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Using risk assessment and sustainability to make the most cost-effective contaminated land management decisions

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- r³ environmental technology ltd, www.r3environmental.com;
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Scale of the Problem

Volume

- UK 300,000 sites?
- Europe ~2.5 million
- China: >10-20% land area?
- JAPAN 300,000 sites?

Cost

- UK £1 bn per year
- EU €3 bn per year
- USA total of >\$110 bn
- China, national fund of RMB 30 bn
- JAPAN €1 bn per year

- These are huge costs
- Public money needs to be properly spent
- This huge public endeavour needs to be sustainable.



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Where we started

The explosion of Love Canal 1978, USA



Abandoned houses - toxic waste sludge in
the middle

Credit US EPA



Where we started

Lekkerkerk, 1980/81, NL



A new neighbourhood in the Dutch village of Lekkerkerk was found to be on a chemical landfill site



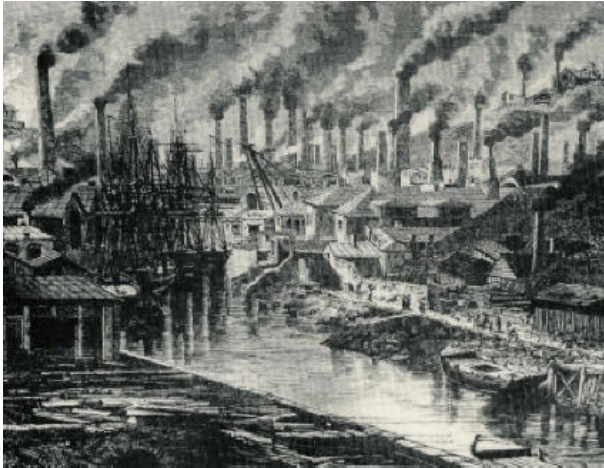
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Where we started

The Lower Swansea Valley, C18- 1950s to restoration in the 1980s, UK



The world's largest copper smelting
area C19

<https://www.youtube.com/watch?v=XLIt-0jZRVE>

<https://www.youtube.com/watch?v=nG7R2nMxWAK>

Credit, University of South Wales,



Mitigate harm, bring the site back into use?

- But how?
 - Removal to land fill, containment, treat?
 - How do we know what is harmful?
- Initially used thresholds linked to possible toxicity (UK 1979)
- In many countries by mid 1990s risk assessment came to be seen as the most rationale approach to decision making, but
 - Functional, or
 - Multi functional
- And what is the environmental “cost” of the remediation, e.g. REC 1993, NL, WEV 1990s, UK.
- There was much international debate: EU networks NATO Studies (via its civic society arm, also involving Japan and Australia) and an “Ad Hoc” International Working Group

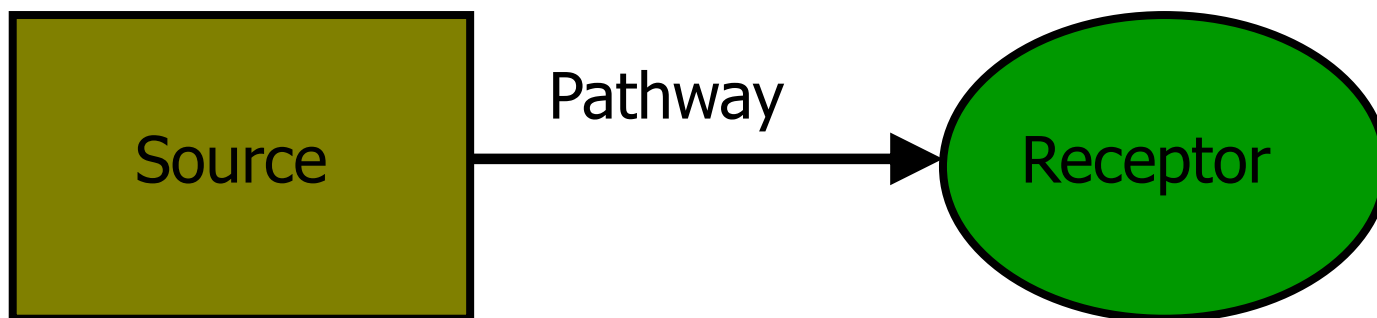
Key Point (1) Risk Based Land Management (CLARINET 2002)





