SoundPLANnoise

Contents of the individual modules

Document version December 2025

SoundPLAN GmbH | Etzwiesenberg 15 | 71522 Backnang | Germany
Phone +49 (0) 7191 9144-0 | Fax -24 | mail@soundplan.de | www.soundplan.eu

Base Module

- Data modelling via georeferenced bitmaps or import data from DXF, ASCII, Excel and QSI (DIN 45687). The number of entered / imported objects is not limited.
- Data adaptation to various data situations via automated geometry, building and elevation tools, e.g., create parallel objects, bridge recognition from the terrain, assign inhabitants to buildings, unite areas, ...
- Transformation between different coordinate systems e.g., Transversal-Mercator coordinates to UTM) at import or during project editing.
- The Property Explorer lists all properties of an object type (e.g., buildings, roads) as a table. Object properties can be changed for several or all objects together - also via formulas.
- Front view, side view and a 3D wire model data control during input.
- The geometry preflight jumps directly to conflicts in the input data, which could lead to problems in the calculation.
- Free properties that can be created as required, for example, to read in additional information during import or to consider preloads at receivers.
- During import, the properties from the import file and the properties of the SoundPLANnoise objects can be assigned not only by direct assignment but also using formulas.
- Import of elevation points (ASCII files, ESRI ASCII Grid, ESRI Binary Grid, GeoTIFF, LAS/LAZ) with intelligent thinning of dense elevation information.
- Creation of digital ground models (DGM) for the elevation supply of the geometry and the calculation.
- Import and export of digital ground models available in the ITF format.
- Calculation of berms and sources in a DGM including calculation of embankments.
- Relative elevation automatically adapts the object elevation to the terrain.
- Various libraries filled with a lot of data, for example for emission, sound transmission, directivity, train tables, day histogram.
- Assessment library with lots of predefined elements for different assessment standards if required with the limit values for the corresponding area usages / classes and time slices as well as rest period additions. E.g., EU standard 2002/49/EG – LDEN, day/night with and without maximum levels and other country dependent assessments.
- Assessment according to psycho acoustic descriptors for frequency-dependent calculations.
- Powerful and fast calculation core supports multi-core and multiprocessor PCs including the unlimited use of all cores /threads of a PC for the calculation.
- Calculation of single receiver points – either assigned to buildings or free field receivers. One receiver may have any number of floors that are simultaneously calculated.
- Batch calculation – by simply clicking on the calculation runs in the calculation run table, they are processed one after the other. Calculation run tables from different projects can also be appended.
- Calculation and evaluation of statistical accuracy according to DIN 45687, Annex F.
- Documentation of results in different levels of detail (e.g., sum levels, source contributions at the receiver, source contribution spectra, sound propagation parameters, detailed protocol).

- An integrated spreadsheet adapted to the special requirements of noise calculation with additional keywords, for example ++ for energetical addition. In statistics lines, for example, the effectiveness of different measures on the number of affected inhabitants can be compared. Conditional formatting increases the readability and visualizes, for example, limit value exceedings automatically. A fully formatted table can be saved as a template, so that for a new project only the corresponding results need to be inserted and the table is then available with all formatting, formulas and statistics.
- Tabular documentation of noise protection measures including coordinates, height, segment length and volume.
- Graphical representation of single point results as level charts and as level tables (also for individual source groups).
- Flexible graphical plan output with title block, legend, length scale and north arrow as well as the individual design of the displayed geometry data.
- Display of geometry bitmaps together with the calculated results (including DGM triangles) in 2D.

