DETAILS OF PROPOSED ACTIONS

C. Concrete (conservation/implementation) actions

For each action or set of actions specify the following:

ACTIONS C4 & C5: High Resolution Urban AQ Modelling

Beneficiary responsible for implementation:

- Leads: City of Krakow (Action C4) and Rabka-Zdroj (Action C5)
- Partners: VITO, Małopolska Region

Description (what, how, where and when): max 10000 characters

The local air quality in the hotspot region of Southern Poland is influenced by different factors amongst which the regional background, meteorology, local emissions and the urban infrastructure (street canyons). To assess the local air quality, it is therefore important to combine all contributing factors in an integrated model setup.

In these two actions, an integrated model chain will be set up. This chain will build on the recently completed LIFE+ project ATMOSYS (LIFE09 ENV/BE/000409, ended Dec 2013) in which VITO developed a modular web based air quality management dashboard to support air quality management in any air pollution (hotspot) region. In the ATMOSYS project it was set up for the Flemish (Northern Belgium) hotspot region. In this project, the high resolution modelling component of the system will be applied to the city of Krakow, and the health resort area, Rabka-Zdroj.

The high resolution modelling component, hereafter the IFDM modelling platform, integrates a traffic emission model (FASTRACE), a dispersion model (IFDM) and a street canyon module (OSPM). It applies the emission model results as input for the high resolution IFDM-OSPM dispersion model and combines these with regional background concentrations. The development and implementation of the IFDM modelling platform is planned for 2016-2017. In 2016, an air quality monitoring campaign is also planned, allowing validation of the model against ground based measurements.

This action’s goal is not only the setup of the integrated modelling system but also capacity building from the modelling perspective. VITO will provide training to the local staff at the city of Krakow so they gain experience of applying the tools in their region with support from modellers who have already set them up in other hotspot regions.

Action C.4: High resolution modelling platform for the city of Krakow

The development and deployment of an integrated modelling system to assess the local air quality in the city of Krakow. Capacity building, knowledge transfer, training and support to the local staff with respect to the configuration and the use of the model setup.

Lead: City of Krakow
Partners: VITO, Małopolska Region

Methodology:

- **Traffic emission model**: COPERT (Gkatzoflias et al, 2012) is the European standard methodology for modelling traffic emissions and within this action, we will adhere to this standard. Under the authority of the Flemish Environment Agency, VITO developed FASTRACE as a software shell encompassing the COPERT tool. FASTRACE requires as input traffic volumes on line segments and historical or future car fleet compositions. For the Krakow setup, FASTRACE will be coupled to the PTV VISUM traffic model output which is already used by the city authority of Krakow for simulation of traffic flows. Detailed information about historical and future car fleet compositions for Krakow will be provided by the city of Krakow (using external contractor). If it turns out that some of the data is missing, the EU data base TREMOVE (De Ceuster et al, 2004) can be used as a backup.
- **Emissions from industry**: will be provided by the Małopolska Region (using external contractor to prepare data) under action C6. As a starting point, the emissions reported under the E-PRTR can be used.
- **Emissions from households**: will be compiled within the action on Inter-regional modelling. The EISSA software will be able to provide output in the correct data formats.
- **High resolution modelling**: High resolution concentration levels will be simulated by the IFDM modelling platform. **IFDM** is well validated and suited to produce concentration maps up to 20m resolution (Lefebvre et al, 2013a, 2013b). The **OSPM street-canyon module** will be coupled to the IFDM model to account for street canyon increments in urban environment (Berkowicz et al, 1997, Berkowicz et al 2008). IFDM also has an interface to the FASTRACE traffic emission model and the EISSA emission data base for households and industry.
- In addition to local sources, IFDM requires **background concentrations** and **meteorological input data**. High resolution meteorology will be provided by the Małopolska Region (external contractor). Regional background concentrations will be provided by the RIO interpolation model (Janssen et al., 2008). The RIO model interpolates measured concentrations at monitoring locations and has proven to be a very accurate estimator of background concentrations at locations where no monitoring stations are in place. RIO will be set up for the whole trans-boundary region (Małopolska, the Czech Republic, and Slovakia) within the action on Inter-regional modelling.

