

# 13<sup>th</sup> UIC Sustainability Conference



## Data Inputs and Outputs, Requirements and Timetable



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12, 13, 14 October 2016

# Overview

- EU Directives
- Acquisition and Integration of Data
- Analysis
- Publication
- Timetable
- Conclusions





# EU Directives



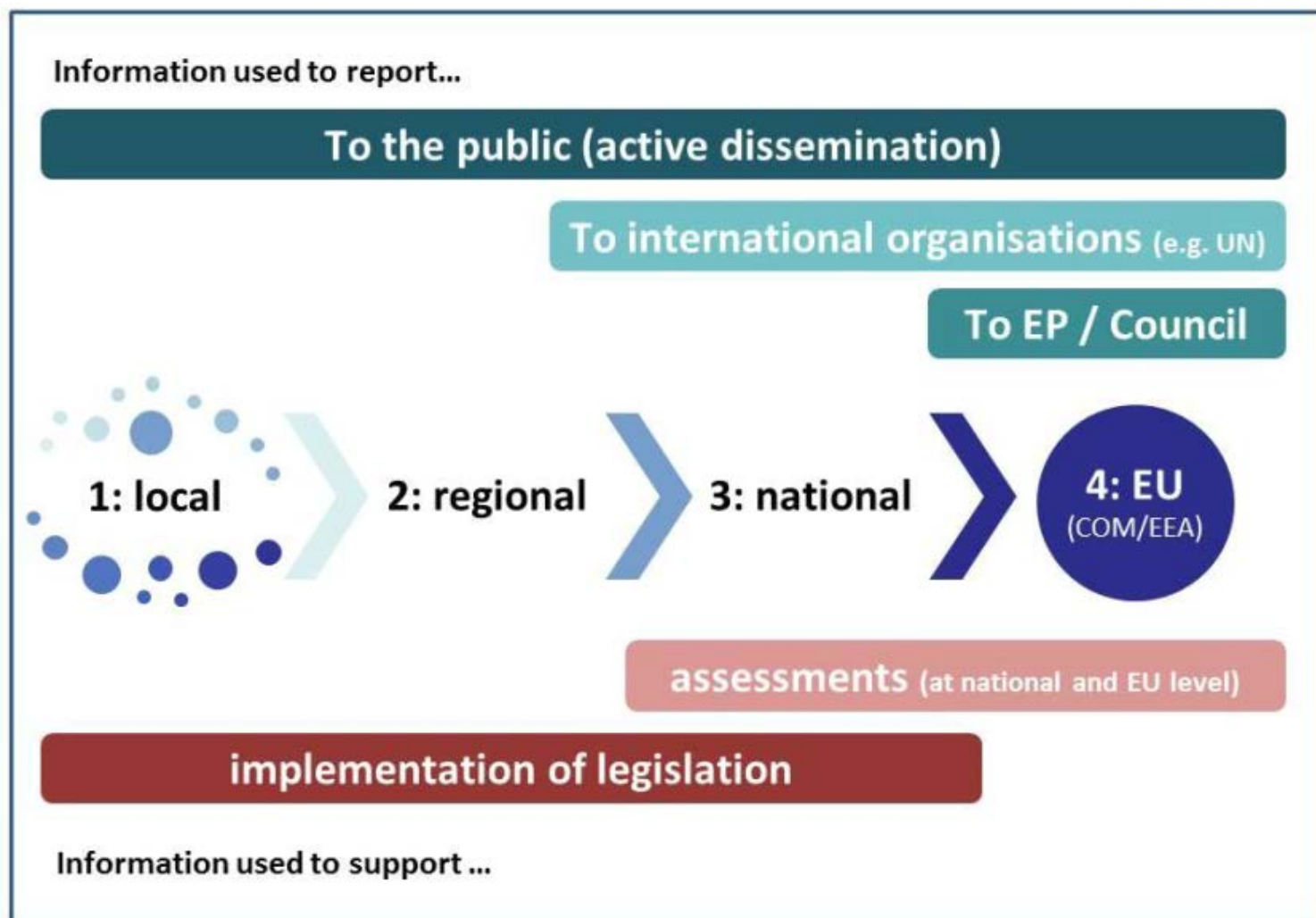
# EU Directives



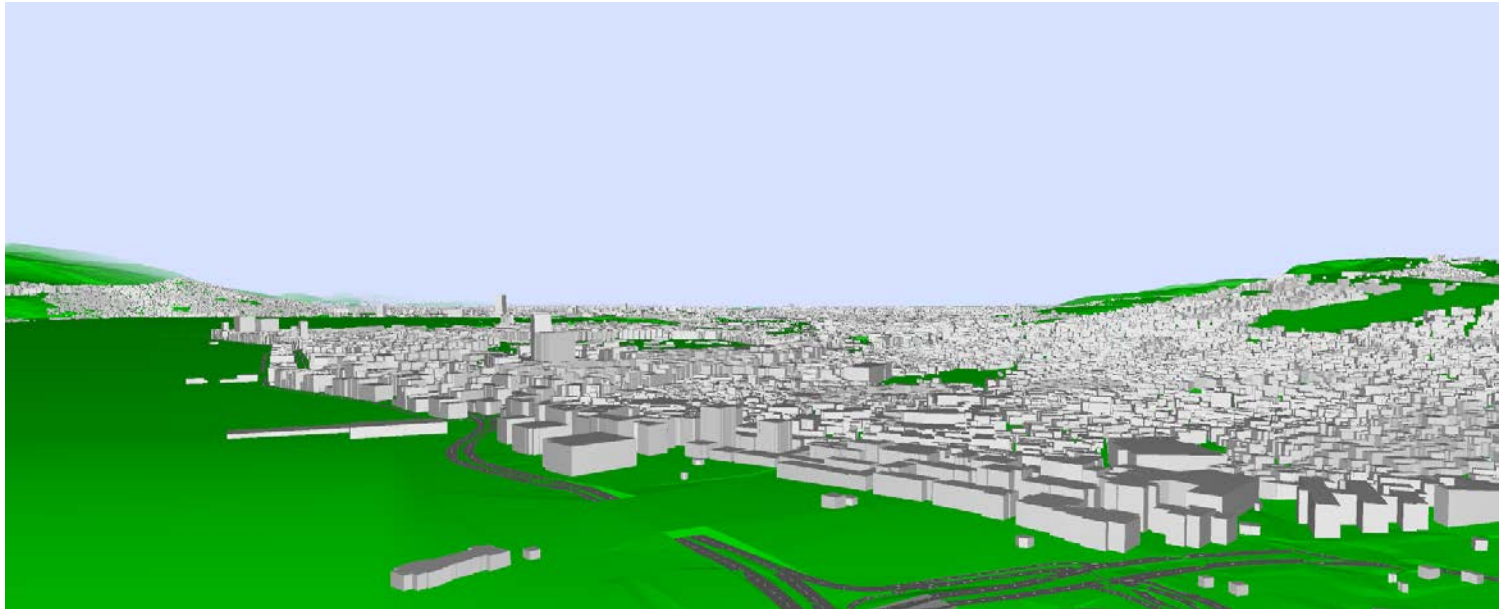
- Directive 2002/49/EC
  - Assessment and Management of Environmental Noise
    - Adaptation of interim noise assessment methods
    - Common noise assessment method (CNOSSOS-EU)
