

Eigg, a small island that is part of the Scottish Inner Hebrides, has generated worldwide attention for being almost energy independent through a careful mix of small-scale renewables, like this solar collector to heat household water, and for its community land ownership and energy planning.
isleofeigg.org



4

Islands, climate change, and net zero

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ABSTRACT

Climate change is one of the gravest threats to society but Small Island Developing States (or SIDS), and islands more generally, are amongst the least responsible for its current state. However, rather than focusing on island vulnerability to climate change, or adaptation and resilience, this chapter focuses on islands and climate change mitigation, exploring both the rationale for policies aimed at reducing greenhouse gas emissions and the possible content of island-specific net

*At the time of writing this chapter, Dr. Sindico was on secondment with the Scottish Government leading its Carbon Neutral Islands project. This chapter reflects his personal opinions and does not reflect in any way the position of the Scottish Government.

zero policy pathways. The chapter focuses its attention on SIDS, but also on semi-autonomous island territories, often referred to as subnational island jurisdictions or SNIJs. Scotland and its islands are also used to provide more context to the analysis. The chapter concludes that net zero-related good practices stemming from islands will not automatically apply to mainland settings but that, in some circumstances (especially transport and energy), the closed nature of islands lends them to be perceived as hubs of innovation capable of distilling learning from which mainland counterparts can also benefit.

INTRODUCTION

Science has made it very clear that anthropogenic-induced climate change is beyond doubt, and that the world has less than ten years to make serious changes in order to avert the most dangerous consequences of rising temperatures (Intergovernmental Panel on Climate Change [IPCC], 2021). It is also well-known that islands, and Small Island Developing States (or SIDS) in particular, barely have any responsibility at all for the greenhouse gas emissions that cause climate change (United Nations Framework Convention on Climate Change [UNFCCC], 2017). So why should islands focus on climate change mitigation, considering the negligible impact their emission reductions will have on the global challenge of climate change? Moreover, if they decide to act, how much action should they take in their climate change mitigation policies, and how should they implement such climate policies? This chapter explores these two questions and focuses on islands' climate change policies and their 'net zero' pathways. In order to provide a comprehensive geographical analysis, the scope of islands referred to will include the United Nations' recognized nation-states commonly labelled SIDS, as well as semi-autonomous island territories, often referred to as subnational island jurisdictions or SNIJs. The chapter will also pay special attention to the experience of the Scottish islands to support the arguments.

The chapter is divided into three sections followed by a set of conclusions. In the first section, the rationale behind islands' climate change policies will be addressed together with a discussion of the concept of 'net zero' vis à vis other climate target options. The second section will explore how SIDS are approaching climate change mitigation and adaptation in the context of the implementation of the Paris Agreement (United Nations, 2015). In the third section, a discussion will take place about how islands in general may be able to move towards a net zero outcome, highlighting the challenges and opportunities for other islands and for shaping mainland climate policies. This section will shed some further light on the climate change experience in the Scottish islands. The chapter will conclude by providing some cautionary observations about replicating "one-size fits all" island net zero policy pathways for other places.

ISLANDS, CLIMATE CHANGE, AND NET ZERO: A RATIONALE

Climate change (mitigation) and islands

This section will address the rationale behind islands' climate change mitigation policies, as well as a discussion of the concept of net zero emissions vis à vis other climate target options. Climate change adaptation is equally as important — and, for most islands, probably more important — but is often not directly linked to net zero policies. The chapter will, however, discuss adaptation in an island context in the coming sections. By net zero, this chapter refers to:

“targets [that] suggest[s] a state in which an actor achieves a balance of carbon dioxide emissions and removals — using either natural sinks, such as reforesting land or adopting agricultural best practices, or a technological solution, such as carbon capture and storage.” (New Climate Institute & Data-Driven EnviroLab, 2020, p. 8)

A BETTER AND FAIRER APPROACH is to consider islands, and SIDS in particular, through the lens of adaptation and resilience rather than vulnerability.

In his address to COP26 delegates, the former American President Barack Obama referred to islands (and islanders) as the “canaries in the coalmines” (Zak, 2021). Of course, this is not the first time this metaphor has been used in reference to small islands and climate change (Hanna & McIver, 2014), with some commentators criticizing the trope regarding which islands would be inherently vulnerable when it comes to climate change (Benwell, 2011; Grydehøj, 2014; Kelman & Khan, 2013; Mallin, 2018). Many suggest that a better and fairer approach is to consider islands, and SIDS in particular, through the lens of adaptation and resilience rather than vulnerability (Teng, 2019). However, because of the small size and close connection to the sea, it is not surprising that islanders may be the first to notice the negative and often tragic effects of climate change, such as sea level rise and the increase in frequency and intensity of extreme events like hurricanes (Johnston, 2014). If we temporarily ignore the larger, more populated island nations (such as the United Kingdom, Japan, or Indonesia), islands, and especially those that are developing, contribute only 0.5% of global greenhouse gas emissions (UNFCCC, 2017). This imbalance raises moral (climate justice) and practical challenges for islanders when it comes to climate change (Teng, 2019). Particularly, why take any locally based mitigation efforts if the outcomes of those efforts contribute little or nothing to solve the global problem of reducing greenhouse gas emissions? To clarify: the increase in atmospheric temperature is caused primarily by the release of a set of greenhouse gases in the atmosphere. These stem from a number of anthropogenic activities, including energy generation, industrial activities, transport, agriculture, and waste (IPCC, 2021). When absolute emissions are measured

by country, the United States, the European Union, China, India, and Brazil are the largest emitters. According to some studies, “about 60% of GHG [greenhouse gas] emissions come from just 10 countries, while the 100 least-emitting contributed less than 3%” (ClimateWatch, 2021, n.p.).

