OPTIMAL EU CLIMATE POLICY

Choosing Efficient Combinations of Policy Instruments for Low-carbon development and Innovation to Achieve Europe's 2050 climate targets

Country report: ITALY

WP 1 – Taking stock of the current instrument mix

Contribution to Deliverable 1.2: Review of the existing instrument mix at EU level and in selected Member States

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0 Executive summary

Though the country is still high in terms of Energy Efficiency, both GHG and Energy Efficiency (EE) performances have lagged behind those of leading EU countries. Despite a substantial increase in the share of Renewables (RE) (Figures 1, 2, 3), significant structural breaks are not showing up, making the achievement of (at least part of) 202020 targets and the Kyoto target unlikely on the basis of the existing policy packages, without amending them. How policy landscapes are structured and how they interact[1] seems to influence the country performance. Even if some mutually reinforcing interactions exist, some gaps and the existence of several conflicting interactions undermine the functioning of the system and its efficiency in specific terms. Within the carbon pricing landscape, the EU-ETS and the Kyoto fund are pivotal. The latter is a funding mechanism which may possess fruitful complementarity with other landscapes but it is currently not totally assessed in its functioning. Non EU-ETS sectors are basically policy free. The government recently stated they will be covered by carbon taxes when the new EU energy directive is in place. The non CO_2 landscape presents a key instrument, the regional landfill tax introduced in 1996. This is one of the main economic instruments that also generates €0.5 Billions in revenues. The main role in the EE realm is played by the tradable market of white certificates deriving from energy saving projects. They interact with another key tool, composed of various somewhat changing tax deductions for EE in (old and new) buildings. On the side of renewable, again tax deductions for building related investments and green certificates seem to show up as key factors. Some interactions are found within policy packages: a key issue is the potential crowding out of energy saving markets based on certificates determined by the overlapping with tax deductions schemes for building/housing that also present 'economic' aims. The promotion of RE for heating overlaps with EE incentives and in turn they overlap (think about white certificates and fiscal rebate for the industry sector). Moreover the promotion of RE and of EE has somehow influenced the EU-ETS ability to provide the right price signal amplifying the excess supply of allowances due to the crisis. Interactions might also have arisen in the RE policy landscape, mostly between feed in tariff/premium systems and green certificates, although the latter are being gradually phased out. The main relevant interactions are between policy landscapes. Those may present drawbacks in terms of crowding out effects that undermine the eventual efficiency of single instruments. A key one is linking the EU-ETS functioning and other schemes that -providing incentives to saving electricity and/or cut GHG emissions- may negatively affect the carbon price effect driven by the EU-ETS. Another flaw may be the limits to cogeneration imposed by new bills, which prevents from adding up electric/renewable and thermal combustion incentives. The cumulativeness issue is then central to efficiency oriented complementarity and conflicts. Cumulating incentives in some circumstances tends to increase efficiency, whereas in other cases decreases it. Some positive complementarity is found, namely within carbon pricing and on the non CO_2 side. There is a strong potential with respect to landfilling reduction. The 'Kyoto fund' can act as a complementary tool to cover non EU-ETS sectors and in relation to all landscapes, given its intrinsic flexibility. The EU-ETS complements incentives and funding towards thermal energy savings not covered by the EU-ETS. Finally, in Italy there are a lot of different ministries,

[1] Policy landscapes and policy interactions are defined in the report and other WP1 documents.

agencies involved in environmental and energy issues: it would be desirable to have a better coordination with a clearer framework of the tasks. Overall, the policy package is mildly and somewhat indirectly shaped towards the aim of cutting CO_2 – and increasing economy wide energy efficiency. It also lacks integration with competitiveness and innovation targets. More pronounced economy wide carbon pricing actions and removal of conflicts between polices that generate crowding out would help to achieve 202020 targets. Even if Italy comes close to achieve them, cost effectiveness and efficiency are far from being optimal.

1 Description of policy landscapes

1.1 Classification of the instruments previously selected into policy landscapes

The objective of this report (and report series) is to perform an initial 'stock-take' of the climate policy instrument mix at the EU-Level and a representative group of Member States – the United Kingdom, Germany, France, Spain, Italy, the Netherlands, Poland and the Czech Republic. An initial list of up to 50 instruments from each country and EU-level was created, from which up to 15 key instruments for each state covering a broad selection of the economy, instrument type and objectives were selected for further analysis. Please refer to the Taxonomy of Instruments, developed under Task 1.1 of CECILIA 2050, for a full description of instrument classification. For each report, the selected instruments were categorised into policy 'landscapes', described below.

(1) **Carbon Pricing:** this includes policies that price CO_2 emissions or otherwise change the relative prices of fuel use, depending on the carbon intensities of fuels. Apart from the obvious candidates (carbon taxes and emissions trading) this would also include the reform or removal of fossil fuel subsidies;

(2) **Energy Efficiency and Energy Consumption:** this includes measures targeted at either increasing the efficiency of the energy sector, including power generation / combustion processes, transmission of energy (heat, electricity) and end-use efficiency, or at reducing overall energy consumption (demand-side management, energy saving, sufficiency);

(3) **Promotion of Renewable Sources of Energy:** this includes policies aimed at increasing the share of energy from renewable sources (solar, wind, hydro, biomass, geothermal);

(4) **Non-Carbon Dioxide Greenhouse Gases:** this covers policies geared at reducing non-CO_2 greenhouse gas emissions, typically from sectors other than the energy sector. It may include emissions like methane emissions from landfills or animal husbandry, N_2O emissions from agriculture, or greenhouse gas emissions from chemical industries (SF6, NF3, HFC etc.)

The list of instruments for Italy, along with their landscape classifications may be seen in Table 1, below. This report describes each instrument based on a set of tabulated information found in Annex 1, and an attempt at assessing their individual 'optimality', based on the concept developed for use in the CECILIA 2050 project also developed in Task 1.1, is provided. Descriptions of interactions between instruments within each landscape are also provided, based on tables found in Annex 2. The categories and methods of interaction are based on

best practice in instrument interaction assessment, and are completed in pairs against a single key instrument, or when important interactions between non-key instruments are present.

The resulting optimality of each landscape based on instruments and their interaction are then assessed, followed by interactions between each landscape and, finally, an analysis of the optimality of the climate policy mix as a whole in each country and at the EU-level is provided.

The climate change policy setting in Italy revolves around the EU ETS as in many countries. The country policy action for reducing GHG is then composed of other pillars, the most important among others the set of policies on energy efficiency and renewable that were introduced over the last decade and that add on the historical high level of energy taxation in Italy. The introduction of a carbon tax on non – ETS sectors have been discussed. It is worth noting as transversal policy scheme the so called Kyoto fund that is in principle aimed at financing CO_2 reduction investments through low interest rates. The fund is possibly fuelled by the ETS auction revenue.

Table 1 – List of selected instruments by policy landscape

	Policy Landscapes			
Policy Instrument	**Carbon Pricing**	**Energy Efficiency and Energy Consumption**	**Promotion of Renewable Sources of Energy**	**Non-Carbon Dioxide GHGs**
ETS	✓	✓	✓	✓
KYOTO FUND[2]	✓	✓	✓	✓
ENERGY EFFICIENCY RELATED TAX INCENTIVE		✓		
ENERGY PERFORMANCE CERTIFICATE FOR BUILDINGS		✓		
INCENTIVES FOR THE PURCHASE OF VEHICLES		✓		
WHITE CERTIFICATES		✓		
ENERGY RELATED FEED IN TARIFF/ PREMIUM (CONTO TERMICO)		✓		
ALL INCLUSIVE TARIFF (TARIFFA OMNICOMPRENSIVA)			✓	

[2] Though the fund is not properly a specific carbon pricing tool, it finances GHG abatement investments and is possibly fuelled in the future by ETS auction revenues.

CERTIFICATES OF RELEASE FOR BIOFUELS CONSUMPTION			✓	
FEED IN TARIFF/PREMIUM (CONTO ENERGIA) PHOTOVOLTAIC			✓	
GREEN CERTIFICATES			✓	
NEW FEED-IN PREMIUM FOR RENEWABLE ENERGY SOURCES OTHER THAN PHOTOVOLTAIC			✓	
REGIONAL OBJECTIVES FOR RENEWABLE ENERGY			✓	
LANDFILL TAX				✓
WASTE MANAGEMENT TARIFFS (TARIFFA IGIENE AMBIENTALE) AND NEW TARES (SINCE JANUARY 2013)				✓

1.2 Detailed Description of Instruments within each Policy Landscape

1.2.1 Carbon Pricing

EU Emission Trading Scheme ratification – (D.L. 257/2010;D.L. 216/2006)

Law 216/2006 and Law 257/2010 have been enacted in Italy in order to ratify the European directives 2003/87, 2004/101/C and 2008/101/CE, better known as EU Emission Trading Scheme. These instruments basically ratify the European directives, and create a national mechanism of tradable permits in line with the European system. Briefly, the EU ETS works on the 'cap and trade' principle, in which the total volume of greenhouse gases that can be emitted each year by plants covered by the system is subject to a cap set at the EU level. Within this Europe-wide cap, companies receive or buy emission allowances, which they can trade on appropriate markets. In particular the decree 216/2006 first ratified the European directive, while Law 257/2010 included also Commercial aviation to the emission trading scheme. The main GHG included in the instrument is Carbon Dioxide (CO2), but also Nitrous Oxide (N2O) and Perfluorocarbons (PFCs) are considered, but only for specific applications, like production of nitric, adipic, glyoxal and glyoxlic acids and aluminium production. The main sectors involved are power and heat generation, energy-intensive industry sectors and commercial aviation. In Italy there are about 1.100 plants involved in this scheme, 71% of which belong to the manufacturing sector. It has to be noted however that hospitals and small plants are excluded from the instrument, i.e. plants with emission lower than 25,000 of CO2, or energy plant smaller than 35MW. The competent body for the administration of the ETS is an intergovernmental committee, formed by the Ministry of the Environment, The Ministry of Economic Development, the Ministry for European Policy, the Ministry of Foreign Affairs and Chambers of Regions (conferenza delle regioni). This committee is also composed of an

executive body, in which, for instance the GSE, Gestore Servizi energetici, take parts - GSE has also been nominated as National auctioneer. The system creates a market for tradable pollution permits, which are allocated among operators, through an auction mechanism. The emission permits are called European Union Allowances (EUA) and European Union Aviation Allowances (EUAA) – and are equivalent to one ton of CO2. The cap is set according to EU Directives, and from 2013 onwards, is reduced by 1.74% every year. However for some production plants, like the ones at high risk of delocalization in foreign countries, part of the allowances are assigned for free according to European benchmark parameter. This precautional measure has been adopted in order to reduce the risk of carbon leakage. Regulated firms can then sell and buy CO2 quotas in the secondary market. The two laws do not provide precise indications about how to use the revenue of this system, but we explicitly refer to the European directive, which states that at least half of the revenue has to be reinvested in emission reducing activities. In case of non-compliance with the scheme, the law introduces a fine between 40 and 100 euro for each ton of CO2 emitted without a permit.

For what concern the future of the instrument is it reasonable to assume that it will follow the main European directive, and it is now expected to be in force at least until 2020.

Concerning optimality, in this particular case the instrument is, in this phase, in line with the European directive. The instrument can be considered both cost effective and environmentally effective. For what concern its feasibility, in this phase, after more than 6 years from its introduction, the policy seems feasible from both political and administrative points of view. As far as we know, up to this point the EU Emission Trading Scheme ratification has not face strong opposition or political resistance from lobbying groups.

Kyoto Fund

The Italian Ministry of the Environment together with the Italian Ministry of Economic Development, enacted in 2012 a rotation fund for the enforcement of the Kyoto Protocol, established by the budget law in 2007 but never put into operation until now. The fund lasts for three years and accounts for €600 million (€200 million each year), providing easy loans to private citizens, local administrations and small and medium enterprises for energy efficiency and renewable energy projects. The fund can only finance projects which seek to reach at least the 20% of energy saving. The fund is administered by the “Cassa deposito e prestiti” an Italian state owned company which manages Italian national savings. Being a rotation fund, it is alimented by the instalments on the initial loan. Kyoto funds can be used to finance both regional and national programmes. At the regional level, it can be used to finance program for the development and realisation of:

- distributed generation and microgeneration plants from natural gas, biogases and biofuels;
- renewable energy plants from wind, hydro, solar photovoltaic, solar thermal or biomass sources;
- energy saving and energy efficiency in the final use of energy

At the national level it has been thought as an instrument able to promote:

- substitution of old industrial electric engines with newer energy-efficient ones;
- improvement in the productive process of firms that produce adipic acid;

- research and development activities specific to the development and promotion of renewable energy;
- forest sustainable management projects, in order to protect natural carbon sinks

Loans have an yearly interest rate of the 0.50%, and may last until 6 years for small firms and private citizens and 15 years for public administrations.

The instrument is fairly new, and it was possible to apply for an easy loan from the 16th of March 2012 to the 14th July 2012. Considering the novelty of the instrument it is difficult to have precise information on the number of project financed and the energy emission saving impact.

The instrument can be considered feasible from both an administrative and legal perspective. It is coherent with European and international objectives and has a relatively straightforward application plane. It can generally be considered as an instrument able to promote static efficiency, giving to all the emitters of the same category (for instance households) the same incentive to reduce emissions. The dynamic efficiency is, however, still not clear. If from the one hand in fact the loans are available for all the technologies, there are not clear mandates towards a specific technology or another, and operators may opt for the most cost effective choice in order to maximise the effectiveness of loan. As a result, technologies like wind and hydro which have marginal production cost close to traditional fossil fuels may be preferred as a more convenient short run option, while emerging and less cost effective technologies (like solar) can be overlooked. Nevertheless the instrument is still in its initial phase and it is difficult to have a clear picture of its effectiveness.

1.2.2 Energy Efficiency and Energy Consumption

White Certificates (WC)

The Energy end-use efficiency and energy services directive (EU Directive 2006/32/EC) of the European Parliament and of the Council, which repeal the Council Directive 1993/76/EEC to limit carbon dioxide emissions by improving energy efficiency concerns energy end-use efficiency and energy services. This Directive applies to (a) providers of energy efficiency improvement measures, energy distributors, distribution system operators and retail energy sales companies (Member States may exclude small providers); (b) final customers (with specific exclusions, see Annex I to Directive 2003/87/EC); (c) the armed forces, only to the extent that its application does not cause any conflict with the nature and primary aim of the activities of the armed forces and with the exception of material used exclusively for military purposes. In Italy, White Certificates (WC henceforth) instrument comes into force with the Decree 20/07/2004. The scheme starts in January 2005, one year before the EU Directive 2006/32/EC. A relevant feature is given by the fact that distribution companies (electricity and gas) with at least 100,000 customers are obliged to deliver a certain number of WCs per year in order to gain energy savings. The Decree 20/07/2004 is then revised and updated with the Decree 21/12/2007 and the Legislative Decree 30/05/2008 n.115 in order to comply with the Energy end-use efficiency and energy services directive the customer number threshold in order to be obliged to emit WC is reduced from 100,000 to 50,000; coupled with the obliged distributors it has been made possible for requesting subjects to be accredited for the emission of WC; a new set of energy savings targets is defined.

The plan of application, within the framework that foresees a 9% saving on the final consumption of energy by 2016, comprises five years 2005-2009 and then an extension on the triennium 2010-2012. 2012 is the last compulsory year, but it is reasonable to think that the scheme of WC will not be abandoned by all the obliged subjects. We can summarise the targets in terms of million tones of oil equivalent (Mtoe) for the compulsory period 2005-2012 as shown in the following scheme.

Table 2 - Yearly targets in terms of Mtoe saved

1.2	2005	2006	2007	2008	2009	2010	2011	2012
Decree 20/07/2004	0.2	0.4	0.8	1.5	2.9			
Post Decree 21/12/07	0.2	0.4	0.8	2.2	3.2	4.3	5.3	6.0

The target of 6Mtoe/year has to be reached by the obliged distributors by May of 2014.

The Authority for Electricity Energy and Gas (AEEG) monitors the accomplishment of the targets assigned to each obliged distributor (for a list of them and their targets we refer to http://www.autorita.energia.it) of electricity and gas and it also provides financial sanctions on a discretionary basis but following the general rules of the Law 24/11/1981 n.689: a. violation seriousness; b. effort of the agent (violator) to reduce the violation consequences; c. agent personality; d. economic condition of the agent.

In terms of future perspective it is reasonable to think that the mechanism will be in force at least until 2020, given that it is one of the primary instruments in reaching the objective of the 20% saving on the primary energy by 2020. Indeed, one potential development of WC, hypothesised in the EU Directive COM(2011) 370, which abrogate the Directive 2004/8/CE e 2006/32/CE, is the extension of the WC market at the European level.

The instrument of WC shows several characteristics that lead us to classify it as an effective, efficient and feasible tool. The ENEA 2011 Report states that by the end of 2009 the WC allowed energy savings equal to 9,457GWh/year simply considering the final balance projects. Hence, on the side of environmental effectiveness, the instrument has proved its efficacy. Indeed, the targets have been modified upward given the good performance in terms of energy saving in the first years of application of the scheme. In Italy the targets have been risen from 2008 onward. The efficiency seems to be granted especially under a dynamic perspective, given that emission reduction through the WC instrument also entails an innovative effort for the obliged distributors. In a static perspective, the compulsory character of the scheme only for large suppliers of electricity and gas possibly undermines its effect: small providers are included in the scheme only if they apply and are accredited to become WC suppliers. In the Italian context the feasibility is revealed to be good along the three dimensions we can consider: political, legal and administrative. Energy saving is an appealing political issue in the public at large, although less exploited in Italy than in other European

countries. On the legal basis there is consistency between the Italian legislation and the recent EU Directives concerning the topic of energy saving (with the notable exception concerning the energy performance of buildings). Finally, the administrative burden is substantial in managing the WC scheme both for monitoring and for applying sanctions, but the public agency in charge of that, the AEEG, accomplished the tasks in an efficient way in the period of WC application.

Energy Efficiency Related Tax Incentives

Here we stress the importance of tax deduction as an incentive to improve the energy performance of the existing buildings. This incentive instrument is closely related to the Energy Certificates one: indeed, in order to gain access to the tax deduction it is compulsory to provide a certificate that demonstrates the energy efficiency improvement.

In force since 1st January 2007, it is a financial incentive consisting of an income tax (IRPEF) or company tax (IRES) deduction established under Law 27/12/2006 n. 296 (2007 Budget Law) and subsequent laws. The deduction applies to a wide range of buildings: private buildings, but also installations and production plants. This law also sets the threshold of the improvement to gain the deduction. The several types of acceptable interventions and the specified technical requisites to be achieved, in terms of efficiency gains, hamper the possibility to provide here the list of indicators. Indeed, the 2007 Budget Law defines the tax incentive for the following cases: reduction in heating dispersion of the entire building; installation of solar panel for hot water; construction of building with high energy performance; measures on opaque horizontal structures, vertical and transparent horizontal structure, including frames and glass and replacement of winter heating with systems using condensation boilers.

Summing up, the deduction can be claimed only when specific threshold levels of energy saving are achieved. Moreover, also the maximum amount of deduction, to be enjoyed within 5 years (under the 2007 Budget Law), depends on the type of intervention.

This tax incentive is still in force under the Legislative Decree 22/06/2012 n.83. However, it is worth reminding that from 2007 onward at the approval of almost any of the subsequent Budget Law the tax incentive and its characteristics and continuity have been critical items on the political agenda. The excessive uncertainty, concerning the continuity and characteristics of the incentive, has potentially undermined its full efficacy.

With the 2008 Budget Law (Law 24/12/07 n. 244) some modification to the parameters used to evaluate the energy performance of opaque horizontal and vertical structures, including frames and glass, are introduced. The threshold to gain the incentive becomes more stringent, the efficiency gain must be higher than in the previous Budget Law. In addition, 2008 Budget Law extends the validity of the incentives until 2010 and it introduces incentives also for other interventions on buildings and installations: e.g. substitution of traditional heating systems with highly efficient heat pumps or with geothermal plant with low enthalpy.

Until the Law 13/12/10 n. 220 (Stability Law 2011) the tax deductions had to be enjoyed within 5 years. The Stability Law 2011 increases the time span to 10 years and it also extends the incentives to 2011. The Legislative Decree 6/12/11 n. 201 changes the rules again. In

particular the maximum amount of the expenses that can be deducted is now measured on single real estate interventions: it is €48,000. It also states, essentially because of budget reasons, that from 01/01/2013 the 55% deduction will be replace by the standard 36% deduction used for traditional building restructuring.

