The winter wildfire at Nes in Ørland, February 2026

Overview of weather drivers and factors limiting building damage

RISE REPORT 2026:23

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Abstract

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The wildfire in Ørland, Norway, started on February 7th 2026, and burned over 200 ha during the night, threatening about 18 buildings, of which one ignited. A long snow-free period of dry katabatic winds from the Scandes mountains dried out the dormant vegetation just as a surge in strong winds occurred during the evening of February 7th. Fire danger, in terms of Initial Spread Index (ISI), was classified as *very extreme* just after ignition, leading to rapid flame spread.

Vegetation comprised open heathland dominated by heather, crowberry, and moss, interspersed with small groves of birch and conifers. Surface fuels (particularly heather) were highly flammable, and firebrands bridged fuel gaps with spot ignitions over 200 meters.

A building was destroyed, but several measures prevented the ignition of dwellings and other buildings. Flame contact and firebrand vulnerability was reduced by active measures such as pre-wetting, suppression of fires and fire breaks, and passive preventive measures such as vegetation management, tidy gardens and well-maintained buildings with non-combustible foundations or surrounding gravel.

This report is available in both English (RISE report 2026:23) and Norwegian language (RISE report 2026:24).

Key words: Wildfire, Ørland, Norway, Scandinavia, weather, winter, wind, wildland-urban-interface, WUI, firebrands, vegetation, fuel, ignition, mitigation, buildings.

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Trondheim, March 2026

Content

1 Introduction

Around 4 p.m. on Saturday, February 7th, 2026, a wildfire started at Nes in the municipality of Ørland on the Trøndelag coast of Norway. The fire burned intensely overnight driven by strong dry winds and finally scorched over 200 hectares (Figure 1).

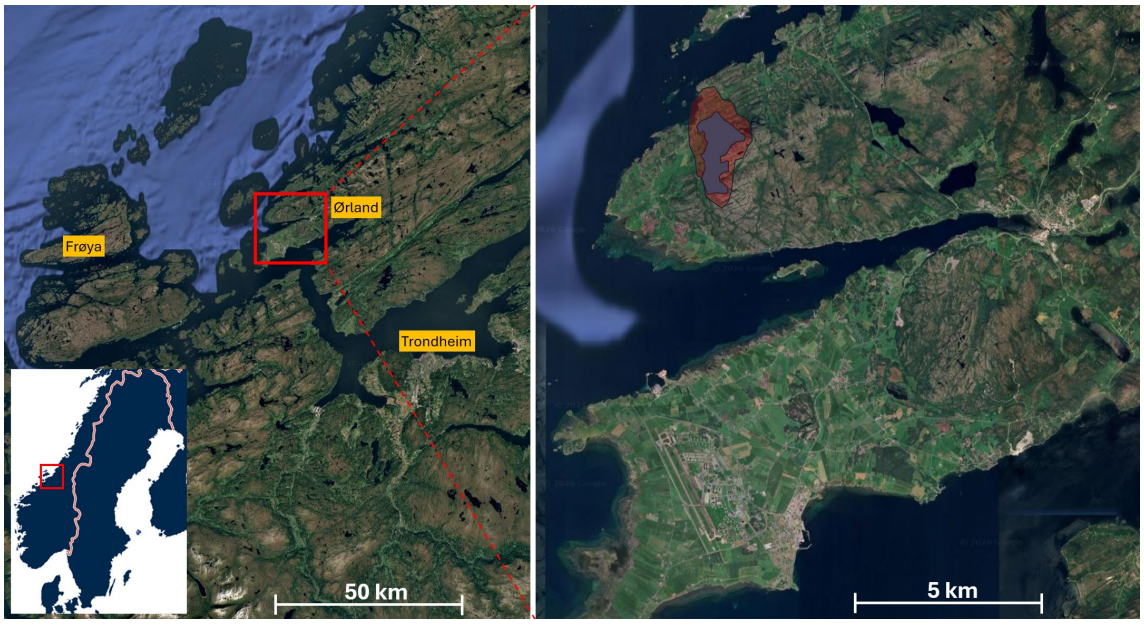

Figure 1. Location of the wildfire at Nes in Ørland, Trøndelag, Norway. Base map: Google Maps, satellite imagery. ©2026 Google. The perimeters on the right panel are the satellite assessments of the burnt area from Modis/VIIRS near real-time platform (red – 250 m resolution) and the Modis/Sentinel-2 (blue – 20 m resolution).

The Ørland fire is one of several wildfires that have burnt during the winter seasons along the coast of Norway, following e.g. the devastating events of 2014 in Flatanger and Frøya, as well as the community conflagration in Lærdal (DSB 2014). These incidents share several defining characteristics: The dominance of coastal fuels such as heather, moss and mixed woods, dry vegetation caused by long stretches of low relative humidity, and rapid, wind-driven fire spread through surface litter and embers during both day- and nighttime of winter months. Together, these factors create conditions for fast-moving wildfires, with significant challenges for the fire- and rescue service.

Due to this rare but recurrent situation and the fire exposure to several buildings in a wildland urban interface (WUI) area, the Ørland incident is an interesting example to study further. In this report, we present an initial overview of the Ørland fire, focusing on weather drivers and factors limiting damage to built structures, based on the information currently available. Information was collected from news and online sources, photos and videos from the incident, and a site visit on February 12th where we met property owners, tenants and the fire and rescue service. This study does not evaluate the fire service's operational response or that of other parties involved. The findings may be subject to revision as additional information becomes available.

2 The conditions prior to ignition

2.1 Fuel and landscape characteristics

The vegetation on the peninsula is a mix of open heathland and smaller groves. The vegetated areas of open heathland are dominated by heather (Norwegian: lyng, *Calluna vulgaris*), crowberry (*Empetrum nigrum*), lingonberry (*Vaccinium vitis-idaea*) and other Ericaceous shrubs, as well as some small juniper (*Juniperus communis*), see photos in Appendix IV. Between and under the dwarf shrubs is a component of mostly feather mosses (notable *Pleurozium schreberi*) and, to a lesser degree, grass litter. The groves, particularly in wind-sheltered hollows along hillsides, are a mix of deciduous species, mostly birch (Norwegian: vanlig bjørk, *Betula pubescens*) and rowan (*Sorbus aucuparia*), as well as conifers such as spruce (*Picea abies*) and pine (*Pinus sylvestris*). Smaller afforested areas of Sitka spruce (*Picea sitchensis*) are also found. The groves have a characteristic understory of feather moss, lingonberry (*Vaccinium vitis-idaea*), crowberry (*Empetrum nigrum*) and both leaf and coniferous litter.

The prevalent non-vascular mosses and the intermixed litter are highly flammable (Sjöström et al 2026) along with the heather. In particular, heather has a large component of dead fuel (Lewis et al 2024) and the evergreen foliage is flammable even under moderate conditions (Log 2020). Deciduous species make negligible contribution to fire behavior, except for loose bark, which may provide limited fuel (Vermina Plathner et al 2023).

The fuel characteristic, typical of much of coastal Norway, is normally not very flammable during high summer due to the high deciduous component, the discontinuous fuel distribution and the mesic weather (Hetzer et al 2024). However, for exceptionally dry winter conditions some areas are easily ignited and flammable. Further, during strong wind conditions fire may bridge gaps in the fuel through wind-borne embers (so-called firebrands), causing spot ignition ahead of the flame front.

2.2 Weather conditions and fire danger

During the winter of 2026, a stable blocking high pressure system was situated over Scandinavia. Its centre (>130 hPa) was located over Finland in January and as it slowly moved westwards it kept a cold and dense air mass over Sweden in early February (Figure A28 in Appendix II). It had been pushing cold air over the Scandes (mountain range along the western Scandinavian Peninsula) for over a week before February 7th (Figure 2b), creating dry katabatic winds. These are characterized by the cold air mass forcing its way beneath the warmer coastal air due to its much higher density. During descent, the air creates strong winds close to the surface and undergo adiabatic heating as altitude decreases, leading to a drastic reduction in relative humidity (RH) (Figure 2a). While RH-values were 70-80% over Sweden and the Scandes, coastal Norway exhibited close to 40% RH, even during night prior to the fire (Figure 2a; Figure A30). A lack of snow and prolonged strong and dry winds had therefore dried out all dead vegetation along coastal Trøndelag.

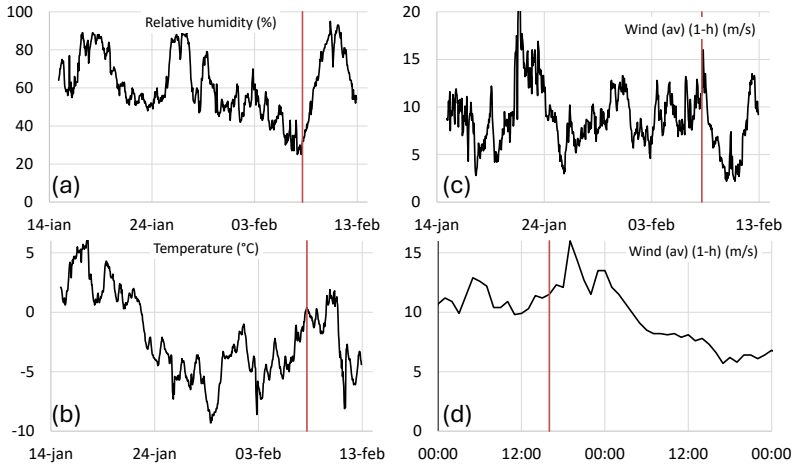

Figure 2. Weather observation from January 15th at Ørland's airport station (Ørland III). (a) Relative humidity, (b) temperature, (c) wind speed and (d) wind speed during 7th and 8th of February 2026. Red lines indicate time of ignition. Data from yr.no.

On February 6th to 7th a low pressure formed in the Atlantic just off the Trøndelag coast, increasing the pressure gradient through a corridor over the Trondheim area (Figure A29) such that local winds became additionally strong (Figure 2c). A surge in wind speed occurred just after the time of ignition on February 7th (Figure 2d). This pushed the ISI-values[1] through most of February 7th to the highest category defined by EFFIS, European Forest Fire Information System[2], as *very extreme* (ISI > 26.8) (Giannakopoulos et al 2020).

