1800 K Street, NW
Suite 400
Washington, DC 20006

Phone: 1.202.775.3270
Fax: 1.202.775.3199
Email:
acordesman@gmail.com
Web:
www.csis.org/burke/reports

Options for dealing with Iran's Nuclear Program

A Risk Assessment Approach

Abdullah Toukan, Visiting Fellow
Arleigh A. Burke Chair in Strategy

CSIS | CENTER FOR STRATEGIC & INTERNATIONAL STUDIES | Burke Chair in Strategy

April 18, 2012

www.csis.org |

This report is based on a series of reports by Dr. Anthony Cordesman on Iran, published by the Burke Chair, CSIS.

This series of reports can be found at: http://csis.org/program/us-and-iranian-strategic-competition

Dr. Abdullah Toukan can be contacted at: abdullah.toukan@sagracenter.org
Strategic Analysis and Global Risk Assessment Center
Abu Dhabi
UAE

Summary and Concluding Remarks

- This study presents the strategic options (dialogue and diplomacy, economic and financial sanctions, deterrence and active defense, military strike), available in dealing with Iran's nuclear program. A multi-dimensional risk analysis approach indicates some of the complexities of the inherent issues, revealing that no one strategic policy option solution stands out as the optimal choice, but pointing us towards a mixed strategy of policy options, that could be a combination of some or all of the various options under consideration. We also show the various linkages related to this now global issue: not only are options linked in duration and intensity but the distinctions of how the international community has to sustain a delicate balance between the four available options that could be primarily identified.

Formulation of how to deal with the Iranian Nuclear Program:

The Aim: getting Iran to end its uranium-enrichment program, and to comply with international agreements and laws and to cooperate fully with the IAEA.

The Strategic Policy Options to achieve the aim: dialogue and diplomacy, economic and financial sanctions, deterrence and active defense, military strike.

Constraints: risks associated with the consequences of each Strategic Policy Option.

The question can be phrased as follows:

Which strategic option or combination of these options does the United States and the international community need to adopt, to achieve the aim, while keeping risk consequences to the global economic and financial systems to a minimum.

- For instance, how long will the international community tolerate the duration and depth (or even eventual shallowness in results) of a dialogue and diplomacy with Iran. The risk perceived is that Iran just wants to exploit an open-ended dialogue to buy time and alleviate the pressure of sanctions, with no intent to terminate any of its nuclear activities. Additionally this will give Iran time to accelerate the process of further dispersing its enrichment facilities to locations buried deep underground. The possibility of dispersed facilities complicates any assessment of a potential mission success, making it unclear what the ultimate effect of a strike would be on Iran's nuclear facilities. (Reference: "Israel: Possible Military Strike Against Iran's Nuclear Facilities" Congressional Research Service. March 28, 2012).

- The initial Strategic Risk Landscape, figure(1), shows how critical and unstable Iran is in the economic, financial and governance sectors. It is clearly evident how much of the needed economic resources have been diverted to building a military Industrial capability thus depriving the economy and financial sectors from the essential resources to develop. It would be safe to state that if Iran continues along this "Self Destruct" path it would, by itself, move into the critical and highly unstable economic and financial phase - even without any international trade and financial sanctions imposed on it.

- Any actions by Iran could definitely move the region and the world to a higher strategic, economic and financial risk level which starts to create instability, especially at these times of critical global financial recovery and volatility; simultaneously any unilateral action against Iran, such as a military strike, can have catastrophic worldwide implications, figure(2).

- When it comes to sanctions, the key principle to be followed is that sanctions are multilateral and must be viewed as such when analyzed. The question become what defines an effective sanction, and can trade and financial sanctions help counter the proliferation of weapons of mass destruction? The policy to increase the severity of sanctions could push Iran into the critical unstable region resulting in an economic collapse, which could have unknown regional implications. Would Iran then accelerate its nuclear program and decide to go nuclear as a means of defending itself. A multiplicity of dangerous moves here could be considered as an initial form of retaliation: Iran could stage attacks in the Straits of Hormuz in an attempt to disrupt the flow of crude oil through it.

- IMF chief Christine Lagarde warned the world of the possible impact of crude oil sanctions (AFP March 21) – indicating that crude oil prices may spike by up to 30 percent if Iranian supplies were disrupted, causing "serious consequences" for the global economy. "Clearly it would be a shock to economies if there was a major shortage of exports of oil out of Iran, it would certainly drive up prices for a period of time. The International Monetary Fund (IMF) has calculated that an interruption in oil supplies from Iran could increase oil prices by 20 to 30 percent"..."A sudden and brutal rise in the price of oil" from Brent crude's current levels of $125 a barrel "would have serious consequences on the global economy" until other oil-exporting nations were able to bridge the gap, she added.

- The history of economic sanctions has demonstrated that in many cases, only military force can finally play a decisive role in forcing a country to modify its behavior and comply with international agreements. However, this is not to say that dialogue, economic incentives and sanctions cannot play a significant role in convincing a country that it must make concessions to change policy direction for the sake of its own socio-economic welfare and regional security and stability.

- Within its unique perspective as a world power and the responsibility that entails the U.S. is the only country that can launch a successful military strike. If all peaceful options have been exhausted and Iran has left no other means to convince it to stop or change its course in pursuing nuclear weapons, then the U.S. alone bears the global responsibility and vision that should determine what the timeline could be if Iran does pursue the path to develop nuclear weapons.

- The paramount question arising is what the objectives of a military strike would be? To wipe out the program completely, or just delay it for five years or even down to one year? This criteria will define the force allocation required to achieve a successful mission against Iran's nuclear facilities. We point out that it is not merely a simple mission of bombers flying in and out of Iran, this is a complicated Offensive Air-to-Ground Operation that will involve many aircraft, each with its own role, such as Combat Aircarft whose role is to suppress enemy air defenses along the way (SEAD), aircraft that fly fighter escort with the bombers, aircraft that carry specialized electronic warfare equipment to jam enemy radars and communications, plus probably air-to-air refueling along the way in and out of Iran. Depending on the forces allocated and duration of air strikes, it is unlikely that an air campaign alone could alone terminate Iran's program or prevent future hostility in the region for once and for all.

- The issue at hand is complex and bears lasting global consequences if not approached with adequate knowledge and awareness, particularly so if not taking the high risk tracks involved into consideration. The threat is perfectly understood: all are in agreement that Iran as a Nuclear Threshold State will be unacceptable to the security and stability of the region. The last thing this region needs is becoming more a part of the global arms race or the heightened dangers of more weapons of mass destruction proliferation, especially within the so far relatively stable GCC region that remains the global hydrocarbon reserve and has attained impressive and model levels of socio-economic development and globalization through oil revenues. The GCC has also been historically generous in crisis resolution throughout the region, as exemplified by the Gulf development funds set up from the 60s as well as extremely generous multilateral and bilateral aid to neighboring countries. The stability of Gulf countries is essential for any regional peace and socio-economic development.

- The report points to the direction of adopting dialogue and diplomacy, sanctions, deterrence and active defense, carefully balancing the timing, duration, and level of intensity of implementation in each phase of trying to defuse the crisis with Iran, and inducing Iran to abide with all international agreements and to cooperate fully with the IAEA. With regards to a Military Strike, it should be made clear that it remains on the table as an option of "Last Resort", if all else fails.

- Finally, it should be pointed out that the U.S. must put all its weight in not allowing any unilateral military strikes by Israel that can definitely push the presently volatile middle east region into a war with far reaching global consequences and a high end price for Israel itself. The issue has become an existential threat for the entire region rather than any one country alone.

- In the MENA Strategic Landscape as shown in figure (1) we have grouped the countries that are in the high risk/unstable region, which are: Iran, Libya, Syria, Algeria, Yemen, Egypt, and Lebanon. The chart shows that Governance also played a major role in situating this group in the high risk unstable region. The group that lies in the moderate risk region consists of the GCC, Tunisia plus Israel.

- Sweden, Switzerland and Singapore are taken as model examples of countries that are in the Low-to-moderate risk region. The aim of all countries would be to establish macro-economic policies plus governance that will move them to the low-to-moderate risk stable region.

- Jordan and Morocco are not in either of these groups, but with careful planning and implementation of economic reform policies will move into the moderate risk region.

- Looking at the Macro-economic plus Finance axis, we see that starting from lowest risk, countries rank in the following order: Qatar, UAE, Saudi-Arabia, Bahrain, Tunisia, GCC (as a block), Israel, Oman, Kuwait. Outside of this group come Morocco then Jordan.

Risk Factors Considered in the construction of the MENA Risk Landscape

Economic:

1. Current Account as % of GDP
2. External Debt as % of GDP
3. Government Budget as % of GDP
4. Gross Government Debt as % of GDP
5. National Saving as % of GDP
6. Industrial Growth Rate as % of GDP
7. Inflation Change
8. Labor as % of Population
9. Total Investment as % of GDP
10. Unemployment as % of Labor
11. Interest Rate Spread
12. Credit Rating
13. Value of Oil Import as % of GDP

Finance:

1. Staring a Business
2. Dealing with Licenses
3. Registering Property
4. Getting Credit
5. Protecting Investors
6. Paying Taxes
7. Trading Across Borders
8. Enforcing Contracts
9. Closing a Business
10. Getting Electricity
11. Business Impact of Rules on FDI
12. Availability of Financial Services
13. Soundness of Banks
14. Regulation of Securities Exchange
15. Business Costs of terrorism
16. Burden of Customs procedures

Governance:

1. Voice and Accountability
2. Political Stability & Absence of Violence/Terrorism
3. Government Effectiveness
4. Regulatory Quality
5. Rule of Law
6. Control of Corruption
7. Democracy Index
8. Corruption Perception Index

Sources:
Economic : IMF World Economic Outlook Data September 2011
Finance: World Bank Doing Business Report 2012
Governance: World Governance Indicators, 2011 Update www.govindicators.org
World Economic Forum. The Global Competitiveness Report 2011 – 2012
World Economic Forum: Global Risks 2012. Seventh Edition. An Initiative of the Risk Response Network
Economist Intelligence Unit, Democracy Index
Transparency International. Corruption Perception Index

MENA Strategic Risk Landscape

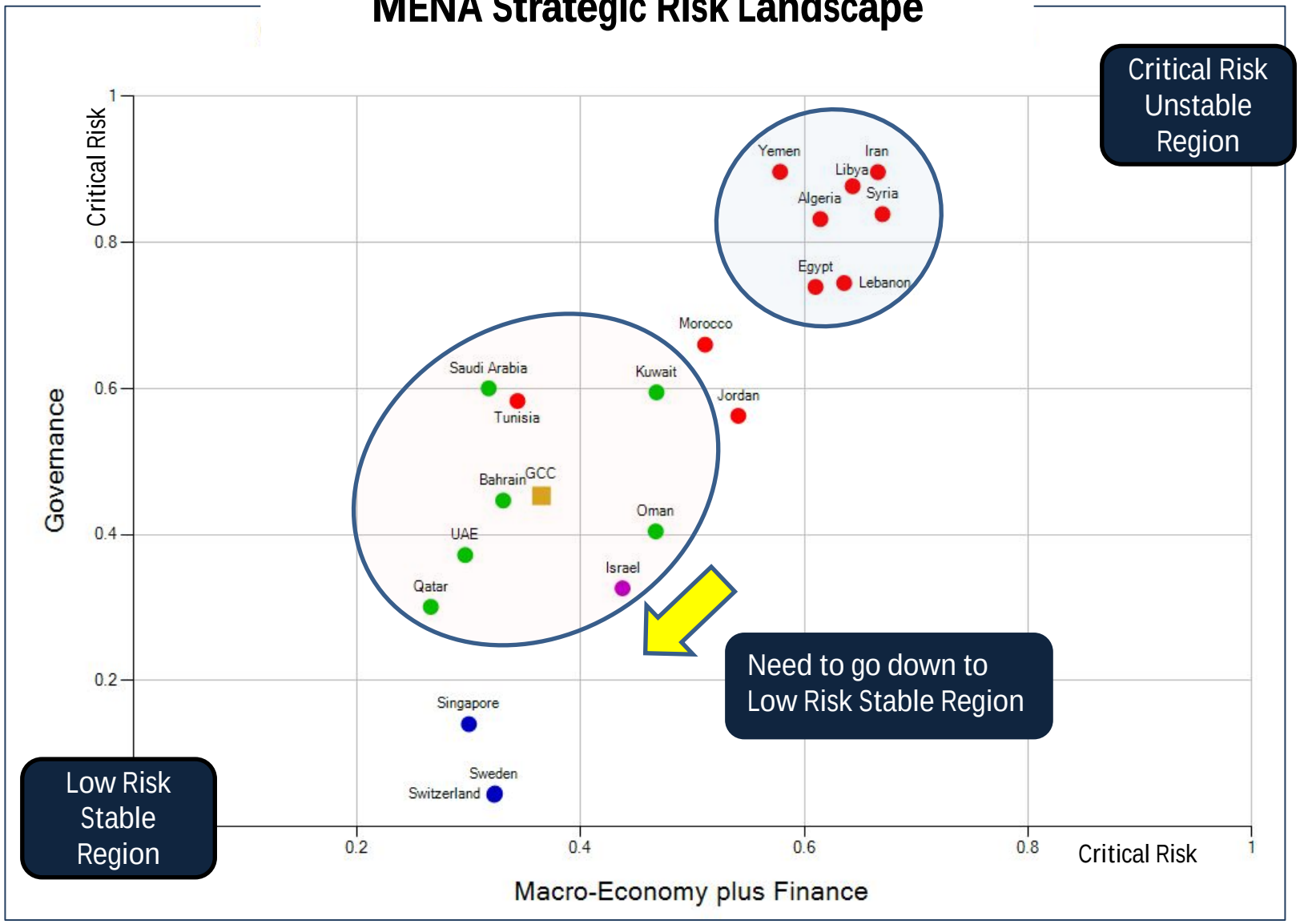


figure (1)

Two possible actions and outcomes that should be avoided at present

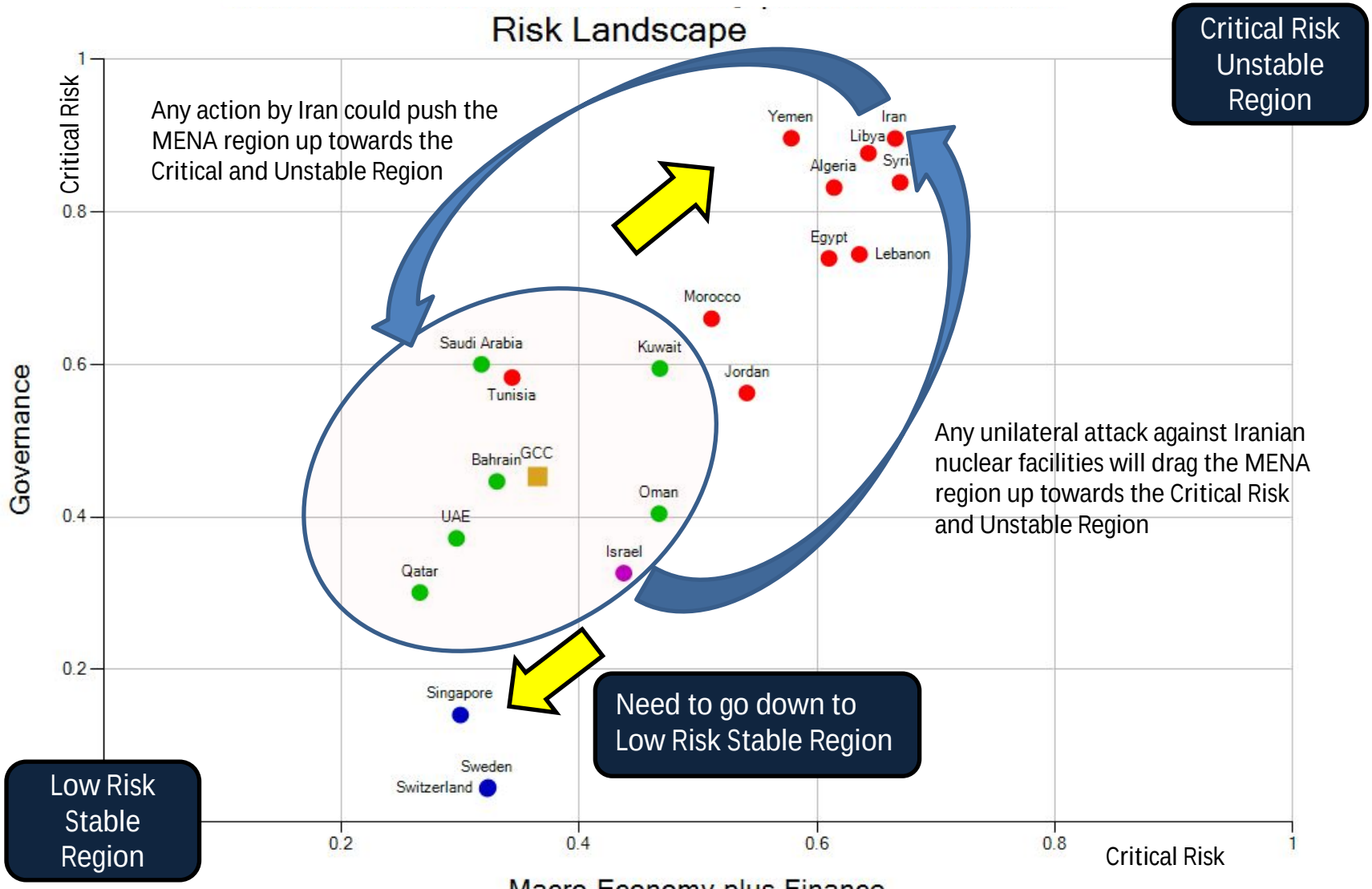


figure (2)

In figure (3) we grouped the countries that are Iran's crude oil top export destinations.: Europe, China, Japan, South Korea and Turkey.. We have also included the U.S. and Israel plus the GCC as being the macro-economic stable region. Whereas the non-GCC Arab States plus Iran are more in the economic unstable region.

Looking at Iran, at the top right hand side of the chart, we point out that it has two directions it can move to. The first being down to the more stable and less risk region by the process of dialog & diplomacy plus economic incentives, and it's full cooperation and transparency.

The second being towards the unstable and critical risk region, as a consequence of severe sanctions and even a military strike. As a consequence could even pull the rest of the region and the world economies up towards the region of instability.

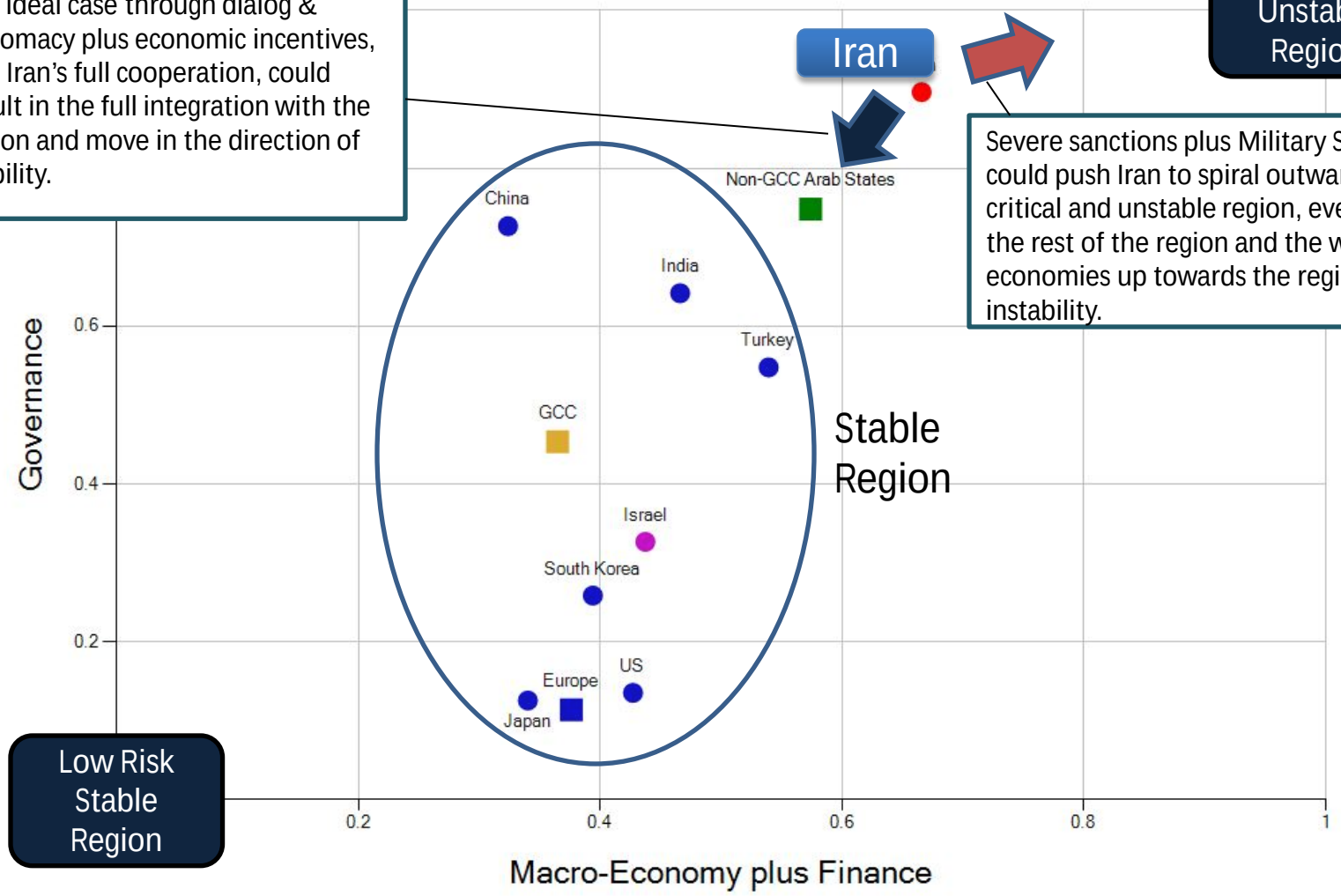
Figure (4) displays the percentage of oil imports as a percent of GDP and total imports, for some emerging and developed economies. Both of these economies rely heavily on imported oil, consequently will be affected by any oil price spikes, and further effects such as: a Fall in $U.S., Slowing of the Chinese Economy (by less than 6%), and Fiscal Crisis. The emerging economies will be further affected by Food Price Volatility (consequence of higher oil prices in transportation costs), Retrenchment from Globalization, and Underinvestment in Infrastructure.

Possible Consequences of each or a combination of the Strategic Policy Options

The ideal case through dialog & diplomacy plus economic incentives, and Iran's full cooperation, could result in the full integration with the region and move in the direction of stability.

Critical Risk Unstable Region

Severe sanctions plus Military Strike could push Iran to spiral outwards to the critical and unstable region, even pulling the rest of the region and the world economies up towards the region of instability.



Low Risk Stable Region

figure (3)

Iran's Crude Oil & Condensate Exports for key Country – Jan to June 2010

	% of Iran's Exports	Total value of Crude Imported from Iran (1,000 bbl/day)	Iran as a % of total Crude Imported
European Union	18	450	
Italy	7	183	13
Spain	6	137	13
France	2	49	4
Germany	1	17	1
UK	Less than 1	11	1
Netherlands	1	33	2
Other	1	22	1
Japan	14	341	10
India	13	328	11
South Korea	10	244	10
Turkey	7	182	51
South Africa	4	98	25
Sri Lanka	2	39	100
Taiwan	1	33	4
China	22	543	11

(Source: EIA Country Brief)

Oil Imports as % of GDP and of Total Imports (2010)

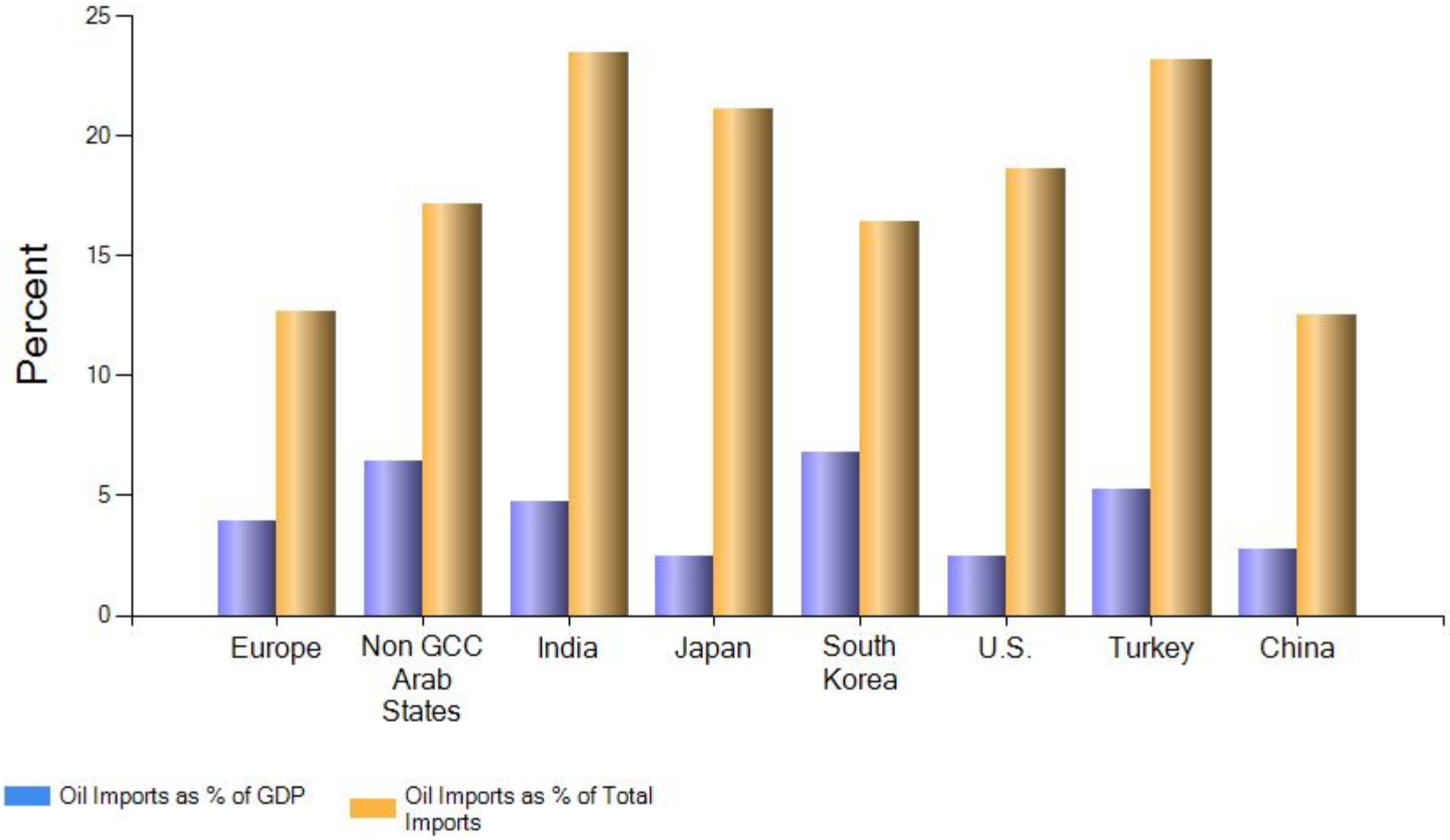


figure (4)

(Reference: IMF World Economic Outlook Tables, September 2011)

Introduction

- Over the past couple of months, speculation about a U.S. or Israeli strike on Iran's nuclear facilities have dominated news headlines around the globe. Negotiations between the five permanent members of the United Nations Security Council plus Germany with Iran, regarding the various enrichment programs that Iran is presently pursuing are scheduled to be held April 13 and 14 in Turkey.

In an interview with The Atlantic, March 2, 2012, President Obama said:

- **"**I think the Israeli people understand it ("all options on the table"), I think the American people understand it, and I think the Iranians understand it. It means a political component that involves isolating Iran; it means an economic component that involves unprecedented and crippling sanctions; it means a diplomatic component in which we have been able to strengthen the coalition that presents Iran with various options through the P-5 plus 1 and ensures that the IAEA [International Atomic Energy Agency] is robust in evaluating Iran's military program; and it includes a military component. And I think people understand that.

  I think that the Israeli government recognizes that, as president of the United States, I don't bluff. I also don't, as a matter of sound policy, go around advertising exactly what our intentions are. But I think both the Iranian and the Israeli governments recognize that when the United States says it is unacceptable for Iran to have a nuclear weapon, we mean what we say. Let me describe very specifically why this is important to us.

