 5 on February 18, 2021. The minutes of the meeting are available on the sharepoint (see Annex 1).

The following is a detailed explanation of these activities.

2.1 Identification of the existing IR metrology infrastructures

The available databases such as BIPM capability list, CONCERT, EURAMET, IAEA SSDL network list were taken into account in identification and recording of the information on the IR infrastructures underpinning the radiation protection regulations (see Figure 2a).

An Excel tool was created that addresses all of these databases and records all the information on the IR infrastructure in detail. A snapshot of this Excel tool is shown in Figure 2b. The Excel tool is available on the sharepoint and will be updated (see Annex 2). The detailed explanation of how to deal with the Excel tools took place during the WP 5 meeting.

In this way, the sorting of the facilities according to i) general use of the infrastructure and ii) special facilities is taken into account by adding the appropriate columns in the Excel tool.

(a)

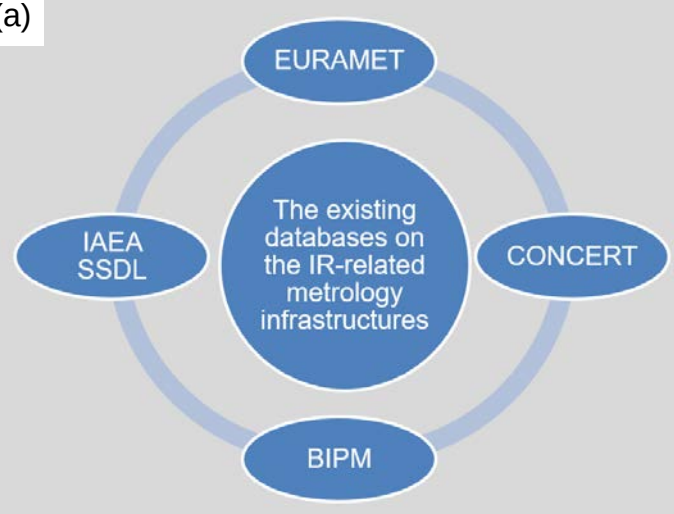

Figure 2:

a) The existing databases that were taken into account in identifying and recording the information on the IR metrology infrastructures.

b) A snapshot of the Excel tool addressing all of these databases and recording complete information about IR infrastructure in detail. The Excel tool is available on the supportBSS sharepoint and is updated regularly.

(b)

A5.1.1 Contents							
	BIPM-infrastructures:	BIPM COMPARISON	BIPM CMCS Dosimetry	BIPM CMCS Neutron	BIPM Radioactivity		
	CONCERT-infrastructures:	External exposure facilities	Internal exposure facilities	Contaminated sites and Observatories	Databases	Sample Banks	Cohorts
	IAEA_SSDLs-infrastructures:	Radiation Protection	External Beam Radiation Therapy	Surface contamination monitor	Conventional Diagnostic Radiology	Mammography	Neutron
	History						

BIPM_CMCS_Neutron (Note: 192 results_Data copy established on 25 January 2021)

TAG	Country code	Institute	Branch	Quantity	Instrument or artifact	Instrument type or metho	Nuclide or sourc
175	GB	NPL	Neutron Measurements	Emission rate	Sealed radionuclide neutron source	Calibration in manganese sulphate bath	Am-241/B source
180	GB	NPL	Neutron Measurements	Emission rate	Sealed radionuclide neutron source	Calibration in a moderating detector	Am-241/B source

2.2 Identification of the IR metrology regulations

The existing guidelines and standards in the field of radiation protection were collected. The available best practice guidelines, ISO standards and IAEA guidelines on radiation protection calibration, type testing and emergency preparedness as well as other documents were taken into account for the existing guidelines and standards in the radiation protection area (see Table 1).

The other Excel tool was prepared for this purpose. The detailed explanation of how to deal with Excel tools took place during the first meeting of WP 5. The Excel tool is available on the sharepoint and will be updated (see Annex 3).