Given this imbalance in cause and impact, the rationale for an island and its policy makers to put forward an ambitious climate change policy is twofold. First, island decision-makers may want to develop an ambitious climate policy to show leadership by example and attract international funding (Dornan & Shah, 2016). By developing and implementing a substantive climate policy agenda, islands are able to maintain moral pressure on the international community (Teng, 2019). The Maldives are a good

example of an island state showing climate leadership and putting pressure on the international community. In its updated Nationally Determined Contribution (NDC), the Maldives maintained that it will strive to reach net zero by 2030 (Maldives Ministry of Environment, 2020). Another good example — although not focused on economy-wide net zero — comes from Cape Verde, whose government stated a pledge to produce 100% of its electricity from renewable sources by 2025 (Nordman et al., 2019).

Although not linked directly to a

significant environmental outcome, there is a second, more practical rationale for engaging in an aggressive climate change mitigation agenda through long-term strategies. By slowly but steadily becoming energy independent, islands are able to decrease their reliance on imported fossil fuels. This was the main reason Iceland started to move away from imported oil and gas (Logadóttir, n.d.). In writing their own (renewable) energy story, islands may also achieve an indirect goal of attracting investment and creating jobs. By transitioning away from fossil fuels, energy independence and its social and economic co-benefits may encourage island residents to stay and attract others to migrate to their island (Attard et al., 2021; Robertson, 2018). One jurisdiction that is moving in this direction is Scotland through the Carbon Neutral Islands project, whose aim is to “demonstrate the low carbon energy potential of Scotland’s islands as hubs of innovation in renewable energy and climate change resilience, whilst positively impacting on island economies and population retention and growth” (Scottish Government, 2021a, para. 3).

President Ibrahim Mohamed Solih states that Maldives can reach net zero emissions by 2030 with international support.
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Net zero and other climate targets

For many years, the threshold temperature increase that would constitute a dangerous climate change was unclear. In article 2, the United Nations Framework Convention on Climate Change (UNFCCC) maintains that the goal of the Convention is to prevent dangerous climate change, but it does not specify what that means (United Nations [UN], 1992). It was only with the 2015 Paris Agreement that, for the first time, a temperature threshold from pre-industrial times was included. States have now agreed in article 2 of the Paris Agreement that their collective efforts must avoid anything greater than a two-degree Celsius increase from pre-industrial levels and, where possible, that global efforts should strive to limit the increase to 1.5 degrees Celsius (UN, 2015). One of the key phrases repeated during the Glasgow COP26 conference was to “keep 1.5 alive” (Carrington, 2021). The IPCC clarifies that, to limit global temperatures to an increase of 2 degrees Celsius from a 2010 baseline, global emissions would first have to decrease 45% by 2030, followed by net zero by 2050 (IPCC, 2021). More importantly, deep and negative emissions reductions would need to take place well beyond 2050 if the world wishes to be more ambitious and meet the 1.5 Celsius target.

Against this background, when referring to ‘net zero’, there are three key sets of challenges that islands should also take into account in the long, medium, and short term. In the long term, net zero is not the only possible emission reduction target (de Andrade Correa & Voigt, 2021; New Climate Institute & Data-Driven EnviroLab, 2020) and, from a climate change perspective, is not the appropriate goal. Beyond 2050, countries (including islands) should consider zero emissions and climate positive targets. Zero emissions implies a climate change policy according to which sinks are not counted towards meeting the target, and the latter will only be met when no greenhouse gas emissions are accounted from a certain territory. The term ‘climate positive’ takes climate change policy one step further and, in this case, a positive target is set whereby a certain amount of greenhouse gases will be removed from the atmosphere for the target to be met. This differs from net zero in that the starting point is zero emissions, after which additional efforts related to sinks are required.

In the medium term, net zero presents a challenge if it is not accompanied by shorter, incremental climate targets and monitoring. Countries that only adopt 2050 net zero targets without holding themselves accountable to implement clear incremental strategies and emission reduction goals will find it difficult to achieve the longer-term goal. The Neubauer case in Germany (London School of Economics and

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Political Science, 2021) reaffirmed the importance of having intermediate steps that are tangible and that can be monitored. The German Federal Constitutional Court concluded that the German government was breaching the Constitution by not setting clear enough targets between 2030 and 2050 (Bäumler, 2021).

In the short term, net zero can also present equity issues if international offsets are abused. As a reminder, ‘net zero’ implies a balance between the greenhouse gas emissions present in the atmosphere and the greenhouse gas emissions that are captured via sinks (e.g., in forests, oceans, peatbogs, etc.). A challenge with net zero is that it could imply that emissions, and the current industrial model that depends on it, can continue unchecked so long as we can rely on nature-based solutions or, in the longer

term, with new carbon-capture technologies capable of capturing and storing large amounts of greenhouse gases. A further challenge can stem from countries whose climate change policies include international offsets whereby domestic net zero is achieved by means of investing in “green” projects in developing countries. From a global climate change perspective, the idea of reducing emissions where it is least expensive may seem an economically feasible option. However, the Paris Agreement and the IPCC make it clear that, in the longer-term, net zero is not enough, and civil society in many developed countries want their own governments to meet their historical climate responsibility domestically rather than “buying their way out” through international offsets (Calnek-Sugin, 2020; Streck & von

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Unger, 2016). The latter are allowed by the Paris Agreement, and COP26 has concluded the rules that will allow them to operate in the context of the implementation of countries’ NDCs (UNFCCC, 2021a). Safeguards to prevent abuse and to ensure the environmental integrity of offsets and carbon markets related thereto have been included, but still some observers have reservations (Amazon Watch, 2021; Louw, 2021; Rogerson, 2021).