  In addition to the profound threat that it poses to Israel, one of our strongest allies in the world; in addition to the outrageous language that has been directed toward Israel by the leaders of the Iranian government -- if Iran gets a nuclear weapon, this would run completely contrary to my policies of nonproliferation. The risks of an Iranian nuclear weapon falling into the hands of terrorist organizations are profound. It is almost certain that other players in the region would feel it necessary to get their own nuclear weapons. So now you have the prospect of a nuclear arms race in the most volatile region in the world, one that is rife with unstable governments and sectarian tensions. And it would also provide Iran the additional capability to sponsor and protect its proxies in carrying out terrorist attacks, because they are less fearful of retaliation."

In Remarks by President Obama and Prime Minister Cameron of the United Kingdom in a Joint Press Conference, Rose Garden, March 14, 2012, President Obama said:

- “We have applied the toughest sanctions ever on Iran, and we’ve mobilized the international community with greater unity than we’ve ever seen. Those sanctions are going to begin to bite even harder this summer. And we’re seeing significant effects on the Iranian economy.

  So they understand the seriousness with which we take this issue. They understand that there are consequences to them continuing to flout the international community. And I have sent a message very directly to them publicly that they need to seize this opportunity of negotiations with the P5-plus-1 to avert even worse consequences for Iran in the future.

- I think they should understand that because the international community has applied so many sanctions, because we have employed so many of the options that are available to us to persuade Iran to take a different course, that the window for solving this issue diplomatically is shrinking.

  And as I said in a speech just a couple of weeks ago, I am determined not simply to contain Iran that is in possession of a nuclear weapon; I am determined to prevent Iran from getting a nuclear weapon -- in part for the reasons that David mentioned. It would trigger a nuclear arms race in the most dangerous part of the world. It would raise nonproliferation issues that would carry significant risks to our national security interests. It would embolden terrorists in the region who might believe that they could act with more impunity if they were operating under the protection of Iran.

- And so this is not an issue that is simply in one country's interests or two countries' interests. This is an issue that is important to the entire international community. We will do everything we can to resolve this diplomatically, but ultimately, we've got to have somebody on the other side of the table who's taking this seriously. And I hope that the Iranian regime understands that; that this is their best bet for resolving this in a way that allows Iran to rejoin the community of nations and to prosper and feel secure themselves.”

Secretary of State Clinton made the following remarks with Saudi Arabian Foreign Minister on March 31, 2012 (US State Department).

- " Of course, the most pressing concern is over Iran's nuclear activities. The international community's dual-track approach has dramatically increased pressure on Iran through crippling sanctions and isolation, while at the same time leaving open the door if Iran can show it is serious about responding to these legitimate international concerns. It soon will be clear whether Iran's leaders are prepared to have a serious, credible discussion about their nuclear program, whether they are ready to start building the basis of a resolution to this very serious problem. It is up to Iran's leaders to make the right choice. We will see whether they will intend to do so starting with the P-5+1 negotiations in Istanbul, April 13th-14th. What is certain, however, is that Iran's window to seek and obtain a peaceful resolution will not remain open forever."

Formulating the Strategic Options

- As the MENA region has been coping with the political and socio-economic changes taking place for the past year, the region is faced with two fundamental critical issues that could be mutually reinforcing to each other.

- The first being, national reforms that need to take place in the economic and governance sectors as well as dealing with the internal conflicts in some regional states, notably Syria being the most violent.

- The second being a concurrent real crisis in the EU which will reinforce a similar crisis in the MENA region, causing a downside in international trade between the two regions, as well as a substantial reduction in tourism arrivals to the region."

- Superimposed on the above two factors are the critical risks in geopolitical tensions in the region as a result of the Palestine-Israel peace negotiations as well as the political-military tensions arising from Iran's Nuclear Program. The latest being that there exists a strong likelihood that Israel will strike Iran before Iran enters what Israeli leaders described as a 'zone of immunity' to commence building a nuclear bomb."

U.S. Policy towards Iran's Nuclear Program:

- The United States recognizes Iran as having the sovereign right to peaceful civilian nuclear power, but does not have the right to Nuclear Weapons as stipulated in the Nuclear Non-Proliferation Treaty (NPT).

- To the United States, Iran is in violation of the IAEA safeguards, and the United Nations Security Council Resolutions. These are also becoming the findings of the International Community and Institutions, and not those of the United States alone.

- As a response, the U.S. policy objective has been not to allow the Arabian Gulf region to be dominated by a hegemonic Iran. The United States believes that Iran cannot try to dominate the Gulf region as long as a U.S. military power is present.

- Washington would arm allies in the region, and extend a "defense umbrella". By extending assistance and a ballistic missile-defense umbrella."

What do we know about Iran's Nuclear Program:

- With the public information and any Intelligence available it is very difficult to estimate the date when the political decision by the Iranian leadership was made, if one was made at all, to start a Nuclear Weapons program.

In an article published in the NY Times, February 24,2012, writes:

"Even as the United Nations' nuclear watchdog said in a new report Friday that Iran had accelerated its uranium enrichment program, American intelligence analysts continue to believe that there is no hard evidence that Iran has decided to build a nuclear bomb.

Recent assessments by American spy agencies are broadly consistent with a 2007 intelligence finding that concluded that Iran had abandoned its nuclear weapons program years earlier, according to current and former American officials. The officials said that assessment was largely reaffirmed in a 2010 National Intelligence Estimate, and that it remains the consensus view of America's 16 intelligence agencies."

The article continues to say:
"At the center of the debate is the murky question of the ultimate ambitions of the leaders in Tehran. There is no dispute among American, Israeli and European intelligence officials that Iran has been enriching nuclear fuel and developing some necessary infrastructure to become a nuclear power. But the Central Intelligence Agency and other intelligence agencies believe that Iran has yet to decide whether to resume a parallel program to design a nuclear warhead — a program they believe was essentially halted in 2003 and which would be necessary for Iran to build a nuclear bomb.

In Senate testimony on Jan. 31, James R. Clapper Jr., the director of national intelligence, stated explicitly that American officials believe that Iran is preserving its options for a nuclear weapon, but said there was no evidence that it had made a decision on making a concerted push to build a weapon. David H. Petraeus, the C.I.A. director, concurred with that view at the same hearing.

Other senior United States officials, including Defense Secretary Leon E. Panetta and Gen. Martin E. Dempsey, the chairman of the Joint Chiefs of Staff, have made similar statements in recent television appearances. "They are certainly moving on that path, but we don't believe they have actually made the decision to go ahead with a nuclear weapon," Mr. Clapper told the Senate Select Committee on Intelligence."

- There does not exist any publicly available information if Iran has made an irreversible and definitive decision to acquire Nuclear Weapons no matter what the cost, or if it is still in the "option" stage. Nor do we know if Iran has become self-sufficient and is in the process of completing a network of clandestine facilities, to either move the enriched uranium around from one to the other until it can produce a nuclear weapon, or one facility that can undertake the total conversion to HEU independently.

- Iran's potential acquisition of nuclear weapons, and future ability to arm its missiles and aircraft with such weapons, represents the most serious risk shaping US, Arab, Israeli with Iran. It is also an area where the exact details of threat perceptions are particularly critical, although many key aspects of Israeli, US, and Gulf perceptions – as well as the perceptions of the decision makers in other states – are impossible to determine at an unclassified level.

- Estimates of the nature of Iran's nuclear weapons efforts vary more sharply, although most US, European, Gulf, and Israeli policymakers and experts now agree that Iran is actively working towards at least the capability to produce nuclear weapons. Similarly, they agree that Iran possesses virtually all the technology and equipment necessary to produce fission weapons and has significant nuclear weapons design data.

- There is no agreement as to exactly how far Iran has come in weapons design, over the nature of its nuclear weapons program if a dedicated program exists, how much is know about Iran's various nuclear facilities, its future enrichment programs and how they will be concealed and protected.

(Reference: Anthony Cordesman and Alexander Wilner. CSIS "Iran and the Gulf Military Balance – I and II.)

- With the public information and any Intelligence available it is very difficult to estimate the date when the political decision by the Iranian leadership was made, if one was made at all, to start a Nuclear Weapons program.

- There does not exist any publicly available information if Iran has made an irreversible and definitive decision to acquire Nuclear Weapons no matter what the cost, or if it is still in the "option" stage. Nor do we know if Iran has become self-sufficient and is in the process of completing a network of clandestine facilities, to either move the enriched uranium around from one to the other until it can produce a nuclear weapon, or one facility that can undertake the total conversion to HEU independently. A possibility that has been talked about by Western analysts would be that Iran could produce 3.5% U-235 or 20% U-235, in these clandestine facilities,

- U.S. believes this will be beyond 2013, and its approach is to leave all options on the table, mainly further sanctions in the form of Financial and Economic that will be crippling for Iran if it chooses to continue its pursuit of Nuclear Weapons.

- In return, Iran has not yet made a compelling case to the international community that it is not pursuing a nuclear weapons capability. There is also no evidence that Iran's decision makers are willing to stop the nuclear program in exchange for lifting sanctions and starting a dialog that will promote confidence, transparency between the international community and Iran.

(Reference: Anthony Cordesman and Alexander Wilner. CSIS "Iran and the Gulf Military Balance – I and II.)

Iranian threat perceptions:

- Views itself as a Gulf power, its aim to keep the waters free from any foreign military presence.
- Prevent outside countries from shaping the political & security future of the Gulf.
- The occupation of Iraq by U.S. and presence of U.S. 5th fleet in the waters of the Gulf.
- Iran maintains that the U.S. is building bases in the Gulf as launching pads for a strike against it.
- Israel views Iran as an Existential Threat and must be dealt with in the immediate future.
- U.S. and Israel working to destabilize Iran and deny it a Nuclear Energy Program.
- Views itself as a regional power in the Muslim Middle East, therefore, has a say in any M.E. Peace Process.

Iranian actions dealing with its threat perceptions:

- Diplomatically active trying to convince GCC States that their security is better ensured by signing mutual agreements with it, not US.
- Iran has been stressing that for longer term regional security & stability Iran and GCC states should replace the reliance on foreign military presence and intervention.
- The need to acquire nuclear weapons and long-range ballistic missiles as a deterrent, power projection and status.
- Accelerating a program to build a network of Uranium enrichment facilities in case any one of them is destroyed by a U.S. military strike.
- Develop short, medium and long-range ballistic missiles to compensate for deficiencies in air power and as a deterrent.
- Building an Asymmetric Warfare capability. Political and Military support to Hezbullah and Hamas.

General Perceptions of the Iranian Threat:

- With occupation of Iraq, Iran now seeks to reemerge as the key power in Arabian Gulf and Muslim M.E. region. It considers itself Central to any Gulf Security Arrangements.

- Nuclear Weapons program that poses as a serious threat to GCC and ME region in addition to the Short, Medium & Long-Range Ballistic Missiles program capable of carrying WMD.

- Iran to intimidate and dominate its neighboring GCC countries, in particular, Saudi Arabia, as Iran believes it can, once it possesses nuclear weapons.

- Iran looks upon Nuclear Weapons and Ballistic Missiles as attractive alternatives to expensive modern conventional weapons for Power Projection and Deterrence purposes and as a means to increase status and prestige.

- Opposition to the Middle East Process and its rising political influence there.

- Support for International Terrorism; Hezbullah and Hamas as well as Train and Control Insurgency Groups.

- Threat to stability of the Gulf States, has annexed the three Islands that dominate entrance to Straits of Hormuz. Iran is also building an Asymmetric Warfare capability.

Options to deal with Iran's Nuclear Program

- Diplomacy, Dialog and Economic Incentives:

  Efforts to persuade Iran to not proliferate, and by convincing Iran that it does not face a sufficient threat to proliferate and cannot make major gains in power or security by doing so. IAEA full access for inspections to ensure that no nuclear weapons program is taking place. Incentives can be in the for of economic and trade advantages much needed to bring back the Iranian economy from a highly critical and unstable level down to a more stable level.

- Sanctions and Regime Change:

  Controls and measures designed to put economic pressure on Iran, limit its access to technology, and/or limit its access to arms. Plus efforts to change the regime and create one that will not proliferate. In general to influence Iranian policy and promote a more positive nature of the regime. Move from a Confrontational to a Cooperative foreign policy.

- Extended Deterrence and Active Defense:

  A mix of measures such as: advanced technology combat aircraft, TBMD Systems, Asymmetric Warfare capabilities, counterterrorism, civil defense, and passive defense that would both deter Iran and protect against any use it can make of its WMD capabilities and other war fighting capabilities, and show that any effort to use WMD weapons to intimidate or gain military advantage would be offset by the response.

- Preventive or Preemptive Strikes Before Iran has a Significant Nuclear Force:

  Military options that would destroy Iran's ability to proliferate and/or deploy significant nuclear forces. To build an international consensus to allow the use of military force as a last resort when all other options absolutely fail. Plus covert operations:

  - Target assassination of Iranian scientists
  - Sabotage of the main enrichment facilities and ballistic sites
  - Cyber Warfare such as the Stuxnet attack with the goal of destroying as many centrifuges as possible in the Iranian Fuel Enrichment Plant at Natanz and other enrichment facilities.

- With the U.S. taking a leading role in dealing with Iran, its interaction with the international community can be displayed in the slide "Matrix Displaying the Strategic Policy Options for the US and the International Community," which clearly shows the complexity of the situation and its multilateral dimension. For every country must weigh its own Risks and Benefits if it decides to join in all aspects of the campaign to stop Iran from acquiring nuclear weapons.

- In other words, every participating country must weigh its strategic option versus every US strategic policy option. For instance, some countries would prefer that only dialog and diplomacy is the way to go, whereas others see sanctions and even severe sanctions added. Whereas other countries, such as Israel, see that dialog and sanctions are not and will never be effective policies but opt for covert operations such as target assassinations of Iranian nuclear scientists, sabotage of the main enrichment facilities and ballistic missile factories, and cyber warfare. In addition, Israel believe's that only a Military Strike will bring about the end of any Iranian "Capability" in developing nuclear weapons.

- The ideal solution would be dialog and diplomacy with economic incentives, if all agree, in particular Iran, to enter the negotiations with a serious political intent in finding a solution and a workable plan. This is not a zero-sum game i.e. one side wins and the other side looses. All sides should come out feeling that they won with a strong set of confidence-building measures to resume dialog between the parties, increase transparency, reduce the possibility of miss-calculations rather than threats and counter threats which most probably will lead to war.

Matrix Displaying the Strategic Policy Options for the US and the International Community

US Policy Options

International Community Policy Options	Dialog & Incentives	Sanctions/ Regime Change	Deterrence/ Active Defense	Military Strike	Accept Iran as a Nuclear Threshold State
Dialog & Incentives					
Sanctions/ Regime Change					
Deterrence/ Active Defense					
Military Strike					
Accept Iran as a Nuclear Threshold State					

Horizontal rows: International Community options
Vertical Columns: US Policy options
Each cell is the interaction between U.S. and International Community in analyzing the associated risks.

- In conclusion, we can state that a solution to this kind of a problem does not have a pure strategy solution, but rather a mixed strategy of policy options. This could be a combination of some of the strategic option's matrix.

Formulation on how to deal with the Iranian Nuclear Program:

The Aim: getting Iran to end its uranium-enrichment program, and to comply with international agreements and laws and to cooperate fully with the IAEA.

The Strategic Policy Options to achieve the aim: dialogue and diplomacy, economic and financial sanctions, deterrence and active defense, military strike.

Constraints: risks associated with the consequences of each Strategic Policy Option.

The question can be phrased as follows:

Which strategic option or combination of these options does the United States and the international community need to adopt, to achieve the aim, while keeping risk consequences to the global economic and financial systems to a minimum.

Risks Associated with the Options

Dialog and Diplomacy Risks

- Some recommend that the U.S. should remain open to dialog and negotiations with Iran, in the words of President Obama, he said, "I believe there is a window of time to solve this diplomatically, but that window is closing," Obama told reporters.

- There is the suspicion that Iran wants to start an open-ended dialog and negotiations to buy time to reduce pressure for sanctions, use it as a screen to crush all domestic opposition and unrest, with no commitments to terminate its pursuit of nuclear weapons. By continuing a diplomatic engagement with the P5+1 until it feels the political conditions are just right giving it the option to “breakout” of the NPT, and move towards the production of nuclear weapons in a short period of time.

- Iran to use the process domestically showing that the hardline stance of the regime, in not making any concessions, has made the West respect and acknowledge Iran’s sovereign right to pursue Nuclear Power.

- To show that there exists corporation with the IAEA, and it accepts a limited freeze, making sure it does not alter its fundamental aim and program in developing a knowledge in the enrichment of Uranium. As an enrichment program in Iran will give it the option to “breakout” of the NPT, and move towards the production of nuclear weapons. Furthermore, Iran will not accept any “Rollback” of its enrichment program.

- Iran to buy time in accelerating the process of moving its enrichment activities into facilities buried deep underground, putting them out of the reach of even the most penetrating “bunker buster” bombs.

Sanctions Risks

- Severe sanctions being imposed leading to the total Collapse of the Iranian Economy with devastating regional consequences to the GCC States, Iraq, and even through Afghanistan, Pakistan and India.

- Sanctions not Successful. Iran will not cave in, and sanctions will not pressure Iran into changing its policy or bring the regime down. It could actually strengthen the Revolutionary Guard Corps. Iran continues with the enrichment process of producing HEU until it reaches to the stage where it is convinced it has the option to "breakout" of the NPT, and moves forward in the production of a nuclear weapon whereby it can then be considered a "Nuclear Threshold State." It could lead to the option of a Military Strike against Iran's nuclear facilities.

- One outcome is that some of the countries which are not participating in the sanctions buy more oil from Iran thereby compensating the amount countries participating in the sanctions have stopped buying. In essence, if the total world production doesn't change, then the sanctions would essentially have little impact on Iran.

- On the other hand, if the sanctions are imposed successfully, then any shortfall in Iranian oil should be compensated by other oil-producing nations, such as Saudi Arabia. The increase in the price of a barrel of oil should be controlled with the projected global economic growth.

- With the United States taking the lead in Imposing and Enforcing sanctions on Iran it will need to apply pressure on countries closely dependent on Iran for oil to Impose and Enforce the sanctions.

Choices for United Nations Member States and Iran regarding sanction

Iran \ United Nations Member States	Impose/Enforce Sanctions	Not to Impose/Enforce Sanctions
Violate Sanctions		
Comply Sanctions		

Iran may choose one of the following two strategies:

- ☐ To Violate or to Comply with international agreements/laws, and to fully cooperate with the IAEA

UN member states may choose from the following two strategies:

- ☐ To impose and Enforce sanctions or not to Impose and Enforce international sanctions.

- IMF chief Christine Lagarde warned (AFP March 21) that crude oil prices may spike by up to 30 percent if Iranian supplies were disrupted, causing "serious consequences" for the global economy. "Clearly it would be a shock to economies if there was a major shortage of exports of oil out of Iran, it would certainly drive up prices for a period of time." The International Monetary Fund (IMF) has calculated that an interruption in oil supplies from Iran could increase oil prices by 20 to 30 percent, said Lagarde, "A sudden and brutal rise in the price of oil" from Brent crude's current levels of $125 a barrel "would have serious consequences on the global economy" until other oil-exporting nations were able to bridge the gap, she added.

- It is believed by many that the policy to increase severity of economic and financial sanctions is not an effective policy, on it's own, as there exists a high probability that the target country might increase it's international violations even more. In other words, sever sanctions can sometimes produce opposite results.

- The history of economic sanctions has demonstrated that in many cases, only military force can finally play a decisive role in forcing a country to modify its behavior and comply with international agreements. However, this is not to say that dialog, economic incentives and sanctions cannot play a role in convincing a country that it must make concessions to change policy direction for the sake of regional security and stability.

Concluding Remarks on Sanctions

- The key principle to be followed is that sanctions are multilateral and must be viewed as such when analyzed.
- What defines an “Effective Sanction”? Question becomes, can Trade and Financial Sanctions help counter the proliferation of Weapons of Mass Destruction?
- No Model exists that provides the international community with evidence that economic and financial sanctions will be successful.
- The Policy to increase severity of economic sanctions alone is not an effective policy, as there exists a high probability that the country under sanctions will increase it’s violation even more. i.e. severe sanctions can have a completely opposite effect from what they were intended to have.
- One conclusion is that although sanctions may help, they most probably will not be able to slow down or prevent determined and well financed countries from achieving a Nuclear Weapon Capability.
- The economic and financial sanctions have been severe. However, Iran still continues to defy the IAEA and international concerns with it’s uranium-enrichment program.
- In recent months, the U.S. approach has been to isolate Iran diplomatically, while increasing the pressure on Iran through economic and financial sanctions, and by extending the duration and slowly adding others.

Deterrence and Active Defense Risks
Iran's Missile Program

- There is little disagreement that Iran's actions pose a potential threat, but there is far less agreement over the nature, scale and timing of this threat. US, European, Gulf, and Israeli policymakers and experts agree that Iran possesses a large and growing missile force, with some missiles capable of hitting Israel, and Europe. They agree that Iran has begun developing longer range and solid-fuel missiles. At the same time, the Iranian program is in flux and many of Iran's missile systems are still in a development phase where their range, accuracy, warhead, and reliability are impossible to predict.

- Iran has been developing ballistic missile capabilities based on Russian, North Korean, and Chinese technology or weapons systems since the early 1980s. Iran currently possesses the largest ballistic missile inventory in the Middle East, and the country's military and scientific establishments are working to increase the sophistication, scale, and reach of its missiles.

- Iran sees its missile capabilities as a way to compensate for its shortcomings in conventional forces, as well as a means to strike at high-value targets with little warning, such as population centers, and Western and Western-backed forces in the region, including US bases in the Gulf. As such, ballistic missiles play an integral role in Iran's asymmetric warfare doctrine. Given the emphasis Iran places on its missile program, it is clear that Iran considers its ballistic missile arsenal among its most important assets as both a deterrent to attack and leverage over other regional players.

- There is no agreement as to when Iran may acquire missiles with homing warheads and the kind of terminal guidance that can hit point targets effectively with conventional warheads. There is no agreement on the reliability and accuracy of Iran's missiles under operational conditions, there is no agreement on Iran's ability to deploy systems with countermeasures to missile defenses. There is no agreement on when Iran might deploy a fully function nuclear warhead. And, there is no agreement on the future size, character, and basing mode of Iran's missile forces once its long-range systems are deployed in strength.

(Reference: Anthony Cordesman and Alexander Wilner. CSIS "Iran and the Gulf Military Balance – I and II.)

Military Strike Risks

Military Strike against Iran's Nuclear Facilities

- The U.S. is the only country that can launch a successful Military Strike, if all peaceful options have been exhausted and Iran has left no other means to convince it to stop or change its course in pursuing Nuclear Weapons. The U.S. should alone determine what the timeline could be if Iran does pursue the path to develop nuclear weapons.

- The question arises is what would the objectives of a military strike be? To pull the Iranian nuclear program back 5 years or delay it for 1 year? This criteria will define the force allocation required to achieve a successful mission against Iran's nuclear facilities. We point out that it is not a simple mission of bombers flying in and out of Iran, this is a complicated Offensive Air Strike that will involve many aircraft, each with its own role, such as Combat Aircarft whose role is to suppress enemy air defenses along the way, aircraft that fly fighter escort with the bombers, aircraft that carry specialized electronic warfare equipment to jam enemy radars and communications., plus probably air-to-air refueling along the way in and out of Iran.

- Depending on the forces allocated and duration of air strikes, it is unlikely that an air campaign alone could alone terminate Iran's program. The possibility of dispersed facilities complicates any assessment of a potential mission success, making it unclear what the ultimate effect of a strike would be on Iran's nuclear facilities.

- The U.S. is very well aware that the action of a military strike could be destabilizing for the entire Middle East region, with an Iranian military response which would consist of:

  - Immediate retaliation using its Shehab III BMs on Israeli military, civilian and nuclear sites, including the use of CBR warheads.
  - Give rise to regional instability through conflict as well as terrorism.
  - Destabilizing Iraq through the Shia against U.S. presence, and further arming insurgency groups when possible.
  - Support and upgrade Taliban capabilities in Afghanistan.
  - Increase threat of asymmetric attacks against American interests and allies in the region. Attack U.S. military bases that are active and stationed in the Gulf States.
  - Use proxy groups such as Hezbullah or Hamas to attack Israel proper with suicide bombings and rocket attacks.
  - Target U.S. and Western shipping in the Gulf, and attempt to disrupt the flow of oil through Straits of Hormuz.
  - Withdraw from NPT Treaty and start accelerated nuclear weapons program.

  On February 3, 2012, Iran's Supreme Leader Ayatollah Ali Khamenei in a speech delivered to Friday worshippers live on state television said: "Threatening Iran and attacking Iran will harm America…Sanctions will not have any impact on our determination to continue our nuclear course…In response to threats of oil embargo and war, we have our own threats to impose at the right time."

Accepting Iran as a Nuclear or "Nuclear Threshold" State

- UN sanctions do not pressure Iran into changing its policy or bring down the regime. It could actually strengthen the resolve of the regime in its pursuit of Nuclear Weapons.
- Iran continues with the enrichment process of producing HEU until it reaches the stage where it is convinced it has the option to "Breakout" of the NPT, and moves forward in the production of a Nuclear Weapon whereby it can then be considered a "Nuclear Threshold State"
- Strengthen Iran as a Regional Power leading it to pursue its Threat Perceptions agenda more aggressively, hence moving the MENA countries into the higher risk unstable region.
- Cause oil price shocks giving rise to further economic pressures on highly dependent industries and consumers, as well as raising geopolitical tensions, whenever the opportunity arises that serves Iran's interests.
- Increase the dangers of an Arms Race and WMD proliferation in the region

Building the Regional Risk Landscape

- In the MENA Strategic Landscape as shown in we have grouped the countries that are in the high risk/unstable region, which are: Iran, Libya, Syria, Algeria, Yemen, Egypt, and Lebanon. The group that lies in the moderate risk region consists of the GCC, Tunisia plus Israel. The chart shows that Governance also played a major role in situating this group in the high risk unstable region.

- Sweden, Switzerland and Singapore are taken as model examples of countries that are in the Low-moderate risk region. The aim of all countries would be to establish macro-economic policies plus governance that will move them to the low-to-moderate risk stable region.

- Jordan and Morocco are not in either of these groups, but with careful planning and implementation of economic reform policies will move into the moderate risk region.

- Looking at Macro-economic plus Finance axis, we see that starting from lowest risk, countries rank in the following order: Qatar, UAE, Saudi-Arabia, Bahrain, Tunisia, GCC (as a block), Israel, Oman, Kuwait. Outside of this group come Morocco then Jordan.

- The initial Strategic Risk Landscape shows how critical and unstable Iran is in the economic, financial and governance sectors. It is clearly evident how much-needed economic resources have been diverted to building a military Industrial capability thus depriving the economy and financial sectors from the resources to develop. It would be safe to state that if Iran continues along this “Self Destruct” path it would, by itself, move into the critical and highly unstable economic and financial phase - even without any international trade and financial sanctions imposed on it.

- Any actions by Iran could definitely move the region and the world to a higher strategic, economic and financial risk level which starts to create instability, especially at these times of critical global financial recovery and volatility; simultaneously any unilateral action against Iran, such as a military strike, can have catastrophic worldwide implications.

- Risk analysis is utilized in this report as a decision support tool, with the aim of providing the right balance between the different strategic options in dealing with Iran's nuclear program. If for example, we have two alternative strategic policies (A) and (B), the results can then be evaluated to give insight into how does option (A) compare with alternative (B), and if we need to apply any risk mitigation measures.

