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Future of Conflicts

A Vision of What Is to Come

Nicolas Minvielle

Marie Roussie

Romane Thomas

INSIGHT

6/2025 October 2025


NATO

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Future of Conflicts
A Vision of What Is to Come

Foresight is intended to inform and illuminate the future. But what if instead it serves to build conceptual blinkers regarding the nature of future conflicts? This paper presents a quantitative and qualitative study of close to 100 foresight reports recently produced by NATO, its members and partners. These are placed in perspective alongside studies from adversarial countries, as well as narratives drawn from institutional science fiction.

Introduction

The future has never seemed so uncertain and complex. Technological transformation, accelerated innovation cycles, geopolitical upheaval, social and environmental pressures, and a multitude of trends and events are creating a sense of urgency to think about tomorrow, lest we be left behind. A wealth of academic research addresses this need to consider the future: "The current historical context, characterized by multiple and interdependent crises, underpins a shared curiosity, interest, and even anxiety about the future and its challenges"[1]. Specific tools have emerged to monitor this sense of uncertainty, such as the World Uncertainty Index, which charts the evolution of uncertainty over time and its remarkable rise over the last twenty years[2]. Across official, political, and managerial discourse, as well as academic research, a broadly held conviction stands out: the future is now understood as a realm filled with unknowns and uncertainties.

The defence sector is particularly affected. The return of conflict to the European continent and the ongoing intensification of flashpoints around the world cast a dark pall over visions of the future. Instability seems to reign supreme. Far-reaching changes are expected to transform operations and organizations, though their contours remain ill-defined. As a result, two races are simultaneously underway: first in the long-established field of intelligence, to anticipate emerging tensions and flashpoints; and more recently in the field of foresight, to explore the parameters of future conflicts. Foresight has become a strategic asset, tasked with making sense of today's changes and trends through long-term projections. At the core of these exploratory efforts lies the same ambition: to identify the future drivers of superiority that will ensure tactical and operational advantage, and to define the most critical factors of resilience in a future environment that will be different from today's.

What exactly do these foresight studies tell us? What visions of future conflicts do they present?

This research focuses on the potential forms that future conflicts could take. A significant portion of foresight reports explore the possible causes and objectives of upcoming conflicts. However, such highly geopolitical studies are not the focus of this paper. Instead, this research investigates the parameters of future conflicts, such as their main features, the actors involved, the settings of confrontation, and the technologies deployed. In other words, this paper seeks to identify the typical profiles of future wars, describing and categorizing the visions conveyed in military strategic foresight reports.

The overarching aim therefore is to compare these visions to identify areas of convergence and divergence. NATO operates entirely by consensus. Member countries share their perspectives of the current and future state of war and conflict and develop a shared understanding of what they may face in operational theatres, including shifting power dynamics, geopolitical changes, decisive technologies, and key drivers of operational superiority. But beyond NATO's consensus, how do individual countries and how do other actors conceptualize the future of conflict? What blind spots exist in the conceptualization of future conflicts?

In other words, we aim to establish whether these visions are shared. When they are not, we strive to identify the differences in order to understand conflicting perspectives and focal points on the future. Furthermore, this research is specifically designed to place these visions of future wars into comparative perspective. It compares so-called Western perspectives (produced by NATO countries and their partners) with foresight reports from competitors and even adversaries, such as Russia and China, as well as with an unexpectedly creative resource: science fiction. The latter is gaining recognition as a valuable source of foresight. Many armed forces and international military institutions commission science fiction authors to craft imaginative narratives about future wars[3].

The following pages provide an initial radar scan of key elements related to the future of conflicts. This radar scan identifies shared beliefs within NATO and potentially among other actors as regards seemingly obvious parameters of future conflicts that warrant further examination. It also reveals areas of disagreement and factors that NATO may be underestimating, relative to its competitors. Implicitly, it is also a way to uncover blind spots in NATO's foresight thinking. On this point, science fiction plays a pivotal role in fuelling our imaginative capacity when envisioning the future.

1 Olivia Bina, Sandra Mateus, Lavinia Pereira, and Annalisa Caffa, "The future imagined : Exploring fiction as a means of reflecting on today's Grand Societal Challenges and tomorrow's options," *Futures, 86*, 2017, 166-184.
2 See website: https://worlduncertaintyindex.com/about-us/
3 Marie Roussie, Sonia Adam-Ledunois, and Cédric Denis-Rémis, "Quand la science-fiction infiltre les organisations," *Revue française d'administration publique, n° 185*(1), 2024, 259-281.

Methodology

1

Methodology

The research was based on the compilation and analysis of approximately 200 documents, including foresight reports and science fiction narratives. This was achieved through a three-step methodology: 1) compilation of the corpus, 2) coding of its key components, and 3) quantitative and qualitative analysis. These three steps were not conducted in a strictly linear, consecutive manner. Rather, they were iterative, interwoven, and carried out simultaneously to ensure cross-fertilization. Figure 1 illustrates this bespoke research methodology.

The originality of our study rests on two pillars: firstly, providing a quantitative analysis of visions of future wars (which, to our knowledge, has never been done before);

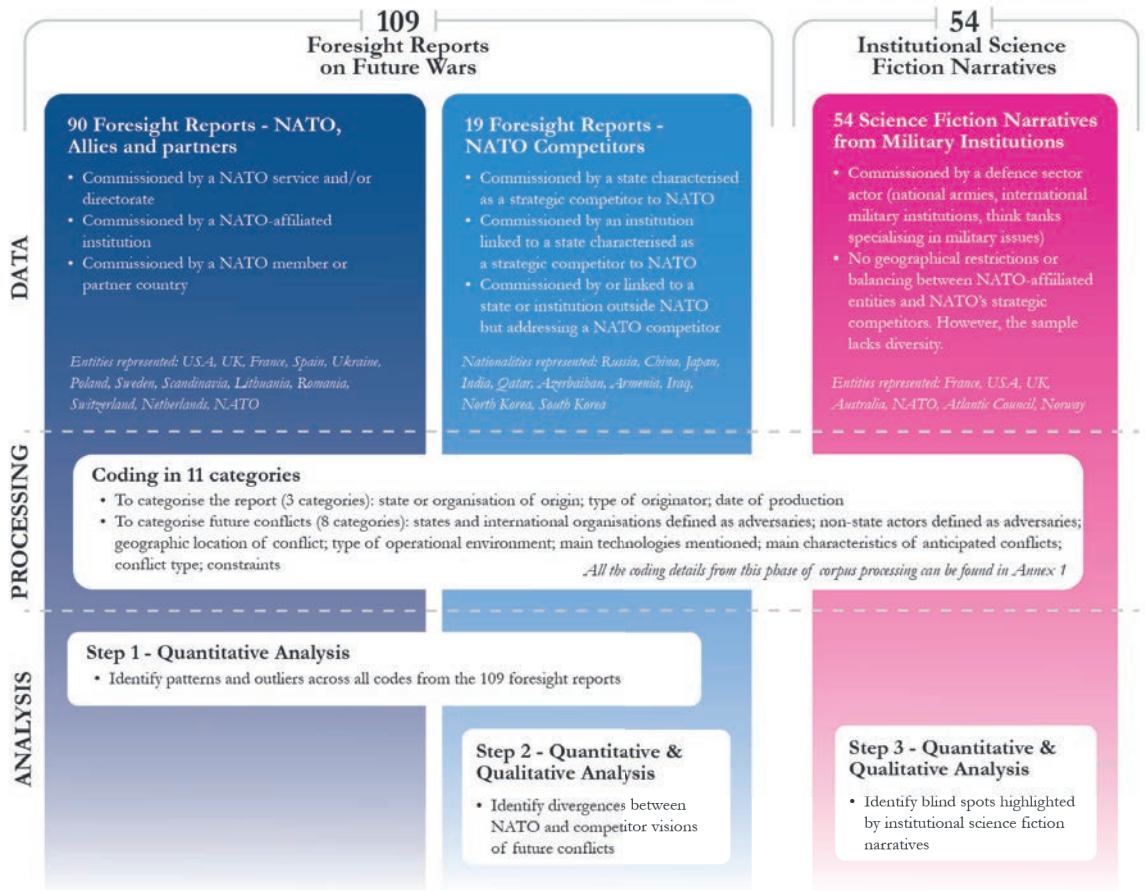


Figure 1 – Modelling of the research protocol implemented

and secondly, enabling a rich dialogue between the three types of sources comprising visions from NATO: NATO Allies and NATO partners; visions from strategic competitors; and military institutional science fiction.

