Belangrijkste citaten uit de masterthesis van ir. Jan ten Kate “**Predicting noise nuisance from outdoor music events in the built environment**” (het voorspellen van geluidsoverlast bij muziekevenementen in de open lucht in de bebouwde omgeving).

Technische Universiteit Delft. Richting: Geomatics voor de bebouwde omgeving

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De thesis was gewaardeerd met het cijfer “9”. De thesis is volledig in de Engelse taal geschreven. De citaten zijn eveneens een op een in het Engels weergegeven met zo nodig een verduidelijking in het Nederlands.

Achtergrondinformatie auteur (bron: www.Linkedin.com)

Jan ten Kate is van februari 2013 tot augustus 2016 hoofd personeelszaken geweest bij de evenementenorganisator Chasing the Hihat B.V. (CTH) Hij was verantwoordelijk voor het aannemen van medewerkers, management gedurende de evenementen en de uitbetalingen van de lonen. Chasing the Hihat is zeer klein begonnen; onprofessioneel en door wat vrienden achter de bar.

In 2016 stonden er meer dan 200 mensen op de salarislijst (bij een totale contactenlijst van ca. 500 personen) en werden er ca. 15 grote evenementen per jaar georganiseerd.

Van augustus 2016 tot maart 2017 was hij studio manager bij Chasing the Hihat B.V., verantwoordelijk voor het laten ontwerpen en uitvoeren van festival concepten en de creatieve en technische uitvoering daarvan onder de naam CTH Studio. Georganiseerde evenementen zijn onder andere: Georgie's Wundergarten, Georgie's Wintergarten, Park am See, Oranjebloesem, Hasbro Showcase, Speed of Light - Amsterdam Light Festival. Tijdens de evenementen werden producten gepromoot: Asics, Desperados, Absolut Vodka, Bulleit. “CTH Studio develops and realizes concepts that enlightens people's festival or brand experience in a fun and beautiful way.”

Op dit moment werkt Jan ten Kate bij adviesbureau DGMR in Den Haag, adviseurs voor bouw, industrie, verkeer, milieu en software. DGMR heeft de software en geluidsmeters ter beschikking gesteld die in het onderzoek zijn gebruikt.

De thesis

De belangrijkste onderzoeksvraag was: Can a noise map be a valid tool for predicting noise nuisance from outdoor music events in the built environment? (kan een geluidskaart een valide instrument zijn voor het voorspellen van geluidsoverlast bij muziekevenementen in de open lucht in de bebouwde omgeving?)

Voor het onderzoek is voor één locatie (het Diemerbos) met omwonenden in de gemeenten Amsterdam, Diemen, Gooise Meren en Weesp onderzoek verricht aan representatieve festivals met luide electronische muziek alle georganiseerd door Chasing the Hihat. De festivals waren:

22 Fest	op zaterdag 23-07-2016
Liquicity Festival 2016	op zondag 24-07-2016
Vunzige Deuntjes Festival 2016	zaterdag 30-07-2016 (dag 1)
Vunzige Deuntjes Festival 2016	zondag 31-07-2016 (dag 2)
Zeezout Festival	op zaterdag 03-09-2016
VunzigeDeuntjes Festival 2017	zaterdag 29-07-2017 (dag 1)
VunzigeDeuntjes Festival 2017	zondag 30-07-2017 (dag 2)

Voor de registratie van klachten is de website www.geluidsoverlast.nl opgezet.

Hieronder staan de belangrijkste citaten uit de thesis opgesomd met verwijzing naar de pagina in het rapport waar deze te vonden zijn. Deze citaten zijn vanuit het bewonersstandpunt belangrijk en dienen in het Nieuwe Evenementenbeleid terecht te komen. Omdat dit beleid al gereed is, dient dit gedaan te worden door middel van moties vanuit de gemeenteraad van de Gemeente Amsterdam.

De belangrijkste conclusies zijn:

- ir. Jan ten Kate is een specialist op het gebied van evenementen doordat hij in deze industrie heeft gewerkt, er onderzoek in heeft gedaan met deze thesis en werkt in het verlengde daarvan nu als professional in hetzelfde werkveld. Het onderzoeksrapport is gewaardeerd met een "9" en kan als volwaardige informatiebron worden beschouwd voor geluid bij evenementen in de open lucht.

