

NICOLE Road Map for Sustainable Remediation

Summary

Over the past decade, good practice for contaminated land management has been based on risk to human health, water, buildings and the wider environment.

It is important that this risk-based approach is achieved in a sustainable manner. NICOLE has recognised that a more comprehensive approach to remediation projects should incorporate sustainability (encompassing environmental, social and economic elements) alongside effective risk management.

To investigate how this approach could be developed, NICOLE launched a Sustainable Remediation (SR) work group in 2008 to assess the application of sustainability principles in remediation projects.

The full outcomes of this project are described in the accompanying NICOLE Guidance on Sustainable Remediation, however the key conclusions from this work are as follows:

1. **A sustainable remediation project is one that represents the best solution when considering environmental, social and economic factors – as agreed by the stakeholders.**
2. **Similar to the concept of risk management and risk assessment, sustainable remediation can be divided into two inter-related components:**
 - a. *Sustainability management*: the discipline of integrating sustainability assessment into contaminated land management decision making
 - b. *Sustainability assessment*: the process of gaining an understanding of possible outcomes across all three elements (environmental, social and economic) of sustainable development.
3. **Sustainability assessment is a tool that supports sustainability based decision-making within a management plan, and also the review and verification of sustainability performance during the implementation of remediation.**
4. **The aim of a sustainability assessment is to build trust and consensus between stakeholders; the simplest tools, indicators or qualitative approaches will be sufficient in the earliest stages and can be further developed in line with the project complexity.**
5. **The earlier stakeholders consider sustainability principles, the more opportunities there are to improve sustainable outcomes and so provide greater benefit, as shown in Figure A.**

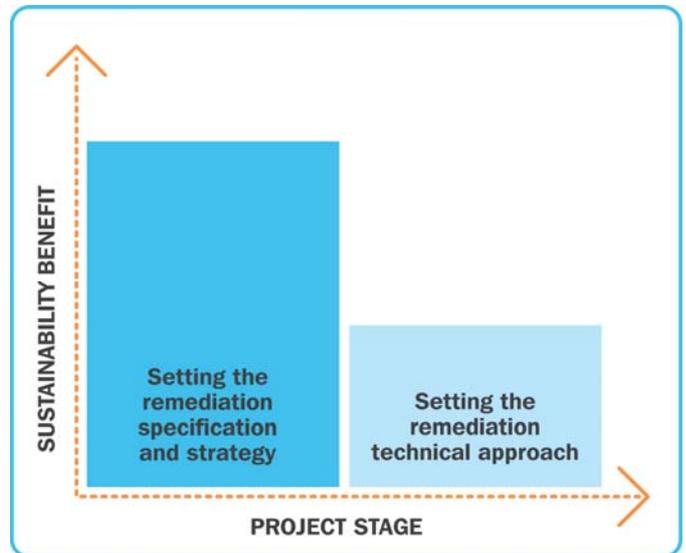


Figure A – Illustration of sustainability gain dependent on the stage of the project at which it is introduced

The established approach to remediation

Decisions that affect how contaminated land is managed are made at a number of levels. Broad decisions in policy or regional planning affect general strategies in countries and regions. These decisions may be direct, e.g. providing support to encourage brownfield re-use, or indirect, e.g. zoning particular areas for housing and others for commercial redevelopment. These decisions define the range of possibilities for contaminated land projects in a particular geographical area.

There are also site-specific constraints and limitations, for example, an operational site may need to deal with a contaminated land problem as part of its general environmental responsibilities or to limit long term liabilities; or a site may be redeveloped and management of land contamination problems become part of the redevelopment process.

Within such projects, risks are assessed and decisions are made about the risk management requirements for particular land uses, land use changes and/or construction work. These decisions set the scope for the remediation (i.e. risk management intervention) which will be carried out for a site.

Finally, there may be a range of possible remediation options that can achieve particular risk management goals and the remedy selection process determines the best way of executing the desired risk management. Verification is then needed to ensure that risk management goals are met.

The Road Map

The NICOLE 'Road Map' is illustrated in two figures. Figure B describes sustainability management, and shows how sustainability assessment, detailed in Figure C, is incorporated within the framework.

