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RESEARCH

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# Collecting perspectives on project prioritisation process in the EU co-funded multinational partnership for the assessment of risks from chemicals (PARC) through focus group discussion

Katya Manuella Permana<sup>1,2\*</sup>, Maria Tannous<sup>1</sup>, Hanna Mouaziz<sup>1</sup>, Pascal Sanders<sup>1</sup>, Nathalie Bonvalot<sup>3</sup> and Christophe Rousselle<sup>1</sup>

## Abstract

**Introduction** The European Partnership for the Assessment of Risks from Chemicals (PARC) is a 7-year multinational partnership aimed at consolidating and strengthening European Union's (EU) research and innovation capacity for chemical risk assessment (RA) to protect human health and the environment. It consists of nine work packages (WP) involving more than 200 participating organisations from 29 countries. PARC is currently mapping the most relevant needs in the field of European chemical RA to steer PARC's future activities in the coming years. The present study aims to gather the perspectives of WP/Task/Project Leaders of PARC to understand their experience during the first prioritisation round of PARC activities and to identify potential points of improvement for future rounds.

**Methods** Three online 90-min focus group discussion (FGD) sessions were conducted between the 3rd and 9th of May 2023. Each session was attended by 4-5 participants with at least one representative from each PARC WPs 4, 5 and 6 ( $n = 13$ ). The sessions were recorded and transcribed, then analysed in NVivo 12 software using thematic analysis.

**Results** Some important aspects for the prioritisation of activities that were mentioned include: (1) having a transparent prioritisation process even though each WP might need different prioritisation criteria, (2) balancing the fulfilment of short-term regulatory needs and anticipating long-term needs in chemical RA, (3) maintaining alignment and synergy between the WPs and with other relevant EU initiatives to avoid duplication and to ensure continuity of work and (4) making sure that PARC can effectively respond to requests from different PARC stakeholders.

**Conclusions** The next round of PARC research activity steering process will provide an opportunity to implement the various improvements identified. PARC should utilise the advantage of having stakeholders from different backgrounds (e.g., risk assessors, policymakers, regulatory bodies, academia, etc.) within its consortium and its advising bodies to prioritise projects and activities that will support its overall objectives. These recommendations could also be of interest outside PARC in the context of prioritising research and innovation needs related to chemical RA.

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**Keywords** PARC, Chemical risk assessment, Research and innovation need prioritisation, EU partnership coordination, Focus group discussion, Regulatory relevance

## Introduction

Around 225 million tons of chemicals that are hazardous to health were consumed in the European Union (EU) in 2021 [1]. These chemicals may be acutely or chronically toxic, mutagenic, or carcinogenic. Chemical risk assessment (RA) and management are necessary to better understand and therefore minimise the adverse effects of exposure on the population and the environment. Unfortunately, out of the >100,000 total chemicals on the market, only around 10% of them are fairly well characterised for their hazards and exposures, while most of them are still poorly characterised [2].

For the past 20 years, different EU and national agencies have been making conscious efforts to protect humans and the environment through several frameworks that monitor and regulate different chemicals circulating in the market. Several research initiatives have been carried out under the EU's Horizon 2020 research programme [3], including the European Human Biomonitoring Initiative (HBM4EU) [4], which focused on basic human biomonitoring research with an emphasis on producing scientific results that can be translated into policy. The European Partnership for the Assessment of Risks from Chemicals (PARC) [5] was established based on these earlier initiatives and in support of the EU Chemicals Strategy for Sustainability towards a Toxic-free Environment [6] and the Zero Pollution ambition of the European Green Deal [7].

PARC was launched in May 2022 with the overarching goal of “consolidating and strengthening the European research and innovation capacity for chemical RA to protect human health and the environment” [8]. PARC is a collaborative effort of around 200 organisations from 29 different countries. The consortium includes three major European Agencies, namely the European Chemical Agency (ECHA), the European Food Safety Authority (EFSA) and the European Environmental Agency (EEA). The partnership has a budget of 400 million euros, co-funded by EU's Horizon Europe research and innovation programme [8].

A governing board (GB) with representatives of European Commission (EC) Directorates and national ministries, steers PARC activities. The Work Package Leaders (WPL) form PARC's management board (MB) and organise the planning and monitoring of the activities carried out by the various WPs. The institutions representing the participating organisations sit on the grant signatory board (GSB) to monitor the

co-financing grant with the EC and the beneficiaries [9].

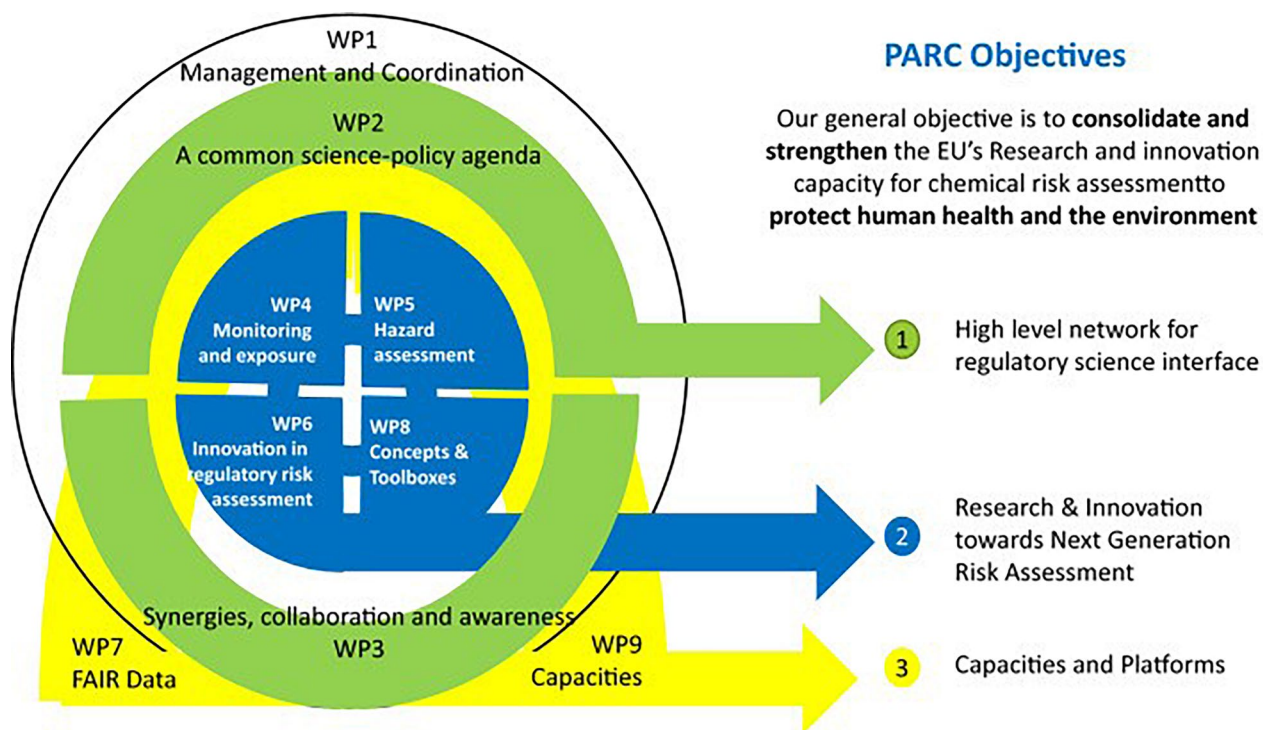
There are nine work packages (WPs) in PARC, each with their own type of tasks and activities. These work packages and how they correspond to the PARC objectives are illustrated in Fig. 1. Most of the research and innovation activities in PARC are conducted in WP 4 “Monitoring and Exposure”, 5 “Hazard Assessment”, and 6 “Innovation in regulatory RA”. There are currently more than 80 projects and case studies running under those work packages.