- Het niet verstoren van de nachtrust en de spraakverstaanbaarheid worden ook in deze thesis enkele keren genoemd als de belangrijkste uitgangspunten.

- Het maximale geluidsniveau op de gevel van woningen is 65 dB(A). De dB(C) norm is ofwel 79 dB(C) ofwel 83 dB(C) maar nooit de in het huidige Nieuwe Evenementenbeleid genoemde 85 dB(C). Deze normen zijn de door de vergunningverlenende gemeenten gehanteerde maximale geluidsniveaus. Als standaarden in Amsterdam worden 65 dB(A) en 80 dB(C) genoemd in de thesis. Geen enkele omwonende zou geluidsniveaus hoger dan deze hoeven te verduren. Deze normen dient derhalve ook in het Nieuwe Evenementenbeleid onverkort te worden opgenomen. Het voorgenomen Nieuwe Evenementenbeleid is hiermee slechter voor de omwonenden dan het oude beleid.

- Een toename met 5 d(B) betekent een versterking van het geluidsniveau met 1,5(!). De muziek is dus 1,5 keer zo luid bij 85 dB(C) als bij 80 dB(C).

- Eindtijden in het weekend zijn zonder uitzondering 23:00 uur.

- Gemiddeld werd er al bij een geluidsniveau van 50,8 dB(A) bij de woningen geklaagd door de omwonenden.

- De huidige acoustische rapporten voor evenementen schieten tekort want gebruiken methodieken die voor industrie-, spoortweg en autoweglawaai zijn ontwikkeld. De huidige methodiek is slordig ("sloppy") en geeft geen goede resultaten in de vorm van geluidskaarten om daarmee de verwachte geluidsoverlast voor omwonenden te kunnen voorspellen.

- Amsterdam afficieert zich als festivalhoofdstad met het Amsterdam Dance Event waarbij electronische dansemuziek de hoofdmoot vormt. Dit is in flagrante tegenspraak met het feit dat juist dit soort muziek de meeste overlast bij omwonenden geeft.

- Er zijn nauwelijks tot geen onderzoeksstudies naar geluid bij muziekevenementen in de open lucht in de bebouwde omgeving. Het huidige onderzoek is de eerste.

- 100 dB(A) is het algemeen aanvaarde maximaal toegestane geluidsniveau op de locatie voor het podium.

- Meteorologische omstandigheden hebben grote invloed op de geluidspropagatie. Door verschillende weersomstandigheden kunnen verschillen tot wel 40 dB(A) optreden in gemeten geluidsniveau's bij woningen onder gelijke geluidsproductie op het evenemententerrein.

- De laagste frequenties (onder 31,5 Hz) kunnen niet met de huidige software gemodelleerd worden terwijl juist deze lage basfrequenties de meeste overlast bij omwonenden veroorzaken.

- Gemeenten werken met beperkende beschikbare apparatuur om de geluidsniveaus te meten.

- Om klachten over geluidsoverlast door omwonenden te voorkomen dienen locaties te worden gezocht waarmee omwonenden zo min mogelijk emotionele binding hebben. Parken zijn hierdoor minder geschikt. Meest geschikt zijn tijdelijk lege gebouwen, ongebuikte parkeerplaatsen en braakliggend terrrein zijn voorbeelden van geschikte locaties.

- Alle omwonenden binnen de 45 dB(A) contour dienen over een evenement te worden geinformeerd.

Citaten

(onderstrepingen zijn toegevoegd om sommige belangrijke passages uit te lichten)

§ 1.1 Motivation and Problem Statement.
P. 16. Acoustic reports about the predicted noise levels of outdoor music events are being made but are underdeveloped. Acoustic companies use the same software packages and directives used for example a railway or a highway. Correct noise predictions could be a very beneficial knowledge above measuring.

§ 1.3 Research Scope
P. 18. The research will focus on popular outdoor event areas in Amsterdam and preferably electronic dance music festivals. The choice for electronic dance music festivals is because of the shear increase in popularity and amount of festivals in this genre. Preliminary research has also shown that these festivals cause the most agitation in neighbourhoods. This is a clashing contradiction with the profile of Amsterdam as dance capital of the world and host of the biggest dance related festival in the world, the Amsterdam Dance Event (ADE).

