



LAKS

Local **A**ccountability
for **K**yoto goal **S**

LIFE07 ENV/IT/000451

REPORT OF
INTERNATIONAL REVIEW

**TOOLS AND METHODOLOGIES FOR GREENHOUSE
GAS EMISSIONS (GHG) ACCOUNTING**

July 2009





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Preamble - Improvement requested (point 3 EC letter)

Please provide an explanation on the fact that action 2.1 was carried out in a different way compared to the project.

Please see Chapter 1 "Introduction", page 5

The report on the international review should be re-submitted with improvements. At least the following is deemed necessary:

- *precisions on the methodology used to complete the action*
Please see Chapter 3 "International review of environmental management and accountability tools and systems to estimate GHG emissions", page 9-10

- *a general overview of the theme*
Please see Chapter 3 "International review of environmental management and accountability tools and systems to estimate GHG emissions", page 9

- *and why you selected some criteria to analyse the reported methodology, systems, tools and projects, while rejecting the others*
Please see Chapter 5 "Evaluation of methodologies" page 43

In addition to the above points, a general revision was undertaken.



Summary

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1. INTRODUCTION

The present report comprises actions 2.1, 2.2 and 2.3 of the LAKS project: it aims to present the results of a survey of international good practices in terms of greenhouse gas emissions (GHG) accounting.

Objectives of this review were to:

- Consider as fundamental starting point European policies and commitments to promote energy savings and climate-friendly energy sources as confirmed by the 2007 Spring European Council;
- Identify studies and analyses of these studies as a starting point. Further collect and analyse different tools, methodologies and practices that could be useful for the definition of the system;
- Identify success factors emerging by the best practices in Europe in the field of commitment against climate change;

A desk research was carried out to identify some interesting initiatives/tools/systems to estimate GHG emissions, with a focus on methodologies applied at local level, because they appear to be of more added value for objectives of LAKS project. The research is based on:

- existing literature on the theme (including guidance documents and manuals of the tools)¹
- websites²
- contact with relevant experts on the theme³
- contact with scientific referees of the project⁴
- contact with project partners⁵

In detail, the activities foreseen were:

- 1) International review of methodologies to evaluate and account greenhouse gases emissions, to assess how they can be standardized and used for GHG emissions due to activities managed by LAKs or linked to local policies and plans;
- 2) International review of environmental management and accountability tools and systems, by collecting and critically analysing the most relevant models to estimate GHG emissions and by exploring tools and systems specifically developed to manage the environment and to make local authorities more accountable with their local environment.
- 3) Links with other EU Projects (Desk research of other EU projects whose results could be useful for designing the "climate accountability" system)

In particular, the first two chapters of the report refer to actions 2.1 and 2.2. Project team decided to focus the analysis on international evaluation methodologies (Ch. 2) and tools (Ch. 3) to account for GHG emissions. In Chapter 2 institutional methodologies are analysed (IPCC, UNFCCC and ISO14064), while in Chapter 3 tools and system applied at various administrative levels are taken into account as good practices. In the opinion of the project team the search for a new methodology

¹ see Chapter 7 for details

² information on every website visited reported in the text, when available

³ see Chapter 3 and 4 for details on persons contacted

⁴ in particular we would like to thank Dr. Giovanni Bizzarri of Faculty of Architecture of Ferrara University (giacomo.bizzarri@fastwebnet.it) for his useful suggestion in the review of the document

⁵ in particular for paragraphs 3.3, 3.4, 3.5, 3.9, 3.11, 3.14 and 3.15.



to account for greenhouse gas emissions linked or connected with local governments activities and planning, has to refer to the official framework analysed in Ch. 2 and could benefit for similar experiences developed by other organisations: so even if different to the original project structure, this design of the report appears to be more focused on the subject of GHG emissions. Chapter 4 analyses the link with other EU experiences, as foreseen in action 2.3 of the project. What is new in the report, in respect to the original structure of Action 2, is the last part (Ch. 5 “Evaluation of methodologies” and Ch. 6 “First results”). The aim of this last part is to create a link between Action 2 and Action 3 (Audit and Roadmap to the climate accountability system, which will define the model for accounting GHG at local level and the steps to be taken for its local application by partner cities): the methodologies reported in the document were discussed between partners during kick-off meeting and some key successful points were highlighted (see following table and Chapter 6 of this report), in order to define a shared structure for the model of accounting to be developed. The above link is useful not only at technical level, but also at management level, because partners could make next phases of the project more effective. Chapter 7 lists all references and sources of information used in the report.

Table - Synthesis of the key success factors emerged (see chapter 6)

- common framework/process (who does what, when and how) adapted to different local realities
- GHG inventory to measure past data and baseline scenario
- translation of policies into drivers and quantification of related emissions
- bottom-up methodologies are preferable, even if they could be difficult to implement;
- top-down methodology could be applied to obtain a first quick estimation;
- implementation of different levels of methodological complexity
- respect of international standard procedures and factors (IPCC)
- common procedures should be adopted in case of lack of data;
- the opportunity of certifying the process according to ISO 14064 should be explored
- monitoring and reporting is fundamental to make local policies more transparent.



2. INTERNATIONAL REVIEW OF METHODOLOGIES TO EVALUATE AND ACCOUNT GREENHOUSE GASES EMISSIONS

To date, the institutional instruments of reference for the accounting of GHG are represented by:

- Guidelines for the implementation of National Emission Inventories for Greenhouse Gas Intergovernmental Panel on Climate Change (IPCC).
- Methods of the United Nations Framework Convention on Climate Change (UNFCCC) designed for the mechanisms under the Kyoto Protocol (ETS, CDM, JI).
- International standard ISO14064, that defines specific guidance on the project level, and organization, for quantification and reporting of emissions of greenhouse gases and their removal

2.1 IPCC Guidelines for National Greenhouse Gas Inventories

The membership of each State to the UNFCCC, established in 1992, foresees the communication of national annual emissions of greenhouse gases. To provide a common standard to prepare national inventories, the IPCC (Intergovernmental Panel on Climate Change) has made since the 1991 Guidelines for the preparation of national inventories of greenhouse gas emissions, in collaboration with OECD (Organization for Economic Cooperation and Development) and IEA (International Energy Agency). The guidelines were subsequently revised in 1996 and 2006. They are divided into 3 volumes (Reporting Instructions, Workbook, Reference Manual) and contain suggestion on calculating emissions from the following source categories:

- Energy⁶
- Industrial Processes and Product Use⁷
- Agriculture⁸, Forestry and Other Land Use⁹
- Waste¹⁰.

In general, the Guidelines identify the different reference processes and for each of the processes identified specify the formulas for calculating the emissions from one parameter of production or activity. Emissions are then calculated by multiplying the parameter of activity and emission factor. With regard to the collection of data needed to construct the parameters of calculation, the Guidelines typically identify three possible levels of methodological complexity (called “tiers”), organised in a hierarchical structure, with higher levels implying increased accuracy of the method and/or emissions factor and other parameters used in the estimation of the emissions and removals. Basically, Tier 1 are the most simple for the calculation of emissions on the territory (and implies a lower accuracy estimation) and are based on default values provided by Guidelines, Tier 2 are similar but with country specific emission factors and other data while Tier 3 are more complex approaches or models.

⁶ CO₂ and non-CO₂ emissions from fuel combustion by source categories and emissions from fugitive sources (Coal Mining and Handling, Oil and Natural Gas Activities, Oil Refining).

⁷ GHG emissions produced from a variety of industrial activities which are not related to energy. The main emission sources are industrial production processes which chemically or physically transform materials (Cement, Lime, Ammonia, Soda production...).

⁸ GHG emissions from domestic livestock (enteric fermentation and manure management), rice cultivation (flooded rice fields), burning of agricultural residues and agricultural soils...

⁹ changes in forest and other woody biomass stocks, forest and grassland conversion, abandonment of managed lands, burning of forest/grassland conversion.

¹⁰ Emissions of CH₄ from solid waste disposal sites, CH₄ emissions from wastewater handling and N₂O from human sewage.



The IPCC guidelines are the reference methodological tool for the establishment of regional inventories (whether national, regional, provincial or municipal), being universally applicable the method of calculation used (*activity data x emission factor*), regardless of the specific territory analysed.

2.2 UNFCCC methodologies for the use of project-based mechanisms

The Kyoto Protocol, drafted in 1997 and came into force in 2005 under the UNFCCC, provides some mechanisms, called flexibility mechanisms, that countries can use to complement the national domestic measures for achieving the objectives of reducing emissions of greenhouse gases for which they are committed. Two of the three flexibility mechanisms (called CDM - Clean Development Mechanism and JI - Joint Implementation) provide for obtaining emission credits (CER - Certified Emissions Reductions and ERU - Emissions Reductions Units, respectively) that may be acquired by individual countries and taken off over the total emissions made within national boundaries. These emission credits can be traded on international credit markets.

In recent years international projects aimed to obtain credits for emission reduction has grown very rapidly, particularly with regard to CDM projects (projects achievable by industrialized countries/organizations in developing countries through a process of technology transfer). For the calculation of emission reductions achieved through the projects (to be validated for the subsequent certification and possible exploitation in the market) the UNFCCC has validated and adopted some official methods of calculation. These methods allow calculating the baseline for the project (or the amount of emissions associated with the related activities in the absence of the project to be carried) and the emission reductions achieved through the completed project. The methodologies for projects under construction can be submitted to the UNFCCC Executive Board for validation. Following validation, they are then inserted between the approved methodologies for the calculation of reductions. A proposing subject can then use one of the methods already available, if applicable, or develop and propose a methodology to be subjected to validation.

Currently, the approved methodologies are divided into four sections:

- Methodologies for CDM projects activities (methodologies for the definition of the baseline project and for monitoring the results of the project);
- Methodologies for projects of Afforestation and Reforestation;
- Methodologies for CDM projects (small scale);
- Methodologies for projects of Afforestation and Reforestation (small scale).

The methods are then divided according to the scale of the projects (large-scale projects plus small-scale ones, for which the method for calculating the baseline and monitoring should be more simple) and distinguish projects related to afforestation/reforestation by others, typically industrial-based or related to the energy production. In addition, it is also possible to check methodologies under consideration (and potential approval) of the CDM Executive Board.

The approved methodologies, in particular those related to small scale projects, are also the reference method used to validate the assertions concerning reduction of greenhouse gas emissions produced by household projects or projects not included (from a territorial point of view or temporal or other) in the scope of the mechanisms CDM / JI: this makes possible the recognition of voluntary emissions reductions (VER) and the possibility of exploiting them in the market.



2.3 International standard ISO14064

In March 2006 the ISO has published three standards (ISO 14064-1, ISO 14064-2 and ISO 14064-3) as the reference standard for quantification and reporting of emissions of greenhouse gases and their removal.

The standard ISO 14064-1 specifies principles and requirements at the organization level for quantification and reporting of greenhouse gas (GHG) emissions and removals. It includes requirements for the design, development, management, reporting and verification of an organization's GHG inventory. It includes the requirements for determining the boundaries of GHG, for quantifying GHG of an organization and their reduction or removal, for identifying specific actions or activities of an organization aimed at improving the management of greenhouse GHG. It also includes requirements for quality management of inventories, the communication of accountability, for the activity of internal audit and the responsibilities of organisation about verification activities. In summary, prefigures an organized management of GHG and of related reporting. The scheme outlined is composed of several stages:

- 1) design and development of GHG inventory (identification and aggregation of the organisation facilities, in order to identify direct and indirect sources of emission; selection of quantification methodology, selection and data collection, calculation of emissions and removals);
- 2) composition of GHG inventory (emissions and removals of GHG report; activities undertaken for the reduction / removal of GHG emissions; determination of the reference year (baseline) and development of the reference inventory; possible recalculation);
- 3) quality management of GHG inventory (procedures for management of information on GHG, registration procedures, procedures for record keeping);
- 4) report on GHG;
- 5) verification.