Cartography

- Google Maps and OSM open with a mouse click in the area of the entered geometry data.
- If the project does not yet contain any geodata, simply select the desired area via the address search and deposit a georeferenced bitmap as a basis with a single click.
- Elevation import from Google Maps.
- Import of OSM geometry within the map viewport with properties included in the data (e.g., address data, road names). Import of external OSM XML files.
- Access to WMS servers for data input and plan output. The section automatically adapts to the selected geometry section. If desired, a bitmap can also be included in the project.
- Export of geometry data and contour bands of a grid noise map to kml.
- Import of photos from a site inspection as photo points with the coordinates from GPS data. Representation of the photo points with view direction in a map and clear tabular photo documentation with number, picture and description.
- Any columns from the integrated spreadsheet can be output in a map as small tables with reference to the receiver point.
- Graphical representation of a DGM with colored scale and a continuous color flow; output of the elevation lines resulting from a DGM with different layouts.
- Display of the objects and scale colors according to DIN 45682.
- Conflict maps and sum conflict maps for noise maps.
- Own layouts of the objects for the output in the Graphics. For example, different layouts for different road types (highway, federal road, ...), to distinguish existing and planned noise protection measures or for individual labeling of different area types.
- With the symbol editor you can create your own symbols, for example traffic signs, which make the thematic maps even more meaningful.
- Extended object representation, for example individual line, chain and surface definitions.
- Automated map description (e.g. reference kilometers of a wall, wall heights, source number, kilometer marking).

- Map sections and overview map for the effective presentation of results of, for example, motorway and noise remediation projects, including automated generation of maps, bitmaps and export data for all map sections.
- Import of measured values (ASCII) into a table or as an aerial measurement map, for example to superimpose results from other programs with SoundPLAN results or to consider a preload.

Road / Railway noise propagation

Standards road: ASJ RTN-Model 2018 · BUB: 2018/2021 · CNOSSOS-EU: 2015/2021 · CNOSSOS-Norway: 2021 · CoRTN: 1988 · DIN 18005: 1987 · EMPA StL 86/86+/97 · FHWA: 1978 · HJ 2.4 Road: 2009/2021 · NMPB 2008 · NMPB 96 · Nord2000 Road · ÖAL 28: 2019/2021 (RVS 4.02.11) · ODM 218.2.013-2011 · RLS-19 · RLS-90 · RTN: 1996 · Russian Road · RVS 3.02/4.02: 2009 · sonROAD 18: 2018/2021/2023/2024 · Standaardrekenmethode 2: 2012 · Statensplanverk report no. 48: 1990 · TNM 2.5 / 3.0 · VBUS: 2006 · VRSS: 1975

Standards railway: BUB: 2018/2021 · CNOSSOS-EU: 2015/2021 · CNOSSOS-Norway: 2021 · CoRN: 1995 · DIN18005: 1987 · FTA: 2018 / FRA - HSGT: 2005 · GOST R 54933: 2012 · HS2 Phase 2b: 2017 · Israeli Rail: 2006 · Japan Narrow Gauge Railways: 2008 · Kilde Report 67/130 · NF S 31-133 Rail: 2007 · NMT: 1996 · Nord2000 Rail · ÖAL 28: 2019/2021 (RVE 4.02.11) · ONR 305011: 2004/2009 · RMR 2002 · Russian Rail · Schall 03: 1990/2012/2014 · SEMIBEL: 1990 · VBUSch: 2006

Emission standards parking lots: Parkplatzlärmstudie (Parking Area Noise): 2007 · RLS-19 · RLS-90 · VSS 40578: 2019

- All properties of roads and railways may change from coordinate to coordinate, for example bridge addition, curve radius or speed limit of 70 km/h. Thus, there is no need to manage individual source segments.
- The coordinates with property changes are specially marked and are thus easy to find.
- The distance between the emission bands and the road edges from defined cross sections can be conveniently graphically adjusted, for example, if a turning lane is added.
- The base line of a noise barrier can be generated directly from the edge of the roadway.
- The road day histogram library allows the direct allocation of hourly traffic volumes from road planning software.
- Conversion of road emissions from / to various standards, e.g. from Nord2000 to CNOSSOS-EU.
- Automated import of train compositions from the Excel data sheets of the German Federal Rail (Deutsche Bahn) for Schall 03:2012.
- Project in neighboring country? All standards - one price.
- New standards, such as recently CNOSSOS-EU, are implemented into the current version and are free of charge with warranty and maintenance.
- Source groups for roads and railways. For example, roads in the responsibility of different authorities can be assigned to their own group and later optionally evaluated and displayed graphically by group.
- The bridge is a property of roads and railways. Bridge width, bridge thickness and, if applicable, a noise barrier on the bridge are defined here.
- The tunnel opening is modeled as a separate object, whereby the resulting emission is calculated from the emission of the road or railway.

