Energy and Economy Overview with Accent on Possibilities in Austria

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ENERGY AND ECONOMY OVERVIEW

WITH

ACCENT ON POSSIBILITIES

IN AUSTRIA

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With rising GDP/capita, population increase on the world scale further rise in energy demand is expected. Today's division on rich north and poor south has added one more category: countries that are endowed with non renewable energy potentials, one that work actively on implementation of renewables and those who do have natural potential and slow to incorporate renewable due to financial, economical, war, other obstacles. Although it is said that energy should be available to all people, and strategy of diversification and security is actively promoted one more aspect even in the most developed world is not tackled: better interrelation, trade, electrical market transparent in all forms (all renewable, nonrenewable part of bills are visible), easy change and substitution of electrical source, and weak social policy to one that lives under lower income brackets.

Austria as highly developed country can serve as educative source, and with reaching its own renewable potentials gain additional strength in exporting clean energy (hydroelectrically plants, wind etc.).

Alida Paunić

A ENERGY AND ECONOMY WORLD

A ENERGY AND ECONOMY, BASIC FACTS

1. PRE WORDS FOR ENERGY DATA

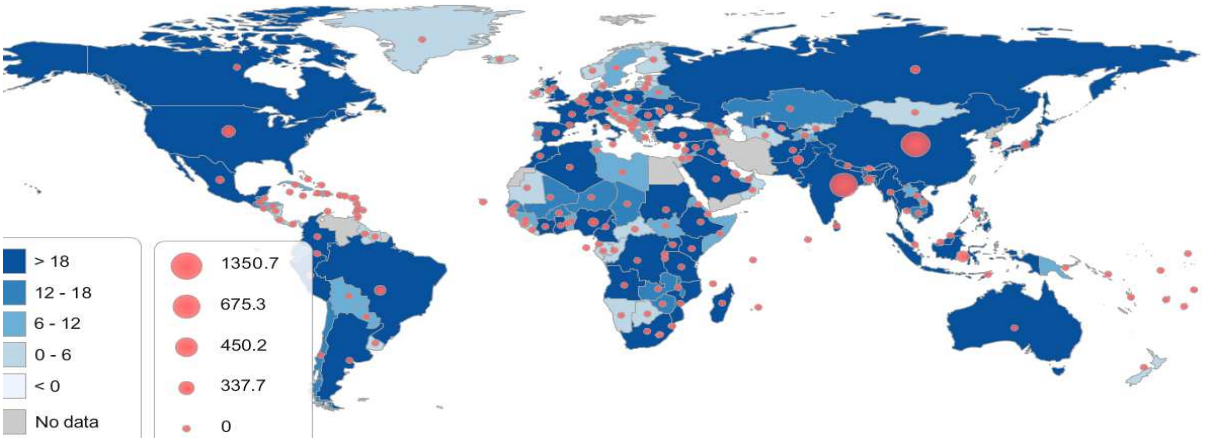
Data that are currently observed throughout world about energy are dependent not just upon energy potentials in the country but on other parameters such as: population, GDP, GDP/capita, political structure, power of innovation and implementation of existing knowledge, policy and speed of legislative implementation,incorporation of environmental issues, and many other significant signs not closely related to energy itself and that can further contribute to growth or reduction in energy strategy of certain country or world in general.

World is not a static place, it changes daily and sectors that are part of energy equation that once was stable and somewhat static nowadays passes through stages of quick change. It is related to innovative process, development, production and implementation of new technologies, new energy efficiency measures, legislative process that must follow national EU / world Agreed frame policy (Kyoto protocol). Some countries also find themselves in the middle of process that is pointed toward decreased production of certain non-renewable energy sources (Great Britain for example on declining path toward Oil production) or some places themselves on the map as potential source for renewables (solar-Spain, Portugal, Greece, Other; wind: Denmark, Germany, other ; etc.). Existing capacity of production and refining process is under more and more regulated environment policy to imply different standards (emissions, ISO rules, etc.) and in that respect some of the existing capacities need to be modernize or faces decreased production even disclosure.

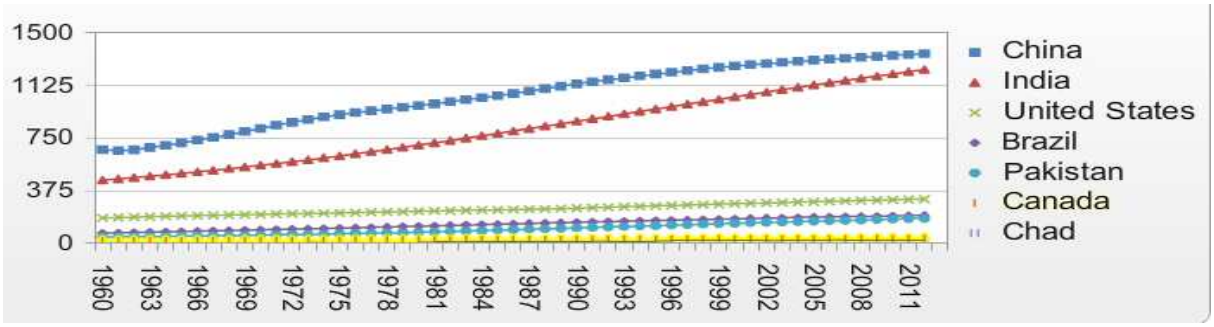
Energy sector in its production part suffers from large discrepancies in potentials. It is a well-established fact that some part of the world is rich with non-renewables resources and many others need to determine different import strategies, the best policy of energy diversification in country. A universal right allocated to each person to have equal opportunity to access energy sources is still challenged by many obstacles that are primarily related to GDP, GDP /capita and growth but also toward country position (Sub Sahara Africa still lagged in developments and access opportunities behind developed EU countries).In this diversified and unequal world it is possible to determine some basic current capacity and from this point start further in developing policy that is specific for one country, region, or even continent in order to reach win win case for everybody . Although from current perspective it still looks as far distant goal proper action can reach results in that respect.

Rising number of population is determined with statistical data where in 1960 world population was around 3 billion people , 1980 4,4 bill. , in 1999 this number passed 6 bill and according to last statistical data published by World Bank Earth is inhabited with more than 7 bill people. This fast growing number is not equally distributed nor is even dependent upon wealth of certain country, so we find that the majority of population 4,89 bill people live in the countries of middle and low income , 2,5 bill live in the areas of lower middle income, and 2,3 bill are placed in the countries that are having high income / middle income group. Only around 1,3 bill people live in the wealthiest states in the current world situation what further implies unequal economic growth and different energy access opportunities. Having a good energy base, developed infrastructure further opens door to industrial, social and economic advances that the developed world have or planes to further update and modernize.

World Population

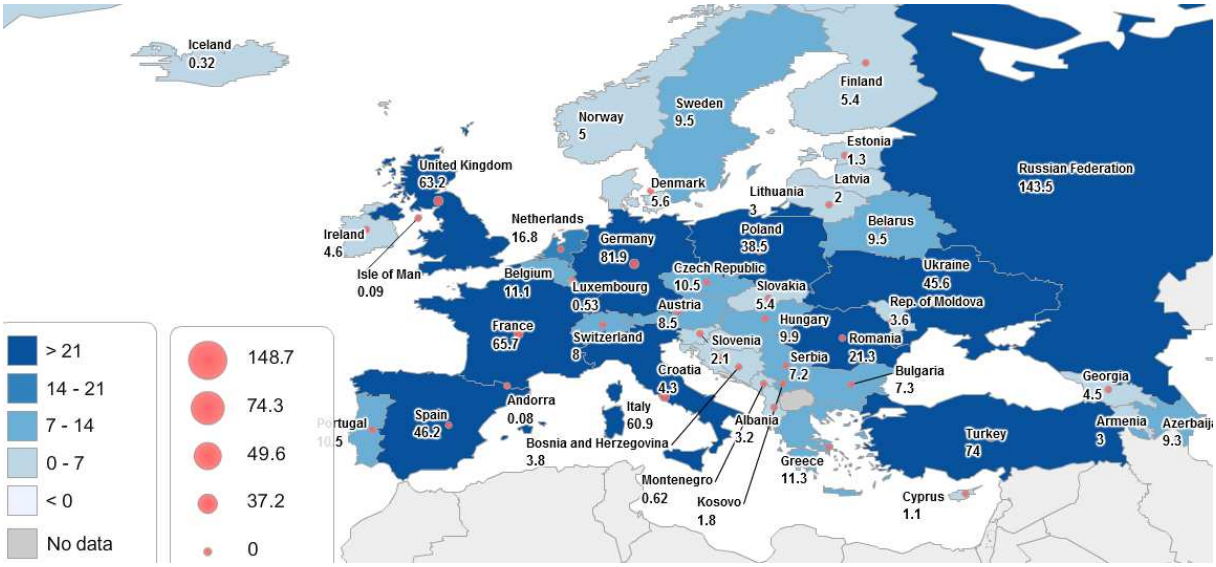


Growing number of population is visible in South East Asia where 2,23 bill people inhabits the area, where China have 1,35 bill, India 1,23 bill according to data published by World Bank (2012).

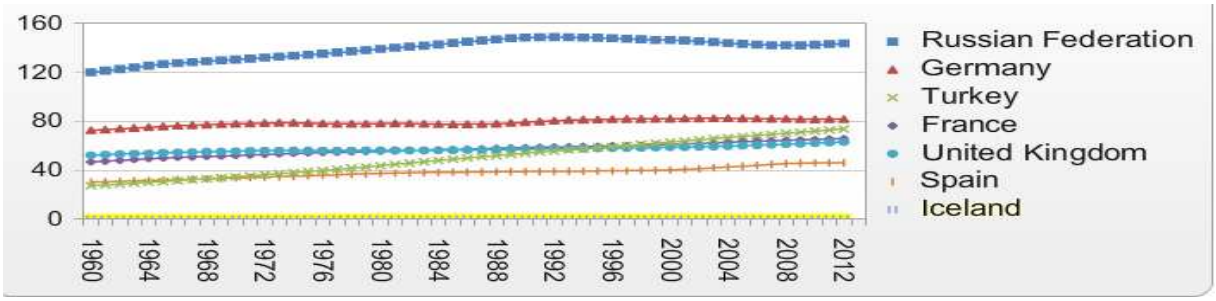


EU has potential in human base with 509 mil people and together with central Asia (Russia, former Soviet Bloc) it raises number to 900 mil population.

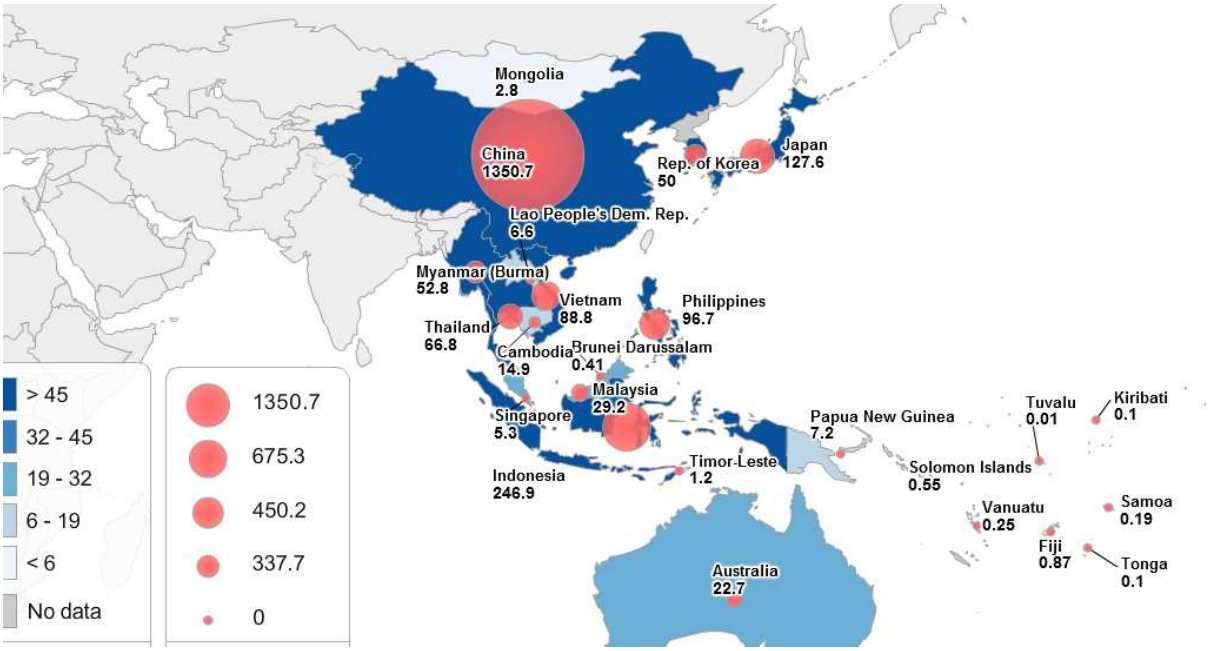
Population Europe/Euro Asia

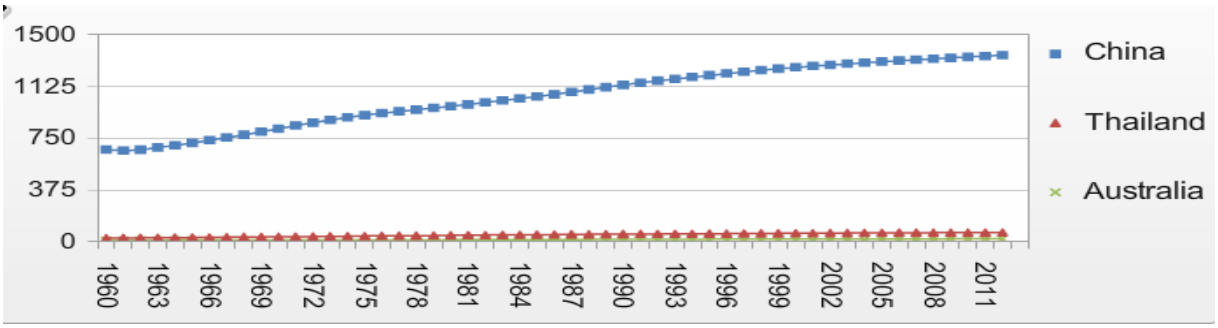


Russian Federation with its 143 mil inhabitants advances ahead of other EU Countries and in EU Germany has the largest number of people 81, 89 mil inhabitants that can further contribute to growth. Along Germany France is one that have significant number of 65 mil people, Italy 60 mil, UK 63 mil, Spain 46 mil. etc. Turkey has been in the process for long time to become one of the EU countries and if the country realizes its ambition on another significant number of 73 mil. People are expected to be part of EU.

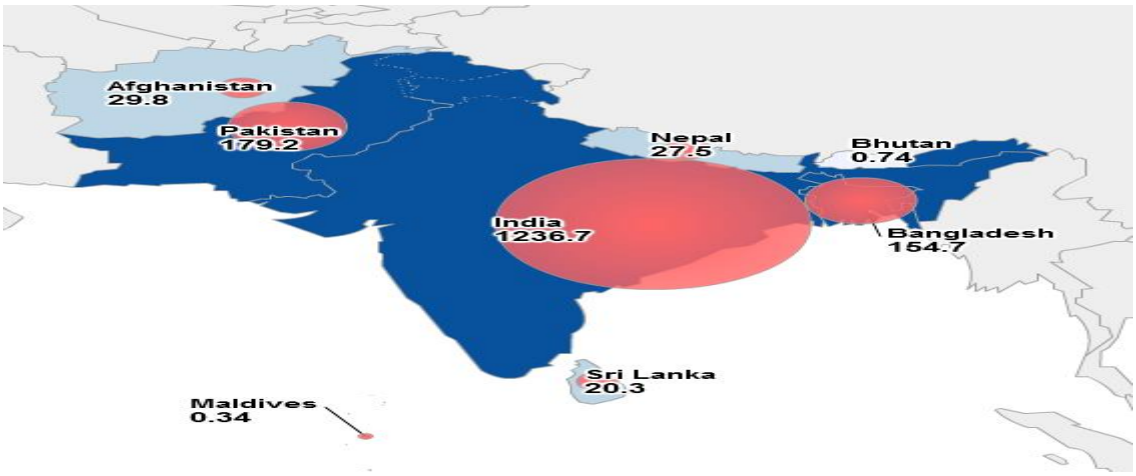


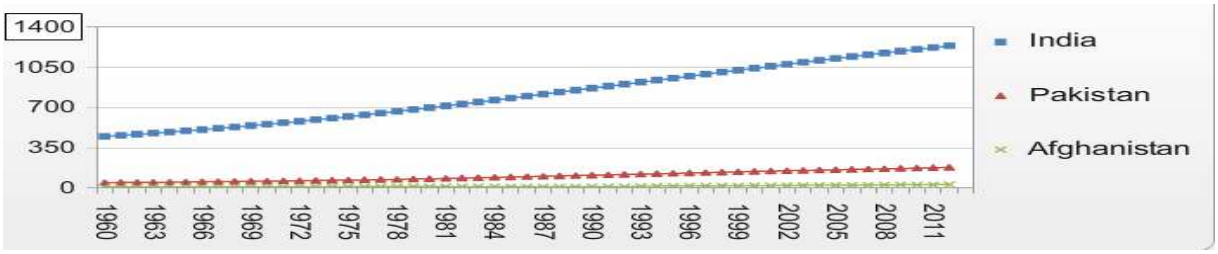
South East Asia has large human and economic potential where only China with 1,35 bill people plays a significant role –further is expected to rise in that respect with two child policy.



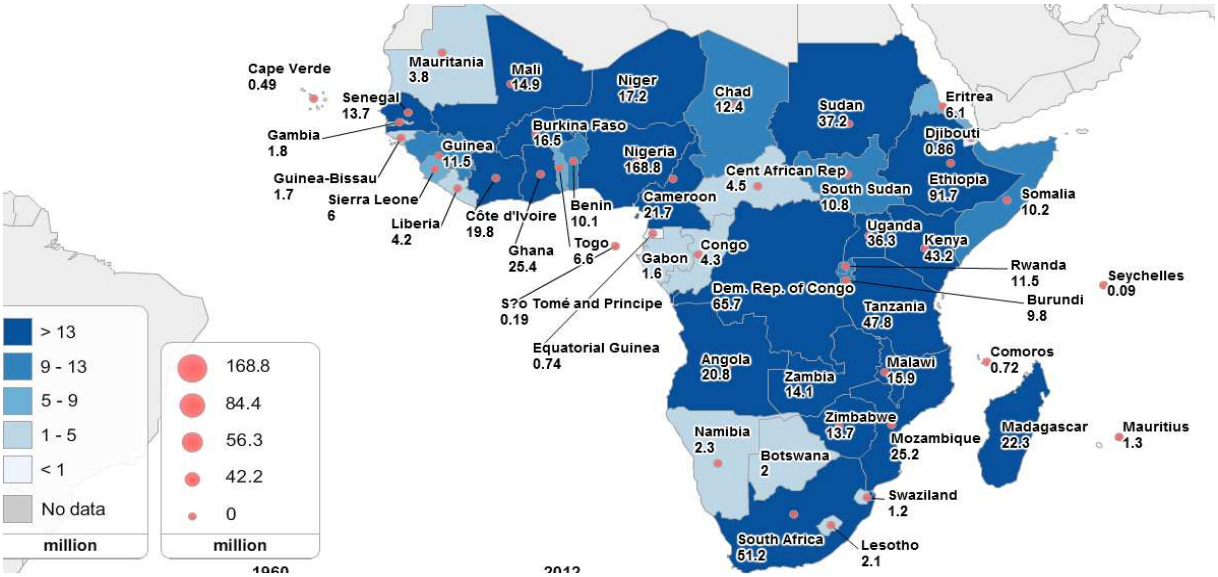


Growing economies of India, Bangladesh, and Pakistan have both: strong GDP growth and increase in population number – one example is India that increased number of population from 400 mil. in 1960 to 1,2 bill in 2012.

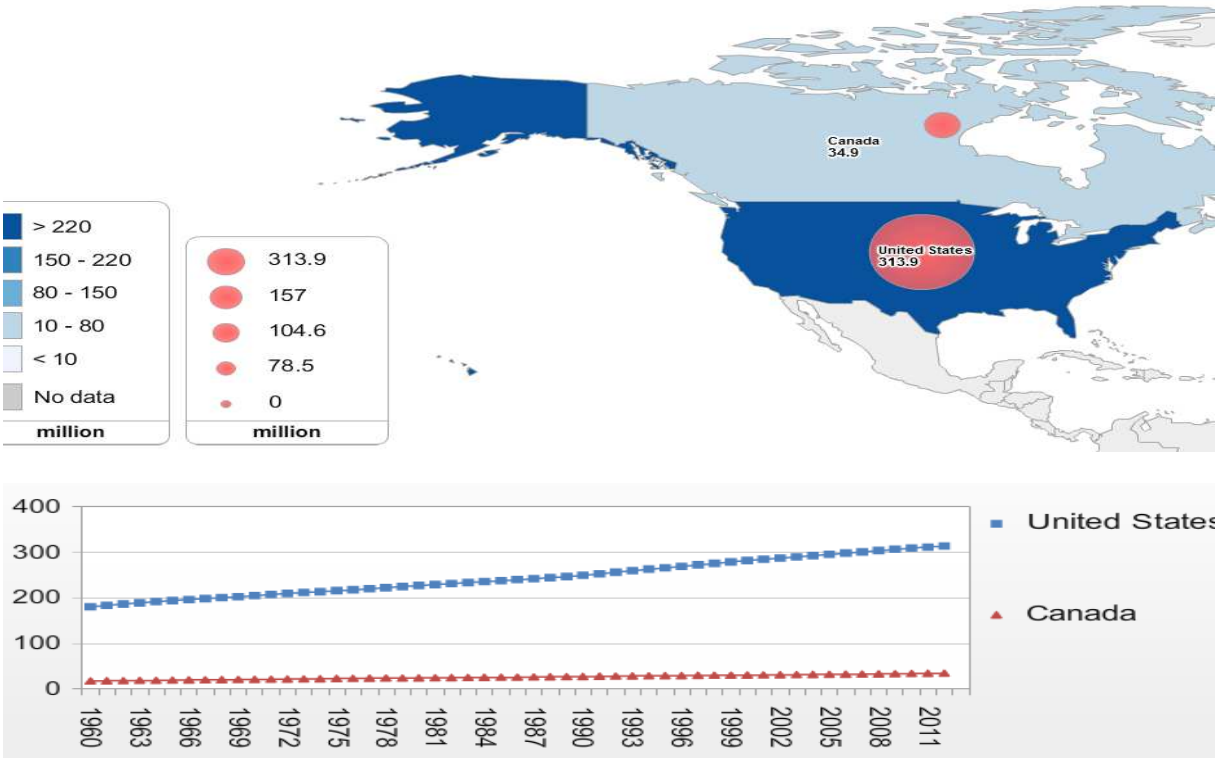




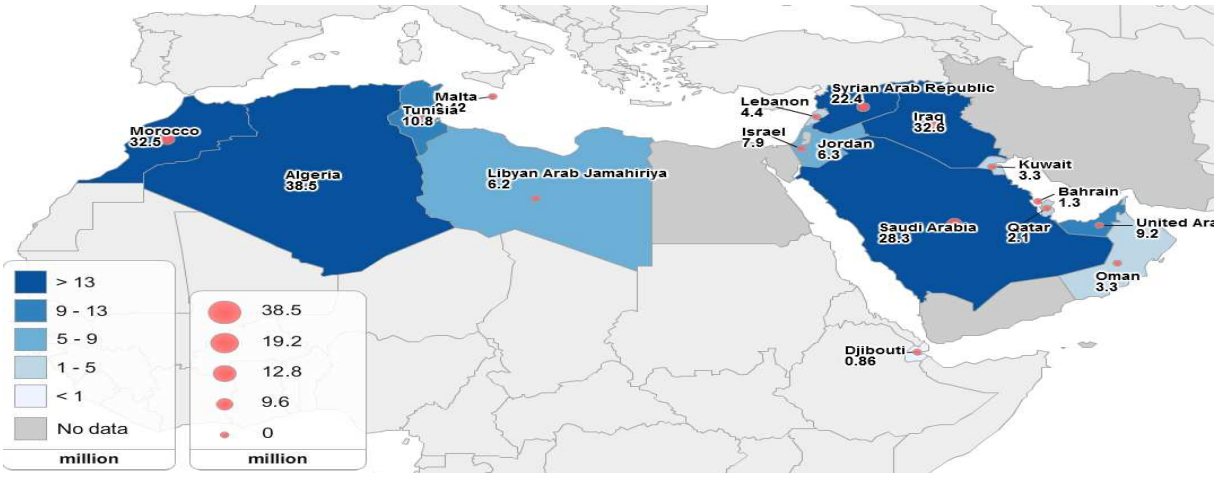
Countries in Sub Sahara region have the lowest income per capita but with 911 mil people can contribute to global economic strategy and in that respect increase the demand for energy.

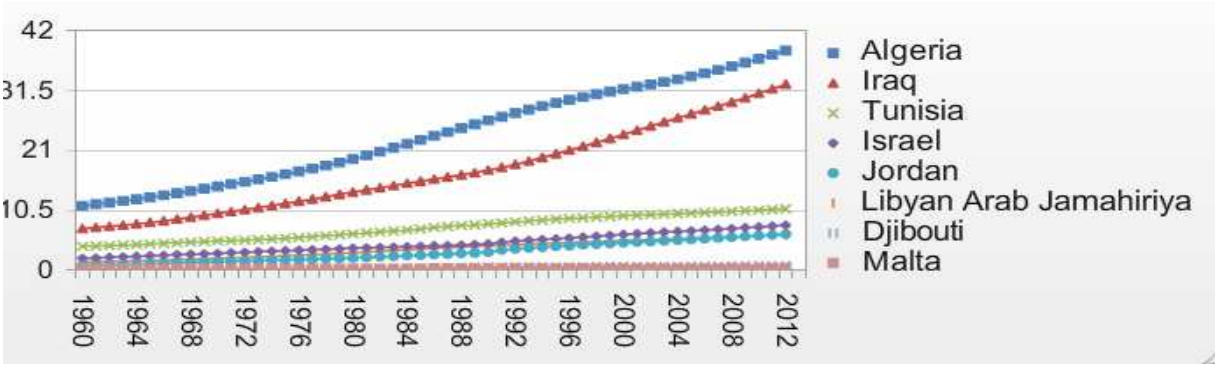


The biggest energy consumers in the world are countries that have the highest GDP/capita. These areas do not have rate of increase in the number of people as Sub Sahara, just to mention USA population is stable around 313 mil. and similar picture is in Canada where live 34,88 mil. people.



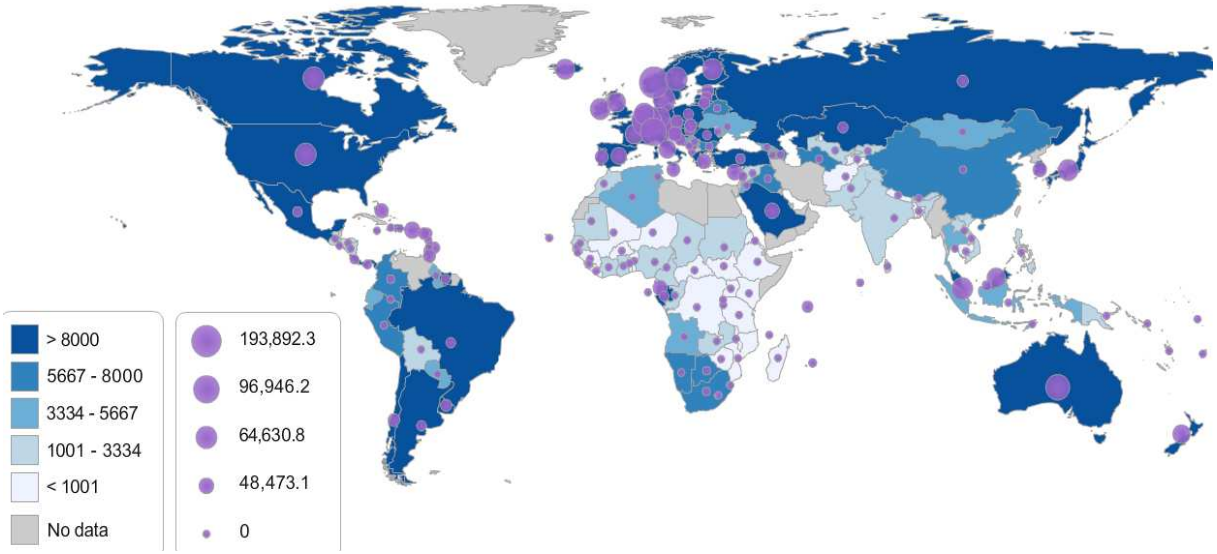
Middle East is significant due to large and significant nonrenewable resources and potentials to solar energy developments. This area has around 339 mil inhabitants similar to USA but with very different economic structure. This is the place also that struggles under big turbulences and that brings uncertainties and problems in their own economic and energy structure asd plans. The currently fastest population growing rate is observed in Algeria that has around 38,4 mil people.





The second significant and in many parts of the world the more important fact is represented in the form of GDP data. On the world scale we can notice a long time of increase of GDP (USD) but not at the same rate of rise. So in the1961 it was around 457 USD /capita; 1980 2500 USD/capita; 1990 4200 USD/ capita; 2007 8400 USD/capita while in 2012 it was 10280 USD/capita.

GDP/capita (USD) World

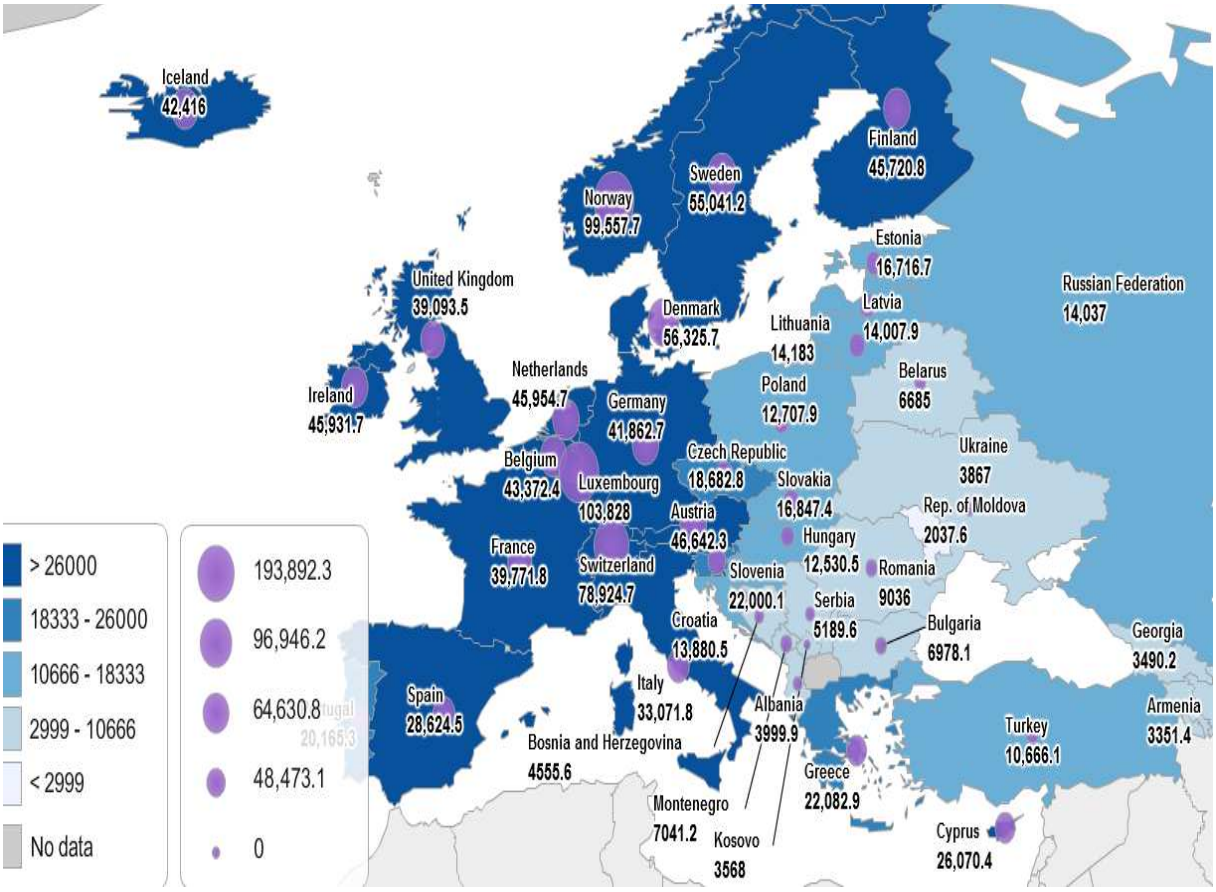


Very unequal GDP structure features world picture for the quite long time. It is enough to say that richest areas are situated on the north (USA, Canada, and EU) while the poorest are one that are situated in Sub Sahara region and Latin America.

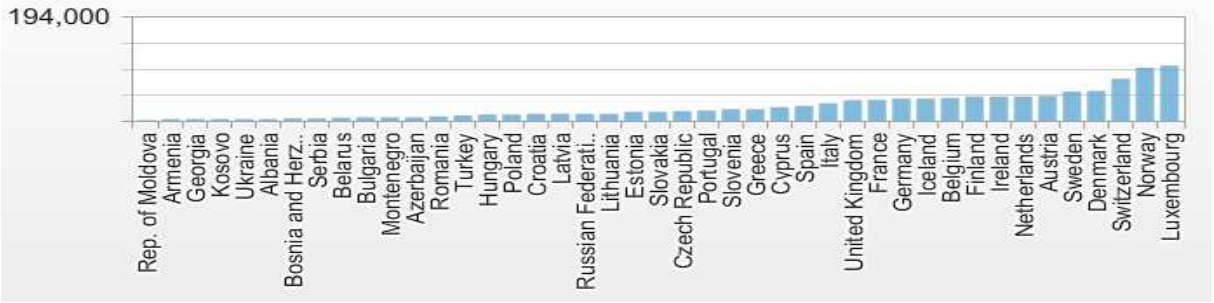
Europe has a long tradition and history so it came with a little surprise that the richest areas can be found in this part of the world. Further social engineering points toward unification of this highly diversified region (in form of EU, EURO) to be able to compete with other regions in the world (China, USA) and bring further advances.

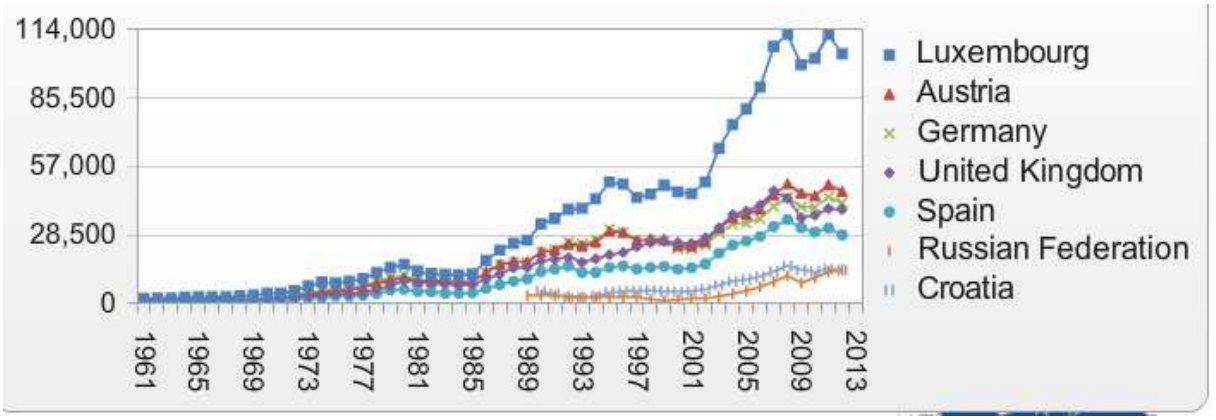
Euro area have around 36.500 USD/capita, and the richest country is Luxembourg with 111 000 USD/capita. The average GDP/capita in EU is much lower and is around 32000 USD/ capita. The most important economies are Germany (41 800 USD/capita), Italy (33 071 USD/ capita); France (39 771 USD/capita);UK (39 093 USD/capita) and these countries can be among those that further give impulse to economy and growth on this region. It is important to mention that Russia with its large base of energy resource (gas, oil) has potentials to increase its GDP/capita structure from current 14 037 USD/capita. It is observed that new EU member countries that are situated on the East of the Europe (Litva, Latvia, Slovakia, Czech,) and still passes through large economic changes lagged in GDP/capita behind other western economies. Countries that expect to become EU members (Serbia, Albania, and BIH) lagged significantly with GDP/capita behind EU counterparts where some of them have around 5000 USD/capita.

GDP/ capita (USD)

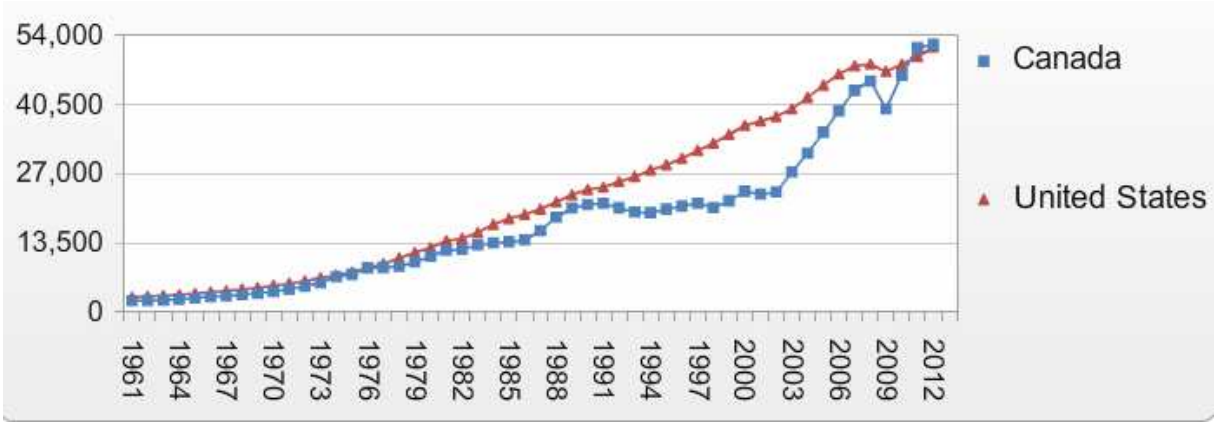


GDP/capita (USD)



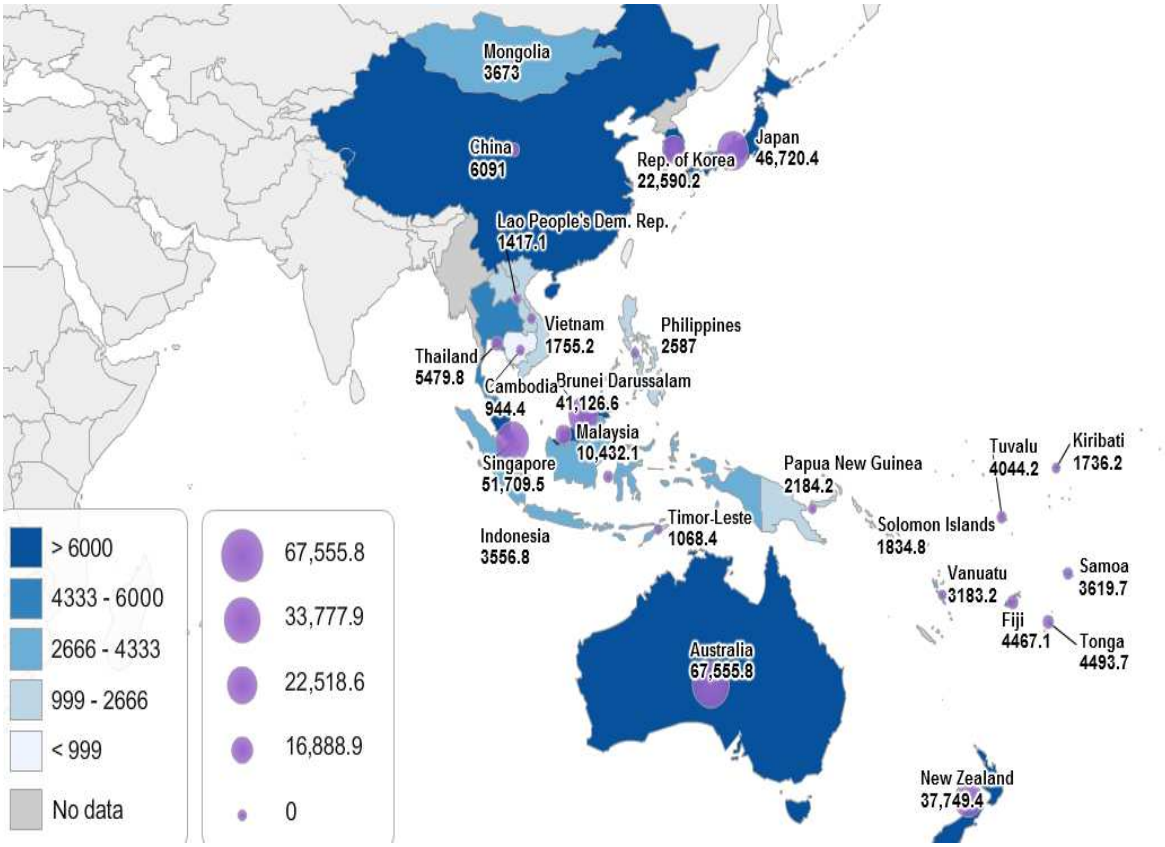


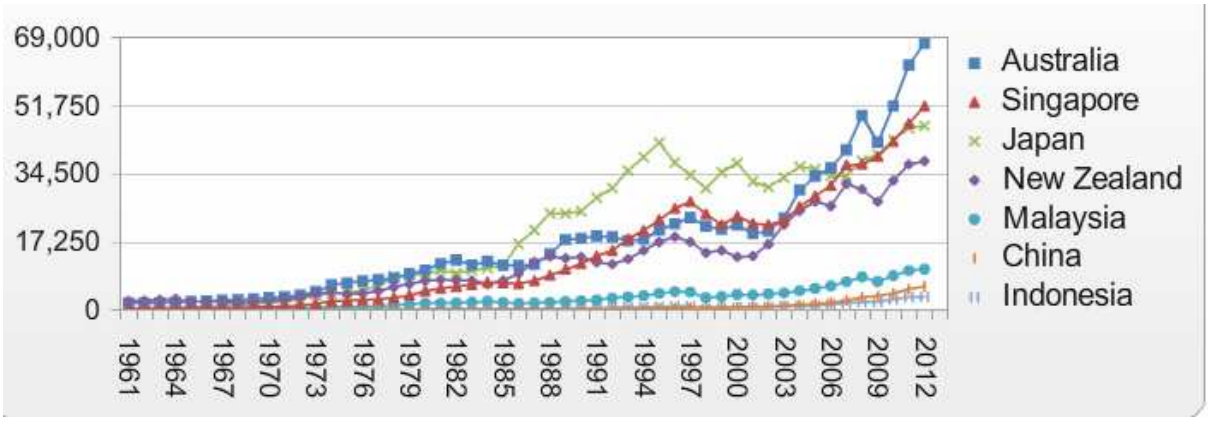
The most economically developed areas in the world are part of North America continents where Canada achieves 52 200 USD/capita; and USA have 51700 USD/capita. This data is consequence of strong rise in 1980 that continued with 1990 with only one correction in 2008.



Although Australia (67 555 USD/capita) and Japan (46.720 USD/capita) have the largest GDP/capita the late time brought attention toward China(6 091 USD/capita) ,Korea (22 590 USD/capita) and Thailand (5 479 USD/capita) .

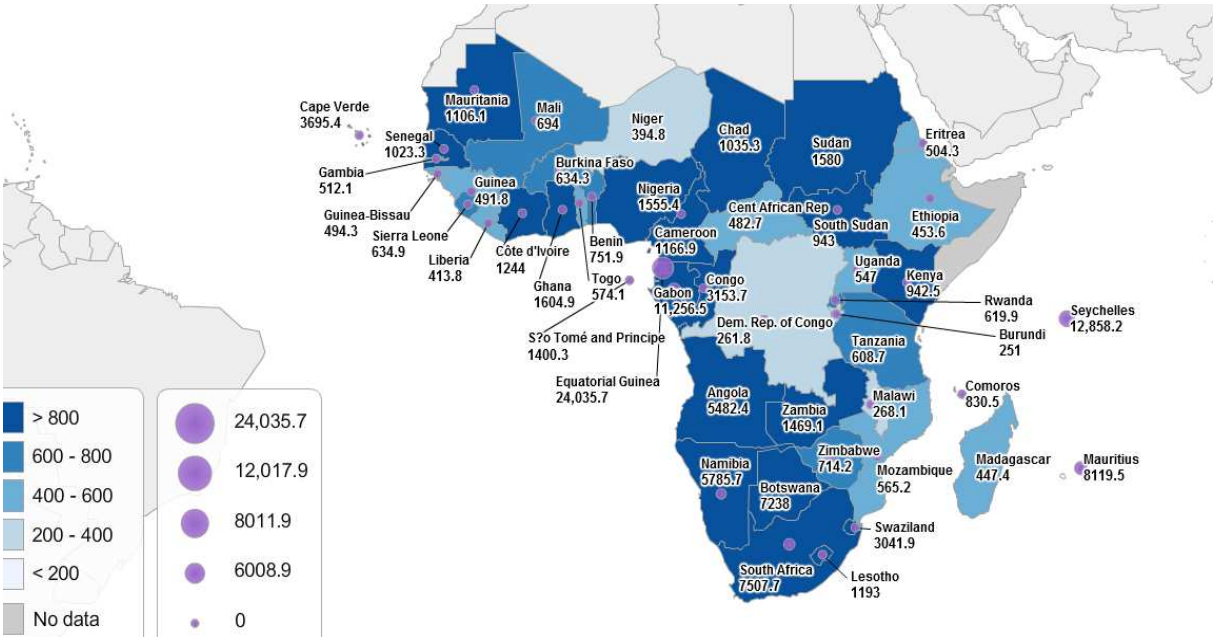
GDP/ capita East Asia





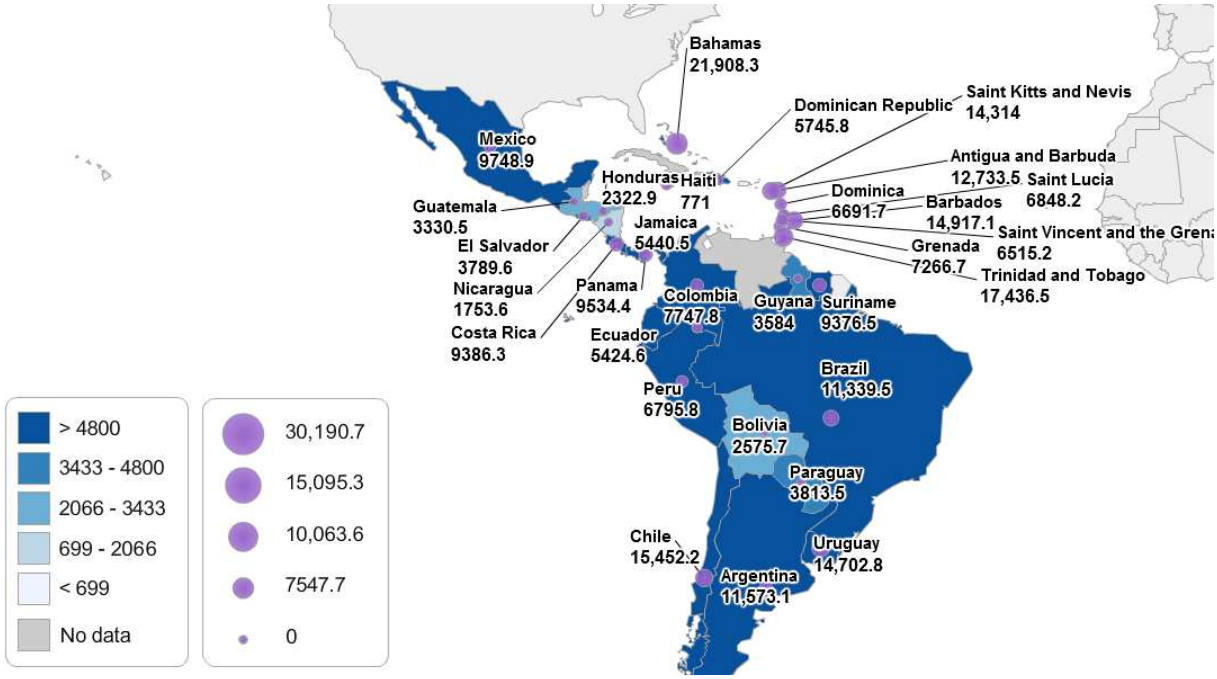
Countries in Sub Sahara have 1 400 USD/capita and the most worries am trend is increasing poverty and bigger and bigger difference between rich and poor. Between these countries there is also a huge difference so Congo DR has 241 USD/capita while Congo Republic 3150 USD/capita, Ethiopia 453 USD/ capita and Egypt 3 256 USD/capita.

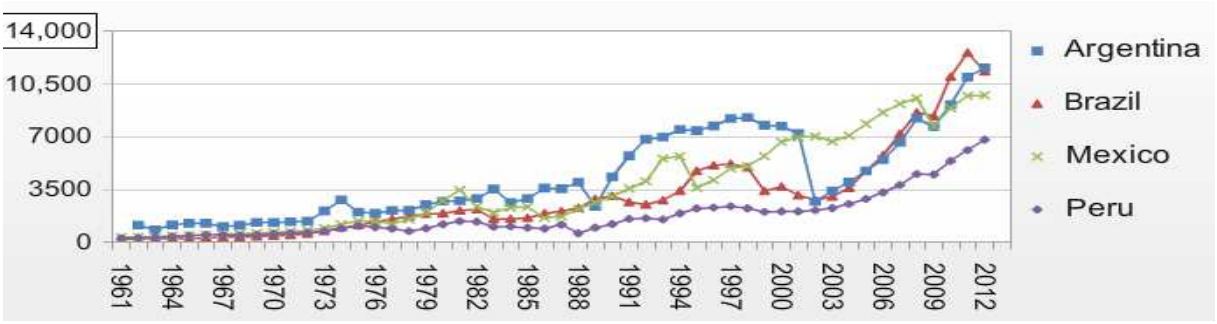
GDP/capita in Africa



Similar difference is observed in Latin America where Brazil has 11 000 USD/capita and Bolivia 2 575 USD/capita.

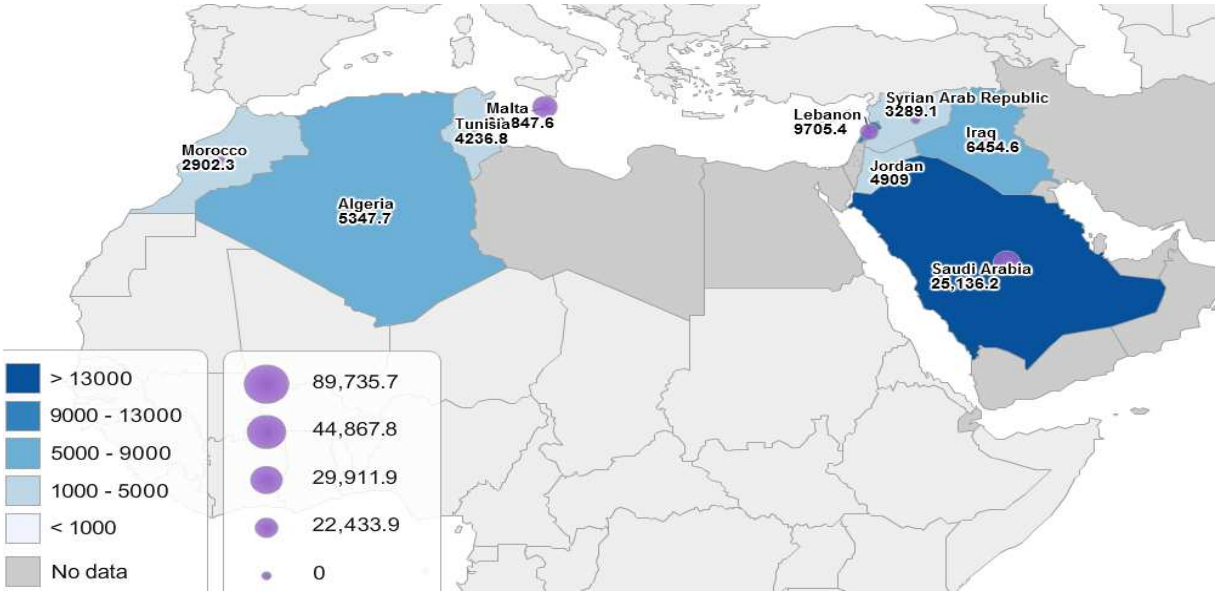
GDP/capita South America

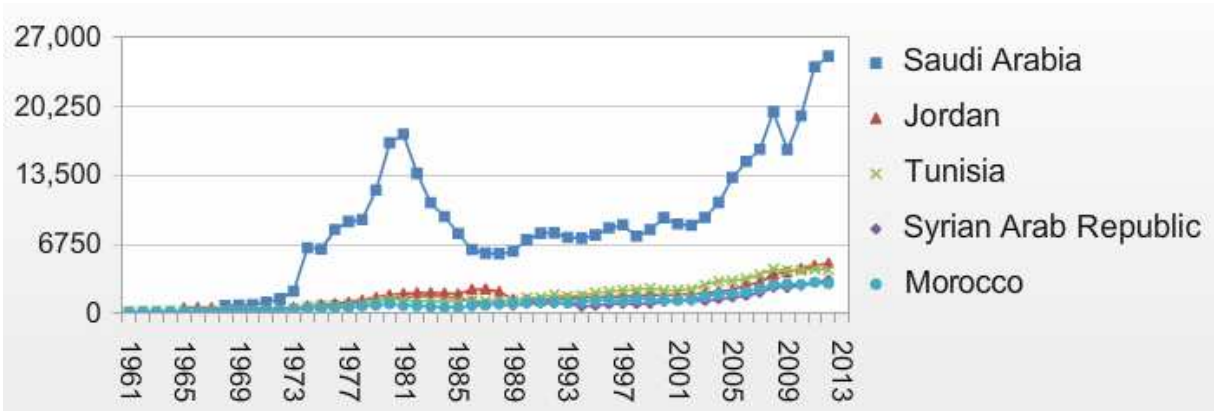




GDP/capita in the area of Middle East is much lower than expected where the richest is Saudi Arabia with around 25 thousand USD/ capita, Israel has 33 thousand USD/capita and Kuwait 51 thousand USD/ capita.

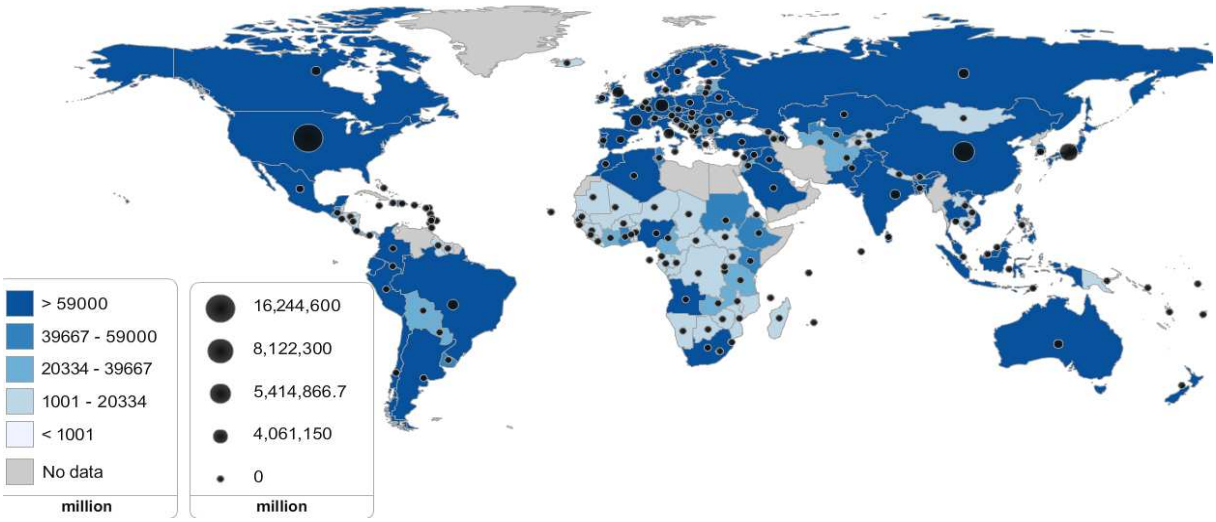
GDP/capita Middle East, North Africa





Total GDP is also marked with the strong increase on the world level and from 1 408 bill USD in 1960 , grew in 1970 to 2 951 bill USD; In 1980 to 11 125 bill USD, in 1990 to 22 237 bill USD, in 2000 32 872 bil USD.

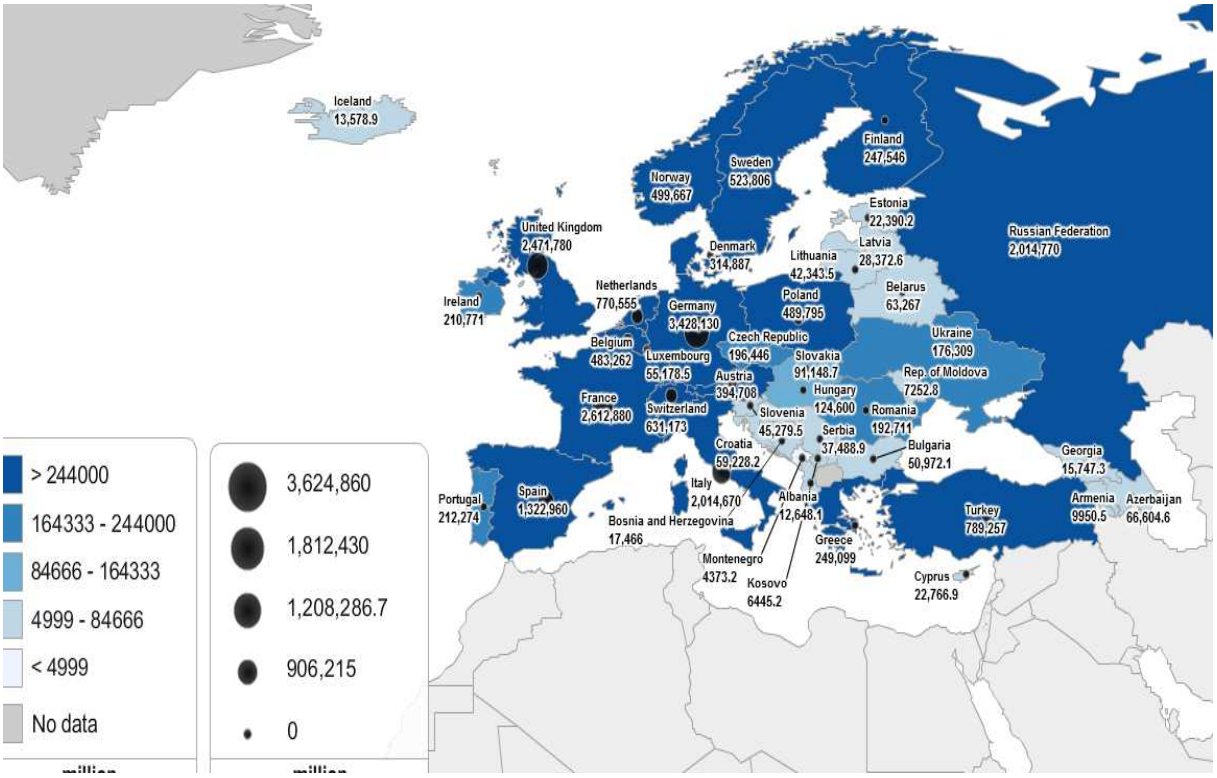
Total GDP (USD) - World

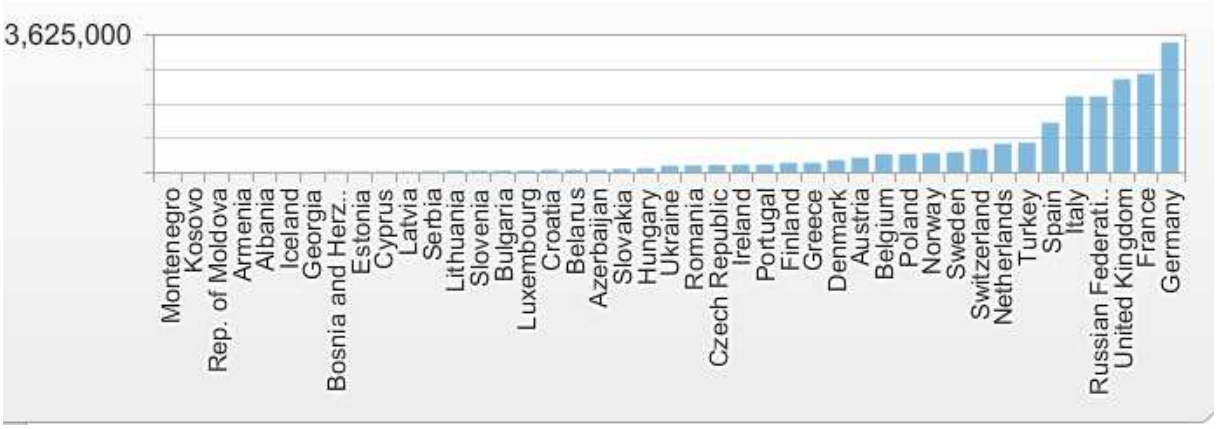


EU has 23% of the total world GDP level. It is slightly disturbing fact that in certain periods it shows signs of weakness and decrease (2012/2011 from 16 687 bill USD/ 17 683 bill USD), where it losses the battle with China, India, USA, and is linked with financial or other crises that can arise in big economic centers (such as the 2008 crises that originated from USA).

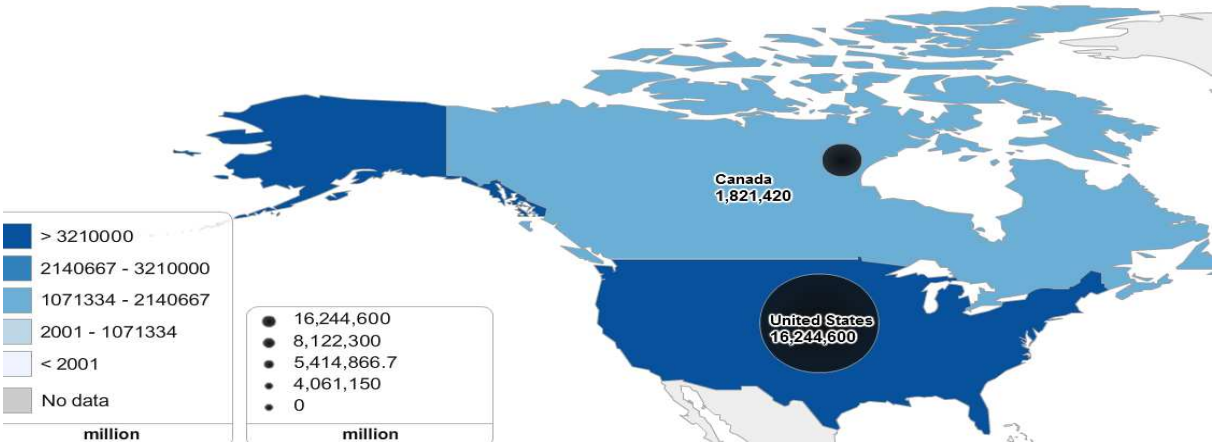
Euro area have income of around 12 200 bill, USD and it is important to compare it with Russia that has only 2 000 bill USD of total GDP. The main engine of growth in Europe is still Germany with its 3 428 bill USD income, having other significant economies to follow Italy 2 014 bill USD, Spain 1 322 bill USD, UK 2 471 bill USD. There is a difference between new and old EU member states in that respects where Slovakia has 91 148 mil USD, Slovenia 45 279 mil USD, and Serbia 37 488 mil USD.

GDP (USD) Total Europe/Euro Asia

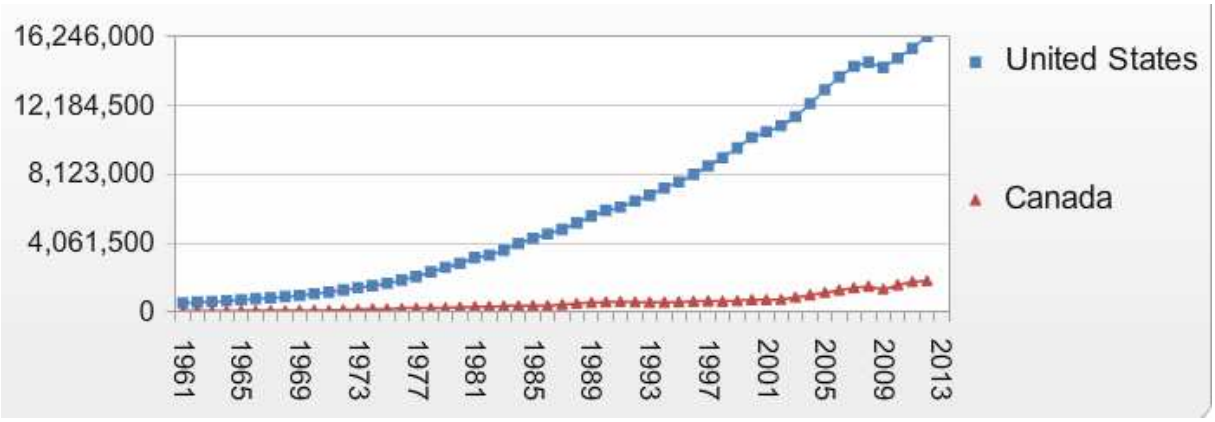




Two the most important economies of Northern America continent differ in absolute value of GDP where USA obtains 16 244 bill USD GDP per year, and Canada 1 821 bill USD GDP per year (as published by World Bank in 2012).

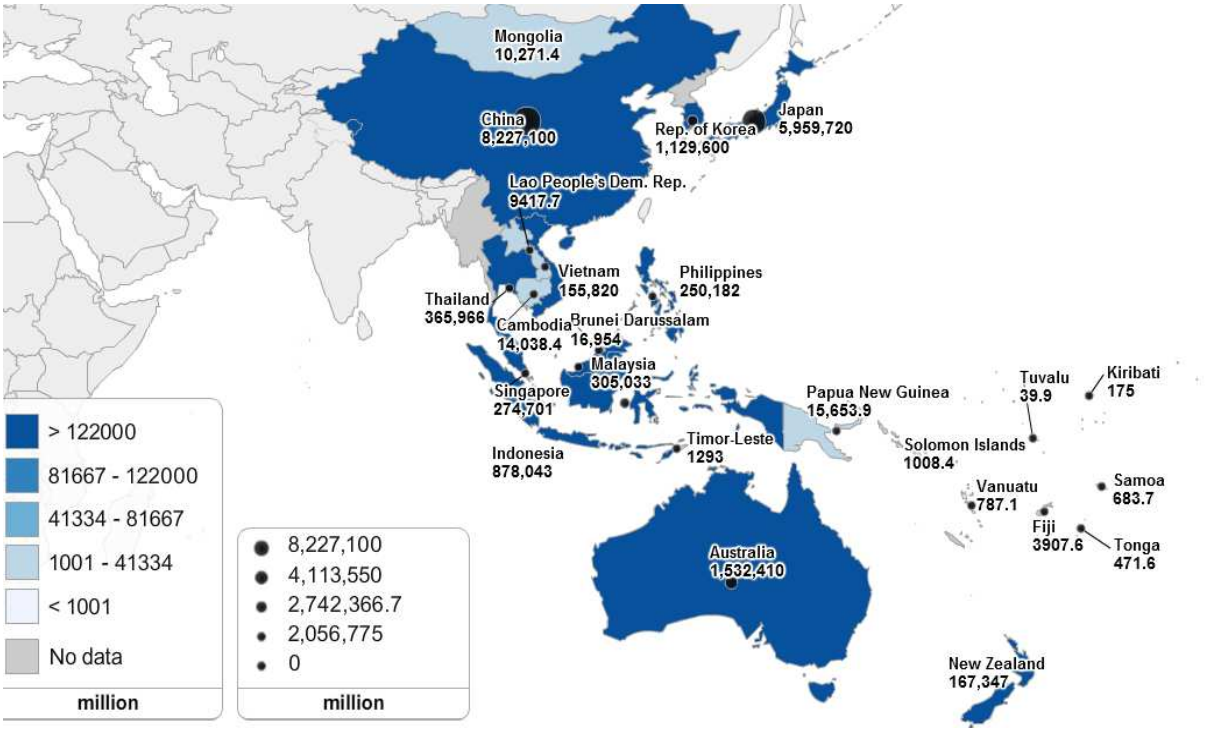


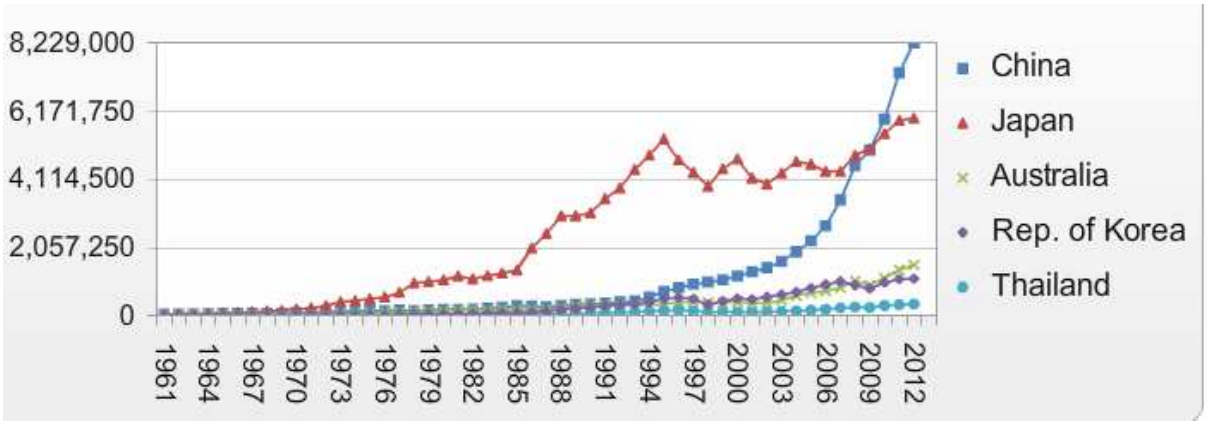
That result is a consequence of strong GDP rise after 1980 in USA when total GDP was around 4 000 bill to be increased to 16.244 bills USD in 2012.



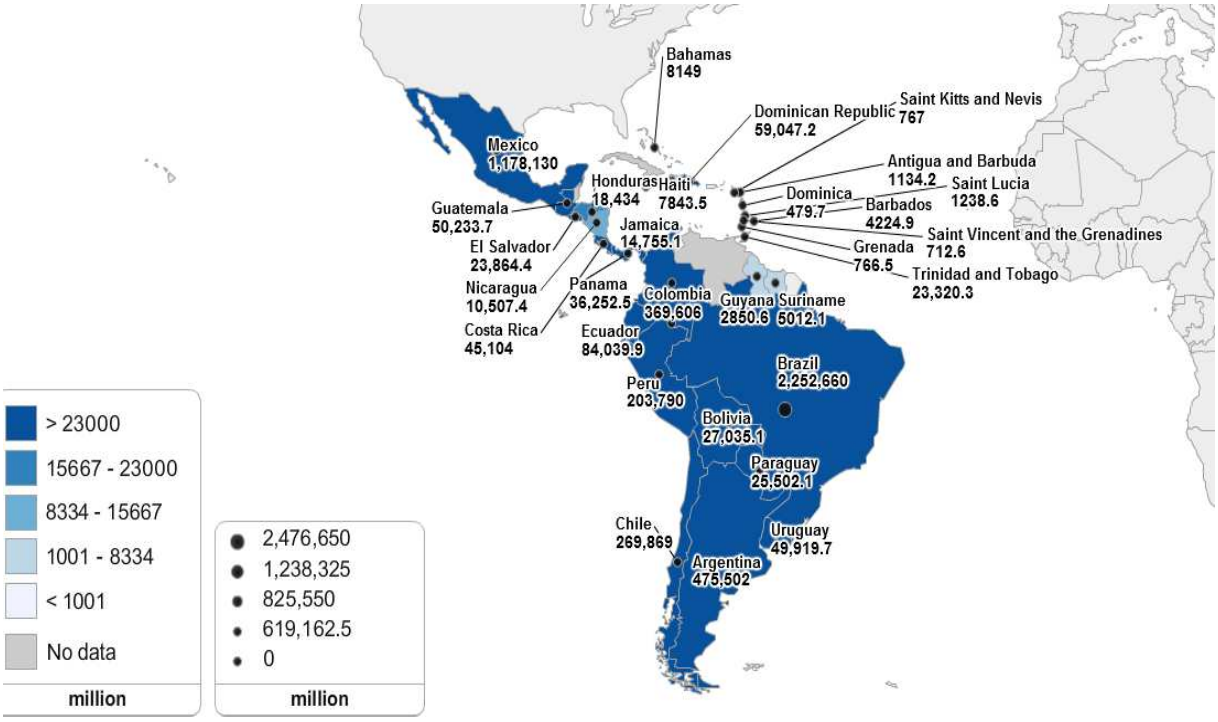
Although China has significantly lower GDP/capita than Japan and Australia, with economic growth managed to contribute to world GDP with 11%. What is important to stress is further increase and rise in potentials where only in 2012 GDP was 9 227 bill USD. Japan have 5 959 bill USD (majority comes from the technical sector) Australia 1 522 bill USD (majority from mining). South Korea is very important as rising economical force and contribute with 1 129 bill USD.

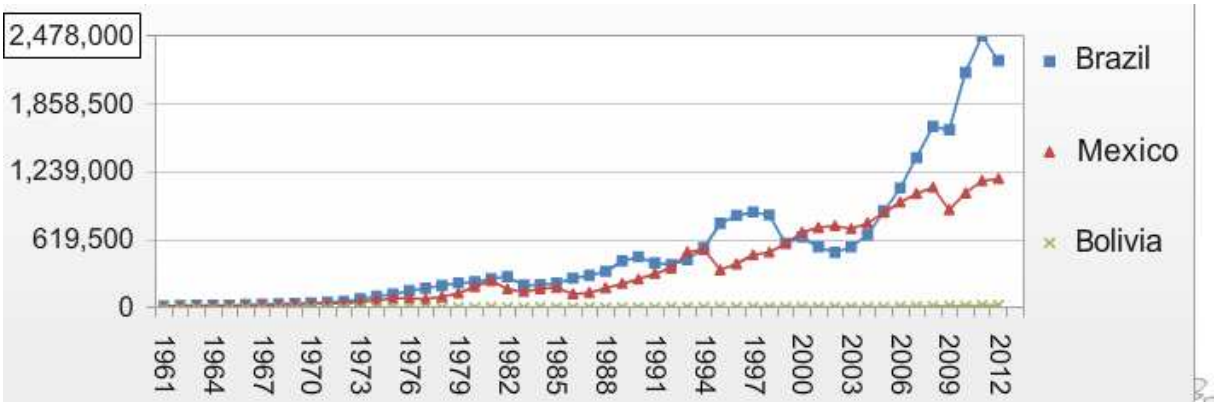
GDP (USD) East Asia





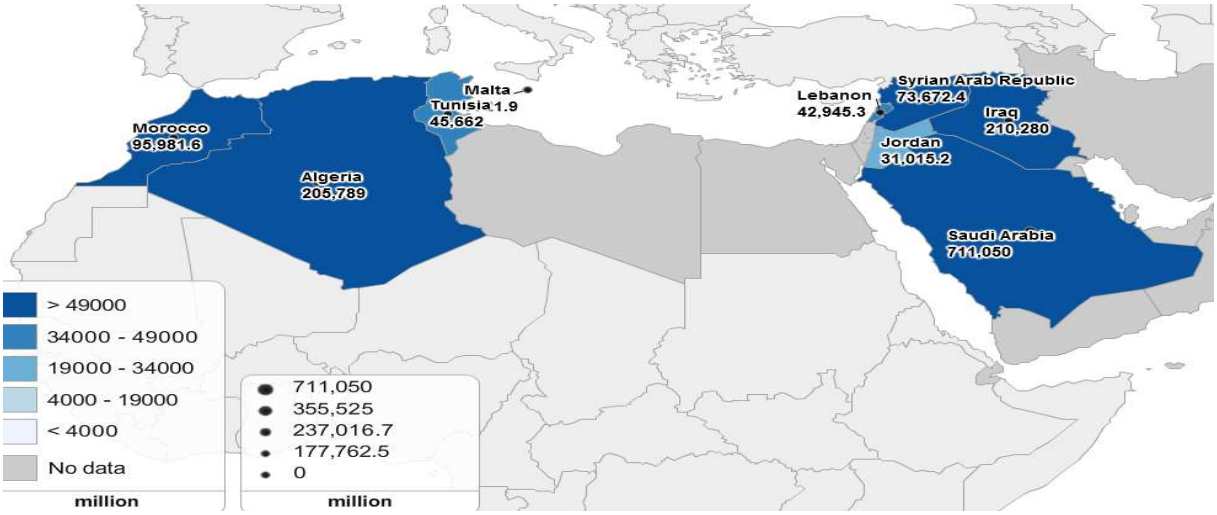
GDP (USD) South America

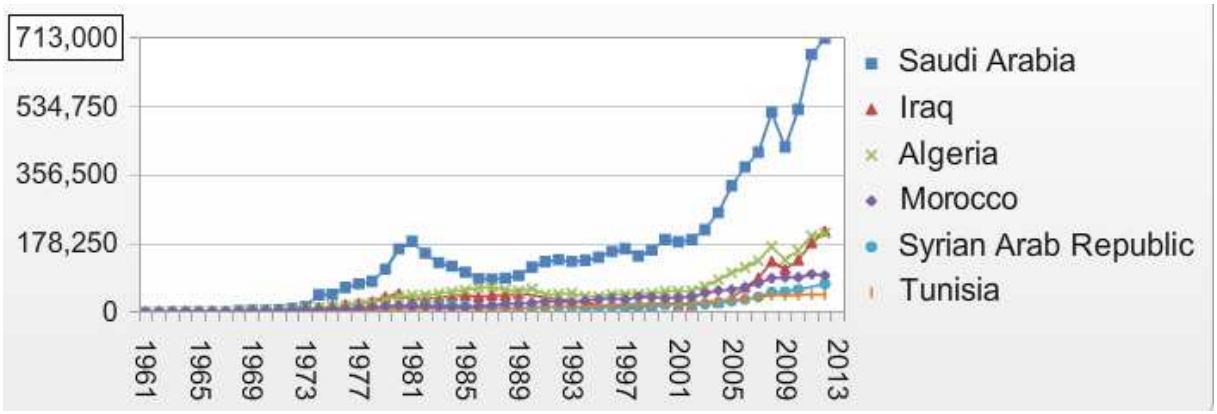




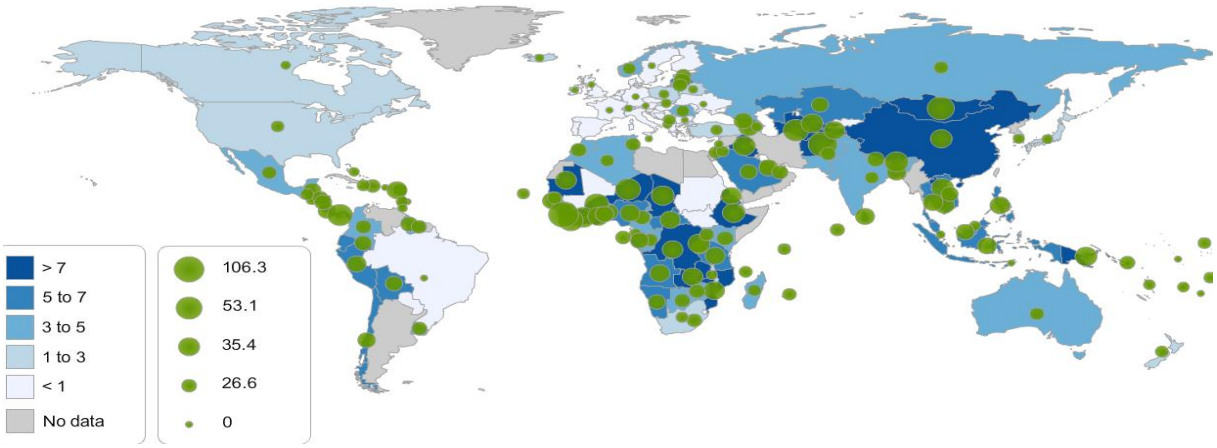
Countries that are having significant oil resource base have income that comes from trade and selling this resource. It is visible from their GDP structure that capital is not used enough to start other economic potentials and current situation of surplus should be more strongly used to develop other branches of industry to reach potentials. Further worsening of situation comes with oil price that dropped significantly from more than 100 $/barrel to 41-63 $/barrel in recent periods. Saudi Arabia has around 711.050 mil USD, Irak 210 280 mil USD, Algeria 206.789 mil USD, Israel 258.216 mil USD, and Kuwait 160.912 mil USD. It is a big difference in income in this region between income groups from different countries and inside country. Total income from region is 3.262 bills USD and the richest countries contribute to it with 1.540 bills USD.

GDP (USD) Middle East, North Africa





On the maps that follow it can be seen that economic growth went through different stages and in the 2012 the highest growth was in the countries of East Asia, Latin America, and in African region. That data do not show absolute value but potentials to increase their current position and it is observed that mature and high developed economies have lower growth rate and poor ones are inclined to have high growth rates. If the world level is observed than the growth was in 1960 4,26 %, in 1970 3,29%, in 1980 1,82 %, in 1990 2,84 % and in 2000 4,24% to decrease again to 2,34% in 2012. The biggest growth in 2012 were marked by economies of Sierra Leone 15,22 %, Afghanistan 14%, Mongolia 12%, Turkmenistan 11%, Liberia 10%, Burkina Faso 10,03%. Negative growth was observed in South Sudan -47%, Guinea Bissau -6,71%, Greece -6,38%, Bermuda -4,87 %, Italy -2,53 %, Portugal -3,23%, Slovenia -2,5 %, Croatia -1,98 %, and Serbia -1,7%.



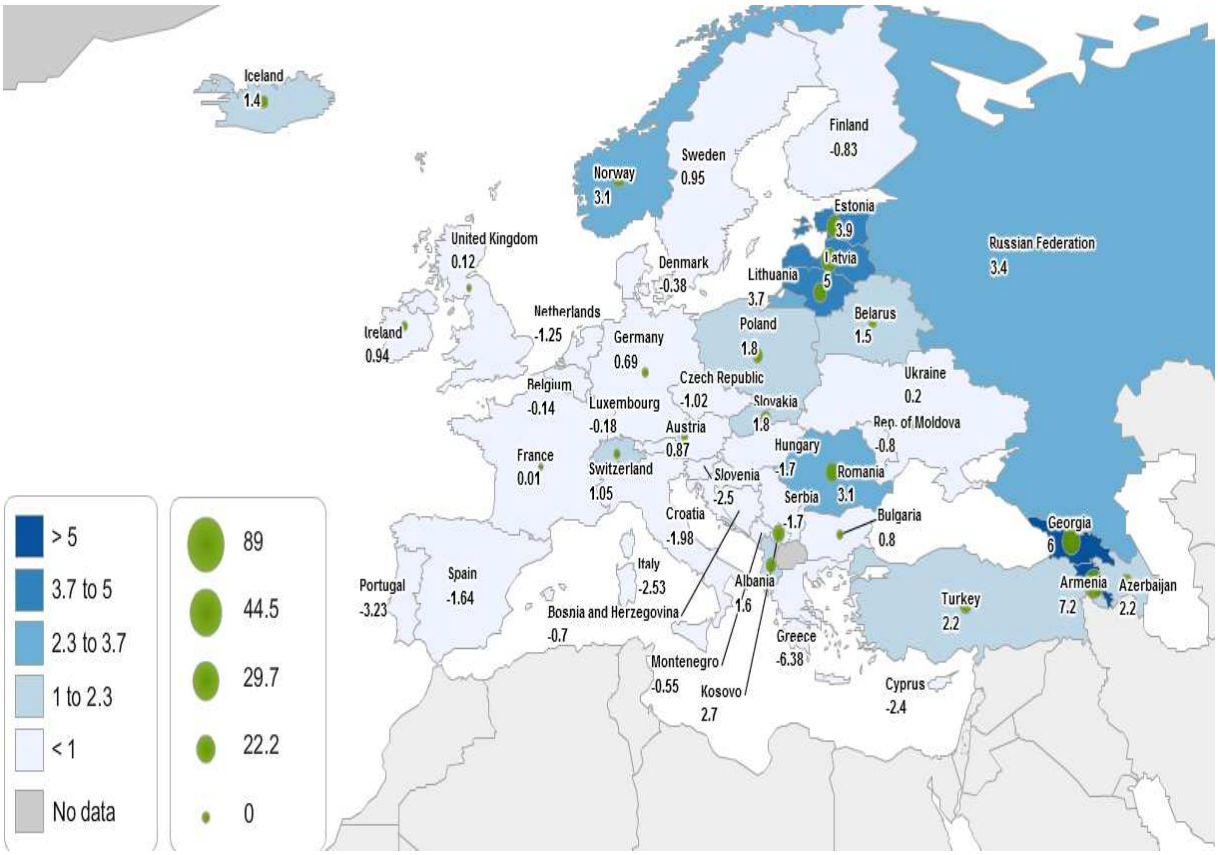
The World Bank gave forecasts for the following period –table that comes- in there it is expected for the economies of EU, USA further rise, continuing negative trend for Russia with slight bounce back in 2016.

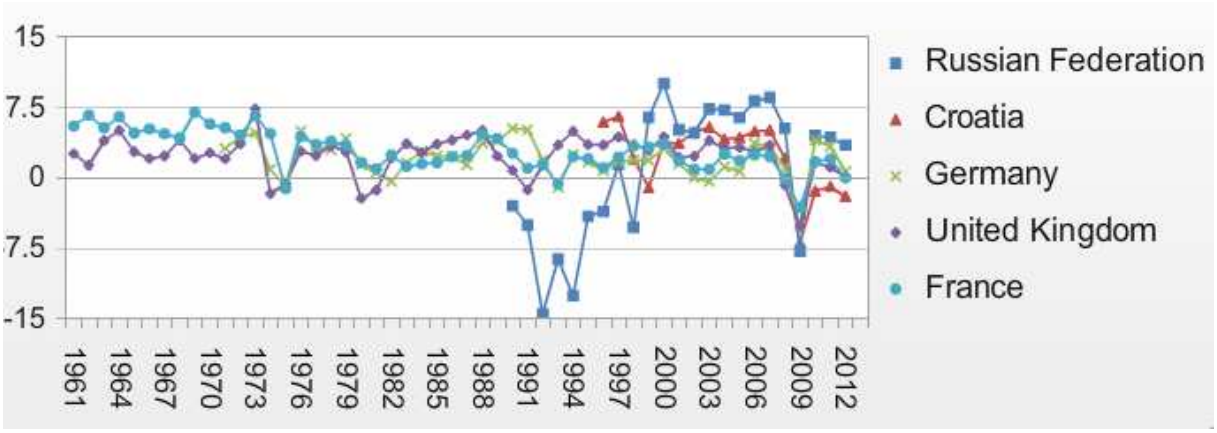
	2012	2013	2014e	2015f	2016f	2017f
REAL GDP[1]						
World	**2,4**	**2,5**	**2,6**	**3,0**	**3,3**	**3,2**
High income	**1,4**	**1,4**	**1,8**	**2,2**	**2,4**	**2,2**
United States	2,3	2,2	2,4	3,2	3,0	2,4
Euro Area	-0,7	-0,4	0,8	1,1	1,6	1,6
Japan	1,5	1,5	0,2	1,2	1,6	1,2
United Kingdom	0,7	1,7	2,6	2,9	2,6	2,2
Russia	3,4	1,3	0,7	-2,9	0,1	1,1
Developing countries	**4,8**	**4,9**	**4,4**	**4,8**	**5,3**	**5,4**
East Asia and Pacific	7,4	7,2	6,9	6,7	6,7	6,7
China	7,7	7,7	7,4	7,1	7,0	6,9
Indonesia	6,3	5,8	5,1	5,2	5,5	5,5
Thailand	6,5	2,9	0,5	3,5	4,0	4,5
Europe and Central Asia	1,9	3,7	2,4	3,0	3,6	4,0
Kazakhstan	5,0	6,0	4,1	1,8	3,2	4,7
Turkey	2,1	4,1	3,1	3,5	3,7	3,9
Romania	0,6	3,5	2,6	2,9	3,2	3,9
Latin America and the Caribbean	2,6	2,5	0,8	1,7	2,9	3,3
Brazil	1,0	2,5	0,1	1,0	2,5	2,7
Mexico	4,0	1,1	2,1	3,3	3,8	3,8
Argentina	0,9	2,9	-1,5	-0,3	1,6	3,1
Middle East and North Africa	1,4	0,5	1,2	2,5	3,0	3,5
Egypt[2]	2,2	2,1	2,2	3,5	3,8	4,0
Iran	-6,6	-1,9	1,5	0,9	1,0	2,2
Algeria	3,3	2,8	3,0	3,3	3,5	3,5
South Asia	5,0	4,9	5,5	6,1	6,6	6,8
India[2,3]	4,7	5,0	5,6	6,4	7,0	7,0
Pakistan[2,3]	3,5	4,4	5,4	4,6	4,8	4,9
Bangladesh[2]	6,5	6,0	6,1	6,2	6,5	7,0
Sub-Saharan Africa	4,0	4,2	4,5	4,6	4,9	5,1
South Africa	2,5	1,9	1,4	2,2	2,5	2,7
Nigeria	4,3	5,4	6,3	5,5	5,8	6,2
Angola	8,4	6,8	4,4	5,3	5,0	5,2
MEMORANDUM ITEMS						
World real GDP (2010 PPP weights)	3,1	3,2	3,3	3,6	4,0	4,0
OECD real GDP	1,2	1,3	1,7	2,3	2,4	2,1
Non-OECD real GDP	3,5	2,4	2,5	0,9	2,4	2,9
Developing country real GDP excluding BRICS	3,5	4,1	3,5	5,0	4,9	5,1
BRICS real GDP	5,4	5,4	5,0	5,1	5,5	5,6
World trade volume[4]	2,8	3,4	4,0	4,5	4,8	4,8
Non-oil commodity price index	-8,6	-7,2	-3,6	-1,1	0,2	0,3
Oil price[5]	1,0	-0,9	-7,7	-31,9	4,9	4,7
Manufactures unit export value[6]	-1,2	-1,4	-0,2	-0,2	1,9	1,7
6-month U.S. LIBOR interest rate (percent)[7]	0,7	0,4	0,3	…	…	…
6-month Euro	0,8	0,3	0,3	…	…	…

Source and picture came from: World Bank

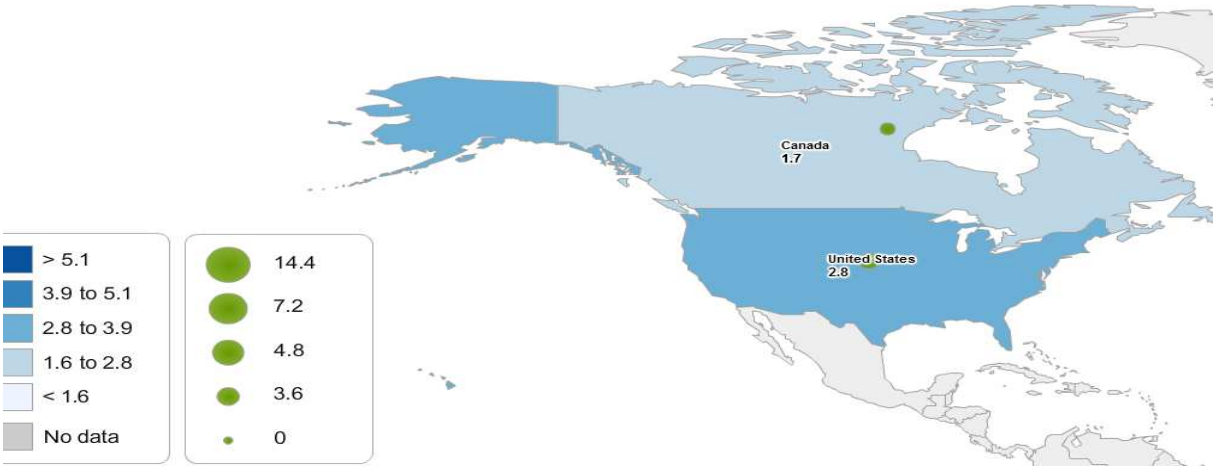
Different numbers stretches through Europe where Community had negative growth of -0,34 in 2012 and in this year Russia had positive trend of 3,4%. In 2014/2015 situation had changed where Russia had negative trend and EU achieves small step forward. In that respect Germany has 0,69%, UK 0,12%, France 0,01%, Sweden 0,95%, and negative values are marked at Slovenia, Czech, Croatia, and Serbia.

