CANADA'S FUTURE ARMY, VOLUME 1:
METHODOLOGY, PERSPECTIVES AND APPROACHES

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CANADIAN ARMY ✕ ARMÉE CANADIENNE

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CANADA'S FUTURE ARMY,

Volume 1: Methodology, Perspectives and Approaches

Canadian Army Land Warfare Centre
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APO BEAT

STRONG. PROUD. READY.
FORTS. FIERS. PRÊTS.

FOREWORD

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PREFACE

AIM

The purpose of this publication is to provide the methodological guidance and initial estimate of the future security environment (FSE) for the 2040 timeframe. In doing so, it provides a foundation from which further army capability development may occur.

APPLICABILITY

This publication is primarily for use by the army capability development community focused on the development of the Future Army model (+15–30 years).

SCOPE

The purpose of foresight is to systematically explore, create, and test both possible and desirable futures to improve decisions. It includes analysis of key dimensions of the international environment, how conditions may change as a result of major trends and drivers at work in the international system and the implications of such changes for implementation of policies and actions. While not a science, the use of foresight methods can be used to provide a framework to better understand the present and expand mental horizons.

Chapter 1 of this publication elaborates the research strategy informing the Future Army effort. Following a brief description of the capability development process that the Army employs to prepare for the future, the discussion briefly outlines the area of foresight, and the development of the overarching framework used in the investigation. It then details the steps involved in developing a series of alternative futures upon which more refined investigation of necessary capabilities will proceed. An illustration of one such framework (e.g., energy and environmental sustainability)—along with a discussion of steps required to conduct systematic exploration and testing of each "alternative future" which that framework yields—concludes the chapter.

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Chapters 2 to 6 present the results of the environmental scans conducted in the eight focus areas—identifying the key trends, drivers and uncertainties likely to characterize the future security environment. This volume then elaborates four alternative futures based on the research provided in the scans and the impact uncertainty analysis described above. This provides a foundation upon which subsequent analysis of alternative futures can be undertaken—with such analysis—along with insights into the missions, tasks, characteristics and capabilities of the Future Army to be presented in a companion volume once such work is completed.

RELATIONSHIP TO OTHER CAPABILITY DEVELOPMENT PUBLICATIONS

This publication should be read in conjunction with B-GL-007-000/JP-009, *Canada's Future Army, Volume 2: Force Employment Implications and* B-GL-007-000/JP-011, *Canada's Future Army, Volume 3: Alternate Worlds and Implications.*

A NOTE ON ARMY TERMINOLOGY

Throughout this publication the word *army* appears many times, as well as in many different formats and contexts that may prove confusing for some readers to follow. Therefore, when reading the document please keep in mind that the word(s) 'army' and 'future army' are employed as a common noun, whereas 'Canadian Army' and 'Future Army' are a reference to the current and future institutions respectively. Of these, depending on the context the latter may also be used in reference to the CALWC project.

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> *"The design of the Army of Tomorrow as in Land Operations 2021, guided by the studies in Towards Land Operations 2021 and the design principles outlined in Designing Canada's Army, continues to evolve through continued experimentation and validation of the concepts and capabilities required to realize the achievement of adaptive dispersed operations (ADO). However, to prepare itself for the bound after next, the Canadian Army must also take on the challenging task of casting its eye to the far future in order to gain some initial insight into how it should prepare for that future."*

INTRODUCTION

For more than a decade, the Canadian Army found itself focused on conducting counterinsurgency operations in Afghanistan. These operations have rightly preoccupied the army with issues concerning the Army of Today. This established a degree of conceptual stability with regard to the Canadian Army's mission, tasks and capability requirements. But, with the end of combat operations in that theatre in 2013, the Canadian Army found itself in the position of once again having to examine the prospects of how the future of conflict may change, what potential future missions and tasks the army could be called upon to perform and what capabilities it would require to succeed in the future operating environment. While continuing to institutionalize what it has learned from operations in Afghanistan, the Canadian Army has now turned its focus toward achieving the objectives for the Army of Tomorrow as outlined in *Land Operations 2021: Adaptive Dispersed Operations* and creating its vision for the Future Army. The design of the Army of Tomorrow as in *Land Operations 2021*, guided by the studies in *Towards Land Operations 2021* and the design principles outlined in *Designing Canada's Army*, continues to evolve through continued experimentation and validation of the concepts and capabilities required to realize the achievement of adaptive dispersed operations (ADO). However, to prepare itself for the bound after next, the Canadian Army must also take on the challenging task of casting its eye to the far future in order to gain some initial insight into how it should prepare for that future.

Starting in November 2012, with the Canadian Army Land Warfare Centre (CALWC) leading, the Canadian Army began to reinvigorate its work on the Future Army model using two major lines of effort: historical analysis and foresight. CALWC conducted historical analysis to highlight issues that typify capability development in postconflict periods through its *Army Between Wars Project* (ABWP). The intent of ABWP was to examine the critical periods between conflicts when armies must confront the challenges of postwar management of resources while simultaneously adapting to prewar institutional reorientation in preparation for the next conflict. This analysis was supported by focusing semi-annual Army Historical Workshops around the strategic questions for the ABWP.

"THE FUTURE IS NOT SOMETHING THAT JUST HAPPENS... IT IS SOMETHING [THAT HUMANS] CREATE, BY THE CHOICES [THEY] MAKE OR AVOID."

The results of the ABWP were published as supplementary products to the Future Army series. Concurrent to this effort, CALWC used foresight to help identify new developments that can challenge past assumptions and provide new perspectives on future threats and opportunities.

THE CHALLENGE OF THE FUTURE

In undertaking to examine the Future Army, there is clear recognition of the limitations involved in doing so. The future is uncertain and defies prediction. Indeed, uncertainty is a predominant characteristic of the 21st-century global security environment, and defence establishments around the world continue to strive to understand and define how their national security policies fit within this paradigm. In this age of complexity, military planners, for all their good intentions, often get caught in the trap of attempting to diminish uncertainty rather than learning how to function within it. Consequently, armies need a robust, evidence-based, efficient way to determine an understanding of the future character of conflict and the requirements for responding to it. The use of foresight, a systematic and disciplined means of examining information to identify future potential threats, risks, emerging issues and opportunities, provides an effective tool to inform and prepare decision makers to take action to mitigate or exploit circumstances that may occur in the future. One must accept the dictum that "the future is not something that just happens ... it is something [that humans] create, by the choices [they] make or avoid."[1] Accordingly, investigating the distant future makes sense.

THE CANADIAN ARMY'S RESPONSE

Canada's Future Army, Volume I: Methodology, Perspectives, and Approaches is the first of three volumes focused on utilizing foresight to help conceive the Future Army. This first volume is designed to elaborate the methodology used by the CALWC in determining its vision of the future security environment and the potential alternative futures in which the Canadian Army may find itself in 2040. The second volume, *Canada's Future Army, Volume 2: Force Employment Implications,* will articulate the results of the analysis of the potential futures from the perspective of the required concepts and capabilities needed for the Canadian Army to remain relevant and effective in 2040 and beyond. Lastly, the third in the series, *Canada's Future Army, Volume 3: Alternate Worlds and Implications, will examine the four alternative futures in more detail as well as various important indicators and signposts.*

Canada's Future Army, Volume I consists of six chapters. Chapter 1, Research Strategy and Method, looks at the Future Army in the context of its capability development process and the Three Army Model.[2] It outlines the ten-step foresight[3] methodology used by the Canadian Army to gain insight into the potential future security and operating environment. Examining eight key domains and the trends and drivers within them, it establishes a framework to create alternative futures within which requirements can subsequently be tested. These alternative futures are further amplified in individual annexes at the end of this publication. Using the results from the analysis of the key domains, Chapters 2 through 6 describe in broad categories their impact on the future security environment (FSE). Chapter 2, Physical Environment, examines potential changes in the physical world, with a particular focus on resource availability and access to key natural resources. It touches on the impact of political regimes, population change and climate change on these resources, their accessibility and security. Chapter 3, The International System, examines how the relationship between members of the international community may be affected by globalization and its impact on the systems framework, including the political, economic and legal considerations and the potential shifting of power structures. Chapter 4, Human Dimension, reaffirms the centrality of the human in conflict and examines trends in six major areas: attributes and competencies; professionalism and ethics; army culture; morale, cohesion and trust; decision-making; and stress, strain and resilience. It emphasizes that while continued technological advances are likely to enhance the effectiveness of tomorrow's soldier, success on the future battlefield will depend in large part on human creativity, innovation, ingenuity and adaptability. Chapter 5, Science and Technology, details a number of these advances, including advances in human performance modification, metamaterials, printed electronics and synthetic biology. It notes that potential military applications in such areas appear numerous. That said, actually realizing such potential will remain heavily dependent on the careful and effective integration of science and technology (S&T) into the profession of arms. Lastly, Chapter 6, Security and Defence, discusses the impact of the increasing number of non-state actors and the empowerment of individuals on the future security environment as well as the increasing uncertainty and potential for surprise that will likely characterize it. In addition, it looks at the need to view conflict in a broad and holistic context—a context that requires comprehensive response.

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1. Adapted from the core beliefs of Futurist.com at: http://www.futurist.com/ourcorebeliefs/.

2. Army of Today, present to +5 years; Army of Tomorrow, 5–15 years; and Future Army, 15+ years and beyond.

3. In the context of Army capability development, foresight is defined as the critical, rigorous and systematic study of long-term developments.
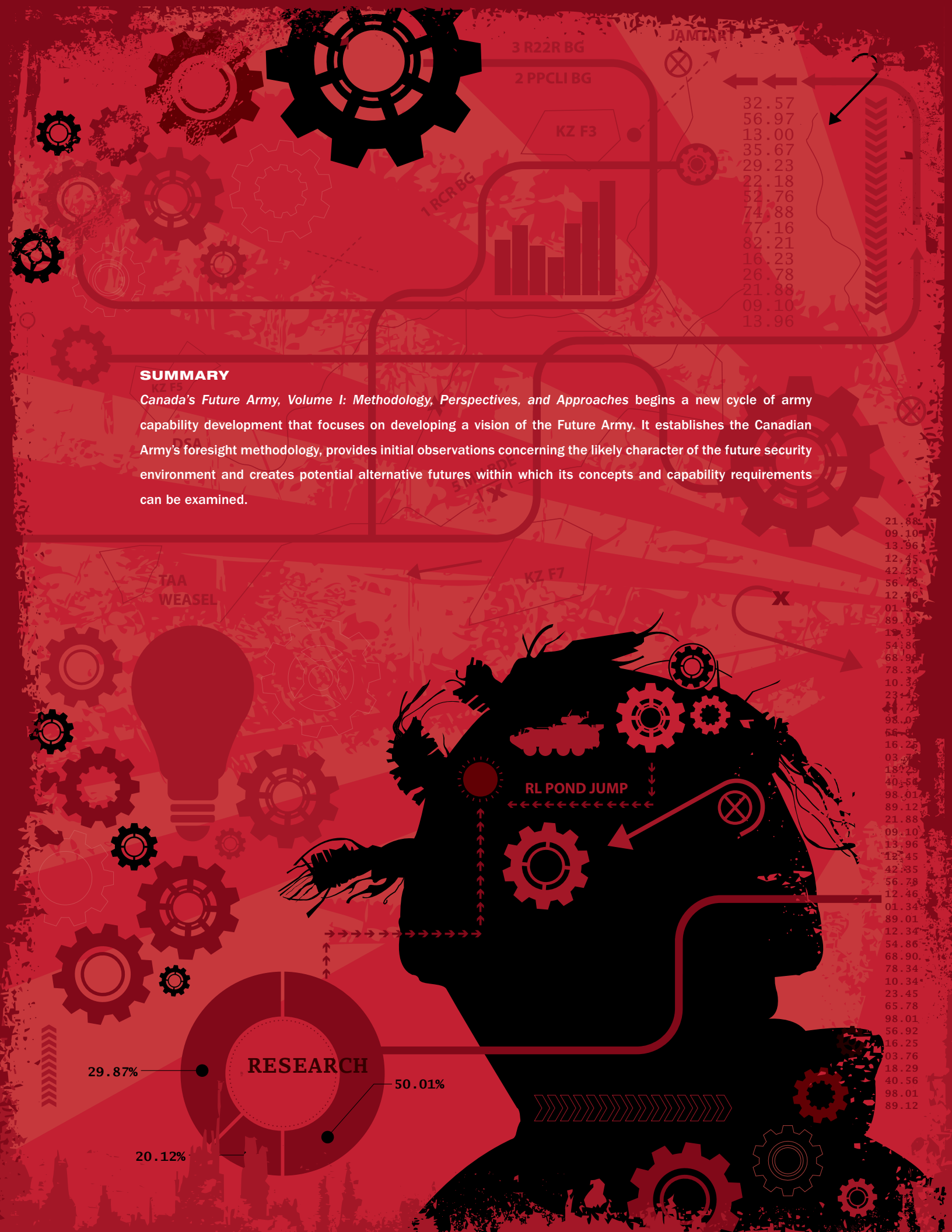
SUMMARY

Canada's Future Army, Volume I: Methodology, Perspectives, and Approaches begins a new cycle of army capability development that focuses on developing a vision of the Future Army. It establishes the Canadian Army's foresight methodology, provides initial observations concerning the likely character of the future security environment and creates potential alternative futures within which its concepts and capability requirements can be examined.

RESEARCH STRATEGY AND METHOD

INTRODUCTION

Uncertainty is a predominant characteristic of the future security environment. For that reason, it is impossible to accurately predict what it will yield. Yet defence establishments must continue to strive to understand and define how their national security policies will meet the challenges arising within such a context. Indeed, state militaries routinely engage in forward planning for a variety of reasons ranging from defence procurement to recruitment and retention of personnel to assessment of emerging forms of warfare.

Preparation for future uncertainty beyond just planning is a daunting task. A vast amount of information exists which can offer guidance for understanding the scope and magnitude of change, but making sense of that information and its military application is difficult. Employment of foresight nevertheless offers a means for ensuring more systematic and rigorous future capability development. The purpose of foresight is to systematically explore, create and test both possible and desirable futures to improve decisions. It includes analysis of key dimensions of the international environment, how conditions may change as a result of major trends and drivers at work in the international system, and the implications of such changes for implementation of policies and actions. The use of foresight methods is not a science, but it can provide a framework for better understanding the present and expanding mental horizons.

In fact, foresight methods lie at the heart of the Canadian Army Land Warfare Centre's (CALWC) Future Army project—an investigation of the security environment and its implications for Canada's Army in the years ahead. This chapter elaborates the research strategy informing the Future Army effort. Following a brief description of the capability development process that the Canadian Army employs to prepare for the future, the discussion briefly outlines the area of foresight and the development of the overarching framework used in the investigation. It then details the steps involved in developing a series of alternative futures upon which more refined investigation of

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necessary capabilities will proceed. An illustration of one such framework (e.g., energy and environmental sustainability)—together with a discussion of steps required to systematically explore and test each "alternative future" the framework yields—concludes the chapter.

FUTURE ARMY AND THE CAPABILITY DEVELOPMENT PROCESS

In dealing with the future, the Canadian Army utilizes a capabilities-based development process.[4] For army purposes, being "capable" is achieved by fulfilling specific human, scientific, doctrinal, infrastructural, environmental, material and institutional conditions essential for successful service (i.e., the ability to achieve an effect). A three-step process is used in developing capabilities:

» **CONCEIVE:** concepts are developed and translated into capability requirements;

» **DESIGN:** selected capability requirements are translated into validated designs for future use;

» **BUILD:** validated designs for force capabilities are refined and realized for use in the field.

The objective of the process is to meet defence requirements, allowing the army to remain relevant and effective in the current and future operating environments. Although each step in the process is considered a distinct activity, considerable overlap occurs as a capability is first conceived, then designed and finally built over a number of years.

The capability development process is also aligned with three separate time horizons:

» The Army of Today has a 0–5-year outlook and is roughly correlated with the Build stage of the continuum.

» The Army of Tomorrow has a 5–15-year outlook and is roughly correlated with the Design stage of the continuum.

» The Future Army has a 15–30-year outlook and is roughly correlated with the Conceive stage of the continuum.

While each horizon has its own set of challenges and outcomes, it is the Future Army outlook, 15–30 years into the future, which perhaps requires the greatest degree of abstract thinking. Indeed, the individuals working in this realm engage in what is commonly referred to as foresight.[5] This group—known as the Concepts Team[6]—examines the future security environment and identifies areas requiring more focused research for the identification of the capabilities required to operate in the future. In turn, the team proposes alternative concepts and technologies to achieve desired capabilities.

FORESIGHT METHOD

The basic approach employed in conducting the Future Army project falls into the category of foresight.[7] At times also referred to as futuring,[8] foresight is a growing international discipline designed to critically examine the difficulties associated with making decisions with long term future consequences in conditions of uncertainty and to provide methods through which- these difficulties can be minimized. Indeed, foresight is the study of long-term developments in a critical, rigorous and systematic manner. As such, it represents a much-needed response to a profoundly human and natural tendency to look forward and prepare for what may come. Indeed, as Denis Loveridge noted:

> Visions of the future exist because they are inevitable. … [W]ithout them the polity can neither develop nor policy be created. Yet vision without discipline is to daydream. Foresight is an essential precursor to creating vision and is essential to prevent daydreaming. In that way foresight enables policy to be shaped.[9]

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4. For further background on the evolution of the army's capability development process, see Andrew B. Godefroy, "Chasing the Silver Bullet: The Evolution of Capability Development in the Canadian Army," *The Canadian Military Journal,* 8.1 (Spring 2007), 53–66; and, by the same author, "Transformation and the Army of Tomorrow," in Major A.B. Godefroy, and P. Gizewski eds., *Towards Land Operations 2021: Studies in Support of the Force Employment Concept for the Army of Tomorrow* (Kingston: Directorate of Land Concepts and Designs, 2009), Chapter 3.

5. To study the future is to study potential change—not simply fads, but what is likely to make a systemic or fundamental difference over the next 10 to 25 years or more. Studying the future involves not simply economic projections or sociological analysis or technological forecasting, but a multidisciplinary examination of change in all major areas of life to find the interacting dynamics that are creating the next age.

6. The team consists of a scientific advisor, a strategic analyst, a historian, operational researchers and operational function experts (Command, Sense, Act, Shield and Sustain). The concepts team represents the core group involved in the development and conduct of the Future Army project and the chief participants in all aspects of the research strategy described below.

7. The World Future Society publication on futuring by Edward Cornish provides a comprehensive treatment of the subject. See Edward Cornish, Futuring: the Exploration of the Future (Bethesda, MD: World Future Society, 2005).

8. Some prefer the term "futures research," by which they mean the use of methods to systematically identify the consequences of policy options and alternative futures with policy implications for decision makers. Others prefer the term "future studies," meaning any exploration of what might happen and what we might want to become. Still others, particularly in Europe and Francophone Africa, prefer "prospective studies": the study of the future to develop a strategic attitude of the mind with a long-range view to creating a desirable future.

9. Denis Loveridge, *Foresight: The Art and Science of Anticipating the Future* (New York: Routledge, 2009), 13–14.

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While a number of useful methods exist in this growing field, environmental scanning and futures wheel approaches, along with hindsight and "red teaming," are selected as the chief means to better understand possible outcomes for the Canadian Army in the 2040 timeframe.[10]

ENVIRONMENTAL SCANNING

Environmental scanning is a process involving the acquisition and use of information about events, trends and relationships that may have a strategic bearing on how an organization does business. The knowledge and insights gained from scanning serve to assist in more effectively planning the organization's future course. The process typically focuses on a large number of areas—in effect, covering every major sector of the environment that can assist management in planning for an organization's future. It also involves the use of four basic techniques (undirected viewing, conditioned viewing, and informal and formal search of primary and/or secondary sources of information). All four techniques are essential to the method's effective use. As one observer explains:

> Undirected viewing helps the organization to scan broadly and develop peripheral vision so that it can see and think outside the box. Conditioned viewing tracks trends and gives the organization early warning about emerging issues. Informal search draws a profile of an issue or development, allowing the organization to identify its main features and assess its potential impact. [And] formal search gathers all relevant information about an issue to enable intelligent decision making.[11]

FUTURES WHEEL

The futures wheel is one of the most common methods employed by futurists. It is a simple way of organizing thoughts and exploring the future. It is comparable to what is more commonly referred to as structured brainstorming and is aligned closely with mind mapping, a similar futures methodology. It is a simple graphic organizer that allows for a representation of complex interrelationships between trends that can be described as follows:

The futures wheel is a simple futures research method designed to systematically capture qualitative expert knowledge. The futures wheel allows researchers to identify and present secondary and tertiary consequences of trends and events.[12]

S Secondary Consequences

T Tertiary Consequences

FIGURE 1: AN EXAMPLE FUTURES WHEEL

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10. The methods detailed are particularly well suited to Future Army given the parameters of the project itself and available material and human resources. All are characterized by an ease of use ideal for a team consisting of a small group of analysts with varying backgrounds, skill sets and time constraints. Indeed, their "user-friendliness" expedites the capacity to focus quickly on the analytical phase of the inquiry. Their technical requirements (e.g., computer support and software) are minimal, thus ensuring that the group is highly cost-effective. And, most important, all methods are particularly well suited to the nature of the analysis undertaken—i.e., the identification and investigation of long-term trends and drivers, an exercise which often involves qualitative data and the exploration of the causal interactions that could occur between them (a task requiring visualization of complex interactions between variables). In fact, the activities involved in employing these methods encompass a number of functions often identified by practitioners in the field as methods unto themselves (i.e., scanning, trend analysis, trend monitoring, and brainstorming). Beyond this, as described later in this chapter, the project employs two additional methods, scenarios and gaming, in subsequent and concluding stages. As such, the project draws on a range of methods associated with the foresight discipline.

11. Chun Wei Choo, "The Art of Scanning the Environment, *Bulletin of the American Society for Information Science*, Vol. 25, No. 3, 14.

