

CLIMATE CHANGE AND STRATEGIC ENVIRONMENTAL ASSESSMENT GUIDELINES FOR LOCAL AUTHORITIES



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*The herein Guidelines have been drafted as pilot activities of the RSC (Regions for Sustainable Chance) project, co-funded by the INTERREG IVC European programme, concerning the “European Territorial Cooperation” strategy.
The aim of these pilot activities was to identify and develop new strategies to locally fight climate change.*

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The information contained herein does not necessarily reflect the views of Piedmont.



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LaMoRo Local Development Agency is a consortium a r.l. based in Asti (Piedmont) and made up of 60 municipalities and the 3 Chambers of Commerce of Asti, Alessandria and Cuneo.

LaMoRo was founded in 1995 with the aim of creating a new economy based on exploitation and enhancement of local resources, valorisation of territorial identity and human capital development.

In order to contrast economic crisis and unemployment related to the depopulation of rural areas, LaMoRo tried and continues to try to promote a favourable environment for the attractions of new investments and for the cooperation between public and private partnerships, by encouraging the development of new ideas.

Over the years LaMoRo has strengthened its expertise to support local authorities by identifying new methods, skills and abilities in the creation of plans and programs for sustainable local development and territorial growth.

The key objective of this agency is to promote economic, social and environmental development of the Piedmont area.

The main activities implemented by LaMoRo concern the following sectors:

- Economic development;
- Technical assistance to municipalities and SMEs;
- Feasibility design and analysis;
- Environmental sustainability and renewable energy;
- Management of tourism and cultural heritage;
- Management of plans and programs.

For more than 10 years LaMoRo has been a reliable partner of Piedmont Region and Ministry of economic Development, working in projects funded by itself and supporting local authorities and SMEs in the creation of plans and programs of local development both economically and socially.

As a partner of the RSC (*Regions for Sustainable Change*) project, funded under the INTERREG IVC European Territorial Cooperation programme, LaMoRo implements at local level a series of actions aimed at developing adapting strategies to climate change and promotes actions to counter CO2 emissions.

In the implementation phase LaMoRo involved Piedmont Region, that is in charge of environmental policies promoted in the territory in which it operates and is the only one able to provide data, technical expertise and guidance necessary to implement the project activities.

In cooperation with the Directorate for Environmental Compatibility and Integrated Procedures of Piedmont Region – which is the associate partner of the project - LaMoRo Agency identified at first instance the pilot activities to be developed within the RSC project.

In accordance with the general objectives of the project, it was considered useful to link the pilot activities to the specific situation of Piedmont area where at local level – with an high regional institutional capacity of the region towards actions concerning climate change and policies aimed at containing carbon emissions – there is a greater difficulty in consolidating policies focused on climate change and low-carbon economy.

The herein Guidelines have been drafted within the RSC (Regions for Sustainable Change) Territorial Cooperation Project (reference number: 03101R1) as a good practice at local level in order to identify new strategies and actions to contrast climate change, create low-carbon economies and sensitize local administrators towards the key subjects of sustainable development, increasing the regional awareness of the climate change impact on economies and activities.

Specifically, these Guidelines are aimed at implementing policies and strategies of mitigation and adaptation within the Strategic Environmental Assessment of local plans and programs.

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Introduction: The RSC Project – Regions for Sustainable Change

The RSC project arose during the implementation of the Interreg IIC project - Greening Regional Development Programmes (GRDP), which ran from July 2004 to October 2007: some of the participating partners found important to continue this positive cooperation, developing the theme of climate change and creating a partnership in order to encourage policies of low-carbon economy (meaning low CO₂ emissions).

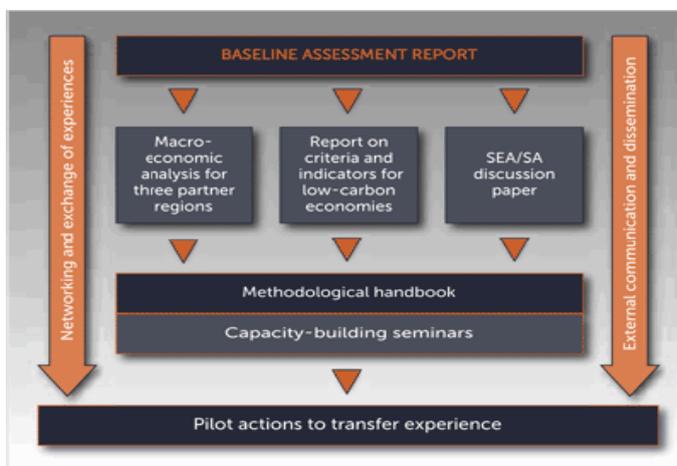
The three-year RSC project began in October 2008 and is co-funded by the INTERREG IVC European Programme within the “European Territorial Cooperation” strategy; the project’s main objective is to increase the effectiveness of local development policies, to aid the economic development and to improve the European competitiveness.

The partnership consists of 12 organizations from 8 EU Member States: national, regional and local public administrations and agencies with public participation of Austria, Italy, Poland, Malta, United Kingdom, Spain and Hungary.

These are regional areas with territorial, climatic, social, demographic, administrative, economic characteristics that are in some cases considerably different: there areas are developing various approaches to the challenge of climate change, also because of different policies, institutional capacities and levels of awareness achieved on these issues.

The RSC project is based – in accordance with the objectives of territorial cooperation – on exchanging and sharing experiences, knowledge and good practice, and it aims to provide regions with instruments and methods to promote, on a European level, low-carbon economic policies.

The challenge is to face the climate change by developing the full potential of the regions, in terms of reducing climate-altering emissions and by exploiting opportunities for sustainable economic and social growth connected to the need for mitigation and adaptation to climate change.



Project Activities

Partners

Cornwall Council (UK); Municipality of Wroclaw (PL); University of Debrecen, CEMP (HU); LaMoRo (IT); Liguria (IT); Marche (IT); Malta Environment and Planning Authority (MT); Bulgarian Ministry of Regional Development (BG); Burgenland Regional Management (AT); Cornwall Development Company (UK); La Rioja (ES); and the REC.

The herein Guidelines have been planned and developed as pilot activities of the RSC project by the Local Development Agency LaMoRo, in cooperation with the Associate Project Partner, the Directorate for Environmental Compatibility and Integrated Procedures of Piedmont Region, which supported these activities by providing information and data useful to their implementation.

The Guidelines will enhance the Methodological Handbook of the RSC project, in the *Planning* section which aims to integrate the issues concerning climate change in the planning and programming strategies, and to explore the possibilities given in this direction by the Strategic Environmental Assessment.

For further details on the RSC project:
www.rscproject.org

1. Purpose and Structure of Guidelines

The main objective of these Guidelines is to provide an easy working tool that helps to integrate climate change issues within the Strategic Environmental Assessment (SEA) of local plans and programs.

In line with EU's recommendations, guidelines and objectives concerning the climate and with the specific purpose of the RSC project, these Guidelines provide an overview of issues related to climate change and of the possibility – connected to the SEA process – to assess these issues and develop appropriate strategies of mitigation and adaptation.

The Directive 2001/42/EC explicitly mentions the climate among the environmental matrices that must be considered in SEA process, but there is a lack of attention of the Member States on these issues and on the practical implementation of the directive itself: ensuring that impact of climate change will be faced in the SEA process is part of the EU's strategies concerning mitigation and adaptation.

The issue does not concern only the correct application of laws and regulations: preventing global temperature average warming to exceed 2°C means to limit the impact on human being, natural ecosystems and biodiversities under “tolerable” limits. Otherwise, irreversible changes could be triggered in the ecosystem of Earth, compromising the survival possibilities of most of the existing animal and plant species, including humans.

It is therefore necessary to increase the awareness of citizens and decision-makers and to find strategies of mitigation and adaptation able to ensure the achievement of reducing emissions to internationally established levels and to limit negative effects, that will not be avoidable and are already in act.

In this context local actions for the climate play a key role and, from the Agenda 21 Action Plan, they have been primarily focused on voluntary initiatives of local authorities, in particular municipalities, which are committed to pursue a sustainable development and to reduce climate-altering emissions and energy consumption.

Although there are not reporting commitments of CO₂ emissions, these territories play a strategic role for the containment of global warming.

For these reasons, the Guidelines – combined with examples and good practice – aim to help local authorities in the integration of climate issues within the SEA process of plans and programs under their jurisdiction, implementing skills and strategies for the ordinary functions assigned to them.

This is not a step by step guidance handbook, related to all the process aspects, but it provides criteria and practical approaches to identify climate issues and consider them as an integral part of the SEA process.

These Guidelines are addressed to all those included in the SEA process of local plans and programs (institutions, evaluators, planners and professionals involved in planning and programming; government and citizens in general; etc.) and aim to achieve a better awareness of these issues and to strengthen the SEA role in the local planning.

The Guidelines are divided in four parts.

The **first part** introduces the theme of climate change, outlining its context: a concise picture of changes that are taking place and of their main causes and effects at global, European and regional level; the objectives of reducing emissions to levels established at community, national and regional level, and the main adaptation strategies; the strategic role of local actions to contrast global warming, plan adaptation and promote a low-carbon development.

The **second part** synthetically deals with the available methodologies to assess at local level the climate change, its impact and the other aspects that must be considered in the SEA process in order to define the objectives of sustainability and climate protection. Also the main fields related to the matrix of climate at local level are identified in terms of impact and vulnerability, together with the possible actions and strategies of mitigation and adaptation connected to them.

The **third part** represents a regional regulatory directory for comparison, divided by subject and containing the main rules and directions, with particular attention to the obligations of the municipalities. Besides the immediate cogent issues, it can be a useful reference to define at local level objectives of sustainability and actions of mitigation, compensation and adaptation.

The **fourth part** collects experiences and practices that are related to different types of local action, but can be taken as a good example for the identification of objectives and actions to integrate the climate change into the SEA process of local plans and programs.

Chapters that follow are a summary report of the Guidelines elaborated by LAMORO in the project.

2. Guidelines

2.1. Methodology of the Guidelines

An initial inspection – at the regional sector of *Environmental Compatibility and Integrated Procedures* – on the SEA process of municipal urban plans reveals a little consideration for climate issues: in most cases the matrix of climate is not taken into account or is considered in a superficial way.

Frequently the environmental reports restrict themselves to an illustration of climate zone characteristics and data concerning air quality, with extensive descriptions that do not include an in-depth examination and a real contextualization and selection of pertinent information; this affects the possibility/capacity to identify criteria, objectives and also potential vulnerability and significant impact.

