Is Bergen Unseasonal? On Europe's Shifting Relation to Seasons

SCOTT BREMER

Centre for the Study of the Sciences and the Humanities, University of Bergen, Postboks 7805, Bergen 5020, Norway. Email: scott.bremer@uib.no

This article reflects on whether and how European communities' cultural frameworks of seasons are coming to poorly correspond to the climatic conditions they experience, and the implications for how Europe adapts to climatic (and social and environmental) change. It starts from a colder- and drier-than-normal autumn and winter (2023/2024) in Bergen, Norway, and a local researcher's investigation into why these climatically anomalous seasons were being culturally celebrated as 'seasonal weather'. He compares studies into the Bergen population's cultural expectations for weather conditions in each of the four seasons, with the statistical climatic record, and reveals a mismatch. He argues that the four-season framework prominent in Europe poorly describes or anticipates meteorology in Bergen, and that other frameworks could fit better. The article argues that seasonal frameworks continuously evolve with interlinked environmental and social change – from drivers such as climate change, landscape modification, social evolution, and globalization – so that seasonal mismatches are as much about how societies culturally re-conceive of seasons as about physical climate change for instance. This is important because the way European societies divide the year by seasonal expectations affects how they relate to the meteorological conditions they come to face each season.

Introduction: Investigating an Apparent Seasonal Mismatch in Bergen

This January (2024), here in Bergen on Norway's western fjord-scape, a colleague remarked to me that the autumn and winter had been so 'seasonal'. Another colleague remarked that we were finally having a 'real' autumn and winter. When I asked them what they meant by *seasonal*, they cited the crisp clear days of October and November, when the city was aflame with autumnal colours, and the snowy

December and January we have had since, including a quite-white Christmas. And it was not only my colleagues taking notice. A story in local paper *Bergens Tidene* (Hirth 2024), on 19 January 2024, reported 38 cm of snow covering the city, noting that while not a record, it was remarkable, and saw people skiing to work. Another article on 12 November 2023 (Stegane 2023) opened, 'Low autumn sun on the face, crunchy, dry leaves underfoot and ducks wading through sparkling water. This is not a scene from a romantic Hollywood movie. This is Bergen in autumn 2023.' The journalist talks to a local 'weather enthusiast', who noted, 'We have had little rain and a lot of sun. In the last 26 days, we have only had 9.7 millimetres of rain. It is unusually little for the season'.

This was why my colleague's statement piqued my interest, because, as the November article notes, the romantic 'seasonal' weather we have lived through since October represents a departure from climatic statistics; it is 'unusual'. Looking back at the measurements for November 2023, I see that Bergen city – measured at 'Florida' – received just 81.5 mm rain, less than 30% of the average November rainfall of 275 mm. This illustrates an apparent mismatch between the ideal weather people culturally expect as seasonal, and the actual climatic conditions they experience in Bergen. Taken to its extreme, I have heard some in Bergen claim the city is unseasonal, or 'does not have seasons' (see Bremer *et al*. 2020). This is an arresting claim, because numerous anthropological studies have established that most societies worldwide have divided the year into seasonal periods, going long back into the archaeological record (Kwiecien *et al*. 2022; Orlove 2003). So, given that local people do likely reckon the year in some seasonal periods, what do people mean by Bergen being 'season-less'? It appears they mean that Bergen's weather poorly corresponds to the idealized version of how weather should be, according to a European four-season model linked to the Gregorian calendar, named as 'spring' (March–May or MAM); 'summer' (June–August or JJA); 'autumn' (September–November or SON) and 'winter' (December–February or DJF).

In this article, I investigate this apparent mismatch, asking: 'to what extent do idealized frameworks of seasonal weather match the weather conditions experienced in Bergen?' In defining seasons, societies track a complex weave of rhythms, from rainfall to phenology, animal migrations to cultural festivals. But, for simplicity, here I will look at seasons climatically, as the weather patterns that are expected in periods of the year. These reflections build on research conducted on seasonal cultures and calendars (Bremer *et al*. 2018, 2023a; Bremer and Wardekker 2024; Meisch *et al*., 2022) and aim to trigger a reader's reflections on what climatic seasons mean for European societies more widely. I connect to a wide-ranging body of work on the timings of human–environment relations (see, for example, Adam 2005; Edensor 2010; Ingold 2000; Tsing 2015), which has in some scholars' perspectives, a pointed relevance for climate adaptation scholarship (Bremer *et al*. 2023b). In one sense, 'cultural detachment' from the environment has become a pedestrian story of modernity, with numerous forces in modern society acting to drive a wedge between 'social life' and the 'natural environment' (Bastian 2012). But, I believe it is important to make these seasonal mismatches visible because European societies'

seasonal cultures influence how they cope with variability and adapt to changes in timings over the year, including from climate change.

