Analysis of the Fossil Fuels Situation of New Members of the European Union to 2014

Lembo Tanning
TTK University of Applied Sciences,
Tallinn, Estonia, EU
lembo.tanning@gmail.com

Toivo Tanning
Tallinn School of Economics,
Tallinn, Estonia, EU
toivo.tanning@gmail.com

***Abstract*—This publication aims at analyzing use of fossil fuels situation in the new European Union (EU) Member States, the Baltic States and Central and Eastern European countries, with special emphasis on natural gas and Baltic States, and to compare them on the Europe and Germany level from 2000 to 2014. Energy security is always one of the most important problems in the EU. The EU and including also new member countries are poor of material and energy region. These countries were part of the former Soviet bloc. With regard to acute political and economic situation in Eastern Europe is very topical, what is the position of resource in the new EU countries, what is resource productivity, or material flow efficiency of small states. This section is focused on non-EU Member States countries on imported fossil fuels, in particular for the purchase of natural gas. How far is the use of these lands resource, including the 2009th economic crisis? What are the lessons from the resource productivity? Which resource saving? What are the prospects for a partial boycott of resources? Scientific novelty is analysis use of gas-effectiveness of small countries and per capita, in relative terms. Usually it is looked major countries and by total material.**

Keywords—fossil fuels, natural gas, resource efficient, resource saving, new EU countries.

I. INTRODUCTION

In the background we look of natural gas in the world. At the beginning we look the whole situation of total fossil fuels, and then separate terms of natural gas. The gas supplies in connection with the war in Ukraine has become very topical. The fossil fuels in 11 new EU states, of CEE-8 and Baltic countries we begin to analyse.

Natural resources underpin the functioning of the European and global economy and our quality of life. Resource-efficient Europe under the Europe 2020 strategy supports the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth. It provides a framework for actions in many policy areas, supporting policy agendas for energy, transport, industry, raw materials, agriculture and regional development. This will provide for economic and employment growth for Europe. It will bring major economic opportunities, improve productivity, drive down costs and boost competitiveness. [1]

II. METHODOLOGY

Fossil energy materials/carriers (MF4) divided: coal and other solid energy materials/carriers (MF41); Liquid and gaseous energy materials/carriers (MF42): Crude oil, condensate and natural gas liquids (MF421), Natural gas (MF422), Fuels bunkered (MF423); Products mainly from fossil energy products (MF43). [2]

The main indicators are: Domestic Extraction Used (DEU). Domestic Material Consumption (DMC). Exports (EXP).Imports (IMP). Direct Material Inputs (DMI). [2]

$$DEU = DMC + (EXP - IMP) \quad (1)$$

$$DMI = DMC + EXP \quad (2)$$

Natural gas *prices for industrial* consumers are defined as follows: Average national price in Euro per Giga Joule (GJ) without taxes applicable for the first semester of each year for medium size industrial consumers (Consumption Band I3 with annual consumption between 10 000 and 100 000 GJ). [3]

Natural gas *prices for household* consumers are defined as follows: Average national price in Euro per GJ including taxes and levies applicable for the first semester of each year for medium size household consumers (Consumption Band D2 with annual consumption between 20 and 200 GJ). [3]

In more detail methodology, the rest of the terms and their definitions are given in the authors' previous works. [4 – 6]

III. THEORETICAL BASE

The history and economic background of his countries and in more detail *theoretical foundations* are given in earlier publications of the authors [7 – 24] and other authors' works [25 - 30].

IV. WORLD NATURAL GAS POSITION

In the background we look at the world natural gas position. In 2013 global natural gas *consumption* grew by 1.4% (EU -1.1%), *production* by 1.1% (EU = -0.5%), *trade* grew by 1.8%, but *LNG trade* rebounded by 0.6%. Total world proved *reserves* of natural gas was: at end 1993 = 118.4; at end 2012 = 185.3; at end 2013 = 185.7 trillion cubic metres (tcm). [31]

Total world *production* growth of natural gas from 2003 to 2013 from 2621.3 to 3369.9 billion cubic metres (bcm). The EU was been retrograde, from 225.8 to 146.8 bcm. In 2013 was the share of the total

global production higher in the US (20.6%) and Russia (17.9%), Iran (4.9%), Qatar (4.7%) Canada (4, 6 %).[31]

In 2013th was the share of the total global *consumption* higher in the US (22.2%), Russia (12.3%), China (4.8%), Iran (4.8%), Japan (3.5%) and Saudi Arabia (3.1%). The share of the EU was (13.1%), Germany (2, 5 %), of CEE-8 countries Poland (0.5%), Romania (0.4%), Czech Republic (0.4%) and Hungary (0.4%).[31]

Next we look gas trade movements by world energy review in 2013th.

In 2013th total world imports- exports natural gas *by pipeline* was 710.6 bcm and total exports of Russian Fed. 211.3 (share of 30%); Norway 104.4 (15%) and Canada 78.9 (11%) bcm. To Europe was import by pipeline from Russia 162.4; Norway 102.4; Netherlands 53.2; Algeria 24.8 and total 397.1 bcm. To Germany was import from Russia 39.8; Norway 33.5; Netherlands 22.4 and total 95.8 bcm. In 2012th was imports by pipeline imports of natural gas to Germany 83.5 billion cubic metres. From Russia export was to Europe 162.4; to Germany 39.8; to Turkey 26.2; to Ukraine 25.1; to Italy 24.9 bcm. Total global export was from Russia 211.3; Norway 104.4; Canada 78.9 bcm. [7]

In 2013th total world imports as *liquefied natural gas* (LNG) was 325.3 bcm. To Japan was imports LNG from Qatar 21.8, Australia 24.4; Malaysia 20.3; Russian Fed. 11.6 and total 119.0 bcm and to South Korea was imports from Qatar 18.3 and total 54.2 bcm. Total export was from Qatar 105.6; Malaysia 33.8; Australia 30.2; Indonesia 22.3; Algeria 14.9; Russia 14.2 bcm. [31]

