



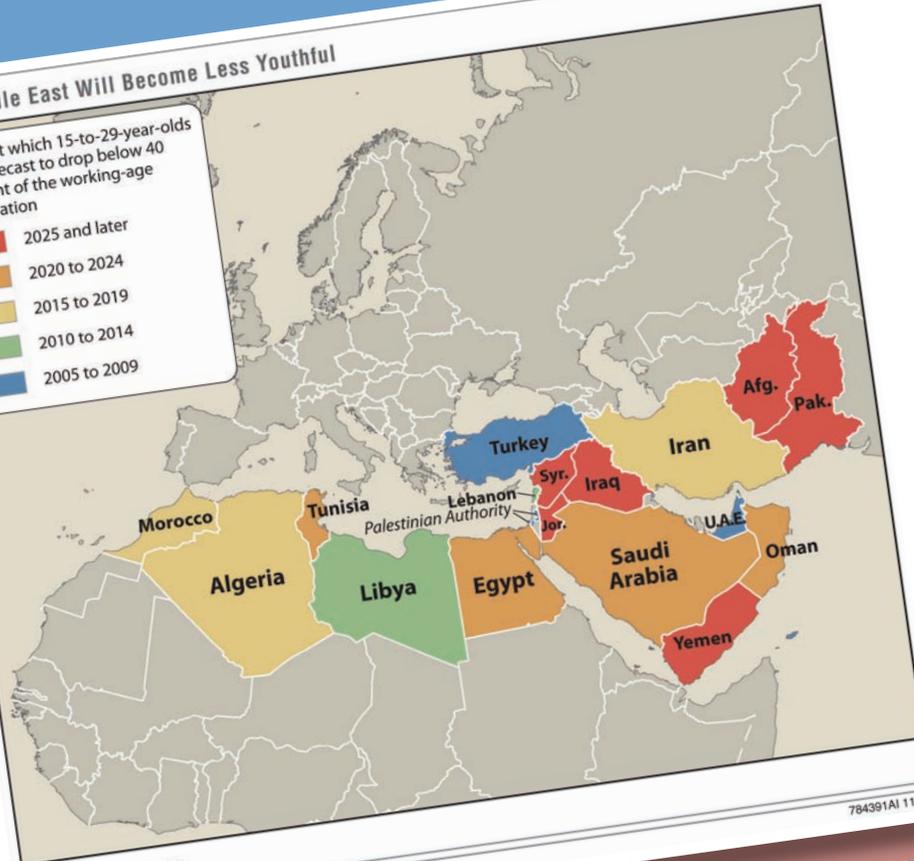
GLOBAL TRENDS 2025: A TRANSFORMED WORLD



The Middle East Will Become Less Youthful

Years at which 15-to-29-year-olds are forecast to drop below 40 percent of the working-age population

- 2025 and later
- 2020 to 2024
- 2015 to 2019
- 2010 to 2014
- 2005 to 2009



Source: US Census data.

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CHAPTER 2

THE DEMOGRAPHICS OF DISCORD

Trends in birth, death, and migration are changing the absolute and relative size of young and old, rural and urban, and ethnic majority and minority populations within and among emerging and established powers. These demographic reconfigurations will offer social and economic opportunities for some powers and severely challenge established arrangements in others. The populations of more than 50 countries will increase by more than a third (some by more than two-thirds) by 2025, placing additional stresses on vital natural resources, services, and infrastructure. Two-thirds of these countries are in Sub-Saharan Africa; most of the remaining fast-growing countries are in the Middle East and South Asia.

Populations Growing, Declining, and Diversifying—at the Same Time

World population is projected to grow by about 1.2 billion between 2009 and 2025—from 6.8 billion to around 8 billion people. Although the global population increase is substantial—with concomitant effects on resources—the rate of growth will be slower than it was, down from levels that added 2.4 billion persons between 1980 and today. Demographers project that Asia and Africa will account for most of the population growth out to 2025 while less than 3 percent of the growth will occur in the “West”—Europe, Japan, the United States, Canada, Australia, and New Zealand. In 2025, roughly 16 percent of humanity will live in the West, down from the 18 percent in 2009 and 24 percent in 1980.

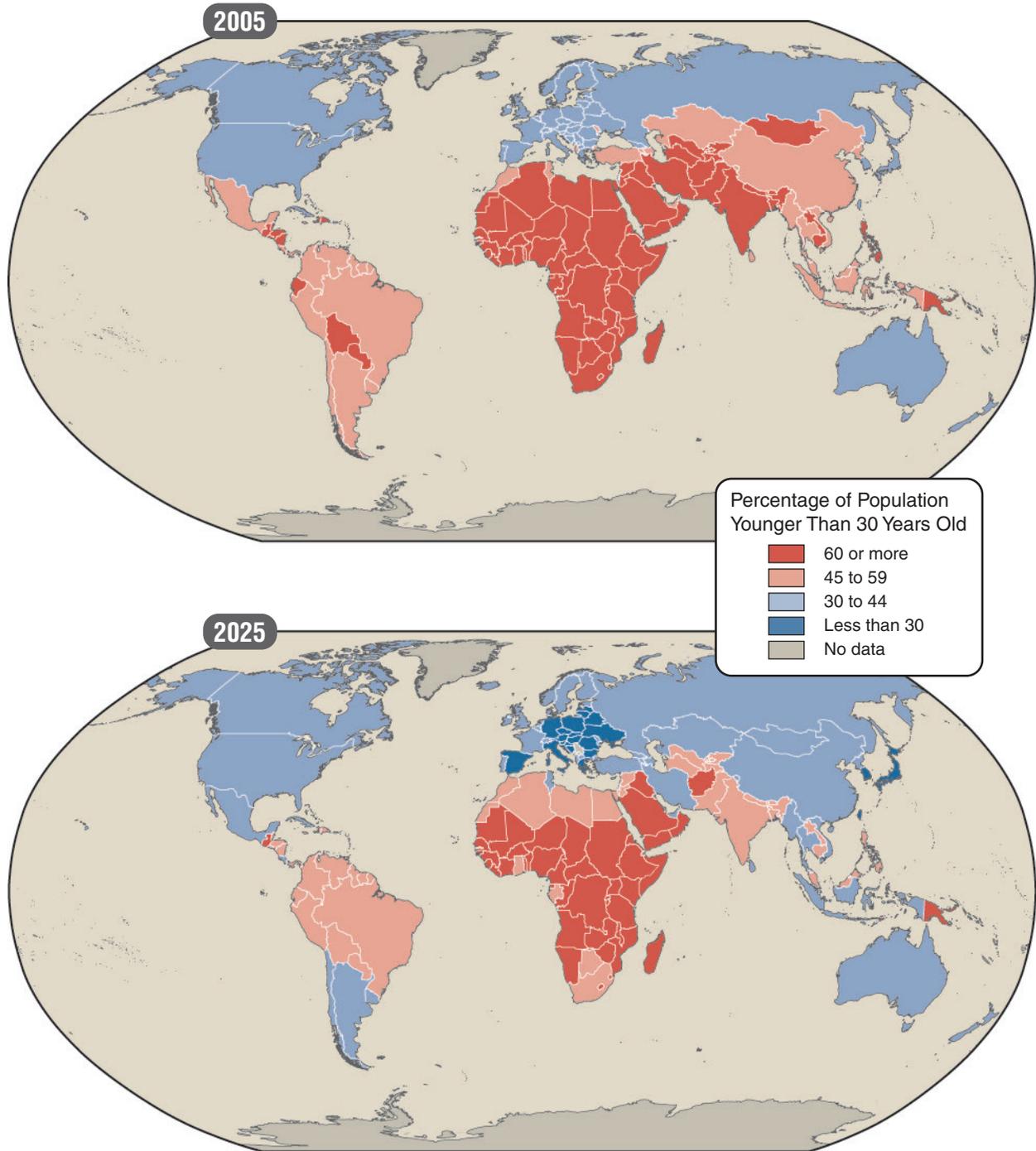
- The largest increase will occur in India, representing about one-fifth of all growth. India’s population is projected to climb by around 240 million by 2025, reaching approximately 1.45 billion people. From 2009 to 2025, Asia’s other giant, China, is projected to add more than 100 million to

its current population of over 1.3 billion. (See graphic on page 22.)

- In aggregate, the countries of Sub-Saharan Africa are projected to add about 350 million people during the same period, while those in Latin America and the Caribbean will increase by about 100 million.
- Between now and 2025, Russia, Ukraine, Italy, almost all countries in Eastern Europe, and Japan are expected to see their populations decline by several percent. These declines could approach or exceed 10 percent of the current populations in Russia, Ukraine, and a few other Eastern European countries.
- The populations of the US, Canada, Australia, and a few other industrial states with relatively high immigration rates will continue to grow—the US by more than 40 million, Canada by 4.5 million, and Australia by more than 3 million.

By 2025, the already diverse array of national population age structures promises to be more varied than ever, and the gap between the youngest and oldest profiles will continue to widen. The “oldest” countries—those in which people under age 30 form less than one-third of the population—will mark a band across the northern edge of the world map. In contrast, the “youngest” countries, where the under-30 group represents 60 percent of the population or more, will nearly all be located in Sub-Saharan Africa. (See maps on page 20.)

World Age Structure, 2005 and Projected 2025



Source: US Census data.

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The Pensioner Boom: Challenges of Aging Populations

Population aging has brought today's developed countries—with a few exceptions such as the US—to a demographic “*tipping point*.” Today, nearly 7 out of every 10 people in the developed world are in the traditional working years (ages 15 to 64)—a high-tide mark. This number has never before been so high and, according to experts, in all likelihood will never be so high again.

In almost every developed country, the period of most rapid growth in the ratio of seniors (age 65 and older) to the working-age population will occur during the 2010s and 2020s, boosting the fiscal burden of old-age benefit programs. By 2010, there will be about one senior for every four working-age people in the developed world. By 2025, this ratio will have climbed to one to three, and possibly higher.

- Japan is in a difficult position: its working-age population has been contracting since the mid-1990s and its overall population since 2005. Today's projections envision a society in which, by 2025, there will be one senior for every two working-age Japanese.
- The picture for Western Europe is more mixed. The UK, France, Belgium, the Netherlands, and the Nordics will likely maintain the highest fertility rates in Europe but will remain below two children per woman. In the rest of the region, fertility probably will stay below 1.5 children per woman, on par with Japan (and well below the replacement level of 2.1 children per woman).

Large and sustained increases in the fertility rate, even if they began now, would not reverse the aging trend for decades in Europe and Japan. If fertility rose immediately to the

replacement level in Western Europe, the ratio of seniors to people in their working years would continue to rise steadily through the late 2030s. In Japan, it would continue to rise through the late 2040s.

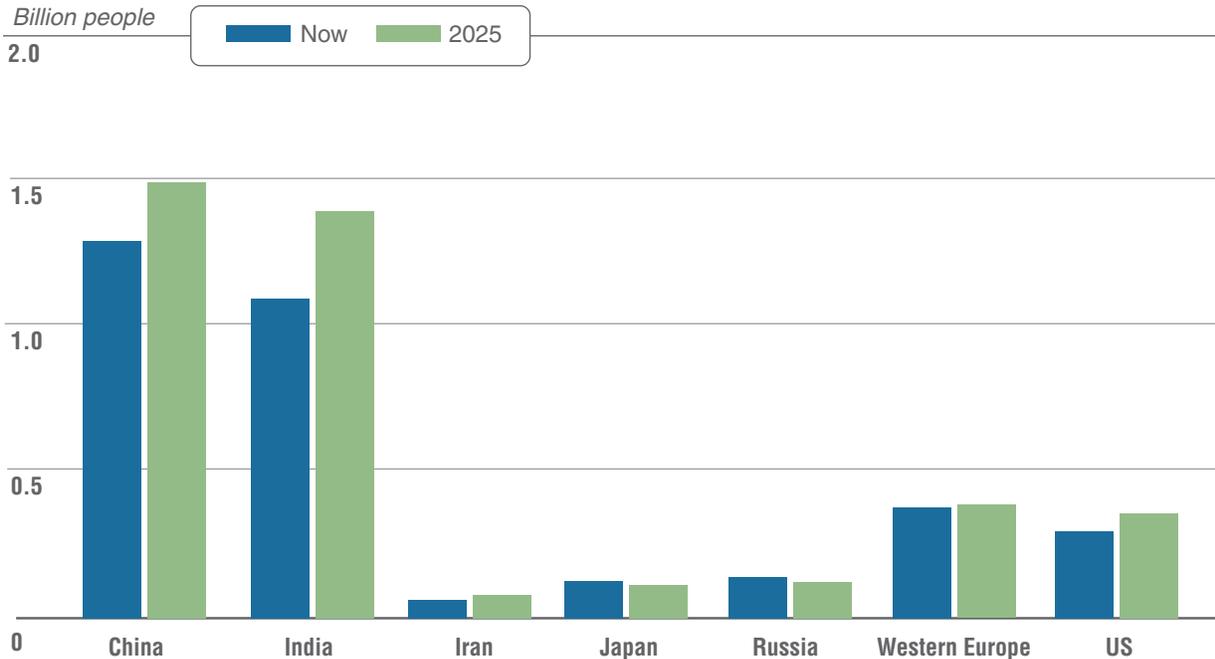
The annual level of net immigration would have to double or triple to keep working-age populations from shrinking in Western Europe. By 2025, non-European minority populations could reach significant proportions—15 percent or more—in nearly all Western European countries and will have a substantially younger age structure than the native population (see page 20). Given growing discontent with current levels of immigrants among native Europeans, such steep increases are likely to heighten tensions.