- Directive 2003/4/EC
  - Freedom of Access to Information
    - Ensures that environmental information is systematically available and distributed to the public
- Directive 2007/2/EC
  - Establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)
    - Metadata
    - Monitoring & reporting
    - Network services
    - Data and service sharing
    - Interoperability of spatial data sets and services



# Strategic environmental monitoring data flow



# Acquisition and Integration of Data

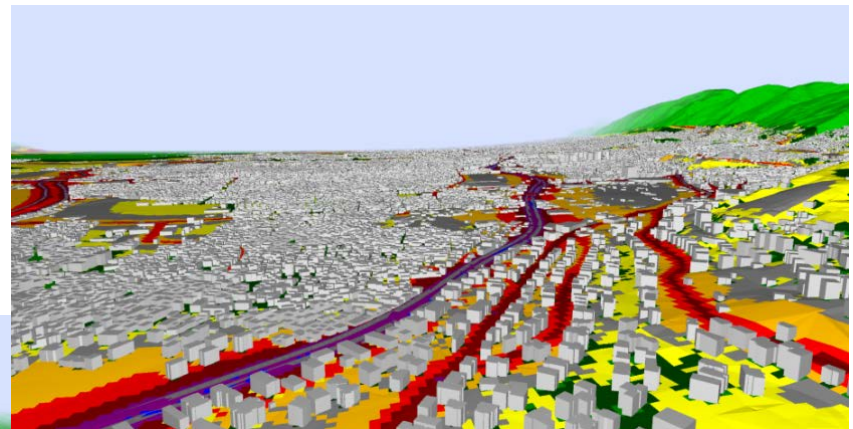
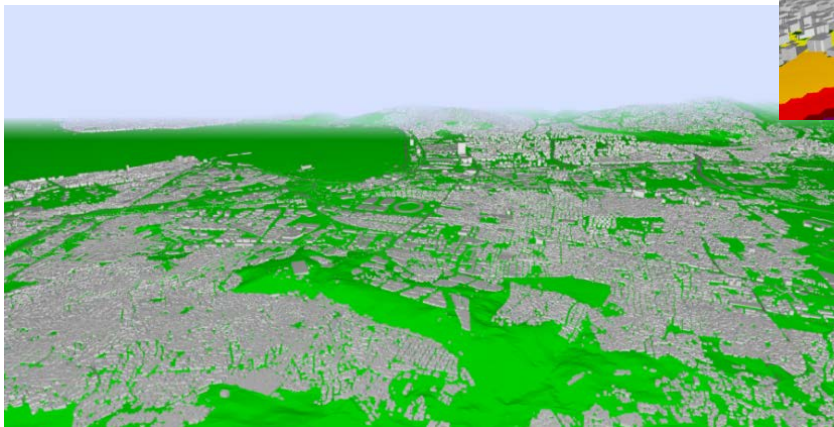




