

 What are the options for sustainable remediation technology selection?

Richard Clayton, Director



Content

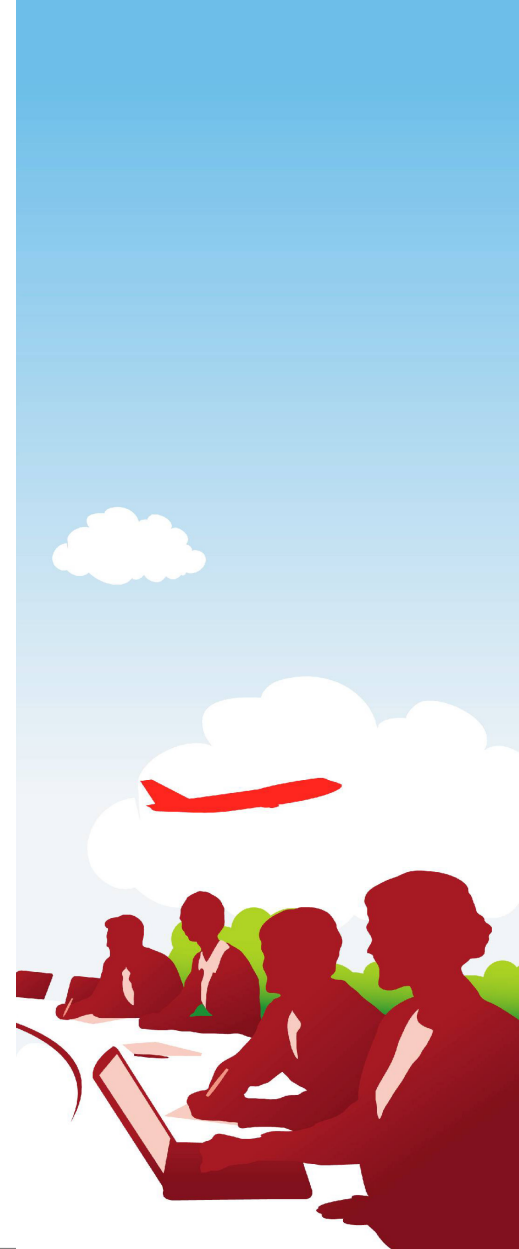
- Setting the Scene
- Sustainability Framework
- Tools for Designing Sustainable Remediation
- “Sustainable Remediation Technologies”
- Final Thoughts
- Conclusions





Why are we talking about it?

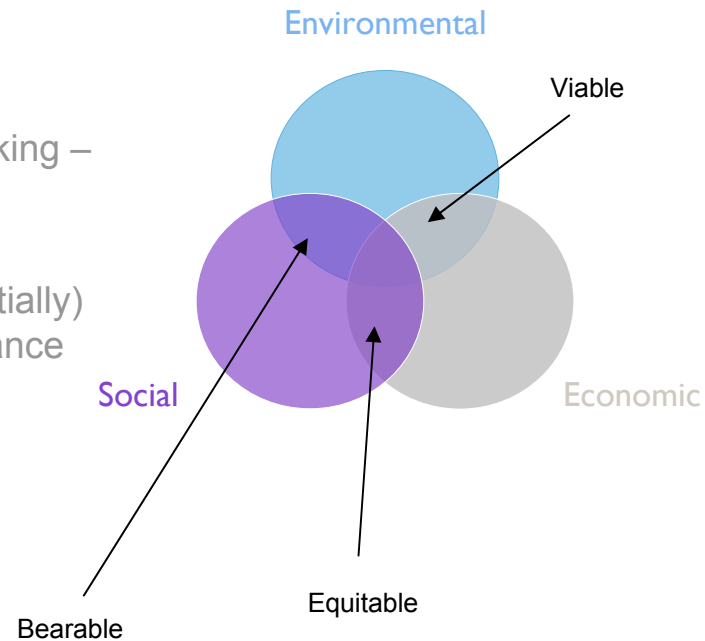
- Global Warming – Our Duty
 - Corporate (CSR) Agenda
 - Competitive Advantage
 - A Commercial Opportunity?
-
- Win Win?





The Facts

- There is no such thing as a sustainable remediation technology
- Sustainable remediation is a way of thinking – a change in behaviours
- Truly Sustainable Remediation is (potentially) incompatible with environmental compliance





The Quandary

- Remediation is viewed as an entirely positive step
- Reduction and / or removal of risks (Legislation)
- No Landfill = Sustainable

But....

-All potential impacts rarely considered
-Politics
-National, regional and cultural differences

SSTL TCE (UK) – 120mg/l
SSTL TCE (Italy) – 0.0015mg/l
Which one is sustainable?
Direct/Indirect Impacts?

In the UK we have a pragmatic approach.
Inconsistent & without method.
Is it sustainable?





A Busy Year

- 2008 USEPA Green Remediation Guide
- <http://www.clu-in.org/download/remed/green-remediation-primer.pdf>

- 2009 Sustainable Remediation Forum (SURF) USA White Paper
- <http://www.sustainableremediation.org/library/issue-papers/>

- 2009 SURF UK – A framework for assessing the sustainability of soil and groundwater remediation (draft for consultation)