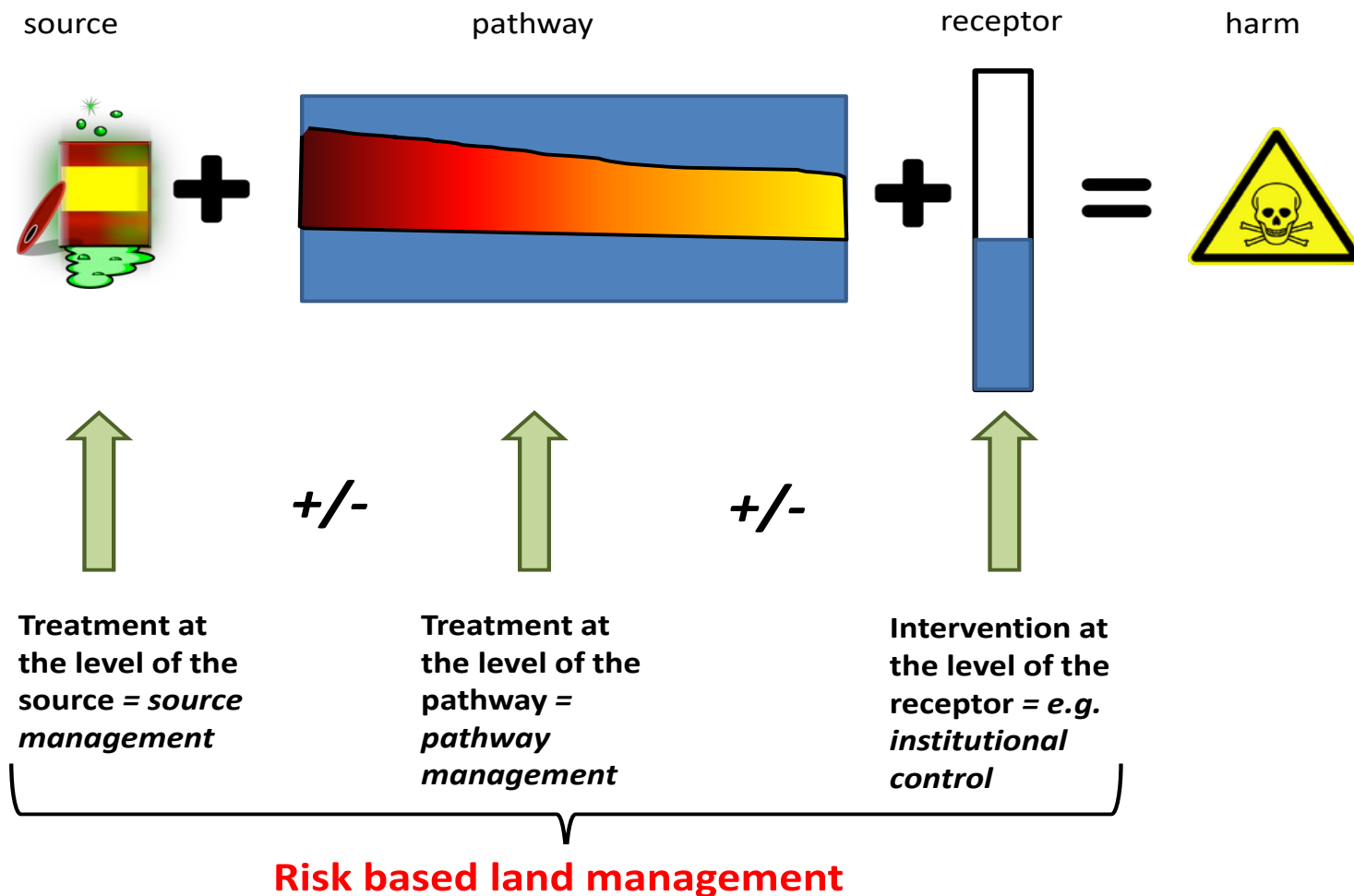
What is risk based land management?

- Risk describes the amount of harm and the probability that it might happen
- For a risk to occur three elements need to be linked:





What is risk based land management?





Benefits of RBLM

- Objective understanding of likely harm
- Methodological framework and rationale for effective remediation
- Ability to prioritise resources to the most significant / urgent problems

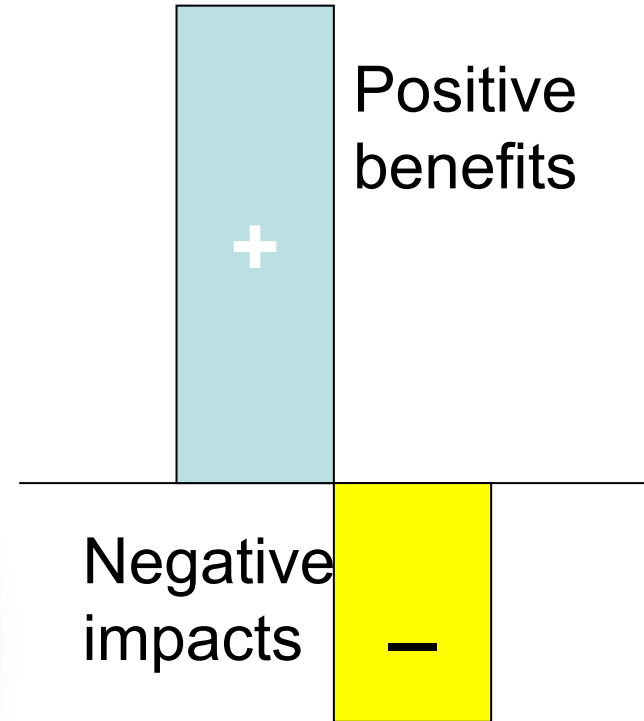
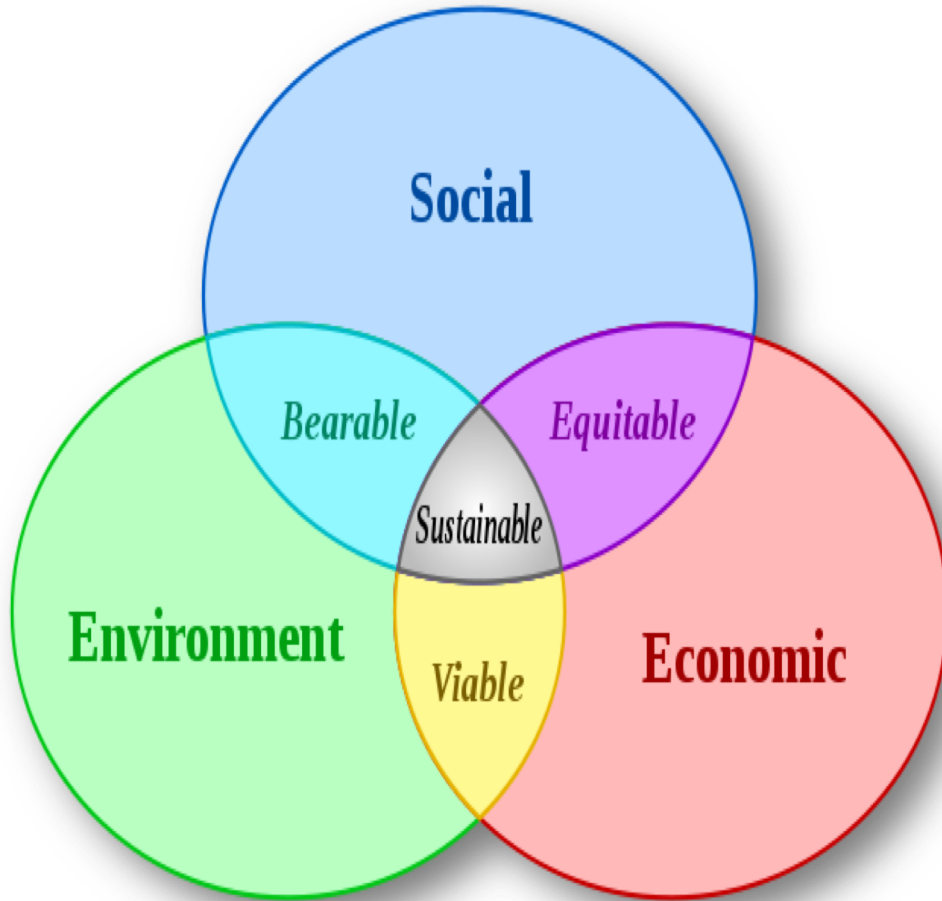
But is it sustainable?

