

Brick Clay:

Issues for Planning

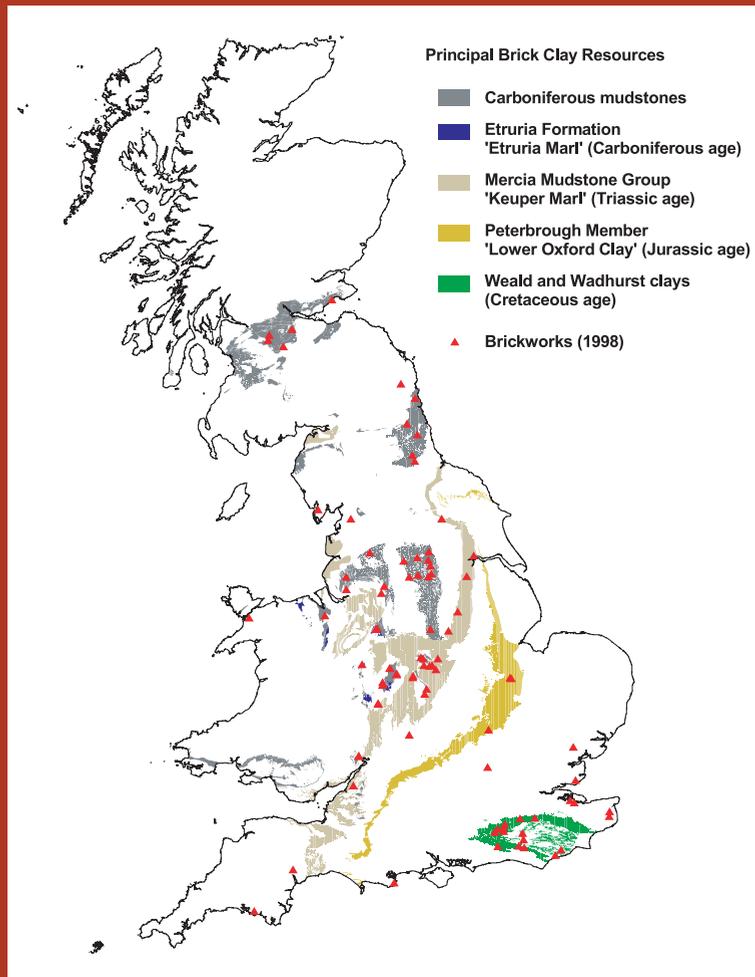


Executive Summary



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL





Map showing the distribution of the principal British brick clay resources, together with the location of sites where bricks, tiles and pipes are manufactured.

Front cover picture captions

Upper picture: Bricks prepared for firing, Nottinghamshire

Middle picture: Fireclay extraction: Northumberland

Lower picture: New housing, Leicestershire



- 1 New housing, Leicestershire.
- 2 Fireclay extraction, Northumberland.
- 3 Modern brickworks, Kent.
- 4 Retail development, Kent.
- 5 An urban landscape in brick, Nottingham

Brick clay: Issues for planning

Bricks are one of the most visible components of the built environment in our villages, towns and cities. Despite the importance of this building material, a number of critical issues face those involved in planning for the future supply of clay raw materials needed for its manufacture. Against a likely background of continued strong consumer demand for a wide range of bricks and related products, a combination of environmental concerns, commercial pressures and technological developments are changing the pattern of demand for brick clay. Through analysis of these trends, a number of recommendations are made for changes to the process that plans for the supply of brick clay. These aim to provide the brick industry with a sustainable supply of raw materials at the least cost to the environment.



Background

Brick is a durable and versatile construction material. Almost half of our housing stock is over 60 years old, the vast majority of which is built from brick. Brick buildings have an innate flexibility which make them easily adapted and refurbished for a variety of uses. The variety of brick products, along with other clay-based construction materials such as pipes and roof tiles, contributes significantly to the rich regional and local architectural diversity of mainland Britain. Continuity of style and materials will ensure that individual character of settlements and 'sense of place' is maintained. As a consequence, the future supply of a diverse range of bricks and related construction materials is a major factor in creating and preserving attractive environments in both urban and rural areas.

The clays used in the manufacture of bricks have a major influence on both their technical performance and appearance. The planning system also has a key role in the provision of minerals to provide the diversity of materials necessary for the construction of a distinct and attractive built environment. However, as with other minerals, brick clay extraction and processing operations may cause undesirable amenity and environmental impacts.