The aging of societies will have economic consequences. Even with productivity increases, slower employment growth from a shrinking work force probably will reduce Europe's already tepid GDP growth by 1 percent. By the 2030s, Japan's GDP growth is projected to drop to near zero according to some models. The cost of trying to maintain pensions and health coverage will squeeze out expenditures on other priorities, such as defense.

Persistent Youth Bulges

Countries with youthful age structures and rapidly growing populations form a crescent stretching from the Andean region of Latin America across Sub-Saharan Africa, the Middle East and the Caucasus, and then through the northern parts of South Asia. By 2025, the number of countries in this “arc of instability” will have decreased by 35 to 40 percent owing to declining fertility and maturing populations. Three quarters of the three dozen “youth bulge countries” projected to linger beyond 2025 will be located in Sub-Saharan Africa. The remainder will be

Total Population



Source: US Census Data

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located in the Middle East and scattered across Asia and among the Pacific Islands.

- The emergence of new economic tigers by 2025 could occur where youth bulges mature into “worker bulges.” Experts argue that this demographic bonus is most advantageous when the country provides an educated work force and a business-friendly environment for investment. Potential beneficiaries include Turkey, Lebanon, Iran, and the Maghreb states of North Africa (Morocco, Algeria and Tunisia), Colombia, Costa Rica, Chile, Vietnam, Indonesia, and Malaysia.
- The current youth bulges in the Maghreb states, Turkey, Lebanon, and Iran will diminish rapidly but those in the West Bank/Gaza, Iraq, Yemen, Saudi Arabia

and adjacent Afghanistan and Pakistan will persist through 2025. Unless employment conditions change dramatically, youth in weak states will continue to go elsewhere—externalizing volatility and violence.

The populations of already parlous youth-bulge states—such as Afghanistan, Democratic Republic of Congo (DROC), Ethiopia, Nigeria, Pakistan, and Yemen—are projected to remain on rapid-growth trajectories. Pakistan’s and Nigeria’s populations are each projected to grow by about 55 million people. Ethiopia and DROC will likely add about 40 million each, while the populations of Afghanistan and Yemen are projected to grow more than 50 percent larger than today’s. All will retain age structures with large proportions of young

The Impact of HIV/AIDS

Neither an effective HIV vaccine nor a self-administered microbicide, even if developed and tested before 2025, will likely be widely disseminated by then. Although prevention efforts and local behavioral changes will depress infection rates globally, experts expect HIV/AIDS to remain a global pandemic through 2025 with its epicenter of infection in Sub-Saharan Africa. Unlike today, the vast majority of people living with HIV will have access to life-extending anti-retroviral therapies.

- If prevention efforts and effectiveness remain at current levels, the HIV-positive population is expected to climb to around 50 million by 2025—up from 33 million today (22 million in Sub-Saharan Africa). In this scenario, 25 million to 30 million people would need anti-retroviral therapy to survive during 2025.
- In another scenario assuming fully scaled-up prevention by 2015, the HIV-infected population would peak and then fall to near 25 million worldwide by 2025, bringing the number needing anti-retroviral therapy to between 15 and 20 million people.

adults, a demographic feature that is associated with the emergence of political violence and civil conflict.

Changing Places: Migration, Urbanization and Ethnic Shifts

Moving Experiences. The net migration of people from rural to urban areas and from poorer to richer countries likely will continue apace in 2025, fueled by a widening gap in economic and physical security between adjacent regions.

- Europe will continue to attract migrants from younger, less developed, and faster growing African and Asian regions nearby. However, other emerging centers of industrialization—China and southern India and possibly Turkey and Iran—could attract some of this labor migration as growth among their working-age populations slows and wages rise.
- Labor migration to the United States probably will slow as Mexico's industrial base grows and its population ages—a response to rapid fertility declines in the 1980s and 1990s—and as competing centers of development arise in Brazil and the southern cone of South America.

Urbanization. If current trends persist, by 2025 about 57 percent of the world's population will live in urban areas, up from about 50 percent today. By 2025, the world will add another eight megacities to the current list of 19—all except one of these eight will be in Asia and Sub-Saharan Africa. Most urban growth, however, will occur in smaller cities of these regions, which are expanding along highways and coalescing near crossroads and coastlines, often without formal sector job growth and without adequate services.

Identity Demography. Where ethno-religious groups have experienced their transition to lower birth rates at varying paces, lingering ethnic youth bulges and shifts in group proportions could trigger significant political changes. Shifts in ethno-religious composition resulting from migration also could fuel political change, particularly where immigrants settle in low-fertility industrialized countries.

- Differing rates of growth among Israel's ethnic communities could abet political shifts in the Knesset (Israel's parliament).

By 2025, Israeli Arabs, who currently comprise a fifth of the population, will comprise about a quarter of Israel's expected population of nearly 9 million. Over the same period, Israel's ultra-orthodox Jewish community could nearly double, becoming larger than 10 percent of the population.

- Irrespective of their political status in 2025, the populations of the West Bank, currently about 2.6 million people, and Gaza, now at 1.5 million, will have grown substantially: the West Bank by nearly 40 percent; Gaza by almost 60 percent. Their combined population in 2025—still youthful, growing, and approaching 6 million (or exceeding that figure, according to some projections)—promises to introduce further challenges to institutions hoping to generate adequate employment and public services, maintain sufficient availability of fresh water and food, and achieve political stability.

A number of other ethnic shifts between now and 2025 will have regional implications. For example, growing proportions of Native Americans in several Andean and Central American democracies are likely to continue to push governments in those countries toward populism. In Lebanon, ongoing fertility decline in the Shiite population, which currently lags ethnic neighbors in income and exceeds them in family size, will bring about a more mature age structure in this community—and could deepen Shiite integration into the mainstream of Lebanese economic and political life, easing communal tensions.

Western Europe has become the destination of choice for more than one million immigrants annually and home for more than 35 million foreign born—many from Muslim-majority countries in North Africa, the Middle

East, and South Asia (see box on page 25). Immigration and integration politics, and confrontations with Muslim conservatives over education, women's rights, and the relationship between the state and religion are likely to strengthen right-of-center political organizations and splinter the left-of-center political coalitions that were instrumental in building and maintaining Europe's welfare states.

By 2025, international migration's human capital and technological transfer effects will begin to favor the most stable Asian and Latin American countries. Although the emigration of professionals probably will continue to deprive poor and unstable countries across Africa and parts of the Middle East of talent, the likely return of many wealthy and educated Asian and Latin Americans from the US and Europe will help boost the competitiveness of China, Brazil, India, and Mexico.

Demographic Portraits: Russia, China, India, and Iran

Russia: A Growing Multiethnic State?

Currently a country with around 141 million people, Russia's demographically aging and declining population is projected to drop below 130 million by 2025. The chances of stemming such a steep decline over this period are slim: the population of women in their 20s—their prime childbearing years—will be declining rapidly, numbering around 55 percent of today's count by 2025.

Russia's high rate of male middle-age mortality is unlikely to change dramatically. Muslim minorities that have maintained higher fertility will comprise larger proportions of the Russian population, as will Turkic and Chinese immigrants. According to some more conservative projections, the Muslim minority share of Russia's population will rise from 14 percent in 2005 to 19

Muslims in Western Europe

Western Europe's Muslim population currently totals between 15 and 18 million. The largest proportions of Muslims—between 6 and 8 percent—are in France (5 million) and the Netherlands (nearly 1 million), followed by countries with 4 to 6 percent: Germany (3.5 million), Denmark (300,000), Austria (500,000), and Switzerland (350,000). The UK and Italy also have relatively large Muslim populations, 1.8 million and 1 million respectively, though constituting less overall proportions (3 percent and 1.7 percent respectively). If current patterns of immigration and Muslim residents' above-average fertility continue, Western Europe could have 25 to 30 million Muslims by 2025.

Countries with growing numbers of Muslims will experience a rapid shift in ethnic composition, particularly around urban areas, potentially complicating efforts to facilitate assimilation and integration. Economic opportunities are likely to be greater in urban areas, but, in the absence of growth in suitable jobs, the increasing concentration could lead to more tense and unstable situations, such as occurred with the 2005 Paris suburban riots.

Slow overall growth rates, highly regulated labor markets, and workplace policies, if maintained, will make it difficult to increase job opportunities, despite Europe's need to stem the decline of its working-age population. When coupled with job discrimination and educational disadvantage, these factors are likely to confine many Muslims to low-status, low-wage jobs, deepening ethnic cleavages. Despite a sizeable stratum of integrated Muslims, a growing number—driven by a sense of alienation, grievance, and injustice—are increasingly likely to value separation in areas with Muslim-specific cultural and religious practices.

Although immigrant communities are unlikely to gain sufficient parliamentary representation to dictate either domestic or foreign policy agendas by 2025, Muslim-related issues will be a growing focus and shaper of the European political scene. Ongoing societal and political tension over integration of Muslims is likely to make European policymakers increasingly sensitive to the potential domestic repercussions of any foreign policies for the Middle East, including aligning too closely with the US on policies seen as pro-Israeli.

percent in 2030, and 23 percent in 2050. In a shrinking population, the growing proportion that are not Orthodox Slavs will likely provoke a nationalist backlash. Because Russia's fertility and mortality problems are likely to persist through 2025, Russia's economy—unlike Europe's and Japan's—will have to support the large proportion of dependents.

Antique China? By 2025, demographers expect China to have almost 1.4 billion people, nearly 100 million above its current

population. The advantageous condition of having a relatively large working population and small proportions of both old-age and childhood dependents will begin to fade around 2015, when the size of China's working-age population will start to decline. Demographic aging—the onset of larger proportions of retirees and relatively fewer workers—is being accelerated by decades of policies that have limited childbirth and by a tradition of early retirement. By opting to slow population growth dramatically in order to dampen growing demand for energy, water,

and food, China is hastening the aging of its population. By 2025, a large proportion of China's population will be retired or entering retirement. Although China may over time reverse its restrictive policies on childbearing to achieve birth cohorts more closely balancing infant girls and boys, marriage-age adults in 2025 will still experience a significant male-dominated imbalance that will create a large pool of unmarried males.

Two Indias. India's current fertility rate of 2.8 children per woman masks vast differences between the low-fertility states of South India and the commercial hubs of Mumbai, Delhi, and Kolkata on the one hand, and the higher rates of populous states in the so-called Hindi-speaking belt across the north, where women's status is low and services lag. Largely owing to growth in India's densely populated northern states, its population is projected to overtake China's around 2025—just as China's population is projected to peak and begin a slow decline.

By then, India's demographic duality will have widened the gap between north and south. By 2025, much of India's work force growth will come from the most poorly educated, impoverished, and crowded districts of rural northern India. Although North Indian entrepreneurial families have lived for decades in southern cities, the arrival of whole communities of Hindi-speaking unskilled laborers looking for work could rekindle dormant animosities between India's central government and ethno-nationalist parties in the South.

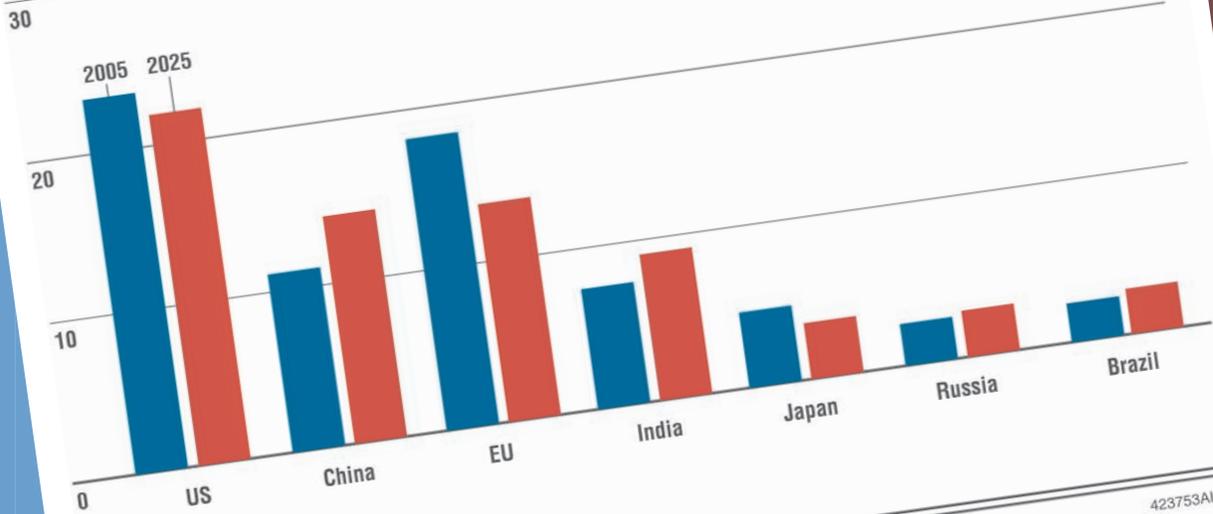
Iran's Unique Trajectory. Having experienced one of the most rapid fertility declines in history—from more than six children per woman in 1985 to less than two today—Iran's population is destined for dramatic changes by 2025. The country's politically restless, job-hungry youth bulge

will largely dissipate over the next decade, yielding more mature population and work force growth rates comparable to current rates in the US and China (near 1 percent per year). In this time frame, the working-age population will grow large relative to children, creating opportunities to accumulate savings, better educate, and eventually to shift to more technical industries and raise living standards. Whether Iran capitalizes on this demographic bonus depends on the country's political leadership, which at present is unfriendly to markets and private businesses, unsettling for investors, and more focused on oil revenues than on broader job creation.

