



Chemical and Material Risk Management Directorate

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Assessing Risks from Emerging Contaminants: Using Expert Elicitation and Group Decisions

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Outline

- **Background on expert elicitation**
- **Phase I impact assessment process**
- **Identification of experts**
- **Elicitation methods**
- **Results**
- **Next steps**

Expert Elicitation

“a formal process by which expert judgment is obtained to quantify or probabilistically encode uncertainty about some uncertain quantity, relationship, parameter, or event of decision relevance”

USEPA, Science Advisory Board, 2009

Some Applications of Expert Elicitation

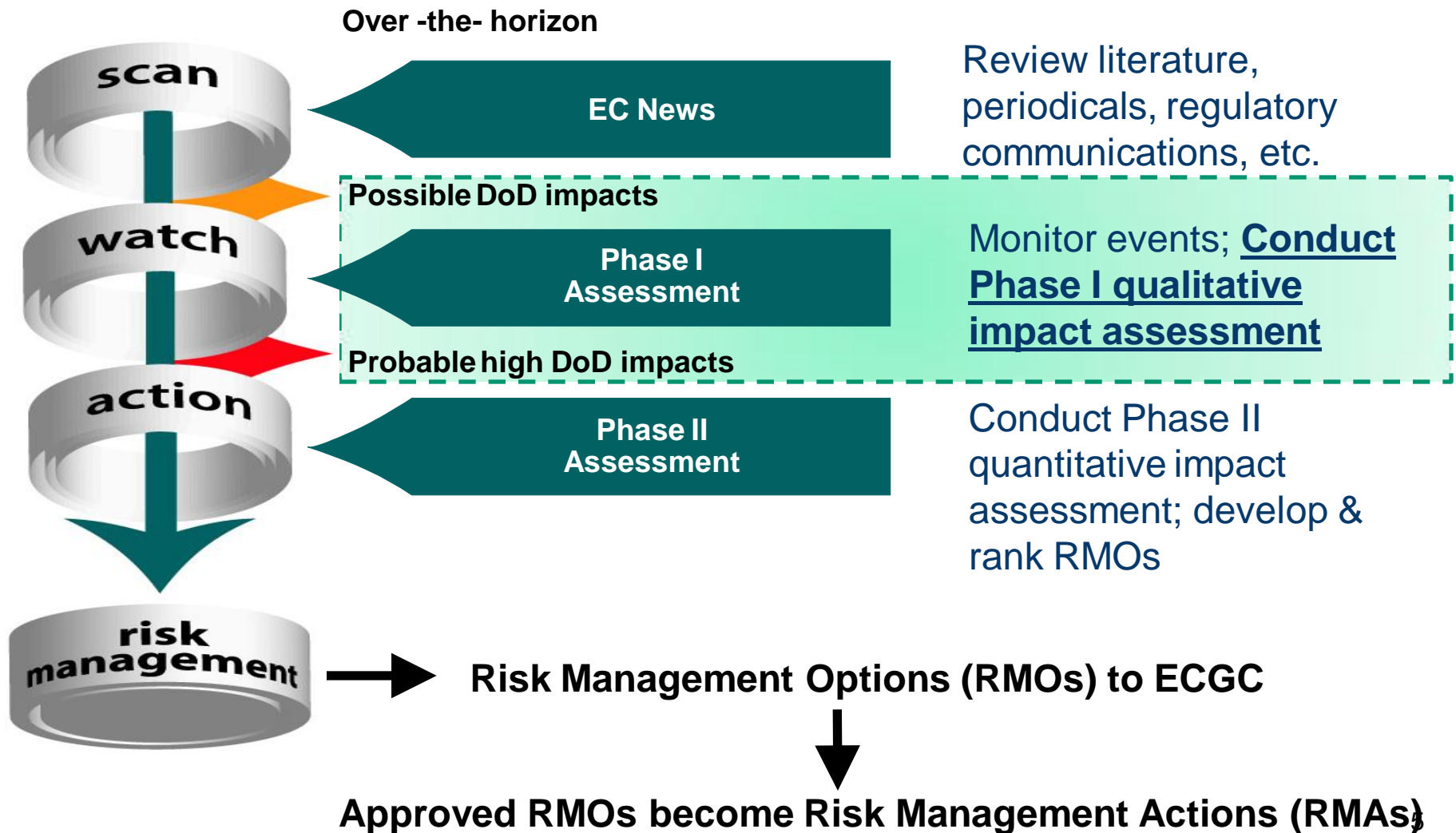
• Regulatory settings

- ◆ US Environmental Protection Agency
- ◆ Nuclear Regulatory Commission
- ◆ US Department of Agriculture