Seasons as Cultural Frameworks for Reckoning Time

Before looking into Bergen's seasons, I want to reflect briefly on how I conceptualize seasons. I introduced this article defining seasons as weather patterns expected in periods of the year. Expanding on this, I want to suggest seasons are cultures of perception and practice: 'individuals' and groups' perceived patterns in yearly rhythms that they segment into periods meaningful for them, and effect practices that maintain or change these patterns' (Bremer and Wardekker 2024). What I mean here is that populations distinguish patterns in meteorological rhythms – the way rhythms of winds, precipitation, temperatures, cloud cover and sunshine hours interact in a particular way – and sense or name that pattern as a season.[a] In this way, seasons are a way of reckoning time, dividing the year into periods of expected meteorological conditions, to anticipate those conditions and plan activities to occur 'on time' (Hastrup 2016). While I would argue, alongside others, that this holds true for more-than-human populations (of cohabiting plant and animal species), I will focus on humans here.

This perspective follows a long tradition in anthropology of seeing seasons as defined by society's activities. It is through people's engagement with the environment that seasonal patterns become apparent (Bourdieu 1977; Ingold 2000; Krause 2013). And this has long been the case, with researchers recently interpreting seasonal calendars painted on the walls of the Lascaux cave, 20,000 years ago,[b] tracking the moon and the lifecycles of the animals cave dwellers hunted. Indeed, the etymology of the word 'season' is from the Latin 'to sow', evoking agricultural cycles. On one hand, this means that seasonal frameworks are specific to groups engaged in activities, such as agriculture, or indeed the collection and analysis of weather data. Meteorological measurement and forecasting is also a human activity ordered seasonally. On the other hand, to coordinate activities across social spheres, societies develop shared seasonal reference points with common names. And these shared seasons become ingrained in the narratives that populations tell about themselves and the places in which they live. In this way, there is a normativity to seasons, an ideal to which seasons should perform. Against this ideal people will talk about 'good' or 'bad' weather for the season (Meze Hausken 2007). In her research in a Norwegian town near Bergen, anthropologist Kari Norgaard (2011) heard people's disquiet about dwindling winter snow on the ski slopes, that there ought to be snow in winter.

Insofar as seasons are ingrained in our cultures, they can become established as unquestioned 'natural categories' or laws of nature that populations draw on for making sense of the world. We lose sight of their cultural roots and talk about seasons as an indelible part of the environments we inhabit (Douglas 1986). They come to be seen as a Platonic ideal – a perfect, absolute, and eternal version of the

year – to which the actual seasons poorly compare. In this way, people recognize seasonal concepts as abstracted versions of the world, removed from the messy variability of year after year. Owing to the complex and dynamic interactions between socio-environmental systems, seasonal cycles 'repeat with difference' (Lefebvre *et al.* 1999), such that no two summers are alike and rarely do they fulfil the conditions culturally typified.

Comparing Cultural and Meteorological framings

The Four Culturally Defined Seasons of Bergen

Turning to Bergen, I started by digging through research conducted between 2018 and 2020, when studying Bergen residents' relation to climate through interviews and ethnographic work (Bremer *et al.* 2020; Krauß *et al.* 2018a, 2018b). Concepts of seasons significantly shape people's relation to the climate here, serving as a backdrop for people's memories (Bremer *et al.* 2020). When first asked to talk through the seasons, interviewees invariably turned to the four-season model, with some people sensing seasons as quite distinct; 'here it's full-on: it's full-on winter, it's full-on summer' (Bremer *et al.* 2020: 6). Indeed, distinct seasons are key devices in the public narratives Bergen city tells about itself, particularly the punchy arrival of spring. There is a municipality pamphlet noting: 'Bergen is a city with a dramatic landscape, and due to heavy rainfall, the spring is especially colourful and beautiful here' (*Bergen Kommune* 2018: 8–9). Tour operators too market Bergen's seasonal experiences:

> In [the Norwegian fjords] there are big differences between the seasons. The long winter in which a thick layer of snow covers the mountains. A bubbling spring. A summer full of contrasts. And autumn when nature puts on its most colourful display. (Fjord Norway 2017: 25)

However, other people spoken to felt that the seasons were smudged together by the long periods of rain in this, 'Europe's wettest city'. They distinguished seasons by periods of more or less intense rainfall, with spring perceived to be the driest time of the year. For others, seasons were signalled by the daylight, with some lamenting the depression that sets in with the shortening days in October/November, or the new hope that arrives with the lighter days in March/April (Bremer *et al.* 2020). This showed dissention from the four-season model.

