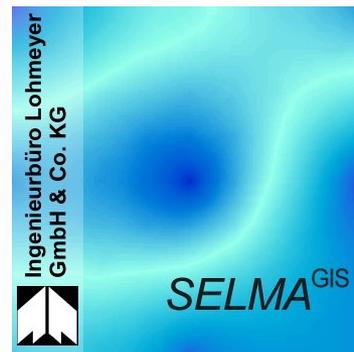




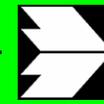
Use of SELMA^{GIS} for Preparation of Air Quality Action Plans



Dipl.-Ing. Helmut Lorentz
Dr. rer. nat I. Düring

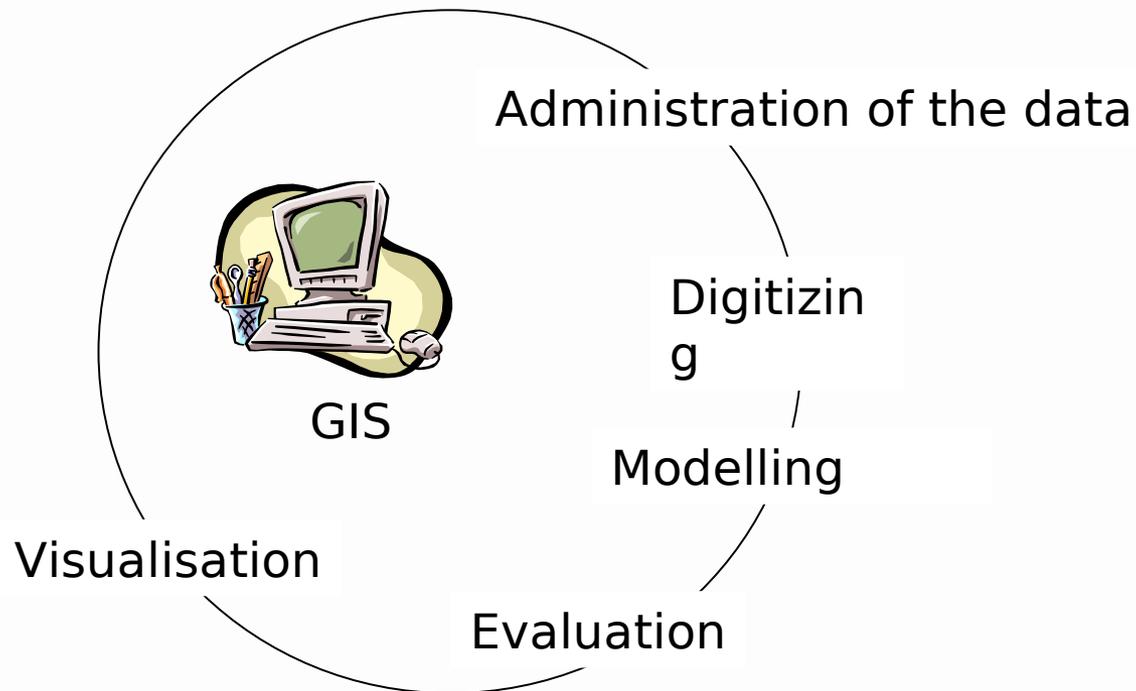


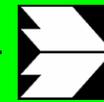
- Description of SELMA^{GIS}
- SELMA^{GIS} Modules
- Emission and Dispersion Modelling with SELMA^{GIS} for the Air Quality Plan Rostock City
- View towards the future



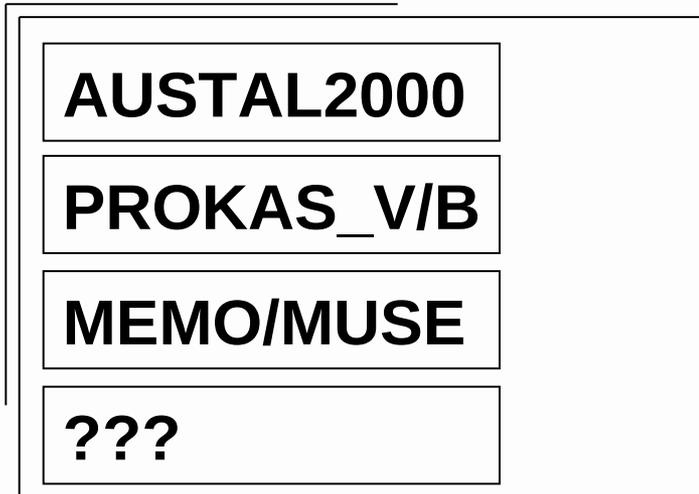
- Municipal environmental protection officers have to survey local and regional air quality and if necessary create air quality plans.
- The preparation of air quality action plans include analyzing the **actual situation** of air quality and identifying the main pollutants as well as pollution **hotspots**.
- Applied dispersion model depends on spatial resolution, type of emission sources, the chemical components, etc.
- SELMA^{GIS} tries to establish unique and user friendly tools for applying different types of dispersion models.
- SELMA^{GIS} is completely implemented into ESRI's geographical information system ArcGIS.

