NICOLE's shared vision on Sustainable Remediation

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Abstract: On behalf of NICOLE (<u>www.nicole.org</u>) this paper shares NICOLE's work on Sustainable Remediation (SR). The NICOLE Sustainable Remediation Work Group, or SRWG was kicked off during the NICOLE Workshop on Decision Tools applied to remediation project, held in October 2008 in Madrid. The workgroup has over 25 active members, all remediation professionals from the European industry, consulting firms, research institutes, and policy makers. Our mission is to study and promote SR, in particular the following:

- provide a working definition of sustainability applied to remediation,
- describe how sustainability thinking can be applied to remediation projects, of any kind,
- leverage other think tanks that are actively studying SR (e.g.; SuRF, in the US and UK), and
- develop a NICOLE's guidance document to assist any project manager in driving for sustainability in a remediation project, by the end of 2009.

The SRWG is organized into five subgroups, each tackling specific aspects which were identified during the Madrid kickoff meeting as critical to achieving our mission, respectively, communication, economics, indicators, risk assessment, and case studies.

A questionnaire exploring the current status of SR in Europe was distributed via the NICOLE network on 19 May 2009. It enabled collation of critical data and material that our working group then used to complete its analysis. The responses covered nine EU member states, and demonstrated that there is considerable variability between the EU member states in the application of sustainability principles, in legislation and remediation projects.

The work of the SR workgroup was also used to design NICOLE's workshop on Sustainable Remediation which was held on June 2009 in Leuven, Belgium. This true European workshop was a real success, with a large audience and great speakers from multiple horizons that addressed societal, economic, communication, sustainability in risk assessment, key performance indicators and legal aspects of SR, and exploring enablers and barriers. Copies of presentations can be downloaded from NICOLE's web site (Bardos 2009a). The workshop was also an opportunity for other workgroups from NICOLE to present their understanding of where sustainability comes into play into brownfield redevelopment, the soil framework directive, IPPC, waste management, monitoring natural attenuation...

The June 2009 SR workshop was essential to finalize our plan of actions until year end and the content of the final Guidance document, our ultimate goal.

On 23 September 2009 a meeting was held in London with SuRF UK to assess how to join efforts and resources. The two organizations recognized the interest of each ones work. We are now close to issuing the draft guidance document which content is presented herein. This paper reviews the likely contents of this guidance (subject to confirmation).

The NICOLE Sustainable Remediation Work Group, where it all came from

Sustainable remediation (SR) and green remediation (GR) are hot topics these days. This is not a surprise in today's climate considering issues such as global urban pressure, water supply, food supply, or global warming. Numerous work groups and initiatives are under way in Europe, in the United States and other countries to tackle what this truly means and how to implement sustainable principles during a remediation project.

NICOLE, the Network for Industrially Contaminated Land of Europe (<u>www.nicole.org</u>) is a leading forum on contaminated land management in Europe, promoting co-operation between industries, academia and service providers on the development and application of sustainable technologies.



As remediation professionals, NICOLE members are very active in this debate, in their everyday lives. NICOLE had previously organized 3 workshops on sustainability and remediation (Barcelona 2003, Akersloot 2007, London 2008 – together with SAGTA) during which it soon became apparent that SR means different things to different people; participants to these workshops often struggled to find a common definition and viewpoint. As a result, in the summer of 2008, NICOLE's Steering Group, then under the leadership of Johan De Fraye, took the decision to launch an initiative to study what SR means to its members and how NICOLE could help promote SR principles across Europe.

The SRWG was created and asked by the Steering Group to develop a first guidance document on SR by the end of 2009. The document was intended to support any type of remediation project across the European Community, be practical in its advice, and to leverage the work done by others. This is not an easy task when considering the raging debate on SR, the fact that NICOLE's members are from different countries, cultures, languages and sometime have widely differing approaches to remediation.

The SRWG's study was kicked off in October 2008 during the Madrid Workshop on Decision Tools, and has been active ever since. During the Leuven June 2009 workshop about 25 active members participated in our meeting, demonstrating a growing interest from NICOLE's members in this topic. The SRWG is led today by Lucy Wiltshire, Honeywell, and Olivier Maurer, CH2M HILL.

During the Madrid kick-off meeting, the 20 members present were tasked with two things: first to agree on a common vision and a definition, and second to participate in a <u>brainstorming</u> exercise organized in 4 successive sessions: High level objectives, Drivers (economic, politics...), Barriers (financials, liability, risk management...), Limits/Definition and Key words.

The SRWG's Mission is close to being accomplished, with a document ready for review by the Steering Group late 2009, to be published early 2010.

