

Extreme weather, climate variability, and childhood: A historical analogue from the Orkney Islands (1903–1919)

Aideen Foley

Department of Geography, Birkbeck, University of London

a.foley@bbk.ac.uk

Abstract: Many small island communities are said to possess high levels of autonomous coping capacity, often linked to peripherality. This social resilience is dynamic rather than static, with environmental, social, and political drivers shaping local patterns of vulnerability, necessitating reflection on how choices in one area may potentially lead to new vulnerabilities or transfers of vulnerability to already sensitive groups, such as children. This article argues that a historical perspective can help shed light on these dynamics. Impacts of extreme weather and climate variability, and resultant impacts of community coping strategies, on children in early-20th-century Orkney are explored using school logbooks. It finds that extreme weather ‘shocks’ directly impact children’s ability to attend school, while adjustments to the school calendar for agricultural operations constitute an indirect impact of climate variability, with reduced recreation time an emergent effect. Contextualised amidst contemporary island scholarship, two key messages emerge. Firstly, that the mobility and/or work of children in island communities remain sensitive to climate stressors in the present day and, secondly, that the island context itself matters, as characteristics commonly associated with ‘islandness’ — such as smallness, remoteness, and high social capital — may intersect in ways that fundamentally impact children’s experiences of weather, work, and education.

Keywords: historical climatology, extreme weather, climate variability, resilience, childhood, Orkney

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Introduction

Islands and coastal areas are at particular risk from climate and environmental change, with extreme weather events a key concern (Petzold & Magnan, 2019). In several ways, physical characteristics commonly associated with ‘islandness’, including smallness, remoteness, and fragmentation (e.g., Fernandes & Pinho, 2017), may amplify extreme weather risks; for example, communities and their assets may be concentrated in coastal areas, where coastal erosion and land loss are major concerns (e.g., Narayan et al., 2020), thus leading to greater exposure to climate-related hazards. Islands are increasingly recognised as spaces of interconnection (Chandler & Pugh, 2018; Grydehøj & Casagrande, 2019), and extreme

weather has substantial potential to disrupt these connections, for example by limiting inter-island ferry travel (Coll et al., 2012) and hampering the delivery of perishable goods (Calderwood & Freathy, 2011). Small island economies may also be characterised by high levels of specialisation (Fernandes & Pinho, 2017), often — but not always — involving climate-sensitive sectors such as fishing, agriculture, and tourism. A pertinent example comes from Grenada's nutmeg industry, a major source of employment which was profoundly impacted by Hurricane Ivan in 2004 (Barker, 2012).

Scholarship on climate change impacts is also increasingly recognising the social and cultural dimensions of climate change (Adger et al., 2013) and the challenges it poses to preserving the “lived values” (Graham et al., 2013, p. 49) of island peoples. Yet, the very fact that societies have developed and thrived in island contexts points to the capability of communities to cope with such stressors. Island communities have been associated with high levels of autonomous coping capacity (Nunn & Kumar, 2019), with more peripheral communities appearing to possess greater autonomous coping abilities than near-core communities, as distance from the facilities of urban centres may necessitate greater self-sufficiency (Korovulavula et al., 2019). Such autonomous coping is an example of social resilience, the ability of communities to cope with external stressors stemming from social change (e.g., demographic), political change (e.g., in governance structures), and/or environmental change (e.g., climate change) (Adger, 2000). These stressors are encountered on different scales, operating at different speeds, dynamically driving local exposures (i.e., the degree and nature of changes being experienced) (Bennett et al., 2016). Yet, although climate risk and vulnerability assessments often recognise non-climate factors, in practice, the dynamic interlinkages between climate and non-climate factors are underrepresented (Jurgilevich et al., 2017; McDowell et al., 2016). For example, climate hazards impact food security and dietary diversity in Pacific communities, but so does the availability of imported, calorie-dense processed food, and such linkages must be recognised in adaptation planning (Medina Hidalgo et al., 2020). This suggests a pressing need for reflection on how the dynamics of vulnerability and resilience can be observed and understood.

The dynamics of vulnerability within a community, including how choices made in one part of social system might lead to new vulnerabilities (e.g., Bennett et al., 2016; Dilling et al., 2015; Westerhoff & Smit, 2008) or transfers of vulnerability (Atteridge & Remling, 2018) to a subset of the population, such as children, is a key consideration. The disproportionate impacts of climate change on children are well-documented (Ebi & Paulson, 2007; Perera, 2008; Towers et al., 2016; Xu et al., 2012). These impacts are both direct (e.g., increased weather-related mortality) and indirect (e.g., increased poverty, food insecurity) in nature (Sheffield & Landrigan, 2011). Socio-economic factors also impact how climate change and weather ‘shocks’ are experienced by communities, families, and children. There are an estimated 98 million child labourers in the agriculture sector worldwide (B. Carter, 2017), and climate trends and weather events impact this group in highly context-specific ways. For example, in India, positive rainfall shocks (associated with greater agricultural productivity) are linked to decreases in school enrolment and poorer scores in maths and reading tests (Shah & Steinberg, 2017), while in rural Ethiopia, summer rainfall is positively linked to education (Randell & Gray, 2016). While much of the scholarship focuses on the Global South, it would be a mistake to assume that child work has been eradicated in the Global North (Morrow, 2010). There is little regulation governing child work on farms in the USA, for example

(Summers et al., 2018). Arnold and colleagues (2020) found that Latinx children hired to work on farms in North Carolina commonly experience heat-related illness — and exposure to extreme heat is likely to become more frequent in a warming climate.

