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Challenges facing Investors in Middle East oil and gas

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Finding Petroleum Middle East Forum

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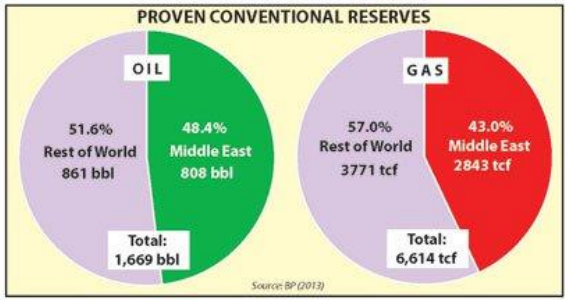
Agenda

- **Why the Middle East is a Key Region**
- What are Investors looking for and Key Challenges
- Host Government and NOC Drivers
- Prioritizing where to invest

Opinions expressed here do not necessarily reflect the views of A.T. Kearney

The Middle East is the "Centre of Gravity" of global oil

- The Middle East has ~ 800 bnb - nearly half the world's proven recoverable oil
- It provides over 30% of our supply, with only 2% of the world's producing oil wells - from only 3.6% of the Earth's surface
- It also holds over 40% of the world's proven recoverable gas - and demand for gas is rising
- The supply from these reserves has huge significance for global economies
- There are signs that the region's political alliances are shifting – and that its stability may come under more threat
- Russian and Chinese interests and influence are also growing



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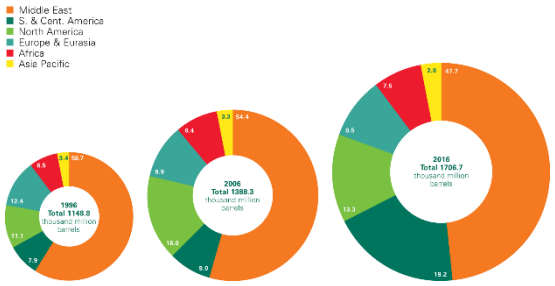
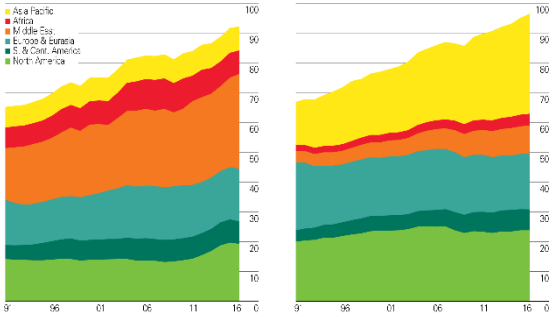
The Middle East holds nearly half of the world's oil, plus over 40% of its gas

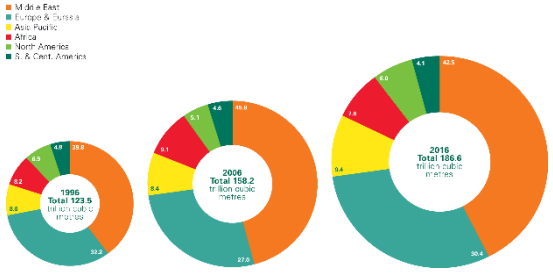
Proved oil reserves by region in 1996, 2006 & 2016



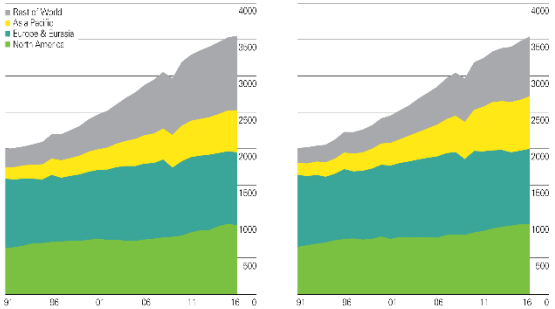
Oil Production and Use (mmb/d)



Proved gas reserves by region in 1996, 2006 & 2016



Gas Production and Use (bcm)



- **The Middle East still has 48% of the world's oil** and **33% of its production**
- Saudi Arabia alone has nearly one-sixth of the world's oil reserves (266 billion barrels)
  - In 2016, it produced 12.35 mmb/day. The ME supplies 34.5% of the world's needs
- **The Middle East also has 42% of global gas**
- But so far provides only 17% of supply
- Estimated Middle East reserve lives are 72 years for oil and 125 years for gas

Source: BP Statistical Review of World Energy 2017

Why so much oil and gas in the Middle East?

