

# An Overview of the Prioritisation Methodology & SRA

Amba Hotel, Marble Arch, London

Tuesday 4<sup>th</sup> April 2017

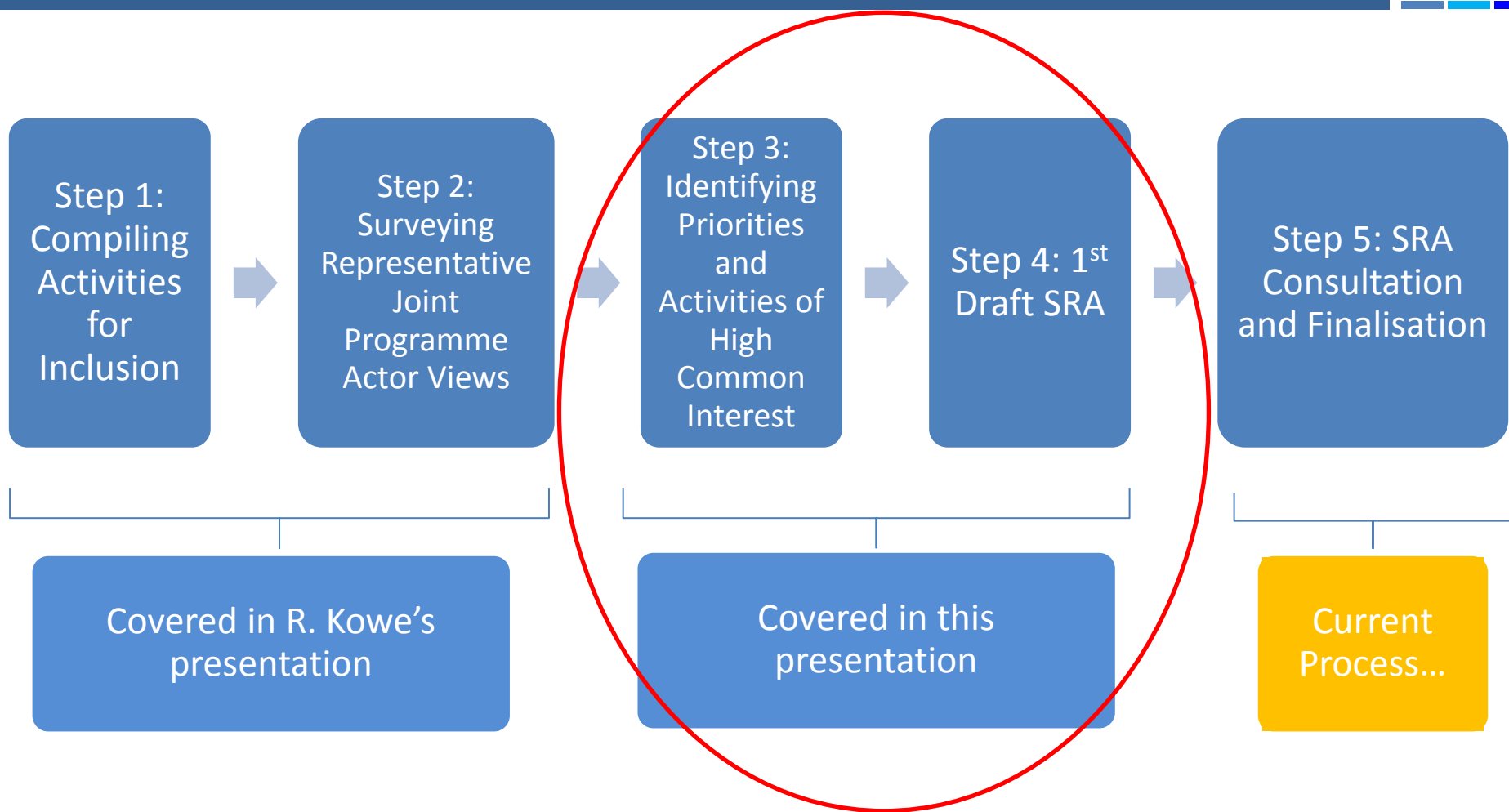
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# Overview of Methodology for Developing SRA



## Step 3 - Identifying Priorities and Activities of High Common Interest

- 92 activities screened, to identify priorities and confirm activities of high common interest:
  1. Total number of respondents for each actor (WMO, TSO, RE) indicating an activity as 'high' or 'medium' interest for the period 2019 – 2024;
  2. 'High' and 'medium' votes weighted (1 for 'high', 0.5 for 'medium') and normalised against the total number of organisations which voted from each Actor Group;
  3. Scores from each Actor group totalled, giving a score between 0 (lowest) and 18 (highest);
  4. 'Level of Common Interest' score classified as:
    - >10 High
    - 6 – 10 Medium
    - <6 Low
- 63 activities High or Medium 'Level of Common Interest' (24 as High and 39 as Medium), 29 activities Low 'Level of Common Interest' => SRA sub-domains.



### **1. Building Understanding - data, experiments, modelling, and testing:**

- Inventory, Waste Form and Waste Characterisation
- Waste Package
- Consequences of Storage
- Near-Field and Engineered Barrier Systems
- Gas Generation and Transport
- Radionuclide and Chemical Species Transport
- Geosphere

**STRATEGIC  
THEMES**



### **2. Building Confidence - tools, assessment and demonstration:**

- Safety Case
- Post-Closure Processes and Upscaling
- Numerical Tools
- Operational Safety
- Practical Implementation