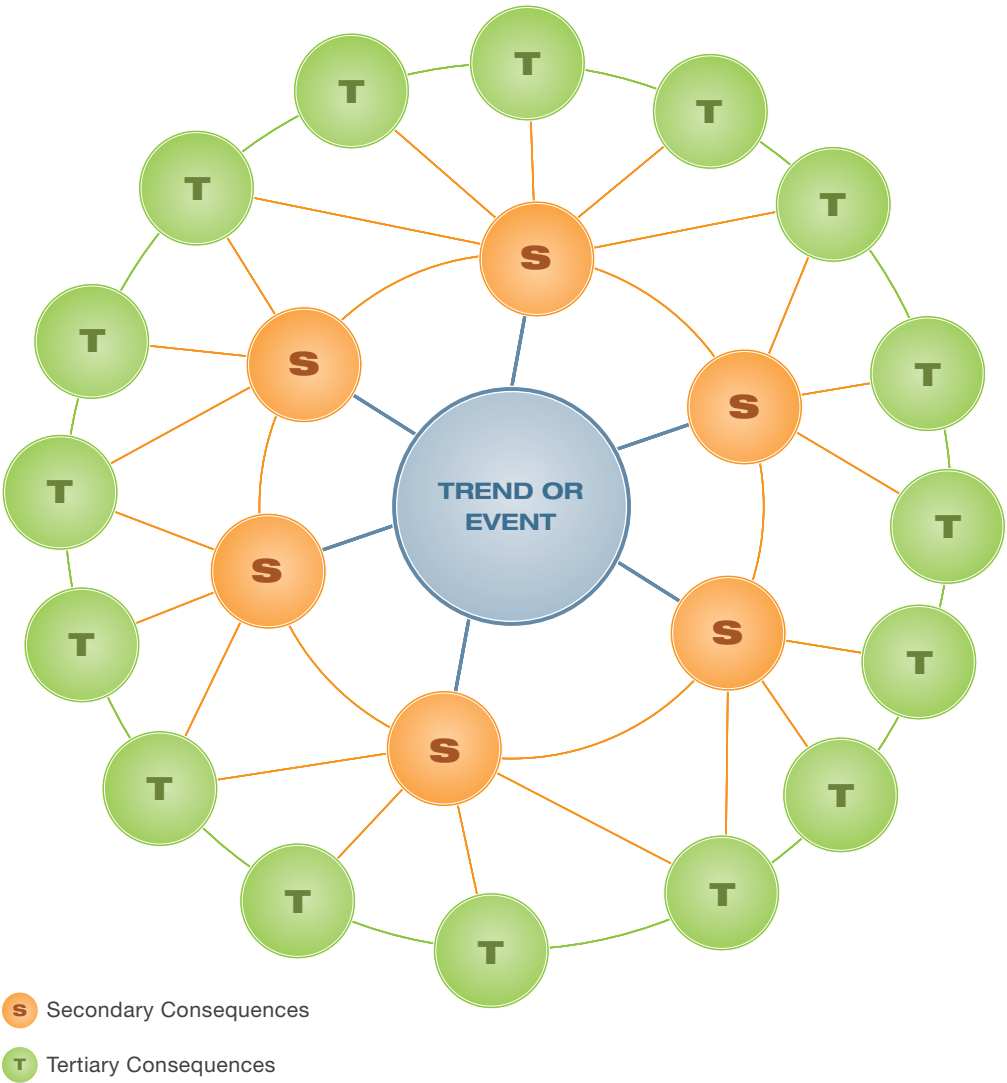
12. Indeed, it is well acknowledged in futures research that "no single method should be trusted; hence, cross referencing methods improves foresight." Further details can be found at http://www.palgrave-journals.com/thr/journal/v8/n1/full/thr20082a.html.

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While the futures wheel method is easily grasped, an undisciplined approach can result in what is referred to as "intellectual spaghetti," (i.e., the generation of a myriad of interactions that become so complex that they tend to complicate and confuse the implications of the trends examined). This method is limited by the participants' knowledge. Although information overload can occur, confining analysis to the primary, secondary and tertiary rings allows for visualization of a vast amount of qualitative information that has both depth and contextual richness.

HINDSIGHT

While the past is often said to be prologue, it is not destiny. Historians themselves acknowledge as much in noting the necessity of devoting some attention to long-term planning visions in order to avoid falling victim to what some have described as the "profound forces of history."[13]

That said, hindsight[14] and learning from the past are essential components of the process of foresight, as past experience often filters and conditions the impact of evolving trends and drivers on states, societies and the organizations and individuals that make them up. To this end, historical analysis of trends, drivers and their potential impacts is also employed to help ensure that observations and conclusions advanced are adequately informed by an appreciation of past history and context.

RED TEAMING

Lastly, throughout the effort, a process of "red teaming" was instituted to provide an additional check on the output of the investigation.[15] One core team member was selected to monitor and participate in group discussions with the aim of questioning the team's fundamental assumptions, the lines of reasoning employed in advancing arguments and conclusions concerning the material under examination, and raising alternative possibilities which might be underplayed or overlooked during group discussion.

APPLICATION: ESTABLISHING KEY FOCUS AREAS, DRIVERS AND ALTERNATIVE FUTURES

A 10-step process was used to develop and test alternative futures and their implications for the Future Army.
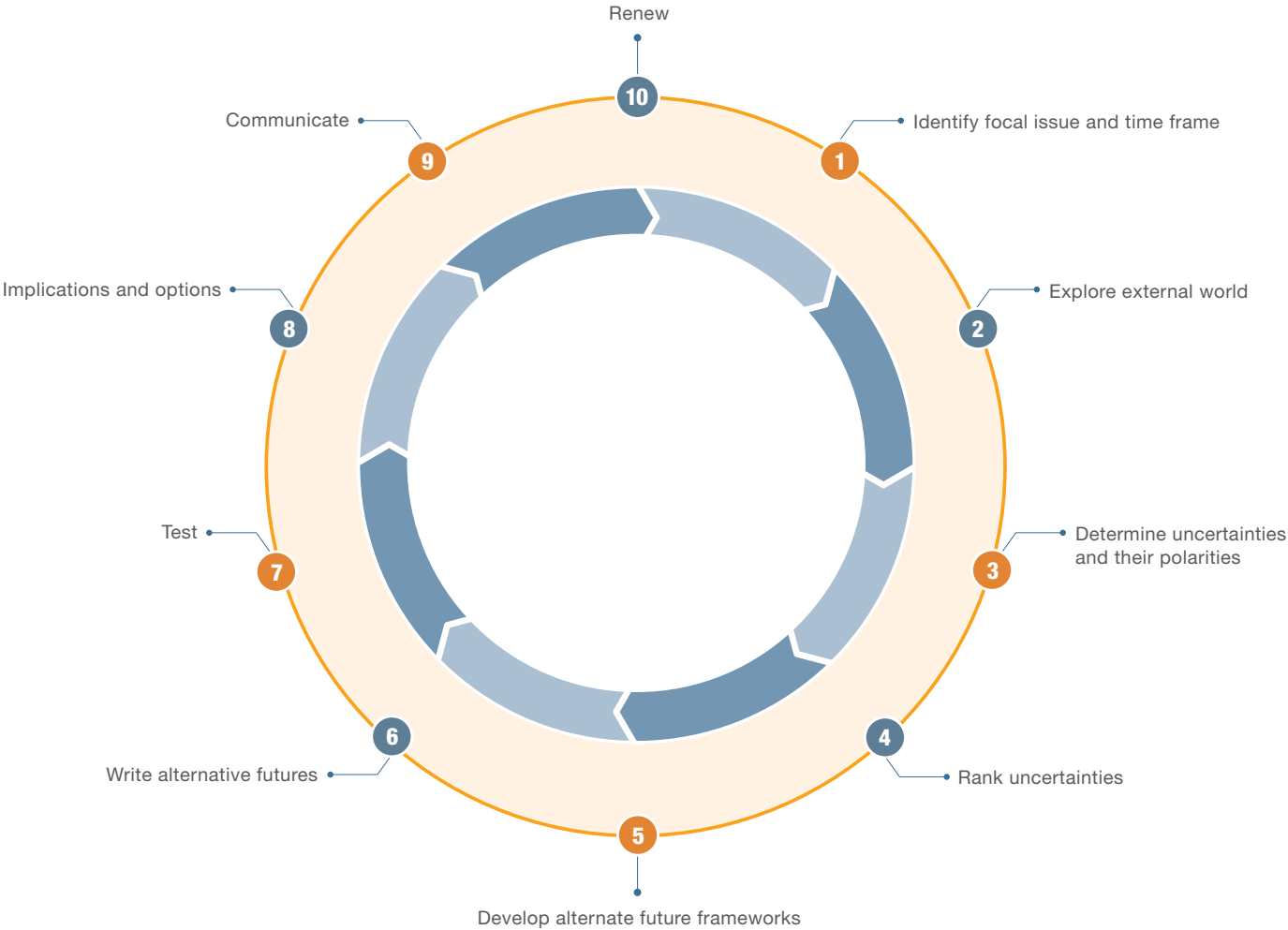
FIGURE 2: ALTERNATIVE FUTURES METHOD

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13. Talbot Imlay and Monica Duffy Toft, "Conclusion: Seven Lessons About the Fog of Peace," in Talbot C. Imlay and Monica Duffy Toft, *The Fog of Peace and War Planning: Military and Strategic Planning under Uncertainty* (New York: Routledge, 2006), 252.

14. Hindsight is an awareness of forces that originate in the past, carry through to the present and persist (albeit often in modified form) in the future. On this point, see Leon S. Fuerth, "Foresight and Anticipatory Governance," *Foresight,* 11:4 (2009), 18.

15. For a discussion of red teaming in a military context, see Susan Craig, "Reflections from a Red Team Leader," *Military Review* (March–April 2007), 57–60.

The steps are identified as follows:

STEP 1: IDENTIFYING KEY ASPECTS OF SELECTED FOCUS AREAS

The initial stage in the process involves use of the environmental scanning method to identify those focus areas judged as key for the Future Army in the 2040 timeframe. Each area identified is then researched and studied in depth by project team participants to gain a full appreciation of potentially important changes: drivers, trends and "weak signals." The method—along with use of the futures wheel, hindsight and red teaming—allows for an analysis of what is constant, what changes, and what constantly changes in the areas under scrutiny. It also helps to provide a number of general, wide-ranging hints as to the direction that the future may take.

Science and technology, social, political, economic, legal, physical environment, and security are key focus areas identified for study. So are changes in the human domain likely to take place in the future environment (i.e., Human Dimension). Future potential shocks and uncertainties which could significantly alter outcomes in each focus area[16] are also identified. Thus, the basic identification and extrapolation of drivers, trends and weak signals[17] provided by environmental scanning is supplemented to ensure a more comprehensive appreciation of future possibilities and potential occurrences.

STEP 2: IDENTIFYING KEY DRIVERS USING THE FUTURES WHEEL

The higher-order impacts of the numerous trends studied are then identified through a process of structured brainstorming using the futures wheel method and a knowledge-mapping tool known as PersonalBrain. This process leads to the subjective identification of key drivers of change deemed as significant for the army in the 2040 time frame. The key change drivers identified for the Future Army project are as follows:

1. Impact of age and demographics on military force composition;
2. Energy security;
3. Exponential technology growth;
4. Human/social response to technology;
5. Expansion of operating environments;
6. Global environmental change;
7. Globalization;
8. Conflicting/shifting identities;
9. Shifting power balances;
10. Resource security;
11. Distribution of wealth; and
12. Weapons proliferation.

STEP 3: DETERMINING UNCERTAINTIES AND THEIR POLARITIES FOR KEY CHANGE DRIVERS

Critical uncertainties are the big questions that are most critical to the focal issue at hand. In the case of Future Army, the focal question is as follows: how should the Canadian Army evolve in order to remain a key instrument of national power in 2040?

A solid analytical framework ultimately rests on the identification of critical uncertainties affecting the army. To this end, the polarities or endpoints of the drivers of change are established to further define and understand each driver—a process that results in creation of the following polarities for each of the change drivers listed above:

1. Impact of age and demographics on military force composition: population decline and aging societies vs. population growth and younger societies;
2. Energy security: surplus of energy vs. energy deficiency;
3. Exponential technology growth: set the pace by actively engaging in technological development and innovation vs. fall behind by rejecting or at best passively accepting new developments and innovations;
4. Human/social response to technology: reject technology vs. embrace technology;
5. Expansion of operating environments: defensive strategies vs. offensive strategies (i.e., monitoring new operating environments vs. actively exploiting new operating environments);
6. Global environmental change: crisis reaction vs. proactive action;

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16. The trends within each of these broad areas are then analyzed using the futures wheel method to reveal the complex interconnections between them.

17. A driver is a factor that directly influences or causes change; a trend is a discernable pattern of change; and a weak signal is an early warning indicator of change that typically becomes stronger when combined with other signals.

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(7) Globalization: acceleration vs. deceleration;

(8) Conflicting/shifting identities: global community vs. fragmentation;

(9) Shifting power balances: cooperative/less friction vs. competitive/more friction;

(10) Resource security: sustainable supply of resources vs. an unsustainable supply of resources;

(11) Distribution of wealth: uneven vs. even; and

(12) Weapons proliferation: disarmament vs. acceleration of weapon spread.

STEP 4: RANKING UNCERTAINTIES

Once polarities for each change driver are established, each driver is then assessed to determine its level of uncertainty and its impact in the future on a low, medium and high scale, thereby indicating a ranking of the change drivers. Uncertainty refers to the degree to which the key change drivers and their related trends are known or well understood. Lower uncertainty suggests a higher degree of confidence that an extrapolation of the trends will closely resemble actual future events. Impact refers to the degree to which the key change drivers will influence future events. The assessment enables an understanding of the position of each change driver in relation to the others on an impact and uncertainty graph.

The CALWC Future Army project analysis focued on change drivers that were high in both impact and uncertainty. Two of the change drivers—energy security (2) and global environmental change (6)—ranked highest on both criteria (see Figure 3).
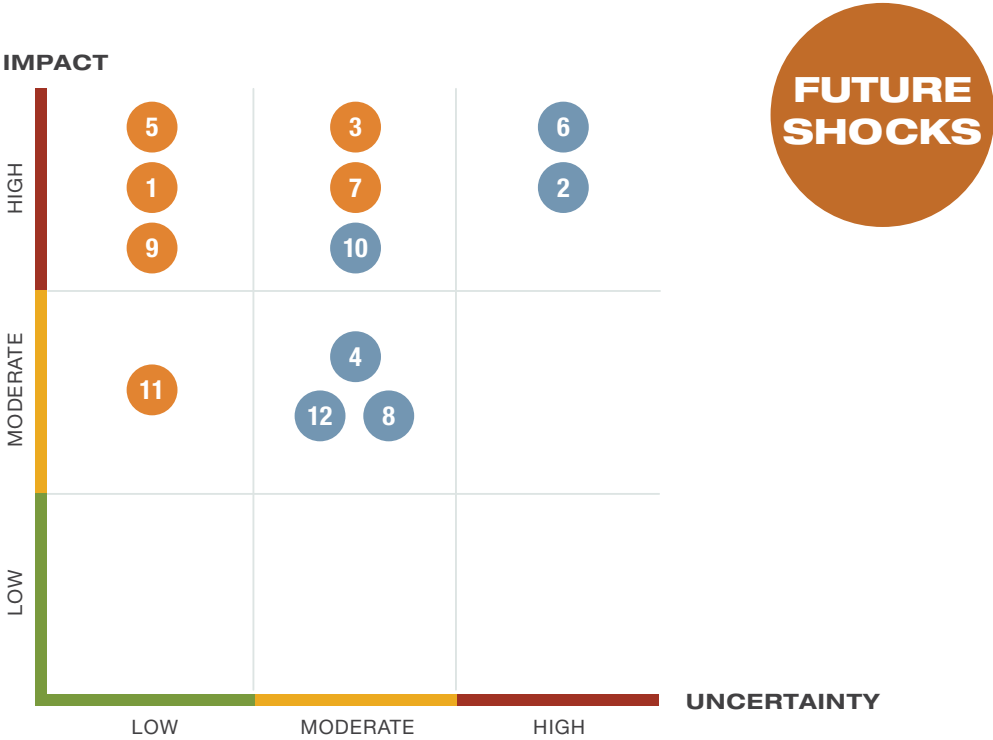
FIGURE 3: IMPACT–UNCERTAINTY CLASSIFICATION

STEP 5: DEVELOPING ALTERNATIVE FUTURE FRAMEWORKS

In the following illustration the ranking of change drivers provides the basis for the creation of a set of alternative futures which are subsequently investigated. Developing alternative futures is an important activity for an organization in an increasingly complex world, as they are a long-range planning tool designed to highlight changes in the operating environment that could influence and indeed shape the trajectory of army capabilities in future decades. Each alternative future is a logical, coherent, detailed and internally consistent description of a plausible future operating environment (FOE). Alternative futures provide a means to hedge against uncertainty and perhaps to envision a range of possible future requirements. The term "alternative future" is often used interchangeably with "alternate world," "future world" and "future scenario."

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Alternative futures describe in objective terms what a future might look like. The probability of each alternative future emerging is not assessed; rather, CALWC consciously argued that each future meets a "not implausible" standard. While it was anticipated that several aspects of the alternative futures may prove inaccurate, their development assisted in guiding long-range Canadian Army planning. In essence, the process provided a hedging strategy against future uncertainty.

STEP 6: WRITING ALTERNATIVE FUTURES

Having established the axes of the framework to be developed, based on the two critical uncertainties determined by the team as having a high ranking in impact and uncertainty, the team then commenced brainstorming the four potential futures: the good, the bad, and two mixed quadrants, not so good / bad (see Figure 4). Moreover, in each of the four alternative futures, consideration is given to those change drivers that are considered to be of high impact but of low to medium uncertainty—(i.e., as represented in Figure 3 by key driver items 5, 1, 9, 3, 7, and 10). It is important here to consider these items within the context of the established alternative future space, since each item will be influenced in subtly different ways by the unique context of each quadrant. As such, each quadrant becomes internally consistent with the overall framework. This allows for more robust futures and assists in the process of crafting scenarios—the next step in the process.[18]

An elaboration of four alternative futures utilizing the change drivers of energy sustainability and global environmental change would thus yield the following four futures, each labelled based on the key message (or central theme) characterizing it:

1. **HIGH-OCTANE "GREEN" WORLD (HOGW)** – A future in which global energy supply exceeds demand (i.e., is sustainable) and in which global actors are taking a proactive approach to the environment.

2. **GLOBAL QUAGMIRE (GQ)** – A future in which energy supply is increasingly scarce (i.e., is not sustainable) and the global actors are taking a reactive approach to the environment.

3. **MATERIALISM GONE MAD (MGM)** – A future in which energy supply exceeds demand (i.e., is sustainable) but in which the global actors continue to take a reactive stance on the environment.

4. **RECYCLABLE SOCIETY (RS)** – A future in which energy is scarce (i.e., demand exceeds supply) but one in which global actors are taking proactive approaches to the environment.

FIGURE 4: ALTERNATIVE FUTURE SPACE (ENERGY & ENVIRONMENT)

STEPS 7/8: SEMINAR WAR GAME – TESTING AND ASSESSMENT

The next logical step in the research agenda involves determining the specific implications that each of the four futures elaborated hold for the Canadian Armed Forces (CAF) in general and the Canadian Army in particular. Once again, such an exercise involves deductions based on the trends and drivers identified and the directional values accorded them in each quadrant.[19]

The testing and assessment of each of the alternative futures is undertaken in a seminar war game format. All seminar war games are conducted in a similar manner to allow for the results to be compared and analyzed. Each exercise consists of a combination of presentations, discussions and ranking of results derived from participant assessment based on the

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18. Any initial determination of key drivers to be used in constructing a set of alternative futures in no way prevents the development of additional sets of alternative futures based on other change drivers identified should further investigation be judged necessary. Indeed, such work is encouraged.

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19. The testing and assessment phase of the Future Army exercise involves the examination of each alternative future and the implications each holds for Future Army capabilities and characteristics. However, the development of specific scenarios based on each future and exploration of the implications of these for capability development offers a second, additional option for the conduct of testing and assessment. Such an exercise would presumably yield conclusions at a somewhat greater level of specificity and fidelity than would a general assessment based solely on the alternative future itself. Yet it also demands greater investment in terms of time and resources. Given such factors, along with the limited size of the Future Army core team, the initial exercise will be confined to use of the more general option. That said, this should by no means exclude consideration and use of a scenario option in future iterations of the exercise.

alternative future under examination. Seminar participation is by invitation and would include personnel from the capability development organizations (e.g., Canadian Army, Royal Canadian Navy, Royal Canadian Air Force, joint agencies, select allied organizations), defence scientists and select academics.

In examining each alternative future, seminar participants are provided with background information on the particular future under examination and asked to describe and prioritize: 1) the potential defence and security implications that the future under examination would produce; as well as 2) the characteristics; and 3) capabilities that the Canadian Army would require to maintain its relevance within the future examined.[20] Following examination and assessment of each future, results are recorded and eventually compared to identify Future Army core capabilities (i.e., those common across all four futures), those capabilities that may not be common but which are seen as nonetheless crucial in a particular future and any signposts that were judged as indicating the direction in which the world is progressing.

A follow-on exercise, aimed at the investigation of any security topics and issues identified during the wargame series as particularly important and relevant for Future Army capability development (e.g., recognition of particularly significant and/or novel threats and capabilities) will also be conducted, if required. Such an exercise would take the form of a workshop consisting of focused discussions involving project staff and key subject matter experts, investigating those subject areas deemed potentially important for the Future Army. The results gained would feed into the final analysis of wargame results as well as a final report detailing Future Army observations and recommendations.

STEP 9: COMMUNICATE

Results from the testing and assessment exercises conducted for each alternative future, together with the findings derived from a comparative assessment of all four, are then widely communicated to educate and inform the CAF and other public and private agencies. The results also provide a key foundation for further exploration, discussion and improvement of the alternative futures process and its outcomes.

STEP 10: RENEW

The alternative futures process is not a static undertaking. Indeed, the process recommences at a predetermined future point. The first step in a new cycle would entail a critical review of previous futures work in order to gauge its accuracy and relevance. Thus, completion of the full lifecycle of the process allows the army to keep pace with the ever changing global environment.

CONCLUSION

The future security environment defies accurate prediction. Defence establishments around the world must continue to strive to understand and define how their national security policies fit within this paradigm. Adoption of a foresight research agenda and use of foresight methods offers a more proactive approach, allowing state militaries to anticipate and possibly highlight certain areas that require policy decisions today—both in defence and national security—to meet future expectations.

The Future Army project and the 10-step research method detailed above aim at providing just such an approach, offering a means to better ensure that even if accurate prediction eludes us, our forces will still be structured and equipped to quickly and effectively adapt to the challenges that do arise.

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20. Questions developed for use in the seminar wargame series could take the following form:
    1) Given the world described, what defence and security implications are likely to affect Future Army and what missions and tasks are required for Future Army?
    2) Given the defence and security implications of the world described, what characteristics are required of Future Army?
    3) Given the defence and security implications of the world described, what capabilities are required of Future Army?

The chapters that follow detail the research and analysis conducted in support of this 10-step process. Specifically, Chapters 2–6 present the results of the environmental scans conducted in the eight focus areas: identifying the key trends, drivers and uncertainties likely to characterize the future security environment. At the end of this volume, four alternative futures are elaborated based on the research provided in the scans and the impact—uncertainty analysis described above. This provides a foundation for further analysis of alternative futures, and insights into the missions, tasks, characteristics and capabilities of the Future Army. When that work is completed, it will be presented in a companion volume.

CHAPTER 2

THE PHYSICAL ENVIRONMENT

INTRODUCTION

It is a truism that the physical environment acts to condition all human and state activity. Not surprisingly, the environmental characteristics of significance in assessing the nature and dimensions of future threats and challenges are numerous. Yet characteristics of particular, and growing, importance include the presence and continued availability of key natural resources, demand for such resources, and access to them.

Such characteristics raise not only issues of resource scarcity and its causes, but also fundamental questions concerning the current and future well-being of societies, states and, indeed, of the international system as a whole. The presence or relative absence of key natural resources along with the capacity to access them can fundamentally impact the character of states, societies and the regions they occupy in ways that can be crucial to stability and security.

Resources essential to the health of societies are generally classified as falling into two broad categories: renewable and non-renewable. While minerals and fossil fuels represent prime examples of the latter, categories of the former, considered particularly essential to the health of developing nations, include fresh water, croplands, forests and fisheries.

The availability of both renewable and non-renewable resources has been, and continues to be, highly uneven. This is due not only to geographic occurrences and the spatial distribution of resources on earth itself, but also to the varying demand for them and the capacity of states and societies to access them.[21]

"THE PRESENCE OR RELATIVE ABSENCE OF KEY NATURAL RESOURCES ALONG WITH THE CAPACITY TO ACCESS THEM CAN FUNDAMENTALLY IMPACT THE CHARACTER OF STATES, SOCIETIES AND THE REGIONS THEY OCCUPY IN WAYS THAT CAN BE CRUCIAL TO STABILITY AND SECURITY."

