The covenant of mayors initiative: transition to an energy efficient low carbon future

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Abstract

Nowadays 80 % of the EU population lives in urban areas that account for about 70 % of the total primary energy demand of the EU. Therefore local governments play a crucial role in mitigating the effects of climate change. Also, cities and towns are recognized to have enormous potential for sustainable energy use, with a positive impact on local economy.

The Covenant of Mayors (CoM) is the mainstream European movement involving local authorities voluntarily committing to meet and exceed the European Union 20 % CO_2 reduction objective by 2020 by increasing energy efficiency and through the use of renewable energy sources on their territories.

In order to achieve its CO_2 reduction objective, a city that signs the CoM commits to a number of actions such as: to prepare a Baseline Emission Inventory; to submit a Sustainable Energy Action Plan (SEAP); to submit an implementation report possibly with a Monitoring Emission Inventory, in order to measure progress towards target.

As of mid-May 2014 5,296 local authorities signed the Covenant of Mayors (CoM), for a total of ca. 160 million inhabitants in the EU-28, and ca. 186 million inhabitants in the whole initiative.

Given the voluntary aspect and the difficulty of adapting sometimes local specificities into the general proposed framework, not all the data could be considered reliable, therefore a methodology has been developed to build a robust sample. The main statistics presented in this paper derive from a data set built according to a "Methodology for Robust Data Statistics in CoM" developed by JRC, to assess the effectiveness of the CoM initiative in terms of estimated energy savings, clean energy production and emission reduction.

Ultimately, the paper aims to emphasize the feature of CoM as a flexible common platform for achieving EU2020 Climate and Energy targets with a bottom-up approach.

Introduction

The Covenant of Mayors (CoM) is the mainstream European movement involving local authorities voluntarily committing to meet and exceed the European Union 20 % CO_2 reduction objective by 2020, by increasing energy efficiency and through the use of renewable energy sources on their territories.

The CoM was launched in 2008 by the European Commission's Directorate General for Energy (DG ENER) to endorse and support the efforts deployed by local authorities in the implementation of sustainable energy policies. Cities are recognised to gather privileged socio-economic and regulatory conditions that prompt the local level as an appropriate level for action (Azevedo I. 2013). Therefore, they are important for climate mitigation strategies.

One of the commitments undertaken by Covenant signatories is to submit, within a year from signing up to the initiative, a Sustainable Energy Action Plan (SEAP) which is based on the results of the Baseline Emission Inventory (BEI) and includes all the planned measures to be implemented in order to achieve the 20 % CO_2 emission reduction target. Data from BEIs and SEAPs are transmitted by each signatory to the European Commission via an online template (Bertoldi P., et al. 2010).

Urban areas account for about 80 % of population and 70 % of the total primary energy demand in the EU (IEA 2010) and

(UNDP 2012). Moreover, sub-national and local actors need to be involved by central governments to properly address energy and climate change issues (Bulkeley H. and Betsill M.M. 2013); (Johnson 2013).

As of mid-May 2014 5,296 local authorities signed the Covenant of Mayors, for a total of ca. 160 million inhabitants in the EU-28, and ca. 186 million inhabitants in the whole initiative.

Acknowledging this success, the European Commission's European Energy Security Strategy (COM (2014) 330) calls on Member States (MS) to accelerate the implementation of SEAPs in the "stress test" countries. The contribution of SEAPs in energy security in the region has been analysed in a JRC report: "Covenant of Mayors: Fuel Switch and Sustainable Demand in "stress test" countries" (Kona A. et al. 2014).

The CoM movement has already been investigated for specific actions, such as achieving energy savings by retrofitting residential buildings (Dall'O', et al. 2013) increasing the energy efficiency of public lighting (Radulovic D., Skok S. and V. 2011) and increasing the acceptance of renewable energy within rural communities (Doukas, et al. 2012). JRC has started to publish a series of yearly assessment reports on the Initiative, which are downloadable from the website: http://www.covenantofmayors.eu.