The International Labour Organization (ILO) distinguishes between child *work* and child *labour*. Child *work* that is not harmful to health, development, or education may be permitted from the age of 12 under ILO standards, depending on the country and the kind of work (ILO, 1973). Child *labour* refers to work that:

is mentally, physically, socially or morally dangerous and harmful to children; and/or interferes with their schooling by: depriving them of the opportunity to attend school; obliging them to leave school prematurely; or requiring them to attempt to combine school attendance with excessively long and heavy work. (ILO, 2021)

This includes the “worst forms” of child labour (ILO, 1999). Commitment amongst nations to the goal of eradicating child labour, which is hazardous, harmful, or interferes with education, is near-universal (de Guzman Chorny et al., 2019), and it is important to note that agricultural work, even within the family unit, can constitute what the International Labour Organization defines as “hazardous work” (ILO Office for Pacific Island Countries, 2014, p. 7) due to its adverse effects on the child’s safety and health. However, there have been calls for greater cultural sensitivity in devising and implementing policy interventions (Adonteng-Kissi, 2018; Kassa & Abebe, 2016), and for policies that focus on improving the wellbeing of children who do work, either as an interim policy goal (van Daalen & Hanson, 2019), or arguing that, in some contexts, children’s participation in work that is not harmful or hazardous may have cultural, developmental, or psycho-social benefits (e.g., Aufseeser et al., 2018; Bourdillon & Carothers, 2019). For example, acknowledging the position of children’s work within indigenous traditions and cultural practice, Bolivia has introduced legislation that does not ban child work but introduces protective measures for working children (Liebel, 2015). Western conceptualisations of childhood (i.e., the ‘schooled child’) dominate in policy discourses and are presented as a global standard that all societies need to attain, but this may overlook diversity in the construction of ‘childhood’ globally (Wyness, 2013). Indeed, Bourdillon (2014) argues that policy-making which attends only to the hazards of child work and not the benefits, where they exist, may ultimately harm those it intends to help.

Scholarship at the intersection of childhood, climate vulnerability, and islandness in the present-day is somewhat limited. Lawler and Patel’s (2012) work in East Asia and the Pacific demonstrates that children in Pacific island states are aware of and concerned with land loss, crop failure, and household livelihood loss; while challenges of islandness were not directly discussed, issues of remoteness and rurality emerge as amplifiers of vulnerability. Henry-Lee (2020, p. 63) asserts that the natural environment “endangers” children in Caribbean Small Island Developing States (SIDS) in ways that are difficult to assess, as disaster data tends to be collated to national level and rarely broken down in ways that allow children’s specific vulnerability to be examined. In light of such limitations, this paper argues that a historical perspective can help shed light on how the dynamic interlinkages between weather, climate, and society can shape children’s experiences in an island environment.

Case studies are increasingly being recognised for the important role that they play in understanding the place-based, interactive nature of vulnerability (Ford et al., 2010).

Historical case studies can aid in understanding the societal and cultural aspects of weather and climate *in situ*, thereby helping to contextualise present-day climate challenges (Adamson et al., 2018) by acknowledging their connections to the past, to place, and to wider systems within which they are embedded (Hughes, 2008). Historical case studies can also act as spatial analogues, as well as temporal analogues (Ford et al., 2010). The concept of spatial analogues is used in climate change literature when referring to regions which today have a similar climate to another region (Mottaleb et al., 2018), or to what might be expected in a study region under future climate change (T. Carter, 1996; Horváth et al., 2008), but a similar approach can also be applied in the historical context to identify past case studies that exemplify similar vulnerabilities to those being faced in another region today. For example, Arenstam Gibbons and Nicholls (2006) drew parallels between the social processes underlying the abandonment of Holland Island in the Chesapeake Bay during the 19th century and the experiences of atoll nations dealing with sea level rise today. McLeman (2011) studied ancient and modern examples of settlement abandonment to better understand the drivers and tipping points for population decline. Similarly, Dugmore and colleagues' (2007) conclusions about the role of memory in determining when to take adaptive action and the potential for 'misleading memories' to lead to a lack of action or maladaptation, though grounded in the experiences of Norse settlements, has clear implications for decision-making today. Although, as noted by Glantz (2019), we cannot rely on analogues as an indicator of future climate impacts, they can help us to understand the factors that build or diminish coping capacity in societies, based on how successful societies were in managing past weather stressors.

Documentary sources can be a useful tool for studying these analogues. There is a rich literature which utilises historical documents quantitatively in order to reconstruct records of extreme weather or climatic variability; for example, Nash et al. (2015) use a range of documents, including newspapers and missionary materials, to reconstruct rainfall variability in southeast Africa in the 19th century, prior to the commencement of the instrumental record. But weather, as Janković and Fleming (2017, p. 156) express, can be understood as both 'natural fact' and 'social artefact', and historical accounts of weather inevitably intersect with social, cultural, political, and economic issues that are more sensitively handled with a qualitative approach. The identity of the individual author, and the cultural identity of the time and community they are a part of, undoubtedly impacts how weather and climate are engaged with, observed, and recorded, thus shaping diverse narratives as "people make weather meaningful by incorporating it in their own structures of temporality" (Golinski, 2010, p. 78; Daniels & Endfield, 2009). People also tend to understand weather and climate through a place-based lens; for example, in Klöck's (2019) work on Hallig Hooge, in the German Wadden Sea, participants spoke of changes in sea currents and in flora and fauna. Drawing on research in the Outer Hebrides, Butts and Adams (2020) use the concept of "weather contracts" to describe how 'difficult' weather is accepted and incorporated into local identity, with potential for maladaptation if people and communities stretch themselves beyond their own adaptive capacity to maintain the 'contract'. As such, it is crucial to take a holistic view of historical weather and climate narratives, as weather-related experiences are sometimes not announced as 'extreme', or labelled as 'difficult', but are coped with through adjustments that become normalised over time, absorbed into the routines of a community.

Here, the Orkney Islands are used as a spatial and temporal analogue, drawing on past experiences of weather and climate variability in rural Orkney to identify parallels with remote

and rural regions in developing countries today. School logbooks are used to examine lived experiences of children in Orkney in the early 20th century, evaluating climate variability and extreme weather exposures, impacts, and responses, and interactions between them. The research is organised around two research questions:

1. How did extreme weather and climate variability directly and indirectly impact children in Orkney?
2. What coping mechanisms were used at individual, family, or community level to respond to or manage these impacts?

Bennett and colleagues' (2016, p. 910) concept of "vulnerability as a dynamic process" is applied as a framework for identifying interactive effects between impacts and responses. Understanding how communities, families, and children in a rural island society responded to historical climate variability and extreme weather events can aid in identifying key sensitivities and considerations for similar communities today, facing contemporary climate change. The paper demonstrates the potential of historical approaches to yield insights relevant to subsets of populations, like children in small island contexts, whose vulnerability cannot be analysed in other ways due to data availability.

