INSPIRE in the context of EC Directive 2002/49/EC on Environmental Noise

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• Acoustics & Environmental Noise
  • END Noise Mapping
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• Environmental and Geospatial Consultancy
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  • Environmental Modelling
  • Data Management
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  • 20 years experience
  • Expert adviser to UK Govt, EC and EEA
Overview

- Acquisition and Integration of Data
- Analysis
- Publication
- Conclusions
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 km²
  - England: 87,000 km²
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 km²
  - 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
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

• 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

- Strategic Noise Mapping
- Noise Action Planning
- Public Information

Integrated Noise Management
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
Publication – Legal Requirements

• END Article 1 (b)
  • “.. information on environmental noise and its effects is made available to the public”

• 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...”.

• requirement to publish noise related information ... but what product(s)?
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 – What to Publish?

- Noise levels
  - how classified?
  - Which indicator?
  - Single source/combined?
- Noise Abatement Zones
- Important Areas
- EU Exposure statistics
- Definition of Sources
- Difference maps
- Measurement surveys
- Noise action plans
- Noise complaints
Publication – Comparability?

• The complex geography and lack of data standards in END implementation has led to some interesting results: agglomeration exposure in EU compared
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
Thank you for your attention

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