§ 1.4 Scientific relevance and contribution
P. 18. There are little to no studies about noise levels from outdoor music events, the propagation of music in an outdoor environment or the relation with nuisance complaints. Methodologies to predict environmental noise are based upon the most common sources of nuisance namely traffic and industries. A methodology that is adapted to correctly determine noise from an outdoor music event could not be found. As mentioned in the problem statement acoustic reports are being made for this purpose but are in its infancy due to lack of research, applications and guidelines. All the legislative directives concerning environmental noise do not include noise from outdoor music events, only a surcharge for clearly audible music-sound. This lead to a shortcoming of a correct common approach to predict, visualise and measure noise from outdoor music events.

§ 3.1 The testing grounds
P. 32. Another prerequisite of the event is that it is categorised as a loud electronic music festival were sound level at least reach the generally accepted maximum allowable level of 100 dB(A) in front of the stage, because preliminary research has shown these events cause the most agitation and are now the most popular genre in Amsterdam.

§ 3.1 Pillar A, noise level prediction
P. 32. At least knowledge about the quality of noise level predictions now, and the quality it could have must be acquired to answer the research question. The literature research made clear that due to lack of guidelines and ambiguous legislation the common approach for these acoustic reports is sloppy. Therefore it is assumed that if there is a relation between the level of noise and noise nuisance complaints the noise levels that are predicted now are not correct enough to create a map to predict noise nuisance, or at least could be better.

§ 3.2.2.2 *Input data for enhanced noise model*
P. 35. Next to that the results from the prevailing noise model and the enhanced one can then be easily compared. The calculation settings can define which attenuation or reflection is included <u>and most importantly the meteorological conditions. Preliminary research have showed the huge influence these conditions can have on the noise levels.</u>

§ 3.3 Pillar B, noise measurements
P. 36. The MeTrao system is an acoustic measurement system developed by Event Acoustics and rented by CTH. The sound technicians at the music stages use this system during the event to see whether the noise level at the resident control points still comply with the permit. Constant control and real-time adjustments of the noise levels allows CTH to maximise their sound capacity without violating the law.

§ 4.1.1 The surrounding area
P. 47. This radius is an estimation and it was based upon the fact that <u>the maximum sound pressure level at the façade at the nearest residential house could not exceed 65 dB(A)</u>.

§ 4.1.2 Legal limits
p.47. (geen citaat maar samenvatting): Table 2 with event data, start and end times and sound level limits. Noticeable is that during weekend days the end time is always 23:00 h. Sound level limits for the nearest residential houses are always 65dB(A) without any exception and the maximum dB(C) levels 79 or 83 dB(C) (and never 85dB(C)!). This shows that the “Nieuwe Evenementenbeleid” is worse for the inhabitants then is was until now under the old regulations.

§ 4.2.1 Data inventory
P.48. For each measuring station the data was extracted for each second. This is around 43 thousand lines per measuring point. The attributes include many different fields such as Leq (equivalent continues level) in dB(A) and dB(C) for multiple time-frames, but most importantly it includes spectral data from 25 Hz upward to 10 kHz. Spectral data is essential to better understand the propagation and perception of the noise.

§ 4.2.1.1 *Munisense system*
P. 49. The data that can be extracted from the Munisense server is limited compared to the MeTrao system. Two values can be extracted and those are Leq in dB(A) and dB(C) with a time-frame of 10 seconds.

§ 4.2.2 Cleaning the data
P. 51. This turned out to be air-planes that fly over, the air-planes actually made more noise than the allowed maximum noise limit of the event. An example of how environmental noise can contaminate noise measurements, and the dubious situation where the apparatus that is meant to monitor whether the event does not break the law is consecutively breached by air-planes.

§ 4.3 Implementation of the noise nuisance complaints
P. 52. The goal was to have every complaint directed to the event processed by *festivaloverlast.nl*. There was a range of residents that were informed with a letter about the events and the website, sadly this was only 2% of the total amount of addresses in the focus area. A decision made by the municipality based on proximity and previous experience.

§ 4.3.1 Data inventory
P. 52. The website started to gain more attention than expected, the complaints about festivals were reported from all over the Netherlands. Probably the name of the website, namely festival nuisance is a popular search term for residents whom try to find an outlet to complain. It shows also the need to have a hotline for this specific form of annoyance.

