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National Aerospace Laboratory NLR



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The relation between NA70 and community complaints during the introduction of the fifth runway at Amsterdam Airport Schiphol




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Abstract

Some major changes have recently taken place at Schiphol Airport, relating to the introduction of the new fifth runway on the 20th of February 2003. Since the new runway has been taken into operation the number of complaints from the surrounding community has increased dramatically. As standard methodologies do not predict this effect very well, this research is a first step in trying to predict nuisance around the airport and describes the noise metric NA70¹ for Amsterdam Airport Schiphol. This noise metric might correlate better to the registered complaints from the surrounding of Schiphol than the standard noise metrics L_{den} and L_{night} . This might support the hypothesis that complaints are related to maximum aircraft noise levels and to the frequency of aircraft passing.

Although registered complaints could give a global impression about some aspects of annoyance, the authors are aware of the fact that they are an inadequate indicator of the full extent of noise effects (for example sleeping or communication disorders, high blood pressure levels etc) on a population. The complaints are however a suitable and easy performance indicator for the noise nuisance around Amsterdam Airport Schiphol. There are multiple reasons to complain for instance noise nuisance, smell or horizon pollution. This research assumes that all complaints arise from noise nuisance.

The paper presents the measured and calculated NA70 values and contours in the vicinity of Amsterdam Airport Schiphol. In addition the complaints are shown with the noise metric NA70.

¹ Number of flights above the 70 dB(A) per time-period (NA = number above)



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1 Introduction

Schiphol, the world's 9th largest airport, is a major driver of the Dutch economy, generating direct employment for over 55,000 people. Some major changes have recently taken place at Schiphol Airport, relating to the introduction of the new fifth runway. The fifth runway, called the 'Polderbaan', is essential for Schiphol's position as a European hub and allows the airport to accommodate the foreseen traffic growth within the environmental restrictions as stated in the new Aviation Act.

On February 20th 2003, the new runway became operational for night flights only; June 2003 was the last month in which the original 4-runway configuration was used. The new runway became gradually operational from July 1st onwards and per November 1st all 5-runways were fully operational. The fifth runway, although situated in a dense populated environment, was supposed to have a major environmental benefit, shifting air traffic from densely populated areas around Schiphol; i.e. the city of Amsterdam, to less densely populated areas.

Since the new runway has been taken into operation, the number of complaints from the surrounding community has increased dramatically. Especially in the area situated north of Schiphol the increase in complaints was significant. This paper is a first step to presenting the nuisance experienced around the airport in relationship to the new metric NA_x ; the number of noise events above x dB(A). An advantage of this NA_x is that it can be well explained to the public, contrary to other noise descriptors like L_{den} and L_{night} . For this reason it is expected that the NA_x metric suits the Schiphol situation very well, reflecting the experienced public's annoyance much better than the traditional noise load descriptors would do.

A study by INTOMART about the experienced nuisance from aircraft flying to and from Schiphol Airport revealed that a large portion of the residents around the airport would prefer more information about traffic in the surrounding of Schiphol [1]. A large number of people would like to have more information about actual runway and route usage.

2 NA70

The NA70, or number of aircraft noise events above 70 dB(A), has been chosen because it results in an indoor sound level of approximately 60 dB(A) in a typical house with open windows. Knowing that normal speech is causing sound pressure levels on the ear in the range of 60-65 dB(A), indoor levels of 60 dB(A) interfere with the average conversation and with



radio or television. At Sydney airport the NA70 metric, together with other presentation formats such as respite hour charts, provides a comprehensive set of information [2].

The NA70 values used in this paper are derived from both noise calculations and noise measurements. The advantage of calculated values is that the NA70 can be determined for a wide area around Schiphol. Measurement data though is only available for a limited number of measurement sites, which are situated relatively close to the airport.

