

Module 2

Homework

Republic of Serbia

Task 1

Comparison of LEAP dataset and national data sources
(2007 – 2011)

- Key social and economic data (i.e. population, urbanization rate, human development indicator, etc.)
- Historical energy balances
- GHG emission factors

Data sources

All data on fuel production and consumption for GHG emission compiling, are provided from **National Energy Balances** (from Ministry of Mining and Energy).

Data on **population** in Serbia are from Statistical Yearbooks, and GDP from Worldbank (2005 value US\$).

Sectors value added are given in „SERBIA 2012 PROGRESS REPORT.“ from European Commission, e.g. Statistical Yearbooks, as well as Life Expectancy.

National income from 2007-2011 is taken from Official Gazette of Republic of Serbia.

Data on **transportation** (road, rail and air) are taken from Statistical Yearbooks for whole time period. Passenger cars per 1000 people is calculated according to total number of passenger cars from the Statistical Yearbooks, divided by number of people in the country, and one thousand.

The percentage of **population living in urban/rural** areas is 59%/41% for the whole time-period, according to 2011 Census of Population, Households and Dwellings in the Republic of Serbia – Households according to the number of members (Statistical Office of the RS, Book 10).

Data sources

- Data which were used for Serbian GHG Inventory compiling (fuel production and consumption, NCV, population, GDP, transportation data, urbanization...) are national data, provided from official sources.
- All emissions were calculated using Tier 1 methodology; for the next Inventory Serbia is planning to use higher level methodology for certain key categories (e.g. Energy industries).
- The GHG inventory for the Republic of Serbia was prepared according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, and employing the Tier 1 Method for all inventoried years. The internationally recommended emission factors were used, and national net calorific values.

Serbian GHG Inventory at the time is under Government consideration, so data presented in this report are unofficial.

Year	2007	2008	2009	2010	2011
Constraints	0.1	0.1	0.1	0.1	0.1
Other Params	1,995.00	1,995.00	1,995.00	1,995.00	1,995.00
GDP					
GDP PPP	83.8	87	83.9	84.8	84.8
GDP MER	27.6	28.6	27.6	27.9	27.9
GDP (million \$) value of \$ 2005	28952	47760	40249	37076	43753
Abx Value Added					
Agriculture	2.3	2.5	2.5	2.5	2.5
Services	13.8	14.5	14.3	14.3	14.3
Industry	6.6	6.7	5.8	5.8	5.8
Manufacturing					
Manufacturing VA	3.6	3.6	3.6	3.6	3.6
Frac of Industry VA	55.2	54.2	62.3	62.3	62.3
Value added					
Agriculture	10.1	10.5	11.1	11.1	11.1
Services	60.8	61.2	63.1	63.1	63.1
Industry	29.0	28.3	25.8	25.8	25.8
Agriculture	10.1	10.4	9.4	9.9	10.4
Services	62.3	62.2	63.5	63.0	61.9
Industry	22.5	21.9	22.3	22.5	23.0
Population					
Low	9,823.7	9,761.0	9,701.9	9,647.1	9,587.4
Medium	9,823.7	9,761.0	9,701.9	9,647.1	9,597.4
High	9,823.7	9,761.0	9,701.9	9,647.1	9,607.5
Population (million)	7,381	7,350	7,320	7,291	7,258
Income					
Income MER (\$)	2,809.50	2,930.00	2,844.80	2,892.10	2,907.00
Income PPP (\$)	8,530.40	8,913.00	8,647.80	8,790.20	8,835.70
Income (\$)	5,709.98	7,049.09	5,648.09	5,261.57	6,634.09
GDP Constant LCU	1,260.0	1,800.0	1,260.0	1,270.0	1,270.0
GDP Constant LCU (USD)	51,155,615,189.4	56,442,428,013.7	45,194,117,359.4	39,370,351,164.1	42,408,050,987.8
GDP Current LCU	2,880.0	2,860.0	2,720.0	2,880.0	2,880.0
GDP Current LCU (USD)	40,331,023,711.6	49,223,661,818.3	42,684,551,324.0	39,370,351,164.1	46,463,687,409.8
Transportation					
Road Passengers Carried	4,030.0	4,240.0	4,170.0	4,030.0	4,030.0
Road Passengers Carried	4,456.0	4,719.0	4,582.0	4,653.0	4,656.0
Rail Passengers Carried	762.0	749.0	683.0	658.0	658.0
Rail Passengers Carried	687.0	683.0	521.0	522.0	541.0
Air Passengers Carried	1,120,000.0	1,140,000.0	927,000.0	985,000.0	985,000.0
Air Passengers Carried	1,395.0	1,445.0	1,123.0	1,142.0	1,399.0
Road Freight Carried	418.0	427.0	418.0	563.0	563.0
Road Freight Carried	1,161.0	1,112.0	1,185.0	1,689.0	1,907.0
Rail Freight Carried	4,420.0	4,210.0	3,010.0	3,870.0	3,870.0
Rail Freight Carried	4,551.0	4,339.0	2,967.0	3,527.0	3,611.0
Air Freight Carried	3.8	3.4	2.0	2.1	2.1
Air Freight Carried	4.6	4.0	2.7	2.7	2.7
Passenger Cars per 1000 People	200.0	202.0	224.0	215.0	215.0
Passenger Cars per 1000 People	200.0	202.0	224.0	215.0	231.0
Development					
Gini coefficient	29.4	28.2	27.8	29.6	29.6
Life Expectancy (year)	73.4	73.6	73.7	73.9	73.9
Izveštaj o napretku Srbije 2012 (Evropska Komisija)	73.7	73.9	74.1	74.8	74.2
Urbanization					
Urban %	55.1	55.4	55.7	56	56
Rural %	44.9	44.6	44.3	44	44