Overall, net zero is what most countries are considering and what many islands refer to in their climate change policies. However, net zero is not enough to achieve the temperature threshold targets in the long term. It requires stringent and clear timetables that can be monitored. Ultimately, difficult questions about equity in the use of offsets need to be carefully considered.

SIDS AND THE PARIS AGREEMENT

This section explores how SIDS in particular are approaching climate change mitigation and adaptation in the context of the implementation of the Paris Agreement (Hoad, 2016; Ourbak & Magnan, 2018).

The Paris Agreement

The Paris Agreement was adopted in 2015 and entered into force in 2016 (Bodansky et al., 2017; Klein et al., 2017; UN, 2015). After five years, the Paris Rulebook, a series of COP Decisions aimed at operationalizing specific provisions of the Paris Agreement that required further negotiations, was concluded at COP26 (UNFCCC, 2021a,b,c,d,e). The Paris Agreement is a bottom-up international legal framework that brings all countries of the world together, but provides them with a degree of flexibility in how to deal with climate change. By signing the Agreement, a country obliges itself to prepare, submit, and maintain an NDC, as spelled out in article 4 of the Paris Agreement (UN, 2015). An NDC clarifies the country's climate change target and lays out the key policies that it will develop to meet its target. Countries often have to put the NDC into domestic legislation for it to carry normative weight domestically. Collectively, the NDCs are intended to prevent dangerous climate change, which, as highlighted earlier, is now understood as limiting global temperature to not more than 2.0 degrees Celsius from pre-industrial times and, where possible, aiming at 1.5°C. NDCs should include a country's climate change policy in the context not only of mitigation, but also adaptation and, where applicable, climate finance. One of the key aspects of the Paris Agreement is that every five years countries are asked to come up with a new, improved NDC. Furthermore, from 2023 and every five years thereafter, a Global Stocktake will be completed which reviews global efforts to deal with climate change in light of the best available science. An interesting development coming out of the COP26 meeting in Glasgow, Scotland (2021) is acknowledgment by countries that setting 2040 or 2050 targets can be irrelevant if not accompanied by stringent and clear timelines between now and 2030. In this respect, the Glasgow Pact "requests Parties to revisit and strengthen the 2030 targets in their nationally determined contributions as necessary to align with the Paris Agreement temperature goal by the end of 2022, taking into account different national circumstances" (UNFCCC, 2021f, para. 29). The non-legally binding nature of the Glasgow Pact and the complexity in upgrading and updating 2030 targets in just one year may lead to many countries not being able to comply with this request. However, the message

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coming out from Glasgow's COP26 is clear: more swift and incremental action is needed in order to deal with climate change effectively.

Overall, the global fight against climate change is housed primarily, but not only, in the Paris Agreement. The latter is an international treaty with no expiry date. Countries needed six years to finish all the specific rules that will allow the Paris Agreement to start operating properly. In this respect, it may be analogous to a machine that needs more parts to operate most effectively. After COP26, it now has those additional parts. The Glasgow Pact, and any future Conference of the Parties decisions, will not replace the Paris Agreement. Future actions may encourage countries to steer the machine in a slightly different direction, but the overarching course set in Paris in 2015 remains.

SIDS and implementation of the Paris Agreement

The Paris Agreement is not just about climate change mitigation. It also includes provisions regarding climate change adaptation, climate finance, and, crucially for SIDS, loss and damage. As mentioned before, even with the most ambitious climate policies,

small island states will still suffer the greatest negative impacts of climate change. While this does not justify inaction, it does mean that SIDS interest in the implementation of the Paris Agreement falls primarily in three key areas: adaptation, climate finance, and loss and damage.

SIDS will need to adapt to climate change (Klöck & Fagotto, 2020; Klöck & Nunn, 2019; Robinson, 2020). A global goal on adaptation has now been agreed and climate finance has been readjusted to consider not only mitigation and transfer of technology, but also climate change adaptation (Robinson & Dornan, 2016; UNFCCC, 2021f; Wilkinson et al., 2021).

Despite the fact that, in many cases, adaptation is about good governance, planning, and working together with nature, there can still be cases when it comes at a high cost.

To that end, climate finance is crucial for many SIDS that wish to implement ambitious climate policies (Canales et al., 2017; Samuwai, 2021; Scandurra et al., 2020). One of the key challenges for all islands in implementing net zero policies is cost. Transforming an island from a fossil fuel-dependent society to an island framed around renewable energy sources will be a costly exercise. For example, in the small archipelago of Cape Verde, situated off the west coast of Africa and with a population of not much more than 550,000 people, it has been estimated that delivering on its pledge of 100% renewables will come at a cost of 1 billion USD (Nordman et al., 2019). Developed countries had promised developing countries \$100 US billion a year in climate finance

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Cape Verde plans to run on 100% renewable energy by 2025 using a system based on solar, wind, and energy storage. It is estimated that delivering on this pledge of 100% renewables will come at a cost of 1 billion USD.