The standard ISO 14064-2 specifies principles and requirements and provides guidance at the project level for quantification, monitoring and reporting of activities intended to cause greenhouse gas (GHG) emission reductions or removal enhancements. It includes requirements for planning a GHG project, identifying and selecting GHG sources, sinks and reservoirs relevant to the project and baseline scenario, monitoring, quantifying, documenting and reporting GHG project performance and managing data quality. The requirements identified relate to different elements concerning:

- 1) project planning;
- 2) identification and selection of sources / absorbers / reservoirs of GHG;
- 3) monitoring, quantification, documentation and communication of performance of projects;
- 4) data quality management.

ISO 14064-2 shall be applied in an integrated manner with requirements, criteria, guidelines provided by legislation, best practices, programs reference.

The standard ISO 14064-3:2006 specifies requirements for selecting GHG validators/verifiers, establishing the level of assurance, objectives, criteria and scope, determining the validation/verification approach, assessing GHG data, information, information systems and controls, evaluating GHG assertions and preparing validation/verification statements.

Taken together the ISO 14064 set the standard for the verification and validation of third party inventory of greenhouse gases at the level of organization (ISO 14064-1) and to check the results obtained from international or domestic reduction of greenhouse gas emissions, even for granting certificates of voluntary reduction (VER). The requirements set by the rules can be used for specific



needs, or recalled in initiatives, campaigns, programs to reduce emissions that organisation can that voluntarily join in. This functionality is provided by the same rules, which define a "program for greenhouse gases" as "a system or scheme, voluntary or compulsory, of international, national or local level, that records, accounts or manages the emissions, the removal, the reduction of emissions or increases in GHG removal by reference to organizations or to projects related to greenhouse gas".



3. INTERNATIONAL REVIEW OF ENVIRONMENTAL MANAGEMENT AND ACCOUNTABILITY TOOLS AND SYSTEMS TO ESTIMATE GHG EMISSIONS

To respond to the challenge of climate change, the European Commission has set strict targets for the reduction of greenhouse gases (GHG). With the 2007 Spring European Council the EU adopted a new strategy which goes beyond Kyoto targets: the new objective is to reduce CO₂ emissions by 20% by 2020 (which is part of the well known 20-20-20 strategy).

In the above context, the role of Local Governments in monitoring GHG and acting to reduce them (and thus mitigate the effects of climate change) is fundamental. At European level two initiatives have to be mentioned: the Leipzig Charter on Sustainable European Cities of 2007 (that considers EU cities to be “*valuable and irreplaceable economic, social and cultural assets*”) and the launch of the Covenant of Mayors in 2008¹¹ (see paragraph 4.2 for more details). Many cities in Europe are willing to go beyond the new European targets and they are ready to prepare innovative and combined energy-climate policies and action plans. Any action to reduce GHG emissions at local level, however, requires that local governments have a good overview on the emission sources and the reduction potentials. Cities need appropriate tools to take a GHG emissions inventory and a lot of promising initiatives have been developed to support local policies on climate change.

Because LAKS project aims to develop a standardized accounting method for measuring GHG emissions that could support cities in their efforts towards EU targets (and beyond), learning from other experiences is invaluable.

Taking into account the above situation a desk research was carried out to identify some interesting initiatives/tools/systems to estimate GHG emissions, with a focus on methodologies applied at local level, because they appear to be of more added value for objectives of LAKS project. The present report is based on the best efforts of project partnership to search for relevant methodologies, even if it does not purport to be a complete research on this subject. Anyway, through the confrontation with other institutions dealing with similar issues (see chapter 4 for details), the authors believe that the most important experiences has been taken into account. As previously stated¹², the research is mainly based on the following phases:

- analysis of existing literature on the theme (including guidance documents and manuals of the tools)¹³
- websites
- contact with institutions and relevant experts on the theme
- contact with scientific referees of the project
- contact with project partners

The above phases lead to the collection of 15 experiences

To better compare the good practices identified, a common review form is used (see following table): this gave the possibility to immediately analyse synergies and differences of the tools. Some points could be highlighted:

¹¹ see paragraph 4.2 of the present report for more details.

¹² see chapter 1 of the present report for more details.

¹³ see chapter 7 for a list of documents analysed



- when describing the organisation that developed or applied the tool, particular importance is given to relevant contacts (name, telephone, email) that could be useful sources of further information;
- the same importance is given to the references and sources of information used to describe the methodology, in order to make possible the deepen of the analysis on a particular tool, if necessary;
- to point out pros and cons of each methodology, a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is used.

In particular, the following review form was used to describe the good practices analysed.

Name of the methodology	
<i>Name</i>	
Description of the Organisation	
<i>Who? Name, address, mission, contacts</i>	
Description of the initiative	
<i>What? Context, reasons and purposes</i>	
Evaluation and accounting of the emissions	
<i>How? Input data, output data, algorithm, dedicated software and copyright</i>	
SWOT Analysis	
Positive and negative factors in relation to Laks project	
Strengths	Weaknesses
<i>Attributes of the good practice that are helpful to achieving the objectives of Laks.</i>	<i>Attributes of the good practice that are harmful to achieving the objectives of Laks.</i>
Opportunities	Threats
<i>External conditions that are helpful to achieving the objective.</i>	<i>External conditions which could do damage</i>
Main References	
<ul style="list-style-type: none"> • <i>Main references and sources of information</i> 	



3.1 French Carbon Neutrality in EU Structural Funds

Name of the methodology
French Carbon Neutrality in EU Structural Funds
Description of the Organisation
<p>DIACT (Délégation interministérielle à l'aménagement et à la compétitivité des territoires) is an interministerial delegation of the French Government. It is in staff to support prime minister; it is located within the Ministry of Sustainable Development and Energy. It prepares promotes and coordinates the policies of land management by following the changes in the economy and supporting the competitiveness of the territories. It deals in particular with the evaluation and monitoring of Operational Programs (OPs).</p> <p>mr. Pascal Mignerey DIACT - Conseiller développement durable, transports et métropoles email: pascal.mignerey@diact.gouv.fr tel. +33 (0)1 40 65 11 91 web: http://www.diact.gouv.fr/</p> <p>mr. Johan Schram Energies Demain email: johan.schram@energies-demain.com tel. ++33 (0)1 42 87 23 27 web: http://www.energies-demain.com</p>
Description of the initiative
<p>French government established the neutrality of GHG emissions as a constraint to be respected in the planning of European Structural Funds. So in France the ratification of OPs depends on the evaluation of actions scheduled by OPs, in terms of CO₂ emitted and avoided. The government has developed and proposed to regions a specific tool to support evaluations (ex-ante and following ones). This software (called "NECATER") is intended to be functional for an evaluation carried out in a standard way via a not analytic methodology - in a first phase of the ex-ante - but functional to define a total balance in terms of CO₂ emissions generated by the Program. NECATER estimates the potential emissions of GHG starting from the financial shares allocated to the various measures envisaged in the plan. The software (which is copyrighted) was validated by MIES (Interministerial Mission for the greenhouse effect) and recognized by the government Agency for Environment and Energy Management agency (ADEME).</p>
Evaluation and accounting of the emissions
<p>It is required to break the OP into actions (chosen from a list) and to define the territorial boundaries of relevance, together with the financial profile (European funding, national public and/or private) and temporal (temporal coverage of the program, implementation, operation). For each action is then developed an outline of the additional emissions (or reductions in emissions) for each year. The calculation is done in simplified way, associating to the financial assistance</p>



provided (in euros) the corresponding profile in terms of emissions over time. It is important to note that NECATER evaluates the entire lifecycle of the project, which usually goes far beyond the period covered by the plan. The sum of the actions of the various policy areas (economic development, energy management, construction, transport, environment) defines the overall plan. The total of increases and reductions in emissions over the years makes it possible to identify the neutral (or positive or negative) character of the plan.

In a next stage, if more technical data are available, the software allows a more analytical and more precise calculation. The data taken into account are:

- for buildings, m² affected by the interventions, by type of use;
- for freight, km covered by the interventions, by type of infrastructure
- for transport of passengers, km affected by type of infrastructure and scope (e.g. urban, suburban)
- for energy, data on the amount of energy affected by interventions of energy efficiency interventions, replacing of traditional sources, etc...

Spatial information stored in the software database is connected to different types of predefined measures, in order to link the cost of intervention (e.g. Construction of infrastructure, buildings, etc...) to the size and use of what developed: in this way it is possible to estimate emissions of GHG through this kind of parameters. Through this mechanism it is possible to identify the correlation between the unit cost of infrastructure and the relative emission coefficient: the GHG emissions related to the intervention are thus available through the financial resources provided for it.

SWOT Analysis

Positive and negative factors in relation to Laks project

Strengths	Weaknesses
<ul style="list-style-type: none"> • The method allows an overall assessment of the program in terms of GHG emissions • It is a decision support tool 	<ul style="list-style-type: none"> • The software requires a strong database at local scales • It is not clear the relationship between the cost of action and GHG emissions derived
Opportunities	Threats
<ul style="list-style-type: none"> • The approach related to the assessment of GHG emissions linked with the decisions could be replicable 	<ul style="list-style-type: none"> • The method is designed for regional Programs and not for Municipality Action Plans a plan • The software is copyrighted

Main References

- DIACT, Energies Demain (2007) *Neutralité carbone des Contrats de Projets État Régions 2007-2013. Méthodologie de calcul des émissions avec l'outil NECATER CPER version 1.1*
- DIACT, Energies Demain (2008) *NECATER PO. Prise en main de l'outil*
- Energies Demain (2008) *Analyse et interpretation des resultats d'une modelisation sous NECATER*
- Foirry JP (2008) *Bilan ex ante de la "neutralite carbone" du PO FEDER 2007-2013 en Auvergne (à partir de la nouvelle version de NECATER pour les PO FEDER)*
- Ministère de l'Écologie et du développement durable (2007) *Neutralite carbone des CPER*



3.2 Local Authority CO₂ emissions estimates in UK

Name of the methodology
CO ₂ emission evaluation of local authority in GB
Description of the Organisation
DEFRA (Department for Environment, Food and Rural Affairs) is the English Public Body for the Environment. DEFRA is providing assistance both to the central government and Public Authorities for the Program of the United Kingdom on Climate Change.
DEFRA- Environment Statistics Service e-mail: enviro.statistics@defra.gsi.gov.uk
Description of the initiative
DEFRA developed a methodology to estimate GHG emissions of a Local Authority. The methods are the same used for national inventories, except that input data are represented by end users consumptions, more than sources of emissions. The outputs are represented by tonnes of CO ₂ emitted. The level of disaggregation necessary for a local inventory requires that some components are calculated in a different way than the methods applicable to a national scale. Another interesting initiative launched by DEFRA is a campaign for educating the public on greenhouse gas emissions deriving from households and traffic. The campaign is called Act on CO ₂ and allows citizens to calculate, via an online software, their carbon footprint.
Evaluation and accounting of the emissions
The sectors considered in the estimation of GHG emissions are the following: industrial and commercial (electricity use, gas use, oil and solid fuel use, waste, agricultural processes and fuel use, off road machinery) household (electricity use, gas use, oil and solid fuel use, home and garden machinery), transport (road transport, railways), land use and forestry. About the input data, in some cases, the component is directly measured, while in other cases, data on activities at local levels are not available and so it is common to go on applying a coefficient proportional to the national data, based on the inhabitants or of other proxy. Obviously this method is less precise. As for CO ₂ emissions from energy consumption, the proposed approach suggests to replace the emission factors representative of the national energy mix with other appropriate to local sources of energy. Data on fuel consumption are derived from national values, applying a coefficient proportional, both for domestic consumption and for industries. Emissions from agricultural activities are estimated from national values, whereas the cultivated area or the number of machinery used, depending on the component in question. Same approach is adopted for gardening equipment. Road transport emissions are calculated from an estimation of the number of vehicles per kilometre circulating on local roads. In calculating the CO ₂ must be kept in mind a number of variables: type of fuel (petrol or diesel), vehicle type, vehicle age, type of engine (Euro 1, Euro 2, etc.). For the railways, the number of circulating trains per km of rail is considered and emissions depend on the engine, that can be electric or diesel. For land use and forestry (absorption of CO ₂), the data is calculated based on the area affected by forest surface or change



in land use. Of course, the above methodology relies on the availability of robust national data.	
SWOT Analysis	
Positive and negative factors in relation to Laks project	
Strengths	Weaknesses
<ul style="list-style-type: none"> • The method is specific for local GHG balances • Input data are well described and suggestions are given on how to get them 	<ul style="list-style-type: none"> • Different quality of the data (it depends on the model of measurement)
Opportunities	Threats
<ul style="list-style-type: none"> • It can be used to calculate a territorial baseline 	<ul style="list-style-type: none"> • Methodology specific for UK: sources used to calculate the emissions are not the same for the different countries
Main References	
<ul style="list-style-type: none"> • DEFRA Department for Environment, Food and Rural Affairs (2008) <i>Local Authority CO2 emissions estimates 2006. Methodology Summary</i> • DEFRA Department for Environment, Food and Rural Affairs (2008) <i>Local Authority CO2 emissions estimates 2006. Statistical Summary</i> • DEFRA Department for Environment, Food and Rural Affairs (2008) <i>Local and Regional CO2 Emissions Estimates for 2005 - 2006 for the UK</i> • DEFRA Department for Environment, Food and Rural Affairs (2008) <i>UK Climate Change Programme: Annual Report to Parliament July 2008</i> 	



