



# Reference Data Tool

## User Guide

**Covenant of Mayors East Office**

December 2013

# 1. INTRODUCTION

The Reference Data tool (RDT) has been designed by the Covenant of Mayors East Office **to provide local authorities with reference data on final energy consumption and CO<sub>2</sub> emissions** when preparing their Baseline Emission Inventory (BEI) and Monitoring Emission Inventories (MEIs). The data is available for the 11 Covenant of Mayors (CoM) East countries: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Ukraine, Tajikistan, Turkmenistan and Uzbekistan.

The tool contains a database of national energy consumption by sector and by energy carrier for each of the 11 countries. The **sectors** covered are: residential buildings, services (tertiary buildings, equipment/facilities), industry, agriculture and transport. The **energy carriers** included are: electricity, heat/cold, natural gas, liquid gas, heating oil, diesel, gasoline, lignite/coal, other fossil fuels and plant oil/biofuel. In order to estimate final energy consumption, the tool **scales data from the national level to the municipal level** by using a **scaling variable**, i.e. an indicator that is both available at national and municipal level. In the case of the residential and transport sectors, the scaling variable is the **number of inhabitants**. The **number of employees** (workforce) is the scaling variable applied to estimate the energy consumption in the services, industry and agriculture sectors at the local level.

Note that the Reference Data Tool was developed with the following concept in mind: **provide reference data to support local authorities in the absence of local data. Nevertheless, local authorities are encouraged to put efforts on collecting local data for the different sectors**. Only local data is able to reflect the local circumstances and to monitor the efforts made by local authorities, contrarily to what happens when using estimates based on national data. The municipal sector (buildings, equipment/facilities) is not included in the tool. Energy consumption data concerning this sector can be directly collected by local authorities for instance through the municipal energy expenditure.

Therefore, the tool provides a set of **reference output data on final energy consumption and CO<sub>2</sub> emissions** by sector and by energy carrier. CO<sub>2</sub> emissions are estimated by using the IPCC (Intergovernmental Panel on Climate Change) default emission factors on fuel combustion. Other greenhouse gases are not addressed. Note that the tool does not consider local energy production. Hence, national emission factors for electricity and heat/cold are applied to calculate CO<sub>2</sub> emissions.

This user guide was prepared to **guide Covenant Signatories through the use of the Reference Data Tool**, specifying the main **inputs** that they should provide and the **outputs** generated by the tool.



## 2. GETTING STARTED

The Reference Data Tool is implemented in Microsoft Excel spreadsheet format. It works in Microsoft Excel 2007 and following versions. In order to work, you will need to enable macros in Excel, if this is not your default setting. To change the macro settings, depending on your Office version, you will need to go to:

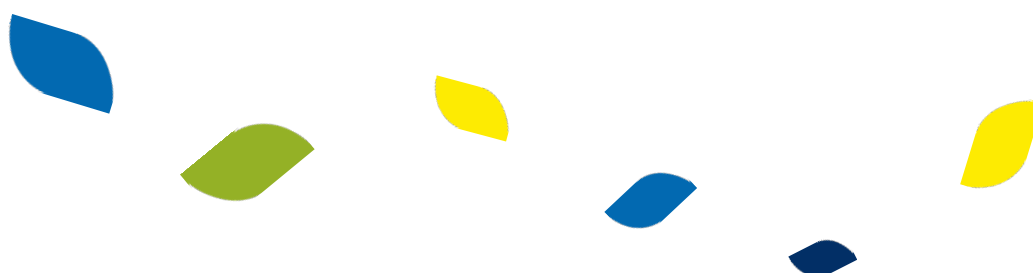
- Excel options (under File) and then click on Trust Center > Trust Center Settings > Macro Settings and click on 'Enable all macros' or
- Excel settings (under the Office button) and then click on Trust Center > Macro Settings and click on Enable all macros.

The Reference Data Tool is structured with input and output worksheets as presented in Table 1.

Table 1 – Overview of the worksheets included in the Reference Data Tool.

Welcome	'Welcome en'	Contains general information on the tool and is available both in English and Russian.
	'Welcome ru'	
Input	'Country choice'	Provides data entry tables.
	'DATA-INPUT'	
Output	'DATA-OUTPUT EC absolute'	Provides data output tables and graphical displays in absolute units (MWh, tonnes CO <sub>2</sub> , pkm, tkm).
	'DATA-OUTPUT CO2 absolute'	
	'DATA-OUTPUT Transport absolute'	
Output	'DATA-OUTPUT EC per capita'	Provides data output tables and graphical displays in absolute units (MWh/capita, tonnes CO <sub>2</sub> /capita, pkm/capita, tkm/capita).
	'DATA-OUTPUT CO2 per capita'	
	'DATA-OUTPUT Transport per capita'	

The navigation between worksheets can be done by using the Excel tabs or by using the navigation buttons at the bottom of each worksheet.



### 3. INPUT DATA

#### 'Country choice' worksheet

In this sheet you will need to select your country from the drop-down menu. Based on the country selected, the tool will use the respective database to generate your output data.

