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Environmental Sensitive Traffic Management System PROKAS^{Online}

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- Introduction
- Functionality
- Resolution
- Environmental Modules
- Examples
- Accuracy of the Prognoses
- Experiences
- Conclusion
- Endnote

Introduction

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- Exceedances of the limit value NO_2 (AM) and/or PM10 (DLV)
- Clean Air Plan or Requirement for approvals of road projects

Clean Air Planning
Traffic related Mitigation measures

Static (continuing) Measures:
- Speed limits
- Optimizing traffic flow
- Lower Emission Areas
- Driving ban for heavy duty vehicles
- ...

Dynamic (temporary) Measures:
- Environmental Sensitive Management according to traffic related measures

Environmental Traffic Management (ETMS) Functionality

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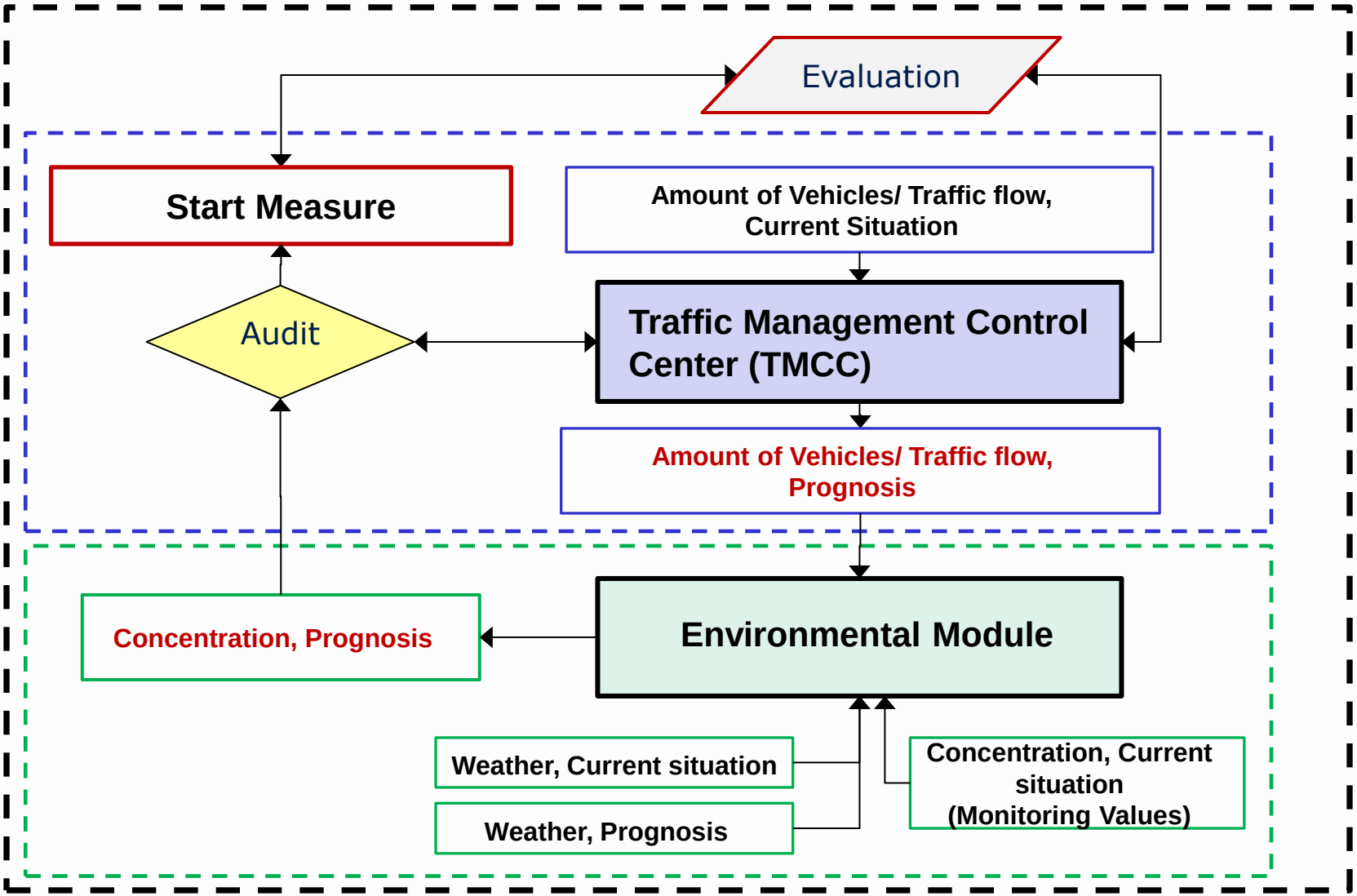