Despite the reduction of the tax deduction to 36% introduced by the Legislative Decree 6/12/11 n. 201, a subsequent Legislative Decree (22/06/2012 n. 83) sets into force again, because of political reasons, the 55% deduction for 2013, but with some amendments: it extends to 30/6/2013 the deduction for energy performance improvements interventions, but the tax rate is 50% from 1/1/2013.

It is reasonable to think that that the incentive scheme will remain into force in the near future, although with some modifications, and that National Agency for New Technologies, Energy and Sustainable Development (ENEA) will remain the managing institution.

The emission reduction achievable through a refurbishment of the existing buildings and through the construction of new ones with a very low energy impact and subsequent low emissions is one of the primary targets to achieve in order to fulfil the 202020 strategy objectives. This represents an important step forward along the path that will lead EU countries to reduce emissions of a share equal to the 80% of the 1990 emissions by the middle of this century. For the Italian experience the 55% tax incentive does not seem to represent an efficacious way to achieve the energy reduction target (and the consequential emission reductions). From the 2011 report of ENEA the larger share of energy reduction is due to the introduction of White Certificate and of Certificate for Energy Efficiency (Energy Qualification before 2009) in the building sector (Legislative Decree 19/08/05 n.192): 82% of energy saving in the period 2007-2010 is due to these two instrument. The contribution of the tax incentive is lower than that of the other two instruments and it is around 10%. However, the diffusion of tax incentive instrument on the territory is high and concentrated in specific regions (northern regions). The diffusion allowed the instrument to reach a cumulative energy saving over the period 2007-2010 of 5,204 GWh (ENEA, 2011). This figure points to validate its efficacy. It is more difficult to validate the cost efficiency of the instrument, especially in comparison with other instruments designed to reduce energy consumption. In general terms, a tax deduction without a dynamic plan that anticipates its progressive reduction and eventual abandonment may lead to dynamic inefficiency, with a disproportionate increase of the number of operators in the markets of buildings and installations. The feasibility, especially the legal and the administrative ones are ‘straightforward’ according to our judgement, but the political one is less immediate. As argued above the tax incentive from 2007 to 2012 has found some opponents among politicians (possibly because of its dynamic inefficiency as it stands) and we cannot take it for granted that it will last in the future, although it is reasonable to think it will remain in force in the near future.

Energy Performance Certificate for Buildings

Among the several measures and instruments that were adopted within the roadmap towards the 202020 objectives, the improvement of building energy performance is one of the most important if we consider that buildings contribute for the 40% of energy consumption at EU level.

The Energy Performance Building Directive (EPBD) 2002/91/CE on housing energy efficiency proposed the energy performance certificate for buildings and invited the EU member states to implement it, coupled with other measures addressed to improve building energy efficiency. Italy was one of the first countries to promulgate a law in order to comply with the Directive in 2005: Legislative Decree 19/08/05 n.192. This law includes the compulsory certification for buildings, but the technical regulation is left to subsequent Decrees. In 2006 the Legislative Decree 29/12/06 n.311 did not provide the technical rules so that a transition instrument was applied: the *energy qualification* label instead of *energy certificates*. In absence of proper regulation on energy certification, this transitory tool secured the possibility to get the tax incentives offered by the 2007 Budget Law. At national level the transitory tool remained into force until 2009, when it was approved by the Ministry Decree 26/06/2009 that enclosed the national guidelines for energy certification.

The energy performance certificates for buildings are certificates provided by qualified subjects (certifiers) that declare that the energy performance of a building fulfil minimum standard requirements, which are defined by law. This applies to new buildings and full refurbishment of buildings with a floor-area of >1000m^2. The performance level is assigned according to the national guidelines for the energy certification.

In 2010 a subsequent European Directive (2010/31/UE), which integrate the EPBD one, imposes new standards and a 'new roadmap' for the fulfilment of the 202020 objectives. The directive sets the deadline for achieving buildings that are energy neutral (Zero Energy Buildings – ZEB) to 2019 for public buildings and to 2021 for all private ones. In addition, the directive sets another deadline for the member states: mid 2012 (09/07/2012) to adopt the measures leading to the fulfilment of its objectives by the end of the decade. Some member states, including Italy, were late in adopting such measures and regulations, with the consequence that they have recently (01/2013) received a formal recall by the European Commission to provide within two months the measures they intend to adopt according to the framework of the Directive 2010/31/UE. If Italy misses this deadline it will be referred to the European Court of Justice. Italian legislation is not in line with the provisions on energy performance certificates. In addition, Italian authorities have not yet communicated any implementing measures regarding inspections of air-conditioning systems.

Indeed, the application of the laws concerning energy efficiency in real estate market is not uniform in Italy. By now all the Italian regions have some regulation concerning energy efficiency of buildings, but some differences still remain, especially in terms of the role and competencies of technicians (certifiers) that draw up compliance certificates with respect to the energy saving criteria and in terms of building classification (energy classification).

Several dimensions are used to measure energy efficiency. As an example, in the residential sector, measures for improving energy efficiency concern two dimensions: the energy yields of buildings (shells and installations) (Directive 2002/91/EC, Legislative Decree 192/05), and consumption by equipment (appliances and lighting fixtures) (Directive 2005/32/EC Energy Using Products, EUP). The implementation of the EPBD in Italy occurs through a set of technical rules: UNI TS 11300. Compliance to these technical rules grants the acquisition of a performance certificate. The latter is mandatory in order to gain access to most of the public incentives for energy efficiency: for example the 55% tax deduction of the expenses incurred for the energy efficiency improvement of existing buildings.

Despite the difficulties in defining a consistent national level legislative framework for the implementation of the Directive 2010/31/UE, which is the cause of the infringement procedure started by the European Commission, the diffusion of regional level legislations concerning energy efficiency in the building sector has spurred the construction of green buildings and the improvement of existing ones. Indeed, the 2011 ENEA report (ENEA, 2011) attributes to this instrument around the 40% of total energy saved (47,711 GWh/year) on the period 2007-2010.

On the side of cost effectiveness it can be said that the incentive scheme based on tax deduction imply a certain amount of public funds to be provided in order to cover the lack of tax return due to deductions. The fund constituted to support the energy certificate instrument, which is related to tax deduction, was for example of €50mln per year in the triennium 2007-2009. When considering a dynamic perspective the diffusion of new technologies related to the building shell, to the heating and cooling systems and to the use of renewable sources may justify the current 'investment' of public money. However, the absence of a clear dynamic plan could compromise the dynamic efficiency of the instrument.

For this instrument a much more critical aspect is related to the feasibility dimension. The relations among the State, Regions and local authorities and among the respective levels of competencies is a limitation on the homogenous implementation of legislative provisions throughout the country. If legal feasibility is still a critical issue, which is also a cause of the European Commission procedure for Italy, the political one does not represent an obstacle.

The administrative feasibility is instead another critical issue since it is quite strongly related to the legal one: the lack of homogeneous legislation leads to the 'proliferation' of regional rules in terms of energy efficiency, with a strong repercussion on the skills needed for the certifier, although in the last years the framework has become much more homogeneous than in the past.

Conto Termico

The genesis of the 'Conto termico', a feed in tariff related to heating/energy - can be traced back to the Legislative Decree 03/03/2011 n.28, which disciplines the incentives for small interventions (e.g. substitution of old hot water heating plants with more efficient ones) for the improvement of energy performance and for the production of heating energy from renewable resources. With the Ministry Decree 28/12/12 the 'Conto termico' comes into force. The Governing Institution for Energy Services (GSE) is the authority that manages the implementation of the mechanism, included the provision of the incentives to the beneficiaries. The latter are both privates and public administrations.

Privates (domestic) can only access to the incentive on the basis of small intervention addressed to installation or substitution of heating plant with highly efficient ones or fuelled by renewable resources, while the public administration may access the incentives both on the basis of interventions addressed to the improvement of the energy efficiency of the building shell and on the basis of those for which the domestic subjects are eligible to receive the incentive.

The incentive is provided on the basis of the intervention, it assumes the form of a contribution to the cost of installation/intervention and it is provided in annual payments for a variable duration comprising between 2 and 5 years. Such contribution should cover 40% of the

expenses. A detailed list of eligible subjects, interventions, technical requisites, duration of the annual payments, on which basis the maximum value of the incentive is calculated is enclosed to the Ministry Decree 28/12/12.

Illustrative Box

Thermal isolation through (vertical) opaque structures delimiting the volume of the building.

For this kind of intervention the eligible subjects are public administrations (buildings), the incentive duration is 5 years and the technical requisites for the technology are the following in terms of maximum values of thermal transmittance allowed: ≤ 0,45 W/sq.m*K climatic zone A; ≤ 0,34 W/ sq.m *K climatic zone B: ≤ 0,28 W/ sq.m *K climate zone C; ≤ 0,24 W/ sq.m *K climate zone D; ≤ 0,23 W/ sq.m *K climate zone E and ≤ 0,22 W/ sq.m *K climate zone F, where K means kelvin, sq.m means square metres and the climate zones go from the warmest A to the coolest F. Once the technical requisites are fulfilled the incentive for this type of intervention, but the incentive calculation changes for other types such as the installation of solar panels, is calculated on the basis of the following formula:

Itot=%Exp.*C*S

where Itot is the incentive, %Exp is the maximum percentage of the expenditure admissible (40%), C is the cost for the technology installed (ratio between the total cost of the intervention and the square meters covered by the opaque structure), S is the surface covered by the intervention. The maximum values admissible for C are 100€/sq.m. for external intervention, 80€/sq.m. for internal intervention, 150€/sq.m. for ventilated façade. The incentive is then calculated on the basis of the parameters and the maximum incentive for this kind of intervention is of 250,000€.

The public funds devoted to the ‘Conto termico’ amount to 900 millions of € subdivided in the following way: 200mln for public administration interventions on publicly owned buildings and 700mln for private interventions. Once the total amount of €900mln is pledged on the basis of the requests from privates and public administration the GSE does not accept any other applications for the incentive. The latter and its amount (the maximum amount included) are strictly dependent on the type of intervention and its technicalities as reported in the Box above.

Finally, the GSE predisposes a web site that makes feasible to access the incentive by simply filling a form that aims to verify the possibility to access the incentive and its amount.

As it is, the ‘Conto termico’ represents a subsidy for the improvement of energy performance of buildings and renewable heat generation. This measure is placed side by side with the 55% tax deduction type of incentive, which has, mutate mutandis, the same ratio.

The ‘Conto termico’ is another brick in the overall strategy aimed at achieving low levels of primary energy consumption in accordance to the Italian action plan for the improvement of energy efficiency and also in accordance with the EU action plan for such an improvement. The reduction of 20% in energy consumption by the 2020 could be achieved also thanks to the contribution of this type of incentive scheme, although it is not possible to provide real data (or projections) right now on its environmental effectiveness given the newness of the instrument.

The 2012 National Energy Strategy report estimates an amount of energy saving of 2,5 Mtoe for the period 2012-2020 thanks to the 'Conto termico'.

On the cost-effectiveness side we can only argue that the introduction of a subsidy without a dynamic plan for its reduction and end can be dangerous for the market on which the subsidy operates. This measure coupled with the 55% tax deduction could generate a disproportionate birth of actors involved in the subsidised sector. In synthesis an 'un-planned' subsidy may not be dynamically optimal.

A point of strength of this measure, at least desirable, ought to be its certainty and stability. The amount of public resources devoted to its implementation should not overrate the national capacity to contribute to the sustainment of the incentive. As a general remark its feasibility is granted in terms of policy, legal and administrative dimensions. The implementation rules are clear and the managing authority, the GSE, owns all the instruments to effectively administer the mechanism.

Incentives for the Purchase of Low-Carbon Vehicles (Decree 83/2012 and Law 134/2012)

Government decree 83/2012 and the following Law 134/2012, create a series of economic incentives (subsidies) with the aim of promoting the sustainability of the transport sector. In particular, it introduced: a) a series of measures for the development of both private and public charging station for electric vehicles; b) incentives to research and development on electric cars and; c) a conspicuous series of economic incentive to sustain the purchase of green vehicles. The most interesting and influential part of this instrument is the article 17-decies, which introduces subsidies for the purchase of Electric vehicles, hybrid vehicles, methane and bio-methane vehicles, and vehicles with low level of emission (less than 120g/Km of CO2). For the period 2013-15 the total founding amounts to 120 millions of euros. The subsidy plan last three years and is structured as follow:

1) For the years 2013 and 2014 the economic incentive is equal to the 20% of the vehicle total value, if:

- the new vehicle produces CO_2 emissions not higher than 50 g/km (subsidy up to 5000 euros per vehicle)
- the new vehicle produces CO_2 emissions not higher than 95 g/km (subsidy up to 4000 euros per vehicle)
- the new vehicle produces CO_2 emissions not higher than 120 g/km (subsidy up to 2000 euros per vehicle)

2) For year 2015 the economic incentive is equal to the 15% of the vehicle total value, if:

- the new vehicle produces CO_2 emissions not higher than 50 g/km (subsidy up to 5000 euros per vehicle)
- the new vehicle produces CO_2 emissions not higher than 95 g/km (subsidy up to 4000 euros per vehicle)
- the new vehicle produces CO_2 emissions not higher than 120 g/km (subsidy up to 2000 euros per vehicle)

Moreover, the subsidy is applied only if some conditions hold:

- the purchased vehicle is new

At the moment there is not a precise plan for the future of the instrument, which will last three years (from 1st January 2013 – 31st December 2015)

Overall this instrument appears cost-effective in a static perspective. It has to be noted that the instrument does not set precise targets in terms of, for instance, the number of low-carbon vehicles with respect to the baseline or overall emission reduction. Italy had some previous experiences with incentives for the purchase of green vehicles which generally increased the purchase of green cars. However, such instrument is certainly not able to promote greener ways of transportation in the long run (promotion of public transport, for instance), reducing its dynamic efficiency. Nevertheless, it can be argued that in a dynamic perspective these subsidies can certainly promote the diffusion of green innovation. The subsidy, in fact, may act as a push factor, which by expanding the demand for green products may increase their diffusion and induce producers to develop new innovations. Previous experience shows that such instruments are politically feasible and well accepted by consumers, sellers and the government. The Ministry of transportation administers the instrument.

1.2.3 Promotion of Renewable Sources of Energy

Regional Objectives for Renewable Energy

Regional objectives for renewable energy supply were introduced at the European Level by directive 2009/28/CE and in Italy by legislative decree 28/2011 and by decree 15 march 2012 that set regional objective trajectories for renewable energy, aiming at simplifying the achievement of the 202020 strategy binding target (17% of the total energy consumption from renewables, at national level for Italy). This regulation defines three kinds of energy consumption, namely gross energy consumption (GEC), renewable energy for electricity consumption and renewable energy for heating and cooling (i.e. non electric sector); all definitions and objectives are defined according to the National Action Plan for Renewable Sources (*Piano d'Azione Nazionale per le energie rinnovabili* - PAN).

The following table from Decree 15 March 2012, shows targets and trajectories for renewables consumption The initial value is obtained from the most recent information available on GEC and renewables at regional level. Following these guidelines, Regions can determine how to comply with regulation on their own (table 3).

Table 3 – Regional objectives

Region	Initial value (%)	2012 (%)	2014 (%)	2016 (%)	2018 (%)	2020 (%)
Abruzzo	5.8	10.1	11.7	13.6	15.9	19.1
Basilicata	7.9	16.1	19.6	23.4	27.8	33.1
Calabria	5.8	10.1	11.7	13.6	15.9	19.1
Campania	7.9	16.1	19.6	23.4	27.8	33.1
Emilia Romagna	8.7	17.7	17.1	19.7	22.9	27.1
Friuli V. Giulia	4.2	8.3	9.8	11.6	13.8	16.7

Lazio	2.0	4.2	5.1	6.0	7.3	8.9
Liguria	5.2	7.6	8.5	9.6	10.9	12.7
Lombardia	4.0	6.5	7.4	8.5	9.9	11.9
Marche	3.4	6.8	8.0	9.5	11.4	14.1
Molise	10.8	18.7	21.9	25.5	29.7	35
Piemonte	9.2	11.1	11.5	12.2	13.4	15.1
Puglia	3	6.7	8.3	10	11.9	14.2
Sardegna	3.8	8.4	10.4	12.5	14.9	17.8
Sicilia	2.7	7.0	8.8	10.8	13.1	16.9
TAA Bolzano	32.4	33.8	33.9	34.1	35.0	36.5
TAA Trento	28.6	90.9	31.4	32.1	33.4	35.5
Toscana	6.2	9.6	10.9	12.3	14.1	16.5
Umbria	6.2	8.7	9.5	10.6	11.9	13.7
Valle d'Aosta	51.6	51.8	51	50.7	51	52.1
Veneto	3.4	5.6	6.5	7.4	8.7	10.3

The definition of trajectories, both for electrical and non-electrical GEC and for electrical and non-electrical renewable consumption results from the multiplication of a regional allocation coefficients[3] by the yearly (expected) national energy consumption. Moreover, the allocation of regional renewable contributions follows technical and economic criteria that account for the different availabilities of energy sources and their different potential exploitation among regions, together with sector differences in directing the heating consumption to renewable energy sources, at the regional level.

According to decree 15 march 2012, the renewable electrical energy sector includes hydroelectric and wind power generation, solar photovoltaic, biomass and bio liquid sectors. Every plant in the region is covered and the decree does not specify any power threshold for the contribution to the regional objective. Basically, the share of energy supplied to 2020 is determined proportionally to the existing capacity of plants (hydroelectric, solar PV, biomass and bio liquid) and on the plant's potential power generation (wind), both at regional level. Non-electrical energy demand is determined by the regional heating needs of the private sector (i.e., households and buildings), agricultural and industrial sectors.

[3] The allocative coefficient is the share of regional energy contribution to the national energy consumption, on a yearly basis.

Regional administrations are delegated to implement programs and measures to fulfill the target. Following article 4 in decree 15 march 2012, administrations are allowed two main channels: first, the development of energy efficiency models according to the different characteristics and the different potential of the territory; second the integration between the regional objectives regulation and other kind of industrial regulation. Regional administrations should address local public administrations as municipalities for energy consumption reduction and can put in place information programs both for public utility management and for small and medium enterprises. Besides, regions are supposed to favour improvements in the public transport through the introduction of biofuel vehicles, and in energy consumption in public sector and are allowed to introduce incentives limited to the cumulate thresholds with national incentives.

Finally, Regions are allowed to stipulate agreements with other institution and other regions in the European Union for renewable energy transfer (*trasferimenti statistici*) but direct import of energy from other Member States is not computed in final energy consumption.

The achievement of the annual target is checked by an observatory established by the Ministry of Economic Development and by the managing authority for energy services *Gestore dei Servizi Energetici* (GSE). Given the national 2020 target for Italy, the observatory will first analyse the regional results and their deviation from the regional and national goals; secondly, the observatory will set guidelines for the overcoming of obstacles that may have led to great deviations from the specified target. However, the Ministry can rearrange regional objectives in case of great deviations from the 2020 national goal only after 2016.

In case regional objectives are not attained, no pecuniary sanction is provided but when the deviation can be ascribed to a regional administration, a commissioner is nominated, who must achieve the given regional target. Information about the achievement of regional objective in year 2012 are not available yet.

Concerning regional objectives after 2020, it is reasonable to assume that it will follow the national and European legislation.

The decentralized management of the regional trajectories, can make this instrument feasible from an administrative point of view, since regional administrations can choose how to comply with regulation. Since regions have a direct responsibility in the achievement of their own target, some environmental benefit should be expected. However, since information on the achievement of the target in year 2012 are not available yet, it is not possible to assess the real success of the instrument

All inclusive Tariff

The all inclusive tariff (*tariffa omnicomprensiva*) is an incentive mechanism for small plants established by decree 18 December 2008 that enacts previous arrangement set in budget law 2008. This benefit is explicitly established to incentivise small plants by easier procedures and by granting them a fixed return; this system covers all kinds of renewables for the production of electricity, excluding solar PV which is included in the *Conto energia* system.

Decree 18 December 2008 established the right only for small renewable plants (with an power capacity between 1kw and 1mw or less than 200kw for wind plants) to apply for the all inclusive tariff instead of access the Green Certificate system. Larger Installations are covered only by Green Certificate system or by the new feed-in tariff for renewables other than photovoltaic, established by decree 6 July 2012.

