WDL 2021 - Live Final

Improving the quality of life by reducing city noise levels

Children Of Jupyter

Ana Almeida
Bruno Silva
Carolina Alves
Fábio Santos

Structure

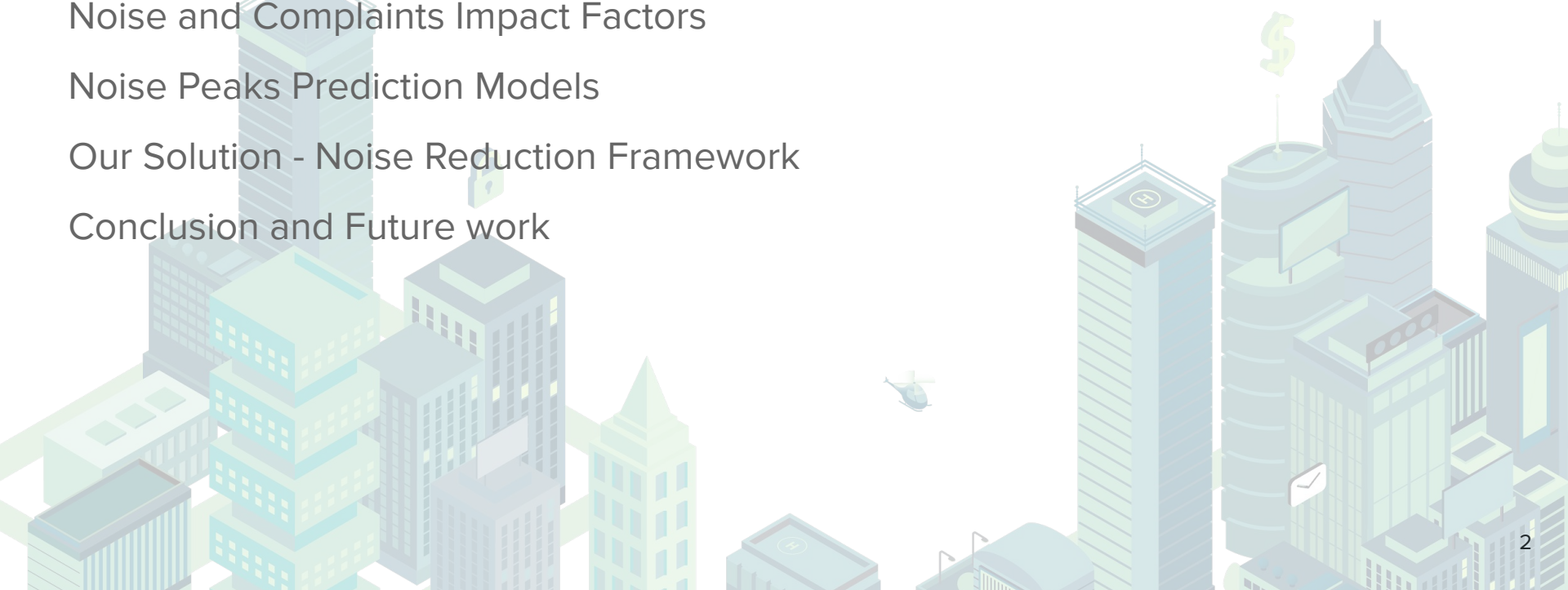
Motivation and Goals

Noise and Complaints Impact Factors

Noise Peaks Prediction Models

Our Solution - Noise Reduction Framework

Conclusion and Future work

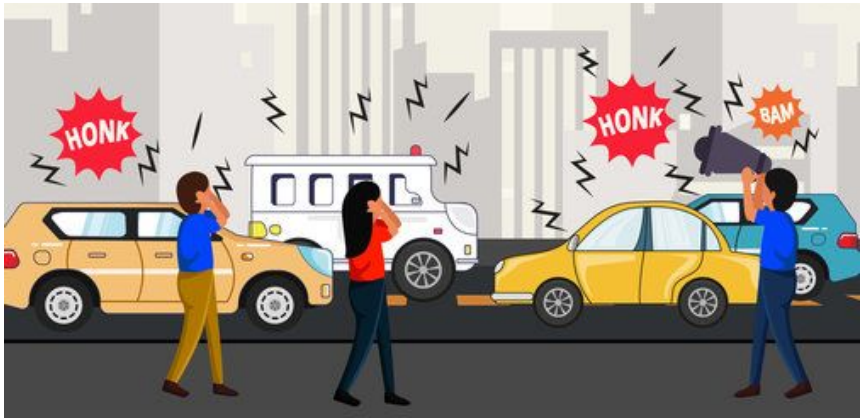


Context and motivation

TORINO'S MODERNIZATION

↳ EXCESSIVE NOISE LEVELS