Examples of Resolution of ETMS

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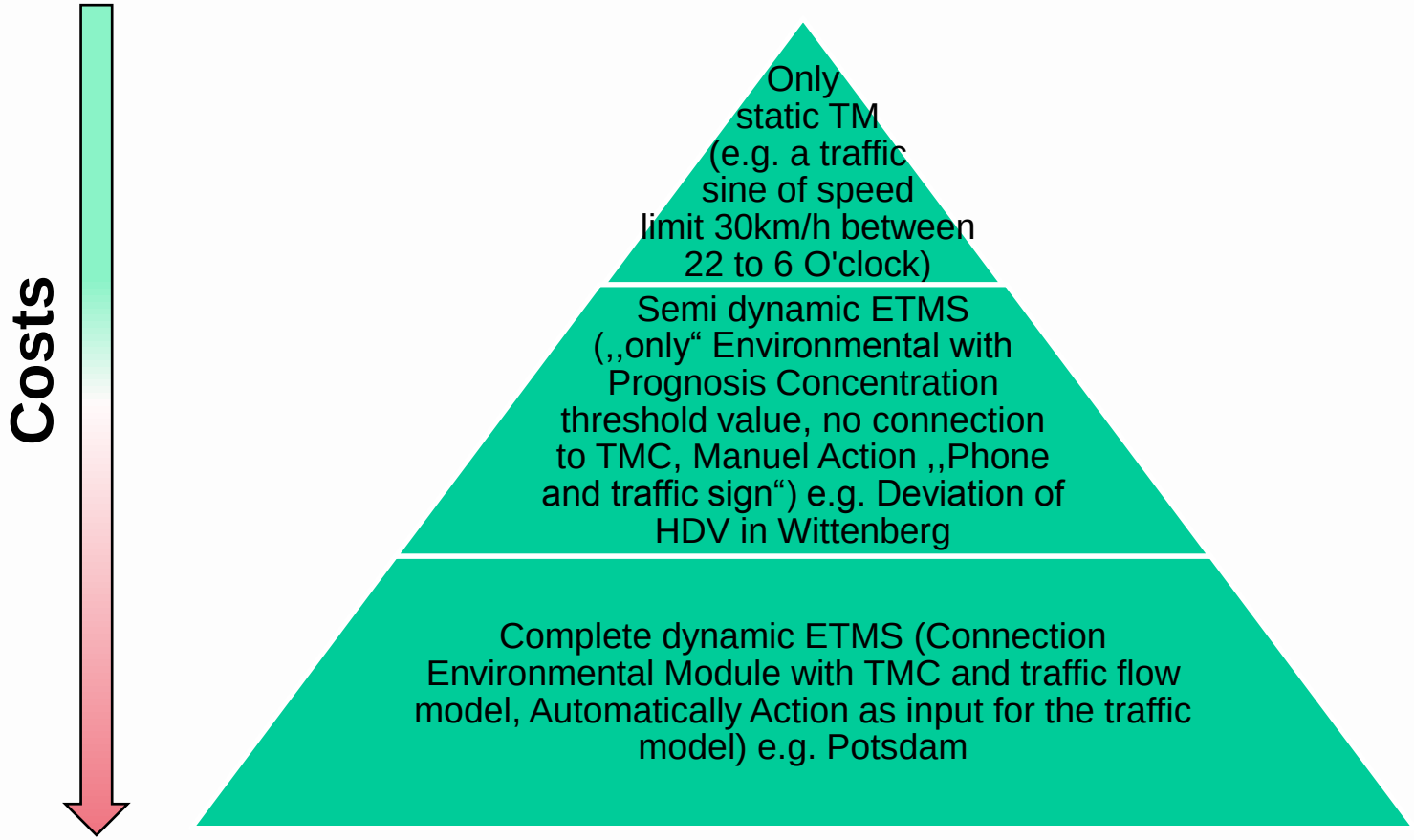

