The built environment

The built environment is the legacy of man-made structures throughout an area. It includes houses, farms, churches, grave yards, schools and other public, industrial and commercial buildings, roads, pavements, and drystone walls.

The built environment and geodiversity

The character of an area's buildings, especially in a rural area, is an element in its landscape as essential and distinctive as the shape of its hills, or the pattern of its vegetation.

The use of geological materials in buildings provides one of the most direct ways of recognising the link between the natural and human landscapes, and of appreciating the importance of the earth's resources through understanding the properties and limitations of these materials.

In addition, built structures may provide readily accessible opportunities to demonstrate a variety of rock types both from the area itself, and through the use of imported materials, a range of more exotic geological materials. Such materials may be both abundant and varied in urban situations. They are thus a potentially valuable educational resource.

The materials employed in the built environment may legitimately be regarded as another facet of the area's geodiversity.

Materials used in the built environment of County Durham

A variety of geological materials, derived from within the county, are employed in its buildings and structures.

Sandstone

One of the most widely used stones in the county is sandstone derived from various parts of the Carboniferous succession. Almost any reasonably durable sandstone can be pressed into service for wall construction and over much of the county sandstone of very local derivation appears to have been employed in most vernacular architecture.

For more significant buildings stone of a more consistent quality and appearance was normally required. The county possesses several sandstones capable of supplying significant quantities of stone of consistent quality. A prominent early example of such a use of stone was in the building of Durham Cathedral. Here sandstone from the Low Main Post, a sandstone above the Low Main Coal of the Coal Measures, was employed. Over the succeeding centuries a variety of other Carboniferous sandstones became favoured as good quality building stones. The county abounds in examples of their use. Significant quantities of such sandstone are still quarried today, with substantial quantities being employed in building and repair programmes throughout Great Britain. A notable example is the use of sandstone from Dunhouse Quarry, near Staindrop, for repair work in Edinburgh where sources of the original Scottish sandstones are no longer available.

A feature of many Northern Pennine villages and farms, in the west of the county, is the use of sandstone slabs for roofing. The number of quarries able to provide these was much more limited than those which could provide walling stone. Although some long-abandoned roofing slab quarries can still be identified, the whereabouts of most of is now lost. One small quarry, at Ladycross, a short distance outside the county, continues to produce slabs suitable for roofing. This quarry is likely to have been the source of roofing material for several buildings in the north west of the county.

A major use of building stone in the 18th and 19th centuries was in lining and supporting shafts and adit levels in the county's lead mines. The county abounds in fine examples of the highly skilled craftsmanship used in constructing the linings to many mine entrances and tunnels. Very considerable care was thus given to their, design, construction and selection of the materials used. Waste rock from the mines was rarely, if ever suitable. Instead, specially quarried stone was taken underground for the purpose. Rather flaggy sandstones, capable of yielding parallel-sided slabs, were

preferred. Quarries from which such stone was obtained can be identified close to many mines.

Enormous quantities of sandstone, much of it of indifferent quality, were employed in building the countless miles of drystone walls throughout the western parts of the coalfield and Pennine dales. Such stone was generally obtained from numerous small pits along the line of the walls' construction.

Limestone

Despite the comparative abundance and accessibility of many of the Carboniferous limestones of the Pennine dales, Carboniferous limestone is little used in buildings in the county. It seems likely that sandstone provided a more abundant and easily worked building material. In these areas limestone appears to have been reserved for making of mortar.

The unique coral-rich limestone, The 'Frosterley Marble', obtained from the Great Limestone, has been an important source of ornamental stone. It was used for pillars and flooring slabs in Durham Cathedral as early as the 14th century. In addition to its use in making internal ornamental pillars in churches, it has been much used in making fonts, tombs and even wash stand tops. Examples of its use within County Durham include:

- Frosterley Church (font)
- Stanhope Church (font, table-top tombs, coffin)
- Eastgate Church (font)
- Wolsingham Church (chancel floor) Auckland Palace Chapel
- Durham Cathedral (extensively used as pillars in Chapel of Nine Altars, Chancel, Rood Screen, Gallilee Chapel, flooring)

It is commonly supposed that much of the stone employed in Durham Cathedral originated at Harehope Quarry, at Frosterley, though other sources may also have been exploited. It is however, worth noting that a few examples of the Frosterley Marble in the Cathedral exhibit a distinctive reddish brown colour, a-typical of much of the stone in known outcrops. This colouration is consistent with oxidation of iron carbonate mineralisation. Such colouring is locally conspicuous in parts of Harehope Quarry, giving strong support to the site as a source of this unusual form of the rock.