V. FOSSIL ENERGY POSITION

TABLE 1. DOMESTIC MATERIAL CONSUMPTION BY MATERIAL - 1 000 TONNES. FOSSIL ENERGY MATERIALS [2]

	2000	2007	2008	2009	2010	2012	2013
Estonia	11,841	16,297	15,406	14,285	16,357	16,465	19,150
Latvia	2,197	2,709	2,972	2,584	2,316	2,409	2,230
Lithuania	4,269	5,879	6,256	4,705	5,330	5,462	5,178

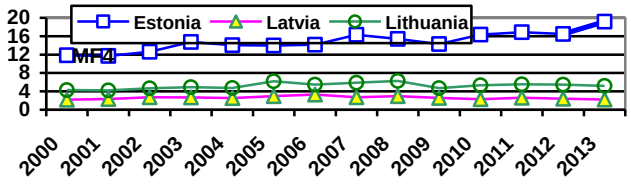

Figure 1. DMC by fossil energy materials/carriers 1000 tonnes. MF4 [2]

EU (27) fossil energy materials/carriers consumption in 2013 was 1,54 million tonnes, within 13 years it decreased 15.2%. It grew until 2005, the peak was 1914 million tonnes. Next it is decreased, which is characterized by a parabola. From 2005 to 2013, consumption dropped by 19.5%.

From 2000 to 2013 Estonia, Latvia and Lithuania growth fossil energy materials consumption according to 61.7%, 1.5% and 21.3%. In 2013 was annual growth of Estonia 16.3%.

TABLE 2. DOMESTIC MATERIAL CONSUMPTION OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA, CEE-8 [32]

	2000	2004	2008	2009	2010	2012	2013
Bulgaria	4.426	4.809	5.524	4.908	5.204	5.691	4.781
Czech Rep.	7.525	7.163	6.86	6.447	6.356	6.258	5.743
Croatia	:	1.906	2.003	1.773	1.754	1.665	1.678
Hungary	3.008	3.360	3.249	2.531	2.61	2.361	2.115
Poland	4.362	4.425	4.378	4.151	4.098	4.322	4.109
Romania	2.346	2.748	2.976	2.647	2.582	2.723	2.532
Slovenia	4.173	4.566	4.868	4.346	4.316	4.207	3.820
Slovakia	3.258	3.359	3.006	2.757	2.749	2.701	2.501

Domestic material consumption (DMC) and extraction used of fossil energy materials/carriers per capita of CEE-8 countries was greatest in Czech Rep. and Bulgaria, even though their economic level is different a great deal.

TABLE 3. DOMESTIC MATERIAL CONSUMPTION OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA, BALTIC [32]

	2000	2004	2008	2009	2010	2012	2013
EU-27	3.76	3.889	3.678	3.404	3.333	3.259	3.066
Germany	5.186	5.466	5.497	5.26	5.287	5.262	5.204
Estonia	8.476	10.30	11.522	10.704	12.285	12.448	14.529
Latvia	0.928	1.128	1.365	1.206	1.104	1.184	1.108
Lithuania	1.22	1.403	1.956	1.487	1.721	1.828	1.751

Domestic material consumption and extraction used of fossil energy materials/carriers per capita was in Estonia very high, thanks to its oil shale. Latvia has it the lowest.

TABLE 4. DOMESTIC EXTRACTION USED OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF CEE-8 COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
Bulgaria	3.242	3.437	3.865	3.657	3.986	4.615	3.987
Czech Rep.	6.666	6.215	5.82	5.42	5.295	5.216	4.549
Croatia	0.591	0.656	0.707	0.692	0.663	0.617	0.566
Hungary	1.887	1.582	1.349	1.327	1.325	1.211	0.984
Poland	4.344	4.267	3.773	3.519	3.455	3.691	3.683
Romania	1.981	2.144	2.34	2.255	2.158	2.256	2.224
Slovenia	2.256	2.41	2.238	2.173	2.165	2.081	1.830
Slovakia	0.693	0.565	0.426	0.466	0.43	0.411	0.328

TABLE 5. DOMESTIC EXTRACTION USED OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF EU-27 AND BALTIC COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
EU (27)	2.154	2.042	1.765	1.664	1.636	1.585	1.491
Germany	2.684	2.749	2.546	2.431	2.398	2.595	2.395
Estonia	7.681	9.174	10.776	10.076	12.041	12.775	14.126
Latvia	0.169	0.266	0.398	0.399	0.336	0.363	0.367
Lithuania	0.165	0.196	0.18	0.15	0.123	0.15	0.165

Of the European was the largest DEU fossil energy materials/carriers than in Norway: 2004th it was 61.845 and of the EU in Estonia: 2013th it was 14.126 tonnes (oil shale) per capita. Of the EU was smaller DEU in Belgium and Sweden - near zero.

TABLE 6. DIRECT MATERIAL INPUTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF CEE-8 COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
EU (27)	4.07	4.256	4.074	3.813	3.754	3.704	3.526
Bulgaria	4.761	5.214	6.15	5.446	5.771	6.369	5.50
Czech Rep.	8.777	8.333	8.176	7.678	7.802	7.514	6.925
Croatia	:	2.542	2.551	2.406	2.357	2.106	2.168
Hungary	3.308	3.821	3.918	3.17	3.176	2.975	2.818
Poland	5.176	5.212	4.948	4.668	4.764	4.85	4.88
Romania	2.50	3.01	3.28	2.912	2.824	2.944	2.782
Slovenia	4.418	4.849	5.372	4.866	4.966	4.96	4.734
Slovakia	4.003	4.259	3.995	3.793	3.873	3.836	3.724

TABLE 7. DIRECT MATERIAL INPUTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF EU-27 AND BALTIC COUNTRIES [32]

	2000	2004	2008	2009	2010	2011	2012	2013
EU-27	4.07	4.256	4.074	3.813	3.754	3.732	3.704	3.526
Germany	5.97	6.477	6.458	6.104	6.19	6.343	6.36	6.352
Estonia	9.22	11.463	13.769	13.371	15.003	15.972	15.155	16.39
Latvia	1.14	1.636	1.976	1.873	1.913	2.244	2.215	2.219
Lithuania	2.237	3.565	4.505	3.965	4.491	4.814	4.83	5.061

Of the EU was the largest DMI of fossil energy materials/carriers in Estonia: 2013th it was 16.39 and of CEE-8 countries in Czech Republic 6.925 tonnes per capita.