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starting in 2020. This target has been missed and negotiations for a new collective quantified goal on climate finance were launched at COP26 (UNFCCC, 2021g). A key challenge when it comes to ‘climate finance’ is agreeing on the definition of the term itself (Colenbrander et al., 2018). In other words, is it public money and, if so, how does it differentiate from aid money? Or is it also private money and, if so, how can countries leverage such large sums of private money (Lundsgaarde et al., 2018)? If it is private money, are these just grants, or will the private investor want something in return? In other words, does acquiring climate finance come with obligations? While all of these are real and challenging problems for SIDS, loss and damage has developed into a self-standing issue for SIDS (Benjamin et al., 2018; Handmer & Nalau, 2019; Thomas & Benjamin, 2018).

Loss and damage can be defined as “the actual and/or potential manifestation of impacts associated with climate change in developing countries that negatively affect human and natural systems” (Rajamani, 2015, p. 17; see also McNamara & Jackson, 2019). Within the Paris Agreement, SIDS were able to secure a specific provision for loss and damage due to climate change (UN, 2015, art. 8), hence separating it from both adaptation and climate finance. Loss and damage is more than just adaptation in that it also refers to those instances that are sudden and/or are caused by extreme climate events. It differs from climate finance because it could provide a more agile and immediate stream of finance when it is needed. While embedding loss and damage within the

Paris Agreement may have been an achievement, from the perspective of SIDS it was less of a success in how it was to be operationalized (Broberg & Martinez Romera, 2020). Developed countries were also able to include a “firewall” provision in the COP Decision that accompanies the Paris Agreement according to which countries cannot be held liable for climate change damages (UNFCCC, 2016, para. 51). In other words, jurisdictions such as the USA or the European Union wanted to be sure that SIDS would

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not sue them for their historical climate change responsibility and require them to pay compensation for the loss and damage which SIDS had incurred (Adelman, 2016). Interestingly, this heated discussion around loss and damage has not been resolved and was once again centre stage at COP26 (Dimsdale, 2021). As was the case with earlier climate conferences, AOSIS (i.e., the Alliance of Small Island States) was not able to get what they wanted during the negotiations, but they clarified that at future Conferences of the Parties they would continue to pursue their loss and damage strategy (Wilkinson & Tanner,

2021). With the Paris Rulebook completed and less to be negotiated overall, it remains to be seen whether the discussions around loss and damage will become a dominant area of future negotiations.

In conclusion, more elements of the Paris Agreement are still to be implemented. For SIDS this means that, in addition to NDCs and, apparently, the annual review of pre-2030 efforts, the international legal machinery around adaptation, climate finance, and loss and damage will become increasingly relevant. SIDS need to fully understand the complexity of the Paris Agreement machinery and leverage funding and other opportunities to support their net zero policies. International initiatives such as the SIDS Lighthouses Initiatives, coordinated by the International Renewable Energy Agency (IRENA) and designed to transition SIDS from fossil fuels to renewable energy sources, is an example of an initiative that starts to achieve these goals (International Renewable Energy Agency, 2021).

CHALLENGES AND OPPORTUNITIES FOR ISLAND NET ZERO POLICIES

This third section discusses how islands in general can move towards net zero, highlighting challenges and opportunities. This section will also analyze the extent to which island net zero pathways may provide an example for mainland climate policies. Throughout this section, and especially in terms of implementation, the chapter will use the experience of islands in Scotland.

Islands' net zero pathways

Emission baseline

The first step in designing a net zero policy pathway for any jurisdiction is to understand the climate change circumstances at that place. In other words, policy makers and community stakeholders need to develop an emissions baseline. In addition to not being able to manage, or regulate, what you do not know, without an emissions baseline scenario it is impossible to track progress towards the net zero target during its implementation process.

Before carrying out the emissions baseline exercise, some difficult but key issues need to be considered. First, what kind of emissions will be included? Emissions are usually categorised as Scope 1, 2, and 3. Scope 1 and 2 can be framed as territorial, meaning that they relate to emissions generated on the island and for which island decision-makers have more direct control. Island-based industry or land use related emissions would fall under these categories. Scope 3 emissions are consumption-based and relate to products or services that are consumed on the island but whose production takes place elsewhere. Within the Scope 3 category, emissions generated in the production of a product are included in the baseline of the consumption location. Emissions related to the generation of imported agricultural products (e.g., fruit and vegetables) fall under Scope 3. This is a progressive methodology as it places the onus on individuals' daily choices. However, by doing so, it can eschew the climate change geopolitical picture that is predominant in the international climate change legal regime, which is centred on production-based emissions.

A second very challenging issue relates to transport, a key sector on many islands, and includes carbon produced by ferries and planes. For many islands, transport is essential to maintain the population — as an economic driver, and as a way to attract tourists and maintain links to the outside world for residents (Karampela et al., 2014). Which, if any, transport-related emissions should be included in the emissions baseline? Take, for example, a ferry that transports people and goods between a mainland and an island. In this hypothetical scenario, to what degree should the emissions generated by mainlanders taking the ferry to and from the island be included in the island emissions baseline?

Decisions regarding the types of emissions to include and how to calculate transport-related emissions are crucial to allowing an island to succeed or fail in achieving its net zero pathway. Island governments and decision-makers should be the ones making such decisions, albeit with the necessary input from the island population at large.

Implementation

Once an island emissions baseline is calculated, the next stage is implementation. It is at this stage that the input of the island community becomes crucial for the overall success of the net zero policy pathway. If the plan for net zero is dictated from abroad, or is predetermined by central decision-makers with little input from local residents, or is even driven by external donors, the island community may contest the legitimacy of the overall net zero trajectory. The island community can, and should, be part of the discussion on how to achieve a net zero outcome (Pacheco et al., 2022), with island governments providing resources and information to allow the community to better understand the net zero context. Islands such as Barra and Vatersay in the Scottish Outer Hebrides have developed or are developing community-based climate change plans in an attempt to keep the input of island residents at the forefront of their climate

change journey (Barra and Vatersay, 2018; Keep Scotland Beautiful, 2021).