Table 1 The existing guidelines and standards databases in the area of the radiation protection

ISO	Good Practice Guide	Report from EURAMET	GUM	IEC	ICRP/ICRU	IRPA	IAEA guides

2.3 Gap-analysis of the IR metrology infrastructures

A gap analysis was carried out in order to determine, in which areas of the radiation protection infrastructures, guidelines and standards are missing. For this purpose and as an agreement of the WP 5 meeting, the metrological gaps in radiation protection that were identified during the Gap-workshop on September 11, 2021 (as part of A6.2.1) were also taken into account. The final report of the Gap-workshop is available on the sharepoint (see Annex 4).

The results of the workshop were summarized in an Excel table and sent to the project partners to supplement the possible missing infrastructures, guides and standards. The Excel tool is available on the sharepoint and will be updated regularly (see Annex 5).

The collected identified gaps should be sent to the stakeholders for feedback. This should be done within the framework of the developed communication strategies between EMN and stakeholders. The development and definition of such a strategy follow the process of WP 1, in which a model for the communication strategy and stakeholder mapping was introduced (see also deliverable number 2 “D2” in Annex 6).

At this point it should be mentioned that the main stakeholders took part in the Gap-workshop, so the related metrological gaps in the RP have already been taken into account in the workshop report that has already been sent to them for feedback. However,

there may be feedbacks from key stakeholders on other issues that may not have been discussed in the Gap-workshop. This point should be taken into account in the future.

2.4 Mapping and prioritizing the existing and needed IR metrology infrastructures

The identified meteorological gaps that were introduced by key stakeholders during the Gap-workshop and by project partners consist of a variety of topics in the field of radiation protection.

Since the results of the gap analysis will in future guide the supportBSS and EMN in the development of the Strategic Research Agenda (SRA) and Roadmaps, a process for mapping and prioritizing the gaps must be taken into account. A proposed mapping model is shown in Figure 3.

According to this model, the identified metrological gaps can be assessed based on the needs of the stakeholder community and the interests of the metrology community. Analogous to the proposed EURAMET model for stakeholder mapping, the evaluation parameters must be scaled. The stakeholder mapping model can be found in deliverable number 2 (D2) in Annex 6.

So far, the needs and interests of the stakeholders and the metrology community have been scaled as LOW (L), MEDIUM (M) and HIGH (H). Accordingly, there will be 9 assigned areas in which the metrological gaps in the radiation protection can be localized.

These areas can be prioritized as following:

I) The area with HH evaluation is considered to be the TOP-PRIORITY area (see small dashed circle in Figure 3).

II) The areas with MH, MM, HM scoring are considered as PRIORITY areas (see big dashed circle in Figure 3).

III) The LH, LM, ML and HL rated areas are considered SECONDARY-PRIORITY areas.

IV) The LL rated area is considered a LOW-PRIORITY area.