Well it optimises how we prevent harm, but it does not necessarily consider either

- Possible impacts elsewhere, e.g. moving contaminants from soil to air, or carbon “costs”
- Possible wider benefits e.g. a better landscape, positive improvements in public health



Sustainability



....a net benefit



Why sustainability? The Big Picture

Enterprise Pressure

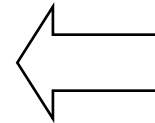
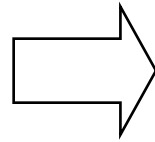
Reputational value

Shareholder value

Take-over threats

Opportunity costs

Globalisation



Societal Pressure

Rising expectations of quality of life

Wish for better business and government ethics

Land contamination and people, homes and schools

Accountability

Codes of conduct

Corporate Scandals



Key Point (2) Sustainable Remediation



- Sustainable remediation
*‘the practice of demonstrating, in terms of **environmental**, **economic** and **social** indicators, that the benefit of undertaking remediation is greater than its impact and that the optimum remediation solution is selected through the use of a **balanced** decision-making process’*

www.claire.co.uk/surfuk



So what does sustainable remediation deliver?

- Better optimised risk management
- Additional benefits and value
- Identifying and avoiding project risks
- Demonstrable compliance with government and/or corporate policies and goals for sustainable development
- Positive impact on reputation and public relations



Being a “good guy”: a contributor to sustainable development

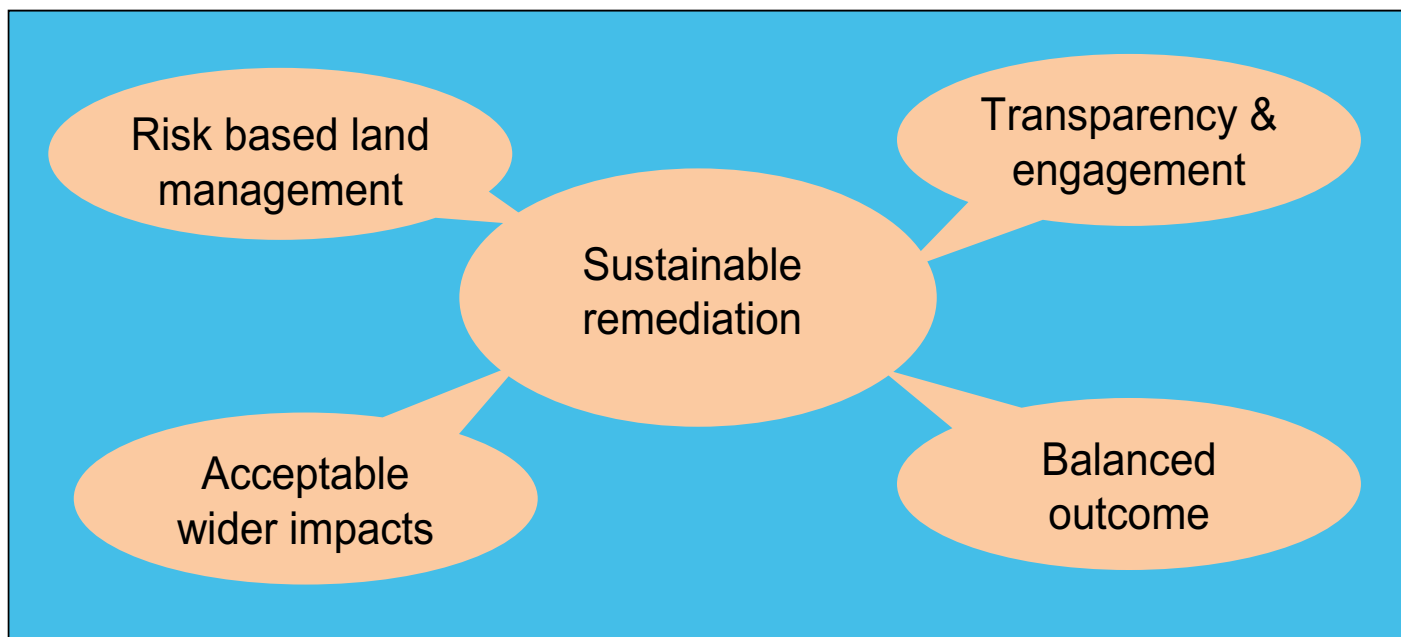


What does sustainability include?