With seasons often apprehended through their activities, Bergen residents also signalled the seasons (and 'sub-seasons' – see Orlove 2003) they expect by recounting the activities they associate with a season. Winter encompasses the cosy sub-season of Christmas, for instance, marked by lights and decorations in the streets, a Christmas market, a busy programme of Christmas dinners with friends and colleagues. Winter is also associated with snow activities, such as ice-skating, skiing, and sledding. Spring is associated with the colours of gardening and the busy cultural calendar of Bergen, from the national day to the host of music festivals. Summer is

associated with water sports – swimming or sailing in the fjords – and school holidays. And autumn is associated with agricultural and forage activities, food festivals, or hibernation.

This also echoes a study done 13 years ago by Elizabeth Meze-Hausken (2007: 21), who studied weather and climate-related front page stories in the local *Bergens Tidene* newspaper, finding that 'Seasonal issues receive by far the most attention on local weather and climate news'. Digging out Meze-Hausken's article, I saw there too a default division of the year into four seasons, ordered into three Gregorian calendar months each, and clear expectations of what constitutes 'good' or 'bad' weather in each season. For example, a good winter day is judged in sunshine hours and sub-zero temperatures, while good summer days should be warm bathing weather. In spring, expectations of escaping the winter months drive perception of good weather so that 'days with some sunshine/moderate temperature [...] are described as wonderful' (Meze Hausken 2007: 23). 'Bad' weather is usually associated with rainfall, even if rain is common in Bergen. Autumn is linked to extended periods of rain.

That Bergen residents think in terms of a four-season model should come as no surprise, since they are raised with the concept. My daughter started school in Bergen in August 2023, and one of the first structuring devices used to organize the curriculum was around seasons, depicted in the four stages of a deciduous tree. Students painted the fiery colours of autumn on tree pictures. And other cultural spaces for children (and adults) in the city are the same. Perusing the children's section at the public library, for example, I found Norwegian books on seasons that opened with sentences such as: 'The year is divided into four seasons: winter, spring, summer and autumn' (Berg 2004). The book entitled 'Autumn' certainly depicted the kind of 'romantic' images Bergen experienced last October/November – the crisp air, and children playing in piles of dry leaves (Berg 2004). I also found books originally published in other countries – the US, UK, or Germany, for example – but translated to Norwegian. This is interesting because it implies that the four seasons experienced in Germany, for example, are comparable to those of Norway, even if Berlin is more than 7° latitude south of Bergen.

Another insight into the seasonal framework Bergen's children are raised on can be seen in the calendars they draw; the symbols they use to mark the year. I flicked through a stack of colourful drawings I have on my shelf, drawn by children at a science fair in Bergen in 2019. At that fair we set up a stand where children could draw symbols of their year on a rectangular paper template drawn to resemble a traditional Norwegian 'primstav' (more on the primstav below). We received a total of 129 primstavs with a diversity of symbols, though some symbols emerged as prominent climatic or phenological markers of seasons, including the sun as a summer marker (75 primstavs), snowflakes and snowmen in winter (75), green plants, flowers, and berries in spring (89), and autumn leaves and bare trees in autumn (33). Rain symbols featured on only 16 primstavs, which is curious in a city that receives an average of 2495 mm/year of precipitation (measured at 'Florida' station 1991–2020) over 200 rainy days. Other symbols were associated with cultural

events or important days such as family birthdays. For evidence that these symbols are institutionalized into how children think about the year, I need only look to my kitchen wall. My daughter made me a 2024 calendar, with each month's image standardized across the school, including: January – snowman; February – carnival; March – a rising sun; April – an Easter rabbit; May – a garden of flowers; June – a poem about swimming and holidays; July – sunglasses and ice-cream; August – a butterfly; September – a fallen leaf; October – Halloween; November – an umbrella; December – Christmas.

Without labouring the point further, I see a relatively clear cultural picture emerge of four seasons in Bergen, tied to the Gregorian calendar, with clear expectations of weather for seasonal activities during three-month periods, symbolized by the summer's sun, winter's snowflake, spring's new growth and autumn's leaves, for instance. This framework is instilled in the population from a young age, through the school curriculum for example, until it becomes taken for granted. But to nuance this, some Bergen residents' relationship to rain – as an important motif in this city – does act to blur these stark seasonal contrasts, and feature in their representations of the year; e.g., symbolizing November with an umbrella.

Climatic Statistics in Bergen

But how well does Bergen's climate match the local populations seasonal expectations? I walked down the road to the Bjerknes Centre and asked some meteorologist colleagues how they divide weather patterns into seasonal periods, and what the statistical record tells us about the seasonal climate in Bergen. To the first question they responded that meteorologically Bergen is divided into the same four seasonal periods that culturally define the year, defined by the same calendar months (DJF/MAM/JJA/SON). So far so good. This at least facilitates a clear frame for comparison. To the second question, they sent me looking through the statistics[c] recorded at the 'Florida' downtown measuring station, situated on the lawn outside my meteorologist colleagues' windows. I looked at the contemporary climate measured since 1990,[d] dividing statistics into the standardized three-month periods.