In further building PARC's project portfolio, PARC WP 2 “A common science-policy agenda” will ensure proper linkage between the high-level priorities of policy-makers at the EU and national level and the activities that will be implemented in PARC in response to these policy and regulatory needs. This will be ensured through a number of activities, including various targeted surveys, focused workshops and/or expert groups to gather information needs from policy makers at EU and national level, as well as from stakeholders and experts involved in regulatory RA activities. Guided by policy and/or regulatory needs, WP2 will develop and implement a well-structured and transparent strategy aimed at prioritising projects, substances and methods. WP2 also sets a common agenda at the science-policy interface, making PARC knowledge available while actively promoting its regulatory consideration, and working towards sustainability of PARC's successful activities.

This present study was done under Task 2.1 “priority setting” which focuses on ensuring that future projects/activities strive for a common goal and maximise PARC's impact, within the available resources, budget and timeline. This task manages and monitors current and future PARC projects, especially those in relation to research and innovation activities.

### First PARC project prioritisation round in context

The prioritisation approach closest to the European context in which PARC operates is the one developed by HBM4EU. An article published in 2021 [10] presents this prioritisation strategy and compares it with other approaches used in several chemical monitoring programmes, concluding that the HBM4EU approach would allow the maintenance of harmonised and comparable results of further prioritisation processes at EU-level and recommends its use in follow-up initiatives such as PARC. However, we are not aware of an already



**Fig. 1** PARC objectives and work packages [8]

established prioritisation approach for a partnership as extensive as PARC with such a broad research & innovation scope, covering several different aspects of chemical RA at once for both the protection of human and environmental health. Our study would therefore contribute to the improvement of research and innovation project prioritisation approaches for future partnerships or initiatives in a similar context.

To select the projects to be carried out in the first 2 years of PARC, the first project prioritisation process was conducted in 2021 with an approach partially adapted from that of HBM4EU's. Both the strategy and the criteria used in the first PARC prioritisation process are summarised in the 2022 PARC Deliverable 2.1 "Prioritisation Criteria" (D2.1) [11]. Substances, methods and endpoints were selected from several HBM4EU legacy documents [12, 13], including the results of the stakeholder consultation carried out on the mapping of needs (MoN). Surveys were also sent to PARC's interim governing board (GB) to identify research and innovation needs of PARC participating countries, organisations and of the relevant European agencies.

Unfortunately, the timeline for PARC's preparation and initiation phase coincided with the COVID-19 pandemic, which posed a major challenge to follow the designed strategy and required the coordination to adapt the process to be able to launch the partnership and its

activities as planned. This led to some initial research and innovation projects being selected by the relevant WP/Task leaders without necessarily well documenting the selection process. Following this initial prioritisation round, a series of internal surveys and meetings collected feedback from WPLs and TLs, identifying the key issues and some suggestions for further work to improve the process. These suggestions were also summarised in D2.1 and are echoed in the results section of this article. The main conclusion was that an agreed common framework was needed to improve alignment with regulatory needs and between WPs. This framework should ensure a transparent process and improve the reproducibility of the prioritisation process for the second half of PARC [14].

#### Study objective

The objective of this qualitative study is to gather the perspectives of major stakeholders of PARC to understand their experience in determining the first set of PARC research and innovation projects and to define a range of best or more appropriate criteria to be applied in future processes. This study aims to identify the challenges and opportunities to address the concerns and interests of all stakeholders, and to propose a series of recommendations to improve future processes.

This study will directly support the PARC MoN process to identify the research and innovation needs that should and could be prioritised by PARC in its fourth-to-seventh year. The MoN process will take into account existing priorities that have already been translated into projects within PARC and other needs that have not been included yet. The scope of this paper exclusively covers the prioritisation process for research and innovation activities related to monitoring, exposure assessment, hazard assessment and RA (PARC WPs 4, 5, and 6).

## Materials and methods

The focus group discussion (FGD) format was chosen as an appropriate method to invite interaction and collaboration among participants and to gather their views and ideas [15]. In this case, several WP/task/project leaders from PARC WPs 4, 5 and 6 were invited to discuss with each other their experience, views and opinions on the prioritisation process and to consider any ideas or recommendations to improve this process. Moderators provided guidance and prompts as needed, while allowing the participants to express themselves for most of the duration of the session. Three FGD sessions were conducted in this qualitative study to answer the following research question: considering the previous prioritisation process in PARC, how can it be improved for the next round?

## Recruitment of participants

A total of 45 email invitations to join the FGDs were sent to all the PARC 8 WPLs and all 35 PARC TLs plus 2 project managers working in WPs 4, 5 and 6. They were chosen, because they have a leadership role within their WPs and tasks, have a good understanding of the projects

under their scope, and will greatly influence future activities in PARC. Forty timeslots were offered and 23 invitees replied with their availabilities. Three sessions with 6–7 participants were scheduled but only 4–5 participants per session were able to finally attend.

## Data collection: FGDs

Prior to a FGD session, the available participants were sent an email containing: a session brief listing some of the topics to be discussed, a short demographics questionnaire and a consent form to express willingness for their interventions to be recorded, transcribed and analysed.

Three online 90-min FGD sessions were conducted via Microsoft Teams on the third, fifth and ninth of May 2023. Each session was attended by 4–5 participants with at least one representative from each targeted WP. Additionally, several members of Task 2.1 team acted as moderators, co-moderators, notetakers and timekeepers. The PARC coordinator and/or deputy coordinator were present during all three sessions for observational purposes or as co-moderators, when needed.

The technical preparation for the semi-structured FGD followed the guidance suggested by Krueger and Casey [15], and King and Horrocks [16]. An interview guideline was used by the moderators and a PowerPoint presentation was displayed as a visual aid for the participants. The key questions asked are listed in Table 1. These questions were only meant to act as prompts to guide the flow of the discussion, flexibility was allowed to adapt the discussion according to how the participant responded and the time available. The sessions were recorded using the Microsoft Teams application and field notes were taken as a backup.

**Table 1** List of key questions for the FGD sessions

### Key questions

1. Prioritisation criteria  
< Participants were shown the main criteria used for the first prioritisation round of PARC mentioned in a PARC deliverable (D2.1) and were asked if there were other criteria not yet included on the list >
  - a. What were the most essential criteria used within your WP?
  - b. What criteria will be used for the prioritisation process of the second half of PARC?
2. Answering policy needs
  - a. What were the main policy needs your work package tried to address for the first prioritisation round of PARC?
  - b. Have your WPs already identified some priorities for the second half of PARC? What are the main policy needs you are planning to address in your WP for the second half of PARC?
3. Experience with prioritisation
  - a. What were the challenges you faced on deciding what projects to prioritise on the first prioritisation round of PARC?
  - b. What approach should be taken in prioritising substances within chemical groups?
4. Lessons learned
  - a. What aspects of the prioritisation process from the first prioritisation round of PARC would you continue using on the second half?
  - b. What should be done differently for the prioritisation process of the second half of PARC?



