Supporting the UK's Environmental Industries

Future Scenarios

Contaminated Land Remediation

EIU Emerging Markets Report

The research for the report was undertaken by the UK Centre for Economic and Environmental Development (UK CEED) on behalf of the Environment Industries Unit (EIU). The EIU is a joint DTI and DEFRA unit that promotes innovation and productivity in the UK environmental goods and services (EGS) sector. The report is required to provide officials with an overview of the competitive environment of the UK EGS sector and provide new market intelligence in specific markets to help in securing the future competitiveness of the UK EGS sector.

Future Scenarios

Introduction

The final part of this study focused on assessing specific sectors for future potential developments and consequent opportunities for UK industry. The two sectors, selected in conjunction with the DTI, were Contaminated Land Remediation and Environmentally Smart Buildings. The latter relates partly to the energy management sub-sector and also covers platform technologies that in itself are not unique to the EGS industry (the information and communications technologies required to enable the 'smart' applications in the home).

For each sector, the UK CEED team held scenario development workshops to define four scenarios, based on the combination of key drivers identified by an expert panel. The workshop then selected one scenario for further analysis, based on a combination of which scenario was considered most likely and also of most value for further review.

For each of the scenarios selected, a further workshop was held to review the value chain and UK capabilities in the sector and then to develop a strategic roadmap. The roadmap covered the development required in products, services, supporting technology platforms and underlying industry capabilities to achieve the scenario depicted for 2015 in that sector.

Additionally a vision for UK industry on how to seize the opportunities presented by the 2015 scenario was constructed, together with the challenges considered by the participants as being critical to address.

UKCEED used fast-track scenario development and fast-track strategic road-mapping approaches facilitated by Codexx, our consulting partner for this work.

Contaminated Land Remediation

Key question for scenario development

"How attractive a market will the Contaminated Land Remediation sector across Europe be for UK industry in 2015?"

Expert Participation

The following personnel participated in the scenario development workshop on 21st March 2006:

Jonathan Selwyn – Director, UKCEED
Stephen Mahon – Chief Executive, Centre for Sustainable Engineering
Phil Shepperd – Centre for Sustainable Engineering
Noah Myers – Consultant, URS (on secondment to DTI)
Bill Leverett – Environmental Consultant
Alastair Ross – Director, Codexx (workshop leader)

Key drivers

The workshop identified the drivers that would impact the development of this sector up to 2015. Those drivers shown in bold were considered most significant by the review team:

POLITICAL

- Degree of EU harmonization
- Germany drive for EU directive on contaminated land
- EU expansion
- UK decision on expanding nuclear power generation
- War/terrorism
- Politicial priorities on environment v other issues
- WTO/EU services directive

ECONOMIC

- Developing countries environmental prioritisation
- Public sector funding for remediation (e.g. tax incentives) particularly in accession states and Eastern Europe
- EU economic growth over period
- Land/property values
- Availability of remediation 'cost cap' insurance
- Investment industry view of risk in land remediation
- Costs of travel
- Growth in business off-shoring (particularly to E Europe)

SOCIOLOGICAL

- Public view on contamination 'scare factors'
- Demographics and ethnic mix in EU
- Availability of environmental hazards information to public

- Cultural view of environment across EU and accession states (e.g. public desire to protect ‘green field’)
- Cultural view on best solutions for environmental challenges – ‘East v West’

TECHNOLOGICAL

- Operational cost of cleanup (e.g. ref land costs)
- Cost of new remediation technology v labour costs
- Public sector funding for new environmental technologies (e.g. research grants, academic-industrial networks)
- Scalable technology to enable economic remediation across large and small applications
- Integrated remediation technology (utilising different technologies to create a single remediation solution)
- Recycling of remediated waste
- Availability of new assessment and monitoring technology for remediation
- Continuation of Intellectual Property framework
- Learning from UK government/military work on decontamination

ENVIRONMENTAL

- New evidence of impact of chemicals on health
- Impact on water resources driven by a combination of climate change and increased house building
- Climate change/Extreme weather – catastrophic impact

LEGISLATIVE

- Proposed EU directives for Waste, Soil
- Implementation of EU Landfill directive (e.g. Landfill tax in the UK)
- Implementation of EU Water framework directive
- EU REACH programme for chemical hazards definition
- Development of IPPC regime
- UK quota for new housing and commercial property on brown-field sites
- Development and harmonization of land remediation standards across EU

Selection of Key drivers

Drivers were analyzed, grouped then ranked against Impact and Uncertainty. The workshop attendees then voted on those that they considered to be the key drivers for the future development of this sector up to 2015. The two drivers selected were EU Regulation and the European Property Market.

