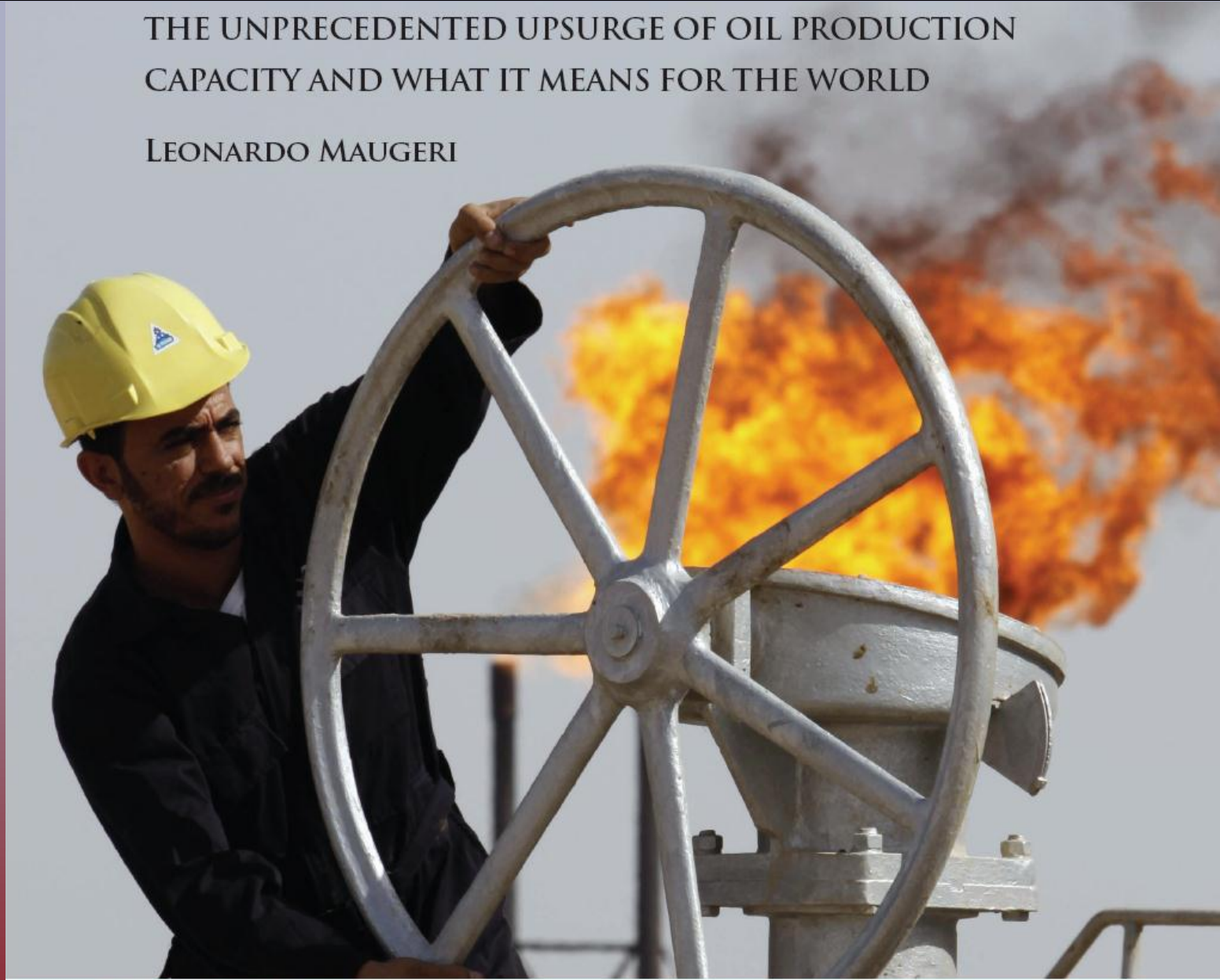


# THE UNPRECEDENTED UPSURGE OF OIL PRODUCTION CAPACITY AND WHAT IT MEANS FOR THE WORLD

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# UNDERESTIMATION OF SUPPLY

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- ❑ “Peak-Oil” production mantra, in spite of ever-growing supply
- ❑ Price, technology, and oil industry behaviour not considered as key factors in shaping the future of oil supply
- ❑ Supply still calculated as a function of demand, but investment-cycles in the oil&gas sector are asynchronous with respect to demand
- ❑ Few analyses based on bottom-up, field-by-field investments
- ❑ General underestimation of huge unconventional oil potential