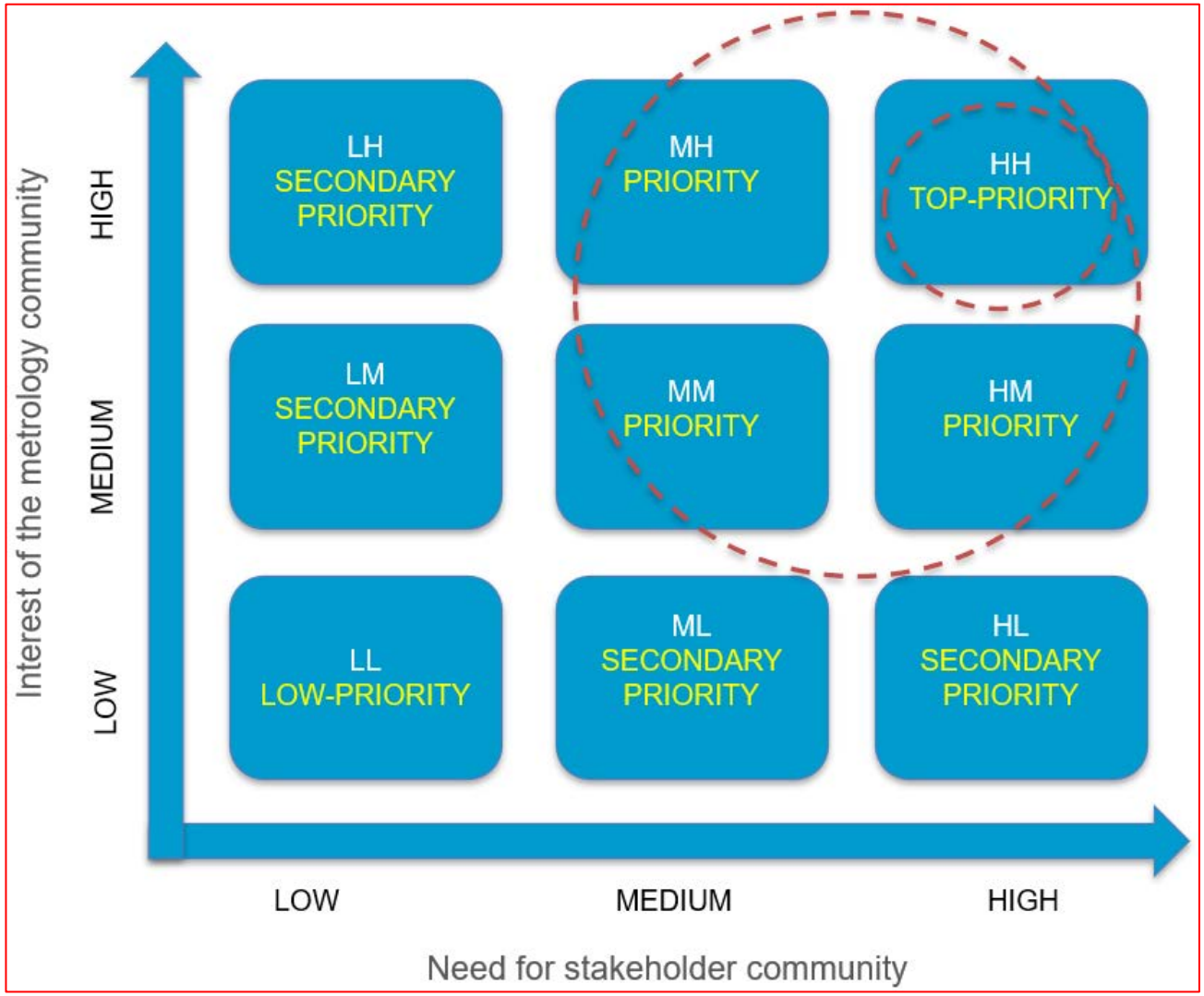

Figure 3 A proposed model of mapping/prioritizing the existing and needed IR metrology infrastructures. The key areas are shown in dashed circles.

2.5 Coordination and smart specialization of IR metrology capabilities

One of the goals of the EMN is to give the metrological communities the opportunity to optimize and improve their metrological services in the field of radiation protection. The same quality of services for all Europeans can only be achieved if every member state applies the same metrological quality assessment (QA) for all radiation protection issues. This requires high costs for maintaining the existing IR metrology infrastructures and creating those needed for metrology communities in the future.

Smart specialization of IR metrology capabilities gives a unique opportunity for members of the future EMN to overcome such difficulties and optimize their metrology services by focusing on competitive strengths and creating the opportunity for realistic growth potential. Smart specialization is a place-based approach, meaning that it builds on the assets and resources available to regions and member states and on their specific challenges in order to identify unique opportunities for development and growth.

An overview of the key elements of smart specialization strategy was discussed in the WP 5 meeting and an analysis for a smart specialization is carried out in Task 5.2. The workflow to prepare for this task is shown in Figure 4.

The prerequisite for the realization of the smart specialization is the identification of the unique facilities as well as the missing RP capacities and capabilities.

The identification of the unique facilities has been already planned in the context of Task 5.1 and corresponding columns were taken into account in the Excel tools (see Annex 2). In addition, some missing RP capabilities were already fixed during the Gap-workshop (see Annex 4).