**DOMAINS**



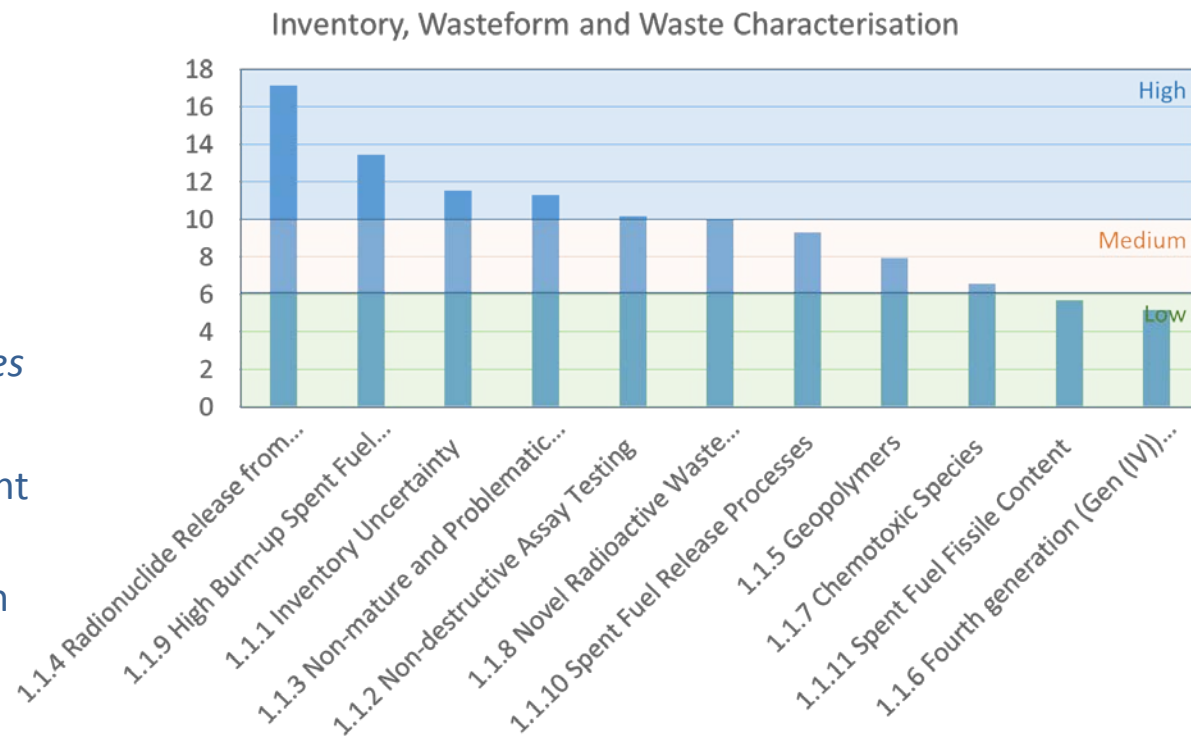
### **3. Integrated Knowledge Management System**

# 1<sup>st</sup> Draft SRA – Domain Overview

## Strategic Theme 1: Building Understanding

### 1.1 Inventory, Waste Form and Waste Characterisation

- 1.1.1 Inventory Uncertainty
- 1.1.2 Non-destructive Assay Testing
- 1.1.3 Non-mature and Problematic Waste Conditioning
- 1.1.4 Radionuclide Release from Wasteforms other than Spent Fuel
- 1.1.5 Geopolymers
- 1.1.6 Fourth Generation (Gen(IV)) wastes
- 1.1.7 Chemotoxic Species
- 1.1.8 Novel Radioactive Waste Treatment Techniques
- 1.1.9 High Burn-Up Spent Fuel Evolution
- 1.1.10 Spent Fuel Release Processes
- 1.1.11 Spent Fuel Fissile Content



# Example Sub-Domain Table

1.1.1 Inventory Uncertainty				
<b>Research Needs/Driver</b> Improved understanding of those species that dominate the transport, operations and post-closure safety cases and targeted fit-for-purpose assay can enable cost-effective data quality improvements, providing increased confidence in the safety case.		<b>Background</b> Knowledge of the radionuclide and chemical inventory (including metals and organic compounds) of wastes requiring disposal in a deep geological repository is important for the transport, operations and post-closure safety cases. Data quality of waste inventories is often variable, with uncertainty often dominated by waste heterogeneity. Nevertheless, in general only a small subset of radionuclides will dominate the safety case. Furthermore, where sampling uncertainty is the dominant consideration there is little benefit to be gained from enhancing analytical accuracy. Therefore, an integrated understanding of safety case requirements, inventory and analytical techniques can provide significant benefits.		
<b>Research Objectives</b> To identify good practice in the management of the inventory for disposal.				
<b>Implementation Driven</b>				✓
<b>Transfer of Knowledge to LAPs</b>				✓
<b>Level of Common Interest</b>				
High	✓	Medium		Low

# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (2)

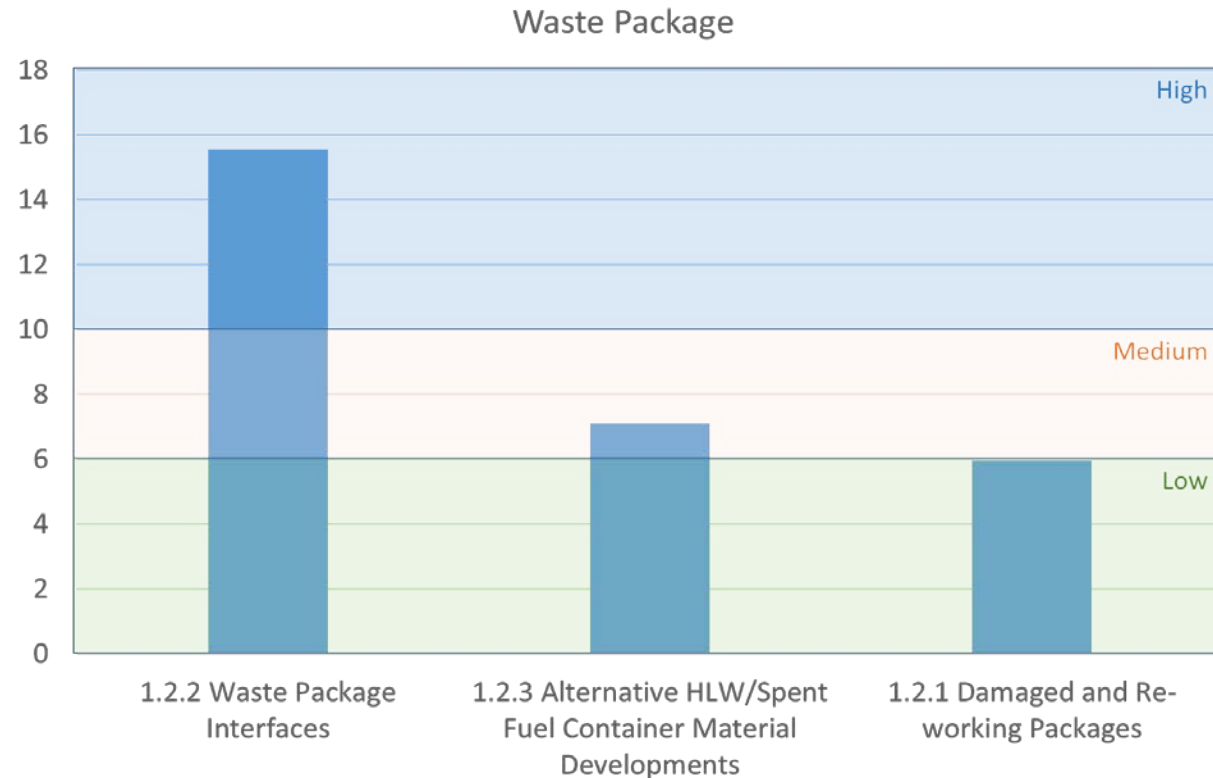
## Strategic Theme 1: Building Understanding