Methods

Study area

The Orkney Islands occupy a strategic position where the North Sea meets the North Atlantic, first capitalised upon by Norse settlers in the 9th century before coming under Scottish rule in the 1460s, resulting in a blend of cultural influences unlike in the UK or even the Scottish mainland, and a strong regional identity (Jones, 2012). Exposed to both the North Atlantic Ocean and the North Sea, Orkney has also long possessed a reputation for extreme weather. In his account of Orkney's climate, Spence (1908) notes that if one were to ask the elders of the islands for their impressions, they would attest that the climate had changed during their lifetime, toward cooler summers and milder winters, while recognising the potential for exaggeration when recounting past weather. Spence (1908, p. 250) went on to write that the winds and the ocean's corresponding "roar" seemed to have led islanders to speak louder and walk with heavier footsteps, and rendered their "countenance more stolid and sombre." Though care must be taken to avoid environmental determinism (Endfield, 2011), this account points to the perceived role of climate in island identity.

Orkney's population in the 1901 Scottish Census was 28,699 (Census Office, 1903). Agriculture was the occupation of 54% of working males and 48% of working females. With a further 12% of working males employed in fishing, the economy and inhabitants possessed significant sensitivity to climate variability and extreme weather. Thus, early-20th-century Orkney and its inhabitants present a pertinent case study in community sensitivities to climatic variability and extremes.

The 1901 Census of Scotland indicates that the majority of children aged 10–14 were not classed as 'in an occupation'; the data also demonstrates that children, especially boys, who worked were very likely to work in agriculture. Importantly, the practice of combining

work and school is not characterised by these data, necessitating exploration of alternative, narrative sources.

Historical sources

Documentary sources may include personal weather diaries (Domínguez-Castro et al., 2015; Golinski, 2001; Wheeler, 1994) or institutional documents such as tax records and prison records (Endfield & Tejedo, 2006). It has been observed that, unlike sources created by independent individuals (e.g., collections of correspondence), which may have been created for a variety of different reasons, institutional records tend to have a unifying purpose, and so there is a greater possibility of long-term, consistent data (Brázdil et al., 2010).

This study utilises a specific type of institutional record, the school logbook, supplemented by statistics from the 1901 Census of Scotland. School logbooks were first introduced in 1862 and were a requirement for all elementary schools eligible for state grants (Horn, 2011). They were written by the head teacher to act as a daily record of activity in the school, capturing the functional details of school life — and also, often, headteachers' perceptions of the communities in which the school and its pupils are situated (Wright, 2012). Comments on absenteeism frequently contain references to children's working and living conditions (Wood, 1981). School logbooks have been widely used in historical research; for example, Wright (2012) uses them qualitatively to draw insights into how headteachers perceived students' home lives, while Gant (2008) adopts a more quantitative approach, tracking pupil attendance rates during the construction of the Severn Tunnel. The application of school logbooks in the environmental field appears to be more limited, although they have been used in a study of flood timing in the Cambrian Mountains (Foulds et al., 2014), and form a substantial part of the source material for the TEMPEST historical weather event database (Veale et al., 2017).

While a school logbook is an institutional record, the recorder is an individual; therefore, logbooks can vary greatly in terms of the type of events and the level of detail recorded therein. The Deerness Public School logbook forms the basis of this research. Deerness is located on Mainland, Orkney's largest island (see Figure 1). From 1903 to 1919, the school logbook of Deerness Public School is particularly detailed in its accounts of both weather and weather-dependent events (see Figure 2) and the impact of these on children and the wider community; this is owing to headmaster Magnus Spence's keen interest in meteorology and geophysics (Deerness Public School Logbook, p. 401; Spence, 1908). While the logbook has continued to be maintained by successive headteachers following Spence's retirement, the focus of this analysis is limited to Spence's tenure in order to limit the uncertainties that could stem from reconciling different narrators' descriptions across a longer timeframe.



Figure 1. Map of Orkney Islands, with marker indicating approximate position of Deerness School. Map created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright ©Esri. All rights reserved.

The school logbook's function as an institutional document gives rise to some limitations in its use as a research tool. Firstly, the temporal structures of the school form the narrative framework. While entries to the logbook are generally made weekly, extraordinary events can disturb this schedule; no entry is made during periods of school closure, such as holidays or epidemics, creating gaps in the record. Secondly, the school logbook is principally shaped by the headteacher's views and, as such, the perspectives of parents and the pupils themselves are either absent or inferred.