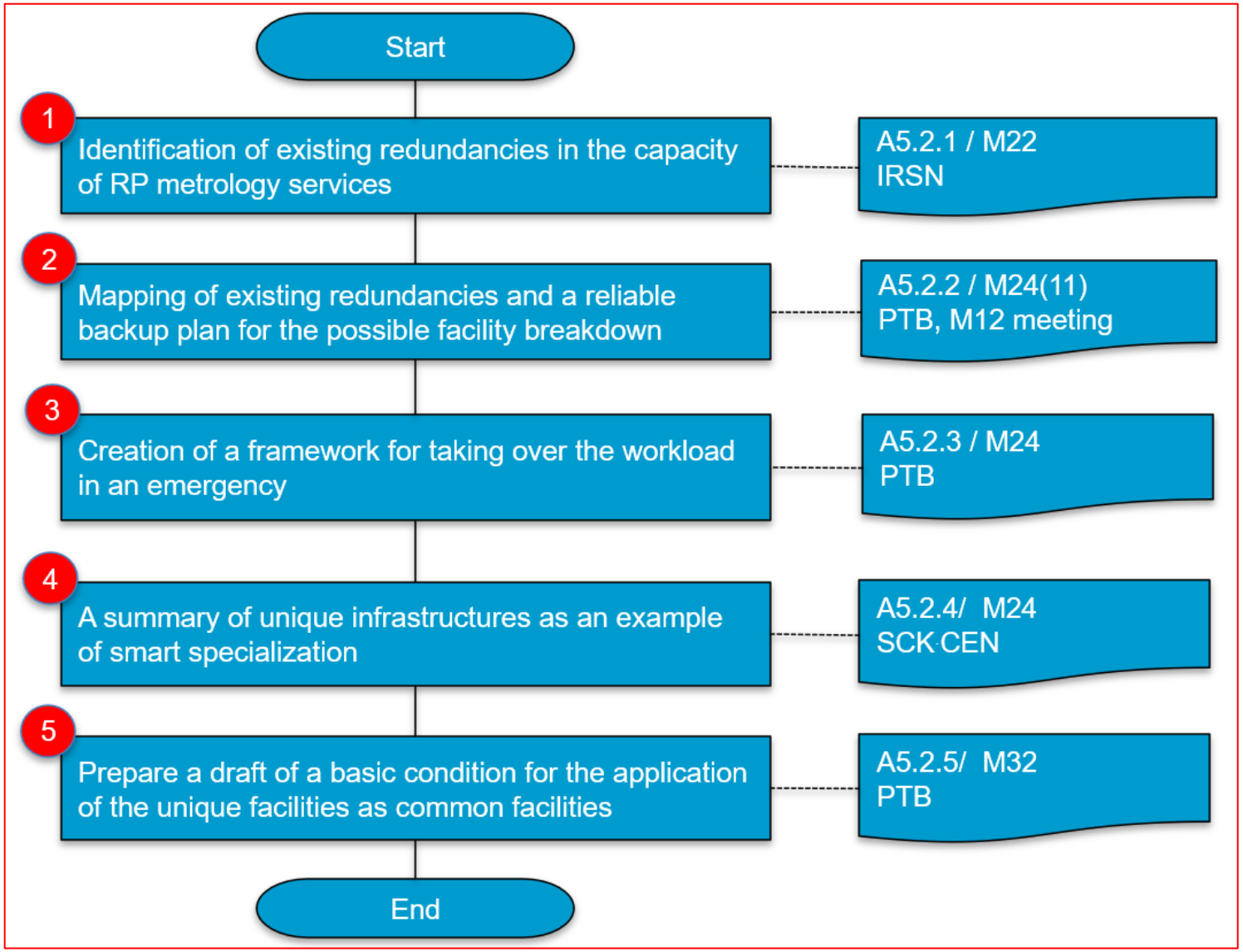

Figure 4 The workflow for analyzing the smart specialization of IR metrology capabilities

3 Develop a knowledge-sharing and capacity building program

Development of a sustainable European metrology network underpinning radiation protection regulation is accompanied by development of a program for knowledge-sharing and capacity building for stakeholders (see Figure 1).