The general tendency is to underestimate the risks connected to climate change and also the need to organize measures of mitigation and adaptation. There is no a complete lack of these measures, but they do not represent a conscious response to climate issues.

Consequently, the first part of the Guidelines introduces the theme of climate change, outlining its context: a concise picture of changes that are taking place and effects at global, European and regional level; the objectives of reducing emissions to levels established at community, national and regional level, and the main adaptation strategies; the strategic role of local actions to contrast global warming, plan adaptation and promote a low-carbon development.

For the municipalities, an additional difficulty arises in adapting to the legislative and regulatory evolution on energy efficiency, in containing emissions, protecting the environment and developing appropriate policies on these issues.

Some of the possible causes, in Piedmont Region and in the rest of the Country, are: evolution of the legal framework, which is already complex because of issues and sectors involved and does not evolve in a clear and coherent way, but with many afterthoughts; parallel and frequent use of national legal devices, a real miscellany of rules (for example the financial acts), extrapolated from their area of expertise, which make difficult to build an overall picture and understand the real impact on regions and local authorities; paucity of economic and human resources.

Consequently, what should have been, in the initial project setting, only a reference to the regional legal framework, including SEA process and issues connected to the climate change, has gained on importance, especially referring to the main aspects of mitigation and adaptation of energy issues, reduction of emissions and environmental pollution, protection of ecosystems and forests.

Though non exhaustive, the Part III *Regional Legal and Regulatory Framework* represents a regulatory directory for comparison, divided by subject and containing the main rules and directions, with particular attention to the obligations of the municipalities. It can be a useful reference to define at local level objectives of sustainability and actions of mitigation, compensation and adaptation.

At the same time a survey has been carried out on:

- Experiences of voluntary actions of local authorities in Piedmont for the environmental sustainability and the reduction of global warming, with special regard to *Local Agenda 21* and *Covenant of Mayors*;
- Regional Call POR-FESR 2007-2013-Piedmont – *Energy Retrofitting of Public Building available to Territorial Housing Agencies*;
- Regional Call POR-FESR 2007-2013-Piedmont Axis II (*Sustainability and Energy Efficiency*) – Activity II.1.3 (*Energy Efficiency*), *Incentives for the Energy Saving in Immovable Property of Local Authorities*;
- Building Regulation and energy-environmental plans annexed;
- Provincial Land Use Planning

with the aim to select strategies and actions which, both in general and specific terms, can represent a good example of mitigation and adaptation measures achievable at local level in the SEA process, with special regard to the regulatory aspect.

According to the available data of the Regional Sector *Environmental Compatibility and Integrated Procedures*, as well as those of the Regional Directorate *Productive Activities*, especially because of the need to respect the project timetable, a significant (for cases number, interest and coverage of themes) geographical area of reference has been identified to focus the study on that.

The area that proved to be more responsive to such requirements was the Province of Turin, but it must be underlined that relevant experiences are being conducted also in the rest of the region.

The Part IV illustrated experiences and good practice – divided by types – considered more significant among those examined, especially in terms of replicability and transferability.

In the second working phase reference texts have been selected in order to methodologically organize the assessment of cumulative effects and climate change in particular, related to the directions concerning Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA), and to identify the most effective methods to integrate climate change issues of local plans and programs.

Consequently it has been decided to not carry out a complete review of the literature concerning SEA, but to selectively choose texts, according to the aim of the project.

The main references and related links for a closer examination of the matter are given below:

- EC DG XI
Environment, Nuclear Safety & Civil Protection, 1999
L. J. Walker J. Johnston
Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions
<http://ec.europa.eu/environment/eia/eia-studies-and-reports/guidel.pdf>
- Cooper, L. M. (2004), *Guidelines for Cumulative Effects Assessment in SEA of Plans*, EPMG Occasional Paper 04/LMC/CEA, Imperial College London.
<http://www3.imperial.ac.uk/pls/portallive/docs/1/21559696.PDF>
- Department for Communities and Local Government: London, 2008
Eco-towns Sustainability Appraisal
Scoping report for the Planning Policy Statement on eco-towns
<http://www.communities.gov.uk/archived/publications/housing/ecotownsscopingreportapps>
- Scottish Executive Welsh Assembly Government
Department of the Environment, Northern Ireland, 2005
A Practical Guide to the Strategic Environmental Assessment Directive
<http://www.communities.gov.uk/publications/planningandbuilding/practicalguidesea>
- UK EA, May 2004, Revised June 2007
Strategic Environmental Assessment and Climate Change: Guidance for Practitioners
<http://www.environment-agency.gov.uk/static/documents/Research/seaccjune07>
- Center for Science in the Earth System (The Climate Impacts Group)
Joint Institute for the Study of the Atmosphere and Ocean
University of Washington
King County, Washington
In association with ICLEI, September 2007
Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments
Downloadable from the following website:
<http://www.iclei.org/>

2.2. SEA and Climate Change

The European Commission has already pointed out a while ago the need to integrate climate issues within the directives on EIA and SEA¹: although the SEA directive already includes the climate among the environmental matrices that must be considered in the assessment process, a lack of attention on these issues stands out among the Member States in the practical implementation of the directive itself².

This orientation has been reconfirmed by the Commission with the *WHITE PAPER – Adapting to Climate Change: towards a European Framework for Action*, April 1st, 2009. In fact this document provides that:

The Commission will work with Member States and stakeholders setting the guidelines and exchanging good practice, to ensure that account is taken of climate change impacts when implementing the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) Directives and spatial planning policies.

Guidelines will be developed

[...] by 2011, to ensure that climate impacts are taken into account in the EIA and SEA Directives.

Box 1

RSC: the SEA Role in Integrating Climate Change into Regional Plans/Programs

One of the objectives of the RSC project is to assess the possibilities given by SEA in integrating climate issues and low emissions development into regional plans and programs: in the European Union the standard procedure does not carefully consider the climate change within the SEA process.

Preliminarily, in the RSC project, the following opportunities have been identified:

- To explore the potential contribute of a plan/program for the greenhouse gas emissions, in order to reduce or remove them when possible;
- To assess the resilience of the plan/program on climate change effects/impacts;
- Identify measures to mitigate the potential negative effects that the plan/program may have on the climate, keeping in mind that in SEA context climate change is a cumulative effect due to the conjunction of different impacts deriving from various actions, that singularly could be considered negligible;
- In the assessment of the alternatives, in relation with the objectives and the reference spatial and temporal scale, the best performance of the plan/program could be taken into account with respect to the reduction of climate-altering emissions or to the vulnerability of energy system;
- The climate change represents itself an unavoidable impact: in the SEA process it could be possible to analyze if the objective to be achieved are caused by impacts related to the increase of temperature and rainfall, and to assess the potential consequences on the future localization of houses, workplaces and facilities.

Dealing with the climate change in the SEA involves a change of perspective on the assessment of other impacts: **in fact climate change is one of the most complex cumulative effects**, in which the single actions have limited or negligible impact, but the conjunction of them can cause serious effects.

It is also necessary to take into account **the effects of the climate on the plan** (vulnerability), that must be identified at the beginning of the project (screening, definition of context, baseline study, scoping), and **the**

¹ Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee, and the Committee of the Regions, 2007, *Adapting to climate change in Europe – Options for EU Action: “Climate proofing must be integrated into the Environmental Impact Assessment (EIA) and the Strategic Environmental Assessment (SEA) Directives. EIAs, SEAs and policy impact assessment must address impact on ecosystems supported by instruments that internalize the costs of damages to natural capital and ecosystem services.”*

² COWI SEA Report to European Commission of 2009 DG, Environment website: <http://ec.europa.eu/environment/eia/home.htm>.

effects of the plan on the climate (concerning in particular the impacts related to potential climate-altering gas emissions) and **on the adaptability**, during the phase of assessment.

Assessing both these effects has a **wide margin of uncertainty** because of the several future reference scenarios and the difficulty of quantifying the impacts, especially with restricted geographical area and synergetic and cumulative effects on a field that extends beyond the spatial and temporal limits of a plan/program.

This uncertainty may affect in a negative way the possibilities and capacities to identify adaptation measures, especially at local level.

Despite the difficulties outlined, even at local level the SEA represents an instrument that can potentially have a greater impact to help policies to reduce emissions, in medium and long term, and to facilitate strategies of adaptation to climate change, than the voluntary actions – which are related to the sensibility of local administrators and politicians – because of its nature of mandatory document, its purpose and process.

Although the standard procedure does not fully exploit its potential, this instrument represents one of the most complete for the sustainability, since it should ensure to go beyond sectorial logics to advantage an overall assessment of the environmental impacts and their synergetic and cumulative effects, in order to identify mitigation and compensation measures and a constant monitoring system for the adoption of corrective measures.

Another significant aspect of the SEA is that, at least in Italy, this is the only “ordinary” process of planning and programming that requires and encourages participation on environmental issues: this participation, together with a clear information and the sharing of planning and programming choices, and supported by the good practice of public administrations, can significantly aid the objective of reducing emissions and supporting adaptation policies, making more tolerable the potential costs.

2.3 Integration of the Climate Aspects in the SEA Process

2.3.1 Identification of General Objectives and Creation of Reference Scenario

As already pointed out, climate change is a very complex cumulative effect and it is necessary to assess impacts of the plan/program on the climate and vice versa, considering the uncertainty of future scenarios, which becomes more relevant moving from the global level to the local one, because modeling simulation tools are not reliable enough on restricted geographical areas and there are less available data.

Despite these difficulties, **contrasting global warming is a duty that every community must responsibly assume**, identifying appropriate mitigation and adaptation strategies, in the awareness that conditions changed or have been changing and that future generations rights must be ensured.

In this state of uncertainty around the quantification of future climate changes, the European Commission, in the White Paper on the adaptation, has identified as **priority** the **no regret** adaptation measures **aimed at increasing the resilience of ecosystems, human health, economy and infrastructure. These actions bring benefits regardless of the climate change impacts, which have sustainable costs and can be implemented, and the measures useful for both mitigation and adaptation (win-win measures).**

These are directions that must be followed for integrating mitigation and adaptation measures within the different phases of the SEA process and for identifying the objectives of sustainability related to climate change.

Table 2.3.1 provides a list of possible objectives to be achieved at local level, that can be integrated and modified depending on the plan /program contents and the reference spatial and temporal scale.