3.3 ICLEI International Local Government Greenhouse Gas (GHG) Protocol

Name of the methodology
International Local Government Greenhouse Gas (GHG) Protocol
Description of the Organisation
<p>ICLEI Local Governments for Sustainability is an international association of local and regional authorities whose key aim is to promote sustainable development through local actions. ICLEI works with hundreds of local authorities cooperating in projects and environmental campaigns. In particular regarding GHG issue, ICLEI launched the campaign "Cities for Climate Protection (CCP)", that have been supported by over 800 local authorities; its principal aim is to assist cities in adopting policies and quantifiable measures to reduce GHG emissions, to improve air quality and enhance the liveability and urban sustainability.</p> <p>ICLEI - GHG Protocol Team e-mail ghgprotocol@iclei.org.</p>
Description of the initiative
<p>Local governments join the Cities for Climate Protection (CCP) campaign by passing a resolution pledging to reduce greenhouse gas emissions from their local government operations and throughout their communities. To help cities achieve their goals ICLEI developed a protocol to help local governments to carry out inventory of local GHG emissions. It describes calculation methodology to quantify emissions using data generally available, in agreement with the main international references:</p> <ul style="list-style-type: none"> • IPCC 2006 methodological changes; • ISO 14064 • UNFCCC • World Resources Institute • World Business Council for Sustainable Development <p>The building of the inventory is structured following two different fields of interest:</p> <ul style="list-style-type: none"> • Local Government Operations: emissions related to the actions performed by local authorities (buildings, vehicles, etc.). • Community Scale: issues regarding the community living in the area managed by the local authority
Evaluation and accounting of the emissions
<p>The GHG Protocol is based on five milestones:</p> <ol style="list-style-type: none"> 1) Conduct a baseline emissions inventory and forecast, based on energy consumption and waste generation, for a base year (e.g. 2000) and for a forecast year (e.g. 2015). The inventory and forecast provide a benchmark against which the city can measure progress. 2) Adopt an emissions reduction target for the forecast year. The target both fosters political will and creates a framework to guide the planning and implementation of measures. 3) Develop a Local Action Plan., that describes the policies and measures that the local government will take to reduce greenhouse gas emissions and achieve its emissions reduction



target. Most plans include a timeline, a description of financing mechanisms, and an assignment of responsibility to departments and staff. In addition to direct greenhouse gas reduction measures, most plans also incorporate public awareness and education efforts.

4) Implement policies and measures, contained in Local Action Plan. Typical policies and measures include energy efficiency improvements to municipal buildings and water treatment facilities, streetlight retrofits, public transit improvements, installation of renewable power applications, and methane recovery from waste management.

5) Monitor and verify results on the implementation of measures to reduce or avoid greenhouse gas emissions. Monitoring begins once measures are implemented and continues for the life of the measures, providing important feedback that can be use to improve the measures over time.

The five milestones provide a flexible framework that can accommodate varying levels of analysis, effort, and availability of data. In particular 3 levels of methodological complexity (*tiers*) are proposed, depending on the information available: the first is the basic method, usually regarding the country scale in relation to IPCC, the other two involve the availability of more data. The methodological complexity is expressed both for the calculation of emission factors and for the search of activities data.

The methodology is similar to what is required by IPCC guidelines for the construction of national inventories e.g. $ACTIVITY DATA \times EMISSION FACTOR = GHG EMISSIONS$. Regarding the fields of application the IPCC macro-sectors are taken into account to do the inventory of emissions. ICLEI suggests more sectors, divided for “government operations emissions” and “community scale emissions”.

SWOT Analysis

Positive and negative factors in relation to Laks project

Strengths	Weaknesses
<ul style="list-style-type: none"> • Specific for a local CO2 balance • Standard methodology (IPCC) • Choice between 3 levels of methodological complexity (tiers) • Baseline and reduction target • Management Process 	<ul style="list-style-type: none"> • As an international methodology needs to be tailored to local level • Software is copyrighted
Opportunities	Threats
<ul style="list-style-type: none"> • Benchmarking (international std) • Available software for support 	<ul style="list-style-type: none"> • Need territorial data

Main References

- ICLEI (2008) *International Local Government GHG Emissions Analysis Protocol. Release version 1.0*



3.4 DESGEL PROGRAM Energetic Diagnostic and Climate Change Emissions Accountability

Name of the methodology
DESGEL PROGRAM Energetic Diagnostic and Climate Change Emissions Accountability
Description of the Organisation
<p>Barcelona Provincial Council (Diputació de Barcelona) is a local government institution that promotes the progress and welfare of the public within its territorial boundaries: currently the province of Barcelona, a network of 311 municipalities, works directly by providing services and, above all, by co-operating with the councils.</p> <p>mr. Enric Coll Diputació de Barcelona - Oficina Tècnica de Sensibilització, Divulgació i Participació Ambiental email: collge@diba.cat tel. +34 93 402 22 22 ext 37212 web: http://www.diba.cat/directori/Directori_Detall.asp?Id=156</p>
Description of the initiative
<p>More than 80 local authorities in Catalonia signed the Covenant of Mayors and begin the process to prepare a Sustainable Energy Action Plan (SEAP). The Diputació de Barcelona with its Environment Department and the townships members of the Network of Cities and Towns for Sustainability (Xarxa de Ciutats i Pobles cap a la Sostenibilitat) offered its technical and economic support to local authorities to prepare their SEAPs. The first chapter of a SEAP includes the GHG emissions evaluation and DESGEL is the computer program created to assist local authorities with the work of developing energy planning strategies to reduce the use of non-renewable energy resources and pollutant gas emissions.</p>
Evaluation and accounting of the emissions
<p>DESGEL is an analysis tool to identify the main sectors to which apply a SEAP and to monitor the local energetic and GHG emissions behaviour and trends. It is designed for municipal work, with a specific methodology and structure allowing local authority data to be entered, added and exported using a simple computer interface. The program, which is available and free, enables local authority technicians to perform calculations, exchange data and represent municipal balances and indicators numerically and graphically. It also facilitates delivery of a clear picture of municipal energy and CO₂ emissions. The DESGEL program stores all historical data entered into it, so facilitating analysis of historical trends for indicators, balances, flows and variables: an essential preliminary step towards identifying local energy priorities and defining action plans and specific measures, with the aim of later integrating them into a municipal strategic energy plan.</p> <p>Using the municipal data required by the program, and via a simple structure of files classified into sectors, the software automatically calculates municipal energy balances and indicators, CO₂ emissions, waste generation and treatment, and water consumption.</p> <p>The results obtained from operating the DESGEL program are designed to be of use to municipal</p>



<p>environmental departments, and to councillors and mayors who require a tool to monitor municipal progress with regard to energy questions and CO2 emissions, waste or water. Summing up, the main characteristics of DESGEL are:</p> <ul style="list-style-type: none"> • Evaluation of local energy consumption. • Support on energetic and climate change planning. • Implementation and periodic monitoring. • Analysis significant indicators trends. • Evaluation of main goals achievement on saving, energy efficiency, renewable energies and greenhouse gases reduction. 	
<p>SWOT Analysis</p>	
<p>Positive and negative factors in relation to LAKs project</p>	
<p>Strengths</p> <ul style="list-style-type: none"> • Supports local energy planning • Good analysis tool to identify main GHG emissions sectors. • Automatic reports generator • Common calculation methodology allows time & space benchmarking • Software is free 	<p>Weaknesses</p> <ul style="list-style-type: none"> • High amount of variables (333) to be introduced hand made • Need all variables to calculate • Heavy interface, problems with slow computers.
<p>Opportunities</p> <ul style="list-style-type: none"> • New evolved version is in preparation, based on knowledge applications • Monitoring of waste generation and treatment, and water consumption (not only GHG emissions) 	<p>Threats</p> <ul style="list-style-type: none"> • Need (a lot of) territorial data to calculate energy balances and indicators
<p>Main References</p> <ul style="list-style-type: none"> • Diputació de Barcelona (2008) <i>Local Mitigation and Adaptation to Climate Change - A Catalogue of Proposals</i> • Coll E (2009) <i>DESGEL Program: Energetic Diagnostic and Climate Change Emissions Accountability</i>. Presentation for LAKs launch seminar, 6th May 2009, Reggio Emilia 	



3.5 ECO2-Regio

Name of the methodology
ECO2-Regio
Description of the Organisation
<p>The Climate Alliance of European Cities is Europe's largest city network for climate protection and aims for the preservation of the global climate. Presently more than 1400 cities, municipalities and districts as well as provinces, NGOs and further organisations (in Austria, Belgium, Bulgaria, Czech Republic, Denmark, France, Germany, Hungary, Italy, Luxembourg, Netherlands, Poland, Slovak Republic, Slovenia, Spain, Sweden and Switzerland) are members of Climate Alliance.</p> <p>The Climate Alliance European Secretariat Galvanistr. 28, D-60486 Frankfurt am Main tel: +49-69-717139-0 fax: +49-69-717139-93 email: europe@climatealliance.org web: http://www.klimabuendnis.org/</p> <p>Alleanza per il Clima Italia Dr. Karl-Ludwig Schibel tel./fax +39 075 8554321 email: coordinamento@climatealliance.it web: www.climatealliance.it</p>
Description of the initiative
<p>In 2006, Climate Alliance's General Assembly enacted a new CO₂ reduction target of cutting CO₂ emissions by of 10% every 5 years. The important milestone of halving per capita emissions (baseline year 1990) shall be achieved at the latest in 2030. In the long-term, Climate Alliance members aim at a sustainable level of 2,5 tons CO₂ equivalent emissions per capita and year by energy saving, energy efficiency and the use of renewable energy sources. As a calculation tool to monitor the reaching of the objectives, Climate Alliance chose the software ECO2Regio, developed by Ecospeed SA (Zurich).</p>
Evaluation and accounting of the emissions
<p>ECO2-Regio is an accounting and decision support tool for energy consumption and associated CO₂-emissions on a regional scale. The software is developed by Ecospeed SA and it is copyrighted. Regions can be flexibly defined, depending on the user's needs. A region may be a community, a city, a metropolitan region, a state or a nation. The tool is tuned to the needs of persons working in institutions and organisations dealing with energy and climate issues, e.g. energy planning or greenhouse gas emission inventories.</p> <p>The tool calculates sectoral consumptions of households, economy and transportation. Users can define scenarios by varying regional population, workforce, floor-space and transportation (mileage) dynamics. Allows simulating the impact of policy measures on regional energy</p>



consumption. Furthermore, effects of restoration activities in the building sector and of increases in the energy efficiency of household, industry and transportation technologies can be assessed. Against that background, users can also model medium- and long-term impacts of measures of climate and energy policies.