Over several stages, a corpus of more than 150 documents was compiled. First and foremost, we focused on identifying foresight reports that dealt with future wars. Our sample focused on the nature of anticipated conflicts, thereby excluding studies solely concerned with the causes of future wars. We then divided the identified reports into two categories based on their country of origin: those produced by NATO and/or a NATO-affiliated country or institution, and reports originating from strategic competitors. A total of 109 reports and 54 works of military science fiction were selected.

1.1. Corpus Compilation

To access these reports, we delved into all available open-source intelligence (OSINT) publications relating to future wars. Only freely accessible reports were studied. To this end, keyword searches were carried out on all the scientific research databases available to the authors (EBSCOH, Science Direct, the NATO Defense College library, etc.). Further research was then conducted using variations of the expression "future of conflicts". The queries, conducted solely in English, yielded reports in various languages, including English, Chinese, Russian, Arabic, French, Polish, Romanian, and Spanish. This method produced an initial corpus of around 40 research works, which served as the starting point for the entire project.

Each document in the preliminary compilation was read and tagged. Artificial intelligence (ChatGPT in various versions, including O3) was used to translate some of the documents, conduct second readings (in addition to that of the authors) and generate summaries. It also helped identify the tags reflecting the content of the documents. This incremental approach allowed the research team to refine and verify the tagging framework. The team's classifications consistently took precedence over those suggested by AI. If an AI-generated tag contradicted one chosen by the research team, the document was re-read to ensure that no detail had been overlooked and that no aspect had been otherwise underestimated or exaggerated. This first step therefore made it possible to establish a foundational corpus, the core coding categories and the main tags used during analysis.

The second step of the tailored methodology was to expand on this initial corpus of work. The aim was to reflect the diversity of perspectives worldwide. Ultimately, more than a hundred resources from OSINT were identified. The principle was to use only non-confidential open-access reports. However, accessing non-NATO resources or resources in languages other than English proved challenging. Consequently, such sources are underrepresented in the final corpus and subsequent analysis.

1.2. Data Processing

The coding phase took place over several months and involved repeated reading of documents to identify the number of relevant analytical categories, ultimately setting it at 11. Three of these categories are descriptive and are related to the report's origin (state or organization of origin; type of originator; date of production). The other eight categories emerged from the initial analysis phase, which allowed us to highlight recurring parameters that appeared in the corpus, as well as aspects that the research team deemed relevant for defining future conflict profiles (states and international organizations defined as adversaries; non-state actors defined as adversaries; geographic location of conflict; type of operational environment; main technologies mentioned; main characteristics; conflict type; constraints). Figure 1 provides a description of these 11 analytical categories. Recent literature on the future of conflicts informed the category design. Once established, the coding work could begin. Tags were developed by the research team through a process of iteration. Annex 1 provides a list of the 11 categories alongside a short definition for each, as well as a list of all the tags developed under each category. In fact, the development of these tags is one of the central outputs of this research. The analysis conducted combined both quantitative and qualitative approaches. Qualitative methods helped define the tags. To identify the main visions of future conflicts, as well as the most commonly shared or, conversely, the most unique ones, a quantitative analysis was carried out on the eight aspects intended to define the typical profile of future conflicts.

In summary, the categories used in this study emerged iteratively, shaped by ongoing reading of the reports and the identification of the salient features identified in the texts. Progressive analysis of the corpus then enabled the creation of a structured matrix of categories, within which tags were defined. This matrix was not predefined but evolved organically through recurrences and contrasts found in the sources. The matrix is as much a product of research as it is a methodological tool.

The research team would like to point out that some of the sources analysed provide a very detailed breakdown of entities and forms of conflict, distinguishing between, for example, insurgent groups, separatists and mercenaries, as well as other categories such as geographical areas and technologies. To ensure analytical consistency and enable comparative analysis of the texts, these specifics were aggregated into broader, macroscopic categories. This approach captures the key trends that will shape future wars, while maintaining analytical clarity despite the diversity of individual cases.

1.3. Results Analysis

We then used the Obsidian data processing tool to apply tags based on their recurrence within the corpus. Cross-analysis was also performed on a small number of variables. This quantitative approach helped identify the most common tags and analyse their distribution based on the organization of origin, especially by nationality.

While informative, such a quantitative approach alone did not uncover the pitfalls – or the blind spots – of the foresight reports. To address this, the corpus was expanded to include science fiction produced by military institutions. Institutional science fiction is defined as science fiction commissioned by or created for an institution (Michaud, 2023). Many military institutions, including NATO, produce such works of science fiction. Notable examples include France's Ministry of Armed Forces *Red Team Défense* initiative (2020–2023) and the NATO Defense College's 2024 graphic novel, *NATO 2099*. Our research team specializes in using science fiction for foresight purposes and turned to these works to broaden the perspective on the results generated from the analysis of traditional foresight reports. The aim was to determine whether these stories conveyed different visions of the military challenges of tomorrow, as depicted in the works of fiction. This inquiry was driven by the principle of performativity in fiction. When science fiction authors speculate about the future, they often reveal elements that tend to materialize. Fifty-four publicly available works of science fiction were identified which were produced for a commissioning organization (and therefore fall under the category of institutional science fiction), and deal with future conflict, making them relevant to this study.

For the remainder of this paper, the term "corpus" refers to all 109 of the foresight reports that have been compiled, coded and analysed. The term does not encompass the 54 sources of institutional science fiction, but these are drawn upon to provide comparative insight.

1.4. Methodological Limitations

Several limitations of the methodology used warrant attention. Acknowledging these limitations is essential for understanding both the scope of the results and the necessary caution with which the analysis should be interpreted. The primary limitation was the difficulty in diversifying the sources, mainly geographically. Readers will note that the corpus consists primarily of studies conducted in the Western world. Despite the research team's significant efforts to broaden the field by using VPNs, conducting multilingual searches, and trawling through specific databases, accessing publications from countries such as China or Russia proved extremely challenging. Efforts were also made to locate perspectives from non-state actors but were unsuccessful. However, as the analysis demonstrates, such actors play a crucial role when conceptualizing future conflicts. The lack of diversity within the corpus introduces a constraint that limits the overall analysis, resulting in a form of linguistic bias. To mitigate this issue, the research team conducted a second analysis, comparing thematic recurrences based on geographical regions (Western and non-Western). When differences between regions were sufficiently pronounced, they were examined separately to highlight contrast. This approach allowed us to weight occurrences by geographical zone, avoiding an undifferentiated global quantitative analysis in which the volume of Western OSINT studies would otherwise overshadow insights from other parts of the world.

The second limitation stems from the fact that the readings and tagging were performed by the research team. Despite the use of artificial intelligence to challenge the tags and the systematic use of double coding to validate the results, biases undoubtedly remain in the way the material was characterized.

Result

2

Result

Analysing the compiled corpus produced a wealth of findings. This enabled us to create a rich radar scan of diverse visions on future conflicts. Nine aspects in particular merit closer attention and are highlighted. These results are discussed and further developed below, opening prospects for deeper research and action.