# Strategic Noise Models



- Engineering methodologies to estimate the emission, propagation and reception of noise outdoors
- Source emission models
  - Aircraft
  - Industry
  - Railways
  - Roads



# 3D Propagation Pathway



- Terrain:
  - 3D breaklines (edges) near to the source
  - Contours away from the source
- Ground cover
- Buildings
- Bridges
- Barriers
- Scale:
  - 1:1000 typical
- Coverage:
  - Malta: 228 km<sup>2</sup>
  - England: 87,000 km<sup>2</sup>

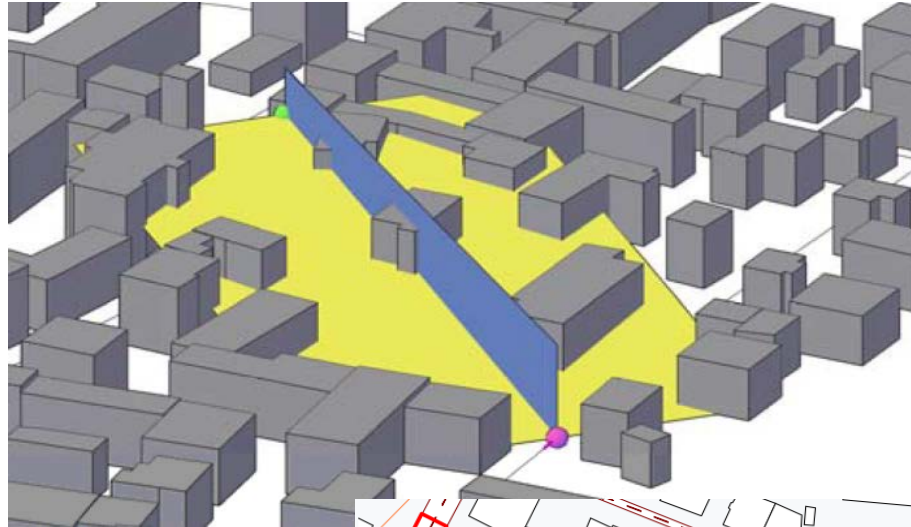




# 3D Propagation Pathway

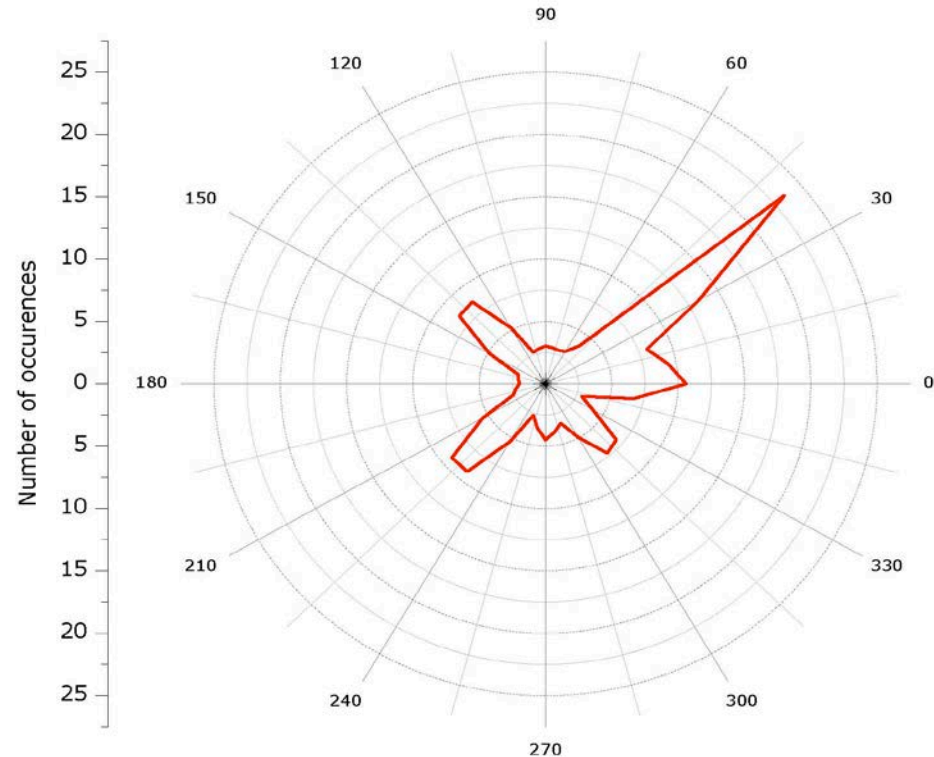


- Noise calculation software cuts the model with a vertical plane
  - Determines the Direct and Refracted ray paths between source and receiver
  - Calculates the attenuation along the path
  - Repeats for millions of source-receiver paths
- Calculation points:
  - 10m grids
    - 10,000 per km<sup>2</sup>
  - Building facades
    - Every 5m