Environment	Social	Economic
Emissions to Air	Human health & safety	Direct economic costs & benefits
Soil and ground conditions	Ethics & equality	Indirect economic costs & benefits
Groundwater & surface water	Neighbourhoods & locality	Employment & employment capital
Ecology	Communities & community involvement	Induced economic costs & benefits
Natural resources & waste	Uncertainty & evidence	Project lifespan & flexibility



Sustainable remediation





Key underpinning principles

- Protection of human health and the environment
- Safe working practices (for workers & local communities)
- Consistent, clear and reproducible decision-making
- Record keeping and transparent reporting (including assumptions & uncertainties)
- Good governance and stakeholder involvement
- Sound science.



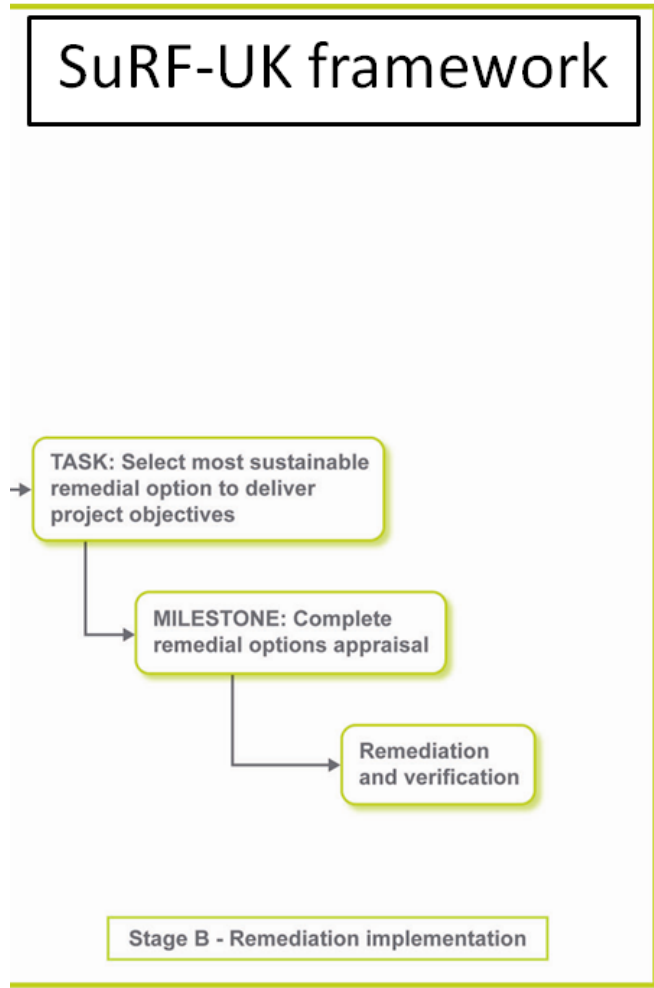
Assessing and understanding sustainability:

The sustainability assessment pyramid





Starting early to maximise sustainability gains





SRBLM and other paradigms

	Strengths include	Weaknesses include
Improvised		Uncertain outcome No framework for regulatory / planning discussion No comparability
To background or multifunctional	Apparent complete removal of liabilities Once only remediation	Background may be unknown Cost prohibitive Less land treated Only as good as the SI Problem transfer
SRBLM	Optimised use of resources Optimal outcomes Flexibility	Requires good guidance and governance and record keeping Sites may need to be re-treated if land use changes



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“SURFs” around the world

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Alliance Organisations

ISRA



International Sustainable Remediation Alliance (ISRA)

International Sustainable Remediation Alliance (ISRA) is a global alliance of organisations whose goals are to work together cooperatively on joint initiatives relating to sustainable land management. ISRA was launched at SustRem 2016, with its initial terms of reference.

 Download the global charter of ISRA here >>>

ISRA would like to reach out to like minded organisations who share their common goals to partner in joint initiatives, to work together and support each other.

Links to Useful International Documents

- SuRF-UK
- SuRF-US
- SuRF-Canada
- SuRF-ANZ
- SuRF-Netherlands
- SuRF-Italy
- SuRF-Brasil
- SuRF-Taiwan
- SuRF-China
- SuRF-Colombia
- SuRF-Japan
- NICOLE

<https://www.claire.co.uk/projects-and-initiatives/isra-surf-int-l>



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SuRF UK



SuRF-UK is the United Kingdom's Sustainable Remediation Forum – an initiative set up to progress the UK understanding of sustainable remediation. SuRF-UK is also a member of International Sustainable Remediation Alliance (ISRA).

SuRF-UK Roadmap

Framework & guidance	SuRF-UK Framework and Annex 1 - Indicator Set		
	SuRF-UK Indicator Report		
Executing sustainable remediation	Sustainable Management Practices		
	Project Framing and Planning a Sustainability Assessment		
	Tier 1 - Qualitative Assessment SuRF-UK Briefcase	Tier 2 - Semi-quantitative Assessment Links to guidance	Tier 3 - Quantitative Assessment Links to guidance
Supporting materials	Illustrative Case Studies, reports, information sources SuRF-UK Case Studies and Bulletins, Journal Papers, SuRF-UK webinar		

To navigate through the SuRF-UK web pages, please hover over the relevant section that you require on the road map and short cuts will direct you to the relevant page, alternatively navigate using the articles index below.