I decided to start with autumn, running from September to November, as the season that started these reflections. Autumn is the wettest season, with an average of 800 mm of rain cumulatively over the three months, getting wetter as the season draws on. October and November are two of the wettest months of the year (268.1 mm and 275.1 mm, respectively) with only December getting more precipitation. This sees October experiencing an average of 18 rainy days (of 1 mm or more) and about 10 heavy rain days (10 mm or more), while November receives 19 rainy days, including 9 or 10 heavy rain days. Predictably, this translates to overcast skies over autumn (74–77% – yearly average 72%), and dwindling hours of direct sunshine, from an average of 96 hours in September to just 30 hours in November. This is a function of cloud cover and the shortening day approaching the winter solstice. Temperatures cool, from a monthly average of 12.6°C in September to 5.3°C in November, although frosts and snow are rare before late November. Only 21% of November days on

average drop below 0°C, and over the past 33 years only 13 Novembers have received any snow at all.

Winter, from December to February, also receives a lot of precipitation (cumulatively over 750 mm), with December receiving on average 290 mm while January and February see 256 mm and 209 mm, respectively. This translates to 18–19 days of precipitation/month over this season on average, including around 9 or 10 days of heavy precipitation. December and January also receive the thickest cloud cover of the year, around 78–79%, and experience the fewest hours of direct sunlight – only 11 hours in December and 14 hours in January. Temperatures are their lowest, from a mean of 3.1°C in December down to a mean of 2.3°C in February. This comes with a high proportion of days that drop below 0°C and bring a propensity for some snow, from 40% of days in December to 52% of days in February. Most winters will see some snow, with only around 10% of Januarys and Februarys, and 20% of Decembers going without snow. But with temperatures regularly above 0°C snow rarely accumulates, instead being washed away in the next shower of rain. As such, the average snow depth over the winter is only between 2 and 3 cm, with average maximums – the deepest the snow lies at any point – of around 9 to 12 cm.

Spring, from March to May, is the driest season, with average cumulative rainfall of around 450 mm and May the driest month of the year, with just 109 mm of rainfall dropped over about 13 rainy days including four heavy rain days. Correspondingly, it is the season with the lowest cloud cover – with April down to 68% cover and May just 61% cover – and increasing sunshine, building from an average of 74 hours in March to 220 hours in May, the sunniest month. Temperatures also steadily warm from mean March temperatures of 3.8°C to 10.7°C in May, but March and April can still see quite a few days drop below 0°C, such that there is often frost and snow in March and April (around two thirds of the years since 1990 have seen snow). But, generally, snow is quite sparse, and the higher temperatures mean it does not last long.

Summer, from June to August, sees precipitation rise again from a dry June with average rainfall of 132 mm over 13 rainy days (four heavy rain days), through a moderately dry July with 158 mm rain over 15 rainy days (six heavy rain days), up to 208 mm in August over 17 rainy days (seven heavy rain days). Cumulative rainfall is almost 500 mm over the three months. Naturally, this sees cloud cover increase over summer – from 65% in June to 73% in August – with a corresponding reduction in sunshine hours, from 162 in June to 152 in July and 142 in August. Notwithstanding the increased rainfall, summer is the warmest season and July the warmest month, with a mean temperature of 15.6°C, closely followed by August at 15.4°C.

So How Seasonal was the Weather Between October 2023 and January 2024?

Returning to the past autumn and winter that started my reflections, how seasonal have they been, culturally and meteorologically? Culturally, we can say that the autumn–winter weather patterns have fulfilled many Bergen residents' idealized representations of seasons encapsulated in schoolbooks and calendars – of crisp

autumn leaves and clear, snowy winter days – although some locals would rather describe this period as typically dark and rainy.

Meteorologically, it has been colder than the 'climate normal' for this period (average from 1991 to 2020) by around 1.5°C, and drier too, with October, December and January getting around 80–90% of the normal rainfall, and November getting less than 30%. This translates to two fewer rainy days than normal in October, December, and January, and 11 fewer rainy days in November. This saw clearer weather, with cloud cover down to 64% in autumn (the values we expect for May/June), and winter also having clearer skies than normal (i.e., 70% in January compared with a normal of 79%). It has also been a whiter winter, with deeper dumps of snow than normal – 14 cm in December and 38 cm in January (over four times the average) – and with drier, cooler weather the snow has remained longer, with an average snow depth of 3 cm in December (average is 2.1 cm) and 5 cm in January (average 2.2 cm). In a recent online blog article,[e] my colleague Erik Kolstad explored how often Bergen has experienced three or more months in a row that are colder than normal. He found that it does happen – there have been 10 instances in the past when there have been 4–7 months in a row that are colder than normal – but it is quite rare.

