

REGENERATION

Land that has been badly treated may be left damaged or unused. Most often this is a result of industrial pollution and contamination or poor agricultural practices but un-restored mines and quarries and man-made and natural disasters also play a part. Most long-standing urban areas have some derelict or despoiled land but some are very extensively affected. Previously developed land (often referred to as "brownfield" land) may be affected by a number of problems.

Contamination of the soils and groundwater is common beneath and around industrial facilities, refueling and parking areas, sewage treatment works, gasworks, former military land and many other types of sites. It is important to reduce any risks to nearby areas and to make the site suitable for the proposed subsequent use. There is a great variety of contaminants, solid, liquid and gaseous, including inorganic toxins, organic toxins, and compounds that can cause physical problems (e.g. carcinogenic asbestos in some demolition sites).

There are a number of ways of treating contaminated land. The commonest has been to simply dig out the most contaminated soils and to transport them for disposal to a lined landfill. However that does not solve the problem - It simply shifts it to another place. An alternative is to install a series of engineered barriers to retain the contaminants within the site but, while that protects nearby land, it places limits on the possible subsequent uses of the site. In recent years there has been more emphasis on alternatives. Soils may be dug out, washed in water and solvents and, when clean, returned them to the ground. The water, once contaminated, is recycled for as long as possible and then is treated before controlled disposal. Another option is



Regenerated dock side

bioremediation in which plants which preferentially take up contaminants are grown, then removed and disposed of, or bacteria are inoculated into the soil to promote chemical reactions to alter contaminants. However these are slow and expensive processes. Lightly contaminated water can be treated by seeping it slowly through reed-beds which allows cleansing reactions to take place before it enters clean water.

Care is required when treating contaminated land because of potential risks to the workforce and nearby residents if toxins, noxious gases or materials such as asbestos may be present.

Brownfield sites commonly have other ground problems. For instance the site may be potentially unstable due to the presence of cavities such as old wells, cellars, tunnels, and mined ground. Wells and mine shafts can be filled or capped by care is needed not to adversely affect groundwater. Voids may be filled directly or, if shallow, dug out and backfilled. Appropriate foundations must be installed for any built development on the site, for instance using raft foundations if partly treated cavities exist. Old foundations can be massive and cause problems for construction. In general these will be removed and crushed if they cannot be incorporated into the new foundation design. Where a site consists of made ground the properties of the materials may vary significantly from place to place. Some may be relatively strong while others may compress when a load is placed upon them. If old mineral working has been undertaken then undisturbed ground may abut directly against the infilled quarry. Therefore caution is needed to ensure that differential settling does not take place when a building loads the ground.

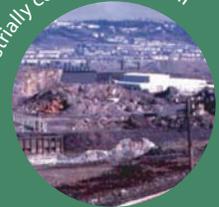
Most land can be rehabilitated to a full range of uses including agriculture, forestry, nature conservation, built development or recreational/amenity use. In urban areas, high land values often favour built development. However it is important that the site should be suitable, or made suitable, for the purpose. In some cases it may prove to be too expensive to rehabilitate a site in which case it could be left as, for instance, an urban wildlife area.

Discharge of polluted water



Techniques for re-vegetating sites and for carrying out monitoring and aftercare have been well developed for mineral workings but could be applied much more widely. There is sometimes a tendency to think in terms of a single subsequent use but, for large brownfield areas, it is possible to develop imaginative mixed use solutions and thus provide a better urban environment.

Industrially contaminated soil



Mine tip containing heavy metals



In general it is best not to damage land in the first place because remedial work is expensive and takes time. It requires careful initial physical and chemical site evaluation to define the nature of problem, identify appropriate uses for the land, and the best and safest techniques to be used.

Care is needed because responsibility for, and liabilities arising from, the site may rest with the party carrying out the works and/or with the landowner. However sometimes the risk of leaving the site as it is makes it inevitable that works must be undertaken. Where there is no identifiable landowner then the costs may fall to government (and thus, through taxation, to the public). One practice is for government to advance grants to treat land but with the developer obliged to pay back part of the profits made from subsequent sale of the developed land.

Works within the EU have to be carried out within the terms of the relevant legislation such as the Integrated Pollution Prevention and Control, and Water Framework Directives.



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