2.1 A Cluttered Horizon

Analysing more than a hundred reports and articles dealing with possible future wars is like a deep-sea dive. As the exploration deepens and data accumulates, clarity is reduced, pressure intensifies and the effort to interpret the data becomes more demanding. The diversity of viewpoints was so broad, even among actors likely to share a similar perspective, that a preliminary standardization of codes became necessary. We had (perhaps naïvely) expected this type of study to reveal a similar and shared vision of future conflicts, especially among NATO countries. However, the analysis proved us wrong.

2.1.1. The Kaleidoscope of Tomorrow's Wars

The initial and primary result of this study is the creation of tags that define future conflicts, such as "states and international organizations defined as adversaries", "non-state actors defined as adversaries", "geographic location of conflict", "type of operational environment", "main technologies mentioned", "main characteristics", "conflict type" and "constraints". A total of 213 tags were developed by the research team. This high number is the result of considerable efforts to collate, harmonize and consolidate the initial tags, which were often highly disparate. The aim was to prevent analytical fragmentation in a sea of divergent and often incompatible interpretations, by focusing on broader, macroscopic categories. This approach had the dual effect of facilitating analysis by limiting the number of tags while reducing the granularity of possible analysis (as a result of macroscopic tags).

In fact, this difficulty proved to be a powerful research outcome. It gave rise to a compelling and potent metaphor of military foresight: "War in a Thousand Shards: Mapping a Kaleidoscopic Future". This conceptual proliferation led us to the phenomenon of the "mirror ball", comprising small mirrors, each one reflecting light differently. Each facet is intrinsically linked to other facets, yet the whole reflects a single perspective. The same can be said of the studied corpus. Each report in the corpus reflects a distinct vision of the future, shaped by its cultural, doctrinal and institutional perspectives. In foresight, this concept is referred to as "plural futures".[4] It denotes the coexistence of diverse strategic perspectives, even among closely aligned actors (such as NATO member countries). On the surface, this diversity seems to be an asset and reflects differing national or organizational strategic challenges.

2.1.2. On the Margins of the Future

Yet within this kaleidoscope, some constants emerge with persistence. A handful of themes recur to such an extent that they saturate the analytical horizon. These themes become fixation points that obscure equally relevant but less emphasized lines of inquiry. A closer examination

4 Similar to the term "possible futures," a concept found in the work of the founding figures of French foresight, from Gaston Berger to Michel Godet and Bertrand de Jouvenel.

of the corpus reveals a typical "long tail" distribution (Anderson, 2006). This concept, borrowed from economics, illustrates attention that is heavily concentrated on a limited number of themes.[5] Our study showed that some subjects (specifically with regard to technology, cyber, artificial intelligence and drones) garnered repetitive, near-obsessive attention. Conversely, many themes emerged sporadically or were mentioned just once. We refer to these subjects as outliers or fringe issues, given their low occurrence within the corpus. The results obtained reveal that such marginal themes exist in all the studied categories and that their occurrence is far from insignificant (75 out of the 213 tags were mentioned five times or fewer, accounting for 35% of the corpus).

This imbalance raises an essential question: do these marginal zones contain weak signals that we are yet unable to decipher? Or, conversely, does overexposure to certain subjects distort our ability to anticipate the unexpected?

Foresight still lacks the tools necessary to truly interpret these fringe areas in strategic thinking. The first key step, in our view, is to acknowledge their existence. Clear-sighted analysis of conceptions of the future should devote equal attention to both dominant themes and minority perspectives (whether or not they diverge). These fringes could be thought of as foresight canaries: events taken alone are not significant, but once a certain threshold is crossed, they wield real influence. These fringes and their key variables should be identified, and the related advancements in technology, society, economics and finance that might trigger them routinely monitored. If left untracked, they could culminate in a strategic surprise.

2.1.3. The Future, but When?

All things considered, for works that pursue a clear goal, i.e. to prepare for tomorrow's conflicts, the methodological objectives are sometimes murky. Works that rigorously set out their approach, limitations and context are fewer and further between than we would expect. Foresight reports from the RAND Corporation, UNIDIR and some other institutions stand out for their analysis and methodology. Meanwhile, the very notion of the "future" is often vague, and "conflict of the future" seldom benefits from clear temporal framing. Explicit dates rarely appear in titles. Of the 109 foresight reports, 104 offer no indication of a time horizon (95%). Positing a foresight hypothesis with dates is always a risky exercise, often doomed to fail. Foresight errors are numerous and dampen many initiatives. Yet, temporal framing is vital to understanding the scope of the proposed work and assessing its relevance. It is also essential for determining how foresight can translate into concrete action for organizational transformations and R&D programmes. Ultimately, setting a date in foresight is difficult, but when time horizons are included, they increase the utility of the work.

All too often, in a corpus, the notion of "war of tomorrow" remains far too vast in its meaning. Some works cover various topics without providing anything actionable for decision-makers. Talking about a space conflict without any timeline (even loosely defined) does little to aid projection. At the very least, it would have been possible to differentiate three broad time horizons: the "next fight", which could occur within the next 1–10 years, very near term; force design, which concerns structural planning and takes approximately 10 years; and the "grand narratives" of future warfare, looking ahead 20 years or more. Without committing to firm dates, this would enable readers to better grasp the dynamics at play and the criticality of the analyses across time horizons.

One way to avoid this pitfall would be to radically rethink our relationship to the future. Beyond setting time horizons for change, foresight would provide an analytical method for evaluating the significance of these ongoing and upcoming transformations. This shift would offer two key benefits. First, it would enable us to transcend cultural differences in how the future is perceived. Does "future war" cover the same time frame across all countries? Nothing could be less certain. Many academic works emphasize the diversity of approaches to thinking about the future based on the country in question. The works of Geert Hofstede point to significant variance in long-term perspectives across national cultures (see Figure 2). By focusing on the significance of transformations rather than dates, we transcend these temporal disparities and emphasize potential impact. This approach would also foster actionability. The analysed corpus primarily offers panoramas: snapshots of what future wars could look like. However, an analytical step is missing to carry this through to action. Foresight would go beyond depiction by assessing these scenarios and guiding decision-making. Such an analytical approach would also be conducive to setting up specific radar scans. The corpus reveals that reflection on future wars is done through one-off individual reports produced on request. Developing a truly relevant and effective tool requires a more rigorous, more systematic approach: an analytical matrix – a radar – that is refined and reformulated every year based on observed developments (especially at the margins, with the so-called canaries).

5 In its original formulation, this economic principle describes the concentration of sales around a few so-called best-selling products. The long tail then represents all the other products, which sell in smaller quantities but collectively are significant.

