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Curtin University

OIL AND GAS  
INNOVATION CENTRE

# A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

Curtin University Oil & Gas Innovation Centre

## Key Stakeholder and Decision Panel Report

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# Key Stakeholder & Decision Panel Report

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## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

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# Executive summary

This research project was a collaboration between Curtin University, the University of Western Australia and the University of Aberdeen (National Decommissioning Centre) and was managed by the Curtin University Oil and Gas Innovation Centre (CUOGIC). The project's aim was to define the priority research questions and knowledge gaps which will act as differentiators in the decision making and approval for decommissioning Australian offshore oil and gas infrastructure over the next 10-20 years.

The project was driven by the need to solicit input and insights from a wide range of stakeholders, who had influence and interest in decommissioning decision and approvals, to ensure the key issues, opportunities and questions were captured. This was a deliberate strategy to move beyond industry and researcher input so future decommissioning research programs would be focussing on the priority questions which were sourced from the ground up and reflected the diversity of interests in this field.

The project team successfully identified, engaged, and consulted with 61 key national stakeholders through five focus group workshops. These workshops captured 371 issues and opportunities and 89 research questions via a detailed and rich causal mapping process (see Attachments A through E). These research questions were synthesised to define a set of 39 key questions, following which an independent Decision Panel was convened to transparently identify and rank a final set of 23 priority questions (see Figure 1, Figure 8 and Table 10). These priority questions, and all the supporting stakeholder generated data, can now be used by the NDRI and other interested parties to inform research strategies in support of the decommissioning of Australia's offshore oil and gas infrastructure.

The key insights of this research project are:

- ❖ Stakeholder workshops and Decision Panel discussions revealed a wide range of perspectives and priorities. The wealth of information and opinion emanating from the workshop activities in the form of 89 stakeholder research questions and their supporting context should play a role in determining the national research roadmap alongside those questions seen as priorities by the Decision Panel.
- ❖ Concerns and requirements for information on the fate and impact of contaminants were seen as priorities by the Decision Panel. Workshop participants did not define what was meant by contaminants, potentially as some stakeholder participants considered this was a specific question to be considered, identifying contaminants of concern. It is clear that, within the context of decommissioning, what is considered a contaminant needs better definition. Improved clarity will help focus future research activities and target specific contaminants.
- ❖ Only one priority regulatory framework and policy question was selected in the final 23 questions which is counter to the prevalence of this issue in previous Australian research and other regions such as the UK, who are actively addressing the research required to support the country's net zero by 2050 policy position.
- ❖ Less attention was accorded to ecological benefits of decommissioning and infrastructure compared with previous similar studies.
- ❖ There was explicit consideration of research questions that may be relevant within different time frames and this focus was used in the context of the stakeholder workshops. Participants found it difficult to make this differentiation explicit which is a recognised cognitive challenge when predicting future issues. Applying a repeated elicitation process for each time frame was not feasible given the time constraints.
- ❖ Degree of understanding of (i.e. the landscape of) decommissioning varied considerably between stakeholders. The engagement process and outcomes from this work are a good foundation and

opportunity for stakeholders to engage more across sectors, both in terms of frequency and knowledge exchange, for a shared and potentially common understanding of values and purpose.

- ❖ The Decision Panel was structured to represent the stakeholder groups participating in the workshops whilst ensuring a deep knowledge of decommissioning decision-making processes. Subjectivity could not be discounted; hence another Decision Panel may not have generated the same outcomes. However, the findings of the Panel are broadly consistent with research elsewhere both nationally and internationally.

Key Recommendations:

- ❖ That a full consideration of stakeholder group outcomes, alongside the Decision Panel recommendations, is necessary when developing the decommissioning research roadmap for the future. This is required to reflect the diversity of issues and secure the social licence necessary for decommissioning decisions.
- ❖ To mitigate the cognitive barrier to forecast issues and questions for the future, there are two levels of recommendation. The first centres on the operational and workshop level, greater care needs to be given as to how to elicit future differentiators in decision-making as this requires a degree of conjecture which may not be comfortable for participants (i.e. scenario planning) or structuring workshops around specific timescales.
- ❖ The second centres on the detailed systemic information generated through the stakeholder workshops and presented in this report – proposing it be used to enhance the level of understanding across all stakeholders. Moreover, based on the observations and feedback from those attending, it is recommended that regular and effective engagement processes (for example, the form of workshop run in this project) be implemented to continually update and improve this understanding so a future orientated and common set of shared values and purpose can be achieved.
- ❖ It is recommended that “a national and recognised organisation” (for example Centre of Decommissioning Australia (CODA) or NDRI) takes accountability for all the key issues identified in the report to manage both the overall decommissioning research plan rollout and the ongoing stakeholder engagement/knowledge sharing. The Research Team is concerned that the outcomes and impetus generated by this study will not be taken forward in its entirety, and organisations will pursue the issues that are most aligned to their priorities without attending to their context and thus potentially impacting systemic and sustainable practice.
- ❖ Additionally, there is an opportunity to integrate the current parallel NSEP and NDRI research road mapping programmes and to share these joint outcomes to all stakeholders identified in the NDRI research study. This would also be a demonstration of the first steps of an aligned and national decommissioning research strategy and could act as the first knowledge sharing reinforcement opportunity following the stakeholder workshops.

Curtin University Human Research Ethics Committee (HREC) confirmed the study meets the National Statement on Ethical Conduct in Human Research 2007 (Updated 2018) and approved the application (HRE number HRE2022-0022) on 13<sup>th</sup> January 2022 for a year duration.



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The Research Team would also like acknowledge the National Research Decommissioning Initiative and the associated industry participants, for the opportunity to conduct this unique research project and to allow the Research Team to independently and objectively engage with the stakeholder community to collect, synthesise, select and rank the priority research questions impacting decommissioning decision making and approvals.

# 1 Introduction

## 1.1 Background

The National Decommissioning Research Initiative (NDRI) has been executing a range of priority projects over the last two years (July 2020 to today) as part of its phase 1 research program focussed on the marine ecology habitat and connectivity value of offshore oil and gas infrastructure, invasive marine species, degradation mechanisms of metallic and non-metallic materials and the marine impact and risk of residual Hg and NORM in subsea pipelines if decommissioned in-situ. As the phase 1 program concludes, NDRI wish to establish what the remaining key research questions are which will address the critical knowledge gaps associated with Australia’s offshore decommissioning challenges over the next 10 - 20 years.

NDRI have also provided phase 2 program framing guidance by targeting research questions and knowledge gaps which are differentiators in the decision making and approvals for decommissioning Australian offshore oil and gas infrastructure. In addition, NDRI are seeking to broaden the research questions beyond those perceived important by the oil and gas industry and research community alone (i.e., beyond the phase 1 program) to all key stakeholders who have an interest in, and influence upon, decommissioning decisions and approvals. The project was collaboratively framed with NDRI in Q4 2021 around a conceptual three step process illustrated in Figure 2. The maturation of this process, changes to and resulting outcomes are captured within this report.

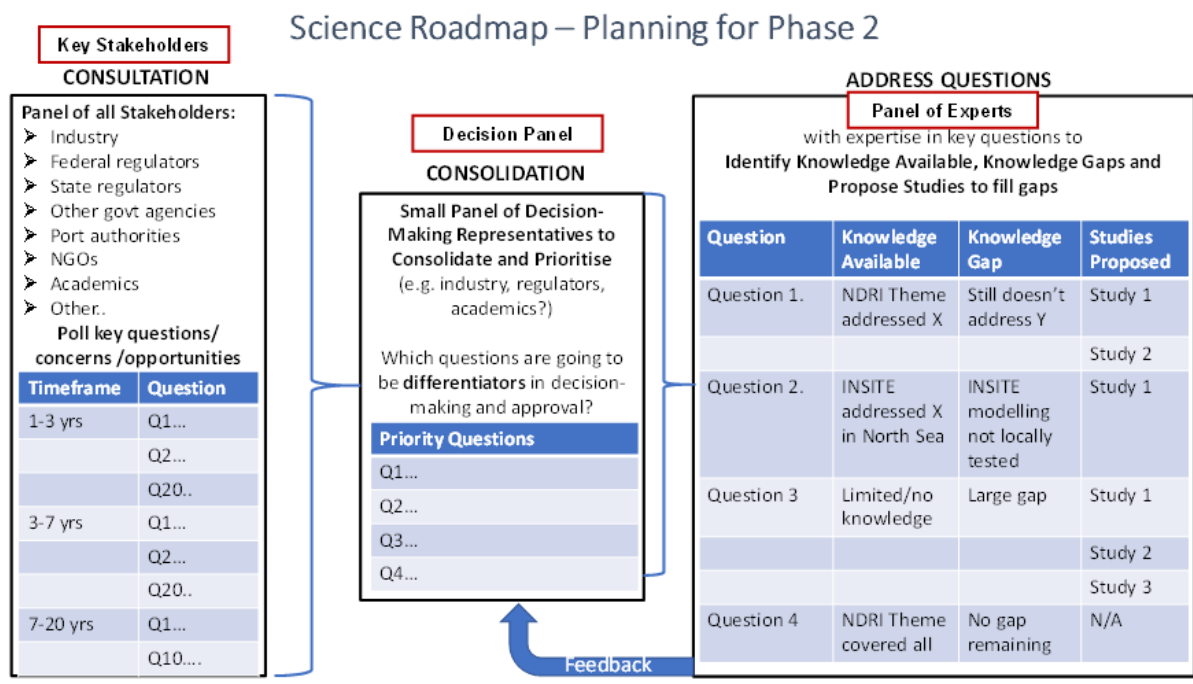


Figure 2 Initial research question conceptual process (Source: NDRI)

The Research Team (RT) is a partnership between Curtin University, The University of Western Australia, and The University of Aberdeen (National Decommissioning Centre) (see Figure 3). The project was managed by the Curtin University Oil and Gas Innovation Centre (CUOGIC) with researchers from the named institutions specifically selected for their expertise in the areas of stakeholder engagement and strategy development, marine ecology, marine/aquatic environmental risk, environmental economics, marine resource management, socio-economics and oil and gas technology and decommissioning research/knowledge management.

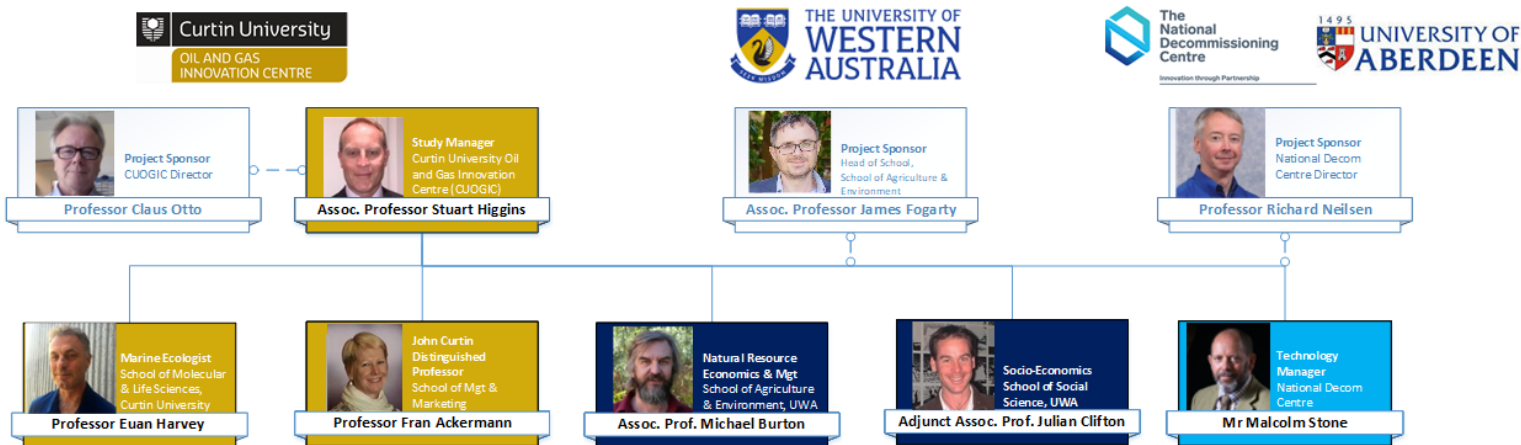


Figure 3 Research Team organisational structure

## 1.2 Project purpose and objectives

The project's aim was to define the priority research questions and knowledge gaps which are differentiators in the decision making and approval for decommissioning Australian offshore oil and gas infrastructure over the next 10-20 years and outline the requisite research programme. The key objectives to meet this aim were:

- **Objective 1- Identify Key Stakeholders & Align Process**  
Identify who are the key stakeholders across industry, government/agencies, community and research/academia with decommissioning decision influence and knowledge. Obtain University ethics approvals and agree to the engagement process for key stakeholders.
- **Objective 2- Key Stakeholder Consultation**  
Secure a comprehensive and systemic elicitation of key stakeholder views underpinning the issues, opportunities and associated key questions for decommissioning decisions and approvals spanning short (0-5 yr), medium (5 -10 yr) & long term (10 -20 yr) time scales.
- **Objective 3 – Synthesise Key Stakeholder Output**  
Provide a synthesis of the stakeholder consultation across all identified focus groups which clearly and concisely articulates the range of issues and opportunities for decommissioning decisions and approvals, the underlying themes and a consolidated list of key questions.
- **Objective 4 – Facilitate Judgement & Ranking of Priority Questions**  
Identify and facilitate a Decision Panel (DP) to determine and rank the priority questions (i.e. a subset of the key questions) which, if answered, will impact decommissioning decision making and approval.
- **Objective 5 – State of Knowledge Review & Research Program Definition**  
For each priority question establish the current knowledge available, assess and quantify the research knowledge gap(s) and propose a high-level research program for each: quantifying scope, approximate timescales, and costs.
- **Objective 6 – Research Program Review, Approval and Communication**  
Table research program to DP for review/approval and communicate to key stakeholders.

**Note:** While objectives 5 and 6 were initially part of the RT's scope of work, it was jointly agreed during the project by the NDRI and the RT that NDRI would manage and execute these objectives immediately following the current study. NDRI preference was for the expert panel to specifically examine the knowledge gaps aligned to their organisational scope accountability. Objectives 5 and 6 along with any associated scope will not be further discussed in the remainder of this report which would include a subset of the issues identified in the stakeholder workshops and prioritised by the Decision Panel, for example environmentally focused issues.

### 1.3 Project scope

The scope of work was framed to support the delivery of the four project objectives for Australian offshore infrastructure decommissioning decision and approvals. Following ethics approvals, stakeholders needed to be appropriately identified and engaged to secure the requisite breadth and depth of their input, along with the underlying drivers, to establish the key questions for DP assessment and ranking. The scope of work was therefore focussed on identifying the most appropriate representation of key stakeholders, engaging them in a process which maximised the breadth and depth of information and insight (within practical timescales and discretionary effort) and facilitating an objective DP question selection and priority process, with clear terms of reference.

#### 1.3.1 Objective 1: Identify key stakeholders & align process

The RT applied for ethics approval from Curtin University. Following approval, external participants were approached to participate and contribute to the project. The RT conducted a kick-off workshop with the NDRI to ensure alignment of purpose, objectives scope, method and study outcomes. Within the kick-off workshop a Social Network Analysis (SNA) (Otte, et al. 2002) was conducted to identify key stakeholders and focal groups across industry, government/agencies, community, and research/academia who have influence and interest in decommissioning decisions and approvals. The SNA spanned all relevant organisations geographically to ensure there was appropriate stakeholder coverage across the nation, a minimum of which was State and Federal entities linked with current oil and gas offshore infrastructure off the coast of Victoria, Northern Territory and Western Australia.

#### 1.3.2 Objective 2: Key stakeholder consultation

The scope for this objective used the existing relationships across the RT and NDRI to connect with the identified stakeholders, introduce the project and objectives securing their participation in a series of virtually run causal mapping workshops (one for each identified focal group) to deliver the Objective 2 requirements. Five focal group workshops were required with a maximum of 10 participants in each (i.e. 50 in total) and via internet access connecting participants in any location throughout Australia.

In accordance with university ethics requirements, the requisite ethics forms and participant approvals were distributed and responses requested from each key stakeholder prior to formally engagement and execution of the virtual causal mapping workshops. The workshop output was captured in a manner which is not attributable to any individual or organisation. The RT captured, as part of the workshop output, the issues, opportunities, causation, themes and associated key questions informed by the conversations within the cohort. Finally, the RT conducted a prioritisation process with the focal group to capture what degree of consensus exists across the key questions.

#### 1.3.3 Objective 3: Synthesise stakeholder output

All causal maps from each focus group were explored by the RT on an individual (single cohort model) and combined (integration of the models) basis to determine homogeneity and heterogeneity of the

issues, themes and questions developing a synthesised set of key questions which objectively captured the stakeholders' views on what they deem are important differentiators for decommissioning decisions and approvals. An objective judgement was required by the RT as to what point the synthesisation process should stop, beyond which the depth and breadth of the key stakeholder input was being inappropriately generalised with the risk of losing the impact for the DP assessment and ranking process in objective 4. The RT created a synthesised set of key questions for the DP which were non-attributable to any one key stakeholder or focal group to minimise the chance of bias during the subsequent DP question selection and ranking process.

### 1.3.4 Objective 4: Judgement and ranking of priority questions

The RT developed a DP Terms of Reference (ToR), based on initial discussions at the kick-off workshop, and subsequent refinement with NDRI. The RT recommended names for the DP based on participant criteria and their availability. Once the DP panel was secured the RT facilitated a kick-off meeting and presentation, followed by a set of key questions surveys (2 off) linked with a DP workshop.

## 1.4 Constraints and exclusions

Scope exclusions of this report include the following:

- Aligning with the commencement of the current study, a Research Project 1.19, "Scoping study: Horizon scan of key science questions in the decommissioning of offshore oil and gas infrastructure", under the National Environmental Science Program, which was initiated by Deakin University. The RT reached out to the Deakin study team to determine if there was duplication of effort and whether both teams could collaborate and share outcomes for reporting and learning purposes. While similar in desired outcomes: identifying key research questions over the medium to long term to inform future decommissioning research, the NDRI study was deemed to be unique due to its stakeholder derived data and assessment methodology. Access to the NESP parallel program outcomes was not possible until the Deakin team had made public their reported outcomes. This public reporting is still pending, and therefore has not been assessed nor captured in this NDRI report.  
(see <https://www.dcceew.gov.au/science-research/nesp/current-projects/marine-coastal>)

## 1.5 Ethics and approvals

In accordance with Curtin University policy, any research which is conducted with or about people, or their data or tissue must comply with the National Statement on Ethical Conduct in Human Research 2007 (Updated 2018). The RT submitted a formal ethics application for the project specifying each researchers' skills and experience, funding body, project summary, location, research impact to the community, risks and mitigations to the participants, participant recruitment, consent and any high-risk attributes, potential conflicts of interest, research method, research data management plan and proposed participant project information sheet and consent forms.

Curtin University Human Research Ethics Committee (HREC) confirmed the study meets the National Statement on Ethical Conduct in Human Research 2007 (Updated 2018) and approved the application (HRE number HRE2022-0022) on 13<sup>th</sup> January 2022 for a year duration.

In accordance with the ethics approval the information collected in this research will be re-identifiable (coded). This means the RT will remove identifying information on any data or sample and replace it with a code. Any information we collect will be treated as confidential and used only in this project unless otherwise specified. No direct attribution of data, to either an individual or an organisation, will be made public.

## 1.6 Document structure

This document is structured around four key headings plus attachments:

- **Approach:** defines the method adopted for the key stakeholder identification, engagement and workshops, the synthesis of key stakeholder output and the DP process (i.e. member appointment and priority question selection and ranking)
- **Key stakeholder outcomes:** key stakeholder workshop generated question sets from 5 focal groups, RT's synthesis of key questions, DP priority questions and ranking outcomes
- **Discussion:** key insights and observations spanning the research approach, stakeholder focus group themes and insights, the DP priority question selection and ranking followed by a high comparison of published previous, current and future decommission research studies and strategy positions both domestically and internationally
- **Conclusions and recommendations**
- **Attachments:** detailed output from stakeholder causal workshops and decision panel assessment process



## 2 Approach

### 2.1 Overview

Figure 4 provides a high-level overview of the sequential approach undertaken by the RT to meet the project’s stated aim and objectives. The approach is segregated into activities undertaken solely within, and between, the RT and NDRI (i.e., “Backroom work”) and “Field work” which involved the participation and interaction with key stakeholders and members of the DP.

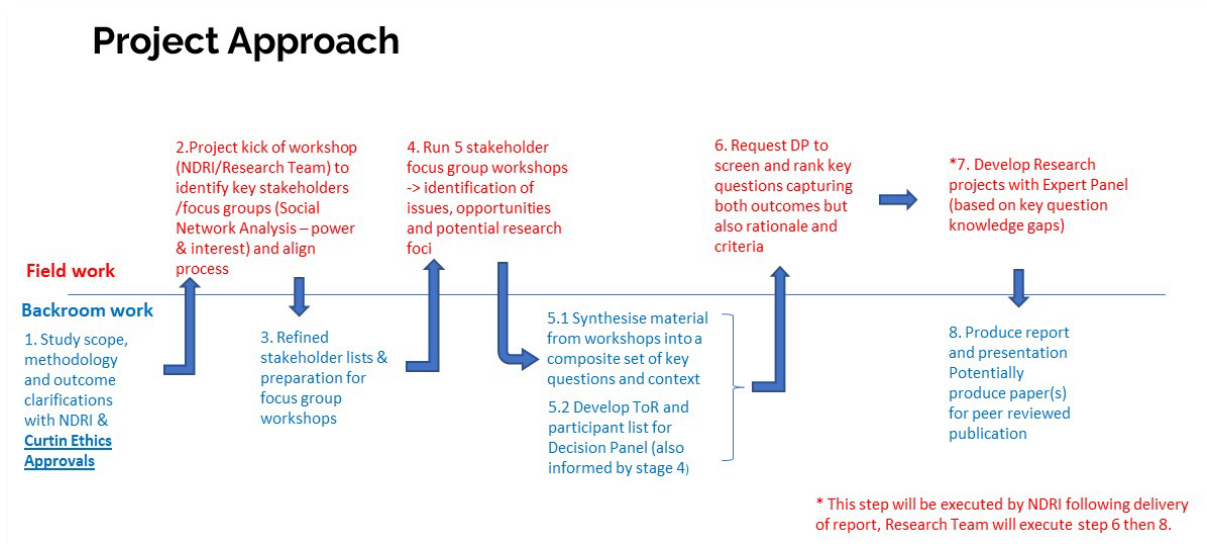


Figure 4 Project approach overview

In developing and executing the study approach the RT gave due consideration to the following matters:

- Selection and engagement process of stakeholders to ensure the primary source of project data was value maximised (i.e., appropriate breadth and depth linked to project aims and objectives)
- Stakeholder participation/engagement would be challenging due to their time, priority constraints and “engagement fatigue” – the process had to be efficient and well communicated
- Subjectivity and bias were a concern (e.g., championing a company or organisation policy)
- The RT’s role was to facilitate an unbiased and unabridged account of stakeholder insights, not provide their own opinion and/or influence the reported outcomes nor allow a stakeholder an undue level of influence
- The DP would be the sole arbiter for the determination of selected and ranked key questions, they needed to be as independent as practicable but, also have decommissioning decision and approvals knowledge
- A need to promote an open and objective based interaction between stakeholders recognising the potential regulatory, commercial, and public sensitivities. Confidentiality would be front of mind; attribution of data could only be reported if it did not link to an organisation or any one individual

The following sections capture the approach in detail for the stakeholder identification and engagement, stakeholder workshop design and synthesis of output and finally the DP process.

## 2.2 Key stakeholder identification and engagement

The RT executed a Stakeholder Network Analysis during the project kick-off workshop with NDRI. This was a facilitated brainstorming session, simultaneously face to face and online, to determine what entities and/or individuals across all Australian States and Territories have both *influence* and *interest* in decommissioning decisions and approvals. Their perceived strength in both these areas were assessed in relative terms and focal groups were identified and mapped.

The list of stakeholder organisations identified to have material *influence* and *interest* is captured in Table 1 which also defines five cohorts. These cohorts guided the minimum number of workshops required. The RT believed the allocation of a workshop to each focal group had the best chance of eliciting a comprehensive set of unbiased stakeholder views. The RT acknowledges that other organisations may have influence and interest in the area, but time and logistical constraints prevented expanding the list further.

An attempt was made to contact all entities within Table 1 and offer participation in the workshops, a total of 61 individual personnel from across 59 organisations were contacted. This was a one-on-one process shared across the RT, and while time consuming, was the only effective means of engaging with stakeholders. This engagement process also informed the RT as to any other organisations who may have been missed and, to the contrary, supported the discounting of others.

Several factors influenced the accessibility and response to the RT's expression of interest process. For example, the fisheries focal group were "engagement fatigued" due to a recent increase in offshore decommissioning activity triggering formal environmental plan consultation with the oil and gas industry. They were also resource constrained and had to prioritise supporting their core business.

The RT also spoke extensively to the NGO focal group, who showed a willingness to participate. Unfortunately, the timing of a federal election made it difficult for NGOs to prioritise oil and decommissioning issues over broader and more urgent state and federal political drivers at the time.

For reasons of anonymity, no details can be provided in Table 1 as to which organisations showed interest *and* attended the workshops. However, the number of stakeholder organisations represented in each workshop was as follows: Industry (12); Government and Regulatory (9); Fisheries (7); NGOs (4); Researchers (9) for a total of 41 participants from the 61 personnel contacted.

## 2.3 Key stakeholder focus group workshops

The design of the stakeholder workshops was informed by the second objective, namely "to secure a comprehensive and systemic elicitation of key stakeholder views underpinning the issues, opportunities and associated key questions for decommissioning decisions and approvals spanning a 0-20 year time scale". As such the stakeholder workshops were designed to allow for participants to surface *deep* (reflecting nuanced, elaborated data capture) and *systemic* (reflecting the presence of interactivity between elements) information. In addition, the focus groups were designed to enable participants to gain an *increased awareness and understanding* of the range of issues, opportunities and questions relating to decommissioning.

To ensure involvement from across the country, the focus group workshops were conducted a group support system approach designed for effective engagement (Ackermann and Eden, 2020) which employs a modelling technique, causal mapping and associated software (<https://www.strategyfinder.com/>). Each focus group was targeted to a particular cohort (stakeholder group). These were industry, regulators, fishing, NGOs and research. The 5 workshops were conducted between April and May 2022 and included 41 participants. Whilst most attendees were from Western

Australia, there were participants from organisations based in Northern Territory, Tasmania, Victoria, New South Wales, South Australia and Canberra.

The process adopted followed a well-established modelling process which allowed for a structured conversation (see Ackermann and Eden (2011), Eden and Ackermann (2010)). Each focus group workshop followed the same design (to ensure comparability) and lasted between 3 to 3.5 hours. The rationale for the selected length of time was to balance busy diaries with being able to capture and explore the emergent material in a comprehensive fashion.

## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

Table 1 List of stakeholder organisations, by cohort, contacted and offered participation in stakeholder workshops. For organisations represented across multiple cohorts, independent and different personnel were selected for each.

	Industry	Government/Regulatory	Fisheries	NGOs	Researchers
1	Australian Petroleum Production & Exploration Association (APPEA)	Australian Maritime and Safety Authority (AMSA)	Australian Fisheries Management Authority (AFMA)	Australian Conservation Foundation (ACF)	Australian institute of Marine Science (AIMS)
2	Chevron Australia Pty Ltd	Department of Agriculture, Water and the Environment (DAWE)	Commonwealth Fisheries Association (CFA)	Australian Marine Conservation Society (ACMS)	Australian Nuclear Science and Technology Organisation (ANSTO)
3	Cooper Energy Ltd	Director of National Parks (DNP)	Department of Industry, Tourism and Trade (DITT) Northern Territory	Cape Conservation Group	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
4	ENI Australia Ltd	Department of Industry, Science, Energy and Resources (DISER)	Department of Primary Industries and Regional Development (DPIRD) WA	Conservation Council of Western Australia	Curtin University
5	ExxonMobil Australia Pty Ltd	National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)	Department of Water and Environmental Regulation (DWER) WA	Environment Centre of Northern Territory	Deakin University
6	INPEX Australia Pty Ltd	Department of Industry, Tourism and Trade (DITT) Northern Territory	Fisheries Research and Development Corporation (FRDC)	Friends of the Earth	Department of Primary Industries and Regional Development (DPIRD) Western Australia
7	International Association of Oil and Gas Producers (IOGP)	Department of Jobs, Precincts and Regions (DJPR) Victoria	Northern Territory Seafood Council (NTSC)	Greenpeace	Energy Transition Institute
8	Jadestone Energy (Australia) Pty Ltd	Department of Mines, Industry Regulation and Safety (DMIRS) Western Australia	Recfishwest	Ningaloo Coast World Heritage Advisory Committee	Macquarie University
9	Santos Ltd	Department of Primary Industries and Regional Development (DPIRD) Western Australia	Seafood Industry Victoria (SIV)	Scuba Divers Federation of Victoria (SDFV)	University of Tasmania
10	Shell Australia Pty Ltd	Department of Water and Environmental Regulation (DWER) Western Australia	South East Trawl Fishing Industry Association (SETFIA)	Sunrise Project	University of Western Australia
11	Vermilion Oil and Gas Australia Pty Ltd		Tasmanian Seafood Industry Council (TSIC)	Surfrider Foundation Australia	Western Australian Marine Science Institution (WAMSI)
12	Woodside Energy Group Ltd		Victorian Fisheries Authority (VFA)	The Nature Conservancy (Australia)	
13			Victorian Recreational Fishing Peak Body (VRFish)	Wilderness Society	
14			Western Australian Fishing Industry Council (WAFIC)	World Wildlife Fund (WWF)	

WA	National	Vic	SA	NT	International	NSW	Tas
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Each focus group workshop began with an introduction to the research objectives, and a review of the agenda, providing participants with a clear outline of how the focus group would unfold. After a brief explanation of mechanics associated with the Group Support System used, all the workshops commenced with participants being requested to surface the “*issues and opportunities regarding future decommissioning decisions and approvals both now and in the future*”.

To enable as wide a range of views to be captured, in an authentic manner, individuals were able to *enter their issues and opportunities anonymously and directly* via their own devices. This process ensured that the contributions were captured in the language of the participants rather than risk being changed through a facilitator paraphrasing them. It also ensured all the views were captured and not lost. Allowing participants to anonymously contribute the issues and opportunities directly helps reduce conformity pressures allowing for more wide-ranging views to be captured. It also enables each participant to speak ‘simultaneously’ enabling an increase in productivity (Ackermann, 2020). In addition, the process enables a breadth of material (attending to the requirement for a comprehensive consideration) to be captured, avoiding the constraints imposed by surveys which frequently present a list of options from which to choose.

Each participant was able to see their own material and that of others as it was generated. This both enables the prompting of further material (participants can piggyback off one another’s contributions) and digestion of others’ contributions (avoiding immediate physiological responses and allowing more thoughtful consideration). As such participants were able to immerse themselves in the wide range of views and gain a deeper appreciation of the issues and opportunities surrounding the topic.

During the generation phase, contributions were clustered according to content by the facilitator. This aided the navigation of the material as typically over 50 statements were captured in a very short time and, by clustering the material, it is possible to manage the unfolding complexity. Once participants had surfaced all the issues/opportunities that came to mind, a review of the clusters was undertaken. The review enables:

- a check to ensure contributions are in the most appropriate cluster (it is not untypical for contributions to be able to ‘fit’ in >1 cluster and so determining the most appropriate helps with effective positioning as well as prompting further conversation).
- each contribution to be checked for comprehension by all - sometimes resulting in the wording requiring further elaboration to ensure a shared understanding.
- the generation of new material as meaning is discussed promoting further thoughts.
- the ability to determine ‘themes’.

The next step was to explore the systemic impacts between the issues and opportunities. This constitutes identifying connections between contributions in the form of causal links (chains of argument) reflecting that issues impact other issues and opportunities. This linking process enables the creation of a network (see Figure 5 reflecting a small section of the causal network) further assisting with the development of shared understanding, revealing systemic properties, and facilitating analysis. Recognition of the interactivity of issues and opportunities emerges early in the cluster review process as participants provide explanations as to why a statement should be in one cluster or another. The process of linking also reveals that issues and/or opportunities can impact more than one value illustrating multiple ramifications and potentially uncovering potent opportunities (supporting >1 value) or risky issues (having multiple negative consequences).

