Executive Summary

Introduction

This executive summary is a supplement to the project report, "Community Resilience in Rural Aberdeenshire in the Face of Severe Weather and Climate Change" by Meredith DiIoia at the University of Aberdeen. This report was in partnership with Vattenfall Unlock our Future Fund and Foundation Scotland.

Overview of Executive Summary

This research project was about community resilience in rural Aberdeenshire, Scotland, especially concerning severe weather, climate change, and energy systems. The aim was to understand what the current and future of community resilience looks like in Aberdeenshire in relation to internal and external forces.

Key Objectives

1. Identify the characteristics of smaller, rural communities in Aberdeenshire and consider how these characteristics influence resilience to the impacts of climate change, severe weather, and disruption to energy systems.
2. Compare the characteristics of rural communities with the characteristics of larger urban areas.
3. Identify opportunities, key players, capacity, and assets for improving community resilience related to climate, weather, and energy systems.

Key Findings

Major findings included that rural communities' isolation and smaller size created better opportunities to initiate resilience plans and practices compared to urban areas where nearby emergency services and fewer impacts from severe weather reduced the need for community resilience in that sense. However, urban areas seemed to be lacking a general sense of community and community members and local authorities both noted strained relationships between each other which requires strengthening for increased resilience. Opportunities identified for improving community resilience are communities engaging with one another to learn from each other and get assistance from communities with more experience in building resilience. Also, communities need more support to increase their technical knowledge around resilience and support to help individuals increase their resilience.

Themes From Literature

Climate Change and Sustainability Transitions

Climate change is forcing communities to make drastic transformations to adapt, and sustainability transitions help shape these transformations in a way that is just, holistic, and lasting. Storms like the extratropical cyclone, Storm Arwen, which kickstarted the need for research on community resilience in rural Aberdeenshire will continue to threaten the energy systems that so many rely on (Shaw et al., 2016). Sustainability transitions objectives include focusing on the current systems and sectors in place that contribute to the challenges being faced and proposing alternative paths and adaptations to those systems that are more sustainable and just (Markard et al., 2012). As shown by the Sustainable Development Goals, sustainability transitions address multiple levels of society and by justly transitioning economic, social, and environmental aspects of society it creates a more resilient society (Schilling et al., 2018).

Community Resilience

To make energy systems sustainable, and recover from extreme weather, requires community resilience. There are varying definitions of community resilience, but most research brings in economic, social, and ecological aspects of community resilience (Adger, 2000; Mackinnon and Derickson, 2013; Wilson, 2012). Wilson (2012) defines community resilience as the development and engagement of community resources to flourish in an unpredictable environment. Adger (2000) mentions that social resilience demonstrates a community's ability to withstand pressure on its social infrastructure. LeDuc (2006) points out the need for an immediate response but also the restoration of the affected community through activities and programs that were previously developed, and mitigation measures.

Recent storms in Scotland and Aberdeenshire

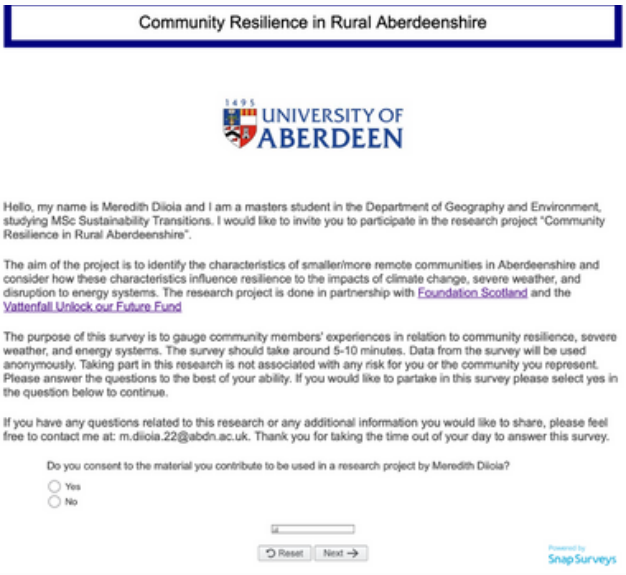
Storm Arwen, the storm that prompted discussions about community resilience in Aberdeenshire, had extreme damages that included more than 100,000 homes losing power for multiple days and even weeks (Met Office, 2021). Other storms since Storm Arwen that have had large impacts as well include Storm Malik, Storm Corrie, and Storm Otto. Storm Malik and Storm Corrie in 2022, had wind gusts up to 92mph, and falling trees from these storms led to power outages for tens of thousands of homes and several schools had to close (Met Office, 2022). Storm Otto in 2023, caused overnight power outages and fallen trees which blocked roads (Met Office, 2023). There was also damage to buildings and over 100 schools were closed in Aberdeenshire (Met Office, 2023). All of these storms, and other severe weather conditions like flooding, heat waves, droughts, and snow have caused damages that have put pressure on Aberdeenshire's resilience.

Methodology

Community resilience in Aberdeenshire contains a variety of research opportunities that need to be developed to create a holistic report. There is primary data and secondary data like first-hand experiences and general town characteristics. At the beginning of the research design, the key data collection methods were established as interviews and surveys for primary data. A literature review and collection of secondary data supplement the process by adding previous data and publications to provide context and help justify primary data.