Bergen's Mismatch in Cultural and Meteorological Seasons

So, to return to the question I posed at the beginning, to what extent do idealized frameworks of seasonal weather match the weather conditions experienced in Bergen?

In a word, partially.

On the one hand, situated at around 60° latitude, the solar insolation Bergen receives does give rise to a seasonal pattern that approximates the European four seasons, as markedly distinct from tropical seasons for instance. Winter is the coldest period of the year, and summer the warmest, and the transition between these extremes describes something like spring and autumn, particularly phenologically. And arguably spring's weather quite closely matches the cultural ideal, associated with increasing sunshine after the long dark of winter, thawing snow, and in Bergen's humid climate, colourful blooms.

On the other hand, Bergen's mild, wet climate arguably smudges the other three seasons together, so that typical four-season cultural symbols and expectations poorly hold. Take winter, when Bergen residents await crisp clear skies and snow underfoot, although climatically this period is usually heavily overcast, with high precipitation that mainly falls as rain, and ensures that any snow cover is fleeting. A snowman is a questionable symbol for winter here. What about summer? It is culturally symbolized by a sun and sunglasses, bathing and ice-cream, yet summer here – at least July and August – is climatically quite overcast and rainy. July is only the fourth driest month, and August the sixth driest with more cloud cover than average. The best we can say is that the sun symbol represents warm temperatures, as summer is warmest. Autumn is notoriously wet, so while many trees here are

deciduous their leaves are quickly washed off the trees by rain, so they appear less often in their crunchy colourful form than as a slippery morass, viewed from under the dripping hood of a jacket.

Based on this comparison, I argue that in Bergen the four-season framework has limited purchase for describing the climate or anticipating weather conditions along the year. Here, some readers may interject and assert that I am levelling unfair criticism on the four-season framework, which is a cultural abstraction of ideal conditions used to divide up the year,[f] and not supposed to account for the variability of weather from year-to-year, or from place to place. They may argue that I am comparing two unlike things. In rebuttal, I would offer up three arguments that justify this comparison and that my assessment is valid.

First, that cultural frameworks of seasons have been devised *precisely* for the purpose of describing and anticipating climatic and other environmental conditions of importance to societies' activities. Synchronizing natural and social rhythms is one of their central cultural functions. I refer to the earliest calendars found in the caves at Lascaux, where the calendar would surely only have been credible insofar as they described conditions necessary to time the hunt. I do recognize that calendars also serve an important coordination function within society, providing shared cultural reference points around which social activities can synchronize (Jordheim and Ytreberg 2021), and that this can be quite independent of environmental conditions. But even in these cases, reference points usually take root in environmental cues, for example, European school holidays were timed to enable children to help with tasks in agricultural high seasons.

Second, in recognition of diverse global climates, there are multiple seasonal frameworks actively drawn on by societies around the world today, recognizing anywhere from two to six (or even more) seasons over the year (Orlove 2003). Indeed, even within the same country there have historically been multiple seasonal calendars. In Norway, archaeologists have turned up about 650 primstav calendars – traditional plank calendars – from between the 1400s and 1800s, which often differ from community to community. So, seasons have always been place-specific, and are supposed to account for particular (micro-)climates.

Third, the mismatch I see here is not based on interannual variability, or the exceptions that do not fit the rule. My focus on climate – on statistical averages over 30 years or more – means I iron out that variability and start from an average measure of climatic seasons. When I discuss a mismatch, it refers to a consistent climatic departure from the cultural ideal, when the two fail to align much more often than they do align. In other words, I compare like with like; a cultural abstraction with the corresponding climatic abstraction.

In parallel with my comparison of cultural norms and meteorological statistics, another argument for this mismatch can be made referring to widespread travel practices in Bergen. As a long-time resident in Bergen, I can assert that a significant set of the population will travel to the mountains to ski each winter, and many own a mountain cabin for this purpose. In other words, residents travel to find the conditions necessary for the activities they associate with winter. Conversely, during

the summer holiday break, which falls in July, a significant portion of the population (those with the resources) will travel south to find summer conditions – hot sunny skies – in the south of Norway, or on the European continent.

Finally, to round off my argument of a mismatch, I could pose the question in another way: can we conceive of a seasonal framework that would better match with Bergen's climate than the four-season model? For me, the answer is an emphatic yes, and, as I noted above, several respondents I spoke to in earlier research put forward alternative frameworks based on periods of rain, or light and dark for instance. Pulling up the primstav, for example, this calendar was carved on both sides of a plank, where each side represented half of the year; one half was the warm, light half of the year – from 14 April to 13 October – and the other side the cold dark half of the year. Gardeners, agriculturalists and beekeepers nowadays still talk about two broad seasons in similar terms, discussing 'the growing season'.