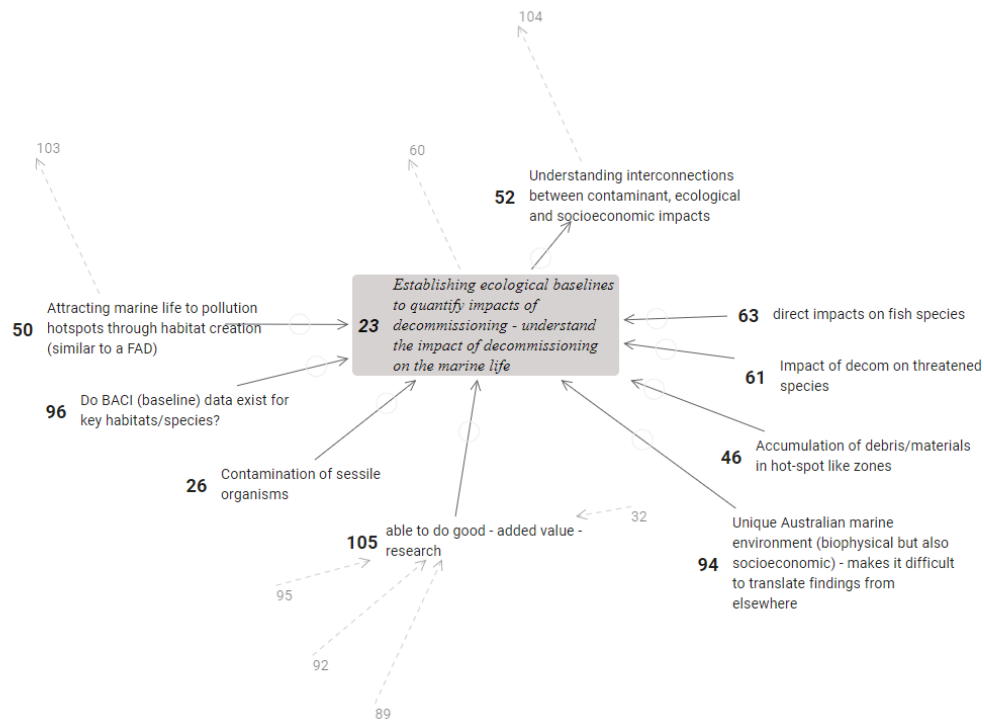


Figure 5 A small section of a causal network from one workshop showing a) categories with 'themes' being noted in grey boxes, b) other connections shown by the dotted arrows and c) the number of statements generated reflected by the numeric tag given to each statement.

The process of exploring the impact of contributions on one another:

- facilitates the prompting of further material as participants are exposed to the thinking of one another and how they perceive the world and as such participants respond to differences in opinion by teasing out alternative chains of argument.
- enables the building of a deeper understanding of the topic as issues and opportunities are seen in context.
- assists the group to move from divergence to convergence attending to the objective of increasing awareness.

To conclude the first part of the workshop, a reflective review was provided by a second member of the RT who had been listening to the conversations and considering the material. This review typically highlighted several emergent overarching themes. A brief tea/coffee break followed this reflection.

Following the break, participants were asked to consider each of the emergent themes and comment on why the issue themes were of concern (the logic is that participants perceive something to be an issue because it is implicitly adversely affecting something valued; likewise, it is an opportunity if it enables the achievement of something desired/valued). Once these had been identified participants were requested to identify key questions that would need to be asked to address the issues and achieve the valued outcomes. Collectively, these were identified, linked to issues, and wording refined. Typically, each emergent theme generated between 2 and 4 key questions.

The final session of the focus group workshop centred on prioritising the key questions. Participants were asked to rate the key questions giving a score of 10 to the question(s) that was/were most important, 0 to the question(s) least important and to rate the remaining questions according to these anchor points. In addition to determining which question received the highest rating, it was also possible

to see the degree of consensus. After a final review, participants were thanked for their involvement and informed about next steps.

Participants fed back comments such as:

- “Thanks all, a good discussion. Did a great job facilitating”
- “Well done to the organisers and all the best with the synthesis”
- “Thanks everyone, this was very useful and interesting”
- “I really enjoyed the workshop and I thought it was a great group with diverse expertise. The facilitation was excellent, and I thought the Strategyfinder tool worked very well. It was a pity it was a little rushed at the end but there was a lot to get through!”

### 2.4 Synthesis of key stakeholder output

The workshop process was intentionally open-ended, with the intention of capturing a wide range of questions. There was no time to synthesise these within the workshop itself, so the RT conducted a process to review the outcomes. The intention was to 1) identify any questions which overlapped and re-word these questions as a single question and 2) to rephrase anywhere it was necessary in order to express it as a research question taking into account the context surrounding it to ensure the meaning remained the same. Each workshop list was assigned to a pair from the RT. Both members worked independently and compared their findings to achieve a consensus. The findings of each pair were then circulated to the full RT for discussion and further re-phrasing if needed. This process led to the questions that were presented to the DP.

### 2.5 Decision Panel ToR and Process

#### 2.5.1 Decision Panel Terms of Reference (ToR)

The primary purpose of the DP was to objectively assess the key questions arising from the stakeholder consultation process; determining which are differentiators for decommissioning decision making and approvals. Once classed as such, provide a ranking of those questions. This was conceptually framed at the initiation of the project (see Figure 2). The scope of work developed for the DP ToR is based around three main activities defined in Table 2. The DP selection process and detailed ToR scope is described in the subsequent subsections.

#### 2.5.2 DP selection

The selection of the DP membership was an important consideration given the role of panel in what is deemed a priority question and by inference what is not. Selection criteria were proposed by the RT, with concurrence by the NDRI; namely:

- Panel should comprise a minimum of 3 individuals
- Candidates should have a deep understanding of the decommissioning decision process and approvals
- They should not have participated in any of the study workshops (to avoid perception of bias)
- They should be senior and knowledgeable in their field of expertise germane to decommissioning issues impacting decisions and approvals.

The Curtin University approved ethics application prevents the disclosure of participant identity without their permission. The individuals who were selected and participate in the DP therefore cannot be identified. We can disclose there were a total of four members on the panel from the NGO, Fisheries, Regulator and Industry sectors.

Table 2 DP Terms of Reference (ToR)

#	ToR Activity	Scope Description	
1	Question merging and binning (1 <sup>st</sup> survey – each panel member independently)	Input	Synthesised key questions from stakeholder workshop
		Scope	Identify questions which are the same for potential further merging (grouping across synthesized key questions).  Determine which of the synthesized key questions meet or exceed the impact criteria & provide a one sentence rationale for their selection.
		Output	Initial priority question “bin”, rationale, merge candidates
2	DP Workshop (All panel members)	Input	Initial priority question “bin”, rationale, merge candidates
		Scope	QA/QC of DP panel’s 1 <sup>st</sup> survey supplied data.  Agree if any questions need to be further merged.  Discuss and agree final priority question set.
		Output	Confirmation of final priority question set
3	Priority research question ranking (2 <sup>nd</sup> Survey – each panel member independently)	Input	Final priority question set
		Scope	Complete 2 <sup>nd</sup> Survey – independent online best/worst scaling for each DP member
		Output	DP aggregated ranking of priority questions

### 2.5.3 Question merging and binning (1<sup>st</sup> Survey)

The outcome of the synthesis of the stakeholder groups is a set of questions that have been harmonized within the stakeholder group. However, there was also duplication across groups, where similar questions were raised by different groups. Initially, a cross-group synthesis process was proposed to be undertaken by the RT, to reduce the total number of questions to generate a single unique set of questions. However, when this was started it was thought that this may lead to too many judgements being made by the RT, leading to questions that would not reflect the initial intent of the stakeholder groups. An adjustment to the process was then made so that the DP should see all questions and asked to complete two tasks:

- To identify questions which were sufficiently similar that they could be combined/re-written as a single question
- To identify those research questions which, if answered, would have the potential for significant impact on the decommissioning decisions and approvals. Impact is defined as a change in the decision, without any prior expectation of the nature of that change.

These tasks were undertaken independently, without interaction between DP members.



### 2.5.4 DP Workshop

The DP members were brought together in a facilitated workshop to ensure there was a correct understanding of the process requested of them by the RT (i.e., an assurance check), to discuss the questions that they proposed could be joined together, and which they had allocated to the set having significant impact. There was no expectation that unanimity would be achieved across all questions. Any question that at least one member of the DP thought was significant was retained in the set for ranking. By reviewing the questions selected and allowing the DP to discuss why they were considered significant, a common understanding across DP members was arrived at on the meaning of the question, even if there were still differences in opinion on impact.

Questions that were thought to be similar, and in the set with impact, were combined into a single question by the RT offline, and the reduced set used in the rating survey.

### 2.5.5 Priority research question ranking (2<sup>nd</sup> Survey)

The objective was to not only produce a set of questions which are deemed to have significant impact but to also to rank those questions in priority order. There are several techniques that can be used to achieve such a ranking (e.g., importance ratings, constant sum, Q-sort, unbounded ratings). It has been found that the Best Worst Scaling (BWS) approach is an effective method of generating rankings based on the time it takes to administer, their ability to discriminate between measures, their predictive validity and test-retest properties (see Chrzan & Golovashkina (2006), Burton et al (2021), Louviere et al. (2015)).

Considering only the 4 questions below, which of these research questions, if answered, do you think would have the **MOST** potential for significant impact on the decommissioning decisions and approvals, and which would have **LEAST**.

Most		Least
<input type="radio"/>	What are the contaminants of primary concern, what are their fate and consequence if released to the environment, both individually and cumulatively?	<input type="radio"/>
<input type="radio"/>	What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial to stakeholder groups?	<input type="radio"/>
<input type="radio"/>	What potential contaminants are associated with decommissioning and what are their potential cumulative impacts on the marine ecosystem and humans?	<input type="radio"/>
<input type="radio"/>	What is the sustainability and equity footprint for managing decommissioning waste and how can best practise be realised?	<input type="radio"/>

Figure 6 An example of BWS question subset, with 4 items drawn from the full list.

In BWS the set of items to be ranked is split into subsets (typically of 4 or 5 items). The number of subsets and the allocation of items to each subset is determined by an experimental design to ensure a set of desirable properties (i.e., each item appears the same number of times, balance in co-occurrence etc). Typically, a Balanced Incomplete Block Design (BIBD) is used, either taken from a design catalogue or generated using software (see Aizaki et al., 2014). For each subset a respondent is required only to select the best and worst (or most/least etc: the framing depends on context) item from each set. Figure 6 gives an example of a BWS question set. Combining responses across all subsets gives a complete ranking of items. It is suggested that if each item is seen at least 4 times in

the whole design, then it is possible to identify individual rankings, although there may be a tendency to have some items that a scored equally. Combining responses from a relatively small number of individuals is shown to give a robust estimate of the group ranking (see Louviere et al., 2015).

There are two methods of deriving the ranking scores: counting and statistical estimation. In the statistical estimation approach a formal choice model is estimated, which models the probability that an item is selected as best/worst from the items seen in the subset. The resulting parameters for each item give an estimate of the value of the item and can be interpreted in both an absolute ranking sense (larger parameters imply a higher rank), but also in a relative sense (i.e., the intensity of the relative ranking). Estimation methods can have issues using an individual's data as cases where an item is always scored best and never scored worst (or vice versa), the parameter cannot be numerically identified, and it is typically employed by combining all responses across all individuals into a single data set.

In the counting approach, indices are produced based on the number of times an item is selected as best and worst. The simplest of these is the *difference* between the counts of best and worst for each item. This can be completed at either the individual, or aggregate group level. It has been shown that scores generated by the count approach are sufficient statistics for the parameters generated by the statistical approach (i.e. the statistical estimates are some monotonic transformation of the counting scores). Because of the small number of respondents, we report the count measures as the metric for generating rankings.

### 3 Key stakeholder outcomes

This section captures the stakeholder workshop generated output, the RT’s synthesis of that output defining a distillation of the output (i.e., a set of amalgamated key questions), and finally the DP deliberations leading to a final priority and ranked question set. These priority questions can then be used by NDRI, and other decommissioning stakeholder groups, to inform the development of future research and study programs.

#### 3.1 Key stakeholder workshop generated question sets

The workshops resulted in 371 issues and opportunities being captured, along with 89 key questions and further consequential material. In addition, this material was structured to capture and reveal causality, thus attending to the requirement for a systemic view.

The rich and systemic data provided a solid foundation against which to review the questions – in essence providing context.

Below, each focus group workshop is presented with the themes noted (and details given regarding their level of elaboration) along with a table revealing the key questions, which of the themes they addressed, and the results of a rating evaluation process.

The completed set of stakeholder workshop outputs (i.e., detailed causal maps) are captured for each of the five focal groups in Attachments A through E. These can be used to visually understand the complex systemic impacts between the issues and opportunities, the emergent issue themes, and the corresponding key questions – by stakeholder focal group.

##### 3.1.1 Industry focus group

This workshop generated 79 issues and opportunities. These were grouped together to form 6 clusters and combined into 6 themes. These themes comprised:

1. National technical capability for decommissioning (18 supporting statements)
2. Government and public perception (14 supporting statements) – linked to theme 5
3. Developing regulations that are up to date (17 supporting statements) linked to theme 6
4. Arriving at a balanced decision (12 supporting statements)
5. Acceptability of contaminants (6 supporting statements)
6. Use of net positive environmental analysis (7 supporting statements)

The review of the themes resulted in 25 key questions being identified. Table 3 notes the key questions, the theme that they related to, and the results of the rating exercise. The rating results are provided with both the average and the standard deviation of the scores, where the latter provides a measure of the degree of consensus (the lower the number the higher the consensus).

*Table 3 Industry focus group key questions*

Key Question	Theme	Rating Result	
		Average	Consensus
104 We need a comprehensive list of the hazardous materials on assets	1	3.2	1.9
105 understand longer term impacts of pipelines - international study	1	6.0	2.4
106 what are the priorities for removal and how best to remove	1	5.5	2.8

## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

Key Question	Theme	Rating Result Average/Consensus
109 assess national needs and forms of execution (e.g. collective approaches, recognised short falls)	1	5.7 3.1
110 Recycling opportunity for materials such as Glass reinforced epoxy etc to reduce landfill impact	1	4.7 2.5
111 technologies that improve safety and efficiency e.g., remote systems	1	5.5 2.1
112 pre-emptive stakeholder engagement to determine collective priorities	2	6.1 1.4
113 understand variance between different stakeholder cohorts i.e., local communities, fishing forms (nets v lines)	2	5.8 2.5
114 explore other key factors aside from climate change that can make a major societal change - hindcasting, scenarios	2	5.9 2.4
116 encourage government to take a broad systemic long-term approach to legislation rather than a knee jerk	2 & 3	7.8 2.4
117 Not really a topic but narrative needs to change from cost avoidance to potential benefits	2	3.5 2.9
118 find a way of getting government to work together - rather than separate bodies (explore other countries models)	2 & 3	7.6 2.7
119 identify and remove duplication of regulation	3	6.7 2.2
120 find a way of shifting mindsets of regulators to a multi-criteria model - beyond environment to include safety - determine how to develop a bespoke regulatory model	3	8.1 2.7
121 find ways of managing timing in decision making and regulation in decommissioning	3	6.1 2.9
122 what current legislative frameworks are in use across the globe (and different industries) and can be applied	3	5.5 2.7
123 determine what is preventing an effective legislative framework in Australia	3	5.0 3.4
124 find processes for dealing with a situation where comparative assessments weren't in place (40 years)	4	*
125 find processes for doing comparative assessment that recognises plurality of criteria	4	*
126 develop a multi-disciplinary national framework regarding contaminants	5	*
127 understand the contaminants at play and study their fate	5	*

Key Question	Theme	Rating Result Average/Consensus
128 how to set up an offset program framework for contaminants e.g. plastics and plastic coatings NOMS	5	*
129 understand balance of biodiversity & ecosystem increase and energy avoidance and carbon sequestration	6	5.3 2.7
130 understand the balance between short and long term impacts and risks	6	8.0 2.1
131 understand effects of removing 40 yr ecosystems when decommissioning	6	7.2 2.3

**Note:** \* accidentally omitted from rating exercise. Shaded key question cells identify the highly rated key questions for the focal group. Question numbers relate to the numbers automatically assigned to the item by the Strategyfinder software in that workshop. There is no relationship between numbers across workshops.

### 3.1.2 Regulatory and Government focus group

This workshop generated 73 issues and opportunities. These were grouped together to form 9 clusters and combined into 6 themes. These themes comprised:

1. Early planning and commitments from operators (6 supporting statements) links with theme 2 and 5
2. Governance framework – liability and long-term monitoring for leaving property in situ (5 supporting statements) links with themes 4, 5 and 6
3. Accounting for a range of stakeholder views (internal/govt and external/public) (12 supporting statements) linked to theme 6
4. Managing contamination concerns (21 supporting statements)
5. Repurposing of wells/pipelines (6 supporting statements)
6. Disturbance to existing habitat if infrastructure removed (13 supporting statements)

The review of the themes resulted in 14 key questions being identified. Below is Table 4 which notes the key questions, the theme that they related to, and the results of the rating exercise. The rating results are provided with both the average and the degree of consensus (the lower the number the higher the consensus).

Table 4 Regulatory and government focus group key questions

Key Question	Theme	Rating Result Average/Consensus
95 establish what is current best practice for infrastructure design support future decommissioning	1 & 5	6.7 1.7
98 how can we ensure that there is sufficient coordinated regulatory expertise - sharing of intelligence and objectives	1 & 2	5.1 3.5
99 enable operators to share and understand best practice for proactive planning for decommissioning	1	6.3 2.2

Key Question	Theme	Rating Result Average/Consensus
100 develop a set of cases illustrating different end states	2 & 4	4.3 2.8
101 establish an effective monitoring regime (operator responsibility)	2 & 5 & 6	6.7 2.2
102 develop across the country a process in place to manage trailing liability e.g., considering levies - understanding the consequences of different policies	2 & 5	3.6 2.4
104 find ways of effective engagement with stakeholders that ensure well communicated and sustainable decisions can be made	3	5.6 1.7
105 determine appropriate standards for consultation dependent on stakeholder - messaging and effort	3	4.6 1.9
106 understand both direct risks (oil spill) and indirect and longer-term cumulative risks (e.g. breeding grounds are impacted)	4	8.0 1.7
107 better knowledge re the range of contaminants (some well understood, some less so) and their impact (both individually and as a whole)	4	8.4 1.8
108 find mechanisms for sharing studies and research on receptors etc across the industry	4	6.3 3.5
109 understand the long-term consequences of repurposing	5	7.4 1.6
111 better ways of sharing modelling process eg current dispersal etc	6	3.1 2.5
112 determine methods for weighing up removal from leaving in situ (in a structured balanced view) for operators	6	8.6 1.7

### 3.1.3 Fisheries focus group

This workshop generated 79 issues and opportunities. These were grouped together to form 8 clusters and combined into 6 themes. These themes comprised

1. Get alignment from all regulatory bodies for engagement and use of research (17 supporting statements)
2. Cumulative impacts - pollution (8 supporting statements)
3. Impact of abandoned equipment (7 supporting statements)
4. Long-term economic viability (of commercial fishers) (8 supporting statements) linked with theme 2
5. Community values and perception with ensuring respectful and informative engagement (14 supporting statements)
6. Oil and Gas push back re removal (informed by O&G asserting benefits without real research (16 supporting statements)

The review of the themes resulted in 18 key questions being identified. Below is Table 5 which notes the key questions, the theme that they related to, and the results of the rating exercise. The rating

results are provided with both the average and the degree of consensus (the lower the number the higher the consensus).

Table 5 Fisheries focus group key questions

Key Question	Theme	Rating Result Average/Consensus
100 determine appropriate resourcing for decommissioning regulation acknowledging the full spectrum i.e., rec fish, biosecurity etc	1	6.8 1.9
102 resolve the overarching issue of NOPSEMA and DAWE understanding, and aligning each other's processes - e.g., definition of activity, pipelines etc	1	6.7 2.6
103 lack of reference point - shared language guide/decommissioning map with roles and responsibilities	1	5.3 2.1
104 what liability and regulatory arrangements are needed to best facilitate decommissioning options between commonwealth and state	1	5.7 2.8
30 What are the CUMULATIVE impacts associated with material breakdown - toxic impacts and understanding time horizon	2	8.8 1.8
105 understand better what is appropriate to leave in the sea - case by case, material by material - to avoid big clean up liabilities in the future	2	7.7 2.1
106 understand better what community and other stakeholders feel is acceptable	2	5.7 2.6
108 investigate the economic impacts (costs) on commercial fishers from snagging, avoidance, etc over the long term to determine compensation	3	5.7 2.6
109 understand spatial variability in decommissioning assets in different areas for different stakeholders	3	5.2 2.5
111 understand economic impacts to all stakeholder groups - community/taxpayer, rec fish, commercial etc	4	6.7 2.1
112 research economic impacts of removal of structures	4	8.2 1.3
113 determine mechanisms for assessing economic benefit of integrated reefs	4	6.2 2.5
114 determine spatial viability for economic viability of commercial fishing - case studies - to determine tipping points	4	6.5 3.0
115 research what are the general community values around decommissioning to establish a base line	5	4.7 2.5
116 research and develop a single signed up model/process that preferentially reflects the concerns of those stakeholders who are most impacted - avoid consultation shopping	5	7.3 1.2
98 What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial	6	8.0 2.2

Key Question	Theme	Rating Result Average/Consensus
117 determine whether current decommissioning environment plans best practice?	6	5.8 2.7
118 O&G research better engineering solutions for operations and decommissioning in the future	6	3.5 3.2

### 3.1.4 NGO focus group

This workshop generated 51 issues and opportunities. These were grouped together to form 8 clusters and combined into 4 themes. These themes comprised

1. Ensure effective evaluation of economic cost benefits (taking a long-term view) (10 supporting statements)
2. Environmental impacts (20 supporting statements)
3. Level playing field for all marine users (6 supporting statements)
4. Clear vision for marine environment (5 supporting statements)

The review of the themes resulted in 14 key questions being identified. Below is Table 6 which notes the key questions, the theme that they related to, and the results of the rating exercise. The rating results are provided with both the average and the degree of consensus (the lower the number the higher the consensus).

Table 6 NGO focus group key questions

Key Question	Theme	Rating Result Average/Consensus
65 research to understand the opportunity in terms of jobs, exportable products (through recycling) /knowledge (to Australia) when removing structures	1	7.7 1.7
66 how do we study economic costs (of removal compared with leaving) including environmental and social costs in an informative way	1	9.3 0.4
68 research effectiveness of inspection and regulatory processes (based on cases o/s or other industries	1	7.7 0.4
72 determine assumptions are credible, reasonable, and responsible for the funds being held by O&G for decommissioning	1	3.7 2.9
73 investigate different environmental risks of aspects e.g., plastic and determining the appropriate scale (region, Australia) etc	2	5.0 4.1
74 investigate gap between O&G implementation of regulatory practice and what was carried out - assess the job	2	5.0 2.9
75 ensure decommissioning regulatory bodies have sufficient resources and knowledge	2	6.0 2.4



Key Question	Theme	Rating Result Average/Consensus
76 assess whether requirements themselves are adequate	2	7.7 0.9
77 determine primary (if not all) risks to the environment of not removing vs removing to determine which matter the most	2	8.7 1.2
78 undertake comparison of regulatory standards set across different marine user groups	3	2.3 1.9
81 investigate the impact of different regulatory practices on the environment - looking back and forward	3	6.3 1.7
83 determine what is known of the marine environment before infrastructure was put in (baseline)	4	8.7 0.9
84 understand the difference between what O&G see as the benefit of what has grown/developed on the infrastructure to what was there before the infrastructure was put in	4	3.7 3.1
85 what new skills would need to be developed and what are their value to the nation	#	5.0 2.2

#: A further question was added by the stakeholders on review of the key question list

### 3.1.5 Researcher focus group

This workshop generated 89 issues and opportunities. These were group together to form 9 clusters and combined into 5 themes namely:

1. Social acceptance (13 supporting statements)
2. Pollution/negative impact on the marine environment (12 supporting statements)
3. Ecological baselines (17 supporting statements)
4. Future proof legislation and competency to assess, (27 supporting statements)
5. Decommissioning options including consideration of waste (21 supporting statements).

The review of the themes resulted in 12 key questions being identified. Below is Table 7 which notes the key questions, the theme that they related to, and the results of the rating exercise. The rating results are provided with both the average and the degree of consensus (the lower the number the higher the consensus).

Table 7 Researcher focus group key questions

Key Question	Theme	Rating Result Average/Consensus
107 What determines the Australian public's level of acceptance for the operators' decommissioning options, recognising context matters	1	7.0 1.5
110 what is the total inventory of harmful substances or contaminants associated with decommissioning, its behaviour in particular contexts and the impacts to the marine ecosystem	2	5.0 3.6

Key Question	Theme	Rating Result Average/Consensus
111 what is the impact on human consumers	2	3.1 2.2
112 monitor/measure contaminants in place currently on the infrastructure	2	3.6 1.7
113 what are the net ecological impacts of different decommissioning options - what alternatives to NEBA are there?	3	6.6 1.8
114 what is the habitat value of structures and how does decom affect this value	3	6.3 1.6
119 what is the optimal regulatory operating model for managing decommissioning across jurisdictions	4	7.7 1.3
120 what is the optimal legislative model for future liability across jurisdictions that is socially acceptable	4	6.4 1.4
124 what is the sustainability and equity footprint for managing decommissioning waste in and from Australia?	5	6.7 2.5
125 What is a road map for repurposing (addressing environment, economic and integrity type questions)	5	5.4 2.9
126 what are the social and environmental impacts of different options	5	6.9 2.6
127 what are the considerations necessary to develop a holistic decision-making model taking into account both advantages and disadvantages of decom options and decision tools	5	8.1 2.7

### 3.2 Key stakeholder workshop synthesis

At the end of the stakeholder workshop process, 89 questions were generated across the 5 workshops. Reviewing the questions within the workshops it was clear that some questions were sufficiently similar that it could be difficult to differentiate between them at the DP assessment stage. In addition, the wording of the stakeholder workshop defined questions needed to be refined so they represented unambiguous research questions. Following the process outlined in Section 2.4, the questions from each workshop were reviewed, independently, by two RT members and proposals to merge/refine questions generated. Each team pair then met to agree a common merging and rewording. These refined questions were then jointly reviewed by the entire RT to come to a consensus on wording, including reviewing the initial causal maps underpinning the original questions. This led to an overall set of 39 merged/refined key questions (see Figure 7).

At this stage there was no consideration of replication in questions across workshop questions (i.e., cases where workshops had independently identified the same question). The original intent was to attempt a merge/refine exercise across workshops, but this was not completed (see Section 3.2.2 below).

### 3.2.1 Synthesis by focal group

#### 3.2.1.1 Industry Workshop

The original question set comprised 26 questions which were merged down to 12 questions. The greatest aggregation occurred within the “regulatory cluster”, where 8 original questions were combined to a single question:

- ❖ *“What is the vision and process for ensuring government agencies take a timely, multi-criteria-based, systemic, effective, balanced, long-term, and integrated approach to legislation (potentially learning from others)?”*

Otherwise, a maximum of three original questions were combined (see Attachment F – Industry Workshop: first synthesis).

#### 3.2.1.2 Regulator/Government workshop

The original question set comprised 16 questions which were merged down to eight questions. The greatest aggregation occurred around four broad questions relating to understanding consequences of different end states leading to the question:

- ❖ *“Develop a set of case studies to fully exemplify the methods needed to compare the decommissioning end states (i.e. including cumulative, direct/indirect, short and long term risks), in a structured and balanced manner, to guide operators.”*

A set of three questions related to ensuring sharing of information was also merged to generate:

- ❖ *“What mechanisms could be designed that ensure industry-held research/knowledge/methods, relevant to decommissioning decisions, are made publicly available?”*

(see Attachment G – Regulator/Government workshop: first synthesis)

#### 3.2.1.3 Fisheries Workshop

The original question set comprised 18 questions which were merged down to eight questions. The greatest aggregation occurred around six questions relating to understanding the economic implications of different end states for different stakeholders, leading to the question:

- ❖ *“What are the costs and benefits to all stakeholder groups of alternative end states for infrastructure, including spatial variability and related tipping points?”*

(see Attachment H – Industry Workshop: first synthesis)

#### 3.2.1.4 NGO Workshop

The original question set comprised 14 questions which were merged down to five questions. The greatest aggregation occurred around six questions relating to current regulatory issues, leading to the question:

- ❖ *“Is current regulatory practice fit for purpose, adequately resourced, effectively inspected and monitored, and considers different marine users?”*

Three other questions relating to the economic costs and consequences for the economy of different end states, leading to the question:

- ❖ *“What are the short and long-term economic costs and benefits (environmental, skills, jobs, products, social) associated with each decommissioning option?”*

(see Attachment I – NGO Workshop: first synthesis)

### 3.2.1.5 Researchers Workshops

The original question set comprised 12 questions which were merged down to eight questions. The original questions were relatively distinct, leading to merging occurring over only two original questions at most (see Attachment J – Researcher Workshop: first synthesis).

### 3.2.2 Synthesis between focal groups

In the original work plan, the intention was to identify if common questions were also produced across focal group workshops, and hence there could be a further merging into single questions. This process was initiated by first interrogating the questions in Figure 7 and identifying whether there were common themes. The ten themes were identified (see Table 8) and allocated to assist with further merging opportunities.

Table 8 Stakeholder key questions – 10 themes

Themes
Societal/stakeholder
Contaminants
Regulatory (Framework/Policy)
Baseline data / Monitoring
Execution methods
Recycling/Re-use
Technology
Decision making
Design for decommissioning
Collaboration/Best practice

However, as the RT worked through this process, it was thought that further merging may lead to a loss of nuance between questions. Hence, it was decided to retain the full set of questions, with a suggestion by the RT as what might be further grouped, and to present this to the DP for their consideration and judgement before they completed the priority selection and ranking process. This has been captured in the survey form within Attachment K – Decision Panel 1<sup>st</sup> Survey Input and Workshop Outcomes.

