
018Chapter 18 Economic geology

Arran has little to show in the way of materials of economic value. The only mineral deposit now being worked on a commercial scale is the barytes of Glen Sannox.

Coal — The coal formerly worked on the shore at the Cock Farm in Arran is referred to by most of the older writers on the island. All agree that the seam or seams belonged to the type of blind or glance coal. It was difficult to work, and principally used for the purpose of making salt from the sea water. The old salt pans are close to the old workings. It was probably also used for burning the limestone near Laggan. Two or three seams are said to have been worked, the principal seam being 3 or 4 feet thick; but though more than one seam may have been found it seems probable that the workings were almost entirely confined to the thickest seam. They are very old and were discontinued considerably more than 200 years ago, probably before 1773, as under that date in the estate accounts there is a record of boring at Cock for coal. In the same year a boring for coal was made on the north side of Lamlash Bay on the Clachland shore to a depth of 114 feet 5 inches, which naturally proved unsuccessful.

It is remarkable that no coal is found at Conic or elsewhere in the island in the strata corresponding to those at the Cock in which coal has been worked; and while strata of Coal Measures age are now known to occur at five different localities in Arran in addition to that of Slidderly Water Head, in none of them do coal-seams occur. An interesting question therefore arises as to the possibility of finding workable coal seams beneath the New Red Sandstone rocks. It is not likely that such seams occur on the north end of the island at the Cock, because the unconformity between the two formations is there apparently very slight, and the area in which they could possibly be found is so small that it would be scarcely worth while to determine the matter by boring. Nor would it be advisable to try the western side of the island, because there the New Red Sandstone overlaps the Carboniferous formation entirely, and reposes on the Old Red Sandstone. If the matter were to be tested, it would be best, therefore, to choose the eastern side of the island, and to select a spot several miles distant from the area at Slidderly Water Head. There is a possibility of meeting with some of the higher Coal Measures in a district where they have been faulted down prior to the deposition of the New Red rocks.

Even if the Coal Measures were thus found by boring, however, the coals themselves might be absent, or poor in quality, or burnt and rendered useless by the igneous intrusions so numerous in the island. The edge coals which have been worked at the Cock are not met with in the corresponding strata at Corrie, although their positions are marked by *coal seats*. Neither has any trace of coal been detected among the rocks exposed at Slidderly Water Head, although in the equivalent beds at Kilmarnock coal seams are abundant.

Peat — There are extensive tracts covered with thick peat in the island of Arran, mainly on the higher plateau-like ground between 700 and 1700 feet above the sea, but occasionally it is found at lower levels, as on the old raised beaches on either side the lower part of the Machrie Water. It was formerly much used for fuel all over the island, and almost everywhere old peat roads to the hills still exist, though they are not marked on the ordnance maps. On the east side peat for fuel has almost entirely been replaced by coal, but on the west side a little peat is still cut and used in the Shiskine district and northwards to Imachar and Lochranza.

Towards the south peat is still cut on Beinn Tarsuinn, near Torr an Daimh, Cnoc Clachog, Innis Dubh, south of Smuraig, and east of Cnoc na Garbad, to supply the remoter farms of the interior and the south coast. West of Cnoc Clachog the peat is of great thickness, no less than six or seven cuts in depth having been got out. The coal strike of 1926 led to the reopening of peat diggings all over the island.

Ironstone, bog iron-ore, and old iron workings — To the north of the landing-place at Corrie is a thin band of clay-ironstone which crops out also to the westward on the hillside, where it is from four to six inches in thickness. It appears to be of good quality, and we were informed that some hundreds of tons of it were formerly exported. Probably it was not mined for, but was collected during the working of the white freestone quarries. A similar band occurs in the section on the Cock shore. A number of old bloomeries exist in the island which have been described by W. Ivison Macadam.<ref>Notes on the Ancient Iron Industry of Scotland, *Proc. Antiq. Soc. Scotland*, vol. xxi., 1886, pp.

89–132.</ref> Three of these are on the farm of Glenkiln near Lam-lash, and in one case there is evidence that bog iron-ore was used. Two sites occur in Glen Cloy to the south-west of Glenrickard, and there were two near the road leading from Brodick to Lamlash, in one of which the slag was utilized for road-making. Another was at Coillemore near Lochranza. At Kilpatrick, Shiskine, W. Ivison Macadam states that the slag exists in considerable quantity, and is of the dense black variety characteristic of the oldest period. On the top of a ridge or mound there is a rude stone building with a circular hollow about 9 or 10 feet in diameter, and the slag has been thrown down the slope. Another site is near Largybeg, on the upper side of the road, where about ten cart-loads of slag were used for drains. On the farm of Gortonallister, south of Lamlash, scattered slag occurs at a point on the western side of the road on the banks of a small stream almost at the summit of the road. In all these cases charcoal appears to have been the fuel used for smelting, and the slag remaining is of the dense black type characteristic of the early period when the smelting process was very imperfect, and a large percentage of iron still remains in the slag.

