

AIR QUALITY PLAN MALAPOLSKA (LIFE IPE PL 021)

Tools to model the impact of
local air quality plans



1. Integrated LIFE Project

- Overview
- Key Actions

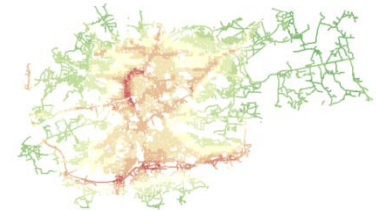
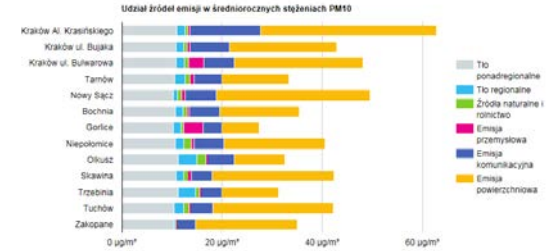
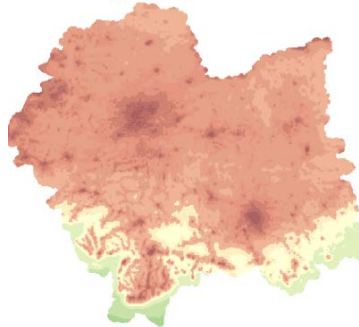
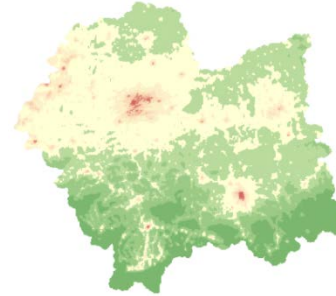
2. Assessment of impact of measures

- PM, NO₂
- EISSA
- ATMOSYS Planning

3. Conclusions

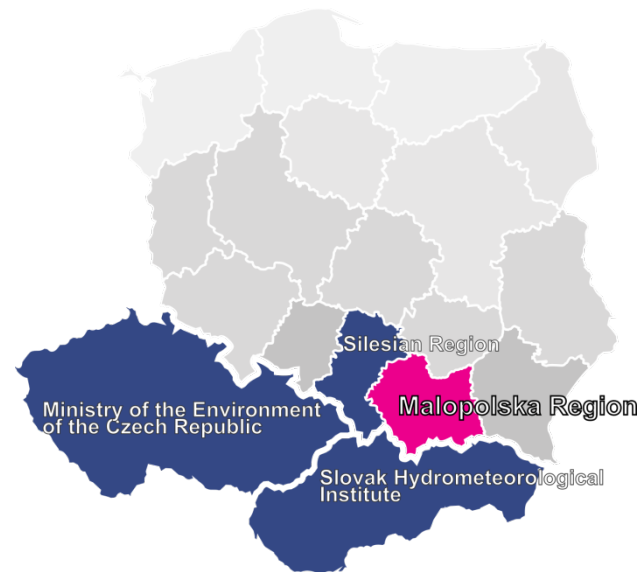
MAŁOPOLSKA REGION – THE AIR QUALITY SITUATION (2015)

- PM10 exceedences: 350 000 people (10% of the pop.)
- Residential areas of 16 municipalities
- Benzo(a)pyrene: All 182 municipalities in the region exceed the target level of 1 ng/m³
- NO₂ exceedences in Krakow



IMPLEMENTATION OF AIR QUALITY PLAN FOR MAŁOPOLSKA REGION

- Key objective is to accelerate the implementation of the “**Air Quality Plan for the Małopolska Region**” & improve air quality in the region
- Planned actions: from grassroots (municipalities) to the regional level
- Budget: **€16.8M**
- Additional actions: **€800M**
- Duration: **Oct 2015 – Dec 2023**





ACTIONS TO SUPPORT AQP

IMPLEMENTING REGIONAL POLICY - ANTI-SMOG REGULATIONS

- Kraków: **solid fuel ban** in - adopted 15 Jan 2016, effective from 1 Sept 2019.
- Małopolska: **Eco-design standards** for all boilers, stoves & fireplaces - adopted 23 Jan 2017, effective from 1 June 2017 (new devices) and from 2023 (existing).
- Silesian Region: similar regulation adopted on 7 April 2017
- 6 other regions: regulation being discussed



MANUAL
COAL-FIRED BOILERS
10 YEARS OLD OR MORE
28.8%
1.4 million



MANUAL
COAL-FIRED BOILERS
UP TO 10 YEARS OLD
30.1%
1.5 million

LOCAL ACTIONS AT GRASS ROOTS LEVEL (ECOMANAGERS)

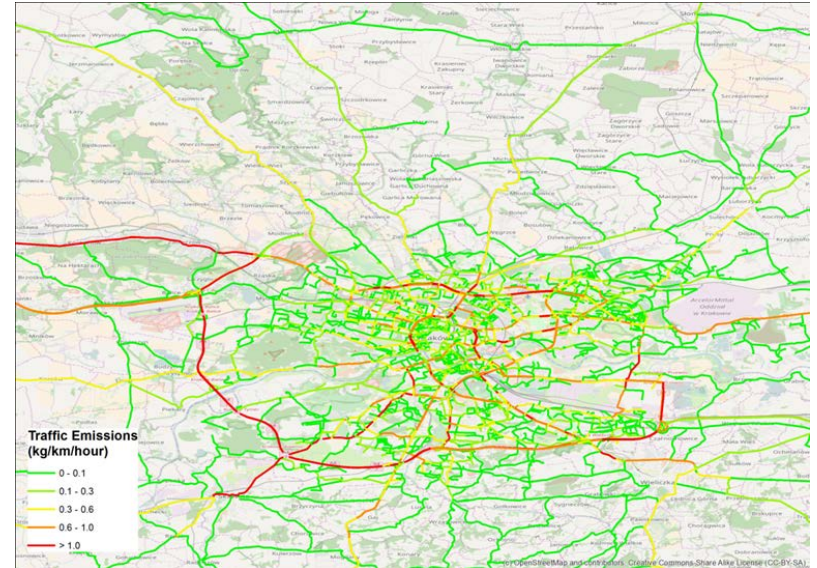
- 60 **Eco-managers** across 55 municipalities
- **Accelerate actions** at local level:
 - replacing coal boilers
 - thermal renovation of buildings
- **Capacity building**, exchange of experiences - local/regional/international.
- **Increase public awareness**