The dolomitic limestones and dolomites of the Magnesian Limestone in the east of the county, have been much used locally as a building stone. Indeed, the distinctive cream or very pale yellow colour of this stone is locally a characteristic element in the buildings and landscape of many east Durham villages, hamlets and isolated farms. Although such limestones from the equivalent Permian beds in Yorkshire have been used in such prominent structures as the Houses of Parliament, there seems little evidence of Permian limestones from County Durham being employed on any scale outside the county.

County Durham is today a major producer of limestone aggregate, obtained from both the Carboniferous limestones and the Magnesian Limestone. Large tonnages are consumed by the construction industry within the county and beyond.

Dolerite ('Whinstone')

Although an extremely durable rock, the dolerite of the Whin Sill has never been widely employed as a building stone, except in drystone walls on or close to its outcrops. This almost certainly reflects the hard, intractable nature of the stone, making it difficult to work.

Although rarely used for building, Whin Sill dolerite has long been employed as a good quality roadstone and for the making of setts and kerbs. Large abandoned quarries mark its outcrop in Teesdale and the related Little Whin Sill was formerly worked for the same purpose at Greenfoot Quarry in Weardale. Force Garth Quarry, close to High Force, is today a major producer of crushed Whin Sill dolerite for road surfacing. Many of the roads within the county are surfaced with tarmac-coated dolerite, obtained either from Teesdale or from Whin Sill quarries in Northumberland.

Clearance stones

Clearance stones from fields have locally been an abundant source of stone. Walls and buildings constructed from such stones can generally be recognised from the very varied nature of the stones and commonly the rather rounded outlines typical of boulders recovered from superficial deposits, in contrast to the angularity of freshly quarried blocks.

Brick

Bricks can be made from a comparatively wide variety of raw materials. Within County Durham bricks have traditionally been made from glacial clays, or from clay-rich rocks within the Coal Measures succession. It was common for several collieries to support a brickworks which employed otherwise waste shale from coal mining. Fireclay, also typically obtained as a by- product of coal mining, was commonly employed for brick making as well as the manufacture of refractory products. Distinctive pale cream fireclay bricks are a feature of several colliery settlements.

Bricks are still made in the county today at Ambion Brickworks, near Bishop Auckland, using local Coal Measures shales.

Sources of local geological materials in County Durham

Where natural outcrops of reasonably durable stone are frequent in rural areas, it was common practice to use the closest available stone source when building farm buildings or even small groups of cottages. Materials have often been sourced extremely locally, commonly from the same farm or even the same field in which they are used. Small quarries are common near many farms and hamlets.

The builders of the many miles of drystone walls typically sought stone as close to the construction site as possible. A feature of many walls is the presence, at intervals along the course of the wall, of small pits from which stone was obtained, either from rock outcrops or from boulders within the superficial deposits. Particularly in valley bottoms, clearance stones from the neighbouring fields may have been important sources of stone.

In early centuries the demand for substantial quantities of stone of consistent quality for major construction projects such as castles and major churches, including Durham Cathedral, led to larger scale quarrying from stone sources which in some instances may have been comparatively distant from the construction site. Until the 20th century stone was the preferred construction material for much urban development, including the comparatively rapid growth of mining and related settlements. Numerous quarries were established to supply a rapidly increasing demand. Sandstones from the Namurian and Westphalian rocks, and limestone from the Magnesian Limestone were the main stones worked. As brick came to supplant stone as the main building material most of these quarries became abandoned. A few sandstone quarries survive today, supplying high quality stone for use both within the county and beyond.

Imported geological materials used in the built environment of County Durham

In most rural areas it was common practice to obtain building stone from the nearest available source. The more costly use of specially quarried stone from further afield was typically reserved for specialist purposes or high cost prestigious buildings. Such uses include the construction of churches or other notable public buildings, and the construction of commercial buildings in major towns. In such situations a very wide range of building stones from from outside County Durham may be seen.

Welsh slate is a widespread roofing material across much of the county, though locally obtained sandstone slabs are common in older buildings in the Pennine dales. Other sources of slate, e.g from the Lake District may be seen locally: such slate has recently been employed in re- roofing of parts of Durham Cathedral. Clay tiles are common, particularly in some southern parts of the county.

A variety of exotic ornamental stones, including many from overseas sources, may be seen employed in gravestones, and as ornamental stones in churches and other buildings.

Although not derived from within County Durham, stones sourced from outside the county may be regarded as offering another useful dimension to the geodiversity of the area.

Such materials may have been employed for specific purposes for which there are no suitable materials within the county. They may have been selected for aesthetic reasons.

Recognition of the exotic nature of such stones, and understanding their original sources, is important in studies of the built environment and may be of practical application in planning repair or restoration work.

The local presence of exotic rocks offers useful educational opportunities.

Influence on the landscape and biodiversity

The character of the built environment, and thus of the materials used, both in rural and urban situations, is an element in the landscape as essential and distinctive as the shape of the hills, or the pattern of vegetation.