The software is characterised by the following features:

- National data as basis for calculating regional energy consumption and CO2 emissions.
- National data are scaled down to regional consumptions with the help of per capita indicators relating to household demand, and demands within economic and transportation sectors.
- The per capita indicators and the regional population and employment figures allow to calculate the regional energy consumption
- All available local/regional data can be used to replace/calibrate the default data.
- All cities/regions use the same boundary data, the same conceptual framework, and the same calculation algorithms.

Lots of applications are foreseen, both monitoring and forecasting:

- Performance control of energy and climate policy measures (declaration tool).
- Plausibility checks of existing energy and CO2 balances.
- Harmonization of data across regions and cities.
- Benchmarking between and cumulative output from different regions/cities.
- Monitoring of regional CO2 emissions.
- Checking for differences between bottom-up and top-down approaches.
- Fast and easy production of figures, graphics and reports for presentations.
- Information about regional energy and CO2 trends on the basis of national indicators relating to energy consumption dynamics, economic and demographic development, and technological trends.
- Assessment of policy measures to achieve future goals.

SWOT Analysis

Positive and negative factors in relation to LAKs project

Strengths	Weaknesses
<ul style="list-style-type: none"> • Specific for a local CO2 balance • Shared web-platform and simple methodology, tuned to the needs of local officers • Widespread in Germany and Switzerland (about 200 Loc Gov) 	<ul style="list-style-type: none"> • Software is copyrighted
Opportunities	Threats
<ul style="list-style-type: none"> • Methodology for scaling down national/regional data to local level to fill gaps • Benchmarking and Scenario analysis 	<ul style="list-style-type: none"> • Need territorial data (but only to deepen the analysis) • Need territorial penetration

Main References

- Ecospeed SA (2009) *What is ECO2Regio?* Ecospeed SA website (<http://www.ecospeed.ch>)
- Schibel KL (2009) *Bilancio di energia e CO2 per Comuni ed Enti territoriali: Il software basato su web ECO2RegioIT*. Presentation for R. Emilia Energy Plan Seminar, 26th March 2009, Reggio Emilia



3.6 RINA Guidelines to certify voluntary initiatives on GHG emissions

Name of the methodology
Guidelines to certify voluntary initiatives on GHG emissions
Description of the Organisation
<p>RINA, certification body working in the fields of environment and Public Administration. RINA Group business activities consist in offering certification, verification, control, assistance and consultancy services to economic and institutional operators, aimed at improving the safety and quality of their products, processes and services. RINA with the technical support of CESISP participated in projects to certificate initiatives aimed at the reduction of GHG emissions, ran by local authorities. It worked out guidelines to validate voluntary initiatives and to get a VER (verified emissions reduction) by public organization. This is an opportunity for public authorities to join a voluntary emission trading scheme.</p> <p>Paolo Teramo Head of Coordination and Technical Control e-mail: Paolo.Teramo@rina.org phone: +39 010 5385306 mobile: +39 335 6997717</p>
Description of the initiative
<p>RINA has developed a guideline for the validation of voluntary initiatives and development of VER (Verified Emission Reduction) from the organizations. This possibility is also open to local authorities and aims to enable them to enter into a voluntary exchange of emission credits (which is different from the ETS market - mandatory for companies identified by national legislation). The document is currently still in draft form.</p> <p>The guideline allows validating greenhouse emission reductions related to a project or organization. The validation report contains the following information:</p> <ul style="list-style-type: none"> • a description of the activity, scenarios or organizational boundaries of the project on GHG; • the assertion on the part of the GHG responsible for which evidence of validation or verification was performed; • the source, the absorption and / or reservoirs of GHG; • the types of GHG; • the period or time covered by the assertion; • the criteria for validation and verification identified; • a description of whether the data and information supporting the assertion relating to GHG are hypothetical, extrapolated and / or historical ones; • a conclusion, including any reservation or limitation, which ensures the expected user, with reasonable level of assurance, that the assertion relating to GHG does not contain material errors, omissions or representations that are not true. <p>If successful, RINA issues a statement of verification, which quantifies the emissions reduction and the relevant time period.</p>



Evaluation and accounting of the emissions	
<p>Methodologies approved by the guidelines are in accordance with:</p> <ul style="list-style-type: none"> • United Nations Framework Convention on Climate Change (UNFCCC); • Procedures, Guidelines, Regulations, Decisions and Clarifications UNFCCC; • Kyoto Protocol; • The Marrakech Accords; • Methods and procedures for the Clean Development Mechanism (CDM); • Arrangements and procedures for CDM project activities of small scale; • IETA Manual for the validation and verification; • ISO 14064 standards. <p>The types of projects eligible correspond to the categories of small-scale CDM. For the choice of baseline and monitoring requirements, methodological rules may be inferred from the Strategic Environmental Assessment (SEA).</p>	
SWOT Analysis	
Positive and negative factors in relation to Laks project	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Method thought to be applied also at a local level • Compliant with international standards • Economic valorisation of the initiatives carried out 	<ul style="list-style-type: none"> • The algorithm is complicated • Input data are not clear.
Opportunities	Threats
<ul style="list-style-type: none"> • Develop an accounting of emissions deriving from actions scheduled by a plan 	<ul style="list-style-type: none"> • Expensive for local authorities
Main References	
<ul style="list-style-type: none"> • RINA (2008) <i>Linea guida per la validazione e la verifica delle asserzioni volontarie relative i gas serra</i> 	



3.7 Local Authorities for Kyoto

Name of the methodology
Local Authorities for Kyoto
Description of the Organisation
<p>Kyoto Club NGO was founded in 1998. It consists of societies, bodies, associations and local administrations committed on achieving aims of GHG emissions reduction in compliant with Kyoto Protocol. To pursue these goals Kyoto Club promotes dissemination and initiatives on energy efficiency, renewable sources and sustainable mobility.</p> <p>Kyoto Club - Enti Locali per Kyoto (in Italian) http://www.kyotoclub.org/EELL_ET/index.htm</p>
Description of the initiative
<p>The project, developed in the years 2005-2007, has received a financial contribution by the Ministry of the Environment and the collaboration of Italian Provinces and Municipalities (UPI, ANCI) and Agenda 21 in Italy. The project is aimed at testing in Local Authorities the mechanisms for emissions trading of GHG, system which is currently open only to organizations in the industry. The project focuses on issues relating to the management of buildings (schools and other buildings) and the car fleet belonging to the Local Authorities.</p> <p>The output of the project were:</p> <ul style="list-style-type: none"> • a proposal amendment of the ETS Directive • a national plan for allocating emission allowances to take account of Local Authorities • a methodology of accounting for GHG generated by the Local Authorities • an analysis of the state of the market for trading GHG (carbon market). <p>The project was attended by numerous Local Authorities, some as "partners", who participated actively in the implementation of the project, and others as "observers".</p>
Evaluation and accounting of the emissions
<p>As mentioned, the methodology is limited to GHG emissions related to buildings (schools and other buildings) and the car fleet. To define the baseline the methodology considers the annual consumption four sectors: fuel for heating in buildings, fuel for transport, electricity and heat from district heating. The baseline is calculated in terms of CO₂ emitted in the reference sectors, both in absolute (t CO₂/year) and relative (t CO₂/m³ building or CO₂/km routes) value. The shift from the amount of fuel / energy carrier used to CO₂ emissions is made on the basis of emission factors approved by existing legislation. The sum of the individual baseline is then the total baseline emissions. Reduction targets were calculated, in respect with the baseline, taking into account the Italian National Plan for GHG Reduction. Reduction targets express, for each of the four sectors, what is the reduction in emissions the Local Authority want to obtain.</p> <p>The system also takes into account there may be new sources of emissions, i.e. new buildings or vehicles owned by the Local Authorities.</p>



SWOT Analysis	
Positive and negative factors in relation to Laks project	
Strengths	Weaknesses
<ul style="list-style-type: none">• This method is thought to be applied in local authorities• The methodology and the data needed are clear	<ul style="list-style-type: none">• The emissions accounting are calculated only referring to real estate and vehicular fleet
Opportunities	Threats
<ul style="list-style-type: none">• This method can be used to develop an accounting of emissions deriving from actions scheduled by plans	<ul style="list-style-type: none">• It refers only to few sectors
Main References	
<ul style="list-style-type: none">• Kyoto Club, Ambiente Italia, FEEM, ERM (2007) <i>Progetto Enti locali per Kyoto - Documento di sintesi</i>• Kyoto Club, Ambiente Italia, FEEM, ERM (2007) <i>Progetto Enti locali per Kyoto - Le fasi di raccolta dati - Consumi ed interventi</i>• Kyoto Club, Ambiente Italia, FEEM, ERM (2007) <i>Progetto Enti locali per Kyoto - Il piano di assegnazione</i>• Kyoto Club, Ambiente Italia, FEEM, ERM (2007) <i>Progetto Enti locali per Kyoto - La proposta di direttiva</i>	



3.8 Observatory for Kyoto - Toscana Region

Name of the methodology
Observatory for Kyoto - Toscana Region
Description of the Organisation
<p>In 2004 Tuscany Region and Biometeorology Institute of CNR (Italian National Research Centre) enabled the Kyoto Observatory, an integrated project to monitor the balance of carbon dioxide (emissions) and launching of decision support and information tools. The Kyoto Observatory was established to value scientific research in the field and support regional planning on the themes of the Kyoto Protocol, in order to respect the constraints and exploit the opportunities. With the Project, Tuscany Region proposes itself as an active player and innovator in the development of local policies, combining the objectives of reducing anthropogenic emissions of carbon dioxide with its model of regional development.</p> <p>Tuscany Region – Osservatorio Kyoto web: www.osservatoriokyoto.it e-mail: info@osservatoriokyoto.it</p>
Description of the initiative
<p>Project goals:</p> <ul style="list-style-type: none"> • to develop regional accounting absorptions of CO₂ emissions by means of innovative technologies capable of measuring carbon flows and assess the balance of emissions and absorptions; • to inform and sensitize the population and local authorities on the regional strategy linked to the Kyoto Protocol and to promote, therefore, a direct participation in the definition of a model for the management and use of territory in coordination with Agenda 21 programs and sustainable development policies; • to provide support to regional policies in achieving the emissions reduction targets.
Evaluation and accounting of the emissions
<p>The Observatory enables the drawing up of a CO₂ emissions balance, annually or monthly and by municipality. The Annual balance is represented by a mapping of emission and absorption at the level of municipality and the corresponding balances (defined as the difference between emissions and absorptions). The Seasonal balance is represented by a mapping of municipal budgets monthly (12 monthly maps of the regional budget). The Municipality balance is the scaling down of regional balance at municipality level, in terms of total emissions (linear, point and diffuse) and absorptions for each municipality of Tuscany in the years of IRSE regional inventory (1995-2000-2005). For each municipality a table with the following fields is calculated: Surface, Forest Area, Total emissions, Emissions punctual, linear and diffuse, Power consumption, CO₂ Budget.</p>



SWOT Analysis	
Positive and negative factors in relation to Laks project	
Strengths	Weaknesses
<ul style="list-style-type: none">• Method thought for a local CO₂ emissions balance• Also the absorptions are taken into account (not only emissions)	<ul style="list-style-type: none">• Data used for the representation of GHG emissions are not explained
Opportunities	Threats
<ul style="list-style-type: none">• The method can be used to develop the municipal baseline (starting from regional data)• Cartographic system• Estimations of Plans' effects can be derived	<ul style="list-style-type: none">• Territorial data are needed• The method requires the evaluation of GHG emissions linked to the policy choices
Main References	
<ul style="list-style-type: none">• Regione Toscana, IBIMET-CNR (2004) <i>Osservatorio Kyoto - Il bilancio di CO₂ nella Regione Toscana</i>	