All the data provided in the current paper are reported by the signatories in an on-line template on a restricted area of Covenant official website and are related to SEAPs submitted as of 13th of May 2014. The on-line template must reflect accurately the content of the official SEAP document, and the coherence of certain key figures is checked by JRC. Yet, given the voluntary nature and the difficulty of adapting sometimes local specificities into the general proposed framework, not all the data could be considered reliable, therefore a methodology has been developed to build a robust sample.

Other consideration has to be taken into account due to different BEIs reference years. In the guidebook "How to develop a Sustainable Energy Action Plan", (Bertoldi P., et al. 2010) a general recommendation was made to use 1990 as the year for the BEI reference; nevertheless signatories are able to choose the closest subsequent year for which reliable data could be gathered.

The JRC has developed a "Methodology for Robust Data Statistics in CoM" to build the dataset used for the present paper, to assess the effectiveness of the CoM initiative in terms of energy savings, clean energy production and CO_2 emission reduction. The methodology is based on selecting signatories with reliable data on BEIs (energy consumption per capita, CO_2 emission factors for energy related sectors) and on SEAPs (estimated emission reductions, estimated energy savings and local energy productions). The main statistical parameters such as the mean, the standard deviation, the skewness and the kurtosis were calculated at the beginning for each set of data of the BEIs. Secondly a Generalised Extreme studentized method was applied for removing the outliers. Similar methodologies, in literature, have been applied to detect outliers (Kenneth L. Lange 2012) or abnormal energy consumptions in buildings (Seem 2007). Regarding the SEAPs, other criteria were applied in order to have reliable data on estimated energy savings and local energy production based on meaningful emission factors of estimated emission reductions and peak power indicators on energy production.

As of mid-May 2014 3,664 signatories had already submitted their SEAP. As a result of the application of the aforementioned methodology, a data set of 3,421 SEAPs was built. Along the present paper, the data set is referred to as "CoM data set as of 13th of May 2014". Further details on the methodology on general statistics on SEAPs can be found in the JRC Report (Kona A. et al. 2015).

The following paragraph presents the main statistics from the "CoM data set as of 13th of May 2014" in terms of GHG emissions and reductions, final energy consumptions and estimated energy savings and local energy production by 2020. Table 1 shows the number of signatories included in the data set with a submitted SEAP with their population per region.

The majority of signatories (3,361 – 98 % of SEAPs in the data set) with a share of 90 % of inhabitants are from countries of EU-28. While 28 signatories with a share of 5 % of inhabitants are from Europe non- EU28 countries such as Bosnia and Herzegovina, former Yugoslav Republic of Macedonia, Montenegro, Norway, Switzerland, Turkey and Iceland.

The CoM has already been extended to Eastern Partnership and Central Asian countries, with distinguished requirement for GHG emission reduction, adapted to specific characteristics of these countries. Since 2010, the CoM initiative has come to involve six Eastern Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Republic of Moldova and Ukraine) and five central Asian countries (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) in the implementation of local sustainable energy policies (Gabrielaitiene I, et al. 2014). In the data set analysed there are 30 signatories from Belarus, Georgia, Moldova, Tajikistan and Ukraine.

Through the CES-MED project, the European Union has opened the CoM initiative to local authorities of ten southern Mediterranean countries (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, Syria and Tunisia) (Saheb Y., et al. 2014). In the data set analysed there is only one signatory with a submitted SEAP from Morocco.

Furthermore other countries from different of the above mentioned regions (Europe, Eastern Partnership and Central Asia and south Mediterranean countries) have joint the CoM. The dataset comprises also a SEAP submitted by a local municipality from New Zealand.

The diffusion of the CoM initiative in Europe is also commented by (Christoforidis G.C, et al. 2013). Most of the towns are located in Southern European countries where dedicated bodies, including Covenant Territorial Coordinators (CTCs), supported cities in the process of adhesion to the CoM. The CTCs are regional authorities which voluntarily join the movement committing to promote it within their respective territory and to offer technical and/or financial support to the signatories which choose to work under their coordination (Melica G., et al. 2014).

In addition, taken into account the harmonized definition of a 'city' for Europe, based on the population threshold, (Dijkstra L. and Poelman H. 2012) the CoM signatories in the data set were classified into categories according to those definitions (Table 2).

