

## Local Actions for Reducing Global Greenhouse Gas Footprint: 10 Years of Covenant of Mayors Initiative

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### ABSTRACT

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*Covenant of Mayors, climate change, energy efficiency, local energy plans, waste to energy*

Covenant of Mayor was launched in 2008 as a voluntary initiative for local administrations that intend to adopt a plan of interventions concerning greenhouse gas mitigations, achieving and exceeding the EU climate and energy targets. In its first decade of activity, Covenant of Mayors has become the world's largest initiative based on actions of energy saving and local climate mitigation, involving 250+ million inhabitants and 7700+ signatories in more than 50 countries worldwide, under the denomination of Global Covenant of Mayors for Climate and Energy. Globally, a total 5996 municipalities subscribed to the above-mentioned agreement in the first decade, in addition to 1743 progress plans and a wide database of indications regarding successful actions of Greenhouse Gas footprint mitigation at a European scale. This work reports on the global statistics of the initiative in the period 2008-2017 and the geographical location of the signatories within the territory of the European Union, highlighting limits and challenges of the initiative.

## 1. INTRODUCTION

Global climate is adapting to changes in ecosystems caused by mankind. If the impact of these changes could be considered almost negligible until the 18th century, starting from the industrial revolution, mankind has accelerated its development in all fields of society, thus affecting the basin of renewable and non-renewable resources present on the planet [1-4]. This suggests that strategies for sustainable management of resources that, in any case, are limited should focus on the maintenance of their resilience [5, 6].

Presently the Paris agreement on climate has been ratified by 185 countries [7] and represents the leading global framework on the topic. It aims [8-10] (i) to keep the global temperature rise in the XXI century below 2°C above pre-industrial levels, possibly limiting this increasing trend to 1.5°C and (ii) to strengthen the ability of countries to deal with the impacts of climate change.

The targets of the Paris agreement have been presented under several sub-targets, with different temporal horizons [11-13]. A first temporal target has been fixed, e.g. by European Community, in 2020 with the so called EU 20/20/20 package. The achievement of the 2020 targets has been monitored and presents various problems linked to aspects such as the uncertainty about the marginal costs of climate change [14].

Although the achievement of the objectives of the 20/20/20 package seems to be satisfied, the new long-term objectives set for 2050 present new challenges in crucial sectors for the development and sustenance of nations' populations, such as greenhouse gas (GHG) emissions due to e.g. breeding, transport, domestic heating and industry sectors [15-17].

For the mitigation of impacts in the various sectors

described, the European Union has implemented measures aimed at encouraging green technologies instead of obsolete technologies. With the multiannual financial framework 2014-2020, the European Union has supported, through community co-financing channels, innovation paths concerning both research and development, and the realization of test projects and pilot projects specifically concerning also the topics of climate change and climate mitigation. From these points of view local authorities and municipalities represent the vanguard of the energy transition to sustainability and play a crucial role in mitigating the effects of climate change. Presently, the world's largest initiative for local climate and energy actions is the so called Covenant of Mayors (CoM) for Climate and Energy [18].

CoM started in 2008 with the aim to gather local governments to achieving the EU climate and energy targets. Municipalities or groups of them (called "signatories") can voluntarily adhere to CoM and sign a declaration stating that they plan to obtain specific targets of CO<sub>2</sub> emissions reduction through specific local actions that are described in the Sustainable Energy Action Plan (SEAP) [19]. CoM initiative is part of the world climate change networks such as the Conference of Parties 21, "C40 cities", the ICLEI – Local Governments for Sustainability [20] and the Smart Cities Initiative [21].

To achieve the goal of reducing GHG emissions, crucial importance is exercised by the administrations that, alone or in small groups, decide to adopt a multi-year plan of actions to be implemented in the area of competence [15-17]. These actions include various sectors, such as: local electricity production, local heat and cold production, municipal buildings equipment facilities, public lighting, residential and tertiary buildings, transport [22].

