



## How Do I Know What's Important?

Identifying Supply Risk in a Complex World

Substitution of Critical Raw Materials – Importance for European Electronics Industry Workshop

*6<sup>th</sup> October 2014, Grenoble*

# We are living in a complex world

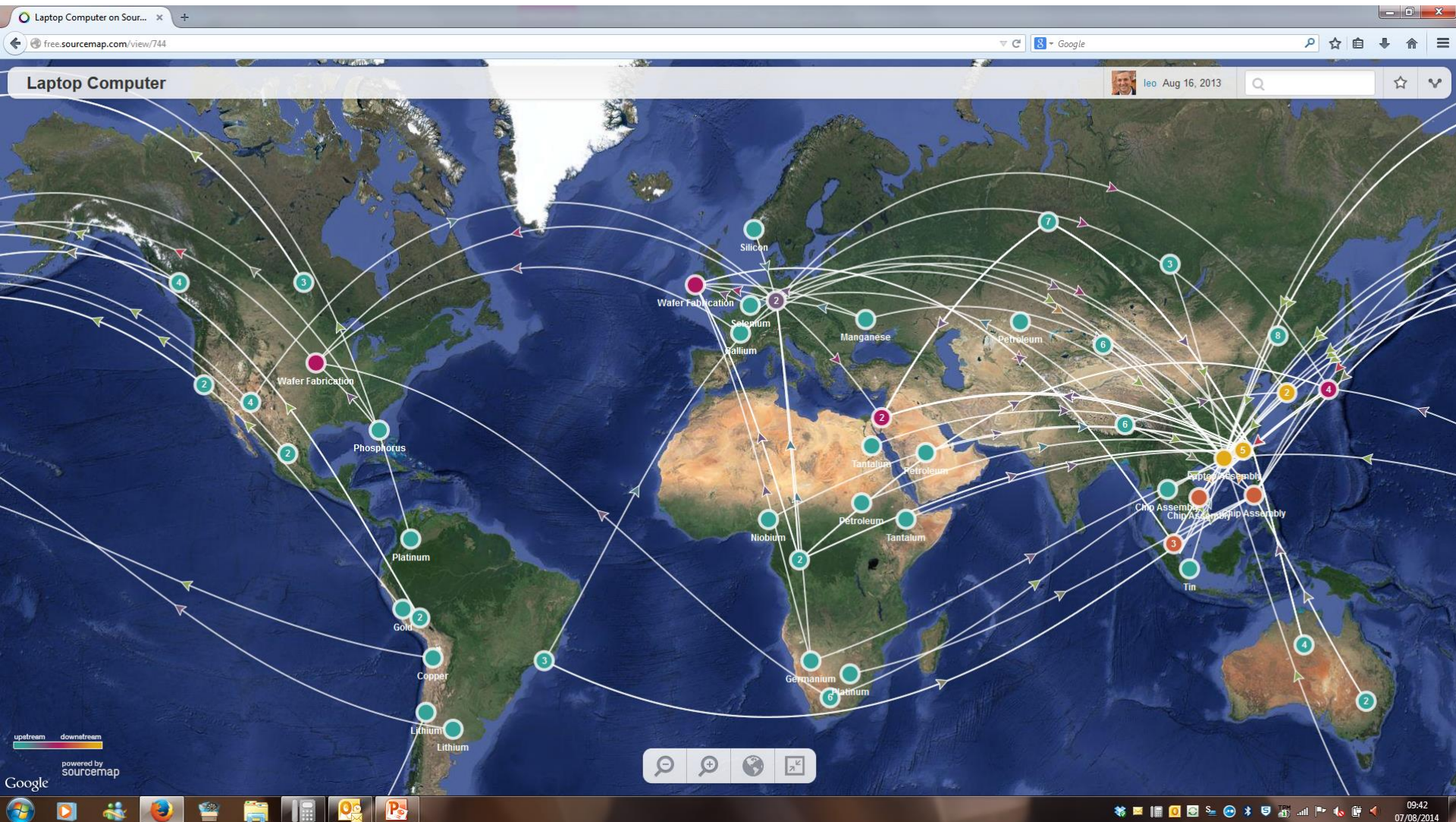
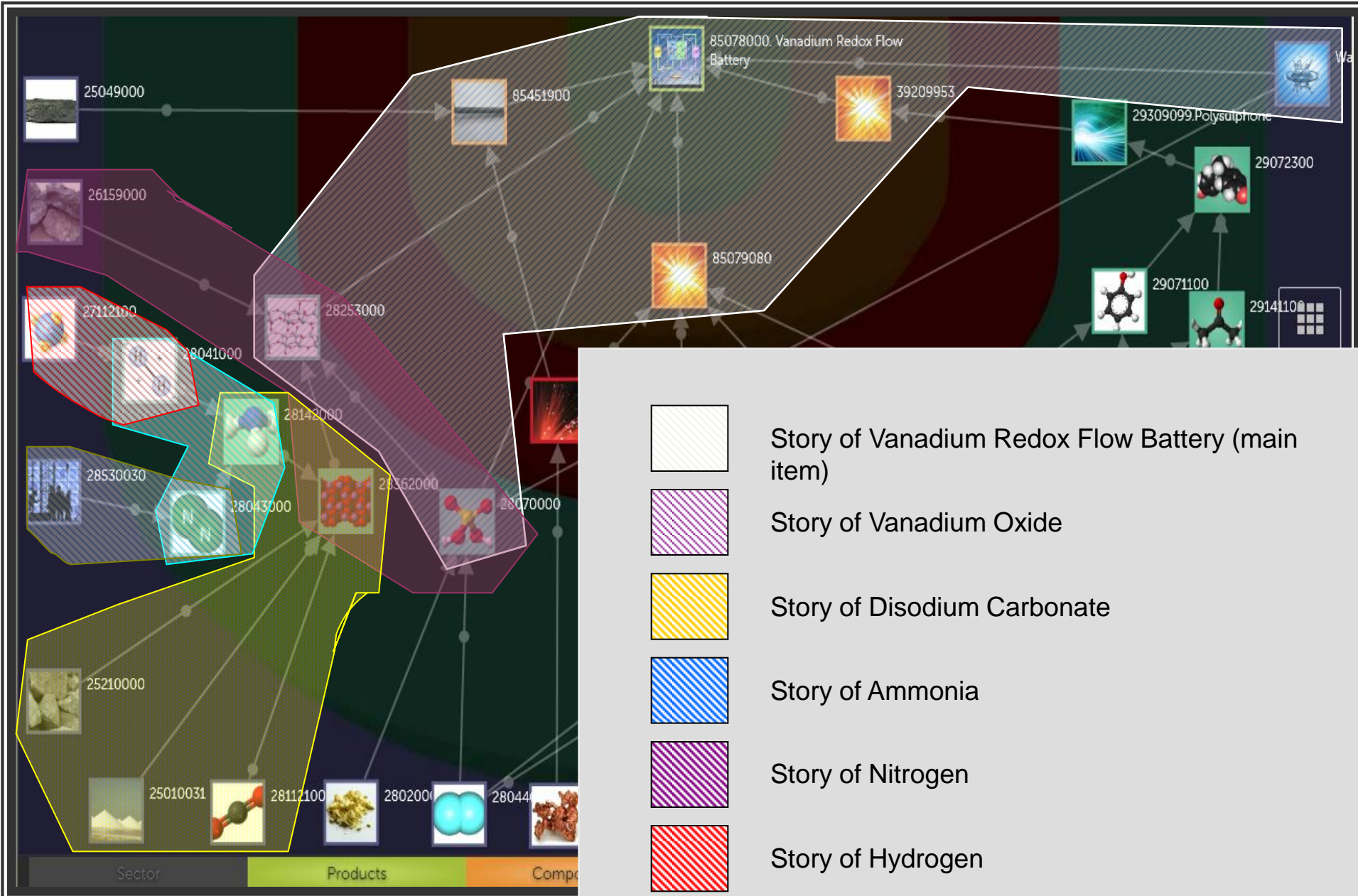


