IEE PROJECT CONURBANT

SUMMARY REPORT ON
ENERGY BASELINE ASSESSMENT

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EXECUTIVE SUMMARY

Development of Sustainable Energy Action Plan (SEAP) consists of several important steps. One of them is the preparation of the Baseline Emission Inventory (BEI). BEI quantifies the amount of CO_2 emitted due to energy consumption in the territory of the local authority in the baseline year. It allows to identify the principal anthropogenic sources of CO_2 emissions and to prioritise the reduction measures accordingly.

One of the main objectives of the Conurbant project is to develop more than 40 SEAPs. Therefore Conurbant project partners from all 10 project areas implemented this activity in their municipalities and/or Conurbation towns involved. In order to acquire good quality energy data and to prepare well defined SEAP, following steps should be followed:

1. Data collection;
2. Data analysis;
3. Application of the methodology (calculation of the emissions);
4. Analysis of the results (identification of the main categories of emissions and support to the municipalities to use correctly information).

This summary report includes the results of all the partners and their experience collecting the energy data, analysing them and calculating CO_2 emissions. The report consists of six chapters. The chapter on Methodology explains the main steps followed in order to reach the objective of this task – to develop good quality baseline emission inventory. The chapter on Existing situation presents the situation in each partner region and summarises the total energy consumption in the base year and also CO_2 emissions. Next chapters describe the data collection procedures applied in each partner region and how the CO_2 emissions were calculated. Chapter on Analysis of the results review total results and amplitude of the project municipalities in regard to reduce CO_2 emissions. The last chapter identifies the main lessons learned.

The main results of this activity are:

- Baseline emission inventories have been developed for 60 municipalities in 10 project partner areas.
- The total area of these municipalities is 90.7 thousand km^2 and total population – 1.6 million inhabitants.
- Their total final energy consumption in the base year was 23.08 TWh (base year selected between 2005 and 2010).
- Total CO_2 emissions in the base year were 8.12 million tCO_2.
- Projected CO_2 emission reduction target in 2020 is 1.64 million tCO_2.
- Each citizen of the project area will contribute in reduction of at least 1 ton of CO_2 emissions until 2020.

РЕЗЮМЕ

Разработването на План за действие за устойчиво енергийно развитие (ПДУЕР) се състои от няколко важни стъпки. Една от тях е изготвяне на инвентаризация на емисиите по базова линия (ИБЕ). ИБЕ определя количествено общата сума на отделените CO_2 в резултат на консумираната енергия на територията на общината през базовата година. ИБЕ позволява да се идентифицират основните антропогенни източници на емисии на CO_2 и съответно да се даде приоритет на мерките за намаляване им.

Една от основните цели на проект Conurbant е разработването на повече от 40 ПДУЕР. Ето защо партньорите по проекта в 10 общини изпълняват тази дейност както на своите територии, така и на териториите на присъединените общини.

За да се съберат подробни данни за енергията и да се изготви добре обоснован ПДУЕР е необходимо да се изпълнят следните стъпки:

1. Събиране на данни;
2. Анализ на данни;
3. Прилагане на методология (изчисление на емисиите);
4. Анализ на резултати (Идентифициране на основните категории емисии и правилно използване на информацията).

Този отчет включва резултатите на всички партньори и техния опит в събирането, анализирането на данни и изчисляване на CO_2 емисии. Отчетът се състои от 6 части. Част Методология описва основните стъпки, които трябва да се следват, за да се постигне целта на тази дейност – качествено разработване на инвентаризация на емисиите по базова линия. Част Съществуващо положение представя ситуацията и CO_2 емисиите във всеки партньорски регион през базовата година. Следващите части описват приложените процедури за събиране на данни и изчислението на CO_2 емисии за всеки регион. Последната част идентифицира основните научени уроци.

Основните резултати от тази дейност са:

- Разработени 60 инвентаризации на емисиите по базова линия в 10 партньорски региона.
- Общата площ на тези общини е 90.7 хиляди km2 с общо население – 1.6 милион жители.
- Общото тяхно потребление на енергия през базовата година е 23.08 TWh (базова година избрана между 2005 и 2010).
- Общите CO_2 емисии през базовата година са 8.12 милиона tCO_2.
- Предвидени CO_2 емисии за намаляване през 2020 са 1.64 милиона tCO_2.
- Всеки жител на територията на проекта ще допринесе за намаляване на най-малко 1 тон на емисиите на CO_2 до 2020 г.

IZVRŠNI SAŽETAK

Izrada Akcijskog plana energetski održivog razvitka (SEAP) sastoji se od nekoliko važnih koraka. Jedan od njih je priprema Inventara osnovnih emisija CO_2 (BEI). BEI izražava ukupnu količinu emitiranog CO_2, uslijed potrošnje energije na teritoriju jedinice lokalne samouprave u baznoj godini. On omogućava identifikaciju glavnih antropogenih izvora emisije CO_2 i prema tome postavlja prioritetne mjere njegova smanjenja.

Jedan od glavnih ciljeva projekta Conurbant je izraditi više od 40 SEAPa. Stoga su partneri iz 10 projektnih područja proveli ovu aktivnost u svom gradu ili općini, kao i u gradovima i općinama Konurbacije. U svrhu prikupljanja kvalitetnih podataka o potrošnji energije i pripreme detaljnih SEAPa, trebalo je pratiti slijedeće korake:

1. Prikupljanje podataka;
2. Analiza podataka;
3. Primjena metodologije (izračun emisija);
4. Analiza rezultata (identifikacija glavnih kategorija emisije i podrška gradovima u pravilnoj primjeni informacija).

Ovaj sažeti izvještaj sadržava rezultate svih partnera kao i njihovo iskustvo u prikupljanju podataka o potrošnji energije, njihovoj analizi i izračunu emisije CO_2. Izvještaj se sastoji od šest poglavlja. Poglavlje o metodologiji objašnjava glavne korake praćene radi postizanja cilja ovog zadatka – izrada dobrog i kvalitetnog Inventara osnovnih emisija. Poglavlje o trenutnom stanju predstavlja stanje regije svakog partnera i utvrđuje ukupnu potrošnju energije u baznoj godini, kao i emisiju CO_2. Slijedeće poglavlje opisuje postupak prikupljanja podataka, koji je primjenjivan u svakoj partnerskoj regiji, kao i način izračuna emisije CO_2. Poglavlje o analizi rezultata daje pregled ukupnih rezultata i obujam smanjenja emisije CO_2 u gradovima i općinama sudionicima projekta. Poslijednje poglavlje utvrđuje glavne naučene lekcije.

Glavni rezultati ove aktivnosti su:

- Inventari osnovnih emisija izrađeni za 60 općina/gradova u 10 područja projektnih partnera.
- Ukupna površina svih partnerskih Općina i gradova iznosi 90.7 tisuća km^2 s ukupnom populacijom od 1.6 milijuna stanovnika.
- Njihova konačna ukupna potrošnja energije u baznoj godini bila je 23.08 TWh (bazne godine odabrane su između 2005 i 2011).
- Ukupna emisija CO_2 u baznoj godini bila je 8.12 milijuna tCO_2.
- Predviđeno smanjenje emisije CO_2, zadano za 2020., iznosi 1.64 milijuna tCO_2.
- Svaki građanin na području provedbe projekta pridonijet će smanjenju emisije CO_2 za najmanje 1 tonu do 2020.

ΠΕΡΙΛΗΨΗ

Η ανάπτυξη του Σχεδίου Δράσης Αειφόρου Ενέργειας (ΣΔΑΕ) αποτελείται από διάφορα σημαντικά στάδια. Ένα από αυτά είναι η προετοιμασία της ΒασικήςΑπογραφής Εκπομπών (ΒΑΕ).Η ΒΑΕποσοτικοποιείτο CO2 που εκπέμπεται λόγω της κατανάλωσης ενέργειας στη περιοχη της τοπικήςαυτοδιοίκησης κατά το έτος αναφοράς. Επιτρέπει να εντοπιστούν οι κύριες ανθρωπογενείς πηγές των εκπομπών CO2 και να δώσουν προτεραιότητα στα μέτρα μείωσης των εκπομπών αναλόγως.

Ένας από τους κύριους στόχους του Conurbant είναι να αναπτύξει περισσότερα από 40 ΣΔΑΕ. Ως εκ τούτου, οι εταίροι που συμμετέχουν στο Conurbantαπό τις 10 περιοχέςτου έργου,έχουν αναπτύξει τα ΣΔΑΕ για τους δήμους που αντιπροσωπεύουν και στηρίζουν κατά τη διάρκεια του Conurbant. Για την απόκτηση σωστών ενεργειακών δεδομένων και την καλή προετοιμασία του ΣΔΑΕ,ακολουθούνται τα εξής στάδια.

1. Η συλλογή δεδομένων
2. Η ανάλυση των δεδομένων
3. Εφαρμογή της μεθοδολογίας (υπολογισμός των εκπομπών)
4. Η ανάλυση των αποτελεσμάτων (αναγνώριση των κύριων κατηγοριών των εκπομπών και την υποστήριξη στους δήμους να χρησιμοποιούν σωστά τις πληροφορίες).

