

III. Consumption, reserves, and developments in energy resources

- **1.Introduction**
- Global population growth over the last century, industrial development, and accelerating urbanization have led to a sharp increase in energy demand.
- Our planet will have nearly 8 billion inhabitants by 2030, an increase largely linked to population growth in emerging countries. Energy demand is expected to triple between 1970 and 2030.

2. Global demand for primary energy

- According to the International Energy Agency (IEA), global primary energy demand is expected to grow by 40% between 2007 and 2030, representing an average annual rate of 1.5%.
- Developing countries in Asia, followed by those in the Middle East, are the main drivers of this growth.

- -Globally, fossil fuels will account for more than three-quarters $\frac{3}{4}$ of the increase in energy demand between 2007 and 2030.
- -The share of coal will increase slightly, as will that of gas.
- - The share of oil will decrease.
- -Non-hydropower renewable energy sources will show the strongest growth rates.

3. Energy-consuming sectors

- Since the Industrial Revolution, energy consumption has continued to rise. It increased by 102% in 41 years, from 1973 to 2014 (final consumption).
- According to the IEA, global **final** energy consumption in 2014 was 9.425 billion toe (4.66 in 1973), 18% of which was in the form of electricity.

- Electricity and transportation are the sectors where energy demand will grow most rapidly worldwide between now and 2030, with significant demand coming from emerging countries.
- The breakdown of final energy consumption by sector is as follows: industry 29%, transportation 28%, residential 23%, tertiary 8%, agriculture and fishing 2%, non-energy uses (chemicals, etc.) 9%.

4. Ranking of primary energy sources

- In terms of production and consumption, the various forms of primary energy can be classified as follows:
 - Fossil fuels
 - Oil
 - Natural gas
 - Coal

- Nuclear energy

- Uranium

- Renewable energies

- Renewable energies known as (high energy potential)

- •Hydroelectric power
 - •Wind energy
 - •Photovoltaic solar energy

- Renewable thermal energy

- •Biomass
 - • Geothermal energy
 - •Solar thermal energy

5. Units of measurement

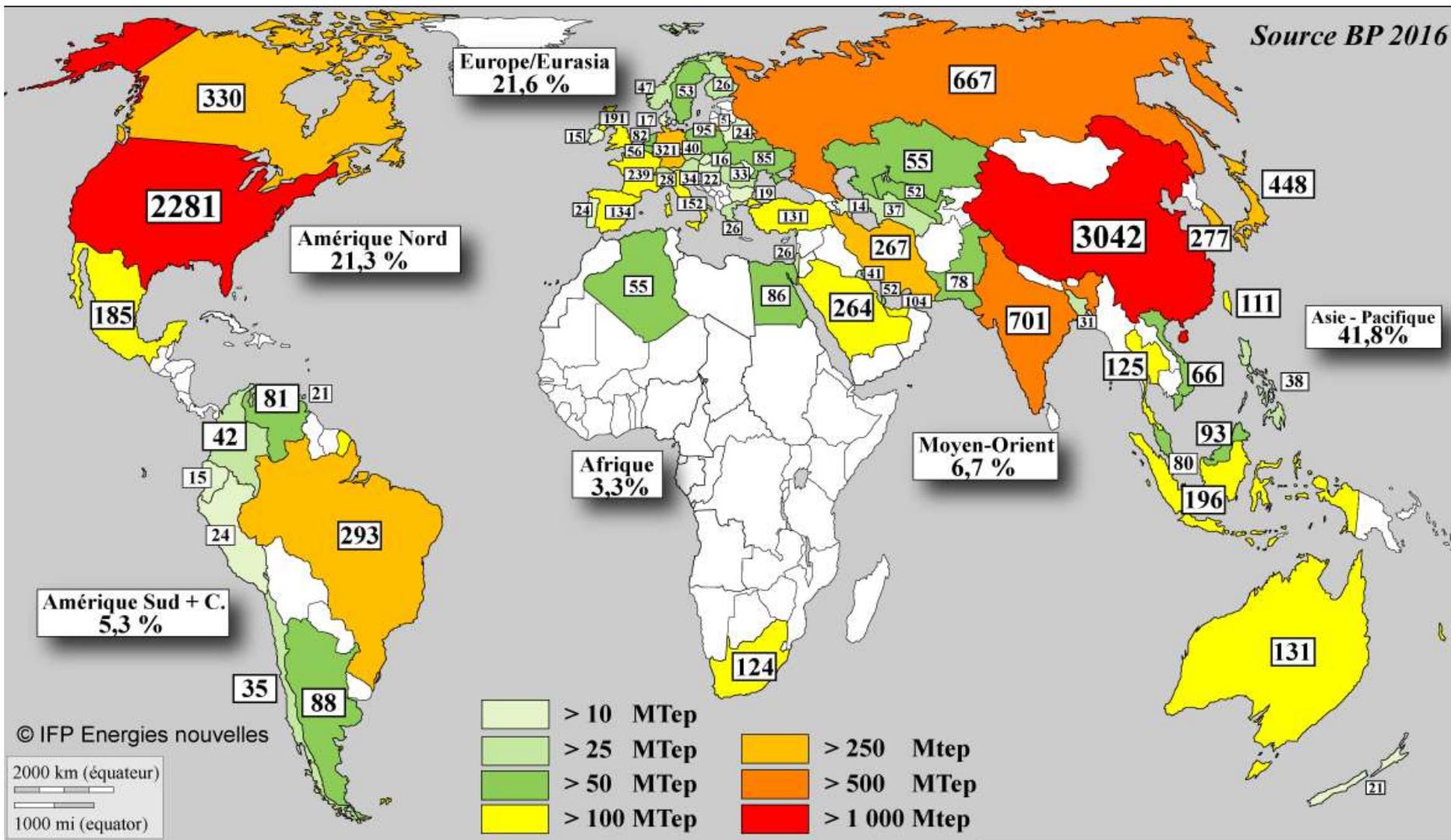
- The official unit of energy is the joule, but out of habit, most statisticians use the ton of oil equivalent (toe).
- Each type of energy has its own preferred unit:

- Oil: ton of oil equivalent (toe)
- Natural gas: cubic meter,
- Coal: ton of coal equivalent (tce)
- Electricity: kilowatt-hour (kWh)

6. Global primary energy consumption and its evolution

- Global energy consumption is increasing year on year, and oil plays an irreplaceable role in meeting energy needs. In [2015](#), consumption reached approximately [13.15 billion](#) tons of oil equivalent (Source: BP 2016).

Source BP 2016



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2000 km (équateur)

1000 mi (equator)

ENERGIES PRIMAIRES : Consommation (2015)

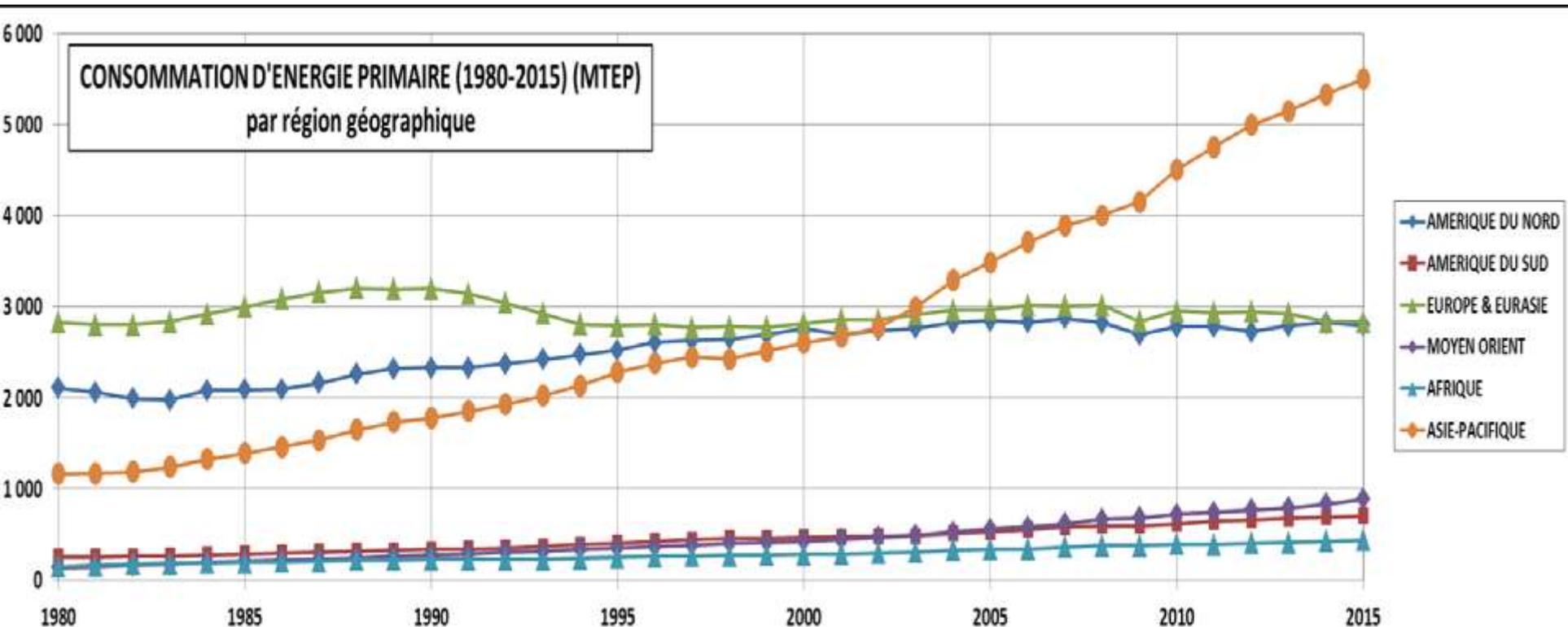
MONDE : 13 147 Mtep
(+ 0,97% par rapport à 2014)