- All actions within a Geographical Information System





SELMA^{GIS}



- supplies a GUI which can be used for different included models.
 - Easy to work with an other model
- includes interfaces to different data bases and data formats.



AUSTAL2000:

- AUSTAL2000 contains a wind field model and a 3-dimensional LaGrangian particle model (according to the German guideline VDI_3945 sheet 3 and TA-Luft)

MEMO/MUSE:

- Mesoscale meteorological model MEMO and Photochemical Dispersion Model MUSE (Aristotle University Thessaloniki, Greece. Head Director of the Laboratory is Prof. Dr.-Ing. Nicolas Moussiopoulos)

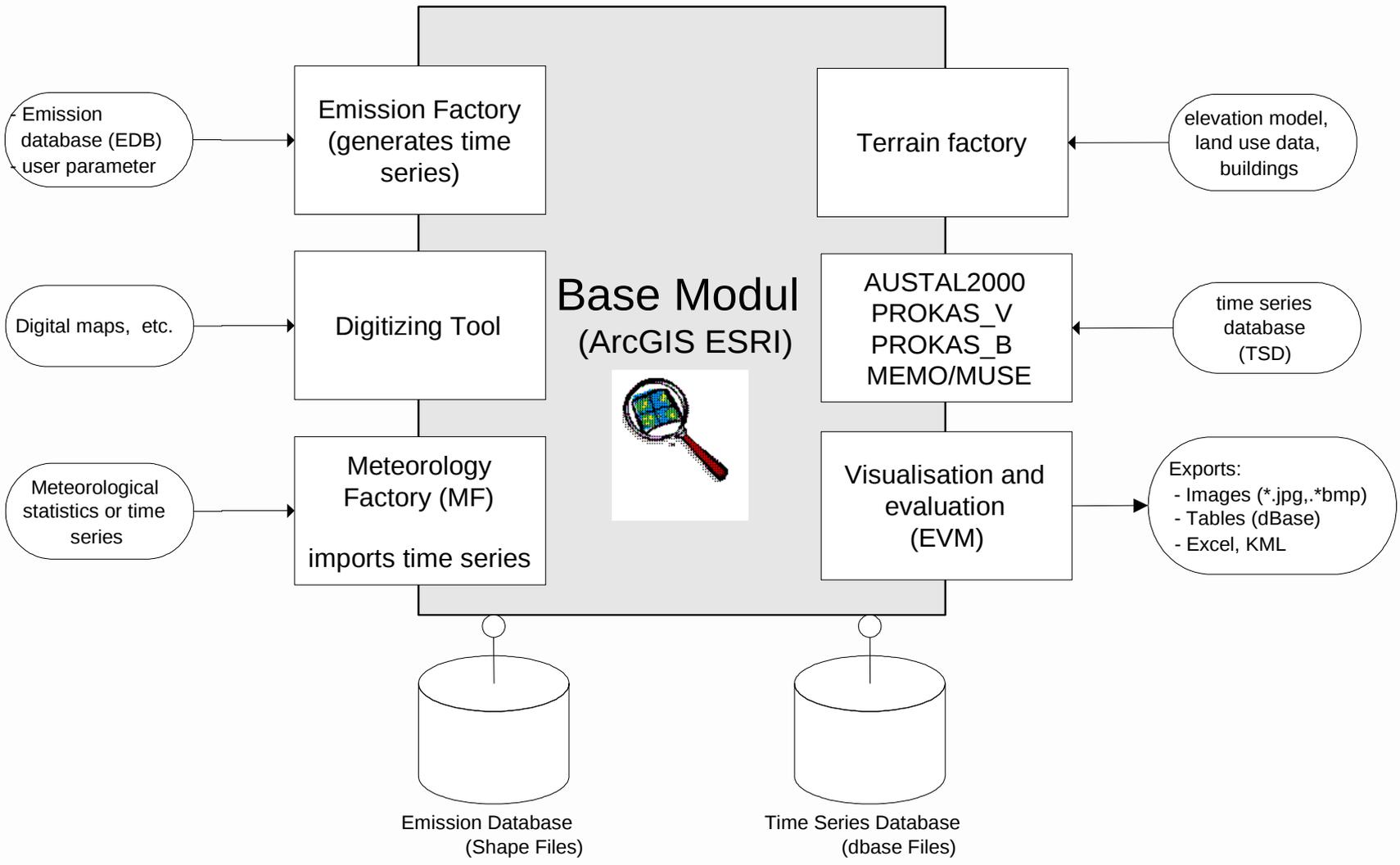


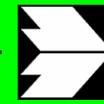
Street Canyon Model PROKAS_B:

- Uses precalculated nondimensionalized concentrations for predefined street canyons according to street width, buildings height and porosity.
- Results represent immissions in 1.5 m distance from the building.

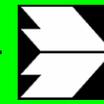
Gaussian Model PROKAS_V :

- 2D Gaussian dispersion model considering meteorology, dispersion parameters, roughness length and source height.





- Rostock is located in North-East Germany nearly centrally on Mecklenburg-Vorpommern's Baltic Sea coast.
- Rostock has about 200 000 inhabitants.
- Rostock-Warnemünde hosts the overseas port.
- Actually Rostock administration is developing the air quality action plan.
- Using SELMA^{GIS} models have been applied for the actual situation and a prediction 2010.



- Gathering emission data for industrial point and area sources (industry/harbour) and traffic sources (maritime traffic and road traffic).
Data base: Emission Inventory
- Deriving background concentration from monitoring stations.
Data base: Rostock municipality
- Implementing the meteorological situation of Rostock on basis of a ten years monitoring data.
- The determination of the concentrations resulting from the main emission sources industry/harbour, maritime and road traffic was executed on a meso-scale and an urban scale.

Calculation of Concentrations from:

Screening

Hot Spot



Road Sources

PROKAS_B/V

WinMISAKM



Ship Sources

PROAKS_V



Industrial Sources

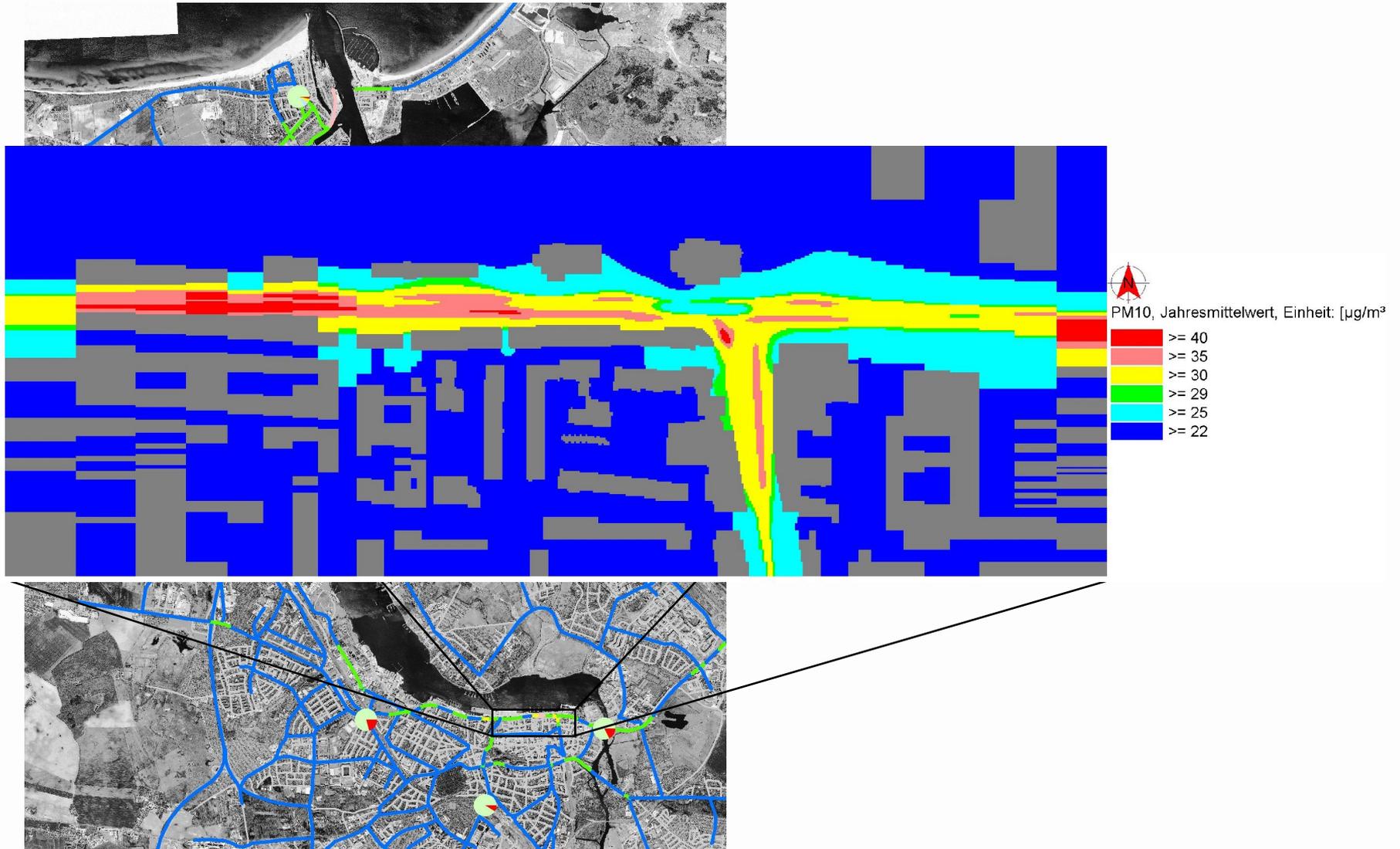
AUSTAL2000

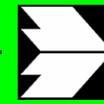
Background Concentration

Σ Total Concentration

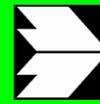


- The resulting concentration fields of background concentrations and concentration of each emission source have been intersected and added. For that the standard tools of ArcGIS have been applied.
