TASK:	**Aircraft Traffic Noise**
Responsible partner:	**Anotec Consulting, S.L.**
Other contributing partners:	
Objective:	*Acquire information about aircraft noise related data set to be used into numerical model for noise level prediction.*

REQUIREMENT A (Anotec Consulting, S.L)

Model method/software:	**ECAC DOC 29 / SONDEO** **SAE-AIR-1845 / INM**
Feature of data:	**VECTOR**
Needed sets of data:	**A. FLIGHT PROFILE:** • **Flight profile** • **Aircraft weight** • **Speed** • **Aircraft configuration (i.e., flaps settings, position landing gear)** • **Aircraft power settings (i.e., thrust management procedures or related power parameter)** **B. GROUND TRACK DATA:** • **Designation of the runway the track originates from** • **Description of the track origin (start of roll landing threshold)** • **Length of segments (for turns, radius and change of direction)** • **Track envelop taking into account dispersion tracks** • **Number of sub-tracks** • **Distribution of movements perpendicular to the backbone track** **C. GENERAL AIRPORT DATA:** • **Aerodrome reference point** • **Aerodrome reference altitude** • **Average meteorological parameters** • **Future changes in the airport configuration** **D. RUNWAY DATA:** • **Runway designation** • **Runway reference point** • **Runway length, direction, mean gradient** • **Location of start of roll and landing threshold** **E. AIR TRAFFIC DATA:** • **Period of time covered by the data (e.g. one year)** • **Number of movements of each aircraft type on each flight tracks subdivided:** **· Arrivals or departures.** **· By time of day as appropriate for noise descriptors.** **· For departures, operating weights or stage lengths** **· Operating procedures** **F. AIRCRAFT DATA:** • **NPD and performance** ***Note: These data are considered an integral part of the noise model***
Data format:	**For SONDEO see: ECAC.CEAC Doc 29 R Appendix A: Data requirements** **(There has been a validation exercise by AIRMOD pending ECAC aprobation)** **For INM see INM Technical Manual**
Input data precision:	**No info**

Default data:	**1. Average meteorological parameters:** • **Default airport temperature is computed using the international Standard Atmosphere (ISA) for "standard day" temperature altitude by default 15 °C.** • **Ambient pressure will be that corresponding to the former temperature and the airport elevation, according to ISA.** • **Default relative humidity of 70 percent.** **2. Future changes in the airport configuration:** • **New configuration will only be taken into account in terms of resulting increased capacity** **3. Traffic details:** • **The default distribution of flights among the tracks should take into account preferential runway use, operational restrictions during certain time periods, and flow distribution obtained from different sources such as environmental studies, airport master plans, noise maps, airport webs pages, Jeppesen.** • **Traffic growth will be applied equally to all aircraft types.** **4. Noise abatement procedures:** • **For take-off: ICAO-B procedure. When this data is not available, the 'standard' INM take-off procedure.** **5. Fleet mix:** • **If for any aircraft type various engine types are available, the most representative one for the EU fleet will be used.** • **If for any aircraft type no data are available, this aircraft will be substituted by an acoustically similar one.**
Error using defaults:	**Depends on too many factors to determine**

SOURCE A.1 (A: Flight profiles, B: Ground track profile. Anotec Consulting, S.L.)

Available data sets:	**FDR data. The number of flight parameters recorded is dependant upon the vintage and size of the aircraft, most of them include:** Timestamp Pressure altitude Airspeed Heading Vertical acceleration Pitch attitude Roll attitude Time for each radio transmission Thrust (each engine) Trailing edge flap position Leading edge slat position Thrust reverser position Speedbrake position Outside air temperature Autopilot engagement Longitudinal acceleration Lateral acceleration Pitch trim position Glideslope deviation Localiser deviation Marker beacon passage Master warning Angle of attack Hydraulic system low pressure Main gear squat switch status Autopilot engagement Control column position Control wheel position Navigation data(latitude/longitude, groundspeed..) DME distance NAV 1and 2 Radioaltimeter altitude	
Available data format:	**Some FDR contain the digital to analogue converters (ARINC 542), other recorders accept data from a FDAU (ARINC 573, 717, 747).**	
Need to transform data	**Complex transformation to feed noise software. (Profile generator)**	
Data source:	**Aircraft FDR, usually not available**	
Cost:	**Unknown, each record describes only one aircraft movement.**	
Accuracy:	**Parameter** / **Accuracy** Timestamp (Cumulative Engine Run-time) — ± 0.125% per hour Pressure altitude — ± 30 m / ± 200 m Airspeed — ± 5% / ±3% Heading — ±2° Vertical acceleration — ±1% (ex. 5% ref) Pitch attitude — ±2° Roll attitude — ±2° Thrust (each engine) — ±2% Trailing edge flap position — ±5% (dependig indicat Leading edge slat position — ±5% (dependig indicat Speedbrake position — ±2% Outside air temperature — ±2°C Longitudinal acceleration — ±1.5% (ex. 5% ref) Lateral acceleration — ±1.5% (ex. 5% ref) Glideslope deviation (above/below Autoflight control system mode approach) — ±3% Localiser deviation (left/right of Radio altitude approach) — ±3%	
Data set validation:	**Surveillance radar data. Overlay plots of selected parameters.**	
Data set improvement:	**-**	

SOURCE A.2 (A: Flight profiles, B: Ground track profile. Anotec Consulting, S.L.)

Available data sets:	**Surveillance Radar data.**	
Available data format:	**ASTERIX format, standard UAP or other user defined formats.**	
Need to transform data	**Conversion of data with specific software: process raw ARTS radar track data.**	
Data source:	**Surveillance radar: PSR/SSR(2D), MSSR(3D)**	
Cost:	**Unknown. Depends on Authorities permission.**	
Accuracy:	**The accuracy of the radar position data is proportional to the range of the aircraft from the radar site.** **Typical accuracies for a monopulse MSSR are:** **Range Accuracy: 0.05 NM RMS** **Azimuth Accuracy: 0.05° RMS** **The overall accuracy can be affected by terrain or meteorological conditions.**	
Data set validation:	**FDR, if available.**	
Data set improvement:	**Data should be completed with aircraft performance data (thrust, aircraft configuration...) obtained by thrust estimators tools, for example ENHANCE (European Harmonised Aircraft Noise Modelling Environment)**	

SOURCE A.3 (A: Flight profiles. Anotec Consulting, S.L.)

Available data sets:	**Real time or fast time simulation data.** **TAAM, SIMMOD, NIRS data**	
Available data format:	**-**	
Need to transform data:	**TAAM and SIMMOD data may be manipulated for use as input to evaluate aircraft noise, for example using ENHANCE (European Harmonised Aircraft Noise Modelling Environment)**	
Data source:	**SIMMOD (Airport and Airspace Simulation Model)** **http://www.atac.com/prodsvs/simmod.htm**	
	ADEPT(Airspace design valuation and planning tools): NIRS(Noise Impact Routing Systems) **http://www.metsci.com/pages/faa-adept.html**	
	TAAM (Total airspace and airport modeller) **http://www.preston.net/products/TAAM.htm**	
Cost:	**-**	
Accuracy:	**-**	
Data set validation:	**-**	
Data set improvement:	**-**	

SOURCE A.4 (A: Flight profiles, F: Aircraft performance. Anotec Consulting, S.L.)

