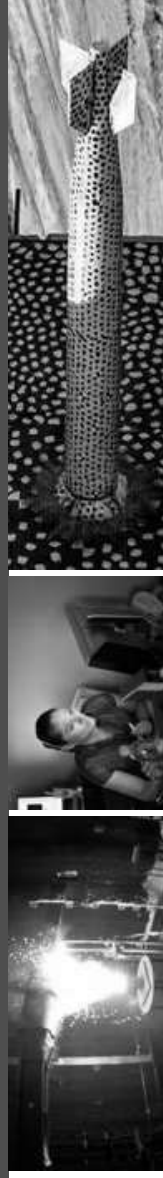


Use of multi attribute decision analysis models to
characterize the WMD vulnerabilities of countries to help
support global threat reduction actions



PRESENTED BY

Susan Caskey

Risk Analysis for Nuclear War and Nuclear Terrorism Methods

SAND2019-13397 C

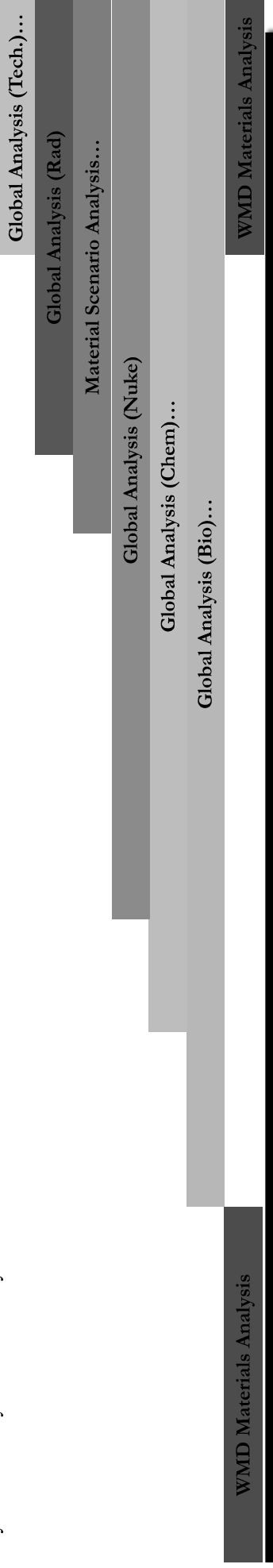


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2 Short Background

Sandia National Laboratories' *Global Risk and Decision Analysis team (GRaDA)* has been providing risk and decision analysis support and tools for the last 15+ years

Some of the methods used include - Multi-Attribute, Fault-Tree, RIMES, MLN, and Complex Systems/System of Systems



GRaDA includes experts in

- Physical security
- International security
- Regulatory frameworks
- Public health
- Physics
- Chemistry
- Biology
- Computer scientists
- System engineers
- Statisticians
- Modeling/Simulation

3 Why was a multi attribute decision analysis model used?

Global threat reduction actions need to be strategic and effective

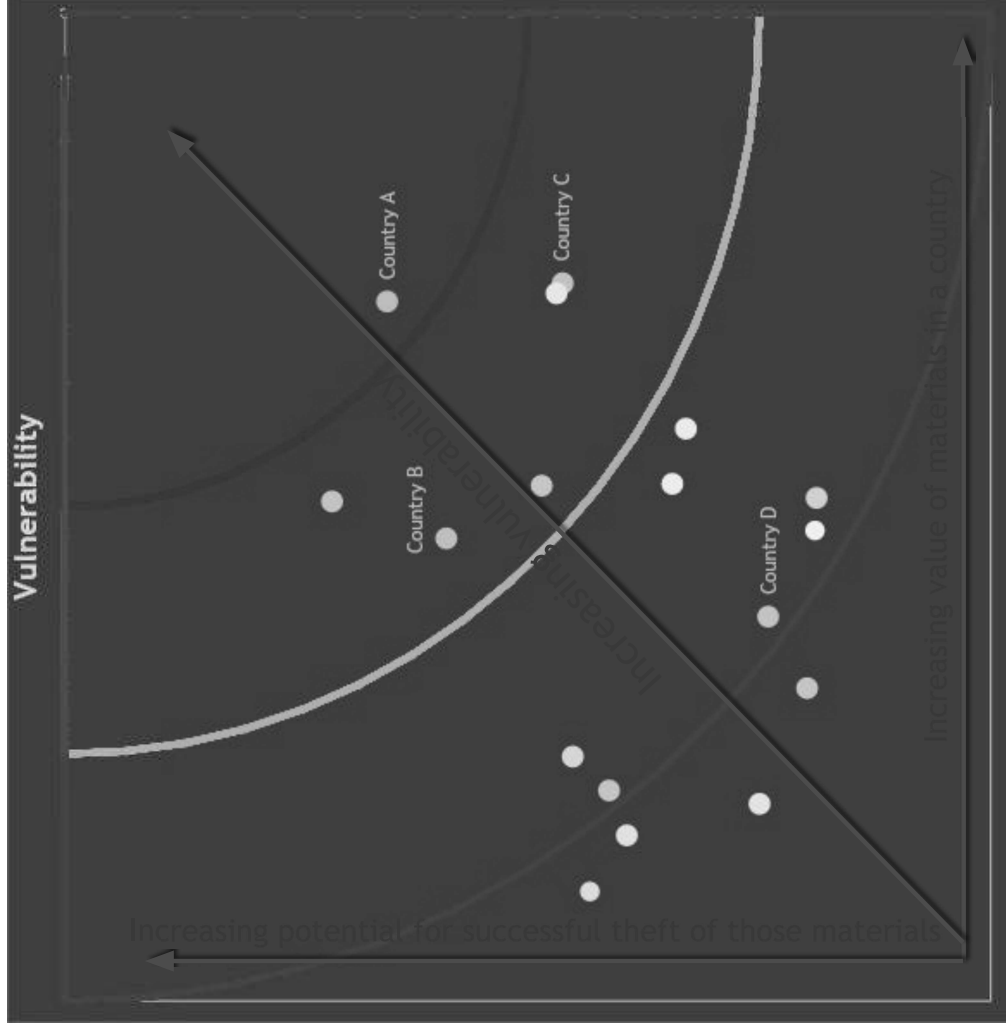
- Budgets are not infinite
- Not all countries have the same situations, problems, or needs

Set one need to clearly define the problem the analysis is trying to address

- Problem leads to the questions and sub questions we need to answer
- The questions define underlying methodology(s), model and tools

A multi attribute decision analysis was selected as it supports a structure country analysis and provide a framework for relative prioritization of countries

This type of modeling can be used to compare a large set of data points in a defensible and easy to communicate framework



How are we defining WMD Vulnerabilities?

Problem...