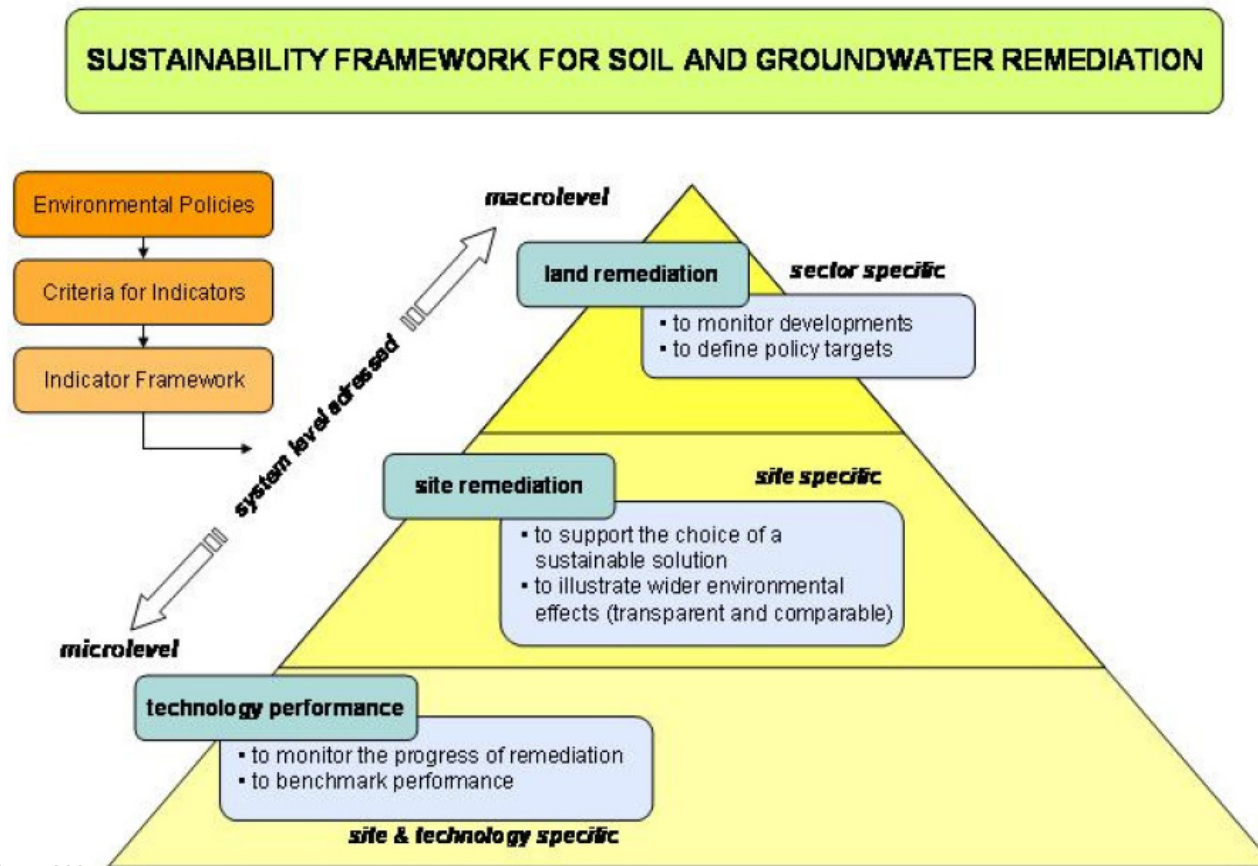
- (early) 2010 NICOLE – Sustainable Remediation Position Paper

- ... previously
- 2007 Eurodemo Framework for Sustainable Land Remediation & Management