↳ DECREASE OF HEALTH



Goals

1 UNDERSTAND THE FACTORS RESPONSIBLE FOR NOISE

Events? Demographics? Locations (e.g., transport stations)? City Visitors?

2 PROVIDE A NOISE PREDICTION MODEL FOR BETTER CONTROL

Noise patterns? External factors?

3 PROPOSE A NOISE REDUCTION FRAMEWORK FOR TORINO

Provide measurable impact through analysis and prediction

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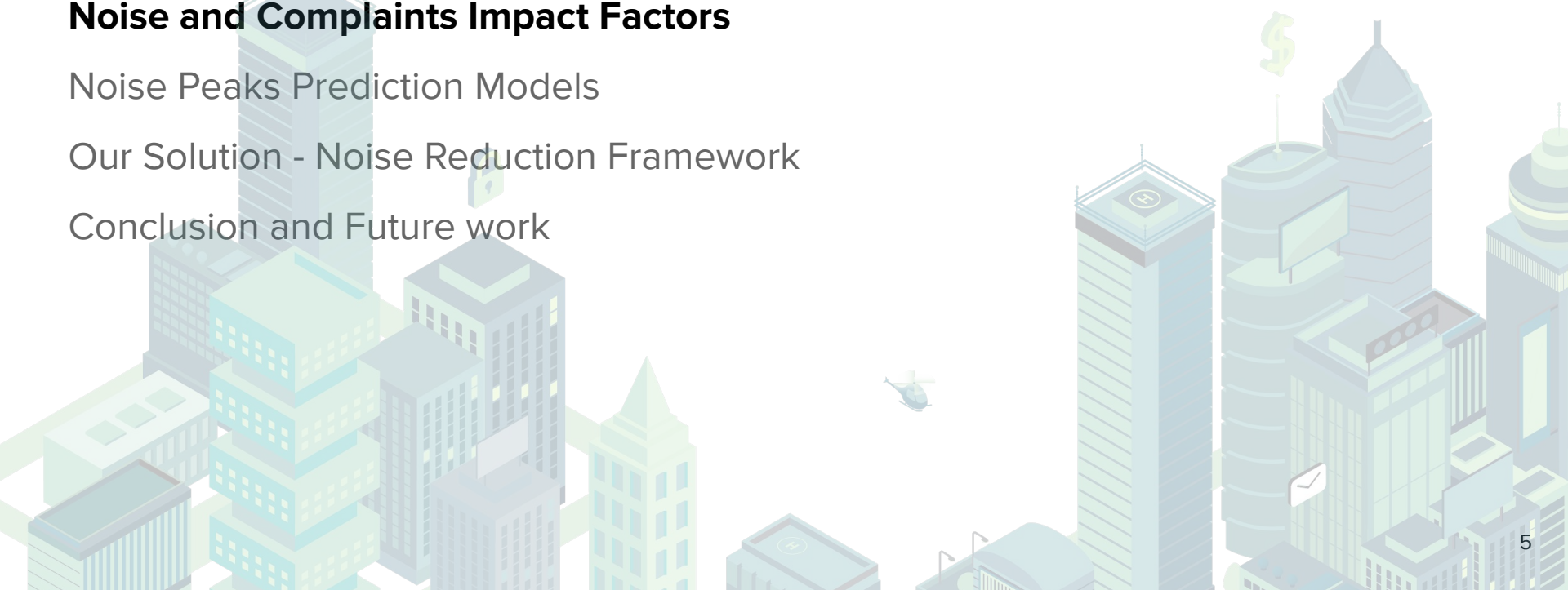
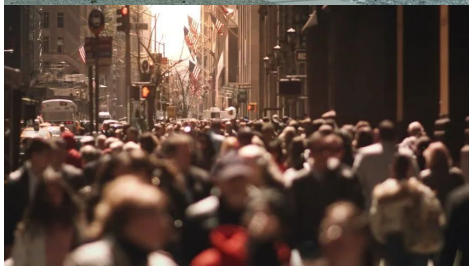


