University of Salford MANCHESTER

New Sources of Environmental Noise

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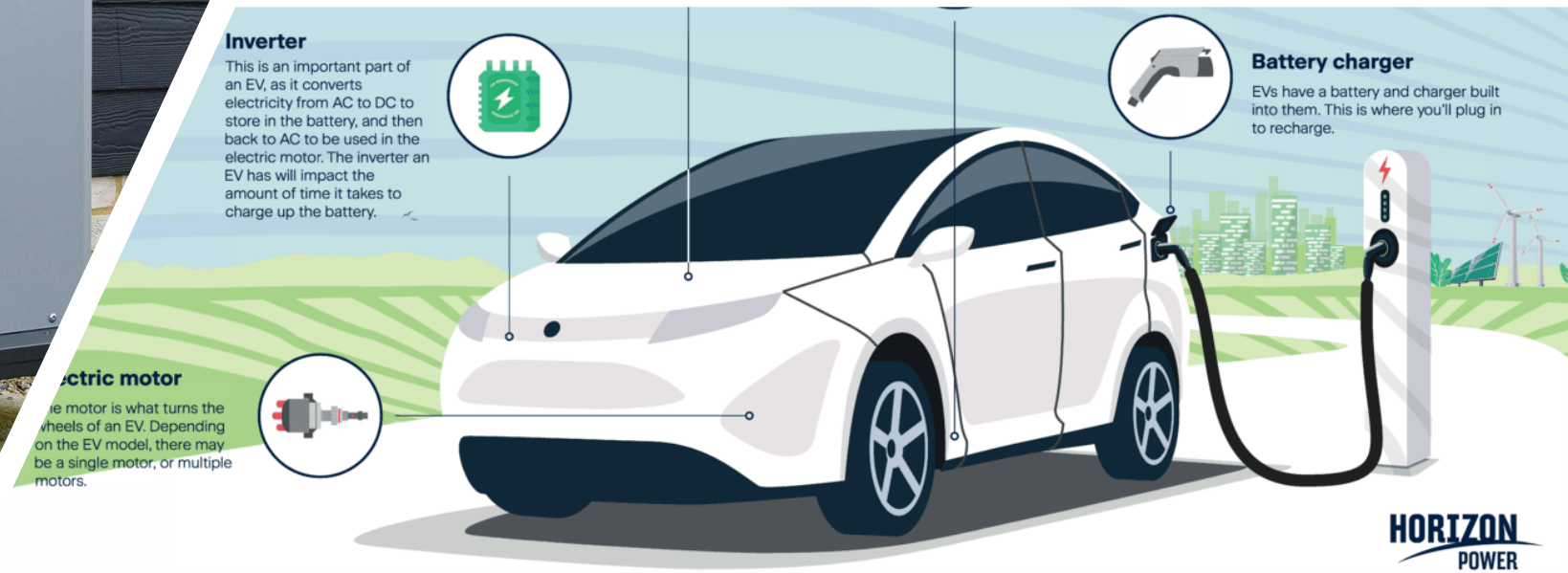
Noise Network Plus co-Lead

Transition towards electrification and decarbonisation leading to the largest shift in soundscapes in living memory



