European Policy Brief

GLOBAL IQ

Policy brief on Climate change/Energy resources: Banning non-conventional oil extraction: A suggested approach for the EU would a unilateral move of the EU really work?

Ongoing project

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SUMMARY

Objectives of the research

The objective of this policy brief is to provide information on the environmental benefit and the economic cost of a global ban on the use of non-conventional oil resources. The policy brief also explores the consequences of a European Union unilateral move.

The extraction and processing of oil shales and oil sands – commonly defined as non-conventional oil resources – is more energy intensive than the extraction of conventional oil resources. The European Union estimates that oil sands lead to 22% more emissions than conventional oil. The European Union (EU) is very concerned by this prospects and advocates a tax on non-conventional oil in order to discourage its production.

How large is the effect of increased use of non-conventional fossil resources on global warming? By how much global temperature in 2100 would change if the use of non-conventional fossil resources was banned globally? Is the non-conventional oil ban an efficient policy? Would it be possible to obtain the same environmental benefits using different policy tools?

Scientific approach / methodology

Scenarios generated using an economy-energy-climate integrated assessment model.

New knowledge and added value

This policy brief relies on a new set of scenarios that provide new insights to formulate an efficient and effective climate policy.

KEY OBSERVATIONS

Key messages

A global ban on the use of non-conventional oil:
substantially reduces global carbon dioxide emissions

- it reduces global mean temperature increase in 2100 by 0.3 °C
- it costs about 277 USD trillion in lost consumption (cumulative, 2010 to 2100 undiscounted)
- the policy is not efficient as other tools may achieve the same environmental goal at lower cost

New knowledge and European added value

The extraction and processing of oil shales and oil sands – commonly defined as non-conventional oil resources – is more energy intensive than the extraction of conventional oil resources. The consumption of one barrel of oil derived from non-conventional resources is thus responsible for more carbon dioxide emissions than the consumption of conventional oil. Emissions from the final use of oil products (e.g. gasoline) is the same, but non-conventional oil has more emissions in both extraction and refining (IEA-ETSAP, 2010). The European Union (EU) estimates that oil sands lead to 22% more emissions than conventional oil (Brandt 2011), while according to the International Energy Agency the difference ranges between 0 and 15% (IEA 2010), depending on the benchmark conventional oil. The extraction of non-conventional fossil fuel resources also requires more water than the extraction of conventional resources, more chemicals and more disruptive processes that may cause serious environmental damage (IEA-ETSAP, 2010).

For these reasons there are growing tensions between the advocates of non-conventional fossil extraction on one side and environmental groups, parts of the public opinion and policy makers on the other side. In the United States the decision of building the XL pipeline from Canada to the Gulf of Mexico is in part opposed because of fear of oil spills, but what worries most the opponents is the fear that the new transportation route will unlock dirty non-conventional oil extraction in Alberta. By offering an easy communication between the Canadian tar sands and the refineries in Texas, non-conventional oil could find its way to the global markets.

The EU is very concerned by this prospects. EU regulators want to stigmatize tar sands oil production in Canada by labelling it as a dirty fuel and they expressed the intention to impose a tariff that reflects the social cost of the additional carbon dioxide emissions in the extraction phase. The EU move would be equivalent to a border tax adjustment, as emissions from the extraction phase would still be counted as part of total Canadian emissions.

Scenarios developed for the FP7 project Global-IQ show that if population and economic growth continue to follow the trends of the past, global energy demand will substantially increase over the next decades because energy efficiency improvements are not expected to be strong enough to curb total demand. The pressure of a growing demand has the effect of increasing the price of fossil fuels in global market. Higher fossil fuel prices make the extraction of more costly non-conventional sources economically attractive. Non-conventional fossil resources thus play an increasingly important role in supplying a growing amount of energy in future energy demand and supply scenarios. Carbon dioxide emissions grow because both total energy demand and the carbon content per unit of energy (carbon intensity) increase.

How large is the effect of increased use of non-conventional fossil resources on global warming? By how much global temperature in 2100 would change if the use of non-conventional fossil resources was banned globally?

