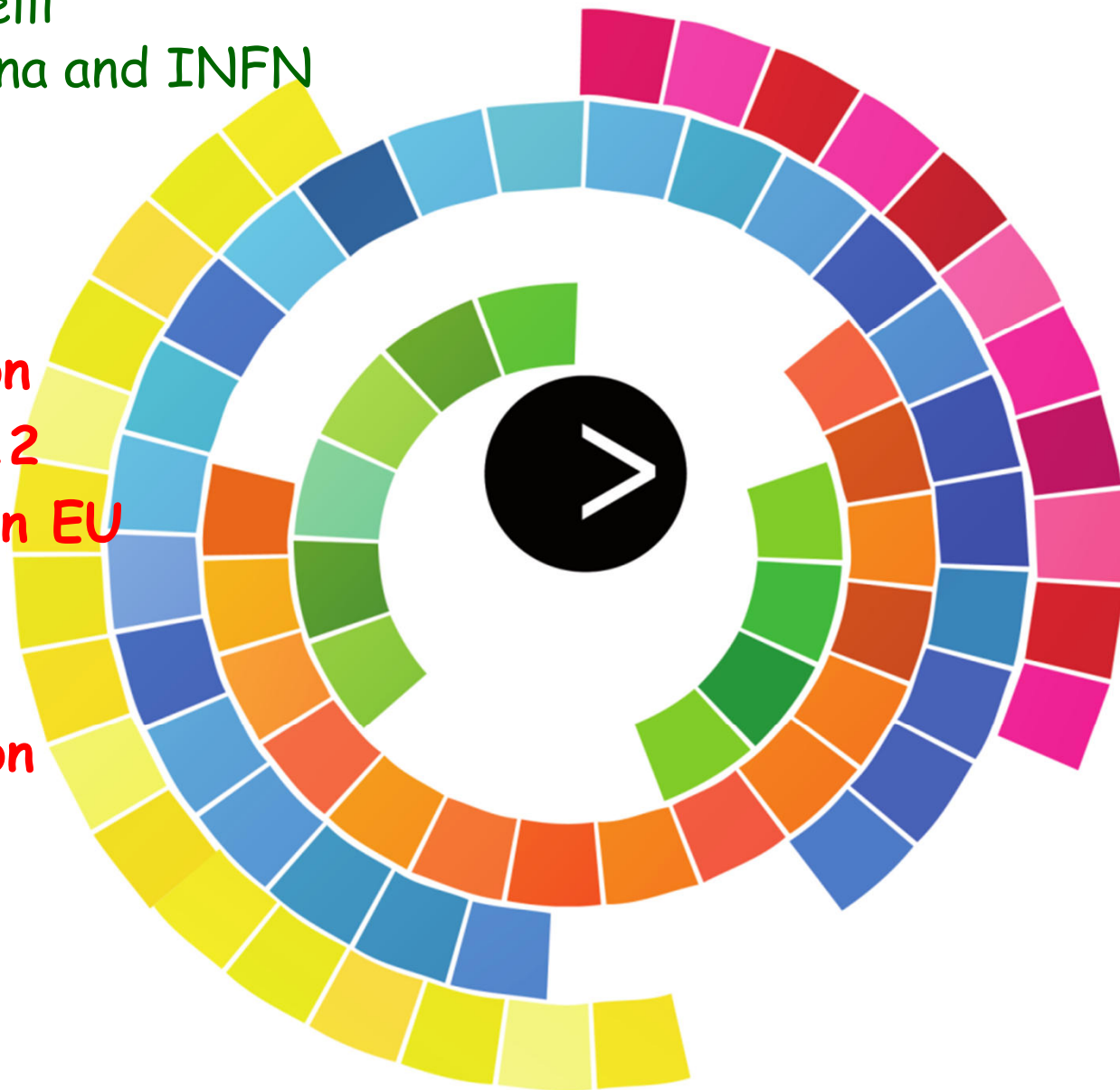


Energy Consumption and Savings Indicators and Indices

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con l'ambiente
Rifiuti acqua energia
Rave
nna
25/26/27
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1. Introduction

The industrial revolution began in the 1750s. It first provided steam-powered trains and ships, then internal combustion engines, which transformed the ways peoples moved and produced goods.

Electrification continued the revolution.

Today, a large number of persons keep their homes warm in winter, cool in summer and lighted at night; they travel by cars with powers of $\approx$ hundred horses. This power comes from our ability to exploit fossil fuels. But in the transition to "horsepower" CO_2 emissions created climate-change risks; the emissions are expected to increase. The world needs another revolution to make our sources affordable and sustainable.

Despite the significant growth in the use of renewable energies, the fraction of non-carbon emitting new renewable energy sources is small.