Image taken from Sourcemap



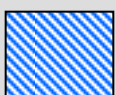
Story of Vanadium Redox Flow Battery (main item)



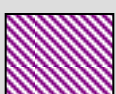
Story of Vanadium Oxide



Story of Disodium Carbonate



Story of Ammonia



Story of Nitrogen



Story of Hydrogen

# Developing a Resource Dashboard

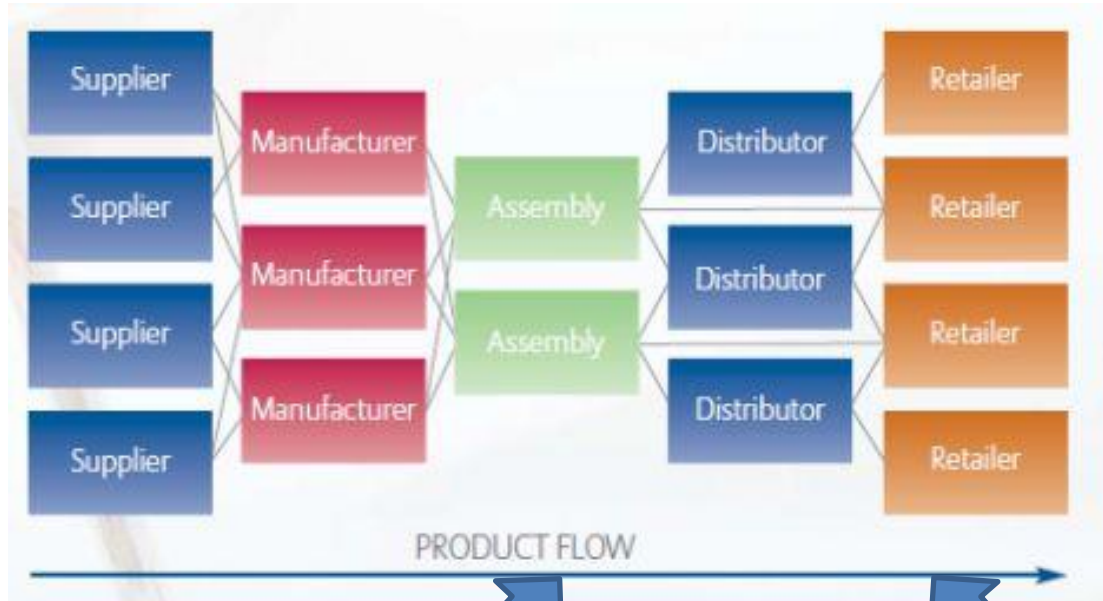
## Resource Security Action Plan

*The House of Commons Science and Technology Committee, and business bodies such as the Aldersgate Group, have called for a dashboard or database to raise awareness and help companies understand the risk and issues associated with the security of materials.*

## Stages of Development

1. An easy to understand representation of the risks to growth resulting from resource limitations
2. Identification of criteria – most useful to identify opportunities and risks
3. Realisation that the limitations may not only be with the primary materials
4. How to represent the interactions – a relational database, and link to other data sources and data rich information
5. How to limit the size of the database