- Great geology:
  - Deposition of many layers of organic rich sediment (4000-7000m) in shallow water,
  - Later folded into giant anticlines in the Zagros thrust, with the Hormuz salt providing a basal decollement
  - Development of a long wide foreland basin in front of the Zagros, infilled with its sediments, including extensive evaporites as good regional cap rocks

Outcrop of the fractured Asmari limestone (Early Miocene) in south-west Zagros

Landsat image of large 'whale back' anticlines in the 'Simply Folded Belt' of the Zagros

Source: Rasoul Sorkhabi, GeoExpro

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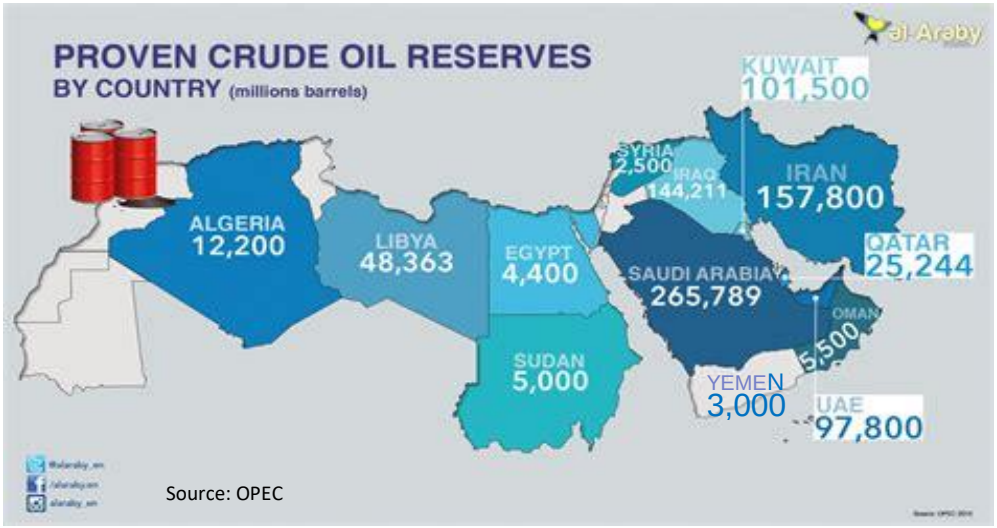
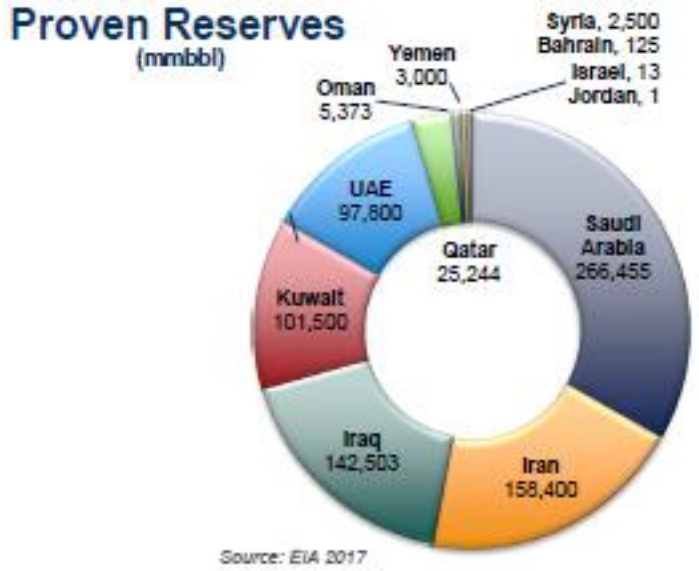
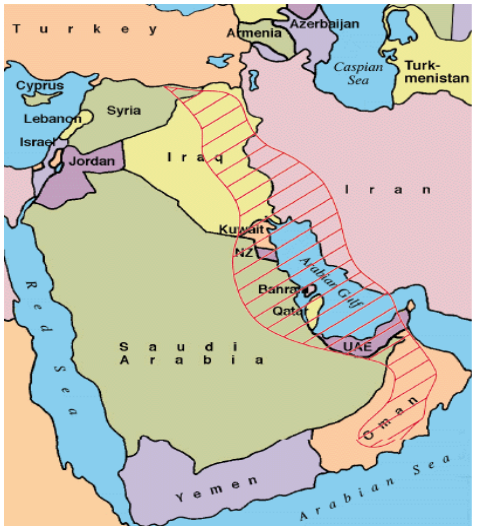
Five countries: Saudi Arabia, Iran, Iraq, Kuwait and the UAE control most of MENA's oil reserves and production





- Around a quarter of the world's giant and supergiant fields are located in the Middle East
- Iran and Qatar lead the region in gas – with an estimated 1180 and 860 tcf (31% of world total, BP, 2017)
  - Saudi has 300 tcf, UAE 215, Iraq 130 and Kuwait 60, but over 1.3 tcf a year of associated gas is flared



Sources: BP Statistical Review of World Energy and Petroleum Economist, Note: Flaring mainly now in Iraq and Kuwait