In Table 2 are represented the shares of signatories of the data set per categories, along with the shares of inhabitants. The peculiarity of the CoM movement, compared to other GHG mitigation networks, is the engagement of small towns' in the effort to reduce greenhouse gases emissions. The majority

of signatories with a submitted SEAP are small and medium towns (SMSTs), representing 88 % of the total number of signatories in the "CoM data set as of 13th of May 2014". Nevertheless, signatories categorized as SMSTs account for a limited share of total population coverage (17%) overall.

This suggests that small cities are willing to play an important role for climate change mitigation. Based on three case studies, (Melica G., et al. 2014) indicates that the Signatory-CTC multilevel governance approach adopted within the CoM has been a key determinant to get the involvement of small towns in the movement.

In terms of population, the highest share (56 %) of CoM signatories' inhabitants belongs to cities with Large-XX Large Urban centres and a Global City with a population over 250,000 inhabitants. London, classified as a Global city, with a population of 7.8 million of inhabitants, represents 6 % of the total population of CoM data set.

Baseline Emission Inventory: 6-year assessment

The BEI document reports data on: final energy consumption, local power and heat production and Greenhouse gases (GHG) emissions occurring in the signatories' territory. Overall statistics have been calculated and reported in the following sections based on the analysis of the BEIs data set as of 13th May 2014.

In the guidebook "How to develop a Sustainable Energy Action Plan", (Bertoldi P., et al. 2010) a general recommendation was made to use 1990 as the year for the BEI reference; nevertheless signatories are able to choose the closest subsequent year for which reliable data could be gathered. As a result, different years have been chosen in BEIs of the dataset.

In Figure 1 are reported the number of signatories per reference year, where in the vertical axes are reported the number of signatories with a submitted SEAP, while the bubble size is proportional to the signatories' population for each reference year. Most of the Signatories (66 %) decided to take 2005, or 2007, or 2008 as their BEI reference year (see figure 1 for details) with a share of inhabitants 34 % of the total inhabitants of the dataset. Small and medium Urban Centres (number of inhabitants less than 250,000) 1,378 signatories have chosen 2005 as BEIs reference year and 832 signatories 2007. Just 80 local municipalities adopted 1990 as reference year for BEIs, nevertheless these signatories include Large Urban Centres (such as Berlin, Munich, Brussels-Capital, etc.) with a share of 19 % of the total inhabitants of the dataset.

GREENHOUSE GASES EMISSIONS IN BEIS

Large Urban centres are currently the focal point of research for Greenhouse-gas (GHG). Studies on the correlation between urbanization and GHG emission per capita are under research (Hoornweg D. 2011). Thus, the methodology for calculating emission inventories is crucial in deriving conclusions. In line with the established framework of the UNFCCC, project guidelines for emission inventory within the CoM broadly follow the IPCC guidelines. Direct emissions as reported in the BEIs of CoM signatories data set as of mid-May 2014 derive mainly from two macro sectors: Building, equipment, facilities, industry and Transport (see Table 3). The Building, equipment, facil-

Table 1. Signatories per region in CoM data set as of 13th of May 2014.

Region	Nr of signatories	Population
European Union-28	3,361	114,237,208
Europe – non EU	28	6,051,021
Eastern Partnership and Central Asian Countries	30	4,526,378
South Mediterranean Countries	1	903,485
Rest World	1	360,000
Total	3,421	126,078,092

Table 2. Shares of signatories' category and population in CoM data set as of 13th of May 2014.

Category	Threshold inhabitants	Share of signatories	Share of population
Small and Medium towns	< 50,000	88 %	17 %
Small Urban Centre	> 50,000 and less than 100,000	5 %	9 %
Medium Urban Centre	> 100,000 and less than 250,000	4 %	16 %
Large Urban Centre	Higher than 250,000	3 %	56 %