Αυτή η συνοπτική έκθεση περιλαμβάνει τα αποτελέσματα όλων των εταίρων και την εμπειρία τους, στη συλλογή των ενεργειακών δεδομένων, την ανάλυσή τους και τον υπολογισμό των εκπομπών CO2. Η έκθεση αποτελείται από έξι κεφάλαια. Το κεφάλαιο μεθοδολογίας που εξηγεί τα βασικά βήματα που ακολουθήθηκαν προκειμένου να επιτευχθεί ο στόχος του έργου αυτού για να γίνει σωστή βασική απογραφή των εκπομπών. Το κεφάλαιο για την υφιστάμενη κατάσταση παρουσιάζειτην κατάσταση στην περιφέρεια κάθε εταίρου και συνοψίζει τη συνολική κατανάλωση ενέργειας, αλλά και τις εκπομπές CO2 κατά το έτος αναφοράς.Τα επόμενα κεφάλαια περιγράφουν την διαδικασία συλλογής των δεδομένων κάθε εταίρου και το πως υπολογίζονται οι εκπομπές CO2. Το κεφάλαιο για την ανάλυση των αποτελεσμάτων αναθεωρεί τα συνολικά αποτελέσματα και καθορήζει τη μείωση των εκπομπών CO2 στους δήμους. Το τελευταίο κεφάλαιο προσδιορίζει τα κύρια διδάγματα που αντλήθηκαν.

Τα κύρια αποτελέσματα αυτής της δραστηριότητας είναι:

- Οι απογραφές εκπομπών έχουν αναπτυχθεί για 60 δήμους σε 10 εταίρους του έργου.
- Η συνολική έκταση των εν λόγω δήμων είναι 90.700 km2 και ο συνολικός πληθυσμός - 1,6 εκατομμύρια κάτοικοι.
- Η συνολική κατανάλωση ενέργειας στο έτος αναφοράς ήταν 23.08 TWh (το έτος αναφοράς επιλέγεται μεταξύ 2005 και 2010).
- Οι συνολικές εκπομπές CO2 κατά το έτος αναφοράς ήταν 8.120.000 tCO2.
- Η προβλέψη μειώσης των εκπομπών CO2 μέχρι το 2020 είναι 1,64 εκατ. tCO2.
- Κάθε πολίτης της περιοχής του έργου θα συμβάλει στη μείωση τουλάχιστον ενός τόνου εκπομπών CO2 έως το 2020.

SOMMARIO

Lo sviluppo di un Piano di Azione per l'Energia Sostenibile (PAES) richiede di realizzare diversi passi importanti . Uno di loro è la preparazione di un Inventario di Base delle Emissioni (IBE). L'IBE definisce la quantità di CO_2 emessa per il consumo di energia nel territorio dell'ente locale per l'anno di riferimento. Permette di identificare le principali fonti antropiche di emissioni di CO_2 e di dare conseguentemente priorità alle misure di riduzione.

Uno dei principali obiettivi del progetto Conurbant è quello di sviluppare più di 40 PAES. Di conseguente i partner del progetto CONURBANT per tutte le 10 aree su cui il progetto si sviluppa, hanno attuato questa attività nei loro comuni e/o città della conurbazione coinvolte. Al fine di acquisire dati sui consumi energetici di buona qualità e per preparare un PAES ben definito, ci si dovrebbe attenere ai seguenti passi:

1. La raccolta dei dati ;
2. Analisi dei dati;
3. Applicazione della metodologia calcolo delle emissioni) ;
4. Analisi dei risultati (individuazione delle principali categorie di emissioni e dare supporto ai comuni per l'uso corretto delle informazioni raccolte).

Questa relazione di sintesi riporta i risultati di tutti i partner e la loro esperienza nel raccogliere i dati di consumo energetico, la loro analisi ed il relativo calcolo delle emissioni di CO_2. La relazione si compone di sei capitoli . Il capitolo sulla Metodologia illustra i principali passi seguiti al fine di raggiungere l' obiettivo di sviluppare un Inventario di Base delle Emissioni di qualità. Il capitolo sulla situazione esistente presenta la situazione in ogni regione partner e riassume il consumo totale di energia per l'anno di riferimento e le relative emissioni di CO_2. I capitoli successivi descrivono le procedure di raccolta dati applicate in ogni regione partner e la metodologia di calcolo delle emissioni di CO_2. Il capitolo sull'analisi dei risultati esamina i risultati complessivi e l'ampiezza delle municipalità coinvolte nel progetto in materia di riduzione delle emissioni di CO_2. L'ultimo capitolo individua le principali lezioni apprese.

I principali risultati di questa attività sono:

- Gli Inventari di Base delle Emissioni di base sono stati sviluppati per 60 comuni in 10 aree partner di progetto.
- La superficie totale di questi comuni è 90.700 km^2 e la popolazione totale ammonta a 1,6 milioni di abitanti.
- Il loro consumo totale di energia finale nell'anno base era 23,08 TWh (anno di riferimento scelto tra il 2005 e il 2010).
- Le emissioni totali di CO_2 per l'anno di riferimento sono state 8.120.000 tCO_2 .
- L'obiettivo di riduzione delle emissioni di CO_2 al 2020 è 1.640.000 tCO_2 .
- Ogni cittadino dell'area di progetto contribuirà a ridurre almeno 1 tonnellata di emissioni di CO_2 entro il 2020.

KOPSAVILKUMS

Ilgtspējīgas enerģijas rīcības plāna (IERP) izstrāde sastāv no vairākiem svarīgiem soļiem. Viens no šiem soļiem ir Bāzes emisiju uzskaites (BEU) izstrādāšana. BEU ir kvantitatīvs rādītājs, ar kuru izsaka to CO_2 emisiju daudzumu, kas bāzes gadā veidojies konkrētajā pašvaldībā enerģijas patēriņa dēļ. Tas ļauj noteikt galvenos CO_2 emisiju antropogēnos avotus un attiecīgi izvēlēties prioritāros CO_2 emisiju samazināšanas pasākumus.

Viens no galvenajiem *Conurbant* projekta uzdevumiem ir izstrādāt vairāk nekā 40 IERP. Tāpēc *Conurbant* projekta partneri visās desmit projekta reģionos ieviesa šo aktivitāti savās pašvaldībās un/vai iesaistītajās aglomerācijas pilsētās. Lai iegūtu labas kvalitātes enerģijas datus un sagatavotu labi definētu IERP, ir jāievēro šādi soļi:

1. Datu vākšana un apkopošana;
2. Datu analīze;
3. Metodoloģijas pielietošana (emisiju aprēķināšana);
4. Rezultātu analīze (galveno emisiju sektoru identifikācija un ieteikumi pašvaldībām, kā pareizi izmantot informāciju).

Šajā ziņojumā iekļauti gan rezultāti no visiem projekta partneriem, gan arī viņu gūtā pieredze vācot, apkopojot un analizējot datus, kā arī aprēķinot CO_2 emisijas. Ziņojums sastāv no sešām nodaļām. Nodaļa par metodoloģiju apraksta galvenos soļus, kas jāievēro, lai sasniegtu šī uzdevuma mērķi – izstrādātu labas kvalitātes BEU. Nodaļa par esošo situāciju sniedz informāciju par katru projekta reģionu. Šajā nodaļā arī apkopota informācija par enerģijas gala patēriņu un CO_2 emisijām bāzes gadā. Nākamajās nodaļās aprakstīta datu vākšanas un apkopošanas kārtībā, kā arī CO_2 emisiju aprēķināšana katrā reģionā. Pirmspēdējā nodaļā pieejami kopējie rezultāti pašvaldībās. Pēdējā nodaļā aprakstītas galvenās gūtās atziņas.

Kopsavilkums par veiktajiem BEU ir sekojošs:

- 60 pašvaldībām no desmit projekta partneru teritorijām ir izstrādātas BEU.
- Šajās pašvaldībās kopējais iedzīvotāju skaits ir 1,6 miljoni iedzīvotāju un kopējā platība ir 90,7 tūkstoši km^2.
- Pašvaldību kopējais enerģijas patēriņš bāzes gados bija 23,08 TWh (bāzes gadi izvēlēti no 2005. – 2010. gadam).
- Kopējais CO_2 emisiju daudzums bāzes gadā bija 8,12 miljoni tCO_2.
- Paredzēts, ka līdz 2020. gadam CO_2 emisijas tiks samazinātas vismaz par 1,64 miljoniem tCO_2.
- Līdz 2020. gadam katrs projektā iesaistītās pašvaldības vai pilsētas iedzīvotājs samazinās vismaz vienu tonnu CO_2 emisiju.

RAPORT DE SINTEZĂ

Elaborarea Planului de acțiune privind Energia Durabilă (PAED) implică mai multe etape importante. Una din ele este realizarea Inventarului de Bază al Emisiilor (BEI). BEi cuantifică cantitatea de CO_2 emis ca urmare a consumului de energie de pe teritoriul autorității locale în anul de referință. Acesta permite identificarea principalelor surse antropice cu emisii de CO_2, în consecință acordă prioritate măsurilor de reducere.

Unul din principalele obiective ale proiectului Conurbant este elaborarea a cel puțin 40 de PAED-uri. Prin urmare, partenerii de proiect Conurbant din toate cele 10 zone, au implementat această activitate in municipiile/localitățile lor de conurbație.