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Implementations

- Sustainability assessment (qualitative example)
- Sustainable management practices
- Code of practice for excavated material (England & Wales)



An example comparative sustainability assessment

- Port Sunlight Riverside Park
- <https://thelandtrust.org.uk/space/port-sunlight-river-park>
- Port Sunlight River Park has been transformed from a closed landfill site to a 28-hectare park providing a popular community space with an array of walkways, wildlife, wildflowers and a wetlands area. Simply put, it's a place for the public to reap the rewards of the great outdoors in a major metropolitan area (Liverpool district).
- This example compares a brownfield restoration against a “no action” baseline, retrospectively. May other comparisons are possible, e.g.
 - Stage B: Remediation option appraisal (most sustainable way to manage risks)
 - Stage A: Site design option appraisal (most sustainable way to manage different areas of a site)

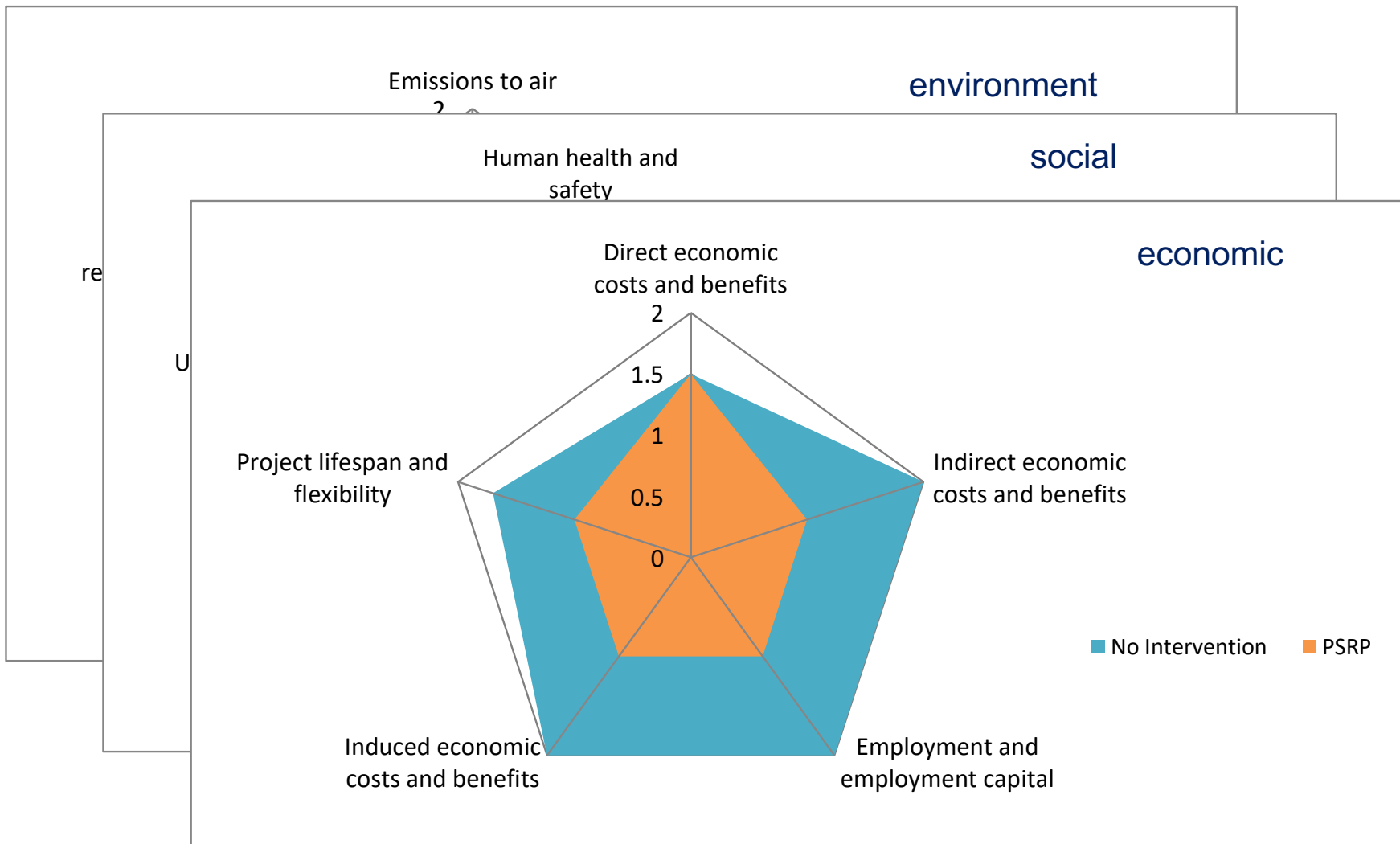


Comparative approach

- PSRP, a 28-hectare park, was transformed from a former landfill at Bromborough Dock with £3.4m funding to:
 - Provide a community resource for health, leisure and educational purposes;
 - Sustainably manage and enhance the Park's nature conservation value;
 - Reconnect local residents to the River Mersey;
 - Make the site safe and improve public access.
- What was this outcome worth?
- Capping, implementation of leachate and gas treatment – already completed.
- We made a comparison with a hypothetical baseline of ongoing maintenance of a capped and managed former landfill



