

Isle of Iona

ENERGY AUDIT

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Coordinated by

Scottish Islands Federation, Mull and Iona Community Trust, Community
Energy Scotland and Local Energy Scotland

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Background

Iona Community Council is supportive of exploring renewable energy sources for the island. Iona has typically been incorporated into statistics for the much larger neighbouring island of Mull. There is almost no published energy data relating specifically to Iona. The purpose of this report is to provide baseline information on energy consumption for the island as a starting point from which the local community can begin to research alternative and sustainable forms of energy supply.

I am very grateful to the island community together with Robin MacCallum and Nikki at Gleaners who were all extremely helpful with providing data. Gordon Bruce provided help with graphics and presentation.



Fuel oil is used for heating and is imported by via road and ferry.

1. Executive Summary

Iona imports all of its energy apart from an extremely small proportion generated from approximately seven solar roof installations.

Grid electricity is supplied by Scottish and Southern Energy (SSE) via an undersea cable from the isle of Mull.

Heating oil, coal, liquid petroleum gas (LPG), propane and wood are all brought onto the island via a small number of local suppliers.

Petrol has to be purchased on the neighbouring island of Mull or on the mainland and is not allowed to be transported in containers on the ferry.

The island of Iona (including the Calmac ferry that serves it) consumes approximately 6,236 megawatts per hour (MWh) of energy per annum. If figures for the ferry and Staffa tour boats are removed, the figure is 4,372 MWh per annum, as they both consume approx 2,400 MWh in diesel fuel every year.

The annual MWh figures for the Calmac ferry are almost the same as the total annual heating oil consumption for the entire island.

Heating oil and electricity are the main sources of energy on the island: 1,755 MWh and 1,371 MWh respectively.

Coal, mostly for secondary heating, and propane for cooking have much lower figures: 380MWh and 181MWH respectively.

Due to its small size, energy figures relating to vehicle use on Iona are relatively small: 169 MWh per annum.

The Iona Community, based at the Abbey and in various other buildings, is by far the largest single consumer of energy outside domestic and marine sectors, accounting for nearly 19% of the island's total energy use (excluding the ferry and Staffa boats).

The Iona Community's annual electrical consumption is a third of the total figure for the whole island (34%) and more than double the island's two hotels combined (15%).

Farming/crofting is a surprisingly low consumer of energy. This is due to its relatively small scale and the predominance of sheep farming. Fuel for tractors and quads is this sector's main consumption at 49 MWh per annum.

There is potential for switching to renewable sources of energy as well as improving on many aspects of energy conservation. The latter is particularly the case with draught proofing and insulation of older buildings.

Iona has enough sunshine hours and south facing roof areas to make solar viable as a significant energy source, as has already been proven by existing installations on both traditional and new build properties.

Iona has an ideal geographic setting for harnessing wind energy and this possibility is definitely worth exploring.

A single 1.5 megawatt (MW) turbine would, as an example, meet the entire island's energy needs.

A turbine of that size is a large structure, however, and in reality a limited number of smaller turbines is a more likely option.

A diversity of stakeholders would need to be involved in any planning process, including the National Trust for Scotland and Historic Scotland.

A new community forest development at Tiroran on Mull is worth researching as a possible source of sustainable timber. The timber could be used as an alternative heating source via wood fed boilers. Transport costs, always a key factor when considering imported goods and services for Iona, could make wood fuel unviable.

The economics of any energy project are in flux due to grid constraints that limit opportunities to export electricity off Iona, combined with pending changes to the energy subsidies regime. However, even amidst these constraints, there is potentially a local market for alternative energy supply and there are opportunities worth exploring.

A new house on Iona featuring solar panels and an air source heat pump.



2. Methodology by Fuel Type

Iona is relatively small in size and population but diverse in terms of energy users.

This diversity makes auditing a challenge as it is hard to select 'typical' examples and then extrapolate data with accuracy.

The housing stock (approximately 68 permanently inhabited homes and 29 seasonally occupied) is varied in terms of insulation, design, use and hence consumption.

One advantage of Iona's size and location is that it is possible to get extremely accurate figures for particular types of fuel consumption for the island as a whole.