Survey Data

The study area for the surveys was rural and urban communities in Aberdeenshire. The main goal of the survey was to make sure that data was collected from individual community members, not just the key stakeholders who were interviewed. In total, there were 101 responses between both surveys with 62 rural responses, 15 small-town responses, and 24 urban responses. Survey questions were designed around the project objectives and centred around questions like how community members defined community resilience, how community members experienced impacts of severe weather and what type, and who community members saw as responsible for resilience planning and recovering from severe weather.


Community Resilience in Rural Aberdeenshire

UNIVERSITY OF ABERDEEN

Hello, my name is Meredith Dilola and I am a masters student in the Department of Geography and Environment, studying MSc Sustainability Transitions. I would like to invite you to participate in the research project "Community Resilience in Rural Aberdeenshire".

The aim of the project is to identify the characteristics of smaller/more remote communities in Aberdeenshire and consider how these characteristics influence resilience to the impacts of climate change, severe weather, and disruption to energy systems. The research project is done in partnership with Foundation Scotland and the Vattenfall Unlock our Future Fund

The purpose of this survey is to gauge community members' experiences in relation to community resilience, severe weather, and energy systems. The survey should take around 5-10 minutes. Data from the survey will be used anonymously. Taking part in this research is not associated with any risk for you or the community you represent. Please answer the questions to the best of your ability. If you would like to partake in this survey please select yes in the question below to continue.

If you have any questions related to this research or any additional information you would like to share, please feel free to contact me at: m.dilola.22@abdn.ac.uk. Thank you for taking the time out of your day to answer this survey.

Do you consent to the material you contribute to be used in a research project by Meredith Dilola?

Yes
No

Reset Next

Powered by Snap Surveys


How do you define your community?

Geographically
Socially
Both
Other

Have you heard of the term of "**community resilience**" before?

Yes
No

How often does your community/area have severe weather? (Severe = has the potential to cause damage, serious social disruption, or loss of human life)

Never Rarely Sometimes Often Always

How often do you find severe weather events impact your access to energy/electricity?

Never Rarely Sometimes Often Always

Have you noticed an increase in severity and/or frequency of severe weather events in your area over the last 10 years?

Yes
No

In your opinion, who should provide infrastructure, funding, and development in terms of planning for severe weather events? (Please select all that apply)

Local Governments (Community Level)
Aberdeenshire Council
National Government
Emergency Services (police, ambulance, and fire)
Community Groups
Road works
NGOs from other communities/or outside of your community
Utilities Services
Power Companies
Other

Back Reset Next

The survey was created through Snap Surveys and included multiple forms of questions, including multiple-choice, open-ended, rating, and a Likert scale. The survey had an introduction that explained how data would be used and got consent from respondents, as per ethical requirements. After both surveys were closed, the data was uploaded onto Excel for analysis. Pivot Tables were created from each sheet to represent each question.

Secondary Data

The secondary data used for research was collected from a variety of sources and in diverse formats. The data ranged from reports, raw data, and video recordings.

Interview Data

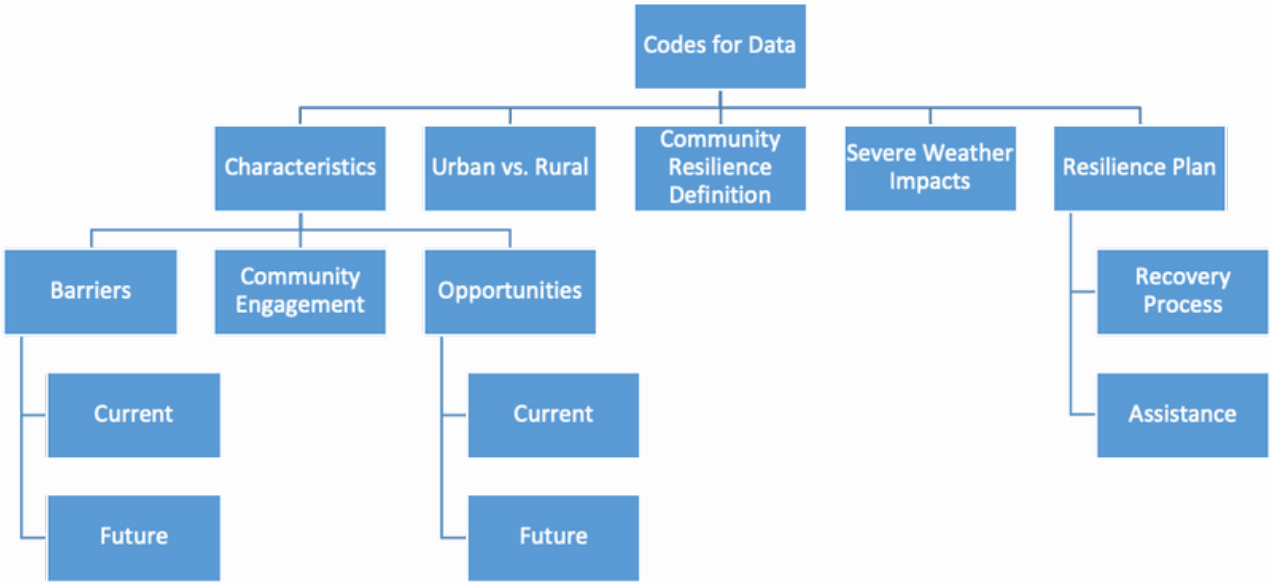
The focus area of the qualitative approach was interviews both in Aberdeenshire and Aberdeen. Both were included to get data from both rural and urban perspectives. The qualifying criteria for the interviewees were that each interviewee must have a position in each stakeholder group and have some experience with community resilience. 21 interviews took place, and the Interview Identification Table on the next page shows which stakeholder group each interview falls under. When it came to interviewees who discussed technical or academic topics regularly, the ten main questions remained the same except for the location distinction changing from rural to urban when necessary. However, when interviewing community groups, the questions were edited to relate more to the specific work that the groups were doing without sacrificing the integrity of the original questions.