The market is still convinced that oil supply capacity will remain structurally tight, but it now admits that short-term weakness of demand may provoke a temporary decline of oil prices

**IT'S NOT  
LIKE  
THIS**

# WHY IS IT SO DIFFICULT TO ASSESS OIL RESOURCES ?

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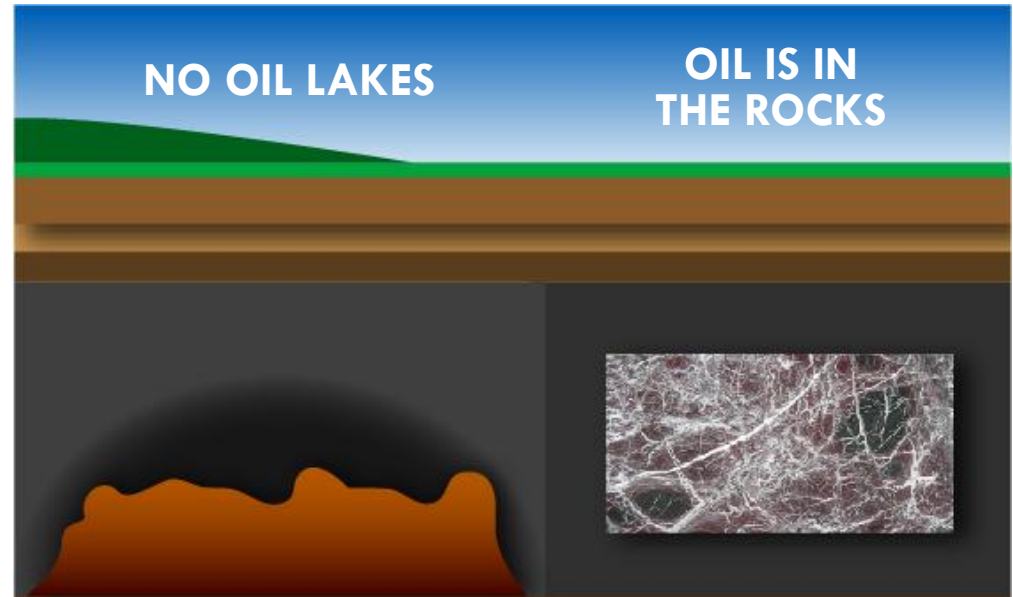
## **Geology Hard Reality**

No great underground oil lakes or caves, but only solid rocks

## **Limited Exploration**

Only **1/3** of world's sedimentary basins has been **explored**

**65%** of world's exploration wells (new wildcats) **drilled in the U.S.** alone in the last 30 years



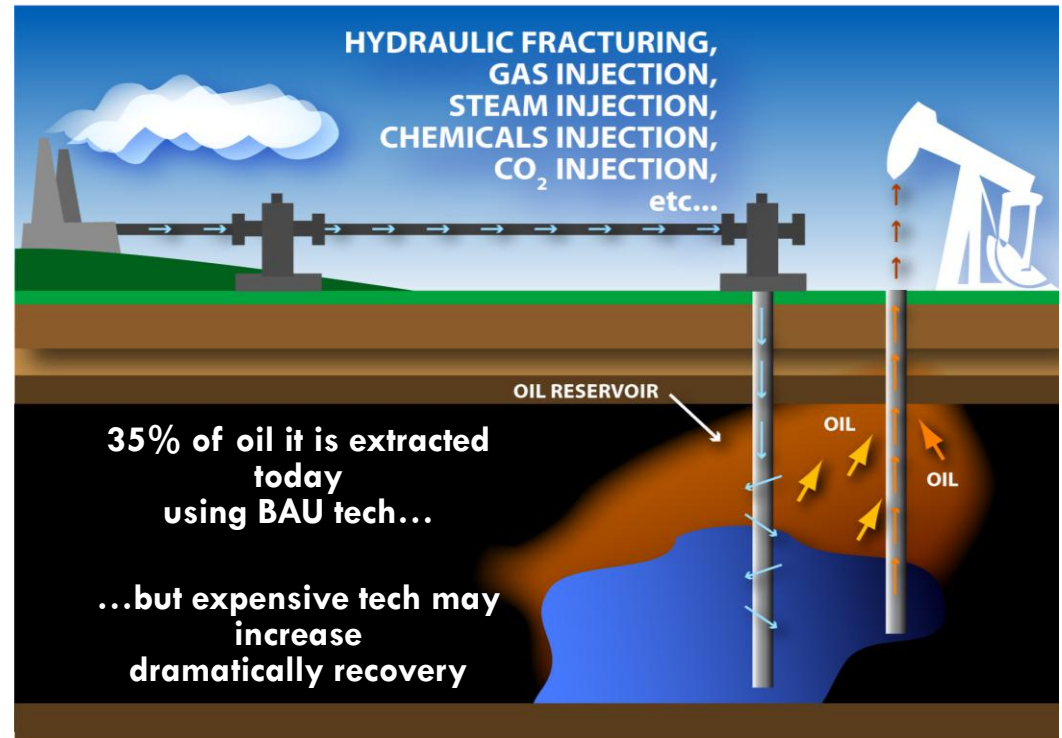
No current technology is capable to give an answer to the question  
**“how much oil lies beneath?”**