The objectives have been divided in mitigation and adaptation, but there is a fine line between these two categories. Some measures belong to both and have been divided according to their prior function. For example the development of renewable energy sources has also a positive effect on the adaptation because it reduces the dependence on external energy sources and therefore the energy system vulnerability.

Table 2.3.2 provides a possible integration methodology of climate aspects in the SEA process, that must be adapted to specific procedures.

Table 2.3.1 – Possible Objectives of SEA related to Climate Change

<p>Mitigation Measure (aimed at containing future climate changes)</p>	<ul style="list-style-type: none"> - To reduce energy consumption - To increase energy efficiency - To increase the use of renewable energy sources - To increase the integrate cycle of waste to reduce emissions - To maintain and increase the natural mechanisms of carbon absorption (carbon sink: forest and soil cover) - To promote a sustainable land use (planning and building) - To promote and increase a system of sustainable mobility - To reduce environmental pollution - To reduce light pollution - To promote agricultural and farming practices to reduce green house gas emissions
<p>Adaptation Measures (aimed at reducing the vulnerability of climate change impacts)</p>	<ul style="list-style-type: none"> - To ensure the water drainage system to be able to cope with possible changes in different types of rainfalls - To reduce the consumption of non-renewable natural resources, in particular water and soil - To improve and preserve the quality of surface and subsurface waters; - To ensure the management of future water demand and potential paucity of water - To reduce and manage the hydro-geological risk - To contrast soil erosion - To design building, settlements and facilities able to cope with the effects of extreme meteorological events - To limit soil sealing - To reduce and manage the industrial risk in order to avoid/limit the impacts on human health and environment - To reduce and manage environmental, light, noise, electromagnetic, soil and water pollution in order to limit the impacts on human health and environment - To provide an appropriate system of services and sanitary facilities - To preserve agricultural soil quality - To protect ecosystems and restore the degraded ones - To preserve biodiversity and avoid irreversible losses - To protect and implement ecological networks - To increase urban green areas - To avoid land fragmentation - To promote agricultural practices aimed at conserving soil moisture, efficiently using water resources, maintaining agricultural soil fertility levels - To avoid actions that can prevent or limit future adaptations (e.g. to adopt principles based on the highest precaution, avoiding to plan and increase settlements or facilities in the environmental criticality areas, like overflow or hydro-geological risk areas)
<p>■ Adapted from: UK EA, May 2004, Revised June 2007 <i>Strategic Environmental Assessment and Climate Change: Guidance for Practitioners</i> and from: SEWAG DE, 2005 <i>A Practical Guide to the Strategic Environmental Assessment Directive.</i></p>	

Table 2.3.2 – Mitigation and Adaptation to Climate Change in the SEA Process

SEA Process (methodological path)	Possible integration of climate aspects
Phase 1- Control of the relevance of effects (screening)	
<ul style="list-style-type: none"> • Initial orientation of the plan/program • Arrangement of the preliminary technical document • Consultation process 	<ul style="list-style-type: none"> • Identification of the probable significant effects due to climate change and/or of the existing criticalities that could be increased by climate change • Characterization of impacts and areas that can be involved with

	<p>special regard to the cumulative effects on climate and to the vulnerability of areas</p> <ul style="list-style-type: none"> • Identification of the other plans and programs that could cause, in the same area, significant impacts on emissions and environmental matrices vulnerable to climate change; • Identification of environmental experts to be consulted during the control phase, especially on (cf. Criteria of Table 5.3.1 and 5.3.3): <ul style="list-style-type: none"> Risks connected to climate change Greenhouse gas emissions Hydro-geological risk Biodiversities/ecosystems/ecological networks Water resources and quality Air quality Protected areas Etc.
<ul style="list-style-type: none"> • Identification of probable significant effects 	<ul style="list-style-type: none"> • According to the Annex I Legislative Decree no. 152/2006 and the criteria of Table 5.3.1
<ul style="list-style-type: none"> • Exclusion from the assessment phase / Exclusion contingent upon the respect of specific prescriptions 	<ul style="list-style-type: none"> • Integration of specific mitigation and adaptation measures in the plan/program drafting
<ul style="list-style-type: none"> • Need to move forward the assessment 	<ul style="list-style-type: none"> • See Phase 2 and the next ones
Phase 2- Identification of the zone of influence (environmental assessment)	
<ul style="list-style-type: none"> • General objectives of the plan/program • Creation of reference scenario <ul style="list-style-type: none"> • Identification of pertinent data and information • Identification of significant environmental criticalities • Identification of other relevant plans, programs and objectives for the environmental protection and sustainability • Identification of the sustainability objectives • Consultation process for scoping 	<ul style="list-style-type: none"> • Description of the actual state and the probable future development of climate change • Identification of probable significant effects or existing criticalities that could be increased by climate change • Identification of other plans and programs that could cause, in the same area, significant impacts on emissions and environmental matrices vulnerable to climate change • Development of context indicators (emissions and vulnerability) • Development of the objectives concerning climate change that take into account the uncertainty of the future climate scenario (precaution and <i>no regret</i> principles) • Identification and consultation of environmental experts, especially on (cf. Criteria of Table 5.3.1 and 5.3.3): <ul style="list-style-type: none"> Risks connected to climate change Greenhouse gas emissions Hydro-geological risk Biodiversities/ecosystems/ecological networks Water resources and quality Air quality Protected areas Etc.
Phase 3 - Elaboration of the Environmental Report and the Plan/Program	
<ul style="list-style-type: none"> • Identification of the plan/program general objectives and external coherence analysis • Creation of alternatives • Estimation of environmental effects and comparison and selection of alternatives • Identification of the specific objectives and line of action and internal coherence analysis • Creation of monitoring indicators • Assessment of environmental effects • Identification of mitigation and compensation measures and estimation of their effectiveness • Elaboration of the report and the non-technical summary / Elaboration of the plan/program preliminary version 	<ul style="list-style-type: none"> • In the external coherence analysis, control of: <ul style="list-style-type: none"> • coherence between reference climate scenario and the one deriving from other pertinent plans and programs • coherence with the objectives of containing emissions and protecting the climate, deriving from pertinent super-ordinate documents (laws, regulations, policy documents, planning and programming acts) and from potential equal-ordinate plans • coherence between identified indicators and those deducible from super- and equal-ordinate plans and programs • deducible suggestions on possible solution of conflict and incoherence • Development of the alternatives related to mitigation and adaptation to climate change • In selecting alternatives, performance must be assessed in terms of the greenhouse gas emission reduction and the ability of integrating adaptation measures • In the internal coherence analysis: <ul style="list-style-type: none"> • Use criteria of the table to control if there is incoherence between the climate objectives and the plan strategies and actions • Control that mitigation and adaptation actions are not in contrast

	<ul style="list-style-type: none"> • Assessment of impacts according to the criteria of Table 5.3.1 • Consideration of a long-term time horizon in the assessment of the plan/program impacts on climate and vice versa • Estimation of the effectiveness of mitigation and adaptation measures according to the criteria of Table 5.3.1 • Explanation of how the climate change aspects have been identified and examined and how the uncertainty factors have been managed
Phase 4 – Assessment and Drafting of the Final Version / Approval	
<ul style="list-style-type: none"> • Participation and consultation process • Assessment • Possible changes of the plan/program • Final approval 	<ul style="list-style-type: none"> • Consultation of environmental experts
Phase 6 – Monitoring	
<ul style="list-style-type: none"> • Management and implementation of the monitoring program: <ul style="list-style-type: none"> • Control of the significant environmental effects of the plan/program implementation • Timely identification of the negative unexpected effects • Indication of possible remedies 	<ul style="list-style-type: none"> • Monitor the efficiency and effectiveness of mitigation measures in reducing climate-altering gas emissions • Monitor the efficiency and effectiveness of adaptation measures • Be ready to adopt remedies
<p>■ Adapted from UK EA, May 2004, Revised June 2007: <i>Strategic Environmental Assessment and Climate Change: Guidance for Practitioners</i> and from: SEWAG DE, 2005 <i>A Practical Guide to the Strategic Environmental Assessment Directive</i></p>	

A valid overview of knowledge allows to identify the objectives that can effectively be achieved and shared, and to set up, in the next phases of the project, specific actions based, in terms of priority and importance, on the reference environmental, territorial and social context.

In order to compensate and manage the possible lack of information and data at local level, among the methodologies available for the assessment of cumulative effects, it becomes essential to **consult** the environmental experts and the public structures and sectors that, thanks to their specific expertise, are involved in planning procedures or in charge of specific processes, related to the plan/program contents and typology to be assessed by the SEA.

The **consultation**, with the additional use of **targeted questionnaires**, can be particularly effective in the initial orientation and the identification of the zone of influence (scoping). This is a flexible way to collect a wide range of pertinent information, including the monitoring indicators of previous, expected and probable conditions and events (deriving from plans, programs, environmental criticalities, etc.), that can affect the plan/program expectations and impacts. It is also possible to prematurely consider the potential impact.

The **targeted questionnaires** can be also useful to **self-orientate** in identifying basic information related to climate impacts, in order to find the additional data necessary for the assessment of impacts and their mitigation and management and for the creation of the consultation process.

Table 2.3.1 can be used as reference on the most sensitive areas, in terms of impact and vulnerability, in order to understand the information useful for the characterization of the environmental context, while **Table 2.3.3** shows the main regional sources of data and indicators, and the typology of available information related to the climate change and its impacts.

This list is useful for orientation and it should be adapted and integrated according to the expectations and the plan/program typology, keeping in mind that further sources to be consulted are the structures and individuals competent in the environment at municipal and provincial level.

Example of Guidance Questionnaire to define the Reference Scenario and Assessment of the Relevance of Effects

Do more sensitive and vulnerable environmental resources or areas exist? What are their conditions (quantity, quality and tendency)? Can they be affected by the plan expectations and impacts?

Which previous activities have caused effects on these resources?

Do other plans or programs that could cause significant impacts on the same resources exist?

What is the reference plan overview on the climate change and the main resources involved (policies, legal framework and possible reference standards)?

Are there problems connected to potential cumulative effects (emissions, environmental pollution, water resources quality, land fragmentation, biodiversity loss, etc.)?