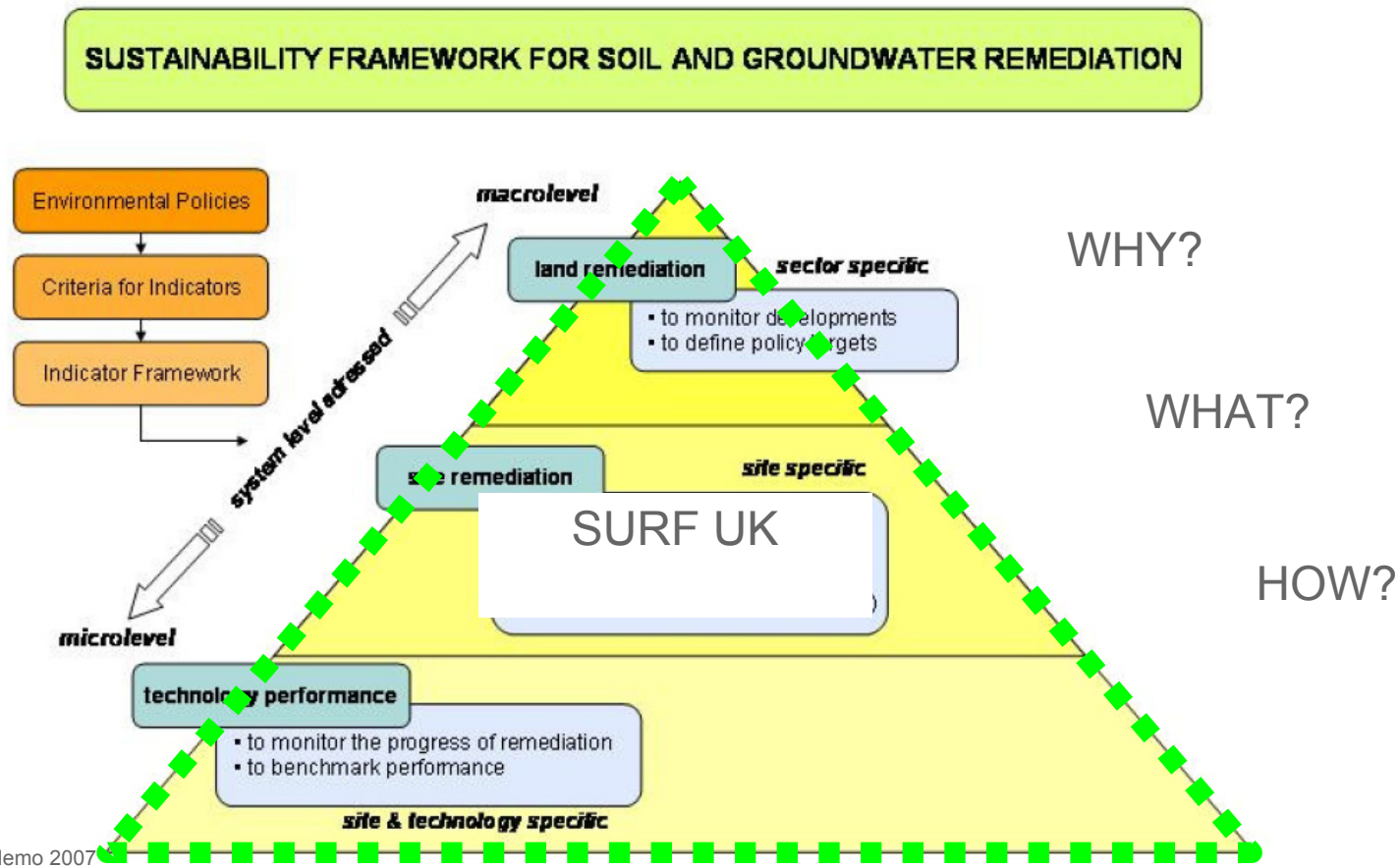
A Sustainable Remediation Framework

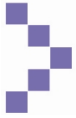


Source: Eurodemo 2007

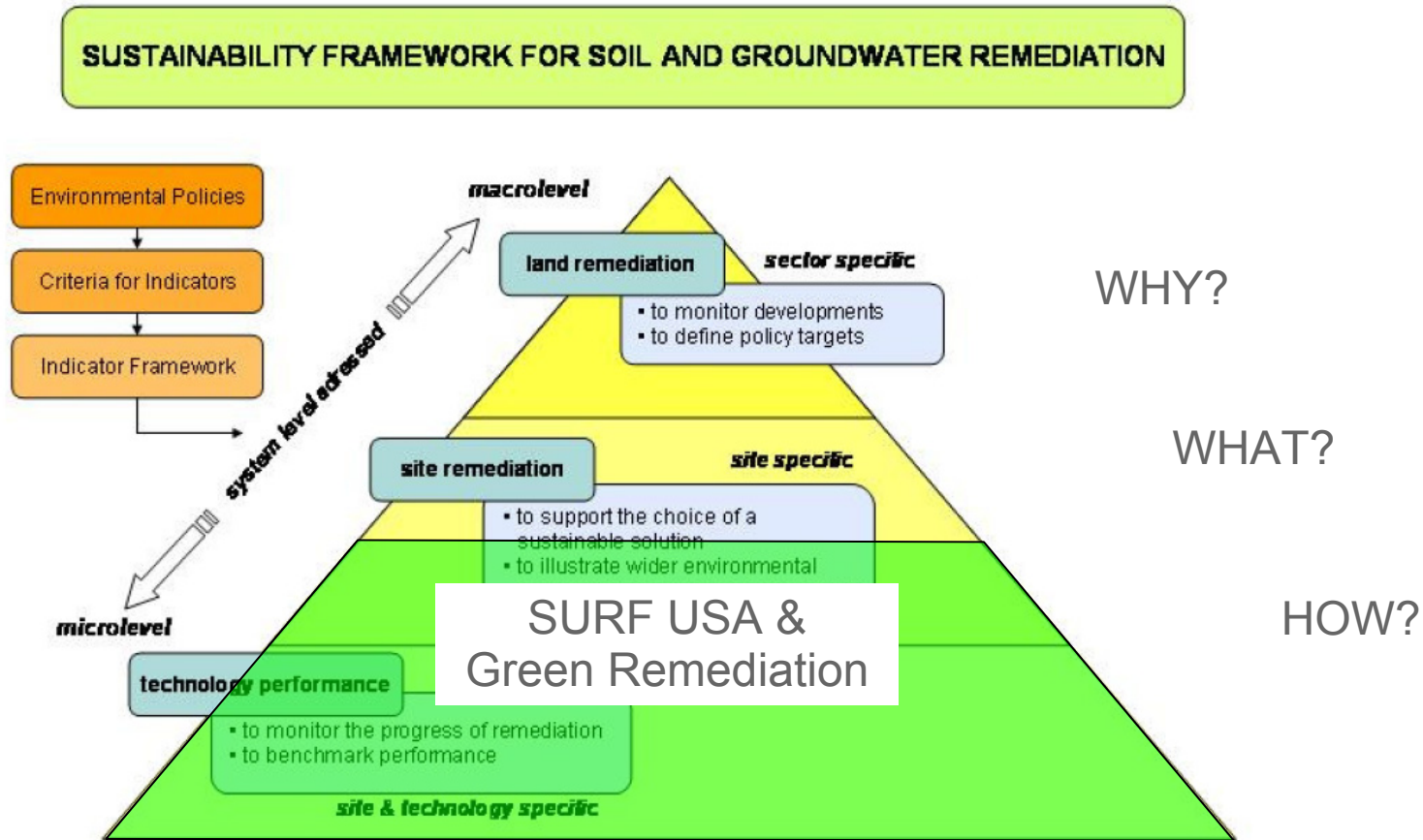


A Sustainable Remediation Framework



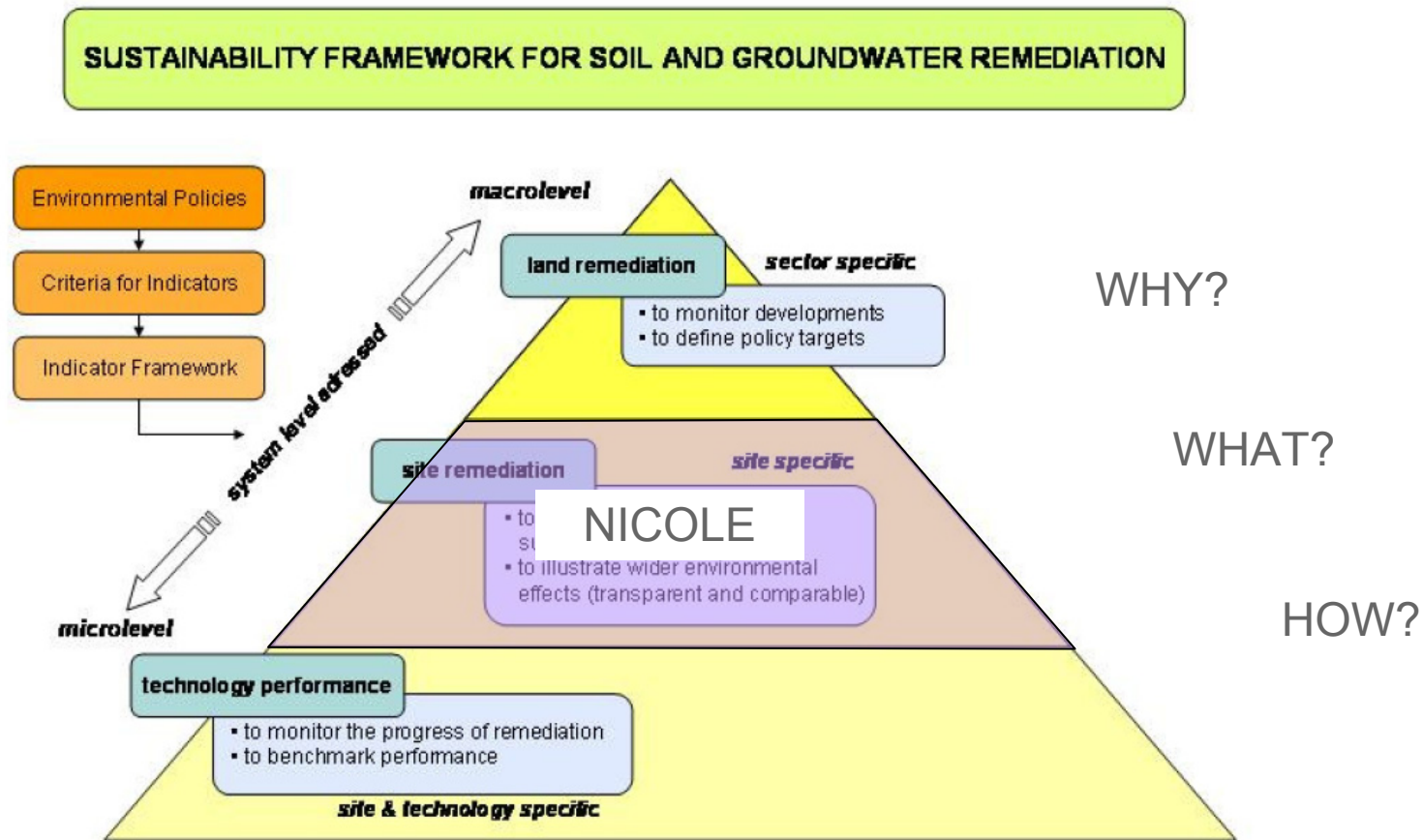


A Sustainable Remediation Framework



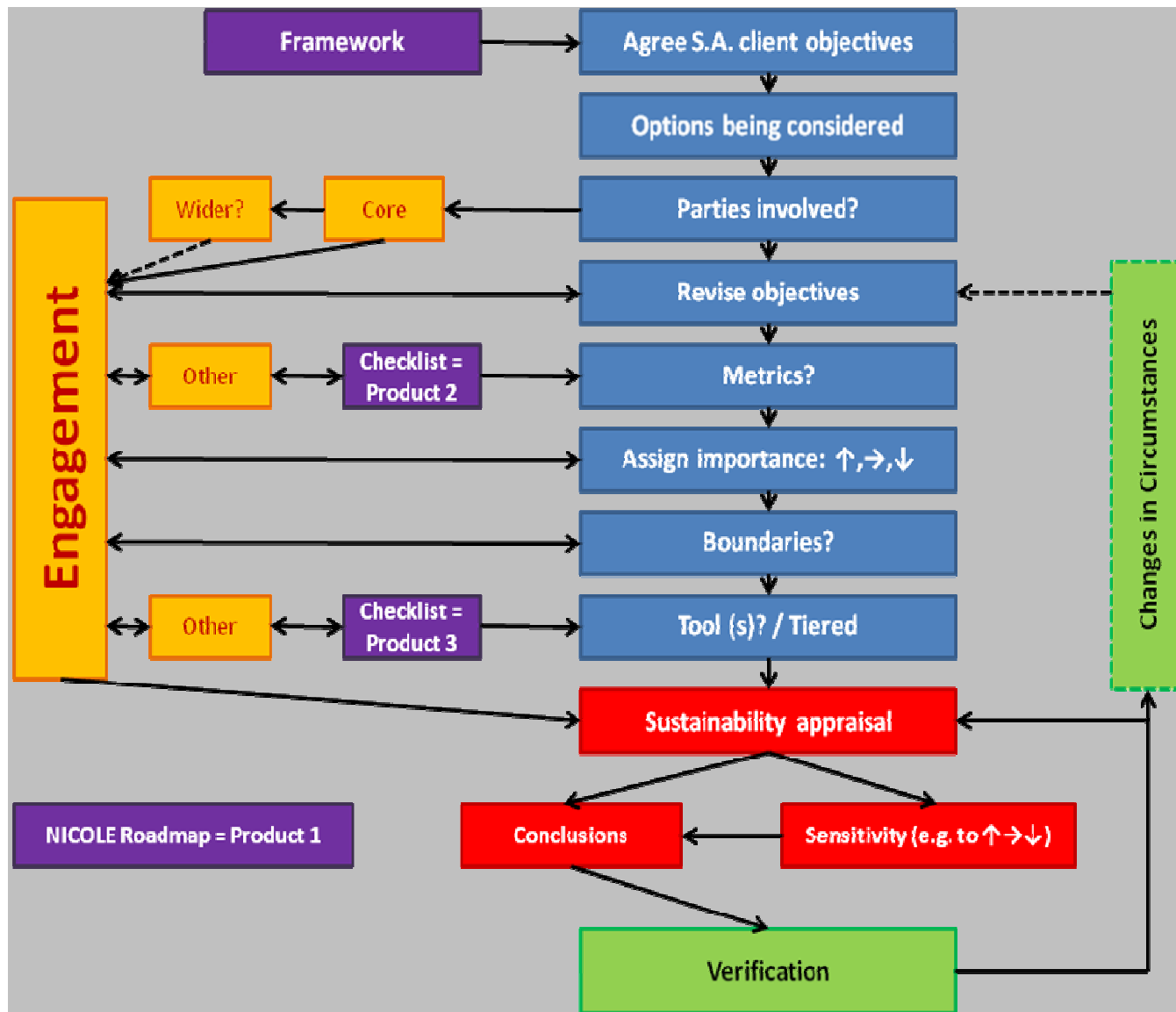


A Sustainable Remediation Framework





NICOLE Roadmap



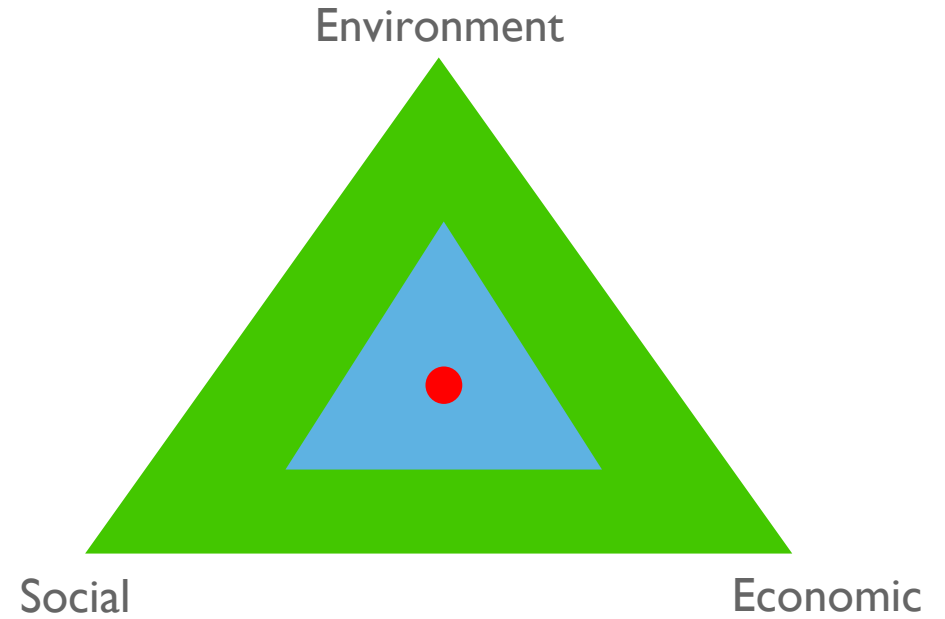
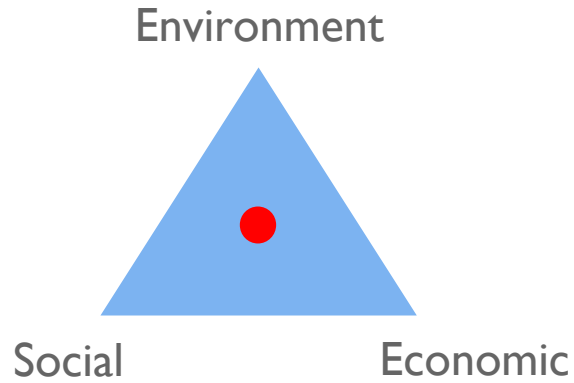


Policy

- Planning Policy Statement 1 and 23
- Environment Act 1995 (s4)
- Environment Act 1995 (s39)
- Environmental Protection. Act 1990 Part IIa