GDP growth /Europa/Eurasia (2012)

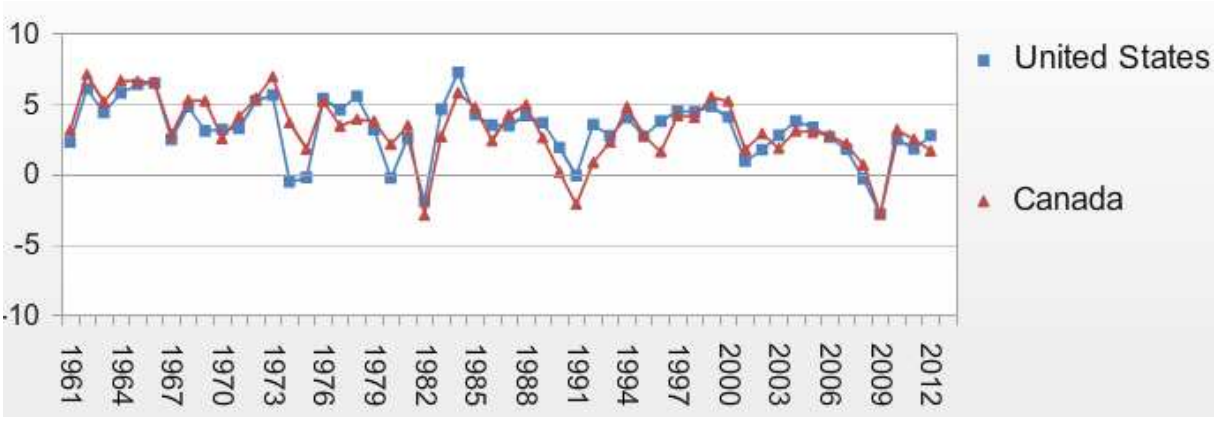




Big growth of over 5% had both Americas in 60-ies 70- is, and negative values were the biggest in 1982, 2008/ 2009. The latest marks are positive and points toward further rise of economies in that region where USA grows with 2,8 %, Canada 1,7%.

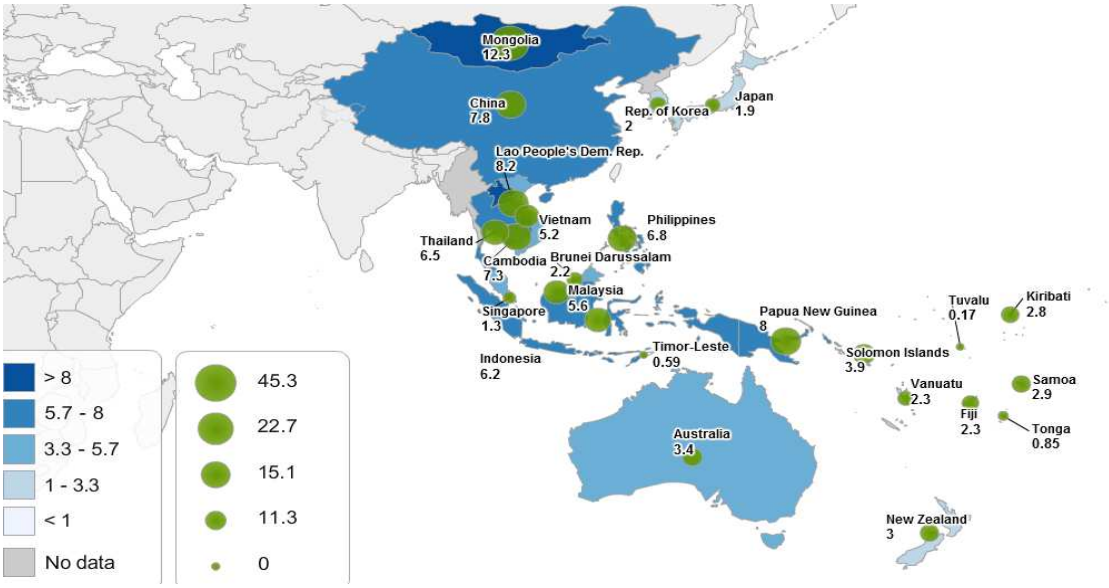


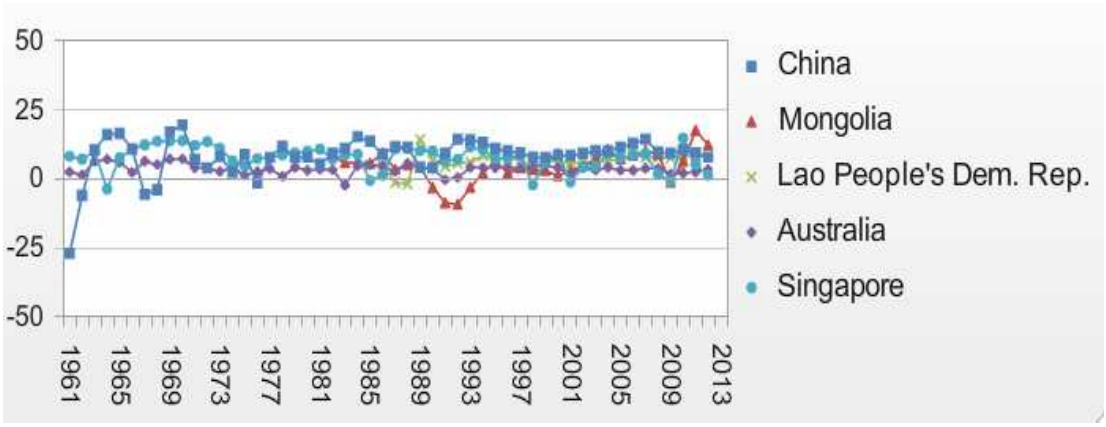
% Growth GDP, USA, Canada



Although China and India are marked as rising stars in economic picture this rate is declining and it is observed that China fell from growth of over 12% to levels to 7-8%, Japan is continuing with constant slow rate of growth 1,9%, and Australia marks certain increase of 3,4%.

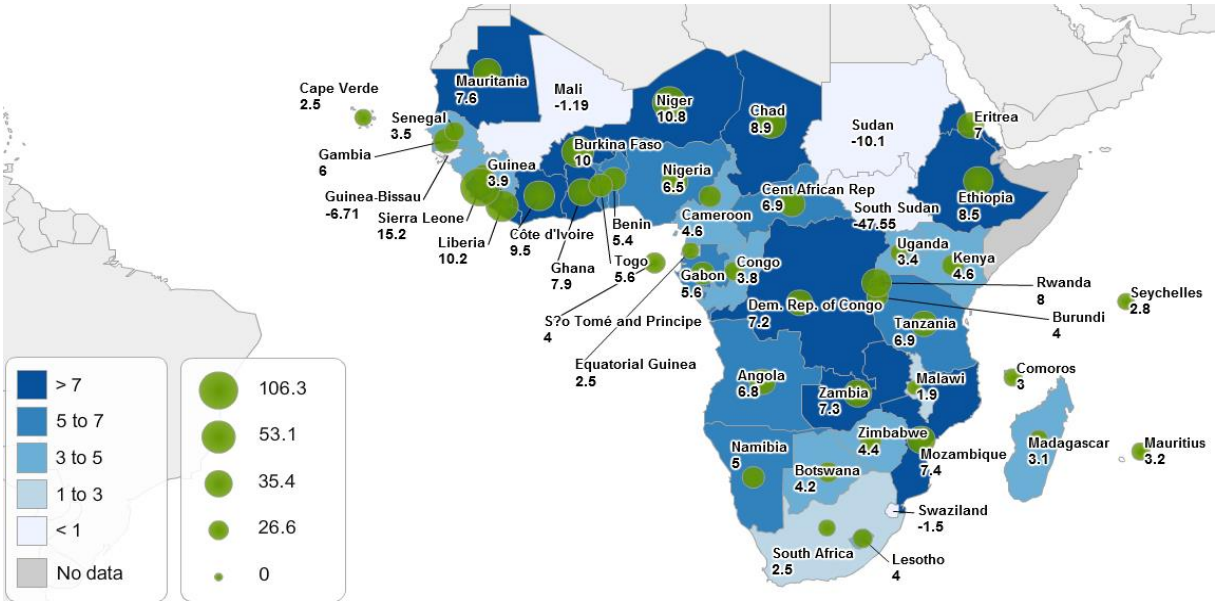
% Growth rate GDP, South Asia

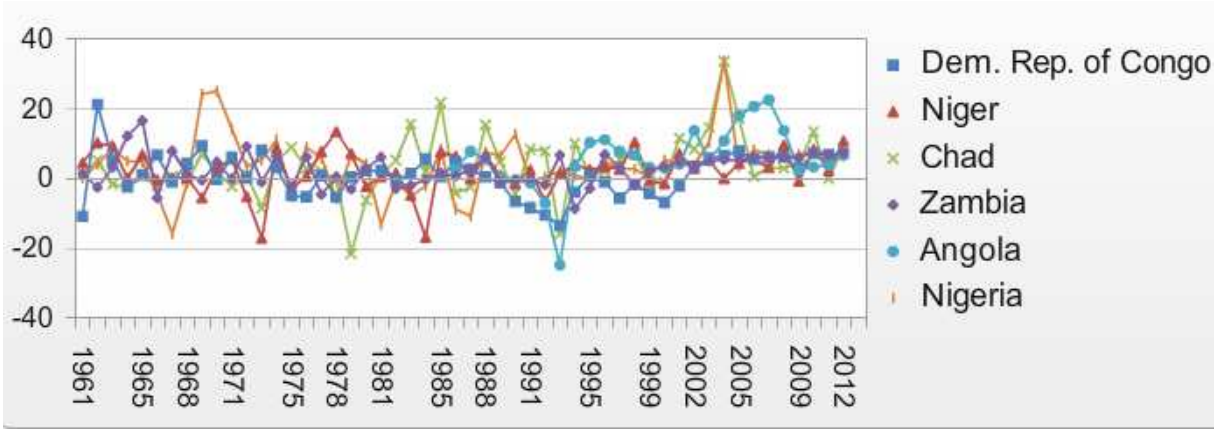




The poorest countries have the strongest opportunity to boost further growth and only war (as the case in Sudan), some unexpected events (disease, natural catastrophes) can influence economies to continue with further growth-the main reason is well known small initial GDP level.

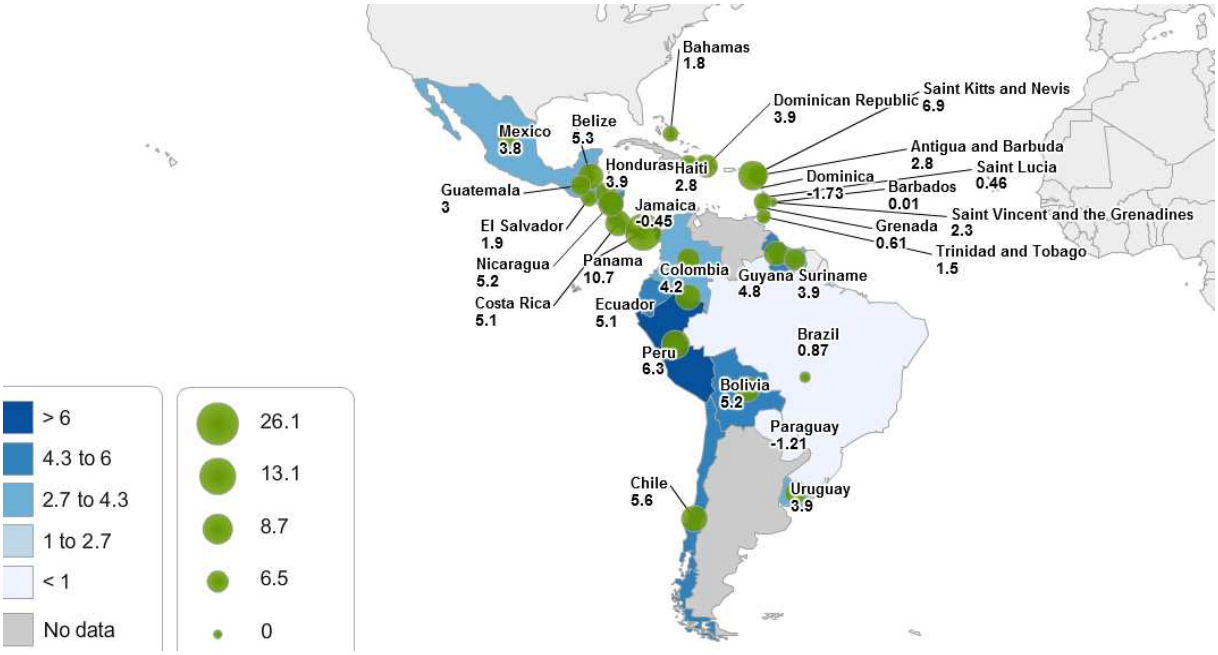
% Growth GDP, Africa

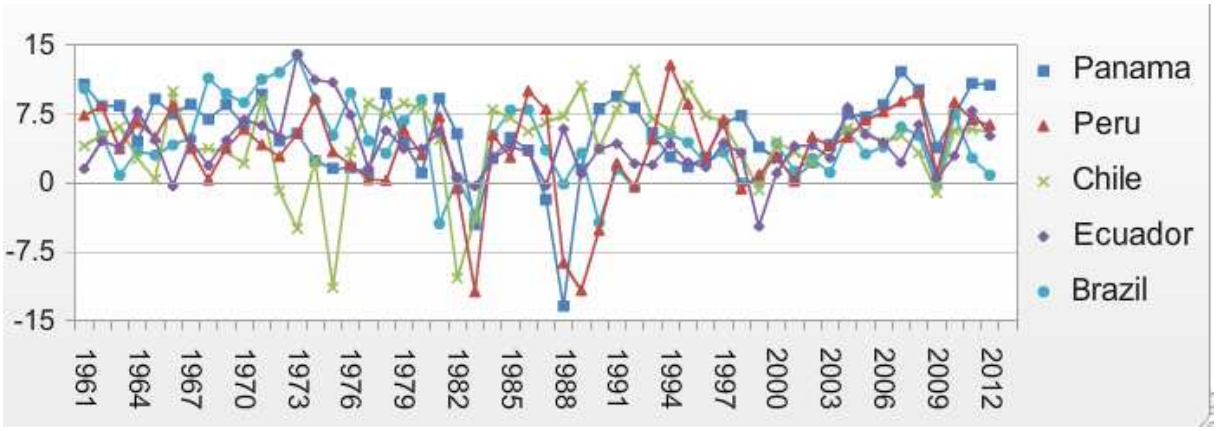




The similar situation is marked in countries of Latin America where rich countries such as Brazil have rate of growth 0, 87%, and Bolivia 5, 2%.

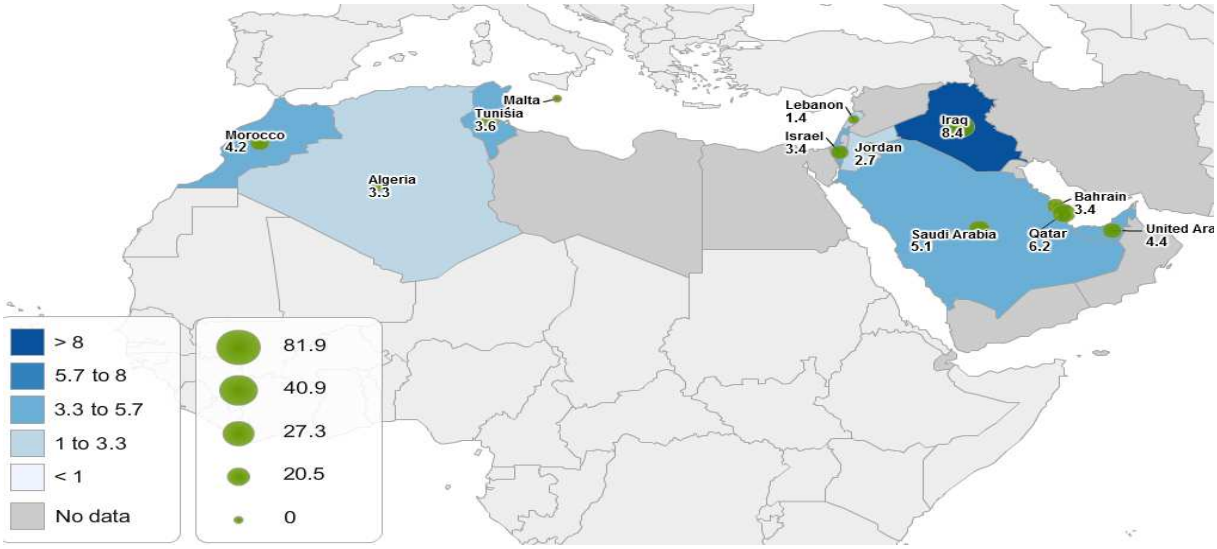
% Growth rate GDP, South America

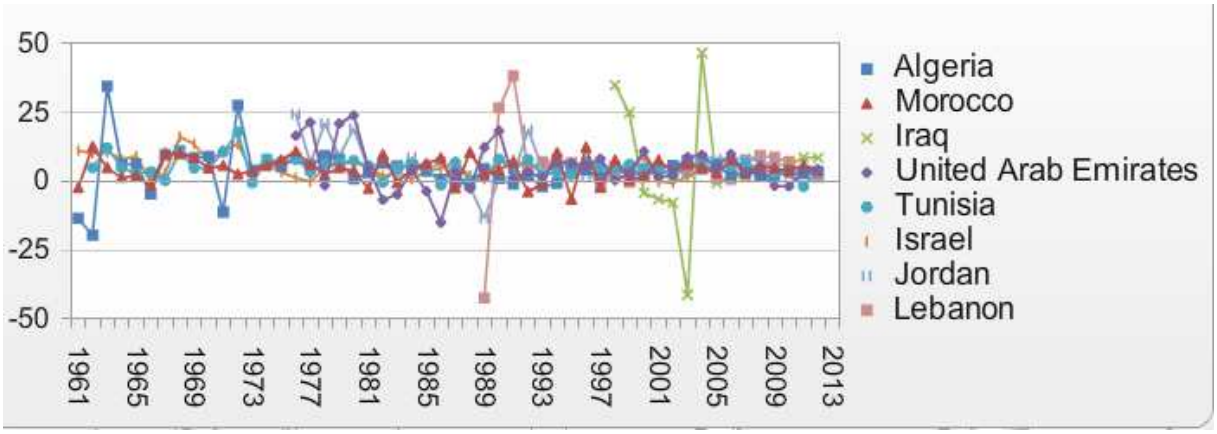




The great potential of growth exist in region of North Africa and Middle East primarily thanks to natural resources but what is important to notice is large inequality of growth as well. Saudi Arabia grows 5, 1%, Israel 3,4%,Algeria 3,3%.

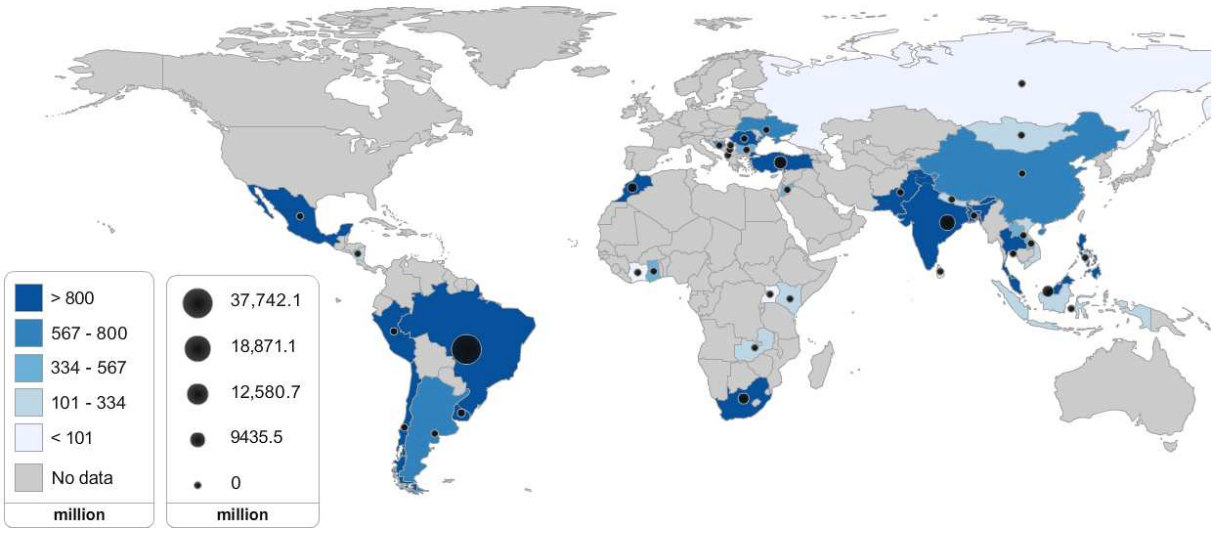
% Growth rate GDP, Middle East, North Africa





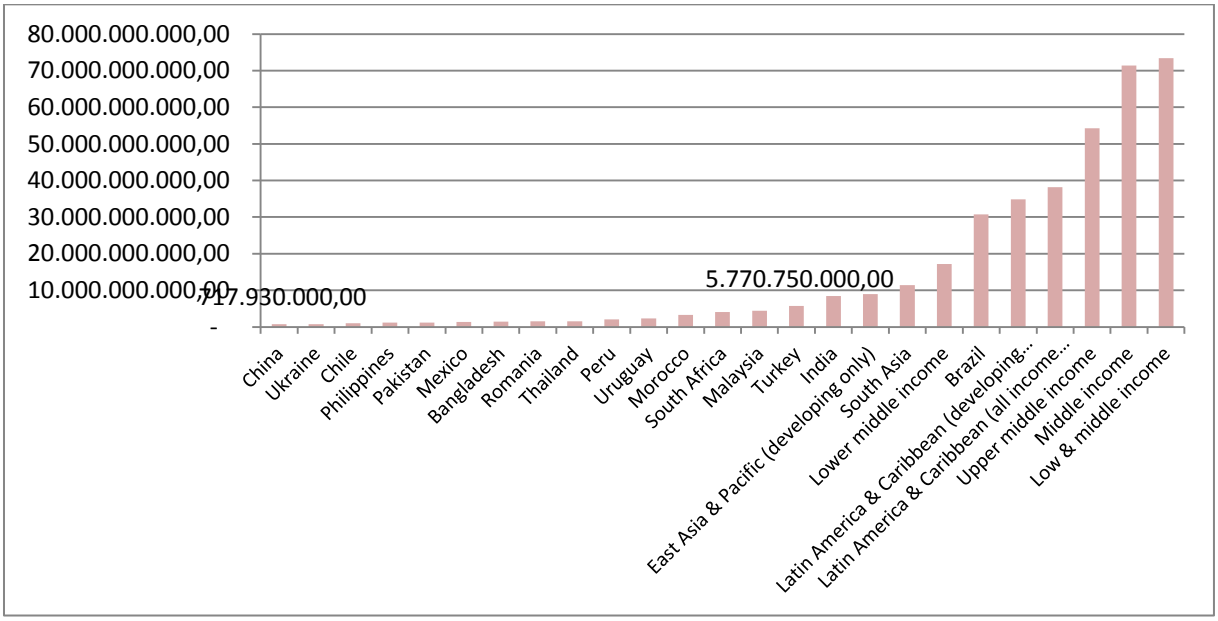
The biggest investments in energy infrastructure with private participation are made in areas of Latin America, Brazil, China, India, and Turkey and in the countries of middle and low income in the observed period year-2012.

Investment in energy business with private capital –Today's USD, in year 2012



In Turkey it was invested 5.770 mil USD while the same period of 2012 in China marked investments of around 717 mil USD.

Investment in energy with private capital, Current USD, in 2012



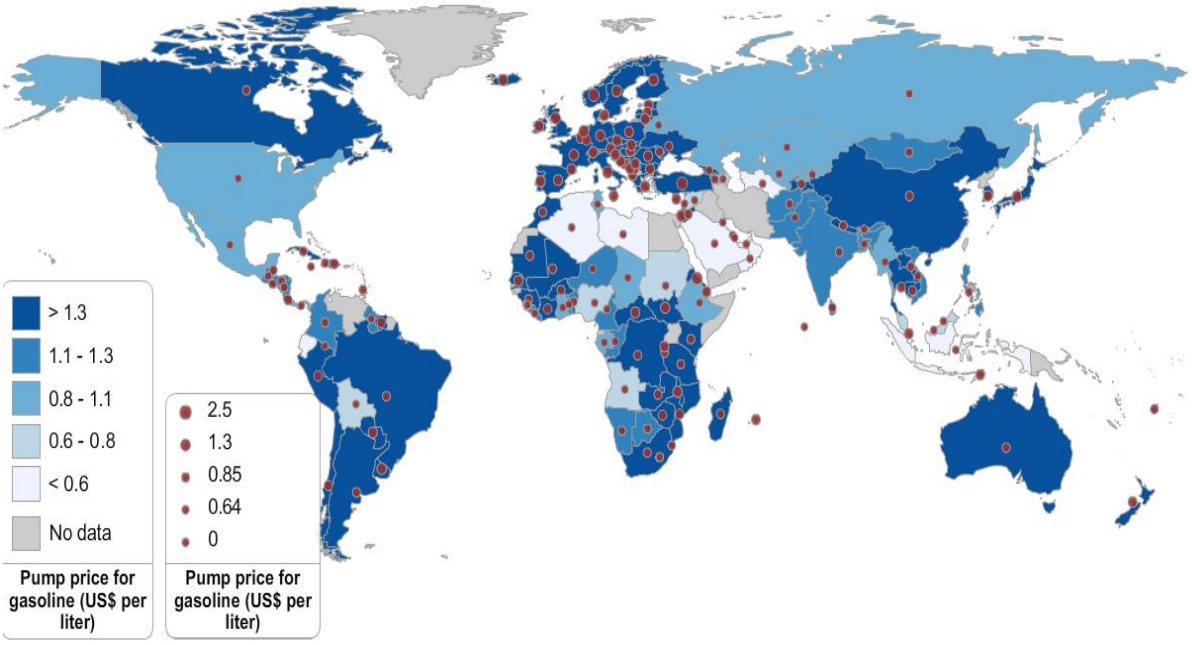
Picture 1

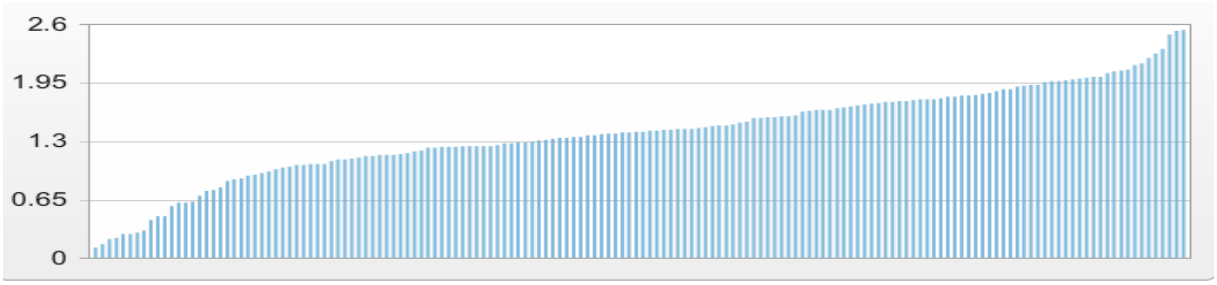
All the data clearly points on diversity in respect of population, wealth and investments as well as further growth of the world and each economy separately.

The end product of crude oil: gasoline, diesel has also different price level that is dependent upon resource opportunities, tax policy, ways of transport etc. The cheapest price is in Venezuela 0,22 $/liter; Libya 0,23 $/liter; Saudi Arabia 0,29 $/liter; and in general in Arab world 0,58 $/ liter. The most expensive prices were observed in Turkey 2,54 $/liter; Norway 2,53 $/liter; Netherland 2,33$/liter ;UK 2,17 $/liter ; and in Croatia it was around 1,77 USD/liter. It is important to stress average price in EU that is 1,92 USD/liter.

Price of gasoline 0,37 USD/liter – 2,6 USD/liter in the world

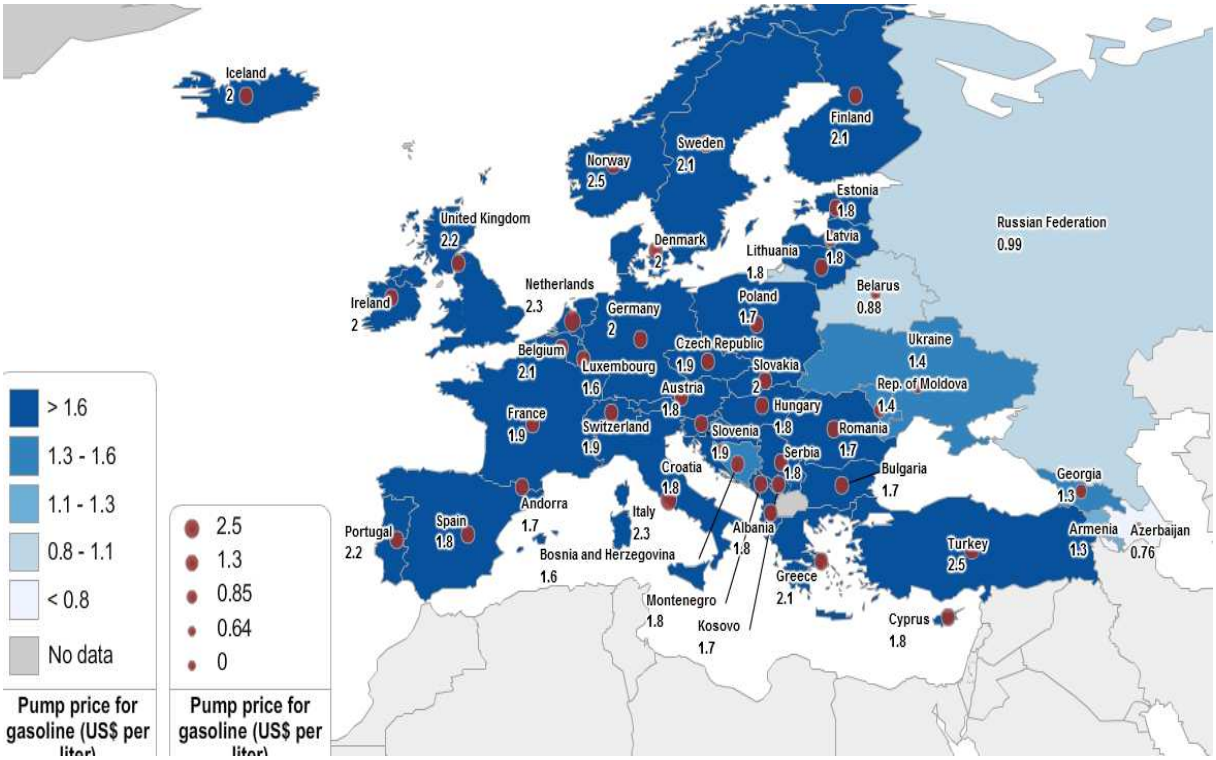
Price of gasoline per liter USD



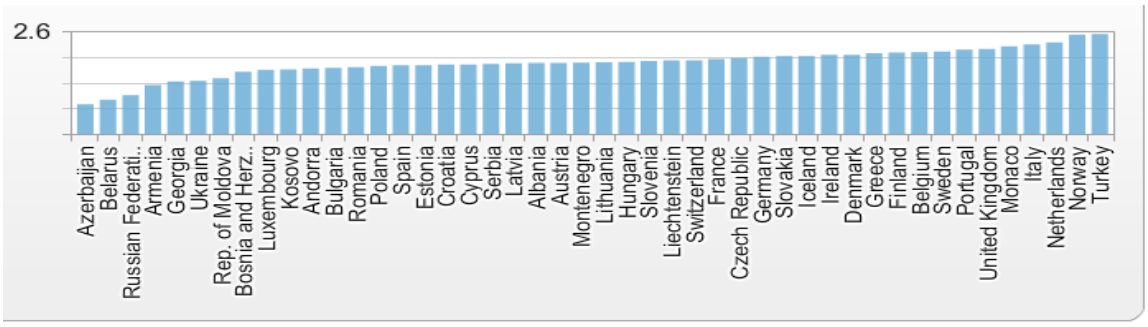


This diversity in prices depends upon production, taxes; acids, refining capacities, and the picture also change with time, place and crude oil selling spot (Mediterranean, North Sea, Russia Brent). In Europe Germany has a price of around 2 $/liter; Spain 1, 8 $/liter, Serbia 1, 8 $/liter; and the bigger producer and exporter Russia has around 0, 99 $/liter.

Benzene price $/ liter Euro / Euro Asia

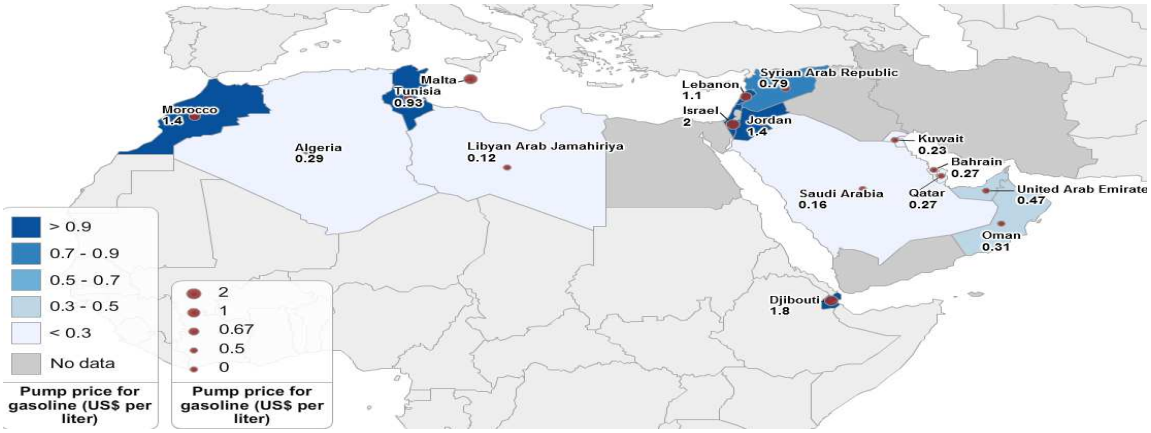


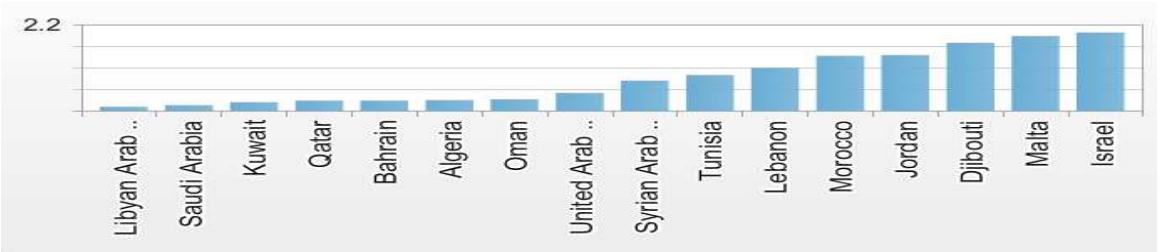
List of prices is presented as follows and marked $/liter where Turkey has the biggest price and producers such as Russia the lowest.



Countries with huge and significant oil reserves have the lowest prices where in the region of Middle East only Israel advance with prices with 2 $/liter.

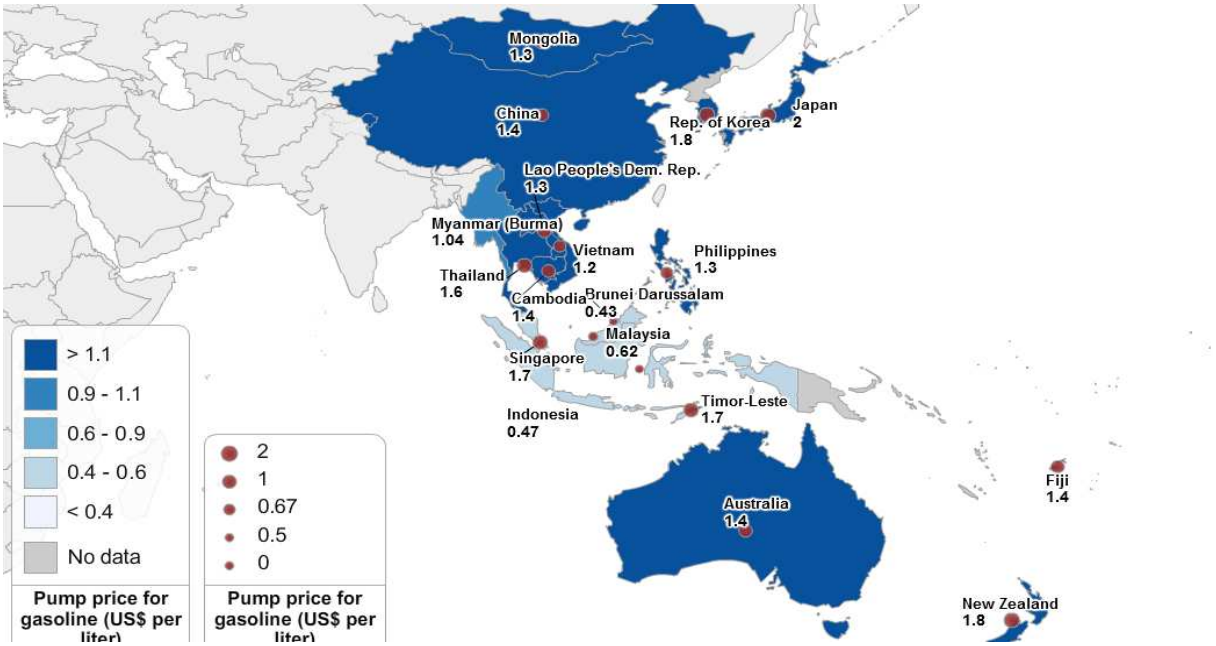
Price $/liter benzin Middle East / North Africa

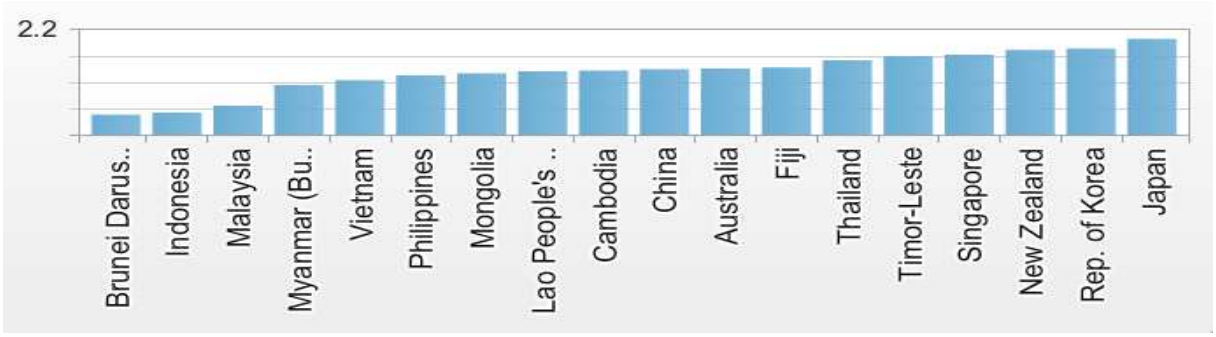




The similar structure is in the region of South Asia where Brunei has the lowest price of end product and Japan the biggest 2 $/liter. Australia and China have similar price of end product around 1,4 $/liter.

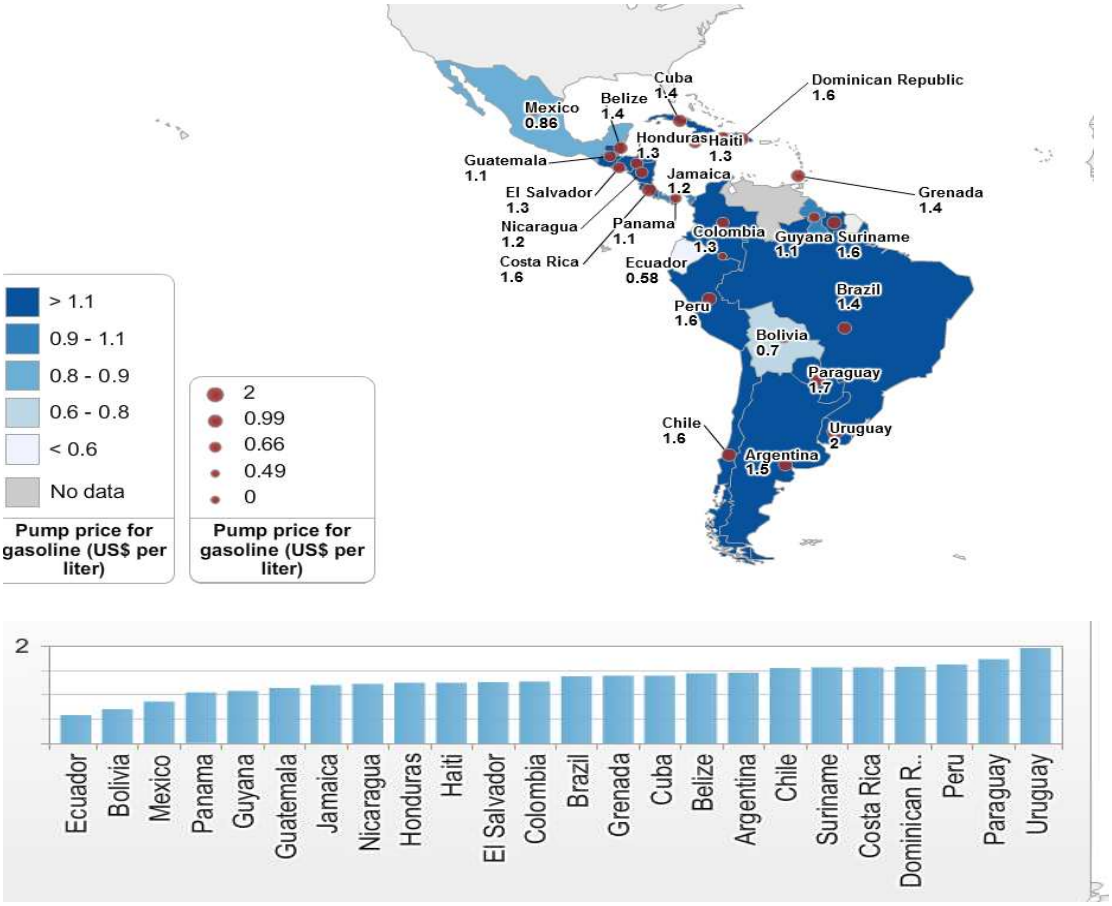
$/liter price of gasoline Eastern Asia





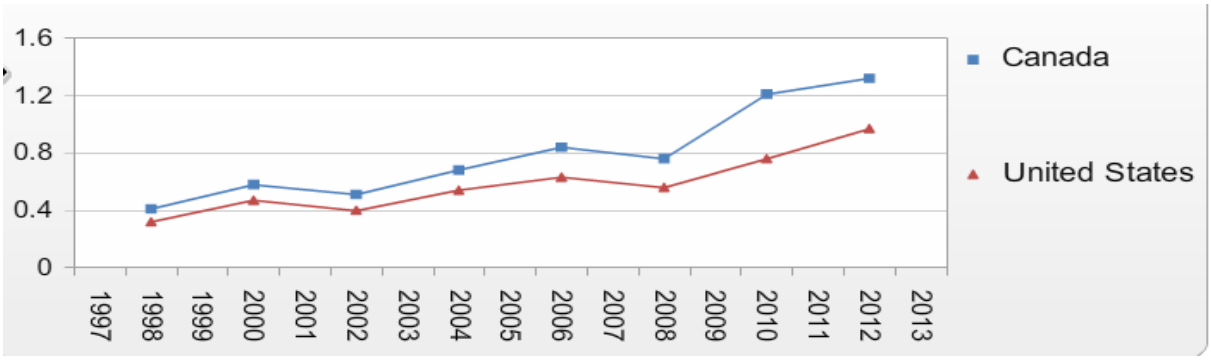
Price of gasoline varies in South America also where Brazil has 1,4 $/liter; Equator 0,58 $/liter.

Price $/ liter gasoline South America



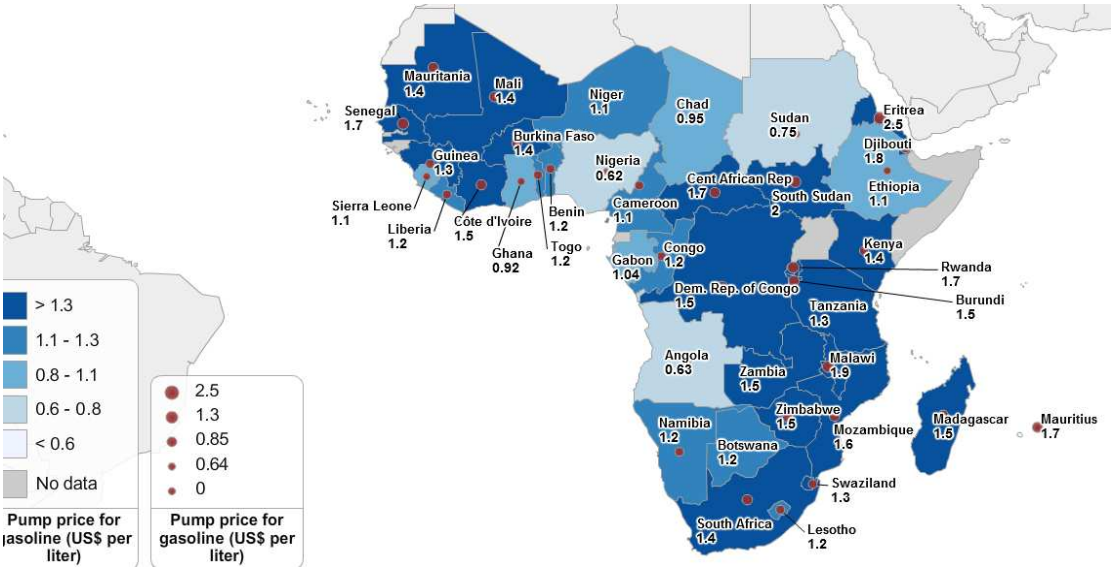
It is very interesting to point out difference in end price between Canada and USA where a person in USA must pay 0, 99 $/liter and in Canada 1, 3 $/liter.

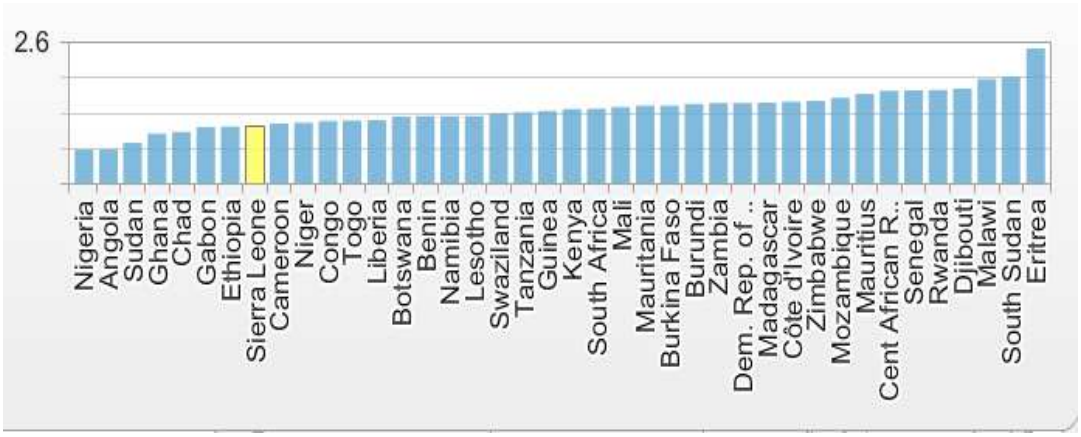
$/liter gasoline North America



In Africa population situated in Eritrea need to give the most 2, 5$/liter and the least in Nigeria 0, 8 $/liter what is also to expected according to oil reserves.

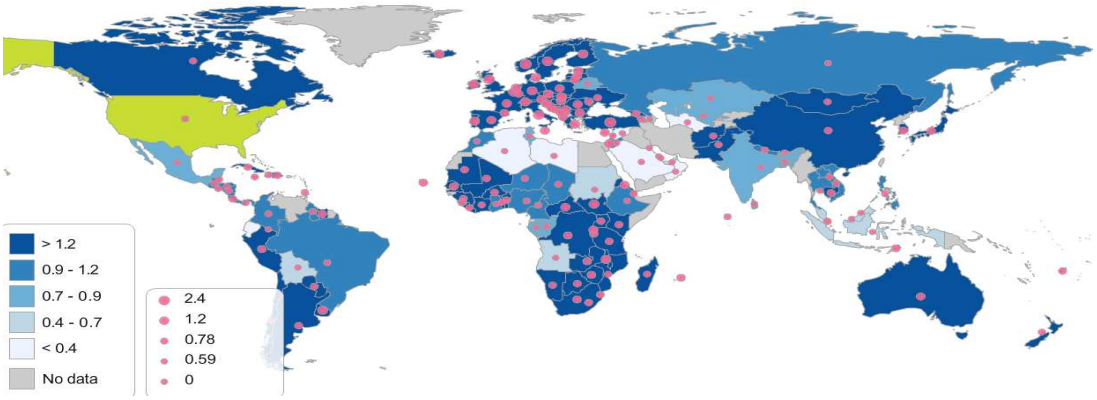
$/liter gasoline Africa



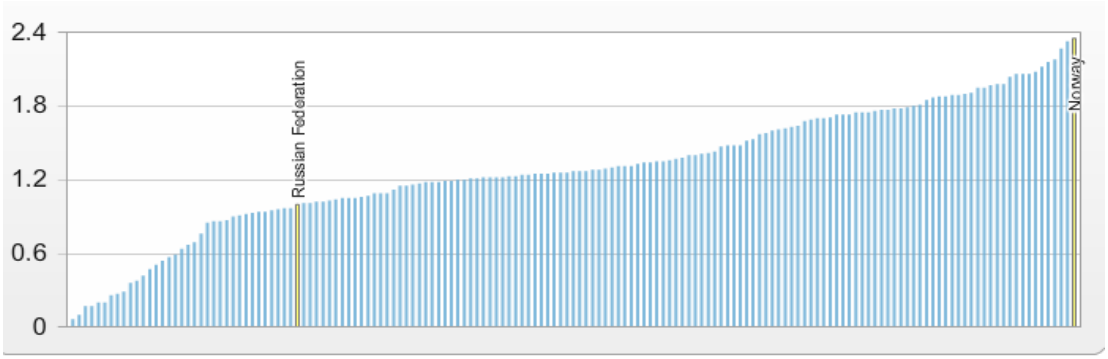


Another important oil product is a diesel. Its price varies also from country to country and can show significant differences between regions. The lowest price as expected is observed in Venezuela , than Saudi Arabia 0,07 $/liter; Libya 0,1 $/liter; Iran 0,12$/liter; Algeria 0,17 $/liter; Kuwait 0,2 $/liter ;Brunei 0,26 $/liter ,Sudan 0,51 $/liter. The largest price is in Norway 2,3 $/liter; Turkey 2,334/liter; UK 2,27 $/liter; 2,18 $/liter; Israel 2,12 $/liter ;Hungary 1,91 $/liter etc.

Price of diesel per liter USD

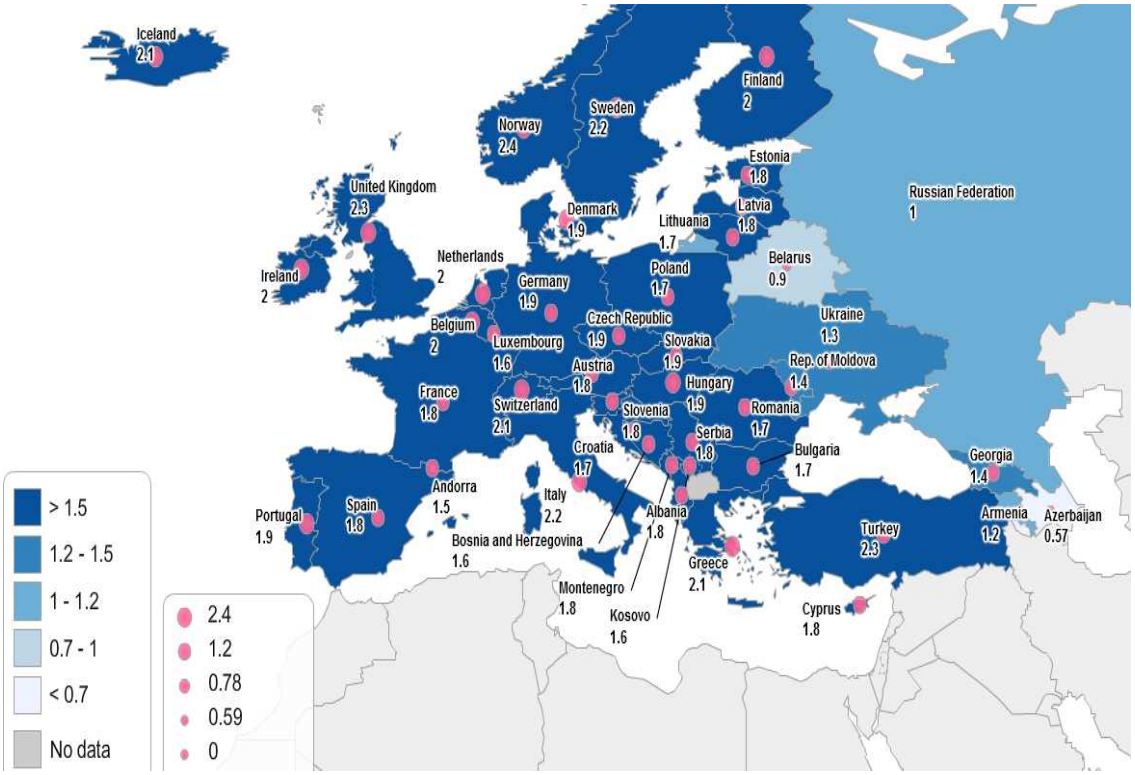


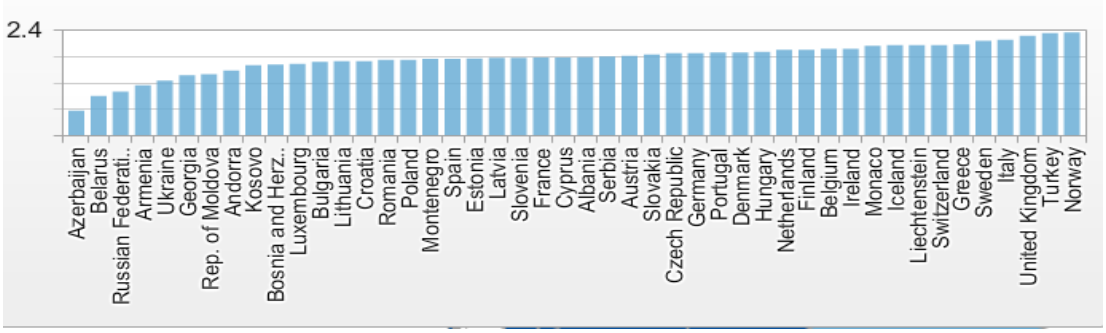
Price of diesel l / USD



It is also shown on the picture that follows on the map of Europe difference in pricing policy of diesel: in Russia it is expected for person to pay 1 $/liter; Germany 1,9 USD/liter; Sweden 2,2 $/liter. In Croatia in 2012 price was 1,7 $/liter.

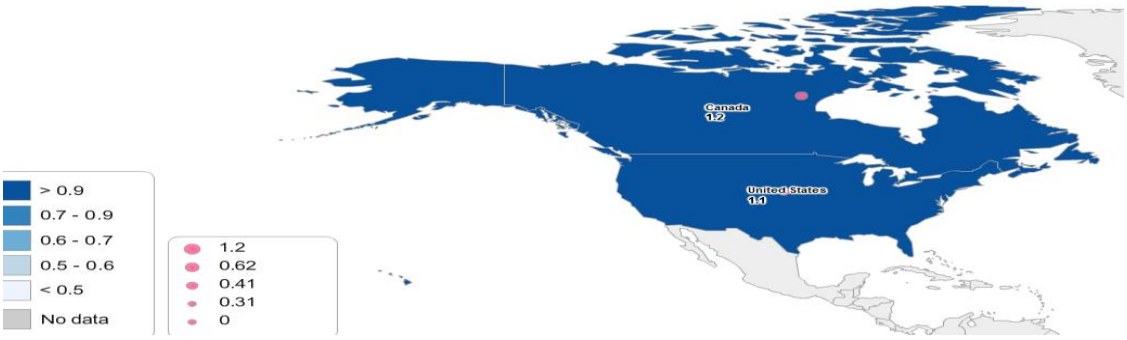
$/liter diesel Europa/Eurasia





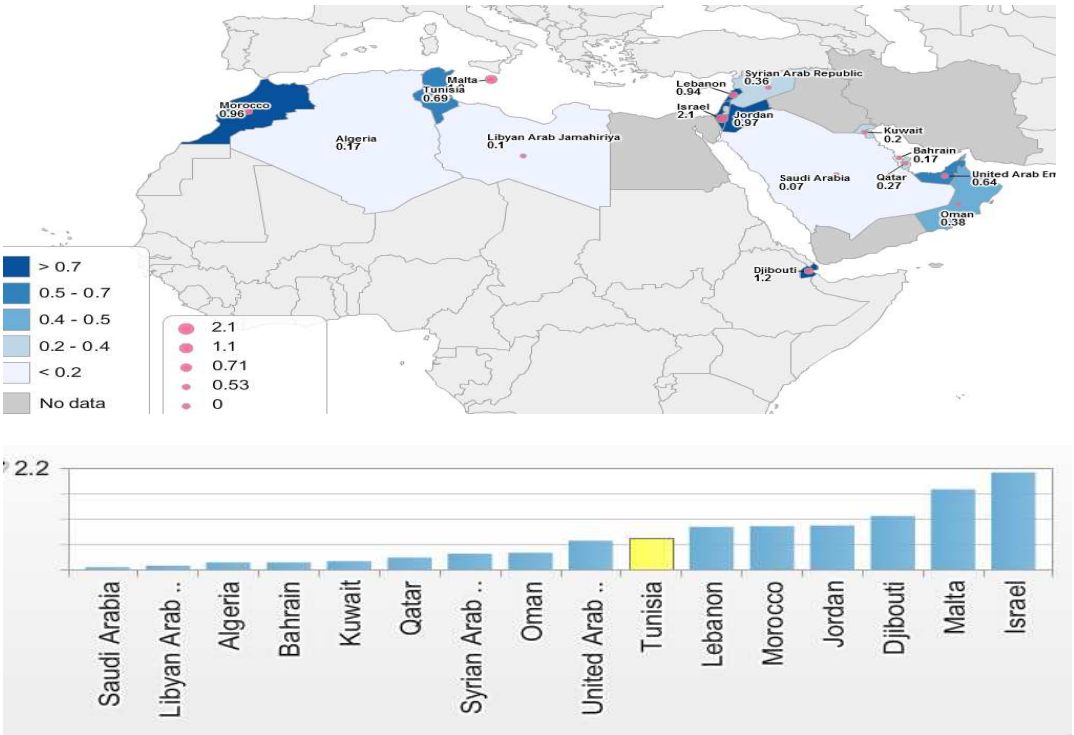
Price of diesel is around the same in Canada and USA and is 1, 1 $/liter.

$/liter diesel, North America



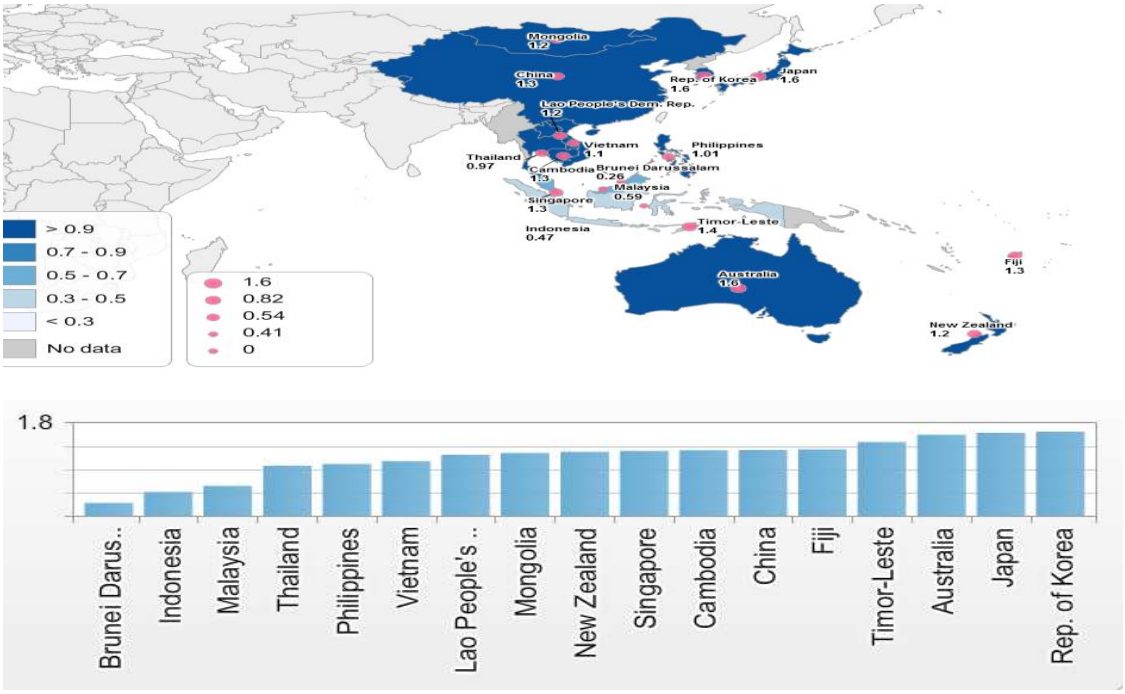
It is expected that the end price is lower in the region that is rich with oil –in that respect only country –Israel- has the above average price.

$/liter diesel Middle East, North Africa



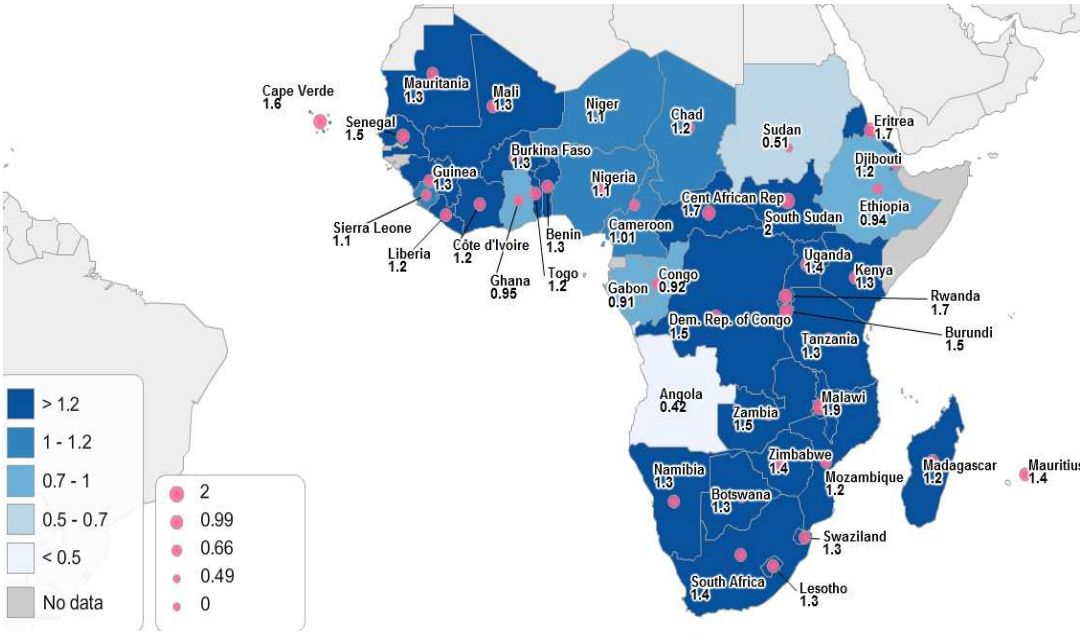
End price of diesel in Asia, China and Australia have different pricing strategies also where Chinese person need to give 1, 3 $/liter and in Australia 1, 6 $/liter.

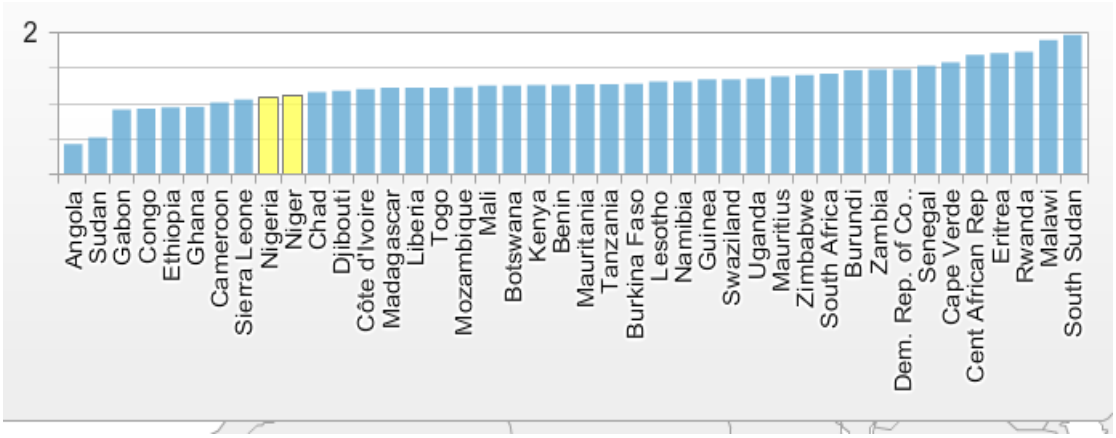
$/liter diesel, East Asia



Angola, Sudan and Gabon have the lowest price of diesel per liter while South Sudan, Malawi, Eritrea, and Rwanda have the biggest values that have to pay per liter.

$/liter diesel Africa

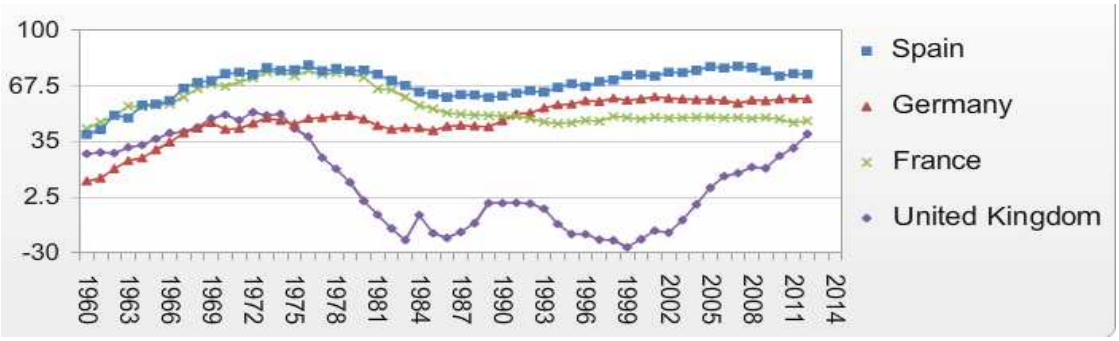




The huge difference depends upon GDP, tax policy, and resource reserves.

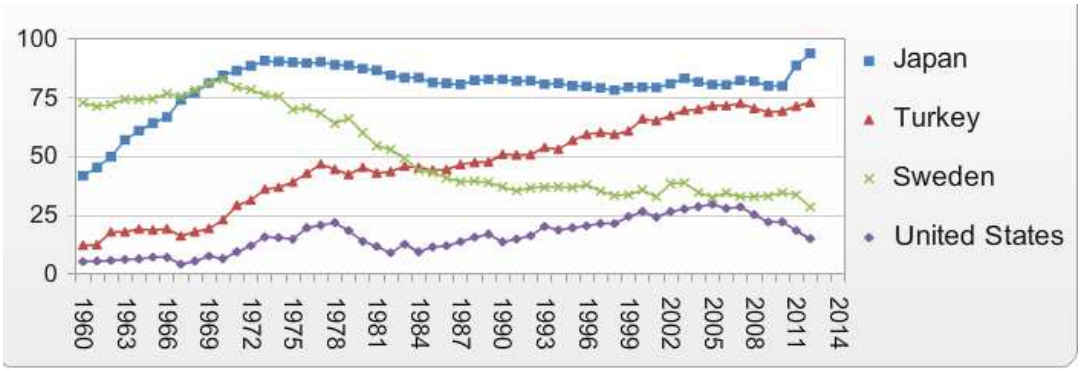
Each country tends to lower risk of market disturbances by developing different ways of import, building renewable facilities, and promoting energy efficiency measures. The majority of EU countries are not rich with oil/gas resources and import dependency is greater than 50%. Only UK, Norway, Romania have reserves that are actively produced and used.

Energy dependence % of import considering consumption



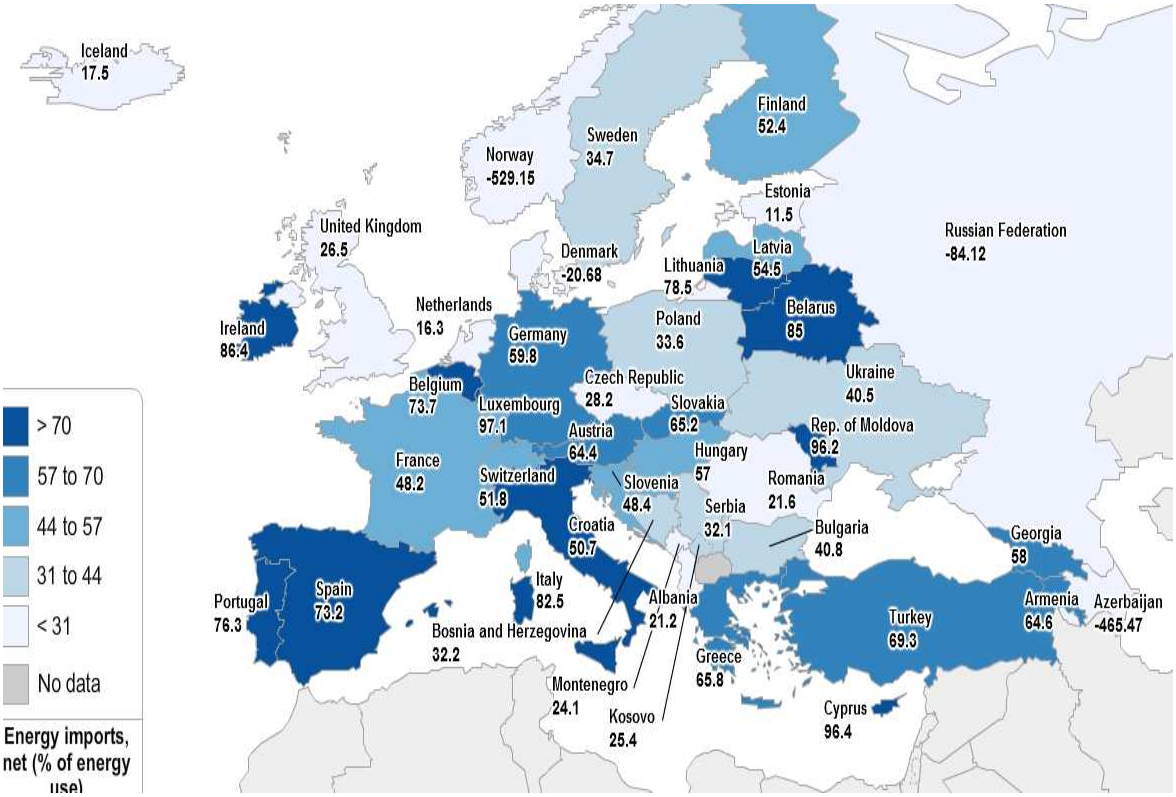
Energy dependence can change from time to time and countries such as Turkey and Japan increase their already large dependence, while some of them (USA 25-19-15% dependence; or Sweden) decrease by working on its renewable potentials.

Energy efficiency % energy import considering consumption

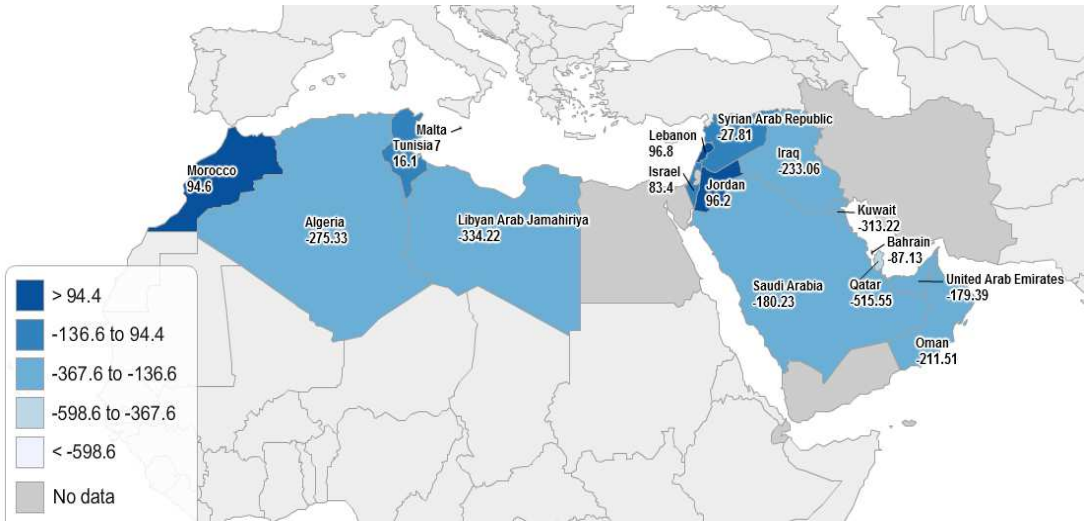


In some countries of EU such as Denmark and Norway net exporters of energy resources or closeness to Russia helps to keep stability in energy supply.

Energy dependence % Europa/ Euro Asia



Countries situated on the Middle East are net exporters (except Israel).

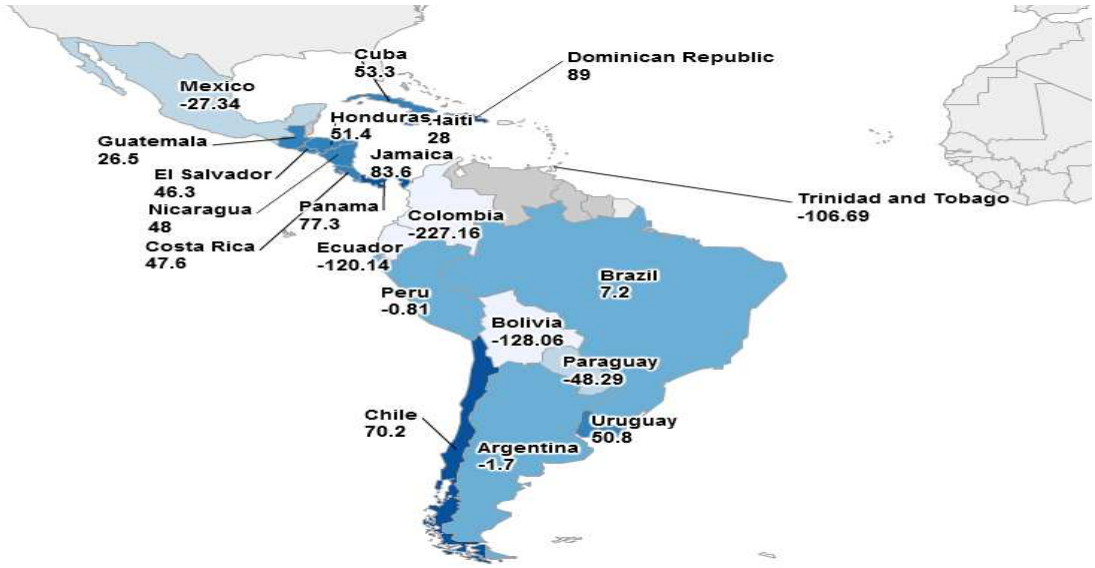


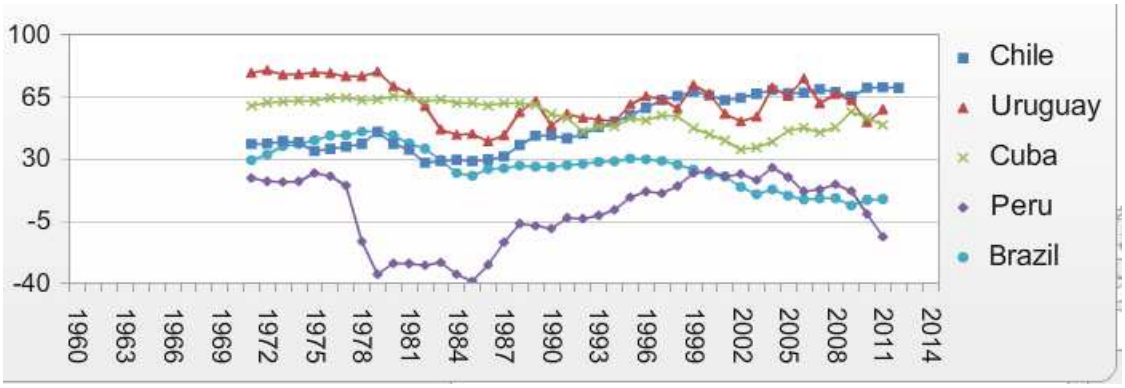
Big engine of growth China is dependent 10 % while its big competitor Japan depends with 80 %.

Energy dependence % East Asia

Different picture of energy dependence is present and in the area of Latin America where Brazil is dependent with 7% of all its needs, Bolivia is net exporter, and Chile is dependent with around 70 % of its consumption.

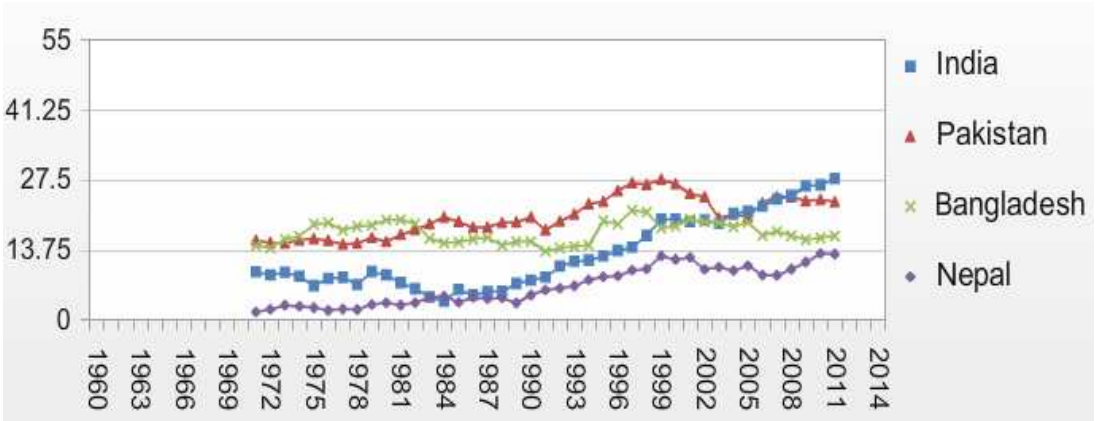
Energy dependence % South America





In India more than 25 % of energy supply comes from abroad and the similar situation is in Pakistan both important nuclear forces and strong economic contributors to growth.

Energy dependence % South Asia



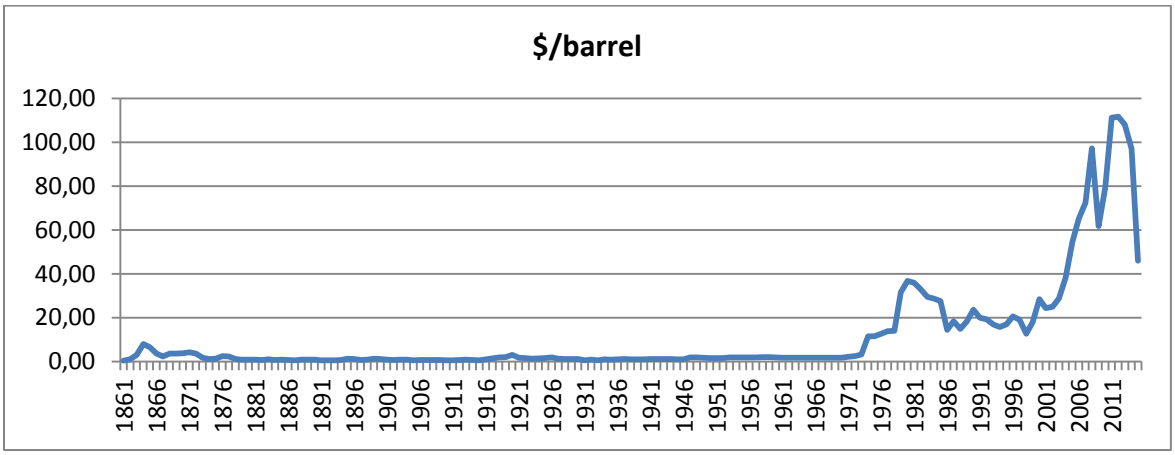
2. OIL

2.1. OIL IN GENERAL

Oil is one of important sources of energy. It is well known fact that areas with significant oil reserves are world important strategic places. Oil is still very much present in transport sector and contributes to economic growth. Lately this energy source is subject to large legislative rules, (emission level) and companies that rely on oil need to incorporate technologies that are not offensive to environment and obtain lower harmful emission levels (CO,CO_2, PM, S,).

Recent developments around oil points toward great disturbance in political structures in countries producers, great fluctuation in prices (160-45$/barrel in only few years) and still large input in transport sector throughout world. (Lower elasticity rate comparing to gas/electric vehicles).

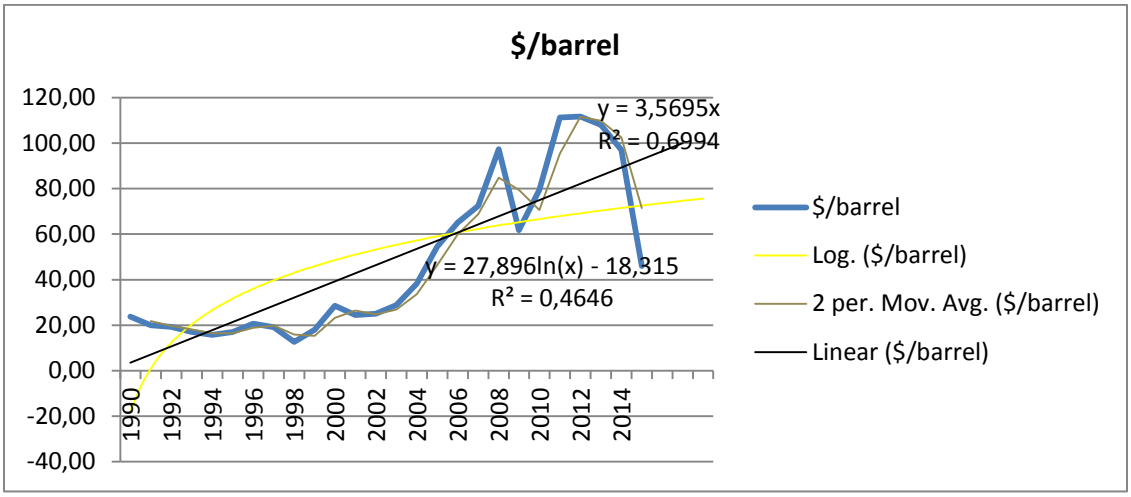
Oil price $/barrel 1861-2015



Picture 2

This imbalances and problems, sudden jumps have in favor of theses that it is hard to predict oil price in advance, and so far the best method observed was moving average. But only technical analysis cannot bring good results (OPEC agreement to increase/decrease production; forward/future agreement policy; speculation, disturbances, natural catastrophes, conflicts, etc.).

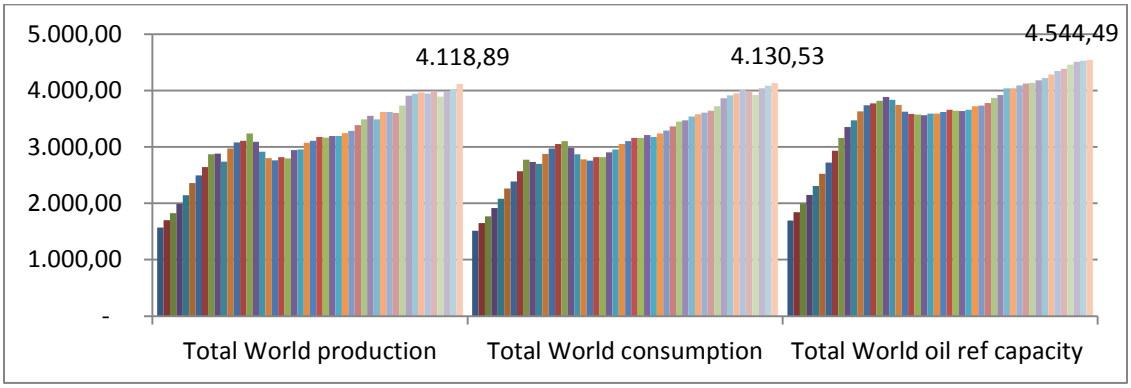
Oil price 1990-2015 $/barrel



Picture 3

Despite unproductive price both production and consumption on the world level marks growth to be around 4.118 mil ton years or 4.130 mil ton year.

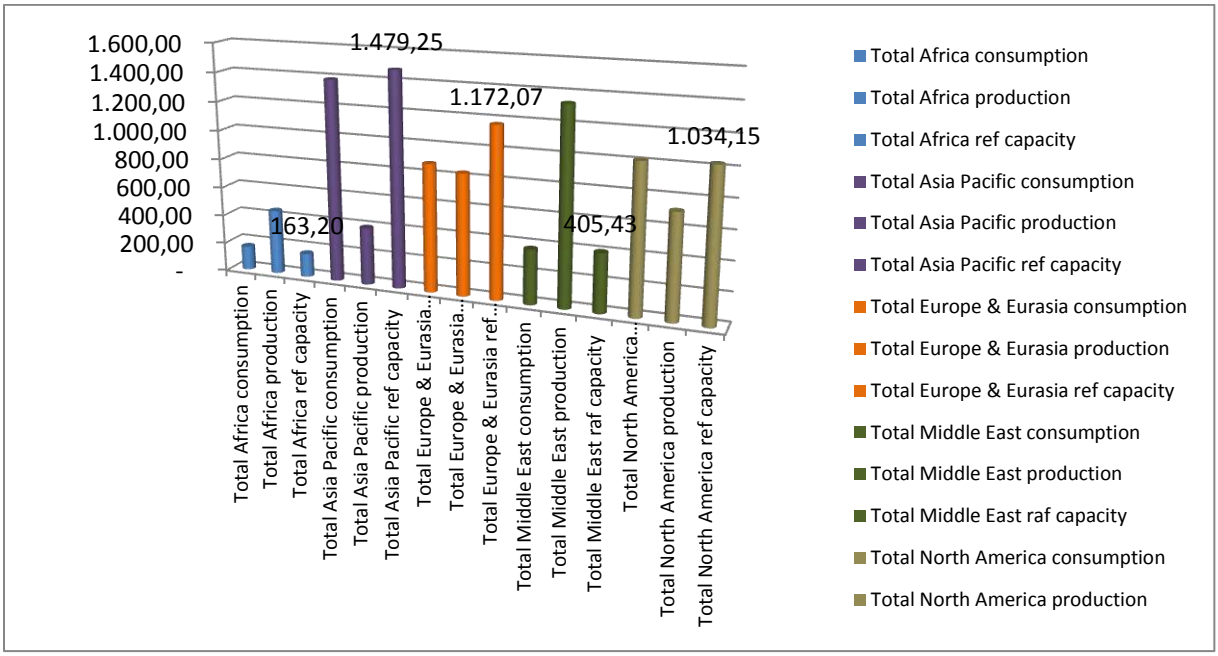
Production, Consumption, Refining Capacity 1965- 2012 mil ton year



Picture 4

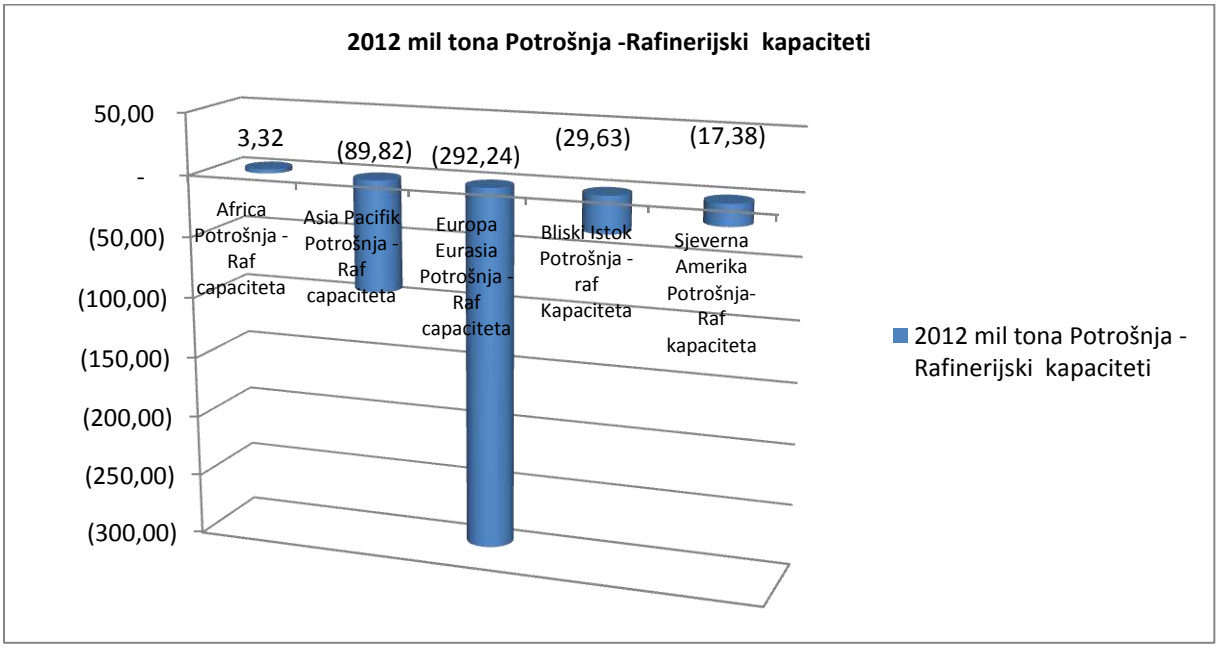
Very different picture in the end price of oil, oil product and reserve opportunities are added to the picture of unequally distributed refining capacities .Large production is situated in the Middle East but refining capacity is hardly sufficient for its own needs. All regions in the world have sufficient or larger than needed refining capacity (except Africa).

Production, Consumption, Refining Capacity



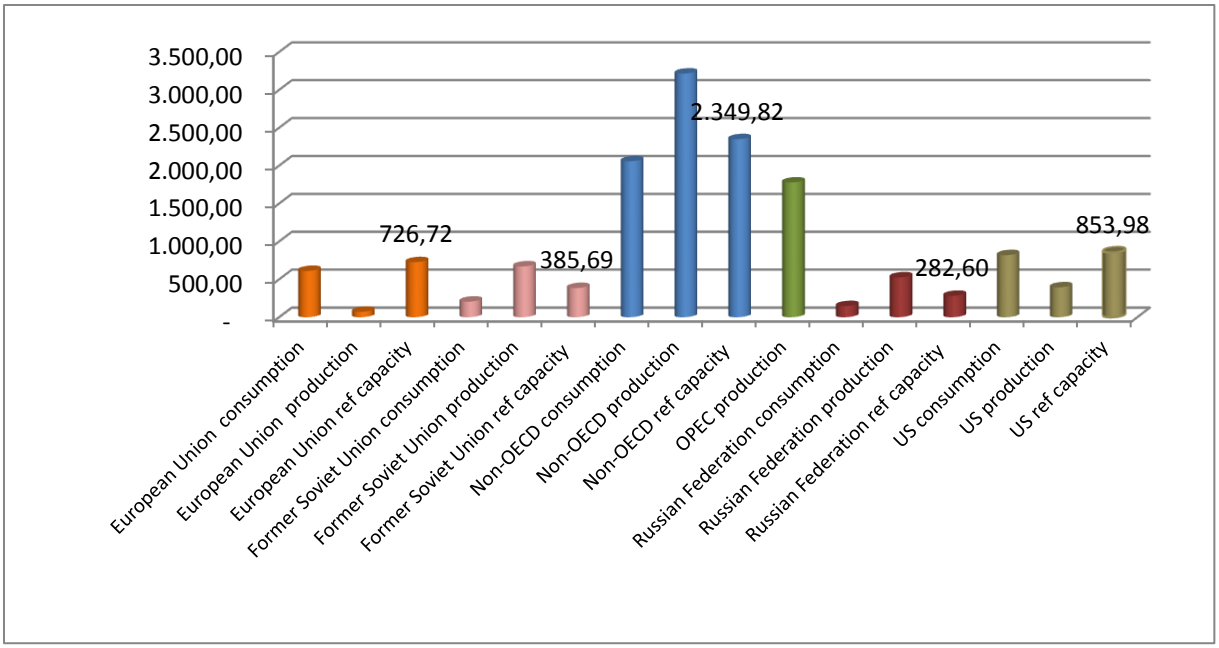
Picture 5

Difference between current refining facilities and consumption is shown on the *Picture 6* where this difference is by far the largest in Europe and Eurasia.



Picture 6

Refining capacity in EU amounts 726 mil ton, while in Russia is 282 mil ton. The big consumer USA has refining capacity capable to intake 853 mil ton.



