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Analysis of the Covenant of Mayors Initiative in Sicily

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Abstract

In the European scene a breakthrough in the field of environmental sustainability is represented by the innovative model of multi-level governance, introduced by European Community in 2008, well known as the "Covenant of Mayors". It is an initiative that involves countries, cities and regions that voluntarily commit to reducing their emissions of greenhouse gases, through the so-called “20-20-20”, that is to reduce by 2020 the 20 % of CO_2, generating 20 % of energy from renewable sources with a reduction of the 20 % of energy consumption. The aim of the initiative is to provide a practical tool in order to guide municipalities in the process of drafting a SEAP (Sustainable Energy Action Plan) according to the European Guidelines drawn up by the Covenant of Mayors Office (Co.MO). Since 2012 the new regional government of Sicily has followed carefully the initiative "Covenant of Mayors" by establishing a technical, scientific and organizational structure called "Control room for the Covenant of Mayors". The Control room has been as promoter of cultural activities with information and educational purpose, organizing and following meetings with many delegates of all municipalities in Sicily. This path led to a full participation of many Sicilian municipalities, recovering the previous gap during the early years of the initiative. In this analysis, a general overview about the participation of all regions of Italy is exposed, focusing the attention on on the virtuous path undertaken by the Region of Sicily. A more accurate statistical analysis by using several indexes has been conducted to better understand the strengths and weakness of this initiative.

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Keywords: SEAP; Covenant of Mayors; global warming; CO_2 emission reduction.

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1. Introduction

The current financial-economic crisis has highlighted the giddiness of the international productive system. In the European panorama a breakthrough in the field of environmental sustainability is represented by the innovative multilevel model of governance called "The Covenant of Mayors" (C.o.M.) introduced by European Community in 2008. Nowadays the cities that are very populated, are probably the principal causes of energetic consumptions of fossil fuels and consequent emission of atmospheric pollutants. The main culprits are the industries [1] and urban mobility [2]. In [3-4] it has been developed an analysis of main air pollutants in a city of Mediterranean area.
In the cities the use of renewable sources for energy production plays a key role for the future vision of a smart grid system with low emissions. Many researches about this topic have been undertaken and in particular a case study of a stand alone concentrating photovoltaic system has been treated in Mediterranean area [5].
In the context of the covenant of mayors the analysis of energy consumption and greenhouse gas emissions of about 978 municipalities in the province territory of Barcelona (Spain) is treated in [6].
The initiative of the "Covenant of Mayors", promoted by European Commission is collocated in a context that has evoked especially during last years a remarkable interest on a large scale. As a matter of fact, the Kyoto protocol that the C.o.M is based on is the reference point for who decides to face the problems of excessive energy consumptions, gas carbon emissions in atmosphere and the consequent global warming.
The C.o.M represents an important commitment aimed at reaching goals about sustainable development, specifically concerning the energetic field and the so-called "20-20-20". This strategy presents three key objectives for 2020: a 20 % reduction in EU greenhouse gas emissions from 1990 levels, raising the share of EU energy consumption produced from renewable resources to 20 % and a 20 % improvement in the EU's energy efficiency. The goal of the C.o.M is to furnish a practical and synthetic tool able to guide the public agencies in the process of making a sustainable energy action plan (SEAP), inventory baseline emissions (IBE) and a set of examples of technical actions for different sectors in compliance with the European guidelines of the Covenant of Mayors Office (Co.M.O.).
Sicily for its geopolitical position in the Mediterranean area represents a natural bridge between the countries of North Africa and those of North Europe, proposing itself to become a hub for the development of sustainable energies in the Mediterranean area. For all these reasons the development of this initiative assumes a fundamental importance in the regional policies.

2. The Covenant Of Mayors, its goals and adhesion steps

This initiative consists in the voluntary subscription by the Mayor to carry on the goals of the so-called "20-20-20" adopted by European community at the beginning of 2008. The principal goal the C.o.M is to reduce of at least 20 % the gas carbon emissions for each municipality through the fulfillment of the SEAP and a monitoring system. Therefore it is important to highlight two aspects of the covenant: the voluntary adhesion of municipalities by assuming several commitments not imposed by the law and a quantitative approach in terms of time and goals.
The first step that a municipality has to face is to deliberate in the city council the acceptance of the agreement scheme arranged by the Co.M.O; it is given a mandate to the Mayor to subscribe the commitments of the C.o.M with European commission Directorate-General for Energy (DG EN).
With this action Mayor undertakes, on behalf of the whole community, to reach and eventually overtake the EU goals within 2020.
This commitment foresees many steps of which most important are:

- The baseline of emissions;
- The presentation of the SEAP within an year from the deliberation by the city council;
- A biannual report about the actions foreseen in the SEAP.