TABLE 8. EXTRA EU-27 IMPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA, CEE-7 COUNTRIES [32]

	2000	2004	2008	2009	2010	2011	2012	2013
Bulgaria	1.335	1.647	2.04	1.57	1.531	1.583	1.518	1.284
Czech Rep.	1.531	1.312	1.555	1.454	1.626	1.456	1.342	1.362
Hungary	1.08	1.774	2.051	1.391	1.31	1.322	1.178	1.281
Poland	0.185	0.214	0.329	0.305	0.345	0.337	0.229	0.219
Romania	0.466	0.798	0.794	0.527	0.481	0.503	0.487	0.383
Slovenia	1.306	1.119	1.467	1.196	1.288	1.228	1.142	1.324
Slovakia	2.416	2.585	2.467	2.256	2.213	2.457	2.226	2.290

Of CEE countries were largest fossil energy materials extra EU-27 import in Slovakia and smallest in Poland. It was in Hungary, Poland and Slovenia slightly increased, the other was a loss.

TABLE 9. EXTRA EU-27 IMPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA, BALTIC [32]

	2000	2004	2008	2009	2010	2012	2013
EU-27	2.919	3.313	3.451	3.178	3.263	3.256	3.227
Germany	3.286	3.728	3.912	3.673	3.792	3.765	3.957
Estonia	1.315	1.615	1.596	1.599	1.446	1.296	1.106
Latvia	0.786	0.943	0.969	0.924	0.962	0.933	0.899
Lithuania	1.924	3.263	4.005	3.514	3.957	4.067	4.309

Extra EU-27 imports of fossil energy materials/carriers per capita was in the EU-27, Germany, and Latvia slightly increased, in Estonia markedly decreased and in Lithuania increased by 2.2 times over the analysis period.

TABLE 10. TOTAL EXPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF CEE-8 COUNTRIES [32]

	2000	2004	2008	2009	2010	2011	2012	2013
Bulgaria	0.334	0.405	0.626	0.538	0.567	0.60	0.678	0.719
Czech Rep.	1.252	1.17	1.316	1.232	1.445	1.335	1.256	1.182
Croatia	:	0.637	0.549	0.633	0.603	0.468	0.441	0.490
Hungary	0.30	0.461	0.669	0.639	0.567	0.598	0.614	0.703
Poland	0.813	0.787	0.57	0.517	0.666	0.61	0.528	0.771
Romania	0.154	0.262	0.304	0.265	0.242	0.245	0.222	0.250
Slovenia	0.244	0.283	0.504	0.519	0.649	0.676	0.753	0.914
Slovakia	0.745	0.90	0.99	1.035	1.124	1.268	1.135	1.223

TABLE 11. TOTAL EXPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF EU-27 AND BALTIC COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
EU-27	1.222	1.364	1.373	1.288	1.384	1.432	1.488
Germany	0.784	1.011	0.961	0.844	0.903	1.098	1.149
Estonia	0.744	1.163	2.247	2.667	2.718	2.707	1.861
Latvia	0.212	0.508	0.611	0.666	0.809	1.031	1.111
Lithuania	1.017	2.163	2.549	2.477	2.77	3.002	3.310

In all EU countries total and extra EU-27 exporting fossil energy materials, including the Baltic States and CEE-8 countries, consumption has increased.

TABLE 12. EXTRA EU-27 EXPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF CEE-8 COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
Bulgaria	0.233	0.287	0.488	0.378	0.447	0.539	0.576
Czech Rep.	0.020	0.035	0.042	0.067	0.067	0.066	0.056
Hungary	0.048	0.14	0.173	0.13	0.138	0.141	0.193
Poland	0.082	0.067	0.077	0.08	0.082	0.102	0.134
Romania	0.087	0.144	0.187	0.149	0.126	0.146	0.153
Slovenia	0.098	0.073	0.188	0.183	0.233	0.207	0.226
Slovakia	0.016	0.035	0.06	0.042	0.047	0.037	0.043

TABLE 13. EXTRA EU-27 EXPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF EU-27 AND BALTIC COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
EU-27	0.311	0.367	0.396	0.409	0.42	0.445	0.460
Germany	0.186	0.214	0.226	0.204	0.205	0.266	0.228
Estonia	0.059	0.235	0.93	1.292	1.26	1.171	0.586
Latvia	0.034	0.102	0.12	0.086	0.135	0.229	0.201
Lithuania	0.196	0.804	0.703	0.651	0.803	0.515	0.945

In 2013, the extra EU-27 export of fossil energy materials most of Lithuania, it was 0.945 tonnes per capita. Great was this also in Estonia and Bulgaria.

TABLE 14. TOTAL IMPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF CEE-8 COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
Bulgaria	1.519	1.777	2.285	1.789	1.785	1.754	1.513
Czech Rep.	2.111	2.117	2.355	2.259	2.507	2.298	2.376
Croatia	:	1.886	1.845	1.714	1.694	1.489	1.602
Hungary	1.421	2.239	2.569	1.843	1.851	1.765	1.834
Poland	0.832	0.945	1.175	1.149	1.308	1.159	1.197
Romania	0.519	0.866	0.94	0.657	0.666	0.689	0.558
Slovenia	2.162	2.439	3.134	2.693	2.8	2.879	2.904
Slovakia	3.311	3.694	3.569	3.327	3.443	3.425	3.396

Of CEE-8 countries was the largest fossil energy materials import in Slovakia and smallest in Romania.