# PRICE AND TECHNOLOGY ARE THE MOST CRITICAL FACTORS IN DETERMINING RESERVE AND PRODUCTION GROWTH

## TECHNOLOGY

On average, less than **35%** of already known oil is extracted today using business-as-usual technologies.

More expensive tech may dramatically increase oil recovery.



## PRICE – COST

Less than **20%** of oil production under development is not profitable (double digit IRR) with an oil price (Brent) lower than **\$ 70** per barrel (at current costs).

# AN EXPLORATION&DEVELOPMENT BOOM IS UNDERWAY

## A huge investment cycle started in 2003, and boomed from 2010 on

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2010-2012 BOOM:  
around **\$1.5 trillion**  
invested for oil&gas E&P

EXPLORATION SPENDING  
RECORD  
about **\$90 billion** in 2011

EXPLORATION&DEVELOPMENT  
RECORD  
more than **\$550 billion** in 2011

2012: AN ALL-TIME RECORD?  
preliminary estimates shows  
that the pace of E&P investments  
is set to overcome **\$600 billion**

# A Note on Methodology

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## **Global field-by-field analysis=**

Oil investments underway based on proprietary database (>1,000 fields)

## **Additional unrestricted production =**

targeted production of each investment project, no risk-factor associated

## **Additional adjusted production =**

actual possible production after cutting targeted production to take risk-factors into account

## **Risk-factors =**

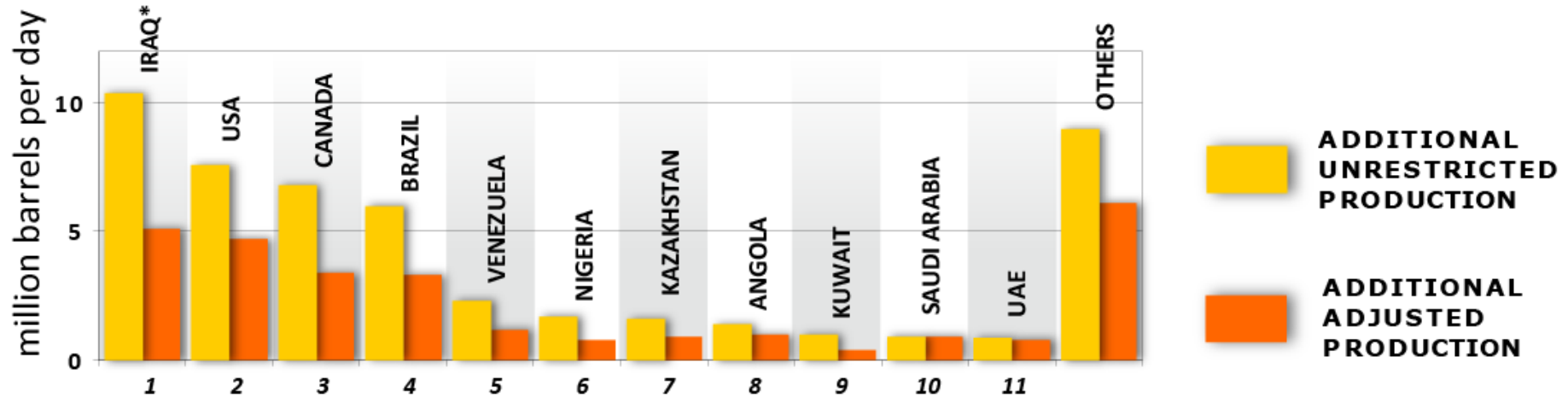
calculated on the basis of personal experience and assessment, and disclosed for each country