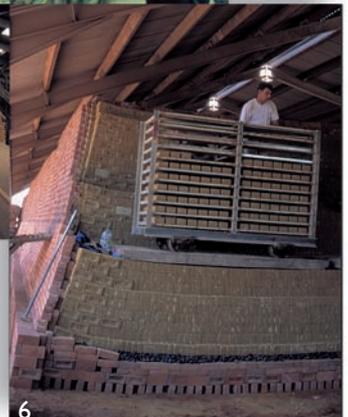
A balance must be achieved which allows the brick industry access to essential clay raw materials, whilst at the same time minimises the impacts of clay extraction and brick manufacture. Achieving this balance is a function of the land-use planning system.

BRICK MAKING

Most bricks are formed or shaped either by extrusion or the 'soft-mud' process. Extrusion involves forming a column of clay by pushing the material through a die at high pressure. The rectangular section column is then cut into bricks (known as 'wirecut'). Most drainage pipes and clay roof tiles are also made using this method. In the soft-mud process, individual bricks are formed in a sand-lined mould from a clay with a relatively high moisture content (known as 'stock' bricks). The bricks are then dried prior to firing. Most are fired using natural gas in a linear kiln known as a 'tunnel kiln' which allows the process to go on continuously. Temperatures between 1050–1100°C fuse or vitrify the brick, giving it the strength and durability it requires to perform in service, as well as an attractive appearance. 'Facing' bricks are used in external walls where architectural appearance is important—they can be wirecut or stock bricks. Wirecut 'engineering' bricks are made to meet strict technical specifications for use in demanding situations where strength and durability are critical.

In 1998, the DTLR commissioned BGS to carry out research into planning issues related to the supply of clay raw materials to the UK brick industry. This summary gives a brief overview of the findings of this research. The results and recommendations arising from this research are set out in the main report*.

* Bloodworth et. al. (2001) Brick Clay: Issues for Planning. British Geological Survey Commissioned Report CR/01/117N. Obtainable from the Sales Desk, BGS, Nottingham NG12 5GG, United Kingdom. Tel. 01159 363 241; Fax 01159 363 488; web www.bgs.ac.uk



- 1 Office development, Yorkshire.
- 2 Birmingham School of Art.
- 3 Clay extraction, Bedfordshire.
- 4 Brick manufacture, Bedfordshire.
- 5 Tunnel kiln, Nottinghamshire
- 6 Traditional clamp firing, Sussex.

Bricks and the brick industry

The production of bricks has declined by over 50 per cent since 1974. This has been mainly due to changes in construction methods (principally the replacement of 'common' bricks by concrete blocks in internal walls), although the general decline in house building (the main market for bricks) is also responsible in part. The signs are that this decline may now be at an end, and that the market for facing and engineering bricks, although still subject to cyclic demand from the construction industry, is relatively stable.

In 1998, the industry produced just under 3000 million bricks, along with pipes, roof tiles and other clay based construction materials, with a total value of about £550 million. Following a major rationalisation over the past 30 years, the industry is now based on a relatively small number of large production units operated by a limited number of companies. These often draw on raw materials from a number of sources. In 1998, six companies accounted for almost 90% of brick production. There also remain a group of 25–30 small, independent operators who are often involved in producing specialist materials or products which are locally or regionally important. These are commonly dependent on a single source of clay raw material or on supplies obtained from others. Almost 95 per cent of the 8.2 million tonnes of clay consumed by the industry is used to make bricks. Clay pipes are made by at least three companies, all of which are based in Yorkshire. Clay roof tiles form the smallest sector of the industry; most are made in the West Midlands by two companies.

BRICK CLAY

Bricks are produced in all three countries of mainland Britain (see map), although England accounts for about 90% of production. Although other clays are used on a small-scale, the location of the industry tends to reflect the distribution of the principal brick clay resources. In approximate order of tonnage used in brickmaking, these are:

- Carboniferous mudstones in northern England and central Scotland: Variable in quality, with only a small proportion suitable for brick manufacture (most too high in carbon and sulphur). Despite this, they are the most important resource, accounting for almost 30% of consumption. Almost all bricks made from Carboniferous mudstones are formed by extrusion. Most clay drainage pipes are made from these clays;
- Etruria Formation or 'Etruria Marl' (Carboniferous age): High quality clay is close in composition to the 'ideal' brick clay. Extracted and used almost entirely within the West Midlands. Bricks are made by both extrusion and soft-mud methods. Often used to 'sweeten' poorer-quality clays. Most clay roof tile makers use this material. Outcrop area is very restricted;
- Mercia Mudstone Group or 'Keuper Marl' (Triassic age) in the Midlands: Extraction and use of these clays confined to the Midlands. Mineralogy of this clay gives rise to a distinctive pale-bodied brick. Extrusion is commonest manufacturing method;
- Peterborough Member or 'Lower Oxford Clay' (Jurassic age): Extraction of these clays confined to Cambridgeshire and Bedfordshire. High carbon content requires an unusual manufacturing process (pressed bricks fired in chambered kilns). There has been a reduction in usage of this clay over the last 30 years and manufacture of bricks is now restricted to three large production units;
- Weald and Wadhurst clays (Cretaceous age): Principal brick clay resource in south east England. Most production takes place to the south of London. Bricks are mostly manufactured using 'soft mud' process;
- Fireclays (from Carboniferous coalfields in the Midlands and the North): Associated with coal seams and produced almost exclusively as a by-product of opencast coal extraction. Although comprising less than 7 per cent of total consumption, they are important clays used extensively in high-value extruded buff bricks which are manufactured at sites across the Midlands, the North and Scotland.

Good quality brick clays consist predominantly of the clay minerals kaolinite and illite. These impart desirable properties which are important in forming and firing the brick. Quantity and particle size of the quartz (silica) component of the clay are also critical in determining forming and firing behaviour. Carbon and sulphur can have a major influence on firing performance, with low levels preferred. The familiar red/ brown colours of most bricks are due to the presence of iron minerals in almost all clays. However, the presence of carbonate minerals such as calcite and dolomite can produce paler-coloured bricks. Production of very pale buff/ cream 'through-colour' bricks is presently only made possible by using fireclays with low iron contents. Fully-durable yellow bricks (such as London 'stocks') are made from a mixture of clay and calcium carbonate (chalk).

Manufacture of bricks in Great Britain is dominated by production in England. The location of the industry in England largely reflects the distribution of the principal clay resources (see map inside front cover). An overview of these resources and the technical issues which define them can be found in the boxes.

Planning for the supply of brick clay

The main report refers to two broad issues that are not specific to brick clay but which relate to planning for minerals in general, or to wider development. They fall into two categories:

- the need to incorporate mineral resources within a framework for sustainable management of all natural resources;
- the need to modernise and make the planning process more effective.

However, the aim of this summary is to concentrate on issues that are specific to brick clay and to ensure that they are addressed within the context of a planning process which is based on sustainable development objectives.

Key economic, technical, social and environmental trends that influence the supply of and demand for brick clay are summarised in the first column of Table 1. The centre columns show their likely influence on future clay extraction. The right hand column of the table is used to show how the planning process might be modified to respond more effectively to specific issues related to brick clay provision.

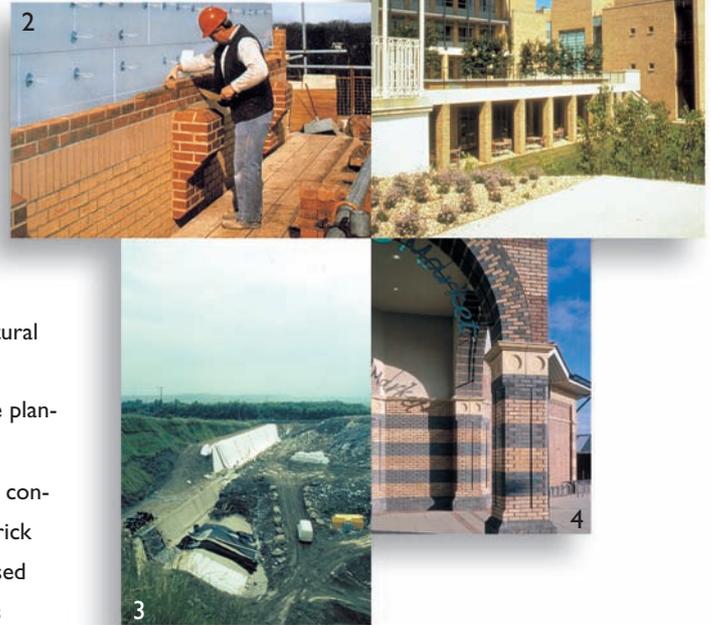
BRICK CLAY PLANNING GUIDANCE

A revision of the existing guidance* on planning for the supply of brick clay is likely to be the most effective way of improving the capability of the planning system to balance the raw material needs of the industry with the need to protect the environment. This guidance would explain the trends affecting brick clay supply. It would identify mechanisms which would deliver changes in the planning process for clay and relate these to more general guidance. It would aim to inform the process, and encourage dialogue between the various stakeholders (such as the public, planners, industry and environmental groups).