Question for implementation

- Which Environmental Module should be used in the ETMS?
- Which input parameters /monitoring data should be required?
- Which traffic related measures should be realized?
- What about the effectivity of the ETMS?
- What kind of influence have the ETMS to other parameters like noise, CO_2 or fuel consumption?
- Which complexity of the system is required? (static traffic data and simple traffic signs are sufficient? In which case dynamic data, electronically control of street lights and traffic signs are required➔ cost-benefit ratio?
- Which experiences of praxis exist? (interference liability, running costs, etc.)

Methodic of the Environmental Modules

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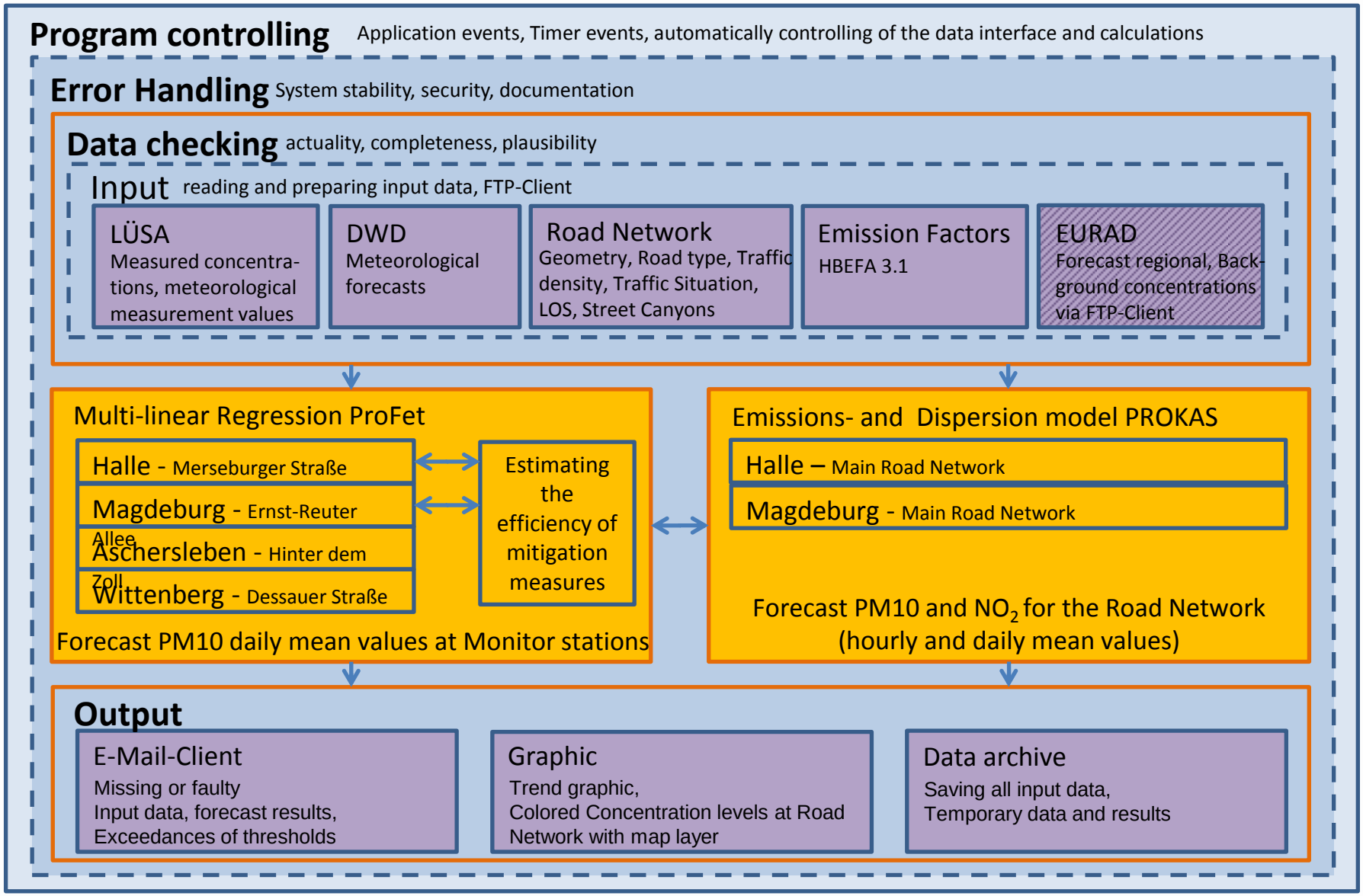
	ProFet	PROKAS^{Online}	
Method	Multiline Regression	Emissions and Dispersion model	
Dispersion model	-	Screening	Detailed model
Spatial Resolution	1 Point (Monitoring station)	Categorized road networks (1 representative value per 100 m Segment)	Area wide and high accuracy
Input	Wind, Temperature, precipitation, season, duration of Inversion situation, background concentration, day of the week	Wind, Temperature, global radiation, background concentration, amount of traffic, traffic situation, Categorized ribbon development	Wind, Temperature, global radiation, background concentration, amount of traffic, traffic situation, Categorized ribbon development, 3-D-building model
Strength of application	Prognosis of PM10 concentration (daily mean)	Prognosis of concentrations of air pollutants (hourly mean) for road networks as well	Prognosis of concentrations of air pollutants (hourly mean) of city areas