Outline Interview Questions

1. What impacts of climate change, if any, do you see in your community/remote communities of Aberdeenshire?
2. What impacts has severe weather and disruption to energy systems had on your community/remote communities in Aberdeenshire?
    a. Who helped and who didn't in this instance? What more could have been done?
    b. What differences have you seen between the experiences and responses in smaller and larger communities?
3. How do you/your community group define community resilience?
4. How often do you/your community group discuss/address sustainability and climate change concerns?
    a. Are there any local strategies/policies/plans in place at the local level to address these concerns?
5. Is there a need for physical and social adaptations within remote communities to adjust to climate change?
6. What factors influence your community's/rural communities' resilience and what factors hinder its development?
7. What are the main differences between rural communities and larger urban communities in Aberdeen/Aberdeenshire?
    a. What impact do these differences have on groups' abilities to improve community resilience?
8. What are your future concerns about community resilience in rural Aberdeenshire, especially in relation to severe weather and energy systems?
9. What future opportunities do you see for improving community resilience related to climate, weather, and energy systems?
10. What would help make it more feasible to improve community resilience?

Interview Identification Table	
Interview Group	**Identification Number**
Rural Community Groups	Interviewee #1 Interviewee #2 Interviewee #3 Interviewee #4 Interviewee #5
Urban Community Group	Interviewee #6 Interviewee #7 Interviewee #8 Interviewee #9 Interviewee #10
Rural Local Authorities	Interviewee #11 Interviewee #12
Urban Local Authorities	Interviewee #13 Interviewee #14 Interviewee #15 Interviewee #16
Non-governmental Organisations	Interviewee #17 Interviewee #18
Academic	Interviewee #19 Interviewee #20
Service Provider	Interviewee #21

Interview data was collected after transcription and anonymised. Coding was used in NVivo software. The codes were based on the objectives and the aim of the project. From the codes, key concepts and words were identified based on either being mentioned repeatedly across interviews, or concepts and words that were also discussed in the secondary data. This figure shows the codes that were used and from these codes, data was split into rural and urban data.



Limitations and Delimitations

Time constraint was a limitation during the research because of how expansive Aberdeenshire is, and how many different characteristics there were to explore about each community. Continually, how extensive, and complex resilience and recovery was difficult to convey in just a few months. The main delimitation was a limited scope because as previously stated, resilience and communities can encompass many different variables. These different variables can include social, economic, environmental, external, and internal variables all of which influence a community and individual's ability to be resilient. However, it was important to focus on severe weather impacts and only an overview of the above-mentioned variables rather than a possible in-depth analysis which each could have.

Research Findings

The next sections discuss the different characteristics identified by interviewees, survey findings, and secondary sources, split into three different sizes of communities: urban, small-town, and rural. The last section looks at how interviewees and survey respondents understand the current resilience plans and recovery processes, and assistance that they have identified they need to grow in resilience and recovery.

Urban Communities

Characteristics

One major characteristic of urban communities that came up was tension around community engagement.

Community engagement

- "It's browbeaten, morale is low. It's a collective consciousness. It is not as engaged as it might be. There are smart people,, hardworking people, but there's a lot of people who... they've got children to look after, they've got rent to pay, and they haven't got time." (Interviewee #9)

- "Money, education, and the ability to influence the network really helps. I also think that the some of those very articulate enable communities to draw some energy away from other communities...I think there's a little bit of institutional apathy around some of these areas that hinders their opportunities to develop resilience." (Interviewee #15)

Severe weather impacts

Urban community survey respondents were asked how often they experience severe weather. Respondents were also asked how severe weather impacts their access to energy.

How often does your community/area have severe weather?	Total
Never	3
Often	1
Rarely	9
Sometimes	11
How often do you find severe weather events impact your access to energy?	**Total**
Never	4
Rarely	15
Sometimes	4

When ranking key impacts from severe weather, urban respondents ranked flooding as the highest and water supply issues as the lowest, as seen on the next page.

Type of impact	Mean ranking (1 = highest impact)
Floodings	2.33
Energy/power outages	2.88
Damage to the physical environment (ex. fallen trees, land/mud slides, and crop/cultivation damage)	2.64
Roads being blocked	2.66
Damage to infrastructure/building/housing	2.75
Droughts	4
Water supply outages	4.33
Other	Not selected

Barriers

Current barriers in Aberdeen that were identified by interviewees included concerns like pollution from large industry areas, budget cuts to councils, and relationships between councils and communities.

Pollution

- "The air quality issue is not specific to my area...people are always saying there are a lot of particles and things." (Interviewee #6)

Budget cuts

- "It's incredibly challenging because councils' budgets are being cut constantly and I there is a lot of money given to climate change projects. But it doesn't identify the link to resilience and community resilience, and then therefore develop funding that could maybe go back into things like maintenance." (Interviewee #13)

Relationship between councils and communities

- "I mean, our relationship with the council can be hit and miss depending which department, while some departments are quick to respond to you on certain issues that you have, or certain questions that you have. Others completely ignore you. It's like, you ask a question and you can immediately hear the drawbridge coming up. You know, we don't want that. We're not here to attack or we're here to challenge if we need to challenge in a diplomatic manner." (Interviewee #8)

When discussing future barriers, interviewees' concerns included the fiscal impacts of the private sector declining in Aberdeen, reliance on an electric energy system, and maintaining a strong community spirit.