### 1.2 Waste Package

1.2.1 Damaged and Re-working Packages

1.2.2 Waste Package Interfaces

1.2.3 Alternative HLW/Spent Fuel Container Material Development





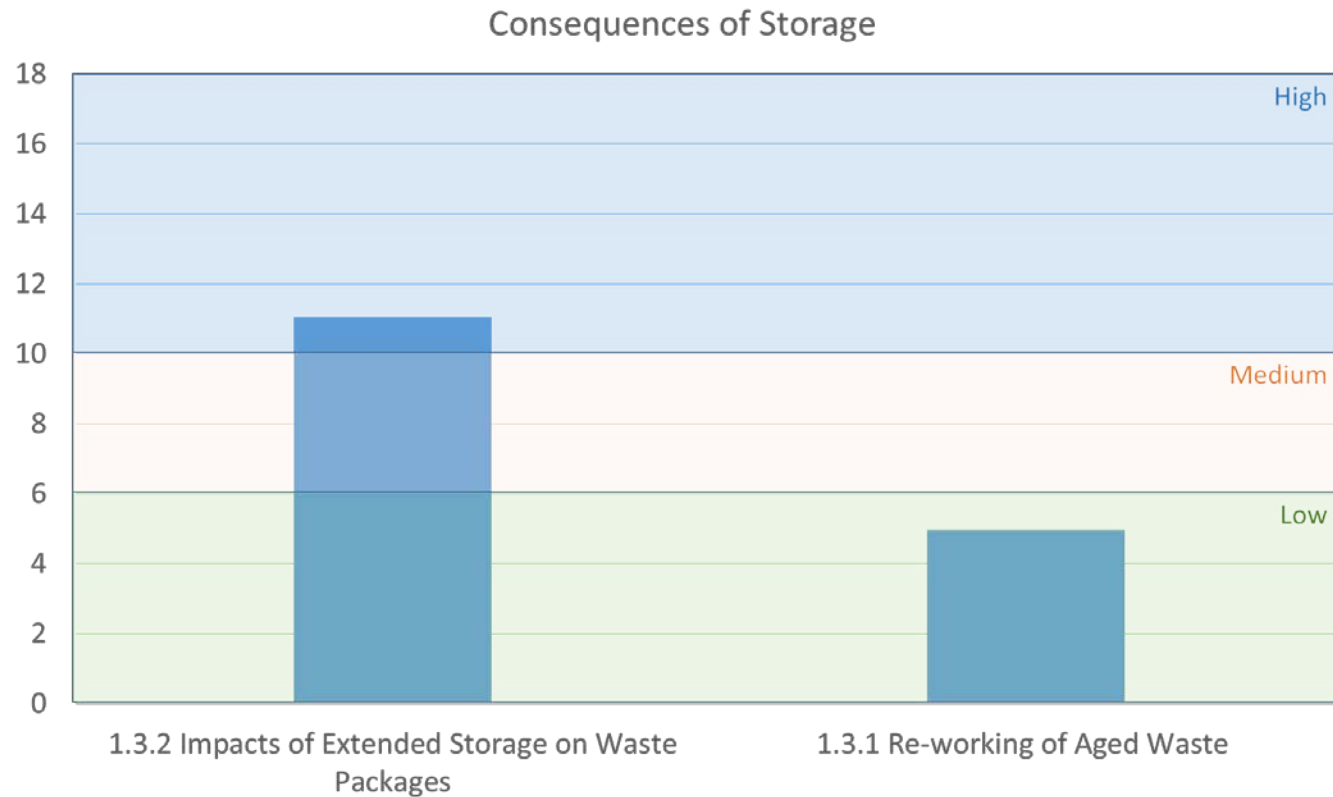
# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (3)

## Strategic Theme 1: Building Understanding

### 1.3 Consequences of Storage

1.3.1 Re-working of Aged Waste

1.3.2 Impacts of Extended Storage on Waste Packages





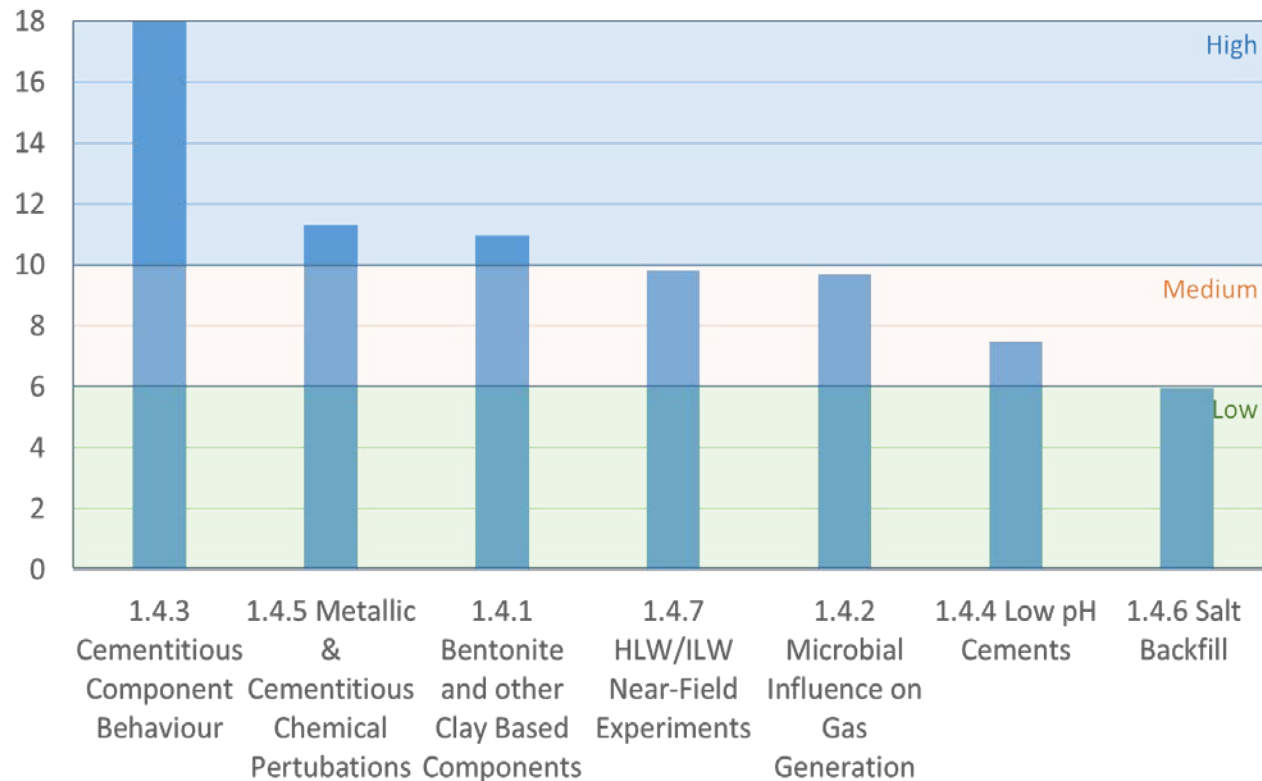
# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (4)