# Linking Data



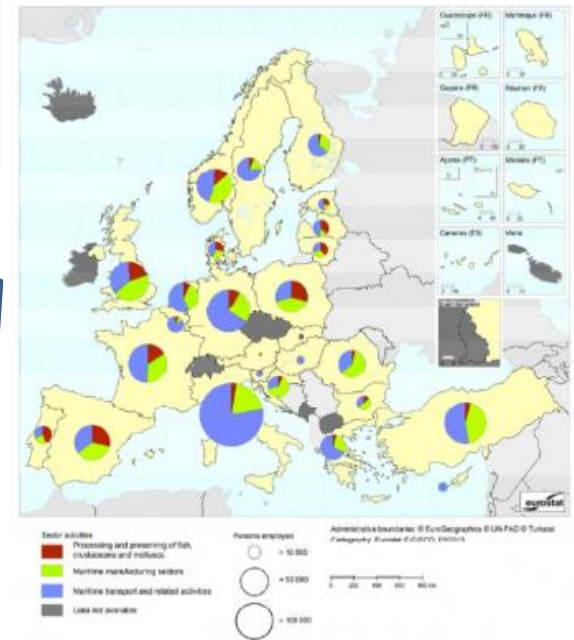
**External Data Sources**



wiseGEEK

**Supply Chain  
Relational Database**

**Statistical Databases**

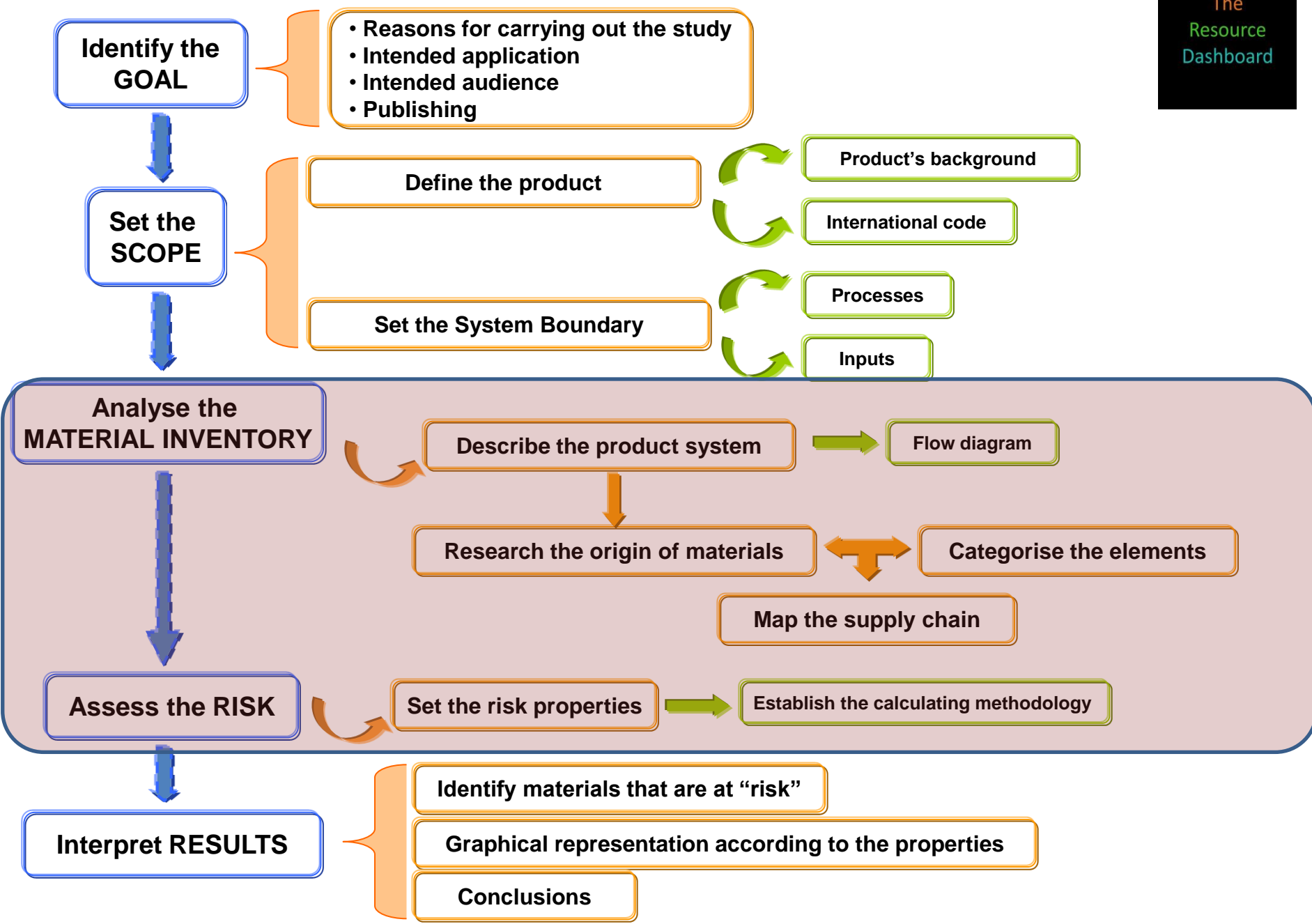


# Other analyses

- Mixture of existing standards and tools
  - Prosuite
  - VDI-Standard: VDI 4800 Blatt 1  
Resource efficiency - Methodical principles and strategies
  - ISO 28000 – Security risks in the supply chain
  - ISO 14051 – Framework for material flow cost accounting
  - LCA – comparisons have been made (potential to conduct both for a specific product – Vanadium Oxide redox flow battery)
  - SCEnAT