Community spirit

- "[Our community] is dogged by inequality, economic inequality, health inequality. I don't see how that blow coming after so many other blows can be tolerated." (Interviewee #7)

Electricity dependency

- "What doesn't worry me is that we're changing our system. It's how we're changing our systems. We're basically going to have one system. It's all going to be electric." (Interviewee #15)

Decline of private sector

- "So, what would have been fisically for us if we had a big decline in the private sector when we're such a small public sector, I think that's going to be probably the biggest element in my worries." (Interviewee #16)

Opportunities

A couple of interviewees mentioned current opportunities they see in Aberdeen for their community groups. For example, Interviewee #6 talks about saving energy with sustainable adjustments to the community hall while reducing their environmental impact, “So, we were trying to save energy and that has certainly helped, and it’s reduced our bills and it’s obviously reduced the amount of carbon and all the rest that we produce as a community hall”. There are also a few future opportunities identified by Interviewee #15.

"...get [people] involved in articulating the changes that they want to see and getting involved in the decision-making precesses and in the governance."

"I think we need a complete transformation in our other areas, but also our energy systems need to adapt as well...To build an energy system for the future that helps us to deliver the mitigation that we have to."

"...collaborating together, providing opportunities for communities to really have a say...and once they start doing that, it just kind of grows from there...people feel that they have something legitimate to say, and they have an opportunitiy and a place for it to be heard and for it to make a difference."

Small-town Communities

Severe weather impacts

Small-town respondents were also asked about how often they experienced severe weather. The majority stated they sometimes had severe weather, with ten respondents, three said rarely, and never and often had one each.

How often does your community/area have severe weather?	Total
Never	1
Often	1
Rarely	3
Sometimes	10
How often do you find severe weather events impact your access to energy?	**Total**
Never	2
Rarely	10
Sometimes	3

The key impacts for severe weather that were identified by small-town respondents were energy/power outages being ranked with the highest impact, and damage to infrastructure being ranked the lowest, as shown in the table on the next page.

Type of impact	Mean ranking (1 = highest impact)
Energy/power outages	1
Roads being blocked	2.5
Floodings	3
Damage to the physical environment (ex. fallen trees, land/mud slides, and crop/cultivation damage)	3.5
Damage to infrastructure/building/housing	4.3
Water supply outages	Not selected
Droughts	Not selected
Other	Not selected

When small-town respondents were given the opportunity to write examples of severe weather impacts nearly all that chose to do so discussed Storm Arwen. They also listed other storms like Storm Frank, Storm Otto, and Storm Corrie. They also mentioned flooding from rivers near their towns, like River Ythan. One respondent mentioned specific impacts like electric and communication blackouts. Another respondent mentioned damage to the physical environment like high winds damaging nature reserves and National Trust properties.

Urban and Rural Communities

Takeaways

Rural and urban interviewees were asked about the differences and similarities between urban and rural communities, especially when it came to community resilience. A common trend across responses was that rural communities are more resilient than urban communities. Reasons that came up often for this were the size and location of rural communities made it easier and rural communities must be more resilient, because of both more severe impacts and less access to resources and help in emergencies, as shown by the interview quotes on the this, and the next page.

Community engagement

- "It's browbeaten, morale is low. It's a collective consciousness. It is not as engaged as it might be. There are smart people,, hardworking people, but there's a lot of people who... they've got children to look after, they've got rent to pay, and they haven't got time." (Interviewee #9)

- "Money, education, and the ability to influence the network really helps. I also think that the some of those very articulate enable communities to draw some energy away from other communities...I think there's a little bit of institutional apathy around some of these areas that hinders their opportunities to develop resilience." (Interviewee #15)

Another element that was looked at was other possible barriers that both urban and rural areas face across different social issues. According to the Scottish Index of Multiple Deprivation (SIMD) 2020, Aberdeen City was one of the areas with the largest increase in deprivation (Scottish Government, 2020). Aberdeenshire in the SIMD 2020 had no data zones ranked within the 5% of most deprived areas but had nine data zones within 20% of most deprived areas (Aberdeenshire Council, 2020).

Rural size and location

- "It's really difficult to get community resilience groups together in a city environment because they don't have that natural community." (Interviewee #13)
- "...you've got Aberdeen as one big community and you can break it down into smaller communities. But I think if you compare that to rural communities which are very distinct, clearly isolated, much more self-sufficient on the whole just because of the nature of where they are and the less services they get." (Interviewee #15)
- "I think that you just accept that, you know any of those services just take time to get to you, you want an ambulance or a fire brigade, it's going to take longer to get here...and more worrying is the fact we are on the end of the line for electricity and telephone lines." (Interviewee #5)

Rural Communities

Characteristics

According to the 2022/23 Aberdeenshire Strategic Assessment, on average Aberdeenshire residents are more likely to be economically employed and economically active (Birnie and Watson, 2022). However, with the 'cost-of-living crisis', the impacts of an ageing population, and reduced resources combined with an increase in demand pose possible challenges for the area (Birnie and Watson, 2022). When discussing community engagement in rural communities, interviewees pointed out that rural communities are willing to help one another including within the community but also across communities, however, some people within communities are not willing to or do not have the time to engage.