- Within the IFDM modelling platform, special attention is paid to the **coupling of the local to the regional scale**. The methodology accounts for double counting effects of local sources in the regional as well as in the local simulations and deals with the complex ozone-NO_x chemistry over the different spatial scales. Over the last thirty years IFDM is extensively used to assess the impact of local policy scenarios. An example is given in Figure 1, where the impact of the Low Emission Zone (LEZ) for the city of Antwerp, Belgium, is investigated.
  IFDM output can be provided in a number of formats such as .shp files or gridded data formats and output will be made available in a topographic database for Krakow and Małopolska.

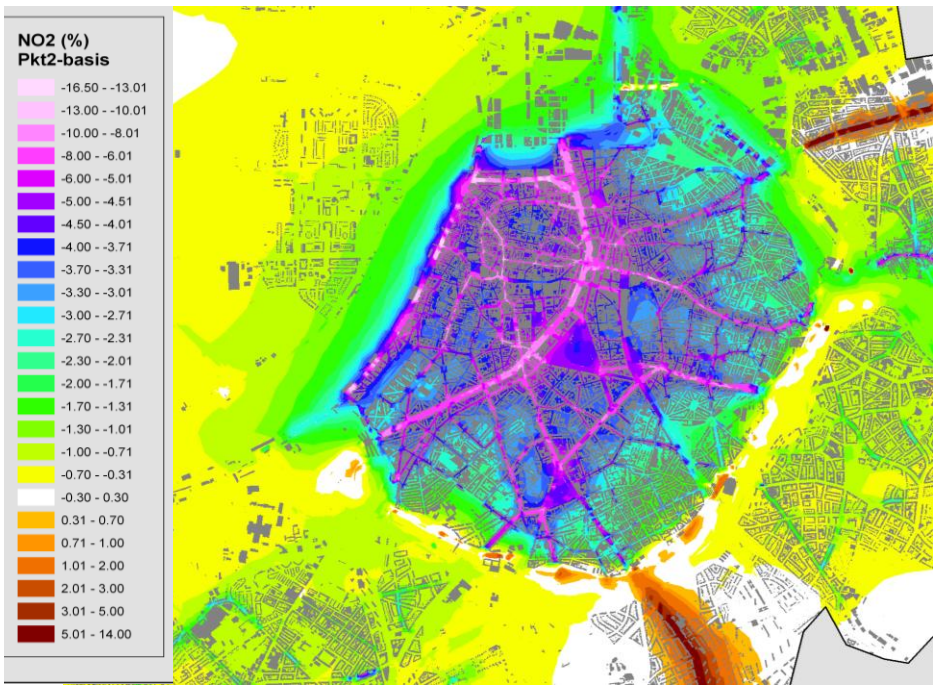

Figure 1: Impact of a Low Emission Zone on the NO_2 concentrations in the city of Antwerp, Belgium.

Training & support:

The IFDM modelling platform (including FASTRACE and the OSPM street canyon module) will be configured and set up on the servers of the Office of the City of Krakow. During the course of the project, staff will be trained to use the IFDM modelling platform, to set up (traffic) scenario analyses and to analyse and visualise the model output. The transfer of knowledge will be organised via a couple of training courses where VITO experts will work together with the staff of the city of Krakow. In phase II of the project, the support will be organised via an annual workshop in the city of Krakow where specific problems and open issues can be addressed. In between the training sessions or workshop, experts will have regular bilateral contacts via mail, skype, video conference, ….

Task C.5: High resolution modelling platform for the health resort Rabka - Zdroj

Application of the high resolution IFDM modelling platform for the health resort Rabka-Zdroj in order to assess the local air quality, to identify the causes of exceedances of air quality limits, and to simulate the effects of measures to improve the air quality. Validation and optimization of the platform using local monitoring data.