Radar plots show PSRP benefits well





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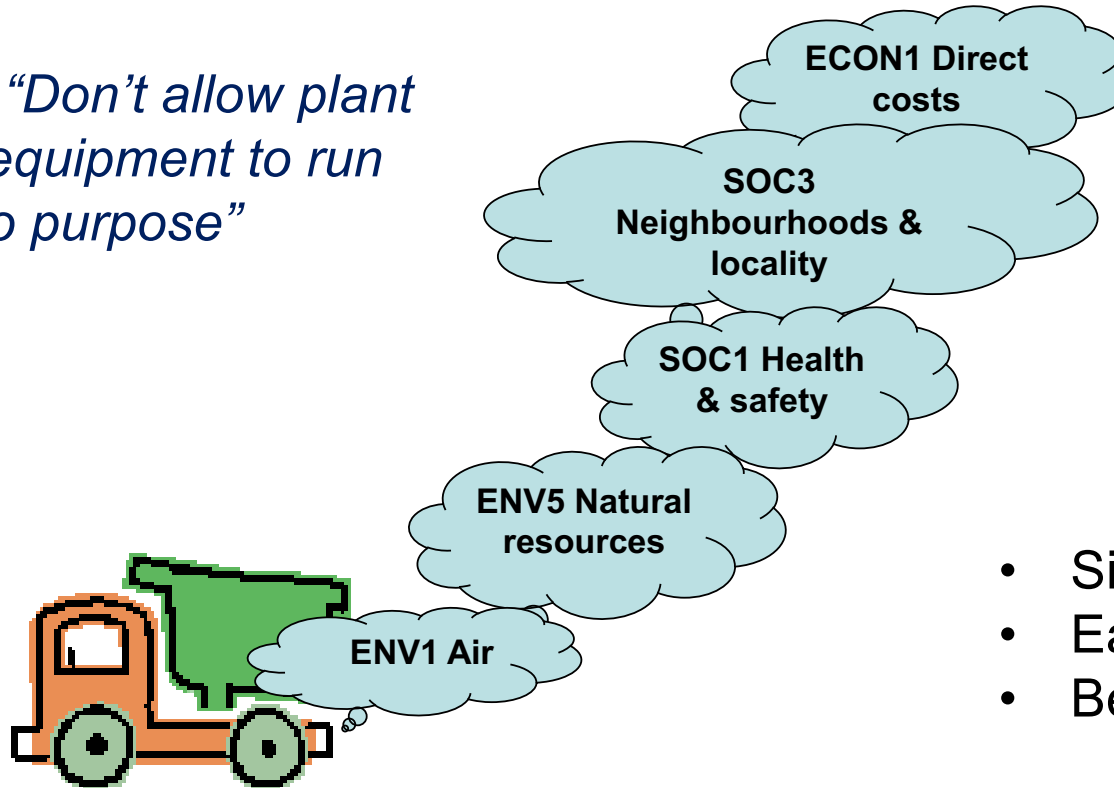
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Even if there is no formal option appraisal,
simple better site management can have
major benefits



Simple sustainable management practices

E.g.: “Don’t allow plant and equipment to run for no purpose”



- Simple
- Easy to implement
- Beneficial

Depend on the project stage: e.g. site investigation vs. remediation, as well as the types of sustainability impacts.



SMP Procedure For Robust Scrutiny

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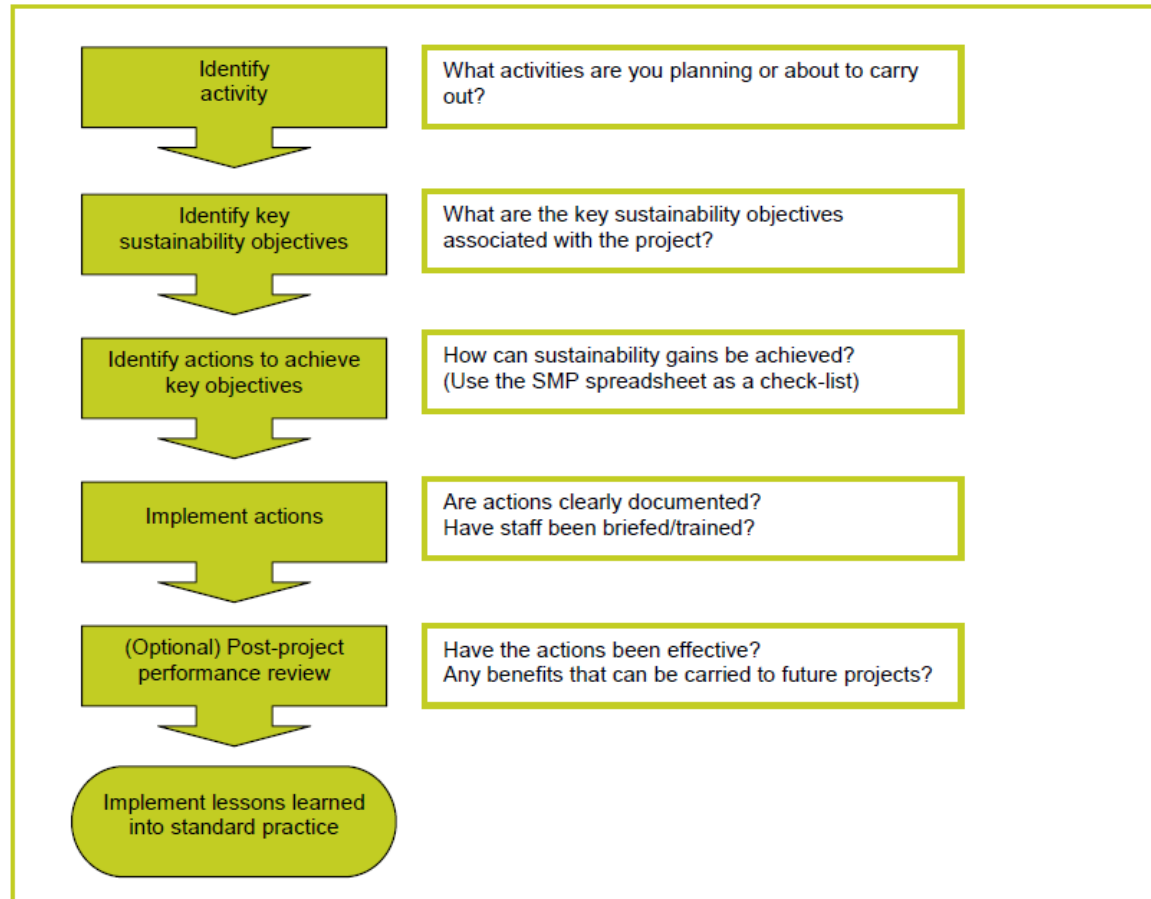