In this policy brief we answer those questions. We focus on non-conventional oil, proposing a thought experiment in which all world countries agree not to use this resource. We run an ad-hoc scenario using the integrated assessment model WITCH and we assess the impact of the global ban on non-conventional oil extraction on global oil demand, on the oil price, on carbon dioxide emissions, on global mean temperature and on aggregate consumption. We then assume that only Europe takes the unilateral measure to ban domestic non-conventional oil extraction and to ban consumption of non-conventional oil extracted elsewhere.

A Global Ban of Non-Conventional Oil

A scenario in which there are no constraints on non-conventional oil use reveals that non-conventional oil is extracted starting from 2020 and it constantly gains market shares over the century, overcoming conventional oil in 2070 and achieving a 58% market share by 2100 (Figure 1), when global oil demand reaches 316 EJ/yr, after a peak of 385 EJ/yr in 2065.

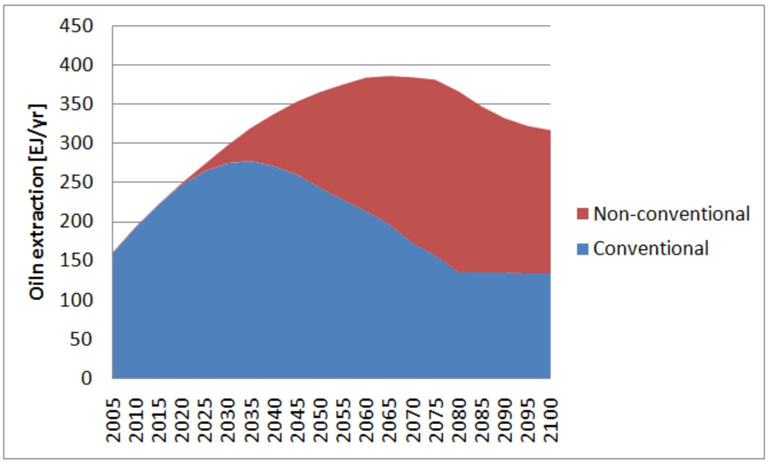

Figure 1 – Conventional and non-conventional oil extraction: World, reference case.

If we introduce a ban on non-conventional oil extraction, conventional oil use increases but the model is forced to direct oil demand towards relatively expensive traditional oil fields instead of exploiting cheaper non-conventional oil resources. As a result, the oil price substantially increases : +17% in 2030, +54% in 2050 and +128% in 2100. The increase in conventional oil production (+12% in 2050, +23% in 2100) does not compensate the absence of the non-conventional contribution, thus global oil supply decreases (-25% in 2050, -48% in 2100). The contraction of oil consumption is almost fully reflected in a reduction of total primary energy use (-12%).

Consequently, global consumption declines. From 2010 to 2050 the undiscounted sum of global consumption loss is equal to 11.5 USD trillion (0.32% of the reference aggregate consumption); from 2010 to 2100 the loss is equal to 277 USD trillion (1.7%). Consumption losses are thus concentrated in the second half of the century, when reliance on non-conventional fossil fuels is strongest in the Reference scenario.

Less non-conventional oil also means less carbon dioxide into the atmosphere. This is undisputed. The policy questions are: what is the expected environmental benefit and what is the cost of achieving this benefit? Is the non-conventional oil ban an efficient policy? Would it be possible to obtain the same environmental benefits using different policy tools?

Our scenarios indicate that the global ban of non-conventional oil resources reduces global carbon dioxide emissions from fuels combustion by 5% in 2030, by 11% in 2050 and by 20% in 2100. The cumulative reduction of emissions from 2010 to 2050 is equal to 122 Gt CO_2 and to 906 Gt CO_2 from 2010 to 2100. In order to put these figures in perspective, the Fifth Assessment Report of the IPCC finds that global fossil-fuel related CO_2 emissions reached 32 (±2.7) $GtCO_2$/yr, in 2010. The overall reduction of emissions from 2010 to 2050 is thus equivalent to about four years' worth of fossil fuels emissions.

These findings clearly indicate that non-conventional oil may become one of the major sources of carbon dioxide emissions in the future. However, this remarkable contraction of emissions has a limited impact on the global concentration of GHGs and on global mean temperature. The increase of mean global temperature above the pre-industrial level in 2050 is not affected by the policy. This is explained by the strong inertia of the climate system. In 2100 the ban of non-conventional oil extraction reduces the temperature increase by 0.3 °C, from +4.1 °C to 3.8 °C.