Key Challenges

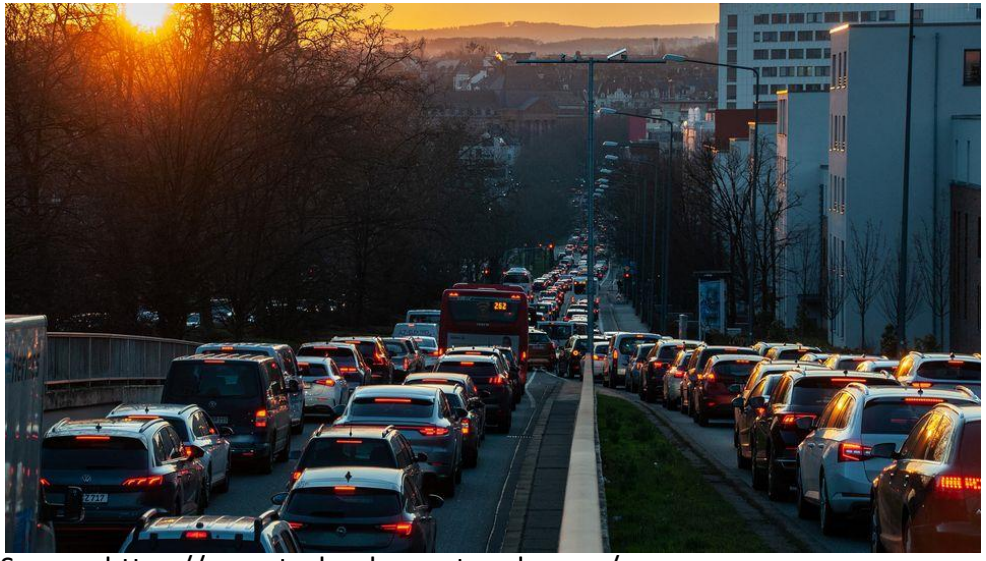
- Different sound sources: E.g., low frequency tonal noise (ASHPs), high frequency tonal noise (drones, AVAS)
  - Interaction between new sources
- New or updated prediction models are needed
- Psychoacoustic knowledge is needed
- New or updated policy and guidance is required

Excellent opportunity to change the way we address environmental noise problems, a fresh start to shape future soundscapes the way we want.

Torija Martinez, A. J. (2024). Future Developments in Noise from Transport. In *A Sound Approach to Noise and Health* (pp. 205-222). Singapore: Springer Nature Singapore.

Towards more ‘Eventful’ Soundscapes

- Current Soundscapes
  - Traffic dominated
  - Low frequency / narrowband noise



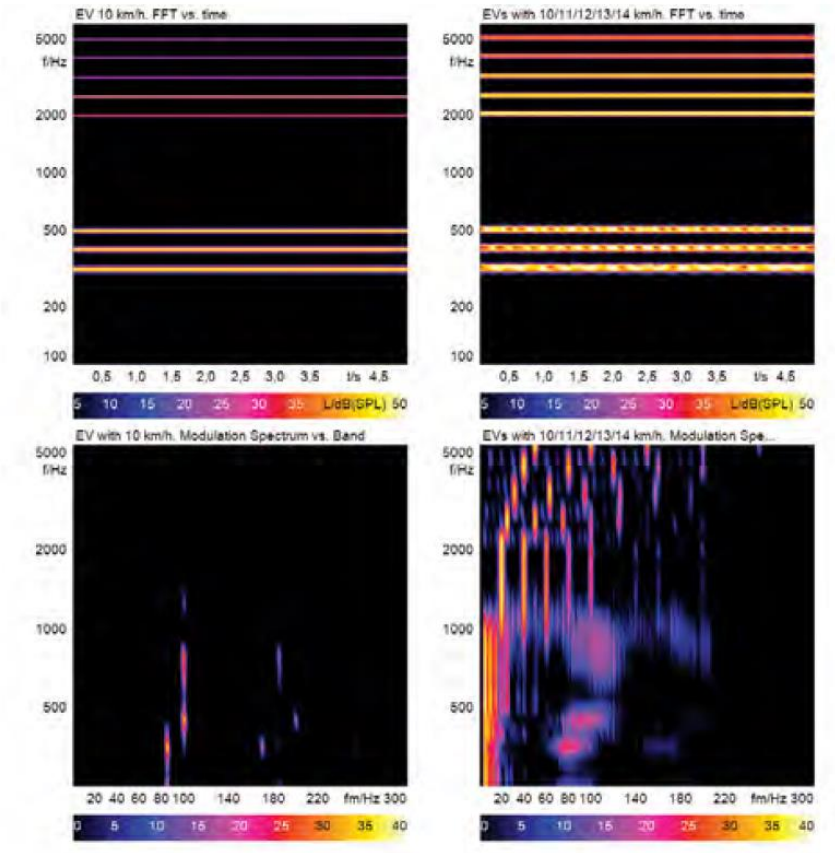
Source: https://www.technologynetworks.com/

- Future Soundscapes
  - Transition towards more ‘eventful’ soundscapes
  - More prominent individual noise events

Source: Torija Martinez, A. J. (2024). Future Developments in Noise from Transport. In *A Sound Approach to Noise and Health* (pp. 205-222). Singapore: Springer Nature Singapore.

