With the contribution of the LIFE Programme of the European Union

LIFE 15 IPE IT 013

prepAIR
Po Regions Engaged to Policies of Air

ACTION A3
PRELIMINARY ASSESSMENT OF THE AIR QUALITY PLANS

FINAL REPORT

Revised on 30/05/2019

With the contribution of the LIFE Programme of the European Union
LIFE 15 IPE IT 013

Po Regions Engaged to Policies of Air

This document was realized within the project PREPAIR (LIFE 15 IPE IT 013) financed by the program LIFE 2014-2020 of the European Union.

Closing date of the report: 30/05/2019

Beneficiary responsible for implementation: ARPAE Emilia Romagna.

Beneficiary responsible for implementation in Slovenia: ARSO.

Authors: Michele Stortini e Roberta Amorati (ARPAE Emilia-Romagna), Marco Deserti, Lucia Ramponi, Carmen Carbonara, Katia Raffaelli (Emilia-Romagna Region), Silvia Pillon (ARPA Veneto), Giovanni Bonafè e Alessandra Petrini (ARPA FVG), Monica Clemente (ARPA Piemonte) Manuela Zublena e Giordano Pession (ARPA VdA), Lavina Laiti (Provincia autonoma Trento), Elisabetta Buganza (Regione Lombardia), Marko Rus, Damijan Bec, Luka Matavž, Don Ciglenečki, Rahela Žabkar, Janja Turšič (ARSO).

Coordinator of Thematic Pillar: Marco Deserti (Emilia-Romagna Region)

Action Manager: Michele Stortini (ARPAE)

Software and Assessment methodology developed by “Terra Aria s.r.l.” on behalf of the Emilia-Romagna Region in the project LIFE PREPAIR.

With the contribution of the LIFE Programme of the European Union

LIFE 15 IPE IT 013

prepAIR Po Regions Engaged to Policies of Air

Index

With the contribution
of the LIFE Programme
of the European Union

LIFE 15 IPE IT 013

prepAIR
Po Regions Engaged to Policies of Air

With the contribution of the LIFE Programme of the European Union
LIFE 15 IPE IT 013

1. Emissions Scenarios

The methodology used to estimate the reduction of emissions in the Po Valley, after the full implementation of the approved Air Quality Plans and the Po Basin Agreement (hereinafter indicated as CLE2025+AQP+Po Basin Agreement) in addition to the PREPAIR project actions, is described in detail in the Annex I "Assessment Methodology".

In summary, the CLE2025+AQP+PoBasinAgreement scenario has been evaluated starting from the local measures collected within the common Data Set provided by the action A2, considered the CLE2025 "no plan" emissions scenario provided by the action A1 (Current Legislation Emissions in 2025).

The C4-C17 PREPAIR actions are the main actions linked to PREPAIR objectives, focused on four different sectors: agriculture, biomass burning, transports and energy efficiency. The regional Air Quality Plans (AQPs) actions have been linked with each PREPAIR action and an improvement percentage has been defined so that PREPAIR Actions improve proportionally the performance of AQPs measures that act in the same sector; the Scenario CLE2025+AAs is the scenario with the implementation of the AQP plans, the Po Basing Agreement and the concrete actions of the project PREPAIR.

Here some figures related to the emissions scenarios are enclosed. In the CLE2025+AAs scenario the expected emission reductions are high: NOx 39%, PM10 38%, PM25 40%, SO2 3%, NH3 22%.

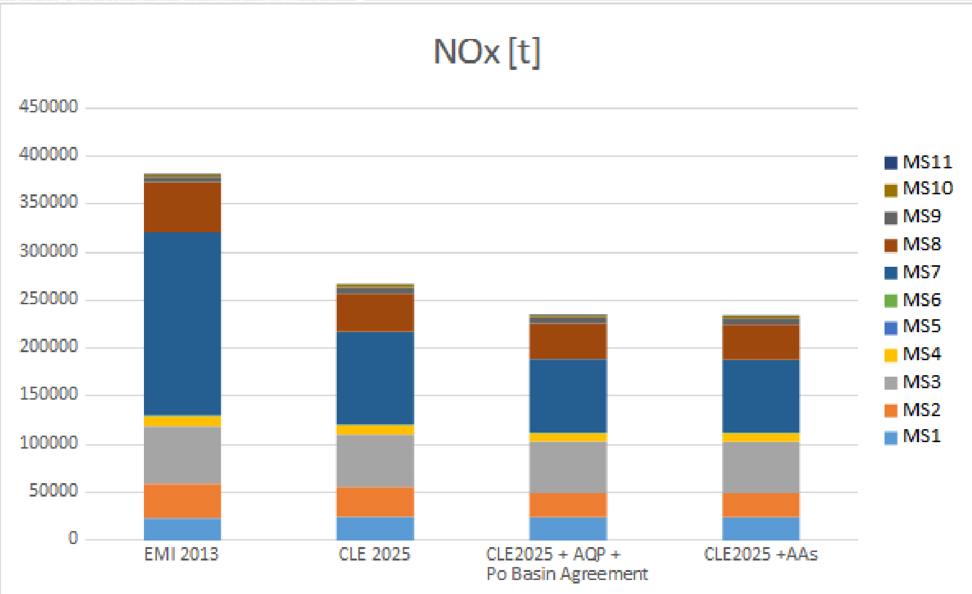


Figure 1 - Emissions for PREPAIR Italian regions for NOx with macro-sector detail

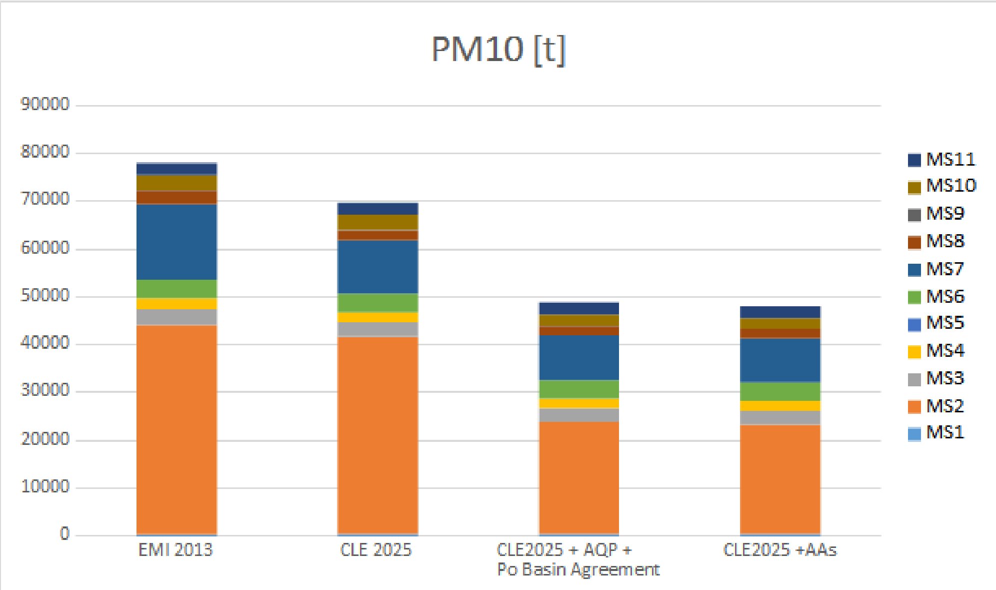


Figure 2 - Emissions for PREPAIR Italian regions for PM10 with macro-sector detail

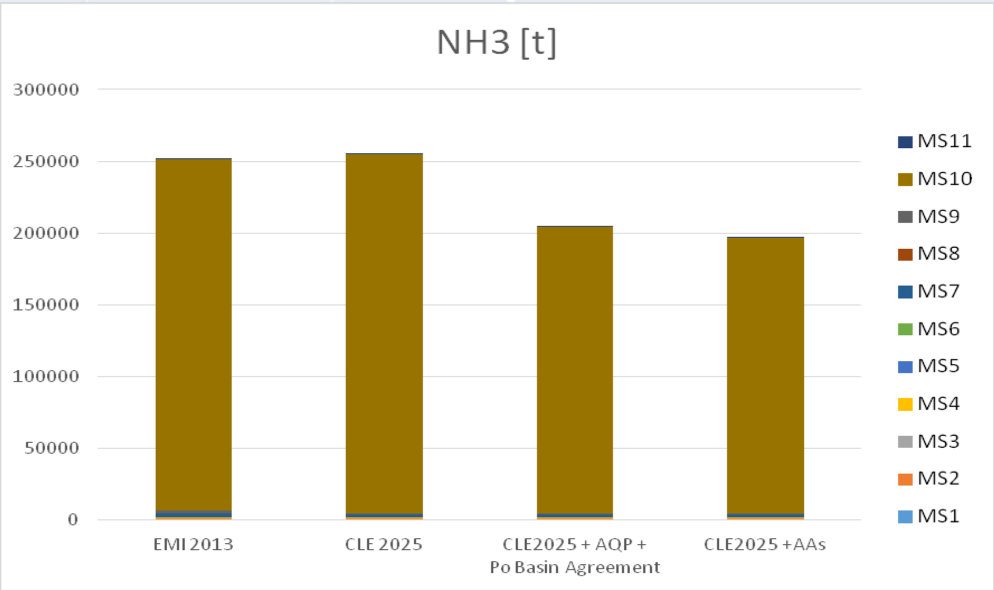


Figure 3 - Emissions for PREPAIR Italian regions for NH3 with macro-sector detail

2. Definition of CTM model setup

The preliminary assessment has been done using CTM NINFA (Northern Italy Network to Forecast Aerosol pollution). NINFA is based on the chemical transport model CHIMERE (http://www.lmd.polytechnique.fr/chimere/), an eulerian grid model, able to simulate transport, dispersion, chemical transformations and deposition (dry and wet) of air pollutants and aerosols.

The meteorological hourly input is provided by the COSMO-I-7 (http://www.cosmo-model.org/content/model/documentation/core/default.htm) non-hydrostatic model. The boundary hourly conditions are provided daily by PREV'AIR (French national platform of quality air forecast) and the anthropogenic emissions are composed by the regional, national and European inventory.