- Central to any Risk Assessment are the Threats and Consequences (Cause and Effect). These are then used to calculate the overall Risk as defined by the Department of Homeland Security method:

$$\text{Risk} = \text{Threat} \times \text{Vulnerability} \times \text{Consequence}$$

- The approach in this report is to consider the risk factors for the Economic, Business and Governance sectors as shown in Table(1), and to produce a risk chart for each sector. The radar chart is an average value for the risks in each of the charts. For purposes of simplicity in this report, we avoided giving weights for each sector, we have assumed all risks have equal weight. (See Appendix 2)

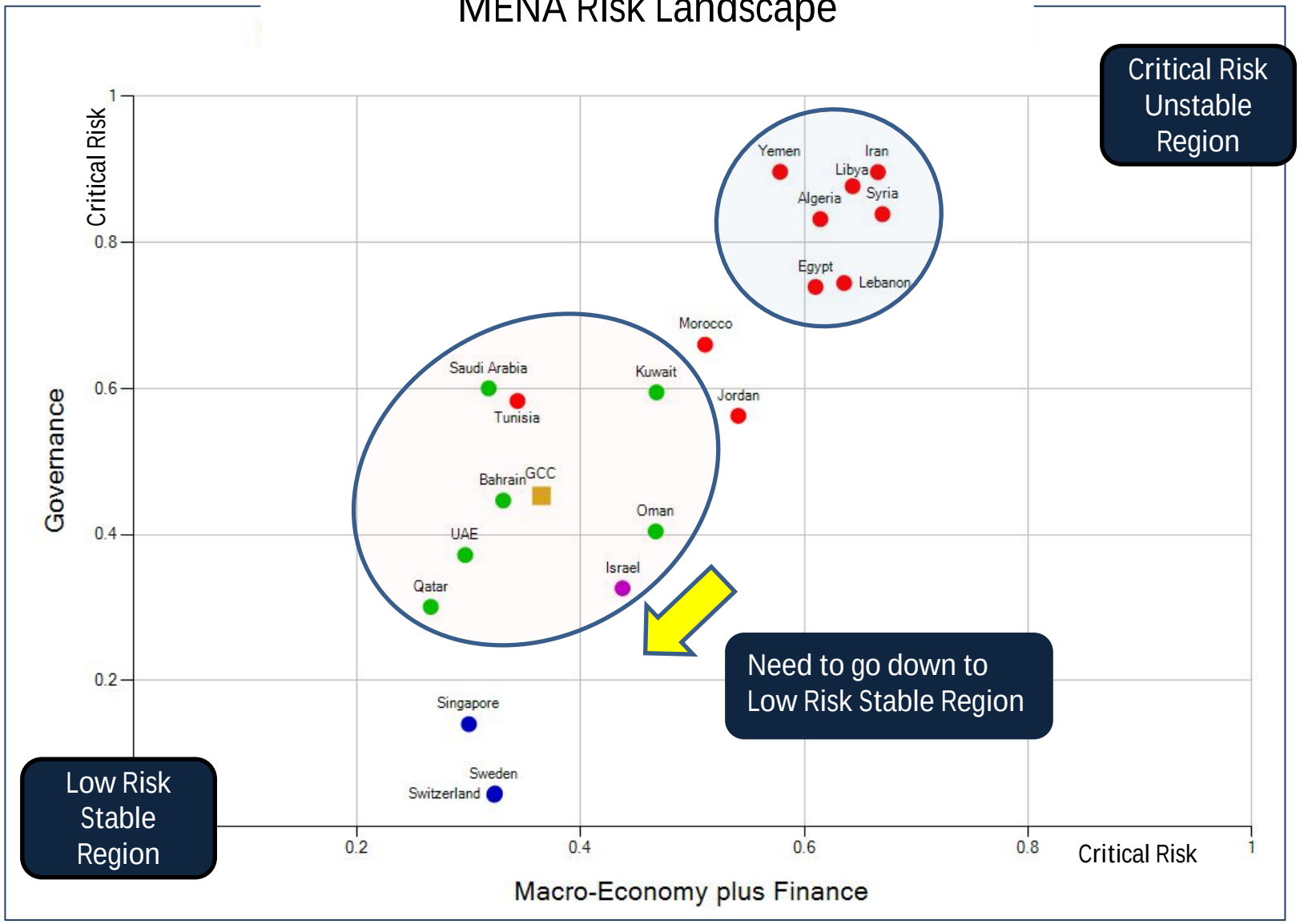
- Finally we plot, on a scatter chart, the average Governance Risk versus the Economic plus Business Risks, for each country or group of countries that make up the Gulf Cooperation Council, and those that form the European Union.

- We have defined the interval 0 to 0.2 as being the Low Risk Stable Region, in Governance, Economics and Business. Region in which dialog and peaceful means are the form of addressing problems, and the overall country business climate is appealing to international investors and companies.

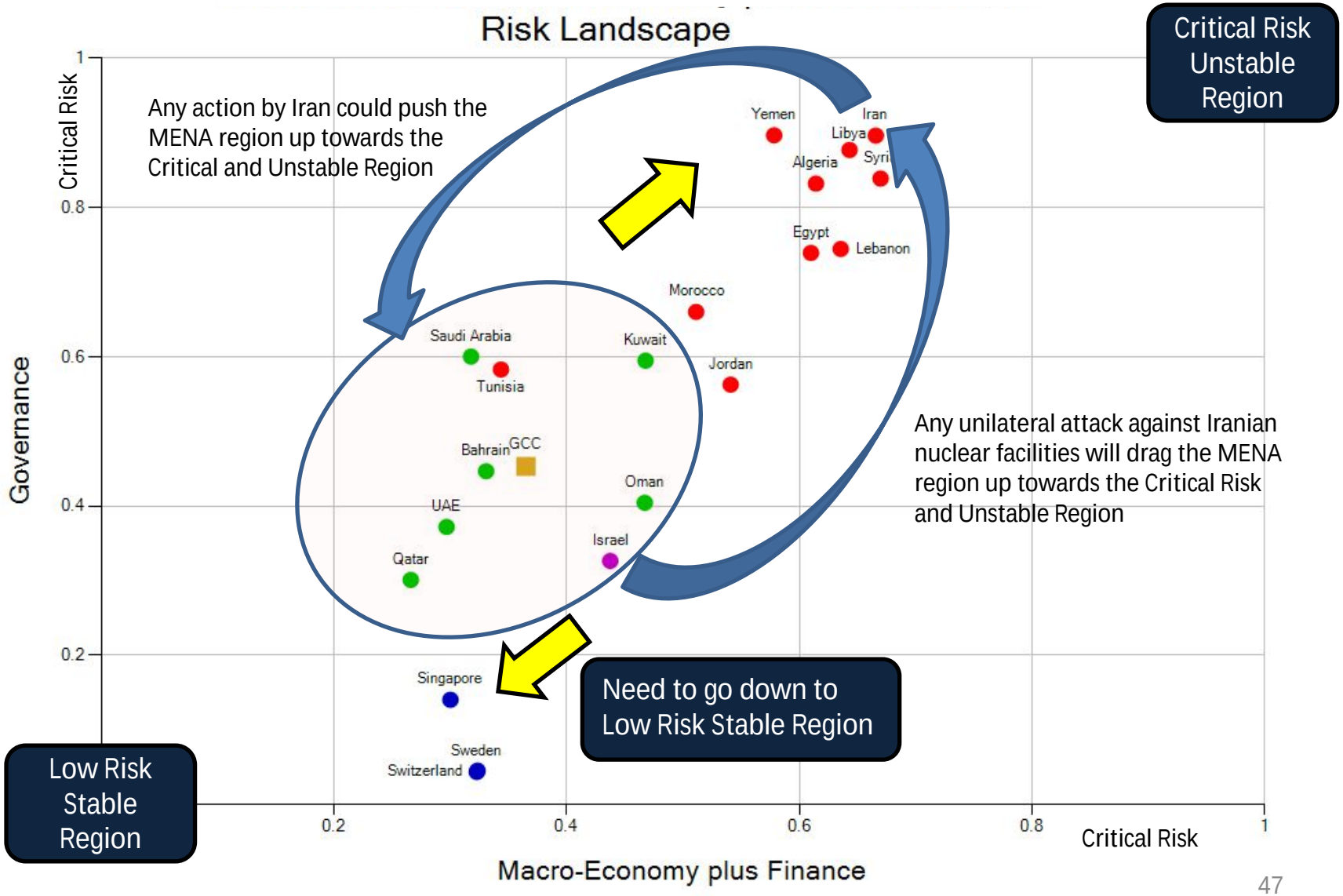
- The interval 0.8 to 1.0 is the Critical Risk Region, in which a country is experiencing high level of turmoil in the economic, business and governance that it is creating a failing/failed state situation that most probably will fuel the proliferation of WMD and the possible outbreak of armed conflict.

(References:
Country Risk Assessment ICRG Risk Methodology. The Political Risk Services (PRS) www.prsgroup.com
Department of Homeland Security DHS Risk Lexicon, September 2008
CRS Report for Congress. The Department of Homeland Security's Risk Assessment Methodology. February 2, 2007
Risk Analysis . Terje Aven, University of Stavanger, Norway. John Wiley & Sons, Ltd. 2008)

MENA Risk Landscape



Two possible actions and outcomes that should be avoided at present

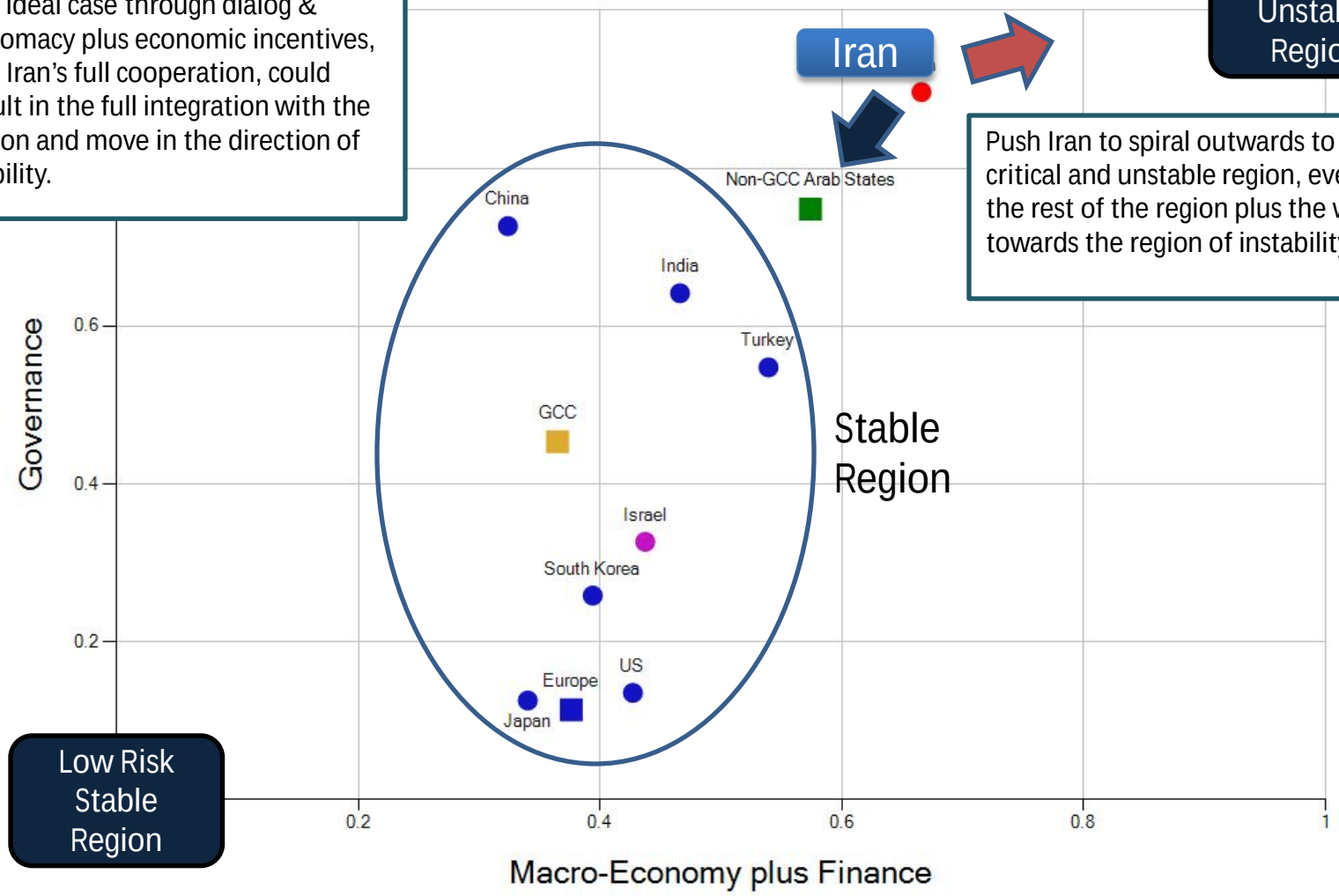


Possible Consequences of each or a combination of the Strategic Policy Options

The ideal case through dialog & diplomacy plus economic incentives, and Iran's full cooperation, could result in the full integration with the region and move in the direction of stability.

Critical Risk Unstable Region

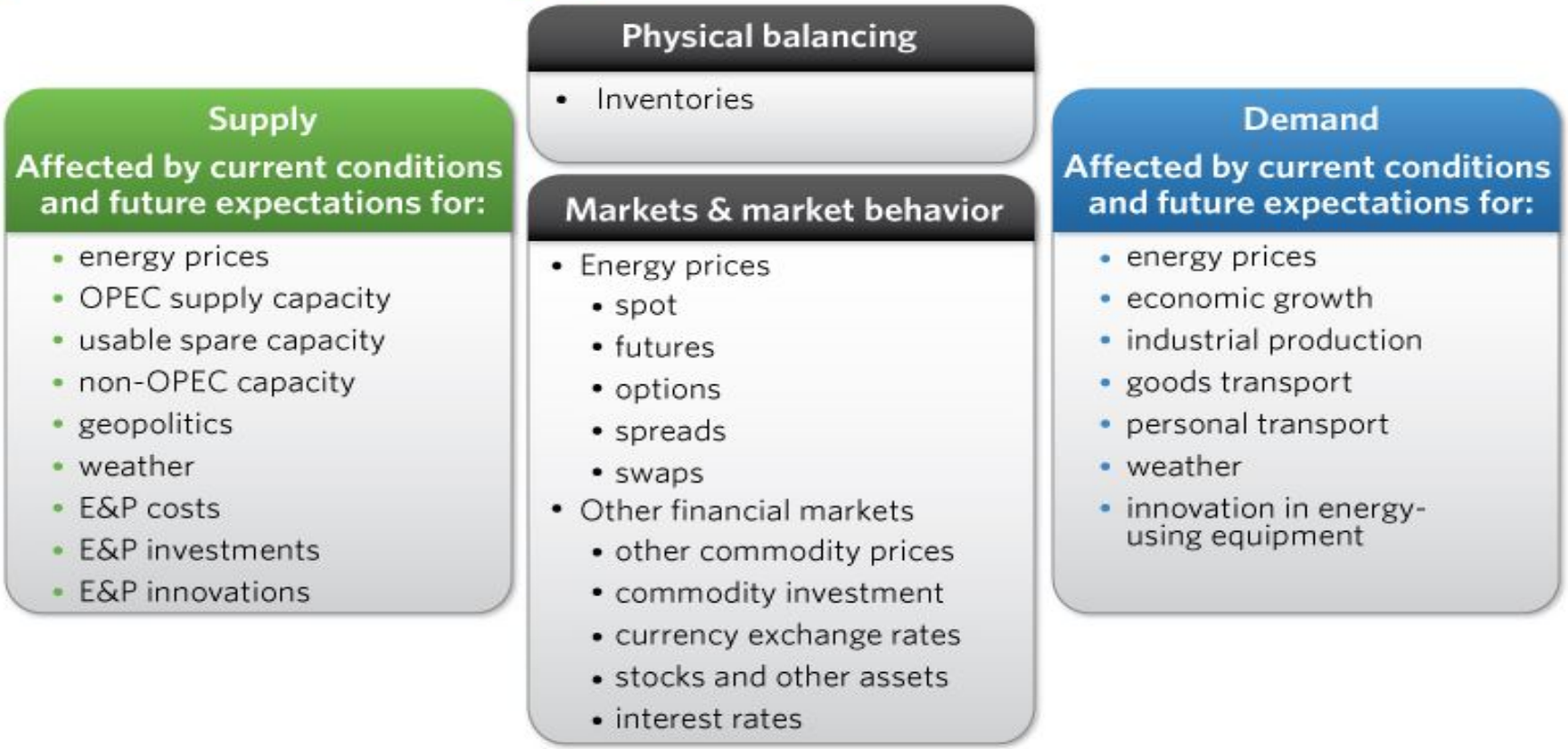
Push Iran to spiral outwards to the critical and unstable region, even pulling the rest of the region plus the world up towards the region of instability.



Low Risk Stable Region

Cause and Effect influencing the formation of Crude Oil Prices

Many factors influence the formation of oil prices and other energy prices



There are many significant uncertainties that could push oil prices higher or lower than projected. Should a significant oil supply disruption occur (such as the closing of the straits of Hormuz for an extended period of time), OPEC members not increase production, or projected non-OPEC projects come online more slowly than expected, oil prices could be significantly higher. If the pace of global economic growth fails to accelerate in Organization for Economic Cooperation and Development (OECD) countries, or if economic growth slows in non-OECD countries, reduced demand could lower prices.

(Source: Energy Information Agency US)

- Both crude oil and petroleum product prices can be affected by events that have the potential to disrupt the flow of oil and products to market, including geopolitical and weather-related developments. These types of events may lead to actual disruptions or create uncertainty about future supply or demand, which can lead to higher volatility in prices. The volatility of oil prices is inherently tied to the low responsiveness or "inelasticity" of both supply and demand to price changes in the short run. Both the stock of oil-using equipment and oil production capacity are relatively fixed in the near-term. It takes years to develop new supply sources or vary production, and it is very hard for consumers to switch to other fuels or increase fuel efficiency in the near term when prices rise. Under such conditions, a large price change can be necessary to re-balance physical supply and demand following a shock to the system.

- Much of the world's crude oil is located in regions that have been prone historically to political upheaval, or have had their oil production disrupted due to political events. Several major oil price shocks have occurred at the same time as supply disruptions triggered by political events, most notably the Arab Oil Embargo in 1973-74, the Iranian revolution and Iran-Iraq war in the late 1970s and early 1980s, and Iraq's invasion of Kuwait in 1990. More recently, disruptions to supply (or curbs on potential development of resources) from political events have been seen in Nigeria, Venezuela, Iraq, Iran, and Libya.

- Given the past history of oil supply disruptions emanating from political events, market participants are always assessing the possibility of future disruptions and their potential impacts. In addition to the size and duration of a potential disruption they also consider the ability of other producers and storage withdrawals to offset a potential supply loss. For example, if the market has ample spare production capacity to offset a possible disruption, its likely impact on prices would be smaller than if spare production capacity was much lower. When there are significant concerns about the potential for a disruption at a time when spare capacity and inventories are not seen as sufficient to substantially offset the associated loss in supply, prices may be above the level that might be expected if only current demand and supply were considered, as forward-looking behavior adds a "risk premium."

(Source: Energy Information Agency US)

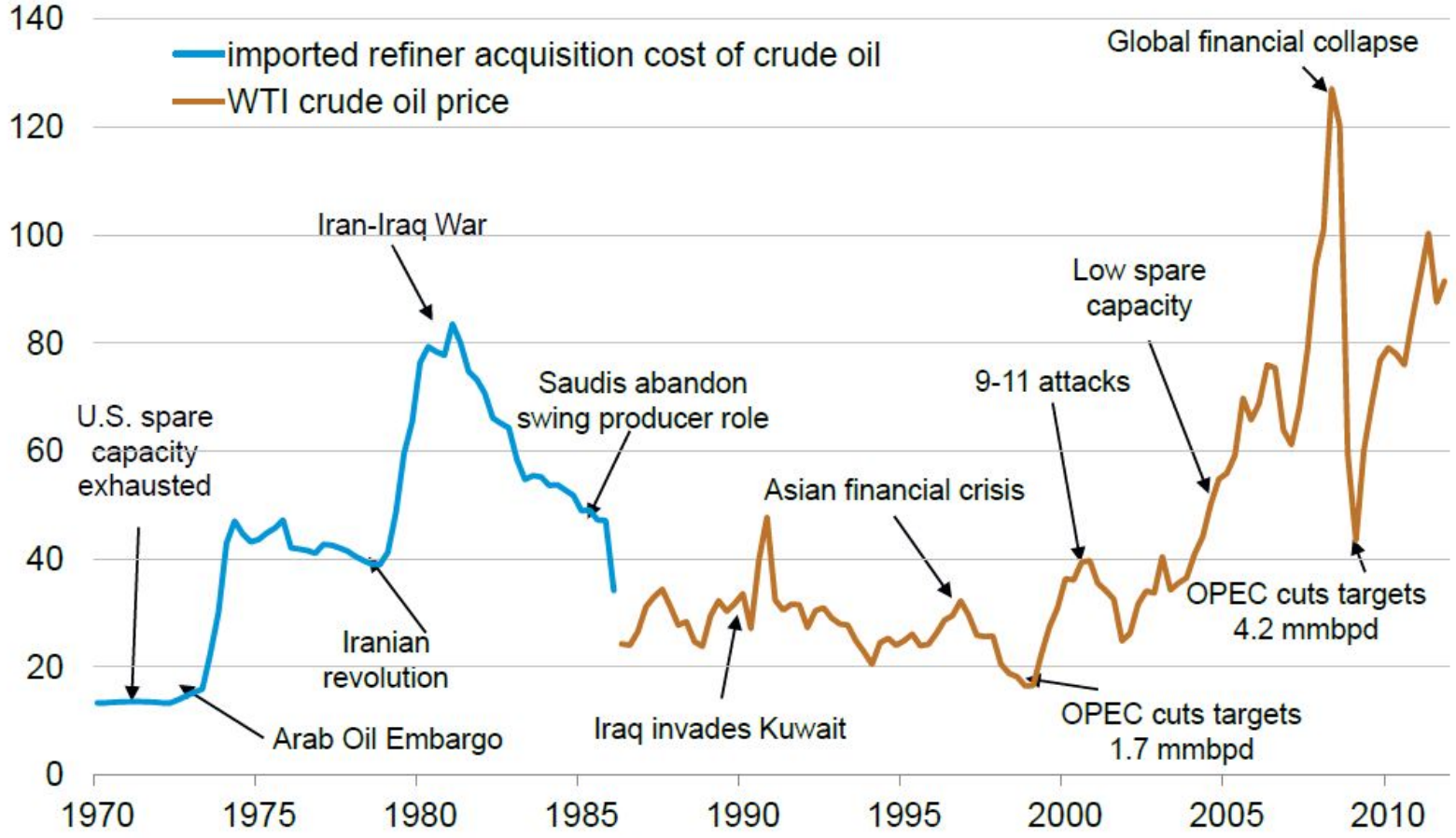
- Weather can also play a significant role in oil supply. Hurricanes in 2005, for example, shut down oil and natural gas production as well as refineries. Petroleum product prices increased sharply as supplies to the market dropped. Severely cold weather in winter can stretch the capability of the market to supply product and push up prices. Other events such as refinery outages or pipeline problems can restrict the flow of oil and products, resulting in higher prices.

- However, the influence of these types of factors on oil prices tends to be relatively short lived. Once the problem subsides and oil and product flows return to normal, prices usually return to previous levels.

(Source: Energy Information Agency US)

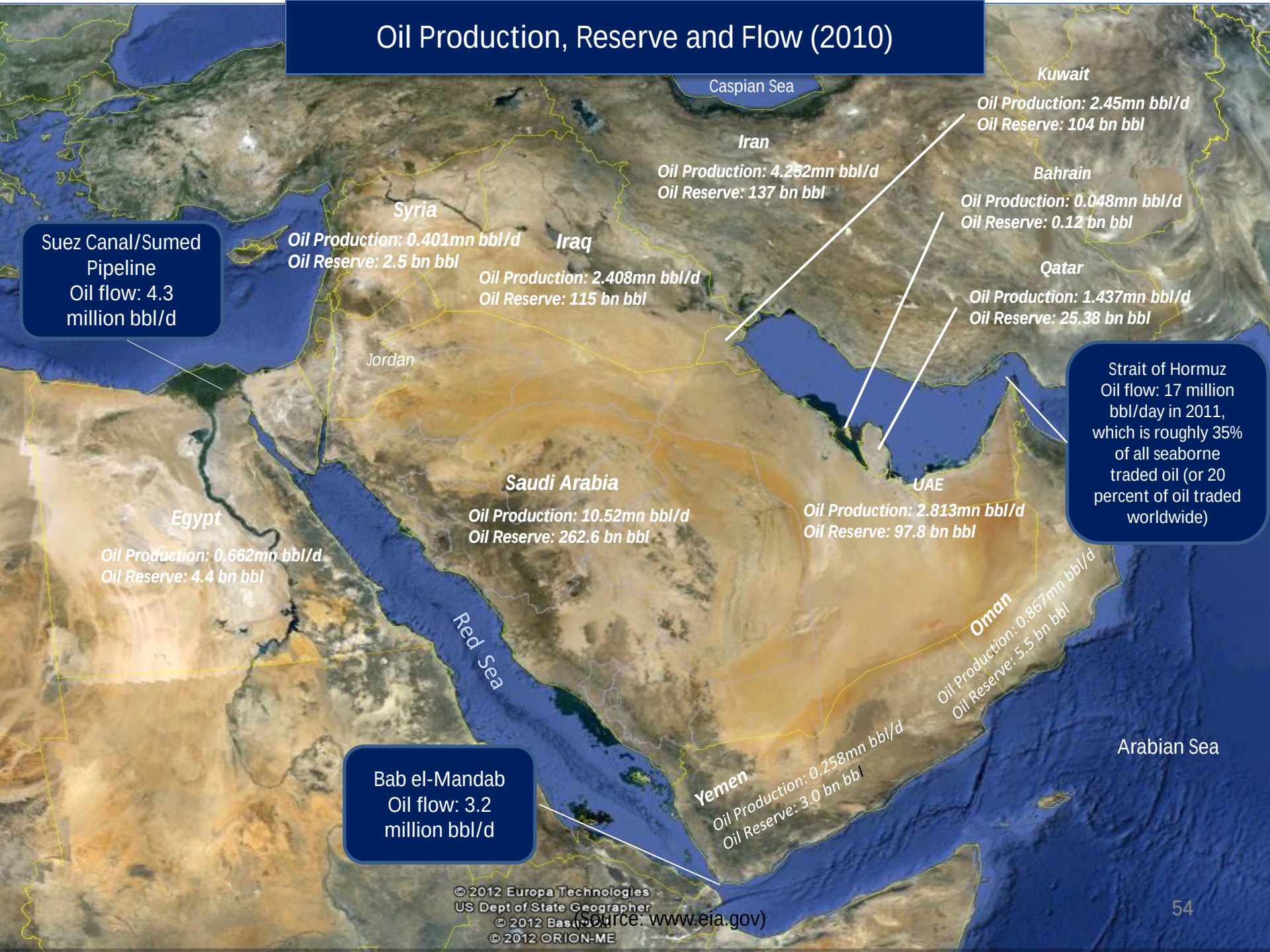
Crude oil prices react to a variety of geopolitical and economic events

price per barrel
(real 2010 dollars, quarterly average)



Sources: U.S. Energy Information Administration, Thomson Reuters

Oil Production, Reserve and Flow (2010)



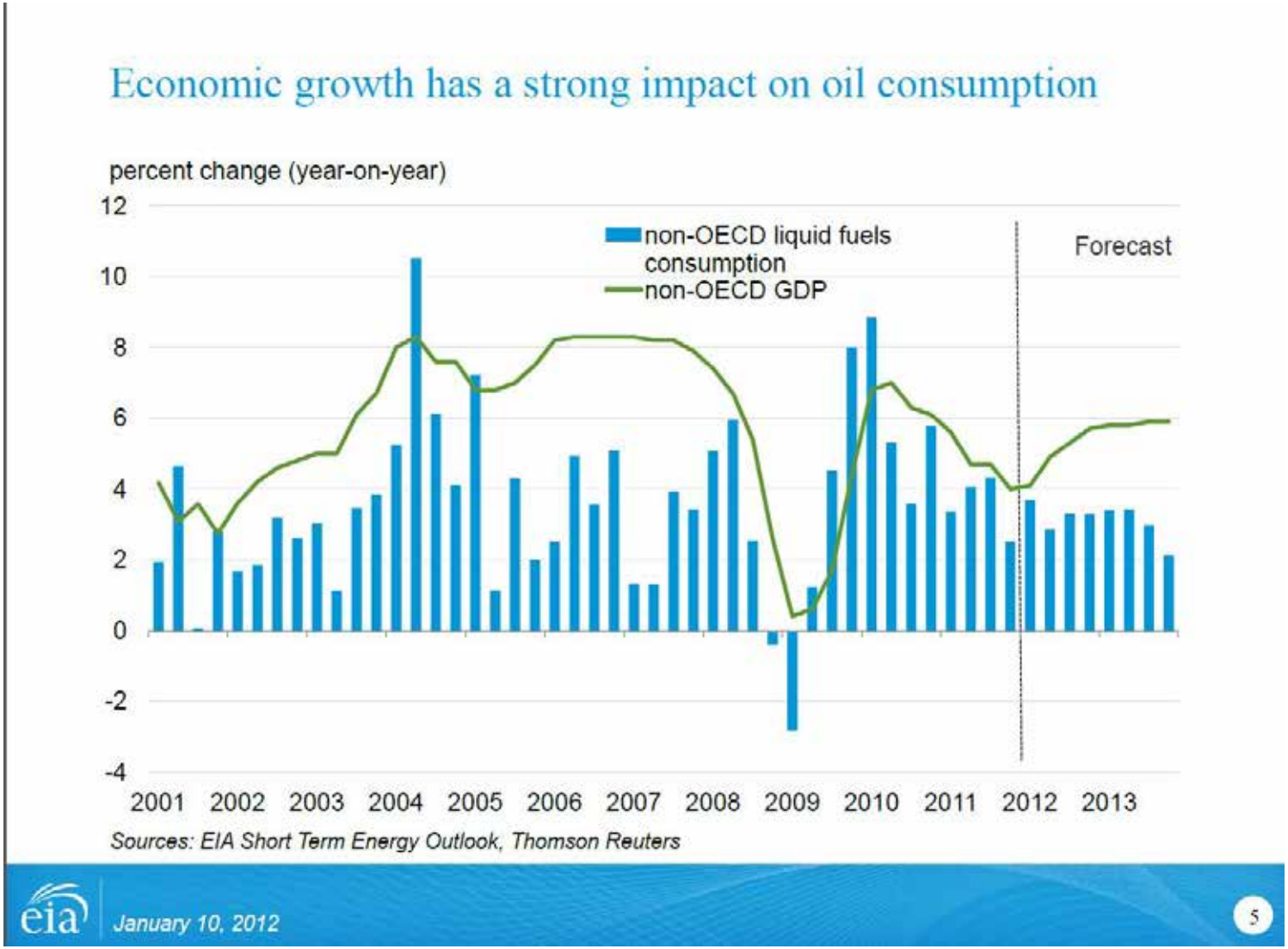
(Source: www.eia.gov)

- Oil consumption in developing countries that are not part of the Organization of Economic Cooperation and Development (OECD) has risen sharply in recent years. While oil consumption in the OECD countries declined between 2000 and 2010, non-OECD oil consumption increased more than 40 percent. China, India, and Saudi Arabia had the largest growth in oil consumption among the countries in the non-OECD during this period.