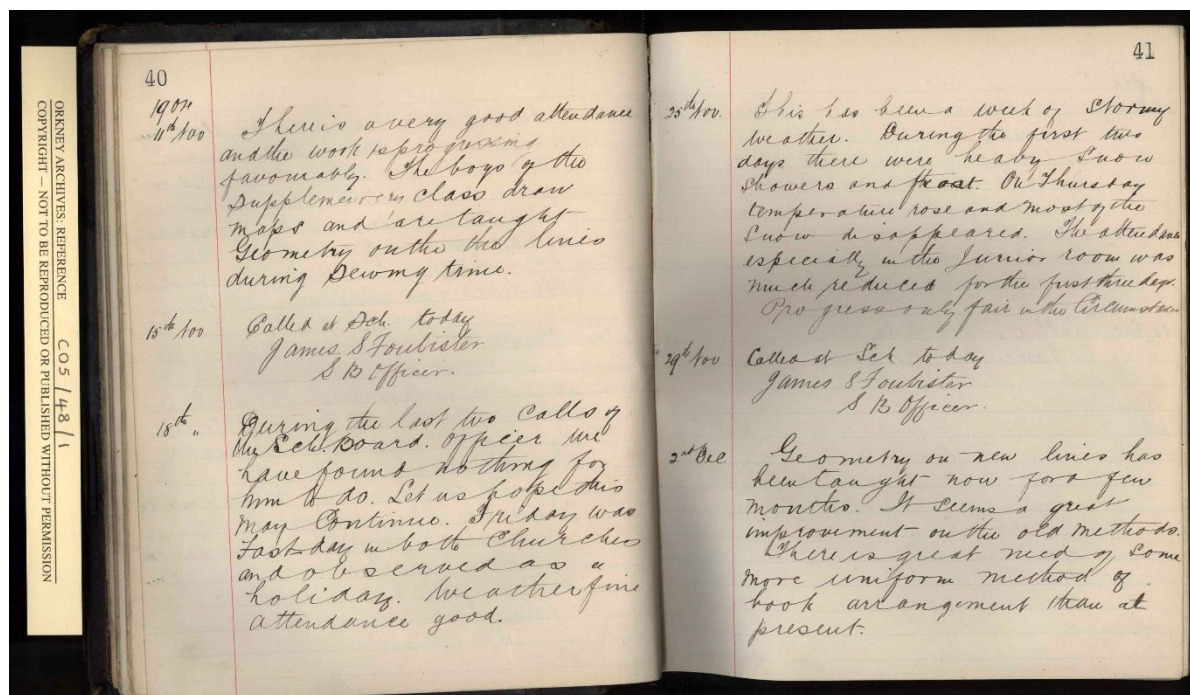


Figure 2. Extract from Deerness Public School Logbook (CO5/48/1), Orkney Archive. Links between weather and school attendance are discussed; for example, the note dated 25 November (p. 41) reports “stormy weather” and that “the attendance especially in the Junior room was much reduced.” Reproduced with the permission of Orkney Archive.

Magnus Spence: Biographical note

Magnus Spence was headmaster and author of the Deerness School logbook between 1903, the date of the earliest archived entries, and 1919, when he retired. He was originally from Birsay, another of the Orkney islands (Deerness Social History Group, 2005). On his retirement, it was noted in the logbook that Spence was “an earnest student and exact observer of Nature,” and “an intellectual force far beyond the parishes in which his teaching was done” (Deerness Public School Logbook, p. 410). He also maintained Orkney’s meteorological station from 1890 until his death in 1919 (Long, 2020).

Analytical approach

This research takes a mixed methods approach, combining quantitative indexing with qualitative analysis of the sources to understand the dynamic relations between weather and climate variability, community coping measures, and children’s experiences. Qualitative information in the logbooks has been classified to form indices. Content analysis has been applied to index weather parameters relating to temperature, precipitation, and wind (e.g., Domínguez-Castro et al., 2015; Pfister & Brázdil, 2006), based on direct descriptions of weather conditions and extreme or disruptive weather events, and in accordance with the intensity of the meteorological phenomenon.

Some terms, such as ‘inclement’, could refer to both wind and precipitation. In the absence of clarifying remarks in the source, these have been indexed under both weather variables (see Table 1). The indices are derived from the range of terms used in the logbooks; for wind and precipitation, the most frequently mentioned weather parameters, a wider range of terms are used, from which a 3-point scale was constructed. For dry weather, which is

lesser encountered, there are fewer descriptions and so a 2-point scale is used. As the logbook entries are made each week, there is scope for variability within a single entry (e.g., drizzly on Monday but downpour on Friday); therefore, for each entry, the highest applicable index has been recorded, as extreme events tend to be recorded in the greatest detail. For each weather parameter, a cumulative monthly index has been derived by summing values across each month. Weeks that fall across months contribute wholly to the month in which the logbook entry was dated. An alternative approach here would be to assume proportional contributions across both months, but this would be similarly arbitrary.

Table 1. Value index for the adjectives used to describe temperature, precipitation, dry conditions, and wind.

Index	Adjectives used
<i>Temperature</i>	
+2 Very hot	Exceptionally mild
+1 Hot	Mild
0 No data	No reference to temperature
-1 Cold	Cold
-2 Very cold	Bitterly cold
<i>Precipitation</i>	
+3 Heavy precipitation	Very wet, very rainy, driving rain, severe storm of rain, persistent rainfall, downpour, snowstorm, blizzard, very rough, heavy [rain, snow, hail]
+2 Moderate precipitation	Wet, rain, snow, hail, inclement, boisterous, rough.
+1 Light precipitation	Drizzle, showery, damp, misty, slight [rain, snow]
0 No data	No reference to precipitation
<i>Dry conditions</i>	
0 No data	No reference to dry conditions
-1 Dry	Dry
-2 Very dry	Very dry, drought
<i>Wind</i>	
+3 Strong wind	Stormy, strong wind, severe wind, gale, hurricane force, blizzard, snowstorm, very rough
+2 Moderate wind	Inclement, boisterous, rough
+1 Light wind	Bracing
0 No data	No reference to wind

Whereas ‘weather’ refers to atmospheric conditions as a specific place and time, ‘climate variability’ refers to variations lasting longer than a single weather event. So, while the author of the logbook writes about ‘weather’, through indexing, we can garner insights about longer-term fluctuations such as seasonal variability.

Direct descriptions of extreme weather were frequently accompanied by evidence of the direct impacts of that weather on children, such as difficulty travelling. The logbooks also contain evidence of indirect impacts of climate variability on children, such as absences due to changes in the timing of harvests and other agricultural events. Camenisch et al. (2016) argue that impacts can be understood as first order biophysical effects (e.g., changes to crop production), second order economic and health impacts (e.g., food prices rise), third order demographic and social impacts (e.g., malnutrition), and fourth order cultural responses (e.g., cultural memory of the episode). Although this more macro-level model is too coarse to apply to the day-to-day experiences conveyed in school logbooks, it helps to highlight how steps taken (or not) to respond to one level of impacts can mitigate (or produce) another level of impacts.

To facilitate analysis, a cumulative monthly weather-related absenteeism index has been derived by recording a week with absences directly attributable to the weather (e.g., gales,

snow blocking roads) as ‘1’ and summing weeks in each month. Similarly, a field work index has been derived by recording a week with absences due to agricultural labouring as ‘1’ and summing weeks in each month. In some entries, the headteacher makes relational comments about attendance, such as stating that attendance has improved now that certain farming operations are complete. In these cases, such comments are interpreted to mean that attendance was down during the previous week. As noted above, weeks that fall across months contribute wholly to the month in which the logbook entry was dated. The total of this index across months over the years studied is then calculated to gain a sense of where in the calendar year such absences are concentrated. References to crops are also indexed in the same way, in order to gain insight into what kind of agricultural labour gives rise to the greatest levels of absenteeism.

