THE ROLE OF THE FIELD OBSERVERS AND AVALANCHE FORECASTERS IN THE NORWEGIAN PUBLIC ROADS ADMINISTRATION

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ABSTRACT: The Norwegian Public Roads Administration (NPRA) is both an end-user of the snow avalanche bulletin and part in issuing. NPRA cooperates with Norwegian Water Resources and Energy Directorate (NVE) and the Norwegian meteorological institute (MET) through the Norwegian Avalanche Warning Service (NAWS). Avalanche technicians (in NPRA) do fieldwork specific for the avalanche bulletin (NAWS). This is on top of other fieldwork related to assessment of roads, either avalanche danger, opening/closing, construction of new roads etc. Why do we (NPRA) allocate specific resources to contribute to the bulletin when we are also end-users? The advantages of being a field observer when reading and using the bulletin has proven many. Working close with forecasting and fieldwork together as practitioners and end-users has increased the level of professional assessments among avalanche technicians in NPRA. Hopefully, the knowledge on problems concerning roads prone to avalanches has increased among the forecasters outside the NPRA.

KEYWORDS: avalanche bulletin, field observers, avalanche forecasters, end-users, Norwegian Public Roads Administration

1. INTRODUCTION

The Norwegian Public Roads Administration (NPRA) is both an end-user of the snow avalanche bulletin and part in issuing. NPRA cooperates with Norwegian Water Resources and Energy Directorate (NVE) and the Norwegian meteorological institute (MET) through the Norwegian Avalanche Warning Service (NAWS). This is where the avalanche bulletin is issued, with NVE as the responsible issuer. The cooperation was started as NAWS was established and is described in (Engeseth, 2013) and (Njål Farestveit, 2013).

NPRA also contributes with economic resources, to the development of expert tools as XGEO (Emma Barfod, 2013) and supplying road specific data so it can be shared openly to the benefit of the warning service. Establishment of weather stations has continued since 2013 and is still ongoing.

Since the start in 2013, the NPRA has increased the number of both field observers and avalanche forecasters. We now have 5 avalanche forecasters and 25 field observers spread throughout the country. After 12 years, the cooperation is ongoing and has developed from what it was in 2013 (Njål Farestveit, 2013). Why do we (NPRA) still allocate specific resources to contribute to the bulletin when we are also end-users?

This paper describes some of the developments done by the NPRA, and highlights many of the advantages that plays a role on a daily basis as both end-users and contributors.

Figure 1: Showing cooperatin between,fieldobservers, avalanche technicians and forecasters from NVE, NPRA and the local county. (Photo: Knut Inge Orset, NPRA)

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2. FIELD OBSERVERS, FORECASTERS AND END-USERS

Avalanche technicians in the NPRA are organized in the section of Operation and Maintenance Geomechanics. This section is responsible for natural hazard preparedness for all public roads in Norway (Knut Inge Orset, 2024).

Avalanche technicians (in NPRA) do fieldwork specific for the avalanche bulletin (NAWS) up to 3 working days a month. This is on top of other fieldwork related to assessments of roads, either avalanche danger, opening/closing, construction of new roads etc. Fieldwork for NAWS gives specific knowledge on the local snow cover. It also trains our mind to do process thinking on avalanche problems, their extent and judging/interpreting what the snow cover can take of weather and additional loads (rain, wind, snow, temperature changes). When assessing avalanche danger for roads the main focus is natural released avalanches, their size and runout length. Fieldwork for NAWS gives us the opportunity to dig more often in the snowpack and consider a broader aspect of avalanche problems.

Avalanche technicians working as forecasters uses the data and can see which data is valuable and which is not. What information is missing regarding road closure? Which information would I rather have as a forecaster trying to apply avalanche problems for a bigger region? When doing fieldwork with “two hats” it is easier to understand the challenges for both forecasters and avalanche technicians, and then again be able to address the challenge.

As forecasters and field observers we also develop deep knowledge on all different components in the bulletin. Avalanche sizes, meaning of qualitative terms as “a few”, “easy”, “hard to trigger” etc. Forecasters are also highly aware of what a bulletin does NOT describe.

To be able to share knowledge within the NPRA of avalanche problems, incidents and upcoming avalanche cycles affecting roads, we have internal meetings every week.

Since there are 25 fieldobservers and 5 forecasters within the group working with natural hazards, at least one or two is represented on each meeting. If there are any questions to the bulletin from NPRA the forecaster can address this at once during its next week of forecasting. The same apply to field observations. If there are observations on roads, close to roads due to car accidents, information from snow plowers etc., it can easily be added to the open data shared between fieldworkers, forecasters and end-users. So, the travel of information is shorter either way. From forecaster to user, from fieldworker to forecaster and even to end-user.

The close interaction between end-user and issuer is also affecting the product (the bulletin). The information needed for the people working in the preparedness system of natural hazards are easily known for forecasters. When an avalanche technician in the NPRA is forecasting for the NAWS, other forecasters, not working with roads, will get the information and can further use it when they issue the bulletin for a different county or another period of time. Close interaction gives the information short ways to travel and changes in routines can be executed quickly.

Figure 2: Avalanche technician Johan Kristoffers at work as field observer. (Photo: Johan Kristoffers, NPRA)

3. DECISION MAKING

As the first bulletin from NAWS was launched in 2013, the NPRA used it in assessments of roads. In the beginning the bulletin was directly used by avalanche technicians in the NPRA and also distributed to contractors responsible for avalanche danger assessment on specific roads. Contractors were also trained in reading the bulletin.

A rather big change in how NPRA uses the bulletin and work with avalanche danger assessment came in 2020, when a 24/7 emergency preparedness system was established with at least 2 avalanche technicians on duty.