Barytes — A well-known barytes mine is at present being worked in Glen Sannox. The following account is taken mainly from the Geological Survey Memoir on Barytes and Witherite.<ref>Special Reports on the Mineral Resources of Great Britain, vol. ii., Barytes and Witherite, 3rd edition, 1922, pp. 100–101.</ref> I am indebted to Mr. Robert Robertson, principal of Messrs. Martin, Barrowman & Co., the lessees of the Glen Sannox mine from the proprietor, the Duke of Montrose, and to Mr. Bryce Longmuir, the manager, for further information freely accorded.

The mine is situated about half a mile up the Glen Sannox Burn, access to it being obtained by a new track which leaves the main road about 100 yards south of the bridge over the Sannox Burn. The occurrence of barytes at this locality has been recognized for over 130 years, and the vein was known to T. Pennant,<ref>A Tour in Scotland and Voyage to the Hebrides, 1774.</ref> R. Jameson,<ref>Mineralogy of the Scottish Isles, 1800.</ref> J. Headrick,<ref>View of the Mineralogy, etc., of the Island of Arran, 1807.</ref> J. Macculloch,<ref>Western Isles, 1819.</ref> and others. When Ramsay<ref>The Geology of the Island of Arran from Original Survey, 1841, pp. 23–24.</ref> visited Arran about 1840 the mine was being worked, and dressing and washing plant had then recently been erected. He describes the process for the manufacture of the finished barytes, which seems to have been almost identical with the method now followed at Muirshiels (Renfrewshire). He also describes a method whereby the barytes was stained yellow by means of chromate of lead.

From 1840 to 1862 the mine appears to have been in continuous operation, but soon afterwards it was closed and the mill dismantled. The output of barytes from 1853 to 1862 was as follows:

Year	Tons	Cwts	Year	Tons
1853	600	19	1858	550
1854	550	—	1859	—
1855	550	—	1860	550
1856	550	—	1861	625
1857	—	—	1862	730

In 1918 the mine was reopened, but little work was done. In 1920, however, about 300 tons of excellent barytes were raised and exported from the island. A new shaft was then sunk; and a railed incline with a self-acting conveyor, and a new loading pier, have now been added to the equipment. About 10,000 tons of barytes have now been raised, the greater proportion of which is on the dump. The export of this material is awaiting the completion of a new barytes mill in Glasgow. Only water power is used in the working of the mine. As regards quality the Sannox barytes is regarded by good authorities as the best in the country. The product is a 'blue' barytes, which, when milled, yields an intense white material superior to the best German mineral. So far as present information goes the reserves are very large.

The country-rock consists of interbedded sandstones, conglomerates, and mudstones of Lower Old Red Sandstone age. Near the old mine the main vein where it crosses the Sannox Burn has been excavated by the old miners. It trends almost due north and south, and dips westward at a high angle; heavy stringers in the hanging wall, although of good quality, were left in place. About 50 yards farther down the north side of the burn, another vein can be seen, which is about 2 feet wide and trends north-west. On the hillside to the north and north-west of the mine, no less than four veins have recently been discovered. They all trend about north-west, and carry from 2 to 5 feet of barytes. In all probability

one of these is the continuation of the main vein. The mineral has now been traced over the divide into North Glen Sannox.

The exact width of the vein where it crosses the burn has not been ascertained, but the sole of the level, driven only a short distance below, shows from 8 to 9 feet of good barytes. Still deeper exploration has recently shown that the vein widens out to 26 feet, and still tends to widen downwards.

Two shafts have been sunk, one on either side of the burn, which communicate with one another by a level driven under the burn at a depth of about 100 feet. From the southern shaft the level has been continued 60 yards farther to the south. At the northern shaft the main vein is seen to be cut by another vein which trends north-west; the level has been driven along this other vein. At and near the junction of the two veins, there were several false walls, and the barytes swelled out into a pocket over 12 feet in width.

The barytes thus seems to occur in a system of fissures and fractures trending between north and north-west, and has filled the lenticular cavities produced by the differential movement of the irregular walls of the fissures.