Available data sets:	**BADA (Base of Aircraft DAta): Aircraft performance database containing performance and operating procedure data for 295 different aircraft types (BADA 3.6), related with flight profiles, and aircraft.**	
Available data format:	**ASCII files**	
Need to transform data:	**-**	
Data source:	**EUROCONTROL: http://www.eurocontrol.int**	
Cost:	**Unknown. To be consulted with Eurocontrol**	
Accuracy:	**-**	
Data set validation:	**Flight data recorders. Surveillance radar data. Other aircraft tracking equipment.**	
Data set improvement:	**Data should be completed with FDR data or surveillance data**	

SOURCE A.5 (C: General airport data, D: Runway data, F: Traffic Data. Anotec Consulting, S.L.)

Available data sets:	**General airport data, runway data, traffic data**	
Available data format:	**Unknown**	
Need to transform data:	**-**	
Data source:	**Airport authority**	
Cost:	**Unknown. Depends on Authorities.**	
Accuracy:	**-**	
Data set validation:	**-**	
Data set improvement:	**-**	

SOURCE A.6 (C: General airport data, D: Runway data. Anotec Consulting, S.L.)

Available data sets:	**General airport data, runway data**	
Available data format:	**None, available data are usually unstructured**	
Need to transform data:	**None**	
Data source:	• **Airport authority (Airport websites)** • **http://worldaerodata.com/**	
Cost:	**Free**	
Accuracy:	**No info. Periodical updates are made.**	
Data set validation:	**AIP**	
Data set improvement:	**-**	

SOURCE A.7 (B: Ground tracks, C: Airport data, D: Runway data. Anotec Consulting, S.L.)

Available data sets:	**Operational guidance material AIP**	
Available data format:	**Printed, electronic format**	
Need to transform data:	**Transformation of data in order to feed noise software.**	
Data source:	**Aeronautical Information Publication (AIP)**	
Cost:	**Public information made available through the aviation departments of the publishing country.**	
Accuracy:	**-**	
Data set validation:	**For ground track profiles: Jeppesen.** **For airport data or runway data: Airport authorities**	
Data set improvement:	**-**	

SOURCE A.8 (B: Ground tracks. Anotec Consulting, S.L.)

Available data sets:	**Jeppesen flight tracks database**	
Available data format:	**Jeppesen format (ARINC 424)**	
Need to transform data:	**Transformation of data in order to feed noise software**	
Data source:	**Jeppesen: http://www.jeppesen.com/wlcs/index.jsp**	
Cost:	**Users must have agreements with Jeppesen for use of the data**	
Accuracy:	**-**	
Data set validation:	**AIP.**	
Data set improvement:	**-**	

SOURCE A.9 (E: Air Traffic Data. Anotec Consulting, S.L)

Available data sets:	**OAG worldwide database**	
Available data format:	**Digital format(MD Access)**	
Need to transform data:	**Transformation of data in order to feed noise software**	
Data source:	**OAG: http://www.oagdata.com/home.aspx**	
Cost:	**Users must have agreements with OAG for use of the data annually.**	
Accuracy:	**Scheduled flights only**	
Data set validation:	**EAD**	
Data set improvement:	**-**	

SOURCE A.10: (E: Air Traffic Data. Anotec Consulting, S.L)

Available data sets:	**Prisme (Pan-European Repository of Information Supporting the Management of EATM) Data**	
Available data format:	**ASCII**	
Need to transform data:	**Transformation of data in order to feed noise software**	
Data source:	**PRISME: http://www.eurocontrol.int** **whose data are obtained from several sources such as CFMU (Central Flow Management Unit), ACARS (Aircraft Communications, Addressing and Reporting System), EAD (European AIS Database), airports DB, major airlines flying in Europe, airframe manufacturers and ICAO registers.**	
Cost:	**Depending on agreement with EUROCONTROL**	
Accuracy:	**All flights actually performed**	
Data set validation:	**Airport authority**	
Data set improvement:	**-**	

SOURCE A.11 (F: Aircraft data. Anotec Consulting, S.L)

Available data sets:	**Noise-Power-Distance and performance (ANP database)**	
Available data format:	**-**	
Need to transform data:	**-**	
Data source:	**Data from the on line international aircraft noise and performance database (ANP): www.aircraftnoisemodel.org**	
Cost:	**Free**	
Accuracy:	**Difficult to quantify. Yearly average is supposed to be rather accurate. Not meant for single event prediction.**	
Data set validation:	**INM**	
Data set improvement:	**-**	

SOURCE A.12: (F: Aircraft data. Anotec Consulting, S.L)

Available data sets:	**Noise-Power-Distance and performance (INM database)**	
Available data format:	**dbf files**	
Need to transform data:	**None**	
Data source:	**INM**	
Cost:	**250 €**	
Accuracy:	**Difficult to quantify. Yearly average is supposed to be rather accurate. Not meant for single event prediction.**	
Data set validation:	**ANP database**	
Data set improvement:	**-**	

SOURCE A.13: (F: Aircraft data. Anotec Consulting, S.L)

Available data sets:	**Noise-Power-Distance and performance (German Austrian database)**	
Available data format:	**-**	
Need to transform data:	**-**	
Data source:	**-**	
Cost:	**-**	
Accuracy:	**Only known application in Airmod workshop showed big difference with INM/ECAC results**	
Data set validation:	**INM database/ ANP database**	
Data set improvement:	**-**	

TASK:	Buildings
Responsible partner:	**CSTB**
Other contributing partners:	**UGent, LABEIN**
Objective:	*Acquire a sufficiently precise description of the buildings to be feed into numerical model for noise level prediction*

REQUIREMENT A (CSTB)

Model method/software:	**NMPB / Mithra software**
Feature of data:	**VECTOR, 2D or 3D closed polygons**
Needed sets of data:	**Closed polygons describing the projection of the buildings on the ground + two height values. Mithra represents buildings as extruded polygons with horizontal base (Z = constant) and top planes (H = constant).** **Height of buildings are represented by number of floors + floor heights. Note that Mithra allows different heights for basement and elevated floors. The total height of the building is calculated as :** **H = H_BASEMENT + (NB_FLOOR - 1) * H_FLOOR**
Data format:	**Mithra can create buildings using the following geometrical items :** - **2D polygons: base height is matched to existing DTM** - **3D polygons representing the base of the building. Such lines will be used to modify the DTM locally.** - **3D polygons representing the top of the building, the corresponding base height will be matched to the existing DTM** **Mithra accepts one or more of the following attributes to calculate the height of the buildings:** - **Number of floors** - **Height of the building in meters** - **Altitude at the base** - **Altitude of roof top** **On import, Mithra accepts:** - **DXF files containing 3D polygons, interpreted as base altitude of the building. Height will be set to default values.** - **DXF files containing 3D polygons, interpreted as top altitude of the building. Height will be calculated from underlying DTM** - **DXF 2D polygons. Base will be matched to existing DTM, height will be set to default values.** - **MIF/MID or SHAPE files containing 2D polygons + attribute tables. Attributes can be assigned to represent one or two of the indicated properties.**
Input data precision:	**Precision of coordinates (X and Y) < 1 m** **Precision of height values < 3 m (one floor level)**
Default data:	**If the base level is missing (Z), the building will be positioned relative to the existing DTM (Z value calculated at the center of the newly created building).** **If no height information is available, buildings will be constructed using default values for H_BASEMENT, NB_FLOOR and H_FLOOR. Default values can be configured by the end-user.**
Error using defaults:	**Highly dependent on site topology and selected default values.**