The strategy of the EMN is to promote a knowledge-sharing programme to promote the transfer of knowledge from NMI/DIs to stakeholders (primarily emerging NMIs/DIs, secondary calibration laboratories and radiation protection workers). This will include regularly hosted capacity building activities for a wide range of stakeholders, such as the exchange of scientific personnel between organisations, metrology workshops, training courses and interlaboratory comparisons.

As part of WP 4, the knowledge sharing and capacity building program is planned during the following activities:

- Identify existing and required knowledge sharing and capacity building activities
- Gap analysis of knowledge sharing and capacity building activities
- Promote the early impact of the knowledge sharing and capacity building program

The procedure for carrying out the main activities will be discussed in the future in the WP 4 meeting, which was agreed at the M12 meeting on May 4, 2021. The minutes of the M12 meeting is available on the sharepoint (see Annex 7).

3.1 Identification of the existing and needed knowledge-sharing and capacity building activities

This activity was carried out as part of Task 4.1. A review of existing knowledge-sharing and capacity building activities in the field of radiation protection metrology from stakeholder was collected within an Excel table. A summary of the obtained results was presented in M12 meeting.

Figure 5 shows the workflow that is considered for performing this task. The broken red block indicated the outlook steps for the creation of an area for stakeholders on the EMN homepage and the gap analysis of the identified activities for the exchange of knowledge and the capacity building of interest groups.