- Rising oil consumption reflects rapid economic growth in these countries. Current and expected levels of economic growth heavily influence global oil demand and oil prices. Commercial and personal transportation activities, in particular, require large amounts of oil and are directly tied to economic conditions.

- Many manufacturing processes consume oil as fuel or use it as feedstock, and in some non-OECD countries, oil remains an important fuel for power generation. Because of these uses, oil prices tend to rise when economic activity and in turn oil demand is growing strongly. Many non-OECD countries are also experiencing rapid growth in population, which is an additional factor supporting strong oil consumption growth.

(Source: Energy Information Agency US)



In this chart there is a strong relationship between GDP growth rates and growth in oil consumption in non-OECD countries. Since 2001, oil consumption in non-OECD countries declined only in the fourth quarter of 2008 and the first quarter of 2009. Increased demand pressure due to economic growth overwhelmed any downward pressure on oil consumption due to higher prices.

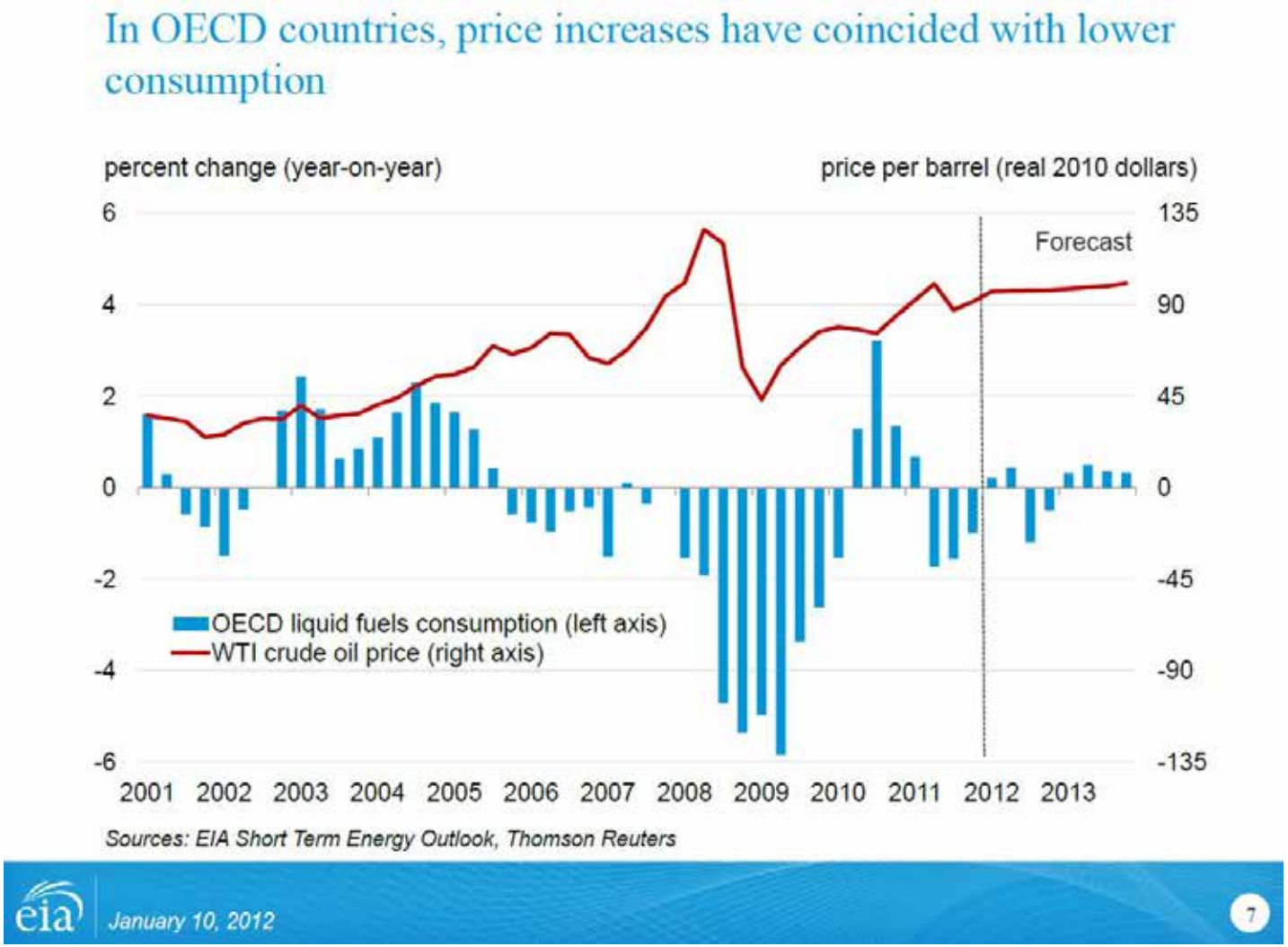
- The Organization of Economic Cooperation and Development (OECD) consists of the United States, much of Europe, and other advanced countries. At 53 percent of world oil consumption in 2010, these large economies consume more oil than the non-OECD countries, but have much lower oil consumption growth. Oil consumption in the OECD countries actually declined in the decade between 2000 and 2010, whereas non-OECD consumption rose 40 percent during the same period.

- Structural conditions in each country's economy influence the relationships among oil prices, economic growth, and oil consumption. Developed countries tend to have higher vehicle ownership per capita. Because of this, oil use within the OECD transportation sector usually accounts for a larger share of total oil consumption than in non-OECD countries; it is also more mature and slower-growing. Economic conditions and policies that affect the transport of goods and people thus have a significant impact on total oil consumption in OECD countries. Many OECD countries have higher fuel taxes and policies to improve the fuel economy of new vehicles and increase the use of biofuels. This tends to slow the growth in oil consumption even in times of strong economic growth. Furthermore, the economies in OECD countries tend to have larger service sectors relative to manufacturing. As a result, strong economic growth in these countries may not have the same impact on oil consumption as it would in non-OECD countries.

- OECD countries tend to have fewer subsidies on end-use prices, so changes in market oil prices are often quickly reflected in prices faced by consumers. However, it takes time for people to adjust their transportation routines and for the vehicle stock to turn over and become more energy-efficient in response to price changes.

- Changes in expected future oil prices also affect consumers' decisions concerning modes of transportation and vehicle purchases. If prices are expected to remain high or increase in the future, more consumers may decide to purchase more fuel efficient vehicles or use public transportation. Decisions like these help to reduce future oil demand and would tend to moderate expected price increases.

(Source: Energy Information Agency US)



In contrast to non-OECD countries, oil consumption in OECD countries fell from 2006-2009 after prices rose, and declined significantly during the economic downturn. Due in part to their relatively slower economic growth and more mature transportation sectors, the impact of prices on OECD consumption has been more evident than for non-OECD countries.

- OPEC member countries produce about 40 percent of the world's crude oil. Equally important to global prices, OPEC's oil exports represent about 60 percent of the total petroleum traded internationally. Because of this market share, OPEC's actions can, and do, influence international oil prices.

- The extent to which OPEC member countries utilize their available production capacity is often used as an indicator of the tightness of global oil markets, as well as an indicator of the extent to which OPEC is exerting upward influence on prices. EIA defines spare capacity as the volume of production that can be brought on within 30 days and sustained for at least 90 days. Saudi Arabia, the largest oil producer within OPEC and the world's largest oil exporter, historically has had the greatest spare capacity. Saudi Arabia has usually kept more than 1.5 - 2 million barrels per day of spare capacity on hand for market management.

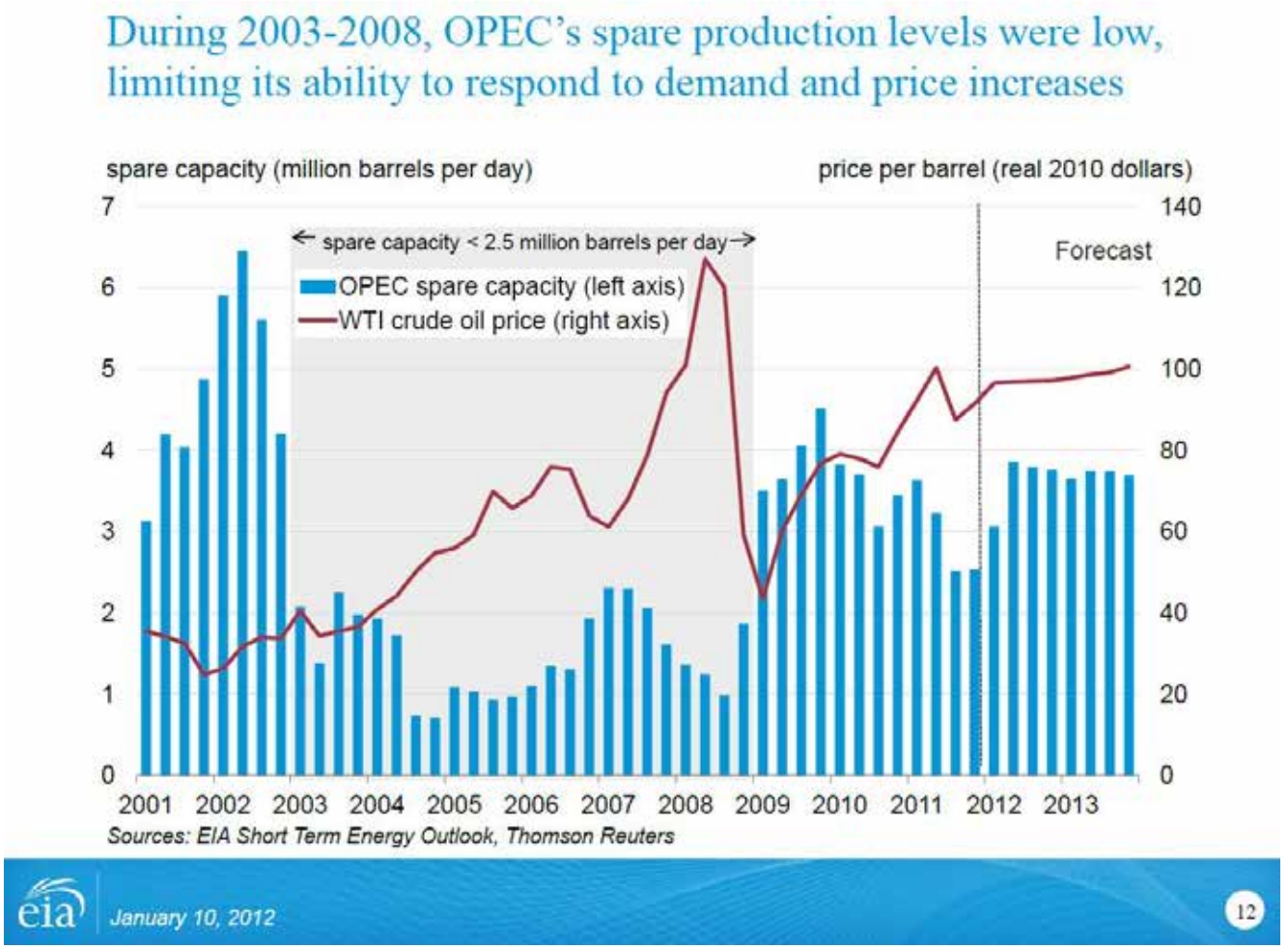
- OPEC spare capacity provides an indicator of the world oil market's ability to respond to potential crises that reduce oil supplies. As a result, oil prices tend to incorporate a rising risk premium when OPEC spare capacity reaches low levels. From 2003 through 2008, OPEC's total spare capacity remained near or below 2 million barrels per day (or less than 3 percent of global supply), which provided very little cushion for fluctuations in supply in a context of rapidly rising demand. Markets are influenced by geopolitical events within and between OPEC countries because they have, historically, resulted in reductions in oil production. Given OPEC's market significance, events that entail an actual or future potential loss of oil supplies can produce strong reactions in oil prices.

- Oil prices increased during 2003-2008 when OPEC's spare capacity levels were relatively low. Low spare capacity limits OPEC's ability to respond to demand and price increases, while high spare capacity indicates a withholding of production presumably for price management purposes.

(Reference: EIA U.S.)

Throughout the years 2003 – 2009 crude oil spare capacity was approximately 2.5 million barrels per day. In 2003 after the US invasion of Iraq, Saudi Arabia increased its production levels by an addition 2 million barrels per day.

The EIA projects that the capacity will be close to 4 million barrels per day for the years 2010-2013, hardly 25% of the total amount of crude oil that passes through the Straits of Hormuz per day, that Iran has threatened to close.



- Rising oil consumption reflects rapid economic growth in these countries. Current and expected levels of economic growth heavily influence global oil demand and oil prices. Commercial and personal transportation activities, in particular, require large amounts of oil and are directly tied to economic conditions. Many manufacturing processes consume oil as fuel or use it as feedstock, and in some non-OECD countries, oil remains an important fuel for power generation. Because of these uses, oil prices tend to rise when economic activity and in turn oil demand is growing strongly. Many non-OECD countries are also experiencing rapid growth in population, which is an additional factor supporting strong oil consumption growth.

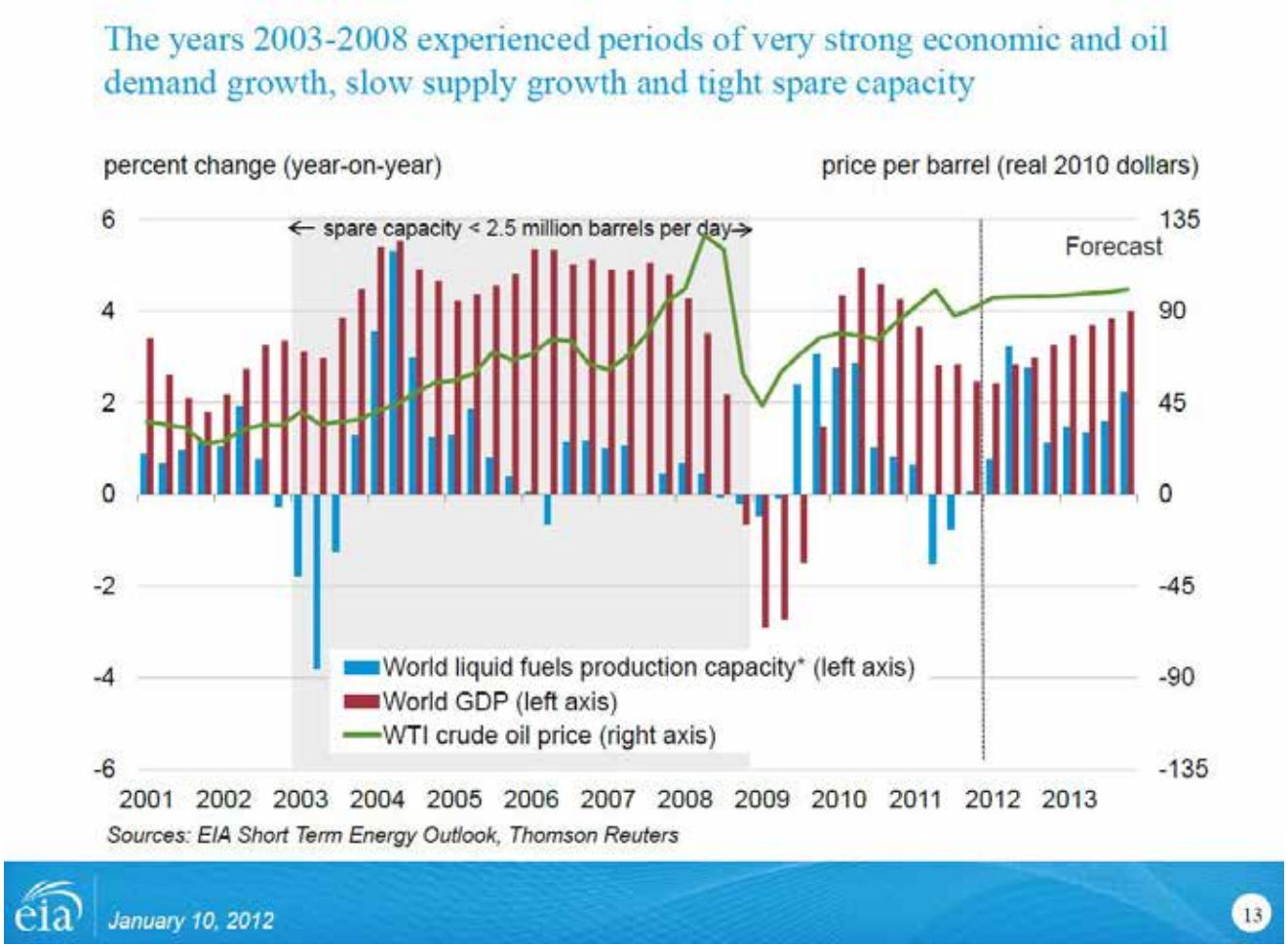
- Structural conditions in each country's economy further influence the relationship between oil prices and economic growth. Developing countries tend to have a greater proportion of their economies in manufacturing industries, which are more energy intensive than service industries. Although transportation oil use is usually a smaller share of total oil consumption in non-OECD countries, this use tends to increase rapidly as expanding economies increase the need to move goods and people. Vehicle ownership per capita is also highly correlated with rising incomes and has much room to grow in non-OECD countries. For these reasons, non-OECD economic growth rates tend to be an important factor affecting oil prices. China's strong economic growth has recently resulted in that country becoming the largest energy consumer and second largest oil consumer in the world. In addition, China's rising oil consumption has been a major contributor to incremental growth in worldwide oil consumption. EIA projects that virtually all the net increase in oil consumption in the next 25 years will come from non-OECD countries.

(Source: Energy Information Agency US)

- Although oil use is clearly tied to economic activity, energy policies also significantly affect that relationship. Many developing countries, for example, control or subsidize end-use prices, which inhibits consumer response to market price changes. This reduced demand response to price changes further contributes to the importance of economic growth as a key driver of non-OECD demand and in turn global oil prices.

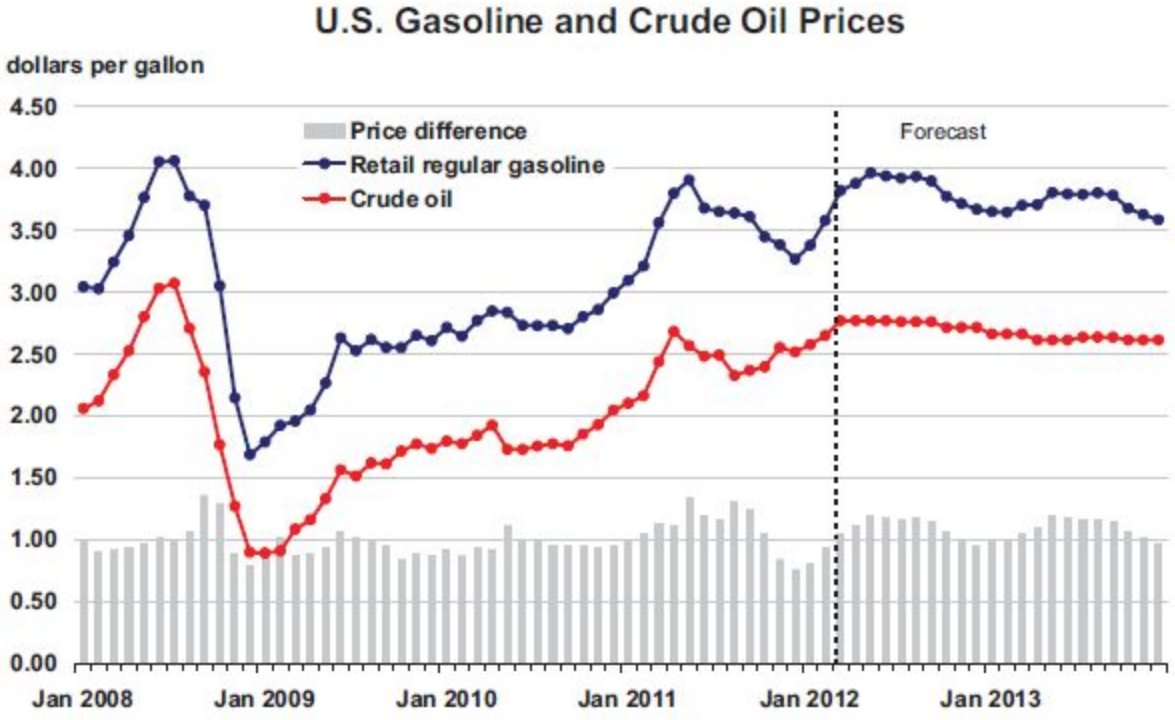
- While current oil consumption is primarily related to current economic activity, changes in the outlook for future economic conditions can also have an immediate impact on oil prices. For example, an improvement in the economic outlook would tend to increase the chance that oil markets will tighten in the future, resulting in higher expected future oil prices. This change in expectations would be reflected in higher oil futures prices. This rise in futures prices increases the incentive to hold inventories, which in turn decreases available current supply and tends to raise current prices.

(Source: Energy Information Agency US)



In this chart, WTI price levels are graphed with changes in world GDP growth rates (as an indicator of underlying oil demand growth) and world oil consumption. Rising oil prices held down global oil consumption growth from 2005 to 2008, despite high economic growth.

(Source: Energy Information Agency US)



Crude oil price is average refiner acquisition cost. Retail prices include State and Federal taxes.

Source: Short-Term Energy Outlook, March 2012

eia

The Role of Oil in the Iranian Economy

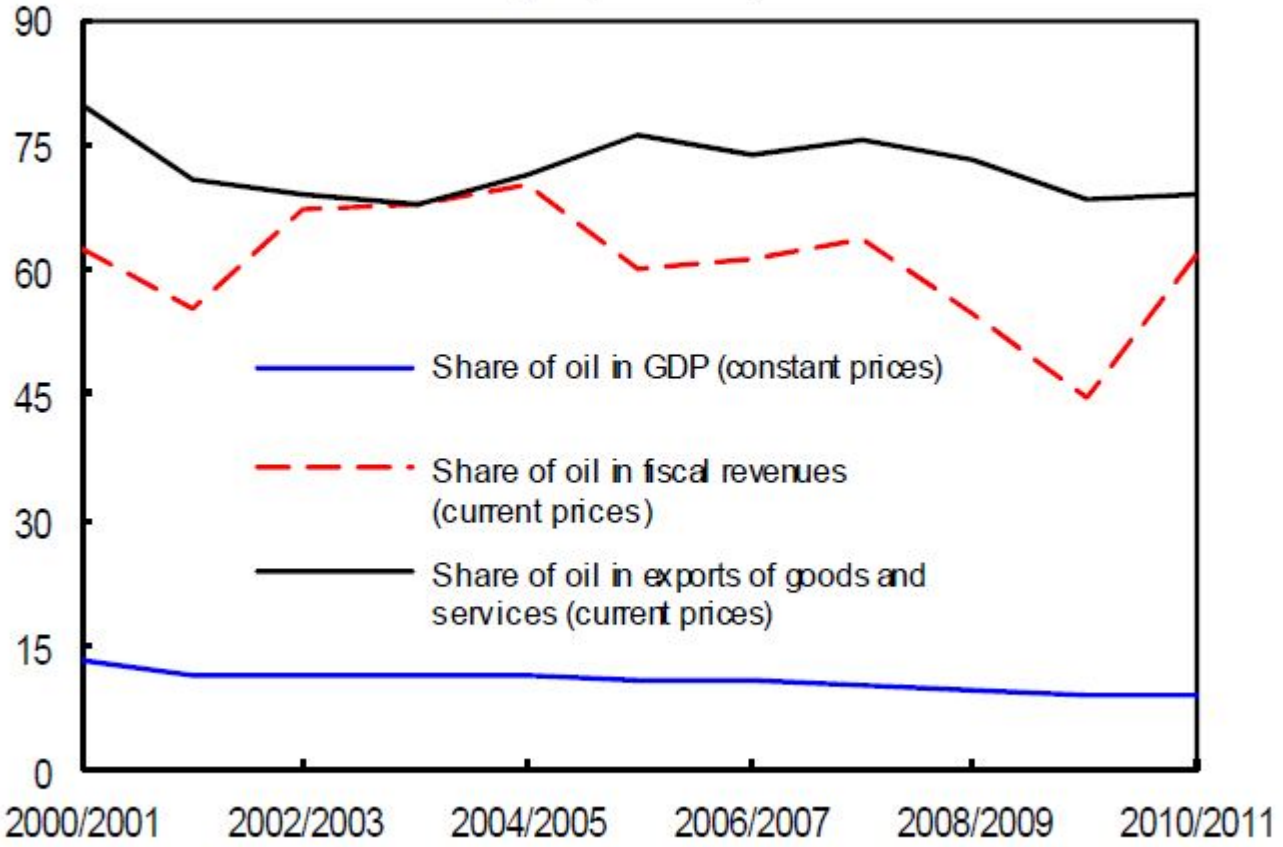
The Role of Oil in the Iranian Economy

Although oil and gas production has accounted for an increasingly smaller share of real GDP, oil and gas revenues remain the main source of foreign exchange earnings and fiscal revenues. The share of oil in real GDP fell from an average of 40 percent of real GDP in the 1960s to about 10½ percent in the last decade, reflecting average annual non-oil GDP growth rate of 5.7 percent compared to only 4.4 percent for oil and gas GDP. Oil and gas receipts accounted for about 72 percent of export revenues in the last decade, despite rapid non-oil export growth.

Oil and gas revenues also account for 65 percent of fiscal revenues, and are likely to remain the main source of financing for development projects in the foreseeable future notwithstanding recent efforts to diversify fiscal revenues.