2.1. The organizational structure of SEAP

A main important role in the SEAP is the organization of the different sectors of public administration according an energy management logic. In order to make a baseline of the municipal emissions of CO_2 and to verify the efficiency of the SEAP, it is necessary to collect information concerning both internal (council management) and external (municipality territory) energy consumptions. In concrete terms it is suggested to identify an internal human resource (energy manager) responsible of consumptions monitory of buildings, thermal machines and machineries. Another important role is played by political organism that would promote and develop, through specific work groups, the principal lines of action for the SEAP. The goal is to involve stakeholders with the aim at mobilizing the civil society around the plan.

2.2. The stakeholders role

The role of stakeholders is fundamental because their participation, support and the information sharing with them are determinant to reach the goals of the plane. Their involvement could be revealed efficient in all phases of the process of SEAP: in the first phase they could express their opinion and being part of the process. During the planning phase they could furnish important and necessary information for the municipality in order to define action strategies; during the realization phase they could provide to make possible the actions that involve them, promote virtuous energy behaviors and encourage the participation of other stakeholders. In the last monitoring phase they could help municipalities with necessary data to evaluate the progress of the actions that involve them.

2.3. The temporal route of SEAP.

A) The starting phase

The first step foresees the organization of the process and the identification of the participants and their responsibilities. The main three parts of this process are: policy part (through the fulfillment of the C.o.M and motivating the entire process), the organizational structure (managers, working groups) and stakeholders.

B) Planning part

It concerns the definition of Inventory Base Emissions e the target of CO_2 reduction that the municipality has to reach by 2020. The following steps are foreseen: redaction of IBE, definition of actions, elaboration and acceptance of SEAP by city council.

C) Realization part

It represents the concretization of the complete process thanks to the realization of those interventions of SEAP; an important role is played by the ability to find funding by municipal administration.

D) Monitoring part

The commitment subscribed for the Covenant of Mayors provides for the mandatory monitoring system of the several initiatives presented in the SEAP and above all their efficiency in terms of variation of emissions. The principal goal of this monitoring system is to verify if the objectives are respected and consider possible corrective actions.

3. The Covenant of Mayors in Italy

Italy has played an important role in the conflict to climate changes being often an opinion leader country in the topics of sustainable development. As demonstration of that, the initiative of C.o.M has achieved resounding success in Italy that is the country with the highest number of signatory cities [7].
However, analyzing the Italian territory not all the regions have responded to this initiative at same way. Fig. 1 illustrates the number of signatory municipalities divided for macro-areas: northern part, central and southern part with islands. It is quite evident that the northern part with its 1395 signatories is the territory with the highest number of signatories followed by the southern part and then the central one. The same trend is visible for the accepted SEAP.

