1st OPERA ANNUAL CONFERENCE

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Opera

Operational Procedure for Emission Reduction Assessment

LIFE09 ENV/IT/000092 (2010-2013)

OPERA: PERSPECTIVE and REQUIREMENTS

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0. SUMMARY

1. Brief discussion of the aim of OPERA tool: RIAT+
2. Presentation of RIATdemo version with highlight on the main characteristics
3. Perspective and requirements: main addresses of development: RIAT – RIAT+

1. RIAT+: AN OPERATIONAL DSS

RIAT+ is the development of RIAT (Regional Integrated Assessment Tool – developed by University of Brescia and TerrAria for IES - JRC): an **open-source DSS** (decision support system) linking tabular, graphical and geographic data, **simulation and optimization models**, focused on the **local and regional spatial scale**, to **select effective (minimum cost) policies to control** population exposure to **primary and secondary air pollutants**.

RIAT+ an answer to legislation Dlgs 155/2010 - Directive 2008/50/EC (ambient air quality and cleaner air for Europe)

Art. 9

Piani e misure per il raggiungimento dei valori limite e dei livelli critici, per il perseguimento dei valori obiettivo e per il mantenimento del relativo rispetto

1. Se, in una o più aree all'interno di zone o di agglomerati, **i livelli degli inquinanti** di cui all'articolo 1, comma 2, **superano**, sulla base della valutazione di cui all'articolo 5, **i valori limite** di cui all'allegato XI, **le regioni e le province autonome**, nel rispetto dei criteri previsti all'appendice IV, **adottano un piano** che contenga almeno gli elementi previsti all'allegato XV (…) e **che preveda le misure necessarie ad agire sulle principali sorgenti di emissione** aventi influenza su tali aree di superamento ed **a raggiungere i valori limite nei termini prescritti**.

RIAT+: why a DSS tool?

• Transparency and tracking of the approach
• User friendliness of the system
• European/Italian sharing of database: technologies, policies and efficiency
• Use of common tool/methodology, integrating local knowledge (regional emission inventory, regional modeling system, regional budget limitation and opportunities …)

RIAT+ opportunities

• RIAT+ Application to two different Regions (Lombardy and Alsace) and interaction with all interested European Region
• RIAT+ direct development in strict contact with Regions technician will drive the improvements in the operational direction
- integration with national and European level (e.g. GAINS)
- integration with GHGs policies
- focus on the local decision problem

2. RIAT DEMO

RIAT is a stand-alone tool that sequentially guides the user by the folder approach. RIAT is developed on J2SE platform (java 2 standard edition), FORTRAN (pre- and post- processing) and MATLAB (optimization), DERBY for database and GOOGLE EARTH as GIS interface
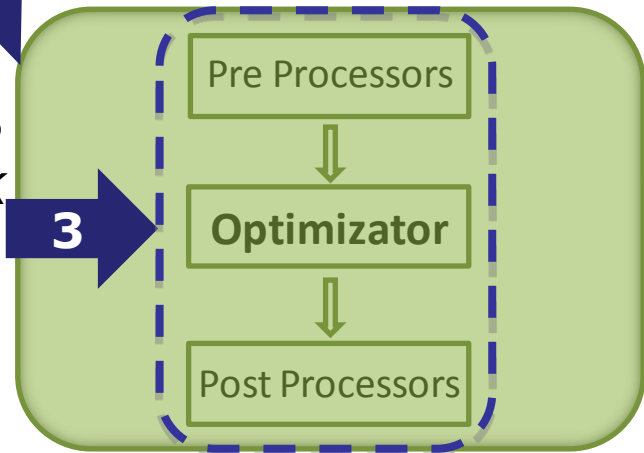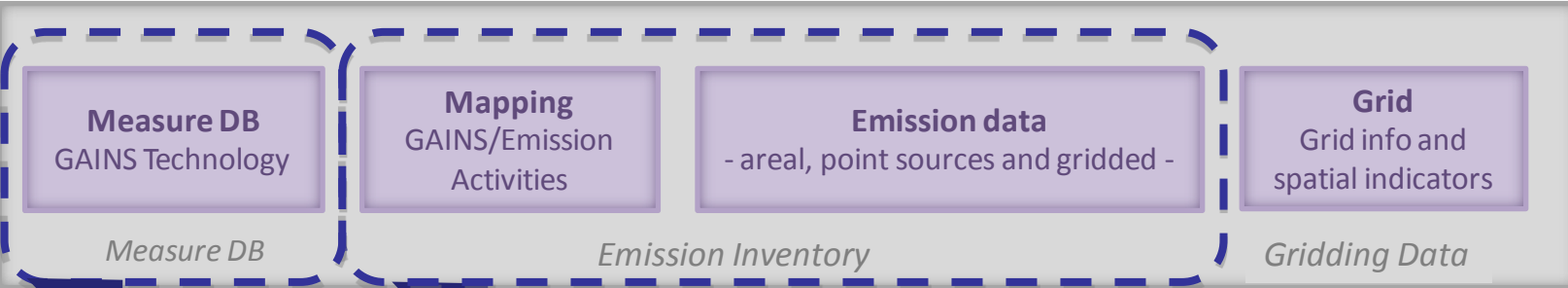
so mainly with open-source technologies