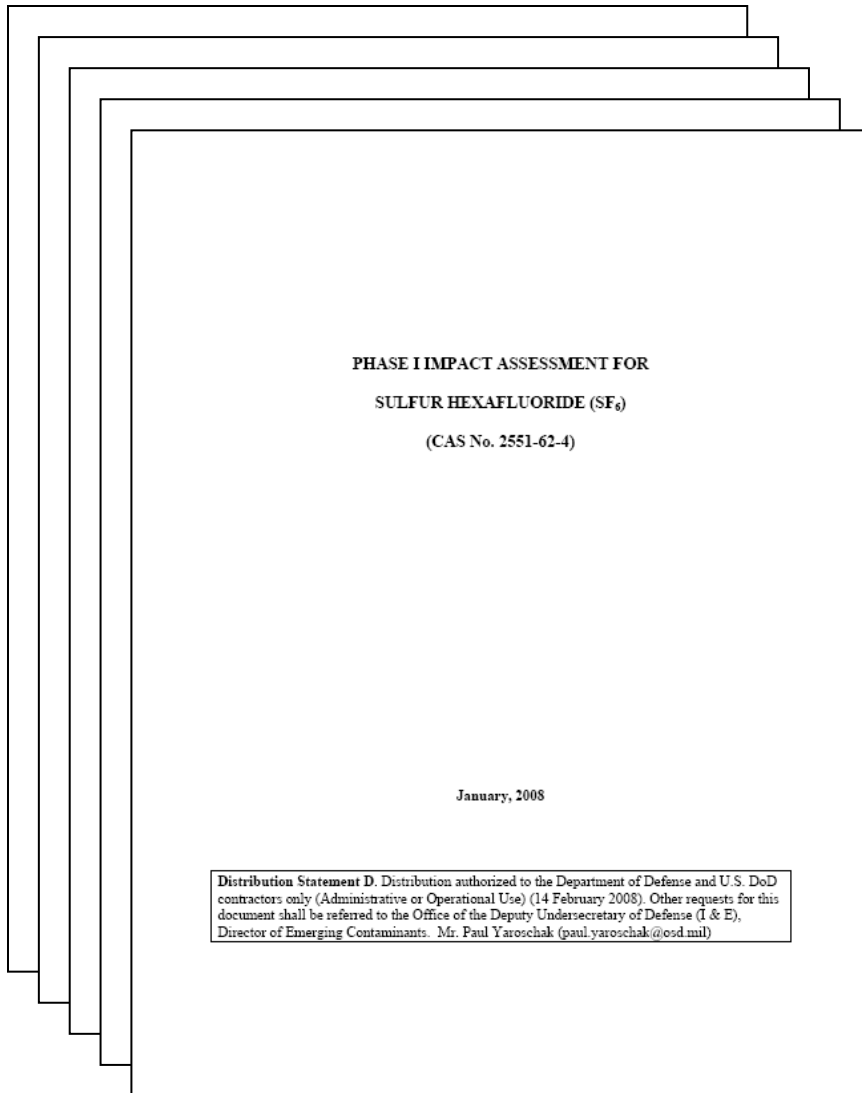
• Non-Regulatory settings

- ◆ Department of Defense
- ◆ US Army Corps of Engineers (Civil Works)
- ◆ National Aeronautics and Space Administration

