# Oil & Gas perspectives:

## What is the future for fossil fuels markets?

Selected outputs from the POLES model

November 2012

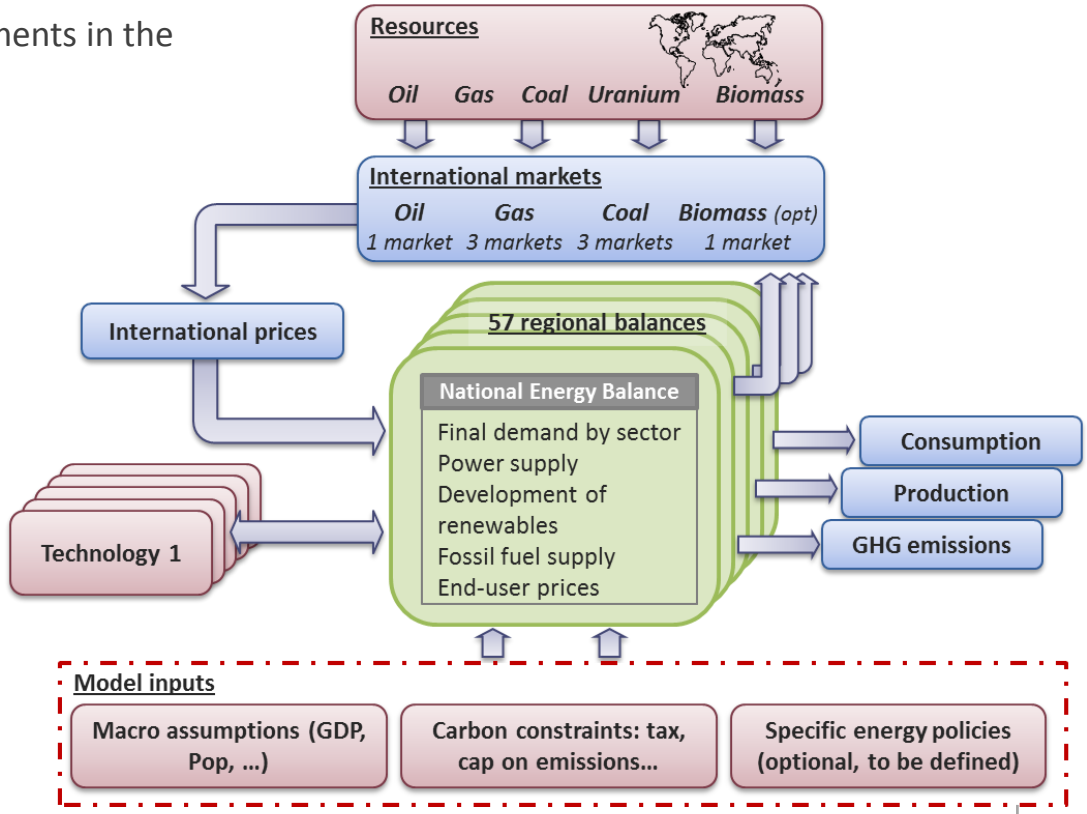
# Enerdata - Overview

- Independent Research & Consulting firm
- Established in 1986
- Experienced team of **energy industry experts, analysts**, **engineers**, **data & IT specialists**.
- Services in **Research**, **Solutions** and **Advisory**
  - Developed **POLES** and **MEDPRO model**
  - Developed **quantitative databases**
- Expertise acquired at world level of:
  - Players and assets
  - Market drivers, trends and outlooks
  - Demand and efficiency