While indexing has the advantage of simplifying a large, complex dataset to produce readily interpretable diagrams, the richness and socio-cultural nuance of the original text is removed in the process of producing indices. Therefore, quotations from the logbooks are also presented and discussed to place the findings of the quantitative analysis in historical context.

There are inherent limitations and uncertainties in analysing historical data, particularly weather data. Firstly, there is the question of how to treat missing data. An absence of references to the weather, or to children being absent in the fields, cannot be assumed to mean that there was nothing unusual to report; it may be the case that other events (e.g., epidemics, accidents) eclipse the everyday in the headteacher’s observations. Another issue is the subjectivity of ‘normal’; the logbook’s writer may not have commented on weather conditions or singular absences that were considered usual for the time of year. This leads to a more general limitation of historical weather narratives, in that they can be used to identify extreme events more readily than slow-onset, gradual change. Yet, both are components of contemporary climate change. However, these limitations should not be construed as a basis to disregard historical sources when seeking to understand today’s climate challenges. Learning about how past communities experienced their weather and climate can still help to equip contemporary communities with the words and frameworks to better understand their own climate context.

Findings

“Away for hay”: Children’s dual role as workers and students

The school logbook shows that at numerous points during term time, pupils are absent because they are engaged in agricultural work, indicating the role that child work played in the rural economy. For example, a note dated August 1910 observed that “Scholars stay away for hay, turnips and other occupations when they think fit” (Deerness Public School Logbook, p. 181).

The field work absence index highlights that these absences occur mainly in July and August, with another smaller peak in November (see Figure 3). References to field work do not always indicate what kind of activity children were undertaking, and references to agricultural activities in the logbooks do not always imply that child work was taking place. However, by indexing the number of references to different types of crop or agricultural activity in each month and visualising this alongside the number of absences, inferences can be made. Turnips are by far the most frequently encountered crop in the logbooks, and their

mention corresponds to a peak in absenteeism in July when the process of turnip ‘singling’ (removing excess seedling) took place. An account from the north of England in the mid-1800s indicated that children were preferred for the task due to their smaller stature:

From the length of a man’s back, he would much rather hoe than single. A child that will attend to proper directions may single turnips quite as well as a person fully grown; and indeed any increase of size tends to disqualify for the work. (Almack, 1843, p. 69)

There is evidence of the school facilitating a compromise during term time between farm work and schoolwork; for example, in an entry from July 1916, it was noted that “classes [were] adjusted to allow scholars home earlier to help in the turnips” (Deerness Public School Logbook, p. 352). There is an observable tension here between the rule of educational policy and the practice of rural schooling, reflecting the broader challenges of reshaping attitudes to education and enforcing compulsory requirements. The *Education (Scotland) Act 1872* made primary education universal and mandatory in Scotland for children aged 5 to 13, with the upper limit revised to 14 in 1901 (J. Scotland, 1972). Until 1908, exemption could be made for children 10 and over who could prove that they had achieved the required proficiency in the curriculum but, even after these exemptions end, agricultural work-related absences continue. Spence notes a visit from the Attendance Officer in July 1905, but goes on to describe that “the result of his calls has been nil” (Deerness Public School Logbook, p. 59).

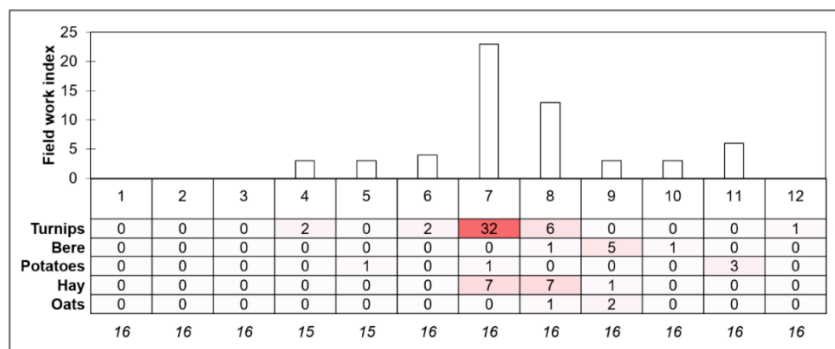


Figure 3. Field work index and number of references to different crops. ‘Turnips’ represents references to either ‘turnip’ or the activity of singling. Italicised numbers indicate number of years for which data is available for that month. Red shading indicates months and crops with the highest total references to field work.

In the absence of effective enforcement mechanisms or social protection programmes that address underlying causes of child work, the steps taken by the school (e.g., adjusting the school calendar) appear to facilitate combining work *and* school, to avoid a dichotomous choice of work *or* school. The school’s awareness and accommodation of children’s dual role as worker and student is also apparent in its efforts to arrange school holidays to coincide with the harvest. In 1909, holidays were extended by a week, as “when the time for reopening the school arrived the crops were still less than half gathered” (Deerness Public School Logbook, p. 157). In 1911, the harvest was noted as “the earliest and finest on record” (Deerness Public School Logbook, p. 207), and the school reopened with good attendance week commencing

13 October. Conversely, in 1907, the school closed a week later than usual, in anticipation of a very late harvest; when school reopened week commencing 8 November, “so few came up it had to be closed again” (Deerness Public School Logbook, p. 110). Similarly, in 1916, an additional week of holidays was given “owing to the protracted and stormy harvest” (Deerness Public School Logbook, p. 357), and it was noted that several farmers still had not finished reaping their potatoes when school reopened on 13 November. The date at which school reopened could vary by as much as a month, then, on account of variability in the harvest, which in turn is linked to climate variability.