- Road edges, rail tracks, tunnels and bridges can be included in the DGM calculation so that the emission bands are not buried.
- Calculation of single points, grid maps, cross-sectional noise maps, facade noise maps.

Industry noise propagation

Standards industry noise: ASJ CN-Model 2007 · BS 5228-1: 2009+A1: 2014 · BUB: 2018/2021 · CNOSSOS-EU: 2015/2021 · Concawe · DIN 18005: 1987 · DIN 45691 · GPM:1982/2019 · HJ 2.4: 2009/2021 · HMRI-II.8: 1999 · Industry Noise Model - based on TNM: 1988 · ISO 9613-2: 1996/2024 · NF S 31-133: 2011 · Nord2000 · ÖAL 28: 1987 · ÖAL 28: 2019/2021 · ÖNORM ISO 9613-2: 2008 · Schall 03: 2012/2014 (RuUBhf) · TA-Lärm einfaches Verfahren · VDI 2714: 1988

Standards wind turbines: BEK nr 1284 af 15/12/2011 · BEK nr 135 af 07/02/2019 · CNOSSOS-EU: 2015/2021 · IoA GPG Wind Turbine Noise · ISO 9613-2: 2024, Wind Turbines (Annex D) · ISO 9613-2 interim: 2015 · Nord2000 · ÖAL 28: 2019/2021 · ÖNORM ISO 9613-2: 2008

- Input and calculation of point, line and area sources (also vertical and on the facade), industrial buildings, parking lots, wind turbines and open-air concerts.
- Noise at Workplace (powerful tool to calculate and document the noise exposure of workers at different workplaces (indoor or outdoor) over the working period.)
- All standards - one price. Also holds for calculations according to the meteorologically and physically demanding Nord 2000.
- New standards, such as recently ISO 9613-2: 2024, are implemented into the current version and are free of charge with warranty and maintenance.
- Open-air events with one or more stages are calculated according to ISO 9613-2 or Nord 2000, taking into account the relevant coherence effects.
- Line sources, area sources and parking lots with relative elevation can be defined as "following the terrain".
- The height of a source above ground can already be given in the emission spectrum in the library, for example for wind turbines where the hub height is type-dependent or the truck where the emission is always 1 meter above ground.
- Exposure time as hourly day histogram in different units, e.g., minutes, percent, events or via direct input of a dB value
- Calculation of low-frequency noise including G-weighting.
- Frequency bands in thirds and octaves from 1 - 20,000 Hz.
- Reflection at round objects (cylinders) according to ISO 9613-2: 2024.
- Sound pressure levels can be converted into sound power levels at the push of a button.
- Rest period surcharges are automatically evaluated for the calculation on the basis of the selected assessment and the usages.
- Individual noise sources and outdoor sources of industrial buildings can be deactivated for the calculation.
- Sources can be combined into source groups, for example the sources of each company separately and later optionally evaluated and graphically documented in groups.
- For grid maps, individual frequency bands can be graphically documented in addition to the sum level.

- Sound transmission through noise protection walls for calculations according to ASJ and ISO 9613-2: 2024.
- The industrial building is a special building in which all outer surfaces, including the shed roof and saddle roof, can radiate sound. In the industrial building editor, the components are conveniently entered, duplicated and provided with properties.
- Unique: Outdoor noise can be calculated in one step using the sound pressure level inside, taking into account the sound transmission values of facades, gates and windows.
- Frequency-dependent 2D and full 3D directivity library.
- Interface to freely available loudspeaker data imports spectrum and full 3D directivity.
- Detailed tabular documentation of results and input data.
- Calculation of single points, grid noise maps, cross-sectional noise maps, façade noise maps.

Indoor Noise

Sound propagation in the interior according to VDI 3760 and an advanced sound particle model with diffraction for the calculation of noise in the workplace and room acoustics. The sound particle model fulfills the requirements of E DIN 38457: 2024.