Program controlling
Application events, Timer events, automatically controlling of the data interface and calculations
Error Handling
System stability, security, documentation
Data checking
actuality, completeness, plausibility
Input
reading and preparing input data, FTP-Client
LÜSA
Measured concentra-tions, meteorological measurement values
DWD
Meteorological forecasts
Road Network
Geometry, Road type, Traffic density, Traffic Situation, LOS, Street Canyons
Emission Factors
HBEFA 3.1
EURAD
Forecast regional, Back-ground concentrations via FTP-Client
Multi-linear Regression ProFet
Halle - Merseburger Straße
Magdeburg - Ernst-Reuter Allee
Aschersleben - Hinter dem Zoll
Wittenberg - Dessauer Straße
Estimating the efficiency of mitigation measures
Forecast PM10 daily mean values at Monitor stations
Emissions- and Dispersion model PROKAS
Halle – Main Road Network
Magdeburg - Main Road Network
Forecast PM10 and NO2 for the Road Network (hourly and daily mean values)
Output
E-Mail-Client
Missing or faulty
Input data, forecast results,
Exceedances of thresholds
Graphic
Trend graphic,
Colored Concentration levels at Road Network with map layer
Data archive
Saving all input data,
Temporary data and results

Example ProFet/PROKAS^{Online} - LÜSA

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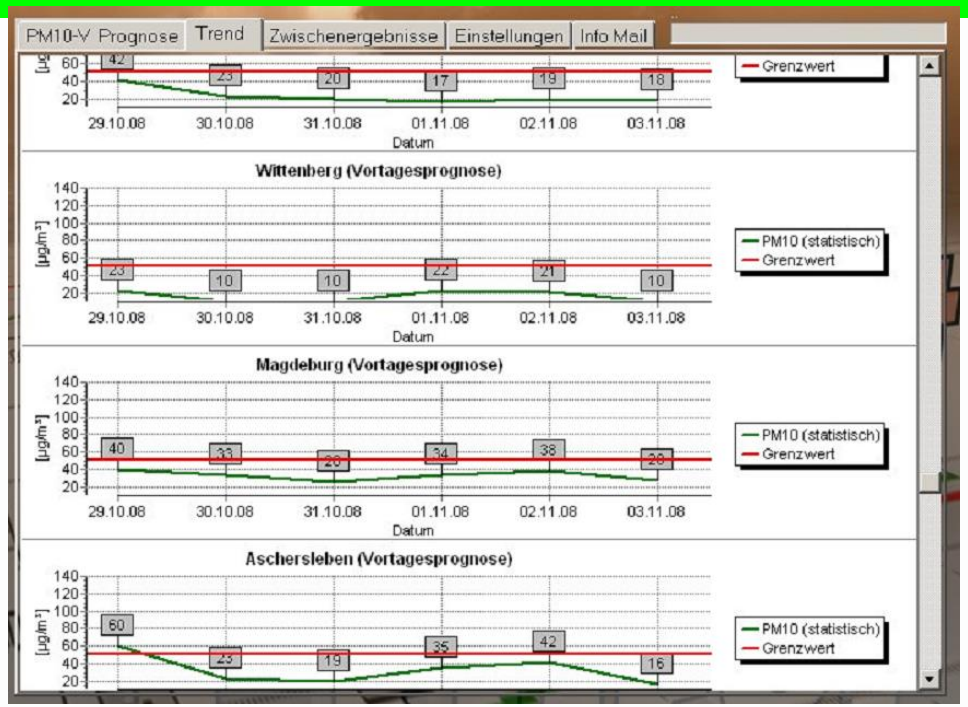