Two additional demographic near-certainties are apparent: first, despite low fertility, Iran's population of 66 million will grow to around 77 million by 2025. Second, by then, a new youth bulge (an echo produced by births during the current one) will be ascending—but in this one, 15-to-24 year olds will account for just one-sixth of those in the working age group compared to one third today. Some experts believe this echo bulge signals a resurgence of revolutionary politics. Others speculate that, in the more educated and developed Iran of 2025, young adults will find career and consumption more attractive than extremist politics. Only one aspect of Iran's future is sure: its society will be more demographically mature than ever before and strikingly different than its neighbors.

New International Lineup in 2025?

Measurements of state power as a percentage of global power



Source: International Future Model

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CHAPTER 3

THE NEW PLAYERS

By 2025, the United States will find itself in the position of being one of a number of important actors on the world stage, albeit still the most powerful one. The relative political and economic clout of many countries will shift by 2025, according to an International Futures model measuring GDP, defense spending, population, and technology for individual states (see graphic on page 28).⁶ Historically, *emerging* multipolar systems have been more unstable than bipolar or even unipolar ones; the greater diversity and growing power of more countries portends less cohesiveness and effectiveness for the international system. Most emerging powers already want a greater say and, along with many Europeans, dispute the notion of any one power having the right to be a hegemon. The potential for less cohesiveness and more instability also is suggested by the relatively steeper declines in national power of Europe and Japan.

Although we believe chances are good that China and India will continue to rise, their ascent is not guaranteed and will require overcoming high economic and social hurdles. Because of this, both countries are likely to remain inwardly focused and per capita wealth will lag substantially behind Western economies throughout the period to 2025 and beyond. Individuals in these emerging economic powerhouses are likely to feel still poor in relation to Westerners even though their collective GDP increasingly will outdistance those of individual Western states. For Russia, remaining in the top tier where it has been since its remarkable resurgence during the late 1990s and early part of the 21st century may be extremely

⁶ National Power scores are the product of an index combining the weighted factors of GDP, defense spending, population, and technology. Scores are calculated by the International Futures computer model and are expressed as a state's relative share (percentage) of all global power.

difficult. Demography is not always destiny, but diversifying the economy so that Russia can maintain its standing after the world transitions away from dependence on fossil fuel will be central to its long-term prospects. Europe and Japan also will be confronting demographic challenges; decisions taken now are likely to determine their long-term trajectories.

Although the rise of no other state can equal the impact of the rise of such populous states as China and India, other countries with potentially high-performing economies—Iran, Indonesia, and Turkey, for example—could play increasingly important roles on the world stage and especially for establishing new patterns in the Muslim world.

“Few countries are poised to have more impact on the world over the next 15-20 years than China.”

Rising Heavyweights: China and India

China: Facing Potential Bumps in the Road. Few countries are poised to have more impact on the world over the next 15-20 years than China. If current trends persist, by 2025 China will have the world's second largest economy and will be a leading military power. It could also be the largest importer of natural resources and an even greater polluter than it is now.

- US security and economic interests could face new challenges if China becomes a peer competitor that is militarily strong as well as economically dynamic and energy hungry.

The pace of China's economic growth almost certainly will slow, or even recede, even with additional reforms to address mounting social pressures arising from growing income disparities, a fraying social safety net, poor business regulation, hunger for foreign

energy, enduring corruption, and environmental devastation. Any of these problems might be soluble in isolation, but the country could be hit by a “perfect storm” if many of them demand attention at the same time. Even if the Chinese Government can manage to address these issues, it will not have the ability to assure high levels of economic performance. Most of China’s economic growth will continue to be domestically driven, but key sectors rely on foreign markets, resources, and technology as well as globalized production networks. As a result, China’s economic health will be affected by that of other economies—particularly the United States and the EU.

In addressing these challenges, Chinese leaders must balance the openness necessary to sustain economic growth—essential to public tolerance for the Communist Party’s monopoly of political power—against the restrictions necessary to protect that monopoly. Facing so many social and economic changes, the Communist Party and its position are likely to undergo further transformations. Indeed, Communist Party leaders themselves talk openly about the need to find new ways to retain public acceptance of the Party’s dominant role. So far, however, these efforts do not appear to include opening the system to free elections and a free press. Moreover, barring the “perfect storm” described above, we do not foresee social pressures forcing real democracy in China by 2025. That said, the country could be moving toward greater political pluralism and more accountable governance.

Chinese leaders could, however, continue managing tensions by achieving significant growth without jeopardizing the Party’s political monopoly, as they have for the past three decades. Although a protracted slump could pose a serious political threat, the regime would be tempted to deflect public

criticism by blaming China’s woes on foreign interference, stoking the more virulent and xenophobic forms of Chinese nationalism.

- Historically, people who become accustomed to rising living standards react angrily when their expectations are no longer met, and few people have had grounds for such high expectations as do the Chinese.
- China’s international standing is based partly on foreigners’ calculations that it is “the country of the future.” If foreigners treat the country less deferentially, nationalistic Chinese could respond angrily.

India: A Complicated Rise. Over the next 15-20 years, Indian leaders will strive for a multipolar international system, with New Delhi as one of the poles and serving as a political and cultural bridge between a rising China and the United States. India’s growing international confidence, derived primarily from its economic growth and its successful democratic record, now drives New Delhi toward partnerships with many countries. However, these partnerships are aimed at maximizing India’s autonomy, not at aligning India with any country or international coalition.

India probably will continue to enjoy relatively rapid economic growth. Although India faces lingering deficiencies in its domestic infrastructure, skilled labor, and energy production, we expect the nation’s rapidly expanding middle class, youthful population, reduced reliance on agriculture, and high domestic savings and investment rates to propel continued economic growth. India’s impressive economic growth over the past 15 years has reduced the number of people living in absolute poverty, but the

growing gap between rich and poor will become a more important political issue.

We believe Indians will remain strongly committed to democracy, but the polity could become more fragmented and fractious, with national power being shared across successive political coalitions. Future elections are likely to be multi-sided affairs yielding awkward coalitions with unclear mandates. The general direction of India's economic policymaking is unlikely to be reversed, but the pace and scale of reform will fluctuate.

Regional and ethnic insurgencies that have plagued India since independence are likely to persist, but they will not threaten India's unity. We assess New Delhi will remain confident that it can contain the Kashmiri separatist movement. However, India is likely to experience heightened violence and instability in several parts of the country because of the growing reach of the Maoist Naxalite movement.

Indian leaders do not see Washington as a military or economic patron and now believe the international situation has made such a benefactor unnecessary. New Delhi will, however, pursue the benefits of favorable US ties, partly, too, as a hedge against any development of hostile ties with China. Indian policymakers are convinced that US capital, technology, and goodwill are essential to India's continued rise as a global power. The United States will remain one of India's largest export destinations, the key to international financial institutions such as the World Bank and foreign commercial lending, and the largest source of remittances. The Indian diaspora—composed largely of highly skilled professionals—will remain a key element in deepening US-Indian ties. The Indian market for US goods will grow substantially as New Delhi reduces restrictions on trade and investment. India's

military also will be eager to benefit from expanded defense ties with Washington. Indian leaders, however, probably will avoid ties that could resemble an alliance relationship.

“Russia has the potential to be richer, more powerful, and more self-assured in 2025...[but] multiple constraints could limit Russia's ability to achieve its full economic potential.”

Other Key Players

Russia's Path: Boom or Bust. Russia has the potential to be richer, more powerful, and more self-assured in 2025 if it invests in human capital, expands and diversifies its economy, and integrates with global markets. On the other hand, multiple constraints could limit Russia's ability to achieve its full economic potential. Chief among them are a shortfall in energy investment, key infrastructure bottlenecks, decaying education and public health sectors, an underdeveloped banking sector, and crime and corruption. A sooner-than-expected conversion to alternative fuels or a sustained plunge in global energy prices before Russia has the chance to develop a more diversified economy probably would constrain economic growth.

Russia's population decline by 2025 will force hard policy choices. By 2017, for example, Russia is likely to have only 650,000 18-year-old males from which to maintain an army that today relies on 750,000 conscripts. Population decline also could take an economic toll with severe labor force shortages, particularly if Russia does not invest more in its existing human capital, rebuild its S&T base, and employ foreign labor migrants.

If Russia diversifies its economy, it could develop a more pluralistic, albeit not

democratic, political system—the result of institutional consolidation, a rising middle class, and the emergence of new stakeholders demanding a greater voice.

A more proactive and influential foreign policy seems likely, reflecting Moscow’s reemergence as a major player on the world stage; an important partner for Western, Asian, and Middle East capitals; and a leading force in opposition to US global dominance. Controlling key energy nodes and links in the Caucasus and Central Asia—vital to its ambitions as an energy superpower—will be a driving force in reestablishing a sphere of influence in its Near Abroad. Shared perceptions regarding threats from terrorism and Islamic radicalism could align Russian and Western security policies more tightly, notwithstanding disagreements on other issues and a persisting “values gap.”

The range of possible futures for Russia remains wide because of starkly divergent forces—liberal economic trends and illiberal political trends. The tension between the two trends—together with Russia’s sensitivity to potential discontinuities sparked by political instability, a major foreign policy crisis, or other wild cards—makes it impossible to exclude alternative futures such as a nationalistic, authoritarian petro-state or even a full dictatorship, which is an unlikely but nevertheless plausible future. Less likely, Russia could become a significantly more open and progressive country by 2025.

Europe: Losing Clout in 2025. We believe Europe by 2025 will have made slow progress toward achieving the vision of current leaders and elites: a cohesive, integrated, and influential global actor able to employ independently a full spectrum of political, economic, and military tools in support of European and Western interests and universal ideals. The European Union would need to

resolve a perceived democracy gap dividing Brussels from European voters and move past the protracted debate about its institutional structures.

The EU will be in a position to bolster political stability and democratization on Europe’s periphery by taking in additional new members in the Balkans, and perhaps Ukraine and Turkey. However, continued failure to convince skeptical publics of the benefits of deeper economic, political, and social integration and to grasp the nettle of a shrinking and aging population by enacting painful reforms could leave the EU a hobbled giant distracted by internal bickering and competing national agendas, and less able to translate its economic clout into global influence.

The drop-off in working-age populations will prove a severe test for Europe’s social welfare model, a foundation stone of Western Europe’s political cohesion since World War II. Progress on economic liberalization is likely to continue only in gradual steps until aging populations or prolonged economic stagnation force more dramatic changes—a crisis point that may not hit before some time in the next decade and might be pushed off even further. There are no easy fixes for Europe’s demographic deficits except likely cutbacks in health and retirement benefits, which most states have not begun to implement or even to contemplate. Defense expenditures are likely to be cut further to stave off the need for serious restructuring of social benefits programs. The challenge of integrating immigrant, especially Muslim, communities will become acute if citizens faced with a sudden lowering of expectations resort to more narrow nationalism and concentrate on parochial interests, as happened in the past.

Europe's strategic perspective is likely to remain narrower than Washington's, even if the EU succeeds in making reforms that create a "European President" and "European Foreign Minister" and develops greater institutional capacity for crisis management. Divergent threat perceptions within Europe and the likelihood that defense spending will remain uncoordinated suggest the EU will not be a major military power by 2025. The national interests of the bigger powers will continue to complicate EU foreign and security policy and European support for NATO could erode.

The question of Turkey's EU membership will be a test of Europe's outward focus between now and 2025. Increasing doubts about Turkey's chances are likely to slow its implementation of political and human rights reforms. Any outright rejection risks wider repercussions, reinforcing arguments in the Muslim world—including among Europe's Muslim minorities—about the incompatibility of the West and Islam. Crime could be the gravest threat inside Europe as Eurasian transnational organizations—flush from involvement in energy and mineral concerns—become more powerful and broaden their scope. One or more governments in Eastern or Central Europe could fall prey to their domination.

Europe will remain heavily dependent on Russia for energy in 2025, despite efforts to promote energy efficiency and renewable energy and lower greenhouse gas emissions. Varying levels of dependence, differing perspectives on Russia's democratic maturity and economic intentions, and failure to achieve consensus on Brussels' role are hampering nascent efforts to develop common EU policies on energy diversification and security. In the absence of a collective approach that would reduce Russia's leverage, this dependence will foster constant

attentiveness to Moscow's interests by key countries, including Germany and Italy, who see Russia as a reliable supplier. Europe could pay a price for its heavy dependence, especially if Russian firms are unable to fulfill contract commitments because of underinvestment in their natural gas fields or if growing corruption and organized criminal involvement in the Eurasian energy sector spill over to infect Western business interests.