Chine : 3042 Mtep
USA : 2281 Mtep
Inde : 701 Mtep
Russie : 667 Mtep

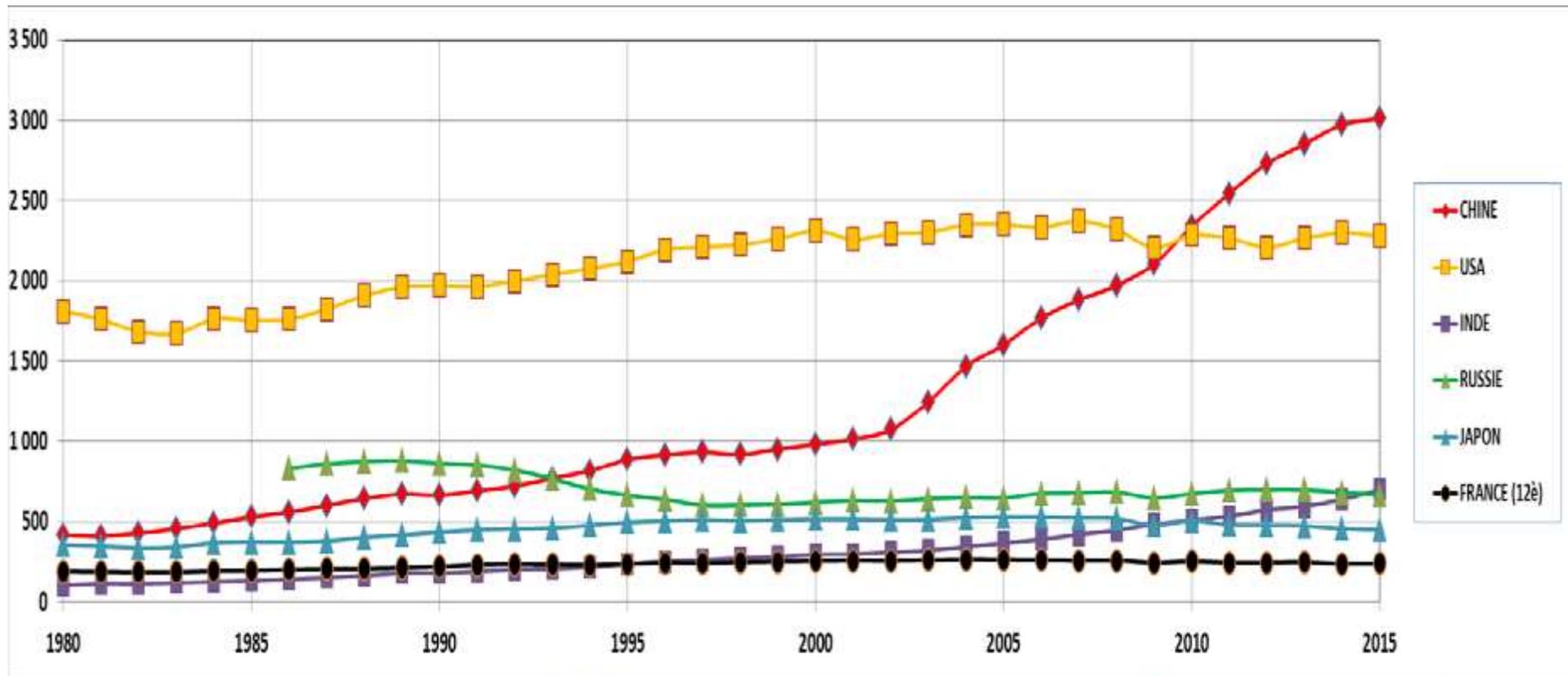
Japon : 448 Mtep
Canada : 330 Mtep
Allemagne : 321 Mtep
Brésil : 293 Mtep

Corée du Sud : 277 Mtep
Iran : 267 Mtep
Arabie Saoudite : 264 Mtep
FRANCE : 239 Mtep

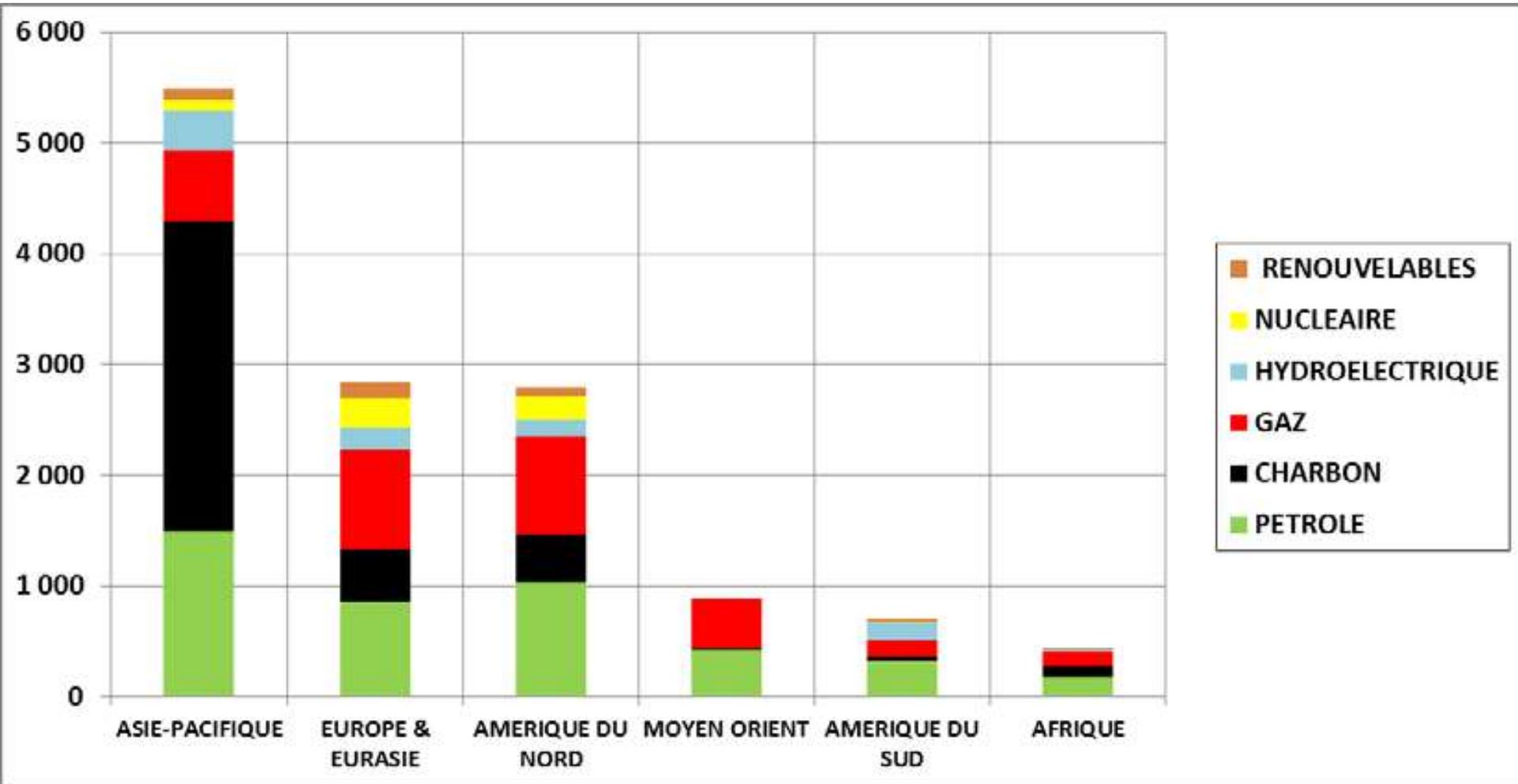
Indonésie : 196 Mtep
Royaume-Uni : 191 Mtep
Mexique : 185 Mtep
Italie : 152 Mtep