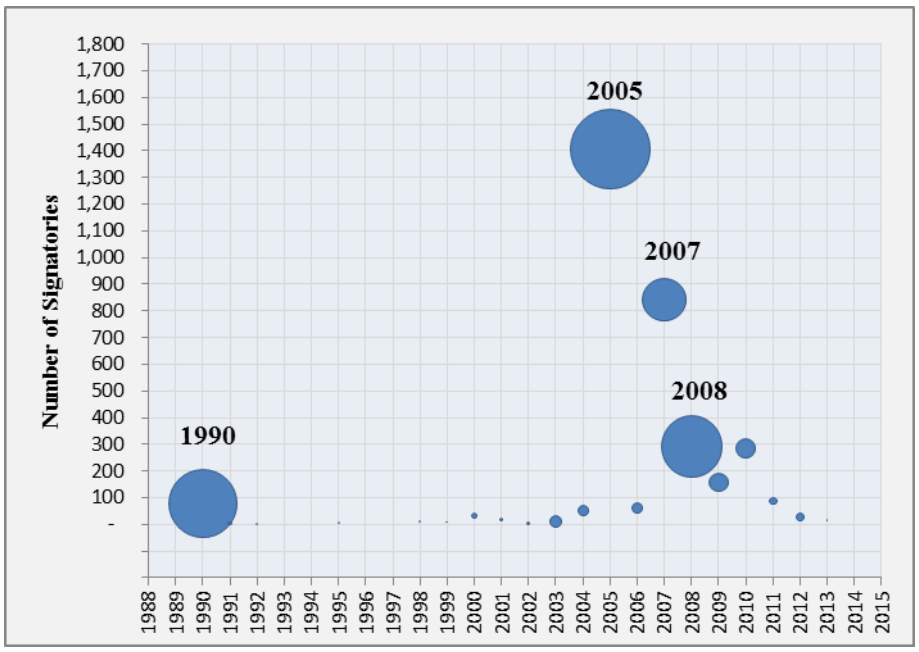


Figure 1. Reference years in BEIs in CoM data set as of 13th of May 2014.

Table 3. Shares of GHG emissions per sectors reported in BEIs.

Sectors Covered	GHG Emissions [tCO_2-eq/year]	Shares
Buildings,Equipment,Facilities and Industry	481,854,280	70%
Transport	188,000,928	27%
Other	16,615,400	3%
Total	686,470,608	

ities and industry sector comprises only small industry which is not included in the European Emissions Trading Scheme.

Note that the emissions in the sector "OTHER" are related to non-energy activities. Signatories have the option to report emissions (and emission reduction targets) for other sectors that fall under their jurisdiction (waste and wastewater treatment, etc.). Also, in an effort to render the emission inventories more comparable, the emissions reported under the LCA approach were converted using a unique conversion coefficient (0.885) considered to be representative of the direct emissions embedded in LCA inventories. The total GHG emissions are 686 Mt CO_2-eq/year, where the highest values are reached in the Building sector (70 %).

FINAL ENERGY CONSUMPTION IN BEIS

The final energy consumption in urban areas derive mainly from two macro sectors: buildings and transport (see Table 4). The total final energy consumption is 2,358 TWh/year, where the largest share in the Building sector. The table reports also the amount of electricity, heat/fuel consumptions per macro sectors in CoM. The largest share of electricity and heat is consumed in the residential sector, while the highest fuel consumption in the transport sector is consumed in the private and commercial transportation sectors.

In Figure 2 are reported the final energy consumption per reference year, where in the vertical axes are reported the number of signatories with a submitted SEAP, while the bubble size is proportional to the final energy consumptions of signatories for each reference year. Just 80 local municipalities adopted 1990 as reference year for BEIs, nevertheless these signatories include Large Urban Centres with a share of 25 % of the total energy consumptions in the data set.

The majority of signatories of the data set adopted 2005 as reference year for BEIs with a share of final energy consumption equal to 22 %. They are in total 1,405 of which 1,378 are small and medium Urban Centres (number of inhabitants less than 250,000).

In Figure 3 are reported the amounts of the final energy consumptions in the building sector, with the split in the subsectors. As it can be seen in the figure the highest share of electricity and heat is consumed in the residential sector. Due to the lack of data by subsector, there are some discrepancies between the amount of the energy reported in the subsector and the totals declared from the signatories. The purpose of

Table 4. Final energy consumptions by sector as reported in BEIs.