Other fire danger indices show that while the fine fuel moisture code (FFMC) was *high* to *very high*, the traditional model for forest fire danger (FWI) was *low* to *moderate* and that the available amount of fuel due to drought (BUI) was *very low* (Figure 3). Thus, simply assessing fire danger through the FWI-index is not sufficient for this area. Instead, the ISI index, representing spread in fine fuel only, provides a better metric for the local risk (Figure 4).

These indices are among several tools used to determine whether a forest fire warning should be issued for a given area in Norway. While the fire danger indices (FFMC, FWI etc) follow a "traffic light" model (from green to red), the national forest fire warning only use yellow and orange[3]. Between January 27th and February 8th, Ørland was under a yellow forest fire warning (see map in Appendix II).

[1] ISI – *Initial Spread Index*, is an estimate of the potential initial rate of fire spread, a component of the Canadian fire weather index system, see Lawson and Armitage (2008).
[2] EFFIS is one of the Emergency Management Services in the EU Copernicus program.
[3] The color scale for the forest fire danger indexes (ISI, FWI etc) follow a "traffic light" model, a system widely used internationally. The colors progress from green up to red or similarly intense shades. Forest fire warnings, issued by the meteorologist officer on duty (vakthavende meterolog) only use yellow and orange. Red is reserved for extreme weather events. More info: https://skogbrannfare.met.no/

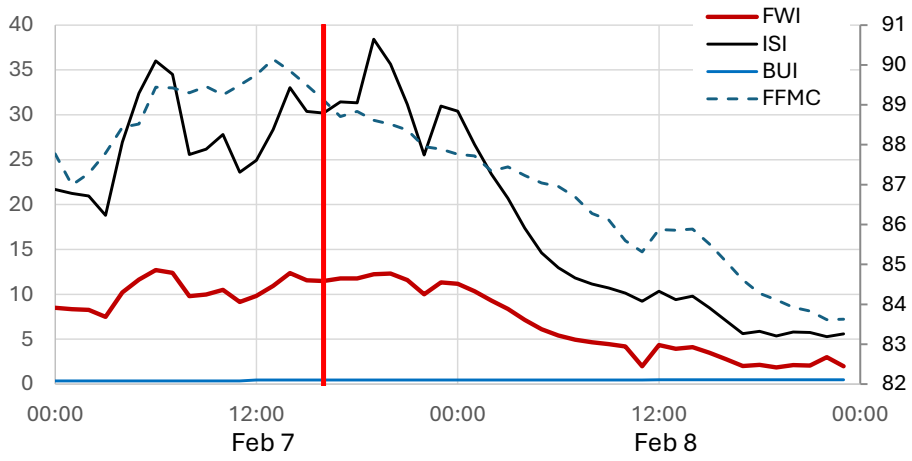

Figure 3. Hourly fire danger index (see Lawson and Armitage 2008) FWI, ISI and BUI (values on left y-axis) and *Fine Fuel Moisture Code* – FFMC (values on right y-axis) during February 7th and 8th based on Ørland's airport station data. Ignition time is marked with a vertical red line. Note that ISI (and thus also FWI) is calculated using the new ISI2025-code, which is adjusted for very high wind speeds.

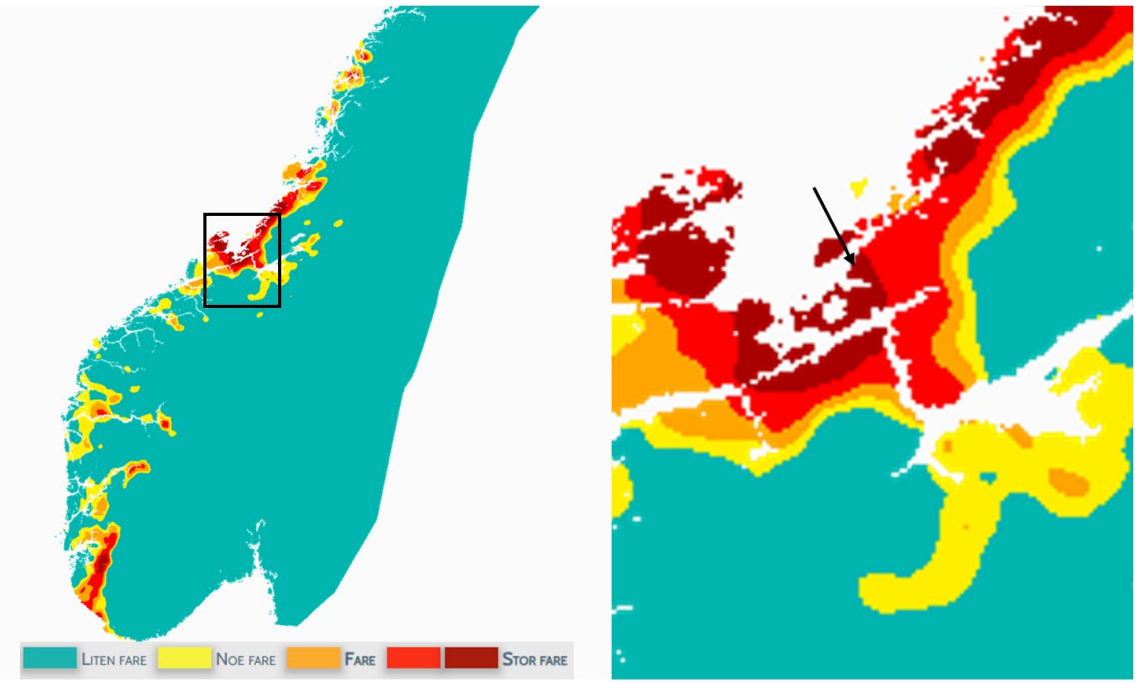

Figure 4. Map of forecasts for February 7th issued on February 7th 2026, for southern Norway (left) and the area around Ørland (square, marked by arrow), showing the ISI index. Colours green to red represent low to high danger. Map provided by MET upon request, used with permission. Maps for FFMC and FWI are given in Appendix II.

Note that this weather situation is a Scandinavian equivalent of the south Californian Santa-Ana winds that, combined with an unusually long drought, enabled the catastrophic LA fires of January 2025. Cold, high-pressure air from the highlands to the east was pushed down the hillsides undergoing drying through adiabatic warming (Guirguis et al 2025).

Also note that the same local characteristics prevailed over western Norway during January 2014 when Norway experienced three exceptional fire events (DSB 2014). The structure-to-structure fire in Lærdalsøyri (Vestland), January 18-19 destroyed 40 buildings of which three were listed cultural heritage wooden buildings within the UNESCO world heritage old town (Steen-Hansen et al., 2015). Just over a week later, the large 1 500 ha wildland-urban-interface fire at Flatanger (Trøndelag), where 64 buildings (thereof 23 dwellings) were lost, and the 1 000 ha wildfire on Frøya, an island at the coast Trøndelag, close to Ørland (see Figure 1). All these events were characterised by very strong and exceptionally dry winds during both night and day. In fact, the oldest record of such event is the 1913 fire on Finnøy in Boknafjorden north of Stavanger, burning a spruce plantation on January 22nd (see Figure A34 in Appendix II). Unlike the fire studied here, the 2014 events were not characterized by a blocking high pressure over Sweden. Instead, the area exhibited more Föhn-type winds than typical katabatic ones. The effect was nevertheless the same, with consistent dry and easterly downslope winds from high temperature gradients over the Norwegian coast over all of January 2014. Thus, even though relatively rare, different types of weather systems enable these local, dry and very strong winds during winter days (and nights) over the Norwegian coast. When such events occur over snow-free areas, the combination with winter dormant vegetation yields very high fire danger.

3 Chain of events

The information in this section is compiled using several data sources, as given in the introduction. Figure 5 shows the impacted area, marking points of interest and the scorched area.

A wildfire started at Nes in Ørland around 4 p.m. on Saturday February 7th, in the terrain (photo in Figure 6, marked by a star in Figure 5) close to the water supply dam. Nearby was a recreational shelter (gapahuk, location 1 in Figure 5) and buildings for the water supply facility (location 2). During Saturday afternoon and evening, the fire spread (red arrows) in the terrain in all directions from the fire origin, with the main spread direction following along the hillside of the Tønnølsfjellet mountain towards northeast. In the terrain, fire services reported spot fire ignitions several hundred meters ahead of the fire front[4]. During the night to Sunday, the local wind conditions changed, and the fire started spreading also more northwest, towards properties with buildings (locations 3, 4, 6, 7, 10).