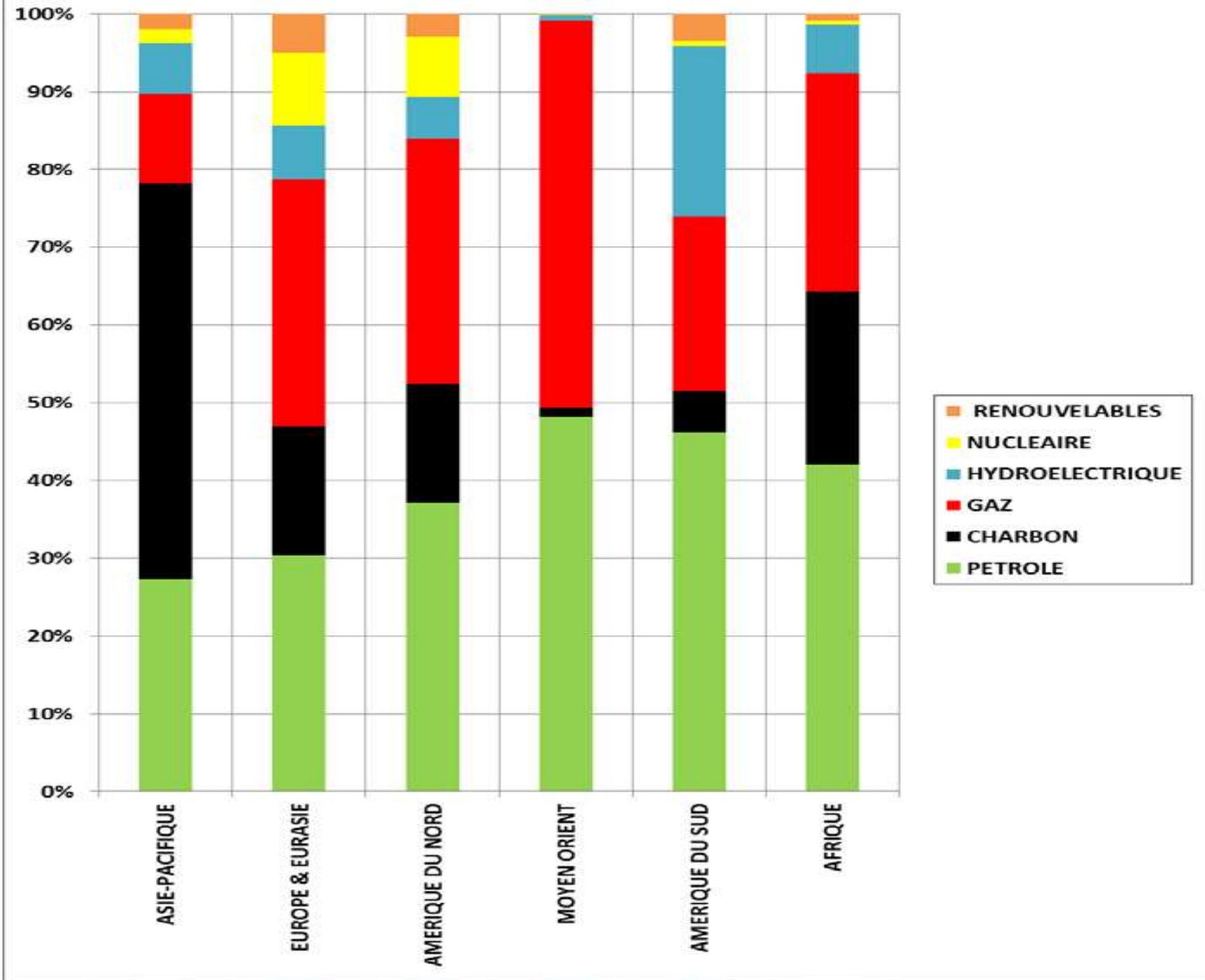


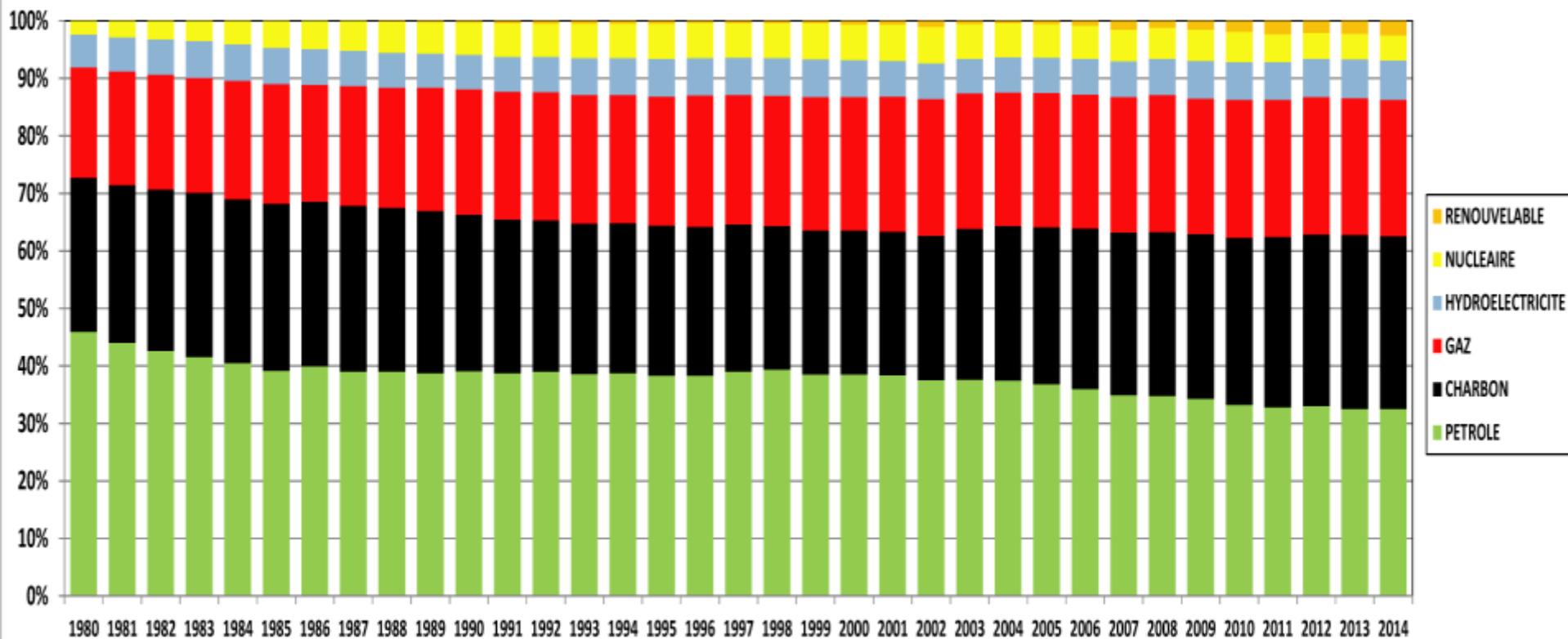
➤ Since 2003, the Asia-Pacific region has been the largest consumer of primary energy.



➤ Since the 2000s, China's primary energy consumption has been increasing very rapidly. In 2010, China's consumption exceeded that of the US.

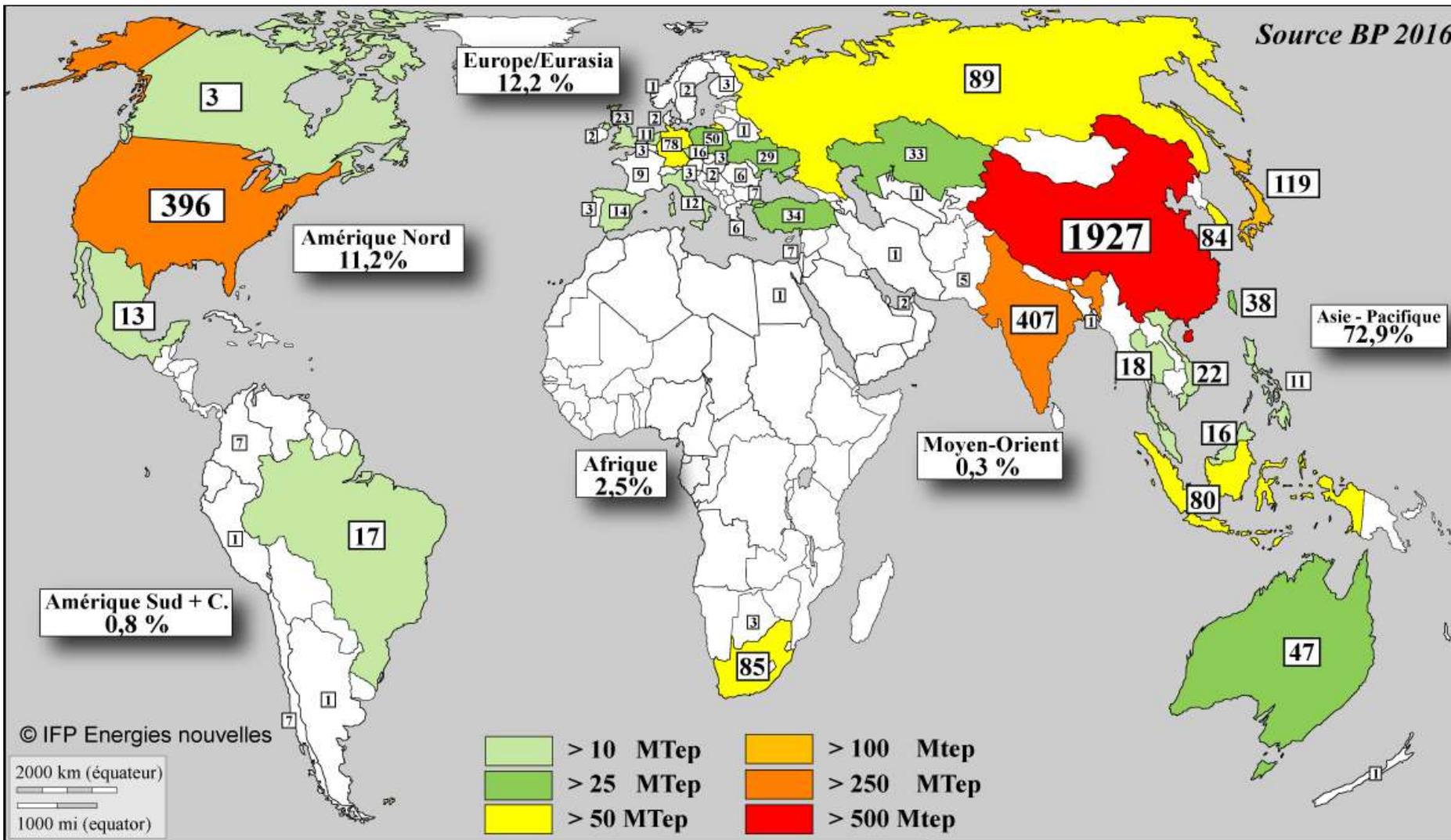






➤ • The evolution of primary energy sources shows that global primary energy consumption depends mainly on fossil fuels.

Source BP 2016



ENERGIES PRIMAIRES : CHARBON (2015)

Diminution par apport à 2014 : -1,8%

MONDE : 3 840 Mtep (29,2% de l'énergie primaire consommée)

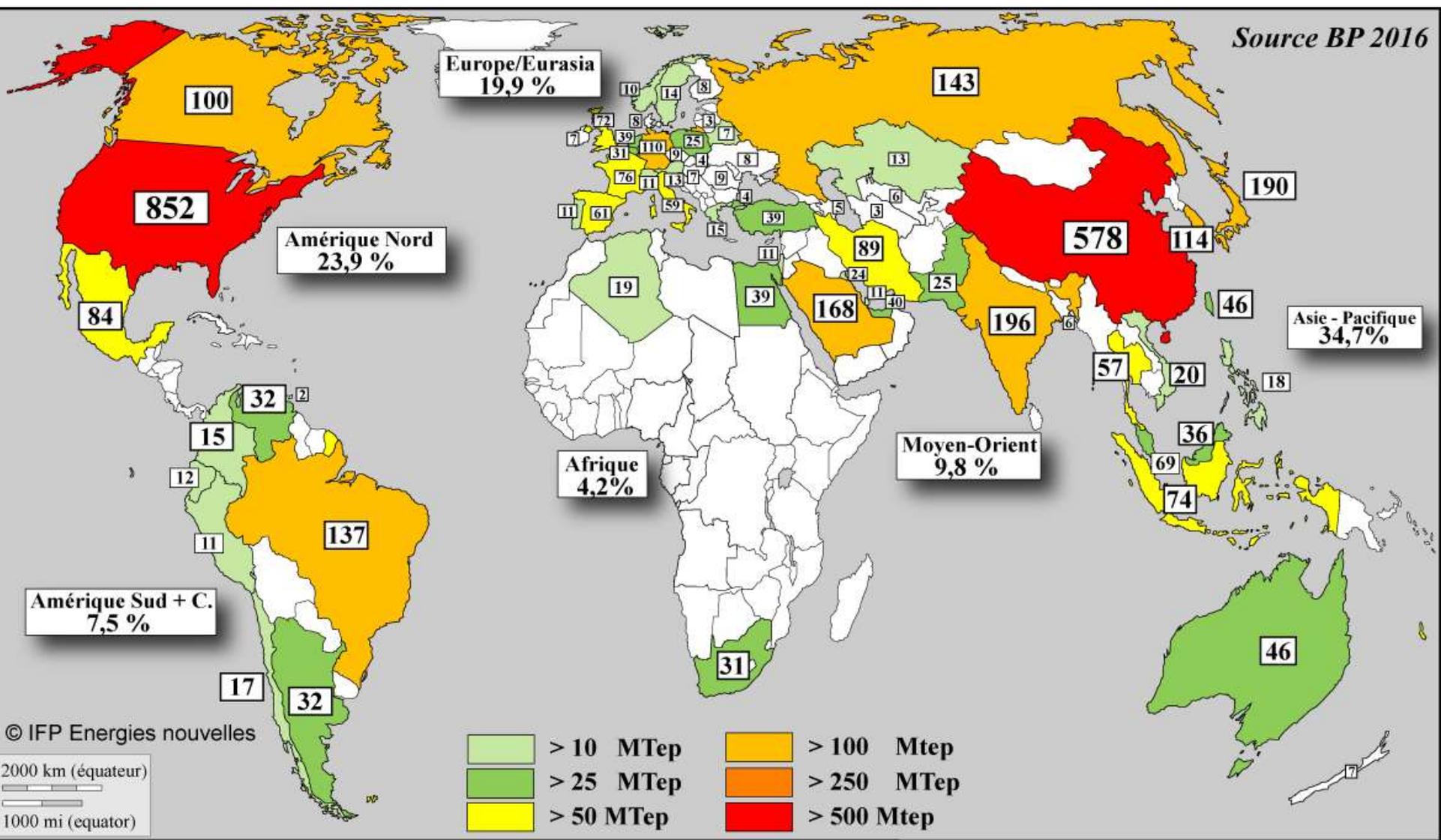
Chine : 1920 Mtep
USA : 396 Mtep
Inde : 407 Mtep
Japon : 119 Mtep