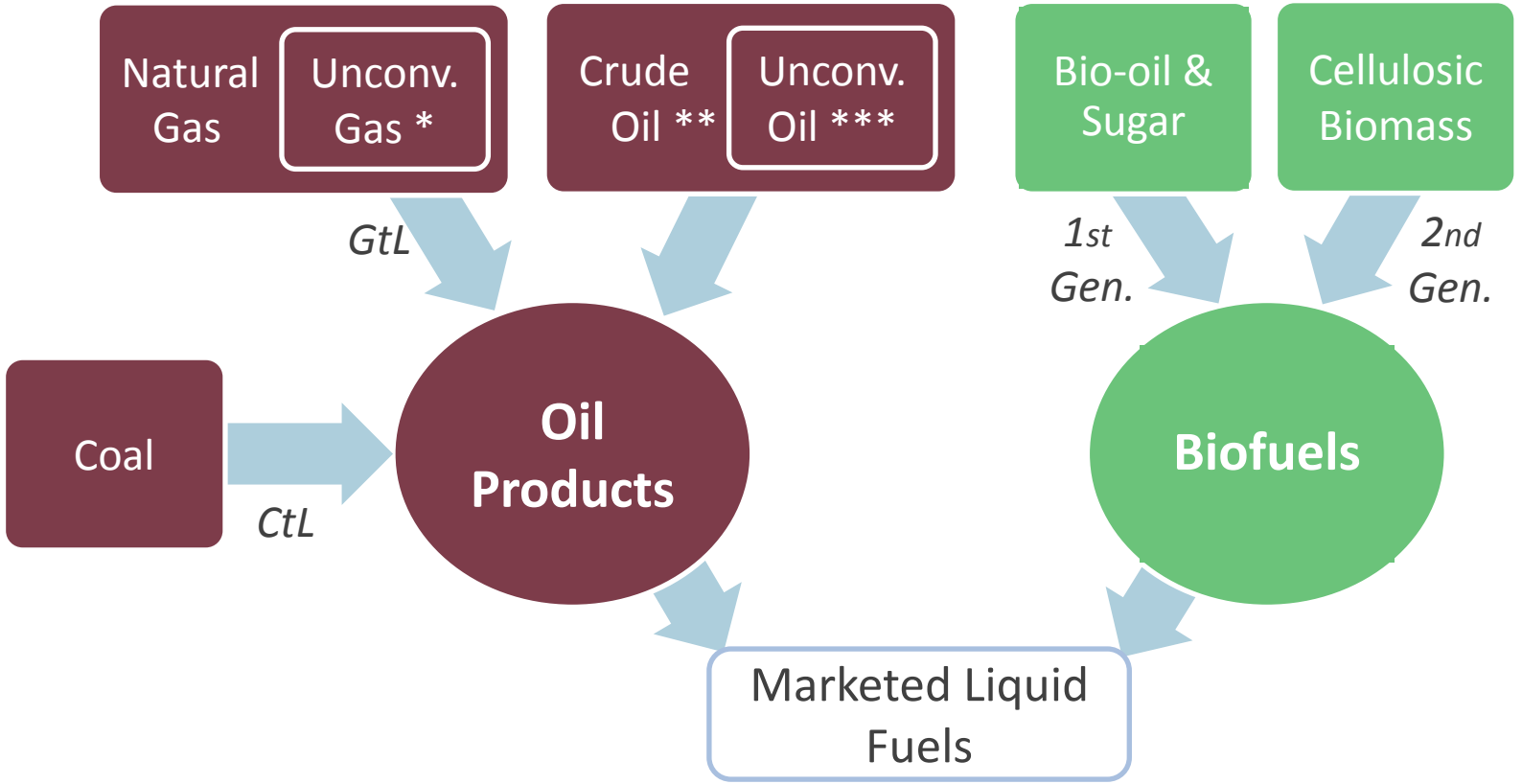
# POLES – An integrated tool to assess the evolution of future energy systems

- **Main features**
  - Projections of energy demand & supply by country and commodity up to 2050 (-2100)
  - Projection of international oil, gas, and coal prices and end user prices (inc. power)
  - Simulation of GHG emissions, analysis of GHG abatement strategies
  - Simulation of future technology developments in the energy sector

- **Structure and fonctions**
  - Yearly dynamic recursive, including anticipation behaviors
  - Simulation of energy balances for 57 countries/regions
  - Disaggregation into 15 energy demand sectors, 50 energy-related technologies & technological learning
  - **Simulation of oil and gas : 80 countries**
  - Full power gen system
  - Uranium & renewable resources
  - International energy prices and markets (oil, gas, coal)