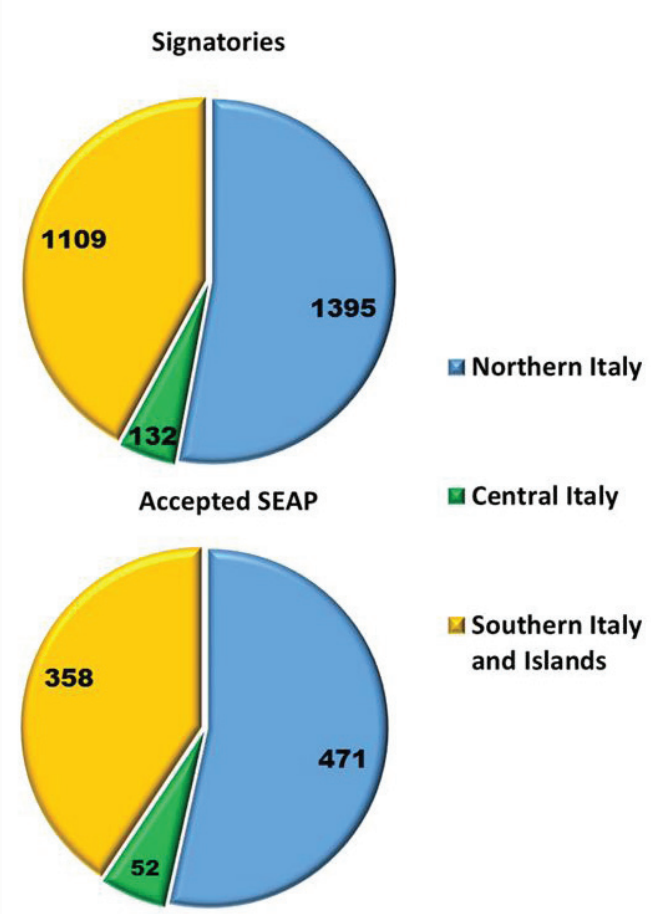

Figure 1. Signatories and accepted SEAP of Italian regions.

3.1. The Sicilian Covenant of Mayors

The Sicily Government during last year (2013) gave a strong impulse to the initiative of the Covenant of Mayors. The control room, instituted in September of 2012, was designed to fulfill the following tasks: to monitor the status of realization of the commitments taken by municipalities toward their citizens and European Community and play a role of coordination for activities and initiatives of public administrations. Therefore the control room met all 390 Mayors of Sicily in order to make them aware to an active participation. This route led to a full participation of many towns and cities of Sicily recovering the previous gap. The signatories of the Covenant considerably increased and

today many Sicilian municipalities are involved to the initiative. The Energy department of Sicilian region arranged a web platform, called Sienergia, to load IBE data especially about energetic balance sheet consumptions of municipal territories at the reference year of 2011. Next step for public administrations, still in progress, is to make the SEAP and to find funding concerning public and private actions to reduce the CO_2 emissions. The main purpose of the region is to invert the negative trend and to contribute at creating a new model of sustainable development that lays the groundwork of actions sharing and above all a participation approach which is at the basis of the Covenant of Mayors.

4. Data Analysis

In order to make a rigorous data analysis many indices [8] have been used to describe the participation of different national territories to the initiative del C.o.M..
The first index "S_{pi}" has been defined as the quote of signatory population of a single region in respect to the total population of the same region:

$$S_{pi} = \frac{population\ of\ signatory\ municipality}{total\ population\ of\ regional\ territory}$$

$$0 < S_{pi} < 1$$

It could vary from 0 (no signatories) to 1 (all municipalities have signed). The second index "A_{rs}" represents the percentage of accepted SEAP for a single region in respect to the total number of accepted SEAP in the national territory:

$$A_{rs} = \frac{Number\ of\ accepted\ regional\ seap}{Number\ of\ accepted\ national\ seap} * 100\ [\%]$$

The third index "$S_{(year)}$" represents the number of signatories in a region for a single year in respect to the total number of signatories:

$$S_{(year)} = \frac{Number\ of\ regional\ signatories\ for\ a\ single\ year}{Total\ number\ of\ regional\ signatories} * 100\ [\%]$$

"$A_{(year)}$" represents the number of accepted SEAP for a single year in respect to the total number of accepted ones:

$$A_{(year)} = \frac{Number\ of\ regional\ accepted\ seap\ for\ a\ single\ year}{Total\ of\ regional\ accepted\ seap} * 100\ [\%]$$

Last index is defined as the "performance" accepted ratio "P_a" and express the ratio between the total accepted regional SEAP with the number of total regional signatories ones:

$$P_a = \frac{Number\ of\ total\ accepted\ Regional\ Seap}{Number\ of\ total\ signatories\ Regional}$$

$$0 < P_a < 1$$

P_a is adimentional and could vary from 0 to 1.

In Tab. 1 it is reported the population of all regions of Italy, the number of signatories, the accepted SEAP per regions, P_a, S_{pi} and A_{rs}. According the first index, S_{pi}, the most virtuous region is Abruzzo (S_{pi} =1) followed by Basilicata (S_{pi}= 0.86). The region Sicily with a S_{pi} = 0.5 is in average. Fig. 2 shows more accurately the trend of this index for all regions.

Table 1. Main indexes and Regional general data .