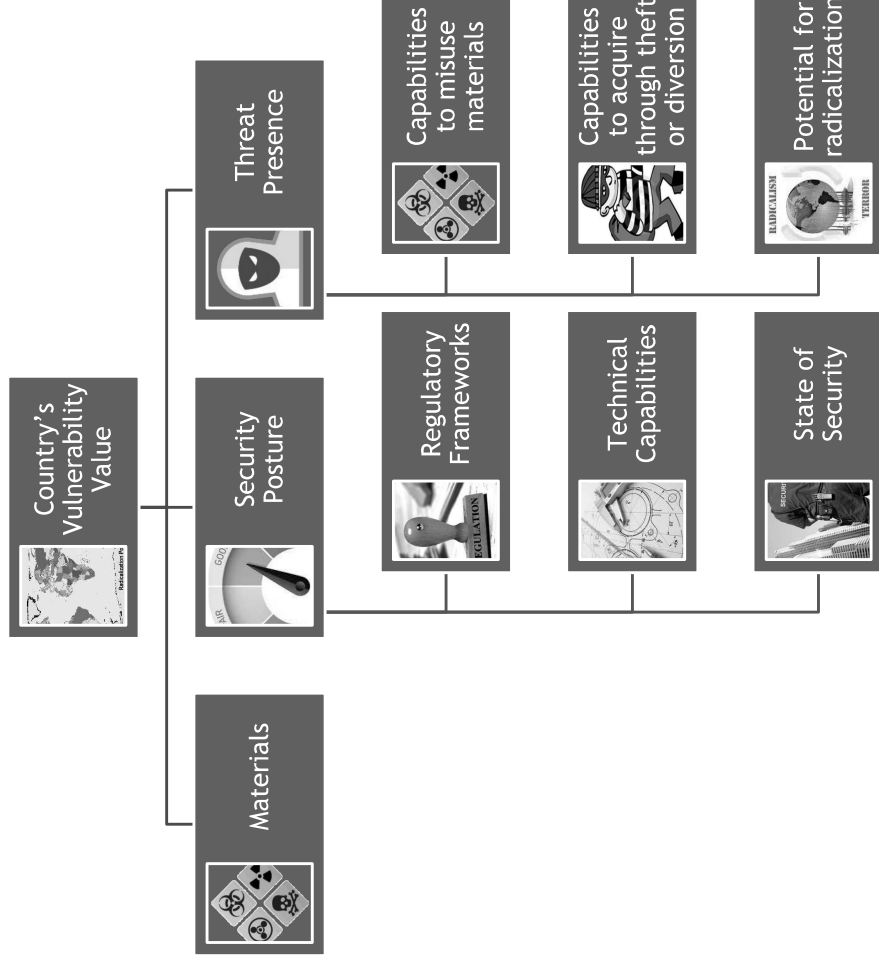
- Dual-Use material could be removed from facilities within countries and used in development of a WMD (facilities outside the US)
- US Gov needs a strategy to determine which countries need support in reducing this risk

Question....

- Which countries have a relatively higher risk of theft or diversion of dual-use materials by non-state actors?

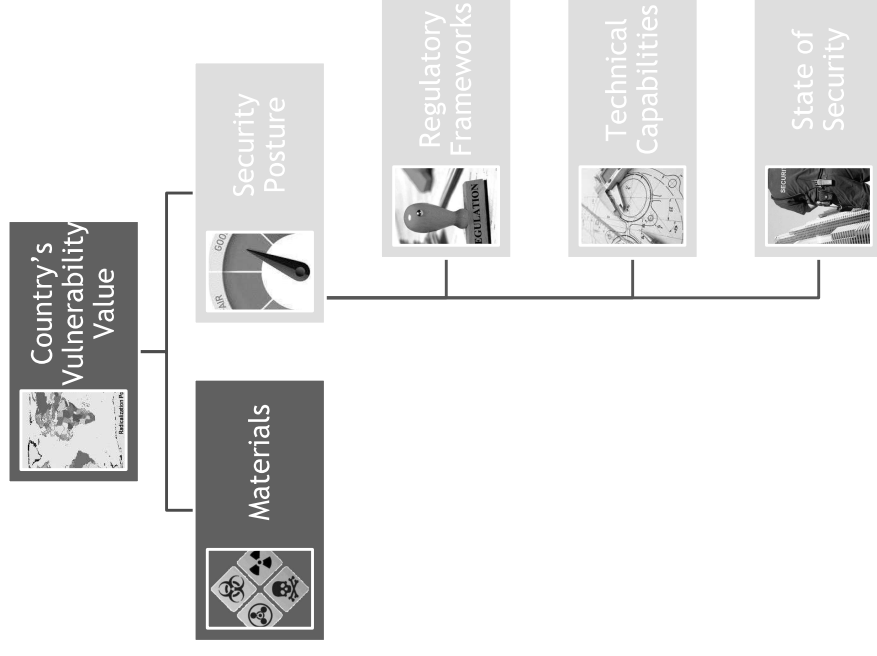
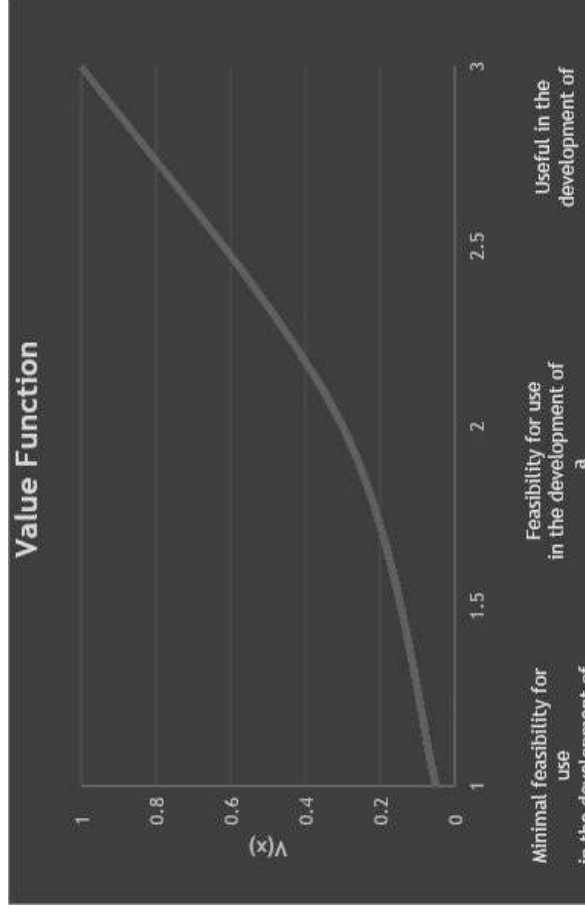
Simply...

- What do they have that could be misused?
- How is it secured?
- Who might want to take it?