Russie : 89 Mtep
Afrique du sud : 85 Mtep

Corée du Sud : 85 Mtep
Indonésie : 80 Mtep

With consumption of 3,840 million tons of oil equivalent, **coal accounts for 29.2% of the primary energy consumed worldwide.**

Source BP 2016



ENERGIES PRIMAIRES : PETROLE (2015)

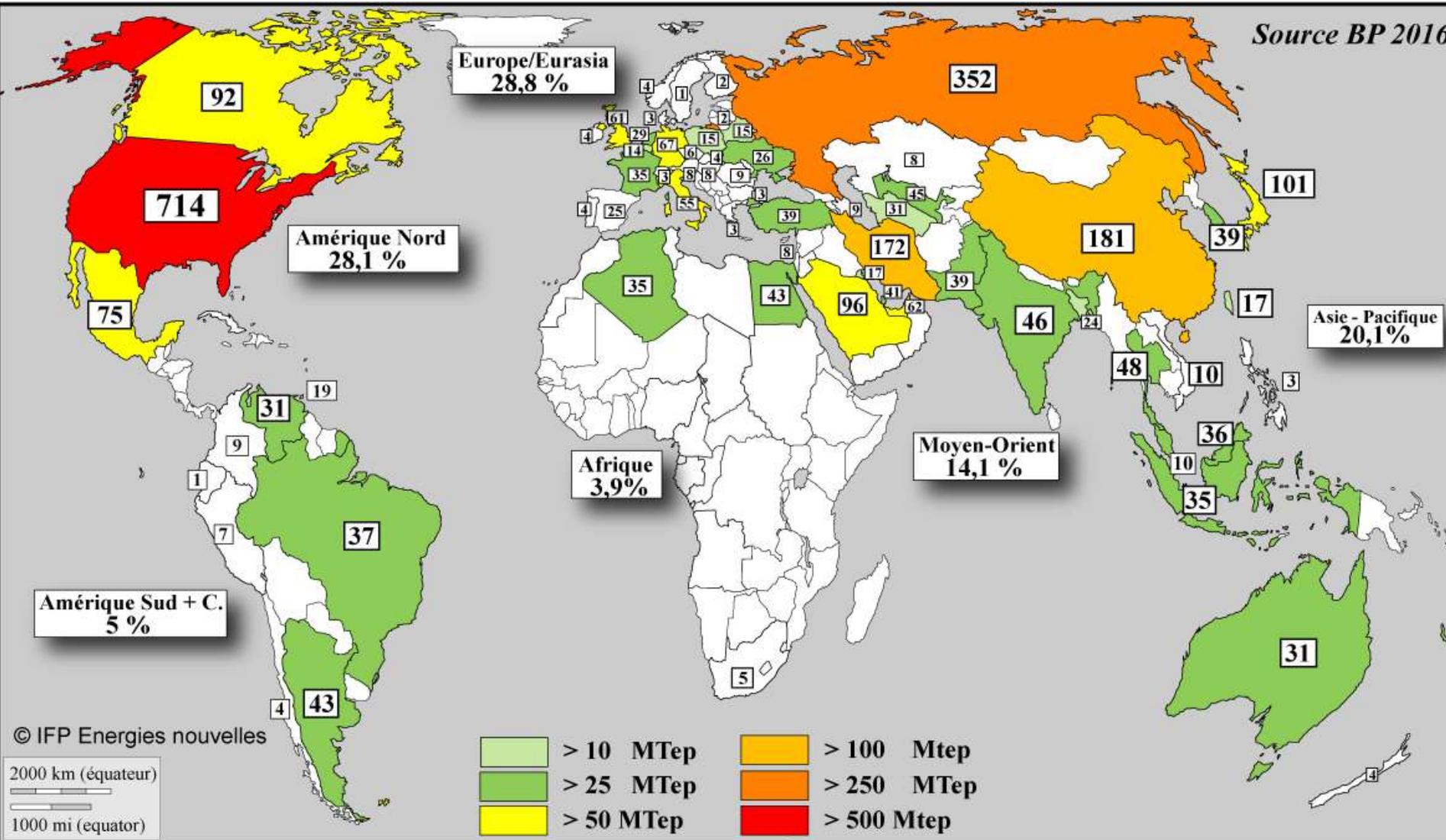
Augmentation par rapport à 2014 : + 1,88%

MONDE : 4 331 Mtep (32,9% de l'énergie primaire consommée)

USA : 852 Mtep	Inde : 196 Mtep	Arabie Saoudite : 168 Mtep	Brésil : 137 Mtep
Chine : 578 Mtep	Japon : 190 Mtep	Russie : 143 Mtep	Corée du Sud : 114 Mtep

- With consumption of 4,331 million tons, oil accounts for 32.9% of the primary energy consumed worldwide.

Source BP 2016



ENERGIES PRIMAIRES : GAZ (2015)

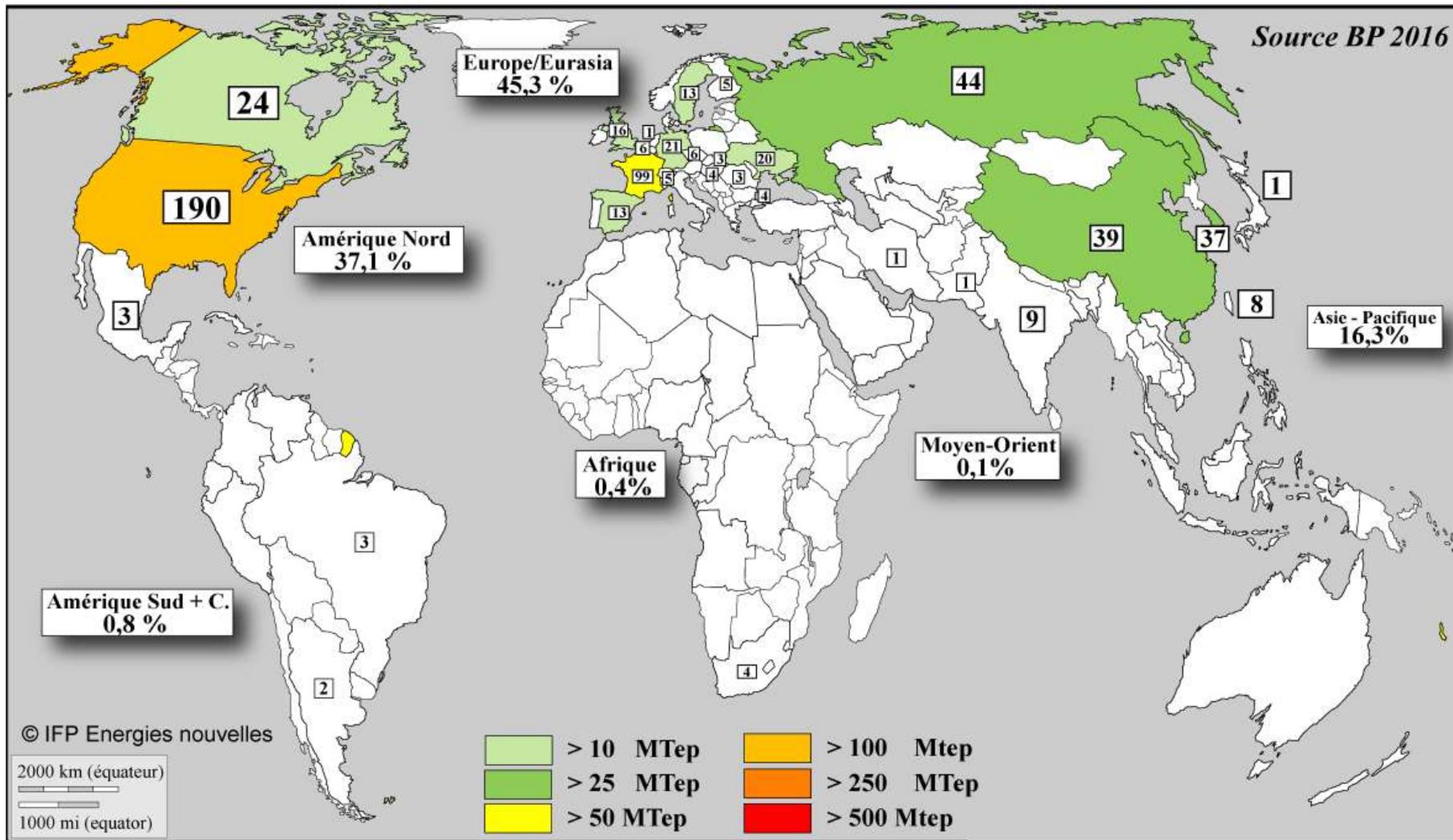
Augmentation par apport à 2014 : +1,7 %

MONDE : 3135 Mtep (23,8% de l'énergie primaire consommée)

USA : 714 Mtep	Chine : 181 Mtep	Japon : 102 Mtep	Canada : 92 Mtep
Russie : 352 Mtep	Iran : 172 Mtep	Arab. Saou : 96 Mtep	Mexique : 75 Mtep

- **With consumption of 3,135 million tons of oil equivalent, gas accounts for 23.8% of the primary energy consumed worldwide.**

Source BP 2016



ENERGIES PRIMAIRES : NUCLEAIRE (2015)

Augmentation par apport à 2014 : +1,3%

MONDE : 583 Mtep (4,4% de l'énergie primaire consommée)