Coal, LPG and Butane

Robin MacCallum is the sole supplier of coal, LPG and Butane to Iona. He provided exact annual figures for all three fuel types.

He was also able to indicate the proportion of LPG going to commercial premises, which accounted for the majority of the 47kg bottle deliveries.

Heating Oil

Gleaners, the sole supplier of fuel oil to Iona, was able to provide three years of tonnage figures.

The data from Gleaners provides a total annual figure for the whole island but does not differentiate amount of users or type (e.g., domestic or commercial).

The report uses audit data from the Columba hotel and an Iona family home to estimate commercial and domestic use from the total provided by Gleaners.

Wood

Wood is used on a very small scale on Iona. Coal is the preferred choice of solid fuel.

There is no source of timber on the island. The Argyll hotel and a very small number of residents order the occasional pick-up load from local suppliers on Mull. The annual delivery is estimated at 25 tons based on the approximate number of deliveries per year.

Domestic Electricity

Iona's housing stock was divided into three categories for the purpose of the audit.

Three domestic audits were then carried out to provide an average figure for each category.

Category 1: A larger permanent home of multiple occupancy (11 MWh pa)

Category 2: A smaller permanently occupied home (8 MWh pa)

Category 3: Seasonally occupied home - Easter to October (4 MWh pa)

Diesel Fuel/ Petrol

Private vehicles

45 vehicle permits have been issued to permanent residents on the island.

People's driving habits are varied. An elderly person living at an end of the island will most likely use their car more than a person living close to the shop. Parents sharing the school run will also most likely have higher mileages than other residents.

Average mileage was estimated at 1000 miles per vehicle, based on the model of every vehicle owner driving approximately 2.7 miles every day of the year. Miles per gallon (MPG) was estimated at 30. Diesel fuel was assumed to be the most common fuel type for kWh conversion purposes.

Annual mileage figures are of only limited value as most mileage is clocked up travelling across Mull and onto the mainland, not on the island itself.

Boats

There is significant pleasure boat use from Iona during the summer months. The report has not included any fuel estimates for this category.

Commercial vehicles

Iona is served by one commercial ferry, five regular couriers, one post van, one taxi, and sporadic deliveries, such as building suppliers and Gleaner's oil deliveries.

Calmac provided the 2012/13 annual diesel fuel figure for the Iona-Fionnphort ferry.

Robin McCallum's truck with coal and LPG delivers fortnightly.

Rubbish trucks collect waste twice weekly and glass recycling monthly

The Iona Community had a monetary figure for total annual petrol costs. The number of litres was worked out at the current price for diesel.

Precise annual mileage was provided by the post van and the Iona taxi along with their MPG.

The estimated mileage for any vehicle delivering across the island is approximately 2.5 miles.

Commercial transport consumption could then be calculated by multiplying this mileage figure by the number of delivery days per year.

Courier van's MPG was set at 30 MPG and trucks at 15 MPG based on interviews with the drivers.

A 'ghost' courier was added to the figures as there is nearly always a temporary van on the island for building work, plumbing etc.

Methodology for commercial energy use

Iona Hotels

The Argyll (electric data only) and the Columba (electric, heating oil and LPG) both provided data. The Columba is the larger hotel of the two and has a third higher electricity consumption. The Argyll's oil and LPG use was therefore estimated at a third less than the Columba's.

Iona Shops

Iona's 8 shops mostly use electricity only. Data from the Craft shop and Aosdana was used to estimate electricity consumption for the other six. The SPAR shop and Martyr's Bay restaurant plus bar both have very specific energy consumption and it has therefore been difficult to estimate figures accurately by comparison with the two sample shops. Hopefully these figures can be accessed in the near future. A rough estimate, meanwhile, has been included for them in the report.

Bishop's House

Only electricity data was received. Bishop's House operates on similar scale to a small hotel. Electricity use is 18% of the Columba Hotel, and oil and LPG use are calculated at the same percentage.

Iona Community

Total figures were received for electricity, coal, LPG and petrol. Data incorporates the Abbey buildings, MacLeod centre, Welcome centre, three houses and various outbuildings.