Essentially, the all inclusive tariff is a feed-in tariff, which amount is set by the GSE (Gestore Servizi Energetici), the managing authority for energy services which qualifies the plant as IAFR (plant feed by renewables). GSE also sets the amount of energy that can be incentivised for each applying plant and that corresponds to the electricity that actually fed the electrical grid in the previous year. The tariff is designed to include both the incentive and the remuneration of the produced electricity.

Providers can choose between the Green Certificate system and the all inclusive tariff when applying for an incentive or can decide to opt out from one system and access the other one in the incentive period; in that case, the remaining time for the incentive is decreased by the period spent using the alternative system.

Plants can benefit from the all inclusive tariff for fifteen years and its value is static over this period; the value of the tariff is in euro per KWh in relation to the amount of energy fed in the grid in the last year and multiplied by a different coefficient depending on the source of renewables and the typology of plants (e.g., if a plant is a new or restored one). These coefficients are shown in Appendix A of decree 18 December 2008. This difference in the calculation of the tariff takes into account the cost relative to the different technologies allowing providers to invest in less diffused and more expensive technology. Tariffs have been revised with Law 99/2009 and are shown in the following table (Table 4).

Table 4 – REE Tariffs

Renewable Energy Source	Tariff (€cent/kWh)
Wind for plants less than 200kw	30
Geotermal	20
Ocean and Tidal	34
Other water sources (exept ocean and tidal)	22
Biogas e biomass, except liquid biofuel	28
Landfill gas and liquid biofuel	18

The agency for electrical energy and gas (AEEG) is in charge for the implementation of the regulation and set the conditions for the administration and the payments of the incentive. The institution in charge of monitoring is GSE that annually checks existing plants and plants under construction and inform the Ministry of Economic Development and the Ministry of the Environment. Finally GSE organizes an information system in which yearly bulletins are available to the Ministry of Economic Development, to the Ministry of the Environment, to Regions and to the AEEG; the information system concerns both plants covered by the all inclusive tariff and plants covered by the Green Certificate system However, the decree itself does not specify the kind of information that the bulletins have to contain.

As for Green Certificate system, this all-inclusive tariff has been repealed by decree 28/2011 and Decree 6 July 2012, which introduced the new feed-in tariff for renewables other than photovoltaic, which is discussed below. The new regulation establishes that plants authorized by 11 July 2012 and plants that begin operation before 30 April 2013 can benefit of the “old” tariff set by decree 18 December 2008. However, these plants will have a reduction of the tariff by 3% monthly starting from 1 January 2013 to 2016. Finally, decree 6 July 2012 set the condition by which plants under the “old” all-inclusive tariff will switch to the new regime.

However, the all inclusive tariff plays a role in terms of environmental efficiency since is directed to encourage small plants, setting up a system more suitable than Green Certificate. Since the incentive is differentiated by source of energy there may be benefits in terms of exploitation of different kinds of renewables.

This incentive isS more feasible for small providers, since they benefit from a more simple system from an administrative point of view. Since a fixed return is granted, all inclusive tariff can bring advantages in terms of cost-effectiveness for installations. However, to our knowledge public information about the number of installation and the installed capacity under this regulation are not easily available.

Tradable Green Certificates System

Legislative decree 79/99 (art 11.) introduces the obligation for electricity suppliers, both producers and importers, to fill the grid with a minimum share of electricity produced from renewable energy sources. The least power capacity to benefit from tradable certificates was initially set over 100 GW and the obligation was set at 2% of total energy fed into the grid, starting from 2002. Decree 79/99 enacts the European directive 96/92/CE. Modifications to this first regulation are discussed below.

According to the regulation, to comply with the obligation electricity suppliers can alternatively choose among the installation of new renewable capacity, the import of renewable energy from other countries or they can purchase their relative quota represented by a Green Certificate a tradable right issued for eight years for the generation of electricity from renewables

Green Certificates are issued by the GSE (*Gestore Servizi Energetici*) the managing authority for energy services and both directly sold to providers and/or exchanged among providers; price is determined by market forces and each certificate, which initially represented the possibility to prodice 50 MW of clean energy but nowadays represents only1MW.

The incentive mechanism lies in the obligation set for the provider to feed the grid with a quota of electricity from renewables: the definition of renewable sources in the decree encompasses every kind of renewable electricity. Producers can comply in two different way: first they can directly produce renewable electricity; second they can simply purchase Green Certificates from other green energy producers, actually transfer the right to another provider. In order to benefit from the incentive, the plant has to be certified as IAFR (plant feed with renewables)

The competent bodies for monitoring are GSE and AEEG. The last, establishes pecuniary sanctions for installation that are not complying with the obligation to buy the certificate and feed the grid with their share of renewable energy.

From 1999, several measures brought changes to the system. First decree 387/03, increased the initial compliance share of renewables by 0,35% per year until 2006 and set deadlines by which additional increases could be defined; moreover it allowed Green Certificate to be issued for biomass and waste fuel plants for twelve years instead of the original eight years.

With decree 24 October 2005, GSE is forced to purchase all the certificates that cannot be sold on the market, due to insufficient demand. Legislative decree 152/06 extended the period during which the production of renewable electricity entitles to the right to obtain Green Certificate from 8 to 12 years for all plants.

Greater changes came with financial law 2008, that lowered the value of each certificate from 50 MW to 1 MW which is more convenient for small producers and increased the period of validity of certificate from twelve to fifteen years (starting from 2008); in addition, Green Certificates are now differentiated for renewable sources since the number of certificates corresponding to the production is multiplied by different factors relative to each energy source as it is shown in the following table (table 5), attached to the financial law.

Table 5 – Green certificates values by source

Renewable Energy Source	Factor
Wind for plants less than 200kw	1
Wind offshore	1.10
Geotermal	0.90
Ocean and tidal	1.80
Other water sources (exept ocean and tidal)	1$
Biomass (except biomass from farming)	1.10
Biomass and biogas from farming	1.10
Landfill gas and biogas (except biogas from farming)	0.80
Solar PV	See article 7 in Decree 387/2003

As it can be seen from the table above, the regulation for Solar PV is determined by another decree. It has to be noticed that article 7 in Decree 387/2003 has been repealed by decree 28/2011, discussed below.

Finally, small plants are given the possibility to opt out from Green Certificate system and sell energy through a feed-in tariff (all inclusive tariff). GSE, provide to the retirement of the unsold certificates on the market at a price equal to the mean price of the previous three years. The price is established on a yearly basis depending on the price in the previous year; in 2012 the price was 105.28 euro per KWh.

However, the Green Certificate system was repealed by legislative decree 28/2011 enacted by decree 5/2012 and decree 6/2012 that introduced respectively the fifth *Conto Energia* and the new feed in tariff for resources other than photovoltaic. The new regulation applies only to plants that begin operation after 31 December 2012, while for older plants the Green Certificate system applies until 2015; after this year, plants that are still entitled to use the certificates will receive an incentive , additional to the price of the energy, for the remaining years. This incentive is computed as I=k*(180-Re)*0,78 where k is the value of the factor

established by financial law 2008 (see previous table) while Re is the price of electricity set by AEEG. The decision about the numerical parameter (180 and 0,78) are not explained in the Decree.

Finally, decree 6/2012 established the retirement procedures for Green Certificates, starting from titles issued in 2011; the decree spreads deadlines for retirement of certificates; depending on the time the certificate entered the market. The authority in charge of the collection is the managing authority for energy services, GSE, that given the deadlines establishes its own conditions for retirement.

Green certificates are a market based incentive, introduced to favor renewable energy providers. Essentially, the intervention of the government is absent, since the whole mechanism is based on the exchange of titles in the market, bringing advantages from the point of view of feasibility.

In terms of cost efficiency, this instrument can encourage technology diffusion and innovation and a cost reduction in the future.

However, until 2007 the so called “equal renewable sources” benefit from the incentive; this category of renewables is specifically provided by the Italian regulation and includes incinerators and processing activities of coal and oil waste, actually reducing the potential environmental benefit and depriving the renewables of economic resources .Only in 2008 these activities were excluded from the definition of “equal renewable sources”.

Following GSE yearly report, in 2011, 22 millions of Green Certificate were circulated by GSE and distributed among the different installation as follow: 41% to wind plants; 28% to hydroelectric sources; 25% to bioenergy sources (biomass and biogas); 6% to geothermal. Moreover, 27% of the circulated certificates were addressed to restored plants.

Table 6 – Green certificates targets

Year	Annual Target (TWh)	Annual Target (%)	Withdrawn Certificates (millions)
2001	161.62	2.00	3.23
2002	180.91	2.00	3.62
2003	203.15	2.00	4.06
2004	193,75	2.35	4.55
2005	202,65	2.70	5.46
2006	189.94	3.05	5.79
2007	186.73	3.80	7.10
2008	186.91	4.55	8.50

2009	153.04	5.30	8.11
2010	147.8	6.05	8.94

Source: GSE, Biannual Bullettin

The table above shows the annual share of renewable energy production established by regulation. The second and the third column display the yearly target established by regulation, in TWh and percentage respectively; the last column shows the number of green certificates (in millions) that were withdrawn from the market since exceeding the useful amount needed to comply with regulation. For example in 2010, 8.94 millions of certificate have not been used to cover the production of clean energy, so the offer of certificates were exceeding the demand. Following these information, diffused from GSE, annual target should have been met every year from 2001.

New feed-in tariff for resources other than photovoltaic

Legislative Decree 28/2011 and Decree 6 July 2012 set a new incentive mechanism for renewable energy plants, which are supported through the definition of an easier and more clear incentive system. The establishment of this new regulation tries to overcome inefficiencies in terms of long run economic sustainability of incentive mechanism, considering the environmental goals set in the National Plan for Renewables (PAN). The feed in tariff introduced by the decrees addresses only renewable sources for the production of electricity other than photovoltaic.

Involved plants are those with an established capacity above 1MW, and that began operation after 31 December 2012; this deadline is extended to 30 April 2013 for plants that obtained the authorization to work before July 2012 even if they have not started working by the end of the same year. For older plants, the Green Certificate system is in force until 31 December 2015.

The total cost of cumulative incentives can not exceed €5.8 billion per year, and the decree also introduces annual quotas of capacity eligible for incentives to 2013 to 2015, differentiated by sources and plants and distributed according to the procedure of access, as described below. According to the different characteristics of the plant, access to the incentives are auctions or registration. Auctions are addressed to hydroelectric sources with a power threshold equal to 10MW or higher and to geothermic electricity sources with a power threshold equal to 20MW. Auctions are accessed also by every plant (new build plants and total reconstruction or reactivation and empowerment) that exceed the established power threshold for that source[4].

Incentives are distributed for the energy actually fed into the grid, thus energy for auto consumption is not computed.

Two different incentive mechanisms are introduced, depending on the source and the power of the plant:

[4] Above the value called “power threshold” the incentive is applied following the auction mechanism. The decree does not specify how the threshold are computed.

- A comprehensive feed-in tariff, (To), addressed to plants with power up to 1MW and determined as the sum of a tariff basis and the amount of any premium (e.g., cogeneration, emission reduction, etc…)
- An incentive determined as the difference between a tariff basis (to which the amount of eventual premium is added) and the hourly area price of energy which depends on the site of grid connection; this incentive is addressed to renewable plants (exept photovoltaic) with power above 1MW. However the regulation states that also plants with power up to 1MW can choose this benefit instead of the all inclusive tariff.

The regulation identifies for each source, type of plant and power class the values of the tariff basis. The starting year to benefit from the incentive is 2013 and rates are reduced by 2% for each subsequent year until 2015. Installations receive the incentive depending on the years of their lifecycle, which is determined by the decree and shown in a table in Appendix 1 to the regulation document.

Since the tariff basis are differentiated for technologies even if relative to the same renewable sources, the following table (table 7) shows tariff for some of the key technologies just to underline the line of reasoning used by the regulator. Detailed information can be found in Appendix 1 to Decree 6 July 2012.

Table 7 – Tariffs for key technologies

Source	Technology	Power	Plant lifecycle	Tariff basis (euro per Mw)
Wind	On-shore	1<P≤20	20	291
		20<P≤200	20	268
		200<P≤1000	20	149
		1000<P≤5000	20	135
		P>5000	20	127
Hydraulic	Basin or reservoir	1<P≤10000	25	101
		P>10000	30	96
Geothermal		1000<P≤20000	25	99
		P>20000	25	85
Landfill gas		1<P≤1000	20	99
		1000<P≤5000	20	94
		P>5000	20	90

Sustainable Biofuels	1<P≤5000	20	121
	P>5000	20	110

The managing authority for energy services, GSE (Gestore Servizi Energetici) settles the amount once a month, based on the measure by the grid managing authority.

GSE is the competent entity for monitoring and verifies information reported by the plants. Sanctions include the decay of the incentive perception together with the obligation to give back the collected amounts; moreover, both the plant and the private entity or the corporate body who made the false statements cannot access the incentive for a period of ten years. However the regulation did not specify how the money derived from sanctions will be eventually employed.

The decree does not set a specific time span, since the incentive is related to the plant lifecycle and can be revised every three years from 2015. However every plant benefits from the tariff which was in force at the time it started working and for all its lifecycle. It is likely that the instrument will be amended based on the evolution of the European policy.

The new feed-in tariff can be considered feasible, thanks to the simplified condition of access; moreover, the setting of annual quota of new power capacity that can be incentived should allow providers to reduce the risk of eventual investments. It is likely to be a more cost efficient instrument since it should be designed to improve the economic sustainability of the incentives in the long run. Further, since the regulation involves empowered and restored plants, managers could be induced to adopt a newer production technology, to benefit from the new system with advantages from the environmental point of view. Unfortunately, since this regulation is recent, there are not available information on the success or the failure of the incentive.

Conto Energia

According to European directive 2001/77/CE, legislative decree 29 December 2003 introduced specific measures to support solar PV. This regulation enacted by decree 28 July 2005, established an incentive program named “Conto Energia” and addressed to photovoltaic plants only

Conto Energia is a program encompassing an incentive tariff to the production of electricity from solar PV plants with power at least 1kW capacity and covers both the electricity fed to the grid and the electricity used for auto consumption; unlike former incentive system there is no direct incentive for the installation of new plants, since Conto Energia is a grant for current expenses thus the provider has a continuous return on the entire production of electricity for twenty years. Since 2005 five different Conto Energia have been in force, setting different quotas of eligible capacity, which corresponds to a determined euro value.

The First Conto Energia was introduced Decrees 28 July 2005 and 06 February 2006, and was in force until 2007. Covered entities are private individuals, corporate bodies and public sectors that did not benefit from the former incentive to the construction and installation of plants. The distribution of the incentive is different for private individuals and corporate bodies:

the first can receive the incentive only on the energy for auto consumption, while eventual energy surplus is considered as a “credit” to be paid the next year (the tariffs for auto-consumption and grid feed-in are the same); on the contrary, corporate bodies receive the incentive on the total production of energy and they can sell the eventual surplus of energy to one of the managers of the electrical grid, receiving an additional tariff, has been set out with a decree by the AEEG (Authority for electrical energy and gas).

Decree 19 February 2007 reformed the regulation for plants that began operation before 31 December 2010: The second Conto Energia set new tariffs that are diversified in relation to the power of the plant and to the period the plants starts working; for example the incentive for plants starting by 31 December 2010 are set 2% under the one for plants starting from 01 January 2009 to 31 December 2010. Besides, a premium incentive for the use of solar PV together with other energy efficiency measures is introduced for the first time. Other reforms concern the simplification of the administrative procedures to access the incentive.

The third Conto Energia is established in 2010 with decree 16 August 2010; differently from the previous regulation, the new Conto Energia lists four categories of plants and a threshold of cumulative power that can be generated: traditional PV plants; PV plants with innovative features (using special parts that can be integrated with architectural elements); concentrating PV system; PV plants with technological innovation.

Some difficulties in the management of the program emerged, since the second and the third programs overlap due to law 129/2010, that dispose that the incentives provided in the second Conto Energia continue to apply for plants installed before 31 December 2010 and starts working by 30 June 2011, actually extending the validity of the second program.

However, less than one year later, decree 05 May 2011 introduces the Fourth Conto Energia, which sets the cumulative amount of the incentive between 6 and 7 billion euro. The new program introduced an all-inclusive tariff incorporating both the incentive and the return for the provider and a premium for auto consumption; the incentive is different depending on the plant’s category (traditional PV plants; PV plants with innovative features; concentrating PV system; PV plants with technological innovation), its power and the time it starts working.

It is also set a gradual reduction of the tariff: the first and the second reduction (for 2011 and 2012) are on a yearly basis, while reductions for 2013 are on a biannual basis. After the first semester of 2013, reductions are by 4% per semester until 2014. However, it is explicitly provided that tariffs are allowed to decrease more than the provided reduction when the demand for the incentive exceeds the expectations; except this case, the mechanism of reduction is based on the assessment on two periods of observation, about six month each. The fourth Conto Energia was in force until June 2012.

Finally, Decree 5 July 2012, set the fifth Conto Energia applying to plants that start working from 27 August 2012. The amount of the incentive is estabished by the AEEG to 6 billion euros. Notwithstanding that, the fourth Conto is still in force for: small plants (less than 1MW power for installation on buildings; less than 200 KW power for installation not on buildings); plants with innovative features; concentrating PV system that start working before 27 august 2012; large plants (more than 1MW power for installation on buildings and more than 200 KW power for installation not on buildings)that are registered before the new regulation; plants build on Public Administration areas and building that starts working by 31 December 2012.

Plants can access the system in two ways, related to the category and power of plants:

- By direct admission: plants less than 50kW installed on buildings to substitute asbestos; plants less than 12kW power; plants with innovative features and concentrating system (only for 50 million euros); plants installed by Public Administrations and plants between 12 and 20 kW that apply for a reduction of 20% of the tariff with respect to the tariff that a plant with the same capacity can obtain if registered. This means that they can be admitted immediately if they renounce to 20% of the incentive; if these installations opt for the registration procedure they will receive the full incentive.
- By registration to GSE: all plants excluding those in the previous category; every register has a different cost threshold.

Decree 5 July 2012 specifies that plants that benefit from previous Conto Energia can't benefit from the new regime. As in the fourth Conto Energia, the value of incentives will be decreasing over time varying from semester to semester for all the period of fifth Conto Energia; however plants will get a fixed tariff for 20 years, depending on the time they start working. Moreover, premium incentive are also foreseen depending on the size of the plant and differentiated for installation on buildings and other installation (these includes all PV plants excluding installations on buildings); these tariff are computed in euro per MW/h and are different for every semester, so as it is not possible to report these value here. For more information on premium tariff see Appendix 5 to decree 5 July 2012.

The managing authority for energy services, GSE, is the competent body for monitoring and verifies the information submitted by the plants. Sanctions includes a ban from the possibility to receive the incentive together with the obligation to return the collected amounts; moreover, both the plant and the individual or corporate body who made the false statements can not access the incentive mechanism for a period of ten years. However the regulation did not specifies how the money derived from sanctions will be eventually employed, nor if the money collected from sanctions will be used to finance the incentive.

Conto Energia has been a successful measure for photovoltaic plants and has contributed to diffuse solar photovoltaic as an alternative source of energy. Compared to the previous incentive which was a grant for the building of a new PV plant, Conto Energia is cost efficient, since it applies to the energy actually produced and fed to the electrical grid.

Following GSE, the most recent data on Conto Energia counts a total of 502,221 installation (1,945 are registered plant but are not working yet); in terms of istalled capacity, power is 16,655,793 kw; the cumulate annual cost is 6,536,306,564 euro. The following table (table 8) summarises information relative to the different Conto Energia that have been in place:

Table 8 – Conto Energia (various waves)

Conto Energia	Number of installations	Installed capacity (in Kw)	Annual Cost (in euro)
I	5,726	163,430	95,158,698
II	203,765	6,791,331	3,270,638,496

III	38,890	1,567,518	649,218,137
IV	201,366	7,441,684	24,32,113,963
V	54,719	1,252,460	144,387,958

Source: GSE

Conto Energia turned to be feasible even if some difficulties emerged especially between the second and third program, due to the so called law “salva Alcoa” which extended the incentive in the second Conto Energia to installations completed by 31 December 2010 and that starts working by 30 June 2011. This law has effectively extended the validity of the second Conto to June 2011, even if the third Conto was in force from the end of 2010.