Rocks in walls and buildings may provide important substrates for a variety of lower plants, including mosses and lichens.

Threats

Progressive deterioration of building stone, principally by weathering, may necessitate replacement of stone. Replacement with stone from the original source may be desirable. For important historic buildings re-establishing a source of stone from the original quarry or from the geological unit known, or believed, to have been the source of stone may be worth considering. Where the original source is unknown or no longer available, an alternative stone is required. This should be compatible with that being replaced. An understanding of stone characteristics and likely performance with time is essential to effective long-term repair and maintenance. Repairs with poorly matched or incompatible stone may result in accelerated deterioration to the existing fabric and may exacerbate maintenance problems.

Opportunities for conservation and interpretation

A variety of initiatives to restore and conserve buildings of all types within the county offer wide ranging opportunities to encourage the use, and re-use of local stone. Opportunities may exist to re-work former sources of stone for repairs or new building work.

It may be appropriate to explore the possibilities of sourcing stone for repair work on major historic buildings, such as Durham Cathedral, by re-opening the quarries which supplied the original stone or from quarries opened within the geological unit known to have been the source.

The use of stones in buildings and structures offers excellent opportunities to develop a variety of interpretation and educational initiatives to explore the essential links between geological features and natural landscapes and the human and social heritage of the county.

Use of local geological materials beyond County Durham

A variety of sandstones from County Durham have been employed in building projects outside the county. A notable use of County Durham sandstone is in building and repair work in Edinburgh. These sandstones may be similar to the Scottish stones originally employed, and which are no longer available.

The coral-rich 'Frosterley Marble' has been widely employed as an ornamental stone in adjoining parts of northern England and beyond. Frosterley Marble may be seen, employed as an ornamental stone, in York Minster, Truro Cathedral, the Roman Catholic Cathedral in Norwich, and as far afield as Bombay Cathedral.

Dolerite ('whinstone') from the Whin Sill of the county has long been employed as an important roadstone across much of northern England.

Selected references

Forbes et al. 2003; Johnson and Dunham, 1982.

Photographs

(Photo 82) Durham Cathedral. A striking example of the use of Coal Measures sandstone (the Low Main Post) as a building stone. B Young, BGS, ©NERC, 2004.

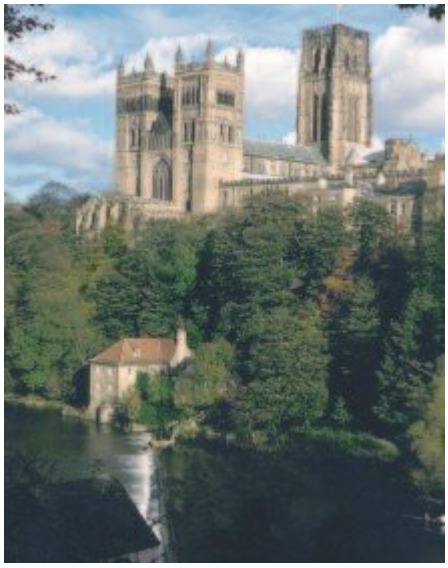
(Photo 83) Durham Cathedral. Polished columns of Frosterley Marble contrasting with Coal Measures Sandstone in the Chapel of the Nine Altars. B Young, BGS, ©NERC, 2004.

(Photo 84) Helmington Row, near Crook. Pale grey bricks produced from Coal Measures fireclay. B Young, BGS, ©NERC, 2004.

(Photo 85) Drystone wall built of limestone as host to a variety of lichens and mosses. God's Bridge, Bowes Moor. B Young, BGS, ©NERC, 2004.

(Photo 86) Heighington Church. Churches and church yards such as this contain a variety of rock types. B Young, BGS, ©NERC, 2004.

Full references



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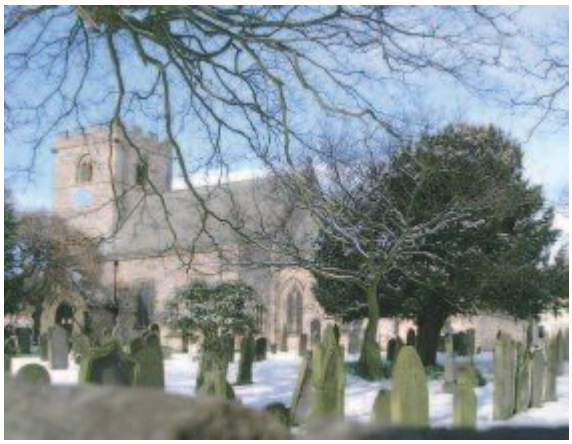

(Photo 86) Heighington Church. Churches and church yards such as this contain a variety of rock types. B Young, BGS, ©NERC, 2004.