# Meteorology

- Weather affects the propagation of sound
- Long term average meteo data required
  - Wind distribution
  - Temperature
  - Humidity
- Data required for each city



**Monthly average air temperature, (°C)**

| Month           | 1    | 2   | 3   | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11  | 12  | Average |
|-----------------|------|-----|-----|------|------|------|------|------|------|------|-----|-----|---------|
| Monthly average | -0,3 | 1,2 | 6,7 | 11,2 | 16,7 | 19,5 | 21,0 | 20,9 | 16,0 | 11,6 | 5,5 | 1,3 | 11      |

**Monthly average relative air humidity, (%)**

| Month           | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | Average |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|---------|
| Monthly average | 87 | 83 | 77 | 75 | 74 | 75 | 75 | 76 | 81 | 84 | 86 | 89 | 80      |



# Data input requirements



- 3D Environment

- DTM – 3D surface model
- DEM – 3D building heights
- Break lines
  - Embankments & Cuttings
- Topography
- Bridges / Underpasses
- Barriers

- Road source

- Carriageway centreline
- Traffic flow
- Traffic speed
- %HGVs
- Road surface type
- Road texture depth

- Industry source

- Location
- Process type
- Noise emission level

- Analysis

- Population values
- Population distribution
- Building use
  - dwelling, school, hospital, industry

- Rail source

- Rail centreline
- Traffic flow
- Train speed
- Train type
- Railhead roughness

- Aircraft Source

- Flight track
- Aircraft type
- Power level along flight track



# Data Integration – the big challenge



- Noise mapping is a secondary user of data
- Multiple spatial and non-spatial datasets to be acquired and integrated
  - Multiple data owners
  - Multiple resolutions
  - Multiple licenses
  - Various currencies
- INSPIRE has delivered benefit, but there remain many challenges:
  - Getting data owners to understand detailed noise requirements
  - Lack of noise data standards significant barrier
  - Inconsistent quality of data – data managed to different update cycles
  - 5-year mapping cycle results in inconsistent funding and planning





# Analysis



# Environmental Noise Directive 2002/49/EC

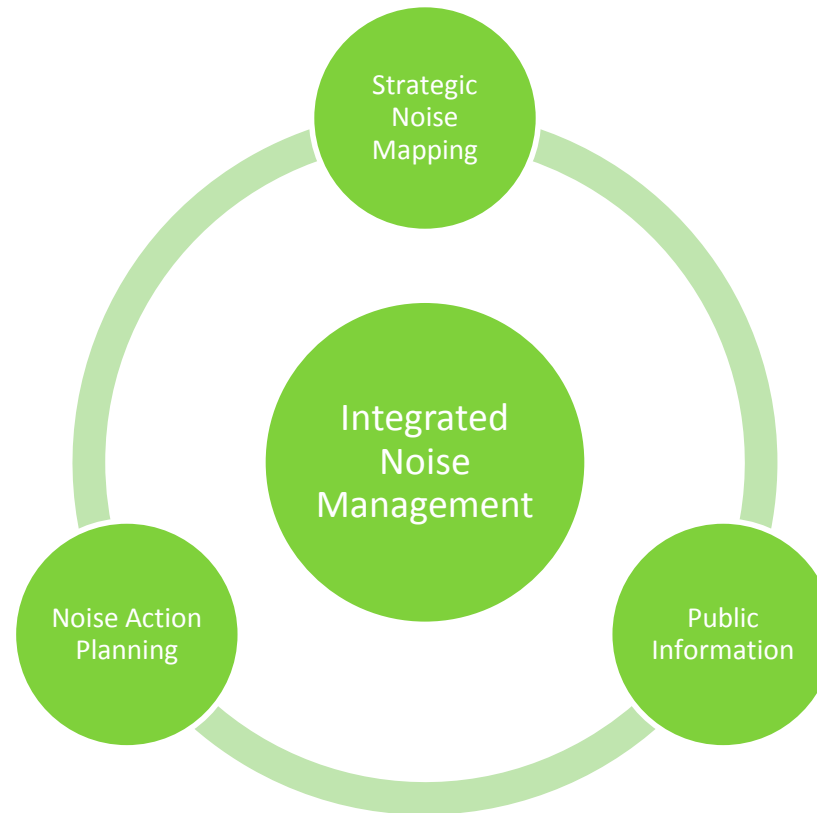


VIENNA

- Scope:
  - Transportation and industrial noise in the environment
- Defines:
  - Noise mapping;
  - Action plans;
  - Central European database; and
  - Public information and participation.
- Areas:
  - Agglomeration: population > 100,000, high density, defined by MS;
  - Major roads: > 3,000,000 vehicles/year (8,000/day);
  - Major railways: > 30,000 trains/year (10 min. daytime schedule); and
  - Major airports: Civil airports with > 50,000 operations year (135/day).
- Mapping reported every 5 years: 2007, 2012, 2017, 2022 etc