Certificates of Release for Biofuels Consumption - Decree 128/2005

Decree 128/2005 set the first national quota system for Biofuels in Italy. In particular, the law set an obligation on distributors of petrol and diesel to enter the network of fuel a minimum proportion of biofuels each year. The decree 128/2005 also introduced an excise exemption for biofuels. This law was enacted for several reasons. First and most important it ratifies the European directive 2003/30 on Biofuels, which established the goal of reaching a 5.75% share of renewable energy in the transport sector by 2010. Moreover, as highlighted in the scope of the national decree, this instrument seeks to promote the development and utilization of Biofuel, and to incentive the progressive substitution of renewable fuels to traditional ones, in order to reach national and European targets in terms of GHG reduction and renewable energy promotion. Finally, this decree also stressed the importance of renewable energy for the national energy security, which is a relevant topic in a country like Italy, which relies heavily on the importation of energetic inputs.

Technically, the instrument proposes a quota system, which place a requirement on suppliers of petrol and diesel to provide a share of their fuel from renewable energy. In other term, distributors are obliged to sell a certain share of their fuel from renewable sources, and this quota is certified thanks to a system of certificates. These certificates are tradable, and represent a proof of the compliance with the quota system. The system mainly involves the transportation sectors, and is mandatory, but target and quota have been amended in the following years. In particular decree 128/2005 set these targets:

- 1% of biofuels by end of year 2005
- 2.5% of biofuels by end of year 2010

Which were well below the 5,65% target indicated in the EU directive 2003/30. For this reason the budget law 2007 changed the target levels, which became:

- 1% by end of year 2005
- 2.5% by end of year 2008

However, under the Directive 2009/28/EC on the promotion of the use of energy from renewable sources this share rises to a minimum 10% in every Member State by 2020, and for this reason the national target have been further amended by the decree 25 Jenuary 2010, which set the following quota:

- 4% by the 1st Jan 2011
- 4,5% by the 1st Jan 2012
- 5% by the 1st Jan 2014

which have been met but are still below the EU requirements.

The decree was proposed jointly by the Ministry of European Policy, the Ministry of Productive Activity and the Ministry of the Economy, while the activity of monitoring is conducted by the Ministry of Agriculture.

From a technologic perspective, the decree refers to all these types of fuel with either organic or renewable origin, like Bioethanol, Biodiesel, biogas from wastes, bio-ETBE, bio-MTBE, synthetic biofuel from biomasses among others. Moreover, decree 100/2008 introduced a monetary penalty in case of infraction, which vary from 600 to 1200 euro according to the

gravity, measured as the share of the total quota not covered by the certificate. (If, for instance, a distributor does buy only the 75% of the quota imposed by the law, the fine is equal to 600 euros per unit of biofuel missing, if it does not buy any amount of biofuel, the fine is equal to 1200 euros per unit).

The decree covered the time period 2005/2010, but as mentioned above the instrument has been amended many times. Decree 3 March 2011 n.28 extended the compliance period in order to met the target of EU 20-20-20. Technically, the system works thanks to a certificate system (Called "Certificati di immissione in consumo di biocarburanti") which are emitted by the Ministry of Agriculture (Ministero per le Politiche Agricole Alimentari e Forestali), with the help of the Agenzia per le Erogazioni in Agricoltura (AGEA). Each document certifies for the distribution of 10 Gcal (1 Gcal = 10^9 cal).

Despite the instrument being in line with European indication of incrementing the share of fuel from renewable sources, the stringency of the Italian quota system is lower than the European recommendation, reducing the potential environmental effectiveness of this instrument. From a broader perspective, renewable quota system can be considered characterized by dynamic efficiency, especially when the framework is clear to operators and the future scenario is certain. In such a context, the system may encourage more costly technological solution otherwise economically not sustainable. However, it has to be noted that there is a certain degree of ambiguity in the current policy design, which may undermine the feasibility and efficiency of the instrument. The targets have in fact often been amended and a clear signal of a medium term strategy and objective still lacks.

1.2.4 Non-carbon dioxide greenhouse gases

Landfill Tax - Law 549/1995

The Italian landfill tax was implemented in 1996 and is defined by and is the responsibility of the 20 Italian regions. This decentralisation of competencies has increased since the reform under Article five of the Italian Constitution in many fields, including environmental issues. Taxation and tax revenues are managed by the regions under the general guidelines provided by the Italian Treasury. The main aim of the tax is to divert waste from landfill activities and disincentive incineration without energy recovery by imposing a tax on such activities. Consequently the tax seeks to reduce the emission of methane and CO_2. The landfill tax is the main environmental tax in Italy and generated around €185 million in revenue in 2010. This amount has decreased consistently over time since a peak of €360 million in 1997. It represents around 38% of total tax revenue (circa half a billion euros from environmental and resources taxation in Italy and 0.005% of total environmental and energy tax revenues). Regions were required to implement landfill taxes under national Law 549/1995; however, the timing of their introduction varied across regions. Most fulfilled the requirements of the national law to impose the new tax within 12 months. However, it took seven years for Valle d'Aosta, Molise, and Puglia to implement regional laws. Amendments to the national law referred to landfill tax adoption, the definition of waste, and the distribution of responsibilities among different regional offices. Moreover, it is interesting to notice that the level of the tax varies in a significant manner among regions, and that there were few adjustments since implementation back in 1996, which means that taxes are subject to an erosion in real value over time. In the time period 1995-2008, only Piemonte, Lombardia, Toscana, Molise, Basilicata, Puglia and

Sardinia made adjustments to their levels of taxation by raising them. In Piemonte levels of taxation increased considerably from €10.33 per tonne to €25 per tonne. In Sardinia the landfill tax increased from €15.50 to €25.8 per tonne, the highest level in Italy. In Molise tax levels doubled from €10.50 to €21 per tonne. In the remaining regions taxation levels increased only slightly. There are quite wide differences among regions: the average over the considered period was €14.9 per tonne of MSW landfilled. Piemonte, Veneto, Sardinia, and Umbria have the highest levels of taxation at €25 or more per tonne of municipal solid waste, while taxes are lowest in Valle d'Aosta and Campania at €5.17 per tonne. Furthermore, we note that various increases in the landfill tax rate were observed after 2008 in many Italian regions. Tax levels generally have increased, possibly because of the more stringent targets set by the 2008 Waste Framework Directive and the higher social costs related to landfill. The enforcement of the instrument depends on the different regional authorities. Every region sets a fine in case of non-compliance with the tax which vary according to regional laws. In Emilia-Romagna for instance it varies from 103 to 516 euros in case of partial compliance with the tax; from the 200% to the 400% in case of totally absent compliance with the tax or in case of illegal dumping (non authorized landfill sites).

The instrument, despite being an interesting case of decentralized implementation of environmental policies, which allows regional authority to adapt the policies at their characteristics, lacks of an overall national plan of implementation and development. In particular, considering that waste disposal plant generally represent long-term investments (landfill sites and incineration plants) the lack of information on the future development of the tax increases the level of uncertainty in the sector. It might be, for instance, difficult, for municipalities who have to choose among different disposal technologies to have a clear picture about the effective development of the tax. However, the overall effect of the instrument seems positive, over the period 1999-2008, the amount of waste going to landfill decreased by more than the 25 percent, from around 380 kg per inhabitant in 1999 to some 260 kg per inhabitant in 2008. At the same time, recycling has increased exponentially, and accounted for some 30 percent of total waste disposal in 2008 compared to only 13 percent in 1999. The Landfill tax certainly played a relevant role in this context (Mazzanti and Nicolli, 2012). Moreover, a stronger level of national coordination may be beneficial, considering the high relevance of waste shipments (a high level of the tax might be responsible of some waste shipments towards less regulated areas). This characteristic may undermine the dynamic efficiency of the instrument. The table 9 below contains the tax level for every Italian region from 2005 to 2013 expressed in euro per tonne.

Table 9 – Landfill tax by region

REGION	2005	2006	2007	2008	2009	2010	2011	2012	2013
Piemonte	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Valle d'Aosta	5.17	5.17	5.17	5.17	10.33	10.33	10.33	10.33	10.33
Lombardia	15.49	15.49	15.49	15.49	10.50	10.50	10.50	10.53	10.53
Trentino Alto Adige	11.36	11.36	11.36	11.36	11.36	11.36	11.36	12.52	12.52
Veneto	25.82	25.82	25.82	25.82	25.82	25.82	25.82	25.82	25.82
Friuli Venezia Giulia	15.49	15.49	15.49	15.49	25.82	25.83	25.83	25.83	25.83
Liguria	10.33	10.33	10.33	10.33	10.30	10.30	10.30	10.30	10.30
Emilia Romagna	18.08	18.08	18.08	18.08	18.08	18.08	18.08	18.08	18.08
Toscana	15.49	15.49	16.98	16.98	17.00	17.00	17.00	17.00	17.00
Umbria	25.82	25.82	25.82	25.82	25.82	25.82	25.82	25.82	25.82
Marche	15.49	15.49	15.49	15.49	20.00	20.00	20.00	20.00	20.00
Lazio	12.91	12.91	12.91	12.91	15.49	15.49	15.49	15.49	15.49
Abruzzo	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Molise	10.50	10.50	10.50	10.50	21.00	21.00	21.00	21.00	21.00
Campania	5.17	5.17	5.17	5.17	5.17	5.17	5.17	25.00	25.00
Puglia	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	25.82
Basilicata	11.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Calabria	10.33	10.33	10.33	10.33	10.33	10.33	10.33	10.33	10.33
Sicilia	12.36	12.36	12.36	12.36	12.36	12.36	12.36	12.36	12.36
Sardegna	15.50	15.50	15.50	15.50	25.80	25.80	25.80	25.80	25.80

Waste Management Tariffs (TIA / TARES)

A 1999 Bill introduced the TIA (Tariffa d'Igiene ambientale), which turned over the old tax that was not framed around environmental targets. We define the former a non environmental tax given that it was merely and mainly calculated on the basis of squared metres of the house. It resembled a property tax. TIA, and the brand new TARES (Tassa sui rifiuti e sui servizi, tax on waste and public services) which is going to see light in 2013, presents potential incentive based mechanisms. TIA and TARES are aimed at covering the cost of separated collection of waste, that supports and favours recycling and incineration options. The revenue goes to municipalities. They are paid by owners of buildings, firms and families.

Part of the TIA tariff introduced in 1999 covers fixed costs and part refers to the variable management costs. The former correlates to the size of household living space and, as a new element, to the number of people in the family. The variable part is associated with the (expected) amount of waste produced, which is calculated on the basis of past trends and location-related features. The variable part is abated by around 10–20% if households adopt domestic composting and/or join garden-waste door-to-door collection schemes. The tariff is a structural break with respect the old tax insofar it presents incentives for landfill diversion, it should cover higher recycling costs. Most provinces that have introduced the new tariff system also increased year by year the price level. Effective implementation of the tariff system

remains highly dependent on local policy decisions and practices, which is partly based on the choices made by the municipalities within the provinces that coordinate waste regulations at local level. Early implementations of the new tariff-based system, therefore, may be a sign of stronger policy commitment. We note that the current status of implementation of the 'new tariff'[5] is heterogeneous, in terms of population covered and/or number of municipalities that have decided to promptly shift to TIA according to the law, even across areas with similar incomes and similar socio-economic variables. Other determinants have influenced the timing of this shift and transition phase. At a macro scale, the observed shift from the old 'non environmental' tax to a new tariff system, the TIA, with some intrinsic incentives to support waste reduction and recycling behavior, should allow capturing the higher 'incentive effect' of the latter. We observe that 2013 witnesses the introduction of a tariff that turns over the TIA, namely the TARES. It is going to be effectively implemented in mid 2013. It fully defines the concept of full cost recovery of waste services. It will then further increase waste tariffs, though it does not embody at the moment strong elements which pertain to 'economic instruments' (e.g. tariff correlated to waste produced). Those may be introduced by municipalities through their delegated policy competences. One currently debated point is whether the tariff should cover 'indivisible' public goods such as road maintenance among others. Even though the TIA and also the brand new TARES present property tax features, the related bills contain normative elements for shaping it partially into an 'environmental economic instrument'. Some incentives mechanisms are introducible.

The new TARES covers al fixed costs and the applies the full cost recovery principle to waste management. It is expected to increase by 10-20% the average tariff level. The average value is around €200 per family. It is highly idiosyncratic and variable across municipalities. National official figures do not exist. TARES will also cover 'indivisible' local public goods, though these specifications are still under definition. The tariffs will be full defined and implemented by July 1st 2013 by municipalities. The tariff is expected to increase the share of separated collection in Italy towards the achievement of EU targets for recycling and recovery of urban waste (including packaging).

1.3 Identification of Interactions of Instruments within each Policy Landscape

1.3.1 Carbon Pricing

Given the presence of the EU-ETS and the proposed introduction of a carbon tax to cover non ETS sectors depending upon the future implementation of the Energy Directive in the EU, we signal one interaction: EU-ETS and Kyoto Fund (KF).

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Objectives

They Pursue the reduction of CO_2, though the mechanisms are pretty different. The Kyoto Fund is discretionary in its funding. It does not explicitly value more than others those projects that abate more carbon. Namely, The funding is not proportional to the amount of carbon reduced.

Scope and Coverage

The Kyoto fund and the EU-ETS may complementary cover EU-ETS and non EU-ETS sectors. Although the KF can be seen primarily as a financial support mechanism to the other policy landscapes (especially renewables and energy efficiency), it is possibly strictly linked to the carbon pricing policy landscape defined by the ETS in the next future in the case the decision to use the ETS auction revenues to fuel the fund is confirmed .

Functioning and Influencing Mechanisms

As a matter of fact, as the Minister of the Environment has recently pointed out, the entries obtained from the EU-ETS by the Public Administration will be directed in the future to the Kyoto Fund. On the other hand, by supporting renewable energy sources, energy efficiency and non CO_2 abatement, the KF helps firms meeting their EU-ETS requirements, thus creating a strict interdependency between these two measures and the related policy landscapes.

Implementation Network/Administrative Infrastructure

There are in principle limited interactions. The Ministry of the environment is in charge of both instruments monitoring and functioning. Nevertheless, the effective way of functioning of the KF is under discussion at the moment.

1.3.2 Energy efficiency and Energy Consumption

We draw out 4 interactions in this domain

- Kyoto fund and energy efficiency related tax incentive for building.
- energy efficiency related tax incentive / white certificates.
- energy efficiency related tax incentive for building and general incentives that fund renewal of buildings.
- Conto termico system' (launched in December 2012) and WC.

Objectives

The objectives differ in the sense that there are some instruments that specifically refer to efficiency improvements in housing, while other are broader and may either embed or overlap with the former. The new Conto Termico presents specific objectives for non electricity generation efficiency. Some of the instruments lack specific objectives (energy efficiency related tax incentive), and they are budget constrained (through budget ceilings)

Scope and coverage

The reasoning is similar to the above. The coverage and scope are extensive and defines the policy package in this landscape as economy wide to a certain extent. There are overlapping insofar energy efficiency related tax incentives have been introduced on top of 'certificates markets' in the evolution of the 'policy history'. The coverage is thus relevantly large, but it might be inefficiently designed. We discuss this issue below regarding the real world functioning of such tolls as they were historically introduced and implemented in Italy.

Functioning and Influencing Mechanisms

This is certainly the most relevant pillar to analyse the properties of the interactions.

Regarding **the Kyoto fund and energy efficiency related tax incentive for building** we note that following a February 2012 Ministry of the environment interpretation, the (low interest rate) funds provided by the Kyoto fund and the tax deductions of 55% are possibly cumulative. We note that only in late December 2012 a decree ruled out the possibility to stockpile different incentives. The addition of incentives was present even before for what concerns white and green certificates (on renewable).

As far as the interaction between **energy efficiency related tax incentive / white certificates** is concerned, adding up different incentives may generate a kind of 'cannibalization' of incentives, namely a reduction of efficiency/ effectiveness of some instruments. This is a possibility. Theoretically speaking, cumulativeness is not by definition generating a crowding out effect. It occurs if one tool is or is perceived as more regarding (or easier to implement, as probably tax deductions are). Some authors (Clò, 2012; Clò et al., 2012) claimed that the white certificates (WC) risked such erosion of potential, namely a reduction of WC supply might occur if new and more rewarding options emerge. In addition, overlapping instruments increase the 'noise' in the system by making the framework less clear for agents, without any clear gain in terms of complementarity effects. The WC market has been partially eroded by 55% tax deductions. The 2010 figure says that tax deductions certified 174,752 oil equivalent tonnes (2,032 GWH) while the WC allowances available for thermal options (not electric) accounted for 37% of that value. There was a 60% loss which might have resulted as a consequence of the minimum scale of the WC projects and higher complexity. All in all, tax deductions 'compensate' 55% of the expenditure, while WC reach up a maximum of 19%, which ranges from 0.3% (heating system renewal) to 31% (building energy efficiency) or 27% (thermal solar cells). Deductions were just more favourable, though possibly not as efficient as WC. Different dynamic properties of deductions and certificates could also affect the relative choice (e.g. WC last for 5-8 years as example), since agents may heavily discount the future.

This demonstrates that overlapping can lead to inefficiencies or not full exploitation of the potential (inefficient in itself), or at least unexpected and unclear consequences. Inefficiencies may be related to the different incentive mechanisms. In the example we provide here, while WC provide funding which proportionally reflects the 'value' of the energy saving investment, tax deductions financially compensate any type of saving. WC are more in line with a 'relative pricing' rationale.

We also signal potential inefficiencies in the functioning which relates to a clash between development oriented schemes and the here selected energy oriented tools. As example, **energy efficiency related tax incentive for building and general incentives that fund**

renewal of buildings may clash. The latter is a non-environmental type of instrument aimed at generating economic growth. It is within the new 2012 'development decree' of the Monti government, similar incentives were adopted in the past. We signal the possibility of a financial trade off. If one the one hand it is true that renewal of building might be a driver of energy efficiency investments, it can also drain resources from specific environmental oriented investments, since a share of renewal building costs that are funded through tax deductions is not primarily oriented towards efficiency. As example, the most recent action of the Italian government in 2012 within the 'development decree', namely 'urgent measures for economic growth', increases to 50% (of the investment expenditure) – it was at 36% - the tax deduction for general renewal investments, compared to 55% for energy efficiency and renewable. The specificity of energy investments is diminished. In addition, uncertainty is again a factor given that the measure elapses the 31.12.2013. A contingent rather than structural feature is present.

A final interaction regarding the functioning we identify is between the new **'Conto termico system' (launched in December 2012) and WC**. It is by law an alternative to WC. It is now impossible to forecast what type of crowding out may eventually occur. We can state that 810,164 certificates deriving from small scale investments in thermal options are potentially overlapping, thus cannibalized. Those represent 7.1% of the total WC supply available in the market.

As a summary, the real world interactions might lead to detrimental drawbacks in efficiency and effectiveness determined by a 'cannibalization' of one instrument over another. Clearer boundaries of coverage and financial effects could mitigate such drawbacks.

Implementation Network/Administrative Infrastructure

Italy is not unlike other countries in many respects, but the number of authorities and government bodies is large. The interactions between as example the Ministry of the environment and the Treasury are not always clear. Some tools such as energy efficiency related tax incentives seem to be introduced by fiscal bodies with aims that strongly refer to development issues even when the energy efficiency content is highlighted, given the relevancy of the construction sector in Italy (and especially in the period before the recession occurred).

1.3.3 Promotion of Renewable Sources of Energy

Objectives

Some overlapping might in principle arise between the subsidization of RES and other related policy tools. This consideration is indeed expected to apply to the national subsidy schemes devoted to electricity generation from RES, (the so called "Conto energia" for PV electricity, "Tariffa omnicomprensiva" for other forms of electricity production etc.) and to the green certificates. Also relevant is the possible overlapping among national and regional targets settings and implementation procedures.

Scope and Coverage

Limitations in terms of energy sources apply to some of the available schemes; this is the case of “Conto Energia” (limited to PV energy) and Tariffa Omnicomprensiva (limited to other energy sources). A differentiated treatment has been present to some extent among energy sources in the past. This problem is gradually disappearing, as an increasing uniformity seems to be under way.

Functioning and Influencing Mechanisms

With respect to the overlapping of the different RES related instruments, interactions in terms of the impact of subsidies on the demand and supply of green certificates could and can be in principle expected, together with a consequential impact on the equilibrium green certificates price, that could affect the overall effectiveness of renewable energy incentives (also in terms of technology adoption). The mutually exclusive nature of the main schemes suggests that the potential overlappings might have been limited, but they cannot be excluded.