The Road Map is intended to provide problem-holders (owners/operators of contaminated land) and all their stakeholders, with a single, structured process to start working together and implementing best practice in sustainable remediation across a wide range of regulatory and policy frameworks.

Designed as a series of steps to ensure a consistent and collaborative approach to decision-making, it can support robust and durable decisions, regardless of the project size.

Sustainability management

NICOLE's research clearly demonstrated that sustainable remediation decisions should be taken as early as possible in the process to greatly increase the opportunity for sustainability 'gains' – as shown in Figure A.

Figure B shows how sustainability management decision-making can be incorporated into a number of project stages.

The best entry point for sustainable remediation decision-making for projects is at the planning or project design stage where remediation specification is set, but it may also be at the stage where remediation technical approach is selected.

Examples of gains that may be obtained through early consideration of sustainable remediation in project planning include opportunities for combining remediation with wider sustainability goals such as urban heat storage, sustainable urban drainage systems, and consideration of a compliance point further down-gradient in a groundwater risk assessment.

It is particularly useful to consider sustainability gains where a large portfolio of sites is being managed, or when considering contaminated land remediation across a wide geographic area, e.g. optimising use of resources to achieve good groundwater quality in urban conurbations.

A key part of sustainability management is verification that the desired sustainable outcomes – based on the sustainability assessment (Figure C) – have been achieved. Based on this monitoring process, further optimisation of the project delivery can be implemented if required.

Finally, a process of review and feedback will allow the wider outcomes of remediation works to influence both the current project, and policy decisions in the future. This is illustrated within Figure B by review and feedback loops.