Region	Population	Number of signatory municipalities	Total population signatory municipalities	Accepted SEAP	P_a	S_{pi}	A_{rs} (%)
Abruzzo	1312507	304	1311674	107	0.352	1.00	11.47
Basilicata	576194	75	495653	14	0.187	0.86	1.50
Calabria	1958238	87	449867	59	0.678	0.23	6.32
Campania	5769750	101	2269160	11	0.109	0.39	1.18
Emilia Romagna	4377487	220	3704370	22	0.100	0.85	2.36
Friuli Venezia G.	1221860	8	359504	2	0.250	0.29	0.21
Lazio	5557276	54	3747092	32	0.593	0.67	3.43
Liguria	1565127	83	1180610	37	0.446	0.75	3.97
Lombardia	9794525	842	6636486	361	0.429	0.68	38.69
Marche	1545155	24	627364	6	0.250	0.41	0.64
Molise	313341	72	223799	62	0.861	0.71	6.65
Piemonte	4374052	124	2178862	52	0.419	0.50	5.57
Puglia	4050803	90	1565704	53	0.589	0.39	5.68
Sardegna	1640379	163	1175110	50	0.307	0.72	5.36
SICILIA	4.999.932	217	2.516.871	2	0,009	0,50	0,21
Toscana	3692828	41	1443092	9	0.220	0.39	0.96
Trentino Alto A.	1039934	67	327820	7	0.104	0.32	0.75
Umbria	886239	13	202351	5	0.385	0.23	0.54
Valle d'Aosta	127844	0	0	0	0.000	0.00	0.00
Veneto	4881756	175	2668331	42	0.240	0.55	4.50

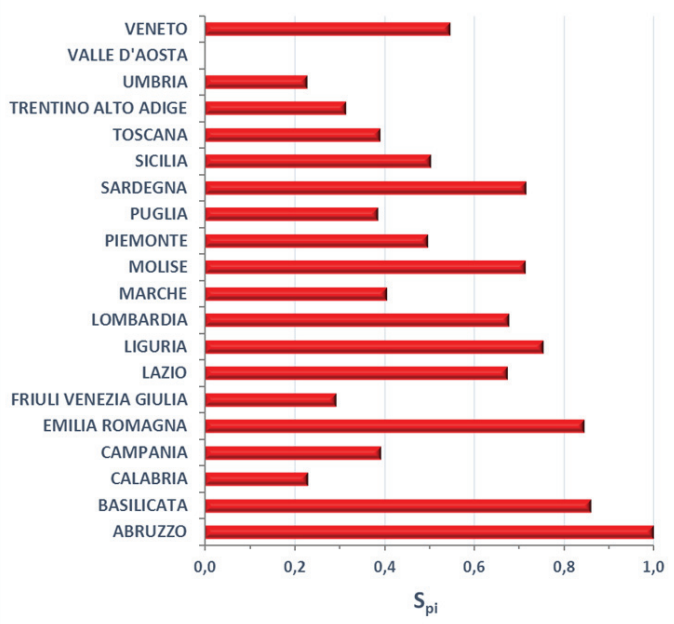

Figure 2. Signature partecipation index of all Italian regions.

Fig. 3 shows the trend of the index P_a. This graph shows that the region with the best index value is Molise (P_a = 0.86) followed by Calabria (P_a=0.67) and Lazio (P_a=0.59). As shown, Sicily is the worst region in terms of accepted SEAP for signatories (P_a=0.009) and just 2 accepted SEAP. Fig. 4 shows the trend of the index A_{rs} for all regions. It is evident that Lombardia, the most populated region with its about 10 million inhabitants, influences for a A_{rs}=38.69 % the national data while Sicily (A_{rs}=0.21 %) is on the bottom of the national classification.

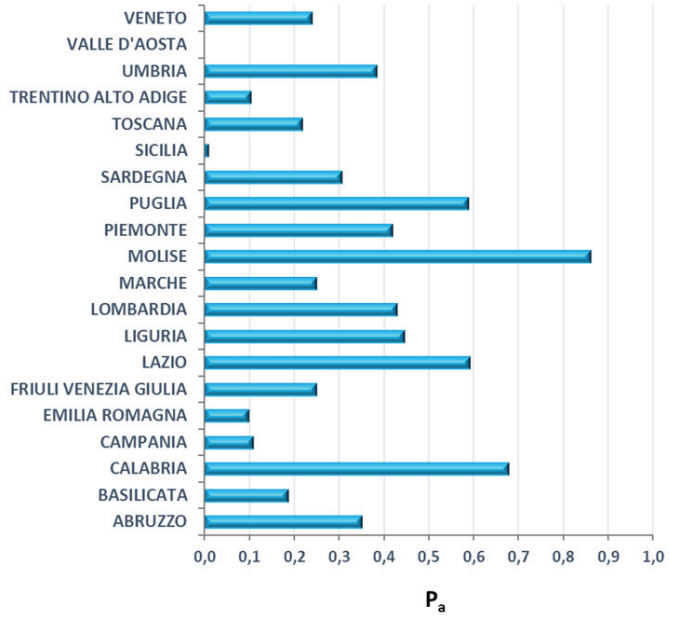

Figure 3. Performance accepted SEAP index of all Italian regions.