Potential *impact* of theft/misuse is a function of:

- Presence of WMD materials
- Value of defined WMD materials (e.g., type/quantity/state/form)



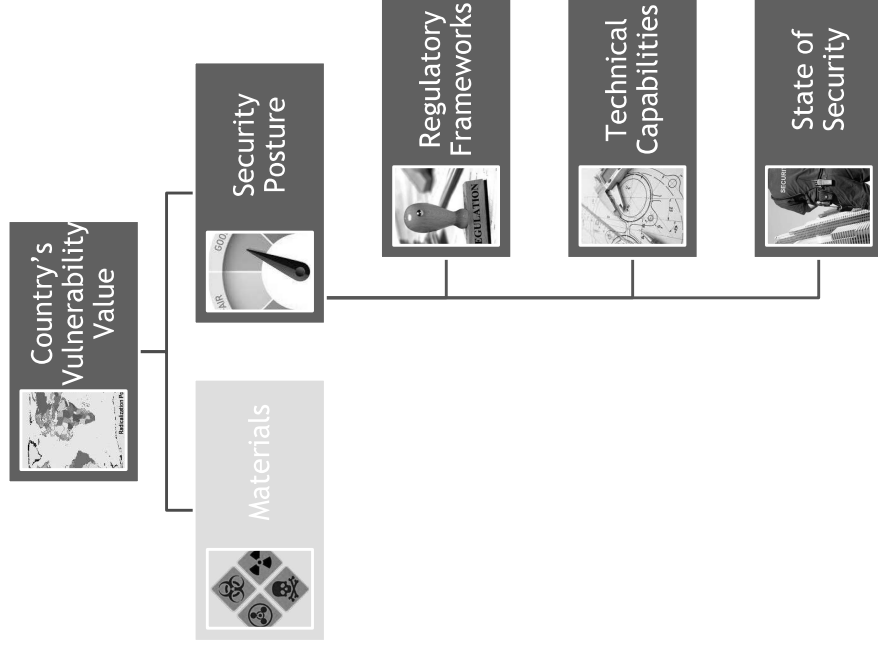
Security Posture

Security posture of the country $\sim$ the *maturity* of measures that impact the overall security of the materials