Figure B – Road Map for sustainability management

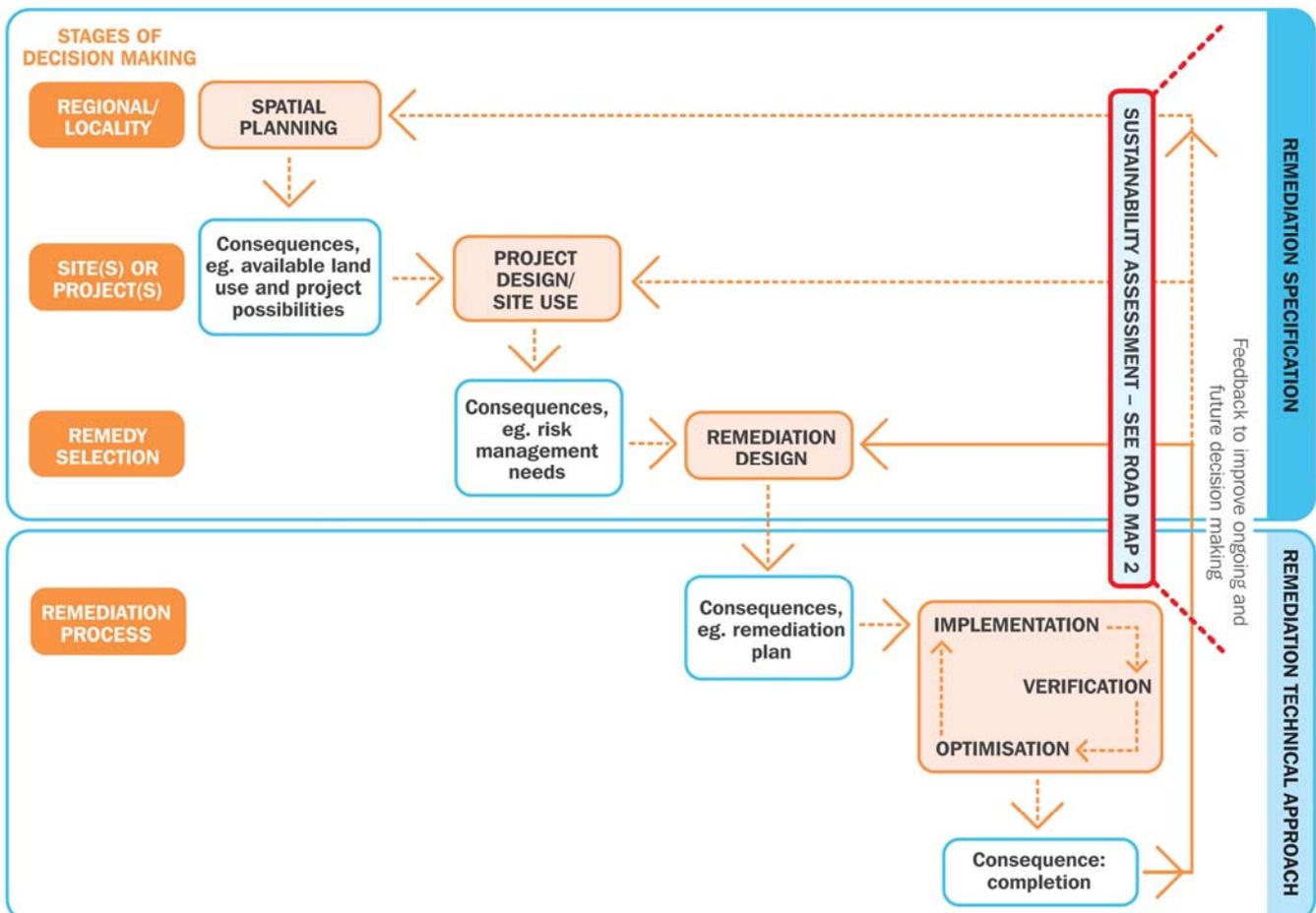
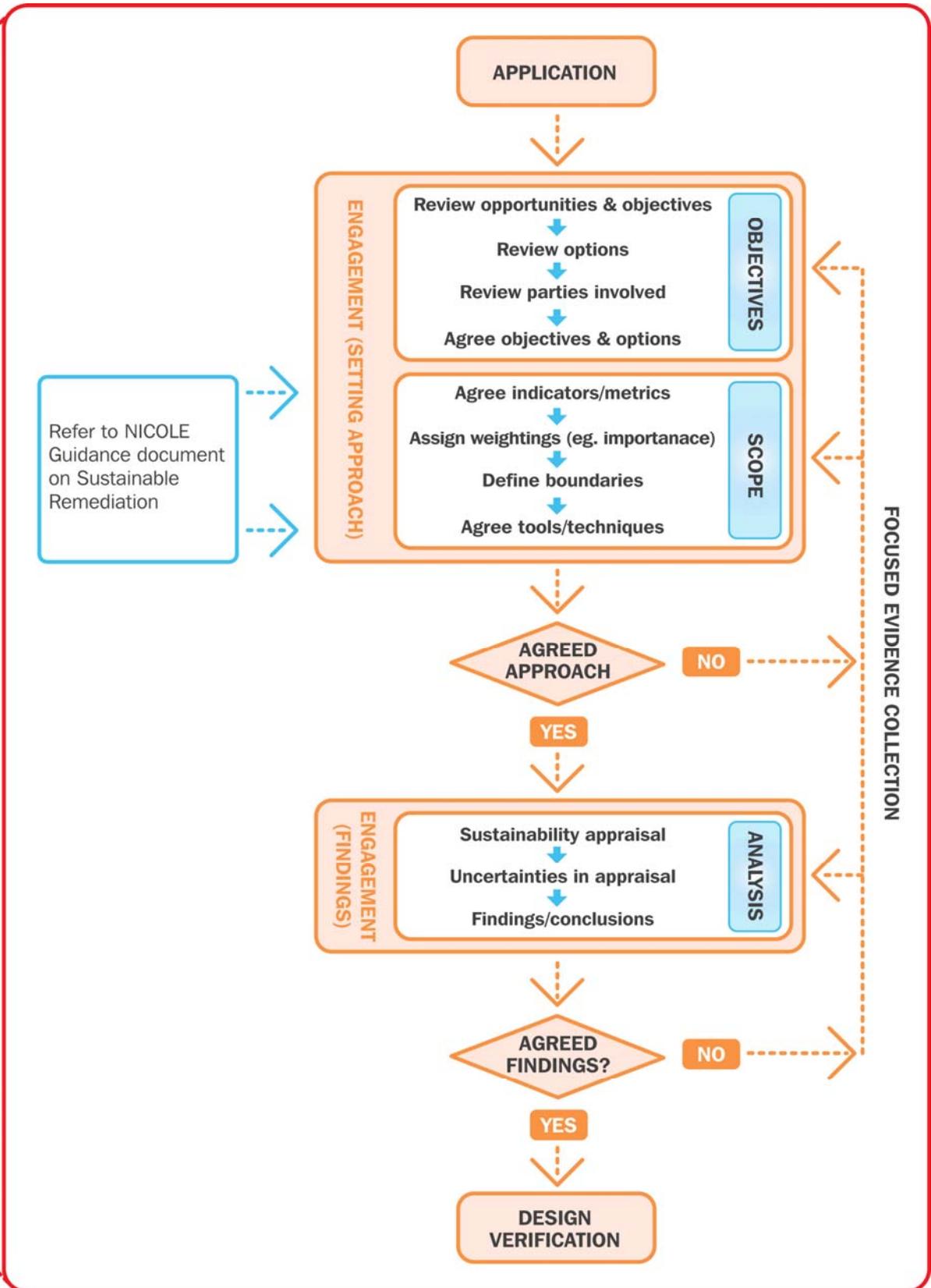