REQUIREMENT B (UGent)

Model method/software:	**ISO9613 / Bass (In-House-developed)**
Feature of data:	**2D closed simple polygons, possibly with holes**
Needed sets of data:	**Closed polygons describing the projection of the buildings on the ground + one height values. Bass represents buildings as extruded polygons with horizontal top planes.** **Height of buildings are represented by a height in m.**
Data format:	**Bass can create buildings using the following geometrical items :** - **2D polygons: base height is matched to the height in the DTM of the centroid of the projected polygon** **Bass accepts one or more of the following attributes:** - **Height of the building in meters** **On import, Bass accepts:** - **SHP files containing 2D or 3D polygons, interpreted as projections, the 3rd dimension is ignored when present. Holes may be present in buildings. Heights are to default values when no attributes are provided for height field.** - **Python code inserting the buildings manually.**
Input data precision:	**Precision of coordinates (X and Y): allowed to 10^{-6} m** **Sufficient precision is needed to avoid overlap with other GIS-layer, such as the roads.** **Precision of height: unknown**
Default data:	**If the base level is missing (Z), the building will be positioned relative to the existing DTM (Z value calculated at the center of the newly created building).** **If no height information is available, buildings will be constructed using default values for the height. Default values can be configured by the end-user.**
Error using defaults:	**Highly dependent on site topology and selected default values.**

REQUIREMENT C (LABEIN)

Model method/software:	**-/IMMI**
Feature of data:	**Polygons (3D)**
Needed sets of data:	**Closed polygons with altitude data at the ground floor and number of floors.**
Data format:	**Shape or dxf/dwg**
Input data precision:	**1:5000 or minor**
Default data:	**Default height of buildings 5 m.**
Error using defaults:	

SOURCE A.1 (CSTB)

Available data sets:	**BdTopo, layer BATIMENT_SURFACIQUE**	
Available data format:	**DXF files containing 3D POLYGONS, representing the building's gutter (height = junction of vertical wall with the roof).**	
Need to transform data:	**Calculate averaged altitude over the polygon, subtract DTM level at the center of the building and use this value as the constant height of the building. The height of the building is than converted to standard representation (H_BASEMENT, H_FLOOR, NB_FLOOR).** **This operation is fully automated in Mithra software.**	
Data source:	**IGN, the French National Geographic Institute** **www.igh.fr** **BdTopo covers approx. 80% of the French territory and 95% of the most populated areas.**	
Cost:	**12 to 54 €/km² depending on size. But for this price you get the full set of available layers, including terrain, buildings, roads, railways, hydro,... You cannot buy single layers.**	
Accuracy:	**Less than 1 meter, both horizontally and vertically.**	
Data set validation:	**None. IGN uses quality assurance on produced data and provides updates every 5 years.**	
Data set improvement:	**Large buildings with varying number of floors are best split up in separate smaller buildings.**	

SOURCE A.2 (CSTB)

Available data sets:	**BdTopo, layer BATIMENT_SURFACIQUE**	
Available data format:	**MIF-MID or SHAPE files containing 2D POLYGONS, representing the building's projection on the ground + attributes Z_MIN and Z_MAX representing the minimum and maximum of the building's gutter (see specification A1).**	
Need to transform data:	**Use (Z_MIN + ZMAX)/2 as roof top height, subtract DTM level at the center of the building and use this value as the constant height of the building. The height of the building is than converted to standard representation (H_BASEMENT, H_FLOOR, NB_FLOOR).** **You cannot do out (Z_MIN + ZMAX)/2 automatically in the Mithra software but you can do it externally using GIS software to create and extra attribute.** **The remaining operation is fully automated in Mithra software.**	
Data source:	**IGN, the French National Geographic Institute** **www.igh.fr** **BdTopo covers approx. 80% of the French territory and 95% of the most populated areas.**	
Cost:	**12 to 54 €/km² depending on size. But for this price you get the full set of available layers, including terrain, buildings, roads, railways, hydro,... You cannot buy single layers.**	
Accuracy:	**Less than 1 meter, both horizontally and vertically.**	
Data set validation:	**None. IGN uses quality assurance on produced data and provides updates every 5 years.**	
Data set improvement:	**Large buildings with varying number of floors are best split up in separate smaller buildings.**	

SOURCE B.1 (UGent)

Available data sets:	**GRB (Groot referentie bestand = Great Reference File)**	
Available data format:	**DXF files containing 2D POLYGONS and LINES, representing the building's gutter (height = junction of vertical wall with the roof).**	
Need to transform data:	**To SHP**	
Data source:	**OC GIS Vlaanderen, mainly on site measurements, finalised by using different other digital sources**	
Cost:	**Free for governmental use, but no definite policy set yet.**	
Accuracy:	**Claimed 1cm on X and Y coordinates.**	
Data set validation:	**Due to data from several sources and high quality measurements, the data set seems to be largely validated.**	
Data set improvement:	**Number of floors is not available. Data set is in development, about 15% of Flanders is mapped at this moment (densely populated regions roughly have priority). Goal is to fully map Flanders in 2014.**	

SOURCE C.1 (LABEIN)

Available data sets:	**Closed polygons with altitude**	
Available data format:	**Shape/dxf**	
Need to transform data:	**No**	
Data source:	**Official cartography**	
Cost:	**Free**	
Accuracy:	**Good**	
Data set validation:	**3D model and aerial photography**	
Data set improvement:	**Updating of data**	

TASK:	Ground characteristics
Responsible partner:	**SP**
Other contributing partners:	
Objective:	*Acquire information about the ground impedance to be feed into numerical model for noise level prediction*

REQUIREMENT A

Model method/software:	**Nord 2000 / SoundPLAN**
Feature of data:	**SURFACE (AREA)**
Needed sets of data:	**AREA polygons with attribute 'Ground impedance'. The acoustic impedance of each individual ground area enclosed by a polygon should be constant. The value of the ground impedance within every polygon should be defined.**
Data format:	• **SHP file hosting polygons with X, Y and Z coordinates (the value of Z coordinate is irrelevant) with attribute Ground impedance defined (as impedance class or as a impedance value).** **or** • **DXF file consisting of layers that contains polygons with X, Y and Z coordinates (the value of Z coordinate is irrelevant). Within each layer the value of the ground impedance of all polygons should be the same and this value should preferably be stated by the name of the layer.**
Input data precision:	**Precision of coordinates (X and Y)** • **Noise mapping projects with high demand on accuracy: 0.5 m** • **For big noise mapping project of survey character the available resolution (25 m) will be satisfactory** **Precision of ground impedance value: ± 1 impedance class**
Default data:	**Road surfaces:** • **ISO road surface: 2 MPas/m2** • **Acoustically hard road surfaces (most roads): 200 MPas/m^2** **Railway beds: 160 kPas/m2** **The ground:** • **Very soft (snow or moss-like): 12,5 kPas/m^2** • **Soft forest floor (short, dense heather-like or thick moss): 31,5 kPas/m^2** • **Uncompacted, loose ground (turf, grass, loose soil): 80 kPas/m^2** • **Normal uncompacted ground (forest floors, pasture field): 200 kPas/m^2** • **Compacted field and gravel (compacted lawns, park area): 500 kPas/m^2** • **Compacted dense ground (gravel road, parking lot): 2 MPas/m^2** • **Hard surface (dense asphalt, concrete, water): 200 MPas/m^2**
Error using defaults:	**There is no information available regarding this**