Construction of Scenario Logic

Using these two drivers as the axes for the environment space, 4 key scenarios were defined:

Scenario space for ‘Contaminated Land Remediation sector across Europe in 2015.”

EU Regulation

LO	HI

European Property Market Activity	HI	*'No place like home'*	*'Green and pleasant land'*
	LO	*'Little England, Little Value'*	*'Strangled by red tape'*

Selection of scenario for further detailing

The meeting agreed that on current trends the positive scenario *'A green and pleasant land'* offered most value in further definition and later analysis for UK industry's ability to exploit.

Scenarios

The four scenarios for the Contaminated Land Remediation Sector are detailed in the following pages.

“A Green and Pleasant Land” (Chosen scenario)

In response to the growing power of Asian and North American trading blocs, the EU has pulled out of its constitutional crisis and recognised that it has to put aside national differences in order to compete as a world power. At the same time, it has embraced public pressures for a cleaner environment from Western European countries. The European Commission gained new powers in areas traditionally reserved for national governments, and used them to bring in strong environmental protection legislation, such as the EU Framework Directives on Soil and Waste and harmonised environmental standards across all EU countries.

By 2015, Turkey, Croatia, Romania, Norway and Switzerland have joined the EU, and much of the Balkans, Iceland, and many former Soviet republics are working towards accession. The European economy is booming and companies are falling over each other in the rush to get into the world’s largest and richest single market. Europe’s cities are growing, and its citizens are relocating themselves as barriers to immigration and land ownership (apart from the price) drop. Six of the ten most expensive cities to live in are in Europe. There is thus pressure to clean up old industrial areas as land prices rise across Europe, and particularly so in the old Eastern bloc countries with their legacy of less regulated industries.

The mixture of traditions and cultures spurs mini-Renaissances in art and science, typified by the dazzling architecture of the 2012 Olympic facilities in London. The fact that the entire Olympic village was sited on previously contaminated land made the Games as much of a showcase for the UK remediation industry as for the athletes. Combining innovative technologies such as bio-remediation from Scandinavian and Dutch companies with UK expertise in assessment, testing and practical deployment of remediation systems has already won Anglo-Swedish and Anglo-Dutch companies solid reputations from Madrid to Istanbul. The land remediation business is in full swing as industries are either cleaning up or moving out of the EU, the high prices they get for their premises easily paying for the remediation of the polluted soil they leave behind.

All European landfills are closed to everything but the most intractable wastes, and there is talk of the next step: mining historic landfills for resources and remediating them. In this field, as with nuclear decommissioning, the UK has had considerable practice in its home market. All of this will stand it in good stead in bidding for the structural fund-driven contracts coming up in the pre-accession countries, such as the Chernobyl cleanup.

"No Place Like Home"

With the UK economy worth 22% more than it was in 2005, the market for commercial property has grown accordingly; new builds, starts and work contracted accounts for 20 million m^2, 10% of the 2005 area. Another 15 million m^2 have permission. In housing, the Sustainable Communities initiative begun by the previous government is nearing completion, having been responsible for 200,000 new homes in the south of England in the period. The next wave of house building is now beginning, in the Midlands, Yorkshire/Lancashire and south west areas, as higher speed train connections, better long term freight economics and lessening concerns about emissions with the rollout of hybrid, bio-fuelled and now fuel cell vehicles, bring those areas into the influence of London and the south east. Whilst the 2000s saw a focus on the conversion of brown-field land, this has pretty much been hollowed out, and the focus now is on clearance and rebuild. Whilst not of revolutionary proportions, a trend has grown in recent years to sweep away Victorian housing and industrial buildings as they get to be prohibitively expensive to refurbish, and go out of fashion.

The health of the UK property market has been reflected everywhere in Europe in the last decade, in line with the growth of the economy and the revival of agriculture. Now freed from the straitjacket of the CAP, and reaping the benefits of investment in energy and other non-food crops over the past 10 years, land prices are very strong, and this had a knock-on effect on urban prices.

