

THE EVOLVING HUMAN ACTIVITY AND THE ENVIRONMENT: THE FUTURE PERSPECTIVES IN POST COLD WAR ERA

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ABSTRACT

People are, and will remain, the most important drivers of change, in underpinning societal, geopolitical, security and developments. This paper seeks to investigate trends in society by considering how challenges in physical domain, will be combined with societal change and technological advances that will shape human and the environment. Robust demographic growth, resource scarcity and the need to address climate change will require innovative technological and organizational solutions that have a profound effect on the society. These demographic, physical and economic drivers will be interlinked and intensify, in shaping behaviors, development and the need for adaptation in 2040.

Keywords: Human and the Environment

Introduction

The Imperatives of Physical Environment

The global population is likely to grow from 6.9 billion in 2010 to 8.8 billion by 2040 with many enjoying increasing prosperity accompanied by burgeoning material expectations.^{1,2} Rapid

¹ For instance in India the middle class has tripled in size to 250 million people and may reach 50% of the population by 2040, Time Asia, November, 2004.

² In 1998, the United Nation (UN)' s best estimate for 2050 was that there would be 8.9 billion human beings on the planet. Two years later, the figure was revised to 9.3 billion. The number subsequently fails and rose again. Modest changes in birth rates can have significant consequences over a couple of generation. For example, raises in US and European birth rates are among the developments factored into the UN's latest 'middle' projection in 2050 will just be over 9.1 billion. UN Population Division of the Department of Economics and Social Affairs.

population growth is a continuation of a trend stretching back to the last century that is likely to continue before possibly moderating in the late 21st century as economic development leads to a progressive decline in global fertility rates.³ Population driven resource demand is therefore likely to increase in intensity by 2040 before gradually subsiding in the late 21st century as technological and organizational innovations takes effect, and the rate of population growth declines. The most acute stresses are likely to arise from competition for energy, food and freshwater, as well as access to the ‘global commons.’⁴ Global energy, food and water supplies are likely to be sufficient for the increased global population. However, geographic distribution, access, cost and transportation will be critical issues. The inability of some regions and segments of society to meet the costs involved in accessing resources makes both local and regional scarcity likely to a stunting economic and societal development and leading to poverty, instability and conflict. For example Mexico City has already experienced conflict over access to water supplies.⁵ Despite this, growing numbers of people are likely to enjoy increasing affluence as consumption and global Gross Domestic Product (GDP) per capita will rise. Such economic growth is likely to lead to a continued reduction in absolute poverty; however, rapid population growth may contribute to increased levels in the least developed regions.⁶ Economic development is likely to be directly linked to greater resource consumption. However, an increased number of cars, the change to protein-rich diets, and increasing personal water usage will partially offset the emergence of renewable and unconventional energy sources, increasing

³ Processes such as globalization and urbanization are likely to contribute to the trends towards smaller family size seen in developed countries over the past 50 years. This trend is likely to continue in developing countries. for example, a recent UN projection assumes a decline of the global fertility rate to 2.02% by 2050, and eventually to 1.85%, with total world population starting to decrease by the end of this century, Department of Economics and Social Affairs, Population Division, World Population in 2300, 2004.

⁴ The global ‘commons’ are those region used jointly by the members of a community. They include, but are not limited to those parts of the earth’s surface beyond national jurisdictions such as the open ocean and the living resources found there, the atmosphere and orbital Space. The only landmass that may be regarded as part of the ‘global commons’ is an Alternative.

⁵ Barkin D. Mexico City’s Water Crisis, NACAL Report on the Americas 2009 and Dry Taps in Mexico City: A Water Crisis Gets Worse at <http://www.time.com/time/world/article/0,8599,1890623,00.html>

⁶ Absolute poverty is defined here as those living on the equivalent of \$1 per day or less.