USA : 190 Mtep

Russie : 44 Mtep

Corée du Sud : 37 Mtep

Allemagne : 21 Mtep

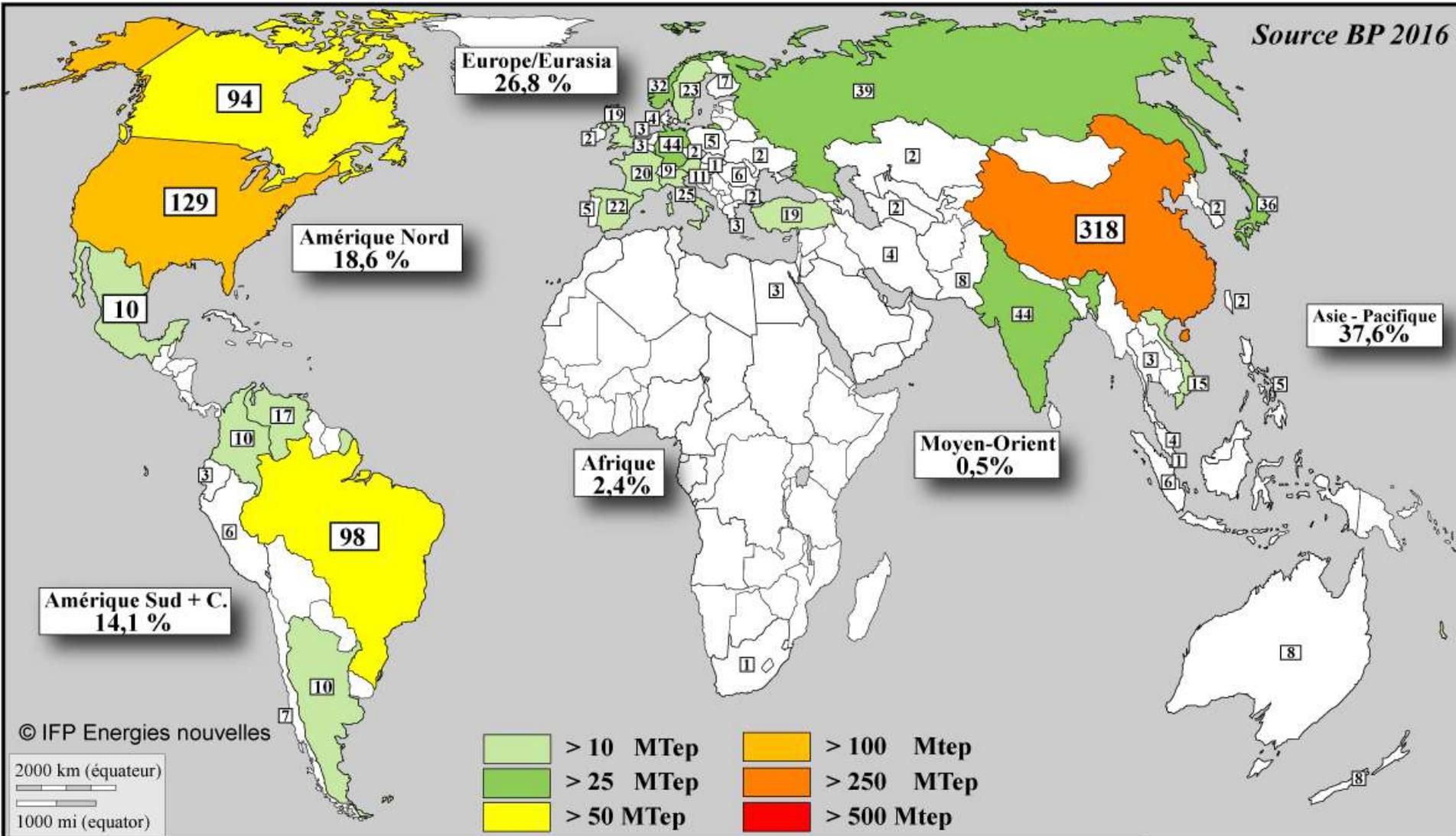
FRANCE : 99 Mtep

Chine : 39 Mtep

Canada : 24 Mtep

Ukraine : 20 Mtep

- With consumption of 583 million tons of oil equivalent, nuclear power accounts for 4.4% of the primary energy consumed worldwide.



ENERGIES PRIMAIRES : Energies renouvelables (2015)

Augmentation de 5,2% par rapport à 2014

Hydroélectricité + Géothermie + Biomasse + Eolien + Solaire : 1 258 Mtep (9,57% de l'énergie primaire)

Chine : 317 Mtep
USA : 129 Mtep

Brésil : 98 Mtep
Canada : 94 Mtep

Allemagne : 44 Mtep
Inde : 44 Mtep

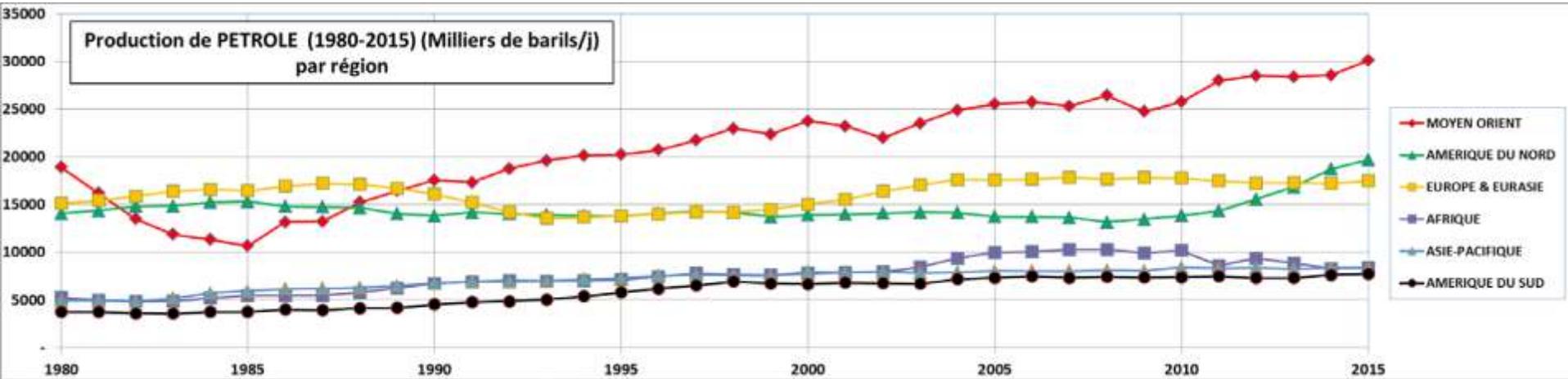
Russie : 39 Mtep
Japon : 36 Mtep

- **•With consumption of 1,258 million tons of oil equivalent, renewable energies account for a total of 9.7% of primary energy consumed worldwide.**

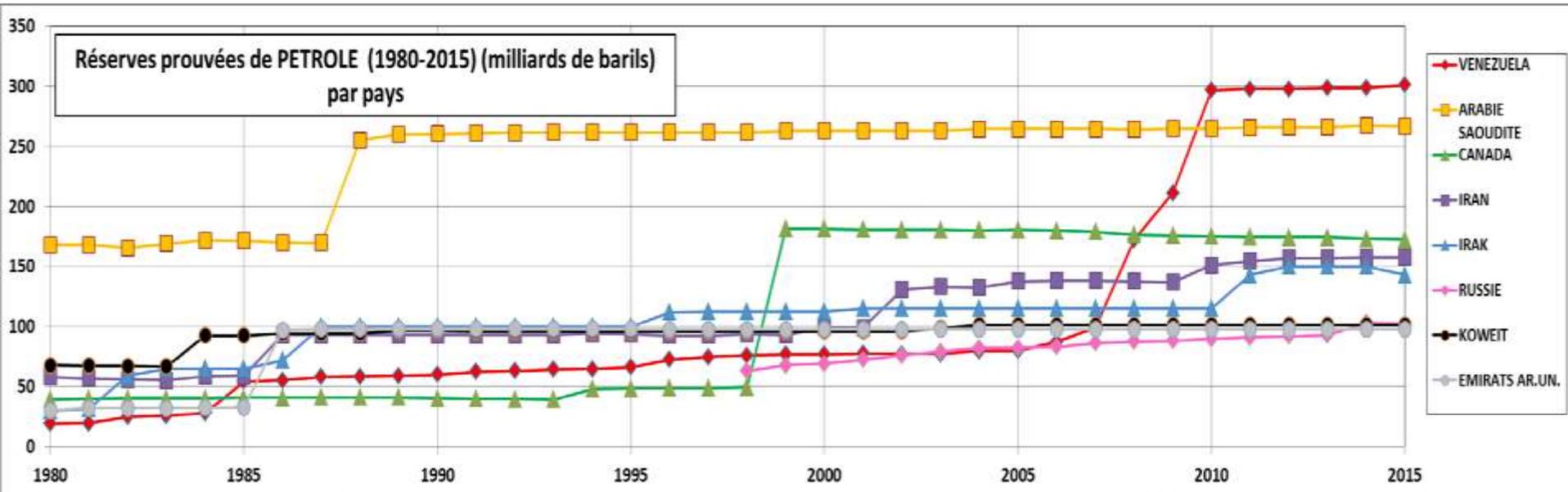
- **Conclusion :**
- To conclude: regardless of the energy source, developed countries consume the most energy, but developing countries are experiencing the greatest growth in consumption.