Staffa Boat Tours

Figures were provided for two of the three boats, based on amount of litres used per hour on the water. The owner of the third boat provided annual diesel figures.

Iona sail boat hire

Annual diesel figures were provided.

Fishing dinghy

Iona's sole commercial fisherman provided annual petrol figures.

Farming

Culbhuirg Farm provided figures for electricity, heating oil, propane and diesel fuel. Even allowing for Iona's small size, the energy consumption from farming and crofting was surprisingly small. Only Culbhuirg is operating on any significant commercial scale. Its relatively large land area, together with management of a beef suckler cow herd are the significant factors in its energy use, which is largely due to increased tractor fuel costs associated with beef production.

Small-scale sheep farming, as carried out by the other crofts, carried almost no significant energy burden other than a human one!

Diesel fuel figures from tractor and quad use are therefore the only significant energy costs from farming. Accurate figures were received from the largest farm, and an estimate of diesel use for all crofts was gained from the farm as a benchmark, then cross-checked in discussions with crofters.

The energy consumption of the croft houses themselves was included in the residential data.

Methodology for Community Buildings

Annual electricity figures were provided for the Village Hall and Primary School.

Estimates were used for the Fire Station, Heritage Centre, Library, Surgery and Parish Church. The majority of these buildings are only periodically in use and their overall energy consumption is estimated to be very low.

3. Island Energy Mix

Fuel	Supplier	Applications
Electricity	SSE infrastructure Standard commercial suppliers	Central heating, heat pumps, underfloor heating, cookers, small appliances, information technology, craft/ small manufacture machinery
Coal LPG Butane Petrol Diesel	Robin McCallum Isle of Mull	Heating, cooking, vehicles
Heating Oil	Gleaner Oils Ltd, Craignure, Mull	Central heating
Wood	Local Mull suppliers	Secondary heating



LPG and Heating Oil used in a typical island house.

4. Energy Supply

Fuel Type	Amount p.a	MWh p.a	CO2 tonnes p.a
Heating Oil	146,271 litres	1,755.312	471.757
Electricity	1,776,700kwh	1,776.700	807.967
Coal	50.7 tonnes	380.250	118.592
Propane	13,293 kg	181.688	38.975
Wood	25 tonnes	95.150	N/a
Butane	86.5kg	11.823	2.536
Petrol (Land)	15,434 litres	169.774	41.615
Petrol (Aquaculture)	62,600 litres	688.600	168.789
Petrol (Ferry)	157,137 litres	1,712.793	428.198
Total		6,772.09	2,078.429