În vederea obținerii unor date energetice corecte și un PAED cu acțiuni corect definite, trebuiesc urmate etapele:

1. Colectarea datelor;
2. Analiza datelor;
3. Aplicarea metodologiei (calcularea emisiilor);
4. Analiza rezultatelor (identificarea principalelor categorii de emisii și sprijin pentru municipalități pentru a folosi corect informațiile).

Acest raport de sinteză cuprinde rezultatele tuturor partenerilor și experiența lor de colectare a datelor energetice, analiza acestora și calcularea emisiilor de CO_2. Raportul este format din șase capitole. Capitolul privind Metodologia explică pașii principali de urmat în scopul de a atinge obiectivul pentru această activitate - de a dezvolta un inventar de bună calitate a emisiilor de bază. Capitol Situația existentă prezintă situația din fiecare regiune parteneră și sintetizează consumul total de energie în anul de referință și, de asemenea, emisiile de CO_2. Capitolele următoare descriu procedurile de colectare a datelor aplicate în fiecare regiune parteneră și modul în care s-au calculat emisiile de CO_2. Capitolul Analiza rezultatelor sintetizează rezultatele totale și evidențiază amploarea reducerii emisiilor de CO_2 a municipalităților implicate in proiect. În ultimul capitol sunt identificate principalele experiențe deprinse.

Principalele rezultate ale acestei activități sunt:

- Inventarele emisiilor de bază au fost elaborate pentru 60 de localități din cele 10 zone ale partenerilor de proiect.
- Suprafața totală a acestor municipalități este de 90,700 km2. Populația totală - 1,6 milioane de locuitori.
- Consumul total de energie în anul de referință a fost de 23,08 TWh (anul de bază selectat între 2005 și 2010).
- Emisiile totale de CO_2 în anul de referință au fost 8,12 milioane t_o.
- Obiectivul de reducere a emisiilor de CO_2 pentru anul 2020 este de 1,64 milioane t_o.
- Fiecare cetățean al zonei de proiect va contribui la reducerea cu cel puțin 1 tonă emisii de CO_2 până în 2020.

RESUMEN

El desarrollo de Planes de acción para la energía sostenible (PAES), consiste en varios importantes pasos. Uno de ellos es la elaboración del inventario de emisiones (IE). El inventario de emisiones cuantifica la cantidad de CO_2 emitido debido al consumo de energía en un municipio, en un año de referencia. Permite identificar fuentes antropogénicas de emisiones de CO_2 y priorizar las medidas de reducción en concordancia con el inventario.

Uno de los principales objetivos del proyecto CONURBANT es el desarrollo de más de 40 PAES. Por lo tanto, los socios del proyecto CONURBANT, que representan 10 áreas urbanas europeas distintas, realizan sus actividades en sus respectivos municipios y municipios que los envuelven en la misma área urbana. Para poder conseguir datos de calidad sobre consumos energéticos y para definir perfectamente el PAES, se deben seguir los siguientes pasos:

1. Recogida de datos
2. Análisis de datos
3. Aplicación de la metodología (cálculo de las emisiones)
4. Análisis de los resultados (identificación de las principales categorías de emisiones y apoyo a los municipios para usar correctamente la información).

Este resumen incluye los resultados de todos los socios del proyecto y su experiencia en la recogida de datos sobre consumos energéticos, analizándolos y calculando las emisiones de CO_2. El informe está formado por seis capítulos. El capítulo de metodología explica los principales pasos seguidos para alcanzar el objetivo de esta tarea, desarrollar un inventario de emisiones de calidad. El capítulo de situación existente, presenta la situación en cada región socia del proyecto y resume el consumo total de energía y las emisiones de CO_2, en el año base. Los siguientes capítulos resumen el procedimiento de recolección de datos aplicado a cada región socia y como fueron calculadas las emisiones de CO_2. El capítulo de análisis de los resultados revisa los resultados totales y lo ambiciosos que se muestran los municipios del proyecto, en cuanto a los objetivos de reducción de las emisiones de CO_2. El último capítulo identifica las principales lecciones aprendidas.

Los principales resultados de esta actividad son:

- Los inventarios de emisiones han sido desarrollados por 60 municipios en 10 áreas socias del proyecto.
- El área total de estos municipios 90.700 km^2 y la población total, 1,6 millones de habitantes.
- El total de sus consumos respectivos en el año de referencia es de 23,08 TWh (el año de referencia o base se sitúa entre 2005 y 2010, según los casos).
- Las emisiones totales de CO_2 en el año de referencia fueron de 8,12 millones de toneladas de CO_2.
- El objetivo de reducción de CO_2 proyectado en 2020 es de 1,64 millones de toneladas de CO_2.
- Cada ciudadano de un área de proyecto contribuirá a una reducción de, al menos, 1 tonelada de CO_2 hasta el año 2020.

INTRODUCTION

The aim of the Energy baseline assessment report is to share the experience and knowledge from Conurbant project during the phase of the development of Sustainable Energy Action Plan (SEAP). Energy baseline assessment includes following tasks:

- Data collection;
- Data analysis;
- Application of the methodology (calculation of the emissions);
- Analysis of the results (identification of the main categories of emissions and support to the municipalities to use correctly information).

The Energy baseline assessment is important because the baseline CO_2 inventory will essentially be based on final energy consumption including both municipal and non-municipal energy consumption in the local authority's territory. BEI is a quantification of the amount of CO_2 emitted due to energy consumption in the territory of a local authority (e.g. Covenant signatory) in a given period of time (the recommended base year is 1990). BEI allows to identify the principal anthropogenic sources of CO_2 emissions and their respective reduction potentials, and to prioritise the reduction measures accordingly.[1] Also those other than energy-related sources may be included in the BEI.

The BEI quantifies the following emissions that occur due to energy consumption in the territory of the local authority:

1. Direct emissions due to fuel combustion in the territory in the buildings, equipment/facilities and transportation sectors.
2. (Indirect) emissions related to production of electricity, heat, or cold that are consumed in the territory.
3. Other direct emissions that occur in the territory, depending on the choice of BEI sectors.

Elaborating a BEI is of critical importance also because the inventory will be the instrument allowing the local authority to measure the impact of its actions related to climate change. The BEI will show where the local authority was at the beginning, and the successive monitoring emission inventories will show the progress towards the objective. Emission inventories are very important elements to maintain the motivation of all parties willing to contribute to the local authority's CO_2 reduction objective, allowing them to see the results of their efforts.

This summary report is based on the input from all the partner reports. Due to the fact that data gathering in some of the partner municipalities has been time consuming, the final version of the summary report has been published in October 2013.

The chapter on Methodology explains the main steps followed in order to reach the objective of this task – to develop baseline emission inventory. The chapter on Existing situation presents the situation in each partner region and summarises the total energy consumption in the base year and also CO_2 emissions. Next chapters describe the data collection procedures applied in each partner region and how the CO_2 emissions were calculated. Chapter on Analysis of the results review total results and amplitude of the project municipalities in regard to reduce CO_2 emissions. The last chapter identifies the main lessons learned.

[1] How to develop a Sustainable Energy Action Plan – Guidebook. Part 2, European Union, 2010, 44 pages

METHODOLOGY

The overall methodology for implementation of this task and the role of partners is presented in the Figure 1.