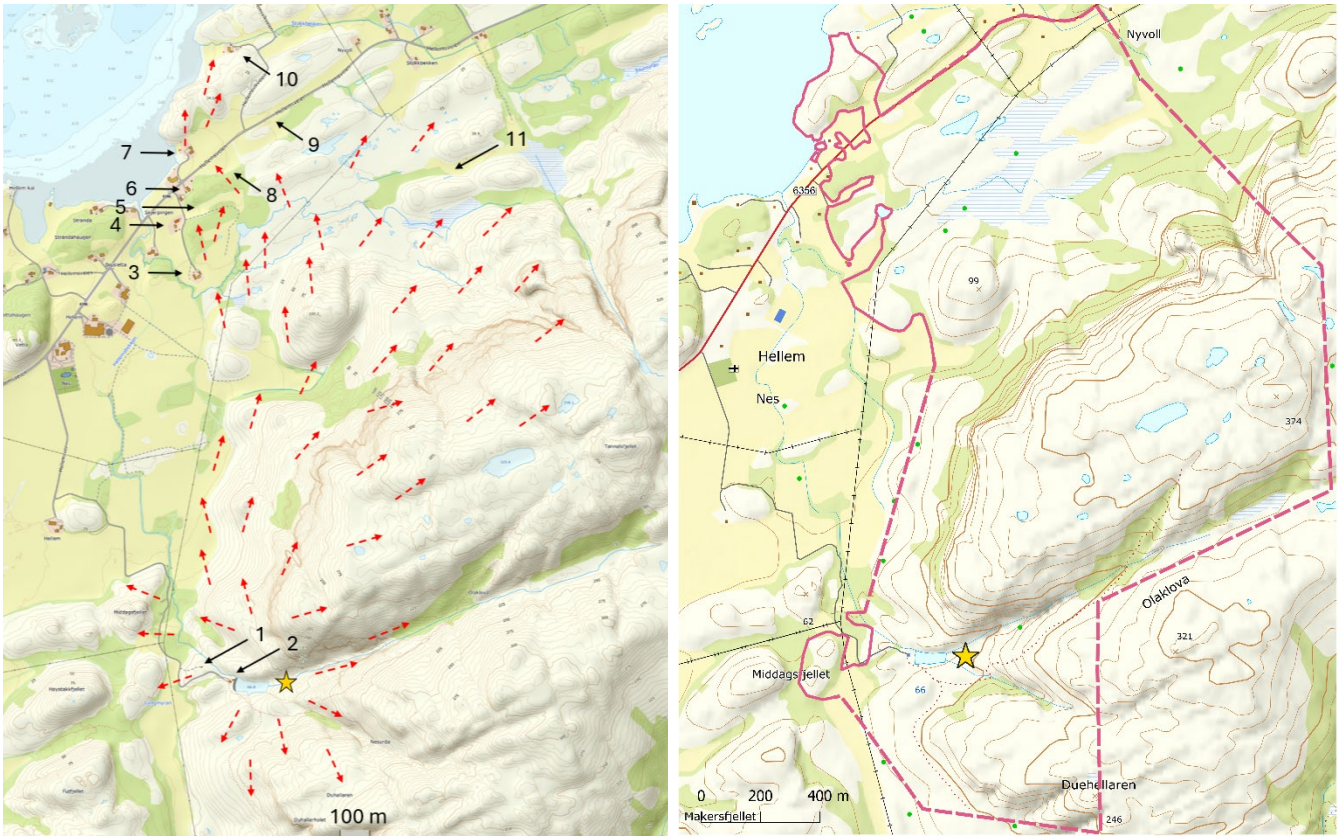

Figure 5. Left figure: The fire started (star) and spread in the terrain (red arrows) to several properties (1, 2, 3, 4, 6, 7, 10). Other points of interest (5, 8, 9, 11) are also described in the text. The figure is illustrative and should not be considered exhaustive. Base map: © norgeskart.no / Kartverket (CC BY 4.0). Right figure: The burned area. Verified fire perimeter is given by full pink line, preliminary fire perimeter by dashed pink line (the fire perimeter in the mountainous region remains uncertain, as of 2026-02-24). The point of ignition is marked with a star. Base map: Kartdata, WMS version 1.3.0, Kartverket (CC BY 4.0).

[4] Observations indicate spot ignition distances in the terrain up to ~400 meters.

Figure 6. Screenshot from a video taken minutes after the fire started, ca 4:15 p.m. on February 7th, showing the point of ignition (marked by star in Figure 5), viewing towards the east. Video shared by a private citizen, via Fosen fire and rescue service IKS (used with permission).

During peak wind conditions, around 1 a.m. on Sunday, a forested area (location 8) of approximately 70 x 200 meters was burning intensely. Post-fire inspection showed significant combustion of the forest floor, smaller trees and bushes, and also torching of mature conifers. Video recordings at 01:17 (Figure 7) additionally show substantial firebrand transport very close to the ground. From location 8, the fire jumped 200 metres across a field, igniting the terrain near location 7, and continuing over the hill towards the property in location 10. The fire in the built areas was stopped by the fire service at the creek just north of the property in location 10. The fire continued in the terrain along the hillsides of Tønnølsfjellet after this, with a wide fire front stretching from the top of the mountain and all the way down to the agricultural areas towards Hellemsveien (see Figure 8 and Figure 9).

Figure 7. Screenshots from a video taken at 01:17 in location 9 in Figure 5, viewing towards the west. The fire spread from a forested area (location 8) to the terrain across a field (near location 7 and 10). Video by Fosen fire and rescue service IKS (used with permission). Full video: https://www.nrk.no/trondelag/dramatisk-video-viser-korleis-brannen-pa-oksvoll-i-orland-spreidde-seg-1.17761201

The fire service described the fire intensity and changing wind direction as very demanding, and at one point necessitated pulling personnel out of given areas to avoid injury.

Fire breaks were created by applying water from handheld hoses, from fire service trucks, from airport fire trucks, and by local farmers using a tractor-drawn tank system (slurry tanker/gyllevogn) to spread water or manure. Examples of such fire breaks using manure and water were the field between two forested hills (location 5) and along a small stream at the edge of a field (location 3). These activities were performed during the approach of fire front, but the exact timing has not been mapped here.

Figure 8. Photo taken Sunday morning at 07:07 just before dawn, in location 11 (Figure 5), viewing towards southwest. Flames can be seen from the top of the mountain, all the way down to the agricultural areas, with a variation in fire intensity. Photo by Fosen fire and rescue service IKS (used with permission).

During the firefighting, a drone was used for aerial monitoring and decision support, and a helicopter was used for extinguishment starting from first dawn on Sunday (as they are not allowed to fly in the dark).

Fire spread was controlled on Sunday afternoon, approximately 24 hours after ignition. Mop-up continued into the following week, and surveillance even longer. The fire finally scorched over 200 hectares, or over 2 km^2 (see Figure 5, right). About 45 people were evacuated, and hundreds of livestock were moved to safety[5]. No fatalities or injuries were reported. One garage and a recreational shelter were destroyed, but aside from a few broken window panes on one dwelling, no additional buildings were damaged, see details in chapter 4 and Appendix I.

[5] Ørland municipality website February 9th 2026, https://www.orland.kommune.no/nyheter/lyngbrann-pa-nes-oppdatering-09-02-26.25573.aspx

Figure 9. Photo seen from east towards west, taken Sunday morning around 8 a.m. by the national forest fire helicopter upon arrival. The lowest point of the fire front is nearby location 11. The downslope winds (fallvinder) blowing from the mountain towards the sea (from southeast to northwest) can be seen in the photo. Earlier in the incident, the predominant wind direction followed the hillsides along the terrain (from west to east). The shift in local wind direction was observed around 1 a.m. Photo: Skogbrannhelikopteret (used with permission).

Many different organizations were involved in the handling of the incident, including several fire and rescue services in the region, police, Ørland municipal emergency management teams, the national forest fire helicopter, operators with drones from the Mid-Norway 110 Emergency Dispatch Centre, the Civil Defence, Red Cross, Armed forces, local volunteers including farmers and the local women's health association (Ørland Sanitetslag)[6].

Post-fire inspection showed that a variation of different types of vegetations have been involved in the fire, see examples in Figure 10 and more photos in Appendix IV. In the areas with flat agricultural fields with grass and similar fuels and hills with heather and bushes - there was only surface charring of the ground, and charring mainly on the lower parts (10-50 cm) of bushes and shrubs. In the forested areas between location 3 and 8, torching of tree crowns, and deeper charring of tree trunks were observed, but also uncharred forest floor areas and areas of undamaged vegetation. In other words, fire behavior exhibited large variations in spread rate, residence time, flame length and fire intensity.

[6] Ørland municipality website February 9th 2026, https://www.orland.kommune.no/nyheter/lyngbrann-pa-nes-oppdatering-09-02-26.25573.aspx

Figure 10. Post-fire vegetation. Top: Typical coastal heather landscape (kystlynghei), with natural vegetation including different types of heather, grass, moss, small bushes and trees. Some areas were charred, others undamaged. Bottom left: Forested area in location 8 with charring of forest floor and torching. Bottom right: Agricultural fields, with a clear intersection between charred and uncharred areas, presumably due to pre-wetting or active extinguishing efforts. Photos: RISE Fire Research.

4 Factors influencing building ignition during the event

The fire came close to damaging 5 dwellings, 13 other buildings and several smaller built structures. In the end, one building (a garage) and one smaller built structure (a recreational shelter) were destroyed. Post-fire inspection showed that both passive and active measures influenced ignition (or non-ignition) of structures during the fire (Figure 11). In Appendix I, we present a detailed overview of this for each property at direct risk from the fire.

Figure 11. Both active (left) and passive preventive measures (right) prevented ignition of structures. Left: Water application from a fire truck onto a ground fire, stopping the fire from spreading to a house. Right: Tidy gardens and incombustible building foundation preventing ignition. Details in Appendix I. Photos: Fosen fire and rescue service IKS (used with permission) and RISE Fire Research.

Active measures impacting ignition of buildings: The extinguishing efforts during the incident are not yet fully detailed. In the assessment of the buildings, we have, however, seen clear examples of active extinguishing being a key influencing factor to prevent building ignition during the event. Several examples show that pre-wetting of surrounding vegetation and structures has prevented flame impingement, as well as active suppression efforts arresting or delaying fire spread towards structures. We have also observed effective fire breaks of water and manure that have played a critical role in stopping fires from spreading along the ground towards structures. Note, however, that although fire breaks reduced the intensity locally to save structures, multiple examples of spot ignitions clearly demonstrate their limited ability to completely stop further spread.

Passive preventive measures impacting ignition of buildings: Several passive measures implemented by property owners prior to the incident have been found to play a key role in limiting fire spread and preventing ignition of buildings during the fire. At one of the houses, the residents had undertaken substantial vegetation management during the previous few years, including removal of tall birch, bushes and invasive Sitka spruce around the house. Although partly motivated by a desire for more sunlight onto

the property, the owners also stated[7] wildfire safety as a key reason, drawing on memories of the 2014 Flatanger wildfire and its destructive impacts (DSB 2014). We find that this most likely played a key role in preventing ignition of this building, by reducing available fuels close to the structures, lowering flame lengths, and limiting direct flame impingement and firebrands towards the façades.