Three times a week (every day if needed due to high danger levels), we make an assessment of avalanche danger specific for roads (Knut Inge Orset, 2024). The bulletin from NAWS is the base

together with coming weather, snow cover, geographical location of roads and known avalanche paths. This, off course, demands a specific knowledge about the network of roads. The assessment is distributed to all contractors and those responsible for roads in all counties. This is further used in decision making for closing and opening of roads.

Figure 3: Avalanche prone road National Road 15 Strynefjellet. Here there is site specific warning during the winter months. (Photo: Jens Tveit, NPRA)

We have also established site specific avalanche warning for different roads especially prone to avalanches. National Road 15 Strynefjellet (Alex Haddad, 2023) and National Road 80 Ytre Kistrand (Dag Theodor Andreassen, 2024) is ongoing and has been for a few years. Avalanche technicians report observations, results from avalanche control and field work to the NAWS. It gives valuable information on local snow cover. Furthermore, we do site specific avalanche warning for construction sites prone to avalanches. The periods may vary from a few months up to several years. Normally all data from site specific warning is made available for NAWS. The exchange of information is valuable both ways.

4. A BROADER UNDERSTANDING OF THE CONDITIONS

When following the snow cover through the winter as an observer, we find it easier to interpret upcoming weather forecasts and understand avalanche cycles. Still, a significant advantage of being a forecaster and/or fieldworker may be the ability to interpret the actual bulletin. A bulletin gives an overall understanding of avalanche problems within a region. The danger level will suggest if infrastructure *could* be exposed to danger. (It will still not give the answer). It is up to the avalanche technician to assess if roads actually are prone to avalanches during a storm/weather event. The range within each danger level is still huge considering how likely it is for a road to be hit by avalanches. There is a broad specter within example level 3, with easy to trigger size 2 avalanches for a skier on most slopes, compared to a few places where possible avalanches could become size 3 but only on certain aspects or avalanche paths. Field work or forecasting experience helps using the components in the bulletin rather than the danger level itself.

When making the assessment for the emergency preparedness system on work as avalanche technicians, we interpret the bulletins for the whole country. As forecasters and field workers, we have local knowledge in our own region. Knowing how these local conditions is described in a bulletin also makes it easier to understand the conditions in other regions where our local knowledge is not as detailed.

5. EXPERIENCES FROM 12 YEARS AS END-USERS, FIELDWORKERS AND FORECASTERS

Our experience is that the awareness on infrastructure and the emergency preparedness system has grown since 2013. The close interaction in NAWS has made it possible for us to influence the content of the bulletin. Our focus is mainly on natural released avalanches. There is now a specific symbol giving information if there is a likeliness of natural released avalanches size 3 or bigger. The purpose is to alert the emergency system in advance. Which again helps municipalities, counties, emergency services and other responsible for infrastructure to address avalanche danger.

Bulletins are not covering all regions with avalanches in Norway. Originally, the coast of Finnmark county was not covered by the bulletin. This is an area where avalanches make an impact on roads and societal needs, more than for instance back country skiers. Due to close involvement between NPRA, as end-user, and NAWS, a bulletin for “Finnmarkskysten” was launched in 2020.

The financially contribution from NPRA, has probably been important for both parties. This has helped NAWS to develop the bulletin over the years, and NPRA has had the opportunity to influence the direction of the development.

Figure 4: Avalanche bulletin with the danger level and the symbol for awareness of infrastructure and the emergensy sytem. Telling that naturally released avalanches of isze 3 or bigger may occur. (Source: varsom.no)

During the first years, field observers in the NPRA did observations close to known avalanche paths hitting roads or in areas close to the roads. We had more focus on observations that were relevant for an assessment of a road closure or opening. Today, we do observations where they are most useful for the NAWS. The benefits of the bulletin being of high quality has proven important.

As field observers and forecasters, we also have experienced how valuable the actual fieldwork is for increasing the level of professionalism in our work. Our experience is that as observers we develop our skills on snow cover, avalanche problems, danger levels etc. And further as avalanche technicians develop a higher quality of professional assessment.

When avalanche technicians from NPRA work as forecasters in the NAWS, our experience is that communication naturally involves the impact on roads/infrastructure. Among the avalanche forecasters, only a few works with roads, but having the discussions among them naturally allows challenges from the roads to enter the room of forecasters. Also challenges on how to communicate prone infrastructure trough the bulletin, is addressed. Direct input from us as end-users may influence the way it is communicated in the bulletin.

In some cases, the avalanche technicians can ask for a meeting with the forecasters for their area and discuss the conditions. This is, in many cases, a lot easier when the cooperation is already established. The result in most cases being useful for both the forecasters, the bulletin, and the avalanche technicians.

6. CONCLUSIONS

The advantages of being a field observer when reading and using the bulletin has proven many. The understanding of the terms used in the text and the meaning of all the different symbols in the bulletin is seldom questioned. Description of stability, uncertainties, and also what the bulletin does NOT cover, is known when an observer interprets the bulletin.

In operational use, the field observers and forecasters look at the components behind the danger level, rather than the danger level itself, when assessing avalanche danger. This information is more nuanced and of higher detail.

Working close with forecasting and fieldwork together as practitioners and end-users has increased the level of professional assessment among avalanche technicians in NPRA. Hopefully, the knowledge on problems concerning roads prone to avalanches has grown among the forecasters outside the NPRA.

Close interaction between forecasters, fieldworkers and end-users helps communication and addresses challenges quickly. This is beneficial for the development and understanding on both sides.

For the Norwegian Public Roads Administration, the benefits of contributing to the Norwegian Avalanche Warning Service, are substantially larger than what we could have accomplished on our own with the same resources.

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