- EU Water Framework Directive
- Draft EU Soil Protection Framework Directive (Stalled)



Why is Policy Important?



Reference Steve Wallace, National Grid, NICOLE 2009



Surf UK Sustainable Remediation Framework

SURF-UK (Working) Definition:

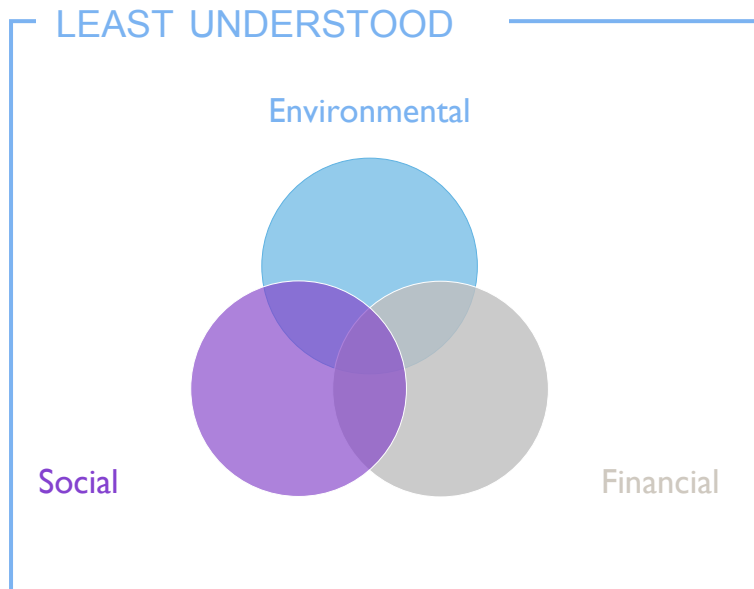
...the practise of demonstrating, in terms of environmental, economic and social indicators, that an acceptable balance exists between the effects of undertaking the remediation activities and the benefits the same activities will deliver.

- **Principle 1:** Protection of human health and the wider environment.
- **Principle 2:** Safe working practices.
- **Principle 3:** Consistent, clear & reproducible evidence-based decision-making.
- **Principle 4:** Record keeping and transparent reporting..
- **Principle 5:** Good governance and stakeholder involvement.
- **Principle 6:** Sound science.

Source: Frank Evans, National Grid and SURF-UK



Designing a Sustainable Remediation Project



- LEAST GUIDANCE
- Identify Stakeholders
 - Agree Objectives
 - Identify Indicators (Surf UK)
 - Define Boundaries
 - Quantify/Estimate Impacts
 - (direct & indirect impacts)
 - (primary & secondary impacts)
 - Consider Impacts (Costs) vs Benefits
 - = Sustainability Assessment?