Inspection reports for Deerness School are very positive, referring, for example, to its “very satisfactory character” and the “very careful, accurate, intelligent and well-advanced” (Deerness Public School Logbook, p. 63) work produced by the Senior Division, suggesting that pupils interchanged worker and pupil roles successfully from an academic standpoint. While the school’s secondary response of changing term dates or finishing classes early mitigates to some extent the impacts on children’s experiences, these responses also have interactive effects. In September 1916, Spence notes:

It is unfortunate from a health point of view that the holidays are so late... It seems an unnatural and unprofitable time to begin holidays just when the colder showering weather is setting in and the nights commencing about seven o'clock. (Deerness Public School Logbook, p. 357)

This may be a reference to the physical health impacts of working outdoors in inclement weather, but it may also reflect broader concerns about the health and wellbeing impacts of limited recreation time when combining work and school.

These decisions to move the school calendar to adapt to the need for children’s farm labour, occurring at different points in and between years due to climate variability and weather events, exemplify the concept of social resilience; that is, the ability of communities to cope with external variability and change both climatic and non-climatic in nature (Adger, 2000). However, choices made in one part of a social system might lead to new vulnerabilities (Dilling et al., 2015) or transfers of vulnerability (Atteridge & Remling, 2018), as in this case, where concern is expressed about children’s wellbeing due to the holidays starting later. Although evidence from the logbook suggests that school inspections were positive, demands for child work may have negatively impacted educational attainment at the individual level. Applying Bennett and colleagues’ (2016) conceptual framework, it is clear that interactive impacts may emerge due to the direct impact of seasonal climate variability on agricultural production, and both the initial response of missing school, and the secondary response of the school moving term dates, resulting in outcome vulnerability.

In 1909 and in 1913, the logbook contains just one entry that explicitly references children being absent for fieldwork. In an entry dated 9 July 1909, the headteacher notes that the pupils are attending week in spite of turnip singling, and attributes this to “anxiety to be present at the inspection” (Deerness Public School Logbook, p. 151) which was taking place that week. This year would have been the first academic year after exemptions for pupils over 10 years of age were abolished, and may be an example of macro-scale policy drivers impacting community-scale coping actions and children’s experiences. In 1913, the headteacher notes that at the start of July, a telegram was received telling of the School Board’s

decision to close the school for four weeks (Deerness Public School Logbook, p. 269). No further details are reported regarding the reasons for the decision, but it corresponds with the period in which the most absences associated with child work tend to be reported.

References to child work are noticeably more frequent in the later years of the logbook. With wartime came a relaxation of attendance by-laws, as children were viewed as the solution to labour shortages. Britain entered the First World War on 4 August 1914 and, by 1916, the number of children in Britain exempted from school specifically to work on farms totalled 15,753, with boys composing the majority (Kennedy, 2014). Again, this is an example of how community vulnerability is constructed by dynamic political and social factors operating on a multitude of scales. Yet, in the logbook, the war is rarely directly referenced; geography is replaced with lessons on war news in August 1914, “which interests the pupils very much” (Deerness Public School Logbook, p. 297) but, by September, some of the supplementary class are “more interested in a novel” (Deerness Public School Logbook, p. 301) than the war editions of the local papers with which they are supplied daily.

“Dangerously wet”: Climatic ‘shocks’ and children’s mobility

Figure 4 illustrates the weather indices developed, and shows annual cycles of drier, relatively calm summers and wet, stormy winters. There are also numerous references to pupils being absent from school due to gales, rain, and snow, indicated in the fourth panel of Figure 4. Some of the more notable features are highlighted and annotated.

Occasionally, the impact of extreme weather on the wider community and broader transportation networks that support the island are conveyed, with one storm in 1905 (a) causing “much damage to shipping along the coast” and the loss of “more than twenty lives” (Deerness Public School Logbook, p. 45). A period of successive extreme weather events is captured during the winter of 1908–1909 (b), which impedes children’s mobility throughout the season. There is a contrast illustrated here between the impacts of extreme weather events which are singular but very severe, versus events which are higher frequency but lower severity.

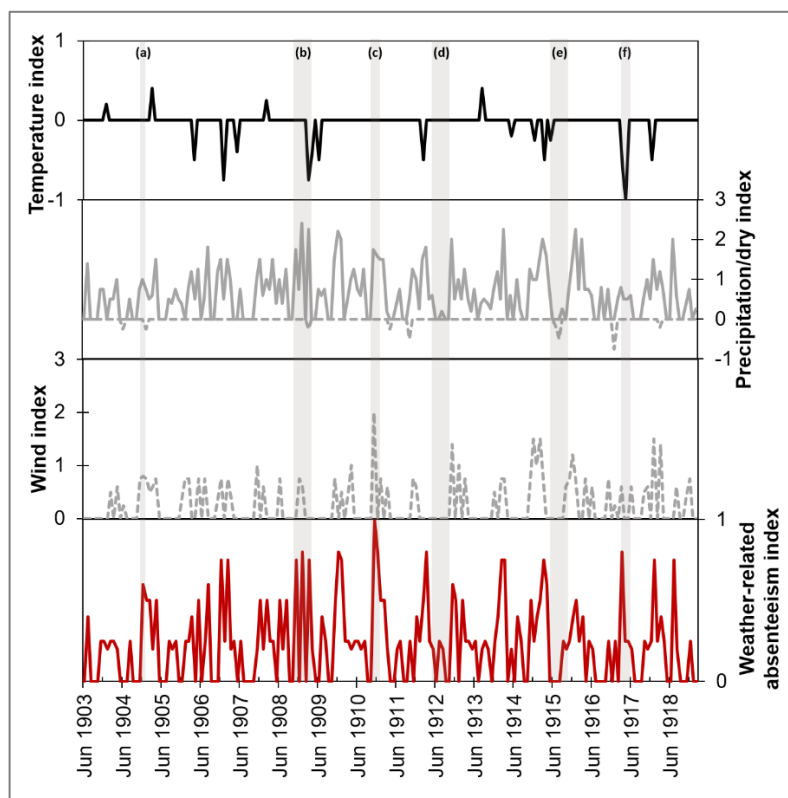


Figure 4. Meteorological information and direct weather-related absenteeism information extracted from the Deerness Public School Logbook. Indices from top to bottom: temperature, precipitation/dry, wind, weather-related absenteeism (construction of the indices is described in Table 1). Some notable features are highlighted and annotated (*a–f*).