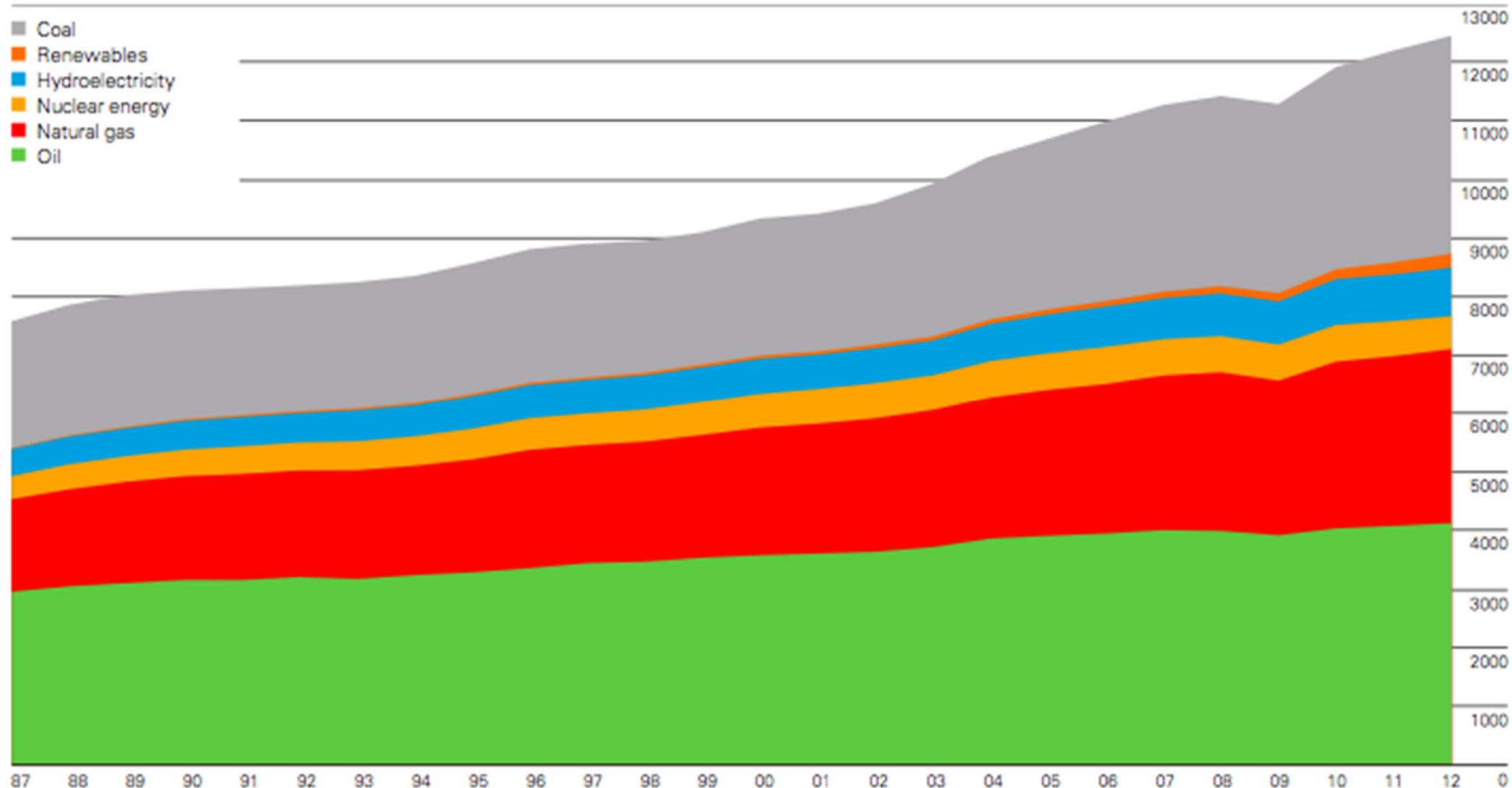
In 2012 there was a technological revolution in the US and Canada, obtaining oil and gas in commercial quantities from oil/gas shales and oil sands, vastly increasing the oil and gas reserves. About 10 years ago this possibility was considered impossible and too costly. But the development of new technologies made it possible.

2. World energy consumption

- The normal oil and gas reserves show a tendency to increase with time because of improved technologies which allow to obtain oil and gas from deeper sources in land and in the seas.
- The addition of oil and gas from oil/gas shales and oil sands increased considerably the reserves, and allow to obtain them from many Countries.
- Coal reserves remain large, but the increasing reserves of oil and gas will reduce its use in many Nations,
- Hydroelectricity is increasing in developing Nations
- Nuclear energy is increasing in Eastern Nations, while the situation is not clear in many Western Nations.
- New renewable energies are increasing, but their global contribution remains small.

World consumption

Million tonnes oil equivalent



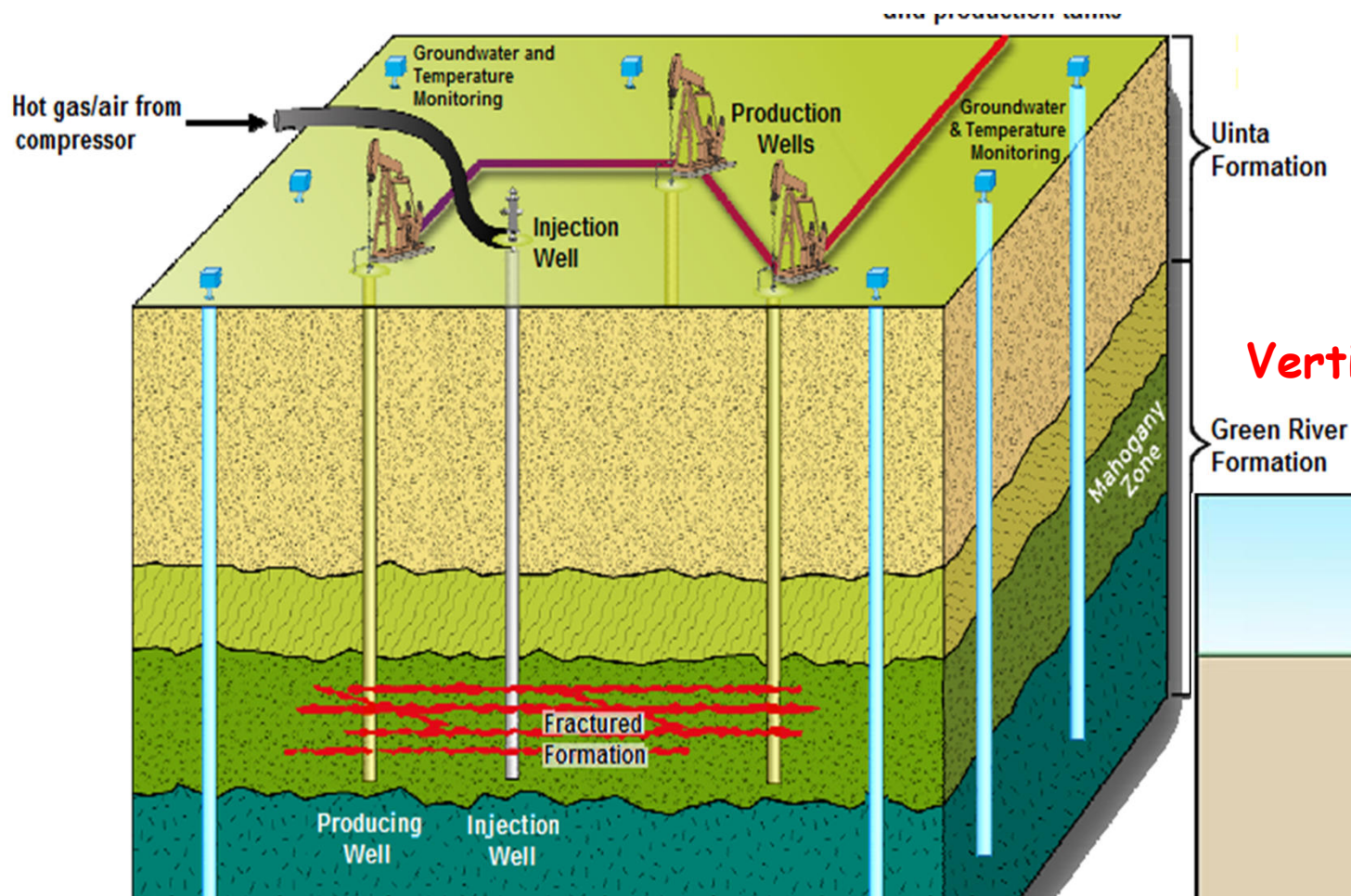
World primary energy consumption grew by a below-average 1.8% in 2012. Growth was below average in all regions except Africa. Oil remains the world's leading fuel, accounting for 33.1% of global energy consumption, but this figure is the lowest share on record and oil has lost market share for 13 years in a row. Hydroelectric output and other renewables in power generation both reached record shares of global primary energy consumption (6.7% and 1.9%, respectively).