Across multiple properties, lawns cut short, a tidy perimeter, limited surface litter and absence of combustible items stored close to buildings were found to be influential. Observations showed, for example, that a robot-mown lawn created a low-fuel buffer where the surface fire self-extinguished. The same was found along a pathway in a grass field, where pedestrian traffic had compacted the grass fuel, preventing ignition.

Another critical factor was the presence of non-combustible materials at the base of structures, such as concrete foundations or brick-and-mortar walls. In addition, gravel immediately adjacent to the structure was found to reduce fire impact. Both acted to prevent direct flame contact with the timber cladding.

In several cases, a combination of factors was critical, such as low vegetation together with non-combustible foundations. If the vegetation had been taller, or debris had accumulated against the wall, ignition pathways would have been likely to be available.

Finally, façade maintenance likely contributed to the resilience of buildings exposed to radiant heat and spot ignition during this fire. Poorly maintained timber façades with small cracks or other openings and gaps, may allow firebrands to lodge and smolder in accumulated dry light fuel. Such areas also represent weak points when a structure is exposed to radiant heat. This was particularly evident in one house, which was not only exposed to the vegetation fire, but also to radiation from a nearby burning garage.

[7]Interview with NRK news, https://www.nrk.no/trondelag/forsker-fra-rise-fire-research-oppfordrer-nordmenn-a-brannsikre-hagene-sine-1.17770930

5 Discussion and outlook

Dry and windy weather events over coastal Norway: Large fires during the winter in the northern hemisphere are reoccurring, although usually within specific regions such as semi-arid winter-cold steppes. Within ten days of the Ørland incident, large grassfires broke out in Oklahoma covering 120 000 hectares as of February 7th. Other examples include the 2021 new year Marshall grassfire, burning over 1 000 structures (Fovel 2022) or the 420 000-hectares Smokehouse Creek Fire, the largest wildfire in contiguous USA during the 21st century (Pal et al 2025). However, in most of the northern hemisphere, wildfires during January and February are orders of magnitude fewer than the high-summer events, warranting close assessment of the specifics of the Norwegian coast.

As described above, the phenomenon of strong and very dry winds down the Scandes towards the Norwegian coast is rare but occurs sporadically. Nevertheless, fire spread under such conditions is highly difficult to control as for many wind-driven events. Several types of meteorological systems can cause similar local weather conditions along the Norwegian coast, but the common denominator is a period of easterly downslope winds (in which cold dense air dries upon descending the hillsides) and a lack of snow cover.

Climate models predict a slight increase in forest fire danger during summer for boreal Scandinavia (Hetzer et al 2024; Berg et al 2024). The risk of early season grass fires does not show any clear trend over the Scandes, but the coastal regions are yet to be studied (Sjöström and Vermina Plathner 2026). In the present example, ambient conditions were caused by a blocking high-pressure over Sweden, and we cannot find evidence for increasing effects of such events in a changing climate (Lohmann et al 2024; van Mourik, et al 2025).

Instead, we recommend keeping the possibility of similar weather conditions in mind when preparing for future wildfire hazards instead of strictly seeking advice from larger scale forest fire danger metrics. The specific situation on the Norwegian coast requires special attention to snow-free events and dry easterly winds, which have occurred many times in the past and likely will occur in the future.

Lessons learned on factors limiting building damage: The assessment of factors influencing building ignition during the event shows that active firefighting, as well as pre-wetting of vegetation and making fire breaks had a large impact. However, in the case of a large or complex wildfire, active suppression is not always possible, if e.g. the fire hits in multiple locations simultaneously, or if the conditions do not enable access to the site.

When that is the case, our assessment illustrates how routine maintenance and low-cost passive measures can make a difference in safeguarding a property if a wildfire approaches. Vegetation clearance, removal of tall trees close to the building, keeping the grass short and avoiding storage of combustible items near the building can all make a difference, as has also been shown in Sweden (Vermina Plathner et.al. 2023). In addition, non-combustible building foundations, or on the ground around the building, can also prevent ignition, as can good maintenance of wooden façades. There is always an element of chance in structure survivability, but these measures can shift the odds in one's favor.

The findings align closely with the recently developed WUI guideline for Norway (Figure 12), which present protective measures for homeowners.

Figure 12. WUI guideline for Norway (Gribble et al., 2025).

Further work: Learning from wildfire incidents remains essential. This event highlights several areas where further work is needed to strengthen understanding, preparedness, and future response to wildfires in Norway. There is a clear need for continued documentation and analysis of fire behavior of Norwegian natural fuels. The Ørland wildfire illustrates episodes of considerable involvement of tree crowns (Figure 10) and long-distance spot ignition. Systematic knowledge is needed about how local vegetation burns, and how fire spreads in scenarios unique to Norway, such as in this winter fire.

Although it is not the focus of the current study, an important aspect of wildfires in rural Norway is the interplay between part-time firefighters (Almklov et al 2026), local communities, volunteers, civil protection personnel and others. Understanding how to best utilize local, regional and national resources, and how to support communities in contributing safely and effectively, remains an important area for further work.

6 References

Almklov, P.G., Gjøsund, G., Haavi, T.K., Antonsen, C.W., 2026. Don't quit your day job. Part-time firefighters in rural Norway. International Journal of Disaster Risk Reduction 135. https://doi.org/10.1016/j.ijdrr.2026.106054

Berg, P. et al. (2024) *Framtida brandrisk – förändringar i perioder av hög brandrisk enligt FWI-modellen*. Myndigheten för samhällsskydd och beredskap, MSB2301; ISBN: 978-91-7927-469-6

Dybeck W (1915) Synpunkter vid skogsbrandförsäkringsfrågans ordnande i Sverige, 1. Föredrag. *Skogsvårdsföreningens tidskrift* , pp. 401-418.

DSB 2014: 'Brannene i Lærdal, Flatanger og på Frøya vinteren 2014, Læringspunkter og Anbefalinger [The fires in Laerdal, Flatanger and Froya in winter 2014. Lessons learned and recommendation]', DSB [The Norwegian Directorate for Civil Protection], Oslo, HR 2286, 2014.

Fovell RG, Brewer MJ, Garmong RJ (2022) The December 2021 Marshall Fire: Predictability and Gust Forecasts from Operational Models. *Atmosphere* 13, 765. https://doi.org/10.3390/atmos13050765

Giannakopoulos C, Karali A & Cauchy A (2020) Fire danger indicators for Europe from 1970 to 2098 derived from climate projections, version 1.0. *Copernicus Climate Change Service (C3S) Climate Data Store (CDS)*, https://doi.org/10.24381/cds.ca755de7

Gribble, M., Aamodt, E., Skilbred, E.S., Mikalsen, R.F., 2025. WUI guideline for Norway, Veileder for å beskytte bebyggelse mot skogbrann i Norge (No. RISE Report 2025:23). RISE Fire Research, Trondheim, Norway. https://risefr.no/media/publikasjoner/upload/2025/rise-report-2025-23-wui-guideline-norway-treeads.pdf

Guirguis K et al. (2025) Compound atmospheric drivers of the catastrophic 2025 Los Angeles urban firestorm. *npj Natural Hazards*, 2(1), 103. https://doi.org/10.1038/s44304-025-00155-7

Hetzer J, Forrest M, Ribalaygua J, Prado-López C & Hickler T (2024) The fire weather in Europe: large-scale trends towards higher danger. *Environmental Research Letters*, 19(8), 084017. https://doi.org/10.1088/1748-9326/ad5b09

Lawson BD & Armitage OB (2008) *Weather Guide for the Canadian Forest Fire Danger Rating System*. Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, Edmonton, Canada.

Lewis CHM, Little K, Graham LJ, Kettridge N & Ivison K (2024) Diurnal fuel moisture content variations of live and dead Calluna vegetation in a temperate peatland. *Scientific Reports*, *14*(1), 4815. https://doi.org/10.1038/s41598-024-55322-z

Log T (2016) Cold climate fire risk; A case study of the Lærdalsøyri Fire, January 2014. *Fire technology*, *52*(6), 1825-1843. https://doi.org/10.1007/s10694-015-0532-8

Log T (2020) Modeling Drying of Degenerated *Calluna vulgaris* for Wildfire and Prescribed Burning Risk Assessment. *Forests*. 11(7), 759. https://doi.org/10.3390/f11070759

Lohmann R, Purr C & Ahrens B (2024) Northern Hemisphere atmospheric blocking in CMIP6 climate projections using a hybrid index. *Journal of Climate*, 37(24), 6605-6625. https://doi.org/10.1175/JCLI-D-23-0589.1

Mishra RK, Sharma PK & Kumar R (2024) Experimental analysis of glass failure criteria under different thermal conditions. *Frontiers in Thermal Engineering*, 4, 1488206. https://doi.org/10.3389/fther.2024.1488206

van Mourik, J, de Vries H & Baatsen M (2025) On the movement of atmospheric blocking systems and the associated temperature responses. *Weather and Climate Dynamics*, 6(2), 413-429. https://doi.org/10.5194/wcd-6-413-2025

Pal s et al (2025) Exploring Vertical and Horizontal Transport of Aerosol Plumes during the Texas Panhandle Wildfire Event of Feb 2024. *105th Annual Meeting of the American Meteorological Society*, New Orleans, USA, 12-16 January. Paper id. 455827

Sjöström J, & Wickström U (2015) Superposition with non-linear boundary conditions in fire sciences. *Fire technology*, 51(3), 513-521. https://doi.org/10.1007/s10694-014-0389-2

Sjöström J, Brandon D, Temple A, Anderson J & McNamee R (2023) External fire plumes from mass timber compartment fires—Comparison to test methods for regulatory compliance of façades. *Fire and Materials*, 47(4), 433-444. https://doi.org/10.1002/fam.3129

Sjöström J & Vermina Plathner F (2026) *Klimatförändringarnas effekt på gräsbrandsrisken i Europa*. RISE rapport 2026:08. RISE Research Institutes of Sweden. ISBN: 978-91-90109-35-9. https://www.diva-portal.org/smash/get/diva2:2040422/FULLTEXT01.pdf

Sjöström J, Vermina Plathner F & Granström A (2026) A rapid and non-destructive method for quantifying boreal forest surface fuels. *Fire Ecology* 22. *In press*.