## Strategic Theme 1: Building Understanding

### 1.4 Near-Field and Engineered Barrier System

- 1.4.1 Bentonite and other Clay Based Components
- 1.4.2 Microbial Influence on Gas Generation
- 1.4.3 Cementitious Component Behaviour
- 1.4.4 Low pH Cements
- 1.4.5 Metallic & Cementitious Chemical Perturbations
- 1.4.6 Salt Backfill
- 1.4.7 HLW/ILW Near-Field Evolution

Near-Field and Engineered Barrier Systems



# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (5)

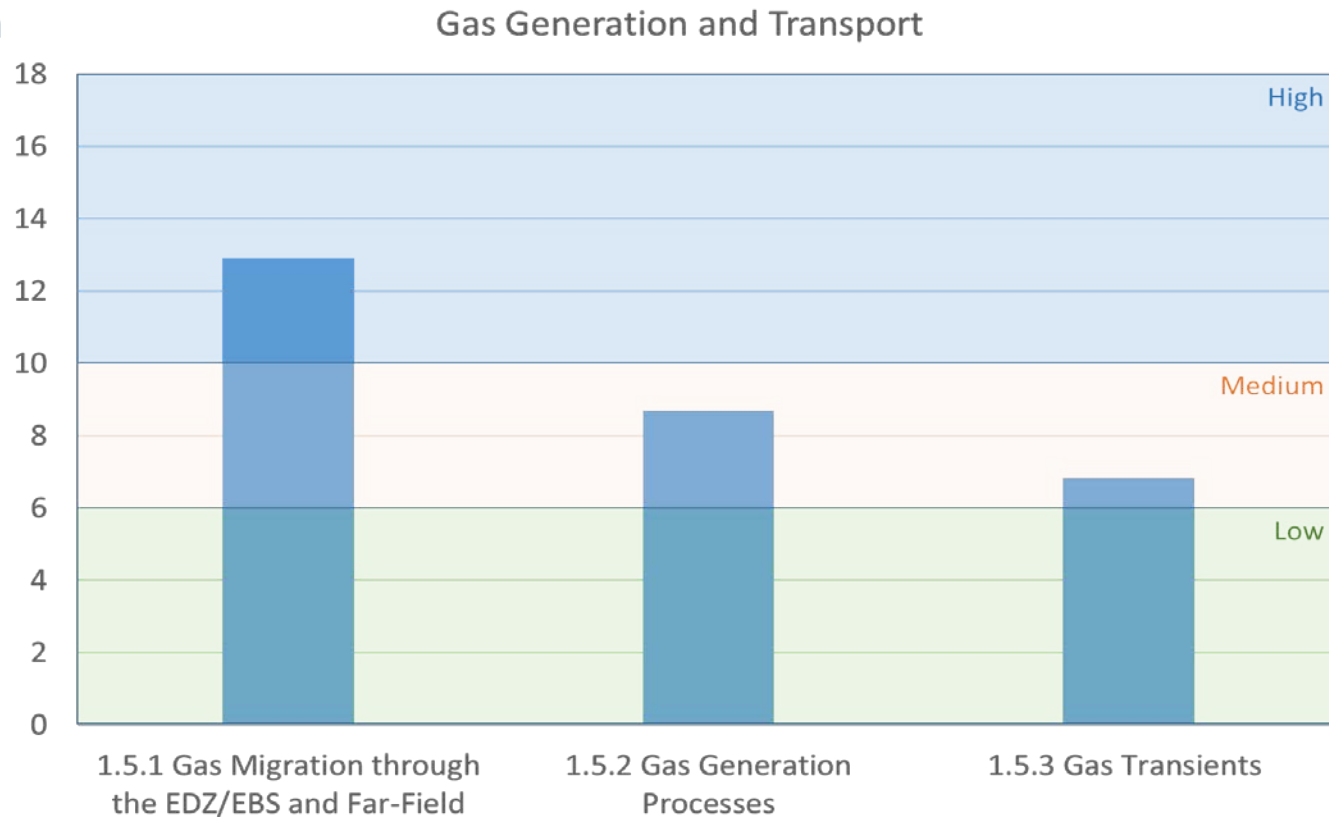
## Strategic Theme 1: Building Understanding