- Calculation in halls, offices, auditoriums, etc., taking into account any room shapes and facilities.
- The equipment, for example interior sources, absorption surfaces, walls, intermediate ceilings, desks, cupboards, machines, baffles, etc. are intuitively entered in the industrial building editor and provided with source and material properties.
- Visualization of different emission, absorption and transmission spectra by assigning different colors.
- "Hallout" is a calculation that calculates the internal level at the enveloping surfaces from the properties of the indoor sources and stores the corresponding spectrum as a day histogram in the library.
- Calculation of single receivers, grid maps, meshed maps, vertical grid maps (extra module) and "Hallout".
- Tabular documentation of assessment levels and sound propagation curves as well as graphical output of horizontal and vertical noise maps.

Room Acoustics

Indoor noise module required

Calculation of reverberation times and various room acoustic parameters, such as speech intelligibility STI, distraction distance or privacy distance according to ISO 3382-3: 2012 and VDI 2569:2019.

Implemented room acoustics parameters: Reverberation time (T60, via T20 or T30 method) · Speech Transmission Index (STI) - male voice, female voice and averaged · Early Decay Time (EDT) · Clarity (C80, C50) · Clarity (D50) · Center Time (CT) · Strength (G) · Early Lateral Energy Ratio (LF and LFC)

- Calculation of measurement paths, single receivers, grid maps and vertical grid maps (extra module).
- Sketchup Import for a detailed and simple modeling of the enclosing walls and the interior furnishing of rooms.

- Integrated Auralisation - the realistic hearing impression makes it possible to evaluate room-acoustic measures already during the planning phase.
- Automatic print-ready room classification according to VDI 2569: 2019 or an assessment according to DIN 18041.
- Graphical representation of all calculated room acoustic parameters via color-coded receivers, small tables as well as horizontal and vertical propagation maps.

Aircraft Noise

Calculation and data input according to AzB 1975 · AzB 1975 Hungary · AzB 2008 · BUF: 2018/2021 · CNOSSOS-AT: 2019/2021 · CNOSSOS-EU AirNoise:2015/2021 · DIN 45643 (AzB 1975) · DIN 45684-1: 2013 · ECAC DOC 29 2nd, 3rd, 4th Edition · INM 7.0 · ÖAL 24 (AzB 1975) · ÖAL 24: 2004 · SANC · VBUF-AzB 1975: 2006

- Complete integration of the current German Fluglärmschutzgesetz (Aircraft Noise Protection Act), checked for accuracy by the German Federal Environment Agency.
- Import of a complete model via QSI.
- Import of aircraft databases from Eurocontrol and INM data
- Calculation of any descriptors, such as Leq, maximum level, NAT exceedance frequency, threshold value acc. to NAT, wake-up probability, ANEF (Australian Noise Exposure Forecast).
- Detailed result documentation of the results including frequency and distribution function of the maximum level for a selected receiver.
- Maximum level statistics for the individual aircraft classes or the sum of aircraft classes.
- Automated graphical output of aircraft noise protection zones and passive noise protection measures.
- Quick and easy combination with any other noise type on the basis of VDI 3722-2.
- Calculation of single points, grid noise maps, cross-sectional noise maps, façade noise maps.
- Graphical presentation of the protection zones according to AzB 2008.

Radar Tracks

Aircraft noise module required

- Import of radar tracks of the data formats Stanly, Fanomos and Topsonic.
- Aircraft database for automatic allocation of emission data.
- Convenient processing and data control of radar data during import.
- The stored ANP database of Eurocontrol allows the selection of procedural height profiles and fixed point profiles.

BA Outside

2. FlugLSV: 2009 · 24. BImSchV · DIN 4109: 1989/2016/2018 · EN ISO 12354-3: 2017 (single values) · VDI 2719: 1987

- Calculation of the airborne sound insulation against outdoor noise (the required evaluated sound reduction index R'w of components or the relevant outdoor noise level.
- Consideration of the flanking transmission.

- Optimization of the acoustic properties of the room enveloping surfaces
- Manual input or transfer of the SoundPLAN results and geometry
- Flexible, structured representation of the buildings, depending on the building structure up to the subdivision into building - floor - apartment - room
- Visualization of the individual object levels via photos and floor plans
- A room can have one or more facades with different exterior levels.
- Many relevant sound insulation dimensions of the components are already contained in the extensive sound insulation library, which can be supplemented at will.
- Efficient handling of large and small projects, also ideal for noise remediation and acoustical building planning to protect against external noise
- Flexible result documentation of the indoor level calculation and the measure list with sketches and pictures.