Definition of Sustainable Remediation

Coming to a consensus on a definition of SR would have been a difficult and time consuming task. Instead, a working definition was suggested and approved by the group. This definition found its origin in the UK chapter of the Sustainable Remediation Forum, SuRF UK, and had been presented and discussed during the NICOLE-SAGTA March 2008 workshop held in London.

Sustainable remediation is a framework in order to embed balanced decision making in the selection of the strategy to address land [and/or water contamination] as an integral part of sustainable land use.

The Madrid Brainstorming Exercise

This brainstorming session truly worked as the foundation of the SRWG. It was very lively, short, and certainly frustrating for some of us, but when pulling together all responses from this large group, net patterns started to emerge. The conclusions of each of the 4 sessions are summarized in Table 1 below. The numbers in parenthesis reflect the number of responses received for each specific topic.

Table 1 – Output of the Brainstorming session on Sustainable Remediation – NICOLE's Sustainable remediation workgroup, kickoff meeting, Madrid October 2008

Hig	h level objectives (of the SRWG)	Driv	vers of SR
1.	Communication, obtaining buy-in from	1.	Societal shift, future generation, society
	stakeholders, convincing arguments, need for a		challenges (e.g.; Energy) (10)
	definition for SR (by far, 19)	2.	Liability management, long term, legal (8)
2.	Cost Benefit, NBA, Economics (9)	3.	Regulation, local, regional, national (7)
3.	Risk Based, decision making, balanced risks	4.	Cost/Benefit, Economics (5)
	and sustainability (8)	5.	Public relation – Image, Win-Win, arguments
4.	Time, realistic timeframe, preserve future		for best solution (4)
	generations (5)	6.	Land value, Urban pressure (4)
5.	Technical, Best Available Techniques (3)		
Als	o noted: the need to leverage other work groups		
(e.g	g.; Surf)		
Ba	rriers to SR	Lim	its, definition; and key words related to SR
Ba 1.	rriers to SR Communication, politics, irrational thinking,	Lim 1.	its, definition; and key words related to SR Efficiency : BAT, ecological, resources, costs,
Ba 1.	Triers to SR Communication, politics, irrational thinking, lack of understanding, arrogance of scientists,	Lim 1.	its, definition; and key words related to SR Efficiency : BAT, ecological, resources, costs, risk, value, NBA, Life cycle, decision making
Ba 1.	Triers to SR Communication, politics, irrational thinking, lack of understanding, arrogance of scientists, public buy-in (10)	Lim 1. 2.	its, definition; and key words related to SR Efficiency : BAT, ecological, resources, costs, risk, value, NBA, Life cycle, decision making Social: Maximize, quality, opportunity,
Ba 1. 2.	Triers to SR Communication, politics, irrational thinking, lack of understanding, arrogance of scientists, public buy-in (10) Liability management and time, long-term (8)	Lim 1. 2.	its, definition; and key words related to SR Efficiency : BAT, ecological, resources, costs, risk, value, NBA, Life cycle, decision making Social: Maximize, quality, opportunity, protective, life
Ba 1. 2. 3.	rriers to SR Communication, politics, irrational thinking, lack of understanding, arrogance of scientists, public buy-in (10) Liability management and time, long-term (8) Regulation, regulators (6)	Lim 1. 2. 3.	its, definition; and key words related to SR Efficiency : BAT, ecological, resources, costs, risk, value, NBA, Life cycle, decision making Social: Maximize, quality, opportunity, protective, life Time: now and in future, next generations,
Bat 1. 2. 3. 4.	rriers to SR Communication, politics, irrational thinking, lack of understanding, arrogance of scientists, public buy-in (10) Liability management and time, long-term (8) Regulation, regulators (6) Costs, efficiency, "why not spending more?"	Lim 1. 2. 3.	its, definition; and key words related to SR Efficiency : BAT, ecological, resources, costs, risk, value, NBA, Life cycle, decision making Social: Maximize, quality, opportunity, protective, life Time: now and in future, next generations, future development
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Ba 1. 2. 3. 4. 5.	rriers to SR Communication, politics, irrational thinking, lack of understanding, arrogance of scientists, public buy-in (10) Liability management and time, long-term (8) Regulation, regulators (6) Costs, efficiency, "why not spending more?" (5) Complexity, technology (2)	Lim 1. 2. 3. 4.	its, definition; and key words related to SR Efficiency : BAT, ecological, resources, costs, risk, value, NBA, Life cycle, decision making Social: Maximize, quality, opportunity, protective, life Time: now and in future, next generations, future development Key Performance Indicators (KPI): Indicators, key performance, semi-quantitative,
Ba 1. 2. 3. 4. 5.	rriers to SR Communication, politics, irrational thinking, lack of understanding, arrogance of scientists, public buy-in (10) Liability management and time, long-term (8) Regulation, regulators (6) Costs, efficiency, "why not spending more?" (5) Complexity, technology (2)	Lim 1. 2. 3. 4.	its, definition; and key words related to SR Efficiency : BAT, ecological, resources, costs, risk, value, NBA, Life cycle, decision making Social: Maximize, quality, opportunity, protective, life Time: now and in future, next generations, future development Key Performance Indicators (KPI): Indicators, key performance, semi-quantitative, qualitative, buy-in
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A few conclusions were immediately apparent from this work.