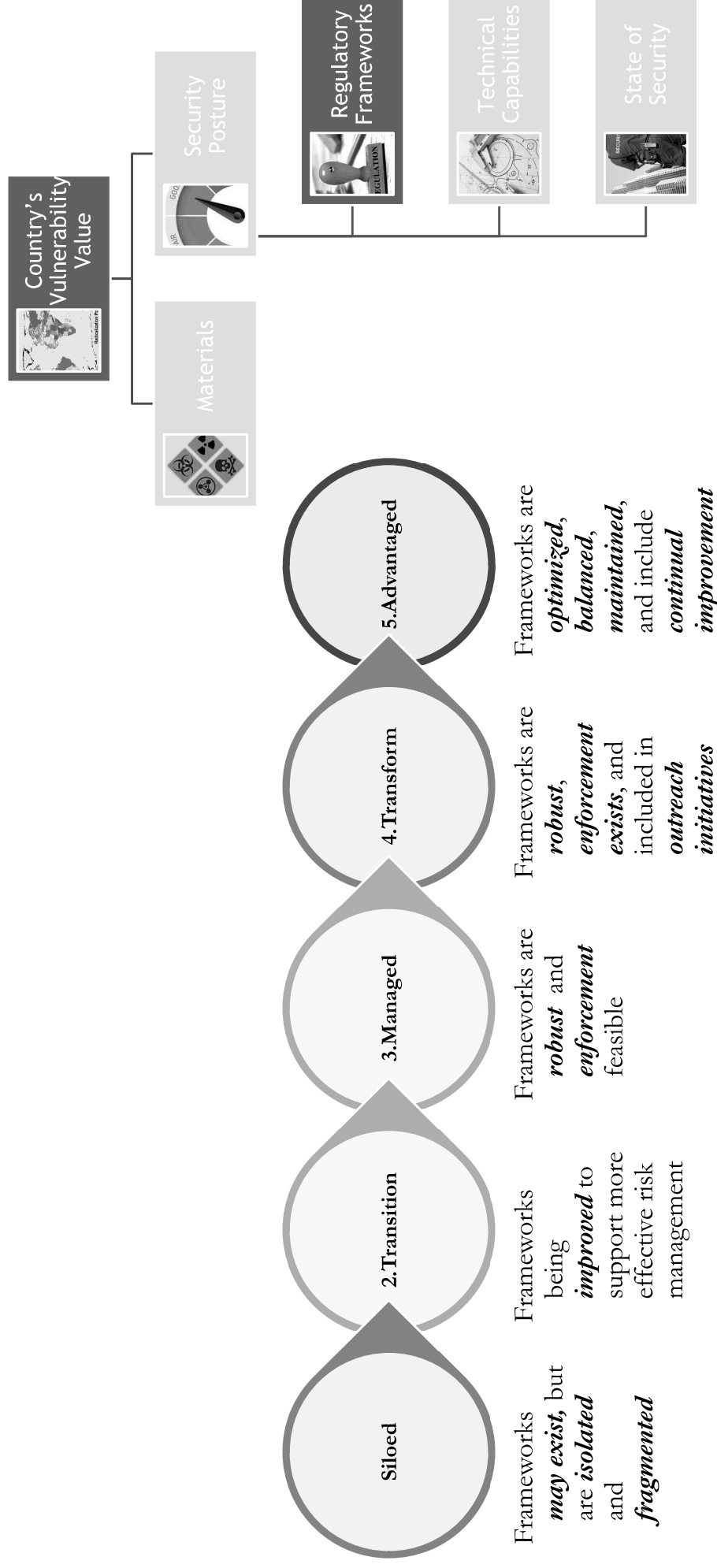
Regulatory Frameworks

Technical Capabilities

State of Security

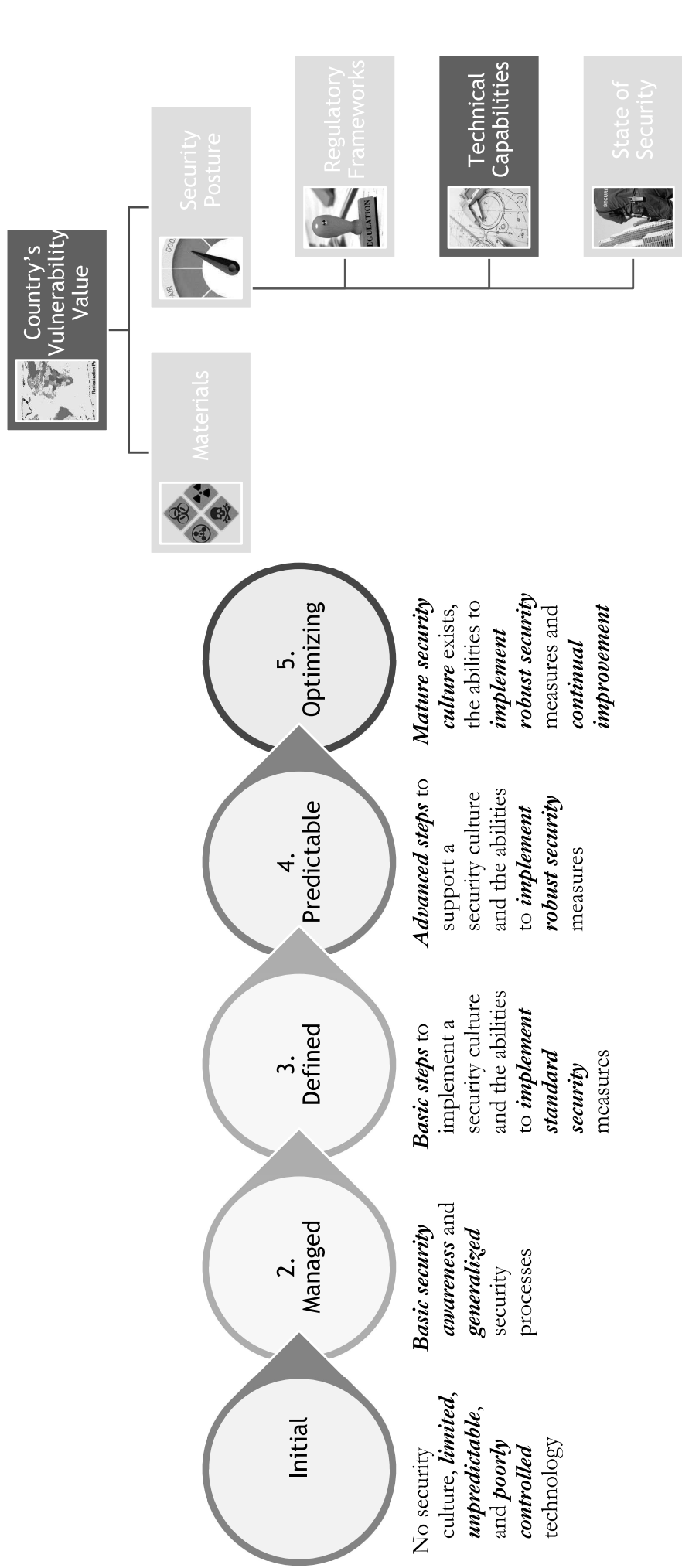


7 Regulatory Framework Maturity Model*



*Based on the language of the RSA Archer Maturity Model

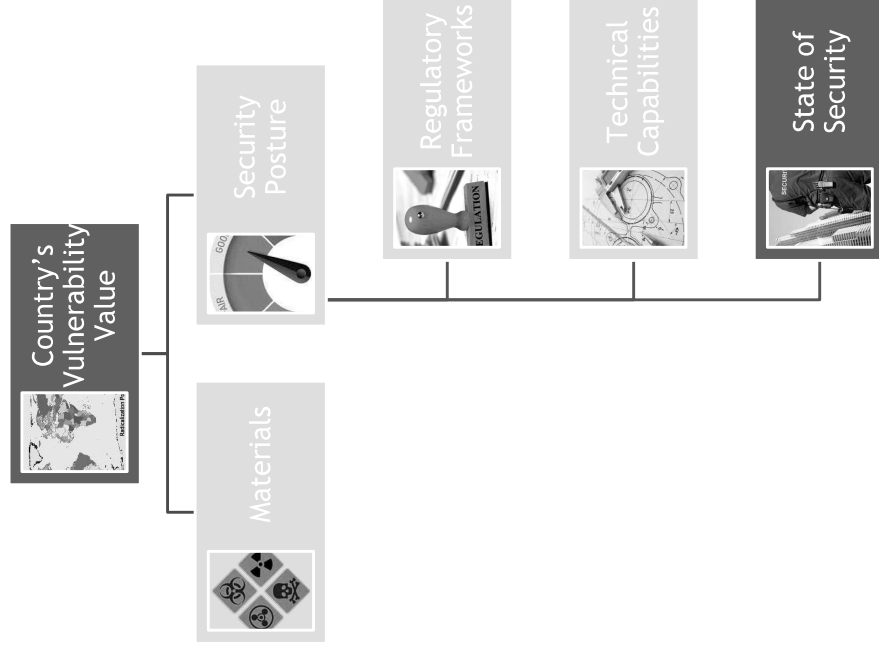
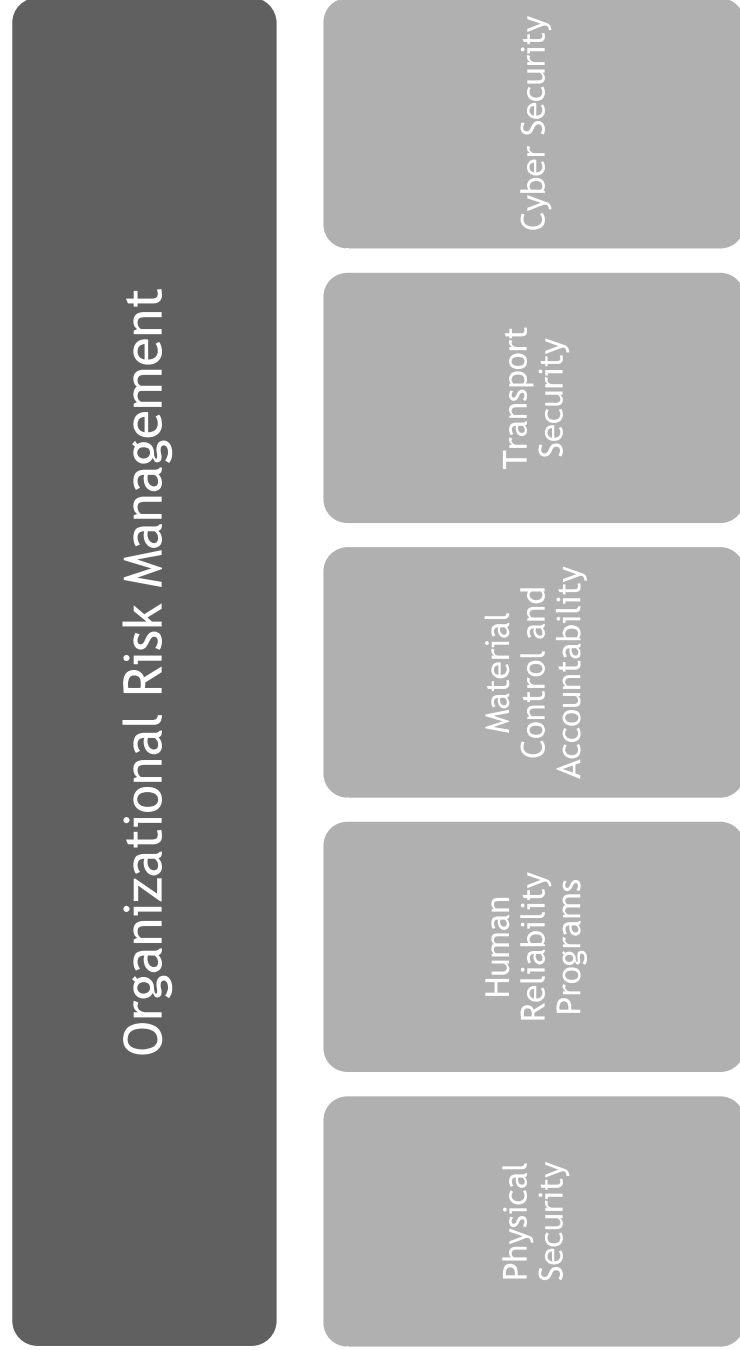
8 | Technical Capabilities Maturity Model*