Application of Expert Elicitation to Emerging Contaminants



Subject Matter Expert Elicitation in the Phase I Impact Assessment Process



Data Collection

+

Regulatory Analysis

+

Subject Matter Expert
Input

=

Phase I Impact
Assessment

Identification of Subject Matter Experts For Phase I Impact Assessments

• Internal

- ◆ Government employee experts
- ◆ Experts under direct government contract

• External

- ◆ Industrial/Commercial firms
and consultants
- ◆ Commercial manufactures



Functional Areas for Impact Assessment



Acquisitions / Research Development
Testing and Evaluation



Environmental Safety and Health



Production, Operation, Maintenance,
and Disposal of Assets



Cleanup/Remediation

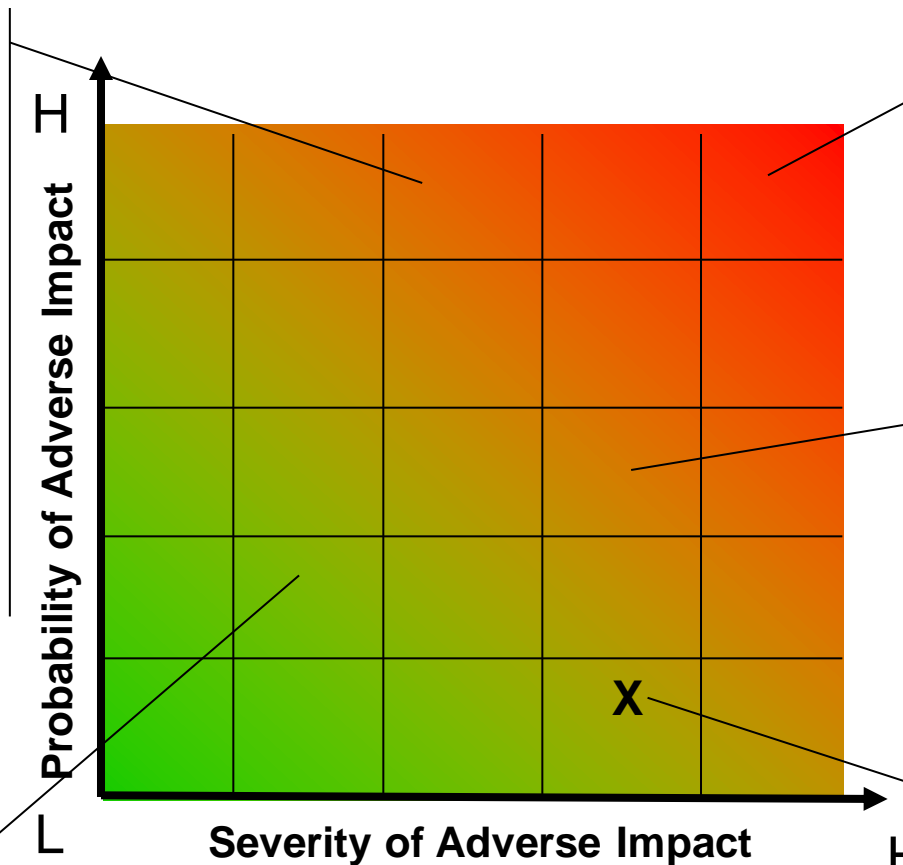


Training and Readiness

Sub-Functional Area Assessment

- O1 – Infrastructure Improvements
- O2 - Production and Maintenance Operations
- O3 - Analytical Testing and Monitoring (env)
- O4 – Analytical Testing and Monitoring (materiel)
- O5 - Material Handling, Storage, and Transport
- O6 - Waste Handling, Storage, Transport, and Disposal
- O7 - Personal Protective Equipment

- RT1 – System Specific
- RT2 – Training Activity
- RT3 - Location Specific



- E1 - Human Health
- E2 - Occupational Health
- E3 - Safety
- E4 - Environmental Health
- E5 - Community, Public or Worker Relations

- R1 - Material Availability
- R2 - Material Qualifications
- R3 - Industrial Base Equipment Suppliers
- R4 - Cost and Schedule
- R5 - Materials Laboratory Scale Activities

- C1 - New Site Identification
- C2 – Remedial Technologies
- C3 - Existing Sites
- C4 - Cost to Complete
- C5 - Property Transfer and Re-Use

