Five Megatrends
And Their Implications for Global Defense & Security

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pwc

Contents

Foreword

Global megatrends are macroeconomic and geostrategic forces that are shaping our world, and our collective futures in profound ways. The implications of these forces are broad and varied, and they will present us with both tremendous opportunities to seize—as well as extremely dangerous risks to mitigate.

In this paper, PwC examines five key megatrends: Shift in Global Economic Power, Demographic Change, Rapid Urbanization, Rise of Technology, and Climate Change/Resource Scarcity. We examine these megatrends with a specific focus on the various disruptive effects we anticipate these five megatrends will have on defense and security. Through this examination it is apparent that these megatrends pose substantial challenges that cannot, and should not, be addressed in isolation.

The depth and complexity of the resultant, and inevitable, security challenges posed by the megatrends will demand "whole of society" solutions. These solutions must leverage the technological, collaborative, and commercial benefits that the megatrends themselves will enable.

We must not fear the megatrends, or their resultant defense and security challenges. Rather, we should anticipate these changes, take them seriously, and apply creativity and resources to stay ahead of the critical issues they will present.

We hope this paper will start a constructive dialogue in this regard--and a sense of urgency.

Thomas Modly
PwC Global Leader, Government and Public Services Sectors

What is a Megatrend?

Megatrends are macroeconomic and geostrategic forces that are shaping the world. They are factual and often backed by verifiable data. By definition, they are big and include some of society's biggest challenges— and opportunities.

The concept of megatrends is not new. Companies, governments, and non-governmental organizations may call megatrends by different names, but the most effective ones have organized their strategy in some way, shape, or form around them.

Our Process

Over the last few years, we have observed that many of our public and private sector clients have been studying global megatrends, and they've been adjusting and refining their strategies in light of them. Those clients are driven not only by short-term performance but also a desire to ensure their organization remains relevant for the long term. Said differently, if an organization is not anticipating and addressing the opportunities and risks driven by the megatrends, they may become irrelevant to a large part of society.

Challenges for Defense and Security

The global implications of the megatrends are not limited to commercial enterprises and commercial interactions. Rather, they will have profound and disruptive effects on the defense and security environments in which these enterprises, their customers, and nations must operate. This will require more agile and accountable approaches from government institutions and greater collaboration across the whole of society to mitigate risk. For some countries, being able to anticipate and adapt to the megatrends will be a matter of national survival.

In the pages that follow we provide:

- A summary of the five megatrends as we have described them and the potential implications to management teams, directors, and other stakeholders

- A specific examination of the challenges that the five megatrends present with respect to defense and security

Megatrend one
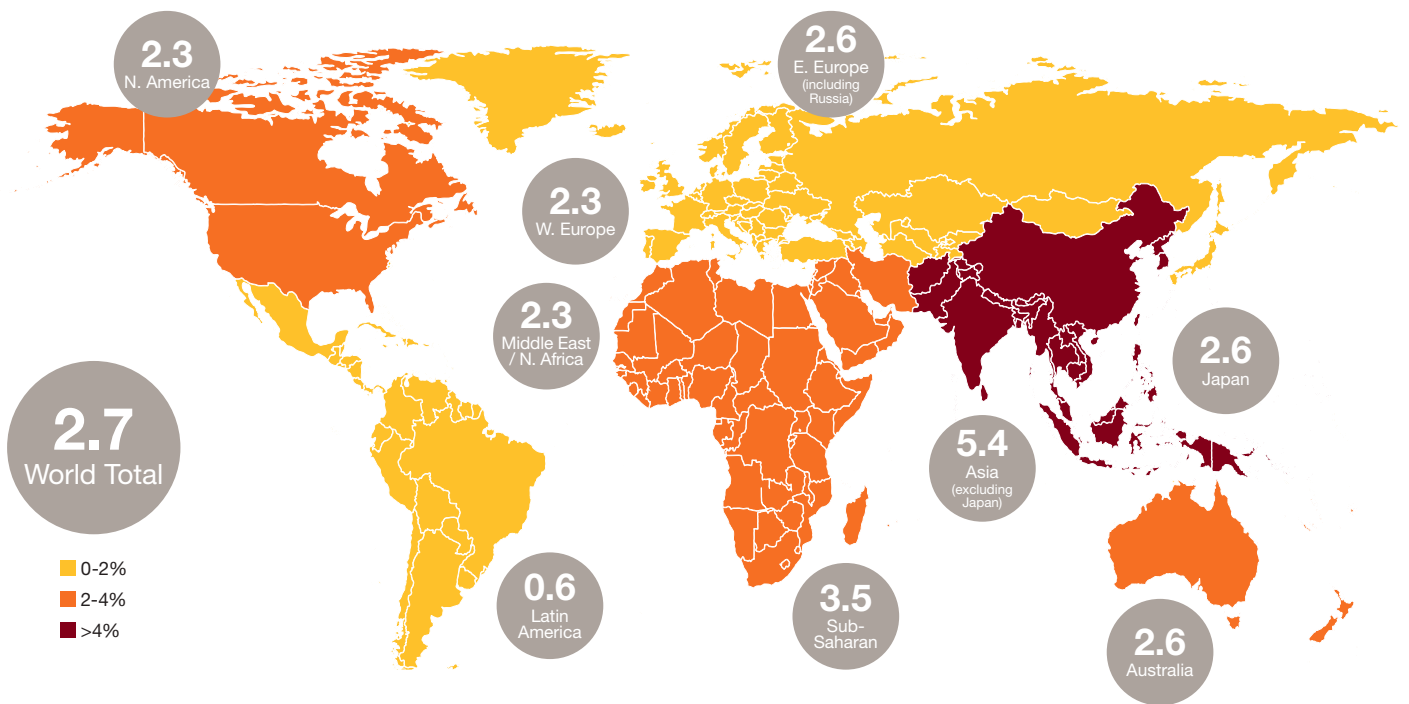## Shift in global economic power

The focus of global growth has shifted. Western economic dominance is a relatively recent historical phenomenon that is waning, and the developments we see are essentially a rebalancing of the global economies.

A realignment of global economic and business activity is transitioning BRIC and other growth countries from centers of labor and production to consumption-oriented economies. As they become exporters of capital, talent, and innovation, the direction of capital flows is being adjusted.

Along with the growth and size of the emerging markets, it's important to appreciate the interconnectivity of the trade and investment flows between them, which are growing much faster than the traditional routes from developed-to-emerging and developed-to-developed countries. China is also expanding its economic presence in the West to include resource investments in Africa and North Sea.

Figure 1: World GDP: 2016 forecast, % increase on a year earlier

- **2.3** N. America
- **2.6** E. Europe (including Russia)
- **2.3** W. Europe
- **2.3** Middle East / N. Africa
- **2.7** World Total
- **2.6** Japan
- **5.4** Asia (excluding Japan)
- **0.6** Latin America
- **3.5** Sub-Saharan
- **2.6** Australia

- 0-2%
- 2-4%
- >4%

Source: *Economist Intelligence Unit*

Industry examples

1 Decoupling from **export-led growth** in Asia-Pacific

The economies of China, Malaysia, the Philippines, Peru, and Chile grew more than 5% in 2012, while also experiencing steep declines in exports relative to their GDPs, according to PwC's 2013 Asia Pacific (APEC) CEO Survey. This trend could continue in 2016 as global GDP growth will likely exceed the rate of growth of global trade— a reversal that has happened just twice during the past 20 years according to PwC's 2016 edition of this survey. GDP growth in Asia-Pacific (excluding Japan) will be twice the global average in 2016 despite the slowing growth rate of global trade.

2 Steering to **emerging markets**

Asia will represent 66% of the global middle-class population and 59% of middle-class consumption by 2030, up from 28% and 23%, respectively, in 2009[1]. This could be a boon for automakers: In India, there are about 18 cars per 1,000 people, and in China, there are about 60 cars per 1,000 people[2]. That compares to 765 in the US[3].
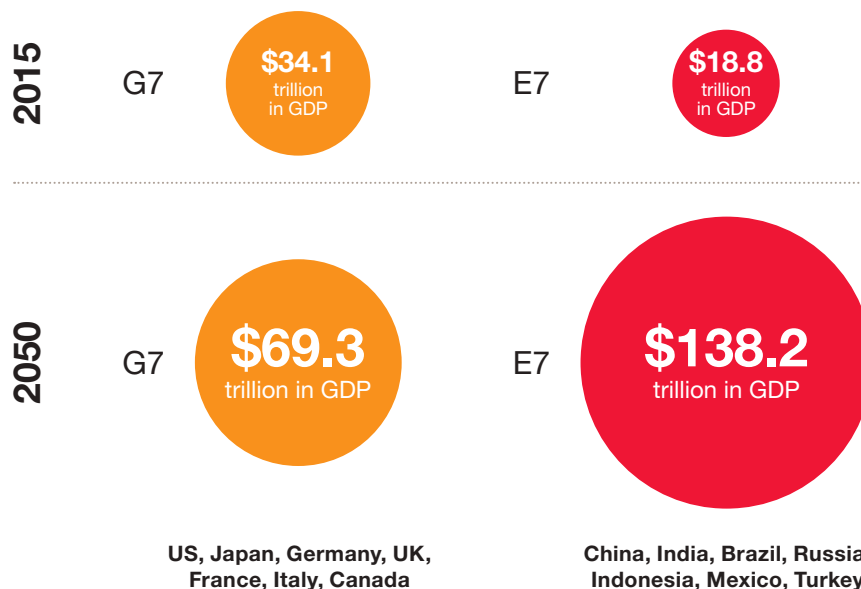
> *There's a major shift in India in the rise of the middle class and geographic dispersion, and we have to meet the needs of our clients there. That's a global trend, and our clients, particularly in the consumer goods sector, have to focus on where the consumers are and how do you reach them.*

Michael I. Roth
Chairman and Chief Executive Officer, Interpublic Group

Possible implications

- The increasingly multi-polar world created by the shift from largely Western-led global organizations to regional players may reshape the competitive environment for companies.

- Competing versions of capitalism could arise as well as an array of planned economies. Planned economies could create/support new global champions in strategically important business sectors.

- Mature markets may lose influence and capital and become less attractive for talent and business. Governments increasingly may compete using tax and regulation as well as investment support.

- Competition generated from new geographies and sources may create different competitor profiles than those historically faced.

Figure 2: **GDP of G7 and E7 countries (US$)**

2015 — G7 $34.1 trillion in GDP — E7 $18.8 trillion in GDP

2050 — G7 $69.3 trillion in GDP — E7 $138.2 trillion in GDP

US, Japan, Germany, UK, France, Italy, Canada

China, India, Brazil, Russia, Indonesia, Mexico, Turkey
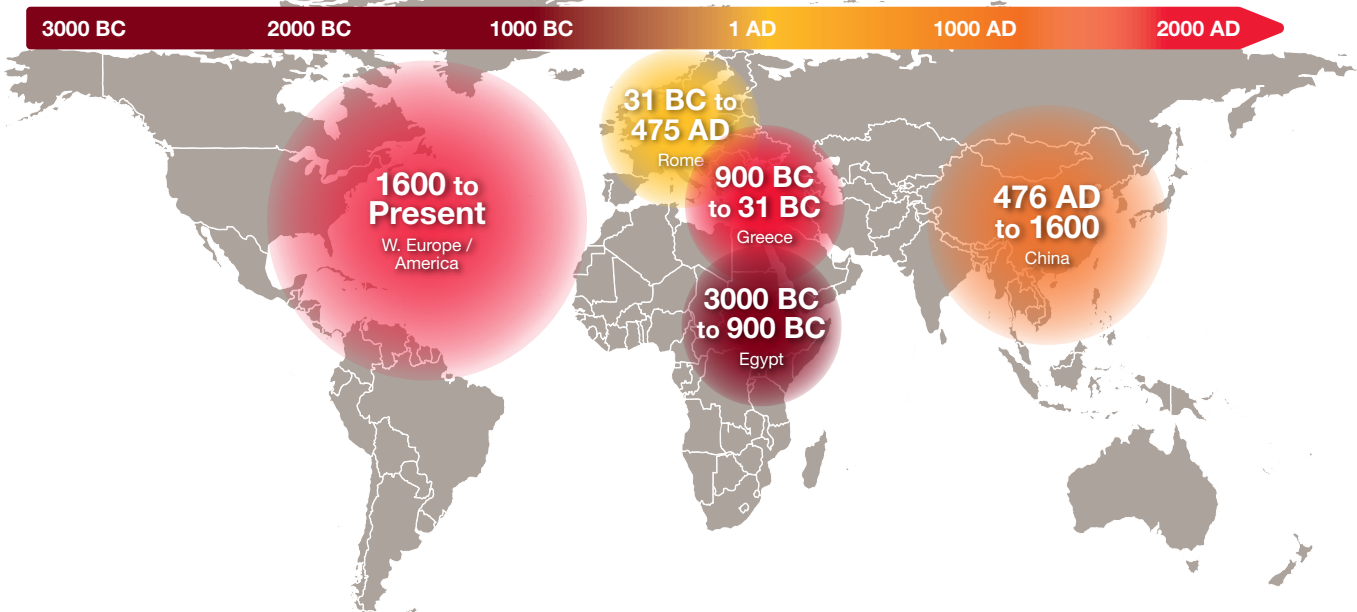
Source: *PwC analysis*

Challenges for defense and security

The focus of global growth has shifted to the East and to the South, but international trade will continue to grow unabated. This will create more powerful national economies in different regions with greater resources to protect, and greater resources available to invest in defense and security.

The shift could also decrease the dependence of some nations on the traditional power projectors such as the United States for protection and increase burden-sharing to ensure economic trade routes and free navigation are protected from hostile actors.

Extensive and complex supply chains seeking to maximize national economic advantages that emerge during this shift will become increasingly vulnerable to disruption from cyber criminals engaged in industrial espionage, theft, or terror-based disruptive activities.

Figure 3: Western economic dominance is a recent historical development...that is now shifting to the East

3000 BC   2000 BC   1000 BC   1 AD   1000 AD   2000 AD

31 BC to 475 AD
Rome

1600 to Present
W. Europe / America

900 BC to 31 BC
Greece

476 AD to 1600
China

3000 BC to 900 BC
Egypt

Source: *PwC analysis*

Critical issues

1 Strategic relevance of Pacific trade routes

Economic and population growth in the East will fuel expanded trade and increase the significance of ocean trade routes in the Pacific. Protecting these routes will require greater resources and collaboration between and among regional and global maritime forces.

2 Transition of China from regional to global power projector

China's greater assertiveness beyond its territorial waters and its investments in a more comprehensive force projection capabilities will challenge the traditional balance of forces in the region.

3 Increasing disruptive relevance of North Korea

Dire economic conditions and unpredictable leadership employing bellicose language and actions will contribute to regional instability. North Korea's nuclear and emerging ICBM capability poses substantial threats to its neighbors and to other nations thousands of miles away including the United States.

4 Declining capacity of western nations to exert power in Asia Pacific region

Resource constraints and extension of forces by western nations in the Middle East and Africa will pose challenges to their ability to exert strategic security influence. Greater collaboration and burden-sharing could characterize the future balance of forces in the region.

Here, we see the future. As the world's fastest-growing region -- and home to more than half the global economy -- the Asia Pacific is critical to achieving my highest priority, and that's creating jobs and opportunity for the American people. With most of the world's nuclear power and some half of humanity, Asia will largely define whether the century ahead will be marked by conflict or cooperation, needless suffering or human progress.

Barack Obama
President of the United States

Figure 4: **Pacific and Indian Ocean Shipping Lanes**
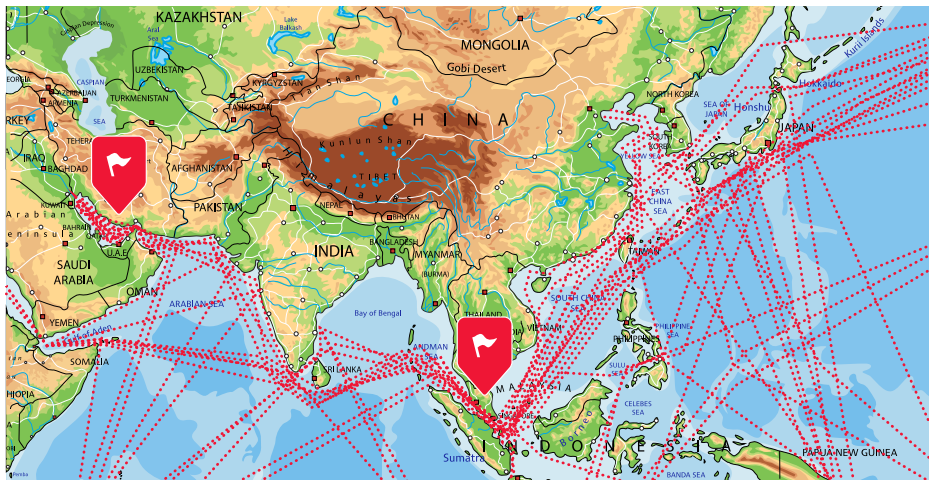
Source: *Investment U*

Megatrend two
Demographic shift

Explosive population growth in some areas against declines in others contributes to everything from shifts in economic power to resource scarcity to the changes in societal norms. Countries have very different demographic trajectories. Some societies' populations are aging rapidly, even shrinking, and their workforces will be constrained as a share of the total population.

Other societies are young and growing, which will create ever larger labor forces and consumer markets.

Youthful, growing populations must be fed, housed, educated, and employed for productive potential to be realized.

> *Although a number of factors contribute to contracting military spending across Europe, demography— particularly widespread, massive populating aging— is among the most important of these causes.*
>
> **Mark L. Haas**
> Duquesne University

Industry examples

1 Turning to **robots** to help growing **elderly populations**

With the number of Americans over the age of 65 expected to nearly double to 72.1 million by 2030[4], many companies, universities, and research facilities are looking to robotsto help with their care. Georgia Institute of Technology researchers developed Cody, a robotic nurse that can help with bathing[5], and **GeckoSystems' SafePath™** robotically assisted wheelchair uses navigation technology for situationally-aware, real-time obstacle avoidance[6].

2 **CEOs** are concerned about **talent**

Half of CEOs are planning to increase headcount in the coming year, according to PwC's *17th Annual Global CEO Survey*, and 93% recognize the need to change or are changing their strategies for attracting and retaining talent. Sixty-three percent are concerned that the lack of key skills could threaten growth prospects.

Figure 5: Proportion of the world population aged 60 years or more
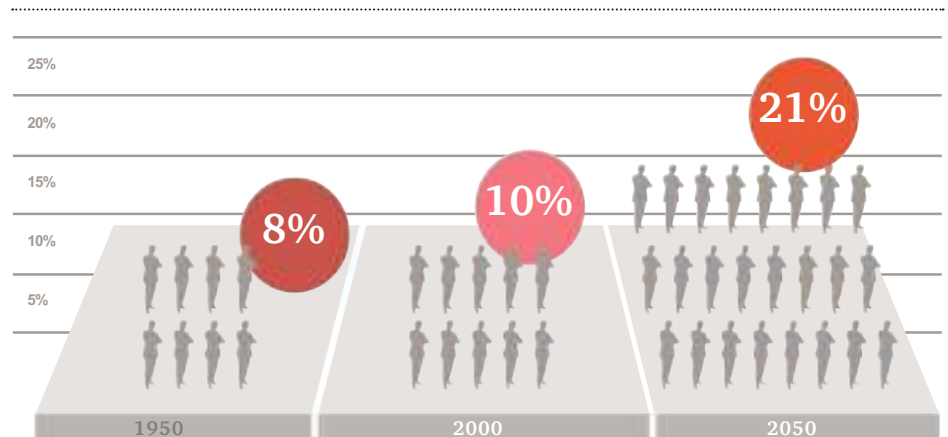
Source: *UN report World Population Ageing 1950–2050*

Possible implications

- As the population ages, and even shrinks, in mature economies and the ability to use debt is limited, governments may come under pressure to raise taxes to maintain social programs.

- Shifts in longevity may affect business models, pension costs, and talent goals/ambitions.

- Societal and political pressure to create jobs may increase, especially for older workers and the "have nots."

- Health systems may need to be re-engineered (and paid for) to handle many more participants in economies which will often see declining GDP.

- The workforce may need to be retooled in all parts of the world: in the aging economies, older workers will need to learn new skills and work longer, and their work may have to be supplemented by migrant populations. In emerging growth markets, the gaps between supply and demand for those with university-level education will have to be filled.

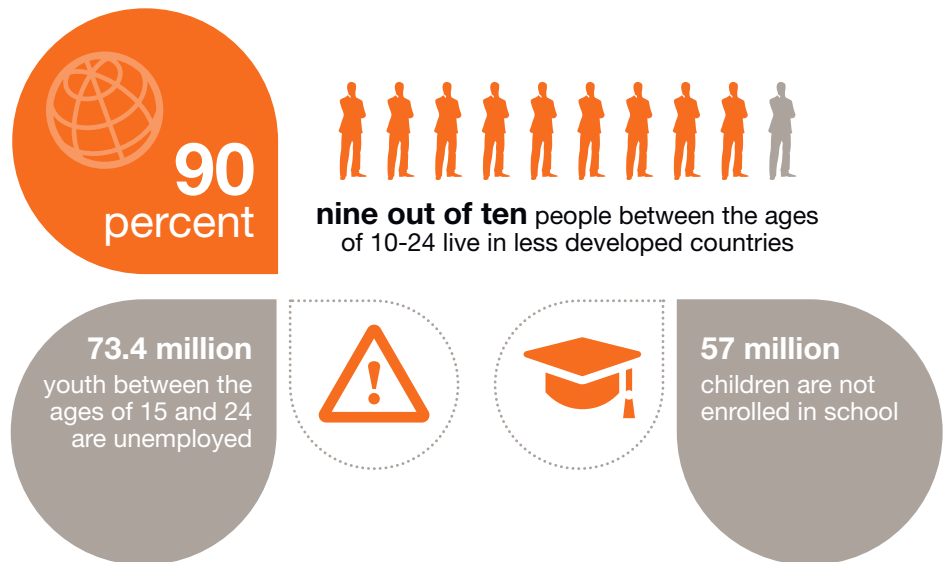# Challenges for defense and security

The megatrend that really affects us is the aging of the populations in most developed countries. The implication of that onto healthcare costs and the ability to deliver healthcare is quite profound.

Dr. Paul E. Jacobs
Executive Chairman,
Qualcomm Incorporated

National demographics set national priorities for government spending. As populations in the West age, the demand for social services and healthcare will put severe pressure on budget priorities that could compete with or even crowd out defense and security expenditures.

On the contrary, the concomitant growth in the youth populations in emerging markets and LDCs could create increased radicalization and civil unrest, and a greater likelihood for disruptive transnational movements to take hold in these societies. This could create both internal and external security issues that will require greater investment, and innovative strategies, to combat.

Figure 6: **Challenging Statistics for the World's Youth**

90 percent

nine out of ten people between the ages of 10-24 live in less developed countries

73.4 million youth between the ages of 15 and 24 are unemployed

57 million children are not enrolled in school

Source: *UN Population Fund's State of the World Population, 2014*

Critical issues

1 Competition for Resources

As populations age in the West, government budget priorities are shifting to entitlements such as healthcare and other social costs associated with a retired population. Entitlement spending as a share of the budget and of overall GDP is competing with and crowding out priorities for defense and security spending. The aging population is also limiting the number of military aged citizens eligible and interested in military service.

2 Youth Bulge as a destabilizing force

The rapidly growing demographic group of young men in developing nations with limited economic opportunities, access to education, and safety is creating significant security challenges as these conditions breed social discontent, crime, violence, and susceptibility to radical ideologies and movements. The greatest growth of this demographic segment is in those nations least prepared to deal with the challenges from a governance and/or defense and security perspective, specifically the North African Tier, Sub-Saharan Africa, Southwest Asia, and Latin America.

If a large cohort of young people cannot find employment and earn satisfactory income, the youth bulge will become a demographic bomb, because a large mass of frustrated youth is likely to become a potential source of social and political instability.

Justin Yifu Lin
The World Bank

Figure 7: Annual population growth rate, 2010–2050 (medium variant)

Legend:
- <0%
- 0-1%
- 1-2%
- 2%+
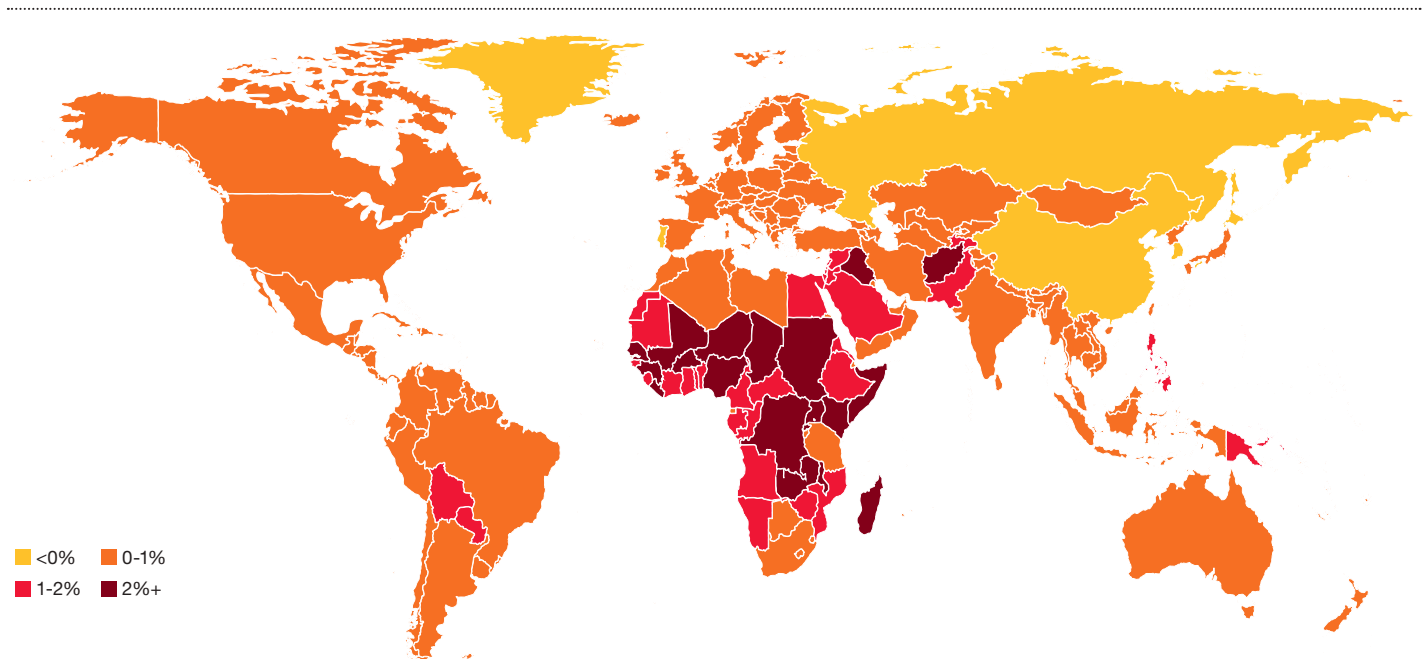
Source: *Economist Intelligence Unit*

Megatrend three
Accelerating urbanization

In the 1950s, less than 30% of the world's population lived in cities. Currently, that proportion has risen to 50% and, by 2030, the UN projects that some 4.9 billion people will be urban dwellers. By 2015, the United Nations (UN) estimated that there would be 22 mega-cities—those with populations of 10 million or more—with 17 located in developing economies. By 2050, the world's urban population will have increased by some 44%[7].

Much of the growth in urban population will likely take place in Asia and Africa. Large scale migrations from rural areas will power much of this growth.

In developed economies and older cities in the developing world, infrastructure will be strained to the utmost— and beyond—as populations expand. Meanwhile, in emerging economies, new cities will rise rapidly and require massive investments in smart infrastructure to accommodate explosive growth.

Industry examples

1 Citi's 150 cities strategy

As part of Citi's strategy, the company has identified 150 cities it believes will shape the world in coming years[8]. It is active in 80% of them and plans to enter the rest. The company has often talked about its presence in more than 100 countries, but CEO Michael Corbat predicts more talk about cities in the future[9].

2 "Smart Cities"

Cisco is one of several large IT and telecommunications companies that have developed new solutions and initiatives for developing smart cities around the world[10]. These "smart cities" will use cloud technology, mobile devices, data analytics, and social networks to automate and connect city departments and promote eco-friendly practices.

Possible implications

- As megacities grow in breadth and number, many analysts believe that their aggregate power will rival that of national governments due to the sheer size of their constituencies.

- Megaprojects will be required to build city infrastructure, support new trade flows (airports, sea ports), address education, health, security, employment demands, etc.

The 2015 terror attacks in France and the 2016 terror attacks in Belgium demonstrated the capacity of terror cells to "hide in plain sight" in unassimilated urban enclaves and coordinate attacks across national borders. Some of these enclaves were considered dangerous 'no go' zones by the local police because of the impenetrability the local social environment was dominated by alternative systems of governance.

Figure 8: World urban population

44%
increase

The world urban population is expected to increase from **50%** to **72%** of total population **by 2050**.

Source: *UN report World Population Ageing 1950–2050*

Challenges for defense and security

The explosion in urbanization will present tremendous challenges for law enforcement, intelligence and internal security agencies, as well as traditional defense organizations. The sheer growth of urban populations may outpace governments ability to provide basic services that could, in turn, breed the growth of radicalization and alternative governance structures dominated by organized crime, and non-state terrorist entities, which will unlawfully force/subjugate the the urban dwelling populations.

Providing adequate police and security for these areas will be costly and will require a higher level of interagency information-sharing and collaboration.

Defense organizations will also be challenged to respond to internal unrest and to monitor foreign influences that seek to destabilize these populations for political ends. The mega-cities that emerge and grow out of this trend will also provide a more fertile ground for non-state actors such as terrorists and revolutionaries, who simultaneously seek to "hide in plain sight" and inflict the highest level of disruption and destruction on a concentrated population.

The higher concentration of people in these cities will increase the impact of natural and man-made disasters, and it will require a massive whole of government approach to address the humanitarian, defense and security challenges that accompany them.

> *In a feral city social services are all but nonexistent, and the vast majority of the city's occupants have no access to even the most basic health or security assistance.*
>
> **Richard J. Norton**
> U.S. Naval War College

Figure 9: 2015 Global Mega Cities

Millions (People)
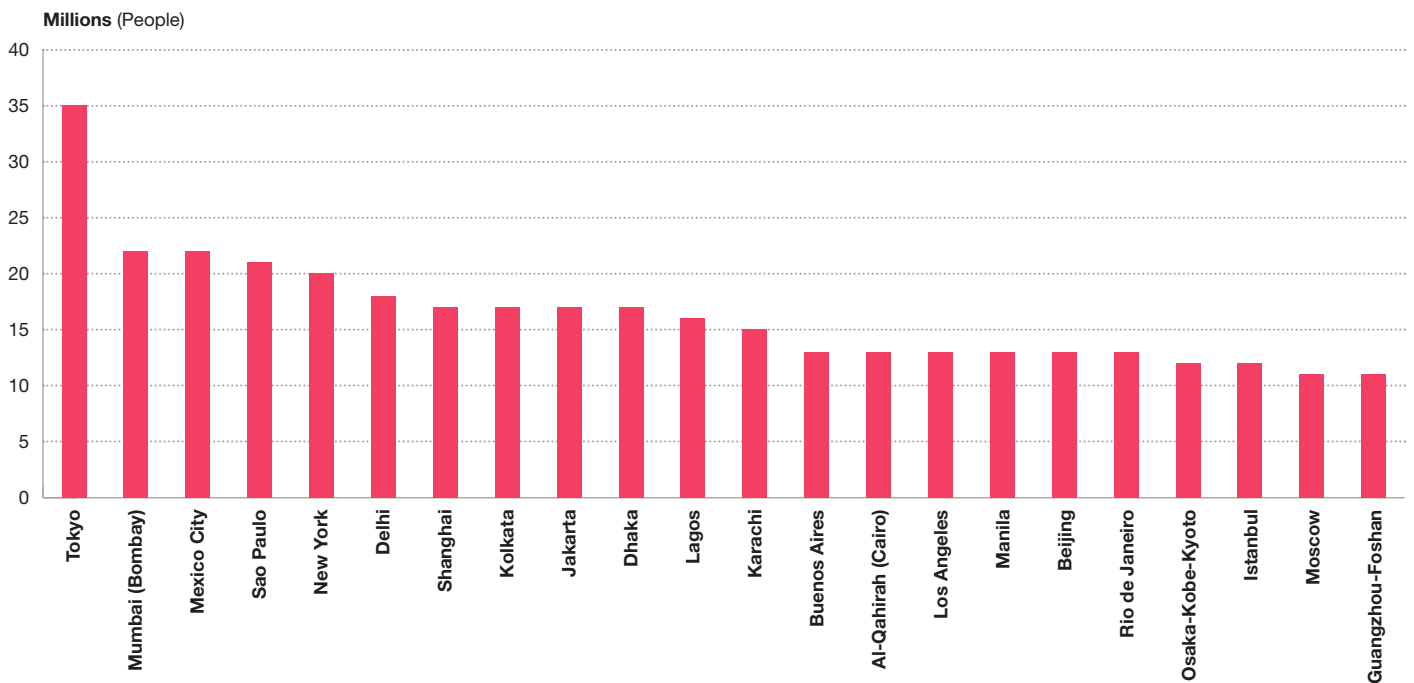
Source: *UN World Urbanization Prospects*

Critical issues

1 Challenge to the Legitimacy of Traditional Defense and Security Forces

As powerful mega-cities continue to proliferate, the legitimacy of national defense and security forces may be challenged as power shifts to municipal/local rather than national government. This portends a requirement for greater collaboration and information sharing between and among the various agencies tasked with the defense and security of the nation and the vast majority of the population.

2 Asymmetric Disruption and Destruction

Larger concentrations of people in smaller geographic areas present greater opportunities for terrorists and other non-state actors to inflict asymmetric disruption and destruction. A terrorist act to impact the electrical or water supply in a city of 1 million does not require substantially more sophistication or resources in a city of 10 million. Large concentrated populations create very large vulnerabilities.

3 "Mega Slums" and "Feral Cities"

Mass migration to cities leads to overcrowding and poverty and overwhelms a government's ability to provide basic services. Additionally, mass migration of foreigners without assimilation may create similar dysfunctions and allow for the proliferation of organized crime and alternate forms of governance and coercion. Already in some megacities there are areas where police and security forces dare not tread. These "ungovernable" spaces can be incubators for continued radicalization of whole segments of the population and breeding grounds for criminal networks/gangs, terrorist non-state actors, and others who wish to disrupt security and stability.

Figure 10: Percentage of population in urban areas, 2030

Legend:
- <20
- 20-39
- 40-59
- 60-79
- 80 and over
- Not estimated
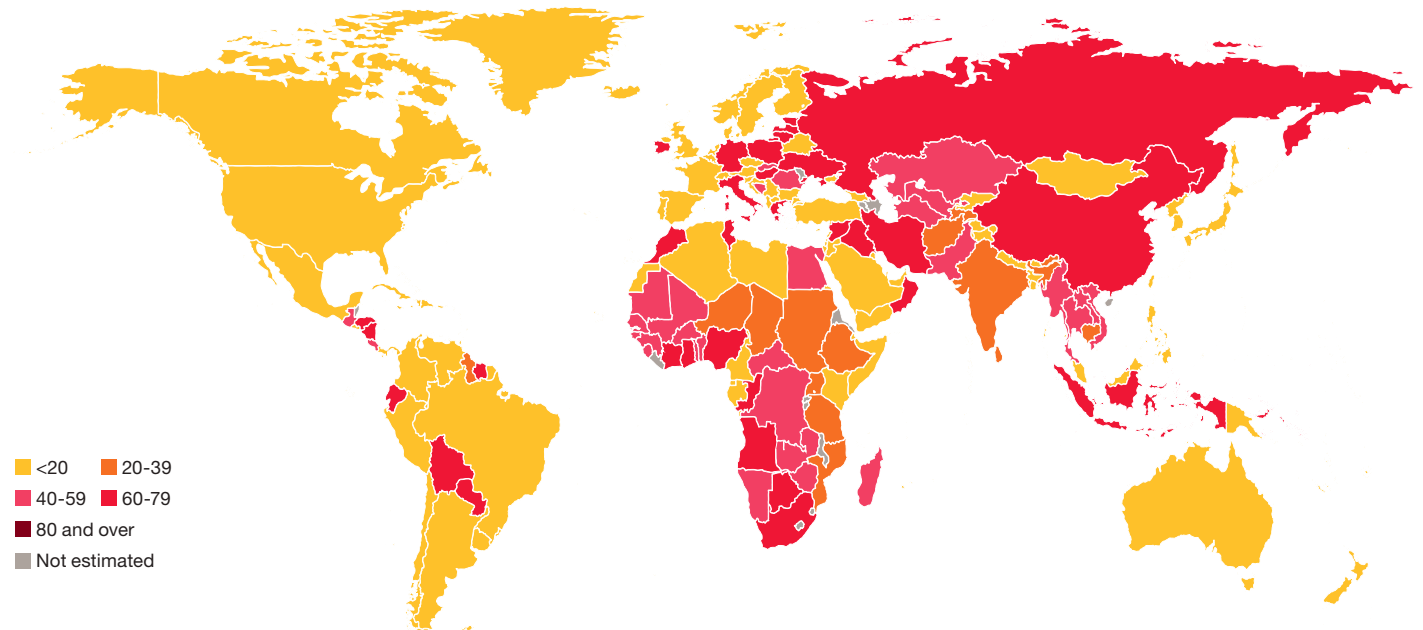
Source: *UN Department of Economic and Social Affairs*

Megatrend four
Rise in Technology

Breakthroughs in such disciplines as artificial intelligence, nanotechnology, and other frontiers of research and development are increasing productive potential and opening up new investment opportunities.

Entire new industries are being created, which could have a significant impact on the size and shape of the world's manufacturing and high-tech sectors and the companies that operate within them.

The combination of the internet, network capable mobile devices, data analytics, cloud computing, and machine and deep learning capabilities will continue to transform our world. Many companies across all sectors are grappling with how these developments will affect consumer expectations, the way they interact with their customers, and the underlying business models that support this.

Industry examples

1 Plans for **drone delivery**

In Australia, where commercial drone activity is legal, textbook rental startup Zookal will start using drones for deliveries this year. In December 2013, Amazon CEO Jeff Bezos unveiled its "Prime Air" delivery plan via drone-like aerial vehicles[11]. The FAA has yet to approve commercial drone delivery in the US.
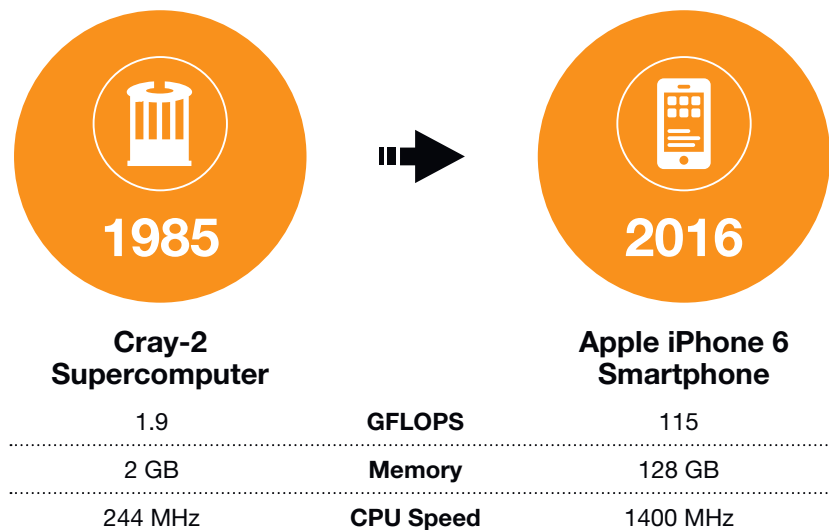
2 A **3D liver** is coming

San Diego-based bioprinting company Organovo delivered its first 3D printed human liver tissue to an outside lab in January 2014[12]. The liver model will only be used for research and drug testing, which could help drug companies combat the average $1.2 billion, 10- to 15-year process to develop new drugs[13].

Possible implications

- Technology will enable virtual versus physical business and operating models.

- Assets (and liabilities) will be increasingly accessed on flexible terms: where previously assets were primarily available to own, adaptable businesses now provide them for rent in innovative ways.

- Access to systems and information should enable management models to flatten organizational structures.

- New competitors will emerge as technology and innovation create new competitive advantages and increase productivity across sectors and geographies.

- The ability to gather and analyze data in real time may become a requirement for doing business, rather than a competitive advantage.

The "next big thing" in IT never ends, but there are a few fundamentals:

One, it will be mobile. Technology will be wherever you are in the world of the Internet, everything connected together

Second will be the data that's analyzed in a free-form format to find business and market opportunities.

The next one is what I would call ease of use…Every vendor is going to make everything that they create simple to use.

Robert M. Dutkowsky
Chief Executive Officer, Tech Data Coroporaton

Figure 11: Dramatic increase in handheld computing power

Cray-2 Supercomputer		Apple iPhone 6 Smartphone
1985		2016
1.9	GFLOPS	115
2 GB	Memory	128 GB
244 MHz	CPU Speed	1400 MHz

Source: *Experts Exchange/PwC*

Challenges for defense and security

While breakthroughs in nanotechnology and other frontiers of research and development are increasing productive potential for commercial enterprises they are also enabling bad actors to advance their own capacity for disruption and destruction.
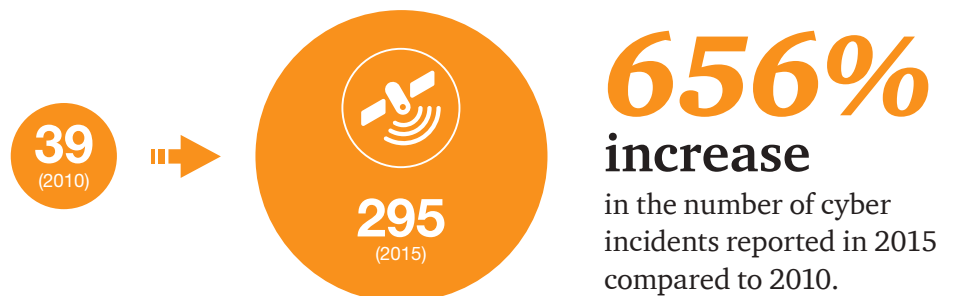
With every new technological advancement that promotes even greater automation, analytics, and communications, new vulnerabilities will be created that will challenge law enforcement, security, and defense organizations like never before.

The combination of the internet, mobile devices, data analytics, drones, artificial intelligence, and cloud computing will provide defense and security organizations step-function increases in capabilities to address and respond to threats that will be using the same, commercially available tools to do harm. Vendors will also make all devices "secure to the user" which will inhibit surveillance and evidence gathering by intelligence and law enforcement entities. The challenge for defense and security organizations will be to develop and adapt these tools at the speed of business—not the traditional speed of government.

> *At its very core, ISIS is a company that creates a product of hate and terror, and it has found a horrifyingly effective way to scale it. ISIS uses technology better than most tech start-ups. Ghost Security Group, a counterterrorism organization, has noted in the past that ISIS utilizes almost every social app imaginable to communicate and share its propaganda, including mainstays like Twitter and Facebook; encrypted chat apps such as Telegram, Surespot, and Threema; and messaging platforms including Kik and WhatsApp.*
>
> **Vanity Fair**

Figure 12: Industrial Control System Cyber Incidents

39 (2010) → 295 (2015)

656% increase in the number of cyber incidents reported in 2015 compared to 2010.

Source: *Experts Exchange/PwC*

Critical issues

**1 Cyber Crime/Cyber Warfare/
Cyber Terrorism**
In recent years there has been a
dramatic increase in unlawful cyber
security breaches and infiltrations.
Some of these have been orchestrated
by independent criminal actors, but
others are far more sophisticated and
coordinated, formally and informally,
by government agencies seeking
to disrupt or create competitive
advantages. Network vulnerabilities
to such attacks creates national
security vulnerabilities that extend
beyond financial crime to the
crippling of key infrastructure and
access to classified information that
could compromise critical national
infrastructure in addition to ongoing
military and police operations.
Undetected cyber penetration of
critical commercial networks can
allow adversaries to gather information
regarding defense supply chains that
could enable major disruptions during
a time of crisis.

**2 The Rise of the Internet
as a Radical Proliferator**
The global reach of the internet and
social media platforms has created a
substantial propaganda and recruiting
vehicle for radical groups seeking to
spread their message to disaffected
populations around the world.

**3 Asymmetric Command, Control,
and Delivery**
The "ease of use" of digital technologies
allows adversaries to take advantage
of advanced capabilities with minimal
investment. Secure communications
for extremist groups has been facilitated
via commercially available apps that
challenge intelligence gathering, law
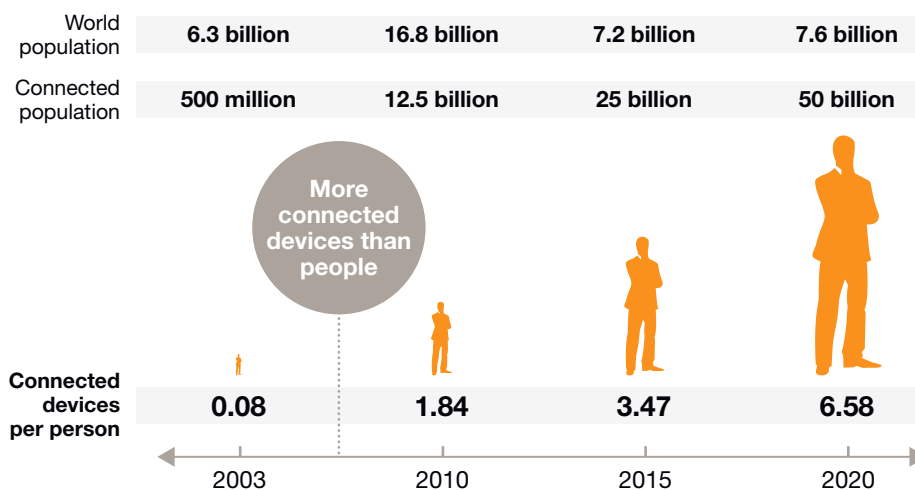enforcement, and military operations.

**4. Maintaining an Adequate Pace
of R&D and Innovation**
Commercial technology product
lifecycles continue to contract,
while those in government defense
and security are elongating. This
"innovation gap" must be breached
creatively, and with some urgency,
in order for intelligence, security,
and defense organizations to stay
ahead of their adversaries.

> *Our nation is at risk.
> The cybersecurity vulnerabilities
> in our government and critical
> infrastructure are a risk to
> national security, public safety,
> and economic prosperity.*
>
> **Philip Reitinger**
> U.S. Deputy Under Secretary of
> Homeland Security

Figure 13: The growth of the network connected devices

	2003	2010	2015	2020
World population	6.3 billion	16.8 billion	7.2 billion	7.6 billion
Connected population	500 million	12.5 billion	25 billion	50 billion
Connected devices per person	0.08	1.84	3.47	6.58

More connected devices than people

Source: *Cisco Internet Business Solutions Group, April 2011*

Megatrend five
Climate change and resource scarcity

Scarcity of resources and the impact of climate change are of growing economic concern. Demand for energy is forecast to increase by as much as 50% by 2030, and water withdrawals by 40%[14].

Impacts may include increases in extreme weather and rising sea levels, which could make traditional methods of farming, hunting, and fishing difficult or impossible in some places.

The need for sustainable solutions may well be at odds with the need for resources to fuel growth and feed populations. Time-honored traditions will be challenged by changes to the physical environment.

> *Sea-level rise will act as a threat multiplier in rapidly urbanizing agglomerations, increasing political, economic, religious, demographic, and ethnic tensions by causing land and water to become scarcer.*
>
> **Carnegie Endowment for International Peace**

Industry examples

1 **Plugging in on the road: an issue for electric vehicle owners**

   More than 96,000 plug-in hybrid and electric cars were sold in the US in 2013[15], but only about 22,000 public charging stations exist[16]. Companies such as electric vehicle charging service and network provider **CarCharging Group** and electric vehicle services provider **Recargo**, whose PlugShare app shows charging spots, see opportunities for innovation[17].

2 **Coca-Cola** and the USDA team up to improve **water resources**

   In 2013, the two announced a five-year public-private partnership to restore and protect US watersheds. The goal: to return more than a billion liters of water to the National Forest System, which provides more than 60 million Americans with drinking water[18].

Possible implications

- Securing resources domestically and internationally via strategic relationships becomes even more critical for governments and businesses.

- Increased conflict and political tension, especially over resources, may occur as food, energy, and water patterns change.

- Increased levels of regulation, both directly relating to environmental changes and indirectly through taxation and similar types of incentives/disincentives.

- New industries created, or existing ones revolutionized, in response to energy scarcity, climate change and lack of resources; the pace of these changes will be accelerated by new technologies.

Figure 14: With a population of 8.3 billion people by 2030, we'll need...

50% more energy

40% more water

35% more food
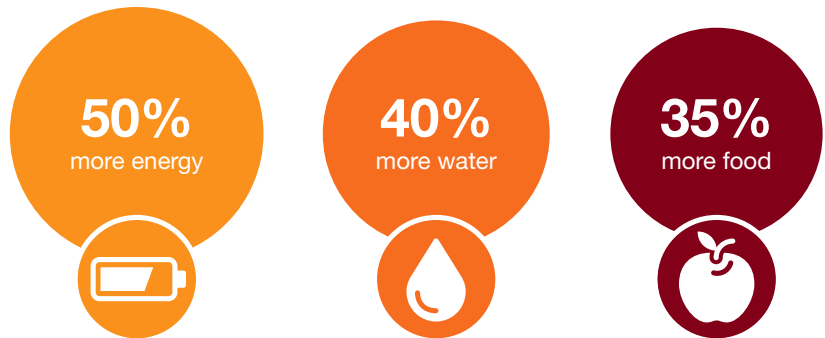
Source: *National Intelligence Council: Global Trends 2030: Alternative Worlds.*

Challenges for defense and security

Tensions between nations over access to natural resources is nothing new. As the global population continues to grow these disputes will become more acute, and more critical to national survival particularly when it comes to very basic resources such as food, water, and energy sources.

This will undoubtedly lead to regional and potentially global confrontations over water, oil, wind, fishing, hunting, and other mineral rights.

Megatrend Three exacerbates this problem by concentrating expanding populations into cities and putting stress on the natural resource supply chain to deliver at much higher demand levels. It makes these supply chains more efficient, but also, from a security perspective, far more vulnerable to disruptions with devastating impact to vastly more people concentrated in urban centers.

Global climate change will also impact this vulnerability through its impacts on sea levels, water scarcity, and farmable land. Natural disasters will put additional stress on traditional security and defense forces to retain order and provide non-traditional defense service during a humanitarian crisis.

Given the growing involvement of military actors in relief activities, humanitarian organizations have an opportunity and, some argue, a responsibility to engage more strategically with the military… in order to limit the risks inherent in their involvement and maximize the potential benefits to the disaster response system and affected populations. The question for humanitarian organizations is no longer whether to engage with the military, but rather how and when to do so.

Charles-Antoine Hofmann and Laura Hudson
British Red Cross

Figure 15: **Nations that provided military support to Japan following the March 11, 2011 Tōhoku earthquake and tsunami**
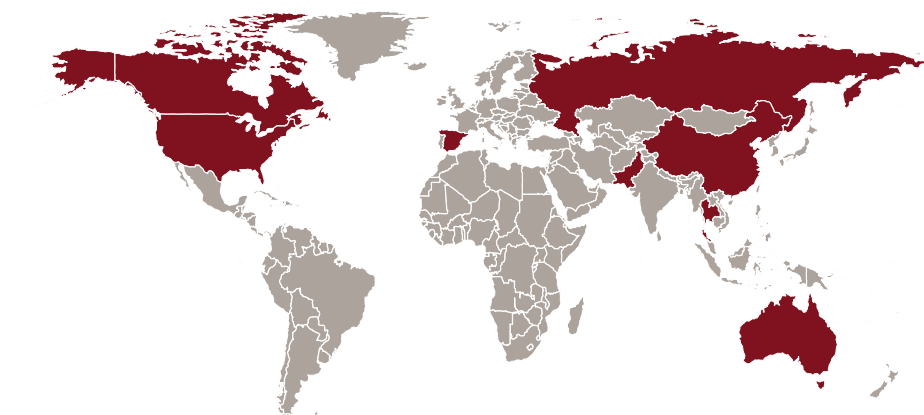
Source: *Center of Excellence in Disaster Relief and Humanitarian Assistance*

Critical Issues

1 Defense Forces as "First Responders"

Due to the advancements in global telecommunications natural disasters in any given nation are quickly elevated to international disasters requiring a response. Defense organizations, given their expeditionary nature, are often called to be first on the scene.
If climate change is accompanied by greater frequency and intensity of storm and other natural disasters responses by defense and security forces will put an ever greater strain on traditional missions and defense and security resources.

2 Resource Scarcity as a threat to national security

Disputes over water and fishing rights have become more common in recent years. Expect this trend to continue as nations seek greater access to the earth's resources for both economic growth and survival. According to the Global Policy Forum, "More than 50 countries on five continents might soon be caught up in water disputes unless they move quickly to establish agreements on how to share reservoirs, rivers, and underground water aquifers."

3 Climate Change Impact on Coastal Populations

As ocean water levels rise commensurate to increased surface temperatures on the Earth, coastal cities which attract population and trade will require larger infrastructure investments to ensure physical safety, diverting resources from traditional security and defense priorities.

As demand for water hits the limits of finite supply, potential conflicts are brewing between nations that share transboundary freshwater reserves. More than 50 countries on five continents might soon be caught up in water disputes unless they move quickly to establish agreements on how to share reservoirs, rivers, and underground water aquifers.

Global Policy Forum

Figure 16: Projected water scarcity in 2025

- Physical water scarcity
- Economic water scarcity
- Little or no water scarcity
- Not estimated
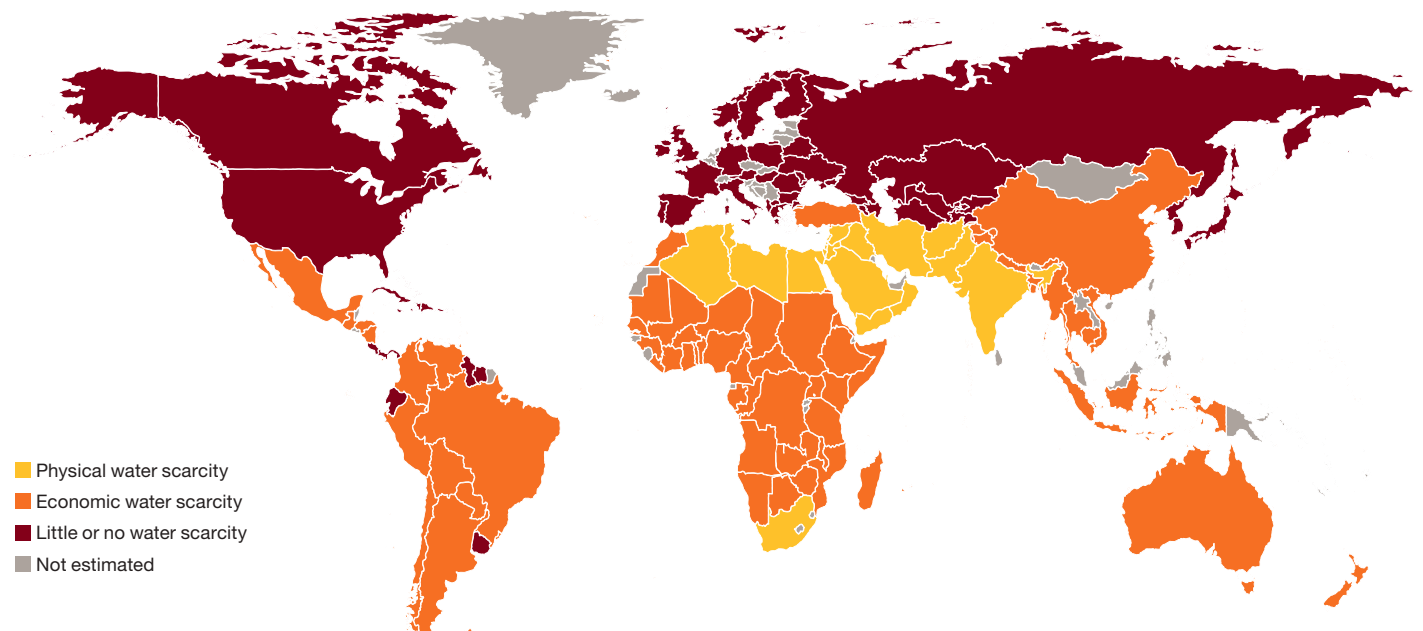
Source: *UN Department of Economic and Social Affairs*

Feature

The "confluence" of global megatrends can intensify defense and security challenges

Economic shift, demographics, accelerating urbanization, climate change.

Much of the world's transportation infrastructure (seaports, airports, and rail and road terminals) will be located in or near megacities and will likely be affected by rapid urbanization where we may find similar relationships as we do today in Beirut where the airport is controlled by Hezbollah, and other transportation infrastructure is controlled by opposing groups. In times of tension, transportation infrastructure could be substantially affected by fighting and battle damage disrupting up-and down-stream flow of imports and exports, and supply chains. Apart from the demographics and the urbanization, many coastal megacities and much their strategic economic infrastructure could be heavily affected by the rise of sea levels, potentially requiring trillions in investment to cope with rising water levels. This effect of climate change could fall with heavy impact on the Gulf States where so much of their urban and economic infrastructure is barely above sea level.

Figure 17: Economic shift, demographics, accelerating urbanization, climate change

Source: *To go here*

Accelearting urbanization, demographics, rise of technology.

Figure 18: Accelearting urbanization, demographics, rise of technology

Source: *To go here*

Megaslums have the potential to become "no go" zones, hindering, or effectively preventing national, regional, and municipal law enforcement and security operations against non-state actors; criminal or terrorist. There will be a greater symbiosis between criminal and terrorist networks. Megaslums will effectively exist beyond the writ of national and regional governance, and intelligence collection in these "denied areas" will be enormously more complex and challenging. With megaslums becoming both incubators for radicalization and support platforms for terrorism, the lethality of attacks in or emanating from these enclaves, will be enhanced and magnified by accelerating technology. Secure means of communications from commercially available applications will afford terrorists the capacity to plan and deliver devastating attacks from cyber to physical attacks that will frequently exceed the capacity of formal government to respond. As technology advances, terrorists, operating from secure enclaves will seek weapons of mass destruction the application of which could bring governments to verge of collapse.

What do these megatrends mean to you as defense and security leaders?

Defense and security leaders have a responsibility for understanding the strategic context in which they will be required to operate. Here are five things for leaders to consider relative to how the megatrends will shape that context:

1   What is your organization's purpose?

Where does your organization fit within the overall **national security ecosystem**? What role do your political leaders, citizens, other government agencies, and allies expect you to perform within that **ecosystem**? A well-defined and well-articulated purpose not only helps build trust with your stakeholders but also helps assure your relevance to society.

2   How is your defense/security organization considering the megatrends in the development of organizational strategy, and how do leadership teams get ready for these changes?

The "day-to-day" pressures are significant, and leaders may need help balancing short- and long-term expectations and demands as they take on the megatrends. Is the proper incentive structure in place to reward strategic thinking?

3   Are you engaging with outside parties to help shape your point of view on where the world is going relative to areas outside of traditional defense and security?

For example, futurists, Silicon Valley or other innovators, or different groups who can inform your teams with outside perspectives and infuse them with creativity? How seriously has your organization considered the threats posed by nontraditional adversaries?

4   What is your acquisition and retention strategy as it relates to talent?

Does it consider the expectations of the millennial generation and/or the emerging markets? Technology is advancing rapidly: have you planned for science, technology, engineering, and math (STEM) skill sets or others to help you keep up with the proliferation of technology for destructive and disruptive purposes?

5   Do you have an articulated focus on driving agility as a key organizational characteristic?

When considering the rapidly evolving threat environment, and its enablement/acceleration by the megatrends, what are you doing to create the rapid, adaptable, innovative, collaborative, and transparent organization that will be required to defend your nation and protect your citizens from harm?

6   Does your national security strategy provide the necessary breadth to address the megatrends, particularly their 'confluence'?

National security strategies often focus on defense and domestic security challenges without emphasizing the required economic and industrial outcomes or outlining the wider people issues and security contingencies. What are you doing to help shape that strategy, and your organization's role in support of it, in order to ensure the strategy's relevance, flexibility and responsiveness?

Contacts

To have a deeper discussion about how these topics might impact your business, please contact Tom Modly or a member of PwC's Global Government Defense and/or Security Networks.

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About PwC's Global Government Defense and Security Networks

We support defense and security leaders around the world develop and implement effective strategies to address emerging threats with greater efficiency and agility. Our purpose is to build trust in society and solve important problems to create a safer world.

Endnotes

1   Mario Pezzini, "An emerging middle class," OECD Observer, 2012.

2   The World Bank, World Development Indicators, 2010.

3   Ibid.

4   "Aging Statistics," Department of Health and Human Services Administration on Aging, retrieved April 16, 2014.

5   "Robotic Cody Learns to Bathe," Georgia Tech College of Engineering, retrieved April 16, 2014.
    http://www.coe.gatech.edu/content/robotic-cody-learns-bathe.

6   "Personal Assistance Robots: Not Just Science Fiction," GeckoSystems, retrieved April 17, 2014.
    http://www.geckosystems.com/markets/personal_assistance.php

7   The United Nations Department of Economic and Social Affairs, Population Division.

8   "New Citi-Commissioned EIU Report Projects Competitiveness of 120 of the World's Major Cities in 2025," Citigroup, June 4, 2013, retrieved February 19, 2014.
    http://www. citigroup.com/citi/citiforcities/home_articles/n_eiu_2013.htm.

9   "Remarks by CEO Michael Corbat at Citi's 2013 Annual Meeting," Citigroup, April 24, 2013, retrieved on February 21, 2014.
    http://www.citigroup.com/citi/news/ executive/130424Ea.htm.

10 Used with the permission of http://thenetwork.cisco.com/, retrieved February 18, 2014.

11 "Amazon Prime Air," retrieved February 19, 2014, http://www.amazon.com/b?node=8037720011.

12 "Organovo Announces First Delivery of 3D Liver Tissue to Key Opinion Leader," Organovo, January 29, 2014, retrieved February 19, 2014.
    http://ir.organovo.com/news/ press-releases/press-releases-details/2014/Organovo-Announces-First-Delivery-of-3D-Liver-Tissue-to-Key-Opinion-Leader/default.aspx.

13 Pharmaceutical Research and Manufacturers of America, 2013 Profile: Biopharmaceutical Research Industry, 2013.

14 National Intelligence Council: Global Trends 2030: Alternative Worlds.

15 WardsAuto.com, January 3, 2014.

16 US Department of Energy, "Alternative Fueling Station Counts by State," www.afdc.energy.gov, as of April 3, 2014.

17 "Car Charging About Us," retrieved February 19, 2014, www.carcharging.com;
    "Recargo PlugShare Overview," retrieved February 19, 2014, www.recargo.com.

18 "USDA and Coca-Cola Partner to Replenish One Billion Liters of Water to Nature," United States Department of Agriculture, September 13, 2013, retrieved February 18, 2014, http://www.usda.gov/wps/portal/usda/usdahome?contentid=2013/09/0180.xml&contentidonly=true.

www.pwc.co.uk/megatrends