(Reference: IMF Working Paper. Iran – The Chronicles of the Subsidy Reform. July, 2011)

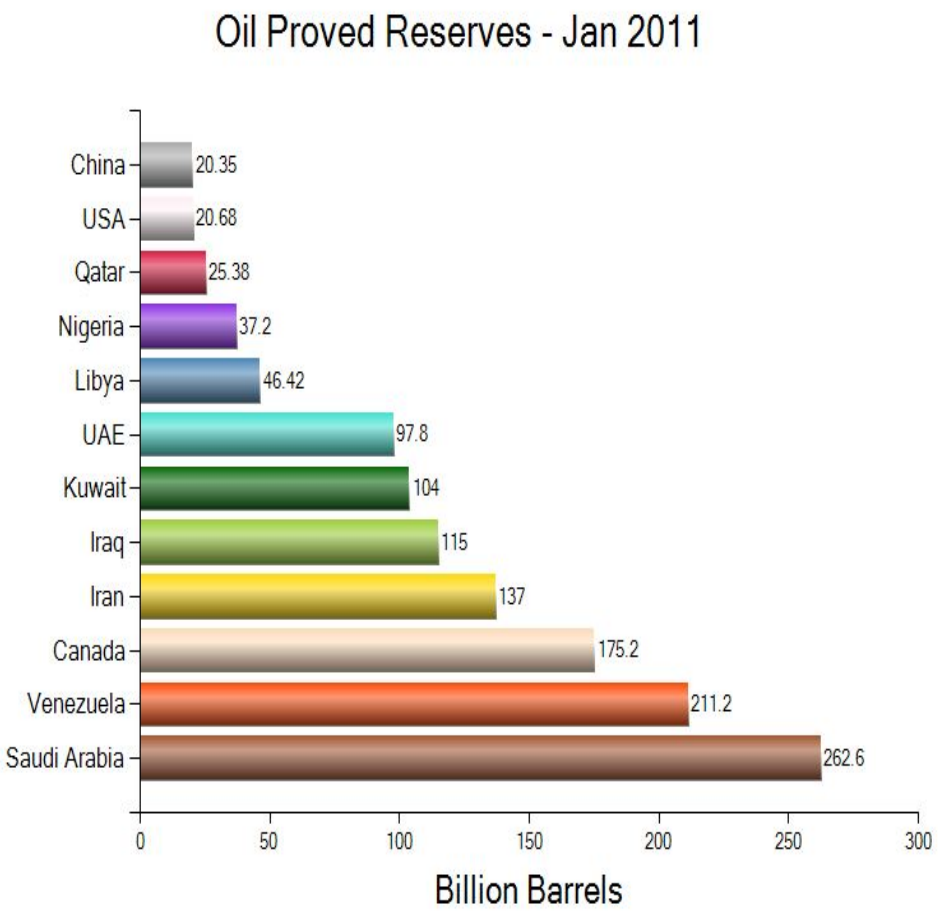
Share of Oil in GDP, Fiscal Revenues, and Exports (in percent)

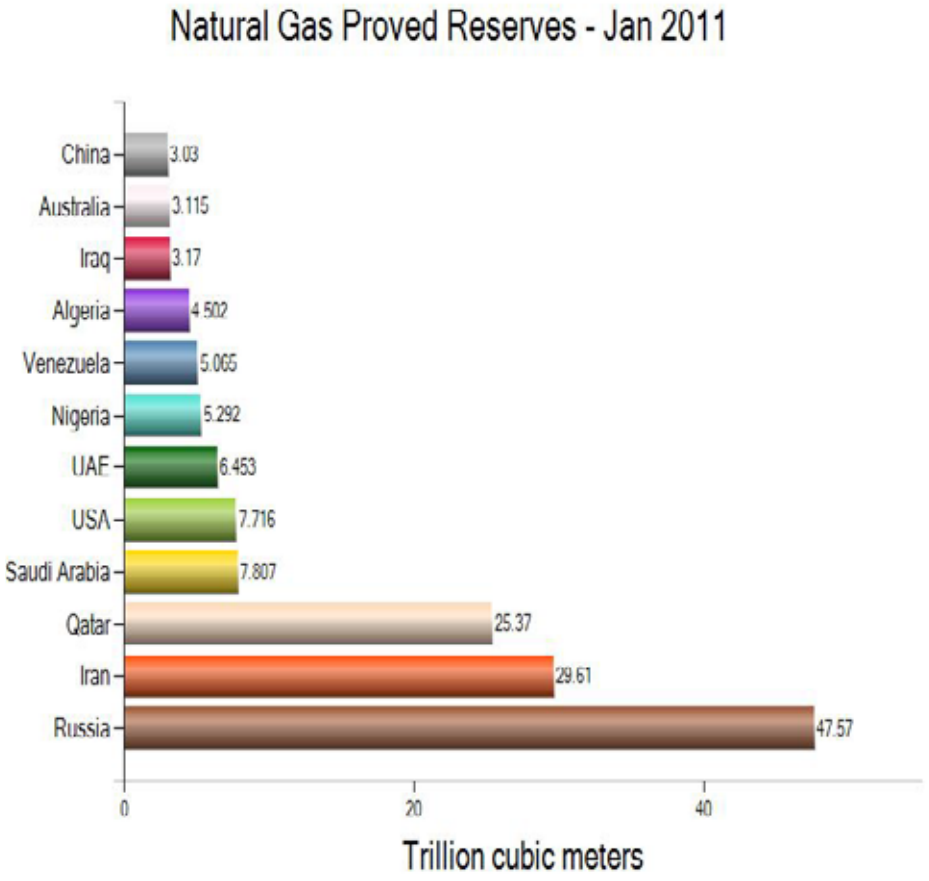


Source: Iranian authorities; and Fund staff estimates

- International sanctions enacted in the summer of 2010 have slowed progress across the energy sector, especially affecting upstream investment in both oil and natural gas projects. The United States, United Nations, the European Union, and a number of European and Asian countries have targeted the Iranian energy sector with sanctions of varying degrees of stringency. These have prompted a number of international energy companies to pull out of upstream projects. Sanctions have also impeded the import of refined products, prompting efforts to boost domestic production and curb rising demand in Iran.
-
- The Strait of Hormuz, on the southeastern coast of Iran, is an important route for oil exports from Iran and other Persian Gulf countries. At its narrowest point the Strait of Hormuz is 21 miles wide, yet an estimated 17 million bbl/d flowed through it in 2011 (35 percent of all seaborne traded oil and 20 percent of oil traded world-wide). In addition to oil, liquefied natural gas (LNG) volumes also flow through the Strait. In total, about 70 million tons of LNG flowed through the Strait between January and October 2011.
-
- According to *Oil & Gas Journal*, as of January 2011, Iran has an estimated 137 billion barrels of proven oil reserves, 9.3 percent of the world's total reserves and over 12 percent of OPEC reserves. In July 2011, OPEC released its 2010 Annual Statistical Bulletin which raised Iran’s proven reserves to more than 151 billion barrels of crude. Some analysts are skeptical of this estimate, however, as Iran revised its reserves a week after Iraq had revised its own, leading some to speculate the move was political.
-
- Over 50 percent of reserves are confined to six supergiant fields. Of those onshore reserves, 85 percent are located in the southwestern Khuzestan Basin near the Iraqi border. Iran's crude oil is generally medium in sulfur content and in the 28°-35° API range. Iran faces continued depletion of its production capacity, as its fields have relatively high natural decline rates (8-13 percent), coupled with an already low recovery rate of around 20-30 percent. Sanctions and prohibitive contractual terms have impeded the necessary investment to halt this decline.

(Reference: EIA Country Brief, Iran)





(Source: OPEC Annual Statistical Bulletin 2010-2011)

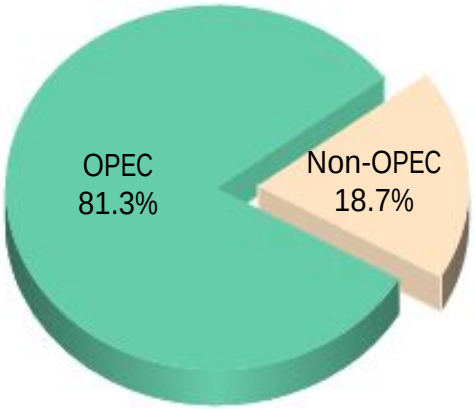
GCC & Iran
Proved Oil and Gas Proved Reserves 2010

	Billion barrels	Billion cubic meter
Kuwait	104	1,784
Bahrain	0.12	-
Qatar	25.38	25,201
UAE	97.8	6,091
Oman	5.5	610
Saudi Arabia	262.6	8,016
Iran	137	33,090
OPEC	1,193	94,292
World	1,467	192,549

(Source: OPEC Annual Statistical Bulletin 2010-2011)

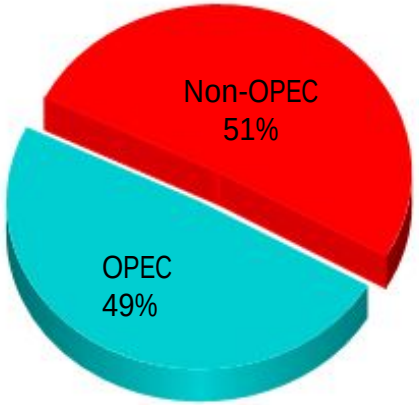
OPEC % of World Proved Oil Reserves

World total: 1,467,012 million barrels



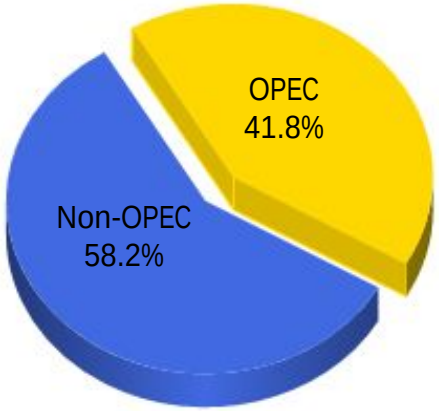
OPEC % of World Proved Natural Gas Reserves

World total: 192,549 billion cubic meters



OPEC % of World Crude Oil Production

World total: 69.745 barrels/day



(Source: OPEC Annual Statistical Bulletin 2010-2011)

Exports

In 2010, Iran exported approximately 2.2 million bbl/d of crude oil. Iranian Heavy Crude Oil is Iran's largest crude export followed by Iranian Light. In 2010, Iran's net oil export revenues amounted to approximately $73 billion. Oil exports provide half of Iran's government revenues, while crude oil and its derivatives account for nearly 80 percent of Iran's total exports.

Iran's Top Export Destinations, 2010		
Country	000 bbl/d	Share of total (percent)
China	426	20
Japan	362	17
India	345	16
Italy	208	10
South Korea	203	9
Other	610	28
Total Exports	**2,154**	**100**

Source: Global Trade Atlas, U.S. Energy Information Administration

Data through the end of June 2011 show that Iranian exports are on track to remain over 2.2 million bbl/d, should exports continue at the same pace for the second half of the year. Based on the 6-month data, China, India, South Korea, and Turkey have increased their imports of Iranian crude oil thus far this year, as crude oil volumes are reallocated to the countries that have imposed less stringent sanctions on them. At the same time, export volumes to Italy and the UK have decreased at least in part due to sanctions imposed on the Iranian energy sector.

(Reference: EIA Country Brief, Iran)

OPEC Member	Total Exports ($mn)	Petroleum Exports ($mn)	Petroleum as % of Total Exports
Algeria	57,800	38,300	66.3
Angola	49,259	47,239	95.9
Ecuador	17,369	9,649	55.6
Iran	83,785	71,571	85.4
Iraq	52,084	51,147	98.2
Kuwait	65,984	61,667	93.5
Libya	46,310	41,874	90.4
Nigeria	70,579	61,804	87.6
Qatar	72,054	29,278	40.6
Saudi Arabia	235,342	196,193	83.4
UAE	198,362	74,027	37.3
Venezuela	65,786	62,317	94.7
OPEC	1,014,714	745,066	73.4

(Source: OPEC Annual Statistical Bulletin 2010-2011)

OPEC Members Crude Oil Exports by Destination – 2010 (1,000 bbl/day)

Country	Total World	Europe	North America	Asia & Pacific	Latin America	Africa	Middle East
Iran	2,583	878	-	1,571	-	134	-
Iraq	1,890	438	492	951	-	-	10
Kuwait	1,430	62	127	1,199	-	42	-
Qatar	587	-	10	577	-	-	-
Saudi Arabia	6,644	658	1,212	4,260	67	148	294
UAE	2,103	3	40	2,011	-	49	1
Algeria	709	155	412	138	4	-	-
Libya	1,118	788	47	131	29	15	-
Nigeria	2,464	744	1,623	91	-	-	-
Angola	1,683	190	602	371	-	-	-
Ecuador	339	-	173	21	144	-	-
Venezuela	1,562	43	362	226	417	-	-
OPEC	23,112	3,958	5,100	11,546	661	389	305

(Source: OPEC Annual Statistical Bulletin 2010-2011)

- Iran's oil exports also have been affected by sanctions. In 2011, Iran experienced significant problems with receiving payments from India for its exports, when the Reserve Bank of India halted a clearing mechanism due to sanctions. Some of the payments have been cleared through Turkish and UAE banks. More recently, NIOC announced that India has cleared all oil debts to Iran through Gazprombank of Russia and Iran has already received all overdue payments for its exports to India.

Export Terminals

- Kharg Island, the site of the vast majority of Iran's exports, has a crude storage capacity of 20.2 million barrels of oil and a loading capacity of 5 million bbl/d. Lavan Island is the second-largest terminal with capacity to store 5 million barrels and loading capacity of 200,000 bbl/d. Other important terminals include Kish Island, Abadan, Bandar Mahshar, and Neka (which helps facilitate imports from the Caspian region).

(Reference: EIA Country Brief, Iran)

Iran
Oil & Gas Facilities

Oil export through the Gulf is The economic lifeline for Iran. any disruptions could be disastrous for the country.

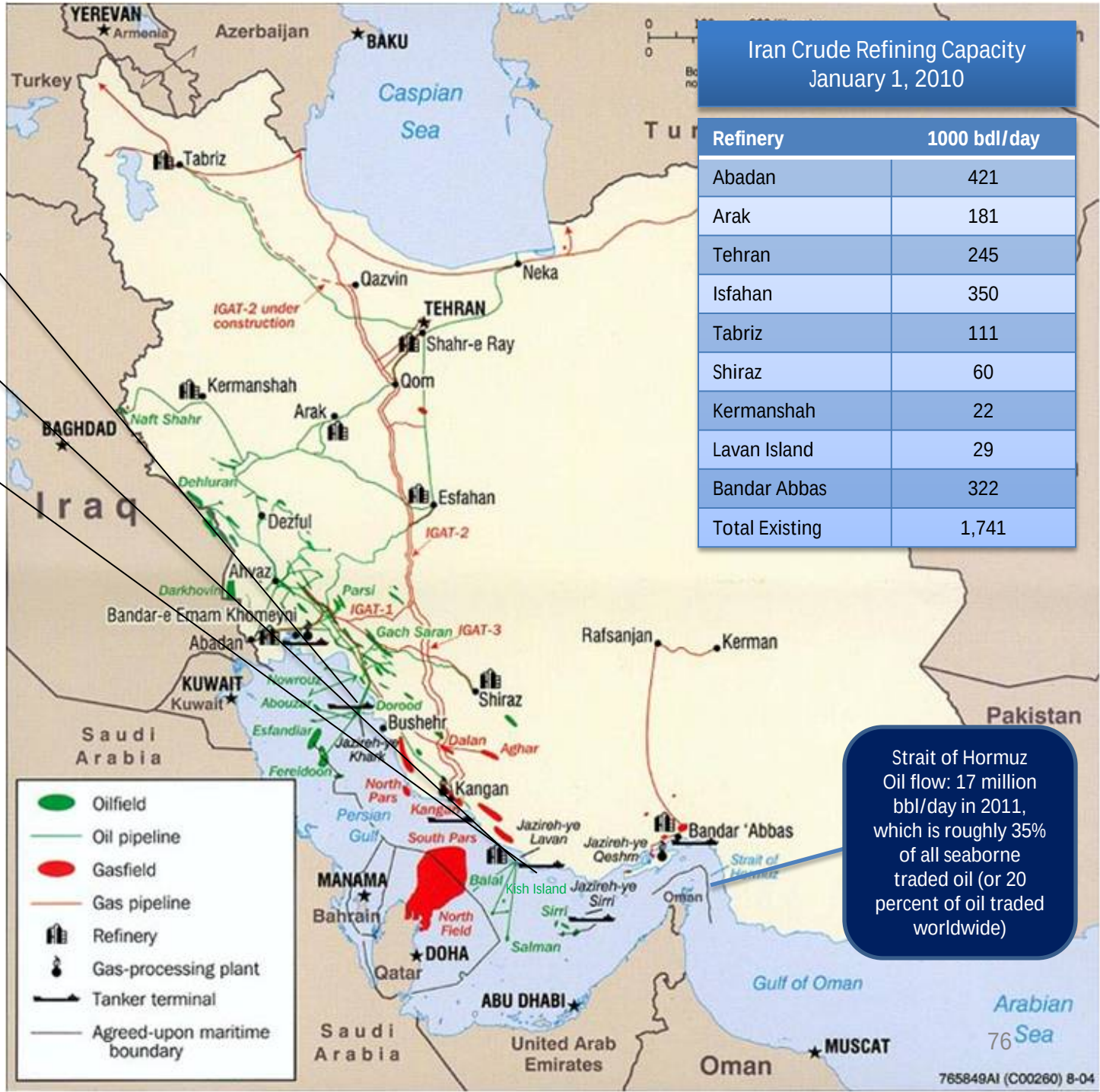
Iran Kharg Island
Storage Capacity : 20.2 mn bbl
Loading Capacity : 5 mn bbl/d

Iran Levan Island
Storage Capacity : 5 mn bbl
Loading Capacity : 200,000 bbl/d

Kish Island

Country	Refining Capacity (1,000/day)
Iran	1,741
Iraq	800
Kuwait	936
Qatar	80
Saudi Arabia	2,109
UAE	466

(Source: EIA Iran Country Analysis Brief)



Iran Crude Refining Capacity
January 1, 2010

Refinery	1000 bdl/day
Abadan	421
Arak	181
Tehran	245
Isfahan	350
Tabriz	111
Shiraz	60
Kermanshah	22
Lavan Island	29
Bandar Abbas	322
Total Existing	1,741

Strait of Hormuz
Oil flow: 17 million bbl/day in 2011, which is roughly 35% of all seaborne traded oil (or 20 percent of oil traded worldwide)

Refinery Capacity in GCC States by type and location (1,000 bbl/day)

		2006	2007	2008	1009	2010
Kuwait		932	936	936	936	936
KNPC	Mina Alahmadi	462	466	466	466	466
	Shuaiba	200	200	200	200	200
	Mina Abdullah	270	270	270	270	270
Qatar		80	80	80	80	80
Qatar Petroleum	Mesaieed I	–	–	–	–	–
Qatar Petroleum	Mesaieed II	80	80	80	80	80
Saudi Arabia		2,135.50	2,130.00	2,135.00	2,109.00	2,109.00
Saudi Aramco	Ras Tanura	550	550	550	550	550
Saudi Aramco	Jeddah	88	85	88	88	88
Saudi Aramco	Riyadh	127.5	120	122	124	124
Getty	Mina Saud	–	–	–	–	–
AOC	Khafji	30	30	30	–	–
Saudi Aramco	Yanbu (Domestic)	235	235	235	235	235
Saudi Aramco/Mobil	Yanbu (Export)	400	400	400	400	400
Saudi Aramco/Shell	Jubail	305	310	310	310	310
Saudi Aramco/Petrola	Rabigh	400	400	400	402	402
UAE		466.3	466.3	466.3	466.3	466.3
ADNOC	Al-Ruwais	120	120	120	120	120
ADNOC	Umm Al-Narr	85	85	85	85	85
Metro Oil	Fujairah	70	70	70	70	70
Emirate Oil	Jebel Ali	120	120	120	120	120
Sharjah Oil Refinery	Hamriyah	71.3	71.3	71.3	71.3	71.3

(Source: OPEC Annual Statistical Bulletin 2010-2011)

Exploration and Production

- Iran is OPEC's second-largest producer after Saudi Arabia. In 2010, Iran produced approximately 4 million barrels (bbl) of total liquids per day, of which roughly 3.7 million bbl/d was crude oil, equal to about 5 percent of global production. Thus far in 2011, it is estimated that Iran's crude production has been approximately 3.6-3.65 million bbl/d, still above its former OPEC production target of 3.34 million bbl/d. Iran has 40 producing fields (27 onshore and 13 offshore), with onshore fields comprising 71 percent of total reserves. Currently, Iran's largest producing field is the onshore Ahvaz field, followed by the Maroun field, both located in Khuzestan province.

- As of the June 2011 OPEC meeting, however, the production target system has been acknowledged as irrelevant, since no formal agreement on production levels could be reached. Saudi Arabia had proposed an increase of 1.5 million bbl/d, but Iran in particular spearheaded an effort to block such an increase, leaving Saudi Arabia, Kuwait, and the United Arab Emirates to boost production independently.

- Since the 1970s, Iran's production has varied greatly. Iran averaged production of over 5.5 million bbl/d of oil in 1976 and 1977, with production topping 6 million bbl/d for much of the period. Since the 1979 revolution, however, a combination of war, limited investment, sanctions, and a high rate of natural decline in Iran's mature oil fields have prevented a return to such production levels. An estimated 400,000-700,000 bbl/d of crude production is lost annually due to declines in the mature oil fields. To offset natural decline rates, Iran's oil fields require structural upgrades including enhanced oil recovery (EOR) techniques such as natural gas injection, which has put even greater strain on energy supply due to rising demand for natural gas domestically.

(Reference: EIA Country Brief, Iran)

Iranian Total Oil Production and Consumption, 1977-2010

Source: U.S. Energy Information Administration

Gasoline

- Sanctions imposed on Iran have made it difficult for the country to import needed volumes of gasoline. The government has attempted to control consumption by implementing accelerated subsidy reform, resulting in a sharp increase in the price of gasoline. The subsidy reform spurred political opposition because of inflationary fears in the midst of an economic downturn. Furthermore, petrochemical plants were converted so that they can produce gasoline as a short term measure. However, the converted plants produce low quality gasoline, causing significant environmental problems.

- In 2010, Iran consumed around 400,000 bbl/d of gasoline, about 4 percent less than consumed in 2009. Iran does not currently have sufficient refining capacity to meet its domestic gasoline and other light fuel needs. However, the government has approved a number of expansions of existing as well as construction of new refineries with the aim to make Iran self-sufficient (and an exporter of gasoline).

- Iranian gasoline imports were approximately 78,000 bbl/d in 2010, nearly 70 percent of total product imports. Current and proposed expansions of Iranian refineries likely will come online between 2012 and 2017. Iran is expected to remain a gasoline importer next year, however if proposed expansions occur as planned, it is possible the country will become a gasoline exporter in 2015.

Rationing and Subsidies

- Iran's energy sector is characterized by inefficiency and the government heavily subsidizes energy prices, particularly gasoline. Since December 2010, private motorists pay approximately 40 cents per liter for the monthly quota of 60 liters and about 70 cents per liter on the market, according to FGE. These prices are significantly higher than the previous price of 10 cents per liter that motorists paid between December 2009 and December 2010. Furthermore, the government lowered the allowance from 100 liters to 60 liters per month.

(Reference: EIA Country Brief, Iran)

Effect on Crude Prices resulting from the Export Sanctions on Iran

Effects of Oil Price Spikes:

- Sharp and/or sustained oil price increases place further pressures on highly oil-dependent industries and consumers, as well as raising geopolitical tensions. According to the International Energy Agency (IEA), a sustained US$ 10/barrel increase in the price of oil could lower growth of global GDP by 0.5 percentage points (pct pts) in the subsequent year. (see Appendix 1)

- "A rule of thumb is that a sustained 10% rise in the price of oil shaves around 0.2% off global growth in the first year, in the U.S. for the second year 0.5%. If the Straits of Hormuz is threatened, the resulting surge in oil price will spell the end of global recovery" (reference: The Economist March 10, 2012).

- In addition to adverse impacts for growth effects, substantially higher oil prices generate current account surpluses in producing countries, which may exacerbate global macroeconomic imbalances and fuel financial market turbulence.

The table below summarizes the average real GDP growth (annual rate) to the overall GDP growth rate in five historical episodes – after oil prices increases.

Period	GDP growth rate
1974:Q1 – 1975:Q1	-2.5%
1979:Q2 – 1980: Q2	-0.4%
1981:Q2 – 1982:Q2	-1.5%
1990:Q3 – 1991:Q3	-0.1%
2007:Q4 – 2008:Q4	-0.7%

(Reference:
John D. Hamilton. Historical Oil Shocks. University of California, San Diego. Dec 22, 2010
John Hamilton. Causes and Consequences of the Oil Shock of 2007 – 08. Brookings Papers on Economic Activity. Spring 2009 Conference Draft)

The IMF in a report “World Economic Outlook (update) January 24, 2012,” summarized the global financial situation as follows:

- Concerns about geopolitical oil supply risks are increasing again. The oil market impact of intensified concerns about an Iran-related oil supply shock (or an actual disruption) would be large, given limited inventory and spare capacity buffers, as well as the still-tight physical market conditions expected throughout 2012.”

- On January 25, 2012, In a regular note to the Group of 20 leading industrialized countries, the IMF said that “if Iran goes ahead with a threat to blockade oil exports via the Straits of Hormuz in the Gulf, the shock could be even greater. A blockade of the Strait of Hormuz would constitute, and be perceived by markets to presage, sharply heightened global geopolitical tension involving a much larger and unprecedented disruption."

Effects of Oil Price Spikes:

- Sharp and/or sustained oil price increases place further pressures on highly oil-dependent industries and consumers, as well as raising geopolitical tensions. According to the International Energy Agency (IEA), a sustained US$ 10/barrel increase in the price of oil could lower growth of global GDP by 0.5 percentage points (pct pts) in the subsequent year.

- In addition to adverse impacts for growth effects, substantially higher oil prices generate current account surpluses in producing countries, which may exacerbate global macroeconomic imbalances and fuel financial market turbulence.

- Already the Iranian currency is plummeting in value against the dollar. International sanctions have already wreaked havoc on Iran’s currency and forced the government to dramatically increase interest rates. The slide of the Rial is a huge blow to Iran’s leaders, who have been claiming that the sanctions aren’t hurting the country.

(Reference: www.exchangerates.org.uk)

Oil Price % change for various possible scenarios in dealing with Iran's Nuclear Program (A first order calculation)

- World Crude Oil Production bbl/day : 86.954 million
- Iran Crude Oil Production bbl/day : 4.234 million (4.87% of World)
- Iran Crude Oil Export bbl/day = 2.5 million (2.88% of World)
- Arab Gulf States Crude Oil Production bbl/day : 21.268 million (24.5% of World)
- Arab Gulf States plus Iran Crude Oil Production bbl/day : 25.5 million (29.32% of World)
- Crude Oil that passes through the Straits of Hormuz bbl/day : 17 million (20% of World)
- OPEC Spare Capacity bbl/day : 2.5 million (2.9% of World)

Reduction in Supply (million barrels/day)	% change in world demand	Estimated % change in price/barrel	WTI Crude Oil Price $ (starting price = $103/barrel)	Brent Crude Oil Price $ (starting price = $123/barrel)
-0.5	0.58	9.7	113	135
-1.0	1.15	19.2	123	147
-1.5	1.73	28.8	133	158
-2.0	2.30	38.3	142	170
-2.5	2.88	48.0	1523	182
-8.5	9.8	163	271	323

Price Elasticity Demand (PED) = - 0.06 see Appendix 1
PED = % change in demand / % change in price
Arab Gulf States: Bahrain, Iraq, Kuwait, Qatar, Saudi Arabia, UAE

- All countries that trade with Iran comply and enforce the imposed trade and financial sanctions, and there are no alternative markets for Iran to sell crude. However, India and China have stated that they will continue to buy Iranian crude oil.

- OPEC crude oil spare capacity is enough to compensate for any shortage in oil demand. Maybe for a short period but not necessarily guaranteed for an extended period of time.

- Deterrence and Active Defense fully capable in protecting against any attempts by Iran to close the Straits of Hormuz. U.S. Military has commented that Iran may be capable of closing the Straits for a short period of time.

- By July of 2012, as a result of the European sanctions around 843,000 barrels of crude oil are taken off the market. To minimize the risk of a quick rise in oil price by 20 to 30% the market must be compensated through the OPEC Spare Capacity.

- Greater than 843,000 barrels approaching the 2.5 million mark, will be equal to all of Iran's crude oil exports. Iran will consider this a declaration of war, and will talk about retaliation, which will drive up the price of oil, If 2.5 million are not replaced by the OPEC Spare Capacity, then we should expect a 50% increase in the price of a barrel of oil. The 2.5 million will very probably bring about the collapse of the Iranian economy, definitely something to be avoided. In retaliation Iran will start attacking the Straits of Hormuz.

- The U.S. admits that the Straits can be closed for a short period of time, this would mean that the market will be deprived from 17 million barrels per day which is 20% of world crude supply. As a result, this will most likely drive the price beyond the $200 mark. The long-term effects will be catastrophic for the world economy, which is just beginning to show positive signs of an economic recovery.

- The threat of closure to the Strait of Hormuz could not be more effective than at this moment, just as the world is starting to show signs of economic recovery. The repercussions of a spike in oil prices could leave the global economy in worse situation than it was a year ago.

- The history of economic sanctions has demonstrated that in many cases, only military force can finally play a decisive role in forcing a country to modify its behavior and comply with international agreements. However, this is not to say that sanctions, dialog and economic incentives cannot play an auxiliary role in convincing a country that to it's best benefit, it must seriously consider changing policy.

Other First Order Risks Strongly Affected an Oil Price Spike:
(World Economic Report. Global Risks 2010. A Global Risk Network Report)

- Major Fall in US Dollar
  A major fall in the value of the US Dollar with impact throughout the global economic and financial system. This will have an adverse impact on the stability of the US financial markets and force the Federal Reserve to raise rates in defense of the dollar to levels not commensurate with growth. An abrupt decline in the US dollar relative to the currencies of major trading partners would affect an already weakened financial system and a weak global economy. During the 2003 – 2008 oil price boom and financial crisis, oil prices surged and the dollar depreciated, whereas during the financial crisis, oil prices fell rapidly while the US dollar appreciated in value.

- Asset Price Collapse
  A collapse of real and financial assets in advanced and emerging-market economies leads to the destruction of wealth, deleveraging, reduced household spending and demand.