Amsterdam Airport Schiphol operates a Noise Monitoring System (NOMOS) with a total of 21 Noise Monitoring Terminals (NMT's). Based on information of the actual flight tracks 18 NMT's are fixed and situated in residential areas around Schiphol. The NOMOS system distinguishes aircraft noise from other noise sources, such as traffic, railroad and industrial noise, fireworks or music. Amsterdam Airport Schiphol publishes the results obtained from these NMT's four times per year in a quarterly bulletin called 'Milieumonitor' ('Environmental Monitor'). These measurements are used to extract the measured NA70 noise events.

Three months were selected that each mark a significant change in runway configuration, each leading to a specific traffic distribution around Schiphol. The first time-frame, June 2003, was the last month in which the original 4-runway configuration was used. In July 2003, the new runway was gradually taken into operation leading to a fully operational 5-runway configuration in November 2003.

The NA70 values for each time frame are presented in more detail for four different periods within the 24-hours period: day (07:00-19:00 hr LT), evening (19:00-23:00 hr LT), night (23:00 hr-06:00 hr LT) and early morning (06:00 hr LT-07:00 hr LT). Each period is representing a different kind of nuisance period, reflecting a different operational usage as well.

2.1 NA70 FANOMOS calculations

Calculated aircraft noise levels are used to calculate the NA70 in a grid and at the measurement locations, using FANOMOS (Flight Track and Aircraft Noise Monitoring System). In figure 1, 2 and 3 grid calculations are presented for the considered months June, July and November 2003 between 07:00 hr and 19:00 hr LT. In this period 25,849 flights for June, 27,348 flights for July and 24,307 flights for November are registered.

2.2 NA70 NOMOS measurements

The NOMOS measurements were used to extract the NA70 noise events. Figure 4 and 5 show both measured (first bar) and calculated (second bar) NA70 values for each NMT location in the month June (figure 4a), July (figure 4b) and November 2003 (figure 5) between 07:00 hr and 19:00 hr LT. From the results it can be concluded that the measured NA70 values are higher than the calculated NA70 values at all NMT sites. This observation is in agreement with earlier



research on measured and calculated noise load around Schiphol Airport [3,4]. The location of the NMT seems to have a large influence on the ratio of calculated/measured NA70.

The distribution of measured NA70 values on the different NMT's is in agreement with the operational usage of the runways. In June the NA70 values are relatively high in the northern part and in the Amsterdam region. In July the NA70 values are still relatively high in the Amsterdam region. In November the NA70 values are again relatively high in the northern part and in the southern region.

3 Complaints around Schiphol

The Complaints and Information Bureau of the Regional Consultation Committee Airport Schiphol (CROS; Commissie Regionaal Overleg luchthaven Schiphol) registers all incoming aircraft noise complaints around Schiphol [5]. The registration of complaints is potentially suitable for monitoring purposes.

The number of complaints during the day is shown in Figure 6 and 7. For June 2003, which was the last month in which the original 4-runway configuration was used, the complaints are more or less equally distributed. Although complaints from arrivals are already relatively high in the northern region. In July 2003 the new runway became gradually operational. This is reflected by an increase in complaints in the northern region, merely caused by arrivals on the new runway. During this month complaints from the Amsterdam region from particularly aircraft departures decreased. In November 2003, when the 5-runway configuration was fully operational, the number of complaints caused by approaching aircraft in the northern region is again significant.

4 Conclusions and recommendations

This research aims to find a relation between the metric NA70 and complaints in the vicinity of Schiphol Airport. In this paper the NA70, or number of aircraft noise events above 70 dB(A), are both derived from noise calculations as well as noise measurements around Schiphol Airport.

The NA70 contours and values clearly reflect the differences in runway usage for the months, June, July and November 2003. It is obvious that the contours are relatively close to the airport, which means that a significant number of complaints is not covered by the NA70 contours. In



order to improve the analysis on the relation between the NA-values and complaints it is recommended to decrease the threshold value of 70 dB(A) to 60 or 65 dB(A).