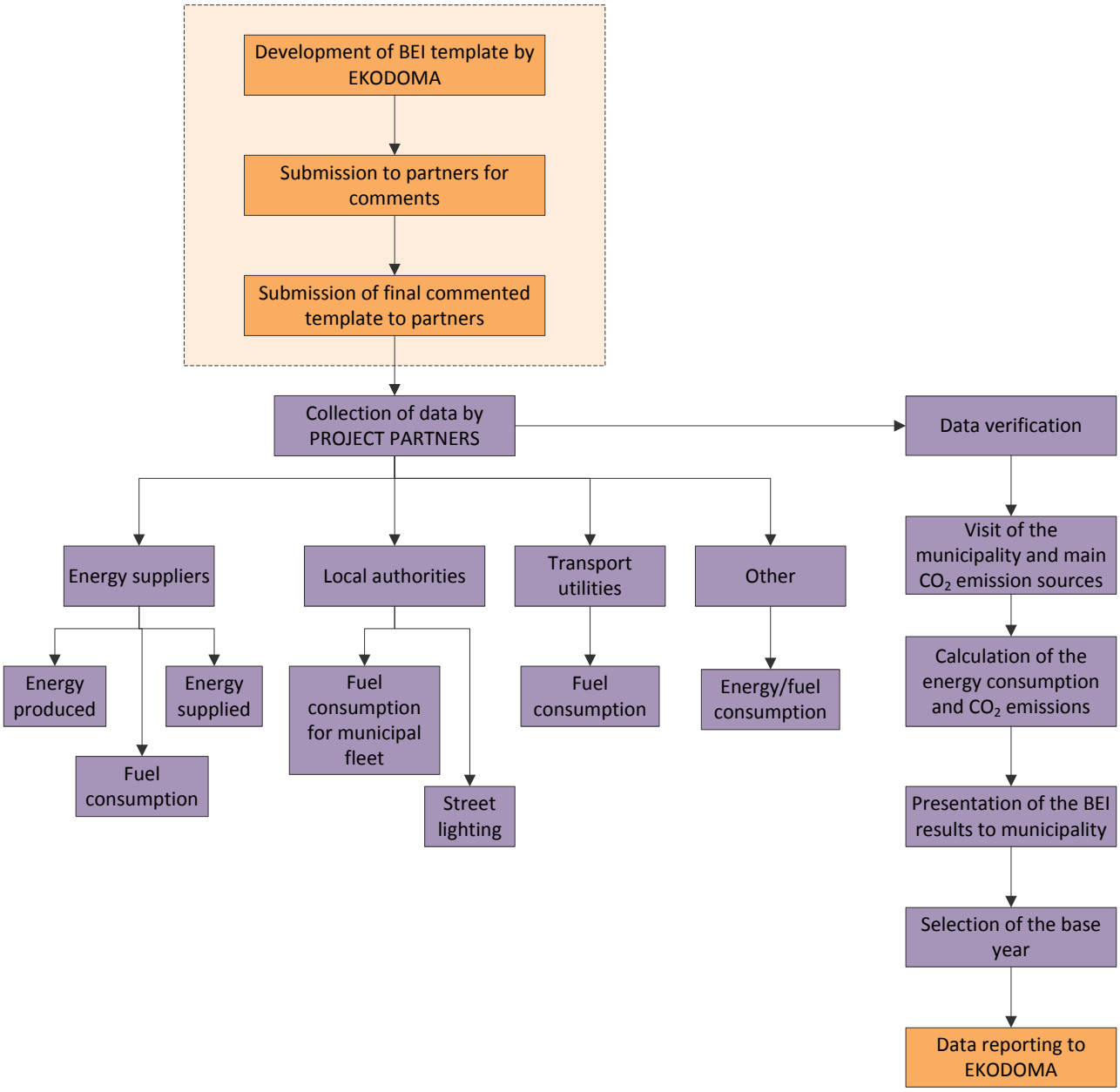

Figure 1: Methodology used to implement the task

In general the implementation of this task can be divided in three main parts:

1. Development of the initial information to explain the necessity of the task to the project partners, what the main expectations are and what working procedures can be used. Main responsible of this activity was task leader (Ekodoma).

In order to reach the goals of the project and develop SEAPs, in the initial phase of this task, the task leader (Ekodoma) provided a general template to summarise the results of this task from each partner region. As some of the partners were less experienced in the development of SEAPs, template included also basic guidelines and references to different documents to assist them.

This information was presented to all the partners during the kick off meeting in Vicenza and also during the second project meeting in Alba Iulia.

2. Collection of the energy and other data from municipalities and energy suppliers. The responsibility of this activity was assigned to partners (municipalities) with assistance from technical partners.

The implementation of this activity was very long. One of the reasons could be the fact that some of the municipalities joined the project activities later and therefore the collection of the data started also later. The other reason was the lengthy procedure of collection of the data from local authorities. It was often noted that data municipalities at the beginning provided partial data and only later gathered all of them.

3. Preparation of summary report with input of all the partners. Main responsible of this activity was task leader (Ekodoma).

EXISTING SITUATION

BULGARIA - VRATSA

Vratsa Conurbation consists of Vratsa (approx. 75 thousand residents) and five smaller towns with total population of 76.38 thousand inhabitants and is located in northwest Bulgaria (see Figure 2).

Figure 2: Municipality of Vratsa and its Conurbation towns

General information about Vratsa and its Conurbation towns is given in Table 1. The total area of the six municipalities is 2348 km^2. The total energy consumption in the base year is 528.7 GWh/year and CO_2 emissions – 347 thousands tCO_2/year. CO_2 per capita varies between 0.09 and 2.84.

TABLE 1

General information about Vratsa Conurbation towns in Bulgaria

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Vratsa	74 648	679	310 721	211 855	2.84
Kozloduy	22 571	285	96 141	40 549	1.8
Mizia	7 301	209.31	17 031	13 673	1.79
Oryahovo	12 314	329	38 293	28 249	2.29
Mezdra	23 395	519.15	64 993	52 121	2.21
Krivodol	10 460	326.86	1 535	952	0.09
TOTAL	**150 689**	**2 348.32**	**528 713**	**347 086**	

CROATIA - OSIJEK

In the eastern part of Croatia is located Osijek – the fourth largest city in Croatia with more than 100 thousand inhabitants. Osijek Conurbation consists of Osijek and four other smaller towns (approx. 10-35 thousand inhabitants). The map with Osijek and its Conurbation towns is given in Figure 3.

Figure 3: Municipality of Osijek and its Conurbation towns

General information about Osijek and its Conurbation towns is given in Table 2. The project area covers 530 km2 with total population of 173.97 thousand inhabitants. The total energy consumption in the base year (except municipality of Vinkovci) was 2.53 TWh and total amount of emitted CO_2 emissions was 732.28 thousand tCO_2/year. CO_2 per capita varies between 1.67 and 6.19.

TABLE 2

General information about Osijek Conurbation towns in Croatia

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Osijek	107 784	171	2 040 415	624 938	5.8
Beli Manastir	10 549	62	279 379	65 338	6.19
Belišće	10 790	69	97 852	18 000	1.67
Donji Miholjac	9 468	134	112 843	24 000	2.53
Vinkovci	35 375	94	-	-	-
TOTAL	**173 966**	**530**	**2 530 489**	**732 276**	

For municipality of Vinkovci total energy consumption and CO_2 emissions in the base year were not available at the time of submitting the summary report.

CYPRUS - LIMASSOL

The Municipality of Limassol is the largest municipality in Cyprus (population is over 100 thousand) and is located in the south of the island (see Figure 4). It is part of the Limassol Province which is the second largest in Cyprus after the Province named after the capital city of Nicosia. The conurbation of Limassol consists of the large Limassol Municipality and 3 smaller ones (population between 13.5-22.0 thousand inhabitants).

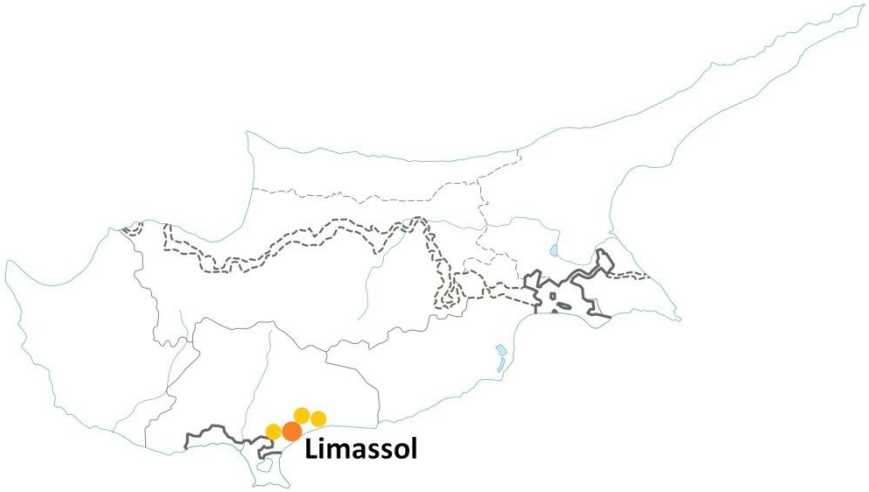

Figure 4: Municipality of Limassol and its Conurbation towns

Limassol has already planned many actions to reduce greenhouse emissions and raise awareness on energy efficiency, renewable energy, CO_2 emissions reduction and waste management in all sectors of Limassol. All municipalities had already signed the Covenant of Mayors and the development of SEAP was at final or medium stage during the time of writing the report. Year 2009 is the earliest and most reliable data year, both for energy suppliers and on most cases for municipalities, too. General information about municipality of Limassol and its Conurbation is given in Table 3.

TABLE 3

General information about Limassol Conurbation towns in Cyprus

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Limassol	101 000	22	1 714 651	705 631	6.99
Kato Polemidia	22 000	12	96 833	61 627	2.8
Mesa Yitonia	14 500	3	72 817	47 605	3.28
Yermasoyia	13 500	9	107 148	77 959	5.77
TOTAL	**151 000**	**46**	**1 991 449**	**892 822**	

The total population of the Limassol and its conurbation towns is 151 thousand inhabitants and their total energy consumption in 2009 was almost 2 TWh. Total amount of CO2 emissions in the base year was 892.8 thousand tons of CO_2. CO_2 per capita in the municipalities vary between 2.8 and 6.99.

ITALY – VICENZA AND PADOVA

There are two municipalities involved in the Conurbant project from Italy: Vicenza and Padova. Both municipalities and their Conurbation towns are located in north-east part of Italy (see Figure 5). As SEAP of Padova was approved in June 2011, the main task of the municipality was to involve four Conurbation towns. All together there are 8 Conurbation towns covered.

Figure 5: Municipalities of Padova and Vicenza and their Conurbation towns

General information about Vicenza and Padova Conurbations is given in Table 4. The total area of the Vicenza and nine Conurbations is 245.9 km^2 with total population of 207.6 thousand inhabitants. Total energy consumption in the base year was 4.26 TWh emitting 1.04 million tCO_2/year.