Stakeholder Workshop Key Questions - 1st Synthesisation Summary by Focal Group

Note: Bolded text reflects updated cells from final RT review prior to decision panel (27/6/22)

Industry	Theme	Regulatory/Government	Theme	Fisheries	Theme	NGO	Theme	Researcher	Theme
104 What are all the materials (i.e. type and quantities) associated with Australian offshore oil and gas infrastructure which may pose a potential hazard to the marine environment?	Contaminants	95 What is best practice for offshore oil and gas infrastructure design to support future decommissioning? How does this compare to past and current practice?	Design for decom	30 What potential contaminants are associated with decommissioning and what are their potential cumulative impacts on the marine ecosystem and humans?	Contaminants	65 What are the short and long-term economic costs and benefits (environmental, skills, jobs, products, social) associated with each decommissioning option?	Decision making	107 What determines the Australian public's level of acceptance for the operators' decommissioning options, recognising context matters?	Societal/ Stakeholder
105 What evidence is there globally which helps understand the long term environmental impact of pipelines being either removed or left in-place?	Collaboration/ Best practice, Contamination	98 Is there a sufficiently coordinated approach to objectives across regulatory agencies? If not then how can this be achieved?	Regulatory (Framework/Policy)	100 What is the appropriate resourcing for decommissioning regulation?	Regulatory (Framework/Policy)	72 Are the assumptions used by the oil and gas sector for decommissioning costs appropriate/credible/reasonable and are there sufficient funds?	Regulatory (Framework/Policy)	110 What contaminants are associated with decommissioning and what are their potential impacts on the marine ecosystem and humans?	Contaminants
106 What are advantages and disadvantages for infrastructure removal options?	Execution methods	99 What mechanisms could be designed that ensure industry-held research/knowledge/methods, relevant to decommissioning decisions, are made publicly available?	Collaboration/ Best practice	104 Is there a sufficiently coordinated approach to objectives across regulatory agencies? If not then how can this be achieved?	Regulatory (Framework/Policy)	74 Is current regulatory practice fit for purpose, adequately resourced, effectively inspected and monitored, and considers different marine users?	Regulatory (Framework/Policy)	112 How can contaminants currently on the infrastructure be monitored/measured in place?	Baseline data/ Monitoring
108 What are the execution models which could be applied (i.e. by asset type, across multiple assets and basins), along with their required resources (i.e. capability, equipment), to determine the optimum execution strategy for Australia to minimise cost, address any capability shortfall?	Execution methods	101 What are the effective monitoring regimes which could be applied to decommissioned infrastructure?	Baseline data/ Monitoring	106 What process is required to accurately reflect social values of stakeholder groups towards decommissioning?	Societal/ Stakeholder	73 What are the environmental risks of in situ and removal options at different spatial scales?	Contaminants	113 What are the net ecological impacts of decommissioning options and how should these be assessed?	Decision making
110 What are the recycling and re-use opportunities for Australian decommissioned offshore infrastructure as an alternative to landfill?	Recycling/re-use	104 What are the effective engagement methods to identify stakeholder positions, and communicate outcomes, so sustainable decisions can be made?	Societal/ Stakeholder	108 What are the costs and benefits to all stakeholder groups of alternative end states for infrastructure, including spatial variability and related tipping points?	Societal/ Stakeholder	83 What baseline environmental data is available and how can it be used to ascertain changes pre and post infrastructure emplacement?	Baseline data/ Monitoring, Decision making	119 What is the optimum regulatory model for managing decommissioning and liability across Australian jurisdictions?	Regulatory (Framework/Policy)
111 What technologies could be applied to offshore oil and gas decommissioning to improve safety and efficiency?	Technology	106 What are the contaminants of primary concern, what are their fate and consequence if released to the environment, both individually and cumulatively?	Contaminants	118 What are the opportunities for better engineering solutions for operations and decommissioning in the future?	Design for decom			124 What is the sustainability and equity footprint for managing decommissioning waste and how can best practise be realised?	Recycling/ re-use,
112 What are the best methods to engage stakeholders early to determine collective priorities, understand societal concerns, and highlight variance between cohorts, recognising values of the day may be challenged in the future?	Societal/stakeholder	102 What policy mechanisms could be designed that support and share opportunities for appropriate re-purposing, while balancing trailing liability?	Collaboration/ Best Practice, Regulatory (Framework/Policy)	117 Do current decommissioning environmental plans reflect best practice?	Collaboration/ Best practice			127 What decision-making tools are needed to ensure decommissioning and repurposing decisions are reflective of environmental, economic, social and equity principles?	Decision making, Societal/ stakeholder
116 What is the vision and process for ensuring government agencies take a timely, multi-criteria-based, systemic, effective, balanced, long-term, and integrated approach to legislation (potentially learning from others)?	Regulatory (Framework/Policy)	100 Develop a set of case studies to fully exemplify the methods needed to compare the decommissioning end states (i.e. including cumulative, direct/indirect, short and long term risks), in a structured and balanced manner, to guide operators.	Decision making	98 What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial to stakeholder groups?	Decision making				
124 What multi-criteria decision methods are there for comparing decommissioning options to determine an acceptable end state given uncertain environmental baselines?	Decision making / Contaminants								
126 How to create a national multidisciplinary framework that takes into account the full suite of contaminants, how they behave over time under different circumstances, and how can they be managed?	Decision making / Contaminants								
128 Can an offset framework be established and applied to contaminants for in-situ decommissioned infrastructure approval? If so for what contaminants and infrastructure?	Contaminants								
129 Is there a methodology that can be applied to decommissioning decisions (i.e. leave in-situ or remove) which takes account of the total net short and long term impacts, opportunities and risks to the environment?	Decision making								

Key Stakeholder Workshop Merged Themes

Societal/stakeholder
Contaminants
Regulatory (Framework/Policy)
Baseline data / Monitoring
Execution methods
Recycling/Re-use
Technology
Decision making
Design for decom
Collaboration/Best practice

Figure 7 Stakeholder workshop key questions following research team 1st synthesisation by focal group and with 10 assigned themes showing distribution across entire key question data set

### 3.3 Decision panel: priority questions and their ranking

#### 3.3.1 Decision panel 1<sup>st</sup> survey

The table of questions reported in Table 12 (Attachment K – Decision Panel 1<sup>st</sup> Survey Input and Workshop Outcomes) was circulated to the DP, and they were asked, independently to perform the following two tasks:

- 1) “Review the groupings. If you think that the questions are distinctly different, please remove the letter coding. If you think that some of the singleton (unmarked) questions could be grouped, please place a common letter in the column identifying
- 2) For the questions (or grouped questions) identify in the **Impact** column those research questions which, if answered, would have the potential for significant impact on the decommissioning decisions and approvals. Impact is defined as a change in the decision, without any prior expectation of the nature of that change. Please provide a brief rationale (a sentence) for your impact position. If there is misalignment on Impact by the DP, this rationale will be used as basis for the workshop to achieve consensus.”

The responses given were collated into a single document which was then the basis for discussion at the in-person workshop.

#### 3.3.2 Key question filtering outcomes (binning & joining)

Table 13 (Attachment K – Decision Panel 1<sup>st</sup> Survey Input and Workshop Outcomes) reports the 1<sup>st</sup> survey outcomes from the 39 questions: the grouping by the panel members, and then the identification of whether a question would have impact. The colour coding identifies the questions which had the potential to be grouped by that individual Panel member.

As indicated in Section 2.5.4, the RT confirmed each DP member had understood the 1<sup>st</sup> survey instructions and had appropriately and consistently allocated an ‘X’ to differentiate the priority questions. This assurance check did yield several inconsistencies in the allocation of ‘X’ which were corrected “live” during the workshop and confirmed verbally by all participants\*.

Although there is some consistency in questions that were deemed to have impact (i.e., multiple X in Table 13), there were also some singletons. The proponents of the singletons were asked to explain why they had included the question and there was some discussion, but there was no attempt to enforce consensus. Any question that had at least one proponent was included in the final set of questions

Looking at the groupings of questions there was a degree of consistency: e.g. Q1 and Q2 (social values), Q3-Q6 (contaminants), Q9 and Q10 (monitoring), Q11-Q15 (regulation), Q16-Q17 (ecological impacts), Q20-Q22) (stakeholder engagement). However, when those groupings that were considered as having impact were discussed, the DP did not see any imperative to merge into common questions: there was sufficient nuance to warrant retaining the separate questions.

\*Foot note: During the reporting write-up phase of the project an inconsistency was found in the recorded ‘X’ allocation updates from the DP workshop. This inconsistency was found after the entire DP process was complete and outcomes were post processed. Therefore, the inconsistency is not captured elsewhere in the report. The impact to Table 13 would be a reduction in allocated ‘X’s from 3 to 2 for question #16 (98) “*What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial to stakeholder groups?*” and the inclusion of a new singleton question #11 (116) “*What is the vision and process for ensuring government agencies take a timely, multi-criteria-based, systemic, effective, balanced, long-term, and integrated approach to legislation (potentially learning from others)?*”. This change would also reduce the theme count for Decision Making by one (updated total of 5) and increase Regulator by one (updated total of 2). The priority questions would be increased from 23 to 24. The ranking of question # 16 would unlikely change given its current positioning (12 of 23) while the new singleton, only supported by one DP member, would likely rank in the lower quartile.

### 3.3.3 Workshop outcomes (final priority question set)

Table 9 below identifies the final priority question set that was considered for ranking, based on a question receiving at least one X and the DP's concurrence to not perform any further merging of questions.

*Table 9 Final priority question set from Decision Panel (in no ranked order)*

Decision Panel Priority Questions
What process is required to accurately reflect social values of stakeholder groups towards decommissioning?
What determines the Australian public's level of acceptance for the operators' decommissioning options, recognising context matters?
What potential contaminants are associated with decommissioning and what are their potential cumulative impacts on the marine ecosystem and humans?
What contaminants are associated with decommissioning and what are their potential impacts on the marine ecosystem and humans?
What are all the materials (i.e. type and quantities) associated with Australian offshore oil and gas infrastructure which may pose a potential hazard to the marine environment?
What are the contaminants of primary concern, what are their fate and consequence if released to the environment, both individually and cumulatively?
What are the effective monitoring regimes which could be applied to decommissioned infrastructure?
What baseline environmental data is available and how can it be used to ascertain changes pre and post infrastructure emplacement?
What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial to stakeholder groups?
What are the net ecological impacts of decommissioning options and how should these be assessed?
What multi-criteria decision methods are there for comparing decommissioning options to determine an acceptable end state given uncertain environmental baselines?
What decision-making tools are needed to ensure decommissioning and repurposing decisions are reflective of environmental, economic, social and equity principles?
Are the assumptions used by the oil and gas sector for decommissioning costs appropriate/credible/reasonable and are there sufficient funds?
Can an offset framework be established and applied to contaminants for in-situ decommissioned infrastructure approval? If so for what contaminants and infrastructure?
What are the environmental risks of in situ and removal options at different spatial scales?
What evidence is there globally which helps understand the long term environmental impact of pipelines being removed or left in-place?
What are advantages and disadvantages for infrastructure removal options?
What are the execution models which could be applied (i.e. by asset type, across multiple assets and basins), along with their required resources (i.e. capability, equipment), to determine the optimum execution strategy for Australia to minimise cost, address any capability shortfall?
What are the recycling and re-use opportunities for Australian decommissioned offshore infrastructure as an alternative to landfill?
What is the sustainability and equity footprint for managing decommissioning waste and how can best practise be realised?
How can a national multidisciplinary framework be created that takes into account the full suite of contaminants, how they behave over time under different circumstances, and how can they be managed?
What are the short and long-term economic costs and benefits (environmental, skills, jobs, products, social) associated with each decommissioning option?
How can contaminants currently on the infrastructure be monitored/measured in place?

### 3.3.4 Ranking of priority questions

An experimental design using 23 items, allocated into 23 sets of four items each was generated within R using the find.BIB command (Wheeler, 2004). The 23 question items were re-assigned a number from 1-23, and then assigned into the sets on that basis. The 23 sets were programmed within Qualtrics, such that the order of items presented within a set (from top to bottom of the question: see Figure 6 above) was randomised, and the order in which the sets were presented also randomised. Members of the DP were sent a link to the survey and asked to complete the BWS task independently. For each DP member, the BWS score (number of times an item selected best-number of times selected worst) was calculated, and the resulting score normalised to run between 0-10. The higher the score the higher the importance deemed for the item. An aggregate score was also generated (based on number of times an item was selected in total by the panel) to give an aggregate score (this is effectively an average of the four independent scores). The outcomes of this process are captured in Figure 8 and Table 11 and discussed in detail in Section 4.3.

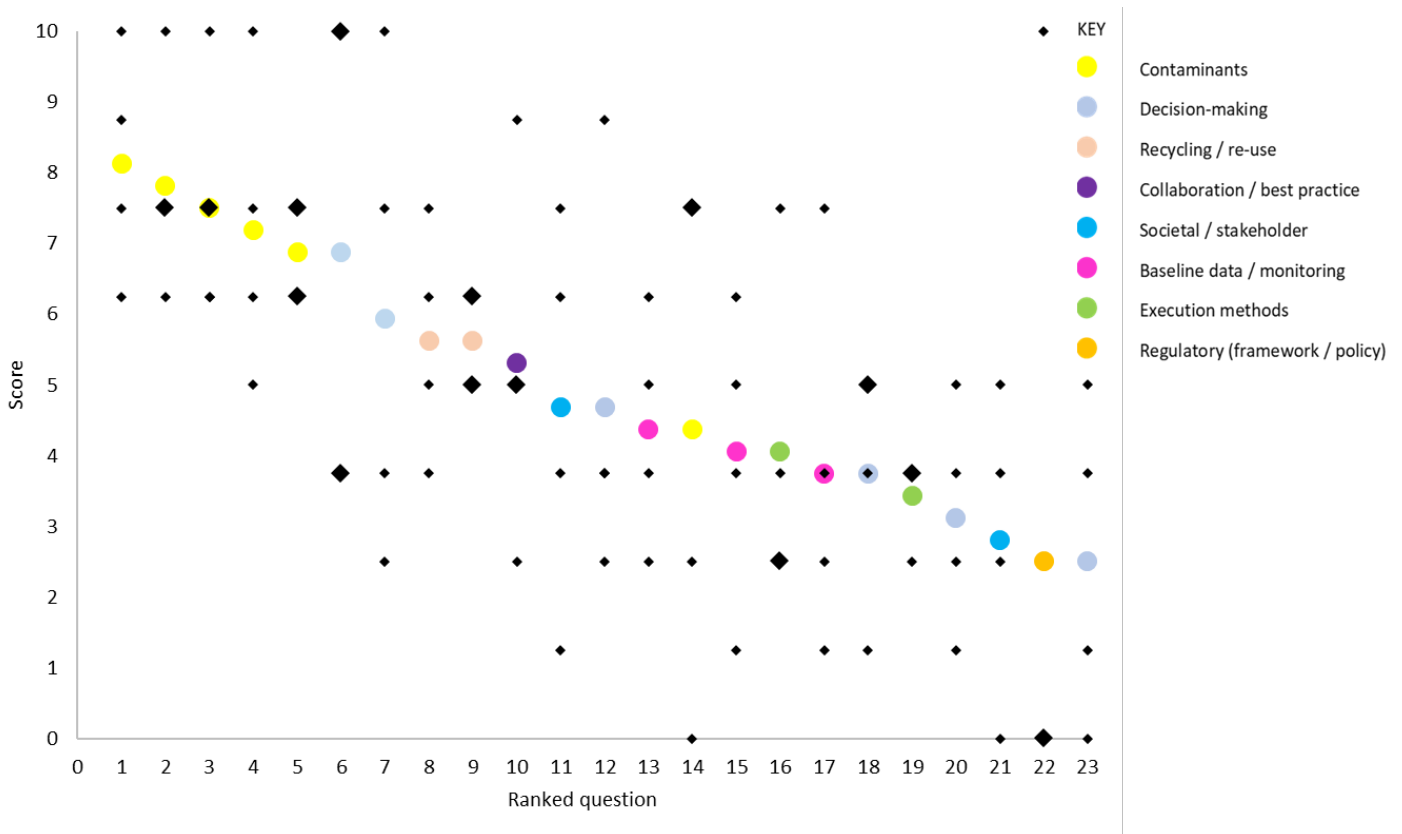


Figure 8. Ranking of priority questions. Colour-coded symbols show average Decision Panel ranking and theme for each priority question. Black symbols represent each Decision Panel member's score for each priority question. Enlarged black symbols represent cases where individual Decision Panel members generated the same score.



## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

Table 10 Details of priority question ranking outcomes (with themes and focal groups)

Rank	Focal Group	Question [including original question number]	Score
1	Fisheries	What potential contaminants are associated with decommissioning and what are their potential cumulative impacts on the marine ecosystem and humans? [30]	8.13
2	Regulator / Government	What are the contaminants of primary concern, what are their fate and consequence if released to the environment, both individually and cumulatively? [106]	7.81
3	Researcher	What contaminants are associated with decommissioning and what are their potential impacts on the marine ecosystem and humans? [110]	7.50
4	Industry	What are all the materials (i.e., type and quantities) associated with Australian offshore oil and gas infrastructure which may pose a potential hazard to the marine environment? [104]	7.19
5	NGO	What are the environmental risks of in situ and removal options at different spatial scales? [73]	6.88
6	Researcher	What are the net ecological impacts of decommissioning options and how should these be assessed? [113]	6.88
7	Industry	How can a national multidisciplinary framework be created that takes into account the full suite of contaminants, how they behave over time under different circumstances, and how can they be managed? [126]	5.94
8	Researcher	What is the sustainability and equity footprint for managing decommissioning waste and how can best practise be realised? [124]	5.63
9	Industry	What are the recycling and re-use opportunities for Australian decommissioned offshore infrastructure as an alternative to landfill? [110]	5.63
10	Industry	What evidence is there globally which helps understand the long-term environmental impact of pipelines being removed or left in-place? [105]	5.31
11	Researcher	What determines the Australian public's level of acceptance for the operators' decommissioning options, recognising context matters? [107]	4.69
12	Fisheries	What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial to stakeholder groups? [98]	4.69
13	Researcher	How can contaminants currently on the infrastructure be monitored/measured in place? [112]	4.38
14	Industry	Can an offset framework be established and applied to contaminants for in-situ decommissioned infrastructure approval? If so for what contaminants and infrastructure? [128]	4.38
15	NGO	What baseline environmental data is available and how can it be used to ascertain changes pre and post infrastructure emplacement? [83]	4.06
16	Industry	What are advantages and disadvantages for infrastructure removal options? [106]	4.06
17	Industry	What are the effective monitoring regimes which could be applied to decommissioned infrastructure? [101]	3.75
18	Regulator / Government	What are the short and long-term economic costs and benefits (environmental, skills, jobs, products, social) associated with each decommissioning option? [65]	3.75
19	Industry	What are the execution models which could be applied (i.e., by asset type, across multiple assets and basins), along with their required resources (i.e., capability, equipment), to determine the optimum execution strategy for Australia to minimise cost, address any capability shortfall? [108]	3.44
20	Industry	What multi-criteria decision methods are there for comparing decommissioning options to determine an acceptable end state given uncertain environmental baselines? [124]	3.13
21	Fisheries	What process is required to accurately reflect social values of stakeholder groups towards decommissioning? [106]	2.81
22	NGO	Are the assumptions used by the oil and gas sector for decommissioning costs appropriate/credible/reasonable and are there sufficient funds? [72]	2.50
23	Researcher	What decision-making tools are needed to ensure decommissioning and repurposing decisions are reflective of environmental, economic, social and equity principles? [127]	2.50

### Theme Legend:

Societal/stakeholder	Regulatory (Framework/Policy)	Execution methods	Recycling/Re-use	Design for decommissioning
Contaminants	Baseline data / Monitoring	Decision making	Technology	Collaboration/Best practice

## 4 Discussion and evaluation

### 4.1 General observations of adopted approach

In accordance with the initial conceptual three step process illustrated in Figure 2, this research project was driven by the need to solicit the input and insights from a broad range of stakeholders, who had influence and interest in decommissioning decision and approvals, to ensure the key issues, opportunities and questions were captured. It was a deliberate strategy to move beyond industry and researcher input so that future decommissioning research programs would reflect priority questions that were both sourced from a wide range of perspectives and were grounded in stakeholder views.

From a Research Team's perspective, we had to ensure our approach, regardless of our decommissioning research experience, was an objective and transparent collation, synthesis and assessment of the stakeholder input and the judgement, in relation as to what was impactful to decommissioning decisions and approvals, was also objective, clear and transparent.

In kicking off the engagement process the stakeholders needed to be genuinely engaged and see the potential future value of their contributions. Once they agreed to participate, the outcomes were also uncertain and of course highly dependent on the individual and the group dynamic. None of this was known at the outset and therefore the method and facilitation of that engagement was critical to extract the maximum insights in a very small window of people's calendars (i.e., 3-hour workshops with 10 participants). Given the number of the stakeholder workshop participants (41 of 61 approached), the breadth and depth of the captured output (see Attachments A through E), reflects the process as efficient and relatively effective. This will be expanded in Section 4.2.

Synthesis of workshop output also presented a challenge for the RT due to the duplication and ambiguity in some of the stakeholder key questions and the need to ensure any redrafting or merging of questions did not introduce a divergence from the raw workshop data. Again, a very time consuming and rigorous process required by the RT.

Defining the DP ToR also required a careful approach to ensure the purpose, scope and required outcomes were clear. Given their influence on the priority question selection and ranking, careful consideration was also given to the selection of the panel. An interesting hypothetical question would be: if the DP panel was selected again today with different members, would the outcomes change? In short, probably yes, but in which direction? In summary, once the DP was selected, the process was surprisingly efficient and produced clear outcomes: priority list of ranking questions deemed to be impactful to decommissioning decisions and approvals.

Specific challenges and shortfalls of the approach in general can be summarised: 1) We were unable to solicit due consideration of timing from either stakeholder or DP in relation to medium 5-10 and long term 10 – 20 year research questions, 2) NGO participation was limited (4 of 14 formally contacted) as the workshop timing corresponded to the 2022 Australian Federal election and 3) it was difficult to secure commercial fisheries participation as they did not have sufficient resources and were suffering from engagement fatigue with the oil and gas industry, 4) diversity of workshop questions and time constraints meant questions required further objective refinement by the RT and 5) it was difficult to secure additional independent stakeholders for the DP as the community of suitable candidates was small.

### 4.2 Stakeholder focus group insights

Conducting 5 stakeholder workshops provided the opportunity to involve 41 participants from 5 different cohorts across Australia enabling a) a comprehensive and representative capture of views (371

issues/opportunities, 89 key questions), b) a systemic examination of the resultant views and c) ownership of the resultant prioritised questions to be achieved.

The process of commencing with issues and opportunities and their impact upon one another allowed participants to contribute in a natural manner, commencing with their concerns and providing a solid platform upon which to begin the process of considering both the consequences of these issues (eliciting values) and subsequently the key questions. Throughout the workshops, participants readily engaged and were able to generate material. As such the process took a 'bottom up' approach rather than being controlled in any particular direction. Participants could take a more considered approach as they were exposed to a range of different perspectives along with their various ramifications and from this holistic view identify questions that reflected the broad spectrum rather than fixing on one or two questions early and potentially missing critical ones. However, given the time constraints (sticking to the 3 hours maximum) and the engagement in the first session of the workshop, there was not enough time to refine the questions – despite participants clearly being engaged in the process and wishing to do so.

As noted earlier, the workshops allowed the identification of 89 key questions, and it was the significant degree of homogeneity that assisted in the final question set being able to be reduced to 39.

Whilst the original design sought to determine short-term, medium term and long-term issues and opportunities, this was not possible in practice as a) a number of issues/opportunities straddled the time periods and b) participants struggled to categorise the issues into this system. Whilst the RT encouraged long term thinking, the workshops were dominated by issues and opportunities in the short and medium term.

There was considerable learning experienced between participants as they were provided with the opportunity to effectively listen to one another, and through the mapping gain a deeper understanding into the subtleties surrounding decommissioning and develop a shared language relating to the topic.

### 4.3 Decision Panel priority question selection and ranking

#### 4.3.1 Priority question selection

The process of selection amongst the 39 initial questions presented to the DP generated 23 priority questions and the elimination of 16 questions. Details of these sixteen questions are given in Table 11. Six of these were questions derived from the regulator / government workshop group activities and five of them were under the theme of 'regulatory framework / policy'. No questions were removed from the themes of 'contaminants', 'baseline data / monitoring' or 'execution methods for infrastructure removal'. Only one question was removed from the list supplied by the researcher and NGO workshop focus groups.

This indicates that the Panel tended to select questions with a more immediate, objective and/or quantitative application (e.g., contaminant impacts, biological monitoring) over more qualitative, longer term or subjective research questions such as those within the 'regulatory framework and policy' and 'societal / stakeholder' themes. In addition, it seems that Panel members tended to focus on the contemporary situation rather than envisaging priorities and scenarios in 20 years' time. As one member expressed, future differentiating issues will partly reflect the quantum of future infrastructure installation which is impossible to predict with any certainty.

Table 11 Details of research questions eliminated by Decision Panel

Workshop group	Number of questions eliminated	Research theme	Number of questions eliminated
Regulator / government	6	Regulatory framework / policy	5
Fisheries	4	Societal / stakeholder	3
Industry	4	Collaboration / best practice	3
Researcher	1	Design for decommissioning	2
NGO	1	Decision-making	2
		Technology	1

#### 4.3.2 Priority question ranking

The outcomes of the DP ranking process are presented in Figure 8 and Table 10. Five priority questions relating to the theme of contaminants (yellow symbols) were ranked highly by all DP members, receiving a collective average ranking of  $7.5 \pm 1.48$ . These five priority questions referred to the range of contaminants associated with offshore structures and decommissioning options and their individual and cumulative impact to marine ecosystems and humans (see Table 10). Two priority questions relating to the theme of decision-making (light blue symbols) in the context of contaminants also received relatively high overall scores, although these are marked by a relatively high variance in scoring between DP members. These are followed in the overall ranking by two priority questions relating to the theme of recycling of decommissioning and decommissioned materials (light brown symbols) which received more consensual ranking from DP members. The only priority question in the theme of ‘collaboration and best practice’ with regards to pipelines received an average score of just over five.

The remaining fourteen priority questions received average ranking scores of less than five. These included questions from themes which also included higher ranked questions (such as contaminants and decision-making), indicating that DP members did not view all priority questions within a single theme in a similar manner. The lower ranked priority questions also included themes such as collaboration, stakeholder views and execution methods. Divergence between Panel members’ scores is particularly evident in this group, epitomized by the priority question within the theme of regulatory framework and policy (beige symbol) being scored zero by three Panel members, but receiving a maximum possible score of ten from the remaining member.

#### 4.3.3 Priority question rationale

Panel members provided explanatory text during the process of selecting research priority questions which can be used in exploring the rankings of priority questions depicted in Table 10 (also see Figure 8). Care is taken to ensure DP anonymity in this part of the report.

The priority accorded to research questions in the ‘contaminants’ theme ranked #1 to #5 in Table 10 (also see Figure 8) was supported by Panel statements, emphasising the importance of demonstrating that any environmental impacts associated with decommissioning were within acceptable limits under current policy (e.g., through reference to ALARP). This was reflected by other opinions which held that current scientific knowledge regarding the behaviour and impact of potential contaminants associated with decommissioning was at an early stage of refinement. Whilst there were statements from some Panel members prior to the ranking process that some of the research questions in the ‘contaminants’ theme could be viewed as inter-related, the Panel did not recommend further merging of these questions prior to the ranking process. This opinion was also shared by the RT, but as stated in Section 3.3.1, the team did not want to risk losing the focus of the workshop groups’ output through further merging the research questions prior to the DP being convened. The outlying ranking of a question in

the 'contaminants' theme (#14 in Table 10, See Figure 8) reflects a perceived lack of global experience relating to the potential for offsetting marine contamination at present.

The two questions ranked highly (#6 and #7 Table 10, also see Figure 8) relating to 'decision-making' are expressed in the context of contaminant assessment and management, and it is therefore not surprising that these are viewed as relatively significant differentiators. Panel members were not as unanimous in their ranking of these, but statements were made referring to the importance of 'net' ecological impacts in the question (i.e., the existence of positive and negative impacts) alongside the importance of a coordinated national approach to managing impacts over extended timescales. The other three questions in the 'decision-making' theme were ranked considerably lower (#12, #22 and #23 in Table 10, also see Figure 8). The Panel felt that the question ranked #12 was part of a broader ecological benefits question, whilst the existence of appropriate multi-criteria decision methods (MCDM) in questions ranked #22 and #23 were not felt to be significant differentiators due to the overriding need for scientific knowledge relating to contaminants referred to above.

Questions within the theme of 'recycling and re-use' were ranked very similarly (#8 and #9 in Figure 8) with a high degree of unanimity amongst Panel members. It was felt that these would be important differentiators as decommissioning decision-makers could consider broader issues of sustainability and the circular economy which would in turn necessitate further research into aspects of waste management. It was, however, noted that these are more likely to impact future rather than contemporary decision-making processes.

One question in the 'collaboration / best practice' theme was ranked fairly highly (#10 in Table 10, also see Figure 8) which relates to the environmental impact of pipelines left *in situ*. Panel members felt that this was particularly important to the Australian context but that research in this field was already well underway.

The remaining priority questions all received average rankings of less than five and will not be addressed in detail here. It is apparent that the questions and themes in this group tend to involve more long term, subjective or qualitative research and it was noted above that the Panel tended to rank these below research questions of a more objective and immediate nature. Although such issues may not be seen as differentiators in decision-making, they can clearly influence the effectiveness of decision-making. It is also interesting to note that questions relating to 'baseline data monitoring' (ranked #13, #15 and #16) were not accorded a similar degree of priority as those in the arguably related 'contaminants' theme. Some Panel members agreed that baseline data and monitoring questions were of importance, but that these were expressed in an excessively broad manner and related more to future management decisions than those in the present. It is therefore possible that these questions were to some extent discounted on this basis.

#### 4.4 Context with other decommissioning stakeholder engagement & research positions

While not intended to be an exhaustive literature review of previous and current decommissioning research focus areas and stakeholder engagement studies, this section is provided as a background context for a comparison to this study's identified priority research questions.

##### 4.4.1 WAMSI Stakeholder Engagement Study

A report by the Western Australian Marine Science Institution (Shaw et al., 2018) reviewing stakeholder views and science priorities for decommissioning identified more than 900 issues, opportunities and concerns. This information was generated from semi-structured interviews and workshops with more than 120 stakeholders. The stakeholders surveyed in the WAMSI study were similar to this study, except they additionally had input from Tourism and Indigenous stakeholders. The 900 issues were

grouped and synthesised down to 30 questions that could be addressed through scientific research. Questions were further summarised and grouped into four themes and 21 questions (Environmental effects (4 questions), Benefits to be realised (5 questions), Risks (6 questions), Management (6 questions), Table 4 Shaw et al. (2018) in comparison to the 8 themes and 23 priority questions we identified. An additional 3 questions identified by experts as precursory information to enable the research questions identified above.

Many of the issues and research priorities identified by Shaw et al. (2018) were also raised in this survey. For example, the fate and impacts of contaminants on marine life and toxicity to marine communities and humans ranked highly in both surveys. There was also divergence with invasive marine species being identified as a risk in the WAMSI report, but not being listed in the final set of research questions in this report, despite being recognised as a major roadblock to decommissioning in workshops. This is most likely a reflection of the knowledge and perceptions of the Decision Panel with the outcome possibly different with a broader or different representation.

#### 4.4.2 NESP Scoping study: Horizon scan of key science questions in the decommissioning of offshore oil and gas infrastructure

At the time of this report's publication, a parallel project funded under the Australian government's National Environmental Science Program remains underway, The RT engaged at an early occasion with the NESP project leads to determine if there was any duplication of effort and what future leverage opportunities there might be between the two projects. This NDRI project's approach is deemed to be unique due to its stakeholder derived data and assessment methodology stakeholder engagement. It has a strong focus on local engagement. However, the two projects have complimentary process which stakeholders will benefit from. It is understood the NESP project includes an international remit with an emphasis on regulatory issues.

#### 4.4.3 Phase 1 NDRI research program

The NDRI phase 1 research program (NDRI, 2020) has focused on two themes: 1) potential impact of decommissioning O&G structures on life in the marine environment and 2) Potential contaminants released in the marine environment if structures remain in-situ. Within these programs the following offshore marine projects focused on:

- 1) Determining the habitat value associated with decommissioning Australia's oil and gas infrastructure
- 2) Understanding the current knowledge of oil and gas infrastructure influence on ecological connectivity in marine ecosystems
- 3) Understanding the spread risk of invasive marine species in the context of decommissioning
- 4) Predicting the lifespan and corrosion behaviour of decommissioned oil and gas metallic infrastructure in the ocean
- 5) Understanding the degradation mechanisms of plastic components of oil and gas infrastructure in the ocean
- 6) Understanding the risks of NORMs and mercury to marine environment from oil and gas infrastructure under various decommissioning scenarios

While item 1) has been captured within the current priority questions, it is not highly ranked, however item 6) aligns within the top ranked contamination theme. The degradation related projects for metals and non-metals (items 4) and 5)) would also be associated with the contamination theme and support the expansion of their investigation to fully support the priority theme.

### 4.4.4 NOPSEMA research strategy

NOPSEMA has made public its research strategy (NOPSEMA, 2022) which identifies the key research gaps and priorities which they believe need to be addressed to reduce uncertainty in risk and impact assessments and activity management. Their broad vision is for industry to collaborate (i.e., prioritise, fund and design) to enhance scientific certainty for offshore energy projects. There are range of immediate priorities identified (2022-23), spanning their regulatory remit, but “decommissioning related research, monitoring and mitigation” is one of the 5 identified priorities. Within this priority there is alignment with some of the current study priority questions, but at a greater level of detail.

Common research themes in both include contaminants, best practice, technology and monitoring, but the specific focus in each is not fully aligned. In the NOPSEMA (2022) strategy there is also a much greater emphasis on the impact (i.e., productivity, aggregation, condition) to fish and more broadly ecological communities associated with left in-situ or removal of offshore infrastructure including the impact of invasive marine species. This was not a highly ranked, nor prevalent outcome from the DP priority question set.

### 4.4.5 Research focus in the UK sector: Net zero 2050

Supporting the oil and gas sector in the UK basin there are a wide range of organisations and stakeholders. As the pace, scope, and scale of decommissioning activities in the UK basin has increased significantly over the last few years they must now work closer together and improve levels of operational transparency. To support this, regulators have established a range of mechanisms to better coordinate between their mandated areas of responsibility. These are focused on improving levels of understanding on shared areas of interest and challenges. As the basin evolves further, this need is set to increase in response to more complex regulation, resource management and the priority to safeguard the marine environment and to ensure sustainability.

Within the area of regulation this has resulted in a highly active research landscape, covering for example, alternative/enhanced regulatory models, decommissioning and legal frameworks, financial securities in relation to decommissioning liabilities, legal and regulatory issues concerning carbon capture and storage, infrastructure left in-situ, and the impact of different legal regimes on decommissioning. The regulatory impact is also under consideration regarding the fate of structures, long term monitoring and the type and effect of contaminants. Some of this research will likely challenge current regulatory norms and guidelines, highlighting new and future areas of responsibilities and the need for further research and supporting technologies. CCUS, hydrogen storage and marine spatial planning would be part of this.