TABLE 15. TOTAL IMPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF EU-27 AND BALTIC COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
EU-27	2.919	3.313	3.451	3.178	3.263	3.256	3.227
Germany	3.286	3.728	3.912	3.673	3.792	3.765	3.957
Estonia	1.539	2.289	2.993	3.294	2.962	2.38	2.264
Latvia	0.972	1.37	1.578	1.473	1.577	1.852	1.852
Lithuania	2.072	3.369	4.324	3.815	4.368	4.68	4.896

Of Baltic countries was the largest fossil energy materials total import and extra EU-27 import in Lithuania. Latvia and Estonia import was lower than in EU-27 and Germany.

Of CEE countries was the largest fossil energy materials import in Slovakia 3.396 and smallest in Romania 0.558 tonnes per capita. As a rule, to economic boom grew, decreased further.

Of Baltic countries was the largest fossil energy materials/carriers total import and extra EU-27 import in Lithuania 4.896. Latvia and Estonia import was lower than in EU-27 middle.

This section is focused on the third (non-EU Member States) countries on imported fossil fuels, especially crude oil imports, and in particular for the purchase of natural gas from Russia.

VI. NATURAL GAS

This main focus is the analysis of the *gas*. In particular imports from third countries.

TABLE 16. DOMESTIC MATERIAL CONSUMPTION OF NATURAL GAS OF CEE AND BALTIC COUNTRIES. TONNES PER CAPITA [32]

	2000	2004	2008	2009	2010	2012
Bulgaria	:	0.33	:	:	:	0.277
Czech Rep.	0.953	0.637	0.627	0.617	0.723	0.647
Estonia	0.006	0.118	0.551	0.368	0.38	0.352
Latvia	0.385	0.447	0.546	0.511	0.575	0.542
Lithuania	0.513	0.532	0.651	0.535	0.64	0.747
Hungary	1.007	1.235	1.323	0.959	0.947	0.731
Poland	0.279	0.332	0.174	0.181	0.171	0.169
Romania	:	:	:	:	:	0.461
Slovenia	0.387	0.445	0.403	0.405	0.455	0.367
Slovakia	1.071	1.036	0.869	0.856	0.923	0.797

EU's largest gas consumers in 2012 were the Netherlands 2.155, Luxembourg 1.853, Austria1.07, Belgium 1.042 and Germany 0.997 tonnes per capita. Sweden consumed 0.102 tonnes per capita, and Cyprus and Malta still less. By comparison, the Norwegian consumes 7.5 to 10 tonnes per capita.

Largest gas consumers in 2012 of CEE and Baltic countries were Slovakia 0.797; Lithuania 0.747 and Hungary 0.731 and smaller Poland 0.169 tonnes per capita.

Gas consumers from 2000 to 2012 increased in Baltic and decreased in CEE countries, Slovenia was stable.

TABLE 17. TOTAL IMPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF CEE-8 COUNTRIES [32]

	2000	2004	2008	2009	2010	2012	2013
Bulgaria	1.519	1.777	2.285	1.789	1.785	1.754	1.513
Czech Rep.	2.111	2.117	2.355	2.259	2.507	2.298	2.376
Croatia	:	1.886	1.845	1.714	1.694	1.489	1.602
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Of CEE-8 countries was the largest fossil energy materials import in Slovakia and smallest in Romania.

TABLE 18. TOTAL IMPORTS OF FOSSIL ENERGY MATERIALS TONNES PER CAPITA OF EU-27 AND BALTIC COUNTRIES [32]

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EU-27	2.919	3.313	3.451	3.178	3.263	3.256	3.227
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Latvia	0.972	1.37	1.578	1.473	1.577	1.852	1.852
Lithuania	2.072	3.369	4.324	3.815	4.368	4.68	4.896

Of Baltic countries was the largest fossil energy materials total import and extra EU-27 import in Lithuania. Latvia and Estonia import was lower than in EU-27 and Germany.

TABLE 19. TOTAL IMPORTS AND EXTRA EU-27 IMPORTS OF NATURAL GAS OF EU-27. TONNES PER CAPITA [32]

EU-27	2000	2004	2008	2009	2010	2012
Total Imports	0.476	0.577	0.638	0.594	0.616	0.595
Extra EU-27 Imports	0.333	0.387	0.454	0.411	0.399	0.381

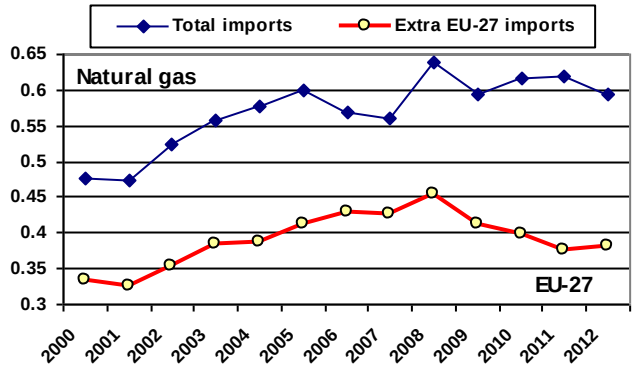

Figure 2. DMC, total and extra EU-27 imports of natural gas tonnes per capita of EU-27 [32]

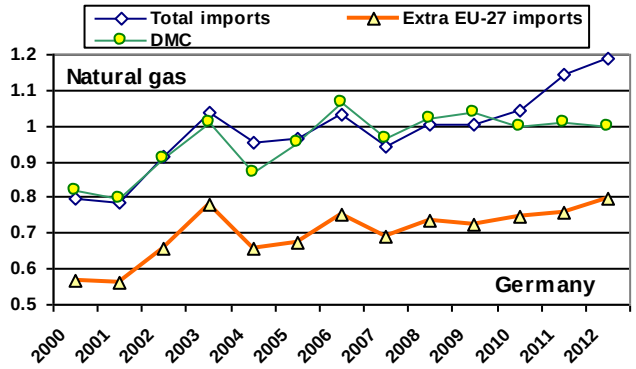

Figure 3. DMC, total and extra EU-27 imports of natural gas tonnes per capita of Germany [32]