ES&H POMD of Assets

Readiness & Training X Cleanup

Acquisition/RDT&E

Types of Subject Matter Experts (SMEs)

Functional Area	Total	SME	Non-SME
Acquisition / Research, Development, Testing, and Evaluation	30	12	18
Clean Up	30	8	22
Environment, Safety, and Health	30	21	9
Production, Operations, Maintenance, and Disposal of Assets	30	11	19
Readiness and Training	30	4	26

Expert Elicitation Process (Probability)

• Probability of Adverse Impact (1-5)

- ◆ Definite > 80% Will definitely be affected
- ◆ Probable 51-80% Will probably be affected
- ◆ Possible 31-50% Will possibly be affected
- ◆ Plausible 11-30% Slight possibility of affect
- ◆ Improbable < 10% Unlikely to have affect or no affect



Expert Elicitation Process (Severity)

❖ Severity of Adverse Impact (1-5)

- ◆ **Unacceptable** increases in the number, type and degree of human health hazards for non DoD employees or offsite populations
- ◆ **Significant** increases the number type and degree of human health hazards for non DoD employees or offsite populations
- ◆ **Moderate** increases the number type and degree of human health hazards for non DoD employees or offsite populations.
- ◆ **Limited** increases the number type and degree of human health hazards for non DoD employees or offsite populations
- ◆ **No** non DoD employees or offsite populations are considered at elevated risk as a result of DoD activities. Hazards are inconsequential



Expert Elicitation Process (Confidence)

❖ Confidence in Probability and Severity (1-5)

- ◆ ***Certain*** - Supported by facts and experience
- ◆ ***Somewhat certain*** - Supported by some facts, experience or anecdotal information
- ◆ ***Not certain*** - Intuitive answer based on similar situations
- ◆ ***Somewhat unsure*** - Intuitive answer but no basis
- ◆ ***Uncertain 'guesstimate'*** - No facts, experience or intuition



Emerging Contaminant Assessment System (ECAS)

The screenshot shows the ECAS web application running in a Windows Internet Explorer browser. The browser address bar displays the URL: `http://merit.micropact.com/index.go?ACTION=PRESS_REVIEWER_GET_PROPOSAL_TO_SCORE&PRESSSCORECARDID=5273*`. The browser's address bar also contains a search engine (Google) and a search input field.

The application header includes the Department of Defense MERIT logo (Materials of Evolving Regulatory Interest Team) and the title "Emerging Contaminant Assessment System". The user is identified as "meritdr" with the role "ECAS Reviewer - Evaluate Questions". A "Logout" link is visible in the top right corner.

The navigation pane on the left shows "WebQTS" and "ECAS" tabs. The "ECAS" tab is active, and the "Assigned Contaminants" link is selected. A "Note" section states: "Your session will time-out after 90 minutes of inactivity on the system. You must click Save to re-set the timer."

The main content area displays the "Questions for Cadmium and Compounds" section. The "Functional Area Number" is "1. ESH FY10 -" and the "Functional Area Title" is "Environment, Safety, and Health". The "Question" text is: "QUESTION 1: Human Health: What is the risk that the revised toxicity values for cadmium and compounds will increase the number, type and degree of human health hazards for non DoD employees or offsite populations as a result of DoD activities?". A link "Back to Assigned Questions List" is provided below the question.

The "PART1" section asks: "What is the probability that revised toxicity values for cadmium and compounds will increase the number of situations considered hazards, or change the classification of the type and degree of human health hazards non DoD employees or offsite populations are exposed to as a result of DoD activities?".