7. Reserves and resources

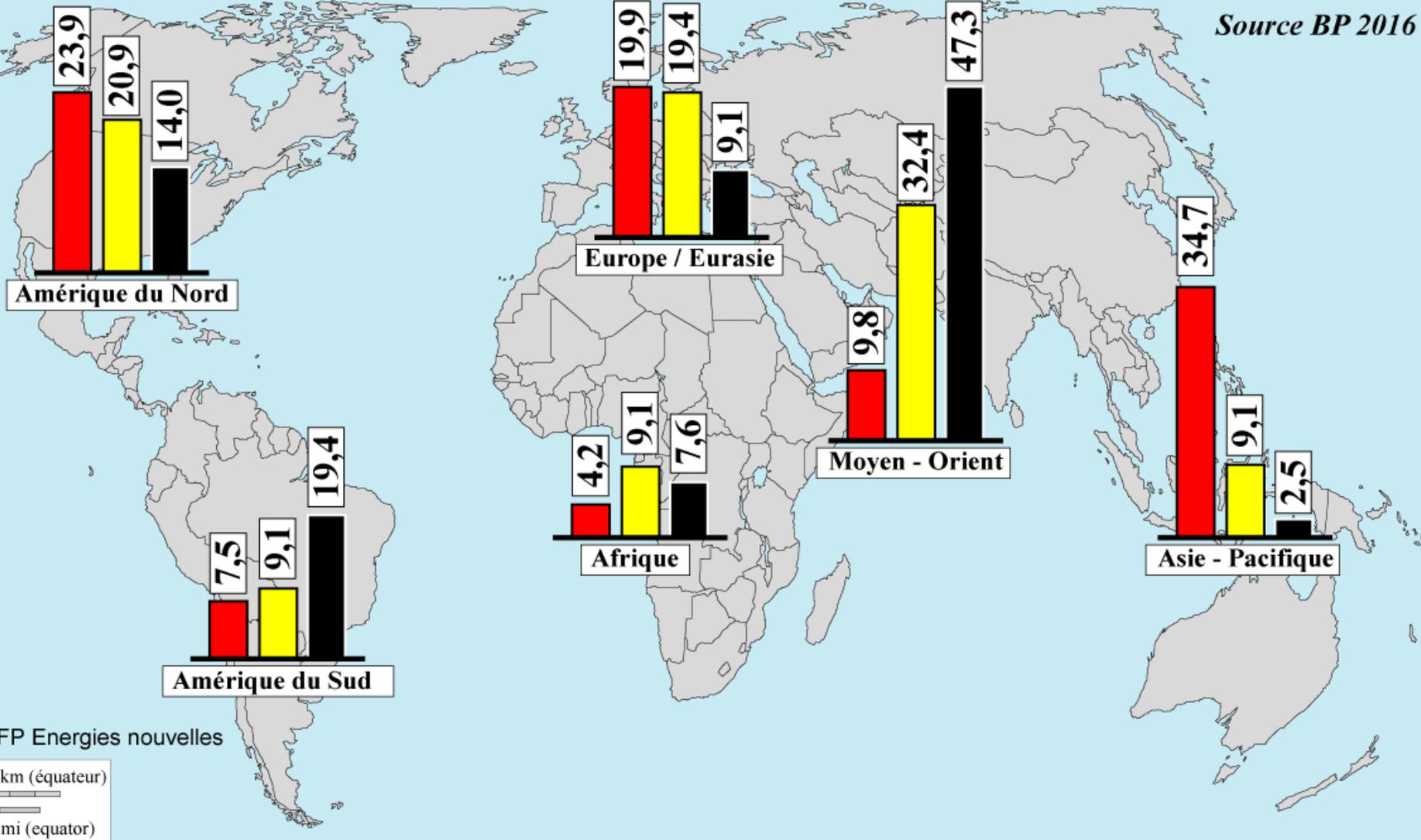
- When we talk about reserves, we are referring to proven reserves that can be exploited using current technologies, not the total quantities existing underground.
- •Oil



- Production in the Middle East continues to increase, while production in Europe-Eurasia stagnates and is surpassed by that of North America, which is benefiting from the "shale oil revolution."



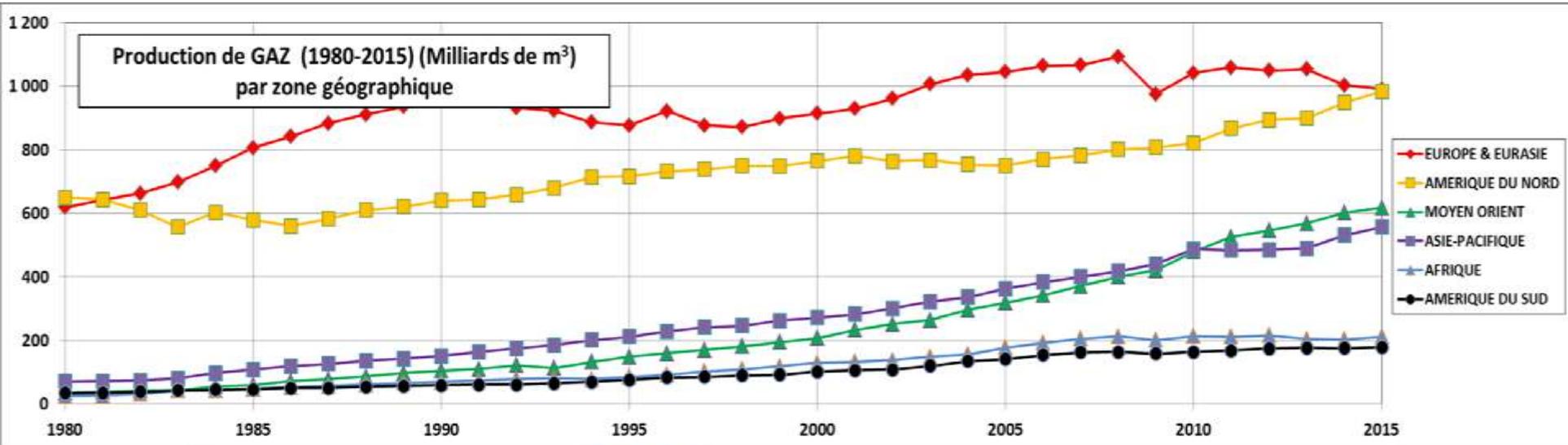
- At the end of the 2000s, [Venezuela](#) became the leading country in terms of reserves when heavy oils are taken into account (301 billion barrels), ahead of Saudi Arabia (267 billion barrels) and Canada (172 billion barrels).



PETROLE : Consommation, Production et Réserves prouvées

- Part de la consommation mondiale
- Part de la production mondiale
- Part des réserves prouvées mondiales

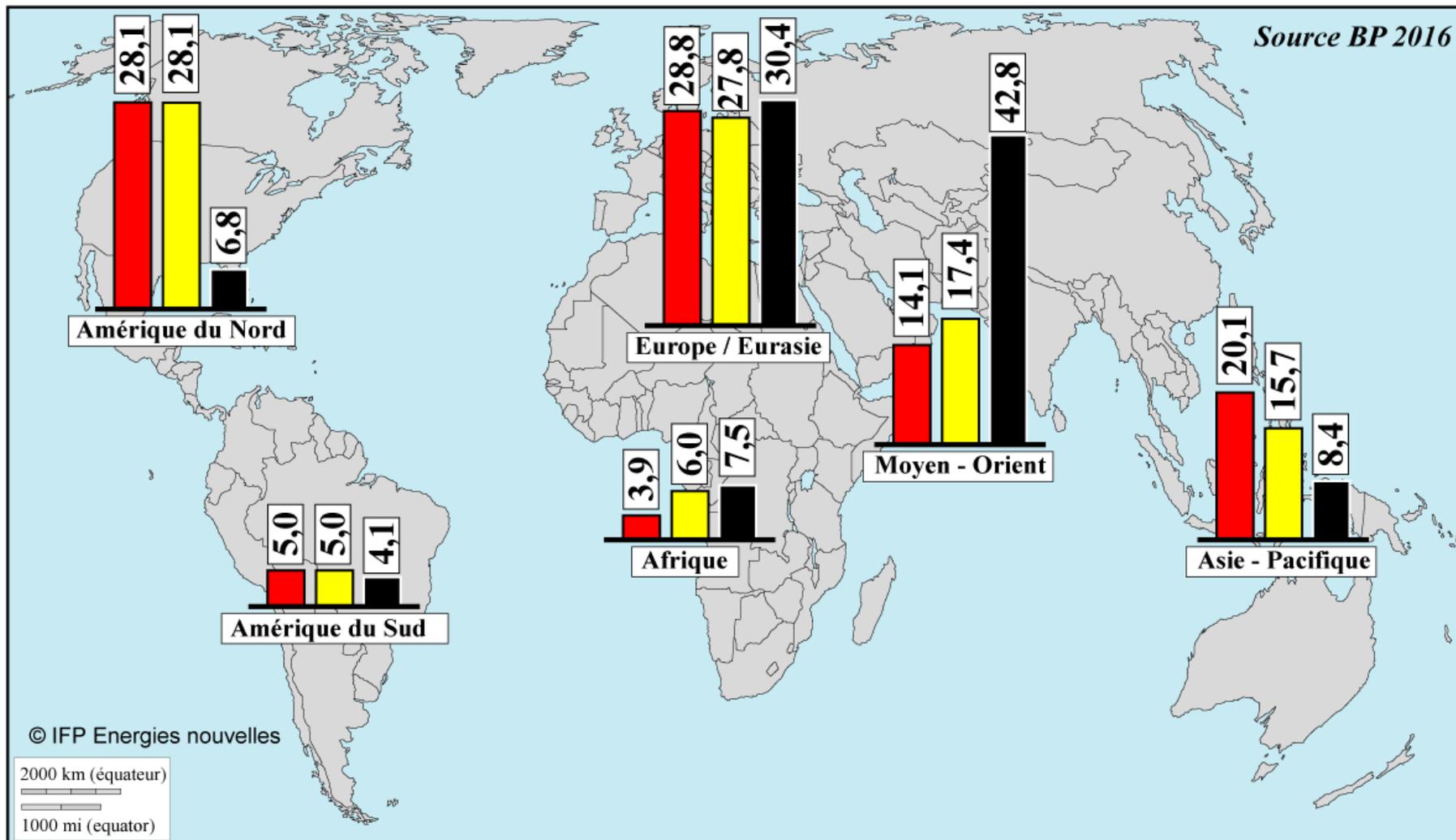
- The geographical distribution of oil consumption, production, and proven reserves shows that there is no strong relationship between consumption and proven reserves. The Middle East and South America have the best long-term potential (reserves).
- **•Natural gas**



- Europe and Eurasia remain the leading natural gas producers, but North America is expected to quickly surpass them (shale gas). The Middle East and Asia-Pacific are also showing strong growth in production.

- Total natural gas production is 4,319 billion m³.
- •USA: 902 billion m³.
- •Russia: 639 billion m³.
- •Iran: 245 billion m³.

