The findings of the two workshops can be summarised as follows:

- Classical approaches for site characterisation are expensive if applied to large sites. The integral groundwater investigation approach proved to be effective. More advanced proven site characterisation technologies and approaches are needed in order to achieve reliable site characterisation on a large scale in a cost effective way.
- Principle remediation options are still "dig and dump" and "pump and treat". Waste legislation and related costs for landfilling are the key drivers for a shift to alternative, more sustainable, on-site and in-situ technologies.
- There is a need for pilot applications to demonstrate the applicability of alternative technologies in different framework conditions (e.g. geology, contaminants, time, and space). Such pilots should already be part of technological development and should be considered in the site-specific technology selection process.
- Local situations and the complexity of brownfield revitalisation requires that a robust appraisal of the environmental impact of each remediation technology be considered in the decision making process. Life cycle assessment of the technologies should be an essential step in all remedial planning.
- Technology demonstration, verification and updated, independently reviewed information are cornerstones of a strategy supporting the implementation of alternative technologies. Bodies like **C**ontaminated **L**and: **A**pplications **I**n **R**eal **E**nvironments [CL:AIRE] in UK, and the Netherlands Centre for Soil Quality Management and Knowledge Transfer [SKB], provide essential information and reference systems for sound decision making on the application of innovative and alternative remediation technologies to reflect specific site conditions.

Removing contaminated groundwater from dismantled gas-holders – Medway

Changes in legislation and increasing requirements for environmental quality lead to stronger efforts to find more sustainable solutions with regard to soil and water decontamination. Conventional tools, such as life cycle assessment and cost benefit analysis, support the quest to improve the sustainability of brownfield remediation techniques. Successful implementation of alternative remediation technologies requires pilot and demonstration projects to facilitate and secure wider acceptability.

Recommendations and Conclusions:

1. Advanced monitoring and site investigation technologies and approaches are needed in order to achieve reliable site characterisation on a large scale in a cost effective way.
2. Waste legislation and landfill costs are key criteria for the selection and development of remediation solutions and technologies. Life cycle assessment and cost benefit analysis of the technologies is an essential step in the remedial planning process.
3. Pilot tests should use site-specific technological solutions.
4. Successful new remediation technologies must be supported by a strong marketing and demonstration campaign in order to gain wider user acceptability.

Natural Assets

Brownfield sites that have been derelict for long periods and/or have extensive land and buildings often develop unique habitats for wildlife. In addition, endangered or unique species may have survived or even prospered when sites were in use and remain important elements of a local ecosystem. The Habitats Directive (EEC of 21/05/1992) relating to nature conservation protects threatened species and related biotopes. Legal frameworks in each country afford additional protection for plants and animals.

During the feasibility phase of redeveloping brownfield sites it is vitally important to survey, bearing in mind the seasons, the natural species that inhabit a site. Masterplanning, cost estimating, potential mitigation issues, environmental management and stakeholder interests are all linked to a good understanding of the ecology of an area or a site.

The Estuary Angelica (Angelica heterocarpa Lloyd), for example, is an endemic species of France, which exists only in the Loire, Charente, Gironde, Adour and Nive estuaries. For the Loire Estuary, most of the Estuary Angelica sites (nearly 80%) are on the banks and shores of the Loire in the region of the Nantes conurbation and a reduction in its area of propagation has been noted for some time. France's responsibility for the survival of this plant is based on legal protective measures at national and international level: i.e. it is registered in the Habitats Directive and the Bern Convention and it is regarded as a vulnerable species by the "Red Book of the Threatened Flora of France".

Estuary Angelica (Angelica heterocarpa Lloyd)

© Nantes Métropole

Consequently, due consideration of this protected and vulnerable species in the Île de Nantes/Loire Bank development project, currently in hand, is essential in order to ensure its protection and its survival.