This activity is good for the Contaminated Land Remediation (CLR) sector. Particularly in the monitoring and assessment of land, companies are finding it difficult to cope with the volume of demand and are investing in training and the application of more efficient assessment technologies. However, the resistance of individual EU Member States to harmonised standards in Waste legislation, since the German attempt in 2008 to introduce a Contaminated Land Directive, has thrown up obstacles to business beyond the UK. Northern European countries mostly agree on *what* should be controlled and removed from land and groundwater, but differ in the degree of cleanup, with Scandinavian countries and Germany requiring a higher percentage removal of most contaminants than the UK. The last few percent of cleanup requires proportionately more effort which UK firms are not always geared up to and which they cannot cite in tenders as having great experience in. Southern and Eastern Europe, on the other hand, generally prohibits fewer substances and has lower cleanup percentages. The issue is heavily influenced by climate change, because the increasing problems arising from extreme weather and periodic sea inundations is focusing the minds and cheque-books of policymakers on energy policy rather than cleaning up toxins.

The differences of view among the legislators have been reflected in the European Standards body, CEN, and other standards bodies. Discussions have stalled for the third time since 2006 on standards for different grades of land. The diversity of standards across countries limits the effective operation of the remediation market in the EU and with most standards in Northern Europe exceeding those in the UK, limits UK CLR industry's export potential.

“Little England, Little Value”

August 2015:

Another record dry hot summer has led to a spate of bush fires in Hampshire that has destroyed over 2000 homes in the last two months leaving almost 10,000 people homeless. The shortage of land for rebuild, following a decade of housebuilding from the Sustainable Communities Programme commenced by Lord Prescott, has driven urban prices beyond the reach of most consumers. This has resulted in the need for the clean-up of brownfield sites, but the additional cost does not make this economic for developers.

The UK domestic market will struggle to benefit from the experience of its European neighbours, who have shared a common Soil Remediation Protocol since 2009. Both Germany and Poland have experienced greater loss from fires in the last 5 years, believed to be due to the impact of climate change. But these countries’ domestic investment in home-grown technologies have enabled a rapid clean-up and rebuild. However, their techniques do not meet the UK’s more stringent remediation regulations, which is no comfort to the many thousands of former home-owners, who face a winter in expensive temporary accommodation

- Same lack of open market in Europe as Phil’s, but low property market means little drive for land remediation and therefore little opportunity for CLR companies. Construction industry in decline in the UK

"Strangled by red tape"

Driven by an increasingly powerful environmental axis of Germany, Denmark and the Scandinavian countries, the EU is now reaping the results of its ever-tightening environmental standards. The legislation implemented between 2006 and 2010, especially the contaminated land framework directive of 2009, imposed ever tighter regulations within the Union and whilst the countries with strong economies and high quality environments have managed the downturn better, the less developed economies of Southern and Eastern Europe have been hit particularly hard.

Land prices have been pushed downwards in the industrialised areas of these countries as it has become increasingly uneconomic to clean up land to the quality required by the legislation and the cost of compliance has increased industry's move offshore. Whilst some EU money has been made available to assist countries in land remediation, disputes over which CLR companies should benefit from the contracts have slowed progress. More prosperous residents of the cities and towns affected have relocated to the booming cities of Western and Northern Europe, notably Munich, Copenhagen, Lyon and Birmingham. Such cities, which first embarked on major regeneration and cleanup in the 1990s, have become thriving cosmopolitan centres of commerce and culture.

However, even the booming cities of the West have more recently started to become victims of their own success with a perception of overcrowding resulting in some downward pressure on house prices. At the same time, advances in information and communications technologies, and a radical relaxation in greenfield development rules in the UK, have enabled many people to retreat to the rural idyll that was last popular in the 1980s.

The EU's environmental legislation proved the final nail in the coffin of the pro-Western secular government in Turkey. The urban middle-classes rose up against the impending high entrance costs of joining the EU block and voted for an Islamic fundamentalist regime which is now making plans to join the increasingly powerful Middle Eastern Trading Confederation.

The other winners from the legislative drive have been the big contaminated land companies specializing in the increasingly efficient assessment and remediation technologies which have replaced less cost-effective manual methods such as 'dig and dump'. The industry is dominated by consolidation of existing CLR companies and vertical integration of property development/construction companies into major remediation service companies such as Virgin Land, EON and Carillion exploiting new technologies such as bio-remediation .

Contaminated Land Remediation: Analysis of UK capabilities and development to 2015

Introduction

In this section we assess the full extent of the opportunities for the UK supply base in Contaminated Land Remediation up to 2015, and analyse the ability of UK companies to meet the competitive challenges that are emerging in those areas.