Picture 7

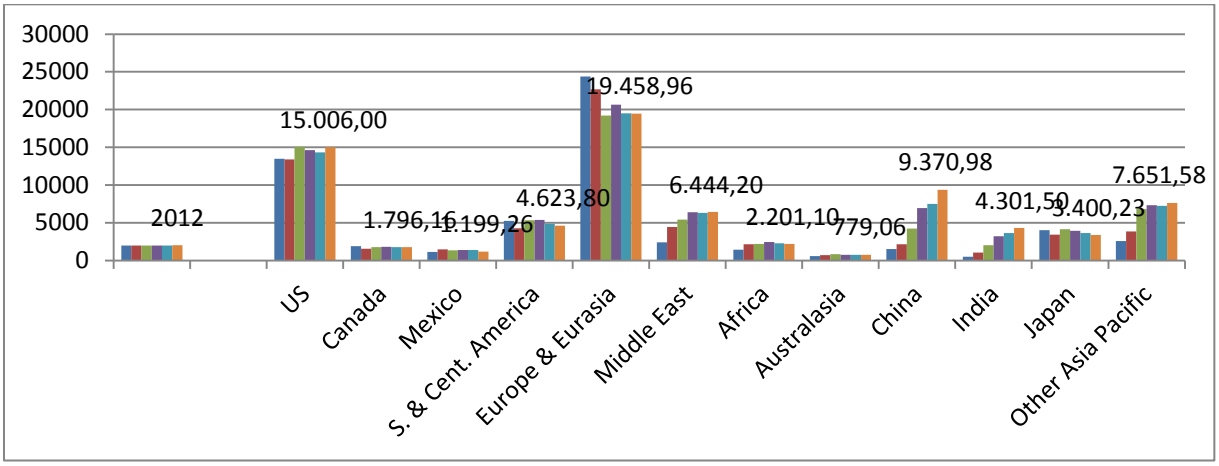
All big consumer countries have a spare refining capacity and now face competition from Middle East that has plans to increase end product and sell instead of oil products that are demanded on the market.

Table 1: Consumption, Production, Refining capacity

	Oil	2012 Mil ton	Difference ref capacity-consumption
European Union consumption	EU consumption	**611,25**	
European Union production	EU production	**72,98**	
European Union ref capacity	EU ref capacity	726,72	- 115,46
Former Soviet Union consumption	FSU consumption	**205,87**	
Former Soviet Union production	FSU production	**670,89**	
Former Soviet Union ref capacity	FSU ref capacity	385,69	- 179,82
Non-OECD consumption	Non OECD consumption	**2.057,68**	
Non-OECD production	Non OECD production	**3.215,87**	
Non-OECD ref capacity	Non OECD ref capacity	2.349,82	- 292,14
OPEC production	OPEC Production	**1.778,41**	
Russian Federation consumption	Russia consumption	**147,48**	
Russian Federation production	Russia production	**526,23**	
Russian Federation ref capacity	Russia refinery capac	282,60	- 135,12
US consumption	USA consumption	**819,87**	
US production	USA production	**394,94**	
US ref capacity	USA refinery capacity	853,98	- 34,11

Although Europe and Eurasia have the biggest refining capacity 19 458 thousand barrels per day, this trends decline and only Middle East and China have desire to increase current status in their counties.

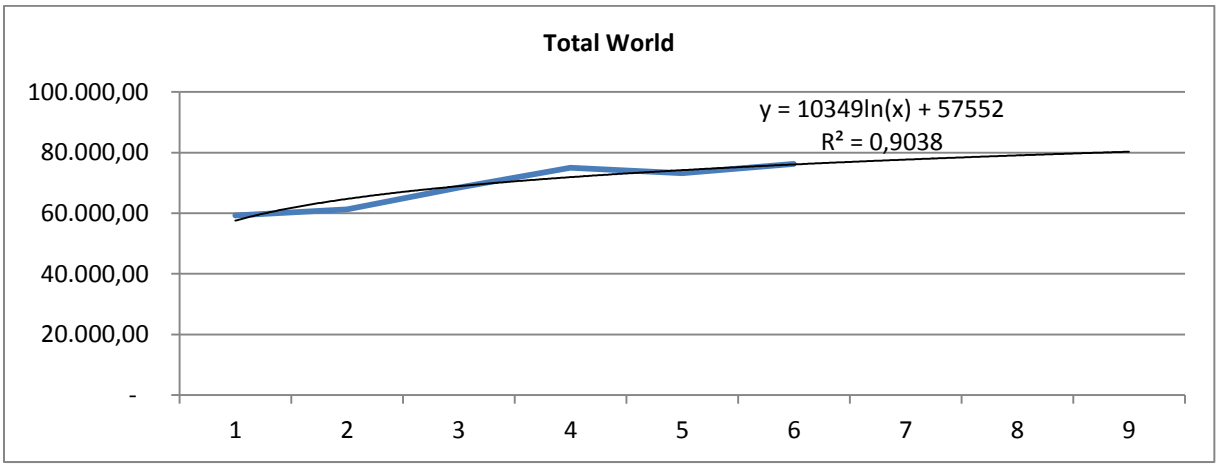
Refining throughput 000 barrel per day



Picture 8

While refining capacity is very hard to build considering more stricter environmental rules and criteria current capacity status is more or less equal and is around 80 000 barrel/day.

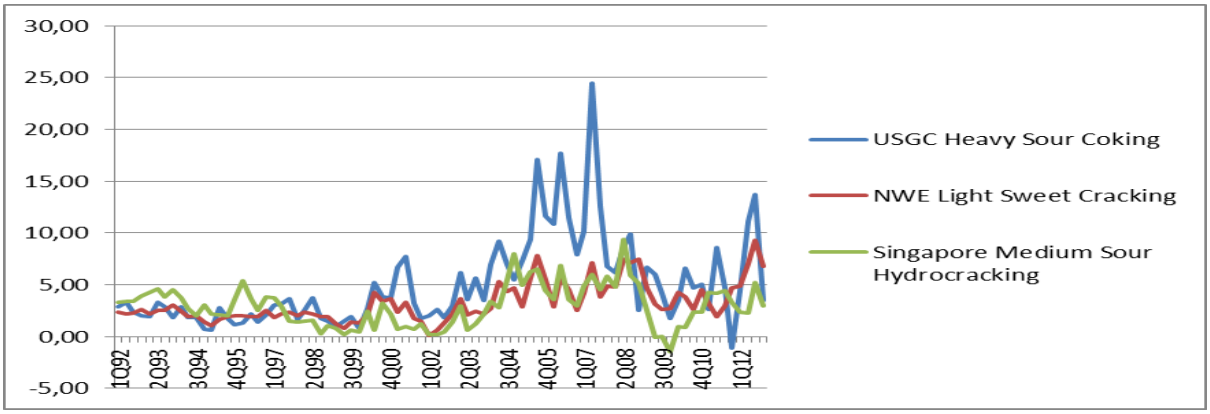
Refining throughput 000 barrel day –world



Picture 9

With rise of oil prices refining margin grew and in 2008 decreased significantly to bottom negative values of refining margin. It depends upon oil price, competition, standards that certain refineries need to comply etc.

Refining margin USD $ /barrel



Picture 10

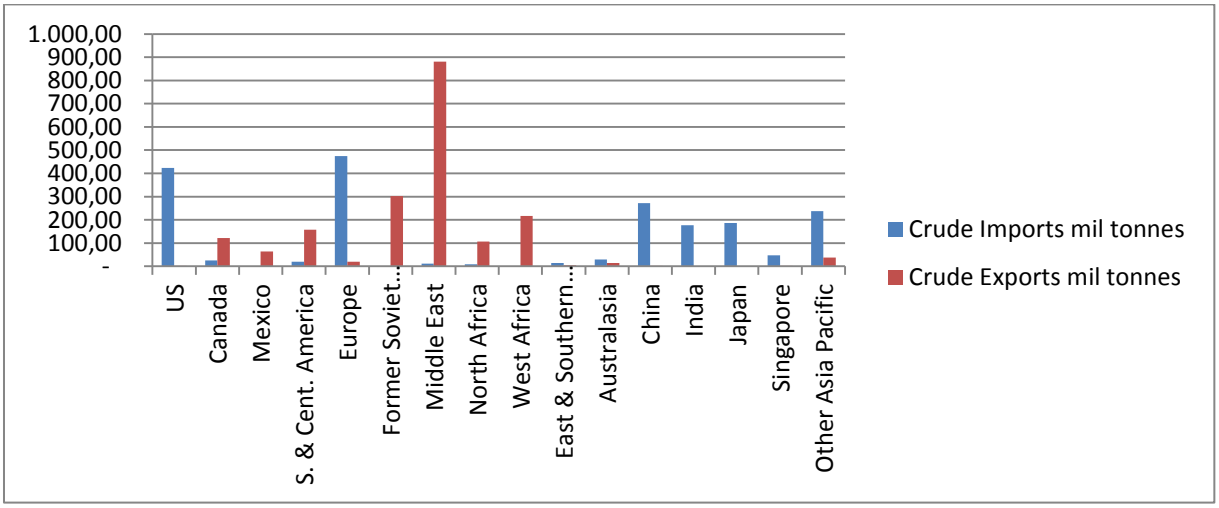
Very vivid and large oil trade is constantly under way and it goes from Middle East to East Asia, Europe, or passes' large continental areas –Druzba oil pipeline, Enbridge etc. The biggest oil importer is USA that needs 524 mil ton oil per year and satisfy its need primarily from import that comes from Canada (around 145 mil ton), than Western Africa 42 mil ton. The second significant importer is Europe that imports oil from former Soviet Union around 250 mil ton, than from Middle East 112 mil ton, and Western Africa 65 mil ton. China grows in its needs and imports around 354 mil ton oil largely from Middle East (144 mil ton), western Africa (51 mil ton). Japan is significant importer with 234 mil ton year oil that comes per sea, and India with 192 mil ton oil (from Middle East).

Pipelines /Transport Import/ Export oil

	US	Canada	Mexico	S. & Cent. America	Europe	Africa	Australasia	China	India	Japan	Singapore	Other Asia Pacific	Rest of World	Total
Million tonnes														
From														
US	-	7,8	23,7	44,8	28,8	3,7	0,2	6,0	0,9	4,9	5,8	0,9	1,0	128,6
Canada	146,5	-	-	0,2	2,7	†	†	1,5	†	0,6	†	†	-	151,4
Mexico	51,4	1,2	-	1,0	9,4	-	-	1,1	3,8	†	0,1	0,1	-	68,1
S. & Cent. Americ	98,3	0,7	0,7	-	20,9	0,4	-	31,5	22,7	1,6	10,9	2,2	0,1	190,1
Europe	26,7	6,1	2,6	8,0	-	22,8	0,2	1,0	0,3	0,9	10,8	13,7	12,0	105,0
Former Soviet Un	26,4	0,2	-	1,3	286,5	3,1	1,3	59,7	2,5	9,3	6,8	17,0	10,2	424,3
Middle East	108,0	7,7	0,6	6,1	112,2	21,1	6,6	144,4	123,1	176,1	55,4	218,0	0,3	979,6
North Africa	16,8	7,5	-	4,3	78,3	-	1,3	11,0	4,5	0,9	0,4	3,4	0,8	129,1
West Africa	42,9	4,2	-	9,6	65,5	-	5,9	51,6	27,3	4,9	0,1	15,5	-	227,4
East & Southern	0,1	-	-	0,4	†	-	†	3,0	0,2	0,6	0,6	0,1	-	5,0
Australasia	0,3	-	-	0,4	†	†	-	7,7	0,2	3,0	2,6	7,2	†	21,4
China	0,2	0,1	-	5,5	0,6	1,0	†	-	0,5	0,5	2,5	14,9	1,3	27,1
India	1,9	0,1	-	4,3	8,1	8,5	0,2	0,5	-	2,9	10,1	11,9	16,3	64,7
Japan	-	0,1	0,1	0,1	0,1	-	1,6	1,8	0,1	-	3,4	3,2	†	10,6
Singapore	0,1	0,1	-	0,1	1,1	0,6	11,2	6,7	1,5	0,4	-	49,5	0,3	71,5
Other Asia Pacifi	5,2	-	0,1	1,2	3,4	1,2	18,4	26,8	5,1	28,4	34,5	-	1,0	125,3
Total imports	524,5	35,8	27,9	87,3	617,7	62,4	46,9	354,2	192,6	234,9	144,0	357,6	43,4	

It is to be noted once more that the biggest export area is situated on the Middle East and importer is USA/Europe-economically strongest countries in the world.

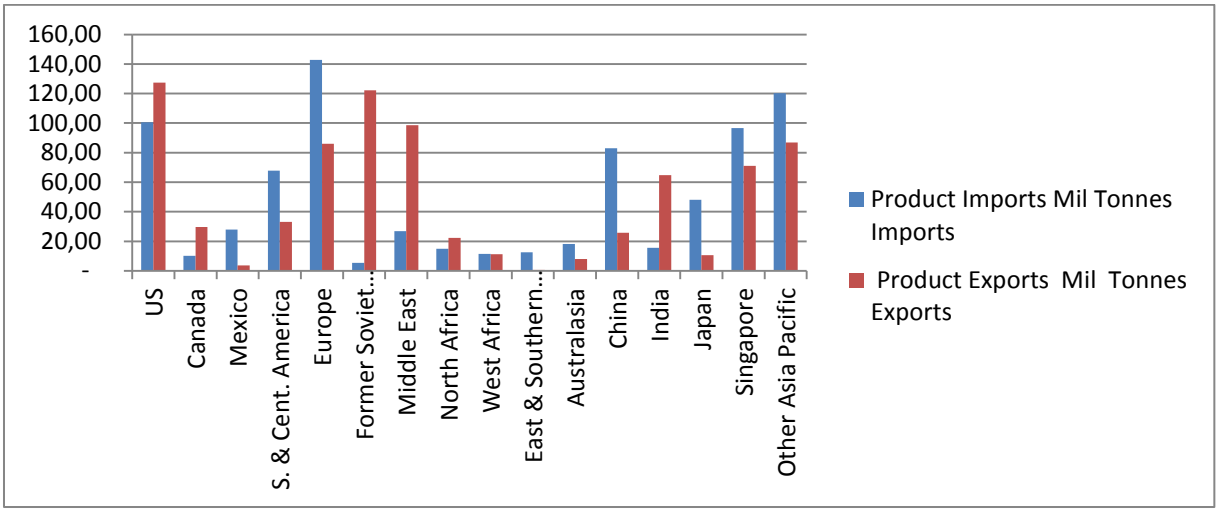
Import/Export Oil



Picture 11

This picture is not the same if the trade of oil products is taken into consideration. Than we can see that the biggest importers are China Asia Singapore but also Europe.

Import/ Export oil products



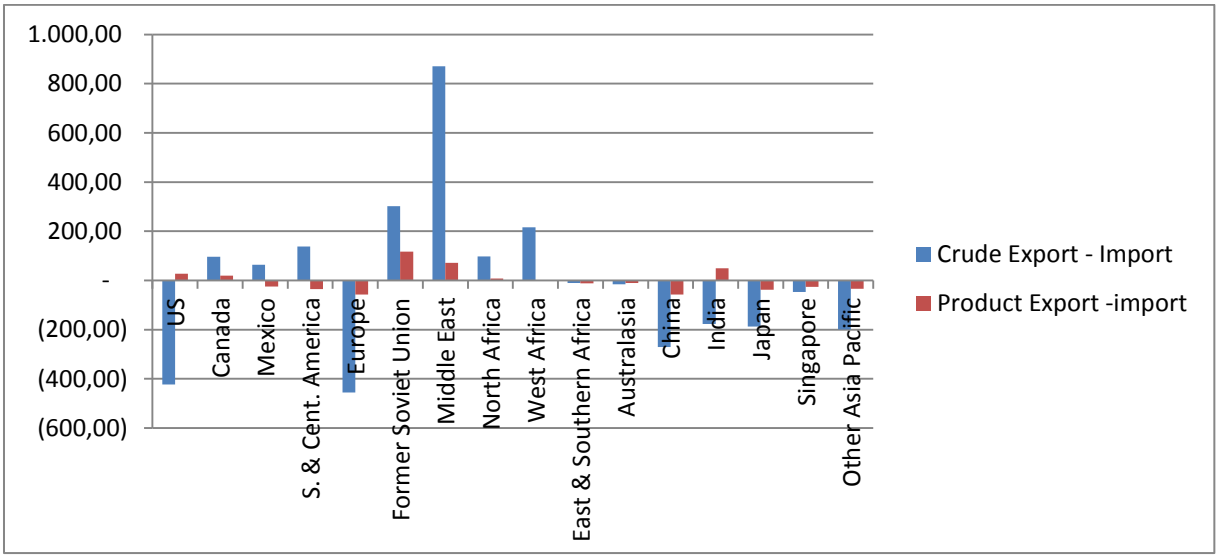
Picture 12

Table 2: Difference import /export oil/oil products

	Crude Export - Import	Product Export - import
US	(422,85)	26,93
Canada	96,02	19,56
Mexico	64,39	(24,20)
S. & Cent. America	137,35	(34,56)
Europe	(455,82)	(56,84)
Former Soviet Union	302,04	116,75
Middle East	870,02	71,65
North Africa	97,49	7,33
West Africa	216,12	(0,15)
East & Southern Africa	(9,95)	(11,75)
Australasia	(15,13)	(10,30)
China	(270,00)	(57,14)
India	(177,13)	49,19
Japan	(186,69)	(37,55)
Singapore	(46,74)	(25,73)
Other Asia Pacific	(199,12)	(33,18)

The biggest difference is visible at countries of Middle East that have the largest oil export, than at USA who is the biggest oil importer but also product exporter, and Europe that imports oil and oil products.

Difference import-export oil/ oil products



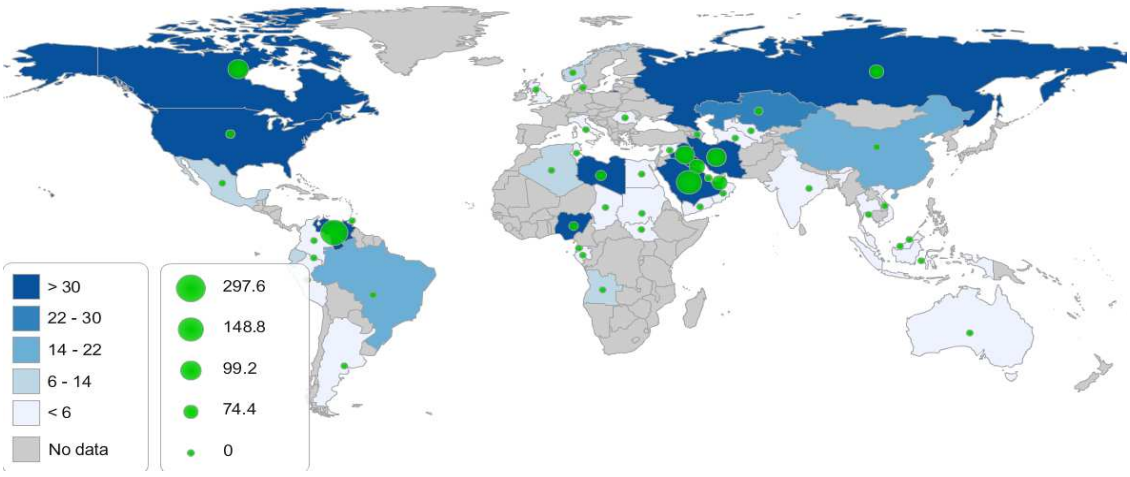
Picture 13

2.2. OIL RESERVES

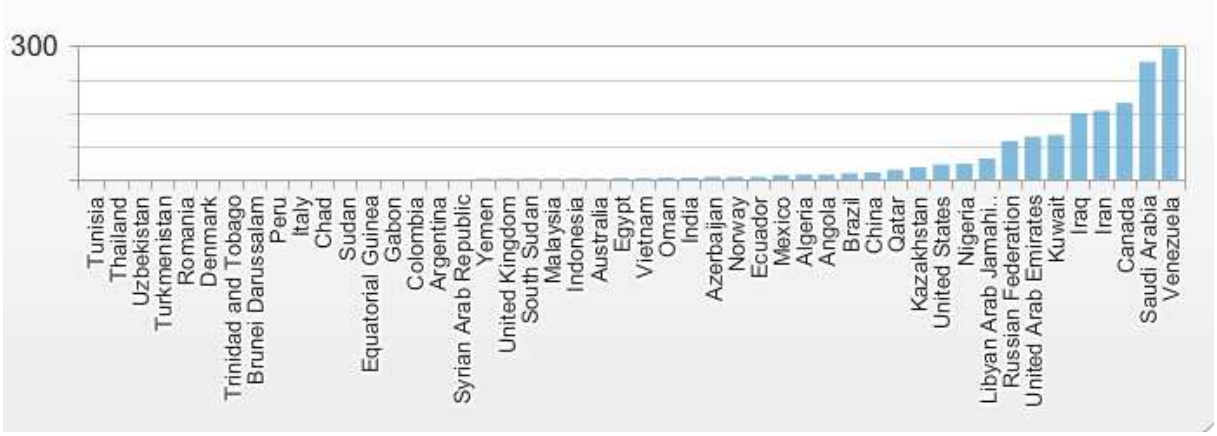
Calculation and reporting of oil reserves has been calculated differently through years and some new methods are implied. For example in 1980 it is reported that oil reserves were 683 thousand mil barrels , 1990 this amount was increased to 1.027 thousand mil barrels, while in 2012 it was 1.668 thousand mil barrels.

Countries that are not members of OPEC have by far the largest quantity of reserves 1.430 thousand mil barrels, while OPEC countries have 238 thousand mil barrels. Countries in OPEC are strong and big oil suppliers and their reserves are around 1.211 thousand mil barrels. EU do not possess huge reserve potential in oil and it is reported to have only 6,8 mil barrel so this area is dependent upon import from Middle East, Former Soviet Union and other areas. It is considered that in Canada oil in sand reaches amounts of around 167 thousand mil barrels of oil.

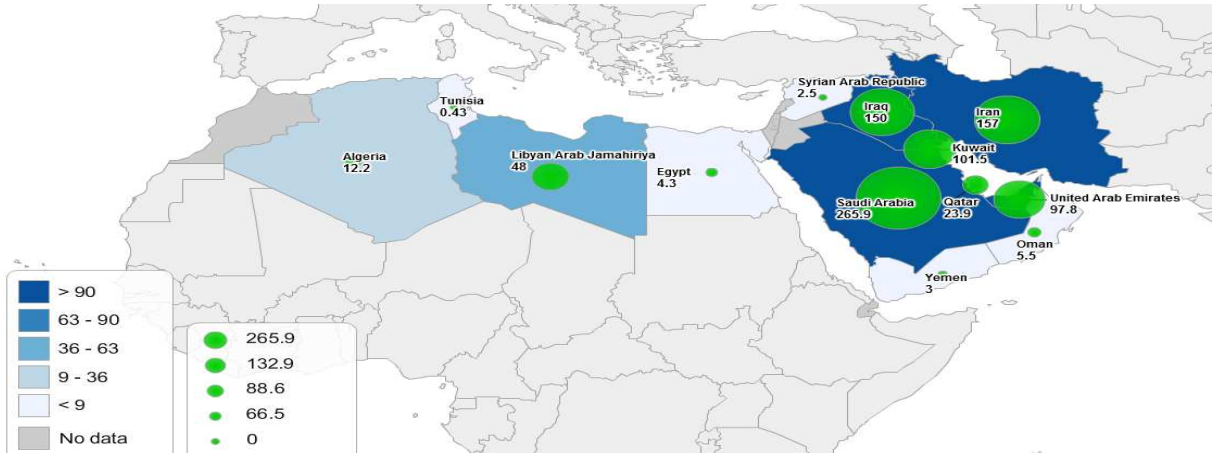
Oil reserves thousand mil barrels

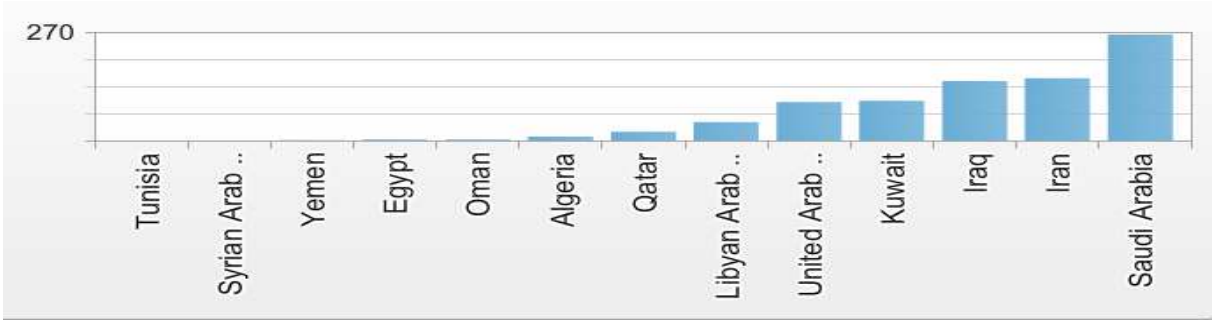


The biggest world reserves are in Venzuela, Saudi Arabia, Iran, Iraq, Kuwait, United Arab Emirats, Russia.

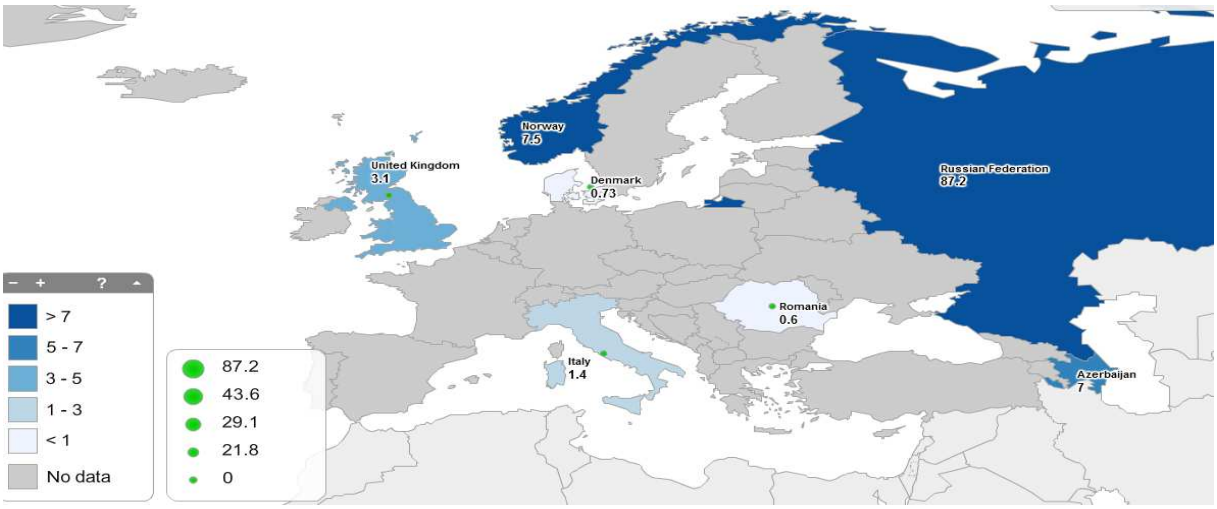


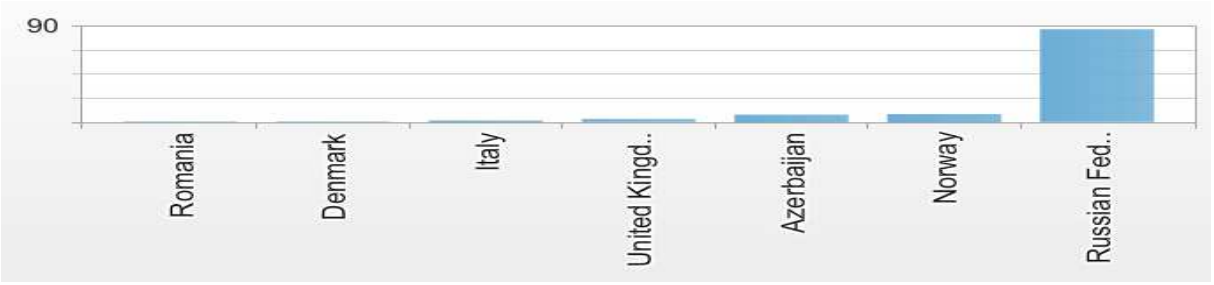
Area of the Middle East is the richest in oil reserves and amounts around 807 thousand mil barrels, where Saudi Arabia has on its disposal 265 thousand mil barrel, Iran 157 thousand mil barrel, Iraq 150 thousand mil barrel, United Arab Emirates 97 thousand mil barrel.



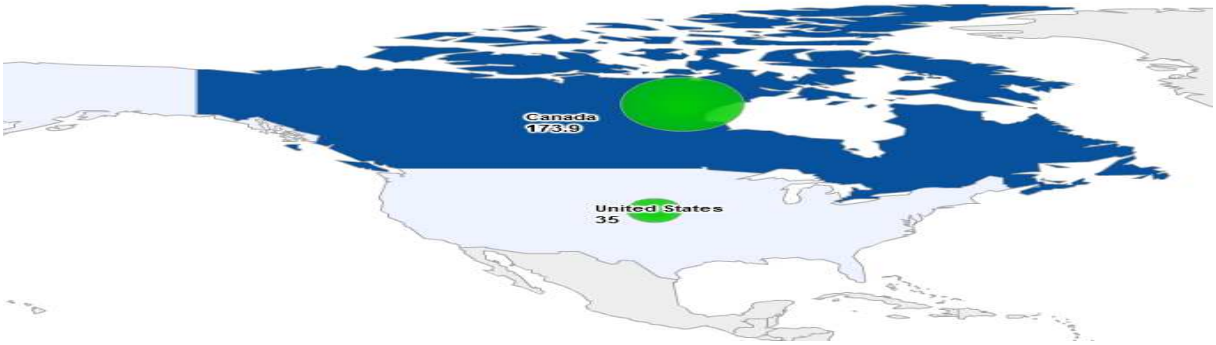


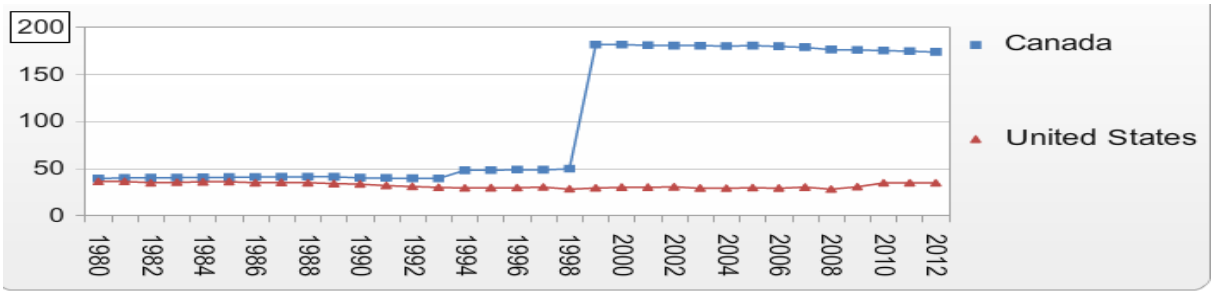
Europe and Euro Asia have 140 thousand mil barrel of oil reserves, where Russia itself have on its disposal 87 thousand mil barrel , Kazastan 30 thousand mil barrel, Azerbaijan 7 thousand mil barrel, Norway 7,5 thousand mil barrel and United Kingdom 3,1 thousand mil barrel of oil. Other potential reserves are situated in Romania, Italy and partly at Denmark.



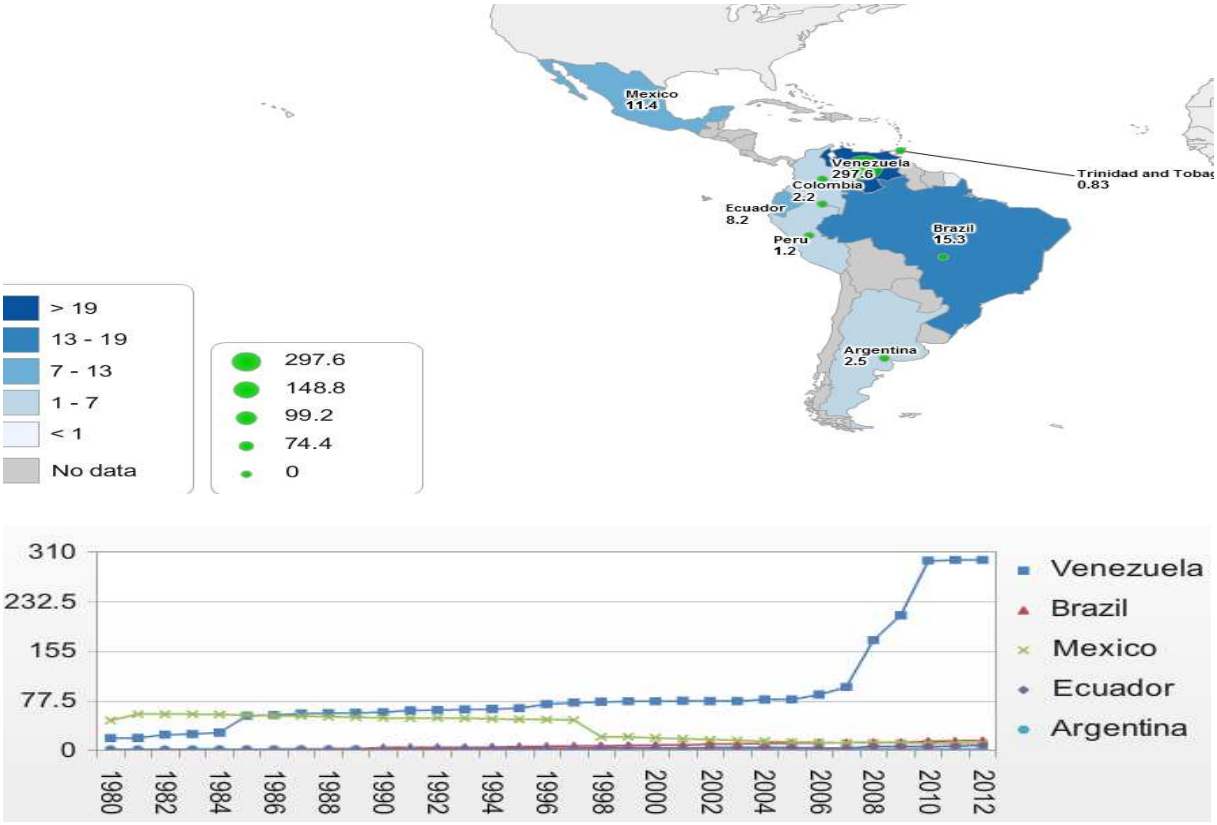


Canada has on its disposal 173 thousand mil barrel of oil while USA 35 thousand mil barrel. It is possible to make a revision upwards and this is related to either new methods of calculation or incorporating sand oil in quantities.

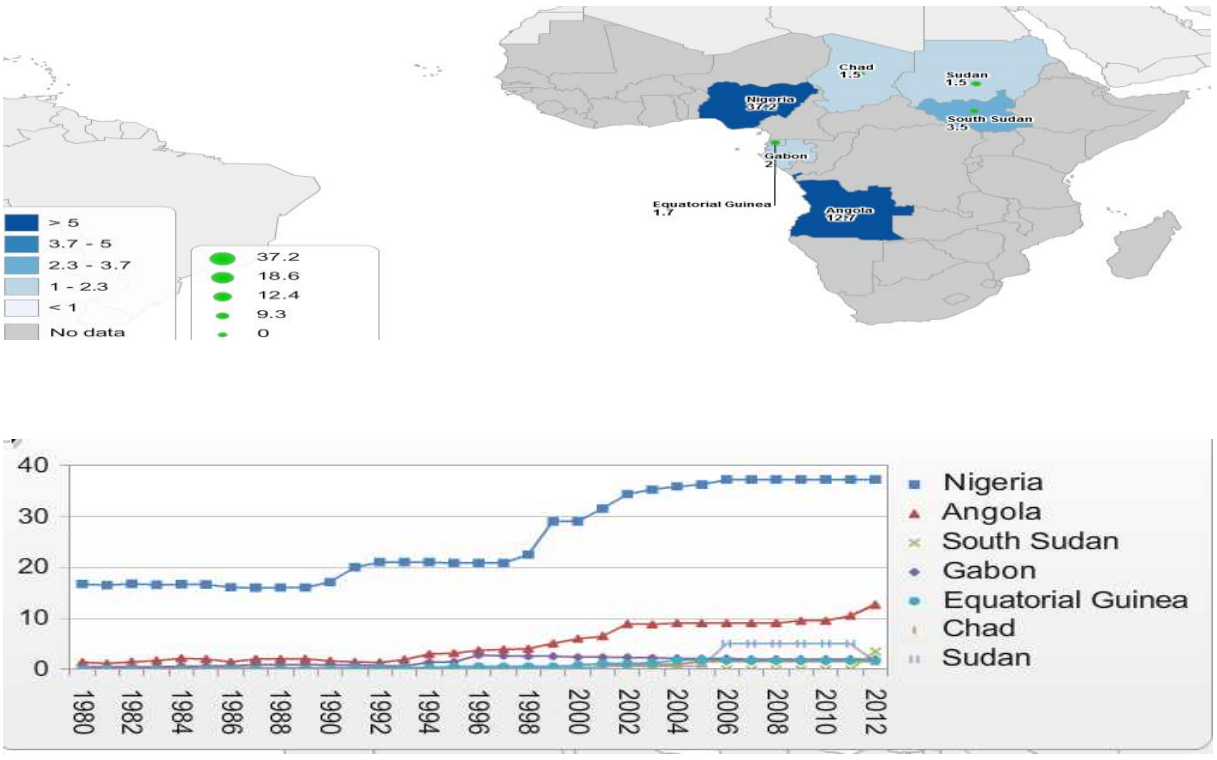




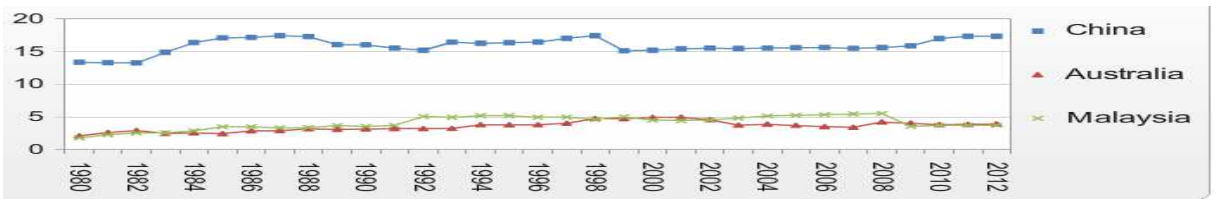
Similar revision upwards was made by Venezuela that has 297 thousand mil barrel of oil.



In Africa the biggest oil treasure is present in Libya 48 thousand mil barrel, Nigeria 37 thousand mil barrel, Algeria 12 thousand mil barrel, and Angola 12 thousand mil barrels.



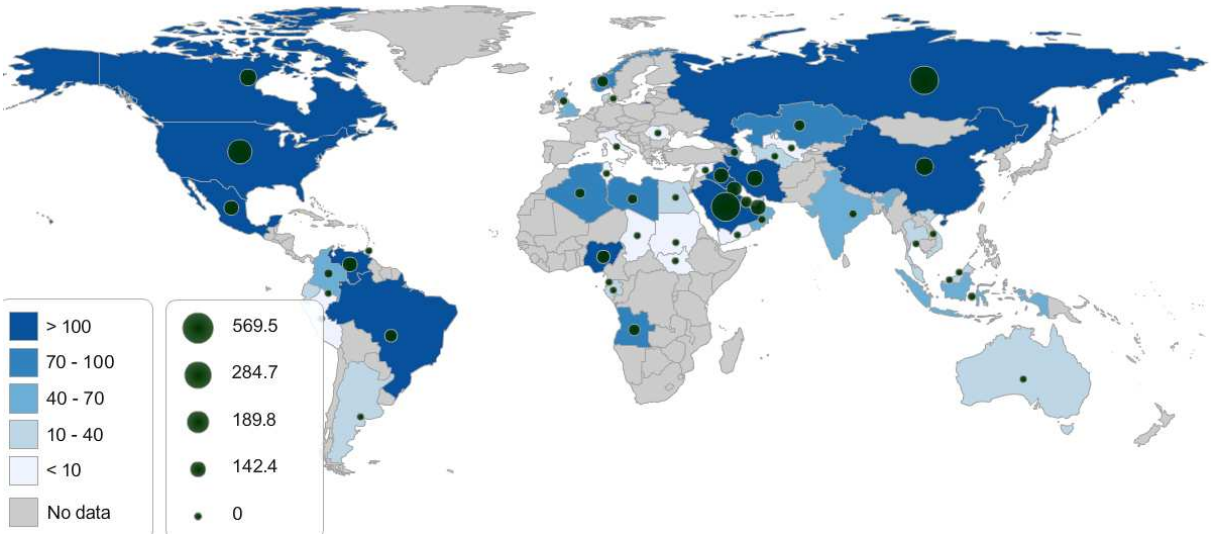
The surprise can be on China side -this country possesses certain quantities of oil reserves that amounts 17 thousand mil barrels.



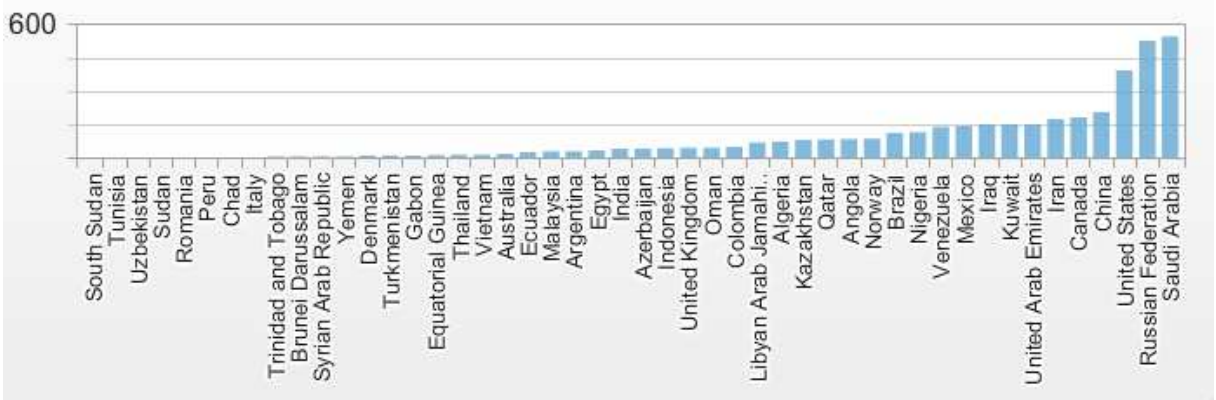
2.3. OIL PRODUCTION

Production has been changed also throughout years. In 1965 amounted 1.567 mil ton on the world level, in 1970 2.358 mil ton; in 1980 3.091 mil ton; 1990 3.175 mil ton; in 2000 3.619 mil ton; and in 2012 4.118 mil ton. The most significant producers came from OPEC block and they put on market 1.778 mil ton produced oil. Countries of the Former Soviet Bloc produce 670 mil ton of oil, while EU have production of only 73 mil ton.

Oil production mil ton



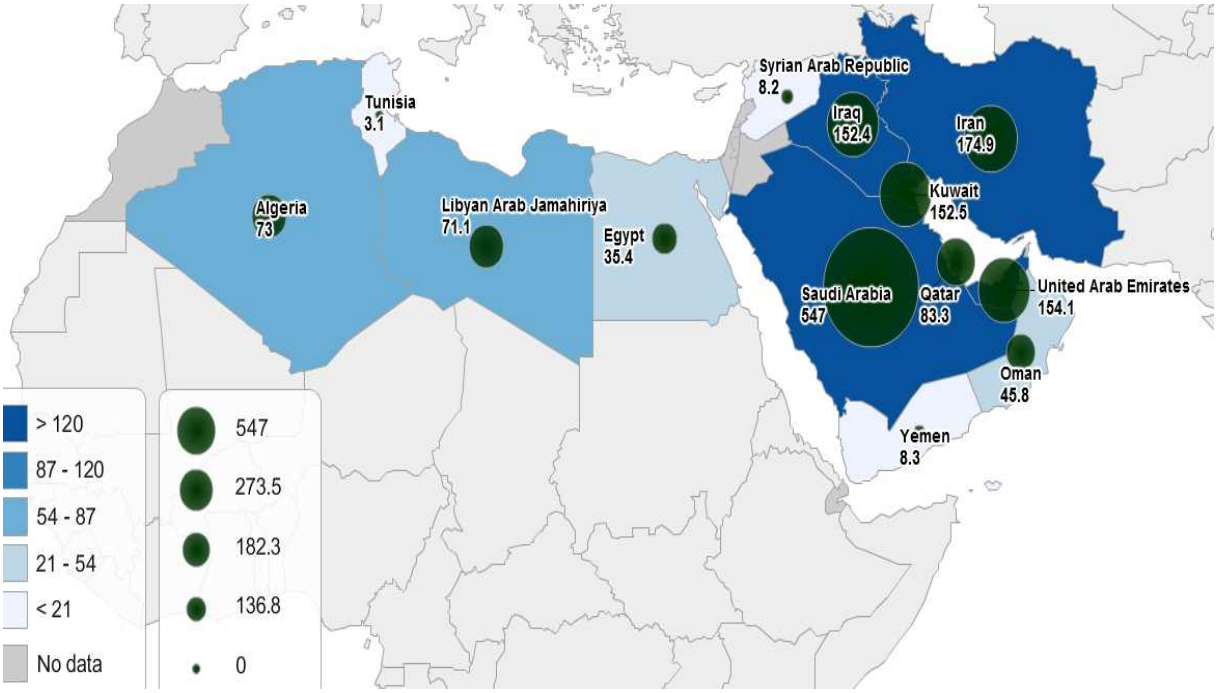
If the single producer is observed than Saudi Arabia with its 547 mil ton is first and Russia with 526 mil ton follows. USA contribute to production with 394 mil ton.

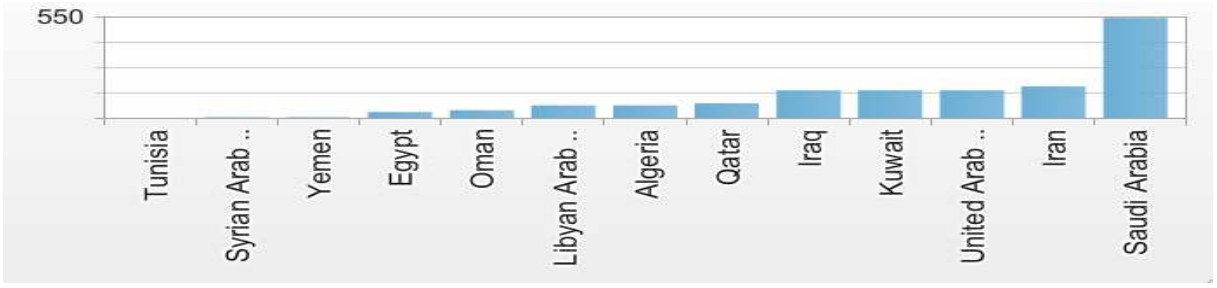


Countries situated in the Middle East have total production of around 1.331 mil ton, with the hugest production that comes from Saudi Arabia; Iran 174 mil ton, Iraq 152 mil ton, United Arab Emirates 154 mil ton and Kuwait 152 mil ton.

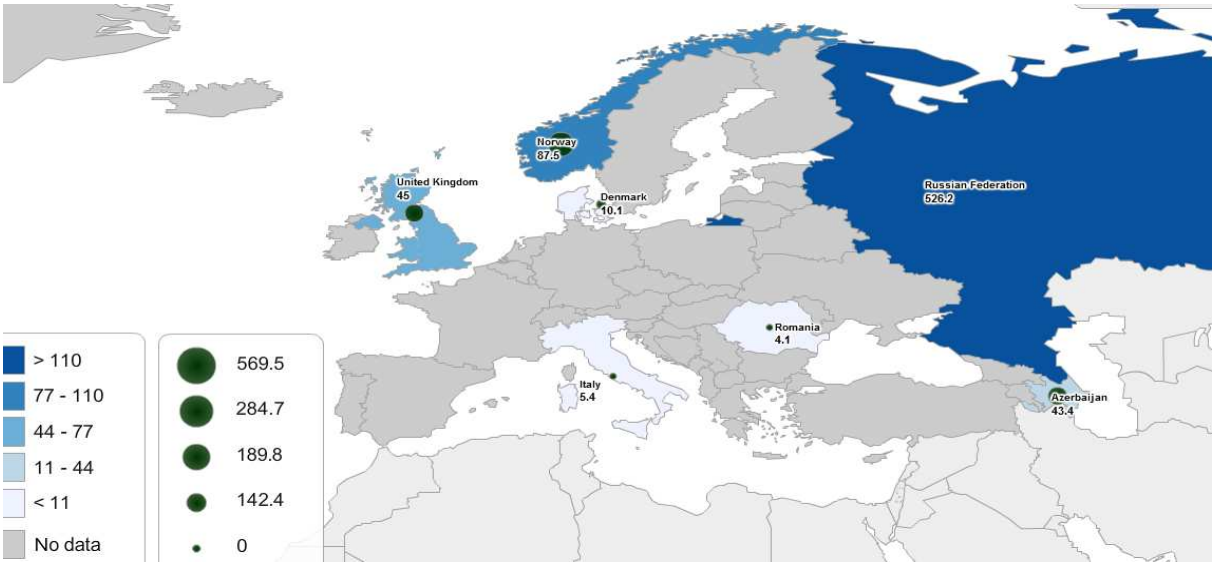
In Northern Africa Libya is important factor in oil industry with rising production (after conflict) of around 71 mil ton of oil. Another significant oil producer in Africa is Algeria 73 mil ton, Egypt 35 mil ton.

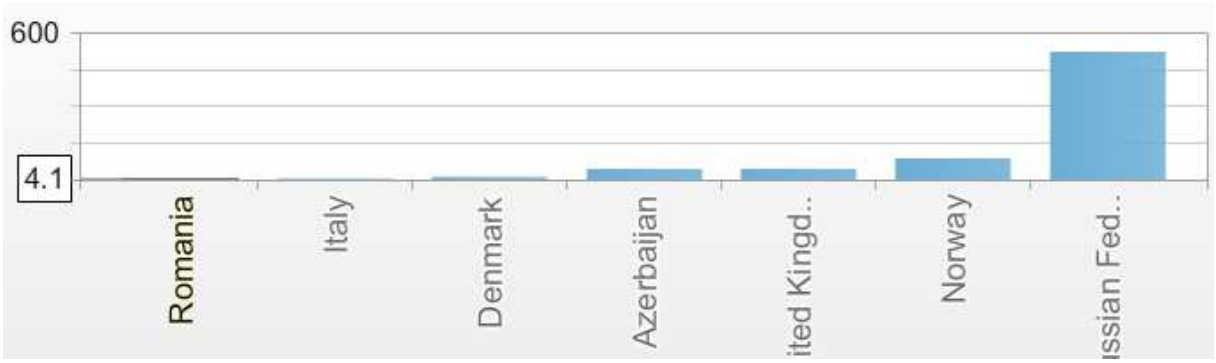
Production oil



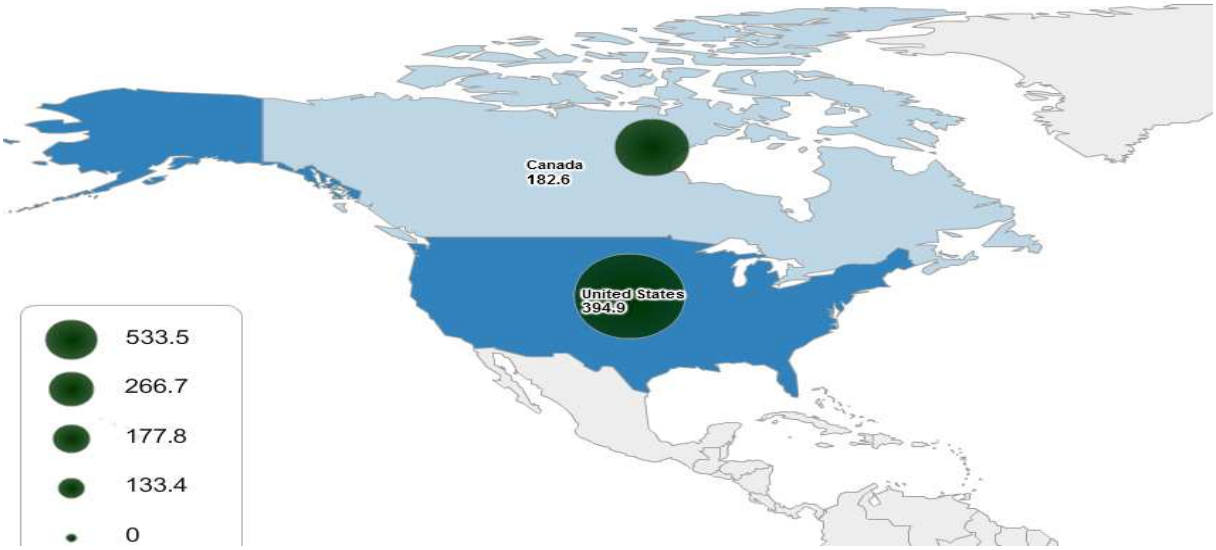


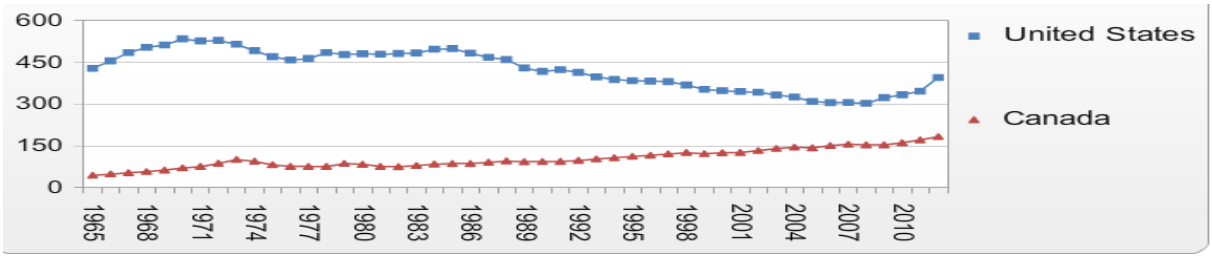
In the Europe and Eurasia the biggest production is observed in Russia 526 mil ton; Kazastan 81 mil ton, Norway 87 mil ton, Azerbaijan 43 mil ton and United Kingdom 45 mil ton.



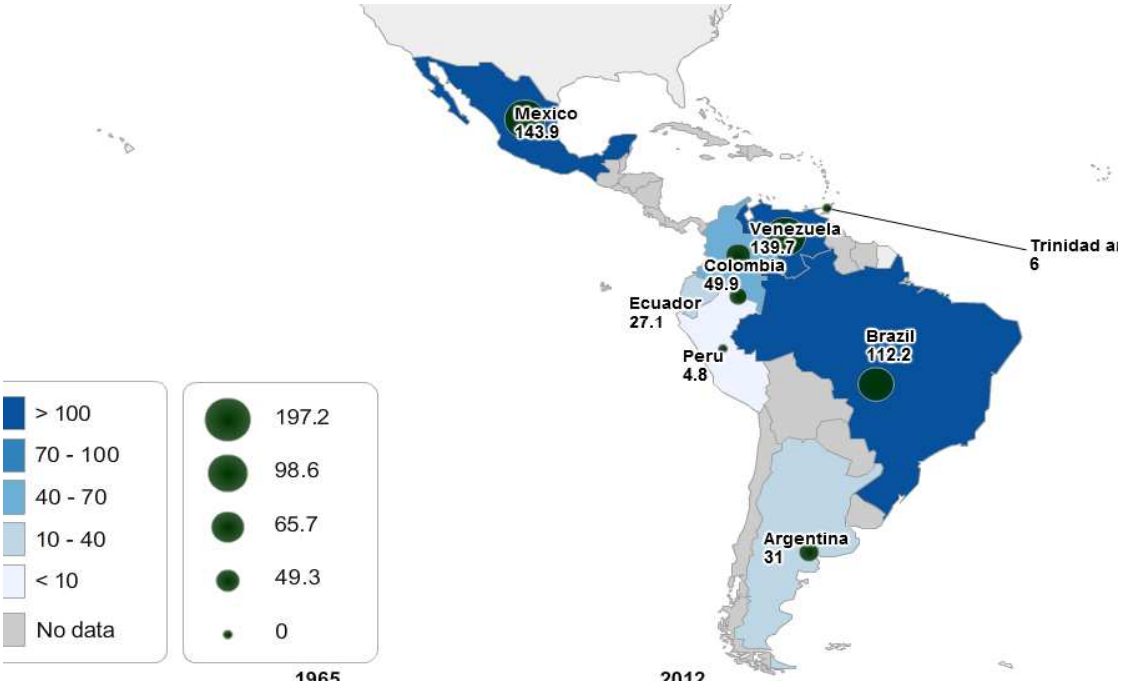


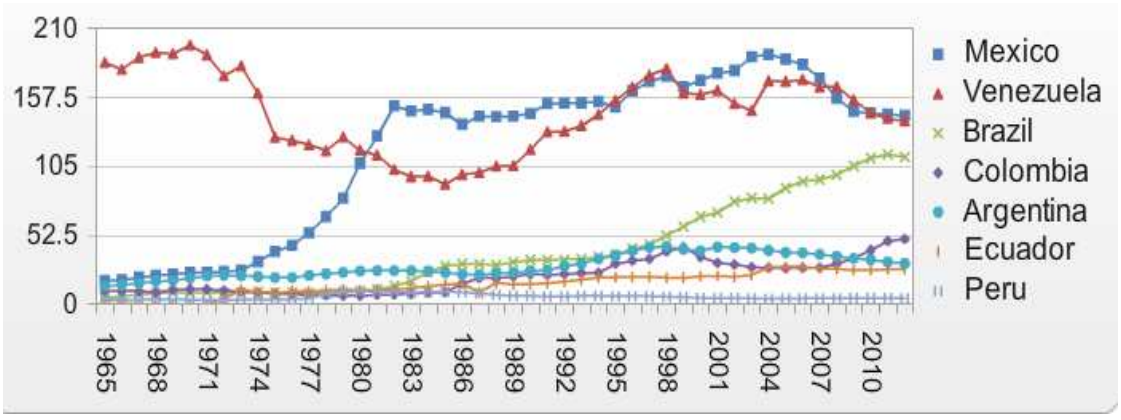
United States of America have a production of around 394 mil ton, Canada has 182 mil ton and Mexico 143 mil ton of oil production per year.



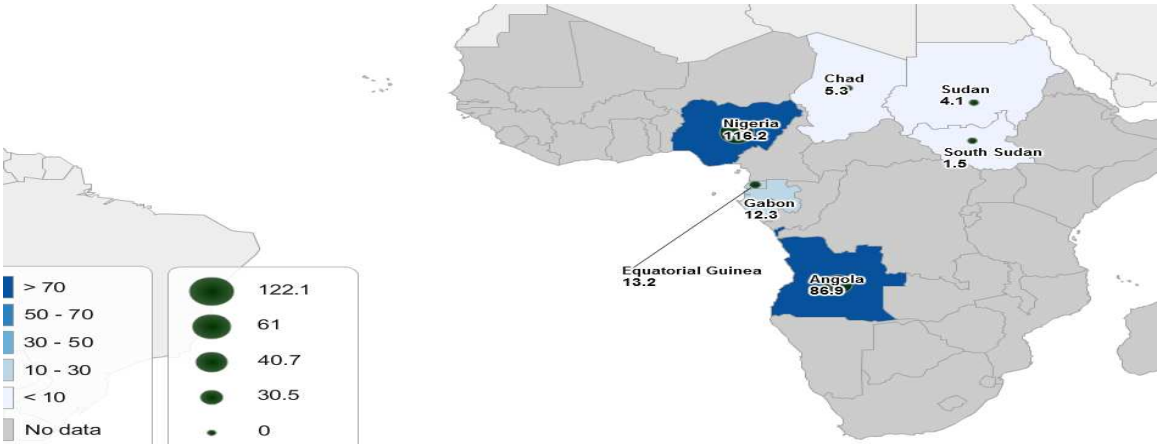


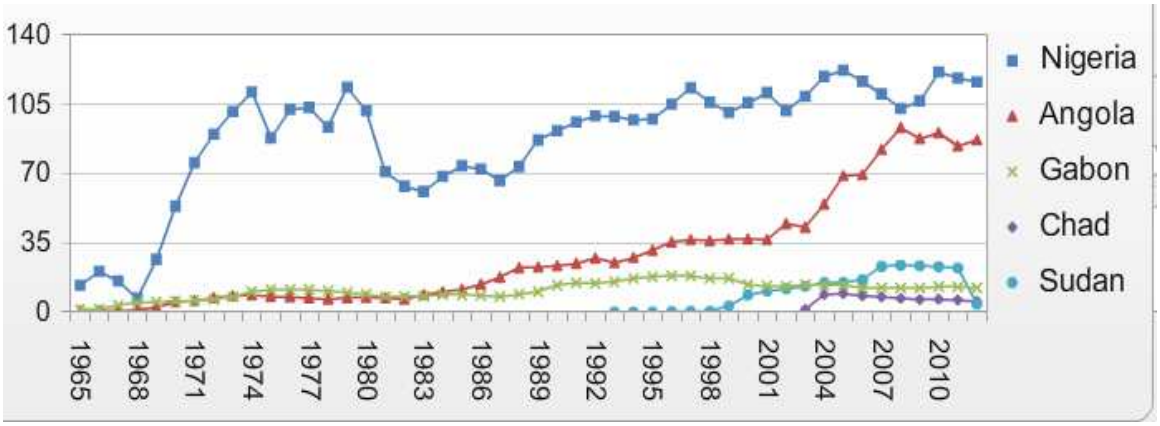
Mexico (143 mil ton) Venezuela (139 mil ton) and Brazil (112 mil ton) are the biggest producers in Middle and South America. The lower production have Argentina 31 mil ton, Columbia 49 mil ton, Equator 27 mil ton.



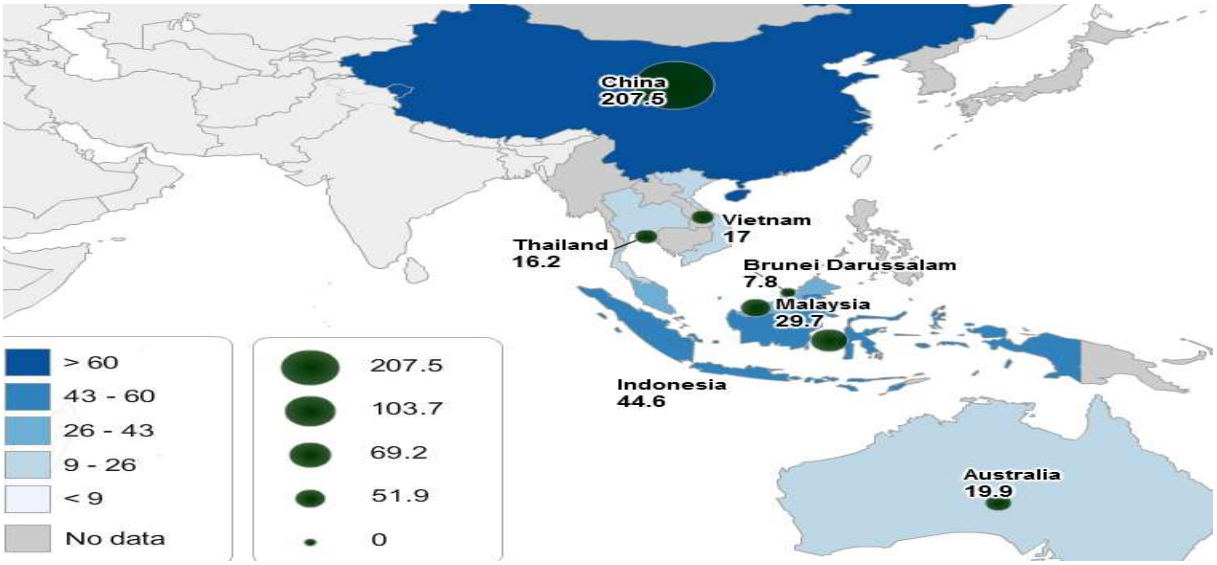


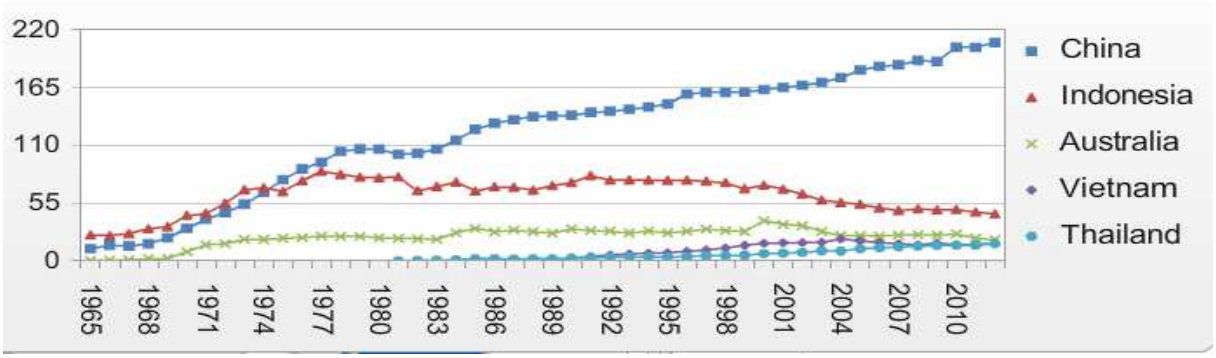
In Sub Sahara Africa the biggest producers are Nigeria 116 mil ton, Angola 86 mil ton and Chad 5,3 mil ton.



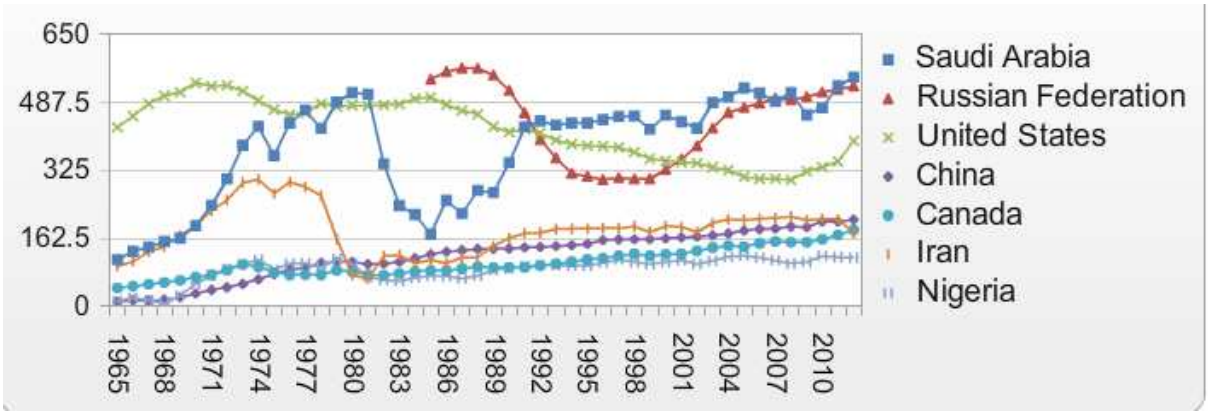


China is successful in generating economic growth, but is also a significant factor in oil production that on yearly level amounts 207 mil ton. The little bit lower production has Australia 19 mil ton, Malaysia 29 mil ton, Thailand 16 mil ton and Indonesia 44 mil ton. It is important to note that India also possess some of its own resources that amounts around 42 mil ton per year.





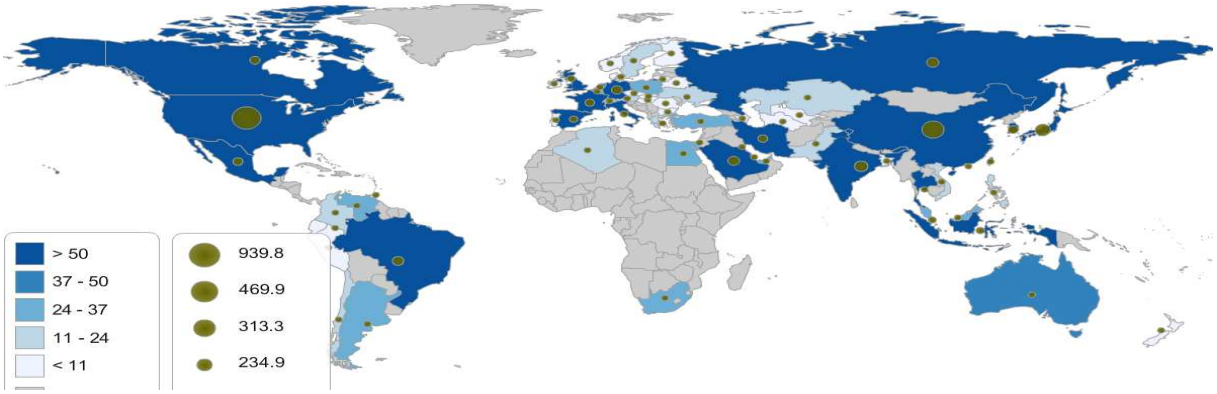
In short the biggest single producers are Saudi Arabia 547 mil ton, Russia 526 mil ton, USA 394 mil ton.



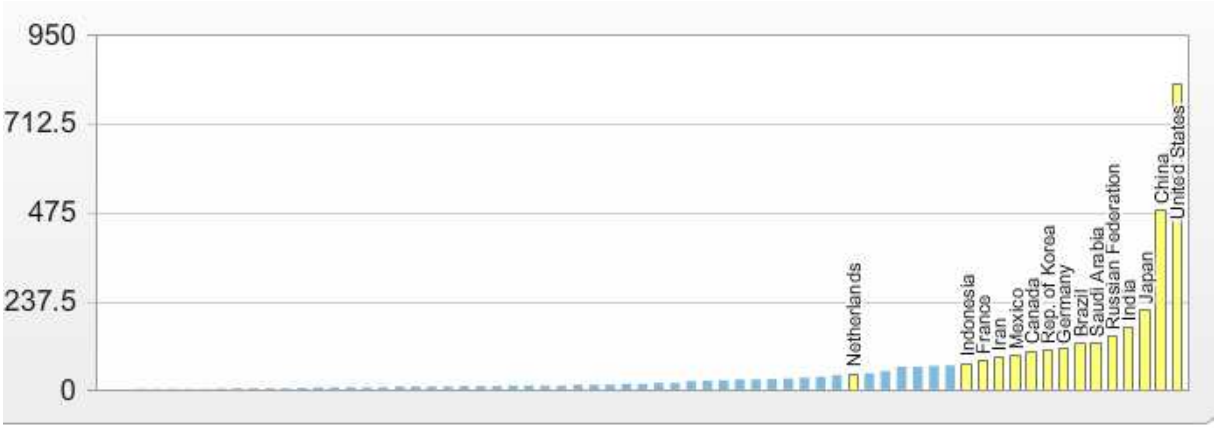
2.4. OIL CONSUMPTION

Oil consumption is growing since 1965 when leveled 1 515 mil ton on the world scale. In 1970 it was 2262 mil ton, 1980 2981 mil ton, and in 1990 3159 mil ton. Although it was expected decreasing trend in oil consumption with development of new energy opportunities in 21. century opposite happened-in year 2000 (3581 mil ton per year) and further years brought also oil consumption growth to 4 130 mil ton per year (2012). As expected it was the largest in the most developed world where OECD countries spend 2 072 mil ton oil per year, while others – and in this case it is a word about large number of countries that consumes 2 057 mil ton of oil products. EU block consumes 611 mil ton per year, while countries of former Soviet Bloc around 205 mil ton.

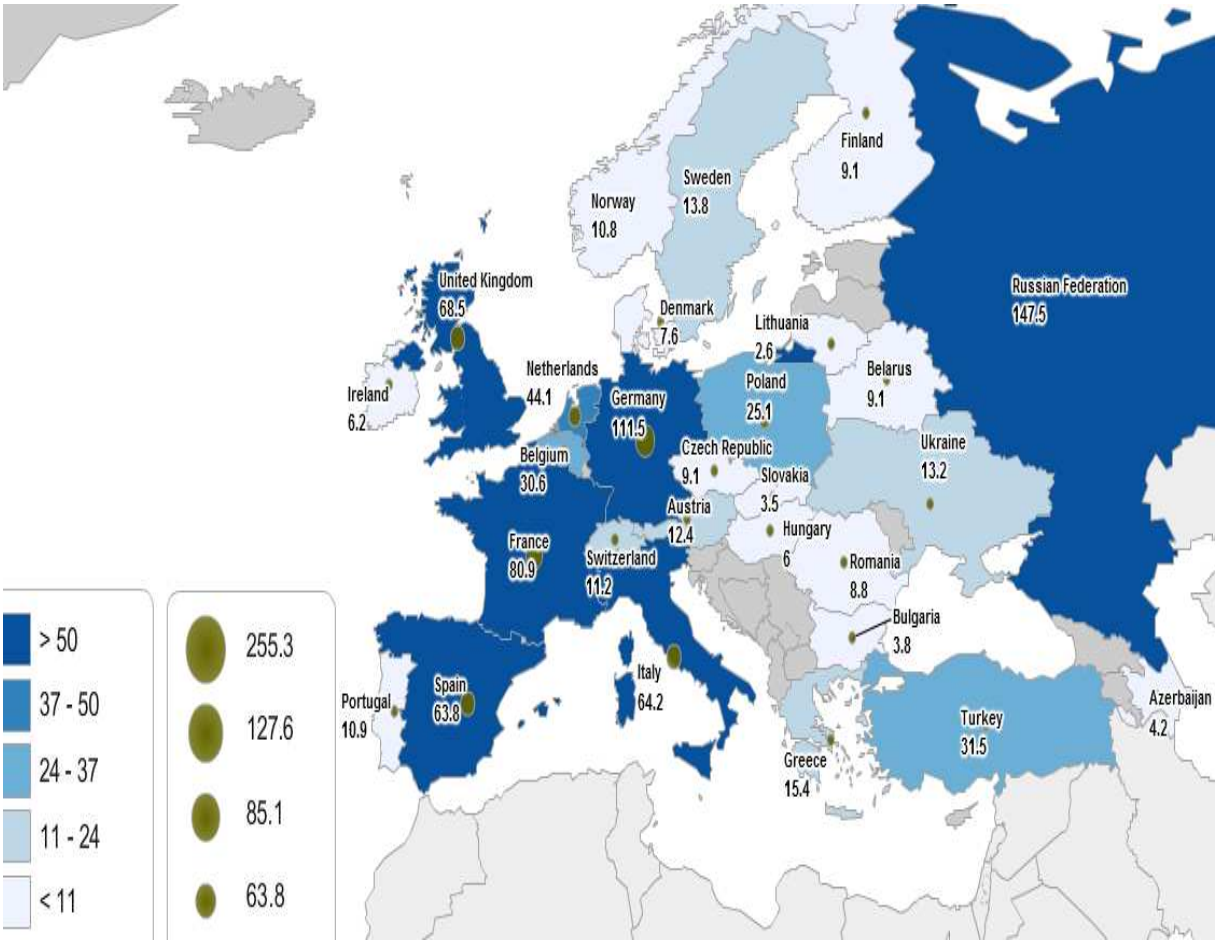
Oil consumption mil ton

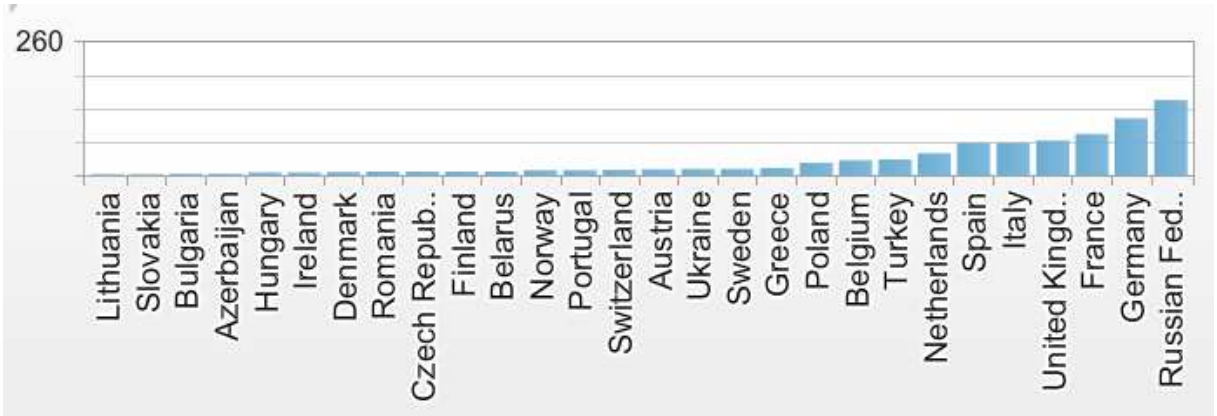


The largest single consumer is USA (819 mil ton) after comes China (483 mil ton), Japan (218 mil ton), India (171 mil ton).

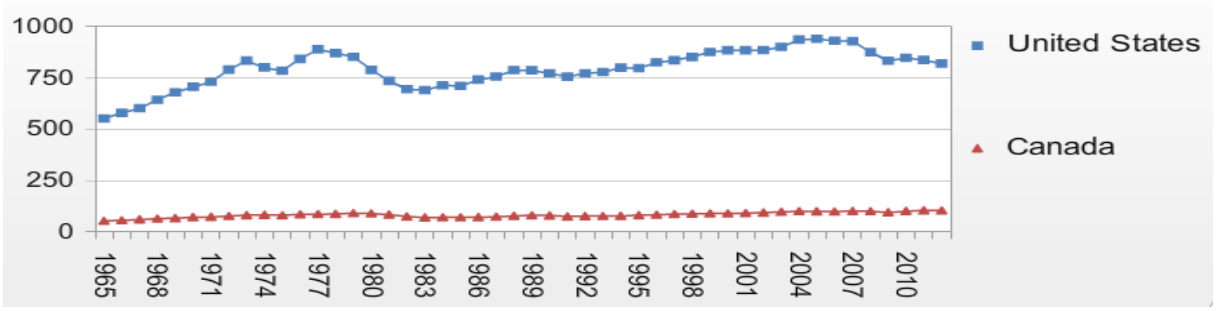


In Europe and Euro Asia the biggest consumption has Russia (147 mil ton), Germany (111 mil ton), France (80 mil ton), Italy (64 mil ton), United Kingdom (68 mil ton) and Spain (63 mil ton).

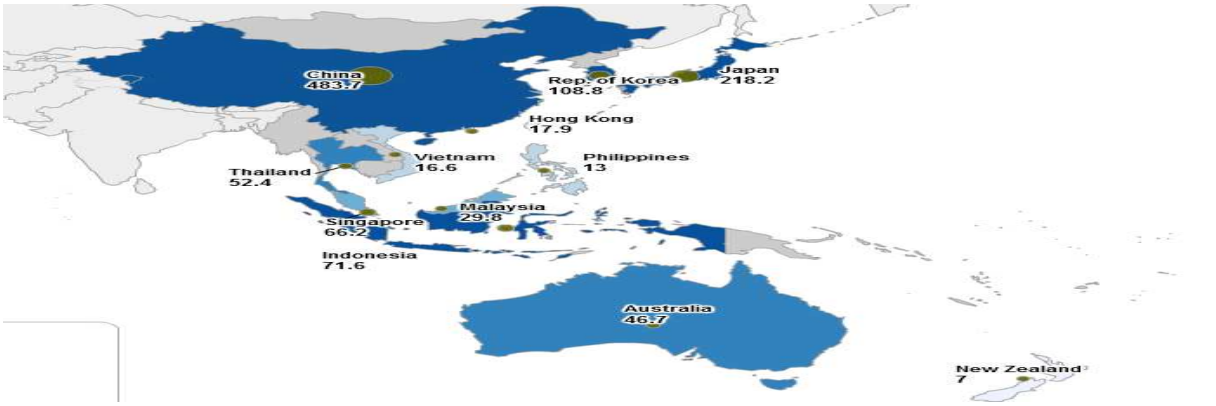


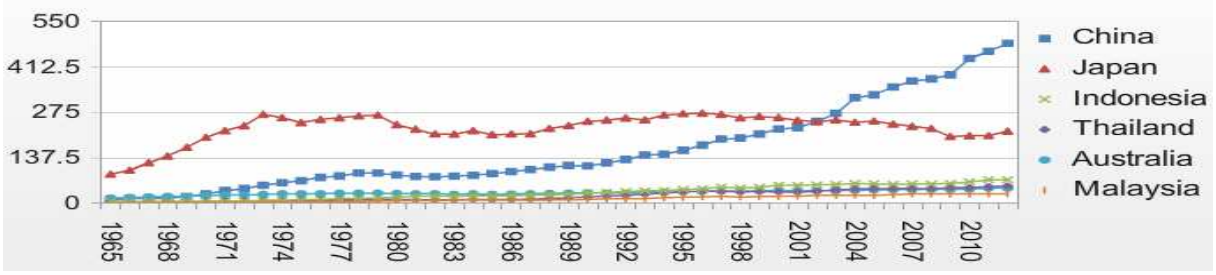


As largest world consumer USA with its oil needs of around 819 mil ton exceeds Canada needs (104 mil ton).

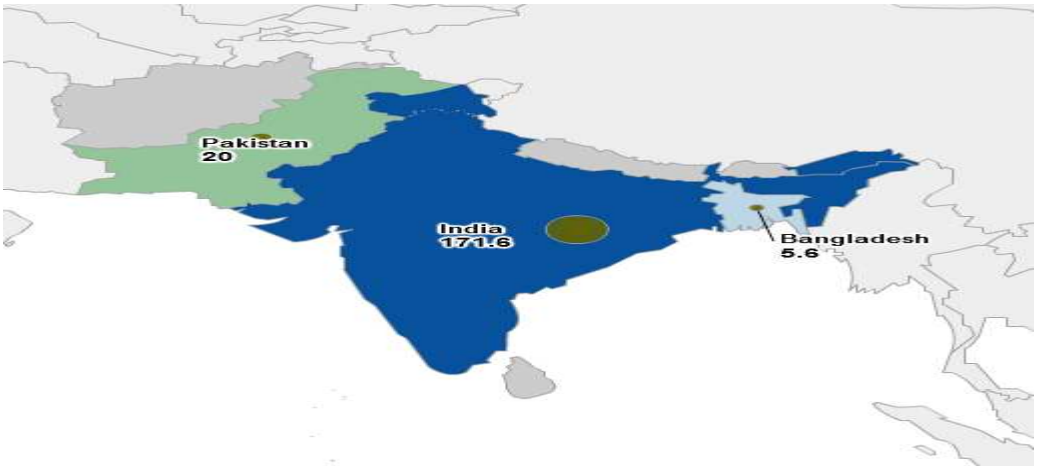


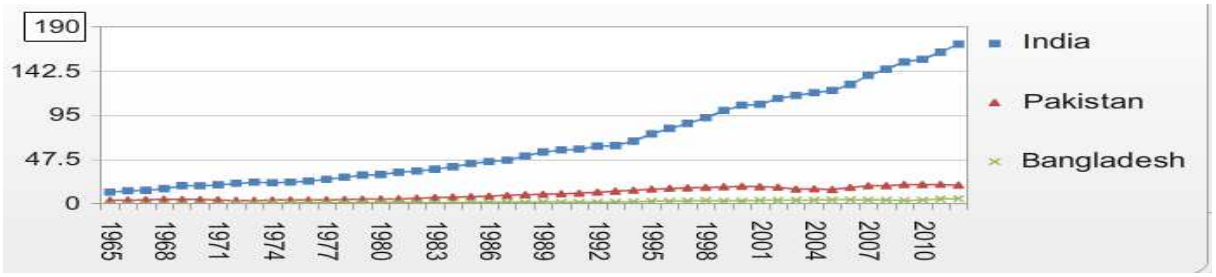
Rising trend of oil need is to be expected with China rising population and GDP and the country needs around 487 mil ton oil per year. The large consumer is Japan 218 mil ton after comes South Korea 108 mil ton, Australia 46 mil ton, Thailand 52 mil ton, Indonesia 71 mil ton, Singapore 66 mil ton.



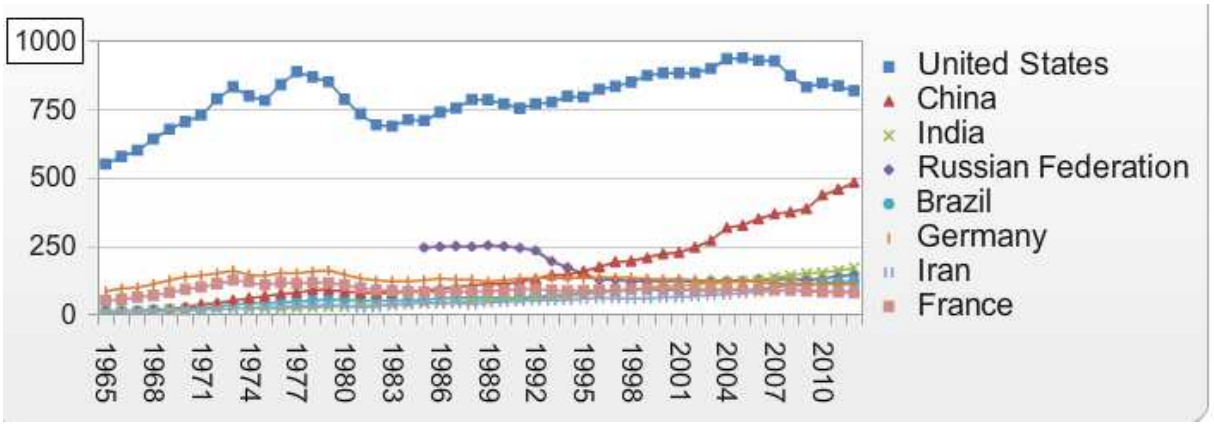


Countries in South Asia have large differences in consumption where India needs 171 mil ton, Pakistan 20 mil ton, Bangladesh 5,6 mil ton oi oil products.





To conclude is by far the largest visible fact that USA (819 mil ton oi products consumption) exceeds other countries in its consumption. It is to be noticed further that China (483 mil ton) increases its needs, and significant oil is required by Japan (218 mil ton), India (171 mil ton) and Russia (147 mil ton).

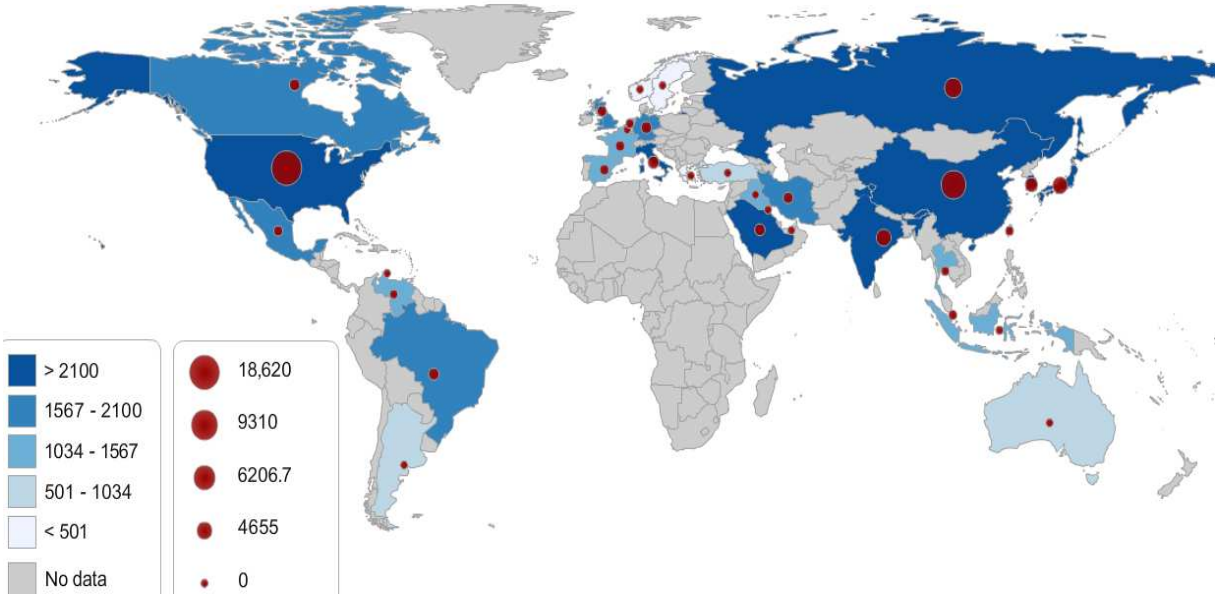


2.5. RAFINING CAPACITY

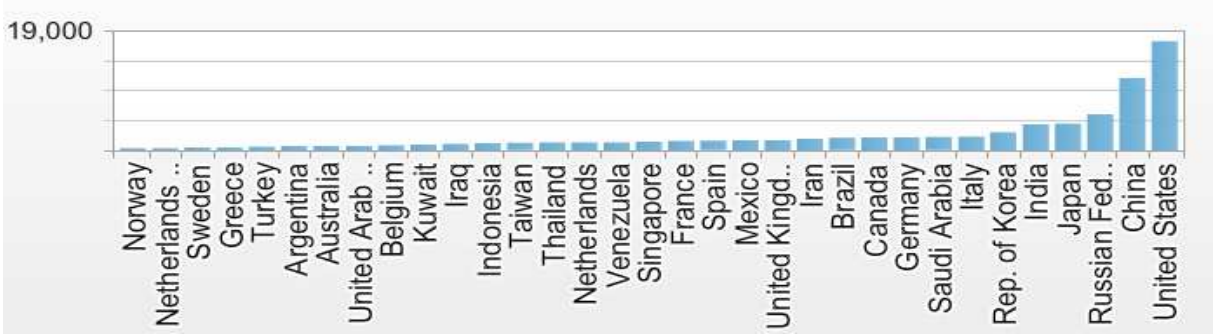
Refining Capacity started to increase significantly from 1960 34.154 thousand barrel daily on the world level and then in 2012 came to amount of 92.532 thousand barrel daily. The big jump was in the year 1970 when refining capacity was 51.344 thousand barrel daily and in 1980 when it was 79.120 thousand barrel daily.

EU have the possibility to intake 14.794 thousand barrel daily what is around 16% of total world refining capacity while Former Soviet Bloc countries have 8% of the world and can produce 7.853 thousand barrel daily.OECD have possibility to refine 44.685 thousand barrel daily while countries that do not belong to OECD have 47.845 thousand barrel daily.

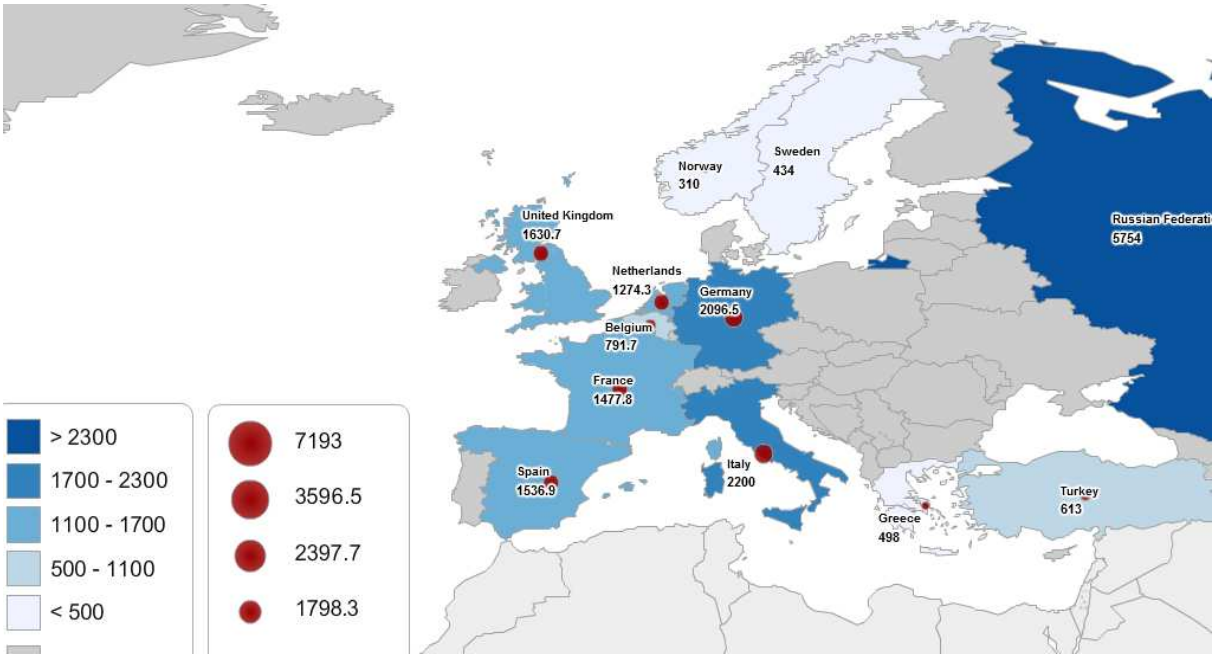
Refining capacity 000 barrel daily

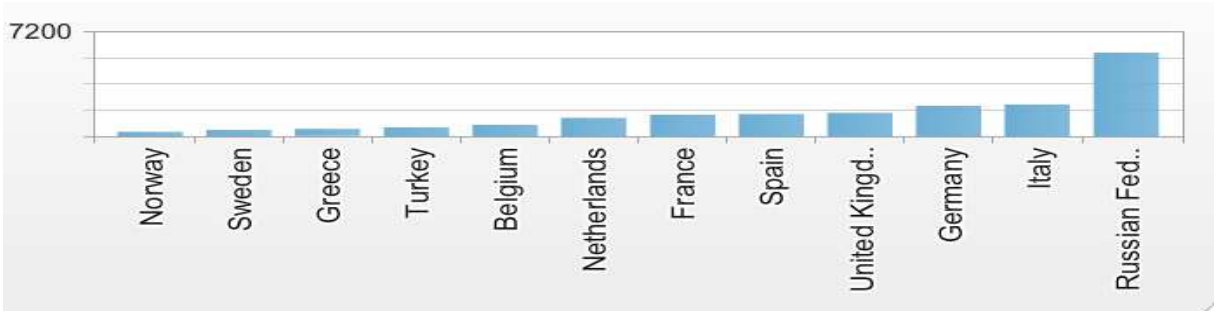


Country with the largest refining capacity is USA that possesses 17 388 thousand barrel /daily refining capacity, after comes China with possibilities to refine 11.547 thousand barrel daily.