# Liquid Fuels Supply Module




** : Unconventional gas covers: shale gas in 34 countries/regions*

*** : Conventional oil can include environmentally sensitive oil (Arctic, deepwater)*

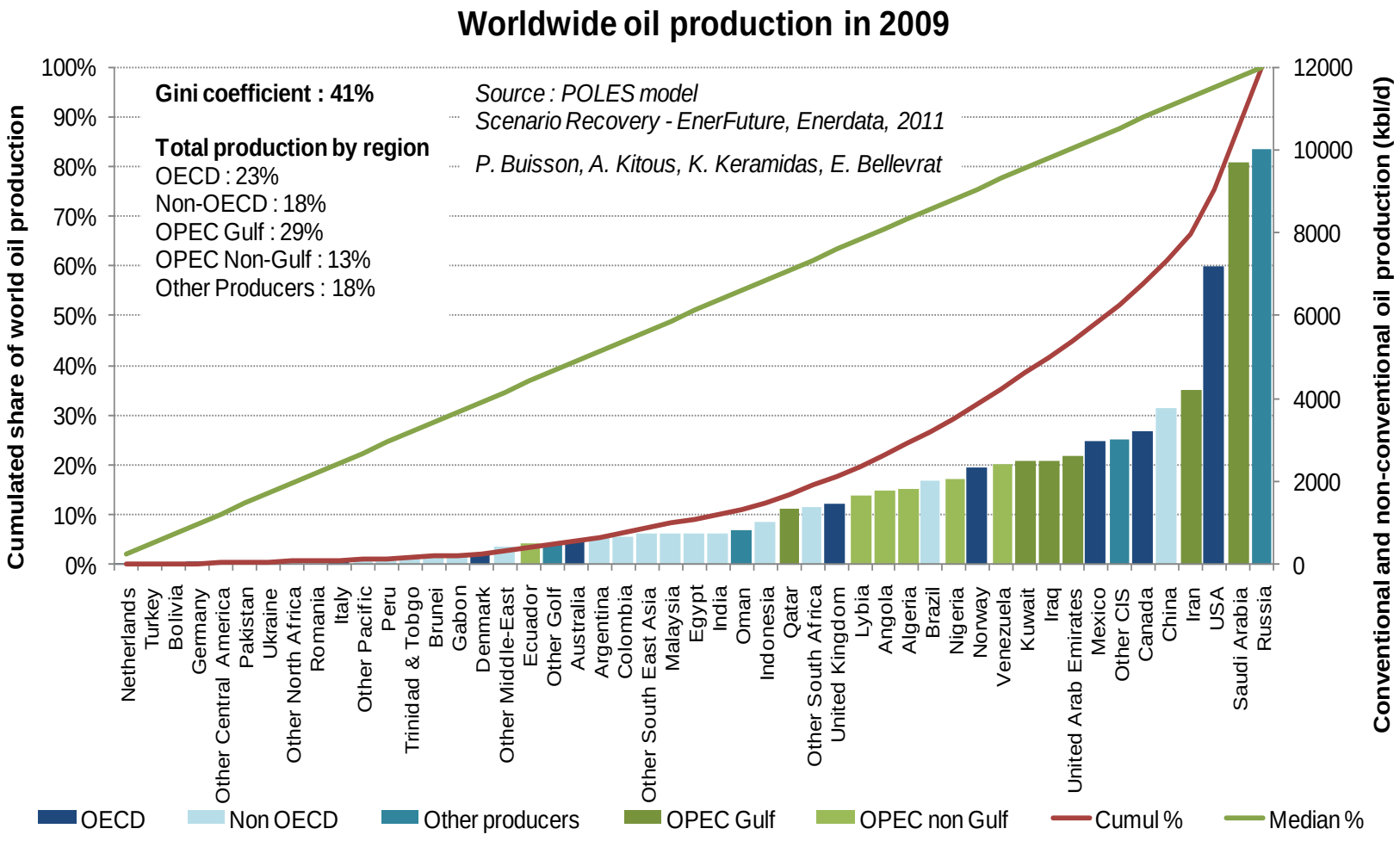
**** : Unconventional oil covers: extra-heavy oil, tar sands, oil shales*

# Simulation of the Oil Market

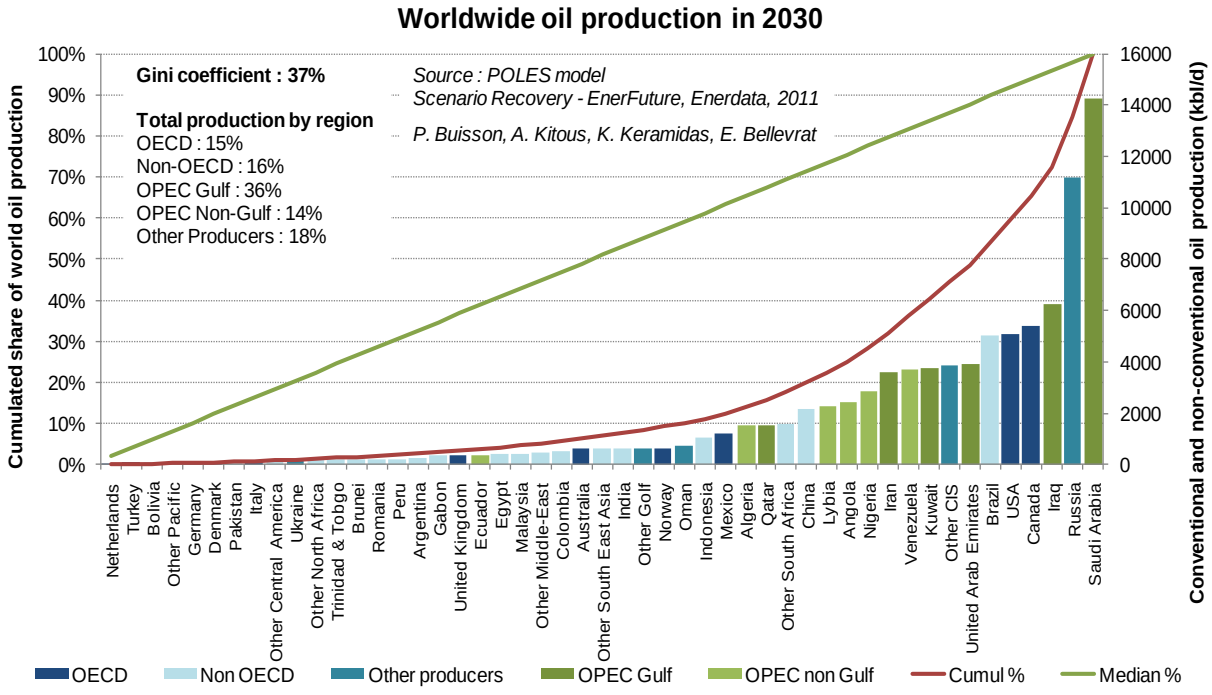
- **Crude oil** is simulated through a process of evolution of discoveries and reserves and interactions with demand via international prices:
  - **80 oil producing countries/regions** (all OPEC modelled individually)
    - Non-OPEC producers: "fatal producers" based on R/P ratio
    - OPEC non-Gulf producers: based on residual demand and total OPEC reserves
    - OPEC Gulf countries: "swing producers" with explicit capacity utilization rate
  - **1 global "pool" market** where producers export, with **one international price**
  - **57 oil consuming countries/regions**
  - there is no "bilateral" oil trade between producers and consumers, meaning that trade routes cannot be specifically tracked or blocked