Steen-Hansen, A., Storesund, K., Mikalsen, R.F., Stensaas, J.P., Bøe, A.G., Hox, K., 2015. The Large Fire in Lærdal, January 2014. How did the Fire Spread and what Restricted the Fire Damage?, in: Gabrielsen,R.H. & Lacasse,S., (Eds.),: Natural Disasters and Societal Safety. Det Norske Videnskaps-Akademi, Norges Tekniske Vitenskapsakademi: Novus Forlag, Oslo, pp. 99–112.

Vermina Plathner F, Sjöström J, Granström A, 2023. Garden structure is critical for building survival in northern forest fires – An analysis using large Swedish wildfires. Safety Science. https://doi.org/10.1016/j.ssci.2022.105928

Appendix I – Assessing details of threatened structures

In this section we present information about what happened as the fire threatened structures, and our assessment of passive and active measures that contributed to saving the structures from the fire. The photos by RISE Fire Research in this appendix are taken on February 12th 2026.

The fire started in the terrain just east of the water supply dam (photo in Figure 6, marked by a star in Figure 5). About 3-400 meters west of the point of ignition was a recreational shelter (gapahuk) consisting of three timber walls, with a tilted peat-covered roof, that was destroyed by the fire (location 1, Figure A13). About 100 meters southeast of the shelter are two utility buildings of the water supply facility (location 2, Figure A13), one of which is timber-clad and equipped with plastic gutters. Post-fire observations show that the fire had spread along the ground vegetation towards the structure from the south and east. A concrete foundation, and a ca 30-50 cm wide gravel perimeter around the building, prevented flames from directly impinging on the façade. Several deciduous trees (effectively non-flammable) emerge from the gravel and only small pockets of accumulated litter showed minor charring. This structure was likely not subject to active protection (given the road condition and the assumed early timing of fire emergence). The passive protection from gravel, foundation and lack of other piled fuel was therefore most likely sufficient in keeping the building safe.

Figure A13. Map and photos of points of interest described in the text. Base map: © norgeskart.no / Kartverket (CC BY 4.0). Photos by RISE Fire Research. Note that a snow cover had accumulated on the ground between the end of the incident and the site visit.

At location 3, about 1.3 km north of the ignition point, are a house (3a) and two outbuildings (3b and 3c) (Figure A14). Along the small stream near the property, a fire break of approximately 15 meters width was achieved using a slurry tanker which effectively stopped the fire from directly reaching the structures (Figure A14, middle left). However, along the eastern perimeter of the property, charred vegetation near building 3c indicated spot ignition from across the field (Figure A14, middle right and bottom). The fire service informed that wetting of the vegetation close to the buildings was performed either before or upon the arrival of the fire (or both).

Another spot ignition occurred just south of building 3b, approximately 2 – 3 meters from the timber-clad façade of the old barn (Figure A14, top right). The fire, a few meters in diameter, caused deep charring on trees nearby, but did not cause any damage to the barn, presumably due to active water application. This therefore constitutes a good example of how active suppression and fire breaks can influence building ignition.

Figure A14. Map and photos from location 3. Areas where it is either known or assumed that manure or water was applied are marked by grey pattern in the map and orange arrows in the photos. Charred vegetation is marked by white arrows. Base map: © norgeskart.no / Kartverket (CC BY 4.0). Photos by RISE Fire Research.

The fire continued its spread in the vegetation east of the road another 170 meters north to near location 4 (Figure A15). It never crossed the road to the four structures on the property. If active extinguishing efforts were made or not is presently unknown, but wheel tracks and the close vicinity to the water supply point (blue triangle in Figure A15) support the assumption of either pre-fire wetting or active suppression. No post-fire image of this property is available.

In location 5 (Figure A15), a fire break of approximately 10 – 20 meters width was also achieved by the help of slurry tankers. Field observations confirm that this stopped the ground fire spread. Nevertheless, spot ignitions again bridged the fire break on the cultivated strip. Vegetation on the hill north of the fire break was ignited, and the fire continued to spread towards location 6.

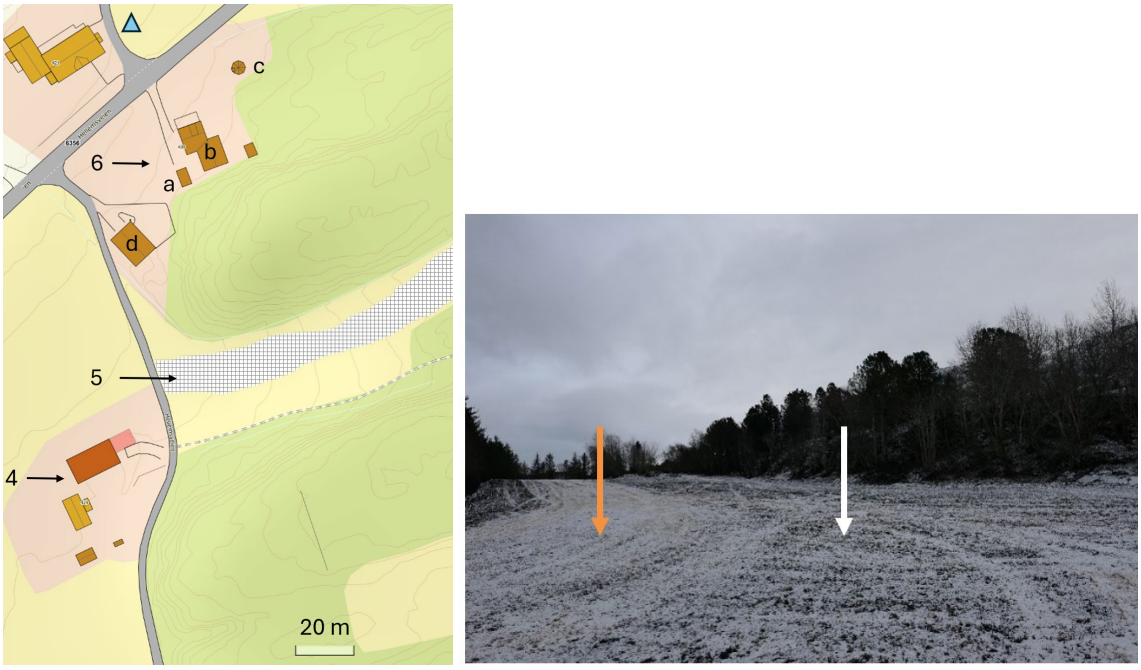

Figure A15. Left: Map of location 4 – 6. The garage that burnt down is 6a. The blue triangle marks a water access point. A fire break from a slurry tanker is marked by the grey pattern in location 5. Right: Photo of the fire break in location 5, seen from west towards east, (orange arrow) and charred surfaces (white arrow). Base map: © norgeskart.no / Kartverket (CC BY 4.0). Photo by RISE Fire Research.

In location 6 (Figure A15) a garage (6a) burnt to the ground (Figure A16), while three nearby buildings were not ignited (Figure A18). The ignition mechanism of structure 6a is not known, but pre-fire light dormant vegetation close to the southern façade indicates direct flame contact.

Figure A16. Before and after the fire, location 6. Garage 6a (white arrow) burnt down. Photo left: Google Street View (September 2019), ©2026 Google. Photo right: RISE Fire Research.

The base area of the garage was approximately 3.5 by 5.5 meters, and there was no vehicle inside. It stored miscellaneous garage inventory, in addition to one or two pallets of firewood. The house (6b) is a typical Norwegian house, with incombustible foundation, timber cladding with a ventilated cavity, eaves with a boxed-in soffit and roof tiles.

Post-fire inspection showed that two windows on the west walls of house 6b had cracked (but panes not fallen out) due to the heat from the garage fire. Other than that, there was no visible damage or even marks on the paint of house 6b, neither from the garage fire nor from the vegetation fire. The grass between the garage and the house, as well as ornamental plants, were uncharred.

Under the prevailing conditions during the night of February 8th, heat transfer calculations (Appendix III) show that the timber façade, even using conservative assumptions, will likely not reach more than 200 °C, well below any thinkable ignition temperature (above 300 °C) (Figure A17). The reason is the cooling effect of the strong and cold wind and that heating of the façade is by radiation only, since flames or hot gases are not likely to reach the building 5 meters away due to the strong buoyancy (see Figure A36 for an example photo). Thus, the strong winds act only to cool the radiantly exposed façade if not directed straight towards the façade.

Similar heat transfer calculations also show, even assuming a much weaker fire, that the temperature difference between the exposed and unexposed parts of an outer glass pane easily exceeds the criterion for window glass breaks (Mishra et al 2024). Thus, cracks in windows but no ignition of façade or ornamental plants are expected from a strict heat transfer perspective in this cold and severe weather as long as flames from an adjacent fire do not impinge on the house (6b). See Appendix III for details.

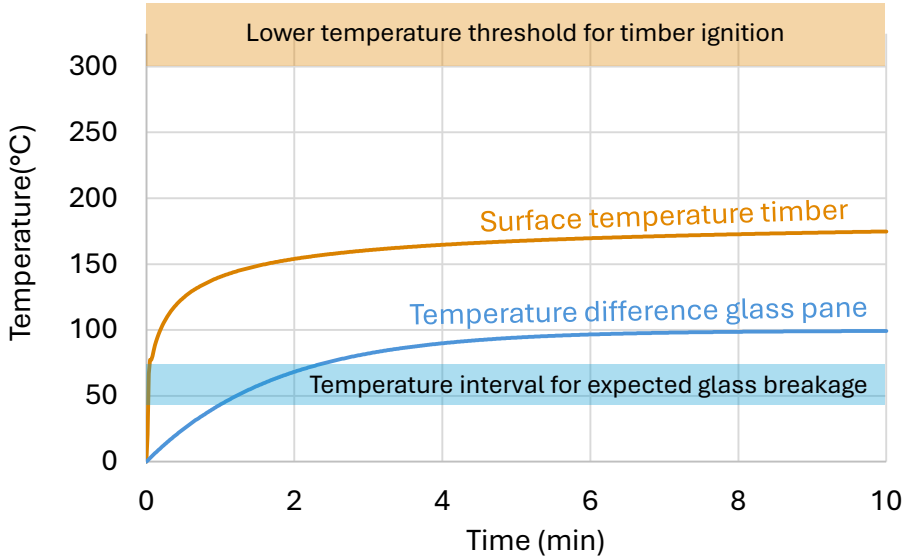

Figure A17. Estimate of timber surface temperature and the difference between exposed and shaded parts of the outer window pane for the position closest to the garage (Appendix III – Heat transfer calculations for house 6b).