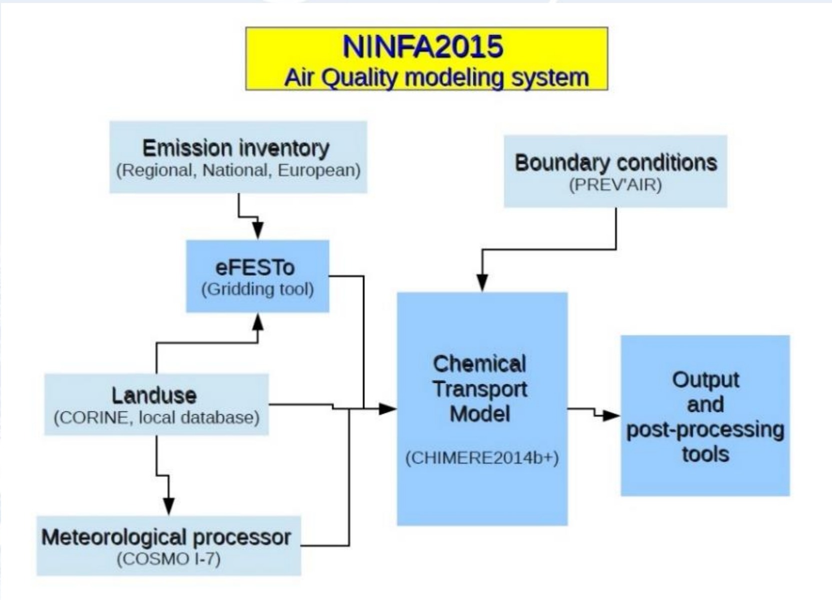


Figure 4- NINFA 2015 – Air Quality modelling system

In the Preparatory Actions of the project PREPAIR three emissions scenarios were evaluated:

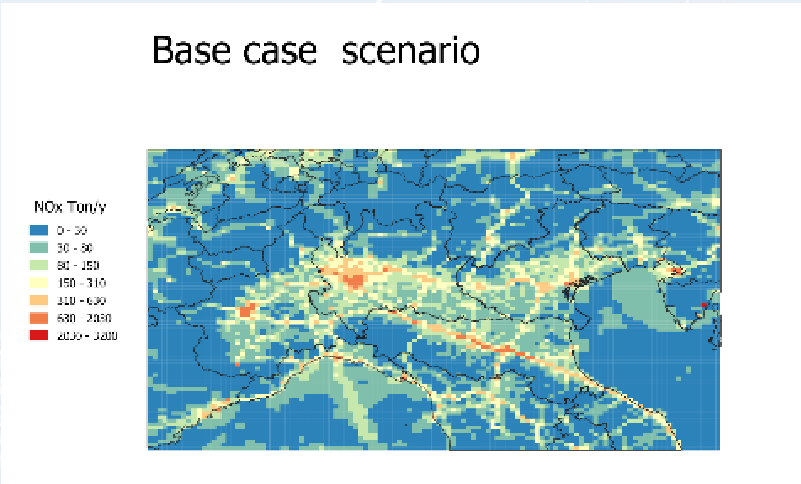
- Base case scenario refers to 2013 and provided by action A1;
- CLE2025 scenario, with no plans, provided by action A1;
- CLE2025+AAs scenario, a scenario with the implementation of the Air Quality Plans, the Po Valley Agreement and the concrete actions of PREPAIR project, as better described in the Annex 1.

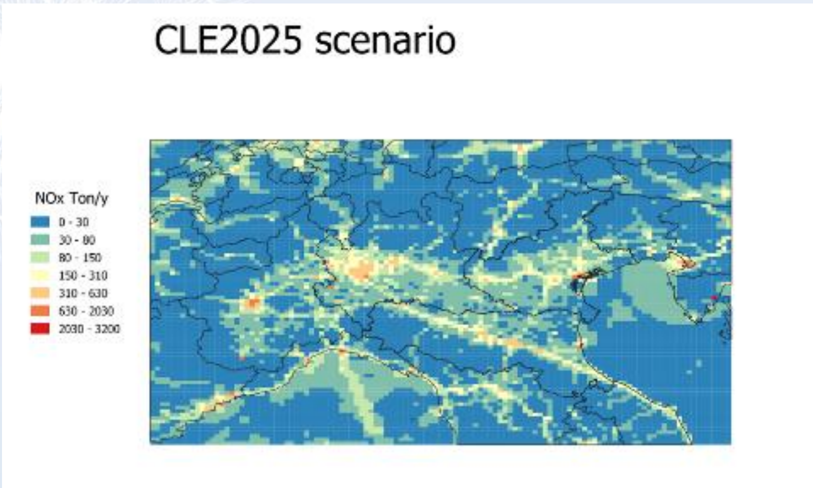
The model setup is the following:

- Meteo: CosmoI7 2016;
- Boundary condition: PREV'AIR;

- Emission: Over Prepair regions: Base case, CLE2025 (Emission scenarios provided by action A1), CLE2025+AAs scenario;
- Outside: Italian national ISPRA scenario (2015), European MACC 2011;
- CTM: CHIMERE2014b;
- Horizontal resolution: 0.07*0.05 degree;
- Vertical resolution: 9 levels.

Starting from the emissions data set for Po Valley, Slovenia and the other regions/countries present in the model domain, the emissions are assigned to the grid model using specific proxy variables for each SNAP3. Here some emission maps:





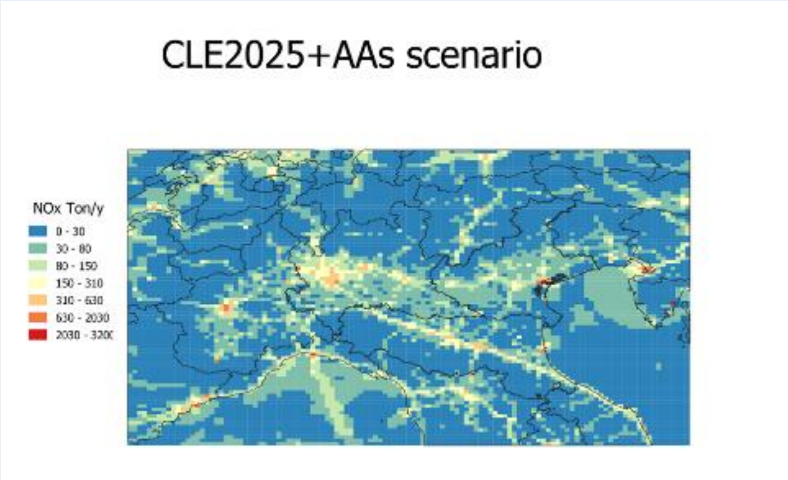


Figure 5 - Figure NOX emissions (T/Y) for three simulated scenarios

3. Base case simulation

In order to estimate the limit value for the 24-h average concentration (no more than 35 days per year exceeding 24-h average concentration 50 µg/m3), a relationship between the numbers of days and annual mean concentration is used. Following this approach an equivalent limit value (ELV) can be defined. Although for specific stations the ELV can have different values (between 25 and 33µg/m3), a statistical analysis using four years (2006-2010) monitoring stations in Emilia-Romagna shows that if ELV is <27.4 µg/m3 or ELF if > 28.8 µg/m3 the method allows to estimate correctly the compliance or not compliance in 95% of cases. A statistical analysis of monitoring data in Netherland and UK indicates that the daily limit value corresponds to an annual mean concentration of about 28-33 µg/m3 depending on location (Buijsman et al 2005; Stedman et al 2007). Therefore, in this preliminary evaluation we assume ELV equal to 28 µg/m3.

Using a kriging technique, model annual average PM10 and NO2 concentrations are merged with monitoring background stations. In the following figures the annual average and frequency concentration distributions are plotted.

In all background stations the annual Limit Value (LV) for PM10 is respected, although in some areas of the domain the annual value exceeds LV, moreover the number of exceedances of the daily LV is higher than the Air Quality EU Directive.

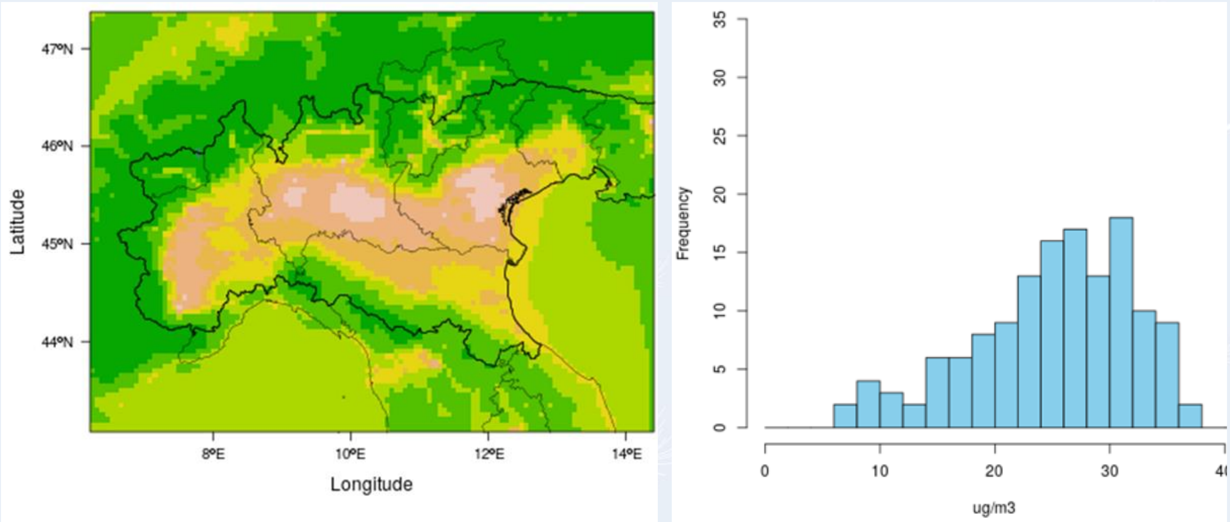


Figure 6-Base case PM10 average concentration (mg/m3) and frequency distribution in background stations

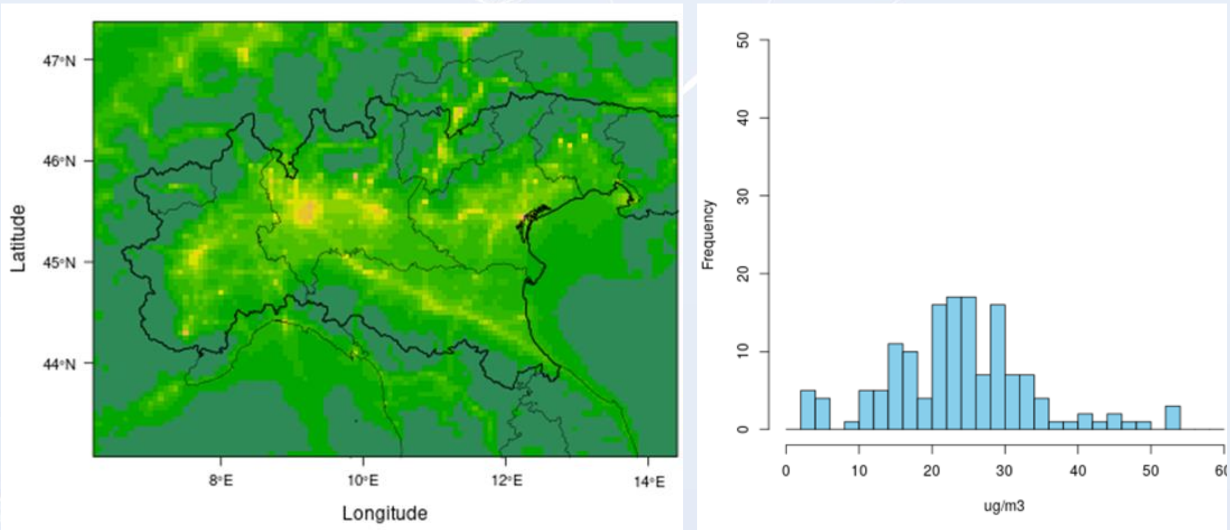


Figure 7- Base case NO2 average concentration (mg/m3) and frequency distribution in background stations

4. CLE2025 simulation

Concentration reductions are evident in the central area of Po Valley and in correspondence with the main roads although the annual values are higher than LV also in background stations. The average reduction is around 10%.