Emerging from consultation, three key strategies should be considered in implementation. First, public resources will be required to fund net zero activities. Most countries will have put in place national public policies to decarbonize those socio-economic sectors that are responsible for greenhouse gas (GHG) emissions. However, especially in mainland jurisdictions, those funds may not be easily accessible or may not be targeted to island realities. To address this, it may be necessary to “island proof” existing national net zero funding (Sindico & Crook, 2021). This phase may

be less relevant for single-island SIDS, such as Jamaica, that are not politically fragmented among various islands, or for those islands that are not dependent on their metropole governments for funding. For islands with less public funding, climate finance becomes crucial to the implementation of their mitigation and net zero strategies.

Second, even on the wealthiest islands, public money alone is rarely enough to achieve a net zero outcome (Soomauroo et al., 2020). A second stream of revenue may be through public–private partnerships whereby public funding is combined with investment from the private sector (Mete et al., 2021). A concern with this form of funding is a potential lack of transparency. If island residents are not aware of their

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The Greek government is partnering with Volkswagen to convert the island of Astypalea to sustainable mobility. The first electric vehicles, including this first fully electric police car, were put into service in June 2021, and the first public and private charging points were also inaugurated. media.vw.com



governments' intentions regarding these partnerships, you may not get community buy-in. So long as the overall economic goal of the private side of the partnership is transparent and the island community accepts these goals, then public–private partnerships may be a feasible source of funding. Greece is home to two examples of such investments. The Greek government has partnered with the German automobile company Volkswagen on the island of Astypalea (Tugwell & Rauwald, 2021) and with the French auto company Citroën on the island of Halki (Randall, 2021) to develop e-mobility projects. By encouraging the use of electric vehicles, increasing the recharging infrastructure, and providing green electricity to the island, the goal is to make the two islands more sustainable and, in the long term, more prosperous.

Third, innovation that will contribute to net zero may come not only through public funding or public–private partnerships, but also through stand-alone private investments. Island-based small and medium enterprises, larger island-based companies, and foreign companies may see financial benefits in assisting in the implementation of island net zero initiatives. Well-developed investments with input and support from the island community can lead to islands taking the lead in climate change innovation.

Implementation in Scotland

This section will explore net zero implementation policies and approaches through the lens of Scottish islands. According to the 2011 census, 103,700 people lived across 93 inhabited islands in Scotland (National Records of Scotland, 2015). Islands in Scotland belong to six local authorities, three of which (Shetland, Orkney, and the Western Isles)



Neist Point is one of the most famous lighthouses in Scotland and can be found on the most westerly tip of Skye, near the township of Glendale.

are made up entirely of islands, while the other three (Highlands, Argyle and Bute, and North Ayrshire) consist of territory on the Scottish mainland in addition to their archipelagos.

One of the key policy characteristics of Scottish islands is that Scotland is one of the few countries with a dedicated piece of legislation centred on islands: the Islands (Scotland) Act 2018 (Scottish Government, 2018; Sindico & Crook, 2019, 2021). The latter stems from the Our Islands Our Future Strategy (Orkney Islands Council, Comhairle nan Eilean Siar, & Shetland Islands Council, 2014) led by the three island-only local authorities mentioned above. As a result of the Islands (Scotland) Act 2018, Scotland now has its first ever National Islands Plan, whose aim is to improve outcomes for island communities (Scottish Government, 2019b). The Act has also enshrined in law island community impact assessments aimed at ensuring that laws, policies, and strategies adopted by the government and local authorities duly consider potential significant impacts on island communities (Scottish Government, 2018, Part 3).

Returning to the discussion of net zero, for an implementation strategy to be successful, public, public-private, and private investment needs to focus on emission reduction projects in key sectors. In Scotland, these are: electricity (power generation); buildings; transport; industry; waste; Land Use, Land Use Change and Forestry (LULUCF); and agriculture (Scottish Government, 2021b). Decarbonizing each of these sectors presents complex technological and socio-economic challenges in any context. However, when framed within an island setting, such challenges can be heightened.

When it comes to power generation, and despite an abundance of energy sources on several islands, many islands are still heavily reliant on fossil fuel imports. With notable exceptions in places such as Orkney, several Scottish islands require diesel generators to produce local electricity (Bennett, 2020). Other islands around the world have been portrayed as successes in renewable energy promotion and electricity generation, including El Hierro in the Canary Islands (Iglesias & Carballo, 2011), and Samsø in Denmark (Jantzen et al., 2018). Eigg, a small island that is part of the Scottish Inner Hebrides, has generated worldwide attention for being almost energy independent through a careful mix of small-scale renewables, and for its community land ownership and energy planning (Chmiel & Bhattacharyya, 2015). Furthermore, as is the case with Fair Isle and Foula in the Shetland Islands, Eigg is an example of an island that is off the mainland electricity grid, thereby requiring innovation to adapt to a renewable energy world. In the future, key renewables and power