- Production of **other liquid fuels** based on their production costs and an equilibrium of crude oil supply and liquids demand:
  - Unconventional oil in 43 countries/regions
  - Environmentally sensitive oil (Arctic in 5 countries, deepwater in 14)
  - Coal-to-Liquids (9 countries), Gas-to-Liquids (9 different countries)
  - Biofuels in 57 countries/regions

# A key driver to understand the Oil market is the evolution of the concentration in production today…



# … and in the years to come

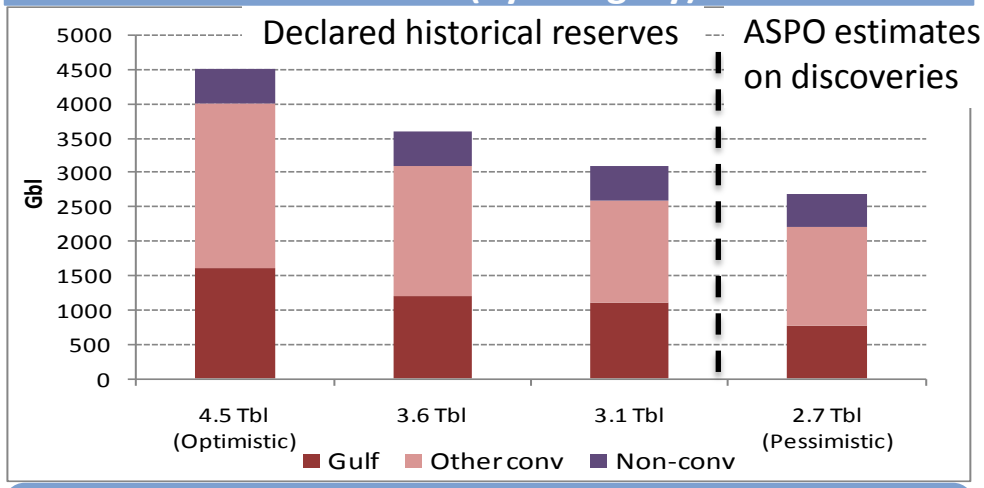



- Saudi Arabia & Russia still top producers in a Reference case
- Declining role of OECD, except USA & Canada

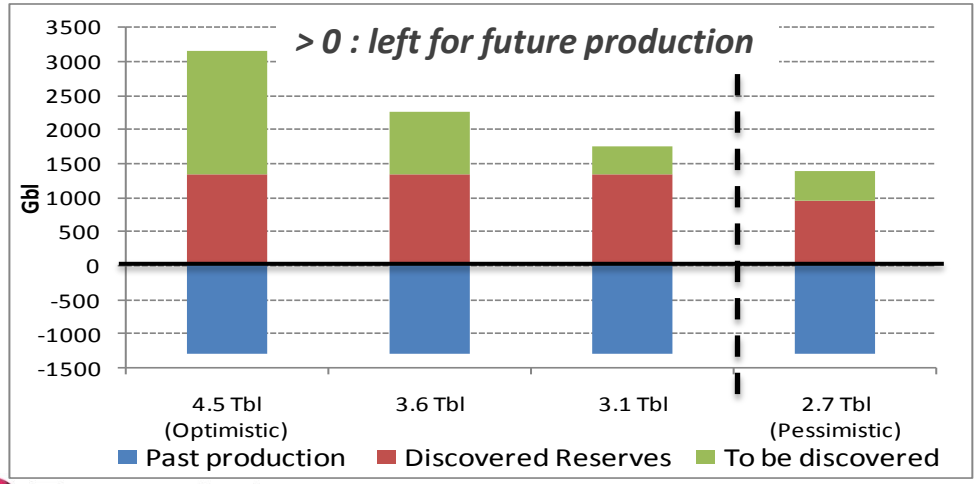
- Under which constraint of :
  - resource?
  - production capacity development?
- What role of alternative fuels (CTL, GTL, BTL, gas) and technologies?