Japan: Caught Between the US and China.

Japan will face a major reorientation of its domestic and foreign policies by 2025 yet maintain its status as an upper middle rank power. Domestically, Japan's political, social, and economic systems will likely be restructured to address its demographic decline, an aging industrial base, and a more volatile political situation. Japan's decreasing population may force authorities to consider new immigration policies like a long-term visa option for visiting workers. The Japanese, however, will have difficulty overcoming their reluctance to naturalize foreigners. The aging of the population also will spur development in Japan's healthcare and housing systems to accommodate large numbers of dependent elderly.

The shrinking work force—and Japan's cultural aversion to substantial immigrant labor—will put a major strain on Japan's social services and tax revenues, leading to tax increases and calls for more competition in the domestic sector to lower the price of consumer goods. We anticipate continued restructuring of Japan's export industries, with increased emphasis on high technology products, value-added production, and information technologies. The shrinking of Japan's agricultural sector will continue, perhaps down to just 2 percent of the labor force, with a corresponding increase in payments for food imports. The working-age population, declining in absolute numbers,

includes a large number of unemployed and untrained citizens in their late teens and 20s. This could lead to a shortage of white collar workers.

With increasing electoral competition, Japan's one-party political system probably will fully disintegrate by 2025. The Liberal Democratic Party may split into a number of contending parties, but it is more likely that Japan will witness a continual splitting and merging of competing political parties, leading to policy paralysis.

On the foreign front, Japan's policies will be influenced most by the policies of China and the United States, where four scenarios are possible.

- In the first scenario, a China that continues its current economic growth pattern will be increasingly important to Japan's economic growth, and Tokyo will work to maintain good political relations and increase market access for Japanese goods. Tokyo may seek a free trade agreement with Beijing well before 2025. At the same time, China's military power and influence in the region will be of increasing concern to Japanese policymakers. Their likely response will be to draw closer to the United States, increase their missile defense and anti-submarine warfare capabilities, seek to develop regional allies such as South Korea, and push for greater development of international multilateral organizations in East Asia, including an East Asian Summit.
- In a second scenario, China's economic growth falters or its policies become openly hostile toward countries in the region. In response, Tokyo would likely move to assert its influence, in part by seeking to rally democratic states in East Asia, and in part by continuing to develop

its own national power through advanced military hardware. Tokyo would assume strong support from Washington in this circumstance and would move to shape political and economic forums in the region to isolate or limit Chinese influence. This would cause states in the region to make a difficult choice between their continued unease with Japanese military strength and a China that has the potential to dominate nearly all nations near its borders. As a result, Japan might find itself dealing with an ad-hoc non-aligned movement of East Asian states seeking to avoid being entrapped by either Tokyo or Beijing.

- In a third scenario, should the United States' security commitment to Japan weaken or be perceived by Tokyo as weakening, Japan may decide to move closer to Beijing on regional issues and ultimately consider security arrangements that give China a de facto role in maintaining stability in ocean areas near Japan. Tokyo is highly unlikely to respond to a loss of the US security umbrella by developing a nuclear weapons program, short of clearly aggressive intent by China toward Japan.
- A fourth scenario would see the United States and China move significantly toward political and security cooperation in the region, leading to US accommodation of a Chinese military presence in the region and a corresponding realignment or drawdown of US forces there. In this case, Tokyo almost certainly would follow the prevailing trend and move closer to Beijing to be included in regional security and political arrangements. Similarly, others in the region, including South Korea, Taiwan, and ASEAN members likely would follow such a US lead, putting further pressure on Tokyo to align

its policies with those of the other actors in the region.

Brazil: Solid Foundation for an Enhanced Leadership Role. By 2025 Brazil probably will be exercising greater regional leadership, as first among equals in South American fora, but aside from its growing role as an energy producer and its role in trade talks, it will demonstrate limited ability to project beyond the continent as a major player in world affairs. Its progress in consolidating democracy and diversifying its economy will serve as a positive regional model.

The country's maturing commitment to democracy is on a secure footing with fair and open electoral processes and smooth transitions having become routine. The current President, Lula da Silva, has a strong socialist orientation and has pursued a moderate policy course domestically and internationally, setting a positive precedent for his successors. Brazilian views about the importance of playing a key role as both a regional and world leader have largely become ingrained in the national consciousness and transcend party politics.

Economically, Brazil has established a solid foundation for steady growth based on political stability and an incremental reform process. The growing consensus for responsible fiscal and monetary policy is likely to lessen the disruptions from crises that have plagued the country in the past. Dramatic departures from the current economic consensus in Brazil, either a radical turn toward a free-market and free trade-oriented economic model or a heavy-handed statist orientation, appear to be unlikely by 2025.

Brazil's recent preliminary finds of new, possibly large offshore oil deposits have the potential to add another dynamic to an already

diversified economy and put Brazil on a more rapid economic growth path. The oil discoveries in the Santos Basin—potentially holding tens of billions of barrels of reserves—could make Brazil after 2020 a major oil exporter when these fields are fully exploited. Optimistic scenarios, which assume a legal and regulatory framework attractive to foreign investment, project oil rising to a 15 percent share of GDP by 2025; even then, petroleum would only complement existing sources of national wealth.

“The oil discoveries in the Santos Basin—potentially holding tens of billions of barrels of reserves—could make Brazil after 2020 a major oil exporter...”

Progress on social issues, such as reducing crime and poverty, will likely play a decisive role in determining Brazil's future leadership status. Without advances in the rule of law, even rapid economic growth will be undercut by the instability that results from pervasive crime and corruption. Mechanisms to incorporate a growing share of the population into the formal economy also will be needed to buttress Brazil's status as a modernizing world power.

Up-and-Coming Powers

Owing to the large populations and expansive landmasses of the new powers like India and China, another constellation of powerhouses is unlikely to erupt on the world scene over the next decade or two. However, up-and-coming developing states could account for an increasing proportion of the world's economic growth by 2025. Others also will play a dynamic role in their own neighborhoods.

Indonesia, Turkey and a post-clerically run **Iran**—states that are predominantly Islamic, but which fall outside the Arab core—appear well-situated for growing international roles. A growth-friendly macro-economic policy

climate would allow their natural economic endowments to flourish. In the case of Iran, radical political reform will be necessary.

Indonesia's performance will depend upon whether it can replicate its success at political reform with measures to spur the economy. In the past decade, Indonesians have transformed their once-authoritarian country into a democracy, turning the vast archipelago into a place of relative calm where support for moderate political solutions is strong, separatist movements are largely fading away, and terrorists, finding little public support, are increasingly found and arrested. With abundant natural resources and a large population of potential consumers (it is the world's fourth most populous country), Indonesia could rise economically if its elected leaders take steps to improve the investment climate, including strengthening the legal system, improving the regulatory framework, reforming the financial sector, reducing fuel and food subsidies, and generally lowering the cost of doing business.

Looking at **Iran**—a state rich in natural gas and other resources and high in human capital—political and economic reform in addition to a stable investment climate could fundamentally redraw both the way the world perceives the country and also the way in which Iranians view themselves. Under those circumstances, economic resurgence could take place quickly in Iran and embolden a latent cosmopolitan, educated, at times secular Iranian middle-class. If empowered, this portion of the population could broaden the country's horizons, particularly eastward and away from decades of being mired in the Arab conflicts of the Middle East.

Turkey's recent economic track record of increased growth, the vitality of Turkey's emerging middle class and its geostrategic locale raise the prospect of a growing regional role in the Middle East. Economic weaknesses such as its heavy dependence on external energy sources may help to spur it toward a greater international role as Turkish authorities seek to develop their ties with energy suppliers—including close neighbors Russia and Iran—and bolster its position as a transit hub. Over the next 15 years, Turkey's most likely course involves a blending of Islamic and nationalist strains, which could serve as a model for other rapidly modernizing countries in the Middle East.

Global Scenario I: *A World Without the West*

In this fictionalized account, the new powers supplant the West as leaders on the world stage. This is not inevitable nor the only possible outcome of the rise of new states. Historically the rise of new powers—such as Japan and Germany in the late 19th and early 20th centuries—presented stiff challenges to the existing international system, all of which ended in worldwide conflict. More plausible in our minds than a direct challenge to the international system is the possibility that the emerging powers will assume a greater role in areas affecting their vital interests, particularly in view of what may be growing burden fatigue for Western countries.

Such a coalition of forces could be a competitor to institutions like NATO, offering others an alternative to the West. As detailed, we do not see these alternative coalitions as necessarily permanent fixtures of the new landscape. Indeed, given their diverse interests and competition over resources, the newer powers could as easily distance themselves from each other as come together. Although the emerging powers are likely to be preoccupied with domestic issues and sustaining their economic development, increasingly, as outlined in this chapter, they will have the capacity to be global players.

Preconditions for this scenario include:

- Lagging Western growth prompts the US and Europe to begin taking protectionist measures against the faster-growing emerging powers.
- Different models of state-society relationships help underpin the powerful (albeit fragile) Sino-Russia coalition.
- Tensions between the principal actors in the multipolar world are high as states seek energy security and strengthened spheres of influence. The Shanghai Cooperation Organization (SCO), especially, seeks reliable and dependable clients in strategic regions—and Central Asia is in both Russia's and China's backyards.



上海合作组织

The Shanghai Cooperation Organisation

Шанхайская организация сотрудничества

Letter from Head of Shanghai Cooperation Organization to Secretary-General of NATO

June 15, 2015

I know we meet tomorrow to inaugurate our strategic dialogue, but I wanted to share with you beforehand my thoughts about the SCO and how far we have come. Fifteen to 20 years ago, I would never have imagined the SCO to be NATO's equal—if not (patting myself on the back) an even somewhat more important international organization. Just between ourselves, we were not destined for “greatness” except for the West's stumbling.

I think it is fair to say it began when you pulled out of Afghanistan without accomplishing your mission of pacifying the Taliban. I know you had little choice. Years of slow or no growth in the US and West had decimated defense budgets. The Americans felt overstretched and the Europeans were not going to stay without a strong US presence. The Afghan situation threatened to destabilize the whole region, and we could not stand idly by. Besides Afghanistan, we had disturbing intelligence that some “friendly” Central Asian governments were coming under pressure from radical Islamic movements and we continue to depend on Central Asian energy. The Chinese and Indians were very reluctant to throw their hats into the ring with my homeland—Russia—but they did not have better options. None of us wanted the other guy to be in charge: we were so suspicious of each other and, if truth be told, continue to be.

The so-called SCO “peacekeeping” action really put the SCO on the map and got us off the ground. Before that, it was an organization where “cooperation” was a bit of a misnomer. It would have been more aptly called the “Shanghai Organization of Mutual Distrust.” China did not want to offend the US, so it did not go along with Russia's anti-American efforts. India was there to keep an eye on both China and Russia. The Central Asians thought they could use the SCO for their own purpose of playing the neighboring big powers off against one another. Iran's Ahmedi-Nejad would have joined anything with a whiff of anti-Americanism.

Still, even with these operations, the SCO would not have become a “bloc” if it had not been for the rising antagonism shown by the US and Europe toward China. China's strong ties to the US had oddly enough provided Beijing with legitimacy. China also benefited from a strong US presence in the region; Beijing's Asian neighbors would have been much more worried about China's rise if they had not had the US as a hedge. China and India were content with the status quo and did not want to get into a strong alliance with us Russians for fear of antagonizing the US. As long as that status quo held, the SCO's prospects as a “bloc” were limited.

Then came the growing protectionist movements in the US and Europe led by a coalition of forces from left to right along the political spectrum. Chinese investments came under greater scrutiny and increasingly were denied. The fact that China and India became first adopters of so many new technologies—next generation Internet, clean water, energy storage, biogerontechnology, clean coal, and biofuels—only added to the

economic-driven frustration. Protectionist trade barriers were put up. Somebody other than “the West” had to pay a price for that recession which dragged on there but not so much elsewhere. China’s military modernization was seen as a threat and there was a lot of loose talk in the West about the emerging powers piggy-backing off the United States’ protection of the sea lanes. Needless to say, the West’s antagonism sparked a nationalistic movement in China.