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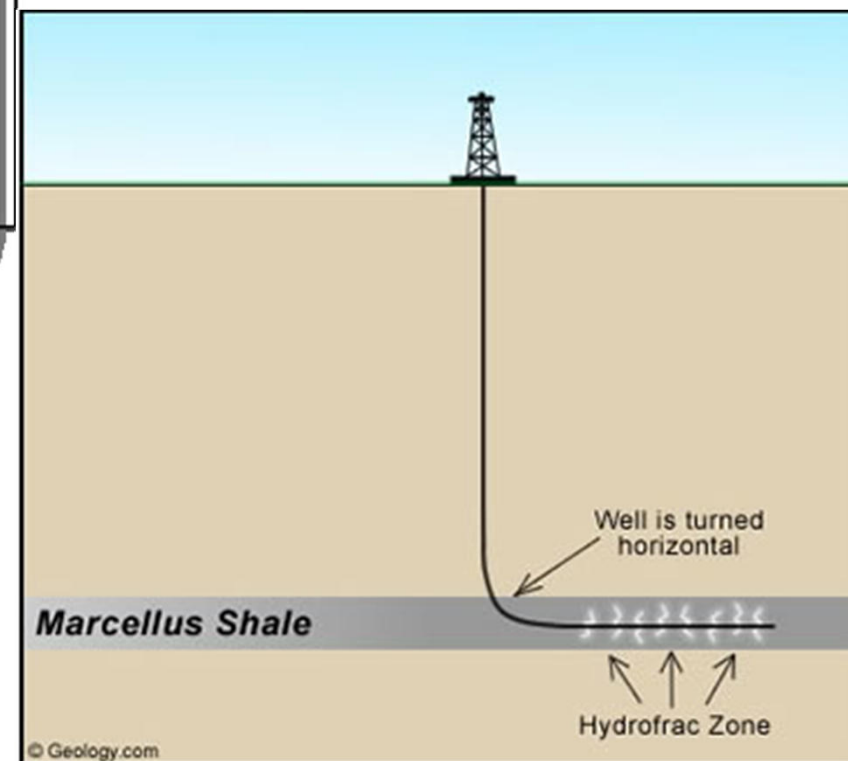
3. New Energy Sources-2012 (gas/oil shales, oil sands)

- In the US in 2012 there was an increase of 40% in the local production of natural gas from gas/oil shales and an increase of 29% of oil. All this produced a new sort of Eldorado in the US and in West Canada.
- The Province of Alberta in Western Canada has about 70% of the world reserves of oil sands (tar sands).
- The US will probably become an exporter of natural gas.
- They also had considerable success in energy savings; thus there is a decrease of gas/oil imports.

Chevron wells in shale



Vertical and horizontal gas well



Oil sand mine in Alberta, Canada

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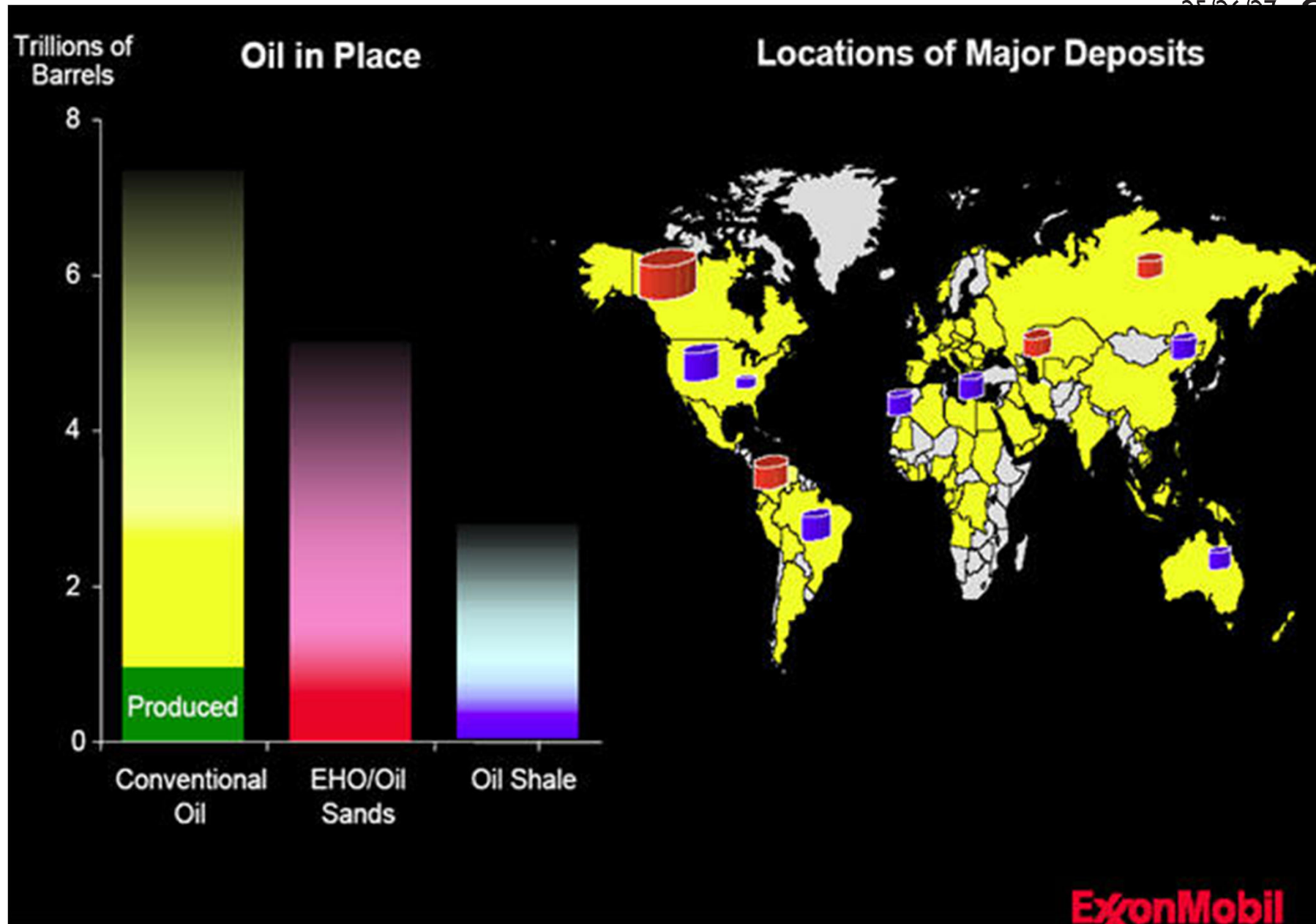
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Largest oil shale deposits (over 1 billion metric tons)^[3]