The interaction among national subsidy policies and regional RES related objectives can be positive or negative:

- A negative link can arise if regions pursue the short run objective of costs reduction and therefore tend to favour a “race to the bottom” attitude.
- A positive link can arise if regions compete to “attract” larger shares of national subsidies but mainly if they act proactively towards regulatory obligations and compete to achieve long run comparative advantages in the RES sectors.

Implementation Network/Administrative Infrastructure

Both local authorities (for the permitting phase) and national authorities, such as GSE, are involved in the administration of the RES schemes. As a result, inconsistencies among local practices and national regulations might lead to efficiency and effectiveness losses.

1.3.4 Non-carbon Dioxide Greenhouse Gases

As far as interactions ‘within the landscape’ we might highlight **the interaction between the landfill tax and the TIA/TARES**. A complementarity outcome might emerge with some inherent conflicts in some areas.

Objectives

First, the two tools target very different levels of the waste chain, the first disposal the second separated collection. They complement each other. As examples, a reduced landfilling of waste might increase the space for recycling and recovery markets, boosting the effectiveness of separated collection. On the other hand, increased separated collection enhances the effectiveness of downstream disposal actions and recycling/recovery activities.

It is well known that a reallocation from landfilling to recycling, and a larger share of energy recovery landfilling within it, would help reducing GHG emissions (Mazzanti and Montini, 2009).

Scope and Coverage

Second, the degree of overlapping in terms of coverage is then very limited. Indirect effects emerge through the reciprocal effects determined by the effectiveness of both tools.

Functioning and Influencing Mechanisms

Third, these indirect effects characterise a mutually supportive relationship. The only drawback is related to the decentralised implementation. Regions where the two instruments have not jointly evolved or not evolved at all face vicious circles – are locked in landfilled disposal options – while others benefit from complementarity oriented virtuous circles.

Implementation Network/Administrative Infrastructure

Fourth, some conflict may emerge due to non identical authorities behind implementation. If regions are the administrative authority behind the landfill tax, they often only set the general framework of waste related targets and delegate to provinces and municipalities the implementation of waste management tariffs. As example, the landfill tax revenue pertains to regions – and is often earmarked in principle to sustainability oriented aims - while the TIA/TARES are a significant source of income for municipalities. It actually covers the cost of the system by the application of the full recovery principle. In this case we face a non overlapping which may end up with lack of integration, limiting the effectiveness of the waste policy as a whole.

1.4 Description and Evaluation of Policy Landscapes in the Light of the Concept of Optimality Developed in task 1.1

1.4.1 Carbon Pricing

Carbon pricing has been applied in Italy almost exclusively through the implementation of the **European Emission Trading System (EU-ETS)** and, to a lesser extent, **the Kyoto Fund** mechanism.

As to the former policy instrument, the implementation of the EU-ETS largely reflects an *economic efficiency* criterion. As it is well known, in fact, cap-and-trade systems theoretically allow to achieve the necessary emission reductions at least cost. From an empirical investigation conducted on the EU-ETS Italian sectors (Borghesi et al. 2012), however, the EU-ETS seems to have satisfied mainly a static rather than a dynamic efficiency criterion in our country. In fact, in the first phase of the EU-ETS, its implementation has had a limited impact on the innovation and diffusion of low-carbon technologies. This applies particularly to some specific EU-ETS sectors (i.e. cement) that seem to have mainly followed a “wait and see” policy so far: most of the firms in these sectors tended to keep their quotas and preferred not to sell them in front of future uncertainties on targets, mechanisms and prices. While this observation is to be verified in the future by looking at the Italian firms' behaviour in the second and third EU-ETS phases, a preliminary analysis of the data at disposal online seems to confirm that the volume of permits being exchanged is relatively low in Italy as compared to other countries. In any case, the difficulties encountered by researchers and citizens to access such data through the online system and/or official institutions currently hinder a proper evaluation of both the static and dynamic efficiency of this instrument, while posing serious doubts on the transparency of its actual implementation. Such doubts seem to be further

supported by some recent scandals (like the one involving the Italcementi, one of the major Italian cement companies) regarding installations that were not duly reported by some firms under the EU-ETS.

The relatively small ecological innovation induced by the EU-ETS casts doubts also on the *environmental effectiveness* of this instrument in Italy. The observed reduction of Italian carbon dioxide emissions in the last few years can be ascribed mainly to the on-going deep economic crisis rather than to a drastic shift to renewable energy sources and/or to a new technological paradigm adopted in the country. If one looks at Italian environmental performance, in fact, it can be easily noticed (cf. European Environment Agency, 2010) that when the crisis began in 2007, the emission reduction was well above the intermediate target needed to achieve the final Kyoto target established for our country (-6.5% by 2008-2012 with respect to the 1990 levels).

Finally, a proper evaluation of the EU-ETS in Italy cannot disregard a few implementation problems in terms of its *policy feasibility* that have emerged in the first two phases. While some of these problems are common to most EU countries, others seem to be linked to specific features of the Italian economic and institutional framework. In the first place, as most EU member countries, the Italian National Allocation Plan allocated an excessively high number of emission permits that was inconsistent with the Kyoto target. This overallocation problem, that occurred both during the first and the second trading phase, was mainly due to political pressure on the government from interest groups who wanted to receive as many permits as possible. Although the centralization of the allocation system has eliminated this problem for the third phase, great effort has been placed in Italy on lobbying actions also in the new EU-ETS phase to be included in the 'free auction' share of firms. The Italian Industrial Association (*Confindustria*) has often criticised in its official newspaper (*Il Sole24ore*) the planned shift from the grandfathering to the auctioning system, due to the expected increase in firms' costs and the related risk of carbon leakage. On the other hand, however, it can be argued that the free allocation of permits according to a grandfathering criterion may have generated windfall profits for a few large firms in key sectors (e.g. energy companies), which may further reduce the relatively small competition level characterizing these sectors in Italy. While this problem is common to other EU member countries (cf. Ellerman and Joskov, 2008; Pearson, 2010), the high number of small-medium enterprises (SME) characterizing the Italian economic system makes this issue even more relevant in our country. While the implementation of an auctioning system could certainly reduce windfall profits and increase the government revenues to be used for environmental purposes, it would not preserve/increase *per se* the competition in the EU-ETS sectors, unless it is properly designed. In this regard, one should recall the past Italian experience in other contexts, such as the auctioning of the UMTS (Universal Mobile Telecommunications System) licences. In that case limited market competition (and possibly collusion among participating firms) caused the auction price and the government revenues to be much lower than expected, particularly as compared to the results observed in Germany and UK in which similar auctions allowed the respective government to substantially reduce their budget deficits in the early 2000s.

The widespread presence of SME in the Italian economic context makes **the Kyoto fund mechanism** -the other carbon pricing instrument identified at the beginning of this section- particularly attractive in our country. The Kyoto Fund (KF), established by the Financial Law in

2007, was conceived to finance the GHG emissions reduction intervention requested by the Kyoto Protocol.

The implementation of the KF, that was originally expected to take place in November 2008, was unfortunately much delayed for about 5 years, up to March 2012 when the first €200 million (mln) of the overall €600 mln Fund were eventually set free to start the programme. In the first phase most of the Fund (€130 mln euros) will be devoted to final uses (e.g. thermal insulation, cogeneration heating systems, geothermal systems etc...); €35 mlns will be used to support widespread micro-cogeneration systems, €10 mlns to renewables (wind and hydro power, solar thermal, installations of photovoltaic panels etc...) and €35 mlns for other activities (e.g. replace electric engines, reduce N_2O, support R&D on renewables, hydrogen and fuel cell and sustainable forestry programmes).

The impressive number of submissions immediately received (605 requests in the first 2 hours and the exhaustion of almost all financial resources destined to the renewables in about 3 days) signals the difficulties that many SME often encounter in Italy in having access to financial support to perform eco-innovations. Moreover, it also suggests that the bureaucratic obstacles that have postponed the beginning of the programme by about 5 years have probably resulted in a serious slow down of the Italian eco-innovations over a crucial period that encompassed the on-going economic crisis. This may have further enlarged the technological gap that Italy seems to suffer with respect to other countries in terms of eco-innovations, with an innovation rate that is currently much lower than that of Germany and Scandinavian countries (cf. Borghesi et al. 2012, Eurostat, 2012).

Although the KF can be seen primarily as a financial support mechanism to the other policy landscapes (especially renewables and energy efficiency), it is strictly linked to the carbon pricing policy landscape defined by the EU-ETS. As a matter of fact, as the Minister of the Environment has recently pointed out, the entries obtained from the EU-ETS by the Public Administration will be directed in the future to the Kyoto Fund. On the other hand, by supporting renewable energy sources, energy efficiency and N_2O abatement, the KF helps firms meeting their EU-ETS requirements, thus creating a strict interdependency between these two measures and the related policy landscapes.

Unfortunately, the lack in Italy of alternative carbon pricing policies beyond the EU-ETS prevent us from identifying further possible interactions within this policy landscape. Summing up, the only true carbon pricing policy introduced in Italy so far has been basically implemented “from outside” (that is, following the EU Directive) with some application difficulties beyond those emerged at the overall EU level and there is still a significant gap in our country that remains to be filled in carbon pricing policies in the future.

1.4.2 Energy Efficiency and Energy Consumption

The landscape is the most substantial together with the renewable oriented landscape, if they are compared to carbon pricing, in terms of scope and number of instruments. This shows up that besides the EU-ETS, the Italian system is – historically and over the recent past as well - biased towards energy policies. This statement is noteworthy, since the analysis of interactions within and between policy landscapes derives from the lack of specific climate policies and fully integrated climate-energy strategies. As example among others, national

energy and environmental taxation amounts at €40.7 Billions in 2010, of which only €491 millions pertain to environmental and resource taxes and €31.2 billions are energy taxes (Istat, 2012). This is possibly true over other EU countries as well, but it is more pronounced in Italy. Climate change policies are at the end of the day energy policies.

Among the various instruments that are present in the extended table, we finally drew out 6 tools, some of which have been in place for some years – passing through various refinements – and others are brand new:

1. the Kyoto fund (also in Carbon Pricing and Renewables landscapes)
2. White certificates
3. energy performance certificate for building
4. energy efficiency related tax incentive for energy efficiency
5. incentives to purchase cleaner vehicles
6. Thermal accounting system (*Conto termico*)

Some have economy wide effects, some are related to housing, consumer and building. A key distinction with that respect is whether they support efficiency for electricity or thermal sources.

The identified package is partially composed of tools that support energy efficiency through funding investment projects (1,4,5) and tools that operate through markets (e.g. 2). Tools based on proper 'pricing' rationale as such are absent, if we exclude the substantial but far too general energy taxation which we decided to exclude from the specific set of tools. Pigovian like instruments are in practice absent.

Another general consideration is that uncertainty covers the future of some instruments, namely subsidies and incentives which are funded by yearly financial bills as well as renewable oriented incentives. This is shared with other countries given the current stagnation of the cycle and public finance issues. The weight of Italian debt adds constraints to expectations on the side of tools funded through the general fiscal pool.

The key and oldest instrument is (2). White certificates were introduced in 2004. They provide the possibility to generate re-sellable allowances when energy efficiency investments are implemented, the measure unit is 100€/tonne of equivalent oil, the electricity consumption of a family in a year. Big players compulsory join the system, while other agents voluntary enter. Efficiency is related to electricity, natural gas, and fuels. Quota exchanges are on a bilateral basis or through institutional authorities. The market is monitored by the Agency for energy and electricity AEEG. National authorities determine the energy saving targets. Players can benefit from selling certificates in excess or for being compliant with the targets. Certificates originate both at the level of production or consumption / users through the selling of more efficient tools to consumers.

As far as **economic efficiency** is concerned, we can state that the key instrument of the bundle (white certificates) possess efficiency rationale, insofar it is framed in a tradable system and the reward is somewhat proportional to the value of the energy saving project. This is less true for tax deductions oriented at energy efficiency. With this respect, their relevance is massively important. Those measures have been largely used to achieve development and energy goals together. Growth oriented goals related to the important construction sector in

Italy. We nevertheless signal two interactions that might have undermined the white certificates and tax deductions performance through partial crowding out: first, energy saving oriented tax deductions might crowd out more efficient 'certificates' markets through overlapping. Second, tax deductions themselves might be crowded out by 'general' (non energy oriented) renewal building tax deductions, that have been normally in place over the same periods of time.

Interactions matter for the assessment of optimality along the efficiency and effectiveness lines. The various interactions affect efficiency, mostly through negative effects, and efficacy.

The last decade and the new deductions systems and markets introduced in 2012 further change the picture and add cumulate incentives. Interactions are delta with by the legislator through the avoidance of cumulativeness of different incentives. This partially mitigates crowding out effects and in some cases preserve efficiency.

Overall, efficiency even in a broad sense is mild. Proper pricing mechanisms are limited. Energy taxation is not aimed at achieving GHG and energy efficiency and 'taxation recycling' systems do not exist (e.g. using revenue to fund innovation)

We also observe that strong uncertainty exists in the Italian system in relation to the cumulativeness / cumulativeness of different tax incentives and funding opportunities. This uncertainty relates to volatile expectations that over time can generate distortions to the investment path (peaks and bumps, waiting to see behaviour, etc..). They are in any case a key element in the analysis of the energy efficiency policy package.

An additional possible drawback of using a bunch of different, cumulated and overlapping instruments is that this can hinder their evaluation: each instrument should be tested with a careful Cost Benefit analysis. Its results could be used to establish a hierarchy among different instruments in terms of economic efficiency, social desirability, and environmental impact. A more extensive and transparent use of cost benefit analysis for valuing project based options may be worthwhile.

As far as effectiveness is concerned, we claim that the achievement of **energy efficiency** is not reached in the medium long run given that the macro figure shows that the country has stabilised its (high) energy efficiency, though the gap with other countries has diminished over time, with some (The UK, Denmark), moving ahead of Italy. The motivations are to be found at a more meso/micro scale by looking at specific sectors. Nevertheless, the overall package probably lacks ambitiousness and integration, namely research of complementarity between instruments and then landscapes. Clearer pricing based rationales would probably help to re-structure relative prices within the economy. In a nut shell, a carbon-energy tax redefines prices and incentives and could be probably more effective as key policy pillar compared to a jungle of energy efficiency and renewable oriented funding tools that interact in various ways, with complementarity but also relevant trade offs showing up.

Regarding the **policy feasibility**, we should stress that transaction costs are present due to (i) the envisaged and commented interactions, which present dynamic – redefinition of instruments, introduction of new ones - and static features, (ii) the various number of ministries and agencies involved in energy efficiency policies and monitoring actions.

Distributive issues are crucial as in all environmental policy schemes. In this landscape and in the renewable energy landscape, the way taxes and/or tariffs fund tax deductions and subsidies are a crucial issue.

Competitiveness is a major factor as well. Namely, most tax deductions for energy saving investments and the broader tax deductions for renewing buildings are within the umbrella of actions aimed at increasing GDP. This depends upon the huge role of the construction sector in Italy. Whether those schemes should present 'economic development' as main aim is questionable and to be assessed on economic grounds. In fact, there may exist sectors presenting higher value added per employee to eventually support. Again a more radical and central scheme of energy/environmental taxation may function as a lever of finding new competitiveness sources within the transition towards a greener economy.

1.4.3 Promotion of Renewable Sources of Energy

In compliance with several EU Directives devoted to the promotion of renewable energy sources - RES (Directive 2009/28/CE among others) and coherently with the 20-20-20 obligations, renewable energy has been subject to substantial intervention, mainly through the use of subsidies in the form of feed in tariffs or premiums, green markets in the form of green certificates and, to a more limited extent, tax exemptions. The institution in charge of managing such schemes is Gestore dei Servizi Energetici (GSE), who is, in particular, in charge to buy back green certificates in case of excess supply at a predetermined price. This is likely to serve as a price floor, but could on the other hand lead to increases in the costs of renewable energy (in particular electricity) incentives. This problem is expected to disappear as the green certificates system is being phased out gradually, with the aim to simplify RES related subsidies. Heat production from renewables has benefited of up to 55% tax rebate, which is being replaced by a feed-in tariff system, similar to that related to other renewables, the so called *Conto Energia Termico*. Finally, biofuel use in transport is promoted through an obligation to mix "traditional" fuels with a percentage of biofuels.

The chosen design of renewable energies has led to difficulties in implementation and to potential efficiency losses, but has also brought about very promising results.

Under the difficulties' point of view, the main problems have been related to:

- the involvement of several levels of government, with potentially conflicting objectives. Two examples can be reported in this respect. First of all, the significant incentives (though decreasing over time) have led to a huge increase in "land intensive" renewable energies, such as onshore wind. This has created significant bottlenecks during the decision processes of local authorities that were in charge of providing the needed permits, especially before a national guidance for such permits was issued (Dm 10 settembre 2010). Secondly, the effectiveness of RES related subsidies can be affected by the way in which the linked revenues are fiscally treated: for example, a preferential treatment for PV plants built in linkage with agricultural activities has led to a boost in these plants installations, crowding out other kinds of plants and also affecting (to some extent) agricultural activities.

- The overlapping with other instruments and policy realms (mainly energy efficiency and carbon pricing) with related objectives (EU ETS, among others), might have led to efficiency losses – see Section 2.1.

- Several changes in the design of RES related policies have been introduced over time. As an example, the latest subsidy schemes are introducing, among other things, a significant innovation in terms of the provision of an auctioning system for large renewable electricity plants (Dm 6 luglio 2012), which is intended to improve efficiency.

Focusing on the specific issue of overlapping regulation, it is clear that using more than one instrument to achieve the same aim can lead to potential increases in overall regulation costs. Another important point is related to the potential impact of regulatory uncertainty. Indeed, the attitude of the regulator(s) seems to have been, at least in some moments, that of "reacting" to existing evidence rather than to plan a long run strategy. This has been confirmed, for example, by the quick passage from the *Terzo* to the *Quarto Conto Energia* and by a missing (or at least lacking) comprehensive analysis of the costs and benefits of the different possible renewable energy sources.

Notwithstanding these problems and decreasing subsidies over time (for example, the average PV related subsidy decreased from 0,435 €/kWh in 2009 to 0,37 €/kWh in 2011) the subsidies regimes have been effective in boosting the installation of renewable energy plants, although additional progress is needed. More specifically, the 2011 statistical report for PV electricity (from GSE) shows how PV electricity production in the same year has reached 10.796 GWh, with an increase of 466% with respect to 2010 and 280-fold from 2007. Similar, though less pronounced, trends can be found in other sectors, such as wind and bioenergy[6].

The link between the costs of feed-in tariffs and other subsidies and the benefits from the reduction in damages due to fossil fuels related emissions is a crucial variable to be considered in assessing the **efficiency** of the subsidies' systems. In this respect, as already mentioned, the average subsidy from *Conto Energia* to PV energy was, in 2011, equal to 0,37 €/kWh; other examples: the price at which green certificates not sold on the market were bought back by GSE in 2011 was 82,12 €/MWh. PV electricity produced through plants with nominal power up to 1MW and sold through "Ritiro Dedicato" was granted in the same year (below certain thresholds) a "price" between 76,2 and 103,4 €/MWh. Though no easy way of aggregating these (and other relevant) cost figures exists, such costs should be compared with the estimates for external costs related to fossil fuels combustion in the production of electricity. An example in this respect is given by the estimates of the average EU external costs for electricity generation technologies reported by the European Environment Agency[7], according to which the average EU external costs from fossil fuels electricity could reach, in 2005, over 0,25 €/kWh. Unfortunately there is no way, at the moment, to compare easily the costs and the benefits side, so that additional up to date research is needed in this field.

Other considerations in terms of efficiency of RES related interventions stem from the consultation documents related to the Italian National Energy Strategy (Strategia Energetica Nazionale), according to which the costs of support also seem to exceed the costs of

[6] See, GSE reports on renewable energies for year 2011 at: http://approfondimenti.gse.it/approfondimenti/Simeri/fer/Pagine/default.aspx

[7] See, for example, European Environment Agency, EN35, "External costs of electricity production": http://www.eea.europa.eu/data-and-maps/indicators/en35-external-costs-of-electricity-production/en35

electricity generation from renewable sources. As Figure 4 shows, for a representative PV plant (200 kW), the average subsidy per MWh has been above the average related cost.