Communication

Sustainable remediation was recognized as not being primarily a technical issue (3 responses in High level objectives and 5 in Barriers). However, communication, political barriers, and stakeholder engagement were considered to be the number 1 issues to address in a SR project (19 responses in High level objectives, and 10 in Barriers). Communication comes obviously as the primary barrier, and at the same time should be seen as the most important enabler when properly implemented from the start of a project. This is not a surprise and is often seen when convincing stakeholders with conflicting interests to engage on a complex and sensitive journey like a remediation project. Building trust is essential to build consensus. We also recognized that, we, as remediation practitioners, are not the best communicators on political or social issues. As engineers and scientists, all too often we tend to remain on the technical or "hard" side.

Risk or Liability Management

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The brainstorming session clearly pointed to the importance of understanding the conflicting interests between the risk assessment and SR. We recognized early on that existing legislation driving remediation in the European Community left no or little room for applying SR. This was confirmed later by the questionnaire responses (see below).

Economics

Based on sustainable development principles, SR is all about the "triple bottom-line", balancing between environmental, social and economic aspects. Remediation practitioners understand well the technical implications of environmental issues but as sais before often lack experience with social and economic issues. A number of tools, standards, and methodologies are widely used such as Net Benefit Analysis (NBA), Life Cycle Analysis (LCA), Best Available Technology Not Exceeding Excessive Cost (BATNEC), and guidance on using these tools in the application of SR is necessary.



Indicators

How can SR be demonstrated on a project? How can we measure the performance of a SR project? Such questions are important to convince stakeholders of the relevance of SR and it became obvious that Key Performance Indicators (KPIs) were probably the necessary controls in a SR project. The next question became: which indicators to pick among the multitude that are available on the "market"?

Case Studies

To illustrate and demonstrate what SR means to the wider audience and to us, it was decided to look for case studies, in Europe, and around the world.

Given the findings from the brainstorming session, the high level of interest from NICOLE's members and the complexity of our project, we decided to breakdown the work group into 5 subgroups: communication, risk management, economics, indicators and case studies.

The **Communication** subgroup was appointed with the mission to promote the work of the SRWG by:

- linking with other NICOLE work groups, and leveraging as much as possible NICOLE's network, (which is unique in Europe considering it brings together Industries, Academics, Consultants and Regulators from all Europe and beyond);
- linking with other think tanks in Europe working on SR, such as SuRF UK;
- shaping the next NICOLE's workshop on SR;
- shaping the content and format of the Guidance document on SR;
- pushing for the "Bottom-Up" approach; and
- participating in the Copenhagen conference on Green Remediation.

The two leaders of this subgroup are Olivier Maurer and Johan De Fraye (ex-Chairman of NICOLE) both with CH2M HILL.

Understanding if, when, and how SR principles can be integrated in a Risk Assessment process became the mission of the **Risk Management** subgroup, led by John Waters and Alan Thomas (ERM). The preliminary conclusion of their work is briefly summarized here but will also be presented separately at the Copenhagen conference (Thomas, 2009).

The **Economics** subgroup, led by Sarah MacKay and Richard Clayton (WSP Remediation), was tasked to identify the off-the-shelf tools that are available to assess the costs of remediation across Europe, how they incorporate sustainability (if at all), identify whether these tools meet with regulatory acceptance or are recognised in legislation for each country, and comment on what these might look like in the future. The ultimate objective is to provide guidance to remediation practitioners.

As for **Indicators**, Dr. R. Paul Bardos (University of Reading; r³ Environmental Technology Ltd), who was already studying this topic on behalf of SuRF UK, was tasked by the SRWG to extend his research, with a European focus, for NICOLE. Dr. Paul Bardos will also present a paper at the Copenhagen conference on Green Remediation on his work on SR for NICOLE and SuRF UK (Bardos, 2009b).

To compile **Case studies** across Europe and other countries it was considered important to leverage NICOLE's Industry sub group (ISG), and Lucy Wiltshire (Honeywell) with Markus Ackermann (DuPont) are leading this subgroup.