Another example is taken from Torfaen, where a previously used building, St. Peter's Church School, is being refurbished to provide an imaginative stand-alone attraction for visitors. St. Peter's Church School comprises two listed buildings situated on the southwest edge of Blaenavon. The site has been disused for the last twenty-five years and a complete renovation is proposed that would return the building to public use.

Roosts of two species of bats, namely lesser horseshoe bats (Rhinolophus hipposideros) and pipistrelles (Pipistrellus sp.) have been recorded in the buildings and there is some evidence that a third species, the brown long-eared bat (Plecotus auritus), roosts here too. All species of bat in Britain and their roost sites are protected by the Wildlife and Countryside Act 1981 (WCA), and by the Conservation (Natural Habitats, etc.) Regulations 1994.

Lesser Horseshoe bat

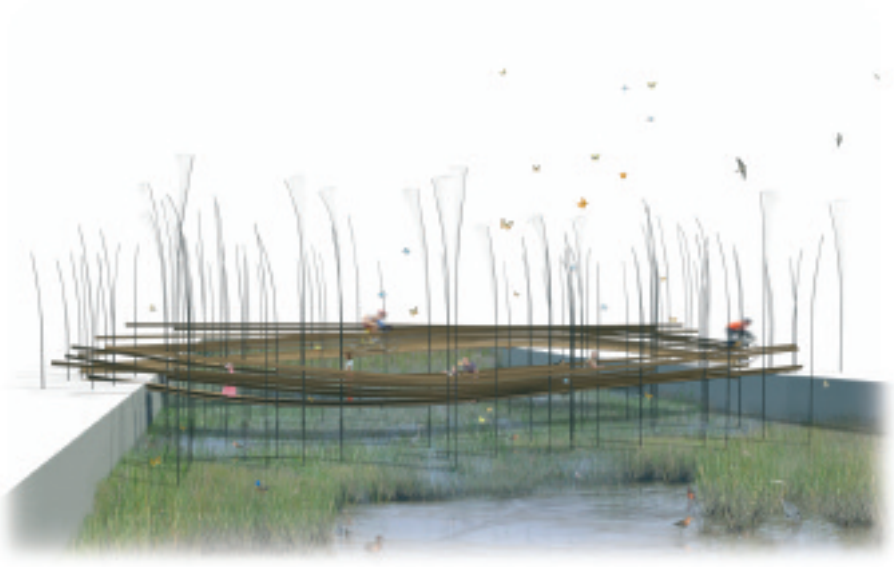
The buildings lend themselves well to provision of alternative roosts upon the completion of the development. The proposed scheme gives bats access into the basement room adjacent to the boiler room of the upper building and from there into the cellar below the porch. Both rooms will be reserved solely for use by bats. These modifications will allow access by bats and will provide a range of conditions, from a cool cellar to a warm roof.

In Tilburg, a particular species of frog that has luminescent legs is to be found on the Volt industrial estate. Plans for the redevelopment of the industrial estate have taken into account the need to protect the natural habitat for this frog.

These illustrations show how new developments can work with nature for the benefit of the natural environment without detriment to building renovations or land regeneration. Today, planning permission for developments on brownfield sites are dependent on full surveys of wildlife and agreement of measures to protect fragile ecosystems or endangered species.

Recommendations and Conclusions:

1. Wildlife surveys must be undertaken as early as possible and during the correct time of the year to determine the measures needed to protect and conserve habitats and legally protected species.
2. Mitigation measures to conserve and protect wildlife may be required during the redevelopment of brownfield sites. Where needed, these must be designed, agreed and costed.
3. Delays and poor publicity can result from not taking account of wildlife issues on brownfield sites. These risks can be avoided if correctly planned and project managed.
4. Distinctive wildlife can add value to the redevelopment of an area. Working to save and/or conserve unique wildlife can create a positive image for a brownfield site.
5. Brownfield sites that have remained undeveloped for long periods of time often develop unique ecosystems that may then have to be protected.



Blue Boar Creek Bridges at Rochester Riverside