Driving Forces Behind the Mismatch, and their Implications

In this final section, I want to briefly interrogate how we may have arrived at this situation – where our cultural frameworks of seasons poorly match onto actual climate conditions – and finish by discussing some of the implications for the Bergen population, or Europeans at large. Insofar as cultural frameworks are developed through social engagement with the natural environment, I claim this mismatch is derived from both social and environmental change. These drivers are many and interconnected, so I will just throw up four here.

Climate change is one obvious driver behind global environmental change, which is rapidly warming the climate of western Norway, over 1°C on average since the 1970s. One way this becomes evident is in the reduced number of days that drop below 0°C, or with a propensity for snow. Climate science colleagues (Dunn-Sigouin 2024) tell me that Bergen has lost 18–20 such days since the 1970s and is projected to lose a further 10 days in the near future (2030–2050), so that Bergen will soon have about a month's fewer winter days, and snow will be an even rarer symbol of winter. The climate is measured and projected to become wetter and wilder too, with around 15% more rainfall projected for winter and autumn in 2070, and about 10% more in spring and summer (Norwegian Centre for Climate Services 2022). This wetter climate will further smudge distinctions between the four seasons in Bergen, with implications too for phenology; the 'growing season' is projected to lengthen by 2–3 months, and spring flowers will bloom in February. This information saw Norwegian outdoor clothing brand Bergans recently pair up with the Worldwide Fund for Nature (WWF) to petition UNESCO to list seasons as a world heritage under threat from climate change (Bergans 2024).

Another environmental driver comes from changes in the cultural landscape. Bergen is surrounded by low mountains, around 300–600 m high, and this hilly landscape provides seasonal cues for residents. A report by the municipality (Bergen Kommune 2002) shows that, up until the 1950s, the mountains were used

for grazing and they were largely bare of vegetation, so that snow settled in winter and wild flowers came with spring. But as grazing stopped, the hillsides became overgrown with heather, juniper and other trees and bushes. Around the same time there was an uptick in reforestation efforts, which now sees the mountains covered with coniferous forest, of spruce and pine. Together, this has transformed the landscape and seasonal colour palette, with autumn leaves less common, and snowfall less visible.

Changes in Norwegian society are also driving this apparent mismatch. Here, I refer back to the primstav calendar as illustrative of how the year was perceived in a fundamentally different way just 200–300 years ago (Bremer and Wardekker 2024). The framework itself was different, with the primstav aligned to the Julian calendar, and capturing the year in two seasons – of winter and summer – on either side of the plank. Within this framework, the markers or symbols of seasons were associated with Christian holy days, and agricultural cues and proverbs tailored to the conditions of particular valleys; when to plant, fish, or hang a bell on your horse. Consider how differently the year is patterned in Bergen today; founded on a Gregorian calendar and divided into four seasons that are roughly standardized nationally, where urbanized communities have little use for agricultural cues, and the diversification of religions and growing atheism empties Christian days of meaning for many. In 2020, we held a workshop with Bergen residents to produce a modern-day primstav for Bergen. While their calendars did include some holy days such as Easter, phenological markers such as blueberries, and meteorological markers such as snow, most markers related to modern-day social organization: the school year, music festivals, or when to put winter tyres on the car.

Two other symbols included on our modern-day primstav for Bergen – UN Day and Halloween – serve to illustrate a fourth driver of this seasonal mismatch; globalization. Today, Bergen is intertwined with the global flow of people, goods, ideas and media, and this influences how the population considers their year. I think back to my daughter's calendar, where October was symbolized by a haunted house, a reference to Halloween. While the pre-Christian festivals associated with Halloween have ancient roots (in Norway too), the modern-day ritual of dressing up and trick-or-treating is quite recent. Norwegians growing up in the 1980s recall that Halloween then was only something seen in American movies. Yet, only half a generation later, and this ritual has embedded itself in Norwegian representations of the year. Still looking at the calendar, I see my daughter has drawn a desert island complete with palm-tree in summer. Here again, an overseas symbol of hot sunny landscapes is edging into Norwegian's view of the year. What I take from this is that the four-season framework is also about connecting to globally prominent visions of seasons – in films and books for instance – in order (perhaps) to coordinate to the same rituals carried out simultaneously 'worldwide' (at least in high-income 'western' countries). It may be more relevant today to connect to international rituals than to connect to the climate in a particular place (see, for example, Edensor 2010).

So, having established there is somewhat of a mismatch between the cultural and climatic seasons in Bergen (and likely other places in Europe), and thrown up some

explanations for how this mismatch comes about, why does this matter? Why is it a problem to symbolize winter with a snowflake in places without snowfall? We often use outdated symbols. The symbol for a public telephone, e.g., in a train station, often resembles the landline telephones with a rotating dial that were phased out in the 1990s, but it serves its communicative function.