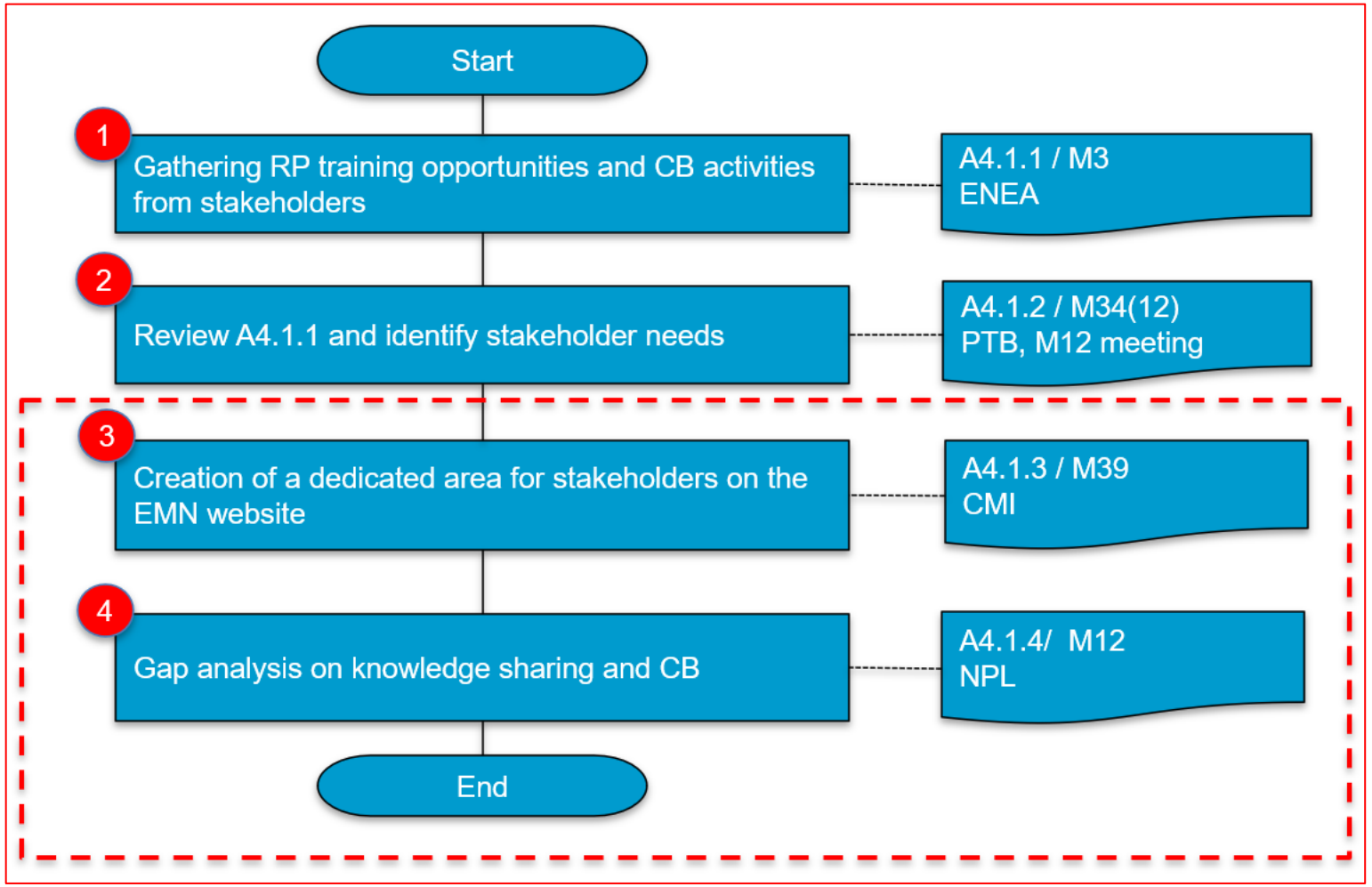

Figure 5 The workflow to identification of the existing and needed knowledge-sharing and capacity building (CB) activities

3.2 Gap-analysis of the knowledge-sharing and capacity building activities

In order to determine in which areas of the radiation protection infrastructures, the knowledge-sharing and capacity building are missing, a gap analysis will be carried out. For this purpose, the capacity building gaps in the radiation protection should be identified. Here the gaps identified during the Gap-workshop should also take into account (see Annex 4).

The results will be summarized in an Excel table and sent to the project partners to supplement the possible missing gaps. When preparing the Excel tools, different areas of IR metrology from different radiation protection databases are taken into account. The following metrological fields were already identified during the process of Task 5.1 (see Annex 2):

- External exposure facilities
- Internal exposure facilities
- Ionizing radiation and radionuclides in health
- Ionizing radiation and radionuclides in environment, energy and industry
- CMCs and Comparisons
- Dosimetry
- Neutron measurements
- Radioactivity
- Radiation protection
- External beam radiation therapy
- Surface contamination monitor
- Conventional diagnostic radiology
- Brachytherapy
- Nuclear medicine
- Tube Voltage
- High dose radiation
- Guides and standards
- …

In this way, the gaps in the metrology infrastructure can be linked to the gaps in the area of the capacity buildings, which enables the simultaneous development of the metrology infrastructure and capacity building program.

The collected identified gaps should be sent to the stakeholders for feedback. This should be done within the framework of the developed communication strategies between EMN and stakeholders. The development and definition of such a strategy should follow the process of WP 1, in which a model for the communication strategy and stakeholder mapping was introduced (see also deliverables D1 and D2).

At this point it should be mentioned that when the main stakeholder participated in the Gap-workshop, the associated metrological gaps in the radiation protection were already taken into account in the workshop report that was already sent to them in order to receive feedback. However, there may be feedback from key stakeholders on other issues that may not have been discussed in the Gap-workshop. This point should be taken into account in the future.

3.3 To encourage early impact resulting from the knowledge-sharing and capacity building program

Eventually, several knowledge sharing activities from the program will be completed and a report will be published summarizing these early impacts. EMN will actively promote the transfer of knowledge between its members, partners and third parties through special series of workshops, publications and assignments.

As an example, a comparison measurement was planned between the project partners so that at least 10 participants were identified during a questionnaire and the summary of the information collected and the initial planning in the context of A4.2.1 were discussed during the M12 meeting. In the next step, PTB creates the detailed plan and informs the participants about the sequence of the comparative measurements. This comparison can increase confidence in CMC. Further technical details can be found in the minutes of the M12 meeting on the sharepoint (see Annex 7).