3.9 Microkyoto Project in Bologna Province

Name of the methodology
Microkyoto Project in Bologna Province
Description of the Organisation
Bologna Province, with its Agenda 21 Office. Caterina Alvisi Provincia di Bologna Settore Ambiente – Ufficio Agenda 21 tel.: +39 051/6598469 fax: +39 051/6598810 Email: caterina.alvisi@provincia.bologna.it
Description of the initiative
<p>The project objective is the description of the contribution of Municipalities in the Province of Bologna to the implementation of the actions of the Environmental Energy Plan (and indirectly to achieving the goals of the Kyoto Protocol), through the identification of appropriate methods of calculation and communication, in coordination with the provisions from Local Action Plan drawn up to Local Agenda 21 Forum.</p> <p>In addition to initiatives for training and the involvement of local stakeholders, the initiative proposed to the municipalities a direct commitment. This commitment has been reflected in the signing of a political agreement to reduce GHG (the "Protocol of Microkyoto"), through which the municipalities are committed to annually realise actions to reduce emissions, in particular:</p> <ul style="list-style-type: none"> • energy efficiency measures in public buildings (optimization of consumption and diversification of energy supplies); • interventions on green areas; • interventions on transport; • other measures for the development and implementation of environmental and energy policies; • information and awareness activities. <p>from a list annexed to the Protocol itself.</p> <p>For each type of intervention a template with indication of the technical parameters and formulas to be used for the calculation of emission reductions achieved has been prepared (in collaboration with the University of Bologna). Each municipality has been able to calculate the reductions achieved and communicate the description of the action, for the preparation of a special good practices database, available on-line. The Province of Bologna has performed the role of coordinator of the network of participating municipalities, providing organizational and technical support necessary for the compilation of templates and the inclusion of good practices in the database.</p>
Evaluation and accounting of the emissions
The technical templates developed for the calculation of the results of emission reductions achieved have been developed, when possible, based on the methods of quantification of energy



<p>savings (the so-called “white certificates”) published by the Italian Authority for Electricity and Gas (AEEG). In these cases the result obtained in TEP, is translated into tons of CO₂ equivalent, considering the composition of the national energy mix and the generation of CO₂ per unit of energy produced by different sources. The list of possible good practice matches then, in a first version, the list of actions planned by AEEG (http://www.autorita.energia.it/ee/schede.htm - in Italian).</p> <p>It should be emphasized that the ad hoc developed formulas do not correspond to recognized methods of calculation possible, such as methods for the UNFCCC CDM projects (for example, for reforestation activities), more complex and therefore more difficult to apply by local officers. In all cases, the templates state the methods of calculation and sources of technical parameters used as reference.</p> <p>In addition to actions listed, it is possible to implement actions that do not provide a quantification of the reductions related, but they are still listed because likely to be communicated, for example:</p> <ul style="list-style-type: none"> • Promotion of trade fairs, events and show-room • Creation of bicycle lanes (km) or pedestrian areas (m²) • Purchase of buses on methane / electric 	
SWOT Analysis	
Positive and negative factors in relation to Laks project	
<p>Strengths</p> <ul style="list-style-type: none"> • Method thought to be applied by local authorities • The emission accounting methodology is easy to apply 	<p>Weaknesses</p> <ul style="list-style-type: none"> • The GHG emissions accounting methodology is not standard • The coordinating function is expensive • Methodology accounts only for savings
<p>Opportunities</p> <ul style="list-style-type: none"> • This methodology can be used to account the emissions reduction deriving from actions scheduled by a Municipality 	<p>Threats</p> <ul style="list-style-type: none"> • The transferability to a local scale can refer only to a few sectors
Main References	
<ul style="list-style-type: none"> • Provincia di Bologna (2007) <i>Progetto Microkyoto - Censimento delle buone pratiche di riduzione dei gas climalteranti dei comuni aderenti a Microkyoto</i> 	



3.10 PALK Lombardia

Name of the methodology
PALK (Local Actions Plans for Kyoto) in Lombardia Region
Description of the Organisation
Lombardia Region (General Direction Quality and Environment), with the technical support of CESTEC and Kyoto club. Regione Lombardia DG Environment Anelisa Ricci http://www.ambiente.regione.lombardia.it qualita_ambiente@regione.lombardia.it
Description of the initiative
Local Authorities of Lombardia Region may voluntarily adhere to PALK initiative (Local Action Plans for Kyoto), which undertake to draw up an action plan and the resulting emissions reductions. The plan can be articulated on the basis of 21 groups of already set up actions. The actions are divided into six main categories, consistent with the regional Action Plan for Energy (PAE). S.I.R.E.N.A. is the regional informative tool used, by local authorities, to build the action plans. This system is divided in 4 areas <ul style="list-style-type: none"> • data analysis - visualization of data of energy consumption and greenhouse gas emissions at local level (currently available data for years 2000 to 2004), based on top-down regional and local data; • PALK policies - building of the structure of the Action Plan, through a database of 21 preset actions. For each action, a specific form allows you to enter the parameters needed to describe the size of the intervention and then calculate the energy savings and associated reduction in emissions • ex-ante evaluation of PALK policies, in physical units - overview that summarizes the total savings and emission reductions associated with the plan. The results of the action plan are presented in terms of: energy production from renewable sources (thermal and electrical) in kWh/year, electricity and thermal energy savings in kWh/year, CO2 saved in tons CO2/year; • ex-post evaluation of PALK policies - monitoring of the effectiveness of policies implemented and, if necessary, setting up of corrective actions.
Evaluation and accounting of the emissions
The calculation of emissions reduction is realised starting from energy savings associated with PALK actions, based on the parameters required by the system. The calculation of energy savings, when possible, is conducted using the methodologies specified by Italian Authority for Electricity and Gas (AEEG) for "white certificates". In any case, the reference methodology for each action is not clearly explained. The actions that can be chosen to compose the PALK are 21; each action requires different input data for the calculation of emission reductions achieved). Among the others we can cite:



<ul style="list-style-type: none"> • implementation of the district heating network (n. of housing units connected); • installation of CHP systems - cogeneration and trigeneration (kW); • high efficiency boilers (n. boilers replaced); • installing solar thermal panels (m2 installed); • solar photovoltaic (total installed power in kWp); • CO2 Absorption through interventions of reforestation (reforested area in ha). • ... <p>Once created the PALK with data input, the system automatically proceeds to the evaluation of the potential of the planned measures, in terms of increased production from renewable sources, reducing energy consumption and emissions of pollutants.</p>	
SWOT Analysis	
Positive and negative factors in relation to Laks project	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Method thought for local authorities • Useful to evaluate GHG emissions linked to a plan or program • The set of actions available facilitates the development of action plan • Monitoring of the effects of the plan 	<ul style="list-style-type: none"> • Estimations of GHG emissions are not rigorous and the calculation methodologies are not clear
Opportunities	Threats
<ul style="list-style-type: none"> • Informative system available for energy balance 	<ul style="list-style-type: none"> • Need of territorial data • Building the plan on the basis of a fixed set of actions could be constraining
Main References	
<ul style="list-style-type: none"> • Regione Lombardia (2008) <i>L'esperienza dei piani di azione locale per Kyoto</i> • Regione Lombardia, Punto Energia (2007) <i>Piano d'azione per l'energia</i> • Regione Lombardia, Punto Energia (2007) <i>Piano d'azione per l'energia - Schede d'azione</i> 	



3.11 INEMAR (Inventory of Emissions in Air)

Name of the methodology
INEMAR (Inventory of Emissions in Air)
Description of the Organisation
<p>The Inventory is realised by Lombardia Region, in cooperation with ARPA Lombardia. Lombardia is the leader of a consortium among Italian Regions (Emilia-Romagna, Veneto, Piemonte, Friuli-Venezia Giulia, Puglia, Province Autonome di Trento e Bolzano) that are sharing a working path to develop INEMAR.</p> <p>Regione Lombardia- DG Environment Arpa Lombardai http://www.arpalombardia.it/inemar/eng_inemarhome.htm</p> <p>Arpa Emilia-Romagna - SIMC Marco Deserti mdeserti@arpa.emr.it Simonetta Tugnoli stugnoli@arpa.emr.it Veronica Rumberti vrumberti@arpa.emr.it</p>
Description of the initiative
<p>INEMAR (Air Emissions Inventory) is a database designed to realise an inventory of air emissions, or to estimate the emission level of pollutants (SO_x, NMVOC, CO, N₂O, PM₁₀, PM_{2.5}, NO₂, CH₄, CO₂, NH₃) for each activity following CORINAIR classification.</p> <p>The data stored can be expressed at municipal, provincial or regional level, for each year for which the database is updated. The data are broken down by Corinair category. The model used for data collection is bottom-up. The tool is functional to Public Authority activities, research and environmental impact assessments.</p>
Evaluation and accounting of the emissions
<p>The generic formula used to calculate the pollutant emissions is: <i>Emission = Activity Data x Emissions Factor.</i></p> <p>The classification of sectors corresponds to that proposed by Corinair methodology in its latest version (SNAP 97). The input data are established for the point sources from the emission values measured and form the indicators of activity collected in a bottom-up way.</p> <p>The input data are the emission values measured/reported (for point sources), the indicators of activity collected in a bottom-up way, emission factors and statistical data for the spatial and temporal disaggregation of emissions. For GHG, the total amount is calculated as the summation of the total emissions (E_i), weighted on the basis of their contribution to the GHG effect: CO₂eq = $\sum GWP_i \times E_i$ (GWP_i = Global Warming Potential).</p> <p>The output of INEMAR is an inventory at regional/municipal scale: in the absence of measured data, the tool is able to estimate emissions through activity indicators. To disaggregate regional data at municipal level it makes use of proxy variables.</p>



SWOT Analysis	
Positive and negative factors in relation to Laks project	
Strengths	Weaknesses
<ul style="list-style-type: none">• Data on emissions provided for municipalities, provinces and regions.• Based on standard and robust methodology and emission factors (Corinair)• Bottom-up model	<ul style="list-style-type: none">• Regional inventory (disaggregation at local level through proxy variables)
Opportunities	Threats
<ul style="list-style-type: none">• GHG module implemented at regional level	<ul style="list-style-type: none">• Need of territorial data
Main References	
<ul style="list-style-type: none">• Regione Lombardia, Arpa Lombardia, Fondazione Lombardia per l'Ambiente (2008) <i>Progetto INEMAR - Inventario emissioni 2005</i>	



3.12 GHG emissions accounting in Siena Province

Name of the methodology	
GHG emissions accounting in Siena Province	
Description of the Organisation	
Siena Province	
Description of the initiative	
<p>The project for "Verification and certification of GHG emissions reduction in Siena Province " derives from the Spin-Eco project, launched in 2001. Spin-Eco enabled the assessment of the sustainability of Siena Province by means of eco-dynamic indicators (e.g. energy, natural capital, exergy, ecological footprint, fluxes of CO₂, etc.). The project led to the creation of a balance of GHG absorption emissions in Siena District and the certification of that balance.</p> <p>Siena Province - Environment Sector Paolo Casprini casprini@provincia.siena.it http://www.provincia.siena.it/pages/Default2.asp?cod=641</p>	
Evaluation and accounting of the emissions	
<p>The following data have been used to build the inventory:</p> <ul style="list-style-type: none"> • local data (bottom-up); • IPCC emission factors; • a mixed criterion for assigning emission (geographical / responsibilities). <p>The methodology is provided by IPCC guidelines, 2006, which provide the counting of emission / absorption resulting from the following sectors: Energy, Industry, Waste, Agriculture, Land Use and Forest. CO₂, CH₄, and N₂O emissions are expressed in CO₂ equivalent tonnes.</p>	
SWOT Analysis	
Positive and negative factors in relation to Laks project	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Method designed to build a CO₂ balance at local scale • Accounting methodology and input data are clear and consolidated 	<ul style="list-style-type: none"> • The calculation methods are complex • It doesn't provide a correlation to planning choices
Opportunities	Threats
<ul style="list-style-type: none"> • The method can be used to develop a calculation of territorial scenario 	<ul style="list-style-type: none"> • Need of precise territorial data
Main References	