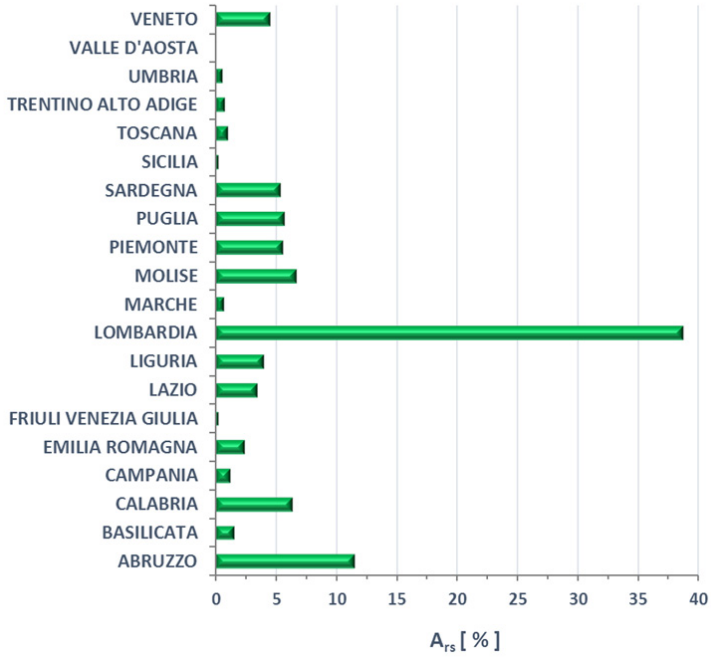

Figure 4. Accepted regional SEAP over national SEAP.

Tab. 2 shows the index $S_{(year)}$ for all the period 2008-2014. As noticed in the table the first year of the initiative many regions does not have participate. However, in 2008 there was a good participation of 15.38 % for the region of Umbria followed by a participation of 4.17 % for the region Marche. In Sicily the first two years (2008-2009) the participation was almost nothing while the trend starts increasing during 2011 with $S_{(2011)}$=17.51 %. The year that shows a greater participation in Sicily is definitely 2013 as shown in Fig. 5 with a number of signatories of about 140 and a $S_{(2011)}$= 61.75 % (Tab. 2). It is clear that the diligence of regional governance with the institution of the control room and the financing for the SEAP has encouraged the participation.
Tab. 3 shows the index $A_{(year)}$ for the years 2008-2014. Sicily with only two accepted SEAP presents a value of 100% for the year 2011. In Fig. 6 are shown the signatories and accepted SEAP for single regions from 2008 to 2014.

Table 2. Number of signatories in a region for a single year in respect to the total number of signatories.

	$S_{(year)}$						
	2008	2009	2010	2011	2012	2013	2014
Abruzzo	0.00	33.88	28.62	37.50	0.00	0.00	0.00
Basilicata	0.00	0.00	1.33	21.33	57.33	20.00	0.00
Calabria	1.15	0.00	2.30	44.83	33.33	13.79	4.60
Campania	0.00	0.99	7.92	15.84	45.54	22.77	6.93
Emilia Romagna	0.91	3.64	5.00	12.73	12.27	65.45	0.00
Friuli Venezia G.	0.00	12.50	12.50	0.00	25.00	50.00	0.00
Lazio	0.00	1.85	51.85	18.52	18.52	9.26	0.00
Liguria	1.20	44.58	8.43	4.82	20.48	20.48	0.00
Lombardia	0.24	12.00	30.29	13.78	18.76	22.09	2.85
Marche	4.17	0.00	16.67	29.17	29.17	12.50	8.33
Molise	0.00	0.00	61.11	30.56	5.56	2.78	0.00
Piemonte	0.81	1.61	20.97	8.87	29.84	22.58	15.32
Puglia	0.00	0.00	64.44	24.44	5.56	3.33	2.22
Sardegna	0.00	0.00	4.91	64.42	11.66	12.27	6.75
SICILIA	0.00	0.46	17.51	4.15	11.06	61.75	5.07
Toscana	0.00	4.88	17.07	14.63	4.88	56.10	2.44
Trentino alto a.	0.00	0.00	1.49	5.97	76.12	13.43	2.99
Umbria	15.38	15.38	15.38	23.08	15.38	15.38	0.00
Valle d'Aosta	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Veneto	1.14	1.71	14.86	33.71	20.57	21.71	6.29