SRWG Questionnaire

One important step achieved by our team was the construction and distribution of a questionnaire to understand if and how SR principles are driven and implemented in EU member states. We received about 40 responses in total, including the questionnaires that were filled out during an interactive session at the Leuven workshop (June 2009) when representatives of each country present at the conference were grouped together to coordinate a definitive response to the questionnaire for each country. Significantly, some groups comprised representatives from industry, consulting, academia and regulatory agencies; while some other countries were less well represented. The fact that

this exercise was delivered at the end of the 2-day conference, after participation in the various sessions, gave even more credibility to the responses received.

One example of a questionnaire is attached to this paper (France), and Table 2 (next page) provides a summary of questionnaires received. The primary lessons learned are the following:

- 1- Unsurprisingly, SR principles are currently referred to and used across Europe in very different ways
- 2- Legislation refers to sustainable principles, but again, to varying degrees across the European countries
- 3- Risk assessment is widely used and referred to in Europe
- 4- Cost benefit analysis (or equivalent) is an accepted tool in some countries but not all
- 5- Economic and social impacts are not widely considered in remediation projects, although economic impacts are partly covered during the cost benefit analysis
- 6- Italy emerges as the country with the least flexibility in implementing sustainable principles during site remediation, while Belgium is the most flexible.

June conference on sustainable remediation

The content and agenda of the June 2009 conference were shaped around the first lessons learned from the SRWG. Separate sessions were designed to cover each of the topics from the 5 subgroups. The full report on the June conference can be found on NICOLE's web site (Bardos, 2009a).

NICOLE's vision for this workshop was to help find a greater understanding of what SR is and can achieve. The workshop explored what might be meant by "sustainable remediation" and considered how sustainability can be included in contaminated land management decisions across Europe.

The workshop began with an introduction to the ongoing discussions in the SRWG and other NICOLE Working Groups contributed their views to the debate (Risk Assessment, Monitoring Natural Attenuation, Brownfield management etc.). Overall, the move to a more sustainable approach to remediation offers a context for integration across different regulatory domains (soil, waste, pollution prevention and control). While there are some positive steps towards a more "joined up" approach, NICOLE remains concerned that opportunities for more sustainable management of contaminated land problems are being lost, and has issued a series of position papers to influence the current implementation and revision of Directives related to waste and IPPC, or the drafting of the proposed Soil Framework Directive (SFD).

Table 2 – Summary from SRWG questionnaires review, June 2009 – Interactive session at the NICOLE workshop on sustainable remediation, Leuven, Belgium, 3-5 June 2009

Country	Legislation (SR refered to)	Risk Assessment	BATNEC and BAT (Best available technology not exceeding excessive cost)	ALARP (As Low As Reasonably Practicable)	MCA (Multi-Criteria Analysis)	CBA (Cost benefit analysis)	Environmental Cost	NEBA (Net environmental benefice analysis)	Sustainability Analysis and Decision Tools	Sustainability Accreditation (e.g., LEED or BREEAM)	Economic Cost	Social Cost	Average	Count "1" / 12 categories
Belgium	1	1	1	1	1	4	1	4	na	4	4	4	2.36	6
Germany	2	1	1	2	2	1	3	2	4	4	2	3	2.25	3
υк	1	1	2	1	3	2	4	2	3	3	4	4	2.50	3
France	2	1	1	3	1	3	3	3	4	4	4	4	2.75	3
Netherlands	2	1	4	1	1	4	4	4	3	3	3	4	2.83	3
Sweden	1	1	3	1	3	3	4	4	3	4	4	4	2.92	3
Italy	4	2	4	4	3	3	4	4	4	2	4	4	3.50	0

Rating	Meaning / Description	
1	It is widely accepted and recognised in regulation and practiced across the country	<1.5
2	It is included /allowed for in the country's legislation / regulation but is not applied by practitioners, organisations or regulators.	1.5-2.5
	It is recognised by regulators and practitioners but only used / adopted occasionally as it has no official / legal support and is therefore only of use for internal decision making and in	
3	developing a qualitative discussion with regulatory bodies.	2.5-3.5
4	It is not used and not applied in country's regulations / legislation or by practitioners.	>3.5

Several papers considered societal aspects from the perspective of sustainable soil policy, the linkage between ethics and concepts of sustainable development and how that might be applied to derelict land management, and a novel re-use of derelict mining areas for "active" tourism (hiking, cycling, trekking etc) in Belgium and France.

As is often the case for contaminated land management issues, effective communication between stakeholders is a pre-requisite for robust decision making. A range of case studies about the stakeholder engagement were presented from Europe and the USA, including former industrial and waste disposal sites for a range of uses including habitat and sustainable urban areas, together with a talk focusing on the mechanics of communication and what is needed to be effective (Wester, 2009). There is an important difference between providing information, and communication where interaction and response are an integral part of the process. Engineers and scientists can be perceived by the public as sometime arrogant when presenting technical facts, e.g. when supporting a remedial strategy.