Following the UK Government’s commitment to reach net zero emissions by 2050, all decommissioning and late-life activities have been impacted by the energy transition. The impact on research activities from net zero and the energy transition is substantial and only set to grow. There is a demand to understand better the impact of all late life and decommissioning activities, driving research into full lifecycle activities, whilst remaining cognisant of safety and cost-effective drivers.

The need to decarbonise processes and technologies, to consider opportunities for asset repurposing and reuse, and the potential for material recycling are now prioritised. This requires a significant increase in planning, reporting and co-operation between stakeholders. This has helped highlight areas of potential collaboration which are not solely focused on cost efficiencies but are contributors to the delivery of net zero. The opportunities for skill sharing and technology transfer and collaboration between energy sectors has the potential for significant societal and economic impacts. These are

receiving significant research input, especially within the context of a 'Just Transition' and the need to maintain a social licence to operate.

Along with the renaming of several key stakeholder organisations (i.e., Oil and Gas Authority is now the North Sea Transition Authority, the Oil and Gas Technology Centre is now the Net Zero Technology Centre) these insights suggest that Australia's near term regulatory and policy position for decommissioning will likely be challenged within the timeline horizon of this study. This is a potential challenge to the DP's view of the priority questions selected.

It is increasingly recognised that O&G decommissioning activities cannot be considered in isolation. All stakeholder users of the sea must be considered and consulted. For example, opportunities for reuse and repurposing for CCUS may conflict with potential wind farm developments, which may in turn, challenge fishing or marine reserve areas.

Both industry and government agencies are actively seeking for cross industry sector synergies. It is recognised that O&G decommissioning practices, learnings and skills will have application for future renewable and alternative energy asset decommissioning. Consideration of this within the context of cost-effective decarbonisation, the current energy transition and future integration is crucial.

## 5 Conclusions and recommendations

### 5.1 Conclusions

The project's aim was to define the priority research questions and knowledge gaps which are differentiators in the decision making and approval for decommissioning Australian offshore oil and gas infrastructure over the next 10-20 years. The research has effectively identified, engaged and consulted nationally with up to 61 key stakeholders, having influence and interest in decommissioning decisions and approvals, and capturing 371 issues and opportunities and 89 key questions through an online causal mapping process. These questions have been synthesised to define a set of 39 key questions and an independent and transparent Decision Panel process has been successfully framed and executed to identify and rank a final set of 23 priority questions. These ranked questions, and all the supporting stakeholder generated material, can now be used by the NDRI, and other interested parties, to inform the development of decommissioning research strategies and plans for Australia's oil and gas infrastructure.

The key insights of this research project are:

- Stakeholder workshops and Decision Panel discussions revealed a wide range of perspectives and priorities. The wealth of information and opinion emanating from the workshop activities in the form of 89 stakeholder research questions and their supporting context should play a role in determining the national research roadmap alongside those questions seen as priorities by the Decision Panel.
- Concerns and requirements for information on the fate and impact of contaminants were seen as priorities by the Decision Panel.
- There was only one priority regulatory framework and policy question selected in the final 23 which is counter to the prevalence of this issue in previous Australian research (Shaw et al. 2018, Harvey et al. 2021). While the Australian regulatory landscape has been rapidly evolving over the last 12-18 months addressing legacy issues (e.g. trailing liability) other regions, such as the UK, have advanced beyond Australia's current decommissioning focus and are actively addressing the research required to support the country's net zero by 2050 position and energy transition which will feature parallel decommissioning knowledge challenges.



- There was less attention overall accorded to the ecological benefits of decommissioning and infrastructure compared with previous similar studies. This may be a reflection that stakeholders believe that industry funded research over the last 4 years has addressed many of these questions or that the specific concerns and questions have been diluted or lost in the synthesis process.
- In the conceptual stage of the design process there was explicit consideration of research questions that may be relevant within different time frames. Although this time frame focus was used in the context of the stakeholder workshops participants found it difficult and it was not possible to make this differentiation explicit in the Decision Panel's consideration of issues/questions. This is a recognised cognitive challenge when predicting future issues, requiring a repeated over time elicitation process for each time frame, which was not feasible given the time constraints.
- The degree of understanding of (i.e. the landscape of) decommissioning varied considerably between stakeholders, and without a shared knowledge base and common understanding there is a risk that it may hinder the ability to effectively move forward. The engagement process and outcomes from this work are a good foundation and opportunity for stakeholders to engage more across sectors, both in terms of frequency and knowledge exchange. This would help to inform each other of their respective priorities, opportunities and challenges and promote a shared and potentially common understanding of values and purpose.
- The Decision Panel was structured to represent the stakeholder groups participating in the workshops whilst ensuring a deep knowledge of decommissioning decision-making processes. There is inevitably an element of subjectivity, hence it is not possible to state that another Decision Panel would generate the same outcomes. However, the findings of the Panel are broadly consistent with research elsewhere both nationally and internationally.

### 5.2 Recommendations

The following recommendations are made in relation to the project outcomes:

- Recognition of the diversity of perceived research priorities detailed in this report is essential in the development of a decommissioning research roadmap for the future. Full consideration of stakeholder group outcomes (i.e., the stakeholder ranked questions) alongside the Decision Panel recommendations is necessary in order to reflect this diversity and secure the social licence necessary for decommissioning decisions.
- To mitigate the cognitive barrier to forecast issues and questions for the future, there are two levels of recommendation. The first centres on the operational and workshop level where greater care needs to be given as to how to elicit future differentiators in decision-making as this requires a degree of conjecture which may not be comfortable for participants. Incorporating scenario planning (eg 'keeping below 1.5°C'; 'net zero by 2050') or structuring workshops around specific timescales, may provide additional necessary context for this element of the research.
- The second, more powerful, recommendation is to use the "stakeholder reflection" captured within this report to further improve the level of understanding across all stakeholders and to implement an ongoing engagement process to continually update and improve this understanding so a future orientated and common set of shared values and purpose can be achieved. The Research Team recommends that regular, effective, and structured conversations continue by leveraging the foundations of the current study (i.e., current understanding and stakeholder enthusiasm).
- The Research Team is concerned that the outcomes and impetus generated by this study will not be taken forward in its entirety, and organisations will pursue the issues that are most

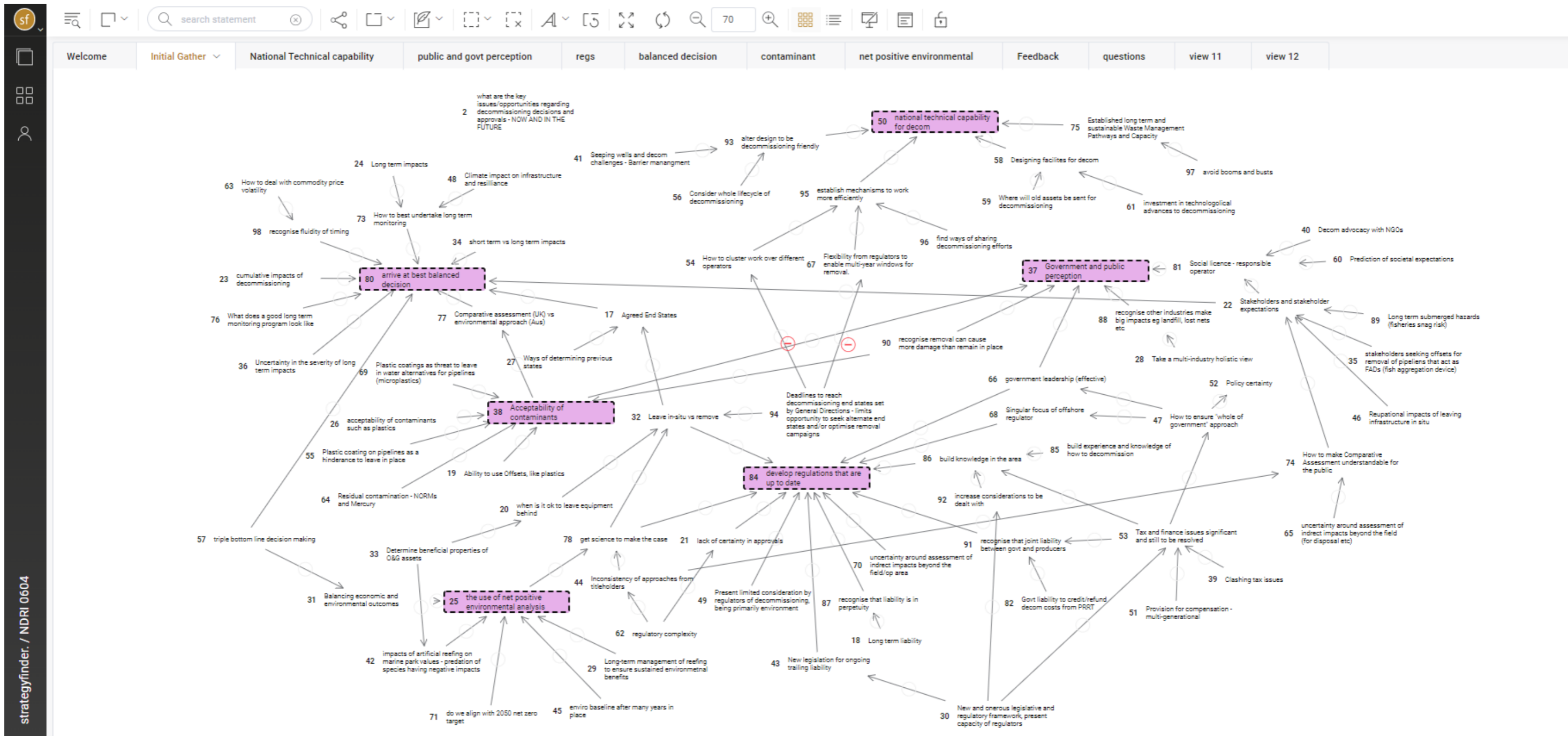
aligned to their priorities without attending to the context within which the issues are situated. As is evident in the stakeholder workshops and Decision Panel outcomes, there are strongly divergent views and there are questions and concerns that go beyond the 23 key questions identified and rated by the Decision Panel – questions that would benefit from resolution. There is a risk that organisational specific research programs and their outcomes could potentially compromise a common understanding across all stakeholders. It is therefore recommended that “a national and recognised organisation” (for example CODA or NDRI) takes accountability for all the key issues identified in the report to manage both the overall decommissioning research plan rollout and the ongoing stakeholder engagement/knowledge sharing to ensure a coherent and consolidated approach.

- A reflection of the above recommendation is the opportunity to integrate the current parallel NESP and NDRI research road mapping programmes and to share these joint outcomes to all stakeholders identified in the NDRI research study. This would also be a demonstration of the first steps of an aligned and national decommissioning research strategy and could act as the first knowledge sharing reinforcement opportunity following the stakeholder workshops.

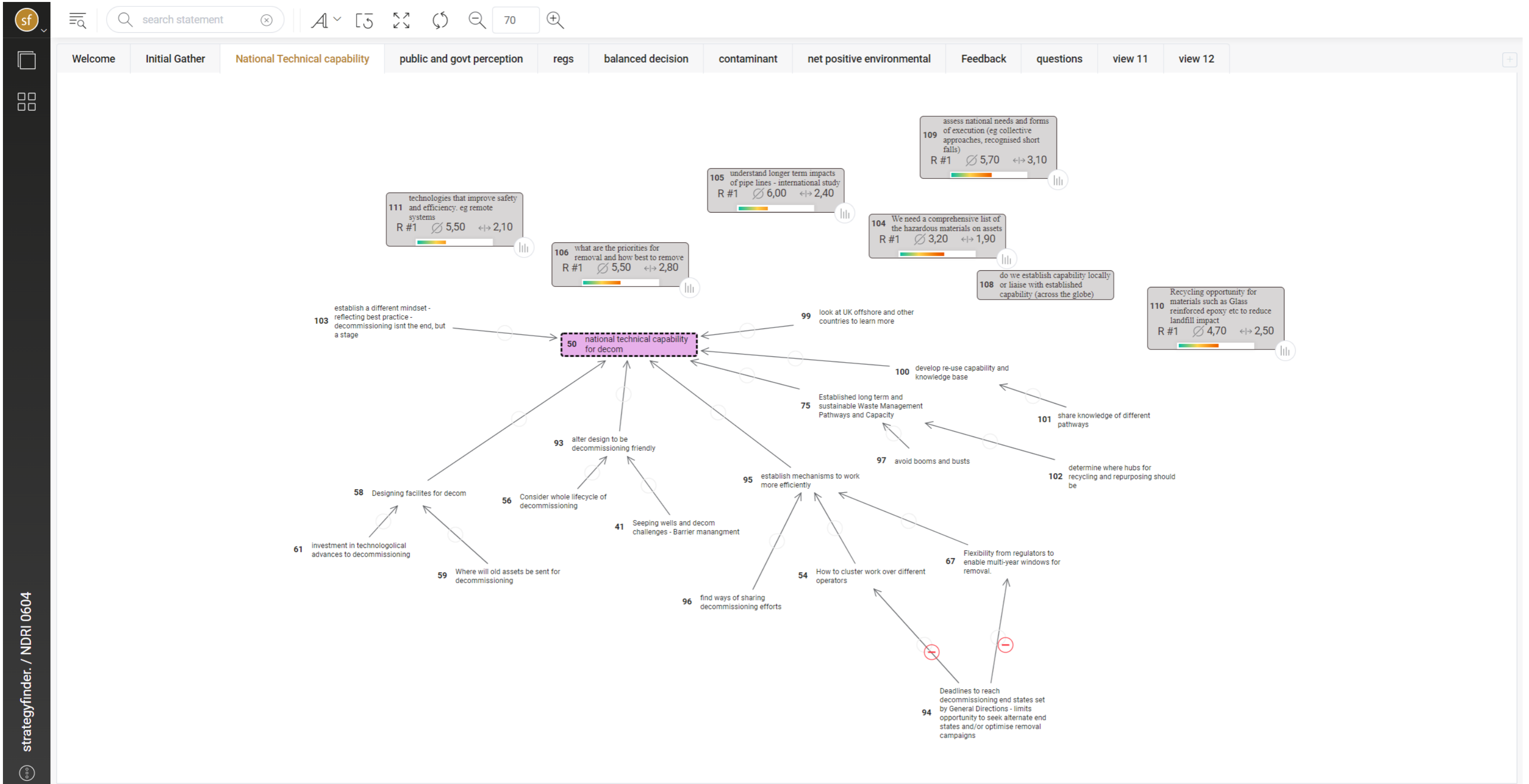
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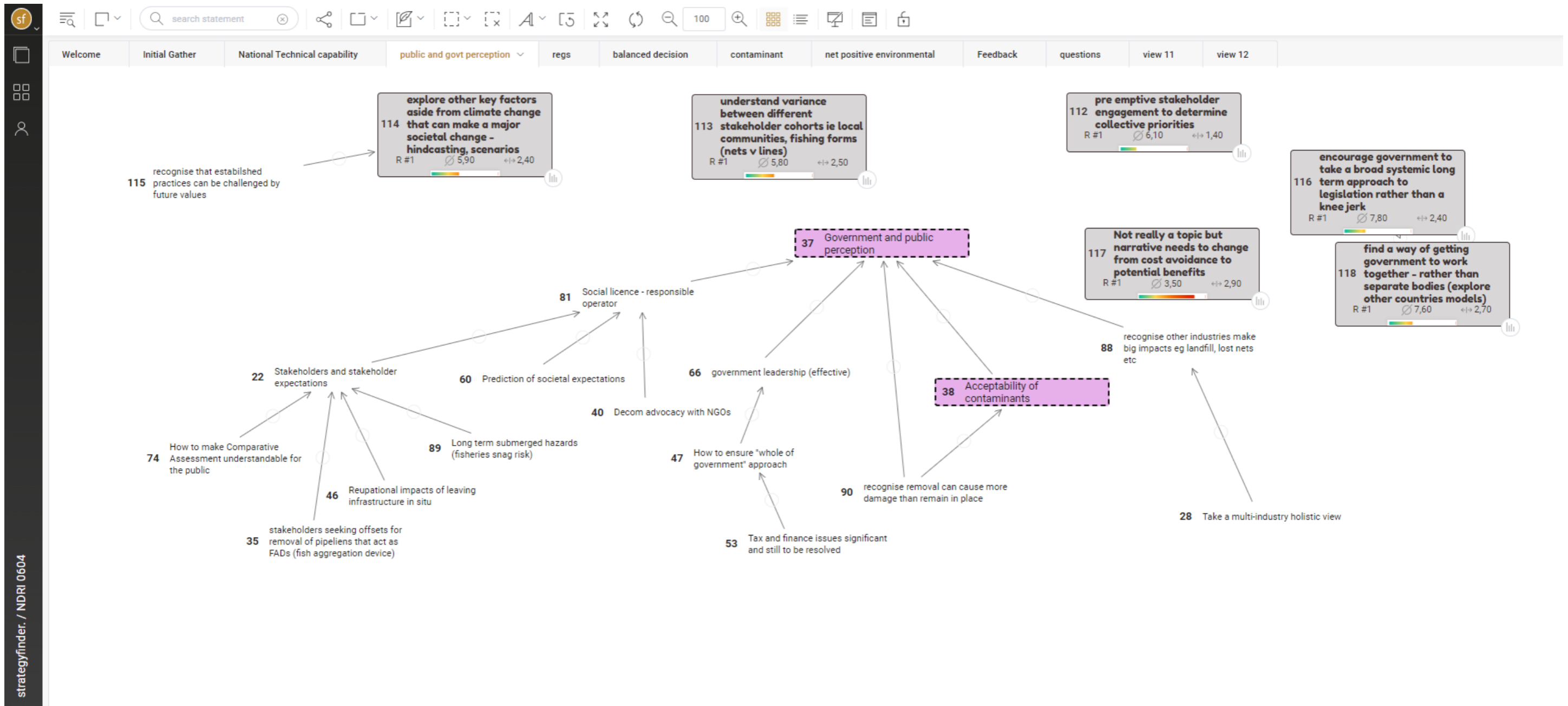
## **Attachment A – Industry Causal Mapping Workshop Output**

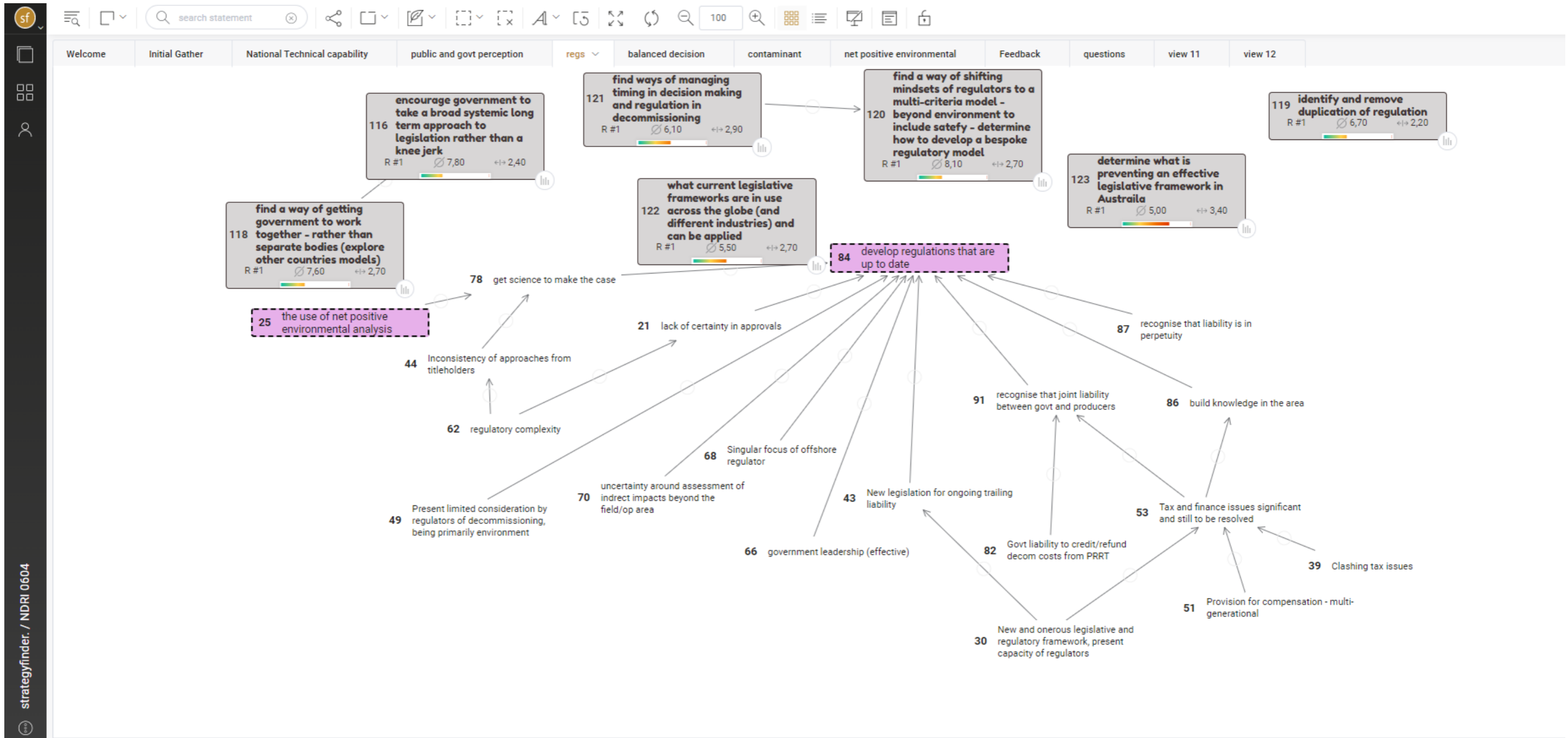


Note: statements in purple boxes reflect theme headings, statements in grey boxes reflect key questions, plain black statements are the issues and opportunities. Links represent causality i.e. statement A may lead to statement B. Where a red circle with line appears, this reflects a negative link i.e. statement A leads to NOT statement B. The numbers preceding the text are numeric tags for data manipulation and do not have any weighting.



Note: the rated key questions (grey boxes) with the results of the rating – R#1 represents the first rating exercise, next the average is displayed followed by the degree of consensus (the higher the number the lower consensus). A heat bar below reflects consensus – green being agreement, red disagreement.





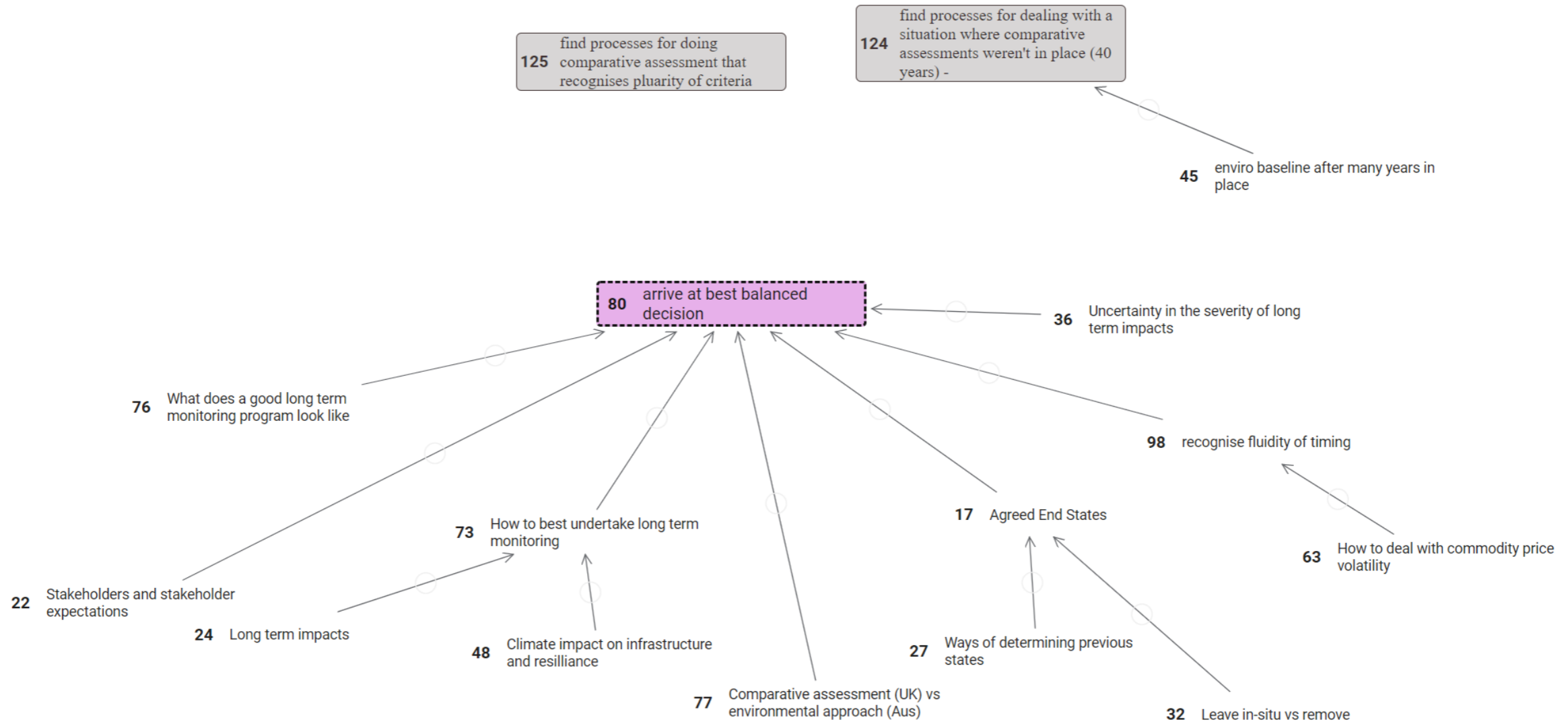
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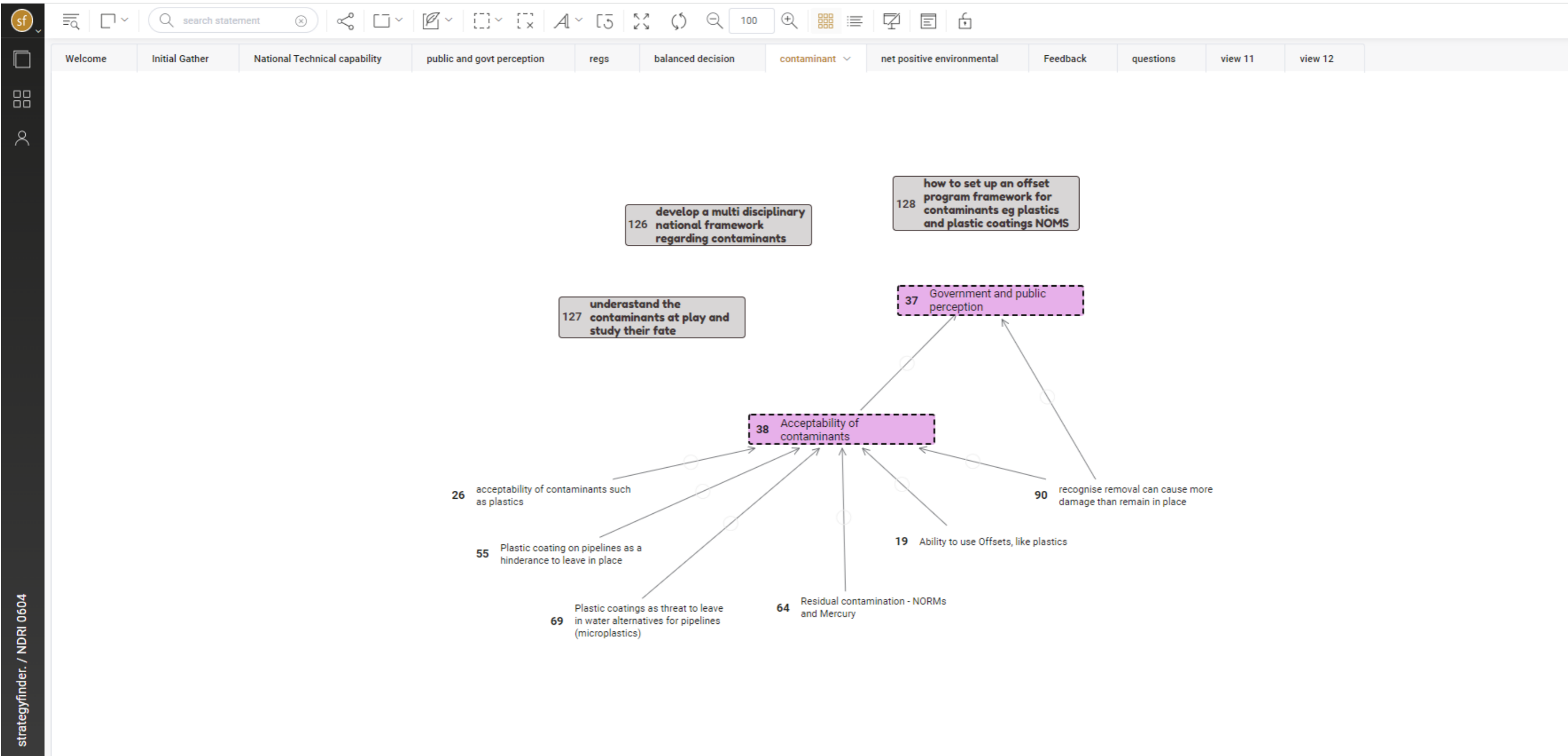




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      25[25 the use of net positive environmental analysis] --> 78[78 get science to make the case]
      25 --> 84[84 develop regulations that are up to date]
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      25 --> 29[29 Long-term management of reefing to ensure sustained environmental benefits]
      25 --> 42[42 impacts of artificial reefing on marine park values - predation of species having negative impacts]
      25 --> 33[33 Determine beneficial properties of O&G assets]
      25 --> 31[31 Balancing economic and environmental outcomes]
      25 --> 45[45 enviro baseline after many years in place]
      25 --> 57[57 triple bottom line decision making]
      25 --> 130[130 understand the balance between short and long term impacts and risks]
      25 --> 129[129 understand balance of biodiversity & ecosystem increase and energy avoidance and carbon sequestration]
      130 --- 130_data["R #1 8,00 +/- 2,10"]
      129 --- 129_data["R #1 5,30 +/- 2,70"]
      131[131 understand effects of removing 40 yr ecosystems when decommissioning] --- 131_data["R #1 7,20 +/- 2,30"]
  
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130 understand the balance between short and long term impacts and risks  
R #1 8,00 +/- 2,10

131 understand effects of removing 40 yr ecosystems when decommissioning  
R #1 7,20 +/- 2,30

129 understand balance of biodiversity & ecosystem increase and energy avoidance and carbon sequestration  
R #1 5,30 +/- 2,70

84 develop regulations that are up to date

78 get science to make the case

71 do we align with 2050 net zero target

29 Long-term management of reefing to ensure sustained environmental benefits

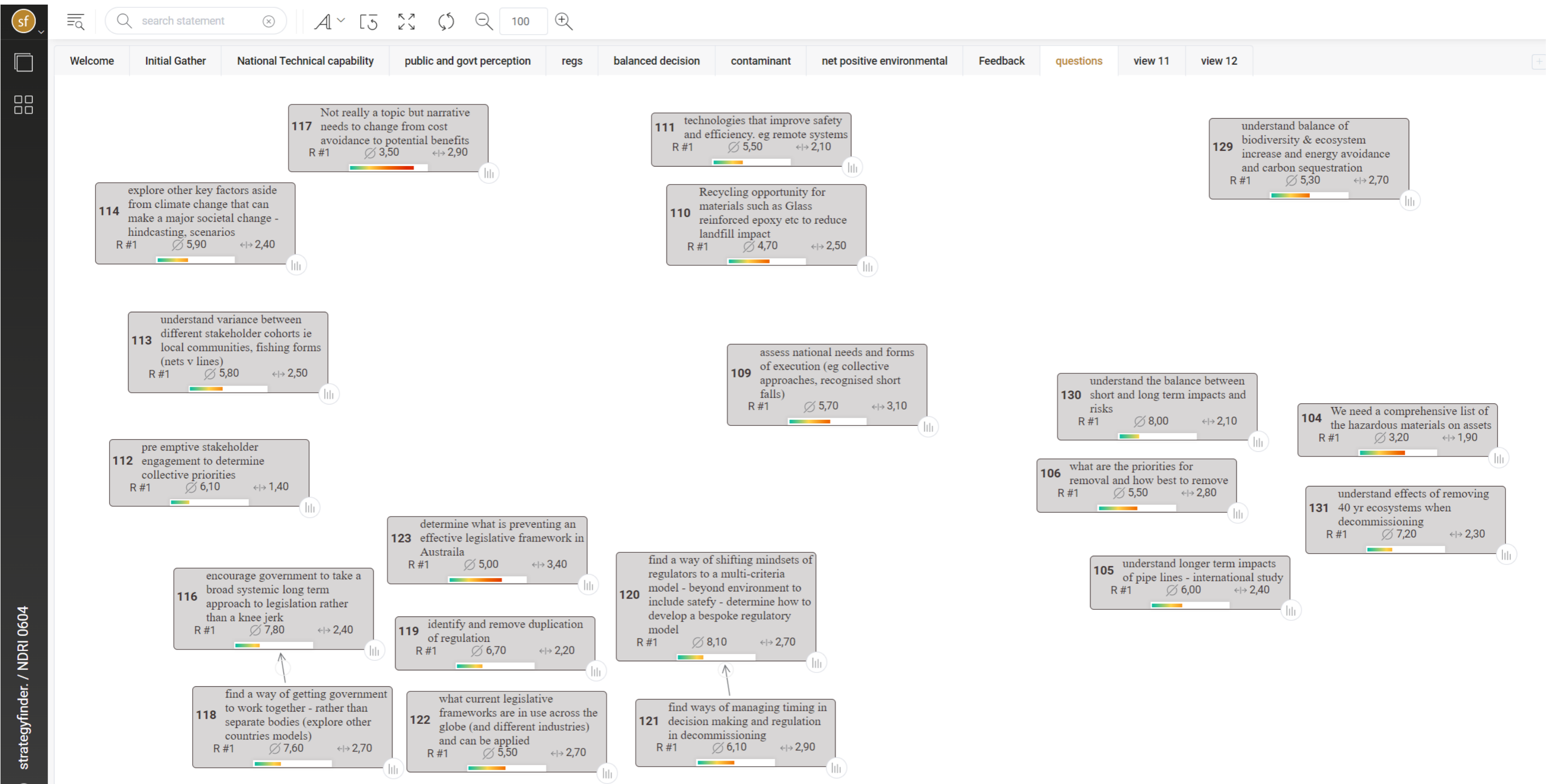
42 impacts of artificial reefing on marine park values - predation of species having negative impacts