# An Integrated Noise Management Process

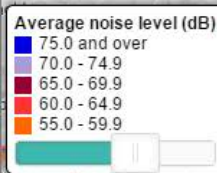
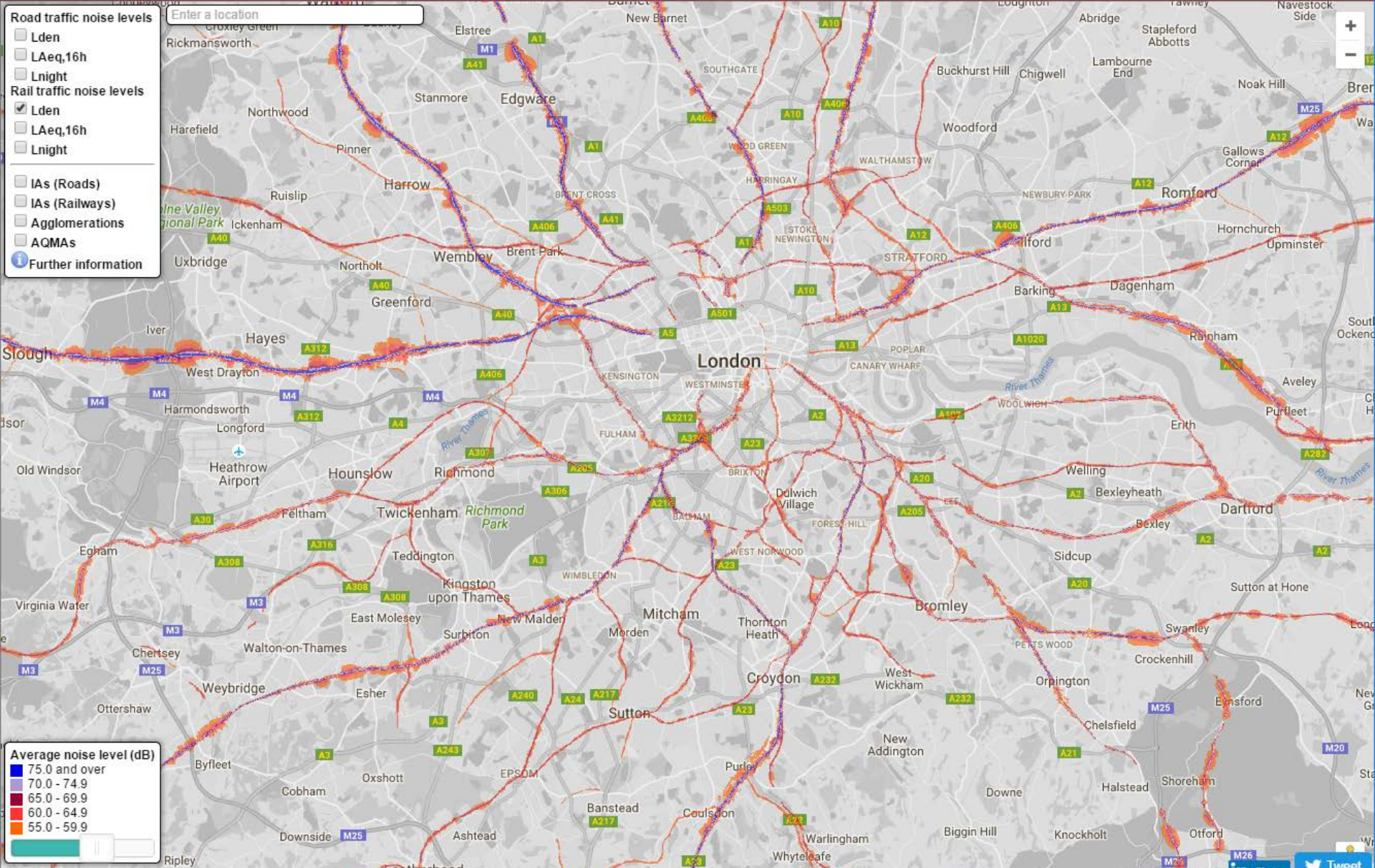






# England Noise Map Viewer

- Enter a location
- Road traffic noise levels**
- ☐ Lden
  - ☐ LAeq,16h
  - ☐ Lnight
- Rail traffic noise levels**
- ☒ Lden
  - ☐ LAeq,16h
  - ☐ Lnight
- ☐ IAs (Roads)
- ☐ IAs (Railways)
- ☐ Agglomerations
- ☐ AQMAs
- [Further information](#)





