Quantum Leap

U.S. Economy	Nature of Disruptions	Role of U.S. Federal Government	Global Mobility
Strong	**Novel**	**Substantial**	**Fluid**

Summary

The U.S. is enjoying a renaissance. A technological revolution fostered by aggressive public-private investment has given the U.S. bleeding-edge advantages in computing, nanotechnology, smart materials, and robotics. So much is happening so quickly – awesomely powerful computers solve complex problems, from basic science to advanced engineering and things as practical as weather prediction. Solar energy promises to end the hydrocarbon era and smart materials are fundamentally changing how things are made. But it's not all upside. The world struggles with the increasingly destructive effects of global climate change. Oil-producing economies will soon be on the brink of collapse, creating a whole new slate of security concerns. A globally networked "elite" appears to enjoy superior political and economic advantages. Cybercrime and intellectual property theft are rampant. No one knows where this brave new cyber world will lead, but for now Americans are enjoying the best economy since the 1990s. Debt is manageable, jobs are plentiful, and the American dream is alive and well.

The Future, Eastern United States

Andre Nolen is one of the most highly regarded civil engineers in the U.S. As a result, he is well traveled, but he'd never been in this area of the White Mountains before. The secondary roads were so snow-covered and complicated that he would have become lost on his own. He seemed to have arrived, however, as he turned down a small road, but . . . "Sophie, is this right? There're no guards, no fence! All I see is a small pasture and a pond off to the left. This can't be right! You confirmed the download, right? . . . what the . . .."

The car's motor stopped abruptly, but something took over the braking and steering. It was a smooth deceleration. A roboguard appeared out of nowhere (literally, out of nowhere), then the pasture and pond disappeared and the entrance of the Institute for Adaptive Materials appeared before him. Apparently, security had already done a remote scan, confirmed his identification, and then dropped the holofield that concealed the Institute's entrance. No, actually the holofield simply shifted behind him, still distorting the view from the road. "Ok, Sophie, that was helpful. We can do this," Andre said.

Andre got up out of his living room chair and went into the kitchen. The holo-senso-graphic version of his car and the White Mountains scenery disappeared as he stepped through it. "Sophie, I'd like a glass of Macallan's 18, please." *Well*, he thought*, I am glad for that practice. I didn't know anyone had that kind of freestanding holofield! I'm glad the IAM security people got us cleared soon enough to get that simulation.*

"Dana's calling," said Sophie, and that brought a smile to Andre's face. He and Dana had been dating for 18 months. At the age of 30, Dana was already on her second career. She had graduated a few years behind Andre from MIT with a degree in Optical Computing and worked in the field for seven years (and had two patents in that short time!). Now she was fast becoming one of New York's most sought-after light sculptors.

"Your heart rate is going up, dear." said Sophie.

Andre sighed, and said, "The owner's manual says you cannot have a sense of humor!"

"What kind of nonsense is that?" said Sophie. "You never scanned my owner's manual and you know it! And here I am, one of the most expensive on the market! Your blood pressure is going up, by the way. Interesting – Dana sends your heart rate up, and I send your blood pressure up. I wonder which is the romantic reaction? Oh, I have already made connection. Dana is listening to this."

Dana's muffled laughter filled the room. "That will teach you to leave me alone in your apartment with your base unit compusist for two days. Sophie and I discovered that there were dozens of sub-routines you never enabled. Two were for personality and humor. It's a learning routine, of course, so Sophie will only get more interesting over time! We *both* love you, you know."

"Am I – are we – going to see you tonight?" asked Andre.

"Ah, no . . . and I am really disappointed, but, well, let's see. I have good news and bad news, and both keep me away for several days, at least. ["Your heart rate is dropping," whispered Sophie.] First the bad news – my brother Colin just had a MLMSD attack, but at least the docs in Bangalore say its not a bad one – it was not a full-up psychotic break." Sophie immediately put information on the screen nearest to Andre and he scanned over the material quickly as they talked:

> MLMSD (Mid-Life Multi Spectrum Disorder) is a new condition resulting from demand multi-tasking and sensory overload . . . acknowledged for ten years . . . only recently understood . . . never hits before age 40 and seldom in women . . . some snap into violence . . . most simply freeze up; a few never return to reality , , , .

Dana continued, "Mom and I are screening his doctors tomorrow, but they are very hopeful of a recovery. Of course, his prospects will be limited for the rest of his life. Damn. I'll let you know what we hear." Sophie was displaying the voice stress levels on the screen, but Andre didn't need that to tell him she was distraught.

"The good news is that some Brit royalty wants to commission a light sculpture. Unfortunately, they are zeta-old-school and want to meet in person. So, I will be in London for a few days. After your secret trip to New Hampshire – Sophie was very closed circuit about it – you're going to Norfolk, right? Can we meet there? I need a few days off and I'm interested to see what you're building."

"Norfolk sounds great," replied Andre immediately. ["Your heart rate is going up again," whispered Sophie]. "Sophie, make whatever changes are needed for travel and get Dana gate passes. Dana, please send Colin my best. I love you, my friend."

"Love you, too. Sophie, please keep him out of trouble."

Later that week in the White Mountains . . . As Sophie parked the car in the underground lot, Andre looked at the entrance to the Institute for Adaptive Materials. *It looks like Cheyenne Mountain,* he thought. Each parking place had inductive electrical connections and he heard the car "plug in."

"I just received permission from the security computer for you to take my presence in with you," said Sophie. "I have lost communication with the home unit and I have been informed that I cannot stay linked with the car, so I will be present in my least effective state." Andre nodded as he walked to the entrance, and then smiled to himself – *Sophie can't see me nod here*!

"Mr. Nolen, this is a genuine pleasure," said the security robot whose name tag said Matt, "And Sophie, too, of course. Director Sheppard is just finishing up an orientation talk with new staff. He suggested you wait in his office or you could sit in on the end of the meeting."

"The end of the meeting sounds great," said Andre, "let's do that."

As Andre Nolen, one robot named Matt, and one compusist presence called Sophie proceeded down the hall, he saw holographic signage appearing in front of various closed doors: *Buckyball Bureau – Self-Replication Lab – Not Authorized - Chaos Controls Lab - Adaptive Crystals - Supercontinuum Broadband – Not Authorized – Diamond Lab – Cold lab – Cloudless Systems.* Sophie whispered in his conformal earpiece, "They are customizing the signage to suit our clearances."

As he sat down in the auditorium back row, Director Sheppard was saying, "So you have all joined an Institute that doesn't exist. Oh, it is true that we do materials research and what we do is very leading edge – actually some truly amazing advances in materials are just on the horizon – but the structure of this Institute and its cover story have historical roots. Outwardly managed by MIT, it is a 75% government-funded national lab for computing. The other 25% is private research investment in joint activities. Like the National Labs before us, such as Los Alamos or Livermore, we operate in the national interest at the creative leading edge of vital technology. But instead of nuclear fusion to crunch cities, we crunch numbers." (He got a small laugh for a very old joke).