Well, on the one hand, it does not matter. We maintain a lot of seasonal rituals because they serve a contemporary social or cultural function, of bringing people together or coordinating action, even if the original environmental roots have long since shrivelled. In Bergen, many celebrate the Sankthans or midsummer festival, where a tower of barrels will be burned by the harbour, although any tethers to agriculture are no longer obvious. A calendar utterly detached from the natural environment would still have value and meaning for societies.

On the other hand, this mismatch raises reasons for concern (Bremer and Wardekker 2024). Seasons come with normative expectations for what meteorological and phenological conditions should be, which are increasingly unrealistic and can lead to unsustainable behaviour. Consider the habit of Bergen residents flying to the Mediterranean in July to find the summer conditions they have come to expect, e.g., the desert island and the palm-tree from my daughter's calendar. In addition, seasons and their symbols cease to be functional cognitive cues for people to understand and situate themselves in annual cycles; we lose a sense of time. As an example of this confusion, at one primstav drawing workshop with children in Oslo in February 2020, one child became upset that she had drawn the year 'wrong' because she had only drawn January with snow, yet she thought there should be three months of snow. Another concern is that we come to see our cultural models of seasons as fixed natural categories – a snapshot of a stable environment like a baseline – and chart deviations as signs of environmental change alone. Yet our seasonal frameworks are continuously evolving with both environmental and social change, so any seasonal mismatch is as much a problem of how we culturally conceive of seasons as it is of environmental change. And this has relevance to how we adapt to climatic change. When we develop unrealistic seasonal ideals (e.g., of summer as desert islands) then we become more vulnerable to climatic changes (e.g., 10% more rain projected in Bergen's summer).

How can Bergen's (and Europe's) populations address themselves to seasonal mismatches, for example as part of climate adaptation? First, I suggest this means recognizing seasons as cultural frameworks for interpreting the environment and organizing society, not as indelible natural categories. Second, it means recognizing that seasonal frameworks have always evolved, and will always evolve with the complex shifting relations between the environment and society. They are not static categories. Third then, it means European societies should be consciously rethinking which seasonal frameworks make sense in the place they live, and what symbols or meteorological conditions to attach to these seasons. Rather than a snowflake, does winter come to be symbolized by floods in Bergen, the same way NE Bangladesh societies symbolize summer with floods (Bremer *et al*. 2023a)? Or does February start to be symbolized by flowering and the start of the growing season? Or does summer

on the European continent come to be symbolized by extreme heat and wildfires? The way we divide the year by seasonal expectations affects how we adapt to the meteorological conditions we come to face.

Acknowledgements

Competing Interests

The author declares none.

Notes

a. Here again I want to re-emphasize that studies show communities distinguish seasons according to a complex relation between diverse climatic, environmental and social rhythms. See, for example, indigenous communities defining seasons by ecological indicators and cultural practices (Chisholm-Hatfield *et al.* 2018). Seasons are much more than meteorological patterns.

b. https://www.artnews.com/art-news/news/amateur-archaeologist-decodes-ice-age-calendar-cave-paintings-animals-1234652741/ (accessed 25 January 2024)

c. Predominantly using the following webpages/databases: https://seklima.met.no; https://era5.lobelia.earth/en/?lon=5.315420099569055&lat=60.4277972796008&zoom=17.102000000000004

d. Note that statistics on sunshine hours are taken between 1990 and 2005.

e. https://klimavarsling.no/2023/12/25/hva-er-sannsynligheten-for-at-januar-2024-blir-kald-rent-statistisk/

f. Another way of phrasing this same argument may be to suggest seasons are broad natural categories, to which specific instances of seasons rarely (if ever) correspond, invoking Platonic ideals. My three arguments in rebuttal would also hold for this argument, I believe.

References

Adam B (2005) *Timescapes of Modernity: The Environment and Invisible Hazards.* London: Routledge.

Bastian M (2012) Fatally confused: telling the time in the midst of ecological crises. *Environmental Philosophy* **9**(1), 23–48.

Berg Ø (2004) *Høst.* Damm: Oslo.

Bergans (2024) https://savetheseasons.com (accessed 18 February 2024).

Bergen Kommune (2018) *The City is Bergen.* Bergen: Bergen Kommune.

Bergen Kommune (2002) *Botanical Survey of the City Mountains in Bergen.* Bergen: Bergen Kommune.

Bourdieu P (1977) *Outline of a Theory of Practice.* Cambridge: Cambridge University Press.

Bremer S and Wardekker A (Eds) (2024) *Changing Seasonality: How Communities are Revising Their Seasons.* Walter de Gruyter GmbH & Co KG.