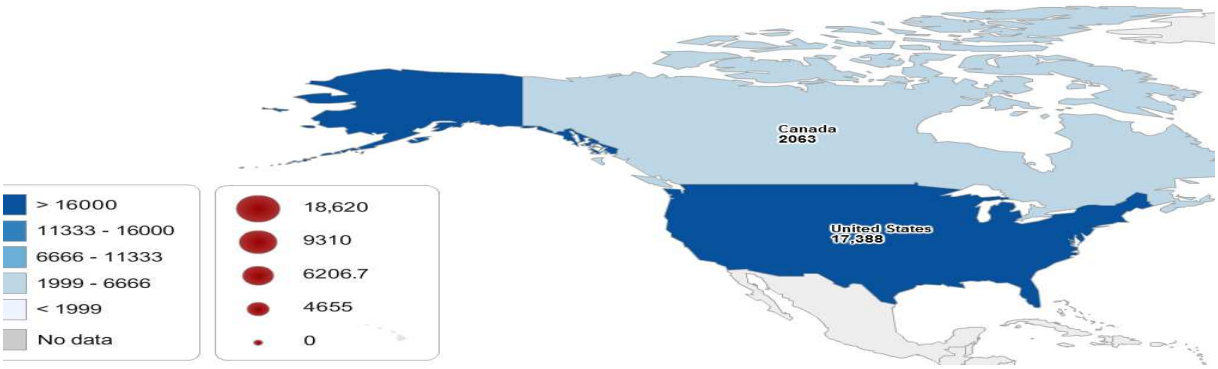


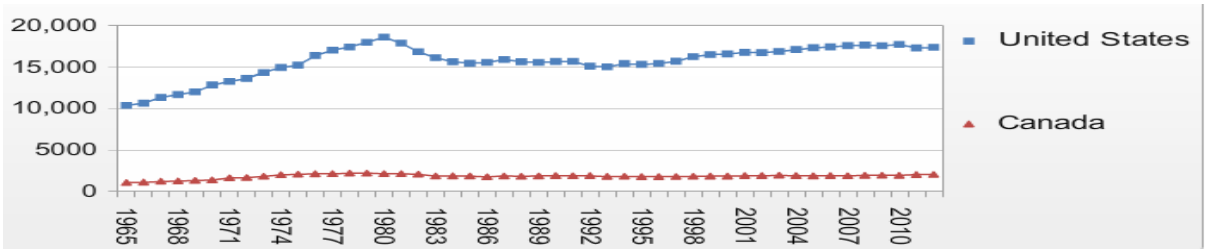
Europe and Eurasia have 23.865 thousand barrel daily possibility to refine in its own refining capacity plants. From this number Russia 5.745 thousand barrel, Germany 2.096 thousand barrel, Italy 2.200 thousand barrel daily.





On the North of American Continent besides USA (17.388 thousand barrel refining capacity) Canada has in its portfolio capacity of 2.063 thousand barrel daily.





On the Middle East there is a possibility to take into refining capacity quantity of 8.255 thousand barrel daily where Saudi Arabia can refine 2.122 thousand barrel daily, Iran 1.892 thousand barrel daily, Iraq 1.042 thousand barrel daily.

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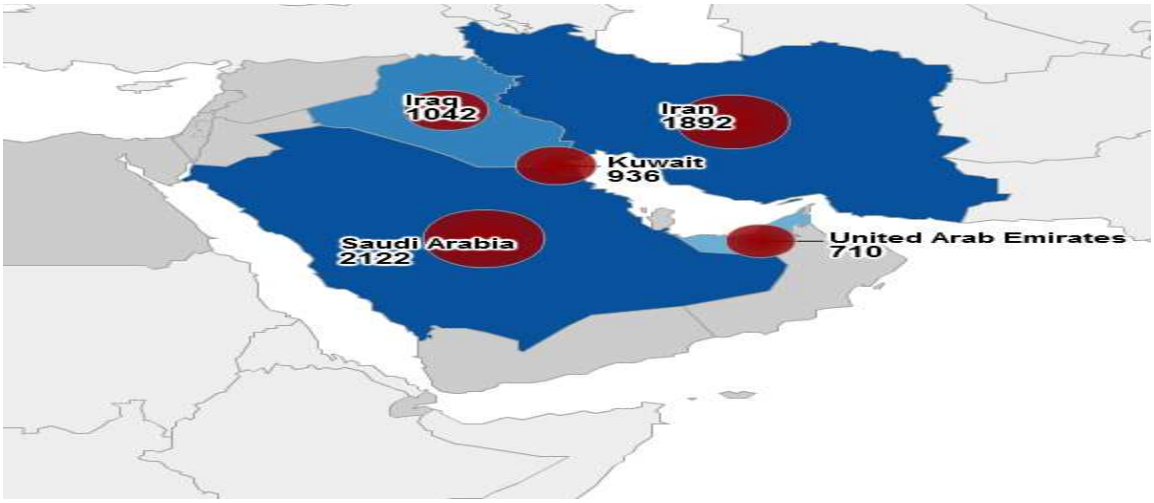
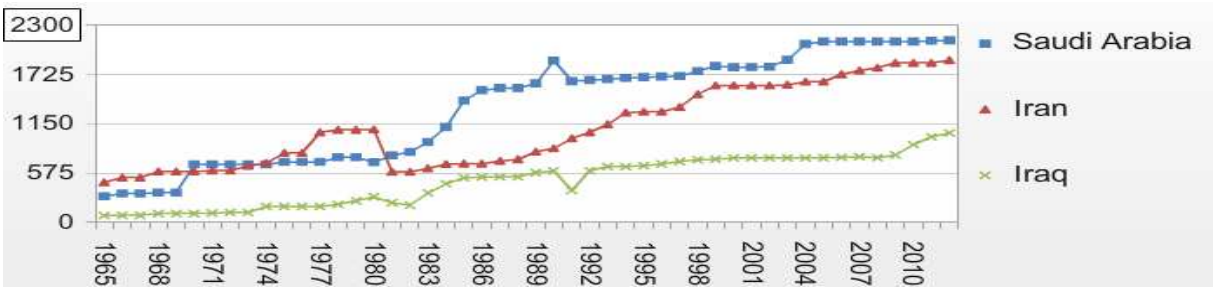
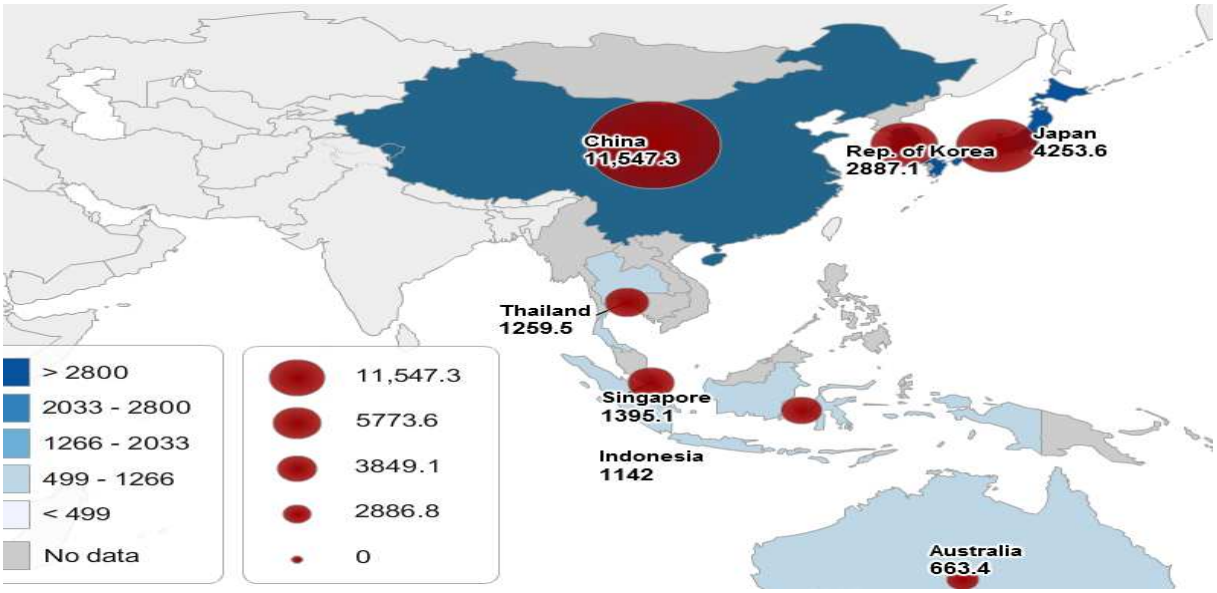
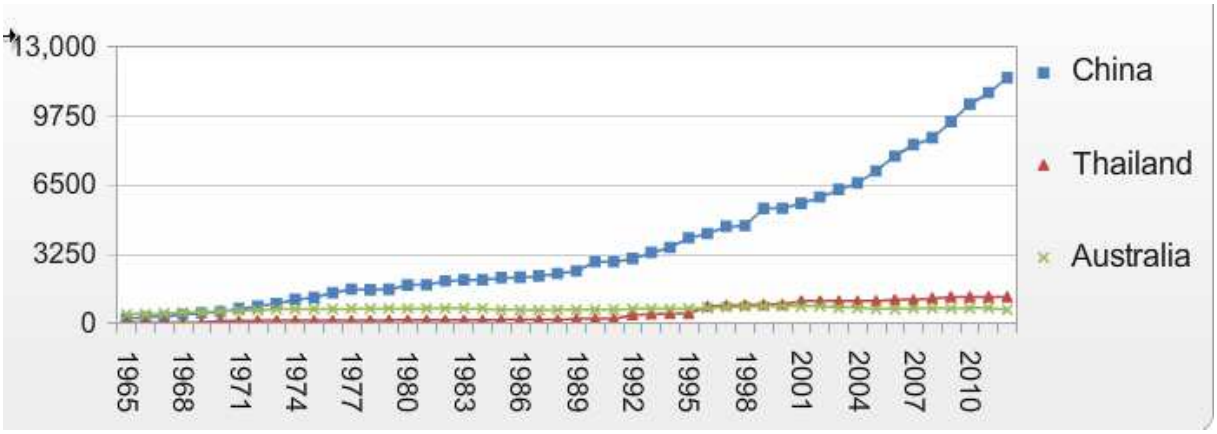


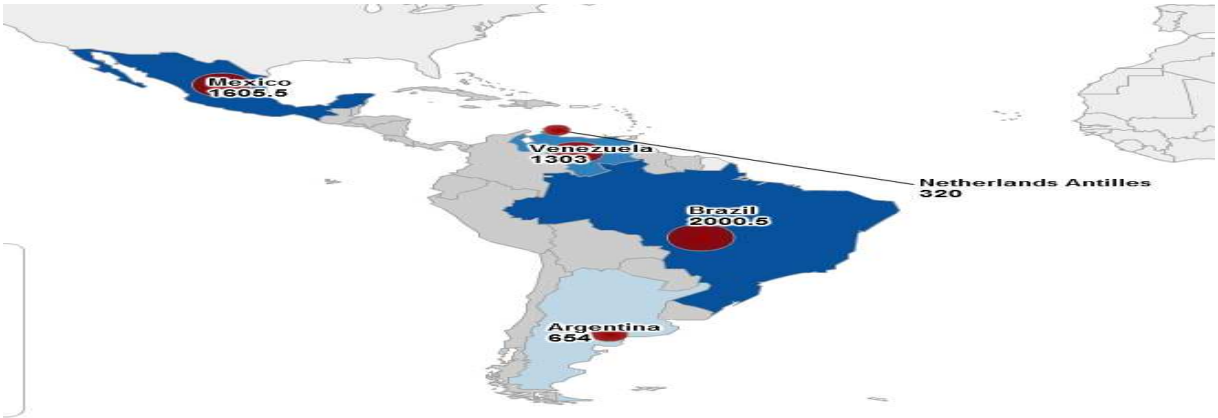


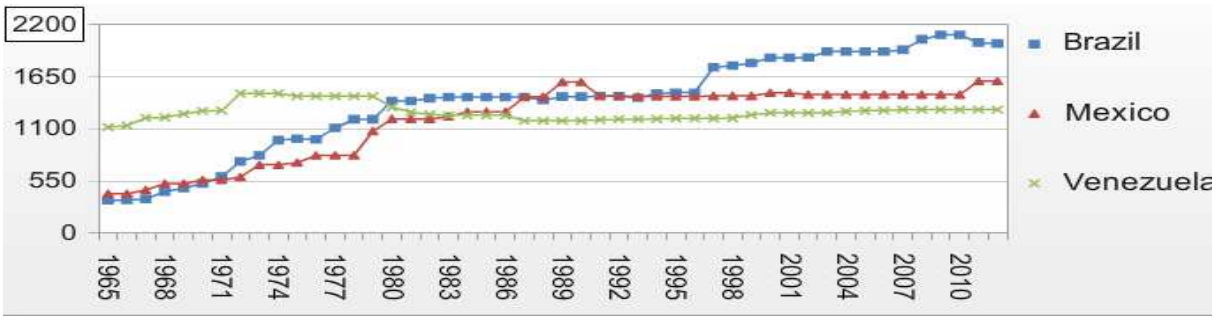
China has refining capacity of around 11.547 thousand barrels daily, Japan 4.253 thousand barrel daily, Thailand 1.259 thousand barrel daily.



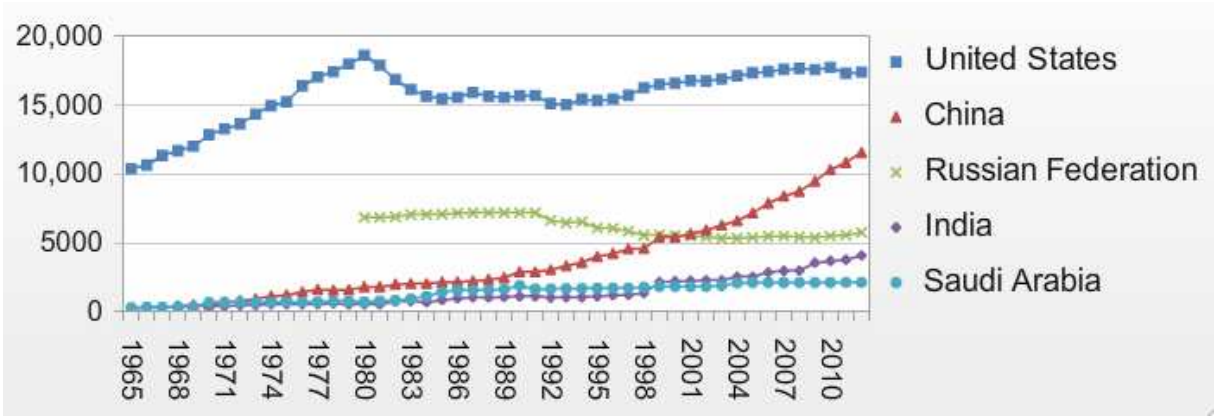


Refining capacity increased in the area in South Mid America where Brazil has 2.000 thousand barrel daily possibility to refine, Venezuela 1.303 thousand barrel and Mexico 1.605 thousand barrel daily.





The biggest refining capacity is situated in the United States where quantity of around 17.388 thousand barely daily corresponds to 865 mil ton per year.



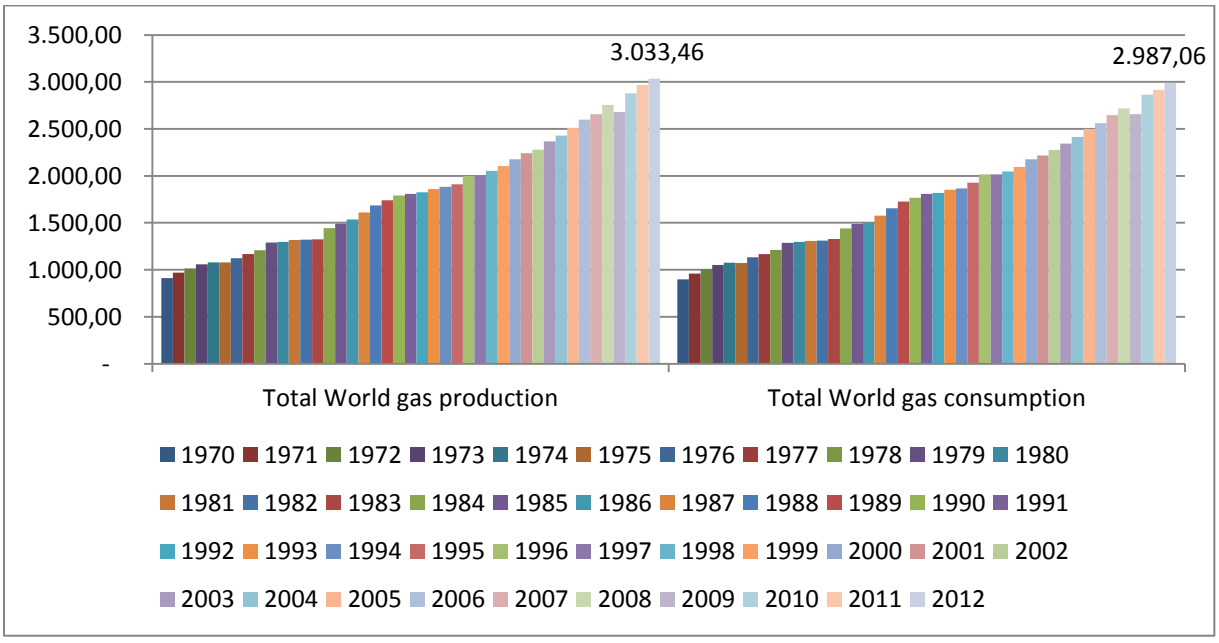
3. GAS, RESERVERS, PRODUCTION, CONSUMPTION

3.1. GAS GENERAL

Gas production grew from 911 mil ton oil equivalent in 1970 to reach in 1980 amount of 1.297 mil ton oil equivalent and further rise to 1.790 mil ton oil equivalent in 1990, in 2000 2.176 mil ton oil equivalent and in year 2012 3.033 mil ton oil equiv. Countries that are not part of OECD group are the one with the most gas reserves and the biggest production of around 1.937 mil ton oil equivalent while OECD countries produce 1.096 mil ton oil equiv. Countries of former Soviet Bloc produce 690 mil ton oil equivalent USA 619 mil ton oil equivalent. It is –compared to other regions in the world –small production of gas in EU (mostly in Norway 103 mil ton oil equivalent) and amounts 134 mil ton oil equiv.

Gas consumption increased significantly through ages and total world consumption in 1965 was 596 mil ton, in 1970 897 mil ton, in 1980 1295 mil ton, in 1990 1768 mil ton, 2000 2177 mil ton, and in the last observed period 2012 2.987 mil ton oil equiv. OECD countries consumes important 1.433 mil ton while the others spend quantities of 1.553 mil ton. Countries of former Soviet Bloc has consumption of 526 mil ton, while the Russia itself 374 mil ton. Russia is the second (after USA) that spends 654 mil ton of gas in consumption. EU has demand of 399 mil ton of gas.

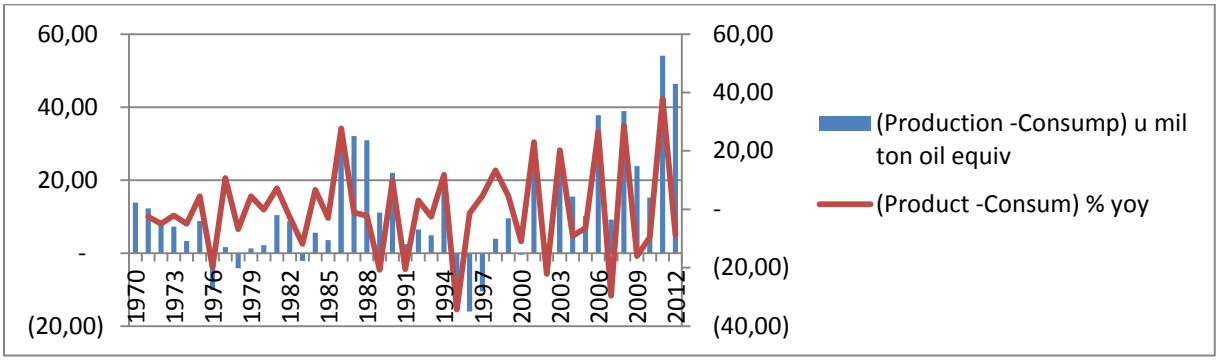
Production and Consumption of gas mil ton oil equiv.



Picture 14

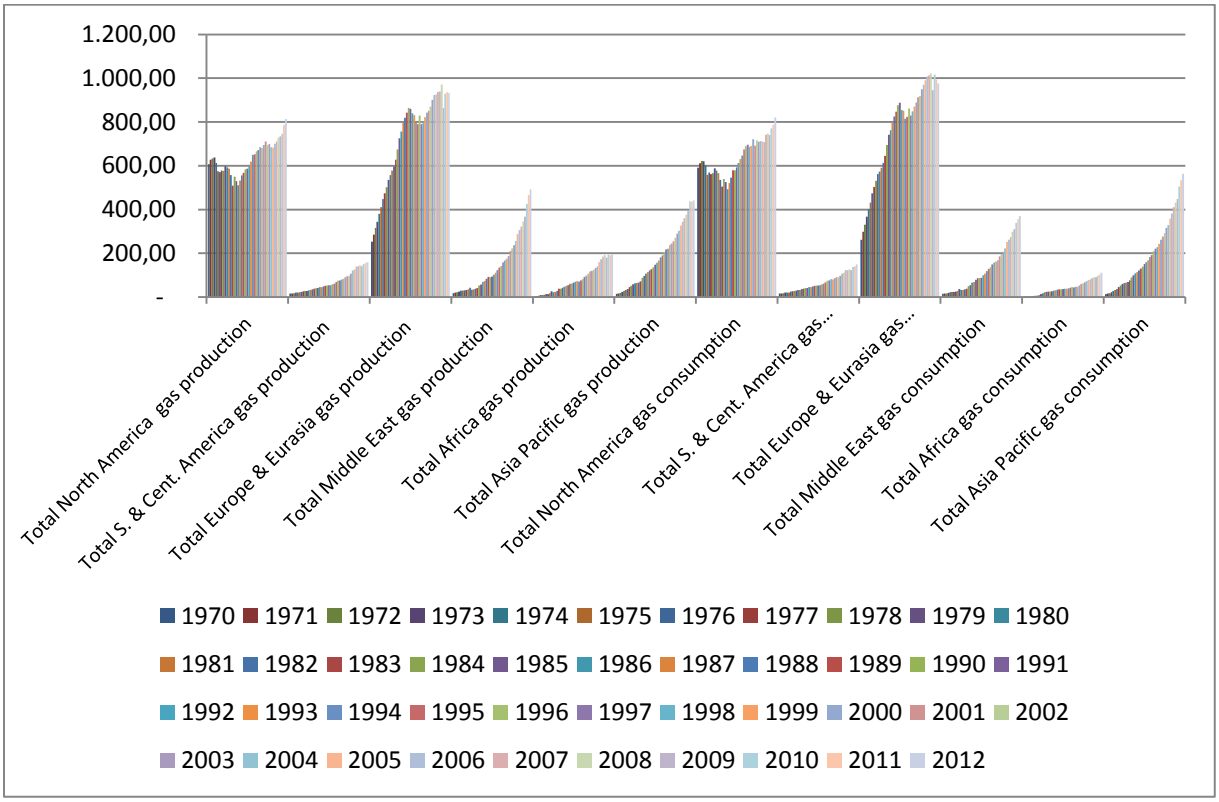
Difference between demand and supply varies from year to year and this increases from 1970 to 2012 significantly .In the first observed year 1970 was 100 mil ton, and in 2012 grew to 46 mil ton oil equiv.

Gas difference, Production-Consumption, Production Consumption y-o-y 1970/2012



Picture 15

The biggest world producers are the regions of Europe and Eurasia that in 2012 had 931 mil ton oil equivalent, and areas of North America that produces 812 mil ton oil equiv. Gas consumption is present not only in the countries that are having high GDP / capita but in areas of gas production that can be areas of lower to lower middle income countries-having said that we can see that Europe and Eurasia spends 975 mil ton oil equivalent and North America 820 mil ton oil equiv.



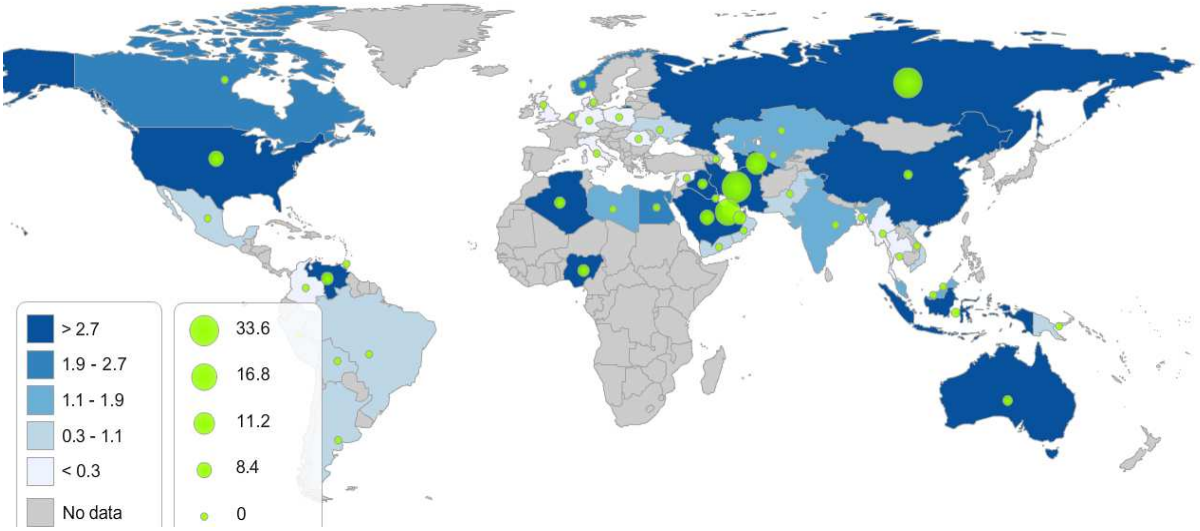
Picture 16

3.2. GAS RESERVERS

Gas reserves are forecasted to be around 187 trillion cubic meters, and this is a consequence of upward revision after data published in 1970 about world reserves and were around 71 trillion m^3, or in 2000 when was 139 trillion m^3.

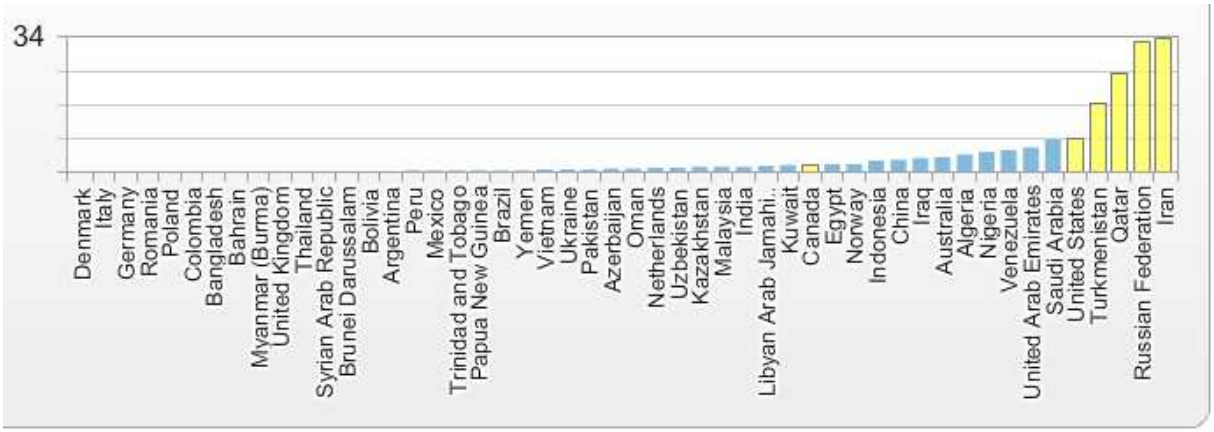
The highest reserves are considered to be situated in the territory of Middle East around 80 trillion m^3, after Euro Asia 58 trillion m^3 , Asia 15 trillion m^3, Africa 14 trillion m^3, Northern America around 10,8 trillion m^3.

Gas reserves trillion cubic meter's



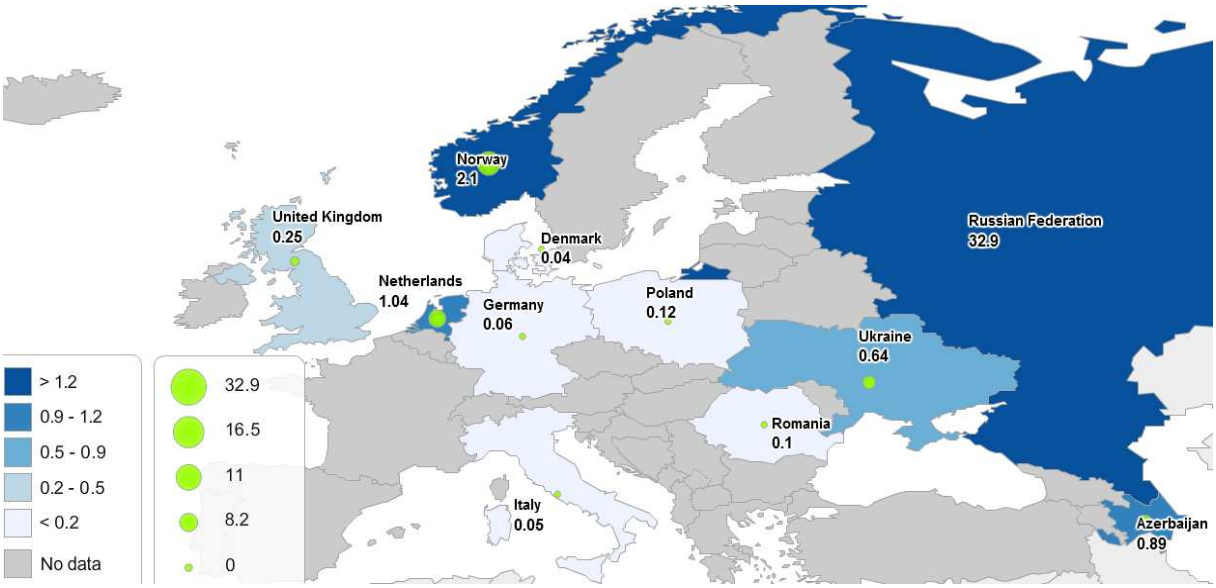
The biggest single countries rich with gas are Iran, Russia, Qatar, and Turkmenistan after follows United States of America and Saudi Arabia.

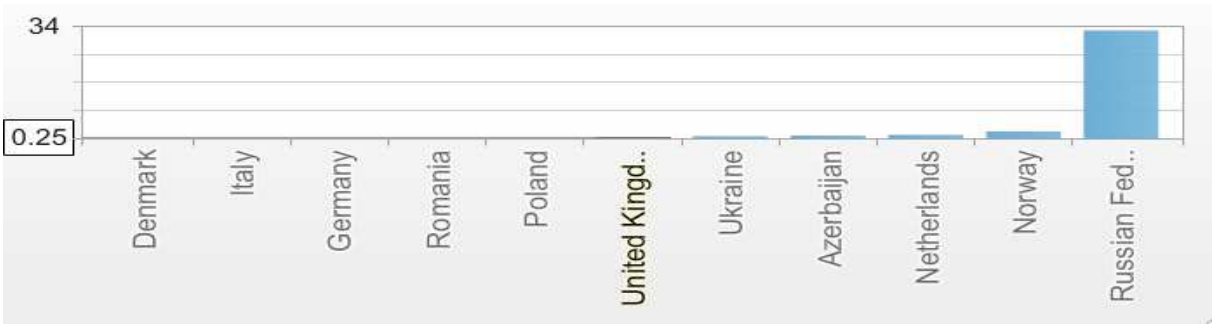
Gas reserves trillion cubic meter's



Area of Europe Eurasia have around 58,4 trillion m^3 gas reserves, of which Russia has 32,9 trillion m^3, Turkmenistan 17,5 trillion m^3 . Norway has around 2, 1 trillion m^3 gas reserves, and it is considered that Nederland's has around 1, 04 trillion m^3.

Europe gas reserves trillion cubic meters

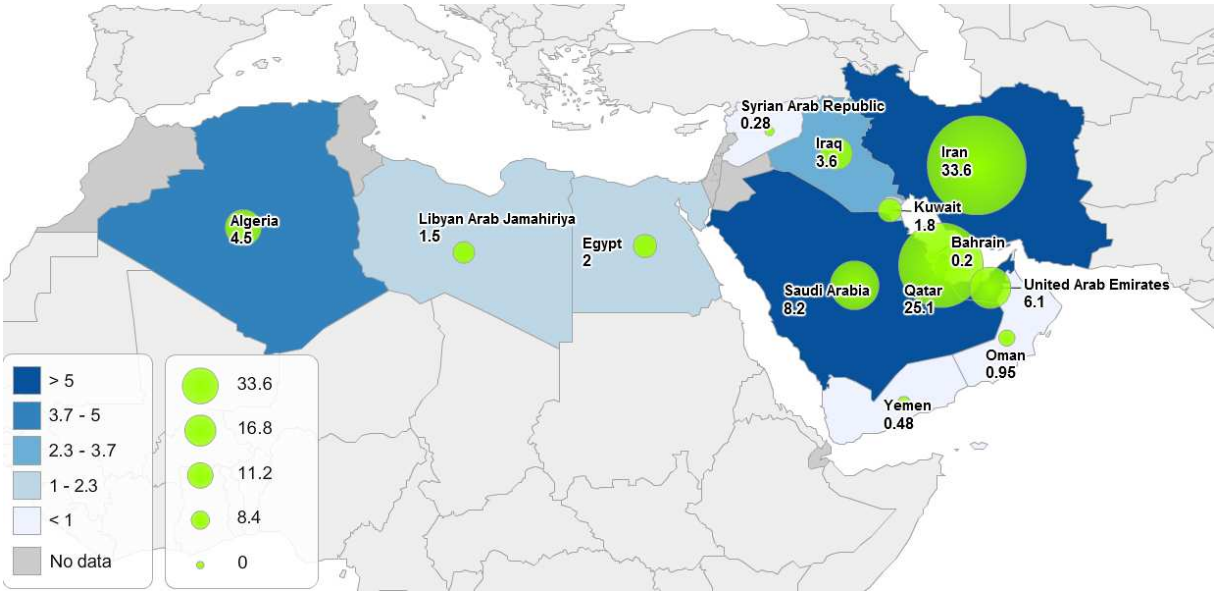




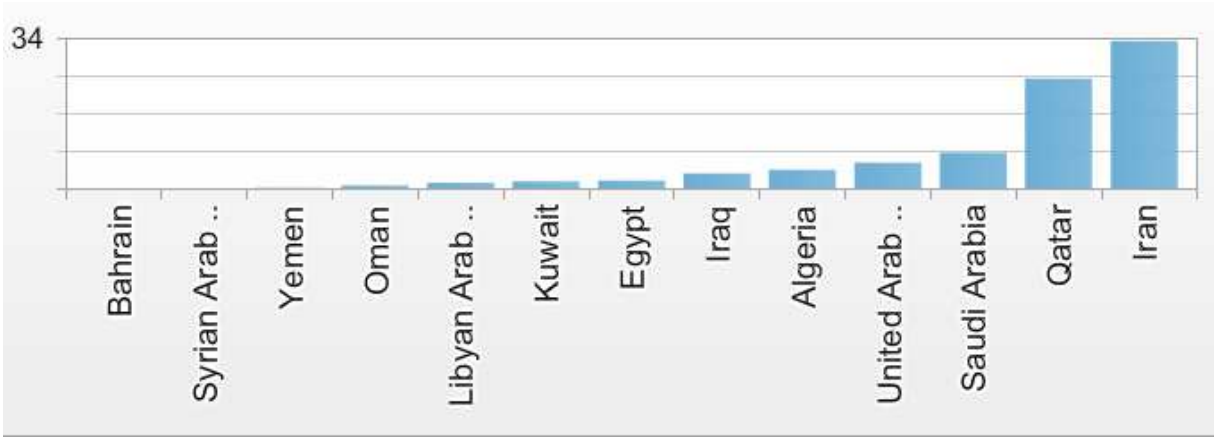
In the Middle East is around 80 trillion m^3 gas reserves where Iran has around 33,6 trillion m^3 , and Qatar 25 trillion m^3 .

In the area of Northern Africa gas is present in significant quantities in Algeria (4, 5 trillion m^3), Egypt (2 trillion m^3), Libya (1, 5 trillion m^3) .

Gas reserves Northern Africa and Middle East

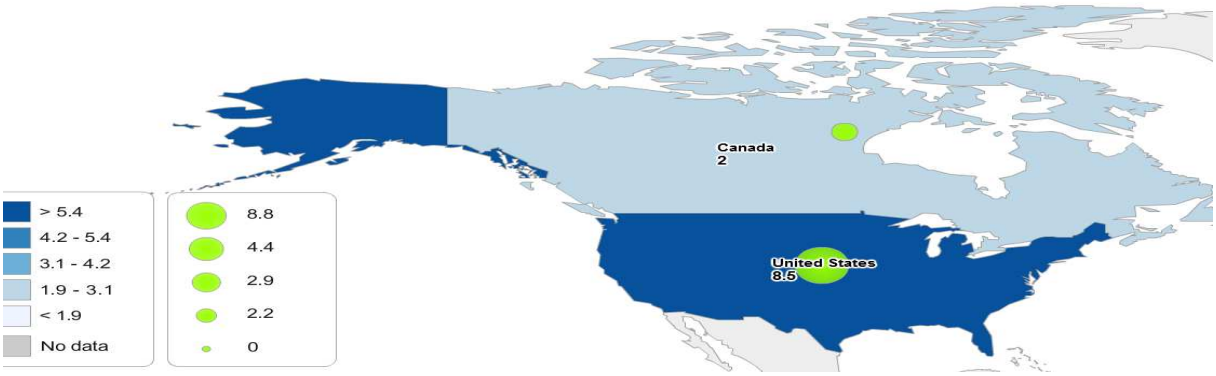


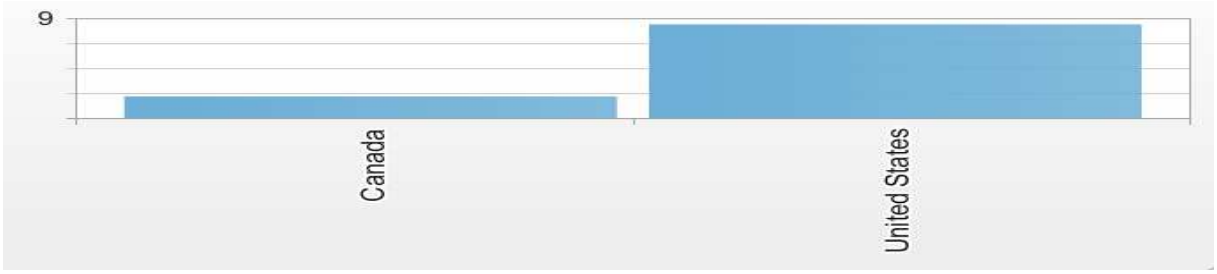
Gas reserves Northern Africa and Middle East trillion cubic meters



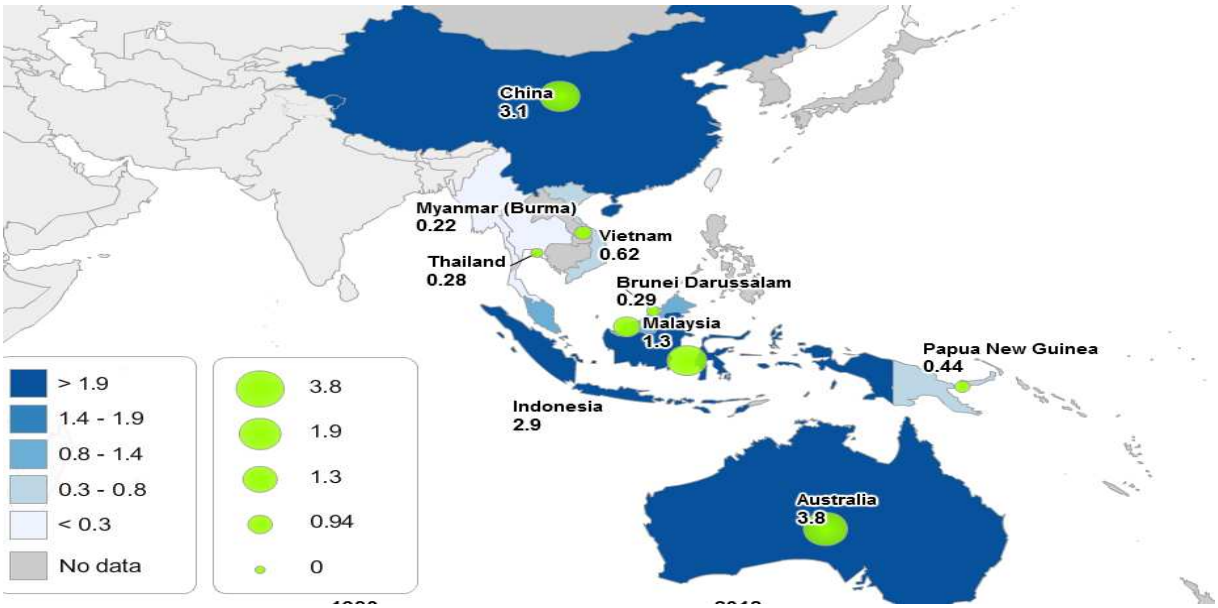
It is forecasted that area of Northern America has around 10, 8 trillion m^3 of gas, where USA has around 8, 5 trillion m^3, a Canada 2 trillion m^3.

Gas reserves Norther America trillion cubic meters





Asia has 15,5 trillion m^3 gas reserves of which majority is situated in Australia (3,8 trillion m^3) ,China 3,1 trillion m^3) and Indonesia (2,9 trillion m^3) .

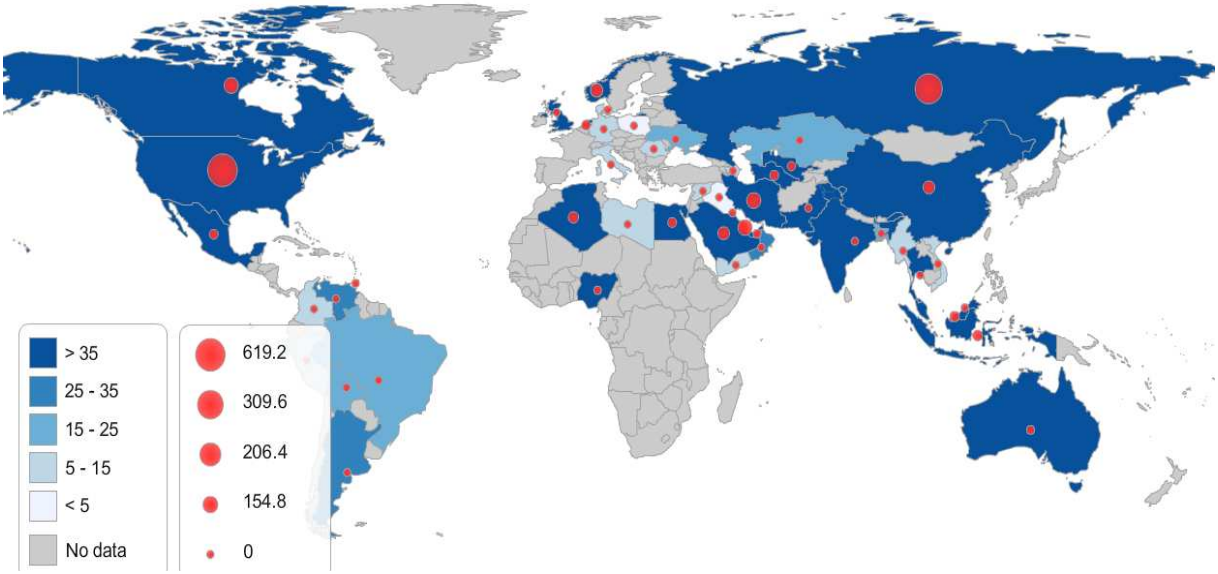


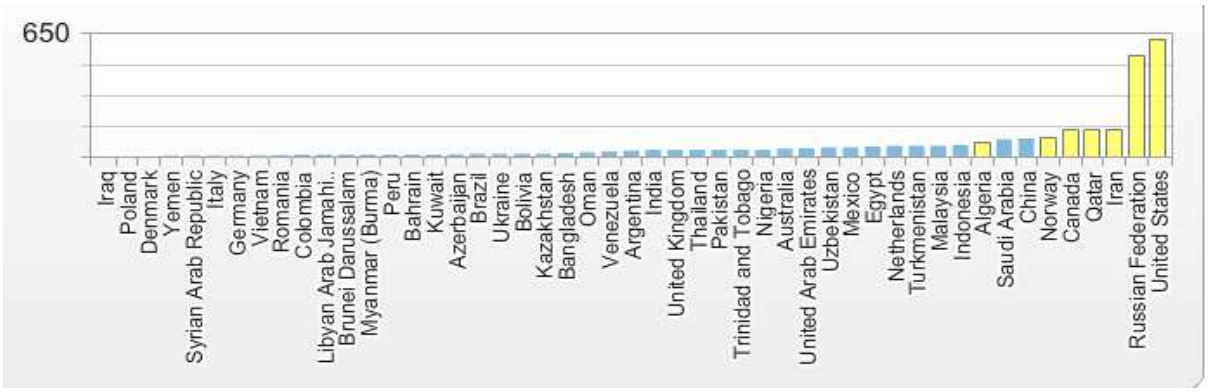
3.3. GAS PRODUCTION

Gas production was in 2012 around 3.033 mil ton oil equiv. what is significant increase of the quantities used in 1970 when was only 911 mil ton oil equivalent on the world level. The biggest producers are the countries that are belonging to the group of OECD and they have production of around 1.937 mil ton oil equiv.

The biggest single producer is USA with 619 mil ton oil equip after comes Russia with around 533 mil ton oil equivalent of production.

Gas production

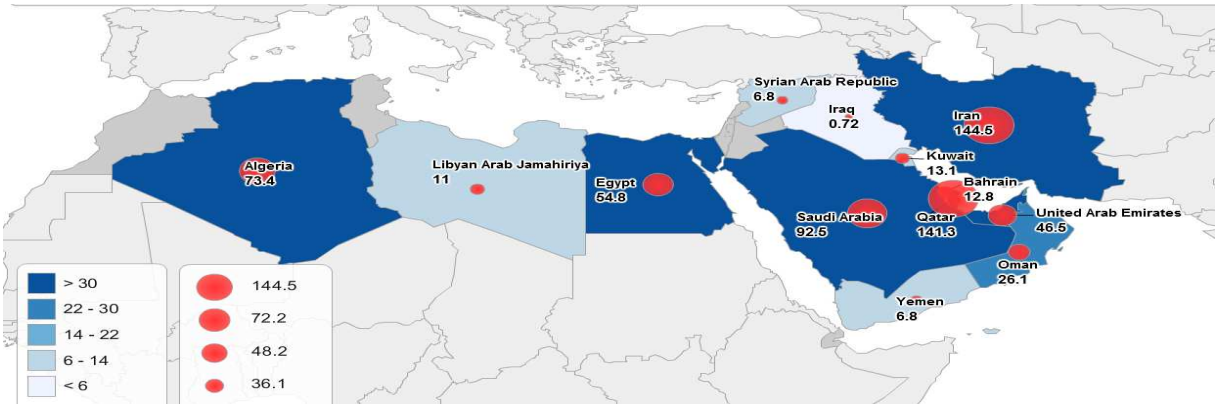




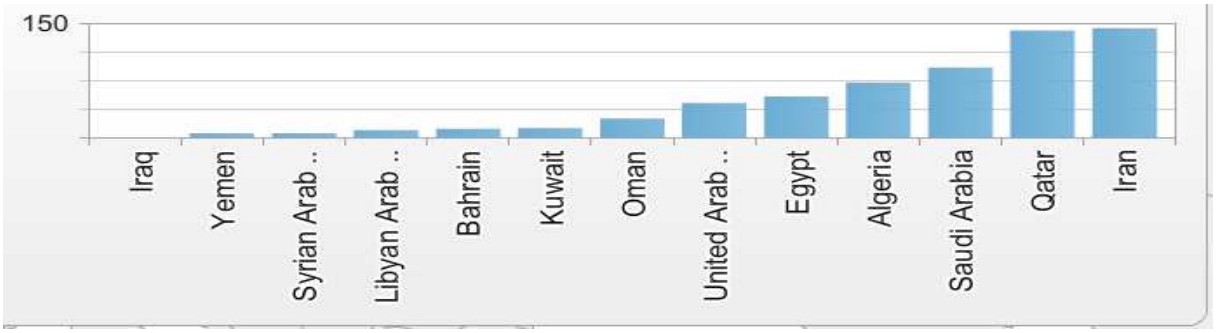
in the area of Middle East it is produced around 493 mil ton oil equivalent where Iran is having production of around 144 mil ton yearly, Qatar 141 mil ton yearly, Saudi Arabia 92,5 mil ton, and United Arab Emirates 46,5 mil ton oil equiv.

Northern Africa is also active in gas production where Algeria has around 73, 4 mil ton, Egypt 54, 8 mil ton, Libya 11 mil ton oil equiv.

Gas production mil ton oil equivalent

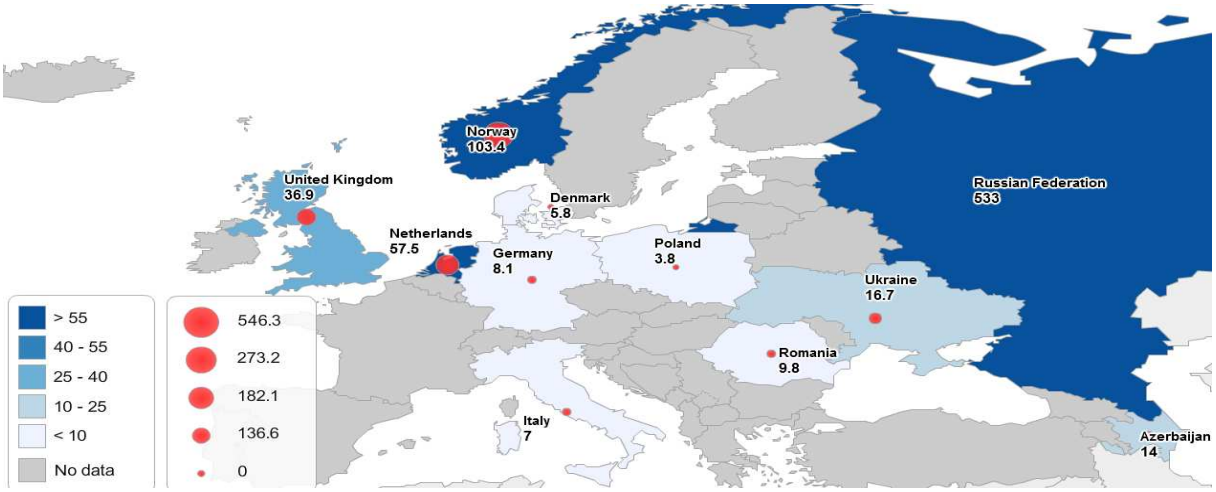


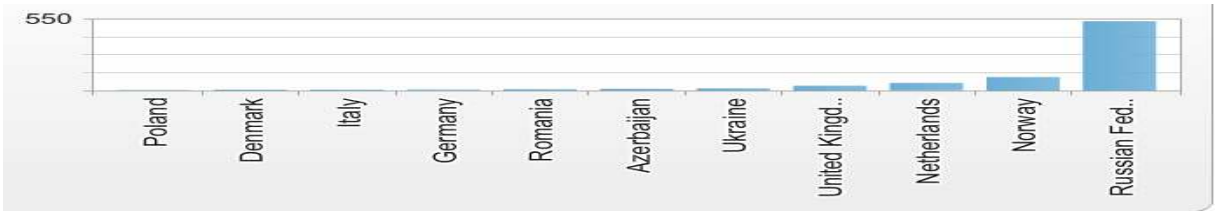
Gas production mil ton oil equivalent



Area of Northern Europe Eurasia is having around 931 mil ton oil equivalent gases, and the most endowed with resources is Russia with 533 mil ton oil equiv. Other gas producers are Norway 103 mil ton, Netherland 57 mil ton, Great Britain 36, 9 mil ton oil equiv.

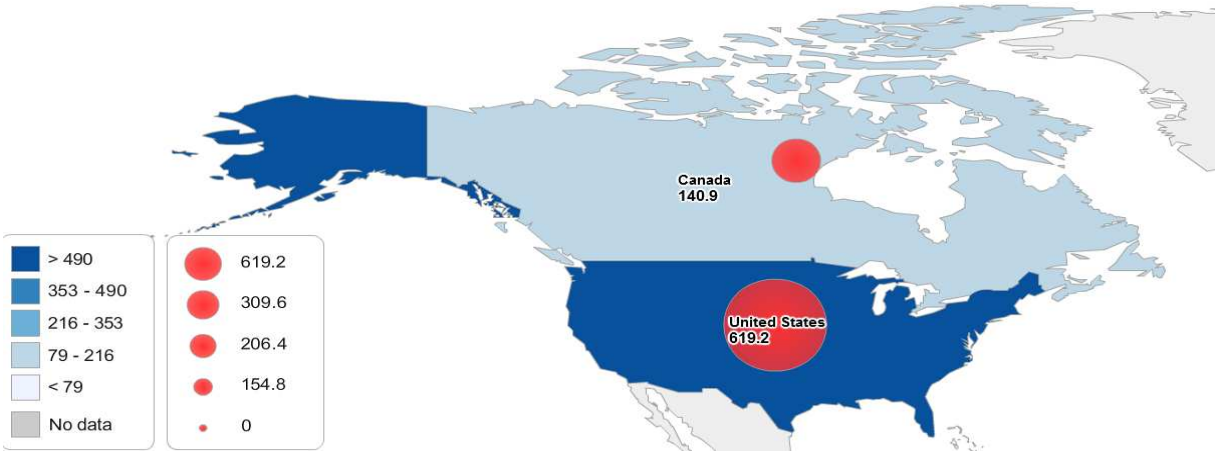
Gas production Europe Eurasia mil ton oil equivalent

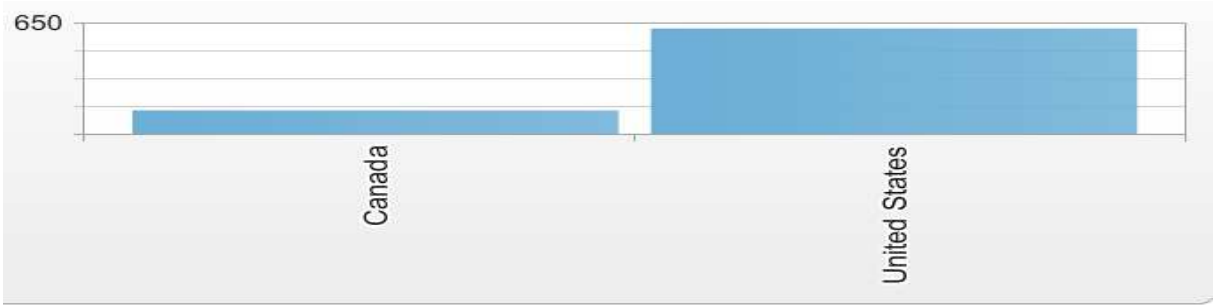




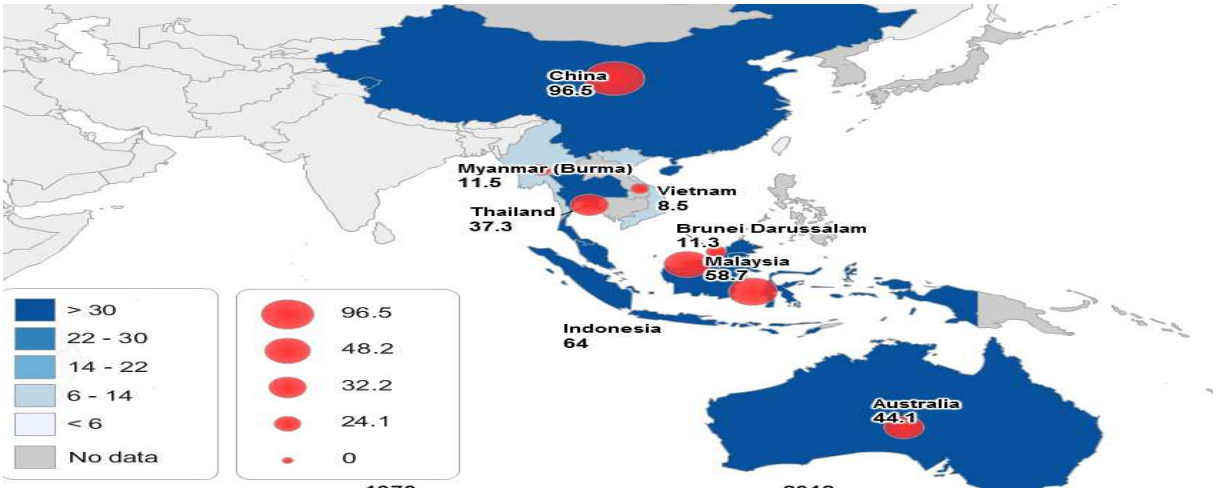
United States of America had by far the biggest gas production that was around 619 mil ton oil equivalent, and its northern neighbor Canada production of 140 mil ton oil equiv.

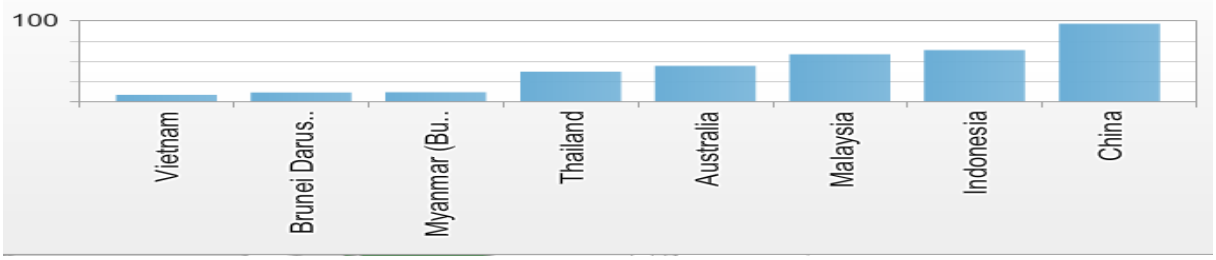
Gas production northern America mil ton oil equivalent





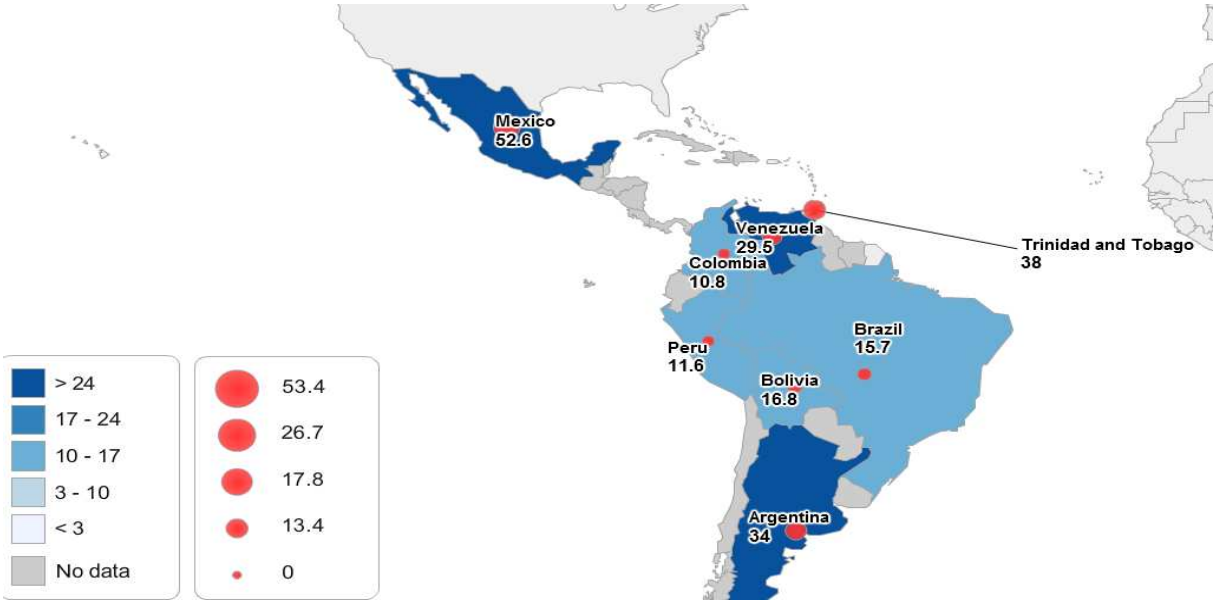
Area of Asia Pacific have production of around 441 mil ton oil equivalent , and the biggest producers are China with 96,6 mil ton, Australia 44,1 mil ton oil equivalent, Malesia 58,7 mil ton oil equip.





The biggest producers in Middle and South America have production of around 212 mil ton oil equivalent and the most important are : Mexico 52,6 mil ton oil equivalent, Venezuela 29,5 mil ton oil equivalent, Brazil 15,7 mil ton oil equivalent, Argentina 34 mil ton oil equivalent.

Gas production Middle South America mil ton oil equivalent

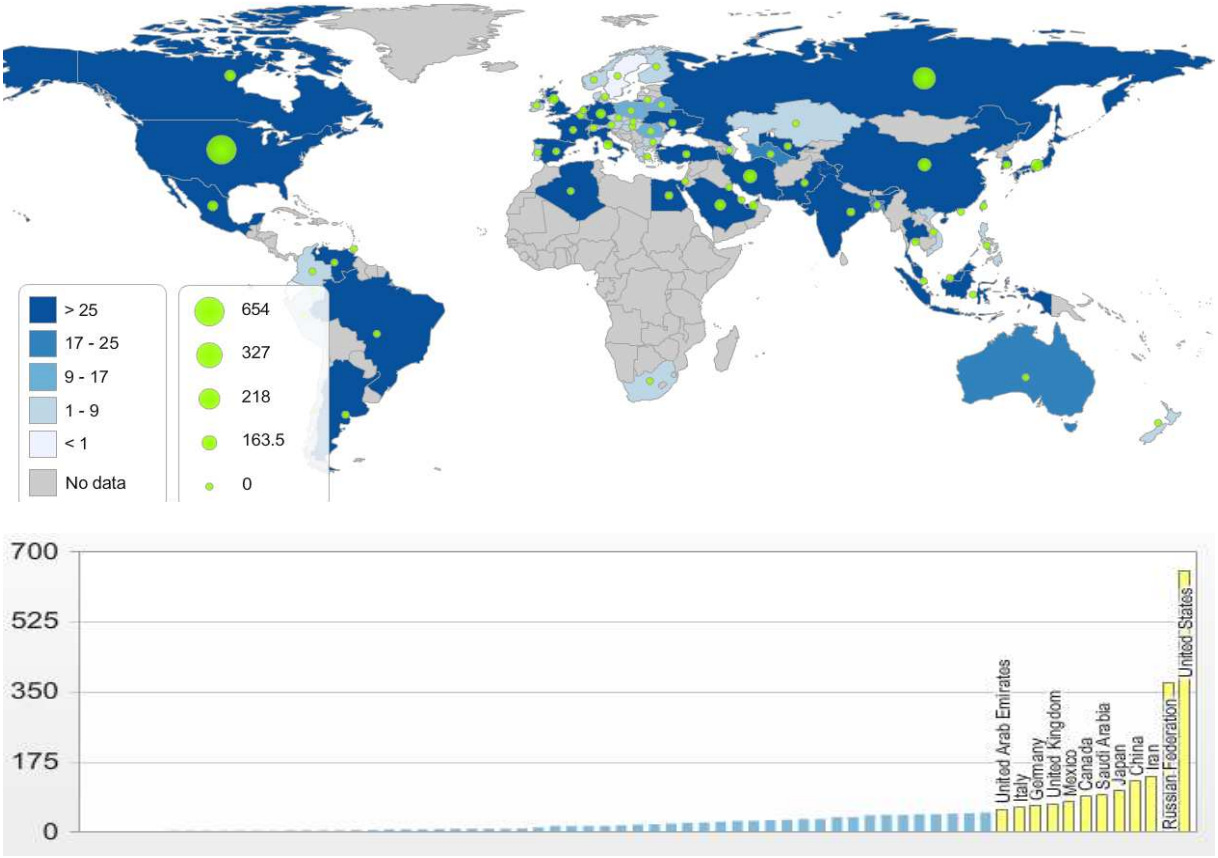


3.4. GAS CONSUMTION

Total world gas consumption in 2012 was 2.987 mil ton oil equiv. The biggest single consumer is the country that is also the biggest producer : USA that is having 22% of total world consumption of around 654 mil ton oil equiv. Europe and Eurasia as the whole are the biggest consumer with 32,6% of total consumption what is around 975 mil ton oil equiv.

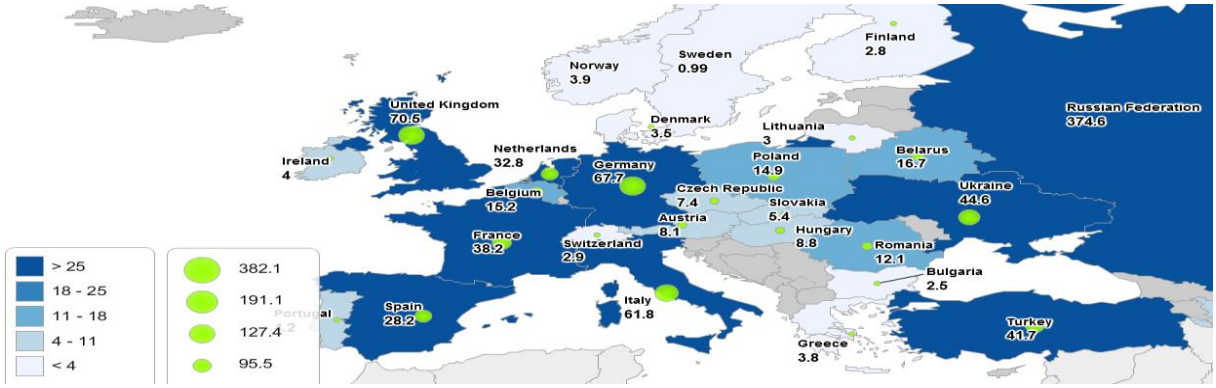
Other big gas users are Russia (374 mil ton oil equivalent), Iran (140 mil ton oil equivalent), China (129 mil ton oil equivalent),Japan (105 mil ton oil equivalent), Saudi Arabia (92 mil ton oil equivalent) Canada (90 mil ton oil equivalent) and Mexico (75 mil ton oil equiv.).

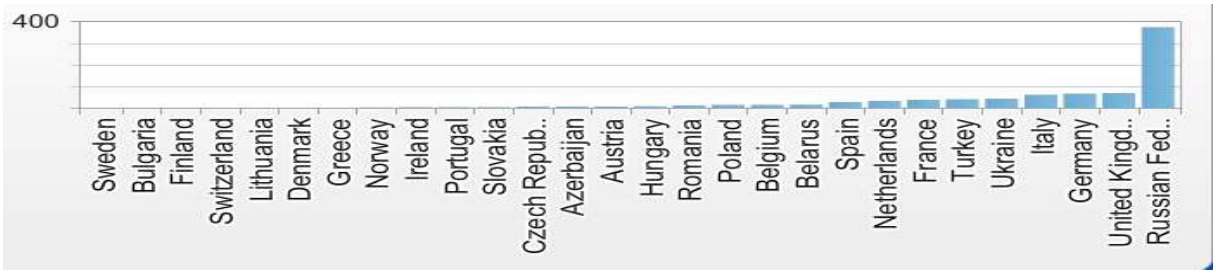
Gas consumption mil ton oil equivalent



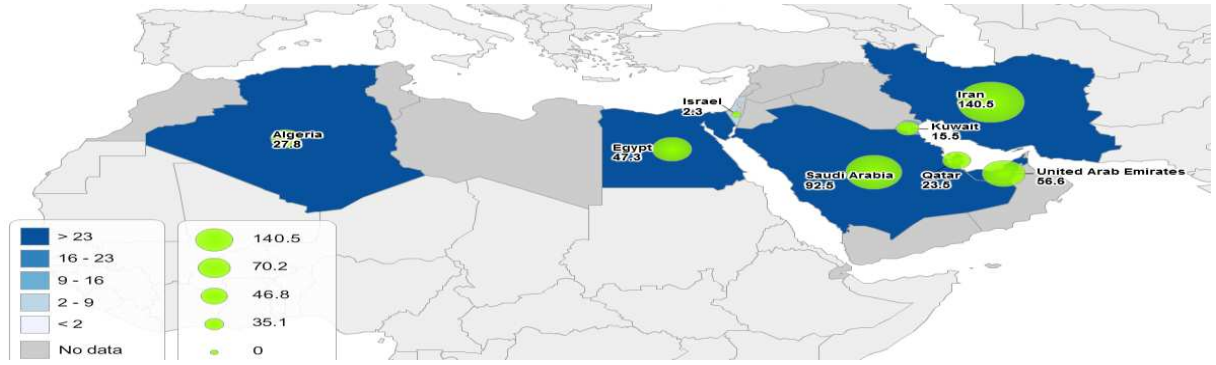
Gas consumption in Europe is the biggest in Russia with 374 mil ton yearly, and other big consumers are Great Britain 70 mil ton, Germany 67, 7 mil ton Italy 61 mil ton, France 38 mil ton, Spain 28 mil ton.

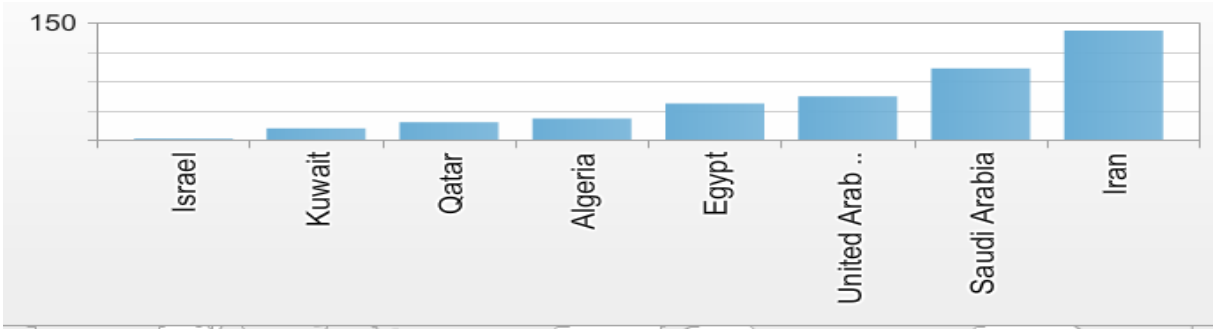
Gas consumption Europe mil ton oil equivalent



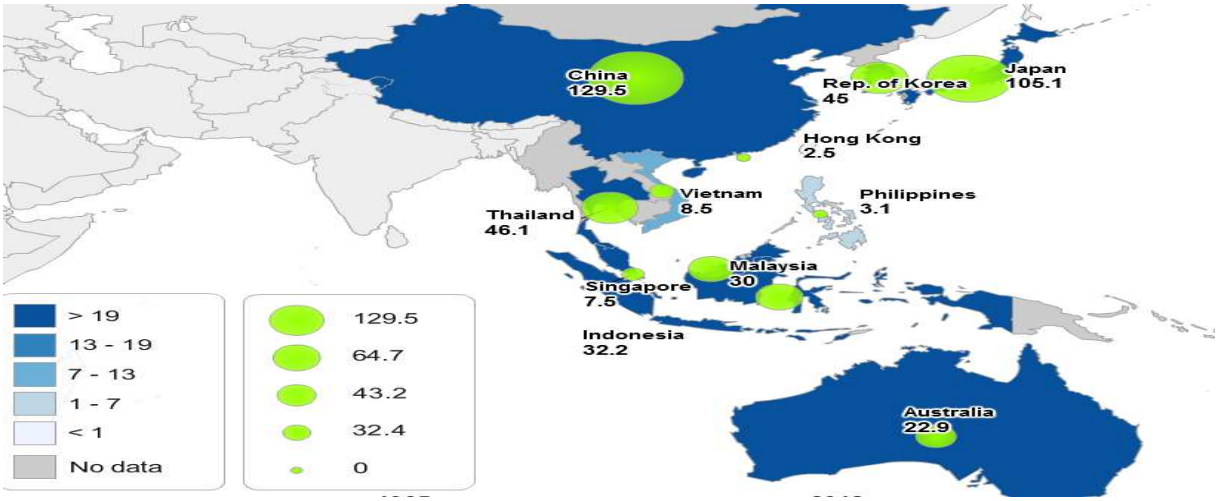


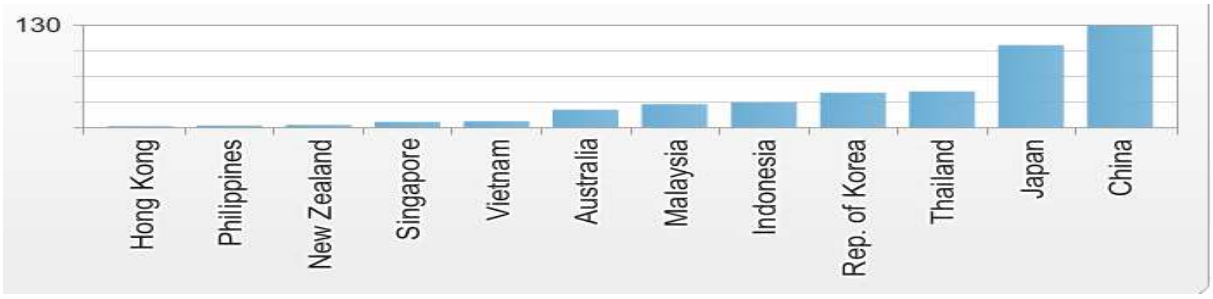
Middle East is the area rich with gas resources and the biggest consumers are Iran 140 mil ton oil eruv, Saudi Arabia 92 mil ton oil equivalent, United Arab Emirates 56 mil ton oil equivalent and Egypt 47 mil ton oil equivalent.



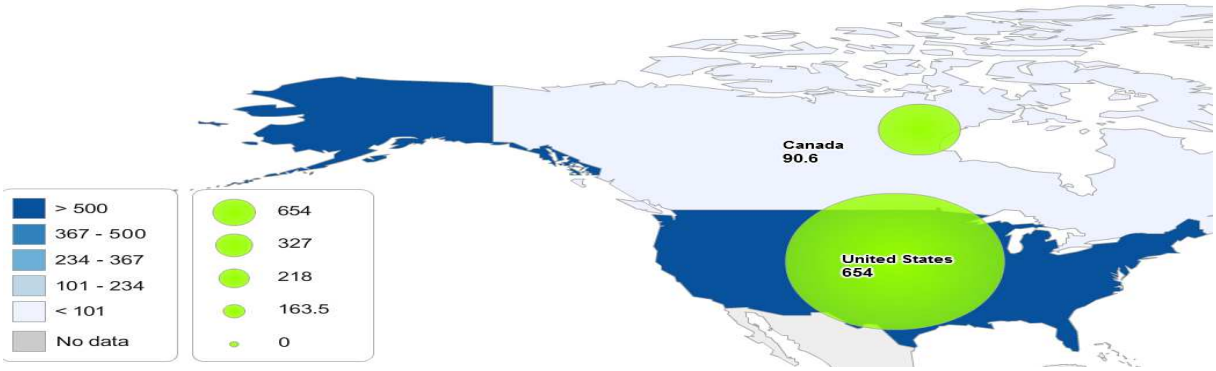


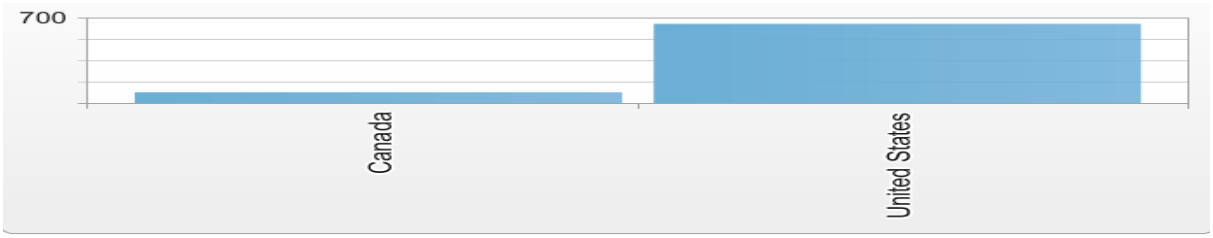
Asia spends 562 mil ton gas, where China has consumption of 129 mil ton Japan 105 mil ton, Thailand 46 mil ton, South Korea 45 mil ton, Pakistan 37 mil ton, India 49 mil ton. Australia with quantity of 22, 9 mil ton consumed gas has the similar consumption as Bangladesh 19 mil ton, Indonesia and Malaysia are both having consumption over 30 mil ton oil equiv.



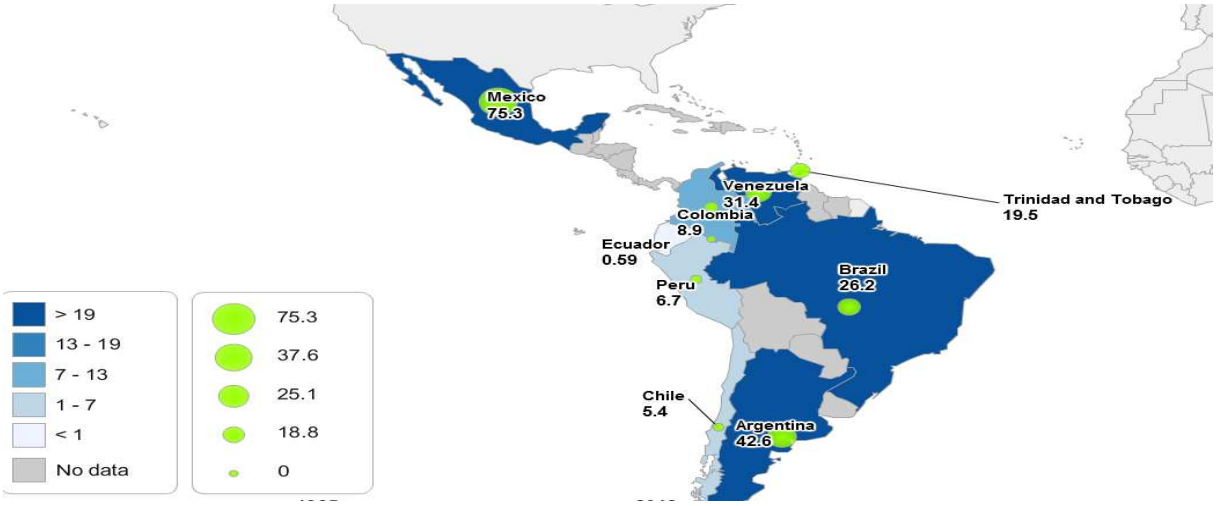


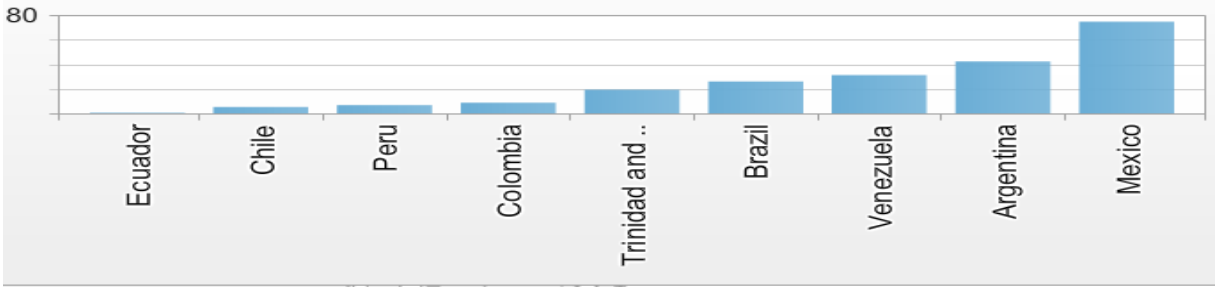
The biggest world consumer USA yearly spends around 654 mil ton, while northern neighbor Canada has consumed 90, 6 mil ton oil equivalent in 2012.





Middle and South America had in 2012 gas consumption of 229 mil ton oil equivalent , where Mexico spend 75,3 mil ton oil equivalent, Argentina 42,6 mil ton oil equivalent, Brazil 26,2 mil ton oil equivalent, Venezuela 31,4 mil ton oil equivalent.





4. RENEWABLE RESOURCES

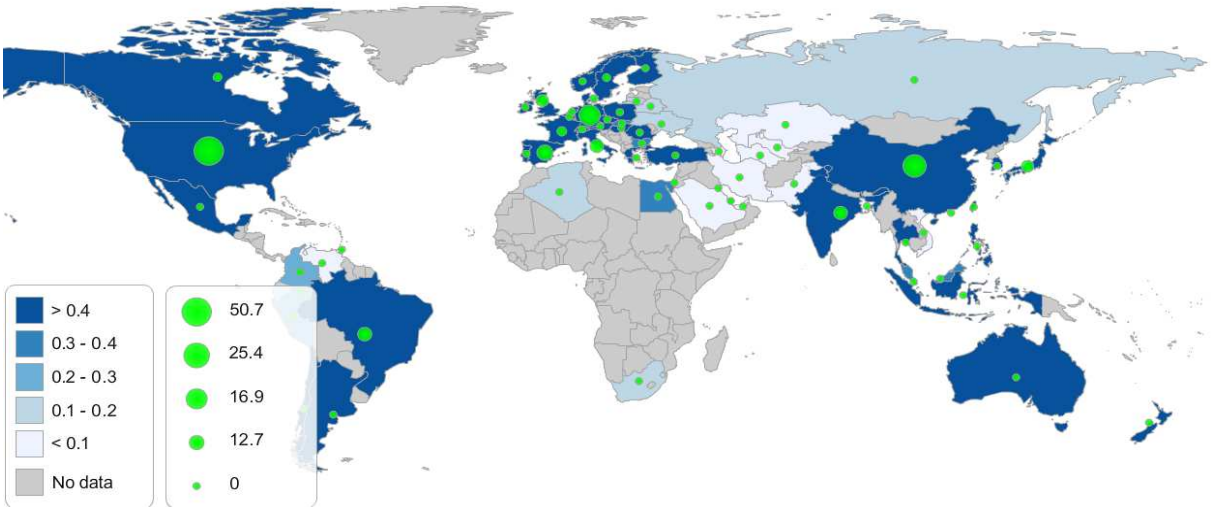
4.1. RENEWABLE RESOURCES CONSUMPTION (WITHOUT HYDRO ENERGY)

Renewables present a great opportunity to mankind because it has no limit in quantities, and can be on one or another way be found everywhere in the world (sun, wind, geo, energy). Further important contribution to mankind is smaller negative impact on environment and reduction of harmful emissions currently present by oil/gas/coal usage. With technology advances and significant scientific steps in this area it is possible to make solid and ground plans to harness energy out of nature in this way.

Increase in renewables was really impressive and the last ten years brought significant share of renewables in new investments and possibilities related to this part. It is enough just to compare numbers of consumption in 1965 where was 1,1 mil ton oil equivalent, with 2000 51,5 mil ton oil equivalent, or to further stress the last number of 237,4 mil ton oil equivalent, progress is visible.

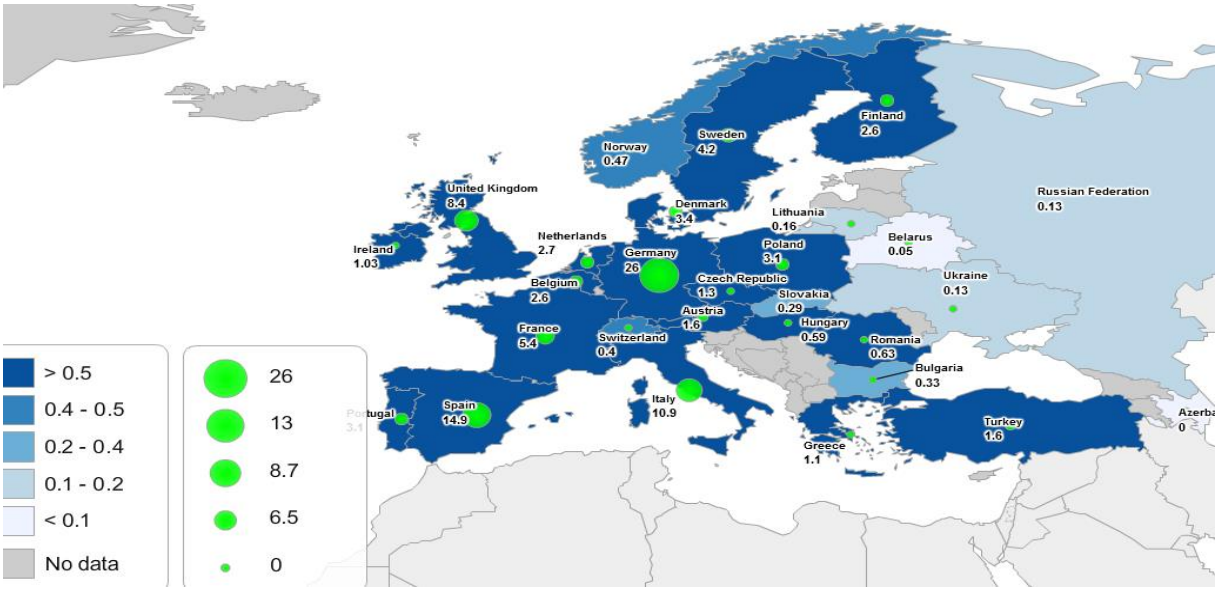
The biggest consumption has the riches countries and in that way OECD blocks uses 169,2 mil ton oil equivalents, and the countries that are not OECD only 68,2 mil ton oil equiv. It is important to stress that EU has consumption of 95 mil ton oil equivalent, while the countries of former Soviet Bloc only 0,6 mil ton oil equiv. This points further on conclusion that renewables advances in the countries with bigger GDP and lower quantities of reserves of classical energy resources. One of the richest countries in the world USA has 50,7 mil ton oil equivalent consumption of renewables.

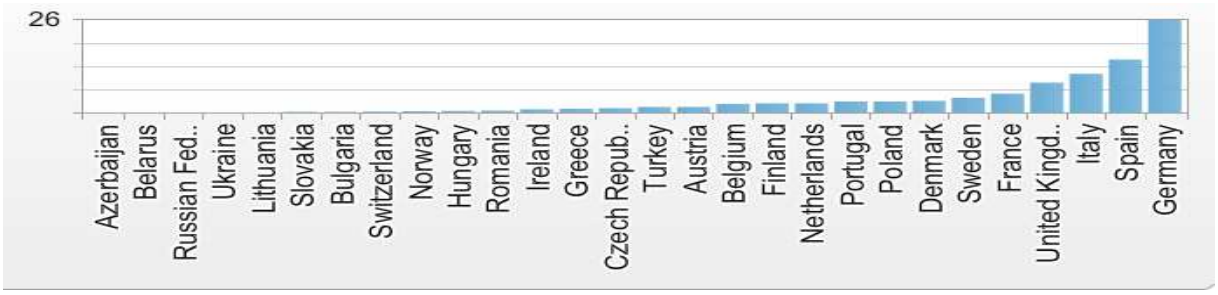
Renewables (without hydro energy) consumption in mil ton oil equiv.



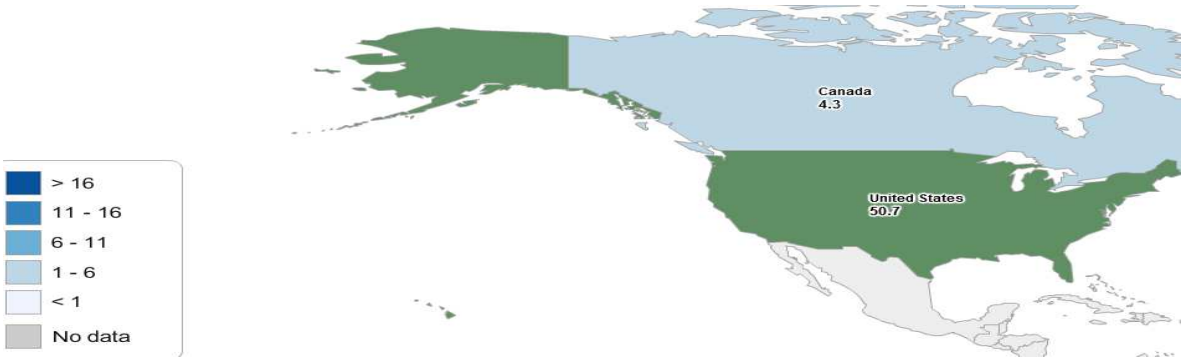
On Asian Continent China is proactive in supply its country with all form of energy resources and in this way incorporates strategy to increase renewables. Currently it uses 31,9 mil ton oil equivalent and Germany around 26 mil ton oil equivalent.

On the picture that follows it is visible that area inside Europe/Euro Asia consumption of renewables is around 99 mil ton oil equivalent from which the biggest consumption is in Germany with around 26 mil ton oil equivalent, Spain 14,9 mil ton oil equivalent, Italy 10,9 mil ton oil equip, UK 8,4 mil ton oil equivalent. Very small consumption is present in Russia with around 0,13 mil ton oil equiv.

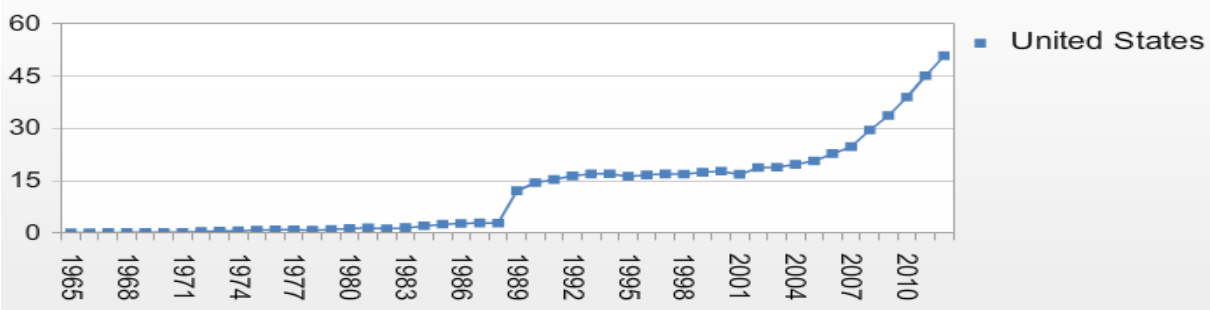




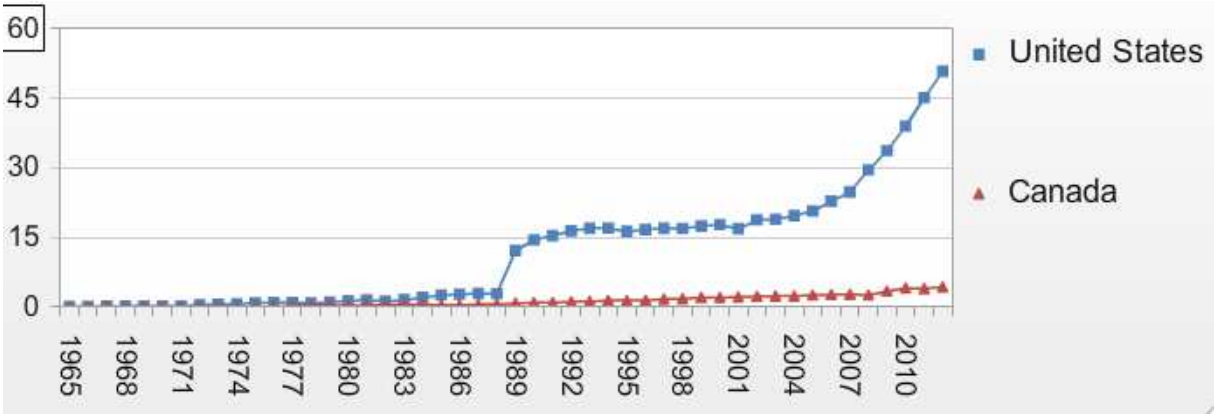
Although North of American continent with high GDP rate have greater than average opportunities to develop all forms of renewables this strategy is not equally implemented in Canada and USA. While USA has consumption of 50,7 mil ton oil equivalent, in Canada it is only 4,3 mil ton oil equivalent and lower inclination toward production and developments of renewables worldwide.