Tools & Approaches

Report to the sue-MoT consortium:

**Sustainable Urban Environment – Metrics,
Models and Toolkits:**

Analysis of sustainability/social tools

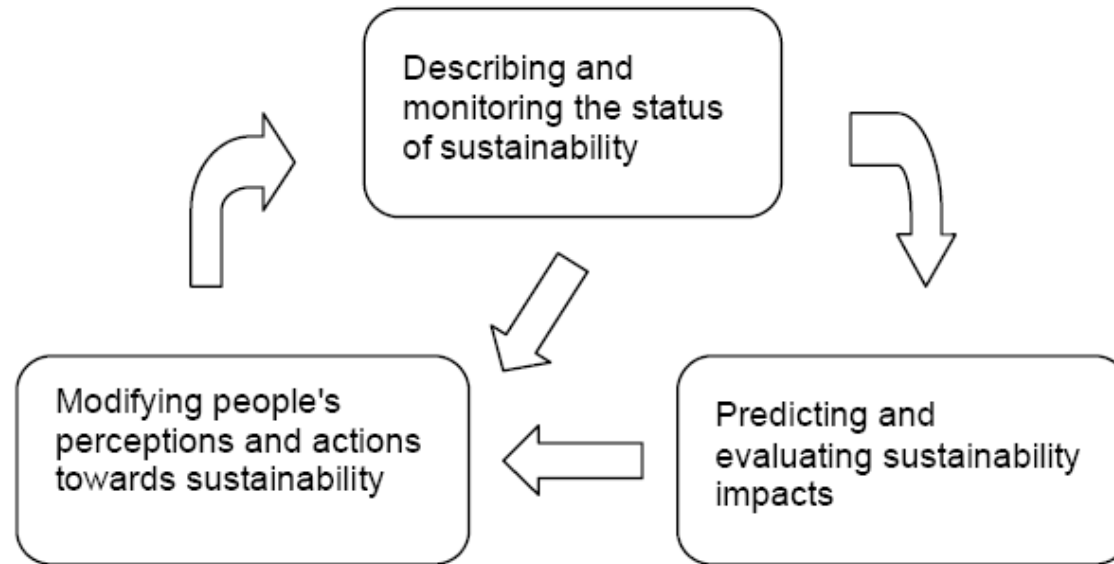
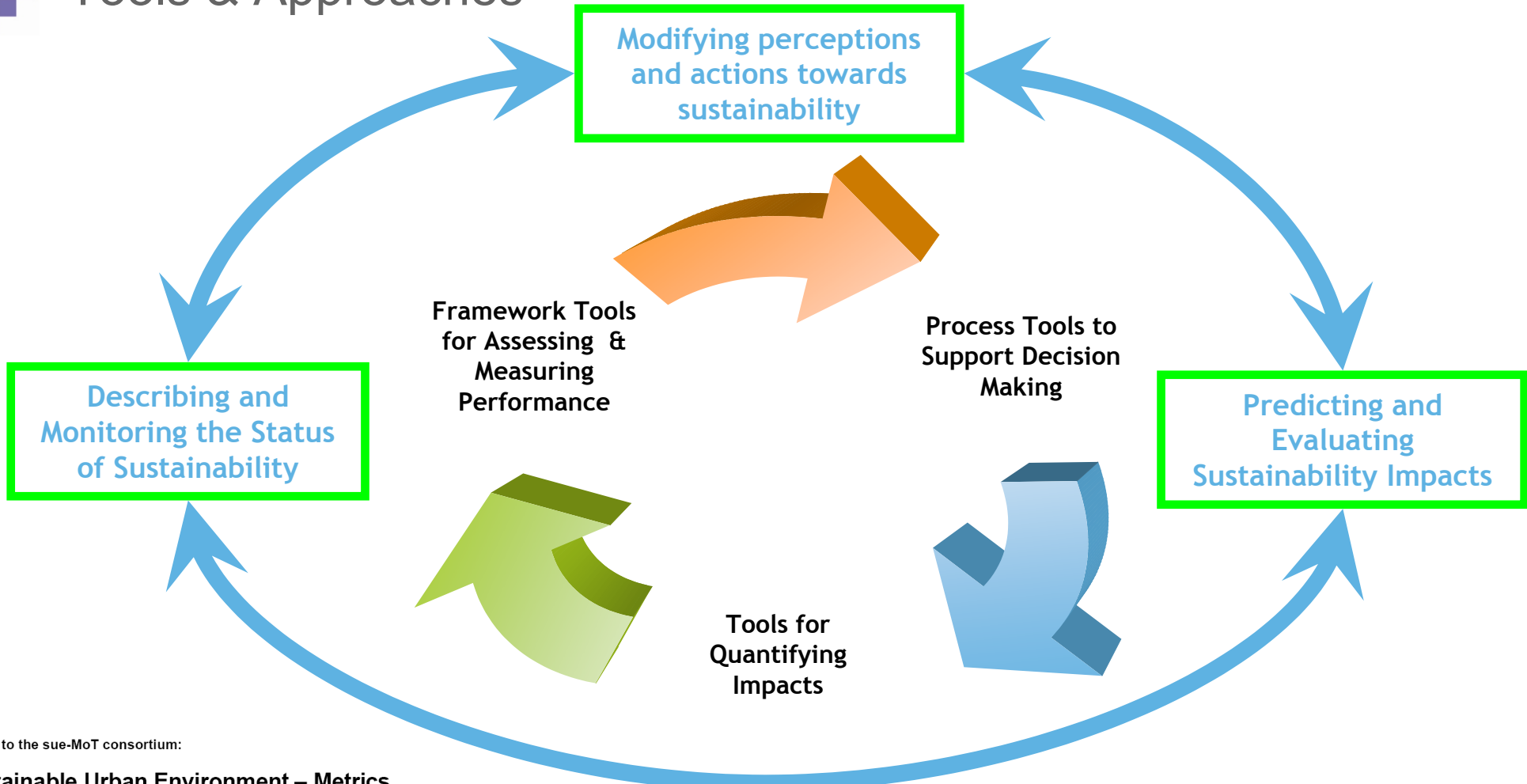