## **Depletion and Reserve Growth =**

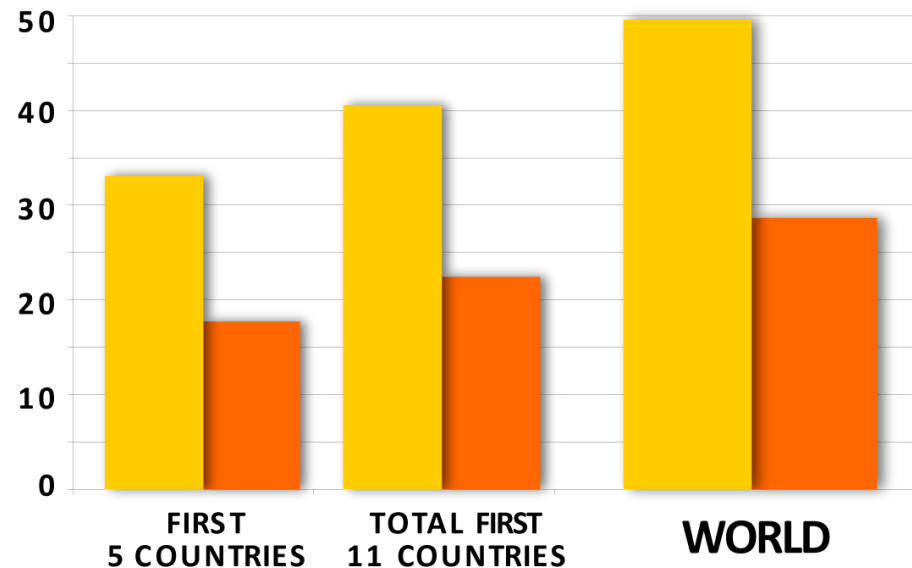
natural decline of already producing oilfields plus possible increase of their producible reserves, due to the technology advance



# WHERE WILL THE NEW PRODUCTION COME FROM? -1 (field-by-field estimates)



A “mosaic” of **new oil production capacity** is growing worldwide, implying an “unrestricted” (no risk-adjusted), additional output of a little less than **50 million barrels per day** by 2020



## **ADDING NEW PRODUCTION TO OLD ONE** **(preliminary field-by-field estimates)**

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- ☐ **New oil production will supplement current world's production capacity**
- ☐ **World's oilfields DEPLETION rates appear to be overestimated, due to an underestimation of technological advance and RESERVE GROWTH**
- ☐ **To 2020, the biggest oil producers tend to maintain a relatively stable production from older oilfields**
- ☐ **Only four big producers (Norway, UK, Mexico, and Iran) may face a net decrease of their current production capacity**