TABLE 20. DMC, TOTAL IMPORTS AND EXTRA EU-27 IMPORTS OF NATURAL GAS TONNES PER CAPITA OF GERMANY [32]

Germany	2000	2004	2008	2009	2010	2012
DMC	0,822	0,868	1,023	1,037	0,999	0,997
Total Imports	0,797	0,954	1,004	1,005	1,044	1,188
Extra EU27 Imports	0,569	0,659	0,736	0,724	0,747	0,799

TABLE 21. DMC, TOTAL IMPORTS AND EXTRA EU-27 IMPORTS OF NATURAL GAS TONNES PER CAPITA OF BALTIC COUNTRIES [32]

Estonia	2000	2004	2008	2009	2010	2012
DMC	0.006	0.118	0.551	0.368	0.38	0.352
Total Imports	0.006	0.119	0.551	0.368	0.382	0.362
Extra EU-27 Imports	0.006	0.118	0.511	0.315	0.353	0.346

Latvia	2000	2004	2008	2009	2010	2012
DMC	0.385	0.447	0.546	0.511	0.575	0.542
Total Imports	0.385	0.451	0.565	0.539	0.613	0.584
Extra EU-27 Imports	0.380	0.446	0.555	0.532	0.61	0.576

Lithuania	2000	2004	2008	2009	2010	2012
DMC	0.513	0.532	0.651	0.535	0.64	0.747
Total Imports	0.55	0.611	0.727	0.584	0.697	0.795
Extra EU-27 Imports	0.55	0.609	0.718	0.57	0.68	0.778

DMC, Total and Extra EU-27 Imports of natural gas of Estonia, Latvia, Lithuania, Bulgaria and Slovakia differ very little, but Croatia, Hungary, Romania, Slovenia, and total the EU-27 a lot.

TABLE 22. TOTAL EXTRA EU27 IMPORTS OF NATURAL GAS TONNES PER CAPITA, CEE-7 COUNTRIES [32]

	2000	2004	2008	2009	2010	2012
Bulgaria	0.305	0.300	0.327	0.235	0.233	0.222
Czech Rep	0.927	0.631	0.672	0.646	0.772	0.569
Hungary	0.587	0.818	1.01	0.588	0.52	0.396
Poland	0.020	0.036	0.018	0.009	0.008	0.008
Romania	0.095	0.16	0.15	0.072	0.08	0.084
Slovenia	0.379	0.363	0.318	0.291	0.31	0.187
Slovakia	1.031	1.001	0.866	0.751	0.911	0.785

Total imports and extra EU27 imports of natural gas of CEE countries are very small differences. This means that the gas imported from outside of EU.

TABLE 23. TOTAL EXTRA EU27 IMPORTS OF NATURAL GAS (MF422) TONNES PER CAPITA OF BALTIC COUNTRIES [32]

	2000	2004	2007	2008	2009	2010	2011	2012
Estonia	0.06	0.118	0.572	0.511	0.315	0.353	0.32	0.346
Latvia	0.38	0.446	0.566	0.555	0.532	0.61	0.597	0.576
Lithuania	0.55	0.609	0.771	0.718	0.57	0.68	0.807	0.778

In 2012 of EU-27 was extra EU-27 imports natural gas 0.381 tonnes per capita. The largest importers were Belgium (1.022), Netherlands (0.877), Austria (0.821), Germany (0.799), Slovakia (0.785) and Lithuania (0.778). At the same time, some countries, it was close to zero. In Estonia (0.346) was it a bit smaller and Latvia (0.576) higher than the EU average.

For 10 years extra EU-27 imports natural gas has been very stable in most countries. In 2003 - 2012 only in Estonia and United Kingdom was strong growth and in France in Hungary a big loss. Estonia extra EU-27 imports natural gas grew strongly until 2007. Next, it decreased and stabilized in the next four years. Latvia and Lithuania are much bigger than Estonia, Lithuania in 2012, even 2.2 times. When Latvia extra EU-27 imports natural gas per capita was stable, then the Lithuanian imports small rose. Extra EU-27 imports natural gas per capita in Latvia and Lithuania is much greater than in Estonia.

TABLE 24. IMPORTS OF NATURAL GAS. MONTHLY DATA 2014. TERAJOULES (GROSS CALORIFIC VALUE = GCV).

CODE: NRG_IND_343M [33]

	2014M01	2014M02	2014M03	2014M04	2014M05	2014M06	2014M07	2014M08	2014M09	2014M10
Bulgaria	9,433	7,758	10,566	10,060	9,193	8,270	6,102	5,133	7,969	8,571
Czech Rep.	118,213	110,620	119,509	113,251	115,111	103,463	104,872	98,701	117,526	134,935
Estonia	3,463	2,382	2,204	1,577	1,133	727	670	802	884	1,663
Croatia	3,042	2,855	2,536	2,867	2,725	3,203	3,458	3,557	3,821	4,331
Latvia	2,815	629	1,074	0	234	883	435	1,138	975	1,920
Lithuania	12,949	10,047	9,377	6,698	6,028	6,400	5,022	4,800	5,470	8,037
Hungary	25,050	20,756	20,717	27,184	30,738	28,473	32,419	32,914	35,720	41,163
Poland	42,407	34,292	37,624	39,645	39,513	38,079	38,269	31,100	32,193	38,288
Romania	6,735	4,663	2,114	475	383	630	763	166	239	243
Slovenia	6,586	5,605	5,046	4,819	4,374	4,583	4,929	4,914	5,366	6,403
Slovakia	165,702	120,763	150,566	148,733	153,617	153,627	133,998	114,097	:	:

Let's look this table of the European Union and Russia on mutual economic boycott (conflict) basis. We see that basically there is no gas imports in 2014, to the former Soviet bloc countries has decreased. Great decrease in imports was only Romania. The reason is his new gas fields. The biggest importer of gas has risen Czech Rep. and significantly decreased in Slovakia.