Building stone — There are extensive old quarries in the white Carboniferous freestone of Corrie which was much wrought a century or more ago. It was used in the construction of the Crinan Canal, and is said to have been shipped to the Isle of Man for building purposes. At present the red freestone at the base of the New Red Sandstone is the principal building stone in Arran, and there are large quarries in it at Brodick and Corrie. The stone is soft and easily worked, and is said to harden by exposure to the air. Large blocks of it can be obtained, and from Corrie the stone was largely exported to various parts of the Clyde district, and some going much farther away — a mansion in Rum being built of it. Troon harbour is said to have been built out of the material from the northern quarry. In the neighbourhood of Lochranza a tough, gritty schist is used for building purposes.

In the southern part of the island red sandstones belonging to the Lamlash–Machrie group furnish good building stone, and large quarries exist at Cordon and Monamore Mill, as well as smaller ones elsewhere. The present condition of these quarries shows that very little stone has been taken from them of recent years. The thick acid and basic sills are also utilized for the same purpose, a quartz-porphry near Glenrie Mill affording a good building stone. Formerly the rock of Brown Head (quartz-porphry) was worked in this way, as was noticed by Ramsay, who says: 'The blocks on the shore (Leac a' Bhreac) have been quarried for economical purposes'.^{<ref>The Geology of the Island of Arran from Original Survey, 1841, p. 54.</ref>} There are distinct signs of quarrying on the cliff near the Preaching Cave on the shore at Kilpatrick.

Slate — Rough slates of a grey colour were formerly worked at the quarries south of the Cock Farm in Arran. In the Brodick estate office there are records of these last workings, from which we learn that between 1773 and 1776 between two hundred and three hundred thousand were sold at prices of 1 per thousand and upward. Work was also carried on here between 1776 and 1781. Most of the slates from this locality have disappeared from the house-roofs of the neighbourhood, but some still remain in Lochranza and North Newton.

Limestone — There are extensive old limestone quarries at An Sgriob, to the north of Maol Donn, and at Corrie. The latter are much the largest; they extend up the steep hillside for a quarter of a mile, and the limestone has been much wrought in artificial caves, besides having been worked at the outcrop towards the dip till in places there was nearly 30 feet of cover.

During the Great War a very pure limestone containing 99 per cent. of CaCO₃ was quarried on the North Locherim Burn, at a point a third of a mile north-north-west of High Corrie. A tram line was laid down to convey the material to the stone quay south of Corrie.

The pebbly limestone of the Clauchan Glen was long ago extensively burnt for lime, and roads, now erased from the map, were made to the quarries from Shiskine and Burican. There are old limekilns at Clauchog, and white Irish limestone (chalk) was at one time imported and burnt in these kilns, as well as at Shiskine.

Road metal — The numerous igneous intrusions, especially the basic dykes and sills, afford abundance of excellent material for road-making almost everywhere. The acid rocks are not so much used for this purpose. However, a felsite sill is so used near the Brodick and Lamlash road, as also the granite near Derenenach on the Shiskine side of Arran, and the diorite from the quarry at the bridge over the Allt nan Calaman on the String Road. The hard sandstones of the Lower Old Red formation are used for road material in one or two places, as on the String Road in Glen Shurig, and the gravel from a raised beach near Ballarrie, Lochranza, is taken for a like purpose.

Notwithstanding the abundance of excellent local road-metal, there has been a considerable import in recent years of road-metal from the Loch Fyne quarries, it being probably cheaper to carry stone from these well-established and well-equipped quarries than to extend and equip the small quarries on the island.

Ganister, fireclay, moulding sand — The exigencies of steel manufacture during the Great War stimulated the search for ganister and moulding sand in Arran. A 'ganister' about 1 foot 9 inches to 2 feet in thickness is exposed on the foreshore near the drain in front of Corrie Hotel. It is a fine-grained, white, hard, compact sandstone, with numerous rootlets. Its exact geological horizon is difficult to determine owing to faulting, but it is probably somewhere near the top of the Upper Limestone group of the Carboniferous Limestone Series. Rocks of this age are exposed at several localities on the hill slopes between Corrie and Brodick Castle, and there should be a fairly extensive field of this ganister. There are good harbour facilities at Corrie.<ref>Special Reports on the Mineral Resources of Great Britain, vol. vi., Refractory Materials: Ganister, Silica-rock, Sand, Dolomite: Resources and Geology, *Mem. Geol. Surv.*, 2nd edition. 1920, p. 156.</ref>