TABLE 4

General information about Vicenza Conurbation towns in Italy

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Vicenza	114 314	80.54	2 452 412	546 708	4.8
Arcugnano	7 944	41.54	148 297	40 524	5.1
Sovizzo	6 369	15.00	127 287	33 974	5.3
Creazzo	11 104	10.67	225 853	59 655	5.4
Monticello	9 252	10.19	188 979	48 867	5.3
Rubano	14 463	14.56	307 124	89 838	6.2
Vigonza	22 008	33.32	412 163	113 741	5.2
Ponte S. Nicolò	13 178	13.50	237 231	61 387	4.7
Due Carrare	9 002	26.58	155 891	42 037	4.7
TOTAL	**207 634**	**245.9**	**4 255 237**	**1 036 731**	

LATVIA – SALASPILS

Salaspils is located in the central part of Latvia, close to Riga. The conurbation towns that Salaspils involved in project are four with 6.2-39.2 thousand inhabitants (see Figure 6).

Figure 6: Municipality of Salaspils and its Conurbation towns

General information about the five municipalities is given in Table 5. Latvian municipalities are the smallest between the project partners with total population of 82 thousand inhabitants. In the meantime it covers the largest area – 1956 km^2. The total energy consumption in the base year was 448 GWh/year but the total amount of CO_2 emissions was 97.1 thousand tCO_2/year. CO_2 per capita varies between 0.68 and 1.51.

TABLE 5

General information about Salaspils Conurbation towns from Latvia

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Salaspils	21 102	115	150 089	30 744	1.46
Ikšķile	8 850	130	25 925	6 045	0.68
Ogre	39 196	993	205 971	44 281	1.13
Lielvārde	6 708	226	56 534	10 113	1.51
Ķegums	6 200	492	10 052	5 914	0.95
TOTAL	**82 056**	**1 956**	**448 571**	**97 097**	

ROMANIA – ALBA IULIA, ARAD AND TIMISOARA

There are three partner municipalities involved in the project from Romania (see Figure 7):

- Alba Iulia (also Tutoring municipality) that has engaged four smaller Conurbation towns. The SEAP of Alba Iulia was approved by the office of the Covenant of Mayors in 2012;
- Arad and five Conurbation municipalities;
- Timisoara and 16 smaller municipalities.

Figure 7: Municipalities of Arad, Alba Iulia and Timisoara and their Conurbation towns

Alba Iulia and its Conurbation municipalities are located in the west part of Transylvania, Romania. Conurbation includes four small municipalities – Berghin, Ciugud, Ighiu, Santimbru with a number of inhabitants between 1.8 and 6.5 thousand. In all four communities renewable energy production plans are not yet developed and district heating is not used – only individual heating systems are used. Baseline year for all Conurbation towns was chosen 2008 – the closest subsequent year after 1990 for which the most comprehensive and reliable data can be collected. Main fuel for individual heating systems is natural gas and firewood. General information about Alba Iulia Conurbation is given in Table 6.

TABLE 6

General information about Alba Iulia Conurbation towns in Romania

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Berghin	1 838	75.17	10 376	4 312	2.35
Ciugud	3 017	43.91	19 577	5 693	1.89
Ighiu	6 500	126.00	37 888	11 634	1.79
Santimbru	3 007	52.94	21 231	6 088	2.02
TOTAL	**14 362**	**298**	**89 072**	**27 727**	

The total population of the Conurbation towns of the Alba Iulia is 14.4 thousand inhabitants in the territory of 298 km^2. The total energy consumption in the 2008 was 89 GWh. CO_2 per capita varies between 1.79 and 2.35 and the total amount of the CO_2 emissions emitted in 2008 was 27.7 thousand tCO_2.

The population in Arad is around 173 thousand but in the Conurbation municipalities varies between 8.1 and 13 thousand inhabitants. General information about Arad Conurbation is given in Table 7.

TABLE 7

General information about Arad Conurbation towns from Romania

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Arad	172 824	77	3 606 642	1 205 386	6.97
Lipova	11 104	14.79	172 296	21 250	1.91
Nădlac	8 154	133.15	153 812	23 766	2.91
Sântana	12 936	93.1	118 879	15 470	1.2
Pecica	13 024	91	262 607	50 816	3.9
TOTAL	**218 042**	**409.04**	**4 314 236**	**1 316 688**	

The total population of the Arad and its Conurbation towns is 218 thousand inhabitants covering territory of 409 km2. Total energy consumption in 2008 was 4.3 TWh but the total CO_2 emissions were 1.3 million tons. Largest CO_2 per capita was in Arad – 6.97 tCO_2/capita but the smallest in Santana – 1.2 tCO_2/capita.

Timisoara Conurbation consists of 16 smaller towns with population between 1.4 and 11.8 thousand inhabitants. General information about Timisoara Conurbation municipalities is given in Table 8. SEAP of the municipality of Timisioara was developed and approved in June 2010.

TABLE 8

General information about Timisoara Conurbation towns from Romania

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Bucovăţ	1 405	33	9 209	3 595	2.56
Cărpiniş	5 156	46	30 552	11 839	2.30
Dudeştii noi	2 657	39	17 918	5 327	2.00
Dumbrăviţa	3 607	18	83 923	26 840	7.44
Ghiroda	5 184	35	39 136	13 232	2.55
Giarmata	6 010	71	39 419	13 307	2.21
Giroc	5 078	55	30 051	9 488	1.87
Jimbolia	11 787	108	83 160	31 852	2.70
Moşniţa nouă	4 459	66	49 710	17 332	3.89
Orţişoara	4 093	145	28 697	10 708	2.62
Peciu nou	4 942	129	No complete data	No complete data	
Pişchia	2 819	123	17 919	7 099	2.52
Remetea mare	1 973	105	23 010	8 417	4.27
Sânandrei	5 874	92	44 257	15 668	2.67
Sânmihaiu român	4 827	75	30 752	11 324	2.35
Şag	2 829	50	20 533	7 395	2.61
TOTAL	**71 295**	**1 190**	**539 037**	**193 423**	

The area of the 16 municipalities is 1190 km^2 and the total population is more than 71 thousand inhabitants. The total energy consumption in 2008 was 539 GWh. In 2008 there were 193.4 thousand tons of CO_2 emissions emitted. The largest CO2 per capita was calculated in municipality of Dumbravita – 7.44 but the smallest (1.87 tCO_2/capita) in municipality of Giroc.

SPAIN – PALMA DE MALLORCA

Palma is the major city of the Balearic Islands in Spain with almost 450 thousand inhabitants. Municipality of Palma involved five smaller Conurbation towns (with 2-54 thousand inhabitants) that are presented on the map in Figure 8.

Figure 8: Municipalities of Palma and its Conurbation towns

General information about Palma and its Conurbation towns is given in Table 9. There are in total more than 528 thousand inhabitants living in six municipalities that cover 551 km^2 of the territory. Total energy consumption in the base year was almost 8.4 TWh. In total 3.5 million tons of CO_2 were emitted in the base year. The largest CO_2 per capita has been in municipality of Calvia – 12.23.

TABLE 9

General information about Conurbation towns in Spain

Conurbation town	Inhabitants	Area, km^2	Total energy consumption in base year, MWh	CO_2 emissions in base year, tCO_2	CO_2 per capita, tCO_2/capita
Palma de Mallorca	449 229	208.63	6 540 294	2 647 334	5.89
Andratx	11 682	82.55	218 287	99 676	8.53
Calvià	54 268	145.00	1 449 737	663 657	12.23
Esporles	4 990	35.00	64 520	25 931	5.20
Puigpunyent	1 938	42.28	24 678	9 669	4.99
Santa María del Camí	6 176	37.59	80 886	32 806	5.31
TOTAL	**528 283**	**551.05**	**8 378 402**	**3 479 073**	

DATA COLLECTION

The data collection stage is of great importance in the BEI process because the results, data quality and reliability depend on the process. Project partners applied different methods. One of the methods used most often was the data collection with “Data Collection Sheets” that include all the relevant sheets per sector to list the data to be collected. Such data collection approach was used in Latvia, Romania and other countries.

Below are listed the sectors for which partners collected for BEI:

- Municipal buildings, equipment/facilities (included by most partners);
- Tertiary (non municipal) buildings, equipment/facilities (included by most partners);
- Residential buildings;
- Municipal public lighting (included by most partners);
- Industries (excluding industries involved in the EU Emission trading scheme - ETS);
- Municipal fleet (included by most partners);
- Public transport (included by most partners);
- Private and commercial transport;
- Energy production;
- Other emission sources.

Other emission sources can be agriculture, waste sector etc. Energy production in most cases includes district heating (data from boiler houses and/or cogeneration plants), renewable energy production using solar or wind energy. Very rarely municipalities include other emission sources, energy production and emissions from industries.

Data sources in each country vary but mostly can be divided in following groups:

- Local or national energy suppliers and producers;
- Local authorities;
- Public authorities;
- Data bases of local, national or EU statistics.

Data request from each source differs, especially concerning data about energy consumption from energy suppliers. In most cases municipality should make a formal request for necessary data which concern its territory. In such case it should be wise to count on various delays especially when data are requested from local authorities or energy services. In some cases data from energy providers could be issued only after 3-4 weeks after the request has been made. Also problems might occur in countries or territories where heat meters are installed only in a part of buildings. There are even cases when heat meter is installed but is not used for determining the cost of energy (here cost of energy is calculated by heated area).