- By calculating the contribution of each emission source it was possible to identify the main polluters and to get a first hint on the hotspots.
- Detailed concentration calculations have been made at hotspots with the prognostic microscale flow and dispersion model WinMISKAM.

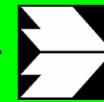




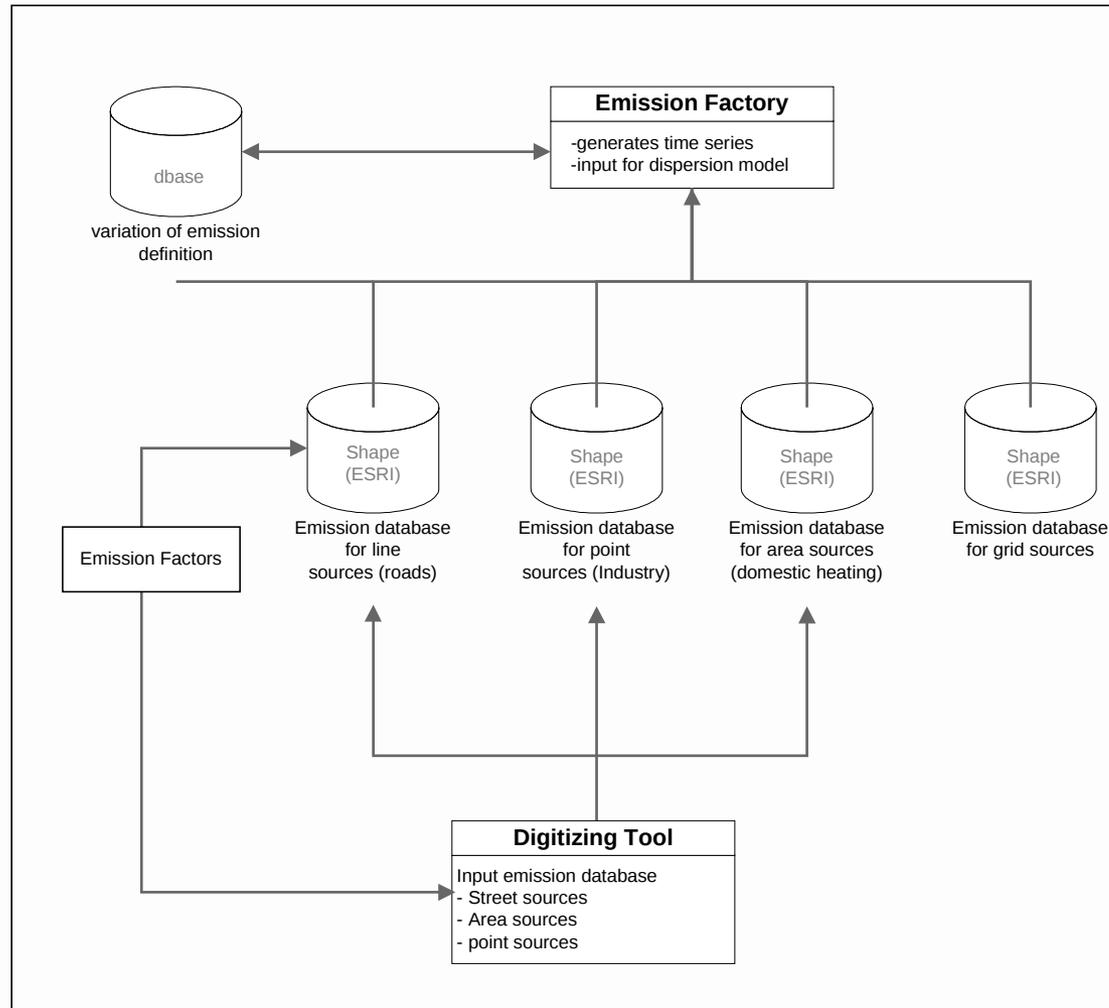
- The modular concept of SELMA GIS allocates a user friendly GUI to implement different dispersion models.
- Different dispersion model can be implemented.
- Currently NERI's OML-Highway is being implemented.