Renewable energy supply

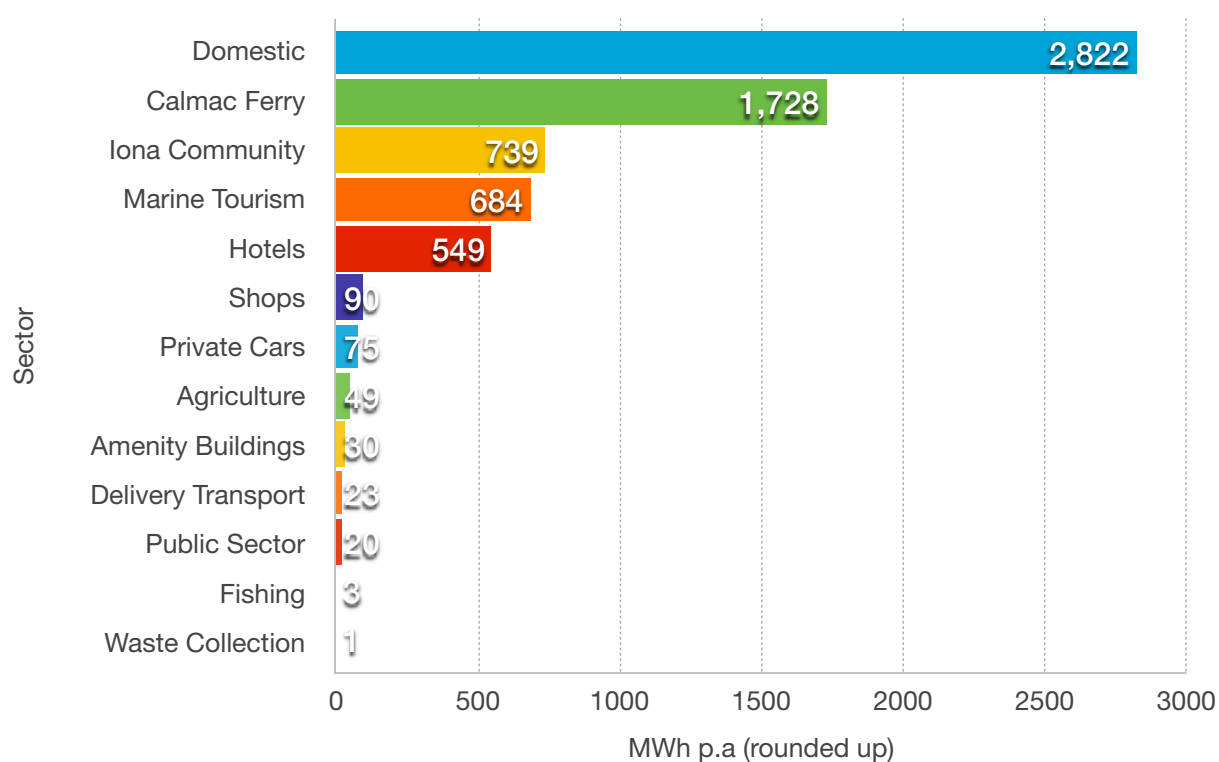
There is very little renewable energy use on the island although there have been a few recent solar and air source heat pump installations. These are estimated at seven solar installations and six air source heat pumps.



Solar Panel installation at Clachan Corrach.

5. Total Annual Energy Consumption by Sector

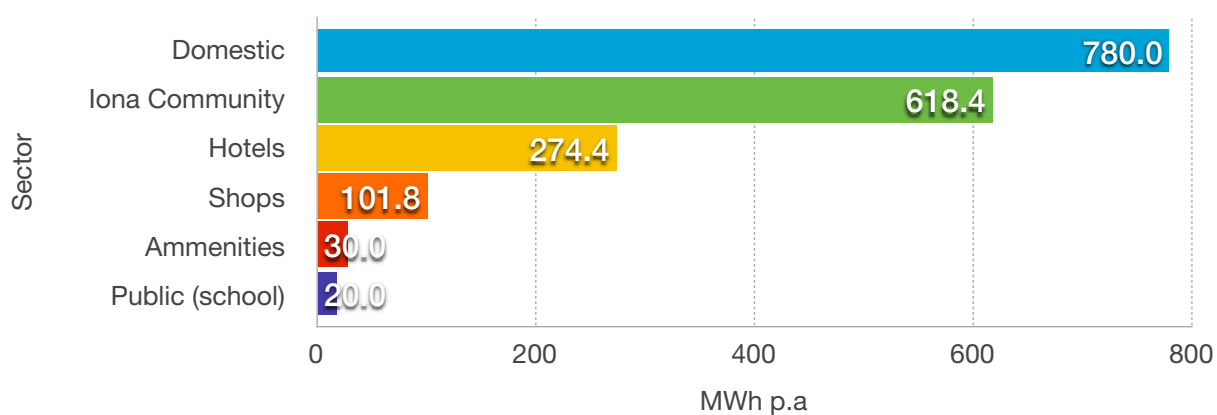
Sector	MWh p.a (rounded up)	Proportion of total consumption (%)
Domestic	2,2822	36
Calmac Ferry	1,728	27.7
Iona Community	739	11.9
Marine Tourism	684	11
Hotels	549	8.8
Shops	90	1.4
Private Cars	75	1
Agriculture	49	<1
Amenity Buildings (Fire Station, Library, Surgery, Hall, Church)	30	<1
Delivery Transport (Royal Mail, van couriers, oil and coal deliveries, taxi)	23	<1
Public Sector (Primary School)	20	<1
Fishing	3	<1
Waste Collection	1	<1
Total	6813	



6. Electrical Energy Consumption

Sector	MWh p.a	Proportion (%)
Domestic	780	43
Iona Community	618.449	34
Hotels	274.361	15
Shops	101.780	5.5
Amenities	30	1.6
Public (school)	20	1
Total	1,824.59	100

The total of 1,824.59 MWh p.a. equates to 832 tonnes of CO₂.