Example of the external message mail (Halle):

Information of the monitoring and information system of Saxonia-Anhalt (LÜSA)

Exceedance of the day limit value for Dust (PM10) in Halle!

Reason of the exceedance of the day limit value for PM10 of 50µg/m³ are expected today and tomorrow in Halle, Merseburger Straße!

The mitigation measures of the clean air plan have to be activated.

Mitigation Measure: Deviation of HDV Wittenberg –

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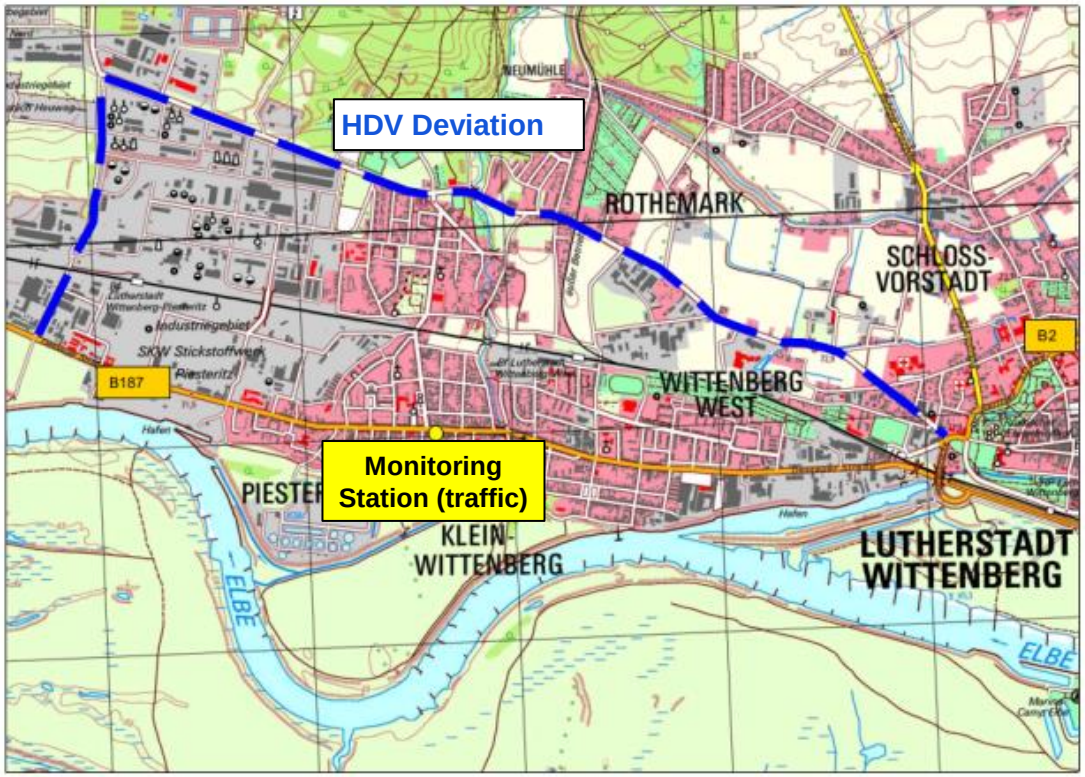
Traffic signs for HDV Deviation, which are opened manually



HDV Deviation: : Coswiger Landstraße – Heuweg – Möllensdorfer Straße – Rothemarkstraße – Dobschützstraße