SOURCE A.1

Available data sets:	**Ground impedance maps**	
Available data format:	**The ground impedance maps can be delivered in the formats specified under REQUIREMENT A.**	
Need to transform data:	**No (one could also buy a land use map and, by help of a conversion table, transform it into a map that shows the acoustic impedance of the ground.)** **These ground impedance maps can be delivered in digital format as polygons marking out ground areas with uniform acoustic impedance. The value of the acoustic impedance of the ground within the polygon is defined.**	
Data source:	**Lantmäteriet (National Land Survey of Sweden)** **www.lantmateriet.se** **More info: marten.sohlman@lm.se**	
Cost:	**The cost for ground impedance maps where the resolution is 25 m would be ca EUR 680 for a 50 by 50 km area.** **(Ground impedance maps with a resolution of 0,6 m could be produced but will be very costly.)**	
Accuracy:	**There is no information available regarding what precision could be expected using this source.**	
Data set validation:	**Visual inspection**	
Data set improvement:	**In the future spatial resolution of remote sensing satellites will increase. If the resolution of land use maps increases so will the resolution of ground impedance maps.** **We have no suggestions on how to improve the precision of the value of the acoustic impedance.**	

TASK:	Industrial sources
Responsible partner:	**DGMR**
Other contributing partners:	**Labein**
Objective:	*Acquire information about industrial noise sources emission and representation to include it in the model.*

REQUIREMENT A (DGMR)

Model method/software:	**HMRI-II.8 / Predictor**
Feature of data:	**POINT: the data is in (X, Y, Z, attributes) format.** **VECTOR: representation of line sources by polylines: coupled set of X,Y,Z coordinates and attributes per polyline.** **Source height: Z height may either be absolute or relative to the underlying ground surface and items.**
Needed sets of data:	**coordinates X, Y, Z** **attribute 1: identification** **attribute 2: description** **attribute 3: height definition (absolute/relative/user-defined)** **attribute 4: source height*** **attribute 5: source type (normal, emitting facade, emitting roof)** **attribute 6: opening angle (0..360 degrees)** **attribute 7: radiation angle (0..360 degrees)** **attribute 8-16: A-weighted sound power level at 31Hz-8kHz** **attribute 17-25: noise reduction at 31Hz-8kHz** **attribute 26-28: operation hours of the source per period (day, evening, night)** *** definition of the source height depends on the height definition (attribute 3)**
Data format:	**Predictor format.** **SHP, DXF and ASCII format are supported by import tools**
Input data precision:	**Coordinates in metres, precision is 0.01m.**
Default data:	**attribute 3: height definition = relative to underlying terrain model** **attribute 5: source type = normal** **attribute 6: opening angle = 360 degrees** **attribute 26-28: operation hours of the source per period (day, evening, night) = 100%**
Error using defaults:	**unknown**

REQUIREMENT B (Labein)

Model method/software:	**-/ IMMI**
Feature of data:	**Points, lines and areas**
Needed sets of data:	**Sound power level, position, type of source, time of operation, directivity**
Data format:	**Shape**
Input data precision:	**Adaptation of the standards ISO3744, ISO3746, ISO9613**
Default data:	**Noise sources sound power level databases**
Error using defaults:	**Unknown**

SOURCE A.1 (DGMR)

Available data sets:	For the larger industrial areas, models with all necessary data are already available	
Available data format:	The format is in almost any case Predictor/Geonoise	
Need to transform data:	Import from SHP, DXF and ASCII format supported by import tools Allocation of source attributes by the use of source type classifications (e.g. by the type of industry) In some cases, global surface sources (closed polygons with a source strength defined per unit area) need to be transformed into discrete point sources. The resolution depends on the distance to the nearest reception point.	
Data source:	-	
Cost:	-	
Accuracy:	-	
Data set validation:	Geometrical validation by visual inspection or comparison with aerial photographs (import as BMP-layer) or topographical datasets Measure specific sound power levels	
Data set improvement:	Geometrical validation by visual inspection or comparison with aerial photographs (import as BMP-layer) or topographical datasets Measure specific sound power levels	

SOURCE B.1 (Labein)

Available data sets:	Studies about acoustic impact of some industries where the noise sources are already characterized, when available	
Available data format:	None	
Need to transform data:	Short term measurements into long term data	
Data source:	Measurements	
Cost:	High	
Accuracy:	Medium-high	
Data set validation:	Validation measurements to check the accuracy of the result.	
Data set improvement:	Creation of databases of noise source emission from noise studies.	

TASK:	**Noise protection/reduction devices**
Responsible partner:	**Labein**
Other contributing partners:	
Objective:	*Location and description of noise reduction devices.*

REQUIREMENT A (Labein)

Model method/software:	**-/ IMMI**
Feature of data:	**Lines with altitude (3D)**
Needed sets of data:	**Polylines with altitude**
Data format:	**Dxf or shape**
Input data precision:	**Scale 1:5.000 or minor**
Default data:	**If the device is represented in the cartography a height of 4 meters is assigned. If the device is not represented usually is not considered.**
Error using defaults:	**If an existing noise barrier is not considered close to the barrier the error is very high.**

SOURCE A.1 (Labein)

Available data sets:	**Very few in the cartography.**	
Available data format:	**Dxf or shape**	
Need to transform data:	**Introduce the ground altitude and the altitude of the upper height.**	
Data source:	**Official cartography or infrastructures owners' cartography**	
Cost:	**Free**	
Accuracy:	**Bad**	
Data set validation:	**3D Model**	
Data set improvement:	**Creation of noise reduction devices' database with information about position and height.**	

TASK:	**Population data**
Responsible partner:	**deBAKOM**
Other contributing partners:	**LABEIN**
Objective:	*Providing data to calculate people per façade according to the EU directive*

REQUIREMENT A (deBAKOM)

Model method/software:	**No method or standard software available**
Feature of data:	**Points, lines**
Needed sets of data:	**People per façade**
Data format:	**Number of persons per unit** **Specification of the unit (e.g. block, address, house, etc.)** **Specification of dwellings** **Supported file formats: dxf, dwg, shape+dbf, ASCII.**
Input data precision:	**No specification available**
Default data:	**Estimation: person per m² from area of dwelling, if height information of buildings is available the volume can be used to estimate the no. of persons per dwelling. The area per person can be estimated from the build up area an the total number of inhabitants. As standard 30 m²/per person ca be assumed.**
Error using defaults:	**No estimation**