4 Align with other running initiatives and projects

The activities for getting the EMN working shall be aligned with other successful EMRP and EMPIR projects such as MetroERM, Preparedness, MetroRadon, DOSEtrace, traceRadon and RemoteALPHA.

5 Promote the development of emerging member state

The member state will profit from being involved in a sustainable, comprehensive European system ensuring traceability in radiation protection on a consistently high and worldwide recognized level. They will also be able to influence the initiation of scientific activities regarding relevant measurands not yet covered by the reference method concept.

The EMN will provide the base to implement and to guarantee the same metrological quality of radiation protection for all European citizens by harmonising procedures and combining the capabilities in service and research (i.e. calibration, type testing and reference fields). This requires a coordinated approach to ensure that the required metrological quality in the dissemination of the radiation protection quantities is reached for all dose assessments performed under the EU-BSS: The basic aim is to balance between the required redundancy whilst avoiding unnecessary duplication of work to free up resources to address the new technological needs.

The EMN will work on coherence procedures in calibration and type testing according to international standards such as those from IEC and ISO. This supports the development of all types of equipment (sources, detectors, dosimeters) in a harmonised market which is growing rapidly.

Further details on promoting the development of an emerging member state can be found in the proposal for an EMN on radiation protection (IR Protect) and the Memorandum of Understanding on participation in the EMN IR Protect (see Annex 8).

6 Collaboration with external organisations and third countries

The activities to get the EMN up and running are supported by a core group of organizations and third countries at European and international level.

6.1 Interaction and contributions at European level

EURAMET, European Association of National Metrology Institutes

Interaction with EURAMET together with other EMNS and TC-IR working group “Ionising Radiation and Radionuclides in Environment, Energy and Industry”: By this intensive exchange, the developing ENM was able to provide information to EURAMET on the Call Scope Green Deal/Pre- and Co-Normative/Research Potential. Contact to the EMN Climate and Ocean and the developing EMN Advanced Manufacturing and Pollution monitoring exists.

Direct contribution to EURAMETs strategic work: By this intensive exchange, the developing ENM was able to provide information to EURAMET on the Metrology for Health (2022) on all topics of the 19th Joint Meeting TCC / EMNC / BoD / WG convenors Agenda and on the Horizon Europe Work Programme for 2021-2. Moreover, input was provided to Joint Workshop TC-IM WG M4D. The developing EMN was mentioned in the policy debate hosted by IPQ and EURAMET on 5th May 2021.

EURADOS, European Radiation Dosimetry Group

The EURADOS took part in gap analysis of the supportBSS project and provided a crosscutting overview for the future EMN. They joined the Stakeholder Committee, published information on the ENM proposal to the EURADOS members and promoted the Stakeholder discussion.

At the 2021 general assembly of EURADOS e.V., the EURADOS chairman presented the potential EMN IR Protect in front of 800 participants worldwide in order to inform the members about the cooperation between EURAMET and EURADOS. At the annual meeting of EURADOS e.V., the consortium presented the first results in working group 3.3 with a special focus on the environmental aspects after the EMPIR environmental call in 2019 and the preparation of the Green Deal call in 2021 of the potential European partnership for metrology.

BfS, Bundesamt für Strahlenschutz, Germany

The Federal Office for Radiation Protection (BfS) took part in the gap analysis of the supportBSS project. They joined the Stakeholder Committee and promoted the Stakeholder discussion. They support the EMN proposal by providing expertise and calibration facilities (see Annex 8).

6.2 Interaction and contributions at the international level

BIPM, Bureau International des Poids et Mesures

The BIPM took part in the gap analysis of the supportBSS project and they joined the Stakeholder Committee. A close cooperation with CCRI has been started in 2020 by exchange of information (virtual seminar on the planed EMN presented to the CCRI members).

IAEA, International Atomic Energy Agency

The IAEA took part in the gap analysis of the supportBSS project and provided a crosscutting overview on metrological gaps in the international context for the future EMN. They joined the Stakeholder Committee.