*Definitions were based upon discussions with subject experts on creating security cultures and reviewing the Carnegie Mellon People Capability Maturity Model (P - CMM)

9 | State of Security Maturity Model

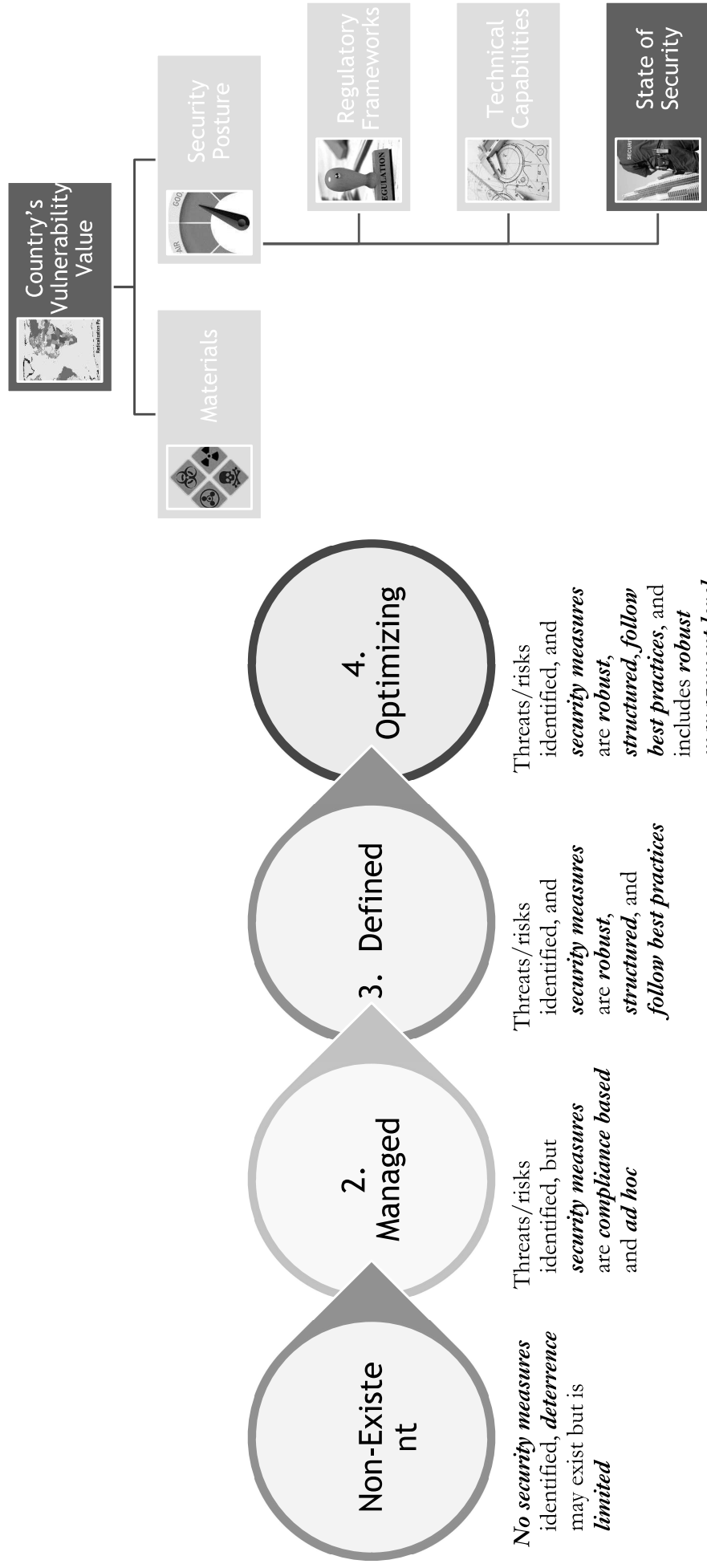
Designed to focus on all pillars of security and risk management



Defined leveraging language from cyber security maturity models (C2M2)



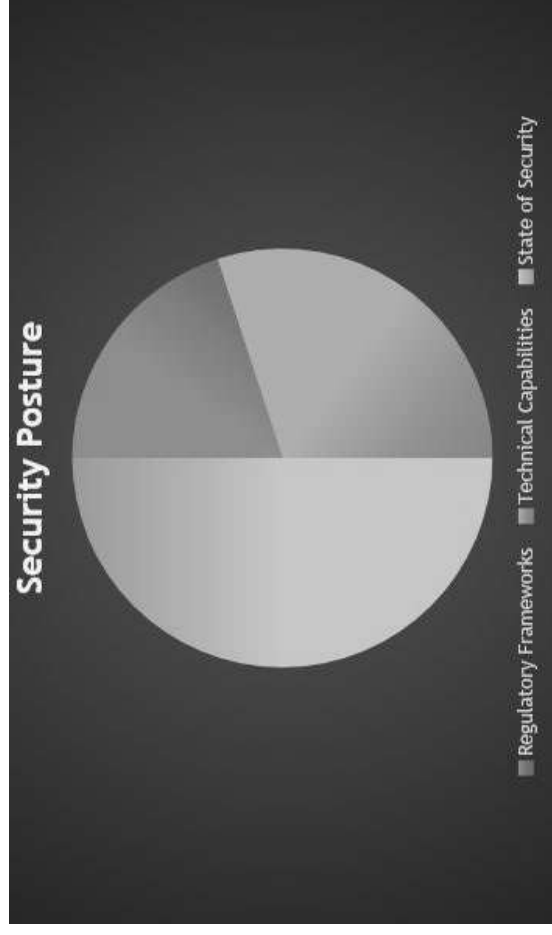
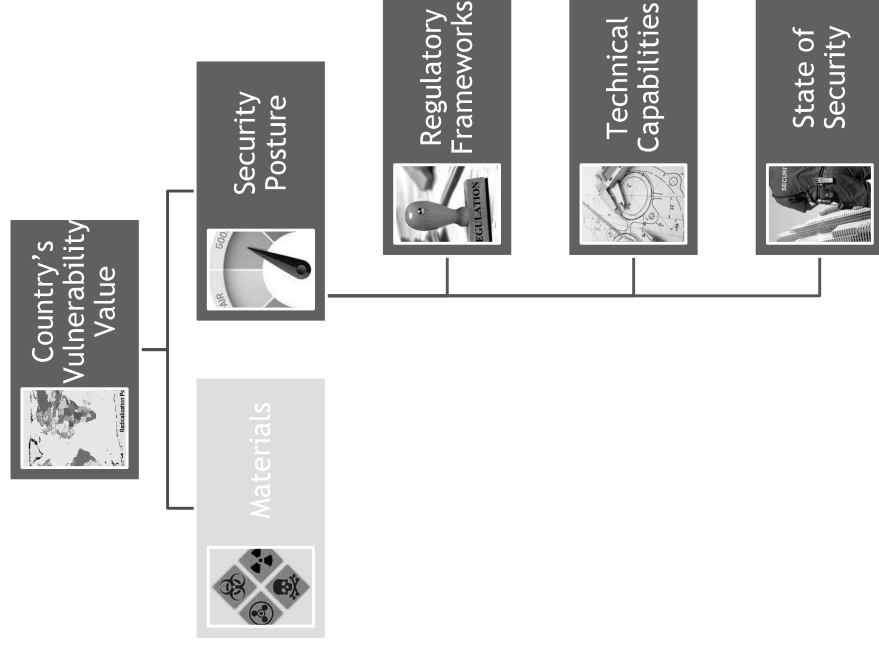
10 | State of Security Maturity Model*