Deposit	Country	Period	In-place shale oil resources (million barrels)	In-place oil shale resources (million metric tons)
Piceance Basin	United States	Cretaceous	1,525,157 ^[11]	
Green River Formation	United States	Paleogene	1,444,992 ^[11]	213,000
Uinta Basin	United States	Paleogene	1,318,964 ^[11]	
Phosphoria Formation	United States	Permian	250,000	35,775
Eastern Devonian	United States	Devonian	189,000	27,000
Heath Formation	United States	Early Carboniferous	180,000	25,578
Olenyok Basin	Russia	Cambrian	167,715	24,000
Congo	Democratic Republic of Congo	?	100,000	14,310
Irati Formation	Brazil	Permian	80,000	11,448
■ Sicily	Italy	?	63,000	9,015
Tarfaya	Morocco	Cretaceous	42,145	6,448
Volga Basin	Russia	?	31,447	4,500
St. Petersburg, Baltic Oil Shale Basin	Russia	Ordovician	25,157	3,600
Vychegodsk Basin	Russia	Jurassic	19,580	2,800
Wadi Maghar	Jordan	Cretaceous	14,009	2,149
Dictyonema shale	Estonia	Ordovician	12,386	1,900
Timahdit	Morocco	Cretaceous	11,236	1,719
Collingwood Shale	Canada	Ordovician	12,300	1,717
■ Italy	Italy	Triassic	10,000	1,431

Oil from sands and shale (world)

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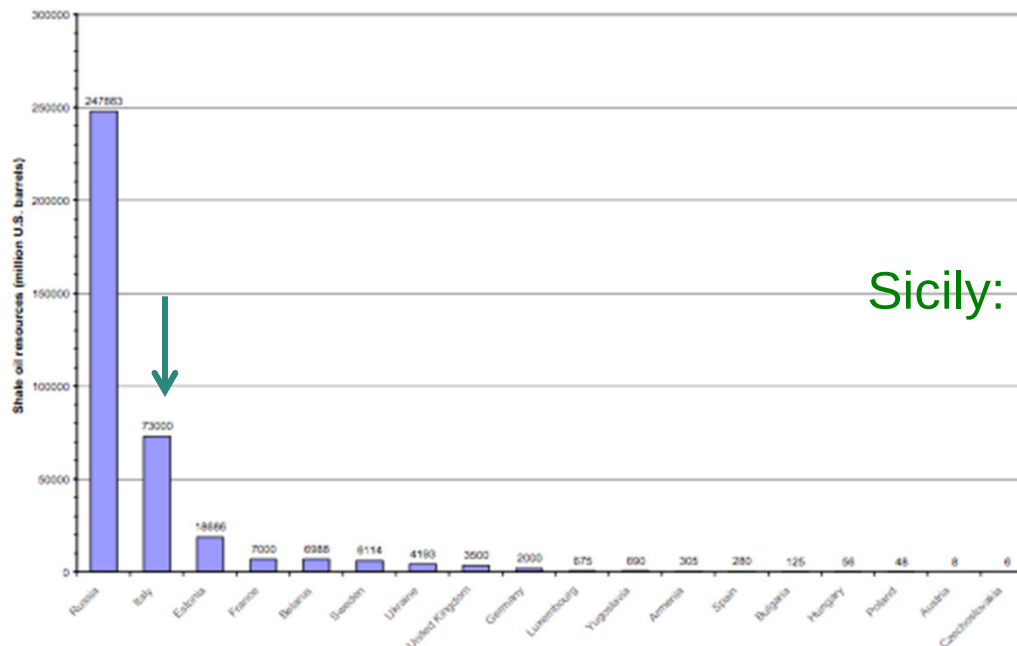


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4. Gas/oil shales in the World and in Europe

- China, Australia, India, ... Have great interest shales.
- In Poland there will soon be a conference on "Shale gas world Europe".
- Poland, Estonia and other eastern european nations are planning or hope to become independent from energy imports from Russia.
- Poland is rich of gas shales at a depth ≈ 1 km deeper than in the US, and already has test wells producing gas.
- Russia, Estonia, have large oil shales reserves, and also Italy.
- There are several european nations planning to start searches and use these new possibilities (gas) to decrease energy imports.