Sectors Covered	Final Energy consumption [MWh/year]	Electricity consumption [TWh/year]	Heat/ Fuel consumption [TWh/year]
Buildings, Equipment, Facilities and Industry	1,665,468,219	514,811,134	1,150,657,084
Transport	692,495,199	10,103,181	682,392,018
Total	2,357,963,418	524,914,315	1,833,049,102

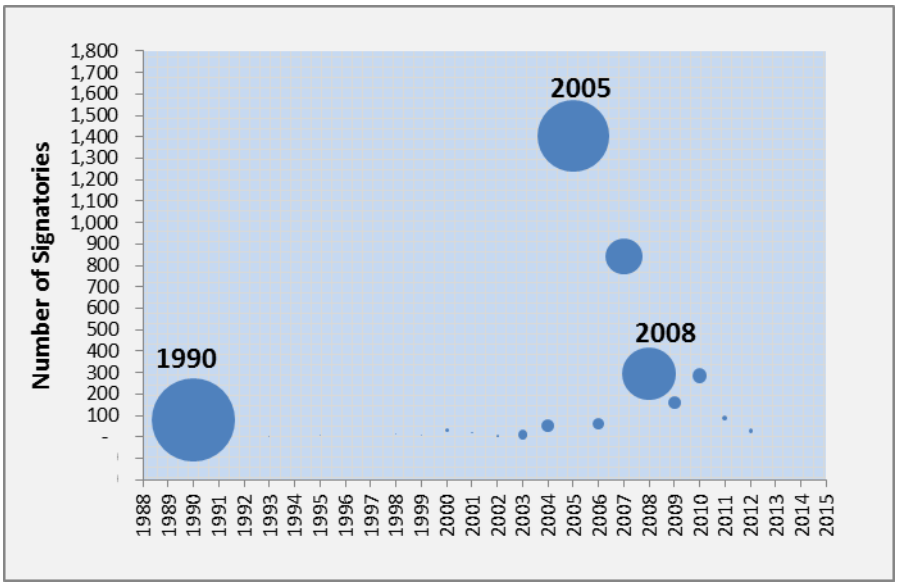
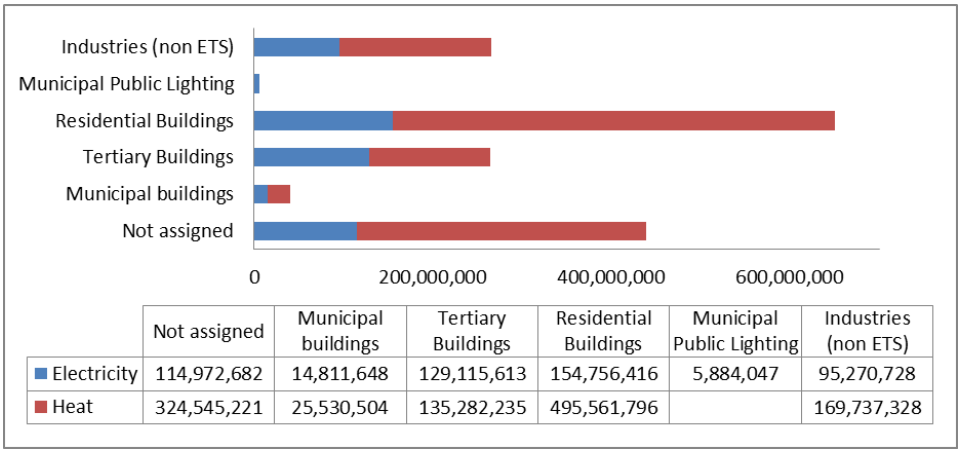


Figure 2. Final energy consumptions per reference years in BEIs.



	Not assigned	Municipal buildings	Tertiary Buildings	Residential Buildings	Municipal Public Lighting	Industries (non ETS)
Electricity	114,972,682	14,811,648	129,115,613	154,756,416	5,884,047	95,270,728
Heat	324,545,221	25,530,504	135,282,235	495,561,796		169,737,328

Figure 3. Final Energy Consumptions in the Building sector in BEIs.

the "Not assigned" subsector is to map all the differences in the reporting.