- Adapted from Cooper, L. M. (2004), *Guidelines for Cumulative Effects Assessment in SEA of Plans*, EPMG Occasional Paper 04/LMC/CEA, Imperial College London

Within the SEA process an additional phase that can help to manage the uncertainty related to future climate scenarios and to test the validity and pertinence of the objectives and indicators of climate sustainability, is the **external coherence analysis**, which, though very important especially for the identification of general objectives, should be carried out in the whole assessment process³.

In relation with climate aspects this analysis can be useful to control:

- coherence between reference actual and future climate scenario and the one deriving from other pertinent plans and programs
- coherence with the objectives of containing emissions and protecting the climate, deriving from pertinent super-ordinate documents (reference plan overview: laws, regulations, policy documents, planning and programming acts) and from potential equal-ordinate plans
- coherence between identified indicators and those deducible from super- and equal-ordinate plans and programs

and to deduce suggestions on possible solution of conflict and incoherence.

³ Enplan Project, *Environmental Assessment of Guidance for Plan and Programs*, p. 90

**Table 2.3.3 – Creation of the territorial and environmental context
Sources of information and possible climate and environmental indicators**

Climate Change Aspects	Description	Possible Indicators	Sources	Types of Available Information
Climate and Climate Change		<ul style="list-style-type: none"> ▪ Average Temperature ▪ Minimum and Maximum Temperature (°C) ▪ Minimum and Maximum Temperature Range (°C) ▪ Extreme Temperature ▪ Mean annual Rainfall (mm/year) ▪ Extreme Precipitation ▪ Chilling Days ▪ Freezing Days ▪ Intense Heat Days ▪ Daylight Temperature Range ▪ Temperature Anomaly ▪ Heating Day-Degrees ▪ Heat Stress Index ▪ Meteorological Drought Index ▪ Consecutive Days without Rain ▪ Total Precipitation Anomaly ▪ Intense Showers ▪ Snowfalls ▪ Standardized Anomaly Index (SPI) ▪ Glacial Fronts Variation 	<p>ARPA Piemonte (Forecasting and Environmental Monitoring Centre) Official Website www.arpa.piemonte.it</p> <p>ARPA Piemonte Environmental Indicators 2010 http://rsaonline.arpa.piemonte.it/indicatori/</p>	<p>Online Services</p> <p>Complete list of weather reports Meteorological and hydrologic data distribution Permanent GPS stations distribution Meteorology Geographic information system Annals of meteorological and hydrologic database Snow reports and avalanche accidents database</p> <p>Publications In this section it is possible to consult and download reports, divided by publication year, carried out by ARPA Piedmont on its activities and those related to the cooperation with other agencies</p>
Emissions to the Atmosphere	- The carried out estimation concerns the sources classified under the SNAP (Selected Nomenclature for Air Pollution) and refers to pollutants like Methane (CH ₄), Carbon Monoxide (CO), Carbon Dioxide (CO ₂), Nitrous Oxide (N ₂ O), Ammonia (NH ₃), Non-Methane	<ul style="list-style-type: none"> ▪ (CH₄) t/year ▪ (CO) t/year ▪ (CO₂) kt/year ▪ (N₂O) t/year ▪ (NH₃) t/year ▪ (NMVOC) t/year ▪ (NO_x) t/year ▪ (SO₂) t/year 	<p>Regional Environmental Information System</p> <p>Inventory of Emissions to the Atmosphere (INEMAR – Air Emission Inventory)</p> <p>http://extranet.regione.piemonte.it/a</p>	This service allows to consult emission estimation concerning the last available year; estimation is expressed in tones per year, except for Carbon Dioxide and Carbon Dioxide Equivalent (which defines the total greenhouse gas emissions weighted on the basis of each pollutant specific contribute),

	<p>Volatile Organic Compound (NMVOC), Nitrogen Oxide (NOX), Sulfur Dioxide (SO2) and Particulate Matter (PM10). Since the 2005 Inventory, an estimation module of CO2 absorptions has been implemented.</p>		<p>mbiente/aria/emissioni/inventario.htm</p>	<p>expressed in Kilotons per year.</p> <p>Standard Reports They contain Excel Data Tables related to emissions at regional and provincial level, divided by macro-sectors and activities (CORINAIR Classification).</p> <p>Predefined Reports They show emission estimation divided by themes and allow the user to choose the territorial detail (region, province, municipality).</p> <p>Advanced Reports They allow the user to choose the territorial detail (region, province, municipality) and the aggregation level (macro-sector, activity, fuel, pollutant) to visualize emissions.</p>
<p>Waste</p>	<ul style="list-style-type: none"> - Data on the production and separate collection of solid urban waste divided by municipality 	<ul style="list-style-type: none"> ▪ TOTAL WASTE kg/inhabitant (tot. t/year) ▪ URBAN WASTE kg/inhabitant (tot. t/yea) ▪ SEPARATE COLLECTION kg/inhabitant (tot. t/year) ▪ % SEPARATE COLLECTION 	<p>Collection of urban waste production data</p> <p><i>Organized by:</i> Directorate for the Environment</p>	<p>Application program for data acquisition concerning the management of urban waste integrated system with special reference to separately collected waste (divided by material and total amount) in each municipality.</p>
<p>Geological, Geomorphologic and Hydrologic Characteristics</p>	<ul style="list-style-type: none"> - Identification of territorial lithostratigraphic characteristics - Identification of territorial geomorphologic characteristic - Identification of watershed characteristics: <ul style="list-style-type: none"> - groundwater - water source - groundwater height 		<p><i>Geographic Information System (SIGEO)</i></p> <p>SIGEO InterEnte - System of Geologic Information</p> <p>Geological Database</p> <p><i>Organized by:</i> ARPA Piemonte</p>	<p>It is possible to consult on a 1:25.000 scale, in a simplified GIS approach, the data related to different geographic information layers, provided to set up the Italian Geological Map Database, to query the alpha-numeric database associated to each geographic object, visualize the descriptions of each geological unit, visualize the geological profiles and the available photographic material, consult the database of the geological samples and produce simple cartographic prints based on the selected information layers of the consultation interface.</p>

			<p><i>Geology and Instability Process</i></p> <p>http://gis.csi.it/scripts/esrimap.dll?name=Rd&Cmd=IndA&Sezione=geo&Indice=geo&Idu=http://gis.csi.it/scripts/esrimap.dll?name=Rc&Cmd=IndA&Sezione=geo&Indice=geo&Idu=</p> <p><i>Organized by:</i> Directorate for Strategic Planning, Territorial Policies and Building</p>	<p>DATA:</p> <p>Slope Activity River and Torrential Activity Basic Geology</p> <p>MAPS:</p> <p>Instability Process connected to slope activity Instability Process connected to river activity Instability Process connected to torrential activity</p>
Soil Protection of Hydrological Risk Areas	<p>Events in Piedmont:</p> <ul style="list-style-type: none"> ▪ Alluvial event March 2011 ▪ Calamitous event April 2009 ▪ Weather events November and December 2008 ▪ Calamitous events July, August, September, October and first decade of November 2008 ▪ Alluvial event May 2008, 29th-30th ▪ Meteoric event August 2007 ▪ Calamitous events July-August 2003 ▪ Alluvial events 2000/02 (Autumn 2000, May / June / July / August / September / November 2002) ▪ Meteoric events August 2000 - December 2001 ▪ Alluvium May-June 2000 ▪ Alluvium Autumn 1994 	<p>Local Impacts on Climate Change: overflows, landslides and damages to works, facilities and public and private building</p>	<p>http://www.regione.piemonte.it/ooop/alluvione/index.htm</p> <p><i>Organized by</i> Directorate for Public Works, Soil Protection, Mountain Economy and Forests</p>	
Protected Areas	<p>Areas established by a specific Legislative Act: in particular, those included in the Regional Plan of Protected Areas (Deliberation of the Regional Council, May 1990, 15th), National Natural Parks and Provincial Parks in Piedmont.</p>	<ul style="list-style-type: none"> ▪ Territorial Extension (sq km) 	<p><i>Protected Areas and Natural Network 2000 Territorial and Administrative Data</i> http://gis.csi.it/parchi/dati.htm</p> <p><i>Protected Areas and Natural Network 2000</i> http://www.regione.piemonte.it/sit/argomenti/parchi/index.htm</p> <p><i>Alphanumeric Data Section</i> http://gis.csi.it/parchi/datialfa.htm</p> <p><i>Geographic Data Section</i> http://gis.csi.it/parchi/datigeo.htm</p>	<p>It is possible to directly access to two sections for data downloading, in alphanumeric or geographic format. Alphanumeric Data: it is possible to visualize, print and download the territorial surface data of protected areas and natural network 2000, referred to municipal, provincial and regional level. For protected areas, data of territorial types, park altimetry and territorial organization of park agencies in Piedmont are available too.</p> <p>Geographic Data: limits of protected areas and natural network 2000.</p>

			<p><i>Organized by:</i> Directorate for the Environment, Sector of Protected Areas Planning</p> <p><i>Protected Areas and Flora and Fauna Analysis</i> http://gis.csi.it/scripts/esrimap.dll?name=Rc&Cmd=IndA&Sezione=par&Indice=par&Idu=</p> <p><i>Restrains and Natural Characteristics of the Soil</i> http://gis.csi.it/scripts/esrimap.dll?name=Rd&Cmd=IndA&Sezione=par&Indice=par&Idu=</p> <p><i>Organized by:</i> Directorate for the Environment, Sector of Protected Areas Planning</p>	<p>DATA:</p> <p>Regional Protected Areas</p> <p>MAPS:</p> <p>Overall Maps Biotopes Plans on Nature Forest Settlement Plans Flora and Fauna Analysis Plans</p>
Areas Subject to Environmental Restraints	<p>Delimitation of areas subject to hydrological restraint (within the meaning of the Royal Decree December 1923, 30th, no.3267), areas named "Galassini" (within the meaning of the Article 139 of the Legislative Decree no. 490 of October 1999, 29th), areas subject to landscape restraint ex-lege 1497/1939 (within the meaning of the Article 139 of the Legislative Decree no. 490 of October 1999, 29th), river and lake areas, mountain areas and wooded areas. Areas vulnerable to Nitrate contamination (Regulation 9/R).</p>	<ul style="list-style-type: none"> ▪ Territorial Extension and Different Types (sq km) 	<p><i>Cartographic Repertoire</i> http://gis.csi.it/scripts/esrimap.dll?name=Rc&Cmd=IndC&Sezione=All&A=&SA=70&Idu=&Indice=All</p> <p><i>Organized by:</i> Directorate for Strategic Planning, Territorial Policies and Building</p>	
Landscape and Cultural Heritage	<ul style="list-style-type: none"> - Localization of cultural, architectural, urban and archaeological heritage; - Identification of agricultural and forest landscape; - Localization of constrained archaeological sites (within the meaning of the Article 2 of the Legislative Decree no. 490 of October 1999, 29th). 		<p><i>Territorial Statistical Database</i> http://gis.csi.it/bdtwin/indice.html</p> <p><i>Organized by:</i> <i>Agriculture and Forests Cartographic Repertoire</i> http://gis.csi.it/scripts/esrimap.dll?name=Rc&Cmd=IndC&Sezione=All&A=&SA=73&Idu=&Indice=All</p>	<p>Information on cultural, architectural, urban and archaeological heritage.</p> <p>Description file for each municipality</p> <p>Fire Development Map (every 10 years)</p> <p>Forest Fertility Map</p> <p>Forest Plant Types, Regional</p>