RIAT DEMO version is provided on **Lombardy domain**, **original data are masked** with a RND function
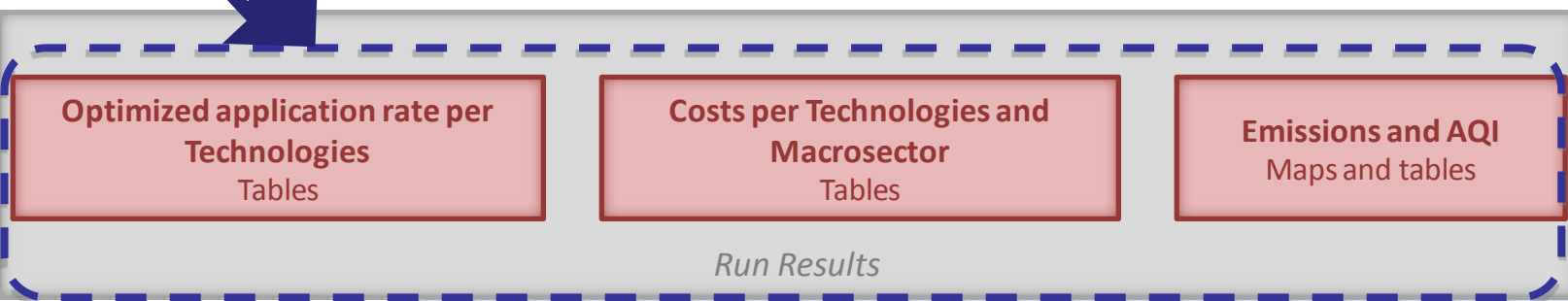
INPUT

Measure DB	Mapping	Emission data	Grid
GAINS Technology	GAINS/Emission Activities	- areal, point sources and gridded -	Grid info and spatial indicators
Measure DB	*Emission Inventory*		*Gridding Data*

2

1

SOURCE-RECEPTOR FUNCTION is the LINK between POLICIES and AIR QUALITY

3

Pre Processors

⇩

Optimizator

⇩

Post Processors

European Commission
Joint Research Centre
Institute for Environment and Sustainability

ies   Regione Lombardia

RIAT *demo version*

Regional Integrated Assessment Tool

Developed under a license of the European Union, Joint Research Centre by

DII, Università di Brescia (I) and TerrAria srl (I)

with consultancy of DEI - Politecnico di Milano (I) - and Les White Associates Ltd (EN)

OUTPUT

4

Optimized application rate per Technologies	Costs per Technologies and Macrosector	Emissions and AQI
Tables	Tables	Maps and tables
	Run Results	

3. RIAT+ PERSPECTIVES and REQUIREMENTS

Two main categories of requirements and development perspectives have been identified:

- Methodology/Functional: mainly linked to what and how RIAT+ compute
- System: linked to software architecture, performance and characteristics

RIAT+ should support local administrations (Regional stakeholders) in designing plans to comply with air quality standards as asked by the Commission. RIAT+ should link to EU assessment systems (i.e. GAINS and RAINS-Italy: national policies/priorities) and to regional air quality system.