Large scale informative events with >20,000 residents
Thermal imaging surveys for 1,000 private and public buildings.

LOCAL ACTIONS - SUSTAINABLE URBAN TRANSPORT PLANS

- Krakow's urban transport plans to tackle air pollution:
 - Traffic restrictions
 - Ring road (complete northern)
 - Invest in public transport infrastructure → new tram lines (2020)
 - LEZ





IMPACT OF MEASURES: RESIDENTIAL EMISSIONS

AIR QUALITY MODELLING PLATFORM FOR THE WHOLE HOTSPOT

Harmonised Residential Emission Inventories (for modelling)

- Key Source of PM, BaP
- Improved bottom-up inventories
- Harmonised/sharing experiences
- Previous LIFE project: EISSA modelling tool

Trans-boundary Emission Data Base

- PM: transboundary pollutant
- Air Quality Policies: emissions are critical
- Reduce cross country border effects

Inter-regional Air Quality Modelling

- Assess current situation
- Future Scenarios: 2023
- Impact: show year on year improvement

Sustainable service

- Continued co-operation
- Outreach
 - Other Polish regions
 - Bulgaria
 - Romania
 -

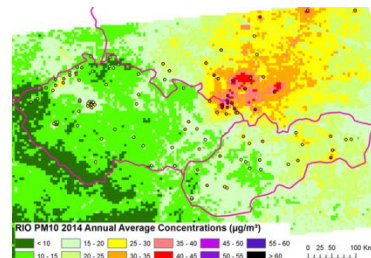
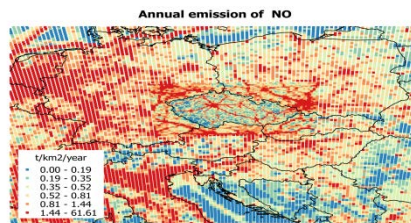
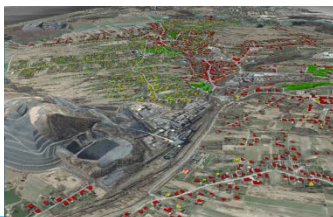
2016

2017

2018

2019...

Exchange best practices & tools (emissions, modelling..)



HARMONISED RESIDENTIAL EMISSION INVENTORIES

Findings: lot of similarities, yet crucial differences exist:

- activity data based on: fuel consumption vs. heat consumption (Malopolska)
- activity data based on statistical data vs. based on surveys
- varying emission factors (EFs) taken from several sources: guidebook, literature, (local) studies, ... ;
- different level of detail or different approaches wrt the methodology of emissions calculation

HARMONISED RESIDENTIAL EMISSION INVENTORIES

Uncertainties out of scope → further studies:

- a. The uncertainty in the fuel usage, combinations
- b. Illegal fuel types (e.g. solid waste) and their emission characteristics
- c. the 'real' emission factors
- d. the 'real' burner operations

TOOL TO SUPPORT EMISSIONS INVENTORY ADMINISTRATIONS: EISSA

- » EISSA: **E**mission **I**nventory **S**upport **S**ystem – **A**ir
- » User friendly tool to aid emission reporting, analysis of emissions and production of aggregated emission maps.
- » One of the products based on the **EISS** framework
 - » EISS: framework, empty box
 - » Functionalities depending on product (WEISS, EISSA, HEISS)
 - » Fill with emission data & aggregation functionalities



POLLUTANTS, SOURCES, ACTIVITY DATA

The screenshot displays the EISSA software interface with three main panels highlighted by colored circles:

- Pollutants (Green circle):** A table listing various pollutants with their symbols and units.

Group	Sum	Symbol	Name	Unit	Exb
POP's	<input type="checkbox"/>	B(a)P	Benzo(a)pyrene	g	
		B(b)Flu	Benzo(b)fluoranthene	g	
		B(k)Flu	Benzo(k)fluoranthene	g	
		HCB	Hexachlorobenzene	g	
		Ind	Indeno(1,2,3-cd)pyrene	g	
		PAK-EMEP4	PAK-EMEP4	g	
		PAK-EPA16	PAK-EPA16	g	
		PCB	Polychlorinated biphenyl	g	
		PCDD-F	Dioxins	g	
		PCN	Polychlorinated naphthalene	g	
		PeCB	Pentachlorobenzene	g	
		B(a)A	Benzo(a)anthracene	g	
		Chr	Chrysene	g	
		dB(a)A	Dibenzo(a,h)anthracene	g	
			Fenanthrene	g	
			Fluoranthene	g	
			Hexabromocyclododecane	g	
			Dicofol	g	
- Sources (Red circle):** A tree view of emission sources. The 'Residential heating' source is highlighted. A property window on the right shows details for this source:

Property	Value
Name	Residential heating
Calculation method	Top-down
Dimension	Point
Emission explanatory variable	Number of inhabitants
Emissions	
POP's	
B(a)P	1141793.3898985
B(b)Flu	1139473.9130119
B(k)Flu	746394.608699473
HCB	20.444180017
Ind	838567.314280656
PAK-EMEP4	3866229.22589052
PAK-EPA16	3866229.22589052
PCB	2235.959010657
PCDD-F	10.198313055
PCN	509.915652793
PeCB	315.422683077
- Activity data: definition (Blue circle):** A configuration window for the 'Number of inhabitants' explanatory variable.