The measured aircraft noise levels at the NMT locations and the calculated aircraft noise levels at these specific locations show that the measured NA70 values are consistently higher than the calculated NA70 values. Apparently the location of the NMT seems to have a substantial influence on the ratio of calculated/ measured NA70.

The introduction of the new fifth runway at Schiphol Airport seems to have increased the number of complaints from the surrounding community. Particularly in the northern region complaints are significant. A possible reason might be that the people in this region are not (yet) used to aircraft noise. For this region in particular the N_{Axx} metric, in combination with other presentation formats, such as respite hour charts, may provide a comprehensive set of information.

References

- [1] Perception research Schiphol- 1-measurement December 2003, Intomart GfK, RvdD/11.250, April 2004
- [2] Sydney airport masterplan: procedures for reporting predicted noise impacts, March 2003, Report 02273-1
- [3] S.P. Galis, Differences in calculated and measured Lden around Amsterdam Schiphol Airport, NLR-CR-2000-647
- [4] F.J.M. Wubben en A.C. Hoekstra, Comparison between NOMOS-noise measurements and FANOMOS-noise calculations, NLR-CR-2000-191
- [5] <http://www.crosinfo.nl/>



Figures

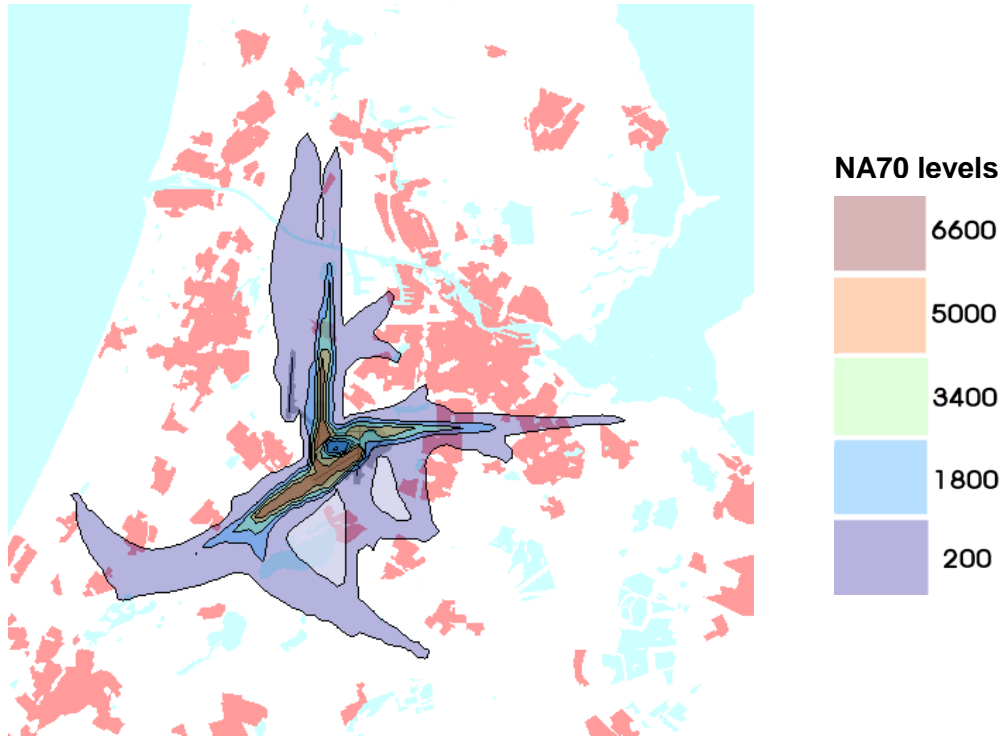


Figure 1: *Grid NA70 calculation for June 2003 07h- 19h*

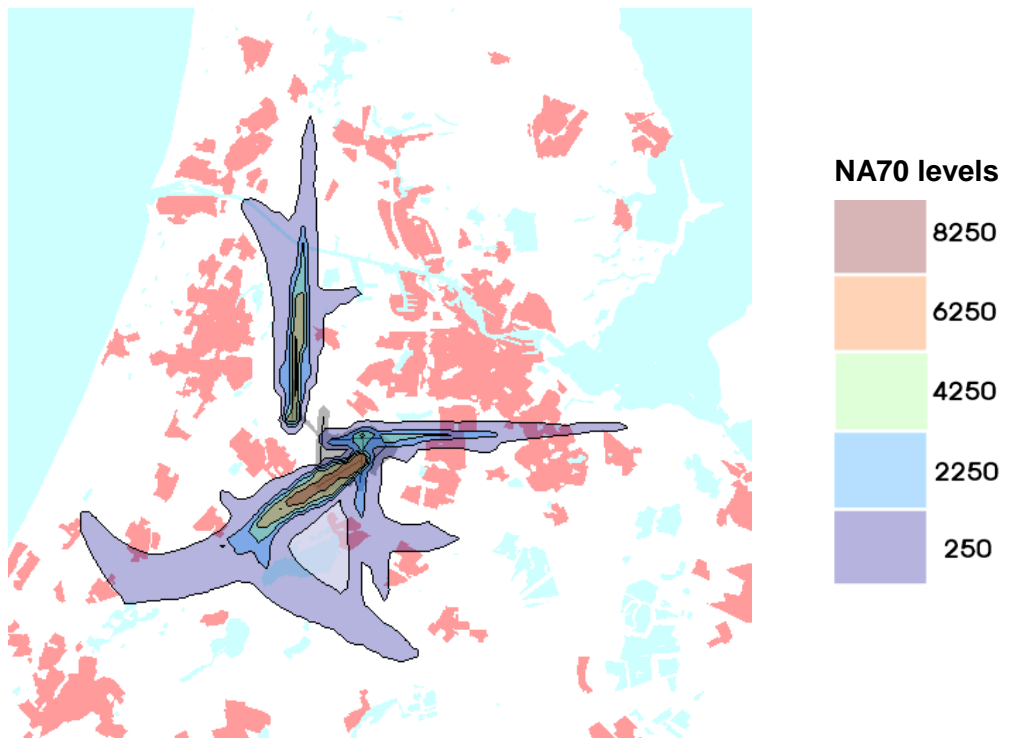


Figure 2: *Grid NA70 calculation for July 2003 07h- 19h*

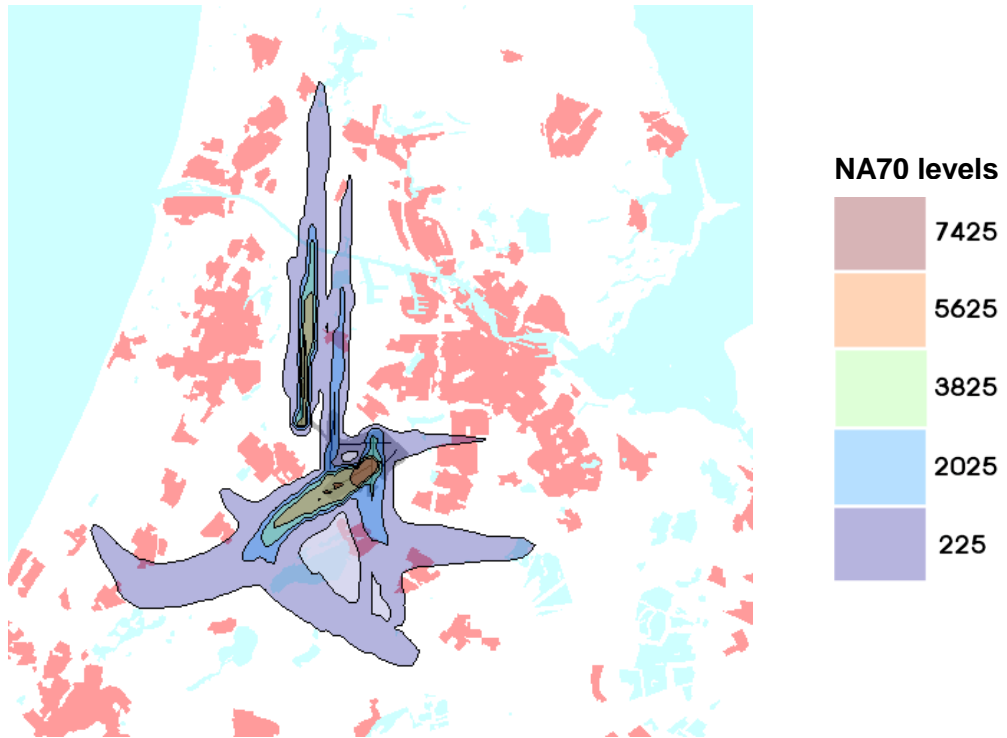


Figure 3: Grid NA70 calculation for November 2003 07h- 19h

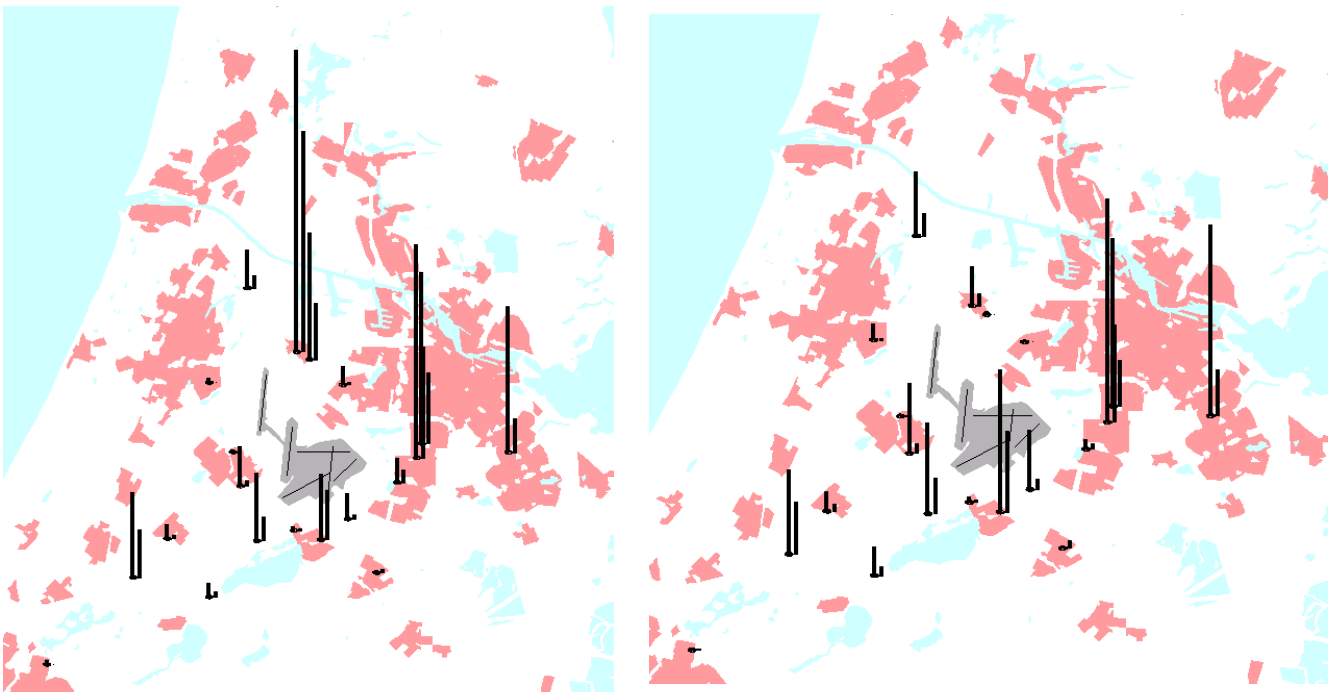


Figure 4a and b: NA70 measurement and point calculation at NMT locations for June and July 2003 07:00 hr- 19:00 hr LT