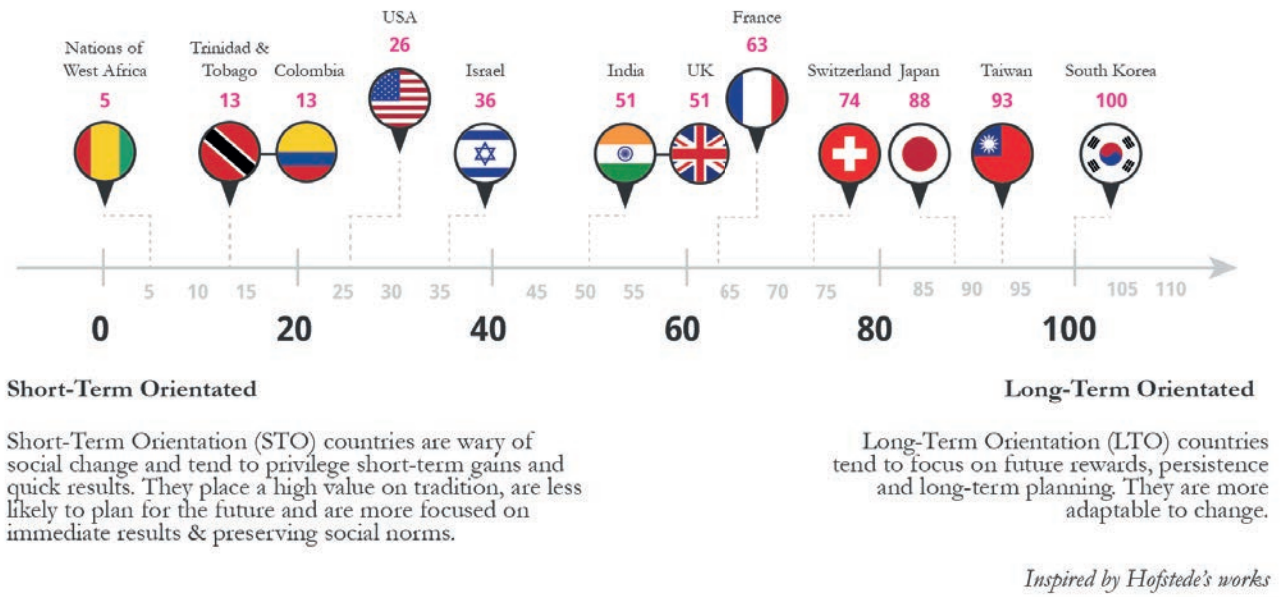


Figure 2 – Different views on long-term perspectives based on Geert Hofstede dimensions of cultural index. Source: Geert Hofstede, *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations*, SAGE Publications, 2001.

2.2 A Technocentric Future

Technology is dominant throughout this corpus. Every report cites multiple technologies, some of which are already in use, others under development. All dimensions of tomorrow's wars are projected through these technologies and their influence. This obsession is all the more striking given that it results in a narrow set of widely accepted technologies. Far from ignoring these mainstream technologies or downplaying their significance for future wars, their high recurrence raises the following question: are we genuinely grappling with the challenges ahead, or are they tantamount to blinkers in understanding the future?

2.2.1. Technological Obsession

As mentioned previously, one of the most striking findings of this study was the relentless focus on technology in the conception of future warfare. It is worth recalling here that the codified categories were developed iteratively based on what the corpus revealed. Technologies were mentioned so frequently as key factors in future conflicts that a separate category was created ("#8 – Main technologies mentioned"). Such a result demands a broader contextual framing. Following the Second World War, foresight in defence was institutionalized to anticipate technological transformations that promised operational and tactical dominance.[6] Since then, interest in future technologies has remained central and is not unique to military foresight. However, foresight can apply equally to the political, social, environmental and economic realms.

A striking historical example is the 1933 report entitled *Recent Social Trends*, which was commissioned by the U.S. government. The aim was to inform economic and social policy during the Great Depression by providing a prospective vision of U.S. society in 1990. So why does the corpus have such a heavy focus on technology? Several possible explanations can be offered, even if they cannot yet be proven. First, technology is an easy entry point to foresight. It seems easier to envision the evolution of equipment rather than societal transformation, as the human variable is so volatile. Second, such a focus may indicate a strong cognitive bias: we assume that technological advances will lead to future victories and operational superiority. Lastly, and perhaps more insidiously, it may reflect the very heavy financial investments made in technological innovations. Foresight then becomes a tool to justify budgets for major innovation programmes,

6 See the chapter dedicated to the RAND Corporation in *Histoire des Futurs, les Figures de l'Avenir de Saint Augustin au XXIe siècle*, by Bernard Cazes (1986).

and to underpin political rhetoric showcasing proactive investment in future solutions (in this case, technological ones).

2.2.2. The Erasure of Human and Environmental Dimensions

With that critique in mind, several patterns emerge before exploring specific technologies. Firstly, citations of technologies go beyond the "main technologies mentioned" category. This theme was given such weight throughout the corpus that other tags refer to it (for example, the "conflict type" category includes the "cyberwarfare" tag, which is a type of conflict determined by a specific type of technology). In fact, the entire corpus pays little (if any) attention to sociological, psychological or humanitarian dimensions. The human dimensions, which are indeed at the centre of any war experience, were broadly neglected.

Notions such as courage, bravery, legitimacy and population health – factors that speak to the capacity to endure and mobilize – were absent. Moral strength, a well-anchored theme in Western strategic thinking, especially regarding the ability to endure loss of life and maintain cohesion in the face of adversity, was only mentioned in passing. Only a few studies mention such challenges, notably the limitations of "human strain" (17 out of 109 reports, or 15%), "demographic decline" (4/109 reports, or 4%) and "mobilization" (1/109 reports, or 1%). Mobilization, in particular, is currently at the heart of discussions in many NATO countries. Does this mean that the studied foresight reports anticipate a continuation of this challenge in future and propose technological solutions? Or does it point to a lack of interest in the human dimension of future conflicts? The frequency of ethical dilemmas reflected (39/109 reports, or 36%) suggests the former. However, the conclusion is stark: the future of conflict is almost exclusively explored through a technological lens.

The way in which climate change is handled also illustrates this narrow, primarily operational approach. Climate change is almost invariably viewed as a constraint: rising sea levels prompt inland displacement; higher temperatures affect the mobility of infantry and restrict flight capabilities; and combat may even have to be conducted at night to avoid extreme heat. However, the analysis often remains at a general level and overlooks the nuanced impact across militaries and theatres of operation. For instance, few studies address the impact of increased ocean salinity on naval materials, biodiversity decline and its systemic ramifications, or intensified winds. Moreover, some dynamics present strategic opportunities, but such potential is seldom recognized. Climate change, for instance, alters the life cycle of phytoplankton, resulting in blooms of unprecedented size and duration, which could be harnessed to develop naval biological sensors. This form of analytical inversion, turning a constraint into an opportunity, is largely absent from current discourse.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

In contrast, institutional science fiction takes a broader view of future conflicts, addressing both human and environmental issues. Many of the stories studied explore issues such as betrayal, especially by an internal enemy, as well as the deliberate exploitation of human weaknesses. *1000 Cuts*, created by Arizona State University for the Army Cyber Institute in 2018, is a short graphic novel which applies the "1000 cuts" strategy to the future, whereby the resilience of a national army is weakened by inflicting minor harm on a high number of its members. Stealing medical payments for a close relative through hacking, psychological attacks through information manipulation – such are examples of non-lethal, non-physical cyberattacks against individual members of the armed forces. When carried out on a large scale, they can cripple a military. Institutional science fiction pushes reflection even further on environmental issues. In 2022, the *Red Team Défense* of France's Ministry of Armed Forces imagined a scenario in which nature was both an operational ally for military missions (via intelligence networks built from mycelium) and a hostile force. *Guerre écosystémique* ("Ecosystemic Warfare") imagines the consequences of unchecked home-based DNA modification technologies, resulting in an ecosystem that spirals out of control.

2.2.3. Three Dominant Technologies

A clear pattern emerges from the analysis of the 109 sources included in the corpus (both Western and non-Western). Three technologies stand out as pivotal for future conflicts: artificial intelligence (AI), cyber systems, and surveillance systems.

AI is referenced consistently throughout the corpus: it is mentioned in 96 out of 109 reports (88%). Focus on AI spans the entire timeframe of the corpus, from 1998 to 2025. This overwhelming trend is therefore both widespread and deeply embedded across the sources studied. While this technology has gained significant attention in the civilian world since the release of software in 2022, particularly OpenAI, military foresight has been exploring AI for over 20 years. However, it has not yet been fully integrated into military systems and force structures.