# Analysis – challenges and best practice



- Strategic noise mapping data is complex:
  - Multiple geographies
  - Multiple sources
  - Multiple noise indicators (statistical measures of noise)
  - Multiple output datasets
- Demand to use data at different levels
  - Local – noise action planning, local noise “hotspots”
  - National – reporting to EU / EEA
  - EU – policy development
  - Various forms of ad hoc analysis



# Analysis – EU Level



- Pan EU exposure assessment
  - 5 year reporting cycle
  - Common reporting format
    - EEA ENDRM
  - Un-common process to develop noise results
    - Comparison with MS questionable
    - Comparison between MS without validity
- Data often not designed for the use
  - risk of misinterpretation
- Analysis can also show up effect of poor design









# EEA Reports

Country fact sheet

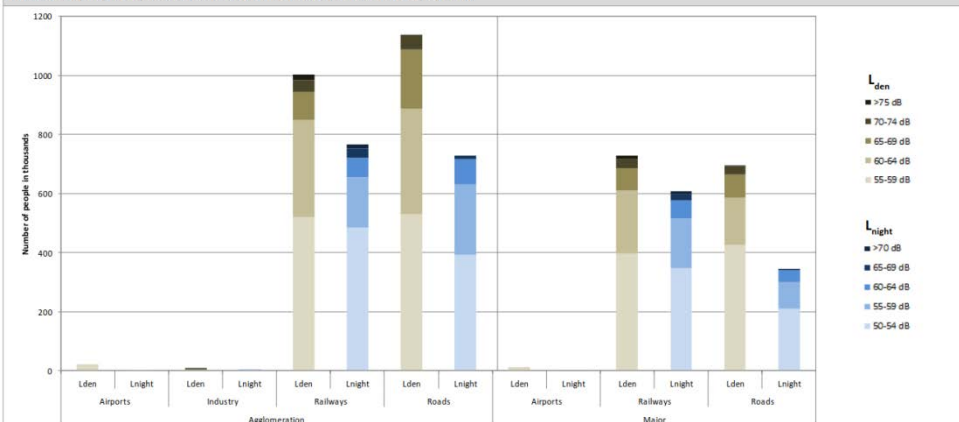
Noise in Europe

2015 overview of policy-related data



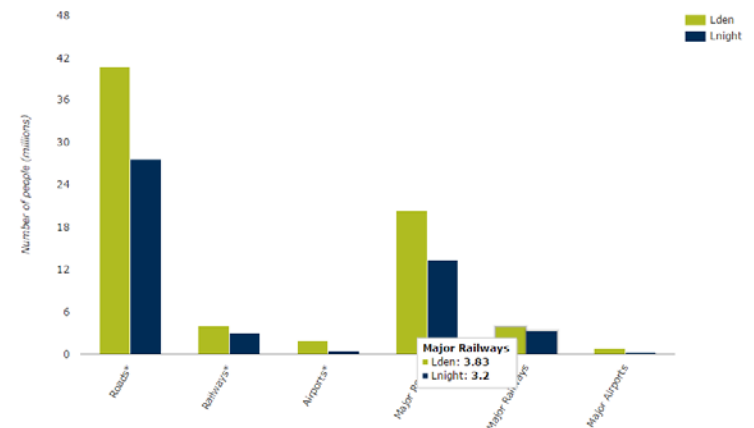
European Environment Agency

Number of people exposed to different noise bands per  $L_{den}$  and  $L_{night}$  (2012)



European Environment Agency

Chart – Number of people exposed to transport noise







# Publication



# Publication – Legal Requirements



- END Article 1 (b)
  - *“.. information on environmental noise and its effects is made available to the public”*
- END Annex VI defines minimum requirements for a strategic noise map:
  - *“A strategic noise map is the presentation of data on one of the following aspects:*
    - *an existing, a previous or a predicted noise situation in terms of a noise indicator,*
    - *the exceeding of a limit value,*
    - *the estimated number of dwellings, schools and hospitals in a certain area that are exposed to specific values of a noise indicator,*
    - *the estimated number of people located in an area exposed to noise.*
  - *Strategic noise maps may be presented to the public as:*
    - *graphical plots,*
    - *numerical data in tables*
    - *numerical data in electronic form.”*