- Università degli Studi di Siena, Agenzia Provinciale per l'Energia e l'Ambiente di Siena (2007)
SPIN-ECO studio di sostenibilità della provincia di Siena attraverso indicatori ecodinamici



2.13 Rome for Kyoto Project

Name of the methodology
Kyoto Roma
Description of the Organisation
Rome Environmental Council - X Department email: romaperkyoto@gmail.com Responsible and General Coordinator: Claudio Baffioni Administrative office: Valeria Pulieri Tel +39 06 6710 71525 Fax +39 06 671071524
Description of the initiative
<p>LIFE-Environment project (No LIFE04ENV/IT/000453) promoted by the Municipality of Rome, which aims to define an action plan to reduce greenhouse gas emissions in the municipality of 6.5% by 2012. Project partners are: Municipality of Rome, Province of Rome, ENEA (Italian National Energy for Energy and the Environment), RomaEnergia (Roma Agency for Energy Saving and Sustainable Development), RomaNatura (Agency of the Lazio Region for the Management of Protected Areas of the Municipality of Rome), Atac (Agency for public and private mobility of the Municipality of Rome), Institute of Technology of Tallaght in Dublin-Ireland. The project began on 1 October 2004 and ended September 30 2008. The project activities were:</p> <ul style="list-style-type: none"> • implementation of GHG emissions inventories in the period 1990-2002, definition of a scenario of GHG until 2012 and, consequently, estimation of emissions reduction targets; • establishment of a Municipal Plan for reducing emissions; • realization of some pilot projects to reduce emissions of GHG at local level; • quantitative and qualitative assessment of results achieved by the Plan • dissemination of results. <p>Pilot projects implemented:</p> <ul style="list-style-type: none"> • Afforestation • Energy efficiency in a school • Energy audit of all municipal schools • Green purchasing • Environmental accounting of the Municipality • LED illumination of a bicycle path • Traffic Plan • Monitoring of production data of three photovoltaic systems installed on three schools
Evaluation and accounting of the emissions
The GHG considered are: Carbon dioxide (CO ₂), Methane (CH ₄), Nitrous oxide (N ₂ O). The other three GHG of Kyoto Protocol (HFCs, PFCs and SF ₆), have not been investigated because their values were considered negligible. The total emissions were expressed in terms of CO ₂



equivalent, using IPCC Global Warming Potentials. Examined sectors were: transport, housing, services, waste, industry, agriculture and energy (refineries and power plants). The area of land use changes and forest management has been considered separately and the amount of stored carbon dioxide was not included in total because this assessment is subject to an uncertainty much larger than that of other sectors. Two different approaches were used for emission accounting: the first "top-down" use macro data on energy, while the second "bottom-up" starts from disaggregated spatial data.

Top-down

Application of IPCC and ICLEI (see par. 2.3) methodologies which required as a pre-requisite the collection of a series of "activity data" regarding all sectors responsible for emissions of GHG and the identification, for each sector involved, of data providers. When basic data for some years were not available, data were obtained correlating households consumptions and regional and national energy balances.

Bottom-up

The estimation of emissions from mobility sector was based on the following steps:

- definition of the circulating park following COPERT III classes (provider of data: ACI - Italian Automobile Club)
- estimation of traffic flows on road network through simulation models (Transcad - simulation model of traffic on roads);
- calculation of emissions in accordance with the COPERT III methodology (see EEA http://www.eea.europa.eu/publications/Technical_report_No_50/)

SWOT Analysis

Positive and negative factors in relation to Laks project

Strengths	Weaknesses
<ul style="list-style-type: none"> • Method designed for a local CO2 balance • Methods of calculation and input data are clear and consolidated • Estimation of emissions linked to policy actions • Bottom-up + Top-down methodology 	<ul style="list-style-type: none"> • Emission calculations are complex • Estimation of emissions linked to policy action is made only for few interventions
Opportunities	Threats
<ul style="list-style-type: none"> • The method can be used to develop a calculation of territorial scenario 	<ul style="list-style-type: none"> • Need of precise territorial data

Main References

- Comune di Roma (2008) *Progetto per Kyoto (LIFE Ambiente n° LIFE04ENV/IT/000453) - Stima delle emissioni al 1990 e al 2008 – 2012. Analisi delle fonti di emissioni*



3.14 Local Agenda21 for Kyoto

Name of the methodology									
Local Agenda21 for Kyoto									
Description of the Organisation									
Agenda21 Italy Coordination by Municipality of Padova Daniela Luise tel.: +39 049/8022488 email: luised@comune.padova.it									
Description of the initiative									
<p>The main objective of the project (still ongoing) is to find a methodology for calculating the shares of CO2 reduction achieved by municipalities and local authorities. The methods under consideration for the identification of the methodology have been the "Microkyoto Project" (see par. 2.9), the "PALK Lombardia" (see par. 2.10) and "Rome for Kyoto" (see par. 2.13). The base methodology is the Microkyoto project, but it will be supplemented by computer-based support and it will seek to add new indicators to identify those aspects that are now considered non-quantifiable ones. A further objective of the project is to develop a technical proposal for a policy at the national level, which could allow Local Authorities becoming full members of the national and regional implementation of Kyoto Protocol (internal burden sharing).</p>									
Evaluation and accounting of the emissions									
As described above, the accounting methodology is mainly based on "Microkyoto Project". See par. 2.9 of this report for more information.									
SWOT Analysis									
Positive and negative factors in relation to Laks project									
<table border="1"> <tr> <td>Strengths</td> <td>Weaknesses</td> </tr> <tr> <td> <ul style="list-style-type: none"> • Agenda 21 network • Algorithm easy to apply and update • Flexible methodology, based on national methodology on efficiency certificates • Mix of relevant methodologies </td> <td> <ul style="list-style-type: none"> • No quantifications for every kind of policy actions (e.g. transports and urban planning) • No relations between saved energy and baseline (only differential effects) </td> </tr> <tr> <td>Opportunities</td> <td>Threats</td> </tr> <tr> <td> <ul style="list-style-type: none"> • Can be supported by an information system • Can be used to account CO2 emissions deriving from local policy actions </td> <td> <ul style="list-style-type: none"> • Can be fitted for local authorities only for specific sectors </td> </tr> </table>	Strengths	Weaknesses	<ul style="list-style-type: none"> • Agenda 21 network • Algorithm easy to apply and update • Flexible methodology, based on national methodology on efficiency certificates • Mix of relevant methodologies 	<ul style="list-style-type: none"> • No quantifications for every kind of policy actions (e.g. transports and urban planning) • No relations between saved energy and baseline (only differential effects) 	Opportunities	Threats	<ul style="list-style-type: none"> • Can be supported by an information system • Can be used to account CO2 emissions deriving from local policy actions 	<ul style="list-style-type: none"> • Can be fitted for local authorities only for specific sectors 	
Strengths	Weaknesses								
<ul style="list-style-type: none"> • Agenda 21 network • Algorithm easy to apply and update • Flexible methodology, based on national methodology on efficiency certificates • Mix of relevant methodologies 	<ul style="list-style-type: none"> • No quantifications for every kind of policy actions (e.g. transports and urban planning) • No relations between saved energy and baseline (only differential effects) 								
Opportunities	Threats								
<ul style="list-style-type: none"> • Can be supported by an information system • Can be used to account CO2 emissions deriving from local policy actions 	<ul style="list-style-type: none"> • Can be fitted for local authorities only for specific sectors 								
Main References									



- *Agenda 21 Italy, Indica (2009) Agende 21 Locali per Kyoto - Working document*



3.15 Reggio Emilia Energy Strategy

Name of the methodology
Reggio Emilia Energy Strategy - Energy Plan and ECOABITA
Description of the Organisation
Municipality of Reggio Emilia Environment - Energy www.municipio.re.it Dr. Giacomo Bizzarri Ferrara University - Faculty of Architecture email: giacomo.bizzarri@unife.it
Description of the initiative
The strategy of sustainability developed by the municipality of Reggio Emilia counts on two main instruments: <ul style="list-style-type: none"> • the Environmental Budget, developed within the EU Life project CLEAR (City and Local Environmental Accounting and Reporting); • the Energy Plan and the ECOABITA energy certification method for buildings. The Energy Plan, approved in 2008 and developed with a two-years work in cooperation with Ferrara University, identifies the main actions to take in order to reduce GHG emissions and increase the energy production from renewable energy, as provided for in the Kyoto protocol. It sets three main targets, further detailed in three actions: <ul style="list-style-type: none"> • respect of international covenants (in particular Kyoto) -> reduction of GHG emissions for Reggio Emilia end users • optimisation of energy requirements -> reduction of fossil primary energy consumption • air pollution -> adoption of clean technologies (low NO_x, dust emissions) ECOABITA project promotes energy efficiency in buildings, through the development of a certification method based on more demanding requirements compared to Italian national legislation.
Evaluation and accounting of the emissions
The Energy Plan has developed a city energy balance through a detailed reconstruction of the energy demand characterizing the main macrosectors (electricity generation, residential and tertiary sector, industry, agriculture, transport, public administration). The procedure is based on three pillars: <ul style="list-style-type: none"> • direct acquisition of energy requirements data from various databases (public administrations, local energy providers, ad-hoc surveys in the territory); • indirect acquisition of wider area data regarding energy infrastructures from various sources of information; • estimation procedures in case of lacks of data. A first evaluation is based on a top-down approach, scaling down regional energy balances and GHG emissions inventory by means of population trend as a proxy variable. A more in-depth



<p>analysis, based on a bottom-up approach, which required an intense activity of data collection from different sources of information and methodology of harmonisation in case of lack of data, lead to the development of a more reliable GHG emissions inventory. All emissions calculations are based on official emissions factors (IPCC). The result of the work is an accurate "energy model" capable of describing past situation from 1990 to today state of the art, but also to simulate the possible developments with regard to different scenarios dictated by the adoption of energy policies that the Administration will undertake. As for building sector, the application of ECOABITA standard is an example of the energy policies taken into consideration that will lead to emission reduction. Of particular interest is that the ECOABITA protocol was verified compliant with the requirements of ISO 14064-2 by an international agency (Bureau Veritas). This process allows to obtain credits for avoided emissions and to exchange them on carbon market. Because the same procedure of quantification, monitoring and reporting of GHG is applied to other potential interventions and policies described in the Energy Plan, the same opportunity could be foreseen in the future at a wider scale.</p>	
<p>SWOT Analysis</p>	
<p>Positive and negative factors in relation to Laks project</p>	
<p>Strengths</p> <ul style="list-style-type: none"> • Methodology used for planning local energy strategy • Impressive work of data collection and harmonisation • Comparison between top-down and bottom-up results • Compliant to ISO 14064-2 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Energy balance and emissions calculations are complex
<p>Opportunities</p> <ul style="list-style-type: none"> • The certified methodology could be used to verify the effective GHG emission reduction and possibly attaining CO₂ credits on the energy stock market 	<p>Threats</p> <ul style="list-style-type: none"> • The bottom-up methodology for calculation of emission reduction can take a long time and is highly dependent from data availability • Site-specific methodology
<p>Main References</p> <ul style="list-style-type: none"> • Bizzarri G (2008) <i>Il Piano Energetico del Comune di Reggio Emilia: azioni e strategie per il rispetto degli obiettivi di Kyoto</i>, II Congresso Nazionale AIGE, Pisa, Italy • Bizzarri G (2008) <i>Laks kick-off meeting: scientific methodology</i>, Presentation to project partners, Reggio Emilia • Bizzarri G(2008) <i>Piano Energetico Comune di Reggio Emilia</i> • Bizzarri G, Belpoliti V, Pratissoli A, Pastore P, Prearo G, Bottarelli M (2008) <i>Potential in GHG emissions abatement through an effective energy policy: the Reggio Emilia case</i>, International Conference "The Sustainable City", Skiathos, Greece 	



4. LINKS WITH OTHER EU PROJECTS

The link with other EU project was mainly achieved by contacts between project team and other organisations involved in CO2 accounting and sustainable energy strategies.