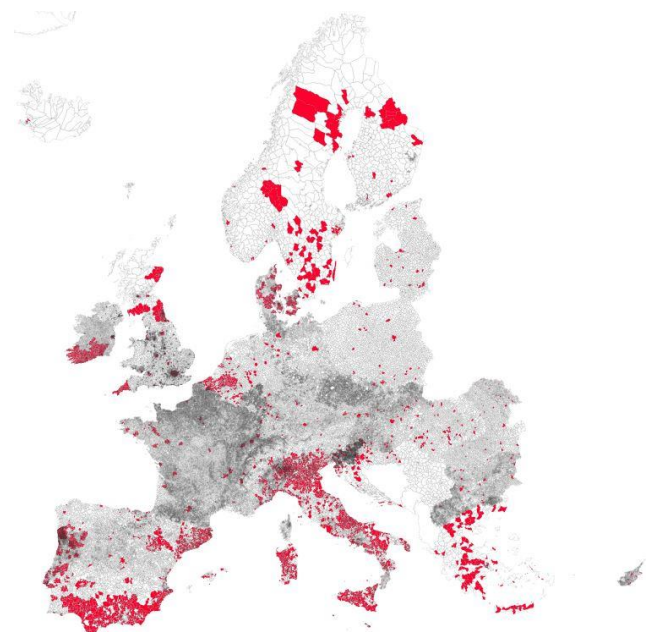
In the transitory path towards a globally sustainable policy, waste can represent a resource to be valued energetically, especially in those emerging countries where growth in terms of population and production is rapid and only rarely is accompanied by energy development planning [23-27], or considered into the local actions of the CoM initiative due to the economic costs. The focus of the work is to provide a statistical analysis of the first 10 years of the CoM initiative and its status of implementation in terms of baseline of GHG footprint and mitigation actions.

## 2. COVENANT OF MAYORS INITIATIVE

CoM is the main European movement that involves local and regional authorities that voluntarily commit themselves to increase energy efficiency and the use of renewable energy sources in their territories. Through their commitment, the signatories of the Pact intend to reach and exceed the European target of 20% reduction of GHG emissions by 2020.

**Table 1.** Signatories of SEAP-SECAP in the period 2008-2017 per different target (2020, adaptation, 2030) and percentage of municipalities and population involved

Country	Target 2020	Adapt.	Target 2030	municipality %	population %
Albania	1	3	2	4.9%	21.0%
Algeria	3	0	0	0.2%	1.7%
Armenia	9	9	9	1.9%	46.3%
Austria	12	2	2	0.6%	22.8%
Azerbaijan	1	1	1	3.3%	1.1%
Belarus	10	22	22	27.1%	25.6%
Belgium	224	117	111	56.5%	95.6%
Bosnia-Herzegovina	19	2	2	14.8%	46.6%
Bulgaria	24	3	1	9.5%	36.0%
Croatia	62	12	9	16.1%	65.6%
Cyprus	24	0	0	77.4%	41.3%
Czechia	6	5	4	0.2%	19.9%
Denmark	37	6	1	37.8%	56.6%
Estonia	5	1	0	2.2%	41.6%
Finland	10	2	3	3.8%	36.0%
France	81	14	12	0.2%	24.4%
Georgia	11	5	5	23.9%	48.4%
Germany	58	19	8	0.6%	22.7%
Greece	121	50	39	47.5%	51.3%
Hungary	30	11	10	1.2%	39.2%
Iceland	1	1	1	1.3%	35.9%
Ireland	8	7	6	37.5%	53.7%
Israel	3	0	0	5.9%	1.9%
Italy	3187	212	152	41.5%	68.9%
Jordan	1	1	1	16.7%	2.9%
Kazakhstan	1	0	0		12.8%
Latvia	19	3	2	17.8%	58.4%
Lebanon	3	7	7	34.6%	3.0%
Lithuania	14	1	1	25.0%	46.7%
Luxemburg	2	0	0	1.9%	4.4%
Macedonia	1	0	0	1.2%	28.5%
Malta	24	0	0	35.3%	26.6%
Moldova	12	8	8	4.6%	13.5%
Montenegro	3	0	0	13.6%	22.8%
Morocco	5	6	6		6.5%
Netherlands	18	5	3	5.4%	25.0%
Norway	8	0	0	1.9%	26.9%
Palestine	4	1	1		4.0%
Poland	38	2	2	1.6%	11.4%
Portugal	113	23	9	38.6%	57.5%
Romania	61	16	15	2.3%	23.1%
Serbia	1	0	0	0.6%	2.7%
Slovakia	4	10	9	0.4%	14.3%
Slovenia	29	2	1	13.7%	34.3%
Spain	1534	329	311	18.9%	54.8%
Sweden	52	8	8	19.3%	46.0%
Switzerland	9	0	0	0.4%	10.2%
Tajikistan	1	0	0	1.7%	0.4%
Tunisia	1	1	1	0.6%	3.0%
Turkey	10	5	4	0.4%	17.7%
Ukraine	81	92	92	33.5%	33.4%
United Kingdom	34	7	2		32.8%
<b>TOTAL</b>	<b>5996</b>	<b>1024</b>	<b>881</b>	<b>5.0%</b>	<b>24.8%</b>