1 Impact Factors on Noise Level

- ⬆️ Increase:
  - More people leads to higher noise levels;
  - Males, intra-regional visitors, and ages between 18-30
  - Leisure Events.
- ⬇️ Decrease:
  - Rain and wind leads to slightly less noise;



1 Impact Factors on Noise Complaints

- ⬆️ Increase:
  - Mondays have the most complaints;
  - Coffee shops, restaurants, bars and hotels appear to be linked to more complaints;
- ⬇️ Decrease:
  - Weekends have less complaints;

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2 How to predict noise levels

- **HISTORICAL NUMBER OF NOISE PEAKS**
- **HISTORICAL LEISURE SCORE**

2 Prediction of Noise Peaks - SARIMAX

GOOD FOR SHORT-TERM FORECASTING (7 DAYS)

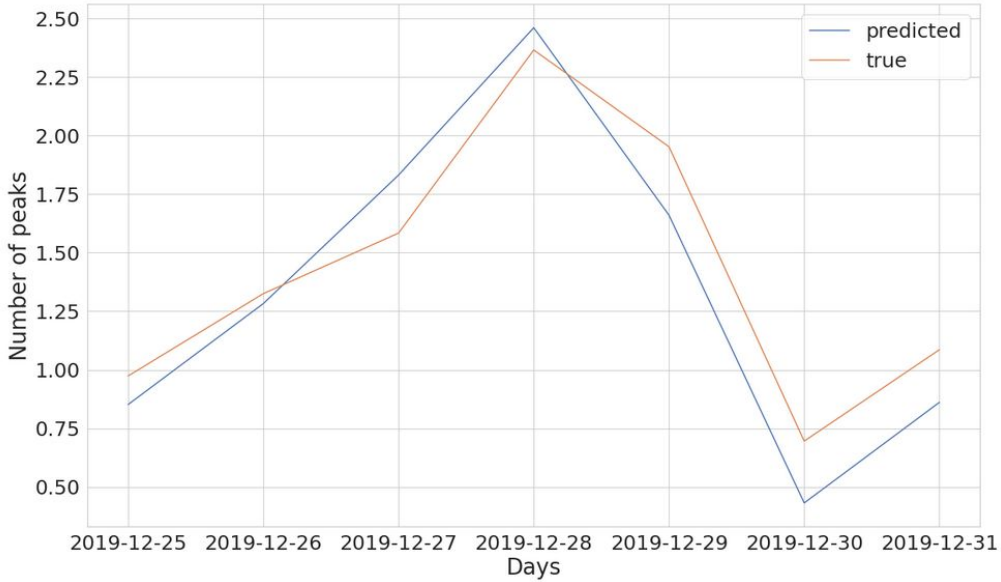

Figure 1

2 Prediction of Noise Peaks - CNN

Good for long-term forecasting (365 days)