LOCAL ENERGY PRODUCTION IN BEI.

In the BEIs template, signatories also report the amount of the actual local energy production. In the following section, data from the BEIs data set as of 13th of May 2014 on local electricity production (see Table 5) and local heat production and distributed through District Heating and Cooling (DHC) networks are reported (see Table 6).

Local authorities can decide to take action in the supply side, for example by encouraging the integration of renewables into the energy systems. It has to be underlined that the CoM methodology for the elaboration of emission inventories sets clear

Table 5. Local electricity production as reported in BEIs.

Local Electricity Production	[MWh/year]	Shares
Photovoltaic	733,913	2 %
Hydro Power	6,730,511	15 %
Wind Power	5,815,590	13 %
Combined Heat and Power (CHP)	17,489,132	38 %
Other(not specified)	15,237,562	33 %
TOTAL	46,006,708	

Table 6. Local heat production as reported in BEIs.

Local Heat Production	[MWh/year]	Shares
District Heating with Combined Heat and Power	59,915,197	39 %
District Heating	68,920,021	45 %
Distributed Heat generation from Renewable Energy Sources	25,314,099	16 %
TOTAL	154,149,317	

rules for considering an electricity production plant as local, therefore not all the production plants within the boundaries of the local authority are necessary included (Bertoldi P., et al. 2010).

Table 5 reports the amount of local electricity production in CoM, classified according to the type of the conversion technology. The highest share of electricity is produced by the Combined Heat and Power plants (38 %).

While in Table 6 are shown the amount of local heat production as reported in BEIs. The share of heat derived from CHP power stations using mainly fossil fuels as primary source is 39 %. While 16 % of Local Heat production is a distributed generation using renewable sources (geothermal, biomass and solar).

Sustainable Energy Action Plans: 6-year assessment

The SEAP document reports the actions/measures planned by the signatories, together with relevant project management information on

- Estimated GHG emission reduction in 2020;
- Estimated energy savings in 2020;
- Estimated local energy production in 2020;
- and generally with details on estimated investment costs;

Based on the analysis of the SEAPs data set as of 13th of May 2014, overall statistics have been calculated and reported in the section.

ESTIMATED GHG EMISSION REDUCTIONS

The estimations on GHG emission reduction per sector as reported in the SEAPs of CoM signatories da set as of mid-May 2014 are shown in table 7. It is important to highlight that the biggest reduction of GHG emissions (44 %) is estimated to take place in the Building sector, followed by the transport sector with a share of 19 %. Other sectors include measures planned in areas of public procurement, in land use planning, and working with citizens on behavioural changes.

The overall share of the emission reductions is calculated as the ratio between the estimated emission reduction and the total emissions of the BEIs. Although the minimum commitment was to reduce the current emissions by 20 %, CoM signatories who have already submitted a SEAP and are part of the sample have estimated an overall reduction of more than 28 %.

In order to achieve the Europe 2020 target of 20 % reduction in greenhouse gases emissions (compared to 1990) by 2020, member states committed to reach legally binding national targets by 2020 (compared to the situation in 2005) for emissions not covered by the EU Emission Trading System (non ETS) by 9 % (EC 2013).

The focus of the Covenant of Mayors inventories are the main non ETS sectors under the direct influence of the local authority (such as residential, transport, services). Additional sectors which are optionally included in the inventories are: Agriculture (only energy-related emissions associated with buildings, facilities and machinery of the primary sector), Industry (small non-ETS installations) and other emissions not related to the energy consumption such as those associated

Table 7. Estimated GHG emission reductions as reported in SEAPs.

Sectors	Estimated GHG Emission reduction in 2020 [t CO_2-eq/year]	Shares
Buildings, Equipment, Facilities and Industries (non ETS)	83,790,055	44 %
Transport	35,978,776	19 %
Local Electricity production	26,268,357	14 %
Local District Heating, CHPs	17,150,441	9 %
Other Sectors	25,368,527	13 %
TOTAL	188,556,156	

Table 8. CoM contribution to the EU target on GHG Emission reduction.