Quelle: Geobasisdaten ©LVerm
(www.lvermgeo.sachser

Maßnahme LKW-Umleitung Wittenberg

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No.	Activation:	Deactivation:	Days total
1	30.01.12	09.02.12	**11**
2	10.02.12	15.02.12	**6**
3	15.03.12	19.03.12	**5**
4	22.03.12	26.03.12	**5**
5	22.10.12	25.10.12	**4**
6	14.11.12	19.11.12	**6**

Sum: 37 days

No.	Activation:	Deactivation:	Days total
1	14.01.13[1)]	18.01.13	**4**
2	24.01.13	28.01.13	**5**
3	06.03.13[2)]	08.03.13	**1**
4	14.03.13[3)]	15.03.13	**1**
5	10.04.13[4)]	11.04.13	**1**

Sum: 12 days

[1)] 16:00, active from 15.01.13 08.00
[2)] 15:00, active from 07.03.13 10.25
[3)] 13:00, active from 14:00
[4)] 10.45, active from 13:00 to 11.04.13 10.45

Albrecht, W. et al. (2012):

Reduction PM_{10}: max. 1 to 2 µg/m³ of daily mean,
3 Exceedances during a period of 14 days

Example PROKAS^{online} City of Stuttgart

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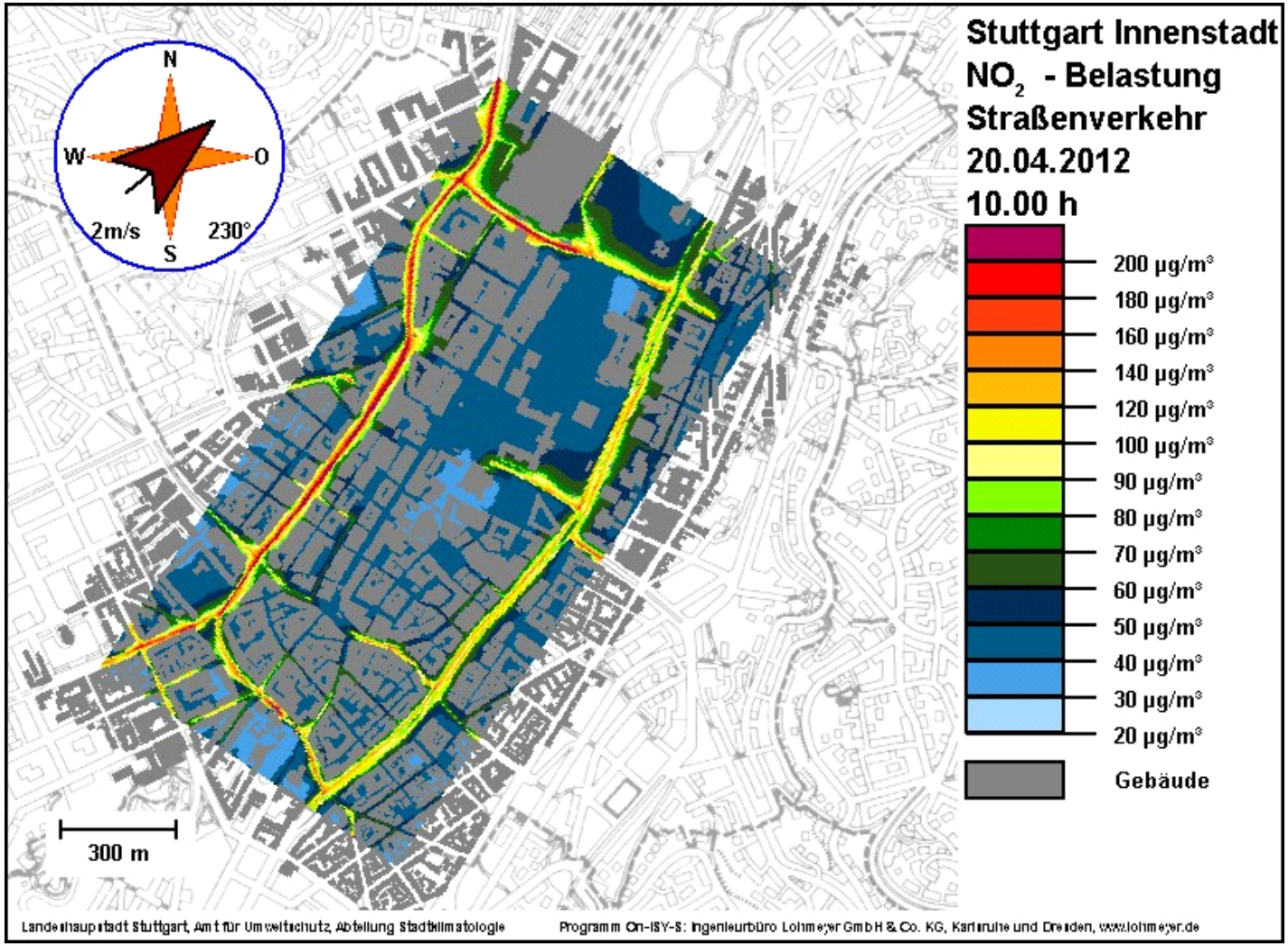