# Enerdata can test very contrasted assumptions on Oil resources and consequent peak-oil

## Resources (by category)




## Produced vs. Remaining resources

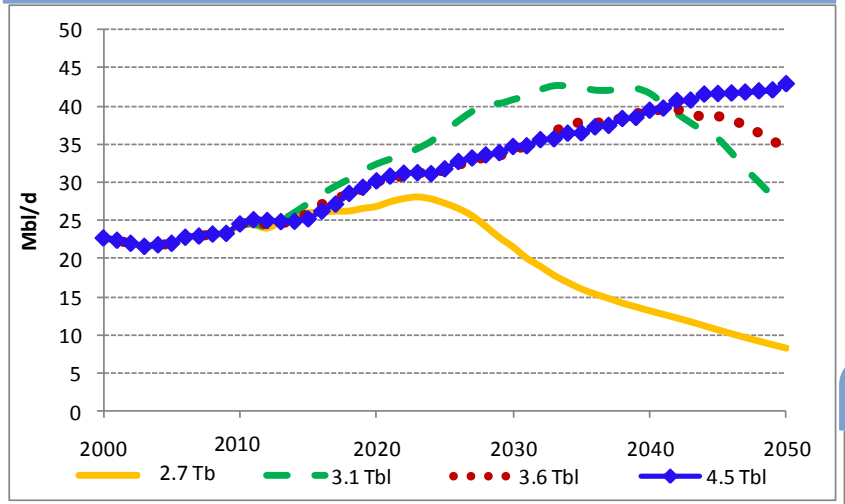



- Oil resources are considered per type of oil and per region
- Volumes left for future production ranges from twice past production (*4.5 Tbl case*), to less than already produced (*2.7 Tbl case*).

*Source: ENERDATA, POLES model*

# Impacts on Future Oil Supply & Prices are assessed along contrasted resource scenarios

## Gulf Production Capacity




*Source: ENERDATA, POLES model, ASPO 2011*
*http://www.aspo9.be/presentations*

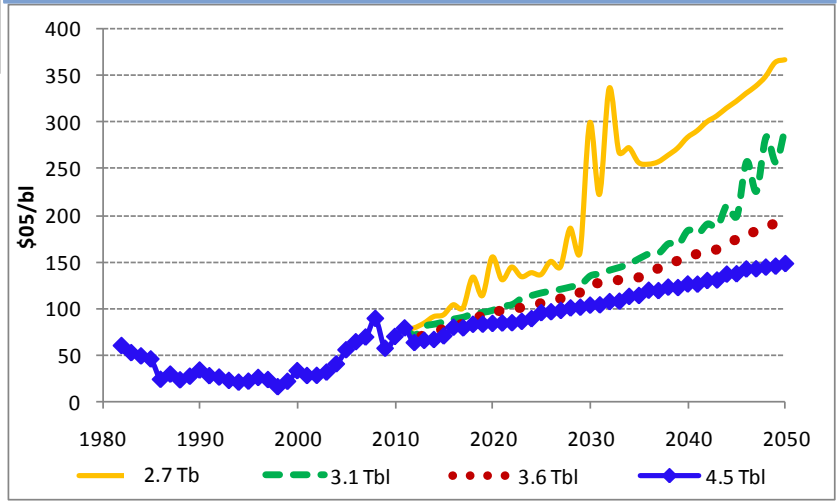
**Production capacity in Gulf**

- 4.5 Tb: "BAU", keeps increasing
- 2.7 Tb: cannot be increased, decreases rapidly from 2025 (Saudi Arabia from 2015)