crop yields and innovative solutions, such as conservation measures.⁷ Producer and consumer economies will seek political and economic partnerships to guarantee supply, some of which will require moral compromises to be made. Scrambles for energy, minerals and fertile land are likely to occur with increasing intensity. These scrambles may not always be motivated by immediate shortage, as many states compete for access to long-term supplies and develop extensive strategic reserves. The combined effects of climate change and increased demand for food production are likely to alter the productivity and distribution of the world's 'bread-basket' regions and accelerate soil degradation in previously fertile areas. The inequality between areas that either possess an abundance of natural resources, or can afford access to them, and those that cannot is likely to be a source of grievance, providing an ethical challenge to the global market-based economic system. By 2040 climate change and associated measures designed to limit greenhouse gas emissions will have a significant effect on the development of societal norms, the cost and usage of energy, land use and economic development strategies. A new and higher temperature of global climate change will be a reality and many measures to limit further long-term temperature increases that are likely to have been implemented. The measures are likely to be agreed multilaterally after a period of discord regarding the associated economic and financial burden of how individual states and regions bear the costs. These disagreements, based on differing narratives for apportioning responsibility for climate change, are likely to be particularly intense between developed and developing economies.⁸ This is likely to place greater emphasis on sustaining rather than maximizing economic growth, particularly in the West. Options for enhancing sustainability include technological solutions, such as carbon capture and storage,⁹ that are likely to allow widespread usage of fossil fuels to continue. Material expectations will be tempered by greater environmental awareness. These developments will mitigate, and may counteract a number of the long-term de-stabilizing impacts of climate change, but considerable uncertainty that surrounds the rapidity with which such solutions can

⁷ These sources include photovoltaic cells within solar panels that are used to convert solar energy into electricity and exploitation of sands. These are oil-rich rocks that contain a form of hydrogen that currently requires considerable effort to extract and process.

⁸ Such difficulties were exemplified during the Copenhagen summit in December 2009.

⁹ The first prototype carbon capture unit in the UK, run by Scottish Power, is working at a coal-fired power station in Longannet. During test it has captured around 90% of the carbon content emitted from exhaust gas. Carbon Capture Journal 30 November 2009.

emerge, and adaptation is unlikely to be smooth or wholly successful. Climate change, and the progressive impact of gradual temperature increases, will exacerbate resource scarcity by altering regional precipitation patterns, affecting agricultural production capacity, and worsening existing problems of resource distribution and access. Climate change will also cause some previously infertile land and regions to become fertile. However, such regions are likely to lack the necessary farming infrastructures and it will take considerable time and effort to establish them. These changes in the pattern of agriculture are likely to impact on food security. Environmental changes are also likely to lead to significant increases in environmentally-induced migration. Such migrants are likely to move locally, and then regionally, with a relatively small proportion of them moving internationally. However, much of these migrations will be uncontrolled and it will generate significant social and economic impacts wherever it occurs. States and cities that are unable to cope are likely to seek international humanitarian assistance of unprecedented scale and duration.

The Imperatives of Changes in the Society

By 2040, the demographic profiles of societies will change. The developing world will account for the majority of population growth and represent 7.6 billion people, or around 85% of the global total.¹⁰ Many of these people will enjoy improved economic status and heightened material expectations. This economic development, along with widespread availability of birth-control measures, increasing life expectancy and continued urbanization, is likely to temper birth rates in some regions. However, limited economic development and cultural norms will persist, sustaining high fertility rates in other regions such as sub-Saharan Africa, parts of the Middle East and Asia, and specifically in countries such as Afghanistan, Syria, Yemen and Pakistan.¹¹ In contrast, Europe, Japan and eventually China and Latin America are likely to face problems of an ageing and declining population. Russia, in particular is likely to experience a population collapse from over 140 million in 2009 down to 122 million by 2040, posing significant social,

¹⁰ UN Population Division definitions 2008. All regions of the world except Europe, Northern America, Australia/New Zealand and Japan.

¹¹ By 2040, Afghanistan I likely to see its population increase from 29.1 million in 2010 to 62.3 million to 34.34.1 million; Yemen from 24.3 million to 46.9 million, and Pakistan from 184.8 million to 302.8 million. UN World Population Prospects, 2008 Revision, Medium Variant.

security and economic problems, particularly as the decline is most acute amongst ethnic Russians rather than minority groups.¹² However, the long-term decline in fertility rates experienced by the most developed states is eventually likely to be halted, or even reversed, as societal norms change.¹³ Climate change will amplify the existing social, political and resource stresses. It is likely to be an indirect factor that sets the conditions for conflict, rather than directly causing it. The effects of climate change are likely to dominate the global political agenda, especially in the developed world where it will represent an increasingly important single issue. The developed world is likely to experience a degree of transformation as it moves from a consumerist society based on freedom of choice to a more constrained, sustainable societal model that provides financial and social rewards to encourage greener practices and discourage waste. This will represent a shift in international norms as the developed world looks to achieve sustainability, while the developing world continues to concentrate on building the infrastructure required to maximize economic growth. Despite this, the developing world is likely to represent an important engine of innovation where new, cheap, environmentally sustainable technologies are trialed without opposition from industrial interests that defend inefficient, legacy systems. The developing world is unlikely to be constrained by the stringent legal controls applied to the developed world. In certain research areas, such as cloning and clinical trials, this may lead to technological advances that may be deemed unethical in the West. Broader and deeper social interaction, facilitated by globalization, sustained international migration, and ubiquitous global ICT connections may drive the development of the global culture, although the characteristics of this culture take a difficult task to anticipate. Social trends are likely to reinforce this, with some religious movements, such as Pentecostalism, becoming

¹² The Population of the Russian Federation is projected to be 140 million in 2010 declining to 122 million by 2040. A decline of 18 million over 30 years (1095 days) equates to a loss of 1700 people a day, UN Population Division, 2008 Revision, Medium Variant.

¹³ Fertility has tended to decrease with increases in prosperity and living standards (as measured by the Human Development Index (HDI). However, this may only be true for earlier stages of development. At higher levels of development (above a HDI of 0.86 % a level found only in the most developed economies) fertility in many countries increases with HDI. Thus, falls occur as HDI approaches 0.86%, but above the level of HDI begins to increase again in many countries. it is likely that countries with an HDI above 0.86%, such as Italy, Spain, Netherlands, Germany, and Sweden, have implemented policies that persuades women to children. However, other countries such as Canada, South Korea and Japan, have yet followed this path. Shripad Turjapurkar, 2009, Babies make a comeback, Nature, Volume 460, page 693, Myrskyta et al (2009), Advances in development reserve fertility declines, 2009.

increasingly globalized in outlook and character. Furthermore, individuals and small businesses are likely to become increasingly connected to worldwide markets. The complex international relationships that result are likely to lead to an increased familiarity with other cultures. Knowledge of overseas events is likely to become constant and real-time, providing the opportunity for violent responses to be orchestrated through communications networks that may be untraceable and poorly understood by the traditional security apparatus. The social tensions caused by intrusive global culture are likely to be most acute amongst those who seek to maintain their indigenous and traditional customs and beliefs, and feel threatened by changes. This is likely to lead to an increasing number of individuals and groups, many of whom form around single issues that differentiate them from wider society in becoming marginalized and possibly radicalized. The presence of transnational Diasporas with close ties to their home countries will often cause events in the migrants' state of origin to become political issues in the host state. Protest action in response to global or transnational issues may be conducted on an expanding scale with for example, local events in Bangladesh leading to protests by ethnic Bangladeshis in London. These protests may include demands for intervention to address problems in their state of origin or, alternatively, leads to transnational inter communal violence conducted between different ethnic communities in the host country. Often the host state government may be perceived as a source of grievance due to ideological or cultural differences. When such conditions exist, particularly when exacerbated by high levels of marginalization and social exclusion, sections of the populace will develop grievances that may lead to extremism. Examples include the 7/7 attacks in 2005 on the London transport network where terrorism was justified through reference to historical injustices, repression and violence against Islam.¹⁴ Technology will facilitate organization to protests and high impact of terrorist attacks will occur rapidly, and without fore-warning, and seek to achieve symbolic effects that will create the greatest media impact. The 2004 Madrid train bombings in the run-up to the Spanish national elections demonstrate the ability of trans-national terrorism to achieve political effect. Regions of alternatively governed space will continue to exist in both rural and urban environments where instruments of legitimate national governance do not operate effectively and

¹⁴ Githens. J. Mazer, Religious Radicalization among North Africans in Britain, British Journal of Politics and International Relations PJPIR Volume 10, pages 550-570, 2008.

power resides locally with tribal groups, warlords or criminal gangs. Diaspora communities in developed states may form similar enclaves.¹⁵ Instability, crime and terrorism are likely to radiate from such centre's making their containment or stabilization an ongoing international problem. Regions that suffer the highest levels of inequality and poverty are also likely to experience increased risk of humanitarian catastrophes caused by an amalgam of climate change and resource pressures, the effect of disease, population growth and clear moral cases that invite humanitarian intervention will persist. Within the global system an innate cultural divide is likely to remain between societies that are principally individualistic in outlook and those that foster strong collective identities. Both types of society will be challenged and undergo change. For example, collectivist societies are likely to face calls for more democracy, freer markets, freedom of speech and belief, and individual legal rights. However, individualistic societies are likely to experience tensions as their constituents increasingly question the role and authority of the state and wrestle with the balance between the needs of the many and the rights of the individual. For example, China is likely to continue to foster a strong collective identity based on nationalism. However, the manner in which the Chinese state resolves the inevitable tensions associated with the rise of individualism, along with divided allegiances as open religious affiliation becomes more widespread which may come to define its future path. Religious affiliation will remain a collective identity that transcends national boundaries. Many religions will have transnational presence and institutions such as the Roman Catholic Church will remain influential and Islam as a faith will continue through the 'umma'¹⁶ to unify individuals across borders. In a number of religious contexts, including Judaism, Sikhism and Islam, religious identity is likely to remain more significant than national identity. Because of increasing global connectivity Diaspora communities are more likely to react to events impacting on their religious or cultural identity. Single issues, such as women's rights or the desire to practice different languages or cultures, will form barriers to integration, generating further tensions and possibly conflict. However, although these differences may result in tension between different societies and they are unlikely to result in a 'Clash of Civilizations'¹⁷ Moreover, external influences and extended exposure to

¹⁵ For example, Albanian, Jamaican or Somali criminal gangs operating in cities such as London.

¹⁶ 'Umma' is the Arabic term for the whole community of Muslims bound together by the ties of religion

¹⁷ Huntington S. The Clash of Civilization and Remaking of World Order, 1993.

liberal cultures is likely to soften support for violent extremism and gradually decrease the impact of ideologically-driven terrorism. As the globalized economy becomes increasingly dependent on knowledge-based industries, creativity and innovation, the importance of advanced education will increase. However, global access to education will remain variable, although ICT based initiatives are likely to improve basic skills in numeracy and literacy. Those who become better educated may suffer frustration if they continue to experience inequality of opportunities based on their physical locations, culture or language. The increasing role that ICT will play in future society is likely to lead to the vast majority of individuals developing the skills required to use and operate such technology. However, the proportion of the population with harder skills required in understanding the fundamental principles of how such technology works is likely to decline.¹⁸ The state will remain the pre-eminent actor in international relations and many individual states will be dominated by elite groups that emerge from distinct socio-economic, educational, tribal and ethnic groups. However, the emergence of a global elite, a powerful network of individuals and institutions that sits above the level of individual states and influences the global agenda, is also possible. Elites provide an indication as to how different regions may see the world and to what strategies they will afford the greatest priority. The Western world is likely to remain dominated by personality politics with charismatic leaders engaging their publics on emotional and personal issues based on morality and values. In East Asia, a more technologically focused leadership will seek stability, economic growth and the collective good, affording less significance to social issues and individual rights. In the developing world, traditional forms of organization are likely to remain significant even if states transform their governance and structures according to democratic principles. Transformation, especially if it is driven by globalization is likely to generate tensions within traditional systems and may spill over into conflict between groups, as was illustrated by violence following the 2007 Kenyan elections.¹⁹ Countries that sustain both caste and class systems may also experience internal tensions or instability as hierarchical systems become subject to stress.²⁰ Huntington S, The

¹⁸ Hard skills describe technical disciplines such as math's, engineering and physics.

¹⁹ The Economist, Kenya's Dysfunction Coalition Government, 23rd April 2009.
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Clash of Civilization and Remaking of World Order, 1993.³¹ Hard skills describe technical disciplines such as mathematics, engineering and physics.

The Imperatives of Radicalization

Radicalization is defined as the process of advocating political, ideological or societal reform that can, in some instances, lead to the generation of extremist beliefs and terrorist activity.²¹ Extremists, either violent or non-violent, are those radicalized groups and individuals who are willing to cross ethical and legal boundaries. Terrorists are the most fanatical examples of extremists, willing to use ‘armed propaganda’²² to achieve their goals and are likely to develop compelling messages to gain support. Through considered narratives which explain their aims and actions to a target audience such groups are likely to encourage local responses in support of their objectives. By 2040, radicalization will continue to be driven by a range of complex factors such as the gradual shift in political beliefs, individual and group grievances,²³ economic and social inequalities.²⁴ Although the precise links between poverty and radicalization remain unclear, poverty is likely to encourage radicalization due to the grievances it generates and the long-term stresses it causes. Traits exhibited by fragile states, including high levels of inequality, poor human rights, and minimal social support, healthcare and welfare systems are likely to allow radicalization to develop.²⁵ States in liberal and developed world are also likely to experience radicalization, partly as a consequence of globalization, migration and sustained societal inequality. State actions are likely to have a significant impact on the process of

²¹ Mosokalenko’s Sand McCauley C. Measuring Political Mobilization: The Distinction between Activism and Radicalization, Terrorism and Political Violence 21:2, April 2009, pages 230-260.

²² Armed Propaganda is classically viewed as the mechanism through which a terrorist group tries to advance its goal by violent actions, based on how a given attack will influence external audiences and constituencies.

²³ The desire to respond to grievances (either long established or recently generated) can be due to the impact of a single event, such as the killing of a family member or a perceived ethnic, tribal or religious affront by another group.

²⁴ Relative deprivation itself is the discrepancy between what an individual or group has, and what they believe they are entitled to. Gurr suggest that relative deprivation leads to discontent, which tends to lead to politicization of discontent, which can lead to political violence. Ted Robbert Gurr, Why Men Rebel, 1970.

²⁵ Department for International Development (DFID), Elimination World Poverty: Building Our Common Future, July 2009.

radicalization. For example, during stabilization operations the over-vigorous application of military power to crush radical groups may result in increased public support for them, or drive them to ally with other extremists. Moreover, it may force radical groups to become more extreme and possibly condensing into terrorist cells. Many of the conflicts and disputes exploited by international terrorist organizations show no signs of early resolution and by 2040, international terrorism will persist. Terrorist organizations, such as al-Qaeda, are likely to evolve, while maintaining their overall strategic aims.²⁶ Al-Qaeda's pursuit of global objectives will rely upon radicalization to provide support and to generate the conditions in which they can operate. However, there may be a number of factors that will reduce the spread of international terrorism. For example, ideologies based upon a selective interpretation of Religion in contemporary politics and history is likely to be rejected by many Worshipers across the world. The use of terrorist violence is unlikely to succeed in the long-term and indiscriminate killing is likely to further erode terrorist support and credibility.²⁷ New forms of extremism and terrorist violence are likely to emerge, both locally and internationally. For example, in China the polarization of societal structures and inequality between the elite and the urbanized workers and rural peasants are likely to become a source of grievance. Consequently, China may experience the radicalization of new generation of urban workers, who already number around 120 million and have been drawn from the countryside by the prospect of better paid employment but do not receive the same rights as those originating from the city.²⁸

The Imperatives Technological Challenge

Technology will provide partial solutions for both adapting to and mitigating the effects of climate change. However, it is unlikely that by 2040, technology will have produced low emission energy sources capable of providing majority of the energy demanded. Nevertheless,

²⁶ Assuming continued international pressure, the al-Qaeda 'core' organization is likely to fragment and may not survive in its current form. The core will not be to achieve its strategic goal (popular unrest and uprising leading to the overthrow of governments and the establishment of a caliphate), but it will still have the capability to conduct significant terrorist attacks. *Third World Quarterly*, Volume 30, No.3, 2009.

²⁷ Ibid

²⁸ The Radicalization of New Chinese Working Class: A Case Study of Collective Action in the Governance in the Gemstone Industry, *Third World Quarterly*, Volume 30, No. 3, 2009. pages 551-565.

advances in carbon capture technology are likely to be significant by allowing fossil fuel usage to continue in a limited emission regime, with particular expansion in the use of coal. Despite this, resource competition, carbon pricing, increased energy demand and limitations imposed by climate change are likely to increase the cost of fossil fuels in stimulating the development of cleaner, renewable energy solutions and nuclear power.²⁹ Supply and demand for energy are likely to be closely matched. However, the inability to alter supply rapidly in response to sharp changes in demand (and vice versa) is likely to result in market volatility and price spikes. Supply problems are likely to be exacerbated by underinvestment, instability and the deliberate actions of states seeking wider political objectives, making energy and security an ongoing concern. These spikes are likely to be of greater magnitude than in previous energy crises, severely affecting global economic growth and making the development of novel energy sources, previously deemed and economically unviable and are both economically and politically necessary.³⁰ These economic imperatives will transform energy production and usage, but the breakthrough events such as commercially viable nuclear fusion are unlikely to come to fruition by 2040, and regions that are rich in natural resources will therefore retain strategic importance. The emerging research into fledgling disciplines such as geo-engineering may provide methods to ameliorate climate change. As mineral processing and extraction of technologies become increasingly efficient, previously exhausted reserves may become economically viable again. This could also include the mining of refuge and waste sites. Developments in social networking and technology change will occur. However, attempts to conduct geo-engineering projects in the Earth's complex biosphere are likely to be a source of tension and considerable anxiety regarding unintended outcomes. The future of global environment will be defined by physical, social and virtual networks. The physical system will consist of complex interconnections including extensive resource pipelines, communication cables, satellites and travel routes. The virtual networks will consist of communications servers linking individuals and objects, many of which will be networked through individual Internet Protocol (IP) addresses. Majority of individuals are likely to have access to network connections leading to large-scale changes in identity

²⁹ Carbon pricing provides economic incentives to reduce carbon emission.

³⁰ As mineral processing and extraction technologist become increasingly efficient previously exhausted reserves may become economically viable again. This could also include the mining of refuge and waste sites.

through the use of multiple online profiles. Remote working is likely to become the norm with controlled network spaces representing new work for environments. Virtual reality technologies are likely to blur the distinction between real and virtual life, in facilitating the formation of ubiquitous groups that will form and disband considerable rapidity. New ideas, beliefs and fads will be transmitted near instantaneously around the globe. Avenues for protest and opportunities for new and old forms of crimes will emerge and may allow hostile groups to form and rapidly create effects. At the same time, however, greater access to information and resources will expand the opportunities for research and knowledge development through virtual interfaces, by diminishing the effect of geographic separation between those who seek to collaborate. The increasing ease of use and importance of computers and networks in many aspects of life is likely to lead to dependence on them and create critical vulnerabilities for potential adversaries to attack. These vulnerabilities will be reduced by reversionary options and in the longer term resilience may be increased by the development of intelligent, self repairing networks. However, institutions based upon hierarchical, ordered structures will find themselves challenged by competitors and potential adversaries who are able to capitalize on the rapidity of communication and group formation that are enabled by social networking technology. There may be need for bureaucracies to decentralize to address these challenges. Developments in social networking and technology will continue to facilitate the rise of ‘citizen journalism’ and make it increasingly difficult for even the most autocratic states to control access to information, especially as globalized connectivity allows local news stories to be broadcasted instantaneously across the globe. In such circumstances tension and instability are likely to occur as autocratic states attempt to address rapid changes in popular opinion through force. The public response to the 2009 Iranian elections, with information spread and protests coordinated through transnational social networks, provides an example of the potential impact. Similarly, in response to the 2008 earthquake in Sichuan Province, Chinese government relaxed its policies in controlling social network services leading to an increased coordination of aid but simultaneously creating a virtual environment in which the official response to the disaster could be openly criticized by the general public leading to wide-scale protest and unrest.

The Imperatives of Trends to Global Health

By 2040, health will be recognized as a fundamental global issue. The acknowledgement that healthcare provision will contribute to stability at local, national and global levels may lead to increased international investment in global health in order to reduce inequality and also provide positive opportunities for education and training. Such developments are unlikely to be rapid, but will be accelerated by high impact and events such as pandemics and episodes of mass migration. Average global life expectancy is likely to increase, driven by continued advances in the quality and coverage of healthcare. However, access to healthcare is likely to remain unequal between the developed and developing worlds and, at the national level, between different socio-economic groups. Hence, although health inequality will be affected by genetic, cultural and behavioral drivers, the most significant inequality drivers are likely to be material deprivation and an individual's local socio-economic environment. The costs associated with healthcare in the ageing societies of the developed world will be considerable, especially in Europe, but also in Japan, Korea and China. Individuals in the developed world and in the expanding middle-classes of India, China and Latin America are likely to demand increasing levels of healthcare. Geriatric and palliative medicine will become increasingly important with a significant proportion of the global health care industry existing to prolong life.³¹ This will create an increased burden on states in addressing long-term healthcare requirements and also increasing pension commitments and welfare support. These costs and the continual pressure are to improve healthcare standards that will be an important ongoing political issue that exerts pressure on government budgets. Dependence on international trades is relatively unconstrained movement of people, and high levels of legal and clandestine migration will minimize the opportunities to isolate outbreaks and provide channels that can propagate a viral pandemic. Other diseases such as cholera, malaria, water-borne infectious diseases, tuberculosis and hepatitis will remain significant. The geographic extent of certain diseases will be modified by variations in climate change with regions not previously susceptible to diseases, such as Dengue fever and Lyme disease in becoming progressively affected. In the developing world global inequality in healthcare provision will result in medical care being poorly coordinated and often reactive. Many states will lack access to legal pharmaceutical industry depending instead on unregulated and often

³¹ Palliative medicine treats the symptoms not the cause of disease.

counterfeit sources of drug and vaccine production. The level of HIV/AIDs will remain significant in the developing world; within Russia there will be increased awareness of better availability of anti-retroviral medications and the likely development of successful vaccines will likely make the disease less as an international concern. Variability in healthcare provision and treatment regimes can make it more likely than the previously manageable diseases, such as tuberculosis, MRSA and other bacterial or viral infections that will continue to be prevalent. Global recognition of the importance of a healthy lifestyle is likely to increase. Diagnosis and treatment of genetic diseases will improve and lifestyle choice is likely to become the main driver of poor health in the developed world. The treatment of chronic lifestyle diseases will grow in importance by placing an increased emphasis on primary care. Individuals within the developing world are increasingly and likely to be exposed to Western mass-consumer dietary options and lifestyle vices and will consequently fall prey to similar lifestyle of diseases. Significant healthcare developments are likely in global pharmaceutical industry with novel and targeted drug design solutions arising from the application of advanced genetics and nano-technology. Stem-cell technology is likely to lead to the growth of tissue specific cells and organs. Research will remain ethically controversial but its application is likely to prove its utility, especially as mature cell re-programming develops. Screening and real-time health monitoring will be available and the systems will be able to regulate health down to the cellular or even nuclear level that is likely to be developed. Genetic testing and modification of fetuses will be achievable, although strict regulation in many societies may result in offshore or illicit treatment centers' that are emerging. Human augmentation, especially with mobile communications and computing devices will become practicable and may have significant military applications despite ethical and legal concerns.

Concluding Remarks

The global population is likely to grow from 6.9 billion in 2010 to 8.8 billion by 2040 with many enjoying increasing prosperity accompanied by burgeoning material expectations.^{32,33} Rapid

³² For instance in India the middle class has tripled in size to 250 million people and may reach 50% of the population by 2040, Time Asia, November, 2004.

population growth is a continuation of a trend stretching back to the last century that is likely to continue before possibly moderating in late 21st century as economic development leads to a progressive decline in global fertility rates.³⁴ Population driven resources demand is therefore likely to increase in intensity Global energy, food and water supplies are likely to be sufficient for the increased global population. However, geographic distribution, access, cost and transportation will be critical issues. The inability of some regions and segments of society to meet the costs involved in accessing resources will make local and regional scarcity likely stunting economic and societal development by leading to poverty, instability and conflict. For example Mexico City has already experienced conflict over access to water supplies.³⁵ Despite this the growing numbers of people are likely to enjoy increasing affluence as consumption and global Gross Domestic Product (GDP) per capita will rise. Such economic growth is likely to lead to a continued reduction in absolute poverty; however, rapid population growth may contribute to increased levels in the least developed regions.³⁶

³³In 1998, the United Nation (UN)' s best estimate for 2050 was that there would be 8.9 billion human beings on the planet. Two years later, the figure was revised to 9.3 billion. The number subsequently falls and rises again. Modest changes in birth rates can have significant consequences over a couple of generations. For example, rises in US and European birth rates are among the developments factored into the UN's latest 'middle' projection in 2050 will just be over 9.1 billion. UN Population Division of the Department of Economics and Social Affairs.

³⁴ Processes such as globalization and urbanization are likely to contribute to the trends towards smaller family size seen in developed countries over the past 50 years. This trend is likely to continue in developing countries. For example, a recent UN projection assumes a decline of the global fertility rate to 2.02% by 2050, and eventually to 1.85%, with total world population starting to decrease by the end of this century, Department of Economics and Social Affairs, Population Division, World Population in 2300, 2004.

³⁵ Barkin D. Mexico City's Water Crisis, NACAL Report on the Americas 2009 and Dry Taps in Mexico City: A Water Crisis Gets Worse at <http://www.time.com/time/world/article/0,8599,1890623,00.html>

³⁶ Absolute poverty is defined here as those living on the equivalent of \$1 per day or less.