Figure 3.1: SMP Process Flow Chart



Worksheet: maps impacts against project stages as defined by the UK “CLR11”

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Procurement of goods & services	Land use planning	CLR11 - RA: site investigation	CLR11 - Options Appraisal	CLR11 - Implementation Design	CLR11 - Implementation Construction	CLR11 - Implementation Verification	SUSTAINABLE MANAGEMENT PRACTICE	INDICATOR (primary impacts)							REFERENCE
1																
2		-	-	W	W	W	W	W	Establish key roles and responsibilities for sustainability performance and evaluation	ALL						ISO 2012
3		W	W	W	W	W	W	V	Hold project meetings by telephone or video conferencing	ALL						ITRC2011
4		-	-	W	-	W	W	W	Set project milestones to ensure periodic review and optimisation of activities	ALL						BIS 2010, SHELL
5		-	-	W	-	-	W	V	Implement site security to prevent accidental access and trespass	ECON2	ECON1	SOC1	SOC3			HSE 2009, Home Office 2009
6		-	-	W	-	-	W	V	Implement measures to prevent flytipping and to remove flytipped wastes	ECON2	ECON1	SOC1	SOC3	ENV2		NFTPG 2006
7		-	-	W	-	W	V	V	Ensure the workforce is suitably trained to operate effectively and safely	ECON3	SOC1	ECON1	ECON2			
8		W	-	W	V	W	W	V	Evaluate carbon footprint for major activities and implement a CO2 emissions reduction plan	ENV1	ENV5	SOC5				defra 2009a
9		-	-	W	-	-	W	V	Don't allow plant and equipment to 'idle'	ENV1	ENV5	SOC1	SOC3	ECON1		USEPA 2010, DfT 2010
10		-	-	W	-	-	W	V	Ensure proper maintenance of vehicles, plant & equipment	ENV1	ENV5	SOC1	SOC3	ECON1		USEPA 2010, VOSA 2013
11		V	-	W	-	V	W	V	Consider use of cleaner fuels & additives (e.g. ultra low sulphur diesel) for non-road plant	ENV1	ENV5	SOC1	SOC3	ECON1		USEPA 2010
12		-	-	W	-	V	W	-	Consider use of engines with efficient exhaust (particulate) filter system	ENV1	SOC1	SOC3	ECON1			USEPA 2010, GLA 2006, EU (updated)
13		-	-	W	-	V	W	-	Consider use of extraction hood/canopy during excavation/drilling in VOC-impacted soils	ENV1	SOC1	SOC3				
14		-	-	W	-	W	-	V	Consider the proximity of laboratories to the site when evaluating qualified laboratories for testing that cannot be completed on-site	ENV1	ENV5	SOC3	ECON1			SHELL
15		-	W	W	-	W	W	-	Identify protected sites (e.g. SSSI, RIGS or heritage sites) and protect them	ENV2	ENV3	SOC3				defra 2003, 2006b, EH (online)



Code of practice for excavated material



Left: debris on a former gasworks site; right: output from a soil washing plant. Credit: Steve Wallace; use Courtesy of National Grid Property

In the UK 30 million tonnes per year of excavated materials disposed of to landfill →