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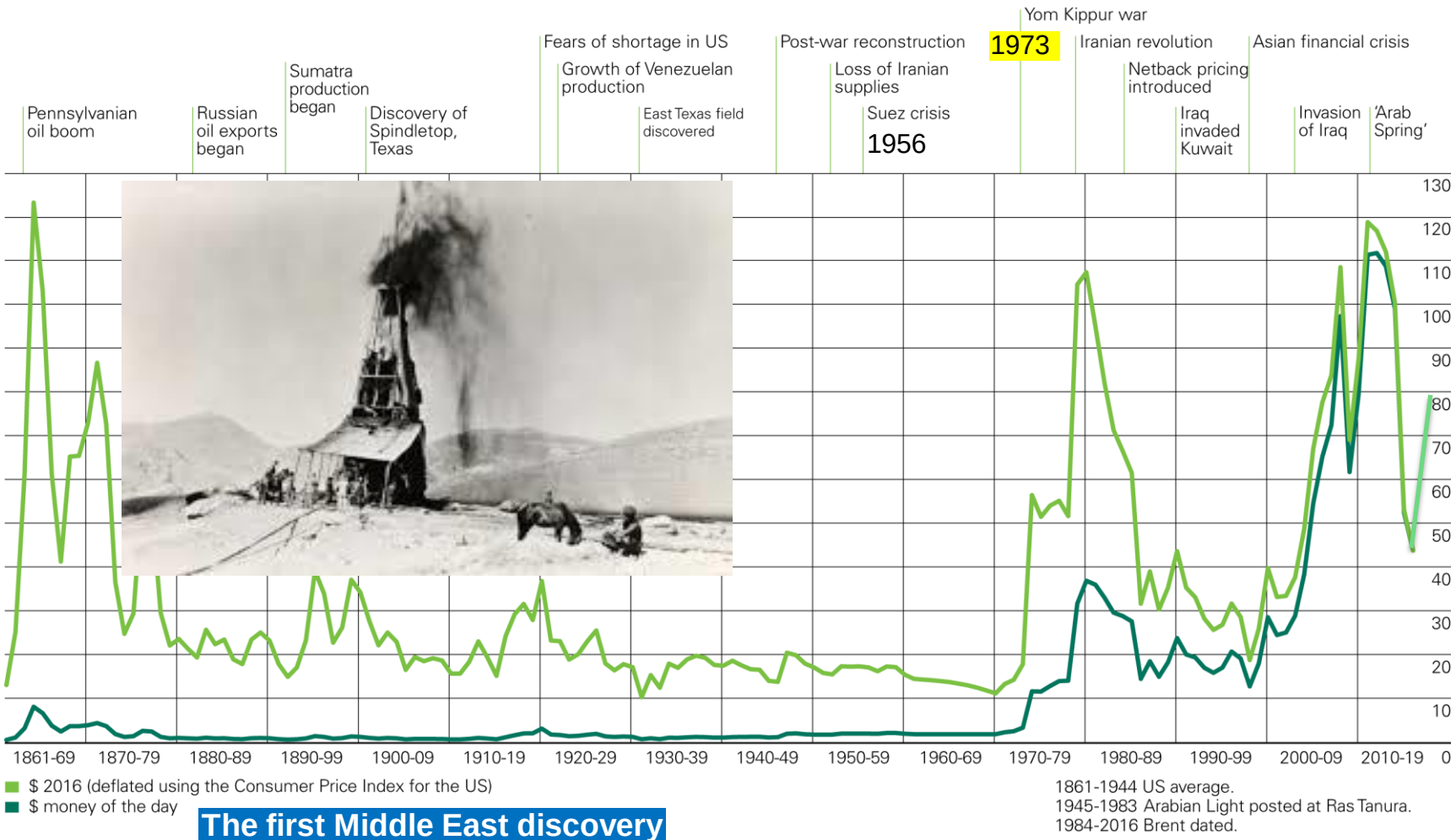
Political events in the Middle East have hit global economies – especially from the 1973 oil embargo onwards



The first Middle East discovery on 26 May 1908 at Masjid-i-Suleiman in the Zagros

Source: BP Statistical Review of World Energy 2017

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Investors tend to assess potential growth areas under four key lenses: Growth Potential, Value & Returns, Access, and Risks

Typical Key Investment Criteria

Sustained growth?
- Reserves growth and production outlook
- Exploration success and materiality
- Maturity and views of yet to find

How profitable?
- Costs and margins
- Government take
- Break-even price
- NPVs/boe and returns
- Faster paybacks

Ability to access?
- Barriers to entry, and ability to build a strong position
- Competitive intensity and ability to focus where best
- Relationships: discovered resource deals or licensing

Can manage key risks?
- Disruption and delay risks
- Fiscal & economic stability
- Political impacts, corruption
- Flexibility to adapt to market changes

Reserves growth and production outlook are mostly strong, but . .