REQUIREMENT B (Labein)

Model method/software:	**-**
Feature of data:	**-**
Needed sets of data:	**Database with population associated to buildings**
Data format:	**Dbf/mdb/oracle/SQL**
Input data precision:	**Population related to doors of building.**
Default data:	**Population distributed as a function of the building dimension. Depending on the surface, number of floors, length of façade: 3 inhabitants per dwelling; 1 dwelling every 10 meters of façade.**
Error using defaults:	**-**

SOURCE A.1(deBAKOM)

Available data sets:	• Persons per block • Persons per road address • Persons per building • Person per address	
Available data format:	Standard data formats e.g. ASCII, shape+dbf, MIF-MID.	
Need to transform data:	Distribution of the population: Identify dwellings Distribute population per dwelling Distribute person onto the façade (person/meter)	
Data source:	Local authorities (e.g. city council), national census institution	
Cost:	> 1000 EUR for a medium sized city of about 250T inhabitants ; costs strongly depend on the details of the required accuracy of the data	
Accuracy:	Depends strongly on the available data	
Data set validation:	Using different population distribution methods and comparing the result according to the EU-directive, different methods should at least for large populations give similar results	
Data set improvement:	3 dimensional façade distribution	

SOURCE B.1 (Labein)

Available data sets:	Population related to building doors.	
Available data format:	Database (dbf/mdb/oracle...)	
Need to transform data:	Assign doors to buildings. Distribute the population along the building façade.	
Data source:	Official census	
Cost:	Free	
Accuracy:	High	
Data set validation:	∑ Population < number of inhabitants in the municipality.	
Data set improvement:	Updating of data	

TASK:	Railway Traffic
Responsible partner:	**ARPAT**
Other contributing partners:	Labein
Objective:	*Define data requirements for railway noise sources.*

REQUIREMENT A (ARPAT)

Model method/software:	**ISO9613, MITHRA**
Feature of data:	**VECTOR**
Needed sets of data:	**ACOUSTIC DATA: noise emission information are contained in a database, according to the following schema:** **▪ For each coach type (valid for the national rolling stock):** **▪ 1 octave emission spectra from 125 Hz to 4 kHz;** **▪ coach length** **▪ number of boogies and their separation** **▪ noise emission vs speed** **TRAFFIC DATA:** **▪ For each train type: coaches composition.** **▪ For the railway line (traffic information):** **▪ Train type** **▪ Mean speed** **▪ Track** **▪ Number of passages/period**
Data format:	**Acoustic information: database of coach type and train type can be provided as TXT file; file format is described in the MITHRA user manual.** **Traffic data: railway traffic information can be imported from a TXT file (format described) and is therefore inserted in MITHRA project file.**
Input data precision:	**No info**
Default data:	**The railway traffic data have no default.**
Error using defaults:	**No info**

REQUIREMENT B (Labein)

Model method/software:	**SRMII / IMMI**
Feature of data:	**VECTOR (Line 3D)**
Needed sets of data:	**Traffic data in the three periods D/E/N.** **Classification of trains as a function of their emission.** **Type of track structure**
Data format:	**Shape**
Input data precision:	**Year average**
Default data:	**Assignment of a train emission to an existing category by means of similarities in the general characteristics.**
Error using defaults:	**Very variable depending moreover on rail roughness. Approximately between [-8, +15 dB]**

SOURCE A.1 (acoustic data) (ARPAT)

Available data sets:	**Italian coach acoustic emission database and standard Italian train type composition database**	
Available data format:	**TXT according MITHRA specification**	
Need to transform data:	**none**	
Data source:	**RFI**	
Cost:	**Not known.**	
Accuracy:	**Inaccuracy derive from the model itself, which does not separate train emission from rail contribution. Otherwise the database have been build on an accurate measurement on Italian rolling stock.**	
Data set validation:	**Measurement**	
Data set improvement:	**Updating of the database, measurement with different train/track combination.**	

SOURCE A.2 (traffic data) (ARPAT)

Available data sets:	**Official train timetable (only PAX trains), official logbook of train passages (M42), info about maximum allowed train speed.**	
Available data format:	**TXT**	
Need to transform data:	**Aggregation of logbook information into statistical traffic information, per train type, per period. Cross-correlation between timetable and logbook.**	
Data source:	**RFI**	
Cost:	**Free; most of the cost is related with validation of data, done mainly by hand.**	
Accuracy:	**Either timetable and logbook are "point based" (i.e. refer to passages across some reference points, generally train stations): those point are spaced on the territory with distances of some tens of kilometres. There may be some uncertainties in extrapolating information on an arbitrary points, but it should be unimportant for statistical base approach.** **Maximum allowed speed is generally a rough estimator of the real speed; inaccuracy related with this parameters could lead to greater inaccuracy with the expected noise level.**	
Data set validation:	**Monitoring of traffic passages.**	
Data set improvement:	**Direct measurement of train passages and their speed.**	

SOURCE B.1 (Labein)

Available data sets:	**Lines (axis of the infrastructure) and some traffic data.**	
Available data format:	**Shape (axis) and txt/documents**	
Need to transform data:	**Assignment of traffic to lines**	
Data source:	**Official cartography, information from the infrastructures owner.**	
Cost:	**Data are free but they need a processing to include them in the model**	
Accuracy:	**Bad**	
Data set validation:	**Analysis of the homogeneity of the data along the infrastructure**	
Data set improvement:	**Create a national trains emission database with information about velocities, track infrastructures, etc.**	

TASK:	Road Traffic
Responsible partner:	**U Gent**
Other contributing partners:	**ULeeds, Labein**
Objective:	*Define data requirements for road noise sources.*

REQUIREMENT A (ULeeds)

Model method/software:	**Calculation of Road Traffic Noise, XPS 31-113, ISO9613** **Running on AVTUNE (U Leeds proprietary software)**
Feature of data:	**Supplemental data to Road Vectors (see Road and Rail Infrastructure)**
Needed sets of data:	• **AADT (Annual Average Daily Total) flow;** • **Flow direction (one way or two way – affects gradient calculations);** • **Base mean flow speed;** • **Base percentage of HGVs;** • **Scaling profiles for 24-hour flows, speeds and vehicle classifications or D/E/N flow speed and vehicle classifications;**
Data format:	**Standard .mif/.mid file or alternate .txt file formats**
Input data precision:	**Under analysis at the present time for IMAGINE WP2.**
Default data:	**Default road templates provided for profile scaling information, based on information derived from annual traffic counts and engineers expert judgement.**
Error using defaults:	**No information – but under analysis at present time for IMAGINE WP2.**

REQUIREMENT B (Labein)

Model method/software:	**-/IMMI**
Feature of data:	**Line 3D**
Needed sets of data:	**Lines with associated traffic data distinguishing D/E/N traffic, velocities and traffic composition.**
Data format:	**Shape**
Input data precision:	**Year average**
Default data:	• **Velocities: the maximum speed assigned to the type of road** • **Q vehicles/hour day = Q vehicles/hour evening = Daily average traffic/17** • **Q vehicles/hour night = Daily average traffic*0.095**
Error using defaults:	**-**

SOURCE A.1 (ULeeds)