INSIGHTS FROM STRATEGIC COMPETITORS

This focus is echoed in institutional science fiction, which is commissioned by military institutions. The narratives reveal an ambivalent stance towards AI, perceived as much as a source of operational superiority as it is a potential threat, even to the point of becoming a global adversary. Caught between fear and fascination, AI is seen as a core domain in future conflicts, although the related issues are not always fully developed in the reports. To discuss AI is to address technological platforms, algorithmic models and access to training data. A compelling example of this is *A Model of Peace*, written by August Cole and Peter W. Singer (authors of Ghost Fleet) for the UK Ministry of Defence in 2022. The story revolves around negotiations over wartime data to feed AI models and conflict simulations.

The other two frequently cited technologies are also prominently featured: cyber capabilities appear in 90 reports (83%), and surveillance systems in 74 (68%). Beyond fascination with technology, such a prolific and stimulating intellectual enterprise would benefit from incorporating insights from the humanities and social sciences. The idea is not just to analyse the use of technologies, but also to understand what they reveal about our societies, our fears, and the way we relate to war, time and death. AI, currently the focus of intense collective attention, is a prime example of this. While its military potential is discussed at great length, very few studies examine what AI says about our times, our concepts of command, the delegation of responsibility, the autonomy of systems, or the logic of warfare. How will this technology be perceived in twenty years' time, from a long-term historical perspective? As a disruption, an illusion or a continuation of an existing technological paradigm? These are all questions that call for deeper critical consideration.

2.3. Technological Blinkers

The initial findings are telling: technology lies at the heart of current thinking on the wars of tomorrow. This prominence results in a strong convergence around a narrow set of technologies, which are also very much of the present. This leads us to a critical question that demands serious attention: what is happening on the fringes of our technological imagination?

2.3.1. Clear-Eyed Thinking or Collective Blindness?

Among the analytical categories used in this study, technology emerges as perhaps the most revealing. This is not for what it predicts about the future forms of conflict, but because of what it reveals about how we imagine them. The fascinating part is not the technologies themselves, but the collective visions they crystallize. Yet there is a pronounced focus on a set of recurring technologies, regardless of the geographic or institutional origin of the foresight reports (see Figure 3). While nearly 40 technologies were tagged throughout the corpus, only five were mentioned in more than 50% the reports. Such convergence of thought is rare, and warrants further scrutiny, especially as part of a foresight exercise aimed at expanding the field of possibilities.

Five hypotheses may explain this consensus.

1. **Shared lucidity.** The authors are simply right. Artificial intelligence, cyber systems and surveillance systems are indeed the foundational technologies of future conflicts. Failing to account for them would be a case of strategic short-sightedness. In this instance, the dominant technologies have been identified, and the field is clear and open for competition.

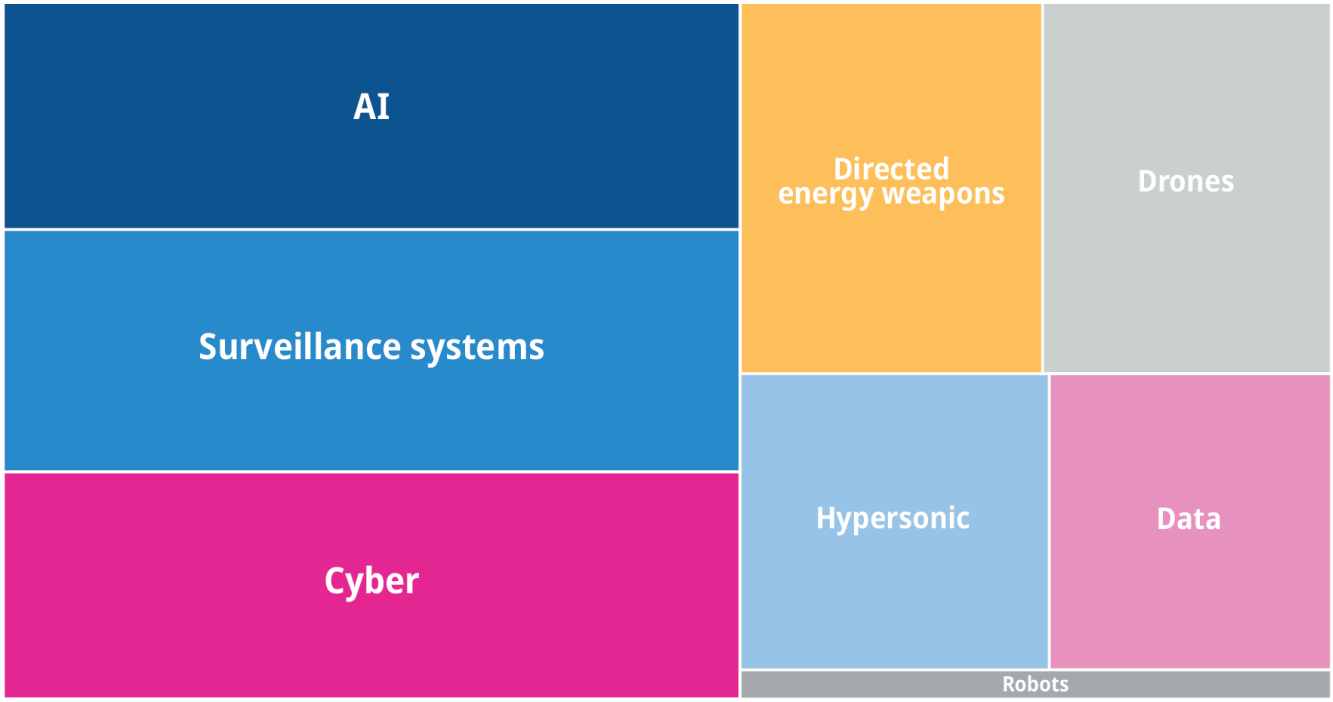


Figure 3 – Converging views on technologies, based on 109 foresight reports on future wars. Size of box equivalent of frequency on occurrence in these reports.

2. **A strategy of influence:** Emphasizing certain technologies may be a form of soft power or perception management. This interpretation makes sense in the context of state actors or organizations that seek to shape security agendas. It becomes more problematic, however, when such homogeneity is found in academic work, which is expected to be more independent and critical. This weakens the strength of this hypothesis.

3. **The mimicry effect:** This uniformity could be a symptom of intellectual conformism. Rather than exploring more marginal or disruptive alternatives, researchers and analysts gravitate towards previously charted, socially validated themes.

4. **The desire for reassurance:** Institutional sociology suggests that military organizations[7] tend to project scenarios in which their capabilities remain relevant. It is indeed difficult to admit that assets developed over decades may be inadequate for future conflicts. In fact, human bias means we tend to view tomorrow's challenges through the lens of today's models. In other words, foresight can reinforce existing doctrine or at least the trajectory it is already on.

5. **The taboo of "blue sky" technologies.** The most risky or radical technologies are omitted because they are too ethically contentious to be discussed publicly. This is not due to classification or sovereignty concerns, but simply because they are morally controversial. Two emblematic examples in the West are genetic modification and climate engineering.

2.3.2. Technological Focalization

One constant stands out across all the material: the most frequently cited technologies revolve around AI, cyber security and drones. Although they recur less frequently, surveillance systems are also on this list. More than the technologies themselves, this repetition deserves to be examined as a reflection of our collective imagination regarding future conflict. The Ukrainian conflict has not altered which technologies are considered essential. Even before 2022, for example, drones were central to military foresight thinking. High-end technologies, such as directed-energy weapons and hypersonic missiles, remain among the most frequently cited, despite recent operational setbacks. Nevertheless, there is still a widespread fascination with this type of weaponry.

7 Charles C. Moskos, Jr., "From Institution to Occupation: Trends in Military Organization," *Armed Forces & Society*, vol. 4, no. 1, pp. 41-50.