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21. Similar categorizations of resource availability and scarcity are available throughout the academic literature. For example, Thomas Homer-Dixon identifies three distinct but often interacting processes by which environmental scarcities can occur: 1) supply-induced scarcity, 2) demand-induced scarcity and 3) structural scarcity. *Supply-induced scarcity* occurs when the method or rate of harvesting of natural resources exceeds a certain level of degradation or depletion. If such excesses are particularly severe, a given resource may become not just temporarily unsustainable, but altogether extinct, regardless of any subsequent efforts to regenerate the resource. *Demand-induced scarcity* can be the result of a constant resource base in conjunction with either a growing population or a growing appetite within a population. Lastly, *structural scarcity* results when one or more groups are excluded from equal access to a particular resource. Such exclusion can stem from a variety of interrelated causal factors. It can also represent one manifestation of various types of societal tension and conflict (e.g., political, ethnic, religious or cultural). For elaboration, see Thomas Homer-Dixon, *Environment, Scarcity and Violence* (Princeton, NJ: Princeton University Press, 1999), especially chapters 2 and 4.

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Increasingly as well, resource availability or lack thereof is attributable to global climate change and its impacts (i.e., extreme weather, ranging from hurricanes to heat waves to droughts). Such forces all interact to determine the ability of states and societies to meet their resource requirements.

CURRENT STATE

The practical result is a world characterized by a patchwork quilt of resource "haves" and "have-nots" and growing stress on the existing global resource base and the environment, as states and societies increasingly compete to address the resource requirements necessary for continued survival, modernization and development.

Evidence of such impacts is plentiful on both a global and regional scale, with many states and societies currently struggling to meet existing, let alone projected, resource needs. The struggle is particularly intense in the developing world, as population growth, rapid urbanization and the demands of industrialization continue to stress and often erode local capacity.

Resource pressures are nevertheless far more acute in the developing world, owing to high population growth, rapid urbanization, weak state capacity, widespread environmental degradation and often poor climatic conditions. Access to renewable resources such as fresh water, croplands and forests is a particularly acute problem. For instance, in the case of fresh water, recent estimates indicate that more than three billion people in over forty countries, the majority of them in the developing world, live under water-stressed conditions. Disease, loss of agricultural productivity (due to inability to sustain irrigation) and economic stagnation are just some of the results. The fact that those societies most affected lie in Sub-Saharan and North Africa, the Middle East, South Asia and North-East Asia is particularly worrisome, especially in light of the longstanding and continued history of instability and armed conflict which characterizes such regions.[22]

Elsewhere, the drive for non-renewable resources is more salient, a fact well illustrated by the increasing consumption of minerals and fossil fuels by nations such as China and India as they attempt to sustain ongoing development and modernization efforts.

Such efforts have resulted in fast-paced industrialization and a marked rise in living standards for millions. Yet they have done so at considerable expense to home environments, polluting the air, countless rivers and groundwater.[23] Beijing's hunt for additional sources of energy supply in areas such as Africa, Central Asia, South America and the Middle East has generated additional concerns ranging from increased geopolitical influence in such regions, to intensified resource competition with other states, to the ecological decimation of host societies and potential instability.

Similar, although less intensive, pressure on resource supplies is also being felt in the developing world. Indeed, resource demand in industrialized societies is increasing. Yet most developed countries continue to maintain relatively sound access to existing sources of domestic and foreign supply. This is due in some cases not only to strong domestic renewable and non-renewable resource bases, but also to the state's solid capacity to ensure ready access to key stocks abroad.

Still, in recent years there have been shortfalls and growing concerns in some key areas. Local shortages of fresh water have been on the rise in a number of nations (including areas of Central and Southern Europe and the Western United States), and more are expected. Concerns over supply of and continued access to fossil fuels have been even more apparent, particularly in light of rising demand within—and growing resource competition from—the developing world (e.g., China and India), as well as political instability in key petroleum-producing regions (e.g., the Persian Gulf, West Africa and Latin America). In addition, there are growing concerns over supplies of certain rare minerals and rare earth elements (REEs), which are used extensively in civilian and military products (e.g., hybrid and electric cars, hand-held electronic devices, fluorescent lights, precision-guided munitions, lasers and satellite communications). Sources of supply are highly constrained in terms of physical location, raising growing concerns over future access.[24]

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22. C.J. Dyck, "The Future of Conflict: Looking Out to 2020" (U.K.: Defence Academy of the United Kingdom; U.K. Ministry of Defence, 2003). As Dyck notes, the fact that a number of states in such regions often share a common water source poses a growing concern as well as a lingering source of potential state turmoil. Today 17 water basins have considerable potential for disputes in the immediate future, including between Jordan, Syria and Lebanon, between Egypt, Ethiopia and Sudan, and between Kyrgyzstan, Uzbekistan and Kazakhstan. See Dyck, 7.

23. In 2008, for instance, China consumed over 22.6 billion tonnes of minerals and fossil fuels, up from 1.7 tonnes in 1970 and four times as much as the United States. Meanwhile, the country still lags global and regional standards in resource efficiency, using 2.5 times more energy than the global average to produce each unit of economic growth. According to a recent UN report, a full 30% of China's major rivers and 60% of its groundwater is polluted and fewer than one in four major cities have safe air. See Li Jing, "China's Industrial Growth 'A Treat to Resources,'" *South China Morning Post,* 4 July, 2014, available at http://www.scmp.com/news/china/article/1294075/chinas-transformation-industrial-powerhouse-eating-away-resources.

24. China possesses approximately 97% of the actual global supply of many REEs, and government policies meant to assure supplies to meet domestic requirements, in conjunction with certain policies in other states possessing REE deposits, have created a de facto monopoly. For a good discussion, see Donald A. Neill and Elizabeth Speed, "The Strategic Implications of China's Dominance of the Global Rare Earth Elements (REE) Market," DRDC CORA TM 2012-204, September 2012, 45.

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Thus far, however, the impacts of such shortfalls in the developed world have been relatively limited. Cases of water scarcity have generally remained sporadic, highly localized in impact and amenable to relatively prompt and effective efforts at remediation. As for fossil fuels, continued investment in exploration, the development of new forms of resource extraction (e.g., horizontal drilling and hydraulic fracturing technologies), the availability of alternative energy sources, and the maintenance of access to key sources of international supply, have ensured that disturbances, while doubtless costly economically, have thus far remained relatively manageable. And while concern remains over potential shortages of and continued access to key REEs, in recent years there has been increasing support for action and the identification of a number of potential alternative sources of supply (e.g., Greenland and Canada).

EVOLUTION

In general, the forces discussed above will probably continue to shape the relationship of states and societies to the physical environment. More specifically, competition for both renewable and non-renewable resources will continue, if not intensify, and pressure on existing sources of supply will probably increase as a consequence. Furthermore, while supplies of both renewable and non-renewable resources will be impacted, a steady decline in the latter is especially likely.

Signposts supporting such a prognosis are evident in a number of areas. Notwithstanding some slowing of global population growth in the decades ahead, projections released by the World Bank indicate that global energy consumption can be expected to increase by approximately 2% annually, a level likely to stress nations despite projected advances in extraction technologies. Scarcities of fresh water may well impact nearly half of the globe's total population, including between 75 million and 250 million people in Africa. Reports indicate that land resources required for crop production may increase in some regions of the world, but gains realized are likely to be modest or totally absent in others (e.g., Near East, North Africa, South Asia).[25]

Notably, ongoing innovation in areas such as efficient energy extraction and use will probably slow the continuing decline in certain areas of non-renewable energy to a degree that will eventually reduce not only overall energy vulnerability, but the importance of a number of longstanding energy suppliers. Recent data indicating a marked increase in oil and natural gas production in the United States as a result of horizontal drilling and hydraulic fracturing

technologies may be a harbinger of things to come (e.g., the so-called "shale gas revolution").[26] If such technologies continue to bear fruit and are more broadly adopted, they may considerably lessen the dependence of some states on regions such as the Middle East and Africa as key energy suppliers. As former energy importers become increasingly self-sufficient and reap the economic benefits of newly available domestic supplies, longstanding oil producers may face corresponding economic decline and even societal instability.

Here, much will depend on a variety of factors, not least of which will be the lingering need for states that are unable to adopt new extraction technologies to continue importing energy from traditional suppliers. Yet, whatever the outcome, the possibility exists that the geopolitical landscape could change considerably as a result.

Certainly, overly detailed projections must be treated with caution. Despite recent successes, questions remain regarding the environmental impacts of hydraulic fracturing ("fracking") technologies, their cost-effectiveness over the longer term and the capacity of other states to adopt such methods given variations in areas such as domestic law (e.g., property rights) and societal attitudes toward the environment.[27] Nor, for that matter, should such methods be viewed as a cure-all for the energy dilemma. While they may ease pressure on existing sources and slow the decline, it is unlikely that they can prevent decline entirely.

Future demand will increasingly come from developing nations, owing to somewhat lessened but still steady population growth, continued efforts to modernize and a likely expansion of consumer classes along the way. As for the developed world, while slower population growth and more environmentally sustainable practices may work to temper resource requirements somewhat, the longstanding habits of consumer societies will probably make truly significant declines in resource demand and use unlikely.

Accordingly, efforts at resource exploration will expand, and at least until the implications of fracking technologies become clear and wider adoption occurs, the significance of regions traditionally rich in key non-renewable energy resources (e.g., Persian Gulf) will probably endure.

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25. See "How to Feed the World 2050, High-Level Expert Forum, Global Agriculture Towards 2050," (Rome: High-Level Expert Forum—How to Feed the World in 2050, Office of the Director, Agricultural and Economics Division, Economic and Social Development Department (12–13 October 2009), 3.

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26. According to Edward L. Morse, Global Head of Commodities Research at Citi, the shale revolution in oil and gas promises "a paradigm shift in thinking about hydrocarbons." Indeed, he notes that U.S. adoption of such technologies has resulted in a 60% increase in oil production since 2008, climbing by three million barrels a day to more than eight million barrels a day, and that the U.S. will exceed its old record of ten million barrels a day in a couple of years. By that point, Morse argues, the U.S. will overtake Russia and Saudi Arabia to become the world's largest oil producer. See Edward L. Morse, "Welcome to the Revolution: Why Shale is the Next Shale," *Foreign Affairs,* Vol. 93, No. 3 (May–June 2014), 3–7.

27. See Fred Krupp, "Don't Just Drill Baby—Drill Carefully: How to Make Fracking Safer for the Environment," *Foreign Affairs*, Vol. 93, No. 3 (May–June 2014), 15–20.

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Other regions such as the Arctic,[28] the Caspian Basin, West Africa, the South China Sea and Latin America will also see considerable activity. Meanwhile, maintaining continued and secure access to major sources of energy supply via secure pipelines and through key waterways and straits (e.g., Straits of Hormuz, Straits of Malacca, Suez Canal), will remain crucial.

Throughout, concerns over security will remain significant, as expanding energy networks and supply lines generate potential vulnerabilities and opportunities for disruption. So too may the chances of disputes arising over territorial boundaries, both on land and offshore (e.g., Arctic, Gulf of Guinea, South Atlantic). Interstate tensions and even prospects for armed conflict in support of energy security may well intensify as a result.

The drivers of such trends are numerous, complex and often interconnected. Indeed, they span virtually all dimensions. Yet several are especially noteworthy. One major driver of change is undoubtedly the population growth rate, particularly at the regional level. To the extent that current population estimates prove inaccurate, demand for resources may well change. So will resource availability. Scarcity and resource pressure are also likely to vary with the level of economic development that characterizes particular societies, with those in the midst of major industrial development likely to consume more resources than those at a post-industrial stage.

Variations in political regime and policy may impact the direction and intensity of trends as well. Indeed, not only can regime type and the policies adopted significantly influence the degree to which certain societal groups and interests are permitted access to key resources, but also the extent to which innovation may serve to heighten or arrest growing resource scarcities.

Beyond this lies the impact of climate change. Despite considerable uncertainty about the pace, cause, magnitude and implications of such change, there is little doubt that it is proceeding. As such, it is an identifiable driver not only of resource scarcity, but also of supply and demand for existing resources.[29]

A range of shocks and random events could also act to significantly alter the direction or intensity of ongoing trends. The occurrence of natural and certain man-made disasters such as earthquakes, tsunamis or armed conflict could work to heighten scarcities, decimating not only immediate environments but those surrounding them. In such cases, the impact of such events might include not only the breakdown of trans-border resource networks, but also considerable pressure on neighbouring lands due to mass migration from the areas initially affected.

Moreover, if human causes lie at the root of climate change and if those causes will not or cannot be halted, climate change could itself become a shock. Indeed, in an extreme scenario, crop failures (or drastic yield changes) could cause mass starvation and/or migrations. Polar ice cap and glacial melts could cause sea-level changes, predicted by some to be in the range of two to several metres. This, in turn, could lead to the abandonment of large urban and cropland areas, further aggravating a broad range of existing resource scarcities.

Still other shocks could work to significantly mitigate or even reverse ongoing trends. The development and widespread distribution of new and as yet unforeseen technologies capable of increasing the yield from existing resources or of harnessing the energy potential of untapped resources would be a case in point.

Many aspects of the future trajectory of resource supply and demand remain highly uncertain. Uncertainties surround not only the degree to which drivers such as climate change will occur, but also their impacts. The possibilities inherent in the adoption of new technologies remain equally uncertain, a fact underlined by ongoing concerns over the environmental impacts of horizontal drilling and hydraulic fracturing. Nor can one easily determine how future government policies (e.g., trade embargos on strategic resources) and even changes in society will ultimately impact future resource supply and demand. Yet, at the end of the day, uncertainty concerning future resource scarcity is not surprising. The physical environment is a complex system within which the full effects of human intervention are not often immediately apparent or, for that matter, straightforward.

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28. Changes in resource scarcities, combined with climate-change impacts, will confer new strategic relevance on global Arctic regions. Global warming could make the Northwest Passage (NWP) navigable for several months of the year before 2040. Some suggest the passage might even become commercially viable before 2020. Use of the NWP could reduce some international shipping routes by 20% to 40%, resulting in fuel savings of more than $14M to $17M per vessel per voyage (based on early 2008 fuel costs). This development might pose new challenges for Canada, since a number of nations (including the U.S.) still refuse to recognize Canada's sovereignty within our Arctic archipelago. Unconfirmed data suggests that energy and mineral reserves in the Arctic could be colossal. Some suggest that Canada's portion of fossil fuel reserves within our northern perimeter could be as large as (or larger than) the sum of all our known reserves today. And as some resources become scarcer, their prices will rise, increasing the feasibility of developing sites previously considered awkward (such as remote Arctic islands and the Arctic seabed.) This opportunity also brings challenges, as a number of nations have conflicting sovereignty claims for the Arctic seabed. Canada has two other conflicting bilateral Arctic sovereignty claims: one with Denmark over Hans Island (situated in the extreme north between Greenland and northern Ellesmere) and one with the U.S. over the offshore maritime boundary between Yukon and Alaska.

29. If this were not true, then the body of evidence that indicates a history of seven independent ice ages should be discarded and the recent record of historic polar ice cap shrinkage should be deemed just another example of a weather anomaly, and not solid evidence of climate change. The sub-debate about the distinction between weather (short-term noise) and climate change (long-term trends), a subject still considered controversial by many, is now beginning to be considered moot.
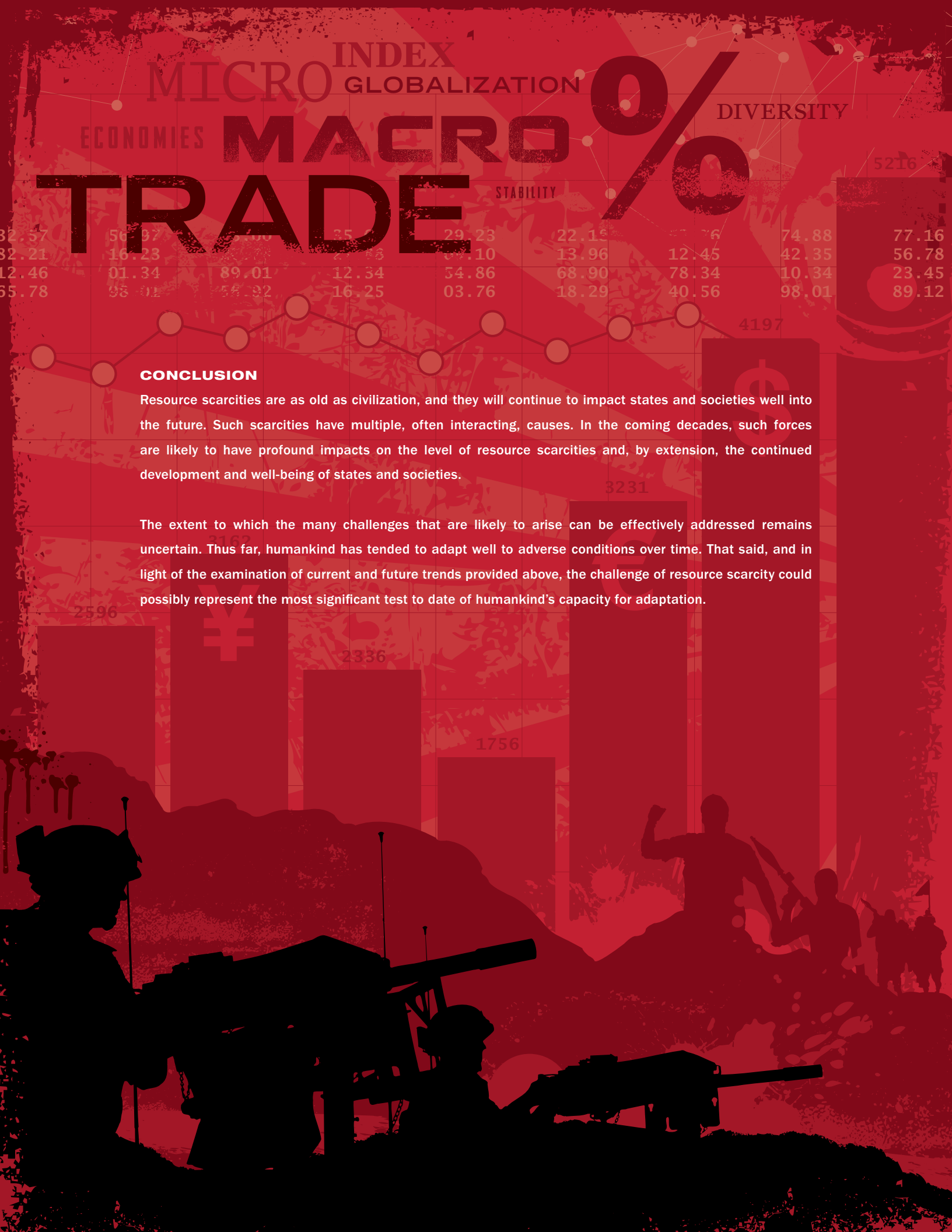
CONCLUSION

Resource scarcities are as old as civilization, and they will continue to impact states and societies well into the future. Such scarcities have multiple, often interacting, causes. In the coming decades, such forces are likely to have profound impacts on the level of resource scarcities and, by extension, the continued development and well-being of states and societies.

The extent to which the many challenges that are likely to arise can be effectively addressed remains uncertain. Thus far, humankind has tended to adapt well to adverse conditions over time. That said, and in light of the examination of current and future trends provided above, the challenge of resource scarcity could possibly represent the most significant test to date of humankind's capacity for adaptation.

THE INTERNATIONAL SYSTEM

INTRODUCTION

Key indicators of importance when examining the overall configuration of power or the basic structure of the international system must include the processes that characterize its ongoing development and character; the nature, diversity, stability and legitimacy of the political units or organizations that are part of it; and the basic issues which generate political action and economic competition.

CURRENT STATE

Even though the evolution of the international system is diverse and may be tracked using any number of indices, for most nations the ongoing convergence of world views, ideas, society, culture, material and communication resulting from globalization continues to largely define and characterize the international system of the 21st century. The evolution of the international system, international and national law, as well as macro and micro economies, will all have considerable influence on future Canadian defence and security issues including Future Army characteristics, capabilities, roles and missions. The following sections examine the evolution of each of these topics looking out to the year 2040, specifically investigating the trends, drivers, shocks and uncertainties that will shape each issue in the future.

EVOLUTION

INTERNATIONAL SYSTEM

A number of trends observed over the past decade will continue to mark the future. To be sure, states of varying types[30] will doubtless continue to represent the chief players in the international system, particularly in the areas of physical security, international law and national economic and monetary policy. At the same time, ongoing globalization, advances in science and technology, and problems such as

> "THE EVOLUTION OF THE INTERNATIONAL SYSTEM, INTERNATIONAL AND NATIONAL LAW, AS WELL AS MACRO AND MICRO ECONOMIES, WILL ALL HAVE CONSIDERABLE INFLUENCE ON FUTURE CANADIAN DEFENCE AND SECURITY ISSUES INCLUDING FUTURE ARMY CHARACTERISTICS, CAPABILITIES, ROLES AND MISSIONS."

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30. A number of democratic states emerged within the international system in the second half of the 20th century, but it is unclear whether this trend will continue. Indeed, there are signs that the system is currently witnessing a move to new, decidedly authoritarian forms of governance, most notably in Russia and China. Even here, however, assertions that such developments will continue into mid-century would be premature.

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resource scarcity and climate change will continue to generate dilemmas that will challenge traditional nation-state sovereignty, authority, control and cooperation. How the future sovereign nation-state will prevail in the face of such issues will probably represent a fundamental challenge for populations and economies in the decades ahead.

Certainly, further growth in the number and importance of supra-national and sub-national organizations and actors will occur (e.g., transnational corporations, international organizations, non-profit organizations, citizen activist groups). Some of these organizations will focus on a broad range of issues that span a number of regions and countries. Others will be local and single-issue in orientation. Yet all will represent new and important vehicles for citizen interaction and empowerment in a system in which a range of emerging forces continues to challenge the capacity of nation-states to respond.

These trends, driven by globalization, will in some cases prompt greater networking, cooperation and partnership between the state and non-governmental actors, with each increasingly recognizing the much-needed capabilities offered by the other for achieving effective, legitimate solutions to problems.[31] In others, the result may simply be the creation of new centres of power and influence beyond the nation-state itself. Yet whatever the outcome, it is likely that norms and procedures governing the manner in which solutions to future problems are pursued, and the means employed to address them, will change and perhaps evolve.

Given recent trends,[32] it is possible that future decades could see a gradual decline in traditional U.S. global influence relative to other developed nations, and a subtle shift from a starkly unipolar to a more multipolar, regional bloc–oriented world. Such a system may well feature a number of key nation-state players forging tight alliances with or against one another to balance power and maintain security. Alternatively, it may take the form of loose alliance configurations founded on traditional norms, with players constantly shifting loyalties depending on the issues at stake.[33] Yet, in either event, key state players will probably include, and possibly not be limited to, the U.S., China, Russia and India.

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31. That said, such partnerships are likely to remain limited and confined to specific states, organizations, issues and circumstances.

32. For empirical evidence, see Elbridge Colby and Paul Lettow, "Have We Hit Peak America? The Sources of U.S. Power and the Path to National Renaissance," *Foreign Policy* (July–August 2014), 56–63. See also Fareed Zakaria, *The Post-American World* (New York: WW Norton and Company, 2009).

33. Some analysts dispute whether such a system would even equate with past cases of multipolarity. In fact, Richard Haas suggests that the future international system may best be described as nonpolar—a condition in which power will be exceedingly diffuse and the influence of nation-states will decline as that on non-state actors increases. See Richard N. Haas, "The Age of Non-Polarity: What Will Follow U.S. Dominance?" *Foreign Affairs* (May–June 2008).

Meanwhile, areas of future political contention and concern will be numerous. Yet potential disputes over natural resources and the environment, sovereignty and territorial rights, state legitimacy and human rights will probably be paramount both internationally and nationally. Furthermore, possibilities for both state and sub-state conflict in many of these areas will continue to exist, especially (although not exclusively) in the developing world.