Figure 2 European shale oil resources (million US barrels)



Sicily: Tripolitic oil shale basin

5. Energy saving



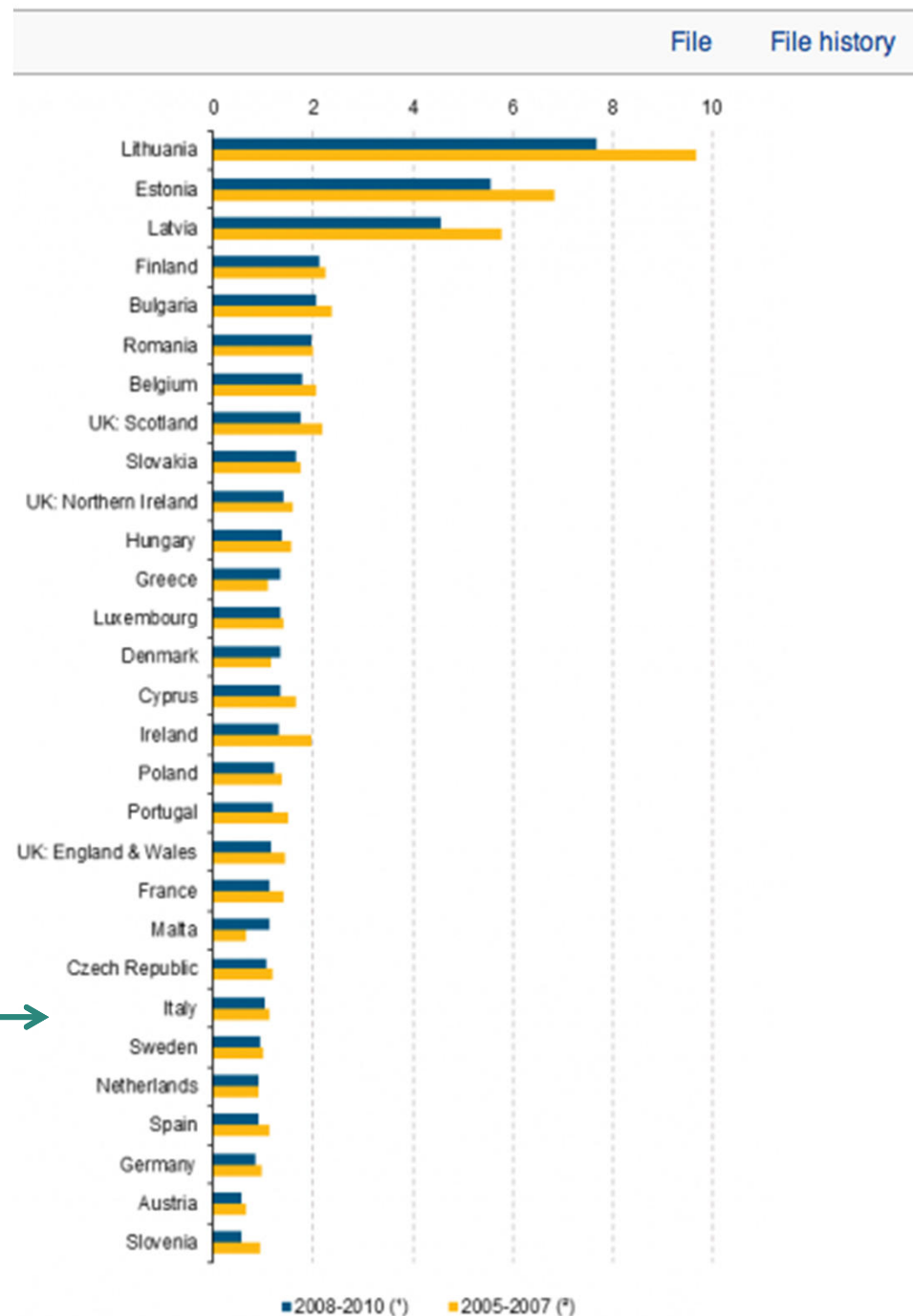
- Energy saving may be considered as a new source of energy. The list of methods is rather long and much progress was made:
 - Electric energy saving with low consumption lamps, domestic appliances.
 - Better insulation of buildings, house certification.
 - Generalized tele-heating of buildings.
 - Energy saving with new airplanes, new engines (50% since 1970).
 - Lighter materials for cars, trucks, and better aerodynamics.
 - New hybrid vehicles.
 - New lighter materials, new metal alloys, carbon fibers, new steel.
 - Electric power conversions via electronics.
 - Mother in law,.....

6. EU Statistics

Crimes in Europe

The latest data indicate a general tendency towards a decrease in the level of recorded crimes in the European Union.

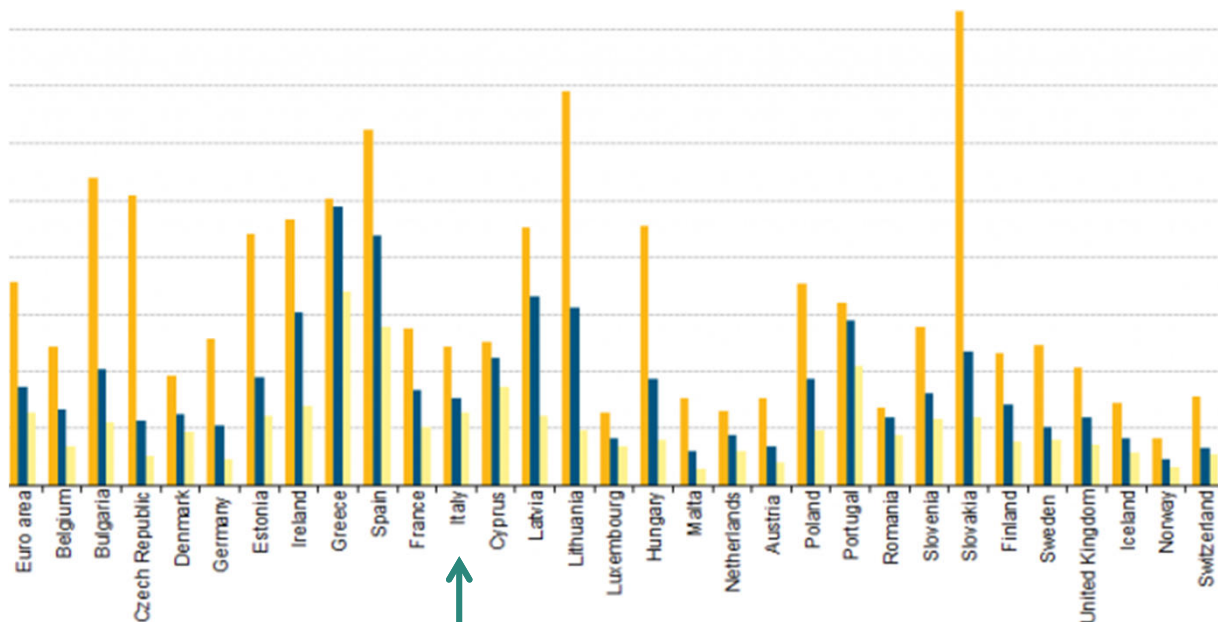
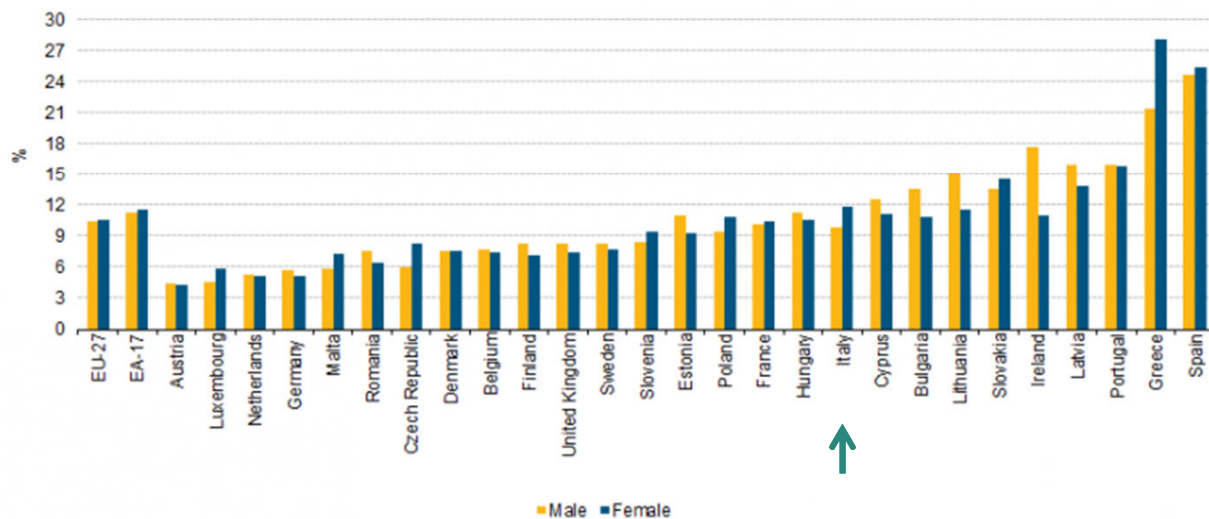
Homicide rate per 100 000 population:



Unemployment in the European Union

File:Unemployment rates, 2012, ranked on the average of male and female.png

File File history File links

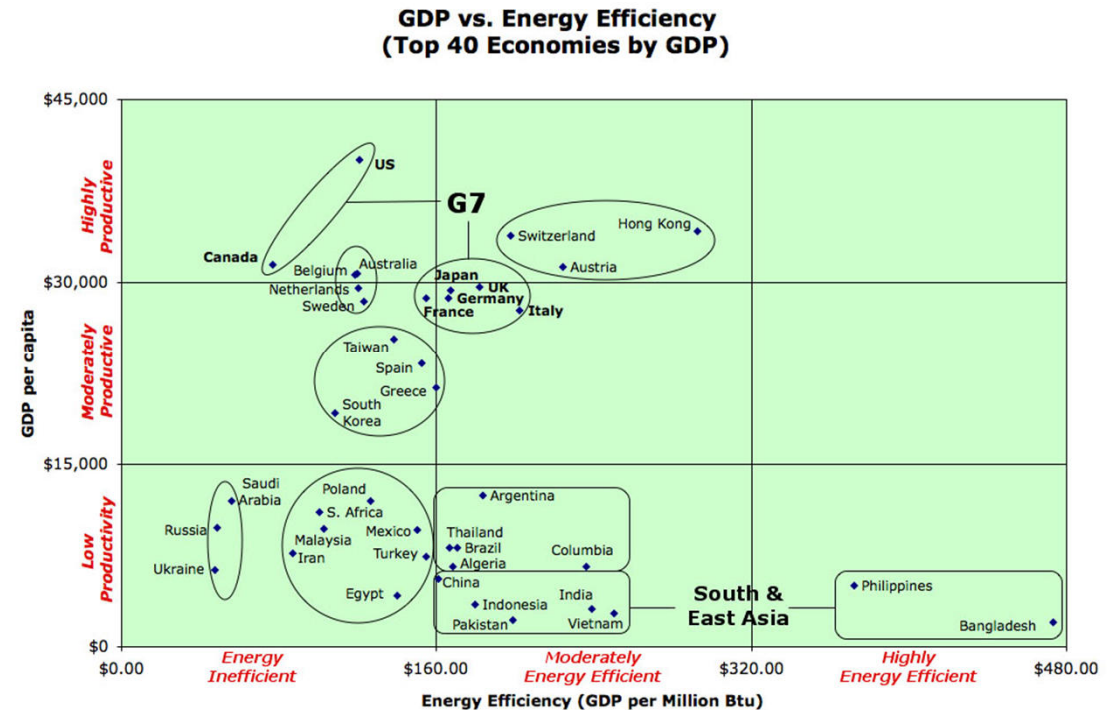
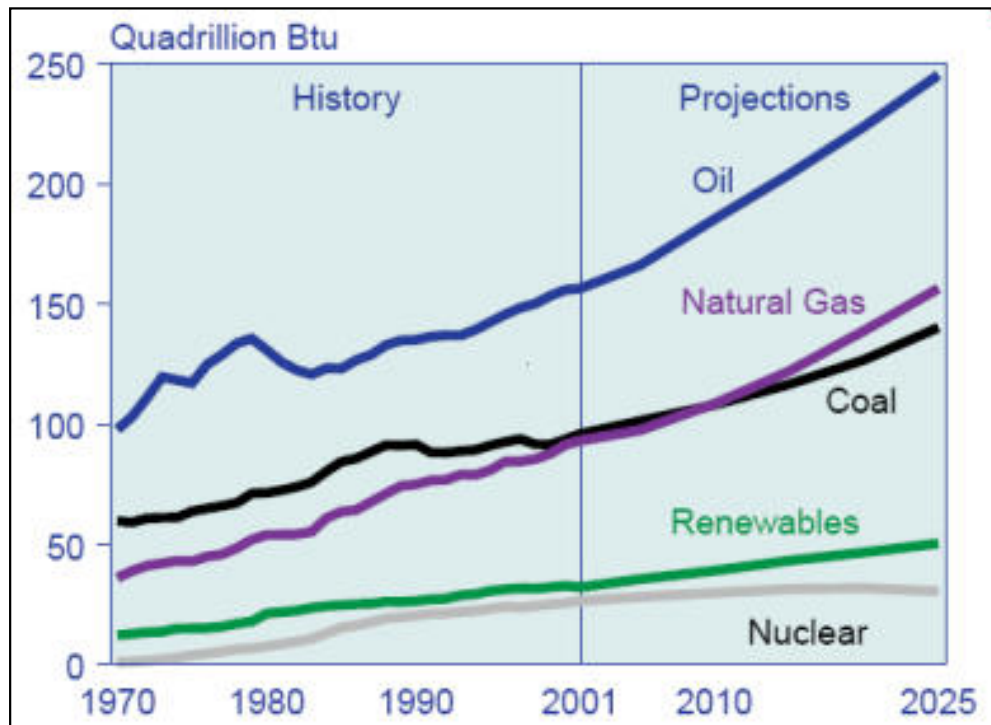