Table 3. Number of accepted SEAP for a single year in respect to the total number of accepted ones.

	$A_{(year)}$						
	2008	2009	2010	2011	2012	2013	2014
Abruzzo	0.00	91.59	7.48	0.93	0.00	0.00	0.00
Basilicata	0.00	0.00	7.14	92.86	0.00	0.00	0.00
Calabria	1.69	0.00	3.39	54.24	38.98	1.69	0.00
Campania	0.00	9.09	36.36	18.18	36.36	0.00	0.00
Emilia Romagna	9.09	27.27	13.64	50.00	0.00	0.00	0.00
Friuli Venezia G.	0.00	50.00	50.00	0.00	0.00	0.00	0.00
Lazio	0.00	0.00	81.25	12.50	6.25	0.00	0.00
Liguria	2.70	86.49	5.41	2.70	2.70	0.00	0.00
Lombardia	0.28	16.34	38.23	18.28	26.87	0.00	0.00
Marche	16.67	0.00	33.33	50.00	0.00	0.00	0.00
Molise	0.00	0.00	69.35	30.65	0.00	0.00	0.00
Piemonte	1.92	1.92	48.08	15.38	32.69	0.00	0.00
Puglia	0.00	0.00	84.91	15.09	0.00	0.00	0.00
Sardegna	0.00	0.00	14.00	62.00	22.00	2.00	0.00
SICILIA	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Toscana	0.00	0.00	77.78	22.22	0.00	0.00	0.00
Trentino Alto A.	0.00	0.00	14.29	28.57	57.14	0.00	0.00
Umbria	20.00	40.00	40.00	0.00	0.00	0.00	0.00
Valle d'Aosta	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Veneto	4.76	4.76	52.38	38.10	0.00	0.00	0.00

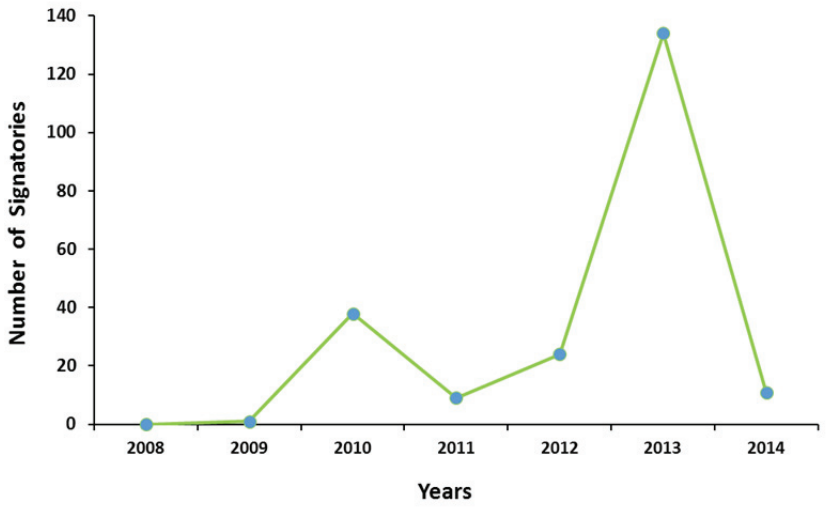

Figure 5. Temporal trend (2008-2014) of the number of singatories in Sicily.