To do this we involved experts in this sector and utilized Strategic Road-mapping to determine the potential development of the UK supply sector to meet the opportunity presented by our scenario for 2015 'A Green and Pleasant Land' where the combination of a high level of EU Environmental Regulation and a booming EU property market has led to major growth in the remediation of contaminated land and hence opportunities both in the UK and across Europe for companies in this sector.

Expert Participation

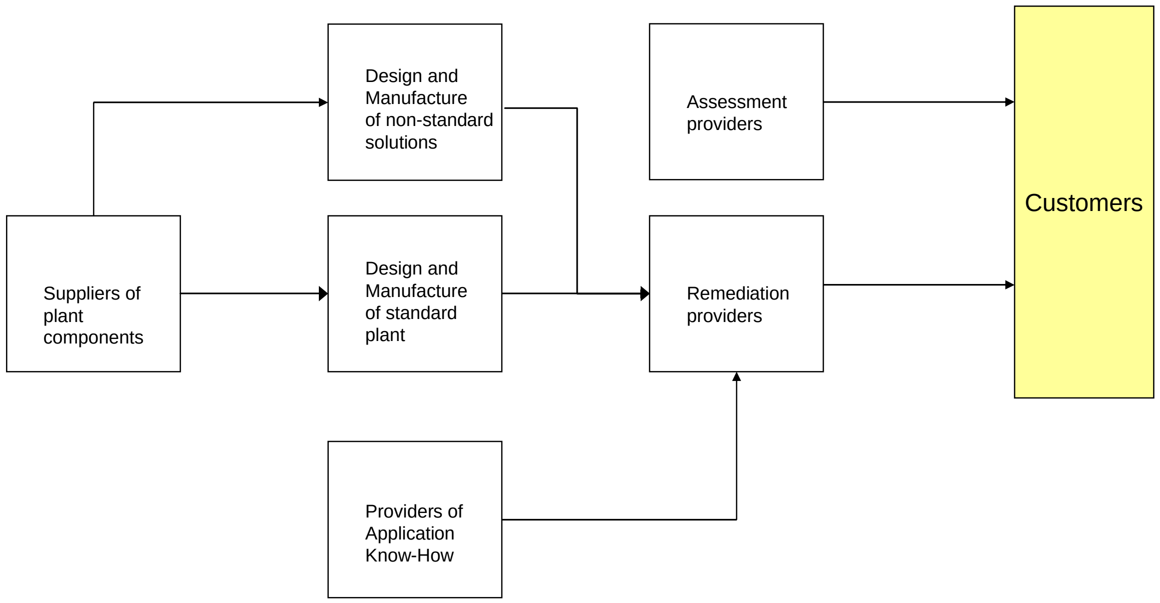
The following personnel participated in the scenario development workshop on 28th April 2006:

Jonathan Selwyn – Director, UKCEED
Bill Leverett – Environmental Consultant
Clive Boyle – Environmental Consultant, Vice-chair of EIC contaminated land group
Redding Thompson – Group Leader, Soil and Groundwater, URS
Alastair Ross – Director, Codexx (workshop leader)

Overview of the Contaminated Land Remediation Sector in the UK

An overview of the remediation value chain is shown below:

Figure 1: Overview of Value chain for UK Contaminated Land Remediation Sector



Key points on the UK market and suppliers:

- The lifecycle for contaminated land remediation starts with an Assessment of the land. Often the cycle is halted here if the level and nature of contaminated found requires such a high level of remediation with associated risks that this is not cost effective within the overall development programme. If this is not the case, the land will then undergo Remediation and finally a final Assessment or Validation to confirm that the remediated land meets requirements.

- Considering the cost across the remediation cycle (or revenue obtainable by remediation suppliers) currently the split is estimated to be approximately 10% on initial assessment, 80% on remediation and 10% on validation. It was considered by the workshop attendees that by 2015, this would change to 20% for initial assessment, 60% for remediation and 20% for final validation, The anticipated changes in % makeup reflects both improved economies in remediation and the recognition that appropriate investment in assessment is required in order to optimise and achieve best cost effectiveness of remediation projects.

- The UK historically has particular strengths in Assessment/Validation and less so in Remediation technologies.

- Suppliers of remediation plant components (such as pumps, piping and controllers) are not typically UK suppliers. The design and provision of standard remediation plant is also typically not from the UK, but from Germany and Italy as well as other European countries. The UK does however have some strengths in the provision of non-standard or bespoke remediation plant (for dealing with mixed contaminants for example). The UK is also strong in providing specialist remediation solutions such as bio-remediation that do not use conventional remediation plant.

