

# Towards a new and better balanced system in assigning weather alarms in the Netherlands

## Summary

Since summer 2005, KNMI have based their warning strategy for the highest level of warnings, the so-called “weather alarm”, not solely on pure meteorological thresholds. A professional judgement on expected impact, due to the initial meteorological event, is also taken into account when issuing the weather alarm. In order to combine pure meteorological thresholds and the expected impact on society an expert team for weather alarms has been established.



## The weather alarm assignment strategy (before July 2005)

Until July 2005, KNMI issued:

1. Weather alarms in a deterministic format, based solely on forecast parameters exceeding thresholds (intensities) over a minimum spatial scale, defined as either an area of 50 x 50 km or, for more geographically stretched phenomena (e.g. a coherent frontal band), at least 50 km in length. For coastal phenomena, the criterion for spatial scale was based on thresholds being exceeded at a minimum of 2 coastal observing stations. Lead times for weather alarms were 0 – 12 hrs in advance.
2. Early warnings of extreme weather based on the same criteria as above (intensity and minimum effected area) with a lead time of 12 – 24 hours in advance. This type of warning also had a deterministic format.

## The problems:

KNMI realised that within the “old” system the level of responsibility for the Senior Meteorologist was too heavy and stressful. He/she was the only decision maker in issuing weather alarms.

- One of the reasons for this stress felt by the senior forecaster was that weather alarms implied the highest level of society awareness (orange or red).
- Also, for obvious reasons, there were hardly any “false alarms” issued, many of the weather alarms were issued quite late (almost without any useful lead time) or sometimes not at all (missed).
- Furthermore, hardly any use was made of the early warning. When senior forecasters were questioned about this, it became clear that they were only prepared to issue an early warning when being very sure the extreme event was going to happen (implying hardly any early warnings and quite often a belated weather alarm or a missed event).



## The new weather alarm assignment strategy (from July 2005)

In order to optimise the system, many discussions took place between all groups of staff working at KNMI (including the forecasters). The outcome was a new decision making strategy with the establishment of a designated expert team. Within the strategy, the expected impact of an event would also be taken into account whilst the early warning would be changed towards a probabilistic format (explicitly mentioning the percentage risk for weather alarm conditions to occur).

1. The early warning, now probabilistic, is based on the same criteria as the weather alarm criteria. Lead time (unchanged) 12 – 24 hours. As soon as the risk of the extreme event is considered to be equal to or more than 50%, the early warning shall be issued.
2. Within the text of this early warning the percentage risk of weather alarm criteria for a certain parameter is explicitly mentioned for all users (general public, civil security and media).
3. The final decision on issuing this early warning for extreme weather is taken only by the senior meteorologist (the shift leader).
4. As soon as an early warning is issued, the so-called expert team on weather alarms at KNMI becomes operational. This team is intended to provide additional information on the vulnerability of society.
5. Bringing together this expert team does not only have to start after an early warning has been issued. It can also be initiated by one of the members of the expert team. This is in order to prevent missing a weather alarm on occasions when an early warning has not been raised. The chairperson of this expert team is the Head of Forecasting Division or his appointed deputy.
6. In a situation where the extreme weather is well foreseen, the expert team members will join the shift change briefing at 14.30 hours (early shift changing for late shift). During the shift change, all the meteorological information and details are exchanged.
7. During this shift change briefing, model and theoretical specialists from the R&D department are present to provide additional comments on initial model performance for certain critical parameters and forecasting methods if needed.
8. After the briefing the expert team meet outside the forecasting room, together with the senior forecasters from the incoming (late) and outgoing (early) shifts. During this meeting additional expert judgement on the initial vulnerability of society for the upcoming weather alarm event is discussed (see next section for more details).
9. Finally the expert team will take the decision to give a “yes or no” for issuing the weather alarm. The certainty of the event happening should be above 90% (though discussions are taking place to lower this towards 80%).
10. The format of the weather alarm is deterministic, so no risk percentage is mentioned in the text itself (though implicitly the risk is more than 90%).
11. When the decision to issue is difficult due to differences of opinion, the chairperson of the expert team will make the final decision. Details of the warning text will also be discussed together with the decision to ‘go’.
12. When a weather alarm situation occurs unexpectedly or outside regular office hours a special procedure to involve the expert team is available. Even a “high speed” procedure to bypass the expert team is available.
13. The chairperson always evaluates the expert team meetings and information is available to all involved.

## The importance of the expert team judgement

Until now only meteorological criteria were triggering the weather alarms. KNMI strongly believe that weather alarms are not only meant to relate to meteorological criteria but also need to warn society of the potential impact and damage due to extreme weather.



### Some general thoughts on initial impact:

- During certain periods, events or situations the country is more vulnerable to the impact of extreme weather.
- In general: on week days and especially during peak traffic times, society is more vulnerable than on Sundays. Also during the summer season when people are camping outside, when many open air events are planned or during major pop concerts the impact may be higher even when the intensity of the weather might be a little below the formal thresholds for issuing the weather alarm.
- In this way during very vulnerable periods, one could decide to issue for high probability events that are not expected to fully reach the thresholds.
- During successive periods of extreme weather, issuing a weather alarm for a slightly less intense event shortly afterwards can sometimes be ridiculous in a strategic sense. In this case it would be prudent to warn at a lower level (by means of use specific warnings = yellow awareness).
- From an outside political perspective, the strategy might be a little bit more cautious for a “yes” or “no” decision at certain times.

Of course KNMI experts are not specialists in assessing the initial vulnerability of society. However, some common sense and feeling for this topic is adding a lot of information.

### The expert team members and their typical value added input with respect to decision making on vulnerability:

1. The account managers for civil security at KNMI are well aware of special events. They are in possession of an events calendar and can get in touch directly with civil security to obtain additional information on large scale outside events.
2. Experts at KNMI know how extreme the expected event is from a climatological point of view. They also have additional information from insurance companies, for example, on the impact of comparable events in the past.
3. KNMI press officers understand or are able to foresee political sensitivities if a severe weather event is expected. They see the forecasts and other messages already issued by commercial meteorological companies in the country. They have a feeling for the impact of repeated extreme events over short periods of time and assign the best strategy to deal with that situation.
4. The KNMI Co-ordinating Officer is an expert in the official issuing of procedures and knows the best methods (or feasible alternative methods) to disseminate warning messages.
5. The shift leaders hold all the meteorological knowledge to provide input on expected intensities.
6. The Head of the forecasting division has overall responsibility.

## Conclusions

- At first the operational meteorologists were quite reluctant to accept the decisive role of the expert team on weather alarms. Now it is well accepted because of the fact that the shift leader is member of the team. The decisions are also considered to be well-balanced.
- KNMI is strongly convinced that the weather alarms issued in the new set-up are more balanced and better linked to the needs of society.
- So far, strong and positive feedback has been received about these weather alarms from society, civil security and insurance companies.
- The new probabilistic method used for early warnings has demonstrated that the forecaster is more at ease and more likely to use the early warning for extreme weather. It seems to have made a major difference for the forecaster to be able to communicate and quantify explicitly the uncertainties.
- Since July 2005, the expert team on weather alarms has assembled eight times. There have been six occasions when weather alarms were issued. On one occasion, an early warning was raised and then withdrawn. There have been no missed events or any false alarms.

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