Figure 1. Links between broad categories of sustainability tools/approaches



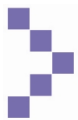
Tools & Approaches



Report to the sue-MoT consortium:

Sustainable Urban Environment – Metrics, Models and Toolkits:

Analysis of sustainability/social tools



**BREEM
LEED
One Planet Living
CEEQUAL**

Framework Tools
for Assessing
Performance



Process Tools to
Support Decision
Making

**LCA
NEBA
CBA
EIA
SA
RA**



Tools for
Quantifying
Impacts



**Environmental
Impacts
Traditional Tools**

**Multi-Criteria Tools
Semi-Quantitative**

**Intensity Tools
Carbon Calculators
Water Footprints
Materials intensity**

**Social
Qualitative?**

**Economic?
Qualitative?**



Euro-Demo Environmental (Eco) Intensity Indicators

ENVIRONMENTAL IMPROVEMENTS	ENVIRONMENTAL IMPACTS
Area of rehabilitated land (m ²)	Energy Consumption (TJ)
Mass of treated contaminants (kg)	Water Consumption (m ³)
Mass or volume of treated groundwater (m ³)	Generated Waste (kg)
	Global Warming (kg CO ₂)

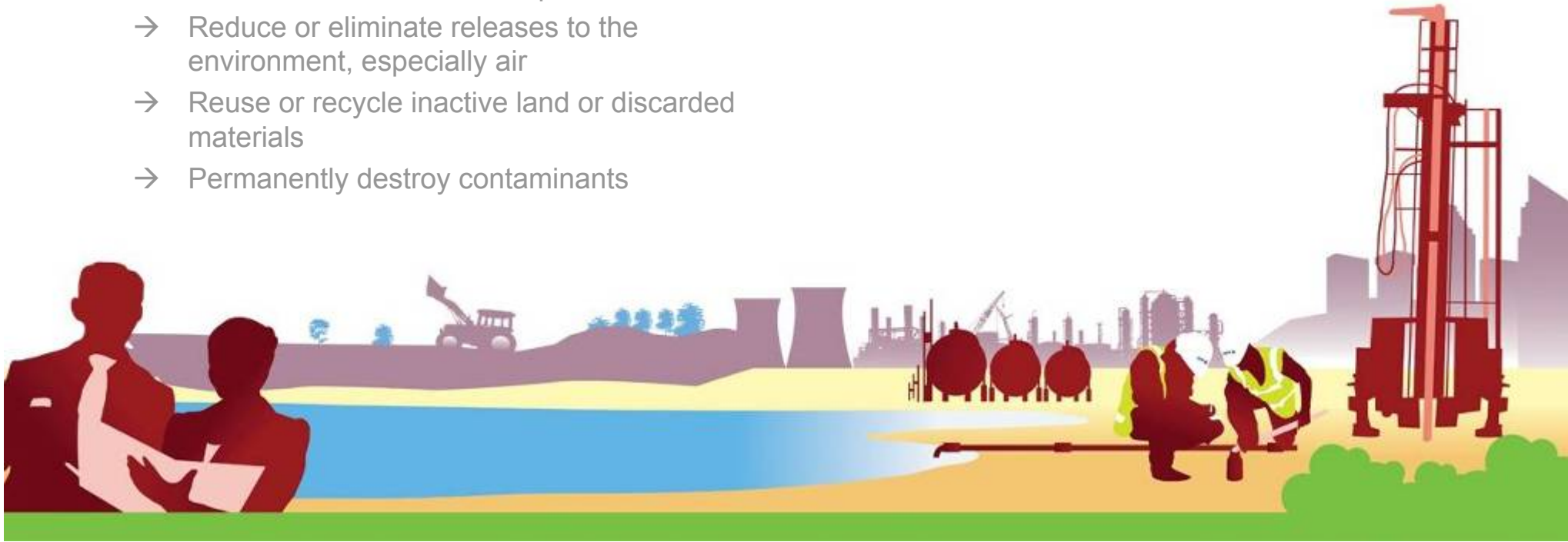




Green Remediation Technologies

Surf USA Recommends:

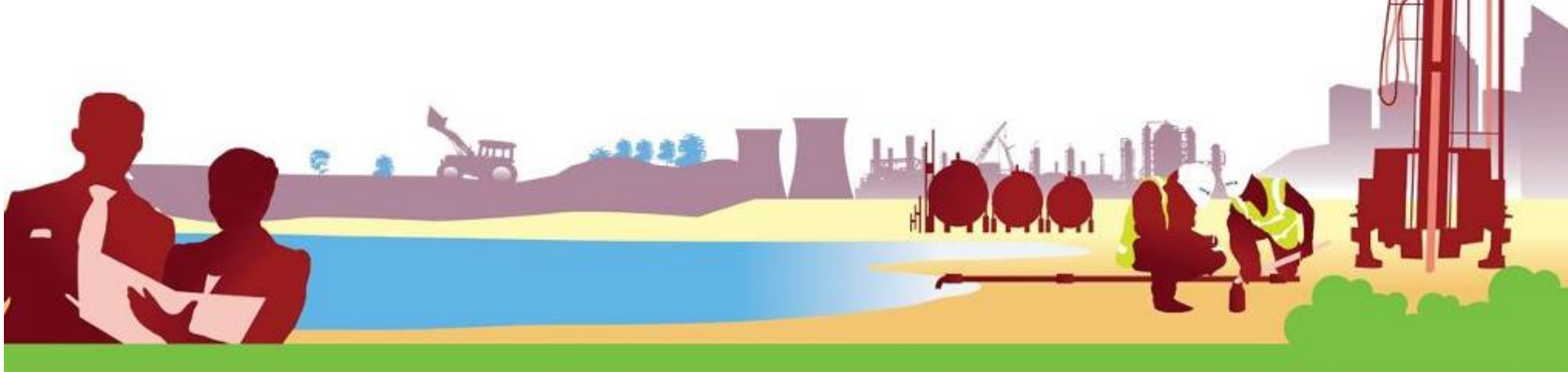
- Minimize or eliminate energy or natural resource consumption
- Harness or mimic a natural process
- Reduce or eliminate releases to the environment, especially air
- Reuse or recycle inactive land or discarded materials
- Permanently destroy contaminants





Bioremediation

- ☺ **Minimize or eliminate energy or natural resource consumption**
- ☺ **Harness or mimic a natural process**
- ☹ Reduce or eliminate releases to the environment, especially air
- ☹ Reuse or recycle inactive land or discarded materials
- ☺ **Permanently destroy contaminants**
- ☹ Accelerate release of CO₂? (ex-situ)
- ☹ Generation of daughter products?
- ☹ Manufacturing Process Bioremediation products – Limited Knowledge of Material Intensity
 - Water Footprint?
 - Carbon Footprint?
 - Natural Resource Use?