Dispersion model: MISKAM

Prognosegüte (Basis = DWD-Prognose)

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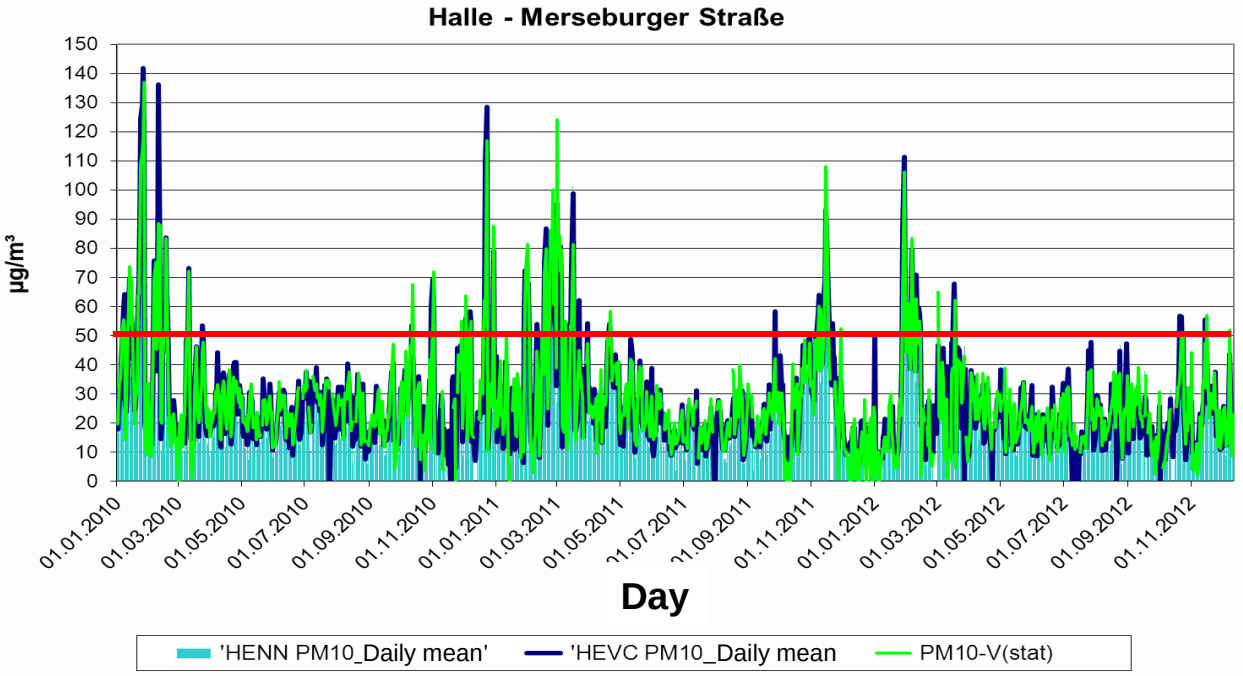

	Annual mean 2012 measured value in µg/m³		Annual mean Prognosis PROKAS^{Online} in µg/m³		Annual mean Prognosis ProFet in µg/m³
	PM10	NO_2	PM10	NO_2	PM10
Merseburger Str.	24 (16)	31	29 (44)	33	24 (16)
Paracelsusstraße	29 (30)	54	33 (35)	47	- (-)