**Figure 1.** Signatories of SEAP-SECAP in the period 2008-2017, with 2020 target. Background grey lines represent borders of local municipalities

After the adoption of the European Climate and Energy Package in 2008, the European Commission launched the CoM to endorse and support the efforts made by local authorities in achieving European targets. Due to its unique characteristics - being the only movement of this kind to mobilize local and regional actors for the pursuit of the objectives of the European Union - the CoM is considered by the European institutions as an exceptional model of multilevel governance.

Signatories are committed to a series of steps and agree to present reports and be monitored on their actions. By the established deadlines, they formally undertake (i) to develop adequate administrative structures, including the allocation of sufficient human resources, in order to take the necessary actions, (ii) to prepare the Baseline Emission Inventory (BEI) that represents the emission condition at the date of the signature of the plan, (iii) to prepare a Sustainable Energy and Action Plan (SEAP) that includes concrete measures to achieve the minimum target of 20% in terms of reducing CO<sub>2</sub> emissions by 2020, (iv) to submit progress plans at least every two years from the date of presentation of the SEAP for evaluation, monitoring and verification purposes, including the so called Monitoring Emission Inventory (MEI) for a direct comparison with the BEI.

Several recent studies on the topic of the CoM initiative have been published, analysing CoM initiative at different scales, from national [19, 28], to regional [29-34] and local [35-38], including also trans-national comparisons [39-44]. Results of the progress plans can be compared with different GHG emissions balances [45], in order to evaluate the progress of local plans [46-48], especially in urban contexts [49-50].

Single and small groups of municipalities play a leading role in the application of the SEAPs [51-53] and their economic investments are supported by citizens [54-55] even if issues and barriers are still remaining [56].

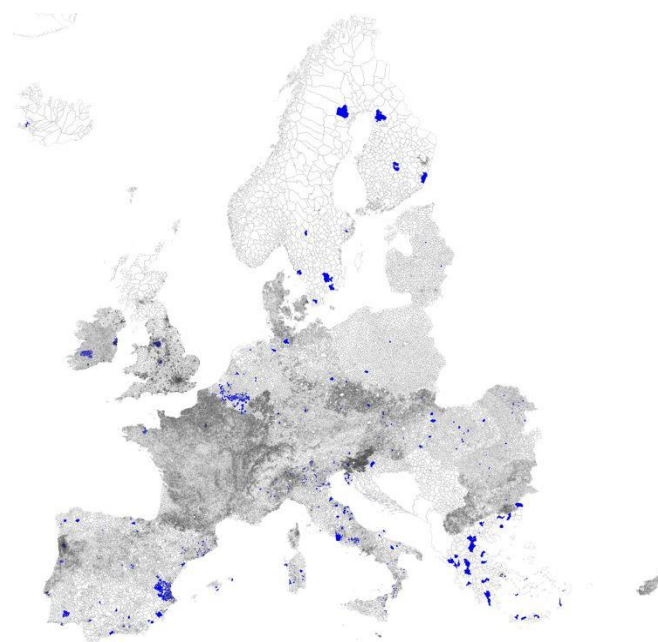
In the first decade of activity (2008-2017) CoM initiative has been joined by a total of 5996 signatories with 2020 target, 1024 with adaptation, 881 with 2030 targets.