Globalization and rapid scientific and technological innovation will be major drivers of the political trends noted above. Often, the impacts of both will increasingly challenge the control, the legitimacy and the authority of traditional state actors and help create and empower new political entities (e.g., transnational organizations, citizen groups) to address major concerns. Yet demographic shifts, economic and environmental conditions and access to resources will propel emerging political trends, affecting the relative power and stability of states and societies as well as the rationales animating the agendas and actions of new political organizations and actors.

What the future political landscape consists of will also derive from past circumstances and events. For instance, the character of many nation-states will doubtless owe much to physical realities (e.g., geography, climate) and social composition (e.g., ethnic, religious and cultural characteristics). And while potential sources of conflict will often stem from emerging trends in other areas, they will also have roots in more longstanding realities (geopolitical circumstances, territorial disputes, historical ethno-religious rivalries, etc.).

To be sure, various shocks could clearly and fundamentally alter this future. A major systemic war involving weapons and means of mass destruction could conceivably work to reduce considerably the power of key actors to a point where the structure of the international system (and thus the behaviour of those within it) is quite different than that projected. Major environmental shocks arising from forces such as climate change may produce similar effects.[34]

Beyond this lies the fact that the fruition of such trends will be heavily contingent on the interaction of a broad range of forces and a wide array of leaders and personalities.[35] Accordingly, both the speed with which they unfold and the degree to which they impact particular regions and states will often involve considerable uncertainty.

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34. According to Vaclav Smil, there are essentially three categories of event which would have major "earth altering," long-term consequences: 1) natural catastrophes, 2) pandemic illness and 3) transformational wars. See Vaclav Smil, "The Next 50 Years: Fatal Discontinuities" *Population and Development Review,* 31:4 (June 2006), 201–236.

35. In this regard, one should note that shifts in the future distribution of power in the international system may crucially turn as much on the policy preferences and decisions of the leadership of major powers as on other factors. Indeed, policy choices may well work to hasten or arrest decline relative to other powers.

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INTERNATIONAL LAW

As the international system evolves, so too will the national and international laws that provide the frameworks for the societies that inhabit them.[36] Although the trend of nation-states existing and interacting within that rule-of-law framework will undoubtedly continue for the foreseeable future, there is an acknowledgment that the principles of Westphalian sovereignty reflected within that body of international law are being challenged by other states as well as individual actors. Increasingly, competing interests and ideologies will circumvent, flout or even disregard international law altogether to achieve individual and/or collective aims.

Emerging issues in international law increasingly involve 1) the establishment of new areas of law (e.g., cyber law) as a result of the evolution of new social and technical domains and 2) the enforcement mechanisms used to garner compliance with these emergent fields of law. While the enforcement issue continues to be well established and articulated within domestic law, mechanisms in international law, supranational law, and cyber and space law are substantially less well developed and enforced. Although progress will probably be made in each of these areas over time, it is anticipated that the mechanisms to garner compliance will evolve at a slower rate. This rate of progress may be exemplified in many ways, such as by the increasingly permissive nature of international law sanctioning or ignoring the use of outside force to intervene within state affairs based on foreign policy goals or humanitarian grounds.[37]

The desire of nation-states, especially within the developed world, to sustain the key principles of the Westphalian sovereignty model—specifically, the right to be left alone, to exclude, to be free from any external meddling or interference and to be recognized as an autonomous agent in the international system—will continue to drive both the evolution of international law and its enforcement.[38] Still, rules, norms and principles of international law will continue to look beyond just maintaining order.[39]

Minimum standards of global justice now considered as implied by international organizations such as the UN will continue to shape future trends, but other non-traditional groups enabled

by technology and globalized networks will also have greater influence than they might have had before. Future laws will probably come to be shaped as much by community acceptance (e.g., social legitimacy) as policy or constitutional counsel, with traditional norms being increasingly challenged by a wider public.

International human rights expectations, at least in the developed world, will continue to challenge legal institutions as well as domestic and international laws. Globalization, together with its emergent global civil society,[40] the convergence of publics, information technology and economic prosperity, has become a key driver in expanding this expectation in the developing world, and even within fragile and failing states. The absolute freedom of states to regulate their internal affairs has been continually eroded to a point where international tribunals and courts can convict those responsible for the worst crimes committed by governments or state militaries, wherever they may have taken place. Further, these tribunals and courts have been codified in customary international law with near universal acceptance. However, the ability to enforce a warrant of an international court, for example, remains an uncertain proposition and is frequently contingent on the good will of a state or states.

Challenges facing states and the international community, such as cross-border pollution, terrorist training camps, weapons proliferation and international organized crime, often have domestic roots where international law remains powerless. Perhaps more significantly, state boundaries are being increasingly confronted by international rules that regulate how states should behave within their territories, thereby advocating standards of global justice (e.g., Responsibility to Protect).[41]

While sovereign nation-states are still the main focus of most international law at present, international law increasingly recognizes individuals, groups, organizations and non-state actors (e.g., human rights law, holding individuals criminally responsible for violations of those rights; the creation of the International Criminal Court). While international law remains incapable of resolving many issues of conflict and confrontation today, it would be prudent to recognize international law's evolution, which signals increased scrutiny and judgment by the international community. From pursuit of global governance to individuals establishing their status as both subjects and agents under international law, to the increasing importance of non-governmental actors in the development and codification of international legal norms,

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36. International law is formally defined as the body of law which governs relations between sovereign states. It is a system of rules and principles created primarily by states, which cover almost every facet of inter-state activity. It is the vital mechanism without which an increasingly interdependent world could not function. International law deals with issues such as nationality, the use of armed force and the human rights of individuals. The practice of International Law is directly related to diplomacy, politics and the conduct of foreign relations.

37. Government of Canada, *Law of Armed Conflict at the Operational and Tactical Levels* (Ottawa: Office of the Judge Advocate General, 2001), 1-1; Christian Reus-Smit, "International Law" in John Baylis and Steve Smith, eds., *The Globalization of World Politics*, 3rd edition (Oxford: Oxford University Press, 2006), 350.

38. Anne-Marie Slaughter and William Burke-White, "The Future of International Law is Domestic (or, The European Way of Law)," Harvard International Law Journal, 47:2 (Summer 2006).

39. Christian Reus-Smit, "International Law" in John Baylis and Steve Smith, eds., *The Globalization of World Politics*, 359.

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40. For a detailed discussion see Mary Kaldor, "The idea of global civil society," *International Affairs* 79:3 (2003), 583–593.

41. See Global Centre for the Responsibility to Protect, viewed 4 June 2010 <http://globalr2p.org/>, and Department of Foreign Affairs and Trade, "Responsibility to Protect," viewed 4 Jun 2010 <http://www.international.gc.ca/glynberry/protect-resp-proteger.aspx?lang=eng>.

it can be argued that a wide body of international law is transforming to a system of supra-national law, laws above the state, where the globalized community as a whole establishes the legal norms in shaping world politics.[42]

As with other subjects in this study, there are many friction points and uncertainties that may directly impact, shape or modify the outcomes of these trends. Two in particular, the future of cyber law and international space law, have the potential to create uncertainty and deliver shocks that could impact sectors well beyond their immediate field.

CYBER LAW. The emergence of cyber law, a generic term which refers to all the legal and regulatory aspects of Internet and the World Wide Web, is concerned with, related to or emanating from any legal aspects or issues concerning any activity of "netizens" in and concerning cyberspace. Interestingly, unlike law governing other fields, the law of the Internet has no lengthy legal history. As such, cyber law is being developed by judges who must do their best to fit legal disputes on the Internet into pre-existing legal frameworks; that is, graft national state-based laws onto a non-state space.[43] Cyberspace continues to be a domain of increasing concern where global responses are sporadic, uncoordinated and uneven.[44] As a result, the legal principles governing conduct and commerce in cyberspace remain only partially defined and must be carefully monitored as we consider the ramifications for 2040.

INTERNATIONAL SPACE LAW. Outer space continues to grow in importance due to the increased number of states and non-state entities involved in space-related activities. Outer space is considered a global commons in international law.[45] This increased emphasis on outer space (i.e., for economic activity and global communication) has driven the need for effective laws and policies regarding outer space at both the national and international levels.[46] The Canadian Army must remain aware of developments in the evolution of international law regarding outer space due to the increasing need for Canada, its partners, its allies, and even its adversaries, to operate in this environment.

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42. Christian Reus-Smit, "International Law" in John Baylis and Steve Smith, eds., *The Globalization of World Politics,* Oxford U Press 2001, 359.

43. For a comprehensive overview of cyber law, see Amhad Kamal, The Law of Cyberspace (Geneva: United Nations Institute for Training and Research, 2005).

44. Cyber space and space are global commons, an area that no one country has sovereignty over and whose resources can be used by all, or, at least by those who have the technological capabilities to explore those resources. Centre for Strategic and International Studies, "Space and The Global Commons," viewed 14 Jun 2010, <http://csis.org/blog/space-and-global-commons>.

45. Ibid.

46. United Nations Office for Outer Space Affairs, "International Space Law," viewed 14 Jun 2010 <http://www.oosa.unvienna.org/oosa/SpaceLaw/index.html>.

GLOBAL AND NATIONAL ECONOMY

Perhaps the greatest impact of modern globalization has been the evolution of the global economy. Enabled by technology and fuelled by human nature, national economies are now perhaps irrevocably intertwined with those of others all around the world. Therefore, to understand emerging trends in one's own national economy, one must make sense of the trends, drivers, shocks and uncertainties of the global economy.

Despite advances made in the effort to curb global debt and reduce the level of poverty in many countries, a trend of divergence between prosperity in the global North (developed states) and poverty in the global South (developing states) persists and will likely persist into the future. Prospects for global markets, partnerships and alliances contribute to the international cooperation and peace observed in mutually dependent nations in the North, but poverty and subjugation of human rights in the South create conditions for increased economic insecurity and risk. In either sphere, national economies are thus affected both positively and negatively by regional and global trends.

While the global economy was deeply affected by the 2008 recession, some regions and countries have managed to weather the storm while others slowly claw their way back to recovery. Still, even those countries that managed to emerge from the crisis relatively unscathed admit that strong economic growth remains far off, with low interest rates and persistent unemployment dogging efforts to make more sustainable progress.[47]

For Canada, the economic forecast is, if not prosperous, at least stable. Strong fiscal policy combined with regulated banking and low interest rates has ensured that fewer Canadians have been caught out by crushing personal debt. However, household non-mortgage debt levels in Canada remain uncomfortably high and are likely to remain so for the foreseeable future. In addition, labour markets have largely flatlined as a result of an older Canadian population remaining in the work force for longer periods. Eventually, this bubble will stress the health-care system and, in turn, public finances. Immigration has been the source of more than half of Canada's population growth, but it will not be sufficient to offset the aging of the baby-boom generation, a fact that will likely constrain the labour force further. Beyond this, as baby-boomers exit the labour force, competition for talented labour will intensify, possibly weakening future GDP growth as a result.[48]

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47. International Bank for Reconstruction and Development / World Bank, "Global Economic Prospects: Managing the Next Wave of Globalization," (Washington, DC: World Bank, 2010), xi.

48. Conference Board of Canada, "Canadian Outlook Long Term Forecast 2009: Economic Forecast" (Ottawa: Conference Board of Canada, 2009), 43.

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While Alberta's oil-sands production is expected to generate over $100 billion in investment by 2030, the long-term outlook is uncertain due to possible restrictions on the oil industry resulting from political sensitivity surrounding existing and new energy resource development. Canada is expected to remain a net exporter of oil until 2030. Investment in other primary energy is dominated by the development of the oil sands. Quebec will lead the country in hydroelectric power development, despite financial, technical and environmental issues, with the Lower Churchill River development costing about $4 billion. Pipeline projects will also form a significant part of the energy investment out to 2030 if they are able to secure appropriate political support.[49]

Canada will remain a trading nation, with the United States being its most important trading partner until 2030.[50] As trade with the U.S. is made up of 80% exports and 65% imports, the U.S. will remain key to Canada's long-term economic performance. The U.S. is the only country where Canada maintains a trade surplus, and, with U.S. growth expected to slow, it is reasonable to assume that this trend will have an impact on Canada.[51]

The huge U.S. current account deficit is being funded by developing nations and has led to a shift in global capital flows. It is expected that this deficit will probably decline in an orderly fashion,[52] signalling continued growth for Canada in the long term. Beyond this, the rise of nations such as India and China raises the possibility that exports may increasingly shift to those countries versus traditional markets of the U.S. and U.K., thereby placing greater emphasis on western infrastructure.[53]

The long-term growth of the global economy through to 2040 will depend upon increasing internationalization of markets for goods, capital, services and labour, driven by population growth (8.0 billion by 2030, and more than 97% of this growth will take place in developing countries),[54]

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49. Ibid., 39–42.

50. Ibid., 37.

51. Ibid., xi.

52. See, for instance, Congress of the United States, Congressional Budget Office, *Updated Budget Projections: 2014 to 2024* (Washington, DC: Congressional Budget Office, April 2014), 11.

53. A number of other projections are also worth noting with regard to Canada. Unemployment will remain largely unchanged through to 2017 but has the potential to decrease from 2018 to 2030. Consumption patterns may change due to a shrinking labour force (retirees draw down savings); savings rates are likely to approach 0 by 2030 (savings and investment (e.g., RRSPs) encourage economic growth). Residential investment, once forecasted to decline, is trending upward and could continue to do so through to 2030, as much of the population remains wary of other forms of investment. Demand for expensive retail space is set to decline due to an increase in online commerce and reliable next-day direct delivery services. Total federal expenditures are expected to stabilize and rise only slightly by 2030. The Canadian dollar is expected to remain stable around US$0.86 out to 2030. Potential diversification is likely in Canadian exports, as the government seeks new trade agreements with Europe, the Americas and Asia. See ibid., 8.

54. International Bank for Reconstruction and Development / World Bank, "Global Economic Prospects: Managing the Next Wave of Globalization" (Washington, DC: World Bank, 2010), xii.

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improvements in productivity (the output of the global economy will rise from $35 trillion in 2005 to $72 trillion 2030)[55] and the greater integration of the global economy (global trade in goods and services is likely to rise more than threefold to $27 trillion in 2030, and roughly half that increase will come from developing countries).[56] It is probable that the normalization of digital commerce and currencies (e.g., Bitcoin) will further facilitate and drive this trend.

The global economy remains fickle and is constantly subject to changes in the global landscape: an aging North; the rise of new regional economic blocs, alliances and partnerships; and shifting patterns of global capital flows (resulting from a huge U.S. current account deficit being financed by developing countries—notably Russia, India and China).

Global energy concerns, stemming primarily from continued economic exploitation of fossil fuels, will continue where global consumers outpace global producers. Global oil markets are expected to remain tight (high global demand out to 2030) over the long term as additions to global supply are expected to just satisfy anticipated growth in demand. Rising global energy demand will probably pose a real and growing threat to the world's energy security. Indeed, China and India will account for close to 60 percent of demand out to 2040.[57]

CONCLUSION

Changes in the international system will be numerous in coming decades. Growth in the number and importance of supra-national and sub-national organizations will probably offer new and promising vehicles for citizen interaction and empowerment in a system in which a range of emerging forces will continue to challenge the capacity of nation-states to respond. At the same time, it is possible that U.S. global influence could decline somewhat relative to other developed nations, resulting in a subtle shift from a starkly unipolar to a more regional bloc-oriented world. In the face of multiple players, often pursuing diverse issues and objectives, areas of potential future contention and concern will be numerous, ranging from disputes over natural resources and the environment to sovereignty and territorial rights to state legitimacy and human rights. Consequently, not only will the agenda of international politics be extensive, but prospects for tension and armed conflict will probably be considerable.

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55. Ibid., 39.

56. Ibid., 46.

57. Conference Board of Canada, "Canadian Outlook Long Term Forecast 2009: Economic Forecast" (Ottawa: Conference Board of Canada, 2009), 38.
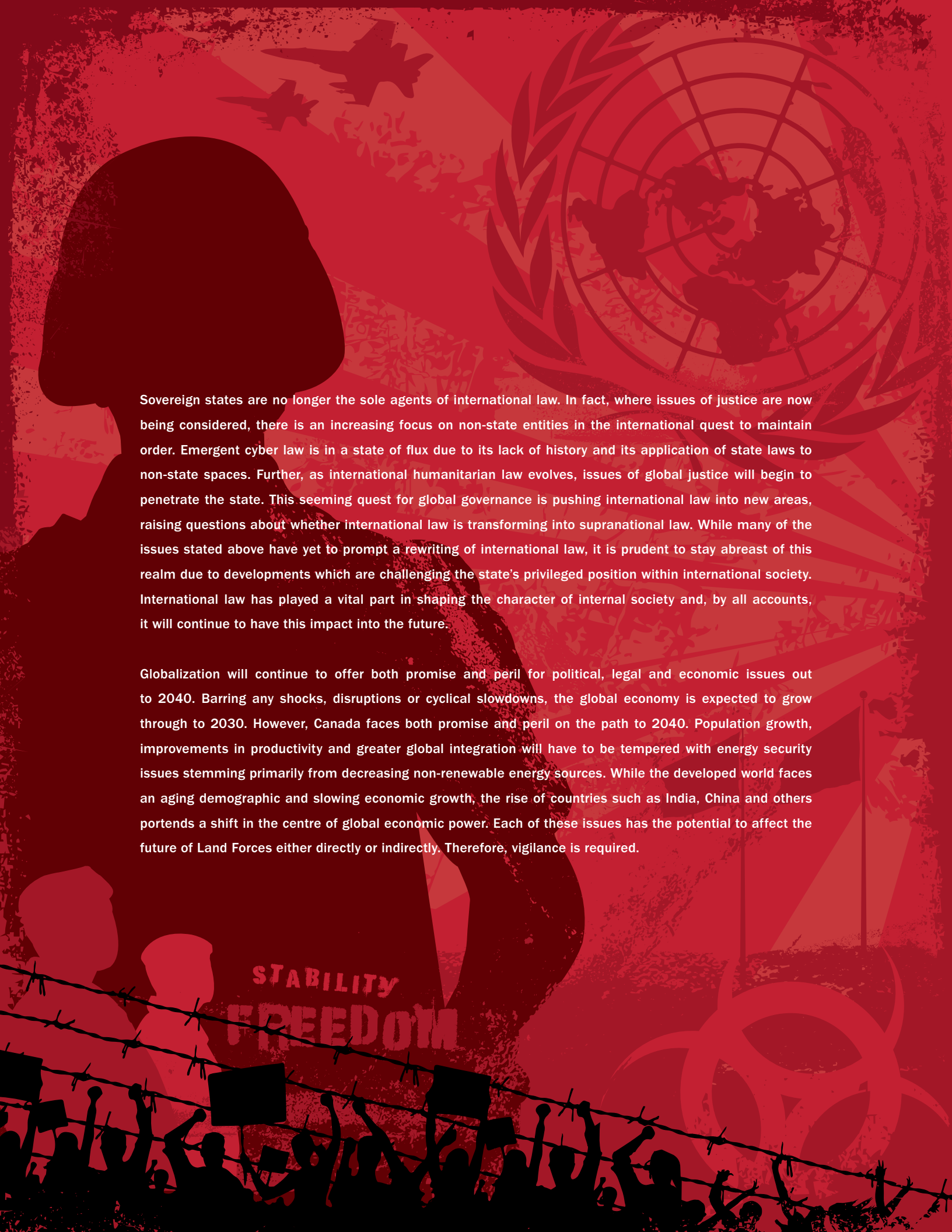
Sovereign states are no longer the sole agents of international law. In fact, where issues of justice are now being considered, there is an increasing focus on non-state entities in the international quest to maintain order. Emergent cyber law is in a state of flux due to its lack of history and its application of state laws to non-state spaces. Further, as international humanitarian law evolves, issues of global justice will begin to penetrate the state. This seeming quest for global governance is pushing international law into new areas, raising questions about whether international law is transforming into supranational law. While many of the issues stated above have yet to prompt a rewriting of international law, it is prudent to stay abreast of this realm due to developments which are challenging the state's privileged position within international society. International law has played a vital part in shaping the character of internal society and, by all accounts, it will continue to have this impact into the future.

Globalization will continue to offer both promise and peril for political, legal and economic issues out to 2040. Barring any shocks, disruptions or cyclical slowdowns, the global economy is expected to grow through to 2030. However, Canada faces both promise and peril on the path to 2040. Population growth, improvements in productivity and greater global integration will have to be tempered with energy security issues stemming primarily from decreasing non-renewable energy sources. While the developed world faces an aging demographic and slowing economic growth, the rise of countries such as India, China and others portends a shift in the centre of global economic power. Each of these issues has the potential to affect the future of Land Forces either directly or indirectly. Therefore, vigilance is required.

THE HUMAN DIMENSION

INTRODUCTION

Violent conflict is, at its root, a contest between personal wills, despite the application of advancing technology as an enabling tool. Global interconnectedness, complexity, ambiguity, volatility and lethality continue to characterize the security environment, and inequities in access to resources, identity-based conflict, environmental degradation and rapid scientific and technological innovation can generate significant social, political and economic challenges. When the reasons are sufficiently compelling, governments rely on armies to help restore order and security.

CURRENT STATE

The Canadian Army continues to rely on its people to operate effectively in the physical, social and psychological realms of the operating environment. Indeed, people form the moral, intellectual, social and emotional foundation upon which the army is established.

The human dimension, in this context, refers to various aspects of soldiering in Canada's Army and may be examined with reference to six major themes: attributes and competencies; professionalism and ethics; army culture; morale, cohesion and trust; decision making; and stress, strain and resilience (to include human enhancement measures). Although advances in science, technology and engineering have great potential to better enable and enhance soldier capabilities in the future, the success of the army is ultimately measured in terms of human creativity, fortitude and adaptability.

"GLOBAL INTER-CONNECTEDNESS, COMPLEXITY, AMBIGUITY, VOLATILITY AND LETHALITY CONTINUE TO CHARACTERIZE THE SECURITY ENVIRONMENT, AND INEQUITIES IN ACCESS TO RESOURCES, IDENTITY-BASED CONFLICT, ENVIRONMENTAL DEGRADATION AND RAPID SCIENTIFIC AND TECHNOLOGICAL INNOVATION CAN GENERATE SIGNIFICANT SOCIAL, POLITICAL AND ECONOMIC CHALLENGES."

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EVOLUTION

SOLDIER ATTRIBUTES AND COMPETENCIES

TRENDS

Future operating concepts imply new tasks for, and demands on, soldiers. This, in turn, will require the development of new attributes and/or improved competencies (skills, knowledge, attitudes) in future soldiers. The next cohorts will likely be more educated and informed, and technology will be more prominent as an enabler to assist, facilitate and accelerate cognition, knowledge and understanding. Emotional stability and mental resiliency may also benefit from technological advances, enabling soldiers to be more adaptable and flexible in body, mind and spirit as a result.

DRIVERS

As the operating environment increases in complexity and technology becomes increasingly pervasive and essential, information and communication systems, as well as equipment and robotics, may become not only an integral part of the soldier's tool set, but an integral part of the soldier's self. Future soldiers may require specific, refined, enhanced or simply different attributes and competencies in order to function within this new operational reality. New classes of soldiers, capabilities and specialists necessary to meet future challenges will create pressure for professional soldiers to keep pace. Consequently, selection processes and assessment methods must vary throughout a soldier's career. While traditional manual skills will undoubtedly remain important, demographic trends will likely reduce the size of available recruiting pools. It will, therefore, be important to automate the dull, dirty and dangerous jobs in order to allow prospective recruits to focus on those tasks where creativity, innovation and ingenuity can be optimized.