Engagement opportunities

- "Lots of groups are understanding that they have to work together within the communities to adapt, to be resilient, to be ready for anything." (Interviewee #20)
- "Lots of different groups of people have helped us either financially or by support." (Interviewee #2)
- "Some of them have got a really strong sense of community identity and it's really easy [to work together]...we're not trying to form groups where groups don't want to be formed. I think that's continued engagement." (Interviewee #12).

Engagement barriers

- "Consistently across communities and any kind of big community project is often a few very engaged and key people who have kind of identified the need for this project and have dedicated themselves to it." (Interviewee #18)
- "I think if you are in that situation where you don't have so much community support. It is really hard...you've got ten people who are kind of desperately trying to move the commubnity forward and that is a real struggle." (Interviewee #5)
- "There are instances where long-term disagreements or a few issues between communities can come at the expense of working towards the common goal of keeping people fed, healthy, and warm." (Interviewee #17)

Severe weather impacts

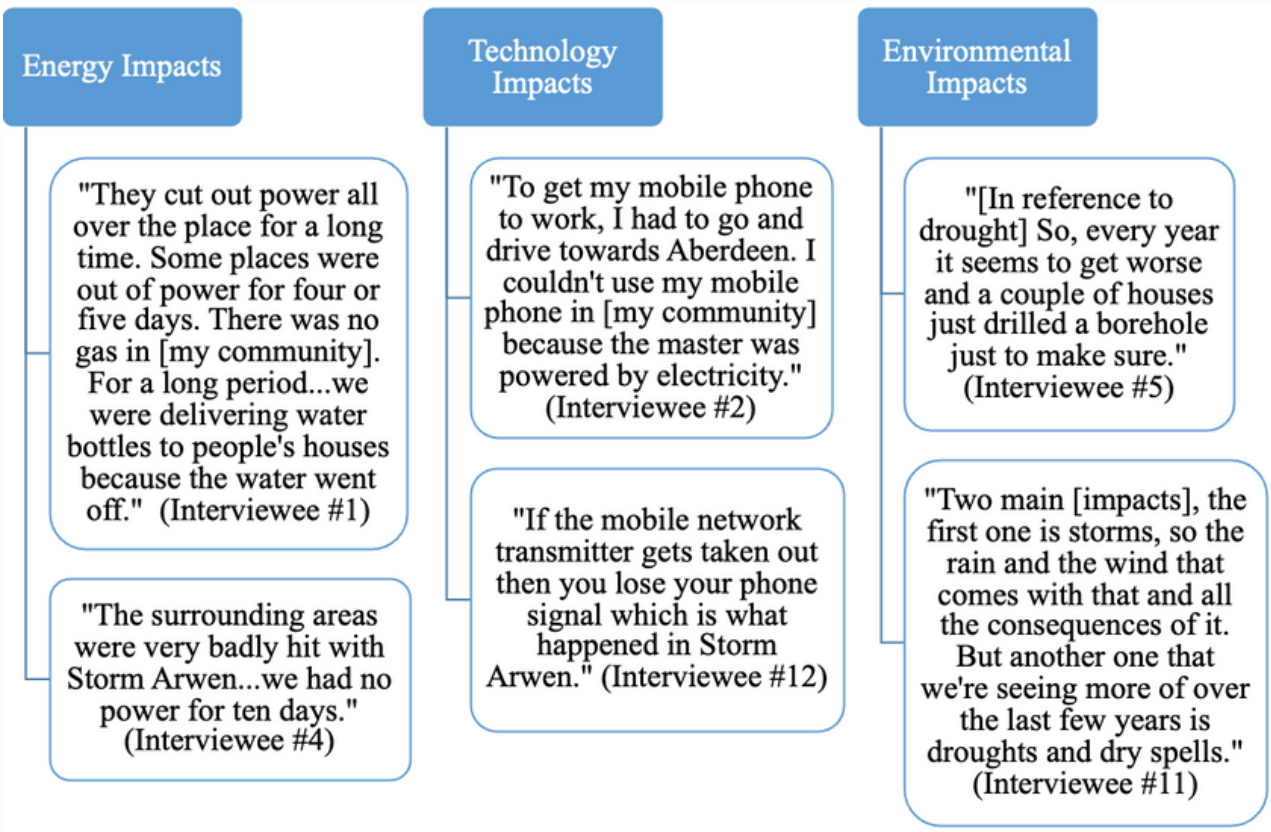
A little over half of the rural respondents stated they sometimes experience severe weather at thirty-four responses, with the second highest being they often have severe weather at fifteen responses. Thirty-two rural survey respondents also indicated that severe weather sometimes impacts their access to energy or electricity, while both often and rarely had thirteen responses respectively, and always had four. No respondent selected that severe weather has never impacted their access to energy or electricity, as indicated in the table on the next page.

How often does your community/area have severe weather?	Total
Always	3
Never	1
Often	15
Rarely	8
Sometimes	34
(blank)	1
How often do you find severe weather events impact your access to energy?	**Total**
Always	4
Often	13
Rarely	13
Sometimes	32

The overall severe weather impacts on their community were energy/power outages which was ranked the highest, and droughts which were ranked the lowest.