Organisation	Contact
College of Europe	Nikolas Bader College of Europe - Development Office Dijver 11, 8000 Brugge, Belgium Tel.: +32(0)5047 7315, Fax: +32(0)5047 7300 E-mail: nbader@coleurop.be
JRC Institute for Energy	Paolo Bertoldi European Commission Directorate General JRC Institute for Energy E-mail: Paolo.Bertoldi@ec.europa.eu http://re.jrc.ec.europa.eu/energyefficiency
Province of Modena	Alessandro Pelligra Energy & Environmental Office Director tel. +39 059 203 3547 Fax +39 059 203 2160 E-mail: pelligra@comune.modena.it
Italian Local Agenda 21 Association	Marcello Antinucci Italian Local Agenda 21 Association - Coordinator of Intelligent Energy Europe project "MUSEC Energy" www.musecenergy.eu

4.1 College of Europe Comparative Analysis of Local GHG Inventory Tools

Due to its leading role in Interreg IIIC GROW project "RAMEA"¹⁴, dealing with the development of a Regional Accounting Matrix including Environmental Accounts, Arpa Emilia Romagna Project team was contacted by College of Europe¹⁵, which is conducting a research aimed at comparing tools for the formation of local GHG inventories (Bader and Bleischwitz, 2009). One chapter of the paper deals with environmental accounting at the regional level, hence their interest in RAMEA. LAKS Action 2 is closely linked with College of Europe research, so Arpa team started a useful exchange of information with College researchers. The College of Europe report describes six experiences of tools for local GHG inventories: the "CO2 Grobbilanz" and the "EMSIG" tool¹⁶, the "ECO2Region" tool¹⁷, GRIP – the Greenhouse Gas Regional Inventory Project¹⁸, the "Bilan

¹⁴ See www.ramea.eu for more information

¹⁵ The College of Europe (Collège d'Europe in French) is an independent university institute of postgraduate European studies, with two campuses, one in Bruges, Belgium, and since 1992 one in Natolin, Poland. It was founded in 1949 by Hendrik Brugmans and Karel Verleye, making it the world's oldest institution of studies and training in European affairs (see www.coleurope.eu).

¹⁶ Klimabündnis Österreich, Energieagentur der Regionen.

¹⁷ Ecospeed, Climate Alliance, European Energy Award.

¹⁸ Tyndall Centre, UK Environment Agency.



Carbone”, the CO2 Calculator¹⁹ and the Project 2 Degrees²⁰. Some of the above tools (ECO2Regio, GRIP and Bilan Carbone) are also analysed or cited in this report.

4.2 JRC Workshop on Methodologies for Sustainable Energy Action Plans

The Covenant of Mayors, in the opinion of European Commission, is one of the most promising initiative is one of the implementing mechanisms of the EU Action Plan for Energy Efficiency. The procedure to constitute a Covenant of Mayors was launched on 29 January 2008²¹. The Covenant of Mayors is a commitment by the participating cities to go beyond the objectives of the EU energy policy in terms of at least 20% reduction of greenhouse emissions through sustainable energy actions. In order to demonstrate such commitment, the cities and regions will submit a Sustainable Energy Action Plan (SEAP) outlining the practical measures and policies they will implement to achieve their objectives, within one year after approval and signature of the Covenant by the city councils. A SEAP is a key element of the Covenant of Mayors. The SEAP allows the cities to assess the current level of energy consumption and CO₂ emission and to identify the areas of intervention. It also helps the cities to design policies and programmes to achieve the CO₂ emission targets.

The purpose of the workshop, held in ISPRA on 18-19 May 2009²² and organised by Joint Research Centre and European Commission, was to provide a forum for technical experts from national and regional/local energy agencies, cities, research institutes and NGOs presenting, discussing and analysing existing and successfully applied methodologies for the development and implementation of local SEAPs. The workshop was organised in three sessions: “1. Overview of SEAP Methodologies”, “2. Successful Examples of SEAP methodologies implemented by cities as input for the SEAP template” and “3. CO₂ emission inventories and monitoring tools”. Arpa participated in sessions 2 and 3 and had the possibilities to discuss with other workshop participants about key elements to be taken into account when realising GHG inventory at local level:

- Coverage: CO₂ from fuel combustion or all Kyoto GHGs and all sectors.
- Boundaries: Community (emissions inside a geopolitical boundary) or Government (emissions over which the local authority exercises control).
- Scopes: Scope 1 (emissions occurring within the geopolitical boundary), Scope 2 (emissions occurring due to the production of electricity, steam, heat and cooling used within the geopolitical boundary, but produced outside it), Scope 3 (indirect emissions that occur as a result of an activity within the geopolitical boundary).
- Estimation of CO₂ from energy use/balance
- Baseline year: 1990 or the best available or the inventory year
- Calculation of emissions as “*emission factor x activity data*”

Among the others, the most interesting project/methodologies discussed were:

¹⁹ Danish National Environmental Research Institute, Local Government Denmark and COWI.

²⁰ Clinton Climate Initiative, ICLEI, Microsoft Corporation.

²¹ See http://ec.europa.eu/energy/climate_actions/mayors/index_en.htm

²² See http://re.jrc.ec.europa.eu/energyefficiency/html/Workshop_CoM_Ispra_18-1905-2009.htm



- *BILAN CARBONE*, a French methodology and tool to build CO₂ balances for Companies and Communities²³, developed by ADEME (French Environment and Energy Management Agency). Bilan Carbone it's a method of accounting for emissions of GHG starting from readily available data and which tries to reach a good evaluation of direct and indirect emissions of business or territory. It applies to any activity: industrial and tertiary sector, government, communities and even to the territory managed by the communities. The method is compatible with ISO 14064, GHG Protocol Initiative and the terms of the Directive 2003/87/EC on emissions trading system.
- *GRIP for Europe* (Greenhouse gas Regional Inventory Project) methodology and tool to develop GHG inventory and make scenario analysis for regions and metropolitan areas²⁴, developed by Tyndall centre in Manchester (UK) and applied as a pilot study to partners of Interreg IIC InterMETREX project. The methodology provides a framework and a web based tool that ensures no double counting of emissions takes place, and that there is a concrete flexibility to enable comparisons between regions to be conducted without ambiguity. Each level of methodology relies on a different level of data availability. The GRIP for Europe Level 1 approaches are the most accurate, with level 3 approaches having the highest level of uncertainty associated with them. The key benefit of GRIP is that every emissions source identified in it has three methodological levels associated with estimating its significance.
- *MUSEC* (Multiplying Sustainable Energy Communities) IEE²⁵ project, which developed a participated process for developing energy sustainability at local level. This process foresees a baseline assessment, identification of potentials and target setting²⁶. The process on how to implement a SEC strategy is described in the "Sustainable Energy Community Blueprint", based on the experience of the partner communities, making reference to the developed methodologies and strategies, available tools, best practice examples and lessons learnt. The Blueprint includes also the strengths and weaknesses of the selected best practices, and other technical details such as use, potential outreach, possible achievable objectives, examples on potential energy savings and reduction in greenhouse gas emissions.

²³ See www.ademe.fr/bilan-carbone.

²⁴ See www.grip.org.uk.

²⁵ Intelligent Energy Europe (http://ec.europa.eu/energy/intelligent/index_en.html).

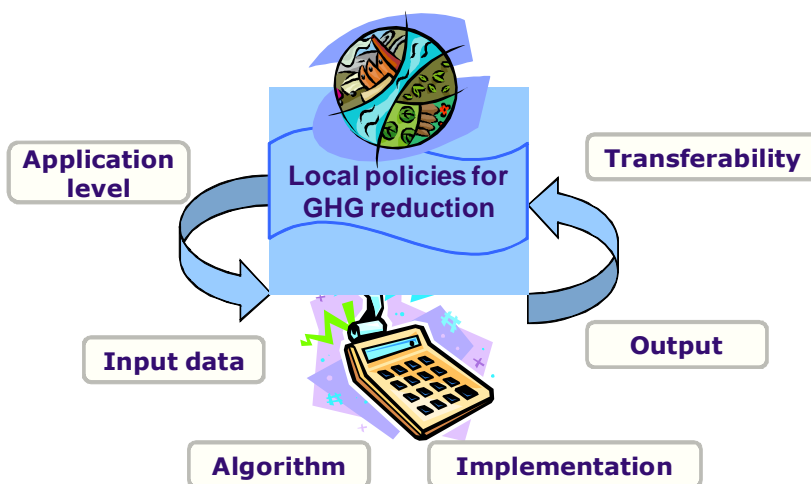
²⁶ See www.musecenergy.eu.

5. EVALUATION OF METHODOLOGIES

The evaluation of methodologies presented in the previous chapter is based on seven evaluation criteria:

- Application to local policies
- Input data
- Algorithm
- Implementation
- Output
- Transferability
- Previous experience

The above criteria were discussed among partners during the kick off meeting and partnership agreed on their choice. Other criteria are possible, but the above seemed to the partnership the ones that better describe a virtuous process (see following figure) that takes into account the main steps to be taken for supporting local policies for GHG reduction through the application of an accounting model: first of all application level, then input, calculation (algorithm and implementation), output and finally transferability. In addition to the above, lessons learned from previous experience has to be highlighted.



The criteria answer to specific questions, which help to assess the methodologies in an objective way and in relation to their value added for LAKs project. In particular:

- Application to local policies: *is the methodology specifically developed for Local Governments?*
- Input data: *what kinds of data are needed to perform the calculation? Are these data clearly identified?*
- Algorithm: *is the algorithm robust? Is the calculation method clear and transparent?*
- Implementation: *is the implementation simple for Local Governments? Is specific expertise/skill needed?*
- Output: *are the outputs in line with LAKs' objectives?*
- Transferability: *are there particular constraints on applying the methodology to Local Governments?*



- Previous experience: *have some of the LAKs Partners previous experience with the assessed methodology?*

The framework described leads to an evaluation matrix, which presents the methodologies in the rows and the criteria in the columns. Each cell of the matrix is filled in with a short description (which represent a simple answer to the above questions, based on the judgement of experts that compared the methodologies) and a colour, immediately representing the judgement, in order to make understanding and comparison easier also for non experts.

- red: *problems may arise, the judgement for this criteria is negative*
- yellow: *it is necessary to pay attention, the judgement for this criteria is mean*
- green: *good context, the judgement for this criteria is positive*

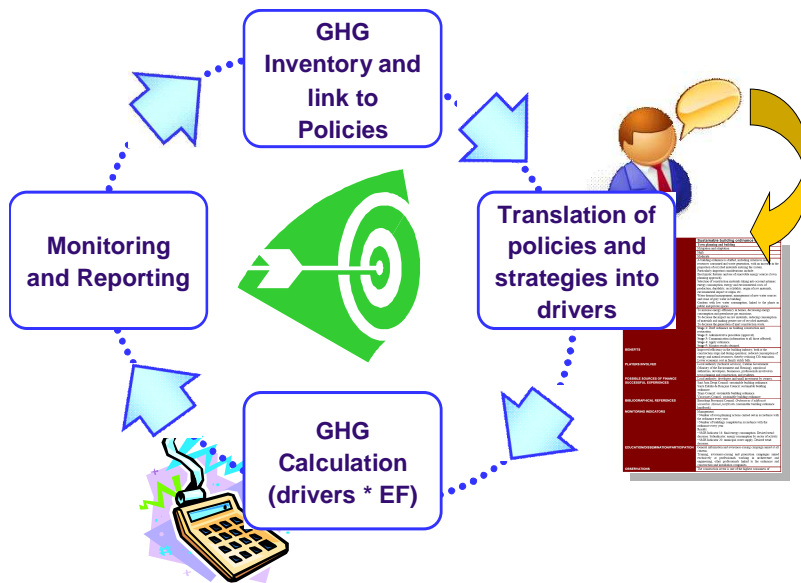
The following table presents the results of this first evaluation.