CO2 (eq) emissions 000 ton (LEAP)	3422	2554.1	1753.1	1866.5	2185.9
CO2 (eq) emissions Gg (National Inventory)	45499.29	44519.307	37188.85	36088.897	38727.205

Task 1 Conclusion: GHG emissions calculated by the LEAP starter dataset is different, e.g. lower than Serbian GHG national emissions

1. Different data on fuel production (import / export) and consumption;
2. Different net calorific values of fuels (national NCV were used in Serbian GHG Inventory);
3. Different default emission factors were used (2006 IPCC default emission factors were used in Serbian GHG Inventory);
4. Fraction of carbon oxidised was presumed to be 1 for all fuels in Serbian GHG Inventory.

Task 2

- a) Improvement of the tree by further disaggregation of the sectors was not possible due to the limited data availability
- b) New LEAP dataset was prepared for the Republic of Serbia

Task 3: Preparation of Reference Scenario for Demand Sectors until 2030

- All data for Task 3 are provided from Draft document of the Energy Development Strategy of the Republic of Serbia for the period until 2025 with projections by 2030.
- Modified projection from the strategy and policy of development of the industry of the Republic Serbia from 2011 to 2020
- Results of census from 2011

Task 3: Preparation of Reference Scenario for Demand Sectors until 2030

- Two scenarios of final energy consumption in the period until 2030 are defined:

The reference scenario (*continuance of the current practice in energy consumption*) and

Scenario with the implementation of energy efficiency measures (maximum promotion of measures of energy efficiency).