# RAIMS: methodological framework



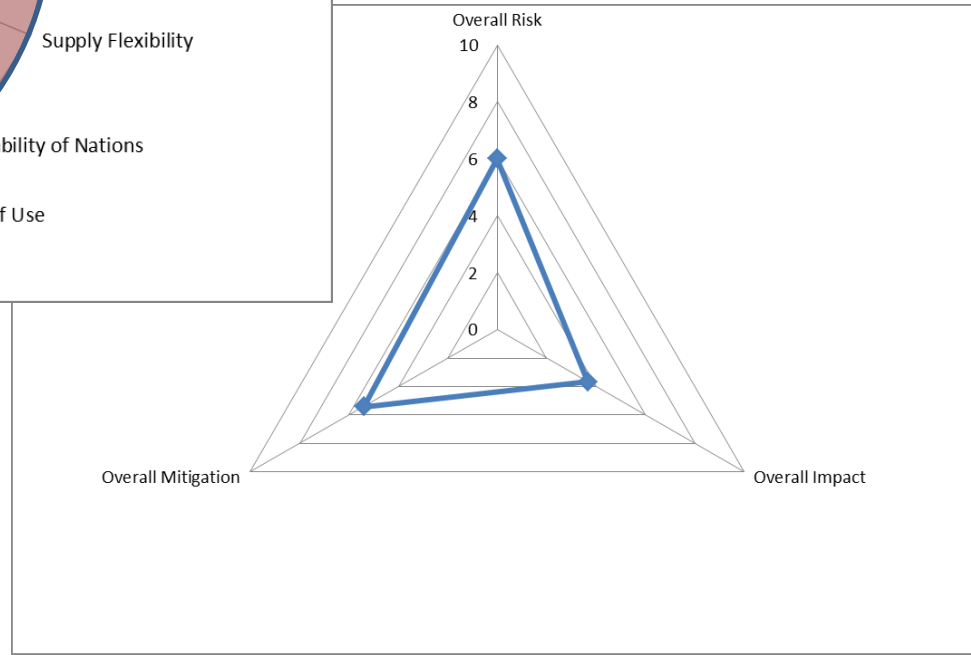
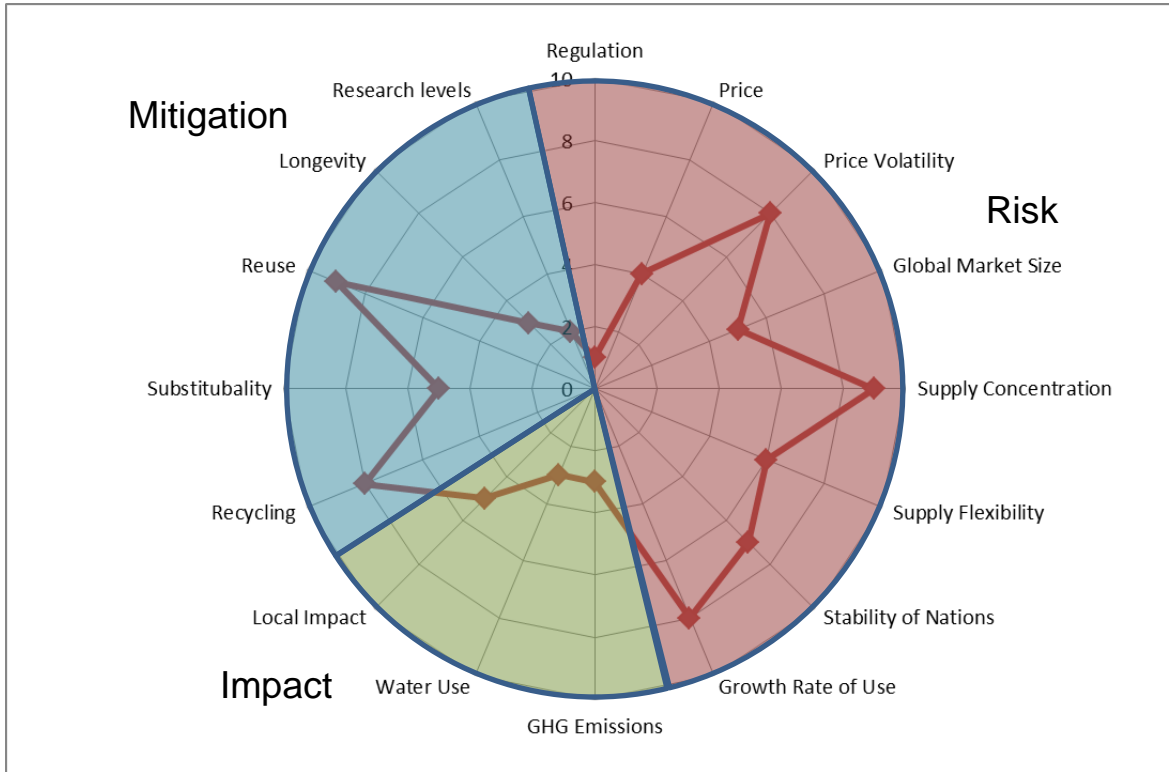
# Mapping the Issues in the Supply Chain

<b>Risk</b>	<b>Impact</b>	<b>Mitigation</b>
Regulation	GHG emissions	Recycling
Price	Water use	Substitutability
Price volatility	Local impact	Reuse
Global market size		Longevity
Supply concentration		Research levels
Supply flexibility		
Stability of nations		
Growth rate of use		

