The land remediation market in the UK has matured over the past decade. There has been no overnight change, with dozens of new players and the adoption of brand new approaches to cleaning up contaminated land – rather the steady growth of an experienced and professional base of remediation practitioners, applying and adapting established remediation techniques to suit the UK situation.

Since land remediation emerged as a distinct area of activity, UK practice has been dominated by civil engineering approaches, principally a reliance on readily available and low-cost landfill disposal. The UK had been seen as lagging well behind its counterparts elsewhere in Europe and in North America in terms of developing and employing more innovative approaches to dealing with the legacy of land affected by contamination. But things have changed and continue to change.

Boom or not?

A glance at industry directories will show that there is now a large number of companies that cite land remediation as their principal activity or a significant arm of their business. Many of those have said that they have been busier in the past two years than ever before.

In a recent survey of the land assessment and remediation industry by the Environmental Industries Commission (EIC), 90% of respondents predicted growth over the coming year, with 19% anticipating growth in excess of 40%. A caveat here is that the survey took place before the full impact of the credit squeeze became apparent.

Most remediation is development driven and that same survey showed that the currently beleaguered housebuilders, construction companies and developers represent a large part (over 70%) of the client base for the remediation industry.

With the recent high level of activity has emerged a significant and growing move away from the traditional approaches to treatment or processbased remediation techniques. There are at least five good reasons for that.

Drivers for change in land remediation

The regulatory climate for land remediation has improved significantly in the past decade, not least as a result of campaigning by industry groups such as EIC. Simpler and quicker licensing of remediation activities by means of mobile treatment licences and now environmental permits has made a big difference, reducing the uncertainty over timescales that developer clients find so difficult to accept.

Excavation and disposal to landfill (or 'dig and dump') is no longer the default low-cost option. The tax on disposal of waste to landfill rose to £32 per tonne in April and is set to reach £48 per tonne by 2011. Importantly, landfill tax exemption, whereby much material from land remediation could avoid this tax, is being phased out, disappearing completely by March 2012.

The significance of this change to remediation economics should not be underestimated. With a typical lorry load attracting tax of some £900 by 2012, even relatively modest sites, with 10,000m3 or so of contaminated soil, could cost nearly £1m more to clean up if the landfill disposal route is used.

Disposal to landfill has also become more difficult as well as more costly. The implementation of the Landfill Directive in the UK led to a dramatic reduction in hazardous waste landfills, with a poor geographic spread; there is now a requirement for pre-treatment prior to landfill and a derogation allowing the disposal of high organic content waste to landfill was withdrawn in July.

Client confidence in treatment-based remediation has grown with experience gained. An appreciation that such approaches, if properly employed, can effectively deal with environmental liabilities makes this an easier sell.

Finally, the 'S' word. Sustainability is becoming an important consideration when selecting remediation strategies.

While the industry is still grappling with the complexities of this topic, dealing with contamination on site has prima facie appeal compared to hauling soil over long distances for burial on another site.

Remediation technologies

So what technologies are being employed? The environmental permit that covers most land remediation activities lists the following:

- Air sparging
- Bioremediation in situ and ex situ (windrows, biopiles, in-vessel bioreactors)
- Biosparging
- Bioventing
- Chemical treatment (including oxidation, dehalogenation)
- Soil vapour extraction (including dual phase SVE)
- Soil flushing (including steam injection)
- Soil washing
- Solidification
- Stabilisation
- Thermal treatment (including thermal desorption and steam injection)
- Treatment plant for blending, mixing, bulking, screening, shredding and particle size reduction in order to facilitate remedial action.

Treatment centres and clusters

Some of those techniques lend themselves to use in soil treatment centres, which have been suggested as a key part of the UK strategy to divert soils from landfill but have yet to find widespread use. A handful has appeared and those established seem to be steadily building custom.

Bioremediation in windrows appears to be the most commonly employed technique, but soil washing, solidification/stabilisation and thermal desorption can also be found in these centres or the plans of operators.

Realisation of the clear benefit of landfill diversion and a reduction in vehicle movements has been hindered to some extent by the difficulties in removing the waste tag from treated materials, to allow beneficial use in construction and development on other sites.

Cluster projects are a local and temporary variant on the soil treatment centre, where soils from one or more 'donor' sites are treated at a central 'hub site', with the clean products returned to another 'receiver' site within the cluster. Full-scale operation of a cluster project has been demonstrated in Sheffield in 2008 and further suitable groupings of sites are now being sought.

Emerging technologies

Novel approaches are emerging, either as a result of innovation by practitioners – usually adapting techniques to suit particular site conditions – or arising from academic research and (importantly) collaborative R&D between the high-quality UK academic base and experienced practitioners. Land remediation featured in a funding programme call in 2005 by DTI.

Now run by the Technology Strategy Board, the funded projects are nearing completion and the results could appear in the UK market over the next few years. Projects range from the use of microwaves or biologically enhanced charcoal for soil remediation to ex situ chemical oxidation, together with a range of instruments and decision support tools to increase the efficacy of existing approaches to remediation.

Green solutions, phytoremediation, the use of hyper accumulating plants – perhaps combined with renewable fuel schemes – have seen a lot of interest but as yet no widespread application. Further out, there is the prospect of electro kinetic techniques and treatments directed specifically at the legacy of radioactively contaminated land; and a recent press report referenced work in USA on the use of nano particles of metal and carbon to capture, transport and release oil droplets in remediation programmes.