7. Domestic Consumption

Estimated electrical consumption based on 97 residential properties is 780 MWh p.a

Category 1 (larger property occupied all year round):

40 properties @ 11 MWh p.a.

440 MWh

Category 2 (smaller property occupied all year round):

28 properties @ 8 MWh p.a.

224 MWh

Category 3 (seasonal use typically May-September):

29 properties @ 4 MWh p.a.

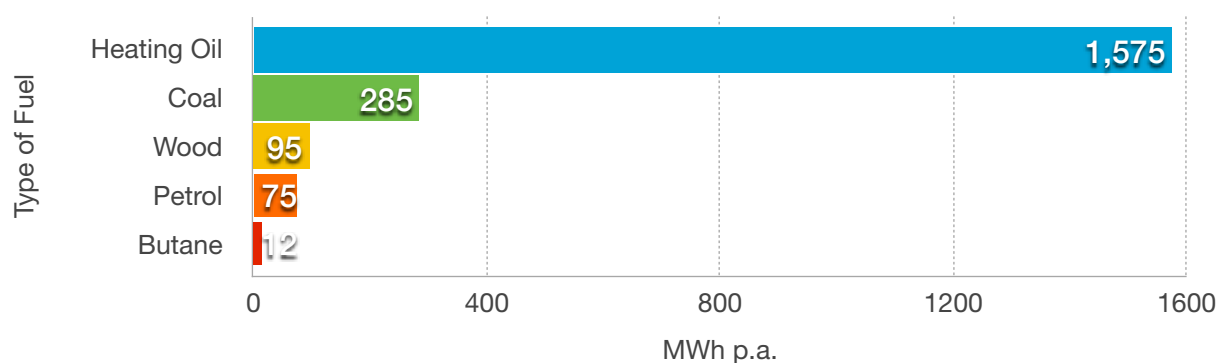
116 MWh

Total

780 MWh

Non electric domestic consumption in MWh p.a.

Fuel type	MWh p.a
Heating Oil	1,575
Coal	285
Wood	95
Petrol	75
Butane	12
Total	2,042



8.Commercial Consumption

Estimated electrical consumption

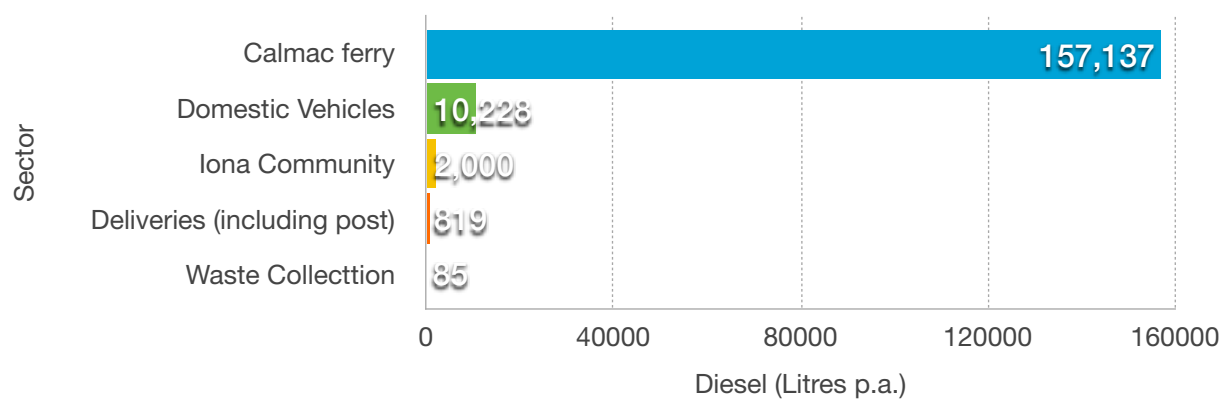
Sector	MWh p.a.
Iona Community	618.449
Hotels	274.361
Shops	101.780
Bishops House	29.370
Total	1,023.960