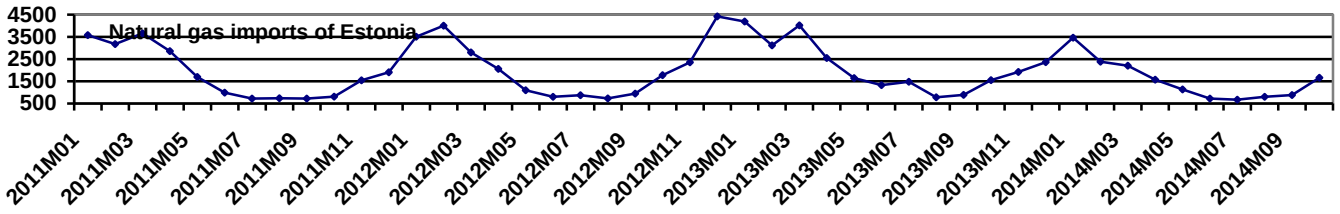

Figure 4. Natural gas imports of Estonia, 2011 - 2014. Terajoules. Code: nrg_ind_343m [33]

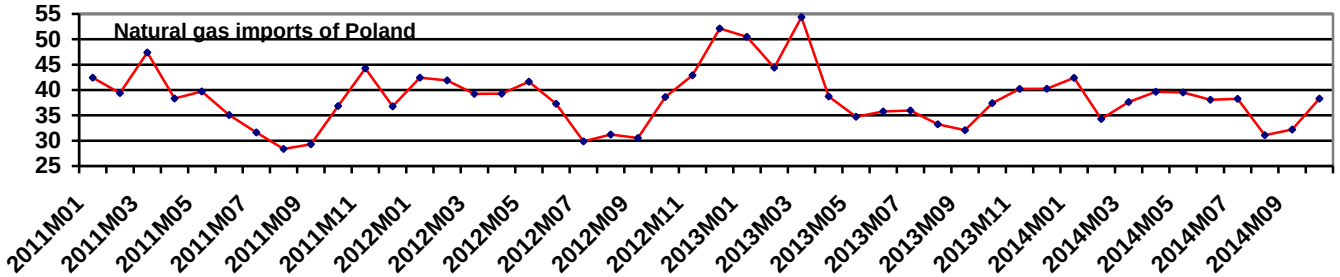

Figure 5. Natural gas imports of Poland, 2011 - 2014. Terajoules. Code: nrg_ind_343m [33]

Estonia's gas imports have fluctuated dramatically the past four years, nearly six times. From the summer of 2014, however, imports increased by more than two times.

Polish gas imports has fluctuated over the past four years only twice. From the summer of 2014. it is also grown.

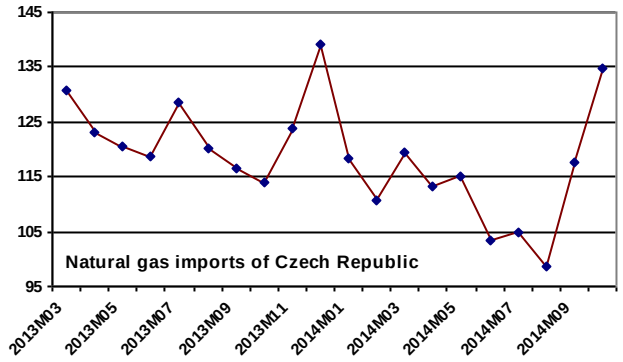

Figure 6. Natural gas imports of Czech Rep., 2011 - 2014. Terajoules. Code: nrg_ind_343m [33]

Gas imports of Czech Rep. have been relatively stable over the past two years. However of CEE-8 countries it is the largest importer of gas.

TABLE 25. CLOSING STOCKS OF NATURAL GAS. MONTHLY DATA 2014. TERAJOULES (GROSS CALORIFIC VALUE = GCV). CODE: NRG_IND_343M [34]

	2014M01	2014M04	2014M07	2014M09	2014M10
Bulgaria	10,496	10,019	15,644	17,149	17,961
Czech Rep.	61,954	49,630	99,868	112,126	112,597
Estonia	0	0	0	0	0
Croatia	11,482	7,895	14,915	18,195	19,575
Latvia	9,618	5,513	4,312	4,339	4,310
Lithuania	670	633	670	633	707
Hungary	64,188	54,488	101,331	140,801	161,002
Poland	73,862	62,470	100,778	115,949	115,321
Romania	89,130	78,066	93,350	111,172	113,449
Slovenia	0	0	0	0	0
Slovakia	61,404	54,884	105,243	:	:

The precarious situation of the gas market is closing stocks of natural gas are very important. Estonia and Slovenia are not available. However together with Finland, Estonia plans to build an LNG terminal. Of CEE-8 countries are the largest closing stocks of natural gas Hungary. Of EU countries were at the greatest 2014M10 closing stocks of natural gas in Germany – 826 108, Italy - France and 672 084 - 476 121 terajoules.

The price of the euro area of *medium size households* has increased 1.6 times. In all CEE-8 and the Baltic countries, the price was lower than the euro area average (20.23). It was higher in Slovenia 18.54 and lower in Romania 8.58 EUR per gigajoule. In 2014, at all was the price lower than the price of the record previous years, except of Poland, Romania and Slovakia.