# Interpreting the results – Overall View



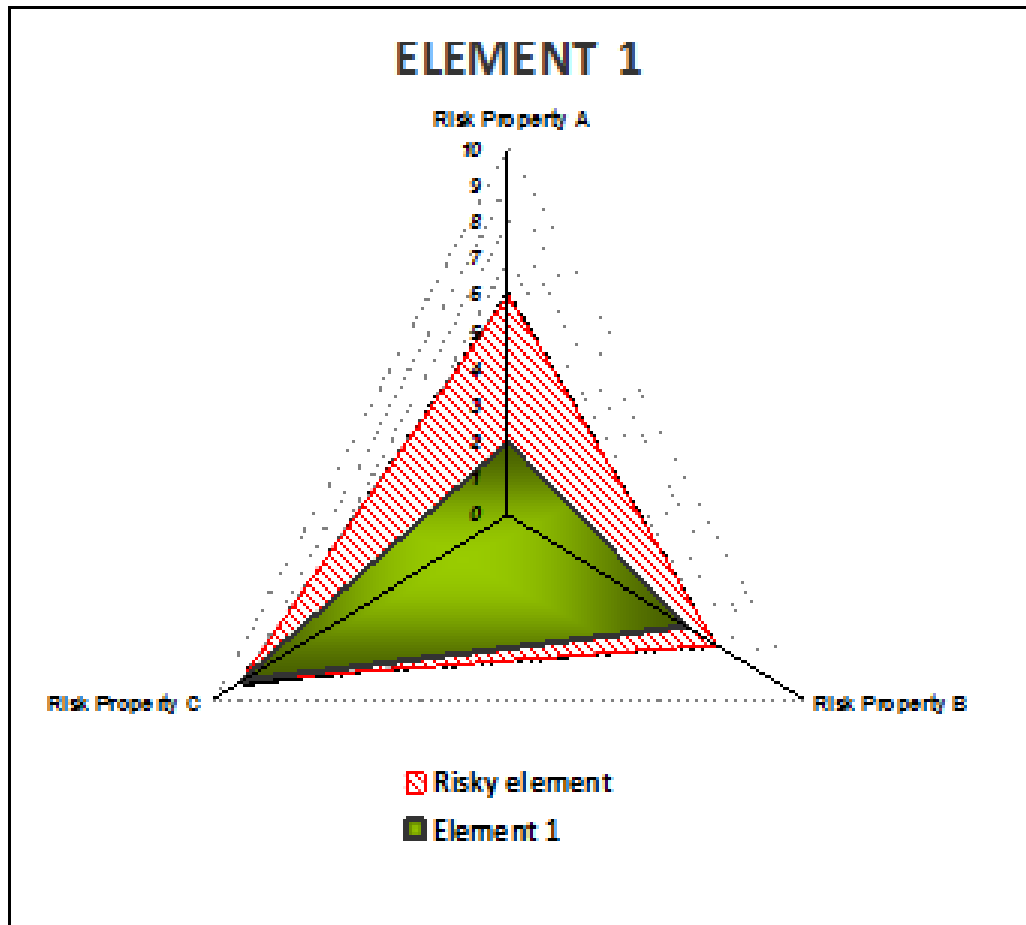
# Interpreting the Results – Single Element



# Interpreting the results

## Shape recognition

A certain shape radar plot is characteristic of a particular scenario



### Property A is risk:

Relatively low risk but high impact and mitigation taking place (e.g. picked up by LCA and seeking substitution)

### Property A is impact:

Potential risk in supply chain, but minimal impact – and mitigation is underway – not picked up by LCA, but a recognised issue in supply chain

### Property A is mitigation:

High impact and high risk, but no mitigating steps – a potential high risk / opportunity area

# What do I do now?

- Identify “hot-spots” for your organisation / product
- Which ones can you influence?
- Do you need to change your supply chain, and at what point (design, use, recovery, substitution)?
- Identify short and long term objectives (a quick fix or long term R&D)

# Some Examples of Resource Efficiency Projects at C-Tech Innovation

- Internal development
  - Vanadium redox flow battery / LCA
  - Identification of key areas of research
    - new products (e.g. Wear2),
    - new processes (microwave chemistry);
    - new from old (Rebiofoam)
    - material recovery (Nd from rare earth magnets)
- European Projects
  - Wastecosmart
  - Remanence
  - Colabats
  - Illuminate
  - Relight



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