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Status of sustainable remediation in the United Kingdom, the United States of America, Japan and China

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1. Sustainable remediation = maximising benefits from the risk management of contaminated sites, while minimising any detrimental wider impacts of the risk management processes, based on
 - assessment of sustainability
 - management of sustainability
 - verification that key sustainability performance goals have been met.
 2. SR can take start at different times: across a site portfolio; during planning of a site; after risk assessment. The earlier the start the greater the potential sustainability gain.
 3. Sustainability assessment requires engagement with wider interest groups as necessary, clear procedures and reporting, and a sound evidential basis.
 4. Risk management remains the key driver for site management to prevent harm.
 5. Simple site measures can also support sustainability (“sustainable management practices”).
 6. This presentation overviews the current state of implementation of sustainable remediation practice in China, Japan, the UK and the USA management remains the key driver for site management.
- In due course we plan a submission to *Remediation Journal*.



China:

- Possibly 1,000,000 sites requiring remediation
- Soil Pollution Prevention and Control Law 31/8/2018 following 2016 soil action plan
- Stresses pollution prevention
- Risk based approach, strong interest in diffuse problems
- Excavation based responses dominate, for treatments mainly on/off site thermal
- Knowledge & economic barriers to advancing practice

Japan:

- Estimated 300,000 potentially contaminated site
- Soil contamination countermeasure law (2002)
- Pollution prevention also legislated by other law.
- Risk based approach was adapted, including risk assessment model(2019). But Standard based approach is common.
- Excavation based approaches common, but increasing use of *in situ*

UK:

- Possibly 300,000 potentially contaminated sites
- Separately legislated across the 4 home countries, two principal regimes environmental and planning
- IPPC also deployed
- Decisively risk based approach
- Excavation based approaches common, but increasing use of *in situ*
- Market preferences impact practice

USA:

- Estimated 450,000 to 1,000,000 brownfield sites
- Multiple legislations (Federal, State and Local level) best known being the “Superfund”
- Pollution prevention also legislated
- Hazard and/or risk based approaches
- Increasing use of treatment based remediation



China:

- Emerging debate, SURF China initiated 2016
- Major MOST project underway to develop a China GSR approach
- Focus on “secondary emissions” and likely now carbon intensity (China’s 14th Five Year Plan - April 2021)
- The term “green and sustainable remediation” is preferred

UK:

- Debate started in the 1990’s; SuRF-UK initiated in 2007 as a *project* of www.claire.co.uk
- Compliant with ISO 18504:2017
- The term “sustainable remediation” is preferred balanced across env, econ and social indicators
- Underpinned by a series of key principles
- Sustainable management practices

Japan:

- Debate started in 2013; SURF Japan initiated in 2016
- SURF Japan is an informal network
- SR is the preferred approach balanced across env, econ and social indicators
- LCA based tools also being investigated and published.
- Compliant with ISO 18504:2017

USA:

- Established the first “SURF” in 2006, predated by US EPA development of “green remediation”
- SURF is now a formal membership organisation
- GR, greener clean-up, GSR and SR all in use depending on project
- Emerging focus on *resilient* remediation
- Best management practices



Available guidance

China:

- MOST guidance is in development
- The China Association of Environmental Protection Industry (CAEPI) published technical guidance on GSR in 2020
- A series of mainly academic case study papers are available

Japan:

- 2019 SURF Japan published its sustainable remediation White Paper
- <https://staff.aist.go.jp/t.yasutaka/SRCons/File/SR-WhitePaper-v1.pdf>

UK:

- Comprehensive guidance is available from www.claire.co.uk/surfuk
 - Sustainable remediation framework
 - Assessment
 - Indicators
 - Sustainable management practices
 - Supporting documents
 - Animation

USA:

- Comprehensive guidance available from the SURF web site, <https://www.sustainableremediation.org>; from www.cluin.org (for greener clean-ups) and from ASTM <https://www.astm.org/Standards/E2893.htm>; and [ITRC](http://www.itrc.org) for GSR and resilient remediation.

China:

- No formal linkage to policy and regulatory regimes at this stage

Japan:

- No formal linkage at a national level
- Tokyo Metropolitan Government has published guidance on GR and is currently preparing further guidance relating to SR.

UK:

- No formal obligations
- Sustainable remediation is not a formal part of statutory guidance but is referenced as an important consideration in a range of regulatory publications and may also be useful in supporting planning applications

USA:

- Public procurement typically requires GSR is included in projects
- NO formal obligations otherwise



Sustainability indicators

China:

- No formally adopted set of indicators
- Suggested indicators published by academic authors

Japan:

- No formally adopted set of indicators

UK:

- SuRF-UK published an indicator set in 2011, recently updated in 2020 with a detailed rationale published in *Remediation Journal*
 - Checklist provided
 - Suggests lines of evidence
 - Suggests linkages to UN SDGs
 - Not prescriptive
- Used outside the UK

USA:

- Greener clean-up metrics and methodologies published by US EPA
- No formally adopted wider set of GSR indicators, although SURF publications do suggest LCA



Levels of adoption

China:

- Limited to academic and proof of concept studies

Japan:

- Uncommon in practice
- At present mainly considered in research projects

UK:

- The SuRF-UK Framework is now in regular use in the UK
- Estimated to have been used at several hundred sites

USA:

- Greener clean-up metrics and methodologies widely adopted on federally funded projects
- Increasing use of SR / GSR but it is not obligatory



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Case Studies



- Some older case studies at www.claire.co.uk/surfuk and some at <https://www.sustainablemediation.org/case-studies>
- Greener clean up case studies well represented on www.cluin.org
- Lack of case studies is seen as a major challenge
 - 2021/22 CONCAWE project will provide 10 case studies
 - 20/21 FECO/MEE project will provide 5 case studies



Conclusions

- All countries set remediation goals based on the mitigation of risks deemed to be unacceptable, although the detail of how this is done varies. Remediation without risk assessment basis is seen as a fundamentally suboptimal, and hence unsustainable, approach, as argued as far back as 2002.
- Regards SR, all four countries seek to reduce the wider impacts of remediation, with a particular focus of the US EPA and China being on environmental impacts.
- The sustainability “triple bottom line” across environmental, social and economic impacts is driving a “sustainable remediation” debate in all countries. The shape of this is only just emerging in China and Japan while established frameworks and guidance exist in the USA and the UK.
- There are two key gaps identified across all countries: the level of practical implementation in projects, and insufficient publication of in-depth case studies.
- There are differences of opinion about *Green Remediation*, *Sustainable Remediation*, *Green and Sustainable Remediation* and *Sustainable and Resilient Remediation*. We will undoubtedly see further debate.
- It is therefore important that remediation professionals, whether practitioners or regulators, have a clear understanding of what is, and what is not included in each concept.



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Thank you – any questions?