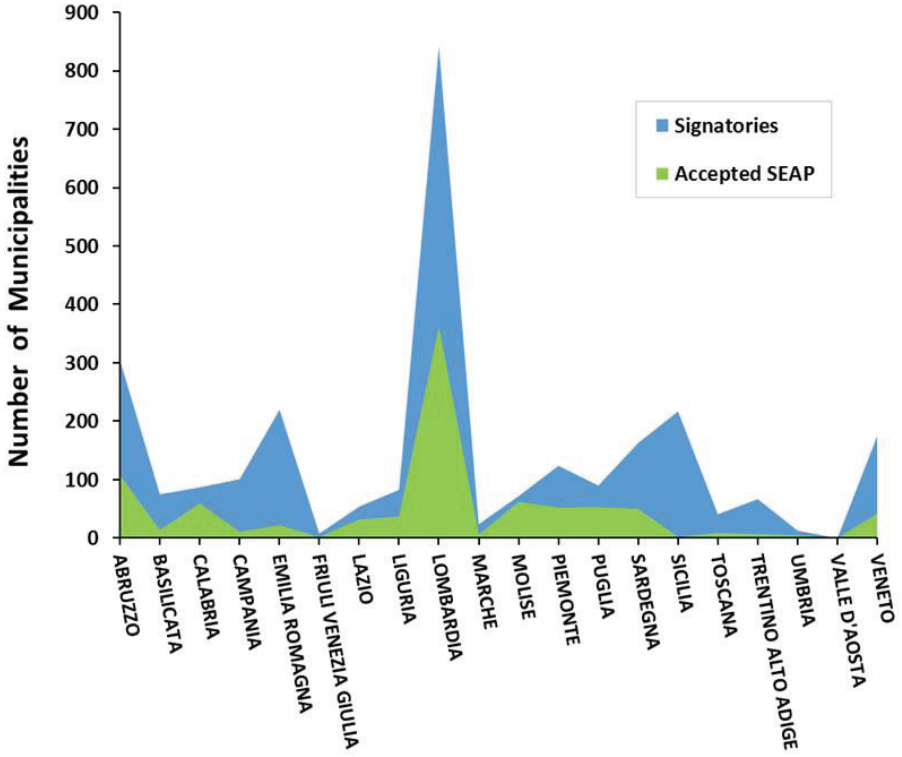

Figure 6. Number of signatories and accepted SEAP of all Italian regions.

5. Conclusions

The conflict to climate changes represents one of the prior actions of European Community. The goal of reducing greenhouse gas emissions (especially CO_2) of at least 20 % by 2020 has become a priority. In this context the initiative of Covenant of Mayors plays a crucial role. The present research regards an analysis of the development in Sicily of this initiative highlighting its state of the art and the peculiarities of this initiative. A first analysis about Italian situation has been undertaken. After that, a sequence of indices have been developed in order to evaluate the level of participation of the Italian regions and the temporal trend of the success of this initiative. A deeper analysis has concerned the situation in Sicily and the virtuous path that the regional govern has undertaken toward a new model of energetic development by financing with European funding this initiative. Moreover, the work of the control room has given a stronger impulse to the success of this initiative incrementing the number of signatories in only one year. Unfortunately the bureaucratic difficulties in the process of management of this European funding by the region of Sicily are retarding this process. Many municipalities have still not provided to commit the making of SEAP to private companies although the terms to report the funding will expire at the end of year 2014.

References

[1] Brusca S. et al., Analysis of Syngas Fed Gas Turbine Performance Depending on Ambient Conditions, ASME Turbo Expo 2003, June 16 – 19, 2003, Atlanta, Georgia, USA.
[2] Brusca S. et al., Analysis of reforming gas combustion in Internal Combustion Engine, Energy Procedia;2014, 45, 899-908.
[3] Lanzafame R. et al., Air quality data for Catania: analysis and investigation case study 2010-2011, Energy Procedia; 2014, 45, 681-690.
[4] Lanzafame R. et al., NO_2 concentration analysis in urban area of Catania, Energy Procedia; 2014, 45, 671-680.
[5] Tina G. M,. Scandura P.F, Case study of a grid connected with a battery photovoltaic system: V-trough concentration vs. single-axis tracking. Energy Conversion and Management, 2012 ; 64: 569-578.
[6] JordiOliver-Solà et al., Energy andenvironmentalevaluationofmunicipalfacilities:Case study intheprovinceofBarcelona, Energy Policy, 2013, 61, 920-930.
[7] Cerruti A.K. et al., The Covenant of Mayors in Figures 5-yearsassesment, jrc scientific and policy reports, ISSN 1831-9424, doi: 10.2788/1062, 2013, 1-52.
[8] Christoforidis G. C. et al., Covenant of Mayors initiative—Public perception issues and barriers in Greece, Energy Policy, 2013, 60, 643-655.