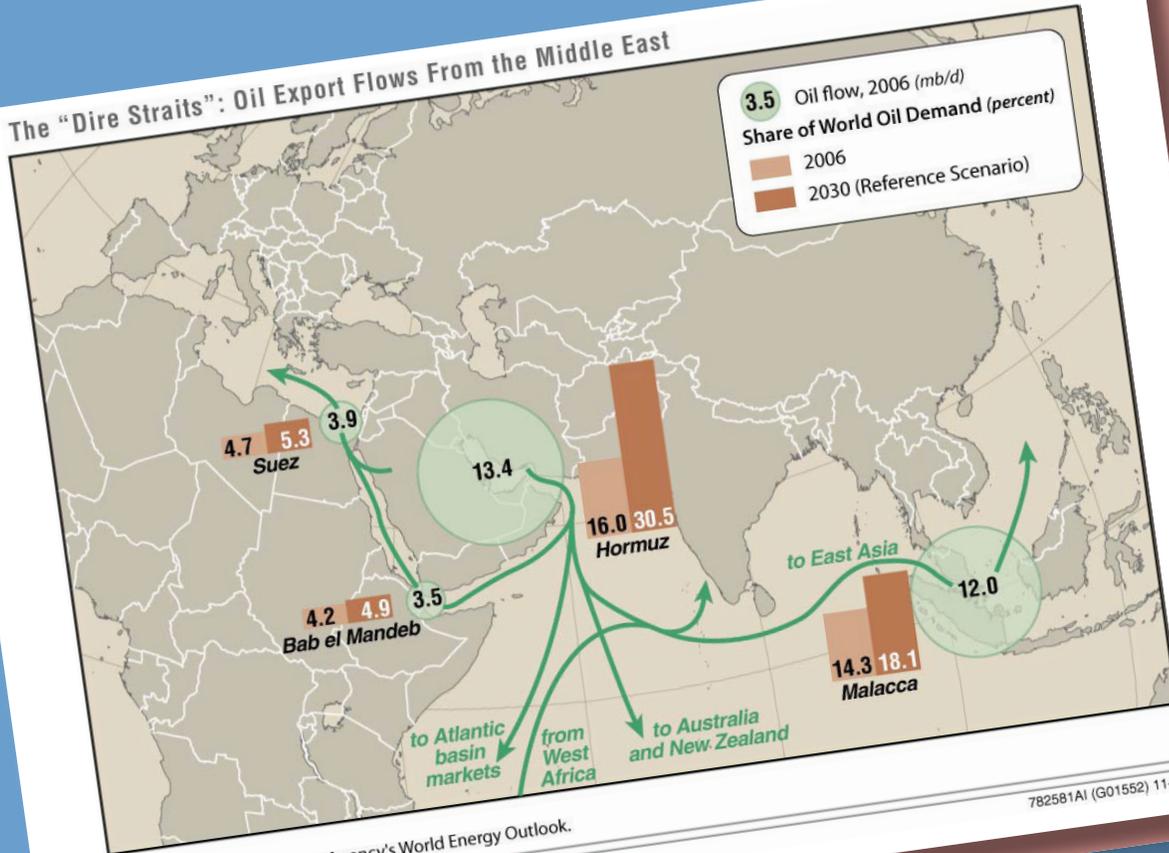
Interestingly, we Russians watched this from the sidelines without knowing what to do. We were pleased to see our good friends in the West take an economic drubbing. It was still nothing like what we went through in the 1990s and, of course, we took a hit as energy prices sagged with the recession in the West. But we had accumulated a lot of reserves before then.

In the end, these events were a godsend because they forced Russia and China into each other’s arms. Before, Russia had been more distrustful of China’s rise than the United States. Yes, we talked big about shifting all our energy supplies eastward to scare the Europeans from time to time. But we also played China off against Japan, dangling possibilities and then not following through. Our main worry was China. Fears about China’s overrunning Russia’s Far East were a part of it, but I think the bigger threat from our standpoint was of a more powerful China—for example, one that would not forever hide behind Russia’s skirts at the UN. The Soviet-China split was always lurking too. I personally was angered by endless Chinese talk about not repeating Soviet mistakes. That hurt. Not that the Chinese weren’t right, but to admit we had failed when they might succeed—that struck at Russian pride.

But now this is all behind us. Having technology that allowed for the clean use of fossil fuels was a godsend. Whether the West gave it to us, or as we were accused of doing, we stole it, is immaterial. We saw a chance to cement a strong tie—offering the Chinese opportunities for a secure energy supply and less reliance on seaborne supplies from the Middle East. They reciprocated with long-term contracts. We also learned how to cooperate in Central Asia instead of trying to undermine each other by our actions with various regimes. Seeing a strong Sino-Russian partnership arise, the others—India, Iran, etc.—did not want to be left out of the picture and have rallied around us. Of course, it helps that US and European protectionists lumped India with China, so there really was not much left for them to do.

How stable is our relationship? Don’t quote me, but this is not a new Cold War. Sure, we talk a great game about state capitalism and authoritarianism, but it is no ideology like Communism. And it is in our mutual interests that democracy not break out in Central Asia as China and Russia would be the targets of any such uprisings. I can’t say that we Russians and Chinese really like each other much more than before. In fact, both of us have to worry about our respective nationalisms getting in the way of mutual interests. Let’s put it this way: the Russian and Chinese peoples are not enamored with one another. Russians want to be respected as Europeans, not Eurasians, and China’s elites are still in their hearts geared toward the West. But temporary expedients have been known to grow into permanence, you know?

The "Dire Straits": Oil Export Flows From the Middle East



Source: International Energy Agency's World Energy Outlook.

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CHAPTER 4

SCARCITY IN THE MIDST OF PLENTY?

The international system will be challenged by growing resource constraints at the same time that it is coping with the impact of new players. Access to relatively secure and clean energy sources and management of chronic food and water shortages will assume increasing importance for a growing number of countries during the next 15-20 years. Adding well over a billion people to the world's population by 2025 will itself put pressure on these vital resources. An increasing percentage of the world's population will be moving from rural areas to urban and developed ones to seek greater personal security and economic opportunity. Many—particularly in Asia—will be joining the middle class and will be seeking to emulate Western lifestyles, which involve greater per capita consumption of all these resources. Unlike earlier periods when resource scarcities loomed large, the significant growth in demand from emerging markets, combined with constraints on new production—such as the control exerted now by state-run companies in the global energy market—limits the likelihood that market forces alone will rectify the supply-and-demand imbalance.

The already stressed resource sector will be further complicated and, in most cases, exacerbated by climate change, whose physical effects will worsen throughout this period. Continued escalation of energy demand will hasten the impacts of climate change. On the other hand, forcibly cutting back on fossil fuel use before substitutes are widely available could threaten continued economic development, particularly for countries like China whose industries have not yet achieved high levels of energy efficiency. Technological advances and policy decisions around the world germane to greenhouse gas emissions over the next 15 years are likely to determine whether the globe's temperature ultimately rises more

than 2 degree centigrade—the threshold at which effects are thought to be no longer manageable.

Food and water also are intertwined with climate change, energy, and demography. Rising energy prices increase the cost for consumers and the environment of industrial-scale agriculture and application of petrochemical fertilizers. A switch from use of arable land for food to fuel crops provides a limited solution and could exacerbate both the energy and food situations. Climatically, rainfall anomalies and constricted seasonal flows of snow and glacial melts are aggravating water scarcities, harming agriculture in many parts of the globe. Energy and climate dynamics also combine to amplify a number of other ills such as health problems, agricultural losses to pests, and storm damage. The greatest danger may arise from the convergence and interaction of many stresses simultaneously. Such a complex and unprecedented syndrome of problems could overload decisionmakers, making it difficult for them to take actions in time to enhance good outcomes or avoid bad ones.

The Dawning of a Post-Petroleum Age?

By 2025 the world will be in the midst of a fundamental energy transition—in terms of both fuel types and sources. Non-OPEC liquid hydrocarbon production (i.e., crude oil, natural gas liquids, and un conventionals such as tar sands) will not be able to grow commensurate with demand. The production levels of many traditional energy producers—Yemen, Norway, Oman, Colombia, the UK, Indonesia, Argentina, Syria, Egypt, Peru, Tunisia—are already in decline. Others' production levels—Mexico, Brunei, Malaysia, China, India, Qatar—have flattened. The number of countries capable of meaningfully expanding production will decline. Only six countries—Saudi Arabia, Iran, Kuwait, the UAE, Iraq (potentially), and

Russia—are projected to account for 39 percent of total world oil production in 2025. The major producers increasingly will be located in the Middle East, which contains some two-thirds of world reserves. OPEC production in the Persian Gulf countries is projected to grow by 43 percent during 2003-2025. Saudi Arabia alone will account for almost half of all Gulf production, an amount greater than that expected from Africa and the Caspian area combined.

A partial consequence of this growing concentration has been increased control of oil and gas resources by national oil companies. When the Club of Rome made its famous forecast of looming energy scarcities, the “Seven Sisters” still had a strong influence on global oil markets and production.⁷ Driven by shareholders, they responded to price signals to explore, invest, and promote technologies necessary to increase production. By contrast, national oil companies have strong economic and political incentives to limit investment in order to prolong the production horizon. Keeping oil in the ground provides resources for future generations in oil states that have limited their economic options.

The number and geographic distribution of oil producers will decrease concurrent with another energy transition: the move to cleaner fuels. The prized fuel in the shorter term likely will be natural gas. By 2025, consumption of natural gas is expected to grow by about 60 percent, according to DoE/Energy Information Agency projections. Although natural gas deposits are not necessarily co-located with oil, they are

⁷ The “Seven Sisters” refers to seven Western oil companies that dominated mid-20th century oil production, refining, and distribution. With the formation and establishment of OPEC in the 1960s and 1970s, the Western oil companies’ influence and clout declined.

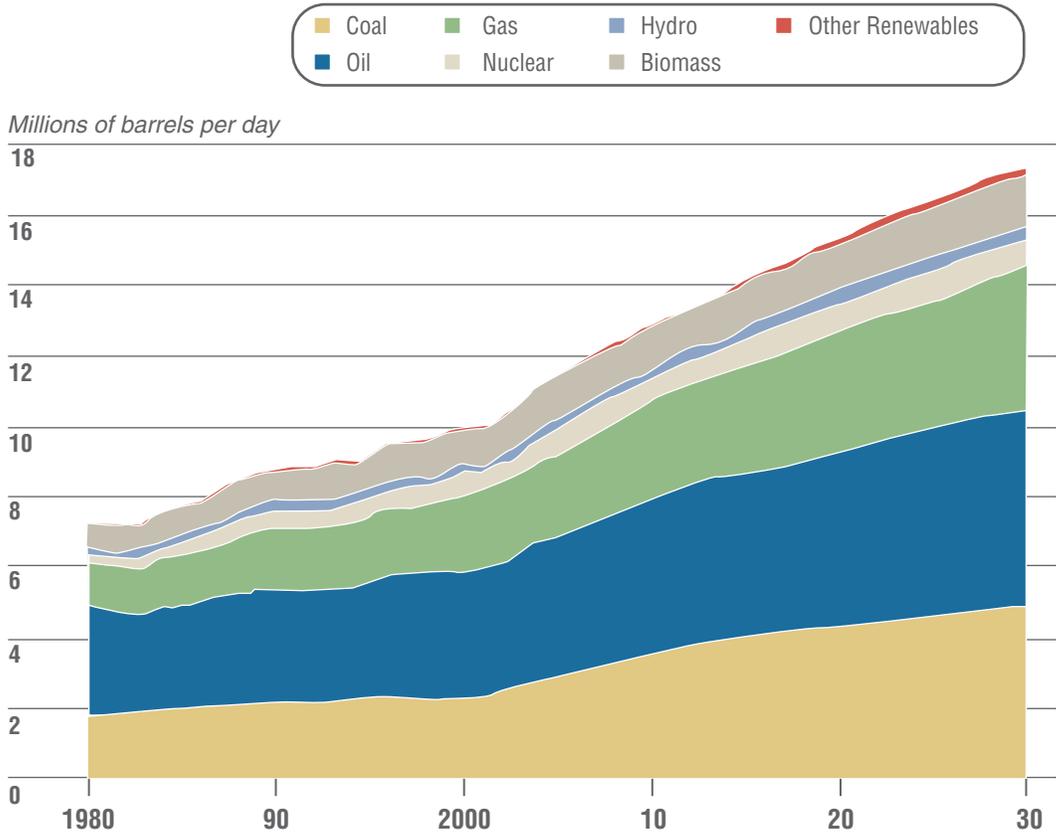
highly concentrated. Three countries—Russia, Iran, and Qatar—hold over 57 percent of the world’s natural gas reserves. Considering oil and natural gas together, two countries—Russia and Iran—emerge as energy kingpins. Nevertheless, North America (the US, Canada, and Mexico) is expected to produce an appreciable proportion—18 percent—of total world production by 2025.

“Aging populations in the developed world; growing resource constraints in energy, food, and water; and worries about climate change are likely to color what will continue to be an historically unprecedented age of prosperity.”

Even though the use of natural gas is likely to grow steadily in absolute terms, coal may be the fastest growing energy source despite being the “dirtiest.” Rising prices for oil and natural gas would put a new premium on energy sources that are cheap, abundant, and close to markets. Three of the largest and fastest-growing energy consumers—the US, China, and India—and Russia possess the four largest recoverable coal reserves, representing 67 percent of known global reserves. Increased coal production could extend non-renewable carbon-based energy systems for one or even two centuries. China will still be very dependent on coal in 2025 and Beijing is likely to be under increasing international pressure to use clean technologies to burn it. China is overtaking the US in the amount of carbon emissions it puts in the atmosphere despite its much smaller GDP.

The use of nuclear fuel for electrical power generation is expected to expand, but the increase will not be sufficient to fill growing demand for electricity. Third-generation nuclear reactors have lower costs of power

Breakdown of Likely Energy Sources



Note: Global demand grows by more than half over the next quarter of a century, with coal use rising in absolute terms.

Source: PFC Energy International.