The economic aspects of remediation are, of course, what ultimately drives remediation forward, whether by private or public sector support or by both. This segment of the conference provided some challenging presentations; one about how to demonstrate the value of sustainability in contaminated land remediation to a potentially skeptical client audience, and a second about managing large land portfolios in Romania. The recent Environmental Liability Directive has crystallized questions of "value" in remedying environmental damage post 2007, and a toolkit for understanding and valuing remediation requirements for compensatory and complementary remedies from the EC REMEDE project was presented.

To close the workshop, Pavla Kacabova of the Ministry of the Environment of the Czech Republic (at the time of the Czech EU presidency) presented on the Soil Framework Directive, looking at how sustainability is addressed within it. Although there have been many concerns surrounding the issue of getting consensus around the Directive, since the conference we have heard that the progress of the Directive has been slowed down because agreement could not be reached under the Czech presidency. The presentations concluded with outlines of the Sustainable Remediation Forum (SuRF) in the USA and the more recent SURF-UK, and a talk on the French approach to managing remediation which depends on identifying potential impact to off-site receptors and is based on an iterative process.

As discussed previously, an interactive session was held, in which participants were asked to congregate in country groups, and answer the SRWG questionnaire as a consensus view for a particular country. The overall opinion resulting from the interactive exercise was a clear demand for guidance from NICOLE about what economic, environmental and social factors should be considered during the sustainability appraisal for remediation decision making, and broad guidance about how it should be undertaken and applied. There are many countries and project specific sustainability issues, so any NICOLE approach must be flexible to accommodate these and not prescriptive. Most importantly, a specific list of key performance indicators to be applied uniformly across any and all sites was not seen as helpful. Rather, NICOLE should focus on producing metrics checklists to help decision-makers in ensuring they have undertaken well rounded assessments. NICOLE was also asked to provide case studies of the use of sustainable decision making and processes in remediation.

A key concern was that NICOLE should use the overarching approach to SR that is suggested, to influence the ongoing debate about sustainable approaches to remediation in the drafting of the Soil Framework Directive. The main conclusion of the SR workshop was that "sustainable remediation" needs the support of "sustainable legislation" (Bardos, 2009a). This means not only the content of the legislation, but the way it relates to other relevant legislation, as well as principles and practices of working. NICOLE will continue to press for joined up thinking at EU and Member State level to provide a consistent approach to soil and waste related regulations as they affect contaminated sites.

A second conclusion from the workshop, especially when considering the activity of the SRWG, is that offering a prescriptive and dogmatic view on tools and indicators is not likely to drive a consensus between different constituencies. As it will be discussed here below NICOLE's preferred approach will be instead to provide a Road Map that can be used to aim for increased sustainability in site remediation decision making; a series of checklists to provide technical support to decision-makers, allowing them to examine suggestions of possible sustainability criteria or factors (indicators); and to provide available tools and techniques in the literature or on the market along with some assessment of their utility.

Finally, it also became clear how SR is different from green remediation. The latter addresses the technical outcome of the overarching SR scheme. In order to drive for a SR approach, such principles must be built in the project from the start, i.e.; from the definition of the remedial strategy, asking "what outcome do the stakeholders involved in a remediation project want for this project?"

Proposed content of NICOLE sustainable remediation guidance document

The outcome from this learning is the Guidance document which will consist of two separate parts.

The first part will consist of a Booklet or Brochure with a **Roadmap** and links to the full documentation. This first part will be separate and is designed to be edited sooner if needed.

The second part, or the "Full" document will have the following outline.

- Introduction, NICOLE's objectives, identification of main stakeholders, description of the SRWG
- Definition of SR, boundaries, drivers, enablers...
- Separate Chapters each containing an introduction and providing guidance
 - Economics, linked to an appendix with tools, check list, and references

- KPIs, linked with an appendix with a check list, and references
- Risk assessment
- Importance of communication, with a link to other Workshops, work groups, think tanks
- Illustrations with case studies

Given the importance of avoiding misunderstanding in the interpretation of the guidance document, especially when it addresses new concepts such as SR, it is likely that the critical parts of this guidance document (e.g. the Booklet) will be translated in the main EU languages.

Proposed Roadmap for considering sustainability in a remediation project

With the objective to help in the implementation of sustainable principles from the start of any remediation project, across Europe, NICOLE's SRWG built a Roadmap presented on the next page. This Roadmap is introduced in detail by Dr. Paul Bardos in his presentation at the Copenhagen conference (Bardos, 2009b). We will only provide here a brief summary of how it was designed.