Available data sets:	**Information derived from existing Traffic Inventory Information used by Local Authorities for Air Quality Management Strategies (AQMS). Typically macroscopic parameters will come from Strategic Transportation Models.**	
Available data format:	**Depends on the exact AQMS/Strategic Transport Model Used. Typically a plain text or GIS file may be exported.**	
Need to transform data:	**Strategic Models generally have cruder network representations than required for noise mapping, and need geo-coding and correcting (requiring manual checks).** **Typically minor transformations are required to file structures.**	
Data source:	**Local Authorities. Supplemented by information from the UK Highways Agency where necessary. Default information (e.g. fleet proportions) may sometimes be found in parts of the National Atmospheric Emissions Inventories (NAEIs).** **Speed limits (road signs) may be present as a data layer in National Mapping information (depending on data set).** **Regarding flow profiles, the UK DMRB (Design Manual for Roads and Bridges) gives some guidance Local Authority Advice is the best source.**	
Cost:	**May be relatively cheap if inventory already exists (main cost is manual geo-coding and checking after port of inventory to noise model).** **Building new traffic model + inventory from scratch would incur considerable expense (£100,000s for major urban area).**	
Accuracy:	**Gross errors in traffic flow information from traffic models are controlled for model base year by guidance given in DMRB. Typically flow errors will give <1 dB error in emissions.** **Errors due to uncertainties or assumptions in other parameters may be higher. Analysis is ongoing for IMAGINE WP2.**	
Data set validation:	**Comparison to automatically or manually collected traffic survey data. Road surfaces from site survey or potentially remote sensing data in future. 'Full' validation for is expensive & time consuming and typically only carried out every 5 years. This may improve in future with grater automation.**	
Data set improvement:	**Inventories are periodically reviewed and updated by competent authorities. Local Authority advice must be sought for specific network features.**	

SOURCE B.1 (Labein)

Available data sets:	**Lines (axis of the infrastructure) and some traffic data.** **Traffic data:** • **Daily average traffic and % of heavy vehicles: nearly always** • **Hourly average traffic and % of heavy vehicles: sometimes** • **Velocity: never**	
Available data format:	**Shape (the axis) and txt/dbf/xls (traffic data)**	
Need to transform data:	**Assignation of traffic data to the axis.**	
Data source:	**Official data**	
Cost:	**Data are free but they need a processing to include them in the model**	
Accuracy:	**Bad**	
Data set validation:	**Analysis of the homogeneity of the data along the infrastructure**	
Data set improvement:	**Distinguish traffic data in the three periods.**	

TASK:	Road and Railway Infrastructure
Responsible partner:	**CSTB**
Other contributing partners:	U Leeds (roads), Arpat (railways), Labein, UGent (roads), Autostrade per l'Italia (roads)
Objective:	*Represent precisely the infrastructures cartography and the terrain in the vicinity.*

REQUIREMENT A (ARPAT)

Model method/software:	**ISO9613, MITHRA**
Feature of data:	**VECTOR**
Needed sets of data:	**GEOMETRICAL DATA: a 3D poly-line represent the railway line (not the single railway track). Additional information are:** ▪ **The number of tracks** ▪ **Separation (in meters) of each track** ▪ **Height of the ballast** ▪ **Width of the ballast either at the base and at the top** ▪ **Height of the noise source related to the railway line**
Data format:	**1. Railway poly-line: DXF file** **2. Other geometrical information: to be provided by hand into the program**
Input data precision:	**No info**
Default data:	**Railway poly-line have no default.** **There can be default values for addition geometrical data (2 tracks, separation of xx meters, ballast shape of ….)**
Error using defaults:	**No info**

REQUIREMENT B (Labein)

Model method/software:	**SRMII / IMMI**
Feature of data:	**3D lines**
Needed sets of data:	**Infrastructures axis with altitude data, and width of the platforms**
Data format:	**Dxf or shape of "polilines z"**
Input data precision:	**Scale 1:10.000 or better**
Default data:	**When the infrastructure doesn't have its own altitude data it is located standing on the terrain digital model. Width of a railway platform 2 meters; Width of a two directions road 8 meters.**
Error using defaults:	**Generation of very high gradients (slopes) in the infrastructure profile.**

REQUIREMENT C (U Leeds)

Model method/software:	**Calculation of Road Traffic Noise, XPS 31-113, ISO9613 running on AVTUNE (U Leeds proprietary software)**
Feature of data:	**Vector**
Needed sets of data:	**Road surface information (Surface type + Texture depth for CoRTN);** **Road width;** **Road centre-line coordinates (UK OS national grid E/N format):** ▪ **Road is assumed to be draped on gridded terrain or TIN surface, else also requires elevation above MSL;** ▪ **Emissions may be corrected by proximity to junctions/merge points**
Data format:	**Standard .mif/.mid file or alternate .txt file formats**
Input data precision:	**Under analysis at the present time for IMAGINE WP2.**
Default data:	**Default road templates provided for profile scaling information, based on information derived from annual traffic counts and engineers expert judgement.**
Error using defaults:	**No information – but under analysis at present time for IMAGINE WP2.**

REQUIREMENT D (UGent)

Model method/software:	**ISO9613 / Bass (In-House-developed)**
Feature of data	**Road centrelines**
Needed sets of data:	**Road centrelines in SHP format.**
Data format:	**Bass can create road using the following geometrical items :** - **1D lines: as centreline of the road** **Bass accepts one or more of the following attributes:** - **Width of the road in meters** **On import, Bass accepts:** - **SHP files containing 1D lines, interpreted as projections, the 3rd dimension is ignored when present.** - **Python code inserting the roads manually.**
Input data precision:	**Sufficient precision is needed to avoid overlap with other GIS-layer, such as the buildings.**
Default data:	**-**
Error using defaults:	**-**

REQUIREMENT E (Autostrade per l'Italia)

Model method/software:	**Citymap-Disiapyr (Italian Ministry of Environment model)**
Feature of data:	**Vector (3D polylines for carriageway/lane centrelines, buildings perimeter, terrain contours)**
Needed sets of data:	• **Geometric (carriageway/lane width – longitudinal slope)** • **Road surface characteristics (surface type as porous or dense)**
Data format:	• **DWG files** • **DXF files** • **Raster data must be entry manually**
Input data precision:	**Iso-levels contours from 0.3 m (close to infrastructure) to 1.0 m**
Default data:	**No default data is provided**
Error using defaults:	**Not applicable**

SOURCE A.1 (railway line) - (ARPAT)

Available data sets:	**Official regional digital maps. Railway lines are already represented as 3D poly-lines.** **Common resolution are 1:2000 and 1:10000: the latter is available for the whole territory, while 1:2000 is used for urban area (but its coverage is increasing).**	
Available data format:	**DXF, DWG, SHP, DWF.**	
Need to transform data:	**none**	
Data source:	**Regional cartographic office**	
Cost:	**About 16 €/Km^2 for digital format: however it includes also other cartographic aspects (it is not limited to railway lines). For public organisation can be foreseen some discount on these costs.**	
Accuracy:	**About 2 meters for 1:2000. Common value about 10 meters**	
Data set validation:	**Visual inspection or comparison with satellite imagery.**	
Data set improvement:	**RFI (infrastructure owner) should have more detailed and up-to-date information.**	