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generation, improved safety characteristics, and better waste and proliferation management features than previous reactor designs. Third-generation nuclear reactors are economically competitive at present electricity prices and are beginning to be deployed around the world. Although most nuclear power plants are currently in industrialized countries, growing demand for electricity in China, India, South Africa and other rapidly growing countries will increase the demand for nuclear power.

The supply of uranium, which is the principal feedstock for nuclear power, is unlikely to

limit the future deployment of nuclear power. Available uranium is likely to be sufficient to support the expansion of nuclear energy without reprocessing well into the second half of the century. If uranium should prove to be in short supply, reactors capable of breeding nuclear fuels, along with recycling of used fuels, could continue to support the global expansion of nuclear energy.

However, because of its infrastructure requirements, concern over proliferation of nuclear expertise and material, and uncertainty over licensing and spent fuel

Timing is Everything

All current technologies are inadequate for replacing traditional energy architectures on the scale needed, and new energy technologies probably will not be commercially viable and widespread by 2025 (see foldout). The present generation of biofuels is too expensive to grow, would further boost food prices, and their manufacture consumes essentially the same amount of energy they produce. Other ways of converting nonfood biomass resources to fuels and chemical products should be more promising, such as those based on high-growth algae or agricultural waste products, especially cellulosic biomass. Development of clean coal technologies and carbon capture and storage is gaining momentum and—if such technologies were cost-competitive by 2025—would enable coal to generate more electricity in a carbon-constrained regulatory environment. Long-lasting hydrogen fuel cells have potential, but they remain in their infancy and are at least a decade away from commercial production. Enormous infrastructure investment might be required to support a “hydrogen economy.” An Argonne National Laboratory study found that hydrogen, from well to tank, is likely to be at least twice as costly as gasoline.

Even with the favorable policy and funding environment that would be needed for biofuels, clean coal, or hydrogen, major technologies historically have had an “adoption lag.” A recent study found that in the energy sector, it takes an average of 25 years for a new production technology to become widely adopted. A major reason for this lag is the need for new infrastructure to handle major innovation. For energy in particular, massive and sustained infrastructure investments made for almost 150 years encompass production, transportation, refining, marketing, and retail activities. Adoption of natural gas, a fuel superior to oil in many respects, illustrates the difficulty of a transition to something new. Technologies to use natural gas have been widely available since at least the 1970s, yet natural gas still lags crude oil in the global market because the technical and investment requirements for producing and transporting it are greater than they are for oil-based fuels.

Simply meeting baseline energy demand over the next two decades is estimated to require more than \$3 trillion of investment in traditional hydrocarbons by companies built up over more than a century and with market capitalizations in the hundreds of billions of dollars. Because a new form of energy is highly unlikely to use existing infrastructure without modifications, we expect any new form of energy to demand similarly massive investment.

Despite what are seen as long odds now, we cannot rule out the possibility of a transition by 2025 that would avoid the costs of an infrastructure overhaul. The greatest possibility for a relatively quick and inexpensive transition during that period comes from better renewable generation sources (photovoltaic and wind) and improvements in battery technology. With many of these technologies, the infrastructure cost hurdle for individual projects would be lower, enabling many small economic actors to develop their own energy transformation projects that directly serve their interests—e.g., stationary fuel cells powering homes and offices, recharging plug-in hybrid autos, and selling energy back to the grid. Also, energy conversion schemes—such as plans to generate hydrogen for automotive fuel cells from electricity in a homeowner’s garage—could avoid the need to develop complex hydrogen transportation infrastructure. Similarly, non-ethanol biofuels derived from genetically modified feed stocks may be able to leverage the considerable investment in liquid petroleum transport and distribution infrastructure.

processing, expansion of nuclear power generation by 2025 to cover anywhere near the increasing demand would be virtually impossible. The infrastructure (human and physical), legal (permitting), and construction hurdles are just too big. Only at the end of our 15-20 year period are we likely to see a serious ramp up of nuclear technologies.

The Geopolitics of Energy

Both high and low energy price levels would have major geopolitical implications and, over the course of 20 years, periods of both could occur. DoE's Energy Information Administration and several leading energy consultants believe higher price levels are likely, at least to 2015, because of plateauing supply and growing demand. These causes are unlike the case in 1970s and early 1980s when high oil prices were caused by an intentional restriction in supply. Even with the overall secular rise in energy costs, prices well below \$100 a barrel are periodically likely with the expected increased volatility and need not come about as a result of technological breakthroughs and rapid commercialization of a substitute fuel. Plausible scenarios for a downward shift and change in market psychology include slowing global growth; increased production in Iraq, Angola, Central Asia, and elsewhere; and greater energy efficiencies with currently available technology.

“With high prices, major exporters such as Russia and Iran would have the financial resources to increase their national power...”

Even at prices below \$100 a barrel, financial transfers connected with the energy trade produce clear winners and losers. Most of the 32 states that import 80 percent or more of their energy needs are likely to experience significantly slower economic growth than they might have achieved with lower oil

prices. A number of these states have been identified by outside experts as at risk of state failure—the Central African Republic, DROC, Nepal, and Laos, for example. States characterized by high import dependence, low GDP per capita, high current account deficits, and heavy international indebtedness form a particularly perilous state profile. Such a profile includes most of East Africa and the Horn. Pivotal yet problem-beset countries, such as Pakistan, will be at risk of state failure.

With *higher prices*, more stable countries fare better but their prospects for economic growth would drop somewhat and political turbulence could occur. Efficient, service-sector oriented OECD economies are not immune but are harmed the least. China, though cushioned by its massive financial reserves, would be hit by higher oil prices, which would make lifting millions more out of poverty more difficult. China also would need to mine and transport more domestic coal, build more nuclear power plants, and seek to improve energy end-use efficiencies to offset the higher priced imports.

With high prices, major exporters such as Russia and Iran would have the financial resources to increase their national power. The extent and modalities of steps to increase their power and influence would depend on how they used their profits to invest in human capital, financial stabilization, and economic infrastructure. Judicious application of Russia's increased revenues to the economy, social needs, and foreign policy instruments would likely more than double Russia's standing as measured by an academic national power index.

A sustained plunge in oil prices would have significant implications for countries relying on robust oil revenues to balance the budget or build up domestic investment. For Iran, a

Winners and Losers in a Post-Petroleum World

We believe the most likely occurrence by 2025 is a technological breakthrough that will provide an alternative to oil and natural gas, but implementation will lag because of the necessary infrastructure costs and need for longer replacement time. However, whether the breakthrough occurs within the 2025 time frame or later, the geopolitical implications of a shift away from oil and natural gas will be immense.

- Saudi Arabia will absorb the biggest shock, as its leaders will be forced to tighten up on the costs of the royal establishment. The regime could face new tensions with the Wahabi establishment as Riyadh seeks to promote a series of major economic reforms—including women’s full participation in the economy—and a new social contract with its public as it tries to institute a work ethic to accelerate development plans and diversify the economy.
- In Iran, the drop in oil and gas prices will undermine any populist economic policies. Pressure for economic reform will increase, potentially putting pressure on the clerical governing elite to loosen its grip. Incentives to open up to the West in a bid for greater foreign investment, establishing or strengthening ties with Western partners—including with the US—will increase. Iranian leaders might be more willing to trade their nuclear policies for aid and trade.

For Iraq, emphasis on investing in non-oil sectors of its economy will increase. The smaller Gulf states, which have been making massive investments designed to transform themselves into global tourist and transport hubs, are likely to manage the transition well, bolstered by their robust sovereign wealth funds (SWFs). Across the Arab world, SWFs are being deployed to develop non-oil sectors of the economy in a race against oil as a diminishing asset.

Outside the Middle East, Russia will potentially be the biggest loser, particularly if its economy remains heavily tied to energy exports, and could be reduced to middle power status. Venezuela, Bolivia, and other petro-populist regimes could unravel completely, if that has not occurred beforehand because of already growing discontent and decreasing production. Absent support from Venezuela, Cuba might be forced to begin China-like market reforms.

Early oil decline states—those exporters which had peaked or were declining as is currently the case with Indonesia and Mexico—may be better prepared to shift the focus of their economic activities and diversify into non-energy sectors.

Technology Breakthroughs^a by 2025

■ Probable ■ Possible ■ Plausible

<p>What Is the Technology?</p>	<p>Ubiquitous computing will be enabled by widespread tagging and networking of mundane objects (the Internet of Things) such as food packages, furniture, room sensors, and paper documents. Such items will be located and identified, monitored, and remotely controlled through enabling technologies—including Radio Frequency Identifications, sensor networks, tiny embedded servers, and energy harvesters—connected via the next-generation Internet using abundant, low cost, and high-power computing.</p>	<p>Clean water technologies comprise a range of technologies that enable faster and more energy efficient treatment of fresh water and waste water, and desalination of brackish and sea water, to provide sustainable and diverse water sources useable for domestic, agricultural, and industrial purposes. The technologies include advances in existing technologies such as membrane bioreactors and a range of materials’ substitutions and advances in other separation and purification technologies driven by the unique chemical and physical properties of nanoparticles and nanofibers.</p>	<p>Energy storage technology encompasses a wide range of materials and techniques for storing energy, a necessity for the viability of many alternatives to fossil-fuel energy sources. Included are battery materials, ultracapacitors and hydrogen storage materials (particularly for fuel cells). Efficient energy storage will enable the on-demand energy component of a variety of systems such as hydrogen-based energy systems, a host of renewable (but intermittent) energy sources such as wind and solar, and low-emission transport vehicles.</p>	<p>“Biogerontechnology” is the science related to the study of the cellular and molecular basis of disease and aging applied to the development of new technological means for identifying and treating diseases and disabilities associated with old age. Supporting technologies include improvements in biosensors for real-time monitoring of human health, robust information technology, ubiquitous DNA sequencing and DNA-specific medicine, and fully targeted drug-delivery mechanisms.</p>	<p>Clean coal technologies include various combinations of carbon capture sequestration (CCS) to prohibit CO₂—a byproduct of burning coal—from entering the atmosphere; coal conversion into syngas (gasification); and processes to convert syngas to hydrocarbons. CCS can reduce or possibly eliminate greenhouse gas emissions from a coal plant. Coal gasification improves efficiency when generating electricity and emits fewer pollutants relative to coal burning plants. The syngas also can be a feedstock for transportation fuels and industrial chemicals that replace petroleum-derived products.</p>
<p>What Are Drivers and Barriers?</p>	<p>Key Drivers: Demand for greater efficiency in a wide variety of applications from food safety to more efficient supply chains and logistics. Corporations, governments, and individuals will benefit in areas such as energy efficiency and security, quality of life, and early warning of equipment maintenance needs.</p> <p>Key Barriers: Implementation depends on availability of power for small, maintenance-free devices, development of profitable business models, and addressing likely major privacy and security concerns.</p>	<p>Key Drivers: Clean water is set to become the world’s scarcest but most-needed natural resource because of new demands resulting from population increases and expectations that climate changes will reduce natural fresh water sources in some areas. Demand will increase for water for domestic use, as well as for agriculture (including new biopharma and biofuel crops) and industry processes.</p> <p>Key Barriers: The demand for sustainable clean water supplies will only be met if both large- and small-scale systems can overcome cost constraints—both in terms of energy requirements and infrastructure costs.</p>	<p>Key Drivers: High fossil fuel energy prices, the desire to reduce dependency on foreign energy sources, and pressure to increase renewable energy sources drive the development of these technologies.</p> <p>Key Barriers: Development and deployment of the technologies are restricted by material science, the unknown cost of large-scale manufacturing, and infrastructure investment costs.</p>	<p>Key Drivers: Aging populations, increasingly expensive medical costs, and the desire to keep older workers in the work force drive the development of these technologies.</p> <p>Key Barriers: Cost of development, lengthy human trials, privacy concerns, possible difficulties of insurance, and religious and social concerns will inhibit their development.</p>	<p>Key Drivers: The desire to reduce dependence on foreign energy sources drives interest in expanding the use of available coal reserves, while pressure for clean energy production requires development of CCS methods.</p> <p>Key Barriers: Substantial technology and cost barriers exist for CCS scale-up and implementation for coal power plants, while uncertainties in both the oil market and environmental regulatory landscape preclude investment in expensive coal gasification plants (even without CCS).</p>
<p>Why Is the Technology a Game-Changer?</p>	<p>These technologies could radically accelerate a range of enhanced efficiencies, leading to integration of closed societies into the information age and security monitoring of almost all places. Supply chains would be streamlined with savings in costs and efficiencies that would reduce dependence upon human labor.</p>	<p>Although the Earth contains a plentiful supply of water, only 1 percent is fit or available for human consumption and some 20 percent of the world’s population does not have access to fresh drinking water. Regions experiencing water scarcity will increase as the global population increases and as climate change induced droughts occur. Both developing and developed countries will be affected. Various industries increasingly will compete for water, including agriculture, food, and beverage processing plants as well as chemical, pharmaceutical, and semiconductor industries. First movers to develop and deploy cheap energy-efficient clean-water technologies could gain huge geopolitical advantage.</p>	<p>The ability to store and use energy on demand from a combination of alternative energy sources offers a significant potential to lead a paradigm shift away from fossil fuels, resulting in significant global economic and social advantages to first commercializers. With widespread deployment, the result could be destabilizing to rentier economies dependant upon fossil fuels.</p>	<p>Deployment would shift the cost, allocation, and use of healthcare resources. Nations will be challenged as a result of the changing demographic structures and new psychologies, behaviors and activity patterns of aging yet healthy citizens and the concomitant need to formulate new national economic and social policies.</p>	<p>A successful accelerated and rapid deployment of clean coal technology could pose a major challenge to other hydrocarbon (predominately oil) energy markets and nascent renewable energy markets. This would change the dependency of coal rich/oil poor nations on imported oil/gas with a resulting significant shift in national interests.</p>

^aThese breakthroughs are categorized based upon the development and initial deployment of the technology. In some cases, full deployment may lag significantly due to infrastructure requirements. Source: SRI Consulting Business Intelligence and Toffler Associates.