What would be the cost of achieving the same environmental target using a global carbon tax, or an emission trading scheme that covers all emissions in all regions? Our scenarios indicate that a more flexible policy approach based on market instruments would cost about fifteen times less than the unilateral ban on non-conventional oil use (19 USD trillion instead of 277 USD trillion, undiscounted). The cost difference is the result of concentrating all emission reduction efforts on one single sector rather than distributing it across many sectors. We find similar results for the European Union (1 USD trillion instead of 14.1 USD trillion from 2010 to 2100, about 0.6% of aggregate undiscounted consumption in the Reference scenario).

Unsurprisingly, we find that the largest impact is in the region that includes Canada, one of the major exporters of non-conventional oil in the Reference scenario. In Canada the flexible policy would cost 0.9 USD trillion instead of 34 USD trillion with the global ban on non-conventional oil (almost 4% of the reference aggregate undiscounted consumption).

A Unilateral European Ban of Non-Conventional Oil

We further extend our thought experiment and we assume that the European Union unilaterally introduces a ban on non-conventional oil resources. We assume that there is no domestic extraction of non-conventional oil and that Europe does not change the total amount of oil imports from the scenario in which all regions implement the non-conventional oil ban.

Our results indicate that this policy is neither environmental effective nor efficient. The increase of global mean temperature is virtually unchanged at the end of the century (+4.03°C instead of +4.06°C). Europe has not the scale to significantly affect global oil markets and the reduction of demand from Europe is almost completely offset by an increase of demand from the other regions, which benefit from the resulting lower oil price. In 2050 Europe reduces its demand by 23% and global demand only decreases by 1%. In 2100 Europe cuts oil consumption by half and at global level demand is still only 1% lower. This implies that the cost of limiting non-conventional oil use falls on Europe while the benefit is shared among all other regions because they face less competition in the global oil market.

RECOMMENDATIONS FOR POLICY-MAKERS

Key messages for policy-makers

We discussed two very simple policy experiments in order to study the environmental effectiveness and the economic efficiency of a ban of non-conventional oil extraction and use. Our results are obtained using very naïve policy tools that abstract from the real world complexities. The key findings that we have highlighted in this policy brief should be interpreted with caution but they provide several important insights.

1. A global ban on the use of non-conventional oil has important environmental benefits but it is a very inefficient policy. A more efficient policy would tax GHG emissions independently from their source, sector and location. If we abstract from other environmental externalities, the extraction of oil sands is not different from any other consumption or production activity that generates GHG emissions. If policy makers are concerned by other externalities of non-conventional oil extraction, they should apply specific policy tools that address those externalities and not an implicit carbon tax.

2. A unilateral ban of the EU on non-conventional oil has no environmental benefits and it is expensive for Europe. The European Union should avoid unilateral aggressive policies against non-conventional oil. Diverting trade routes may be expensive and a short-term victory is possible. However, in the long-run, with rising energy prices and technological progress in oil extraction and transportation, it is likely that non-conventional oil will flow where demand is and Europe alone will have a negligible impact on global patterns.

3. Instead of investing political capital in a global dispute against non-conventional oil extraction abroad, the European Union may invest energies to introduce universal carbon taxes, at least in major developed economies and trading partners.

If the objective of the EU is to reduce global GHG emissions it must invest political capital to convince other countries to implement economy-wide policies to penalize GHG emissions. There are not effective long-term substitutes to global efficient climate change mitigation policies.

SCIENTIFIC APPROACH / METHODOLOGY

Scientific approach/ Methodology

We use scenarios generated using an economy-energy-climate integrated assessment model within the Global-IQ project. The scenarios are realistic and coherent representation of future economic, technological and energy pathways. Scenarios are not forecasts and they do not necessarily represent the most likely outcome in the future. Scenarios are extensively used in the literature that studies climate change policy because they allow long-term policy evaluations and provide useful insights that must be used together with expert judgment and other policy assessment tools.

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http://www.iea-etsap.org/Energy_Technologies/Energy_Supply/Unconventional_Oil_and_Gas_Technology.asp

PROJECT IDENTITY

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