Lead: Rabka-Zdroj
Partners: VITO, Małopolska Region

Methodology:

- The same methodology as described under Task C.4 will be applied for the health resort Rabka-Zdroj. The main difference between both Tasks is that for the Krakow case, the high resolution modelling system will be set up at the premises of the Office of the city of Krakow, whereas here, only an assessment and validation report will be delivered. The town of Rabka has no resources available to set up and perform modelling exercises themselves. Therefore, an assessment report is of much more value to give insight in the current situation, to explore possible options towards a better air quality and to raise awareness amongst policy makers and citizens.
- **Emissions**, **background concentration** & **meteo**: All relevant emissions (especially households) will be provided by the action on Inter-regional modelling. The same holds for the background concentrations which will be estimated by the RIO interpolation model that will be set up in the same action. High resolution meteorology will be made available by the Małopolska Region (external contractor).
- **High resolution modelling**: PM_{10}, $PM_{2.5}$ and BaP are the pollutants of primary concern in this region. The high resolution concentration maps will be simulated by the IFDM modelling system.

Validation:

Under the supervision of the Office of Rabka-Zdroj, a temporary monitoring campaign will be set up in the town of Rabka-Zdroj. The monitoring data collected during this campaign will be used for further validation and optimisation of the model.

Once validated, the system will be used to simulate a reference case and a predefined set of (residential heating emission reduction) scenarios. Results of the scenario analysis as well as the model validation will be discussed in detail and presented in a report.

References

- Berkowicz, R., Hertel, O., Larsen, S.E., Sørensen, N.N., Nielsen, M., 1997. Modelling Traffic Pollution in Streets (Report in PDF Format, 850 kB). Link on. http://www.dmu.dk/en/air/models/ospm/ospm_description/
- Berkowicz, R., Ketzel, M., Solvang Jensen, S., Hvidberg, M., Raaschou-Nielsen, O., 2008. Evaluation and application of OSPM for traffic pollution assessment for a large number of street locations. Environmental Modelling & Software 23, 296-303.
- De Ceuster G., Van Herbruggen B., Logghe S., Proost S., 2004. TREMOVE 2.2 Model and Baseline Description, DG ENV. http://www.asser.nl/upload/eel-webroot/www/documents/TREMOVEreport.pdf
- Gkatzoflias D., Kouridis C., Ntziachristos L., Samaras Z., 2012. COPERT 4 Computer programme to calculate emissions from road transport, Emisia, http://www.emisia.com/sites/default/files/COPERT4v9_manual.pdf
- Janssen S., Dumont G., Fierens F. and Mensink C., 2008, Spatial interpolation of air pollution measurements using CORINE land cover data, Atmospheric Environment 42, 4884-4903
- Lefebvre W., Fierens F., Vanpoucke C., Renders N., Jespers K., Vercauteren J., Deutsch F., Janssen S., 2014. The effect of wood burning on particulate matter concentrations in Flanders, Belgium, HARMO14, extended abstract.
- Lefebvre W., Degraeuwe B., Beckx C., Vanhulsel M., Kochan B., Bellemans T., Janssens D., Wets G., Janssen S., de Vlieger I., Int Panis L., Dhondt S., 2013. Presentation and evaluation of an integrated model chain to respond to traffic- and health-related policy questions, Env. Mod. & Soft., 40, 160-170, doi: 10.1016/j.envsoft.2012.09.003
- Lefebvre W., Van Poppel M., Maiheu B., Janssen S., Dons E., 2013. Evaluation of the RIO-IFDM-street canyon model chain, Atmospheric Environment., 77, 325-337, doi:10.1016/j.atmosenv.2013.05.026

Reasons why this action is necessary: max 2000 characters

Integrating all relevant spatial scales in high resolution concentration modelling is important for assessing the local air quality. The platform offers the opportunity to perform assessments, to calculate the impact of future (traffic) scenarios and to identify which measures sufficiently improve the air quality to improve the local environmental quality and to meet EU air quality limits.

Moreover, the action is aimed at creating the long term capacity to implement plans or strategies that are addressed in hotspot regions. The action will help the regions to gain access to resources which are currently lacking and thus hindering the implementation/assessment of their AQ plans.