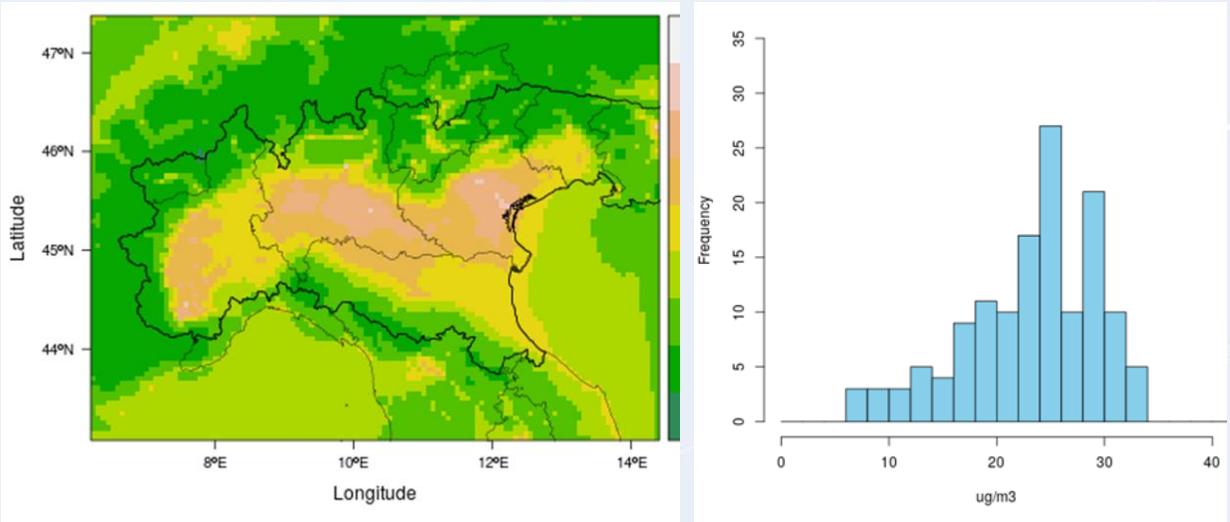


Figure 8- CLE2025 average PM10 concentration (μg/m3) and frequency distribution in background stations

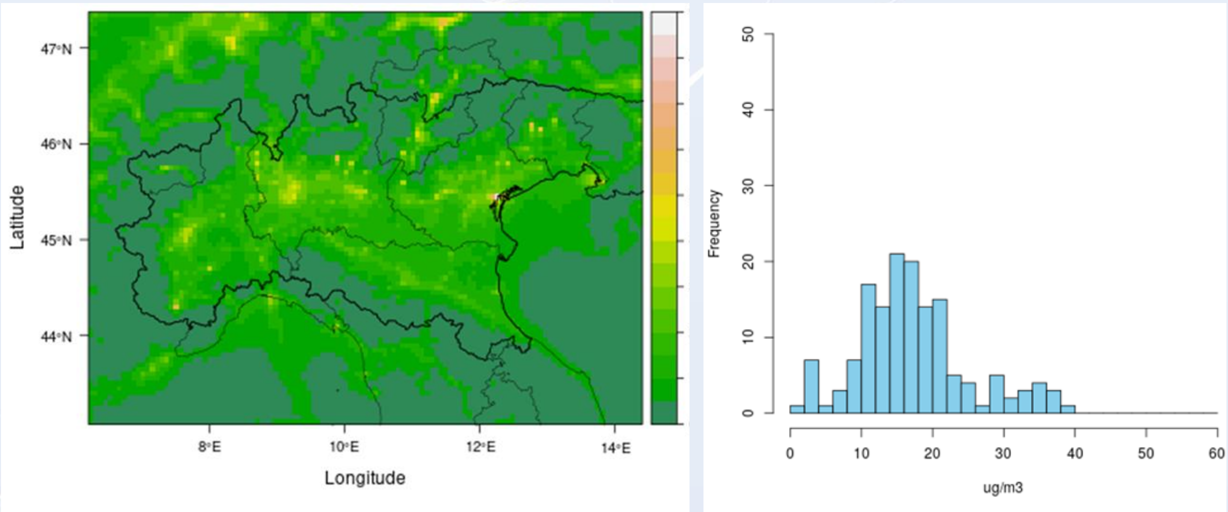


Figure 9 – CLE 2025 average NO2 concentration (μg/m3) and frequency distribution in background stations

Concentration reductions are evident in the central area of the Po valley and in correspondence with the main roads and the annual values are lower than AQD LV in background stations. The average reduction is about 20%.

5. CLE2025+AAs simulation

In this case only one background station has annual PM10 concentration average greater than the LV and only six stations greater than 26 μg/m3, so the compliance with the AQ Directive seems to be achievable.
In this scenario all background stations respect the AQ Directive LV for NO2 and the average reduction respect to the base case is about 35%.

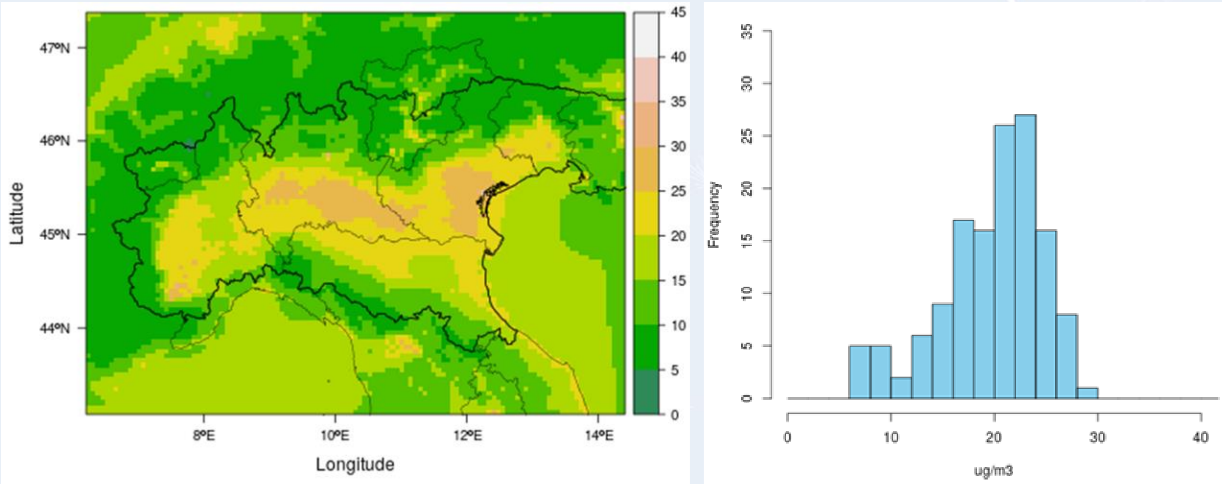


Figure 10 - CLE2025+AAs average PM10 concentration (μg/m3) and frequency distribution in background stations

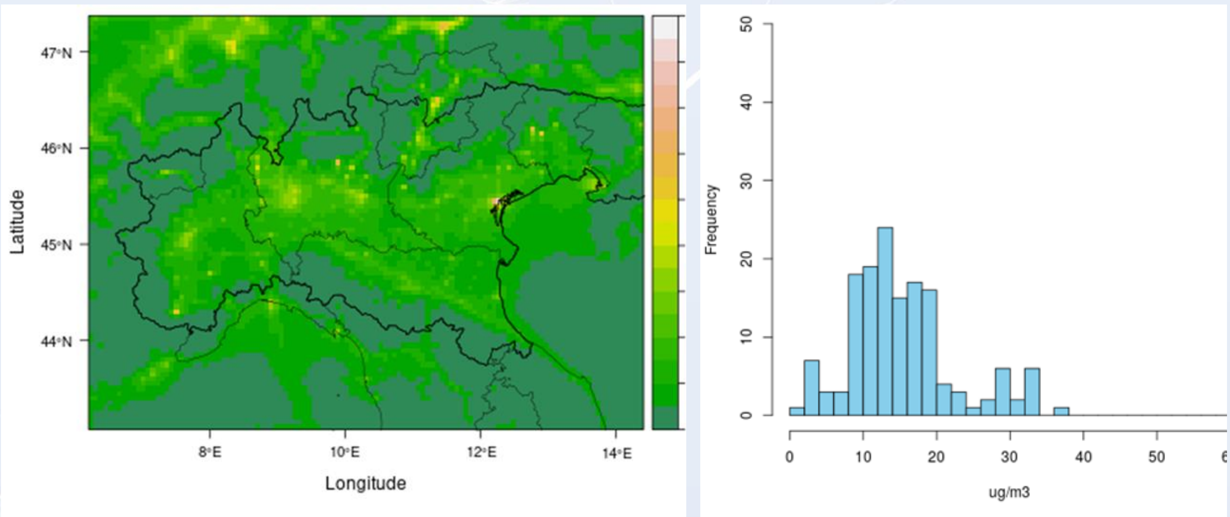


Figure 11 - CLE2025+AAs average NO2 concentration (μg/m3) and frequency distribution in background stations

About the transboundary impact, the NO2 reduction in Slovenia is negligible while the reduction on PM10 annual average concentration is about 2-3%, as reported in the Annex II.

ANNEX I: ASSESSMENT METHODOLGY

1. Introduction

This methodology report, supporting the action A3 of the project PREPAIR, aims at realizing an assessment of the expected emission pollutant levels in the Po Valley target area after the full implementation of the approved AQPs (Air Quality Plans) and of the PREPAIR project actions. This assessment is based on two emission scenarios produced by ARPA Lombardia (detailed at municipality level and SNAP3 + fuel level) in the action A1:

1. the 2013 baseline scenario: the existing regional emissions inventories mosaic;
2. the 2025 CLE "No plan" scenario.

This assessment is built in order to dynamically input the Decision Support System RIAT+ in the Po Valley supporting the evaluations of the action C3.