Data reported in Figure 4 might be interpreted in a strict way: subsidies have significantly exceeded costs and lower values could have produced more efficient outcomes; a more "benevolent" interpretation could however focus on the possible role the generous schemes might have played in improving the innovation pattern in renewable energies. Though we cannot provide general conclusions in the latter respect, the data on patenting activity are encouraging, notwithstanding the general bad innovation performance of Italy. Indeed, using data from the OECD Patents Statistics Database it is clear that a significant increase in the patenting activity has taken place, at least up to 2009, in the "Energy generation from renewable and non-fossil sources" realm (Figure 5).

Environmental effectiveness shows an "average" performance, at least up to 2009, for Italy. Focusing on the share of renewable energy over total energy, in Italy as well as compared with other EU countries, the European Environment Agency[8] underlines that from 1990 to 2009, the share of renewable energy in total gross inland energy consumption increased from 4,2 to 9,5%, slightly above the 9% share in 2009 for the EU27. Yet, Italy is expected to comply with the 17% share in 2020, at least according to its National Renewable Energy Action Plan[9].

1.4.4 Non-carbon Dioxide Greenhouse Gases

Within the overall set of instruments, the instruments we present here are the Italian landfill tax and the Waste management tariff (known as TIA, introduced in 1999, currently under reform and substituted with the new TARES by the Bill 214 of 22 December 2011 n. 214). Though it's not based on proper evaluation of environmental external costs, the former has changed the relative price between waste management and disposal. The TIA provides some economic incentives and structurally funds the activity of separated collection of waste which grounds recycling and disposal forms as well. The other possible relevant tool that is included in the extended set of instruments is the pesticide tax which changes the relative price between organic and non organic agricultural systems and products. Overall speaking, the landfill tax is the key tool in this landscape.

The landfill tax helps reducing GHG through its impact on landfill diversion (EEA, 2009, ETC/SCP, 2013). We note that the Italian pesticide tax – which we do not include into the set - might also have impacts through effects on the organic agriculture share in the primary sector, notwithstanding the fact that the GHG benefits of organic agriculture are far from being fully demonstrated.

The landscape is relatively more relevant in Italy with respect to other countries given the share of agriculture based GHG emissions (30% in 2009 compared to 26.7% in the EU_{27}) and the still important share of waste being landfilled, notwithstanding important achievements

8 http://www.eea.europa.eu/data-and-maps/indicators/renewable-primary-energy-consumption/renewable-primary-energy-consumption-assessment-7 (last accessed: 2013/02/07)

9 EEA-ECN (2011), Renewable Energy Projections as Published in the National Renewable Energy Action Plans of the European Member States: http://www.ecn.nl/docs/library/report/2010/e10069.pdf (last accessed: 2013/03/22)

over the past, also attributable to the landfill tax (D'Amato et al., 2013 – see also Figure 6). On that basis, significant marginal reductions of CH_4 might be obtained by full compliance with the Landfill directive and the introduction of complementarity management and disposal oriented tools. The increase of landfill tax levels and diffusion is a potential key pathway. Policies help reducing waste being landfilled: the EU witnessed two significant structural break in the series, 2001 for EU_{27} – which witnesses MSW landfilled per capita decreasing from 300kg per head in 1995 to 200 per head in 2008 - and 2002-2005 for EU_{15} (ETC/SCP, 2013).

It is worth noting that within the aforementioned lack of environmental taxation – which historically constitutes 1.5% of total energy, transport, environmental taxation, and around 0.03% of GDP (Istat, 2012), the two instruments – landfill tax and pesticide tax - represent key examples of 'environmental taxation' in the country. Let us focus on the landfill tax.

The landfill tax is surely the most relevant environmental tax in Italy. Introduced back in 1996 – one of the first of the kind in the EU – it has been not regularly adjusted by regions since then (ETC/SCP, 2012, Nicolli et al., 2013). Its revenue, due to the lack of regular adjustments, at least to inflation, and to the decrease in landfilled waste, has shrunk from €315 millions in 1996 to €186 millions in 2011 (€229 millions was the figure in 2007). In 1996 the landfill tax revenue was €315 millions, out of €434 millions of all environmental and resource taxes, in 2011 is €189 millions out of €490 millions. Other taxes are nevertheless represented by various regional taxations which do not present key examples of 'instruments'.

Along similar lines, the waste management tariff TIA was introduced by a 1999 Bill which delegated the introduction to municipalities. This has generated a non uniform implementation of the tariff.

We highlight the general consideration that in 'federal' countries such as Italy the delegation of competencies to regions and beyond is associated to the benefits and costs of decentralisation of public good provision (Mazzanti and Zoboli, 2013).

Both the landfill tax and the waste tariffs obey to environmental federalism, namely as many other environmental policy in Italy they are effectively implemented at regional and provincial level. Figures 6, 7 and 8 show the landfill diversion that has occurred in Italy and how policy decentralisation characterises the country. This comment applies to emission taxes as well. Climate policies obey to more centralised principle though it might happen that energy efficiency targets are delegated to regions, especially if they pertain specific sectors.

From the point of view of **efficiency,** we can state that both identified tools do not refer to efficiency as primary aim, neither in terms of market creation or links to accounted externality. The main rationale is to target a defined option (landfill diversion, separate collection). The landfill tax should then fund sustainability (compensatory) investments, the tariff should fully cover waste management fixed and variable costs. The TIA/TARES actually contains the possibility to abate the price paid through the application of composting, namely waste reduction. This is an efficiency element within the tariff.

Thus, they introduce even a new economic rationale (e.g. the TIA turned over a general waste tax completely unrelated from waste systems feature and people's behaviour), but related to effectiveness (not cost effectiveness) at a general level.

Interactions help augmenting the effectiveness.

From the point of view of **environmental effectiveness**, we might affirm that they separately and jointly contributed to increasing the performance of the system, and then reducing GHG emissions (D'Amato et al., 2013; Mazzanti et al., 2012, 2011).

Finally, **policy feasibility** issues are critical with respect to the (i) non homogeneous diffusion of the two tolls over the territory, that might generate drawbacks in terms of average national achievements (Mazzanti and Montini, 2013), (ii) lack of adjustments of the landfill tax due to typical inertia and una tantum implementation. Distributional impacts and competitiveness are probably minor issues in this case, even if more homogeneous, more integrated use of the instruments and an increase of landfill taxes might spur waste related technologies as well, a source of double economic-environmental gain (Nicolli, 2013).

2 Description and initial evaluation of the overall instrument mix

2.1 Identification and description of the main interactions between policy landscapes

Objectives

The targets of energy efficiency, renewable energy promotion, carbon pricing and other greehouse gases reduction are strongly related, as, for example, increases in energy efficiency and in renewable electricity and heating/cooling indeed improve the GHG related impacts and, at the same time, stronger incentives to reduce GHG emissions are expected to bring about an improvement in technology adoption, in terms of more efficient appliances or of renewable resource based energy production systems. On the other hand, several "bad" overlappings are possible, so that two or more instruments aimed at obtaining interlinked objectives can lead to inefficiencies.

Scope and Coverage

Focusing first on the carbon-price – renewable energy sources (RES) promotion links, the only available example of the first one in Italy is the application of the EU ETS (Directive 2009/29/CE), which includes regulation of a subset of all the sectors emitting greenhouse gases (ETS sectors) leaving some emitters outside the scope of the system (non ETS sectors). Notice that we explicitly chose to leave out of the analysis a set of instruments related to greenhouse gases, namely taxation of energy products. Indeed, energy taxes might be viewed as environmental taxes in a "broad" sense, but in Italy they are mostly intended as revenue raising taxes, with little impact on energy consumption. A second set of potential interactions can be found between the EU ETS and energy efficiency (EE) measures; possible links stem from considering that a national measure addressed only to non-ETS sectors does not necessarily rule out overlapping completely. Potential interactions also arise between energy efficiency and renewable energy policies in terms of the carbon saving impacts related to these two kinds of intervention. Finally, a broader link exists between the Kyoto fund and the other aforementioned instruments, as the former has as its main scope the provision of financial support to the promotion of GHG saving technologies, which is also a possible, albeit not always direct, consequence of all other policies.

Functioning and Influencing Mechanisms

We identified three main possible sources of interactions:

1. Focusing first on the carbon-price – renewable energy sources (RES) linkages, if RES use is boosted in sectors that are already regulated by the EU ETS, then an overlapping is identified. It is the case of the national subsidies or incentives to electricity generation from RES, such as the solar feed-in tariff/premium (for example, the so called “Conto energia” for PV electricity, or “Tariffa omnicomprensiva” for other forms of electricity production etc.) and of the green certificates (to the extent they induce an increase of RES electricity, such as wind power or electricity generation from biomass). With respect to the latter, the recent evolution of the RES related legislation, which is quickly phasing out the possibility to obtain green certificates, is likely to proceed in the direction of removing the possible overlapping to some extent. On the contrary, if RES related intervention is increased in those sectors that are not covered by the EU ETS, overlapping can be substantially reduced, and a complementarity might occur. An example in this respect is the very recently introduced “Conto Energia Termico” (Dm 28 dicembre 2012).

2. Moving to the interactions between the EU ETS and energy efficiency (EE) measures, possible linkages stem from considering that the EU ETS is mainly a production-based scheme, while energy efficiency measures are mainly consumption-based. So, for instance, if a national measure promotes a reduction of electricity consumption in a residential area (non-ETS), this will indirectly generate a reduction of emissions in the EU ETS sectors. This might lead to an underestimate or overestimate of the improvements in GHG emissions stemming from the consumption and/or production side.

One of the main sources of these first two sets of interactions is related to the linkages between national policies and the EU ETS equilibrium price. Indeed, if an overlapping takes place, then the environmental effectiveness of RES related or EE measures can be at least in part counterbalanced by a reduction in the equilibrium permits price on the EU ETS market. In other words, some of the environmental improvements in the share of renewable energy and/or in the energy efficiency in production or consumption, might be compensated by increases in emissions in EU ETS sectors due to a reduction in the corresponding CO_2 price. This is likely to also lead to decreased incentives in technology adoption.

The nature of this overlapping is very well exemplified, among others, in Lehmann and Gawel (2013), where a very good survey of the literature (with reference to RES-E policies) is provided, although the same paper identifies several possible rationales for overlapping regulation, both in terms of technology development and adoption (due to the failure of markets, policies, and to the path dependency in socio-technical systems) and in terms of additional benefits related to renewable energy deployment.

According to our experts and to the overlapping regulation literature, inefficiencies also arise due to lacks of coordination across energy and climate market-based instruments, increasing the cost and public expenditure to comply with the Italian non-ETS targets. Indeed, while Italian emissions in EU ETS sectors have been systematically lower than the assigned cap, generating a surplus of allowances that private sector can sell in the emissions trading market, non-ETS emissions are higher than the related target, entailing a public expenditure to acquire the amount of international allowances required to ensure national compliance with the Kyoto

target. This problem might be counteracted by increasing intervention in non-ETS sectors through complementary EE and RES related policies.

3. Also, several potential interactions are expected to arise between energy efficiency and renewable energy policies. Indeed, according to our experts, the promotion of renewable electricity and that of EE have influenced the EU ETS ability to provide the right price signal, amplifying the excess supply of allowances due to the crisis. Further, the promotion of RES in the heating sector (RES-H) seems to overlap with energy efficiency incentives, as they both cover mainly the residential sector. Theoretical analysis (Del Rio, 2010) underlines that such interactions can be expected to have limited consequences (at least focusing on renewable electricity) due to the different scopes and absence of direct interaction, but policy design plays a crucial role.

A final note is deserved for the Kyoto Fund, which somehow crosses the diverse policy landscapes and is therefore expected to be complementary and help the effectiveness of policies aimed at boosting renewable energy and energy efficiency, although to a limited extent, due to delays in implementation as well as to the limited amount of available resources so far. Also, linkages with the carbon pricing policy landscape are evident, due to the commitment to direct (at least part of) the EU ETS related revenues accruing to the Public Administration to the Kyoto Fund (see section 1.4.1).

2.2 Summary discussion of the combination of policy landscapes (the overall instrument mix) against each one of the elements of the concept of optimality

The overall instrument mix is the result of an historical process that has progressively shifted its emphasis from environmental taxes to market-based instruments. The possible implementation of a carbon energy tax, briefly introduced at the end of the1990s under the Prodi government and eliminated shortly afterwards, does not seem to show up in the political agenda today. Increasing attention has been devoted instead over time to the potential of trading instruments (e.g. white and green certificates, and the Emission Trading System).

The key policy instruments in the Italian environmental strategy at the moment are probably white and green certificates, the EU-ETS, the *conto termico* described above and the large use of tax incentives to increase energy efficiency (EE) and the adoption of renewable energy sources (RES). Unfortunately, most of these instruments often tend to overlap hindering a proper evaluation of the effect of each instrument.

The main interactions across policy landscapes concern RES, EE and the ETS. Some of the instruments being used so far show conflicting relationships that partially prevent their efficacy. For instance, fiscal rebates to improve the energy efficiency of buildings and for equipment refurbishing may have crowded-out white certificates. Similarly, the promotion of RES and EE can possibly clash with the carbon pricing policies (Borghesi, 2011; Kolev and Riess, 2009). In particular, RES and EE policies contribute to reduce emissions if they are applied to sectors not covered by the ETS scheme, but may fail to do so if applied to the ETS sectors. In fact, if the supply of emission permits is kept constant at a given carbon emissions level, supporting these policies in the ETS sectors might end up simply decreasing the demand of the emission permits and thus their price without generating additional emissions cut. If so, the renewable

energy policies set forth in the ETS sectors should be seen as a substitute rather than as a complement to the ETS. In particular, this applies to national subsidies or incentives to electric RES generation, such as the solar feed-in tariff (conto energia, tariff omnicomprensiva etc.) and the green certificates. More generally, as the national experts have underlined, any instrument that induces either an increase of electric RES or a reduction of electric consumption will overlap with the ETS.

The overlapping issue described above can contribute to explain why the current policy mix presents some critical aspects in terms of economic efficiency, environmental efficacy and policy feasibility.

Overlapping instruments, in fact, can generate some systemic inefficiencies increasing the overall costs for achieving the given 2020 targets. In this regard, as emerged from the interviews to the national experts, since the electricity sector is already subject to the ETS, it would be desirable to extend energy saving measures from the electric and ETS sectors to the non-ETS sectors. This would ensure a better coordination between climate and energy policies, improving the systemic effectiveness of the related market-based instruments (IEA, 2011**).** In general, differently from other countries (e.g. France), more than 70% of the EE measures has favoured a reduction of carbon emissions in sectors (such as the industry and power generation) already covered by the ETS, while only less than 30% of the energy saving has been achieved in the household, tertiary service and public administration thermal energy consumption. This has provoked a limited reduction of carbon emissions in the non-ETS sectors, where governments are financially liable for the compliance of the related target. In this regard, it should be pointed out that while ETS Italian emissions have been systematically lower than the assigned cap, non-ETS emissions are higher than the related target, increasing public expenditure to purchase the required international credits that are needed to comply with the Kyoto target.

Beyond the economic inefficiency deriving from the lack of coordination among energy and climate market-based instrument, the current policy mix has had a limited environmental efficacy so far. The reduction of GHG with respect to the 1990 levels in Italy has been remarkably low (almost absent) (see fig.1); the same applies to the reduction of energy intensity per unit of GDP (see fig.3). And even when the environmental performance has actually improved, as for the share of RES in total energy (see fig.2), the increasing rate is much lower than in most of the main EU countries.

Finally, several problems remain to be solved also in terms of the policy feasibility of the current instrument mix. Transaction costs are often high, the innovation impact of the adopted measures seems to be rather limited, as well as the transparency on the actual functioning of some of the measures (cf. Section 1.4). Moreover, the number of agencies and institutions being involved (the Ministry of the environment, the Ministry of Finance, technical agencies (ISPRA and ENEA), the Energy Regulator (AEEG) and other entities (GSE, GME)) appears to be too high and the overlapping of their respective tasks too large at the moment, which generates credibility and coordination problems.

The unclear overlapping of different instruments and monitoring institutions and the lack of an economy-wide instrument are, in our opinion, the key problems to be faced in the future. One may wonder, for instance, whether the introduction of a sufficiently high carbon tax might perform better in terms of overall optimality than the large number of measures adopted so far.

Moreover, a remarkable feature of the Italian system is the lack of any carbon pricing policy (and almost of any carbon policy) apart from the Emission Trading System implemented to apply the EU Directives.

Unfortunately, the problems described above do not seem play any role in the political debate and few initiatives have been taken so far to face and overcome them.

3 Conclusions

Besides the EU-ETS the Italian policy on climate change is biased – both historically and over the recent past - towards energy policies. Italy has never presented a key carbon (pricing) policy. Environmental taxes represent a negligible 0.03% of GDP, resource taxes being the largest share of this limited amount. Energy taxes are historically high, but they have been mainly driven by a revenue raising principle rather than by environmental considerations, whereas schemes to fund sustainability and eco-innovation have been absent so far. Indirect effects thus prevail over direct policy effects. A coherent and structured climate policy is lacking. It is also not clear if EE improvements are an objective *per se* or also a strategy to reduce GHG and improve the economy's resilience to oil price shocks. Climate change targets as well as EE goals are achieved by a package of various instruments, some major and other minor in scope and entity. Within the carbon pricing landscape, the EU-ETS and the Kyoto fund are pivotal. The latter is a funding mechanism which may possess fruitful complementarity with other landscapes. Non EU-ETS sectors are basically 'carbon policy free'. The government recently stated they will be covered by carbon taxes when the new EU energy directive is in place. The non CO_2 landscape presents a key instrument, the landfill tax. The main instrument in the EE realm is played by the tradable market of white certificates deriving from energy saving projects. They interact with another key tool, composed of various somewhat changing tax deductions for EE in (old and new) buildings. On the side of renewables, again tax deductions for building related investments and green certificates seem to show up as key factors. Some interactions are found within policy packages: a key issue is the potential crowding out of energy saving markets based on certificates determined by the overlapping with tax deductions schemes for building/housing that also present 'economic' aims. Moreover the promotion of RES-E and of EE has somehow influenced the EU-ETS ability to provide the right price signal amplifying the excess supply of allowances due to the crisis. Main relevant interactions are between policy landscapes. Those may present drawbacks in terms of crowding out effects that undermine the eventual efficiency of single instruments. A key one is linking the EU-ETS functioning to other schemes that - by promoting electricity savings - may negatively affect the carbon price effect driven by the EU-ETS. Some positive complementarity is found, namely within the carbon pricing and non CO_2 landscapes. There is a strong potential with respect to emissions reduction from landfilling. The 'Kyoto fund' can act as a complementary tool to cover non EU-ETS sectors and in relation to all landscapes, given its intrinsic flexibility. The EU-ETS is complement to incentives and funding towards thermal energy saving not covered by the EU-ETS. Looking at non environmental direct effects, specific actions are not witnessed. Sector specific actions prevail over economy wide actions (e.g. labour tax cuts and /or innovation funding through environmental taxes). For example, competitiveness and innovation are not fully consistent with the renewable portfolio obligation. These policies bring about efficacy but this often occurs at the expense of their

efficiency, thus generating a trade-off between these two components of optimality. Incentives remuneration of renewables and also EE investments give a mixed signal to improve innovation and to stimulate the green sector (they provide a return to producers whatever technology they use). It would be better to provide a clear and durable price signal using green taxation on the basis of 'double dividends' rationales. Scarce resources should be allocated to the best action. For this purpose, it would be desirable to decide whether cutting labour taxes is better than funding some (eco) innovation taking the joint economic-environmental viewpoint properly into account.