33 Determine beneficial properties of O&G assets

31 Balancing economic and environmental outcomes

45 enviro baseline after many years in place

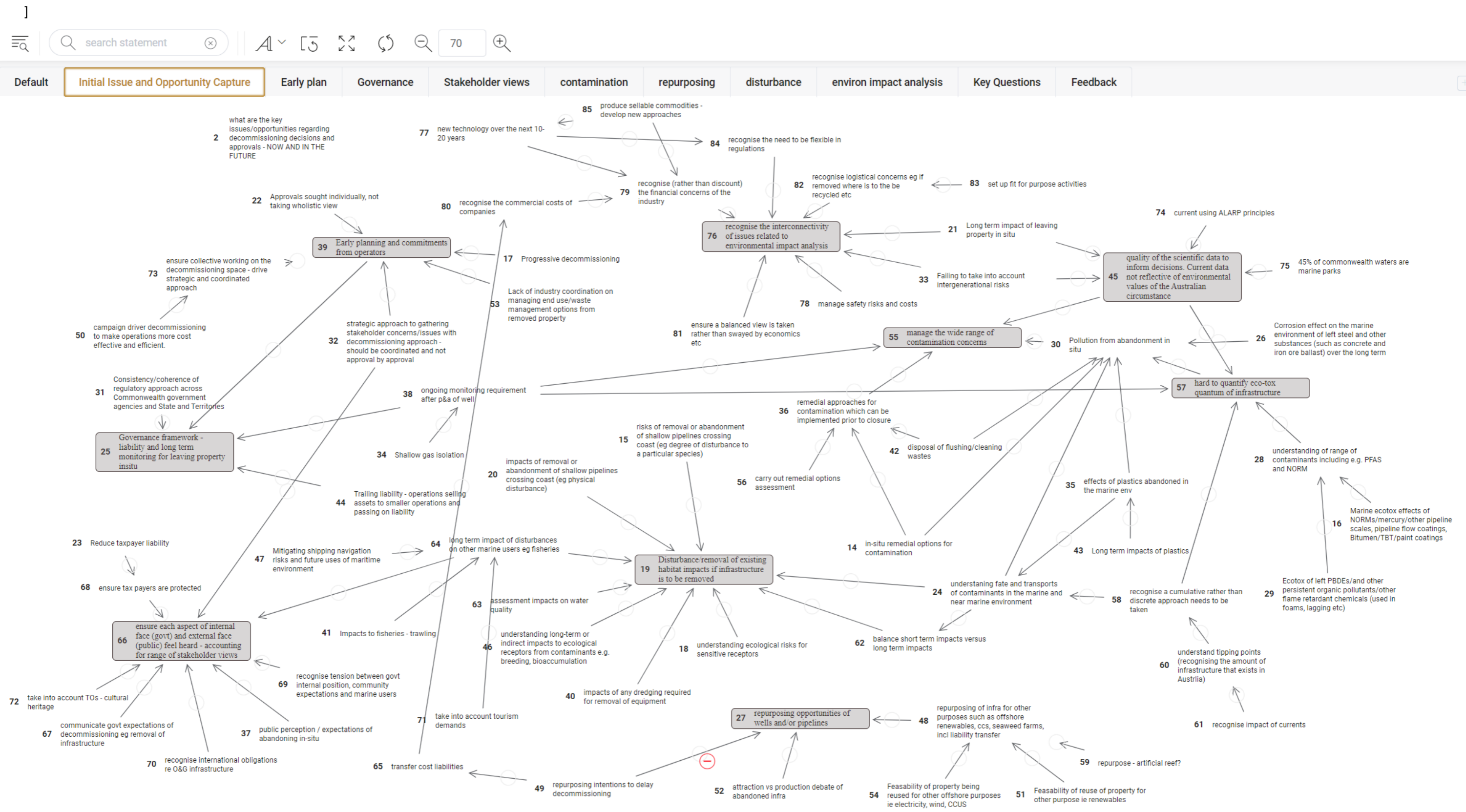
57 triple bottom line decision making



Note: the rated key questions (grey boxes) with the results of the rating – R#1 represents the first rating exercise, next the average is displayed followed by the degree of consensus (the higher the number the lower consensus). A heat bar below reflects consensus – green being agreement, red disagreement.

## **Attachment B – Regulatory/Government Causal Mapping Workshop Output**

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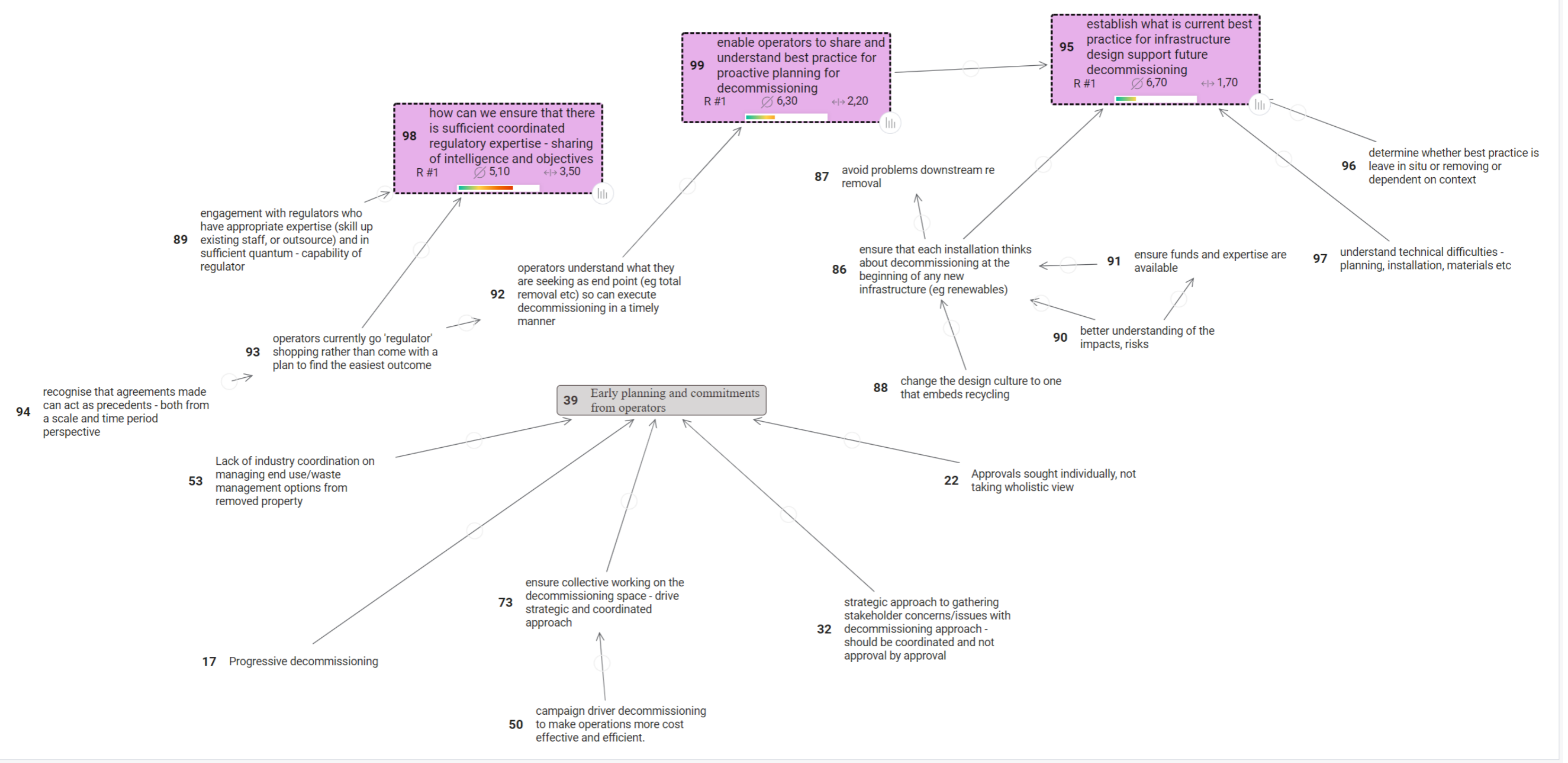


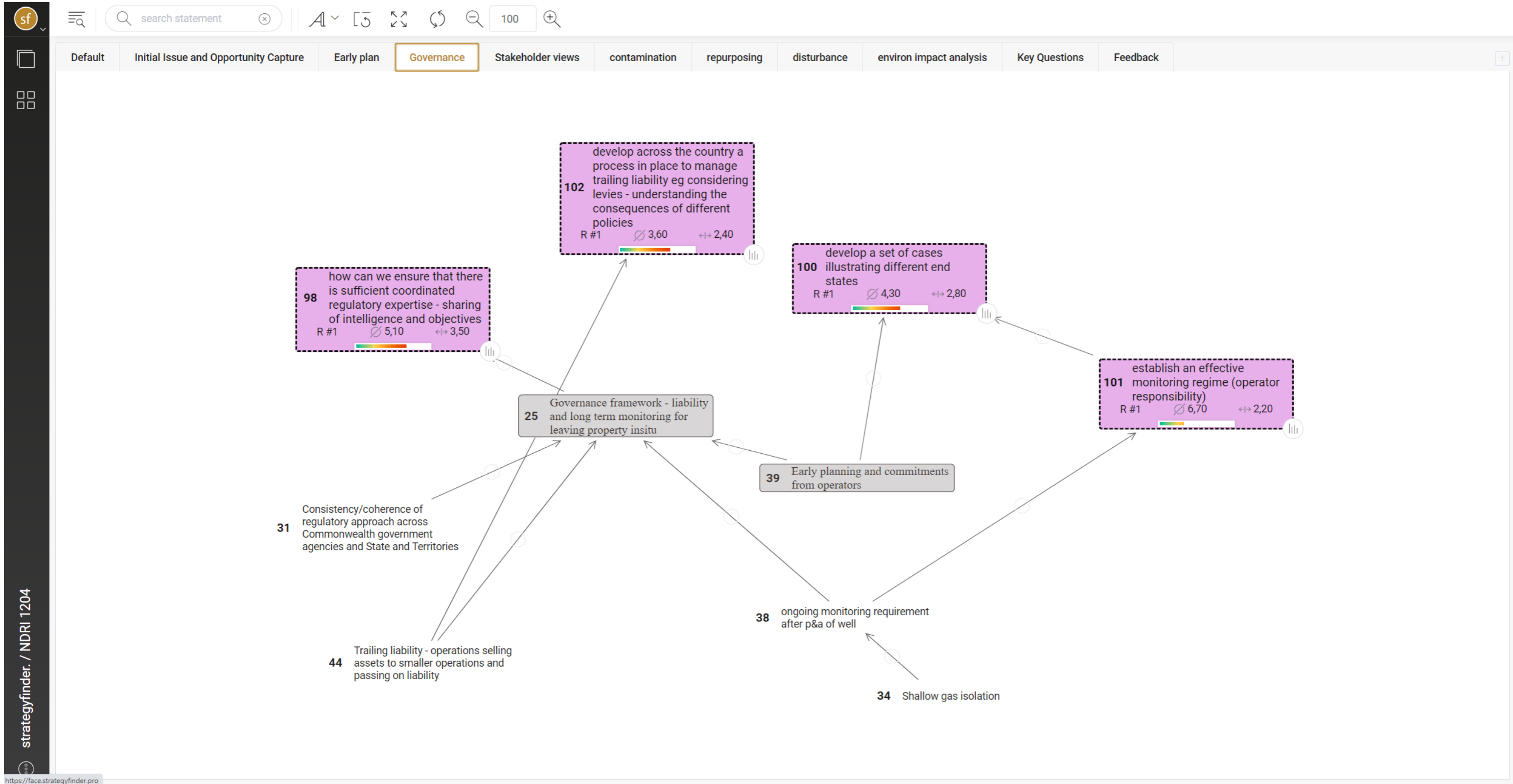
Note: statements in grey boxes reflect theme headings, statements in pink boxes reflect key questions, plain black statements are the issues and opportunities. Links represent causality i.e. statement A may lead to statement B. Where a red circle with line appears, this reflects a negative link i.e. statement A leads to NOT statement B. The numbers preceding the text are numeric tags for data manipulation and do not have any weighting.

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- contamination
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- environ impact analysis
- Key Questions
- Feedback

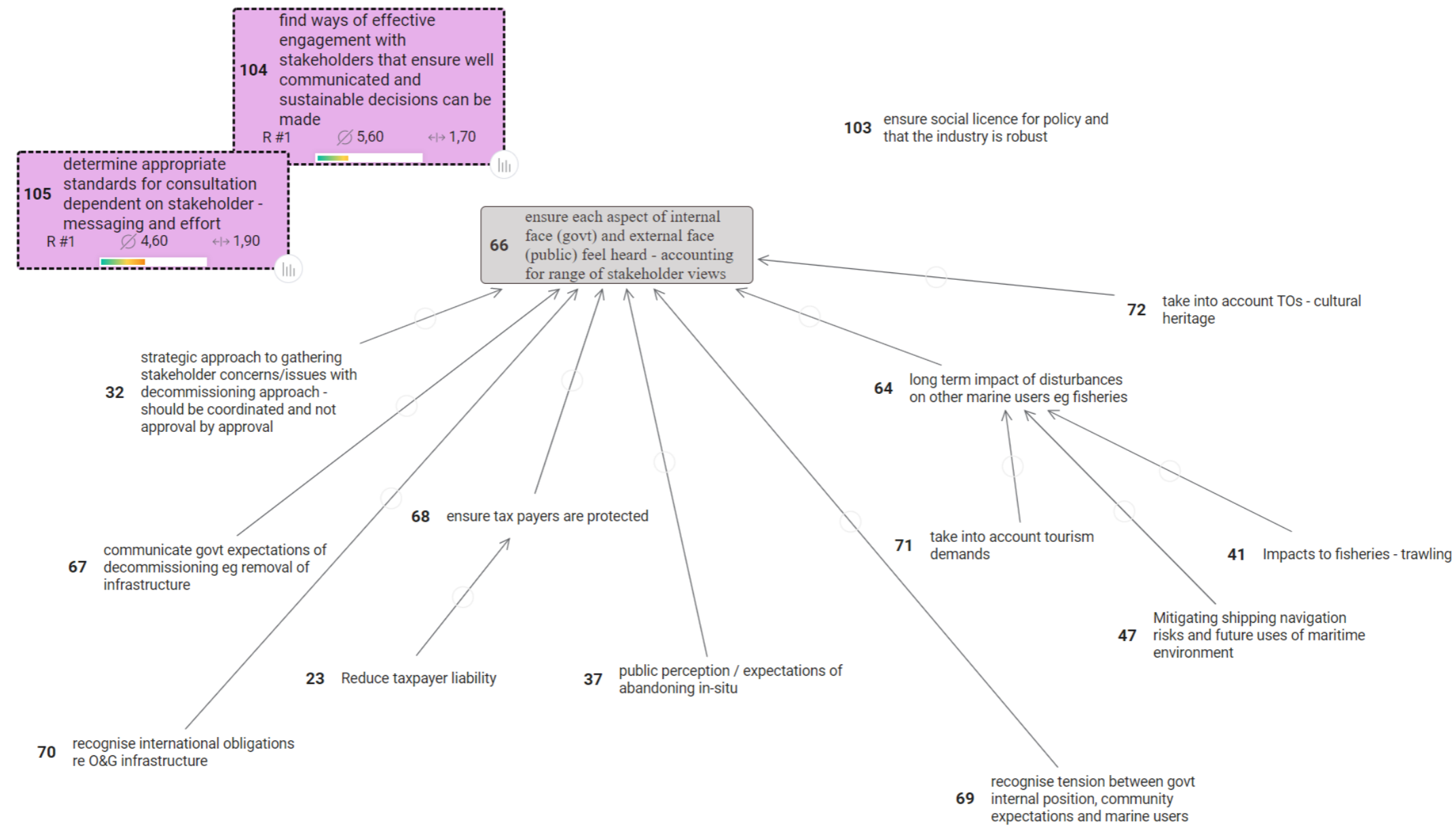


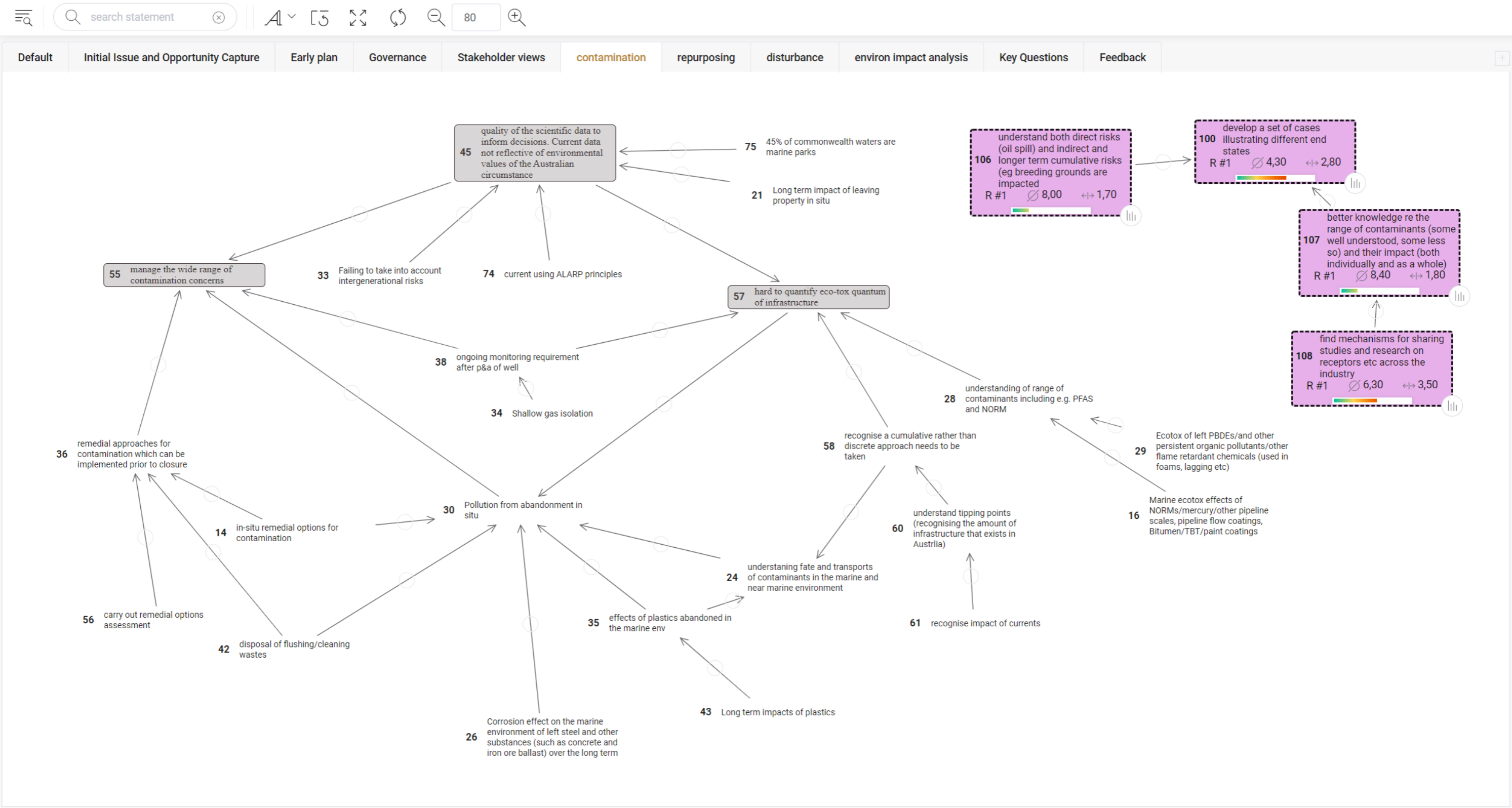




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contamination
repurposing
disturbance
environ impact analysis
Key Questions
Feedback

**101** establish an effective monitoring regime (operator responsibility)  
R #1 ⌀ 6,70 ↔ 2,20

**102** develop across the country a process in place to manage trailing liability eg considering levies - understanding the consequences of different policies  
R #1 ⌀ 3,60 ↔ 2,40

**109** understand the long term consequences of repurposing  
R #1 ⌀ 7,40 ↔ 1,60

**95** establish what is current best practice for infrastructure design support future decommissioning  
R #1 ⌀ 6,70 ↔ 1,70

**27** repurposing opportunities of wells and/or pipelines

**49** repurposing intentions to delay decommissioning

**48** repurposing of infra for other purposes such as offshore renewables, ccs, seaweed farms, incl liability transfer

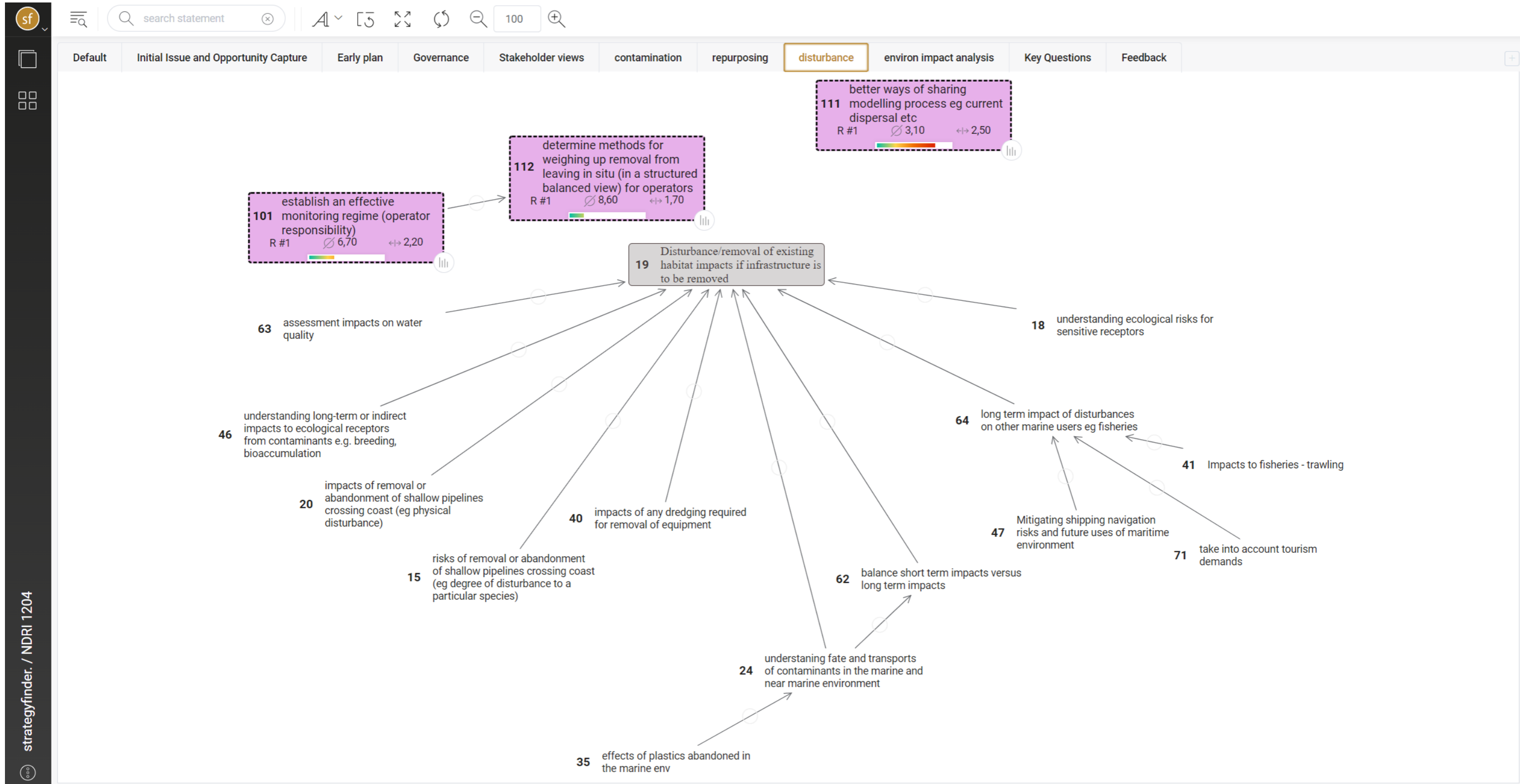
**52** attraction vs production debate of abandoned infra

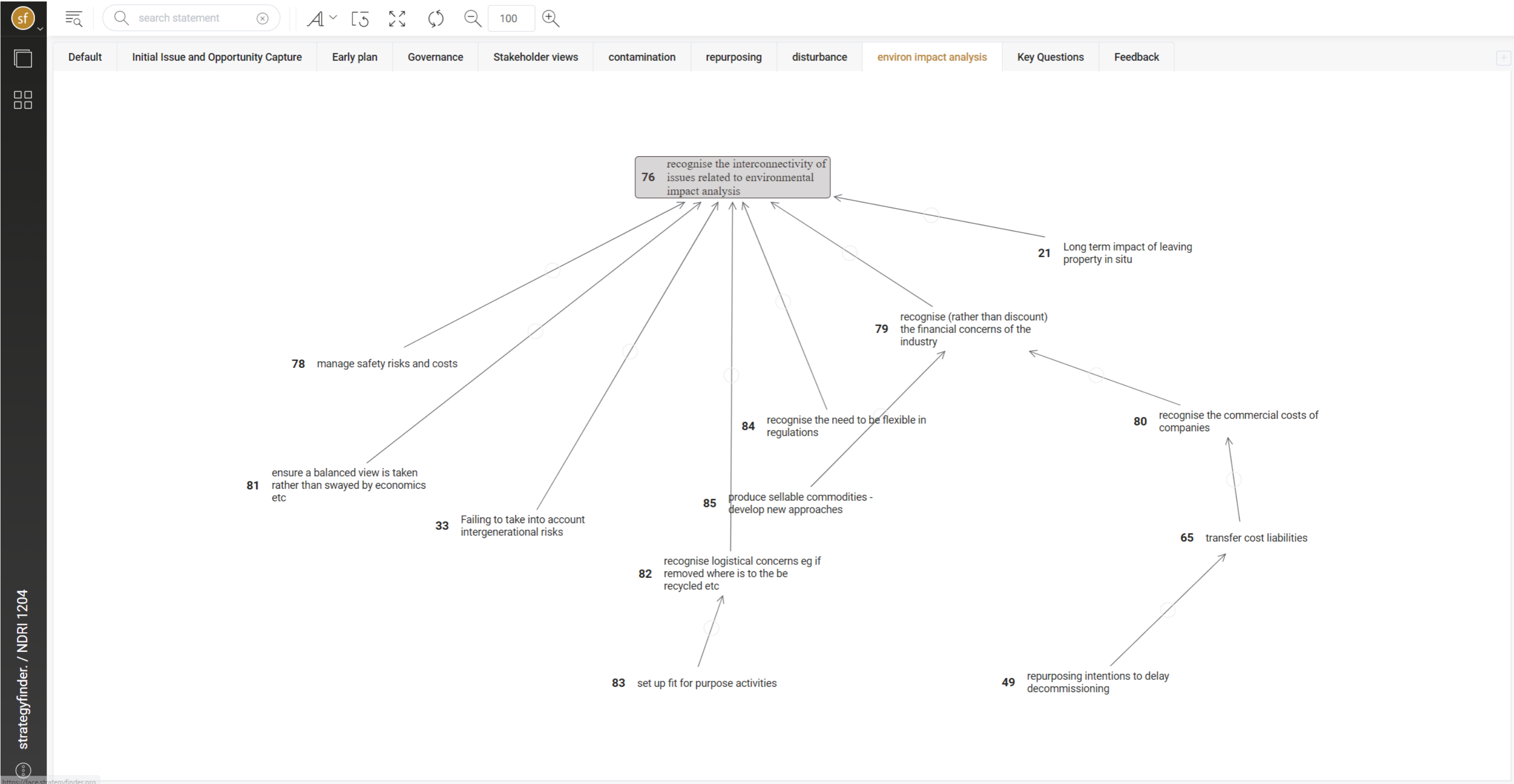
**54** Feasibility of property being reused for other offshore purposes ie electricity, wind, CCUS

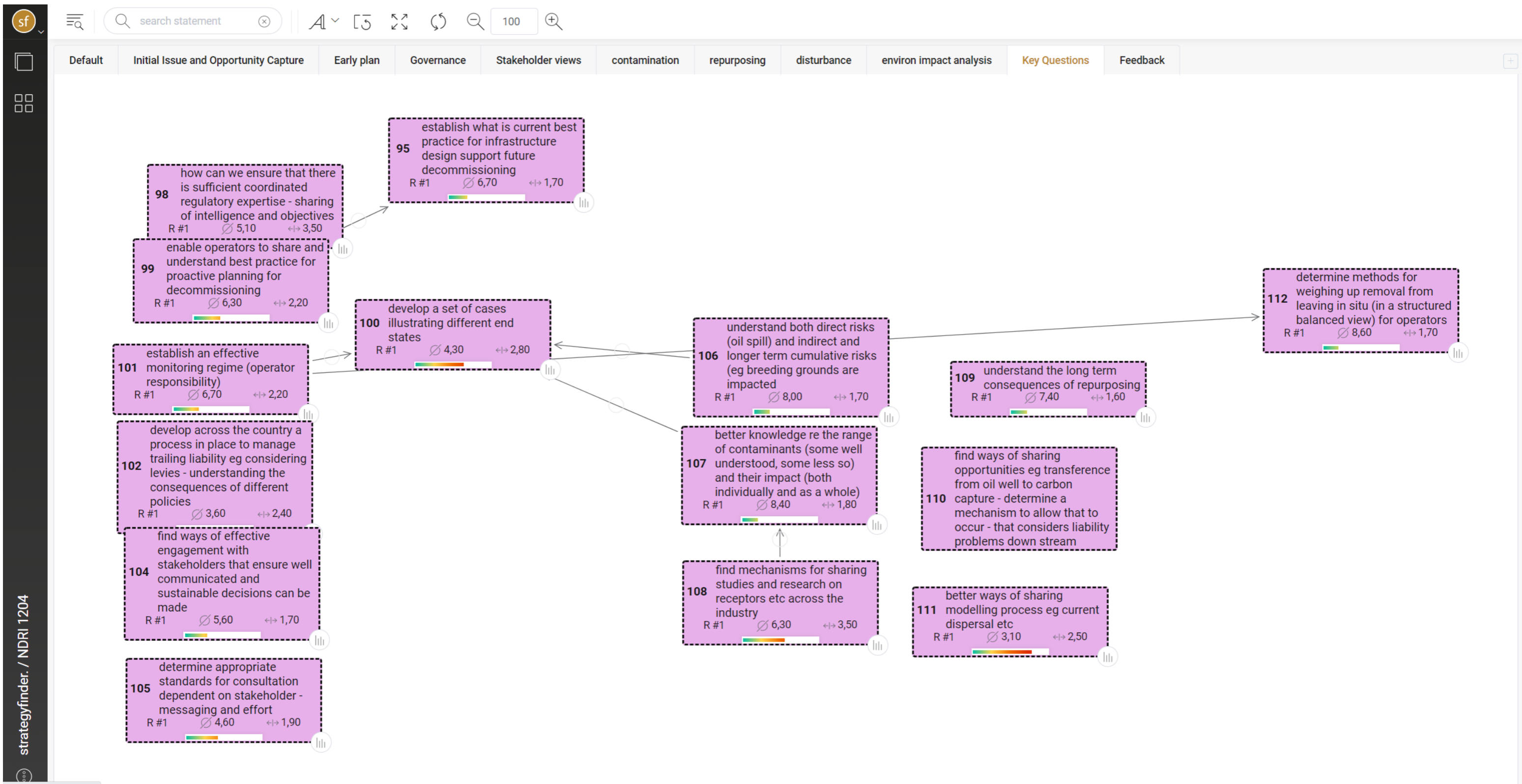
**51** Feasibility of reuse of property for other purpose ie renewables