SOURCE A.2 (additional geometrical information) – (ARPAT)

Available data sets:	**General geometrical information about railway line.**	
Available data format:	**None; available data are usually non structured.**	
Need to transform data:	**Extrapolation of information from various sources.**	
Data source:	**Photographs, rough information from infrastructure owner, visual inspection.**	
Cost:	**Direct costs very low, but indirect costs rather high.** **Estimation: about 30 €/km.**	
Accuracy:	**Depending on the source can be from 0.1 m to 1-2 meters**	
Data set validation:	**Cross correlation of data**	
Data set improvement:	**RFI (infrastructure owner) should have more detailed and up-to-date information.**	

SOURCE B.1 (Labein)

Available data sets:	**Central axis of infrastructure with altitude and sometimes platform width.**	
Available data format:	**dxf (3D)**	
Need to transform data:	**Generation of the platform where the infrastructure stands on.**	
Data source:	**Official cartography or infrastructures owners' cartography.**	
Cost:	**Free**	
Accuracy:	**Medium**	
Data set validation:	**3D model and aerial photography**	
Data set improvement:	**Improvement of terrain model around the infrastructure. (Platform and terrain in the vicinity).**	

SOURCE C.1 (ULeeds)

Available Data Sets :	**Digital mapping data from the UK Ordnance Survey (UK National Mapping Agency). A variety of mapping products at various scales exist[1].** **Road centreline data may be obtained from:** ▪ **Information on elevated sections of road is available from 3rd party data suppliers.** ▪ **Node and junction information may be inferred from mapping data or may be present as a separate data layer in the mapping data[2].**	
Available Data Format:	**OS Mastermap data is in GML 2.0 format (XML data schema). Other datasets are available as .dxf or .ntf format**	
Need to Transform Data:	**Conversion of .dxf or .ntf to .mif/.mid files (LandLine.Plus data), plus extraction of road layers. This may be done by freeware software (e.g. NTF2MIF) or GIS applications. Potential need to identify and recode elevated/tunnel/cutting sections.**	
Data Source:	**Ordnance Survey data providers.** **Regarding road surfaces, whilst the HA maintains records for the major trunk road and motorway networks, Local Authorities may have patchy information at best.**	
Cost:	**Price varies with product and license type, and typically includes a minimum license duration and number of product updates during the license period [3].**	
Accuracy:	**Varies by product, though typically road centreline data is accurate to within 1-2m horizontally**	
Data Set Validation:	**Comparison with ortho-rectified and geo-referenced aerial photography**	
Data Set Improvement:	**Correct with actual survey site data, Highways Authority Data or Local Authority Data. Corrections might be necessary given timings of OS programme of rolling updates.**	

[1] Examples include:

- **Ordnance Survey MasterMap data (Topography and Integrated Transport Network Layer) – this is the UK's state-of-art digital mapping data.**
- **Ordnance Survey LandLine.Plus data**
- **Ordnance Survey Meridian 2 data**
- **Ordnance Survey OSCAR (Traffic Network) data**

[2] Nodes/junctions are treated as point information and may be automatically or manually linked to roads within the model. The direction of flow and proximity to junction may then be used to apply a 'traffic flow type' correction to noise emissions.

[3] For MasterMap data pricing depends on the number of map objects purchased, the # of terminals on which data may be accessed and the density of map objects. Full base corporate cost for all UK topographical data (not just road layers, 101+ terminals) for 1 year is £4,990,000; for all UK ITN data the base cost is £109,000.

For LandLine.Plus 1:1250 (urban) 1:2500 (rural) or 1:10000 (moorland) data, quoted prices range from £18 to £42 per map tile (Oct 2005), but each tile has many more data layers than just roads.

For OSCAR data prices depend on the #of terminals and scale of mapping: e.g. all UK data on a single terminal for £18,500, or 101+ terminals for £148,000.

See full info at: http://www.ordnancesurvey.co.uk/oswebsite/products/pricing/D02086.pdf

UK Academic users may gain access to some datasets for nominal fees if they are subscribers to UK CHEST/EDINA agreements.

SOURCE D.1 (UGent)

Available data sets:	**Streetnet [(1)]**	
Available data format:	**SHP-files**	
Need to transform data:	**No**	
Data source:	**Teleatlas**	
Cost:	**Government has obtained license for governmental use. Cost of Multinet (new version with more attributes) is about 8600 euro for Flanders, which is about 0.55 – 0.60 euro / km^2. Maps can however only be obtained per province. (There are 5 provinces in Flanders)**	
Accuracy:	**Unknown**	**?**
Data set validation:	**Unknown**	
Data set improvement:	**Unknown**	

[(1)] The data set of the GRB (used for the buildings) will eventually also contain a road centreline and road borders. The use of the Street / Multinet dataset can then be avoided, reducing cost. However, the planning of the completion of the GRB-dataset is set at 2014. Densely populated regions will be done first (approximately). There is a high chance that for the regions of interest the data will be available.

SOURCE E.1 (Autostrade per l'Italia)

Available data sets:	• **Scanner laser (LIDAR) cartography** • **Post processing of numerical CTR (*Carta Tecnica regionale* or Regional Technical Chart)**	
Available data format:	• **SHP files** • **DWG files**	
Need to transform data:	**Included in the software**	
Data source:	• **Scanner laser (LIDAR) data** • **Numerical CTR maps or numerical data (*Carta Tecnica regionale* or Regional Technical Chart)**	
Cost:	**-**	
Accuracy:	**± 1.5 db(A) , after model calibration**	
Data set validation:	**-**	
Data set improvement:	**-**	

TASK:	Terrain Model
Responsible partner:	**deBAKOM**
Other contributing partners:	**U Leeds, Labein, Autostrade per l'Italia**
Objective:	*Collect information about the ground profile for noise mapping*

REQUIREMENT A (deBAKOM)

Model method/software:	**ISO 9613-2, DIN 2714, DIN 2720 / LIMA, Cadna, IMMI, Soundplan**
Feature of data:	• **Regular 3D grid points** • **Height profile vector lines**
Needed sets of data:	• **Regular grid points (x, y, z) with a horizontal resolution of 5 to 50 m** • **Height profile lines with 1 to 5 m height steps (2D+1/2 format: height1: x1/y1 … xn/yn; height2 x1/y1 … xn/yn)**
Data format:	• **ASCII-files** • **Dxf-files** • **Shape-files** • **Other GIS data files (ArcView, etc.)**
Input data precision:	• **Grid data: 5-10 m distance between grid points** • **Vector data: 2-5 m steps between the height lines**
Default data:	**Flat terrain**
Error using defaults:	**Up to 10 dB**

REQUIREMENT B (U Leeds)

Model method/software:	**Calculation of Road Traffic Noise, XPS 31-113, ISO9613 / AVTUNE (U Leeds proprietary software)**
Feature of data:	**Grid**
Needed sets of data:	**Terrain grid at sub 10m resolution.**
Data format:	**Standard ASCII raster Grid [1].**
Input data precision:	**Under analysis at the present time for IMAGINE WP2.**
Default data:	**Assumption of Flat Plane or National Mapping (OS LandForm Profile) Data (10m resolution).**
Error using defaults:	**May be >10 dB if flat plane is assumed.**

[1] ASCII Raster Grid Format: the ASCII raster file format is a simple format used to transfer data between various applications. It consists of a few lines of header data, followed by a list of cell values.