Task 3: Preparation of Reference Scenario for Demand Sectors until 2030

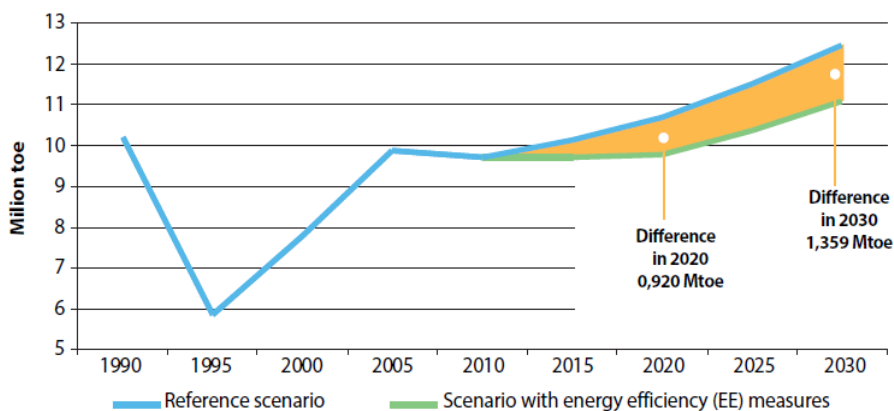
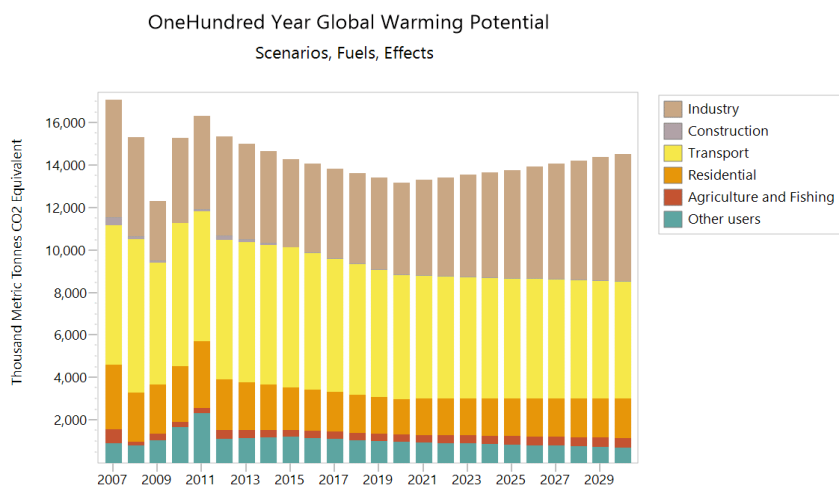
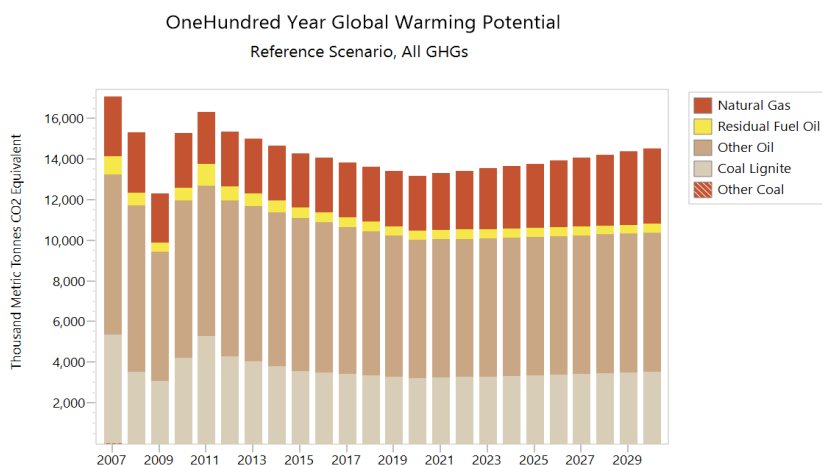


Figure 1. Projection of final energy consumption

Task 3: Preparation of Reference Scenario for Demand Sectors until 2030



Task 3: Preparation of Reference Scenario for Demand Sectors until 2030



One Hundred Year Global Warming Potential												
Reference Scenario, All Fuels, All GHGs												
Branch: Demand												
Units: Thousand Metric Tonnes CO2 Equivalent												
Branches	2008	2010	2012	2014	2016	2018	2020	2022	2024	2026	2028	2030
Industry	4,621.7	3,957.2	4,623.4	4,284.4	4,154.2	4,226.3	4,299.0	4,599.2	4,899.9	5,227.0	5,580.6	5,934.9
Construction	167.6	18.8	211.0	94.0	26.2	28.9	31.7	31.8	31.8	33.1	35.9	38.7
Transport	7,202.1	6,730.5	6,577.5	6,589.7	6,442.0	6,137.5	5,837.0	5,760.2	5,683.7	5,617.4	5,561.3	5,505.5
Residential	2,323.8	2,641.1	2,390.5	2,127.6	1,932.8	1,803.6	1,674.6	1,715.2	1,755.8	1,790.7	1,820.0	1,849.3
Agriculture and Fishing	169.9	226.3	429.6	358.7	331.9	344.3	356.6	376.4	396.2	417.1	439.1	460.9
Other users	838.4	1,700.8	1,128.0	1,200.4	1,184.9	1,083.7	986.4	941.9	894.1	842.7	787.7	729.1
Total	15,323.5	15,274.7	15,360.0	14,654.8	14,072.0	13,624.3	13,185.3	13,424.7	13,661.4	13,928.1	14,224.6	14,518.3