Window dimensioning

24. BImSchV · DIN 4109: 1989 · VDI 2719: 1987

- Simple solution for calculating the sound insulation window classes in the integrated spreadsheet for rooms with one external wall. Calculation of costs for windows and fans.

Wall Design

- Dimensioning of noise barriers and noise berms on the basis of the location of a planned structure with different wall/berm heights
- Calculation for individual receiver locations or with the module Façade Noise Map for entire areas
- Various optimization strategies - compliance with limit values, minimization of facade lengths above limit values, finding the optimal cost-benefit ratio, cost ratio of active to passive noise protection measures, costs per solved protection case (EBA), efficiency and effectiveness according to the Swiss economic viability index (WTI).
- The database, which contains the level reduction for each receiver and each wall element, is read by Wall Design and, depending on the optimization strategy selected, builds the wall elements in the order of use.
- The results can be called interactively for each optimization step in the wall construction diagram.

Tools Industrial Noise

Consideration of special tasks in industrial noise

- The analysis tool “Expert Industry” for noise protection concepts of complex industrial plants helps to identify reduction potentials and to select the most suitable reduction measure, also regarding cost/benefit aspects.
- Optimization concepts to ensure the greatest possible efficiency while complying with the limit values, for example for the optimum control of the individual wind turbines of a wind farm.
- The frequency-dependent sound power levels of individual noise sources can be calculated from the measured sound pressure levels, which is helpful, for example, if there are no manufacturer specifications for the sound sources.

- Sound power can be calculated using formulas from any technical parameters, such as the internal level of a pipeline and its external noise emission.

Noise Mapping Toolbox

Tools for the preparation of strategic noise maps - EU Environmental Noise Directive and action planning as well as for the efficient processing of extensive projects, such as road planning with several variants

- Tile projects - large projects are processed clearly and with shorter loading times if a tile system with tiles of the same size is overlaid over the investigation area. Only the data in the selected section is loaded for processing and calculation. This also minimizes the calculation time.
- Import data can be imported into multiple files, e.g., to provide buildings separately for each community.
- Annoyance analyses.
- Inhabitants and area statistics in level intervals or above thresholds.
- Statistical evaluation according to CNOSSOS-EU - Assignment of inhabitants and dwellings according to e.g. median or façade sections.
- Commission Directive (EU) 2020/367 (assessment methods for harmful effects of environmental noise).
- Comparison of variants on the basis of affected inhabitants or areas via level statistics.
- Export of the building center of gravity with the highest level per building.
- Calculation of hotspots from Grid Noise Maps, e.g. as noise scores.
- The line band map can visualize, for example noise scores, optionally normalized to a certain section length.
- VDI 3722-2 - Overall noise assessment.
- Automated generation of map sections for large investigation areas.

Distributed Computing

- Computing in the network with all free resources using all cores / threads of the connected PCs.
- With only one license you can equip an unlimited number of computers with SoundPLANnoise and start calculating.
- Automatically temporarily integrate computers, e.g., overnight or at weekends.
- Completely automated sending of tasks and collection of results in the original project.
- So easy to set up that it's worth even for small projects.
- Work through calculations from different projects one after the other.

Noise Allotment

DIN 45691 · ÖAL 41

- Optimization of noise quotas for different company sites within an area, so that the individual industrial sites are restricted as little as possible.
- Consideration of noise preload manually entered or automated from a preload calculation.

- Optimal utilization of immission values via additional allotments for individual directional sectors.
- Printout optimized for determined specification in a development area.
- Graphical representation of the sectors and optionally as a noise map.