Source BP 2016



GAZ : Consommation, Production et Réserves prouvées



Part de la consommation mondiale



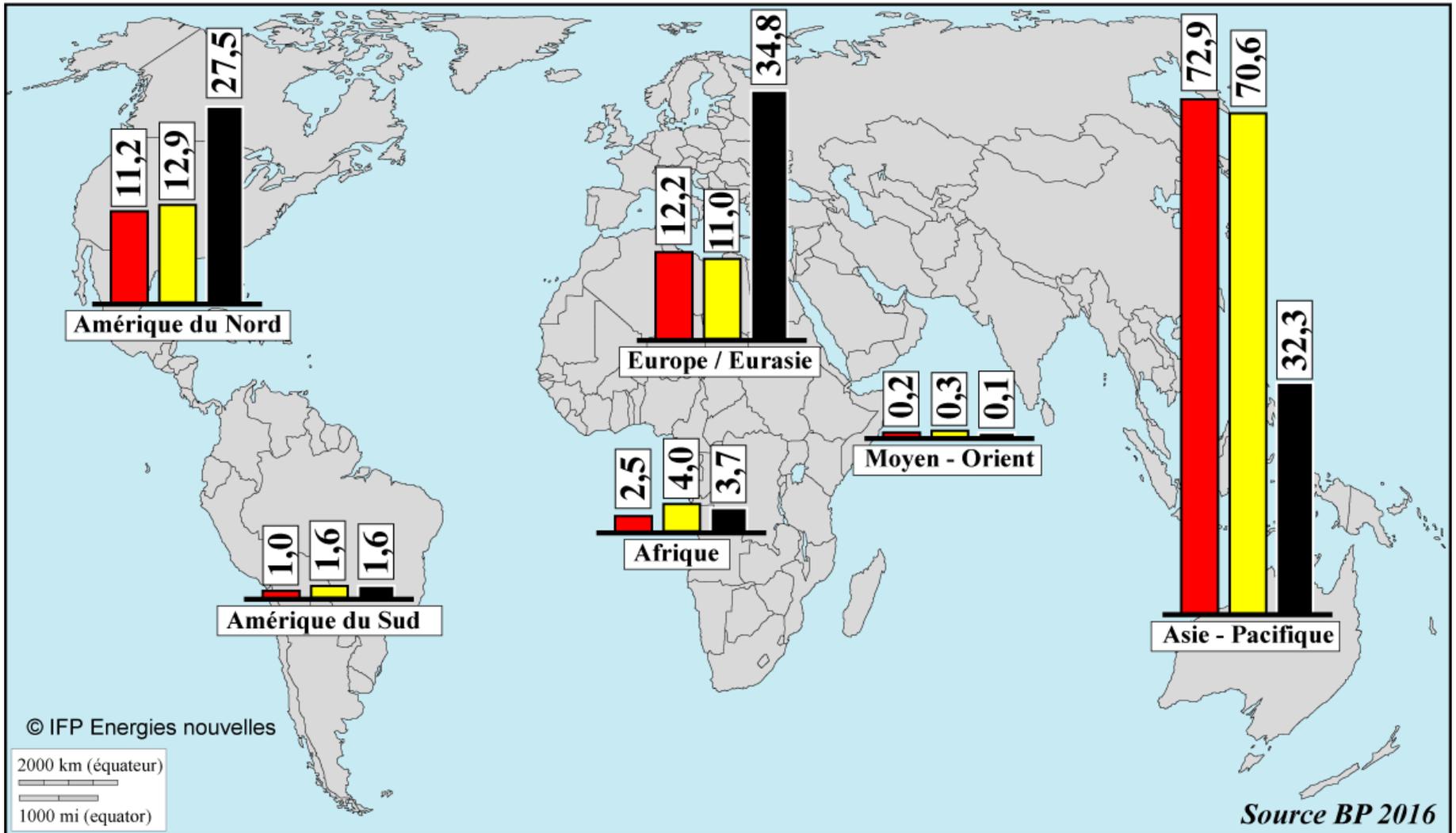
Part de la production mondiale



Part des réserves prouvées mondiales

- **•The Middle East and, to a lesser extent, Europe-Eurasia offer the best long-term potential in terms of resource development.**

- **Coal**



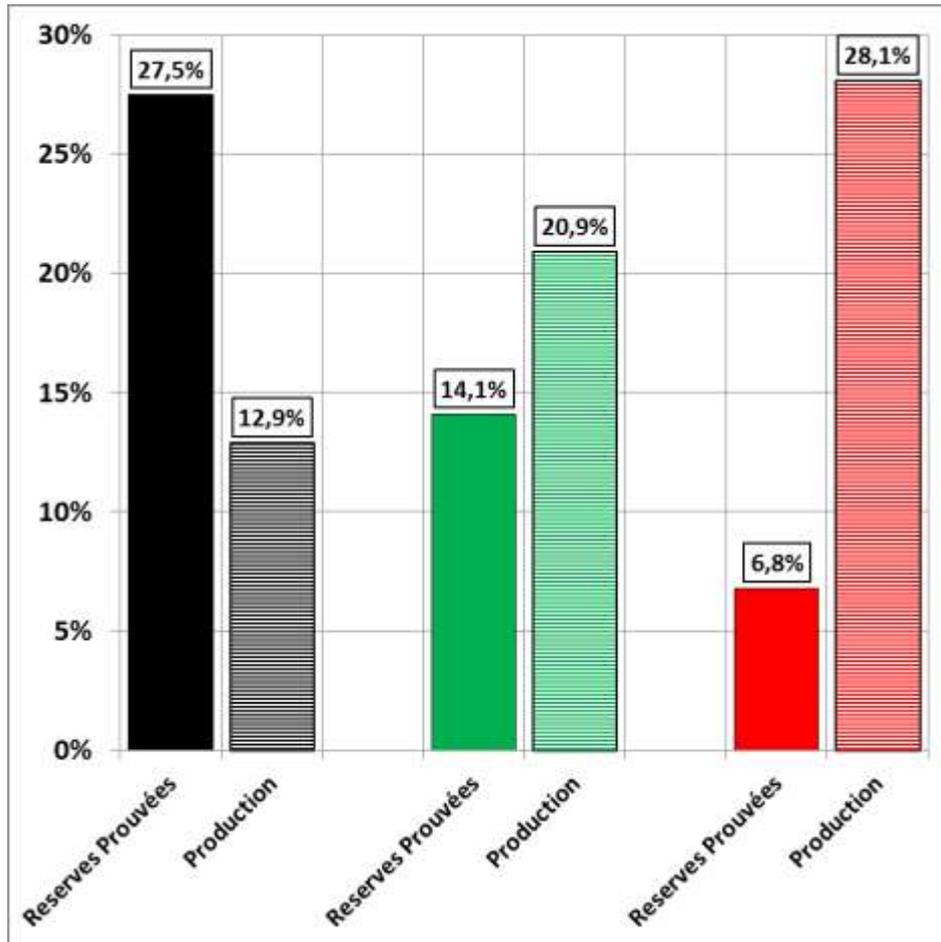
CHARBON : Consommation, Production et Réserves prouvées



- •North America and Europe-Eurasia have proven reserves that exceed their consumption, while Asia-Pacific produces and consumes more than its proven reserves.

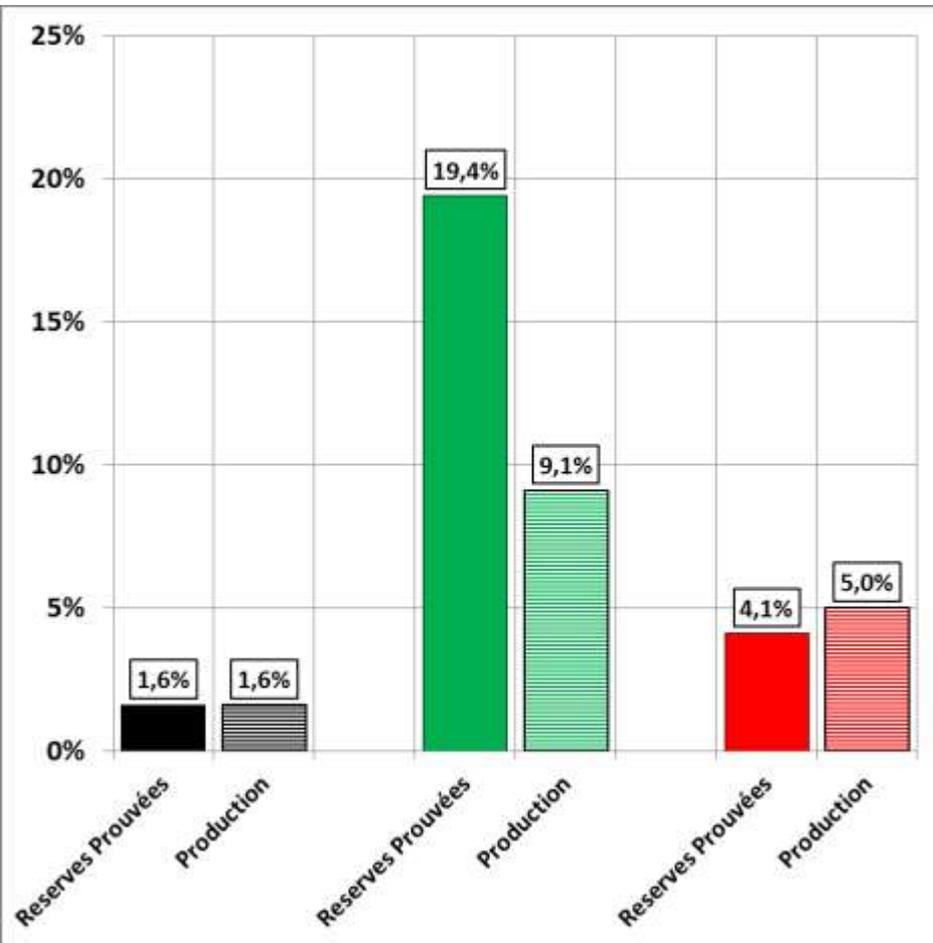
8. Comparison between production and proven reserves of fossil fuels by region

North America



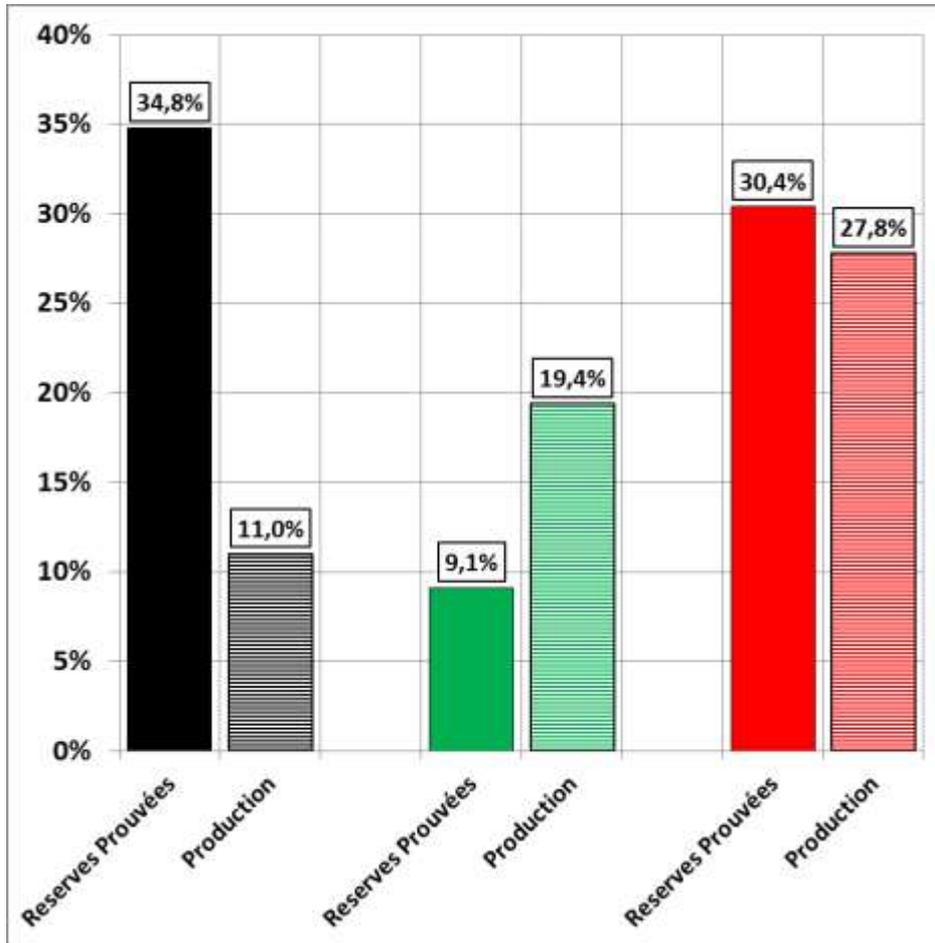
North America has large coal reserves, but its production is declining, while this region produces much more hydrocarbons, even though proven reserves (particularly of gas) are low.