# Publication – Legal Requirements



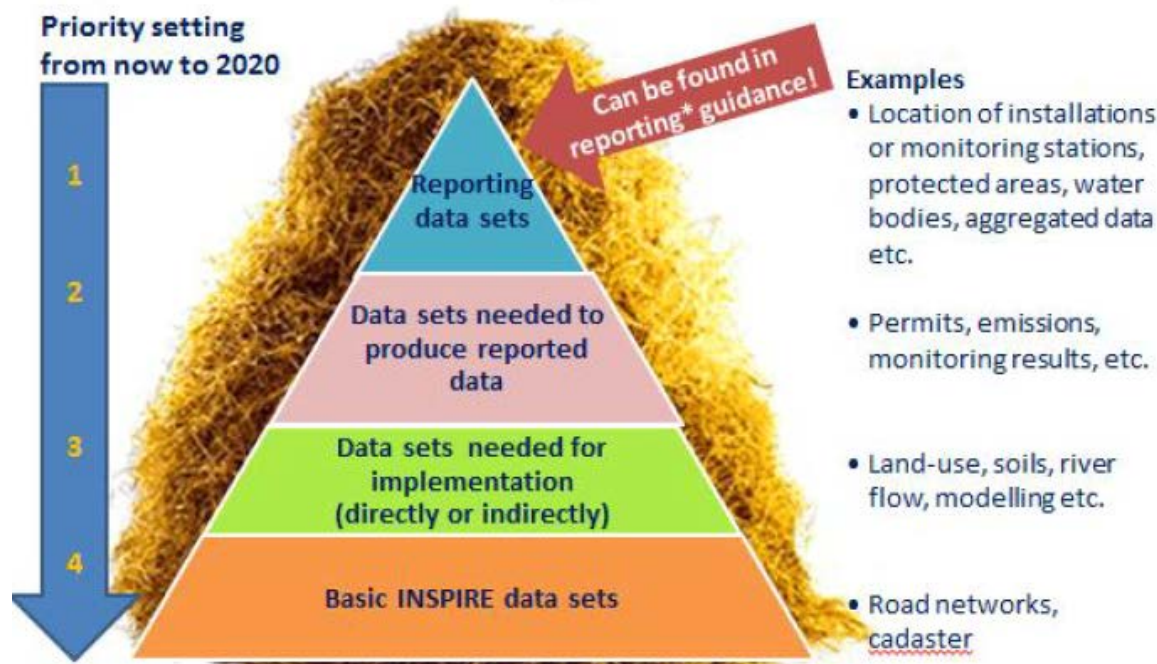
- INSPIRE Annex III
  - Theme 5 - Human health and safety: *“Geographical distribution of... information indicating the effect on health ... or well-being of humans ... linked directly ( ... noise ... ) ... to the quality of the environment”*
  - Theme 11 - Area management/restriction/regulation zones and reporting units: *“Areas managed, regulated or used for reporting at international, European, national, regional and local levels. Includes ... noise restriction zones ..., relevant reporting units...”*



# Publication – END definition



- INSPIRE REFIT Report 2016
  - Priority setting to 2020

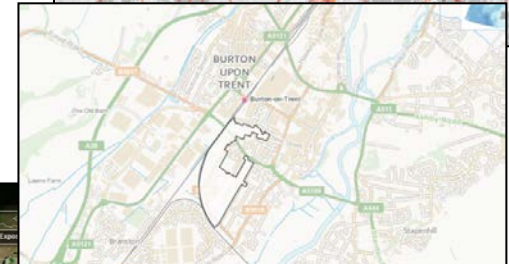
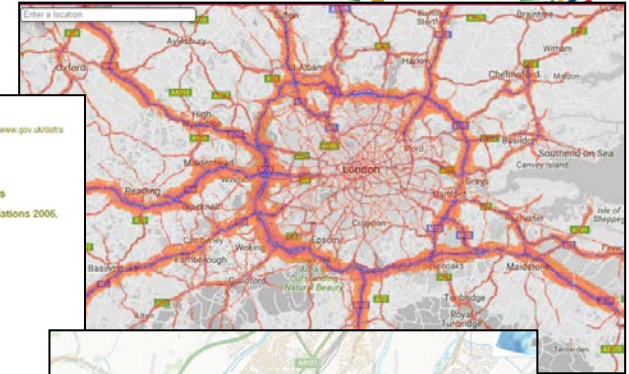


\* Reporting Obligations Database EEA: see for UMWIT <http://rod.eionet.europa.eu/obligations/613>