Façade Noise Map

- Using the building facades selected at the push of a button, receivers are automatically set according to various criteria, e.g., one receiver in the middle of the facade, according to the specifications of CNOSSOS-EU or with an indentation from the facade corners.
- Floor-by-floor calculation and calculation at a fixed height above terrain.
- Calculation of a receiver grid for the facades and the roof and display as 3D contour areas.
- The number of receiver points above each other (floors) and the height of the first calculation point are automatically taken from the building.
- Calculations of the economic damage caused by noise according to the Swiss WTI ("Economic feasibility and proportionality of noise abatement measures", Series 301, Federal Agency for the Environment BAFU) in the Spreadsheet.
- Representation of facade levels as color marks, colored facades or colored buildings in 2D and 3D. In 3D the color changes according to the level on the respective floor.
- Display of results further processed in the integrated spreadsheet (e.g., decisive level from different variants).
- Building reference points in accordance with RE-2012 with reference to a receiver table from the integrated spreadsheet.
- Texts in the color marks in 2D and 3D, for example the number of the receiver point as reference to the table or the level value.
- Output of difference maps and other arithmetic links such as the identification of noise level zones.
- Freely definable color scale for graphic output. The scale intervals can be arranged ascending or descending and can be equidistant or non-equidistant, e.g., for highlighting special thresholds.
- Output of the sum level or individual groups for the calculated time slices, additionally selection whether the highest / lowest level or a certain floor should be displayed.

Grid Noise Map (also indoor grid map)

- Calculation of a receiver grid at a user-defined height above ground level. The grid size can be selected at will.
- Display as an isophone map with contour line labelling or grid map, also with color gradient.
- Output of difference maps and other arithmetic operations e.g., sum maps, maximum value maps or addition of constant values or levels
- Freely definable color scale for graphic output. The scale intervals can be arranged ascending or descending and can be equidistant or non-equidistant, e.g., for highlighting special thresholds.
- Display of the area proportions in the different color scale intervals in % or area related.
- Output of the sum level or individual frequencies and groups for the calculated time slices.

Grid Noise Map and Façade Noise Map

- Meshed Noise Map: Calculation and presentation of a triangular noise map. The density of the receiver grid varies according to the model data - closely meshed at sources, buildings and walls, larger mesh width in free field.
- Output of the sum level or individual frequencies, frequency bands and groups for the calculated time slices for the Meshed Noise Map.

Cross-sectional Noise Map (vertical grid noise map)

Module Grid Noise Map required

In addition to the properties of the Grid Noise Map:

- Vertical grid calculation along a cross-section line.
- Shows the effect of noise barriers in a particularly meaningful way.
- Especially impressive as 3D cross-sectional noise map with semi-transparent areas and non-transparent contour lines.

3D Graphics

- The 3D Module is accessible already during data entry to check the data with regards to the consistency of the 3-dimensional location of the objects in the terrain.
- Individual design of the displayed geometry data and geometry bitmaps together with the calculated results of grid noise maps and façade noise maps in 2D and in 3D.
- Switch the graphic object type to the object types supplied as standard - roof ridge, different tree species for a more realistic 3D view.
- 3D wall with posts [Prerequisite: Cartography].

3D Animation

3D Graphics required

- Driving along any road or railway axis in the project, for example to check the position in the terrain.
- Enter any animation path and fly over the 3D investigation area, for example.
- Animated train pass-by via a Grid Noise Map, 2D and 3D display.
- Level-time chart at each point of the calculated noise map, also as a graphic box with reference to the location in the map.
- Arithmetic operations of animated noise maps with several trains, for example from different directions or trains running at a certain time interval.

GIS interface

- Import of ESRI shapefiles with any geometry properties.
- Open dbf files (property tables of Shapefiles), edit, supplement, modify using formulas, create and save columns with additional properties.
- Shapefile export of the geometry with any property data.

- Shapefile export of the receiver results with any desired columns (also the columns calculated in the SoundPLAN spreadsheet).
- Shapefile export of grid values, contour lines (as line, surface or band) and the triangle points and triangles of a DGM and a meshed noise map.
- Geopackage import.
- Manual import of OSM XML files.
- Import of CityGML with building properties included in the data (e.g., address data, building heights).
- Import of grid maps of other software products.

Interface from German road planning software

- Import from the road planning programs CARD/1, STRATIS and VERBUND.
- The original data is automatically converted into SoundPLAN objects and completely read into a SoundPLAN project.

TNM interface (FHWA Traffic Noise Model)

- Import of TNM v2.5 and v3.1 projects into the Geo-Database.
- Preparation of SoundPLANnoise model for TNM Export.
- Exporting SoundPLANnoise models from the Geo-Database back to a TNM v2.5 or v3.1 project.