**59** repurpose - artificial reef?

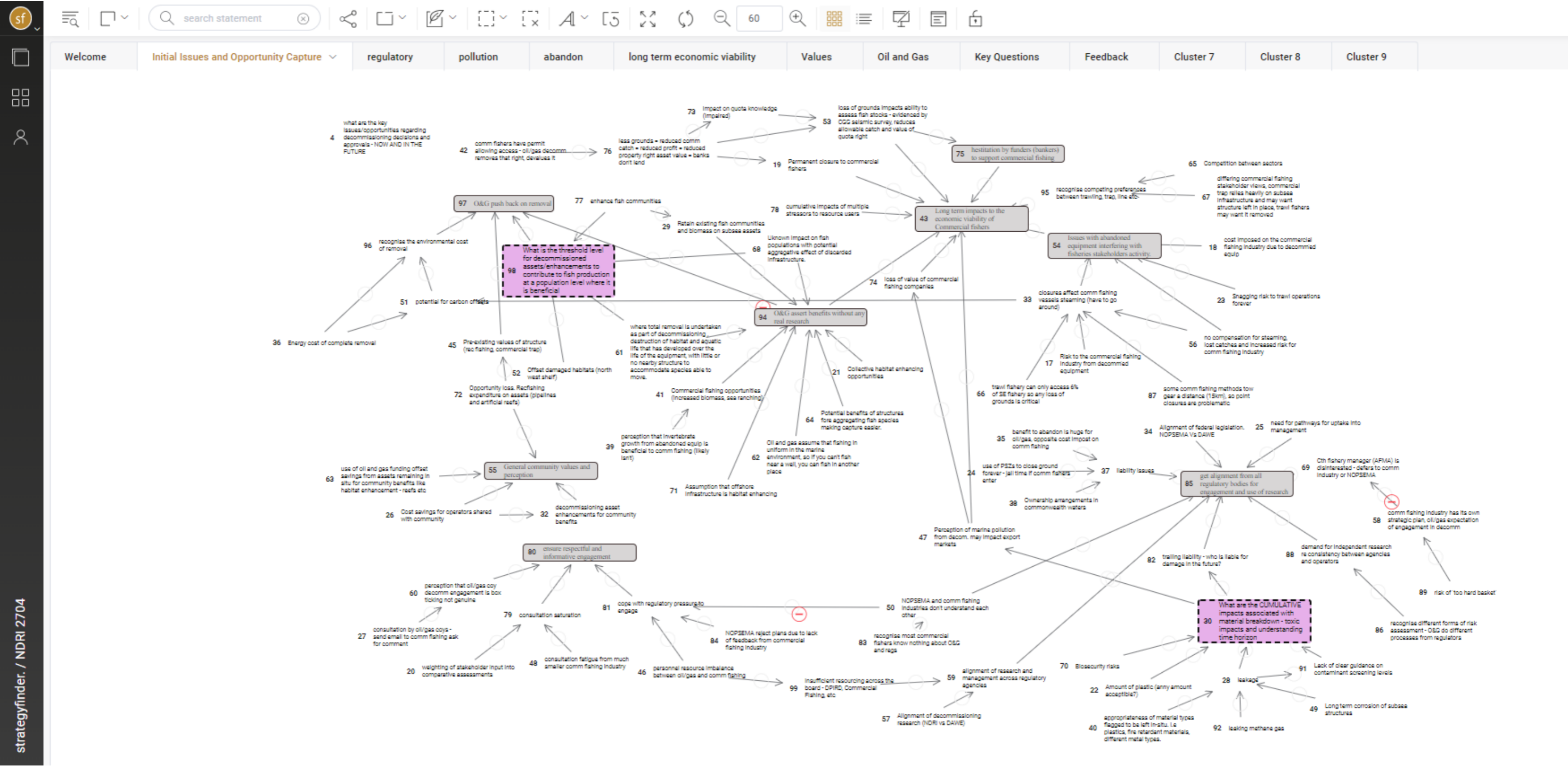
**110** find ways of sharing opportunities eg transference from oil well to carbon capture - determine a mechanism to allow that to occur - that considers liability problems down stream







## **Attachment C – Fisheries Causal Mapping Workshop Output**



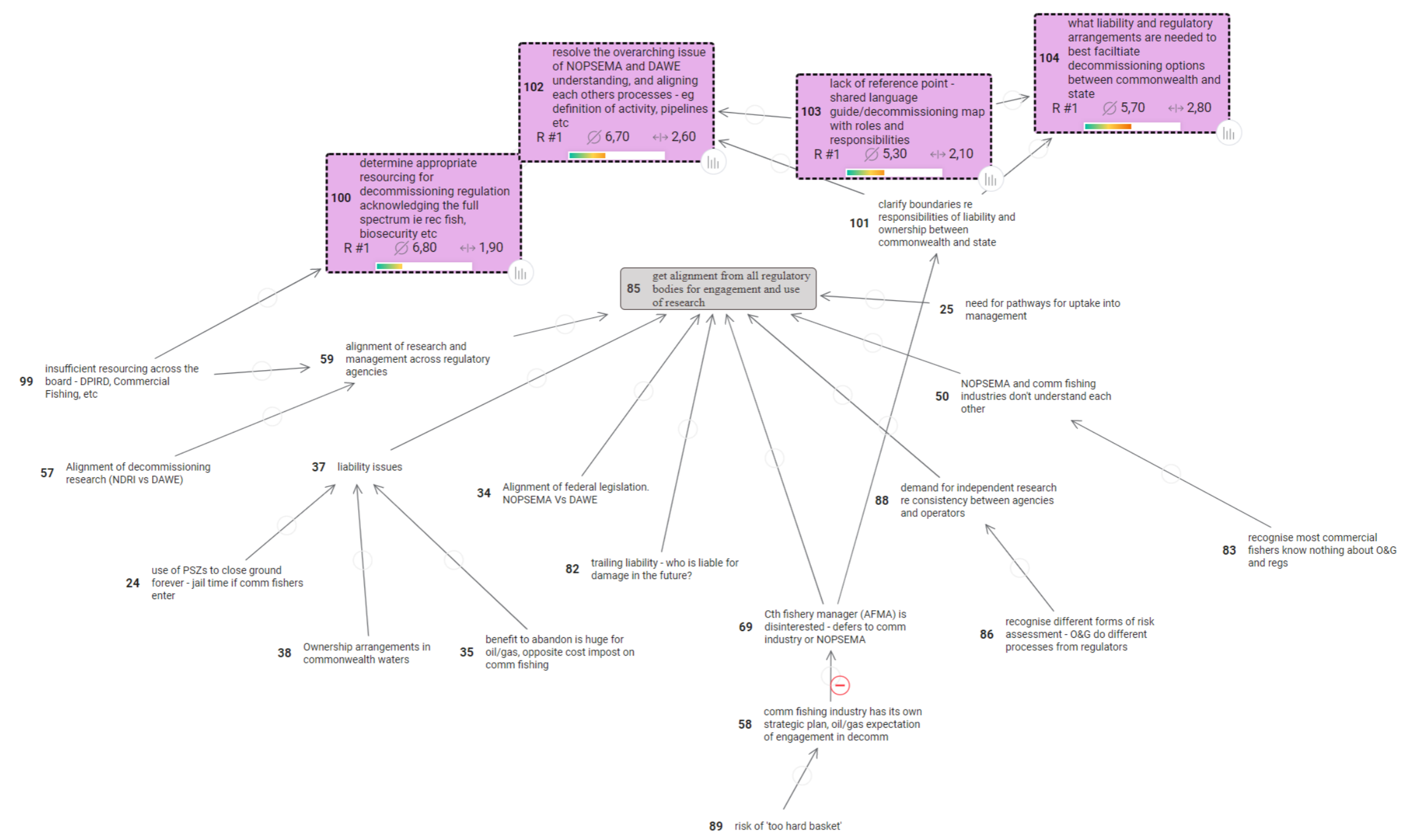
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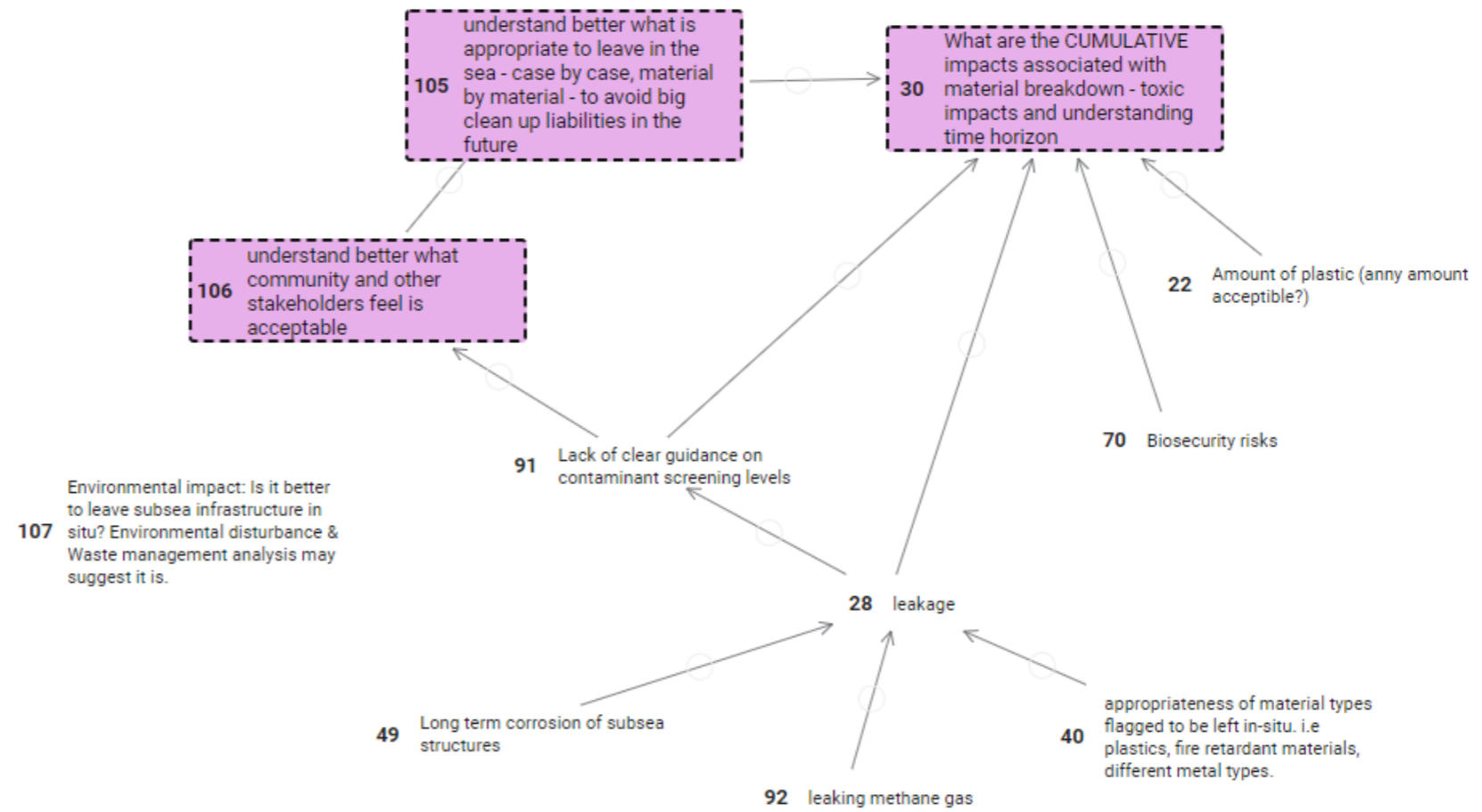
- Welcome
- Initial Issues and Opportunity Capture
- regulatory
- pollution
- abandon
- long term economic viability
- Values
- Oil and Gas
- Key Questions
- Feedback
- Cluster 7
- Cluster 8
- Cluster 9

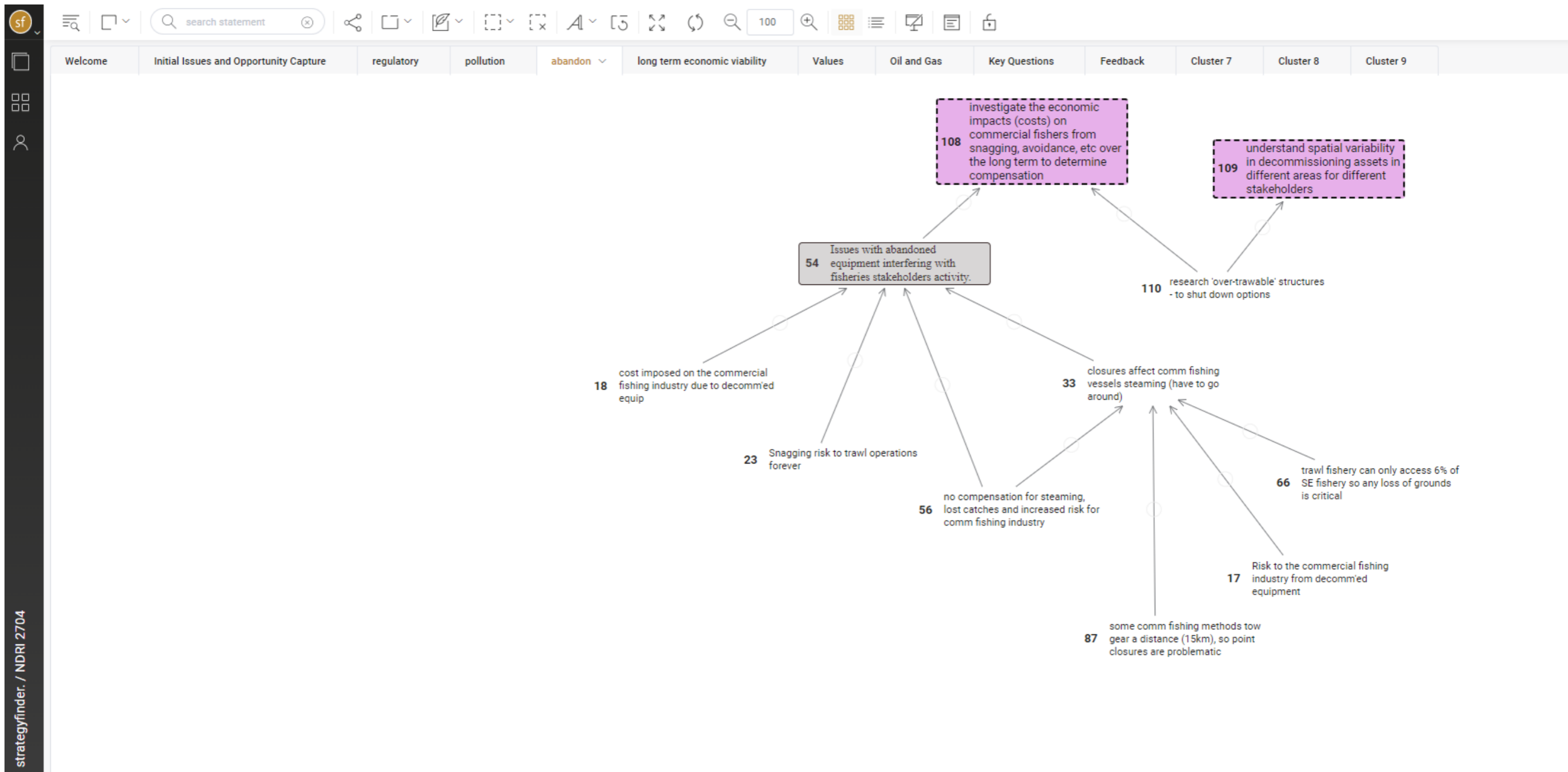


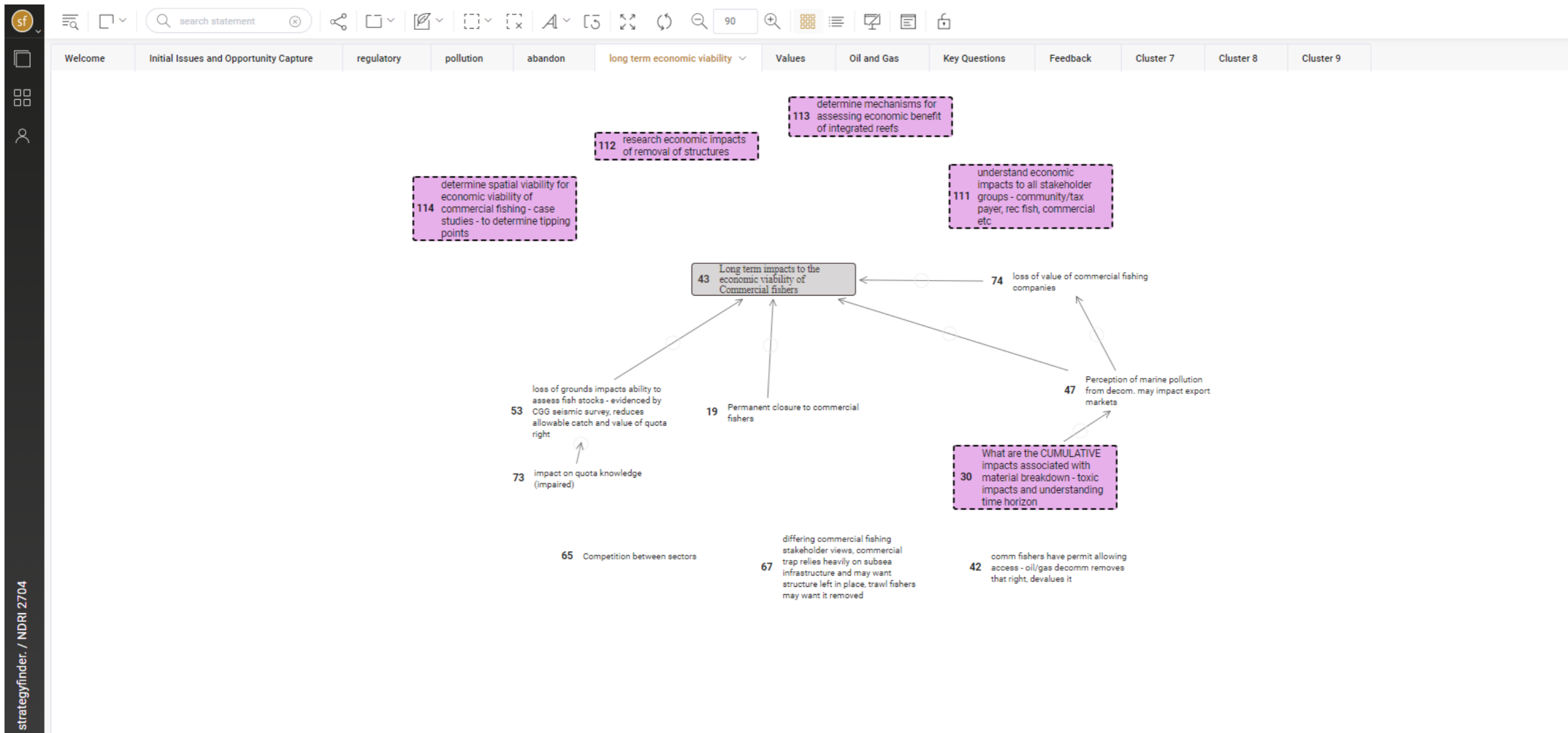
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Welcome Initial Issues and Opportunity Capture regulatory **pollution** abandon long term economic viability Values Oil and Gas Key Questions Feedback Cluster 7 Cluster 8 Cluster 9



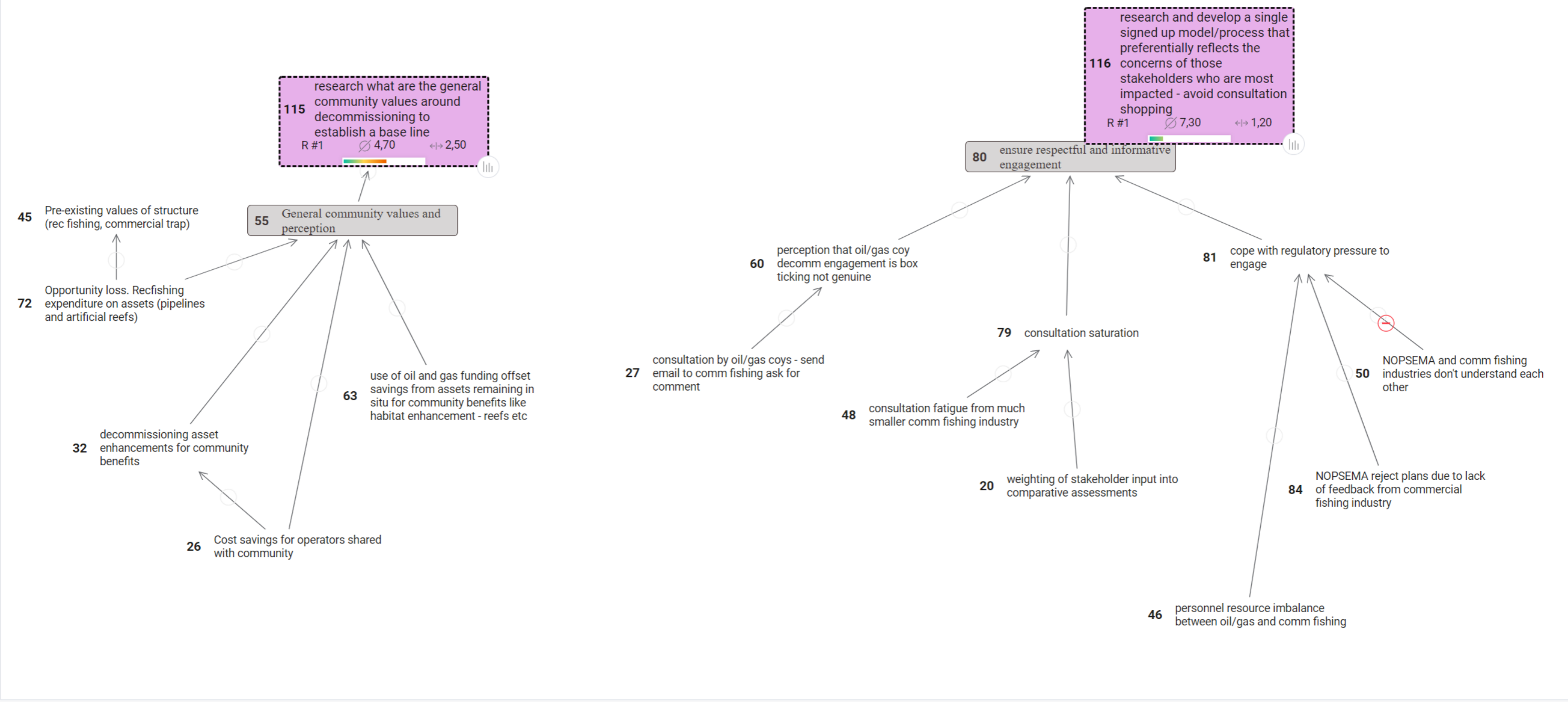


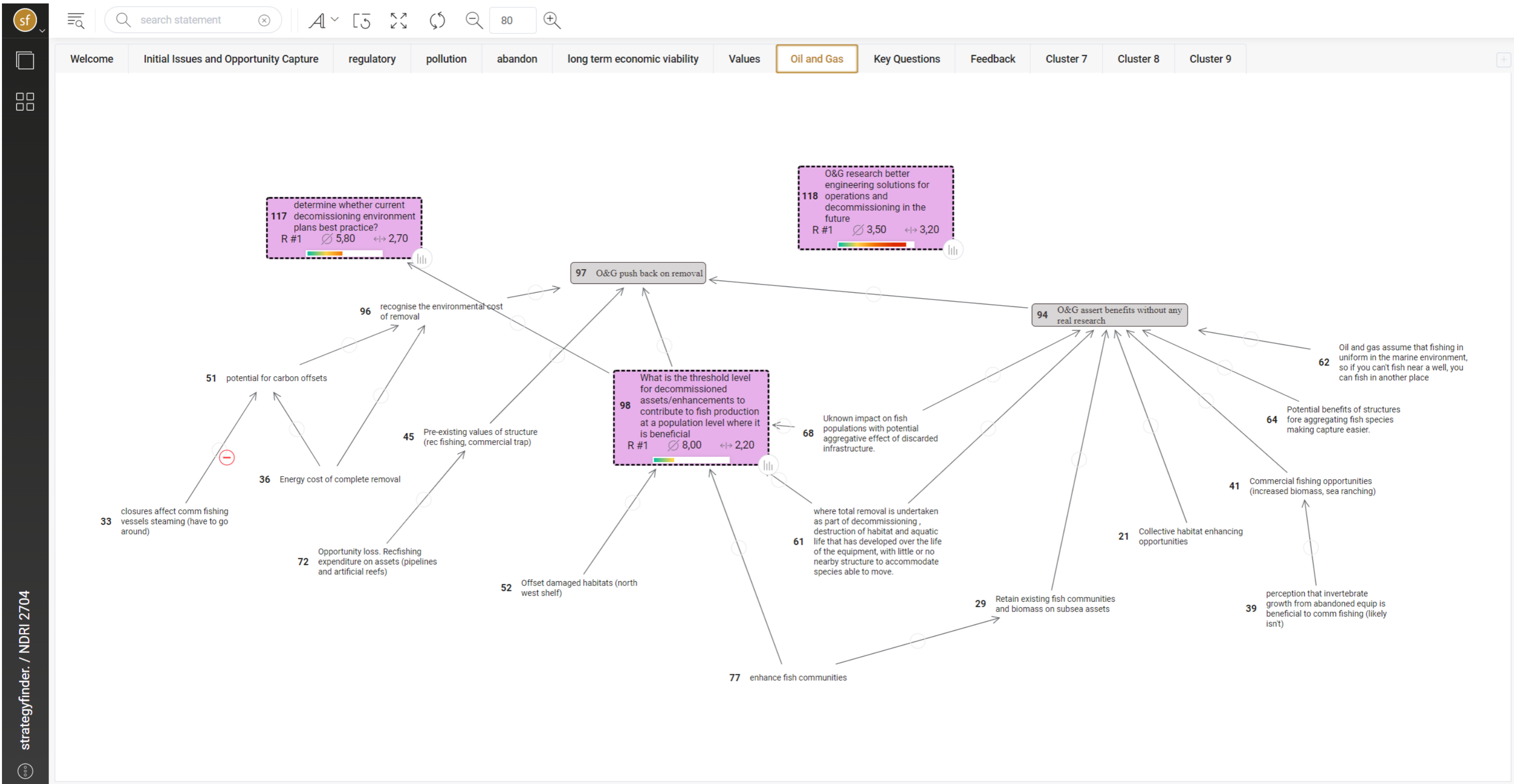


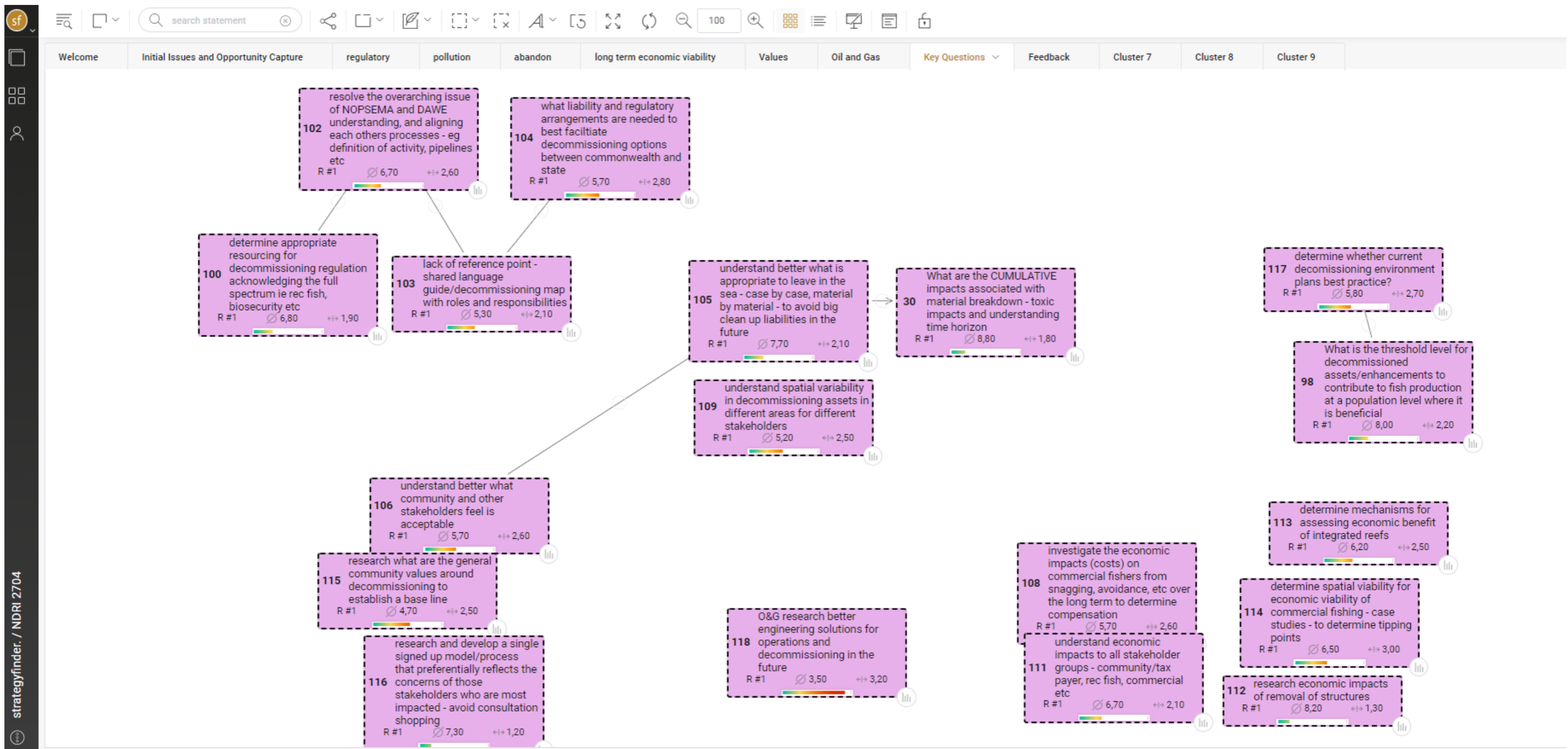


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- Welcome
- Initial Issues and Opportunity Capture
- regulatory
- pollution
- abandon
- long term economic viability
- Values**
- Oil and Gas
- Key Questions
- Feedback
- Cluster 7
- Cluster 8
- Cluster 9