Figure C – Road Map for sustainability assessment





Sustainability assessment

Demonstrating a sustainability gain builds trust and therefore support from stakeholders. Sustainability assessment is a tool used for understanding sustainability impacts and benefits. There is no 'absolute' measure of sustainability, and each decision is specific to a project site and its context. As sustainability assessment is essentially a *subjective* process, transparency in the sustainability assessment approach greatly improves the chances of agreement between all stakeholders, and an acceptable and durable decision.

The sustainability assessment component of NICOLE's Road Map recommends a simple process to help establish an agreed view between the different project stakeholders. It includes two broad stages, each of which is carried out, as far as possible, in consultation with the stakeholders to develop the case and objectives for a particular initiative's sustainability. These broad stages are the same for all applications.

In the first stage the stakeholders are identified and the objectives and the scope of the sustainability assessment are agreed with these parties.

Objective setting includes:

- i. making sure that everyone who should be, is involved;
- ii. agreeing the sustainable development opportunities and objectives for the project;
- iii. agreeing the range of possible options that are going to be compared, for example remediation methods;
- iv. setting out a common understanding of purpose (objectives and options).

The scope has four components:

- i. the indicators/factors that will be considered as representing sustainability;
- ii. any weightings, e.g. to reflect relative importance, that will be assigned;
- iii. the boundary conditions of the assessment, e.g. the 'system boundary' which describes the operational limits of the options being compared;
- iv. the techniques or tools that will be used to compare options for this particular combination of factors, weightings and boundaries.

Sustainability assessment involves balancing the benefits of remedial action with the impacts of those actions. For example, changes in soil functionality (e.g., organic matter content) may be seen as beneficial (the soil is returned to productive use for landscaping), neutral (the soil is not in productive use) or detrimental (the soil will be under a building and so might produce methane).

In this first stage, it should be apparent whether sufficient consensus about objectives and scope exists to allow a sustainability assessment to take place, or whether the team needs to revisit the objectives.

The second stage of the process is the sustainability analysis. This consists of three activities:

- i. a sustainability appraisal based on the agreed scope and objectives;
- ii. a review of the uncertainties within the appraisal;
- iii. ultimately drawing the conclusions or sustainability findings, together with the stakeholders.

Finally, a monitoring and verification process should be developed and applied during project execution to demonstrate sustainability, achievement of project objectives and satisfaction of stakeholders.

Reference should be made to NICOLE's Guidance on Sustainable Remediation for further details.

NICOLE recognises the contributions of SURF, SURF-UK (and other fora) in the field of sustainable remediation, without which this work would not have been possible. The full NICOLE sustainability guidance is available from: www.nicole.org/sustainability

NICOLE is a network for the stimulation, dissemination and exchange of knowledge about all aspects of industrially contaminated land. Its 125 members of 15 European countries come from industrial companies and trade organisations (problem holders), service providers/ technology developers, universities and independent research organisations (problem solvers) and governmental organisations (policy makers).

The network started in February 1996 as a concerted action under the 4th Framework Programme of the European Community. Since February 1999 NICOLE has been self supporting and is financed by the fees of its members.

www.nicole.org