Figure A18. Photo taken standing at garage 6a towards house 6b (left). Two cracked windows are marked by orange arrows, and charring on the ground by a white arrow. Photo taken standing on the road towards garden grill cottage 6c and house 6b (right). Photos by RISE Fire Research.

Flames approached house 6b from both the south (Figure A19) and east (Figure A18, right). Fire spread stopped at (1) the lawn maintained by a robot mower (Figure A19; Figure A20), (2) the foundation of building 6c, the garden grill cottage (Figure A21), the incombustible brick-and-mortar building 6d (Figure A21, left), and by the adjacent road (Figure A18). The only exceptions were a slightly scorched strip of grass litter, 10 cm wide and 1 – 2 meter long, along the 6b-foundation (Figure A19, right) and minor sooting on the logs above the 20 cm high non-combustible foundation of the grill cottage (Figure A21, right).

Figure A19. Photo behind house 6b looking towards garage 6a (left). Arrow marks surface charring. Close-up photo of the charring of the narrow strip of grass litter against the foundation (right). Photos by RISE Fire Research.

Figure A20. Charring on the ground, except for the area where the robot lawn mower had cut the grass (outlined in yellow). Photo: RISE Fire Research.

Figure A21. Photos of building 6d (left), garden grill cottage 6c (middle and right). Photos: RISE Fire Research.

The owners of house 6b stated[8] that they and their neighbours had cleared vegetation and trees around the house over the past two to three years. This was done both on the southern hill (mostly birch and shrubs, Figure A22) and on the flat area east of the house (invasive Sitka spruce).

Figure A22. Before and after the fire, location 6. Garage 6a burnt down (white arrow). The tall vegetation marked by orange arrow has been cut down after the left image was taken, as can be seen in the post-fire photo to the right. Photo left: Google Street View (September 2019) ©2026 Google. Photo right: RISE Fire Research.

Active suppression activities were performed at Property 6, however, the exact timing and extent of the actions are not known. For context, the inhabitants were evacuated around 1 am, and thus approximately 17 minutes before the intense fire depicted in Figure 7, captured just 200 m away towards this location.

Location 7 (Figure A23) comprises of a house and a large outbuilding. The property also contains miscellaneous stored objects. Note that the two smaller built structures visible on the map (7a) were not there at the time of the fire. During the fire, active extinguishing took place near this property. Figure A24 shows a fire truck hosing down the field. The post-fire images clearly show the effect of this extinguishing effort, with the vegetation being charred halfway across the field, but the charring has stopped in this location.

While the firefighting on the field effectively stopped the fire from spreading to the house in location 7, the fire simultaneously jumped from location 8 and across the field (a spot ignition distance of ~200 meters). Objects on the property at location 7a started burning (Figure A25, yellow arrow). It is not known if firefighting was conducted here.

[8]https://www.nrk.no/trondelag/forsker-fra-rise-fire-research-oppfordrer-nordmenn-a-brannsikre-hagene-sine-1.17770930

Figure A23. Left: Map of location 7 and 10. Right: Photo seen from location 7c, towards location 7a, b (yellow arrow). Locations 6 (white arrow) and 8 (orange arrow) are also seen. Base map: © norgeskart.no / Kartverket (CC BY 4.0). Photo: RISE Fire Research.

Figure A24. Left: Screenshot from a video taken at 01:17 on February 8th by the fire service positioned in location 9, viewing towards west. The fire truck is in location 7b. Water application positions visible in the video are marked (orange arrows). Right: Location 7b after the fire. Photos: Fosen fire and rescue service IKS (used with permission) and RISE Fire Research.

Figure A25. Top: Photos taken at 01:33 on February 8th by the fire service positioned in location 9, viewing towards west. Objects in location 7a are burning (yellow arrows), and vegetation on the hill is burning (white arrows). Bottom: Photo after the fire of location 7. Photo: Fosen fire and rescue service IKS (used with permission) and RISE Fire Research.

By spot ignition, the fire ignited the hill between location 7a and 7c, where vegetation was burning at 01:10. With heavy winds from the mountain towards the sea, the fire spread over the hill towards the property in location 10, at which time the residents were evacuated shortly after this. Active suppression, including water application on both the house, surrounding structures, and other vegetation.

The natural vegetation on most of the hill was charred (Figure A26, green arrows), and the fire had also spread down to the field of grass stubble between the house and the sea (Figure A26, white arrows). The footpath between the building and the sea was not charred (Figure A26, yellow arrow). On the north side of the property is a frozen creak (Figure A26, blue arrows), which functioned as a natural, frozen fire break.

There was no observed damage to the house or any of the built structures on this property, including a small wooden outdoor toilet located on the hill south of the house, with a 10 meters unburned margin (Figure A27, right). The frozen creak marks the northernmost end of the fire spread, stopped by the active fire suppression efforts (Figure A27).

Figure A26. Location 10, seen from south towards north. Charring of natural vegetation between location 7 and 10 (green arrows), charring of the cut grass area (white arrows), uncharred pathway from the house to the sea (yellow arrow) and the frozen creek north of the property (blue arrows) are marked. Photos: RISE Fire Research.

Figure A27. Location 10. Left: The garden and the cut grass area, seen from the property towards the sea. Arrow markings are the same as in Figure A26. Right: A wooden outdoor toilet, about 10 meters from the charred vegetation. on the natural vegetation area south of the house. Photos: RISE Fire Research.

Appendix II – Photos and weather maps

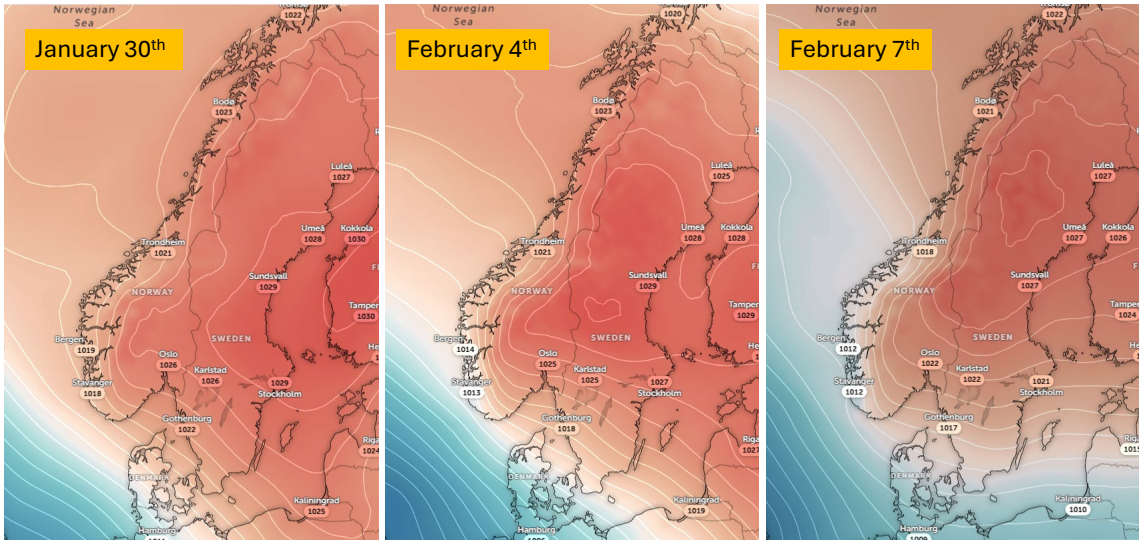

Figure A28. Noon pressure over Scandinavia for January 30th, February 4th and February 7th shown as isobars (white contours) and colours (blue to red represent low to high).

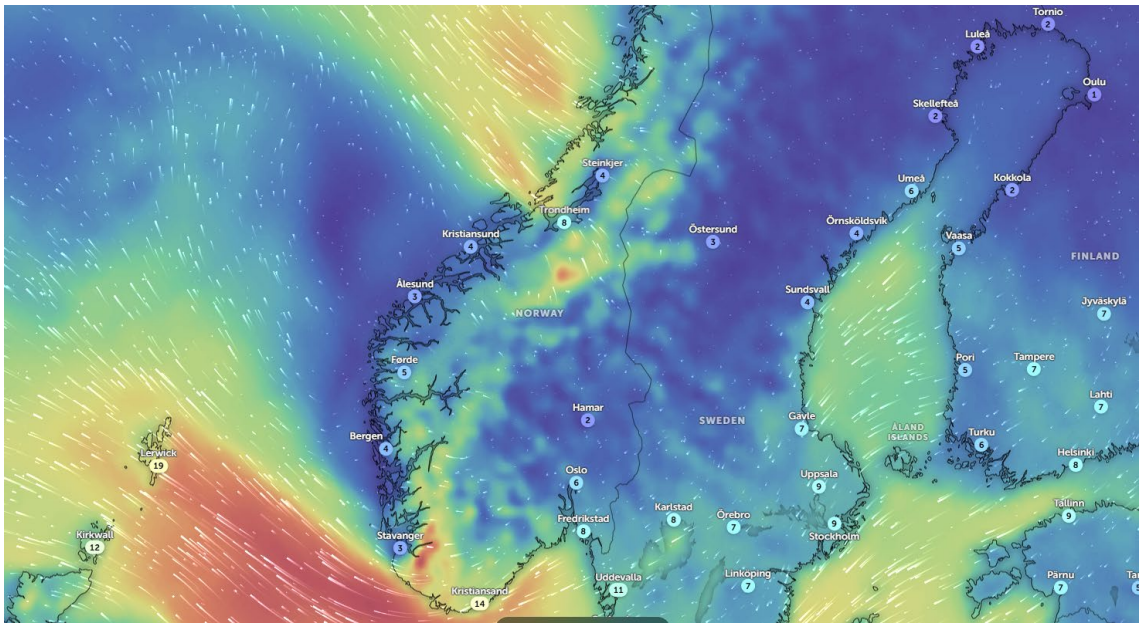

Figure A29. Winds over Scandinavia on February 7th at 13:00. Note the wind corridor from the mountains just over the Trondheim area. Absolute numbers are indicated by numbers in circles, and color (increasing for blue – yellow – red). Arrows indicate wind direction.