AVAS – Psychoacoustic Aspects

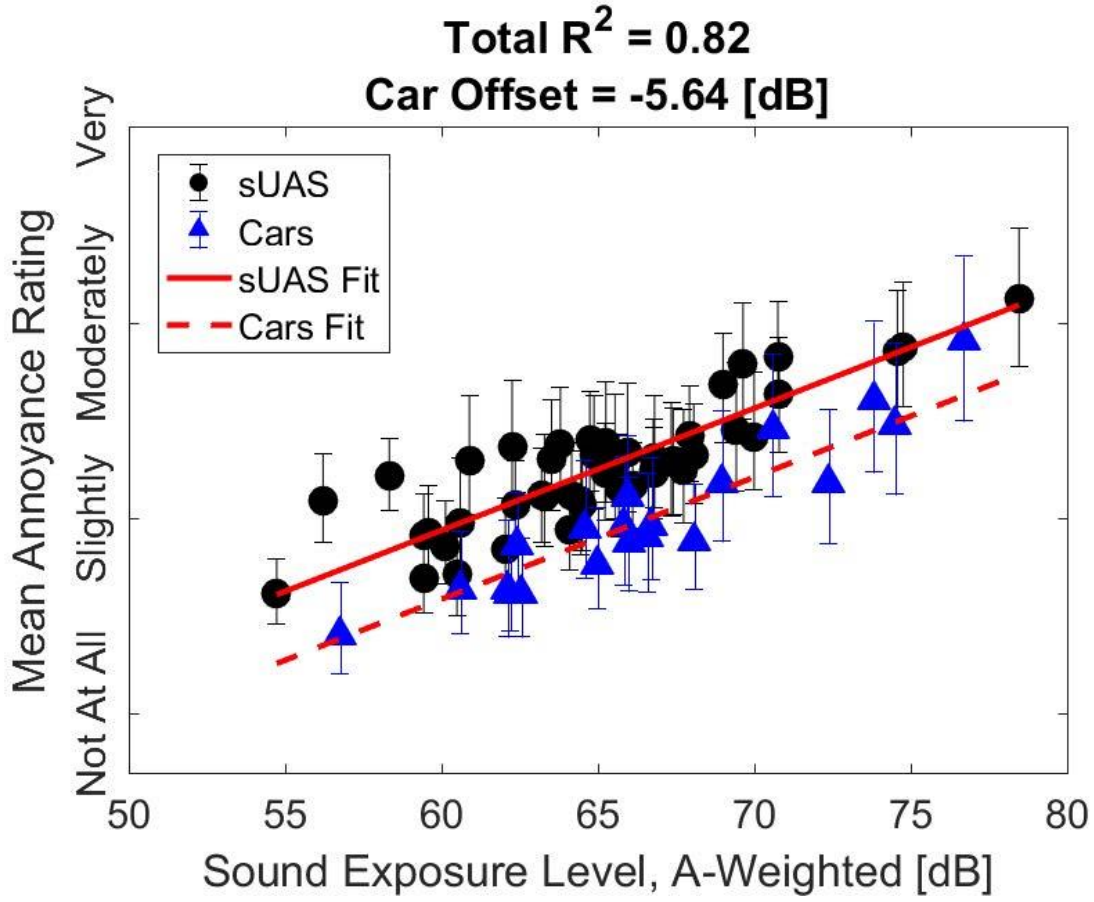
- Balance between noticeability and noise annoyance
- Multiple e-vehicles:
  - Dissonant noise patterns due to several ‘untuned’ superposed alert signals
  - Universal AVAS?
- How to account for aural diversity and conflict of goals?



Fiebig, A. (2020). Electric vehicles get alert signals to be heard by pedestrians: benefits and drawbacks. Acoust. Today, 16(4), 20.