Type of impact	Mean ranking (1 = highest impact)
Energy/power outages	1.35
Floodings	2.88
Damage to the physical environment (ex. fallen trees, land/mud slides, and crop/cultivation damage)	3.29
Roads being blocked	3.55
Damage to infrastructure/building/housing	3.77
Water supply outages	3.77
Droughts	6
Other (1 respondent/ranked 5th)	Telephone lines

Rural respondents were also given the opportunity to write examples of severe weather impacts and like previous respondent groups, they mentioned Storm Arwen, Corrie, Malik, Frank, and Barra. Many rural respondents also listed power, water, and communication outages. They also mentioned high winds, flooding, droughts, being snowed in, and intense rain. The severe weather impacts that the rural respondents discussed are similar to the ones that were brought up by rural interviewees, shown on the next page.



Barriers

Future barriers that were identified in interviews were long-term planning and an ageing population.

Aging population

- "[I am worried] about not enough people under the age of 60 coming forward to help with things." (Interviewee #3)
- "[Talking about a decline in children at local school] You want to say, well, these houses actually are reserved for young families, but you can't do that. So it's a worry." (Interviewee #5)

Long-term planning

- "One of the things I found with communities and extreme weather events is they have very short- term memories...[for example] come winter [community members] will forget they lost their water this summer, you forgot about it." (Interviewee #11)
- "We have been reassured that those long-term plans are in place, but I think we're not quite sure how robust those are, or how quickly they are being embedded within regulations, rules, and planning because that is vital." (Interviewee #17)

According to rural interviews, three main barriers that rural communities in Aberdeenshire face include top-down government, cost of energy, social issues, and lack of resources and technical resilience knowledge.

Top-down government

- "[Talking about landlines going away]You know it's out of our hands with that the phone network is going. That's a decision made at the UK government level." (Interviewee #12)

Cost of energy

- "[Community off-grid energy] The opportunity is largely gone. Post feed-in-tariff system and Westminster's ban on onshore energy has completely screwed that possibility." (Interviewee #20)

Resources and technical knowledge

- "The kind of knowledge and understanding is an initial barrier, but there are resources and organisations out there that would support groups like that, which would be in terms of rethinking energy resilience as people's housing and energy costs." (Interviewee #18)
- "Working our way through the council's legal system...and get the lease approved and it had to go back and forth, and we had to engage with solicitors and then get our own solitics to get involved...which all costs money." (Interviewee #4)

Social issues

- "But when electric costs go up so much, you have to then think how much it costs to burn oil." (Interviewee #2)
- "So, I think while climate change if on people's minds, I don't think it's the first thing that people think about. I do think it's more like lifestyle, finance, and jobs…It's really more about survival." (Interviewee #1)

Opportunities

Current opportunities that rural interviewees discussed were community growth and building resilience.

Resilience in relation to community growth

- "Communities tend to be looking at facilities-based project where they're wanting to make a community building run more sustianably, and maybe they can expand that to a few other buildings." (Interviewee #18)
- "[Talking about priorities] A town centre regeneration obviously being number one." (Interviewee #1)

Interviewees were also asked about what future opportunities they identified were alternative communication methods when technology is impacted by severe weather and backup storage for power during outages and energy production.

Alternative communication methods

- "[Radio stations] started to broadcast bulletins, [that] there will be an update on the arrangements in Aberdeenshire and so on. I think the message got across." (Interviewee #12)

Energy alternatives

- "...how we could do that in terms of moving away from diesel generation...and moving towards solar and battery power generator to try and back-up power supplies." (Interviewee #21)
- "I think we try and make sue we have a secure electricity supply. But you know that just causes other griefs." (Interviewee #5)

Resilience Plan

Current resilience plans

First, survey respondents were asked how prepared they felt their community was to withstand severe weather and its impact on energy systems. Urban survey respondents mainly felt sometimes prepared. Most small-town respondents selected rarely prepared, with sometimes prepared being a close second. Most rural respondents stated somewhat prepared, with prepared being second.

Urban responses	
Not Prepared	5
Prepared	5
Rarely	1
Sometimes	11
Very Prepared	1
(blank)	1
Small-town responses	
Not Prepared	2
Prepared	2
Rarely	6
Sometimes	5
Very Prepared	0
Rural responses	
Not Prepared	11
Prepared	13
Rarely	11
Sometimes	23
Very Prepared	4

When looking at current resilience planning in Aberdeenshire and Aberdeen, across all survey respondents the national government was ranked number one as the stakeholder most responsible for resilience planning. Resilience planning included providing infrastructure, funding, and development in terms of planning for severe weather events. Common themes across all the areas are councils being near the top of most responsible and community groups, NGOs, and road works being near the bottom as the least responsible. Interviewees were also asked about resilience planning. Urban interviewees brought up planning for warm spaces in the winter during the cold and increased cost of living "[our community hall] is a popular spot in the winter for community members to gather for warmth" (Interviewee #6) and "[we created] warm rooms and spaces and all that kind of thing to do with cost of living and fuel crises" (Interviewee #19). Rural interviewees stated the importance of building up individuals first, and then the community. Another interviewee also discussed the concern about spending too much money on items that would be used unpredictably, "So it's a lot of money being spent on these generators are going to sit in the back of hall without doing very much…" (Interviewee #5).

Survey respondents were also asked what resources their community currently has that they are aware of for withstanding severe weather impacts.