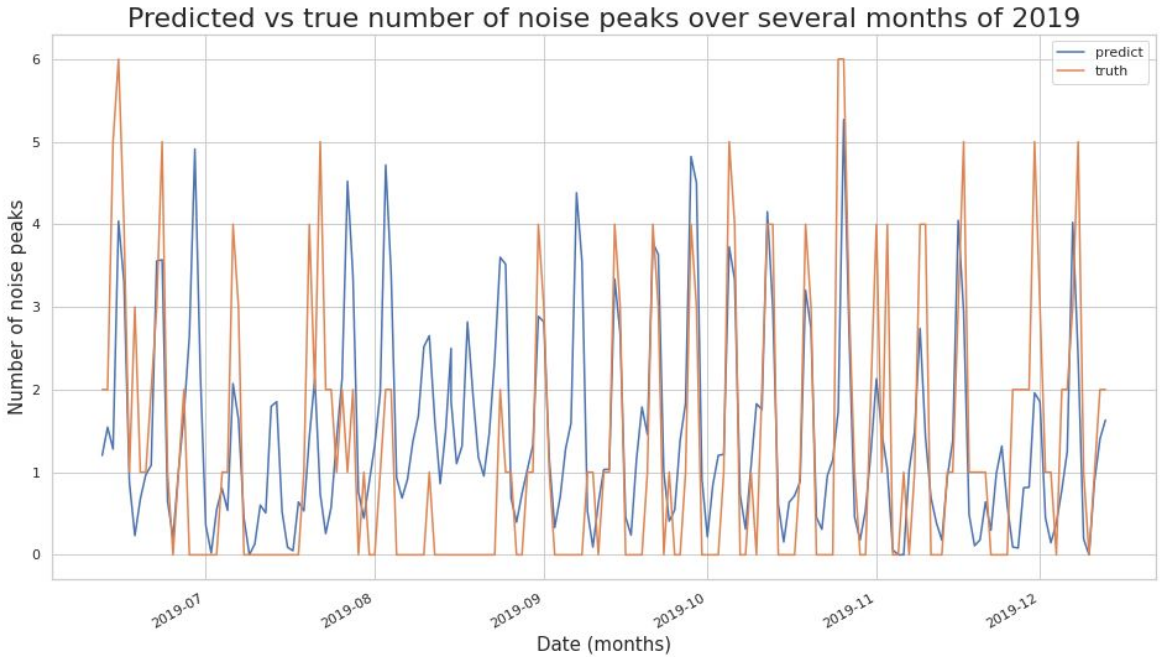

Figure 2

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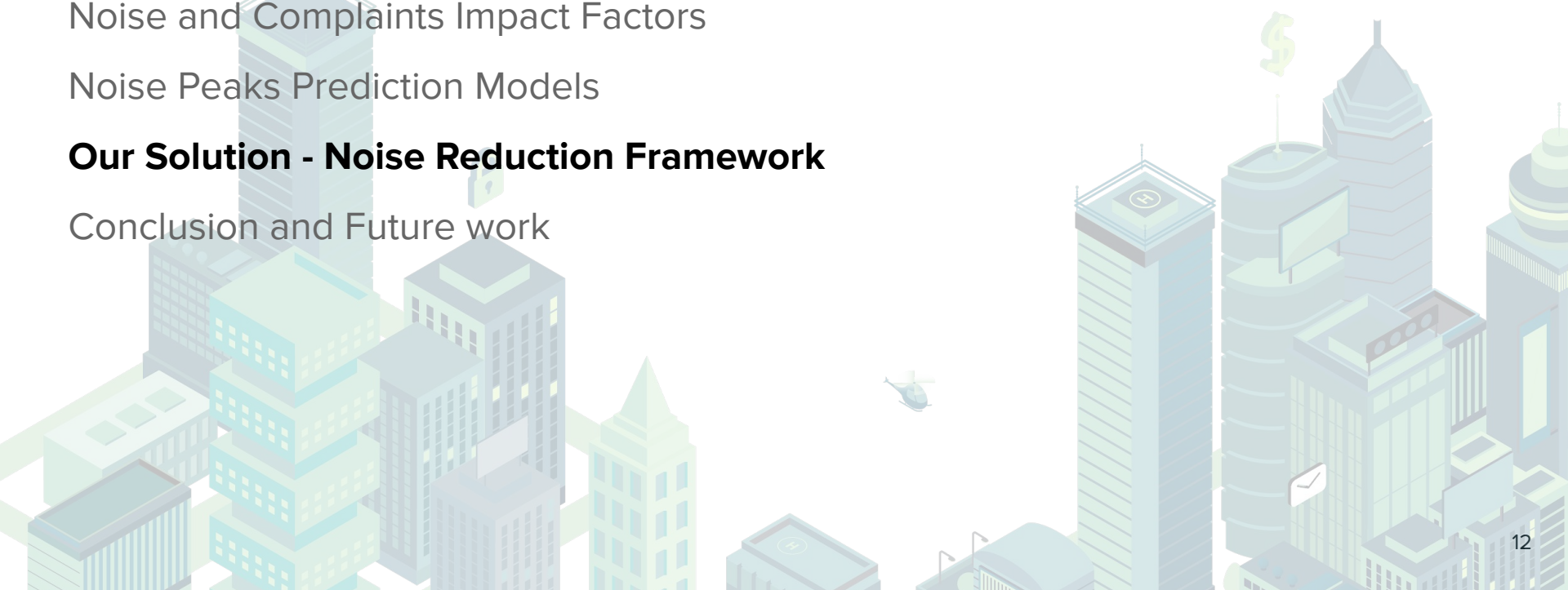

3 Our noise reduction framework (1)

- Proactive measures by leveraging our **noise peak prediction models**:
  - Allocate police patrols [1];
  - Reinforce surveillance on events;

  Earlier allocation of resources and better containment of noise levels
- Activate noise reduction laws over specified schedules:
  - Stricter occupancy laws on establishments on workdays;