From local authority various data can be requested starting from basic information about authority including population, area and ending with energy consumption in municipal buildings, public lighting, fleet and other. Local authority can also provide necessary contact information, addresses of buildings and similar. Receiving data from local authority might take even longer time than from energy suppliers, e.g., two to three months. In such cases keeping good communication between involved parties is essential. One of main reason for these delays is lack of optimal data recording system concerning necessary data. For example older data are only available in paper format in archives.

Data concerning transport sector, major energy trends, number of households in the territory or specific energy consumption per household can be obtained from public authorities or Statistical services. In such cases data might be available in online data bases (acquired immediately) but in such cases one should take into account that afterwards data sorting will be necessary.

Requested data will not always be complete. In such cases different approaches might be used. One way is to use extrapolation method if data about larger territory which includes the local authority are available (respectively data can be divided proportionally). Also trends in the sector should be defined and used if necessary, e.g., if data about recent years are not available then trends based on historical data might be used.

One of most problematic sector identified by most of the partners is transport due to the lack of data. Annual fuel consumption in municipal and public transport can be required rather easily at least in cases when public transport in the territory is provided by a specific company. But data about traffic intensity and fuel consumption in private and/or commercial transport are not available or are not even monitored in most municipalities. Therefore different approaches are used to determine the fuel consumption and CO_2 emissions from this sector. Most common approach is to create a specific tool for the particular country or territory. Assumptions used in the tool can be based on results from questionnaires, statistical data in the country, scientific researches and other sources.

CALCULATION OF THE EMISSIONS

Calculating emissions correctly is an important task in BEI. Emission calculation is based on collected data in previous BEI stage where annual total energy consumption has been determined. One has to consider which method to use. Either the chosen method will be using

- "Standard" emission factors in line with the IPCC principles which cover all the CO_2 emissions that occur due to energy consumption within the territory of the local authority, either directly due to fuel combustion within the local authority or indirectly via fuel combustion associated with electricity and heat/cold usage within their area or
- Life Cycle Assessment (LCA) emission factors which take into consideration the overall life cycle of the energy carrier. This approach includes not only the emissions of the final combustion, but also all emissions of the supply chain.

The greenhouse gases to be included in the BEI depend on the choice of sectors and also on the choice of emission factor approach (standard or LCA). If the standard emission factors following the IPCC principles are chosen, it is sufficient to report only CO_2 emissions, because the importance of other greenhouse gases is small. In this case, the box 'CO_2 emissions' is ticked in the SEAP template, in point 'emission reporting unit'. However, also other greenhouse gases can be included in the baseline inventory if the standard emission factors are chosen. For example, the local authority may decide to use emission factors that take into account also CH_4 and N_2O emissions from combustion. Furthermore, if the local authority decides to include landfills and/or wastewater treatment in the inventory, then the CH_4 and N_2O emissions will also be included. In this case the emission reporting unit to be chosen is 'CO_2 equivalent emissions'.

Another aspect which should be taken into account is whether to calculate total emissions (tCO_2) or to calculate specific emissions on one inhabitant (tCO_2/person). In either way Standard or LCA approach can be used.

For each country different approach may be chosen but in most cases Standard emission factors from IPCC Guidelines were chosen to calculate emissions. In Spain and Romania national or regional emission factors were chosen for electricity. The national or regional electricity factor gives a more realistic and objective approach towards determination of overall CO_2 emission in the energy sector. During the implementation period the same information coming from the energy supplier will be considered in respect to all considerations, including the % of renewable energy from the total amount of energy produced. Percentage that will be increased during the year and the overall CO_2 conversion factor should decrease normally.

For one of the Latvian municipalities' national emission factor for district heating was used due to lack of correct information from energy producer. In Spain waste incineration and composting was taken into account therefore CO_2 equivalents were chosen. Emission factors were calculated based on the results provided by a local software tool. In Romania besides standard approach LCA emission factors were used for biomass. In areas where biomass has been harvested in unsustainable way highest LCA emission factor was chosen (0.405 t $CO_{2\text{-eq}}$/MWh) but in other areas emission factor was taken from Ecoinvent database (0.01 t $CO_{2\text{-eq}}$/MWh).

ANALYSIS OF THE RESULTS

This chapter includes the selection criteria of the base year in partner municipalities and its Conurbation towns and also the analysis of the results of the main emitting sectors.

Selection of the base year is of great importance for the next phase when SEAP will be developed. It is important to choose the most appropriate year due to the fact that against this year the CO_2 emission reduction of 20% will have to be reached by 2020.

For each municipality the baseline year may differ. Various factors should be considered while selecting the reference year. First of all baseline year can be chosen only from years with reliable data (e.g. if data are available only for time period 2005-2011 then it is not possible to chose 1990 as baseline year).

Also national decisions should be taken into account – if a country has decided to choose one year as the reference year for measuring its progress in the field then this year should be chosen. For example the year 2005 was chosen in Palma Conurbation because the Regional Government marked the year as a reference in order to receive a grant to develop SEAP. It was a condition to receivable the grant in order to develop each SEAP. Palma de Mallorca too accepted this condition although no grant was received later. The case of Calvia was a bit different because Calvia did not apply for the grant therefore year 2007 was chosen as the baseline year due to the difficulty of finding reliable energy data.

In Cyprus the year 2009 was chosen as the baseline year. This was decided by discussions with several departments of the Municipalities and the EAC. The final decision was made after consultations with Cyprus Energy Agency that concluded that the most balanced, accurate and complete data are available since 2009.

In Romania 2008 has been considered as baseline year for data collection for an objective reason: this is the first year after Romania's integration in the EU when it was mandatory to start fulfilling certain legal requirements related to consumption data reporting and centralizing.

In Croatia the City of Osijek decided to select 2010 as baseline year because this is the year for which there are most of data available. The criteria for selection of baseline year for all conurbation towns were the same. Regarding that the collection of any similar data was not done in the early nineties because of the war in Croatia, it was not possible to collect any data from 1990, or any other following year. Regional Energy Agency of North-western Craoatia, which will be developing SEAPs for Osijek, Belišće and Donji Miholjac decided to check all available data from the year 2000 to year 2011, and according to that decided on the baseline year. They only defined baseline years at the reporting time are for Osijek and Belišće. DOOR (Society for Sustainable Development Design) which will be developing SEAPs for Vinkovci and Beli Manastir had the same process of determination of baseline year. At the reporting time data collection for Vinkovci was still in progress, therefore the baseline year for mentioned Conurbation towns was not yet decided.

In Italy the choice of the baseline year was determined by three main factors:

- Data availability of public authority;
- Availability of data for the Utilities energy distribution;
- Number of energy efficiency measures and renewable energy production has already been done locally by the private sector and the public authority.

For Latvian municipalities data from 2006 till 2011 were gathered. Based on the data availability and quality and also calculated CO_2 emissions, the base year was chosen. In most of the cases the year with the highest CO_2 emissions were selected. In municipality of Salaspils that was 2010 but in municipalities of Ogre and Ķegums the base year is 2007.

Information about chosen baseline years and also calculated CO_2 emissions in all partner municipalities and their Conurbation towns is given in Table 10.

TABLE 10

Selected baseline years and calculated CO_2 emissions in Conurbations

Country	Conurbation town	Base year	CO_2 emissions in the base year, tCO_2	Projected CO_2 emissions in 2020, tCO_2
Bulgaria	**Vratsa**	2010	211 992	158 993
	Kozloduy	2008	40 549	38 774
	Mizia	2010	13 673	10 894
	Oryahovo	2009	28 249	22 645
	Mezdra	2005	52 121	36 700
	Krivodol	2009	952	762
Croatia	**Osijek**	2010	624 938	499 950
	Beli Manastir	2009	65 338	52 270
	Belišće	2010	18 000	14 400
	Donji Miholjac	-	24 000	19 200
	Vinkovci	-	-	-
Cyprus	**Limassol**	2009	705 631	564 505
	Kato Polemidia	2009	61 627	49 302
	Mesa Yitonia	2009	47 605	38 084
	Yermasoyia	2009	77 959	62 367
Italy	**Vicenza**	2006	546 708	437 366
	Arcugnano	2009	40 524	32 420
	Sovizzo	2010	33 974	27 179
	Creazzo	2010	59 655	47 734
	Monticello	2009	48 867	39 094
	Rubano	2006	89 838	71 871
	Vigonza	2009	113 741	90 993
	Ponte S.N.	2009**	61 387	49 110
	Due Carrare	2009**	42 037	33 630
Latvia	**Salaspils**	2010	30 744	24 596
	Ikšķile	2009	6 045	4 836
	Ogre	2007	44 281	35 425
	Lielvārde	2008	10 113	8 091
	Ķegums	2007	5 914	4 731
Romania	**Arad**	2008	1 205 386	964 309
	Lipova	2008	21 250	17 000
	Nădlac	2008	23 766	19 013
	Sântana	2008	15 470	12 376
	Pecica	2008	50 816	40 653
	Bucovăţ	2008	3 595	2 876
	Cărpiniş	2008	11 839	9 471
	Dudeştii noi	2008	5 327	4 262
	Dumbrăviţa	2008	26 840	21 472