RIAT+ is an integrated modelling environment using tabular and geographic data, simulation and optimization models, graphical and geographical user interface, focused on the local and regional scales. It incorporates explicitly the specific features of the area, i.e. the local meteorology, the detailed pattern of the emission precursor sources and the prevailing chemical regimes. RIAT+, developed and delivered by the LIFE OPERA project (LIFE09 ENV/IT/092 www.operatool.eu), supports the policy makers in the selection of optimal emission reduction technologies.

In order to properly evaluate and monitor the effect on air quality of the yearly and of the full implementation of the Regional AQPs (and of the PREPAIR actions) with RIAT+ tool, 2 different emissions scenarios should be considered to allow the full compliance between ARPA Lombardia emission scenarios and RIAT+ emission projections methodology:

- the 2013 baseline scenario: to yearly evaluate the impact on air quality of the incremental application of the emission reduction foreseen in regional air quality plans (AQP Monitoring Phase);
- the 2025 CLE "No plan" scenario: to evaluate the full implementation of all regional AQPs and PREPAIR actions.

The information on AQPs implementation collected by A2 monitoring tool is complaint with RIAT+ emission scenario tool specifically designed for this activity.

In the next paragraphs, the methodology used to evaluate the following two emission scenarios is explained:

- 2025 CLE with the full implementation of the regional AQPs and Po Valley agreement (2017);
- 2025 CLE with the full implementation of the regional air quality plans and the C4-C17 PREPAIR actions.

2. AQPs emission reduction: A2 action dataset

The first step for the estimation of this emission scenario was the technical analysis for each local measure in the regional AQPs. All the measures have been collected within the common data set provided by A2 action.

For each Region, here below all the steps implemented to evaluate the measures:

- exclusion from the analysis of all the measures without an emission reduction target;
- standardization of the emission reductions to 2025 as a common AQP reference year;
- link of each measure to emission activities (SNAP and fuel codes);
- disaggregation of the emission reduction to each SNAP-fuel code and for each measure, proportionally with the CLE 2025 “no plan” emission scenario.

Here below a summary of the specific analysis made for each region.

Region/Province	***AQP Reference Year***	***Activities***
Emilia-Romagna	2020	• Analysis of all the plan measure’s • All the reduction targets have been estimated for the year 2025. • PM2.5 emission reductions estimate with the same percentage of the PM10 reduction over CLE.
Friuli Venezia Giulia	2020	• Analysis of all the plan measure’s • All the reduction targets have been estimated for the year 2025.
Lombardia	2020	• Analysis of all the plan measure’s • Lombardia Region provided the 2018 update of the regional AQP with 2025 reference year.
Piemonte	2030	• Analysis of all the plan measure’s • All the reduction targets have been estimated for the year 2025 in proportion respect to 2030 CLE provided by ARPA Piemonte.
Trento	2020	• Analysis of all the plan measure’s • All the reduction targets have been estimated for the year 2025.
Valle d’Aosta	2024	• Analysis of all the plan measure’s
Veneto	2020	• Analysis of all the plan measure’s • All the reduction targets have been estimated for the year 2025

The graphs of all Air Quality Plans, for all the previous 7 AQPs, for each pollutant and with macrosector detail are in the file excel ‘SCENARI+PREPAIR_20190318.xlsx’.

3. C4-C17 PREPAIR Actions

C4-C17 PREPAIR Actions are the main actions linked to PREPAIR objectives, focused on four different sectors: agriculture, biomass burning, transports and energy efficiency. These actions were listed in the A2 action dataset without an emission reduction estimate. These measures mainly deal with communication (workshops, guidelines, promotions, planning) and they are not end-of-pipe measure (non-technical measures).

For all these reasons, the emission reduction estimation is very difficult; so, in the meeting held in Torino on the 25th of September 2018 the following approach was discussed and approved:

- PREPAIR Actions improve proportionally (through a percentage) the performance of AQPs measures that act in the same sectors;
- there could be different levels of improvement percentage on the base of the intensity in terms of the temporal horizon and the intensity of stakeholders involved the actions and of the number of emission activities involved;
- regions can define different values for each action;
- the maximum improvement percentage should be supported on a reference base.

Following this approach, regional AQPs actions have been linked with each PREPAIR action and an improvement percentage has been defined on the base of different parameters as explained in the table below.

Type of action (A):	***Value***
1. Communicative action (workshops, guidelines, promotions, planning)	0.3
2. Applicative action (BAT, case studies, prototypes ...)	0.6
3. Incentive action	1.0
Intensity of the application (B):	***Value***
1. Limited targets and discontinuous action over time	0.3
2. Limited targets but prolonged action over time	0.6
3. Numerous targets but discontinuous action over time	0.6
4. Numerous targets and prolonged action over time	1.0
Number of activities involved (C)	***Value***
1. Few emission activities	0.3
2. Many emission activities	0.6
3. All emission activities	1.0
Maximum emission target reduction (R_{max})	50%[1]

The final improvement percentage *Inc (%)* $_{n,R}$ estimated for each AQPs actions (n) for each Region (R) has been computed with:

$$Inc(\%)_{n,R} = A_{n,R} \cdot B_{n,R} \cdot C_{n,R} \cdot R_{max}$$

The graphs of all Air Quality Plan, for all the previous 7 AQPs, for each pollutant and with macrosector detail and all PREPAIR actions, for each region and pollutant with macrosector detail, where the emission reductions have been computed multiplying Inc(%)n,R per the

1 The United States Experience with Economic Incentives for Protecting the Environment, 2011 - National Center for Environmental Economics, U.S. Environmental Protection Agency

emission reduction of the linked "n" AQP action for Region "R" are in the file excel 'SCENARI+PREPAIR_20190318.xlsx.

4. Output scenarios

All the output scenarios have been provided in database tables (mdb format). Here below the database structure, where the scenario emission tables (with activity and fuel detail for all pollutants) are:

- *EMI_DIFFUSE_CLE*: CLE 2025 areal municipality emissions;
- *EMI_PUNTUALI_CLE* : CLE 2025 point source emissions;
- *EMI_DIFFUSE_CLE2025withAQP*: CLE 2025 municipality emission with the full implementation of the regional air quality plans;
- *EMI_PUNTUALI_CLE2025withAQP*: CLE 2025-point source emissions with the full implementation of the regional air quality plans;
- *EMI_DIFFUSE_CLE2025withAQP_PREPAIR*: CLE 2025 municipality emission with the full implementation of the regional air quality plans and the PREPAIR actions (C4-C17);
- *EMI_PUNTUALI_CLE2025withAQP_PREPAIR*: CLE 2025-point source emissions with the full implementation of the regional air quality plans and the PREPAIR actions (C4-C17);

Support tables are:

- *MAC_SETT*: link between sectors and macrosectors codes;
- *T_COMBUSTIBILI*: list of fuel codes and descriptions;
- *T_COMUNI*: list of municipality codes (ISTAT) and name;
- *T_INQUINANTI* : list of pollutants codes and descriptions ;
- *T_POLVERI*: list of PM codes;
- *T_PROVINCE*: list of province codes (ISTAT) and name;
- *T_SNAP*: list of snap codes and description.

Table Name	Type	Date Created	Date Modified	Keys
EMI_DIFFUSE_CLE	TABLE	05/04/2018 11:28:14	28/06/2018 10:29:06	PrimaryKey
EMI_DIFFUSE_CLE2025withAQP	TABLE	04/02/2019 09:04:52	04/02/2019 09:04:52	
EMI_DIFFUSE_CLE2025withAQP_PREPAIR	TABLE	28/02/2019 10:35:19	28/02/2019 10:56:56	
EMI_PUNTUALI_CLE	TABLE	05/04/2018 11:30:21	28/06/2018 10:29:38	PrimaryKey
EMI_PUNTUALI_CLE2025withAQP	TABLE	04/02/2019 09:06:54	04/02/2019 09:06:54	
EMI_PUNTUALI_CLE2025withAQP_PREPAIR	TABLE	28/02/2019 10:41:25	28/02/2019 10:57:17	
MAC_SETT	TABLE	05/03/2018 12:00:07	05/03/2018 12:00:20	
T_COMBUSTIBILI	TABLE	12/01/2018 09:11:08	16/01/2018 11:35:09	PrimaryKey
T_COMBUSTIBILI_GAINS	TABLE	14/02/2018 15:02:12	14/02/2018 15:02:12	
T_COMUNI	TABLE	16/01/2018 16:05:09	17/01/2018 09:48:11	PrimaryKey
T_INQUINANTI	TABLE	12/01/2018 09:11:08	12/01/2018 09:14:28	PrimaryKey
T_POLVERI	TABLE	19/01/2018 09:49:28	19/01/2018 09:51:26	
T_PROVINCE	TABLE	12/01/2018 09:11:09	14/02/2018 18:01:17	PrimaryKey
T_SNAP	TABLE	28/09/2017 14:16:37	16/01/2018 16:10:37	PrimaryKey
T_SNAP_FULL	TABLE	14/02/2018 15:13:56	14/02/2018 15:13:56	PrimaryKey