South America



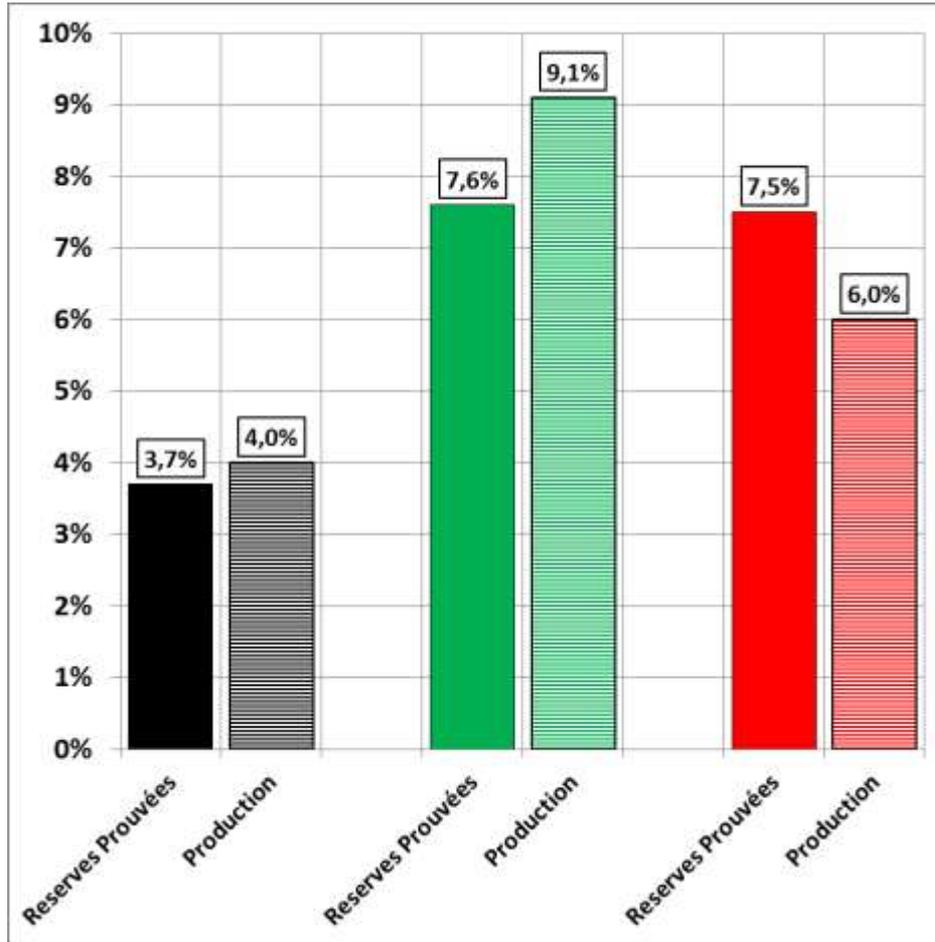
South America has large hydrocarbon reserves (mostly heavy and extra-heavy oils in Venezuela) and has strong potential to produce more liquid hydrocarbons.

Europe / Eurasia



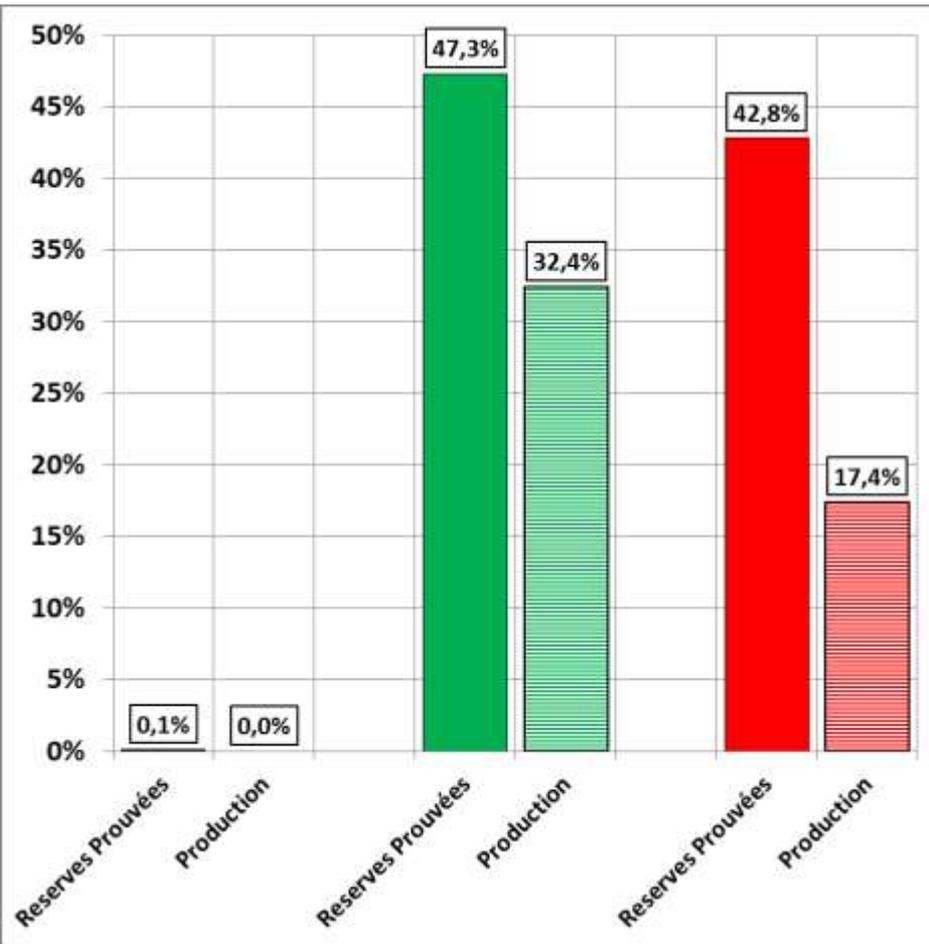
Europe-Eurasia has large coal reserves, but production is declining. There is strong potential for gas development, but also for oil if we take into account shale hydrocarbons, particularly in [Russia](#).

Africa



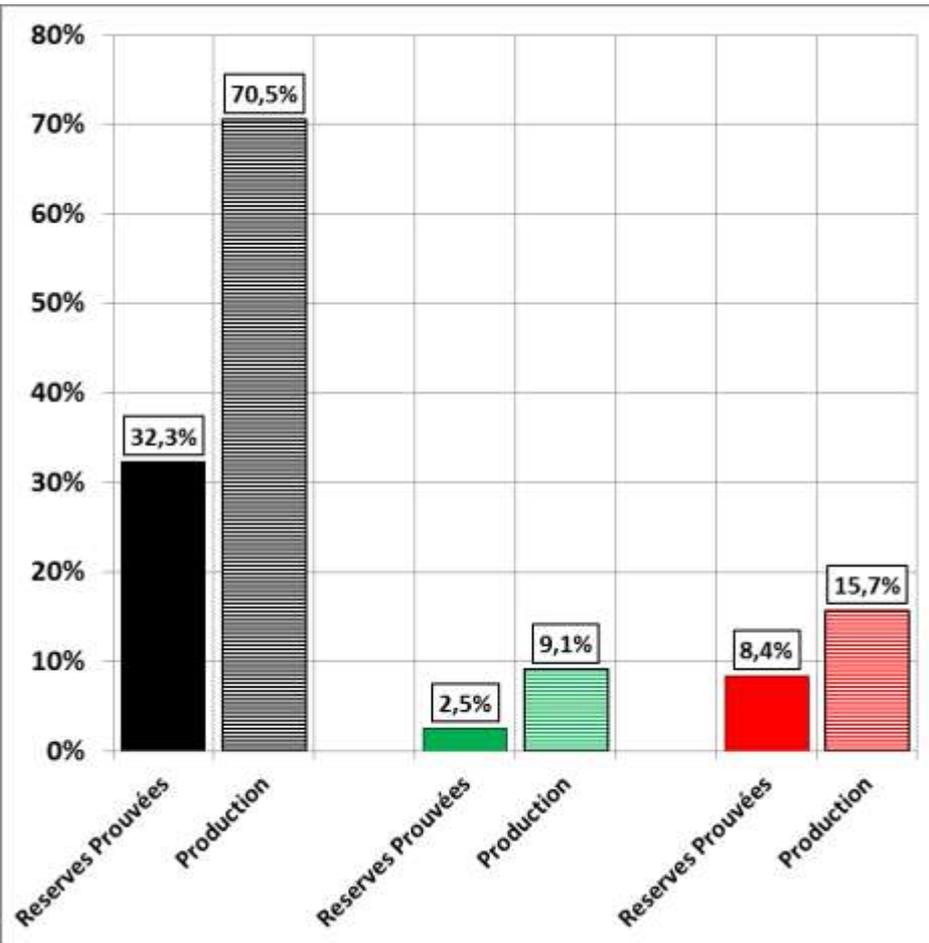
Africa's coal, oil, and gas production is in line with its proven reserves.

Middle East



The Middle East produces exclusively hydrocarbons, with oil accounting for the lion's share. Proven reserves are sufficient to ensure sustainable production for several decades.

Asia/Pacific



Asia-Pacific has few fossil fuel resources. Coal is the most abundant, but current production in this region is much higher than proven reserves.