UNCERTAINTIES

Maintaining the correct balance and combination of attributes and competencies will be critical for soldier success out to 2040. These provide the foundational material for an effective military personnel generation system and should balance and be based on current and future job analysis and requirements. Research on future soldier attributes[58] suggests that the following attributes and competencies will be crucial for soldiers to be effective in 2040:

» stronger cognitive abilities to enable decentralized decision making in complex operating environments;

» greater capacity to learn from experience in order to facilitate individual soldier adaptability; emotional stability to promote soldier resilience;

» conscientiousness to enable trust and allow greater soldier autonomy; cultural competencies to operate effectively in diverse cultures; and moral character to maintain public support and facilitate the development of trusting relationships with joint, interagency, multinational and public partners and local civilians.

Given the anticipated increase in conflicts grounded in issues of identity, ethnicity and culture, it is also expected that knowledge—and sometimes embedded expertise—in areas such as history, religion, sociology, anthropology and psychology may well be essential for the Canadian Army to gain a decisive advantage on the future battlefield. Yet how the Canadian Army will recruit and retain the necessary and appropriate future soldiers is currently unclear.

PROFESSIONALISM AND ETHICS

TRENDS

Canadian soldiers will likely continue to reflect Canadian values and beliefs at home and abroad, and they will be expected to maintain the highest levels of professionalism and the highest ethical standards. Popular support for the Canadian Army will necessarily remain directly linked to its credibility, which will hinge on the level of trust and confidence the army's leadership, and its soldiers, command within the broader public sphere.

DRIVERS

Information and communications technology are highly likely to become even more pervasive in the future. Governments, the media and the general population will thus have an increased capacity to scrutinize how operations develop and are performed, what kind of an impact they have on soldiers and how soldiers behave. Families and friends will also expect an increasing level of connectivity and information. The strategic impact of a soldier's tactical actions may continue to gain in importance. Accordingly, impeccable professional behaviour, solid doctrine and adherence to the highest ethical values will be essential for maintaining the public's trust. Technological applications may be developed to assist soldiers in making professional and ethical decisions.

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58. Christopher E. Sager, Teresa L. Russell, Roy C. Campbell and Laura A. Ford, *Future Soldiers: Analysis of Entry-level Performance Requirements and their Predictors* (Arlington, VA: U.S. Army Research Institute for the Behavioral and Social Sciences, 2005).

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UNCERTAINTIES

Properly preparing the soldier for the moral challenges of the complex operational environment, and providing tools for that purpose, will permit a better shielding of the soldier's psyche. Transparency will become an operational imperative, and any infringement of core professional and ethical values will be exposed quickly to the public and will require immediate and appropriate action from the army leadership. The level of institutional credibility and stakeholder support over the longer term is at stake.

CULTURE

TRENDS

Culture is an expression of the values and principles of an organization or group. It brings cohesion and efficiency to the organization and facilitates the integration of new members. It is of vital importance that the army's culture be coherent and resonate with Canadian culture and values.

It is expected that respect for democracy, the rule of law, human rights and freedom will remain the principles that define what it is to be Canadian. They will be equally important in defining what it is to be a Canadian soldier and must be fully respected and upheld. Indeed, failure to do so would create the risk of losing Canadians' trust and undermining the army's credibility.[59] The Canadian Army must therefore closely monitor and shape its culture and its soldiers' behaviour to ensure that they reflect the population's expectations.

As the population diversifies, so too will the army's human resource pool. The next generation of soldiers will be recruited from a more demographically diverse environment, influencing the army's culture and ostensibly improving the Canadian Armed Forces' and army's knowledge and understanding of other cultures and values. Other cultural priorities and concerns (economic, environmental, health, social, etc.) will impact and shape the army's culture. Operational considerations such as threats and risks, or collateral damage, could also have an impact on army culture and affect how soldiers operate, interact and perform their tasks.

DRIVERS

Soldiers in the 2040 timeframe will be more technologically inclined and more dependent on technology than those of today. They will be comfortable with the prominence and pervasiveness of technology in their lives. Constant connectivity to peers, both within and outside the organization, will be an expectation. As a result, control measures and restriction of information and communication norms will require re-examination. The defence network must be pervasive and permit the soldier to remain continuously connected and updated. While soldiers in 2040 may have fewer face-to-face interactions than their predecessors, the relationships with their circle of contacts will seem equally important and real.

The nature of land combat will continue to ensure that soldiers share a different perspective on their work than most others do. The seriousness, potential violence and risk which their profession involves serve to shape an outlook that has a significant impact on their psychological and social states. While this may not always be recognized, it is and will likely remain a powerful force in the development of an army culture in 2040.

UNCERTAINTIES

Converging trends are shaping army culture in ways that are just beginning to be understood. While the Canadian Army is likely to remain unique and distinct from the broader cultural norms of society given its code of shared liability for duty and sacrifice, it is unclear how its relationship with society will develop. Responding to ongoing change will require flexibility and continuous adaptation. At the same time, the Canadian Army must acknowledge that soldiers, and the culture they embody, will remain its most valued asset.

MORALE, COHESION AND TRUST

TRENDS AND DRIVERS

Morale, cohesion and trust are critical psychosocial contributors to an army's operational effectiveness.[60] Indeed, they are fundamental components of soldiering and will remain so in 2040. Soldiers will inevitably cover greater distances given a proliferation of diverse and powerful enablers. Physical distances caused by disaggregation in the operational environment, yet bridged by secure communications between and within teams, will have an impact on soldiers' morale, their cohesion within operations, and their trust in technology and leadership. Trust always takes time to build within and beyond a group, but methods for developing trust are beginning to be better understood. The challenges of integrating soldiers

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59. "The Army centre of gravity is institutional credibility, which is defined as recognition of the Army as a valued national institution and trusted partner and ally." It comprises legitimacy with the Canadian public, relevance to national leadership, trust within the CAF/DND, identity and reputation, and expertise sought by allies. Land Force Command, The Army: Advancing with Purpose (Ottawa, 2009), 24–25.

60. R.L. Campise, S.K. Geller and M.E. Campise, "Combat Stress," in Military Psychology: Clinical and Operational Applications, eds. Carrie H. Kennedy and Eric A. Zillmer (New York: Guilford Press), 215–240.

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into a team will continue to evolve and will require new tools and techniques (e.g., social networking, wikis, blogs). To the extent possible, technology should be leveraged to enable faster development of more tangible, trusting relationships.

Uncertainties

The intensity and resilience of soldiers' bonds are well known. However, these must be built on to become more holistic, cooperative and complementary. Additionally, the Canadian Army should move toward greater interaction with other organizations as part of a comprehensive approach to operations. Exposure to and inculcation with a more inclusive operational environment early in a soldier's career will be essential. The importance of operating within such an environment must be reinforced throughout a soldier's career. The leadership must ensure that the fundamentals of morale, cohesion and trust are developed and strengthened in the 2040 timeframe.

DECISION-MAKING

Trends

Information overload and the pervasiveness of information and communication systems will increase the complexity of the 2040 timeframe and challenge decision-making at all levels.[61] Automated pre-screening, filtering and analysis of information will be increasingly necessary. Artificial intelligence is likely to become increasingly ubiquitous and more capable of rendering automated and autonomous decisions, even in combat or other lethal engagement situations. Nonetheless, human oversight will likely be seen to be ever more essential at all times.

Drivers

A greater integration of human resources, doctrine and technology will be required to assist the soldier in making sound and timely decisions. Important decisions will be required ever more rapidly. It will be essential to develop more effective, reliable and pervasive information technologies and systems. To these ends, the army culture must be disciplined but tolerant and encourage soldiers to be innovative in their approaches to information management and networking.

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61. Cheri Speier, Joseph S. Valacich and Iris Vessey, "The Influence of Task Interruption on Individual Decision Making: An Information Overload Perspective," *Decision Sciences* 30.2 (March 1999), 337–360.

Uncertainties

Secure communications may become somewhat harder to preserve given the pervasiveness of powerful commercial technology. Soldiers will be expected to make decisions in a context in which each and every action taken is recorded, scrutinized, analyzed and subject to criticism, not only by the chain of command, but also by the media and the general population. The Canadian Army must be cognizant of such possibilities and prepare soldiers through proper doctrine and training. It must also protect its personnel through refinements in policies, programs and procedures so as to empower the soldier with the authority needed to make decisions.

RESILIENCE AND HUMAN ENHANCEMENT

Trends

Increasing complexity in 2040 is likely to require greater resilience in soldiers. Resilience is the ability to overcome challenges and bounce back from adversity. It is highly likely that programs that continue to deal with comprehensive soldier fitness and recovery will increase in importance as Canada's Army enters into more demanding operational environments.

Human enhancement technologies—both cognitive and physical—are becoming more prevalent within society. In 2040, human potential and capabilities will certainly differ in some ways from those of today. It is likely that technological, medical and pharmaceutical research and development will continue to provide means to enhance human resilience.

Drivers

Resilience is a function comprising physical, psychological, social, spiritual and family dimensions. As adversaries take advantage of emerging technologies to out-perform our soldiers, there will be increasing pressure for the Canadian Army to do likewise. Ultimately, societal concerns over the ethical dilemmas that such upgrades may raise are likely to require formal debate within and outside of the Canadian Army.

Shocks and Uncertainties

Long-term second- and third-order effects, more immediate side-effects, and impact on the soldier's life will require monitoring and measurement. Doctrine, policies and programs will need to be reviewed and revised accordingly. This in turn may have an impact on the army's selection process as "enhanced" individuals may form the basis of the new recruitable cohort. As this phenomenon becomes more widespread and normative, military policies such as those relating to drugs and universality of service (i.e., the requirement to be physically fit, employable and deployable for general operational duties) may require revision.
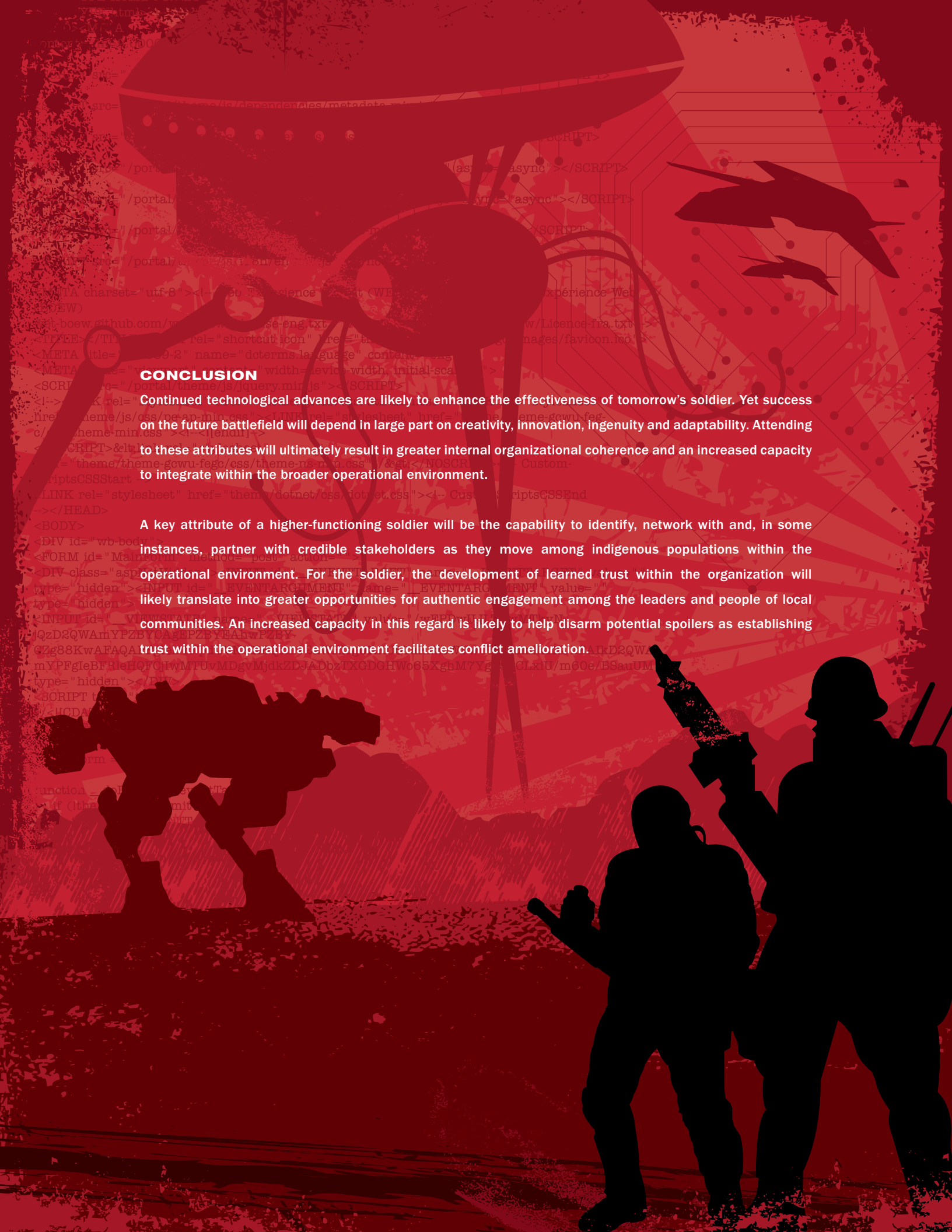
SCIENCE AND TECHNOLOGY (S&T)

INTRODUCTION

Warfare is permeated by science and technology to the point that every single element is governed by or at least linked to it. No element of warfare—planning, preparation, execution and evaluation; operations and intelligence; organization and supply; objectives and methods; capabilities and missions; command, leadership, strategy and tactics; even the conceptual frameworks employed by the human mind in thinking about war and its conduct—is immune to technology. Yet while science and technology[62] can bring change to the operating environment, there are many other factors that contribute to the ability of modern military forces to deter, fight, survive and win against adversaries in combat."[63] As we look forward to 2040 and scan advancing science and technology, it is important to note that the character of the particular technologies themselves matters less than their successful integration into the armed forces.

"LOOKING AHEAD IN A WORLD WHERE ADVANCING TECHNOLOGY BRINGS CONSTANT CHANGE, IT IS IMPORTANT TO UNDERSTAND THAT THE REAL CHALLENGE IS TO DETERMINE WHAT LEVEL OF SCIENTIFIC AND TECHNOLOGICAL SOPHISTICATION IS NECESSARY."

CURRENT STATE

Looking ahead in a world where advancing technology brings constant change, it is important to understand that the real challenge is to determine what level of scientific and technological sophistication is necessary. In many circumstances it will be necessary to apply cutting-edge science and technology to help maintain a competitive military advantage. Yet, in order to be effective, a military must possess the concepts, doctrine, education, training and mindset that allow for such technology to be applied effectively. Careful, balanced thought is necessary to properly understand, within the context defined by the profession of arms, the importance of any particular scientific or technological advancement. One expert has written, "What matters in technological adaptation as well as technological innovation is how well new and improved technologies are incorporated into effective and intelligent concepts of

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62. "Science and technology" is a common organizational and business term in DND. The term "science, technology, engineering and math" (STEM) was not used; however, for the purposes of Future Army development, the disciplines of engineering and math can be implied.

63. Martin van Creveld, *Technology and War: From 2000 BC to the Present* (New York: Collier MacMillan Publishers, 1989).

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fighting: it is not the technological sophistication that matters, rather it is the larger framework." Similarly, while adversaries adapting high technology to target Canadian and allied forces will pose a challenge in the future, the experiences of the past decade (not to mention more distant history) tell us that the use of less sophisticated means can pose significant problems. The possession and application of sophisticated science and technology may perhaps be the major enabling factor contributing to success in the future operating environment.

"Science and technology provides an advantage on the battlefield, reduces risks to the safety and well-being of Canadians, and supports policies and decisions with timely, evidence-based advice." [64]

EVOLUTION

GLOBALIZATION OF SCIENCE AND TECHNOLOGY [65]

The globalization of science and technology is a significant megatrend. A world in which science and technology was dominated historically by the European Union, Japan and the United States has given way to an increasing number of public and private research hubs spreading across many states. Those states that have progressed fastest in recent years are the ones that have adopted policies to promote science, technology and innovation. Out to 2040, countries such as China and India are expected to make significant contributions to innovation due to the size of their educated workforce and the scale and diversity of their domestic markets. They will also drive the development of many new products for export to the West. Given current international trends in R&D investments, several new technologies are likely to be discovered and marketed by China in defence, security, agriculture, food production, and information and communication technologies. Increasingly, states such as Brazil, India and other developing countries will play a larger role as designers, manufacturers and providers of sophisticated defence and security technology. More and more, Canada and its traditional allies will need to access offshore non-U.S. technology for defence and security capabilities, with potential impacts on the evolution of the *International Traffic in Arms Regulations* and Controlled Technology Access and Transfer agreements.

Established and emerging economies alike are expected to maintain innovation-oriented strategies to stimulate growth and national interests. The private sector and academia, rather than government-run entities, will continue to dominate the technological cutting edge in many areas. Geographical barriers to the propagation of advanced technologies are already fewer and have become harder to control. Agreements between states for the removal of impediments to trade further ease the diffusion of technology on a global scale, and maintaining competitiveness will likely continue to require the outsourcing of major elements of design and manufacturing. As a side effect, detailed knowledge of the pedigree of foreign technology components will become increasingly blurred and difficult to certify. Moreover, given uncertainty about how long current global economic problems may last, underinvestment in basic and early applied research, which often appears to have little relationship to ultimate economic benefits, may lead to decreasing industrial financial support to innovation sectors that require long-term research investments.

Internationalization of science remains an enduring trend, fostered by easy access to the Internet, collaborative megaprojects (such as the International Space Station), the creation of dispersed research and development centres by the private sector, and the nature of venture capital markets that increasingly fund new science and technology ventures in developing states. In terms of research collaboration, data shows an increase in partnerships and international co-authorship in scientific publications. Complementary trends include the acceptance of open universities, online distance learning courses, and open access to scientific and technical peer-reviewed publications. Collectively, these trends will contribute to accelerating the diffusion of knowledge and altering the traditional organization of academic and industrial research.

One potential effect of the globalization of S&T is the levelling of the playing field between state and non-state actors, since the same devices or devices with similar capabilities will be globally available. Combined with the advent of additive manufacturing and expandable commercial autonomous systems, this will result in continued development and use of low-tech but effective weapons by opponents with relatively high technical and technological skills who otherwise would be unable to threaten Western military forces. In specific instances, the application of such weapons by technically savvy opponents may undermine the effectiveness of Western military forces.

64.   DND Defence and Security S&T Strategy (2014), 11.

65.   CFD/DCI, *The Future Security Environment 2013–2030*, Draft (9 Aug 2013), 50–52.

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A further result of the globalization of S&T is that certain instruments of war, such as various cyber-based instruments, non-lethal weapons, bio-engineered weapons and, in the worst case, WMD, may become increasingly accessible to a wider variety of actors. States will continue to seek the prestige and deterrent value of WMD systems to reinforce their regional power. Efforts to ensure the security of nuclear weapons and related technology, radiological material, biological pathogens and toxic chemical agents and their precursors will continue to be essential to reduce the risk of proliferation and incompetent handling.

The fast pace of advances in devices and systems will increasingly challenge capability-based planning cycles, particularly the decision-making process necessary to understand what level of technological sophistication is necessary to maintain capability advantage. While rapid obsolescence of devices will continue to characterize the commercial market, technological and scientific advances must not be considered for their own sake but in light of entire capabilities. Nevertheless, life cycle and maintenance of specific army tactical systems may require shorter cycles, with modular sub-systems and ad hoc devices being plugged in and then replaced by new ones. Such rapid developments will both stimulate and challenge the continued evolution of the current capability-development model. As a potential second-order effect, early adoption of new technologies could increase the risk of unintended consequences on humans and legacy systems.

INFORMATION, COMMUNICATION AND COMPUTING TECHNOLOGY PERVASIVENESS[66]
Another megatrend is the pervasiveness of information, communication and computing technology. By 2040, the world will be characterized by increased connectivity, with individuals, communities and groups, governments, academia and corporations, as well as sensors, weapon systems, critical infrastructure and everyday objects seamlessly networked into the digital world. For several reasons, including economies of scale, much of the information and processing power will reside in clouds. Education, work and services will be increasingly performed online, impacting labour markets, retail models, urban design and transportation systems. Socio-technical networks will continue to change how people and devices cooperate to achieve goals. Nevertheless, in the "Internet of things," the increasing role and pervasiveness of networked technological devices, such as embedded radio frequency identification (RFID) tags, in day-to-day life and the risks of their malicious use will likely create new vulnerabilities and raise policy issues with respect to their control and security.

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66. CFD/DCI, *The Future Security Environment 2013–2030,* Draft (9 Aug 2013), 56–57.

In the military context, the technologies that have led to the creation of socio-technical networks may allow for alteration of traditional command and control (C2) structures that enable efficiencies to be realized. Such technologies may be exploited to allow for such concepts as decentralized C2 hubs. The use and exploitation of personal smart devices and social media in operational environments will impact the conduct of influence activities, C2 and intelligence. However, without proper cyber security, smart devices will increase the potential for operational security breaches. According to IBM, social networking has become the primary activity on the Web, and social networks are being used on workplace devices with or without authorization. With ever more devices connected to socio-technical networks, these will continue to generate ever growing arrays of data demanding more automated analytical power to produce actionable information for decision makers. Advances in artificial intelligence, big data analytics and cognitive and human behaviour sciences will likely provide reliable means to better exploit and understand such data.

Socio-technical networks will continue to facilitate the organization of protests. They will also offer new means to monitor and sense social grievances. Groups will proliferate and realize objectives that are more complex and nuanced than those arising from social networking today. However, the long-term effectiveness of such groups, beyond addressing specific issues for relatively short periods of time, remains in question. Socio-technical networks could also enable attacks to be launched rapidly in both the physical environment and the cyber domain, without forewarning, by groups or individuals seeking to achieve symbolic effects through the greatest media impact. Governments at national, regional and local levels will need to adapt to a growing array of non-state actors and social movements, some of which will emerge, mobilize and vanish rapidly using connective technologies. Lastly, socio-technical networks will continue to offer opportunities for foreign states to perform influence activities against the interests of Canada and its allies.

Owing to globalization, most parties involved in conflict will likely use comparable or identical networking technology. Maintaining military information systems capability advantage may thus centre on conceiving clouds that provide differential advantages, whether in information content, processing, speed, organization, robustness or security. As well, new cloud-enabled C2 technologies are expected to provide commanders and their staffs with improved ability to build situational awareness, reconcile operational pictures, devise plans and direct operations seamlessly. Networked weapon systems such as Joint Strike Fighter and the Iron Dome missile defence system illustrate this trend. They link sensors, commanders and weapon platforms in a manner that provides auto-cuing, automated assessment and decision-making, and dynamic targeting.

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Ensuring credibility and reliability of information will become increasingly challenging. Assessment of information and identification of original sources will become more difficult. The vast majority of the content will be either raw sensor data—including citizens' sensors broadcasting over the Internet—or opinion-based information, difficult to distinguish from objective, validated products.

A shortage of the analytical and managerial talent necessary to make the most of big data may be a significant and pressing human resource challenge in the coming decade.

The evolution of new forms of intelligence in cyber-technologies through means such as scripts, bots, and machine learning code and agents will introduce radically different computational processes that could be deployed seamlessly in ever smarter computing clouds. With potential for concealment in the cloud, those potentially disruptive forms of intelligence could constitute a new weapon in cyber warfare.