- Slowing of the Chinese Economy (<6%)
  Sudden reduction in China's growth to 6% or less. China's economy is firmly linked to the global economy and to the global capital markets, it is a large importer of commodities. The country's reserves are invested abroad (predominantly in US government bonds). China has developed a strong presence on the African continent through direct investments and development aid. A loss in China's growth momentum below 6% could adversely affect global capital and commodity markets.

- Fiscal Crisis

  Overstretch of fiscal positions generating unsustainable levels of debt, rising interest rates, inflationary and sovereign debt crisis. According to an IMF baseline scenario, government debt-to-GDP ratios for the G20 countries will increase from 63% in 2007 to 85% by 2014. In advanced G20 countries, the increase will be even more pronounced, from 78% to 114%. The marked deterioration is likely to exert strong upward pressure on real interest rates; according to IMF estimates, an aggregate deterioration in the global debt-to-GDP ratio of 10 percentage points may raise global interest rates by 40 basis points. In highly indebted economies, spreads on government bonds may rise significantly, exacerbating the risk of sovereign debt crises.

- Food Price Volatility

  Rise in transportation costs with raise food prices, causing malnutrition and health consequences in the poorest segments of global society. In addition causing unrest and riots.

- Retrenchment from Globalization

  Multiple Emerging and Developing economies may start adopting policies that create barriers to flows of goods, capital and labor and fail to engage with multilateral governance structures to address global challenges.

- Underinvestment in Infrastructure (Water, Agriculture, Energy and Transport)

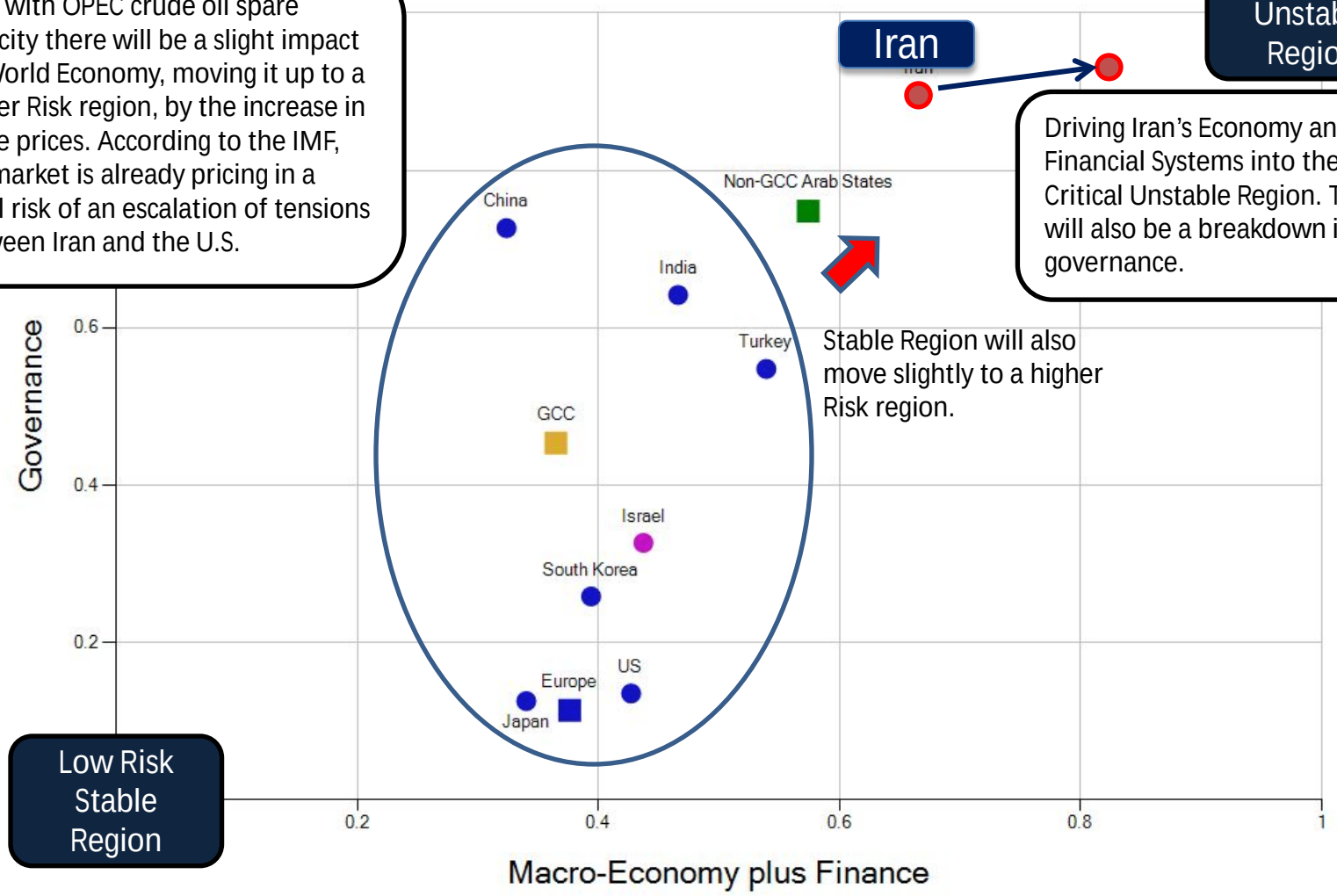
  Underinvestment in infrastructure is not just a risk to existing structures in the developed world, if it is not addressed it is also a barrier to growth and development in the developing world as well.

- Interstate Conflicts
  - Rising geopolitical tensions can give rise to interstate conflicts and subsequently and increase in International Terrorism.

(Reference: World Economic Report. Global Risks 2010. A Global Risk Network Report)

Possible Consequences of Economic and Financial Sanctions, Cutting Iran's Crude Oil Export by 1.5 million barrels/day

Even with OPEC crude oil spare capacity there will be a slight impact on World Economy, moving it up to a Higher Risk region, by the increase in crude prices. According to the IMF, the market is already pricing in a small risk of an escalation of tensions between Iran and the U.S.



The Role of the US in Gulf Stability and Security:

Deterrence and Active Defense

US Extended Deterrence against the proliferation of WMD and their delivery systems.

- Iran with its ballistic missiles and potential of developing a nuclear weapon is a direct threat to the GCC and also poses a threat to all friends and allies in the Middle east region.

- Iran has ignored all of the U.S. warnings similar to that of North Korea, and Iran has pressed ahead with its uranium-enrichment program and has recently announced that it is totally “self-sufficient” in nuclear technology. Iran claims that it can domestically produce its own raw uranium for enrichment.

- U.S. extended deterrence have been statements that the full range of U.S. military capability in both conventional and unconventional weapons will be available and ready to be committed to defending its allies and friends against any threat. The U.S. should start implementing a strategy to influence the decision-making bodies in Iran as to the devastating consequences if the GCC, and any other allies are attacked or threatened.

- Should deterrence fail, the U.S. should have already provided the GCC countries with Ballistic Missile Defense Systems with all the Early Warning and Command Control facilities, that will limit the damage should they be attacked, and to enhance the conventional deterrence capability of the GCC. In addition providing modern technology combat aircraft that can be launched within a very short window of time to block any first attack wave and to have the capability to move the war into enemy territory, in the shortest time period, using both Defensive and Offensive Counterair Missions.

Deterrence & Active Defense

- Ballistic missile defense (BMD) systems have been provided to four countries on the Arabian Peninsula. BMD systems were provided to Kuwait, the United Arab Emirates, Qatar and Oman, as well as stationing BMD capable, Aegis-equipped warships in the waters of the Arabian Gulf.

- The U.S. has been developing an integrated early warning radar system across the GCC states that could help U.S. and GCC forces to quickly respond to an Iranian missile.

- The moves are intended to reassure Gulf countries that they would be protected against possible offensive action from Tehran. U.S. officials stressed the defensive nature of the actions being taken throughout the region.

- U.S. officials also are working with allies in the Gulf to ensure freedom of navigation in the region. Arab countries worry that during a crisis, Iran could try to prevent their ships from traversing the Strait of Hormuz, cutting off their oil export business.

- US officials have repeatedly insisted they are keeping "all options on the table," which includes a military option, when it comes to Iran.

Secretary of State Clinton made the following remarks with Saudi Arabian Foreign Minister on March 31, 2012 (US State Department).

“We believe strongly that, in addition to our bilateral military cooperation between the United States and every member nation of the GCC, we can do even more to defend the Gulf through cooperation on ballistic missile defense. We began that conversation in this forum today. Admiral Fox, the commander of the Fifth Fleet, made a presentation outlining some of the challenges that we face when it comes to ballistic missile defense. But we are committed to defending the Gulf nations and we want it to be as effective as possible.

So we want to begin expert discussions with our friends about what we can do to enhance ballistic missile defense. There are some aspects of a ballistic missile defense system that are already available, some of which have already been deployed in the Gulf. But it’s the cooperation – it’s what they call interoperability that we now need to really roll up our sleeves and get to work on.”

Components of a multi-layered integrated Ballistic Missile Defense System

Sensors

Space Tracking and Surveillance System

In Mid - Course Phase

Sensors

Defense Support Program in Boost Phase

Vehicles & Decoys

Mid-Course Phase

Reentry Vehicles & Decoys

Terminal Phase

Sea Based Radar

Sea Based Radar

Forward-Based Radar

Midcourse Radar

Boost Phase Vehicles

- Boost Phase short in time duration limiting interception opportunities.
- Missile destruction occurs before dispersal of payload.
- Debris from missile, including warheads, may fall on the launching country.

- Speed of warhead and short duration of terminal phase are challenges.
- Warheads can maneuver.

- Longer flight duration
- Exoatmospheric (above atmosphere)
- Must be able to discriminate between weapons and decoys.

- Threat most vulnerable.
- Destroy many RVs with single shot.

Ground Based Interceptor

Early Warning Radar

THAAD "Hit to Kill" Technology Direct hit of incoming ballistic missile.

Sea Based Terminal

Patriot Advanced Capability PAC-3

Ground Based Radar

U.S. Aegis Ballistic Missile Defense

Standard Missile-3

Ground Based Midcourse Defense

Multiple Kill Vehicle

Arborne Lasers

Air Launched Concepts

Kinetic Energy Interceptors

Counterforce Operations

C4I and Battle Management

Ballistic Missile Defense System, C4ISR & Battlefield Management.

• The Challenge for the GCC States is to design an effective multi-layered Ballistic Missile Defense System (BMDS) to counter the Short, Medium and Intermediate Ballistic Missiles.

• Due to the very short time window in the defense against Ballistic Missiles, they will have to be engaged automatically, which requires intercept authorization and rules of engagement to be agreed upon in advance. All part of an effective C4ISR / BM system in both peace time and war. This will also act as a Force Multiplier.

• Evident that the key to an effective BMD lies in regional cooperation, which can take a range of forms from coordination and cooperation between command centers and defense systems for BMD purposes - while enabling each state to control its own defenses. Similar to the "Cooperation Belt" that links together all the operations command centers in the GCC states, which produces a Common Operational Picture.

• Cooperation to be comprehensive in nature, leading to a near-real time situation awareness of the military developments in the area, hostile and friendly military capabilities and their operational levels. This would also be in the form of cooperation into BMDs and NBC threat assessment. This requires an C4ISR capability in all its Components, such as, Unmanned Air Systems (UAS's) / Unmanned Air Vehicles (UAV's).

• As the Front Lines will be over the Arabian Gulf region, the Navy will have to play a role in Air Defenses and in a Ballistic Missile Defense Network. Sea based systems will provide an efficient and highly mobile defense against Theater Ballistic Missiles.

• The Naval System, such as the U.S. Navy Aegis system, will allow the BMD command to move its defense capabilities close to the enemy sites and serve as a forward deployed sensor and will have the Long Range Engagement and Tracking Capability. This will extend the battle space of the BMDs and contribute to an integrated layered defense.

Military Strike

The New York Times, March 19, 2012
"U.S. War Games Sees Perils of Israeli Strike Against Iran"

- A classified war simulation held this month to assess the repercussions of an Israeli attack on Iran forecasts that the strike would lead to a wider regional war, which could draw in the United States and leave hundreds of Americans dead, according to American officials.

- The officials said the so-called war game was not designed as a rehearsal for American military action — and they emphasized that the exercise's results were not the only possible outcome of a real-world conflict.

- But the game has raised fears among top American planners that it may be impossible to preclude American involvement in any escalating confrontation with Iran, the officials said. In the debate among policy makers over the consequences of any Israeli attack, that reaction may give stronger voice to those in the White House, Pentagon and intelligence community who have warned that a strike could prove perilous for the United States.

- The results of the war game were particularly troubling to Gen. James N. Mattis, who commands all American forces in the Middle East, Persian Gulf and Southwest Asia, according to officials who either participated in the Central Command exercise or who were briefed on the results and spoke on condition of anonymity because of its classified nature. When the exercise had concluded earlier this month, according to the officials, General Mattis told aides that an Israeli first strike would be likely to have dire consequences across the region and for United States forces there.

- The two-week war game, called Internal Look, played out a narrative in which the United States found it was pulled into the conflict after Iranian missiles struck a Navy warship in the Persian Gulf, killing about 200 Americans, according to officials with knowledge of the exercise. The United States then retaliated by carrying out its own strikes on Iranian nuclear facilities.

The New York Times, March 19, 2012
"U.S. War Games Sees Perils of Israeli Strike Against Iran"

- The initial Israeli attack was assessed to have set back the Iranian nuclear program by roughly a year, and the subsequent American strikes did not slow the Iranian nuclear program by more than an additional two years. However, other Pentagon planners have said that America's arsenal of long-range bombers, refueling aircraft and precision missiles could do far more damage to the Iranian nuclear program — if President Obama were to decide on a full-scale retaliation.

- The exercise was designed specifically to test internal military communications and coordination among battle staffs in the Pentagon; in Tampa, Fla., where the headquarters of the Central Command is located; and in the Persian Gulf in the aftermath of an Israeli strike. But the exercise was written to assess a pressing, potential, real-world situation. In the end, the war game reinforced to military officials the unpredictable and uncontrollable nature of a strike by Israel, and a counterstrike by Iran, the officials said.

- American and Israeli intelligence services broadly agree on the progress Iran has made to enrich uranium. But they disagree on how much time there would be to prevent Iran from building a weapon if leaders in Tehran decided to go ahead with one.

- With the Israelis saying publicly that the window to prevent Iran from building a nuclear bomb is closing, American officials see an Israeli attack on Iran within the next year as a possibility. They have said privately that they believe that Israel would probably give the United States little or no warning should Israeli officials make the decision to strike Iranian nuclear sites.

- Officials said that, under the chain of events in the war game, Iran believed that Israel and the United States were partners in any strike against Iranian nuclear sites and therefore considered American military forces in the Persian Gulf as complicit in the attack. Iranian jets chased Israeli warplanes after the attack, and Iranians launched missiles at an American warship in the Persian Gulf, viewed as an act of war that allowed an American retaliation.

Military Strike
Israel Scenario I

Mission Analysis:

- Approximate range to the furthest target Esfahan is some 1,110 nmi. When approaching the 550 nmi range, the F-15Es and F-16Is need to refuel on the way to Iran and on the way back.

- Refueling can be done in three ways:
  - o Refueling from KC-135A and KC-10 tankers.
  - o Buddy Refueling between F-15Es and F-16Is
  - o A temporary landing strip, along the Syrian, Turkish and Northern Iraq region, where aircraft refueling is available.

- Total Fuel in an F-15E for the Hi-Lo-Lo-Hi strike mission is 26,300 lbs, whereas that for an F-16I is about 14,755 lbs. The total maximum strike package was around 80 aircraft, all the 30 F-15I in the Israeli Airforce Inventory plus 55 F-16I/C. The F-15E would then need 5 to 6 KC-130s to refuel from, and the F-16Is would require 6 to 7 KC-130.

- Israel presently has 5 KC-130H and 4 B-700 (Source IISS). So all the Israeli Tankers will have to be airborne to service the F-15E and F-16I Strike Force during the outbound leg and inbound legs of the mission. Could be difficult to find a location along the route such that the tankers could avoid detection and possible interception.

- These estimates were done assuming a 100% aircraft and weapons operational reliability and the strike force not encountering any Iranian Air and Ground Defense. So if we give the overall reliability to be 90% then we should add around 9 to 10 more aircraft, bringing the total strike force to 95.

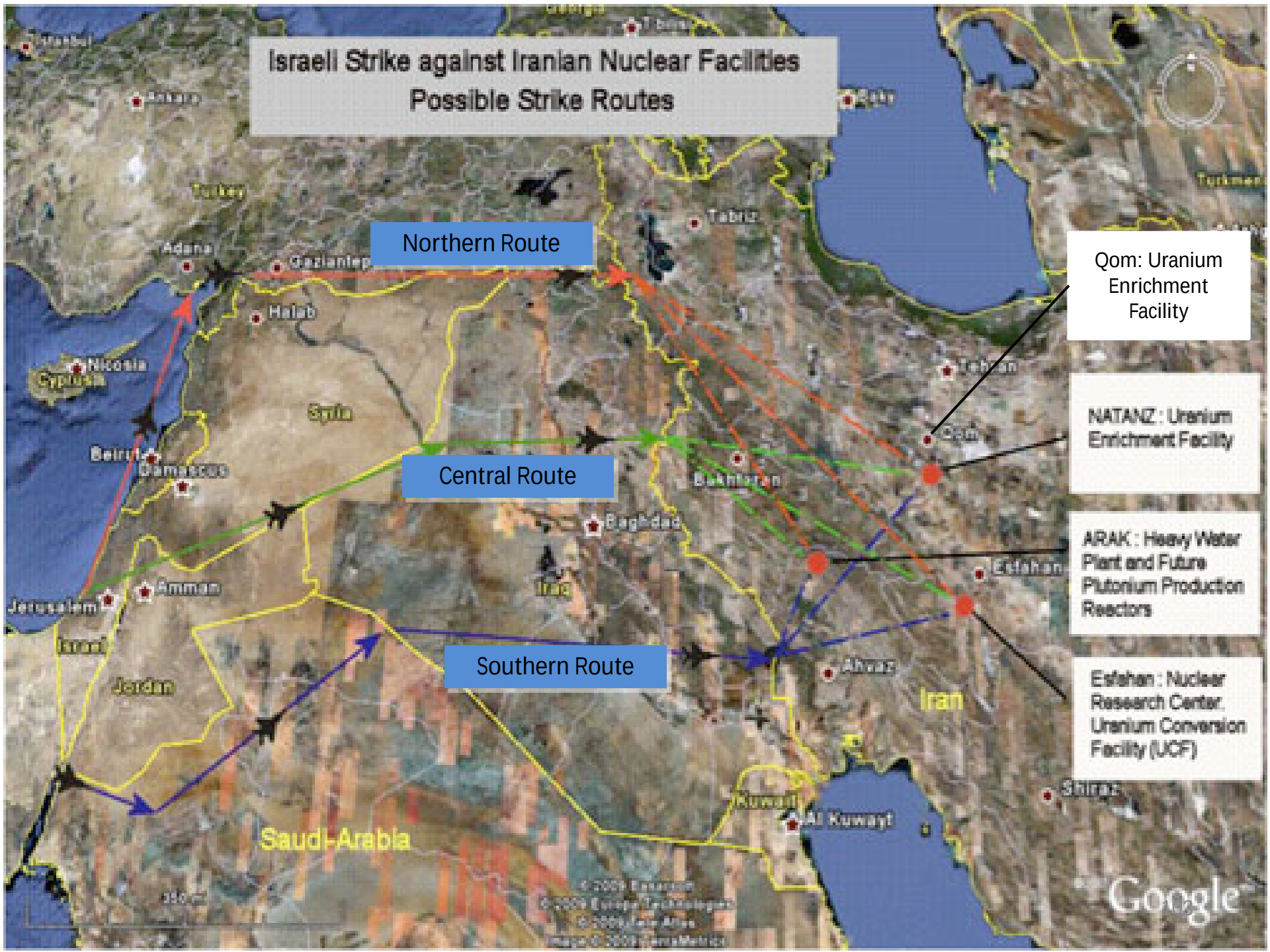
- So in essence over 25% of the high end combat aircraft of Israeli Airforce and 100% of the Tankers will have to be allocated for this mission.

- One strike would not necessarily be enough to achieve the mission objectives. Strike aircraft need to return for another strike. This would put a heavy burden on the Israeli Airforce.

- We can conclude that a military strike by the Israeli Airforce against Iranian Nuclear Facilities is possible, however, it would be complex and high risk in the operational level and would lack any assurances of a high mission success rate.

- Iranian retaliation will have a devastating regional consequences. U.S. expects Israel to be responsible and not to carry out such a strike.

- Air to ground strike mission can be difficult to implement and would involve some risks. Flying on a very tight route, practically hugging the Turkish-Syrian borders. Aerial refueling along the way and avoid being detected by Turkey, Syria and the U.S. Flying down to S/L when in Iranian territory, avoid being detected by flying low and applying ECM all the way. If detected by Iranian air defense the strike formation should be prepared to encounter interceptors, and to encountering firing of ground based SAMs.


Israeli Strike against Iranian Nuclear Facilities
Possible Strike Routes
Northern Route
Central Route
Southern Route
Qom: Uranium Enrichment Facility
NATANZ : Uranium Enrichment Facility
ARAK : Heavy Water Plant and Future Plutonium Production Reactors
Esfahan : Nuclear Research Center. Uranium Conversion Facility (UCF)
Tabriz
Adana
Gaziantep
Halab
Nicosia
Cyprus
Syria
Beirut
Damascus
Tehran
Baghdad
Iraq
Amman
Jerusalem
Israel
Jordan
Ahvaz
Iran
Shiraz
Kuwait
Al Kuwayt
Saudi-Arabia
Google

Northern Route: 

• Flying to the North towards the corner of the Syrian – Turkish borders, then turning East hugging the Syrian border all throughout the West to East flight route.

• Israel could again utilize its EW capabilities as during the raid on Dayr az-Zawr, Syria, on September, 2007

• The Israeli F-15s and F-16s that got through the Syrian air defense radars without being detected is attributed to a Network Attack System, similar to the U.S. "Suter" system. In this EW environment even if Turkey detects an aerial activity it very likely might look upon the Aircraft as friendly and not flying over its territory. Whereas Syria would be spoofed to believe no major threats are flying over its border.

• No major Syrian Airbases are close to the Northern border and the aircraft stationed are the MiG-21 type, one airbase for training.

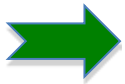
• On the last leg of the flight, only a small fraction of the distance left to the Iranian border could be in Turkey or the Northern tip of the Iraqi borders.

•The flight route would also be ideal for the F-15's and the F-16's to do aerial refueling from airborne tankers, on ingress and egress from Iran.

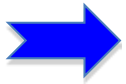
• This northern route, along the Syrian – Turkish borders, could result in a low political risk with Syria, whom Israel has no Peace Treaty with and not even a formal negotiations process any more.

• If the Israeli aircraft do actually fly over Turkey that would constitute a clear Turkish – Israel and even U.S. conspiracy to attack Iran, so the Political risks could be high with Turkey.

• Operationally, the risk from Syria would be low, whereas the risk from Turkey could be of medium level if Turkey deems it necessary to react militarily.

Central Route: 

- Israel has a Peace Treaty with Jordan signed in October 1994.
- Therefore Israel is obligated legally to notify Jordan of any planned flights over Jordan.
- Jordan will not accept an Israeli over flight through Jordanian Airspace to strike Iran.
- High political risks for Israel to violate Jordanian airspace, in effect jeopardizing the Peace Treaty.
- Operationally, an Israeli Strike Mission of the size envisioned would certainly be detected and challenged by Jordan, and the whole region will be informed.
- Israel will encounter some operational risks due to Jordanian Airforce Intercepting the Israeli aircraft. This could upset the whole mission.
- So the Central Route through Jordan, or the Jordanian Syrian border would be of High Risk politically and High Risk Operationally.
- Iraqi airspace will also have to be violated. Iraq would object to this, and the U.S. most probably would detect this and would not allow Israel to proceed through Iraq.

Southern Route: 

- Israel could try the June1981 Iraqi Osirak Nuclear Reactor strike route again, flying through the southern tip of Jordan and into Saudi-Arabia then through Iraq or even Kuwait.
- Politically the U.S. would not allow Israel to take such risks which would jeopardize its strategic relationship with Saudi-Arabia.
- Iraq would also object to any violation of its airspace by Israel, and so would Kuwait.
- This route would create high political risks even though the operational risks could be somewhat low.

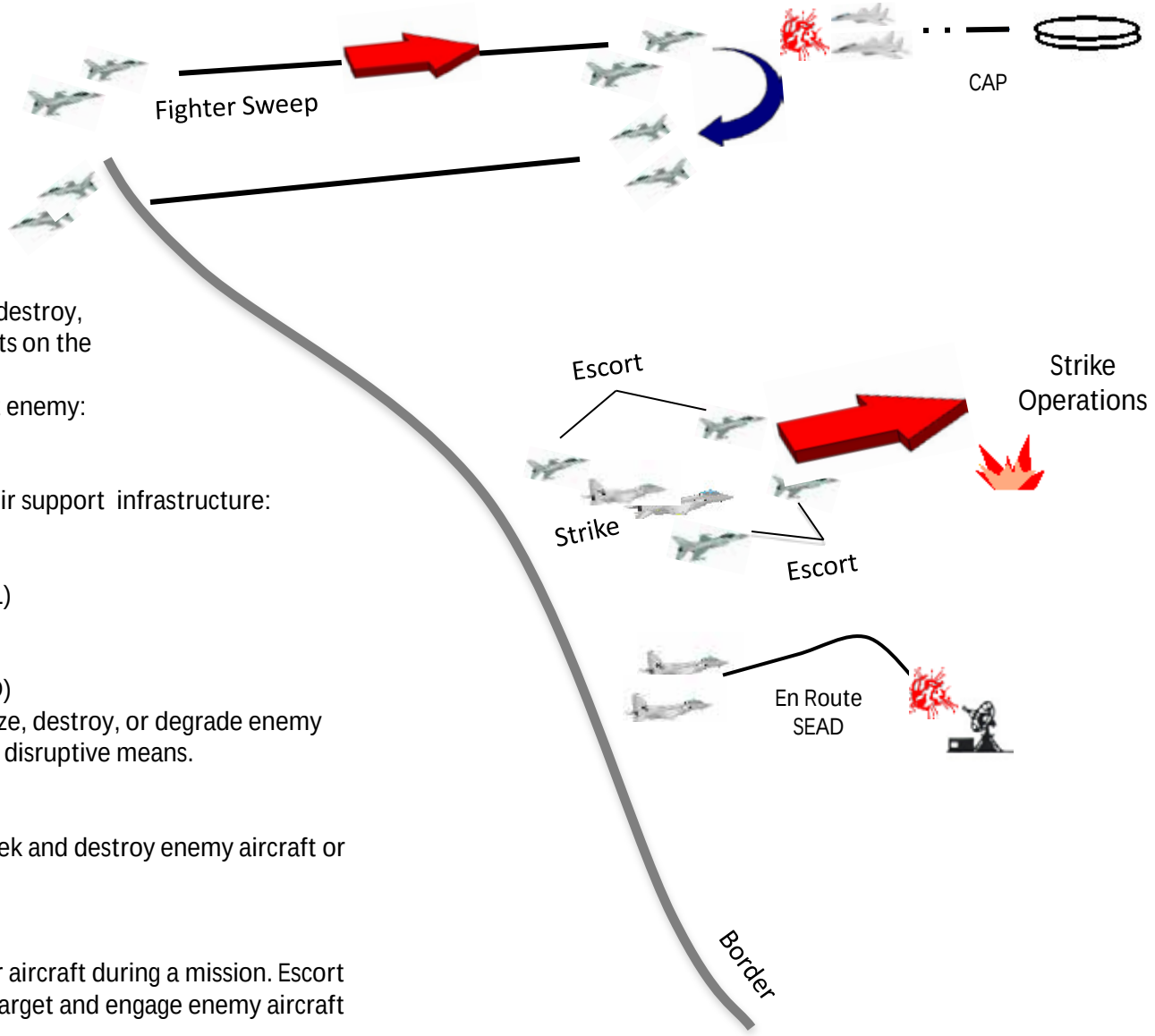
Strike Force Required

Target Facility	If 2 PG Bombs are carried	If 1 PG Bomb is carried
Natanz	25 F-15E	50 F-15E
Esfahan	3 F-16I	5 F-16I
Arak	4 F-16I	8 F-16I
Total	25 F-15E + 7 F-16I	50 F-15E + 13 F-16I

- F-15E Empty Weight plus Maximum Fuel = 66,831 lbs
- F-15E Take off Gross Weight = 81,000 lbs
- So each F-15E will still be capable of carrying an extra 10,000 lbs, 2 BLU-113 5,000 lb class warheads (2 GBU-28 PG Bombs).