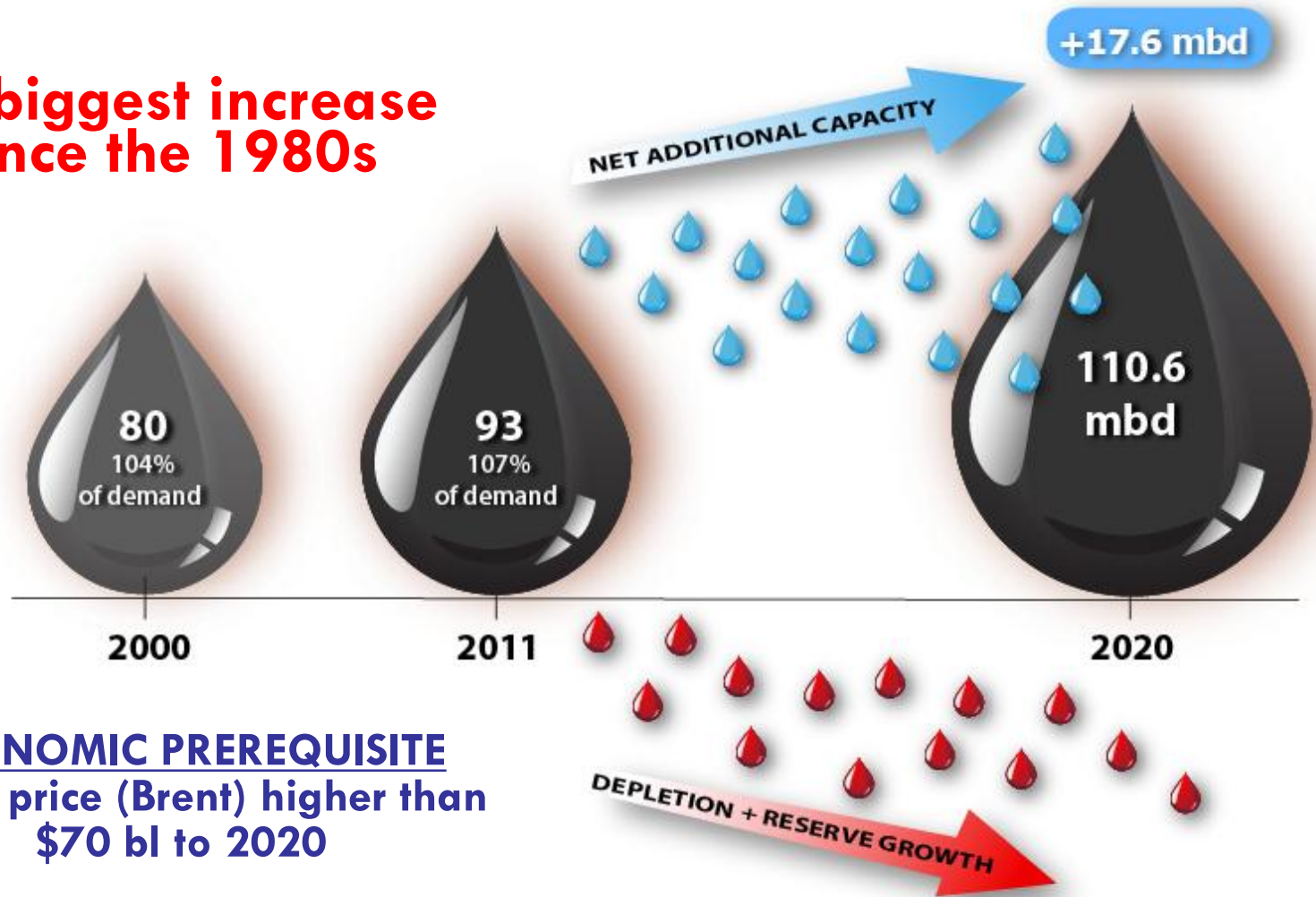
**As a result, current world's oil capacity of about 93 mbd  
(end of 2011) will decline more slowly,  
probably at a 2-3 percent rate**



# WHAT COULD THE OUTCOME BE?

World liquids production capacity excluding biofuels (Million b/d)