The Roadmap is built to drive a project from the beginning until the end. At the start, the overarching framework for the project is defined, and agreed with all stakeholders. This may make use of existing frameworks, for example the one developed by SURF-UK (CL:AIRE (2009b). However, the nature of this framework is likely to vary from Member State to Member State. NICOLE's "Roadmap" complements these national or regional frameworks by providing a structure whereby sustainability assessments can be carried out and the results used in decision making.

It includes a series of steps. The rationale behind these steps is to support (as far as possible) a consensus based approach to the sustainability appraisal. There is no absolute measure of sustainability in the same way we might have for a distance (km) or energy (kWh). Sustainability is a "soft" measure used to help decision-makers choose optimally for a particular set of circumstances around a particular site and project. It will include factors that relate to the site, the project, the technology, the context of the site and whatever corporate reporting requirements might exist for stakeholders such as authorities and businesses. Hence by its nature "sustainability" is very variable, and essentially site/project specific in nature. NICOLE's Roadmap provides a stepwise pathway that supports the agreement of key principles in advance of the sustainability assessment being carried out. The aim of this is to have agreed objectives, measurements and measurement approaches, and agreed "boundaries" before the sustainability appraisal takes place. Unless these are in place it will be hard to find a sustainability assessment that all stakeholders can support because they might be disagreeing about objectives and methodology. Depending on the size of the project, stakeholders can be a limited group or wider. The overall strategy for the project (future end use of project site, how the site can be integrated within the wider regional strategy etc.), are debated and agreed upon.

The next step is to agree on the metrics (indicators) that will be used throughout the project to measure and demonstrate SR performance. These indicators are selected from the NICOLE guidance document, and should comply with the project objectives, and policies of the various stakeholders involved. NICOLE believes that given the site/project-specific nature of decision making, it is not useful or constructive to specify a prescribed list of indicators that must be used in all cases. However, what would be useful is a checklist so that decision-makers can check that the scope and range of their sustainability appraisal is indeed effective, and find a way of linking specific metrics they may be interested in to a larger structured hierarchy of indictors which in turn map back to the three broad elements of sustainability: economy, environment and society (Bardos 2009b). The tools considered the most appropriate for the project to integrate economical and social impacts are then defined, again tapping into the NICOLE guidance document. Once this step is complete, the remedial option appraisal (remedial alternative analysis) can be conducted, looking for example at green remediation technical solutions. The Roadmap allows for several iterations in case the measure of performance demonstrates the selected solution is not adequate.

Figure 2 – Draft Roadmap for driving to sustainability in a remediation project, SR Work Group, NICOLE, October 2009



While this "Roadmap" provides a structured process for reaching consensus in the sustainability based decision-making (Bardos, 2009b), perhaps such consensus may not

always be possible. In that case carefully recording where the points of disagreement have occurred, or are taking place, will allow a clever project manager to understand where the greatest efforts to provide more convincing information such as quantitative measurements, need to be made. Also, this should help us understand to what degree arguments against any particular option are truly rational.

Conclusion from the Risk Assessment subgroup

After intense research and debating the risk management subgroup has concluded in September 2009 that at present there is no clear consensus on the interrelationship between SR and risk assessment. There are however some clear conflicting interests between SR on one side and human health and/or ecological risk assessment on the other. Risk assessment principles and rules, driven by the precautionary principle (Commission of the EC 2000), are embedded in most if not all of the current (and some draft) regulations and/or methodologies controlling remediation projects across Europe. In most cases they do not authorize regulators to explicitly consider sustainable principles that may influence risk assessment inputs and outcomes, though in some jurisdictions the adoption of a tiered and iterative approach to risk assessment does offer the future opportunity to consider SR as one of a number of decision making variables. For SR to be effectively and materially implemented policy makers and regulators will need to be allowed to integrate it with the concepts of risk assessment, without undermining the principles of human health and ecological protection.

Collaboration with SuRF UK

In September 2009, after being invited by SuRF UK, the two organizations decided to join their efforts and resources to continue the research on SR, promote SR in the region, and develop some of the material required to achieve our project objectives, in particular the chapter on Indicators. What is interesting about this collaboration is the complementarily of the SURF-UK framework and the NICOLE Road-Map. The SURF-UK framework essentially addresses the question of "when" sustainability should be considered (in a UK context). The NICOLE Road-map considers" how" sustainability should be used as a decision-making criterion. The "when" may be affected by national or regional considerations, the "how" is more generic. It therefore seems likely that there is a good opportunity for the cross-fertilization of ideas.