This raises a key question regarding why these particular technologies are dominant. Their technology readiness levels (TRLs) are generally high. Cyber technologies have been in use for a long time, AI has already demonstrated its capabilities, and surveillance technologies are widely deployed and both drones and robots are common. Even hypersonic weapons are being released by laboratories. Technological maturity is therefore not what holds these technologies back from becoming today's realities instead of future visions. What does stand in the way is the challenge of producing these weapons affordably and defining use cases that integrate them meaningfully into existing force structures. To a foresight analyst, this short list of technologies seems less like a bold leap into the unknown and more like a linear projection of systems that, while perhaps not fully mature, are already well understood. At face value, the reports do not propose any true intellectual break that would radically reimagine the role of emerging technologies still in the advanced research phase.

Nevertheless, it must be noted that the issue is rather complex. For example, understanding AI as a high-TRL technology oversimplifies its polymorphic nature. While the use of AI for computer vision is well developed, controlling swarms of autonomous drones is still in the developmental stage. Here, we encounter the aforementioned limitation regarding the accuracy of analyses resulting from the need to apply broad, macroscopic tags. Moreover, the fact that technologies are prioritized similarly across regions does not imply they will have the same impact in future conflicts. The technological ecosystems (entrepreneurship, industry, financing, research, etc.) are vastly different from one region to another. So are the doctrines of use and ethical frameworks. In other words, even if rival powers rank the same technologies as priorities, the actual combat outcomes will likely vary significantly.

INSIGHTS FROM STRATEGIC COMPETITORS

One key finding of this study is that NATO's and its strategic competitors' visions of technology are similar. This similarity is most evident when it comes to key or obvious technologies, the ones most frequently cited in the corpus. As illustrated in Figure 4, four of the six most mentioned technologies – cyber, AI, drones, and surveillance systems – appear in both sets of sources. For countries closely aligned with NATO, the two other most frequently mentioned technologies are "directed-energy weapons" and "hypersonics". For the strategic competitors, they are "robots" and "ICT". However, the stark imbalance between the two samples (with 19 reports representing NATO competitors' point of view, versus 90 reports from NATO or NATO-aligned entities) prevents us from concluding with confidence that there is convergence in technological visions for future wars. However, we can confirm shared points of interest. To detect possible differences, we must pay particular attention to the fringe technologies in this corpus.

2.3.3. Blind Spots

Alongside the three dominant technologies that attract widespread attention, we find others that are mentioned only occasionally. In fact, 16 out of the 38 tagged technologies (42%) are mentioned in ten reports or fewer. Four of these are mentioned in only one report in the entire collection. Earlier, we called for greater consideration of fringe technologies. Let us take a look at what these fringe technologies reveal.

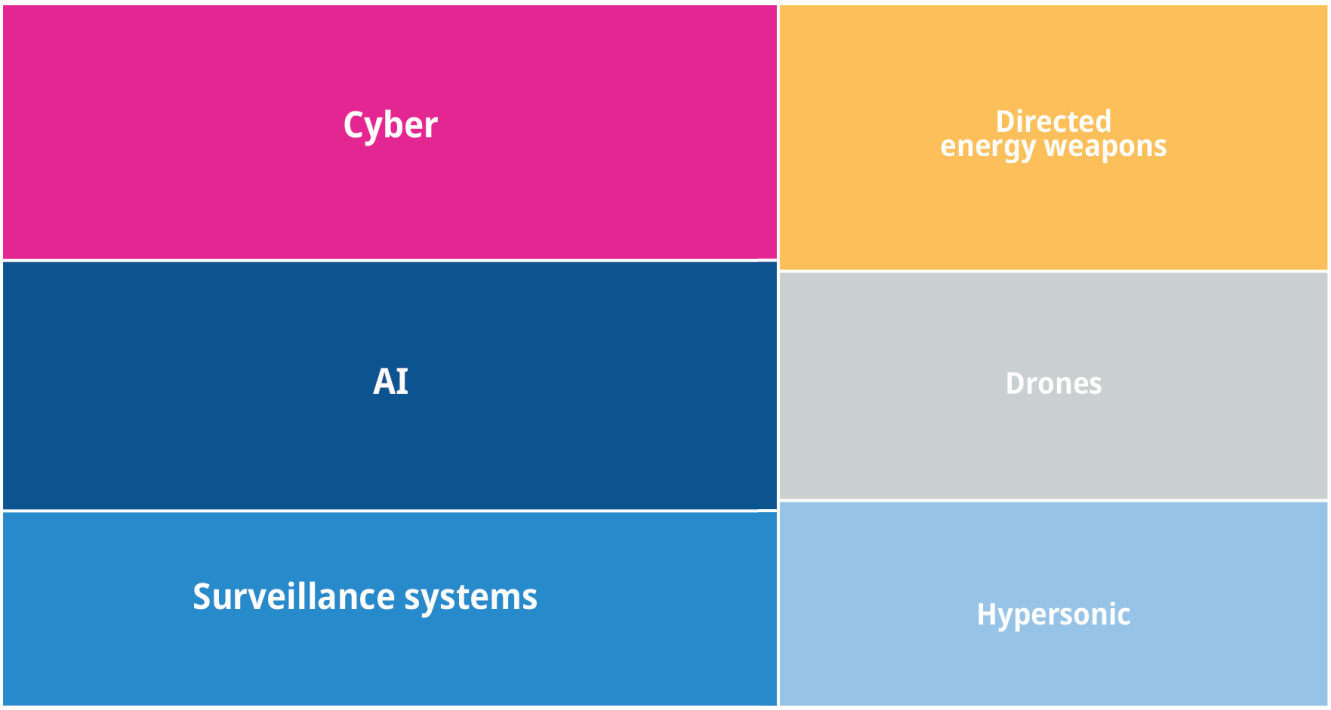
Psychopharmacology stands out in particular

This technology involves the study and manipulation of the effects of drug treatments on the human psyche. It is referenced in a Russian foresight report from 2021. The study explores, in extreme terms, a theme often considered taboo in Western reflections: warfare within the anthroposphere, whereby all dimensions of the human condition, including culture, technology, politics and health, can become operational levers in times of conflict.

In contrast, some technologies stand out for their absence. To identify these technologies, we made particular use of the Critical Technology Tracker produced by the Australian Strategic Policy Institute.[8] This publicly accessible database maps countries' performance in research and innovation across more than 60 critical technologies, offering insights into future capabilities. While our three dominant technologies (AI, cyber and drones) are well represented in this database, several other domains receive scant attention in our corpus.