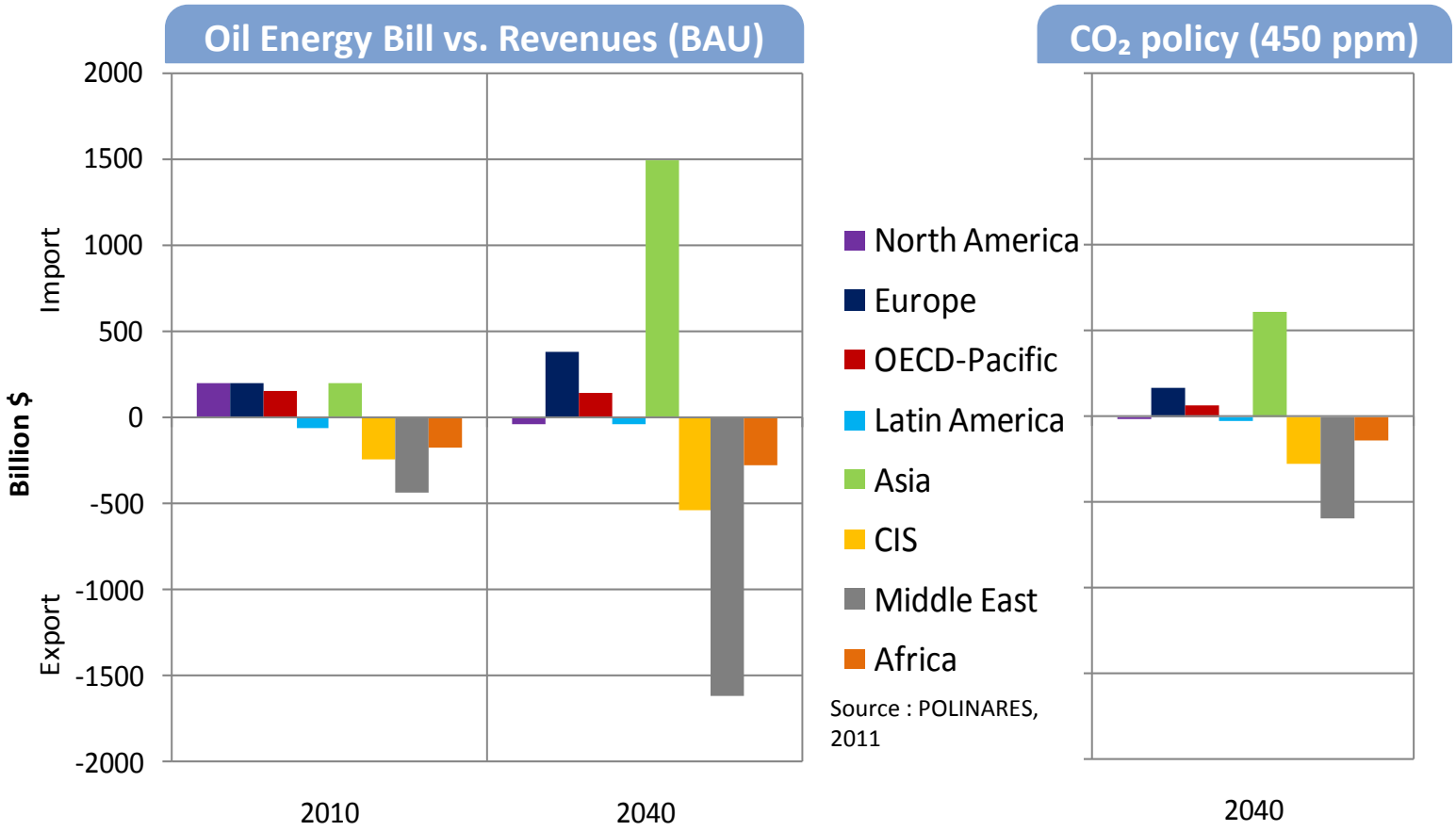
**Oil Price**

- 4.5 Tb: increases steadily, no shock
- 2.7 Tb: increase in line with 2003-2008, permanent instability, potentially extreme peaks

## Oil Price



# Financial aspects are also analysed to provide insights on potential Future Geopolitical Issues

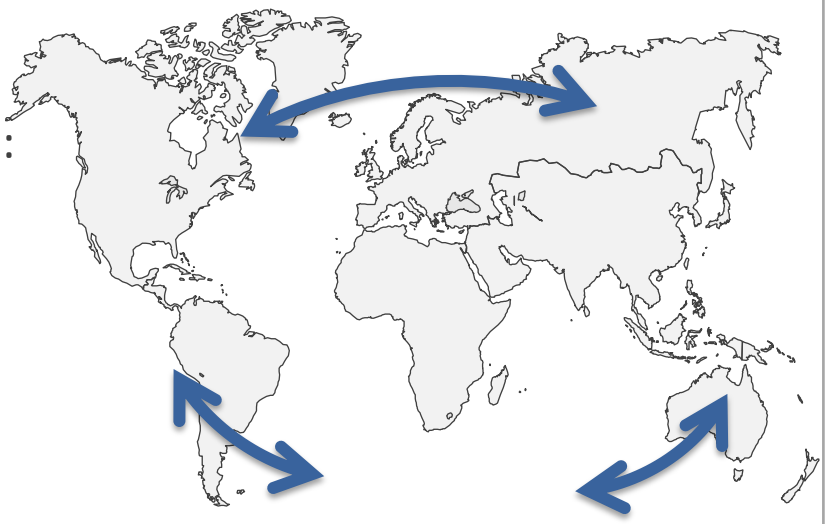



- Study of oil export incomes, as volumes and as a share of GDP
- Sensitivity analysis: income change with different non-OPEC climate policies, OPEC internal market subsidies change, etc.