#### 'DATA-INPUT' worksheet

The data entry table (figure 1) requires the following data:

- Number of inhabitants
- Number of employees in the following sectors of activity: Agriculture, Industry and Services/Tertiary buildings, equipment and facilities.

You can enter your data from 2000 until 2009, if available, in order to have an overview of the evolution of your energy consumption and CO<sub>2</sub> emissions in the output sheets. Otherwise, you can simply enter the data for your selected base year. Note that only numbers are allowed in the cells.

The data entered in this sheet will be the basis to generate the output data.

**Quantity matrix**  
Кількісна матриця

Please fill in the tables  
Пожалуйста, заполните таблицы

		Number of inhabitants Населення									
Year Год		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Inhabitants Населення											

		Number of employees Кількість зайнятих									
Year Год		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sector Сектор економіки											
Agriculture Сільське господарство											
Industry (I+M+ETI) Промисловість, інвентарна вантажівка, система торгівлі											
Services (Tertiary) Третинний сектор (Інші)											
Subtotal Сума		0	0	0	0	0	0	0	0	0	0

Before starting the calculation, please fill at least the table "Number of inhabitants" for one year.  
If you have available data for both tables "Number of inhabitants" and "Number of employees", please take care about fill both tables for one corresponding year.

Перш ніж приступити до розрахунку, будь ласка, заповніть по  
Якщо у вас є доступні дані для обидвох таблиць

Figure 1 – Screenshot of the 'DATA-INPUT' worksheet.

# 4. OUTPUT DATA

## 'DATA-OUTPUT EC absolute' worksheet

In this worksheet, you will need to select from the drop-down menu the year for which you would like to visualise the final energy consumption data. All the following output worksheets will refer to the same year.

The final energy consumption data is presented in the table in MWh by sector and by energy carrier for the chosen year. You can also visualise pie charts concerning the final energy consumption per sector (see figure 2) and per energy carrier by clicking on the respective buttons at the bottom of the table.

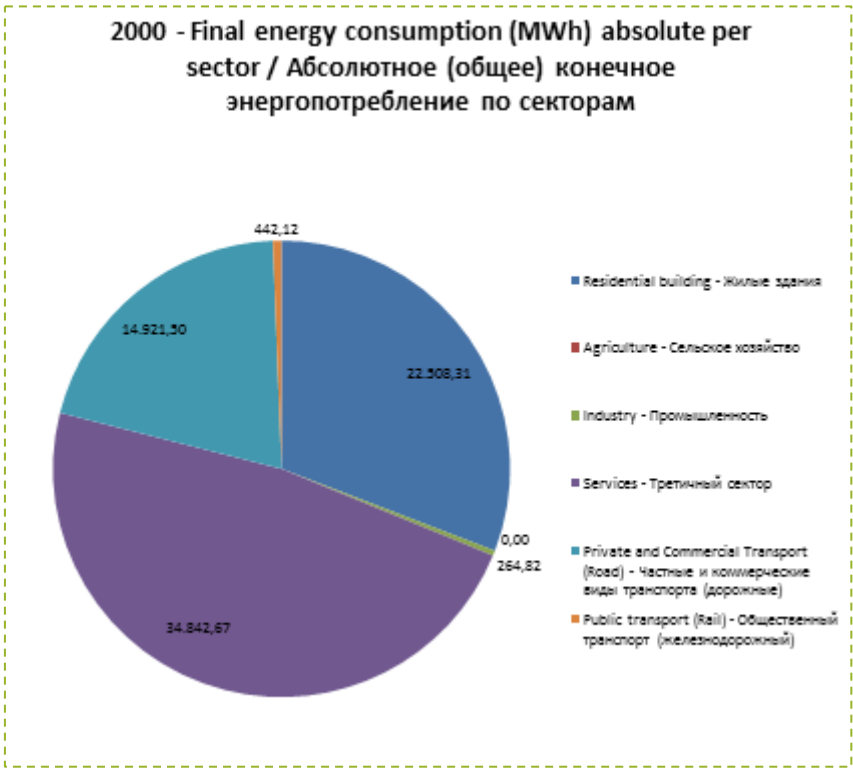


Figure 2 – Graphical representation of final energy consumption per sector.

## 'DATA-OUTPUT CO2 absolute' worksheet

This worksheet is dedicated to the CO<sub>2</sub> emissions in tonnes for the selected year. The Reference Data Tool uses IPCC (Intergovernmental Panel on Climate Change) default emission factors to calculate the CO<sub>2</sub> emissions.

### **‘DATA-OUTPUT Transport absolute’ worksheet**

More detailed data on the transport sector can be found in this worksheet, namely the number of passenger-km<sup>1</sup> travelled and the tonnes-km hauled by road and by train.

### **‘DATA-OUTPUT EC per capita’ worksheet**

In this worksheet, you can visualise your final energy consumption data expressed in MWh per capita. This refers to the amount of energy consumed by person per year.

### **‘DATA-OUTPUT CO2 per capita’ worksheet**

Your CO<sub>2</sub> emissions data is here expressed in tonnes of CO<sub>2</sub> per capita for the selected year.