Acknowledgments

The NICOLE Sustainable Remediation Work Group is a team. By definition this paper could not have been developed without the support from all its active members. I want here to thank in particular each of the leaders of the subgroups. I want also to thank the Organizing Committee of the NICOLE workshop on Sustainable Remediation held in Leuven in June 2009 which was essential in achieving our objectives. Finally, a special thank goes to NICOLE's Steering Group and its secretary who provided constant support to our work group.

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NICOLE SUSTAINABLE REMEDIATION QUESTIONNAIRE

NICOLE's Sustainable Remediation (SR) Working Group has a number of subgroups considering the opportunities and barriers to incorporate sustainability in remediation projects across Europe. The aim is to develop guidelines on Sustainable Remediation in Europe.

The guidance is meant for all NICOLE's members and your help in determining the form of the guidance and its content is very much appreciated.

To leverage fully our regional network please share this questionnaire with experienced practitioners within your respective organizations.

Timescales are short !!! and we would be grateful if this questionnaire could be completed by return to be with the working group by 27 May 2009 to enable assimilation of the results before the June 3 conference on Sustainable Remediation.

To expedite the processing of your feedback, please return the questionnaire to all our Sub Group leaders:

Work Group Leaders : Lucy.Wiltshire@Honeywell.com Olivier.Maurer@ch2m.com

Economics : <u>Richard.clayton@wspgroup.com;</u> KPIs : <u>p-bardos@r3-bardos.demon.co.uk</u> Risk Assessment : <u>John.Waters@erm.com</u> Case Studies : <u>Markus.Ackermann@che.dupont.com</u> Communication : <u>Olivier.Maurer@ch2m.com</u>

Thank you in advance for your assistance.

As a general introduction, please help us understand how sustainability is considered in general in remediation projects based on your own experience, and how has this changed over the past five years?

Sustainability is not explicitly stated in legal, regulatory documents. However it starts to show up implicitly in guidance documents and in few projects.

Economics Sub Group

Introduction

The Economics sub group of NICOLE's Sustainable Remediation initiative has been tasked with identifying existing and potential future tools, available to:

- Incorporate sustainability in remediation projects across Europe
- Describe how these tools incorporate remediation costs and other economic factors

To support the completion of this task the subgroup has identified the requirement to gather information across the EU member state countries on the status, availability and use of risk assessment, tools and key performance indicators in measuring sustainability in remediation.

Your answers will be used to benchmark the use of sustainable remediation tools across the EU at present. The data will be used to provide an indication of the scale of the work that may be required to facilitate its introduction across the EU.

Rating	Meaning / Description
1	It is widely accepted and recognised in regulation and practice across the country
2	It is included /allowed for in the country's legislation / regulation but is not applied by practitioners, organisations or regulators.
3	It is recognised by regulators and practitioners but only used / adopted occasionally as it has no official / legal support and is therefore only of use for internal decision making and in developing a qualitative discussion with regulatory bodies.
4	It is not used and not applied in country's regulations / legislation or by practitioners.

The format of this section of the questionnaire is based on a rating system:

There is a free comment box supporting each response; please respond with short answers only. Finally there is a free response section at the end of the questionnaire should you wish to provide any other relevant information.

The working groups aim is to use this information to create a matrix of current practices used in quantifying sustainable remediation across the EU member states.

Section E1 Location

1. Location	1. Location				
1a. Country	Please provide the name of the country / region for which subsequent answers apply.	France			
1b. Regional Differences	Please comment on whether your responses apply to regions within a country and whether there is a substantive difference between regions	National			

Section E2 Policy and Guidance - Site Assessment

Question 2a	Sustainability in environmental protection, planning and / or remediation / contaminated land in Legislation/ Policy / Guidance - Is the concept accepted, or at least allowed for in the country's guidance / legislation for remediation?
Rating	Comment
1	

2	✓	Costs & benefits. Social / societal aspects in the side. Methodology / Tools
3		and not regulatory (in France results are a must but tools are left to choice.)
4		

Question 2b		Risk Assessment for contaminated land and water - Is risk assessment and
		risk based remediation decision making accepted and used in practice? If
		not, why not?
Rating		Comment
1	✓	If rated 1 please complete questions 2c, 2d & 2e
2		
3		If rated 2, 3 or 4 please complete question 2f
4		

If rated 1 in Question 2b, can the approach or conservatism of input
parameters to human health or appleaded risk assessments he modified by
parameters to numan nearth or ecological risk assessments be modified by
sustainability issues?
Comment
Ver Gesther he behaltment Organizate / Organizate
Yes - flexible - be intelligent. Communicate / Convince

Question 2d	If rated 1 in Question 2b, is there a conflict between site specific risk assessment based on existing or future land use and sustainability ?
	Comment
	Not a conflict in theory. However often in practise reluctance at the local level. Training & communication is on going and needed.