*Defined leveraging language from cyber security maturity models (C2M2)



The levels of maturity are given values (zero to one) and combine using a weighted average to define the country's security posture value



Threat Presence

THEFT

Are there Threat Actors who have:

- Intent and capabilities to misuse material
- Intent and capabilities to acquire material (via external theft)

Are people within the facilities prone to radicalization:

- Creating opportunity for insider theft or coercion with outsiders

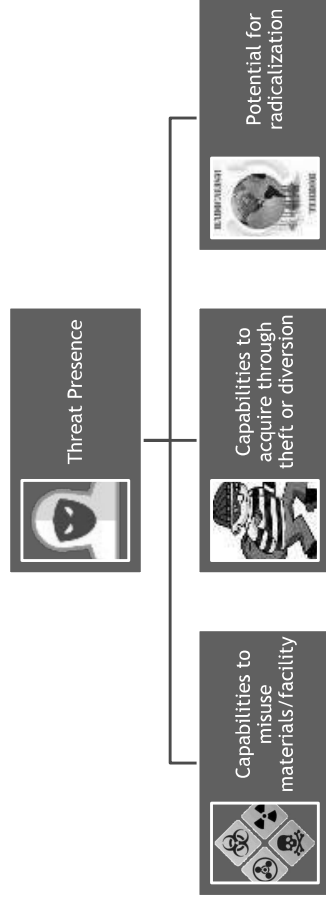
SABOTAGE

Are there Threat Actors who have:

- Intent and capabilities to create a sabotage event

Are people within the facilities prone to radicalization:

- Creating opportunity for insider sabotage or coercion with outsiders



Who are the Possible Threat Actors?

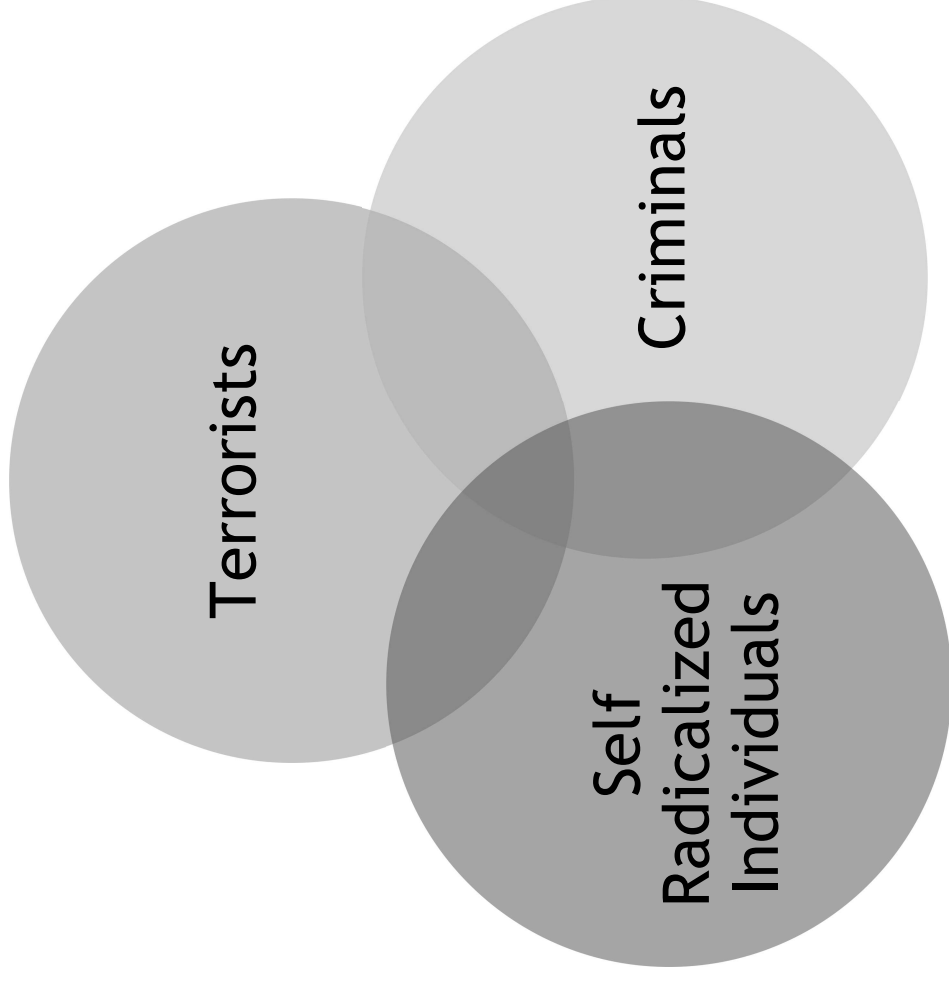
Violent Extremist Organizations / Terrorists

- Secular
 - Left
 - Right
 - Separatists
- Religious
 - Apocalyptic
 - Cleansing (Create a Pure State)
 - Government
- Cults
- Activists (Environmentalist, Animal Rights, etc.)