			<p><i>Land Use Cartographic Repertoire</i> http://gis.csi.it/scripts/esrimap.dll?name=Rc&Cmd=IndC&Sezione=All&A=&SA=72&Idu=&Indice=All</p> <p>Organized by: Directorate for Strategic Planning, Territorial Policies and Building</p>	<p>Objective and Directions Map</p> <p>Turin Hills Landscape Plan</p> <p>Forest Types Map</p> <p>Land Use Capacities Map</p> <p>http://www.regione.piemonte.it/foreste/cms/sifor.html#banchedati</p>
			<p><i>Agricultural Soil Map</i> http://www.regione.piemonte.it/agri/suoli_terreni/index.htm</p> <p>The activities related to the mapping of soil and agricultural/forest landscapes are implemented in the Soil Sector of the Institute for Forest Plant and Environment (IPLA Spa), an instrumental agency of Piedmont, while the soil analysis is carried out in the Regional Agrochemical Laboratory.</p>	<p>Soils in Piedmont Soil Maps and Derivate Maps 1:50.000 Soil Maps and Derivate Maps 1:250.000 Current Activities</p> <p>LANDSCAPES OD PIEDMONT Map of scale 1:250.000</p> <p>DOCUMENTATION Soil Maps and Derivate Maps Land Use Capacity Soil Protection Capacity PCI (Program of Community Interest)</p>
<p>Flora and Fauna Ecosystems</p>	<p>Description of the existing ecosystems, with special regard to Sites of Community Interest (SCI), Sites of Regional Interest (SRI) and Special Protection Area (SPA). Identification of the flora and fauna of the area, with special reference to valuable species (ref. Legislative Directive "Habitat")</p>	<ul style="list-style-type: none"> ▪ SCI (sq km); ▪ SRI (sq km); ▪ SPA (sq km). 	<p><i>Protected Areas and flora and fauna analysis</i> http://gis.csi.it/scripts/esrimap.dll?name=Rc&Cmd=IndA&Sezione=par&Indice=par&Idu=</p> <p><i>Restrains and Natural Characteristics of the Soil</i> http://gis.csi.it/scripts/esrimap.dll?name=Rd&Cmd=IndA&Sezione=par&Indice=par&Idu=</p> <p>Organized by: Directorate for the Environment, Sector of Protected Areas Planning</p> <p><i>Wildlife Observatory / Agriculture</i> http://www.regione.piemonte.it/agri/osserv_faun/index.htm</p>	<p>DATA:</p> <p>Regional Protected Areas</p> <p>MAPS:</p> <p>Overall Maps Biotopes Plans on Nature Forest Settlement Plans Flora and Fauna Analysis Plans</p>

<p>Forests</p>	<p>The Regional Forest Information System is an instrument for information research and consultation related to Territorial Forest Plans, Forest Types and Seed Stands of the regional territory.</p>		<p>Sifor – Regional Forest Information System</p>	<p>SIFOR provides, organizes and coordinates Piedmont forests database (Regional Forest Map, Territorial Forest Plans, Seed Stands), phytopathological database and another one of Forest Types.</p> <p>Actually the available sections are the database of Seed Stands (since 2009), the documentation of Territorial Forest Plan studies and the Atlas of Forest Types (since June 2011).</p> <p>It's an open access service of "Piedmont System" portal, Mountain and Forest Section.</p> <p>The database of Seed Stands allows to consult details about basic materials, identified at the source and selected (Legislative Decree 386/2003). Data related to localization, accessibility, site, evolutionary cultivation and dendrology are available and useful for collecting single species of every stand.</p> <p>The Section of Territorial Forest Plan Studies allows to consult, visualize on WebGis And download the documentation on the Territorial Forest Plan studies of the whole regional territory (regional forest map and documentation of the Plan).</p> <p>The Atlas of Forest Types collects monograph of every forest type recognizable in Piedmont and provides information on distribution, variability, ecology, floral composition and forestry.</p>
<p>Biodiversity</p>	<p>Analysis of the variety of biotic organisms (animals and plants) within ecosystems of the reference territory.</p>		<p>Database on Nature</p>	

	Assessment of the effects on biodiversity. Application program that integrally manages data and information on Water Resources (water derivations, waste from industrial plants, monitoring, integrated water structures, water resources register).			
Water Quality	Identification of the environmental quality of surface waters on the basis of the ecological and chemical state (through the analysis of chemical macro-descriptors) of the water body.	<ul style="list-style-type: none"> ▪ ECOLOGICAL STATE: EBI Index. ▪ CHEMICAL STATE: BOD5 (O2 mg/L); COD (O2 mg/L); NH4 (N mg/L); NO3 (N mg/L); Total Phosphorus (P mg/L); Escherichia coli CFU/100 mL) 	<p><i>SIRI - Water Resources Information System</i></p> <p>SIRI – Water Resources Information System / SIBI – Information System on Drainage and Irrigation Water</p> <p><i>Monitoring of surface waters</i></p> <p><i>Monitoring of subsurface waters</i></p> <p><i>Waste waters</i></p> <p><i>Use of surface, subsurface and source waters</i></p> <p><i>Organized by:</i> Directorate for the Environment</p>	<p>Chemical, microbiological and EBI data related to the regional monitoring network of surface waters, in electronic format: Excel or .DBF file or Access. Temporal coverage from January 2000.</p> <p>Piezometric and chemical data related to the regional monitoring network of subsurface waters, in electronic format: Excel or .DBF file or Access. Temporal coverage from January 2000.</p> <p>Information on waste waters. Water Protection Plan. Information on the 12000 sampling points of surface, subsurface and source waters, geo-referenced on Military Geographic Institute Maps of scale 1:25000. Every point is connected to alphanumeric information of the water resource register.</p>
Anthropization of Soil and its Characteristics. Socio-Economic Data	Identification of the soil anthropic characteristics.	<ul style="list-style-type: none"> ▪ Number of residents; ▪ Residential density; ▪ Number of inhabitants/sq km); ▪ Population divided by age class ▪ Territorial extension (sq km); ▪ Urban area extension (sq km); ▪ % Total urbanized areas; ▪ Public green space (sq m / inhabitant) (maximum of 15 sq m per inhabitant, established by the Regional Law 56/77); ▪ Number of industrial units / manufactures 	<p><i>DEMOGRAPHIC EVOLUTION DATABASE</i></p> <p>DEMOS – Demographic Observatory of Piedmont</p>	<p>The Demographic Evolution Database is a collection of data on the population resident in Piedmont and its structure and characteristics. It contains all the personal data of the 1206 municipalities of Piedmont, provided by statistical data of ISTAT from 1991.</p> <p>The Demographic Evolution Database has been made in two versions: the web page, public and freely consultable, allows the access to four theme modules of resident population and the mining of any territorial data</p>

		<p>(Mineral extraction; Manufacturing activities; Electricity, gas and water distribution and production; etc.);</p> <ul style="list-style-type: none"> ▪ Number of workers by sector. 		<p>(starting from a single municipality) from 1991; the client/server version, accessible only within the RUPAR (telematic network of Piedmont), allows both the mining of data and indicators and the use of analysis techniques.</p>
<p>Characterization of activities related to services for the community</p>	<p>Identification and geo-reference (by activity generating a great impact on the climate) of incinerators, landfills, waste treatment plants, ecological collection areas, aqueduct, purifiers, public sewage system, sanitary facilities, radio and television communication stations, electric power distribution network. Identification of the considered amount and the quality and quantity assessment of possible impacts.</p>		<p><i>Waste Management Plants Waste Information System – Regional Waste Observatory</i></p> <p>http://extranet.regione.piemonte.it/ambiente/rifiuti/impianti/index.htm</p> <p>http://extranet.regione.piemonte.it/ambiente/rifiuti/impianti/discariche/index.htm</p> <p>http://extranet.regione.piemonte.it/ambiente/rifiuti/impianti/inceneritori/index.htm</p> <p>http://extranet.regione.piemonte.it/ambiente/rifiuti/impianti/rifiuti_organ/index.htm</p> <p><i>Organized by: Directorate for the Environment, Sector of Waste Management Planning</i></p> <p><i>SIRI - Water Resources Information System</i> SIRI – Water Resources Information System / SIBI – Information System on Drainage and Irrigation Water</p> <p><i>Organized by: Directorate for the Environment</i></p>	<p>It provides information on disposal installations (landfills and incinerators) and valorization of urban waste merceological fractions. Landfills: localization and list of the first and second category landfills active from 2000 and the landfills of non-hazardous waste (data updated to December 2002, 12th). Incinerators: localization and list of the incinerators plants active from 2000. Biowaste treatment: localization of the bio-fraction treatment plants. Treated quantities. Search for active composting plants.</p> <p>It provides information on aqueduct, sewage and purification facilities. The web service is characterized by a cartographic interface that allows to visualize aqueduct elements, sewage system and purification on the Regional Technical Map and to consult information associated to the elements themselves. Furthermore this instrument allows to print the visualized element (on the A4-format predefined layout) and the associated technical data, and also to download the cartographic and technical data concerning the facilities.</p>