Country	Conurbation town	Base year	CO_2 emissions in the base year, tCO_2	Projected CO_2 emissions in 2020, tCO_2
	Ghiroda	2008	13 232	10 586
	Giarmata	2008	13 307	10 646
	Giroc	2008	9 488	7 590
	Jimbolia	2008	31 852	25 482
	Moşniţa nouă	2008	17 332	13 866
	Orţişoara	2008	10 708	8 566
	Peciu nou	2008	-	-
	Pişchia	2008	7 099	5 679
	Remetea mare	2008	8 417	6 734
	Sânandrei	2008	15 668	12 534
	Sânmihaiu român	2008	11 324	9 059
	Şag	2008	7 395	5 916
	Berghin	2008	4 312	3 449
	Ciugud	2008	5 693	4 554
	Ighiu	2008	11 634	9 307
	Santimbru	2008	6 088	4 870
Spain	**Palma**	2005	2 647 334	2 117 867
	Andratx	2005	99 676	79 741
	Calvià	2007	663 657	530 926
	Esporles	2005	25 931	20 745
	Puigpunyent	2005	9 669	6 575
	Santa María del Camí	2005	32 806	26 245
TOTAL			**8 123 116**	**6 486 755**

* Incomplete data

** Still under consideration

According to the information of the partners and their Conurbation towns, each citizen of all the covered municipalities will contribute in reduction of at least 1 ton of CO_2 emissions until 2020 (see Figure 9).

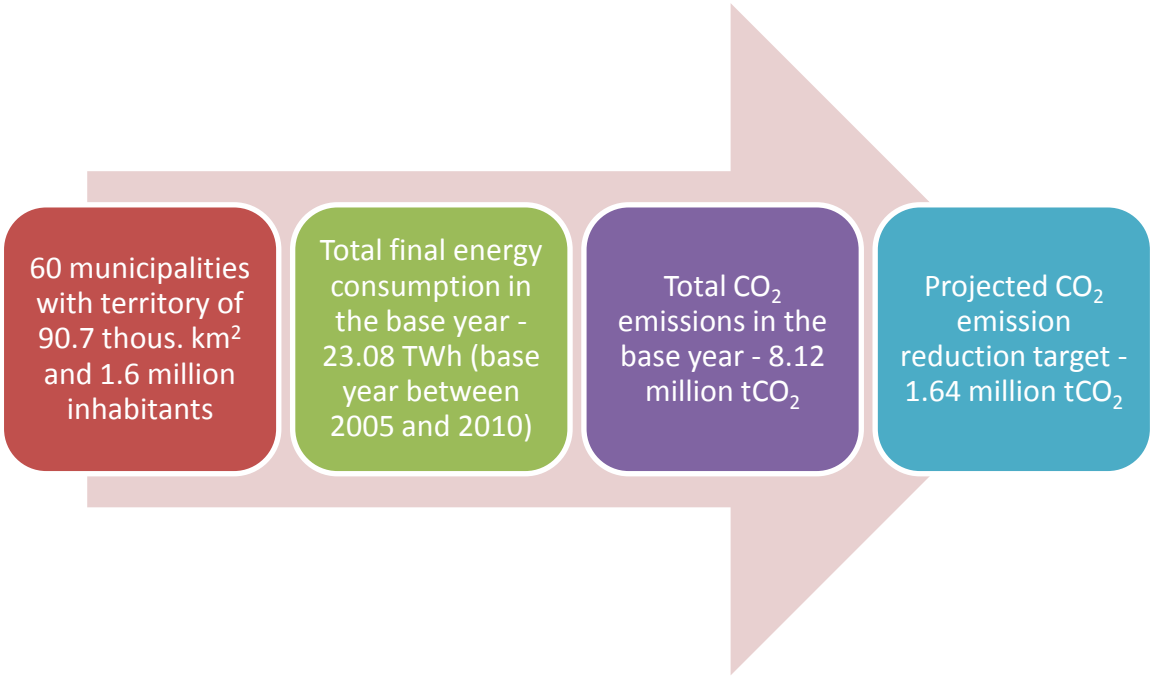

Figure 9: Main results of the BEIs in municipalities of the Conurbant project

LESSONS LEARNED

From data collection and CO_2 emission calculation in Conurbation towns following conclusions can be stated:

- The initial phase of Energy baseline assessment and BEI is of great importance because following stages in the process of developing SEAP are based on collected data.
- Strong support and interest from the local authority is important. If such support exists, BEI can be developed faster and easier. Lack of the support and interest extends data collection period.
- Every local authority should be visited at the beginning of the data collection stage. Such visit is important not only for improving communication between involved stakeholders but also to see and analyze the current situation on site.
- Data collection from private enterprises can be complex; in cooperation with the municipality data from private enterprises can be collected faster and easier (the municipality should send a formal data request).
- Smart planning is essential. Also it would be wise to count on various delays especially when data are requested from local authorities or energy services.
- Accurate data collection is very important – all collected data from local authorities, energy suppliers etc. should be checked and verified before CO_2 emission calculation phase. Also calculated CO_2 emissions should be checked systematically.
- Energy consumption data for transport sector are rather poor in each Conurbation town – assumptions must be made in order to calculate CO_2 emissions and to monitor them in the further years. Therefore questioners or other tools should be used to make assumptions which are as close as possible to reality.

ANNEX. TEMPLATE WITH GUIDELINES FOR PARTNERS

IEE PROJECT CONURBANT

REPORT ON

ENERGY BASELINE ASSESSMENT IN XXX COUNTRY

AUTHOR(S)

NAME OF THE PARTNER

DATE OF WRITING THE REPORT

CONTENTS

INTRODUCTION

Energy baseline assessment includes following tasks:

5. Data collection;
6. Data analysis;
7. Application of the methodology (calculation of the emissions);
8. Analysis of the results (identification of the main categories of emissions and support to the municipalities to use correctly information).

This report forms common template for the energy baseline based on Covenant of Mayors (CoM) organisation guidelines "How to develop a Sustainable Energy Action Plan" at http://www.pilsetumerupakts.eu/IMG/pdf/004_Part_II.pdf.

Each project partner should develop one unified report that includes Energy baseline assessment of its own municipality (except Alba Iulia and Padova) and four Conurbation towns.

The time period is between 1990 and 2011. If data are not available from 1990, please report on the first available and reliable data for each municipality.

The Baseline Emission Inventory (BEI) quantifies the amount of CO_2 emitted due to energy consumption in the territory of the local authority (i.e. Covenant Signatory) in the baseline year. It allows to identify the principal anthropogenic sources of CO_2 emissions and to prioritise the reduction measures accordingly. The local authority may include also CH_4 and N_2O emissions in the BEI. Inclusion of CH_4 and N_2O depends on whether measures to reduce also these greenhouse gases (GHGs) are planned in the Sustainable Energy Action Plan (SEAP), and also on the emission factor approach chosen (standard or life cycle assessment (LCA)). For simplicity, we mainly refer to CO_2 in these guidelines, but it can be understood to mean also other GHGs like CH_4 and N_2O in the case that the local authority includes them in the BEI and SEAP in general.

Elaborating a BEI is of critical importance. This is because the inventory will be the instrument allowing the local authority to measure the impact of its actions related to climate change. The BEI will show where the local authority was at the beginning, and the successive monitoring emission inventories will show the progress towards the objective. Emission inventories are very important elements to maintain the motivation of all parties willing to contribute to the local authority's CO_2 reduction objective, allowing them to see the results of their efforts.

The overall CO_2 reduction target of the Covenant of Mayors Signatories is at least 20% reduction in 2020 achieved through the implementation of the SEAP for those areas of activity relevant to the local authority's mandate. The reduction target is defined in comparison to the baseline year which is set by the local authority.

In the compilation of BEI, the following concepts are of utmost importance:

1. Baseline year. Baseline year is the year against which the achievements of the emission reductions in 2020 shall be compared. The EU has committed to reduce the emissions 20 % by 2020 compared to 1990, and 1990 is also the base year of the Kyoto Protocol. To be able to compare the emission reduction of the EU and the Covenant signatories, a common base year is needed, and therefore 1990 is the recommended baseline year of the BEI. However, if the local authority does not have data to compile an inventory for 1990, then it should choose the closest subsequent year for which the most comprehensive and reliable data can be collected.
2. Activity data. Activity data quantifies the human activity occurring in the territory of the local authority. Examples of activity data are:
    - oil used for space heating in residential buildings [MWh_{fuel}];

- electricity consumed in municipal buildings [MWh_e];
- heat consumed by residential buildings [MWh_{heat}].

3. Emission factors. Emission factors are coefficients which quantify the emission per unit of activity. The emissions are estimated by multiplying the emission factor with corresponding activity data. Examples of emission factors are:
    - amount of CO_2 emitted per MWh of oil consumed [tCO_2/MWh_{fuel}];
    - amount of CO_2 emitted per MWh electricity consumed [tCO_2/MWh_e];
    - amount of CO_2 emitted per MWh heat consumed [tCO_2/MWh_{heat}].