METHODOLOGY	CRITERIA	APPLICATION to LOCAL POLICIES	INPUT DATA	ROBUSTNESS of ALGORITHM	SIMPLICITY of IMPLEMENTATION	OUTPUT	TRANSFERABILITY	PREVIOUS EXPERIENCE
NECATER		Developed for French Regional Programs	Need territorial data	No, in particular for EUR -> CO2		Evaluation of carbon neutrality of OPs	Software is copyrighted	No
DEFRA		Yes, specific for Local Authorities	Bottom-up + Top-down	Yes		Statistics and Monitoring	Applied only in UK	No
ICLEI		Yes, specific for Local Authorities	Need territorial data	Yes (International Standards)	Three different level of complexity	CO2 inventory, target of reduction	International Standard and Process	Partial
ECO2REGIO		Yes, specific for Local Authorities	Bottom-up + Top-down	Yes	Tuned to needs of Loc Gov officers	CO2 balance and support to policies	Software is copyrighted	Yes
DESGEL		Yes, specific for Local Authorities	Bottom-up data	Yes	Many variables, to be introduced hand made	Local Plan for emission reduction	Software is free, but in Catalan	Yes
RINA		Not specific for Local Authorities	Not clear input data	Yes (International Standards)	Need complex calculation	Certification of emission reduction	High costs	No
KYOTOCLUB		Yes, specific for Local Authorities	Bottom-up data	Yes	Easy to apply	Target of reduction	Only for few sectors (buildings and traffic)	No
KYOTO TOSCANA		Yes, specific for Local Authorities	Top-down data	Yes		CO2 balance and support to policies	The link to local action is missing	No
MICROKYOTO		Yes, specific for Local Authorities	Bottom-up data	Not standard methodology	Easy to apply	Energy Saving and CO2 avoided	Only to few sectors	Partial
PALK		Yes, specific for Local Authorities	Regional Energy Environment DB	Not standard methodology		Plan of Local Action for Kyoto	Need database	Partial
INEMAR		Developed for Reg. Emissions Inventory	Bottom-up data	Yes (International Standards)	Many variables, to be introduced hand made	Regional CO2 inventory	Only the emissions factors DB	Yes
GHG SIENA		Yes, specific for Local Authorities	Need territorial data	Yes (International Standards)	Need complex calculation	CO2 balance and certification	The link to local action is missing	No
KYOTO ROMA		Yes, specific for Local Authorities	Bottom-up + Top-down	Yes (International Standards)	Need complex calculation	CO2 balance and support to policies	Only for few sectors	Partial
A21 KYOTO		Yes, specific for Local Authorities	Bottom-up data	Not standard methodology	Easy to apply	Energy Saving and CO2 avoided	Only for few sectors	Yes
REGGIO EMILIA ENERGY		Yes, specific for Local Authorities	Bottom-up + Top-down	Yes (International Standards)	Need complex calculation	Energy Plan for Emission Reduction	Very site-specific methodology	Yes

6. FIRST RESULTS

The international experiences analyzed show that there are numerous initiatives designed to develop local policies to reduce greenhouse gas emissions and reporting of such reductions.

During the kick-off meeting, the following scratch of the accounting model structure was debated.



Some key success factors emerged from the discussion between project partners and scientific committee:

- it is necessary to define a common framework/process (who does what, when and how) which could be adapted to different local realities;
- a GHG inventory, to measure past data and baseline scenario is very important for robust target setting;
- translation of policies into drivers and quantification of related emissions ($emission = driver * emission\ factor$), helps to define a link between policy and CO2 reduction and to calculate effects of local strategies;
- bottom-up methodologies are preferable, even if they could be difficult to implement;
- top-down methodology could be applied to obtain a first quick estimation;
- implementation of different levels of methodological complexity could help partners to manage most difficult sectors in terms of lack of data, scarcity of resources, time limits, ...
- respect of international standard procedures and factors (IPCC) is fundamental to allow benchmarking between partners;
- common procedures should be adopted in case of lack of data;
- the opportunity of certifying the process according to ISO 14064 should be explored, in order to obtain emissions credits to be negotiated on carbon market;
- monitoring and reporting is fundamental to make results understandable by decision makers and public and to make local policies more transparent.

The evaluation matrix presented in the previous paragraph can lead us to some preliminary results. If we look at the matrix, we can identify some prominent methodologies which should be taken into consideration as good practices for the specific objectives of LAKs project:



- *ICLEI*

It is a methodology specifically designed for Local Authorities, which follows IPCC Guidelines. It aims at both building a CO₂ inventory and setting a reduction target. The possibility of choice between three levels of methodological complexity could solve problems of lacks of data. It is thought as an International Standard and a Management Process.

- *ECO2REGIO*

It is designed for Local Authorities, aiming at building a CO₂ balance and supporting policies. One of the most interesting aspects is the possibility of combining Bottom-up and Top-down approaches, with a method to scale-down national/regional data in case of needs. It is tuned to needs of Local Government officers, with a shared web-platform and simple methodology. Software is copyrighted.

- *A21 KYOTO*

Methodology designed for Local Authorities, in order to quantify their contribution to energy efficiency interventions and CO₂ reduction. The methodology, albeit not standard and taking into account only differential effects, is easy to apply and update. Particular emphasis is given to the link between the policy action implemented and the CO₂ reduction.

- *DESSEL*

Designed for Catalan Local Authorities, in order to help them in building Sustainable Energy Action Plans (SEAPs). The software tool uses bottom-up data and standard methodologies for emission reduction accounting. A lot of variables have to be introduced hand made. Software is free, but in Catalan.

- *REGGIO EMILIA ENERGY*

Designed for developing local Energy Plan and Strategy. Based on International Standards (IPCC). Both top-down and bottom-up methodologies are used. Problems of lack of data and harmonisation are addressed. The complete process is certified according to ISO 14064.

Of course the above results should not be considered definitive, but could form the basis for the discussion needed to implement the following Action 3, which will develop the Climate Accountability" system to be locally applied by project partners.

In particular, it will be necessary to:

- analyze and compare the environmental management and/or accountability systems already adopted by the developer partners;
- define - on the above basis - common approaches and to share methods, that should be used as framework for concrete application to be developed in the next actions;
- define a common greenhouse emissions accounting model, specifically addressed to the local authorities, able to monitor and evaluate the real greenhouse emissions of a territory and the impact of local policies in terms of emissions;
- define the steps and the milestones of the process to be developed by the cities in the next actions.



7. MAIN SOURCES OF INFORMATION

- Agenda 21 Italy, Indica (2009) *Agende 21 Locali per Kyoto - Working document*
- Bader N, Bleischwitz R (2009) *Study Report - Comparative Analysis of Local GHG Inventory Tools*, College of Europe and Institut Veolia Environment
- Bizzarri G (2008) *Il Piano Energetico del Comune di Reggio Emilia: azioni e strategie per il rispetto degli obiettivi di Kyoto*, II Congresso Nazionale AIGE, Pisa, Italy
- Bizzarri G (2008) *Laks kick-off meeting: scientific methodology*, Presentation to project partners, Reggio Emilia
- Bizzarri G (2008) *Piano Energetico Comune di Reggio Emilia*
- Bizzarri G, Belpoliti V, Pratisoli A, Pastore P, Prearo G, Bottarelli M (2008) *Potential in GHG emissions abatement through an effective energy policy: the Reggio Emilia case*, International Conference "The Sustainable City", Skiathos, Greece
- Comune di Roma (2008) *Progetto per Kyoto (LIFE Ambiente n° LIFE04ENV/IT/000453) - Stima delle emissioni al 1990 e al 2008 – 2012. Analisi delle fonti di emissioni*
- DEFRA Department for Environment, Food and Rural Affairs (2008) *Local Authority CO2 emissions estimates 2006. Methodology Summary*
- DEFRA Department for Environment, Food and Rural Affairs (2008) *Local Authority CO2 emissions estimates 2006. Statistical Summary*
- DEFRA Department for Environment, Food and Rural Affairs (2008) *Local and Regional CO2 Emissions Estimates for 2005 - 2006 for the UK*
- DEFRA Department for Environment, Food and Rural Affairs (2008) *UK Climate Change Programme: Annual Report to Parliament July 2008*
- DIACT, Energies Demain (2007) *Neutralité carbone des Contrats de Projets État Régions 2007-2013. Méthodologie de calcul des émissions avec l'outil NECATER CPER version 1.1*
- DIACT, Energies Demain (2008) *NECATER PO. Prise en main de l'outil*
- Energies Demain (2008) *Analyse et interpretation des resultats d'une modelisation sous NECATER*
- Foirry JP (2008) *Bilan ex ante de la "neutralite carbone" du PO FEDER 2007-2013 en Auvergne (à partir de la nouvelle version de NECATER pour les PO FEDER)*
- ICLEI (2008) *International Local Government GHG Emissions Analysis Protocol. Release version 1.0*
- IPCC (2006) *Guidelines for national greenhouse gas inventories*
- ISO (2006) *ISO 14064-1:2006 Greenhouse gases -- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*
- ISO (2006) *ISO 14064-2:2006 Greenhouse gases -- Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements*
- ISO (2006) *ISO 14064-3:2006 Greenhouse gases -- Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions*
- Kyoto Club, Ambiente Italia, FEEM, ERM (2007) *Progetto Enti locali per Kyoto - Documento di sintesi*
- Kyoto Club, Ambiente Italia, FEEM, ERM (2007) *Progetto Enti locali per Kyoto - Le fasi di raccolta dati - Consumi ed interventi*
- Kyoto Club, Ambiente Italia, FEEM, ERM (2007) *Progetto Enti locali per Kyoto - Il piano di assegnazione*
- Kyoto Club, Ambiente Italia, FEEM, ERM (2007) *Progetto Enti locali per Kyoto - La proposta di direttiva*



- Ministero de l'Ecologie et du developpement durable (2007) *Neutralite carbone des CPER*
- Politecnico di Milano, Arpa Lombardia (2008) *Progetto Kyoto Lombardia -Emissioni di gas serra*
- Provincia di Bologna (2007) *Progetto Microkyoto - Censimento delle buone pratiche di riduzione dei gas climalteranti dei comuni aderenti a Microkyoto*
- Regione Lombardia (2008) *L'esperienza dei piani di azione locale per Kyoto*
- Regione Lombardia, Arpa Lombardia, Fondazione Lombardia per l'Ambiente (2008) *Progetto INEMAR - Inventario emissioni 2005*
- Regione Lombardia, Punto Energia (2007) *Piano d'azione per l'energia*
- Regione Lombardia, Punto Energia (2007) *Piano d'azione per l'energia - Schede d'azione*
- Regione Toscana, IBIMET-CNR (2004) *Osservatorio Kyoto - Il bilancio di CO₂ nella Regione Toscana*
- RINA (2008) *Linea guida per la validazione e la verifica delle asserzioni volontarie relative i gas serra*
- Università degli studi di Milano (2008) *Progetto Kyoto Lombardia - Scenari emissivi, tecnologici ed economici - Linea Scenari e Politiche*
- Università degli Studi di Siena, Agenzia Provinciale per l'Energia e l'Ambiente di Siena (2007) *SPIN-ECO studio di sostenibilità della provincia di Siena attraverso indicatori ecodinamici - Progetto per la verifica e la certificazione della riduzione delle emissioni di gas a effetto serra per il territorio della Provincia di Siena*