### Analysis of the data collected during the FGD sessions

Automatic transcriptions either from Microsoft Teams or the transcription function on Microsoft Word were used. The auto-transcribed scripts were manually corrected by comparing them to the video recordings to ensure accuracy and clarity. NVivo [17] was used as the main software for the qualitative data organisation and analysis for this study. The transcript was minimally altered for coherence, then formatted to fit the requirement for the auto-coding function in NVivo 12 [17], which allowed the categorisation of the transcript based on the different speakers participating in the FGD sessions. The transcripts were uploaded to the NVivo project file and then manually analysed using the thematic analysis method described by Braun and Clarke [18]. The first round of coding was done descriptively with a structure similar to the evaluation coding described by Saldana [19], coding for the strengths and challenges of the first prioritisation process and recommendations for the future prioritisation process in PARC. During the first round of coding, we also identified prioritisation criteria similar to those mentioned in D2.1 mentioned throughout the sessions. These criteria could be categorised into three overarching themes: (1) policy and regulatory relevance, (2) positioning: synergy and alignment, and (3) practicality: feasibility and technicality. The strengths, challenges and recommendations coded from the transcript earlier were also then categorised into these themes. Figure 2 summarises the analysis process from raw transcripts to themes.

## Results

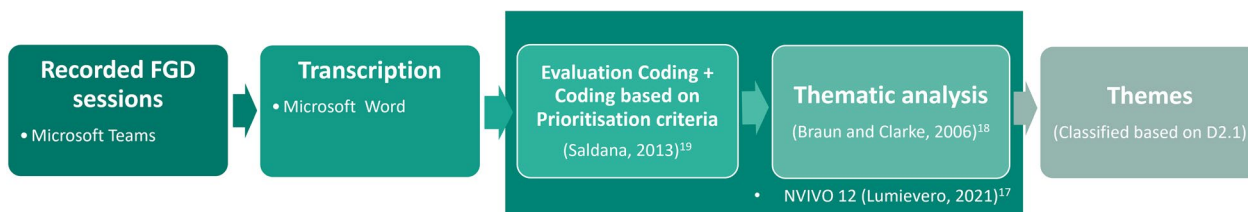
### Participant demographics

More than half of the invitees responded to the invitation to participate in the study. Based on availabilities, 20 potential participants were separated into three groups and finally, a total of 13 participants from seven countries were able to attend the three FGD sessions. France was the most represented—with four participants. Almost equal numbers of participants worked for universities, national research institutes or government agencies. At least seven of them had previously participated in a chemical RA research need prioritisation

process other than PARC, with three participants having previously been part of the HBM4EU project, while others reported participations in their countries' national initiatives or in other EU projects such as the "Network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances" (NORMAN) [20], "Assays for the identification of thyroid hormone axis-disrupting chemicals: elaborating novel assessment strategies" (ATHENA) [21], and "Female reproductive toxicity of EDCs: a human evidence-based screening and identification approach" (FREIA) [22]. The complete participant demographics can be seen in Table 2.

**Table 2** FGD participant demographics

Characteristics	n
Gender (n = 13)	
Male	6
Female	7
Type of institution (n = 13)	
Government Agency	4
National Research Institute	4
University	5
Location of Institution (n = 13)	
Belgium	1
Czech Republic	1
Denmark	2
France	4
Portugal	1
Switzerland	1
Sweden	3
Involvement in WP (n = 13)	
WP 4	3
WP 5	5
WP 6	4
WP 5 and 6	1
Involvement in a chemical RA prioritisation process in the frame of other initiatives (n = 12)	
Yes	7
No	5



**Fig. 2** Flowchart of the analysis process of the data collected during the FGD sessions

### General perspectives on the prioritisation process for activities in PARC

As shown in Sect. “[Analysis of the data collected during the FGD sessions = focus group discussion](#)”, the feedback provided by the participants on the strategy and criteria used during the first prioritisation round of PARC can be arranged into three broad and different themes: (1) policy and regulatory relevance, (2) positioning: synergy and alignment, and (3) practicality: feasibility and technicality. Table 3 presents how the criteria mentioned in both PARC D2.1 and the FGD can fit into these themes. The participants discussed challenges in prioritising activities or projects for answering long term vs. short term research and innovation needs, improvement of the positioning of these activities and projects within PARC and in relation to other EU initiatives, and challenges in responding to requests from different PARC stakeholders. Some opportunities for improvement were also highlighted by the discussion. These challenges and opportunities are mentioned in Table 4.

Each PARC WP was designed to address different aspects of chemical RA. This led to them having different needs when it came to prioritisation criteria of substances and methods. It was evident that each WP performed their own separate prioritisation process. Despite the FGD participants agreeing that it would be difficult to create a crosscutting prioritisation framework for PARC, the need to set up a transparent process with a set of defined criteria was generally suggested.

The participants assured that these in-WP prioritisation efforts were not intended to replace the function of PARC Task 2.1 in priority setting. It was mentioned that the structure of PARC contributed to the heterogeneity

of the programme which made PARC prone to misalignment. Participants were aware that Task 2.1 and the coordination team were still needed to ensure that the priorities set within each WP aligned perfectly with the general objectives and impact framework of PARC.

*“The priorities within a work package differ. You cannot always use the same criteria. (...) on the other hand, you will try to have as much alignment as possible. So, these are two aspects which maybe a bit contradictory but, in the end, there are probably ways to have them integrated.”—(Participant FGD2-WP6#2).*

FGD participants mentioned that the prioritisation process could often be a subjective process making it harder to get a reproducible result. Priorities could be different based on the assessor’s experience.

The questions raised in the FGDs (Table 1) were used to identify the challenges and aspects of greatest interest to participants in each of these categories, as well as opportunities and ways to improve the implementation of the criteria in future priority setting processes. The findings, summarised in Table 4, are presented below.

### Specific perspectives on policy and regulatory relevance

One of the identified prioritisation challenges was related to determining the short-term and long-term goals of PARC while responding to specific priority research and innovation questions. The FGD mentioned that academia and regulatory bodies were often interested in answering research and innovation questions over different time frames. Although most FGD participants were aware of the different terms, the term policy and regulations were

**Table 3** Prioritisation criteria used during the PARC first prioritisation round [11], categorised into themes

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1. Policy and regulatory relevance
Do the activities/projects respond to:
1.1. Specific needs from regulatory agencies (e.g., Scientific Committee for Consumer Safety (SCCS), ECHA, EEA, EFSA, etc.)
1.2. Regulatory needs identified by WPL/TL according to their WP/Task objectives
1.3. Needs identified in other European policy or strategy documents such as the “Chemical Strategy for Sustainability” and the “Strategic Research and Innovation Plan for Safe and Sustainable Chemicals and Materials”
2. Positioning: synergy and alignment
How are the activities/projects positioned in the chemical RA research and innovation needs landscape?
2.1 Interactions and crosslinks with other WPs or Tasks within PARC
2.2 Scientific activities carried out outside PARC
2.3 Legacy prioritisation strategy and criteria from HBM4EU
2.4 Requirements and priorities previously identified by the PARC GB
3. Practicality: feasibility and technicality
What are the practicalities to be considered for PARC to be able to execute the activities/projects?
3.1 Partners’ interests, capacities and resources
3.2 Available data and knowledge gaps
3.3 Hazardous properties and characteristics of substances

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often used interchangeably. The regulatory bodies tend to have short-term needs that have to be addressed in a specific timeframe, while scientific pursuit would often focus on trying to answer long-term needs, which would be addressing a broader policy need. An example that was mentioned was in relation to animal testing. While current regulatory needs still call for the use of animal testing data, the EU is working on changing the policy to move away from it as much as possible in the future. It was suggested that prioritisation should be specified based on the two different timeframes to ensure that PARC could make an effort to address both short and long-term needs.