It is recommended that new guidance for brick clay should include the following topics:

- (a) Sustainability: Economic, social and environmental sustainability objectives should be incorporated into all aspects of the planning process for brick clay. Adoption of a long-term perspective will allow the development of a sustainable security of supply and conservation of resources. The contribution of clay products to sustainable construction should be outlined (this may require more research), their role in restoration and re-use, and options for recycling should all be described and related to supply issues (see below).
- (b) Clay supply: This should set out the need for brick clay and the likely effects of continuing change in the economics and geography of the industry. It should describe the planning response issues such as:

* MPG1 (1996) Mineral Planning Guidance Note 1: General Considerations and the Development Plan System.



- 1 Corporate HQ, Surrey.
- 2 Bricklaying is a specialised skill.
- 3 Former clay pit is prepared for landfill, Yorkshire.
- 4 Retail park, Cheshire.

- shifting emphasis on a restricted number of clay resources;
- increased transport of raw materials;
- the need for a diverse supply to make a diverse product range and the existence of dormant sites;
- the recovery and/ or stockpiling of fireclay from opencast coal sites where this is environmentally acceptable.

As stated above, delivering sustainable security of supply requires a long view. This should be at least 25 years, delivered through a 'landbank' of planning permissions, along with allocations of ground (which might be granted planning permission for extraction at a later date) in the local development plan. This provision should be subject to regular short term review and revision.

(c) Role of different levels of administration: The guidance should clarify which level of government (UK-wide, national, regional, local) does what in order to meet sustainability objectives. In particular, it should set out the role of the English regional planning boards in taking a regional 'resource-based' perspective when guiding decisions on the most sustainable courses of action.

(d) Development plan procedures: This should emphasise the need to properly explore brick clay issues in development plans which are up to date. It should emphasise the need for a long-term approach to sustainable security of supply and the need for regular review (see 'Clay supply' above) to meet emerging circumstances.

(e) Development control: This should stress the objective of ensuring better quality of life for all and the need to adopt high standards in relation to environmental and amenity impacts of clay extraction. It should refer to other relevant published

guidance. Advice on restoration options in relation to sustainable development objectives should be set out, including the status of landfill as a restoration option for clay extraction sites.

ADDITIONAL RESEARCH

Additional research is required in order to maximise the benefit of the proposals for changes in planning provision for brick clay. It is recommended that this should comprise:

- A survey of planning permissions to assess reserves. This should be initiated by DTLR, in collaboration with planning authorities and industry.
- Dormant permissions should be separately identified in that survey. It is suggested that this analysis should be carried out by DTLR as part of the above survey.

- Research into clay-based building materials needs to be undertaken to clarify their real contribution to sustainable construction. It is proposed that this should involve DTLR, the brick manufacturers and the construction industry.

- 1 Residential development, Surrey.
- 2 Clay paving, Belfast.
- 3 Bricks prepared for firing, Nottinghamshire.
- 4 Mixed-use brick buildings in inner city Nottingham



Trend	Specific issues
<p>Demand for improvements in the urban landscape and in the quality and quantity of housing</p>	<ul style="list-style-type: none"> • demand for bricks is likely to remain around present level; • consumers will require a wide choice; • architectural fashion and other factors will change (see below);
<p>Continuing technological and economic changes in the construction and construction materials industry</p>	<ul style="list-style-type: none"> • products from the UK brick industry will soon have to meet new European standards; • industry is striving to become more efficient by consolidating into large, automated factories; • new clay products are being developed to make building quicker and more efficient;
<p>Increased demand for more sustainable building methods</p>	<ul style="list-style-type: none"> • more re-use and regeneration of existing buildings; • more demand for 'sustainable' building materials (low environmental impact in extraction, manufacture and use, durable, recyclable). Bricks may meet many of these criteria - highly durable therefore buildings are both low maintenance and long-lived;
<p>Demand for increasingly rigorous environmental standards</p>	<ul style="list-style-type: none"> • environmental standards for extraction of clay and restoration of pits will become much more strict. Urban fringe location of many clay pits makes this a sensitive issue; • progressive reduction in the permitted level of emissions to atmosphere during the firing of bricks;
<p>Decline in the production of opencast coal</p>	<ul style="list-style-type: none"> • fireclay is produced almost exclusively as a by-product of opencast coal mining. This clay is used to produce bricks which combine a distinctive pale cream or buff colour with excellent resistance to weather.