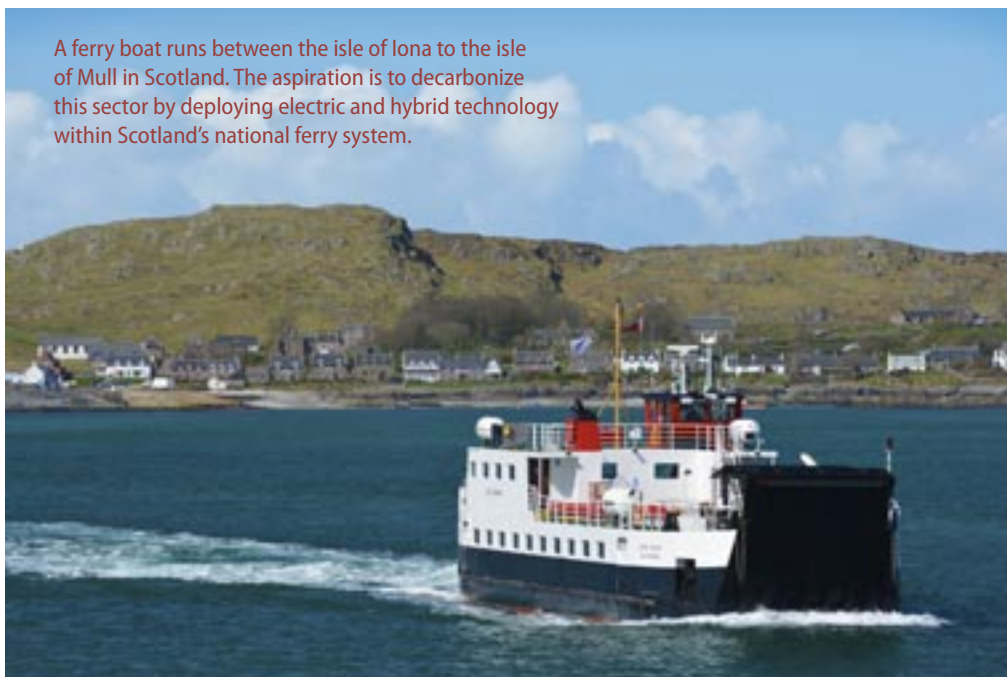
THE ISLANDS (SCOTLAND) ACT has enshrined in law island community impact assessments aimed at ensuring that laws, policies, and strategies adopted by the government and local authorities duly consider potential significant impacts on island communities.

generation challenges and opportunities will be dependent on technology (storage and hydrogen in particular), financing, and regulation.

Decarbonizing public and private buildings is a key component of any new net zero policy (Lorch, 2019). Public buildings, such as schools and hospitals, can have a very high carbon footprint and therefore require special attention. Private housing is also often energy inefficient, leading some island communities in Scotland to suffer from high levels of fuel poverty. The construction of new buildings on the Hebridean island of Mull (MacDonald, 2019) is an example of a community-led project that has decreased household energy costs, while collectively playing a positive role in mitigating climate change.

Transport-related emissions are a major source of greenhouse gas emissions worldwide (Yoro & Daramola, 2020). As noted earlier, on islands, transport is often seen as an essential sector, both for islanders seeking access to higher-order services not available on the island (e.g., health services) as well as to transfer tourists to and from the island. In Scotland, there are new initiatives related to the nature of air and sea transport infrastructure. This includes testing electric airplanes in Orkney (Keane, 2021) and a plan to decarbonize Highlands and Islands scheduled flights to net zero by 2040 (Highlands and Islands Airports Limited, n.d.). Ferry services have long been the main means of passenger and freight transport for many island communities in Scotland. Given the high energy intensity of ship transport, there are efforts focusing on improving efficiency of this mode of transport (Caledonian MacBrayne, 2021). In the longer term, the aspiration will be to decarbonize the sector by deploying electric and hybrid technology within the national ferry system. Although it is a lesser contributor to

A ferry boat runs between the isle of Iona to the isle of Mull in Scotland. The aspiration is to decarbonize this sector by deploying electric and hybrid technology within Scotland's national ferry system.



overall greenhouse gases, emissions from private road transport are also being considered in the implementation of a net zero policy. This is one of the sectors where the small scale of some islands may be advantageous in testing new technologies (McKenzie, 2021), as will be discussed later in this chapter. Additional examples of increases in the number of electric cars, development of car-sharing data bases, and e-vehicle charging stations can be seen on several Scottish islands in a move to decarbonising the private transport sector (Shetland Islands Council, n.d.).

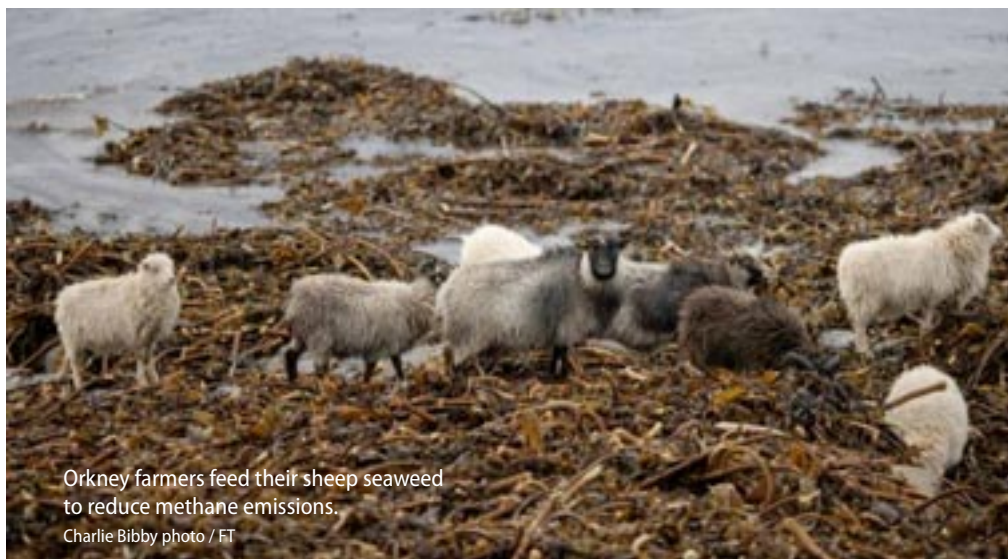
Industry will also need to reshape itself in a net zero world. In addition to those sectors that contribute directly to climate change, such as the oil and gas sector, any other industry (considered in a broad sense as activity leading to an economic output) will need to contribute to the net zero agenda while staying competitive. The rationale for engaging in these strategies goes beyond any legislative or policy requirement. Instead, it may be driven by consumers themselves who may not want to do business with climate unfriendly industries. In Scotland, two examples illustrate the net zero future facing businesses. In November 2021, the Shell oil company opted to not proceed with the development of a new oil field northwest of Shetland (BBC Scotland, 2021). It is too early to tell whether this signals the end of direct fossil fuel operations in Shetland and other Scottish islands. Another example relates to fish farming (particularly salmon) in Shetland. As the largest employer on the islands, their climate credentials will also be scrutinized by consumers and the public sector, encouraging them to become more efficient and climate friendly.