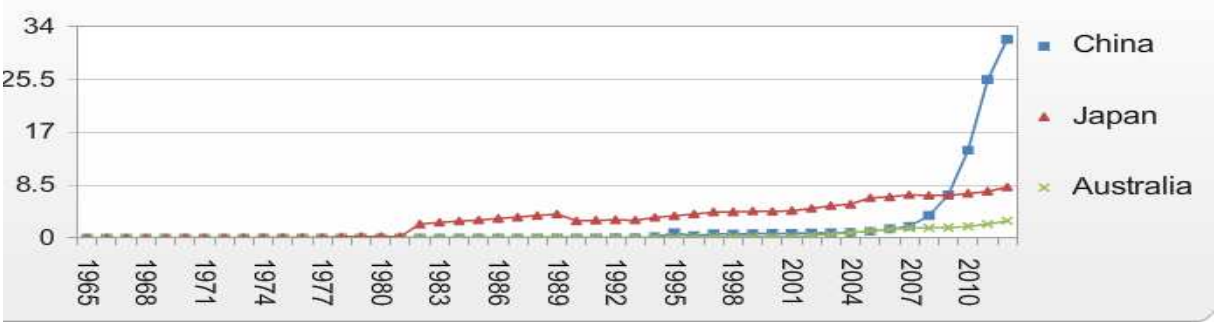
USA itself started to develop and implement more vigorously renewables after 2007 after this time consumption grows at exponential rate.



It is of interest to note that while one country that is the hugest world energy consumer per capital develop different strategies in other types of energy that are not related to oil gas, its neighbor Canada invests largely in gas oil and with late penetration of renewables (some hydroelectric Niagara) small wind projects around biggest cities.

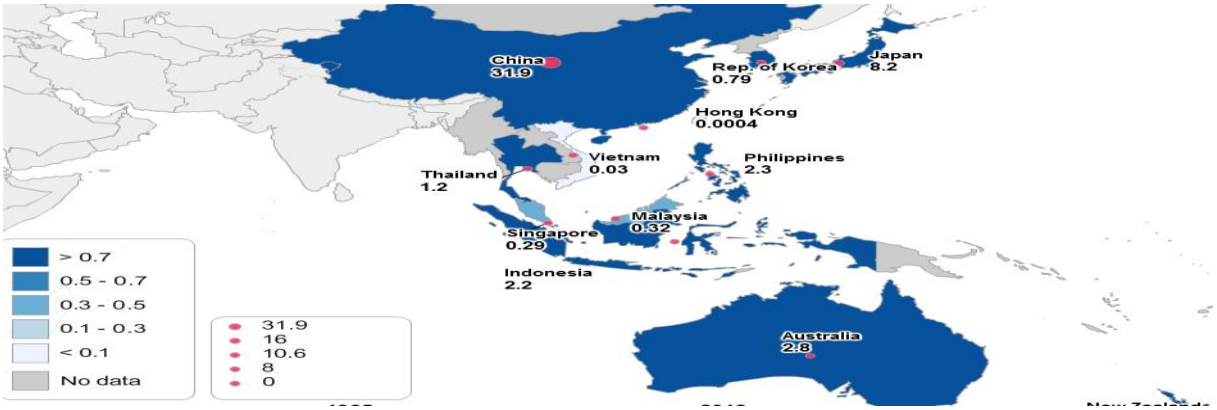


The third very important economy in the world is Japan country with insignificant mineral resource potential also tries to develop renewables but with current structure of 8,2 mil ton oil equivalent fell behind USA in that area.

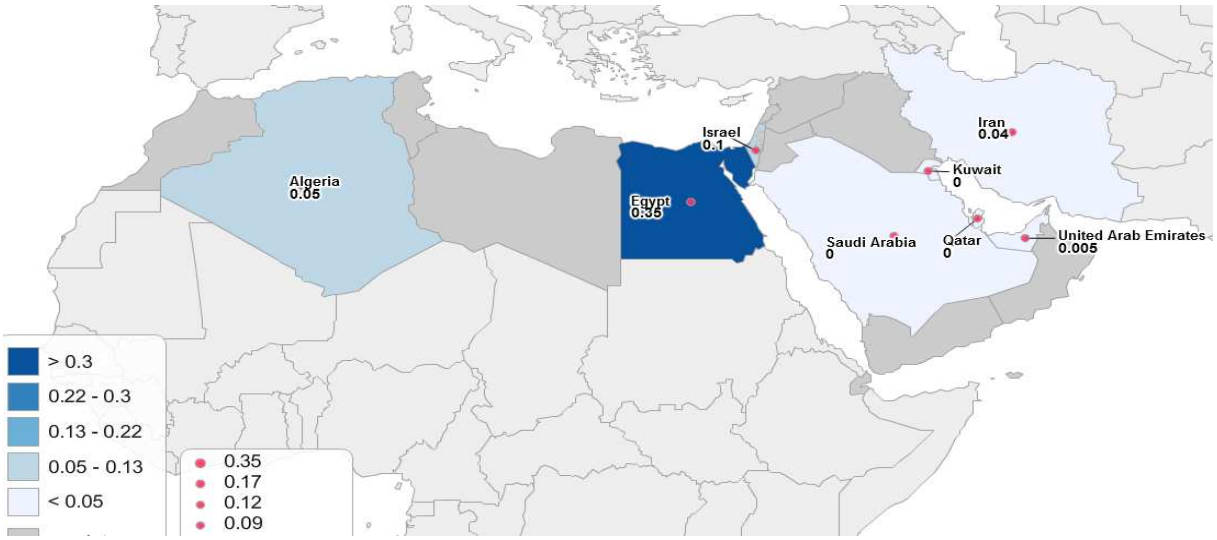


Total consumption of renewables without hydroelectric energy in Asia and Pacific area is around 64, 1 mil ton oil equivalent from which China has 31, 9 mil ton oil equivalent, Japan around 7-8 mil ton, Australia 2, 8 mil ton oil equivalent, Indonesia 2,2 mil ton oil equivalent,

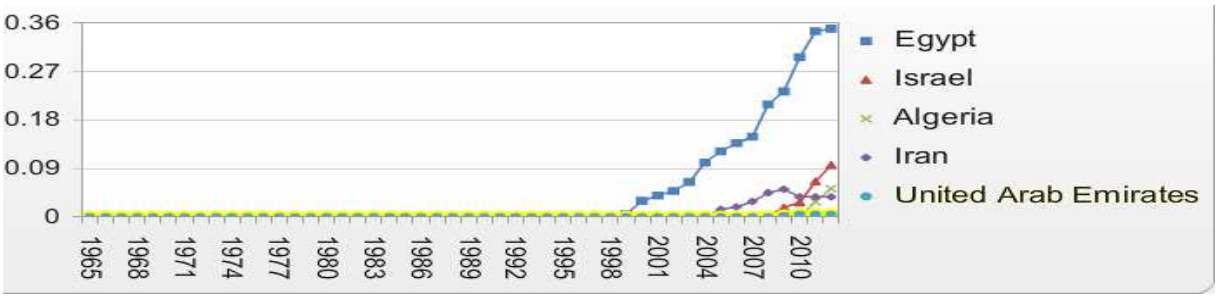
Thailand 1,2 mil ton oil equiv., Filipinos 2,3 mil ton oil equivalent, and Republic Korea 0,79 mil ton oil equiv.



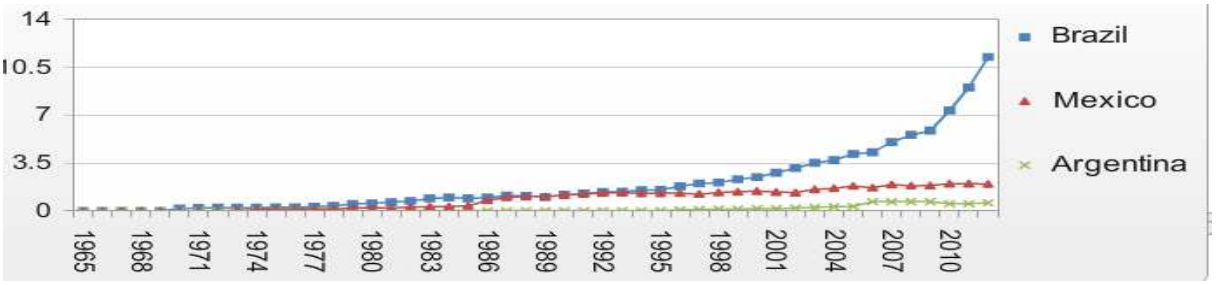
Very low phase of renewable implementation is present on the territory of North Africa and Middle east , where the biggest rate is observed in Egypt 0,35 mil ton oil equivalent Israel 0,1 mil ton oil equiv.

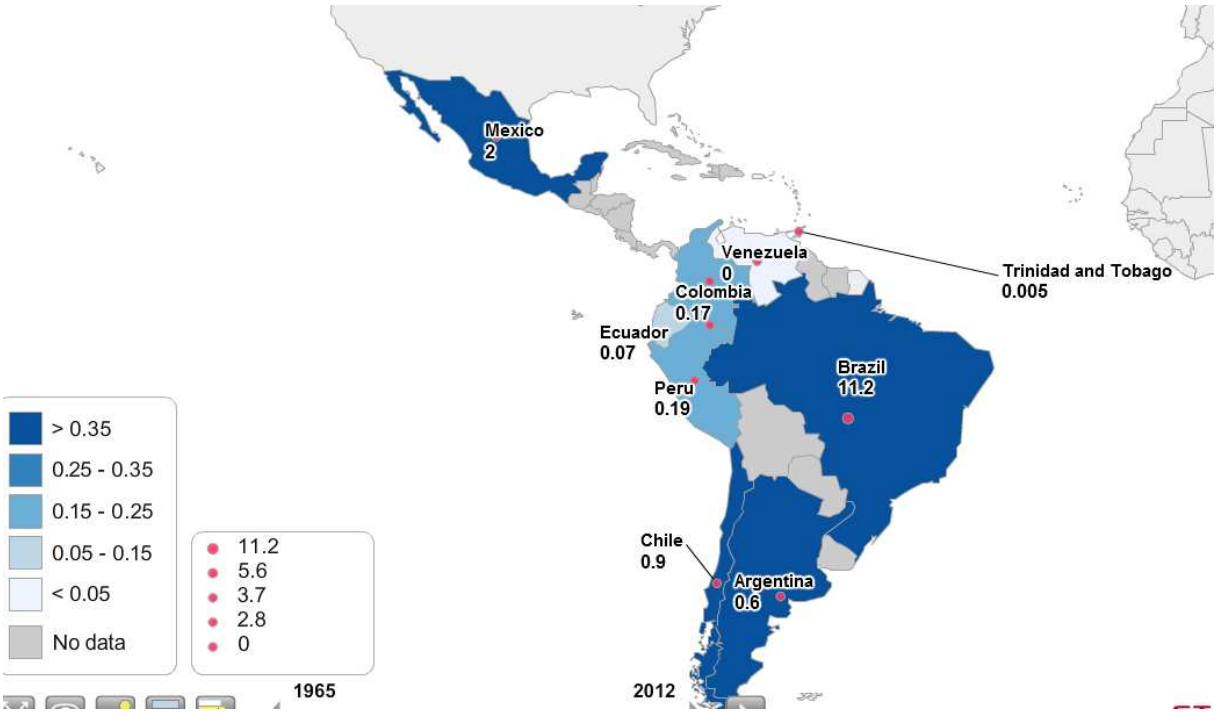


Installation and consumption of renewables started in Africa and Middle East also in mid-2000 and since today the only significant quantities are present in Egypt.



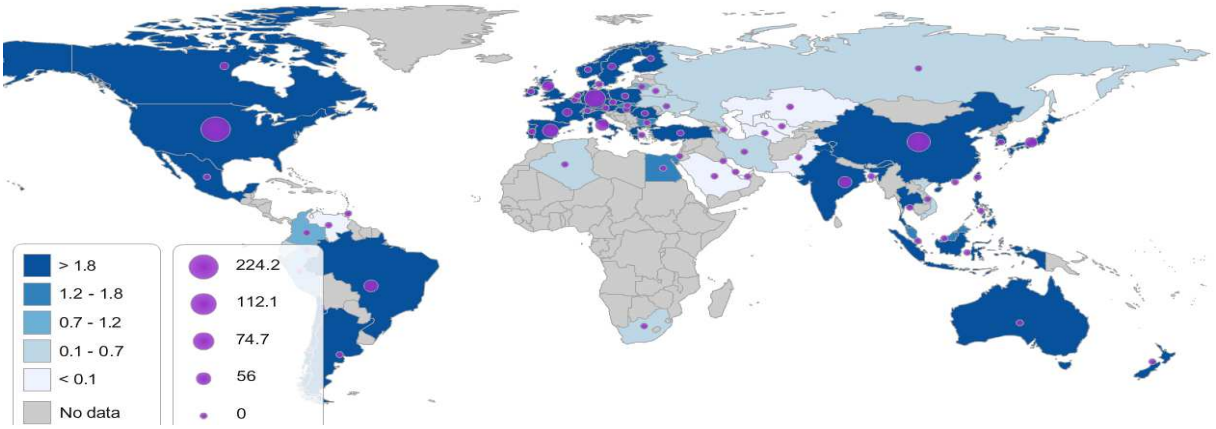
In the South America renewable energy consumption is around 17, 6 mil ton oil equiv. The majority of investments comes from Brazil that consumes 11, 2 mil ton oil equiv.



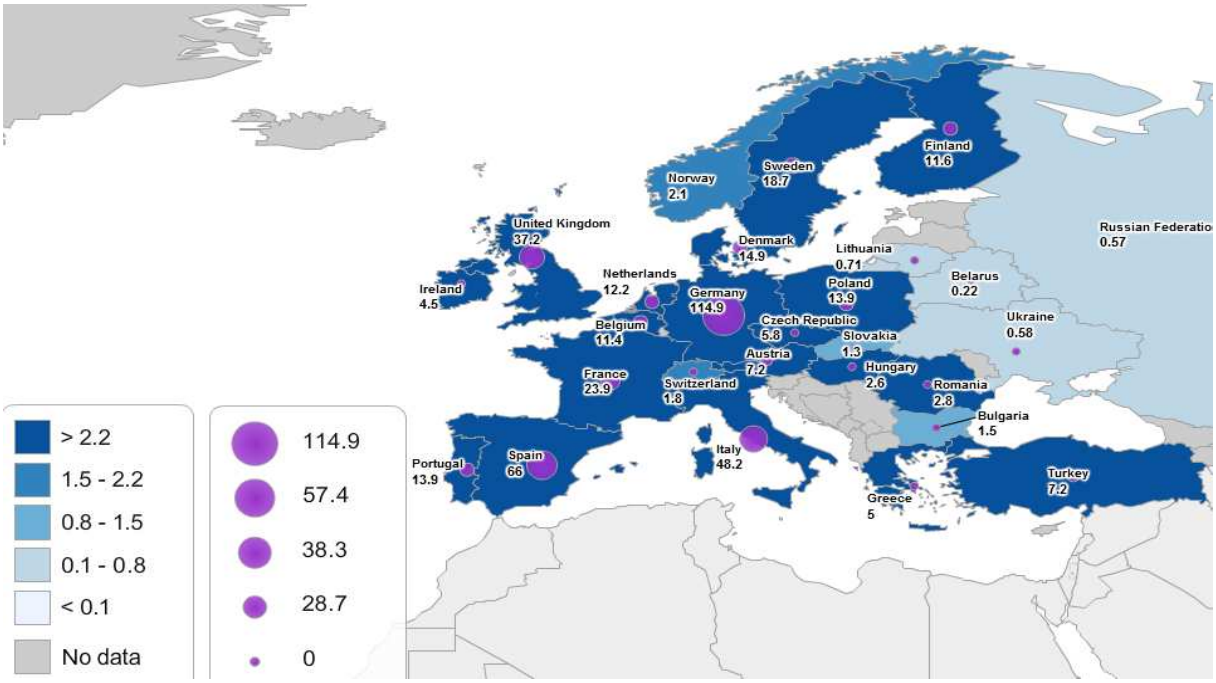


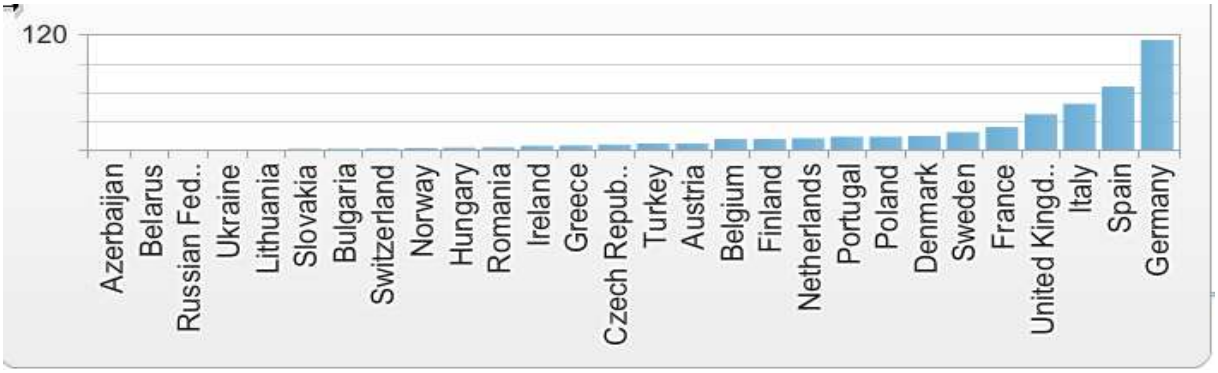
4.1.1. CONSUMPTION OF ENERGY FROM RENEWABLES (WITHOUT HYDRO ENERGY) IN TWh

Energy consumption from renewables (without hydro energy) was in 2012 1.049 TWh what is significant increase from 1965 when was only 5 TWh or from 1990 when was 125,9 TWh. with USA China and Germany as leading forces in the field.

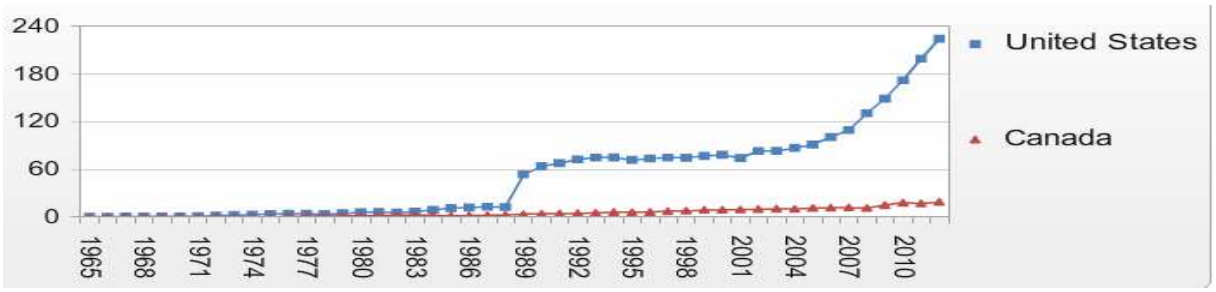


In Europe the biggest consumption was in Germany 114,9 TWh than in Spain 66 TWh Italy 48 TWh UK 37 TWh Denmark 14,9 TWh ,France 23,9 TWh, Finland 11,6 TWh. Consumption in Portugal was 13,9 TWh ,Turkey 7,2 TWh, Sweden 18,7 TWh.

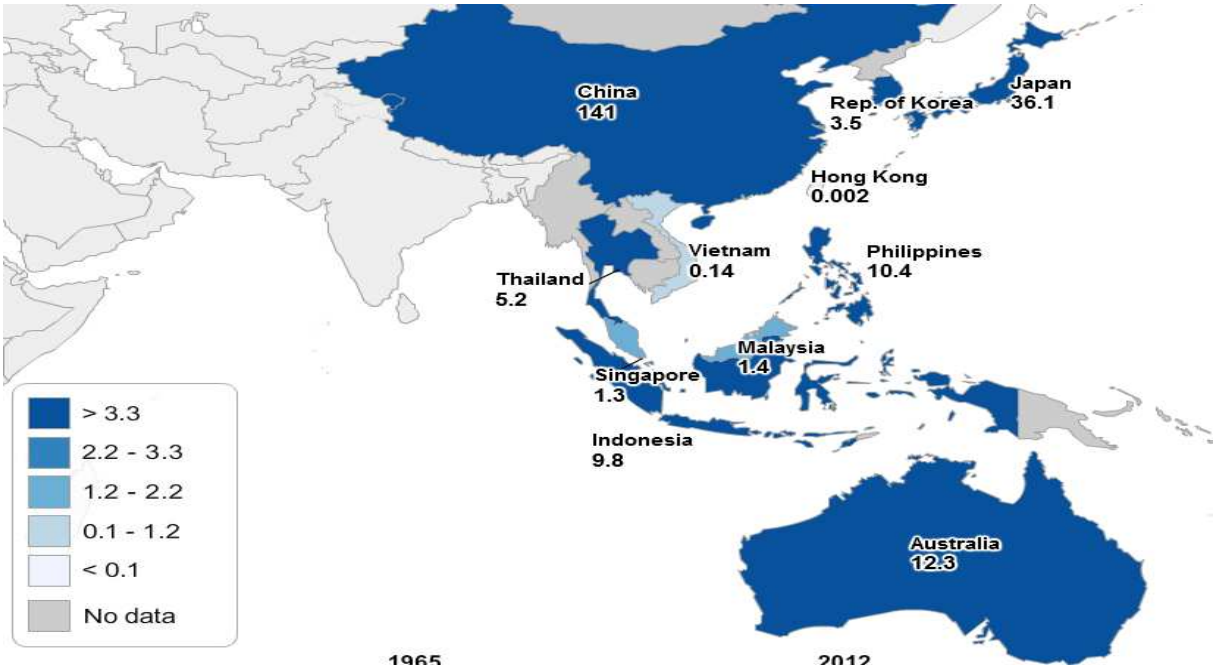




Consumption in USA was 224,2 TWh and in Canada only 19,1 TWh.



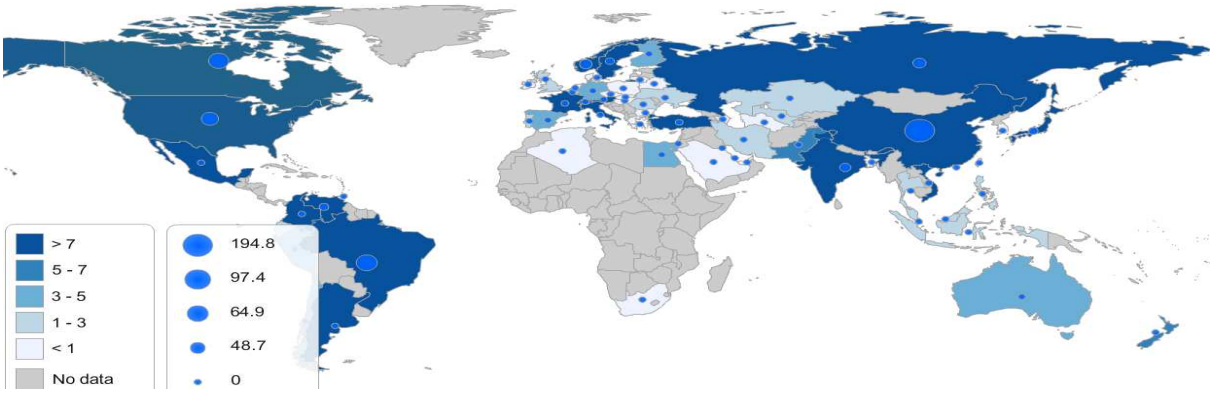
Consumption in Asia and Pacific is 283,5 TWh from which China has 141 TWh and Japan 36,1 TWh and Australia 12,3 TWh and Indonesia 9,8 TWh.



4.2. CONSUMPTION FROM HYDROELEKCTRIC PLANTS (mil ton oil equiv.)

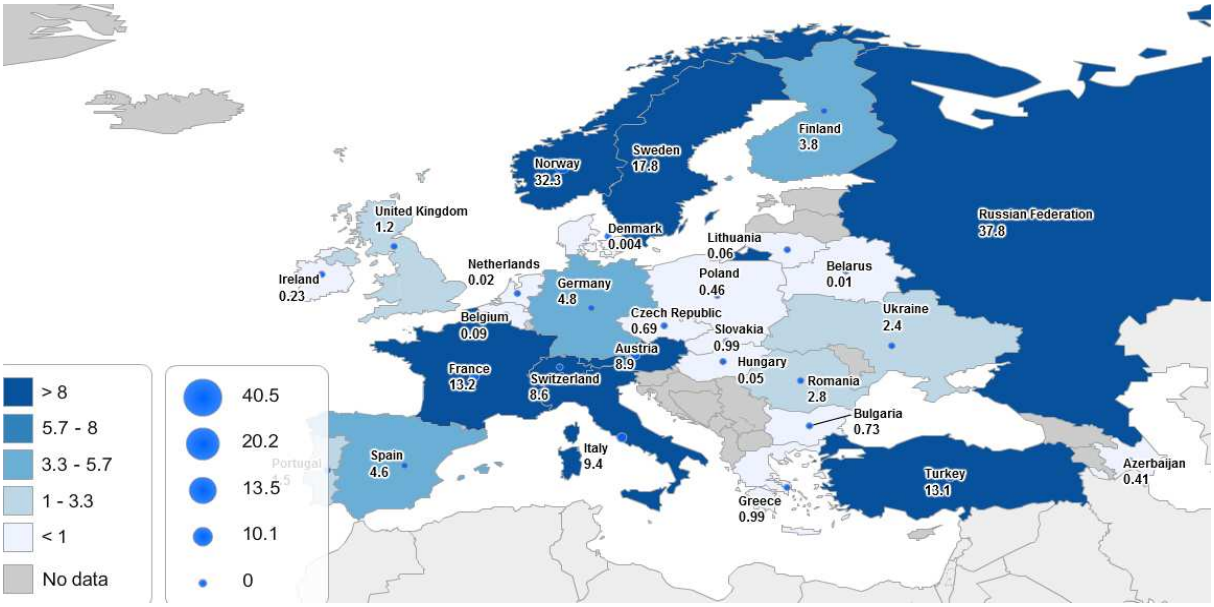
Besides non renewables sources of energy represented by oil, gas, NE, coal and other potential energy sources water resource is one of the leading energy sources in front of renewables. Total world consumption in 2012 was 831 mil ton oil equivalent what presents increase from 1965 when it was 209 mil ton oil equivalent, 1990 489 mil ton oil equiv. Countries of OECD had in 2012 consumption of 315 mil ton oil equivalent and countries that do not belong to this block 515 mil ton oil equiv. In EU consumption of energy from hydro sources was 74 mil oil equivalent, and in the countries of former Soviet bloc 55 mil ton oil equiv.

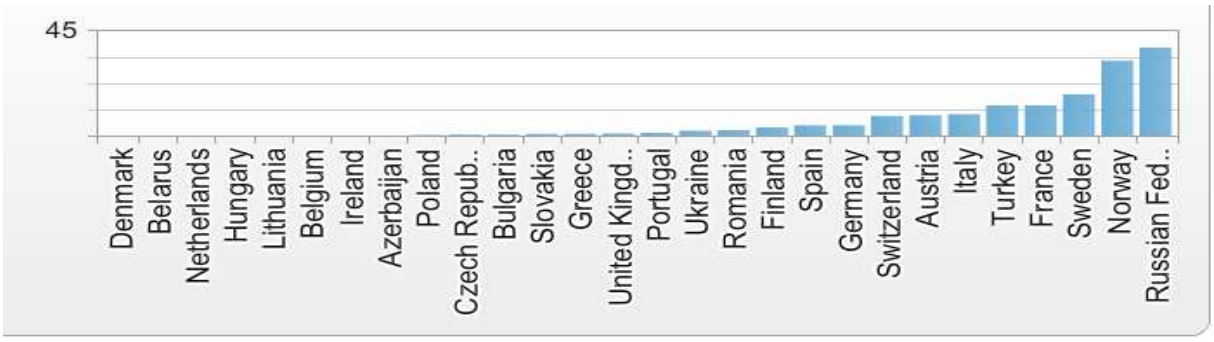
The biggest consumer is China with around 200 mil ton oil equivalent than Brazil 94,5 mil ton oil equivalent, Canada 86 mil ton oil equivalent, USA 63,2 mil ton oil equivalent, Russia 37,8 mil ton oil equiv.



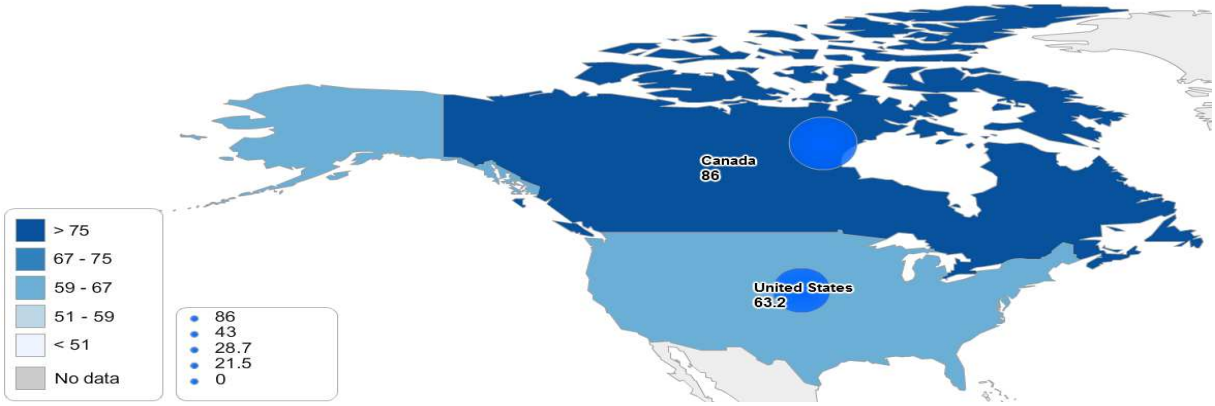
Europe has consumption of energy that comes from water sources around 190, 8 mil ton oil equiv. The majority of production comes from Russia 37, 8 mil ton oil equivalent, Norway 32, 3 mil ton oil equiv. Other important producers are France 13,2 mil ton oil equivalent, Sweden 17,8 mil ton oil equivalent, Turkey 13,1 mil ton oil equivalent, Swiss 8,5 mil ton oil equivalent and Austria 8,9 mil ton oil equiv.

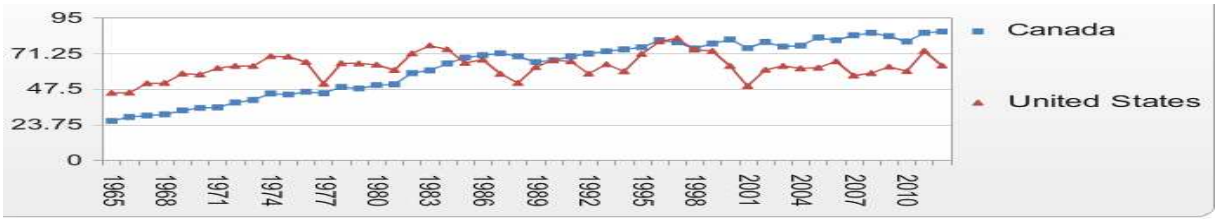
Energy consumption hydro mil ton oil equiv-Europe, Russia,



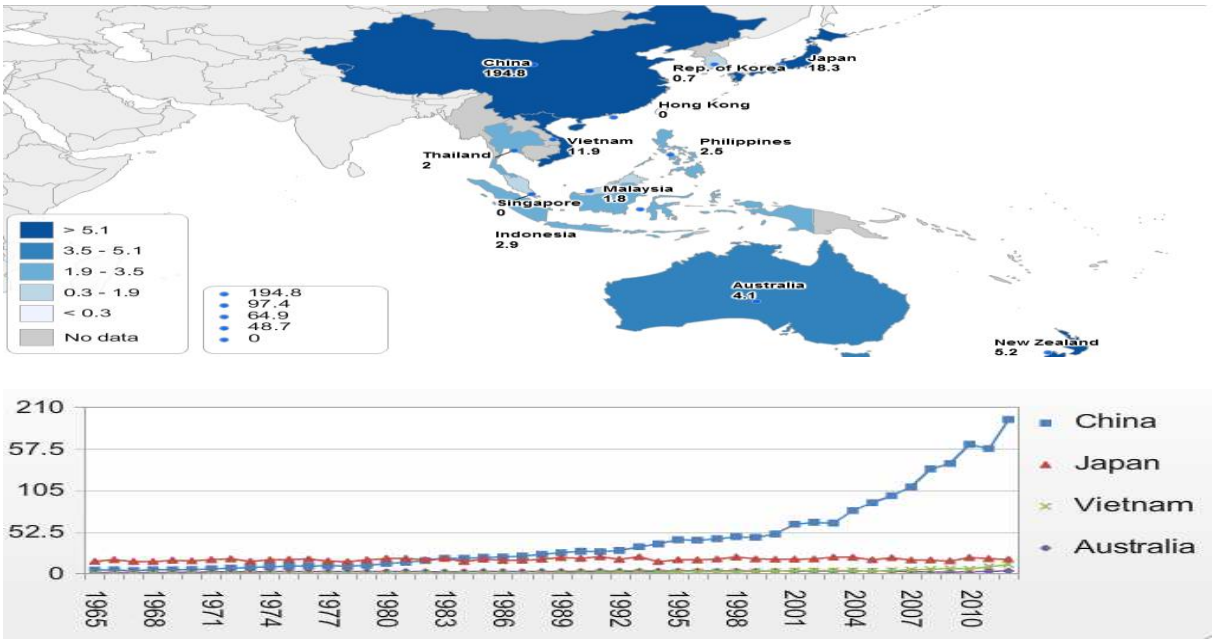


North Americas is active in development and harnessing water resources where USA uses around 63,2 mil ton oil equivalent, and Canada 86 mil ton oil equiv. Consumption depends upon installed capacity, quantities of rain/snow and new investments in energy fields.

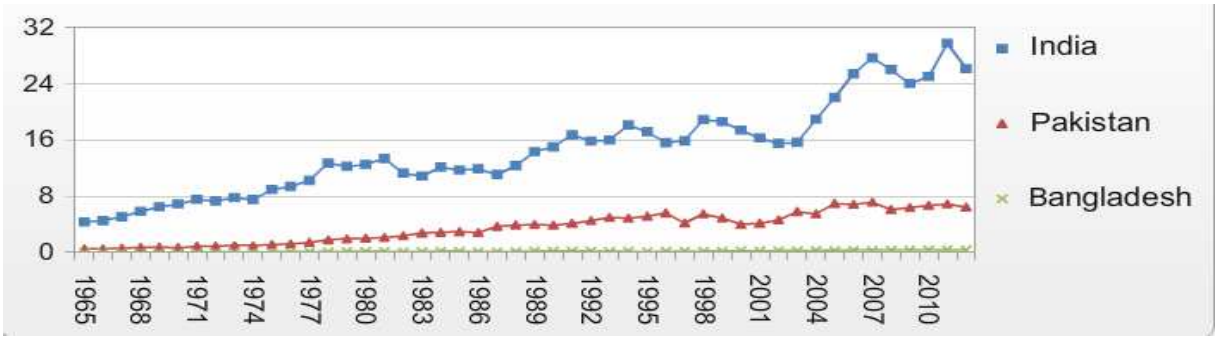




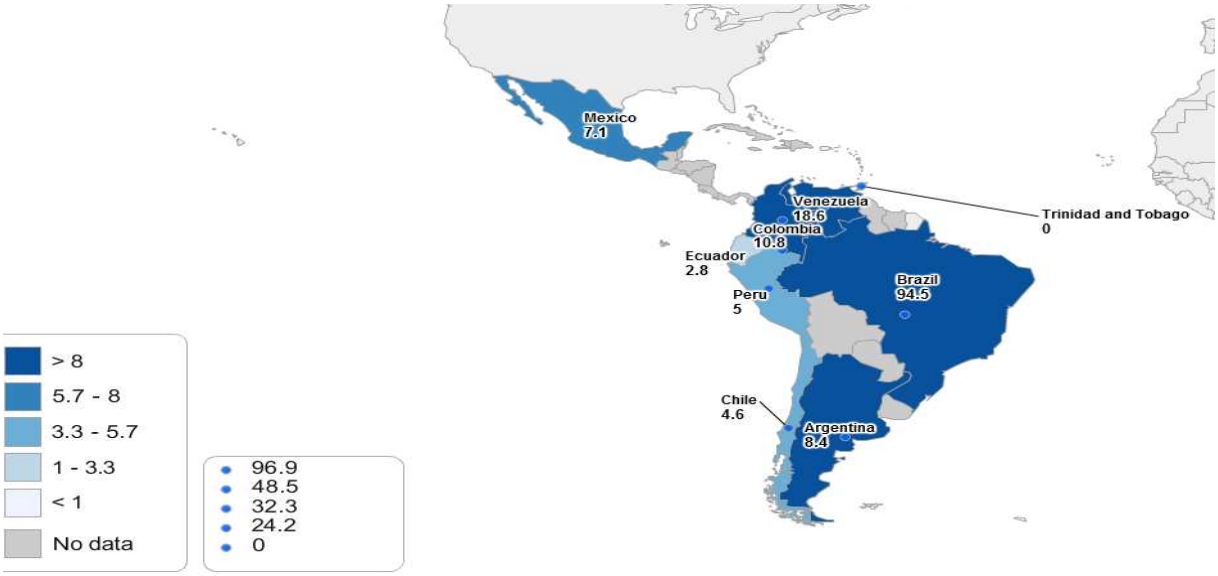
In Asia and Pacific region 289 mil ton oil equivalent comes from water resources. The biggest producer and consumer is China with 194, 8 mil ton oil equivalent energy that comes from hydro plants.

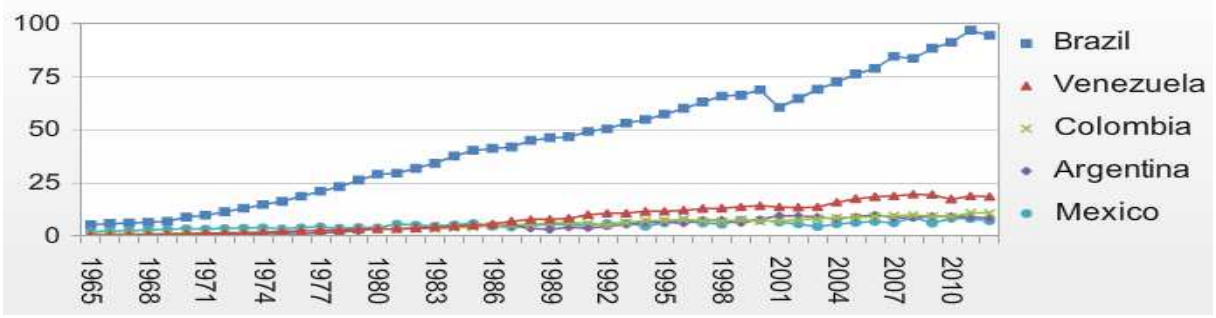


India has 26, 2 mil ton of oil equivalent that comes from hydro energy while Pakistan only 6, 4 mil ton oil equivalent.



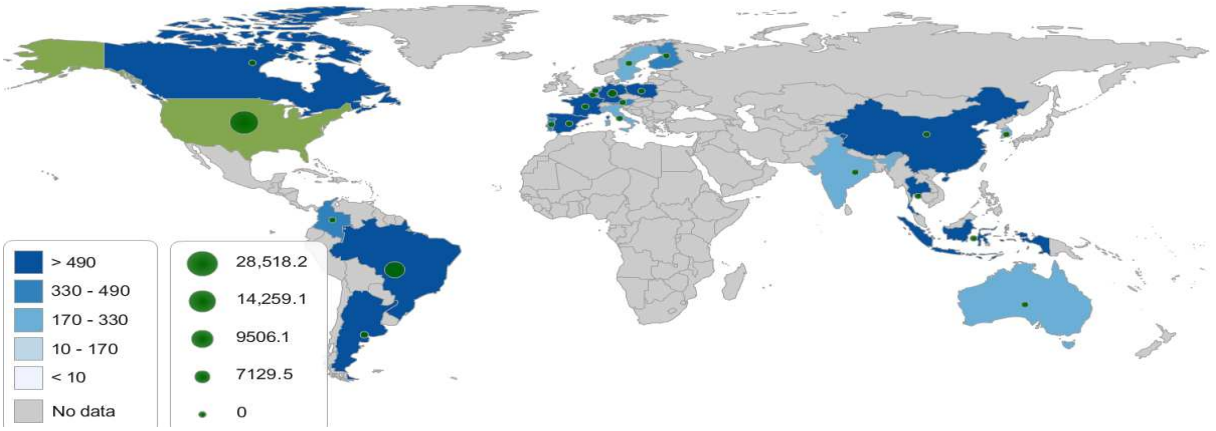
In South America consumption from water sources is 172,8 mil ton oil equivalent, from which Brazil has 94,5 mil ton oil equivalent, Argentina 8,4 mil ton oil equivalent, Colombia 10,8 mil ton oil equivalent, Mexico 7,1 mil ton oil equivalent.



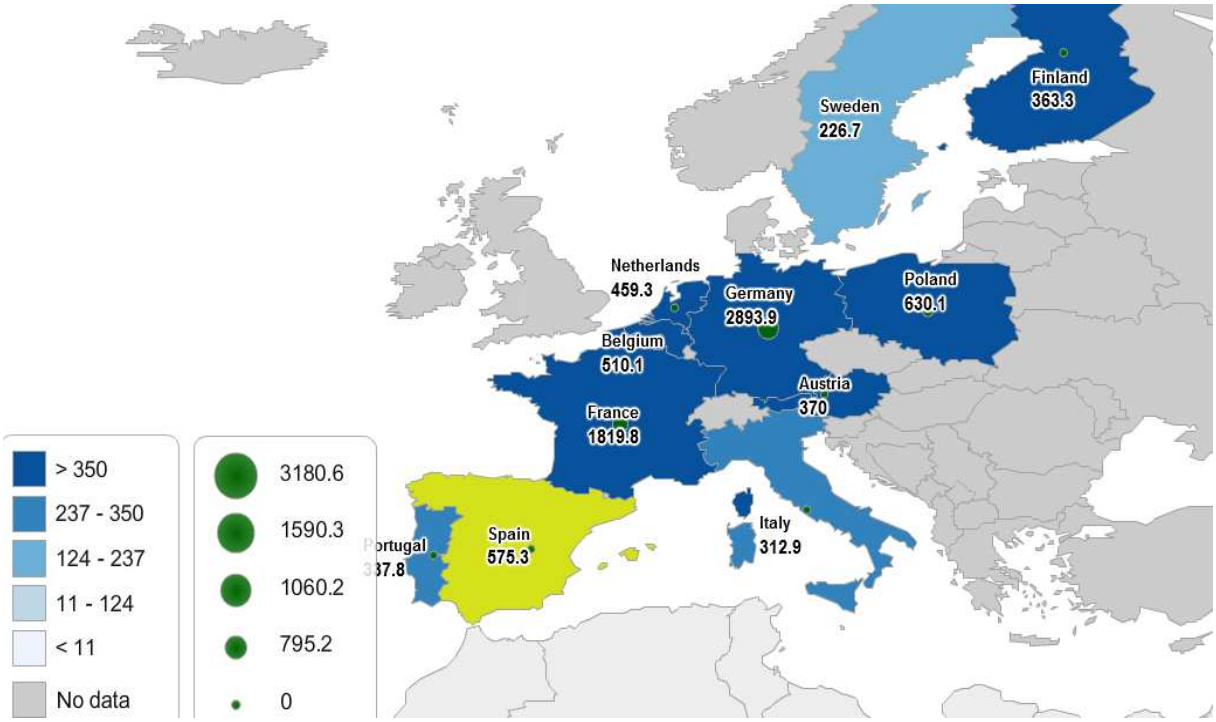


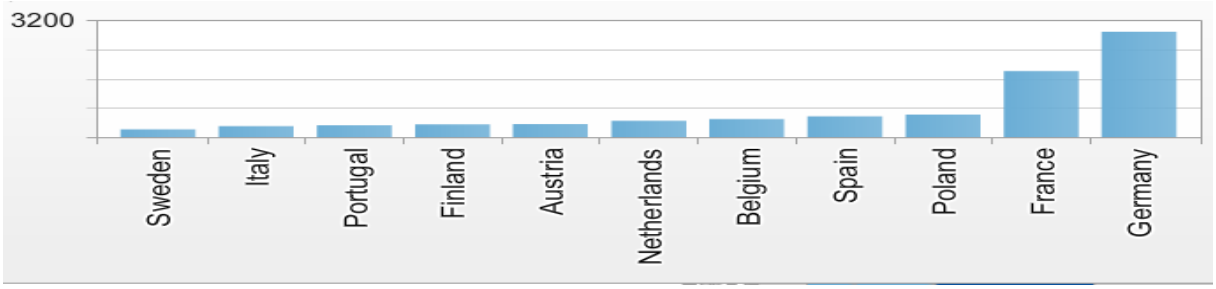
4.3. BIOFULES PRODUCTION (thousand ton oil equiv.)

Biofuel consumption grew significantly after 1990 when was 7 094 thousand ton oil equivalent to reach in 2012 around 60.220 thousand ton oil equiv. The biggest consumers are the richest countries OECD that spend around 38.456 thousand ton oil equivalent, while countries that do not belong to OECD block has consumption of around 21.763 thousand ton oil equivalent. The biggest consumption of bio fuels is in region of Northern America with consumption of around 16.675 thousand ton, EU 10.022 thousand ton and Asia Pacific 5.173 thousand ton. Very small quantities of biofuels are used in Africa with around 23 thousand ton oil equivalent.

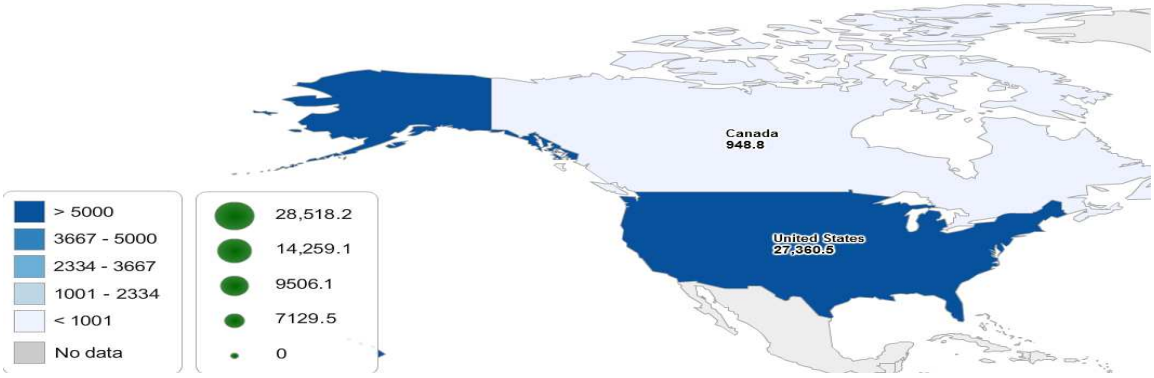


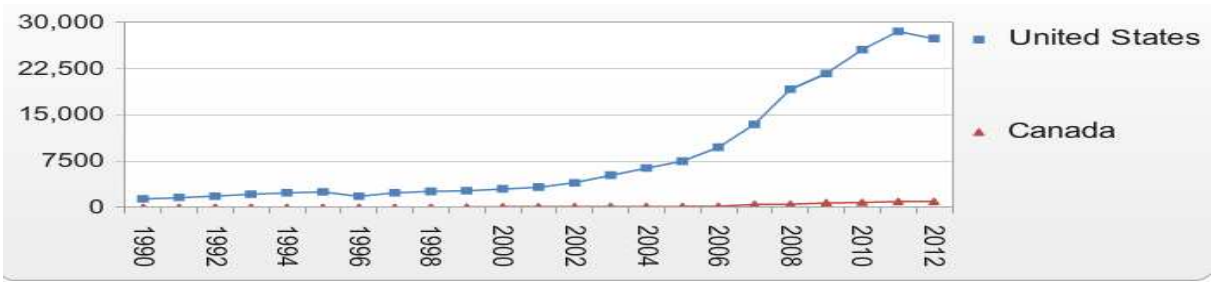
The biggest single consumer of bio fuel is Germany with around 2.893 thousand ton oil equivalent , after comes France 1.819 thousand ton ,Poland 630 thousand ton oil equivalent Belgium 510 thousand ton , Netherland 459 thousand ton oil equiv.



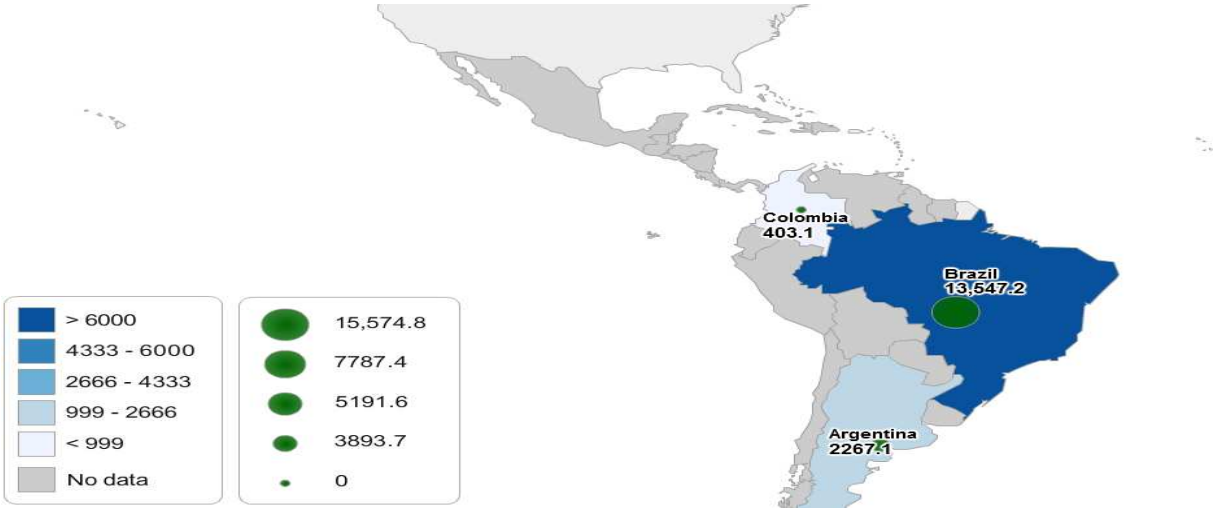


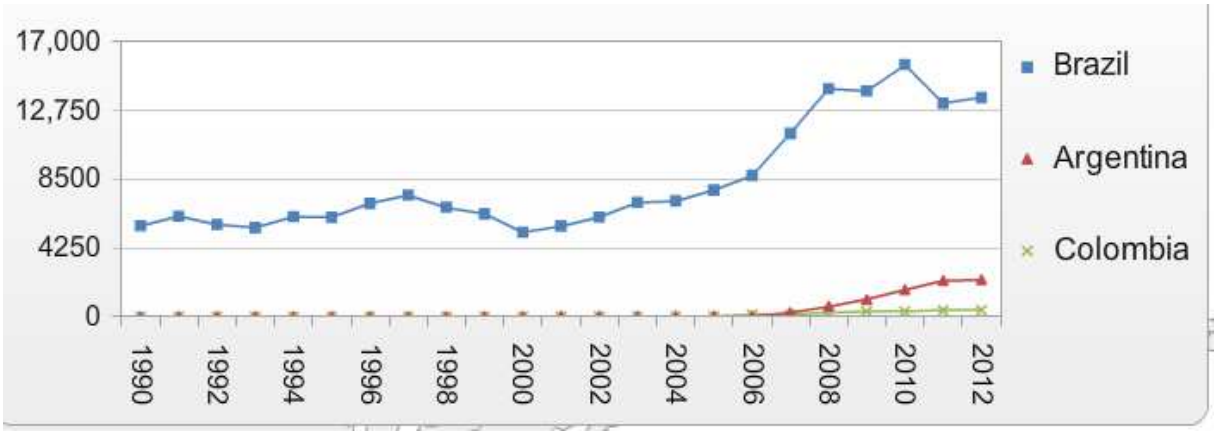
Huge discrepancy is noted in the region of northern America where United States of America spends around 27.260 thousand ton, Canada 948 thousand ton yearly.



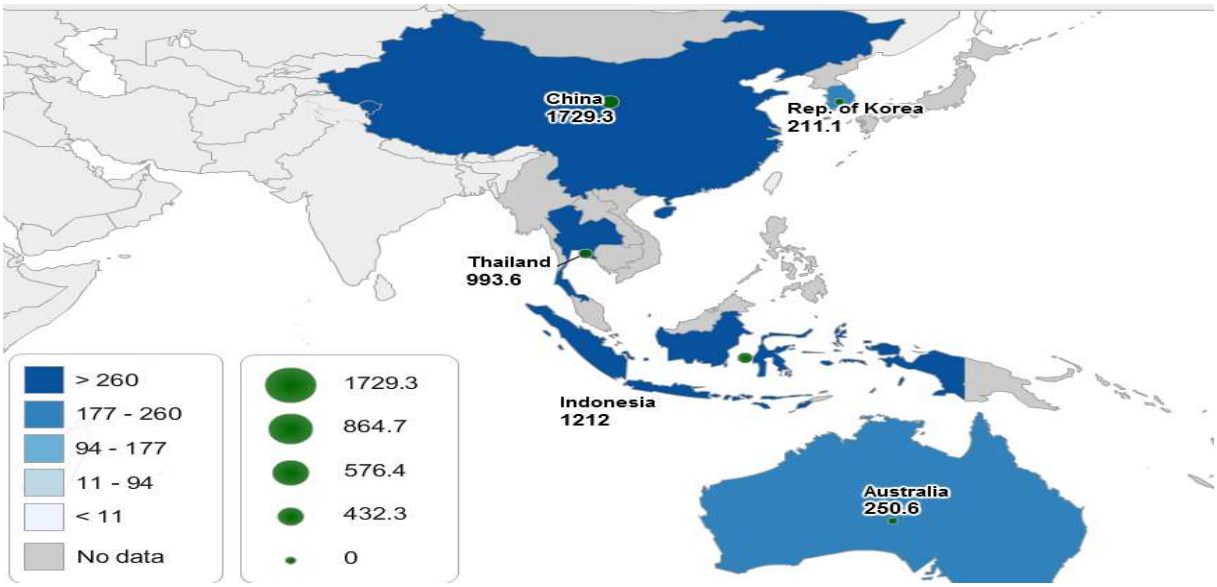


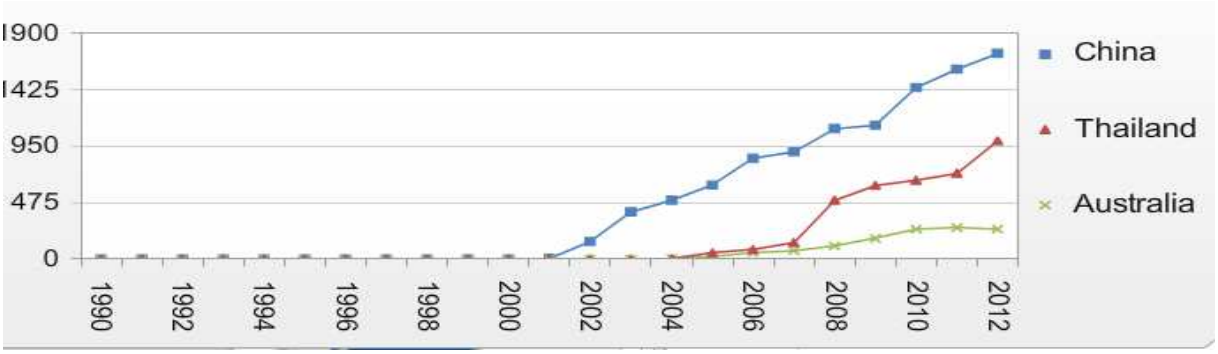
In South America Brazil is the biggest consumer of bio fuel with around 13.547 thousand ton oil equivalent yearly.





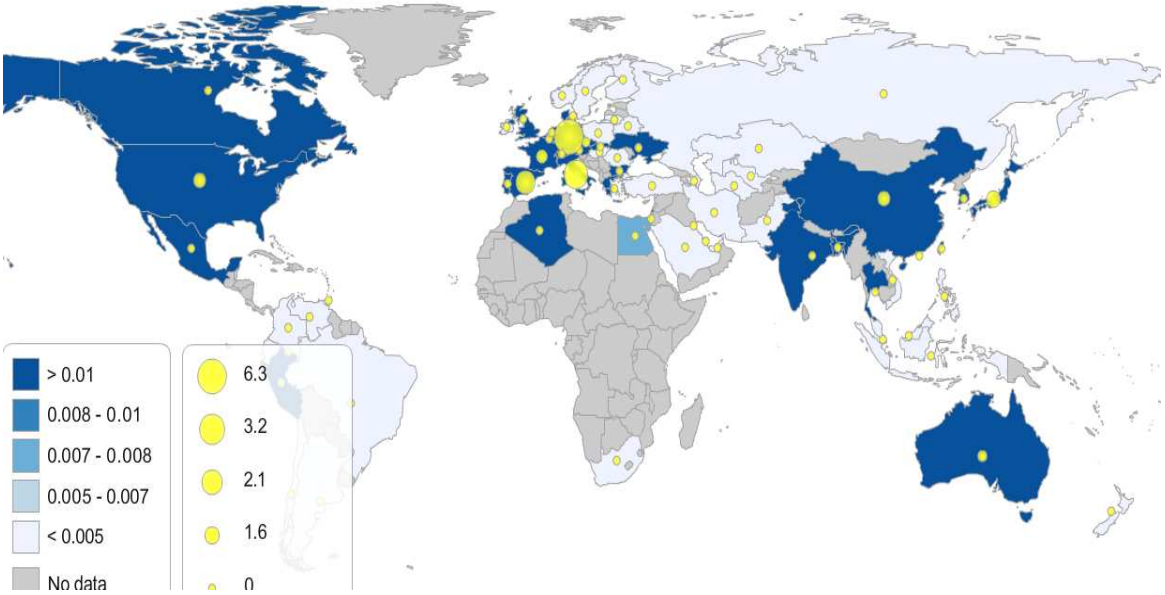
Although Asia is fetching the phase with western world in many aspects of living it also increases its part on biofuels consumption. China is consuming 1729 thousand ton oil equivalents, Indonesia 1212 thousand ton oil equivalent, and Republic Korea 211 thousand ton oil equiv. But this still lags after USA in quantities.



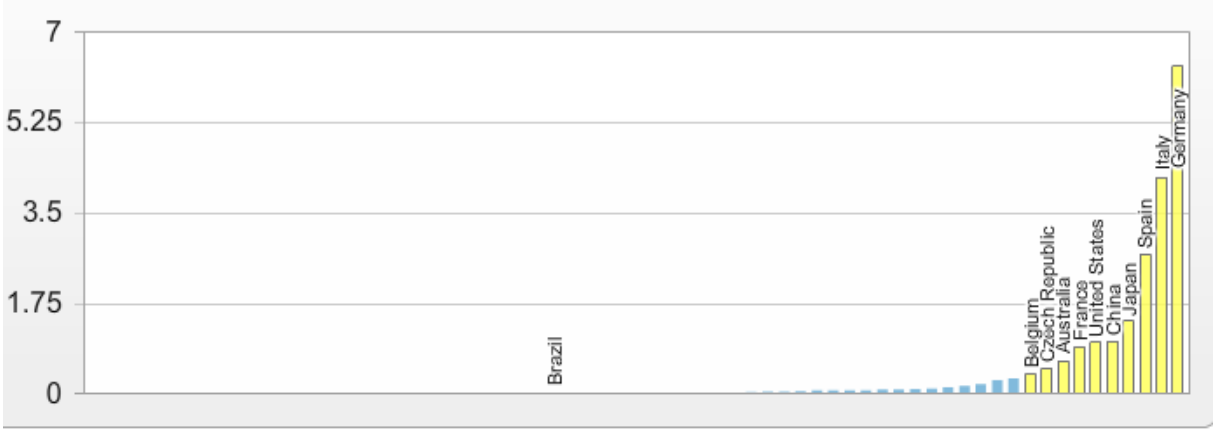


4.4. CONSUMPTION OF ENERGY FROM SOLAR RESOURCES (mil ton oil equivalent)

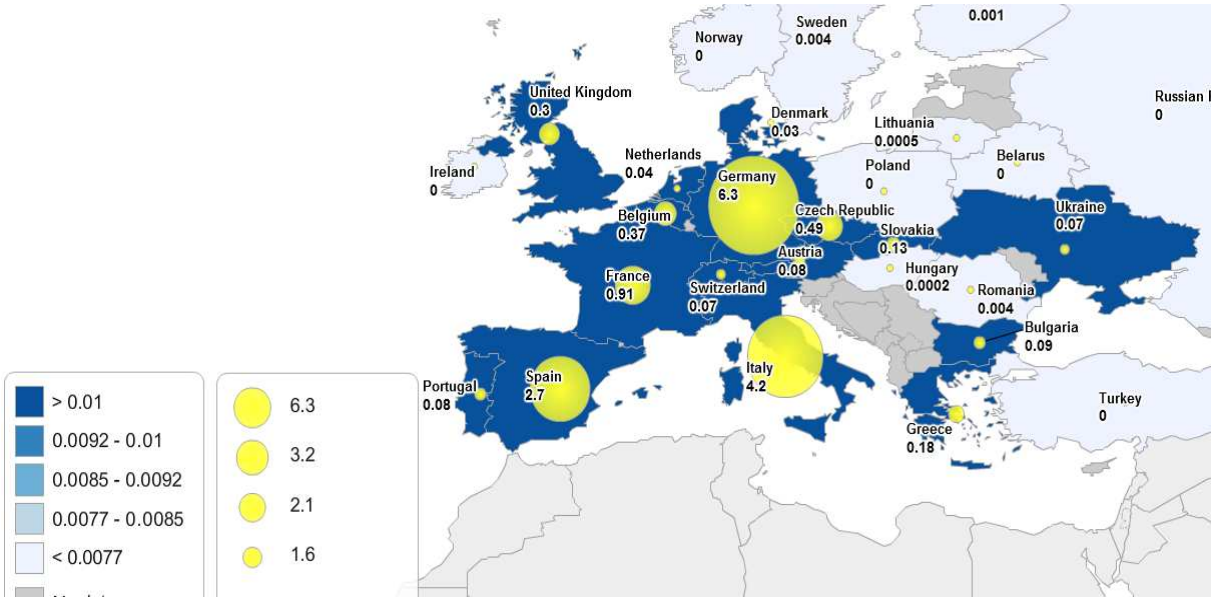
Possibilities of solar energy consumption are immense and only after 2000 full potential are recognized and come with each year to importance. In 1996 it was only 450 MW of installed capacity, it increased to 2006 where reached 6.961 MW, and in 2010 40.415 MW, to be at levels of around 100.114 MW in 2012. This quantity of installed capacity is equal to 21 mil ton oil equivalent that was spent in 2012.



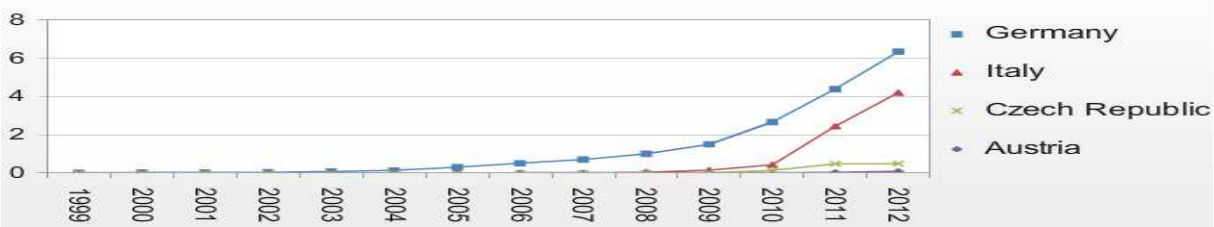
The most important region in the world is EU with 68.466 MW of installed capacity what is equal of around 16 mil ton oil equiv. Germany took and extreme effort and installed around 32.643 MW of solar panels what is around 6, 1 mil ton of oil equivalent consumption.



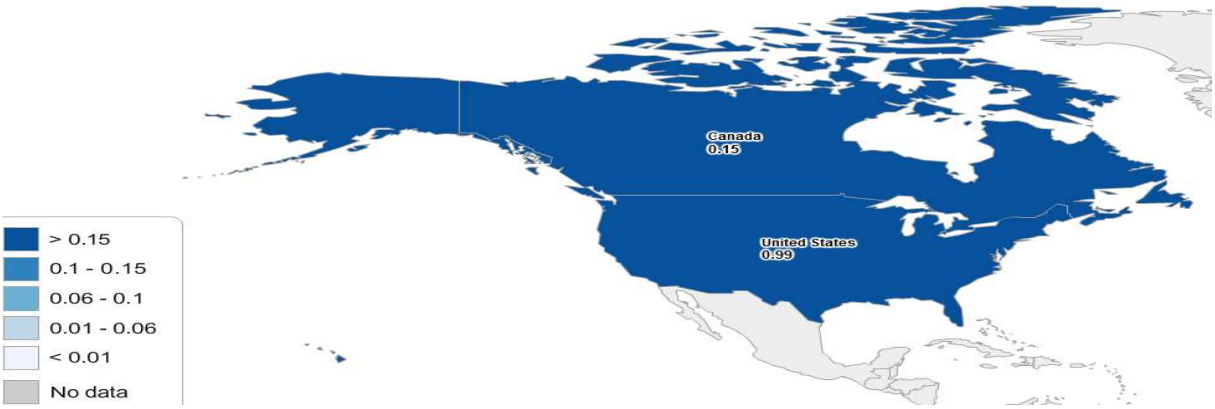
Besides Germany Italy has around 4, 2 mil ton oil equivalent, Spain 2, 7 mil ton oil equivalent from solar resources.

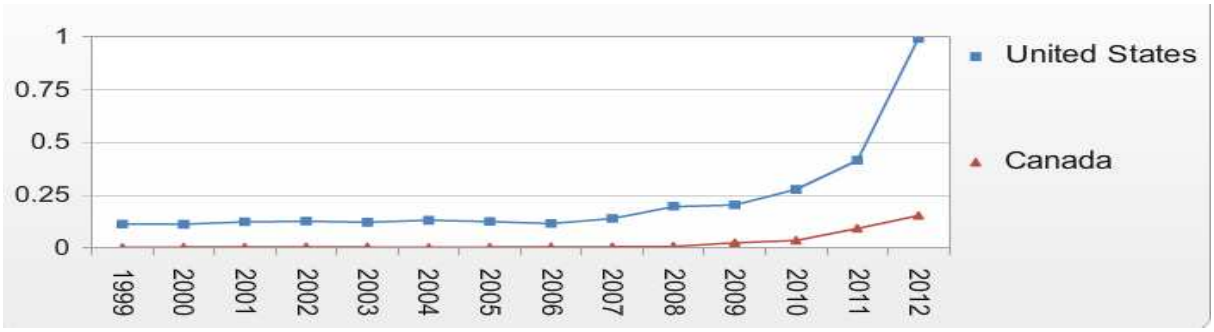


Production of solar panels and consumption of solar energy are new branches in economy to, and presents further possibilities in area of energy production, consumption, and work places.

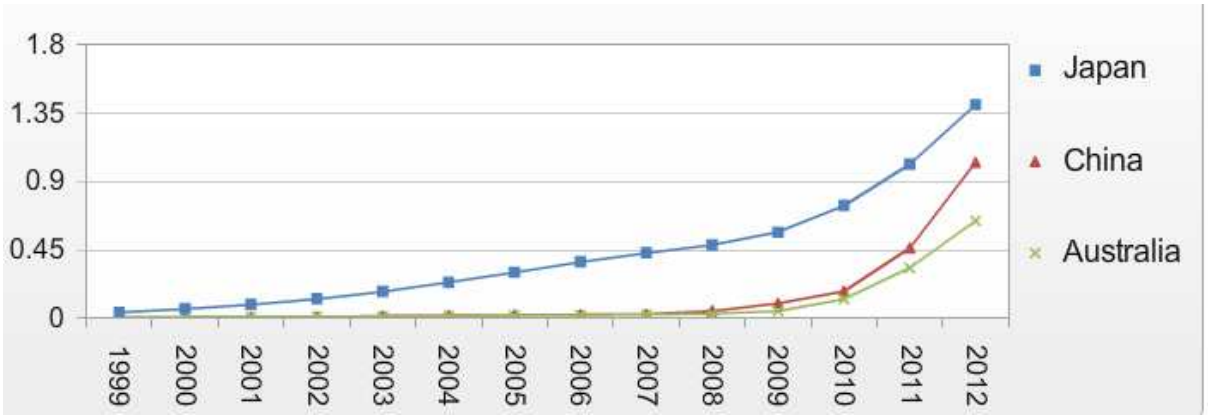


USA developed solar potential that is equal to 1 mil ton oil equivalent, and this potential has grew exponentially from year to year. Canada retards in developing this potentials.

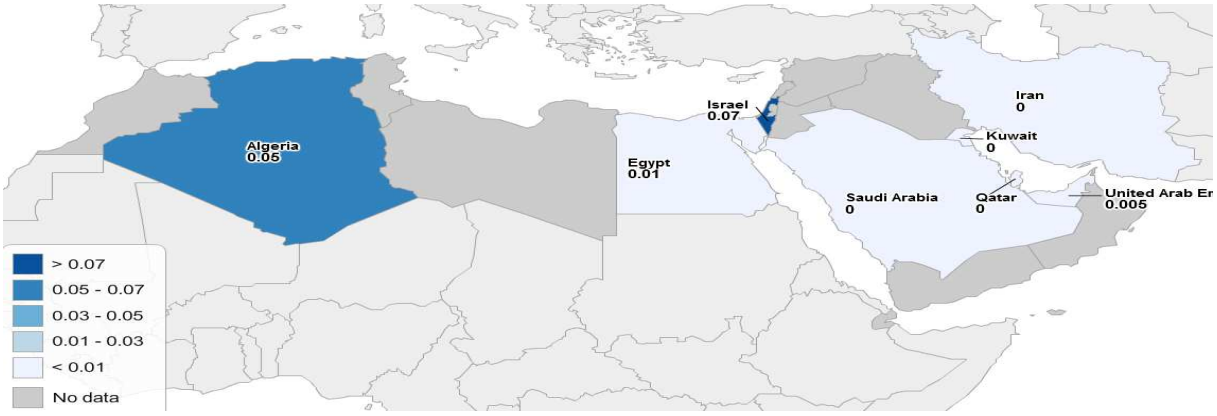


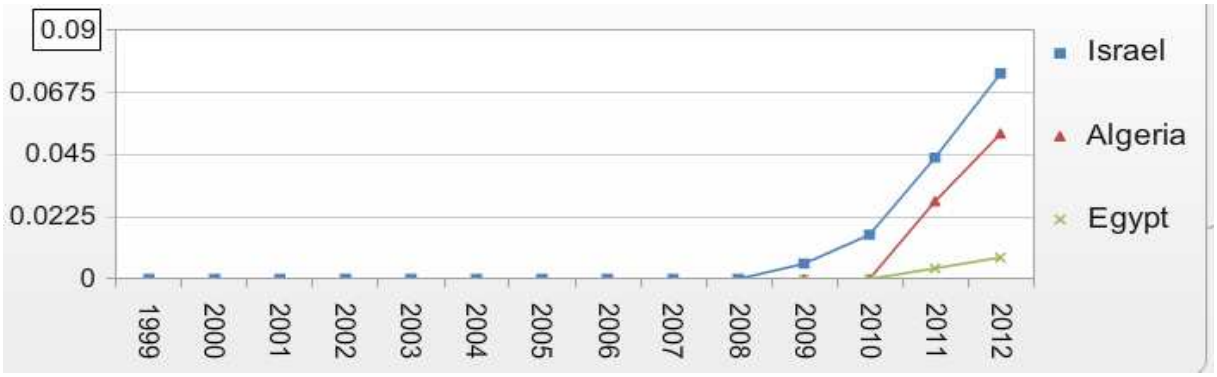


Similar consumption of solar energy is observed by China and Japan and that reaches 1 mil ton oil equivalent per year. Australia lags and yearly produces only 0, 64 mil ton oil equivalent from solar resources.



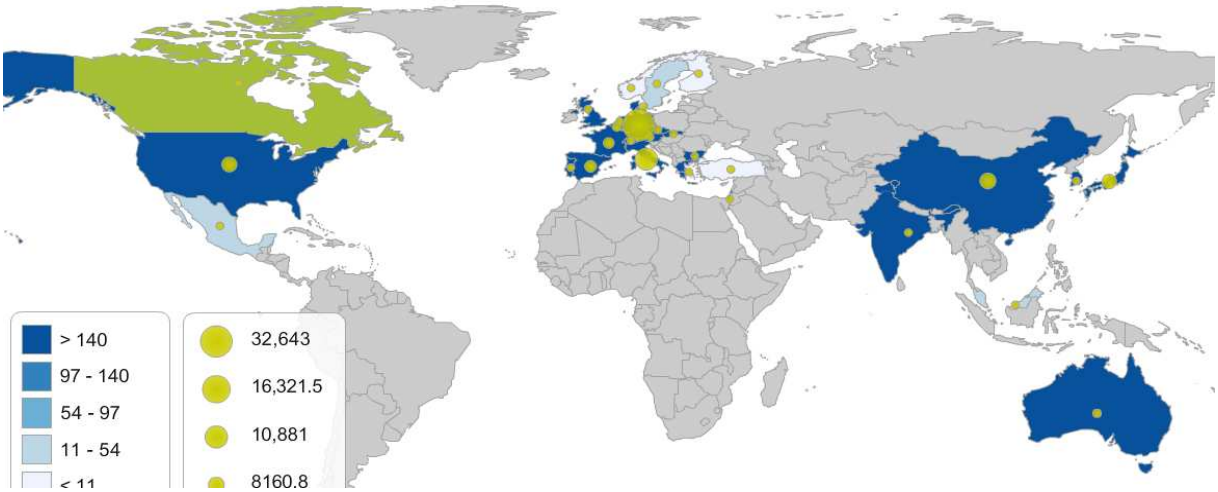
The huge possibilities to obtain energy from solar are clearly possibly in region of Middle East and North Africa. Some countries recons this strategy and the hugest installed capacity are currently in Algeria and Israel.

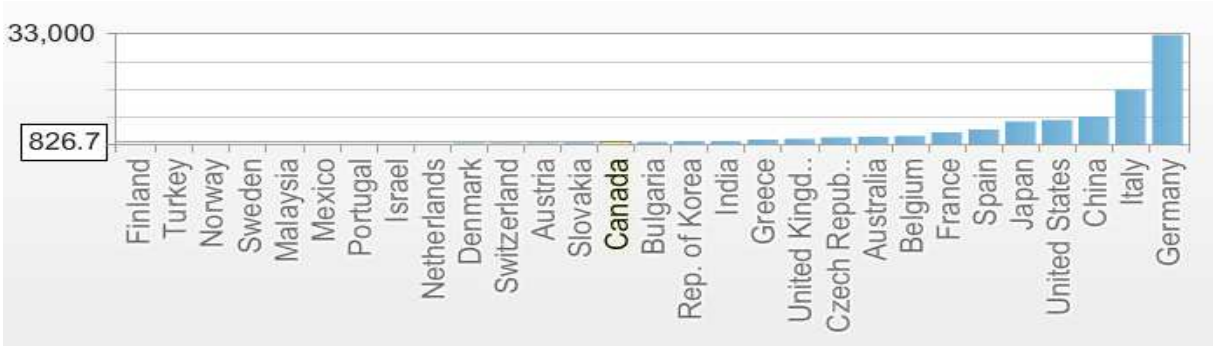




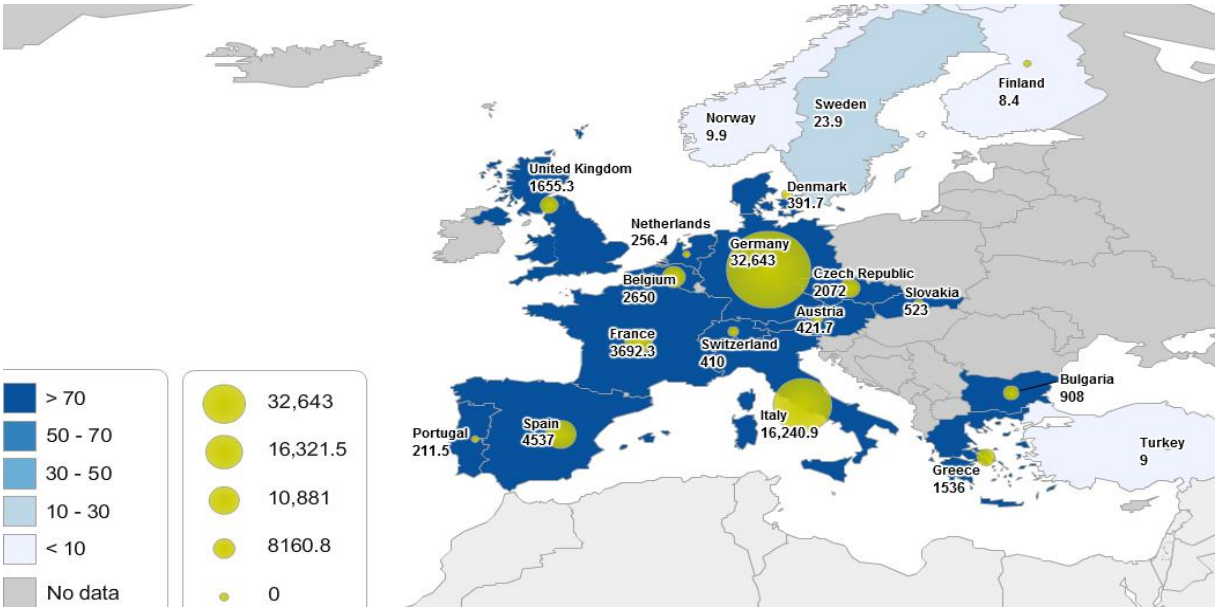
4.4.1. INSTALLED SOLAR SYSTEM (PHOTOVOLTAIC PV U MW)

There are around 100.114 MW solar panels installed in the world. The most agile is Germany with 32.643 installed MW after comes China 8300 MW and Italy 16.240 MW.

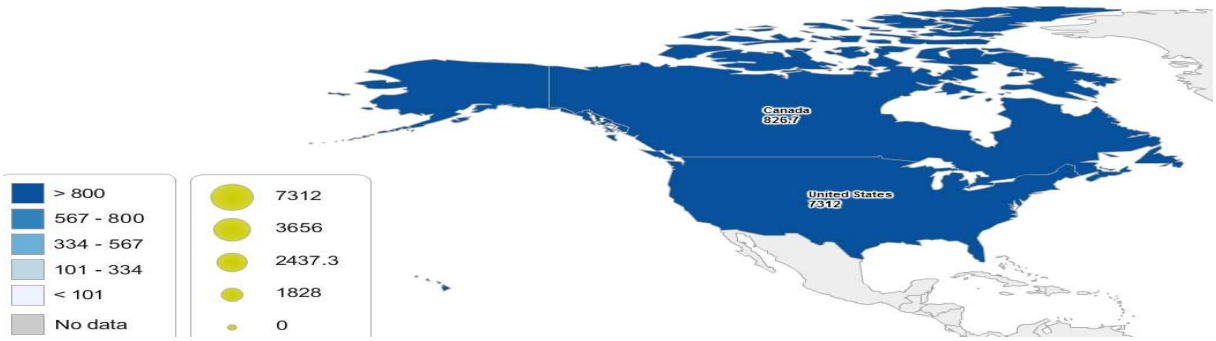


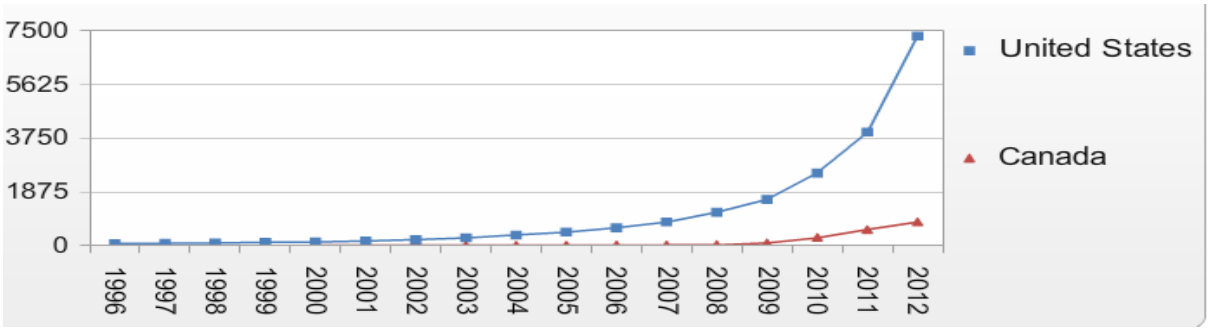


Germany and Italy advances in Europe where the total installed capacity is 68.466 MW.

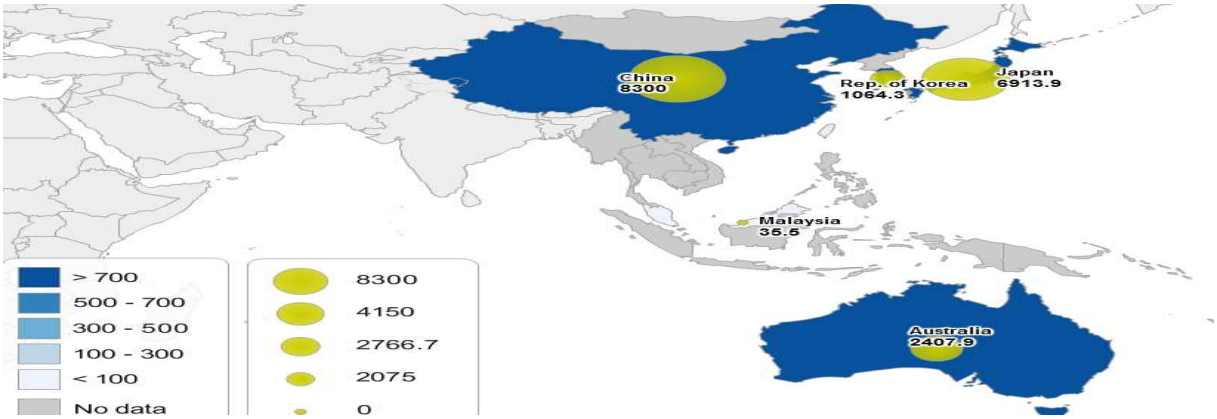


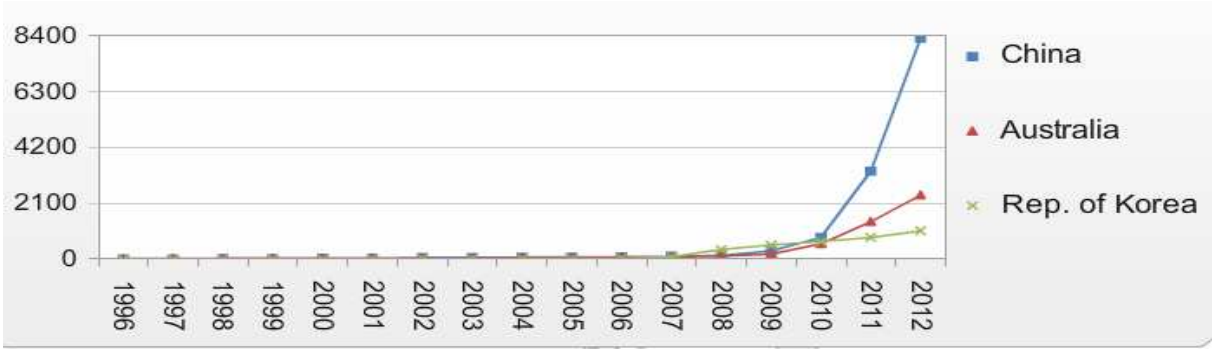
USA is pushing all renewables strongly and only in 2012 they reached 7.213 MW of installed capacity.





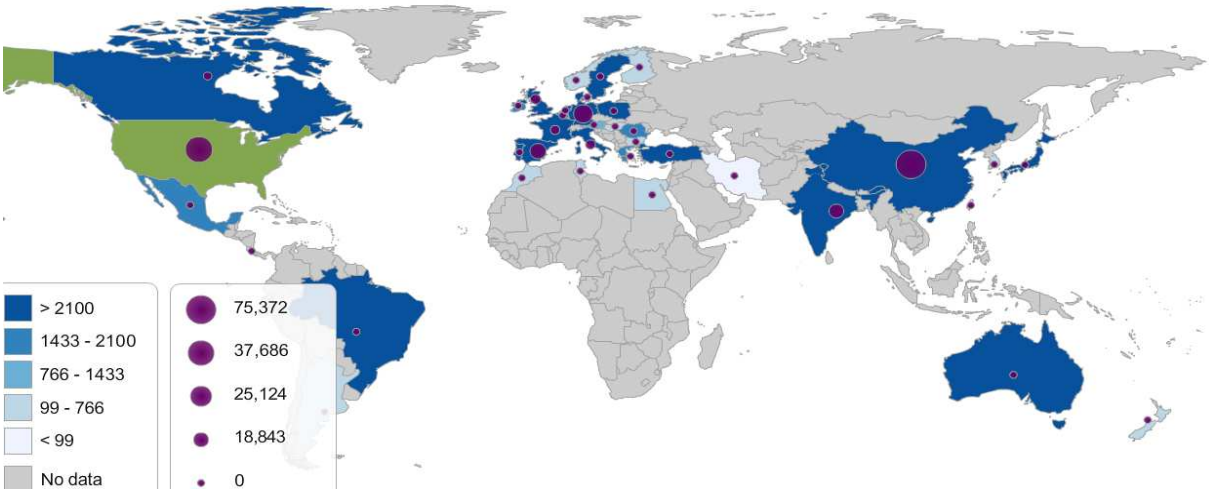
China has around 8.300 MW while Australia only 2.407 MW.



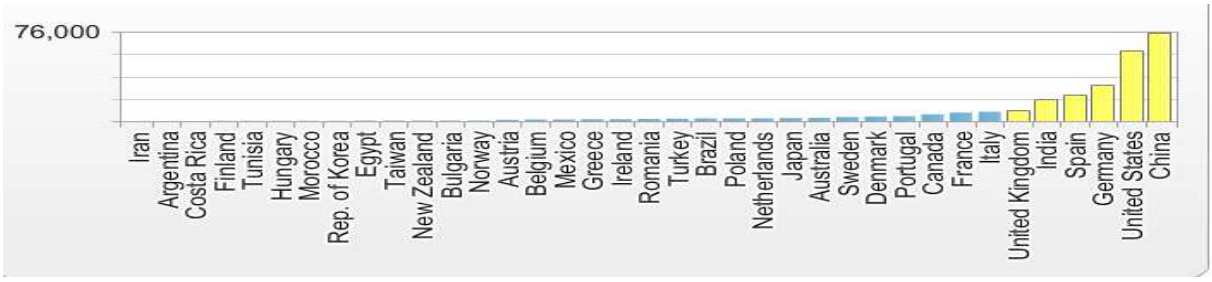


4.5. INSTALLED CAPACITY WIND (MW)

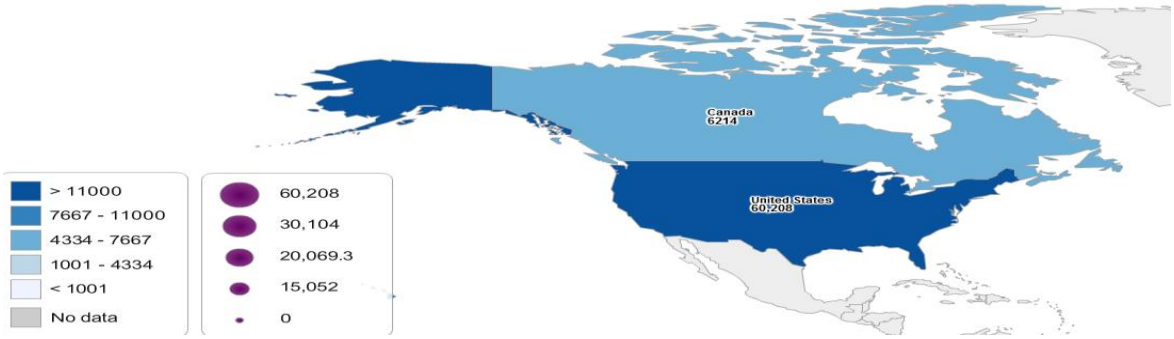
Wind capacity and potential to harness this source was given a great support all around the world. This fact is underlined with data that says that in 1997 it was only 7.644 MW installed capacities , to be increased in 2000 to 17.934 MW, in 2006 74.086 MW, to be in 2012 around 284.236 MW. The Biggest installed capacity is in Europe 109.552 MW, after follows Asia Pacific Region 101.114 MW, and North America that have around 67.934 MW of installed capacity . This process is taking large steps forward so we can expect that other parts of the world will establish large and significant base in wind resources.

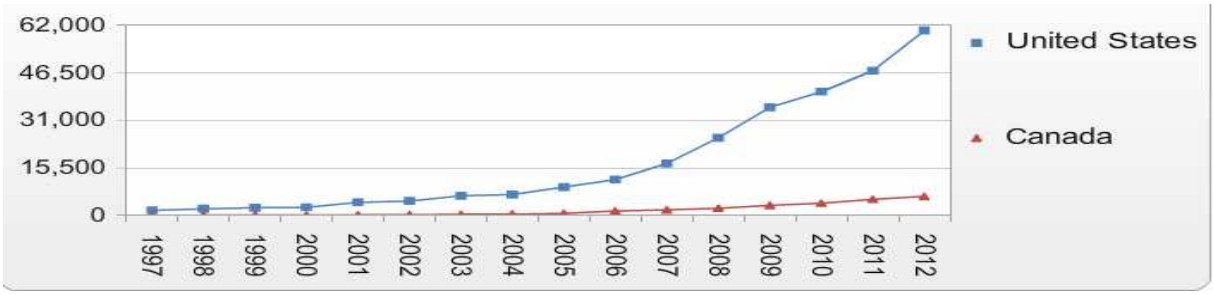


With 75.372 MW of installed capacity China is leader as the single country in harnessing the wind energy.

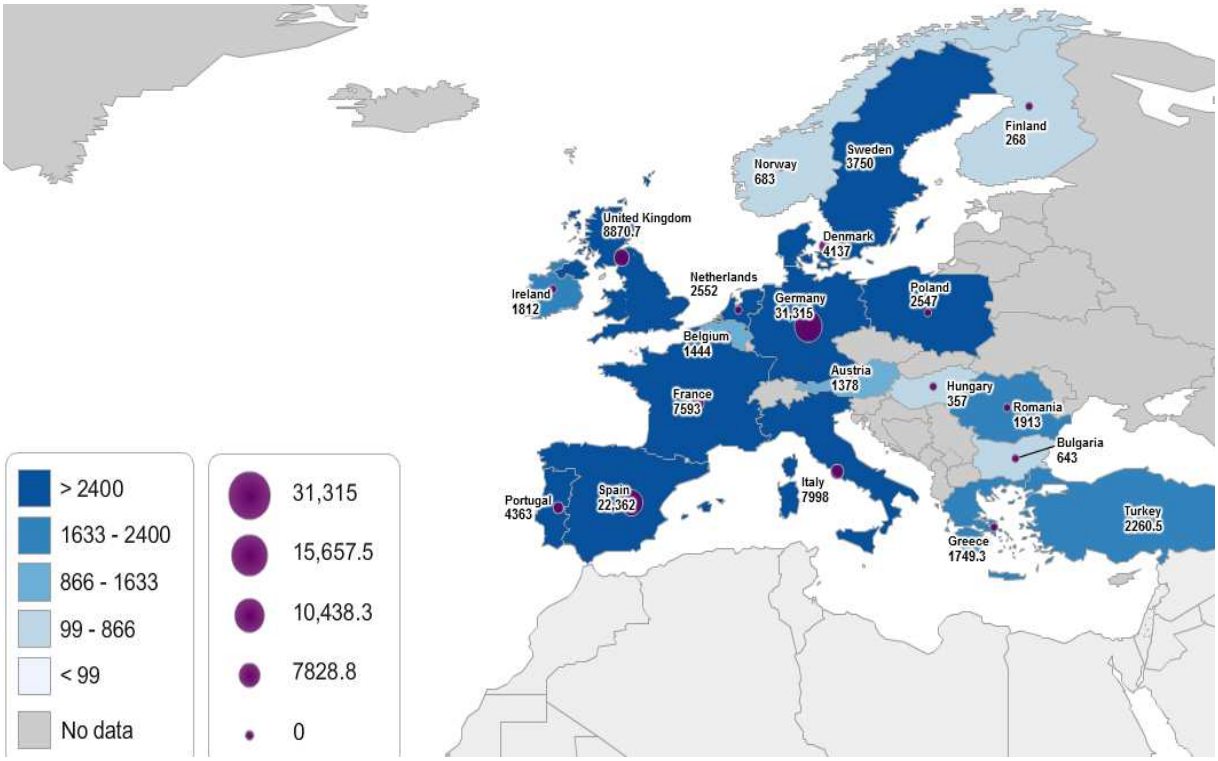


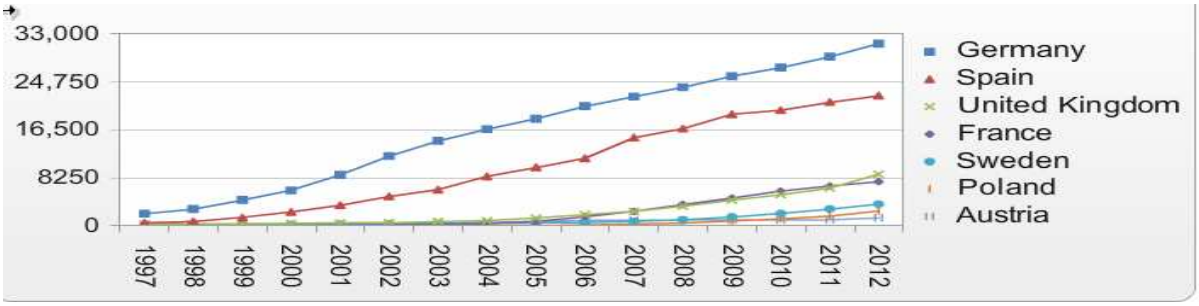
USA is having a lead in America and jumps forward with construction of 60.208 MW with that overloading Canada that has only 6.214 MW of installed capacity. Strong development and building of wind capacities is having its bigger importance after 2006.