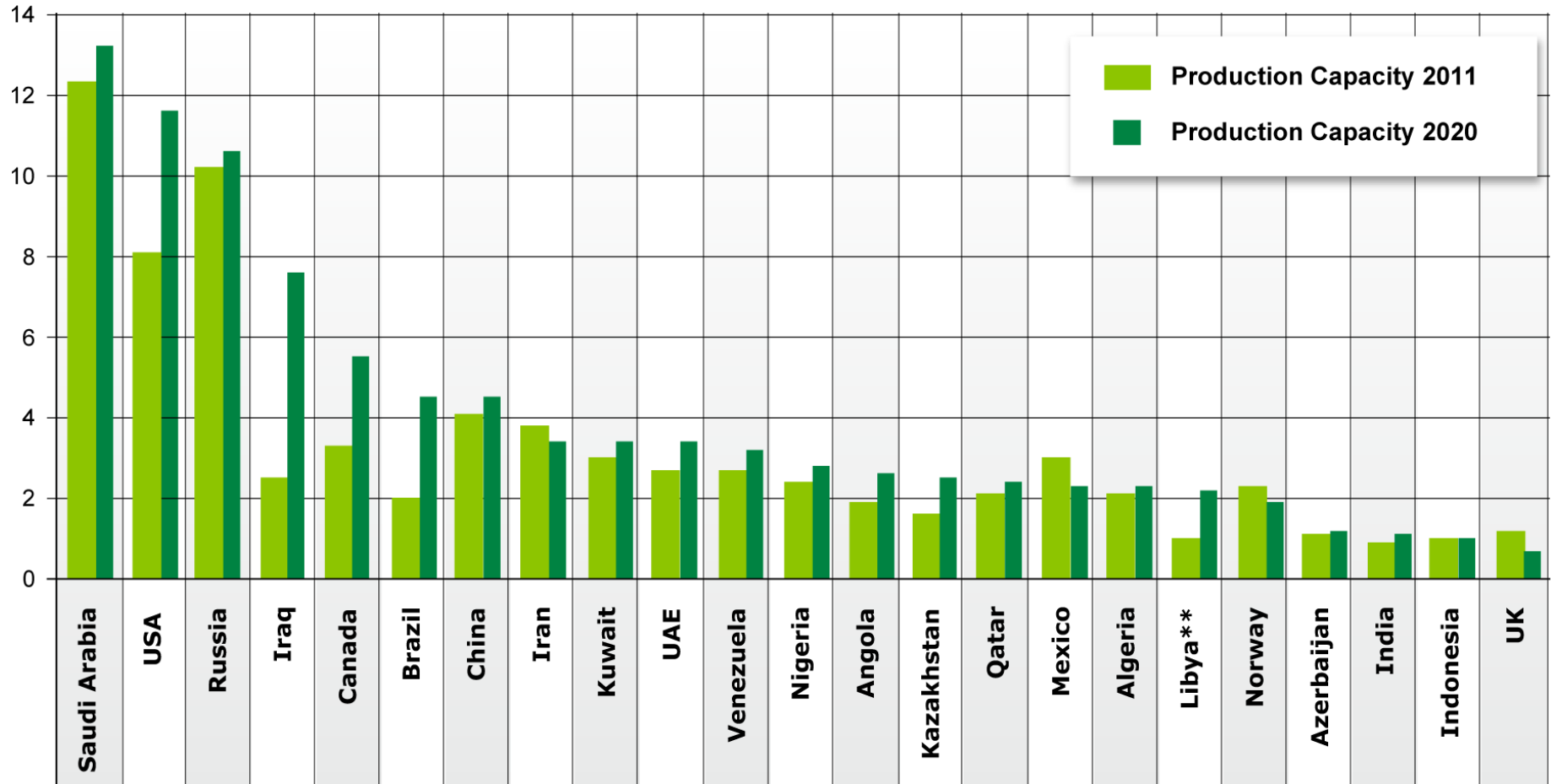
**The biggest increase  
since the 1980s**



## ECONOMIC PREREQUISITE

An oil price (Brent) higher than  
\$70 bl to 2020

# Country-by-country evolution of oil production capacity to 2020 (Million b/d)



# U.S. SHALE-TIGHT OIL: A NEW PERSIAN GULF OR A HYPE?

## 1 - The case of Bakken Shale



### PRICE (1999) BAKKEN'S POTENTIAL ASSESSMENT

**271-503** billion barrels of original oil in place

Mean of **413** billion barrels

**206** billion barrels of recoverable oil

# U.S. SHALE-TIGHT OIL: A NEW PERSIAN GULF OR A HYPE?

## 2 - The case of Bakken Shale

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**2006**

First combination of horizontal-drilling and fracking tested.

**Production: 7,600 bd Bakken, 110,000 bd North Dakota**

**2006-2008**

Average weekly drilling rigs: **25-30 (50 including Montana)**

**2010**

Production: **264,000 bd**

**2011**

Production **+530,000 boe/d in December, more than 80 percent light oil.**

Drilling rigs 183 (200 including Montana)

**Preliminary evidence suggests that  
Price's analysis was right**

# U.S. SHALE-TIGHT OIL: A NEW PERSIAN GULF OR A HYPE?

## 3 – Bakken is not alone....

**Additional production from U.S. shale/tight oil plays by 2020**  
(million barrels per day)

Shale Play	Additional unrestricted production	Additional adjusted production
★ Bakken/Three Forks	2.5	1.5
★ Eagle Ford	2.1	1.47
★ Permian	1	0.7
★ Utica	0.2	0.1
★ Niobrara/Codell	0.2	0.1
★ Others	0.6	0.3
<b>Total</b>	<b>6.6</b>	<b>4.17</b>

# U.S. SHALE-TIGHT OIL: A NEW PERSIAN GULF OR A HYPE?

## 4 – **Cons** versus **Pros**

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- **The obstacles/1: the inadequate U.S. oil transportation system, and the structure of the refining complex**
- **The real obstacles/2: the fear of Hydraulic Fracturing**

***But...***

- **The U.S. shale revolution is the biggest oil revolution since decades**
- **It will allow the U.S. to produce 65% of the oil it consumes (or about 90% - considering Canada's oil imports)**
- **It will likely represent the single, most important factor of economic growth and job creation in the next few years**