With the contribution of the LIFE Programme of the European Union

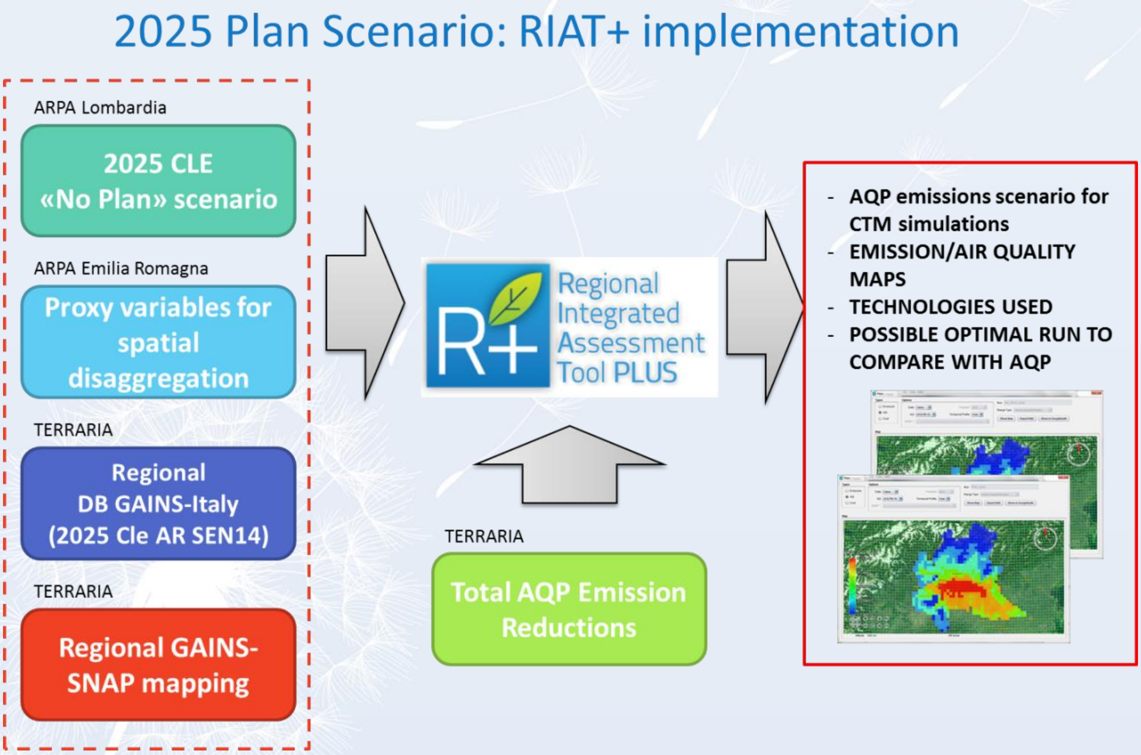
LIFE 15 IPE IT 013

prepAIR Po Regions Engaged to Policies of Air

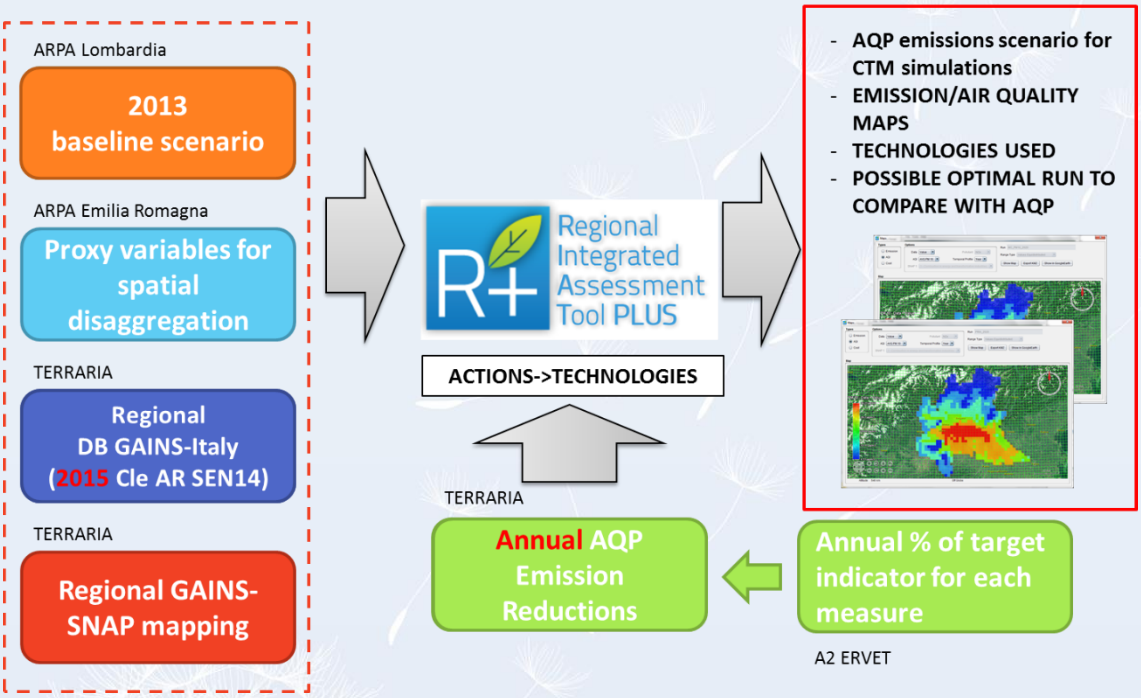
5. RIAT+ Input

The use of RIAT+ for two options (1) full AQPs + PREPAIR actions implementation on CLE2025 baseline and (2) yearly AQPs + PREPAIR actions implementation on 2013 inventory baseline allows the immediate analysis in terms of air quality of the measures adopted by the several AQPs and consequently supports their effectiveness monitoring and their eventual rearrangement.

Here below the two schemes for the two options of scenarios evaluation in RIAT+ (2025 Plan Scenario and Plan Monitoring) are reported explaining the possible applications of RIAT+.



Plan Monitoring: RIAT+ implementation



To support the previous evaluations two RIAT+ input have been prepared for each Region:

- Regional technological database (GAINS-Italy);
- Regional mapping between SNAP + fuel and GAINS-Italy.

5.1 DB GAINS

GAINS model (developed by IIASA) is used as part of the standard modeling framework for negotiations under the Convention on Long-range Transboundary Air Pollution and the European Union. ENEA, as technical experts to support the Environmental Ministry in the negotiation process, in collaboration with IIASA has decided to develop the GAINS-Italy model. The tool represents the first optimization tool that acts on a national scale where all the 20 Italian Regions are considered so providing many flexibility degrees.

In this contest, the SEN2014 scenario, based on the National Energy Strategy approved by the Italian Government in March 2013 and further refined in September 2013, has been regionalized and harmonized with 2010 (national and regional) inventories. SEN2014 scenario has been made available online as a public scenario. In RIAT+, it represents the basis for the emission projection and the calculation of the CLE scenarios for the years 2020, 2025 and 2030.

The DB GAINS in RIAT+ is an Excel file containing 7 sheets:

- *UM*: defines Activity Level Unit

- *SNAP*: establishes the name and the associated code for each SNAP
- *Sector*: contains the list of GAINS Sectors
- *Activity*: contains the list of GAINS Activity
- *Technology*: contains the list of GAINS Technology
- *Sector–Activity*. Fixes the association between sector and activity (with parameters: Unabated Emission Factor for the pollutants and Activity Level for the years considered)
- *Sector–Activity–Technology*. Fixes the association between activity and technology (with the parameters: Removal Efficiency for each pollutant, Application rate (CLE and potential, for the years considered and Unit Cost).

For each PREPAIR regions all the measure presented in GAINS-Italy SEN2014 scenario, has been downloaded and integrated in a regional RIAT+ DB-GAINS.

5.2 Mapping File

It is a txt file containing the correspondence between SNAP-fuel emission activity included in the regional inventory (2013 baseline scenario) and activity in GAINS-Italy SEN2014 scenario.

A Mapping file has been produced for each region.

ANNEX II: PRELIMINARY ASSESSMENT OF THE PO VALLEY EMISSION REDUCTIONS ON AIR QUALITY IN SLOVENIA

1. Preliminary assessment of the Po Valley emission reductions on air quality in Slovenia

In Slovenia the most problematic pollutants in terms of air quality are PM10 and O3. Widespread use of wood for domestic heating in technologically outdated stoves and boilers, together with low wind speed conditions and complex terrain, accompanied by pronounced long-lasting temperature inversions is supposed to be the main reason for measured exceedances of PM10. Po Valley emissions are expected to be the most significant source of secondary PM outside Slovenia, where the estimated contribution of secondary PM is typically around one third of Slovenian urban background sites. In case of O3 high levels in Slovenia typically relate to widespread Mediterranean episodes, with the highest O3 levels measured in Primorska region, located within the Northern Adriatic Basin west of Dynaric Alps. Part of Slovenia bordering the Italy in general experiences the most significant impact of trans-boundary pollution due to transport of polluted air masses with western winds from Po Valley over the Adriatic Sea towards Slovenia.

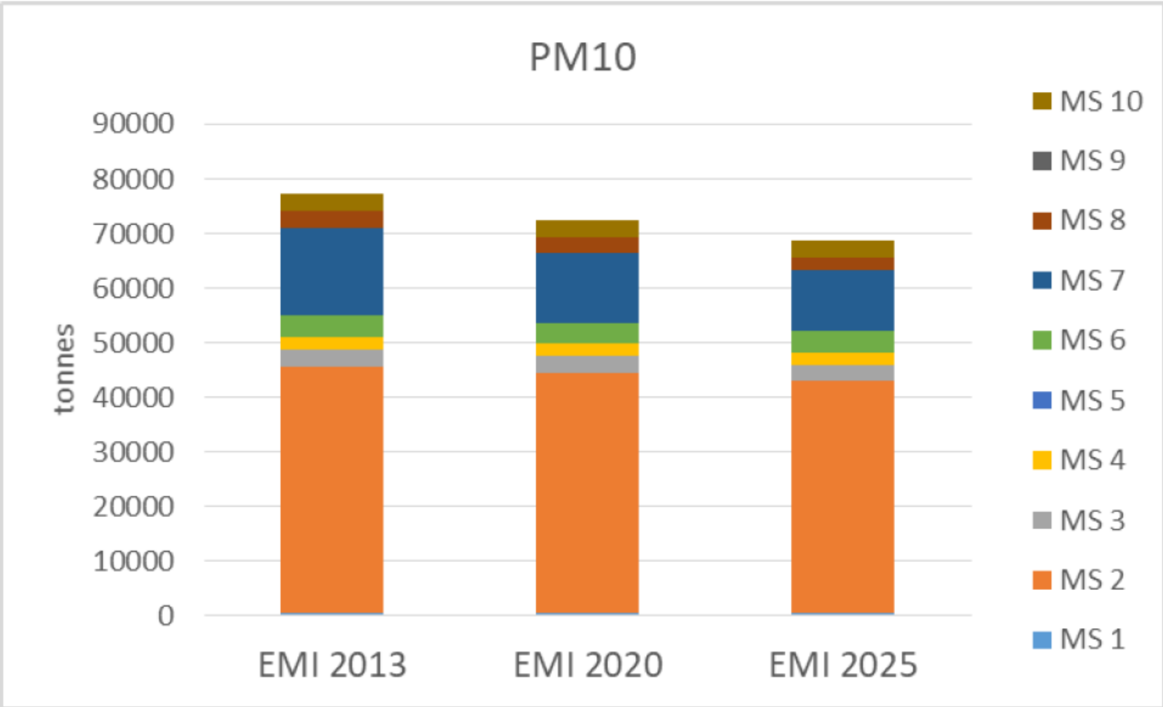
The purpose of this preliminary study is to provide the first estimate of air quality improvement in Slovenia due to emission reductions in Po Valley. The preliminary assessments have been done using ALADIN-SI/CAMx modelling system and SHERPA model. The models used are more in-depth described below.

1.1 Emission Scenarios

Impact of emission reductions in Po Valley on air quality in Slovenia was estimated using different scenarios, base case (EMI 2013) and estimations for emissions in the year 2020 (EMI 2020) and 2025 (EMI 2025). Estimations for emission in the year 2020 and 2025 are based on essential current legalisation (CLE) scenario.

Figures 10 and 11 show some additional information about emissions used for pollutants PM10 and NOx.

In the EMI 2020 scenario emission reductions with respect to base case EMI 2013 scenario are the following: 19% for NOx, 6% for PM10, 7% for PM2.5, 1.4% for SO2 and 13% for VOC. In the EMI 2025 scenario with respect to base case EMI 2013 scenario the reductions are 30% for NOx, 11% for PM10, 12% for PM2.5, 0.3% for SO2 and 15.2% for VOC.