Technology Breakthroughs^a by 2025

■ Probable ■ Possible ■ Plausible

<p>What Is the Technology?</p>	<p>Human strength augmentation technologies involve mechanical and electronic systems that supplement human physical capabilities. They include wearable exoskeletons with mechanical actuators at hips, elbows, and other skeletal joints. At the extreme an exoskeleton could resemble a wearable humanoid robot that uses sensors, interfaces, power systems, and actuators to monitor and respond to arm and leg movements, providing the wearer with increased strength and control.</p>	<p>Biofuels technology is used to produce ethanol from crops such as corn and sugarcane and biodiesel from crops such as grapeseed and soy. Next-generation processes will convert lignocellulosic materials to fuels. Significant potential also exists to cultivate high-growth microalgae for conversion to biodiesel and other biofuels.</p>	<p>Service robotics comprise robots and unmanned vehicles for non-manufacturing applications, using a large number of enabling technologies including hardware (e.g. sensors, actuators, power systems) and software platforms (advanced systems might incorporate behavioral algorithms and artificial intelligence). These technologies would enable a wide variety of remote controlled, semiautonomous (with human intervention), and completely autonomous robotic systems.</p>	<p>Human cognitive augmentation technologies include drugs, implants, virtual learning environments, and wearable devices to enhance human cognitive abilities. Training software exploits neuroplasticity to improve a person's natural abilities, and wearable and implantable devices promise to improve vision, hearing, and even memory. Bio and information technologies promise enhanced human mental performance at every life stage.</p>
<p>What Are Drivers and Barriers?</p>	<p>Key Drivers: Demand for enhanced strength, endurance, and physical security for assisting the handicapped and elderly, and for reducing reliance on manual labor drive these technologies.</p> <p>Key Barriers: The cost of manufacturing and the uncertain economic payoff, challenges with portable power sources, and humans' ability to accept and use the technology all constrain development and deployment of the technologies.</p>	<p>Key Drivers: High crude oil prices, the desire to reduce dependency on foreign oil sources, and government policies to increase renewable energy sources drive these technologies.</p> <p>Key Barriers: Development and deployment of the technologies are restricted by land use, water availability, competition from food applications, and the challenge of scaling up for large-scale production. Biofuels under development today are more sustainable, but production costs are still too high.</p>	<p>Key Drivers: Security and safety applications, healthcare or home care for aging populations, and the desire to improve manufacturing productivity and reduce demand for service labor drive these technologies.</p> <p>Key Barriers: Development of viable business models, cost, uncertain technology reach (portable power sources and especially artificial intelligence), and integration issues (e.g. IT, robot standards), inhibit the deployment of service robots.</p>	<p>Key Drivers: Desires for improved military planning, combatant performance, treatment of Alzheimer's disease, increasing education effectiveness, enhanced personal entertainment, and improving job performance could spur the development of these technologies.</p> <p>Key Barriers: Cultural hesitancy to go down an "unnatural" path of human development, and fears of unknown effects could slow down development and deployment. Major scientific and medical research challenges would need to be overcome.</p>
<p>Why Is the Technology a Game-Changer?</p>	<p>Biomechanical devices promise to give a person superhuman strength and endurance or restore a disabled person's capabilities. The widespread use of the technology would greatly improve labor productivity by reducing the number of humans needed for a task or increasing the amount of work a single human can accomplish, while enabling unassisted activity by the disabled or elderly. Such technologies also could greatly improve the combat effectiveness of ground combat forces.</p>	<p>A large-scale move to energy-efficient biofuels could reduce demand for oil and ease international competition for world oil supplies and reserves. In addition, widespread use of biofuels would fundamentally alter the energy dependence of some nations upon imported fossil fuels thereby shifting national interests. Emerging biofuels technologies that avoid significant land-use changes—using feedstocks such as agricultural waste products, native grasses, and biofuels from algae, could significantly reduce net CO2 emissions to the atmosphere.</p>	<p>In domestic settings, widespread use of the technology could leverage manpower, disrupt unskilled labor markets and immigration patterns, and change care for a growing elderly population. As early adopters, governments could provide increased security and project combat power with reduced levels of manpower and system life-cycle costs.</p>	<p>The uneven deployment of these technologies could quickly reshape economic and military advantages between nations. Early and robust adopters could see significant benefits, while nations and societies hesitant to employ the technologies may find themselves disadvantaged. International pressure to regulate the technologies could likewise be disruptive as some cultures may welcome the changes to obtain quick benefits, while others loathe their "un-human" character.</p>

^aThese breakthroughs are categorized based upon the development and initial deployment of the technology. In some cases, full deployment may lag significantly due to infrastructure requirements.

Source: SRI Consulting Business Intelligence and Toffler Associates.

drop in oil prices to the \$55-60 range or below would put significant pressure on the regime to make painful choices between subsidizing populist economic programs and sustaining funding for intelligence and security operations and other programs designed to extend its regional power. The notion that state-dominated economies, apparently able to achieve economic growth absent political freedoms or a fully free market, are a credible alternative to Western notions of free markets and liberal democracy could be badly dented, particularly since history suggests the US and other Western states adapt more quickly and effectively to unexpected changes in energy markets.

Under any scenario energy dynamics could produce a number of new alignments or groupings with geopolitical significance:

- Russia, needing Caspian area natural gas in order to satisfy European and other contracts, is likely to be forceful in keeping Central Asian countries within Moscow's sphere, and, absent a non-Russia-controlled outlet, has a good chance of succeeding.
- China will continue to seek to buttress its market power by cultivating political relationships designed to safeguard its access to oil and gas. Beijing's ties with Saudi Arabia will strengthen, as the Kingdom is the only supplier capable of responding in a big way to China's petroleum thirst.
- Beijing will want to offset its growing reliance on Riyadh by strengthening ties to other producers. Iran will see this as an opportunity to solidify China's support for Tehran, which probably would strain Beijing's ties to Riyadh. Tehran may also be able to forge even closer ties with Russia.
- We believe India will scramble to ensure access to energy by making overtures to Burma, Iran, and Central Asia. Pipelines to India transiting restive regions may connect New Delhi to local instabilities.

Water, Food, and Climate Change

Experts currently consider 21 countries with a combined population of about 600 million to be either cropland or freshwater scarce. Owing to continuing population growth, 36 countries, home to about 1.4 billion people, are projected to fall into this category by 2025. Among the new entrants will be Burundi, Colombia, Ethiopia, Eritrea, Malawi, Pakistan, and Syria. Lack of access to stable supplies of **water** is reaching unprecedented proportions in many areas of the world (see map on page 55) and is likely to grow worse owing to rapid urbanization and population growth. Demand for water for agricultural purposes and hydroelectric power generation also will expand. Use of water for irrigation is far greater than for household consumption. In developing countries, agriculture currently consumes over 70 percent of the world's water. The construction of hydroelectric power stations on major rivers may improve flood control, but it might also cause considerable anxiety to downstream users of the river who expect continued access to water.

“Experts currently consider 21 countries, with a combined population of about 600 million, to be either cropland or freshwater scarce. Owing to continuing population growth, 36 countries, home to about 1.4 billion people, are projected to fall into this category by 2025.”

The World Bank estimates that demand for food will rise by 50 percent by 2030, as a result of growing world population, rising affluence, and shifts to Western dietary preferences by a larger middle class. The

Two Climate Change Winners

Russia has the potential to gain the most from increasingly temperate weather. Russia has vast untapped reserves of natural gas and oil in Siberia and also offshore in the Arctic, and warmer temperatures should make the reserves considerably more accessible. This would be a huge boon to the Russian economy, as presently 80 percent of the country's exports and 32 percent of government revenues derive from the production of energy and raw materials. In addition, the opening of an Arctic waterway could provide economic and commercial advantages. However, Russia could be hurt by damaged infrastructure as the Arctic tundra melts and will need new technology to develop the region's fossil energy.

Canada will be spared several serious North American climate-related developments—intense hurricanes and withering heat waves—and climate change could open up millions of square miles to development. Access to the resource-rich Hudson Bay would be improved, and being a circumpolar power ringing a major portion of a warming Arctic could be a geopolitical and economic bonus. Additionally, agricultural growing seasons will lengthen, net energy demand for heating/cooling will likely drop, and forests will expand somewhat into the tundra. However, not all soil in Canada can take advantage of the change in growing season, and some forest products are already experiencing damage due to changes in pest infestation enabled by warmer climates.

global food sector has been highly responsive to market forces, but farm production probably will continue to be hampered by misguided agriculture policies that limit investment and distort critical price signals. Keeping food prices down to placate the urban poor and spur savings for industrial

investment has distorted agricultural prices in the past. If political elites are more worried about urban instability than rural incomes—a safe bet in many countries—these policies are likely to persist, increasing the risk of tight supplies in the future. The demographic trend for increased urbanization—particularly in developing states—underscores the likelihood that failed policies will continue.

Between now and 2025, the world will have to juggle competing and conflicting energy security and food security concerns, yielding a tangle of difficult-to-manage consequences. In the major grain exporters (the US, Canada, Argentina, and Australia), demand for biofuels—enhanced by government subsidies—will claim larger areas of cropland and greater volumes of irrigation water, even as biofuel production and processing technologies are made more efficient. This “fuel farming” tradeoff, coupled with periodic export controls among Asian producers and rising demand for protein among growing middle classes worldwide, will force grain prices in the global market to fluctuate at levels above today's highs. Some economists argue that, with international markets settling at lower grain volumes, speculation—invited by expectations of rising fuel costs and more erratic, climate change-induced weather patterns—could play a greater role in food prices.

A consortium of large agricultural producers—including India and China, along with the US and EU partners—is likely to work to launch a second Green Revolution, this time in Sub-Saharan Africa, which could help dampen price volatility in worldwide grain markets. By 2025, increases in African grain yields probably will be substantial, but the increases will be confined principally to states in the southern and eastern regions of the continent, which will have deepened trade and security relations with East and South

Strategic Implications of an Opening Arctic

Estimates vary as to when the Arctic is likely to be ice free during the summer. The National Snow and Ice Data Center suggests a seasonally ice-free Arctic by 2060; more current research suggests the date could be as soon as 2013. The two most important implications of an opening Arctic are improved access to likely vast energy and mineral resources and potentially shorter maritime shipping routes.

Transiting the Northern Sea Route above Russia between the North Atlantic and the North Pacific would trim about 5,000 nautical miles and a week's sailing time off a trip compared with use of the Suez Canal. Voyaging between Europe and Asia through Canada's Northwest Passage would trim some 4,000 nautical miles off of a trip using the Panama Canal.

Resource and shipping benefits are unlikely to materialize by 2025. The US National Petroleum Council has said that some of the technology to exploit oil from the heart of the Arctic region may not be ready until as late as 2050. Nonetheless, these potential riches and advantages are already perceptible to the United States, Canada, Russia, Denmark, and Norway—as evidenced by the emergence of competing territorial claims, such as between Russia and Norway, and Canada and Denmark.

Although serious near-term tension could result in small-scale confrontations over contested claims, the Arctic is unlikely to spawn major armed conflict. Circumpolar states have other major ports on other bodies of water, so the Arctic does not pose any lifeblood blockade dangers. Additionally, these states share a common interest in regulating access to the Arctic by hostile powers, states of concern, or dangerous nonstate actors; and by their shared need for assistance from high-tech companies to exploit the Arctic's resources.

The greatest strategic consequence over the next couple of decades may be that relatively large, wealthy, resource-deficient trading states such as China, Japan, and Korea will benefit from increased energy resources provided by any Arctic opening and shorter shipping distances.

Asian states. Elsewhere south of the Sahara, civil conflict and the political and economic focus on mining and petroleum extraction are likely to foil most of the consortium's attempts to upgrade irrigation and rural transportation networks and to extend credit and investment, allowing population growth to outpace gains in agricultural productivity.