Urban ranking	
Resources communities have for severe weather and impacts	**Mean ranking from most effective to least effective** (1 = most effective)
Economic security to recover from damages	2
Nearby emergency services that can arrive within a reasonable time	2.5
Community halls/other community spaces	2.5
Strong volunteer base	2.5
Back up energy sources (ex. off-grid energy)	3
Community First Responders	3.66
Accessible transportation	4.66
Community Emergency Plan	5.66
Communication options if normal communications are disrupted	7
Other	Not selected
Small-town ranking	
Resources communities have for severe weather and impacts	**Mean ranking from most effective to least effective** (1 = most effective)
Nearby emergency services that can arrive within a reasonable time	1.5
Community Emergency Plan	2.5
Community First Responders	2.5
Strong volunteer base	2.5
Community halls/other community spaces	2.8
Back up energy sources (ex. off-grid energy)	3
Accessible transportation	Not selected
Communication options if normal communications are disrupted	Not selected
Economic security to recover from damages	Not selected
Other	Not selected
Rural ranking	
Resources communities have for severe weather and impacts	**Mean ranking from most effective to least effective** (1 = most effective)
Strong volunteer base	1.79
Community halls/other community spaces	2.21
Community Emergency Plan	2.21
Nearby emergency services that can arrive within a reasonable time	2.71
Community First Responders	2.8
Back up energy sources (ex. off-grid energy)	2.82
Accessible transportation	4
Communication options if normal communications are disrupted	4.14
Economic security to recover from damages	Not selected
Other (1 respondent/did not rank)	Power company provides mobile support service and contacts, I am not aware of or connected with any other support
Other (1 respondent/did not rank)	Landowners and contractors have significant resources: staff, chainsaws, lifting equipment, VHF radios, pumps, etc
Other (1 respondent/did not rank)	None, as we are a disperse community there is nothing

Recovery process

Survey respondents ranked what stakeholders were responsible for assisting in the recovery process. As seen in the table all the respondents had an almost identical top five, but the order was slightly varied. Interviewees talked about the importance of communication and preparation and how willing community members were to help each other during the recovery process.

Urban ranking	
Stakeholders who should be responsible for assisting in the recovery process	**Mean ranking in order of responsibility** (1 = most responsible)
Aberdeen City Council	1.66
National Government	2.64
Local Governments (Community Level)	2.75
Emergency Services (police, ambulance, and fire)	3.63
Power Companies	3.88
Community Groups	4.2
Utilities Services	4.66
NGOs from other communities/or outside of your community	5
Road works	6.2
Other	Not selected
Small-town ranking	
Stakeholders who should be responsible for assisting in the recovery process	**Mean ranking in order of responsibility** (1 = most responsible)
Aberdeenshire Council	1.66
National Government	2.25
Emergency Services (police, ambulance, and fire)	3
Local Governments (Community Level)	3.25
Power Companies	4.25
Utilities Services	5.5
Road works	6.66
Community Groups	7
NGOs from other communities/or outside of your community	9
Other (1 respondent/did not rank)	Individuals
Rural ranking	
Stakeholders responsible for assisting in the recovery process	**Mean ranking in order of responsibility** (1 = most responsible)
Emergency Services (police, ambulance, and fire)	2.58
Aberdeenshire Council	2.63
Power Companies	3.26
National Government	3.29
Utilities Services	3.52
Local Governments (Community Level)	3.84
Road works	5.53
Community Groups	6.11
NGOs from other communities/or outside of your community	7.4
Other (1 respondent/ranked 3rd)	Telephone services
Other (1 respondent/did not rank)	Households need to accept personal responsibility
Other (1 respondent/did not rank)	Landowners and contractors

Assistance

Survey respondents identified resources that their community would require to become more resilient in the table below. Interviewees discussed increasing skills and training, assistance on the ground to help with technical information and logistics and increasing community energy production.

Urban ranking	
Resources communities require for severe weather and impacts	**Mean ranking from most important to least important** (1 = most important)
Political support	2.13
Funding for infrastructure development	2.27
Improved road access	3
Better strategy for the community	3.14
Better community leadership	3.17
Off-grid energy solutions (ex. community-owned turbines or solar panels)	3.38
Skills and training for community members	4
Other	Not selected
Small-town ranking	
Resources communities require for severe weather and impacts	**Mean ranking from most important to least important** (1 = most important)
Political support	2
Better community leadership	2
Skills and training for community members	2.66
Funding for infrastructure development	3
Off-grid energy solutions (ex. community-owned turbines or solar panels)	3
Better strategy for the community	3.5
Improved road access	Not selected
Other (1 respondent/not ranked)	Individuals taking responsibility for their own resilience.
Other (1 respondent/not ranked)	Better community communication, a central point for coordinating support and for passing out information about what is available. I don't think many people in the community would know what support is available or how to offer help if they wanted too.
Rural ranking	
Resources communities require for severe weather and impacts	**Mean ranking from most important to least important** (1 = most important)
Funding for infrastructure development	2.11
Off-grid energy solutions (ex. community-owned turbines or solar panels)	2.5
Better strategy for the community	2.66
Political support	2.83
Skills and training for community members	3.27
Improved road access	3.5
Better community leadership	3.66
Other (1 respondent/not ranked)	Volunteers
Other (1 respondent/not ranked)	Support in implementing resilience plans
Other (1 respondent/not ranked)	Phone service support
Other (1 respondent/not ranked)	Wider knowledge of any support the community might already have

Discussion and Conclusion

In conclusion, severe weather will continue to increase in severity and frequency across the world, particularly in Scotland because of climate change (Adaptation Scotland, 2021). The impact of severe weather requires an increase in resilience to protect communities and individuals. After Storm Arwen hit Scotland in 2021, gaps in the resilience of energy systems and communities became more evident, especially in rural Aberdeenshire where some communities were out of power for nearly two weeks (Scottish Government, 2022). The purpose of this project was to identify in Aberdeenshire, how rural communities' characteristics influence their resilience, the differences between rural and urban communities when it comes to their resilience, and opportunities to improve community resilience. The project aimed to understand what the current and future of community resilience looks like in Aberdeenshire.