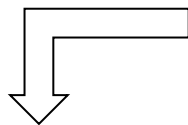
Parameter	Value
Name	Number of inhabitants
Dimension	Point
Unit	number of inhabitants
Algorithm	Add point values
File	D:\EISSA_E\Data\gis_data\eev\inwoners\inwoners.shp
Layer	inwoners
Column	alle_inw
- Activity data: spatial map (Blue circle):** A map of the Netherlands showing population density by municipality, with a legend on the left.

Population Range	Color
2032 ... 3047	Light Green
3047 ... 4063	Light Green
4063 ... 5078	Light Green
5078 ... 6094	Light Green
6094 ... 7109	Light Green
7109 ... 8125	Light Green
8125 ... 9140	Light Green
9140 ... 10156	Light Green
10156 ... 11171	Light Green
11171 ... 12187	Light Green

EISSA – OUTPUT DATA:



EMISSION MAPS, AGGREGATED MAPS, ANALYZED DATA



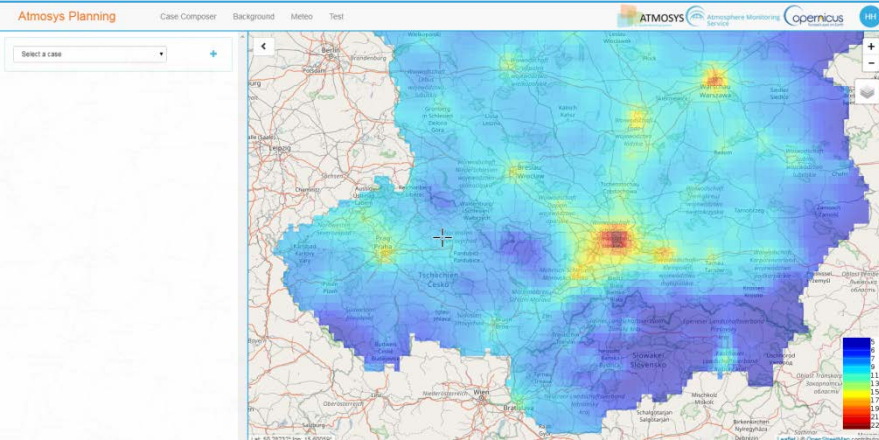
The screenshot displays the EISSA software interface with three main panels:

- Emission maps:** A map of Belgium showing residential heating emissions. The legend ranges from 0.000 to 1.000. The map is mostly green, with some yellow and orange spots.
- Aggregated maps:** A map of Belgium showing road emissions. The legend ranges from 0.115 to 19.315. The map shows higher emissions in the central and eastern parts, with yellow and orange colors.
- Analyzed data:** A table showing the top 10 substances and their emissions. The substance is Benzo(a)pyrene. The table includes columns for Substance, Zone, Source, and Emission.

Substance	Zone	Source	Emission
B(a)P	Antwerpen	Road	9,807.2462
B(a)P	Antwerpen	International sea-shipping	1,583.7466
B(a)P	Antwerpen	National sea-shipping	448.5773
B(a)P	Antwerpen	Rail	445.3908
B(a)P	Antwerpen	Inland shipping	322.4751
B(a)P	Limburg	Road	4,353.2657
B(a)P	Limburg	Rail	196.2753
B(a)P	Limburg	Inland shipping	176.7348
B(a)P	Limburg	International sea-shipping	0.0000
B(a)P	Limburg	National sea-shipping	0.0000
B(a)P	Oost-Vlaanderen	Road	8,892.7121
B(a)P	Oost-Vlaanderen	International sea-shipping	1,043.8222
B(a)P	Oost-Vlaanderen	National sea-shipping	295.6502
B(a)P	Oost-Vlaanderen	Rail	250.9891
B(a)P	Oost-Vlaanderen	Inland shipping	134.3191

EISSA IN THE LIFE-IP

- » Setup of EISSA for the residential sector
- » Collection of activity data at high spatial resolution
- » Configuration and setup of similar but independent EISSA applications for Malopolska region, Czech Republic and Slovakia
- » Harmonization of software platform, methodologies and reporting formats



IMPACT OF TRANSPORT MEASURES: KRAKOW

IFDM-TRAFFIC: AN IMPACT ASSESSMENT TOOL FOR ROAD TRANSPORT SCENARIOS

Main objective: **harmonization** and **transparency** in Environmental Impact Assessments

→ standardized:

- ✓ *AQ model*
- ✓ *Road transport emission factors*
- ✓ *Background concentrations*
- ✓ *Meteorology*

- Owned by the Flemish Environmental Agency
- **Freely available** for environmental consultants
- Developed by VITO as a **web-application**
- Up and running since 2011



IFDM-Traffic

Home Rooster IFDM-Traffic Adminis Help Contact

Update Emissiefactoren wegverkeer voor EL-look (2017)

IFDM-Traffic

Welkom bij IFDM-Traffic, de webapplicatie voor het doorrekenen van mobilisatiescenario's naar luchtkwaliteit voor wegtransport op autosnelwegen, gewestwegen en buitestedelijke wegen in Vlaanderen.