In addition to salmon farming, Shetland produces over 80 percent of Scotland's mussel harvest.

Aquasens photo



Agriculture is an often-neglected part of any net zero policy or strategy. Agriculture may not be a major sector on most Scottish islands, but it is important on some islands, in particular those that raise sheep that produce methane gases. Arran and Orkney have strong agriculture sectors and are in the process of developing good practices for farmers to contribute to a net zero world. For example, Orkney farmers are providing a winter diet of seaweed to their sheep in an effort to reduce methane emissions (Dupont, 2021).



Orkney farmers feed their sheep seaweed to reduce methane emissions.
Charlie Bibby photo / FT

The last net zero sector of relevance in Scotland is ‘Land Use, Land Use Change and Forestry’, or LULUCF. Most often associated with carbon offsets, including carbon sequestration, significant opportunities and challenges may exist on islands in this area. Scottish islands are home to vast quantities of peat that act as natural carbon sinks (Gewin, 2020). Peat is still used locally as a heating source, which releases carbon into the atmosphere. If it is to be replaced and kept in the ground, sequestration of peat bogs becomes a natural solution to climate change (NatureScot, 2015).

The implementation of net zero activities on Scottish islands will focus on the sectors mentioned above, tailored to the specific socio-economic and territorial conditions of each island. Overall, net zero is promoted across Scotland as a policy with an aim of reaching the target by 2045 (Scottish Government, 2019a). From an island perspective, mitigating climate change is a strategic objective of the National Islands Plan (Scottish Government, 2019b), which stems from the Islands (Scotland) Act 2018 (Scottish Government, 2018; Sindico & Crook, 2019). As part of the implementation of the National Islands Plan, the Scottish Government has established an Island Communities Fund, whose projects have (also) focused on and promoted net zero-related activities (Inspiring Scotland, 2021). As mentioned above, the Scottish Government

also launched the Carbon Neutral Islands project in 2021 to support up to six islands to become carbon neutral by 2040 (Scottish Government, 2021a).

A final observation that applies to both the climate accounting phase and the implementation of a net zero pathway relates to who carries out such activities. Ideally, both the emission baseline and the implementation of the net zero pathway would be driven by islanders. However, in many cases, island populations may lack the capacity or the human resources to carry out accounting and/or implementation. Therefore, a key priority for the Scottish islands, and SIDS in general, is to develop an internal capacity so that island net zero plans embody island priorities, knowledge, and experience.

Tracking the progress

Following the development of an emissions baseline and implementation of funding and strategy options, a net zero pathway needs to be monitored to ensure that progress is taking place. At this stage, two key observations need to be made: the timing of the monitoring, and the selection of those responsible for undertaking the monitoring. Timelines that are too distant may be meaningless. Net zero targets need to incorporate short-term deadlines for monitoring, reporting, and verification. It is crucial that governments and decision-makers investing in net zero policies incorporate periodic deadlines to ensure that incremental progress towards net zero targets is being met.

The second overall observation is about who will be undertaking the monitoring, reporting, and verification (MRV). If, for example, the same actor carries out all three activities, the net zero process may be perceived as being biased. Monitoring progress requires a new emissions baseline that can be compared to the one completed when the net zero pathway was first developed. If the emission baseline was developed by an independent consultant, it may be advisable to have the same organization monitor the MRV process. In order to take advantage of the information and capacity already developed in the initial development of the baseline, this same recommendation would apply regardless of who carried it out (e.g., island government, non-governmental organization).

Reporting requires a formal procedural activity aimed at informing the government about the emission reductions, carried out in a specific timeframe in the context of the implementation of the net zero goal. Where the organization tasked with monitoring the emissions also has the capacity needed to undertake the reporting, it may be wise to combine these closely linked activities. Verifying requires an additional control and those tasked with this third activity will need to scrutinize the initial emissions baseline and the progress made as demonstrated in the monitoring and framed by the government in the reporting. Although it may appear to be a duplication of effort, for the process to be considered credible it is important that verification is carried out by an

independent organization different from that which carried out the monitoring and reporting. However, this would require more funding and, at least in the public sector, verification is rarely a high priority. Most SIDS do not have sufficient resources to undertake all of these activities, so they may legitimately decide to focus their budget on projects and initiatives aimed at emissions reduction rather than the more costly verification process. Verification appears to be more important in the private sector where consumers may not be content with assurances from private sector companies regarding monitoring and reporting on their own operations.