- Loss of material resources
- Excavation of virgin material
- Other impacts



“DOW-COP” in a nutshell

For material being a resource and not a waste

Applications

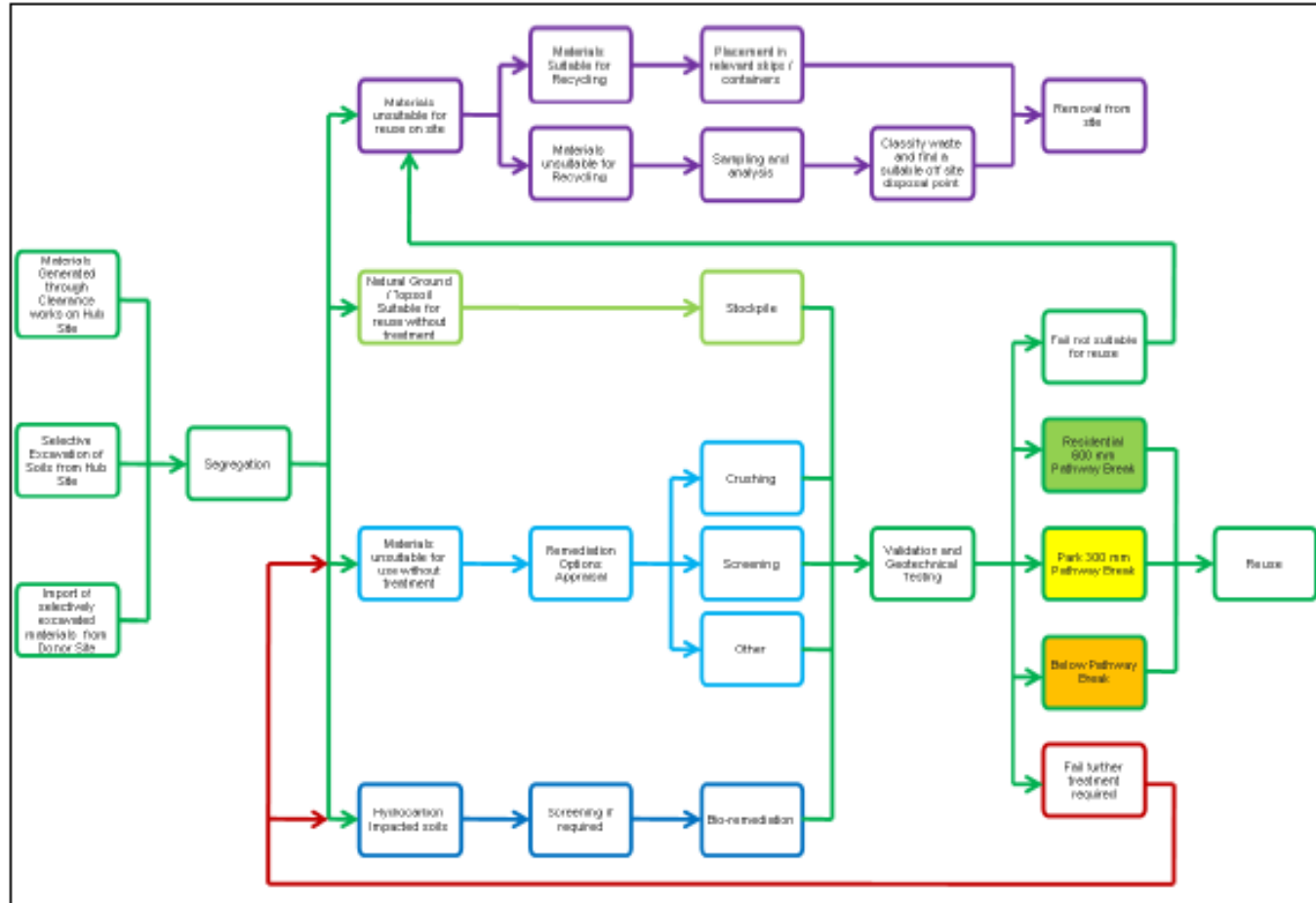
- Use on the site of origin
- Directly transfer from one site to another development site for use
- Cluster: a temporary treatment is shared by several sites in relatively close proximity
- Fixed (permanent) soil treatment facilities

Resource not a waste

- Protection of health & the environment
- Suitability for use (in all respects)
- Certainty of use
- Only be used in the quantities necessary, and no more.



Example Materials Management Plan





Procedure

1

- Ensuring that an adequate Materials Management Plan (MMP) is in place, covering the use of materials on a specific site

2

- Ensuring that the MMP is based on an appropriate risk assessment, that underpins the Remediation Strategy or Design Statement, concluding that the objectives of preventing harm to human health and pollution of the environment will be met if materials are used in the proposed manner

3

- Ensuring that materials are actually treated and used as set out in the MMP and that this is subsequently demonstrated in a Verification Report.



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SuRF UK and SURF Japan / Taiwan / Asia

- Our work is one of the underpinnings the 2017 ISO on Sustainable Remediation (ISO 18504:2017)
- SuRF-UK offers its published outputs, free to view
- SuRF-UK wishes to collaborate for the development of on-line training
- We can also facilitate other collaborations and joint researches
- We can offer comment and peer review as required
- In fact we welcome any / all suggestions and commit to respond as soon as possible.



Some final thoughts

1. Sustainable and risk based land management is the optimal approach for guiding actions on contaminated land, maximising output / benefit, while minimising inputs, cost, harmful effects.
2. Its deployment critically depends on good governance, availability of know-how, agreed methodologies, suitably qualified people, proper record keeping and a shared consensus based understanding. A SURF-Asia could assist the delivery of this context in some of the most important economies in the World.



Some final thoughts contd

3. In remediation it is know-how, and not technologies, that is critical for effective and optimal contaminated land management. In established markets the majority of the business relates to know-how. It is know-how that determines the most effective use of technologies.
4. A proper functioning of contaminated land management markets will not happen without the economic recognition of (SRBLM) know-how, and without SRBLM, resources will be wasted on bad projects.



Resources

- www.claire.co.uk/surfuk
- <https://www.claire.co.uk/projects-and-initiatives/dow-cop>
- www.claire.co.uk/projects-and-initiatives/isra-surf-int-l
- ISO (2017) Soil quality -- Sustainable remediation ISO 18504:2017
<https://www.iso.org/standard/62688.html>
- J Environmental Management Special Issue on Sustainable Remediation,
<http://www.sciencedirect.com/science/journal/03014797/184/part/P1>
- <http://cnukcontaminatedland.com/uk/downloads> &
<http://cnukcontaminatedland.com/cn/downloads>



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ありがとうございました

Thank you very much

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