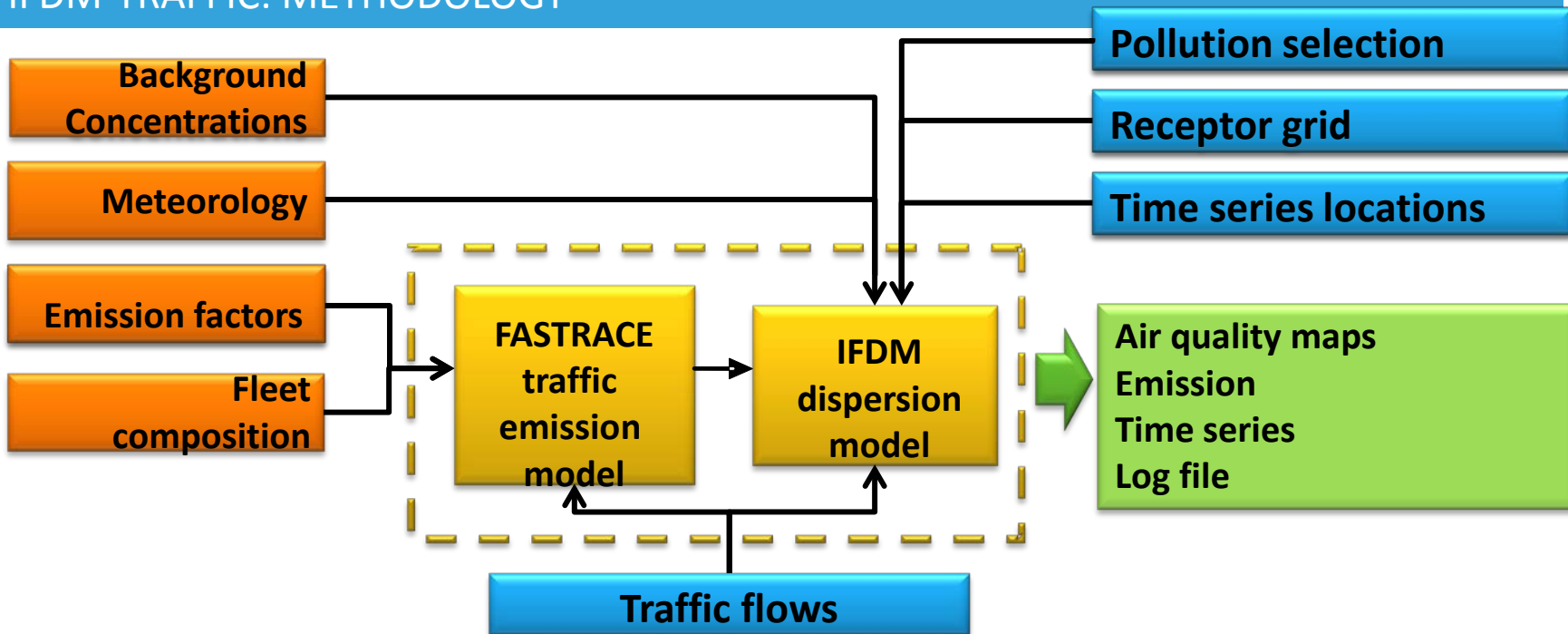
2017 - jaar gemiddelde (PM₁₀, O₃, NO₂)

IFDM-Traffic werd in 2009-2010 door VITO ontwikkeld en in 2011-2016 volledig vernieuwd in opdracht van de Vlaamse overheid (departement Leefmilieu, Natuur en Energie) ter ondersteuning van de opmaak van milieueffectrapportages en het Vlaamse luchtkwaliteitsbeleid. De output van IFDM-Traffic bestaat uit indicatoren Gas grondstoffen, aantal overbrengingen van PM₁₀-dag- en NO₂-uurroos, meest belangrijke percentielwaarden voor PM₁₀, PM_{2.5} en NO₂. IFDM-Traffic berekent deze luchtconcentratie-indicatoren op basis van emissies ingeschat door het FASTRACE-model, het referentiemodel van de Vlaamse overheid. De gebruiker kan kiezen uit huidige (2015) en toekomstige (2020, 2025 en 2030) vlootomstellingen en acht grondconcentraties. Op de figuren hierboven ziet u de jaargemiddelde NO₂-concentratie voor het jaar 2015 in Vlaanderen. Naast de luchtconcentraties levert IFDM-Traffic ook emissies voor de belangrijkste pollutanten voor het totale stadsgebied.

De in 2014-2016 uitgevoerde update van IFDM-Traffic omvat een nieuw emissie-model voor wegverkeer (FASTRACE kwam in de plaats van Mimosa), nieuwe achtergrondconcentratiekaarten voor de jaren 2015, 2020, 2025 en 2030 op basis van recente emissieprojecties, werden toegevoegd, de projecties betreffende de samenstelling van de vloot werden geüpdatet, nieuwe wegbestanden werden toegevoegd en het metajaar werd geüpdatet naar 2011 (in plaats van 2007).