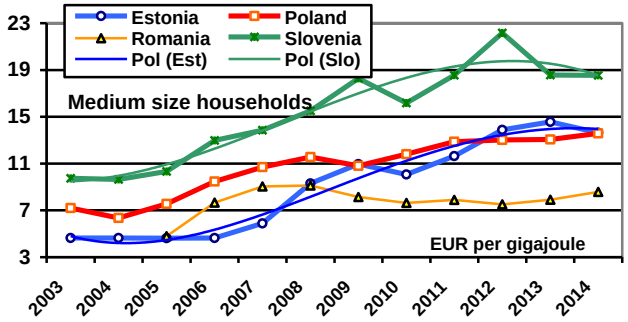

Figure 7. Gas prices households, 2003-2014[3]

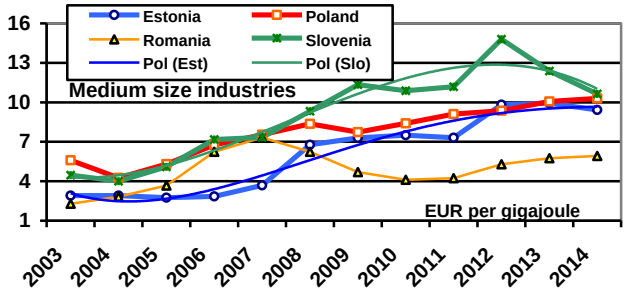

Figure 8. Gas prices industries, 2003-2014[3]

Households of Estonia: Pol (Est) $y = 0{,}0008x^4 - 0{,}0448x^3 + 0{,}6715x^2 - 2{,}3001x + 6{,}4742$; $R^2 = 0{,}9606(3)$

Households of Slovenia: Pol (Slo) $y = -0{,}0243x^3 + 0{,}3995x^2 - 0{,}5583x + 9{,}667$; $R^2 = 0{,}9203(4)$

Industries of Estonia: Pol (Est) $y = 0{,}0015x^4 - 0{,}0578x^3 + 0{,}7038x^2 - 2{,}3286x; + 4{,}762$; $R^2 = 0{,}9447(5)$

Industries of Slovenia: Pol (Slo) $y = -0{,}0268x^3 + 0{,}4467x^2 - 0{,}9882x + 4{,}8627$; $R^2 = 0{,}9342(6)$

The price of the euro area of *medium size* industries has increased also 1.5 times, but a third smaller than the households. CEE-8 and the Baltic countries prices are a little different from the average price of the euro area, except for Romania. The higher price was in Lithuania 11.498 and lower in Romania 5.918 EUR per gigajoule. In 2014, at all was the price lower than the price of previous years, except of Romania, Poland and Slovakia.

4-degree polynomials of Estonia and 3-degree polynomials of Slovenia are characterized prices of gas dynamics.

TABLE 26. GAS PRICES BY TYPE OF USER. *MEDIUM SIZE INDUSTRIES.* EUR PER GIGAJOULE [3]

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bulgaria	:	3.5	3.777	4.502	5.217	5.716	8.743	6.662	7.976	10.032	9.894	9.495
Czech Rep.	4.136	4.201	5.109	7.341	6.563	8.538	8.982	8.228	8.357	8.969	9	8.454
Estonia	2.913	2.913	2.752	2.845	3.691	6.777	7.301	7.502	7.31	9.82	9.94	9.42
Croatia	:	:	6.422	6.572	6.577	6.1	7.32	9.45	11.238	11.85	12.694	11.408
Latvia	:	3.474	3.476	4.052	5.29	7.903	10.859	7.158	8.118	9.938	9.939	9.24
Lithuania	4.205	3.828	3.606	4.454	6.021	8.787	8.73	8.912	9.74	12.477	12.234	11.498
Hungary	5.199	5.415	5.807	7.953	9.477	9.389	10.044	7.976	8.26	11.599	10.942	10.681
Poland	5.594	4.261	5.305	6.767	7.545	8.363	7.733	8.401	9.11	9.359	10.062	10.296
Romania	2.293	2.829	3.678	6.234	7.319	6.233	4.7	4.115	4.23	5.286	5.75	5.918
Slovenia	4.46	4.003	5.096	7.17	7.33	9.33	11.34	10.877	11.19	14.8	12.38	10.64
Slovakia	:	5.328	5.081	7.655	8	9.279	11.12	8.739	9.22	10.6	9.88	9.91

TABLE 27. GAS PRICES BY TYPE OF USER. *MEDIUM SIZE HOUSEHOLDS.* EUR PER GIGAJOULE [3]

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bulgaria	:	6.748	6.731	7.7	8.835	9.848	13.14	10.211	11.944	13.723	14.24	13.626
Czech Rep.	6.351	6.566	7.494	10.026	9.454	12.202	13.748	13.04	15.125	18.311	17.803	15.228
Estonia	4.636	4.636	4.63	4.635	5.888	9.3	10.96	10.068	11.64	13.88	14.57	13.64
Croatia	:	:	7.99	8.176	8.183	7.592	8.859	10.633	10.421	10.644	12.919	12.898
Latvia	:	4.22	4.538	5.345	7.498	8.704	14.541	8.726	10.749	14.235	14.052	13.45
Lithuania	:	5.45	5.41	6.238	7.044	9.147	11.799	10.431	12.074	14.165	16.746	15.538
Hungary	4.411	4.756	5.1	5.282	7.16	11.237	13.377	14.871	15.572	13.429	12.01	10.147
Poland	7.203	6.344	7.55	9.463	10.692	11.562	10.801	11.807	12.872	13.019	13.055	13.587
Romania	:	:	4.792	7.66	9.049	9.212	8.114	7.638	7.898	7.517	7.911	8.58
Slovenia	9.874	9.641	10.331	12.986	13.86	15.51	18.28	16.177	18.56	22.16	18.57	18.54
Slovakia	:	7.267	8.14	10.882	11.482	11.888	12.829	12.111	12.93	14.32	13.85	14.1