# Simulation of Gas Markets

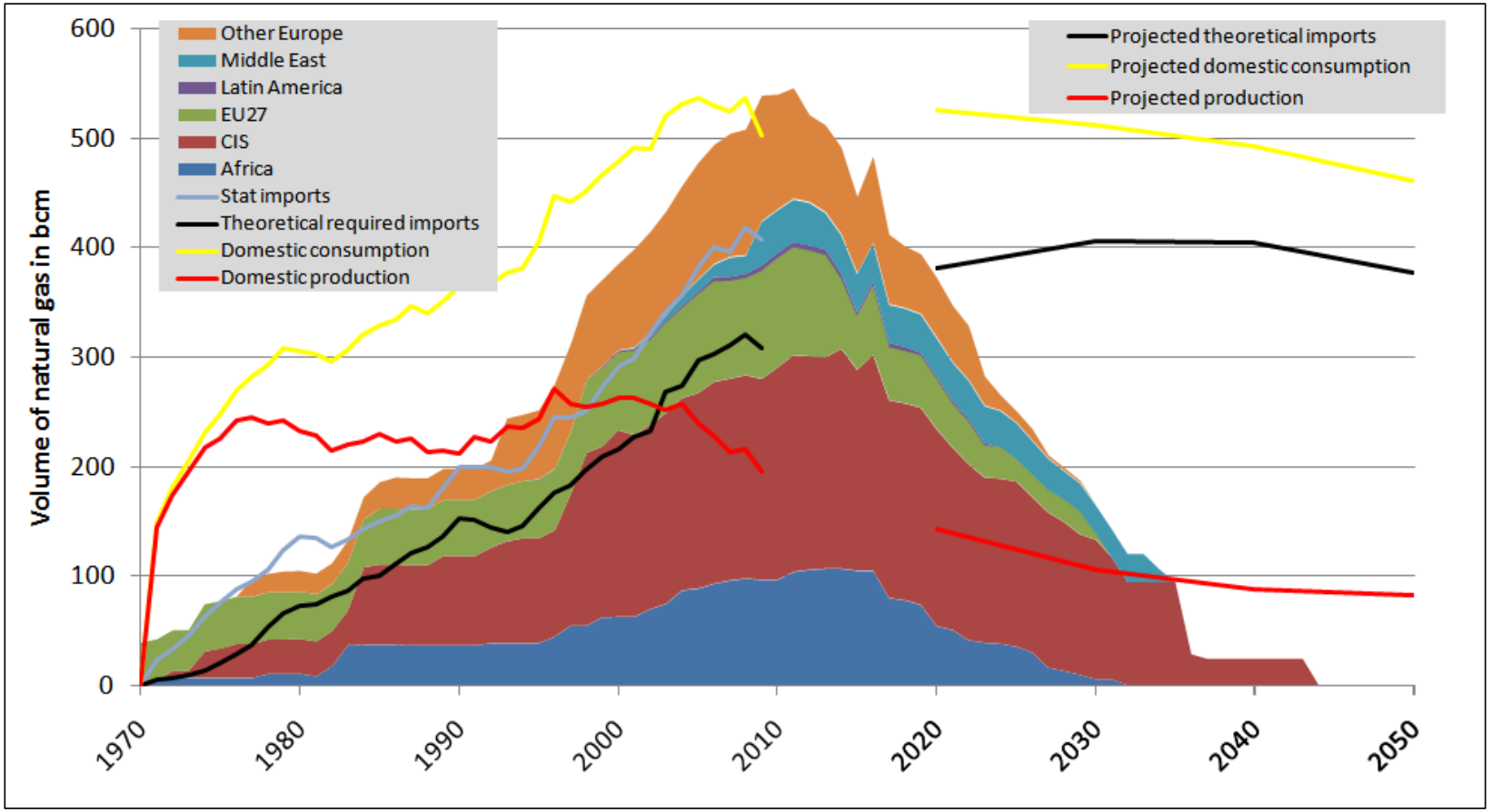
- The simulation of gas discoveries and reserves is similar to the case of oil , however there are significant differences:
  - **80 gas producing countries/regions**
    - 37 “key producers” based on regional market supply/demand
    - 43 “fatal producers” based on R/P ratio
  - **3 regional gas prices** are identified: Asia, Europe, America
  - **14 explicit consuming gas markets**
  - “Bilateral” **gas trade** between producers and each of these 14 markets, either through gas pipeline or LNG