WILM VITO, 2010-2010

IFDM-TRAFFIC: METHODOLOGY



ATMOSYS PLANNING

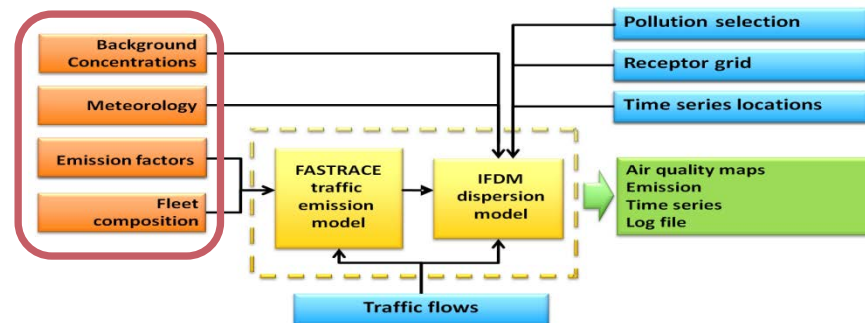
International interest in IFDM-Traffic approach

→ **ATMOSYS Planning**

- ✓ Not only traffic: also point and area sources
- ✓ Modernised user interface
- ✓ Improved scenario case emission manager
 - ✓ LEZ functionality

Requirements in other regions:

- ✓ **Local data** sources (fleet compositions) → local partner
- ✓ **Reliable background** concentrations → available from **CAMS**



demo

Grid

POI

reference

Emissions

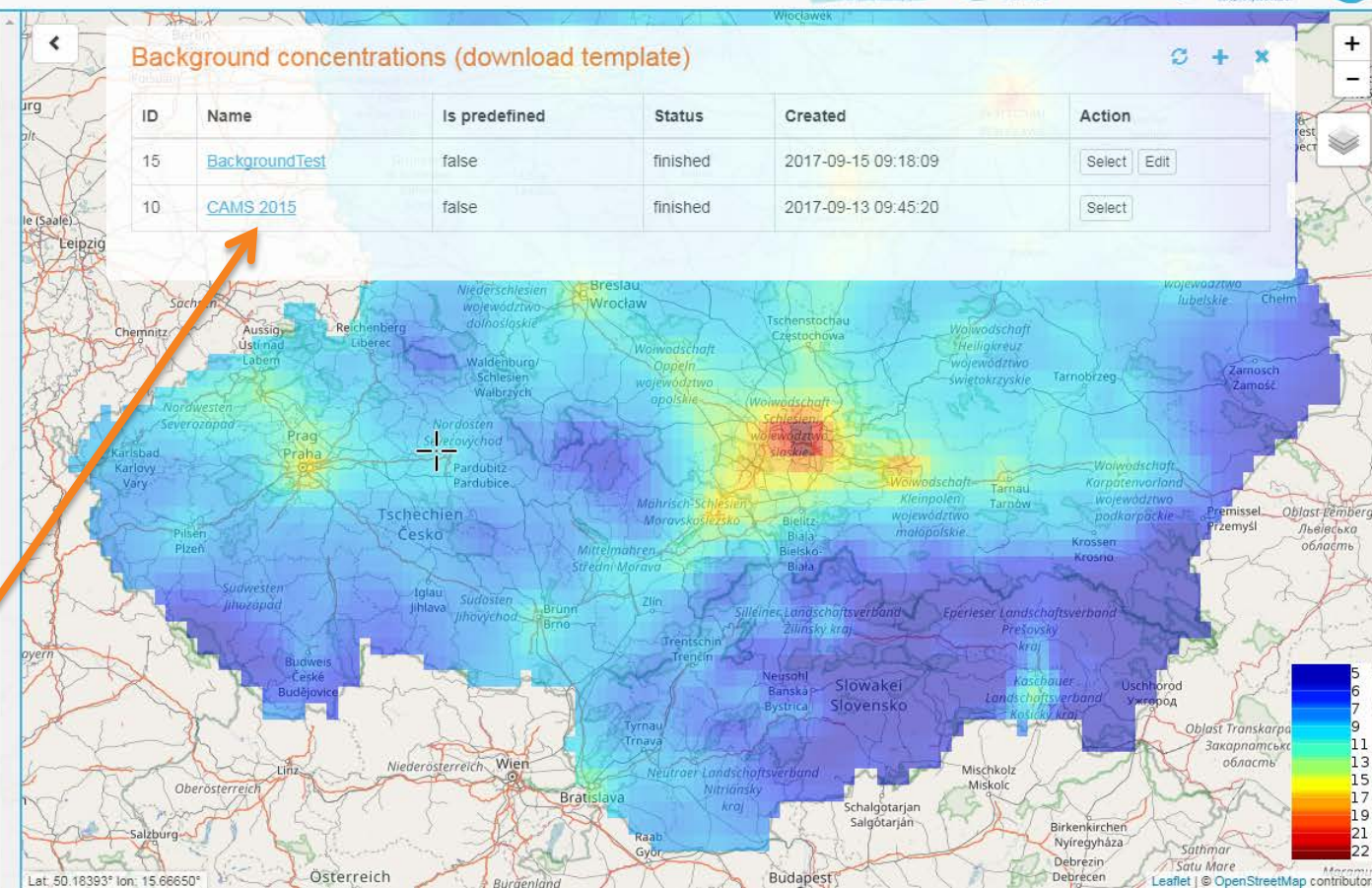
Background

Meteo

Low emission zones

Define case (measures):
Ref., scenario 1...