  - Stricter noise restriction laws (event duration) on events on workdays

  Apply laws using a more defined schedule

3 Our noise reduction framework (2)

- Activate noise reduction laws over specific locations:
  - Restrict traffic flow per-district [2].
  - Reinforce the infrastructures to muffle the noise [3] (e.g., trees, humps)

Apply laws using a more defined geographical area

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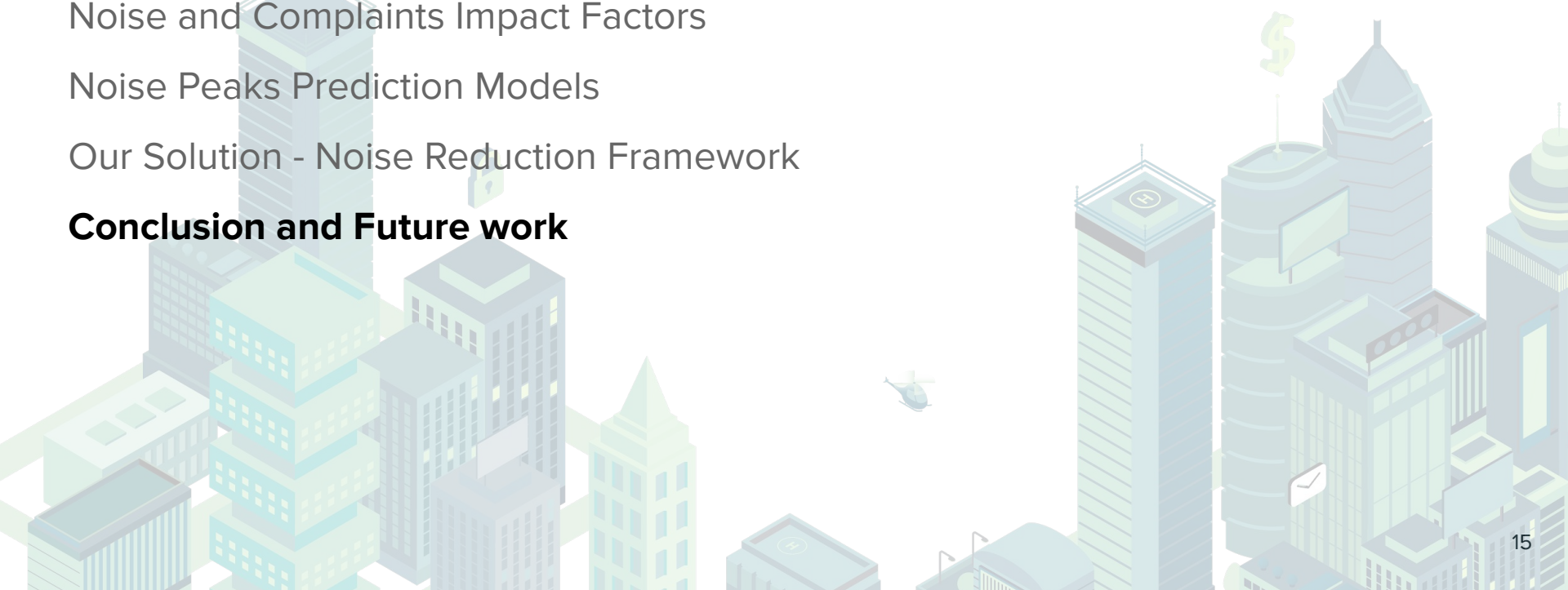