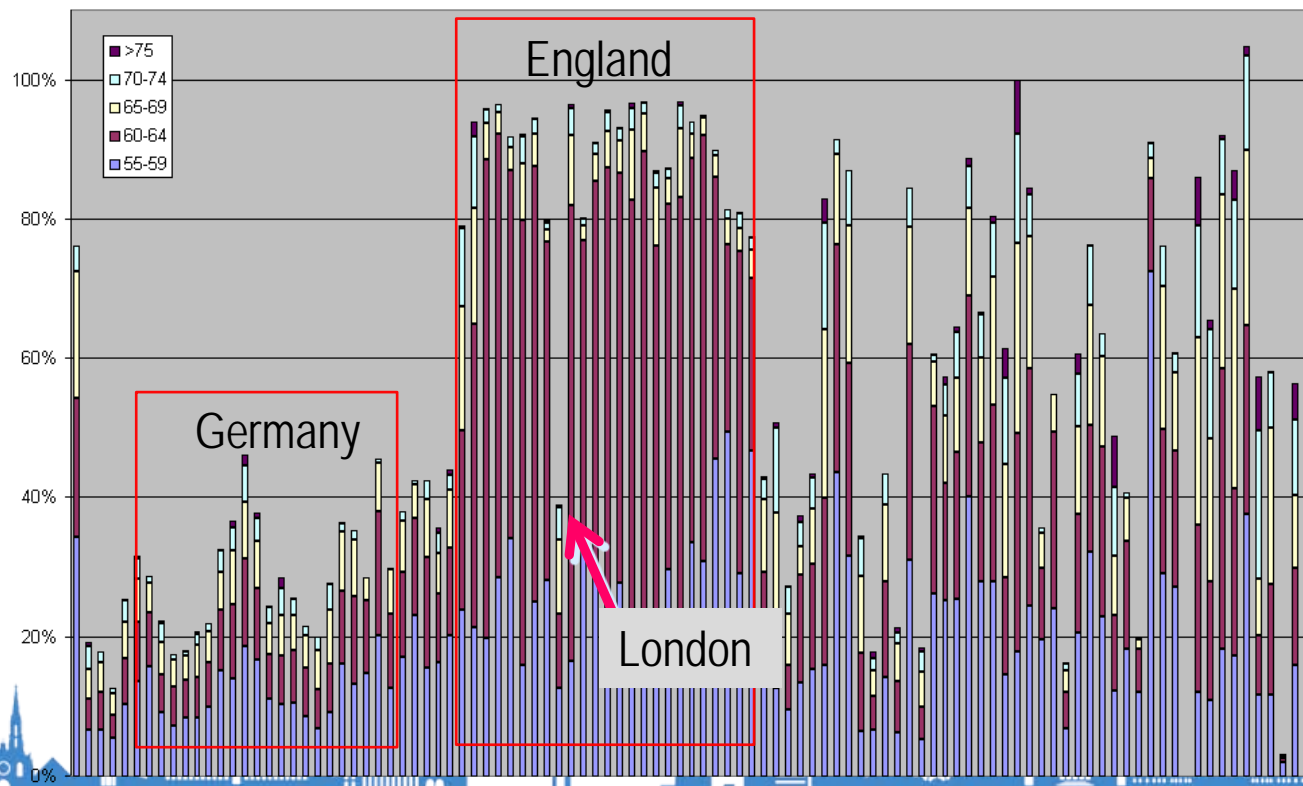
- 
[www.gov.uk/defra](http://www.gov.uk/defra)  
 Department  
 for Environment  
 Food & Rural Affairs
- Noise Action Plan: Agglomerations**  
**Environmental Noise (England) Regulations 2006,**  
**as amended**  
 January 2014

[illegible]

# Publication – Comparability?



- The complex geography and lack of data standards in END implementation has led to some interesting results: agglomeration exposure in EU compared





# END Timetable



- R3 Noise Maps
  - Completed June 2017
    - **Common Method optional**
  - Reported to EC/EEA December 2017
- R3 Noise Action Plans
  - Reported to EC/EEA January 2019
- R4 Noise Maps
  - Completed June 2022
    - **Common Method mandatory**
  - Reported to EC/EEA December 2022
- R4 Noise Action Plans
  - Reported to EC/EEA January 2024







# Conclusions



# Conclusions



- Strategic noise maps require a wide range of data at a very high level of detail
  - INSPIRE is helping, but detail of data specifications is important
  - Need further engagement between END and INSPIRE decision makers to ensure noise requirements are captured and understood
- Analysis of END data takes place at local, national and EU level.
  - Greater need for end uses to be considered around the noise domain
  - Range of END 'end uses' – a defined range of products?
- Publication of noise data is a complex issue
  - What is published is a very subjective decision and varies across EU
  - Lack of data standards currently results in non-comparable data
- The issues above are inter-related
  - Require further ongoing work from experts and policy makers
  - Not just a 1 in 5 year process!



# Conclusions



- Noise domain has pan-thematic data requirements and outputs
  - INSPIRE Thematic Clusters
    - Environmental Monitoring and Observations Cluster
    - Topographical and Cadastral Reference Data
    - Elevation, Orthoimagery, Reference systems, Geographical Grids
    - Land Cover and Land Use Cluster
    - Statistical and Human Health Cluster
- Noise domain not INSPIRE aware
  - Lack of standards in noise
  - Lack of engagement with INSPIRE development & Thematic Clusters
  - Lack of adoption of INSPIRE standards, specifications and guidance
- Directive 996/2015 defines a new “Common Method” for noise
  - Opportunity to engage and implement INSPIRE in Noise
  - Requires experts and policy support from EU and MS



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## Thank you for your attention



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