Characterization of Primary Sector	<p>Quantitative characterization of activities like agriculture (utilized agricultural areas for agricultural use), breeding (types and number of reared heads).</p> <p>Identification and geo-reference (by activity generating a great impact of the environment) of mining activities, exploitation of natural resources and quantitative and qualitative identification of the produced impacts.</p>	<ul style="list-style-type: none"> ▪ Agriculture: <ul style="list-style-type: none"> ▪ % of lands used for agriculture; ▪ Number of UAA; ▪ Total extension of UAA. ▪ Breeding: <ul style="list-style-type: none"> ▪ Types and number of heads in the territory; ▪ Number of heads/UAA ▪ Mining activities: <ul style="list-style-type: none"> ▪ authorized slide volumes m3/year 	<p>AGRIDATA: http://www.regione.piemonte.it/agri/ita/agridata/index.htm</p>	<p>AGRIDATA contains the main statistical official data concerning agriculture in Piedmont, which have been collected, elaborated and spread by the National Statistical System (SISTAN) in the National Statistical Program within the meaning of the Legislative Decree no. 322 of September 1989, 6th.</p>
			<p>Database on mining slides: Mining Activities Database (BDAE)</p>	<p>This online database of the mining activities in Piedmont allows to add information of its own sphere of competence and to consult the whole database.</p>
Characterization of Secondary Sector	<p>Identification and geo-reference (by activity generating a great impact on the environment) and quantitative and qualitative characterization of the possible impacts of different industrial sectors and energy production plants in the territory.</p>		<p><i>Economic and Production Activities Register</i> http://intranet.ruparpiemonte.it/aaep/</p>	<p>This service, organized by Piedmont, provides to the Regional Public Administration Agencies a set of personal data (punctual and statistical), deriving from different public sources related to economic and production activities of the regional territory. The Piedmont Public Administration Agencies can access to the above-mentioned information through the Consultation, Query and Reporting Service.</p>
			<p><i>SIAR – Information System on Relevant Risk Activities</i> SIAR – Information System on Relevant Risk Activities</p> <p><i>Organized by:</i> Directorate for the Environment, Sector of Serious Environmental Risks, Damage and Remediation</p>	<p>This service provides information on: Classification of dangerous substances; Characterization of incidental scenario in terms of probability of occurrence and consequence; Geo-reference of undertakings and distress centres; Visualization of areas potentially involved by incidental event as well as different territorial elements. It is also possible to visualize the of</p>

				relevant risk activities register.
Characterization of Tertiary Sector	Identification of tourist facilities (including reception, sport, entertainment and tourism orientation Facilities), research scientific activities, environmental education initiatives.	<ul style="list-style-type: none"> ▪ Accommodation Service: Hotels, B&B (number of beds) ▪ Food Supply Facilities (Restaurants, pizzerias, etc.); ▪ Bars. 	<p><i>Statistical Data on Craft Information System and Observatory</i> http://www.regione.piemonte.it/artig/dati.htm</p> <p><i>Statistical Data</i> http://www.regione.piemonte.it/artig/dati01.htm</p>	Data are updated to December 2008 and respect the division by production sector established by the National Institute of Statistics (ISTAT) in 1991 (ATECO 1991, Economic Activity Classification). The variables identified for data analysis are: consistency of companies divided by production sector and province; total number of workers; enterprise dimension; activity duration; new inscriptions and cessation of annual inscriptions to the Register of Enterprises .
General			<p>Access to Piedmont System and RUPAR (telematic network of Piedmont) http://www.regione.piemonte.it/bdati/</p> <p><i>Diffused Territorial Information System (SIDAT)</i> www.sistema.piemonte.it_sidat_</p> <p><i>Organized by:</i> Directorate for Strategic Planning, Territorial Policies and Building</p> <p><i>Webgis for the Environmental and Territorial Data Consultation</i> http://www.sistemapiemonte.it/ambiente/webgis.</p> <p>Catalogue of Environmental Data http://www.sistemapiemonte.it/ambiente/vas.shtml</p> <p><i>Organized by:</i> Directorate for the Environment</p>	<p>SITAD is the Diffused Territorial Information System of Piedmont Public Agencies. In these pages it is possible to research and visualize territorial and environmental information that are collected, documented and provided by various agencies involved in the project.</p> <p><i>Webgis:</i> the service allows the integrated consultation of some geographic data concerning different environmental aspects, provided by agencies involved in the Regional Focal Point of Piedmont. The Cartographic Reference System of available data is UTM-WGS84. The Catalogue of Environmental Data collects the set of information resources available within the Regional Environmental Information System of Piedmont.</p>
<p>■ Adapted from DOCUP (Single Planning Document) 2000/2006 of Piedmont Region, MEASURE 2.3 – COMPLETION AND DEVELOPMENT OF SETTLEMENT FACILITIES FOR THE ECONOMIC SYSTEM <i>Guide to Implement an Environmental Management Plan for Equipped Areas</i></p>				

2.3.2 Monitoring

Table 2.3.3 provides a list of possible indicators connected to climate change useful to set up a monitoring plan.

Obviously they must be selected and/or integrated to be pertinent and representative of the plan/program contents and objectives.

As already said (cf. Paragraph 2.3.1), through the consultation and control of external coherence, it is possible to obtain appropriate information also for the setting of a monitoring plan, with a reference to existing databases and indicators used to monitor other plans, identifying where possible measurable indicators.

Distinguishing between context indicators (climate, climate change and evolution of the main elements vulnerable to the impacts of the change itself) and efficiency (state of implementation) and effectiveness (achievement of objectives and respect of the implementation timetable) indicators of the plan/program and mitigation and adaptation measures, allows to monitor the evolution of the initial reference scenario and to control at the same time the need of a reorientation of the plan/program, if in the implementation phase there are unexpected negative impacts.

It becomes significant to monitor adaptation strategies and maintain them in case of probable acceleration and intensification of climate change, in order to show potential criticalities of the strategies themselves and adopt remedies.

In this way local authorities help to know the best strategies. In fact, it is important to ensure that

*[...] the various initiatives are not counterproductive or duplicated at other levels of authority. Timely involvement of local and regional authorities could ensure that the proposals complement each other as municipalities, cities and regions can offer information on the experiences and solutions that have already been developed at sub-national level; [...]*⁴

Further indications on monitoring can be obtained from the experiences gained within the field of voluntary local actions for climate (cf. Box 3).

⁴ Opinion of the Committee of the Regions on the White Paper "Adapting to Climate Change: towards a European Framework for Action" (2010/C 79/03), Strategic Recommendations, point 5.

Local Inventories and Monitoring of Greenhouse Gas Emissions Operating Manuals

Considering the actions aimed at achieving the objectives of environmental sustainability and contrast of global warming based on the voluntary adhesion of local authorities, ICLEI Association carried out a significant experience:

- **ICLEI Local Governments for Sustainability - CCP Cities for Climate Protection Campaign:** the operating manual elaborated by this Association aims to assess, register and monitor the emissions and it is supported by the software for report accounting and monitoring. It is divided by types based on the inventoried emissions area in order to elaborate an action plan to reduce greenhouse gas emissions, to identify and assess the possibility to reduce the main vulnerabilities related to climate change impacts, to identify mitigation and adaptation strategies and to monitor and implement them.
International Local Government GHG Emissions Analysis Protocol (IEAP) Version 1.0 (October 2009)
<http://www.iclei.org/>
- Further useful information are placed on the Web by **THE COORDINATION OF ITALIAN LOCAL AGENDA 21**. In particular the *Environmental Accounting of Local Authorities* Working Party has been made to place on the web and spread the knowledge and experience on the environmental accounting of Italian local authorities, and in particular to update the methodology developed by the LIFE CLEAR Project.
<http://www.a21italy.it/IT/index.xhtml>

2.4 Main Sectors related to Climate Change: Mitigation and Adaptation Actions

Provinces, with direction and coordination tasks, and Municipalities, through the adaptation of building regulations and urban plans to rules and principles of environmental sustainability, have a key role in identifying mitigation and planned adaptation policies: not only they receive super-ordinate directions and regulations, that are implemented with supervision tasks, but they can also help the innovation through programming, planning and regulatory activities, and identify criteria, project directions and incentive mechanism, calibrated and contextualized in their own territory.

Therefore it is necessary to identify appropriate protections in programming and planning acts and to consider climate and sustainability as information principles of the government decisions on the territory.

Moreover, as underlined by the Opinion of the Committee of the Regions on the White Paper “*Adapting to Climate Change: towards a European Framework for Action*” (2010/C 79/03),

[...] climate change does not distinguish between geographical, organisational or administrative boundaries, and therefore urges that a horizontal joined-up approach be taken at local, national and regional bodies that share common features such as stretches of waters, estuaries, coastal and river flood plains, islands and outermost regions, whereas, from a vertical perspective, adaptation effort requires bottom-up action and recommends that joint actions on adaptive measures be undertaken by all relevant levels of government.

and

[...] climate change impact recalls the need to employ a combination of policy instruments, including local strategic plan. It is highly important that aspects of climate change be incorporated directly into local planning tools in order to ensure that climate impact is taken into account.⁵

⁵ Opinion of the Committee of the Regions on the White Paper “Adapting to Climate Change: towards a European Framework for Action” (2010/C 79/03), Strategic Recommendations, point 7.

In many of the sectors involved by impacts, planning, guidance and implementation responsibilities fall on local planning instruments.

Moreover, in our government system, most of the general and sectorial directions deriving from regional plans need to be received and implemented by territorial provincial plans and urban municipal plans.

In particular on the front of adaptation, local authorities will be involved in:

- facing damages to houses and facilities, consequent flooding and overflows, protecting the land and ensuring an appropriate drainage system and controlling if sewage system is able to support the additional load due to the increasing rainfall episodes;
- planning the development and managing the existing one, dealing with the management of future water demand and the probable paucity of water;
- contrasting the effect of increased heat waves in urban areas due to the soil sealing (heat island);
- planning the adaptation strategies, on the front of information and communication to the population and economic agents, to increase the knowledge on the risks connected to climate change but also on the growth opportunities related to the need of adaptation;
- developing appropriate alarm systems.

Moreover the sphere of local action is larger and includes a variegated series of mitigation and adaptation interventions, needed to reduce impacts on climate and vulnerabilities of the reference territory:

Energy saving and efficiency in buildings; promotion of renewable energy sources and low-carbon power; protection of natural resources, in particular soil, water, forest and plant coverage; protection and creation of local ecological networks; protection of ecosystems and biodiversity; waste management; reduction of environmental pollution and pressure factors that can strengthen impacts on human health and environment, caused by climate change and by the intensification of weather events (light, noise and electromagnetic pollution, industrial risk pollution, soil and water contamination, etc.).