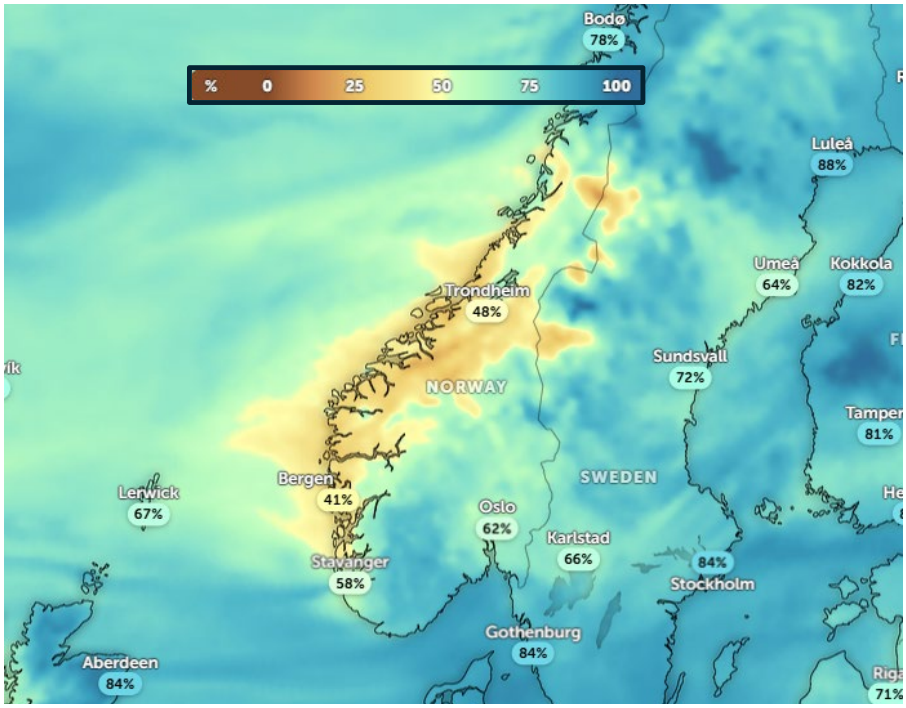

Figure A30. Relative humidity over Scandinavia, February 6th at 13:00.

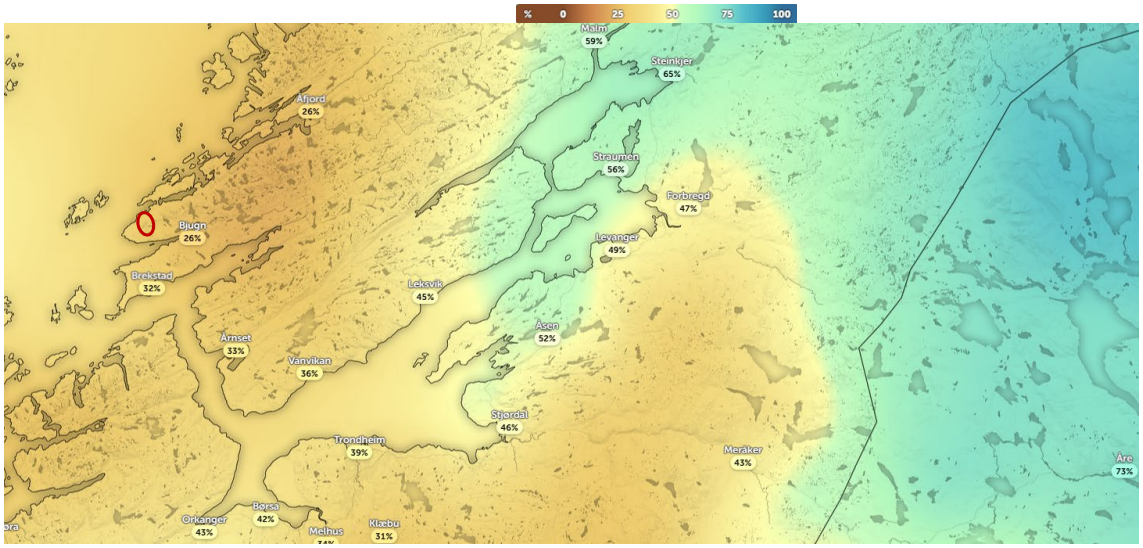

Figure A31. Relative humidity over the Trondheim area on the day of ignition, February 7th at 13:00. Red circle indicate the fire location.

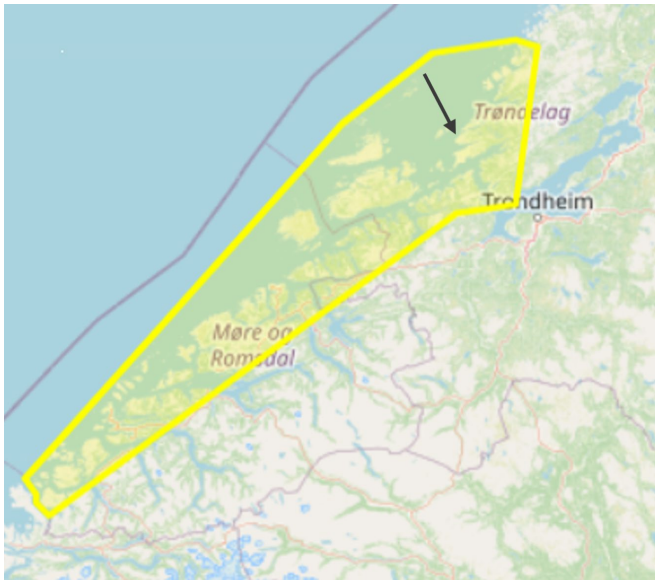

Figure A32. Map of the forest fire warning for the coast of Trøndelag. Ørland (arrow) was in an area covered by a yellow forest fire warning from January 27th to February 8th. Yellow is the lowest warning level, followed by orange, while red is reserved for extreme weather events. Figure provided by the Norwegian Meteorological Institute (MET) upon request, used with permission.

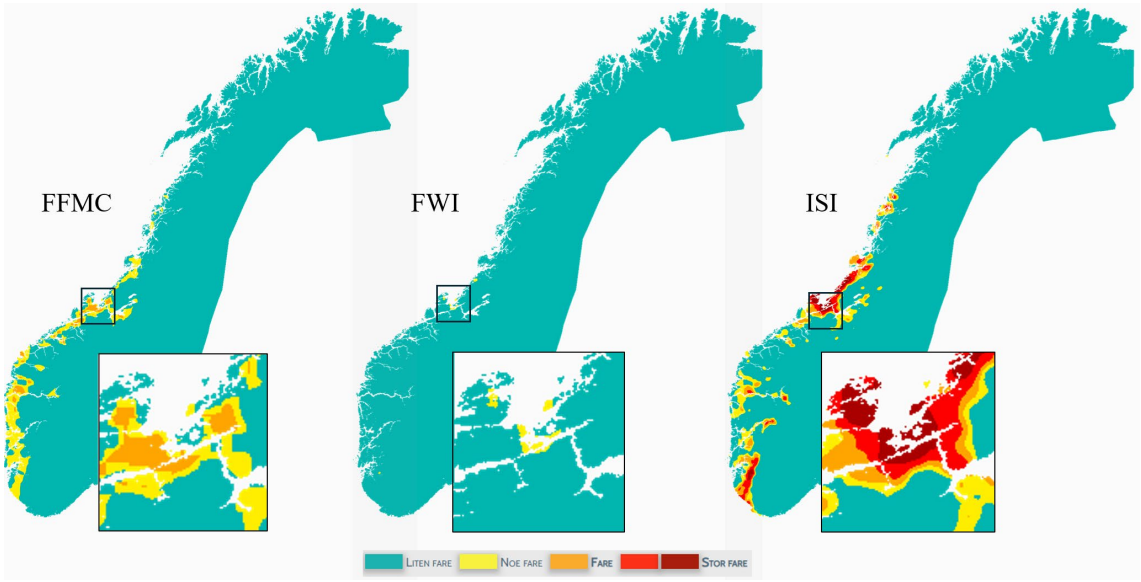

Figure A33. Maps of forecasts for February 7th issued on February 7th, for Norway and the area around Ørland (squares), showing the FFMC index, the FWI index and the ISI index. Colours green to red represent low to high danger. More info on the indexes and the forest fire warning system is given at https://skogbrannfare.met.no/. Figure provided by MET upon request, used with permission.