Non electrical consumption

Sector	Fuel	MWh p.a.	Proportion of Total (%)
Calmac ferry	157,137 litres diesel	1,728.507	60
Marine Tourism	62,200 litres diesel	684.420	24
Iona Community	2000 litres diesel	22	4.2
	3597 kg LPG	49.163	
	6650 kg coal	49.875	
Hotels (e)	8242 kg LPG	112.651	9.5
	11022 litres heating oil	132.264	
	4 tonnes coal	30	
Farming	4500 litres diesel	49.5	1.7
Transport	2115 litres diesel	23.265	8
Total		2.881.645	100

9. Transport Consumption

Sector	Diesel Litres p.a.	MWh p.a.	Co2 Tonnes
Calmac Ferry	157,137	1,728.507	6,987.569
Domestic Vehicles	10,228	112.508	458.991
Iona Community	2,000	22	89.752
Deliveries (including post)	819	9	36.731
Waste Collection	85	0.935	3.814
Total	170,269	1,872.95	7,576.856



Winter delivery.

10 Assessment of the Potential for Fuel Switching

Grid constraints currently limit opportunities to export electricity off Iona, and there are several changes under consideration to energy subsidies. However, even amidst these constraints, there is potentially a local market for alternative energy supply and there are opportunities worth exploring.

Wind Energy

Iona is ideally placed to take advantage of strong and reliable wind speeds and further investigation of this option would be worthwhile.

Assuming a 25% capacity factor, a typical 1.5 MW turbine would produce 3,285 MWh per annum (source: National Wind Watch).

Iona's total energy consumption, including transport but excluding the ferry and Staffa boat figures, is 3,836 MWh. This amount could be reduced through energy conservation measures. It could be comfortably met through, for example, a 1.5 MW turbine supplying all island based energy demand including transport

That size of turbine has an approximate hub height of 80 meters. Visual impact could be mitigated through switching from a large turbine to smaller turbines located out of sight on the south west side of the island. A diversity of stakeholders would need to be involved in any planning process, including the National Trust for Scotland and Historic Scotland.

Solar

Iona shares a similar climate to the neighbouring island of Tiree. Tiree has an airport which means that the Met Office compiles accurate weather data from its systems there. Average sunshine hours for the month of May numbered over 220 and current performance of solar installations on Iona suggest that this is an area with significant potential, especially as many of Iona's houses have south facing aspects.

There is significant 'dead' space in the centre of the island which could lend itself to solar field technology.

Sustainable Timber

A recently acquired community forest at Tiroran on the neighbouring island of Mull could potentially create access to a sustainable source of timber to power wood boilers for central heating.

The project is in its infancy so it is currently premature to assess potential.

Transport costs would also be a major factor.

11 Cost Data and Expenditure

The energy costs of each fuel, together with the annual spend, are shown in the table below.

These average figures have been borrowed from the isle of Lismore's energy audit as they are similar to Iona in terms of delivery surcharges. The costs include VAT, average payment method and delivery to the resident.

FUEL	COST per KWh in pence	Annual Expenditure in £
Electricity	18	319,806
Heating oil	4.5	78,989
Red diesel (farm)	5.2	5,390
Marine diesel	5.2	264,153
Diesel (Road)	11	18,675
Coal (weighted average)	4.9	18,632
LPG	6.5	11,809
Total		717,454

12 Geography and Infrastructure

Iona is a small Hebridean island, approximately 3.4 square miles in area, off the Ross of Mull on the western coast of Scotland. It is famed for its Abbey and the island holds a unique place in Scottish history. The Abbey attracts over 55,000 visitors a year while the island as a whole remains an extremely popular tourist destination.

Although the National Trust for Scotland owns the majority of land on Iona there is still a significant amount of other stakeholders on the island which poses both opportunities and challenges for future development projects.

Major stakeholders include: the National Trust for Scotland, Iona Community Council, the Iona Community, Historic Scotland and Argyll and Bute council.