Option: load CAMS
Regional Background



demo ✕ 🔗 +

Grid

POI

reference ✕ 🔗 +

Emissions

Background

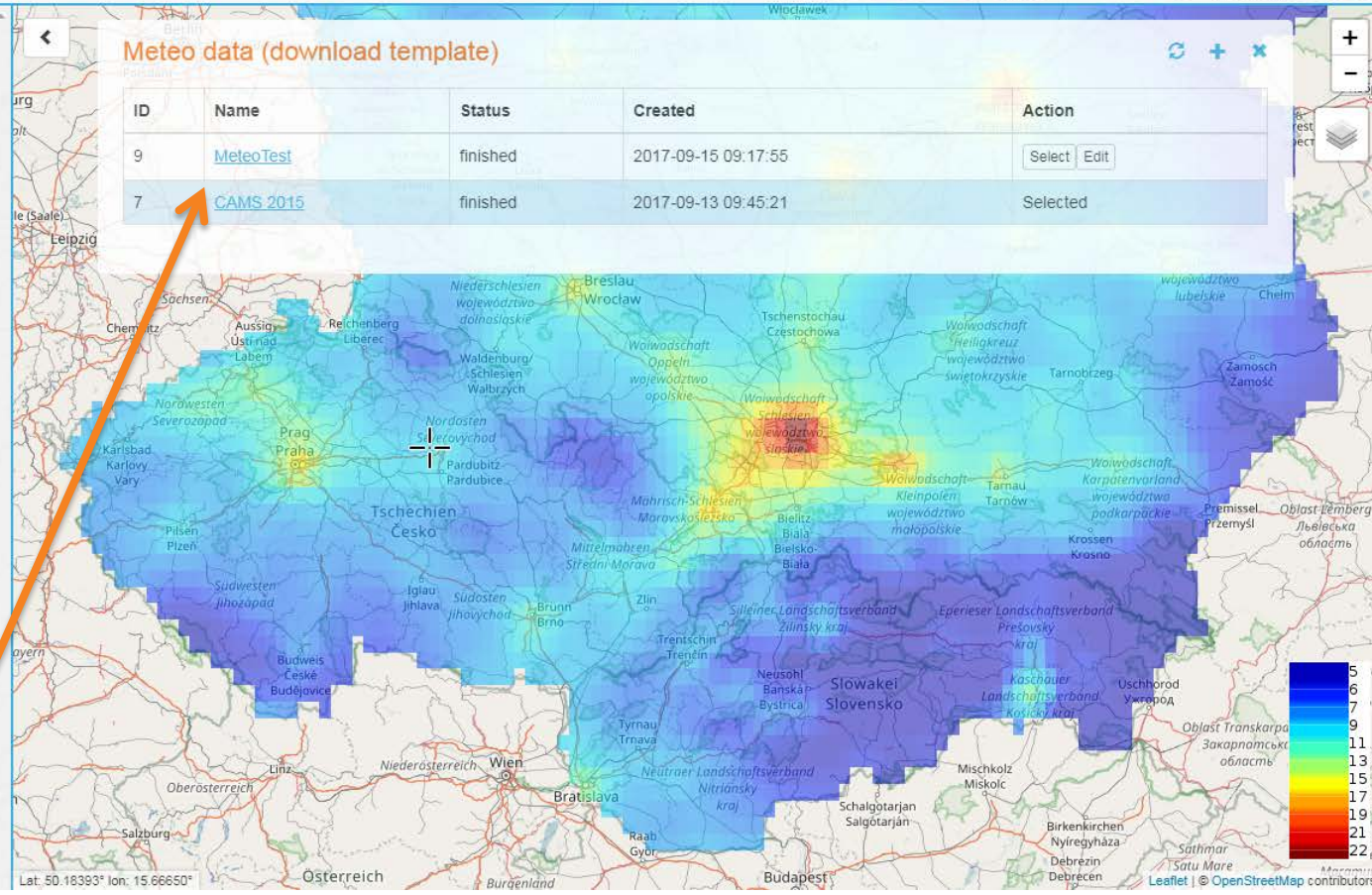
Meteo

Low emission zones

Concentrations

Define Low Emission Zone

Load own meteo data or ECMWF data



Vehicle Fleet
composition

Network

Manage Emissions

Upload fleet file (download template)

Click here or drop a file to upload and inspect it.

Upload network file (download template)

Click here or drop a file to upload and inspect it.

Upload an optional tunnels file (download template)

Please upload a network file and wait until it is imported. Afterwards you can upload a tunnel file if you would like to add tunnels.

Map vehicle types

Please upload a network file and wait until it is imported. Afterwards you can create the vehicle type mapping.

Done

Emission data

Name	Type	Toggle
------	------	--------

traffic_emissions	traffic	
-----------------------------------	---------	--

Traffic	Add
---------	-----



Edit grid parameters



The total number of grid points should not exceed 40000.