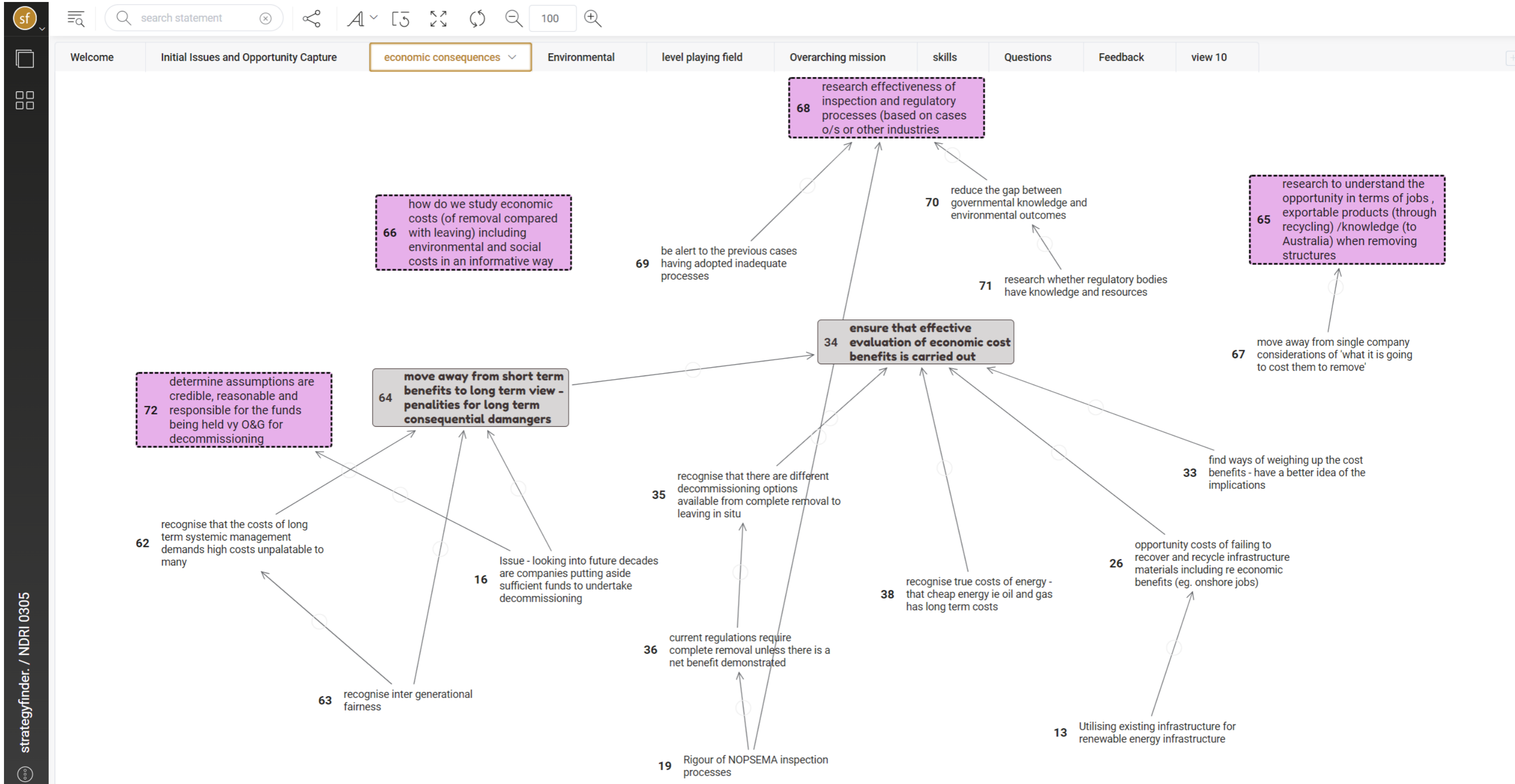




## **Attachment D – NGO Causal Mapping Workshop Output**



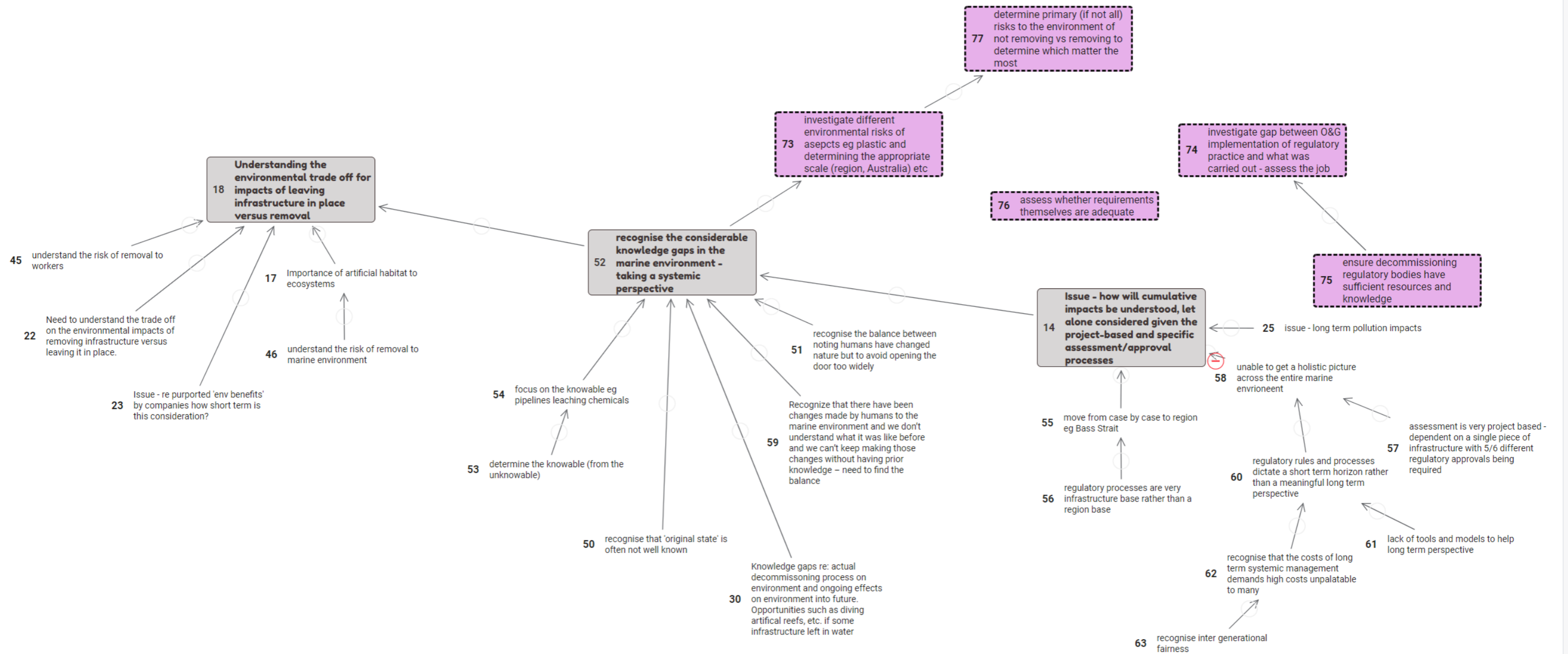


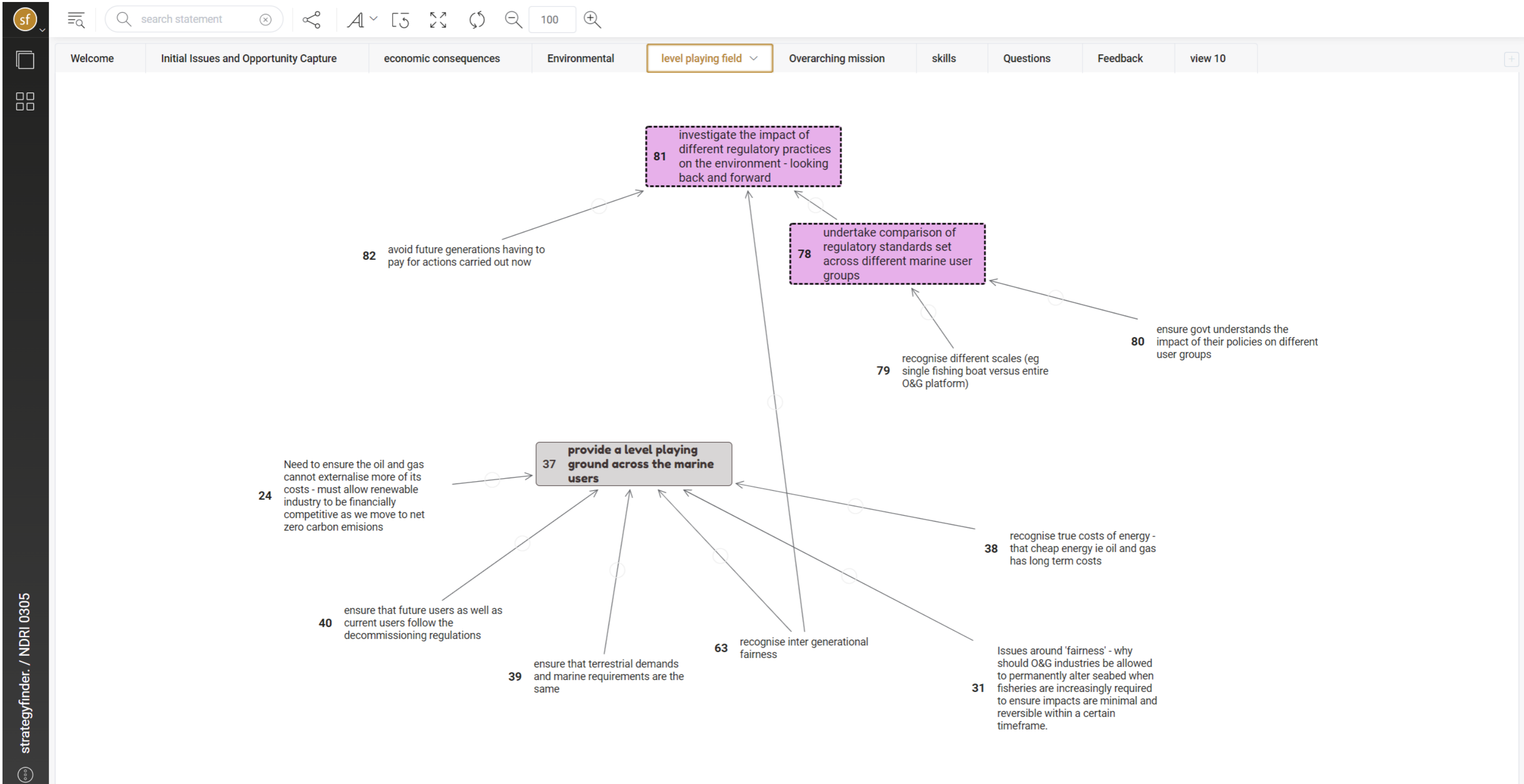




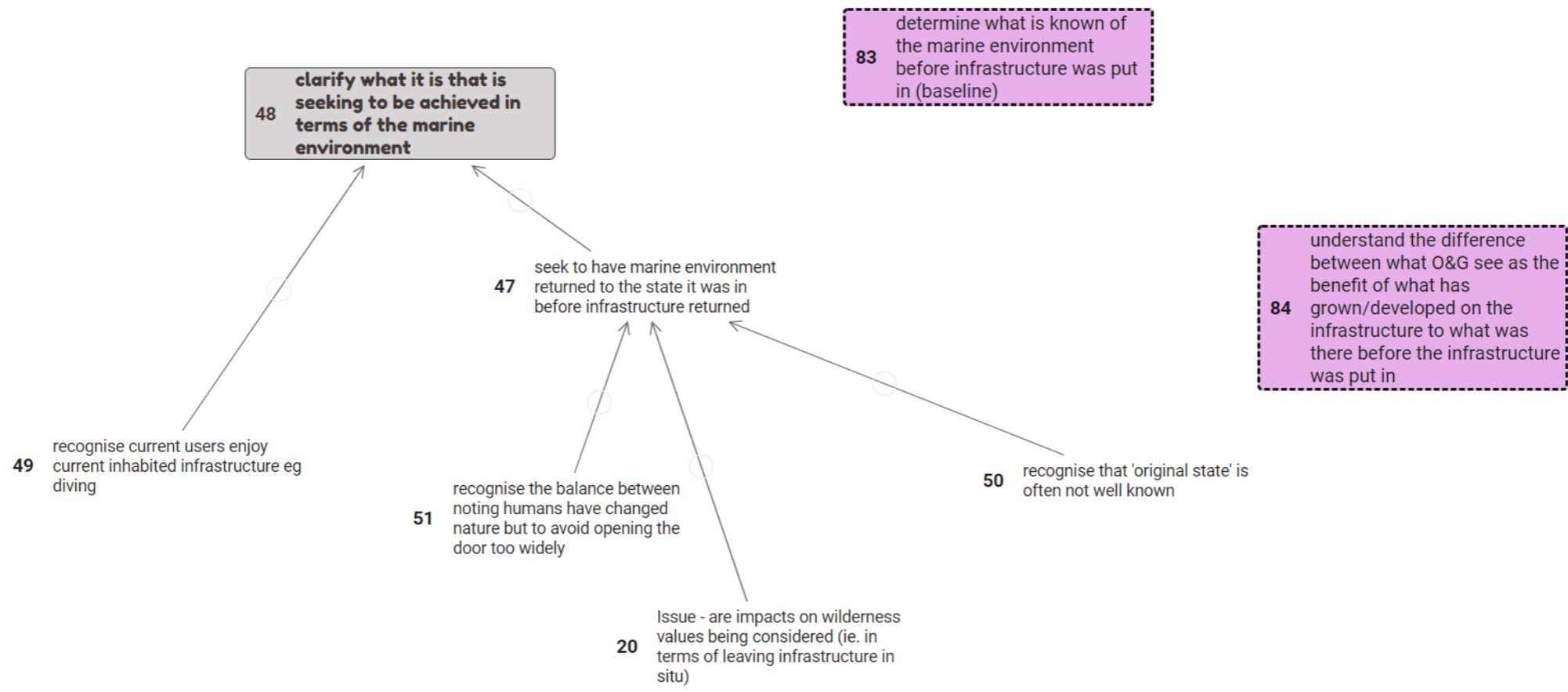
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- Welcome
- Initial Issues and Opportunity Capture
- economic consequences
- Environmental**
- level playing field
- Overarching mission
- skills
- Questions
- Feedback
- view 10

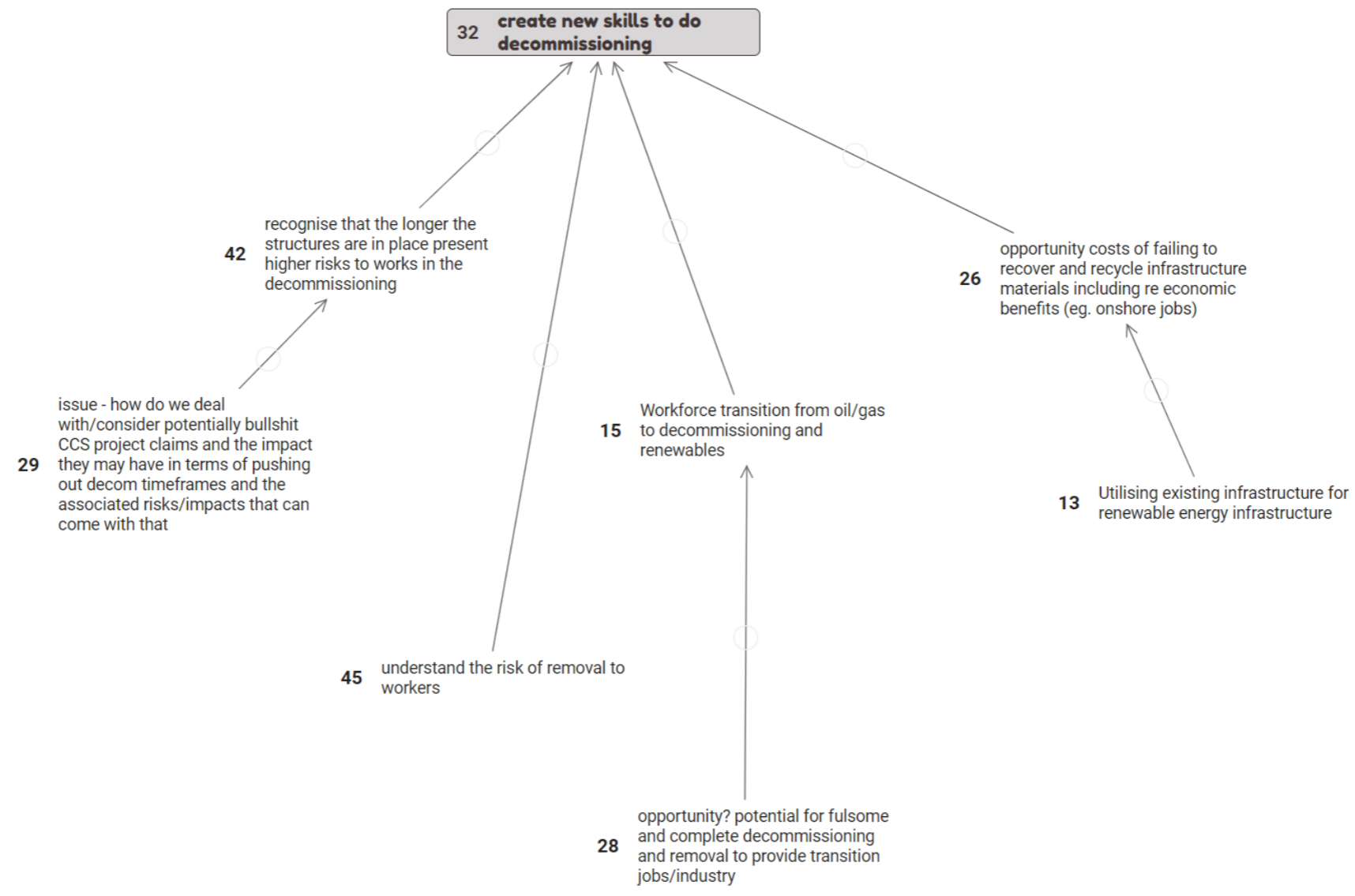


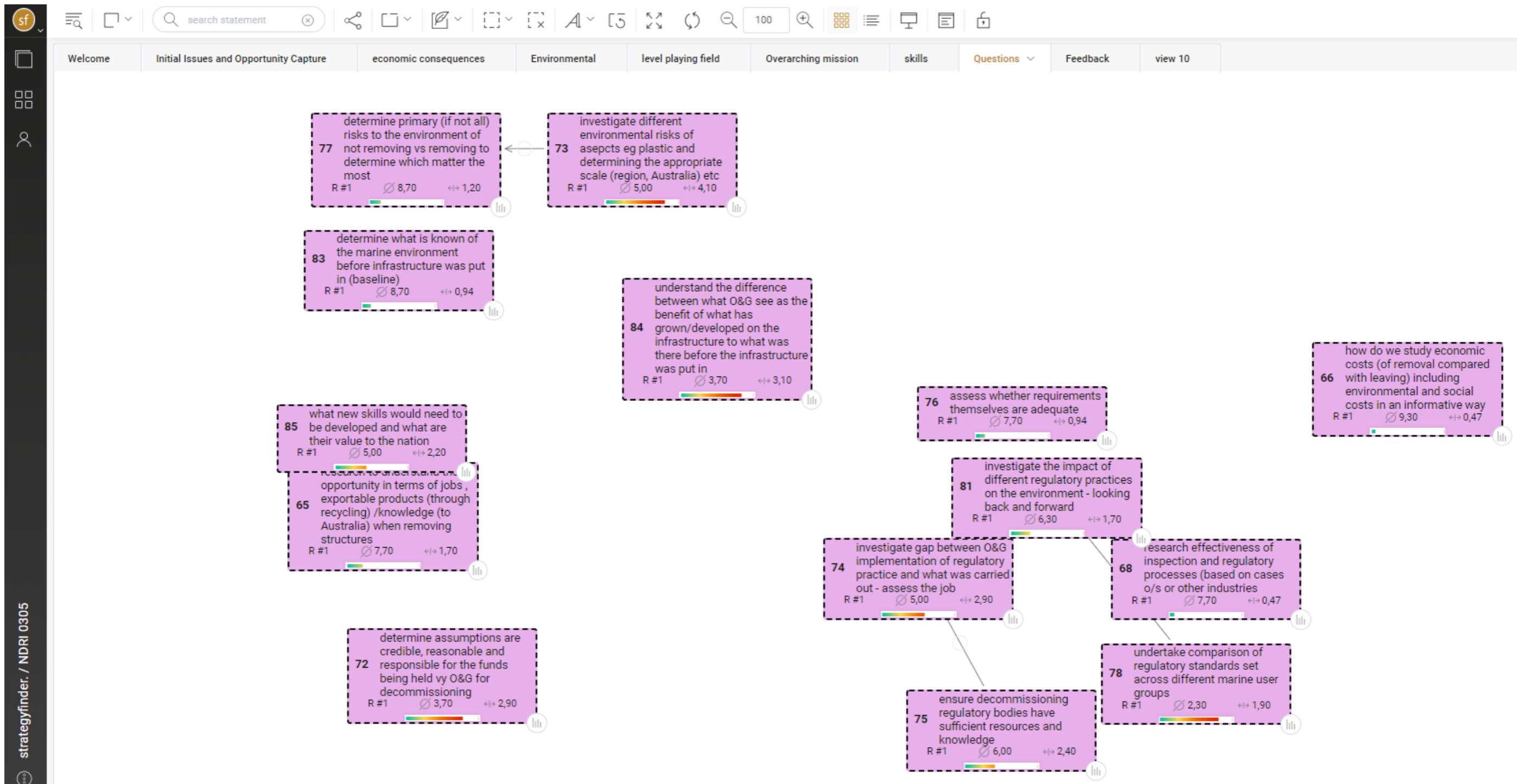


Navigation bar with search, share, and zoom icons. Search bar: search statement. Zoom: 100. Tabs: Welcome, Initial Issues and Opportunity Capture, economic consequences, Environmental, level playing field, **Overarching mission**, skills, Questions, Feedback, view 10.



85 what new skills would need to be developed and what are their value to the nation