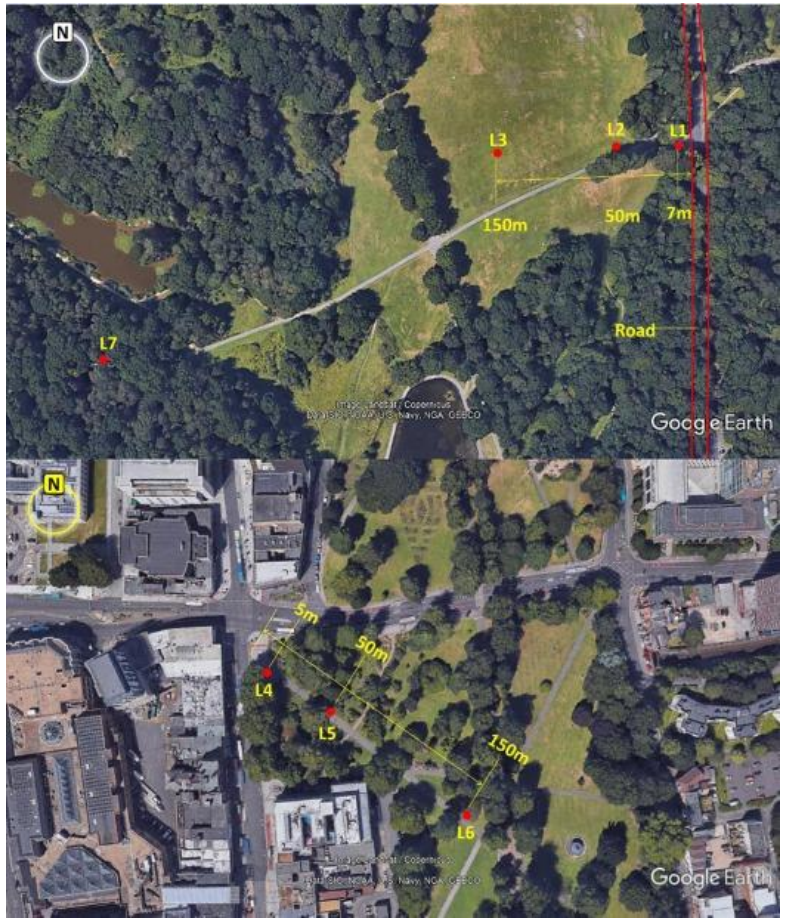
Challenges on Drone Noise

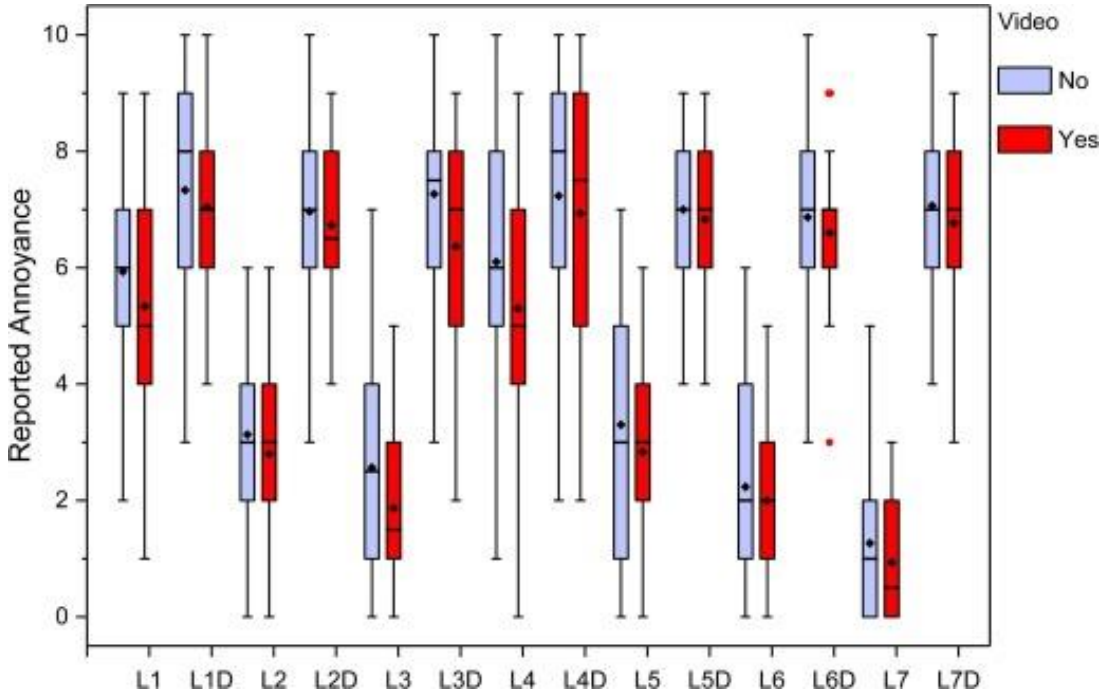
Drone Noise vs. Road Vehicle Noise



Christian, A. W., & Cabell, R. (2017). Initial investigation into the psychoacoustic properties of small unmanned aerial system noise. In 23rd AIAA/CEAS aeroacoustics conference.