§ 4.2.1.1 *The reproduction results*
P. 62. (over de algemeen gebruikte software voor geluidsmodellering): The source power levels that are chosen do not have any power in the lower octave band and in the highest. The lowest band than can be modelled in Geomilieu is 31.5 hertz. None of the sources had any source power on that octave band. This seems incorrect because the spectrum of the music that is played on these events mostly do have a significant amount of energy in the lower frequencies and subsequently the sound in the lower frequencies have been seen as the big culprit of noise complaints.

§ 4.2.1.1 *Analyses of the prevailing noise model*
P. 64. The wind should not exceed 2 meter per second and no extreme hot temperatures or precipitation. By using KNMI (The Royal Netherlands Meteorological Institute) data from the nearest meteorological station a time-frame of 70 minutes was found that satisfied these strict meteorological criteria, that is 1.6% of the total cumulated opening hours of the event.

§ 5.1.1 Multiple meteorological situations
P. 74 The differences are most apparent further away from the event area. In some areas the meteorological influences cause a 40 decibel difference. Even relatively nearby at the residential control points a 12 decibel difference is predicted. These two noise maps depict the two most extreme divergent weather conditions witnessed during the events. Nonetheless it were actual occurring weather phenomena and it proofs the importance of the involvement of meteorological influences when assessing the impact of noise.

§ 5.2.1 Acoustic analysis
P. 82. According the loudness scale a 5 dB difference would be perceived as a 1,5 doubling of the noise. The average dominant frequency at the residents was low. This is expected because higher octave bands are quickly absorbed, reflected and deflected. In 71% of the measurements the dominant frequency was 250 Hertz or lower with a mode of 200 Hertz.

§ 5.2.3 Spatial analysis
P. 85. The results are that the direction of the wind is the dominant factor to influence the location of the complaints at 1500 meters distance or more. At low wind speeds and close by to the event the circular distributions around the event is more evenly spread and depends on the sight-lines of the speaker. But further than 1500 meters from the event and a wind speed above 20 km/h the noise nuisance complaints were always within in 10 degrees deviation of the wind direction. The effect of the

wind should be addressed together with the directivity of the speakers. The sight-lines of the speakers are the leading effect on the location of the nuisance complaint further than 1500 meters when there is no or little wind.

§ 5.2.5 Noise level as a predictor for noise nuisance

P. 88. The average noise level at the location of the complaint was 50.8 dB(A). This level is loud enough to distinguish the noise from the event above the environmental noise. While the evening falls more residents are at home and there is more chance they notice the noise, next to that the temperature drops and this influences the sound rays. The relevance of the duration of noise exposure is questionable. It could be that residents start to complain in the evening because after 9 hours of noise they are fed up and had enough. But the wind analyses have shown that rather quickly after a change of wind direction residents start to complaint. Especially in the evening hours it appeared that the exposure of noise did not have to be long to cause annoyance. While during the day the tolerance is higher.

§ 5.3 Analyses 3: Noise maps as a tool to predict noise nuisance

P. 89. **limits and enforcement** Noise limits have to be set to not endanger the health of the visitors. A 100 dB(A) and a 110 dB(C) at the FOH is an appropriate limit that will still please the visitor. A maximum level at the building facade of 65 dB(A) and 80 dB(C) have proven to be possible in Amsterdam. No resident should endure louder noise levels than that.

P. 91. Everyone inside the 45 decibel contour line are the residents that will notice the noise and 42% of the complaints come from these areas. Another main predictor of the nuisance complaints are the sight-lines from the speakers. 38% of the noise nuisance complaints felt within a 10 degrees aperture angle of the sight-lines over a distance of 4 kilometers. The other 20% of the complaints came from residents from who the relation to the noise could not be understood, or from residents during atypical meteorological circumstances.

P. 92. Next to noise control a lot can be done to prevent the nuisance. To start with the location of the event area. Preferably the location should have as little emotional connection with the surrounding residents as possible. If it is a well visited park or everyone's favourite picnic spot the noise will cause more annoyance because it reminds residents of the spot that has been taken. Temporary vacant building-sites, empty parking lots, pieces of no-ones lands are examples of suited areas. This will also reduce the amount of resident that fiercely feel the need to protect their neighbourhood. The municipality should actively inform all possible residents (within the 45 dB contour) about the upcoming events.

3 december 2017, Jacob Stroet