Question 2e		If rated 1 in Question 2b, is sustainability only considered once the risk assessment is complete? If so, how?
		Comment

Questi	on 2f	If rated 2, 3 or 4 in Question 2b, can sustainability principles be applied to remediation option appraisal?
		Comment

Question 2g	Sustainability accreditation /assessment schemes - Is the remediation phase of projects and/or brownfield development included in overall sustainability assessment of land regeneration / redevelopment projects (e.g., LEED or BREEAM)?
Rating	Comment
1	

2		No accreditation system required, but possible in redevelopment projects.
3		(I.e. required in the stimulus plan to fight against the current crisis).
4	✓	

Section E3 Common Solution Selection methods

Question 3a		BATNEEC - Is Best Available Technology Not Exceeding Excessive Cost the basis for deciding the remediation approach / technology used?
Rating		Comment
1	✓	
2		Not the basis. But one of the elements of decision making.
3		
4		

Question 3b		ALARP - Is the cheapest approach/technology that meets the remediation objective (i.e. As Low As Reasonably Practicable) usually adopted?
Rating		Comment
1		
2		No - See 3A.
3 🗸	1	
4		

Question 3c	Please note any other similar solution selection procedures used?
Rating	Comment
1	
2	
3	
4	

Section E4 Other Decision Support and Costing Tools

Question 4a		MCA - Is Multi-Criteria Analysis used to support remediation decision making?
Rating		Comment
1	✓	
2		Specified in the methodology, Semi quantitative.
3		
4		

Question 4b		Cost Benefit - Cost Benefit Analysis - Is quantitative analysis used that monetises internal and external (non-direct) costs and benefits to compare different options to achieve the objectives.
Rating		Comment
1		
2		Nothing is impossible. Should be justified.
3	✓	
4		

Question 4c	NEBA - Net Environmental Benefit Analysis - Is the decision of which remediation approach / technology to adopt based on choosing the one that maximises the net environmental benefit (e.g., qualitative / semi- quantitative and it includes impacts to ecosystems/natural resources, consideration of costs compared to clean-up criteria, material and resource use, waste and emissions such as Green House Gas).
Rating	Comment

1		
2		Same comment as 4B.
3	✓	
4		

Question 4d	Sustainability analysis and decision tools - Please note any other similar decision support tools used
Rating	Comment
1	
2	
3	
4	

Section E5 Aspects to Consider / Weigh Up

Question 5a		Social Impacts and Benefits- Are there any other tools used to measure	
		social impact / benefit aspects of remediation and, if so, what?	
Rating		Comment	
1			
2		Be practical. Use common sense. (The French one!).	
3			
4	✓		

Question 5b		Economic Impacts and Benefits s - Are there any other tools used to measure economic impact / benefit aspects of remediation and if so what?
Rating		Comment
1		
2		No evidence.
3		
4	✓	

Question 5c		Environmental Impacts and Benefits - Are there any other tools used to measure environmental impact / benefit aspects of remediation and if so what?
Rating		Comment
1		
2		LCA possible.
3		
4	\checkmark	

Section E6 - Indicators Sub Group

Question 6a How does your country's overall sustainable development policy framework affect your work in contaminated land management?

If you can help further with your country information, please supply a document link to any available information, particularly any information summarised in English. If no English language documentation is available, would you be prepared to assist the sub group to incorporate details into the study?

MEEDDAT - some incentives in the stimulus plan to fight against the crisis.

Question 6b What specific sustainable development policies are you aware of that apply to land management, and especially contaminated land management in your country?

If you can help further with your country information, please supply a document link to any available information, particularly any information summarised in English. If no English language documentation is available, would you be prepared to assist the sub group to incorporate details into the study?

Same as above.

Question 6c What criteria does your organisation use to assess sustainability (economic, environmental and social criteria) in an overall sense?

If you can help further with your country information, please supply a document link to any available information, particularly any information summarised in English. If no English language documentation is available, would you be prepared to assist the sub group to incorporate details into the study?

Question 6d In what ways are these criteria (or "indicators" grouped or simplified to facilitate assessment of sustainability?

If you can help further with your country information, please supply a document link to any available information, particularly any information summarised in English. If no English language documentation is available, would you be prepared to assist the sub group to incorporate details into the study?

Section E7 Closing

Question 7a	Are there any other comments you'd like to make about remediation decision making tools and sustainability?
Comment:	
Sustainability	is a way of thinking not an end in itself.

Question 7b	What would be the most useful items that a NICOLE guidance document on sustainable remediation could include to support your needs?		
Comment:			
Inform, communicate, push.			
Definition of sustainable remediation Case studies considered sustainable to illustrate the principles.			