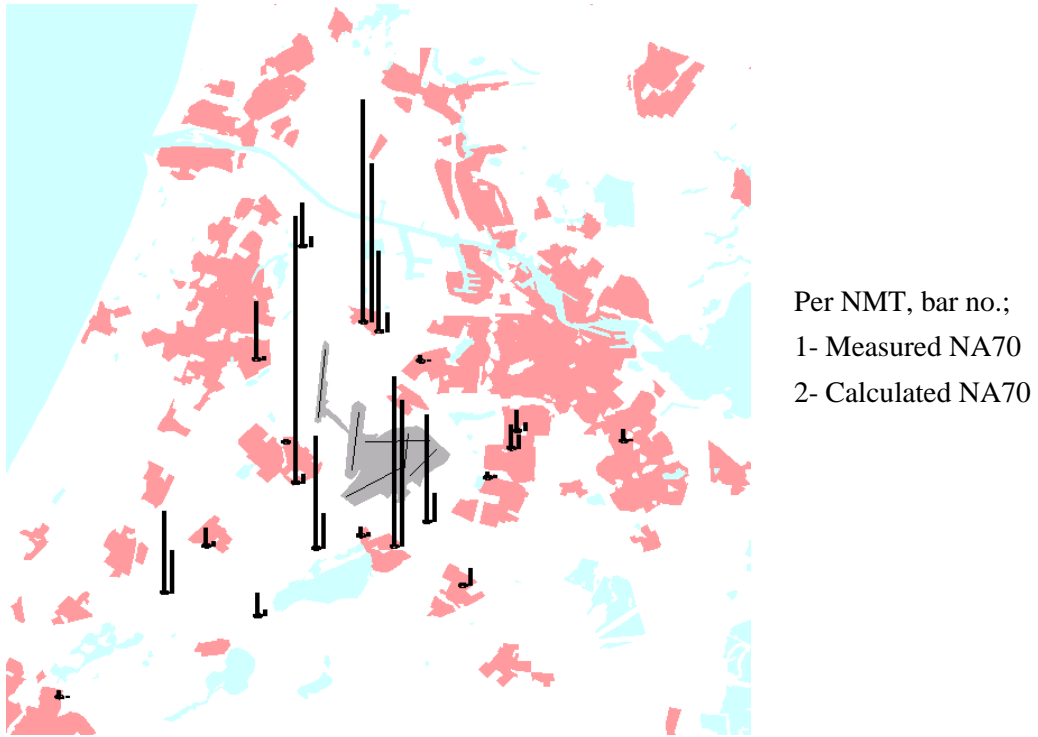


Figure 5: *NA70 measurement & point calculation on the NOMOS locations for Nov 2003 between 07:00 hr LT and 19:00 hr LT*