Effect of Drone Noise on Soundscape

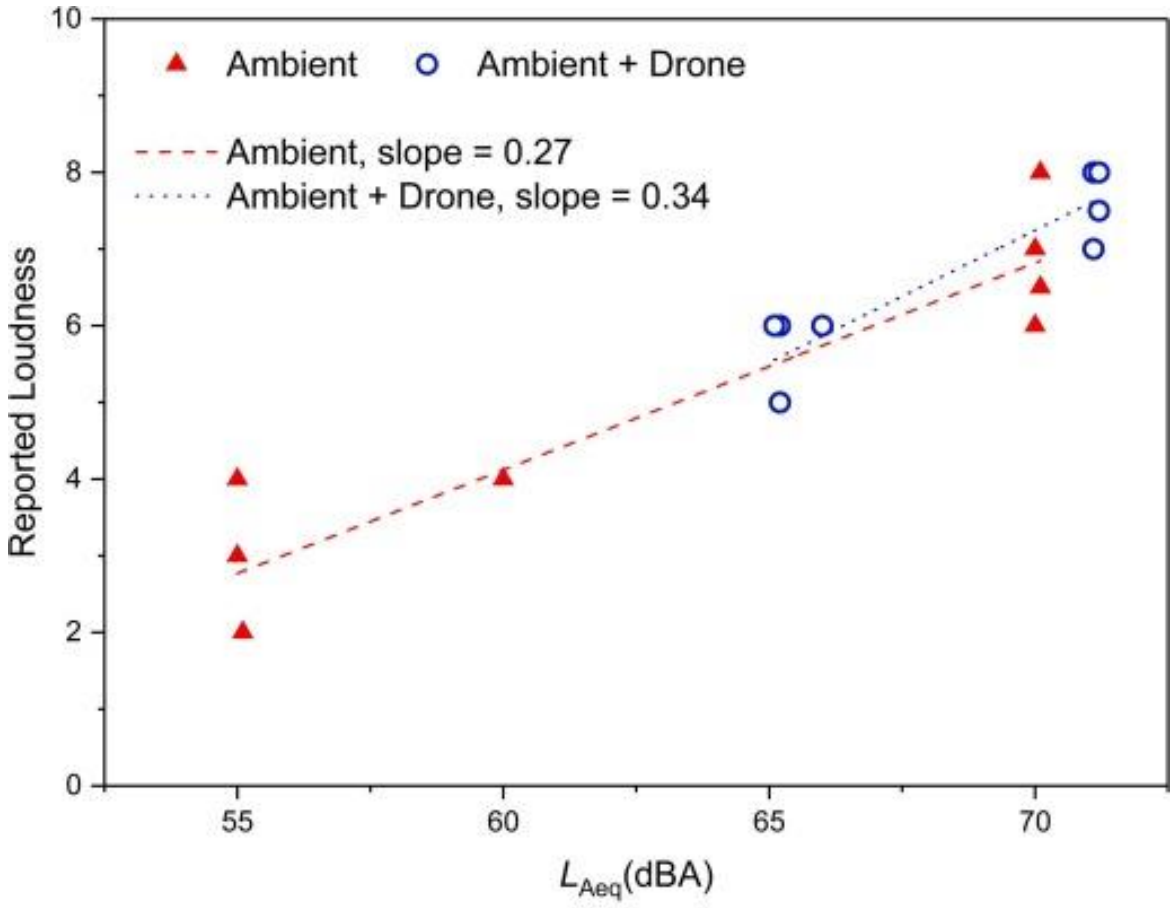


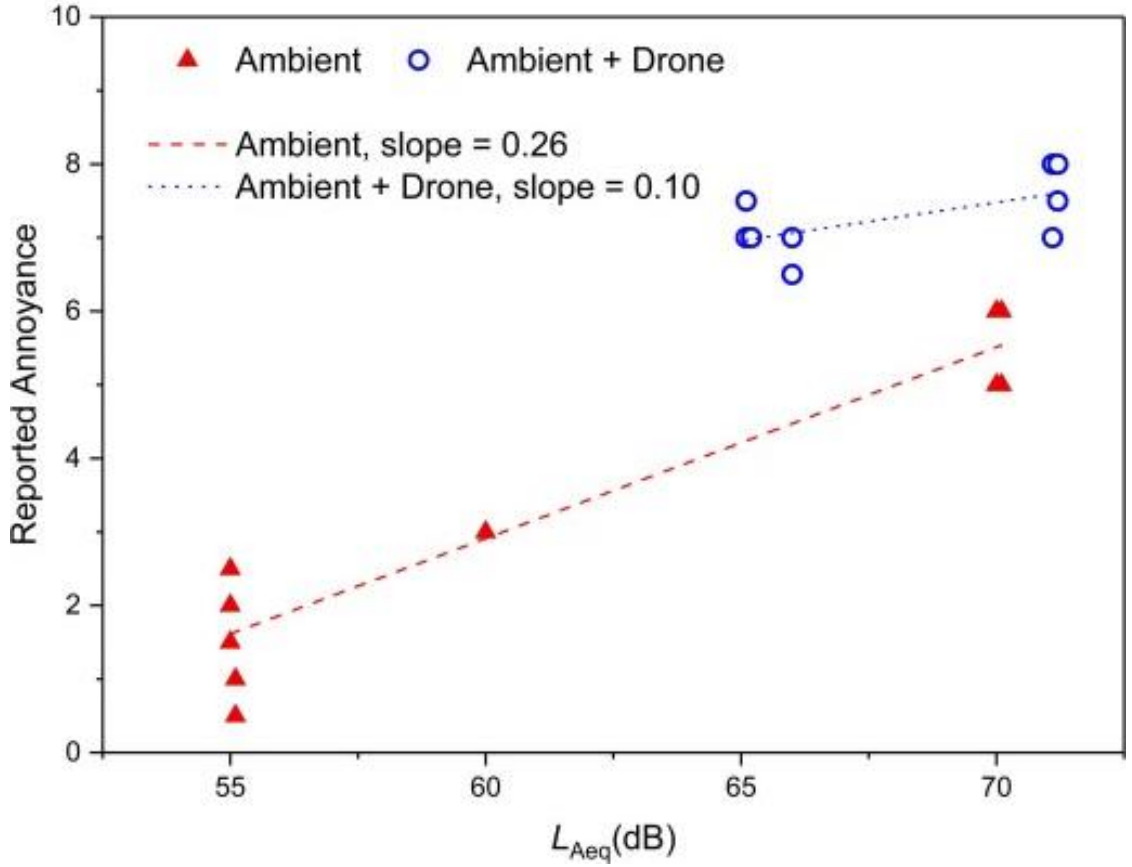


Reported annoyance about 7 (scale from 0 to 10) with drone noise, regardless the overall L_{Aeq} in the location.

Torija, A. J., Li, Z., & Self, R. H. (2020). Effects of a hovering unmanned aerial vehicle on urban soundscapes perception. Transportation Research Part D: Transport and Environment, 78, 102195.