% unemployment by Education in 2012

- Pre-primary, primary and lower secondary education
- Upper secondary and post-secondary non-tertiary education
- Tertiary education (ISCED levels 5 and 6) (2)

7. Estimates of future energy consumption

Energy intensity

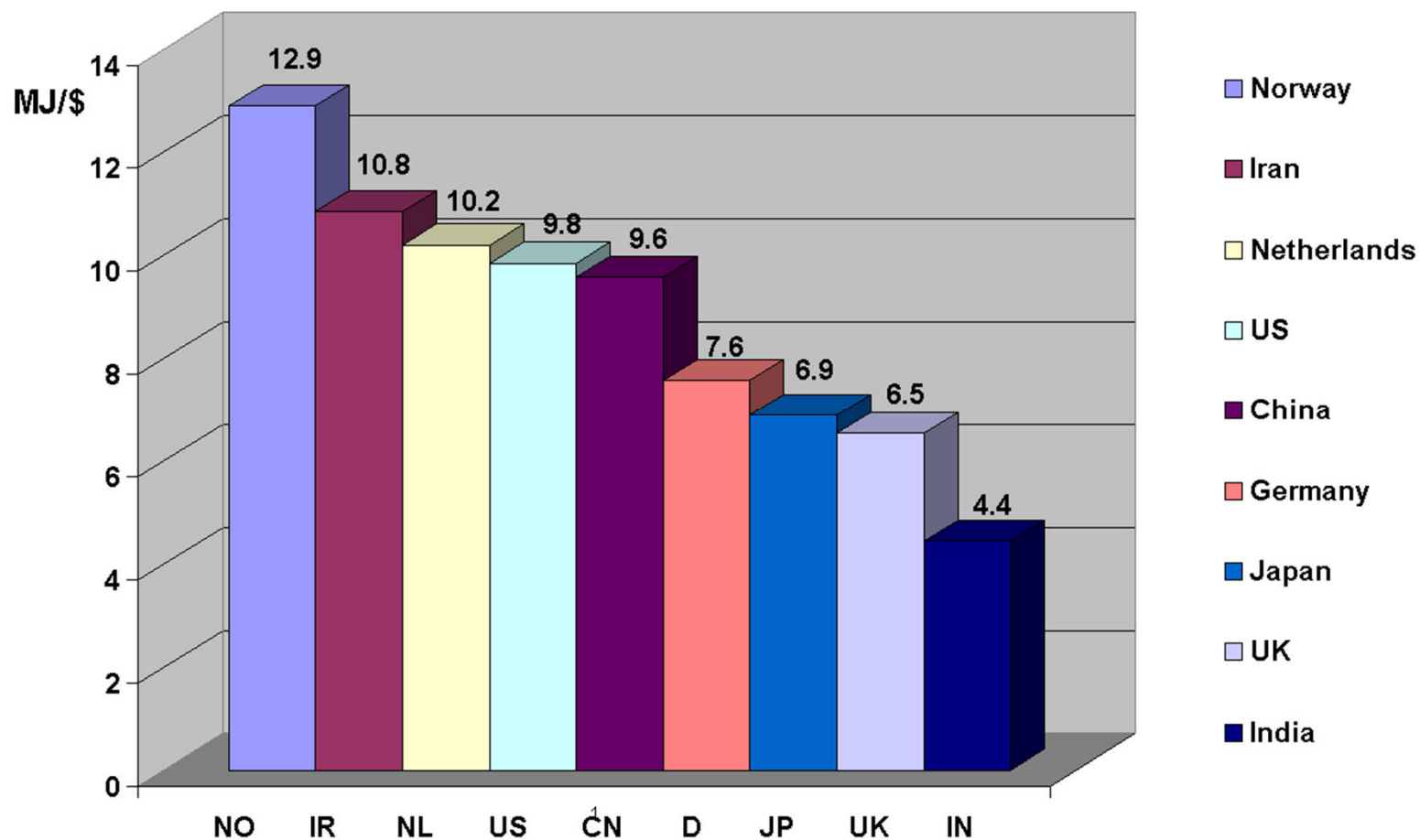


Energy Intensity is a measure of the energy efficiency of a nation's economy. It is measured in units of energy per unit of GDP.

Italy: population=60 million, GDP=1.8 trillion \$, GDP pro capite ≈ 31000 \$, Annual energy intensity 122.8 t oil equivalent pro capite. Italy is the most energy efficient country of G8 and one of the most energy efficient in the industrial world (probably because of high energy prices, which resulted in more efficient companies and consumer behaviours). (EIA data up to 2003).