Shift of Focus from Volume to Value

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Key challenges for upstream investors are instability & security, sanctions, resistance to partnering, delays and limited rewards

Political Risks

- **Security and internal instability, shifting alliances**
- Sanctions on firms who invest
- Terrorism impacts key facilities or ongoing proxy wars escalate
- Rising Russian and Chinese involvement
- Corruption, lack of transparency, subsidies. More domestic needs, low prices
- **Delays and changes to key decisions**

Commercial Risks

- **Resistance to outside help**
- Infrastructure bottlenecks
- Terms do not provide sufficient incentive for investor and bureaucracy
- **Poor communication** from Governments & NOCs
- High overheads, little or no competition and inertia stifle initiatives and projects
- Oil prices fall back, as shales surge again
- Long term demand falters as renewables and efficiency grow

Technical Challenges

- **Complex, fractured carbonate reservoirs**
- Imaging thrusts & deep levels
- Capturing more assoc. gas & developing deep gas
- Effective recovery of heavier oil, Improved recovery, EOR
- **So costs rising**
- Limited data for some under-explored areas
- Need to move faster on key projects and opportunities, with better project mgt & ops
- **Many have fields that need outside help & experience**

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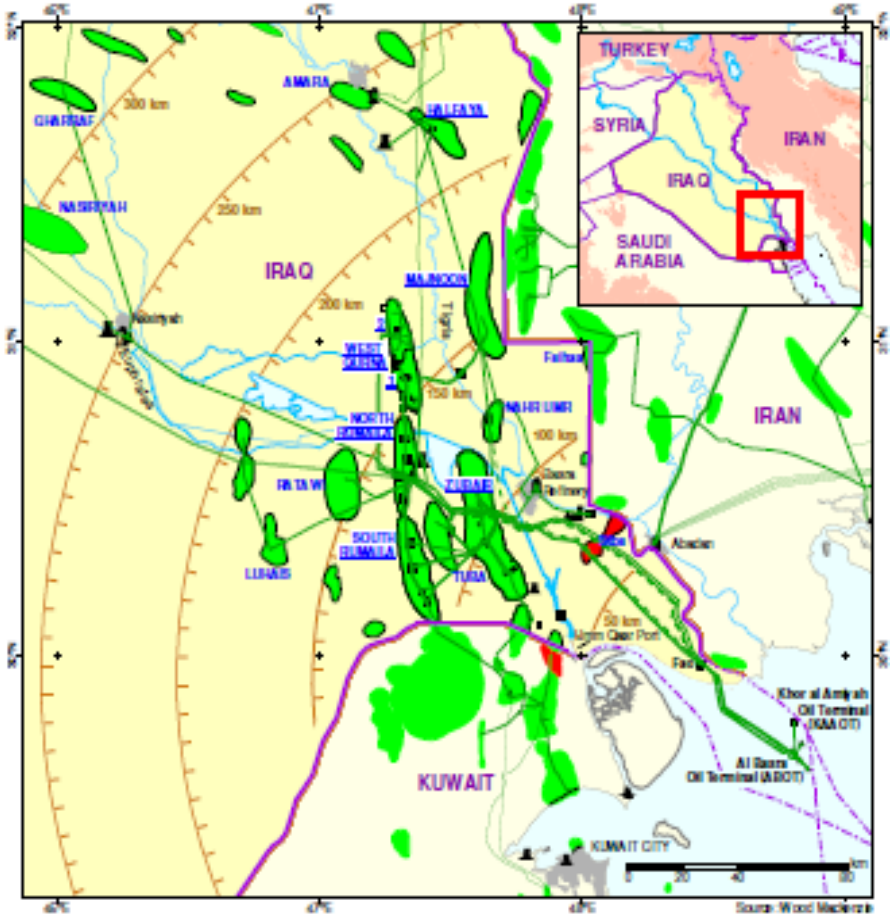
Many of these issues are evident in Iraq, where most of its rising production comes now from the big fields in the south

- Irag now produces 4.5 mmb/d, and wants 5 mmb/d by end 2018
- It has a mid-term target of 6.5, but **many hurdles**:
  - Unattractive terms, political instability, bureaucracy, onshore bottlenecks and security impede progress

- Iraq's budget was heavily impacted by low prices and fighting ISIS.
- Now more secure, and 2017's oil export revenue was $60bn, but likely instability after May 12th election

- **Some TSCs not delivering**, and Shell and Exxon reducing their exposure
  - Asian NOCs are likely to replace them
- BP plans to triple Kirkuk area (~9 bnb) production to over 1mmb/day