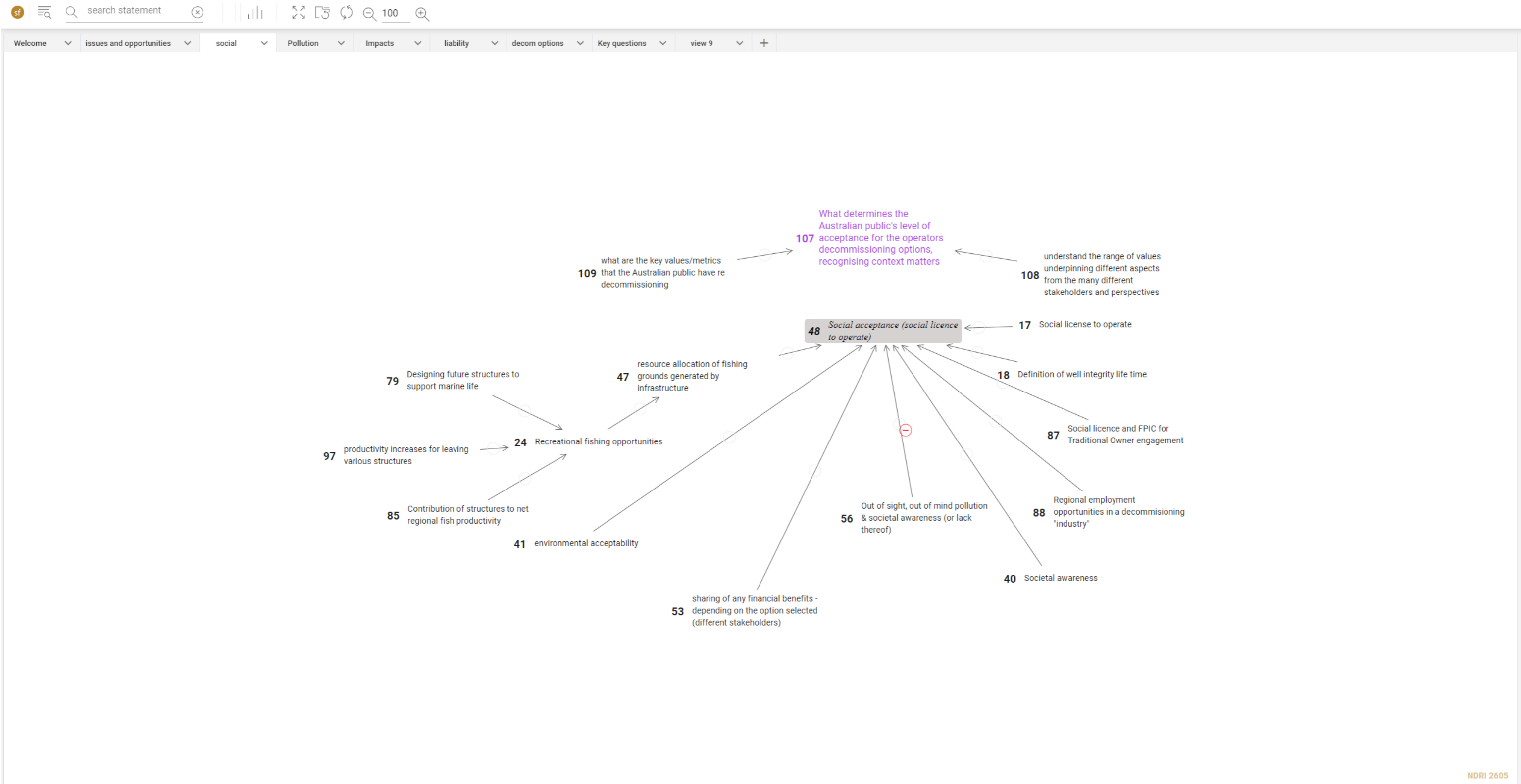


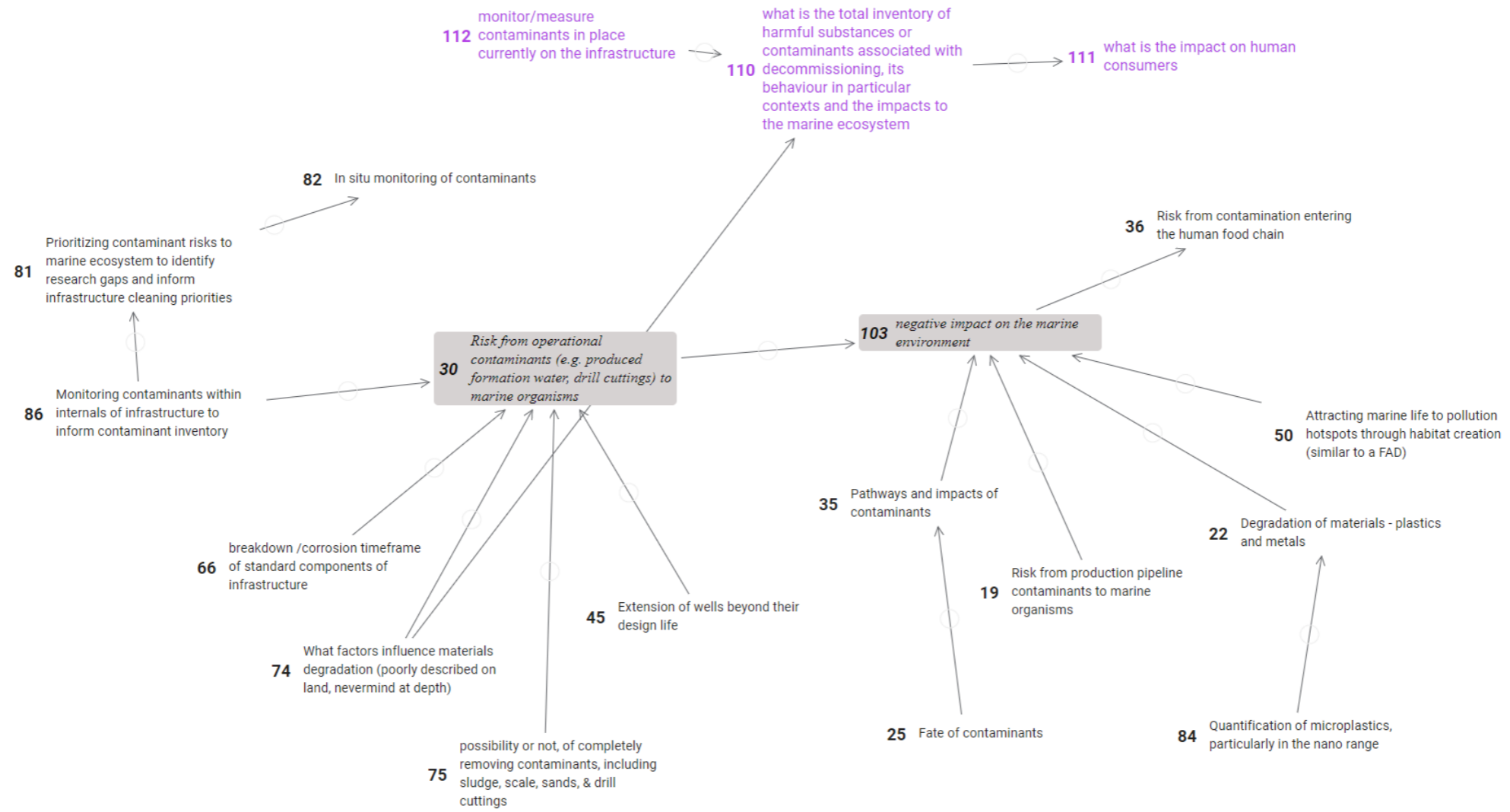


## **Attachment E – Research Causal Mapping Workshop Output**



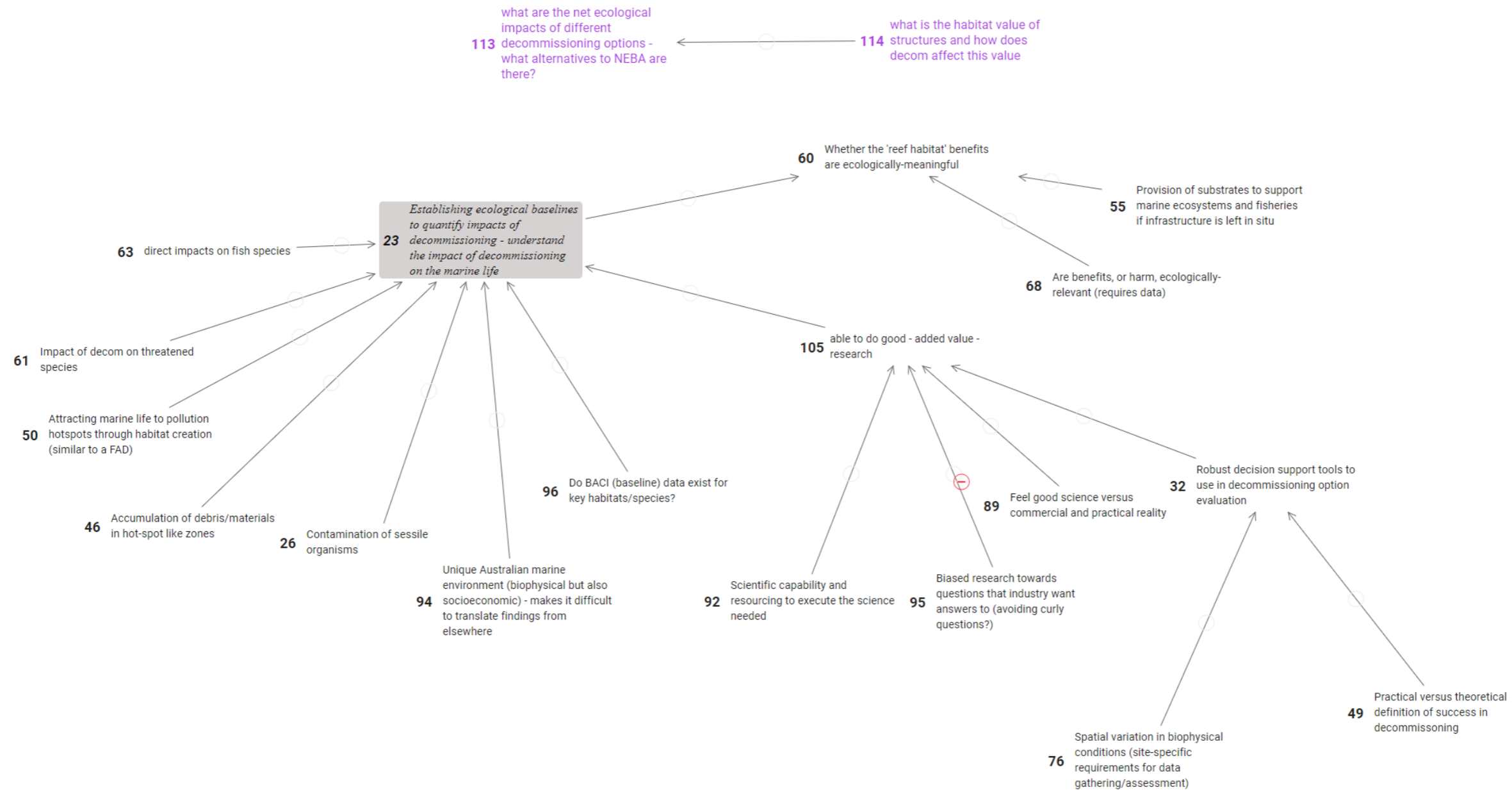


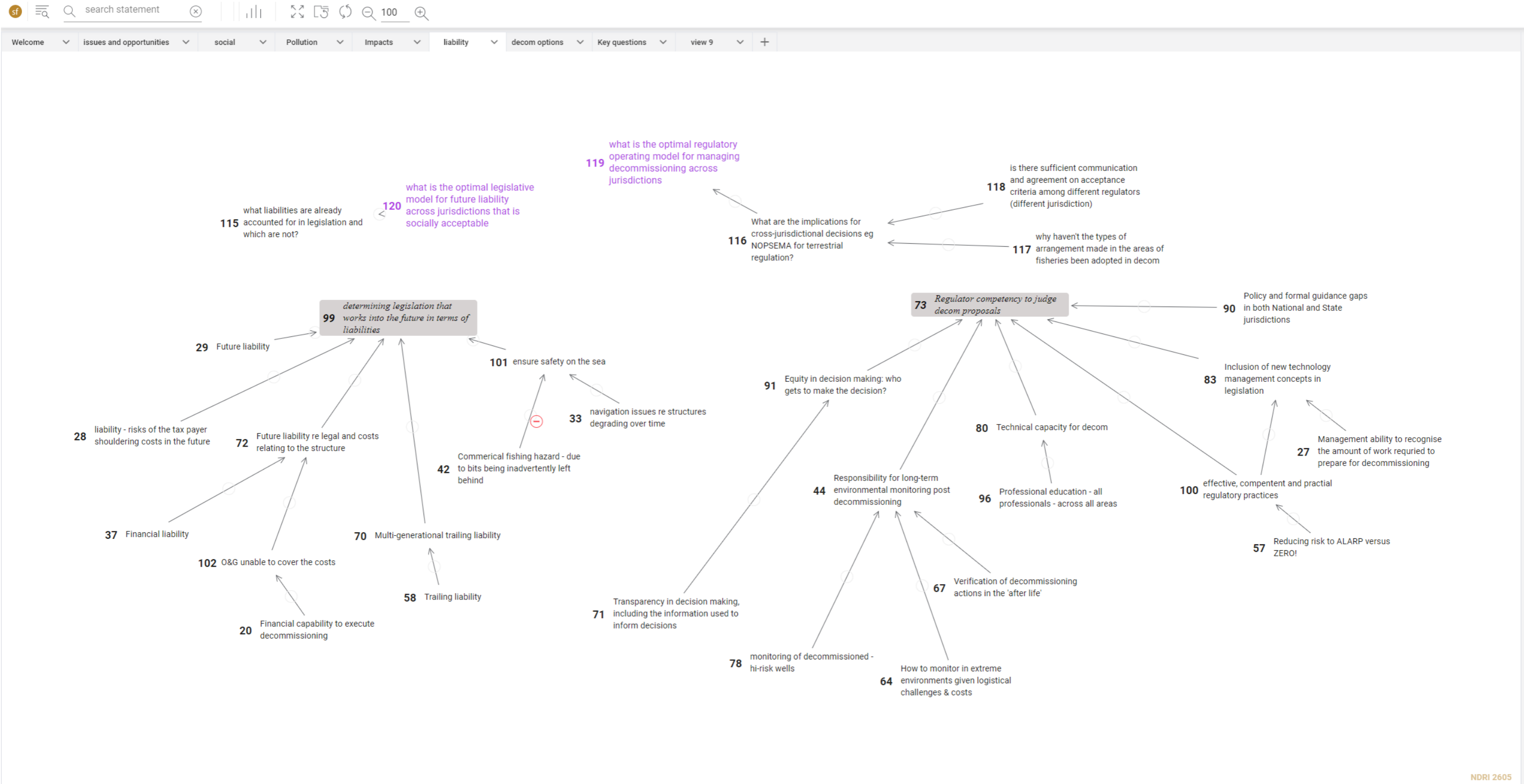




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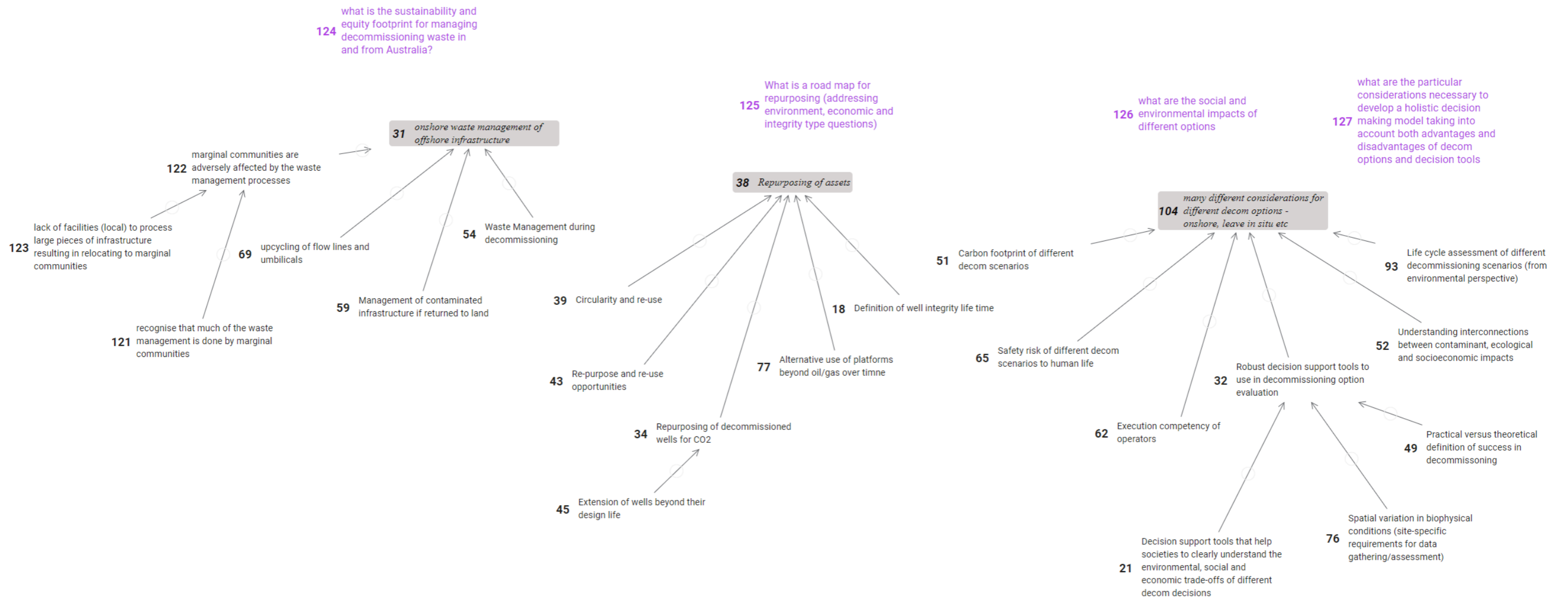
Welcome issues and opportunities social Pollution Impacts liability decom options Key questions view 9





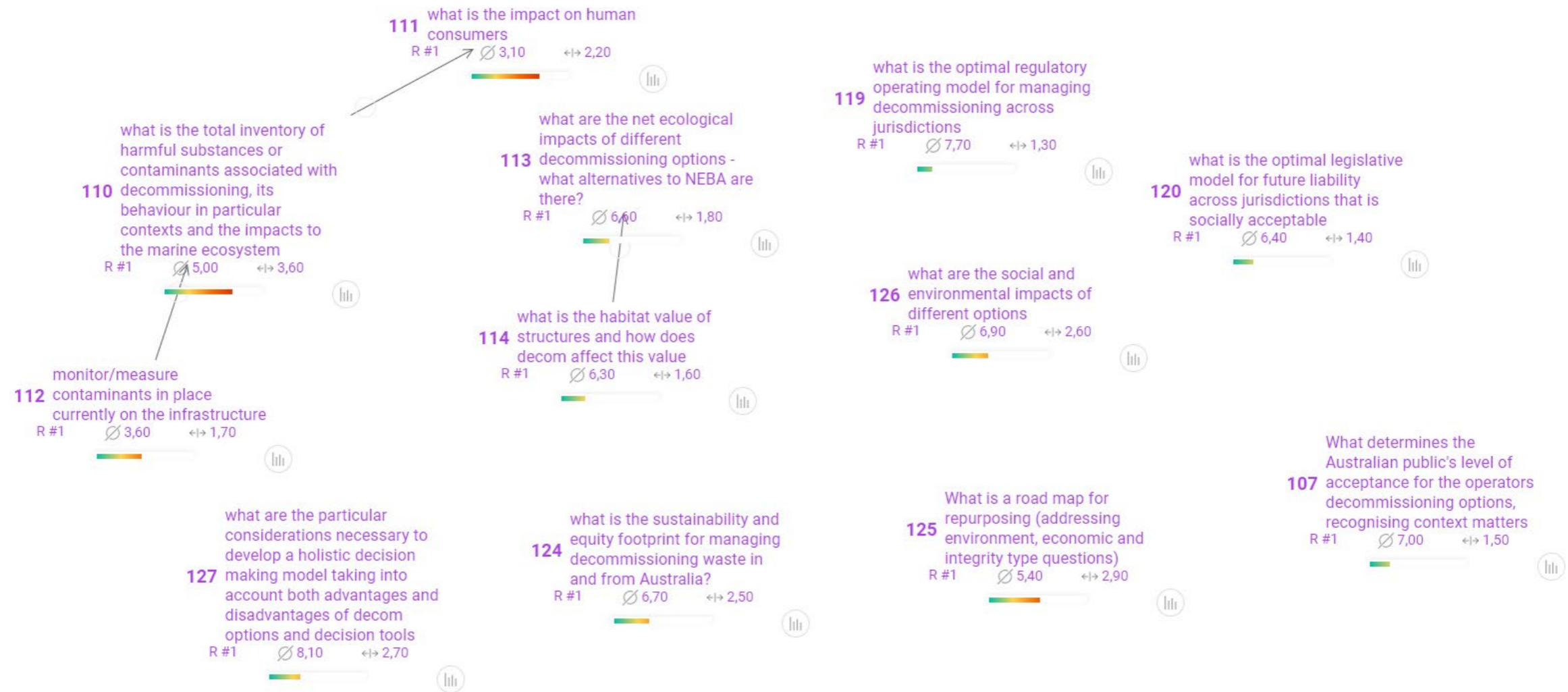
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Welcome issues and opportunities social Pollution Impacts liability decom options Key questions view 9



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Welcome issues and opportunities social Pollution Impacts liability decom options Key questions view 9



## **Attachment F – Industry Workshop: 1<sup>st</sup> synthesis**



Original (raw) Question	Refined/Merged Question
104 We need a comprehensive list of the hazardous materials on assets	104 What are all the materials (i.e. type and quantities) associated with Australian offshore oil and gas infrastructure which may pose a potential hazard to the marine environment?
105 understand longer-term impacts of pipelines – an international study	105 What evidence is there globally which helps understand the long term environmental impact of pipelines being either removed or left in-place?
106 what are the priorities for removal and how best to remove	106 What are advantages and disadvantages for infrastructure removal options?
108 do we establish capability locally or liaise with established capability (across the globe)?	108 What are the execution models which could be applied (i.e. by asset type, across multiple assets and basins), along with their required resources (i.e. capability, equipment), to determine the optimum execution strategy for Australia to minimise cost, address any capability shortfall?
109 assess national needs and forms of execution (eg collective approaches, recognised shortfalls)	
110 Recycling opportunity for materials such as Glass reinforced epoxy etc to reduce landfill impact	110 What are the recycling and re-use opportunities for Australian decommissioned offshore infrastructure as an alternative to landfill?
111 technologies that improve safety and efficiency. eg remote systems	111 What technologies could be applied to offshore oil and gas decommissioning to improve safety and efficiency?
112 pre-emptive stakeholder engagement to determine collective priorities	112 What are the best methods to engage stakeholders early to determine collective priorities, understand societal concerns, and highlight variance between cohorts, recognising values of the day may be challenged in the future?
113 understand the variance between different stakeholder cohorts ie local communities, fishing forms (nets v lines)	
114 explore other key factors aside from climate change that can make a major societal change - hindcasting, scenarios	
116 encourage the government to take a broad systemic long term approach to legislation rather than a knee jerk[1]	

## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

117 Not really a topic but the narrative needs to change from cost avoidance to potential benefits	116 What is the vision and process for ensuring government agencies take a timely, multi-criteria-based, systemic, effective, balanced, long-term, and integrated approach to legislation (potentially learning from others)?
118 find a way of getting the government to work together - rather than separate bodies (explore other countries' models)[2]	
119 identify and remove duplication of regulation	
120 find a way of shifting mindsets of regulators to a multi-criteria model - beyond the environment to include safety - determine how to develop a bespoke regulatory model	
121 find ways of managing timing in decision making and regulation in decommissioning	
122 what current legislative frameworks are in use across the globe (and in different industries) and can be applied	
123 determine what is preventing an effective legislative framework in Australia	
124 find processes for dealing with a situation where comparative assessments weren't in place (40 years)	124 What multi-criteria decision methods are there for comparing decommissioning options to determine an acceptable end state given uncertain environmental baselines?
125 find processes for doing a comparative assessment that recognizes plurality of criteria	
126 develop a multidisciplinary national framework regarding contaminants	126 How to create a national multidisciplinary framework that takes into account the full suite of contaminants, how they behave over time under different circumstances, and how can they be managed?
127 understand the contaminants at play and study their fate	
128 how to set up an offset program framework for contaminants eg plastics and plastic coatings NOMS	128 Can an offset framework be established and applied to contaminants for in-situ decommissioned infrastructure approval? If so for what contaminants and infrastructure?

129 understand the balance of biodiversity & ecosystem increase and energy avoidance and carbon sequestration	129 Is there a methodology that can be applied to decommissioning decisions (i.e. leave in-situ or remove) which takes account of the total net short and long term impacts, opportunities and risks to the environment?
130 understand the balance between short- and long-term impacts and risks	
131 understand the effects of removing 40 yr ecosystems when decommissioning	

[1] Also appears in Regs cluster

[2] Also appears in the Regs cluster

**Legend-workshop themes:**

- Blue = National technical capability
- Red = Public and Govt perception
- Purple = Regulations
- Brown = Balanced decision
- Orange = Contaminants
- Green = Net positive environmental

## **Attachment G – Regulator/Government workshop: 1<sup>st</sup> synthesis**

Original (raw) Question	Refined/Merged Question
95 establish what is current best practice for infrastructure design support future decommissioning [1]	95 What is best practice for offshore oil and gas infrastructure design to support future decommissioning? How does this compare to past and current practice?
98 how can we ensure that there is sufficient coordinated regulatory expertise - sharing of intelligence and objectives	98 Is there a sufficiently coordinated approach to objectives across regulatory agencies? If not then how can this be achieved?
99 enable operators to share and understand best practice for proactive planning for decommissioning[2]	99 What mechanisms could be designed that ensure industry-held research/knowledge/methods, relevant to decommissioning decisions, are made publicly available?
111 better ways of sharing modelling process eg current dispersal etc	
108 find mechanisms for sharing studies and research on receptors etc across the industry	
101 establish an effective monitoring regime (operator responsibility) [3][4]	101 What are the effective monitoring regimes which could be applied to decommissioned infrastructure?
104 find ways of effective engagement with stakeholders that ensure well communicated and sustainable decisions can be made	104 What are the effective engagement methods to identify stakeholder positions, and communicate outcomes, so sustainable decisions can be made?
105 determine appropriate standards for consultation dependent on stakeholder - messaging and effort	
107 better knowledge re the range of contaminants (some well understood, some less so) and their impact (both individually and as a whole)	106 What are the contaminants of primary concern, what are their fate and consequence if released to the environment, both individually and cumulatively?
106 understand both direct risks (oil spill) and indirect and longer-term cumulative risks (eg breeding grounds are impacted)	
102 develop across the country a process in place to manage trailing liability eg considering levies - understanding the consequences of different policies	102 What policy mechanisms could be designed that support and share opportunities for appropriate re-purposing, while balancing trailing liability?
110 find ways of sharing opportunities eg transference from oil well to carbon capture - determine a mechanism to allow that to occur - that considers liability problems downstream	
100 develop a set of cases illustrating different end states	

106 understand both direct risks (oil spill) and indirect and longer-term cumulative risks (eg breeding re impacted)	100 Develop a set of case studies to fully exemplify the methods needed to compare the decommissioning end states (i.e. including cumulative, direct/indirect, short and long term risks), in a structured and balanced manner, to guide operators.
112 determine methods for weighing up removal from leaving in situ (in a structured balanced view) for operators	
109 understand the long-term consequences of repurposing	

[1] Also in the repurposing cluster

[2] Also in the governance cluster

[3] Also in the repurposing cluster

[4] Also in the disturbance cluster

[5] Also in the contamination cluster

**Legend-workshop themes:**

- Red = Early plan
- Purple = Governance
- Blue = Stakeholder views
- Brown = Contamination
- Green = Repurposing
- Orange = Disturbance

## **Attachment H – Industry Workshop: 1<sup>st</sup> synthesis**

Original (raw) Question	Refined/Merged Question
30 What are the CUMULATIVE impacts associated with material breakdown - toxic impacts and understanding time horizon	30 What potential contaminants are associated with decommissioning and what are their potential cumulative impacts on the marine ecosystem and humans?
105 understand better what is appropriate to leave in the sea - case by case, material by material - to avoid big clean up liabilities in the future	
100 determine appropriate resourcing for decommissioning regulation acknowledging the full spectrum ie rec fish, biosecurity etc	100 What is the appropriate resourcing for decommissioning regulation?
104 what liability and regulatory arrangements are needed to best facilitate decommissioning options between commonwealth and state	104 Is there a sufficiently coordinated approach to objectives across regulatory agencies? If not then how can this be achieved?
102 resolve the overarching issue of NOPSEMA and DAWE understanding, and aligning each other's processes - eg definition of activity, pipelines etc	
103 lack of reference point - shared language guide/decommissioning map with roles and responsibilities	
106 understand better what community and other stakeholders feel is acceptable	106 What process is required to accurately reflect social values of stakeholder groups towards decommissioning ?
115 research what are the general community values around decommissioning to establish a base line	
116 research and develop a single signed up model/process that preferentially reflects the concerns of those stakeholders who are most impacted - avoid consultation shopping	
111 understand economic impacts to all stakeholder groups - community/taxpayer, rec fish, commercial etc	108 What are the costs and benefits to all stakeholder groups of alternative end states for infrastructure, including spatial variability and related tipping points?
108 investigate the economic impacts (costs) on commercial fishers from snagging, avoidance, etc over the long term to determine compensation	
114 determine spatial viability [variability] for economic viability of commercial fishing - case studies - to determine tipping points	



## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

109 understand spatial variability in decommissioning assets in different areas for different stakeholders	
112 research economic impacts of removal of structures	
113 determine mechanisms for assessing economic benefit of integrated reefs	
118 O&G research better engineering solutions for operations and decommissioning in the future	118 What are the opportunities for better engineering solutions for operations and decommissioning in the future?
117 determine whether current decommissioning environment plans best practice?	117 Do current decommissioning environmental plans reflect best practice?
98 What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial	98 What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial to stakeholder groups?

### Legend-workshop themes:

- Red – Regulatory
- Blue – Pollution
- Green – Abandon
- Purple - Economic viability
- Brown – Values
- Orange – Oil and Gas

## **Attachment I – NGO Workshop: 1<sup>st</sup> synthesis**

Original (raw) Question	Refined/Merged Question
65 research to understand the opportunity in terms of jobs, exportable products (through recycling) /knowledge (to Australia) when removing structures	65 What are the short and long-term economic costs and benefits (environmental, skills, jobs, products, social) associated with each decommissioning option?
66 how do we study economic costs (of removal compared with leaving) including environmental and social costs in an informative way	
85 what new skills would need to be developed and what are their value to the nation	
72 determine assumptions are credible, reasonable and responsible for the funds being held by O&G for decommissioning	72 Are the assumptions used by the oil and gas sector for decommissioning costs appropriate/credible/reasonable and are there sufficient funds?
68 research effectiveness of inspection and regulatory processes (based on cases o/s or other industries	74 Is current regulatory practice fit for purpose, adequately resourced, effectively inspected and monitored, and considers different marine users?
74 investigate the gap between O&G implementation of regulatory practice and what was carried out - assess the job	
75 ensure decommissioning regulatory bodies have sufficient resources and knowledge	
76 assess whether requirements themselves are adequate	
78 undertake a comparison of regulatory standards set across different marine user groups	
81 investigate the impact of different regulatory practices on the environment - looking back and forward	73 What are the environmental risks of in situ and removal options at different spatial scales?
73 investigate different environmental risks of aspects eg plastic and determining the appropriate scale (region, Australia), etc	
77 determine primary (if not all) risks to the environment of not removing vs removing to determine which matter the most	

<p>83 determine what is known of the marine environment before the infrastructure was put in (baseline)</p>	
<p>84 understand the difference between what O&amp;G see as the benefit of what has grown/developed on the infrastructure to what was there before the infrastructure was put in</p>	<p>83 What baseline environmental data is available and how can it be used to ascertain changes pre and post infrastructure emplacement?</p>

**Legend-workshop themes:**

- Green = Economic consequences
- Blue = Environmental
- Purple = Level playing field
- Red = Overarching mission
- Brown = New skills

## **Attachment J – Researcher Workshop: 1<sup>st</sup> synthesis**

Original (raw) Question	Refined/Merged Question
107 what determines the Australian public' level of acceptance for the operators' decommissioning options, recognising context matters	107 What determines the Australian public's level of acceptance for the operators' decommissioning options, recognising context matters?
110 what is the total inventory of harmful substances or contaminants associated with decommissioning, its behaviour in particular contexts and the impacts to the marine ecosystem?	110 What contaminants are associated with decommissioning and what are their potential impacts on the marine ecosystem and humans?
111 What is the impact on human consumers?	
112 Monitor/measure contaminants in place currently on the infrastructure	112 How can contaminants currently on the infrastructure be monitored/measured in place?
113 What are the net ecological impacts of different decommissioning options – what alternatives to NEBA are there?	113 What are the net ecological impacts of decommissioning options and how should these be assessed?
114 What is the habitat value of structures and how does decommissioning affect this value?	
119 what is the optimal regulatory operating model for managing decommissioning across jurisdictions?	119 What is the optimum regulatory model for managing decommissioning and liability across Australian jurisdictions?
120 What is the optimal legislative model for future liability across jurisdictions that is socially acceptable?	
124 What is the sustainability and equity footprint for managing decommissioning waste in and from Australia?	124 What is the sustainability and equity footprint for managing decommissioning waste and how can best practise be realised?
125 What is a road map for repurposing (addressing environment, economic and integrity type questions)?	
126 What are the social and environmental impacts of different options?	127 What decision-making tools are needed to ensure decommissioning and repurposing decisions are reflective of environmental, economic, social and equity principles?

127 What are the particular considerations necessary to develop a holistic decision-making model taking into account both advantages and disadvantages of decommissioning options and decision tools

**Legend-workshop themes:**

- Red = social
- Blue = pollution
- Green = ecological
- Brown = liability
- Purple = decommissioning options

## **Attachment K – Decision Panel 1<sup>st</sup> Survey Input and Workshop Outcomes**



## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

Table 12 Decision Panel 1<sup>st</sup> survey input - set of 39 merged questions, with proposed grouping by Research Team

#	Questions	Joint Group
1	106 What process is required to accurately reflect social values of stakeholder groups towards decommissioning?	A
2	107 What determines the Australian public's level of acceptance for the operators' decommissioning options, recognising context matters?	A
3	30 What potential contaminants are associated with decommissioning and what are their potential cumulative impacts on the marine ecosystem and humans?	B
4	110 What contaminants are associated with decommissioning and what are their potential impacts on the marine ecosystem and humans?	B
5	104 What are all the materials (i.e. type and quantities) associated with Australian offshore oil and gas infrastructure which may pose a potential hazard to the marine environment?	C
6	106 What are the contaminants of primary concern, what are their fate and consequence if released to the environment, both individually and cumulatively?	C
7	95 What is best practice for offshore oil and gas infrastructure design to support future decommissioning? How does this compare to past and current practice?	D
8	118 What are the opportunities for better engineering solutions for operations and decommissioning in the future?	D
9	101 What are the effective monitoring regimes which could be applied to decommissioned infrastructure?	E
10	83 What baseline environmental data is available and how can it be used to ascertain changes pre and post infrastructure emplacement?	E
11	116 What is the vision and process for ensuring government agencies take a timely, multi-criteria-based, systemic, effective, balanced, long-term, and integrated approach to legislation (potentially learning from others)?	F
12	98 Is there a sufficiently coordinated approach to objectives across regulatory agencies? If not, then how can this be achieved?	F
13	100 What is the appropriate resourcing for decommissioning regulation?	F
14	74 Is current regulatory practice fit for purpose, adequately resourced, effectively inspected and monitored, and considers different marine users?	F
15	119 What is the optimum regulatory model for managing decommissioning and liability across Australian jurisdictions?	F
16	98 What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial to stakeholder groups?	G
17	113 What are the net ecological impacts of decommissioning options and how should these be assessed?	G
18	124 What multi-criteria decision methods are there for comparing decommissioning options to determine an acceptable end state given uncertain environmental baselines?	H
19	127 What decision-making tools are needed to ensure decommissioning and repurposing decisions are reflective of environmental, economic, social and equity principles?	H
20	112 What are the best methods to engage stakeholders early to determine collective priorities, understand societal concerns, and highlight variance between cohorts, recognising values of the day may be challenged in the future?	
21	104 What are the effective engagement methods to identify stakeholder positions, and communicate outcomes, so sustainable decisions can be made?	

## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

#	Questions	Joint Group
22	108 What are the costs and benefits to all stakeholder groups of alternative end states for infrastructure, including spatial variability and related tipping points?	
23	72 Are the assumptions used by the oil and gas sector for decommissioning costs appropriate/credible/reasonable and are there sufficient funds?	
24	128 Can an offset framework be established and applied to contaminants for in-situ decommissioned infrastructure approval? If so for what contaminants and infrastructure?	
25	73 What are the environmental risks of in situ and removal options at different spatial scales?	
26	105 What evidence is there globally which helps understand the long-term environmental impact of pipelines being removed or left in-place?	
27	99 What mechanisms could be designed that ensure industry-held research/knowledge/methods, relevant to decommissioning decisions, are made publicly available?	
28	117 Do current decommissioning environmental plans reflect best practice?	
29	102 What policy mechanisms could be designed that support and share opportunities for appropriate re-purposing, while balancing trailing liability?	
30	106 What are advantages and disadvantages for infrastructure removal options?	
31	108 What are the execution models which could be applied (i.e. by asset type, across multiple assets and basins), along with their required resources (i.e. capability, equipment), to determine the optimum execution strategy for Australia to minimise cost, address any capability shortfall?	
32	110 What are the recycling and re-use opportunities for Australian decommissioned offshore infrastructure as an alternative to landfill?	
33	124 What is the sustainability and equity footprint for managing decommissioning waste and how can best practise be realised?	
34	111 What technologies could be applied to offshore oil and gas decommissioning to improve safety and efficiency?	
35	126 How can a national multidisciplinary framework be created that takes into account the full suite of contaminants, how they behave over time under different circumstances, and how can they be managed?	
36	100 Develop a set of case studies to fully exemplify the methods needed to compare the decommissioning end states (i.e. including cumulative, direct/indirect, short and long term risks), in a structured and balanced manner, to guide operators.	
37	65 What are the short and long-term economic costs and benefits (environmental, skills, jobs, products, social) associated with each decommissioning option?	
38	129 Is there a methodology that can be applied to decommissioning decisions (i.e. leave in-situ or remove) which takes account of the total net short and long term impacts, opportunities and risks to the environment?	
39	112 How can contaminants currently on the infrastructure be monitored/measured in place?	

## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

Table 13 Decision Panel 1<sup>st</sup> survey and workshop output - 39 questions, with groupings by Decision Panel (colour represents grouping) and number of times identified as having impact (marked by 'X').

#	Questions	DP1	DP2	DP3	DP4	'X' count
1	106 What process is required to accurately reflect social values of stakeholder groups towards decommissioning?					2
2	107 What determines the Australian public's level of acceptance for the operators' decommissioning options, recognising context matters?					2
3	30 What potential contaminants are associated with decommissioning and what are their potential cumulative impacts on the marine ecosystem and humans?					4
4	110 What contaminants are associated with decommissioning and what are their potential impacts on the marine ecosystem and humans?					4
5	104 What are all the materials (i.e. type and quantities) associated with Australian offshore oil and gas infrastructure which may pose a potential hazard to the marine environment?					3
6	106 What are the contaminants of primary concern, what are their fate and consequence if released to the environment, both individually and cumulatively?					4
7	95 What is best practice for offshore oil and gas infrastructure design to support future decommissioning? How does this compare to past and current practice?					~
8	118 What are the opportunities for better engineering solutions for operations and decommissioning in the future?					~
9	101 What are the effective monitoring regimes which could be applied to decommissioned infrastructure?					1
10	83 What baseline environmental data is available and how can it be used to ascertain changes pre and post infrastructure emplacement?					1
11	116 What is the vision and process for ensuring government agencies take a timely, multi-criteria-based, systemic, effective, balanced, long-term, and integrated approach to legislation (potentially learning from others)?					~
12	98 Is there a sufficiently coordinated approach to objectives across regulatory agencies? If not, then how can this be achieved?					~

## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

#	Questions	DP1	DP2	DP3	DP4	'X' count
13	100 What is the appropriate resourcing for decommissioning regulation?					~
14	74 Is current regulatory practice fit for purpose, adequately resourced, effectively inspected and monitored, and considers different marine users?					~
15	119 What is the optimum regulatory model for managing decommissioning and liability across Australian jurisdictions?					~
16	98 What is the threshold level for decommissioned assets/enhancements to contribute to fish production at a population level where it is beneficial to stakeholder groups?					3
17	113 What are the net ecological impacts of decommissioning options and how should these be assessed?					2
18	124 What multi-criteria decision methods are there for comparing decommissioning options to determine an acceptable end state given uncertain environmental baselines?					1
19	127 What decision-making tools are needed to ensure decommissioning and repurposing decisions are reflective of environmental, economic, social and equity principles?					1
20	112 What are the best methods to engage stakeholders early to determine collective priorities, understand societal concerns, and highlight variance between cohorts, recognising values of the day may be challenged in the future?					~
21	104 What are the effective engagement methods to identify stakeholder positions, and communicate outcomes, so sustainable decisions can be made?					~
22	108 What are the costs and benefits to all stakeholder groups of alternative end states for infrastructure, including spatial variability and related tipping points?					~
23	72 Are the assumptions used by the oil and gas sector for decommissioning costs appropriate/credible/reasonable and are there sufficient funds?					1
24	128 Can an offset framework be established and applied to contaminants for in-situ decommissioned infrastructure approval? If so for what contaminants and infrastructure?					2
25	73 What are the environmental risks of in situ and removal options at different spatial scales?					2

## A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

#	Questions	DP1	DP2	DP3	DP4	'X' count
26	105 What evidence is there globally which helps understand the long term environmental impact of pipelines being removed or left in-place?					2
27	99 What mechanisms could be designed that ensure industry-held research/knowledge/methods, relevant to decommissioning decisions, are made publicly available?					~
28	117 Do current decommissioning environmental plans reflect best practice?					~
29	102 What policy mechanisms could be designed that support and share opportunities for appropriate re-purposing, while balancing trailing liability?					~
30	106 What are advantages and disadvantages for infrastructure removal options?					1
31	108 What are the execution models which could be applied (i.e. by asset type, across multiple assets and basins), along with their required resources (i.e. capability, equipment), to determine the optimum execution strategy for Australia to minimise cost, address any capability shortfall?					1
32	110 What are the recycling and re-use opportunities for Australian decommissioned offshore infrastructure as an alternative to landfill?					2
33	124 What is the sustainability and equity footprint for managing decommissioning waste and how can best practise be realised?					2
34	111 What technologies could be applied to offshore oil and gas decommissioning to improve safety and efficiency?					~
35	126 How can a national multidisciplinary framework be created that takes into account the full suite of contaminants, how they behave over time under different circumstances, and how can they be managed?					3
36	100 Develop a set of case studies to fully exemplify the methods needed to compare the decommissioning end states (i.e. including cumulative, direct/indirect, short and long term risks), in a structured and balanced manner, to guide operators.					~
37	65 What are the short and long-term economic costs and benefits (environmental, skills, jobs, products, social) associated with each decommissioning option?					1
38	129 Is there a methodology that can be applied to decommissioning decisions (i.e. leave in-situ or remove) which takes account of the total net short and long term impacts, opportunities and risks to the environment?					~

A Roadmap of Offshore Oil and Gas Decommissioning Research Priorities and Projects

#	Questions	DP1	DP2	DP3	DP4	'X' count
39	112 How can contaminants currently on the infrastructure be monitored/measured in place?					3