EU-28 GHG Emission all sectors reference 1990 [Mt CO_2-eq]	5,626
EU 28 GHG Emission Reduction Target [Mt CO_2-eq]	1,125
CoM EU-28 GHG Emission Estimated reduction by 2020 [Mt CO_2-eq]	170
CoM EU-28 contribution to EU2020 GHG Emission reduction target [%]	15 %

Table 9. Estimation on Final energy savings by sector as reported in SEAPs.

Sector	Estimated Energy savings in 2020 [MWh/year]	Associated with specific measure	Share
Buildings, Equipment, Facilities and Industries (non ETS)	251,913,287	79,352,047	53 %
Transport	116,515,30	41,571,880	24 %
Local Electricity production	17,606,006	2,304,802	4 %
Local District Heating, CHPs	20,993,479	9,933,109	4 %
Other Sectors	71,535,147	33,087,870	15 %
TOTAL	478,563,225		

with waste and waste water. In addition to the non-ETS sectors, the CoM inventories also account for indirect emissions associated with consumption of electricity and heat/cold (as final product delivered to the final consumer). As a consequence, a certain share of emissions arising from power generation by plants included in the EU ETS scheme are computed in the inventories and addressed via the SEAPs.

Taken into consideration the above points the EU 28 values and CoM EU-28 values on GHG emissions for 1990 and reduction target for 2020 are reported in table 8. The reduction target is the share of 20 % of the GHG emission in 1990.

The data of EU-28 for the CoM sectors are collected from EEA greenhouse gas: http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer, while the data on CoM EU-28 are taken from the "CoM data set as of 13th of May 2014".

The EU-28 Reduction Target in all sectors has been calculated as the difference between the 1990 values and 2020 target. In conclusion CoM signatories from EU-28 may contribute to 15 % of the overall reduction target of GHG emission.

ESTIMATED ENERGY SAVINGS

The estimation on energy savings per sector by 2020 are reported in Table 9. It is important to highlight that the biggest energy savings (53 %) are estimated to take place in the Building sector, followed by the transport sector with a share of 24 %. Other sectors comprehend measures planned in areas of public procurement, in land use planning, working with citizens.

The reduction target will be achieved through energy efficiency measures in the municipal territories along with energy

Table 10. Share of Energy savings: CoM data set as of 13th of May 2014.

Final Energy Consumption in BEIs [MWh/year]	2,357,963,418
Estimated Energy Savings by 2020 [MWh/year]	478,563,225
Share of Estimated Energy savings [% by 2020]	20 %

Table 11. Estimated Energy production as reported in SEAPs.

Sector	Estimated Local Energy production in 2020 [MWh/year]	Amount associated with specific measure	Share
Buildings, Equipment, Facilities and Industries (non ETS)	11,978,373	8,903,217	9 %
Local Electricity production	56,763,237	26,297,090	43 %
Local District Heating, CHPs	42,032,750	21,672,044	32 %
Other Sectors	21,972,310	12,132,704	17 %
TOTAL	132,746,670		

Table 12. Share of estimated local energy production as reported in SEAPs.

Local Energy production in BEIs [MWh/year]	200,156,025
Estimated Local Energy production by 2020 [MWh]	332,902,694
Share of Local Energy production [% by 2020]	18 %

production from renewables and more efficient energy conversion technologies like CHPs. In fact, the estimated energy savings by 2020, correspond to 20 % of the energy consumption in the CoM signatories' territories (table 10).

The difference in methodologies for calculating the energy savings between CoM and the Energy Efficiency Directive has prevented us from assessing the potential contribution of SEAPs to the achievement of EU-28 targets to 2020 with respect to energy savings.

ESTIMATED LOCAL ENERGY PRODUCTION

Table 11 reports the estimates on energy production per sector by 2020. The highest share of estimated energy production (43 %) refers to electricity, followed by the Local District heating, CHPs with a share of 9 %. Other sectors comprehend fuel switch measures planned in areas of public procurement, in land use planning, working with citizens and in the transport sector.

Furthermore, the current local energy production (as reported in the BEIs dataset) constitutes 8.5 % of the overall final energy consumption. This figure is calculated as the sum of two terms: energy produced locally by renewables and thermal energy distributed through district heating networks.