Chemical Oxidation & Reduction

- ☺ **Minimize or eliminate energy or natural resource consumption**
 - ☺ **Harness or mimic a natural process**
 - ☺ **Reduce or eliminate releases to the environment, especially air**
 - ☹ Reuse or recycle inactive land or discarded materials
 - ☺ **Permanently destroy contaminants**
- ☹ **Manufacturing Process – Limited Knowledge of Material Intensity**
 - Water Footprint?
 - Carbon Footprint?
 - Natural Resource Use?





Thermal Treatments

- ☹ Minimize or eliminate energy or natural resource consumption
- ☹ Harness or mimic a natural process
- ☹ Reduce or eliminate releases to the environment, especially air
- ☹ Reuse or recycle inactive land or discarded materials
- ☹ Permanently destroy contaminants
- ☺ Accelerate treatment timescales – possibly reducing impacts?

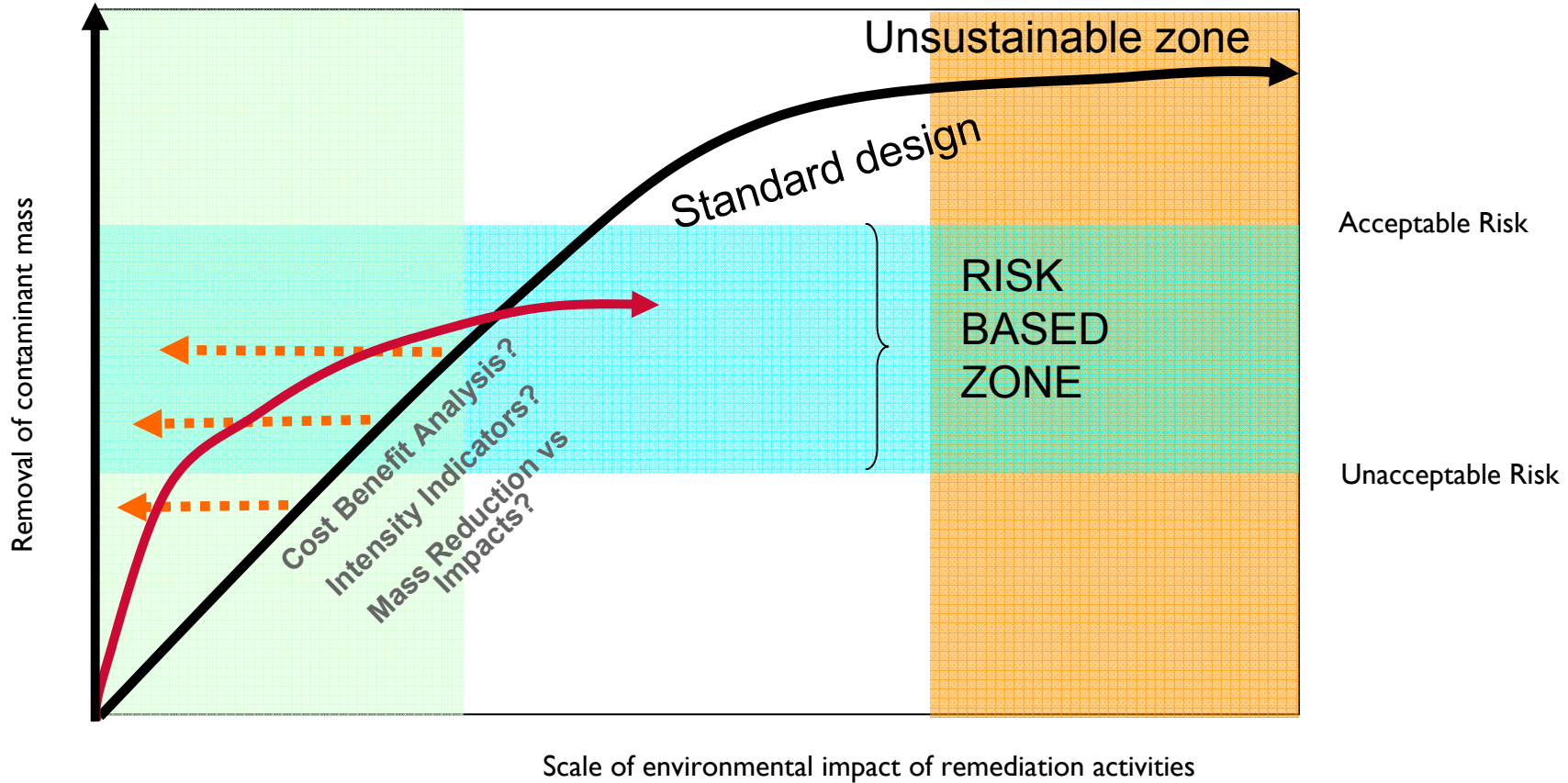




A final thought

→ Principle 1 of SURF UK is protection of human health and environment

→ Risk assessment and risk reduction





Conclusions

- Rapidly Evolved
 - Clear framework is proposed
 - Green remediation technologies exist
 - Most work required in developing a sustainable remediation design process (meat in the sandwich)
 - Relationship between risk assessment and sustainability needs exploring
-
- Education, Education, Education
 - It's a way of thinking



Thank you.

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