Table I Planning for brick clay supply: trends, issues and how the planning system might respond.

How will this affect brick clay extraction?

How should the planning process respond?

It should recognise:

Demand for brick clay will remain about the same, although industry will need access to a range of clay types. More transport of clay for blending at works which are some distance from the pit where it was dug. Level of demand for different clays will change over time.

- the need for security for the industry, and certainty for the wider community, in planning to provide for a sustainable supply of clay raw materials;
- that industry needs access to different clay types (possibly indifferent parts of the country) in order to supply products to meet consumer choice;
- that there is likely to be more transport of clay within and between planning authorities;
- the relative importance of different clay types will change over time;

More demand for clays which are consistently of high quality. More transport and blending to improve clay feedstock.

- see above;

Access to a variety of bricks (and therefore brick clays) needed to conserve and re-use existing buildings.

- see above;
- the need to maximise the re-use of both bricks and brick buildings;
- the need to further investigate the sustainability of brick relative to other construction materials;

Restoration options other than landfill much more likely in future. Changing economic circumstances means that some sites with planning permission for clay extraction now have little or no commercial value for that purpose. Industry more likely to seek 'low emission' clays and alternative materials which produce lower levels of pollutants during the firing process.

- the need to keep development plans up to date and integrate policy across planning authorities will assist in reducing conflict between clay extraction and other forms of land-use;
- that restoration options should be considered which provide rapid route to beneficial after-use (particularly extending or providing new habitats to encourage biodiversity);
- that the nature and extent of old clay planning permissions which are now dormant should be investigated;

As opencast coal production declines in the UK, so the supply of fireclay suitable for brick manufacture becomes more restricted.

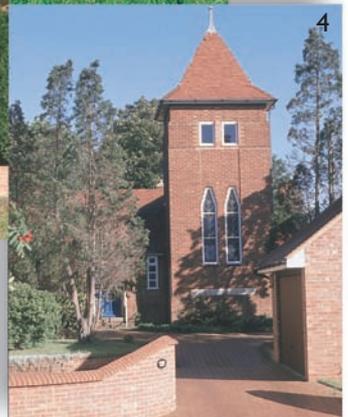
- the need to develop innovative solutions to maintaining supply of fireclay and/or alternative raw materials.

Action plan

Mechanism	Recommended timetable		
	Actions (18 months)	Actions (18-36 months)	Actions (36 months +)
Research	<ul style="list-style-type: none"> carry out reserves survey (DTLR/ industry/planning authorities); assess results and inform draft guidance (DTLR); 		
	<ul style="list-style-type: none"> undertake assessment of contribution of brick to sustainable construction (DTLR/industry); assess results and inform draft guidance (DTLR); 		
Brick clay guidance	<ul style="list-style-type: none"> draft guidance and consultation (DTLR/industry/ planning authorities/other stakeholders). 	<ul style="list-style-type: none"> issue guidance (DTLR); use guidance to institute regional planning framework for brick clay (DTLR/regional bodies/planning authorities/ industry). 	<ul style="list-style-type: none"> monitoring and feedback (planning authorities, regional bodies/DTLR/ industry/other stakeholders); revise guidance (DTLR).

Table 2

Key actions recommended for stakeholders over a three year time period are set out in Table 2. The lead stakeholder is the first to be listed after the action. Actions within each time band are listed in approximate order of priority.



- 1 Inner city housing development, Nottingham.
- 2 Restored former clay pit, Bedfordshire.
- 3 Brick in a traditional housebuilding material.
- 4 Community buildings, Bedfordshire.

Bibliographic reference:

BLOODWORTH, A J, COWLEY, J F, HIGHLEY, D E
& BOWLER, G K. Brick Clay: Issues for Planning
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**British Geological Survey
Kingsley Dunham Centre
Keyworth, Nottingham
NG12 5GG**

Tel: 0115 936 3100

Fax: 0115 936 3200

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