Iraq's reserves have grown to over 150 bn of oil and 110tcf

Source: Woodmac, 2017

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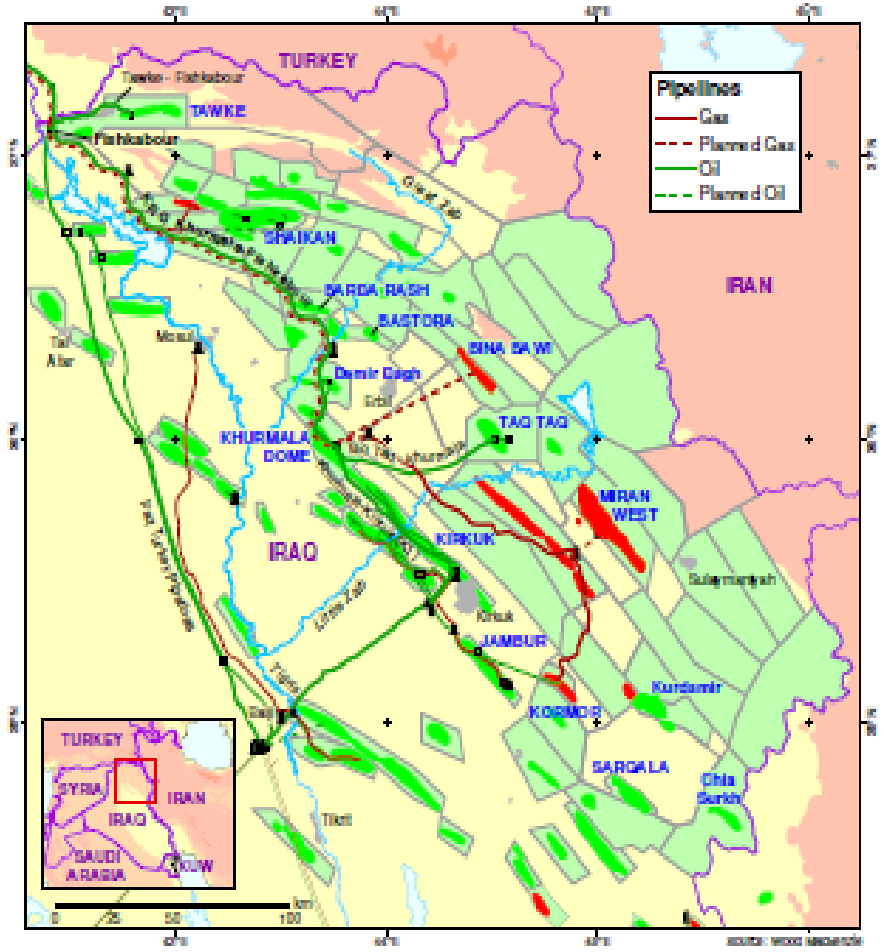
In Kurdistan, the referendum, dispute with Baghdad and loss of Kirkuk cut funding, but KRG has key northern oil export line

- Emerged as **a new exploration area** from 2005, now has 8 bn b and 27 tcf
- Attractive terms, but late payments
- Security better after 2014 ISIS defeat, and investors came back

- Complex fractured carbonates have led to **big reserve write downs**
- High terrain and H_2S raise costs, and no gas export line yet

- KRI very dependent on oil exports
  - Were 500kb/d, incl. 250 from Kirkuk & Bai Hassan to Oct 2017

- Dispute with Bagdad: the **referendum** raised tensions - Kirkuk retaken and funding cut, but holds key to oil exports



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NOCs are investing in their large onshore fields, and IOCs are going increasingly into gas - in Qatar, Egypt and Oman

- **NOC investment** is dominated by low-cost Saudi and Iraqi oil projects. These and UAE, Kuwait, Egypt are likely to take 2/3 of 2018 MENA capex
- Saudi Aramco and KOC are investing $25 billion in large onshore oil projects

- **IOCs want to lock-in low-cost, dependable returns**, to move down the cost curve, like ENI's deal for a stake & others' interest in ADMA and Total in ADCO
- Asian and Russian NOCs also see the low-cost, long-term assets as attractive

- **Gas is becoming more important** in the region - to supply growing domestic markets and boost LNG exports
  - Start-up of Zohr, West Nile Delta, Khazzan phase 2, Fadhili and Leviathan will need $12bn in 2018
  - **Qatar** wants a major increase in its LNG output: +30%, at an estimated cost of $18bn
  - **Iran** has been seeking investors, and Total and Shell have signed deals . . .