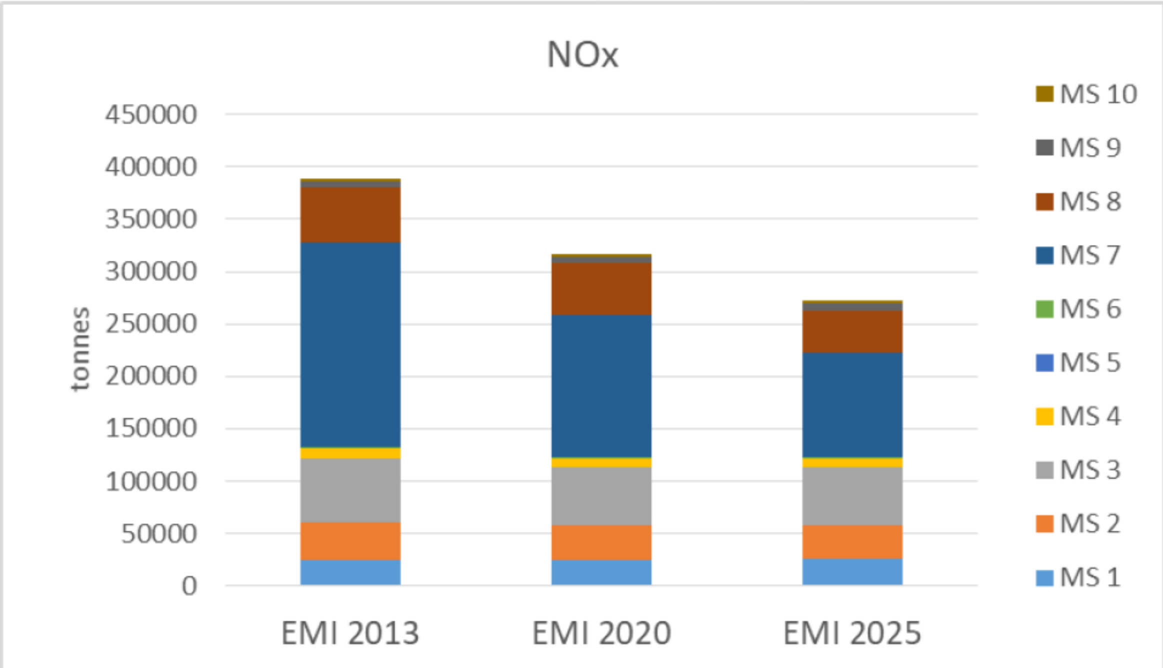


Figure 12 – Total emissions of PM_{10} and NOx in Po Valley for EMI 2013, EMI 2020 and EMI 2025 scenarios by macrosector.

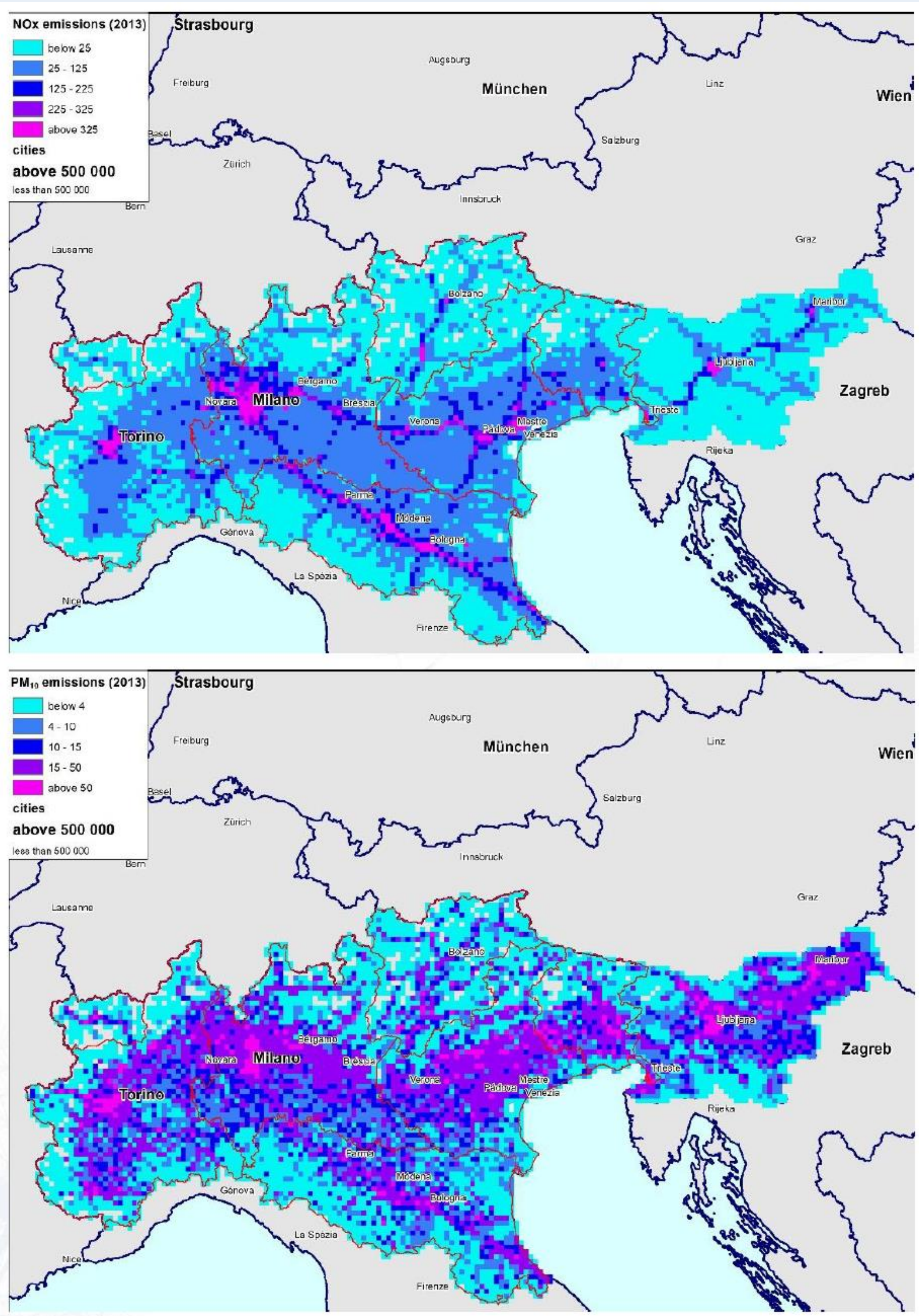


Figure 13 – NOx and PM10 emissions (Ton/Year) for EMI 2013 emission scenario

1.2 ALADIN-SI/CAMx air quality modelling system

ALADIN-SI/CAMx modelling system consists of chemical transport CAMx model (Comprehensive Air Quality Model with Extensions) coupled offline in 1-hour interval with the operational meteorological ALADIN-SI model. CAMx is an Eulerian model, able to simulate transport, dispersion, chemical transformations and deposition (dry and wet) of air pollutants.

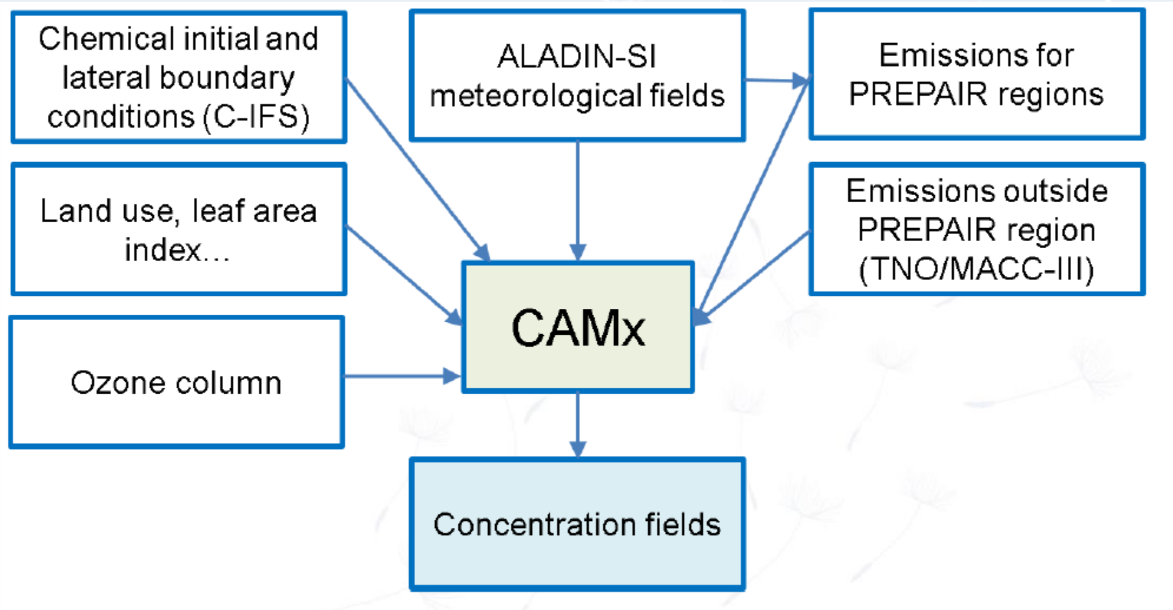


Figure 14– ALADIN-SI/CAMx Air Quality modelling system

Model setup is the following:

- Meteorology: ALADIN-SI model for January and July 2016;
- Chemical initial conditions: from previous run;
- Chemical boundary conditions: CAMS reanalysis from ECMWF;
- Emissions over Slovenia: National inventory for year 2013;
- Emissions outside PREPAIR area: European TNO-MACC-III;
- Chemical transport model: CAMx version 6.50;
- Chemical mechanism used: SAPRC07TC ("Toxics" version of SAPRC07, with additional model species to explicitly represent selected toxics species);
- Horizontal resolution: 4.4 km, 270 x 210 points;
- Vertical resolution: 68 levels, near ground resolution 20 m.

The following two emission scenarios for Po Valley are evaluated using ALADIN-SI/CAMx modelling system:

- EMI 2013
- EMI 2020.

1.2.1 Base case simulation EMI 2013

In order to estimate the impact of Po Valley emission reductions on air quality in Slovenia, simulations for two one-month periods, January 2016 and July 2016, were performed. January 2016 represents wintertime conditions with a significant number of PM_{10} exceedances measured at Slovenian urban background stations. Most of these exceedances over central Slovenia were accompanied by pronounced temperature inversion and predominately related to primary PM emissions trapped in complex topography. However, the impact of emission reductions on concentration levels is expected to be higher in the case of NO_2 (NO_x), for which the simulation results for January 2016 are presented.