The island is served by a public ferry from Fionnphort on Mull which makes regular crossings across the Sound of Iona throughout the day. The service can be disrupted by bad weather, especially in the winter months.

Power and water is supplied to the island via undersea cables/ pipes from Mull. There were numerous power cuts on the island during the winter of 2013/14, which has added urgency to the search for an island based power source.

A single track road runs through the island. Vehicle use is restricted to residents and visiting commercial vehicles.

There are approximately 100 domestic properties on Iona of which nearly 29% are seasonally occupied.

The popularity of Iona means that house prices are significantly higher than the average for Argyll and Bute, which can make it difficult for local residents to own their own homes.

There is one council house on Iona managed by the Argyll Community Housing Association.

Building is currently underway to provide four affordable homes on the island.

Iona has a designated NHS surgery building. The local GPs from Mull visit one morning a week.

Other community facilities are the Parish Church, Post Office, library, Fire Station and Village Hall. The latter is at the centre of island life, hosting film nights, fundraising events, ceilidhs and an annual music festival.

13 Population and Demography

Iona has a resident population of approximately 177 people (2011 Census), spread across the island. The population increases significantly during the holiday season due to the influx of temporary workers and visitors.

The Primary School has seen a significant increase in numbers over the last two years from seven pupils in 2012 to 20 in 2014, bucking the statistical trend for other islands in Argyll and Bute.

14 Local Economy

The main focus for the Iona economy is tourism.

The tourist season lasts roughly from the Easter holidays through to the October half term.

Due to the seasonal and localised nature of much of the employment on the island, income is often restricted to the tourist season.

Broadband is, however, allowing more residents to work both remotely and year round on the island. Improvement of this infrastructure is an important development topic for the Iona Community Council.

Main economic sectors:

Accommodation

2 Hotels, 11 bed & breakfasts, 21 self-catering, 1 Hostel, 4 retreat centres and 1 campsite

Shops

8

Aquaculture

2 Staffa boat tour companies (3 boats in total)

1 Sail Boat Hire

1 fisherman supplying the island hotels

Agriculture

2 Farms, 14 crofts, 2 hotel vegetable / fruit gardens

Restaurants/ Cafes

Heritage Centre Cafe

Martyrs Bay Restaurant and Bar

Heritage

Iona Community: Iona Abbey (co-run with Historic Scotland), the MacLeod Centre and Welcome Centre
Iona Heritage Centre

Transport

Calmac ferry
Iona Taxi
Parcel couriers
Postal van
Fuel deliveries
Waltons

Community Buildings

Village Hall
Fire Station
GP surgery
Library
Parish Church

Public Sector

Iona Primary School

Appendix

Key Organisations and Contacts

Stephen Duncan, *Historic Scotland*

Douglas Wilson, *Historic Scotland*

Graeme Bell, *Historic Scotland*

Jane Martin, *Historic Scotland*

Sharon Kyle, *Iona Community (Macleod Centre)*

Fiona Menzies, *Iona Heritage Trust & Iona Housing Partnership*

Rosie Magee, *Director of the Iona Community on Iona*

John MacLean, *Chair Iona Community Council*

Philip Ruhemann, *PPG, smilegov volunteer*

Emily Wilkins, *Mull & Iona Ranger Service & NTS*

Chris Cassels, *National Trust for Scotland*

Colin Macdonald, *Iona resident and Harbour committee member*

Morven Gibson, *MICT Local Development officer*

Sandy Brunton, *Mull & Iona Community Trust*

Finlay MacRae, *Calmac*

Iain Erskine, *Calmac*

Angus Johnston, *Iona Cathedral Trust*

Terry Hegarty, *MICT & Scottish Islands Federation*

Iain Dougall, *East End Common Grazings*

Moray Finch, *Mull & Iona Community Trust*

John MacInnes, *West End Common Grazings*

Dot Stewart, *Iona Business Forum, Iona Housing Partnership, St Columba Hotel*

Toben Lewis, *Bishops House*

Robbie McLellan, *Bishops House*

Alistair MacDougall, *Argyll & Bute Council*

Mary-Jean Devon, *Argyll & Bute Council*