The estimated local energy production is calculated as the sum of current local energy production and the estimated local energy production in the SEAPs.

Based on this analysis, we can affirm that the estimation for 2020 in CoM signatories of local energy production from renewable sources and by more efficient energy generation technologies (CHPs connected with District Heating Networks), the share of local energy production will be 18% of the total energy consumption (table 12).

The lack of detailed data on local energy production split between renewable and non-renewable sources has prevented from assessing the potential contribution of SEAPs to the achievement of EU-28 targets to 2020 with respect to RES.

ESTIMATED IMPLEMENTATION COSTS IN SEAPS

In order to evaluate the estimated implementation cost planned by the municipalities, an economic analysis has been carried out on the data as reported in table 13. The implementation cost refers to the capital required to implement each action as well as the operating cost required during the implementation time frame of the action. The total implementation cost also incorporates operational, maintenance costs and other costs. This amount is based on the forecasted total implementation cost municipalities have declared to invest in order to implement the measures described in the SEAP. It does not take into consideration the economic aspect of the energy savings the measure will generate. Furthermore, not all the measures are implemented during the same time period. Therefore implementation cost of the measures varies from the year 2008 to 2020.

The overall estimated implementation cost, as reported in the SEAPs submitted as of mid-May 2014, are around 108,701 mil-

Table 13. Estimated Implementation Costs as reported in SEAPs.

Estimated implementation costs [Million €]	
Buildings, Equipment, Facilities and Industries (non ETS)	39,851
Transport	8,793
Local Electricity production	15,289
Local District Heating, CHPs	36,101
Other Sectors	8,666
TOTAL	108,701

lion euros. These costs are not discounted. It is the estimated cost reported by local authorities to implement the measures reported in their SEAP. Although municipalities are invited to provide foreseen financing sources for SEAP implementation and to distinguish between public/private such information is not systematically reported.

Conclusions

By implementing the CoM programme, the European Commission has given visibility to the role of local authorities and their relevant contribution to EU2020 Climate and Energy targets.

It is important to highlight that the majority of signatories which submitted the Sustainable Energy Action Plan are small and medium towns, representing 88 % of the total number of signatories of the CoM data set as of mid-May 2014. The peculiarity of the CoM movement, compared to other GHG mitigation networks, is the engagement of small towns in the effort to reduce greenhouse gas emissions.

Although the minimum commitment was to reduce the current emissions by 20 %, CoM signatories who have already submitted a SEAP as of mid-May 2014, have estimated for 2020 an overall reduction of 28 % of the overall GHG emissions in BEIs reference years.

Energy efficiency has a fundamental role to play in the transition towards a more competitive, secure and sustainable energy system with an internal energy market at its core. In fact, the estimated energy savings by 2020 of CoM signatories amount to 479 TWh by 2020, which correspond to a reduction of 20 % of final energy consumption in BEIs reference years.

Furthermore, the report aims to emphasize the feature of CoM as a flexible common platform for achieving EU2020 Climate and Energy targets with a bottom-up approach. Given the overall EU-28 reduction target on GHG emission (100 %), CoM signatories from EU-28 may contribute to 15 % of this target.

In the coming years signatories will be challenged with the monitoring phase of CoM initiative. Every second year, signatories will have to submit a monitoring report on the implementation of the SEAP actions. Future studies will allow the assessment of the real progress of energy efficiency and local energy production measures planned in the SEAPs.

In this phase, bottom-up methodologies and GIS based tools may be integrated. Other regulatory frameworks and platforms (ex. Inspire) and open data sharing policies may further support the CoM signatories' efforts.

Glossary

BEI	Baseline Emission Inventory
CH4	Methane
CHP	Combined Heat and Power
CO	Carbon monoxide
CO_2	carbon dioxide
CO_2-eq	CO_2-equivalents
CoM	Covenant of Mayors
CTC	Covenant Territorial Coordinators
ETS	Emission Trading System
EU	European Union
GHG	Greenhouse gases
ICLEI	Local governments for Sustainability
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
MS	Member States
PV	photovoltaic
RES	Renewable Energy Source
SEAP	Sustainable Energy Action Plan
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme

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