Regular Grid

Line Based Grid

Point Based Grid

Latitude *

48.13975

Latitude of the center point

Longitude *

17.11035

Longitude of the center point

Number of points in x direction *

20

Min value: 1

Number of points in y direction *

20

Min value: 1

Distance between points (m) *

1000.0

Min value: 50, max value: 1000

Save

Cancel

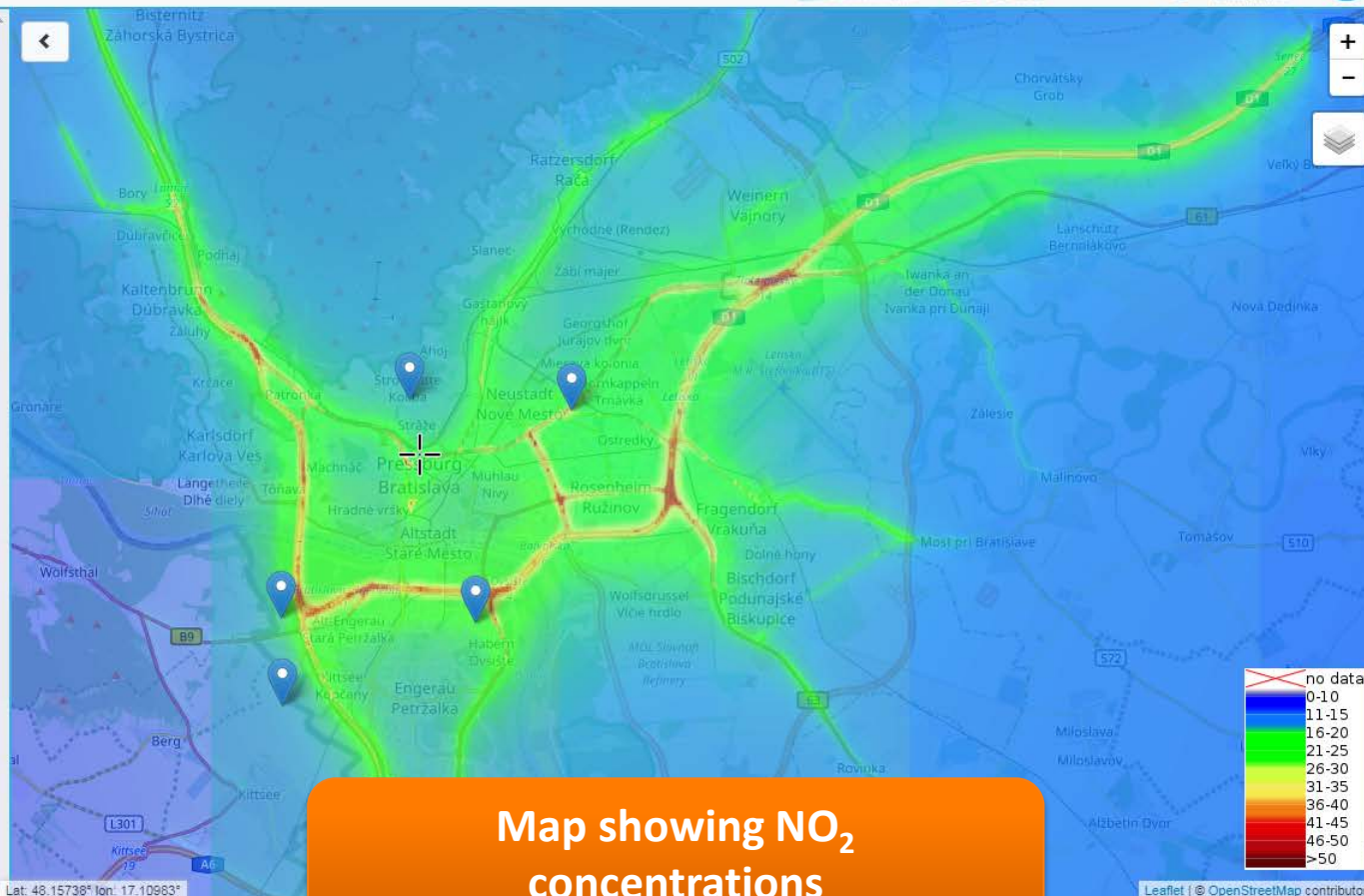
✕ 📍 +
 Grid
 POI
 ✕ 📍 +
 Emissions
 Background
 Meteo
 Low emission zones
 Concentrations

This case and its scenarios should not be modified as the result calculation is in progress or finished.

Concentrations

The calculation is finished.