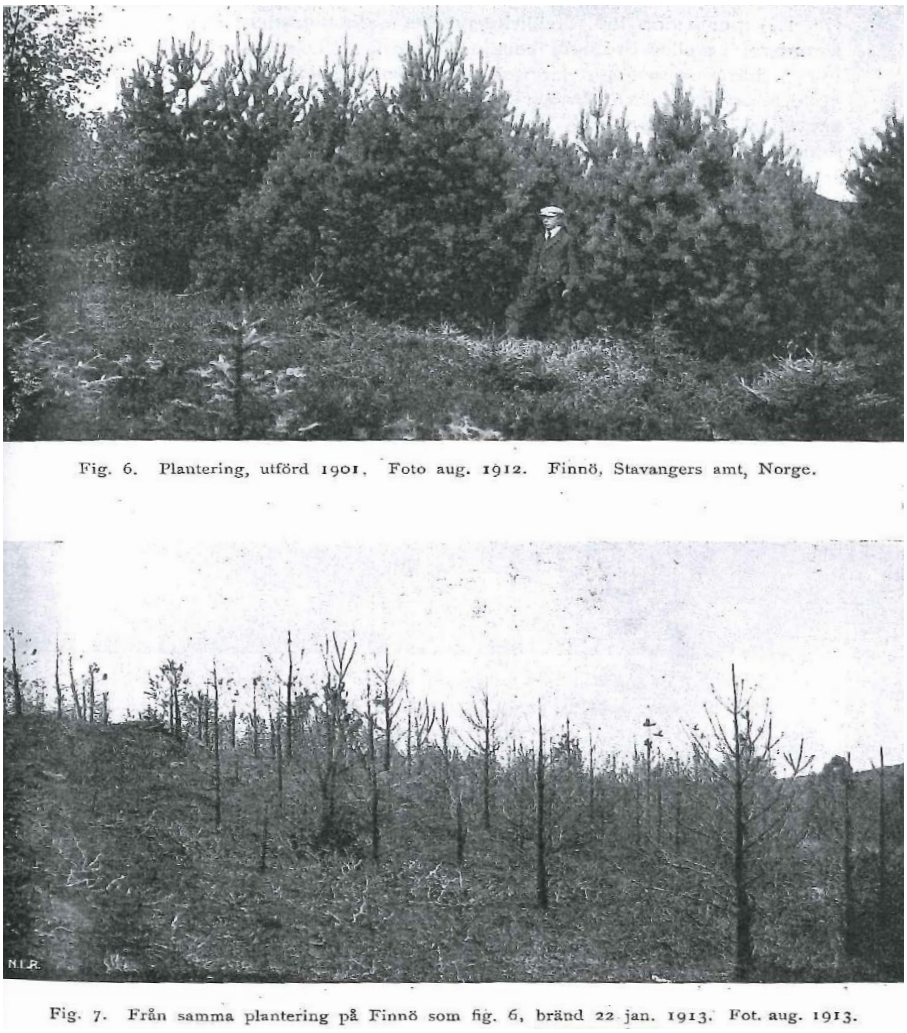

Fig. 6. Plantering, utförd 1901. Foto aug. 1912. Finnö, Stavangers amt, Norge.

Fig. 7. Från samma plantering på Finnö som fig. 6, bränd 22 jan. 1913. Fot. aug. 1913.

Figure A34. Photos of a spruce plantation on Finnøy. Top: August 1912. Bottom: August 1913. The stand burned on January 22nd, 1913. From Dybeck, 2015.

Appendix III – Heat transfer calculations for house 6b

Assuming that the closest distance from the garage to the house is 5 meters and that the radiant heat from the garage fire was not larger than that of full-scale tests of mass timber apartment (Sjöström et al 2023) (Figure A36), we can define an upper incident radiant heat flux of 16 kW/m^2 at the house surfaces. Assuming standard thermal properties of wood and using conservative assumptions for heating (i.e. no mass transport or evaporation), we obtain a timber thermal conductivity k = 0.12 Wm^{-2}K^{-1}, density ρ = 450 kgm^{-3}, heat capacity c_p = 1600 Jkg^{-1}K^{-1}, and assume surface emissivity ε = 0.8. Outdoor air temperature at 02:00 was -1 ± 0.5 °C and wind speed 12 ± 1.5 m/s. This yields a forced convective heat transfer coefficient of 50 – 55 Wm^{-2}K^{-1}. Using linear response theory, we calculate the surface temperature of the timber for these conditions according to Sjöström & Wickström (2015). The duration of the garage fire is likely longer than ten minutes, but definitely shorter than one hour. The temperatures obtained within ten minutes have almost reached steady-state and will therefore suffice as an estimate of temperature boundaries.

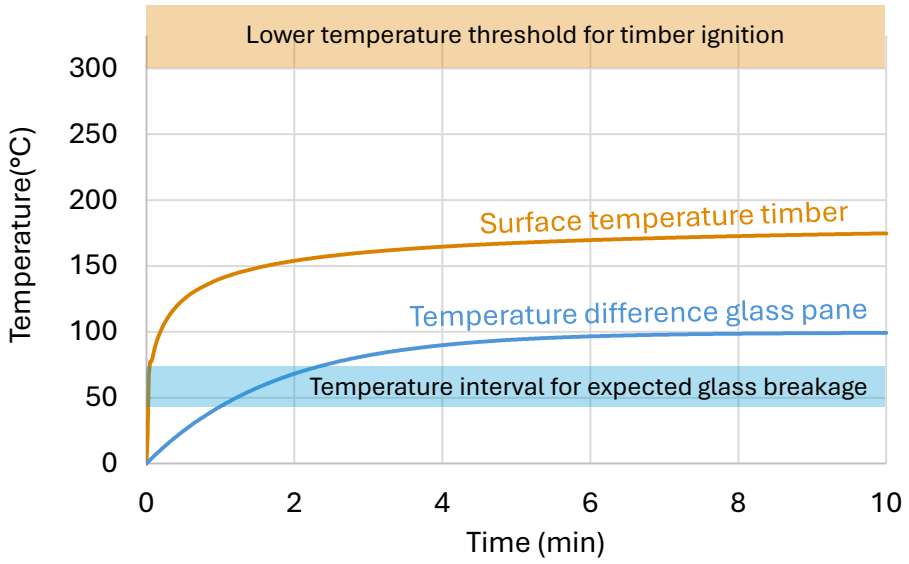

Figure A35. Estimated surface temperatures of the timber façade and the outer window glass panes of building 6b.

For the glass pane we instead use underestimations of the heat exposure. Incident radiant heat flux is assumed 8 kW/m^2, 50% of that assumed for the timber surface. Further, for glass we assume thermal conductivity k = 1.0 Wm^{-2}K^{-1}, density ρ = 2500 kgm^{-3}, heat capacity c_p = 7850 Jkg^{-1}K^{-1}, surface emissivity ε = 0.8, and a thickness 3.5 mm. Using the same wind speeds, the temperature of the exposed part of the outer window pane is calculated using linear response of finite thickness material (Sjöström & Wickström 2015) assuming no in-plane conduction. Window glass breaks due to the stress developed as the exposed part is heated but restrained from the unexposed

framing-shaded perimeter. Recent studies suggest that standard window panes break when the temperature difference between the exposed and shaded areas are between 30 and 60 °C (Mishra et al 2024). Assuming conservatively that the shaded area exhibits a temperature between the outdoor and indoor temperatures, yields temperature threshold 10 °C higher than 30 – 60 °C.

Figure A36. Photo from test 1 of full-scale mass timber buildings setting an upper boundary of the incident radiant heat to the timber façade. From Sjöström et al (2023).

Appendix IV – Additional photos

In this appendix, we show additional photos from the incident, that have been used as part of this study.

Figure A37. Post-fire landscape, location unknown. Screenshot from video by Adresseavisen (February 9th), available at Adressa Play: https://play.adressa.no/video/3022148/to-barn-far-oppnevnt-forsvarer-etter-storbrannen. Video: Terje Svaan/Martin Strøm, Adresseavisen.

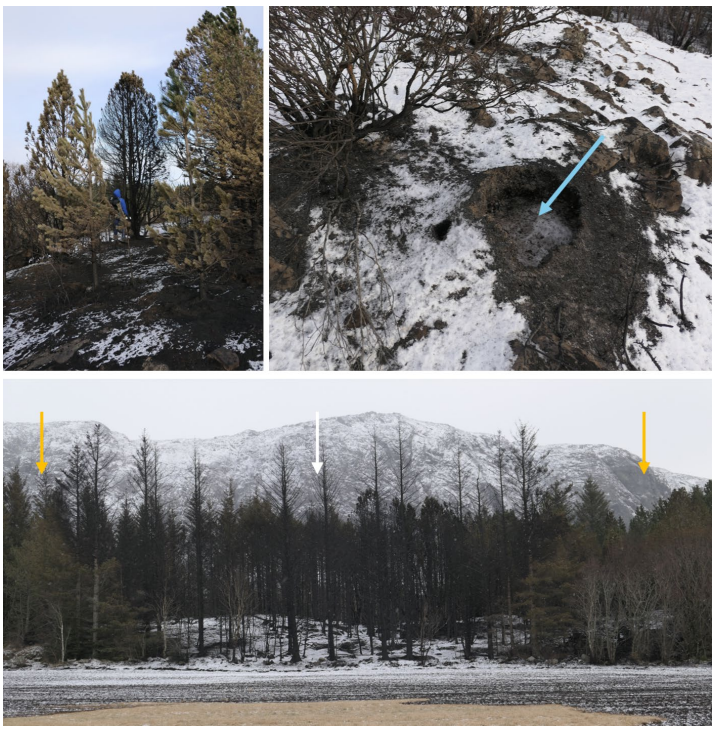

Figure A38. Post-fire vegetation. Top left: Tree damage ranged from undamaged, to a few centimeters scorching, to several meters and full treetop fires. Top right: Some deeper burns occurred, here most likely an old ant nest has smouldered, leaving a ~50 cm wide and 30 cm deep hole (blue arrow). Bottom: Location 8 viewed from the road, showing both undamaged (orange arrow) and completely burned areas (white arrow). Photos: RISE Fire Research.

Figure A39. Post-fire vegetation. In some areas, scorching was observed only in patches of the forest floor litter. Photos: RISE Fire Research.

Figure A40. Post-fire vegetation. Top: Agricultural fields, and border between hills with natural vegetation and agricultural fields. Bottom: Typical coastal heather landscape (kystlynghei), with natural vegetation including different types of heather, grass, moss, small bushes and trees. Photos: RISE Fire Research.

Figure A41. Examples of undamaged vegetation at the coastal heather landscape (kystlynghei), with crowberry (*Empetrum nigrum*), lingonberry (*Vaccinium vitis-idaea*), heather (*Calluna vulgaris*), feather mosses (notable *Pleurozium schreberi*), small juniper (*Juniperus communis*) and other species. Photos: RISE Fire Research.

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