As already said, general principles to be respected in the identification of mitigation and adaptation measures are those established at community level:

- Identifying flexible strategies that can be implemented and modified depending on future climate conditions;
- Avoiding actions that can prevent or limit future events (e.g. to adopt principles of maximum precaution, avoiding to plan and increase settlements and facilities in high environmental criticality areas, such as overflow and water risk areas);
- Prioritising *no regret* adaptation measures, aimed at increasing the resilience of natural, anthropic, economic and infrastructural systems and involving benefits regardless the entity of climate changes, sustainable in costs and implementable;
- Identifying measures useful both to mitigation and adaptation (*win win* measures) (for example the measures on energy efficiency contribute to develop the innovative low-carbon economies)

In accordance with such principles, the main programming and planning fields at local level, connected to climate aspects in terms of impact and vulnerability, are highlighted below, together with the possible orientation that can be taken by the general objectives indicated in Table 5.3.1.

Table 2.4.1 and **2.4.2** show some possible mitigation and adaptation measures to be implemented at local level, related to building and settlement planning and management.

<i>Table 2.4.1 - Building</i>	
Mitigation Measures	<p>Energy Saving and Efficiency; Reduction of Emissions and Environmental Pollution.</p> <ul style="list-style-type: none"> • To identify the requirements on energy performance of the building/plant considered in its entirety and the specific elements of construction sites and industrial plants, for interventions for new buildings and the existing ones* • To ensure the respect of minimum emissions requirements of heating appliances • To provide for the obligation to dispose the connection to district heating/cooling in case of network sections within a certain distance • To encourage, for the energy requirements of the building, the renewable energy sources use (photovoltaic, solar thermal or geothermic system and biomass) for power generation and DHW (Domestic Hot Water)* • To reduce the energy needed in the life cycle of materials (production, transport, implementation, maintenance and disposal), encouraging and/or prescribing, for new buildings or renovation actions: <ul style="list-style-type: none"> - use of recyclable materials** - use of recycled materials** - use of local materials, where possible** - use of incorporated low energy materials and/or environmental certification** - bio-housing interventions <p>* For the minimum cogent levels, see Part III ** It is possible to set minimum use percentage</p> <p>Waste</p> <ul style="list-style-type: none"> • To ensure the waste recovery and recycle, and for the non-residual or non-recyclable part, the correct disposal of demolition materials and wreckage from construction plants • To provide for integration criteria of curbside collection of the waste of new buildings
Adaptation Measures	<p>Architectural and Environmental Inclusion</p> <ul style="list-style-type: none"> • To identify planning and settlement criteria able to ensure the best internal comfort, with a view to further temperature increase, and to reduce the energy demand (orientation optimization, natural ventilation and daylighting, screening systems, ventilated facades, solar greenhouses, etc.) • To identify architectural inclusion criteria of photovoltaic and solar plants, greenhouses, screening systems, etc. <p>Water Saving</p> <ul style="list-style-type: none"> • To identify measures for water saving and re-utilization of rainwater, encouraging and/or prescribing new buildings or renovation actions: <ul style="list-style-type: none"> - percentage of water use reduction compared with the average daily consumption per inhabitant and based on the immovable property destination

	<ul style="list-style-type: none"> - use of devices to reduce the drinking water consumption (water meters for a single housing unit, mixers, water flow reduction devices, time management devices for public buildings, flush double button toilet tanks) - rainwater abstraction, filtration and accumulation systems and creation of related dual networks to be used for irrigation of pertinent green spaces, cleaning of paved external areas, supply of water tanks and other compatible uses - greywater saving and re-utilization systems with the same purpose <p>Urban Microclimate and Soil Sealing</p> <ul style="list-style-type: none"> • To identify the minimum percentage of pertinent green spaces in case of new building or renovation of the existing fabric with full ground operations • To ensure the maximum permeability of pertinent areas, using systems for drainage and a good green cover • To create green cover and facade aimed at mitigating and compensating environmental impacts caused by the construction of a building: <ul style="list-style-type: none"> - Improvement of the landscape - improvement of heat and sound insulation performance of the building - improvement of environmental conditions, exploiting their ability of absorption of environmental pollutants, flood retention and reduction of the heat island effect in urban areas
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Table 2.4.2 – Settlements	
Mitigation Measures	<p>Energy Saving and Efficiency; Reduction of Emissions and Environmental Pollution</p> <ul style="list-style-type: none"> • To encourage the renewable energy sources use (photovoltaic, solar thermal, aeolian, hydroelectric or geothermic system, biomass) for the local energy demand • To use district heating/cooling systems • To ensure the respect of regional and municipal requirements on air quality clearance and protection • To privilege, in new building and urban renovation actions and in commercial plans, the development of mixed destination areas with various functions, able to reduce motorized displacements in favour of the pedestrian and cycle ones, with additional benefits on human health thanks to the reduction of accidents and pathologies determined by sedentary lifestyle and with the reduction of soil consumption thanks to an intensive use of urban space • To develop a more sustainable mobility through implementation and reorganization of public transport and pedestrian/cycle links, connected to regional rail and metropolitan system and to interchange parking, and the rationalization of private transport • To encourage bike sharing and car sharing services, with cooperation between municipalities • To develop a sustainable mobility and tourism usability system

	<ul style="list-style-type: none"> • To encourage interventions aimed at replacing and modernizing of public vehicles and contributions to transform private cars with low emission vehicles • To realize and ensure an appropriate maintenance of urban green spaces in order to mitigate environmental pollution <p>Soil</p> <ul style="list-style-type: none"> • To limit soil consumption, encouraging interventions of regeneration, reorganization and reutilization of the existing urban and productive fabric, and consolidate settlements • To contrast urban dispersion • To protect fertile soils and lands for certified and/or valuable cultivation <p>Waste</p> <ul style="list-style-type: none"> • To ensure at least the minimum percentage of separate collection established by law • To set up the integrated system of urban waste separate collection related to land characteristics in order to minimize the amount of waste to be used for energy recovery and landfill diversion, in order to protect soil • To reduce waste contamination in order to allow recovery of materials and limit their harmfulness, giving priority to curbside collection systems • To implement home composting for the users who do not use curbside collection of bio-fraction • To provide for municipal and inter-municipal collection centers in the service of urban waste curbside collection • To ensure a correct management of sewage sludge for municipal and industrial waters • To increase the collection of biogas produced by existing landfills
<p>Adaptation Measures</p>	<p>Hydrogeological Risk / Soil Protection</p> <ul style="list-style-type: none"> • To manage and reduce the hydrogeological risk, avoiding to increase the use of critical areas and secure them • To prefer, where possible, bioengineering techniques to ensure the territory in order to limit the impacts on ecosystems and ecological corridors • To ensure the maximum permeability of soil, using drainage asphalt, permeable paving, absorptive outlet in parking areas, along the road and in public open surfaces • To compensate the soil sealing and the loss of small drainage networks, applying the principle of hydraulic invariance to the transformation of land use • To provide for seepage trenches, detention baths and ponds in green spaces • To provide for systems of prevention from oil and residual means of transport pollution, in rainwater collection systems • To protect agricultural soils in periurban space

Water

- To ensure the respect of regional programming measures for qualitative protection of water bodies (Water Protection Plan)
- In planning the new residential settlements and the increase settlement capacity, to assess the state of water resource and the compatibility between the expectations and the current and future availability of resource
- To control the ability of sewage networks and rainwater disposal to support the additional water load that can be caused by intense weather events

Urban Microclimate and Soil Sealing

- Creation of green system with public parks, playing areas, tree-lined roads, historic gardens and urban agricultural areas, to implement the role of ecological network of urban green spaces and the ecosystem quality, and to get benefit in terms of settlement quality and landscape, recreational and social usability
- To maintain and implement green spaces in urban context to contrast the heat island effect
- To ensure an equal distribution of urban green spaces in order to have not inequalities for the adaptation solutions
- To identify appropriate planning criteria for pedestrian areas and links and cycle tracks, ensuring the safety and a good urban and landscape inclusion, without relegating them to marginal and residual areas. It is necessary to integrate green spaces, water resources and urban design in order to allow a pleasant and safe use and the improvement of urban microclimate
- To protect agricultural soils of periurban space

Productive Areas

- To reduce and manage the industrial risk
- To introduce, for the expected new productive areas or the requalification of the existing ones, criteria and normative directions of environmental and landscape sustainability on the model of Ecologically Equipped Productive Areas

Table 2.4.3 – Soil, Forests, Agriculture

<p>Mitigation Measures</p>	<ul style="list-style-type: none"> • To identify measures of prevention from forest fires • To reconstruct and manage forest ecosystems and wetlands (bogs), taking into account the impacts caused by climate on these ecosystems • To protect wooded areas and forests (even from the residual elements) • To protect soils and in particular fertile soils and wetlands • To increase the quantity of organic matter in agricultural soils, using compost and sludge deriving from depuration of civil waste in order to reduce the desertification and increase the agricultural soil carbon sequestration capacity • To promote policies for the reduction of greenhouse gas emissions (nitrogen monoxide, methane and ammonium) caused by agricultural practices and to encourage sustainable manure settlements • To encourage the use of renewable energy sources and agricultural waste to respond to the energy demand of agricultural activities
<p>Adaptation Measures</p>	<ul style="list-style-type: none"> • To promote agricultural practices and cultivations aimed at soil moisture preservation, water resources efficient use and maintenance of agricultural soil fertility levels

Table 2.4.4 - Biodiversity, Ecosystems, Ecological Networks

<p>Adaptation Measures</p>	<ul style="list-style-type: none"> • To contrast land fragmentation and loss of natural habitat • To re-establish degraded habitat and create or renovate ecological networks and in particular surface drainage channel • To mitigate impacts on ecosystems and ecological networks caused by the land transformation and to compensate the residual ones using prior compensation • To limit the artificialization of surface drainage channel and restore, where possible, the morphological balance • To revitalize rivers through ecological restoration of pits and reconstruction of riparian wooded areas, with the additional function of natural filtration to protect water quality • To protect valuable areas • To protect and restore the small elements of ecological network (hedges, rows, wooded buffer zones, etc.) • To ensure the ecological connection in urban and periurban areas through the green system design
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3. Good Practices and Significant Experiences

In order to respect the project timetable, a significant (for cases number, interest and coverage of themes) geographical area of reference has been identified to focus the study on that.

The area that proved to be more responsive to such requirements was the Province of Turin.

The time horizon of the case studies is rather recent (2004/2011).