While precipitation is the most frequently referenced meteorological phenomenon, extreme wind events can also be identified (e.g., *c*). Although descriptions relating specifically to temperature are relatively rare, the cold spring of 1916 (*f*), which would be followed by one of the latest harvests of the period, is captured in the school logbooks. The dry summer of 1915 (*e*) is identifiable, and the failure of the water supply for a month is attributed to this drought (Deerness Public School Logbook, p. 325). This analysis highlights the importance of considering context when working with weather indices, and the power of non-climatic bias; in 1912 (*d*), there is a distinct lack of precipitation data, but no negative evidence to indicate drought. In fact, the lack of precipitation references here is attributable not to climatic conditions, but an epidemic of measles which closed the school for several weeks (Deerness Public School Logbook, p. 235).

At various points in the logbook, the author draws attention to the fact that pupils are arriving to school in wet clothes and expresses concern about this; specific descriptions include “dangerously wet” (Deerness Public School Logbook, p. 180) and “with their clothes soaked through” (Deerness Public School Logbook, p. 188). Thus, in addition to the physical impacts of extreme weather on the accessibility of roadways, weather further inhibits travel through its potential to impact human health. In 1913, the author advises his pupils to get oilskins (waterproofs) in order to improve attendance (Deerness Public School Logbook, p. 277), and suggests that the educational authorities could play a role in implementing this measure, writing that “money spent on Medical Officers and Clerks, unless they have the power to

enforce their orders, would be much better spent on providing oilskins leggings and watertight boots to keep out the rain” (Deerness Public School Logbook, p. 287). The logbook notes that “the girls are better provided with rain coats than the boys” (Deerness Public School Logbook, p. 271), resulting in a gendered bias in absenteeism. Four years later, Spence reports that children are better equipped “owing to the prosperous times of the farmer” (Deerness Public School Logbook, p. 381), highlighting the role of economic context in determining sensitivity to environmental ‘shocks’.

This case exemplifies the trade-offs and feedbacks of Bennett et al.’s (2016) conceptual framework for understanding community vulnerability, where broad scale context (like economic trends; here, the prosperity of the farmer) shapes sensitivity to weather stressors (through the provision or absence of appropriate wet-weather clothing). Yet, while children’s farm work may contribute to the household economy, leading to the provision of better clothing and, through this, better access to school, children’s work also directly leads to their absence from the classroom at other times of the year.

Discussion and conclusions

School logbooks demonstrate that weather variability and extreme weather impacted the lives of children in 20th-century Orkney in both direct and indirect ways. Emergent effects may also arise from weather variability and extreme weather ‘shocks’. Though ‘islandness’ is not explicitly mentioned in the school logbooks, references to storms causing shipwrecks and disruption along the coast are a reminder of littoral lifeways. Disruption to mobility networks caused by extreme weather creates considerable barriers to school attendance. The school logbook provides crucial long-term context for these impacts, which is important given the role of memory in individually processing extreme weather events and contributing to a shared cultural weather heritage. For example, Hall and Endfield’s (2016, p. 16) work with rural communities in Cumbria found that nationally significant extreme winters, and disrupted journeys to school specifically, tended to be recalled with fondness and nostalgia, while there is a “collective forgetting” of weather that was less severe, or localised in impact, but still disruptive.

Climatic variability leads to considerable shifts in the timing of agricultural work, resulting in numerous absences from school, thereby potentially contributing, through differentials in educational attainment, to further vulnerability. However, by contributing to household economies, child work may have helped families to better equip their children for inclement weather conditions, potentially increasing school attendance. Pragmatic approaches were exercised to reconcile children’s dual role as worker and pupil, with the impact of a later harvest on absenteeism, and subsequently, on educational attainment, mitigated by adjusting term dates. Yet, such measures may have interactive impacts on children’s wellbeing, illustrating how broader family- and community-level coping strategies further affect children. Returning to Butts and Adams’ (2020) concept of ‘weather contracts’, the tendency for communities living with ‘extreme’ weather to incorporate it into local identity may serve as a form of adaptation — but may also mask emerging vulnerabilities, particularly what Bennett et al. (2016) refer to as ‘dynamic vulnerability’, in which steps taken to mitigate the impacts of a stressor at community-level have, in themselves, impacts on a vulnerable subset of that community. Figure 5 illustrates these trade-offs and complexities through a modified version

of Bennett and colleagues' (2016) conceptual framework for understanding community vulnerability, incorporating Bourdillon's (2014) recognition of risks and opportunities attached to child work.

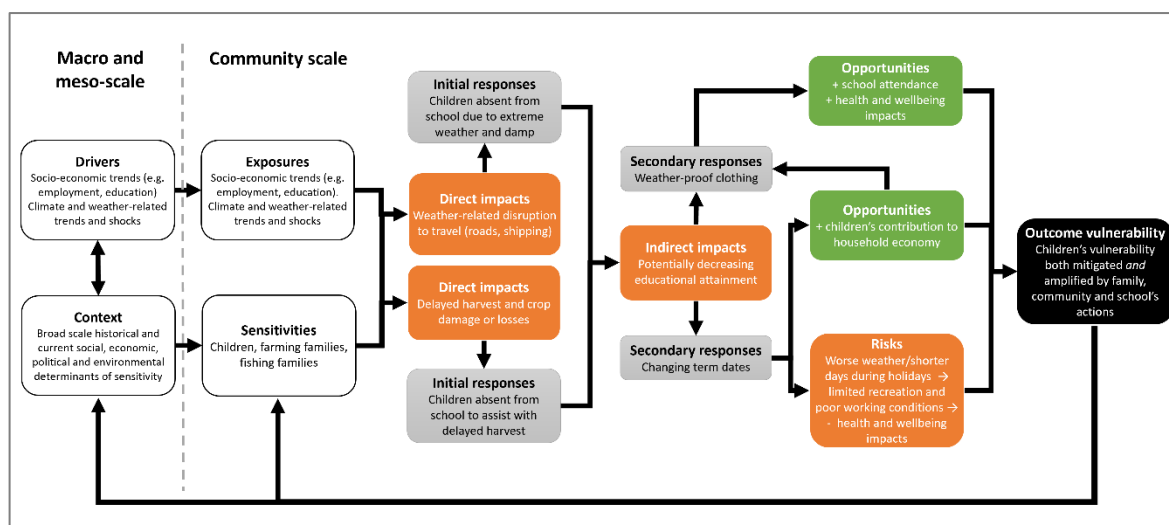


Figure 5. A visual representation of dynamic linkages between weather and climate variability, and children's experiences in early-20th-century Orkney, drawing on Bennett et al. (2016) and Bourdillon (2014).