- **Aramco and other IPOs** are planned . . While mostly little interest in Exploring

- But **instability and political uncertainty are rising.** Active militants and wars plague parts of the region. Investors could be hit by the moves of key powers

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Middle East NOCs have a range of strengths, needs and constraints which partner IOCs need to address - to realise long term growth

Strengths	Needs	Constraints
Large oil or gas resources	**Revenue** and Capital	**Budgets**, Make maximum contribution to state coffers
Long experience with and knowledge of own fields	Management and **technical capabilities** for complex projects: EOR, heavy oil and difficult reservoirs	Tight controls
Experience of carbonate reservoirs	**Clearer relations with govt** and so priorities	**Political reticence to foreign investment:** only limited access or upstream closed
Efficient refining, retail and petrochem businesses	Overseas growth	Sanctions
International marketing	Less bureaucracy, more commercial outlook, staff recognition & opportunities	Energy subsidies
	Value based portfolio mgt and project priorities, **Profitability**	Overstaffing, jobs for life
		Turf Issues, little teamwork across silos, low energy

Further growth is likely from: Recovering more, going deeper, testing less explored areas and the region's world class shales - with new technologies

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Investors should balance their hosts' different needs - to make IOC-NOC partnerships work well

Government Needs

- Revenue Maximisation and Limits on Investment
- Maximise Jobs and Economic Development
- Social Welfare, Subsidies and Political Stability
- National and Energy Security (as use rises)
- Diversifying economy away from oil
- Environment and Image

IOC Relationships and Trust

Individual Needs

NOC Needs

- Operational Efficiency
- Oil Capacity Expansion
- International Aspirations
- Diversification
- Employment Security
- Control of their fields, but
- Rising technical challenges: EOR, Heavy oil, Reservoir mgt, drilling, exploration or integrated supply management

IOCs can bring capabilities and a more commercial business focus. But good relationships are key to best results – for both sides

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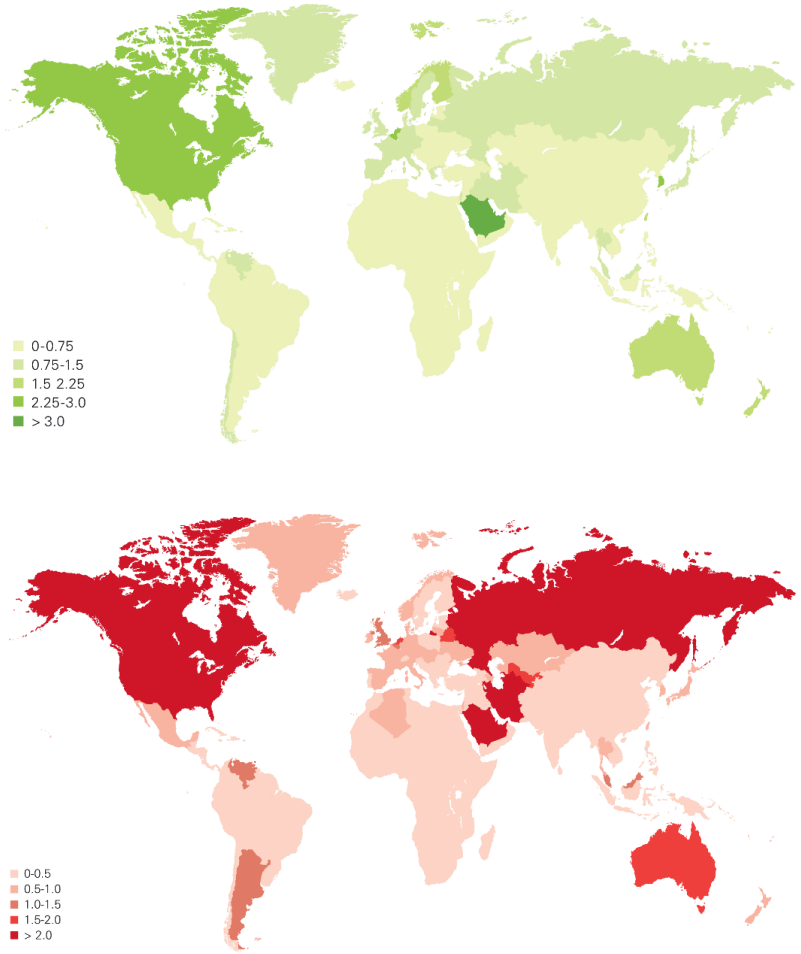
Domestic energy use is rising fast, notably in Saudi, UAE, Iran and Kuwait, but it's hard for Governments to reduce subsidies



Oil & gas use in tonnes of oil equiv./head in 2016

Sources: BP Statistical Review of World Energy and IMF 2017

- **The Middle East's population has grown**
- Iran has the most at 82m, Iraq 39m and Saudi 34m (while Egypt has 99m)
- **Many are under 30, and need productive jobs**. 60% of Saudis are under 30, and 67% in Iraq
- Subsidies help ease tensions
- **GDP/head and energy use have risen**, so less for export
  - Qatar ranks 6th in the world at $61k/head, ahead of the US - and Saudi at $21k/head
- The leading Gulf states increasingly see the need to **diversify away from oil** – ahead of the anticipated energy transition
- Many are starting to turn to **solar** to generate power – for cooling on hot days