Criminals

Self Radicalized Individuals

- Lone Wolf
- Disgruntled Employees



Country Assessment - Hydrozastan

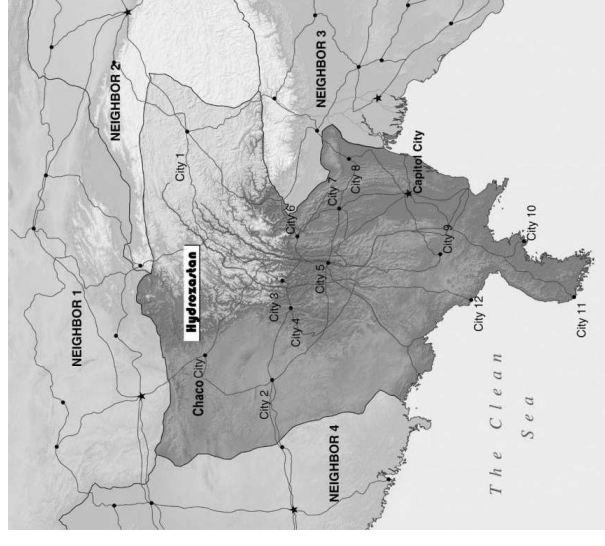
Some dual-use chemicals are imported, used, stored, and disposed (specifically at Chaco City Chemical)

Import/Export regulations exist for dual-use chemicals

No regulations regarding transport, storage, use, or disposal

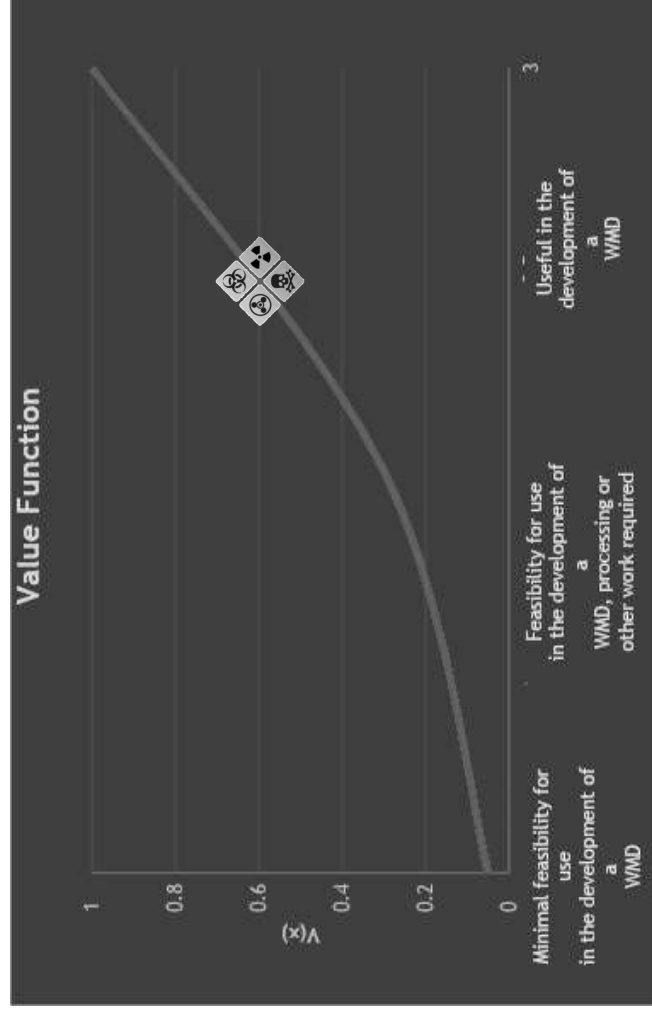
Site assessments highlight security existing at facilities but mostly based on perimeter cameras and CCTV cameras

Chemical associations promote chemical safety but have only just started to include security in their education, those with security expertise are very limited



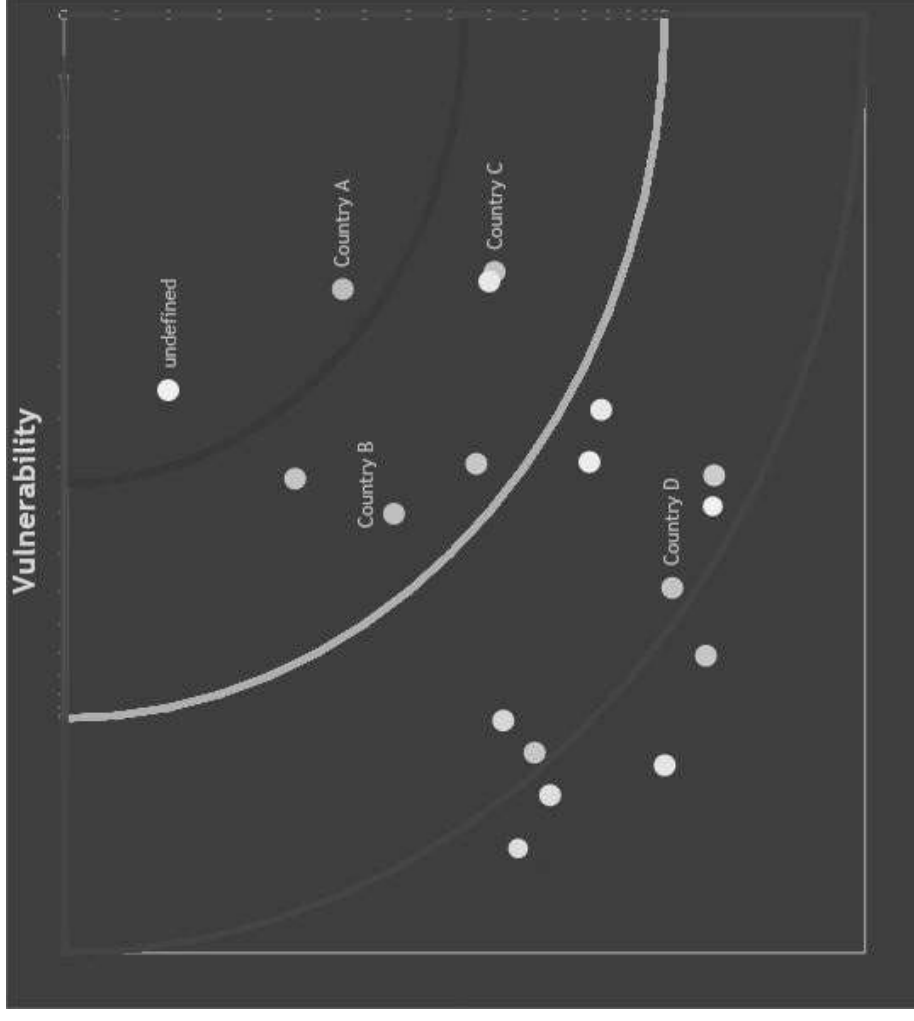


Dual use chemicals are useful in the development of a WMD, but due to the small quantity existing do not receive the full value of 1, but rather a .6