PHE, Public Health England, United Kingdom

The PHE took part in the gap analysis of the supportBSS project. They joined the Stakeholder Committee and promoted the Stakeholder discussion. They support the EMN proposal by providing expertise and calibration facilities (see Annex 8).

Third countries

EMN has stakeholders from non-EU countries and takes into account the metrological needs of these stakeholders in order to work with the partner who is also not a member of EURAMET. They also joined the stakeholder committee. The list of all EMN stakeholders, including those outside the EU, was given in Deliverable number 1 ”D1” (see Annex 9).

Other RMOs, Regional Metrology Organisations

The interaction with other RMOs was carried out through the Gap-Workshop, CCRI webinar, presentation on World Metrology Day on the "Metrology for All" platform (connection to Afrimet).

7 Summary and outlook

One of the main objectives of the EMN is to create a sustainable infrastructure in radiation protection that is of strategic importance for the future of European metrology by:

- Education and training,
- Creating and disseminating knowledge,
- Setting up a coordinated metrological infrastructure,
- Organizing and delivering of services via the member and partner institutes in a smart coordinated manner,

For this purpose and within the framework of WP 5, the initial plan for the establishment of a joint and sustainable metrology infrastructure was developed. This goes hand in hand with the development of the corresponding program for knowledge-sharing and capacity building in the various areas of IR metrology, which was planned as part of WP 4.

With the released metrology capacities, new challenges can be tackled according to the needs of the stakeholders. The smart specialized joint facilities make it possible to achieve the EMN goal by freeing up resources to fill gaps in radiation protection metrology (e.g. calibration of instruments in pulsed fields) without unnecessarily increasing the cost and by harmonizing of the metrological services for end users.

8 Annex

8.1 Annex 1 Minutes of WP 5 meeting

The Minutes of WP 5 meeting is available on the sharepoint.

SharePoint→ Document→ SuportBSS→ activities and results→ WP5→Meetings→ 2021_02_18

8.2 Annex 2 List of IR metrology capabilities

Excel tool: supportBSS-A5.1.1_Metrology capabilities_xx-xx-2021. The Excel tool is available on the sharepoint and is updated.

SharePoint→ Document→ SuportBSS→ activities and results→ WP5→A5.1.1

8.3 Annex 3 List of IR standards and guidelines

Excel tool: supportBSS-A5.1.2_List_of_Standards_ xx-xx-2021. The Excel tool is available on the sharepoint and is updated.

SharePoint→ Document→ SuportBSS→ activities and results→ WP5→A5.1.2

8.4 Annex 4 Minutes of Gap-workshop

The final report of Gap-workshop is available on the sharepoint.

SharePoint→ Document→ SuportBSS→ activities and results→ WP6→A6.2.1→ Minutes_GAP_Workshop_final

8.5 Annex 5 List of the identified metrological gaps in the RP

Excel tool: supportBSS-A5.1.3_Gap-analysis_xx-xx-2021. The Excel tool is available on the sharepoint and is updated.

SharePoint→ Document→ SuportBSS→ activities and results→ WP5→A5.1.3

8.6 Annex 6 Deliverable number 2 (D2)

The D2 is available on the sharepoint.

SharePoint→ Document→ SuportBSS→ Deliverables→ D2→ supportBSS_A1.2.6_D2-Final

8.7 Annex 7 Minutes of M12 meeting

The Minutes of M12 meeting is available on the sharepoint.

SharePoint→ Document→ SuportBSS→ Meetings→ M12→ Minutes - Developing EMN IR Protect and SupportBSS M12

8.8 Annex 8 Proposal for EMN on IR Protect and the MoU

The proposal for an EMN on radiation Protection (IR Protect) and the Memorandum of Understanding on participation in the European Metrology Network IR Protect are available on the sharepoint.

SharePoint→ Document→ EMN IR Protect→ 2-submission

8.9 Annex 9 Deliverable number 1 (D1)

The D1 is available on the sharepoint.

SharePoint→ Document→ SuportBSS→ Deliverables→ D1→ Annex1_supportBSS-draft Communication strategy_List of stakeholder