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IOCs will prioritise where best to invest - based on their own criteria and relationships, focusing on likely returns and risks

Illustrative Upstream Opportunity Attractiveness - for an IOC with experience in the Middle East

Illustrative View

Less favourable — Favourable

Area	Growth Potential	Value and Returns	Access to a Good Position	Ability to Manage Risks	Comments
1					Promising new gas play, IOCs active. Costs low, as existing infrastructure nearby. Good gas market
2					Pragmatic terms, with an attractive operating environment. Gas, EOR and exploration opportunities Challenging reservoirs. Can negotiate gas prices
3					Wants significant gas and **LNG** growth, needing major investment
4					Good relations with foreign partners. Key offshore areas for bid in 2018, a growing focus on gas, and some difficult reservoirs
5					Plan production growth - now more secure, but more political instability likely, bureaucracy & onshore bottlenecks. Some IOCs cutting positions
6					Disputes and loss of key fields have cut funding. Controls oil export pipeline, but none yet for gas. Reserve write downs and some majors have left
7					Mature & heavier fields need IOR/EOR, deep gas & under explored offshore. Bureaucracy & fear of FDI
8					The main risks are above ground. Slow negotiations, plans change, bureaucracy, rising political issues and factional infighting

The illustrative examples here do not necessarily reflect the views of A.T. Kearney

Summary

- The Middle East is the leading, **low cost, hydrocarbon rich region**, with a **wealth of opportunity** – an Aladdin's cave of treasures, **but** . .
- **Major risks lie above ground**: Security, rising sectarian tensions, proxy wars that may escalate, sanctions, factional infighting, corruption, bureaucracy and opposition to foreign investment
- **Technical challenges are rising** that need outside help, available **if sufficient incentives** can attract the right investors, and
  - **Further growth is likely** by applying new technologies **to recover more**, go deeper and test less explored areas and the world class shales
- **Good relationships are key:** Host Governments, NOCs and individuals have very different drivers. Recognizing these makes for better partnerships
- Smart investors will focus where they have the best relationships and see **the best returns and value - for the risks taken**

Questions?

A summit in the High Zagros - Zard Kuh (4,548m), with dipping Jurassic and Cretaceous carbonates

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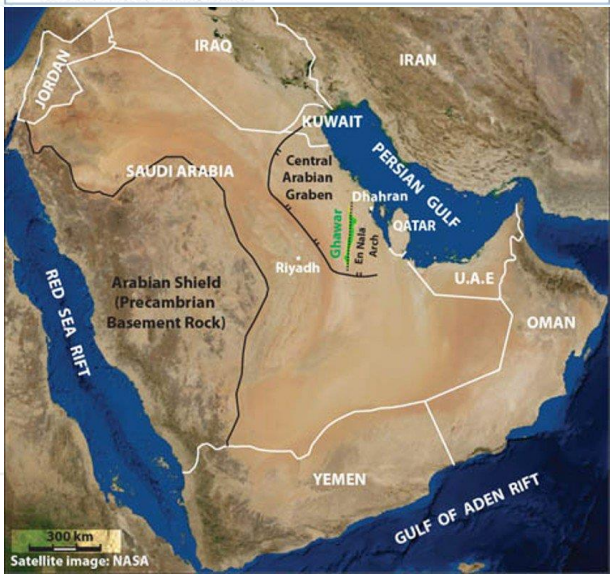
Middle East giant fields are led by Ghawar, producing 5 mmb/d

Field	Country	Year	Discovery Reservoir	Oil (Bbl)	Natural Gas (tcf)
Masjid Suleiman	Iran	1908	Asmari Limestone (Oligocene), 354 m	1.1	0.8
Kirkuk	Iraq	1927	"Main Limestone" (Oligocene), >420 m	17.0	-
Jabal Dukhan	Bahrain	1932	Waisa Limestone (Cretaceous), 600-750 m	0.91	12.2
Burgan	Kuwait	1938	Burgan Sandstone (Cretaceous), 1120 m	31.8	42.8
Dammam	Saudi Arabia	1938	Arab Limestone (Cretaceous), 1441 m	0.9	2.4
Dukhan	Qatar	1940	Zekrit Limestone (Jurassic), 1733 m	1.6	9.0
Bab (Murban)	Abu Dhabi	1953	Kharaib Limestone (Cretaceous), 3,776 m	10.1	29.3
Karatchok	Syria	1956	Massive Limestone (Cretaceous), 3155 m	>1.0	-
Yibal	Oman	1962	Shuaiba Limestone (Cretaceous), 2275 m	1.3	4.5 + 33 condensate
Alif	Yemen	1984	Sab'atayn Formation (Jurassic), 2400 m	0.9	-