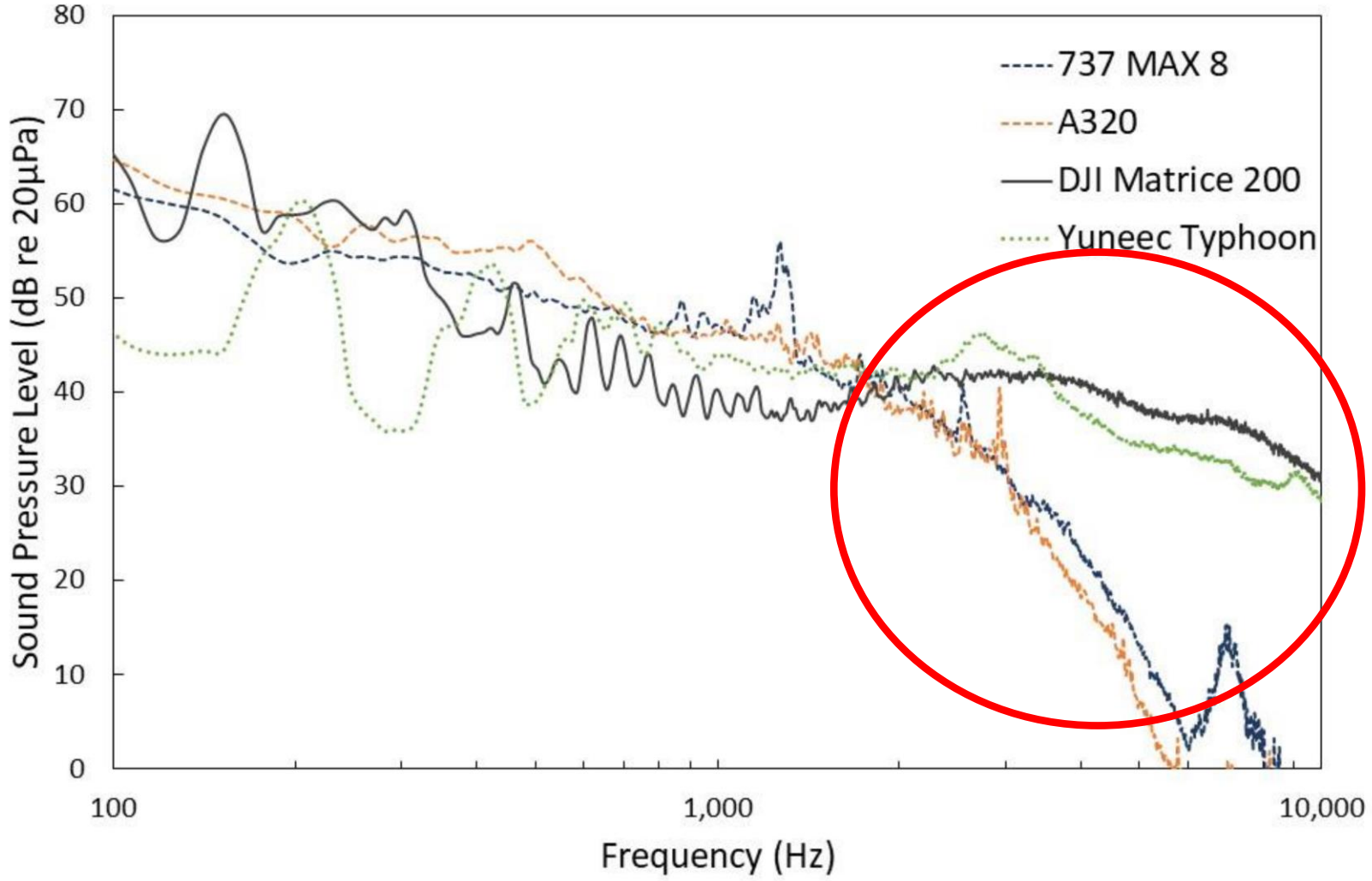
Drone Noise vs. LAeq





Torija, A. J., Li, Z., & Self, R. H. (2020). Effects of a hovering unmanned aerial vehicle on urban soundscapes perception. Transportation Research Part D: Transport and Environment, 78, 102195.