As previously discussed, case studies in past weather vulnerability act as contextualisation for the contemporary climate adaptation challenge *in situ*, and as analogues for regions facing similar challenges today to those faced by the study region in the past. Social, economic, and technological progress and improvements — such as changing attitudes and legislation around child work and schooling, and different farming practices — mean that the ways in which extreme weather impacted the lives of children in early-20th-century Orkney does not directly map on to other places or experiences today. But, despite these differences, this historical case study and its contemporary contextualisation highlight a set of interrelating challenges faced by children and young people, where different facets of 'islandness' overlap.

Firstly, the geographic characteristics commonly associated with 'islandness', such as remoteness and peripherality, give rise to mobility issues which continue to have real implications for children's experiences and educational opportunities. In contemporary Orkney, children on the North and South Isles commute by ferry to attend senior secondary school on the main island, Mainland, either daily as day pupils or weekly as boarders in a Halls of Residence, requiring contingencies for adverse weather (Orkney Islands Council, n.d.). Some students travel via the Churchill Barriers, a set of four causeways that link Mainland with the isles of Lamb Holm, Glimps Holm, Burray, and South Ronaldsay, which can be closed when high winds or wave conditions are anticipated, thus disrupting travel to and from school (Orkney Islands Council, 2020). Affordability and complexity of island travel are also identified as a wider concern in the *National Plan for Scotland's Islands* (Scottish Government, 2019, p. 34), which calls for transport policies to be "fully island proofed," meaning that legislation and strategy at the national scale must not adversely impact island communities. The geographic constraints of 'islandness' are also reported as a barrier to Native Hawaiians and Pacific Islanders' educational attainment, as many islanders found that they needed to

relocate to attend secondary school on another island, often at some distance from home (Kerr et al., 2018).

Secondly, strong familial obligations amongst some small island communities may amplify issues relating to children's work inside or outside the home and their educational attainment. Familial obligations, including caring for younger siblings and carrying out customary roles, were also cited by Kerr et al. (2018) as a barrier to Native Hawaiian and Pacific Islander students leaving home. Contemporary work in the Republic of Maldives has also highlighted links between educational attainment and hours available for play and study, with reliance on child work for the completion of household tasks noted as a potential barrier to attainment (Yamada et al., 2015). A similar reliance on children to assist with household is noted in rural Fiji (Toren, 2011), where such work may include gardening, cutting sugar cane, tending crops and livestock, and fishing (Mattison & Neill, 2013). Climatic stressors can exacerbate risks associated with household tasks; during droughts in Chuuk, Micronesia, violence against young girls, who must walk further to reach water wells, has been reported (McLeod et al., 2018). In some Small Island Developing States, the issue of child labour also remains pertinent (e.g., International Labour Organization, 2015), and there have been media reports of children undertaking paid work outside the home to contribute to their families due to economic strain brought about by the COVID-19 pandemic — another kind of 'shock' (Kumar, 2020).

Experiences of children in rural Fiji also reflect the potential for these challenges to intersect; children report having to cross rivers and walk five kilometres to get to school, which, when coupled with agricultural work during harvest and planting seasons, where days can begin as early as 5 a.m., creates significant physical demands and time burdens (ILO Country Office for South Pacific Island Countries, 2010). Similar issues emerge around how children navigate core–periphery connectivity relations in non-island contexts. For instance, research with a sample of over 100 child street traders in Cusco, Peru found that one-quarter felt they have no time for play, with rural children disproportionately impacted by the time taken to travel to their place of work (Bromley & Mackie, 2009).

Furthermore, just as macro-level trends have been shown to have local impacts, local trends may have outward effects. For example, Bunce et al. (2009) note that, in the island of Rodrigues, in the Indian Ocean, low educational attainment and associated 'brain drain' may have placed further stress on an island economy limited by its small size and increased import dependence.

Remoteness and peripherality may also make it more challenging to develop curricula, and to monitor and evaluate teaching (Shiuna & Sodiq, 2013; Yamada et al., 2015), further complicating study of links between child work and educational attainment in island settings. In mountainous areas of Nicaragua, which share the remoteness that is often associated with small islands, the coffee harvest coincides with the beginning and end of the school year, and schools and NGOs are trialling adjustments to the school calendar similar to those implemented at Deerness School (Shier, 2017). However, as the remarks found in the Deerness logbooks illustrate, effective policy involves resolution of a trilemma (school–work–wellbeing), rather than a dilemma, as measures aimed at reconciling school and work alone may create unanticipated impacts on children's wellbeing. More than a transfer of vulnerability (Atteridge & Remling, 2018), this could constitute a concentration of vulnerability within a group already disproportionately impacted by environmental change.

Thus, coping strategies that aim to address child work from a socio-cultural perspective demand reflection on emergent effects.

Viewed as an analogue, this historical case highlights the complex interlinkages characterising children's experiences of weather, mobility, familial obligations or work, and/or school in island contexts. Traditional approaches to child protection, which may act 'for' but not 'with' the child in a meaningful way (Toros et al., 2013; van Bijleveld et al., 2014), would appear at risk of overlooking these linked effects and their impacts on children's experiences. However, the treatment of children as victims in climate change, development, and disaster discourse is shifting toward recognition of children as stakeholders with agency in their own development (Bourdillon, 2006) and resilience (Amri et al., 2018; Muzenda-Mudavanhu, 2016; Tanner, 2010). Combining an islandness 'lens' with children's own perceptions will be critical in designing policies and interventions for sustainable futures which are 'island proofed' and child-centred.

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