- The UK market for land remediation is now more attractive to UK and foreign suppliers due to the changes in landfill legislation which have severely limited the previous ‘dig and dump’ approach. However, UK remediation suppliers, lacking a market for their services for many years, are in catch-up with established competitors on the European mainland

- UK remediation suppliers typically have a limited amount of small capacity remediation plant and a very limited amount of large capacity plant – this may limit their ability to compete with overseas suppliers for remediation contracts, once those overseas suppliers engage more actively in the UK market.

- The UK remediation supply industry has a limited supply of experienced personnel (i.e. typically 10+ years of remediation experience).

- For major land development programmes, such as the Thames Gateway scheme, a cost-effective solution is based on a ‘Cluster’ solution where remediation plants would be installed at points within the area determined by logistics.

- One issue limiting market growth in the UK is the variable and, in places, poor application of the contaminated land legislation (Part IIA) together with the "uncertainty" over landfill disposal requirements and costs, with possibly a light touch regulation from Environment Agency as the new regime settles in.

Vision for the UK Industry

The workshop developed a 2015 vision for the UK industry which was considered 'Ambitious but achievable', this comprised the following elements:

- The UK will focus on providing assessment services and bespoke (not standard) remediation solutions.
- There will be a healthy UK remediation industry in size, margins and image.
- There will be consolidation within the UK remediation sector to build large players with more capability for investment, offering development and export.
- There will be a continued growth in UK remediation assessment business across Europe.
- By 2015 there will be maximum recycling capabilities for soil which will be based on sustainable solutions.
- There will be a substantial soil recycling infrastructure established across UK regions.
- There will be an effective supply of UK remediation 'brokers' established, operating trading marketplaces (e.g. growth in exchanges such as the 'Waste Exchange' http://www.waste-exchange.org/).
- Remediation cluster solution will be established to support large regional development schemes such as the Thames Gateway and the London Olympics development, providing business and marketing opportunities for UK suppliers.
- The UK home demand for remediation will be met substantially by UK operators.
- There will be a growth in nuclear cleanup business for UK leaders in the UK and abroad.
- UK government funded technical development programmes for remediation assessment, technologies and application will continue – utilizing joint academic-industry programmes.

Strategy to achieve vision

The workshop used strategic road-mapping to develop a potential strategy for the UK industry to achieve the proposed vision, with the objective of identifying the key activities required and highlight the potential barriers. Within the time constraints of this project, this roadmap is by intent at an overview level – further insight would be gained from additional review and analysis. We excluded Nuclear Remediation from the scope of the roadmap, due to its specialist nature.

The strategic roadmap aligns the required product/service offerings, over time, with the opportunities and threats posed by market and external events, It then identifies the required technologies to enable these new offerings and also enablers within the industry itself such as skills, investment etc.

The summary roadmap is shown below with a more detailed one in the Appendix.

	2006-08	2009-12	2013-15
Market + Externals	• Continuation and enhancement of UK remediation tax breaks, other incentives •Introduction of practical waste guidance from DEFRA •Improved clarity on risks for assessment from DEFRA, EA •Transposition of EU environmental liabilities directive •Major UK developments in Thames Gateway, Olympics •Increase in landfill tax escalator	•EU soil framework directive •80% brownfield quota for new housing in UK •Possible opening of Asian markets for remediation •2012 Olympics in London •Part IIA-driven remediation	•UK Olympic legacy •MOD execute its obligations on land cleanup •Potential legislation in UK to ban landfill of soils
Product and service offerings	• New assessment & remediation solutions for current sites	• New remediation solutions for complex sites	
Enabling technologies	•Improved application of current technologies, funded R&D for new technologies and improved brokering	▪ Electrochemical, advanced thermal and biochemical solutions	▪Breakthroughs in biokinetics and nanotechnology
Required UK industry enablers	•Improved training and accreditation •Improved remediation plant capacity •Ongoing DTI funding for near-market and long-term R&D •More realistic remediation contract liabilities and terms •Govt database on remediation technology approvals •Enforcement of Part IIA by Local Authorities	•DTI trade mission to E Europe for remediation •Consolidation & cooperation in UK suppliers •Availability of improved market knowledge	

Figure 2: Strategic roadmap for UK Contaminated Land Remediation Sector up to 2015

Commentary from the roadmap:

- The road-map shows how the UK supply industry (and other UK bodies) would best respond to the 2015 scenario. It identifies key external events – such as new EU regulation and the 2012 London Olympics (as a potential show-case for UK remediation skills). It identifies new product and service offerings and the supporting technology developments required. Finally it identifies the key actions required for the UK industry to be capable of developing the new product and service offerings and new technologies.