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Annex I: table for the description of instruments

Areas of Policy interaction in design parameters	**White certificates (TEE)**	**Energy Performance Certificate for buildings**	**Energy efficiency related Tax incentive**	**Conto termico**
Instrument category	**Instrument category**	Command and Control	Command and Control	Taxes
Instrument subcategory	**Instrument subcategory**	Performance standards	Building codes and standards	Negative tax for environmentally-friendly activities
Level of governance	**Level of governance**	National	National/Regional	National
Degree of bindingness	**Degree of bindingness**	Mandatory and Voluntary	Mandatory	Voluntary
Objectives*	**Objectives***			
Goal(s)	**Goal(s)**	Mitigation and other goals equally important. Diffusion of energy saving technologies	Mitigation and other goals equally important. Diffusion of energy saving technologies	Mitigation and other goals equally important. Diffusion of energy saving technologies
Type of target	**Type of target**	Primary energy saving	Primary energy saving / end use energy saving	Primary energy saving / end use energy saving
GHG Scope	**GHG Scope**			
GHGs covered	**GHGs covered**	'Kyoto' GHGs: Carbon Dioxide (CO_2); Methane (CH_4); nitrous Oxide(N_2O); Hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); Sulphur hexafluoride (SF_6)	Mainly Carbon Dioxide (CO_2) but also other 'Kyoto' GHGs: Methane (CH_4); Hydrofluorocarbons (HFCs)	Mainly Carbon Dioxide (CO_2) but also other 'Kyoto' GHGs: Methane (CH_4); Hydrofluorocarbons (HFCs)
Direct/indirect emissions	**Direct/indirect emissions**	Indirect impact on emission	Indirect impact on emission	Indirect impact on emission
Primary/final energy	**Primary/final energy**	Primary energy saving	Primary and final energy saving	Primary and final energy saving
Opt-in/opt-out	**Opt-in/opt-out**			
Sectoral scope	**Sectoral scope**			

Sectors of economy	**Sectors of economy**	All sectors, mainly energy supply	All sectors, mainly building sector	All sectors, mainly building sector
Covered entities	**Covered entities**	All energy distributors + industrial and non-industrial customers that have to appoint an energy manager	Installations, residential buildings and other buildings	Installations, residential buildings and other buildings
Covered sites	**Covered sites**			
Capacity thresholds entities/sites	**Capacity thresholds entities/sites**	More than 50000 final customers served for energy distributors	Applies to new buildings and to full refurbishment of buildings with a floor-area >1000^2	Ceiling for the amount of deduction depending on the type of intervention
Opt-in/opt-out for sectors	**Opt-in/opt-out for sectors**			
Opt-in/opt-out for entities	**Opt-in/opt-out for entities**	Obliged energy providers with at least 100000 customers from 2005 to 2007; Obliged energy providers with at least 50000 customers from 2008		
Opt-in/opt-out for sites	**Opt-in/opt-out for sites**			
Implementation network	**Implementation network**	European Commission, ministries and other national authorities	European Commission, ministries and other national authorities	European Commission, ministries and other national authorities
Competent bodies for adopting instrument	**Competent bodies for adopting instrument**	National authority: National Energy Agency (Autorità per l'Energia Elettrica ed il Gas)	National and regional authorities	National authorities
Competent body for setting-up instrument	**Competent body for setting-up instrument**	National Energy Agency (Autorità per l'Energia Elettrica ed il Gas)	National authorities and Regions	National authorities: National Agency for New Technologies, Energy and Sustainable Development (ENEA)
Competent body to administer instrument	**Competent body to administer instrument**	Regions	Regions	National Agency for New Technologies, Energy and Sustainable

				Development (ENEA
Competent body for registration of participating entities	**Competent body for registration of participating entities**	Regions	Regions	National Agency for New Technologies, Energy and Sustainable Development (ENEA
Competent body for Monitoring & verifying compliance	**Competent body for Monitoring & verifying compliance**	National Energy Agency (Autorità per l'Energia Elettrica ed il Gas)	Regions	National Agency for New Technologies, Energy and Sustainable Development (ENEA)
Competent body for enforcement of compliance	**Competent body for enforcement of compliance**	National Energy Agency (Autorità per l'Energia Elettrica ed il Gas)		
Rules & influencing mechanisms	**Rules & influencing mechanisms**			
Market arrangements	***Market arrangements***			
Non-obligatory for eligible parties	**Non-obligatory for eligible parties**	Obligatory for energy distributors with more than 50000 customers	Obligation for new buildings and for full refurbishment of buildings with a floor-area >1000^2	None
Number of participants	**Number of participants**	322 (31 Dec 2010)		
Market flexibility	***Market flexibility***			
Trading	**Trading**	Yes, allowed	No	No
Unit type and name	**Unit type and name**			
Nature of unit	**Nature of unit**	Tone of oil equivalent (toe)	Tone of oil equivalent (toe) and KWt/h	Tone of oil equivalent (toe) and KWt/h
Lifetime of unit	**Lifetime of unit**	Each WC is emitted for every year of duration of the intervention that reduce energy consumption		

Banking provisions	**Banking provisions**			
Borrowing provisions	**Borrowing provisions**			
Financing	***Financing***			
Cost-recovery	**Cost-recovery**	Possible via price increases for unit of electricity and/or gas provided		
Revenues raised	**Revenues raised**			
Technological parameters	***Technological parameters***			
Eligible technologies	**Eligible technologies**	Technologies that allow a reduction in the energy consumption, with a primary energy saving	Building related technologies addressed to improve energy performance	Technologies related to: reduction in heating dispersion of the entire building; installation of solar panel for hot water; construction of building with high energy performance; measures on opaque horizontal structures, vertical and transparent horizontal structure, including frames and glass; replacement of winter heating with systems using condensation boilers
Opt-in/opt-out	**Opt-in/opt-out**			
Treatment of additionality	**Treatment of additionality**			
Timing	***Timing***			
Operational?	**Operational?**	Yes	Yes	Yes
Operational changes foreseen?	**Operational changes foreseen?**	Unknown	Unknown	Possible end but uncertain; reduction in the tax deduction from 2013 (?)
Compliance period(s)	**Compliance period(s)**	From 2005	From 2005	From 2007

Future continuation	**Future continuation**	Yes	Yes	Yes/No
Compliance	***Compliance***			
Monetary penalties	**Monetary penalties**	Determined by regulator: National Energy Agency (Autorità per l'Energia Elettrica ed il Gas)	No	No
Naming and shaming	**Naming and shaming**			
Administrative liability	**Administrative liability**	Yes		
Civil liability	**Civil liability**			

Areas of Policy interaction in design parameters	**Incentives for the purchase of vehicles – Decree 83/2012 and law 134/2012**	**Certificates of release for biofuels consumption - Decree 128/2005**	**ETS - D.L. 257/2010;D.L. 216/2006**	**Kyoto Fund**	**Landfill Tax**
Instrument category	Techsupport	Command and control	ETS	Techsupport	Taxes
Instrument subcategory	Financial measures (subsidies)	Performance standard	Cap-and-trade	Policies to remove financial barriers to acquiring green technology	Taxes directly applied to the pollution source (Carbon Tax)
Level of governance	National	National	National	National	Regional
Degree of bindingness	Voluntary	Mandatory	Mandatory	Voluntary	mandatory
Objectives*	mitigation and other goals equally important	mitigation and other goals equally important	Mitigation only	mitigation primary/other goals secondary	mitigation and other goals equally important
Goal(s)	CO_2	Mitigation	Reduction of	enforcement of the	CO2 from

	reduction and promotion of green vehicles	Biofuel support Energetic independence	greenhouse gases / Kyto protocol ratification	Kyoto Protocol through the promotion and development of new technologies	waste management (from both landfilling and incineration without energy recovery). Landfill diversion and recycling promotion.
Type of target	CO_2	Obligation on suppliers of petrol and diesel to enter the network of fuel the following minimum proportion of biofuels: - 1% by end of year 2005 - 2.5% by end of year 2010 These quota have been sequent amended by the Finanziaria law in 2007 (government Budget), and became: - 1% by end of year 2005 - 2.5% by end of year 2008 - 5.75% by end of year 2010 Decree 25 Jen 2010, further amended the quota: - by the 1st Jan 2011: 4% - by the 1st Jan 2012: 4,5%	GHG reduction	GHG emissions	Landfill sites and incineration plants without energy recovery
GHG Scope		CO_2 reduction			

GHGs covered	CO_2	CO_2	Carbon Dioxide (CO2); Nitrous Oxide (N2O); Perfluorocarbons (PFCs)	Carbon Dioxide (CO_2); Methane (CH_4); nitrous Oxide(N_2O); Hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); Sulphur hexafluoride (SF_6)	CH4, CO2
Direct/indirect emissions	Direct	Direct	Direct	Indirect	Direct
Primary/final energy	final	Final	Primary		final
Opt-in/opt-out			Opt-in		
Sectoral scope					
Sectors of economy	Private and public transportation	Transport	ETS Sectors	Private, public and industrial (mainly small firms)	Waste management
Covered entities	Private households	suppliers of petrol and diesel	All energy producers and polluting sectors included in EU-ETS. In Italy there are about 1.100 plants involved in the ETS scheme, the 71% of which belong to the manufacturing sector.	private citizens, local administrations and small and medium enterprises	Landfill sites / incineration plant
Covered sites					
Capacity thresholds entities/sites			Are excluded fro EU-ETS hospitals and small plant, i.e. plant with emissions lower than 25000 of CO_2, or energy plant smaller than 35MW.	Not valid for big firms	
Opt-in/opt-out for sectors					
Opt-in/opt-out					

for entities					
Opt-in/opt-out for sites					
Implementation network					
Competent bodies for adopting instrument	Ministry of transport (Ministero delle infrastrutture e dei trasporti)	Ministry of European policy; Ministry of productive activity and Ministry of the economy (Ministro per le politiche comunitarie, Ministro delle attivita' produttive e del Ministro dell'economia e delle finanze)	National government	Ministry of the environment and Ministry of Economic development (Ministero dell'ambiente e minister dello sviluppo economico)	Regional authority
Competent body for setting-up instrument	Ministry of transport (Ministero delle infrastrutture e dei trasporti)	Ministry of European policy; Ministry of productive activity and Ministry of the economy (Ministro per le politiche comunitarie, Ministro delle attivita' produttive e del Ministro dell'economia e delle finanze)	ETS committee, formed by: Ministry of the environment; Ministry of economic development; Ministryfor European policy; Ministry of foreign affair; Chambers of Regions (conferenza delle regioni).	Ministry of the environment and Ministry of Economic development (Ministero dell'ambiente e minister dello sviluppo economico)	Ministry of the environment
Competent body to administer instrument		Ministry of Agriculture (Il Ministero delle politiche agricole alimentari e forestali) Agenzia per le Erogazioni in Agricoltura (AGEA)	ETS committee, formed by: Ministry of the environment; Ministry of economic development; Ministryfor European policy; Ministry of foreign affair; Chambers of Regions (conferenza delle regioni)	Cassa deposito e prestiti (state-owned investments organisation)	Regional authority
Competent body for registration of participating entities		Ministry of Agriculture (Il Ministero delle politiche agricole	GSE, Gestore Servizi energetici, (National	Regional authorities	Regional authority

		alimentari e forestali)	auctioneer)		
Competent body for Monitoring & verifying compliance		Ministry of Agriculture (Il Ministero delle politiche agricole alimentari e forestali) Agenzia per le Erogazioni in Agricoltura (AGEA)	ETS committee, formed by: Ministry of the environment; Ministry of economic development; Ministryfor European policy; Ministry of foreign affair; Chambers of Regions (conferenza delle regioni)		Regional authority
Competent body for enforcement of compliance		Ministry of Agriculture (Il Ministero delle politiche agricole alimentari e forestali) Agenzia per le Erogazioni in Agricoltura (AGEA)	ETS committee, formed by: Ministry of the environment; Ministry of economic development; Ministryfor European policy; Ministry of foreign affair; Chambers of Regions (conferenza delle regioni)		Regional authority
Rules & influencing mechanisms					
Market arrangements					
Non-obligatory for eligible parties				easy loans upon request – non obligatiry	
Number of participants		All distributers	About 1100 plants in 2012		All landfill sites and incineration plants without energy recovery
Market flexibility					
Trading		Yes	Allowances are		

			tradable		
Unit type and name			Allowances (or quota)		
Nature of unit			Tradable, allocated with an auctions system (the European Common Auction Platform –CAP). Part of the allowances are allocated on a free bases according to some precise principle (for instance in these sectors at high risk of delocalisation, in order to avoid leakage)		
Lifetime of unit				Loans last a maximum of 6 years	
Banking provisions					
Borrowing provisions				Yearly interest rate 0.50%.	
Financing					
Cost-recovery					
Revenues raised			It follows EU-ETS principles, which states that at least half of the revenue have to be reinvested in emission educing activities.		10% of the revenues goes to municipalities. The other possible use of revenues depend on different regional authority choices.
Technological parameters					

Eligible technologies	Electric vehicles, hybrid vehicles, methane and bio-methane vehicles, vehicles which low level of emission (less than 120g/Km of CO2)	Bioethanol, Biodiesel, biogas from wastes, bio-ETBE, bio-MTBE, synthetic biofuel from biomasses	ETS Sectors		Landfill sites / incineration without energy recovery
Opt-in/opt-out					
Treatment of additionality					
Timing					
Operational?	1st January 2013 – 31st December 2015. Subsidy decreasing in time, 20% of the vehicles value the first year, 15% the second.	2005-2010	Until 2020	From the 16th February 2012. Last three ears	Since 1996
Operational changes foreseen?	No	Budget Law 2007 and Decree 25 Jen 2010 changed the target	They will follow EU-ETS	No	There is not a precise scheme, some regions changed the level of the tax, some other not. There is not a clear national scheme.
Compliance period(s)		2005-2010	2003-2020	Three years	1996-ongoing
Future continuation		Certainly until 2012	Will follow EU-ETS		Is still in force
Compliance					
Monetary		Yes, see decree 100/2008. It varies	Fine between 40 and 100 euro for		Yes (it varies from region to

penalties		between 600 to 1200 euros according to the gravity of the infraction, measured as share of the total compliance	each tonne of CO_2 emitted without a quota		region, but it range generally from about 100 to 500 euros)
Naming and shaming					
Administrative liability		Yes	Yes		Yes
Civil liability		No	No		yes

Areas of Policy interaction in design parameters	**All inclusive tariff**	**Green Certificates**	**Fifth Conto Energia**	**New feed-in tariff for renewable sources other than photovoltaic**	**Regional objectives for renewable energy**
Instrument category	Technological support	Technological Support	Techonological Support	Technological support	Command and control
Instrument subcategory	Feed-in tariff	Green certificates	Feed in Tariff	Feed-in tariff	Performance standard
Level of governance	National	National	National	National	National and Regional
Degree of bindingness	Voluntary	Mandatory	Voluntary	Voluntary	Mandatory
Objectives*	Mitigation primary/other goals secondary	Mitigation primary/other goals secondary	Mitigation primary/other goals secondary	Mitigation primary/other goals secondary	Mitigation only
Goal(s)	Incentivate small renewable plants by granting a fixed return on the energy fed in the grid; simplify the procedures to access the incentive for	Ensure electrical grid is fed with a quotas of renewables; encourage the development of a market for renewables	Incentiv the production of electricity from photovoltaic source	supporting renewable energy production through the definition of simplified access to incentives. Promoting efficiency and sustainability relative to both	Renewable energy production at regional and level to comply with national objective towards 2020

	small plants			the incentives mechanism and the target set by the (PAN).	
Type of target	Renewable energy	Renewable energy	Renewable energy	Renewable energy	Renewable energy
GHG Scope	CO2 and SOx reduction	CO2 and SOx reduction	CO2 and SOx reduction	CO2 and SOx reduction	CO2 and SOx reduction
GHGs covered	CO2 and SOx	CO2 and SOx	CO2 and SOx	CO2 and SOx	Co2 and SOx
Direct/indirect emissions	Indirect	Indirect	Indirect	Indirect	Indirect
Primary/final energy	Renewable energy	Renewable energy	Primary	Renweable energy	Renewable energy sources
Opt-in/opt-out	Both		Opt-in		
Sectoral scope					
Sectors of economy	Energy supply	Electricity production	Electricity production	Energy supply	Economy wide
Covered entities	Plants with installed capacity between 1 kw and 1 mw	Electrical energy providers	Solar PV energy provider	Plants with an established capacity above 1mw, and that started their activity after 31 december 2012 or have been authorized before July 2012 but are starting in 2013 (deadline: 30 April 2013)	Region (administrative) and regional renewable energy plants
Covered sites					
Capacity thresholds entities/sites	Less or equal to 1mw		Different incentives for plants up to 1MW and plants above 1MW; direct access for plants less than 50 kw in substitution of asbestos, plants with capacity less than 12 kw and plants by Public	Max: 5mw, excepted hydroelectric sourecs with established capacity of 10 mw and geothermal sources with established capacity of 20 mw	

			Administration with capacity between 12 and 20 kw		
Opt-in/opt-out for sectors					
Opt-in/opt-out for entities	Yes	Yes		For plants starting before 2013, an incentive is provided for the residual entitled period after 2015, when Green Certificate won't be in force	
Opt-in/opt-out for sites					
Implementation network					
Competent bodies for adopting instrument	Ministry of the Economic Development; Ministry of the Environment	Ministry of Industry and Trade; Ministry of the Environment	Ministry of Economic Development; Ministry of the Environment	Ministry of economic Development, Ministry of the Environment, Ministry of Farmin and Forestry	Regional administrations
Competent body for setting-up instrument	AEEG	GSE (Gestore Servizi Energetici)	AEEG (Autority for Electrical Energy and Gas)	GSE (Gestore Servizi Energetici)	Regional administrations
Competent body to administer instrument	GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	Regional administrations
Competent body for registration of participating entities	GSE(Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	Regional administrations
Competent body for Monitoring & verifying compliance	GSE(Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	Ministry of economic development; GSE (Gestore Servizi Energetici)

Competent body for enforcement of compliance		GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	GSE (Gestore Servizi Energetici)	Ministry of economic development; GSE (Gestore Servizi Energetici)
Rules & influencing mechanisms					
Market arrangements					
Non-obligatory for eligible parties					
Number of participants					
Market flexibility					
Trading		Certificates are tradable			
Unit type and name		Green Certificates			
Nature of unit		Certificates are attributed to the plants depending on the electricity produced and relative to a coefficient which is different for every renewable.			
Lifetime of unit		15 years			
Banking provisions					
Borrowing provisions					
Financing					
Cost-recovery					
Revenues raised					
Technological					

parameters					
Eligible technologies	Renewable sources other than photovoltaic	All renewables and equal renewables (until 2007)	Traditional PV plants; PV plant with innovative features; Concentrating PV system.	Renewable sources other than photovoltaic	Hydroelectric; Solar PV; Eolic; biomass; bio gas.
Opt-in/opt-out					
Treatment of additionality					
Timing					
Operational?	From 1 january 2008 to 31 december 2012	Until 2015	45 days after the publication of decree 5 July 2012	From 1 January 2013	Until 2020
Operational changes foreseen?	No	No	Yes, when the cumulative cost threshold is reached		Eventually from 2017, if the regional objectives are far from being achieved
Compliance period(s)		15 years	20 years		2012-2020
Future continuation	No	No			Unknown
Compliance					
Monetary penalties			Return the sum received as incentive	Return the sum received as incentive	
Naming and shaming			The private/corporate body cannot access any incentive for 10 years	The physical/giuridic person cannot access incentives for 10 years	
Administrative liability			Yes	Yes	Yes
Civil liability			No	No	No

Annex II: Types of interactions between instruments

	Type of policy interaction	Description
Carbon pricing		
EU-ETS / Kyoto fund	different	Interaction between a tradable market and a project based funding system
Degree of bindingness	m-v	Mix of mandatory ETS and voluntary project based system the other
Objectives	p-p	The Kyoto fund in principle target GHG abatement projects as well as carbon pricing tools
Scope	i-i	Indirect interactions
Implementation network	p-r	Partially overlapped
Rules and influencing mechanisms	Regulatory	Potentially mutually supportive.

	Type of policy interaction	Description
Energy efficiency and energy consumption		
energy efficiency related tax incentive / Kyoto fund	different	Interaction between two different project funding systems in different areas. One economy wide the other related to buildings.
Degree of bindingness	v-v	Completely voluntary, cutting interest rate for one, tax deductions in the other case
Objectives	p-s	Only the Kyoto fund targets GHG, though the assessment is project based without ex ante fixation of pricing
Scope	i-i	Indirect interactions
Implementation network	p-r	Partially overlapped
Rules and influencing mechanisms	Regulatory	Carbon pricing and trading are not involved. Efficiency principle are dependent upon the choices of the investor and evaluators in the case of the Kyoto fund. Potentially mutually supportive.

	Type of policy interaction	Description

Energy efficiency and energy consumption		
energy efficiency related tax incentive / white certificates	different	Interaction between two different mechanisms: certificates and tax deductions One economy wide the other related to buildings.
Degree of bindingness	m/v-v	partially voluntary
Objectives	s-s	Energy efficiency oriented tools
Scope	p-pa	Some overlapping
Implementation network	p-r	Partially overlapped
Rules and influencing mechanisms	Regulatory	Carbon pricing and trading are not involved. Efficiency principle is dependent upon the choices of the investor. Potentially conflicting.