Field	Country	Year	Oil[1] (Bbl)	Oil[2] (Bbl)	Gas[1,2] (tcf)
Ghawar	Saudi Arabia	1948	75.0	66.1	186.2
Abqaiq	Saudi Arabia	1941	18.7	10.3	14.2
Berri	Saudi Arabia	1964	18.5	9.1	12.2
Zuluf	Saudi Arabia	1965	20.2	12.2	5.2
Manifa	Saudi Arabia	1957	23.1	16.8	4.8
Safaniya	Saudi Arabia	1951	55.6	21.1	3.9
Burgan	Kuwait	1938	60.0	31.8	42.8
Aghajari	Iran	1936	17.4	5.8	9.9
Ahwaz	Iran	1958	25.6	13.4	23.3
Marun	Iran	1963	22.0	12.6	75.3
Gachsaran	Iran	1928	16.2	11.8	31.1
Fereidoon	Iran	1966	4.3	10.0	
Azadeghan	Iran	2004	4.6	6.0	2.0
Pars South	Iran	1971	1.3	1.3	350.0
Rumaila S & N	Iraq	1953 1970	30.0	22.0	20.0
Kirkuk	Iraq	1927	25.0	17.0	8.2
Majnoon	Iraq	1975	13.0	12.0	11.0
North Field	Qatar	1971			9.0 + 10.7 condensate
Zakum	UAE Abu Dhabi	1965	21.7	17.2	12.4
Bab	UAE Abu Dhabi	1953	11.6	10.3	29.3

1. Mike Horn, "Giant Fields" (2013)
2. Mann, Caghagan and Gordon (2003) "Tectonic Setting of the World's Giant Oil and Gas Fields" in AAPG Memoir 78

Source: Rasoul Sorkhabi, GeoExpro, 2014



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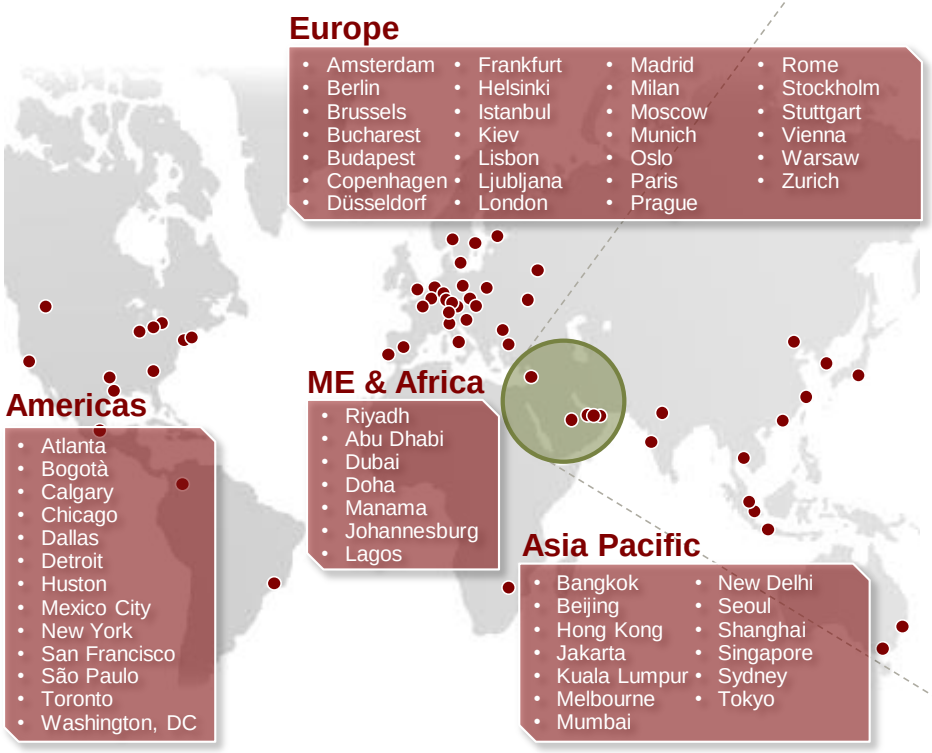
A.T. Kearney is a leading management consulting firm, founded in 1926, with a strong presence in the Middle East

A.T. Kearney Worldwide

- **Tradition** – Founded 1926 in Chicago
- **Revenues** – Over $1 billion
- **Global Footprint** – ~60 offices in 41 countries
- **Resources** – Over 3,000 employees; 300 partners
- **Ownership** – Fully independent, fully partner owned



A.T. Kearney Middle East

- **Experience** – 35+ years in the Middle East
- **Presence** – 6 offices: Upstream and Downstream
- **Resources** – 150+ employees

- **Strong focus on Oil & Gas and Petrochems**
- **Broad regional experience:**