"We are a classified research facility for the simple reason that in this era, national wealth, security, stability and our ability to sustain those attributes – plus prepare for the climate change upon us and to come – is 100% dependent upon maintaining the computational advances the U.S. has pioneered in the last 30 years. The U.S. is a strong and prosperous country again, and the world is mostly at peace because of what we do here – because of the power our technology gives to the U.S. So we take security seriously. For us, the security threat is almost entirely about cyberspies. So you get a sense – 10% of our budget and 15% of our computer processor power (the most powerful computers in the world) are spent on cyber security. We try to keep security unobtrusive, but remember – we are flippin' paranoid about it!

According to your profiles, most of you are here because you want to continue the quantum computing revolution. Well, I am here to tell you that's not possible. The quantum computing revolution is barely out of its infancy. You are here to START the revolution. Oh, we have already accomplished huge strides in weather and climate modeling, and even more amazing advances in solar energy, but we are still just taking careful baby steps.

Twenty years ago we entered a second computer revolution and it has been an AWESOME ride. Nanowires, optical computing, and advances in conductive, semi-conductor, and substrate materials like graphene didn't just extend Moore's Law; they nearly halved it – down to 10 months. That, plus optical wireless and agent-based software, have brought untold advances in mobile computing, processer power, memory, and imagery to everyone. It gave us the ability to design and build new power systems that are freeing us from petroleum dependence. But, perhaps most importantly for us in this room, it finally gave us the computing power to fully understand and design workable and reliable quantum computers. Now we can really stretch our legs.

So what are we doing right now? Outside of the NSA, almost 50% of the quantum computing power in the world sits under this mountain. We are using that computing power to do six things: build new quantum computers, study quantum mechanics and quantum effects, deepen and extend advances in solar energy, model and simulate new materials, model and simulate

climate and weather, and, of course, extend work in cryptology. So, at the moment, three applications are science or R&D and three are more practical. Why not more? Well, after you see what we are doing in materials, climate & weather and solar advances, you might be less critical. And don't forget our partners in India. We and others in this country work closely with the U.S.-Indian Cyber Security Center and we are also in close collaboration with another Indian research center, which I won't discuss further at this time.

Okay, I can read body language from here. Oh! You want to be great computer theorists, with articles in *Scientific American*! Well, the ones who are working on climate, weather and solar energy just might end up being the real heroes of this story. They will end up saving the U.S. economy and maybe much of our technological civilization. We must have energy independence, but for a fast-growing economy, that's the trick. Solar can't just replace oil, it must outpace the demands for more energy.

And the climate . . . the oceans are warming faster than scientists predicted just two decades ago. Ice sheets are melting faster. They are becoming unstable and slipping. Weather has become much more severe – so much so that there are ports, airports, even highways that shut down for days at a time. The New York City subway has flooded three times now. All over the world refugees are on the move – millions and millions of them! Thirty years ago, scientists told us to expect a one-meter rise in ocean levels by 2100. We might see that in 10 to 20 years now. Think of what that means. Two hundred and fifty million people live within a one-meter rise of sea level. That includes 8 out of 10 of the world's largest cities.

One last thought to give you before I turn you over to HR. You see the massive installations in this facility – massive installations sitting under the overhead protection of an entire mountain! Partly that is there for concealment and better cyber protection. But never forget, for all that size, how very, very fragile this technology still is. You don't see quantum computers in homes and it's possible you won't for decades. For all our recent advances, we still suffer from quantum decoherence. Even the slightest perturbation from the outside environment can distort quantum calculations. So here is the great irony: after all our advances in mobility and miniaturization, someone from 1965 would recognize a quantum computer setup and think it looked normal. The carefully controlled environment, shock mountings, massive plumbing for cooling (of course ours is just above absolute zero), and dozens of people monitoring everything . . . it looks just like a university IBM 360!" (Sheppard could see that no one in the audience knew what that was. Oh well . . .).

Andre, with Sophie taking notes, spent the rest of the day with Sean Sheppard and some of his top materials scientists. What they showed him was going to bring some exciting changes to his profession. It had been made possible using quantum computer simulation and modeling, but the standard contemporary computer technology would be more than adequate to manage the new systems. He had just the place in his Norfolk-Hampton Roads project to test this out. The best part was that it was all unclassified.

Later that afternoon, as they drove along the auto-control interstate, Sophie broke into his thoughts, "Your neighbor Dave is calling. The system is charging you, not him and, while it is his phone, Butch is not present. Do you want the call?"

"Sure, but shut it down if you get suspicious," said Andre. "Dave, what's up?"

"Andre! Where've you been? I'm screwed! My identity was hacked this morning! They got everything – accounts, authorizations, passwords, and access to my compusist! It's a horrible mess – horrible!"

What Andre thought was, *how many times did I tell you to stop relying on cheap security software?* What Andre said was, "How can I help, Dave?"

"Look, at least I paid attention to one thing you told me," said Dave. "I kept an off-line backup and, if I can get that to the police, they might still be able to do something. But I can't get into our building – no access code and no compusist to interface for me! Will you send an authorization? I gave Sophie my codes last year."

Before Andre could even ask, Sophie whispered to him, "It's him; at least 99.4% sure. His stress levels are interfering a bit, but it's him. Wait. Okay, I just checked the bio-scan sensor at the front door. It is Dave and he's ready to go in. I can do his apartment door and switch his apartment to manual mode, too."

"Okay, Dave, when I hang up, Sophie will transmit the access. After security scans you at your apartment door, she will get you inside and shift your apartment controls to manual. Good luck!"

Serves him right, thought Andre. *He was ultra-cheap on software and never put enough processor power into his compusist, called Butch, of all things. He will spend two years in personal identity hell for not spending a little more money.*

Four days later, at the Ocean Barrier Project, Hampton-Norfolk . . . "This is really impressive, Andre," said Dana, as they looked out to the barrier. "What is best of all, to me, is that it is not an ugly industrial looking structure. What's that over there?"

"Oh, three days ago the Terra Defense Force crashed an explosives-packed hydro-skimmer into the wall. They'd been more clever than usual and had really good robotic 'humans' that fooled everyone from a distance and the craft seemed smaller than it was. They did some very respectable damage, actually. If they had crashed the gates, it would have been much worse. Now I have to add active defenses." While Andre was talking, Sophie projected on the car's windshield:

> The Terra Defense Force is a splinter group off the more respectable Earth First Association. They believe that all artificial means to mitigate the effects of climate change will only make things worse. Humanity should be forced to live with all the consequences of its actions . . . The group has gone underground and is becoming more violent and much more effective in its attacks . . . .

"Odd really," continued Andre, "it was a technically sophisticated attack – stealthy ultra-high-speed... It had to be really expensive. Where is a splinter group getting that kind of money and military-grade explosives?"

"Anyway, back to how the wall looks. The Navy didn't much care how it looked and they are paying for most of it, but the Port Management and the local towns cared a lot. Competition is so extreme among ports today, that they figured anything that made things both safer and more attractive was a good thing to do. They actually lobbied pretty hard for the extra money to make the barriers and gates look good.

The main problem is this: The design was approved and funded ten years ago and was planned on the basis of a reasonable extrapolation of the weather and climate threats that could be modeled at the time. While that barrier will probably handle expected sea rise for decades, it will not manage the storm surges we now understand will be upon us very soon. Those storm surges might well make the port towns, the Navy and Coast Guard facilities, the shipyards, plus Langley AFB and NASA completely untenable in a decade, maybe less. Recent quantum models of weather patterns are really alarming." Andre paused and looked at Dana.

"I'm guessing that dramatic pause is meant to prepare me to be wowed with how your New Hampshire trip is going to solve all this," said Dana.

Andre grinned before he could control it. "Precisely! Look, when I designed that barrier, I employed the most advanced adaptive and smart structural materials that met my cost constraints. However, ten years ago I was locked into the fairly standard piezoceramics, unsymmetric laminates, shape memory polymers, and early versions of graphene that have been known since R&D activities in the 2000s. They work well, but the range of motion and self-healing that I could build into the wall were limited, and the power consumption needed for such a large wall to remain adaptive is very high."

"Of course," said Sophie, putting on the childish accent of a famous holo star, "I mean like, what kindergartener doesn't know that constant current is needed for piezoceramics to sense stress differentials, or that fiber optic delivery of an IR laser is needed to actuate a shape memory polymer? I mean, like, duh!"

Dana looked at Andre and said, "Maybe I made a mistake activating those personality sub-routines."

With a shrug of resignation, Andre continued. "Those guys at IAM gave me some awesome improvements – things that will make a huge difference all over the world. The first advance is in materials. They have built new sandwiches of dissimilar materials that people once thought could never be combined. 'My' wall will be able to stretch, bend, and form new shapes with a range of motion I never thought possible. It's sort of like the compound bow invented a couple thousand years ago. The wall will have a lot of strength and power, but it will be rigid when needed and also bend and change shape when that is required to dampen storm surges. The wall can do that automatically, with a new material that acts like a piezoceramic – sensing changes in external forces – or at command from a control station.

With new materials that act like the old shape memory polymers added in, I can have very flexible gates. There are limits, but I will have many options for 'hinging' that allow a gate of almost any size. That means I can get 'just-in-time' opening and need not let in more water than is needed for the exact size of the vessels."

"Now, here is the really cool part. These new materials have semi-permeable membrane sieves built into their structures that allow water in through the wall's surface. That system can pump water out of the harbor. The same mechanism can take in seawater and, with internal filtration technologies based on new graphene developments, break it down and send hydrogen to shore as fuel to run the wall's power plant. It does take quite a bit of electricity to make all this happen, but the wall is actually going to have a large positive energy budget and a tiny carbon footprint. And, the same processes can be used to desalinate the water. Port protection, power generation, and fresh water all from a sea barrier!

"I have set up a new company expressly for this and posted recruiting on GlobalNet. I already have one Chinese architect and two Indian engineers, one who worked on 3rd-generation morphing wings at Tata. All three look promising. Sophie has talked with their compusists and is satisfied they are good enough for now. I'm screening the humans tomorrow. I'm going to need an accountant to work with Sophie. Is that something Colin might handle? It wouldn't require multi-tasking."

"Thanks," she said softly, "I'll talk to Colin." Then much less softly, "Can you imagine where this can go in the art world? Adaptive sculptures matched to integral light sculpture! This could be a whole new field of human art!"

"I called the company D&A Enterprises, by the way," said Andre, "and I am looking for a long-term partner . . . " The last sentence sounded a bit like a question.

"His heart rate is going up," said Sophie.

Characteristics Matrix	
U.S. Economy	**Strong**
Nature of Disruptions	**Novel**
Role of U.S. Federal Government	**Substantial**
Global Mobility	**Fluid**

Background

In the years following the Great Recession, the U.S. staved off economic turmoil by forging a grudging consensus around essential tax and spending issues. Congress and the President hammered out essential deals, some of which exacted a toll on domestic constituencies, while putting finances on a stable footing. U.S. withdrawal from Iraq and Afghanistan was accomplished. The expense of these commitments had been part of the national spending debate. These measures gave the economy a breathing space.

The U.S. has become the center of a technological renaissance, made possible by dramatic U.S.-based advances in computing technology. The first advances were in the synergies of nanotechnology, optical computing, optical wireless, and new semi-conductor advances. Moore's Law was halved. Then many years later came breakthroughs in practical quantum computing, which is still in its infancy. These two computer revolutions have precipitated an innovation feeding frenzy. More and more, the balance of power in the world is determined by technological "haves" and "have-nots."

One of the most significant applications of these technology breakthroughs is in highly efficient solar energy capture and transmission. Solar power, combined with new nano-based filtration materials, has made large-scale desalination viable.

Oil may still be king (well, prince), but its days are numbered and the markets are already discounting its value. Oil-producing nations that have no alternative means of support face wrenching adjustments and instability.

Extreme weather around the global and rapidly melting polar ice has convinced all but the most hardened skeptics that climate change is happening. Quantum simulation has given us a deeper (but still imperfect) understanding of climate phenomenon and greatly increased the predictability of weather disruption.

Global Stability & Conflict

The primary sources of conflict in the world are economic and technological competition and mass dislocation of people resulting from climate change. There is less traditional arms acquisition, though no nation has disarmed.

Cyber conflict is a central feature of public and private life. It is a never-ending "invisible" series of attacks, counter-attacks, feints and misdirection, with no certainly that you have succeeded, or just been had – or who just attacked? It is not war in the classic sense but certainly it is not peace to the cyber warriors who have become the bulwark of national defense. No "cyber world war" has broken out, but it is always in the background, even as all understand how devastating such a war might be. The private sector mimics the public, but with victory often defined by theft or defense of Intellectual Property.

Climate change is also a source of conflict. Flooding in poor, low-lying areas and drought and desertification have caused mass population movements, across borders and sometimes over oceans. Many poor nations have been further hurt by disruptive weather, population uprooting, unfriendly neighbors, and technological changes causing shifts in global supply chains.

While the U.S. has the most effective (albeit smaller) classic global military force, it has embraced a decidedly "soft power" role, tightly focused on promoting U.S. interests in global governance, trade stability, standards, and IP protection. While still providing international aid, the U.S. does not see itself fixing every global problem.

Globally, regional powers take up the "stability and first responder" role when needed: Japan, China, India, South Africa, the European Community, the U.S., and Chile, as examples. The U.S. is the lone power with sustainable global reach, but it is reluctant to intervene without clear national interest. However, providing logistics and expertise in a support role is common.

A viable Palestinian state deflates the appeal of radical Islam, but there are new sources of tension as petroleum states lose income and environmentalists and anti-technologists are radicalized. Iran, which, while still anti-western, has grown more moderate and secular, is now wrestling with harsh economic realities in the emerging post-petroleum world. It is a nuclear power, but has not weaponized this capability.

Global Governance

Global governance is relatively strong, but not generally from multilateral treaties. The UN is not particularly effective at the General Assembly/Security Council level, but UN agencies are effective at technical levels, especially where leading nations and regional powers share common interests.

Science-based rule making is the new clarion call in the face of climate change and disruptions in the natural environment. But this has not eliminated uncertainty or dispute. Quantum simulations of weather and climate have only spotlighted how little we still understand.

Key Global Actors

Economically stable and technology-rich countries are the key global actors. The U.S. has emerged as the locus of the breakthroughs, due to well-funded research, world-class universities, and innovative government-business alliances. The U.S. allies with India and others to ensure technological depth.

China is also among the world's leading powers, but not without challenges. The interior has suffered from neglect and climate change. Coastal regions, especially the major port cities, are leading edge players in the world market, with apparent separate agendas. Experts wonder if central government control is declining in the face of these internal differences.

Global corporations are also important actors and frequently have leverage over national governments. But international technical institutions and local governments are active regulators, and play a key role in a very dynamic power balance. Professionals often have careers in both public and private sectors.

Cyber-based "meaning communities" have become powerful global channels for connection and influence. There are many cyber committees (not all with official standing) within and among individuals, organizations, companies and governments. Many important decisions, for example in standards, are organically "grown" and de facto implemented among meaning communities, before formal authorities render actual decisions. Transparency, therefore, is questionable. Some observers raise questions about the dilemmas of democracy, openness, and citizen participation. Is this 21st century democracy at work – or the first steps down an Orwellian path to a cyber-oligarchy?

Status of Haves & Have-Nots

The global economy is as strong as it has been in decades, with continuing disparities between nations and within countries. There is strong, sustainable growth in mature knowledge-based economies, including the U.S., Germany, the UK, Japan, and Korea. India has emerged as a leader among the former "developing" nations. Brazil and China are encountering significant challenges, but are still dynamic powers.

Less technologically endowed nations still provide resources to the expanding world economy. But due to robotics, low-end manufacturing no longer is a sure ticket to development, thus there are tensions between have and have-not nations. Poverty is declining overall, but the least educated and technologically connected and those wracked by climate change continue to be marginalized.

Within affluent nations, a lot of traditional white-collar jobs are gone, but new knowledge-based careers have sprung up to take their place. There are government and private training programs, but not all are reached. Many less skilled find work in infrastructure development or services for the affluent. A globally mobile (physical and cyber) career-oriented, well-educated elite is arising that have few clear loyalties to their own nation-states.

Oil-producing nations face uncertainty, as non-traditional energy sources send oil prices falling. Nations that have not begun the transition to a post-petroleum world could be at great risk.

Terrorism

Militant Islamic extremism is now a fringe movement, thwarted by coordinated global action and technology. Moreover, the appeal of *jihad* has declined. Foreign soldiers no longer occupy Arab lands. The Palestinians have their homeland.

There are new terror threats: environmental extremists, anti-technology groups, and Unabomber-type loners – all of which have occasional successes, many deadly. There are also regional terrorist activities, often conducted against defenseless migrating populations. The classic alliance of crime and terror still has a home in failed states. Greater tracking and surveillance technology have kept this threat partially at bay in developed countries. Criminal networks from the Caucuses to Kazakhstan smuggle arms to terrorist organizations of all types.

WMD/E

More countries have nuclear capabilities. Fortunately, owing to stiff international sanctions and enhanced surveillance capabilities, very few have built weapons.

Chemical weapons have been used on mass refugees in Africa and South East Asia to prevent or punish border crossings. Terrorists are assumed to have access to both chemical and biological weapons, but have shown a preference for explosives and cyber attacks.

Cyber-terror and the potential for cyber war is an ever-present danger, as more technically trained armed forces and individuals have the ability to disrupt systems and inflict potentially large-scale destruction. It is for this reason that the U.S. has sought strict controls over the "export" of quantum computing know-how.

Global Crime

There is less crime resulting from entrenched poverty, but a vigorous arms trade and smuggling in and through poor areas still thrives, particularly in Africa and parts of Latin America.

Most major consuming nations have decriminalized marijuana, which has allowed law enforcement authorities to concentrate on other issues, like the many homemade designer drugs.

Global criminal enterprises are based in corrupt or ungoverned regions. They will sell, barter, or steal whatever will make them money and bring them power, but keep them "off the net": slavery, smuggling of addictive fake performance enhancing drugs, and even the "classics" like heroin and cocaine (in some poorer regions). While smuggling through elaborate security systems is hard, it is not impossible, and the economic rewards are enormous for technologically sophisticated criminals. The U.S. has decided to rely on its multi-purpose high-tech surveillance and has ended its *war on drugs.* It treats the issue as part of all smuggling.

There is fairly high incidence of industrial and white-collar crime, intellectual piracy, identity theft, and widespread potential for electronic fraud.

Global Markets	Technology breakthroughs are driving new supply chains and trade routes. With increasing use of robotics, and the demand for new green-certified factories, manufacturing locations are no longer determined solely by low wages. Some products are now produced close to ultimate consumers. Some factories in China and Southeast Asia are closing – and some opening in the U.S., Japan and Europe. Technology breakthroughs are also lowering raw material demand. Nano-manufacturing techniques, high-tech ceramics, and carbon-based materials are replacing metals in many applications. U.S. imports of previously critical minerals have dropped drastically. Additionally, advances in robotics have made it economical to open many North American mines, thus further reducing imports. However, rare earth minerals (important in green technologies) still require importation from China. Energy markets have taken a major hit, with the emergence of solar as a viable new energy alternative. There is a very fluid movement of capital across borders. There is widespread electronic commerce, with minimal use of paper currency and a very high premium on secure transactions, for individuals as well as businesses. "Green Certification" is critical for competing in global markets. In the U.S., agricultural supply chains are shorter, as more people opt for locally produced "green" produce, with minimal carbon footprints.
Global Trade	There exists a relatively open and dynamic global trade system, with regular business boom and bust cycles, but an unambiguously upward movement in global economic fortunes. Competition for market advantage is fierce, and major trading nations look to the World Trade Organization to help maintain order (but resorting to bilateral haggling to work out disputes). Traditional piracy is a minimal threat, but intellectual piracy is a major risk; protecting against it is a shadow cost behind all transactions.
Energy	A new energy era is emerging, driven by fears of climate change and massive government investment in new energy technologies. While oil and gas still play a key role, the trend away from hydrocarbons is clear. Conservation technologies have had a huge impact and solar is increasingly an effective substitute. Energy independence is in view for the U.S. Poorer parts of the world are still dependent, but they can afford it more now because global oil prices have dropped significantly. Oil producers are accelerating production to maximize returns before prices drop further; there's hardly any incentive to hold back now. Oil imports to the U.S. are nearly down to 2010 levels, and declining by 5% per year and accelerating.
Natural Resources	There is much uncertainty over the value of natural resources. Many minerals and metals are now mainly used as additives to advanced ceramics rather than in their own right, so while the need for them is declining, global economic growth uses more ceramics, and therefore more additives. Quantum computing also holds the future promise of molecular engineering, and that will have

profound implications for natural resource extraction.

Breakthroughs on desalination and solar power make fresh water available near oceans. In food, advances in crop genomics are offset by bad weather and disease outbreaks. Wild fisheries are no longer commercially viable (thus, wild fish caught and smuggled demand astronomical prices). The one exception is in the Arctic, where many species have migrated due to climate change.

Some depleted fish stocks are now raised via aquaculture. U.S., Latin American, and European aquaculture is safer thanks to water filtration technology, thus allowing some wild fish stocks to stage a slow comeback under globally set safeguards.

Environment

Most nations embrace global standards in environmental protection. It's a matter of wanting to do the right (and critical) thing, and avoiding global sanctions. A global cap-and-trade system now exists for carbon emissions. ISO "tariffs" on non-sustainable manufacturing disadvantage some Chinese and Southeast Asian industries because of their outdated "dirty" processes.

While land-based water, air and ground pollution are serious, the oceans are in terrible shape. Warming and acidification have destroyed or forced many fish stocks to migrate to polar regions. Coral reefs are mostly dead everywhere. This has multiplied the impact of storms and created more erosion – particularly in the Pacific. The Maldives are under water, as are many Pacific islands.

The growth rate in pollution has slowed. But at the same time there's a debate rising about possible nano-pollution (including disposable sensors) and other possible side effects of new technologies.

Climate & Weather

There is a solid scientific consensus about the reality of climate change and the joint effects of human and natural causes. The effects of climate change are seen in:

- Sea level rise more than predicted
- Measured slippages in Greenland and Western Antarctic ice sheets
- Acidification of oceans
- Expansion of arable land in high latitudes (especially Europe, Russian and Canada); falling crop yields in many low latitude countries
- Increases in the number and intensity of typhoons and hurricanes
- New regions at risk from hurricanes, and more inland impacts
- Spread of equatorial diseases further north and south.

There is a vigorous debate about leveraging new technologies to "geo-engineer" the climate. Eco-terrorist groups have threatened extreme violence against anyone who attempts climate intervention.

Natural & Accidental Disasters	Natural disasters are falling along a normal distribution, but often seem worse due to sea rise and the violence of storms. Climate-driven weather problems are occurring with both much greater frequency and intensity across the globe. The one great wild card is the ice sheets of the Antarctic and Greenland. They are showing more and more signs of instability and slippage, after a period of some quiescence. If just one ice sheet (for example Greenland) were to slip completely, the ocean level would rise by seven meters.
Demographics	There's nothing new in the U.S. ethnic balance. The nation continues to diversify and in the process grow less white. Legal immigration into the U.S. is at historically high levels. Demographers are starting to note the start of a new baby boom. A liberal guest-worker program provides plenty of people at the base of the employment pyramid. There has been significant progress in understanding and treating serious chronic diseases like Alzheimer's. All of this extends longevity in the workplace. Globally, people are living longer with better nutrition and healthcare. The clear exceptions to this are the migrating masses fleeing climate change in Africa, Southeast Asia, and Central America. Among them, disease outbreaks and chronic illness are high, despite relief efforts.
Migrant Flows	Rising sea levels and destructive weather have caused mass land and sea migrations in the Indian sub-continent, much of North and Central Africa, Pacific Islands, Southeast Asia and Central America. U.S. high-tech border surveillance retards much smuggling; however the pressure to get into the U.S. is extreme and attempts are constant and desperate. This is mostly from the Caribbean and Central America (especially Haiti and Honduras), as sea levels rise and hurricanes pound the region. A relatively liberal guest-work program exists with Mexico but there is still hardship and some pressure to emigrate illegally. Attempted mass migrations from the Pacific are on the rise. There is a slow, steady internal U.S. migration away from the coasts to the interior – especially to lakes and rivers. Insurance for coastal dwellings is no longer affordable for the middle class; those who stay must reinforce and self-insure. Staying is dangerous.
Human Health Issues	Technology has driven significant progress on human health. New genetic therapies correct many diseases in childhood. Enhanced computing power and nanotechnology are permitting much more efficacious treatment of cancers. Robotics and research have resulted in many new therapies and bent the cost curve. People are generally living longer and better. Yet the stresses of complex, technology-driven lifestyles are creating new psychological and cognitive problems, (ADD, depression, anxiety, even psychosis). Computer "learning and education" programs, some illegal and psychologically

addictive, promise permanent mental performance enhancement. Added to this are the legal, illegal and fake "performance-enhancing drugs," some of which do improve mental acuity, but the long-term effects are not well understood. Some are fake and addictive.

As climate and weather patterns shift, classic equatorial diseases like malaria have moved north and south. In the U.S., nearly all the southern states now have malaria. There are also growing concerns about human exposure to new materials like nano-particles.

Education

A radically different continuous lifetime education paradigm is emerging. There is a pronounced emphasis on math, science, engineering and the open scientific method; traditional liberal arts curricula are less emphasized, except to promote critical thinking skills. (The focus on problem solving over rote learning is seen as a competitive advantage of U.S., UK and Canadian educational systems over those in Asia.) Foreign language education has practically disappeared with advances in excellent cheap translation devices.

Similarly, Business Administration has lost its appeal, except when it is fused with science and technology issues (e.g., R&D Management, Applied Human Factors Theory, etc.). The field of Finance is now preoccupied with the valuation and trading of exotic new commodities. Cultural critics worry that the U.S. (and the West in general) is losing its cultural heritage and its sense of history.

There are still traditional universities, but these have been reengineered to meet new professional and economic realities. There are many new learning structures as well, e.g., media companies that have entered the higher education business with cyber tools. Colleges wrestle with mental performance-enhancing drugs and software that leave some users addicted or mentally unstable.

Because of the furious pace of change, students often forego formal degrees, instead acquiring certificates of technical competence and combining this with on-the-job experience. Students expect to have many careers over their lifetimes.

Media

The media offers a smorgasbord of variety and quality. There are relatively hard, credible reporting and sensational, create-your-own-reality coverage, as well. Many news organizations feature both professional and "crowd-sourced" reporting. Heavily editorialized news is less appealing. Paradoxically, there's an old-school media culture, with new wave platforms. In the end, everything is customizable. I know what I need to know (or what I want to know) and I set my media devices to filter and feed me information. Up-to-date and accurate information is a personal competitive advantage.

Religion, Beliefs, Values, Ideology	There has re-emerged a strong belief in science, engineering, and the possibilities of human progress – the confidence that we can solve problems again, like in the 1950s and 1960s. Society is broadly secular and tolerant. At the same time there's a lot of uneasiness from all sectors about this "brave new world." Many people are concerned about privacy, civil liberties and dependence on computers and robots. There are anti-science counter-movements, from the left and the right, covering the least educated and most educated members of the population. Other observers worry about the unintended consequences of complexity brought about by changes in technology and lifestyles. Internet conspiracy theories abound.
Nature of Business	The U.S. is much like the 1960s national security state, only this time formed around major disruptive new technologies and green priorities. Close, even co-dependent, government-business relations, especially in cutting-edge research & development sectors, thrive. Government is investing in expensive, high-risk "R" and sharing the "D" with industry. New, highly secure consortia have been formed, made up of government and private sector scientists, to deal with cutting-edge quantum computing. Protection of intellectual property is paramount for both security and commercial reasons. National identities of corporate organizations become critical; non-native companies must be prevented from leaking technologies to adversaries or competitors. "Blue collar" job opportunities exist in construction, electronics, maintenance (especially of robotic systems), etc. With robotics, productivity has been rising strongly, creating new job sectors that would otherwise not exist. In many ways, this is a global labor force in transition. You can choose to be a contract laborer with your own mobile benefit package, or take a more traditional salaried job in industry or government – probably both.
Information Management	There has been a massive proliferation of information and data, with greater (but never enough) ability to process it. Soon, great leaps forward will be supported by quantum computing. The government needs commercial and other national technology partners to keep up; it's all evolving at such a blistering pace. All complex systems can now be much more effectively managed with new computing power. RFIF sensors are everywhere, in both public and private venues. Most have functional economic value and are not perceived to be overly intrusive.
Areas of Technological Innovation	The broad areas of technological innovation are: ▪ Information management (hardware, software and processes) ▪ Alternative energy (especially solar) and conservation ▪ Nanotechnology ▪ Optics and optronics ▪ New conductor and semi-conductor materials

- Healthcare (especially biotechnology)
- Robotics
- Remote sensors
- Smart infrastructure and materials
- Genetics

The U.S. advantage rests in its ability to fuse these technologies. This is an era when the old joke, "every order of magnitude helps," has real meaning. Intellectual property is passionately fought over and safeguarded. In the commercial space, innovators have ever-decreasing time to get new ideas to market before they are copied. Courts are clogged with lawsuits claiming patent infringement. The law has not been able to keep up with the pace of technological advances or the meaning of community roles in interpretation of common usage and standards.

The breakthroughs in computing resulted from government-private investment in specialized government labs. This model is replicated in all sensitive R&D areas. Public-private partnerships help facilitate leading edge technology transfer into the economy.

Cyber Security

Cyber security is a critical issue and an all-pervasive concern, public and private. When people talk about the critical "commons," they mean cyberspace. Identity theft is an ever-present threat. The question for the U.S. and major powers with quantum computing is whether or not there are still major vulnerabilities. The U.S. and India jointly sponsor a cyber-security research center. Cyber attacks are carried out routinely. Culpability is hard to prove and thus is a tool of both criminals and terrorists. The potential for the next world war to be cyber-geddon is a major field of study in the military. *(See Conflict & Global Stability)*

U.S. Economy

The U.S. has achieved better-than-1990s levels of economic growth and job creation. Recessions are short and manageable. Not all people benefit equally. There is still an underclass not able to reap the benefits of the dynamic new economy. There is also an emerging global elite that reaps exceptionally high benefits.

Unemployment is low. Prior restructuring of entitlements has put the question of retirement on a more stable footing. Seniors tend to retire fully, thus freeing up jobs, or work just part-time. Most retirement portfolios have grown richer with the tech boom. What is called "new manufacturing" with advanced materials and robotic processes is taking root in some regions. Meanwhile, infrastructure recapitalization is providing plenty of job opportunities for lower-skilled workers.

A number of powerful forces converged to create this economic renaissance: government-business partnerships in computation, alternative energy, and infrastructure development; a series of game-changing breakthroughs in standard computing technology followed by quantum computing, catalyzing other new private investment and leading to a host of new businesses. The U.S. is a leader in both the development and export of new technologies and related products. The nation

	benefits by first-mover advantages – this is where the action is, and this is not unnoticed by global capital.
U.S. Political Climate	The nation has been growing less politically polarized. An enhanced sense of engagement has engendered renewed political literacy. It's a more moderate time. Some new extremism is based on radical interpretations of environmentalism, plus there are overlapping movements based on pro- and anti-technology positions. There continue to be some anti-immigrant sentiments on the part of those feeling left behind and that is mixed with some anti-robot sentiment – both are taking our jobs! Those are minority perspectives, however. These are good economic times, with ample opportunities. Voters are satisfied. People are less worked up about taxes and jobs and more concerned about quality-of-life issues, which tend to get worked out at state and community levels. The one issue that continues to strike an emotional chord for most voters is privacy. Electronic intrusiveness is a fact of life, but no one is happy about it.
U.S. Fiscal Status	The public watches government spending carefully and is intolerant of deficit spending for non-emergencies. However, the nation is on a stable fiscal footing, thanks to a series of tax and spending adjustments during the 2010-decade. By now, effective tax burdens are moderately high but the system is simpler and relatively progressive. There are incentives built into the tax system to reward green behavior. Revenue sharing with states is moderately generous, but highly specific, and states are managed on a very lean basis. There is widespread rationalization and inter-state sharing of government activities including security, law enforcement, environmental protection, and administration.
U.S. Social Climate	Households feel more economically secure. This is a time of skittish optimism. Uncertainty remains about how good all of this is going to be. Will robotics take away my job? And what is the end-state of this massive technological change? Have we lost our ability to interact with each other meaningfully? Most workplaces offer a range of options for telecommuting or working from a remote office location. It is less necessary for households to invest in full-time childcare. Americans generally accept the rules and regulations of living a sustainable lifestyle. A lot of fortunes are being made in this "Wild West" technological environment. Most Americans, while not rich, enjoy a moderately affluent lifestyle, with money (if not time) to travel and recreate. Rising sea levels and more frequent storms have rendered parts of the U.S. coast effectively off-limits for housing. In some areas insurance for shoreline properties is unavailable. Increasingly, lakefront properties are viewed as a more secure investment, and prices for these are rising accordingly.

Status of Entitlement Programs	The entitlement system has been reformed in piecemeal fashion, after extended debate, compromise, and a phased-in approach. New therapeutic developments have cut the cost of medical procedures, while at the same time the government has taken a hard line against healthcare inflation. The major stabilizing factor in the U.S. long-term fiscal picture was the return of unexpectedly high levels of sustained economic growth, which has obviated the need for harsher measures to bring entitlement spending under control. Increased immigration has played its part, by growing the size of the younger workforce and re-balancing the support equation.
Transportation Infrastructure	This is an emerging world of green, smart, adaptive, and weather-resistant transport infrastructure. Infrastructure rebuilding has been an important piece of the U.S. economic strategy, as it has soaked up thousands of lower-skilled workers who might otherwise have floundered. Behind the steel, cement, and smart, adaptive materials, are advanced management processes. The USG has developed much of this system in partnership with the private sector.
Canada	There is a high level of economic integration between Canada and the U.S. (and with Mexico via NAFTA). Canadian energy stocks are in decline, but in a "green" world, hydropower is still vital. It's a painful time for Canada facing a post-oil world, but Canadian manufacturing is aggressively adopting robotics, and high-tech Canadian industries are well integrated with U.S. counterparts. Agriculture is strong, a beneficiary of climate change. Canada has some Arctic infrastructure, from previous oil and gas ventures, but there are no new investments going up there. U.S. and Canada are cooperating on fisheries issues, developing as a result of climate change. Some U.S. retirees are moving to Canada, with a more temperate climate and a somewhat lower cost of living. Wilderness vacationing is also attracting many from the U.S. Canadian-U.S. economies have always been tightly integrated, but the past is only a pale comparison to today, and that has created some backlash among Canadian nationalists.
Mexico	Mexico is piggybacking on the fortunes of the dynamic U.S. economy, despite challenges at home in the form of climate change (especially drought in the interior) and falling prices for petroleum exports. In the interest of border stability, the U.S. has combined tightened border surveillance (using advanced sensors, unmanned vehicles, etc.) with a liberal guest worker program. Mexico is an early beneficiary of desalination technology. This has helped Mexico's farm economy to remain viable, and also keep people on the land. Crime families are less powerful because of stronger governance and marijuana decriminalization in the U.S. With increased economic stability, Mexico has been able to leverage close proximity to the U.S. to promote new manufacturing opportunities and technology exchanges. Mexico's own Monterrey Institute of Technology is making a name for itself and attracting world-class talent. The nation is finally seeing the fruits of its long-delayed education reform efforts.

Central America & the Caribbean	The region is highly vulnerable to extreme weather, including hurricanes and flooding. Nature's pounding of this region is seemingly relentless. There's widespread human dislocation and desperate efforts to escape the hardship. Political instability is also rife. Donors are offering help to make their infrastructure more resilient. There's a critical need for forward-based aid infrastructure. The economies are never able to recover. Governance is challenged on all fronts; strongman "caudillos" or dictatorships are back. Panama and Costa Rica are doing relatively well – they are pretty much the exceptions. Cuba is gradually opening up, developing, and managing the environmental challenges.
South America	Brazil, somewhat surprisingly, is struggling. The nation has undergone a revolution of rising expectations, precipitated by a series of political scandals. In different times such expectations might have been managed, but with declining oil revenue the government has had limited resources to buy off discontent. These political and economic failures have reinforced each other and magnified a range of distortions that had crept into the Brazilian system of governance. For the first time in decades, Brazil is dealing with capital flight and there is in the distance the faint sound of sabre rattling on the part of the military. The rest of the continent is mixed. Chile and Argentina are doing relatively well, especially sectors not integrated closely with Brazil. Climate change is wreaking havoc in Peru, Colombia, and in Brazil. There are many refugees within countries and moving across borders. Venezuela is in dire straits with oil prices dropping and no alternatives, plus severe climate change effects.
Europe *(including Russia)*	Europe, for the most part, is doing moderately well, economically and politically. It is able to compete in the new global economy on the bases of its still substantial intellectual capital and world-class enterprises, including a very solid financial services sector. The EU has made uneven progress in integrating younger Islamic and other immigrant populations. Externally, it has achieved greater integration with select African nations that offer complementary skills and assets. Europe's legacy in high-end machinery skills is an important contribution to this world (Bavarian Nano-Works, or BNW, for example). Key problems come from mass migrations out of Africa, and a new brain drain toward the U.S. and India. Climate change has improved European agriculture. Russia is struggling with droughts and declining energy prices. Their industrial infrastructure is old, just like their population. But they still have exports, namely Siberian oil, minerals, and farm products. The future value of oil and minerals is what is in question. In addition, Russia has leading math and engineering talent, but many of them emigrate. Russia is pushing far more aggressively into the Arctic than anyone else. They are constantly testing boundary issues and have angered many with pollution-causing extraction activities that threaten the last great fishing preserve. China is concerned about Russian stability and is investing, as it is able.

Cross-border criminal enterprises are an ongoing challenge to stability and long-term reform in the country. Links exist across Russia, Georgia and Kazakhstan, all of which are complicated by the latter's historic role in financing and supporting terrorists. There are indications that Russia, through criminal gangs, supports many radical environmental and anti-technology groups in an effort to slow the headlong advances of North America, Europe and India.

China

China is both something of an enigma and a mixed bag. On the one hand, most coastal regions are doing extremely well and are active participants in the global economy – some are leading edge. But even here, there are pockets of antiquated industrial policies and high unemployment. Many of these industries cannot export due to green ISO standards they cannot meet. Plus, many of the most prosperous cities on the coast are under threat of ocean level rising and extreme weather patterns. On the whole, the coastal regions are where the action is and where the wealthy and powerful live. There is mounting evidence that these regions are acting more and more independently, but subtly and without obvious and explicit challenges to Beijing.

In the western provinces there is growing political conservatism and nationalism as the western areas economies' slow and once again become the second-class citizens of China. The high-end infrastructure projects of decades ago have been completed and not extended. The one bright spot is natural resources. Many Chinese minerals, like rare earths, are critical to new green industries and that alone gives the "westerners" a voice in some national policy-making. In the east, they act more independently. In the west they talk about patriotism and national power. Chinese politics remain complicated and unpredictable.

Overall economic growth has slowed to 4-6%. The nation's lopsided demographics have now become evident, with a large elderly population, and declining numbers of new entrants to the labor market. Perhaps more significantly, India has surged ahead, propelled by a more open system, a dynamic entrepreneurial sector, and intimate links with the U.S. technology community. In light of all this, China is feeling defensive. Its naval modernization program is winding down now that it has a strong and sustainable regional navy. It is boosting conscription, among other reasons to ensure domestic stability at a time of slower economic growth, as well as to shore up its position as the region's preeminent military and economic power.

China is also suffering climate effects. Bad weather is complicating an already challenged environmental situation. China finds itself virtually cut out of the quantum-computing revolution, while sustaining a leadership position in many scientific areas (e.g., genomics, nano-technology, etc.). It was not for lack of effort – China just did not manage to secure the critical breakthroughs – some say for lack of the deep talent required.

Meanwhile, China is losing out because of changes in global supply chains. Many foreign investors have moved manufacturing capabilities to alternative venues, either to save costs or to move closer to final markets – an increasing priority as

manufacturing technology changes.

India

India has become the fastest growing and the most dynamic emerging market, despite still significant poverty, development challenges and environmental risks (alternate bouts of droughts, floods and storms). India has managed to avoid serious conflicts with Pakistan, notwithstanding periodic border clashes and internal ethnic flare-ups. For the most part, its democratic system of governance is working, and it has become a major U.S. industrial and research partner, and a large importer of U.S. agricultural products. There are very strong military and technical exchanges between the U.S. and India. U.S. diplomats are careful not to become too overtly pro-India, at the risk of unsettling a delicate Asian security balance.

India's future continues to look very bright. It is realizing massive payoffs from its educational and high-tech investments in the 2000s. Beyond its high-tech offerings, it has developed into a regional manufacturing hub. Aquaculture is a large and growing industry here.

A critical development is a deal with Pakistan over Kashmir, intermediated by the U.S. and Great Britain, with promises of aid and preferential market access. However, Pakistan remains locked in bitter internal political strife and clings to democracy by a thread. This is one place where now out-dated jihadists still exercise power on many national policies.

Northern Asia

Korea is more integrated, if not united formally. North Korea is receiving Chinese political support while the South provides investment and generally accommodating policies. North Korea's nukes are no longer rattling. There is a sense that the nation is headed down a more moderate path that will end in accommodation, if not unity.

Japan is doing well. Its investment in quantum computing and micro technologies are paying off, too. The economy and indeed the entire society is pushing the envelope on automation and robotization, even in hospitals and nursing homes. The U.S. maintains a bare-bones military presence in the country.

Southeast Asia

Southeast Asia is experiencing slower growth because of China's slowdown, but this is partially offset by its own efforts to supplant Chinese manufacturing. In addition, the region is moving closer to India. Some foreign investors see the region as a less politically risky production center than China. China continues to ensure the security of regional sea-lanes, thus piracy is not an issue. It remains the local great power, and exercises that power with restraint. Most of the nations are enjoying relative political stability. But weather (more frequent and violent typhoons) is a perpetual challenge, especially for the Philippines and Vietnam. And tens of thousands of people in low-lying areas (Vietnam and Indonesia, among others) are regularly displaced by flooding, leading to frequent humanitarian intervention (India and China), as well as complex political and economic challenges. Faced with extreme conditions, the most desperate

in the region flee their homelands, often in unstable boats.

Australia has had its own environmental challenges – both flooding and drought. This is causing internal population shifts and some economic dislocation. One bright spot is Australia's ability to economically harness solar power. This promises to be a huge advantage going forward.

Africa

Very few African nations are enjoying sustained political and economic stability. The continent continues to be weighed down by legacies of corruption, poor governance, inadequate physical and social infrastructure, and now harsh weather conditions and climate change. Drought conditions are now widespread, affecting more than a dozen nations, especially in Central and East Africa. Oil is on the way out; this is a mixed blessing. North Africa is hit hard by the decline in oil prices; other nations benefit from lower energy costs. Many nations are highly dependent on U.S. and European assistance, as well as NGOs and private foundations. They look to the outside to get plugged into major technological developments, leading to cleaner water, improved health, etc.

In the meantime there are tension-creating population movements, as people flee environmental hardships. Africa is still supplying raw materials in demand at the start of the 21st century. But how much these materials will be in demand in the future is a source of considerable uncertainty. Reformist African nations in the good graces of the U.S. and EU aid agencies (e.g., South Africa, Ghana, Rwanda) get rewarded. Others, with challenged governance (or no governance), stagnate, decline, and/or become havens for criminal organizations. There is some military support from the U.S. and Europe to help police borders and insulate beneficiary nations from instability coming out of ungoverned territories.

Middle East

An extended period of unusual quiescence (in part resulting from the establishment of a Palestinian state) is now threatened by the slow-motion shock of "the post-petroleum era." The oil age is not over, but it will be within the decade or so. Long-term contract oil prices are already falling dramatically and the spot market is widely variable. Oil-producing nations are feeling the squeeze. (Producers of higher quality crude have not been as directly affected, yet.) It will be less possible going forward to "buy" stability with oil revenue. This situation is not yet explosive, but there are serious new economic and political challenges – in the Middle East and elsewhere – and these will be very difficult to manage. Many oil-producing nations are spending heavily on domestic security and resorting to hard-line authoritarianism. Some of the best and brightest are emigrating (in some cases, to their countries of origin, like India). In Iran the turn to more moderate and secular rule will be tested by declining oil revenues.

The glimmers of hope in the region are based on new trade and commercial relationships formed around the new Palestinian state, often involving Israeli technology. Israel's high-tech industry is world class, even attracting talent from outside the country and bringing some stability to the eastern end of the

	Mediterranean. The U.S. still guarantees Israel's security and the 6th Fleet is one of the larger forward-deployed forces.
Polar Regions	The Polar Regions are demonstrating the more dramatic symptoms of global climate change. There has been unprecedented melting in the Arctic, to the extent that the Northwest Passage and the Northern Sea Routes are consistently navigable (for vessels with reinforced hulls) for several months. There is less energy extraction in U.S./Canadian territories than originally predicted because of the less attractive risk/reward ratio resulting from declining world oil prices. Russia, in contrast, has continued to explore and drill while oil has residual value. Similarly, Russia continues to aggressively work the non-energy mining sector, where there are rich and increasingly accessible deposits of iron ore, tin, magnesium, and certain rare metals. They continue to "push" border issues and their pollution angers many who see them destroying the last wild fish preserve. With some of the more dire forecasts pointing to the Arctic disappearing before 2100, tourism in the region is booming, with both cruise ship tours and more treacherous "wildcat expeditions" favored by young people and adventurers. There are increased visits from fishermen, tourists, scientists, NGOs, and environmental groups. The Greenland and Antarctic ice sheets are showing signs of increasing instability and slippage. The UN Law of the Sea has been signed by the U.S. and is in effect.