Bremer S, Stiller-Reeve M, Blanchard A, Mamnun N, Naznin Z and Kaiser M (2018) Co-producing 'Post-normal' climate knowledge with communities in Northeast Bangladesh. *Weather, Climate, and Society* **10**(2), 259–268.

Bremer S, Johnson E, Fløttum K, Kverndokk K, Wardekker A and Krauß W (2020) Portrait of a climate city: how climate change is emerging as a risk in Bergen, Norway. *Climate Risk Management* **29**, 100236.

Bremer S, Stiller-Reeve M, Mamnun N and Lazrus H (2023a) Co-producing representations of summer rainfall in Bangladesh. *Regional Environmental Change* **23**(2), 60.

Bremer S, Klenk N, Bastian M and Kwan-Lafond D (2023b) Adaptation requires attuning to shifting temporal patterns. *Nature Climate Change* 1–3.

Chisholm-Hatfield S, Marino E, Whyte KP, Dello KD and Mote PW (2018) Indian time: time, seasonality, and culture in traditional ecological knowledge of climate change. *Ecological Processes* **7**(1), 1–11.

Douglas M (1986) *How Institutions Think*. Syracuse University Press.

Dunn-Sigouin E (25 January 2024) Personal communication.

Edensor T (ed.) (2010) *Geographies of Rhythm: Nature, Place, Mobilities and Bodies*. Ashgate Publishing.

Fjord Norway (2017) *Fjord Norway Travel Guide 2017–2018*. Bergen: Fjord Norway.

Hastrup K (2016) Climate knowledge: assemblage, anticipation, action. In SA Crate and M Nuttall (eds), *Anthropology and Climate Change: From Actions to Transformations*. New York: Routledge, pp. 35–57.

Hirth ML (19 January 2024) So much snow fell last night. *Bergens Tidene*, https://www.bt.no/nyheter/direkte/i/8JgG7x/saa-mye-snoe-falt-i-bergen-i-natt

Ingold T (2000) *The Perception of the Environment*. London: Routledge.

Jordheim H and Ytreberg E (2021) After supersynchronisation: how media synchronise the social. *Time & Society* **30**(3), 402–422.

Krauß W, Bremer S, Wardekker JA, Marschuetz B, Baztan J and da Cunha C (2018a) *Chronology and In-Depth Analysis of Weather-Related and Place-Specific Narratives of Climate Change*. University of Versaille Saint-Quentin-en-Yvelines.

Krauß W, Bremer S, Wardekker JA, Marschütz B, Baztan J and da Cunha C (2018b) *Initial Mapping of Narratives of Change*. University of Versaille Saint-Quentin-en-Yvelines.

Krause F (2013) Seasons as rhythms on the Kemi River in Finnish Lapland. *Ethnos* **78**(1), 23–46.

Kwiecien O, Braun T, Brunello CF, Faulkner P, Hausmann N, Helle G, … Breitenbach SF (2022) What we talk about when we talk about seasonality – a transdisciplinary review. *Earth-Science Reviews* **225**, 103843.

Lefebvre H, Régulier C and Zayani M (1999) The rhythmanalytical project. *Rethinking Marxism* **11**(1), 5–13.

Meisch SP, Bremer S, Young MT and Funtowicz SO (2022) Extended peer communities: appraising the contributions of tacit knowledges in climate change decision-making. *Futures* **135**, 102868.

Meze-Hausken E (2007) Seasons in the sun-weather and climate front-page news stories in Europe's rainiest city, Bergen, Norway. *International journal of biometeorology* **52**, 17–31.

Norgaard KM (2011) *Living in Denial: Climate Change, Emotions, and Everyday Life*. MIT Press.

Norwegian Centre for Climate Services (NCCS) (2022) Klimaprofil for Hordaland. Last updated April 2022: https://klimaservicesenter.no/kss/klimaprofiler/hordaland#intro (accessed 18 February 2024).

Orlove B (2003) How people name seasons. In Strauss S and Orlove B (eds), *Weather, Climate, Culture*. Providence: Berg Publishers, 121–140.

Stegane E (12 November 2023) Bergen has had 86 hours sunshine in the past three weeks. Oslo has had one. *Bergens Tidene*, https://www.bt.no/vaer/i/0Q6Rog/bergen-har-hatt-uvanlig-mye-sol-de-siste-ukene-og-det-skal-fortsatt-vaere-fint-vaer

Tsing AL (2015) *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton: Princeton University Press.

About the Author

Scott Bremer is a research professor at the Centre for the Study of the Sciences and the Humanities at the University of Bergen, and at the research institute NORCE Climate, and an adjunct professor at the University of Toronto-Scarborough. He is an interdisciplinary environmental social scientist whose work investigates how diverse ways of knowing are (and should be) mobilized in support of governance, particularly around climate adaptation. Most recently his research looks at the influence of seasonal cultures on climate adaptation, recommending seeing adaptation as timely action.