All the FGD participants were aware of PARC’s objectives to support policy. However, one challenge identified during the FGD was that the research question from regulatory bodies were not specific enough, which made it harder to design a specific strategy to answer to their needs. This issue was encountered when analysing the result of the GB survey that was sent out before the start of PARC.

**Specific perspectives on positioning: synergy and alignment**

Another important aspect of the prioritisation process mentioned during the FGDs was the need to improve synergy and alignment within WPs in PARC and with

other EU initiatives. The European Cluster to Improve Identification of Endocrine Disruptors (EURION) [23] was mentioned as an example. The importance of synergy and alignment was to ensure that there was no duplication of work and that projects could be built upon others [24].

Although everyone agreed that their tasks could benefit from other tasks’ research results, the participants mentioned that it was challenging to keep track of all the projects that were going on in the different WPs. The participants were aware that it would not be possible to have a perfect alignment for every substance or endpoint within PARC, and different coordination channels are available through cross-WP meetings to ensure that continuity and maximisation of work is possible within PARC.

To ensure continuation of work, the FGD participants mentioned that there should be a review process for the current ongoing projects in PARC to see its potential for extension or for results to be transferred to other WP and further developed. Other suggested modalities of nomination for new projects for the second prioritisation round of PARC including: using the initial GB surveys to check for unrealised projects or to conduct another simple survey that can be used as a basis to conduct more in-depth workshops or interviews with stakeholders.

**Table 4** Summary of study results

Themes and related quotations from FGD participants	Main challenges	Concerns	Opportunities
<p><b>Theme 1–Policy and regulatory relevance</b>  <i>“We need to consider the time scale when we do the prioritisation within PARC, at least to be aware of it, so that we have projects that are relevant within a short time scale as well as maybe a little longer time scale.”— (Participant FGD2-WP6#1)</i></p>	<p>Mapping of specific regulatory or policy needs to be addressed by PARC both at EU and national level.</p>	<p>Unclear research questions from the regulatory bodies. Policy (preparatory) Vs. Regulatory (immediate need).</p>	<p>Workshops and question mapping exercises. EU agencies within PARC.</p>
<p><b>Theme 2–Positioning: synergy and alignment</b>  <i>“We shouldn’t work in silos. We should work for each other.”—(Participant FGD1-WP4#1)</i></p>	<p>Keeping track of the projects running in different WPs and other EU initiatives.</p>	<p>Avoiding duplication of work. Continuation of work.</p>	<p>Project review and mapping. Inter-EU initiative collaboration.</p>
<p><b>Theme 3–Practicality: feasibility and technicality</b>  <i>“I think one key thing that we have to also consider and acknowledge, when it comes to prioritisation with PARC, is that funding is only provided for to 45% of the research. That means we have to find other sources of funding. (...) And it will influence the projects that will be submitted for PARC.”— (Participant FGD3-WP6#1)</i></p>	<p>Matching priority projects with available partners.</p>	<p>Missing out on partners that are capable but have no funding. Only working with topics that are already well explored. “Who has the most influence on the nomination of projects?”</p>	<p>Mix of Top-down ↔ Bottom-up approach. Opening up to new partners.</p>



### Specific perspectives on practicality: feasibility and technicality

Many participants expressed facing a challenge in matching research and innovation need priorities with feasible partners within PARC. Feasible partners meant partners with aligned research interests that could provide co-funding and expertise. PARC activities are only partially funded by the European Commission. The rest of the funding comes from partner countries and participating organisations. With finite resources, it was only natural for partner countries to mostly commit to activities that were in their current interests.

During the FGD sessions, it was mentioned that feasibility with partners and availability of resources were some limiting factors for how research projects in PARC were prioritised. The type of projects that could run within PARC would depend on the availability of participating organisations and this might cause PARC to be led to working on research area that had been previously well researched instead of filling in knowledge gaps. This was something that the consortium should be aware of, especially to make sure that PARC anticipates future needs.

This challenge with feasibility would then come down to who should provide the nominations of projects to be considered for prioritisation. The past prioritisation process in PARC was mentioned to be mostly a bottom-up process. The WP would prioritise projects based on what partners could provide. It was mentioned during the FGD that this process gave more freedom for research entities to perform projects that interests them and most likely already have resources for. However, this should be balanced with a top-down approach where regulatory bodies and policymaker could provide oversight on the projects carried out within PARC to ensure that the projects were relevant and still carried PARC's objective of transferring science to policy.

### Discussion

Prioritisation of research needs is necessary in various field of scientific studies, this is due to the common factor of having limited time and resources to reach certain objectives. Fadlallah et al. [25] published a scoping review on approaches to prioritising primary health research. Although this review analysed prioritisation approaches in a different research context, their summary of the steps taken during the development of prioritisation approaches and the aspects to be addressed in the prioritisation process could be applied to assess our prioritisation approach.

The article mentioned the steps taken during the development of the prioritisation approaches including: (1) use of pre-existing approach, (2) literature review, (3) consensus building, (4) stakeholder input, and (5) pilot

testing. The authors also mentioned the following aspects to be addressed in the prioritisation process: (1) situation analysis/environmental scan, (2) methods for generation of initial list of topics, (3) use of prioritisation criteria, (4) stakeholder engagement, (5) description of ranking process/ technique, (6) dissemination and implementation, (7) revision or appeal mechanism, and (8) monitoring and evaluation.

In PARC context, the FGD is part of stakeholder involvement and consensus building steps in the development of a prioritisation approach. PARC is also adapting its prioritisation approach based on the pre-existing approach explained in HBM4EU, which was built based on a literature review [10]. These cover steps (1) to (4) mentioned by Fadlallah et al. [25].

When it comes to the aspects to consider during the prioritisation process, our FGD participants proposed the importance of doing a horizon scanning, creating a transparent method for generation of initial nomination list, creating a ranking system, using prioritisation criteria for research need selection, and improving stakeholder engagement. These cover factors (1) to (5) mentioned by Fadlallah et al. [25], these are the points of improvements to be made in the next prioritisation round of PARC.

Factors (6) to (8) are already currently implemented in PARC. Regarding "dissemination and implementation", PARC produces an annual work plan stating its strategy for the following year. PARC also has a rapid response mechanism (RRM) procedure [26] where additional activities or projects can be proposed outside of the timeframe of the normal prioritisation mechanism, in case of urgent needs. This covers the "appeal mechanism" of the checklist. PARC has also set up a list of indicators, covering output, outcome and impact indicators that help in monitoring and evaluating the impact of the priority setting during the partnership.