A "Probability (1-5)" table is displayed, showing the mapping between probability ranges, descriptions, and scores:

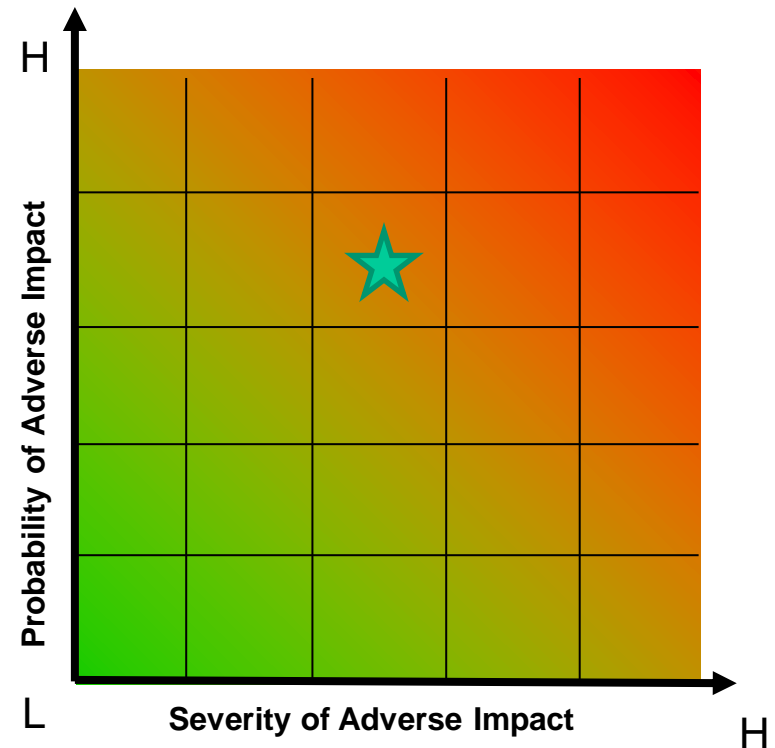
Probability	Probability Descriptions	Scores
Definite- > 80%	Will definitely be affected	5
Probable- 51-80%	Will probably be affected	4
Possible- 31-50%	Will possibly be affected	3
Plausible- 11-30%	Slight possibility of affect	2
Improbable- < 10%	Unlikely to have affect or no affect	1

Below the table is a "Probability Comments" text area. A dropdown menu on the right side of the table shows the value "3".

The browser's status bar at the bottom indicates "Internet" and "100%" zoom level.