In the year 2016 ozone levels were somewhat lower than usual with no exceedances of the information threshold measured in Slovenia. July was the month with highest O_3 mean and daily maxima measured in the year 2016. For that reason, July was simulated as month, representing high ozone pollution in Slovenia.

Figures below show simulated concentration fields of NO_2 and ozone, separately for entire modelling domain and Slovenia region only.

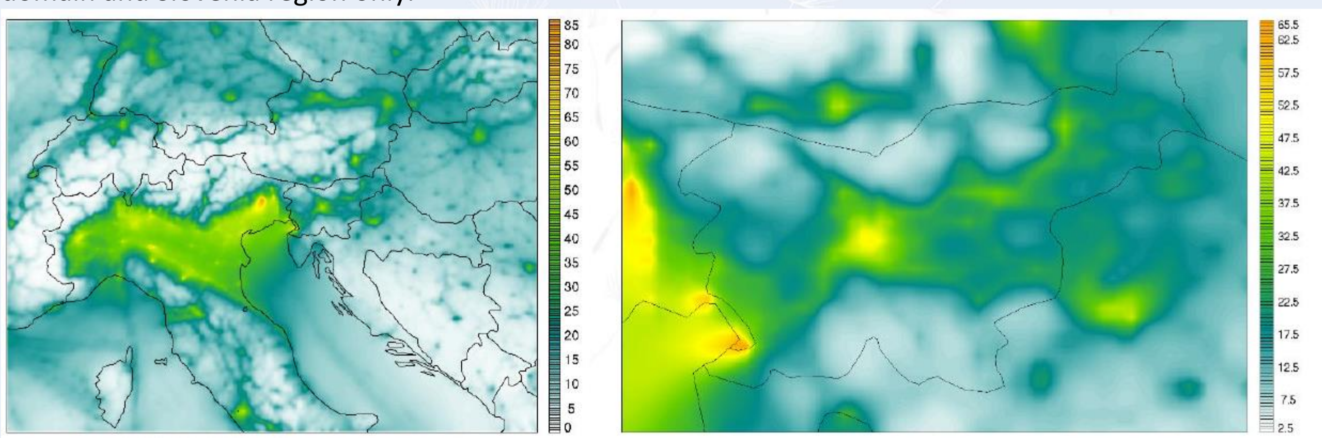


Figure 15–NO_2 average concentration (µg/m3) for EMI 2013 scenario in modelling domain (left) and Slovenia region (right), for January 2016

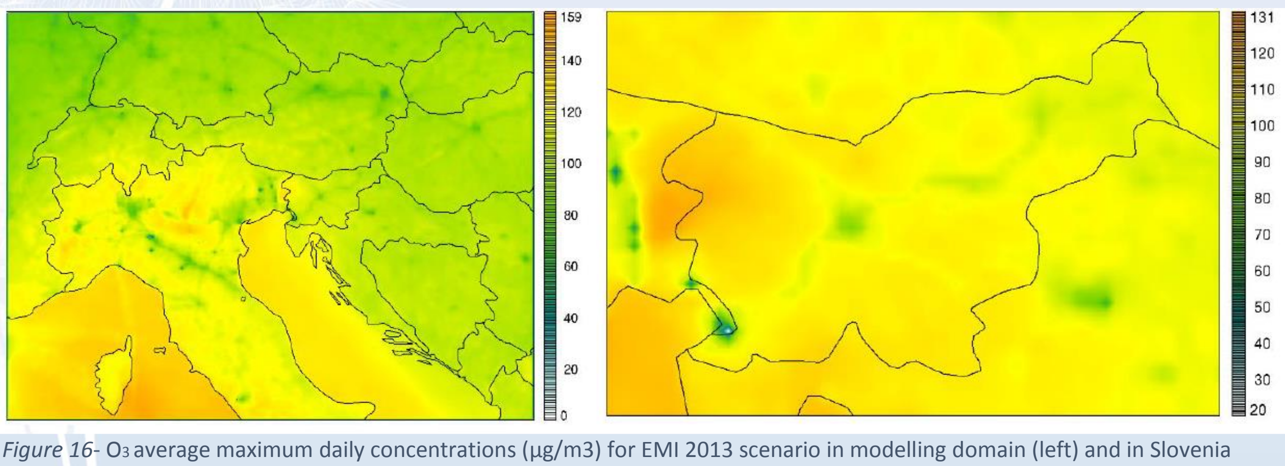


Figure 16- O_3 average maximum daily concentrations (µg/m3) for EMI 2013 scenario in modelling domain (left) and in Slovenia region (right), for July 2016

1.2.2 EMI 2020 scenario

Improved air quality in Slovenia is most notable close to the border in Primorska region. The maximum reduction of NO_2 is around 3.5 µg/m3 in Nova Gorica region. In general, the NO_2 reduction impact is covering mostly the area between Nova Gorica and Ljubljana. Transboundary impact of pollutant's reduction in Po Valley is almost negligible in the case of ozone. The ozone concentrations slightly increase close to the border.

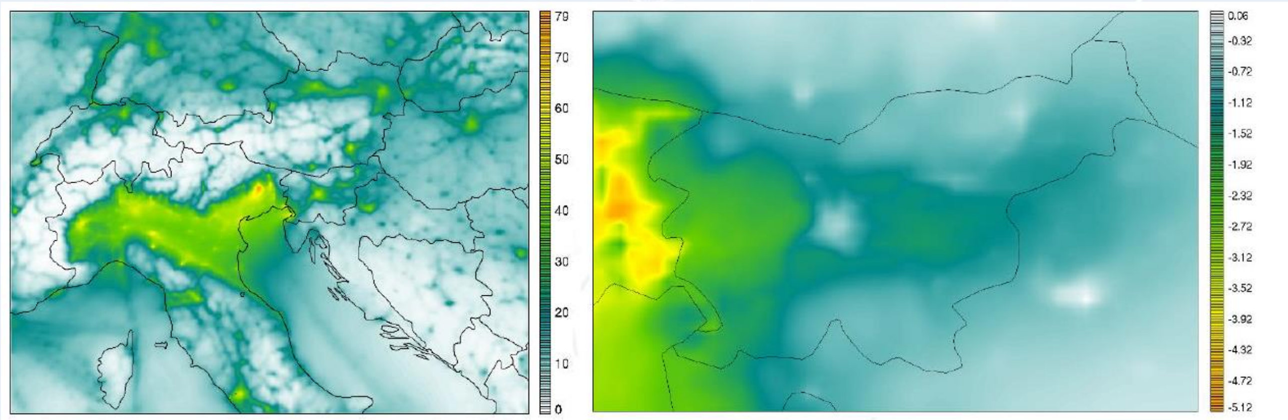


Figure 17–NO_2 average concentration (µg/m3) in EMI 2020 scenario in modelling domain (left) and difference between simulation EMI 2020 and 2013 in Slovenia region (right), for January 2016.

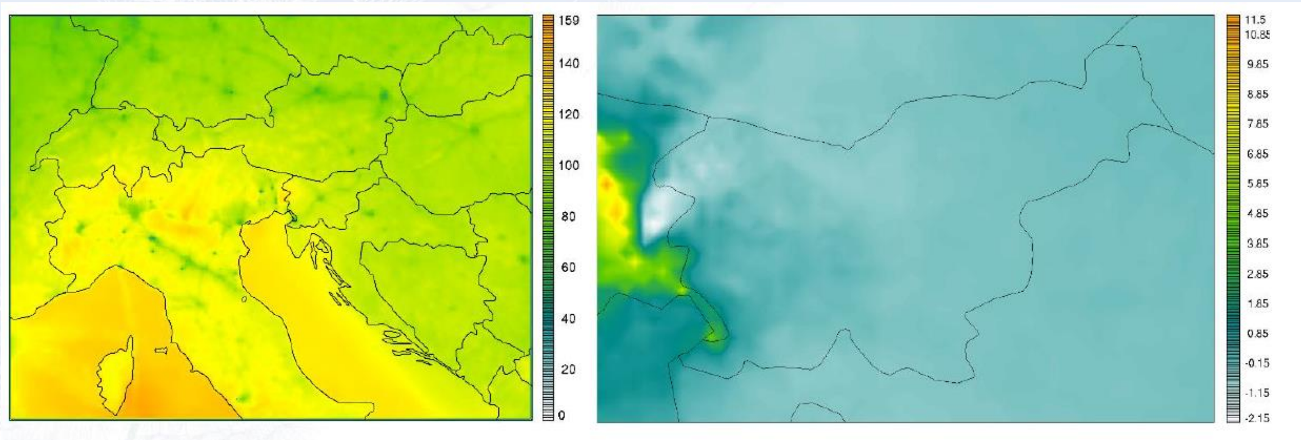


Figure 18- O_3 average maximum daily concentration (µg/m3) in EMI 2020 scenario in modelling domain (left) and difference between simulation EMI 2020 and 2013 in Slovenia region (right), for July 2016

1.3 SHERPA model

Calculations have also been performed using a SHERPA model with setup as originally released by JRC. It needs to be emphasized that SHERPA in its original configuration gives rather inaccurate results for Slovenia (e.g. in terms of source apportionment), which suggests that these results need to be considered as highly preliminary.

SHERPA consists of the following:

- Meteorology: year 2010;

- Emissions: original data for year 2010 are used in estimations for EMI 2013 and EMI 2025 scenarios;
- CTM model: CHIMERE, horizontal resolution 7 km.

The following two emission scenarios for Po Valley has been evaluated using the SHERPA model:

- EMI 2013
- EMI 2025.

The emission data built in SHERPA have been compared with EMI 2013 and EMI 2025 scenarios. Weighted reduction coefficients have been computed by SNAP sector for each pollutant and used in the scenario assessment module of SHERPA to get estimates for concentration levels in EMI 2013 and EMI 2025 scenarios.
Emission reductions applied in the regions of Po Valley impact air quality in Slovenia as presented in the figures below. In case of NO_2 30% emission reductions in Po Valley cause up to 7% reduction in concentration levels over near the border area in Slovenia. In case of PM_{10} due to emission reductions in Po Valley, including a 11% reduction of primary PM_{10}, concentration levels decrease up to 3% in Slovenia, with the highest improvement achieved near the borders. Result is similar for $PM_{2.5}$ levels.