# OVERESTIMATION OF DEMAND ?

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- Hype about China and Emerging Countries' oil “bulimia”
- Underestimation of “Peak-demand” in OECD countries: it's not economy alone
- Incapacity to assess the impact of ageing population, energy efficiency spurred by new legislations, technological innovation, consumers attitude
- Long-term predictions of Emerging Countries demand extrapolated from past/present consumption trends

**UNLESS OIL DEMAND GROWS  
AT A SUSTAINED YEARLY RATE OF 1.6% TO 2020  
(CURRENT RATE= LESS THAN 1%)....**

**.....A COLLAPSE OF OIL PRICES IS POSSIBLE**



# MAJOR GEOPOLITICAL IMPLICATIONS

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- **The Western hemisphere could become virtually independent from the rest of the world, and the major source of oil production growth over the next decades**
- **However, the U.S. won't be insulated from the global oil market; any major crisis in the Middle East will always influence the oil market**
- **Middle East's oil will be only one pillar - not the Center of Gravity - of the global oil market**
- **Asia to become the key market for Middle Eastern Oil, and China a U.S. political competitor in the region, as well as in Africa**
- **China will try to extend its grip on Venezuela and Canada too (fields, pipelines, etc.)**
- **Opec strained by Iraqi oil resurgence and global production growth**

# ***Back-up***

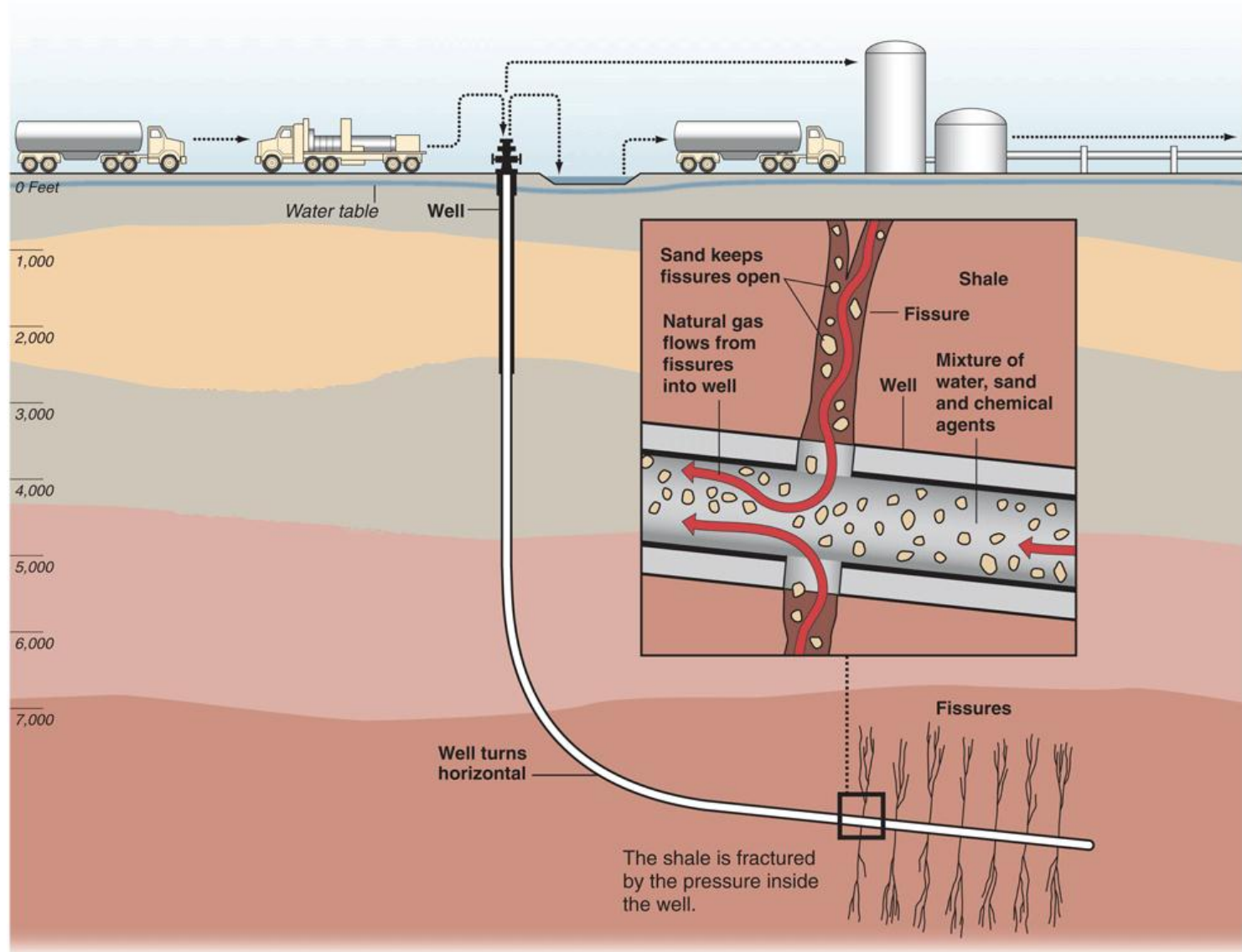
# WORLD'S OIL PRODUCTION CAPACITY TO 2020 (MBD) - 1/2