In the digital world, some actors identify cyber vulnerabilities of potential adversaries and calculate that exploiting such vulnerabilities in times of conflict is more affordable and less risky than the employment of munitions, while being more difficult to detect, attribute and prove. It is thus likely that adversaries will continue to attack in the cyber domain, where military networks and critical infrastructure could be vulnerable and actions remain difficult to trace. Cyber-attacks for military intelligence purposes have taken on a new dimension, as evidenced by the disabling of Iran's nuclear centrifuges by the Stuxnet computer worm and by a recent U.S. report on China's Cyber Espionage Units. With foreseen shortages of cyber experts, highly trained and motivated attackers constitute a growing threat to security. Cyber security is one issue which is likely to define future relationships between the western world and Russia, China and, on a lesser scale, India and Iran. To manage cyber security, state governments must accept the fact that all advanced states will use cyber capabilities to carry out espionage against which they have a right and an obligation to protect themselves. Maintaining unbreakable cryptographic security will be imperative for commercial, financial, defence and security requirements. Developments in S&T areas such as quantum cryptography could enhance secure communications.

AUTONOMOUS SYSTEMS

Machines that perform tasks and functions without human intervention have been around for over twenty years. Growth of these autonomous systems continues in the military, industrial, transportation, commercial and domestic sectors to automate the dull, dirty and dangerous work. While economic imperatives largely drive adoption of autonomous systems, as future science and technology advancement overcomes limitations,[67] increased application in land robotic and autonomous systems can be expected.

ADDITIVE MANUFACTURING

Additive manufacturing,[68] also known as 3D printing, is the process of manufacturing three-dimensional objects using an additive process. Additive manufacturing is usually achieved using digital data created from computer-aided design software to direct the application and fusion of layers of material. A variety of additive manufacturing processes and technologies exist, including laser sintering, electron beam melting and extrusion deposition. These processes use a broad range of materials, including metals, polymers, ceramics, biological materials and composites. Additive manufacturing has been demonstrated to have potentially disruptive implications for both manufacturing and end-users, including defence. However, additive manufacturing technologies are at varying levels of maturity, facing a number of non-trivial challenges that currently limit widespread application.

HUMAN PERFORMANCE MODIFICATION

Human performance modification[69] is the targeted enhancement or degradation of individual or group performance achieved by influencing or interfacing with individuals' underlying biology. Human performance consists of combinations of cognitive, physical and socio-emotional (or interpersonal) aspects. Existing and prospective technologies show the potential to modify performance, especially drugs and nutrition; genetic modification technologies; machines that interface with or influence the body; and new generations of techniques, from modelling to training. Because of its influence on humans, HPM raises critical ethical, legal, social and policy questions.

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67. Canadian Army Land Warfare Centre, *No Man's Land: Tech Considerations for Canada's Future Army,* (Kingston, 2014), 2-28.

68. TTCP EDTAG Additive Manufacturing, 2013.

69. TTCP EDTAG Human Performance Modification, 2014.

METAMATERIALS

Metamaterials[70] feature purpose-designed sub-structures for interaction with wave energy. The wave energy can be electromagnetic—from optical to long wave radio or mechanical, which includes acoustic waves. Metamaterials can exhibit properties not found in ordinary materials, including extreme and negative values of refractive index, THz response, tuneable response, and unity absorption in nano scale layers. Metamaterials promise new options for influencing all types of fields and waves, including electric and magnetic fields, the electromagnetic spectrum (from radio frequencies to light), and acoustics. There are diverse potential applications covering areas such as electrically small conformal antennas, super-lensing, cloaking, and even seismic dampening to mitigate the effects of seismic waves on man-made structures. The concepts may be applicable to mitigating the effects of blast waves.

PRINTED ELECTRONICS

Printed electronics[71] use printing techniques to directly apply conductive materials to suitable substrates, in the same way that ink is printed onto paper. Substrates can be flexible, stretchable, cuttable or even biological and the conductive ink is usually silver. Current applications include extremely thin and lightweight conductive displays for smart phones; sensors for home health monitoring; and systems to track and monitor perishable goods. Printed electronics technology has the potential to strongly affect not only national security but all of society. As the global commercial market increasingly focuses on and invests in printed electronics, governments must respond to the increasing pace of developments.

SYNTHETIC BIOLOGY

Synthetic biology[72] is an emerging field in which scientists modify or "engineer" DNA to understand, predict, design, build and utilize biological systems. For more than a century, scientists have been applying knowledge of biology to medicine and industry, but advances over the past twenty years have enabled research programs that modify organisms in substantially more complex ways. Synthetic biology has the potential to affect the commodity and specialty materials, sensing, medicine and human performance, and biological and chemical weapons areas.

DRIVERS, SHOCKS AND UNCERTAINTIES

Our recent experience with capability development and technology during the Afghanistan War suggests that potential or real conflict ultimately drives rapid acceptance or development of

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new technologies for military purposes. That said, as we look out to 2040, one very relevant driver of military science and technology and the adoption of commercially available technology is the expansion of the operating environment[73] or indeed conflict itself. While the character of conflict in this expanded operating environment is expected to evolve and will certainly be difficult to predict, we can expect the Canadian Army to leverage advancing technologies to be able to face a range of simultaneous threats and adversaries in an anarchic and extended area of land operations. The challenges and problems will be both old and new. However, ensuring the army's freedom of manoeuvre in the physical and moral plane and denying the same to our adversaries will be paramount. The challenges that complexity of terrain, dispersion of forces, information sharing, power and energy demand bring will be ever more apparent in this expanded operating environment. Looking out to 2040, we can expect advancing technologies to improve cyber and influence activities capabilities and C4ISR architectures and systems in order to operate effectively in this expanded operating environment. Technology development and integration that overcome these challenges and improve our ability to operate effectively in the future will need to be harnessed.

Another force likely to drive technologies will be the human and social response to technological innovations that enhance soldier performance or lead to the employment of autonomous systems. Continuing developments in biological sciences, neuroscience, robotics and nanotechnology have provided the ability to sense, assess and improve performance across psychological, emotional, cognitive and physical elements in ways previously not envisioned. The adoption or rejection of these technologies will be significant for land force capability development.

The affordability of technology will represent a key uncertainty. The costs associated with the development of advanced systems and platforms will continue to be high and challenge an army that is faced with the reality of small production runs and finite budgetary resources. The subsequent costs associated with the identification, development, fielding and operation of emerging and advanced military technologies may push our capability development toward greater development cooperation with our allies in order to offset the extreme costs likely to be involved. Additionally, the problem of determining what level of technological sophistication is necessary to counter the capabilities of the most challenging likely opponents will be increasingly difficult.[74]

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70. TTCB EDTAG, Metamaterials, 2014.

71. TTCB EDTAG, Printed Electronics, 2014.

72. TTCB EDTAG, Synthetic Biology, 2024.

73. A composite of the conditions, circumstances and influences that affect the employment of capabilities and bear on the commander's decisions.

74. CFD/DCI, The Future Security Environment 2013–2030, Draft, 9 Aug 2013, 56–57.

Technology shocks could well include a major solar event of the kind that is known to have happened historically (1959 was the most recent). An event like this could instantly disable virtually all space assets and cause a major medium- to long-term disruption to the power grids and other things. An estimated cost of an event similar to the 1959 event happening is $2.6 trillion (in 2014 dollars). Other shocks would be the unleashing of a genetically engineered biological agent or a breakthrough technology development that would transform or revolutionize our world and have significant implications for defence and security capability development.

CONCLUSION

Science and technology will continue to have a prominent role in future land force development. Ongoing trends indicate a level and range of technological advancement that will offer both considerable opportunity and significant challenges to Canada's Army in the years ahead. While the acquisition of progressively more advanced equipment and technology will doubtless be a continuing and important requirement, proper consideration of such S&T and its integration with overall capabilities will be the most significant challenge for the army and for the Canadian Armed Forces as a whole.

SECURITY AND DEFENCE

INTRODUCTION

The impacts of globalization—greater connectivity and complexity—ensure that the future will be challenging, uncertain and volatile. Negative trends in economics, demographics and social well-being, including challenges from gross violations of human rights, fragile states,[75] environmental degradation, terrorism, transnational organized crime, gender-based violence, infectious diseases and natural disasters, will ensure that existing tensions and hostilities at the state and intra-state level can be expected to increase. These and other destabilizing factors will likely lead to either humanitarian crises and/or the requirement for peacebuilding missions aimed at ending instability and chaos and re-establishing some form of peace.[76]

Cases of inter-state conflict will continue to arise. Yet it is probable that the onset of intra-state conflict will be more frequent.[77] Too often, intra-state conflict is accompanied by a large displacement of people moving outside of traditional borders, increasing the likelihood of regional conflict erupting. Such regional escalation is expected to be quite rapid and will continue to challenge the will of decision-makers to intervene from both a resource and timeliness perspective. For military and security forces, the impact

> "TOO OFTEN, INTRA-STATE CONFLICT IS ACCOMPANIED BY A LARGE DISPLACEMENT OF PEOPLE MOVING OUTSIDE OF TRADITIONAL BORDERS, INCREASING THE LIKELIHOOD OF REGIONAL CONFLICT ERUPTING."

75. Rotberg categorized so-called problem states as "strong, weak, failing, or collapsed." Those categories have subsequently been encompassed within the term "fragile state," which the Organization for Economic Co-operation and Development (OECD) defined as any state with the "inability or unwillingness to provide for the physical security, legitimate political institutions, sound economic management and social services for the benefit of its population." Note that a fragile state is considered to differ from the diplomatic term "state of concern" as used by the U.S. Department of State to denote not only those states with "erratic authoritarian leaders" but those who also have a "history of sponsoring terrorism and pursuing NBCD programmes." See, for instance, Robert Rotberg, "The Challenge of Weak, Failing, and Collapsed States," in Chester Crocker, Fen Osler Hampson and Pamela Aall, eds., *Leashing the Dogs of War: Conflict Management in a Divided World* (Washington, DC: United States Institute of Peace Press, 2007); Yahia H Zoubir, "Libya in US Foreign policy: from rogue state to good fellow?" *Third World Quarterly*, Vol. 23, No. 1 (Feb 2002), 46; and Anne Friederike Röder, ed., "Whole of Government Approaches to Fragile States," OECD Publication, 2006: 17.

76 The United Nations defines peacebuilding as "a range of measures targeted to reduce the risk of lapsing or relapsing into conflict by strengthening national capacities at all levels for conflict management, and to lay the foundation for sustainable peace and development. Peacebuilding is a complex, long-term process of creating the necessary conditions for sustainable peace. It works by addressing the deep-rooted, structural causes of violent conflict in a comprehensive manner. Peacebuilding measures address core issues that affect the functioning of society and the State, and seek to enhance the capacity of the State to effectively and legitimately carry out its core functions." UN Department of Peacekeeping Operations, "United Nations Peacekeeping Operations: Principles and Guidelines," 2008, 18.

77. The trend is already evident. See for instance, Human Security Research Group, *Human Security Report: 2013* (Vancouver: Simon Fraser University, 2013), 86–87.

is likely to be threefold: difficult and complex peacebuilding mandates; a demand for greater adaptation and flexibility of response across the entire spectrum of conflict; and short-notice mission deployments that remain ad hoc in nature.

CURRENT STATE

Globalization is changing the nature of states and the international community. Its enablers—technology, economics and culture—are already responsible for greater friction between states and the likelihood of greater conflict. Those same enablers have provided a foundation that has allowed non-state actors to emerge as more visible figures, at times assuming more powerful and potentially more destructive roles in the world.

Complicating efforts to find an appropriate means by which to deal with non-state actors is the move away from traditional concepts of state sovereignty toward a concept of individual citizen rights balanced against sovereignty. State responsibility to its citizens brings with it greater scrutiny and greater potential for friction leading to conflict, often at the regional level. At the same time, the international will to deal with the underlying issues comprehensively has been weak: band-aid solutions have been the rule, and that trend is expected to continue. Consequently, fragile states can be expected to continue to fluctuate between weak and failing status.

These societal and technological changes are translating into evolutionary change to warfare, wherein traditional force-on-force engagements still take place but less frequently than in the past. Instead, future warfare is likely to be dominated by other forms of military power, information and special operations, and interventionist activities focused on peacebuilding (building or rebuilding state institutional capacity). This translates into a recasting of strategies, organizations and equipment priorities. Changes to military/security doctrine and attitudes/culture, including embracing the diverse challenges resident in the emerging and future continuum of operations, will also be evident.

Humans will remain the centre of any future operating environment. That human centrality necessarily translates into future operations that will, within an increasingly complex environment, remain uncertain and prone to surprise. Countering both then requires highly adaptive and innovative soldiers and leaders. Changing societal and personal values and attitudes will probably have a significant impact moving forward. To recruit new members, the Canadian Army will need to understand their attributes and motivations and the impact both will have on decision-making competencies. The professional culture of the Canadian Army moving forward is likely to be shaped by considerations

of family, connection to communities, recognition of individuality, a postmodern soldier ethos[78] and the necessity to constantly strive for mental and physical resilience.[79]

At the same time, it is important to note that, while the Canadian Army strives for innovation and adaptation, so do its potential future adversaries, either by choice or by necessity. Such adaption and innovation will not necessarily fit or support our traditional concept of peace-support operations. Further, the Canadian Army must be conscious of how its activities may impact non-combatants who are themselves seeking to solve local problems related to regions that are witness to state failure, weak or highly authoritative governance, and the deprivations often caused by resource scarcity and environmental disasters (starvation, droughts, etc.).

Overall, the threats and vulnerabilities facing the West are expected to increase in both scope and complexity, which in turn require more complex and longer-term solutions. Moreover, Western militaries will confront additional challenges from the militarization of space, cyber operations including the threat of cyber-attacks against information networks, criminal activities that threaten the fabric of society, and the collective impact of ideological extremism. All have added to the blurring of lines between public safety concerns and those of a traditional military or security nature.

EVOLUTION

We can expect the 2040 operating environment to be characterized by two significant trends: continuing urbanization within most regions; and the growing influence of non-state actors, including *inter alia* warlords, local militias and gangs, terror and criminal entities, and private military companies (PMC). Urbanization brings significant challenges including epidemics, poverty, food and water scarcity, desertification and deforestation, erosion, poor governance and corruption. In addition to increasing the likelihood of localized violence, urbanization also has considerable potential to trigger mass migration. Mass migration, with its attendant volatility, instability and uncertainty, can very quickly escalate a local problem into a regional conflict.

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78. Charles C. Moskos, John Allen Williams and David R Segal, eds., *The Postmodern Military: Armed Forces After the Cold War* (Oxford: Oxford University Press, 2000).

79. For example, militaries have typically sought out physically fit men and women for service. However, a 2014 study published in the British medical journal *Lancet* found that over two billion people were obese and that "not a single country has had a significant decline in obesity" over the years 1980–2013. This trend may affect recruitment pools and policy. See Marie Ng et al., "Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013," *The Lancet,* 29 May 2014. Online at TheLancet.com.

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The proliferation of non-state actors within the complex operational environment of the future necessarily points toward a confusing array of grievances and adversarial activities, again reinforcing the need to be prepared for the full continuum of operations. It also points to a future in which the fragile state model moves away from the larger social contract and instead toward one in which guarantees of equitable treatment by the state are no longer possible. Hence, seemingly minor grievances could end up providing the stimulus for violence to spiral out of control.

Non-state actors also move the dynamics of security operations out of the conventional paradigm defined by a state-centric view. In fragile states, there are often significant gaps in services that are normally provided by state institutions. Criminal groups are one type of entity that often moves into such gaps. Over time, they have a tendency to become institutionalized as normal and in effect, create a new governance dynamic that needs to be understood. Dealing with that level of criminality in the future will probably require a greater understanding of suitable inclusive and coercive approaches.

Conversely, local communities may instead seek to employ home-grown solutions for covering the gaps, through either hired security or the creation of local security forces (vigilante groups, militias or neighbourhood gangs). They represent not a *de jure* power systems parallel to that of the state, but rather a *de facto* local community or regional power system which can exploit and challenge traditional state control over legitimate violence. Such non-state actors will also build legitimacy by providing services formerly provided by the state, including money lending, security services, and any number of social services. Our understanding of the future operational environment requires a grasp of this potential shift in the institutional rule of law from the state to private concerns.

Thus, the growing complexity of the future operating environment requires a fundamental shift in our understanding of the relationship between the state and its citizens. Increasing urbanization and the growing infringement by non-state actors on those areas traditionally considered the purview of the state will require a new understanding of future warfare. Operational zones can be expected to become crowded as more players, including Other Government Departments (OGDs), Non-Government Organizations (NGOs) and private military companies, move in to deal with that complexity. Coordination of operations within a comprehensive framework will probably become an ever greater necessity to avoid duplication of effort and the waste of critical and scarce resources.

Drivers in the future operating environment that fuel insecurity often include poverty or poverty-related insecurities (e.g., access to safe drinking water, adequate health care, and energy supplies). Such insecurities will continue to feed tensions, particularly as urbanization increases and globalization accelerates. Tensions increase the prospects for armed conflict, particularly, though not exclusively, in developing regions.

One other significant driver is transitional governance in fragile nations making the move from more authoritative governance models to more democratic ones.[80] Too often, former authoritative leaders fall back on what they understand, including the subversion of institutions within the transitional state to allow them to achieve more successful authoritative rule. Too often, the ability to reverse democratic freedoms represents not so much a shift in values as "the successful adjustment by autocrats to post–Cold War constraints on authoritarian rule."[81] Not surprisingly, successful nation building has become an lengthy incremental process that needs to be examined in a timeframe of decades or generations.

Issues with state governance also drive grievances and a sense of injustice. Most Western states, for example, are dealing today with grievances and a sense of injustice over the growing divide between haves and have-nots. In many fragile states and dysfunctional regions, those grievances and feelings of injustice are magnified exponentially, increasing the likelihood for confrontation and violence.

Two specific security and defence uncertainties present themselves: uncertainty over the potential militarization of space; and increasing militarization of cyberspace. The future of fossil fuels and their finite nature represents another significant uncertainty, with its impact on the prospects for, and the conduct of, future conflict.

Shocks to security and defence may be traditional (e.g., an adversary gaining capabilities (technological or otherwise) that allow for potential of military dominance, or the employment of weapons of mass destruction—nuclear, biological or chemical); or non-traditional (e.g., massive and unexpected environmental degradation or climate change). Dramatic and lasting shifts to global economies are another potential area of (non-military) shocks. The recent 2007–2008 global financial crisis and recession is one such example that has the potential to be duplicated in the future.

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80. The metric currently being employed for determining the democratic stability of a formerly fragile state is that of a "consolidated democracy," defined as a democracy that has attracted the support of 70% or more of the population for several years. This definition was originally applied to Africa, but it can be extrapolated for world-wide use without issue. Robert Mattes, Francis Kibirige and Robert Sentamu, "Understanding Citizens Attitudes to Democracy in Uganda," AfroBarometer *Working Paper* No. 124 (October 2010), 16.

81. Lucan A. Way, "Deer in Headlights: Incompetence and Weak Authoritarianism after the Cold War," Slavic Review, Vol. 71, No. 3 (Fall 2012), 645.
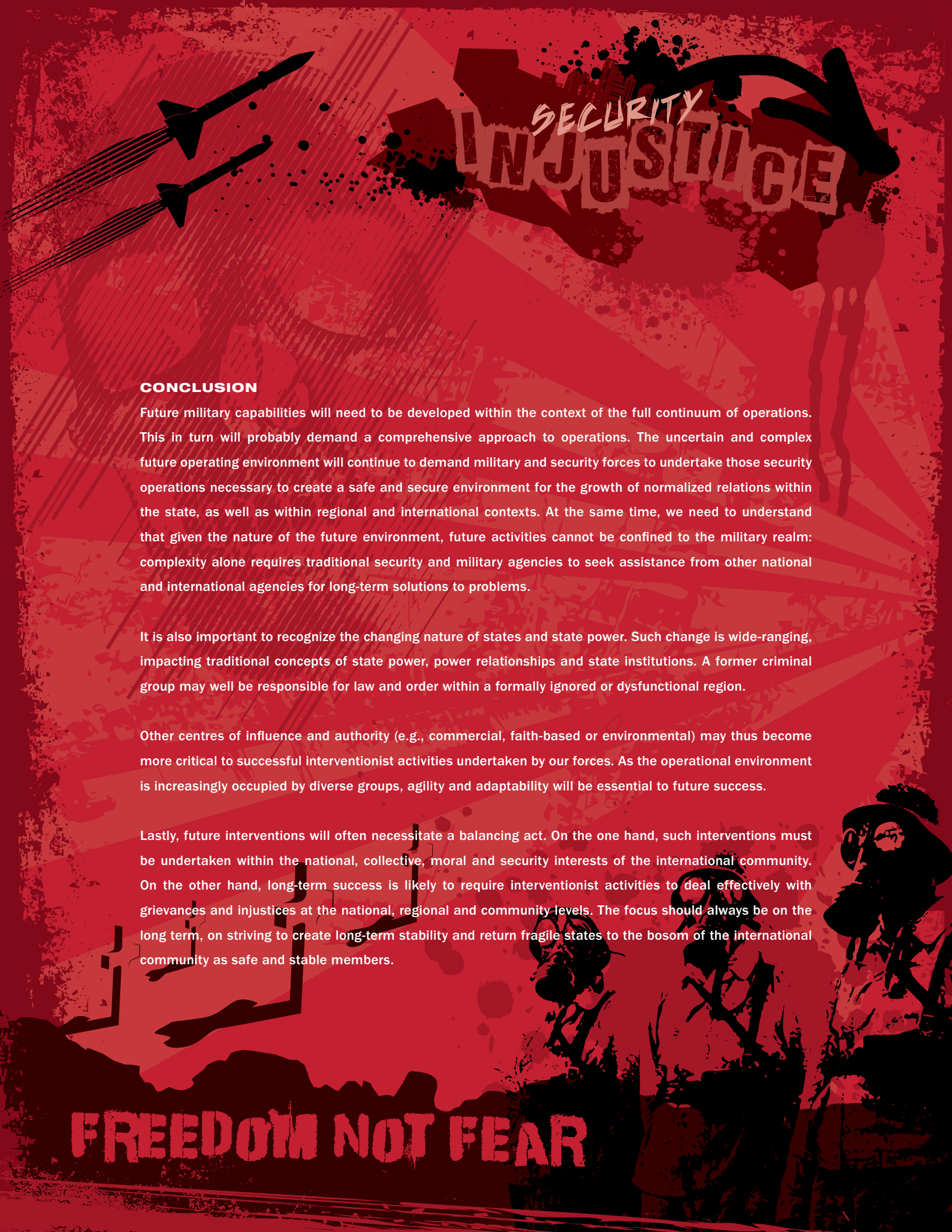
CONCLUSION

Future military capabilities will need to be developed within the context of the full continuum of operations. This in turn will probably demand a comprehensive approach to operations. The uncertain and complex future operating environment will continue to demand military and security forces to undertake those security operations necessary to create a safe and secure environment for the growth of normalized relations within the state, as well as within regional and international contexts. At the same time, we need to understand that given the nature of the future environment, future activities cannot be confined to the military realm: complexity alone requires traditional security and military agencies to seek assistance from other national and international agencies for long-term solutions to problems.

It is also important to recognize the changing nature of states and state power. Such change is wide-ranging, impacting traditional concepts of state power, power relationships and state institutions. A former criminal group may well be responsible for law and order within a formally ignored or dysfunctional region.

Other centres of influence and authority (e.g., commercial, faith-based or environmental) may thus become more critical to successful interventionist activities undertaken by our forces. As the operational environment is increasingly occupied by diverse groups, agility and adaptability will be essential to future success.

Lastly, future interventions will often necessitate a balancing act. On the one hand, such interventions must be undertaken within the national, collective, moral and security interests of the international community. On the other hand, long-term success is likely to require interventionist activities to deal effectively with grievances and injustices at the national, regional and community levels. The focus should always be on the long term, on striving to create long-term stability and return fragile states to the bosom of the international community as safe and stable members.