8 Available online: https://techtracker.aspi.org.au

Technologies in Western documents



Technologies in non-Western documents

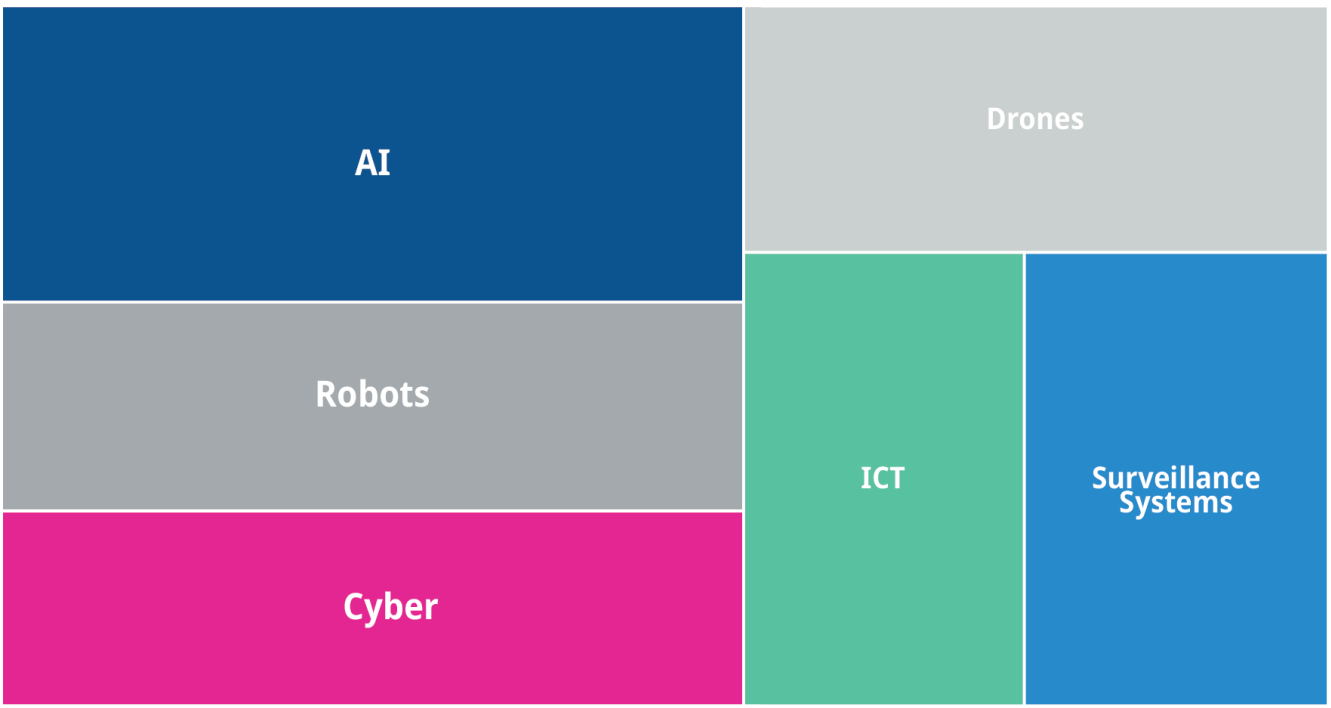


Figure 4 – Common ground on technologies of interest among Western and non-Western strategic competitors. Visual based on 109 foresight reports on future wars. Size of box equivalent of frequency on occurrence in these reports.

Sensing, Timing and Navigation

While technologies such as "sensor networks" and "detection" are well represented (cited in 35 and nine reports, respectively, accounting for 32% and 8% of the corpus), the number of mentions was limited. There were few, if any, mentions of new sensor technologies, such as photonic sensors or atomic clocks. Nevertheless, some sources do anticipate that weapons systems will become increasingly precise.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Institutional science fiction abounds with speculative stories exploring the future use of quantum technology and the operational superiority that can be achieved over adversaries by mastering it. In these stories, quantum technology is described a decisive edge, almost always with an element of surprise. Allied forces, long accustomed to technological superiority, are unexpectedly and swiftly defeated due to their adversaries' command of quantum systems. These imaginings illustrate a clear vision that demands scrutiny, that of a technological arms race, which in this case is over quantum technology.

Materials

Materials are conspicuously absent from the corpus. The only references are to additive manufacturing technologies (15/109; 14% of the corpus) and, upon further analysis, to nanotechnologies (16/109; 15% of the corpus), which could be used to create novel materials. There is no mention of materials themselves, such as new coatings or superconductors. There is also no mention of combatants' clothing. This is surprising given the real innovation happening in this area, worthy of attention. One striking example is origami-style nanorobots made from pork gelatin and cotton, which can deliver medication before dissolving naturally in the body.[9] Similarly, the corpus shows no interest in explosives or other materials that could enhance engineering activities or the stealth and/or durability of equipment.

Indeed, the 55 technological tags formulated by the research team have one thing in common. Nearly all refer to weapon systems or heavy equipment, with the exceptions of "biotechnology" and "psychopharmacology". However, there is no discussion of smaller-scale yet strategically vital elements, such as the wheel of the future, critical for military equipment mobility, or innovations in food and water production essential to combatant survival and morale. "Low-tech" solutions are scarcely mentioned, further reinforcing the observation that future conflict is overwhelmingly refracted through a high-tech lens.

One decisive blind spot ought to be highlighted. While the corpus mentions more than 50 technologies, they are often addressed in an almost magical way, treated as fully formed rather than as the end points of complex systems. Fundamental building blocks, such as raw materials and energy infrastructure, are largely ignored. This points to a bias of critical self-sufficiency, an assumption that the technologies can exist independently of the value chains that support them.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Surprisingly, the same convergence occurs among the institutional science fiction stories. The technologies featured in these stories are, for the most part, extrapolations of technologies that are already mature technologies or currently under development (AI, quantum technology, biotechnology, satellites, etc.). The value of fictional works is that they do bring these technologies to life, often by pushing them to their limits. For example, *La ruée vers l'espace* ("The Space Rush" – *Red Team Défense*, France), *Skyfall* (NATO) or *Canadian Shield* (NATO), to name but three examples, imagine societies where space technologies have been tried, tested and are widely available, leading to new forms of conflict.

In *A Visit to Weizenbaum* (Atlantic Council), a complete disconnect is envisioned between physical reality and virtual spaces, with soldiers having to be quarantined between missions to prevent DNA-targeted attacks;

9 Pingdong Wei et al., "Biodegradable origami enables closed-loop sustainable robotic systems", *Sci. Adv* (2025).DOI:10.1126/sciadv.ads0217

all their social interactions, relationships and hobbies, even with therapists like the titular Weizenbaum, who turns out to be an AI, are virtual. There are two other fictional technologies that are worthy of mention here. In *Fear Me* (NATO), biotechnologies turn soldiers into fear-inducing machines through hormonal modification, so extreme that even their families are terrified of them. Lastly, in *Northwest Passage* (NATO), all biomass is converted into fuel, leading to insatiable predatory behaviour in the North Sea.

Before concluding this chapter, one final critique must be addressed: these technological analyses are often conducted in stovepipes. This makes it difficult to highlight the subtle relationships between technologies, or how they can serve as enablers for other technologies, or how their impacts can vary dramatically across different domains. Addressing this shortfall requires targeted efforts from the academic field. In 2022, Marina Favaro, Neil Renic and Ulrich Kühn introduced the notion of "negative multiplicity,"[10] a refreshing perspective on foresight studies. Their framework details the TRLs of several key technologies across select countries (China, Russia and the United States). The objective was to consider how these technologies will influence the world order. The authors thus identify a few broad categories of technologies and assess their likely impact on the arms race, stability and humanitarian principles. The core insight of their work is that the most impactful technology categories are composed of systems that do not share any, or very little, technical commonality. The authors then conclude:

> *Research or policy focused solely on one technology or domain of impact can obscure the similar effects of seemingly unrelated technologies. Such a narrow approach risks overlooking significant side effects that could jeopardize human security. These concerns become more pressing as many technologies are expected to mature significantly in the next decade... Overly compartmentalized debates and analyses risk ignoring the potentially overlapping and interconnected effects of emerging technologies, both globally and on a human scale. These can include, but are not limited to, the entanglement of emerging technologies with existing military systems – potentially destabilizing in a crisis (Acton, 2018); the cumulative effects of multiple co-existing technologies (Sechser, Narang & Talmadge, 2019); or the battlefield interactions of new technologies (European Parliamentary Research Service, 2021).*
> **(Favaro et al., 2022, p.13).**

In conclusion, even if our assessment of the key technologies that will be used in future conflicts converges, we must be alert to the unexpected consequences and links among them if we are to carry out foresight work correctly. One of the central findings of this study on future conflict is that foresight studies are already organized in stovepipes. All of the reports studied aim to create panoramas of tomorrow's key technologies. Yet meaningful foresight requires a relational approach that anticipates cross-functional uses, technological synergies, and the enabling building blocks that underpin the operation of more complex systems.