- Total Force could be 25 F-15E for strike and 7 F-16I, with 38 F-16I for Air Escort/Fighter Sweep and Suppression of Enemy Air Defense (SEAD).
- Bringing the total allocated strike force against Nuclear Targets in Iran to 70 aircraft.

Offensive Counterair Missions (OCA)
A Strategic Strike would require the following support missions



☐ Attack Operations
- • Attack operations are intended to destroy, disrupt, or degrade counterair targets on the ground.
- •These missions are directed against enemy:
  - ☐ Missile Sites
  - ☐ Airfields
  - ☐ Command Control and their support infrastructure:
    - o Launch Sites
    - o Launchers
    - o Fuel Supplies (POL)
    - o Runways

☐ Suppression of Enemy Air Defenses (SEAD)
SEAD is an OCA mission designed to neutralize, destroy, or degrade enemy surface-based air defenses by destructive or disruptive means.

☐ Fighter Sweep:
An offensive mission by fighter aircraft to seek and destroy enemy aircraft or targets of opportunity in a designated area.

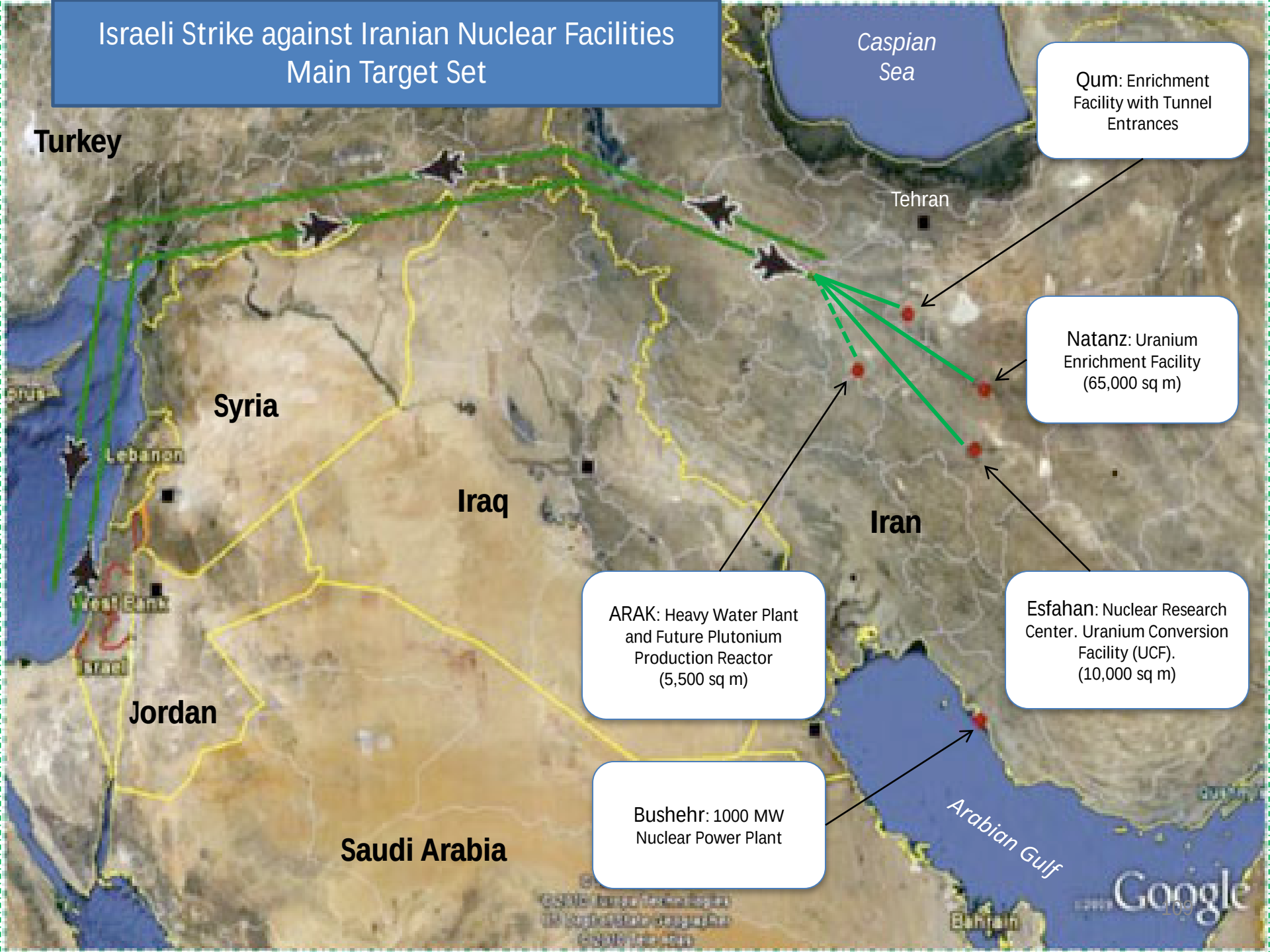
☐ Escorts:
Escorts are aircraft assigned to protect other aircraft during a mission. Escort missions are flown over enemy territory to target and engage enemy aircraft and air defense systems.

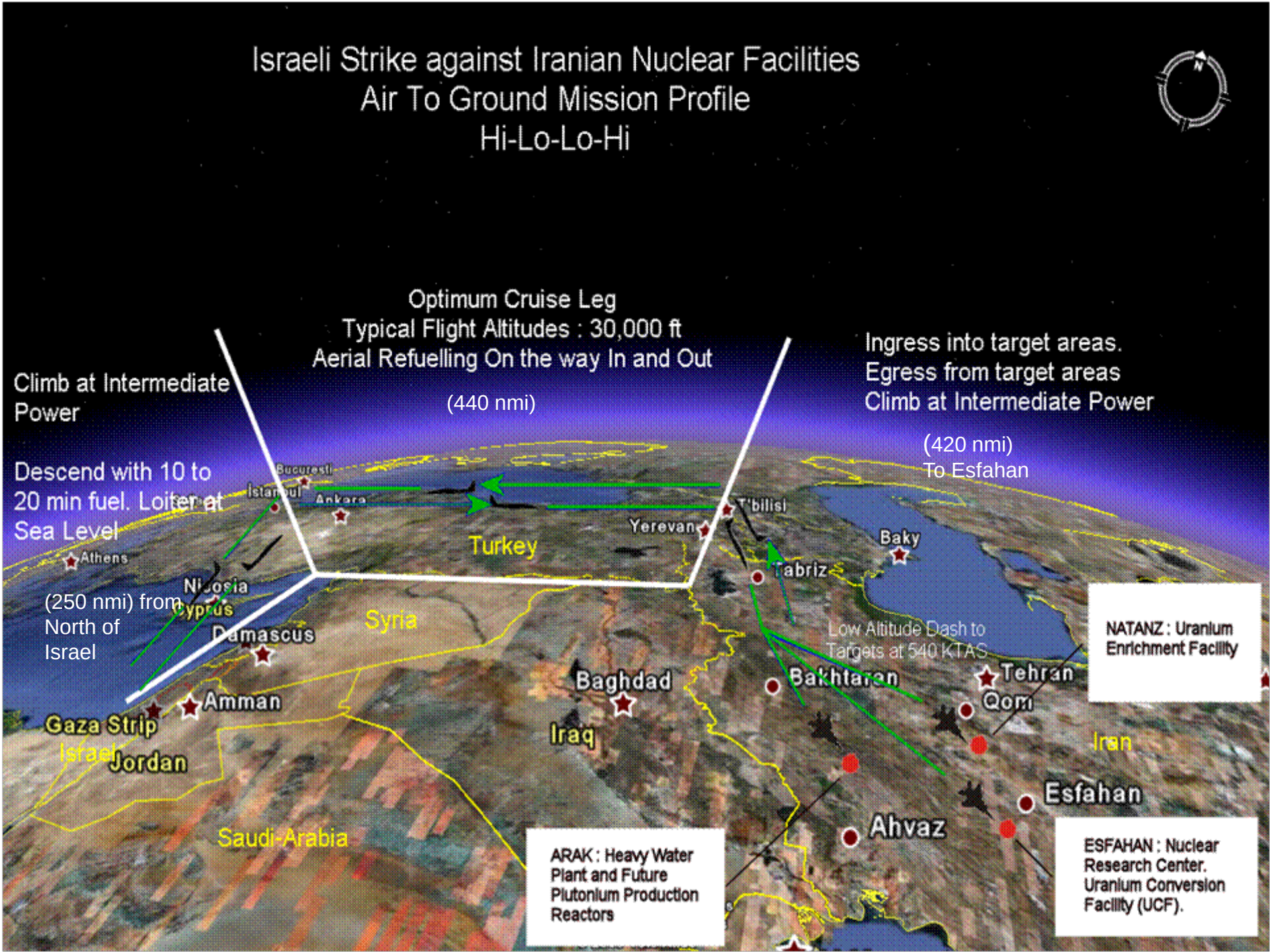
(Source: Counterair Operations USAF AFDD 2-1.1 October 1, 2008)

Israel Mission Force Allocation

Aircraft	Number	Payload	Mission	Fuel Required (lbs)	KC-130 Tankers required for Refueling
F-15E	30	4 AAM 2 GBU-28	Natanz & Qom	657,500	6
F-16I	3	2 AAM 2 GBU-27	Esfahan	44,265	0.5
F-16I	4	2 AAM 2 GBU-10	Arak	59,000	0.5
F-16I	10	2 AAM 2 GBU-27	Bakhtarun (Close to Arak) Khorramabad (close to Arak) Manzariyah (Close to Arak) Qom (Close to Natanz) Hasa (Close to Esfahan)	147,550	1
F-16C	38	AAM ASM	Fighter Sweep Battlefield Air Superiority Suppression of Enemy Air Defense	560,690	5
TOTAL	85				13

The KC-135A has a Range of 1,150 nmi with 120,000 lbs of transferable fuel. (GlobalSecurity.org)


Israeli Strike against Iranian Nuclear Facilities
Main Target Set
Caspian Sea
Turkey
Tehran
Qum: Enrichment Facility with Tunnel Entrances
Natanz: Uranium Enrichment Facility (65,000 sq m)
Syria
Lebanon
Iraq
Iran
ARAK: Heavy Water Plant and Future Plutonium Production Reactor (5,500 sq m)
Esfahan: Nuclear Research Center. Uranium Conversion Facility (UCF). (10,000 sq m)
Jordan
Bushehr: 1000 MW Nuclear Power Plant
Saudi Arabia
Arabian Gulf
Bahrain
Google


Israeli Strike against Iranian Nuclear Facilities
Air To Ground Mission Profile
Hi-Lo-Lo-Hi
Optimum Cruise Leg
Typical Flight Altitudes : 30,000 ft
Aerial Refuelling On the way In and Out
(440 nmi)
Climb at Intermediate Power
Descend with 10 to 20 min fuel. Loiter at Sea Level
(250 nmi) from North of Israel
Ingress into target areas.
Egress from target areas
Climb at Intermediate Power
(420 nmi)
To Esfahan
Low Altitude Dash to Targets at 540 KTAS
Bucuresti
Istanbul
Ankara
Athens
Nicosia
Cyprus
Turkey
Yerevan
T'bilisi
Baky
Tabriz
Syria
Damascus
Baghdad
Iraq
Bakhtaran
Tehran
Qom
Iran
Amman
Gaza Strip
Israel
Jordan
Saudi-Arabia
Ahvaz
Esfahan
NATANZ : Uranium Enrichment Facility
ARAK : Heavy Water Plant and Future Plutonium Production Reactors
ESFAHAN : Nuclear Research Center. Uranium Conversion Facility (UCF).

Israeli Strike

Scenario II:
Low Yield Earth Penetrating Nuclear Weapons:
Ballistic Missiles
Sea Launched Cruise Missiles

Low Yield Earth Penetrating Nuclear Weapons

- Another scenario is using these low yield earth penetrating nuclear warheads as a substitute for conventional weapons to attack deeply buried nuclear facilities in Iran. Some believe that nuclear weapons are the only weapons that can destroy targets deep underground or in tunnels.

- Israel launched a Jericho II missile across the Mediterranean that landed about 250 miles north of Benghazi, Libya. The missile flew over 800 miles, and U.S. experts felt it had a maximum range of up to 900-940 miles (1,450 kilometers), which would allow the Jericho II to cover virtually all of the Arab world.

- The most recent version of the missile seems to be a two-stage, solid-fuel propellant with a range of up to 900 miles (1,500 kilometers) with a 2,200 pound payload.

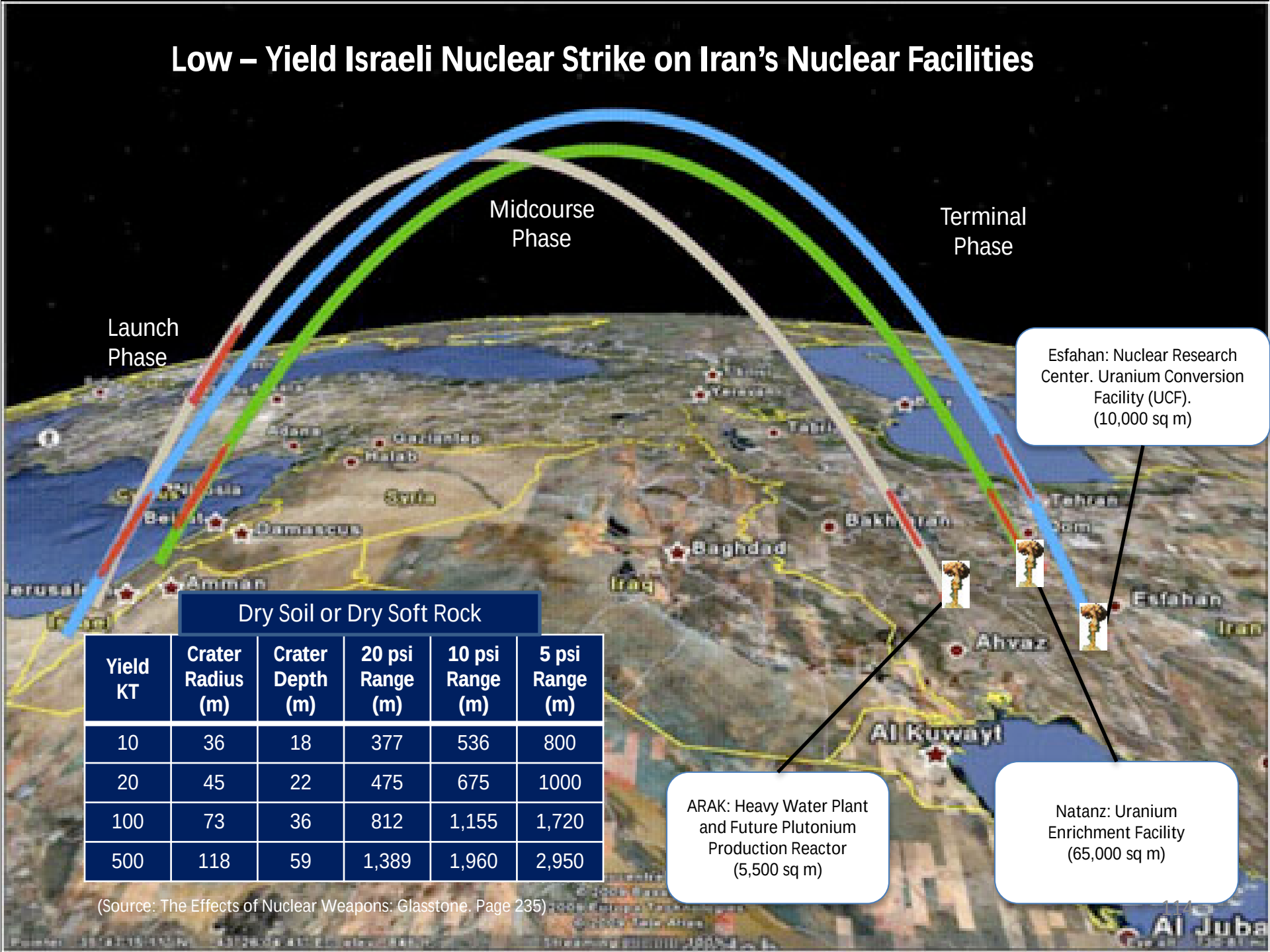
- There are reports that Israel is developing a Jericho III missile, based on a booster it developed with South Africa in the 1980s. Jane's estimated that the missile has a range of up to 5,000 kilometers and a 1,000-kilogram warhead. This estimate is based largely on a declassified Defense Intelligence Agency estimate of the launch capability of the Shavit booster that Israel tested on September 19, 1988.

Israel Ballistic Missiles

System	Class	Payload	Warhead	Range (km)	Estimated CEP
Jericho I	Short Range Ballistic Missile (SRBM)	Single Warhead	450 kg; Nuclear 20KT; HE	500 km	500 m (Obsolete)
Jericho II	Medium Range Ballistic Missiles (MRBM)	Single Warhead	Nuclear 1MT; HE	1,500 km	1.5 km
Jericho III	Intercontinental Range Ballistic Missile (ICBM)	Single Warhead	750 Kg	4,800 – 6,500 km	4.8 – 6.5 km

(Source: Israeli Weapons of Mass Destruction. An Overview Anthony H. Cordesman, CSIS, June 2008)

Low – Yield Israeli Nuclear Strike on Iran's Nuclear Facilities



Dry Soil or Dry Soft Rock

Yield KT	Crater Radius (m)	Crater Depth (m)	20 psi Range (m)	10 psi Range (m)	5 psi Range (m)
10	36	18	377	536	800
20	45	22	475	675	1000
100	73	36	812	1,155	1,720
500	118	59	1,389	1,960	2,950

(Source: The Effects of Nuclear Weapons: Glasstone. Page 235)

U.S. Strike

US Strike Mission

•The U.S. is the only country that can launch a successful Military Strike, if all peaceful options have been exhausted and Iran has left no other means to convince it to stop or change its course in pursuing Nuclear Weapons, The U.S. should alone determine what the timeline could be if Iran does pursue the path to develop nuclear weapons.

•B-2 bombers out of Diego Garcia, each carrying 2 GBU-57 MOP bombs.

• Mission can be achieved with a high success rate also maintaining a sustained strike over a couple of days.

• B-2 bombers escorted by F-18s from the 5th fleet stationed in the Gulf area, or F-15Es and F-16Cs from forward area air bases.

• United States and Western allies considered to be the only countries involved, no GCC or any Arab country involvement and especially no-Israeli direct involvement.

• Still though, Iran most probably will accuse Israel to be part of the Strike and will try to retaliate, either by launching a Ballistic Missile on Israel carrying conventional or WMD (chemical, biological, radiological) and activating Hezbullah to launch cross border attacks against Israel.

• Iran would also try to attack any U.S. military airbases that are active in the Gulf even if they are stationed in GCC countries.

• If Iran attacks any of the GCC countries, then they will have the right to self-defense. In addition the whole Arab Middle East will not accept an Iranian attack on any of the GCC countries.

• In July 2009, verification of equipment required to integrate the MOP on the B-2 was complete - the hardware that holds the MOP inside the weapons bay.

• The MOP is a GPS-guided weapon containing more than 5,300 pounds of conventional explosives inside a 20.5 ft long bomb body of hardened steel. It is designed to penetrate dirt, rock and reinforced concrete to reach enemy bunker or tunnel installations. The B-2 will be capable of carrying two MOPs, one in each weapons bay.

• The B-2 currently carries up to 40,000 pounds of conventional ordnance. For example, it can deliver 80 independently targeted 500-lb class bombs from its smart bomb rack assembly; or up to 16 2,000-lb class weapons from its rotary launcher.

• Integration of the MOP on the B-2 is the latest in a series of modernization programs that Northrop Grumman and its subcontractors have undertaken with the Air Force to ensure that the aircraft remains fully capable against evolving threats.

The B-2 Bomber

Primary Function	Multi role heavy bomber
Engines:	Four GE F-118-GE-100 engines, each with a thrust of 17,300 pounds (7,847 kg)
Speed, Cruise:	High subsonic
Ceiling:	50,000 ft (15,000 meters)
Weight Takeoff, (typical):	335,500 – 350,000 pounds (152,600 – 159,000 kg)
Weight, Empty (typical):	125,000 – 160,000 pounds
Range:	6,000 nmi (9,600 km), unrefueled range for a Hi-Lo-Hi mission with 16 B61 nuclear free-fall bombs 10,000 miles with one aerial refueling.
Payload:	40,000 pounds (18,000 kg)
Crew:	Two pilots
Current Armament:	Nuclear: 16 B61, 16 B83 Conventional: 80 MK82 (500lb), 16 MK84 (2000lb), 34-36 CBU-87, 34-36 CBU-89, 34-36 CBU-97 Precision: 216 GBU-39 SDB (250 lb), 80 GBU-30 JDAM (500 lb), 16 GBU-32 JDAM (2000 lb), GBU-27, GBU-28, GBU-36, GBU-37, AGM-154 HSOW, 8-16 AGM-137 TSSAM, 2 MOP / DSHTW/ Big BLU

(Source: http://www.GlobalSecurity.org/wmd/systems/b-2-s[ecs.html)

GBU-57A/B Massive Ordnance Penetrator (MOP)	Specifications
Weight, total	13,600 kg (slightly less than 30,000 pounds)
Weight, explosive	2,700 kg (6,000 lb)
Length	6m / 20.5 feet
Diameter	31.5 in diameter
Control	Short-span wings and trellis-type tail
Penetration	60 meters (200ft) through 5,000 psi reinforced concrete 40 meters (125 ft) through moderately hard rock 8 meters (25 feet) through 10,000 psi reinforced concrete
Contractors	Boeing, Northrop Grumman
Platforms	B-52, B2
Guidance	GPS aided Inertial Navigation System

Potential US Strike on Iran's Nuclear Facilities

Air Superiority Aircraft Escorting the B2 Bombers could be F-18's off the US 5th Fleet, or could be F-15E/F-16C launched from Forward Area Bases.

These aircraft can also perform all Offensive Counterair Operations:

- Fighter Sweep
- SEAD (Suppression of Enemy Air Defense)
- Interdiction
- Escort

Iranian Defensive Counterair capabilities against a Military Strike

Weakness in the Operational Performance of the Iranian Air Force

- Long C4I Early Warning delay time due to antiquated System, semi-automated man in the loop.
- Long Response / Scramble Time by Combat Aircraft
- Low Operational Readiness Rate of Combat Aircraft
    - o Need Improvement in maintenance operations
    - o Need Improvement in supply of spare parts
- Low Combat Aircraft Sortie Rates, Sustained and Surge.
- High Loss Exchange Ratio in a Closing / BVR Environment and Visual Engagement Environment.
- Centralized Battle Management

Iran's Current Air/Missile Defenses

- U.S. never delivered integrated system before fall of Shah.
- Only modern short-range point defense system is TOR-M.
- Other short-range systems mix of older Russian system, SHORADs, and aging – possible inactive British and French systems.
- Medium to long-range systems are low capability or obsolescent.
- HAWKS and IHAWKs do not have capable ECM. Date back to 1960s and 1970s.
- Various versions of SA-2 obsolete.
- Radar sensor and battle management/C4I systems have major limitations.
- Less than 30 export versions of MiG-29, some not operational.
- F-14s do not have ability to use primary air defense missile since 1979-1980.

(Source: Anthony Cordesman Security Challenges and Threats in the Gulf: A Net Assessment. September 2008)

Air Bases and Air Force Order of Battle (2009)

Three Main Iranian Nuclear Facilities

- Natanz: Uranium Enrichment Facility
- Arak: Heavy Water Nuclear Reactor and Possible Future Plutonium Production Reactor
- Esfahan: Nuclear Research Center. Uranium Conversion Facility (UCF)

Air Bases Source: Global Security.org
Order of Battle Source: Anthony Cordesman and Adam Seitz CSIS "Iranian Weapons of Mass Destruction: The Birth of a regional Nuclear Arms Race". Feb 14, 2009.

	Combat A/C	Attack Helo's
Iran	319	95
Iraq	-	37
Kuwait	50	45
Bahrain	33	16
Qatar	18	25
UAE	184	67
Oman	64	41
Saudi Arabia	278	67
Yemen	79	18

Iran Airbases

Tabriz	F-5E/F, MiG-29
Hamadan	F-4E/D Su-24
Dezful	F-5E/F
Bushehr	F-4E/D F-14
Bandar Abbas	2 Helicopter Wings
Shiraz	Su-25 Su-24
Esfahan	F-5E Su-24
Tehran	MiG-29 Su-24
Zahedan	F-7M
Kermanshah	F-5E/F

Iran Airforce Tactical Fighter Capabilities

Type	No	Operational Readiness (%)	Force Available	Total Sortie Per Day	Postulated Employment
MiG-29A	25	60	15	30	Air Defense/Escort/FS/BAS
Su-25	13	60	8	16	CAS/BI/Deep Strike
SU-24	30	60	18	36	CAS/BI/Deep Strike
F-14	25	60	15	30	Air Defense/FS CAS/BI/Deep
F-4E/D	65	69	39	78	Strike/SEAD
Total	158		95	190	

BAS: Battlefield Air Superiority
CAS: Close Air Support
BI: Battlefield Interdiction
DS: Defense Suppression
FS: Fighter Sweep
SEAD: Suppression of Enemy Air Defense

Sustained Conditions : 12 hr Operational Day
18 hr Maintenance Day
2 Sorties per Aircraft per day

Iran Force Allocation Matrix

A/C	Order of Battle	Force Available	Total Sorties	CAP	Maximum SLI	Runway Strike	SEAD	Escort	FS	Left for other Mission
MiG-29	25	15	30	12	3					0
SU-25	13	8	16							8
SU-24	30	18	36				8			10
F-14	25	15	30	12	3					0
F-4E/D	65	39	78		32		7			0
Total	158	95	190	24	38		15			18

BAS: Battlefield Air Superiority
CAS: Close Air Support
BI: Battlefield Interdiction
DS: Defense Suppression
FS: Fighter Sweep
SEAD: Suppression of Enemy Air Defense

Aircraft Operational Readiness Rate: 60%
Sorties per Aircraft per Day: 2

Possible Iranian Response

Iran Military Doctrine:

- Since Iran presently does not have access to high technology military weapon systems, it will need to develop all ranges of Ballistic Missiles to compensate for its deficiencies in conventional forces.
- Iran has no problem in Strategic Depth, can be an advantage fighting in and over familiar territory. Force Structure Planning based on:
    - High attrition rate inflicted on adversary civilians
    - In depth defenses, as Iran has the strategic depth

Tactical Ballistic Missiles Threat:

- Iran's ballistic missiles cover the complete spectrum range from150 km up to 5,500 km, the Short, Medium, and Intermediate Ranges of Ballistic Missiles. Iran believes that these will compensate for any deficiencies in its Air Power.
- Ballistic Missiles can be used with success against Soft Targets, in open areas and cities to inflict maximum human casualties and create terror. In essence what is considered as a major component in Asymmetric Warfare in the form of high civilian casualties.
- This arsenal of Ballistic Missiles possessed by Iran has been declared to be for defensive purposes against any foreign invasion, in particular against the U.S.
- However, it has become very clear that it is an arsenal that is intended to inflict maximum casualties and damage, in essence a major component for Asymmetric Warfare in the form of high attrition and defenses in depth and to compensate for any deficiencies in its Air Power.

Iran

SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
Shahab-1	Shahab-3	Shahab-5	Shahab-6
Shahab-2	Shahab-4	-	-
Mushak-120	Ghadr-101	-	-
Mushak-160	Ghadr-110	-	-
Mushak-200	IRIS	-	-
-	Sajil	-	-

Syria

SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
SCUD-B	-	-	-
SCUD-C	-	-	-
SCUD-D	-	-	-
SS-21b	-	-	-

Israel

SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
-	Jericho II	-	Jericho III

Pakistan

SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
Shaheen I	Shaheen II	-	-
Hatf I	Ghauri I	-	-
Hatf II	Ghauri II	-	-
Hatf III	Ghauri II	-	-
M-11	-	-	-

India

SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
Agni I	Agni II	Agni III	Surya
Prithvi I			
Prithvi II			

States with Nuclear Weapons

Israel	Pakistan	India	Iran (Potential)

Iran is the only state between the four that has signed and ratified the NPT Treaty.

Iran has been heavily investing in:

- Precision Strike Munitions
- Naval-anti-ship weapons such as the Chinese C802 that hit the Israeli Navy ship during the 2006 war in Lebanon and the Ra'ad 350 km anti-ship missile.
- Ballistic Missiles
- Cruise Missiles such as the Kh55 Russian land attack cruise missile, effective against Oil Platforms.