	Production Capacity 2011 - end	Additional Unrestricted Production	Additional Adjusted Production	Net production additions or losses*	Production Capacity 2020
<b>Saudi Arabia</b>	<b>12.3</b>	0.9	0.9	0.9	<b>13.2</b>
<b>United States</b>	<b>8.1</b>	7.6	4.7	3.5	<b>11.6</b>
<b>Russia</b>	<b>10.2</b>	1.2	0.8	0.4	<b>10.6</b>
<b>Iraq</b>	<b>2.5</b>	10.4	5.1	5.1	<b>7.6</b>
<b>Canada</b>	<b>3.3</b>	6.8	3.4	2.2	<b>5.5</b>
<b>Brazil</b>	<b>2</b>	6	3.3	2.5	<b>4.5</b>
<b>China</b>	<b>4.1</b>	0.7	0.5	0.4	<b>4.5</b>
<b>Iran</b>	<b>3.8</b>	<b>0.5</b>	<b>0.2</b>	<b>-0.4</b>	<b>3.4</b>
<b>Kuwait</b>	<b>3</b>	1	0.4	0.4	<b>3.4</b>
<b>UAE</b>	<b>2.7</b>	0.86	0.8	0.7	<b>3.4</b>
<b>Venezuela</b>	<b>2.7</b>	2.3	1.2	0.5	<b>3.2</b>
<b>Nigeria</b>	<b>2.4</b>	1.7	0.8	0.4	<b>2.8</b>
<b>Angola</b>	<b>1.9</b>	1.38	1	0.7	<b>2.6</b>
<b>Kazakhstan</b>	<b>1.6</b>	1.6	0.9	0.9	<b>2.5</b>

# WORLD'S OIL PRODUCTION CAPACITY TO 2020 (MBD) - 2/2

	Production Capacity 2011 - end	Additional Unrestricted Production	Additional Adjusted Production	Net production additions or losses*	Production Capacity 2020
<b>Qatar</b>	<b>2.1</b>	0.7	0.5	0.3	<b>2.4</b>
<b>Mexico</b>	<b>3</b>	0	0	-0.7	<b>2.3</b>
<b>Algeria</b>	<b>2.1</b>	0.7	0.5	0.2	<b>2.3</b>
<b>Libya**</b>	<b>1</b>	1.2	1.2	1.2	<b>2.2</b>
<b>Norway</b>	<b>2.3</b>	<b>0.4</b>	<b>0.2</b>	<b>-0.4</b>	<b>1.9</b>
<b>Azerbaijan</b>	<b>1.1</b>	0.4	0.3	0.1	<b>1.2</b>
<b>India</b>	<b>0.9</b>	0.6	0.3	0.2	<b>1.1</b>
<b>Indonesia</b>	<b>1</b>	0.4	0.3	0	<b>1</b>
<b>UK</b>	<b>1.2</b>	<b>0.2</b>	<b>0.1</b>	<b>-0.5</b>	<b>0.7</b>
<i>Sub-Total</i>	<b>75.3</b>	47.54	27.4	18.6	<b>93.9</b>
<i>Others</i>	<b>17.7</b>	<b>2</b>	<b>1.2</b>	<b>-1</b>	<b>16.7</b>
<b>WORLD TOTAL</b>	<b>93</b>	49.54	28.6	17.6	<b>110.6</b>
<i>Of which:</i>					
Crude Oil	<b>78</b>				<b>86</b>
NGLs	<b>15</b>				<b>24.6</b>

# How hydraulic fracturing works



Adaption from: Al Granberg/ProPublica

# US oil pipeline network