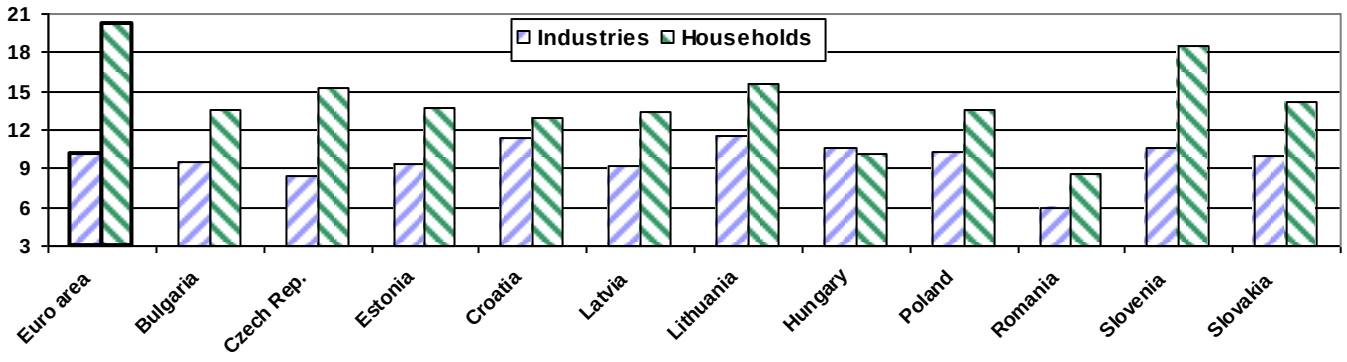

Figure 9. Gas prices by type of user, EUR per gigajoule, 2014 [3]

Households and industries gas prices ratio is very different from country to country.

Taking into account this publication and the previous work of the authors [4 – 24] and other authors' works [25 - 30] have made the following conclusions and suggestions.

VII. DISCUSSION & CONCLUSIONS

- In 2013 global natural gas *consumption*, *production*, *trade* and also total world proved *reserves* of natural gas grew, but *LNG trade* rebounded.
- Of the European were the largest domestic extraction used fossil energy materials than in Norway: 2004th it was 61.845 and of the EU in Estonia: 2013th it was 14.126 tonnes per capita.
- Of the EU was the largest direct material inputs of fossil energy materials/carriers in Estonia.
- EU's largest gas consumers in 2012 were the Netherlands 2.155, Luxembourg 1.853, Austria1.07, Belgium 1.042 and Germany 0.997 tonnes per capita.
- EU-27 fossil energy materials consumption decreased 12 years 10.1%; Estonia, Latvia and Lithuania grew according to 39.0%, 9.6% and 27.9%.
- Largest gas consumers in 2012 of CEE and Baltic countries were Slovakia 0.797; Lithuania 0.747

and Hungary 0.731 and smaller Poland 0.169 tonnes per capita.

- Gas consumers from 2000 to 2012 increased in Baltic and decreased in CEE countries, Slovenia was stable.
- Resource export shows that the EU and the Baltic countries are not very poor in terms of material or natural resources. Exports resource per capita grew in all Baltic countries in 2003 - 2012: in Estonia - of 1.4 times, in Latvia and in Lithuania –of two times.
- Total exports; direct material inputs and domestic extraction used resource per capita grew in all Baltic countries in 2003 – 2012.
- In all EU countries total and extra EU-27 exporting fossil energy materials, including the Baltic States and CEE-8 countries, consumption has increased.
- In 2013, the extra EU-27 export of fossil energy materials most of Lithuania.
- The EU is, however, a poor energy region, it is unexpected decrease in mineral fuels (sanctions) is very sensitive.
- The great problem in the energy sector of EU is growing import of natural gas dependence on Russia and high import price level.
- So far the mineral fuels imports from third countries progressed steadily.
- Extra EU-27 imports liquid and gaseous energy materials and crude oil per capita: Latvia - small decrease, Lithuania – growth, Estonia - growth over 2 times.
- Of CEE-8 countries was the largest fossil energy materials import in Slovakia and smallest in Romania.
- Of Baltic countries was the largest fossil energy materials total import and extra EU-27 import in Lithuania.
- Total imports resource per capita grew in all Baltic countries.
- Before the crisis grew in all extra EU-27 imports resource per capita. However, already before the crisis began Latvia and Estonia this decrease.
- In summary, total extra EU27 imports resource per capita trend: Lithuania intermittent growing, Estonia decrease and Latvia was stable.
- Extra EU27 imports per capita of Estonia and Latvia was two times less when in Lithuania. This shows that Latvia and Estonia should be much better over live an economic blockade when Lithuania.
- In the EU-27 in 2012 was extra EU-27 imports natural gas 0,381 tonnes per capita. The largest importers was Belgium 1.022, Lithuania was 0.778. In Estonia (0.346) was it a bit smaller and Latvia (0.576) higher than the EU average. For 10 years extra EU-27 imports natural gas has been very stable in most countries. Only in Estonia and UK was strong growth and in France in Hungary a big loss.
- Extra EU imports natural gas per capita in Latvia and Lithuania is much greater than Estonia.
- Estonia's gas imports have fluctuated dramatically the past four years, nearly six times. Polish gas imports has fluctuated over the past four years only twice.
- Of the Baltic countries are more dependent of the imported resources Lithuania.
- The precarious situation of the gas market is closing stocks of natural gas are very important. Estonia and Slovenia are not available. However together with Finland, Estonia plans to build an LNG terminal.
- The price of the euro area of *medium size households* has increased 1.6 times. In all CEE-8 and the Baltic countries, the price was lower than the euro area average (20.23).
- The price of the euro area of *medium size* industries has increased also 1.5 times, but a third smaller than the households. CEE-8 and the Baltic countries prices are a little different from the average price of the euro area.
- Households and industries gas prices ratio is very different from country to country.
- The use of environmentally friendly materials has risen, and the use of sustainable materials is reduced.

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