- **Main drivers of the regional gas prices**:
  - Gas R/P of regional main gas producers
  - Connection to oil price
  - Interconnection of regional gas prices
    *through the development of LNG*
  - Transport Cost



# The global gas market is assessed, challenging current market organisation vs. fundamental equilibriums

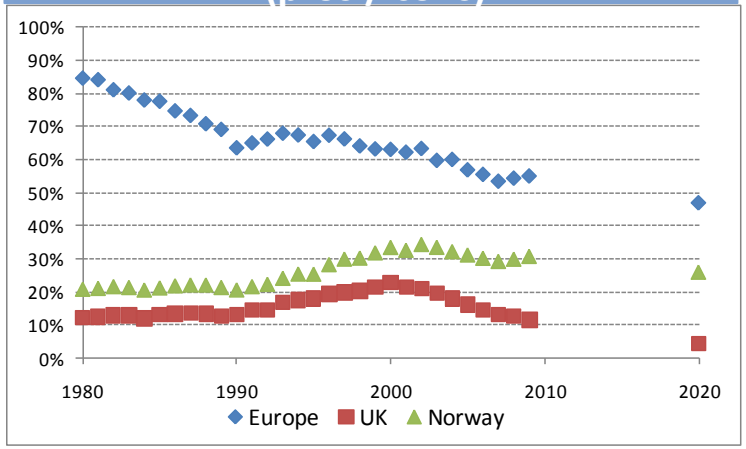
**EU 27 contracted gas supplies and demand outlook (EnerFuture Recovery scenario)**




Source: Enerdata Gas Contracts database , POLES model

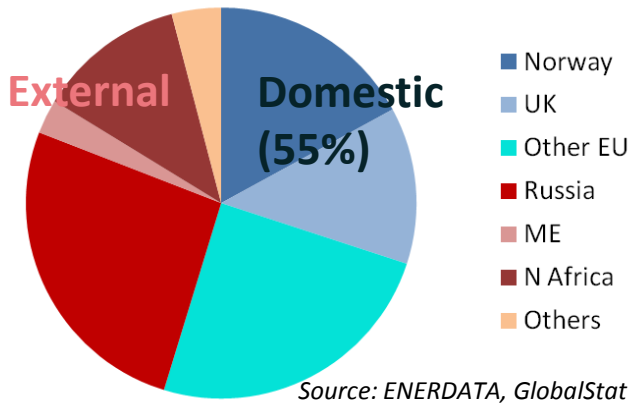
# In Europe, a key security driver is the increasing level of gas dependence to non-EU providers for future supply

## Europe Gas Independence Rate (pros / cons)



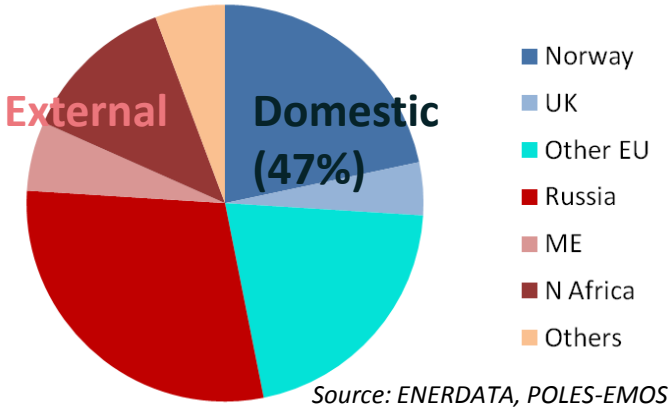

Source: EMOS scenario (Enerdata)

## Gas Supply to Europe 2009 (550 bcm)




*Source: ENERDATA, GlobalStat*

## Gas Supply to Europe 2020 (590 bcm)




*Source: ENERDATA, POLES-EMOS*

# Enerdata Gas Market Simulations cover main challenges in mid & long term

- Future evolution of long-term gas **price** formulation
- Role of gas **resources** on future international markets :
  - Decline of Europe domestic resources
  - Role of new “unconventional” gas resources
- Impact of CO2 & **environmental policies** on gas markets
- Required **investments** for LNG vs. pipelines

# Enerdata Clients include…








# Thank you for your attention !

Enerdata | global energy intelligence

**Enerdata in SINGAPORE**
ICB Enterprise House,
#08-03/04,
116 Middle Road,
Singapore 188972

**Tel/Fax:** +65 633 355 74
**Mobile:** +65 818 334 07
romain.boissin@enerdata.net