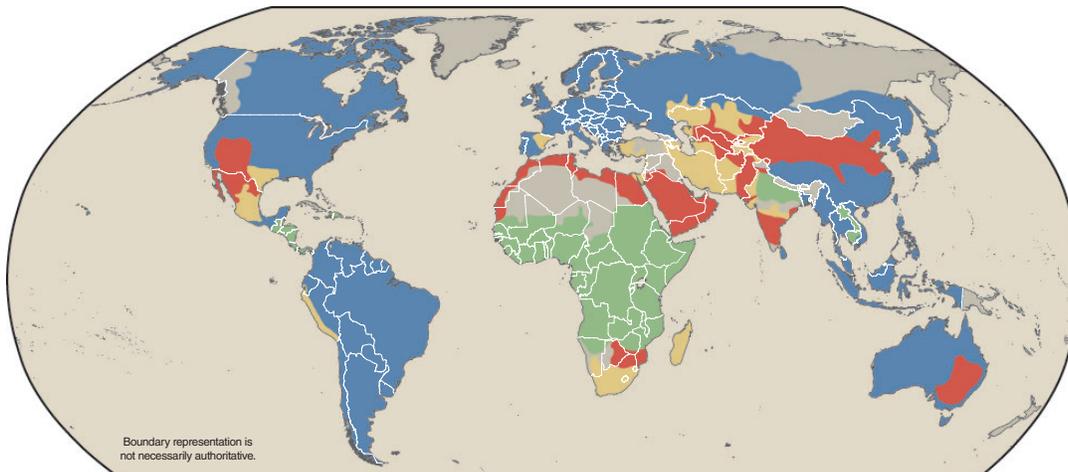
In addition to the currently projected scarcities of freshwater and cropland, the UK Treasury-commissioned Stern Report estimates that by the middle of the century 200 million people may be permanently displaced "climate migrants"—representing a ten-fold increase over today's entire documented refugee and internally displaced

populations. Although this is considered high by many experts, broad agreement exists about the risks of large scale migration and the need for better preparation. Most displaced persons traditionally relocate within their home countries, but in the future many are likely to find their home countries have diminishing capabilities to accommodate them. Thus the number of migrants seeking to move from disadvantaged into relatively privileged countries is likely to increase. The largest inflows will mirror many current migratory patterns—from North Africa and Western Asia into Europe, Latin America into the US, and Southeast Asia into Australia.

Over the next 20 years, worries about climate change effects may be more significant than any physical changes linked to climate change. Perceptions of a rapidly changing environment may cause nations to take unilateral actions to secure resources, territory, and other interests. Willingness to engage in greater multilateral cooperation will depend on a number of factors, such as the behavior of other countries, the economic context, or the importance of the interests to be defended or won.

Many scientists worry that recent assessments underestimate the impact of climate change and misjudge the likely time when effects will be felt. Scientists currently have limited capability to predict the likelihood or magnitude of extreme climate shifts but believe—based on historic precedents—that it will not occur gradually or smoothly. Drastic cutbacks in allowable CO₂ emissions probably would disadvantage the rapidly emerging economies that are still low on the efficiency curve, but large-scale users in the developed world—such as the US—also would be shaken and the global economy could be plunged into a recession or worse.

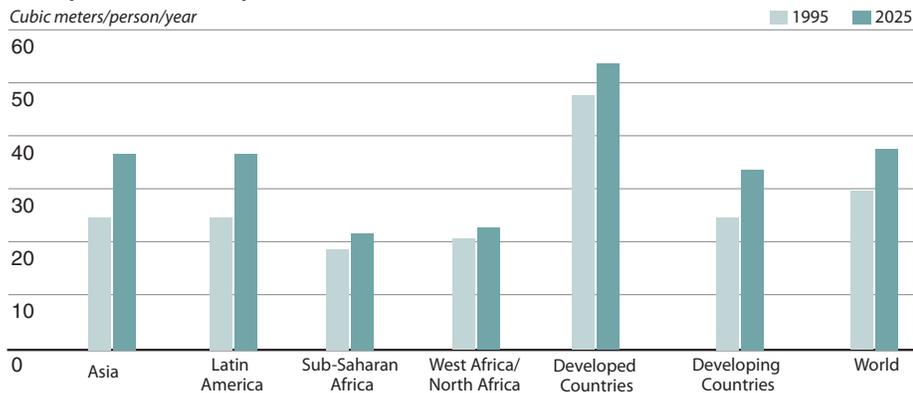
Projected Global Water Scarcity, 2025



- **Physical water scarcity:** More than 75% of river flows are allocated to agriculture, industries, or domestic purposes. This definition of scarcity — relating water availability to water demand — implies that dry areas are not necessarily water-scarce.
- **Approaching physical water scarcity:** More than 60% of river flows are allocated. These basins will experience physical water scarcity in the near future.
- **Economic water scarcity:** Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists.
- **Little or no water scarcity:** Abundant water resources relative to use. Less than 25% of water from rivers is withdrawn for human purposes.
- **Not estimated**

Source: International Water Management Institute.

Per Capita Water Consumption, 1995 and 2025



Source: International Food Policy Research Institute, Global Water Outlook to 2025.

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Sub-Saharan Africa: More Interactions with the World and More Troubled

In 2025, Sub-Saharan Africa will remain the most vulnerable region on Earth in terms of economic challenges, population stresses, civil conflict, and political instability. The weakness of states and troubled relations between states and societies probably will slow major improvements in the region's prospects over the next 20 years unless there is sustained international engagement and, at times, intervention. Southern Africa will continue to be the most stable and promising sub-region politically and economically.

Sub-Saharan Africa will continue to be a major supplier of oil, gas, and metals to world markets and increasingly will attract the attention of Asian states seeking access to commodities, including China and India. However, despite increased global demand for commodities, increased resource income may not benefit the majority of the population or result in significant economic gains. Poor economic policies—rooted in patrimonial interests and incomplete economic reform—will likely exacerbate ethnic and religious divides as well as crime and corruption in many countries. Ruling elites are likely to continue to accrue greater income and wealth, while poverty will persist or worsen in rural areas and sprawling urban centers. The divide between elite and non-elite populations is likely to widen, reinforcing conditions that could generate divisive political and religious extremism.

By 2025, the region's population is expected to reach over one billion, notwithstanding the effects of HIV/AIDS. Over one-half of the population will be under age 24, and many will be seeking economic opportunity or physical safety via out-migration owing to conflict, climate change, or widespread unemployment. The earliest global effects of climate change, including water stress and scarcity, will begin to occur in Sub-Saharan Africa by 2025.

Today almost one-half (23 of 48) of the countries in Sub-Saharan Africa are classed as democracies, and the majority of African states are on a democratic path, but the most populous states in the region and those with high population growth could backslide.

Although Africa is already assuming more of its own peacekeeping responsibilities, the region will be vulnerable to civil conflict and complex forms of interstate conflict—with militaries fragmented along ethnic or other divides, limited control of border areas, and insurgents and criminal groups preying on unarmed civilians in neighboring countries. Central Africa contains the most troubling of these cases, including Congo-Kinshasa, Congo-Brazzaville, Central African Republic, and Chad.

In contrast to other regions of the world, African attitudes toward the US will remain positive, although many African governments will remain critical of US policies on issues like the Middle East, Cuba, and global trade. Africa will continue to push for UN reform and for permanent representation on the UN Security Council.

Global Scenario II: *October Surprise*

In the following fictionalized account, global inattention to climate change leads to major unexpected impacts, thrusting the world into a new level of vulnerability. Scientists are currently uncertain whether we already have hit a tipping point at which climate change has accelerated and whether there is little we can do—including reducing emissions—that will mitigate effects even over the longer term. Most scientists believe we will not know whether we have hit a tipping point until it is too late. Uncertainties about the pace and specific vulnerabilities or impacts from climate change are likely to persist over the next 15-20 years even if our knowledge about climate change deepens, according to many scientists.

An extreme weather event—as described in this scenario—could occur. Coping with the greater frequency of such events, coupled with other physical impacts of climate change such as growing water scarcities and more food crises, may preoccupy policymakers even while options for solving such problems dwindle. In this example, relocating the New York Stock Exchange to a less vulnerable location is considered, but serious consideration also would be given to relocating other institutions to ensure continuity of operations. Although this scenario focuses on an event that occurs in the US, other governments have been caught by surprise with different types of environmental disasters and have suffered a loss of standing. Mitigation efforts—further cutbacks in carbon emissions—are unlikely to make any difference, at least in the short run, according to this account. Such a world involving potentially major dislocations could threaten both developed and developing countries.

Preconditions assumed in this scenario include:

- Nations adopt a “growth-first” mentality leading to widespread environmental neglect and degradation.
- Governments, particularly those lacking transparency, lose legitimacy as they fail to cope with environmental and other disasters.
- Despite significant technological progress, no technological “silver bullet” is found to halt the effects of climate change.
- National solutions to environmental problems are short term and inadequate.



Presidential Diary Entry

October 1, 2020

The term “October Surprise” keeps recurring in my mind...I guess we had it coming, but it was a rude shock. Some of the scenes were like the stuff from the World War II newsreels, only this time it was not Europe but Manhattan. Those images of the US aircraft carriers and transport ships evacuating thousands in the wake of the flooding still stick in my mind. Why does hurricane season have to coincide with the UNGA in New York? It’s bad enough that this had to happen; it was doubly embarrassing that half the world’s leaders were here to witness it—and a fair number of them had to be specially airlifted or spirited away for their safety.

I guess the problem was that we counted on this not happening, at least not yet. Most scientists assumed the worst effects of climate change would occur later in the century. Still, enough warned there was always a chance of an extreme weather event coming sooner and, if it hit just right, one of our big urban centers could be knocked out. As I remember, most of my advisors thought the chances were pretty low after the last briefing we got on climate change. But we were warned that we needed to decentralize our energy generation and improve the robustness of our infrastructure to withstand extreme weather events. Tragically, we did not heed this advice.

We’ll survive, but Wall Street really has taken a blow and I don’t think we will get the NY Stock Exchange back up and running as quickly as we did after 9/11. There is a question whether it will continue to be the NY Stock Exchange to begin with; it might have to change its name to the “Garden State (New Jersey) Stock Exchange”—wouldn’t that be a blow to New Yorkers’ pride!

It’s not as if this is just happening to us. Truth be told, the problem has been our whole attitude about globalization. When I say “our,” I really mean in this context the elite or even the little knot of leaders around the world. We all have been focused on boosting or maintaining greater economic growth. We have a lot to be proud of too in that regard. We have avoided giving in to protectionist urges and managed to reenergize the trade rounds. But we have not prepared sufficiently for the toll that irresponsible growth is having on the environment. The New York disaster may not have been preventable with any measures we could have taken 20 years ago, but what are we laying in store for future generations by ignoring the signs? We all assume technology will come to the rescue, but so far we have not found the silver bullet and carbon emissions continue to climb.

What we did not understand is that the general publics in several countries appear to be ahead of leaders in understanding the urgency or at least they have had a better sense of the need for trade-offs. They have become early adopters for energy generation from renewables, the use of clean water technologies, and using improved Internet connectivity to avoid the concentration of people that make them vulnerable to extreme weather events. The Europeans, of course, have been out in the lead on energy efficiency, but they have been too ready to sacrifice growth, and without economic growth, they have not been able to generate high-paying jobs.

In China, it's the opposite—too much crony capitalism. It's not clear, for example, that China's Communist Party (CCP) will survive the scandal over burst dams and the devastation that followed. A couple of decades ago, I would have thought it possible. At that time, the public there was so grateful for the material benefits accruing from China's hell-bent efforts to modernize that the Chinese people forgave the leaders almost everything. Now it is different. The middle class wants clean air and water. They don't like the environmental devastation that was the price of rapid modernization or corruption that winks at the turning off of US provided carbon capture equipment in their coal fired electrical plants. The Party is split too. Half worry about a slowdown from more sustainable, environmentally prudent growth that could be politically devastating if jobs are not generated to the same degree. The other half understands the hardships and is more attuned to changing middle class priorities. I would not be surprised if the 100,000 who perished in the recent dam disaster turn out to be the straw that breaks the CCP's legitimacy, coming as it does on the heels of those corruption allegations against high party officials.

The poorest countries have suffered the most from our hands-off approach to globalization. I know we have talked for some time about not all boats being lifted and the need to do something about it. But I think we thought it best that Bill Gates, NGOs, and others handle the problem. Of course, everyone has to get involved. NGOs can't mount peacekeeping operations. States at some point have to take responsibility. Most of these countries did not have a chance without strong outside intervention. The fact that we had clean water technology and could not find a way to get it delivered to the most needy only made the bad impacts of climate change worse.

With the climate changing rapidly, we are facing more problems—though not insuperable—in maintaining adequate agricultural production. More challenging than boosting agricultural yields overall is that changing weather patterns mean certain areas can't sustain themselves. People migrate to the cities but the infrastructure is insufficient to support such burgeoning populations. This in turn sows the seeds for social conflict which impedes any steps toward good governance and actually digging out from a long downward cycle. I count about 20 countries in this condition.

The problem is that some of these are not small, geopolitically insignificant countries. Some—like Nigeria—we in the developed world rely on for needed resources. Because of the encroaching desertification in the north, the religious clash between Muslims and Christians is heating up. Another Biafra-like civil war—only this time along North-South lines—is not inconceivable.

We talk a lot about these problems at the G-14 summits and in fact have started to engage in joint scenario exercises, but doing anything about an impending storm cloud is still beyond us. My last thought for the diary before I have to greet the dignitaries being airlifted onto the aircraft carrier for the UNGA reception: the growth projection figures are really bad. The cumulation of disasters, needed cleanups, permafrost melting, lower agricultural yields, growing health problems, and the like are taking a terrible toll, much greater than we anticipated 20 years ago.