3.1. Covenant of Mayors: Sustainable Energy Action Plans (SEAP)

The European Commission has identified, in *How to Develop a Sustainable Energy Action Plan (SEAP) – Guidebook*, the main policies and measures to be pursued in the SEAP elaboration, concerning the following sectors of direct and indirect management of municipalities:

1. Building
2. Transport and Urban Mobility
3. Renewable energies and District Heating Systems
4. Public Procurement
5. Urban and Territorial Planning
6. Information and Communication to Citizens and Operators

The nodal point of the Plan setting is the elaboration of BEI (Baseline Emission Inventory), an inventory of emissions on municipal scale that should be considered for the future objectives identification of 2020. 1990 – the same year of the Kyoto Protocol – is the reference basic year adopted by European Union to reduce emissions by 2020. In order to compare the reduction of emissions on European scale with the one indicated in the Covenant of Mayors, the Commission recommend to use 1990 as reference year of BEI, if required data are available on municipal scale. If this is not possible, the local authorities will be free to choose a different year between 1990 and 2005, taking into account completeness and accuracy of the data that will be documented.

In Piedmont, only three municipalities involved in the Covenant have elaborated the SEAP: Avigliana, Turin and Collegno.

The **Province of Turin** has also elaborated, as support structure, **the energy balance and inventory of greenhouse gas emissions for all the municipalities** of its own area (baseline referred to 2000⁶, for the setting of Action Plans provided for by the Covenant of Mayors in Turin area).

Torino- TAPE - Turin Action Plan for Energy

The City of Turin approved the SEAP in September 2010.

The reference basic year for the inventory of emissions and energy consumption is 2005. The purpose is to reduce CO₂ emissions at least by **28,6%**.

Although data for the inventory of emissions related to 1991 were available, it has been considered necessary to create another inventory related to 2005, because of the deep social and economic transformations of the last twenty years in Turin. The two inventories are methodologically homogeneous and comparable. They have defined the objectives of emission reduction to 2020.

Final consumption of electricity and heat energy have been quantified for Building and Tertiary Sector, Industry, Public and Private Transport, and the corresponding CO₂ emissions have been calculated.

The energy consumption of Municipality, Public Lighting and Public Transport Sectors have been recorded directly. For Residential and Tertiary Sectors, Industry and Private Transport, assessments with direct methodologies have been done.

*The **reduction of CO₂ emissions by over 40% between 1991 and 2020**, presents a more accentuated curve in the years to come with respect to the registered trend in the previous fifteen years.*

⁶ http://www.provincia.torino.it/ambiente/energia/progetti/baseline_comuni

Inventories of CO2 Emissions ⁷ (tonne/year)									
Sectors	Year 1991		Year 2005		Year 2020 (Assessment of Emissions after the SEAP)		Emission Reduction between 1991 and 2005 (%)	Emission Reduction between 2005 and 2020 (%)	Targeted Emission Reduction between 1991 and 2020 (%)
1. Building and Tertiary Sector	3.000.90₇	57%	2.856.77₈	56%	2.016.35₄	53%	-20,7%	-29,4%	-32,8%
1.1. Municipal	180.269	3%	70.034	1%	30.948	1%	-61,2%	-55,8%	-82,4%
1.2. Tertiary Sector	846.842	13%	997.163	20%	927.372	24%	+17,8%	-7,0%	+9,5%
1.3. Residential	2.537.84 ₇	40%	1.744.79 ₀	34%	1.026.51 ₃	27%	-31,2%	-41,2%	-59,5%
1.4. Public Lighting	35.949	1%	44.791	1%	31.521	1%	+24,6%	-29,6%	-12,3%
2. Industry	1.800.80₅	29%	1.508.71₆	30%	1.323.97₂	35%	-16,2%	-12,2%	-26,5%
3. Transports	868.879	14%	734.852	14%	473.173	12%	-15,4%	-35,6%	-45,5%
4. Electricity Production	-	-	-	-	170.312	-	-	-	-
TOTAL	6.270.59₁	100%	5.100.34₆	100%	3.643.18₇	100%	-18,7%	-28,6%	-41,9%

This reduction is due to the implementation of effective measures, realized in a short time.

*The key elements of this strategy are represented by the great improvement of energy performance of existing buildings, the use of renewable energy sources, the significant plan on transport to decrease the role and impact of private vehicle transport in favor of public transport, and the large extension of urban **district heating** network based on the cogeneration, that will cover the **45% of the residential volumes in the city**.*

The priority sectors to implement the TAPE plan are public and private building, mobility and transport: here great structural investments have been started, with short- and medium-term effects.

The single actions identified in the TAPE plan are to a large extent deriving from other plans or planning acts and have been identified through the following criteria:

- implementation time: actions that are finished or still ongoing (planned from 2005 and expected to end by 2020);
- high implementation possibilities, supported by expenditure commitments already adopted by the responsible authority (Municipality, Province, Region or State) or approved by the competent people;
- possibility to monitor them in progress and follow-up.

Actions of the **Municipal Sector** related to public building heritage equal to 8% of the whole built-up surface of Turin are significant for sense of responsibility and spreading value towards citizens: interventions are aimed to **improve building energy performance, increase use of renewable energy sources** (cf. Paragraph 7.1) and raise the number of public properties connected to the district heating network, with the aim of connecting 70% of the public volumes by 2020.

⁷ According to the European Commission Indications, only CO2 emission reduction related to the sectors involved in the inventory were quantified (1. Building and Tertiary Sector; 2. Industry; 3. Public and Private and Commercial Transport). In Sector 4. Local Production of Electricity, not considered by inventories related to 1991 and 2020, the emission reduction to 2020 has been quantified after the implementation of scheduled actions. In the inventory of 2020 the CO2 emissions related to this sector have a negative value; the sector concerns the production and not the final consumption of electricity.

The extension of **district heating** network has a key role in reducing the emissions due to building: *Turin is the most district heated metropolitan city of Italy, with 39 millions of m³ covered in 2008, that represents 20% of the total volumes covered at national level.*

Piedmont Region, Province of Turin and City of Turin consider the development of district heating in Turin area as a priority of their energy policy.

In fact, in urban energy systems, the district heating represents the most effective instrument, in terms of energy and environment, to convert the primary energy (fossil or renewable) in heat energy. Moreover, the district heating allows use and valorization of the heat energy produced by Waste-to-Energy facilities.

The estimated reduction of CO₂ emissions is around **567.679 tons per year**.

Other significant results in the **Residential Sector**, in terms of energy efficiency and emission reduction, are expected from the **implementation of national and regional regulations of the sector** (adjustment of existing buildings, increase of photovoltaic and renewable sources) and the implementation of **Environmental Energy Annex of the Building Code**, that provides for a maximum discount of urbanization costs equal to 50%, in order to encourage the adoption of incentive requirements.

Requalification of Via Arquata District (TAPE - Paper 1.3.9)

*The project, realized within the "Concerto" Community Programme, aimed at the energy and environmental requalification of city centres, involved **30 residential buildings** and the head building of Territorial Housing Agency of the Province of Turin, included in the social housing district of Via Arquata, with the active participation of over 2000 tenants.*

Interventions were implemented on common parts of buildings, condominium common spaces and public land, and a 1MWe and 1,2 MWt trigeneration plant was installed for the whole housing complex.

Furthermore a system for energy flow monitoring and data acquisition has been prearranged.

The intervention, started in 2002, will be ended by 2010.

Responsible: Territorial Housing Agency of the Province of Turin

Beginning and Ending: 2002 - 2010

Estimated Costs (euro): 3.841.000

Established Investments: 3.841.000

Expected Energy Saving (MWh/year): 780

Renewable Sources Energy Production (MWh/year): 187

Expected CO₂ Emission Reduction (ton/year): 260

The reference for the **Transport Sector** actions is the Sustainable Urban Transport Plan, from which TAPE actions have been extrapolated. They focus on completing the Metro Line 1, constructing the Metro Line 2, renovating vehicles of public transport, improving private transport system, increasing cycle mobility and replacing private vehicles with the low emission ones.

Here, instead of focusing on structural interventions like those of the metropolitan railway – which can be transferred in smaller contexts considering their demographic, territorial and administrative importance – implemented or planned interventions about the **cycle mobility** are highlighted.

Before 2009, **172 km** (of the 290 expected) of cycle tracks have already been realized.

The network is integrated to the intermodal transport system, through the realization of cycle parking that should be increased nearby railway and metropolitan stations. Furthermore, about 4300 cycle racks have already been installed, close to the main points of public interest.

A **bike sharing** service has been activated, to the amount of 390 cycle stations and about 1300 bikes, and the construction of 130 stations in the city centre has already been funded and started.

The TAPE plan estimates that these actions will allow a reduction of around 3%, compared to 2005, on the number of daily displacement with private vehicles – total amount of displacements being equal – with an energy saving of 86.235 MWh/year and a CO₂ emission reduction estimated in 22.218 ton/year.

For further details:

www.comune.torino.it

Further Information and Good Practices:

- Piedmont Region:

<http://www.regione.piemonte.it/ambiente/energia/documentazione.htm>

- ENEA – Energy Efficiency
<http://efficienzaenergetica.acs.enea.it/>
- EnerBuilding.eu–Adiconsum, *The rational use of energy in public buildings*
http://www.energiaenergetica.enea.it/doc/pubblicazioni/Edif_Pubblici_2ed_int.pdf
- The European Greenlight Programme (European Commission Initiative):
<http://www.eu-greenlight.org/>
- CieloBuio Association
http://cielobuio.org/index.php?option=com_content&view=frontpage&Itemid=1
- “Sustainable Energy for Europe” Campaign (European Commission Initiative):
<http://www.campagnaseeitalia.it/see-eu>
- ICLEI (International Council for Local Environmental Initiatives) - Local Governments for Sustainability
<http://www.iclei.org/>
- Coordination of Local Italian Agenda 21:
<http://www.a21italy.it/IT/index.xhtml>
- Covenant of Mayors (European Commission Initiative):
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<http://www.environment-agency.gov.uk/static/documents/Research/seaccjune07>

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In association with ICLEI, September 2007

Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments.

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<http://www.iclei.org/>

Implementation of the 2001/42/EC Directive concerning the assessment of effects of given plans and programs on the environment.

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Guidelines

<http://www.interreg-enplan.org/guida/index.htm>

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MEASURE 2.3 – COMPLETION AND DEVELOPMENT OF SETTLEMENT FACILITIES FOR THE ECONOMIC SYSTEM

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