The header data is as follows:

ncols – the number of columns in the data set;

nrows – the number of rows in the data set;

xllcenter or xllcorner – x-coordinate of the lower-left corner or the lower-left centre of the lower-left cell;

yllcenter or yllcorner – y-coordinate of the lower-left corner or the lower-left centre of the lower-left cell;

cellsize – the dimension of a side of a square grid cell;

nodata_value – value assigned to any cells who's data value is unknown.

The header is followed by the data. Data in the ASCII raster file format is a simple space delimited list. The first row of the data corresponds to the top of the data set, working from left to right. No carriage return or line feed is necessary to mark the end of a row as the number of columns defines where a line should end. There should always be a total of ncols x nrows data elements in the file.

REQUIREMENT C (Labein)

Model method/software:	**-/ IMMI**
Feature of data:	**1. Contour lines** **2. Points (x,y,z). UTM co-ordinates**
Needed sets of data:	**1. Feature of lines** **2. X,Y,Z**
Data format:	**1. DXF, SHAPES** **2. ASCII file (x;y;z)**
Input data precision:	**10m/5m**
Default data:	**1. Interpolation of contour lines. Additional data from the DTM can be included in the interpolation.** **2. Interpolation of existing data**
Error using defaults:	**-**

REQUIREMENT D (Autostrade per l'Italia)

Model method/software:	**Citymap-Disiapyr (Italian Ministry of Environment)**
Feature of data:	• **Height profile vector iso-lines** • **TIN (Triangulated Irregular Network), DTM (Digital Terrain Model)**
Needed sets of data:	• **Regular grid points (x, y, z) defining geo referred triangle vertices** • **Height profile lines with 0.1to 1 m height steps (3D format)**
Data format:	• **ASCII-files** • **Dxf-files** • **Shape-files** • **DWG or ArcView**
Input data precision:	• **Grid data: 0.1-1 m distance between grid points** • **Vector data: 0.1-1 m steps between the height lines**
Default data:	**No default data at terrain**
Error using defaults:	**About 1 dB**
Data set improvement:	• **To use LIDAR data with higher resolution** • **To adopt iper spectral photos.**

SOURCE A.1 (deBAKOM)

Available data sets:	**Maps, grid data from national or regional cartographic Institutes**	
Available data format:	**Dxf, shape, dwg, MIF-MID, ASCII (x,y,z), geo-referenced grid data (e.g. bitmap)** **Height information in meter, co-ordinates according to national systems**	
Need to transform data:	**Required sets of data are profile lines. The grid data can be transformed into height lines using the mapping software or any other means.**	
Data source:	**Maps, grid data from national or regional cartographic Institutes**	
Cost:	**Approx. 3-7 EUR/km² (20x20 m resolution)**	
Accuracy:	**Estimated errors can be up to 10 dB, average error < 3 dB**	
Data set validation:	• **Transform the grid data into height lines using different steps (e.g. 5m and 2m)** • **Calculate noise map for each ground profile** • **Calculate the standard deviation between the two**	
Data set improvement:	**To improve the ground profile local ground elevations must be included which are usually not part or the available data due to the resolution limits**	

SOURCE B.1(U Leeds)

Available Data Sets :	Digital mapping data from the UK Ordnance Survey (UK National Mapping Agency). A variety of mapping products at various scales exist[1]. Third party data covers the majority of the UK[2].	
Available Data Format:	Ordnance Survey data is supplied as .ntf files. 3rd Party data may be supplied in many formats (as requested).	
Need to Transform Data:	Conversion of .ntf to .asc files (Landform Profile data). This may be readily done GIS applications. 3rd Party data may be supplied in required data format[3]. Some post processing and smoothing may be required to draped objects on terrain model to remove 'jaggies' occurring due to grid triangulation method.	
Data Source:	UK National Mapping Agency (Ordnance Survey) or 3rd Party Data Providers.	
Cost:	Price varies with product and license type, and typically includes a minimum license duration and number of product updates during the license period [4].	
Accuracy:	Varies by product[5].	
Data Set Validation:	Comparison with site survey. Cross validation between differing data sets.	
Data Set Improvement:	Use higher resolution remote sensing data – i.e. LiDAR.	

[1] Previously used data is the Ordnance Survey Landform Profile Data. This is a DTM derived from photogrammetric survey contours.

[2] Examples include:

Radar terrain data, such as NEXTMap IFSAR (Interferometry Synthetic Aperture Radar) data, supplied through Getmapping UK Plc. NEXTMap data covers 231,000 km^2 of the UK at 5m or 10m grid postings. Vertical accuracy is of the order of 1m, depending on altitude of survey aircraft and the slope of the ground.

LiDAR (Light Detection and Ranging) data, such as the City Data supplied by Infoterra UK Plc. Infoterra Urban LiDAR data covers 53 UK cities, with grid spacing of between 3m and sub 1m. Vertical height accuracy is stated as 0.1 – 0.2m.

[3] Note that data collected by remote sensing will typically have been processed by the consultant. This processing attempts to remove vegetation and buildings from the sensor data, i.e. to convert a raw DEM (Digital Elevation Model) to DTM (Digital Terrain Model or bald earth) data.

[4] OS Landform data is approx. £5,500 for dull UK coverage on a single terminal or approx. £44,000 on 101+ terminals. Exact prices may be found at:
http://www.ordnancesurvey.co.uk/oswebsite/products/landformprofile/pdf/d02086_L-FPROFILE.pdf

Third party data may be supplied at a variety of prices depending on the size of order, and needed consultancy time to process. High resolution remote sensing data typically starts at sub £100 per km tile, with substantial savings made for bulk purchases.

[5] OS Landform Profile data is quoted as having a vertical accuracy of ±2.5m in most areas or ±5m in moorland or mountainous areas.

SOURCE C.1(Labein)

Available data sets:	1. Vector elements (lines and altitude points) 2. Regular grid points 10x10m or 5x5m.	
Available data format:	1. Shape, dxf, dwg, gdn 2. ASCII file	
Need to transform data:	1. None 2. ASCII to shape (by means of GIS tools) OR import directly to IMMI	
Data source:	Official Cartography	
Cost:	Free	
Accuracy:	Good	
Data set validation:	Revision of 3D Model and Aerial Photography	
Data set improvement:	Higher precision in infrastructures cartography.	

SOURCE D.1 (Autostrade per l'Italia)

Available data sets:	• **Scanner laser (LIDAR) cartography** • **Post processing of Numerical CTR (*Carta Tecnica Regionale* or Regional Technical Chart)**
Available data format:	• **SHP files** • **DWG files**
Need to transform data:	**Included in the software**
Data source:	• **Scanner laser** • **Numerical CTR (*Carta Tecnica Regionale Numerica* or Regional Technical Numerical Chart)**
Cost:	
Accuracy:	**± 1.5 db(A) , after model calibration**
Data set validation:	
Data set improvement:	