In conclusion, an island net zero pathway includes three key phases: the development of an emissions baseline; the implementation of the pathway itself that can be framed around three different but complementary funding streams (public, public-private, and private); and the monitoring, reporting, and verification of the net zero process. A further question, which the chapter now turns to, is the extent to which island-based net zero pathways may serve as templates for other mainland jurisdictions.

Islands as hubs of innovation for mainland climate policies

Some research has raised concerns over projects focusing on climate change that gives islands an eco-status label. This “conspicuous sustainability” occurs “when a community or organisation undertakes an initiative that gains much of its value from its

visibility, iconicity and symbolism (rather than from the environmental benefits it produces)” (Grydehøj & Kelman, 2017, p. 107). Conspicuous sustainability could also allegedly divert attention from more pressing policy matters (Baldacchino & Kelman, 2014) or issues more crucial for the livelihood of those in island communities (Robertson, 2018). This chapter acknowledges that ill-developed net zero island policies may lead to conspicuous sustainability, but it also contends that this is not necessarily the case. As noted

NET ZERO POLICIES THAT emerge as a result of bottom-up community engagement can generate co-benefits that go beyond environmental and climate change objectives.

earlier, net zero policies that emerge as a result of bottom-up community engagement can generate co-benefits that go beyond environmental and climate change objectives (Attard et al., 2021; Robertson, 2018). It is here that the concept and policies related to a just transition away from fossil fuel dependency become important to ensure that such socio-economic benefits are at the heart of net zero policies (Wang & Lo, 2021), preventing them from being perceived as a form of conspicuous sustainability.

Against this background, to what extent can the implementation of island net zero policies lead to good practices applicable to mainland jurisdictions? Leaving aside the complexity of what may be meant by ‘mainland’, and the differences between islands (e.g., SIDS, dependent islands, and SNIJs) (Petzold & Magnan, 2019), what may be

transferable from island to mainland contexts? The field of renewable energy provides an initial answer (Skjølsvold et al., 2020). The small scale, physical separation, and, in some cases, isolation of some islands provides an opportunity for them to be considered as laboratories for innovation (Gugganig & Klimburg-Witjes, 2021; Harrison & Popke, 2018; Lee et al., 2020). The clear territorial boundaries offer the possibility of deploying smart solutions that can test the feasibility of moving to a 100% renewable energy system (Soomauroo et al., 2020). Islands have also been seen as pilots for innovation in the transport sector, with e-mobility schemes being deployed and considered on many islands due to their small size, limited resources, and isolated locations (Soomauroo et al., 2020). However, while small scale can be beneficial to test a technology in the context of a pilot, it may present a challenge and a limitation to investment due to the possible lack of a sustainable financial return.

Taking the discourse back to Scotland, good practices in the renewable energy and transport domain of a net zero policy implementation landscape can be relevant for mainland Scottish regions for two reasons. First, some rural mainland areas are also isolated and still have access to natural resources. In particular, the livelihoods and cultures of coastal communities may be very similar to that which exists on small islands. In such cases, the island net zero rationale that includes factors beyond the environment and climate change can also apply to rural or coastal isolated mainland regions. These areas may also seek to become more energy independent by making greater use of renewables. Lessons learned in the development of renewables on islands can, hence, be of interest to decision-makers and communities on the mainland.

Second, islands in Scotland can become testbeds for innovation not only in the energy field, but also in transport and other net zero sectors. Although the characteristics on the Scottish mainland will often differ, good practices developed on islands can be beneficial, as lessons will spill over not only to rural areas, but also to the mainland more generally. One caveat and word of caution on this dynamic, however, comes from islanders themselves who may not want to be seen as ‘laboratories’ where mainland governments can test innovative but also sometimes controversial technologies for the benefit of the mainland. These pilots and laboratories need to have the necessary community support and be seen to benefit island communities in the first place.

Overall, it is important to clarify that the extent to which island net zero policy implementation can benefit the mainland will depend on a case-by-case basis and on the kind of mainland that is being considered. Furthermore, good practices such as the ones stemming from Iceland’s renewable energy story, which relate to matters of regulation, funding, and public participation, may have more to do with governance than to the island nature of Iceland (Logadóttir, n.d.).

CONCLUSIONS

Islands are often considered particularly vulnerable to the effects of climate change. Despite such vulnerabilities and the minimal role they play in contributing to climate change, islands have a strategic interest in developing ambitious climate change mitigation actions and policies. It is against this background that this chapter has analyzed islands' climate change policies and their 'net zero' pathways.

Four key conclusions can be drawn. First, islands, and SIDS in particular, have island-specific reasons for developing and implementing ambitious climate change targets, which go beyond the foundational environmental and climate change objectives. After all, on some small islands, sea level rise and extreme weather events are existential threats to the livelihood and lives of islanders. Second, despite the strategic importance of net zero targets for islands, the interest expressed by SIDS in the implementation of the Paris Agreement lies mainly in adaptation, climate finance, and loss and damage, with effective and increased climate finance being crucial to the success of any SIDS net zero policy in the future. Third, island net zero policy pathways require attention to three phases: the development of an emission baseline, a community informed (or led) net zero strategy or plan, and funding from three sources (public, public-private, and private) capable of investing in key sectors of the island economy and society. Fourth, net zero island best practices cannot necessarily be automatically replicated in mainland regions. However, especially in the fields of renewables and road transport, the small scale and relative isolation of some islands can lend themselves to serve as hubs of innovation from which practical experience can be shared with and adapted to mainland regions that may have similar socio-economic and geographic characteristics.

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