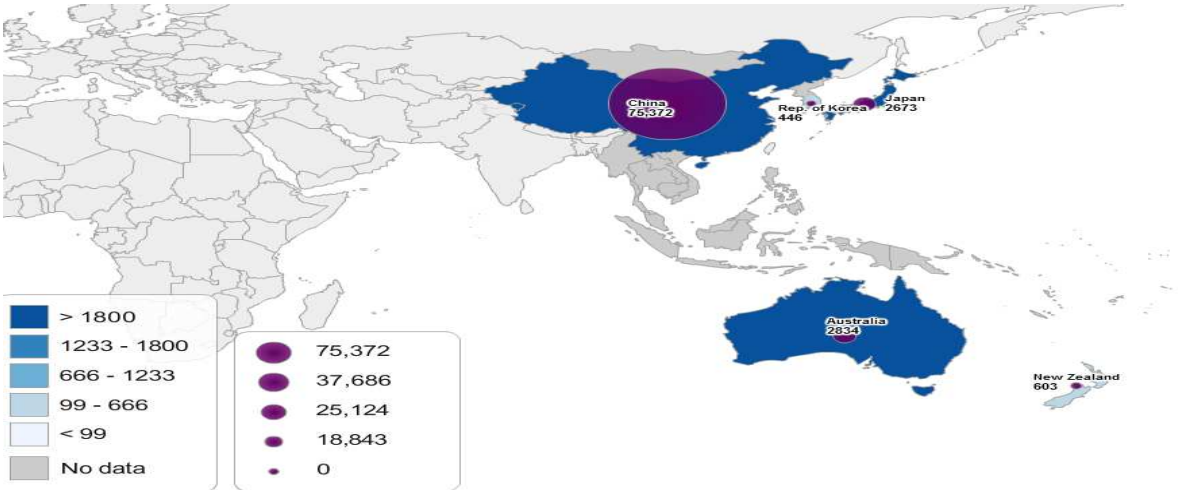


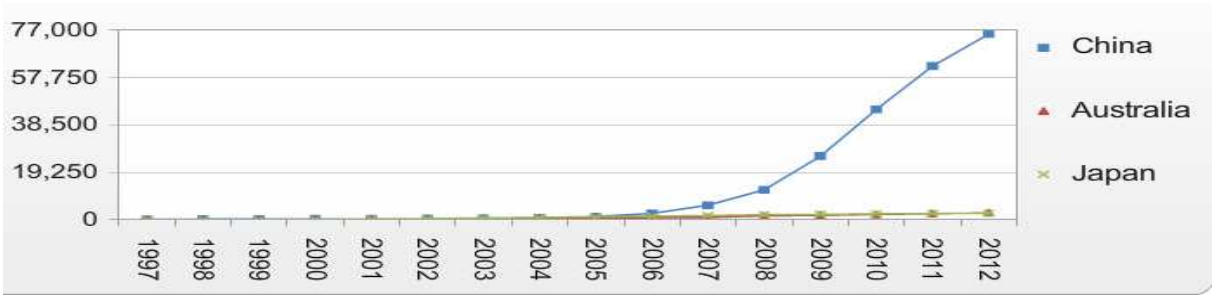
Europe has on its disposal 109.552 MW installed wind capacity where Germany leads with 31.315 MW, Spain 22.362 MW, Italy 7.998 MW, Great Britain 8.870 MW, France 7.593 MW and Denmark 4.137 MW.



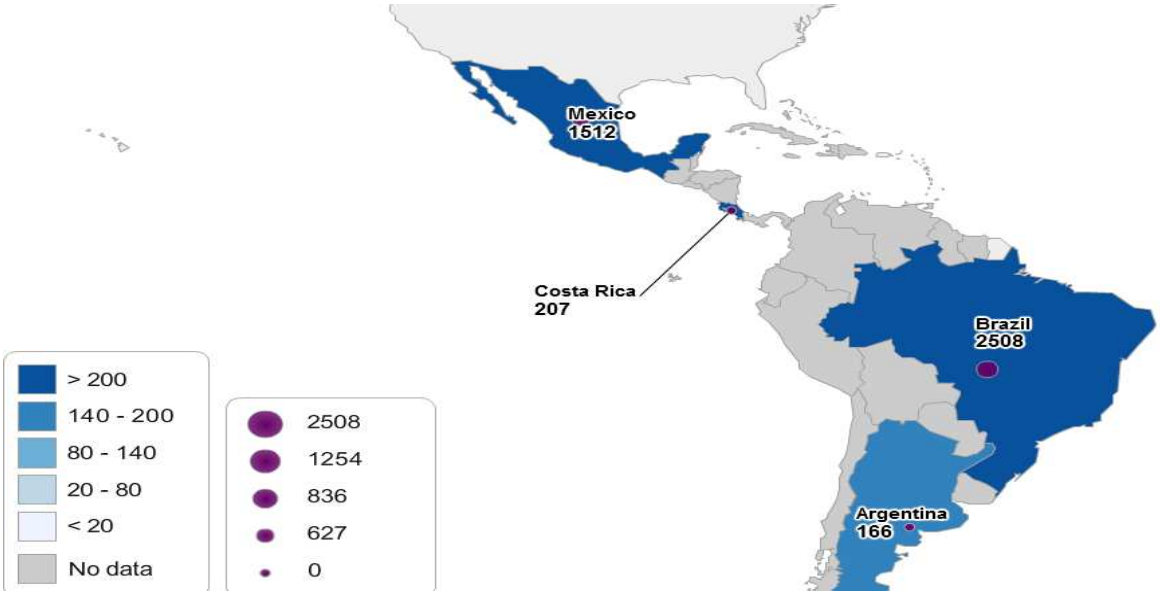


China is extremely active as producer of solar equipment and its own has significant resources those levels of around 75.372 MW. It is among the most developed in the region in that respect.



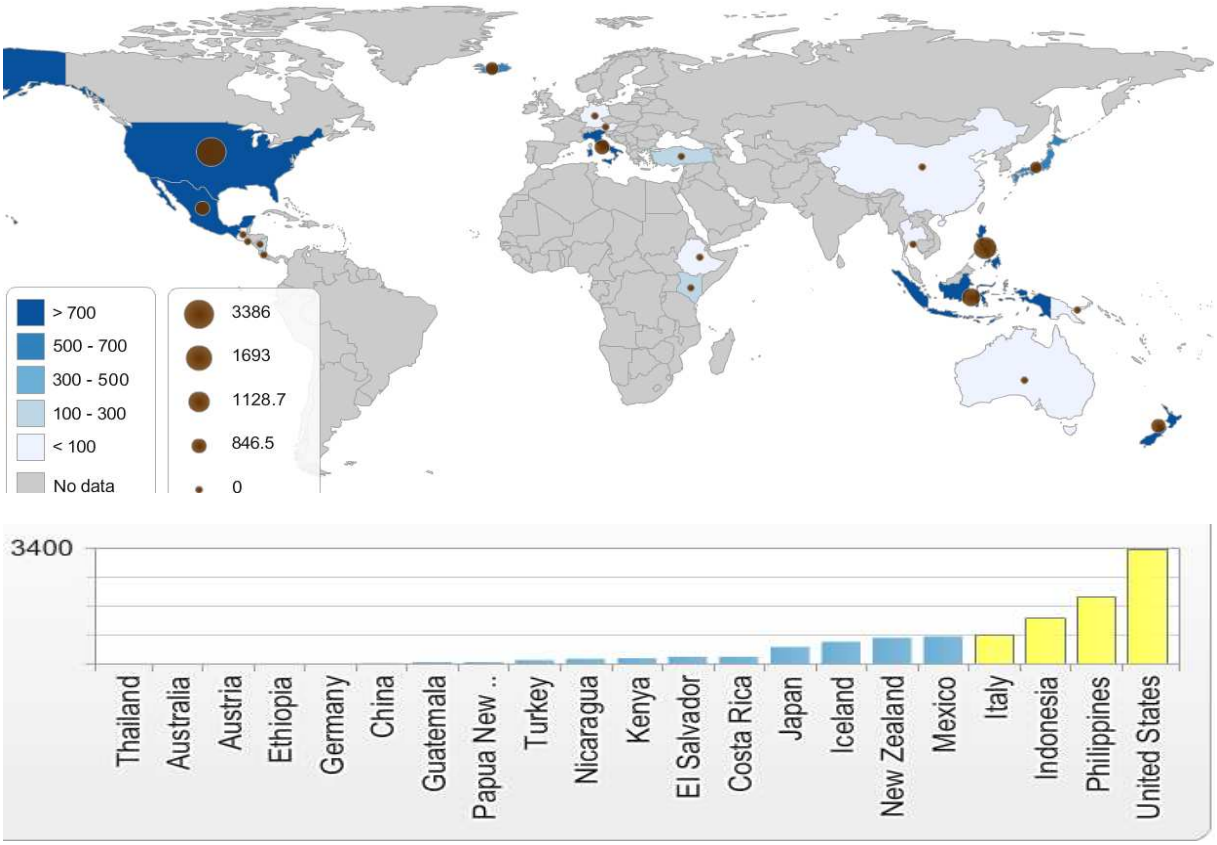


After 2006 countries of South and Middle America work on installing the capacity that has wind as the main source of energy. In that area Brazil stands up with 2.509 MW installed capacity, Mexico 1.512 MW capacity.

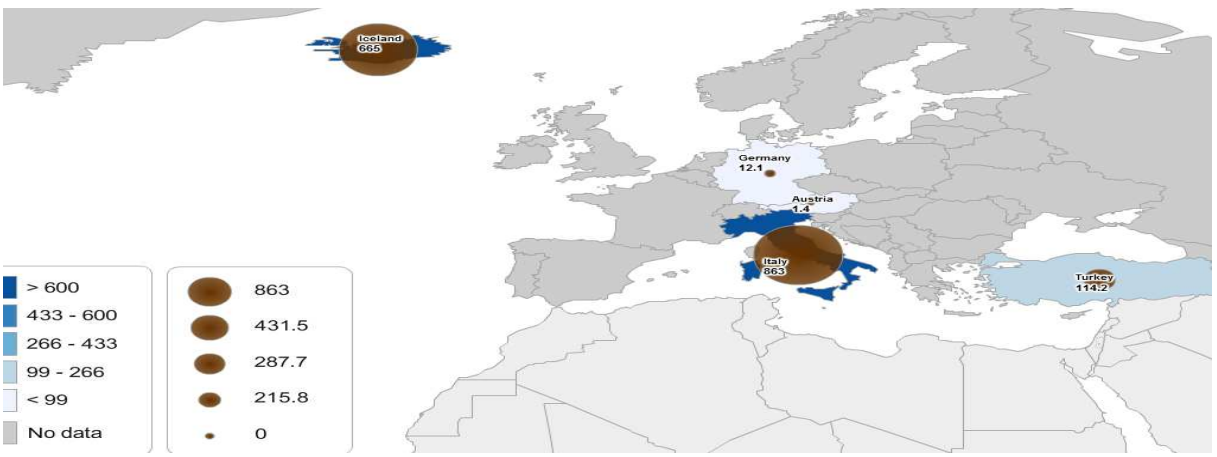


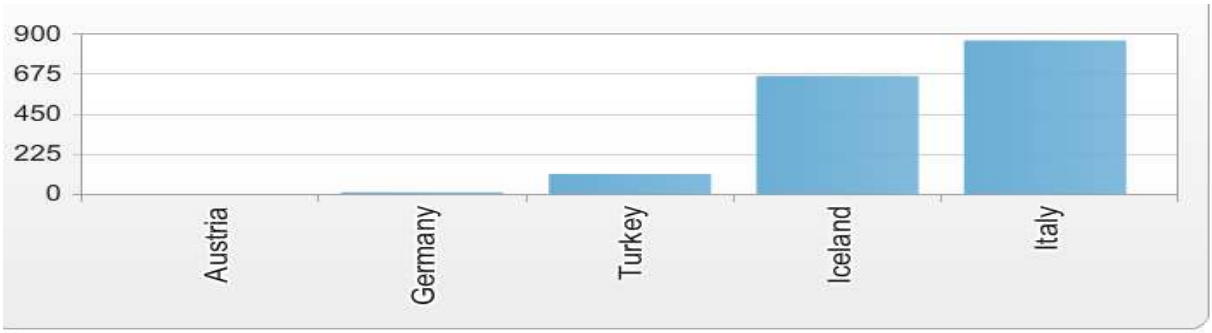
4.6. INSTALLED CAPACITY – GEOTHERMAL ENERGY (MW)

Total installed geothermal capacity is increased from 6.766 MW in 1995 to 11.145 MW in 2012. On the World Level. The biggest single installed capacity is in USA with around 3.386 MW, after comes Philippine 1.968 MW and Indonesia 1.339 MW.

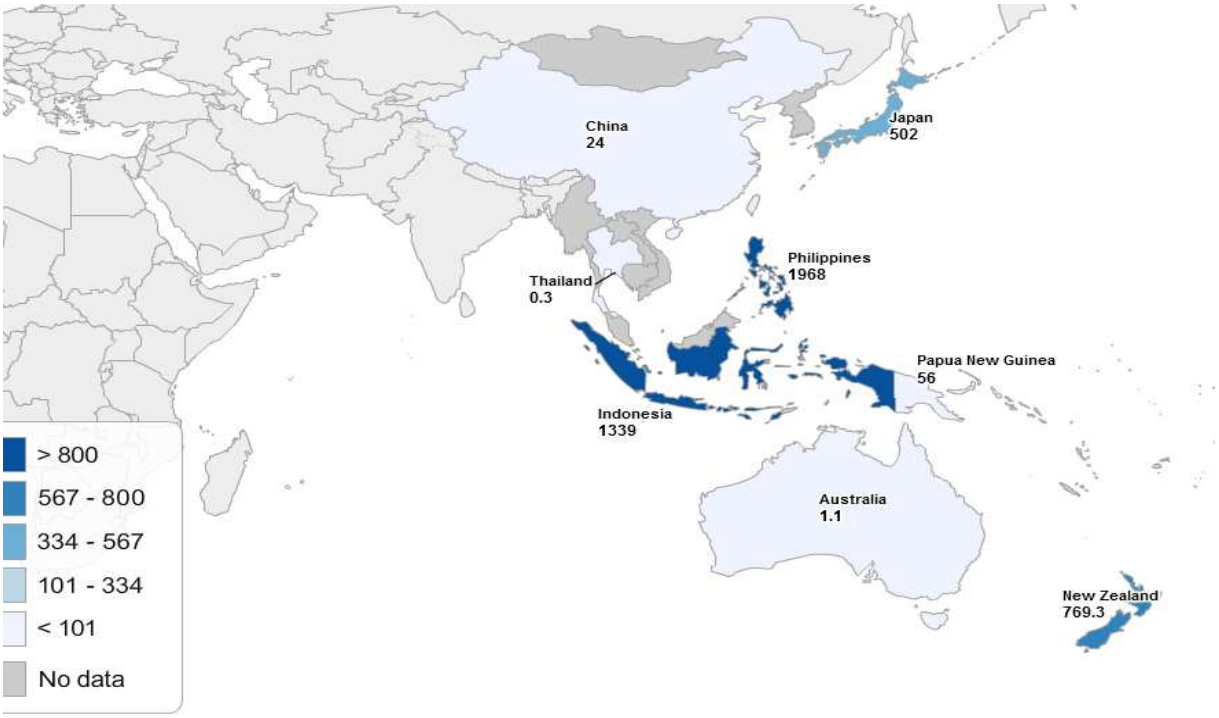


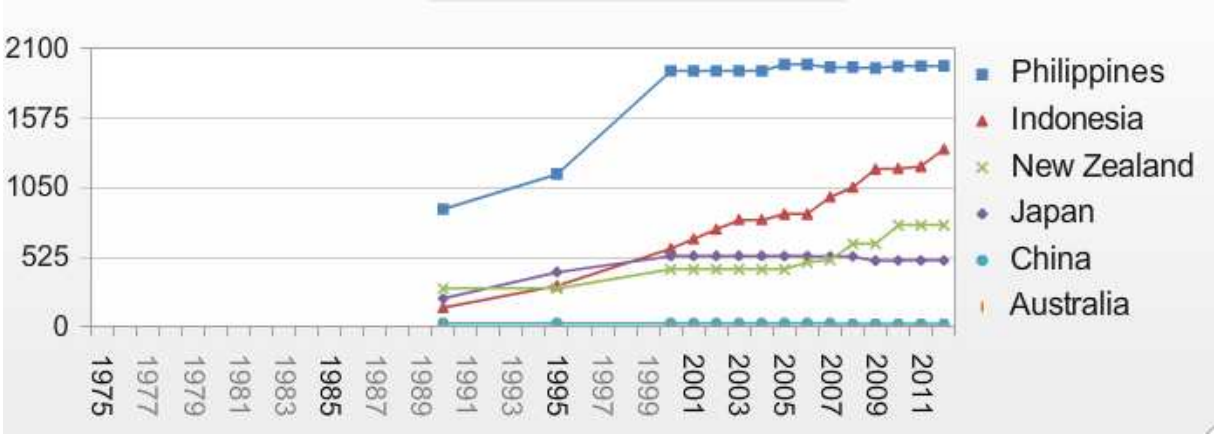
In Europe installed capacity that is using energy from geo potentials is situated in Italy with 863 MW, Island 665 MW and Turkey 114 MW.



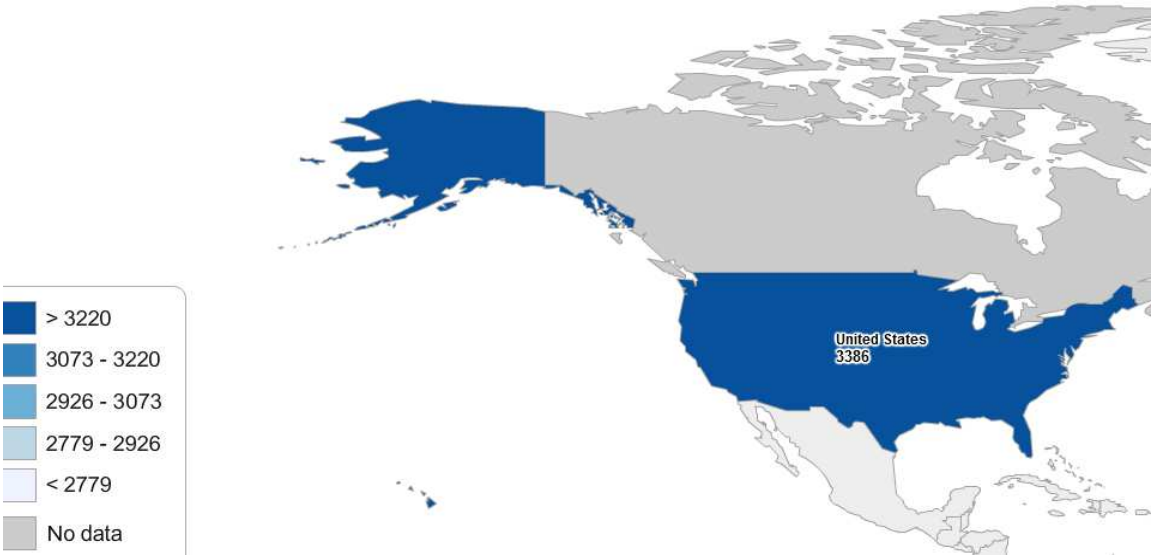


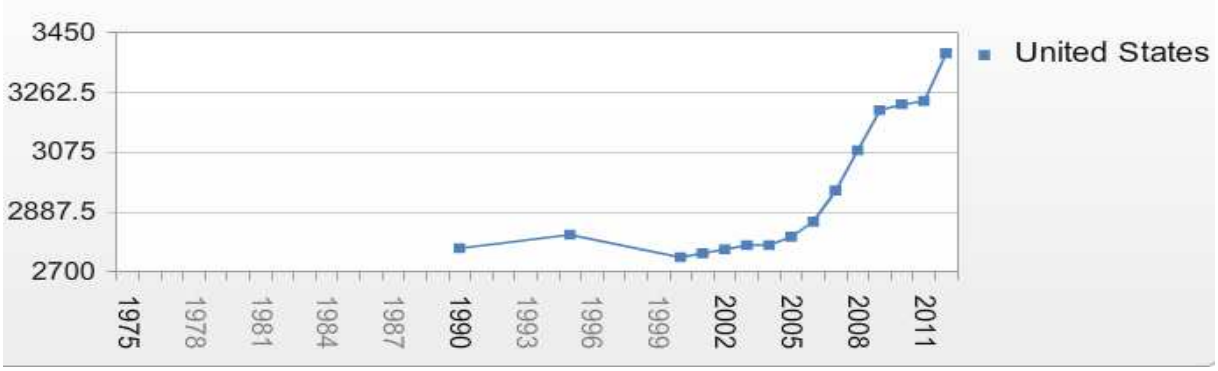
Significant installed capacity for geo sources is in Philippines 1.968 MW, Indonesia 1.339 MW, and New Zealand 759 MW.





Installed go thermal capacity in USA has been increased since 2005 to be around 3.386 MW in 2012.



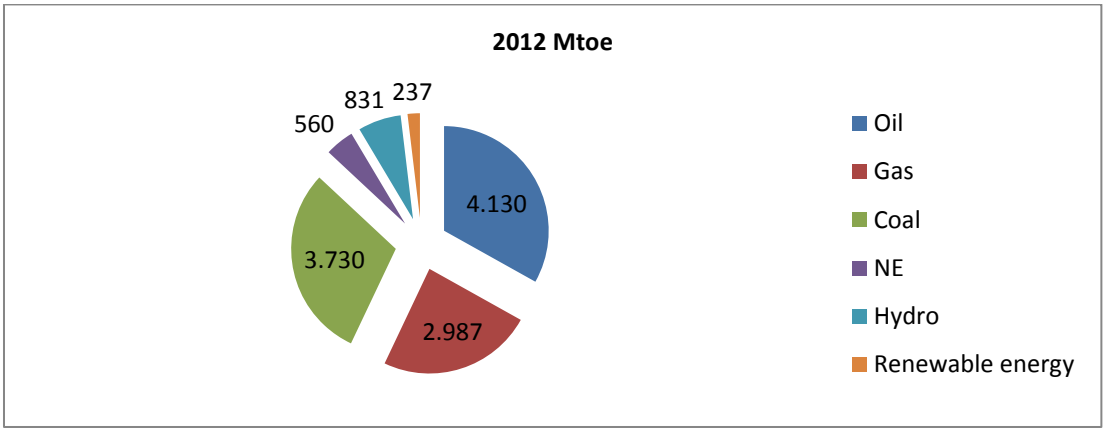


4.7. RENEWABLES IN SHORT

Although renewables present large potential and possible impulse for further energy stability and security in the whole world it is still at the very beginning of its developing process and full capacity on the Planet Earth. Further advance is its potential to reduce harmful emissions, and impacts environment on more positive way than non-renewables (emissions, holes, wars etc.) If comparing data about consumption it is to be seen that total consumption is 12 475 mil ton oil equivalent, and only 2% is coming from renewables. Picture is colored with brighter point of view if hydroelectricity is taken as energy resource. In that respect world is having around 8, 5% of green energy in total energy supply.

Table 3: Energy consumption

	2012 Mtoe	**%**
Oil	4.130	33,11
Gas	2.987	23,94
Coal	3.730	29,90
NE	560	4,49
Hydro	*831*	*6,66*
Renewable energy	**237**	**1,90**
TOTAL:	**12.475**	**100**



Picture 17

Renewable energy is very different from each other where the most expensive technology is still to be found among solar potentials, and wind , bio energy are competitive with classical sources. It is to expect that solar technology price is going to decline with time, but this is still the long term period of time. The main obstacle for many is price for solar it is still to expensive in largest part of the world. Further to note countries with lowest income are the ones that have the most favorable conditions for solar technology. With usage of solar panels it is important to have enough solar days and to consider better energy storage than it is done so far. Wind energy can be important source of energy but also if some natural predispositions are reached, also facing problems with energy storage as downside risk.

So far is to be observed that very large potential lays in solar, but the countries such as Germany and USA have the largest installed capacity in their countries. Although some initiatives started a long ago to use Sahara as a resource some distribution, storage, financial considerations so far hindered growth in that respect.

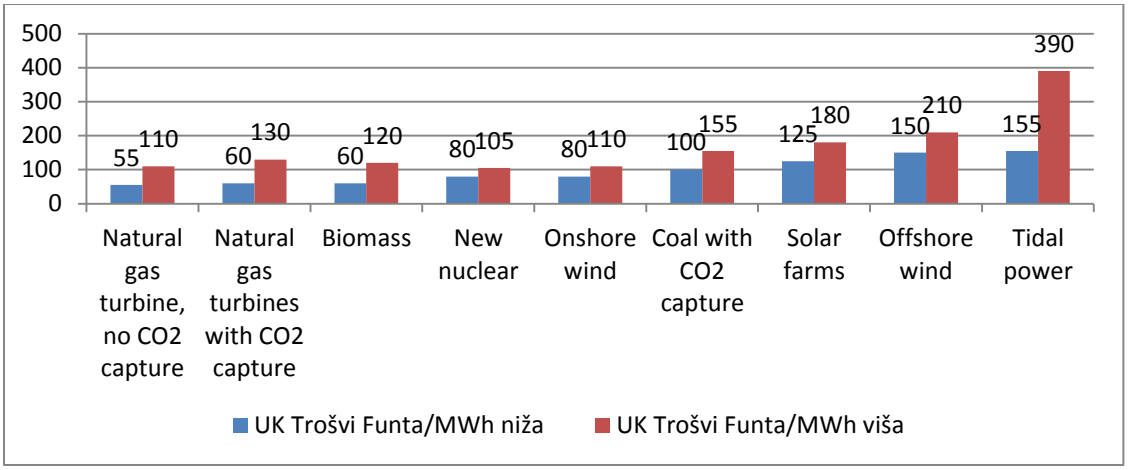
Table 4: Energy from different sources

	Thousand ton oil equiv
Biofuels	60.220,00
Geo	37.880,00
Wind	117.900,00
Solar	21.000,00
Renewables other	**237.000,00**
Hydro energy	831.000,00
TOTAL:	**1.068.000,00**

Table 5: Potential of energy usage

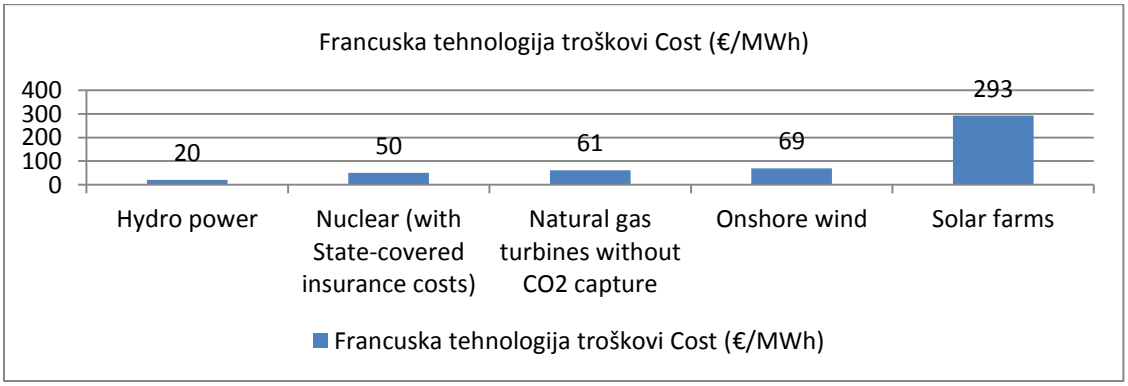
	Potential yearly usage TW
Solar	23.000,00
Wave	2
Geothermal	2
Hydro	4
Biomass	6
Wind	70
TOTAL	23.084,00
Current world production	16

Technology prices as given by Great Britain, Cost Pound /MW high /lower price



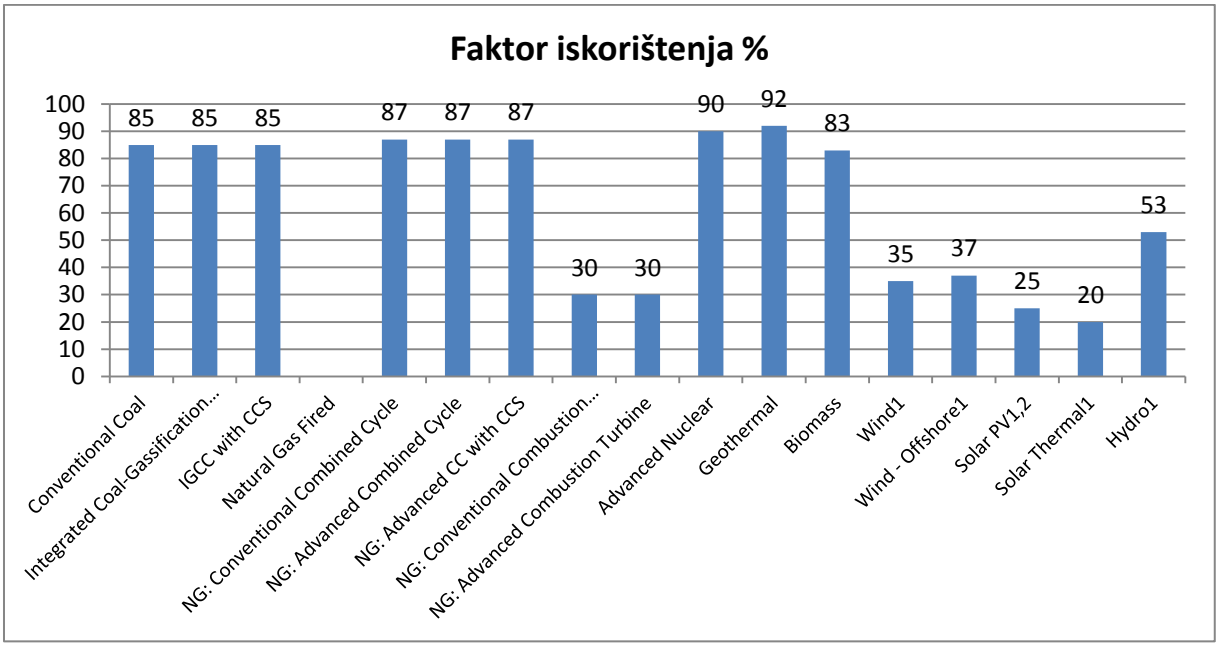
Picture 18

French technology costs €/MWh-changes with time- expected further to decrease



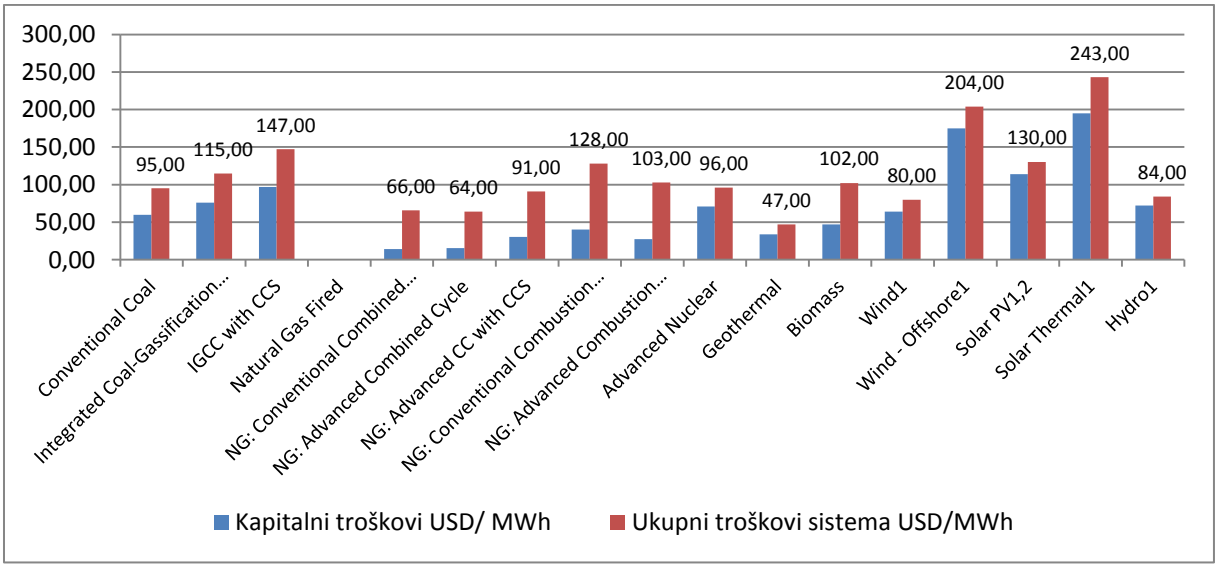
Picture 19

Capacity usage -possibilities



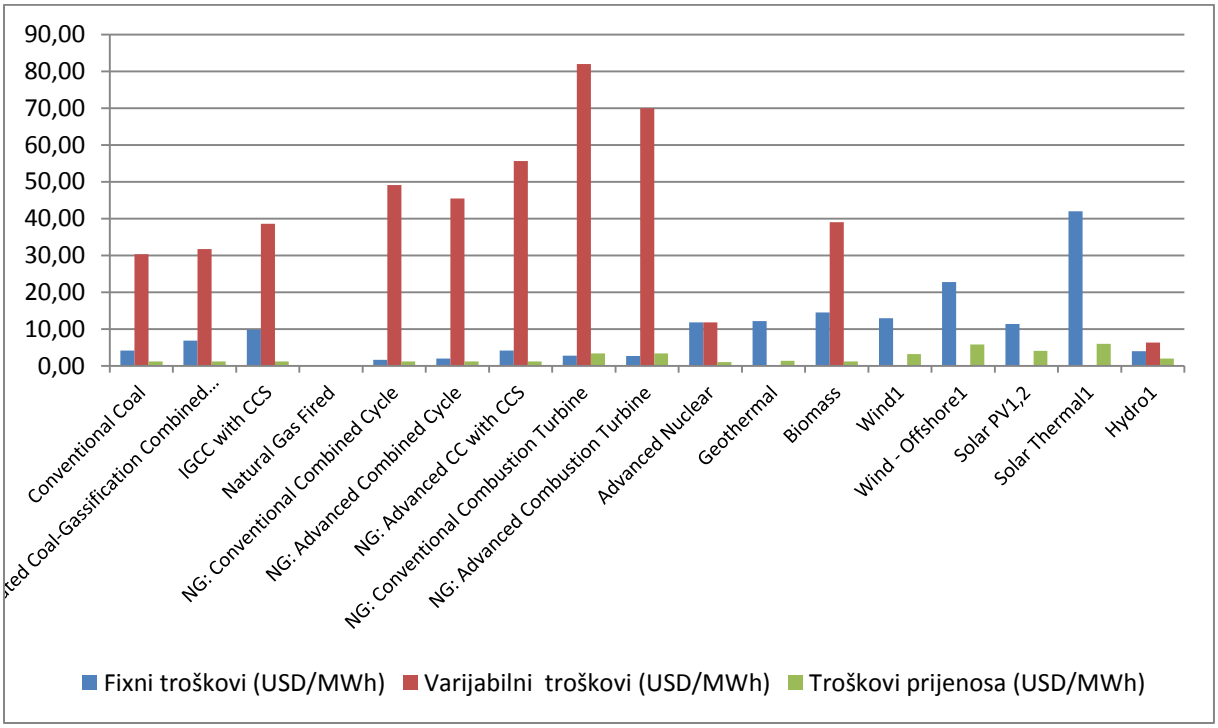
Picture 20

Capital costs- Total Costs USD/MWh



Picture 21

Fix, variable, Cost of transmission USD/MWh



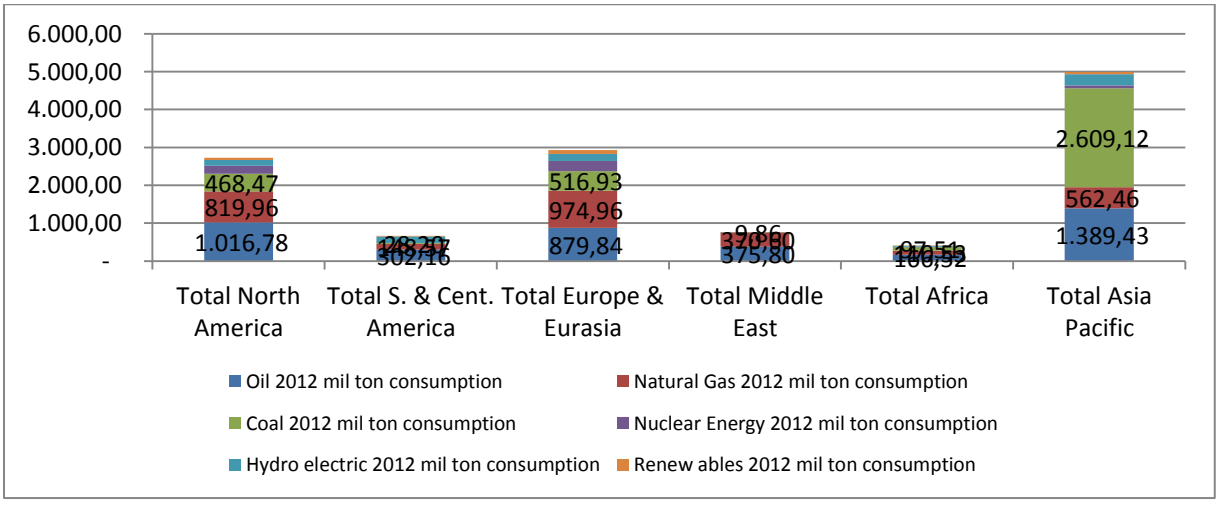
Picture 22

5 . CONSUMPTION OF PRIMARY ENERGY (Milton oil equiv.)

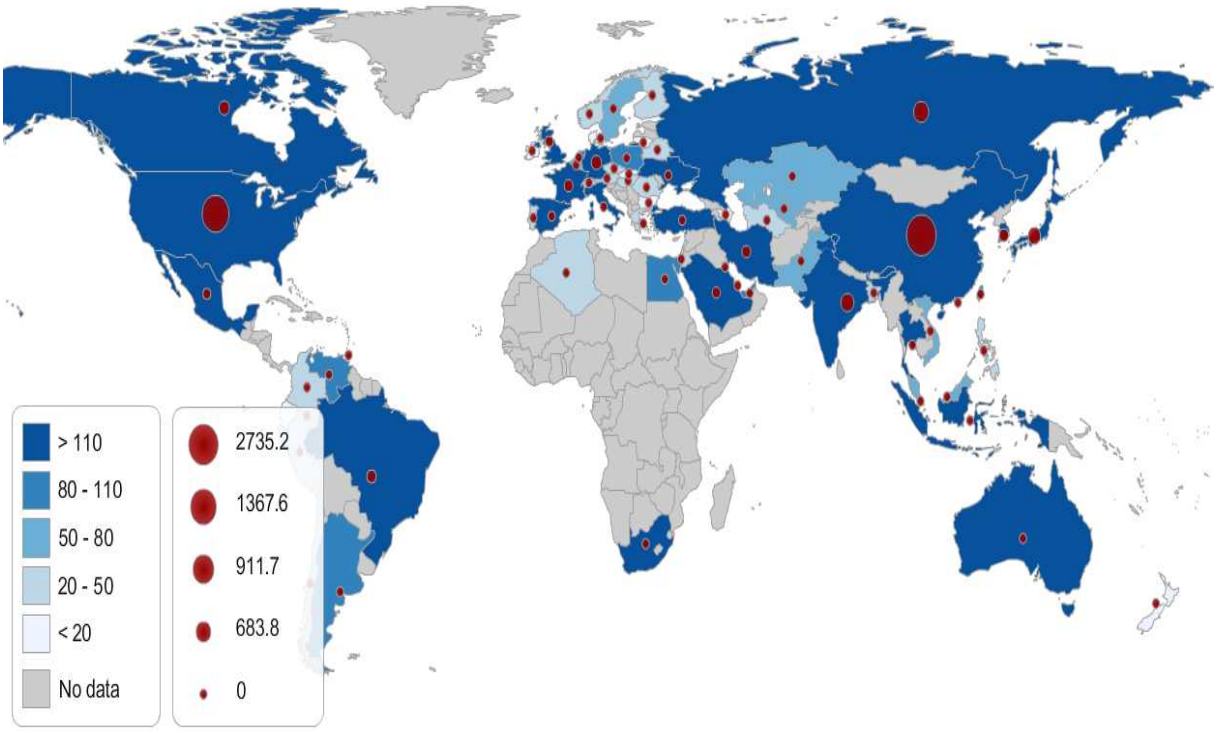
Increased Consumption of primary energy is due to increased number of population, GDP growth, industrial developments, increased trade, and communication on the world scale. Oil is still the most significant energy source, followed by coal that is in China and the less developed world still widely in usage. Last decade is features with lingering or closure plans of nuclear industries and strong advances and communication regarding renewable technology and implementation. Wind, solar geo and biofuel went with big steps in the most developed world forward-EU, USA, but made significant effort to diversify in some developing countries such as Brazil (ethanol in transport). The biggest energy consumers are interested in developing its owns technologies and further to implement in its country strategies.

Table 6: Consumption, total world 2012 mil ton oil equivalent

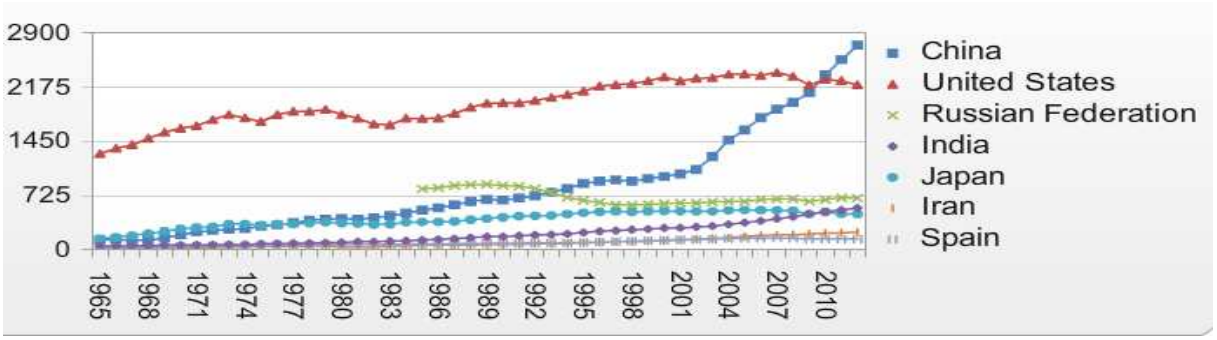
	Oil 2012 mil ton consumption	Natural Gas 2012 mil ton consumption/	Coal 2012 mil ton consumption	Nuclear Energy 2012 mil ton consumption	Hydro electric 2012 mil ton consumption	Renew ables 2012 mil ton consumption	**Total 2012 mil ton consumption/**
Total North America	1.016,78	819,96	468,47	206,90	156,31	57,01	**2.725,42**
Total S. & Cent. America	302,16	148,57	28,20	5,04	165,72	15,62	**665,31**
Total Europe & Eurasia	879,84	974,96	516,93	266,87	190,81	99,10	**2.928,51**
Total Middle East	375,80	370,60	9,86	0,32	5,14	0,14	**761,86**
Total Africa	166,52	110,53	97,51	3,22	24,14	1,40	**403,31**
Total Asia Pacific	1.389,43	562,46	2.609,12	78,06	289,02	64,15	**4.992,23**
Ukupno	**4.130,53**	**2.987,06**	**3.730,09**	**560,39**	**831,14**	**237,42**	**12.476,63**

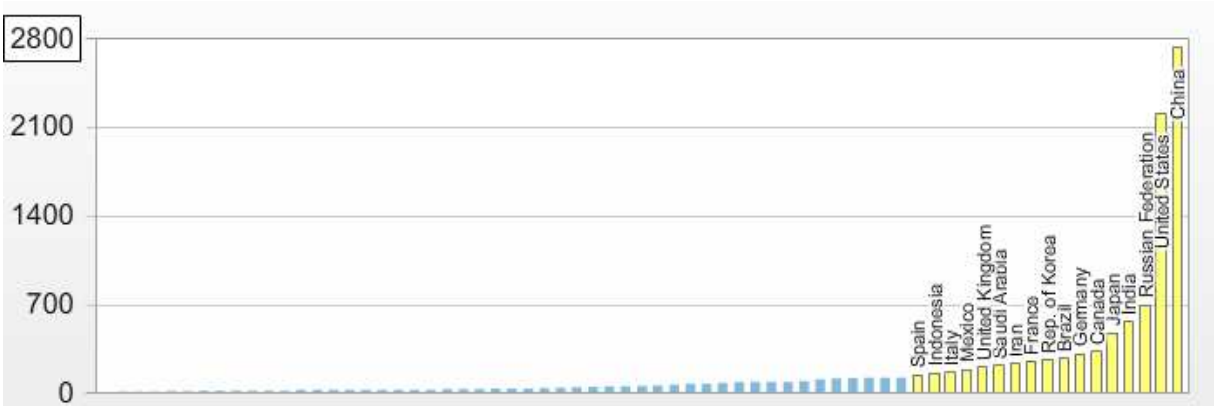


Picture 23



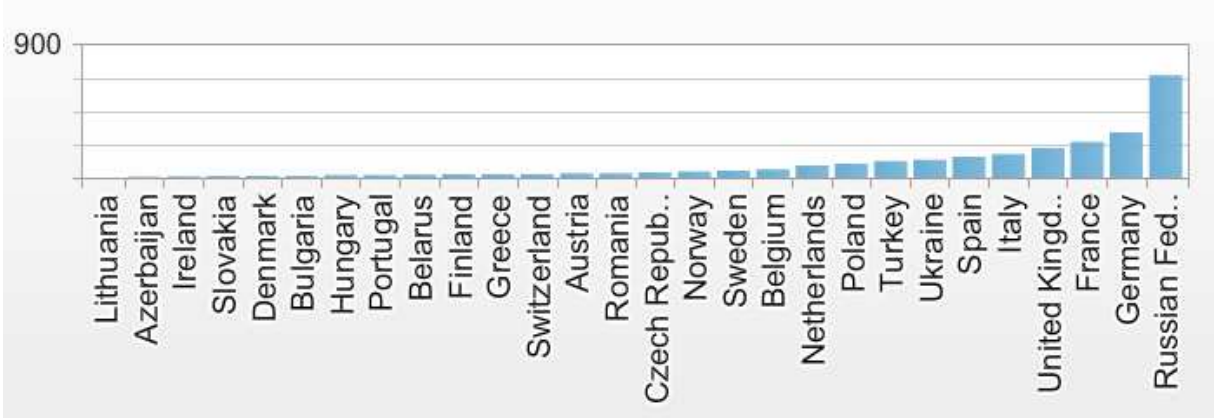
USA is known as large energy consumer but works also actively on implementing renewables in its strategy and putting technology on ground. China with its exponential growth is seen as developer for industry but also consumer of wind, geo, in future. Russia is lagging behind the world in renewable development strategy due to significant oil, gas reserves, Japan is concentrated on nuclear and oil , but in its technological advances such as car production produces new possibilities other than oil (hydro Toyota Mirage) and India is seen as important country in the future world plans due to rising population and GDP growth.



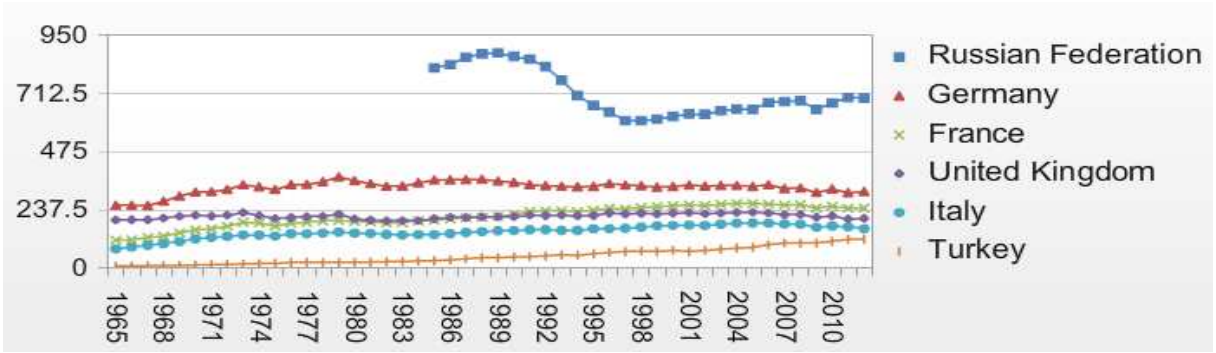


Total consumption of primary energy in Europe and Eurasia is 2.929 mil ton oil equivalent. The most significant producers are Russia (694 mil ton oil equivalent) Germany (311 mil ton oil equivalent) France (245 mil ton oil equivalent) Great Britain (203 mil ton oil equivalent.).

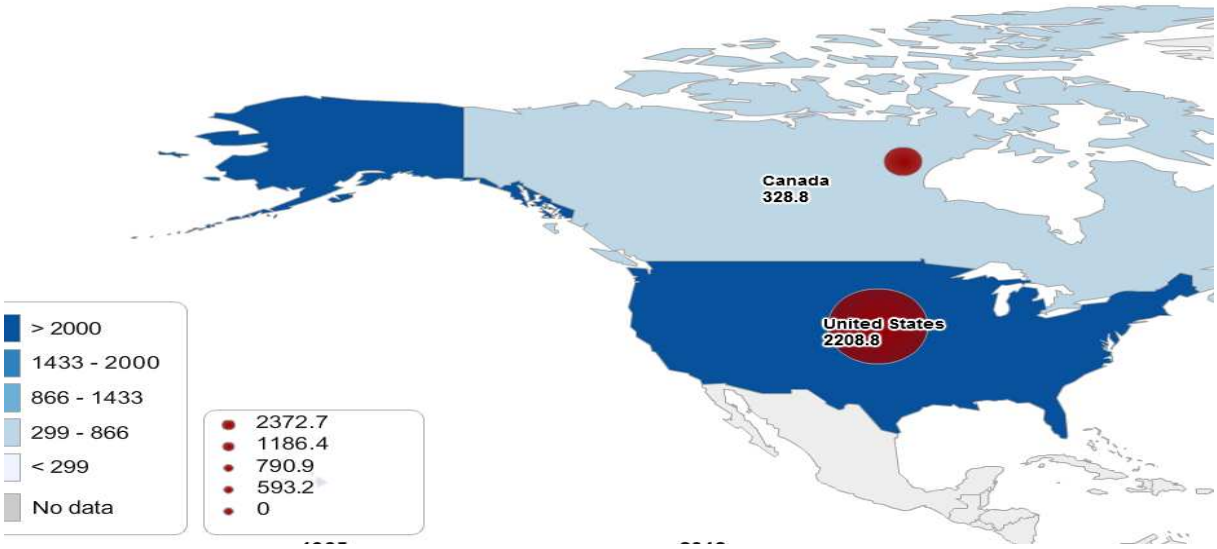
Europa- total primary consumption mil ton oil equiv.

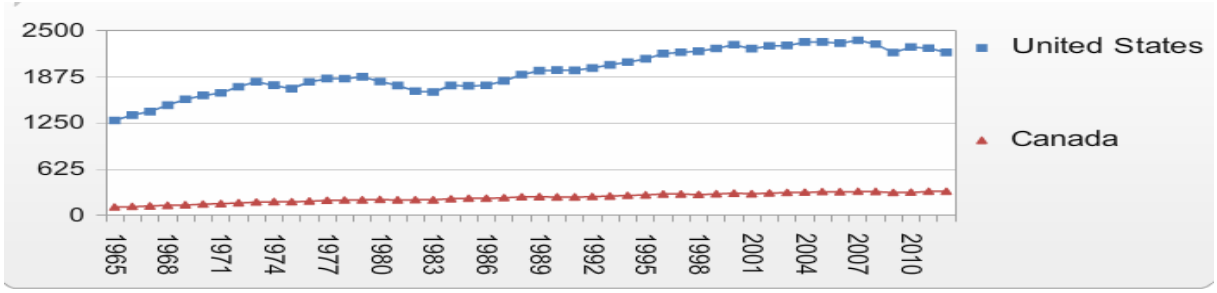


With the Soviet Union break up energy consumption stagnated and decreased due to industrial break down and new market for Asian and European goods. EU countries keep the same level of consumption and Turkey is growing.

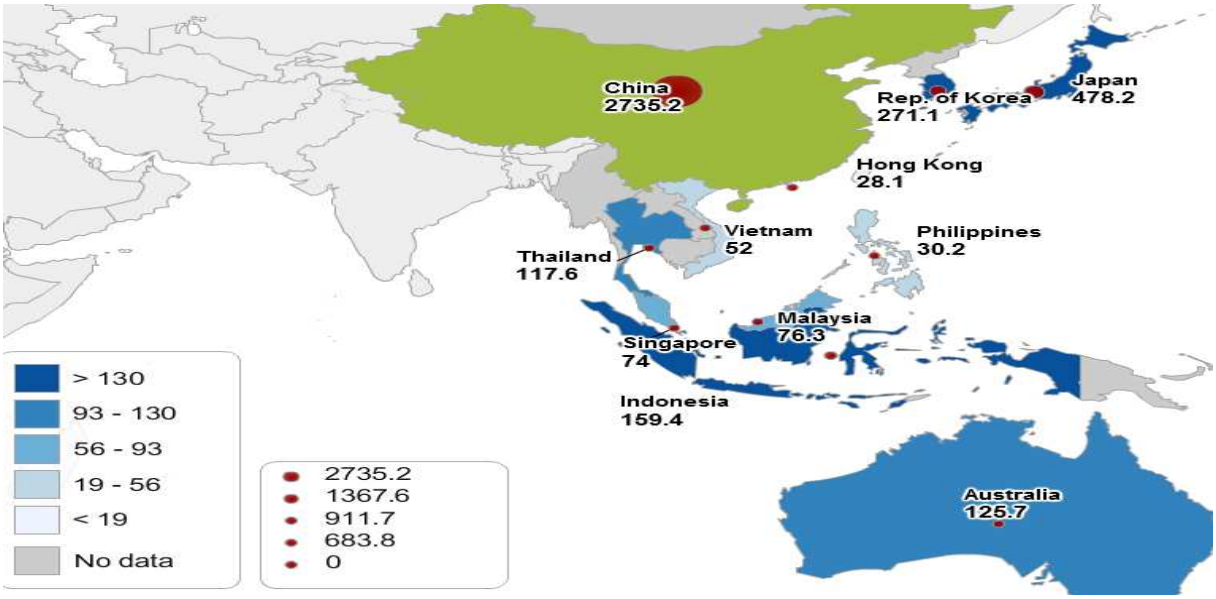


It is a big difference between Canada and USA in energy consumption where Canada spends 328 mil ton oil equivalents, USA 2.208 mil ton oil equivalent.

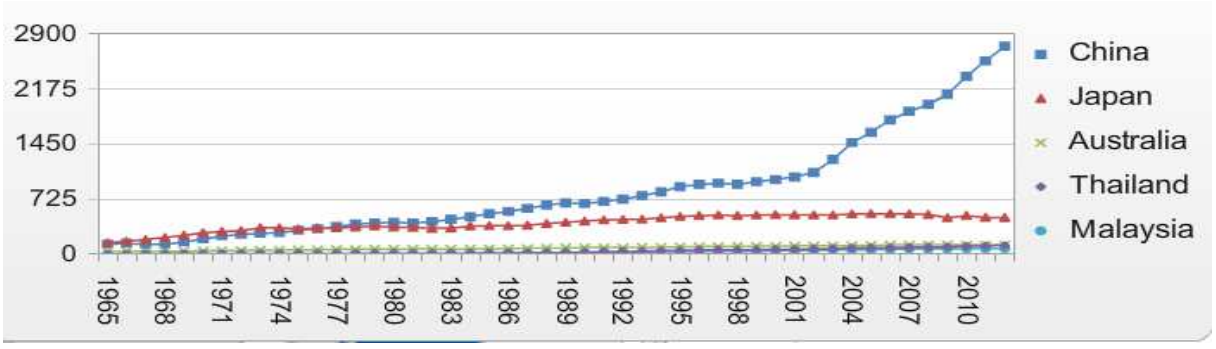

Canada
328.8
United States
2208.8
> 2000
1433 - 2000
866 - 1433
299 - 866
< 299
No data
2372.7
1186.4
790.9
593.2
0


2500
1875
1250
625
0
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
United States
Canada

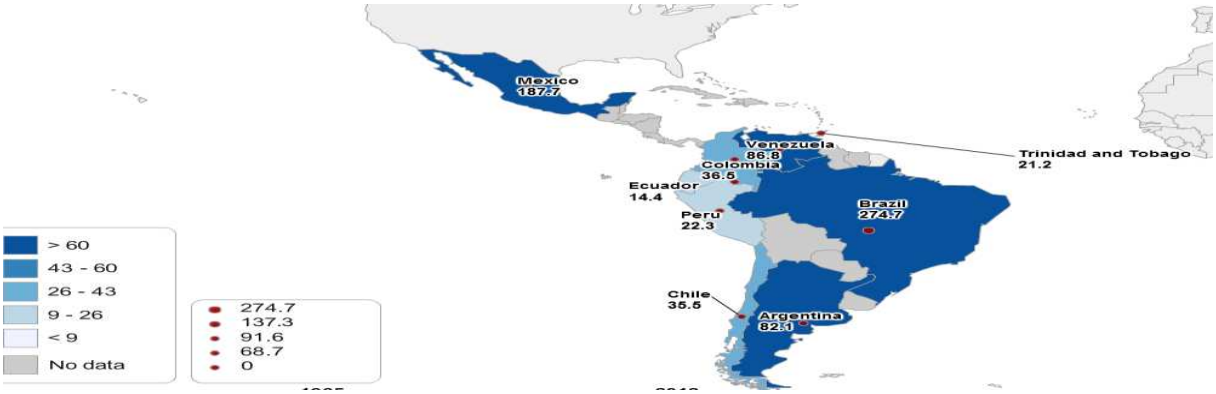
China uses the most energy 2 735 mil ton and further increases is to be expected. Other big consumers in Asia Pacific region are Japan 478 mil ton oil equivalent, Republic Korea 271 mil ton oil equivalent, Australia 125 mil ton oil equivalent and Indonesia 159 mil ton oil equivalent.

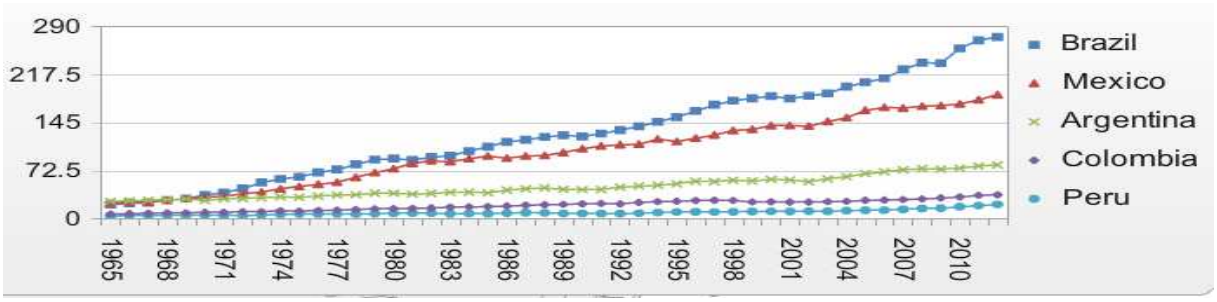


The biggest growth has China with further increased trend.



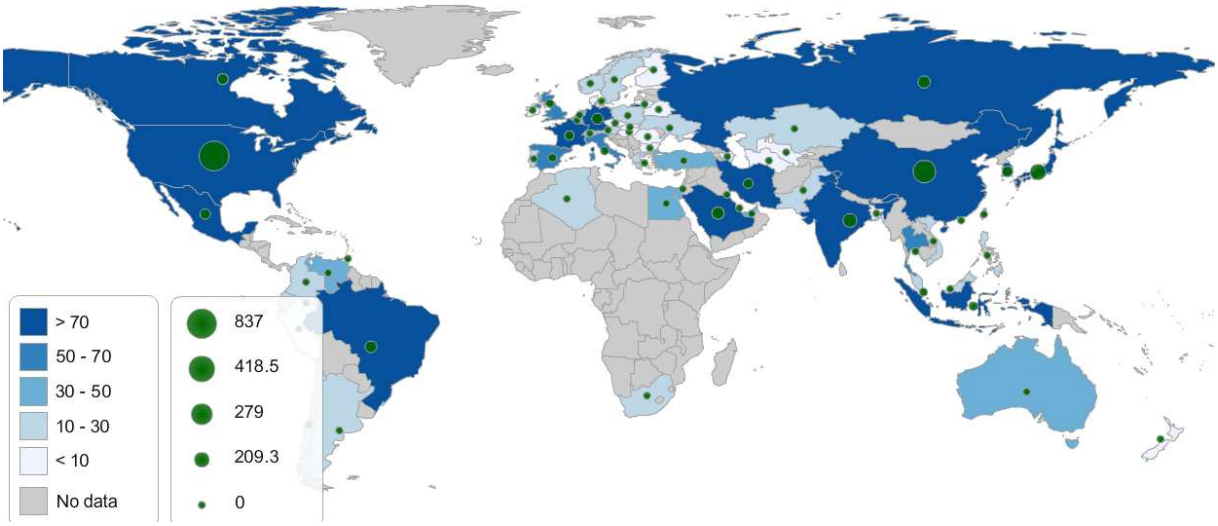
Countries in South America also contribute with growth to world consumption where Brazil has 274 mil ton oil equivalent and Mexico 187 mil ton oil equivalent.

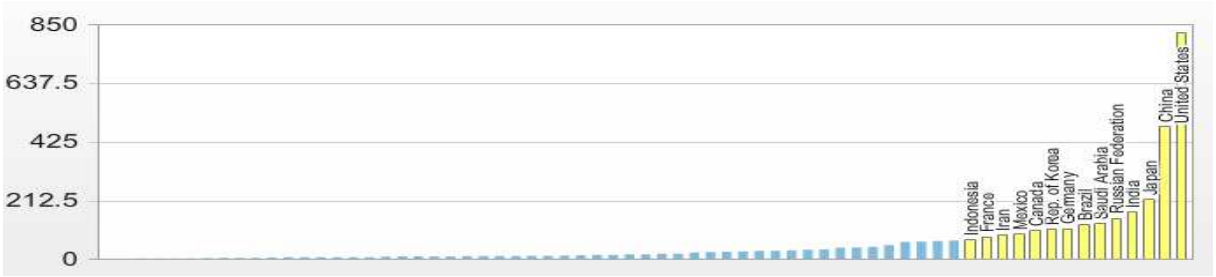


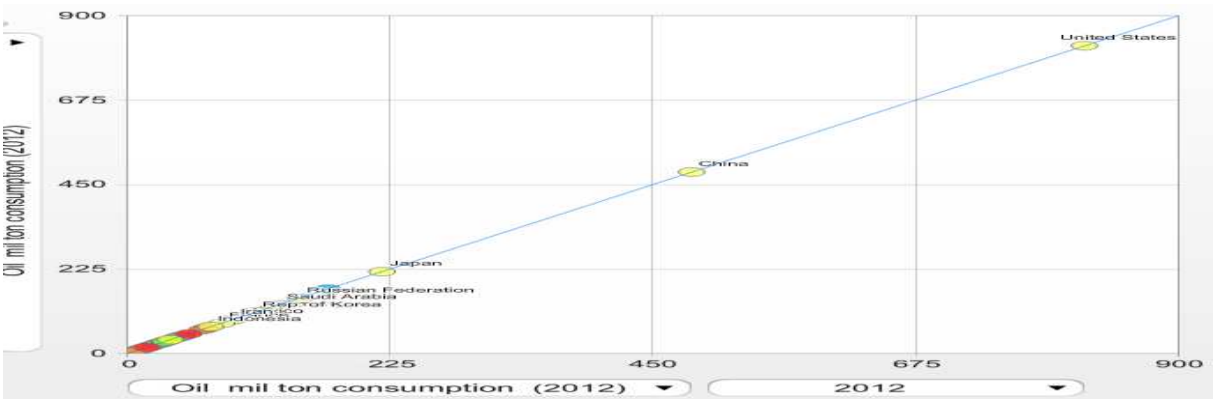


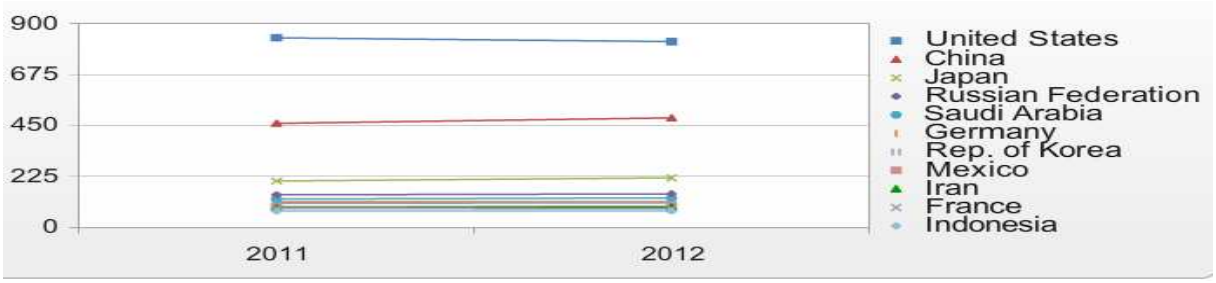
The most significant source is still oil, with USA as the largest consumer 819 mil ton oil and China that follows but with half that quantities 483 mil ton oil products.

Oil consumption mil ton



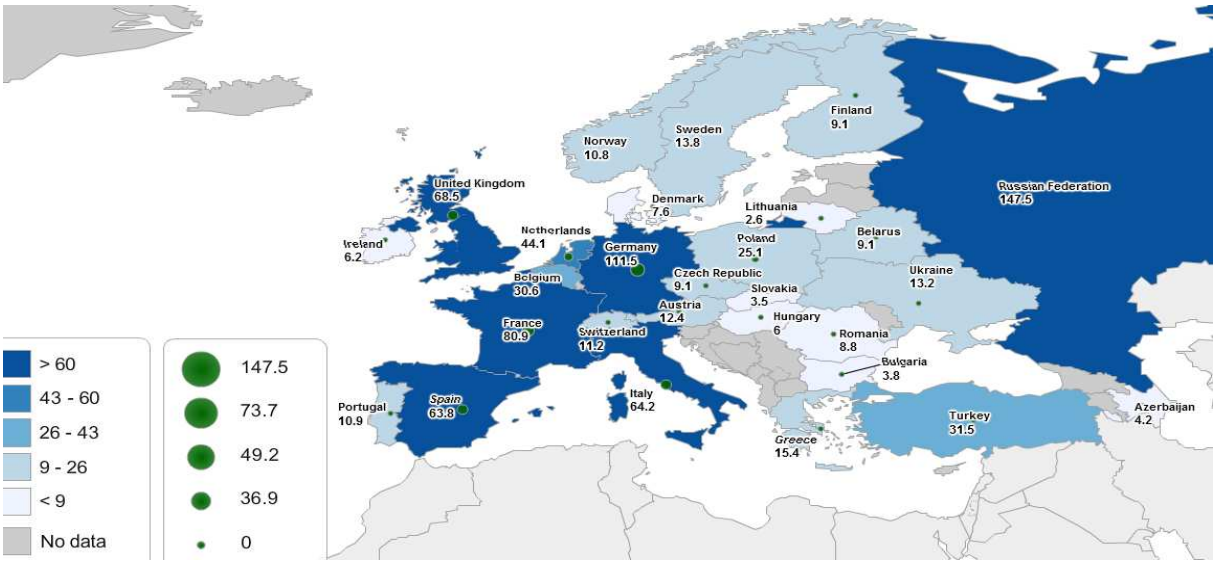


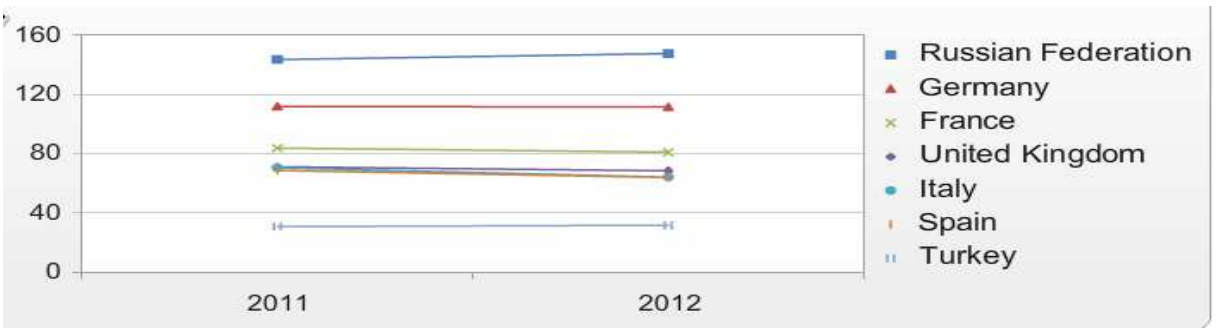


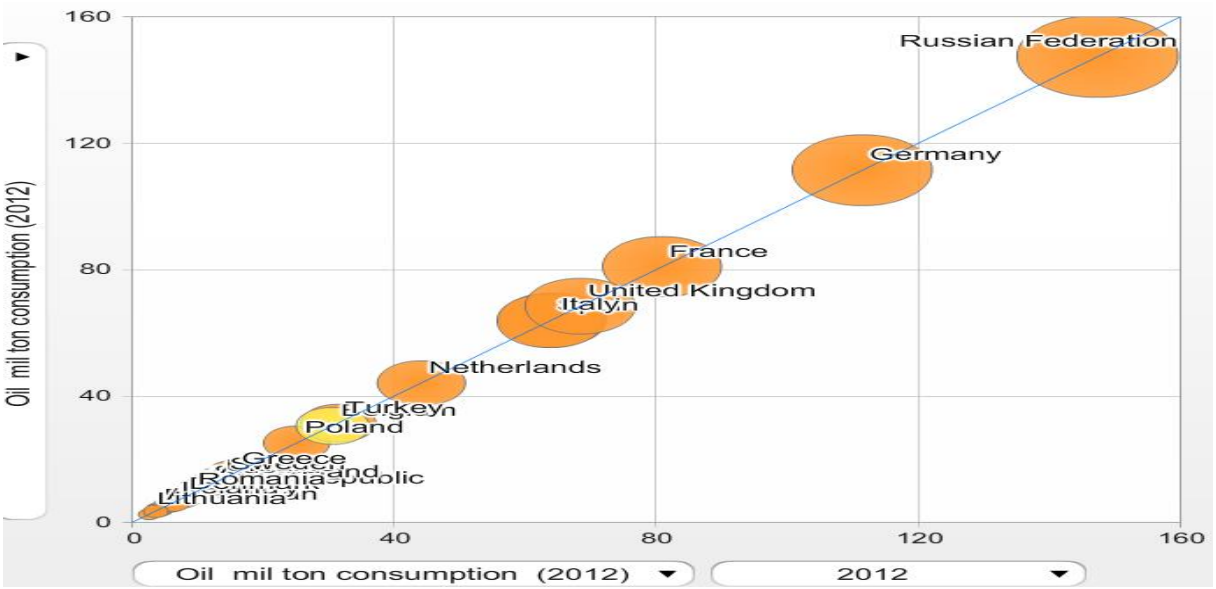


Europe and Eurasia have consumption as USA and that is around 879 mil ton per year.

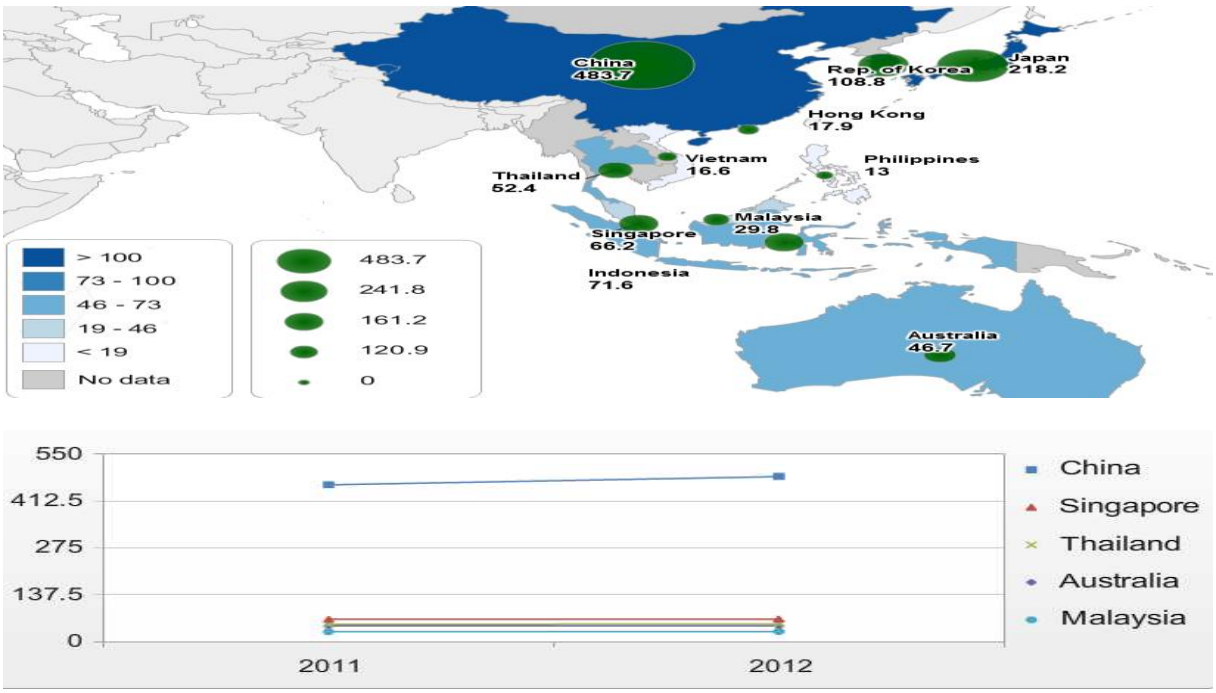
Oil consumption mil ton



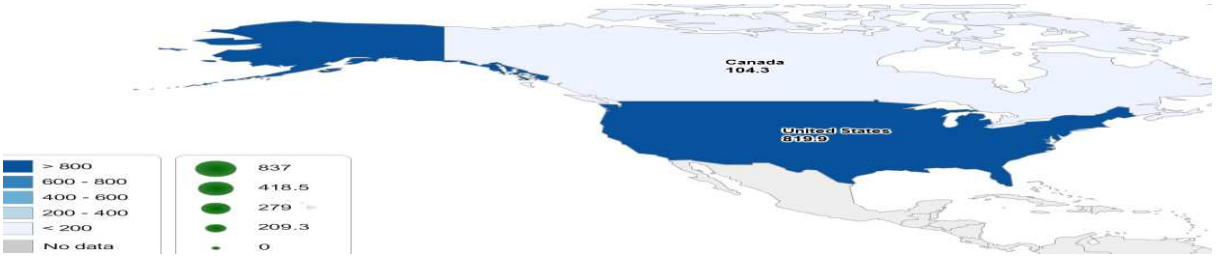


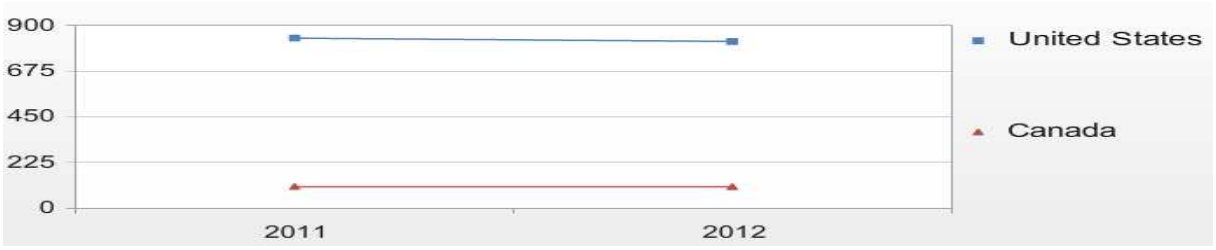


Besides China 483 mil ton other consumers in Asia are Japan 218 mil ton, Korea and Indonesia.

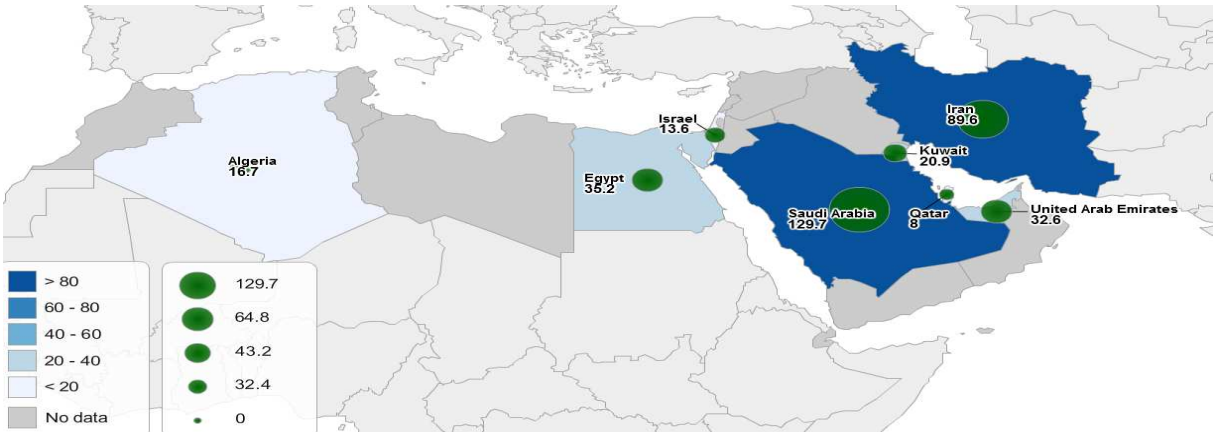


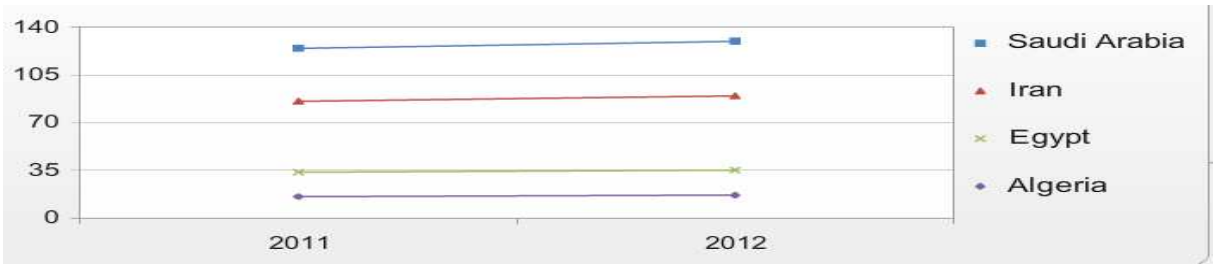
USA and Canada have consumption of 923 mil ton together.





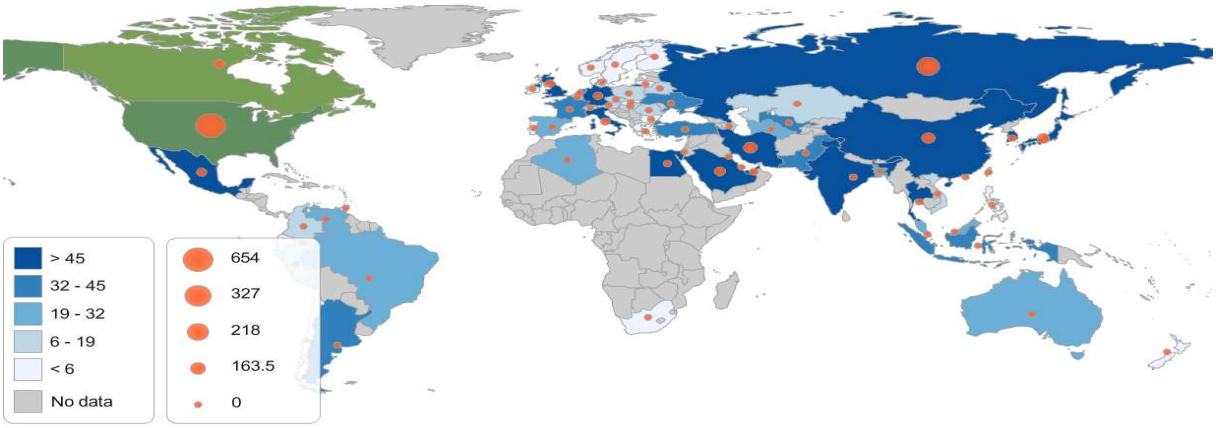
In the area of Norther Africa and Middle East the biggest consumer is Saudi Arabia with 129 mil ton.

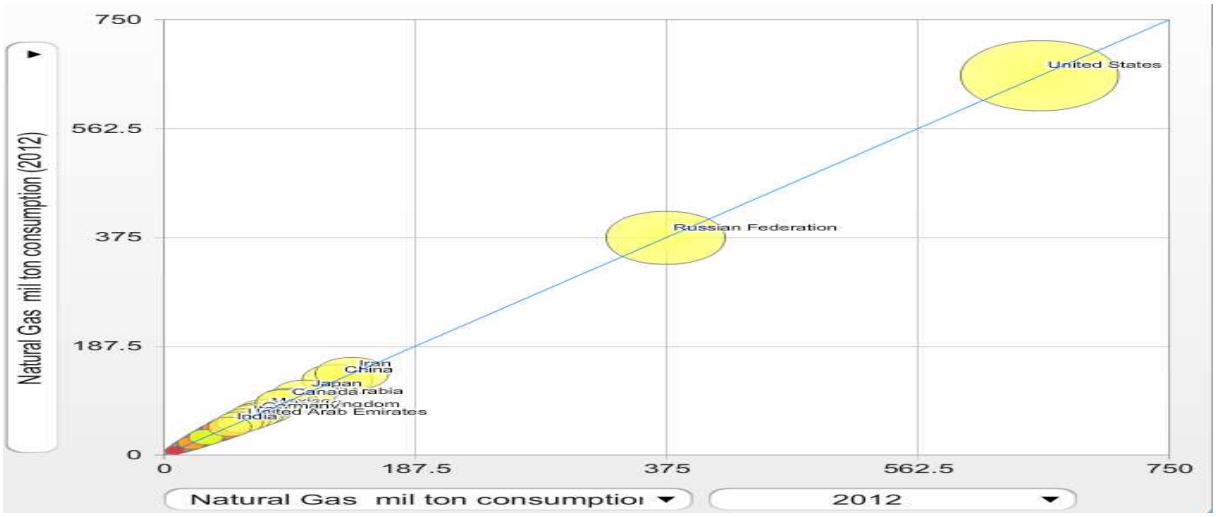




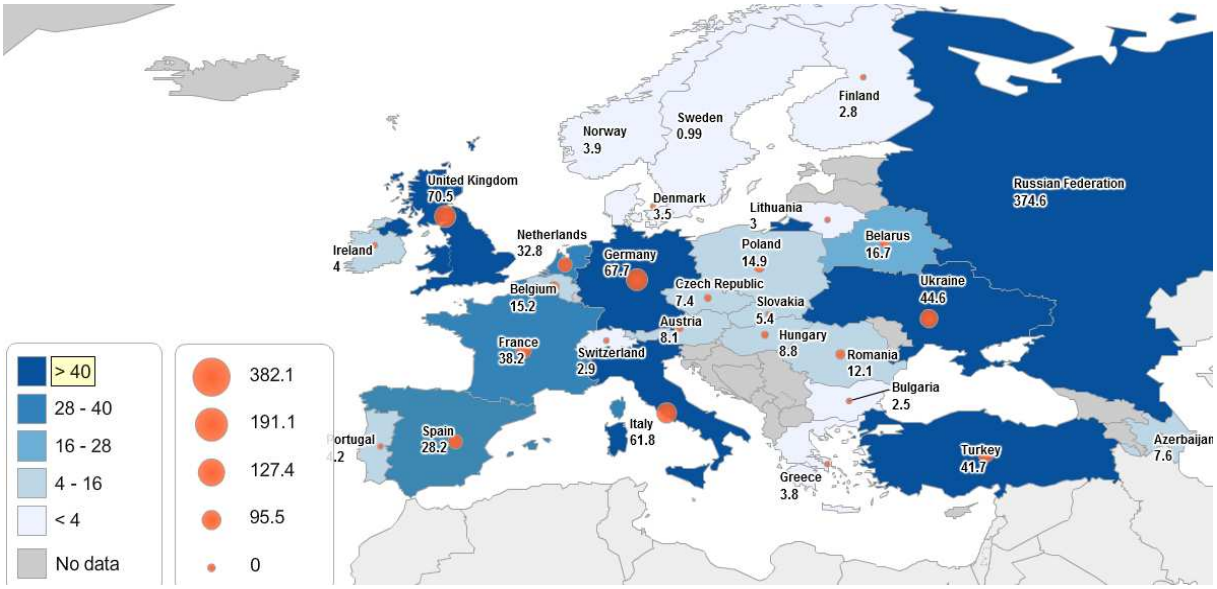
Total consumption of natural gas on the world scale is 2 987 mil ton. It is interesting to mention that USA is also one single country that spends the most 654 mil ton oil equivalent. After comes Russia that has 57% of USA consumption in quantities of 354 mil ton of oil equivalent. Other economies are less significant consumers of gas.

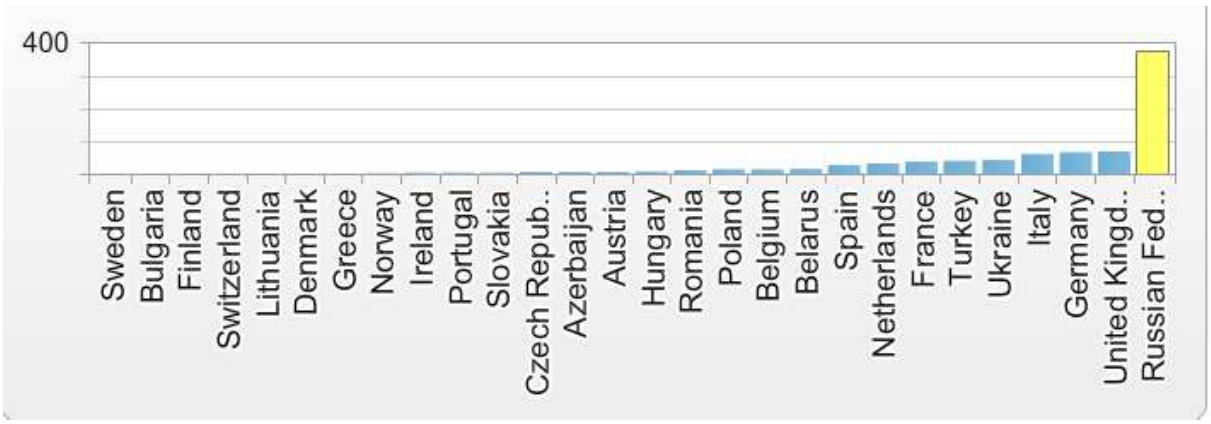
Gas consumption mil ton





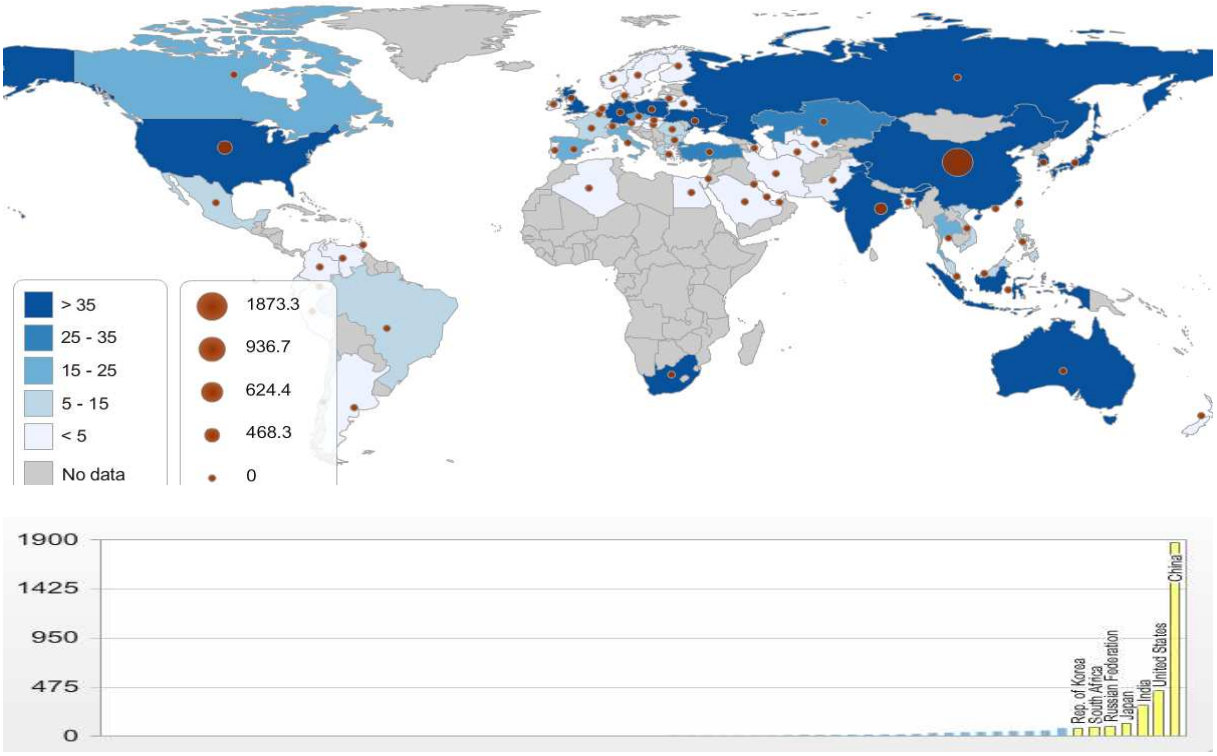
Gas consumption in Europe and Euro Asia is 975 mil ton oil equivalents. Besides Russia with consumption of 374 mil ton other consumers are Germany 67 mil ton, Great Britain 70 mil ton, Italy 61 mil ton, and Turkey 41,7 mil ton oil equivalent.



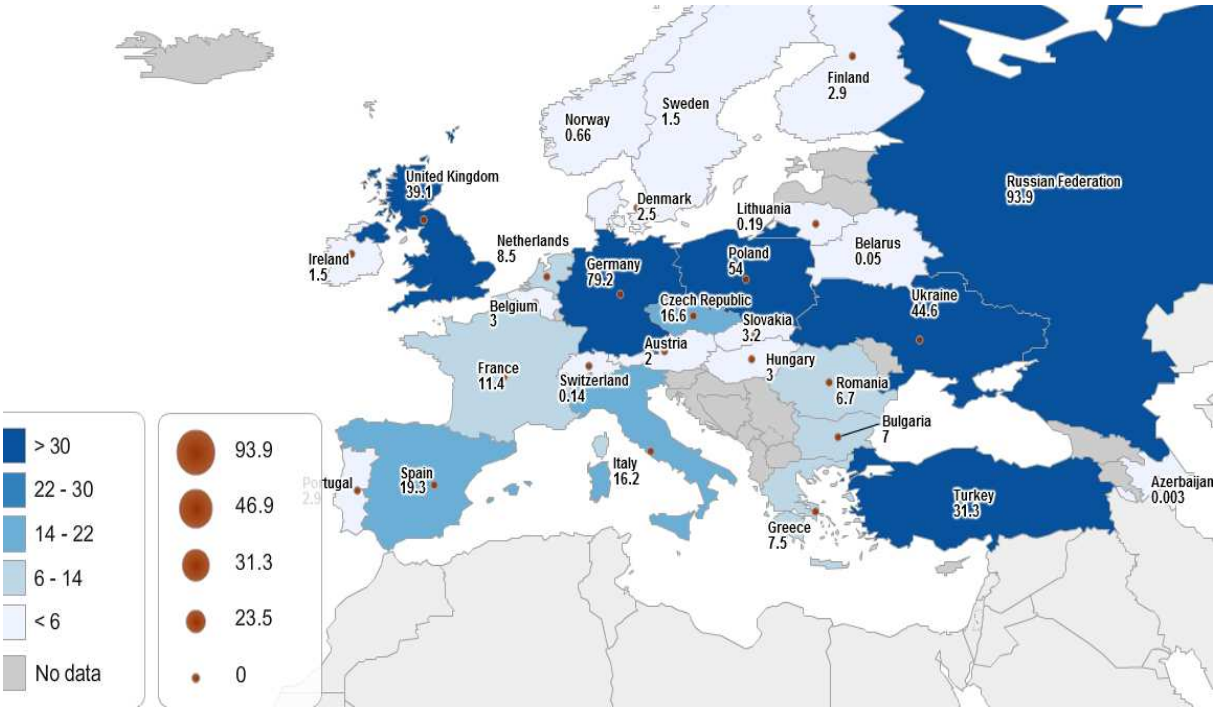


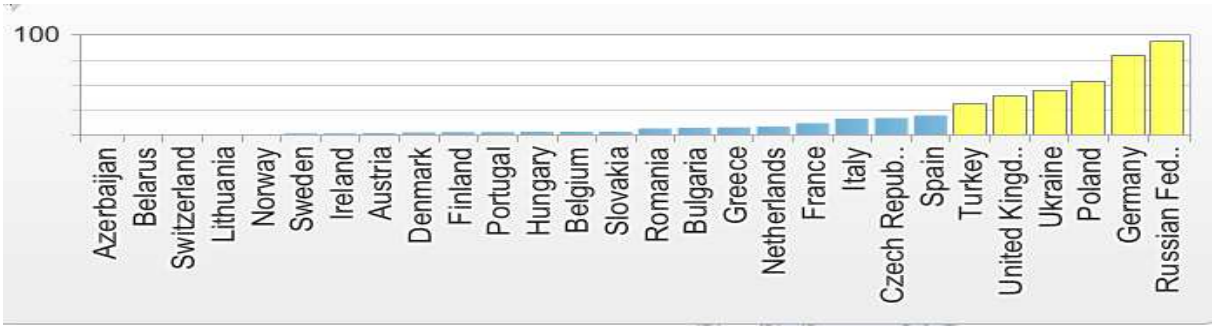
Coal is still on important place in the total primary energy consumption with 3 730 mil ton oil equivalent used yearly. The biggest consumer is China 1873 mil ton oil equivalent, USA 437 mil ton oil equivalent. India belongs to a group of big coals users with 298 mil ton oil equivalent.