### **‘DATA-OUTPUT Transport per capita’ worksheet**

Similarly to the previous worksheets, the data is presented in per capita terms.



**Note that when reporting your final energy consumption and CO<sub>2</sub> emissions data in the SEAP and monitoring templates, you must report in absolute and not in per capita terms.**

## **5. DATA SOURCES**

The data included in the Reference Data Tool uses the following sources:

- Number of inhabitants: World Bank (<http://data.worldbank.org/data-catalog>);
- Number of employees by sector of activity: Asian Development Bank (<http://www.adb.org>);
- Final energy consumption by sector: United Nations Statistics Division (<http://unstats.un.org/unsd/energy/>);
- CO<sub>2</sub> emission factors: JRC (2013), SEAP Guidebook ([http://www.soglasheniemerov.eu/support/library\\_ru.html](http://www.soglasheniemerov.eu/support/library_ru.html));
- CO<sub>2</sub> emission factors for heat/cold: IEA (2011), ‘CO<sub>2</sub> emissions from fuel combustion’;
- Mileage, number of vehicles, number of passenger-km/tonnes-km: International transport forum (<http://www.internationaltransportforum.org>); UNECE work on transport statistics (<http://w3.unece.org/pxweb>), World Bank (<http://data.worldbank.org/data-catalog>).

---

<sup>1</sup> Passenger-km - unit of measure representing the transport of one passenger over one kilometre. It is the product of the distance a vehicle travels times the number of occupants travelling that distance.

## ANNEX I – EMISSION FACTORS

### Emission factors for fuel combustion (IPCC, 2006)<sup>2</sup>

Energy carrier	t CO <sub>2</sub> /MWh
Natural gas	0.202
Liquid gas	0.231
Heating Oil/diesel	0.267
Gasoline	0.249
Lignite/Coal	0.364
Other fossil fuels	0.382
Plant oil/Biofuel	0.000

### Emission factors for electricity by country (JRC, 2013)<sup>3</sup>

Country	t CO <sub>2</sub> /MWh									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	
Armenia	0.609	0.652	0.375	0.336	0.374	0.357	0.265	0.254	0.252	
Azerbaijan	0.874	0.810	0.778	0.737	0.701	0.680	0.713	0.900	0.891	
Belarus	0.780	0.752	0.805	0.801	0.920	0.901	0.898	0.899	0.961	
Georgia	0.201	0.215	0.074	0.090	0.121	0.135	0.282	0.211	0.174	
Kazakhstan	1.398	1.409	1.406	1.483	1.538	1.475	1.459	1.507	1.508	
Kyrgyzstan	0.233	0.280	0.272	0.208	0.242	0.212	0.193	0.231	0.149	
Moldova	0.876	0.863	0.669	0.603	0.625	0.625	0.593	0.747	0.684	
Tajikistan	0.014	0.011	0.008	0.010	0.009	0.007	0.013	0.021	0.017	
Turkmenistan	1.369	1.398	1.397	1.397	1.397	1.397	1.396	1.395	1.395	
Ukraine	0.923	0.998	1.009	0.982	0.830	0.851	0.933	0.927	0.924	
Uzbekistan	0.689	0.701	0.708	0.684	0.663	0.664	0.659	0.693	0.615	

<sup>2</sup> IPCC, 2006. Guidelines for National Greenhouse Gas Inventories. Prepared by the National Greenhouse Gas Inventories Programme. Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan. Available at : <<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>

<sup>3</sup> JRC, 2013, 'How to develop a Sustainable Energy Action Plan (SEAP) in the Eastern Partnership and Central Asian Cities – Guidebook', Part II – Baseline Emissions Inventory, JRC scientific and technical reports, <[http://www.soglasheniemerov.eu/support/library\\_ru.html](http://www.soglasheniemerov.eu/support/library_ru.html)>.

## Emission factors for heat/cold by country (IEA, 2011)<sup>4</sup>

Country	t CO <sub>2</sub> /MWh								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Armenia	-	-	-	-	-	-	-	-	-
Azerbaijan	-	-	-	-	-	-	-	-	-
Belarus	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.175
Georgia	-	-	-	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-	-	-	-
Kyrgyzstan	-	-	-	-	-	-	-	-	-
Moldova	0.199	0.199	0.199	0.199	0.199	0.199	0.199	0.199	0.162
Tajikistan	-	-	-	-	-	-	-	-	-
Turkmenistan	-	-	-	-	-	-	-	-	-
Ukraine	0.243	0.243	0.241	0.247	0.247	0.265	0.265	0.265	0.268
Uzbekistan	0.204	0.204	0.204	0.204	0.204	0.204	0.204	0.204	0.205

<sup>4</sup> IEA, 2011, CO<sub>2</sub> emissions from fuel combustion 2011. Available at: <[http://www.oecd-ilibrary.org/content/book/co2\\_fuel-2011-en](http://www.oecd-ilibrary.org/content/book/co2_fuel-2011-en)>; IPCC, 2006. Guidelines for National Greenhouse Gas Inventories. Prepared by the National Greenhouse Gas Inventories Programme. Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan. Available at : <<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>>