Functional requirements: EMISSION

A specific part of RIAT+ should developed to provide more instruments for the emission (a part the gridding one):

- Format of CTM emission (CLE, MFR, OPT …) files
- Format of ANN emission scenarios (B, M, H and combination) files
- Flexible emission input files
- An estimate of the emission linked to the activity included in the optimization (dynamic link between CORINAIR (emission) and GAINS (technology)

Functional requirements: MEASURE

A specific tool for preparing NON TECHNICAL MEASURE should be provided

Substitution concept should be developed: it is a central point in action plan (in RIAT a dichotomy approach: no substitution – new tech could be applied only to NOC, substitution – new tech could be applied on obsolete tech). Tech lifetime and dismissing costs should be considered. A completely new approach is the application of the technology with the change of the fuel (meaning a change in the activity)

A specific link to regional policies should be provided: TRAFFIC is a key point at a local level (distinct policies on urban, rural and highway) while at EU is focus on EURO

GHGs policies and ex-post reduction should be included

Functional requirements: DECISION PROBLEM

In RIAT+ a specific procedure (SCENARIO MODE) should be implemented to let the user apply directly (without optimization) the technologies

ANNs should include all EU AQIs (i.e. PM10 number of exceedance), ANNs seasonality and spatiality could leave to a more strict link between emission and AQI

OPTIMIZATOR should include exposure concept (e.g. population weight)

Budget constraints per sector or per province will provide a more strict link to real decision way to proceed

Emission, cost and AQI output should be provided also at administrative level (municipality/province...)

System requirements:

RIAT+ compatibility with standard sw in input and output

RIAT+ should use an open-source approach

Optimization CPU time reduction should be provided (client & server approach)

Online application, sharing of databases (technical and non technical measures, GAINS mapping ...), FAQ ...

RIAT+ should be freely distributed and documented (help online, user guide, technical guide ...)

Thanks to all

Project set up

❑ Defines the project (file, comments and configurations)

❑ This helps the user to save standard configuration, that will be provided together with all relatives files to Lombardy

❑ Specifically the output manager tool is able to save and manage different kind of outputs

❑ **HELP is present in each window**

Emission inventory

❑ Loads EMISSION (areal - TABOUTPUT, point and gridded – outside Lombardy) and all the information about the emission inventory used (spatial unit, pollutants…)

❑ Defines MAPPING file that is the actual link between the emission inventory activity (SNAP) and measure DB (GAINS)

Gridding procedure

❑ Provides Grid information: origin, cell size, and proxy variables to lead disaggregation procedure

Measure management

This is one of the core module:

chooses activity (their measures) to be/or not used in the optimization

chooses activity (their measures) to be/or not considered replaceable (i.e. that could be substitued by more efficient measures)

introduces new measures and edits the existing ones

Run settings

It sets:

Optimization type: Multi-Objective (two steps procedures through PARETO curve and a C.E. run) or directly Cost-Effectiveness

Both procedures could be run with one or two AQIs

Area to be optimized (provinces, AQP zonization, altitude)

S/R models

Reference year (changing CLE – base case)

Output manager tool

Three different kind of outputs are provided to see the effectiveness of the optimized solution:

❑ spatial detail -> map

❑ measure detail -> table/figure

❑ synthetic information on the run output

Parameters mapped (values, absolute and relative difference):

Emission (total/macrosector)

Cost (total/macrosector)

AQI

Run results

❑ The system will manage different runs through a batch procedure to allow the user to compute different scenario without waiting for the end of each process

❑ All previous run associated with a specific project could be saved so that the user could explore also "historical" output, one advanced option is to start from a previous Pareto curve to save computing time

Output manager tool – Tool di gestione degli output

Le mappe mostrano le emissioni e gli AQI: è possibile visualizzare il valore del parametro, la differenza assoluta e relativa rispetto al cle; le emissioni di ciascun inquinante possono essere visualizzate per singolo macrosettore o totali.

È possibile scegliere tra diverse scale per una migliore rappresentazione del parametro.

Le tabelle sono dettagliate per attività/misura o SNAP1.

Il dettaglio per attività/misura permette di visualizzare la variabile di controllo ottimizzata (anche in formato "barra"), le emissioni ridotte e I costi totali e oltre il CLE;

Il dettaglio per SNAP1 permette di visualizzare per ciascun inquinante le emissioni iniziali e le relative riduzioni e il costo oltre il CLE.