The bauxitic fireclay horizon of the Millstone Grit has been found in Arran, where it appears to be an extension of the North Ayrshire field.<ref>Special Reports on the Mineral Resources of Great Britain, vol. xiv., Refractory Materials: Fireclays: Resources and Geology, *Mem. Geol. Surv.*, 1920, pp. 230, 235.</ref> It is best seen on the sides of the Merkland Burn, north of Brodick Castle, about half a mile up the stream from the Brodick–Corrie road. The section shows 5 to 6 feet of pale pink, hard, fireclay with occasional red iron patches, resting directly on a highly-decomposed, ferruginous lava-flow. Although this clay is very similar in many respects to ordinary bauxitic clay, it is not truly bauxitic, since it contains an excess of silica. Its refractory quality is therefore not so high as that of the clay found in North Ayrshire.<ref>G. V. Wilson, The Ayrshire Bauxitic Clay, *Mem. Geol. Surv.*, 1922, pp. 5, 8, 24</ref>

Two analyses of the fireclay from the Merkland Burn are given below:<ref><Special Reports on the Mineral Resources of Great Britain, vol. xxviii., Refractory Materials: Fireclays: Analyses and Physical Tests, By F. R. Ennos and A. Scott, 1924, pp. 47, 64.</ref>

SiO ₂	51.90	49.72
TiO ₂	4.06	3.32
Al ₂ O ₃	32.96	34.80
Fe ₂ O ₃	3.48	4.08
Combined Water	7.44	7.37

Red sandstones, regarded by Prof. P. G. H. Boswell as suitable for the purpose of providing good moulding sand of the same character as the Belfast or Mansfield sands, occur in the south of Arran, and belong mainly to the upper part of the LamlashMachrie group of the New Red Sandstones.<ref>A Memoir on British Resources of Refractory Sands for Furnace and Foundry Purposes, Part i. London, 1918, p. 169.</ref> From the point of view of transport the best site for working them would appear to be the old quarry in the raised-beach cliff about one mile south of Whiting Bay Pier. There is a small jetty a quarter of a mile north of this quarry, and a good road connects them. The soft, well-bonded red sandstones occur as beds sometimes 20 feet thick, interbedded with more massive, calcareous, yellow sandstone of Glen Dubh type.

Sandstones which could be easily crushed to serve either for glass-making or as hearth-sand for furnaces have been noted by Mr. G. V. Wilson in the Carboniferous rocks of the Corrie shore.<ref>Special Reports on the Mineral Resources of Great Britain, vol. vi., Refractory Materials: Ganister, Silica-rock, Sand, Dolomite: Resources and Geology, *Mem. Geol. Surv.*, 2nd edition. 1920, p. 156.</ref> Several excellent examples were noted, particularly at the bathing pool near Corrie

Post Office, and at an old quarry on the hillside just behind the Corrie Hotel. In the main these rocks are reddish; but some are white, even-grained rocks forming beds up to 20 or 30 feet in thickness. The reserves are large, and there are good harbour facilities.

Soil and agriculture — The alluvial flats and raised beaches at the mouths of the principal streams afford the best soil, and the narrow terrace or raised beach round the island is in general carefully cultivated. The upper limit of enclosed and cultivated land is between 400 and 500 feet above the sea, but the greater portion is below 300 feet. As in the northern part of the island the ground rises steeply from the sea, almost everywhere the arable land is necessarily but a narrow belt along the coast, and even there is not continuous, though apparently more land was formerly cultivated in the olden times. In the Millstone Point district there were at one time fourteen families residing at Cock, Cuithe, Laggan, and Laggantuin, where there are now but a farmer and a shepherd. In North Glen Sannox there was once a large population where is now but a solitary shepherd's house. Several deserted farmsteads in the high fields above Corrie, at North High Corrie, and elsewhere, tell of former cultivation where all is now pasture land.

The southern part of the island probably contains considerably more than one half of the total arable land. Along the coast, in the Black Water valley, and near Lamlash, the strips of cultivated ground have a light, gravelly soil, peculiarly suitable for the growth of potatoes. Arran growers, notably Mr. D. McKelvie of Lamlash, have specialized in the cultivation of seed potatoes, of which they have established many new varieties held in high repute. In the south end, however, which is the most valuable of the agricultural districts, the subsoil is stronger and of a more clayey nature than in any other quarter of the island, no doubt owing to the wide spreads of boulder-clay. The amount of land under the plough has probably not varied much for the last hundred years. In a few places additional land has been reclaimed from the moors, while in others old arable land has relapsed into the general pasture, as at Corriehaim and Gargadale in the Sliderry valley.

There is evidence that it was at one time the general custom in the island to take the cattle to mountain pastures in the summertime, and remains of the summer shielings or *airidhs*, as they were called, are common in nearly all the high glens.