APPENDIX – FOUR ALTERNATE WORLDS

The following section elaborates on the four alternative futures identified in Chapter 1. The futures are based on the identification of two global factors judged as ranking especially high in terms of impact and uncertainty (i.e., energy sustainability and global environmental change), and their extrapolation into four quadrants (i.e., good, bad, not so good, and not so bad), each representing a potential future. Each is named to reflect the key message or theme characterizing the world described. When viewed as a whole, they offer a plausible, broad window into the future, within which it is reasonable to anticipate how actual events might unfold.

Within each future, consideration is also given to the change drivers considered to have high impact but low to medium uncertainty (i.e., the expansion of operating environments, the impact of age and demographics, shifting power balances, exponential technology growth, and globalization). The intent is to ensure the development of robust alternative futures, and thus a solid base for discussion and analysis.

HIGH-OCTANE "GREEN" WORLD

A future in which global energy supply exceeds demand (i.e., is sustainable) and in which the world is taking a proactive approach to the environment.

Decades of steadily increasing resource depletion and environmental crisis lead to growing international awareness of the need for substantial change in policies surrounding energy and the environment. In the midst of rising societal concerns, world leaders from a number of quarters move to take action. The result by 2040 is a "high-octane" "green" world in which energy is relatively plentiful and in which the environment is ever more sustainable and sound.

Science and technology are increasingly underpinned by policies encouraging innovation on both the energy and environmental fronts. And globalization—along with the interconnectedness that accompanies it—works to ensure ever more effective results. Major powers such as the U.S., China, Brazil and Russia invest heavily in the development and distribution of increasing quantities of energy. A number of significant breakthroughs (e.g., in areas such as nano- and bio-technologies) ensure not only that traditional energy sources (e.g., oil, gas and coal) are used more efficiently and effectively, but also that a number of "clean" "green" alternatives are developed and widely implemented and distributed (e.g., solar, wind, bio-fuels and "clean" coal). In fact, by 2040 the world sees a marked rise in renewable and sustainable sources of energy supply and a reduction in the use of fossil fuels. Moreover, as the supply of surplus energy grows, the potential for innovation rises.

At the same time, international campaigns underlining the critical interdependencies which characterize the global ecosystem result in the increasing adoption of an ethic of sustainability among not only governments but also general publics. Traditionally narrow and often short-term conceptions of national interest are gradually replaced by broader views. Environmental responsibility is seen as integral to prosperity.

State power in the international system continues to shift—with the steady rise of the BRIC nations representing perhaps the most salient development. Yet such shifts are, on the whole, managed diplomatically using methods short of armed conflict. Indeed, with long-term global prosperity and sustainability representing key goals among states and societies, the security and welfare of each nation is increasingly seen as indivisible from that of all nations.

Commitment to norms of greater openness and transparency rises. Increasingly, states and societies rally to strengthen both domestic and international organizations and institutions. New norms and rules, together with increasingly reliable, robust surveillance, monitoring and enforcement mechanisms—many reflecting a strong focus on sustainability—emerge. Sustainable practices are encouraged through an abundance of incentive schemes. Actions resulting in environmental damage are harshly penalized. Not surprisingly, forces in charge of security and law enforcement take on an increasingly environmental focus. And markets expend more and more effort on delivering "green solutions" to problems—a practice made increasingly feasible by the adoption of more responsible energy policies and greater cooperation between government and industry. Meanwhile, business cultures devote progressively more attention to norms of "corporate social responsibility" and more ethical and equitable (i.e., fairer) business practice.

Both domestically and internationally, various gaps between "haves" and "have nots" are reduced. While pockets of poverty and human misery continue to plague various regions—particularly in the developing world—societies generally enjoy higher living standards worldwide. Aided by continued advances in technology and innovative governmental practices, key staples such as food and water become increasingly sustainable, and shortages in a number of regions are increasingly mitigated through use of sustainable, genetically engineered crops and use of a range of food substitutes.

Demographically, the world is marked by a slowing of population growth. Yet variations continue to exist between regions and states, with developed nations, including Canada, experiencing the highest rates of population decline and aging while still-growing and younger population cohorts continue to characterize the majority of their less developed counterparts. General increases in levels of education and changes in workforce composition, most notably in the increased ascent of women to positions of responsibility and leadership within societies (particularly in the developed world), are also evident.

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Global migration continues to occur. Yet population movements derive less from necessity than desire, as the introduction of technologies offsets projected labour shortages in the developed world, while prosperity and economic stability increases elsewhere. Moreover, while urban growth continues, it is more intelligently managed, with sustainability representing an integral aspect of city planning and development.

Canada stands at the vanguard of the global sustainability ethic. Nationally, the development of strong legal regimes has worked to more fully ensure the sustainable use of Canadian resources, with government departments and agencies playing strong surveillance and enforcement roles. On the international front, a series of technology-sharing agreements with other leaders in the energy and environmental spheres (e.g., Brazil and India), together with active support for continued development of sound international regimes and practices, have enhanced Ottawa's reputation as a global leader in both the alternative energy and environmental fields.

Overall, the international system is marked by relatively high levels of peace and stability. Progress on the sustainability front and rising prosperity work to gradually alleviate disparities between haves and have-nots, thus reducing (but not eliminating) a key source of strife in the international system. Nevertheless, armed clashes continue to occur, particularly in a number of less developed regions of the world. At, times, the quest for wealth and power overrides new norms of sustainability. As shifts in energy and environmental practices increase demands on old orders for economic and societal restructuring, some states experience considerable turmoil. Beyond this, climate change, environmental degradation and a range of natural disasters continue to ensure their share of human misery and societal dislocation.

Accordingly, such forces and their consequences become a more pressing concern for governments. Interventions abroad take on a stronger humanitarian focus. Internationally mandated environmental enforcement missions, addressing the negative impacts generated by climate change and environmental degradation, gain particular salience. The delivery of emergency relief and aid are priorities. And technology sharing and transfer are increasingly used as options to mitigate the impacts of such forces when they occur. Moreover, when armed intervention does occur, it is increasingly informed by plans, technologies and doctrines of employment reflecting norms of sustainability. Emphasis is placed on efforts to prevent the destruction of energy resources and the physical environment.

KEY SECURITY THREATS AND CHALLENGES

Widespread corruption and non-zero-sum thinking represent central precursors and key characteristics of a high-octane green world. Faced with the spectre of rising energy deficits and global environmental decline, societies and their leaders increasingly come to the realization that national prosperity and security cannot be attained unilaterally. Indeed, such goals require the development and implementation of policies and practices that must serve the world as a whole.

Gradually norms of cooperation and sustainability become increasingly pervasive, particularly in the energy and environmental realms. And a widening web of domestic and international linkages is gradually forged to support them. Increasingly, forces of innovation and a rising environmental consciousness take hold. The result is greater prosperity and environmental sustainability worldwide.

Such realities, together with ongoing progress in science and technology, work to ensure an expansion of military operating environments and activity—not only on land, at sea and in the air, but in the domains of cyber- and outer space as well. At the same time, many longstanding security challenges are moderated and diminished. A number of age-old incentives contributing to armed conflict (e.g., greed, distributional inequities, fear of attack) wane in intensity. Alliances flourish and expand. So, too, do international organizations and regimes. The prospect of major (i.e., systemic) war declines dramatically. And, in many societies, sources of domestic strife are reduced as well. Moreover, growing scientific, technological and social innovation increases the capacity to address the onset—and, if necessary, the impacts—of other potential sources of threat such as climate change, natural disaster and accidents.

In fact, for many states and societies, maintenance and extension of the "high octane" green world and the institutions, arrangements, values and norms that inform and enable it becomes the overriding goal. And guarding against the vulnerabilities which an increasingly globalized and interconnected world faces from various forms of tampering and/or breakdown becomes a central challenge both domestically and internationally. Accordingly, the protection, effective maintenance and extension of the alliances, institutions and networks essential to innovation, the free and secure flow of goods, services, capital and ideas and environmental sustainability become paramount.

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Still, uneven distribution of many of the benefits of the energy-rich green world nevertheless ensures that crises, conflict and armed strife do not disappear entirely. While plentiful energy, growing prosperity, international cooperation and environmental sustainability reduce considerably the prospect for major war, regional armed conflict—both between and within states and societies—continues to occur. Cases of civil unrest, armed rebellion and state repression still remain alive and well in a number of locations. So do trans-border disputes between neighbouring states. Often, the key drivers stem from the actions of regimes unwilling or unable to transit from old social arrangements to the clean-energy, environmentally green order. Other times, triggers involve issues of ethnicity, culture and religious belief. Yet whatever the cause, armed strife and the human misery that accompanies it remain distinct possibilities, particularly in areas of the developing world.

So do complex emergencies and humanitarian disasters. Particularly in the developing world, various regions continue to be marked by devastation and human misery in the wake of not only armed conflict, but also global weather change, natural disasters (e.g., earthquakes, floods and tsunamis), and the impacts of human error and accident (e.g., oil spills, nuclear accidents and collisions). And while the more innovative capacities possessed by developed societies help to reduce their own vulnerability to the impacts of many such events, they too are by no means immune to their occurrence or the damage that accompanies them.

Beyond this lies the constant possibility of small groups and even individuals inflicting considerable damage upon states and societies for reasons of prestige or personal gain and/or in the name of particular ideological agendas and beliefs. Indeed, notwithstanding the many benefits of an energy-rich and more environmentally sustainable world, the conduct of espionage continues to take place, some degree of national and transnational organized criminal activity still flourishes, and acts of group and individual terror against individuals and societies remains a possibility. The increased capacity of some such groups to harness the innovations which such a world provides to enhance their effectiveness, lethality and disruptive potential makes the potential dangers that they pose all the more acute.

That said, the challenges faced in an energy-rich, environmentally sustainable world remain, by and large, limited and manageable. Given the innovation, creativity and prosperity which such a world yields, not only is the onset of crises and armed conflict far less frequent than in the decades preceding it, but generally less intense in character and less consequential to the world at large in terms of impact.

SUMMARY INFORMATION

1. DRIVERS OF INSTABILITY/CONFLICT

Resource exploitation, environmental degradation, organized criminal activity, state and industrial espionage, state repression, exploitation, both real and perceived, natural disasters, territorial conquest.

2. SECURITY THREATS AND CHALLENGES (BY ROUGH PROBABILITY AND TYPE)

THREAT	PROBABILITY	
TYPE	DOMESTIC	INTERNATIONAL
Inter-State Systemic War	NA	LOW
Inter-State Regional War	NA	LOW
Intra-State Armed Conflict	LOW	MEDIUM
Terrorism	LOW-MEDIUM	LOW-MEDIUM
Organized Criminal Activity	LOW-MEDIUM	MEDIUM
State Espionage	LOW-MEDIUM	MEDIUM
Industrial Espionage	LOW-MEDIUM	MEDIUM
Humanitarian & Environmental Disasters	LOW-MEDIUM	MEDIUM
Radicalization/Violent Protest	LOW-MEDIUM	MEDIUM

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3. HIGH-OCTANE GREEN WORLD: KEY CHARACTERISTICS

ASSUMPTIONS	CHARACTERISTICS
Goal(s)	Prosperity (Quality of Life)
Chief Means	Cooperation (self-help secondary) Technological Innovation
Predominant Attitudes	"When world prospers – I prosper" "We do best when we work together." "I am my brothers keeper"
National Interest	Broad View (National Interest closely tied to Global Interest).
Rough Historical Analogies	Concert of Europe (1815–1820), Early Post - WWI, WWII periods, Early Post-Cold War period (1989–1992).

GLOBAL QUAGMIRE

A future in which energy supply is increasingly scarce (i.e., is not sustainable) and the globe is taking a reactive approach to the environment.

By 2040, the international system has crossed a dangerous precipice. Decades of wasteful energy exploitation and mistreatment of the environment have led to a steady decline in energy supplies and accelerating environmental ruin. The world is increasingly trapped in a vicious Catch-22 where the energy resources required to achieve environmental sustainability progressively reduce the energy options that are crucial to future productivity. The result is an unending spiral of economic and societal decline.

Growing pessimism and a focus on short-term solutions to problems increasingly dominate calculations of security. Internationally and on the domestic front, human interaction is governed by highly competitive, zero-sum thinking. Narrow conceptions of self-interest trump aspirations of international cooperation.

Ever greater emphasis is placed on national interest. And concerns over the maintenance and, if possible, the attainment of greater power are acute. Military power, viewed as increasingly vital to ensuring security, commands larger and larger shares of more finite national budgets. So does the provision of basic necessities such as food and shelter. Nevertheless, social safety systems and national infrastructure suffer.

Conquest of energy-rich territories and the aggressive exploitation of existing resources increasingly eclipse investment in the development of new, more sustainable energy supplies and extraction technologies. Some sustainable practices are explored (such as in the nano- and biotechnology spheres), but efforts are limited. Moreover, the dangers of international espionage and theft are high, as states and businesses seek any means to gain capability and additional power over their peers in the global arena. Accordingly, states and societies move toward greater protectionism. Existing energy resources are tightly guarded.

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In the midst of steadily decreasing energy stocks and environmental decay, innovation slows. So do certain forces of globalization (e.g., international travel), as states and their citizens increasingly turn inward. Electronic networks remain a key means of maintaining international connectivity. Overall, however, efforts to interact and connect with the external world are highly selective and energy-focused (e.g., emphasis is placed on maintaining and/or gaining access to existing raw materials, food, water and labour). Moreover, they are less enabled by new technologies, as declining innovation forces states and their citizens to rely on those means already at hand.

Markets are highly unstable. Commodity prices increase, and economies increasingly experience stagnation as investment in science and technology wanes, automation declines and labour becomes increasingly important for production, particularly in the developed world. Meanwhile, competition among multinational corporations intensifies and often occurs at the expense of the environment, as the quest for profit works to encourage environmentally unsound practices as well as a significant decline in the quality and often the safety of goods and services provided. Pollution levels increase and the overall health of populations decline.

The world experiences continued "greying" of global population, particularly in developed countries. Societies continue to become more urban in character, yet urban growth often occurs in the face of an increasing inability of cities to absorb rising populations, particularly (although not exclusively) in developing countries. As essential services and infrastructure deteriorate, urban squalor becomes more pervasive, and the risks of societal tension and the spread of disease intensify. In turn, prospects for much-needed investment and improved economic productivity are dashed. In the face of reduced employment opportunities, many workers focus on militaries as a destination of choice. Accordingly, militaries become more labour-intensive, and growing concerns with domestic security and safety lead to greater emphasis on Reserve and community service.

Amid the downward economic spiral, global migration continues as the developed world's need for cheap labour combines with the increasingly desperate conditions of developing countries to encourage the movement of populations from South to North. Indeed, while deterioration of societal conditions is by and large a global phenomenon, conditions in the developed states continue to offer a lifestyle preferable to those in less developed regions. That said, in weak economies the capacity of populations to move, and of host countries to absorb the flow of immigrants and refugees, is far lower than it was in earlier periods. Moreover, those who do gain entry are often subject to resentment and racial discrimination.

Canada remains a destination of choice for immigrants. Its vast territory and still-considerable resource base continue to offer newcomers the prospect of living space, work opportunities and a level of environmental quality difficult to match elsewhere. Still, the need to compete in an increasingly competitive and ruthless international environment works to encourage adoption of many of the unsustainable practices found abroad. Accordingly, energy supplies gradually contract, the environment suffers, and the economy worsens.

While Alberta's oil sands are actively exploited, issues over the control of energy increasingly come to the fore. Federal–provincial tensions rise as energy-rich provinces seek to retain greater shares of control and revenue from their assets. Resource extraction in northern areas encounters similar problems with aboriginal leaders. And Canada–U.S. relations become heavily focused on issues of energy sharing, with Ottawa increasingly prone to trade on its energy assets for an increase in U.S. military protection. Talk of nationalizing energy resources grows, and existing energy resources (e.g., oil, gas, uranium and fresh water) and key storage and distribution systems are heavily monitored and guarded. This, together with dangers such as espionage and unchecked migration from abroad, leads Ottawa to adopt a more pronounced domestic security focus. Notably, service in the armed forces becomes a short-cut to citizenship for new immigrants—a practice which increases the cultural diversity of the military.

Locations that are richest in key resources (e.g., food, water and oil), are increasingly the most coveted, and their owners gain enhanced prestige and power in the global arena as a result. Yet such assets often serve as lightning rods for tension and armed strife. Indeed, as states and societies increasingly jockey to retain and, if possible, expand their control over scarce energy resources, the dangers of both inter- and intra-state conflict are heightened. Conflicts involving ownership and access to oil, water and food become more widespread. The danger of resource wars, both between and within states, is acute. And when fighting occurs, it is conducted with less and less regard to international norms.

Much of the violence occurs in the developing world, as dictators, organized crime groups and revolutionary movements fight for control of increasingly desperate societies. Yet developed countries are by no means immune to strife. As environmental conditions worsen, elements of society lash out against the ongoing exploitation of the earth's resources and the irreparable damage it causes. Often, action turns violent, with acts of terrorism directed against government officials and corporations becoming more frequent.

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An increase in environmental disasters compounds problems. With pressures for quick development on the rise, and the quality of practices and procedures for energy extraction and distribution in decline, incidents such as oil spills, forest fires and even nuclear accidents become more frequent. Meanwhile, the effects of natural disasters are magnified as economically stressed societies become less and less capable of marshalling the resources required to mitigate their effects.

Humanitarian crises and calls for international assistance increase markedly. Yet in a world of intense competition, mistrust and declining budgets, such aid is often harder to obtain. UN interventions are thus problematic and increasingly rare, making self-help often the only alternative to the growing misery of a world in peril.

KEY SECURITY THREATS AND CHALLENGES

Key features of the global quagmire are intense concern for security and survival, a more zero-sum approach to interaction and a narrowing in orientations toward both individual and national interest. Confronted by a world in which the energy resources essential to continued growth, innovation and prosperity are running out, and in which existing modes of human intervention and ingenuity are insufficient to stem the decline of the physical environment, states and societies are trapped in a downward spiral of economic decline, environmental degradation and societal decay.

In the midst of widespread decline, governments and their citizens focus more attention on ensuring self-preservation and retaining power and influence above all else. Daily life is increasingly characterized by an intense, often desperate scramble to secure access to a finite and dwindling resource base. And intensified competition gradually eclipses cooperation among states and societies in the quest for survival. To be sure, cooperation is not extinct. Yet it is more circumscribed, as longstanding relationships based on bonds of friendship and loyalty are increasingly replaced by alliances of convenience driven heavily by self-interest and the overriding goal of survival.

As energy supplies decline and economic and environmental conditions worsen, instability increases both internationally and domestically. So do the prospects for the onset of tension and armed strife. In fact, chances for both intra- and inter-state conflict increase as states and their societies struggle to retain access to key sources of energy and, where possible, expand their control and access to new sources of supply.

On the international stage, inter-state disputes over access to and ownership of resource-rich territories increase. So does the prospect of strife based on the impacts of unsustainable environmental practice, particularly as trans-border pollution and degradation of resources heighten the flow of refugees to neighbouring states. All the while, the dangers of preventative and preemptive war increase, as national decision makers increasingly fear the decline of their state relative to others. Arms build-ups, development of nationalistic ideologies, a rise in state and corporate espionage and aggressive foreign policy rhetoric become more common. So do possibilities for misperception, miscalculation, crisis and the escalation of conflict. Not surprisingly, there is increased concern about the possibility of systemic—(i.e., global)—war.

Challenges are equally widespread on the domestic front, as unemployment and declining services generate higher levels of societal grievance and misery. Rioting, violent demonstrations and other forms of civil disobedience gradually become more common. So does theft, looting and the emergence of a wide range of organized criminal networks often engaged in the exploitation, theft and sale of key resources.

In the developing world, such conditions generate acts of terror, armed insurgencies, government repression and increases in state failure. And, while developed countries remain somewhat less vulnerable to violent regime change, they are hardly immune from harm. as citizens who have enjoyed relative prosperity find themselves ill-prepared to adapt to the deteriorating situation. Perhaps not surprisingly, violent acts—including assaults directed at the forces and practices seen as responsible for decline—increase (e.g., the powerful, corporations, government officials, and the use of "dirty" energy). Gradually, incidents of kidnapping, assassination and terror increase against such groups and their assets. So do demands for greater security and policing of societies.

Throughout, the onset of complex emergencies and humanitarian disasters (resulting from armed conflict, global weather change, natural disasters, etc.) is ever more frequent, and their results are often devastating. Developing countries are especially hard hit, as declining national economies erode already weak programs aimed at crisis prevention and response, and other members of the international community lose the capacity and the will to assist The result is increased human misery and instability, as incidents of poverty, disease and death become more frequent, governments collapse and ungoverned spaces proliferate. Refugee flows to developed countries are on the rise. And while some gain sanctuary in chosen destinations, limits on the capacity of host states to absorb the influx ensure that many are turned away. Meanwhile, there are demands for heightened border security to help stem the tide.

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Overall, widespread economic decline works to limit military activity in a number of domains (e.g., cyber and space). Still, as states confront increasing pressures to guard key natural resources, the potential for military activity on land, at sea and in the air is considerable. And while declining economies work to constrain somewhat the size, quality and use of armed forces, the range of threats and challenges faced ensures that their possession and use—if and when required—is a key national priority.

SUMMARY INFORMATION

1. DRIVERS OF INSTABILITY/CONFLICT

Growing energy scarcity, resource exploitation, resource capture, environmental degradation, organized criminal activity, state and industrial espionage, natural disasters, territorial conquest.

2. SECURITY THREATS AND CHALLENGES (BY ROUGH PROBABILITY AND TYPE).

THREAT	PROBABILITY	
TYPE	DOMESTIC	INTERNATIONAL
Inter-State Systemic War	NA	MEDIUM
Inter-State Regional War	NA	MEDIUM-HIGH
Intra-State Armed Conflict	MEDIUM	HIGH
Terrorism	MEDIUM	MEDIUM-HIGH
Organized Criminal Activity	MEDIUM	HIGH
State Espionage	MEDIUM	MEDIUM-HIGH
Industrial Espionage	MEDIUM	HIGH
Humanitarian & Environmental Disasters	LOW-MEDIUM	MEDIUM-HIGH
Radicalization/Violent Protest	MEDIUM	MEDIUM-HIGH

3. GLOBAL QUAGMIRE: KEY CHARACTERISTICS

ASSUMPTIONS	CHARACTERISTICS
Goal(s)	Survival
Chief Means	Self-help (Cooperation secondary and heavily driven by immediate self-interest)
Predominant Attitudes	"The world is a jungle—look out for No. 1." "Get all you can to survive." "There are no permanent friends or allies, just permanent interests—and survival is key."
National Interest	Narrow, short-term view (national interest increasingly tied to self-interest and survival). Tendency toward zero-sum thinking.
Rough Historical Analogies	Pre-WW I and WW II Europe (1914, 1939), early Cold War period (1947–1953). Periods leading up to Middle East Arab–Israeli conflicts (1956, 1967, 1973).

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MATERIALISM GONE MAD

A future in which energy supply exceeds demand (i.e., is sustainable) but in which the globe continues to take a reactive stance on the environment.

Rising concerns over a looming energy crisis and fears of an extended and deepening global recession work to spur states and societies to take concerted action on the energy front. Aggressive exploitation of existing sources and exploration of new energy alternatives soon follows. Yet efforts to ensure environmental sustainability are secondary. The result is an "energy rich" world in which economic growth, development and consumerism are attained at a considerable and steadily growing environmental price. Waste, pollution and environmental degradation become increasingly widespread and threaten global security.