Constraints and assumptions: max 2000 characters

This action uses the results of the action on inter-regional modelling: emissions and interpolation model results as background contribution. To validate the model chain, monitoring data collected during a temporary campaign in Krakow and Rabka-Zdroj will be applied. The high-resolution model uses meteo data to simulate pollutant concentrations. The success of this action partly relies on the availability and quality of this data. The model chain has been extensively validated and applied for air

quality applications in other regions, yielding a solid base to build the platform for the selected cities in Southern Poland.

Expected results (quantitative information when possible):

This action results in the setup, validation and application of the high resolution air quality modelling platform for the city of Krakow and the health resort Rabka-Zdroj. The future use of the platform is ensured by training of the local staff at the city of Krakow and further support offered after the training. The direct results of the action include high resolution air quality maps of the regions, identification of problematic pollution sources and the exploration of possible options towards a better air quality through screening of scenarios.

Cost estimation:

Cost of establishment and validation of the integrated systems and capacity building by VITO (€125.104) is based on the number of air quality modelling expert days required, together with travel costs to Krakow and Rabka-Zdroj:
System at Krakow, action C4 = 125 days * €688/day (€86,000) & €6,720 travel costs for 6 meetings/training events (2 persons)
System for Rabka-Zdroj, action C5 =43 days * €688/day (€29,584) & €2,800 for 5 meetings/training events (1 person)

Enter details on role (data providers, Krakow = participation in set-up & training) and costs for City of Krakow, Office of Rabka-Zdroj & Małopolska Region external contractor:

Deliverables:

Task 1:
- 31/12/2017 – IFDM modelling platform operational at the premises of the city of Krakow.

Task 2:
- 31/12/2017 – Validation of the IFDM modelling system and scenario report describing mitigation strategies for the town of Rabka

Milestones:

Task 1:
- 31/12/2016 - FASTRACE traffic emission model available for the city of Krakow.
- 31/12/2017 – Staff at the city of Krakow is trained in the setup and use of the IFDM modelling system
- 31/12/2019 – Staff at the city of Krakow is able to independently operate the IFDM modelling system.

Task 2:
- 31/12/2016 - Monitoring campaign finalized and data available for model validation
- 31/12/2016 - First setup of the IFDM modelling system for the town of Rabka

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DELIVERABLE, MILESTONES AND REPORTING SCHEDULE

MAIN DELIVERABLE PRODUCTS OF THE PROJECT

Name of the Deliverable	Code of the associated action	Deadline
IFDM modelling platform operational at the premises of the city of Krakow		31/12/2017
Validation of the IFDM modelling system and scenario report describing mitigation strategies for the town of Rabka-Zdroj		31/12/2017

MAIN MILESTONES OF THE PROJECT

Name of the Milestone	Code of the associated action	Deadline
FASTRACE traffic emission model for the city of Krakow available.		31/12/2016
Monitoring campaign at Rabka-Zdroj finalized and data available for model validation		31/12/2016
First setup of the IFDM modelling system for the town of Rabka-Zdroj		31/12/2016
Staff at the city of Krakow are trained in the setup and use of the IFDM modelling system		31/12/2017
Staff at the city of Krakow are able to independently operate the IFDM modelling system.		31/12/2019

ACTIVITY REPORTS FORESEEN

Type of report	Deadline

TIMETABLE

List all actions ordered by number and using their numbers or names. Tick as appropriate.

Action	2015	2016				2017				2018 - 2019			
Number/name	IV	I	II	III	IV	I	II	III	IV				
A. Preparatory actions, elaboration of management plans and/or action plans :													
C. Concrete (conservation/implementation) actions :													
Setup of the high resolution air quality modelling platform at the city of Krakow													
Training of the staff at the city of Krakow													
Support of the staff at the city of Krakow (until 12/ 2019)													
Setup of the high resolution air quality platform for the health resort Rabka-Zdroj													
Validation of the model chain and determination of impact of mitigation scenarios at Rabka –Zdroj													
D. Monitoring of the impact of the project actions													
E. Public awareness and dissemination of results :													

F. Project management and monitoring of project progress:													