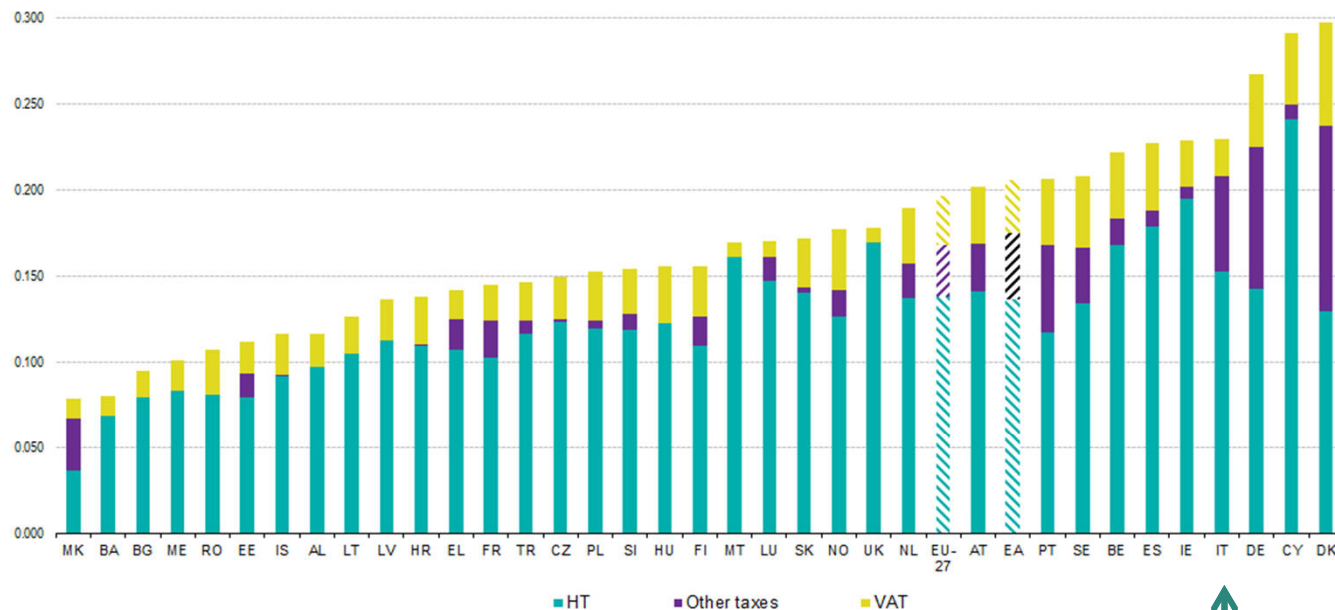
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Energy intensity

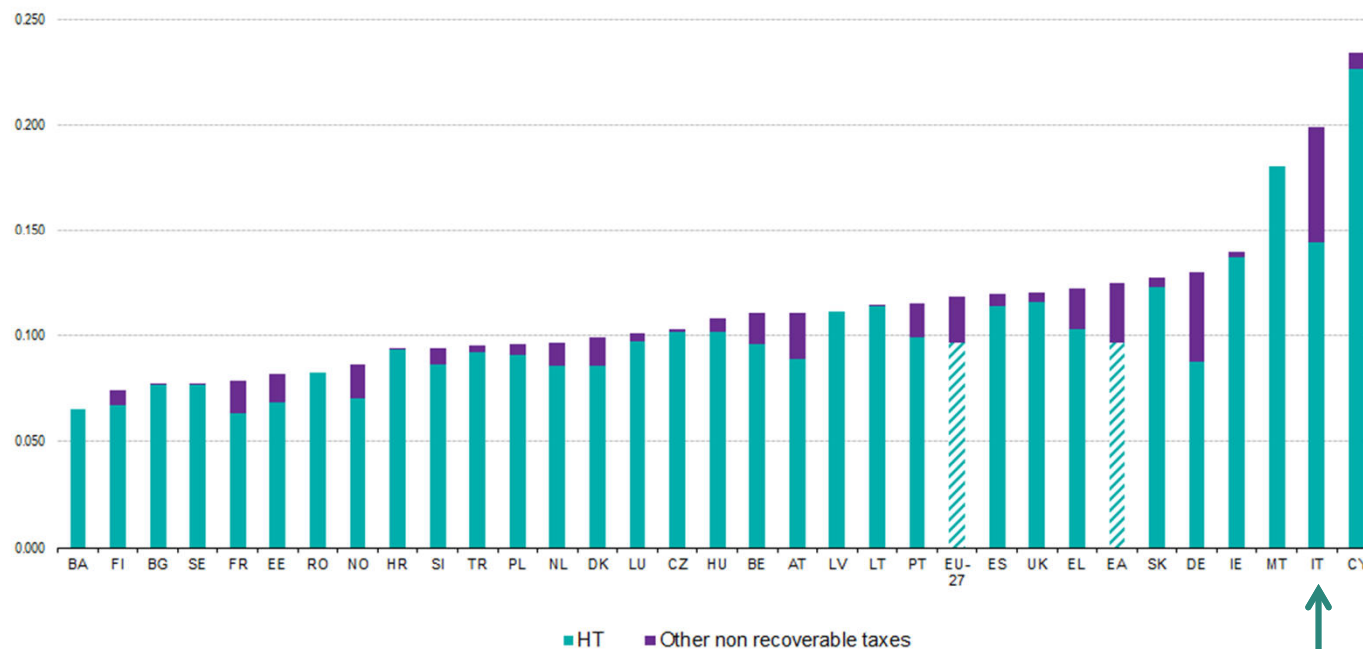


Electricity prices for domestic/industrial consumers 2012s2

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Eur/kWh
(Eurostat)



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8. Italian Regions: no prospections in italian seas

- The Regional parliaments of all the Italian Adriatic regions will approve the same law approved by the Regional Council of Puglia, which forbids prospections, research and utilization of liquid fuels in the Adriatic sea.
- In the italian press one sees :
 - Alberta : the paradise lost for the oil ! But the Canadian Region has given a financial contribution to each citizen of the Region !
 - The US progress may have labour consequences in Italy, in particular in Sicily. In an article in the italian press an author writes : Should we invest in these technologies or in green technologies ? I prefer the second option.
 - Many questions : Fracking produces microsismicity ?
 - The italian steel companies had considerable financial problems with the italian law; may be many people do not know that technical improvements can solve most problems.
 - The new problems with TAV may indicate new Nimby effects.

9. Conclusions. Perspectives.

- The world energy consumption keeps increasing.
- The main energy sources are still fossil fuels. Their reserves keep increasing because of technological innovations and, recently, because of the oil sands and oil/gas shales commercialized in the US, Canada and soon in other Countries.
- I think that we should try to use all our local energy sources, including those in our seas and those in Sicily (using the best technology).
- New renewable energies (RE) made considerable progress, but their contributions are still limited; and the discovery of oil sands and gas/oil shales may cause some decrease of interest in them.
- The major interest in RE is for reducing CO₂ emissions.
- Energy savings made major progress everywhere. We should go further!
- Nuclear technologies are improving, but in the Western Nations we have to solve the problem of large oppositions.
- Italy has the great problem coming from a very large financial debt.
- We have seen everywhere that the correct application of new technologies may solve all problems, so we may be confident for the future.