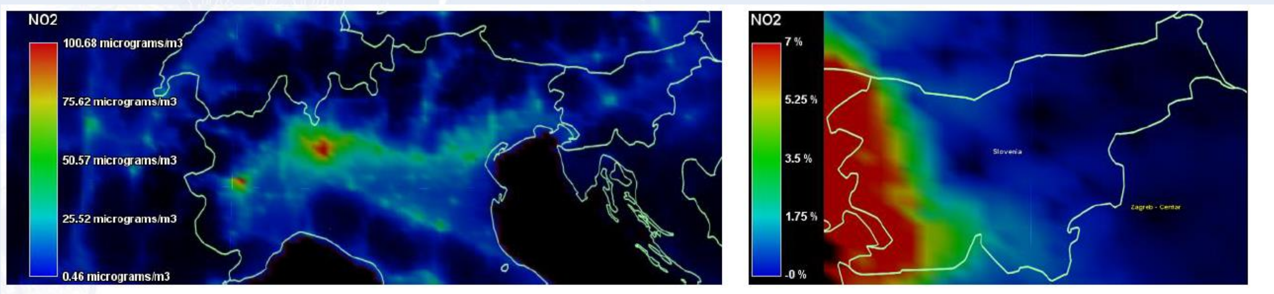


Figure 19- NO2 average concentration (µg/m3) according to EMI 2013 (left) and the predicted reduction of NO2 concentrations over Slovenia due to emission reductions over Po valley in the period between 2013 and 2025 (right).

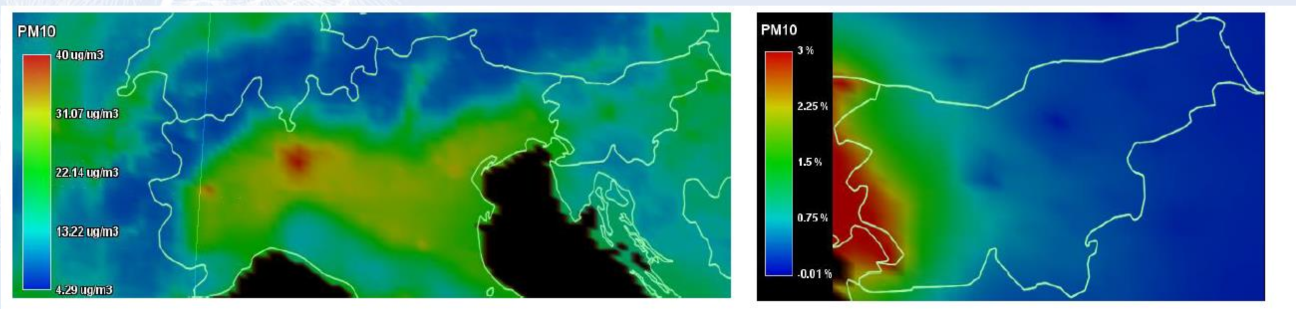


Figure 20- PM10 average concentration (µg/m3) according to EMI 2013 (left) and the predicted reduction of PM10 concentrations over Slovenia due to emission reductions over Po valley in the period between 2013 and 2025 (right).

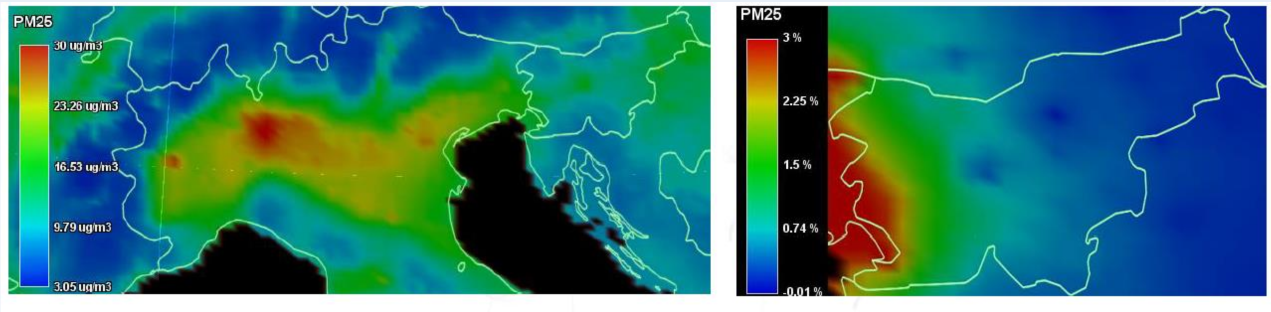


Figure 21- PM2,5 average concentration (µg/m3) according to EMI 2013 (left) and the predicted reduction of PM2,5 concentrations over Slovenia due to emission reductions over Po valley in the period between 2013 and 2025 (right).

With the contribution of the LIFE Programme of the European Union

LIFE 15 IPE IT 013

prepAIR Po Regions Engaged to Policies of Air

THE PROJECT PREPAIR

The Po Basin represents a critical area for the quality of air, as the limit values of fine powders, nitrogen oxides and ozone set by the European Union are often exceeded. The northern Italian regions re included in this area as well as the metropolitan cities of Milan, Bologna and Turin.

This area is densely populated and highly industrialized. Tons of nitrogen oxides, powders and ammonia are emitted annually into the atmosphere from a wide variety of polluting sources, mainly related to traffic, domestic heating, industry, energy production and agriculture. Ammonia, mainly emitted by agricultural and zootechnical activities, contributes substantially to the formation of secondary powders, which constitute a very significant fraction of total powders in the atmosphere.

Because of the weather conditions and the morphological characteristics of the basin, which prevent the mixing of the atmosphere, the background concentrations of the particulate, in the winter period, are often high.

In order to improve the quality of the air in the Po Valley, since 2005 Regions have signed Program Agreements identifying coordinated and homogeneous actions to limit emissions deriving from the most emissive activities.

The PREPAIR project aims at implementing the measures foreseen by the regional plans and by the 2013 Po Basin Agreement on a wider scale, strengthening the sustainability and durability of the results: in fact, the project involves not only the regions of the Po valley and its main cities, but also Slovenia, for its territorial contiguity along the northern Adriatic basin and for its similar characteristics at an emissive and meteoclimatic level.

The project actions concern the most emissive sectors: agriculture, combustion of biomass for domestic use, transport of goods and people, energy consumption and the development of common tools for monitoring the emissions and for the assessment of air quality over the whole project area.

DURATION

From February 1st 2017 to January 31 2024.

TOTAL BUDGET

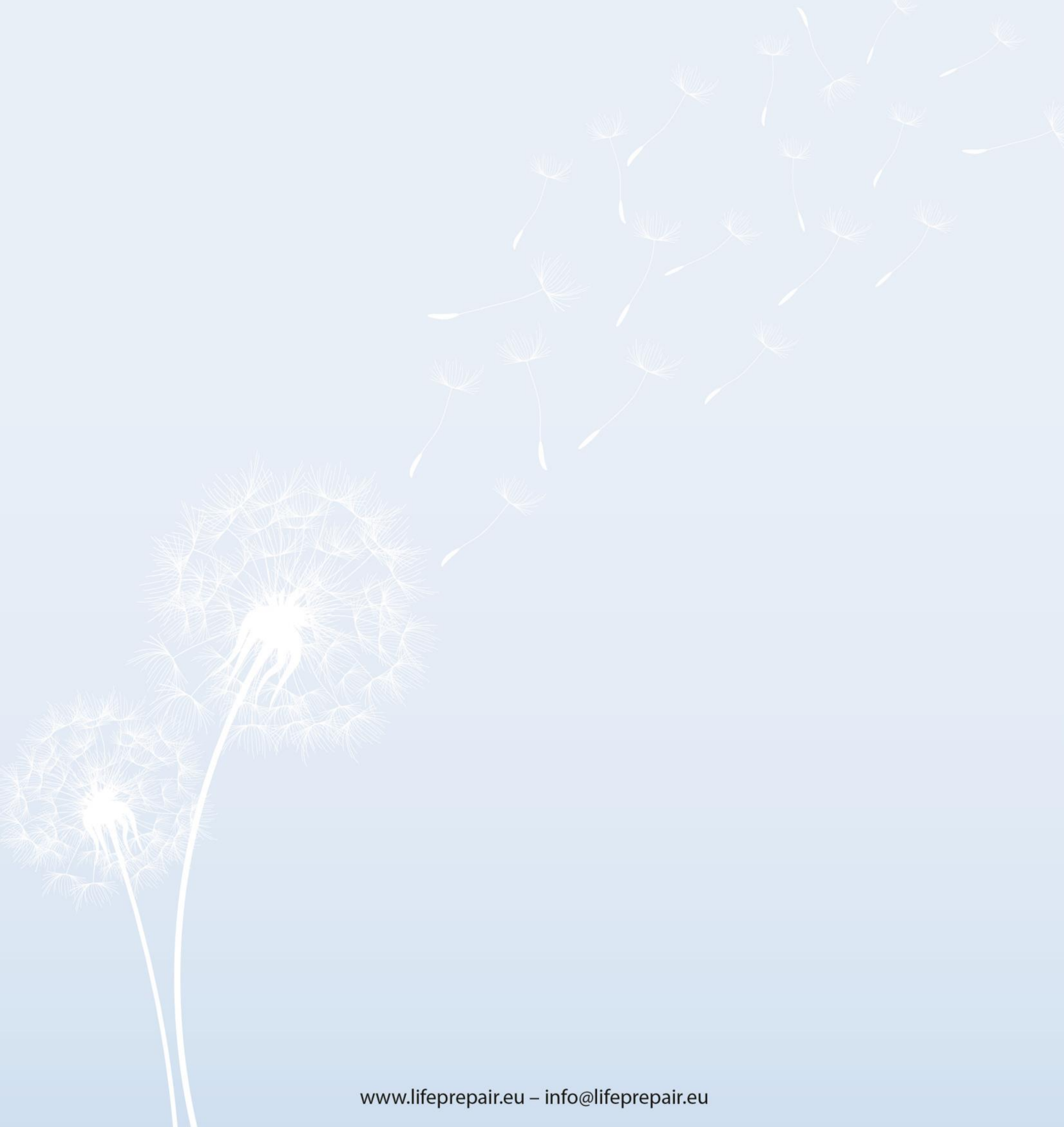
17 million euros available to invest in 7 years: 10 million of which coming from the European Life Program.

COMPLEMENTARY FUNDS

PREPAIR is an integrated project: over 850 million euros coming from structural funds and from regional and national resources of all partners for complementary actions related to air quality.

PARTNERS

The project involves 17 partners and is coordinated by the Emilia-Romagna Region – General directorate for the territorial and environmental care.



www.lifeprepair.eu – info@lifeprepair.eu

Regione Emilia-Romagna
Regione del Veneto
Regione Lombardia
Regione Piemonte
Regione Autonoma Friuli Venezia Giulia
Provincia Autonoma di Trento
arpae agenzia prevenzione ambiente energia emilia-romagna
arpav Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto
Arpa Piemonte Agenzia Regionale per la Protezione Ambientale
ARPA Lombardia Agenzia Regionale per la Protezione dell'Ambiente
ARPA Valle d'Aosta
arpa FVG
ARSO ENVIRONMENT Slovenian Environment Agency
Comune di Bologna
Comune di Milano
Città di Torino
ERVET Emilia-Romagna Valorizzazione Economica Territorio
FLA Fondazione Lombardia per l'Ambiente