▼ Download Toggle PoIs



Map showing NO₂ concentrations

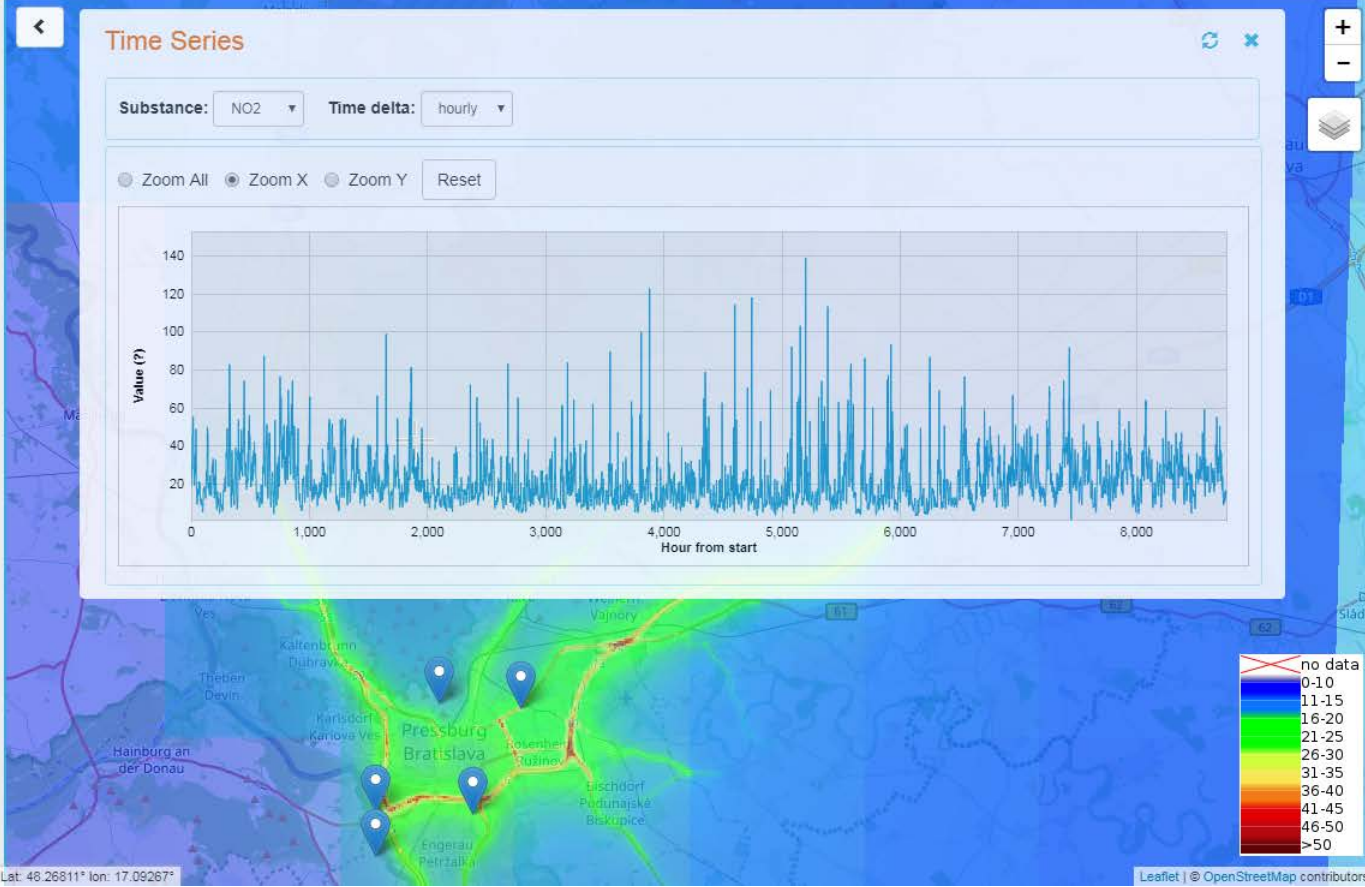
Compleet ✕ 📄 +
 Grid
 POI
 VerkeersemissiesCompleet ✕ 📄 +
 Emissions
 Background
 Meteo
 Low emission zones
 Concentrations

This case and its scenarios should not be modified as the result calculation is in progress or finished.

Concentrations

The calculation is finished.

NO2 - MEAN ▼ Download Toggle Poi's

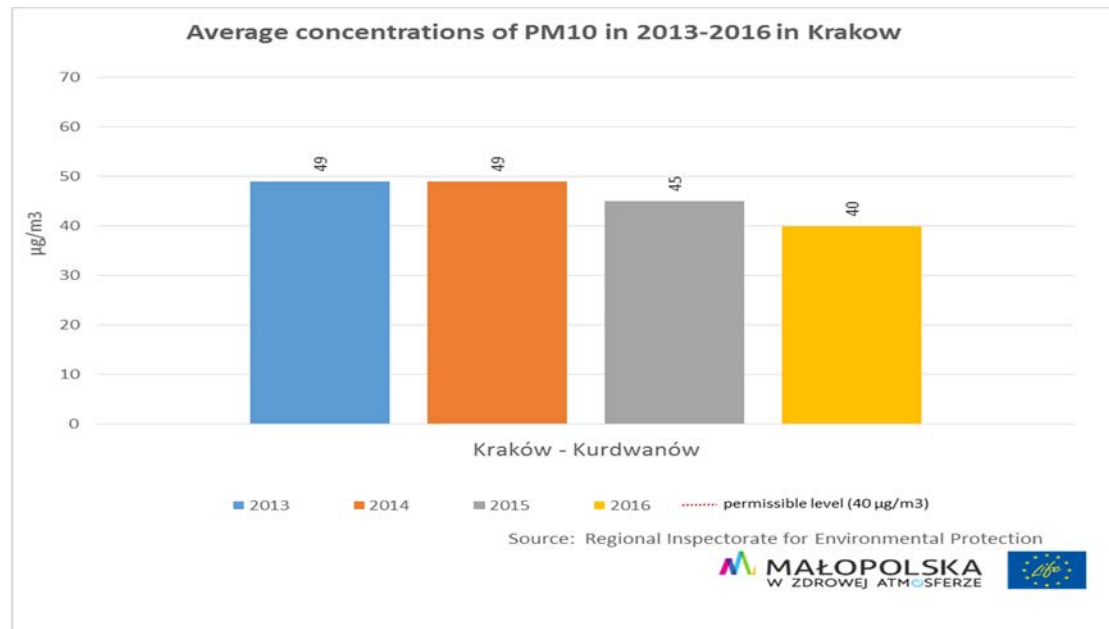


CONCLUSIONS

- LIFE IP in Malopolska is already making an impact at regional & local level
- Regional modelling cooperation platform across south PL, CZ, SLO to assess the impact of the actions to primarily reduce PM emissions
 - Harmonised residential emission inventories
 - Strengthening modelling capabilities in the regions (EISSA, CAMx...)
- ATMOSYS planning: user friendly web based modelling tool to assess effectiveness of local management plans: traffic, but also point (industry) and area.

THE IMPACT – REDUCTION IN MEASURED PM LEVELS

- About **100 green jobs** created
- **Capacity building**
- The increase of **public awareness.**
- Support for **additional actions.**



ACKNOWLEDGEMENTS

- **Malopolska Region: LIFE Team**
- **CHMU Life Team**
- **SHMU Life Team**
- **VITO Colleagues**



THANK-YOU

For further information contact:

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