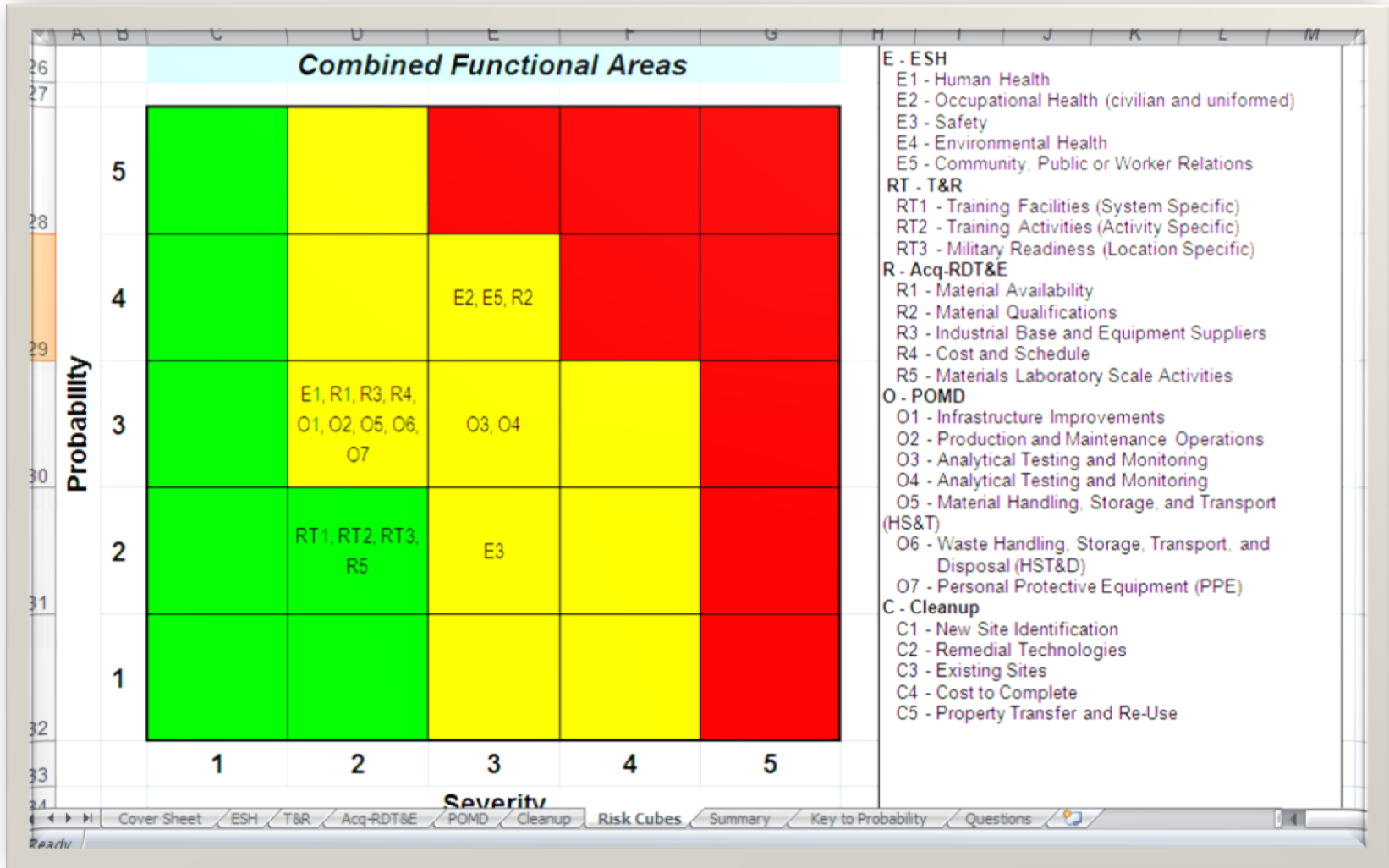
Example from Expert Elicitation

- ❖ Acquisition / Research, Development, Testing, and Evaluation
- ❖ Question 2 - Material Qualifications:
 - ◆ What is the risk that increasing international regulatory restrictions [e.g., REACH or RoHS] for cadmium and compounds will increase testing, specification, and evaluation requirements?



Data from Cadmium and Compounds, Oct 2009

Expert Elicitation Data Summary



Phase I Impact Assessments Completed

- ✓ Tungsten
- ✓ Tungsten alloy
- ✓ Tetrachloroethylene (PCE)
- ✓ Dioxins
- ✓ 1,4-Dioxane
- ✓ Perfluorooctyl sulfonate (PFOS)
- ✓ Di-nitrotoluenes (DNT)
- ✓ Lead
- ✓ Nickel
- ✓ Hexavalent Chromium
- ✓ Cerium
- ✓ Trichloroethylene (TCE)
- ✓ Sulfur Hexafluoride (SF6)
- ✓ Polybrominated diphenyl ethers (PBDEs)
- ✓ 1,2,3-trichloropropane (TCP)
- ✓ N-nitrosodimethylamine (NDMA)
- ✓ Dichlorobenzenes
- ✓ Beryllium
- ✓ Naphthalene
- ✓ Perfluorooctanoic Acid (PFOA)
- ✓ RDX
- ✓ Cadmium (report in preparation)
- ✓ Antimony (report in preparation)

Next Steps

- Apply a continuous process improvement
- Integrate confidence measurements
- Continue outreach to improve breadth and depth of pool of subject matter experts
- Independent review of expert elicitation process

Future Phase I Impact Assessment Subject Matter Expert Meetings

CHEMICAL	CAS NUMBER	PROJECTED MEETING DATE
Dinitrotoluene (DNT)	25321-14-6	July 2010
Nanomaterials	---	October 2010
Phthalate Esters	---	January 2010
1,4-dioxane	123-91-1	Future reassessment TBD
Antimony and Compounds	7440-36-0	Future assessment TBD
Cobalt and Compounds	7440-48-4	Future reassessment TBD
Nickel	7440-02-0	Future reassessment TBD
Tungstate	7440-33-7	Future reassessment TBD

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