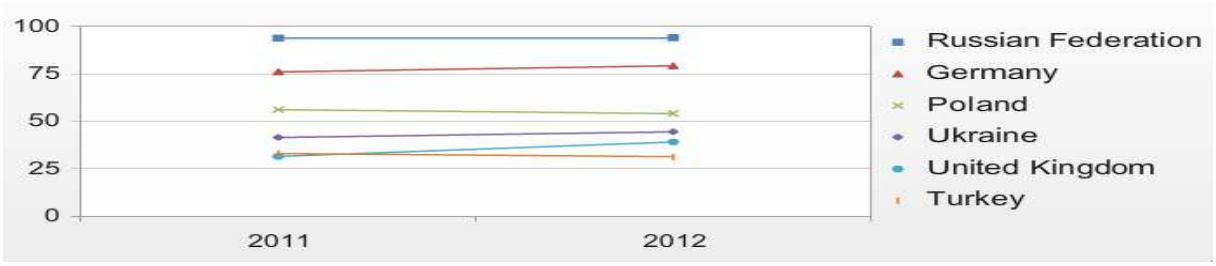
Coal consumption mil ton oil equivalent.



Europe and EU Asia spends around 516 mil ton oil equivalent of coal, where biggest users are Russia, Germany and Poland.

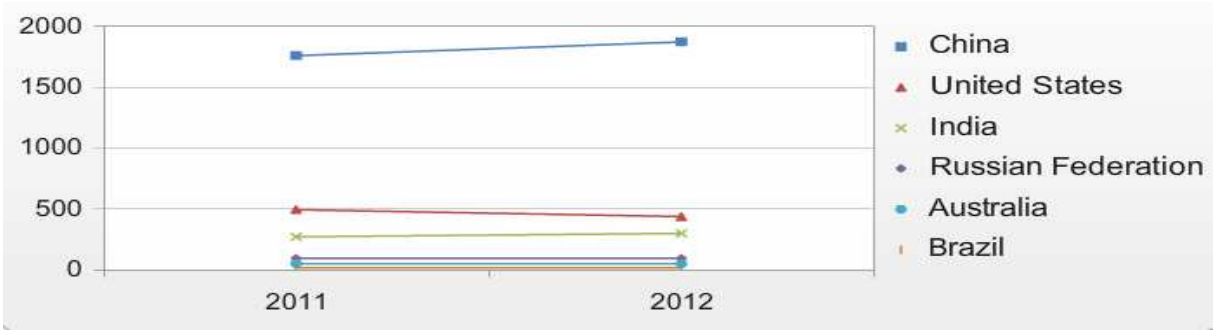






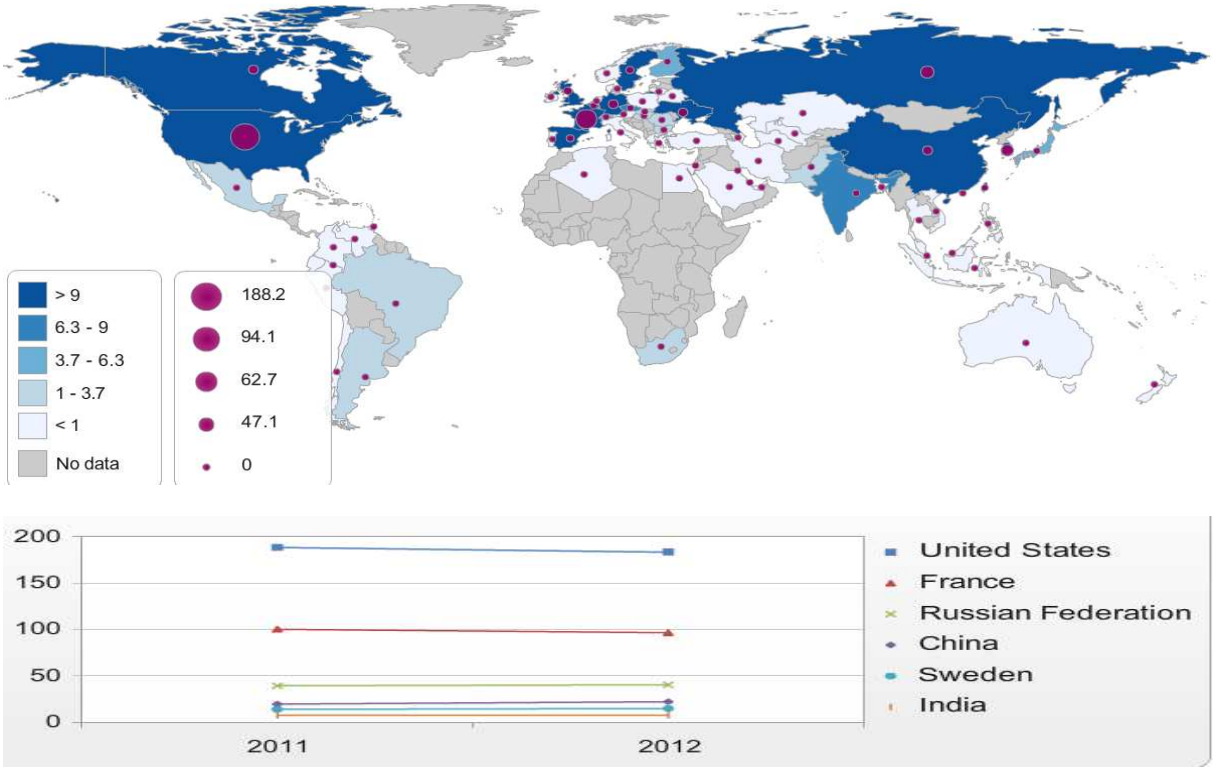
Although it is considered that coal will be replaced with renewables statically data point toward another on ground result. In 2012/2011 some economies increased instead of lowering coal usage and this is the most significant fact to observe further. It is not just the case in China but also Chile, New Zealand, Spain, etc.

Coal consumption 2012/2011 mil on oil equivalent.



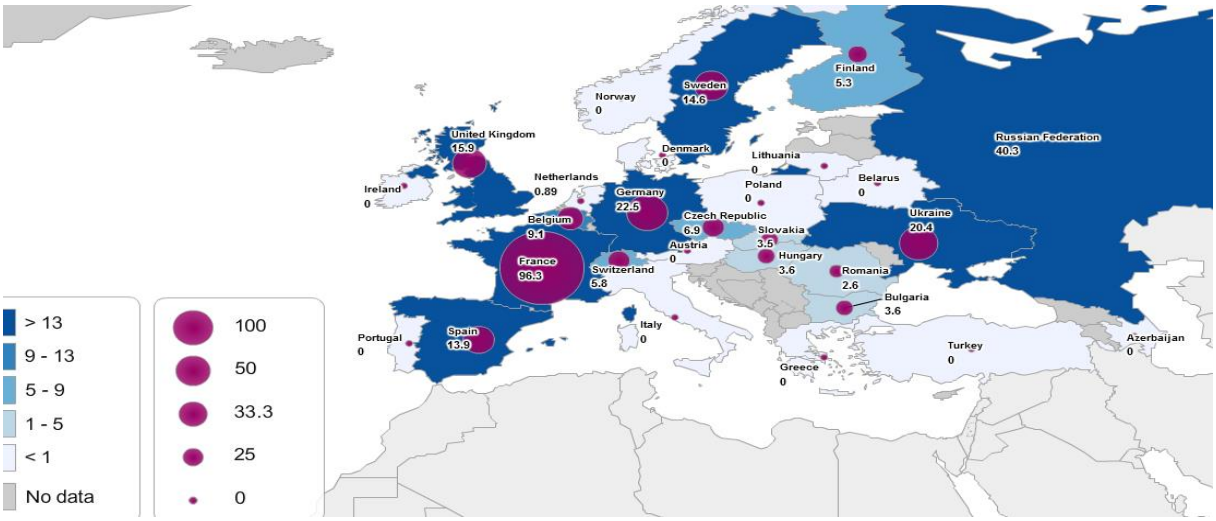
Total world nuclear consumption is 560 mil on oil equivalent, and the biggest production has USA 183 mil ton oil equivalent, France 96 mil ton oil equivalent, Russia 40 mil ton oil equivalent, China 22 mil ton oil equivalent.

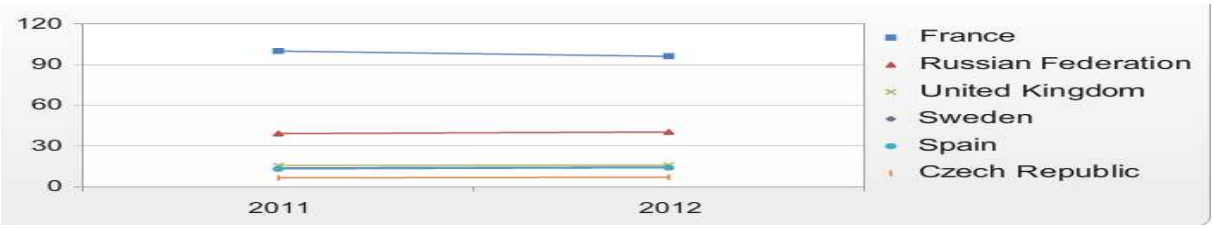
Nuclear energy consumption mil ton oil equivalent.



Nuclear production and consumption in Europe and Euro Asia is around 267 mil ton oil equivalent the biggest consumer is France 96 mil ton, Germany 22,5 mil ton oil equivalent, Ukraine 20,4 mil ton oil equivalent United Kingdom 15,9 mil ton oil equivalent, Sweden 14,6 mil ton oil equivalent, Russia 40,3 mil ton oil equivalent ,others (Czech, Spain, Finland, Belgian, Bulgaria, Romania).

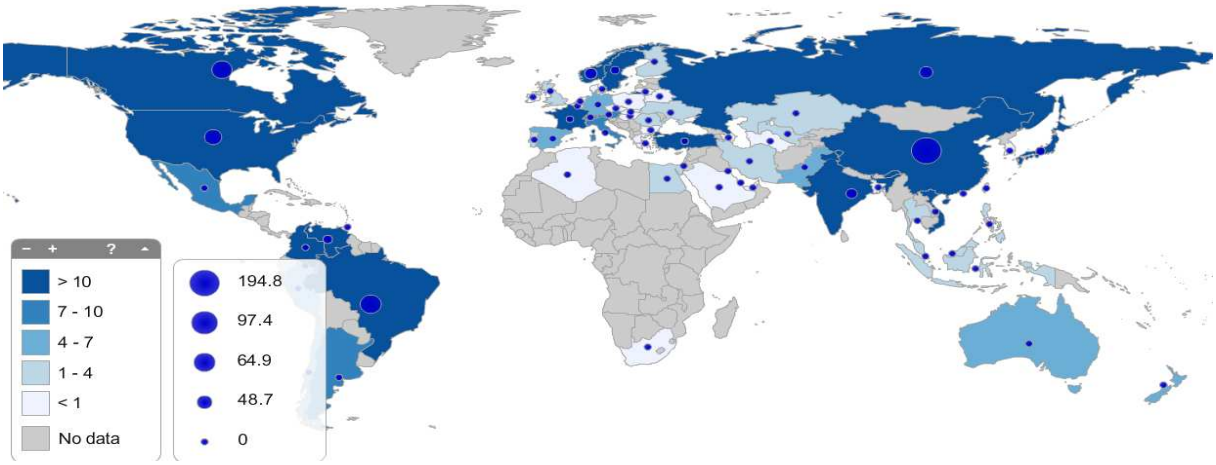
Nuclear consumption Europe

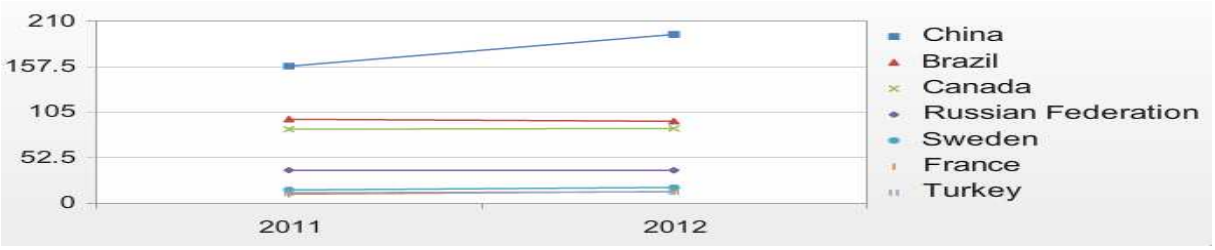


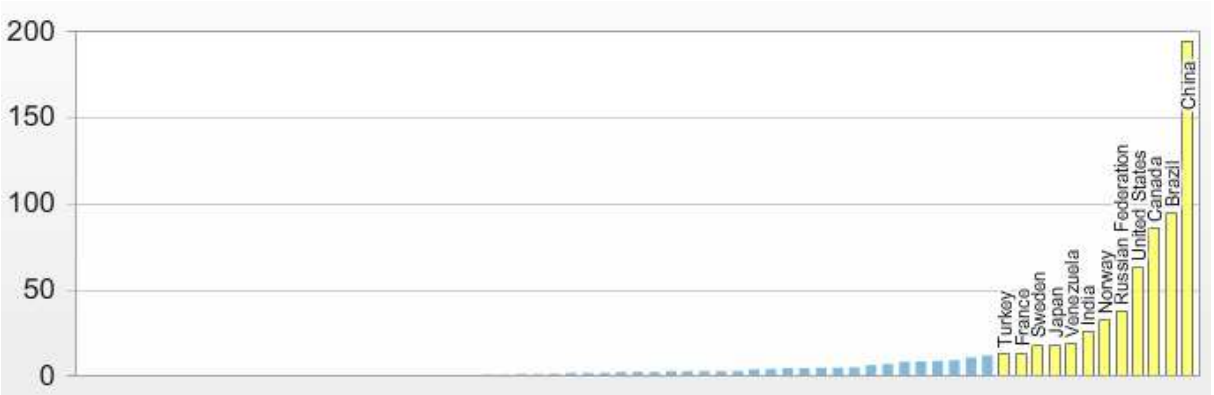


Total world consumption from hydro energy resources is 831 mil ton oil equivalents. The biggest producer is China 194 mil ton oil equivalent. After follows Brazil, Canada and USA.

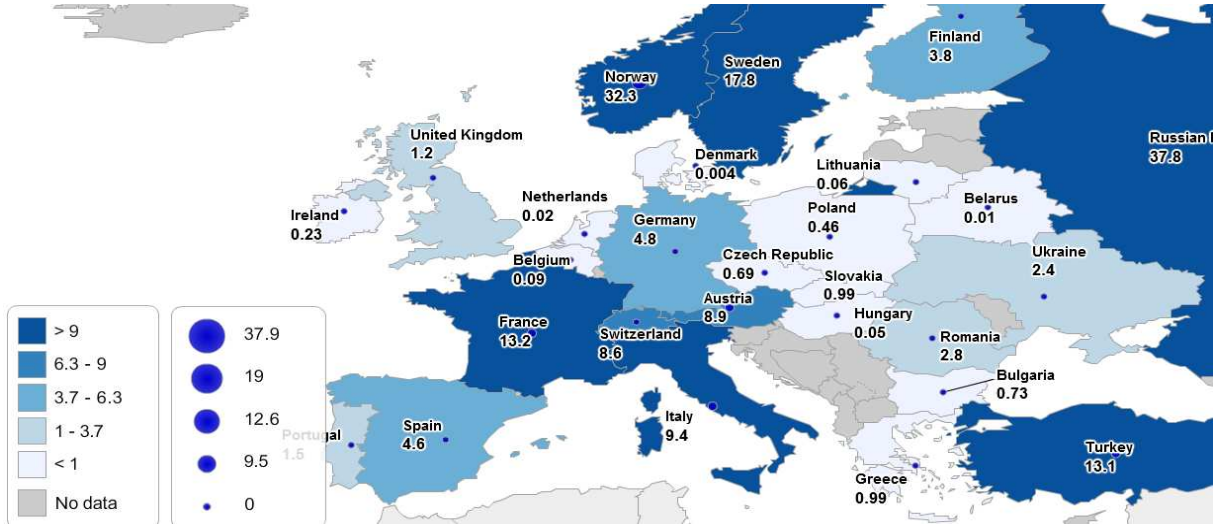
Consumption from hydro energy mil ton oil equivalent.

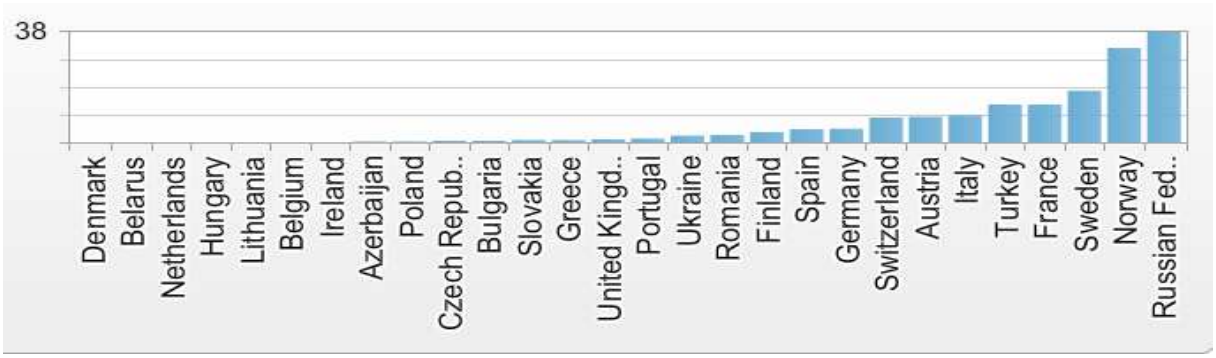






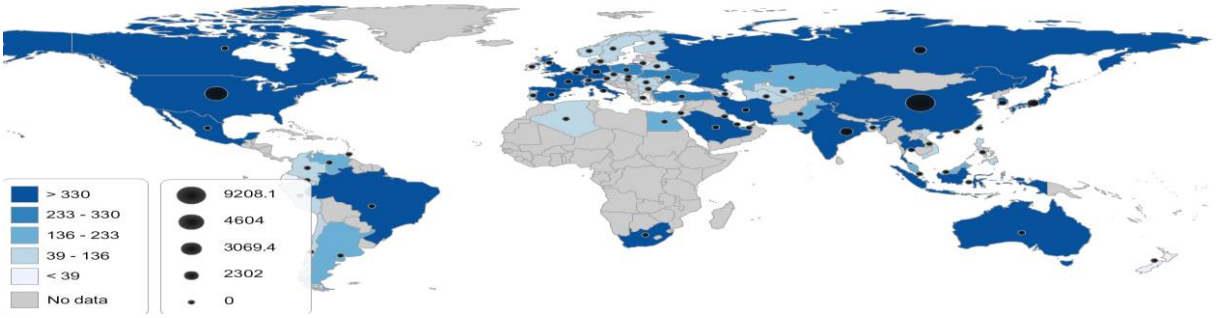
Area in Europe and Eurasia used in 2012 around 190 mil ton oil equivalent from hydroelectric sources. The biggest users are Russia 37,8 mil ton oil equivalent, Norway 32,3 mil ton oil equivalent, Sweden 17,8 mil ton oil equivalent, France 13,2 mil ton oil equiv.



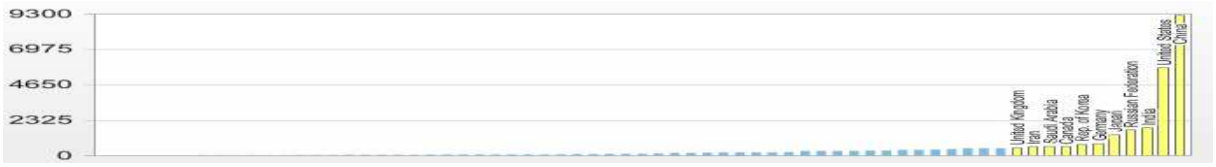


The big energy users from nonrenewable sources have the biggest increase in harmful gas emissions such as CO_2 gas. Total quantity of CO_2 that was released in 2012 was 34.466 mil ton. It is significant increase of 36% if compare with 2000 when was 25.300 mil ton CO_2 .The same increase in spending in primary energy was 33%.

CO_2 emission mil ton

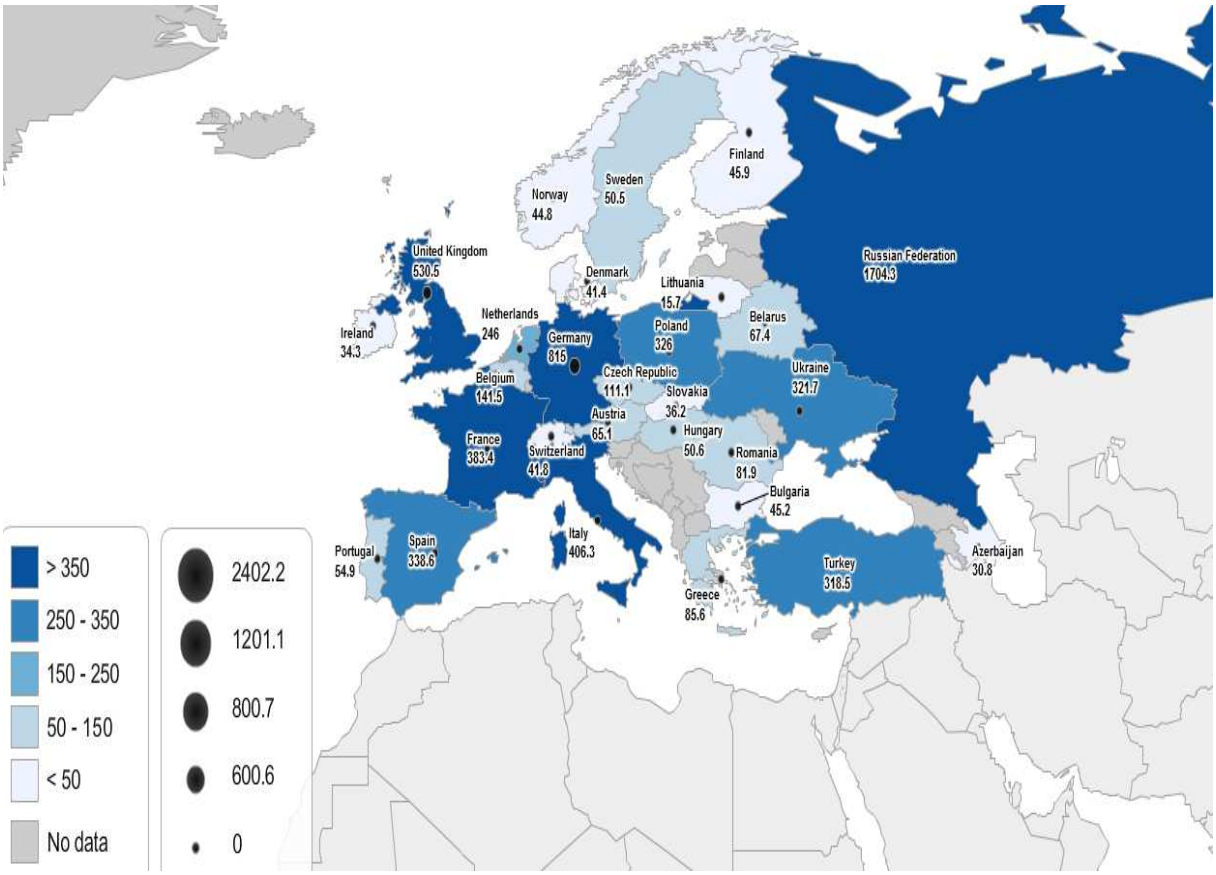


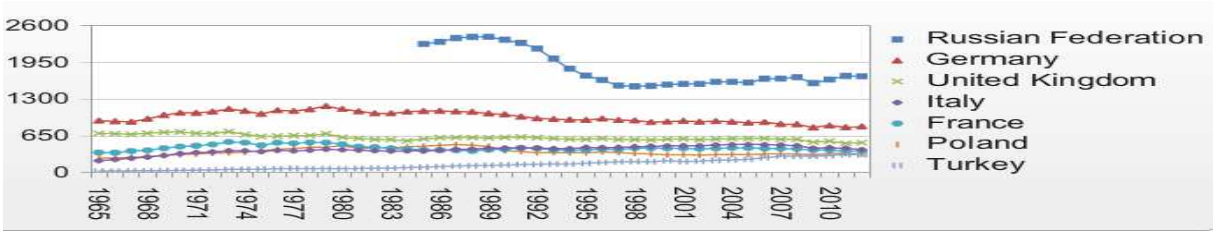
China had CO_2 emission of around 9.208 mil ton and USA 5.786 mil ton CO_2.



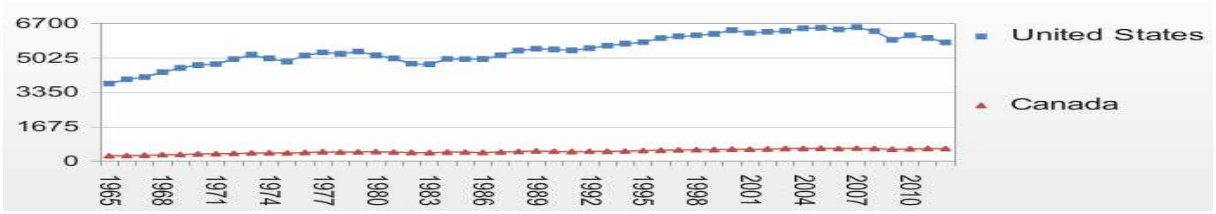
Emission CO_2 in Europe and Eurasia were 7.037 mil ton. The largest CO2 quantity were measured in Russia with 1.704 mil ton CO_2, after comes Germany 815 mil ton CO_2, Great Britain 530 mil ton CO_2.

Europa/Eurasia CO_2 mil ton

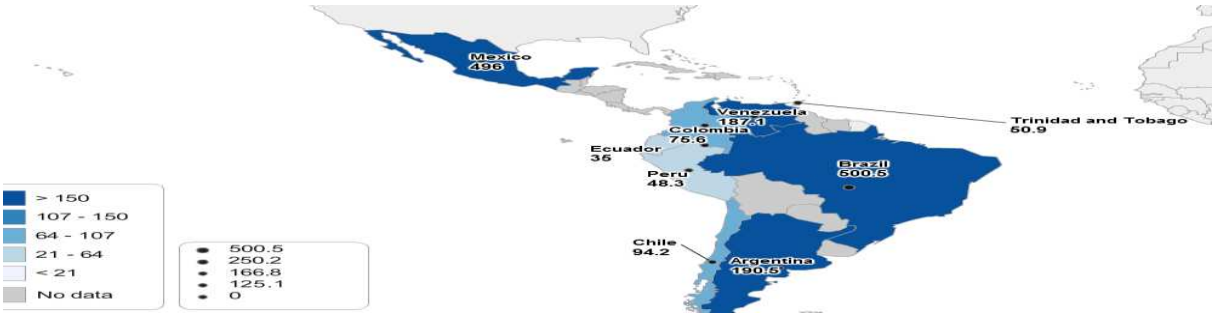


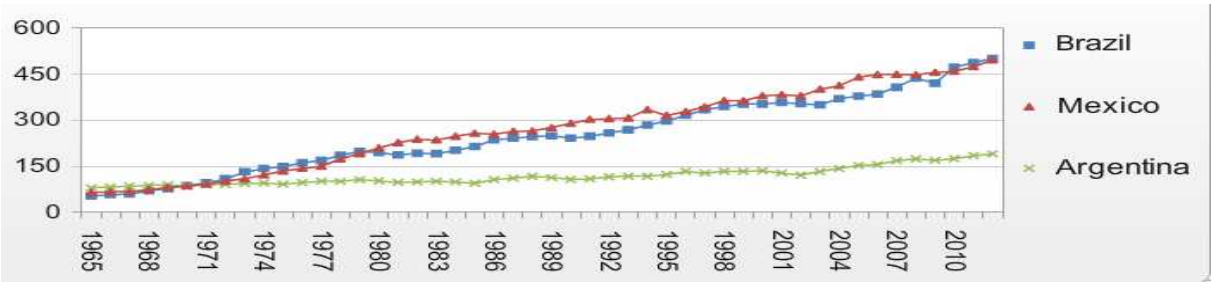


CO_2 emission that was released in 2012 were measured in Canada and USA and it was around 6.405 mil ton. Canada is much smaller CO_2 (9 times less) polluter than its neighbor.

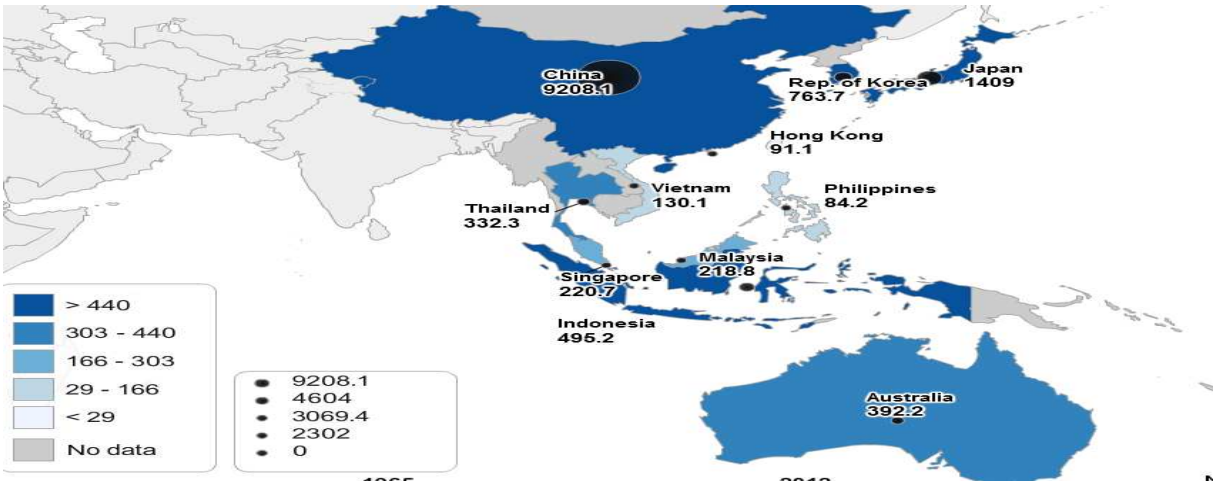


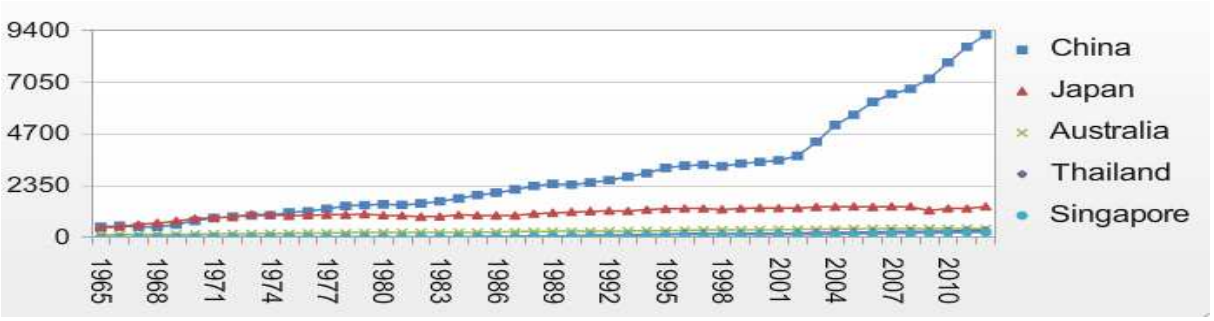
Middle and Southern America had around 1.884 mil ton CO_2 from which equally around 500 mil ton Mexico and Brazil.





Absolute and biggest polluter in harmful emission of CO_2 is area in Pacific/Asia that had in 2012 around 15.919 mil ton CO_2. China is the country that had a strong GDP growth in the last two decades and its industrial development and increased quantity of cars on roads is observed in data of CO_2 where in 2000 3.429 mil ton CO_2, and in 2012 9.208 mil ton CO_2.

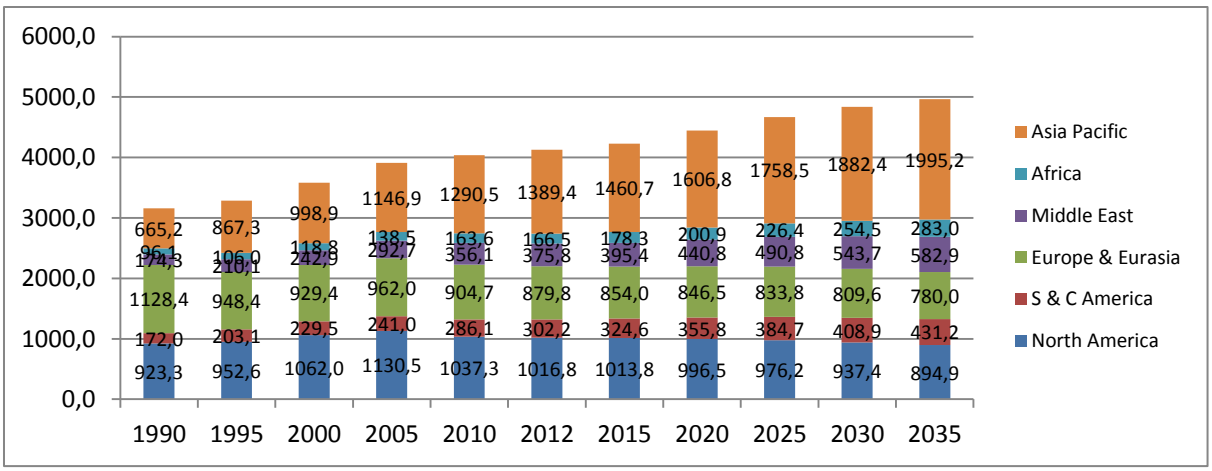




6. INCREASE OF SUPPLY (BP)

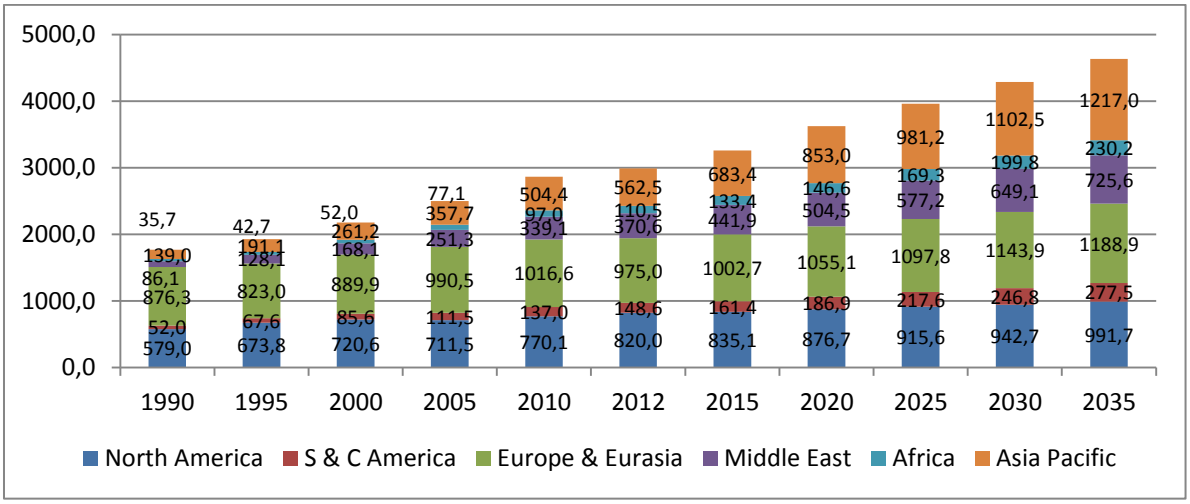
Institutes, energy companies, Government bodies, consumers and many other participants on market are trying to establish the best possible supply /demand structure in near future in order to increase its own energy pricing policy and contribute to efficiency. Although basis is current consumption, reserves, population growth, GDP/capita it is hard to establish right energy mixture as well as price that is going to be present in mid long term energy plan. Many analyst starts form current situation and have some base to observe future consumption. Usually they take into account population number, GDP/capita, current energy picture, new legislative, technology etc. This picture, in addition, can be added with some government interventions- taxes, credits- to certain technologies, advances that can came up from current research centers. Each analyst or institution has its own methods and it is possible that certain deviation occur. By following consumption history so far, BP analyst made certain forecast plans that stretches to 2035. They think that the biggest increase will come in the area of Asia and Pacific in respect of oil, and Europe will rely more heavily on gas in times that come. This short overview presents one point of view and calculation method.

Consumption oil /oil products mil ton 1990-2035 BP Oil consumption 1990-2035 BP



Picture 24

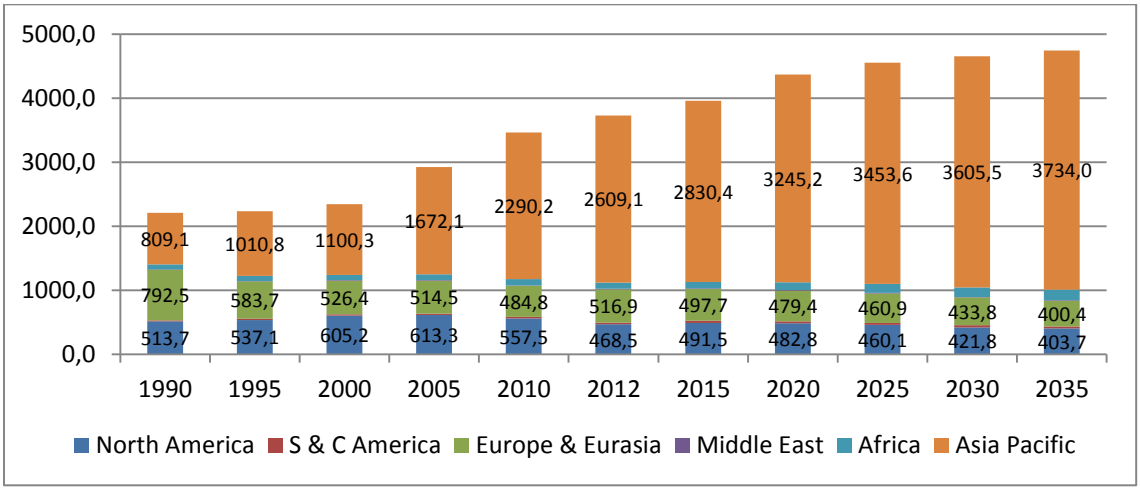
Gas consumption 1990-2035 mil ton oil equiv.



Picture 25

Asia and Pacific are still very much dependent upon coal - this trend is likely to stay according to some analyst. Further coal usage from 2.609 to 3.734 mil ton oil equivalent stresses this fact.

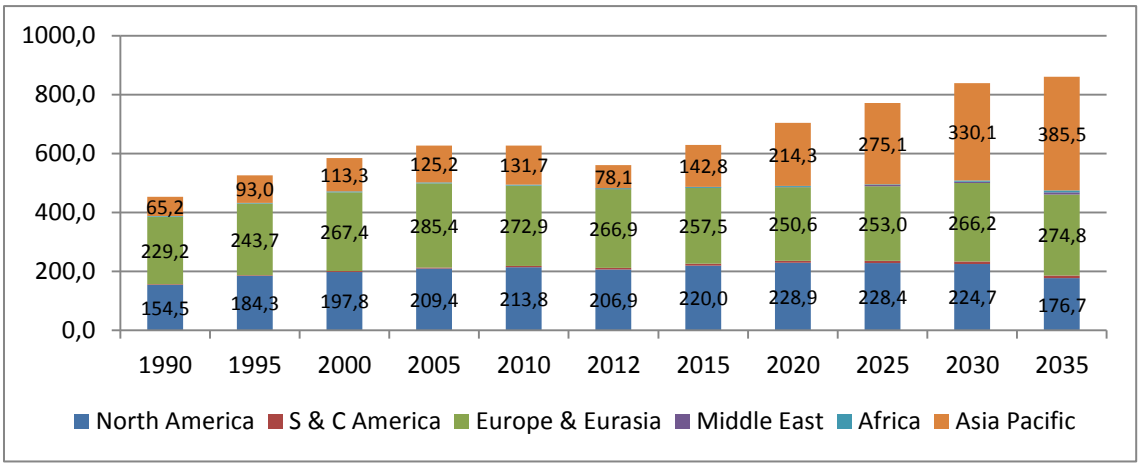
Coal consumption 1990-2035 mil ton oil equivalent.



Picture 26

Although NE is perceived as potential dangerous many countries still in its strategies have plans to build or invest in current nuclear energy capacity. It can be case for the region of Asia Pacific.

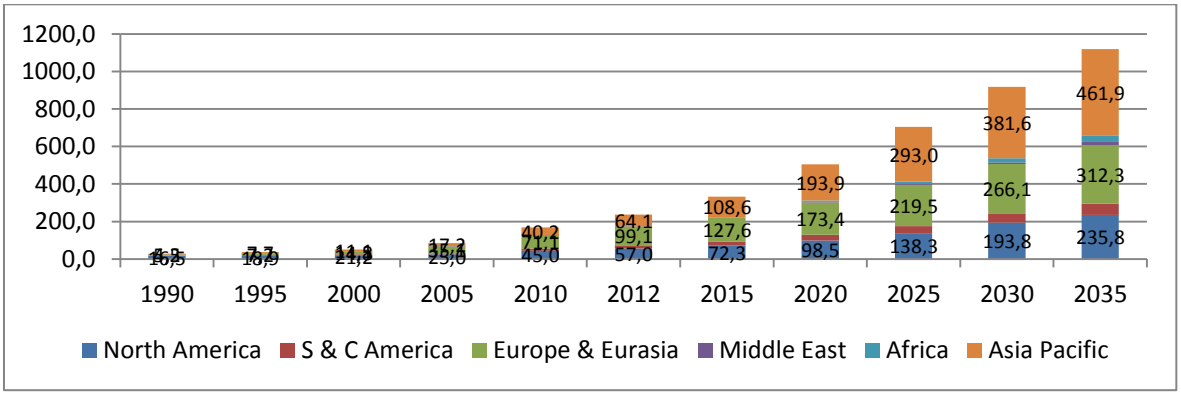
Consumption NE 1990-2035



Picture 27

The most significant feature is energy increase from renewables .While in 2000 it was less than 200 mil ton oil equivalent, in 2035 it is perceived to be around 1.500 mil ton oil equivalent on the world scale.

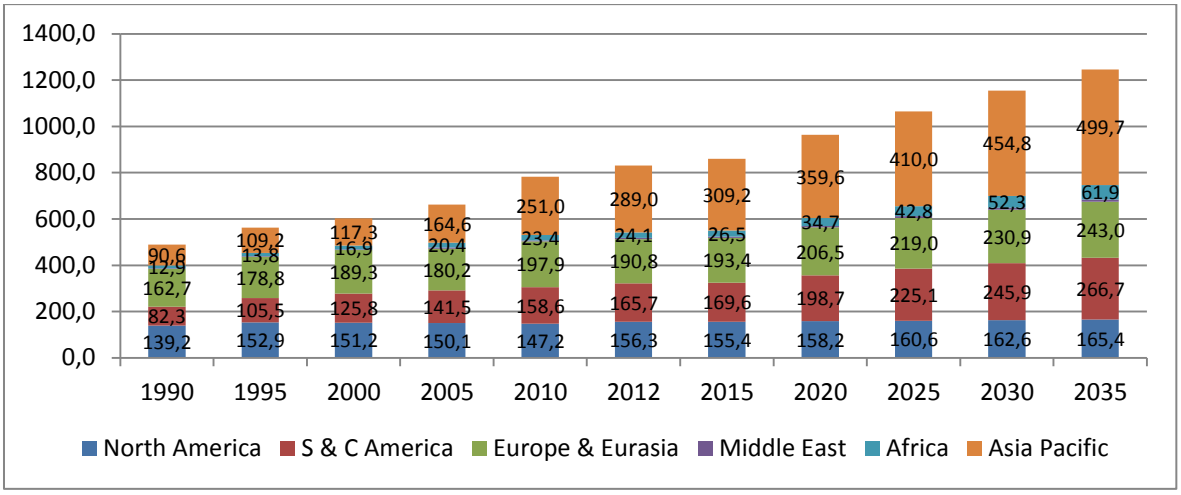
Total consumption of energy from renewable sources mil ton oil equivalent.



Picture 28

The most significant green resource comes from hydro energy and it further predicts growth from 800 mil ton oil equivalents in 2012 to 1200 mil ton oil equivalent in 2035.

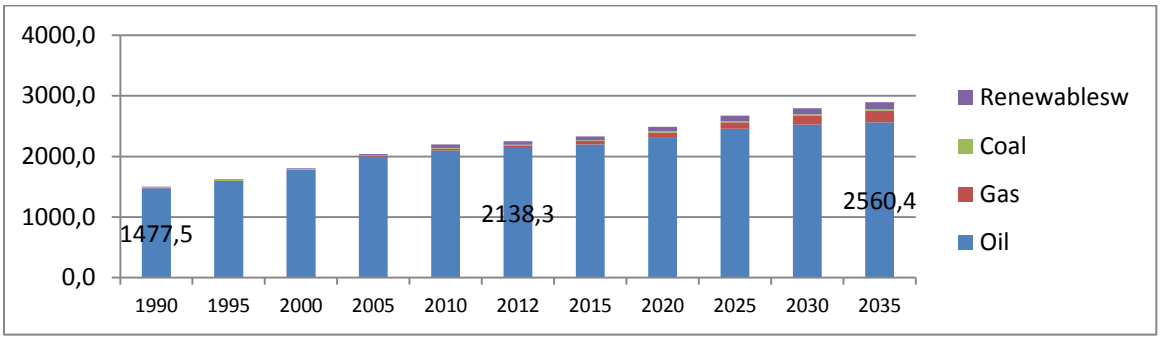
Total consumption of hydro energy 1990-2035, mil ton oil equivalent. 1990-2035



Picture 29

Oil is largely used in transport sector. With new technologies- electrical cars, hydro – it will decrease to certain extent its part in total used volume in period that comes.

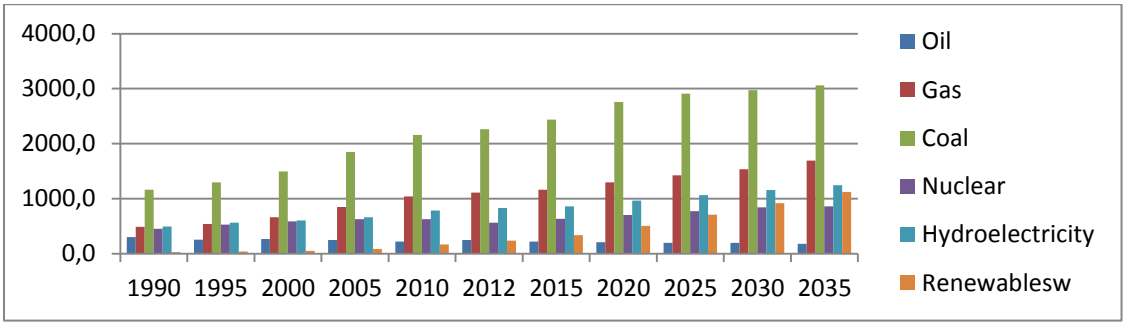
Consumption in transport sector



Picture 30

Electrical energy is produced using coal in Asia and this trend is likely to continue.

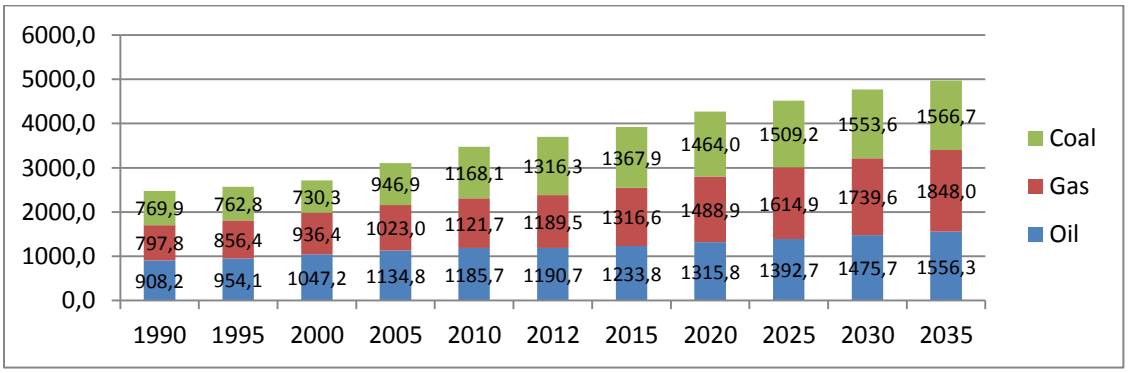
Electrical energy production –inputs 1990-2035



Picture 31

Industry is further heavily relied on coal, oil and gas and it needs grows from 400-5000 mil ton oil equivalent.

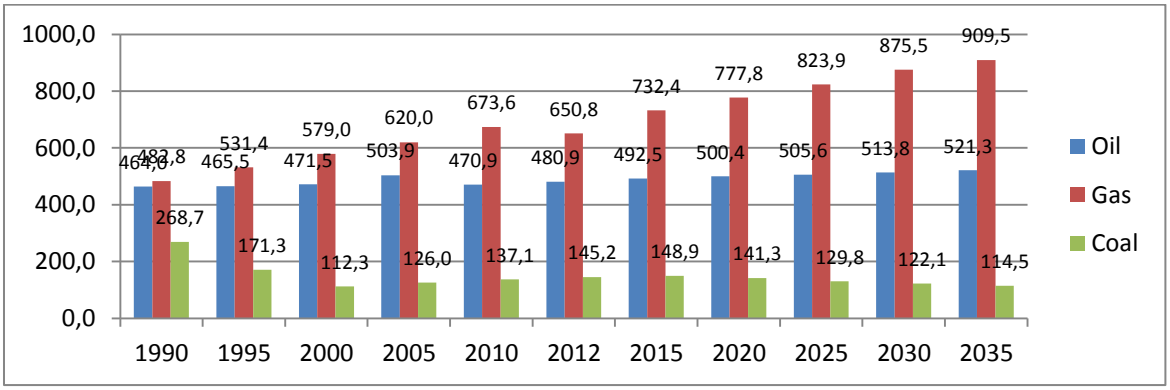
Energy consumption industry



Picture 32

Other sectors – households, heating, other- is based on consumption that grows from to 650-909 in observed period.

Consumption in order sectors

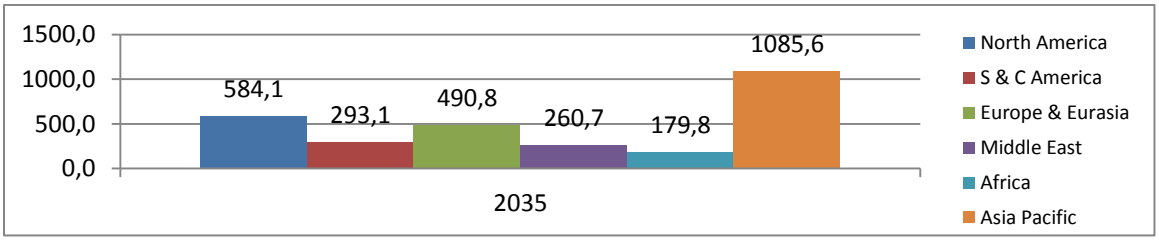


Picture 33

In the last observed period in year 2035 we can conclude that in the transport sector the biggest consumption is in area of Asia Pacific and almost half less in Northern America.

Transport sector will spend the most energy inputs in Asia Pacific region in times that come.

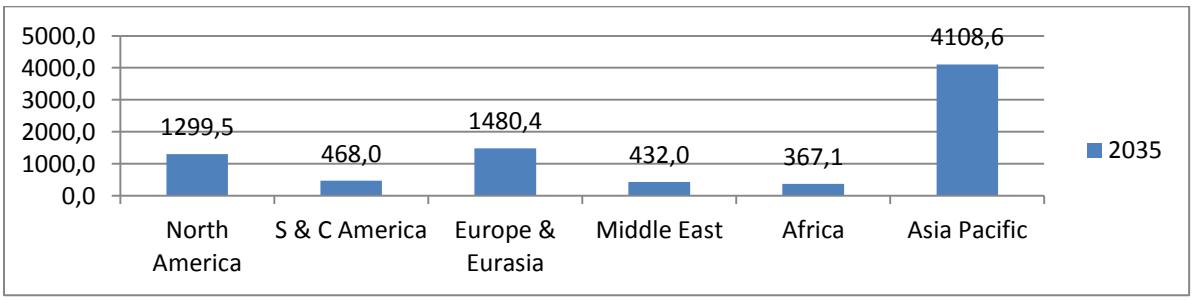
Consumption in transport sector BP forecast 2035 mil ton oil equivalent



Picture 34

Similar situation is observed for consumption of electrical energy (4108/1299 Asia/North America) for production and consumption of electrical energy with significant difference in usage between North America and Asia.

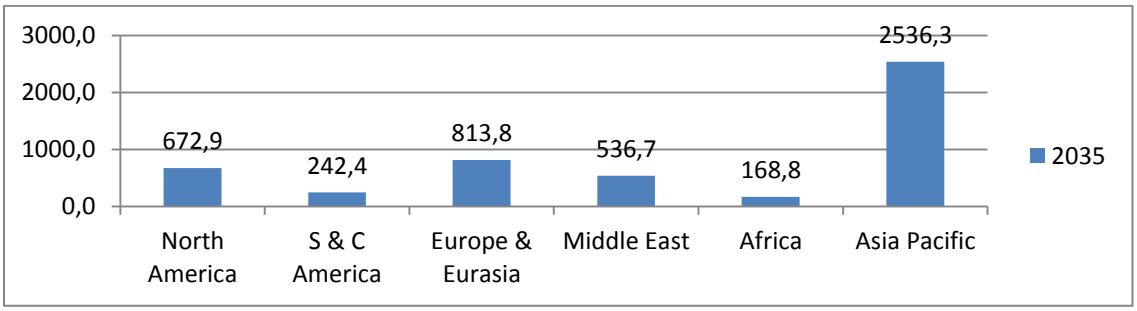
Electrical energy production mil ton oil equivalent.



Picture 35

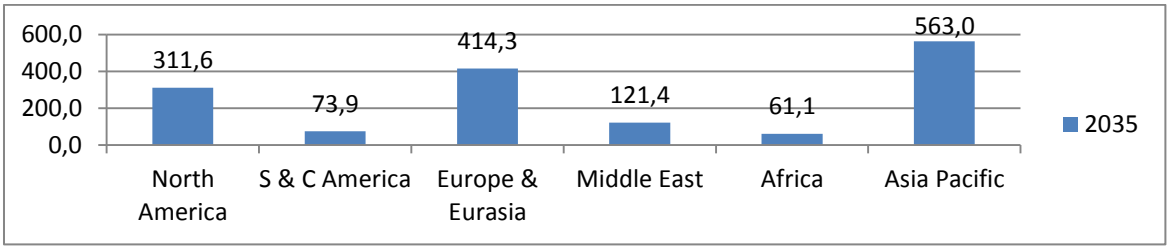
The same situation is visible for industry consumption almost 3,7 times more is forecasted to be used in Asia Pacific 2536/ 672 than in North America.

Energy consumption in industry mil ton oil equivalent.



Picture 36

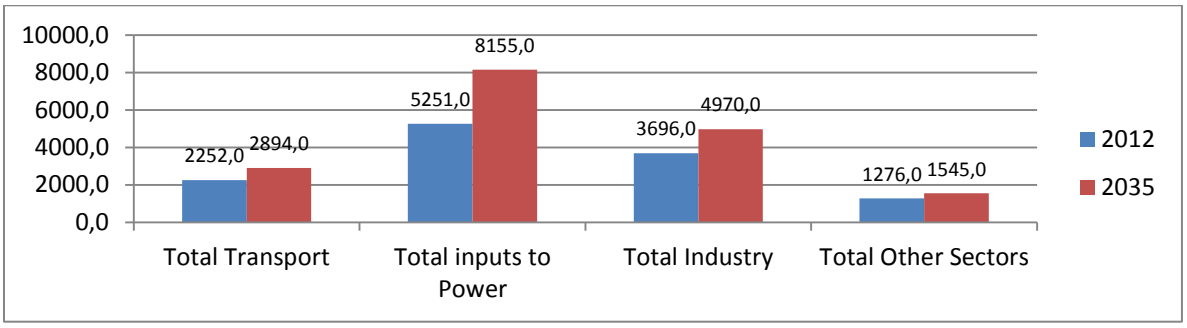
Consumption other sectors mil ton oil equivalent.



Picture 37

Total energy consumption is highest in the sector that is engaged in electrical energy production and this can further increase its share from 5251/8155)

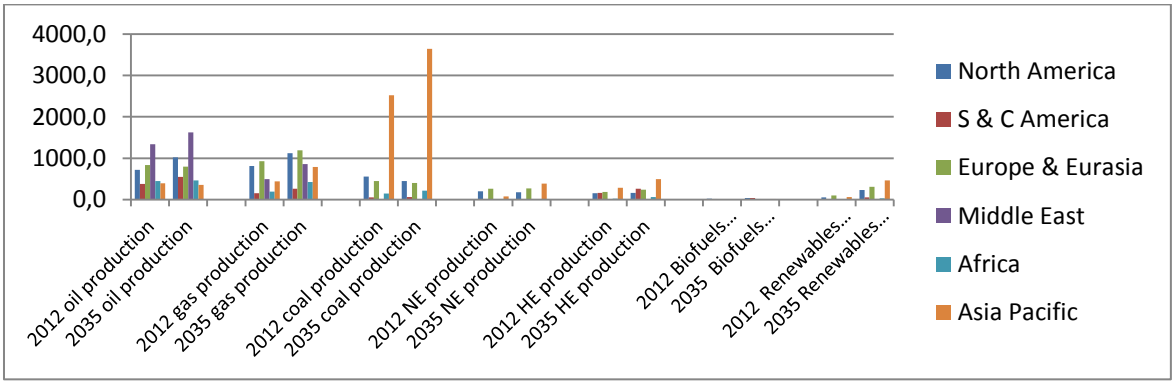
Total consumption 2012, 2035 BP forecast in mil ton oil equivalent.



Picture 38

The main fact to conclude is further coal share in total energy usage and further plans to increase coal consumption not just in Asia Pacific but worldwide.

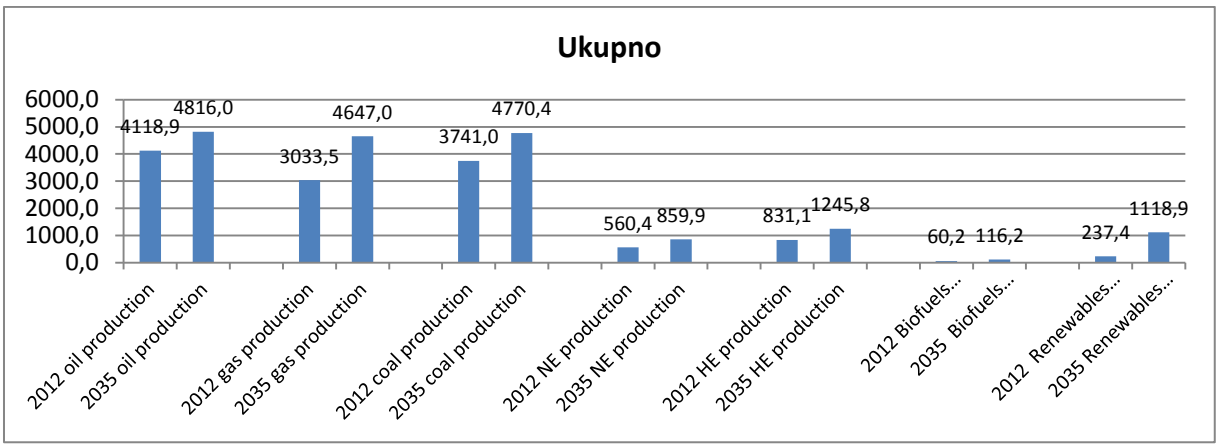
Production 2012/2035 mil ton oil equivalent. 2012/2035



Picture 39

The biggest jump in production will be made in area of renewable resources in period 2035/2012.

Production Total: 2012/2035 mil ton oil equivalent.



Picture 40

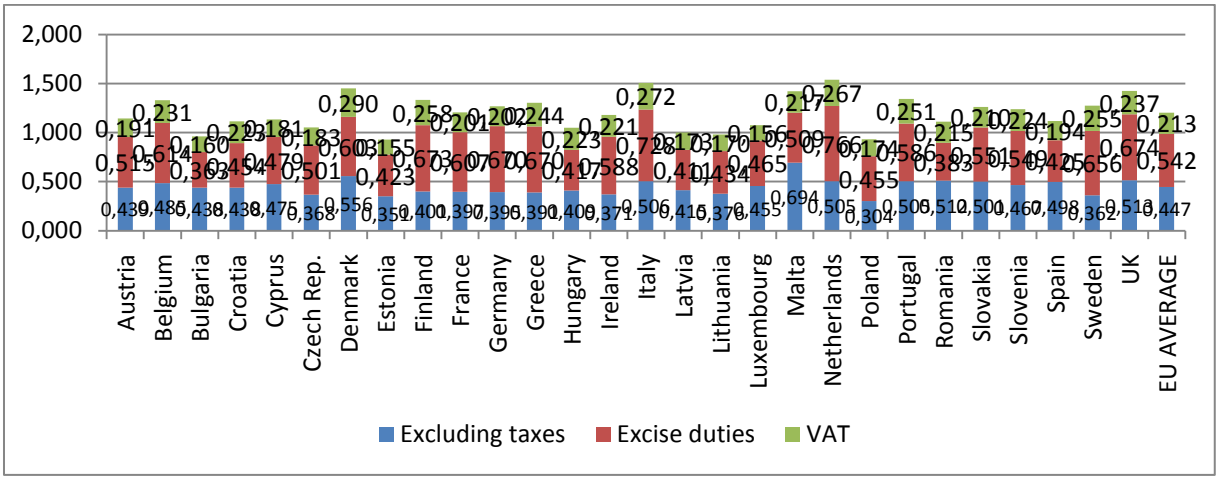
7.CONSCLUSION PART 1

Energy reserves, consumption and production are important part of human , industrial developments, quality of life, transport possibilities, variety of possibilities and are strong base for further GDP growth. Different energy resources are possible to be components in total energy structure and many developed region tends to diversify not just energy source but ways of transport. In total picture oil is still one of the most important energy sources today. What is further to note is future rise of renewables, diversification of all energy sources and constant trend of energy efficiency, innovative techniques connected with energy sources. Having said that it is also to be noted that increase is not going to happen linear in all countries, even areas, not by step by step approach and sometimes inefficient decision process is present in the countries with the highest GDP. What is clear since now is that richness of energy rich areas or potential fields for renewables is not enough for the energy to be implemented on the best possible way and to gain the end result as expected. Renewables are developing in the countries with the highest GDP , are connected with technological advances as well and price competitiveness.

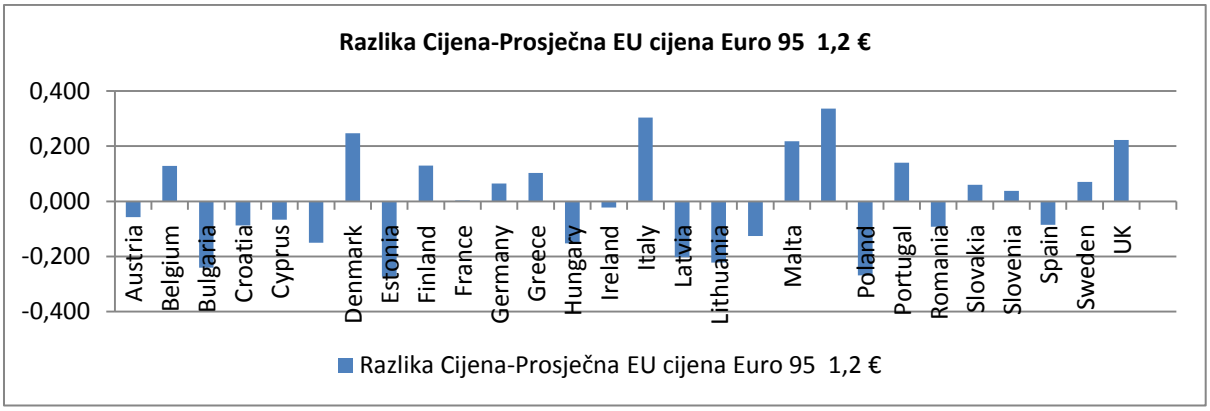
Very long and linear increase of oil prices was observed from 1900 till mid 2000 but since that period it has shown some un cyclical elements like 2012/2013 strong increase till 130 $/barrel and few years later drop to 45 $/barrel. This is explained partly by increased supply, price war between countries that supply and market that do not have its own energy sources but are buyers, and consequences of the world crises in 2008. It is to expected further small increase in oil price in decades that come.

End price of oil products diesel benzene is observed by buyers and incorporates besides oil price taxes, and country policy toward other energy issues such as State or Compulsory storage activities. In Europe the highest price is observed in countries such as Norway and Denmark that do have its own natural resources, but have the highest tax around 0,72€/liter. Poland, Estonia and Bulgaria have the lowest tax of about 0, 4€/liter.

Euro 95 price 2015



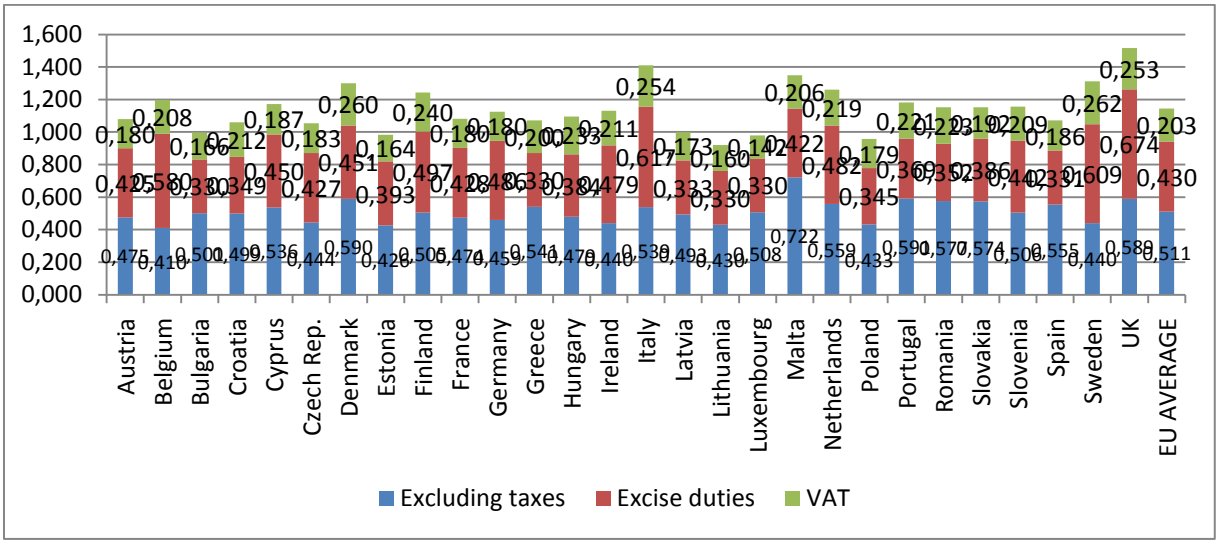
Picture 41



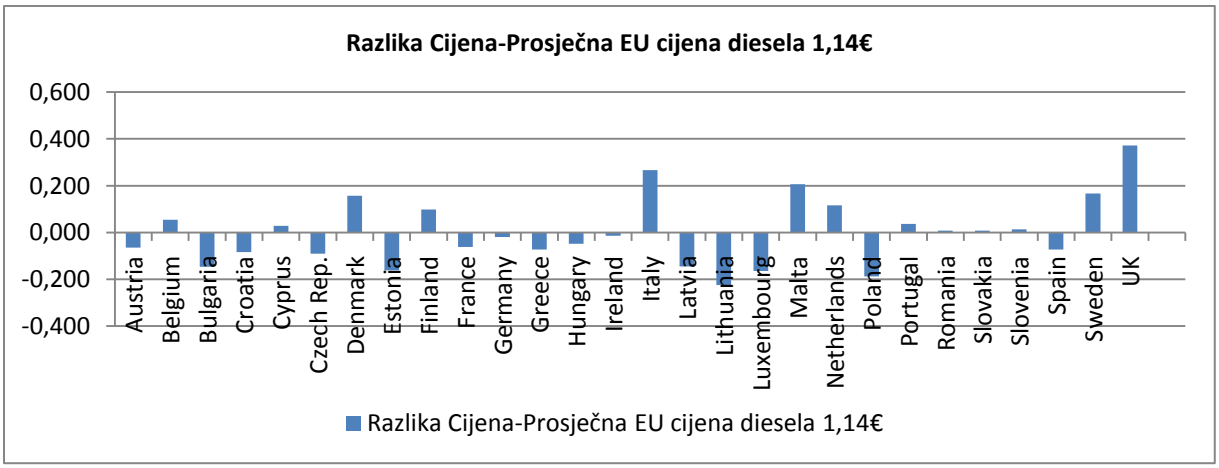
Picture 42

Although diesel is more competitive if compared with benzene its end price is also dependent upon tax policy and end market. The most expensive is in UK over 1, 4 €/liter and that country has the special tax of about 0,674/l. It is more expensive than average in Italy, Denmark, Malta. Countries that have somewhat better price are Litva, Poland, Estonia and Bulgaria.

Price diesel 30 January 2015



Picture 43



Picture 44

In this complex structure of market, tax policy and diversification the latest accent is put on harmful emission gases, new technologies, and plans about future demand supply structure of the world and specific markets that incorporates diverse energy input mix in all aspects of human actions.

B AUSTRIA GENERAL DATA

1. Austria in general
2. Neighboring Countries Data
3. Potentials

1. Austria in general

When thinking about energy potentials of certain region and consider possible plans for future energy structure it is of a high importance to compere its main characteristics to other countries. In this way basic trends in demand and supply of each energy carrier in country and in region is observed and establish possible trade, legislative connections (EU framework/or not) or to determine is there any possible environmental security risk from the neighboring countries.

Austria can be compared – if looking at population data– with Switzerland, Hungary, Czech and Slovak, and it is outnumbered by Germany (81 mil) and Italy (61 mil people). Although it has GDP more favorable than its eastern neighbors it is still dependent on energy import more than these eastern area countries. Austria uses more than average electrical consumption MWh/capita and significantly jumps ahead in that respect if we look at all observed countries. Further increase in energy structure can be related to population growth, GDP growth and industrial plans, possible export of energy. Also it is possible to consider some export potentials for the countries that have out of date energy structure, plans to increase electrical usage but do not have its own resources, to increase green share in electrical picture of each country and contribute with new technological advances in region or plan to reduce NE capacity.

Table 7: Basic data Austria neighboring Countries

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
Population (millions)	5,41	10,51	2,06	81,92	9,92	7,93	60,91	8,43
GDP (bill USD)	63,11	149,64	38,25	3.073,86	108,94	439,80	1.729,86	337,69
GDP PPP (bill 2005USD)	114,81	250,41	50,29	2.851,34	169,08	314,23	1.605,06	306,34
Energy production (M toe)	6,45	32,64	3,56	123,38	10,58	12,73	31,86	12,80
Net imports (M toe)	10,12	10,81	3,64	199,56	12,43	14,59	132,60	21,57

TPES (M toe)	16,65	42,65	7,00	312,53	23,47	25,61	158,80	33,11
Electrical consumption TWh	27,78	66,27	13,94	584,71	38,87	63,06	321,38	71,72
CO_2 (Mt CO_2)	31,88	107,77	14,63	755,27	43,56	41,26	374,77	64,73
TPES/popul (toe/capita)	3,08	4,06	3,40	3,82	2,37	3,23	2,61	3,93
TPES/GDP (toe/th 2005USD)	0,26	0,29	0,18	0,10	0,22	0,06	0,09	0,10
Tpes/GDP PPP (toe/th 2005 USD)	0,15	0,17	0,14	0,11	0,14	0,08	0,10	0,11
Elec consumption/popul (MWh/capita)	5,14	6,31	6,78	7,14	3,92	7,95	5,28	8,51
CO_2/TPES (t CO_2/ toe)	1,91	2,53	2,09	2,42	1,86	1,61	2,36	1,96
CO_2/population (t CO_2/ capita)	5,90	10,25	7,11	9,22	4,39	5,20	6,15	7,68
CO_2/GDP (kg CO_2/ 2005 USD)	0,51	0,72	0,38	0,25	0,40	0,09	0,22	0,19
CO_2/ GDP PPP (kg CO_2/2005 USD)	0,28	0,43	0,29	0,26	0,26	0,13	0,23	0,21

Source:IEA.org

Austria consumes the most electrical energy in the region if compared with the countries with similar number of people. In absolute value the biggest electricity consumers are Germany 584 TWh and Italy 321 TWh. It is also net energy importer as the majority of EU countries is.

Table 8: Elec consum TWh, Net imports Mrie

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
Electr consum TWh	27,78	66,27	13,94	584,71	38,87	63,06	321,38	71,72
TPES/popul (toe/capita)	3,08	4,06	3,40	3,82	2,37	3,23	2,61	3,93
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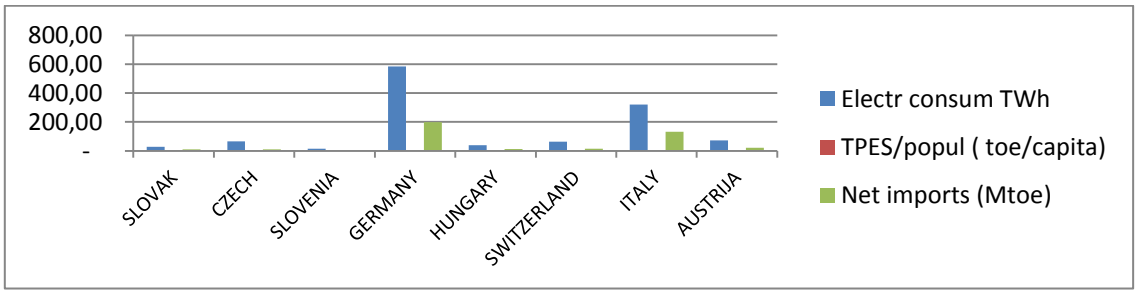
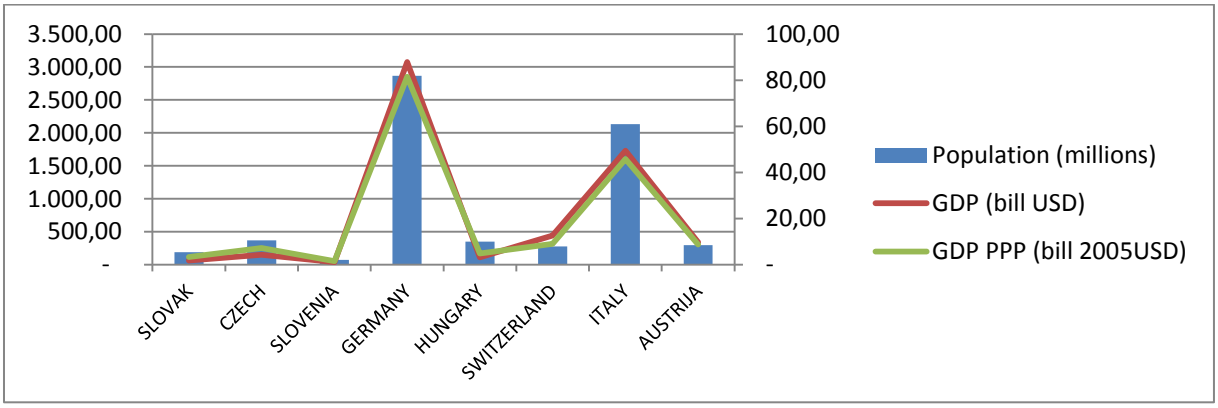


Picture 45

Curranty favorable GDP advances over eastern neighbors can further help to develop and diversify energy picture that is not just pointed toward country itself but can assure energy security for the future in region. Austria GDP potential is enough to build infrastructure for energy export for the region, think about technological cooperation with more advanced countries such as Germany or Switzerland, or make transport diversification with southern neighbors such as Italy.

Table 9: Population, GDP

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
Population (mill	5,41	10,51	2,06	81,92	9,92	7,93	60,91	8,43
GDP (bill USD)	63,11	149,64	38,25	3.073,86	108,94	439,80	1.729,86	337,69
GDP PPP (bill 20	114,81	250,41	50,29	2.851,34	169,08	314,23	1.605,06	306,34



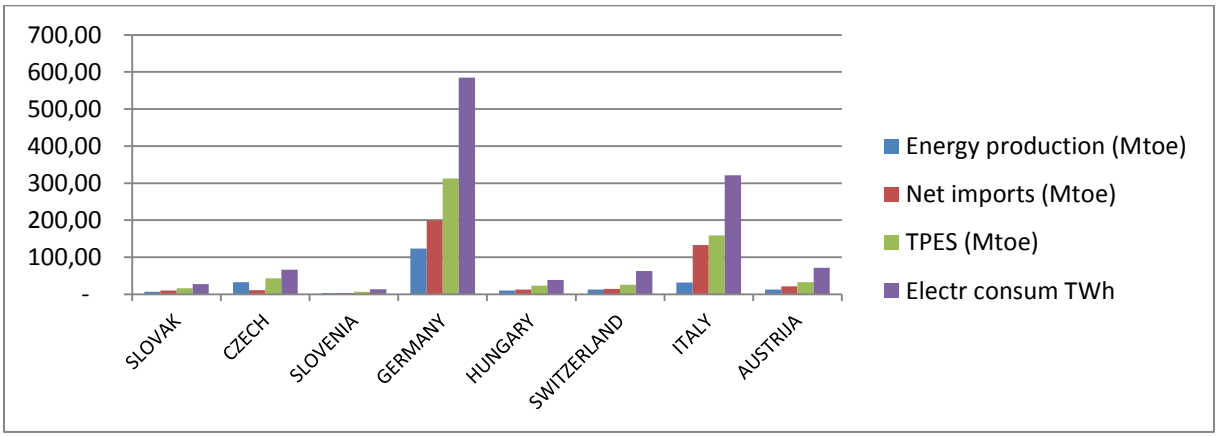
Picture 46

Current large electricity consumption is a clear signal of very well developed energy and electricity production and distribution facilities as it is expected in the area of Central Europe. Further in devours are pointed toward renewable increase and many aspects of energy efficiency measures (ISO 15001, social policy, government decision, legislative acts, diversification, ways of new income etc.).

What is observed in the table that follows is the largest energy consumption in Germany that is produced 39% in country and 61% came from import. Half of that consumption is needed in Italy but with different import structure where 83% of its energy needs came from abroad. Austria produces around 12,8 Mtoe what is also only 37% of its energy needs and is dependent –mostly oil- on import possibilities. When comparing the whole region it is visible that only Czech has lower import energy structure where total energy needs are substituted with only 23% that came from import.

Table 10: Energy production, TPES

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
Energy production (Mtoe)	6,45	32,64	3,56	123,38	10,58	12,73	31,86	12,80
Net imports (Mtoe)	10,12	10,81	3,64	199,56	12,43	14,59	132,60	21,57
TPES (Mtoe)	16,65	42,65	7,00	312,53	23,47	25,61	158,80	33,11
Electr consum TWh	27,78	66,27	13,94	584,71	38,87	63,06	321,38	71,72



Picture 47

Large dependency on energy import in the whole central regional of Europe can further leads us to following: to look closely to import good (what kind of energy good) ,to see if current energy production is in line with long term EU/Country policy aims, and possibilities to increase domestic production and decrease import.

Import is by far the largest and the most significant by oil and current production is still strongly present in the nuclear energy. Oil can be substituted partly with biofuel , gas and different strategy in transport industry –electric cars, gas, hydro- while nuclear energy policy fluctuates between plans of nuclear facilities closure (Germany), and different possibilities of substituting it with wind, hydro energy etc.

Table 11: Energy production,Net import Mtoe

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
Energy production (Mtoe)	6,45	32,64	3,56	123,38	10,58	12,73	31,86	12,80
Net imports (Mtoe)	10,12	10,81	3,64	199,56	12,43	14,59	132,60	21,57
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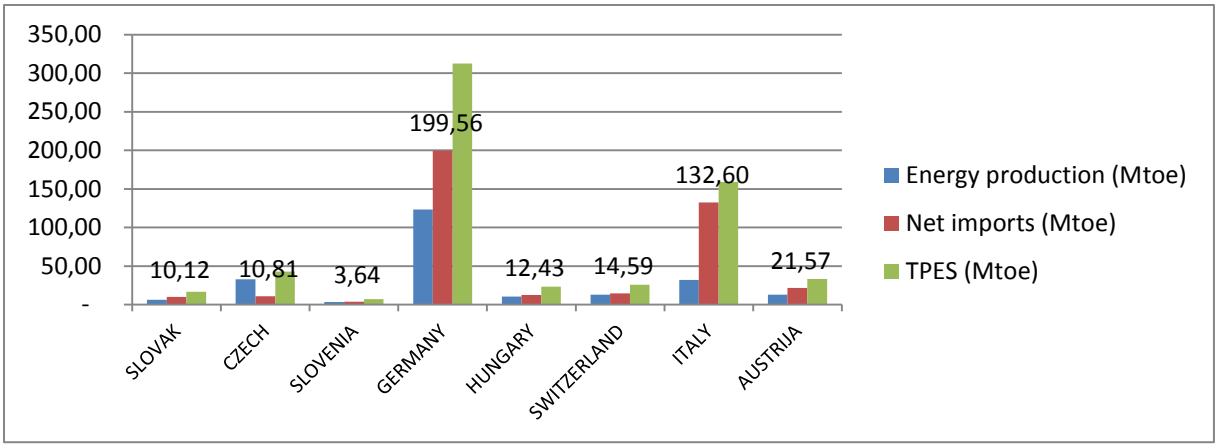
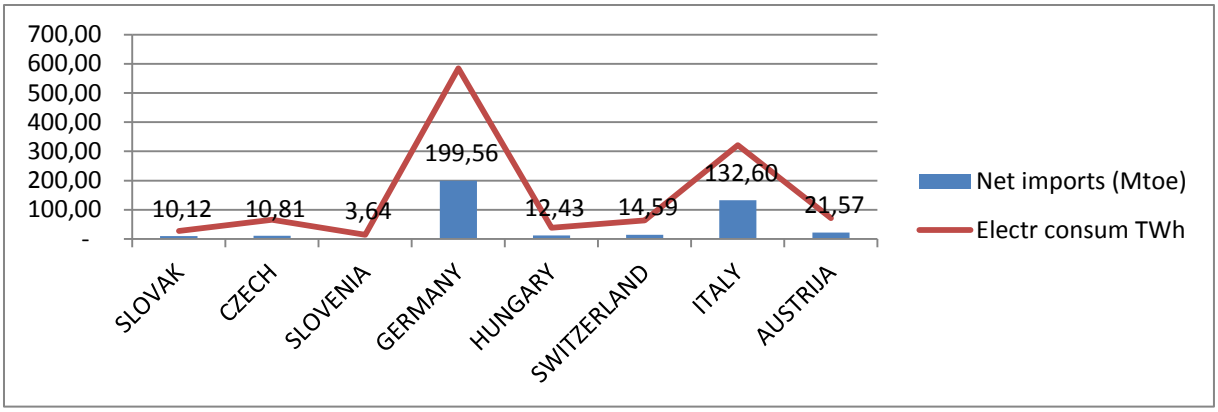


Picture 48

Large import dependency on certain energy carriers and further aims of GDP growth, energy consumption can bring not just the energy diversification strategy in country but develop different strategies of cooperation in the region. More educative meetings, cooperation between different industries in making end product, Government policies that lead to common goal are just the first steps. All countries are members of EU energy strategy and need to comply with its policy to reach common goal that is the most visible in famous 20 20 20 strategy. But what is important to stress here is that energy is to some extent bounded to regional production- due to transport losses and possibilities and in that respect regional policy is valued in this kind of good production and distribution. When considering oil new transport strategies need to be raised not juts locally but globally, but in electrical type of industry we can develop different measures such as: energy efficiency, electricity trading sports to trade and buy/sell cheapest good, to incorporate different strategies of end price depending of input in production (came from coal, hydro energy, wind, etc.), setting up pricing policies that are common to all in region (without tax on import, etc.), having transparent measurement policy in the region (winter/summer difference –transparent) etc.

Table 12: Net imports, Electr consum TWh

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
Net imports (Mtoe)	10,12	10,81	3,64	199,56	12,43	14,59	132,60	21,57
Electr consum TWh	27,78	66,27	13,94	584,71	38,87	63,06	321,38	71,72

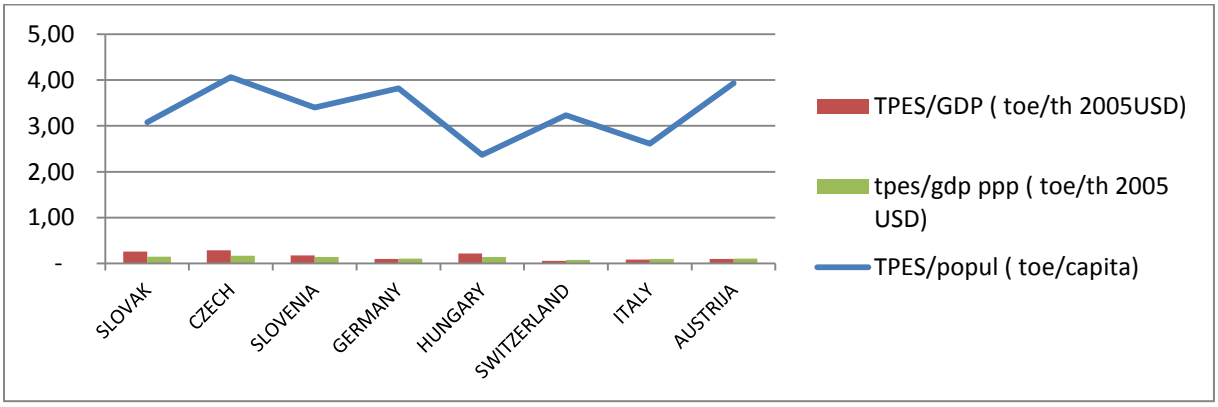


Picture 49

With the GDP rise , energy usage increases and Austria significant TPES/capita can further point toward questions of energy efficiency, transparency, possibilities to change supplier, possibilities to invest in certain part of standard or new technologies, difference between sectors in end usage price and opportunities, bills on which is visible part of each energy source, import or domestic part, etc. many questions are in area of social engineering, but they further bust and bring new infrastructure facilities, current usage and potentials for end users to become more transparent, choose between choices on market based decisions available to each end consumer.(price, domestic, jobs related, new technology potentials, environment friendly etc.)

Table 13: TPES/population

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
TPES/popul (toe/capita)	3,08	4,06	3,40	3,82	2,37	3,23	2,61	3,93
TPES/GDP (toe/th 2005US	0,26	0,29	0,18	0,10	0,22	0,06	0,09	0,10
tpes/gdp ppp (toe/th 200	0,15	0,17	0,14	0,11	0,14	0,08	0,10	0,11



Picture 50

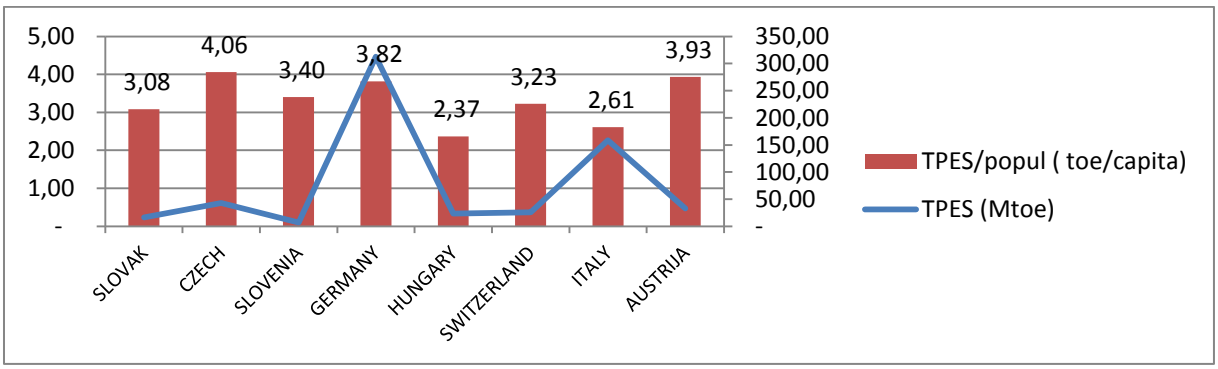
Question of nuclear facilities rises and diminishes frequently and are burdened with level of security in production, left overs or hazardous waste storage , very large investment

that are needed in order for this type of energy to be substituted with clean resources etc. Austria and Italy are the only countries in the region that tries to develop its energy strategies without nuclear plans. Further to note is that as neighboring countries they suffer from negative consequences if some failure / accident arise. In that respect Austria has certain passive right to have more than average and publicly known data about NE business, and can in that respect some negotiating strategy by selling its renewable potentials. Also it is possible on EU level to discuss gains/treats that are visible in active and passive formed and to give certain rights to those who are not the users of energy but can bear negative consequences of certain policies. Some countries –such as Slovenia and Germany – have publicly announce strategy to close nuclear energy plant or to limit work on certain period of time (till a year is allowed to work) and this represent a chance for hydroelectricity, wind etc. strategy in Austria.

Slovak has a lower than expected TPES (Mil. ton) and part of it comes from nuclear technology. In that respect this can present a chance for Austria in exporting part of electrical energy (clean energy from hydroelectricity) but much other potential can be also implemented. Czech is also dependent upon nuclear energy and in that respect Austria can determine level of security, danger potentials, certain measures to implement in business, require more frequent controls, be part of exchange program (allow nuclear but with level of present in market in other sectors – transport etc.) . When looking at Hungary certain exchange of resource can be made- import left overs of agro production and in that way exported energy; in relation with Italy Austria can consider hydroelectricity export, and Germany is very well supplied and work on energy strategy but exchange of technology and tech parks is a way for further advances.

Table 14: TPES (Mtoe)

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
TPES (Mtoe)	16,65	42,65	7,00	312,53	23,47	25,61	158,80	33,11
TPES/popul (toe/capita)	3,08	4,06	3,40	3,82	2,37	3,23	2,61	3,93



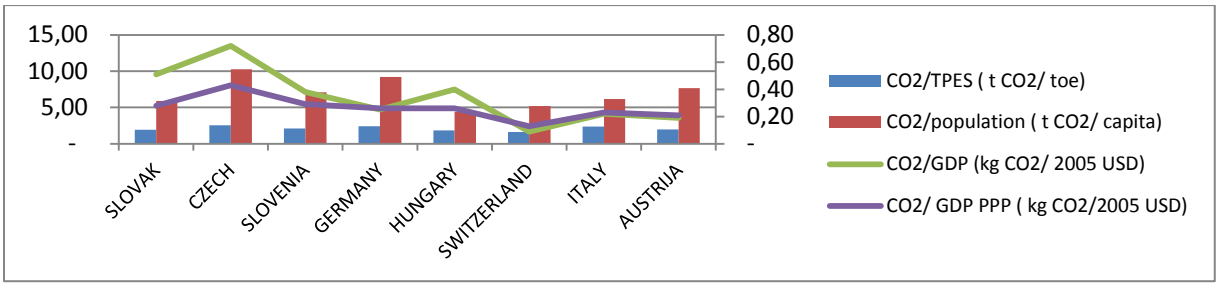
Picture 51

More and more rigorous environmental rules, CO_2 emissions that are subject to measurement, fines and constant lowering standards, dangers that can come with increased CO_2 on vulnerable environment such as is present in mountains, snow areas of Austria, level of dependence between snow days – tourism potentials, number of tourist arrivals- car quality, and damage that can be made in mountains areas are further ways to look into.