- The road-map identifies the actions required by both industry and government to improve the remediation market in the UK and also to better position UK suppliers to compete in it

- Key requirements on UK industry over the next 3-5 years are:
    - Improved training and accreditation
    - Growth in remediation plant capacity
    - Consolidation to develop major players who can compete across Europe

- Key requirements on UK government bodies over the next 3-5 years are:
    - Improved guidance on waste risk assessment and classification

- Consistent enforcement on Part 2A regulations
- Use of tax incentives to promote remediation
- Ongoing DTI funding for new remediation technologies and application
- Enabling major national developments like Olympics site to be a remediation showcase

Barriers to realizing vision

The workshop participants identified the key barriers to achieving the proposed vision for the UK remediation supply sector:

1. Lack of clarity on waste standards (currently being defined by case law) – industry is looking to the UL government to define. This is inhibiting both UK developers and remediation suppliers from investment.

2. The perception of the remediation industry as a 'waste' industry, rather than an increasingly high tech and development focused industry.. This colours both the government's view and potential employees when students and can only be improved through marketing.

3. The need for multiple government departments (e.g. DTI, DEFRA, Education) to work together to enable key requirements in the proposed strategy.

4. Current lack of experienced UK professionals in assessment and remediation.

5. Industry concern over possible changes in government policy and support for brown-field development.

6. Potential shortage of UK university science skills in areas key for this sector such as Hydrogeology.

7. The fragmented makeup of the UK remediation supply base with a long tail of SMEs and few large and medium-sized suppliers.

Appendix

Strategic roadmap for UK contaminated land remediation sector - detail

	2006-08	2009-12	2013-15
Market + Externals	• Continuation and enhancement of UK remediation tax break and other fiscal incentives •Introduction of practical waste guidance from DEFRA etc with examples •Improved clarity on risks (SGVs etc) for risk assessment from DEFRA and Environment Agency •Transposition of EU environmental liabilities directive •Major UK developments in Thames Gateway and Olympics •Increased landfill tax escalator	•EU soil framework directive •80% brownfield quota in UK •Opening of Asian markets for remediation •2012 Olympics in London •Possible acceleration of renaissance of UK Northern cities •Part IIA remediation	•UK Olympic legacy •MOD execute its obligations on land cleanup •Potential legislation in UK to ban landfill of soils
Product and service offerings	• New field assessment techniques •Small site remediation solutions •Rapid remediation solutions •Gate treatment at landfill sites •Cluster remediation sites for development areas	• Soil treatment centres for single contaminants •Solutions for mixed contamination sites •Remediation solutions for hardcore sites (currently sitting in landbanks) •Treatment for high organic content soils	
Enabling technologies	•Improved application of geophysics – down-hole and ground penetrating radar – for assessments •Improved application of current technologies •New technologies and applications from funded collaborative R&D •Advanced oxidation processes •Brokering in Soils	▪ Electrochemical approaches ▪Advanced thermal techniques ▪Advanced biochemical solutions	▪Breakthrough in biokinetics enabkes fast and effective in-site treatment ▪Nanotechnology
Required UK industry enablers	•Improved remediation plant capacity •Training in core science at Universities (e.g. Hydrogeology) •Technical training for remediation systems •Application training in remediation •Improved skills accreditation of companies and people 'Remediation Industries Accreditation' •Launch of an 'Institute for Land Remediation' •Ongoing DTI funding for near-market R&D •Funding for long-term R&D in remediation •Launch of new Faraday for remediation technologies •Introduction of more realistic remediation contract liabilities and terms •Available government database on remediation technology approvals •Recognition of MCerts for chemical testing of soils at EU level •Enforcement of Part IIA by Local Authorities	•MCerts for soil sampling •Recognition of value of treatment based remediation (enabling a 'healthy market') – reasonable client expectations on time, cost and certainty •DTI-led trade mission to Eastern Europe for remediation •Balanced UK supplier base with some consolidation into bigger more mature players •Improved working between UK Assessors and Remediation companies to generate downstream UK remediation work •DTI provide good information (inc metrics) on remediation marketplace to help suppliers	

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