The old runrig system of cultivation, which was general a hundred years ago, still exists at Balliekine.

There is much natural wood in Arran, mostly of birch, alder, hazel, rowan, and willow, with some scrubby oak. Belts of these trees are found along the sea coast from Dougrie to Lochranza on the west coast, and on the east coast between Sannox and Brodick. There is a good deal of natural wood also in the lower parts of some of the glens, especially in Lag a' Bheith and in Glen Cloy, also in the Shiskine district near the Machrie Water, and in the lower part of Glen Rosa. In Glen Dubh (Glen Cloy) the wood grows up to about 800 feet above the sea, and to nearly the same height in Coire Fhraoich (Glen Rosa), and on the higher ground west of Corrie. Along several of the smaller streams trees flourish up to nearly 1000 feet, especially if the streams run in ravines, but the only locality where there is a small forest at this height is at Doire na Ceardaich, to the east of the summit of the Corrie and Lochranza road. One or two stunted specimens of the rowan tree were observed on the north side of Glen Sannox at a height of about 1500 feet near Suidhe Fhearghas.

The southern half of the island cannot be said to be well wooded, as the western and southern coasts are comparatively bare. There is a good deal of natural wood in places on the east coast, especially about the crags at Dippin and Kingscross, and along the coast west of the latter point. Much of it, as elsewhere, consists of birch and hazel. Most of the small streams flowing into Whiting Bay have pretty strips of natural wood along their banks, and there is a good deal in the lower part of the Monamore Glen. Between this glen and the Kingscross Burn lies Lagavellie, around which is one of the best wooded districts in this part of the island. Elsewhere what wood there is generally grows along the banks of the streams, and Sliderry Water and portions of its tributaries are bordered with trees in many places, the alder being conspicuous. The Kilmory Water in part is also fairly wooded. The Black Water and the smaller streams which debouch into Drumadoon Bay, have likewise their strips of greenery.

In North Arran the largest fir plantations are around Brodick Bay; and up the Merkland Burn and in Glen Shurig these trees flourish up to nearly 700 feet above the sea. There are plantations also at Whitefarland, Sannox, South Corrygills, etc. Glen Iorsa in Arran is almost treeless, and the granite district generally is comparatively bare of wood.

Comparatively little has been done in the southern part of Arran to remedy the deficiency of natural wood. Only a few plantations exist, and none are large. The most important are in Glen Ashdale; along the small burns west of Kildonan; and along the banks of the Kilmory Water at Lagg.

Wales supply — The rainfall in this west country is heavy, some 40 inches per year and upward; and the water supply from springs and streams is almost everywhere abundant. The water from the northern granite area is beautifully fresh and clear, and several of the springs which supply the streams are very powerful. One of these, three-quarters of a mile from the shore at Corrie, rises near the edge of the granite and furnishes the greater part of the water of the Locherim Burn. Another strong spring is found near the head of North Sannox at the foot of Garbh Choire, south-east of Creag Dubh. It rises at the edge of a moraine, and strong springs rise in a like position in the corrie west of Cir Mhòr. One of the most remarkable of the springs is that which rises on the ridge south of Caisteal Abhail at a height of nearly 2400 feet. The hillside west of Caisteal Abhail is called from it Leac an Tobair, or the Slope of the Well. One famous well at Mid Thundergay on the west side of Arran, Tobar Challumchille, takes its name from St. Columba. Several shallow wells have been sunk for water in the gravel and sand of the raised beach at Tormore. Another at the most southerly house by the roadside is about 14 feet deep. The greater part of it is in rubble and clay (glacial drift), but the lower part is sunk 21 feet in yellowish sandstone like that seen at the King's Cave.

In the southern part of the island the supply of water, mostly from small streams and springs, is good and copious.

Population — The distribution of the people has little connection with the geological formations, the population being confined in Arran to the neighbourhood of the coast and to the lower parts of some of the glens. The district of Shiskine, on the west side, is the only exception, and here a few scattered farms are found some distance from the sea. The resident population of Arran is small, but is much increased in the summer months by an influx of visitors, so that the inhabitants are probably doubled in number. Many of the natives find employment in the summer in catering for the visitors in various ways, but the majority of the people are engaged in agriculture, and the cultivated parts of the island are practically those in which the people reside. The remainder, and by far the larger portion, is devoted to sheep and deer.

The fishing industry is almost extinct, and chiefly confined to that of herrings on the west coast off Lochranza and Pirnmill. W.G., W.G. (MS.), G.W.T.