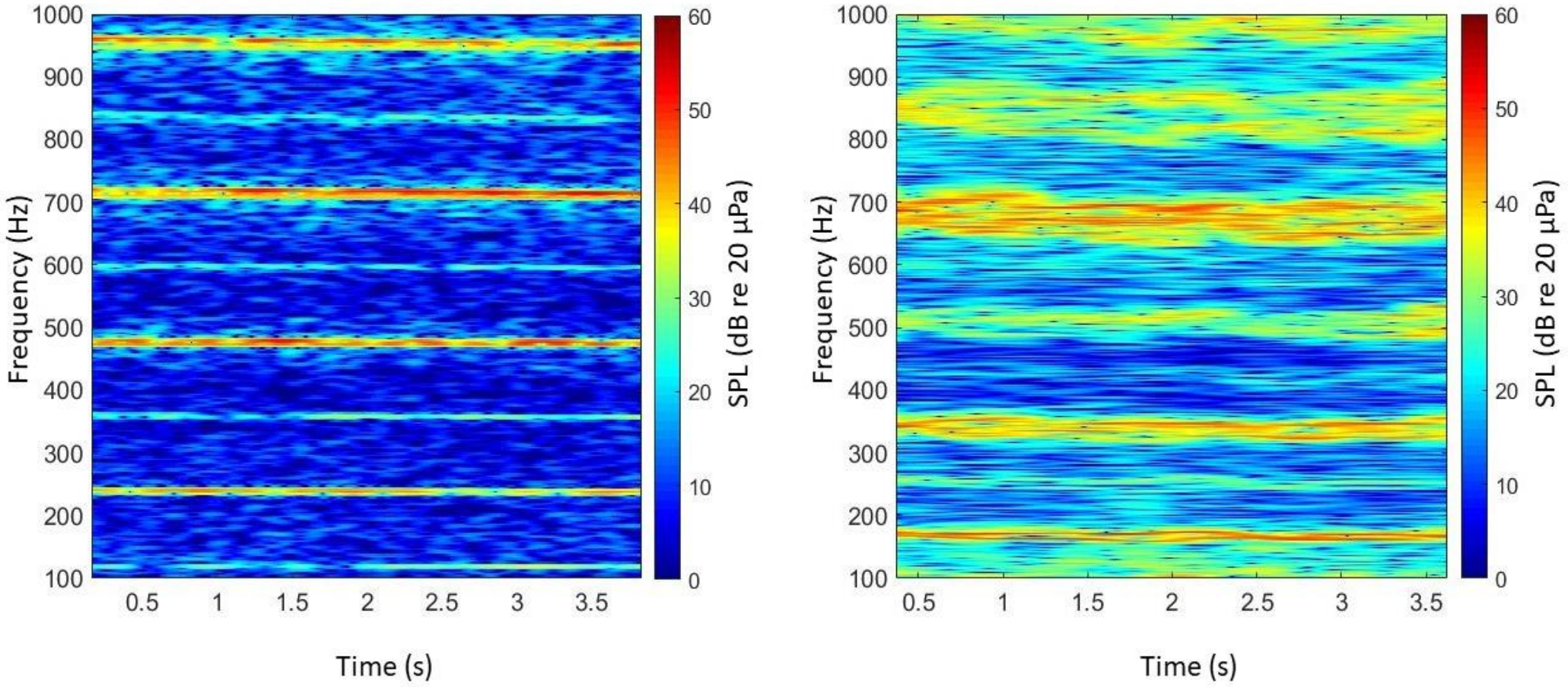
Drone Noise vs. Aircraft Noise



Frequency spectra of two conventional aircraft and two multi-copter UAVs. Frequency spectra normalised to 65 dB(A).

Torija, A. J., & Clark, C. (2021). A psychoacoustic approach to building knowledge about human response to noise of unmanned aerial vehicles. International Journal of Environmental Research and Public Health, 18(2), 682.

Drone Noise vs. Weather Conditions



Torija et al., 2019. Psychoacoustic Characterisation of a Small Fixed-pitch Quadcopter. Internoise 2021, Madrid, Spain

Is the evidence, tools/metrics and policy available (based on broadband low-frequency dominated soundscapes) fit for purpose for the upcoming more 'eventful' higher pitch soundscapes?

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