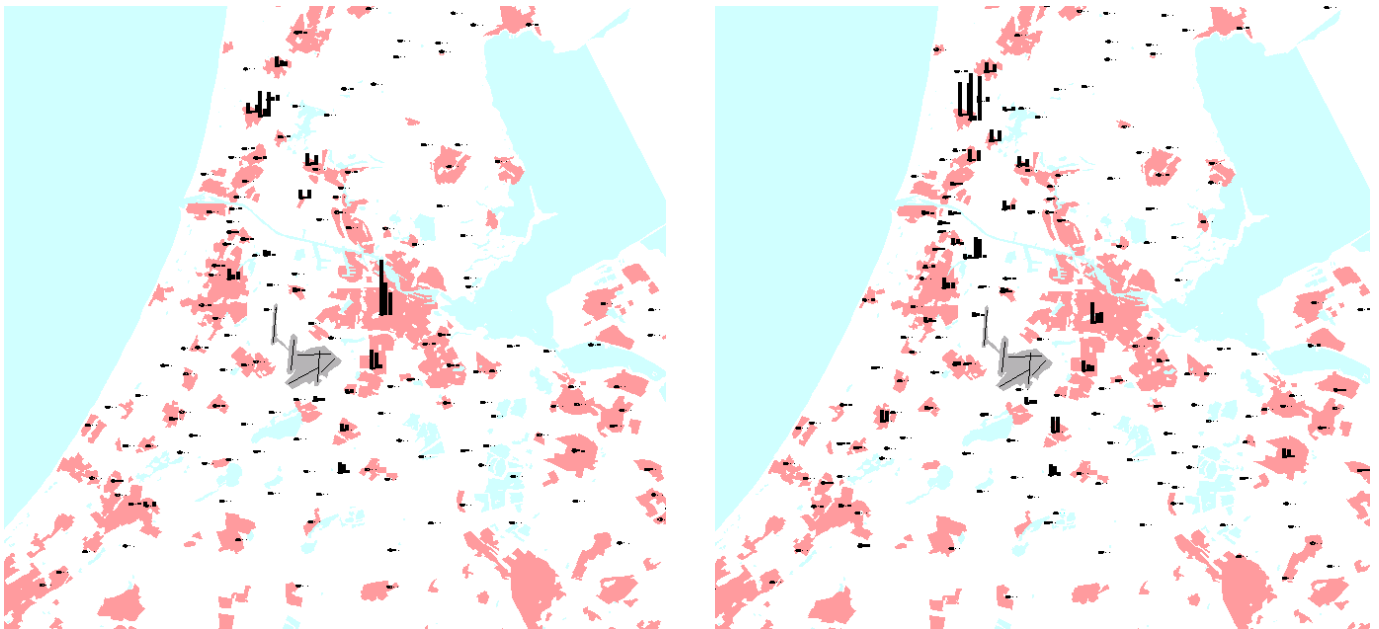
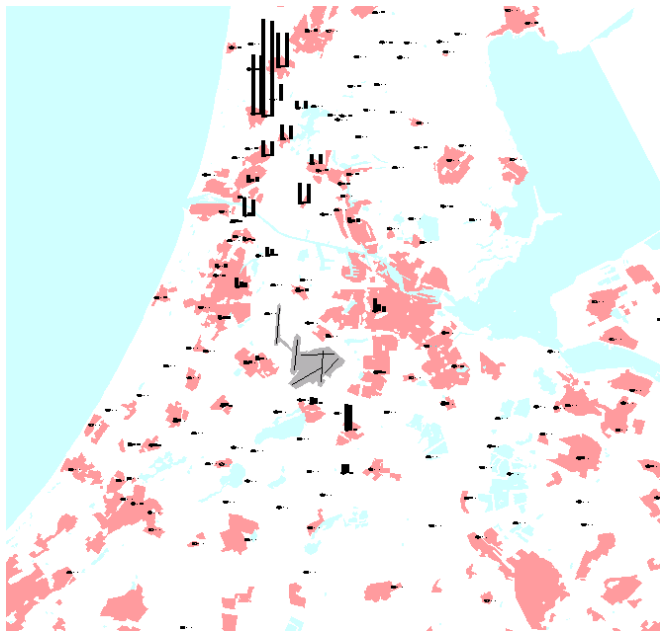


Figure 6a and b: *Number of complaints during the day around Schiphol Airport for June and July 2003*



Per complaint site, bar no.;

- 1- Total amount of complaints
- 2- Complaints from starts
- 3- Complaints from landings

Figure 7: *Number of complaints during the day around Schiphol Airport for Nov 2003*