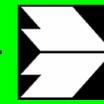


Thank you for attention !



- **Generate Shape types:**
 - Emissionsshapes for Point, Area and Street sources
 - Building shapes
- **Input of emission rates:** Point, Grid and Area sources
- **Input dispersion parameters:** turbulence parameter, plume rise
- **Input parameter to estimate street emission:**
 - amount of vehicles in an street, traffic situation (type of emission factor)
- **Input of meta data:** address, informant etc.





- **Estimate street emission from:**
 - amount of vehicles (VEH)
 - amount of heavy vehicles (HDV; >3.5t)
 - emission factors for defined traffic situations
- **Generate Time series out of:**
 - year cycle
 - week cycle
 - day cycle
 - a standardised time series is generated (100% = 6760 h)
 - later the standardised time series weights the annual mean values of the emission rate



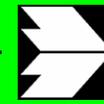
AUSTAL2000 is the official German Federal Environmental Agency air pollution dispersion model and meets the demands contained in appendix 3 of the German "Technical Instruction Clean Air" (TA Luft).

The calculation nucleus of Austal2000 was developed by Ingenieurbüro Janicke in order to the Federal Agency for Environment of Germany (UBA).

Actual version inclusive source code and FAQ you can find in:

www.austal2000.de

SELMA^{GIS} is a graphical user interface for AUSTAL2000



- AUSTAL2000 contains a 3-dimensional LaGrangian particle model (according to the German guideline VDI_3945 sheet 3)
- allowing to calculate as well concentration time series as statistical concentration parameters (annual mean)
- AUSTAL2000 is able to cope with complex terrain (mountains, hills; max slope 1:5) and also the effects of buildings
- AUSTAL2000 is able to handle at least 500 point and area sources and at least 5000 line sources



The terrain grid defines for which area the calculation will be done

- AUSTAL2000 is able to generate a terrain grid automatically
- The terrain grid can be defined manually (Terrain factory)
- Nested terrain grids are possible
- according to TA-Luft the extent of the terrain grid is defined through a radius of 50x the height of every emission source
- AUSTAL2000 allows up to 300 x 300 grid points (i.e. the grid resolution for a simulation of a region of 25 km x 25 km is approx. 85 m)

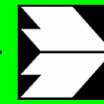


Meteorological input:

- a meteorological time series in the so called AKTerm format (hourly meteorological data from one meteorological station) or
- the frequency distribution of wind speed, wind direction and dispersion category from one meteorological station.

Physiographic parameters :

- the topography height
- the aerodynamic roughness of the surrounding
- building information (building contours and building height).



- **Point sources:** stacks, industry plants
- **Area sources:** domestic heating, heaps, diffuse area source
- **Grid sources:** emission inventory
- **Street sources:** side-roads, main-roads



(1)

- Applicable for urban regions/cities (Analyses and prognoses for action plans)
- Applicable for all relevant source types (e.g. streets, stacks or dumps)
- Results applicable to EU AQ Directives
- Used in Austria, Luxemburg, Bulgaria, Lithuania, Bosnia and Germany
- Input data available with reasonable effort
- Easy user support by model developer

But also: