STRATEGIC FORESIGHT ANALYSIS

2017 REPORT

FOREWORD

The Strategic Foresight Analysis (SFA) 2017 Report aims to support NATO leadership's visualization of the future security environment, which is characterized by a rapid rate of change, complexity, uncertainty and interconnectedness. The SFA sets the foundation for the follow-on report, the Framework for Future Alliance Operations (FFAO). Together, the SFA and FFAO provide military advice and inform the NATO Defence Planning Process (NDPP), as well as other NATO and national processes that require an assessment of the long-term future.

NATO, like many successful and enduring organizations, has continuously adapted itself to the changing environment with the resources and the resolve to ensure a leading role on the world stage. Since the 2014 Ukraine crisis, NATO's emphasis has returned to collective defence whilst taking a 360 degree approach to projecting stability and cooperative security given the wider understanding of interrelated crises and security challenges.

The SFA 2017 Report suggests that polarization within and between states, power politics and competition between major powers have increased the potential for instability. Also other trends include state and non-state actors using hybrid and cyber tools to impact the security environment in the grey zone under the threshold of conflict. Other transnational challenges such as organized crime, climate change and economic instability might further deepen the uncertainty, disorder and complexity that is now called the new normal. Consequentially, no nation or organization can manage any future crisis on its own. The global nature of threats necessitates us engaging a wider range of actors, out of the Euro-Atlantic area, to address future transnational and transregional challenges. This requires the creation of an ecosystem made up of a wide network of partners, including Nations, International Organizations, Non-Governmental Organizations, the private sector and academia, to share information, provide early warning and shared awareness and make maximum use of existing expertise.

Nations, and institutions such as NATO and the EU, can benefit from the information provided in this document to help develop coordinated strategies to respond to potential risks, and take advantage of opportunities that arise from this new normal. Innovation and rapid advancement of technology may also offer opportunities to address these global problems.

The SFA Report does not seek to predict the future but instead provides potential trajectories for several trends and highlights their implications for the Alliance. Where some of these trends did not meet general agreement, the report offers complete transparency of the alternative views to maintain maximum objectivity.

The rapidly changing, complex security environment will continue to be the main driver for NATO's adaptation efforts. These efforts focus on the transformation of NATO's military capacity, to ensure the Alliance remains relevant and credible, now and in the foreseeable future, and can accomplish its core tasks: collective defence, cooperative security and crisis management. The findings of this Report help the Alliance understand today as well as visualize the future, establishing a bridge between the two, thereby enabling NATO to adapt and remain fit for purpose.

This Report is the result of a collaborative effort drawing extensively on expertise from the nations, our partners, other international organizations, think tanks, industry and academia; and in close collaboration and consultation with the EU. I greatly appreciate their support, involvement and active engagement throughout the process in establishing a shared perspective for the Alliance.

"ACT- Improving today, shaping tomorrow, bridging the two"

GENERAL DENIS MERCIER
FRENCH AIR FORCE
SUPREME ALLIED COMMANDER TRANSFORMATION

> "The rapidly changing, complex security environment, will continue to be the main driver for NATO's adaptation efforts."

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> "SFA and FFAO are designed to improve the Alliance's long-term perspective of the future security environment to support and inform the NATO Defence Planning Process."

1. The Strategic Foresight Analysis (SFA) 2017 Report builds upon the SFA 2013 and 2015 Update Reports and provides a wide-ranging shared understanding of the future security environment. The SFA describes the future NATO expects to unfold to 2035 and beyond, depicted as political, social, technological, economic, and environmental trends. Where trends may move in diverging directions, an alternative view is provided to maintain utmost objectivity.

2. The SFA is the initial phase of the ongoing Long-Term Military Transformation (LTMT) efforts at Allied Command Transformation (ACT) and sets the intellectual foundation for a follow-on report, the Framework for Future Alliance Operations (FFAO). The FFAO looks into the interaction of trends, identifies instability situations then develops military implications. Together, the SFA and FFAO are designed to improve the Alliance's long-term perspective of the future security environment to support and inform the NATO Defence Planning Process (NDPP), as well as other NATO and national processes that require an assessment of the long-term future.

3. The confluence of several political, social, technological, economic, and environmental trends is redefining the global security context. Some trends driven by technological innovation may offer opportunities to address global problems. But the confluence of trends has also created complexity, disorder and uncertainty that are now called the new normal. Western countries and institutions, such as NATO and the EU, can benefit from the information provided in the document to develop coordinated strategies in order to respond to potential risks, and take advantage of opportunities that arise from this new normal.

4. Political. Fundamental changes in the international security environment, driven by power transitions among states from West to East and power diffusions from governments to non-state actors worldwide, have created strategic shocks resulting in increasing instability within the post-Cold War world order. These shocks have contributed to greater public discontent and increasing challenges to governance.

> The predominance of NATO and the West is likely to be increasingly challenged by emerging and resurgent powers.

a. The redistribution of economic and military power, most notably towards Asia, continues to contribute to the relative decline of the West. The predominance of NATO and the West is likely to be increasingly challenged by emerging and resurgent powers.

b. Non-state actors, benign and malign alike, are expected to exert greater influence over national governments and international institutions.

c. Power politics and competition between major powers may intensify, increasing the likelihood of confrontation and conflict in the future, thus highlighting the importance of commitment to collective defence.

d. Alternative global governance institutions, championed by emerging and resurgent powers, are likely to challenge the existing international organization as they seek a voice in decision-making structures.

e. Public discontent has led to increasing polarization between political and social groups, further eroding trust in governments and traditional institutions.

5. Human. Social trends that will most profoundly shape the future are asymmetric demographic change, rapid urbanization and increasingly polarized societies.

a. In societies with an ageing population, the demand on resources for medical and social welfare will grow, nations' ability to allocate necessary funds for defence and security will be increasingly strained and changes in demography may limit recruitment for security forces.

b. In developing countries, high fertility rates lead to youth bulges resulting in unemployment and insufficient education opportunities for the young that will foster perceived disenfranchisement and may lead to social unrest.

c. Rapid urbanization might lead to resource scarcity and challenge the distribution of available resources.

d. Fractured and polarized societies and growing interconnected human networks are likely to present unprecedented opportunities and challenges in the next two decades.

6. Technology. Technology will continue to shape the social, cultural, and economic fabrics of our societies at all levels. New and emerging technologies offer enormous opportunities, but also present new vulnerabilities and challenges as the world pivots towards digitalization.

a. The increasing rate of technology advancement will challenge acquisition management processes and the interoperability between nations and institutions. New technologies, such as offensive cyber, artificial intelligence, autonomous systems and human enhancement, are not yet widely accepted and will expose divergent ethical and legal interpretations.

b. Individuals, state actors and non-state actors have greater opportunity to exploit readily available technologies in an innovative and potentially disruptive manner.

c. The scale and speed of global networks allow individuals and groups immediate access to information and knowledge but may also enable the dissemination of false or misleading information. Additionally, data will increasingly become a strategic resource.

d. Commercial innovation has outpaced traditional defence Research and Development (R&D). Reductions in defence budgets have led to over-reliance on commercially available solutions, the loss of defence-focused R&D skills and may increase security risks.

e. Operational effectiveness has become overly dependent on advanced technology and civilian infrastructure without redundant systems. Technological advancements will continue to open new domains of warfighting such as cyber and space.

7. Economics/Resources. Globalization has opened markets and intensified economic integration, while increasing the influence of developing countries and straining natural resources. The advent of emerging markets has also shifted jobs to countries and regions with cheap labour and eroded the economic base for the working middle class in Western countries, fuelling social inequality.

a. An increasingly interconnected global financial system is more vulnerable to attacks by both state and non-state actors. Through the exploitation of decentralized networks, financial origins and transactions supporting terrorism and organized crime will become less visible and traceable.

b. The demand for resources will increase with population and economic growth particularly in developing countries.

c. Access to and control over natural resources will play an increasing role in power politics.

d. Increased inequality is a catalyst for migration and can have second-order effects such as fractured and conflictual societies, violent extremism, nationalism, isolationism, and protectionism.

e. The existing burden on national economies will grow due to the rise in competing demands for limited resources.

8. Environment. Environmental issues are dominated by climate change and its far-reaching and cross-cutting impacts. Climate change may also lead to increasing incidences of natural disasters. The demand for natural resources is increasing. Water and food security are growing concerns along with losses to bio-diversity. These stresses on eco-system services may reduce resilience.

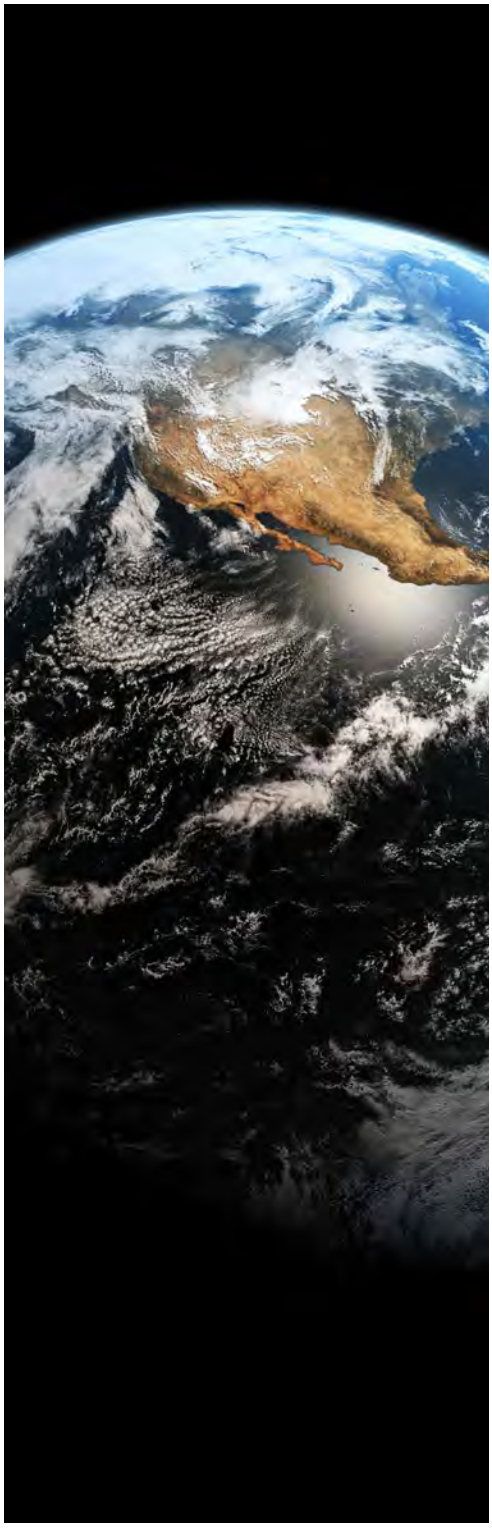
a. Changes to the climate will impose stresses on current ways of life, on individuals' ability to subsist and on governments' abilities to keep pace and provide for the needs of their populations.

b. Natural disasters will have an increasing impact, particularly in those areas unaccustomed to such events.

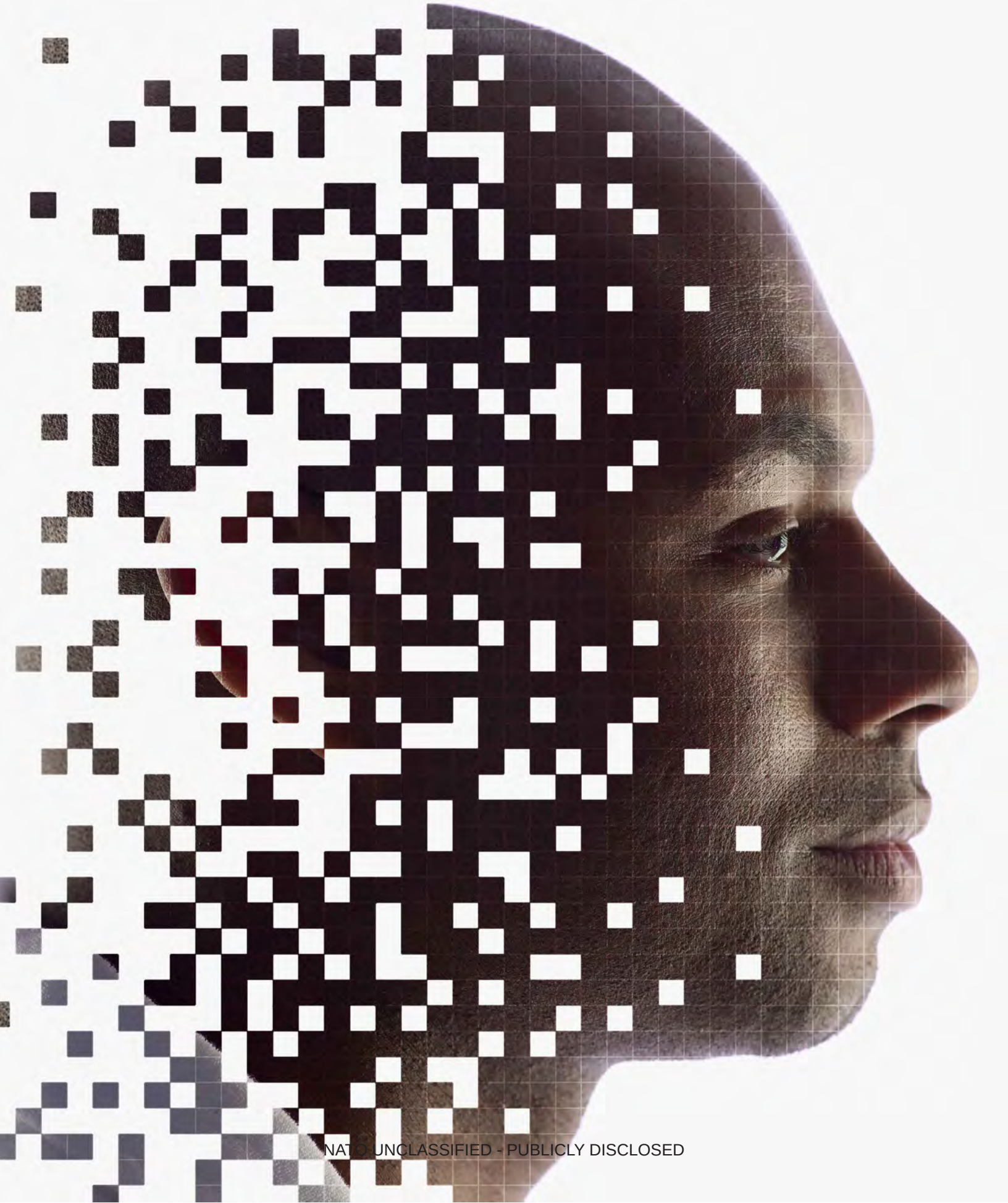
c. Governments and international institutions will be expected to provide humanitarian assistance and relief with increasing frequency.

9. The SFA is a collaborative effort drawing on expertise and resources from NATO and partner nations, international organizations, think tanks, industry and academia to identify trends and implications that are likely to shape the future security environment. The SFA is built upon analysis of commonalities and differences in trends while focusing on the future challenges, opportunities and other relevant implications facing the Alliance. (See Appendix A for the list of trends and implications.)

10. NATO will remain the key security alliance for the Euro-Atlantic region for the foreseeable future. Accordingly, it behoves NATO to further explore and prepare for these possibilities, to best posture for a dynamic future and to effectively meet its core tasks.



> "Changes to the climate impose stresses on current ways of life, on individuals' ability to subsist and on governments' abilities to keep pace and provide for the needs of their populations."



INTRODUCTION

"It is a truism that in an increasingly complex, competitive and connected world, the challenge is not responding to what we know today, but rather preparing for what tomorrow might bring." *UK Ministry of Defence, GST 2045*

AIM

1. The aim of the Strategic Foresight Analysis (SFA) 2017 Report is to identify trends that will shape the future strategic context and derive implications for the Alliance out to 2035 and beyond. The SFA does not attempt to predict the future, for the future is neither predictable nor predetermined. It provides an iterative assessment of trends and their implications to understand and visualize the nature of the dynamic and complex security environment.

BACKGROUND

2. NATO will continue defending Alliance territory and populations against attack, as set out in Article 5 of the Washington Treaty. The trend analysis and the resultant defence and security implications in the SFA 2017 Report will help NATO to determine how the Alliance could accomplish several key actions: establish and apply a unifying vision, adapt and transform to fulfil its core tasks (Collective Defence, Crisis Management, and Cooperative Security), address a full range of security challenges, and advance a conceptual framework for forces and abilities required to succeed beyond the mid-term planning horizon. These actions will also allow NATO to address a set of security challenges and provide the means for deterrence and defence, and serve to protect common values and project stability beyond the Euro-Atlantic region.

3. The world is transforming in multiple, yet connected, areas at an exponential rate. Driven mostly by rapid changes in technology, the world is becoming more interconnected. As people communicate within and across national boundaries more than ever before, the events and decisions in one region influence the lives of others across the rest of world. Ageing populations, with their attendant health and pension costs, are gradually straining social welfare systems that are already stressed with mounting public debt in both developed and developing economies. The global power shift continues toward multi-polarity. While an information society is evolving globally and economic globalization is intensifying, nationalist reactions and anti-globalization sentiments are also growing. Additionally, the effects of climate change are more evident and pervasive than ever before. While these developments increase uncertainty and complexity, they present challenges to the capacity of individual states to manage a mounting set of interconnected problems.

"NATO will continue defending Alliance territory and populations against attack, as set out in Article 5 of the Washington Treaty."

> Since the release of the SFA 2013 and SFA 2015 Update Reports, one of the biggest changes in the world is the increased risk of major conflict.

4. Since the release of the SFA 2013 and SFA 2015 Update Reports, one of the biggest changes in the world is the increased risk of major conflict due to pressures on the international order. The following developments continue to affect the post-Cold War order:

a. Actions of a resurgent Russia in Eastern Europe and a more assertive China in the South China Sea using both hard and soft power to achieve political ends.

b. Poor economic and political policies, radicalization and terrorist activities in weak and failing states amplifying the potential for instability along NATO's borders.

c. Regional conflicts, such as in Syria, Iraq, the Sahel and the Horn of Africa, which threaten global peace and security.

d. Mass migration with significant social, economic and geopolitical implications.

5. The SFA 2017 Report suggests that the future will be no less complex than today's diverse, unpredictable, and demanding security environment. The SFA highlights general trends and their associated implications for the global security environment that create converging effects. This trend analysis and the resultant defence and security implications help prepare the Alliance for the future and provides the visualization of the future security environment to support decision-makers in:

a. Identifying actions to shape the future security environment or otherwise adapt to a changing world.

b. Developing relevant agreements, policies, and organizations required by the Alliance in this environment.

c. Exploring associated defence planning and capability development.

d. Understanding the legal, ethical, and humanitarian aspects of Alliance security that may potentially evolve in upcoming decades.

Thus, the SFA describes the trends to establish a shared perspective of the future to assist the Alliance in preparing for potential threats, meeting diverse challenges and capitalizing on emergent opportunities through critical thinking and fostering innovative solutions.

SCOPE

6. The SFA is the initial phase of the ongoing Long-Term Military Transformation (LTMT) efforts at Allied Command Transformation (ACT) and sets the intellectual foundation for a follow-on report, the Framework for Future Alliance Operations (FFAO). Together, the SFA and FFAO are designed to improve the Alliance's long-term perspective of the future security environment to support and inform the NATO Defence Planning Process (NDPP), as well as other NATO and national processes that require an assessment of the long-term future. The FFAO 2018 Report will be released in spring of 2018, drawing upon the SFA 2017 Report. Both reports will inform the 2019 NDPP cycle.

7. The SFA is built upon the principles described in NATO's 2010 Strategic Concept and subsequent Summit Declarations as the basis for ensuring Alliance security. It is based on the information derived from recent national/international studies and supported by an array of literature from different sources that address future trends out to 2030-2050 timeframe. Analysis of these resources focuses on the commonalities in different documents, and findings are taken to workshops for further discussions with a wider audience. The results covering political, human, technological, economic, and environmental trends and their implications are used as the foundation of the Report. SFA does not include scenarios or alternative futures. However, in order to explain diverging trajectories of trends and their implications such as redistribution of global power, globalization and the rise of China, an alternative view box is provided to maintain objectivity.

8. The SFA is designed to be a regularly updated, collaborative and transparent effort, which encourages meaningful discourse and an open exchange of ideas amongst the Nations. This report identifies a range of defence and security implications based upon current recognized trends likely to shape events in the foreseeable future out to 2035 and beyond.

9. The SFA does not imply a particular or specified future. This report provides a balanced view of the future, describing challenges, but also identifying potential opportunities. It is based on analysis of the past to help the Alliance understand today as well as visualize the future, establishing a bridge between the two, thereby enabling NATO to adapt, ensuring it remains fit for purpose. The trends and implications identified in this report are not simply important short-term events and issues of today; they are projected to have relevance for the next two decades, describing the future security environment. They are pertinent worldwide, to developed and developing regions and nations. The implications are derived from trend analysis using professional military judgement, academic expertise and outcomes of workshops, and are not intended to be prescriptive or necessarily linked to any specific capability.

TERMINOLOGY

10. For the purpose of this study, themes, trends, and implications are defined as:

a. *Theme.* A collection of similar or related trends.

b. *Trend.* A discernible pattern or a specified direction of change.

c. *Implication.* A significant effect on the defence and security of one or more NATO Nations that results from one or more particular trends.

SFA STRUCTURE

11. The first chapter of the SFA describes the general characteristics of the future. The subsequent chapters examine each of the principal themes and discuss the main trends of global change with the resultant defence and security implications for NATO as follows:

a. *Political:*
Includes the re-distribution of geostrategic power, challenges to governance, non-state actor influence in domestic and international affairs, power politics, public discontent and disaffection, interconnectedness, and polycentrism.

b. *Human:*
Includes asymmetric demographic change, increasing urbanization, fractured and/or polarized societies, gender norms and relations, and increasingly connected human networks.

c. *Technology:*
Includes rate of technology advancement, access to technology, global network development, dominance of the commercial sector in technological development, and dependence on certain technologies.

d. *Economics/Resources:*
Includes globalization of financial resources, geopolitical dimension of resources (rare earth elements, water, food, and energy), asymmetric change in defence expenditures, and increased global inequality.

e. *Environment:*
Includes climate change, climate adaptation and mitigation measures, water and food stresses, and natural and man-made disasters.

> "The SFA and FFAO are designed to improve the Alliance's long-term perspective."

$x = x_0 + vt$; $V = V_0 + at$, $V = \sqrt{V_0^2 - 2as}$;

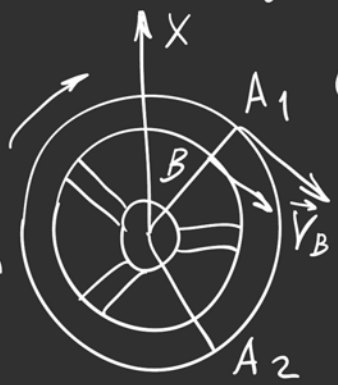
$\vec{v} = |v| \cdot \vec{e}_\tau$

$\vec{a} = a_\tau \vec{e}_\tau + \frac{v^2}{R}\vec{e}_n$,

$\vec{a} = \vec{a}_\tau + \vec{a}_n$

$F = G\frac{m_1 m_2}{R^2}$

$\omega = \frac{d\varphi}{dt}$,



$\omega = \frac{v}{R}$, $\omega = \frac{2\pi}{T}$; $v = \frac{1}{T}$, $\vec{\varepsilon} = \frac{d\vec{\omega}}{dt}$;

$\vec{v}_A$ $\vec{v} = [\vec{\omega} \cdot \vec{r}]$, $V = \frac{N}{t}$;

$V = \frac{2\pi R}{T}$; $\vec{F}_{12} = \vec{F}_{21}$; $ma = ma_0 + F_{in.}$

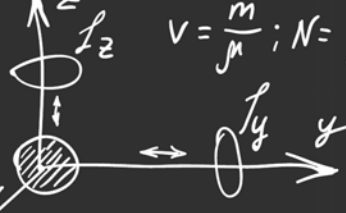
$\sum F = 0 = V =$

$\vec{F} = \mu N$; $F = -kx$; $Q = \frac{F}{S}$; $\varepsilon = \Delta\ell/\ell_0$; $\varepsilon' = \Delta d/d_0$; $\frac{\varepsilon'}{\varepsilon} = \mu$. $\sigma =$

$\vec{L} = J\vec{\omega}$, $\vec{M} = \frac{d\vec{L}}{dt}$; $\vec{M} = J\vec{\varepsilon} + \vec{\omega}\frac{dJ}{dt}$; $L = \text{const}$; $M = F\ell$; $J = J_0 + mb^2$; $W =$

$p = mv$, $\sum F = 0$; $A = \vec{F}\cdot\vec{S}$, $A = (E$; $N = \frac{dA}{dt}$; $E = \frac{mv^2}{2}$; $E = \frac{mv^2}{2} + \frac{J\omega^2}{2}$; $E = m$

E_{p2}; $pV = NkT$; $U = \frac{i}{2}NkT$;



$v = \frac{m}{\mu}$; $N = \frac{m}{m_0}$; $p = \frac{1}{3}m_0 n v^2$; $p = \sum p_i$; $n = \frac{N}{V}$; $p = n$

$\langle v^2 \rangle = \frac{3kT}{m_0}$; $v = \sqrt{2kT/m_0}$; $v =$

$U = \frac{i}{2}pV$;

$\ell = \frac{1}{\sqrt{2}\pi d^2 n}$;

$\frac{\rho v^2}{2} + \rho g h + p = \text{const}$; $h = \frac{2\sigma}{\rho g r}$;

A; $A = \rho\Delta V$; $V^\gamma p = \text{const}$;

$\vec{E}\cdot d\vec{r}$; $A = q\int_A^B E\cdot d\ell$, $A = q(\varphi_1 - \varphi_2)$, $U = \varphi_1 - \varphi_2$;

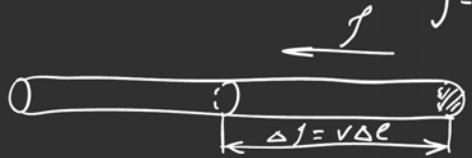
$\vec{E} = \sum$

$\varepsilon_0 S$, $W = \frac{qU}{2} = \frac{CU^2}{2} = \frac{q^2}{2C}$; $C = 4\pi\varepsilon\varepsilon_0 r$;

$= 4\pi\varepsilon\varepsilon_0 \frac{r_1 r_2}{r_2 - r_1}$;

$p = \frac{\sum \rho_i}{V}$;

$J = \frac{q}{dt}$, $J = qnSv$; $j = \frac{I}{S} = qnv$; $\sum$



$J = \frac{U}{R}$, $J = \frac{\varepsilon}{R+r}$; $J = \frac{E}{\rho} = E\gamma$

$n = kq = k(T$; $k = \frac{\mu}{neN_a}$; $\vec{B} = \frac{[\vec{v}\cdot\vec{E}]}{c^2}$, $\vec{B} = \frac{\mu_0}{4\pi}\cdot\frac{q[\vec{v}\cdot\vec{r}]}{r^3}$;

$\vec{B} = \mu\mu_0\vec{H}$;

$V = -A\omega_0 \sin(\omega_0 t + \varphi)$; $\vec{B} = \sum \vec{B}_i$ $\vec{B} = \frac{\mu\mu_0}{4\pi}\cdot\frac{2J}{R}$;

$\vec{B} =$

$t + \varphi)$; $E = \frac{1}{2}mA^2\omega_0^2$; $T = \frac{2\pi}{\omega}$; $T = \frac{2\pi}{\Delta\omega}$;

$+ 2A_1A_2\cos(\varphi_2 - \varphi_1)$, $\zeta_1 = \zeta_2$; $\omega = i\lambda \pm \omega_0$; $\sqrt{\omega^2 - \quad}^2 \cdot 2\pi b$

$\vec{B} = \frac{\mu_0 I}{2\pi b}(\cos\alpha_1 - \cos$

CHAPTER ONE

CHARACTERISTICS OF THE FUTURE

1. For the past two decades, the world has been experiencing a period of significant changes in political, social, economic and environmental areas substantially influenced by exponential developments in technology. The confluence of several political, socio-economic and technological trends is redefining the global security context resulting in complexity, disorder and uncertainty that has become a new normal. In contrast, convergence of trends, driven by technology and innovation, could offer the prospect to address global problems such as poverty, natural resource scarcity, access to health services and education. This chapter describes the characteristics of the future to provide a better understanding of the trends and their implications presented in this report.

PERIOD OF GLOBAL TRANSITION

2. The international order, established after World War II, is continuously undergoing profound transition driven by numerous changes taking place within and between countries. Although the organizations and institutions of the existing order continue to provide a framework for international politics, their relevance is being questioned and challenged progressively by developing countries and new alternative international organizations led by emerging powers. The BRICS group and regional organizations, such as the Association of Southeast Asian Nations (ASEAN), will offer greater quantities of 'global public goods' to the international community and are likely to be more influential in the future.

3. Western countries and institutions, such as NATO and the European Union (EU), are starting to recognize the potential implications of the ongoing transition in order to develop strategies on how to respond to impending risks. Instability will likely increase in the next two decades unless the main players in the international system can come to understand root causes, adapt to the changing situation, and apply reforms necessary to address the problems instead of treating the symptoms. One viewpoint suggests that collaborative adaptation must be part of the way ahead to arrest negative trends in the future by staying committed to the core values and by enhancing cooperation in the framework of the international order.

RAPID RATE OF CHANGE

4. The rate of change in many aspects of human society is expected to continue increasing complexity and uncertainty while creating concurrent opportunities and risks. The exponential growth in technology and

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> Recognizing the complexity of current world affairs helps the Alliance better anticipate the potential trajectory of future trends, allowing the development of defensive measures as deemed necessary and achievable.

computing power, the development of Artificial Intelligence (AI), biotechnology, autonomous systems and the human-machine interface could be considered as game changers that might help humanity solve problems at a global level. On the other hand, they will create disruption by displacing workers from traditional jobs and causing other unintended negative consequences such as changing the psychological profile in societies. The moral, ethical and legal concerns surrounding the development of new technologies, from human enhancement and autonomous systems to AI, will continue to struggle to keep pace with the technological changes.

5. The analysis of trends within the major socio-economic areas such as population, gross domestic product (GDP), urbanization, primary energy use, foreign direct investment, fertilizer consumption, water use, transportation and telecommunications indicates that exponential growth is occurring. In recent decades, substantial economic expansion has been accompanied by growth in cities, transportation, agriculture and technology. While progress has been slower across Organisation for Economic Co-operation and Development (OECD) countries, this growth has been driven by the BRICS and non-OECD countries. Whether or not this considerable growth continues, it has already led to significant environmental impacts that will have to be addressed.

COMPLEXITY

6. The growing number of stakeholders combined with the interconnected nature of the international system, the exponential rate of change and the confluence of trends has continued to increase the potential for disorder and uncertainty in every aspect of world affairs. This represents a shift from a complicated to a complex environment. In a complicated environment, the analysis of interaction with many actors in different situations could still draw reasonable conclusions to support decisions. Whereas in a complex environment, there are too many interactions to comprehend all the possible outcomes, increasing the risk of surprise or even failure.

7. Complexity is already part of everyday life for many people and will be more pervasive in the future. Dealing with this requires a more comprehensive approach. However, socio-economic regulations and political systems are slow to adapt to the major changes in global politics, society and humanity, technology and innovation, world economics, and the environment. Recognizing the complexity of current world affairs helps the Alliance better anticipate the potential trajectory of future trends, allowing the development of defensive measures as deemed necessary and achievable.

8. Complexity is likely to increase the divergence of national interests and fuel greater differences in the perception of risks and threats. With the involvement of non-state actors who may aim to influence the expected outcomes of a situation, decision-makers will face greater challenges when attempting to create unity among Allies and Partners whose constituents may be more inclined to pursue their own agendas. For example, in the operation in Afghanistan or the Syrian crisis, it becomes even more difficult to define success versus failure or victory versus defeat. Complexity will also increase the number and probable trajectories of potential outcomes, which in turn will require leadership to utilize a more comprehensive, flexible and adaptive decision-making system both within the Alliance and individual Nations

UNCERTAINTY

9. The state of the global economy combined with increasing polarization, regionalization and fragmentation has created a growing perception of uncertainty in Western societies that are plagued with a lack of unity to address regional and global challenges. The United Kingdom's forthcoming withdrawal from the EU, commonly known as 'Brexit', and the potential for further dissolution of the EU are due largely to the perception of loss of control of national sovereignty, greater concerns of an uncertain future and indications of dissatisfaction with current policies. These developments are likely to lead to a period of ambiguity, growing risks of instability and fundamental transformation – the beginning of a more uncertain international era.

10. Although socio-economic, political and environmental changes will continue to create uncertainty at individual, organizational, local, regional and global levels, new methods and tools, in particular big data, technological literacy and AI, have the potential to provide new ways of managing uncertainty and complexity. This will require a shift from an organizational culture that takes an incremental approach, has stove-piped working practices and waits for greater clarity, to one that has a more collaborative approach that supports bold and innovative decisions.

GLOBALIZATION

11. Globalization refers to human activities that span national boundaries. These activities can be economic, social, cultural, political, technological or even biological, as in the case of disease. Economic globalization has benefitted mostly the very rich, those at the top of national and global income distributions, and the middle classes of the emerging market economies, particularly in China, India, Indonesia and Brazil. Some 200 million Chinese, 90 million Indians and about 30 million people from Indonesia, Brazil, and regions of progress throughout Africa are potential winners of globalization. On the other hand, those that have not benefitted from globalization are the 'global upper middle class', which includes citizens of European countries whose incomes have stagnated. Growing inequalities brought on by globalization will continue to contribute to a greater lack of Western cohesion and will

undermine Western economic strength as Europe struggles to innovatively reintegrate its working class and other social groups most affected by globalization.

CONFLUENCE AND INTERCONNECTEDNESS

12. Confluence refers to the interactions and intersection of different trends causing a multiplication of the effects, the outcomes of which may be very challenging to predict but should be considered nonetheless. Confluence is especially driven by the rate of technological advancement affecting almost every trend from political, human and socio-economic to environmental. Interconnectedness will open up the potential for more interactions between trends resulting in a boost in technological innovation. An increased rate of advancement in individual technologies will lead to new technologies and novel usage that will have major, and in some cases, disruptive impacts. Technology, in particular the Internet, has driven a growing interconnectedness globally, not only affecting trends but also connecting people within and across national boundaries.

DISRUPTIVE CHANGE AND STRATEGIC SHOCKS

13. The confluence of trends, compounded with uncertainty, is more likely to create strategic shocks and problems of great magnitude. A strategic shock – also called a "black swan" event – could be the result of a rapid, unanticipated, less predictable event, such as the 9/11 attacks or a consequence of the earlier than expected arrival of a dangerous waypoint along a trend line.

14. Existing and foreseeable problems of great magnitude and complexity, such as mass migration and climate change, may

> "Growing inequalities brought on by globalization will continue to contribute to a greater lack of Western cohesion and will undermine Western economic strength."

> Existing and foreseeable problems of great magnitude and complexity, such as mass migration and climate change, may not be adequately addressed due to short-termism, even though potentially serious consequences are expected.

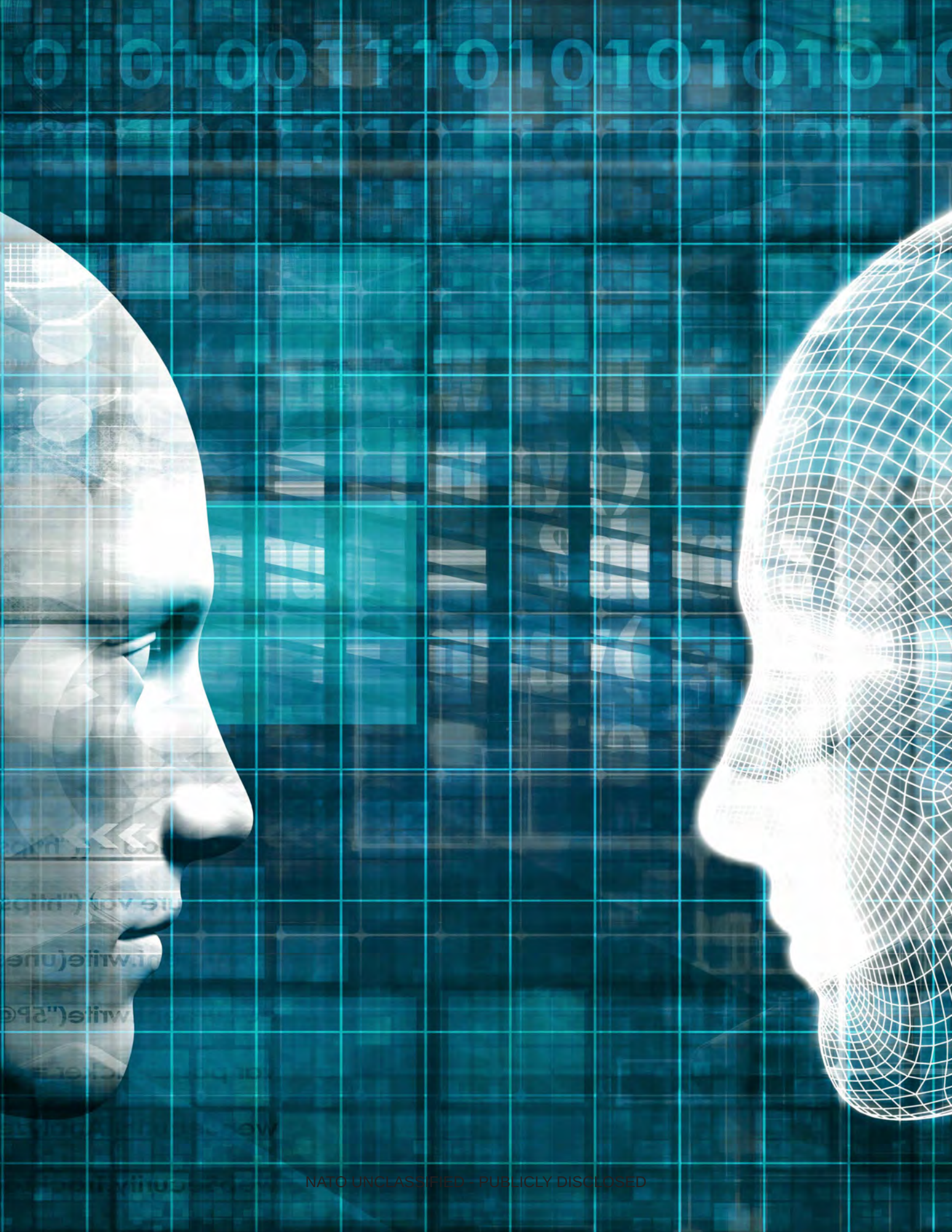
not be adequately addressed due to short-termism, even though potentially serious consequences are expected. Additionally, predictable and normal developments could become a tipping point as a result of interactions amongst several trends that then cause a major disruption. Rapid development of innovative technologies might have major socio-economic and political impacts. The potential for disruption has increased, driven by second and third order effects of technological advancements and innovation such as the 'uberization' of services, logistics and healthcare. Finally, the growing role of non-state actors and super-empowered individuals in domestic and international affairs has amplified the difficulty of addressing challenges that are likely to be defining ingredients of the future security environment.

15. The characteristics of the future should be regarded as trend multipliers. They are not trends themselves but help to comprehend how trends could be disrupted or may change over time in an unanticipated direction.

ALTERNATIVE VIEW - GLOBALIZATION STAGNATED:

Globalization has been blamed as one of the main reasons for increasing income inequality and social instability. As a consequence, globalization could stall or even move backwards due to increased nationalism, economic protectionism, and populism boosted by the disgruntled upper middle classes in Western countries. Brexit and further disintegration of the EU, as well as fragmentation of other multilateral institutions, could increase regionalism and local solutions and could degrade the development of globalization.

Sources: ESPAS, 2015, p. 23. See also UK Ministry of Defence, 2014, p. 78.



CHAPTER TWO

POLITICAL

1. Fundamental changes in the international security environment, driven by power transitions among states from West to East and power diffusions from governments to non-state actors worldwide, have resulted in increasing instability within the post-Cold War world order. As power is shifting away from the West toward Asia, the West's ability to influence the agenda on a global scale is expected to be reduced. The redistribution of political, military, and economic aspects of geostrategic power, led by the developing world, will most likely affect the former-Soviet space, Middle East and North Africa (MENA) and Asia-Pacific Regions. These areas are expected to witness more power politics and major-power competition resulting in interstate conflict. While countries are increasingly working together to address global challenges such as poverty and climate change, recent years have seen a worrying growth in the potential for confrontation between major powers.

2. Moreover, the power vacuum created by weak and failing states is likely to continue to provide fertile ground for instability, radicalization and the rise of terrorist and criminal organizations resulting in a destabilization along NATO's border and large-scale refugee movements to Europe. Due to the increasing number of terrorist attacks, maintaining security has become a significant concern in recent years and is likely to remain so because state and non-state actors have more access to lethal technologies. Use of satellite imagery, position, navigation and timing (PNT) systems such as GPS, internet of things, cyber tools and Chemical, Biological, Radiological, Nuclear (CBRN) or toxic industrial materials could give terrorist and radical groups an increasing ability to stage technologically advanced attacks that could create overwhelming effects. Additionally, possession of significant employable weapons of mass destruction (WMD) capacity by 'Strategic States' would result in a vast potential for harm, if they succumb to sudden catastrophic instability or failure.

ALTERNATIVE VIEW - A WORLD WAR UNLIKELY:

The forces for world peace are on the rise, so are the factors against war. In the foreseeable future, a world war is unlikely, and the international situation is expected to remain generally peaceful.

Source: U.S. Naval Institute News, "Chinese Military Strategy: National Security Situation", May 2015

"As power is shifting away from the West toward Asia, the West's ability to influence the agenda on a global scale is expected to be reduced."

CH 2.1

THE REDISTRIBUTION OF GEOSTRATEGIC POWER

3. The redistribution of economic and military power, most notably towards Asia, continues to contribute to the relative decline of the West. Both hard and soft power instruments influence the geostrategic power balance. China's economy became the world's biggest in Purchasing-Power-Parity (PPP) terms in 2014. China's GDP is projected to overtake the USA in 2026-2028, even with its gradually slowing growth rate. India has the potential to become the second largest economy in the world by 2050 in PPP terms. While the future and exact pace of the shift in global economic power to Asia is difficult to predict, the general direction of change and the historic nature of this shift are clear. The global economic power shift away from the established, advanced economies in North America, Western Europe and Japan is likely to continue to 2035 and beyond.

4. Economic power alone is not sufficient to define the global balance of power; however, economic strength is the foundation of military power. Therefore, change in defence spending is an important factor for military power. In the Asia-Pacific, Eastern Europe and the Middle East, military expenditure has grown steadily in recent years. The United States, with total expenditure of $596 billion in 2015, remains

by far the world's largest military spender, at nearly three times the level of China, which is ranked second. Chinese defence expenditure reached around $215 billion in 2015. Although Russia's defence spending declined to $67 billion in 2015 due to falling oil and gas prices and economic sanctions, Russia remains one of the top spenders in terms of the share of GDP spent on defence. While defence spending in Western and Central Europe stagnated ($253 billion), Eastern Europe observed an increase in 2015 ($75 billion). It should also be noted that in 2016, 22 NATO Allies declared increased defence spending in real terms. Even so, the predominance of NATO and the West is likely to be increasingly challenged by emerging and resurgent powers. Asia-Pacific economies are projected to drive 60% of the total global increase in defence acquisition, research and development and 30% of the total global defence acquisition budget through 2020.

5. As a consequence of these developments, a geostrategic power transition is taking place in the Asia-Pacific region that has created a dual hierarchy with a potential for competition: security provided by the USA and economy led by China. This is likely to create uncertainties and insecurities across the region. The growing importance of maritime commerce to all Asia-Pacific economies, combined with the absence or disregard of international laws, treaties or institutions equipped to manage conflicting interests, might also increase the potential for confrontation in the region.

6. At the same time, actors such as Russia may also succeed in enhancing their power position by the bold use of their resources and capabilities, while benefitting from the difficulty for their counterparts to forge unity. Crises, such as the illegal annexation of Crimea, have the potential to create competition in political, military and economic realms. The West's fragmented responses to the challenges presented by the redistribution of geopolitical power, due to a lack of leadership, unity and resolve, may play to its disadvantage. Rapid changes might result in an unpredictable strategic environment for the next two decades, which could lead to a potentially uncertain transition to a post-Western world order.

> "The global economic power shift away from the established, advanced economies in North America, Western Europe and Japan is likely to continue to 2035 and beyond."

> The present level of European military dependency on the USA is likely to continue and NATO is likely to remain the key security Alliance for the Euro-Atlantic region for the foreseeable future.

IMPLICATIONS

a. *Challenges to the rule-based world order.* International competition for the redistribution of power is tending to intensify and national interests are being reprioritized. The establishment of alternative economic and security structures has the potential to bring balance of power dynamics that might expand globally. Given these circumstances, the challenge for NATO will be to remain an effective Alliance with the associated ability to react to a changing security environment.

b. *Euro-Atlantic relations and Alliance cohesion challenged.* The global security context is changing rapidly and NATO cannot remain indifferent to the re-distribution of geostrategic power. The present level of European military dependency on the USA is likely to continue and NATO is likely to remain the key security Alliance for the Euro-Atlantic region for the foreseeable future. The USA's existing and emerging global commitments are likely to mean that European members of the Alliance may have to assume more of the security burden in their region – and possibly in Africa and the Middle East as well. Although European countries are reconsidering their defence spending and an increase has been observed, if Europe does not assume a greater role, Euro-Atlantic relations and cohesion could be challenged. A robust strategic narrative needs to be maintained to clarify and communicate the importance of NATO, as well as the importance of fair burden-sharing for maintaining Alliance cohesion.

c. *Increased requirement for cooperation with other actors including rising powers.* As NATO confronts a range of dynamic threats from the East and South, the need for a cohesive transatlantic Alliance to address these complex and difficult challenges is greater than at any time since the end of the Cold War. This highlights not only the importance of NATO as the vehicle for transatlantic collective security, but also places increasing resource requirements upon the Alliance. To address these demands, NATO is likely to continue to cooperate with partners such as the UN, EU and OSCE. Furthermore, reaching out to rising powers for military-to-military dialogue would help to develop confidence and security building measures. Therefore, relevant actors, state and non-state, need to be identified and engaged to establish a framework for cooperation that includes confidence building. Working together with these actors allows NATO to address complex crises such as fighting against the Islamic State of Iraq and Syria (ISIS), also known as DAESH (al-Dawla al-Islamiya al-Iraq al-Sham). Additionally, establishing effective partnerships with state and non-state actors might help to mitigate the relative decline of the West.

ALTERNATIVE VIEWS - A RISING POWER: THE FUTURE OF CHINA:

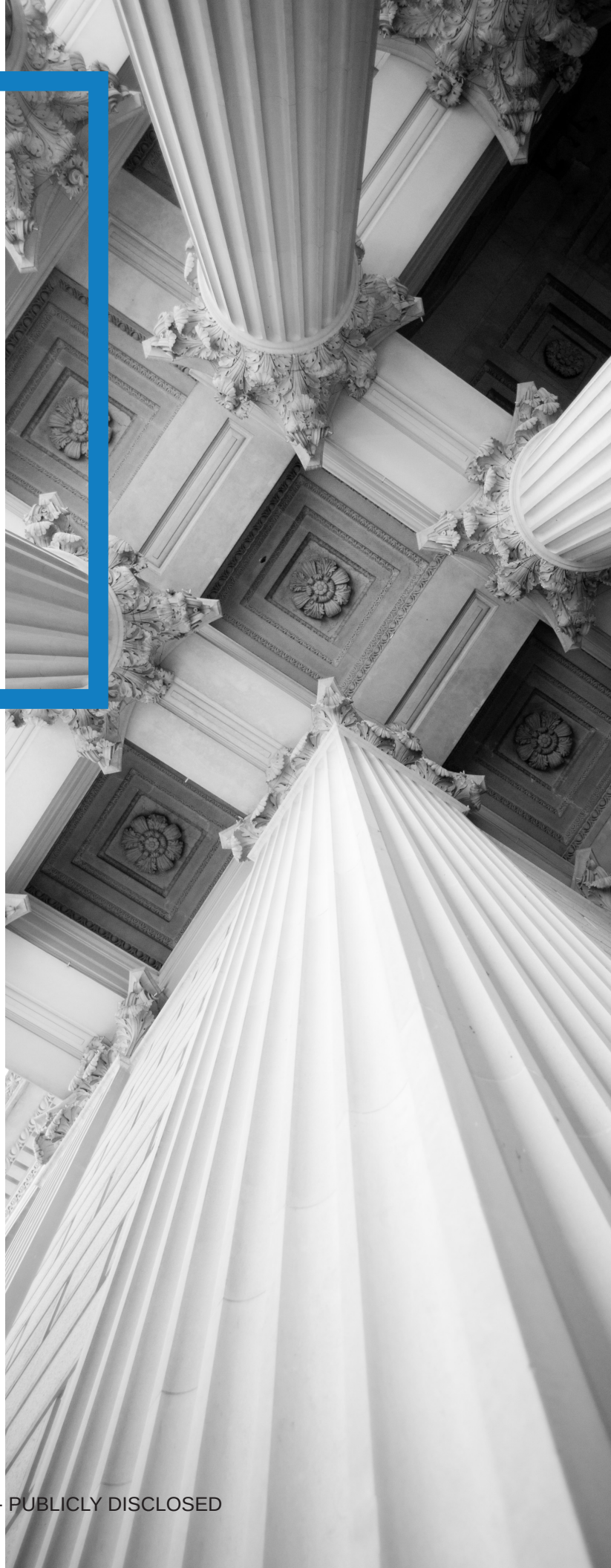
China is now the world's largest trading nation, is the largest consumer of energy, holds the world's largest foreign exchange reserves ($3.7 trillion), has had the world's highest annual growth rate for three decades, and now has the world's second largest military budget and largest internal security budget. Thus by any measure China is a global power. However, there are differing views about two questions regarding the future of China:

- *Will China be able to maintain its economic growth?*
- *Will the rise of China be peaceful?*

Sources: David Shambaugh, "The China Reader: Rising Power", 2016, p. 1, 2. See also John J. Mearsheimer, "China's Unpeaceful Rise," Apr 2006. See also Zheng Bijian, "China's 'Peaceful Rise' to Great Power Status" 2005, p. 21, 22. See also The Economist, "Hard Landing Looms in China" Oct 2016. See also U.S. Naval Institute News, "Chinese Military Strategy: National Security Situation", May 2015. See also Chi Lo, "Hard Landing Averted: What's Next for China?", Apr 27, 2017.

CH 2.2

USE OF POWER POLITICS



7. Power is distributed in a pattern that resembles a complex three-dimensional chess game. On the top, military power: largely unipolar, the USA is expected to retain significant global advantages, albeit contested in certain regions, over the next two decades. In the middle, economic power: multipolar for more than a decade, the USA, the EU, Japan, China and India are likely to remain the major players. At the bottom, transnational relationships outside of government control that are likely to expand in the future. The use of different aspects of power and coercion to achieve political ends never disappeared from international relations. At the same time, emerging powers and organizations, such as BRICS and the Shanghai Cooperation Organization (SCO), may seek to change regional dynamics and establish regional structures that might fuel power competition with existing structures.

8. There has been a serious breakdown in security both regionally and within states in recent years. Despite legal conventions, political agreements, security instruments and institutions of different kinds being in place, the crisis in Ukraine rapidly escalated into a conflict resulting in the illegal annexation of

> The illegal annexation of Crimea and Russia's intervention in eastern Ukraine highlight the evolution of hybrid warfare.

Crimea and Russia's intervention in eastern Ukraine. These developments highlight the evolution of hybrid warfare, where an adversary's use of unattributable means and plausible deniability signals a paradigm shift in the use of power. Given its role as an international organization to maintain peace and security, the perceived lack of effectiveness of the UN in response to the crisis in Ukraine might undermine the role of other supranational/international organizations such as the EU, African Union (AU), ASEAN and NATO. While multilateralism as an approach to security governance might be in decline, the return of power politics at the same time underscores the increased importance of NATO as the main framework for collective defence of the Euro-Atlantic region.

9. Deterrence and defence remain a core element of NATO's overall strategy. The Alliance is also concerned with disarmament and the risks of nuclear proliferation, such as the attempts of the Democratic People's Republic of Korea and Iran to acquire and improve nuclear weapon technology and delivery systems, as well as nuclear trafficking in other regions of the globe. Although the Alliance reaffirms its resolve to seek a safer world and NATO's aspiration for a world without nuclear weapons has not changed, the prevailing conditions of the international security environment are not currently favourable for achieving disarmament. The Alliance's concerns have significantly increased due to modernization of nuclear forces by major and regional powers and recent changes to their nuclear strategies. Consequently, for the foreseeable future, nuclear weapons are expected to remain as a core component of NATO's overall capabilities for deterrence and defence, alongside conventional and missile defence forces.

IMPLICATIONS

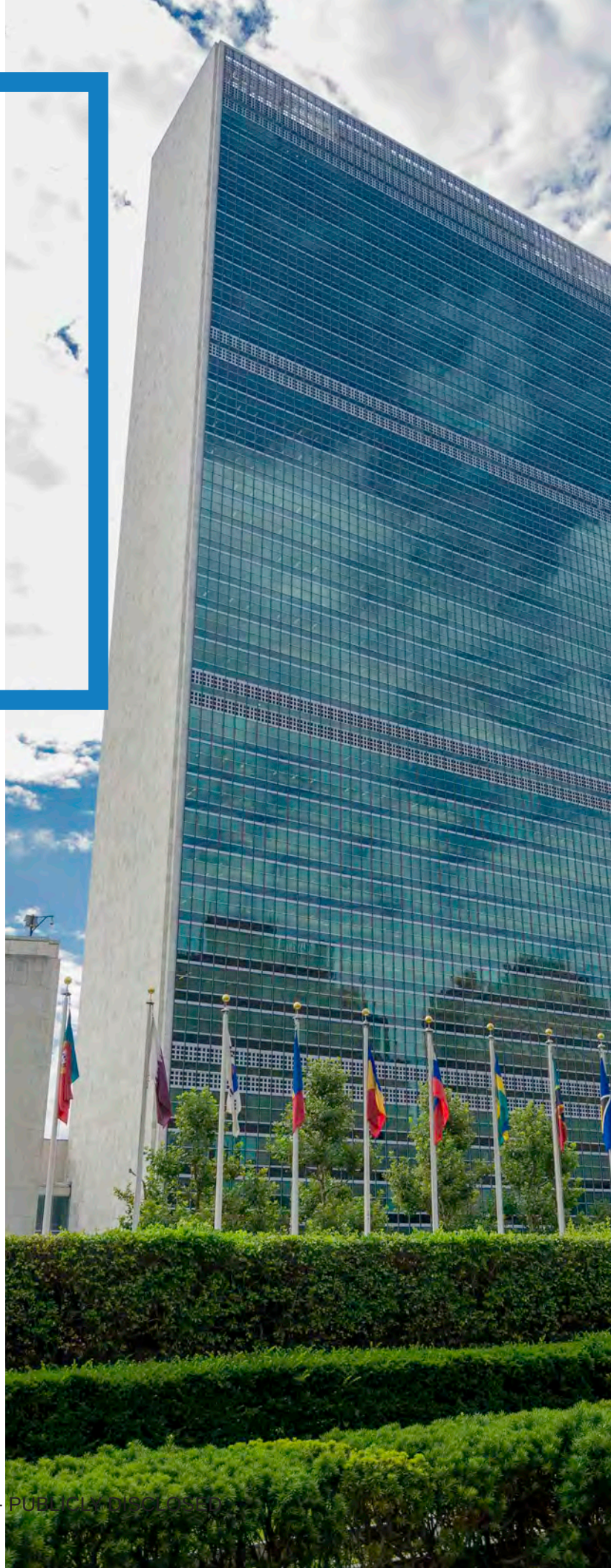
a. *Increased potential of confrontation and conflict.* The security environment around the Euro-Atlantic region has become more volatile due to threats from the East and instability from the South. The Balkans, located at the confluence of interest between Russia and the West, will also continue to be an area for competition. Any crisis in these regions could spark refugees and provoke external intervention. Recent events re-emphasize the importance of territory and the traditional roles of deterrence and defence, with a particular focus on collective defence. Future conflicts could range from hybrid wars, selective military operations by major powers, precise long-range strikes, and the use of small mobile units in special operations to disrupt communications. The objectives are likely to be specific and limited and will be achieved by use of select elements of power. The use of power to influence key regions (e.g., High North, the Middle East, Balkans, etc.) and to maintain assured access to global commons is likely to increase the potential of confrontation and conflict in the future.

b. *Nationalism and divergent risk and threat perception.* Growing nationalism worldwide is resulting in changes to national risk and threat assessments, which are driving Euro-Atlantic countries to look inwards and favour national solutions. Finding a balance between national and collective efforts to strengthen security has been an important component of Europe's recent discussion on internal security. Divergent perceptions of risks and threats may cause NATO Allies to change their defence priorities, which could challenge the cohesion of the Alliance.

c. *Requirement for a robust and credible deterrence and defence.* The threat posed by the changes in nuclear strategy and modernization of nuclear and conventional forces of major and regional powers needs to be recognized. While a shift in nuclear strategy and policies might not immediately be required, NATO must continue to maintain a robust and appropriate mix of nuclear, conventional and missile defence capabilities to accomplish NATO's core tasks. Additionally, NATO's resolve should be reflected in its deterrence and defence posture and its solidarity clearly communicated to the international community.

CH 2.3

NON-STATE ACTOR INFLUENCE IN DOMESTIC & INTERNATIONAL AFFAIRS



10. Non-state actors are "non-sovereign entities that exercise significant economic, political, or social power and influence at national and at international levels". Non-state actors include benign and non-benign entities from Non-Governmental Organizations (NGOs), Multinational Corporations (MNCs), advocacy networks, transnational activists, super-empowered or rogue individuals, and terrorist and criminal organizations. As the diffusion of power from state to non-state actors continues, the latter are expected to exert greater influence over national governments and international institutions and their role is likely to expand.

11. The growing number of benign and malign non-state actors has increased the complexity of addressing issues such as corruption, social and economic inequality and effectiveness of state institutions. Benign non-state actors have played significant roles in combatting global issues, such as poverty, disease, and lack of essential services. The importance of non-state actors as NATO partners is expected to increase significantly as NATO continues to focus on projecting stability using federated networks. In this context, NATO cooperation with the EU, UN, International/National Law

"The growing number of benign and malign non-state actors has increased the complexity of addressing issues such as corruption, social and economic inequality and effectiveness of state institutions."

Enforcement Agencies and working with other International Organizations (IOs) and NGOs will require the Alliance to implement a comprehensive approach. On the other hand, malign non-state actors, such as terrorist organizations, criminal organizations, traffickers, and pirates, have increasingly challenged governments by demonstrating state-like qualities and threatening the global commons with terrorism, extremism and crime. The proliferation of non-state actors has the potential to create disruption in domestic and international affairs.

12. Advances in education and access to technology have helped empower individuals and groups as never before, leading to increased demands for transparency and participation in government and public decision-making. Additionally, NGOs are expected to continue intensifying their influence on local, regional and global issues. Supported by technological development and interconnectedness, non-state actors will also raise awareness of environmental and social justice issues and human rights.

13. MNCs, as non-state actors, have evolved over time. Some MNCs, either privately or publicly controlled, have grown to the extent that governments and international institutions are perceived to be either unable or unwilling to regulate their activities. Traditional multinational private companies, headquartered in one country and with subsidiaries in others, operate in accordance with market forces to achieve cost efficiencies. On the other hand, largely state-owned MNCs such as Russia's Gazprom or China's National Petroleum Corporation may or may not share the same incentives and goals as their private counterparts. As a result, some state owned/controlled MNCs are acting like proxies to extend the political objectives of their countries, diminishing the separation between the private and public sectors.

14. Private military and security companies (PMSC) have become a part of modern armed conflict and post-conflict reconstruction. Recent NATO out-of-area operations have highlighted the increasing reliance on PMSCs to provide a broad range of scalable services. PMSCs represent a convenient and, in some cases, economical force multiplier, through their provision of services traditionally conducted by military personnel, including logistic and intelligence support, force protection, and training. As such, it is anticipated that the appetite for PMSC services will continue to grow. Consequently, the dependency on governmental military forces might be further decreased and the role of the state as a provider of security might be reduced. It is also important to acknowledge that, although private companies may operate independently, they often have some degree of dependency on state actors, and may also act as proxies of the latter. The vague relationships between the PMSCs and states, and the potential lack of control and accountability, may contribute to the risk of international humanitarian law violations.

15. Terrorist groups and criminal organizations are the most overt challengers of state authority, and many exert significant influence in domestic and international affairs. There has been a significant increase in terrorist attacks, predominantly in Europe, the Middle East and North Africa. Although DAESH/ISIS and Al-Qaeda attacks are well known due to their wider publicity, there are many similar groups, such as Boko Haram and Hayat Tahrir al Sham, affecting larger populations and increasing their influence. Terrorist organizations could fill the vacuum created by weak and failing states, providing state-like qualities as an alternative to traditional state-based governance structures.

IMPLICATIONS

a. ***Growing complexity due to a wide variety of non-state actors.*** The huge diversity of non-state actors under this category creates a complex environment where it is difficult to comprehend each player's role in domestic and international affairs. It is also important to recognize that in some areas, the line between state and non-state actors is increasingly blurred. In future operations, NATO will need to understand which non-state actors could be supportive, benign or confrontational.

b. ***Requirement for closer cooperation with non-state actors.*** Many non-state actors, operating transnationally, are already working towards supporting effective governance in preventing crises, managing conflicts and stabilizing post-conflict situations. Increased NATO cooperation with non-state actors, in particular NGOs and MNCs, would be mutually beneficial. This underlines the importance of an effective comprehensive approach that

could alleviate human suffering and reduce the burden on military forces. Therefore, NATO needs to further adapt policies to interact and develop closer cooperation with a wide array of non-state actors.

c. ***Increased role of private actors for security.*** Many military functions and activities have been outsourced during recent NATO out-of-area operations. The role of PMSCs in future NATO operations is likely to increase. PMSCs should be monitored in accordance with the guidelines highlighted in the Montreux Document to avoid problems such as abuse of authority, dishonest or poor business practices, non-reporting of crimes, and a lack of public complaint channels. More importantly, private actors should be kept accountable for their actions.

d. ***Increasing concerns for the Protection of Civilians (PoC).*** The changes in demographics and society, and access to technology, have heightened the awareness of the threat to civilian populations and the consequences of violence. A comprehensive strategy will be needed to address not only the sources of harm, but also to contribute to a safe and secure environment and facilitate access to the basic needs of the affected population. NATO will be required to continue to take PoC into consideration and implement appropriate measures in future engagements in line with the NATO Policy for the PoC.

"Increased role of private actors for security. Many military functions and activities have been outsourced during recent NATO out-of-area operations."

CH 2.4

CHALLENGES TO GOVERNANCE

16. The global governance institutions, established at the end of World War II, have been increasingly lagging behind the rapid rate of change. The increasing numbers of international interactions, actors, and modes of information sharing and communication necessitate the transformation of existing global governance institutions. They are being challenged in addressing complex problems, such as aftershocks of the global financial and economic crises, terrorism, transnational crime and drug trafficking, cyber-attacks, climate change, water and food security, high energy prices, failing and fragile states, and WMD proliferation. Additionally, many emerging powers and developing countries consider themselves marginalized, or even excluded, from decision-making systems and other standard-setting bodies, which therefore lack true representativeness and accountability. Thus, alternative governance structures, established by emerging powers led by China, are likely to have an increasing role in global affairs.

17. In developed regions and countries, governance systems and institutions are influenced by a multiplicity of independent actors, both public and private, each pursuing

its own objectives and priorities, with its own clientele and constituency, with its own technical language and organizational culture, and with its own mandate and specialized focus. As a result, international institutions and supranational organizations, such as the UN and EU, have focused on improving their own performance rather than working together with partners to address more pressing challenges, i.e. high unemployment, heightened fears of migration, concerns over globalization and a loss of identity, as well as the rise of populism. This has led to increased dissatisfaction with the existing institutions, raising questions over their future relevance.

18. In developing regions and countries, existing governance structures are not addressing sufficiently the requirements of the broader population. Compounded with the youth bulge and chronic unemployment, challenges to governance extend beyond political structures to include economic and social frameworks. Lack of effective governance may result in more weak or fragile states in regions of strategic importance to NATO, such as the Middle East and North Africa (MENA), Sahel, and the Horn of Africa, which are sources of instability, extremism and terrorism. Instability along NATO's borders continues to have severe implications for European NATO Allies, such as the risk of terrorist groups increasing their influence over ungoverned spaces and spreading violence across regions and beyond.

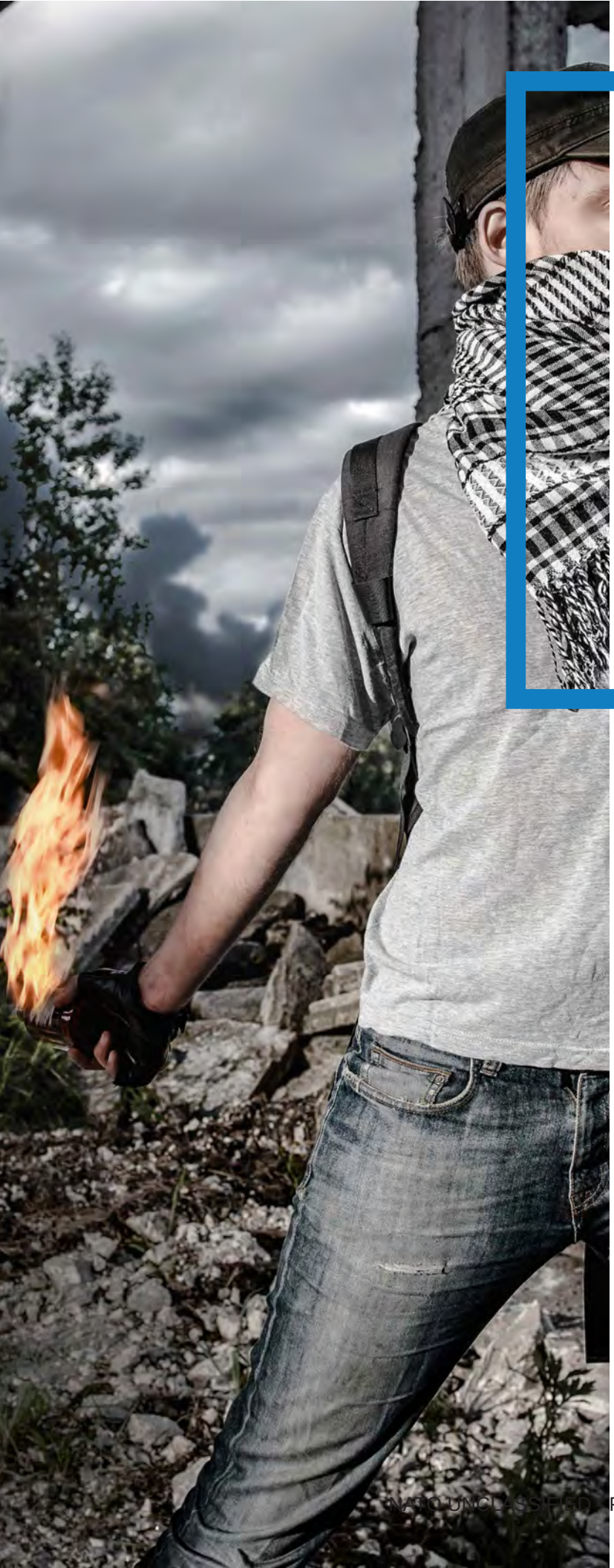
IMPLICATIONS

a. ***Duplication of existing global governance structures.*** Emerging powers are increasing pressure for a greater role in global governance decision-making systems to ensure that their concerns and/or agendas are addressed, or are creating alternative structures of their own. In particular, China's shadow network of alternative international structures encompasses everything from financial and economic partnerships (the Silk Road Economic Belt and the Asian Infrastructure Investment Bank) to full-blown political groupings like the Shanghai Cooperation Organization, Conference on Interaction and Confidence Building Measures in Asia (CICA), and the BRICS. Today, these organizations are perceived as supplementary – in part complementary, in part competitive – channels. However, their role might change over time with the shift of global power.

b. ***Increased requirement for partnership and inclusive governance.*** In response to this unprecedented range and multitude of global developments, innovative approaches for new forms and varieties of international cooperation and information sharing will be required. International cooperation at different levels will increasingly need to address concerns regarding transnational issues, such as organized crime and terrorism; assuring access and use of global commons, such as space and cyberspace; and matters beyond the capacity of any single country, such as climate change, water and food scarcity.

c. ***Projecting stability beyond the Euro-Atlantic region.*** Governance and security are interrelated and mutually reinforcing. Therefore, it is important to create security and stability by preventing violence. In order to stop violence, and to defeat and destroy terrorist groups, the use of force and military action may increasingly be required, especially in the areas close to NATO's borders. Additionally, enabling local forces and authorities in their fight against terrorism will be important. Support to local authorities needs to include improving the effectiveness of governance in political structures and economic/social frameworks as well as implementing security sector reforms.

> "The increasing numbers of international interactions, actors, modes of information sharing and communication necessitate the transformation of existing global governance institutions."



CH 2.5

PUBLIC DISCONTENT/ DISAFFECTION & POLARIZATION

19. The lack of trust in governments in some OECD countries and increasing political polarization in many western democracies have been fuelling public discontent and disaffection. The main reasons for public discontent and disaffection include issues such as chronic economic crisis, income inequality, unemployment, mass migration, inefficient social and welfare systems, corruption and a perceived lack of leadership in addressing these problems. Moreover, problems (real, perceived, and manufactured) are often leveraged and exacerbated by hostile states to disrupt societies. As a result, in western countries, the legitimacy of an elected government's mandate may come into question and their credibility may suffer.

20. Recent events have shown that the ideological, economic or religious polarization between contending groups is a major source of conflict within and between countries. In particular, fringe movements, some operating within established political structures, are placing pressure on mainstream parties, making it difficult for them to mobilize their supporters to address major challenges such as unemployment and migration. Polarization generally results in growing

confrontation among different political and social groups within Western societies, as well as in developing countries. Additionally, an increasingly polarized news media is likely to amplify divisions in a society. Polarization could be deepened by adversaries' use of social media and other sources of distorted, biased news, creating an alternative reality and adversely impacting social cohesion. A trend of increasing social polarization will impede a government's ability to implement legislation and reforms. The resulting discord on the major issues of the day is likely to have a dramatic impact on political, social and economic policies.

IMPLICATIONS

a. ***Lack of trust in governments and institutions.*** The lack of trust, as shown in the recent OECD survey, reduces the willingness of citizens and businesses to respond to the policies of governments and institutions and to contribute to reforms for a sustainable economic recovery. Historically, populist movements in Europe were internationally minded, supporting multilateral institutions of global governance and cooperation, humanitarian engagement, fluid national borders and open societies. However, increasing nationalistic sentiment is likely to be observed in populist movements and their approaches to domestic and international affairs.

b. ***Increasing polarization in the West and developing countries.*** The rise of populism, extreme nationalism and xenophobia has become a significant concern in developing countries as well as in established democracies. The agenda of populist groups, often anti-establishment and anti-globalization, is likely to become a major cause of concern for NATO as it threatens to undermine the cohesion and capabilities of the Alliance. Yet it has to be addressed primarily at the national level, since NATO has few means to counteract it collectively.

> "Polarization could be deepened by adversaries' use of social media and other sources of distorted, biased news, creating an alternative reality and adversely impacting social cohesion."

CHAPTER THREE

HUMAN

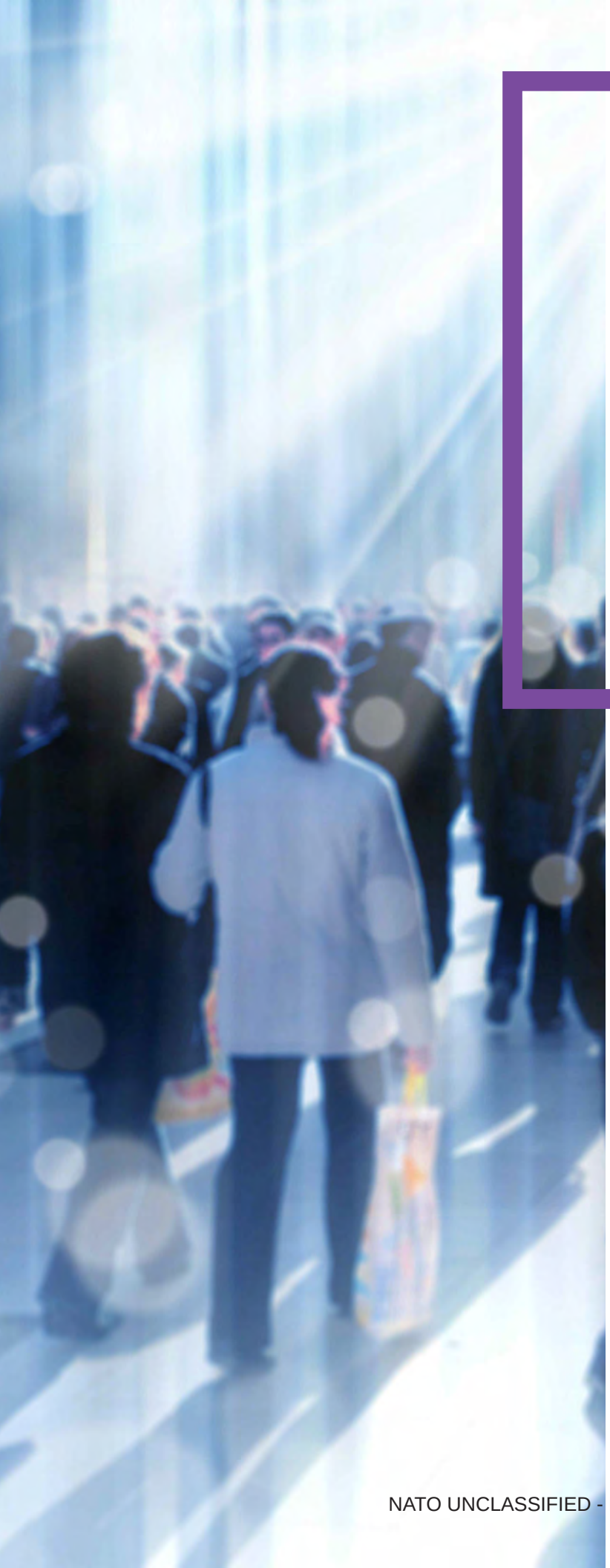
1. Population growth compounded by ever-increasing urbanization, ageing populations, rising inequality, fractured and polarized societies, and growing interconnected human networks, as well as a youth bulge in most developing countries, is likely to present unprecedented challenges in an increasingly globalized and rapidly evolving world. While the individual impacts of these challenges will be far reaching, the trends are highly convergent and interrelated. Asymmetric changes in demographics are likely to threaten regional stability and increase the risk of conflicts around the globe.

2. World population is expected to grow rapidly by 2035, albeit at a slower pace than in the last 20 years. Greater life expectancy will lead to ageing populations around the globe. The change in population growth will be significantly different between developed and developing countries, with the latter growing up to seven times faster, mostly due to higher fertility rates, creating youth bulges in those countries and regions. The young population may seek better opportunities by migrating abroad. Population growth is mostly absorbed in urban areas continuing the rise of urbanization, especially in developing countries. This increasing urbanization could present many opportunities but at the same time could bring serious challenges, such as growing concerns for security.

3. Ideological, social, economic or religious polarization between contending groups results from the interaction of within-group identity and across-group alienation and continues to be a major source of conflict. This polarization could also take place between countries, regions and civilizations. In the next two decades, governments are likely to face numerous obstacles in ever-growing, fractured and polarized societies that often lack confidence in government decisions.

4. The rate at which the future demands new skills, talents, experiences, and investments in human capital is accelerating. The exponential development, integration, and interaction of technical networks (network of things) and technically-enabled social networks (networks of people) will be pervasive and empower individuals.

"Asymmetric changes in demographics are likely to threaten regional stability and increase the risk of conflicts around the globe."



CH 3.1

ASYMMETRIC DEMOGRAPHIC CHANGE

5. The world's population is projected to increase by more than one billion people, reaching 8.5 billion in 2030. It is further expected to reach 9.7 billion in 2050. The largest population growth will take place in Africa, followed by the Middle East and South Asian countries. There are large variations in fertility rates: Europe, North America, Russia, Japan and China have the lowest, while most African countries have the highest. Today, 13% of the global population consists of people aged 60 or over. Although Europe has the greatest percentage (25%) of population in this age group, rapid ageing will occur in other parts of the world as well. By 2050, all regions of the world, except Africa, will have 25% or more of their populations aged 60 and above. This worldwide ageing will result in a decline in working-age populations that will cause major challenges for some economies and government budgets. Therefore, social security systems, especially in Europe, will come under serious pressure. Additionally, in Western countries, reduced birth rate could limit potential recruits for future security forces.

6. Even though the worldwide population is ageing, the population in countries with a high fertility rate will remain relatively young, as seen in Africa, where 41% of the population is under the age of 14, thus creating a youth bulge. The governments of these societies face significant challenges in providing opportunities for education, employment, and competitive wages, to name just a few, for their young population. Furthermore, a tidal wave of young people reaching working age and trying to enter the labour force causes challenges to governments struggling to integrate them into saturated labour markets.

7. The existence of economic, social and gender inequalities, lack of opportunities and future prospects, environmental concerns as well as ongoing and future violent conflicts might lead to a considerable potential for migration in the next two decades. In addition, ongoing and future violent conflicts (and displacement by natural disaster) will act as drivers of mass movement. Even today, the flow of refugees has reached a level that is unprecedented in recent history, and it is expected to rise. The collective inability to recognize and mitigate rapidly deteriorating circumstances in a specific region, and to prevent a crisis from occurring, might lead to a mass migration. Additionally, inability to integrate the resultant migrant flow leads to near overwhelming challenges, including the potential for radicalization. Uncontrolled migration on this scale exacerbates security risks for the country of origin as well as for transit and receiving countries.

IMPLICATIONS

a. *Ageing populations will strain resources.* Global ageing is expected to increase with significant regional differences. Northern America will be less affected by an ageing population, but China, Europe, Russia and Japan are ageing rapidly. In these countries, the demand on resources for medical and social welfare will increase. Therefore, there will be increased strain on national budgets to allocate necessary funds for defence and security.

b. *Youth bulges and gender imbalance leading to instability and migration.* Gender imbalance in countries, such as China, and youth bulges in developing countries, are likely to continue creating disruptive impacts. Youths' frustration with unemployment, under-education and disenfranchisement may lead to social unrest and instability. Furthermore, a sense of hopelessness, due to a lack of prospects and an insecure future, is expected to drive youth migration. Migration might lead to destabilization in the country of origin, as well as in transit and receiving countries. Additionally, migration of educated youth, because of a lack of appealing job prospects, might cause a 'brain drain' in the country of origin.

c. *Failed integration of migrants.* In receiving countries, a lack of effective policies and/or lack of national intent to provide equal opportunity to integrate migrants into society might lead to frustration and disenchantment amongst both migrants and the local population, which might create recruitment environments for radical and extremist groups. Integration will be increasingly difficult, as migrants often wish to maintain their ethnic and cultural identity to the exclusion of the receiving countries' customs and traditions. Surges in the number of migrants will create social and financial strain in receiving countries as well as posing security concerns.

ALTERNATIVE VIEW - AGEING POPULATIONS, AI & AUTOMATION:

Ageing populations and declining birth-rates are reducing the share of working-age populations. Therefore, there will not be enough workers for countries to meet their aspirations for growth in GDP per capita. While automation and AI could further create unemployment, and increase economic inequality, they could provide significant opportunity by serving as a new productivity engine for the global economy. At the same time technology enables the elderly to become increasingly economically active. A higher life expectancy and better health status of elderly people will lead to an enlarged number of potential labourers in a working environment.

Source: McKinsey Global Institute, 2017, p. 87-90.

> "By 2050, all regions of the world, except Africa, will have 25% or more of their populations aged 60 and above."

CH 3.2

INCREASING URBANIZATION

8. Urbanization is increasing at different rates, with the highest growth rates in the least developed parts of the world. By 2050, approximately 6.4 billion people (66% of the world's population) are expected to live in urban areas. While most of this urban growth will take place in medium-sized cities with fewer than 1 million inhabitants, megacities with inhabitants of more than 10 million will increase from 20 today to 37 in 2025. Additionally by 2030, approximately 40% of the urban population will live in slums. Prevailing conditions in slums create serious economic, social, political and physical insecurities for the inhabitants. Therefore, inequality has become a major emerging urban challenge.

9. Even though cities occupy only 2% of the world's land surface, they consume about 75% of all natural resources. The demand for food and water is exceeding local capacity to provide for the increasing urban population. Massive urbanization, coupled with climate change effects, exacerbates resource scarcity and increases the unpredictability of resource availability. Even slight disruptions in resource flows in urban areas can result in disproportional consequences to populations.

10. Large-scale urbanization creates the challenge of providing adequate basic services and a functioning infrastructure to ensure a minimum quality of life for citizens. Basic services can only be delivered by certain urban critical infrastructure. This critical infrastructure should be resilient enough to effectively respond to natural or other disasters.

11. Governance is challenged when governments cannot keep up with massive and sometimes uncontrolled growth of the cities and fail to deliver basic services. This failure can easily create weakly governed spaces, vulnerable to exploitation from terrorist and criminal organizations, thus potentially becoming hotbeds for radicalization. Such circumstances undermine the security, resilience and long-term sustainability of cities worldwide.

12. Three-quarters of all large cities, and many megacities, are located in low-lying coastal areas. Furthermore, half of the world's population lives within 60 km of the sea. Coastal proximity allows easy access to trade and other resources, establishing coastal cities as hubs for international, national, and regional economies.

IMPLICATIONS

a. ***Increasing urbanization might lead to resource competition.*** People will increasingly live in crowded and dense urban environments, which will create disproportionate requirements for natural resources, energy, raw material, food, goods and supporting infrastructure to sustain the daily life of inhabitants and their economic activities. This might lead to a resource scarcity across all domains and aggravate the distribution of the available resources.

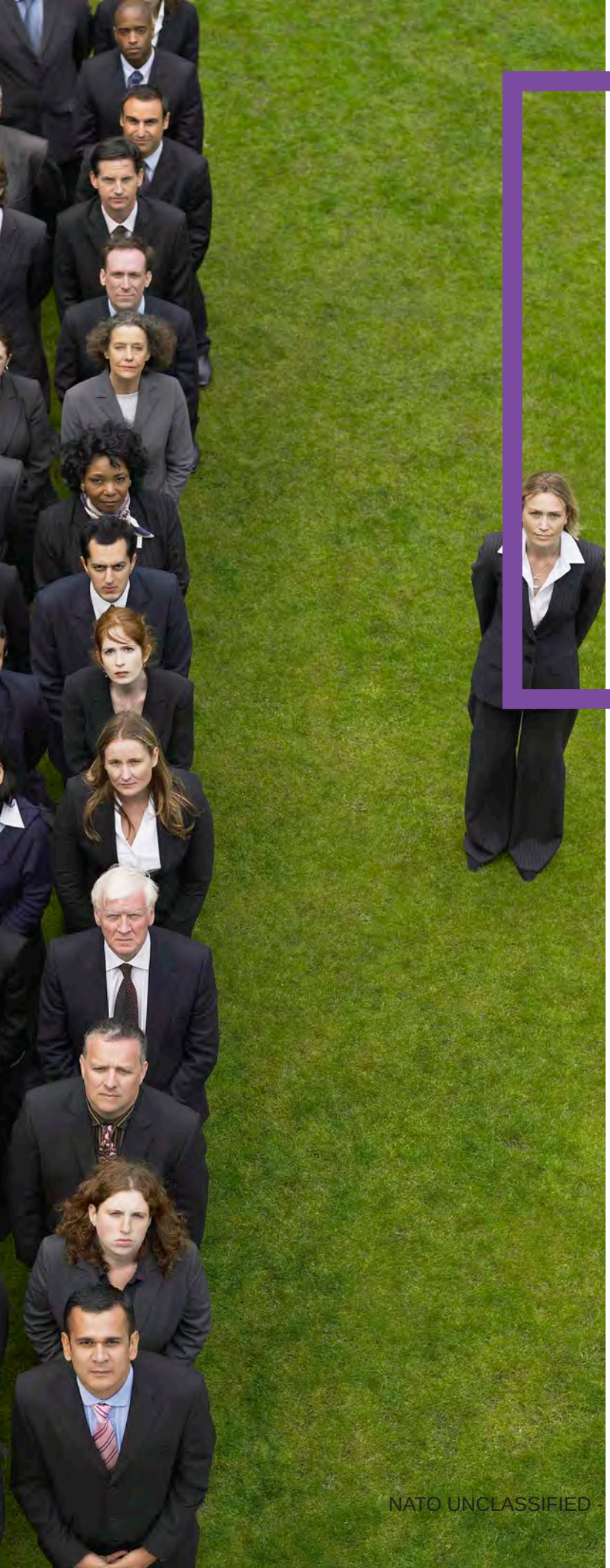
b. ***Ownership and control of critical infrastructure could be contested.*** Urban areas include public and privately owned large scale critical infrastructures (e.g. electric power, water supply and transport networks) that provide the basic services necessary for daily life in cities. Given the privatized nature of national infrastructure, meeting supply demands in increasingly complicated environments may be more challenging. Therefore, achieving resilience may require regulations regarding the critical infrastructure that private companies are allowed to own. Raising the strategic awareness of critical infrastructure will be one of the key aspects for increasing resilience.

c. ***Governance challenged by uncontrolled urban growth.*** Uncontrolled growth in urban areas, including slums, will challenge governance to such a degree that it might not be effective or could fail. Consequently, there is a potential for other state and non-state actors to fill the vacuum created by the absence of governance. In addition, these areas may be more vulnerable to natural and man-made disasters, epidemics and pandemics.

d. ***Dependence of littoral urban areas on sea lines of communication (SLOC).*** Urbanization growth will continue to concentrate in coastal areas in the future. As a result of this concentration, some coastal communities may become overly reliant on their associated SLOCs for trade and commerce. In a world that embraces the 'just in time' delivery logistics concept, this over-reliance may create an easily exploitable vulnerability. A large population may find their logistic lifeline threatened by natural disaster, piracy or terrorist attack. A focused exploration of vulnerabilities and resilience requirements may serve to minimize the impact of such catastrophes.

e. ***Increased urbanization may require NATO involvement in urban areas.*** When interventions are authorized, they are more likely to take place in urban areas due to increasing urbanization. Interventions in heavily concentrated urban areas will require the participation and cooperation of a wide range of security actors, including civilian authorities, police, and military. Key to success in this complex operating environment is comprehensive governance, as well as a robust communications strategy, to collaborate and cooperate with all stakeholders.

> "Achieving resilience may require regulations regarding the critical infrastructure that private companies are allowed to own."



CH 3.3

FRACTURED AND/OR POLARIZED SOCIETIES

13. Polarization of societies has become a worldwide phenomenon; however, western developed nations are particularly vulnerable due to increased empowerment of individuals. Polarization could originate from the differences in a wide variety of areas from political (ideological, populist/mainstream) and social (ethnic, religious, racial, gender, urban/rural, young/old, educated/uneducated) to economic (rich/poor, employed/unemployed, etc.). The common denominator is the differing and possibly diverging interests of individuals. Polarization becomes more acute when different factors compound each other, such as unemployment, lack of equal opportunity for education, asymmetric demographic change, and gender bias. Polarization can gradually cause a lack of cohesion and disagreement within society, which might eventually lead to civil unrest and benefit terrorist recruitment.

14. Polarization can also exist between countries. Terrorist attacks, in particular, have intensified the fault lines over ethnicity and religion and have contributed to existing fragmentation over nationality and identity within and between societies and countries. Tensions due to polarization need to be tamed to maintain regional and global stability.

15. Authoritarian societies/countries may try to hide these unpleasant fractures and appear to be more stable, but they may shatter rather quickly; whereas democratic societies, because of greater transparency, seem to be more fragile, but are in fact more resilient due their openness to discuss and address challenges/differences. Regardless of the regime style, identity issues do need to be addressed and the social contract should be renewed in order to maintain stability within countries.

16. Already an increasing global concern, mutual suspicion has developed between the general public and the elites in Western democracies over the past decades. This has fuelled the belief that governing elites are corrupt, ignorant and will not bring any change to address the public's social, welfare and economic concerns. This could reduce legitimacy, lead to less collective thinking and make focusing on common issues difficult.

IMPLICATIONS

a. *Polarization causes instability and civil war.* In particular, the rift between political groups has increased along ethnic and sectarian lines. These developments have led to polarization and subsequent civil war in several countries, such as Iraq, Syria, Yemen and Sudan. Polarization can be used as a weapon to disturb social and political cohesion.

b. *Instability along NATO's border causing large-scale migration.* Lack of economic development, de-legitimization of the state, non-provision of public services, ineffective government control over its territory, and widespread corruption and criminality are, amongst many other reasons for instability, resulting in large scale refugee movements. Additionally, the fragility and failure of state institutions along NATO's border are a major challenge. The power vacuum created by weak and failing states provides a breeding ground for many extremist groups, as well as a large volume of involuntary migration due to violence and intra-state conflicts.

c. *Fractures in society might undermine trust and legitimacy.* The lack of trust in existing governance systems may well be fuelling the population's alienation, increasing polarization and potential loss of political participation. Additionally, increasing differences in views on issues such as income inequality, climate change, access to healthcare, etc. amongst groups and societies are likely to deepen polarization. Such societies are likely to become more susceptible to external influence and pressures that may exploit social, ethnic, and religious fractures.

ALTERNATIVE VIEW - POLARIZATION MAY NOT BE A BAD THING:

Polarization engages the public and increases participation in the electoral process. Greater participation in the democratic process, whatever the cause, supports and validates the system of government. Polarization may have some beneficial effects, including the ability to self-correct the course of mainstream politics.

Sources: Alan I. Abramowitz, 2010, p. 5, 6.

> "The power vacuum created by weak and failing states provides a breeding ground for many extremist groups, as well as a large volume of involuntary migration."

CH 3.4

INCREASINGLY CONNECTED HUMAN NETWORKS

17. The future level of human mobility, opportunities for global communication and population interconnectivity will increase the complexity of the security environment at home and abroad. The increased flow of people and goods may bring a higher risk of pandemic diseases. Human networks are expected to become increasingly decentralized. Malign human networks (i.e. transnational crime groups, terrorist organizations, human traffickers and pirates) challenge national social and security systems. They do not follow agreed rules, regulations and laws, and are expected to be in constant competition with legitimate authorities. These networks transcend borders; therefore, maintaining awareness of their activities requires close coordination at different levels between countries.

18. Additionally, non-physical networks, such as those in the cyber domain, are increasingly used to influence the political, social and economic realms. Non-physical networks could also be exploited by states, state-proxies and non-state actors to disrupt important activities. These networks are able to adapt faster than state authorities can react and it will be increasingly difficult to acquire the information needed to target and monitor

them. Non-physical networks are expected to increase in quantity and change their nature to act in cross-domain environments. Taking the rapid rate of technological advances into consideration, non-physical networks might become more important than physical entities.

IMPLICATIONS

a. ***Increasingly decentralized and diverse human networks.*** A greater understanding of the influence of human networks on legal, political, social, religious and economic issues will be necessary. Every actor within a network can have multiple roles, identities and interests, quickly changing from friendly to neutral to hostile. Familiarization with human networks reduces the ambiguity of the actors. It will be important to understand evolving networks (e.g. structure, processes, and key elements), adapt and react accordingly to counter potential threats. These networks are able to act faster than state authorities can react, and the Alliance narrative will need to adapt at a faster pace than the networks and actors to avoid being outflanked.

b. ***An increasing need to understand human networks.*** Human networks, physical or non-physical, will need to be increasingly understood and assessed for antagonistic aims and the potential for violence. This will require close cooperation across all possible domains both within and between countries. Therefore, appropriate legal frameworks have to be established and recognized accordingly.

c. ***The need for influencing human networks with effective and precise strategic communication is increasing.*** Human networks can be influenced by effective strategic narratives. Consideration of public opinion and perception will be increasingly important for stability. The nature of human networks makes it necessary to address them with individually focused messages in a truly comprehensive approach. To avoid being outflanked by these networks and actors, the Alliance narrative will need to adapt at a faster pace.

"Every actor within a network can have multiple roles, identities and interests, quickly changing from friendly to neutral to hostile."

CHAPTER FOUR

TECHNOLOGY

1. Technology will continue to shape the social, cultural, and economic fabrics of our societies at the individual, community and state levels across the world. New and emerging technologies offer enormous opportunities for raising productivity and living standards, improving health, and conserving natural resources. The introduction of Artificial Intelligence (AI), autonomous systems, additive manufacturing, robotics, nanotechnology, chemistry, bio-technology and a significantly improved human-machine interface has the potential to help humanity solve problems. However, these technologies have the potential to create disruption and might result in large scale changes to employment while raising ethical concerns and instability. These technologies may also bring new hazards, requiring an improved capacity for risk assessment and management.

2. Continued development across the range of technology is enabled by exponential advances in the computing power described by Moore's Law. Greater affordability of digital technology, ubiquitous wireless networks and mobile devices have created the conditions for users to connect and communicate anywhere and at any time. The digitalization of society, sharing of information, and leveraging of ever-increasing computer power will lead to significant advances across a wide swathe of applications. The ability to combine and recombine these technologies, to build on existing advances, will drive innovation. That said, societal expectations that technology can solve most problems might be unreasonable.

ALTERNATIVE VIEW - AI AND THE HUMAN-MACHINE INTERFACE:

Technological developments generally, but AI specifically, are expected to enable humans to achieve a profound new state. Advances in genetics, nanotechnology, and AI will dramatically increase human longevity. Intelligent machines will become more human at the same time that humans become significantly augmented by technology. In the past machines have automated manual labour; in the future they will become capable of automating intellectual tasks. This should result in a new age of collaboration between humans and machines. While some argue that such changes will bring abundance, others focus on perils, disruptive or unforeseen effects of rapid development.

> "The introduction of Artificial Intelligence (AI), autonomous systems, additive manufacturing, robotics, nano-technology, chemistry, bio-technology and a significantly improved human-machine interface has the potential to help humanity solve problems."

CH 4.1

RATE OF TECHNOLOGY ADVANCE

3. Advances in technology and innovation will accelerate as they are fuelled by continued exponential increases in computing power and advances that augment human intelligence. Though not all technologies advance simultaneously, improvements in single technologies lead to advances in others in an amplifying way. This is likely to lead to surprising combinations and novel applications, resulting in both positive and negative impacts, but will most certainly fuel innovation across the breadth of commercial and defence applications.

4. The rapid rate of advancement in technology is significantly leading the development of supporting policy and legal regulations. For example, AI and autonomous system technologies will challenge moral values and ethical principles. In light of continued population growth and a greater number of users connected to the Internet, the demand for energy to run this vast, growing and complex network will increase.

> "AI and autonomous system technologies will challenge moral values and ethical principles."

IMPLICATIONS

a. ***Rapid development of technology challenges interoperability.*** While new technologies may provide tools to further improve interoperability, the disproportionate rates of technological development amongst Alliance Nations could lead to compatibility issues. Additionally, the rate of advancement, along with the potential for unanticipated employment of emerging technologies, increases the level of uncertainty. Adaptive mind-sets and technological awareness will be needed to keep pace with and facilitate the adoption of new technologies.

b. ***Increasing legal and ethical concerns***. New technologies, such as offensive cyber, AI, autonomous systems and human enhancement, are not yet widely accepted. Divergent ethical and legal interpretations, and acceptance of the evolving technologies, create differing levels of adoption and a reluctance to partner with Nations that employ such technologies in military operations. Policy and legal frameworks will need to keep pace with accelerating technological change.

c. ***The rate of technical advancement challenges acquisition and life-cycle management processes.*** Exploitation of state-of-the-art technology will require a change to defence and security organizations' acquisition and life-cycle management processes. Programmes today, and in the future, will require the flexibility to conduct technology insertion at every stage of design, build, delivery and service in the life-cycle of major military equipment. The procurement system must retain the flexibility to incorporate the latest technology at any point of the life-cycle.

CH 4.2

ACCESS TO TECHNOLOGY

5. The ability of individuals, states and non-state actors to access technology has significantly increased. While current acquisition processes could hinder the fielding of new technologies within the Alliance, potential adversaries could gain advantage as some sensitive technology becomes more widely available. The increased access to technology empowers individuals to conduct research and development and to operate in new technology areas that are outside the control of states and commercial business. Moreover, while the international community of states is bound by norms, regulations and international agreements, some states and non-state actors may not be so observant. Alliance capabilities will need to keep pace with the evolving technological landscape that will drive faster obsolescence thus reducing capabilities over time.

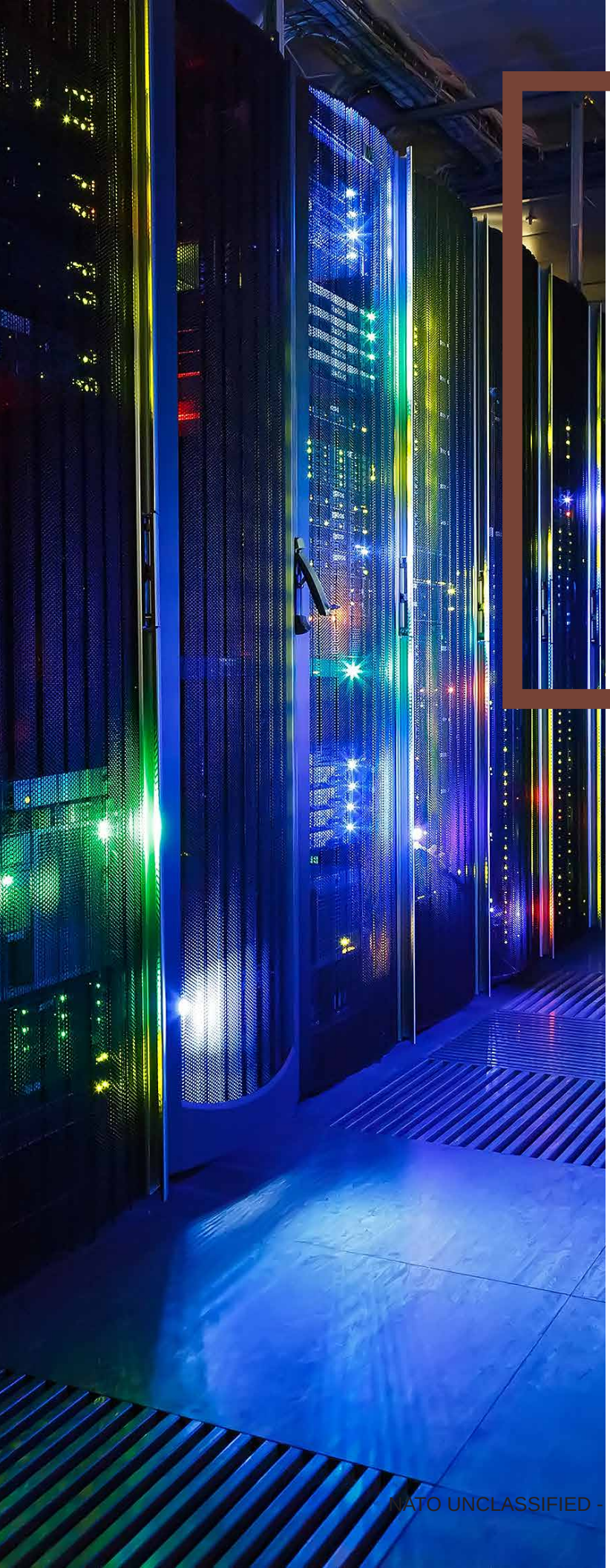
IMPLICATIONS

a. ***Access to technology enables disruptive behaviours.*** The current near-monopoly held by major state powers on the possession of high-tech weapons continues to decrease, allowing smaller states and non-state actors to acquire

disruptive technologies. A broad array of low-cost, unsophisticated technological advancements, such as drone and robotic technologies, are readily accessible and can be employed innovatively as weapons.

b. ***Uncontrolled access to technology challenges existing frameworks.*** Technology advancements continue to outpace the international community's ability to develop compliance strategies, legal and policy frameworks. Some states and non-state actors may be less constrained in how they employ unproven technologies. One example where this is particularly acute is the leveraging of dual-use components in the acquisition of WMD by states and non-state actors.

> "Current near-monopoly held by major state powers on the possession of high-tech weapons continues to decrease."



CH4.3

GLOBAL NETWORK DEVELOPMENT

6. Interconnectedness and digitalization have increased the volume and value of information. The scale and speed of networks in cyberspace allow individuals and groups immediate access to vast amounts of data and knowledge. Data is a strategic resource. Massive deployment of sensors through the Internet of Things and real-time processing of the collected data will enable a new set of analytical tools that enhance decision-making. The massive amount of information presents lesser challenges for processing and storage; however, bandwidth and connectivity could be a problem as they lag in development compared to other areas.

7. The number of sensors in the environment is increasing exponentially. Networks are becoming ubiquitous, creating a denser and broader situational awareness. These networks will become embedded in our lives and interwoven into everything that we do, seamlessly fading into the background. Furthermore, these networks are increasingly being created and used in a distributed manner, with no central node or control, which when combined with a lack of governance, creates challenges between utility and privacy. As states try to govern, defend and control this notional environment, some networks will

establish themselves in ungoverned areas such as the 'dark web'.

8. The cycles of technology-induced societal and economic change are becoming increasingly fast. The Internet has promoted increased citizen advocacy and government transparency. Increased access to information, particularly via social media, can be a catalyst for social mobilization; for example, an event that in and of itself would not be significant can be amplified when shared an enormous number of times across a network.

9. Finally, global networks provide the opportunity for the dissemination of information to large audiences for shaping global opinion. For example, where such networks are under state control, information generated by external sources can be withheld, modified or censored, and a state's own message can be spread unhindered and without refute.

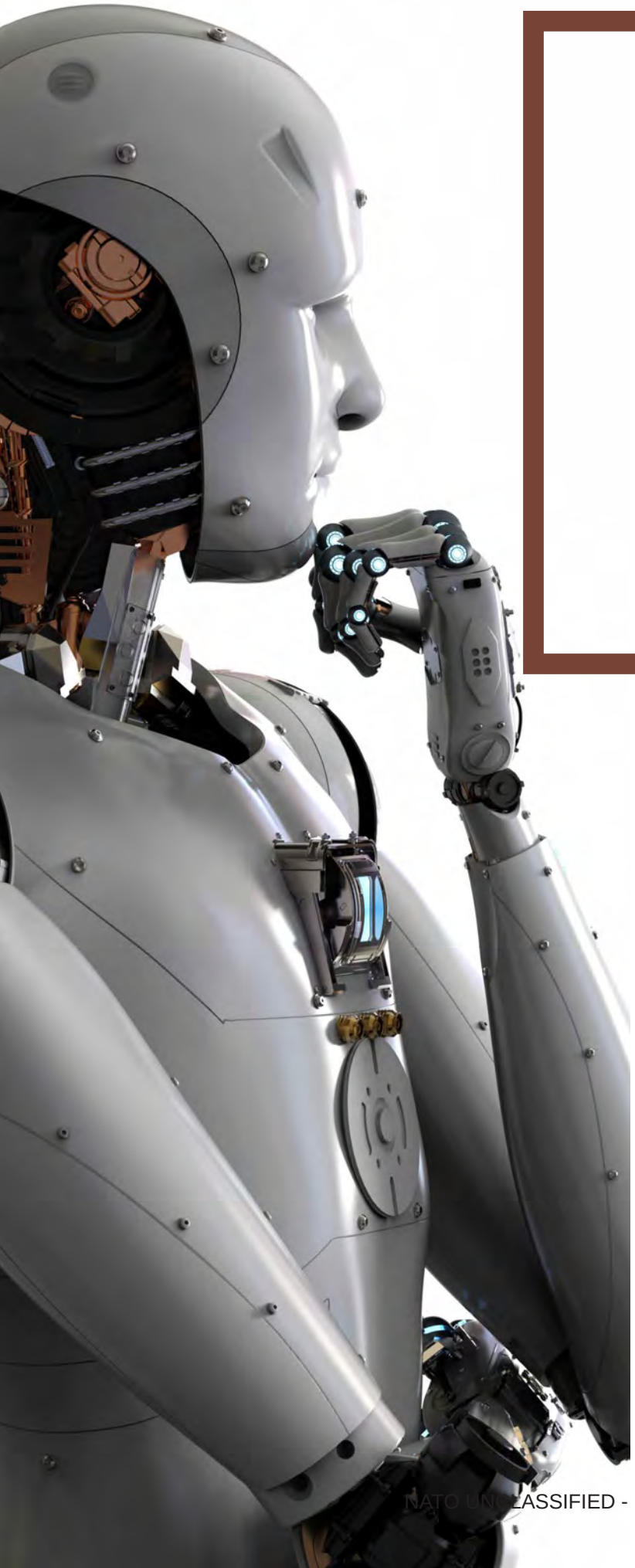
IMPLICATIONS

a. ***The increasing number of sensors, access to data and global networks generates operational vulnerabilities.*** States and non-state actors with malicious intent will have the ability to access information at an unprecedented rate, potentially gaining sensitive knowledge to use against members of the Alliance. This could increase the risk to NATO military forces operating in an environment of ubiquitous surveillance. Additionally, as access to data continues to increase, procedures will need to be developed or amended to consider the growing vulnerability of information.

b. ***Opportunities to exploit sensors, data, and global networks.*** Use of the rapidly evolving open-source and commercially available data will enable the Alliance to meet the challenges of the future information environment. NATO needs to develop capacities to detect both subtle and seismic changes in the information environment and understand them on local, operational and global levels.

c. ***Adversaries will use global networks for dissemination of false or misleading information.*** Adversaries will increasingly use global networks to disseminate false or misleading information to influence public opinion and decision-making. The Alliance will require an agile approach to strategic communication in order to maintain an edge.

> "Data is a strategic resource."



CH 4.4

DOMINANCE OF THE COMMERCIAL SECTOR IN TECHNOLOGICAL DEVELOPMENT

10. The commercial sector will be increasingly dominant in technological development. Reductions in defence-specific research brought about by reduced budgets, and the application of commercial innovations to military requirements, has seen the commercial sector overtake defence research and development. There is an increasing need to leverage the commercial sector to support defence-specific research and development. Growing commercial entry into sectors such as space exploration/exploitation will strengthen this trend.

11. Governments may not be able to economically adapt technologies for their specific uses because of commercial ownership of intellectual property. As a result, some Nations may be challenged to tailor the latest commercial innovations for defence and security purposes. Moreover, the potential exists for adversaries to gain access to technological developments and knowledge by investing in corresponding commercial entities.

12. If a comprehensive view of the defence industrial base is not maintained, then critical skill-sets associated with some niche areas might be lost. Although new relationships

> "The commercial sector has grown in areas where states used to dominate."

are being forged with non-traditional defence companies, the commercial sector may not address some areas of science and technology that are critical for defence innovation. Intellectual capital will flow where economic resources and opportunity lie. Moreover, there may be a geographic consolidation of some technologies within states that have more control over their commercial sector (e.g. supercomputer development in China) resulting in a greater ability to exploit new technologies.

IMPLICATIONS

a. *State approaches are not keeping up with the commercial sector.* The changing economics and technology of production and distribution, along with the shifts in consumer demand and the emergence of 'smart' products, are pushing the commercial sector to explore radical new ways of creating and capturing value. The commercial sector has grown in areas where states used to dominate, such as space exploration technologies and the defence industry. As a result, commercial off-the-shelf solutions have become increasingly available and are appealing due to the lower cost and the rapid rate of technological advancement. However, using these technologies will continue to pose security concerns.

b. *The Alliance will lose perishable skills that cannot be easily recovered.* With the reductions of military budgets, the overall defence industrial base has had to consolidate, and niche skills have been lost. As a result, fewer system integrators remain across the Alliance. Protection of the defence industrial base through targeted research and development (R&D) initiatives has been successful in some Nations, though R&D funding over the next decade is likely to continue to decline. Nations will require re-investment in niche R&D areas, and focus on long-term acquisition strategies, to ensure an organic defence industrial base is viable for the future. In this regard, the NATO Science & Technology Organization (STO) and ACT foster innovation and multinational cooperation to actively pursue initiatives that can offer fruitful options to Nations to mitigate these negative trends.

CH 4.5

TECHNOLOGICAL DEPENDENCIES

13. Operational effectiveness has become overly reliant on technology. For example, it has become very difficult to operate without wireless communication, global navigation satellite systems, or the Internet. The scale, pace of advancement and cost have made it unattractive for governments to develop redundant technologies solely for military use.

IMPLICATIONS

a. ***Reliance on certain technologies will create vulnerabilities.*** The reliance of the military on certain technologies, such as space-based communication and navigation systems, reduces the resilience of the force if these technologies are denied. Old skills may need to be relearned and analogue technologies that are less vulnerable could be considered as back-ups. New applications are heavily reliant on additional bandwidth for data exchange and connectivity that requires use of commercial solutions. Resilience needs to be considered in design and information exchange requirements.

b. ***Necessity to protect critical civilian infrastructure.*** Governments and militaries are increasingly relying on the private sector to provide a range of services, including information and communications, power generation and distribution, oil and gas infrastructure, transportation, water, and emergency services. Non-government ownership of critical infrastructure and its voluntary or self-regulatory structure leaves essential services vulnerable to disruption. Given the continued military reliance on this infrastructure, governments will need to invest in its protection. The process of enhancing protection will continue to move slowly, as governments struggle to formulate affordable solutions to protect infrastructure.

c. ***Over expectations from technological solutions.*** Improvements in technology may lead society towards an expectation that it can solve most problems. However, in order to address big challenges, political leaders and the public must first understand the problem and its nature, then have the ambition to solve it and have the support of institutions, regardless of the availability of technology.

> "The reliance of the military on certain technologies, reduces the resilience of the force if these technologies are denied."

CHAPTER FIVE

ECONOMICS / RESOURCES

1. Globalization has shifted economic power. While globalization has opened markets and intensified international economic integration, it also has increased the economic influence of emerging countries. The advent of emerging markets has shifted jobs with cheap labour and eroded the economic base for the working middle class in Western countries, fuelling social inequality. This has direct implications for the ability of Western governments to generate tax revenue and may ultimately lead to a rejection of globalization, as observed in the rise of populism and anti-globalization political stands. Although growth in globalization is expected to continue, it is likely to be at a slower pace due to increases in nationalism, protectionism and regionalization.

2. Technology and free trade have opened markets, increasing opportunity and access but causing vulnerability. Access to and use of big data, and vastly interconnected financial systems have provided the net effect of enabling commodity and market globalization, thereby increasing the speed of transactions, and the transfer of goods and services. At the same time, they also have the potential to disrupt national economies due to lack of control, and the threat from cybercrimes and attacks. As national economies become more interdependent, the carry-over effect of any financial disruption, both regionally and globally, could act as a contagion with severe consequences to market stability.

3. Global population and economic growth, including a burgeoning middle class, will exponentially increase demand for natural resources. The increased production of technology-related goods is another factor driving growth in demand, particularly for rare earth materials. Although the share of renewable energy is likely to increase up to 30% by 2030, oil and other fossil fuels are expected to remain the main source for transport and electric power generation for the next two decades. Additionally, water, energy and food scarcity will present a continuing source of stress on the global community.

4. Defence expenditures will reflect changing government priorities. The existing burden on national economies will be increased due to the rise in competing demands for limited budgets. This may result in reduced defence spending. To mitigate shortfalls, multinational solutions could offer answers by leveraging federated capabilities, thus the burden of building, developing and maintaining a capability could be shared by nations.

"Oil and other fossil fuels are expected to remain the main source for transport and electric power generation for the next two decades."

CH 5.1

GLOBALIZATION OF FINANCIAL RESOURCES

5. The global economy is projected to grow at an average of just over 3% per annum by 2050; however, a slowdown in global growth is expected around 2020 as the rate of expansion moderates in China and in other major emerging economies. China is likely to become the largest economy by 2026-2028. India has the potential to become the second largest economy in the world in PPP terms by 2050.

6. The growth in global debt in all sectors (government, corporate, and household) is at unprecedented levels as a percentage of Gross National Product (GNP). The International Monetary Fund (IMF) reported that global debt had grown by $57 trillion and reached $152 trillion in 2015, a level higher than at the 2008-2009 financial crisis ($112T). Major economies have not decreased their debt-to-GDP ratios since 2007. This is unsustainable and could precipitate a domino effect across financial markets far greater than the worldwide economic collapse of 2007. Innovative solutions to address the challenges and decompress the debt bubble to avert crisis will need to be developed.

7. An increasingly interconnected global financial system is more vulnerable to attacks by both state and non-state actors. Monetary systems outside of governmental structures are also developing, and the anonymous nature of cyber currency, like Bitcoin, increases susceptibility to misuse. Additionally, the growing use of transnational financial networks increases vulnerability to abuse by organized crime networks and non-state organizations using malware and hacking. Conversely, Bitcoin and digital finance, using technologies such as Blockchain, may introduce a digital revolution from "Internet of information to Internet of value" with positive consequences for growth in developed and emerging economies.

IMPLICATIONS

a. ***Erosion of trust in increasingly fragile financial institutions.*** Disenfranchisement and disillusionment with the financial system have increased as a result of globalization. Interconnectedness of the markets makes them increasingly susceptible to a contagion scenario. Any future global economic crisis might spark populist and protectionist sentiments and a new rise in nationalism. This could have far-reaching implications for the solidarity and cohesion within the Alliance, as Nations become less inclined toward burden sharing and defence expenditures.

b. ***Lack of visibility on transactions supporting criminal and terrorist activities.*** Financing of terrorism and organized crime will become less visible and transactions less traceable through the exploitation of decentralized networks. This may challenge governments' abilities to regulate and repress criminal activities and terrorism.

c. ***Growing interdependencies may reduce potential for interstate conflict.*** Due to economic interdependencies in financial markets, there is an increase in the threshold for major state-on-state conflict. The reduced tendency of interstate conflict represents a positive effect, with the reduction of the risk of major conflicts, but could potentially promote hybrid warfare, as nations will favour actions that are short of conventional war.

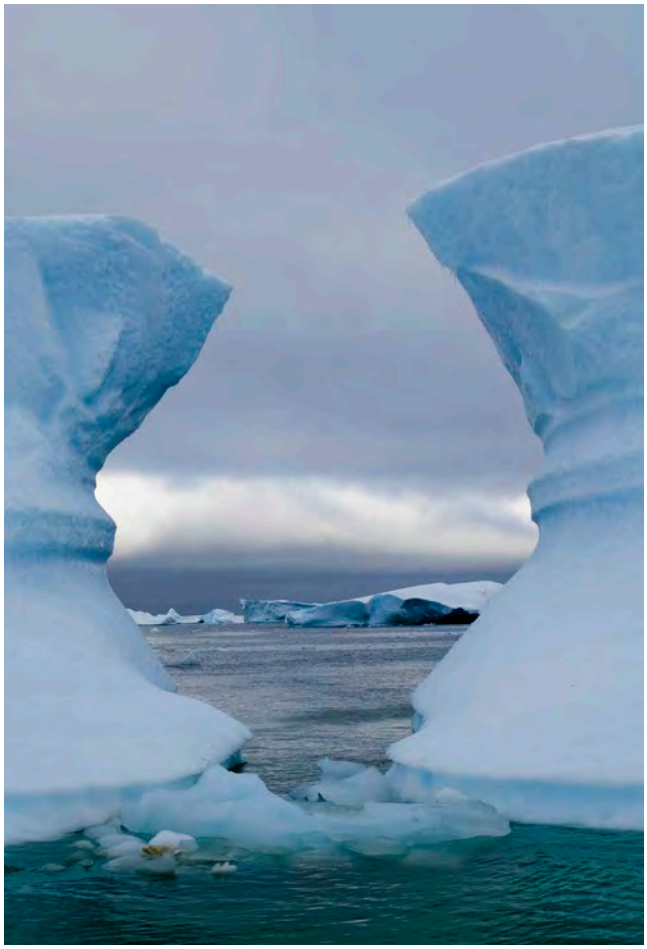
"Financing of terrorism and organized crime will become less visible and transactions less traceable through the exploitation of decentralized networks."

CH 5.2

GEOPOLITICAL DIMENSION OF NATURAL RESOURCES

8. Emerging technologies and the exploration opportunities availed by climate change may allow the exploitation of mineral and energy resources in previously inaccessible areas, such as the High North, and in possibly disputed regions, such as the South and East China Seas. The United States Geological Survey estimates that over 87% of the Arctic's oil and natural gas resources (about 360 billion barrels of oil equivalent) are located in the Arctic basin. As the polar ice cap continues to recede, allowing increased resource exploration in the High North and access via the Arctic Shipping Routes, territorial claims and economic exclusion rights will be asserted by nation states. Although the likelihood of a conventional offensive military operation in the Arctic is very low, militarization efforts mainly from Russia, should not be ignored. Similarly, China's actions and intent in the South and East China Seas pertaining to island claims and economic exclusion zones will foster tension and territorial disputes with its regional neighbours and the USA. These regions are important for global sea trade, hold significant natural resources and promise extensive reserves of oil and gas.

9. In tandem with climate change, the water, energy and food nexus will present a continuing source of stress for the global community. Climate change will affect how and where we grow food to meet the demands of an increasing world population. Water security and the stewardship of water, the sustainment of arable land for food production and the balance with the competition for biofuel demand will present a major challenge in resource management. Additionally, the increasing global consumption of meat and dairy products will require more arable land to support livestock. Production rights and shared resources, particularly pertaining to water supply where sources extend across national and territorial boundaries (e.g., lakes and rivers), can give rise to regional partnerships and strengthened political leverage, or conversely, be a source of boundary strife and conflict.



10. New technologies are expected to provide improved energy storage, increased energy efficiency, and new and renewable energy sources, all with the potential to reduce power generation costs, pollution and greenhouse gases. Climate change and the increasing regulations on fossil fuel emissions may have profound implications for national economies, as well as private companies, from both the supplier and user perspective.

IMPLICATIONS

a. ***Natural resources will play an increasing role in power politics.*** Natural resource exploitation and the leverage it provides has the ability to significantly shape the geopolitical arena. Control over natural resources could lead to the rise of new developing powers and promote new alliances that will challenge standing coalitions, as nations adjust to national and/or regional self-interests.

b. ***Resource-driven crises remain a constant.*** Fossil fuels are likely to remain the principal resource for global energy, but their use will face an uncertain period of adjustment to market conditions and the prospect of a new policy landscape after the Paris agreements. Access and control of resources will likely increase competition in disputed regions and introduce the potential for conflict.

c. ***Climate change has the potential to disrupt traditional areas of food production while offering new opportunities.*** Some regions may benefit from climate change, potentially with longer growing seasons or expanding arable regions. Conversely, other areas may be impacted by drought or the loss of access to traditional agricultural areas. Overall, the negative impacts of climate change will outweigh the possible opportunities, necessitating greater cooperation and cohesion to address resource-scarcity (i.e., the water, energy, and food nexus).

"Access and control of resources will likely increase competition in disputed regions and introduce the potential for conflict."

CH 5.3

INCREASED INEQUALITY

11. Widening inequality within nations is one of the most pressing trends that will continue to fracture and polarize societies. The distribution of wealth has tilted predominantly in favour of the extremely wealthy at the expense of the working middle class in the West. The middle class has felt the squeeze due to stagnation in real earnings, loss of benefits and overall compensation as the private sector has sought to reduce expenses by outsourcing support and labour costs and shifting from full-time to part-time employment. The upper 10% of population in net wealth have experienced the biggest gains since the recovery of the 2007 economic collapse, with the gains becoming exponential for the upper 1% to the upper 0.01%.

12. On the other end of the spectrum in the developing world, the poorest have realized an improvement in quality of life through access to basic services (water, healthcare, food, shelter) and have modest increases to income. Although the first UN Millennium Development Goal of halving the proportion of people whose income was less than $1.25 a day (considered as “extreme poverty”) was not completely achieved by 2015, 2 billion people did move out of poverty.

> "Widening inequality within nations is one of the most pressing trends that will continue to fracture and polarize societies."

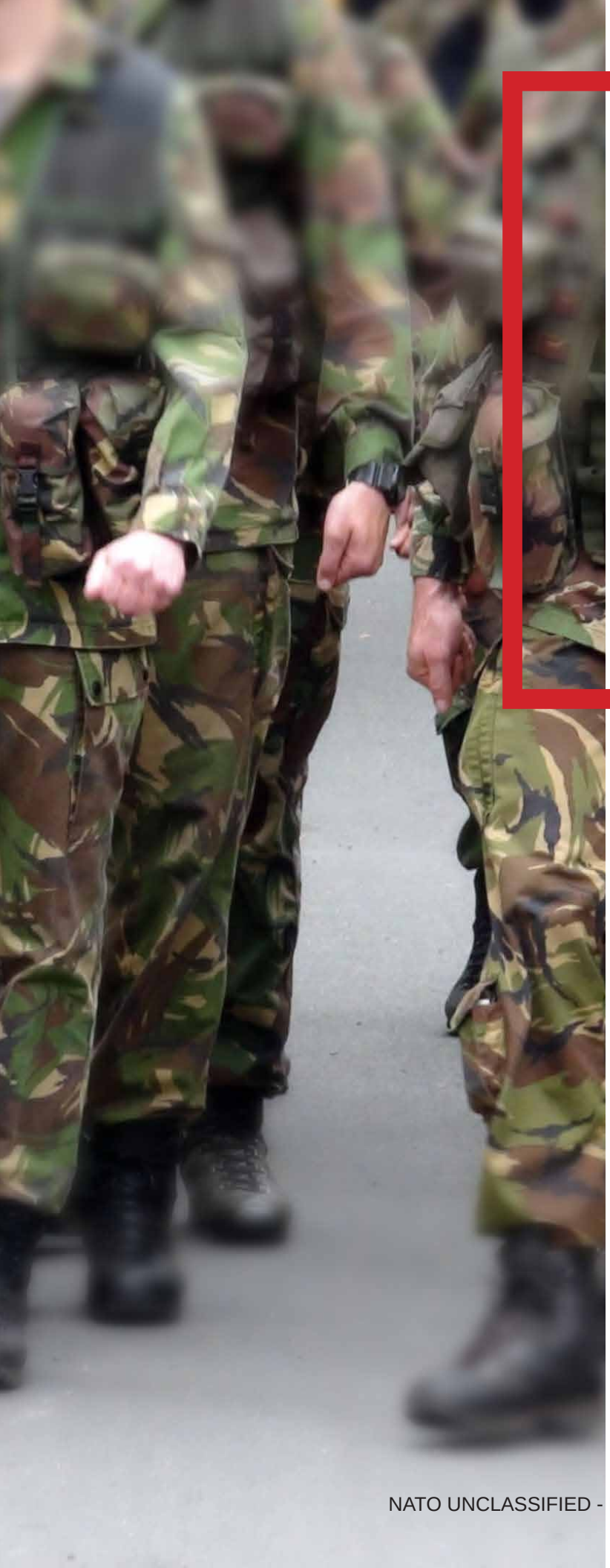
The new UN Sustainable Development Goal remains to eradicate "extreme poverty" completely by 2030.

13. While inequality increased within nations, it has decreased between nations. Middle-class incomes in China and India have drawn closer to the stagnating incomes of the middle classes in the developed world. Nevertheless, even if a rapidly growing consumer class exists, it may mask a rise in global income inequality. On the other hand, over 80% of global income differences is due to a still significant gap among the average incomes in different countries, and unskilled workers' wages in rich and poor countries often differ by a factor of 10 to 1. This income disparity will affect the inequality among world populations and be a catalyst for migration as people seek a better quality of life and opportunity.

IMPLICATIONS

a. *Differences between the haves and have-nots will increase.* The widening chasm between the haves and have-nots will continue to cause social conflict, polarization, populism, nationalism and isolationist policies (protectionism), affecting women and men, young and old differently. Employment is the largest determinant in viable sustainment of the middle class and reducing inequality. However, employment opportunity in the West will be reduced due to outsourcing jobs to cheap labour markets and increased automation.

b. *Increased inequality will drive migration.* Inequality is a catalyst for migration and can have second order effects such as fractured and conflictual societies, violent extremism, nationalism, isolationism, and protectionism. Migration caused by inequality is expected to continue well into the future and will drive rapid urbanization, the rise of megacities and slum formation. The rise of megacities could also amplify the gap between urban and rural societies. Additionally, mass migration may increase civil unrest and pose a threat to security in the country of origin, as well as in transit and receiving countries.



CH 5.4

DEFENCE EXPENDITURE CHALLENGES IN THE WEST

14. Political commitment to long-term defence sustainment and procurement programmes is driven as much by internal factors as it is by world affairs. Nations need to balance competing domestic demands for budget share with their capacity to generate a growing and robust tax revenue stream. Servicing national public debt is taking a larger percentage of national budgets, as debt-to-GDP ratios have ballooned since 2007. Major government programmes, such as social welfare, are under significant stress to keep pace with the demands of an ageing population, as there are more recipients and fewer payees into the system. Education, modernization, and infrastructure issues are often more prominent and visible, pushing defence funding to a lower priority.

15. While worldwide military expenditures decreased between 1988 and 2000, they increased again from 2001 until 2012 and have stabilized in recent years. USA and European military expenditures have declined in the drawdown from the Iraq and Afghanistan wars, but also as a consequence of economic crisis. In Central and Eastern Europe, however, the trend turned upwards with a 7.5% increase in defence spending after the illegal Russian annexation of Crimea and the subsequent

crisis in Ukraine. The Wales Summit declaration formalized the Alliance Nations' intent to reverse the trend in budgetary decline and reach the guideline of a 2% GDP defence spending within a decade (2024). Nations were able to change a decreasing defence spending trend in 2016, which resulted in an increase by 3.8% in real terms among European Allies and Canada. Projections to 2045 show an increase in military spending among most major world powers.

IMPLICATIONS

a. ***Increased defence spending due to rising regional tensions and fair burden sharing.*** As Russia increasingly asserts claims on its 'near-abroad' and economic exclusion rights, disputes with regional nations will heighten and maritime lines of commerce will be threatened. Reactions to Russia's re-assertiveness, long-term strategic ambitions and return to power politics is driving NATO to adapt its capabilities and readiness posture. Progress toward meeting Warsaw and Wales commitments is likely to increase defence spending and address fair burden sharing concerns. However, a potential increase in Western defence spending might create a security dilemma and start an arms race, as was the case during the Cold War.

b. ***Realignment of expectations with national fiscal priorities.*** Competition and stressed government budgets will limit NATO's reaction options. Levels of ambition and expectation will have to align with fiscal realities and constraints. Individual nations may be forced to specialize in development of specific military capabilities and form collaborative partnerships in order to meet their defence requirements and manage costs. This may create potential critical shortfalls in the fulfilment of the Alliance Minimum Capability Requirements.

"Reactions to Russia's re-assertiveness, long-term strategic ambitions and return to power politics is driving NATO to adapt its capabilities and readiness posture."

CHAPTER SIX

ENVIRONMENT

1. Environmental issues are dominated by climate change and its far-reaching and cross-cutting impacts. A large and growing body of data, in particular the work presented by the Inter-Governmental Panel on Climate Change (IPCC) in its 5th Assessment Report, led governments to meet in Paris in 2015 at the 21st Conference Of the Parties (COP21), to discuss greenhouse gas emission targets to mitigate the causes of climate change. By COP22 in Marrakesh a year later, the Paris Agreement had been ratified by 111 nations representing ¾ of global emissions.

2. However, even if the targets were met today, any mitigation efforts would not have impact for at least two decades, and so climate change will continue along its current trajectory through 2035 and beyond. The consequence of this will be that oceans will warm, Arctic sea ice and glaciers will shrink and sea levels will rise. Rainfall patterns will change and overall surface temperatures will increase. The natural ecosystem and human habitats, agriculture, food and water systems will all be affected in some way. The instabilities caused by these changes, while not necessarily direct drivers, will exacerbate existing tensions in the human, political, and economic spheres, and for this reason climate change is often described as a Threat Multiplier.

3. However, scientific advances and increasing computing power mean that weather and climate prediction and early warning will become increasingly long-range, more accurate and available. Employing this knowledge with intelligent application of risk-based methodologies will allow governments and authorities to take positive steps to plan, prepare and respond to events that are related to climate, environment or natural disaster.

4. Aside from climate change, environmental security remains an area facing a multitude of challenges, including loss of biodiversity, stresses on water and food supplies and threats to other ecosystem services that directly or indirectly support human life. Much of the stress is a result of the demands of a rapidly growing population, its use of resources and its damaging, unsustainable activity. Disease outbreaks are growing in number and a pandemic outbreak, whether natural or engineered for bioterrorism, would threaten international stability. For the most part, the threats to environmental security will be compounded by the effects of climate change.

5. Natural disasters will have greater impact, partly due to increases in frequency and severity of extreme weather events, but also due to shifts in the areas and times of the year where these events may occur and to the growth in the size of exposed populations.

> "Climate Change is a Threat Multiplier. It not only threatens to exacerbate conflicts within and between States, it is itself a threat to international peace and security."

CH 6.1

ENVIRONMENTAL / CLIMATE CHANGE

6. Climate change is drawing unprecedented international attention because it impacts nearly all domains and is a compounding factor for other existing issues. The Paris Agreement is an indication that nations may take positive steps to reduce or mitigate the effects. However, short of employing extreme geoengineering, such as Solar Radiation Management and Carbon Dioxide Capture and Removal (SRMCDCR), which carry great technical, legal and political challenges and risk of unforeseen/unintended consequences, the effect of climate change along its current trajectory will continue unchecked over the next two-to-three decades, regardless of international mitigation efforts. As a consequence, direct impacts will be felt: Arctic sea ice will continue to shrink and thin, the Greenland ice sheet and glacier volumes will reduce, and the extent of near-surface permafrost in high northern latitudes will recede. In addition, sea levels will increase through ice-melt and ocean thermal expansion. Likewise, changes to rainfall patterns will occur, with climate projections indicating increases in precipitation in high latitudes and tropical regions, and decreases in mid-latitude and subtropical dry regions. There will be increased intensity and frequency of high surface temperatures and heatwaves.

7. The changes in climate will bring challenges and opportunities. Rising sea-levels will continue to threaten low-lying coastal states and regions and increase the impact of storm surge events. The movement of the temperature band suitable for key crops will lead to reduced yields in lower latitude regions along with increased water stress. But the same shift of temperature could result in increased productivity further north, including in regions where agricultural productivity is primarily limited by cold, and for crops that are able to benefit from the enrichment of the atmosphere with CO_2. Retreating Arctic ice will open up access to new resources and introduce the possibility of trans-Arctic shipping for at least several months of the year, which could cut distances between Asia and Europe by a third.

8. Changing climate regimes will also shape the security environment in numerous indirect ways that impose stresses on current ways of life, on individuals' ability to subsist and on governments' abilities to keep pace and provide for the needs of their populations. The costs of adaptation and mitigation can be extremely high and fall disproportionately across the globe, such that some of the world's poorest nations, which contributed very little to creating the crisis, will face some of the greatest challenges. The legitimacy of governments could be undermined by their inability to respond to evolving climate and environmental stressors, and thereby failing to uphold the implicit social contract with their populace. Where governance fails and populations migrate, power vacuums could be created, allowing other state and non-state actors to move in and take advantage of the situation.

9. The scientific evidence-based and general understanding of climate change is growing, and will be available for the Alliance to employ in a systematic way when conducting long-term planning and risk assessments. Many governments have begun implementing adaptation measures and the Alliance will need to consider its own adaptation plans as part of its strategic thinking. Additionally, defence organizations will be directly impacted by new climate-related legislation and by increased competition for the financial resources allocated for defence spending.

10. The global focus on climate adaptation and mitigation measures may also offer improved efficiency technologies, which could be beneficial to military forces, especially if they provide more efficient use of supply-chain resources, greater energy independence or improved resilience. Furthermore, a growing international willingness to invest and act together to combat this global challenge could in itself act as a unifying stabilizer in international relations.

11. Aside from climate change, the demand for natural resources is growing as a direct result of population growth, urbanization and improved living standards. Water and food security are growing concerns; in particular, demands for water are growing faster than population growth and are set to be unsustainable. Despite massive efforts and improvements in the past 20 years, an estimated 663 million people still rely on unimproved water sources, and 2.4 billion lack sanitation. The problems are worst in Sub-Saharan Africa, Oceania and Central Asia, with rural areas being affected the most. Globally, agriculture takes 70% of total water use, and energy production (the greater part of industrial consumption) accounts for more than 15%. Even with more efficient use in the future, demand from each of these sectors is set to grow and will challenge for greater shares.

12. Managing water allocation presents difficult choices, especially where supply crosses national boundaries. In some cases this has led to water treaties and acted as a force for stability, but in others, competition for water could lead to conflict. Where water scarcity or mismanagement exists, localized or even inter-state conflict can result. At the extreme ends of the scale, drought is assessed to have affected 50 million people in 2015 and flooding, 27 million. Water crisis is ranked as one of the top 5 risks in the 2017 Global Risk Report. Climate change is expected to exacerbate the problems, with rainfall patterns shifting away from already dry regions and towards wetter ones. More broadly, losses to bio-diversity and the stresses on eco-system services may reduce resilience and carry deep consequences that will be difficult to quantify or address.

13. The number of emerging infectious disease outbreaks is increasing year on year, due to population growth, increased urbanization and more abundant and rapid travel. Even with medical advancements and

> "Demands for water are growing faster than population growth and are set to be unsustainable."

> Weaponizing a pathogen is relatively easy and well within the grasp of would-be bio-terrorists.

better containment methods, nations would struggle with a serious pandemic outbreak. In addition to viral threats, more bacteria are becoming resistant to antibiotics, with resistance estimated to be responsible for over 2 million infections and 23,000 deaths in the USA in 2015.

14. The 1918 influenza pandemic killed in excess of 50 million people, and more recent epidemics, such as SARS, H1N1 and Ebola, albeit with far fewer deaths, have nevertheless caused huge social and economic disruption and have served to act as a warning for what could come. Weaponizing a pathogen is relatively easy and well within the grasp of would-be bio-terrorists. The response to Ebola highlighted deficiencies in almost every aspect of global defence against potential pandemics and "the conditions for infectious disease emergence and contagion are more dangerous than ever". The impact of a major pandemic would be globally destabilizing and could leave affected nations extremely vulnerable to external intervention.

IMPLICATIONS

a. ***Increased range of activities in the Arctic due to growing accessibility.*** The Arctic region will increasingly open to a range of activities, such as oil, gas and mineral exploration and exploitation, fishing and tourism by Arctic and non-Arctic nations, presenting opportunities and challenges that will need to be considered. Growing accessibility will also allow increased military use of the High North and Arctic regions.

b. ***Climate and environmental challenges to governance.*** Lack of effective governance may allow other state and non-state actors to exploit the power vacuum. Under-governed or un-governed areas due to newly inhospitable local climates or in the aftermath of pandemic could provide refuge or safe havens to potential adversaries.

c. ***Increased requirements for environmental awareness.*** Allies will need to consider climate and environmental stressors, extreme weather events, changes to seasonal weather patterns, as well as water and food security issues in their situational awareness and their planning processes. New data for improved climate and weather forecasting can be used to inform planners and decision makers.

d. ***Impacts of climate change adaptation and mitigation measures.*** Nations will need to improve resilience by addressing climate adaptation measures for their infrastructure and equipment. Increased pressure will probably be placed on defence to shoulder its share of climate mitigation plans as well. Adoption of new, efficient or renewable energy technology may help to meet this remit and prove militarily advantageous.

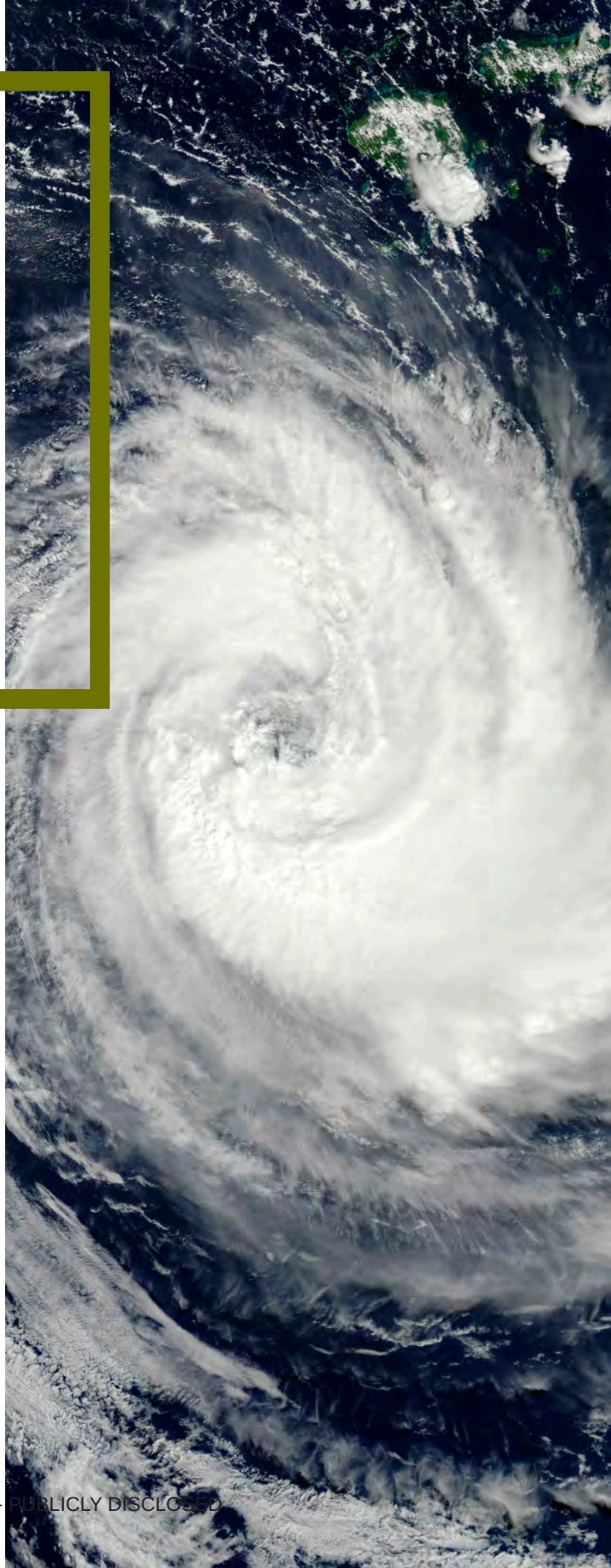
ALTERNATIVE VIEW - ARCTIC REGION NOT EXPLOITED AS ANTICIPATED:

The following factors may inhibit commercial expansion in the region: the economic balance of reduced fuel cost and transit-times due to shorter passage routes, against increased costs for ship strengthening, equipping, operating and insurance; the high costs and difficulties of maintaining infrastructure on thawing permafrost; the risk of environmental damage, and the massive clean-up costs and litigation that would be levied against those responsible for incidents and the license-issuing states. The Arctic will still be an exceptionally unforgiving operating environment, made worse by increased severe storm conditions as a result of climate change effects.

Sources: Lloyd's Chatham House, 2012. See also Financial Times Online, 2016. US Navy, 2014.

CH 6.2

NATURAL DISASTERS



15. Natural disasters will have increasing impact, partly due to overall increases in the severity and prevalence of severe weather events, but also due to changes in the regions and times of the year where these events may occur, and increases in the population, infrastructure and assets that are exposed. Regions that are accustomed to hurricanes have adapted over time to this threat by developing infrastructure standards to cope; similarly, arid regions have developed farming patterns to suit. However, with an expected rise in severe weather events and a change in their patterns, newly affected regions may struggle to actively adapt. This could be further compounded by cascading disasters, both natural and also manmade, such as the 2011 Japanese earthquake and tsunami that triggered the nuclear crisis in Fukushima Daiichi.

16. Some nations will not be able to cope with natural disasters and still meet the needs or expectations of their populations. It may be enough to force migration or displacement. There were 19.2 million new displacements associated with disasters in 113 countries across all regions of the world in 2015. Disasters accounted for twice as many new displacements as conflict (8.6 million). Climate

> With an expected rise in severe weather events and a change in their patterns, newly affected regions may struggle to adapt.

change, in tandem with people's increasing exposure and vulnerability, is expected to magnify the impact of natural disasters, as extreme weather events become more frequent and intense in the coming decades.

17. Natural disasters are likely to have differing effects on NATO Nations. While many of them may escape the extremes of change, there is an increasing likelihood that a Member Nation could suffer a major disaster, which could affect its ability to contribute to existing or emerging Alliance operations.

18. The interconnectedness and inter-dependence of global supply chains and the low stock-holding levels common in advanced logistic management are advantageous in terms of economic and resource efficiency and the ability to accurately meet demand without surplus. However, the leanness of the modern system and the small number of suppliers for some key materials and goods can also leave nations unwittingly exposed to serious impact and unexpected deficiencies in their resilience when the supply chains are disrupted even briefly by disasters on the other side of the world. For example, the March 2011 Fukushima disaster affected crucial automotive industry supplies worldwide, and again in April 2016, a double earthquake hitting Kumamoto, Japan, halted key production of Sony image sensors, used globally including by Apple.

19. On a positive note, predictions and early warnings will become increasingly far-sighted, and there is much that can be done to address the defence and security implications through intelligent application of risk-based methodologies to plan, prepare for and respond to events related to climate, environment or natural disasters.

IMPLICATIONS

a. *Increased requirement for Humanitarian Support.* Allies will more frequently be working in areas of humanitarian aid, which will require truly comprehensive (military, governmental and non-governmental) interoperability. Education and training schemes will need to encompass climate risk and humanitarian aid. Given the increased likelihood of civilian/military cooperation being required, enhanced understanding and trust will be needed between civilian and military entities, including non-governmental stakeholders, to ensure effective strategic coordination, planning and execution of disaster relief and humanitarian support operations.

b. *Unavailability of national military assets due to natural disaster.* A large scale, environmentally-triggered disaster within a NATO Nation is increasingly possible, requiring a major employment of their military to relief operations. As nations increasingly respond to disasters with the use of their military to aid civil authorities, there will be a subsequent effect on military training, readiness and availability of forces. This could affect the overall readiness of the Alliance.

c. *Increased requirement to improve resilience.* A better understanding will be required of the civil and military vulnerabilities of Nations to environmental, climate or natural disaster-related disturbances in the global supply and distribution system of food, water and key resources. This, along with the understanding of civil preparedness and interdependence between services, is an essential element for improving sustainment and developing NATO resilience.

CONCLUSION

> "NATO will continue to provide the main framework for collective defence of the Euro-Atlantic region."

"Looking into this future is challenging. However, the difficulty in looking ahead does not excuse the military professional from considering the demands of future war." *U.S. Joint Staff, JOE 2035*

1. The Strategic Foresight Analysis (SFA) is a collaborative effort drawing on expertise and resources from NATO and partner nations, IOs, industry and academia for identifying trends and implications that are likely to shape the future security environment. It is built upon the analysis of commonalities and differences in order to understand diverging visualizations of future challenges, opportunities and relevant implications facing the Alliance. The SFA provides a baseline for an Alliance long-term perspective that is essential to success in a period of unprecedented changes resulting from a dynamic and complex world.

2. The SFA highlights and discusses several debated issues, such as the fate of globalization, the impact of polarization, the future of AI, the rise of China and the redistribution of geostrategic power. While the West might be less dominant in the future economic order, NATO Allies can still influence the future security environment by the strategic choices that they make today. Although the levels of violence linked to armed conflict have shown a decreasing trend, the security environment around the Euro-Atlantic region has become more volatile, with a growing potential for interstate conflict and increased terrorism threat, polarization and regionalization. Rapid, and in some cases disruptive, changes associated with the shifts of power and challenges to the existing world order are likely to take place in the next two decades. In this context, NATO will continue to provide the main framework for collective defence of the Euro-Atlantic region.

3. The SFA 2017 Report provides NATO leaders and defence planners with a perspective of the challenges and opportunities facing the Alliance in the coming decades. The SFA also serves as an intellectual foundation for the development of the Framework for Future Alliance Operations (FFAO) 2018 Report. Together, the SFA and the FFAO will inform the 2019 NDPP cycle, and may provide an input into the development of NATO Nations' security and defence plans and strategies as part of an enduring and continuous Alliance transformation.

APPENDIX A

SUMMARY OF 5 THEMES, 20 TRENDS, AND 59 IMPLICATIONS FOR NATO

THEMES	TRENDS	IMPLICATIONS
POLITICAL	1. **The redistribution of geostrategic power.** The predominance of NATO and the West is likely to be increasingly challenged by emerging and resurgent powers.	a. Challenges to the rule-based world order. b. Euro-Atlantic relations and Alliance cohesion challenged. c. Increased requirement for cooperation with other actors including rising powers.
	2. **Use of power politics.** The importance of NATO has increased for collective defence of the Euro-Atlantic region as it is the main framework that maintains a robust and an appropriate mix of nuclear and conventional capabilities.	a. Increased potential of confrontation and conflict. b. Nationalism and divergent risk and threat perception. **c.** Requirement for a robust and credible deterrence and defence.
	3. **Non-state actor influence in domestic and international affairs.** Non-state actors are expected to exert greater influence over national governments and international institutions and their role is likely to expand.	a. Growing complexity due to a wide variety of non-state actors. b. Requirement for closer cooperation with non-state actors. c. Increased role of private actors for security. d. Increasing concerns for the Protection of Civilians.
	4. **Challenges to governance.** Emerging powers are increasingly challenging established global governance institutions and requesting greater roles. Existing governance structures, particularly in weak and failing states, are not sufficiently addressing the requirements of the broader population.	a. Duplication of existing global governance structures b. Increased requirement for partnership and inclusive governance. e. Projecting stability beyond the Euro-Atlantic region.
	5. **Public discontent/disaffection and polarization.** In western countries, risks such as undermined legitimacy of the government mandate, political impasse and the difficulty of implementing reforms and social polarization are likely to be increased.	a. Lack of trust in governments and institutions. b. Increasing polarization in the West and developing countries.
HUMAN	6. **Asymmetric demographic change.** The worldwide ageing populations will cause major challenges for some economies and government budgets. Gender inequality will further destabilize demographic change. However, the population in countries with a high fertility rate will remain relatively young, as seen in Africa, thus creating a youth bulge and potential for migration.	a. Ageing populations will strain resources. b. Youth bulges leading to instability and migration. c. Failed integration of migrants.
	7. **Increasing urbanization.** Urbanization is increasing at different rates globally, with the highest growth rates in the least developed parts of the world thus creating the challenge of providing adequate basic services and a functioning infrastructure to ensure a minimum quality of life for citizens.	a. Increasing urbanization might lead to resource competition. b. Ownership and control of critical infrastructure could be contested. c. Governance challenged by uncontrolled urban growth. d. Dependence of littoral urban areas on sea lines of communication. e. Increased urbanization may require NATO involvement in urban areas.
	8. **Fractured and/or polarized societies.** Polarization of societies has become a worldwide phenomenon; however, western developed nations are particularly vulnerable due to increased empowerment of individuals. Polarization can also exist between countries.	a. Polarization causes instability and civil war. b. Instability along NATO's border causing large-scale migration. c. Fractures in society might undermine trust and legitimacy.
	9. Increasingly connected human networks. Human networks are expected to continue to be increasingly decentralized thereby allowing unforeseeable threats.	a. Increasingly decentralized and diverse human networks. b. An increasing need to understand human networks. c. The need for influencing human networks with effective and precise strategic communication is increasing.

APPENDIX A

SUMMARY OF 5 THEMES, 20 TRENDS, AND 59 IMPLICATIONS FOR NATO

THEMES	TRENDS	IMPLICATIONS
TECHNOLOGY	**10. Rate of technology advance.** The advances in technology and innovation accelerate as they are fuelled by continued exponential increases in supporting computing power and advances in augmented intelligence.	a. Rapid development of technology challenges interoperability. b. Increasing legal and ethical concerns. c. The rate of technical advancement challenges acquisition and life-cycle management processes.
	11. Access to Technology. The ability of individuals, non-state and state actors to access technology has significantly increased.	a. Access to technology enables disruptive behaviours. b. Uncontrolled access to technology challenges existing frameworks.
	12. Global network development. Global networks will increasingly enable access to and provide information on commodities and capital assets. Global networks will increasingly be used for dissemination of post-truth information.	a. The increasing number of sensors, access to data and global networks generates operational vulnerabilities. b. Opportunities to exploit the sensors, data, and global networks. c. Adversaries will use global networks for dissemination of false or misleading information.
	13. Dominance of the commercial sector in technological development. The advances in defence technology developments/sales and space exploration /exploitation by commercial sectors have taken away the monopoly that used to be held by governments.	a. State approaches are not keeping up with the commercial sector. b. The Alliance will lose perishable skills that cannot be easily recovered.
	14. Technological dependencies. Both society, and defence and security, have increasingly depended on certain technologies which have become essential in everyday lives.	a. Reliance on certain technologies will create vulnerabilities. b. Necessity to protect critical civilian infrastructure. c. Over expectations from technological solutions.
ECONOMICS	**15. Globalization of financial resources.** An increasingly interconnected global financial system makes it more vulnerable to attacks by both state and non-state actors.	a. Erosion of trust in increasingly fragile financial institutions. b. Lack of visibility on transactions supporting criminal and terrorist activities. c. Growing interdependencies may reduce potential for interstate conflict.
	16. Geopolitical dimension of resources. Emerging technologies and the exploration opportunities availed by climate change may allow the discovery of mineral and energy resources in previously inaccessible and possibly disputed regions such as the High North.	a. Natural resources will play an increasing role in power politics. b. Resource-driven crises remain a constant. c. Climate change has the potential to disrupt traditional areas of food production while offering new opportunities.
	17. Increased inequality. The bulk of the world's population, the middle class, particularly in western society has felt the squeeze due to stagnation in real earnings after inflation adjustments, loss of benefits and overall compensation as the private sector has sought to reduce expenses by outsourcing support and labour costs and shift to part time versus full time employment.	a. Differences between the 'haves and have-nots' will increase. b. Global inequality will drive migration.
	18. Defence expenditures challenges in the West. A majority of NATO Nations were able to change a decreasing defence spending trend into an increase in real terms in 2016. Political and national will would be required to sustain defence expenditures in competing priorities with limited national budgets.	a. Increased defence spending due to rising regional tensions and fair burden sharing. b. Realignment of expectations with national fiscal priorities.
ENVIRONMENT	**19. Environmental / Climate Change.** The changes in climate will bring challenges and opportunities. The changes to the climate impose stresses on current ways of life, on individual's ability to subsist and on governments' abilities to keep pace and provide for the needs of their populations.	a. Increased range of activities in the Arctic due to growing accessibility. b. Climate and Environmental challenges to governance. c. Increased requirements for environmental awareness. d. Impacts of climate change adaptation and mitigation measures.
	20. Natural disasters. Natural disasters will have increasing impact, partly due to overall increases in the severity and prevalence of severe weather events, but also due to changes in the regions and times of the year where these events may occur.	a. Increased requirement for Humanitarian Support. b. Unavailability of national military assets due to natural disaster. c. Increased requirement to improve resilience.

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