Values in parentheses = amount of exceedances of the day limit value of PM10

Overview Functionality

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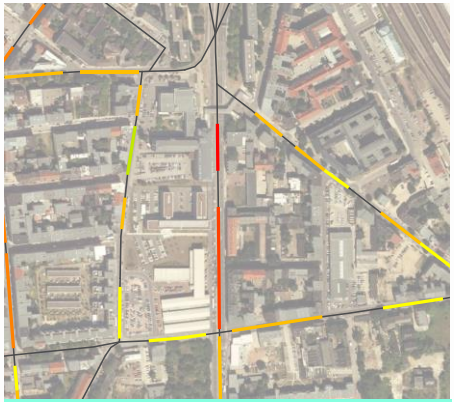
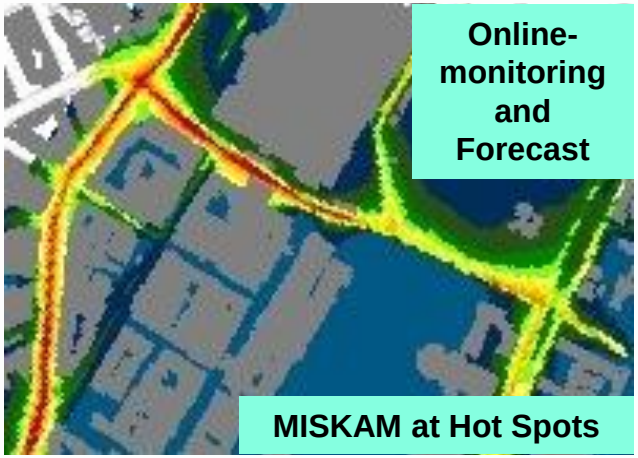


PROKAS Road Network



Online-monitoring and Forecast

MISKAM at Hot Spots

Impact Analysis

Calculate the pollutant concentration due to the current / predicted traffic situation (amount/ type of vehicles, traffic flow), measured meteorological data and background concentration.

Informing

Optimize air Quality Situation by influencing traffic routing and vehicle choice via public traffic information system considering environmental parameters.
Informing sensitive population Groups (Nursery, School, Hospital, Retirement Home)

Management

Reducing speed limit, optimizing traffic flow via traffic light coordination and information boards

Reducing traffic input at hot spot traffic segments for reducing peak loads

Temporary driving ban for large vehicles (electronic information boards and site maps)

Endnote

- The Application of ETMS could increase the acceptance of traffic measures for improving environmental situations (Air quality and noise), because they are spatially and temporary limited. (low wind Conditions in combination with high background concentration and high traffic density, etc.)
- For the implementation it have to be considered the local conditions, the required sensors, the type of traffic measures and as well the determination of control values (substance of pollutant, threshold value etc.) and
- also the selection of the Environmental Module.
- ETM-Systems could useful for the following issues:
  - quantitative impact assessment
  - Informing people
  - CO_2-Balancing of the traffic etc..

Conclusion for operation

- Perfected Algorithms of evaluation are required for the autonomic operation. The accuracy of prognosis's must fulfill an minimum level (Evaluation of all input data for completeness and plausibility)
- The quality of the predicted input data (Meteorological data, traffic density, traffic situation, background concentration) determinates the accuracy of the prognosis
  ➔frequently Controlling and Validation of the prognosis is required
- The validation of the predicted concentrations has to be done by considering current monitoring values but also by predicted input data.

Nearly every large city in Germany is using a traffic control system. The implementation of an environmental module is only an extension of an existing system. Nevertheless there are only a few samples for ETMS in Germany.

The dynamic ETMS requires financial sources according to the complexity of the selected method and the already installed infrastructure. An static system need less recourses.

The relation between financial sources and the effectivity of dynamic ETMS's is not clear yet. Also there is the unanswered question, if there exists an optimum of the ETMS according to e.g. position of the road, goal value and traffic measures.

This also affects the selection of the environmental module.

→Research work has to be done and more experiences are required.

Thank you for your attention !

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