### Perspectives on PARC prioritisation approach and opportunities for improvement learnt from other initiatives

Figure 3 shows a diagram showing different priorities set by each task within WP 4, 5 and 6 for the first years of PARC that were being considered for re-nomination during the MoN process. It can be seen how certain tasks required prioritisation by substances or substance groups, while other tasks required prioritisation by health effect/endpoint. Task 4.3 and 6.4 could not be included in either prioritisation by substance groups nor by endpoints because of their focus on methodologies and case studies. These groupings were based on the previous prioritisation round, but it was worth noting that not all FGD participants agreed with how substances and health

effects/endpoints had been grouped and that it should be up for discussion for the next round.

This figure visualises the challenge mentioned by the participants of creating a one-size fits all approach for every WP. When asked to prioritise activities or projects, criteria are always used, even if they are not set clearly or harmonised and can sometimes be subjective. In light of the specificities of each PARC WP/task and the diversity of needs they respond to, the process has to be transparent, agile and adaptable, with a core set of defined criteria that, the FGDs showed can be categorised into broad themes that are applicable by all, like the three mentioned in Table 4.

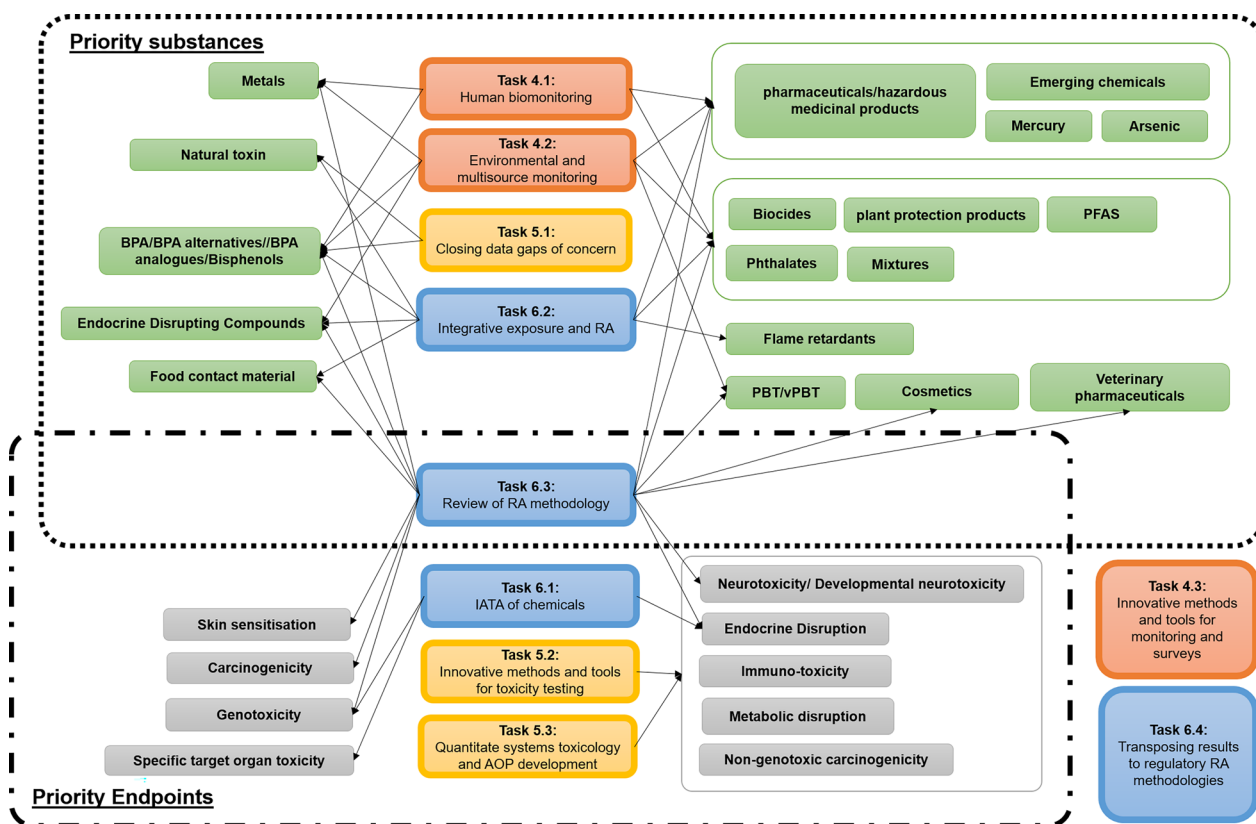
The first theme mentioned in Table 4 was on “Policy and Regulatory Relevance”. To help balance responding to policy/preparatory and regulatory/immediate needs in chemical RA, PARC can draw inspiration from a scientific mapping exercise [27] that separated research needs based on timeline (short-term vs. long term). This exercise was conducted by the Health and Environmental Science Institute (HESI). Similar to PARC, HESI was also interested in a multipartite approach where they involved engagement of industry, government, and academia. For their 2009 exercise [28], their aim was to produce a list of

human and environmental health challenges for the years 2010–2020.

By using an opportunity matrix [27], they were able to map out the issues they wanted to address for the decade. This opportunity matrix consisted of ‘timeframe’ on the *x*-axis and ‘potential for impact’ on the *y*-axis. This exercise could also be applicable to PARC in producing a post-PARC projects legacy document. A future ambition that was brought up during two of the three FGD sessions.

Sutherland [29] mentioned that often researchers had the willingness to inform policy decisions but did not know the specific needs of the regulatory agencies. The practice of listing out research questions was previously done in HBM4EU during the preparation of background or scoping documents prepared to aid the prioritisation process. This was done especially for chemical substance groups. However, the formulation of questions varied greatly and could be specific or non-specific depending on the people filling in the form for a particular chemical group [13].

Following a set of criteria may help in the formulation of questions and ‘horizon scanning’ exercise conducted with different stakeholders in PARC. An example



**Fig. 3** Priorities within WPs 4, 5, 6 tasks of PARC under consideration following the first round of prioritisation

would be the method described by Sutherland [29]. This guideline had been previously implemented by the European branch of SETAC Horizon Scanning [30] in 2014 and 2015 to identify the priority research questions for Europe towards Sustainable Environmental Quality which successfully shortlisted a manageable number of research questions by the end of the process [31].

Shortlisting research needs can also be done using the weight-of-evidence (WoE) approach. WoE is a practice of decision-making through combining several lines of data (i.e., criteria), something that might have taken place during PARC's past prioritisation process to some degree. Various WoE evaluation approaches are available, ranging from qualitative to quantitative with their advantages and disadvantages [32]. This seems to be a common issue in research prioritisation efforts, the main challenge described was the lack of official guidance and definition on how to conduct WoE [33]. PARC should make an effort to improve the "ranking" system for its second prioritisation round.

The second theme mentioned in Table 4 was "Positioning: Synergy and Alignment". Positioning refers to how closely or distantly related to a potential project is with other projects in chemical RA (within or outside of PARC) and how it is located in the landscape of chemical RA. Some effort to align research topics could be seen in Fig. 2 where the same substances or endpoints were already prioritised by the different tasks within PARC. Additional efforts are currently being made by Task 2.1 to create a searchable database of on-going projects within PARC via harmonisation of keywords.

PARC is currently trying to establish a network of synergies with external initiatives working on topics related to chemical RA. Despite having some individuals within PARC currently working in other related EU initiatives, coordination was still challenging. This network of synergies aims to improve that. PARC launched a call for groups that are working in the same chemical RA scope as PARC to join this network [34]. An example of collaboration currently being pursued is one with the NORMAN Association. They expressed an interest in having synergies on some PARC activities and even published an article [35] specifying potential points of collaboration with PARC, such as in sharing of database and substance prioritisation scheme [36].

The third theme mentioned in Table 4 was "Practicality: Feasibility and Technicality". Practicality refers to what is needed for PARC participating organisations to be able to realistically carry out the activities/projects. This aspect of prioritisation can often contribute to what is called the "Matthew effect". The term "Matthew effect" was coined by Merton [37] to refer

to the bias that exists in the selection of research topics. The Matthew he was referring to was the Bible's New Testament Gospel of Matthew, one of the verses reading: "For whoever has will be given more, and they will have an abundance. Whoever does not have, even what they have will be taken from them." Merton compared this to the tendency for scientific funding to be granted over and over again towards topics that were relatively well studied. Research topics that were well studied were seen as more likely to produce 'results' due to their predictability, often being publishable in high-impact journals. In addition, certain areas may continuously keep having high-density research out of convenience such as the availability of developed and affordable technologies or the availability of experts in that field [38]. Branching out from a research area that a certain expert has dedicated their academic life to might not be very attractive and understandably so. Moreover, it would not be uncommon for these experts to train students in the same area of expertise [38].

The FGD participants highlighted that a bottom-up approach, where research organisations nominate projects for prioritisation and is prone to putting emphasis on these practicality aspects, should be balanced with a top-down approach where regulatory bodies and policymakers can provide oversight on the activities and projects prioritised. Facilitated dialogues between the regulatory bodies and PARC partners, to create this balanced top-down/bottom-up approach, would mitigate the Matthew effect. This is attainable in PARC since three major EU agencies and national agencies are already a part of the consortium. PARC should use this to its advantage to perform some matchmaking between projects and regulatory/policy needs.

Many FGD participants also mentioned that it might be beneficial to be open to taking in more partners that could contribute meaningfully to this partnership. One of the lessons learnt from HBM4EU coordinators was that scientific governance (including activities such as budgeting, planning, steering and coordination effort, which require a lot of investment of the partner's work time), should not be underestimated as merely administrative tasks. They mentioned that since these activities affected the production of quality-assured HBM data useful for the EU chemical policy strategy, they should be better valorised and incentivised accordingly [39]. This would make it more attractive for organisations to sign up to become partners of an EU-funded initiative. A wider range of available resources provided by an increasing number of participating organisations

within its consortium could provide a potential PARC project/activity with a higher possibility of being practically executable.

### Strengths and limitations of the methods used in this study

The purposive sampling method was conducted due to the specific participant criteria set. The composition of participants for each session was set to include views of participants from differing backgrounds and training, especially according to different WPs, types of organisations, and countries, which provided an opportunity for the participants to compare their perspectives on PARC's prioritisation process for research and innovation activities.

There were only 13 participants in total which makes it difficult to generalise the results. Several potential participants cancelled at the last minute due to other engagements. However, the smaller group was not something to be concerned with as a mini-FGD was commonly practiced for FGDs conducted with a group of experts as it allowed more interaction and more time for each participant to express themselves [15].

The FGD is one of the most largely used types of qualitative research method in medical and public health research along with individual interviews and the Delphi method [40]. FGD was chosen to promote interactions between study participants, which is not applicable in the other two methods mentioned. However, it is also important to note that the FGD format might influence the individual opinions of the participants or the way they expressed them due to group dynamics, making it more difficult to separate individual opinions from group thinking [16]. The presence of the PARC coordinator and/or deputy coordinator in all the sessions might influence how the participants expressed their perspectives but it also allowed for direct interactions between the coordinators and the WP/task/project leaders. It is also important to remember that all the participants were experts in their respective fields and were experienced with the format of online discussion within PARC. These factors supported active participation in every session.

All in all, despite all the limitations described in this section, there are currently not many publications dealing with the project management side of an EU-scaled chemical RA project. The results, insights and recommendations highlighted by the participants can be very useful to present some perspectives on the topic. This could contribute to the necessary discussion and cooperation between all stakeholders and ultimately improve approaches for prioritisation of activities and projects in the field of chemical RA.

### Conclusion

Establishing and implementing a transparent process to prioritise activities or projects responding to research and innovation needs within a large partnership like PARC was found to be challenging, namely the identification of common criteria and how to balance the different needs. It is, however, a necessity to ensure continued coherence and relevance of the research and innovation projects running within PARC in line with policy and regulatory needs to maximise their contribution to benefiting human health and the environment. Some of the challenges mentioned by participants in the FGDs carried out included: (1) mapping of specific regulatory or policy needs to be addressed by PARC, (2) keeping track of the projects running in different WPs and other EU projects, and (3) matching priority projects with suitable partners.

Some of the important aspects or suggestions to improve the prioritisation process for activities and projects in chemical RA that were mentioned by the participants were: (1) having a transparent and adaptable prioritisation process with criteria under broad themes, even though each WP might need different specific prioritisation criteria, (2) balancing the fulfilment of short-term regulatory needs and anticipating long-term needs in chemical RA, (3) maintaining alignment and synergies between the WPs and with other EU projects to avoid duplication and to ensure continuity of work and (4) making sure that PARC could utilise its partnerships to the fullest in term of matchmaking projects/activities with potential partners.

It is also important to note that PARC is still young and full of potential with the WPs already working towards overcoming the challenges mentioned in this study, especially when it comes to the promotion of alignment and synergies.

The second round of prioritisation for PARC will provide an opportunity to implement various improvements that were expressed and analysed in this study. PARC should fully utilise the advantage of having stakeholders from different backgrounds (e.g., policy makers, regulatory bodies, academia, non-governmental organisations, industry representative, etc.) within its consortium and advisory boards to prioritise activities and projects that contribute to the achievement of its objectives by facilitating inter-party discussions and taking into account the interest of EU as a whole.

These lessons-learn from the first prioritisation round in PARC can be taken into consideration by other EU partnerships or large-scale initiatives responding to high-level policy and regulatory needs to improve their efforts in designing a prioritisation process that best suits them and helps them achieve and maximise their impact.



## Abbreviations

ANSES	French Agency for Food, Environmental and Occupational Health & Safety/Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail
ATHENA	Assays for the identification of thyroid hormone axis-disrupting chemicals: elaborating novel assessment strategies
D2.1	PARC Deliverable 2.1 "Prioritisation Criteria"
ECHA	The European Chemicals Agency
EEA	European Environment Agency
EFSA	The European Food Safety Authority
EC	European Commission
EU	European Union
EURION	European Cluster to Improve Identification of Endocrine Disruptors
FGD	Focus Group Discussion
FREIA	Female reproductive toxicity of EDCs: a human evidence-based screening and identification approach
GB	Governing Board
GSB	Grant Signatory Board
HBM4EU	European Human Biomonitoring Initiative
MB	Management Board
MoN	Mapping of Needs
NORMAN	Network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances
OECD	Organisation for Economic Co-operation and Development
PARC	European Partnership for the Assessment of Risks from Chemicals
RA	Risk Assessment
RRM	Rapid Response Mechanism
SCCS	Scientific Committee for Consumer Safety
TL	Task leader
WoE	Weight-of-evidence
WP	Work package
WPL	Work package leader

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12302-024-01041-1>.