### 1.5 Gas Generation and Transport

1.5.1 Gas Migration through the EDZ/EBS and Far-Field

1.5.2 Gas Generation Processes

1.5.3 Gas Transients

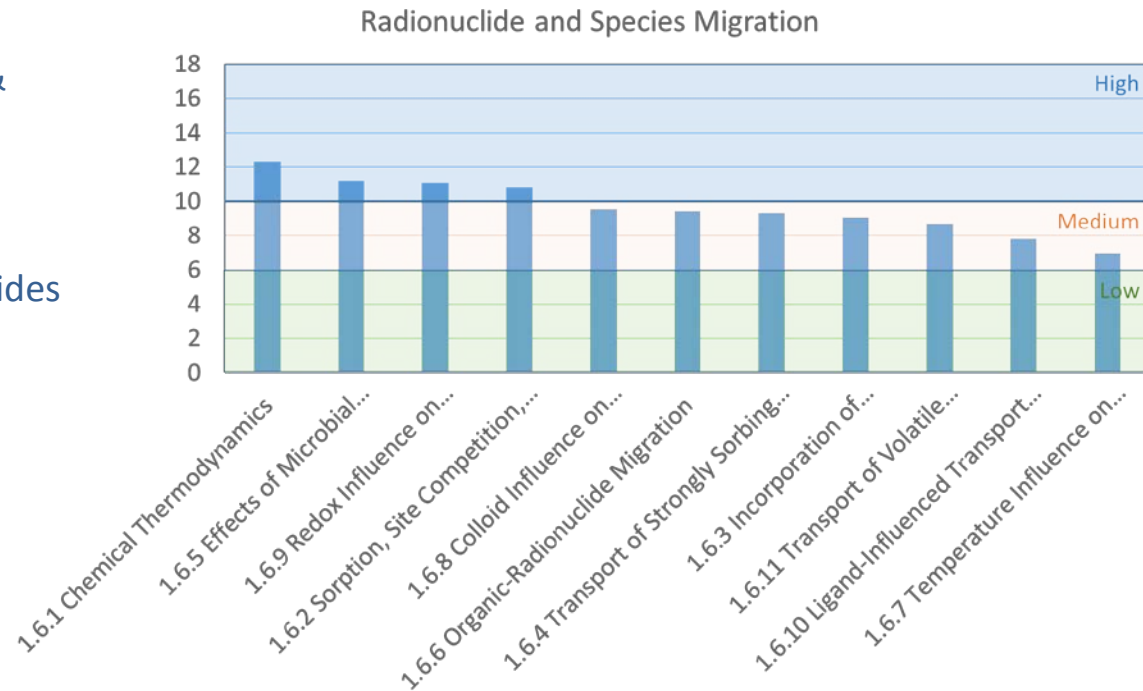


# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (6)

## Strategic Theme 1: Building Understanding

### 1.6 Radionuclide and Chemical Species Migration

- 1.6.1 Chemical Thermodynamics
- 1.6.2 Sorption, Site Competition, Speciation & Transport
- 1.6.3 Incorporation of Radionuclides in Solid Phases
- 1.6.4 Transport of Strongly Sorbing Radionuclides
- 1.6.5 Effects of Microbial Perturbations on Radionuclide Migrations
- 1.6.6 Organic-Radionuclide Migration
- 1.6.7 Temperature Influence on Radionuclide Migration
- 1.6.8 Colloid Influence on Radionuclide Migration
- 1.6.9 Redox Influence on Radionuclide Migration
- 1.6.10 Ligand-Influenced Transport Modelling
- 1.6.11 Transport of Volatile Radionuclides

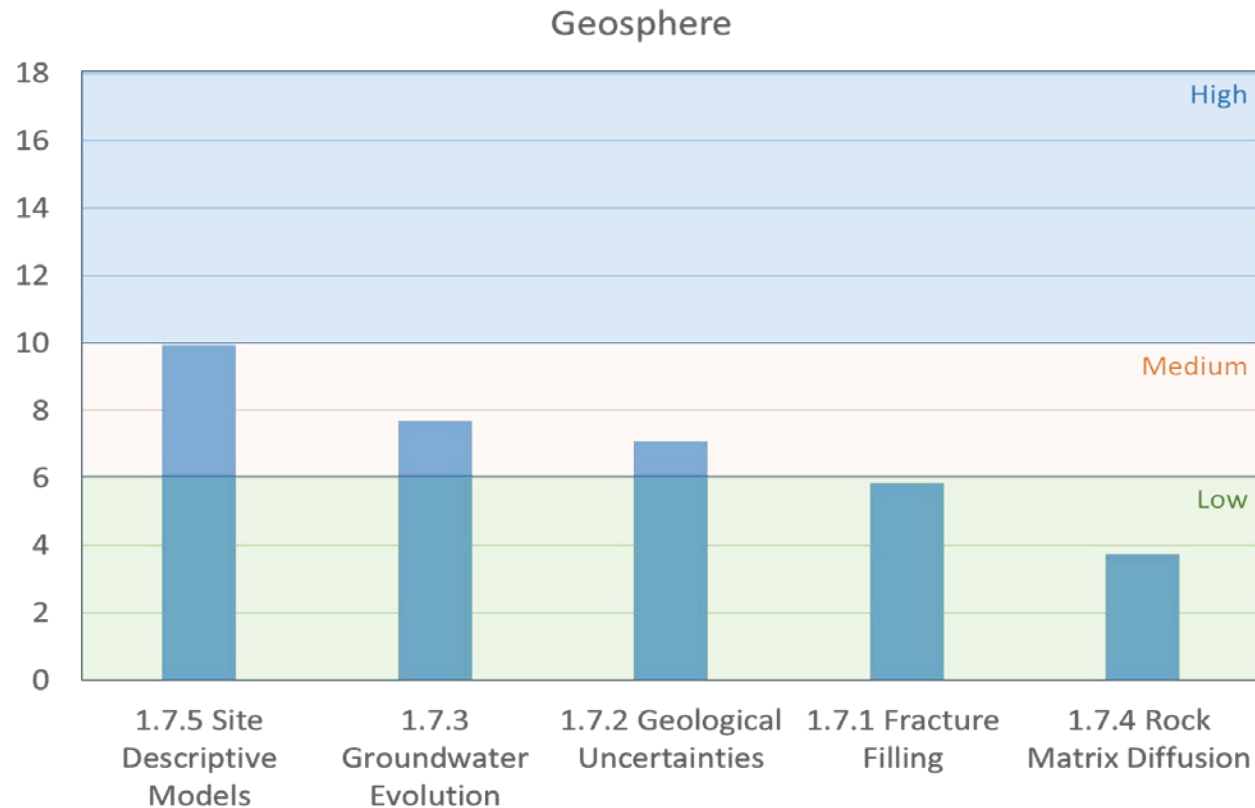


# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (7)

## Strategic Theme 1: Building Understanding

### 1.7 Geosphere

- 1.7.1 Fracture Filling
- 1.7.2 Geological Uncertainties
- 1.7.3 Groundwater Evolution
- 1.7.4 Rock Matrix Diffusion
- 1.7.5 Site Descriptive Models

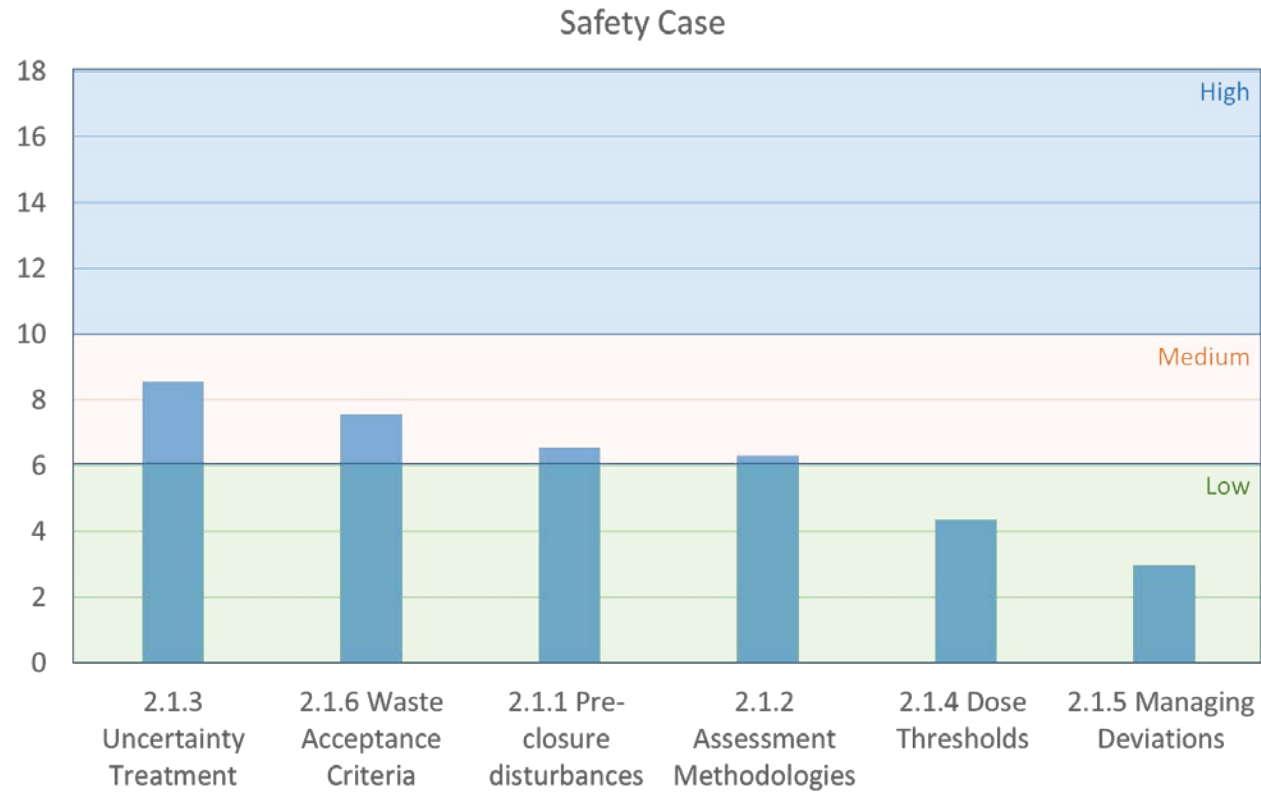


# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (8)

## Strategic Theme 2: Building Confidence

### 2.1 Safety Case

- 2.1.1 Pre-closure Disturbances
- 2.1.2 Assessment Methodologies
- 2.1.3 Uncertainty Treatment
- 2.1.4 *Dose Thresholds*
- 2.1.5 *Managing Deviations*
- 2.1.6 Waste Acceptance Criteria



# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (9)

## Strategic Theme 2: Building Confidence

### 2.2 Post-Closure Process Modelling and Upscaling

2.2.1 THMC Evolution

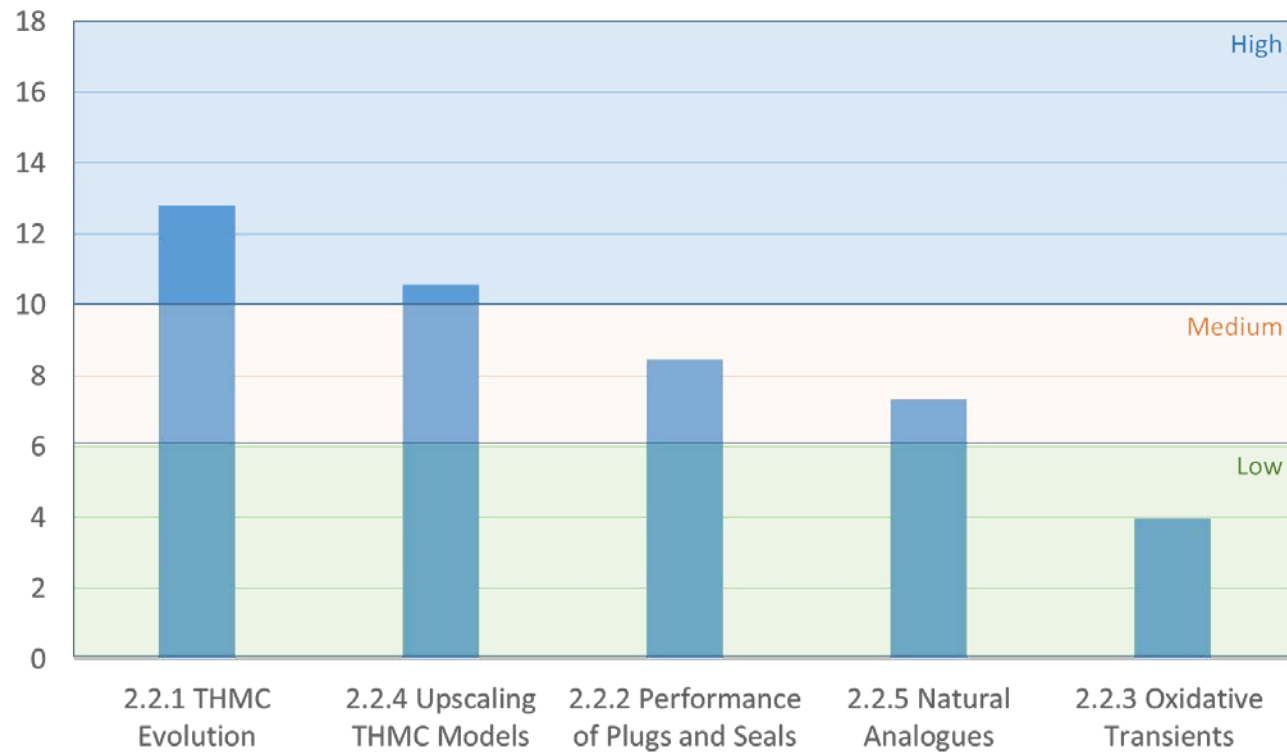
2.2.2 Performance of Plugs and Seals

2.2.3 *Oxidative Transients*

2.2.4 Upscaling THMC Models

2.2.5 Natural Analogues

Post-Closure Modelling and Upscaling



# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (10)

## Strategic Theme 2: Building Confidence

### 2.3 Numerical Tools

2.3.1 Performance Assessment Tools

2.3.2 Open-source Performance Assessment Code

2.3.3 Long-range Transport Models

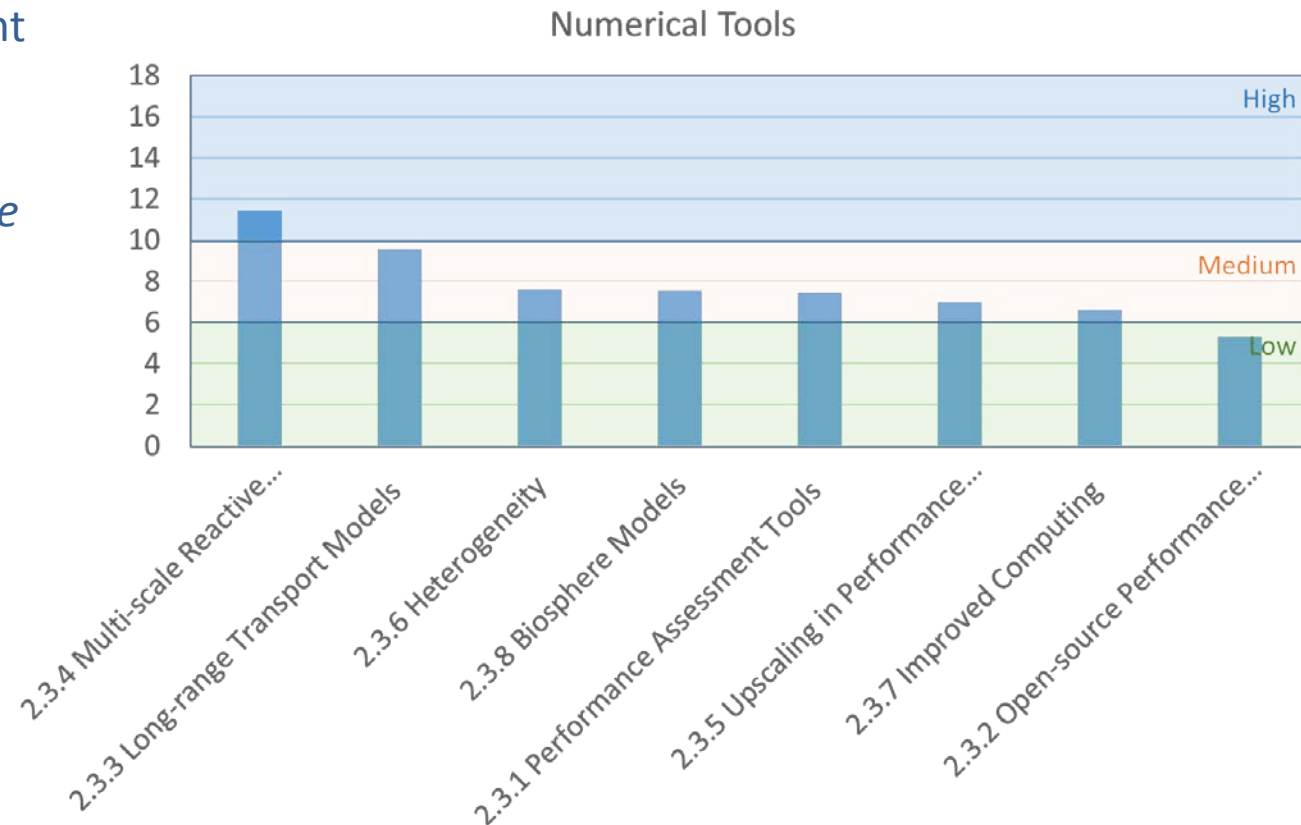
2.3.4 Multi-scale Reactive Transport Models

2.3.5 Upscaling in Performance Assessment

2.3.6 Heterogeneity

2.3.7 Improved Computing

2.3.8 Biosphere Models





# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (11)

## Strategic Theme 2: Building Confidence

### 2.4 Operational Safety

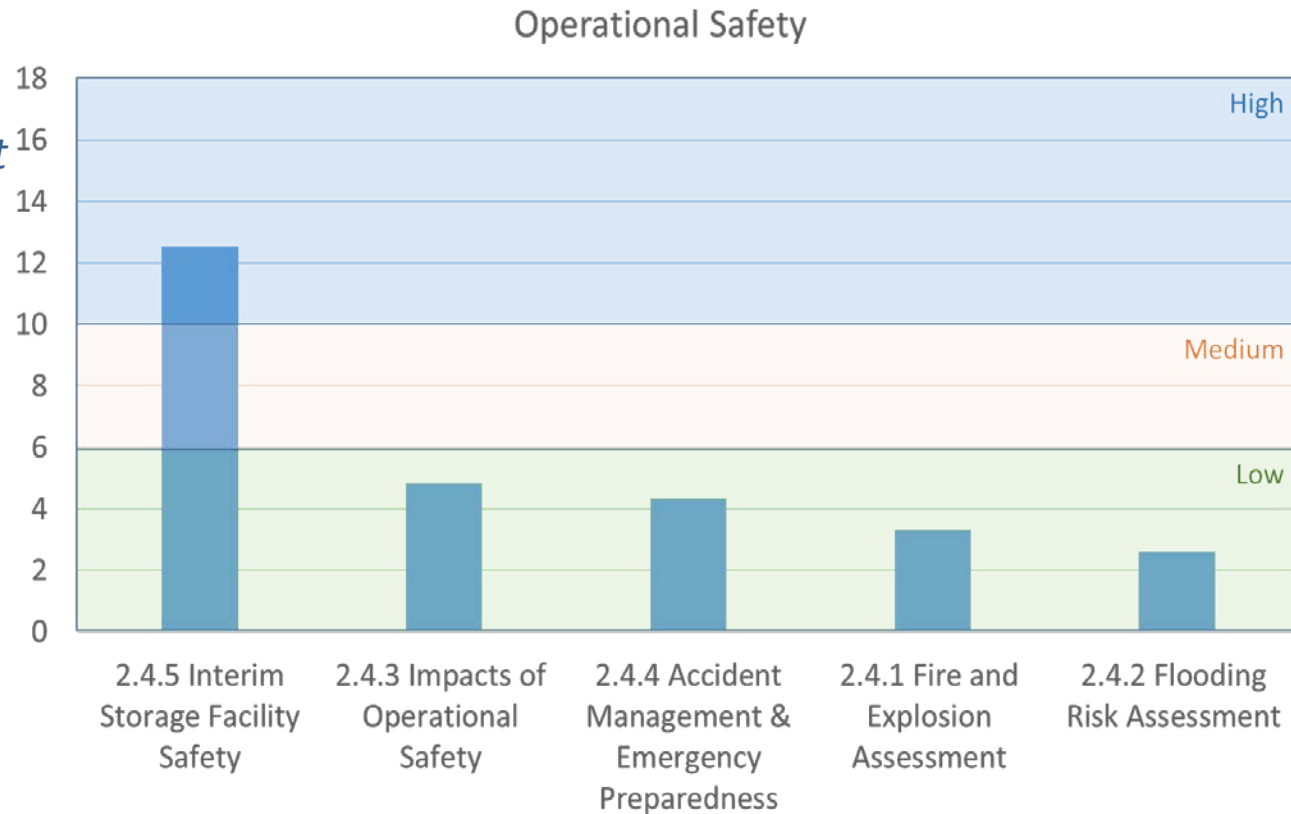
2.4.1 Fire & Explosion  
Assessment

2.4.2 Flooding Risk Assessment

2.4.3 Impacts of Operational  
Safety

2.4.4 Accident Management &  
Emergency Preparedness

2.4.5 Interim Storage Facility  
Safety



# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (12)