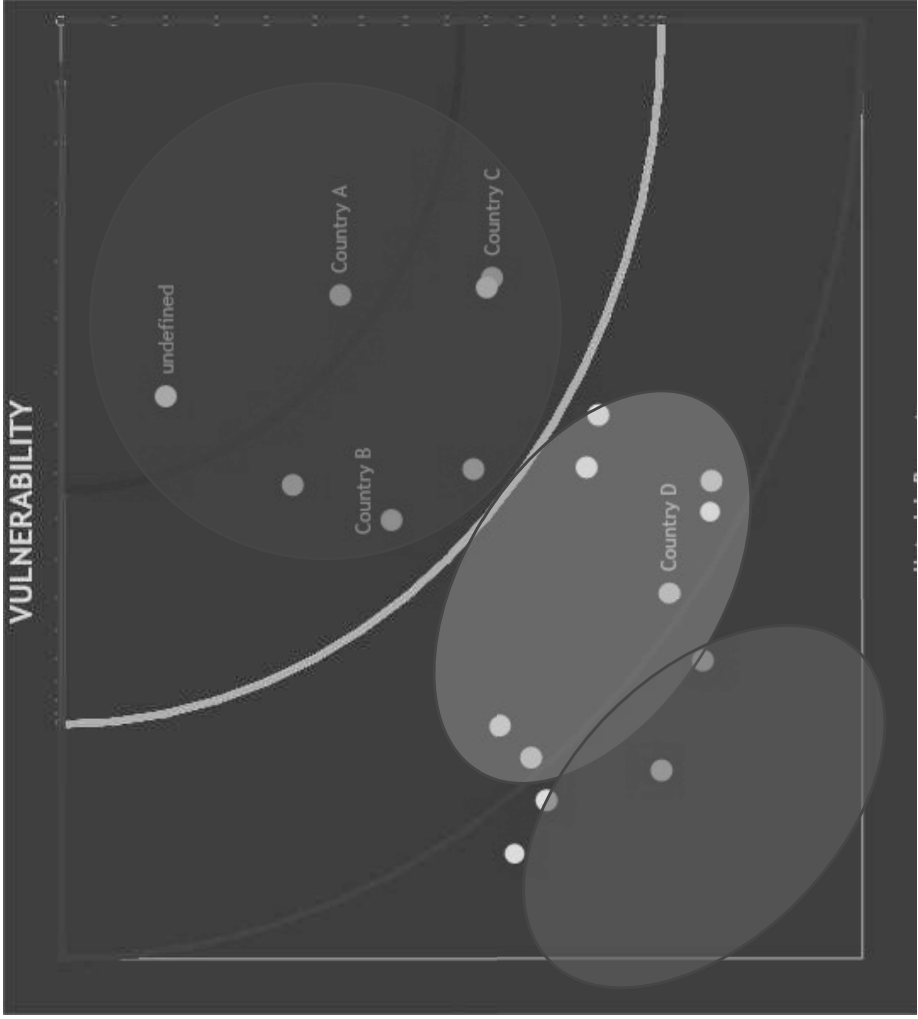
Regulatory Framework – Siloed
Technical Capabilities – Managed
State of Security - Managed

Overall security posture .13 out of 1



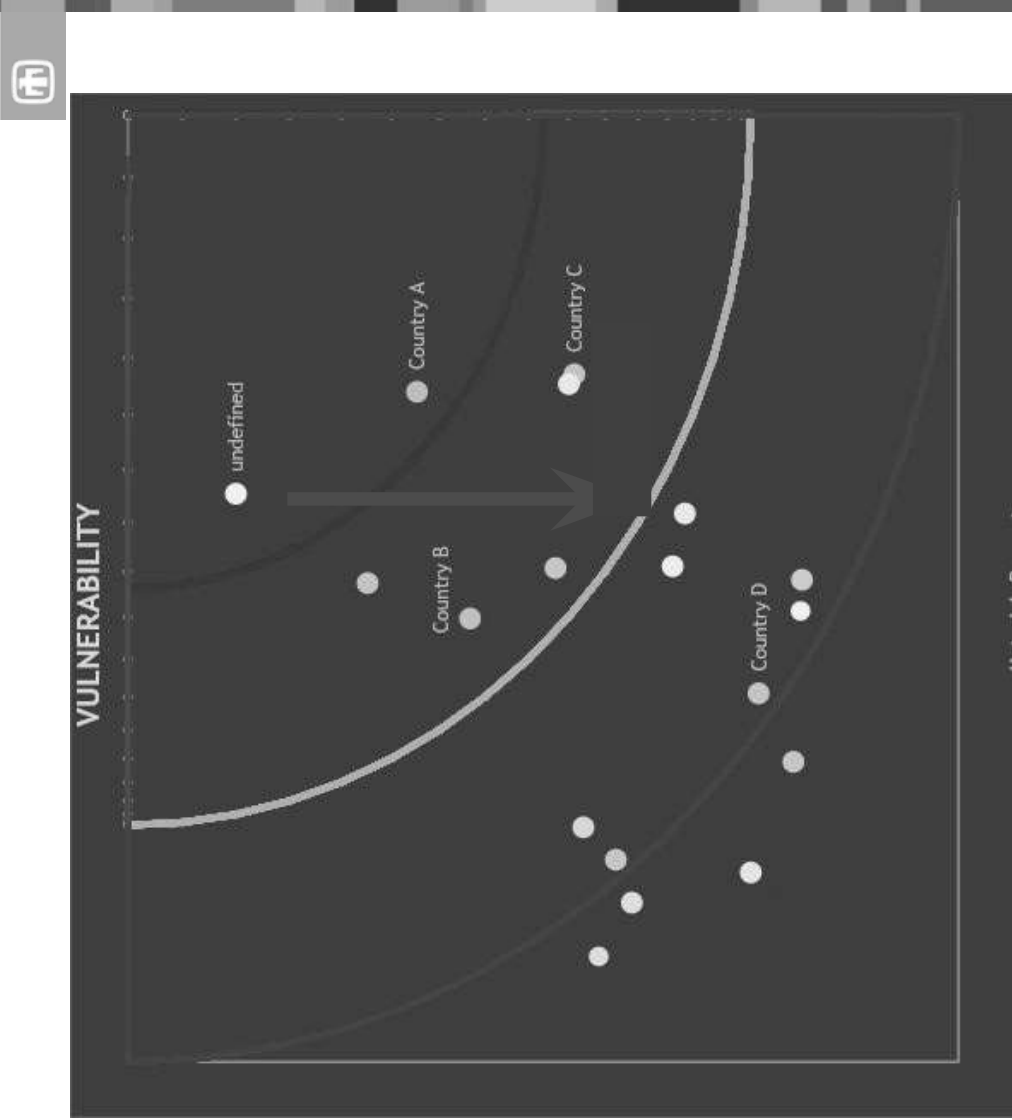
17 Engagement Priorities

Tier I	Countries with Materials with WMD potential and gaps in their security posture	Work to improve security and/or reduce materials
Tier II	Countries with Materials but a better Security Posture	Partner with countries
Tier III	Countries with no notable Materials	Little engagement needed



Changes over time - Hydrozastan

Engagement Strategies	Implemented Measured
Regulatory Framework Changes	No changes Regulatory frameworks (Siloed)
Technical Capabilities Expansion	Increased education and outreach on chemical security with chemical associations (Defined)
State of Security Enhancement	Increased security of the sites with the dual-use chemicals (Defined)
Updated security posture 0.6 out of 1	



Use of multi attribute decision analysis models to characterize the WMD vulnerabilities of countries to help support global threat reduction actions

Global threat reduction actions need to be strategic and effective

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A multi attribute decision analysis model can structure country analysis and provide a framework for relative prioritization of countries

This type of modeling can be used to compare a large set of data points in a defensible and easy to communicate framework