Supplementary Material 1.

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## Author contributions

KMP, MT, HM, PS, and CR were involved in the conceptualisation of the study and conducting the focus group discussions. KMP was responsible for the data analysis and writing the first draft of the manuscript. All authors were involved in the review and editing of the manuscript until it was finalised. PS, NB and CR supervised the study. HM managed the project administration.

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## Availability of data and materials

Data are provided within the manuscript or supplementary information files.

## Declarations

### Ethics approval and consent to participate

All participants signed consent forms for participating in the study prior to each focus group discussion session.

### Consent for publication

Not applicable.

### Competing interests

Non-financial interests: This research was conducted as part of an internship for KMP's Master's program completion. This did not influence the results of the research. Other authors declared that they have no known competing financial or non-financial interests that could have appeared to influence the work reported in this paper.

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## References

1. Eurostat Statistics Explained Website (2022) Chemicals production and consumption statistics. [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Chemicals\\_production\\_and\\_consumption\\_statistics#Consumption\\_of\\_chemicals\\_hazardous\\_to\\_health](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Chemicals_production_and_consumption_statistics#Consumption_of_chemicals_hazardous_to_health). Accessed 06 Mar 2023
2. European Environment Agency (2020) Infographic: The unknown territory of chemical risks. <https://www.eea.europa.eu/soer/2020/soer-2020-visuals/the-unknown-territory-of-chemical-risks/view>. Accessed 06 Mar 2023
3. Bopp SK, Barouki R, Brack W, Dalla Costa S, Dorne JCM, Drakvik PE, Faust M, Karjalainen TK, Kephelopoulou S, van Klaveren J, Kolossa-Gehring M, Kortenkamp A, Lebreton E, Lettieri T, Norager S, Ruegg J, Tarazona JV, Trier X, van de Water B, van Gils J, Bergman Å (2018) Current EU research activities on combined exposure to multiple chemicals. *Environ Int* 120:544–562. <https://doi.org/10.1016/j.envint.2018.07.037>
4. European Commission (2024) European Human Biomonitoring Initiative (HBM4EU). <https://cordis.europa.eu/project/id/733032>. Accessed 03 Oct 2023
5. PARC (2024) PARC Website. <https://www.eu-parc.eu/>. Accessed 22 Nov 2024
6. European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Chemicals Strategy for Sustainability Towards a Toxic-Free Environment. <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2020:667:FIN>. Accessed 06 Jun 2023
7. European Commission (2021) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil'. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0400&qid=1623311742827>. Accessed 03 Oct 2024
8. Marx-Stoelting P, Rivière G, Luijten M, Aiello-Holden K, Bandow N, Baken K, Cañas A, Castano A, Denys S, Fiollo C, Herzler M, Iavicoli I, Karakitsios S, Klanova J, Kolossa-Gehring M, Koutsodimou A, Vicente JL, Lynch I, Namorado S, Norager S, Pittman A, Rotter S, Sarigiannis D, Silva MJ, Theunis J, Tralau T, Uhl M, van Klaveren J, Wendt-Rasch L, Westerholm E, Rousselle C, Sanders P (2023) A walk in the PARC: developing and implementing 21st century chemical risk assessment in Europe. *Arch Toxicol* 97(3):893–908. <https://doi.org/10.1007/s00204-022-03435-7>
9. PARC (2023) PARC: Governance structure. <https://www.eu-parc.eu/about-us/governance>. Accessed 06 Jun 2023