Conclusion

- **KEY TAKEAWAYS:**
  - Noise sensitivity increases on workdays;
  - More people and leisure events increase noise levels

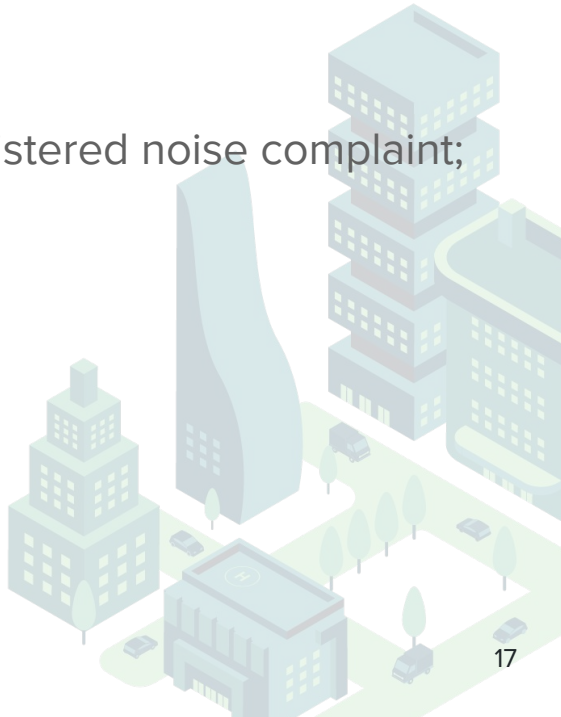
- **POLICY FRAMEWORK:**
  - Early allocation of resources to contain noise;
  - Identification of timestamps and locations to apply policies.

- **OUR SOLUTION ALLOWS A MORE PRECISE AND EFFECTIVE POLICY-MAKING**

Where To Go From Here...

💡Improve current data:

- Add more precise and additional details over each registered noise complaint;
- Spread more noise sensors across the city;



References

[1] C. B. Dewitt and M. H. Moore, “The Strategic Management of Police Resources,” no. 14, pp. 1–10, 1993.

[2] Lars Ellebjerg Larsen, “Noise Control through Traffic Flow Measures”. 2007.

[3] "Can Trees Reduce Noise Pollution in Urban Areas?", https://www.conserve-energy-future.com/can-trees-reduce-noise-pollution.php

Thank you!

from Children of Jupyter

Ana Almeida

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