Short-term thinking and narrow self-interest are on the rise, as states and their citizens revel in the increased wealth and rising living standards made possible by available energy. Nationalism increases, with states using the renewed economic growth that energy provides to aggressively compete for still more power and influence on the international stage. Also present is a sense of confidence, and in some respects, arrogance regarding the capacity of human ingenuity and science and technology to solve global problems. Yet such heady optimism is not accompanied by concerted efforts to ensure that growth is sustainable: the quest for national power and increasing consumerism trump social responsibility and the longer-term welfare of the global commons.

Forces of globalization continue to permeate the international system—working to extend and strengthen ties between states and peoples. Technological advance is widespread and increasingly swift (i.e., technology plateaus shorten). Yet while plentiful energy and the scientific and technological innovation that accompanies it produce gains in sustainable energy and solutions to environmental problems, most notably by yielding some improvements in the availability and quality of food and water supplies, these efforts and accomplishments are limited. "Dirty" energy represents the lion's share of global supply. Intensified use of dirty

energy in the service of state power and societal growth causes increased environmental damage, especially in the developing world. Populations within environmentally stressed areas experience declines in health. Meanwhile, efforts at remediation and cleanup are reactive and increasingly lag behind environmental realities.

International interaction is evident. Yet state cooperation is limited. While some agreements exist in the development and exploitation of energy resources, most are temporary or regional in character (e.g., Western hemisphere, Middle East, Central Asia). On the environmental front, international organizations are fragmented and by and large impotent. While "lip service" is paid to the need for greater environmental sustainability, international legal regimes offer little in the way of sound regulation or enforcement. Protection of the environment is largely a function of individual state interests.

Economic prosperity is relatively widespread. Yet developed powers and the wealthy remain the chief beneficiaries of energy affluence. They also represent the principal global polluters. In fact, the conquest and exploitation of foreign territories, undertaken to help achieve energy plenty, eventually leads to tensions with the developing world. Violent protest and armed action increases, as populations in the South increasingly charge the developed world with neocolonialism, "environmental rape" and use of their native lands as branch plants and dumping grounds.

At the same time, an educated, affluent but increasingly greying developed world struggles with problems of a declining tax base and labour shortages. Not surprisingly, efforts to automate and attract immigration increase. So do attempts to retain older workers longer. Yet some issues remain perplexing. The challenge of military recruitment proves particularly so, as increasingly skilled native workers focus greater attention on careers in a lucrative commercial environment. Beyond this lie growing concerns among some over values and the prospect that continued emphasis on materialism and consumerism may result in a loss of society's moral compass.

Global population experiences a modest rise, and urban growth continues at a moderate pace. Yet the drive for rapid industrial and commercial expansion ensures that the development of urban centres is uneven and environmentally unsound. Urban sprawl is a growing problem. And urban squalor, pollution and disease become growing concerns as traditional waste-disposal systems prove unable to cope.

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Global migration increases, as developed societies seek additional labour from the developing world to service burgeoning economies, and populations from developing regions in turn move to escape environmentally pressed homelands. The latter motivation is particularly acute, resulting in increasing waves of environmental refugees seeking entry into more developed societies. Illegal immigration flourishes, crime increases, and a number of immigrant communities soon become the targets of backlash in receiving nations.

Canada is no exception to these trends. A solid resource base and impressive economic growth ensures that it represents a destination of choice for immigrants. And while aggressive resource extraction (e.g., through development of oil sands and various Arctic resources) and ongoing urban growth ensure that the country is no stranger to environmental problems, its sheer size helps ensure that Canada remains one of the "best of the increasingly bad" vis-à-vis its environment.

Yet significant increases in the numbers seeking entry challenge the country's absorptive capacity. Concerns over border security grow. Ottawa continues to engage internationally, offering considerable amounts of donor aid to a rising number of countries in need. Stabilization and reconstruction also remain key aspects of activity for Canadian security forces abroad.

Competition for power and influence in the international sphere is intense, with players ranging from key states and international organizations to a growing array of corporations and other non-official entities. In some regions, particularly in the developing world, organized crime groups increasingly vie with state governments for dominance. These groups possess a level of private military power and a degree of influence at times exceeding the capabilities of states themselves.

Meanwhile, plentiful energy and innovation work to increase weapons arsenals and ensure that the potential for "security dilemmas" is considerable.[82]

Not surprisingly, military environments expand. Both inter- and intra-state conflict remain as possibilities. Potential areas of dispute include cross-border pollution, industrial espionage, conquest of neighbouring territories—often to provide additional living space for citizens in environmentally stressed regions—and ethno-religious issues.

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82. The security dilemma refers to a situation whereby actions taken to ensure one's own security inadvertently and often unexpectedly decrease or threaten the security of others—a condition that can increase the prospects for tension and armed conflict. For the classic statement, see John Herz, *Political Realism and Political Idealism* (Chicago: University of Chicago Press, 1951).

The majority of strife, however, is South–South and North–South in character. The issue of environmental destruction is an especially prominent trigger. In this regard, governments and their representatives, as well as businesses and multinational corporations, become major targets of hostility. Kidnapping, murder and sabotage represent key methods of disruption. Meanwhile, the negative impacts of climate change and various natural disasters (e.g., floods, tornados and tsunamis) are felt more frequently and serve to heighten insecurity, particularly in already fragile regions of the globe. As a result, societal misery, tension and conflict increase even more.

Humanitarian crises and emergencies occur more often, and calls for international assistance proliferate. Interventions increasingly take on an environmental focus. Yet need outstrips the capacity—and the willingness—of nations to mount an effective response. And states must rely more and more on their own devices to address the more frequent security concerns generated by a world heavily focused on aggressive growth and consumerism.

KEY SECURITY THREATS AND CHALLENGES

In the world of materialism gone mad, concerted action on the part of states and societies to meet the growing challenge of impending energy scarcity gradually results in a situation of energy plenty, innovation and economic growth. Yet such gains are increasingly used for the pursuit of material wealth, power and influence rather than sustainability and protection of the global commons. The result is an environment characterized by an intensified desire for growth at all costs and by increasing neglect and degradation of the physical environment.

While cooperation continues to inform a number of areas in international affairs (e.g., energy development and extraction), it is limited and is becoming more regional in character. Competition increasingly eclipses cooperation, with states and societies continually jockeying for relative gain and advantage. National interest is conceived in ever narrower terms, and the societal quest for material comfort tends to eclipse all else.

Forces of globalization (i.e., the increased mobility of goods, services, labour, technology and capital throughout the world) are strong and increasingly geared toward consumption and material comfort. Internet use is pervasive and heavily focused on marketing and sales. Domestically, individuals focus more of their attention on personal gain. Actions aimed at benefiting society as a whole are increasingly viewed as of secondary importance. Norms of civility, trust and fair play gradually erode. So do efforts to ensure a sustainable global commons. Criminality increases, with white-collar crime (and cyber-crime) becoming especially prominent.

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On the international front, the quest for power and influence intensifies, as the consumerism and materialism of domestic populations generate greater pressures for the acquisition of resources and new markets. Soon, nationalistic rhetoric, together with increasingly assertive foreign and defence policies, increases. And the wealth and innovation enable by plentiful energy ensures a capacity to acquire a wide array of sophisticated, and often lethal, military technologies.

Not surprisingly, security threats and challenges are particularly wide-ranging. The sources of tension are often triggered by greed as opposed to need. The danger of inter- and intra-state armed conflict is heightened as global competition generates arms build-ups and increases in disputes over ownership of and access to resource-rich territories, inter-state and commercial/industrial espionage, corporate and white-collar crime, and growing economic exploitation and environmental destruction of other lands, particularly in the developing world.

While the prospect of a global (i.e., systemic) war remains relatively low,[83] regional wars, armed insurgencies, incidents of international and domestic terrorism and violent protest become increasingly common. And such conflicts are pursued by more varied means.

At times, such strife is North–South in character, pitting nations in the developed world and corporate entities eager to increase profit margins against developing societies lashing out against exploitation and environmental rape of their territories. Dangers of armed conflict within the developed world are also evident, as habits of cooperation increasingly wane in an ever more competitive multi-polar environment.

As for the developing world, the dangers of conflict are still more acute. Intra-state turmoil is especially pronounced, as indigenous populations rail against perceived injustices stemming from exploitative policies and corrupt practices of local government officials and societal elites. Throughout, the power and influence of organized crime is becoming more pervasive, as ongoing innovation increasingly empowers such organizations to exploit the tensions and growing climate of avarice and greed to their advantage. State concerns with surveillance, monitoring and policing correspondingly rise.

Meanwhile, environmental and humanitarian disasters increase, as armed conflict, unchecked economic growth, and the continual emphasis on material consumption generate more degradation, pollution and disease. As territories become increasingly unliveable, human misery grows and refugee flows increase. So does the likelihood of inter-state tension, as peoples from ecologically stressed regions increasingly clamour to gain access to nations boasting better living conditions.

In the face of rising refugee flows, pressure on national borders grows, particularly in the developed countries. Calls for heightened border security soon follow. Overall, security activity is considerable. In the midst of ongoing globalization, innovation and ever greater economic, political and commercial competition, not only do calls for military power increase, but military activities extend to a widening range of environments. The traditional emphasis on land, sea and air operations is increasingly supplemented by operations focusing on both cyber- and outer space.

SUMMARY INFORMATION

1. DRIVERS OF INSTABILITY/CONFLICT

Quest for material gain, resource exploitation, territorial conquest, environmental degradation, state and industrial espionage, organized criminal activity, abrupt population movements, natural disasters.

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83. While the capabilities required to conduct such a war are considerable, relative economic prosperity and growth in key states and regions works to ensure that the will to do so remains muted. That said, given the highly competitive character of the international system, inter-state war remains a possibility and escalation of such a conflict to encompass major states in the system cannot be ruled out. However, it is likely that such a war would occur less by initial intent than through inadvertent escalation. For a discussion of escalation dynamics, see Herman Kahn, *On Escalation: Metaphors and Scenarios* (New York: Praeger, 1965).

2. SECURITY THREATS AND CHALLENGES (BY ROUGH PROBABILITY AND TYPE)

THREAT	PROBABILITY	
TYPE	DOMESTIC	INTERNATIONAL
Inter-State Systemic War	NA	LOW
Inter-State Regional War	NA	MEDIUM
Intra-State Armed Conflict	LOW	MEDIUM-HIGH
Terrorism	LOW-MEDIUM	MEDIUM-HIGH
Organized Criminal Activity	MEDIUM	HIGH
State Espionage	MEDIUM	MEDIUM-HIGH
Industrial Espionage	MEDIUM	HIGH
Humanitarian & Environmental Disasters	MEDIUM	MEDIUM-HIGH
Radicalization/Violent Protest	LOW-MEDIUM	MEDIUM-HIGH

3. MATERIALISM GONE MAD: KEY CHARACTERISTICS

ASSUMPTIONS	CHARACTERISTICS
Goal(s)	Material Gain
Chief Means	Self-help (Cooperation secondary and heavily driven by immediate self interest, i.e., quest for material gratification)
Predominant Attitudes	"World is a producer – and consumer" "I want more."
National Interest	Narrow – short term view (Individual and National interests increasingly tied to material gratification & consumption). Tendency toward zero-sum thinking.
Rough Historical Analogies	Late Roman Empire, Pre- and Post- 9/11.

RECYCLABLE SOCIETY

A future in which energy is scarce (i.e., demand exceeds supply) but one in which global actors are taking proactive approaches to the environment.

Decades of wasteful, unsustainable energy consumption and environmental neglect combine to generate global energy scarcity and increasing ecological fragility. As energy deficits work to limit the economic growth and technological innovation needed to address key societal needs and challenges, states and societies increasingly recognize that they must do "more with less" if continuous economic decline and disaster are to be averted. The result is a world of radically changed priorities and lifestyles that increasingly reflect the need for aggressive energy conservation and more proactive approaches to environmental protection and improvement.

With energy deficits limiting growth and fuelling declining prosperity, states and citizens focus less on expansion than on national interests and survival. Yet leaders increasingly recognize that such survival is intimately connected to, if not dependent on, sustainable practices and policies both at home and abroad. Particularly in an energy-poor world, this amounts to living and acting within recognized limits and, where possible, adopting an ethic of sustainability.

Accordingly, governments and industries drastically reign in spending in a range of areas including infrastructure, education, social services, and health and welfare, and citizens are gradually compelled to shift from an emphasis on unchecked consumption, consumerism and the escalating pursuit of material goods to a post-materialist, recyclable society. Commercialism declines and mistrust of large corporations increases. Self-discipline, restraint, recycling and reuse become the new watchwords of everyday life. Responsibilities that previously rested with central governments increasingly shift to the community level (e.g., healthcare), and greater attention is focused on the goals of environmental correction and protection.

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Overall, energy deficits and economic stagnation limit options for achieving sustainability. Where feasible, low-cost energy technologies are developed and used to meet the basic necessities of life (e.g., investment in food production, improved water quality). So too are technological innovations viewed as having particularly high social value. Yet economic stagnation often reduces the ability to procure technological solutions. Indeed, solutions are sought through a process marked by increasing social innovation. Individual rights are increasingly eclipsed by those of the community. And societal needs and challenges are met though an ever greater reliance on local bartering systems, community action and community living.

Markets are unstable as commodity prices increase. States increasingly adopt protectionist policies on the energy front, and the practice of energy hoarding becomes more widespread. International travel is greatly reduced. Economies are virtualized, and reliance on cyberspace grows as a way of reducing transportation and related costs. E-commerce is a strong force. So too is trade in existing (versus new) commodities. Manual labour becomes ever more important to economies in light of energy shortages. There is increased emphasis on teleworking. And the use of human-powered transportation, for both leisure and business, is more widespread. Recessions are nonetheless continuous, as a lack of surplus energy inhibits growth and development.

Canada is no exception to the general trends sweeping the globe. Although it is still a nation in the upper echelons of relative wealth and stability internationally, environmental and economic decline gradually take their toll on the state and society. Unemployment rises and budgets supporting social services decline. Untapped resources in the North lie dormant as exploration and extraction costs rise. Amid shrinking federal and provincial government budgets, citizens adopt a more localized focus, with volunteer groups and organizations emerging in an attempt to fill growing gaps in the provision of essential goods and services left unaddressed by governments.

In Canada and other developed nations, the limitations and disruptions triggered by energy scarcity and environmental decline force particularly drastic changes in lifestyle. Innovation is heavily "social" versus "material" in orientation. There is a particularly strong emphasis on use of existing technologies in new ways. Both elected officials and citizens place growing emphasis on environmental protection and stewardship. There is a rise in communal living and local community cooperation and involvement.

To be sure, gaps in living standards decline somewhat across the globe. And the pace of life slows down in many regions. Still, crime rates increase, especially for localized offences. Not surprisingly, the emphasis on neighbourhood policing grows.

International cooperation increases, particularly on the energy front, with many international organizations and institutions adopting a radicalized "green" focus. Monitoring and enforcement capacities are somewhat underdeveloped due to a lack of capacity, but compliance with international rules and norms on the environment is relatively strong and non-compliance is viewed as an increasingly serious offence. This results from a greater recognition of the interrelationships between national interests and sustainable development, and more generally from an increasing sense of global community. In other areas, cooperation is more limited, with states adopting a more regional focus.

Global population growth is in decline, particularly in the developed world. And while urban growth continues, it is marginal and slow at best, as economic decline reduces incentives to move to cities. In some cases, urban dwellers move to rural areas, preferring to live off the land over the high densities and noise and pollution levels of the cities. Global migration decreases as well. Economic stagnation reduces the need for cheap labour in the developed world, as does the ability and incentive of citizens from developing regions to move.

International politics remains anarchical. Multipolar power distribution helps to ensure that both states and non-state actors continue to compete for influence on the world stage. Yet the competition for power is more muted. States and their citizens view the costs of expansion and intervention abroad as increasingly prohibitive. In an energy-poor world, skilful diplomacy and dialogue are at a premium and there is a move toward the adoption of more cautious foreign and defence policies. Overall, however, states and societies adopt a more inward focus. Military technology declines as a priority area of investment. And regular military forces decrease in size, with many having a strong reserve component and a focus on providing domestic and even community-based security. Protection of scarce resources and energy supplies represents a key responsibility for governments and their militaries. And armed forces themselves are designed and trained to be more environmentally conscious in the conduct of operations.

Canada's role and activities in the security realm are generally reflective of these realities. Notwithstanding adoption of a somewhat more domestic focus in the face of changed energy and environmental realities and their impacts on Canadian society, the nations' support for allies as well as for international cooperation and regime building remains prominent. And diplomatic activity in global and regional organizations is particularly strong on the environmental and energy fronts.

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Notably, growing global allegiance to a strict environmental ethic works to mitigate some ecological degradation as well as the human disaster and societal dislocation that at times accompany it (e.g., starvation, disease, sickness, refugee flows, state failure and collapse).

Nevertheless, armed conflict and crises continue to occur as organized criminal activity, civil wars, state failure and natural disasters continue to plague various regions, particularly in the developing world. Meanwhile, calls for humanitarian aid and assistance remain a fact of international life. Yet, while members of the international community—including Canada— continue to respond, such assistance is increasingly selective, as the willingness to intervene is frequently eclipsed by an absence of financial capacity to do so. Accordingly, the quest for policies and practices aimed at prevention of such tragedies rather than reacting to their occurrence becomes ever more crucial to security and stability.

KEY SECURITY THREATS AND CHALLENGES

Increasingly scarce energy and growing ecological fragility result in a world in which the security and survival of states and societies are increasingly at risk. With energy deficits rising and the environment in decline, the capacity for scientific and technological innovation declines, industry and commerce slow and economies deteriorate. Gradually, the ongoing crisis prompts an ever greater realization not only that states and societies must do more with less, but also that the security and survival of nations is increasingly dependent on the cooperation and well-being of the international community as a whole.

National security is increasingly tied to global security. While the struggle for power and influence continues on the international stage, cooperation increasingly eclipses competition, both within and between states. Norms of unchecked consumption and waste are replaced by a growing ethic of energy sustainability and environmental activism. And while capacities for scientific and technological innovation decline, norms favouring greater social interaction and social innovation increasingly arise to partially compensate for the loss. Accordingly, social networks thrive, cyberspace grows stronger as a key enabler for social interaction, and norms reflecting increasing social responsibility (e.g., neighbourhood policing, recycling, barter systems).

Prospects for international tension and armed conflict continue to exist. Yet, in general, international armed conflict is increasingly muted and contained (i.e., limited in nature), owing both to growing norms of cooperation and collaboration and to the fact that in a world of energy deficits, economic decline and widespread environmental awareness, the costs of preparing for and prosecuting armed conflict are viewed as exceedingly prohibitive. Accordingly, the vast majority of such strife is regional and/or domestic in character, with key drivers including disputes over scarce energy supplies, wanton degradation and destruction of the environment, and increasing societal dislocation and poverty.

Conflicts arising as a result of economic decline are particularly salient, as states and societies are forced to cope with ever more sluggish development and economic stagnation. Impacts are felt world-wide. Yet they are particularly salient in the developed world, as once-affluent societies are increasingly confronted with the challenges of undertaking a major restructuring of economic, political and social life. One result is the rising challenge of maintaining domestic order. As unemployment and underemployment rise, social services decline and criminal activity increases. Looting, rioting and gang violence become more common. Organized crime flourishes and focuses more attention on the theft of—and illicit trade in—scarce energy supplies and key resources. Accordingly, maintaining internal order and guarding increasingly finite energy stocks becomes an ever growing security challenge. So does cyber-security and the need for increased surveillance, monitoring and internal policing of societies and their natural resources.

To the extent that such problems fester and increase, dangers of intra-state armed conflict and even regional wars with neighbours intensify. The prospects are particularly apparent in the developing world, as declining levels of foreign aid and still relatively weak local capacity continue to ensure that such states remain prone to failure and collapse in the event of social unrest.

Beyond this lie the ever present possibilities for the onset of a range of humanitarian disasters and emergencies arising not only as a result of social conflict itself, but also from the effects of global weather change and natural disasters (e.g., earthquakes, floods and tsunamis), disease and human error (i.e., accidents). To be sure, growing cultures of environmental activism, conservation and social innovation reduce the prospects for such occurrences somewhat. So does the fact that energy deficits ensure that some of the negative environmental impacts of economic development are reduced. Yet the prospect for such events arising is by no means eliminated. And the consequences of their occurrence remain potentially profound, particularly in the developing world, as weak local capacity and even weaker chances for outside assistance combine to hamper any effort at an effective response.

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In fact, promotion of environmentally sound practices and protection of already scarce energy resources represent the key challenges within a recyclable international society. And while international politics remains somewhat competitive, resource constraints work to ensure not only that such competition is muted, but that armed conflict, when it occurs, is relatively short in duration and more limited in its environmental effects. More often, states and societies focus inward, and internal and local problems dominate national agendas. Security becomes not only a government responsibility, but also a community responsibility.

SUMMARY INFORMATION

1. KEY DRIVERS OF INSTABILITY/CONFLICT

Scarce energy supplies, environmental destruction/degradation, economic decline, increasing societal dislocation and poverty.

2. SECURITY THREATS AND CHALLENGES (BY ROUGH PROBABILITY AND TYPE)

THREAT	PROBABILITY	
TYPE	DOMESTIC	INTERNATIONAL
Inter-State Systemic War	NA	LOW
Inter-State Regional War	NA	LOW-MEDIUM
Intra-State Armed Conflict	LOW	MEDIUM
Terrorism	LOW-MEDIUM	MEDIUM-HIGH
Organized Criminal Activity	MEDIUM	MEDIUM-HIGH
State Espionage	LOW-MEDIUM	MEDIUM
Industrial Espionage	LOW-MEDIUM	MEDIUM-HIGH
Humanitarian & Environmental Disasters	LOW-MEDIUM	MEDIUM
Radicalization/Violent Protest	MEDIUM	MEDIUM-HIGH

3. RECYCLABLE SOCIETY: KEY CHARACTERISTICS

ASSUMPTIONS	CHARACTERISTICS
Goal(s)	Survival (of planet)
Chief Means	Co-operation (Self-help secondary)
Predominant Attitudes	When the world survives – I survive (We need one another to survive) "I am my bother's keeper" "We all sink or swim together"
National Interest	Broad - long term view (national interest increasingly tied to interests of international community as a whole). Tendency toward positive-sum ("win-win") thinking.
Rough Historical Analogies	Greek City-State System, Pre-Westphalian Europe.

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NOTES

Canada's Future Army, Volume I: Methods, Perspectives, and Approaches is the first of three volumes focused on utilizing foresight to help conceive the Future Army. This first volume is designed to elaborate the methodology used by the Canadian Army Land Warfare Centre (CALWC) in determining its vision of the future security environment and the potential alternative futures in which the Canadian Army may find itself in 2040. The subsequent volume, *Canada's Future Army, Volume 2: Force Employment Implications*, will articulate the results of the analysis of the potential futures from the perspective of the required concepts and capabilities needed for the Army to remain relevant and effective in 2040 and beyond. The last volume, *Canada's Future Army, Volume 3: Alternate Worlds and Implications*, will examine the four alternative futures in more detail as well as various important indicators and signposts. *Canada's Future Army, Volume I: Methodology, Perspectives, and Approaches* begins a new cycle of Canadian Army capability development that focuses on developing a vision of the Future Army. It establishes the Army's foresight methodology, provides initial observations concerning the likely character of the future security environment and creates potential alternative futures within which its concepts and capability requirements can be examined.

CANADIAN ARMY LAND WARFARE CENTRE

The Canadian Army Land Warfare Centre serves as the army's intellectual foundation for the development of overarching concepts and capabilities for tomorrow and into the future. It is responsible for delivering concept-based, capability-driven tenets and specifications for force structure design; drawing up the army's concept development and experimentation plan; serving as a focal point for connection with other warfare centres, government departments, partner nations, external agencies and academia; and delivering high-quality research and publications in support of the Canadian Army's force development objectives.

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