	Type of policy interaction	Description

Energy efficiency and energy consumption		
energy efficiency related tax incentive/ building renewal tax incentives	Identical	Apply to the same sector and agents (housing, building)
Degree of bindingness	v-v	Not compulsory
Objectives	s-s	Indirectly reducing GHG, depending upon the chosen investments, the funding is not related to GHG abated
Scope	p-pa	Same coverage
Implementation network	f-r	Same authority
Rules and influencing mechanisms	regulatory	Potentially conflicting.

	Type of policy interaction	Description
Energy efficiency and energy consumption		
Conto termicoing system / white certificates	identical	Interaction between two highly overlapping systems, totally overlapping for small scale projects
Degree of bindingness	m/v-v	partially voluntary
Objectives	s-s	Energy efficiency oriented tools
Scope	p-pa	Some overlapping
Implementation network	p-r	overlapped
Rules and influencing mechanisms	Regulatory	Carbon pricing and trading are not involved. Efficiency principle is dependent upon the choices of the investor. Potentially conflicting.

	Type of policy interaction	Description
Promotion of renewable energy		
Green certificates market and feed in tariffs or premium	different	interaction between Green Certificates market and feed in tariffs or premium to PV and other RES
Degree of bindingness	v-v,m-v	Both kinds of instruments depend on the choice of the regulated agent to install RES plants and/or to trade certificates. Both, however, are subject to mandatory green energy provisions and targets.
Objectives	p-p	The instruments have RES related improvements as the primary objective
Scope	p-pa/f-pa	Limitations in terms of energy sources apply to Conto Energia (limited to PV electricity) and to Tariffa Omnicomprensiva (limited to other RES).
Implementation network	p-r	Both local authorities (for the permitting phase) and national authorities are involved.
Rules and influencing mechanisms	Trading	The main link is through the possible impact on the equilibrium price of Green Certificates of other RES related schemes.

	Type of policy interaction	Description
Promotion of renewable energy		
National and regional renewable energy provisions	different	Positive/negative interaction between national and regional renewable energy provisions.
Degree of bindingness	m-v, m-m	Regional as well as national objectives are mandatory. National subsidies depend on the choice to install RES producing plants.
Objectives	p-p	RES improvements as the primary objective
Scope	f-pa	
Implementation network	d-r	National authorities (e.g. GSE) and regional ones are in charge of the different implementation phases
Rules and influencing mechanisms	Regulatory	The main link is expected to take place through competition by regions to obtain (weaker or stronger) regional targets.

	Type of policy interaction	Description
Non CO2 landscape		
Landfill tax / waste management tariff	different	Implemented at different administrative levels: regional and municipal
Degree of bindingness	m-m	Both mandatory tools
Objectives	s-s	Different targets
Scope	i-i	Indirect effects taking place on reciprocal basis
Implementation network	f-r/p-r/d-r	Potentially Different administrative authorities (lack of integration)
Rules and influencing mechanisms	regulatory	Potential mutually supportive relationship

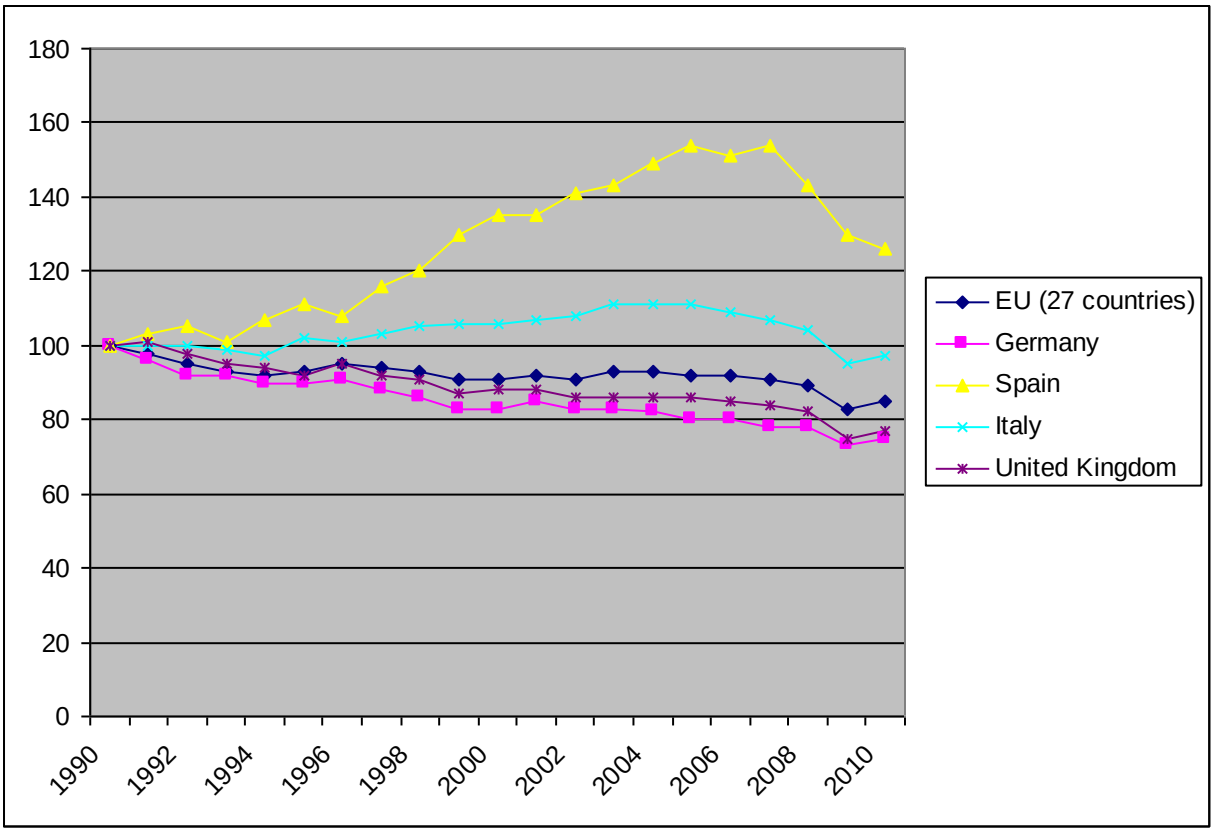


Figure 1 - GHG trends (1990 =100), source EUROSTAT

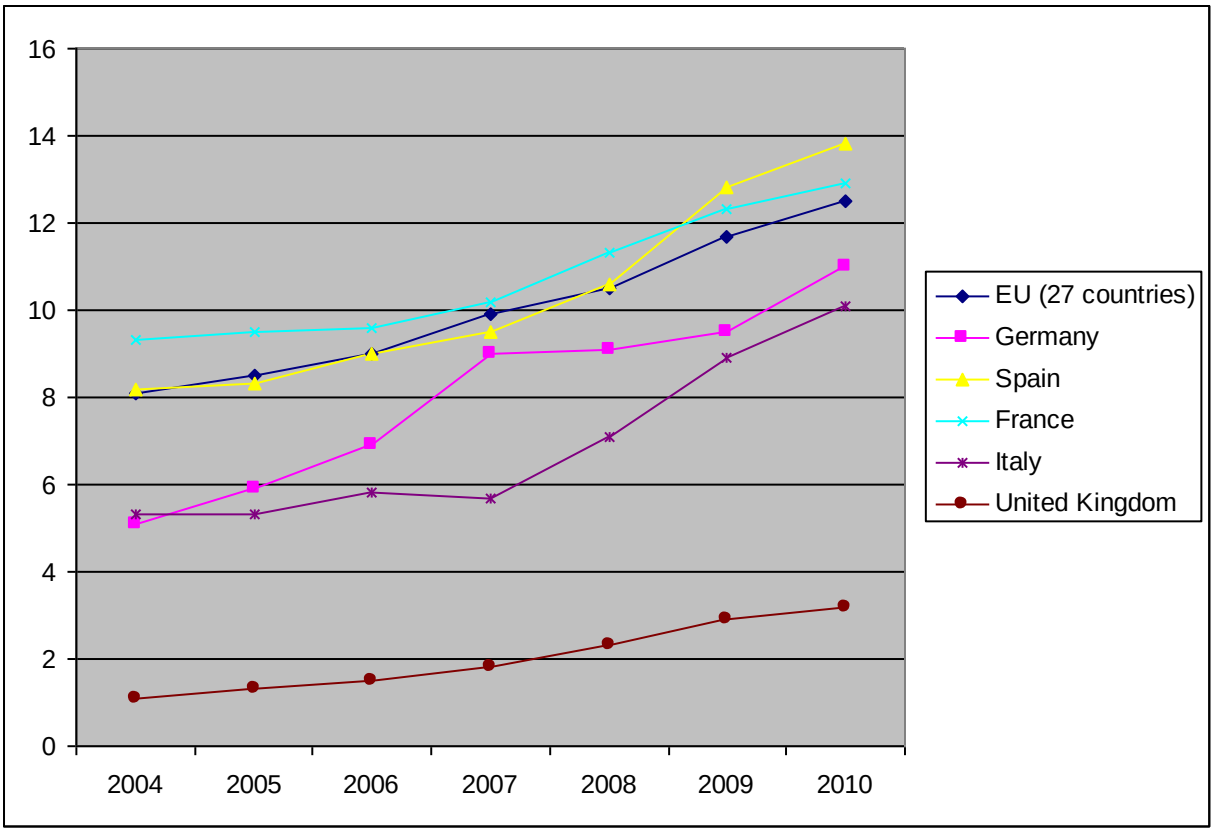


Figure 2 - Share of renewable energy on total energy, source EUROSTAT

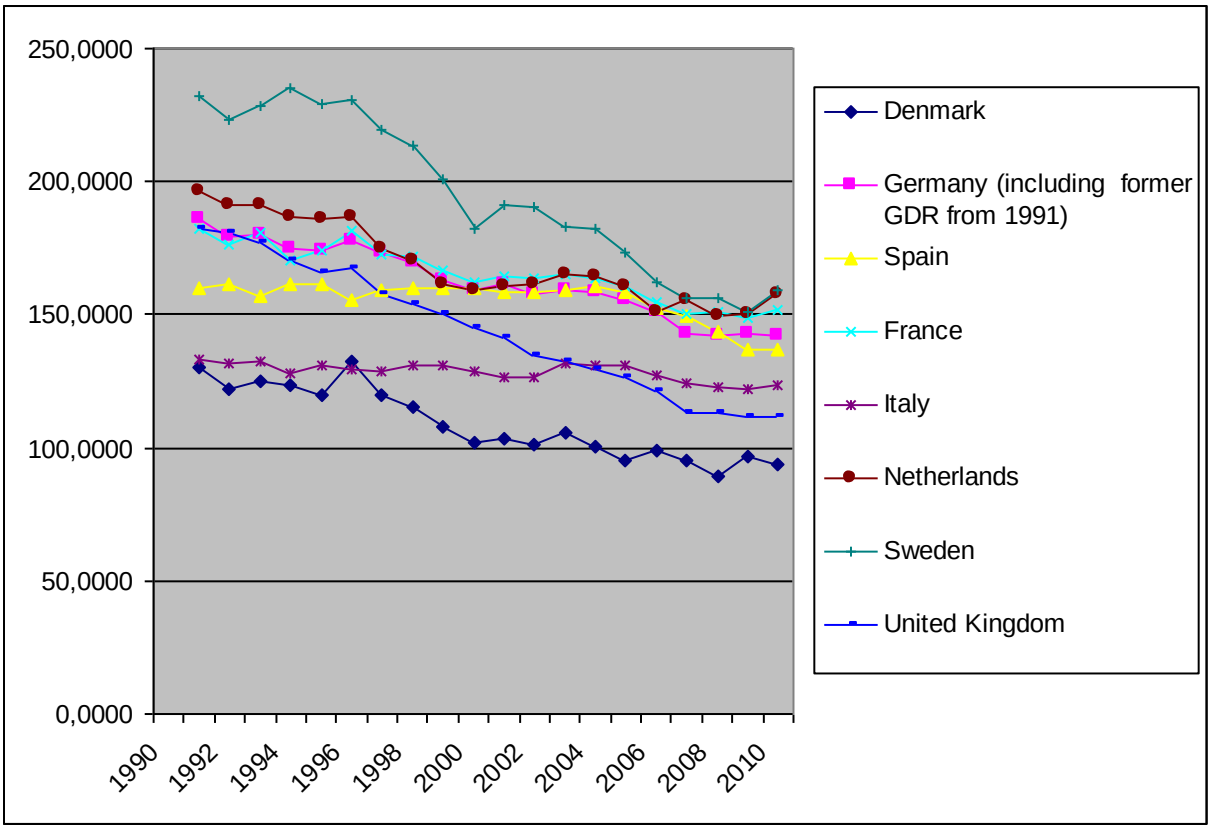
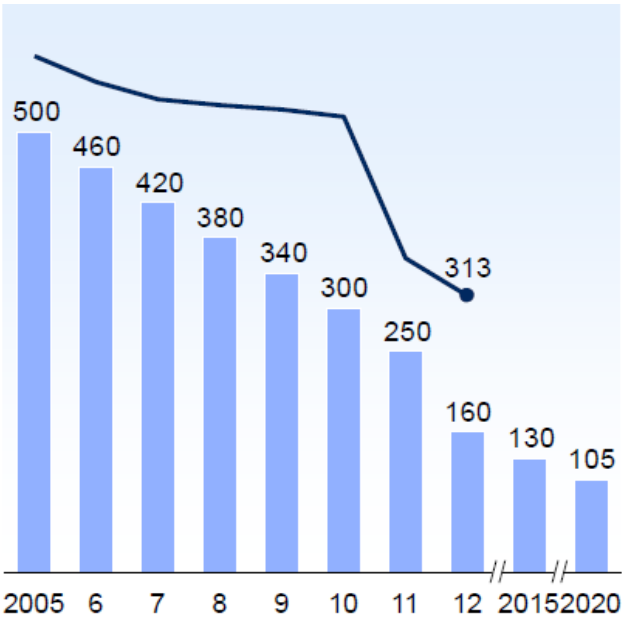


Figure 3 - Energy intensity of GDP, source Eurostat

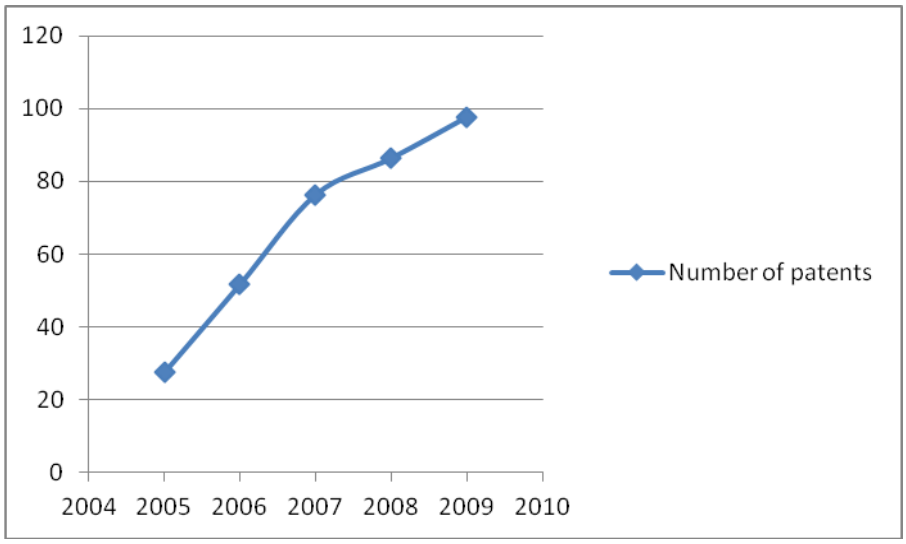
Past and forecasted cost (EU average - columns) and incentives (blue line) – PV plant – 200 kW - €/MWh



Source: Audition at the Italian Senate, presentation by the Minister of Economic Development, 26 April 2012[10].

Figure 4 – Average subsidy and costs

10 http://www.astrid-online.it/Regolazion1/ENERGIA/Atti-parla/Indagine-c/Audizione-Passera_26_04_12.pdf (accessed: 2013/03/22)



Source: Elaboration on data from OECD Patents Statistics Database[11].

Figure 5 – Patents in "Energy generation from renewable and non-fossil sources" - Italy

[11] Patents applications to the EPO based on priority date and the investor's country of residence. http://stats.oecd.org/Index.aspx?DatasetCode=PATS_IPC# (accessed 2013/02/07).

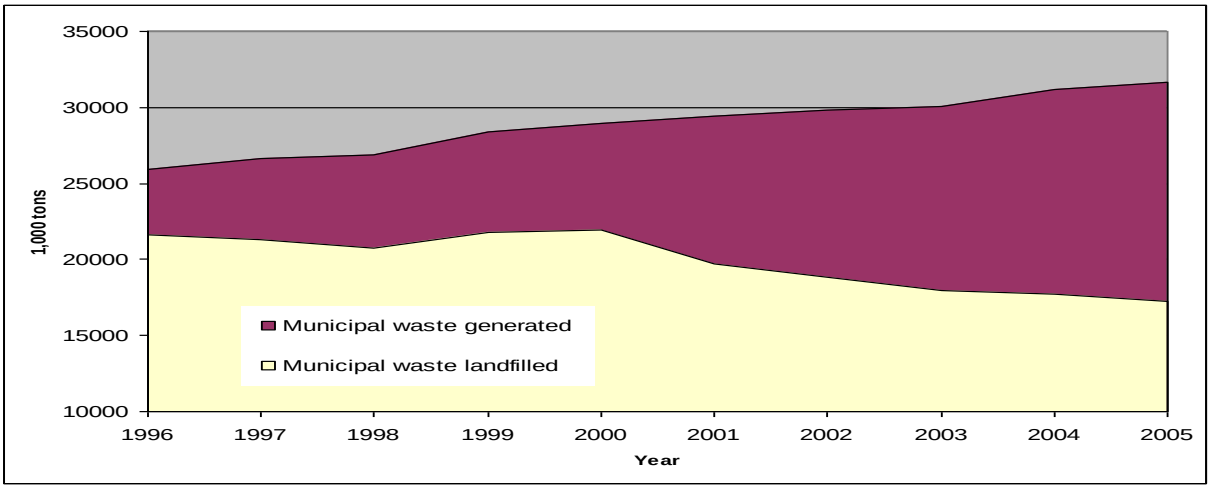
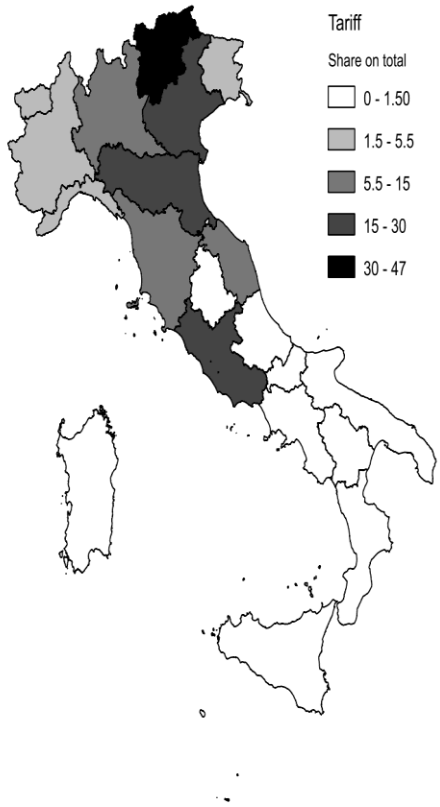
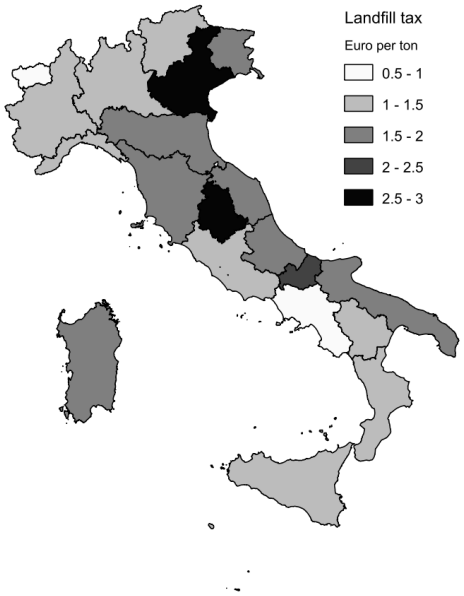


Figure 6 – Waste generation and landfilled waste in Italy





Figures 7 –8. Waste management tariff (diffusion by regional population) and Landfill tax in Italy (2000-2005 values)