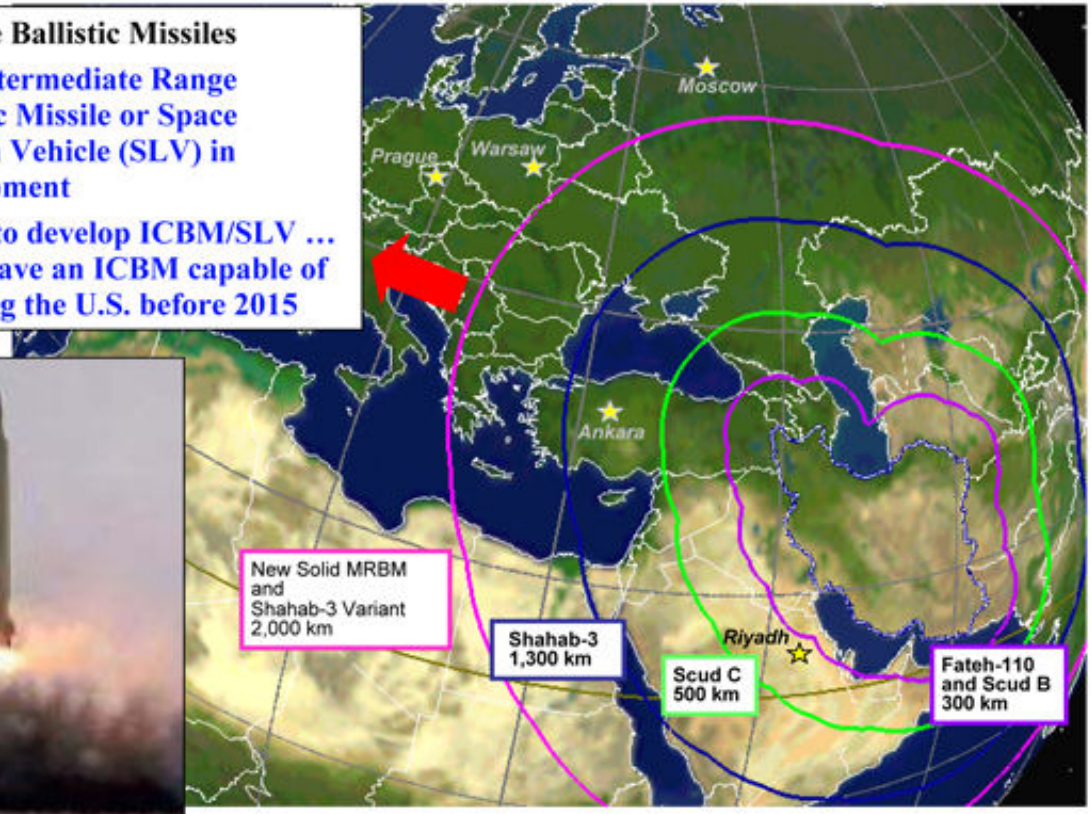
Iran Ballistic Missiles

Designation	Progenitor Missiles	Class	Propellant	Payload (kg)	Range (km)	Estimated CEP
Mushak-120	CSS-8, SA-2	SRBM	Solid	500	130	130 m
Mushak-160	CSS-8, SA-2	SRBM	Liquid	500	160	160 m
Mushak-200	SA-2	SRBM	Liquid	500	200	200
Shahab-1	N. Korean SCUD B	SRBM	Liquid	987-1,000	300	450
Shahab-2	N Korean SCUD C	SRBM	Liquid	750-989	500	700
Shahab-3	N. Korea Nodong-1	MRBN	Liquid	760-1,158	1,300	1,300 m
Shahab-4	N. Korea Taep'o-dong-1	MRBM	Liquid	1,040-1,500	3,000	3,000 m
Ghadr 101	Pakistan Shaheen-1	MRBM	Solid	NA	2,500	2,500 m
Ghadr 110	Pakistan Shaheen-2	MRBM	Solid	NA	3,000	3,000 m
IRIS	China M-18	MRBM	Solid	760-1,158	3,000	3,000 m
Kh-55	Soviet AS-15 Kent	MRBM	Jet Engine	200kgt nuclear	2,900-3,000	2,900 – 3,000 m
Shahab-5	N. Korea Taep'o-dong-2	IRBM	Liquid	390-1,000	5,500	5,500 m
Shahab-6	N. Korea Taep'	ICBM	Liquid	270-1,220	10,000	10 km

(Source: Anthony Cordesman. CSIS)

Iranian Ballistic Missile Threat

- **Long-Range Ballistic Missiles**
  - New Intermediate Range Ballistic Missile or Space Launch Vehicle (SLV) in development
  - Likely to develop ICBM/SLV … could have an ICBM capable of reaching the U.S. before 2015

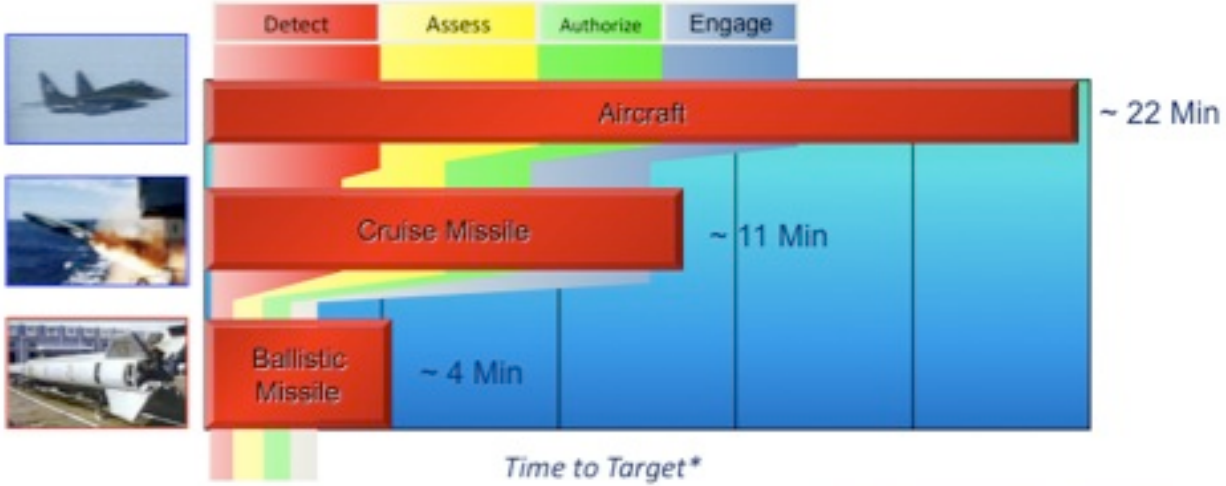


Shehab 3/3A

Range (km)	Payload (kg)
1,350	1,158
1,400	987
1,500	760
1,540	650
1,560	590.27
1,580	557.33
1,600	550
1,780	240
2,000	-

(Source: Missile Defense Program Overview for the European Union, Committee on Foreign Affairs, Subcommittee on Security and Defense. Dr. Patricia Sanders. Executive Director. Missile Defense Agency)

Missile Defense Challenge



* Based on Approximate Range of 320 Km

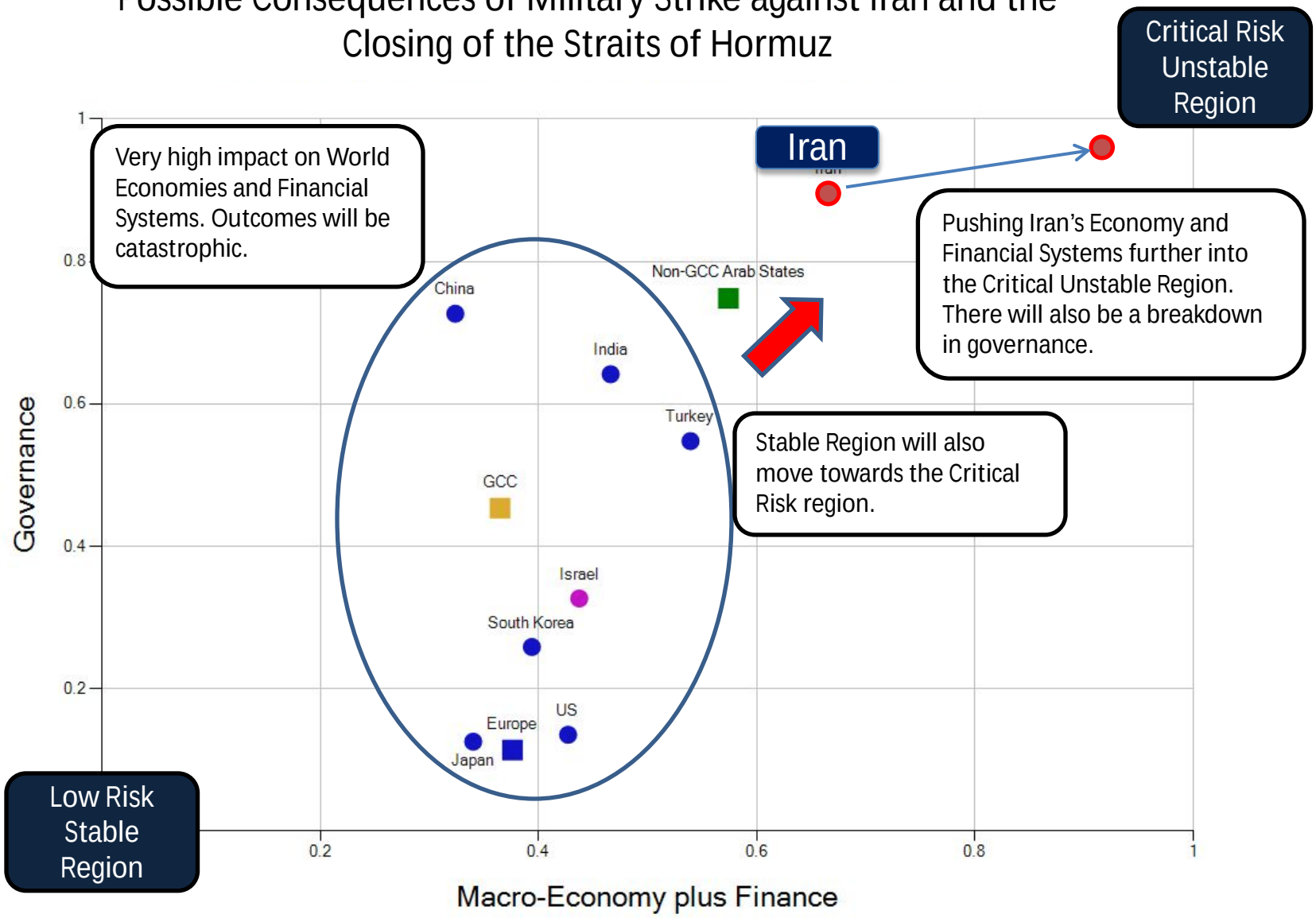
Responsive Missile Defense System is Crucial

(Dennis Cavin, "Counterforce Capabilities Against Cruise and Ballistic Missiles", MEMAD 14 & 15 December, 2008)

Range (Km)	Class	Burn-out velocity (km/sec)	Boost Phase (sec)	Flight Time (min)
120	SRBM	1.0	16	2.7
500	SRBM	2.0	36	6.1
1,000	SRBM	2.9	55	8.4
2,000	MRBM	3.9	85	11.8
3,000	MRBM	4.7	122	14.8

Ballistic Missile War between Iran the U.S. and the GCC States

Possible Consequences of Military Strike against Iran and the Closing of the Straits of Hormuz



Appendix 1

Price Elasticity of Demand = % Change in Demand / % Change in Price

Estimates of Demand Elasticities

Study	Product	Method	short-run price elasticity	long-run price elasticity	long-run income elasticity
Dahl and Sterner (1991)	gasoline	literature survey	-0.26	-0.86	1.21
Espey (1998)	gasoline	literature survey	-0.26	-0.58	0.88
Graham and Glaister (2004)	gasoline	literature survey	-0.25	-0.77	0.93
Brons, et. al. (2008)	gasoline	literature survey	-0.34	-0.84	---
Dahl (1993)	oil (developing countries)	literature survey	-0.07	-0.30	1.32
Cooper (2003)	oil (average of 23 countries)	annual time-series regression	-0.05	-0.21	---

(Reference: James D. Hamilton. Understanding Crude oil Prices. National Bureau of Economic Research. Working Paper 14492. November 2008.)

Demand for crude oil

	Oil consumption % growth per capita	Real GDP % growth per capita	Price elasticity Short-run	Long-run
Australia	*–0.3*	*1.7*	–0.034	–0.068
Austria	*–0.7*	*3.1*	–0.059	–0.092
Canada	*–1.3*	*1.6*	–0.041	–0.352
China	*3.6*	*8.6*	0.001	0.005
Denmark	*–2.5*	*1.5*	–0.026	–0.191
Finland	*–1.2*	*2.1*	–0.016	–0.033
France	*–1.5*	*1.7*	–0.069	–0.568
Germany	*–1.4*	*1.2*	–0.024	–0.279
Greece	*2.2*	*1.5*	–0.055	–0.126
Iceland	*0.5*	*2.2*	–0.109	–0.452
Ireland	*0.2*	*3.9*	–0.082	–0.196
Italy	*–0.4*	*2.2*	–0.035	–0.208
Japan	*–1.0*	*8.1*	–0.071	–0.357
Korea	*8.3*	*6.4*	–0.094	–0.178
Netherlands	*–0.5*	*1.7*	–0.057	–0.244
New Zealand	*–0.4*	*1.4*	–0.054	–0.326
Norway	*0.2*	*2.9*	–0.026	–0.036
Portugal	*3.0*	*2.9*	0.023	0.038
Spain	*1.3*	*2.1*	–0.087	–0.146
Sweden	*1.3*	*2.8*	–0.043	–0.289
Switzerland	*–0.7*	*0.9*	–0.030	–0.056
United Kingdom	*–1.1*	*2.0*	–0.068	–0.182
Unites States of America	*–0.7*	*2.0*	–0.061	–0.453

The calculations for China and South Korea are based on the period 1979–2000.

(Reference : Price Elasticity of Demand for Crude Oil Estimates for 23 Countries. OPEC John C.B. Cooper. March 2003.)

Appendix 2

Risk Factors Considered in the construction of the MENA Risk Landscape

Economic:

1. Current Account as % of GDP
2. External Debt as % of GDP
3. Government Budget as % of GDP
4. Gross Government Debt as % of GDP
5. National Saving as % of GDP
6. Industrial Growth Rate as % of GDP
7. Inflation Change
8. Labor as % of Population
9. Total Investment as % of GDP
10. Unemployment as % of Labor
11. Interest Rate Spread
12. Credit Rating
13. Value of Oil Import as % of GDP

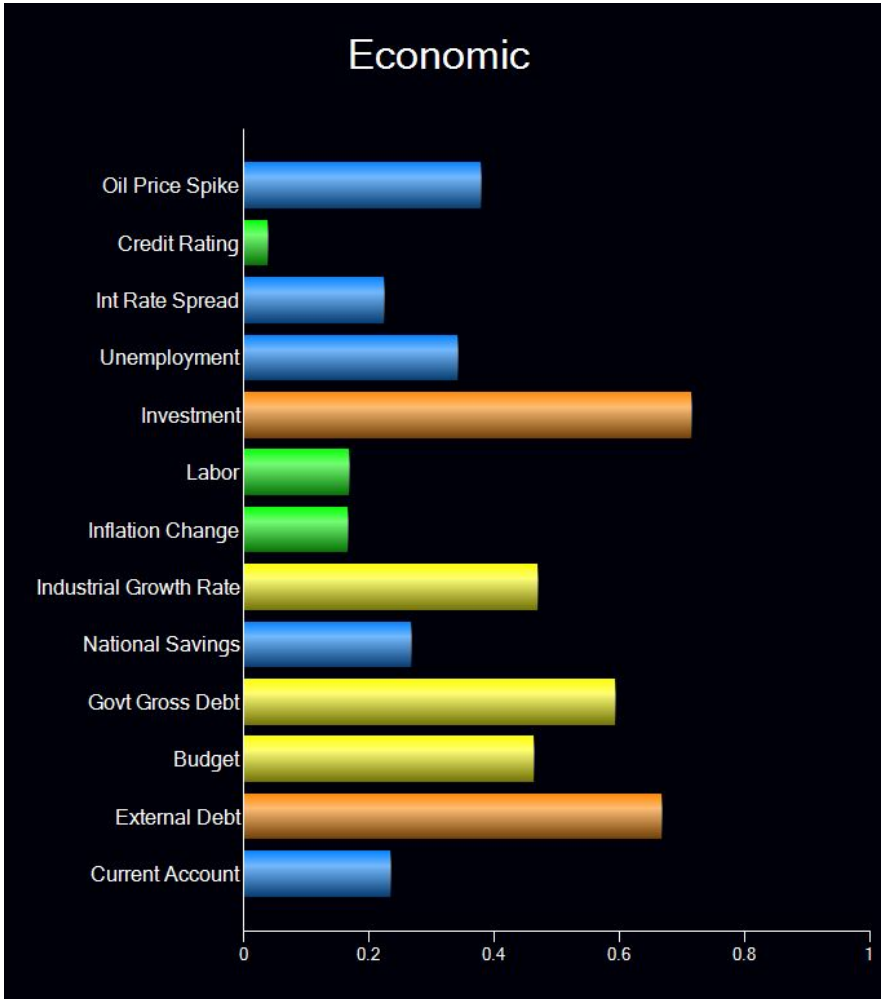
Finance:

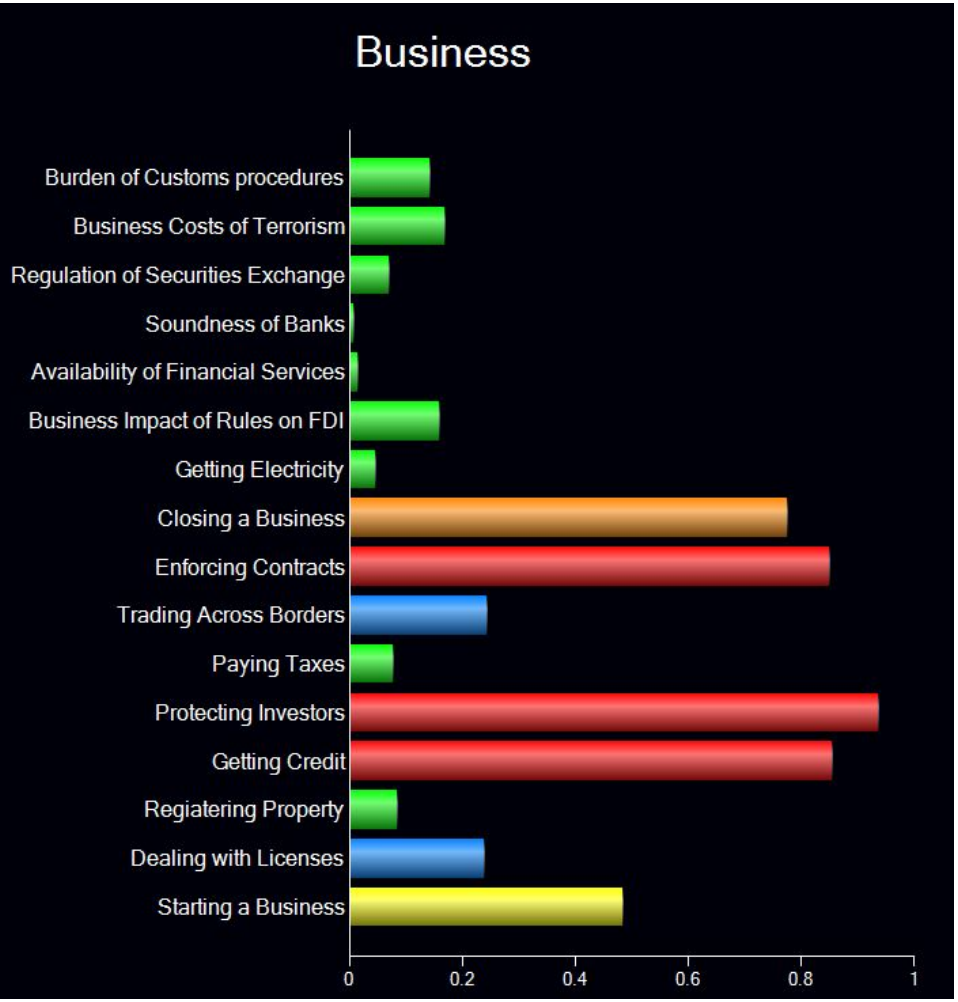
1. Staring a Business
2. Dealing with Licenses
3. Registering Property
4. Getting Credit
5. Protecting Investors
6. Paying Taxes
7. Trading Across Borders
8. Enforcing Contracts
9. Closing a Business
10. Getting Electricity
11. Business Impact of Rules on FDI
12. Availability of Financial Services
13. Soundness of Banks
14. Regulation of Securities Exchange
15. Business Costs of terrorism
16. Burden of Customs procedures

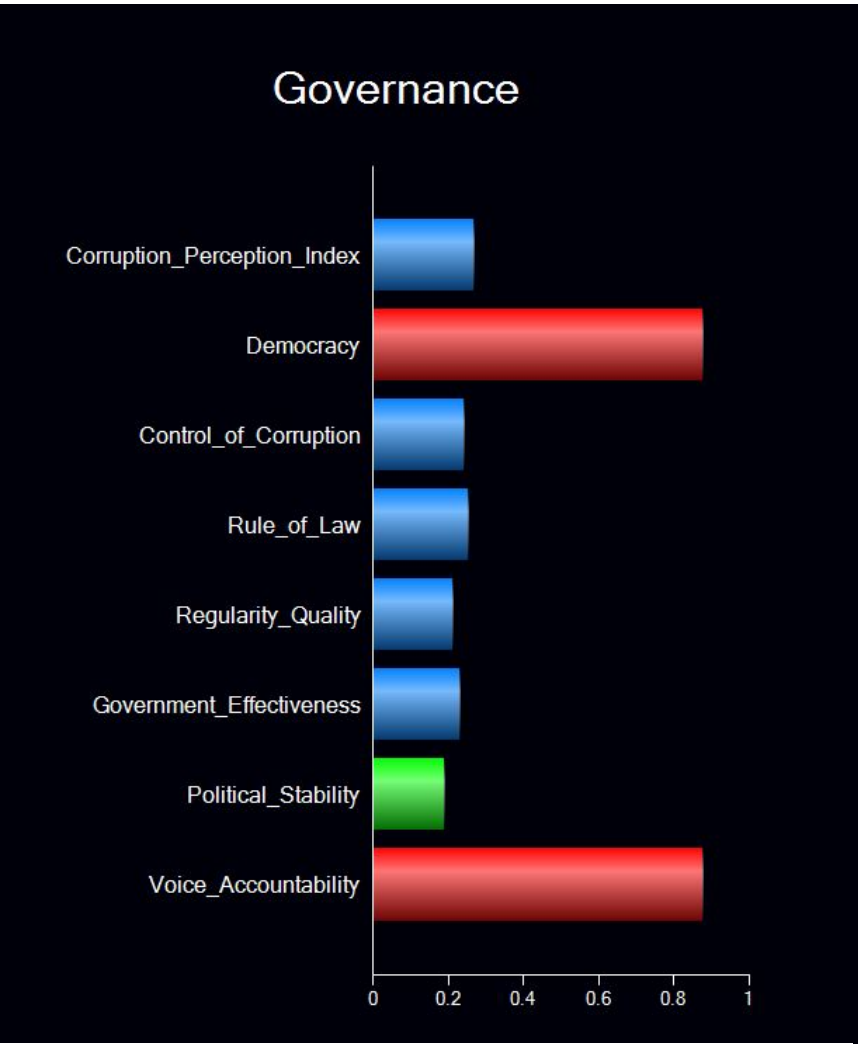
Governance:

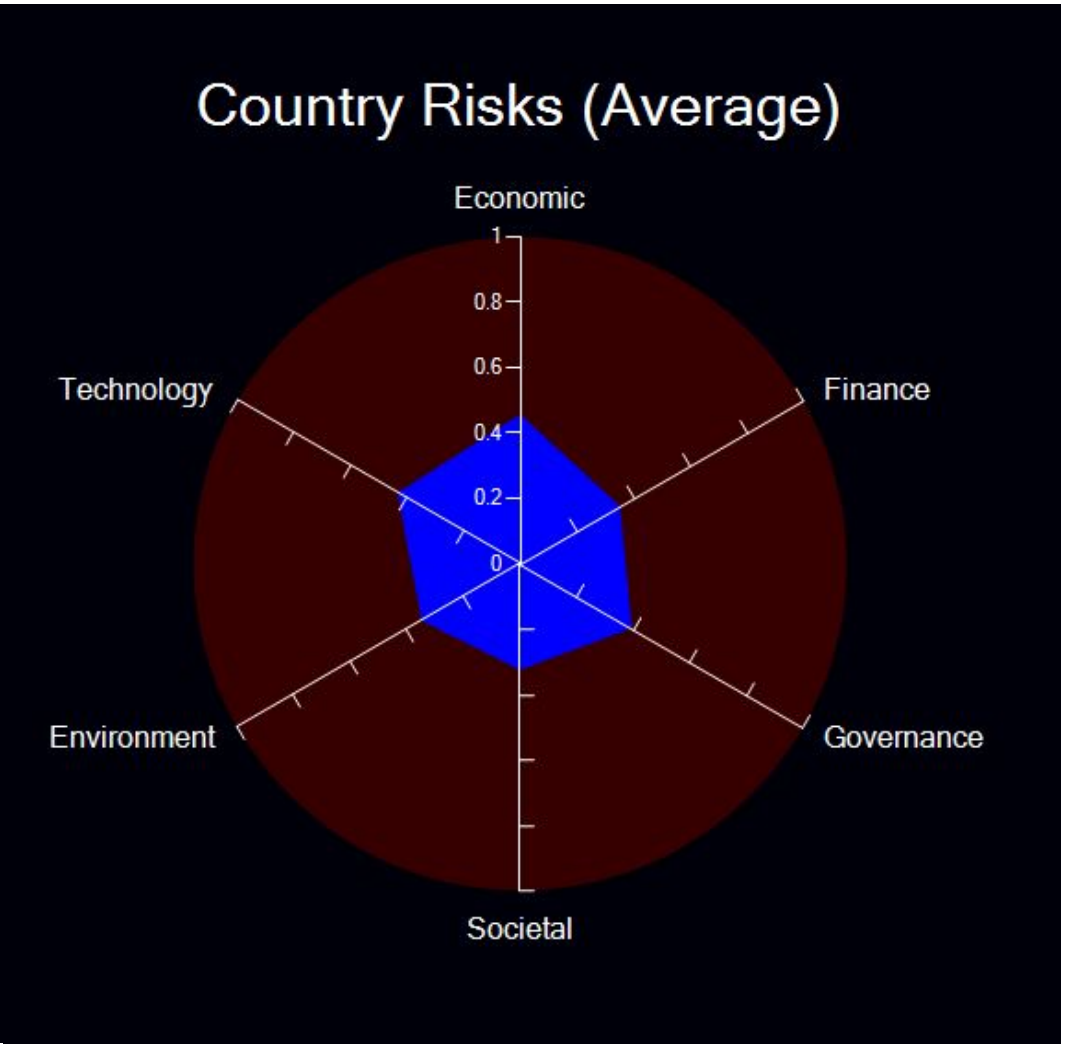
1. Voice and Accountability
2. Political Stability & Absence of Violence/Terrorism
3. Government Effectiveness
4. Regulatory Quality
5. Rule of Law
6. Control of Corruption
7. Democracy Index
8. Corruption Perception Index

Sources:
Economic : IMF World Economic Outlook Data September 2011
Finance: World Bank Doing Business Report 2012
Governance: World Governance Indicators, 2011 Update www.govindicators.org
World Economic Forum. The Global Competitiveness Report 2011 – 2012
World Economic Forum: Global Risks 2012. Seventh Edition. An Initiative of the Risk Response Network
Economist Intelligence Unit, Democracy Index
Transparency International. Corruption Perception Index


Economic
Oil Price Spike
Credit Rating
Int Rate Spread
Unemployment
Investment
Labor
Inflation Change
Industrial Growth Rate
National Savings
Govt Gross Debt
Budget
External Debt
Current Account
0
0.2
0.4
0.6
0.8
1


Business
Burden of Customs procedures
Business Costs of Terrorism
Regulation of Securities Exchange
Soundness of Banks
Availability of Financial Services
Business Impact of Rules on FDI
Getting Electricity
Closing a Business
Enforcing Contracts
Trading Across Borders
Paying Taxes
Protecting Investors
Getting Credit
Regiatering Property
Dealing with Licenses
Starting a Business
0
0.2
0.4
0.6
0.8
1


Governance
Corruption_Perception_Index
Democracy
Control_of_Corruption
Rule_of_Law
Regularity_Quality
Government_Effectiveness
Political_Stability
Voice_Accountability
0
0.2
0.4
0.6
0.8
1


Country Risks (Average)
Economic
Finance
Governance
Societal
Environment
Technology
1
0.8
0.6
0.4
0.2
0