Rural communities' characteristics influence on resilience

Rural communities' characteristics that influence resilience in Aberdeenshire, include that many communities are far away from helpful and necessary services which are crucial in severe weather situations. These services include emergency services, and workers restoring power during outages. Continually, this distance, and the fact rural communities have smaller populations than small-town and urban communities, means that these rural communities are usually the last to have their power, technology, or water services restored because the urban areas require a quicker response. However, rural communities are very resilient because of their size and geographic isolation from other communities, which allows them to have a strong sense of community that helps in times of crisis. There also are community spaces available that allow community members central places to go if assistance is needed. Given there is more land and key locations that build resilience in these rural areas, it puts the communities in a good position to consider off-grid energy solutions to reduce dependency on delayed services and ensure warm spaces for community members through severe weather or other disturbances on energy systems.

Rural communities have to be resilient

- "...you kind of have no choice because there's not really very much else to do and you might have anyone else to call on other than the people who live really really close to you or whatnot." (Interviewee #3)
- "...more rural communities tend to have less support available to them and...for any emergency partner trying to get to a more rural community, it's going to take longer." (Interviewee #21)
- "But when [rural communities] know storms are coming, they're very good at working together as communities to prepare for and then to clean up afterwards and stuff like that. So there's a lot more of community resilience out in smaller communities than the bigger ones. But that's because there has to be." (Interviewee #11)

Rural communities compared to urban communities

A common theme that came up multiple times in interviews was that rural communities have a more natural route of creating community resilience given their isolated features and the fact they must be resilient being in more remote areas. Urban communities, on the other hand, can find it difficult or unnecessary to build community resilience, because communities are not as easily definable, and because of how readily available emergency services are in urban areas. Data also shows that urban communities have felt less of the impacts of severe weather compared to rural communities. Most urban interviewees stated they had less severe experiences with storms, like Storm Arwen, than the rural communities in Aberdeenshire. Urban survey respondents listed flooding as their most severe impact, while rural respondents listed energy and power outages.

Opportunities for improving community resilience

Opportunities that came up in the research for improving community resilience included creating situations and conditions where communities can meet and learn from one another. Many community groups that were interviewed were very willing to work with other community groups across different areas and assist with their resilience needs. Additionally, survey respondents and interviewees brought up the importance of individual resilience, but the fact that resilience requires a certain amount of money to self-fund, and there are other pressing social issues means that individual resilience can be hard for community members to pursue. Another opportunity that was brought up was adding more training and support on the ground in communities to help teach the skills and technical knowledge required for community resilience and distributed energy resources.

Individual resilience

- "So, the key way of increasing resilience is to probably, if you can afford it, act individually." (Interviewee #20)
- "So build the resilience of an individual...because you can't have resilient communities until you get resilient individuals." (Interviewee #12)

Communities resilient actions

- "We've installed a Tesla Powerwall battery, which will give us 13 kilowatts for use at some point. But you know we could add another few batteries to that." (Interviewee #2)
- "A lot of communities themselves have set up like walkie-talkie systems in their village and stuff. So, when the systems do go down, they still have a way of communicating." (Interviewee #11)

Recommendations

Future Research

- A more in-depth study that incorporates spending time in the communities being researched and focuses on even more remote and rural areas that are not identifiable on a map.
- Research more technical ways that rural communities can incorporate distributed energy systems into their community halls and use energy generation not only in cases where power is disrupted.
- Research how accessible individual resilience is for rural communities and gauge how willing community members are to take on the responsibility of individual resilience.
- Urban communities could also be researched further to look at how their characteristics, location, and politics influence community resilience in the sense of community integrity and longevity of the community.

Policy

- More national policies that support community-created energy sources since the process has become more difficult in recent years.
- Regionally, councils should continue to encourage resilience planning with the addition of creating more roles on the ground to assist communities with technical knowledge and help the current staff cover the large area of Aberdeenshire.

Funding Stakeholders

- Support community programs that work on reducing social issues to help reduce everyday concerns for community members, so they have the capacity to consider long-term resilience.
- Support small-scale resilience projects like emergency grab bags alongside large-scale projects like community energy generation.
- Advocate locally, regionally, and nationally for more resilience and energy policies that will help communities strengthen their resilience.

Final Remarks

In conclusion, this report aimed to understand what community resilience looks like in Aberdeenshire, both currently and in the future. Climate change will continue to increase the severity and frequency of severe weather and requires adaptations and community resilience. Sustainability transitions is one way that resilience and adaptations, like distributed energy sources, should be looked at to ensure that a just and holistic approach is taken that includes the many communities and individuals that will be impacted. As shown, by the number of responses to the surveys and the number of interviewees, resilience is a very prevalent topic that many people are interested in. Future engagement and research on this topic will be imperative to protecting communities against severe weather and climate change.

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