10. Ougier E, Ganzleben C, Lecoq P, Bessems J, David M, Schoeters G, Lange R, Meslin M, Uhl M, Kolossa-Gehring M, Rousselle C, Vicente JL (2021) Chemical prioritisation strategy in the European Human Biomonitoring Initiative (HBM4EU)—development and results. *Int J Hyg Environ Health* 236:113778. <https://doi.org/10.1016/j.ijheh.2021.113778>
11. Rousselle C, Tannous M (2023) PARC Deliverable D2.1 Prioritisation Criteria Report. PARC, Paris. [https://www.eu-parc.eu/sites/default/files/2023-09/PARC\\_D2.1.pdf](https://www.eu-parc.eu/sites/default/files/2023-09/PARC_D2.1.pdf). Accessed 02 Nov 2023
12. Vicente JL, Ganzleben C, Gasol R, Meslin M, Rousselle C, Popin L, Gerofke A, Schoeters G, Bessems J, Baken K (2021) Deliverable Report D4.10—2nd Report on stakeholder consultation and mapping of needs. HBM4EU, Berlin. <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e50c14050&appld=PPGMS>. Accessed 03 Mar 2023
13. Meslin M, Rousselle C (2021) Deliverable Report D4.8—Third list of HBM4EU priority substances. HBM4EU, Berlin. <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5e4e70e4c&appld=PPGMS>. Accessed 13 Apr 2023
14. OECD (2019) International best practices for identification of priorities within chemicals management systems OECD series on testing and assessment. vol 314. OECD Publishing, Paris <https://doi.org/10.1787/0fafd6f5-en>. <https://www.oecd-ilibrary.org/content/publication/0fafd6f5-en>. Accessed 03 Oct 2024
15. Krueger RA, Casey MA (2014) Focus groups: a practical guide for applied research. 5th edn. SAGE Publications, London. <https://books.google.fr/books?id=ai7goAEACAJ>. Accessed 03 Oct 2024
16. King N, Horrocks C (2010) Interviews in Qualitative Research. SAGE Publications, London. <https://books.google.fr/books?id=Cj1dBAAAQBAJ>. Accessed 03 Oct 2024
17. Lumivero (2021) NVIVO 12 (Windows). <https://help-nv.qsrinternational.com/12/win/v12.1.112-d3ea61/Content/welcome.htm?cshid=139>. Accessed 16 April 2023
18. Braun V, Clarke V (2006) Using thematic analysis in psychology. *Qual Res Psychol* 3:77–101. <https://doi.org/10.1191/1478088706qp0630a>
19. Saldana J (2013) The coding manual for qualitative researchers. Sage Publication, London. <https://emotrab.ufba.br/wp-content/uploads/2020/09/Saldana-2013-TheCodingManualforQualitativeResearchers.pdf>. Accessed 03 Oct 2024
20. NORMAN Network (2023) NORMAN: network of reference laboratories, research centres and related organisations for monitoring of emerging environmental substances. <https://www.norman-network.net/?q=Home>. Accessed 02 Nov 2023
21. ATHENA (2023) ATHENA: assays for the identification of thyroid hormone axis—disrupting chemicals: elaborating novel assessment strategies. <https://athenaedctestmethods.net/>. Accessed 02 Nov 2023
22. FREIA Project (2023) FREIA project: safeguarding female reproductive health against endocrine disrupting chemicals. <http://freiaproject.eu/wp/gen-info/>. Accessed 02 Nov 2023
23. EURION Cluster (2023) EURION: European cluster to improve identification of endocrine disruptors. <https://eurion-cluster.eu/>. Accessed 02 Nov 2023
24. David M, Schwedler G, Reiber L, Tolonen H, Andersson A-M, Esteban López M, Joas A, Schöpel M, Polcher A, Kolossa-Gehring M (2020) Learning from previous work and finding synergies in the domains of public and environmental health: EU-funded projects BRIDGE Health and HBM4EU. *Arch Public Health* 78(1):78. <https://doi.org/10.1186/s13690-020-00460-9>
25. Fadlallah R, Daher N, El-Harakeh A, Hammam R, Brax H, Bou Karroum L, Lopes LC, Arnous G, Kassamany I, Baltayan S, Harb A, Lotfi T, El-Jardali F, Akl EA (2022) Approaches to prioritising primary health research: a scoping review. *BMJ Glob Health* 7(5):e007465. <https://doi.org/10.1136/bmjgh-2021-007465>
26. PARC (2024) PARC: rapid response mechanism (RRM). <https://www.eu-parc.eu/thematic-areas/science-policy/rapid-response-mechanism>. Accessed 22 Nov 2024
27. Smith LL, Brent RL, Cohen SM, Doerrer NG, Goodman JI, Greim H, Holsapple MP, Lightfoot RM (2008) Predicting future human and environmental health challenges: the health and environmental sciences institute's scientific mapping exercise. *Crit Rev Toxicol* 38(10):817–845. <https://doi.org/10.1080/10408440802486378>
28. Bonnefoi MS, Belanger SE, Devlin DJ, Doerrer NG, Embry MR, Fukushima S, Harpur ES, Hines RN, Holsapple MP, Kim JH, MacDonald JS, O'Lone R, Pettit SD, Stevens JL, Takei AS, Tinkle SS, van der Laan JW (2010) Human and environmental health challenges for the next decade (2010–2020). *Crit Rev Toxicol* 40(10):893–911. <https://doi.org/10.3109/10408444.2010.506640>
29. Sutherland WJ, Fleishman E, Mascia MB, Pretty J, Rudd MA (2011) Methods for collaboratively identifying research priorities and emerging issues in science and policy. *Methods Ecol Evol* 2(3):238–247. <https://doi.org/10.1111/j.2041-210X.2010.00083.x>
30. Van den Brink PJ, Boxall ABA, Maltby L, Brooks BW, Rudd MA, Backhaus T, Spurgeon D, Verougstraete V, Ajao C, Ankley GT, Apitz SE, Arnold K, Brodin T, Cañedo-Argüelles M, Chapman J, Corrales J, Coutellec MA, Fernandes TF, Fick J, Ford AT, Giménez Papiol G, Groh KJ, Hutchinson TH, Kruger H, Kukkonen JVK, Loutseti S, Marshall S, Muir D, Ortiz-Santaliestra ME, Paul KB, Rico A, Rodea-Palomares I, Römbke J, Rydberg T, Segner H, Smit M, van Gestel CAM, Vighi M, Werner I, Zimmer EI, van Wensem J (2018) Toward sustainable environmental quality: priority research questions for Europe. *Environ Toxicol Chem* 37(9):2281–2295. <https://doi.org/10.1002/etc.4205>
31. Flynn TN, Louviere JJ, Peters TJ, Coast J (2007) Best–worst scaling: what it can do for health care research and how to do it. *J Health Econ* 26(1):171–189. <https://doi.org/10.1016/j.jhealeco.2006.04.002>
32. Linkov I, Loney D, Cormier S, Satterstrom FK, Bridges T (2009) Weight-of-evidence evaluation in environmental assessment: review of qualitative and quantitative approaches. *Sci Total Environ* 407(19):5199–5205. <https://doi.org/10.1016/j.scitotenv.2009.05.004>
33. Ågerstrand M, Beronius A (2016) Weight of evidence evaluation and systematic review in EU chemical risk assessment: foundation is laid but guidance is needed. *Environ Int* 92–93:590–596. <https://doi.org/10.1016/j.envint.2015.10.008>
34. PARC (2023) PARC: Synergies SYNnet. <https://www.eu-parc.eu/synnet>. Accessed 05 Jun 2023
35. Dulio V, Koschorreck J, van Bavel B, van den Brink P, Hollender J, Munthe J, Schlabach M, Aalizadeh R, Agerstrand M, Ahrens L, Allan I, Alygizakis N, Barcelo D, Bohlin-Nizzetto P, Boutroup S, Brack W, Bressy A, Christensen JH, Cirka L, Covaci A, Derksen A, Deviller G, Dingemans MML, Engwall M, Fatta-Kassinos D, Gago-Ferrero P, Hernández F, Herzke D, Hilscherová K, Hollert H, Junghans M, Kasprzyk-Hordern B, Keiter S, Kools SAE, Krueve A, Lambropoulou D, Lamoree M, Leonards P, Lopez B, López de Alda M, Lundy L, Makovinská J, Marigómez I, Martin JW, McHugh B, Miège C, O'Toole S, Perkola N, Polesello S, Posthumus L, Rodriguez-Mozaz S, Roessink I, Rostkowski P, Ruedel H, Samanipour S, Schulze T, Schymanski EL, Sengli M, Tarábek P, Ten Hulscher D, Thomaidis N, Togola A, Valsecchi S, van Leeuwen S, von der Ohe P, Vorkamp K, Vrana B, Slobodnik J (2020) The NORMAN Association and the European Partnership for Chemicals Risk Assessment (PARC): let's cooperate! *Environ Sci Eur* 32(1):100. <https://doi.org/10.1186/s12302-020-00375-w>
36. Dulio V, von der Ohe PC (2013) NORMAN Prioritisation framework for emerging substances. NORMAN Association, Verneuil en Halatte. [https://www.norman-network.net/sites/default/files/files/Publications/NORMAN\\_prioritisation\\_Manual\\_15%20April2013\\_final%20for%20website-f.pdf](https://www.norman-network.net/sites/default/files/files/Publications/NORMAN_prioritisation_Manual_15%20April2013_final%20for%20website-f.pdf). Accessed 03 Apr 2023
37. Merton RK (1968) The Matthew effect in science. The reward and communication systems of science are considered. *Science* 159(3810):56–63
38. Grandjean P, Eriksen ML, Ellegaard O, Wallin JA (2011) The Matthew effect in environmental science publication: a bibliometric analysis of chemical substances in journal articles. *Environ health* 10(1):96. <https://doi.org/10.1186/1476-069X-10-96>
39. Kolossa-Gehring M, Pack LK, Hülck K, Gehring T (2023) HBM4EU from the Coordinator's perspective: lessons learnt from managing a large-scale EU project. *Int J Hyg Environ Health* 247:114072. <https://doi.org/10.1016/j.ijheh.2022.114072>
40. Brown J (2018) Interviews, focus groups, and Delphi techniques advanced research methods for applied psychology: design, analysis and reporting. Routledge, London <https://doi.org/10.4324/9781315517971>. [https://eprints.lse.ac.uk/100954/1/Brown\\_interviews\\_focus\\_groups\\_delphi\\_techniques.pdf](https://eprints.lse.ac.uk/100954/1/Brown_interviews_focus_groups_delphi_techniques.pdf). Accessed 02 Jan 2024

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