By updating and extending data shown by Kona et al. [48], in Table 1 we present the list of countries with at least one signatory for one of the three targets proposed by the initiative. Table 1 includes 52 countries, geographically located in the European and Mediterranean area. Italy and Spain are the only two countries with 1000+ signatories for 2020 targets, but national distribution in the single country is different. As presented in Figure 1, Spain shows a greater density of signatories in the coastal area of the south, in Catalonia and Aragon regions, while other regions as Galicia, Castilla and Leon are almost not represented.

On the contrary, Italy shows a rather homogeneous distribution of signatories in the country, with all the regions with at least one signatory and peaks of more than 90% of municipalities that signed the agreement in regions like Marche.

Only two countries (Belgium and Cyprus) has more than 50% of the municipalities that published a SEAP, while in terms of percentage of population involved in the initiative on the total of the country, presently 9 countries satisfied this criterion: Belgium (95.6%), Italy (68.9%), Croatia (65.6%), Latvia (58.4%), Portugal (57.5), Denmark (56.6%), Spain (58.4%), Ireland (53.7%), Greece (51.3%).

Countries like France and Germany, Montenegro, Norway have only a few dozen signatories, while still reaching a percentage of population involved larger than 22% of the total, indicating that cities and metropolis are easier to participate than small cities and villages.



**Figure 2.** Signatories of SEAP-SECAP in the period 2008-2017, with 2030 target. Background grey lines represent borders of local municipalities

In Figure 2 the geographical distribution of the signatories of the CoM initiative with 2030 target in the EU region is presented. In this case only 881 signatories are present in the whole region, but the signatories that are committed to the 2030 targets have exceeded the 2020 target signatories already since 2016.

Progress plans cover up to seven sectors in which specific actions are identified: industry, local electricity production, local heat cold production, municipal buildings equipment

facilities, public lighting, residential buildings, tertiary buildings, transport; an eighth sector, called others, includes the remaining local fonts of energy consumption. From a total of 1743 progress plans, presently we have the following total per sector:

• Industry	35
• Local electricity production	659
• Local heat cold production	150
• Municipal buildings equipment facilities	1063
• Public lighting	849
• Residential buildings	505
• Tertiary buildings equipment facilities	552
• Transport	473
• Others	612

These data show that, on average, each progress plan contains between two and three sectors of action (average = 2.81) and that the two sectors specifically related to public administration (Municipal buildings equipment facilities and public lighting) covers together 1528 progress plans on a total of 1743 (87.7%). In this area the most common actions to reduce the dependency of municipalities from non-renewable sources of energy regard waste to energy (WtE) (77 actions) in particular in the breeding sector, while the industrial sector is still marginal, and different national legislations and limits to emissions are generating difficulties in the application of existing and innovative technologies.

### 3. DISCUSSION AND CONCLUSIONS

In this work we presented a global statistics of CoM signatories in the first decade of activity of the initiative (2008-2017), describing the SEAPs subscribed in terms of target (2020, adaptation, 2030) and of municipalities and population involved. Progress plans, that are still

less than 30% of the active SEAPs, describe the relative success of the initiative in terms of GHG emission reduction and of population involved. Despite the EU encourages climate actions with local emphasis (e.g. through calls for actions co-financed by EU itself), the rate of success of the initiative can be increased, for example, through a coordination of the initiative of rural municipalities (e.g. with less than 5000 inhabitants), in which often the limited presence of technical and administrative staff can influence the progress of the SEAPs. Moreover, a limited 'network-effect' between municipalities or a coordination of the initiative at intermediate scale (e.g. provincial and regional) is presently limiting a possible virtuous circle that could generate a scale effect for smaller administrations with fewer technical and economic resources.

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