## Strategic Theme 2: Building Confidence

### 2.5 Practical Implementation

2.5.1 Operational Monitoring Strategies

2.5.2 Monitoring Strategies for Closure and Post-Closure

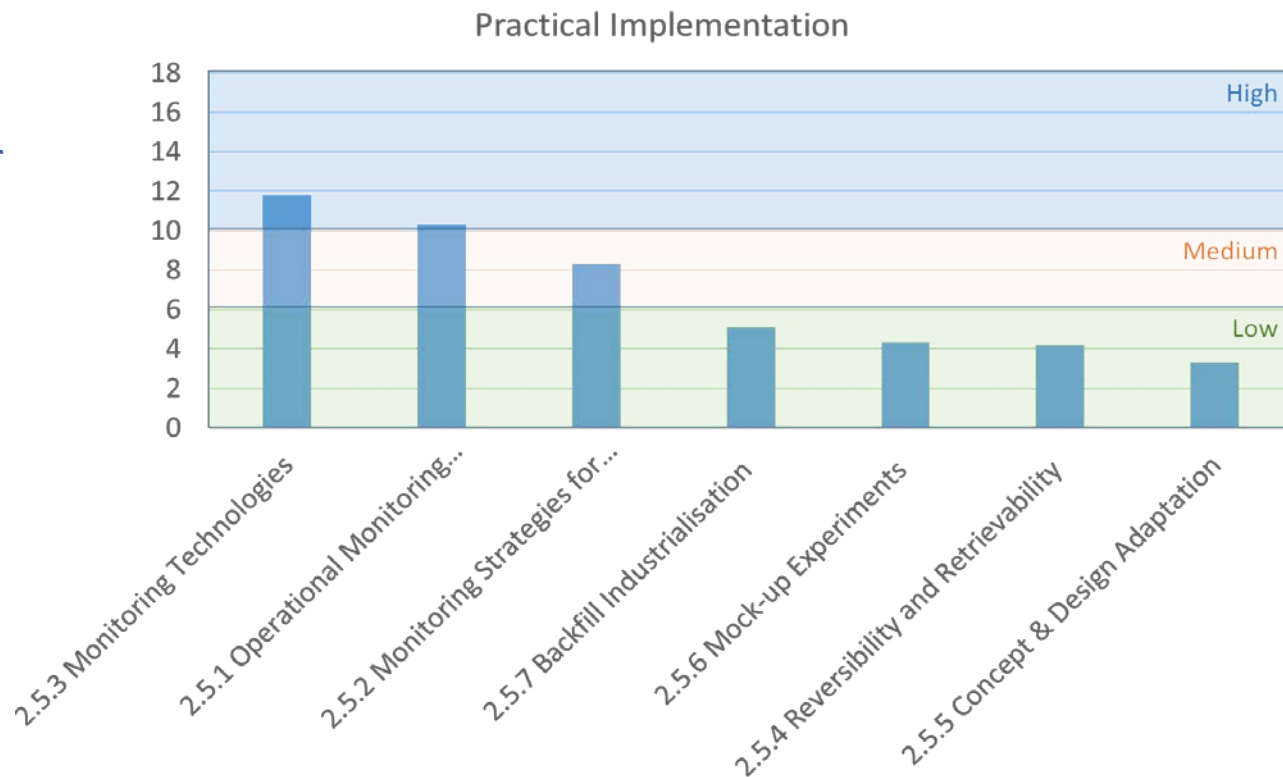
2.5.3 Monitoring Technologies

2.5.4 Reversibility & Retrievability

2.5.5 Concept & Design Adaptation

2.5.6 Mock-Up Experiments

2.5.7 Backfill Industrialisation



# 1<sup>st</sup> Draft SRA – Sub-Domain Overview (13)

## Strategic Theme 3: Integrated Knowledge Management System (IKMS)

- |   |   |
|---|---|
| 3.1 Site Uncertainty Treatment                                | 3.9 Safety Case Guidelines,<br>Management & Review          |
| 3.2 Site Evolution Models                                     |   |
| 3.3 Site Selection Process                                    | 3.10 <i>Disused Sealed<br/>Radioactive Sources</i>          |
| 3.4 <i>Technical and Socio-<br/>Political Siting Criteria</i> | 3.11 Pre-licensing<br>Management                            |
| 3.5 Inventory Collation &<br>Forecasting                      | 3.12 <i>Co-Disposal Interactions</i>                        |
| 3.6 <i>Evolution of Waste<br/>Inventory</i>                   | 3.13 <i>Radiation Protection<br/>Optimisation Principle</i> |
| 3.7 <i>Link to Waste<br/>Producers/Fuel Manufacturers</i>     | 3.14 Information Management<br>(NEA RepMet)                 |
| 3.8 <i>Concept Adaptation and<br/>Optimisation</i>            | 3.15 EU Research Directive                                  |
|   | 3.16 <i>EU DGR Curricular</i>                               |

***More on IKMS in the next  
presentation!***

# Socio-Political Cross-Cutting Themes

## 3 Socio-Political Cross-Cutting Themes Identified

Safety Culture

Uncertainty,  
Epistemology and  
Social Trust

Socio-technical  
Hybridisation and  
Aggregating a  
Diversity of People,  
Stakeholder  
Engagement

## JOPRAD Programme Document SRA (2017)

Technical Domains

Domain 1  
Domain 2  
Domain 3 etc.

Social Science  
Domains

Domain 1  
Domain 2  
Domain 3 etc.

## Future Joint Programme (2019-2024)

### Projects

Technical Project 1

Technical Project 2

Complex  
(multidisciplinary)  
Project 3

### Civil Society Contribution

Knowledge Sharing &  
Interpretation

Knowledge Sharing &  
Interpretation

Citizen Science

# Consultation Questions

- Are there any scientific, technical or knowledge management topics you consider that are missing in the document?
- Are there any scientific or technical topics you consider should have a higher or lower level of common interest, than currently scored? If so, please provide a clear description of why.

***Responses to consultation needed by 30<sup>th</sup> April 2017***

# Thank You !



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*London, April 4, 2017*