In that respect country can provide: new and clean technology, infrastructure related to transport, social engineering by different types of tax relief, offers in tourism for those who uses environmentally friendly cars etc.

Table 15: CO_2

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
CO2/TPES (t CO2/ toe)	1,91	2,53	2,09	2,42	1,86	1,61	2,36	1,96
CO2/population (t CO2/ capita)	5,90	10,25	7,11	9,22	4,39	5,20	6,15	7,68
CO2/GDP (kg CO2/ 2005 USD)	0,51	0,72	0,38	0,25	0,40	0,09	0,22	0,19
CO2/ GDP PPP (kg CO2/2005 USD)	0,28	0,43	0,29	0,26	0,26	0,13	0,23	0,21

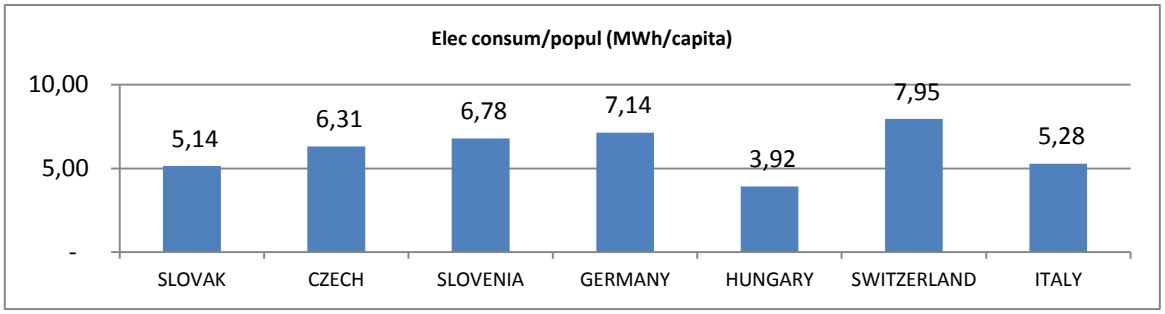


Picture 52

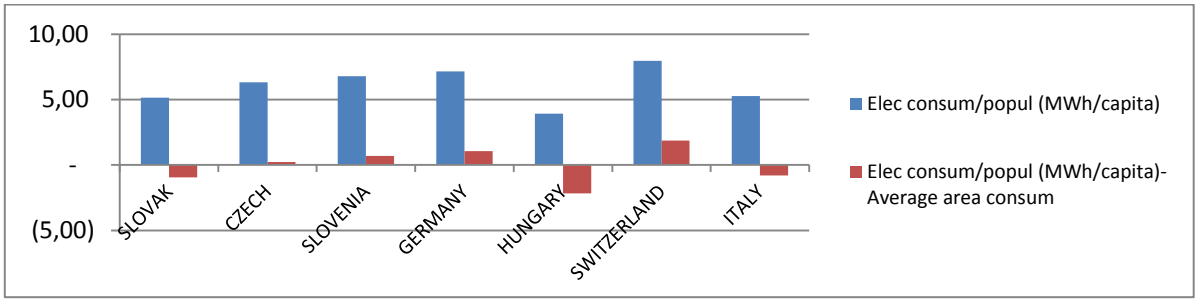
Very high potential in developing of new infrastructure /technologies comes if we look at the following graph –with further GDP rise that is expected from eastern neighbors it is normal that electricity demand grows, large number of eastern or southern neighbors (Slovenia, Slovak, Hungary, Czech, Germany) have nuclear plants- cooperation and if future closure will take place replacement with clean energy that comes from countries production.

Table 16: Electr consum /population

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
Elec consum/popul (MWh/capita)	5,14	6,31	6,78	7,14	3,92	7,95	5,28	8,51
Elec consum/popul (MWh/capita)-Ave	- 0,93	0,24	0,71	1,07	- 2,15	1,88	- 0,79	



Picture 53

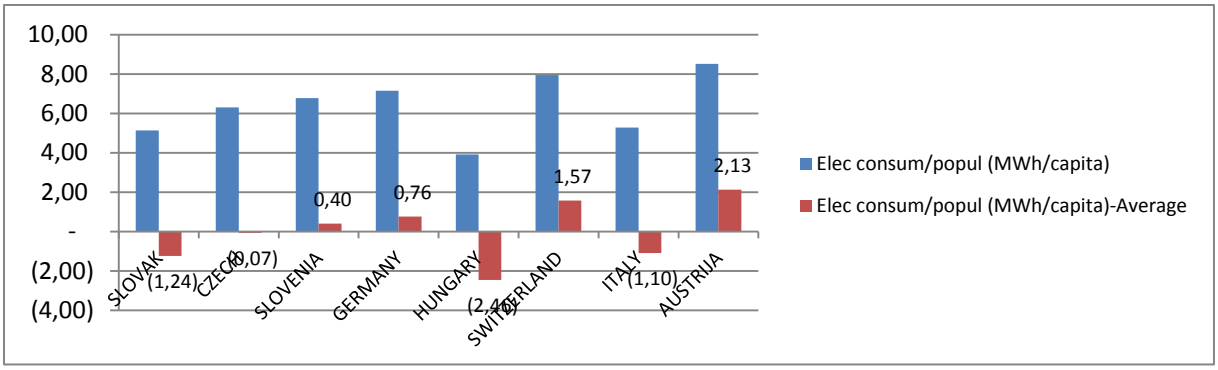


Picture 54

From the table that follows it is visible that Austria has above average electricity consumption per capita in region – even if it is compared with Germany and Italy. This fact can further impose two questions. The first is: energy efficiency in country, type of infrastructure, potentials of social engineering related to it, diversification and transparency of choices influence on environment, knowledge that comes in different measurement procedures, transmission to the countries in region etc. The second question deals with the possibilities of electricity consumption that is expected in neighboring countries and ways to boost export , or increase between countries trade –import / export by developing electricity sport markets and make lowest available price to the end consumer in the whole region.

Table 17: Electr consumption

	SLOVAK	CZECH	SLOVENIA	GERMANY	HUNGARY	SWITZERLAND	ITALY	AUSTRIJA
Elec consum/popul (MWh/capita)	5,14	6,31	6,78	7,14	3,92	7,95	5,28	8,51
Elec consum/popul (MWh/capita)-Average	- 1,24	- 0,07	0,40	0,76	- 2,46	1,57	- 1,10	2,13


10,00
8,00
6,00
4,00
2,00
-
(2,00)
(4,00)
SLOVAK
(1,24)
CZECH
(0,07)
SLOVENIA
0,40
GERMANY
0,76
HUNGARY
(2,46)
SWITZERLAND
1,57
ITALY
(1,10)
AUSTRIJA
2,13
Elec consum/popul (MWh/capita)
Elec consum/popul (MWh/capita)-Average

Picture 55

BALANCES

Further analysis goes toward each country current position of production, consumption and import of each type of energy resource. Although it is given only by one year (source IEA), and as basic fact- large and more detail analysis is needed – to some extend can present current situation and bring new ideas about further potentials.

Italy is a big energy importer and consumer. Energy import is mostly observed by two types of energy input oil around 75 mil, and gas 55 mil oil equv. It also imports coal in quantities of around 15 mil ton oil equv. Country tries to gain significance in exporting oil products, and developing geothermal, biofuels potential in production. It increases energy dependence while it's heavily dependent upon oil.

Austria can find its strategy by looking at followings:

- *Build additional hydroelectric potentials and export electricity, to import crude oil and export crude oil products with biofuels products (mixture)-in that way lowering harmful emissions, export of clean technologies, mixture of bioenergy in end product and selling to Italy, increase biofuel by reversing transport etc.*

			Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Biofuels	Electricity	Heat	TOTAL
Italija	Production	Italy Production	51,00	5.629,00	-	7.046,00		3.601,00	7.887,00	7.641,00	-		31.855,00
Italija	Import	Italy Import	15.978,00	75.693,00	9.728,00	55.451,00				2.807,00	3.905,00		163.562,00
Italija	Export	Italy Export	- 213,00	- 2.181,00	-28.198,00	- 114,00				- 56,00	- 198,00		- 30.959,00
Italija	Interna bunkers	Italy Internal bunkers			- 2.467,00								- 2.467,00
Italija	Inter avio	Italy Inter avio			- 3.101,00								- 3.101,00
Italija	Stock changes	Italy Stock Change	483,00	112,00	331,00	- 1.045,00							- 89,00
Italija													
Italija	TPES	Italy TPES	16299	79254	-23707	61338	0	3601	7887	10421	3707	0	158800

Although land locked country with limited natural energy resources Swiss is with its long term energy strategy and diversification met around 48% energy needs with domestic production. Swiss produces around 6,6 mil ton oil eqiv energy from nuclear plants, have large and significant hydro energy output –around 3,3 mil ton oil eqiv, and biofuel production of around 2,3 mil ton oil equv. Its weak point as in all countries in region is oil 3,5mil ton, oil products 8,4 mil ton and gas import 2,9 mil ton .

For **Austria** there is a chance:

- *to export its clean energy if Swiss consider closing up nuclear plants. Further potentials are by selling cheaper end product –mixture of oil, bioenergy, and increase hydroelectricity part in end structure of consumption. Austria can also consider certain social engineering - export possibilities together with Swiss - or to develop energy technology by having Joint ventures and make possible some tax incentives in the field.*

			Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Biofuels	Electricity	Heat	TOTAL
swiss	Production	Swiss Production					6663	3320	370	2376			12730
swiss	Import	Swiss Import	134	3564	8431	2926				34	2713		17802
swiss	Export	Swiss Export			-305					-8	-2902		-3215
swiss	Interna bunkers	Swiss Internal bunkers			-8								-8
swiss	Inter avio	Swiss Inter avio			-1533								-1533
swiss	Stock changes	Swiss Stock Change			-157								-163
swiss													
	TPES	Swiss TPES	134	3564	6428	2926	6663	3320	370	2402	-189	0	25613

Hungary is very active in its energy policy and tries to diversify its energy potentials. Although it produces 1,6 mil ton oil eqiv in coal, 1,03 milt on of crude, 1,7 mil ton oil equv gas, 1,8 mil ton oil equv in biofuels it is still dependent upon import where imports 1,2 mil ton oil eqiv , 5,7 mil ton crude oil, 1,9 mil ton oil products, 6,7 mil ton natural gas, etc.

There are many opportunities for **Austria** by looking at the balances that are presented by Hungary:

It is also visible that country is dependent upon nuclear energy –Austria can start a relation of security / trade potentials. Low level of hydro energy can boost export of this clean energy resource end product and lower import of coal; develop trade special relation import /export of agriculture left overs. (Bioenergy). Be present in technological and social engineering processes that took place in country.

			Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Biofuels	Electricity	Heat	TOTAL
hungary	Production	Hungary Production	1.606,00	1.030,00	-	1.768,00	4.128,00	18,00	180,00	1.852,00	-	-	10.583,00
hungary	Import	Hungary Import	1.272,00	5.755,00	1.938,00	6.743,00				80,00	1.459,00	-	17.248,00
hungary	Export	Hungary Export	- 291,00	- 21,00	- 2.775,00	- 690,00				- 270,00	- 774,00	-	- 4.821,00
hungary	Interna bunkers	hungary Internal bunkers											-
hungary	Inter avio	Hungary Inter avio			- 172,00								- 172,00
hungary	Stock changes	Hungary Stock Chang	93,00	35,00	9,00	483,00				10,00			631,00
hungary													
hungary	TPES	Hungary TPES	2.680,00	6.799,00	- 1.000,00	8.304,00	4.128,00	18,00	180,00	1.672,00	685,00	-	23.469,00

Germany is large and significant country not just in economic terms but as energy market active in planning and diversifying its energy policies. Country is dependent on import in oil and gas but works actively to build new resources especially in promoting renewables such as wind and solar energy. Around 60-75% of energy comes from import (it imports coal 33 mil ton oil eqiv, 95 mil crude oil, 74 mil ton oileqiv gas, and produces coal around 47 mil ton oil eqiv, gas 9,5 mil ton oil eqiv, nuclear 25 mil ton oil equv, biofuels 27,8 mil ton oil eqiv.)

At the first glance there are no room for Austria in any way to be one that competes with energy potentials and diversified strategy of Germany.

Austria can consider:

-*Opportunity comes primarily from nuclear energy situated in Bayern and future plans of closure, investment in new infrastructure, together work on technological advances and import of technologies on more favorable terms. (Better loan policy and strategy in developing renewables, exchange of energy/technology, spot market electricity etc.)*

			Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geotherm al	Biofuels	Electricity	Heat	TOTAL
germany	Production	Germany Production	47.596,00	3.373,00		9.566,00	25.920,00	1.823,00	7.292,00	27.810,00			123.380,00
germany	Import	Germany Import	33.285,00	95.405,00	32.645,00	74.067,00				1.184,00	3.979,00	-	240.565,00
germany	Export	Germany Export	- 1.167,00	- 198,00	-18.614,00	-14.258,00				- 1.018,00	-5.746,00	- 6,00	- 41.007,00
germany	Interna bunkers	Germany Internal bunkers			- 2.518,00								- 2.518,00
germany	Inter avio	Germany Inter avio			- 8.314,00								- 8.314,00
germany	Stock changes	Germany Stock Chan	438,00	- 777,00	334,00	424,00							419,00
germany													-
germany	TPES	Germany TPES	80.152,00	97.803,00	3.533,00	69.799,00	25.920,00	1.823,00	7.292,00	27.976,00	-1.767,00	- 6,00	312.525,00

Slovenia produces around 50% of its energy needs and large part of it comes from nuclear energy 1,4 mil ton oil equv. In its import policy country depends on import of oil products while it consumes around 3,4 mil ton of oil products.

Austria can develop cooperation strategy in a way:

-Although small market Slovenia is not insignificant if longer energy strategy is taken into picture. Country has a nuclear energy plant, and also plan to close this facility in it's mid to long term energy policy. In that respect it opens wide door for clean energy import that can be produced and exported from Austria, developing common electricity sport markets etc.,

			Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geotherm al	Biofuels	Electricity	Heat	TOTAL
slovenija	Production	Slovenia Production	1.093,00			2,00	1.441,00	335,00	56,00	631,00			3.558,00
slovenija	Import	Slovenia Import	301,00		3.488,00	708,00				55,00	641,00		5.193,00
slovenija	Export	Slovenia Export	- 1,00		- 830,00					- 4,00	- 719,00		- 1.554,00
slovenija	Interna bunkers	Slovenia Internal bunkers			- 49,00								- 49,00
slovenija	Inter avio	Slovenia Inter avio			- 24,00								- 24,00
slovenija	Stock changes	Slovenia Stock Change			- 125,00					- 1,00			- 126,00
slovenija													
slovenija	TPES	Slovenia TPES	1.393,00	-	2.460,00	710,00	1.441,00	335,00	56,00	681,00	- 78,00	-	6.998,00

Czech imports around 45% of its total energy needs in : coal 1,8 mil ton oil equv, 7,1 mil ton oil eqiv, 6,1 natural gas in mil ton oil equv. It produces large quantities of coal around 20 mil ton oil equv, and nuclear 7,9 mil ton oil eqiv.

Austria can develop followings:

The same type of reasoning can be implied with thinking about energy export to Czech. It can be made two folds: if nuclear is reduces large potential of renewable export can arise, or in certain types of negotiation when new infrastructure comes in country. Together market spot –for electricity, interchange of ideas, knowledge, and common industrial production can be ways for further energy strategy and relation between these two countries.

			Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geotherm al	Biofuels	Electricity	Heat	TOTAL
czech	Production	Czech Production	20.676,00	319,00		214,00	7.926,00	183,00	234,00	3.054,00	-	34,00	32.640,00
czech	Import	Czech Import	1.843,00	7.178,00	2.961,00	6.106,00				208,00	996,00		19.292,00
czech	Export	Czech Export	- 4.084,00	- 21,00	- 1.657,00					- 241,00	- 2.469,00	- 2,00	- 8.474,00
czech	Interna bunkers	Czech Internal bunkers											-
czech	Inter avio	Czech Inter avio			- 292,00								- 292,00
czech	Stock changes	Czech Stock Change	- 1.125,00	42,00	37,00	541,00							- 505,00
czech													
czech	TPES	Czech TPES	17.310,00	7.518,00	1.049,00	6.861,00	7.926,00	183,00	234,00	3.021,00	- 1.473,00	32,00	42.661,00

Slovakia imports more than 80 % of it end energy needs. In its own production relays heavily on nuclear -around 4 mil ton oil eqiv and biofuels 1 mil ton oil equv. Quantities that comes from import are :coal import 3,1 mil ton oil , crude import 5,3 mil ton oil equiv., 3,9 mil ton oil equv in gas, etc.

Austria can develop cooperation in and a way:

Nuclear energy in Slovakia is also a subject of environmental and security concern in Austria. Further cooperation can come from energy export (hydroelectricity), import of oil and refining to be end product more environmental friendly, to have different social engineering strategy implied (banks and loans that connect energy/ efficiency /new infrastructure etc.), industrial facility and production of technology- Slovakia is more cost competitive etc.

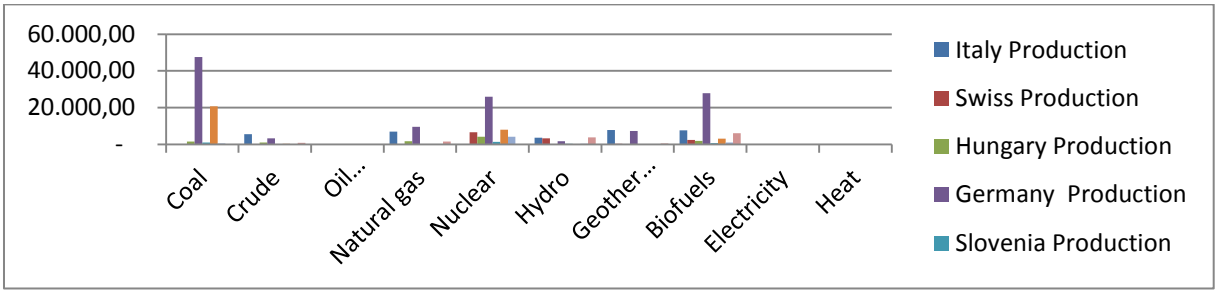
			Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geotherm al	Biofuels	Electricity	Heat	TOTAL
slovakai	Production	Slovakai Production	567,00	189,00	-	127,00	4.089,00	353,00	48,00	1.075,00			6.448,00
slovakai	Import	Slovakai Import	3.187,00	5.395,00	1.249,00	3.958,00				30,00	1.159,00		14.978,00
slovakai	Export	Slovakai Export	- 79,00	- 12,00	- 3.494,00	- 39,00				- 106,00	- 1.125,00		- 4.855,00
slovakai	Interna bunkers	Slovakai Internal bunkers											-
slovakai	Inter avio	Slovakai Inter avio			- 37,00								- 37,00
slovakai	Stock changes	Slovakai Stock Chang	- 208,00		- 21,00	317,00							88,00
slovakai													-
slovakai	TPES	Slovakai TPES	3.467,00	5.572,00	- 2.303,00	4.363,00	4.089,00	353,00	48,00	999,00	34,00	-	16.622,00

When looking at balance that is related to Austria several possibilities can be examined. The first one is usage of coal –its impact on environment and negative consequences on tourism, harmful effect of snow, mounting biodiversity. The second is hydro potential that is large but can be also used more vigorously connected with other activities (agriculture, industry, social engineering). The third is oil/biofuel policy- diversification; different types of strategy, cooperation in respect of import export with eastern neighbors can be one of ways to go. Being nuclear energy free country can be a negotiator in a nuclear energy strategy on EU level promoting security and information exchange.

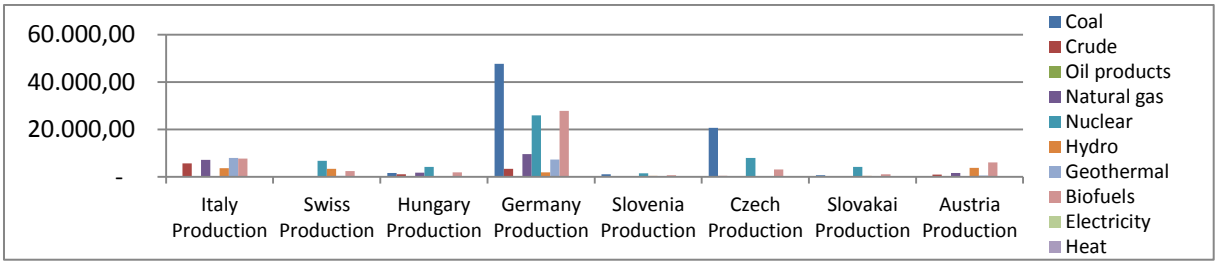
			Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Biofuels	Electricity	Heat	TOTAL
austria	Production	Austria Production		933		1.564		3.766	449	6.089		2	12.804
austria	Imports	Austria Import	3.343	7.775	5.774	11.627				928	2.001		31.448
austria	Exports	Austria Export	-2	0	-2.436	-5.231				-446	-1.759		-9.875
austria	International marine bunkers	Austria Internal bunkers			-16								-16
austria	International aviation bunkers	Austria Inter avio											-677
austria	Stock Changes	Austria Stock Change	-85	-22	70	-548							-575
austria	**TPES**		**3.256**	**8.686**	**2.715**	**7.412**		**3.766**	**449**	**6.580**	**242**	**2**	**33.109**
austria	TOTAL FINAL CONSUMPTION		461		10.502	4.849			180	4.020	5.418	1.818	27.247
austria	Industry		392		640	2.592			0	1.538	2.421	277	7.861
austria	Transport		0		6.903	177			0	479	264		7.824
austria	Other transformation		43		1.517	1.765			180	2.006	2.732	1.540	9.780
austria	Residential		38		1.199	1.229			132	1.685	1.514	820	6.617
austria	Commercial and public services		3		93	522			45	73	1.150	711	2.597
austria	Agriculture forestry		1		225	14			2	245	68	10	2.597
austria	Fishing		1										565

When comparing production possibilities in the region it is clear that all the countries are import dependent on oil and gas. The larger energy producer in region is Germany (coal 47 mil ton oil eqiv, nuclear 25 mil ton oil equv, biofuel 27 mil ton oil eqiv etc). Czech and Italy have around 30 mil ton oil eqiv in total energy production where in Czech it comes from coal and nuclear, and in Italy from geothermal, gas, biofuels and oil. Austria has energy production in absolute quantities similar to Hungary but also different structure. Energy in Austria comes from hydroelectricity and biofuels and in Hungary from nuclear and biofuel. This production structure points out import dependencies, coal impact, and large and heavy nuclear presence. Further ways are possible in better cooperation strategy, boosting renewables, graduate phase out of nuclear and coal and replacing with renewables (hydroelectricity, wind, solar, waste usage, biofuel etc.).

	Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Biofuels	Electricity	Heat	TOTAL
Italy Production	51,00	5.629,00	-	7.046,00		3.601,00	7.887,00	7.641,00	-		31.855,00
Swiss Production					6663	3320	370	2376			12730
Hungary Production	1.606,00	1.030,00	-	1.768,00	4.128,00	18,00	180,00	1.852,00	-	-	10.583,00
Germany Production	47.596,00	3.373,00		9.566,00	25.920,00	1.823,00	7.292,00	27.810,00			123.380,00
Slovenia Production	1.093,00			2,00	1.441,00	335,00	56,00	631,00			3.558,00
Czech Production	20.676,00	319,00		214,00	7.926,00	183,00	234,00	3.054,00	-	34,00	32.640,00
Slovakai Production	567,00	189,00	-	127,00	4.089,00	353,00	48,00	1.075,00			6.448,00
Austria Production		933		1.564		3.766	449	6.089		2	12.804



Picture 56



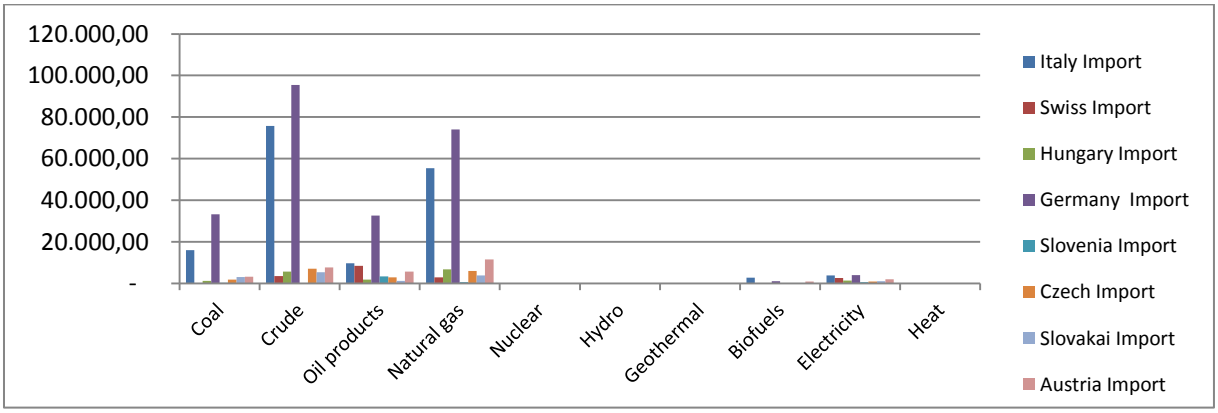
Picture 57:

It is visible from the table below that Central Europe is dependent on oil and gas import. This cannot be substituted or lowered in the near term, but it can be diversified in the longer term with different transport possibilities and potentials, and usage of energy mixture (waste, biofuel, oil, gas, electricity, hydro- in transport potentials).

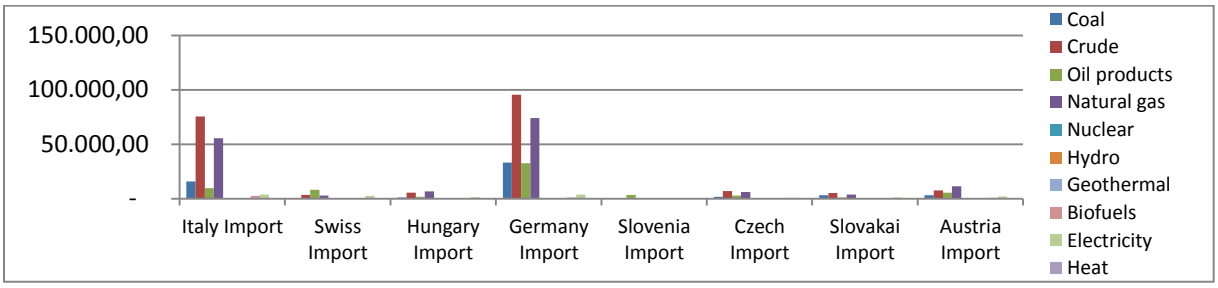
Import:

	Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Biofuels	Electricity	Heat	TOTAL
Italy Import	15.978,00	75.693,00	9.728,00	55.451,00				2.807,00	3.905,00		163.562,00
Swiss Import	134	3564	8431	2926				34	2713		17802
Hungary Import	1.272,00	5.755,00	1.938,00	6.743,00				80,00	1.459,00	-	17.248,00
Germany Import	33.285,00	95.405,00	32.645,00	74.067,00				1.184,00	3.979,00	-	240.565,00
Slovenia Import	301,00		3.488,00	708,00				55,00	641,00		5.193,00
Czech Import	1.843,00	7.178,00	2.961,00	6.106,00				208,00	996,00		19.292,00
Slovakai Import	3.187,00	5.395,00	1.249,00	3.958,00				30,00	1.159,00		14.978,00
Austria Import	3.343	7.775	5.774	11.627				928	2.001		31.448

Import:



Picture 58

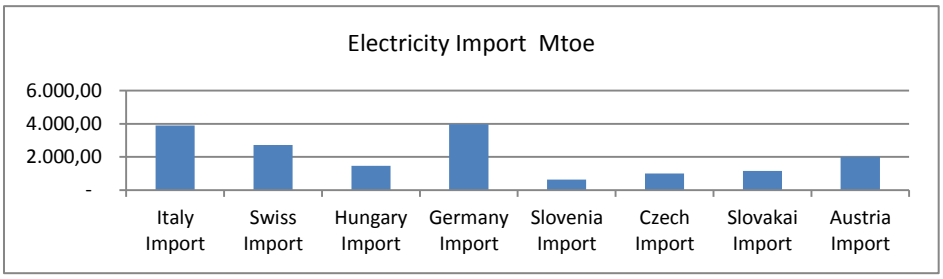


Picture 59

All countries are dependent on electricity import. Possibilities in that sector comes from larger number interconnection and trading spots, clear and visible picture of energy source-electricity in what part comes from renewable and in what part from other sources, price strategies, having winter/summer electricity exchange strategies, day/night price transparency on the spot markets, clear and visible CO_2 impact from electricity source (CO_2 from electricity that comes from cola and that comes from other sources) in trading terms and arrangements on spot markets, price possibilities that are possible for lower than average income groups –social price etc.

Table 18: Import: Electricity

Import	Electricity Mtoe
Italy Import	3.905,00
Swiss Import	2713
Hungary Import	1.459,00
Germany Import	3.979,00
Slovenia Import	641,00
Czech Import	996,00
Slovakai Import	1.159,00
Austria Import	2.001



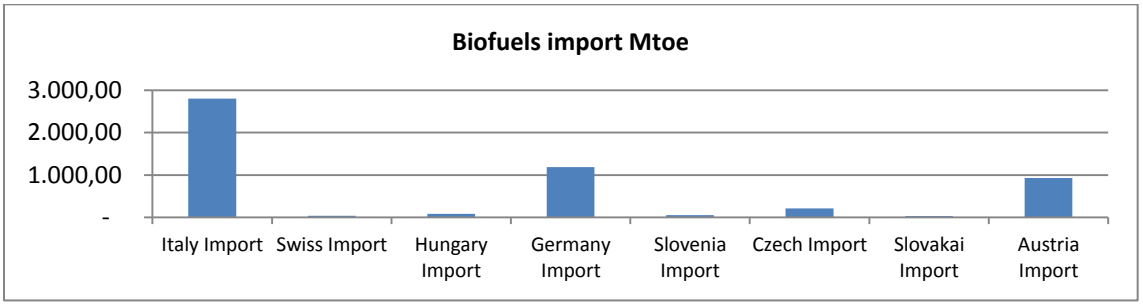
Picture 60

In terms of biofuel production and import export strategies there are many ways to increase and improve for all countries in region. Increased production, better usage of left overs in agriculture, waste usage , greater and better implementation of common facilities, price policy that is supported by tax policy of governments, CO_2 measurements with usage clean and transparent, new transport routs, interchange of raw material and end product etc.

Table 19: Import: Biofuels

	Biofuels import Mtoe
Italy Import	2.807,00
Swiss Import	34
Hungary Import	80,00
Germany Import	1.184,00
Slovenia Import	55,00
Czech Import	208,00
Slovakai Import	30,00
Austria Import	928

Biofuels: Import



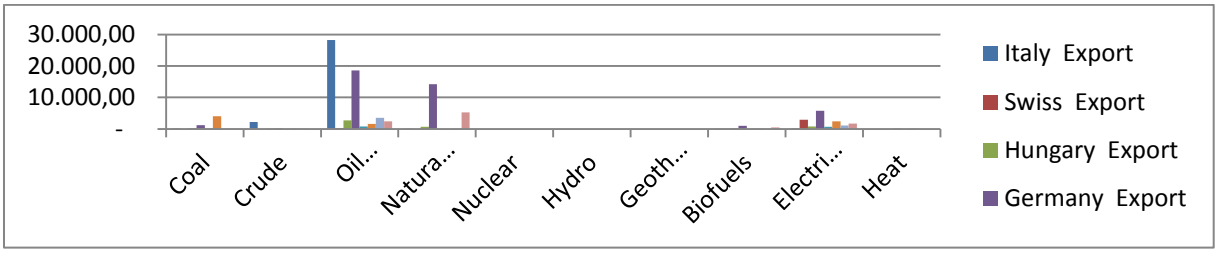
Picture 61

There is a still much room for energy export and change of potentials. Diversification and security are two terms that are often related to energy strategy, with diversification larger potentials in export import strategies are needed, while security till now was only related to country itself and its strategy to meet and have goal of energy security. This paper tries to show that security is also related to security of neighboring countries. More vigorous export policies are a way that is reached by communication, government relation in terms of tax policies, spot markets, common nuclear strategy and security plants etc.

Table 20: Export:

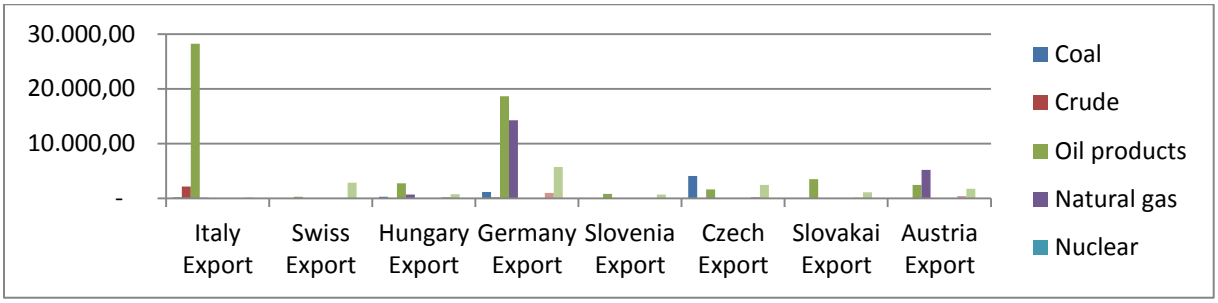
	Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Biofuels	Electricity	Heat	TOTAL
Italy Export	213,00	2.181,00	28.198,00	114,00	-	-	-	56,00	198,00	-	30.959,00
Swiss Export	-	-	305,00	-	-	-	-	8,00	2.902,00	-	3.215,00
Hungary Export	291,00	21,00	2.775,00	690,00	-	-	-	270,00	774,00	-	4.821,00
Germany Export	1.167,00	198,00	18.614,00	14.258,00	-	-	-	1.018,00	5.746,00	6,00	41.007,00
Slovenia Export	1,00	-	830,00	-	-	-	-	4,00	719,00	-	1.554,00
Czech Export	4.084,00	21,00	1.657,00	-	-	-	-	241,00	2.469,00	2,00	8.474,00
Slovakai Export	79,00	12,00	3.494,00	39,00	-	-	-	106,00	1.125,00	-	4.855,00
Austria Export	2,00	-	2.436,00	5.231,00	-	-	-	446,00	1.759,00	-	9.875,00

Export



Picture 62

Export per Country:

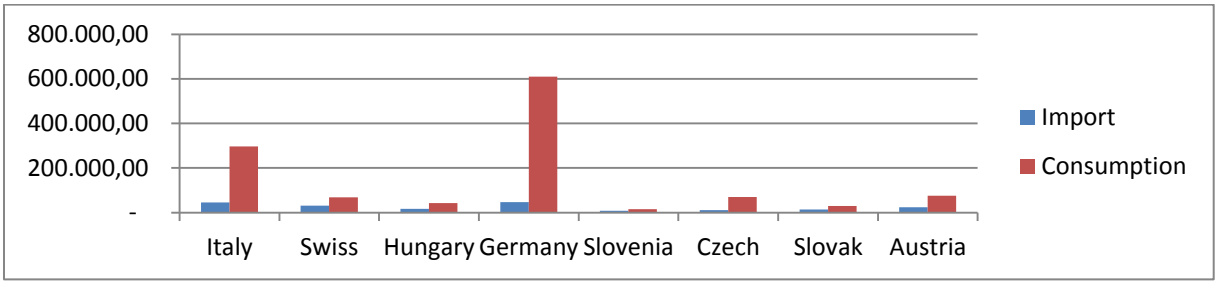


Picture 63

Electricity consumption will increase with GDP rise, population growth, and with warmer summer periods where more electricity will be needed in period July, August. It is important to observe import dependence of each country in region. From the table that follows it is visible that the largest import dependence is in Slovakia, Slovenia, Hungary and Swiss. The lowest import dependence is in Germany. Having said that is further to conclude that Austria can further work on common strategy with Germany that is related to social engineering, technology import export, while with countries already dependent on import to try to communicate pricing strategy as well as export of electricity from renewable sources.

Table 21: Electrical Energy GWh : Import/ Consumption /Import/Consumption

	GWh	*GWh*	
	Import	Consumption	Import/Consump
Italy	45.407,00	296.742,00	15,30
Swiss	31.549,00	67.666,00	46,62
Hungary	16.970,00	42.549,00	39,88
Germany	46.268,00	609.270,00	7,59
Slovenia	7.452,00	14.818,00	50,29
Czech	11.587,00	70.037,00	16,54
Slovak	13.472,00	29.051,00	46,37
Austria	23.264,00	75.426,00	30,84
Sum	**195.969,00**	**1.205.559,00**	16,26



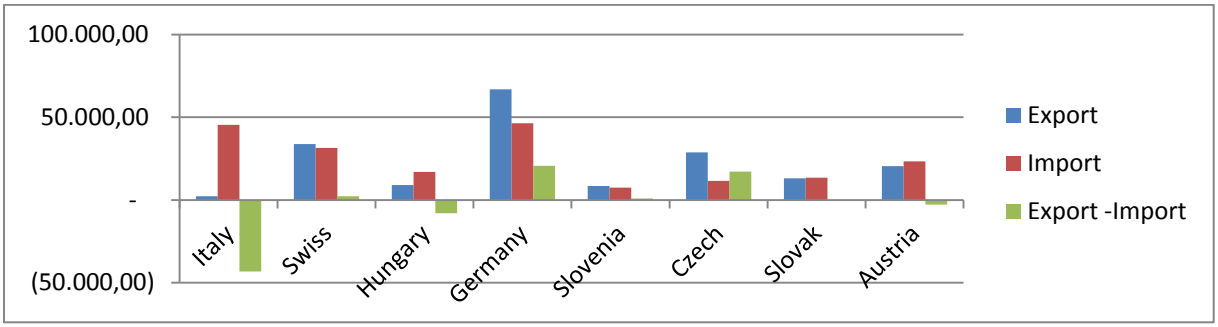
Picture 64

All the countries have possibilities and ways to export and import electricity. The largest negative difference is in Italy, Hungary, and Austria. Positive difference is in Germany and Czech. Positive difference is due to the fact that countries have either nuclear plant production, or rapidly increases their renewable potentials. Countries that have negative difference can work on increasing electricity production in country or work with neighboring on spot market in order to import lowest possible price based on good strategy related to renewable and CO_2 decrease policy. The sound significant mark is to relate Export import policy with overall consumption. It is to be noted that Hungary and Italy have lowest potential, but while Italy is already having high electricity consumption per head in Hungary there are still potential to grow. In that respect Austria can establish some export strategy based on –import raw left over from agro production and export end good, export from wind energy, export from hydroelectrically resources. etc.

Table 22: Electricity: Export/Import; Export-Import; Consumption, Export-Import/Consumption;

	GWh	*GWh*	*GWh*	*GWh*	
	Export	Import	Export -Import	Consumption	mport/Consump
Italy	2.304,00	45.407,00	- 43.103,00	296.742,00	- 14,53
Swiss	33.749,00	31.549,00	2.200,00	67.666,00	3,25
Hungary	9.003,00	16.970,00	- 7.967,00	42.549,00	- 18,72
Germany	66.810,00	46.268,00	20.542,00	609.270,00	3,37
Slovenia	8.363,00	7.452,00	911,00	14.818,00	6,15
Czech	28.707,00	11.587,00	17.120,00	70.037,00	24,44
Slovak	13.079,00	13.472,00	- 393,00	29.051,00	- 1,35
Austria	20.454,00	23.264,00	- 2.810,00	75.426,00	- 3,73
Sum	**182.469,00**	**195.969,00**	- 13.500,00	**1.205.559,00**	- 1,12

Electricity: Export/ Import



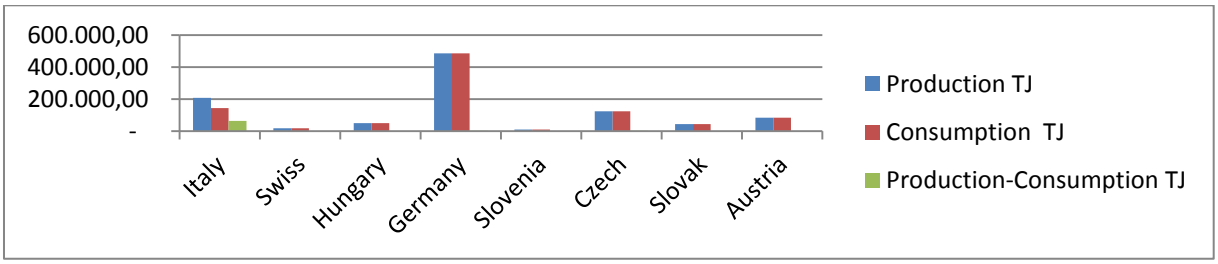
Picture 65

As expected heat production is equal to consumption in all countries. It will increase with population, infrastructure, better common policy, energy efficiency measures etc. Many ways to improve in common production in small towns, villages etc. Austria can cooperate with Germany in developing right technology in that filed-to meet all environmental standards and with best possible technical characteristics.

Table 23: Heat Energy

heat

	Production TJ	Consumption TJ	Production-Consumption TJ	Population(mill)
Italy	206.985,00	143.721,00	63.264,00	60,91
Swiss	18.366,00	18.366,00	-	7,93
Hungary	49.540,00	49.540,00	-	9,92
Germany	485.036,00	484.787,00	249,00	81,92
Slovenia	9.499,00	9.499,00	-	2,06
Czech	124.140,00	124.052,00	88,00	10,51
Slovak	43.171,00	43.171,00	-	5,41
Austria	83.023,00	83.023,00	-	8,43
Sum	**1.019.760,00**	**956.159,00**	**63.601,00**	



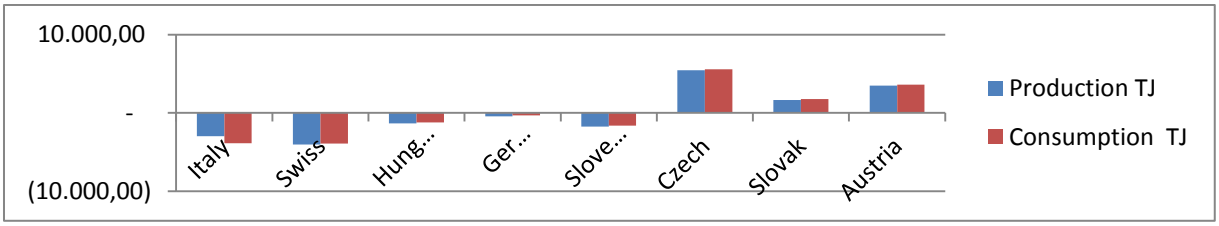
Picture 66

Difference in production and consumption based on average , is observed by highest in Slovak, Austria and Czech who realized importance in heat production and sharing, but lowest in Italy and Swiss. In Italy it relays partly on warm climate, while in Swiss on nuclear industry.

Table 24: Heat Energy Production /Consumption TJ

Difference to average		
	Production TJ	Consumption TJ
Italy	- 2.961,81	- 3.869,20
Swiss	- 4.044,01	- 3.912,75
Hungary	- 1.366,07	- 1.234,81
Germany	- 439,17	- 310,95
Slovenia	- 1.748,86	- 1.617,60
Czech	5.451,59	5.574,47
Slovak	1.619,83	1.751,09
Austria	3.488,50	3.619,75
Sum		

Difference to Average



Picture 67:

As expected the largest electricity production is in Germany. What is observed is high coal input 45% in total structure in total electricity production what further implies greeted CO_2 values, high nuclear energy production 15% in total structure what brings questions of security and problems from waste disposal. The good news is high wind energy 8% in total energy consumption and rising awareness of possibilities in respect of developing renewables in countries but as well as import clean energy from neighboring countries and from abroad (Sahara project).

Austria on the other hand has high degree of hydroelectric energy in end demand and consumption strategy, 65%, and significant presence of gas and cola. It can further work on coal phase out – to decrease environmental harm in environment, and work toward different gas import strategy – east direction Hungary , Russia, or bio energy Hungary, Ukraine.

Italy has high gas input in total consumption 43% and the problem is that majority comes from import; the second important energy input is coal and hydro resources. The good news is high than average solar input 6% in total electricity consumption. Swiss is dependent on hydro and nuclear energy, Slovenia as well with coal as add in, Czech also with coal and nuclear, while Hungary with nuclear and gas.

From this data is is visible that large potential exist if policy toward environment become more fiercly persued – coal usage, and nuclear policy is changed toward more aggressive development of other more secure energy sources.

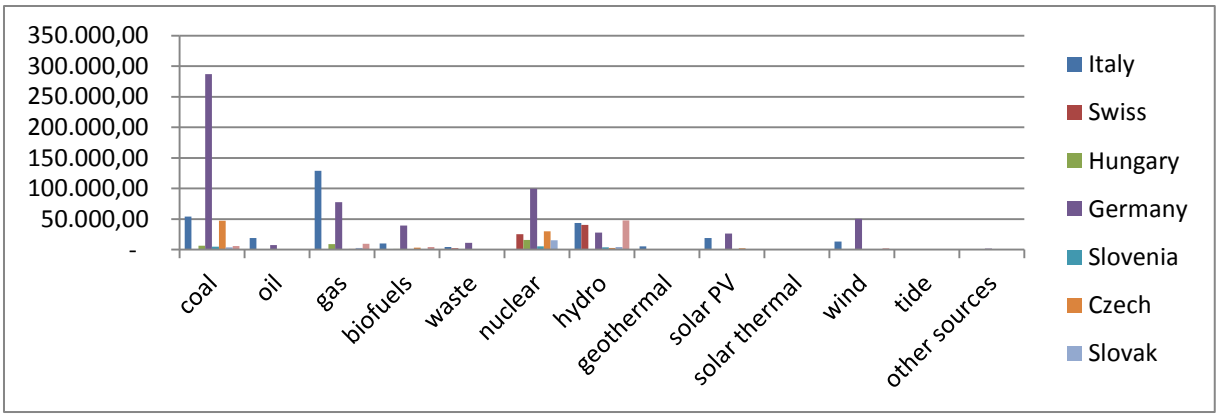
Austria can contribute:

- Larger production from clean resources: hydro, bioenergy, wind, waste
- Cooperation in technology development
- Sharing of knowledge
- Presence in strategies related to nuclear energy future

Table 25 : Electricity Production GWh

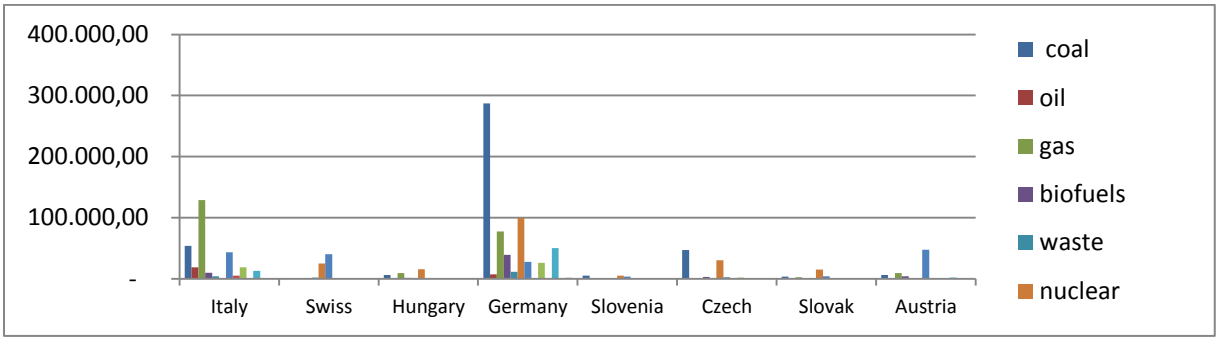
electr produc GWh								
	Italy	Swiss	Hungary	Germany	Slovenia	Czech	Slovak	Austria
coal	54.110,00	-	6.456,00	287.013,00	5.145,00	47.095,00	3.906,00	6.243,00
oil	18.890,00	53,00	176,00	7.627,00	9,00	91,00	506,00	743,00
gas	129.058,00	923,00	9.401,00	77.602,00	531,00	1.204,00	2.853,00	9.707,00
biofuels	10.324,00	527,00	1.544,00	39.678,00	267,00	3.285,00	914,00	4.400,00
waste	4.429,00	2.209,00	229,00	11.504,00	6,00	149,00	52,00	1.030,00
nuclear	-	25.441,00	15.793,00	99.460,00	5.528,00	30.324,00	15.495,00	-
hydro	43.854,00	40.305,00	213,00	27.849,00	4.080,00	2.860,00	4.439,00	47.681,00
geothermal	5.592,00	-		25,00	-			1,00
solar PV	18.862,00	320,00		26.380,00	163,00	2.149,00	424,00	337,00
solar thermal								-
wind	13.407,00	88,00	770,00	50.670,00				2.463,00
tide								-
other sources	751,00			2.004,00			69,00	11,00
TOTAL	299.277,00	69.866,00	34.582,00	629.812,00	15.729,00	87.157,00	28.658,00	72.616,00

Electricity Production GWh

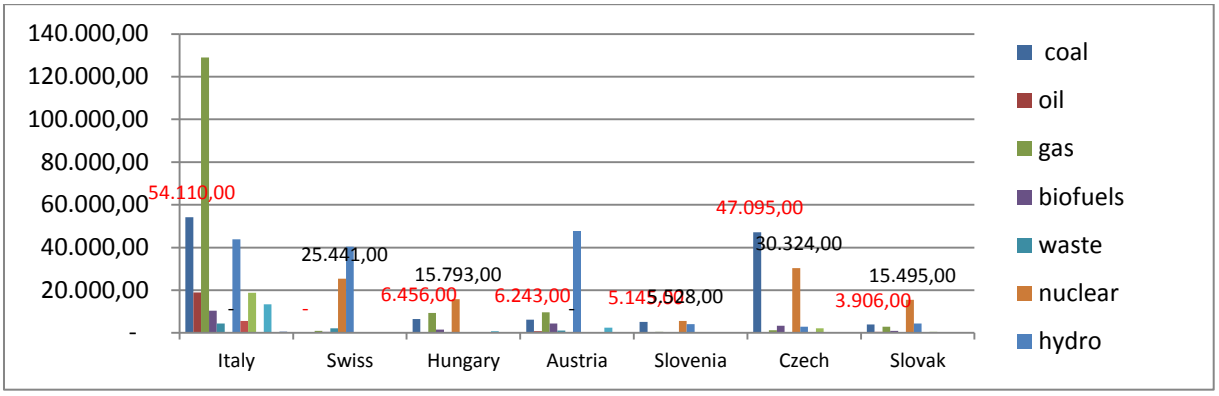


Picture 68

Electricity Production GWh



Picture 69



Picture 70

NUCLEAR ENERGY

Country	NE	Installed Capacity	Energy Produced	Remark 1	Remark 2
Slovenia	Krško	696 MW	5,5TWh	sell in croatia 50%; what is 15% total Croatia energy	
Austria	NO NE			9.7.1997. Austrian Parliament passed legislation to raimain anti nuclear country	
Hungary	Csilleberc,Paks Nucelar Power Plant	1826 MWe		Increase capacity to 2 000 Mwe	Plan to build 2 more 950 MWe ,this was installed
Slovakia	4 nucelar reactors	1815 MWe		52% ot total energy comes from nuclear	
Czech	2 NE nucelar reactors Temelin,Dukovary	1000 MWe +440 MWe		50 km from border Austria Czech/problem	
Italy	There was a proposal to build 10 new reactors by 2030; due to 2011 accident it was stalled				
Germany	In 2011-by 2022 17 nuclear reactors will be shut down,			Current 17 % of all electrical supply	

Nuclear energy presents a large and reliable source of energy for many countries in the region. Almost all besides Austria and Italy are dependent to certain part on its nuclear potentials. For some of them it is a question of export income and strong input to industry. However, security treats and problems with waste disposal in some areas – especially Germany – make fierce discussions about future of this energy source. There are plans to close certain number of plants but this is burdened with high investment cost, longer period of buildup, country do not have enough potentials in renewable to meet all its needs with current level of prices and technology etc.

Also to mention is that some countries do have plans to close nuclear facility , while other consider additional infrastructure and increase in production (Hungary).

What is important to note related to this energy carrier is that nuclear energy should not be seen as classical cost benefit project or even modern with environmental pro and cons (waste disposal, uran mining as question) but also should have security part that is related to country of origin and neighboring regions. In that respect end result is to certain effect important in region as a whole. Austria is strongly against nuclear facilities in neighboring regions (Germany, Slovakia, Czech) – but cannot influence neighboring policy. It can be part of team to observe data, check security, have deeper knowledge about business in general, or involved with long term strategy on EU level.

RENEWABLES

Italy		Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave, ocean	Wind
Italy	Gross elec generation GWh	4.326	103	2.582	4.620	3.122	5.592	0	43.854	18.862	-	13.407,00
Italy	Gross heat production TJ	5.942	38	14.452	5.812	912	650					
Italy												
Italy	Production TJ	67.560	11.184	176.340	49.352	423	207.551	6.504				
Italy	Import TJ			47.931		1.837						
Italy												
Italy	Supply TJ	67.560	11.184	223.972	49.352	2.239	207.551	6.504				
Italy	Final Consumption TJ		9.309	159.682	1.861	1.552	4.950	6.503				

Italy note:

1. Country itself: many prospects for increasing waste usage, increase solar, solar thermal PV, usage of sea, Import of solar energy Tunis –Italy route etc. Further transport rout Austria Germany

2. Potential to Austria: Import routs in form of oil exits, can be added oil products, bio fuel, increase geothermal energy, technology cooperation in country

Swiss		Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave, ocean	Wind
Swiss	Gross elec generation GWh	2.012	197	266	261				40.305	320		88,00
Swiss	Gross heat production TJ	10.708	376	1.575								
Swiss												
Swiss	Production TJ	46.060	10.260	39.200	3.745	7	12.184	1.853				
Swiss	Import TJ			1.180								
Swiss												
Swiss	Supply TJ	46.060	10.260	40.080	3.745	15	12.184	1.853				
Swiss	Final Consumption TJ	5.292	9.074	34.664	1.764	14	12.184	1.853				

Swiss note:

1. Country itself: Can increase waste usage, develop technology for waste usage, storage, solar geothermal to less extend developed – to increase production, nuclear security

2. Potential to Austria: Possibility to Austria in form of hydroelectricity export, wind electricity export, transmission solar Tunis, Italy, Austria Swiss, technology development in area of waste usage etc.

Hungary		Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave, ocean	Wind
Hungary	Gross elec generation GWh	222	7	1.333	211	0			213	8		770,00
Hungary	Gross heat production TJ	618	178	2.467	53		395	5				
Hungary												
Hungary	Production TJ	3.766	1.804	55.695	2.212	197	4.490	247				
Hungary	Import TJ	76		576		93						
Hungary												
Hungary	Supply TJ	3.842	1.804	55.695	2.212	197	4.490	247				
Hungary	Final Consumption TJ		1.463	38.449	309	198	4.071	242				

Hungary note:

1. Country itself: low level of waste usage (municipal, industrial), low level of bio energy biogas ethanol, low level of diversity and possibilities on tank places,

2. Potential to Austria: Austrian import agro left overs export end product, Austria can contribute to electricity with industrial municipal waste export, hydroelectricity export if nuclear is closed

Germany		Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave, ocean	Wind
Germany	Gross elec generation GWh	9.900	1.604	12.091	27.238	349	25	0	27.849	26.380		50.670,00
Germany	Gross heat production TJ	53.382	9.741	23.222	3.392	126	85	11				
Germany												
Germany	Production TJ	217.346	59.464	494.498	268.633	3.664	3.767	24.120				
Germany	Import TJ					1.507						
Germany												
Germany	Supply TJ	217.346	59.464	494.498	268.633	4.037	3.767	24.120				
Germany	Final Consumption TJ	17.330	29.025	342.794	43.280	3.848	2.682	24.109				

Germany note:

1. Country itself: Increase municipal waste usage, technology production in filed, municipal, industry and agro waste usage

2. Potential to Austria: export of hydroelectricity, closure of nuclear give rise in cooperation on renewables

Slovenia		Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave, ocean	Wind
Slovenia	Gross elec generation GWh		6	114	153	0			4.080	163		
Slovenia	Gross heat production TJ		80	827	391		22					
Slovenia												
Slovenia	Production TJ		1.333	23.445	1.597	1	1.360	392				
Slovenia	Import TJ					65						
Slovenia												
Slovenia	Supply TJ		1.333	23.445	1.597	60	1.360	392				
Slovenia	Final Consumption TJ		1.017	21.649	100	60	1.276	392				

Slovenia note:

1. Country itself: better usage and widely implemented of municipal agro and industrial waste, more aggressive approach toward other renewables wind geothermal, technological and industrial development of renewable technology

2. Potential to Austria: Export of hydroelectric electric energy, export of technology, knowledge sharing, education

		Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave, ocean	Wind
Czech	Gross elec generation GWh	144	5	1.817	1.468				2.860	2.149		416,00
Czech	Gross heat production TJ	2.507	308	2.944	365							
Czech												
Czech	Production TJ	5.840	7.046	90.138	15.698	275		561				
Czech	Import TJ			4.009		132						
Czech												
Czech	Supply TJ	5.840	7.046	86.114	15.698	334		561				
Czech	Final Consumption TJ	1.430	6.167	65.786	4.146	335		561				

Czech note:

1. Country itself: increase all renewable

2. Potential to Austria: export of renewable energy, work of technological advances, social engineering

		Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave, ocean	Wind
Slovak	Gross elec generation GWh	41	11	724	190				4.439	424		
Slovak	Gross heat production TJ	117	127	7.225	112		95	2				
Slovak												
Slovak	Production TJ	1.407	1.175	33.528	2.594	212	245	224				
Slovak	Import TJ					39						
Slovak												
Slovak	Supply TJ	1.404	1.226	32.921	2.594	116	245	224				
Slovak	Final Consumption TJ	218	985	13.417	817	116	55	222				

Slovak note:

1. Country itself: increase all renewables,

2. Potential to Austria: increase export, industrial production of renewable parts

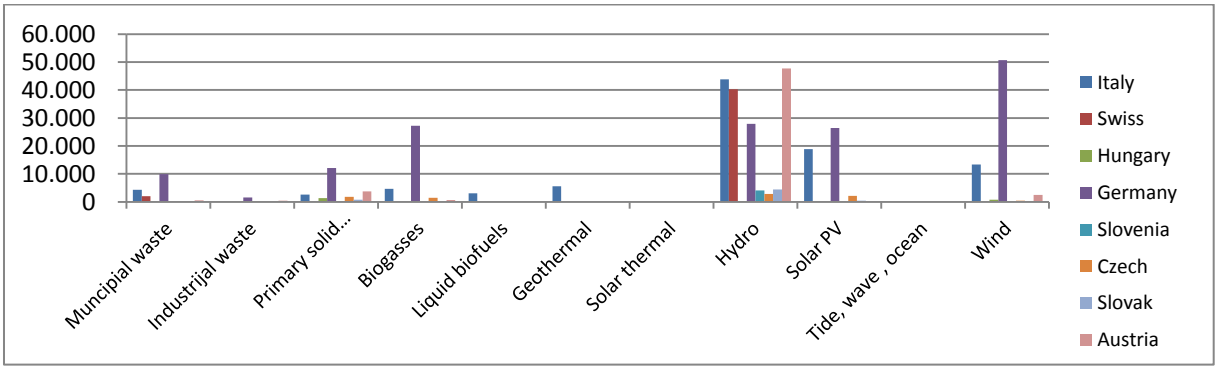
For Austria there is potential to increase municipal waste, industrial waste, biogases production in respect of thermal and electricity production. It can be used in transport (subway, tram, public buses, trains, cars, schools, hospitals etc.) and further of use in industry.

Austria	GWh	Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave , ocean	Wind
Austria	Gross elec generation	568	462	3.762	638	0	1	0	47.681	337	0	2.463
Austria	Gross heat production TJ	5.313	1.948	34.382	291	0	561	57				
Austria												
Austria	Production TJ	15.555	19.030	201.800	8.688	301	1.441	7.296				
Austria	Import TJ			20.238		508						
Austria	Export TJ			-12.197		-194						
Austria	Stock Changes TJ			371		6						
Austria												
Austria	Domestic supply TJ	15.555	19.030	210.212	8.688	621	1.441	7.296				
Austria	Transformation TJ	15.556	7.153	77.487	7.045	0	1.147	57				
Austria	Electrical plants TJ											
Austria	CHIP plant TJ											
Austria	Heat plant TJ											
Austria	Other transformation TJ											
Austria												
Austria	Final Consumption TJ		11.877	132.727	1.643	621	294	7.239				
Austria	Industry TJ		11.855	50.146	1.568	23						
Austria	Transport TJ				5	576						
Austria	Residential TJ			70.307	27	0	0	5.546				

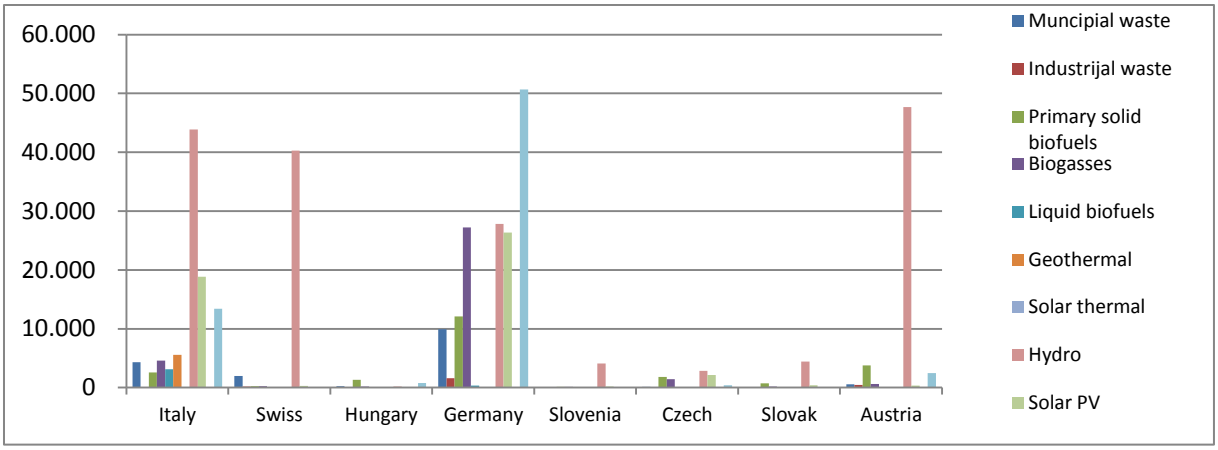
Each category (municipal, industrial, biogases, solar thermal, geothermal, etc.) can bring new renaissance in implementation, technological advances but as well as end usage. Energy efficient usage, with implementation in big cities, large industrial complexes is some natural way to go. Further development and usage that will come with price decrease will bring implementation to smaller towns, villages.

		Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal
Italy	Production TJ	67.560	11.184	176.340	49.352	423	207.551	6.504
Italy	Final Consumption TJ		9.309	159.682	1.861	1.552	4.950	6.503
Swiss	Production TJ	46.060	10.260	39.200	3.745	7	12.184	1.853
Swiss	Final Consumption TJ	5.292	9.074	34.664	1.764	14	12.184	1.853
Hungary	Production TJ	3.766	1.804	55.695	2.212	197	4.490	247
Hungary	Final Consumption TJ		1.463	38.449	309	198	4.071	242
Germany	Production TJ	217.346	59.464	494.498	268.633	3.664	3.767	24.120
Germany	Final Consumption TJ	17.330	29.025	342.794	43.280	3.848	2.682	24.109
Slovenia	Production TJ		1.333	23.445	1.597	1	1.360	392
Slovenia	Final Consumption TJ		1.017	21.649	100	60	1.276	392
Czech	Production TJ	5.840	7.046	90.138	15.698	275		561
Czech	Final Consumption TJ	1.430	6.167	65.786	4.146	335		561
Slovak	Production TJ	1.407	1.175	33.528	2.594	212	245	224
Slovak	Final Consumption TJ	218	985	13.417	817	116	55	222
Austria	Production TJ	15.555	19.030	201.800	8.688	301	1.441	7.296
Austria	Final Consumption TJ		11.877	132.727	1.643	621	294	7.239

GWh	Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave , ocean	Wind
Italy	4.326	103	2.582	4.620	3.122	5.592	0	43.854	18.862	0	13.407
Swiss	2.012	197	266	261				40.305	320		88
Hungary	222	7	1.333	211	0			213	8		770
Germany	9.900	1.604	12.091	27.238	349	25	0	27.849	26.380		50.670
Slovenia		6	114	153	0			4.080	163		
Czech	144	5	1.817	1.468				2.860	2.149		416
Slovak	41	11	724	190				4.439	424		
Austria	568	462	3.762	638	0	1	0	47.681	337	0	2.463



Picture 71


60.000
50.000
40.000
30.000
20.000
10.000
0
Italy
Swiss
Hungary
Germany
Slovenia
Czech
Slovak
Austria
Muncipial waste
Industrijal waste
Primary solid biofuels
Biogasses
Liquid biofuels
Geothermal
Solar thermal
Hydro
Solar PV

Picture 72

AUSTRIA

Balances:

		Coal	Crude	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Biofuels	Electricity	Heat	TOTAL
austria	Production		933		1.564		3.766	449	6.089		2	12.804
austria	Imports	3.343	7.775	5.774	11.627				928	2.001		31.448
austria	Exports	-2	0	-2.436	-5.231				-446	-1.759		-9.875
austria	International marine bunkers			-16								-16
austria	International aviation bunkers											-677
austria	Stock Changes	-85	-22	70	-548							-575
austria	**TPES**	**3.256**	**8.686**	**2.715**	**7.412**		**3.766**	**449**	**6.580**	**242**	**2**	**33.109**
austria	Transfers		316	-310								
austria	Electricity Plans	-1.149										
austria	CHP Plants	-151		-230								
austria	Heat Plants											
austria	Gas works											
austria	oil refineries		-9.003	8.972								
austria	Coal transformation	-783		-108								
austria	Liquefication plants											
austria	Other transformation											
austria	Energy industry own use	-668		-500								
austria	Losses	-43										
austria	TOTAL FINAL CONSUMPTION	461		10.502	4.849			180	4.020	5.418	1.818	27.247
austria	Industry	392		640	2.592			0	1.538	2.421	277	7.861
austria	Transport	0		6.903	177			0	479	264		7.824
austria	Other transformation	43		1.517	1.765			180	2.006	2.732	1.540	9.780
austria	Residential	38		1.199	1.229			132	1.685	1.514	820	6.617
austria	Commercial and public services	3		93	522			45	73	1.150	711	2.597
austria	Agriculture forestry	1		225	14			2	245	68	10	2.597
austria	Fishing	1										565
												1

PLEASE NOTE:

1. Austria produces around 1/3 of total energy needs in the form of natural gas, biofuels

2. Around 1/3 of all energy consumption is related to oil products/ biofuels and primarily used in transport sector

3. Biofuels are used in industrial, residential and industry sector; to less degree transport so far

4. Large quantities of coal imported are used for energy transformation electricity plants, can be changed for hydroelectricity

5. Crude supply can be diversified, changed toward bio fuel, bioethanol

			AUSTRIJA
millions	Populatio	Population	8,43
bill USD	GDP	GDP	337,69
	GDP PPP	GDP PPP	306,34
Mtoe	Energy producti on	Energy production	12,80
Mtoe	Net impor	Net imports	21,57
Mtoe	TPES	TPES	33,11
TWh	Electr con	Electr consum	71,72
MTco2	CO2	CO2	64,73
	TPES/popu	TPES/popul	3,93
	TPES/GDP	TPES/GDP	0,10
	tpes/gdp p	tpes/gdp ppp	0,11
	Elec consu	Elec consum/popul	8,51
	CO2/TPES	CO2/TPES	1,96
	CO2/popu	CO2/population	7,68
	CO2/GDP	CO2/GDP	0,19
	CO2/ GDP	CO2/ GDP PPP	0,21

PLEASE NOTE:

1. Base for energy study so far is in line with average EU picture: energy importer, good GDP, population structure good, energy consumption above average

2. Lacks initiatives in new technologies, still relies on old energy sources coal, wood, gas and oil.

3. Can consider CO_2 policy on many levels - industrial, transport, and household and determine influence to environment, tourism, etc.

4. It may induce more vivid down to earth, pro poor,pro-environment social engineering in legislative, bank, business

5. More aggressive approach toward usage of biogas in transport - public, development of wind geo energy strategy, induces import possibilities of electrical cars etc.

GWh	Muncipial waste	Industrijal waste	Primary solid biofuels	Biogasses	Liquid biofuels	Geothermal	Solar thermal	Hydro	Solar PV	Tide, wave , ocean	Wind
Gross elec generation	568,00	462,00	3.762,00	638,00	-	1,00	-	47.681,00	337,00	-	2.463,00
Gross heat production TJ	5.313,00	1.948,00	34.382,00	291,00	-	561,00	57,00				
Production	15.555,00	19.030,00	201.800,00	8.688,00	301,00	1.441,00	7.296,00				
Import			20.238,00		508,00						
Export			- 12.197,00		- 194,00						
Stock Changes			371,00		6,00						
Domestic supply	15.555,00	19.030,00	210.212,00	8.688,00	621,00	1.441,00	7.296,00				
Transformation	15.556,00	7.153,00	77.487,00	7.045,00	-	1.147,00	57,00				
Electrical plants	*7.704,00*	*3.177,00*	*22.368,00*	*6.422,00*							
CHIP plant	*5.607,00*	*3.424,00*	*33.802,00*	*541,00*		*24,00*					
Heat plant	*2.245,00*	*552,00*	*21.210,00*	*82,00*		-					
Other transformation			107,00			1.123,00	57,00				
Final Consumption		11.877,00	132.727,00	1.643,00	621,00	294,00	7.239,00				
Industry		11.855,00	50.146,00	1.568,00	23,00						
Transport				5,00	576,00						
Residential			70.307,00	27,00	-	-	5.546,00				

PLEASE NOTE:

1. The most part of renewable energy comes from hydro source

2. Solid biofuels advances over municipal industrial waste, it can be changed drastically

3. Wind energy progress leaving solar and geothermal behind, work on solar technology to lower prices, and examine all geothermal solutions

4. Level of transparence-in end usage – possibility to choose according to energy source

Austria: Oil

Unit 1000 tonnes	Crude Oil	Natural gas liquids	Refinery feedstock	Naphta	Liquified petroleum gases	Motor gasoline	Aviation gasoline	Jet kerosine	Other kerosine	Gas/diesel	Fuel oil
Production	839	80		1.009	70	1.553		618/		3.780	953
Imports	7.473	44	143		80	841				4.119	59
Domestic Supply	8.349	124	84	824	128	1.685		29	22	6.927	793
Transformation	8.349	124	395								361
Oil refinaries	8.349	124	395								33
Final Consumption				824	122	1.628		29		6.823	186
Transport						1.628		29		5.044	
Residential										1.141	7
Agriculture										217	2

PLEASE NOTE:

1. All crude is transported by TAL Italy, consider other alternatives

2. Consider alternatives from import agriculture left overs export biofuel, ethanol

3. Develop infrastructure-pump station for other types of alternatives-electric hydro

4. Develop cooperation in region

TJ	NATURAL GAS
Production	72.778
Imports	541.064
Exports	-243.427
Stock Changes	-25.489
Domestic Supply	344.926
Transformation	102.234
Electricity plants	*25.786*
CHP plants	*64.407*
Heat plants	*12.041*
Energy industry own use	16.944
Final consumption	225.646
Industry	*120.621*
Transport	*8.237*
Residential	*57.179*
Commercial	*24288*
Agriculture	*648*
Non energy use	*14673*

PLEASE NOTE:

1. Gas primarily from import, consider alternatives in line with EU standards and legislation,

2. Level out gas usage household/industry

3. Measure harmful gases, lower level of gas in environmentally vulnerable areas

4. Redirect gas in plants, from plants to households, lower negative impact on environment

		ELECTRICITY	HEAT
austria		GWh	TJ
austria	Production		
austria	coal	6.243,00	3.109,00
austria	oil	743,00	4.941,00
austria	gas	9.707,00	32.322,00
austria	biofuels	4.400,00	34.673,00
austria	waste	1.030,00	7.261,00
austria	nuclear	-	-
austria	hydro	47.681,00	-
austria	geothermal	1,00	561,00
austria	solar PV	337,00	-
austria	solar thermal	-	57,00
austria	wind	2.463,00	
austria	tide	-	
austria	other sources	11,00	99,00
austria	TOTAL	72.616,00	83.023,00
austria			
austria	Imports	23.264,00	
austria	Exports	- 20.454,00	
austria	Domestic supply		
austria			
austria	**Final consumptior**	**75.426,00**	**83.023,00**
austria	Industry	28.155,00	11.612,00
austria	Transport	3.083,00	-
austria	Residential	17.600,00	34.338,00
austria	Commercial public services	13.371,00	29.754,00
austria	Agriculture/forestry	792,00	417,00
austria	Fishing	-	
austria	Other	-	

PLEASE NOTE:

1. Electricity production is made around 50% from hydroelectricity and further is accomplished by coal, gas, biofuels

2. With decrease of coal, gas country can increase wind, solar, geo, waste usage but also increase hydroelectric potential

3. By reducing input that have negative impact on environment country can boost production of renewables technology, more widely engage in social engineering, keep biodiversity advances (topics such as flooding, snow season ,tourism, fog becomes important etc.)

4. With government initiatives ensure tax exemption for industry households that choses renewables supplier over those who offer coal, wood solution.

C HYDROENERGY POTENTIONALS

1. Basis for calculation

2. Calculation

3. Conclusion

To build a hydroelectric plant is a large and complex job that requires many resources, knowledges, resources and has clear aim about future market. Hydroelectric plant can differ: small (small, mini, micro), middle and large hydroelectricity project. For each one good preparation not only in financial, technical and economic skill but pre environmental study is of primary importance. Although this project can in certain extent cause damage to environment proper plan, finding a place with minimum negative impact, avoiding places of bird, fish ,shortly-biology richness need to be examined at the first phases of projects.

One example in the case of small dam project is presented as follows. It has a capacity of 6 MW, and flow around 6 m^3/s. Some steps in finding end solution are presented. In reality it can differ significantly depending upon location, technology (type of turbine), construction works, need for roads, supplier of electrical parts etc.

Comfar Hydroelectric Project

Based on pre reported numbers some small scale project is shown as an example of further possibilities. Project is based on followings:

Input:

-small dam 6MW (24*365*cca 0,6 /0,7coef of usage) 36.894

-2 years construction period,20 years of operation

-discounted rate 8%

-price 0,08€/kWh

Result:

-NPV 9.788.435 EURO

-IRR 14,81%

The first step is to find all relevant investment cost that is needed to be making on chosen location. Pre environmental study need to determine all the relevant facts that this project

can influence – positively or negatively on environment. The second stage is making pre-feasibility study based on engineering proposal of construction and type of turbines, penstock, need for roads, length of transmission lines, etc.

For a small project of 6 MW it is determined in the high developed world cost of construction that can reach 15,74 mil EUR. This cost can be decreased depending upon country that works are done. Construction workers can work for lower wages, public procurement can bring a constructor equally valued but with much competitive prices and being on common EU market many potentials arise in that respect. Although praxes can bring lower than expected costs certain standard observed measures are taken in this calculation.

It is visible from the table below that construction works as well as energy equipment are the most significant part of investment and valued the most. It is important to determine timeline of investment worked period 2-3 years, when each job is done, and determine depreciation rate of each type of work or equipment.

1. INVESTMENT

	Total		2017	2018
Lokation	1.570.000,00		1.570.000,00	
Feasibility Study	504.000,00		504.000,00	
Development	529.000,00		529.000,00	
Engineering	537.000,00		537.000,00	
Construction work	7.422.000,00		3.596.000,00	3.826.000,00
Access road	1.096.000,00		596.000,00	500.000,00
Construction work	6.326.000,00		3.000.000,00	3.326.000,00
Machines	5.255.000,00		2.200.000,00	3.055.000,00
Energy Equipment	3.032.000,00		1.000.000,00	2.032.000,00
Transmission line	217.000,00		100.000,00	117.000,00
Substation and transformer	175.000,00		100.000,00	75.000,00
Penstock	1.831.000,00		1.000.000,00	831.000,00
Other auxilary	500.000,00			500.000,00
Environment	500.000,00		500.000,00	
Cost other	500.000,00			500.000,00
INVESTMENT TOTAL	15.747.000,00		7.866.000,00	7.881.000,00

The second stage of calculation needs to determine what type of costs and amounts need to be taken into calculation as part of yearly activity. They include energy, workers, material, government other fees, different types of services etc. Also these amounts can vary depending amount country and average wage, structure and capacity of plants, quality of worked an equipment build in etc.

2. OPERATIVE COSTS

	2019	2020	2021	2022	2023	2036
Energy	68.328,00	68.328,00	68.328,00	68.328,00	68.328,00	68.328,00
Material	209.000,00	209.000,00	209.000,00	209.000,00	209.000,00	209.000,00
Fees	46.000,00	46.000,00	46.000,00	46.000,00	46.000,00	46.000,00
Workers	115.000,00	115.000,00	115.000,00	115.000,00	115.000,00	115.000,00
Cost Operating Total	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00
Total Cost	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00
Depreciation	490.930,00	490.930,00	490.930,00	490.930,00	490.930,00	490.930,00
Total Cost	929.258,00	929.258,00	929.258,00	929.258,00	929.258,00	929.258,00
COST OVERALL	929.258,00	929.258,00	929.258,00	929.258,00	929.258,00	929.258,00
	25,187103	25,257067	25,257067	25,257067	25,257067	25,257067
Strani udjel (%)						
Promjenljivi dio (%)	47,169677	47,169677	47,169677	47,169677	47,169677	47,169677

Production includes number of KWh and price per KWh sold. Pre market demand need to be determined in advance and price can take form: winter, summer, low hydro, high hydro, daily, night etc.

In a year we can calculate with 50-80% efficiency (24h*365*6MW)*efficiency * price determined on market, inside the project, depending upon hydro potential, competition etc.). (36.894 MWh) (36.894.000 kWh/0,0827€/kWh=3.053.736€ revenue)

3. PRODUCTION

	2019	2020	2021	2022	2023
		102,2	102,2	102,2	102,2
Quantity	36.894,20	36.792,00	36.792,00	36.792,00	36.792,00
Revenue	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00
Neto prihodi od prodaje	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00
PRIHODI OD PRODAJE	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00

After considering certain scenarios project results are given in the form of financial flow, Economic flow, Balance sheet, Profit Loss Account, and indicators that shows the strength weaknesses of the projects (loan dependence, profit/revenue scale, etc.)

In Financial flow it is visible large outflow at the years of construction, and type's inflow from loan or investors that are collected and put in construction process. Further years bring receivables in a form of electrical energy sold on the market, and outflow in the form of operative costs that occurs during business operation.

4. FINANCIAL FLOW

	2017	2018	2019	2020	2021	2022	2023	2024	2025
RECIVABLES	7.866.000,00	7.881.000,00	3.054.954,11	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00
Finance	7.866.000,00	7.881.000,00	1.218,11						
Business revenue			3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00
Expenditure	7.866.000,00	7.881.000,00	443.198,31	438.328,53	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00
Increase of capital -asset increase	7.866.000,00	7.881.000,00							
Shirt term asset increase			4.870,31						
Cost operative			438.328,00	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00
Marketing									
Tax profit									
Financial cost									
Dividends									
SURPLUS			2.611.755,79	2.615.407,47	2.615.408,00	2.615.408,00	2.615.408,00	2.615.408,00	2.615.408,00
Cummulatice recivables			2.611.755,79	5.227.163,27	7.842.571,27	10.457.979,27	13.073.387,27	15.688.795,27	52.304.507,27
Surplus			2.611.755,79	2.615.407,47	2.615.408,00	2.615.408,00	2.615.408,00	2.615.408,00	2.615.408,00
Cummulatice			2.611.755,79	5.227.163,27	7.842.571,27	10.457.979,27	13.073.387,27	15.688.795,27	52.304.507,27

Since project is done in the area with high energy demand, all quantities are sold and transmitted, hydro potential is good and stable, and since it is a long term project over 25 years with low operating costs it produces good results. These comes in form of Net Present Value that is over 9 mil Euro, and high rate of return 14,8%. Years of return are 8 years, discounted 11years.

5. ECONOMIC FLOW

	2017	2018	2019	2020	2021	2022	2023	2024	2025
RECIVABLES			3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00
From business			3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00
Other									
Expenditures	7.866.000,00	7.881.000,00	441.980,21	438.328,53	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00
Increase of assets	7.866.000,00	7.881.000,00							
			3.652,21	0,527222					
Cost of operation			438.328,00	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00	438.328,00
Marketing									
Net recivables	-7.866.000,00	-7.881.000,00	2.611.755,79	2.615.407,47	2.615.408,00	2.615.408,00	2.615.408,00	2.615.408,00	2.615.408,00
Cummulative net recivables	-7.866.000,00	-15.747.000,00	-13.135.244,21	-10.519.836,73	-7.904.428,73	-5.289.020,73	-2.673.612,73	33.942.099,27	36.557.507,27
NPV	-7.866.000,00	-7.297.222,22	2.239.159,63	2.076.194,78	1.922.402,96	1.780.002,74	1.648.150,68	561.131,10	519.565,83
Cummulative discounted net reciv	-7.866.000,00	-15.163.222,22	-12.924.062,59	-10.847.867,82	-8.925.464,86	-7.145.462,12	-5.497.311,44	8.090.433,38	8.609.999,21
NPV	uz 8,00%	9.788.435,58							
IRR	14,81%								
MIRR	14,81%								
YEARS OF RETURN	uz 0,00%	8.02 godine	2025						
YEARS OF RETURN DISCOUNTED	uz 8,00%	11.03 godine	2028						
RELATIVE NPV	0,645405								
	122.017								

Investors can be satisfied with gross profit due to low operating costs, and then invest further in new plant or decide to withdraw money and try to find different investment opportunities. Profit and Loss account in the case of stable hydrology has a good and solid picture throughout years. This can be somewhat changed if flooding occurs, period of draught came , some unexpected new technological advances appear and lower than market price is offered to end consumer .Since now it was not the case so small hydroelectrically dam was successful project. It presents clean energy and if proper environmental study is made minimum negative impact on environment occurs.

6. PROFIT LOSS

	2019	2020	2021	2022
Revenue	3.053.736,00	3.053.736,00	3.053.736,00	3.053.736,00
Var cost	438.328,00	438.328,00	438.328,00	438.328,00
Border	2.615.408,00	2.615.408,00	2.615.408,00	2.615.408,00
% in revenue	85,646172	85,646172	85,646172	85,646172
less fixed costs	490.930,00	490.930,00	490.930,00	490.930,00
Operative border	2.124.478,00	2.124.478,00	2.124.478,00	2.124.478,00
% revenue	69,569799	69,569799	69,569799	69,569799
Nett gain	2.124.478,00	2.124.478,00	2.124.478,00	2.124.478,00
% revenue	69,569799	69,569799	69,569799	69,569799
Gain before tax	2.124.478,00	2.124.478,00	2.124.478,00	2.124.478,00
OPOREZIVA DOBIT	2.124.478,00	2.124.478,00	2.124.478,00	2.124.478,00
NETO DOBIT	2.124.478,00	2.124.478,00	2.124.478,00	2.124.478,00
u % prihoda od prodaje	69,569799	69,569799	69,569799	69,569799
Dividende				
ZADRŽANA DOBIT	2.124.478,00	2.124.478,00	2.124.478,00	2.124.478,00
OMJERI				
gain/stock capital (%)	13,491319	13,491319	13,491319	13,491319
gain/worth (%)	11,887534	10,624538	9,604142	3,648014
gain+interest/investment (%)	13,488191	13,48819	13,48819	13,48819

Balance Sheet is presented as follows. It is in case of kept profit and continued good business selling opportunities.

In praxis however certain type of loan is often made and this balance sheet can be changed by increased long term loan obligation that was made at the beginning of the project.

7. BALANCE SHEET

	2017	2018	2019	2020	2038
ASSET	7.866.000,00	15.747.000,00	17.872.696,11	19.997.173,58	58.237.777,58
Short term			2.616.626,11	5.232.033,58	52.309.377,58
Long term	7.866.000,00	15.747.000,00	15.256.070,00	14.765.140,00	5.928.400,00
PASIVE	7.866.000,00	15.747.000,00	17.872.696,11	19.997.173,58	58.237.777,58
Short term			1.218,11	1.217,58	1.217,58
Long liability					
Stock capital	7.866.000,00	15.747.000,00	15.747.000,00	15.747.000,00	15.747.000,00
Reservers				2.124.478,00	40.365.082,00
Kept profit			2.124.478,00	2.124.478,00	2.124.478,00
Net values	7.866.000,00	15.747.000,00	17.871.478,00	19.995.956,00	58.236.560,00
CAPITAL/TOTAL LIABILITIES	100	100	88,106461	78,746128	27,03915
VALUE/TOTAL LIABILITIES	100	100	99,993185	99,993911	99,997909
LONG TERM DEBT/NET VALUE					
SHORT TERM ASSET/SHORT TERM LIABILITIES			2.148,11	4.297,08	42.961,84

D INNOVATIONS AND FURTHER POSSIBILITIES

1. Innovations/ Possibilities in Economic Sector

2. Innovation/ Possibilities in Trade

3. Innovation / Possibilities in Technical Possibilities

Table 27: Short glance at possibilities

		Some examples, possibilities
Economic/Social Sector		
	Tax regulation	Lower tax rate on clean energy production and construction
	Social policy	End price sensitivity on lower than average income families (end price in electricity)
	Monetary -Banks	More credit opportunities for renewables , and implementation of renewables, lower than average interest rate
	Bills	Each category visible, day night price, renewable production, impact on environment
	Possibility to change	Easy change of energy seller – based on personal preferences, price , renewables, etc.
	Tax	If you buy more expensive energy input that is based on renewable- possibility to deduce of tax at the end of year- partly
	Tourism	Lower vignette charge for electrical vehicles,
	Tourism	Heating , Cooling- loans with favorable interest ,small electrical cars to rent
	State Institutions	Hospitals, schools, pension homes- lower end price possibilities –social program established,renewable input
Trade		
	Spot trading places	In end price visible: -Part in renewable , nonrenewable source -Impact on environment(CO_2) -Different summer/winter prices - Different day/night prices -Possibilities At border of two three countries, visible price of transmission
	New transport routs	Transport and cooperation in bio fuels
	Export Import	Equal rights and opportunities to all ,tax benefits, cooperain in aims and with environmental and security stability in region, Regional cost benefit analysis
Technical Possibilities		
	Implementation	Subway, trains, Tramway, Trolleybus-electrical power, or on waste generated transport
	Clear and visible signs	Signs and information
	Informatics	Linking the countries, Information possibilities on phone about buying electricity, harmful emissions, parking places
	Cars	More small cars –plug in

E CONCLUSION

Energy policy is closely related to economic structure, GDP, population, its place on map as well as country strategy toward regional and relief position.

Each country has a history and its own way in finding the best possible solution in meeting energy demands. Austria is no different than other countries in the region - it imports energy mostly oil, gas, but also tries actively to implement renewables in its energy strategy– so far it was successful in hydroelectricity production. Country works in communication, education and cooperation with other countries in region to promote common goals. Its electricity production comes from electricity, gas and coal, but there are potential to increase share of electricity production from wind, geothermal, municipal, industrial waste, or to import left over from eastern countries and produce biofuels.

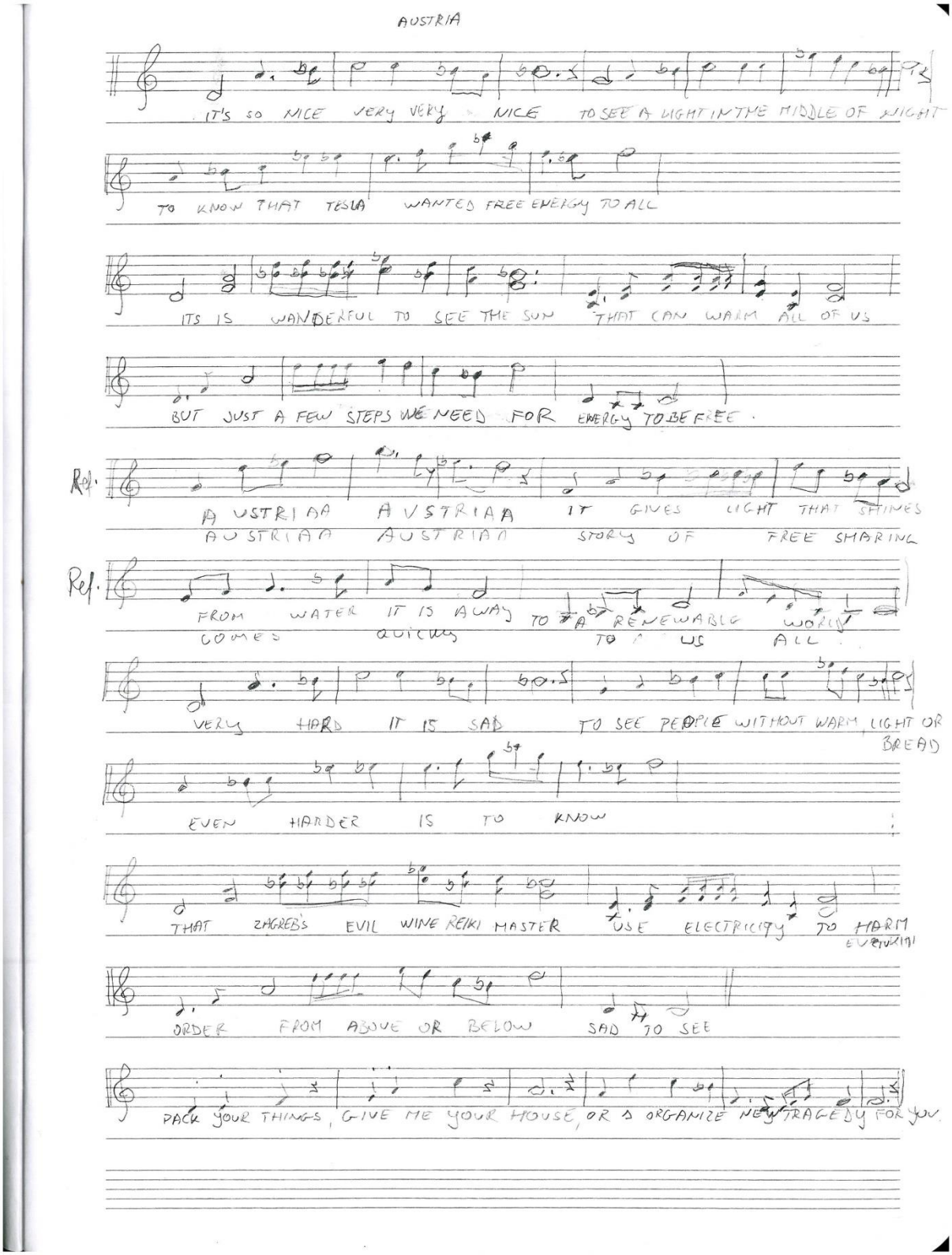
Country itself can develop two way lines of actions. The first one is directed toward inner opportunities: more energy efficiency, better and more transparent information about energy, information and calculation about environmental impacts, work on innovative strategies (more parking places with electrical power, more vehicles with two way power – bio fuel electrical , reforestation instead of wood input, trading buying per phone of energy with all information, loans for clean energy implementation etc.). The second line of action is directed toward cooperation, or export import opportunities that come with neighboring energy policy. With increase demand for energy - it comes with population growth, GDP increase especially by eastern neighbors- energy demand will increase. It can be partly met by each country own energy policy but can incorporate pricing strategy or clean energy resource that comes from Austria

This paper is only overview of possibilities of one countries action and strategy potentials, it can be done for each country in a similar way but it is important to note that energy policy is not solely related to one country (in case of nuclear facilities), it can bring innovation (informatics, information, technological advances, usage of existing materials on better way, etc.), bring new working places (industrial facilities with renewable production), bring cooperation and sharing of knowledge between countries and promote social stability (lower price for under lower bracket income, vouchers for energy usage for certain time, greater flexibility etc.)

Literature:

- Web BP
- Eurostat.eu
- Eia.org
- iea.org
- UNCTAD
- World Bank
- Wikipedia
- Other sources
- STAT ANALYSIS, software

Anex1


AUSTRIA
IT'S SO NICE VERY VERY NICE TO SEE A LIGHT IN THE MIDDLE OF NIGHT
TO KNOW THAT TESLA WANTED FREE ENERGY TO ALL
ITS IS WANDERFUL TO SEE THE SUN THAT CAN WARM ALL OF US
BUT JUST A FEW STEPS WE NEED FOR ENERGY TO BE FREE.
Ref.
AUSTRIAA AUSTRIAA IT GIVES LIGHT THAT SHINES
AUSTRIAA AUSTRIAA STORY OF FREE SHARING
Ref.
FROM WATER IT IS AWAY TO A RENEWABLE WORLD
COMES QUICKLY TO US ALL
VERY HARD IT IS SAD TO SEE PEOPLE WITHOUT WARM, LIGHT OR BREAD
EVEN HARDER IS TO KNOW
THAT ZAGREB'S EVIL WINE REIKI MASTER USE ELECTRICITY TO HARM EVERYTHING
ORDER FROM ABOVE OR BELOW SAD TO SEE
PACK YOUR THINGS, GIVE ME YOUR HOUSE, OR I ORGANIZE NEW TRAGEDY FOR YOU