Introduction should include general information on each Conurbation town described in the report in following table (if need, please add rows):

Conurbation town	**Inhabitants**	**Area, km^2**	**Total energy consumption in base year, MWh**	**CO_2 emissions in base year, tCO_2**
…				

DATA COLLECTION

The geographical boundaries of the BEI are the administrative boundaries of the local authority.

The baseline CO_2 inventory will essentially be based on final energy consumption, including both municipal and non-municipal energy consumption in the local authority's territory. However, also those other than energy-related sources may be included in the BEI.

The BEI quantifies the following emissions that occur due to energy consumption in the territory of the local authority:

1. Direct emissions due to fuel combustion in the territory in the buildings, equipment/facilities and transportation sectors.
2. (Indirect) emissions related to production of electricity, heat, or cold that are consumed in the territory.
3. Other direct emissions that occur in the territory, depending on the choice of BEI sectors.

Sectors to be included in the BEI:

Data should be collected in a separate Excel sheet available at http://www.pilsetumerupakts.eu/IMG/xls/template_en.xls (see also Annex 1).

In this chapter partner should describe in detail the data sources used for the data collection. The sources can be:

1) Data from energy suppliers

2) Information from public authorities

3) .... other

Please indicate the source of the data for each sector separately and describe the methodology used to collect these data (how long it took to collect the data, how did you do, did the municipality have most of the data etc.). If the data are e.g. about the buildings, please describe if each building has its own heat meter and when it was installed etc.

A table below should be filled in with collected data from 1990-2011. If data for 1990 are not available, please start to fill in the table with the most recent data available.

Conurbation town	**Final energy consumption, MWh/year**																				
	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11

A separate excel file for each partner municipality should be prepared with detailed Emission baseline assessment and sent together with the report.

More information on activity data collection can be found in the guidelines “How to develop a Sustainable Energy Action Plan” Part II Chapter 4 (page 68).

CALCULATION OF THE EMISSIONS

Two different approaches may be followed when selecting the emission factors:

1. Using 'Standard' emission factors in line with the IPCC principles, which cover all the CO_2 emissions that occur due to energy consumption within the territory of the local authority, either directly due to fuel combustion within the local authority or indirectly via fuel combustion associated with electricity and heat/cold usage within their area. The standard emission factors are based on the carbon content of each fuel, like in national greenhouse gas inventories in the context of the UNFCCC and the Kyoto protocol. In this approach, CO_2 is the most important greenhouse gas, and the emissions of CH_4 and N_2O do not need to be calculated. Furthermore, the CO_2 emissions from the sustainable use of biomass/biofuels, as well as emissions of certified green electricity, are considered to be zero. The standard emission factors given in these guidelines are based on the IPCC 2006 Guidelines (IPCC, 2006). However, the local authority may decide to use also other emission factors that are in line with the IPCC definitions.

2. Using LCA (Life Cycle Assessment) emission factors, which take into consideration the overall life cycle of the energy carrier. This approach includes not only the emissions of the final combustion, but also all emissions of the supply chain. It includes emissions from exploitation, transport and processing (e.g. refinery) steps in addition to the final combustion. This hence includes also emissions that take place outside the location where the fuel is used. In this approach, the GHG emissions from the use of biomass/biofuels, as well as emissions of certified green electricity, are higher than zero. In the case of this approach, other greenhouse gases than CO_2 may play an important role. Therefore, the local authority that decides to use the LCA approach can report emissions as CO_2 equivalent. However, if the methodology/tool used only counts CO_2 emissions, then emissions can be reported as CO_2 (in t).

The greenhouse gases to be included in the BEI depend on the choice of sectors and also on the choice of emission factor approach (standard or LCA). If the standard emission factors following the IPCC principles are chosen, it is sufficient to report only CO_2 emissions, because the importance of other greenhouse gases is small. In this case, the box 'CO_2 emissions' is ticked in the SEAP template, in point 'emission reporting unit'. However, also other greenhouse gases can be included in the baseline inventory if the standard emission factors are chosen. For example, the local authority may decide to use emission factors that take into account also CH_4 and N_2O emissions from combustion. Furthermore, if the local authority decides to include landfills and/or wastewater treatment in the inventory, then the CH_4 and N_2O emissions will also be included. In this case the emission reporting unit to be chosen is 'CO_2 equivalent emissions'.

TABLE 4. STANDARD CO_2 EMISSION FACTORS (FROM IPCC, 2006) AND CO_2-EQUIVALENT LCA EMISSION FACTORS (FROM ELCD) FOR MOST COMMON FUEL TYPES		
TYPE	STANDARD EMISSION FACTOR [t CO_2/MWh]	LCA EMISSION FACTOR [t CO_2-eq/MWh]
Motor Gasoline	0.249	0.299
Gas oil, diesel	0.267	0.305
Residual Fuel Oil	0.279	0.310
Anthracite	0.354	0.393
Other Bituminous Coal	0.341	0.380
Sub-Bituminous Coal	0.346	0.385
Lignite	0.364	0.375
Natural Gas	0.202	0.237
Municipal Wastes (non-biomass fraction)	0.330	0.330
Wood (a)	0 – 0.403	0.002 (b) – 0.405
Plant oil	0 (c)	0.182 (d)
Biodiesel	0 (c)	0.156 (e)
Bioethanol	0 (c)	0.206 (f)
Solar thermal	0	- (g)
Geothermal	0	- (g)

In this chapter partner should describe the chosen emission factor (standard or LCA) and motivate this choice. Please, describe also the emission factors chosen and used (e.g. if IPCC or the country emission factors were used etc.).

A table below should be filled with calculated total CO_2 emissions in the partner municipality and in each Conurbation town. The figures should be consistent with the energy consumption data.

Conurbation town	CO_2 emissions, tCO_2/year																					
	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11

ANALYSIS OF THE RESULTS

This chapter includes the analysis of the results on the main emitting sectors and also the selection of the base year for partner municipality and four Conurbation towns.

BASELINE YEAR

Selection of the base year is of great importance for the next phase when SEAP will be developed. It is important to choose the most appropriate year due to the fact that against this year the CO_2 emission reduction of 20% will have to be reached by 2020.

In this chapter partner should describe the background information for the selection of the base year for each partner municipality and how it was done (e.g. discussions in the municipality and/or group etc.). Table below should be filled in.

Conurbation town	Base year	CO_2 emissions in the base year, tCO_2	Projected CO_2 emissions in 2020, tCO_2
...			

ANNEX 1. BASELINE EMISSION INVENTORY

Sustainable Energy Action Plan (SEAP) template

BASELINE EMISSION INVENTORY

1) **Inventory year**

For Covenant signatories who calculate their CO2 emissions per capita, please precise here the number of inhabitants during the inventory year:

Instructions

2) **Emission factors**

Please tick the corresponding box:

☐ Standard emission factors in line with the IPCC principles
☐ LCA (Life Cycle Assessment) factors

Emission reporting unit

Please tick the corresponding box:

☐ CO2 emissions
☐ CO2 equivalent emissions

3) **Key results of the Baseline Emission Inventory**

Green cells are compulsory fields | **Grey fields are non editable**

A. Final energy consumption

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Category	FINAL ENERGY CONSUMPTION [MWh]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities																
Tertiary (non municipal) buildings, equipment/facilities																
Residential buildings																
Municipal public lighting																
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries																
TRANSPORT:																
Municipal fleet																
Public transport																
Private and commercial transport																
Subtotal transport																
Total																

Municipal purchases of certified green electricity (if any) **[MWh]:**	
CO2 emission factor for certified green electricity purchases (for LCA approach)**:**	

B. CO2 or CO2 equivalent emissions

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Category	CO2 emissions [t]/ CO2 equivalent emissions [t]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Biofuel	Plant oil	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities																
Tertiary (non municipal) buildings, equipement/facilities																
Residential buildings																
Municipal public lighting																
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries																
TRANSPORT:																
Municipal fleet																
Public transport																
Private and commercial transport																
Subtotal transport																
OTHER:																
Waste management																
Waste water management																
Please specify here your other emissions																
Total																

Corresponding CO2-emission factors in [t/MWh]	
CO2 emission factor for electricity not produced locally [t/MWh]	

C. Local electricity production and corresponding CO2 emissions

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Locally generated electricity (excluding ETS plants , and all plants/units > 20 MW)	Locally generated electricity [MWh]	Energy carrier input [MWh]											CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for electricity production in [t/MWh]
		Fossil fuels					Steam	Waste	Plant oil	Other biomass	Other renewable	other		
		Natural gas	Liquid gas	Heating oil	Lignite	Coal								
Wind power														
Hydroelectric power														
Photovoltaic														
Combined Heat and Power														
Other *Please specify:*														
Total														

D. Local heat/cold production (district heating/cooling, CHPs...) and corresponding CO2 emissions

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Locally generated heat/cold	Locally generated heat/cold [MWh]	Energy carrier input [MWh]										CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for heat/cold production in [t/MWh]
		Fossil fuels					Waste	Plant oil	Other biomass	Other renewable	other		
		Natural gas	Liquid gas	Heating oil	Lignite	Coal							
Combined Heat and Power													
District Heating plant(s)													
Other *Please specify:*													
Total													

4) **Other CO2 emission inventories**

If other inventory(ies) have been carried out, please click here ->

Otherwise go to the last part of the SEAP template -> dedicated to your Sustainable Energy Action Plan