2.4. Our Best Enemies

To name an adversary is to predefine the military response in the event of conflict.

The actors, or countries we identify as adversaries are far from neutral in shaping how we imagine the morphology of future conflicts. On the contrary, these perceptions constrain the capabilities and doctrines deemed necessary to address future threats. What, then, do the 109 reports in our corpus reveal about perceived adversaries?

2.4.1. Between Strategic Symmetry and Analytical Conservatism

Firstly, naming the enemy is not the norm. Many reports refrain from identifying any strategic competitors as adversaries or from offering any typology of conflict actors. This is clearly one of the main limitations of our corpus. By relying on public reports, which are accessible to all, the scope of data is inevitably constrained. Publicly naming a state or actor as a future enemy carries clear political implications. Authors therefore often adopt one of two strategies: either avoiding the naming of adversaries altogether or selecting politically acceptable adversaries.

Taking a closer look at the data reveals two categories of adversaries: those recognized as state actors or institutions (such as NATO), and those characterized as non-state actors. Let us start with state adversaries.

10 Favaro et al., "Negative multiplicity: Forecasting the Future Impact of Emerging Technologies on International Stability and Human Security" (2022), IFSH Research Report #010.

Russia and China clearly dominate the rankings here. Russia is cited in 60 out of 109 reports (55%), and China in 57 out of 109 reports (52%). These two far surpass other named entities such as Iran (29/109, or 26%), North Korea (28/109, or 25%), and even the United States (21/109, or 19%). The corpus shows a pronounced concentration: only 19 distinct state-level tags were identified, and just five of them, Russia, China, Iran, North Korea, and the United States, account for nearly a quarter of all mentions. As for the less frequently named adversaries, there are no surprises: Taiwan, Japan, Ukraine, the European Union, and Pakistan appear, reflecting current geopolitical tensions and closely aligning with the national perspectives of the report authors.

INSIGHTS FROM STRATEGIC COMPETITORS

In these reports, the top three most frequently mentioned adversaries are quite different: the United States, NATO and the European Union. This kind of symmetrical perception is not surprising. When one state identifies another as a rival, the sentiment is often mutual. This symmetry suggests a kind of "market balance" in geopolitics, whereby adversarial narratives evolve with strategic alignments but generally stabilize around familiar figures.

Yet, the persistent recurrence of these "usual suspects" highlights a certain lack of imagination.[11] Few foresight analyses venture beyond this predictable framework, which reinforces a perception of intellectual rigidity in the field. This deficit in creativity is likely partly due to the public nature of these reports, as mentioned above. It is politically and diplomatically sensitive to designate a state as an enemy or competitor unless overt tensions are already explicit in the media. Therefore, it is easier to speculate about a conflict with China than to imagine a potential clash with an official ally or partner. But this constraint limits our ability to explore highly realistic scenarios, such as the "problem ally" within a coalition who, under certain circumstances, in specific regions, or in the face of certain competitors, might itself act as a competitor.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Similarly, institutional science fiction seems constrained by the same limitations when it comes to identifying adversary countries. Very few stories explicitly name adversaries, and when they do, it is usually Russia, China or Pakistan. This is a far cry from the breakthrough caused by *Ghost Fleet*, the first novel to use fiction in the early 2010s to declare China as a future adversary.

2.4.2. Non-State Actors: Slow Conservatism

When it comes to non-state threats, the results are once again highly clustered. Only five tags emerge from the corpus: "terrorist" (78/109, or 71%), "organized crime" (44/109, or 40%), "proxy" (44/109, or 40%), "private military companies" (27/109, or 25%), "armed groups" (19/109, or 17%). One notable takeaway here is that there is no fringe tag, all five categories appear repeatedly across the corpus.

Unsurprisingly, terrorist groups dominate the discourse. However, the scenarios presented once again tend to be conservative, often based on a simple extrapolation of past trends. This means that there is no real consideration of potential disruptive events. It is interesting, however, that organized crime is ranked the same as proxy forces, revealing a growing blurring between law enforcement missions and traditional military engagement.

It is also important to note the porous boundaries between these categories: organized crime can serve as a proxy or evolve into an armed force, depending on the context. This fluidity underscores the growing complexity of conflict environments and the need for a more flexible and imaginative approach to foresight.

11 One interesting point should be noted, however: the fact that the Middle East–Central Asia region is perceived as the primary zone of future conflicts. Perhaps in this category, the analyses show that their authors have managed to distance themselves from the immediacy of current events, which tend to focus exclusively on the broader Russian area.

INSIGHTS FROM STRATEGIC COMPETITORS

Conventional analyses from NATO's strategic competitors do not yield any significantly unexpected adversary categories. Surprisingly, there are no striking differences in how non-state actors are perceived as adversaries.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Institutional science fiction offers a break from these undoubtedly relevant but rather conventional visions. Many fictional narratives focus on non-state enemies, perhaps as a way to sidestep censorship, and propose more creative ideas. U.S. military-commissioned fiction, in particular, exhibits the recurring theme of betrayal, whether from within the system or from individuals who, under pressure or unwittingly, act against their own country or military. Some stories are based on a global threat that transcends the logic of competition among actors. RADAR, an institutional science fiction project by the French *Direction générale de l'armement*, imagines a plastic-eating bacterium that spreads throughout the world, undermining every sector of activity. *A Model of Peace*, produced for the British Ministry of Defence in 2022, portrays a private company as a potential strategic competitor or an outright adversary. The same goes for *La ruée vers l'espace* ("The Space Rush"), by *Red Team Défense*, in which a space conflict progressively escalates as two private corporations rival each other in pursuit of their interests. It is remarkable that these stories should seriously consider the idea that powerful business actors might eventually become autonomous and confrontational. Institutional science fiction makes interesting forays into certain fields by portraying, for example, new technologies as adversaries. One classic trope of science fiction, machines and robots as enemies, features prominently, especially with AI. *A Quiet Army* (NATO) imagines AI as a globalized adversary. This expanded vision also applies to the natural world. In *Guerre écosystémique* ("Ecosystemic Warfare"), the environment itself becomes the enemy that military forces must confront.

2.4.3. Blind Spots

While identifying blind spots in foresight exercises is inherently difficult, certain types of actors stand out by their absence from the corpus. Does this mean that they do not truly represent adversary figures? We believe the opposite: these overlooked categories should be the subject of serious consideration. Without claiming to offer a comprehensive overview, we outline a few of our key insights in what follows.

First, neither the corpus nor institutional science fiction mentions a growing demographic linked to increased societal tension: neo-reactionaries and sovereign citizens. The former are inspired by figures such as Nick Land (author of *Dark Enlightenment*, 2012) and Curtis Yarvin, a blogger who advocates the collapse of democracy. They both reflect a deep disillusionment with the democratic system, leading to a total rejection of institutions. The latter embody a transnational conspiracy movement that denies the legitimacy of the modern state, rejecting any form of engagement with it. These two movements illustrate the real and growing tension surrounding the time-honoured concept of social contract, as developed by Jean-Jacques Rousseau. While institutional science fiction explores the notion of the internal, even intimate, adversary, it does not account for categories of citizens who, by their own choice, seek to abandon and dismantle the system.

Second, the role of foreign-held territories is conspicuously absent. This omission may reflect a French analytical bias, yet the situation in former colonial territories (French, British, Dutch, etc.) remains highly complex. The remaining ties appear increasingly fragile, with many of these islands grappling with socioeconomic crises and the encroachment of rival powers. Power dynamics and longstanding bonds of solidarity are now widely contested, which ought to prompt serious reflection about future developments. This theme intersects with another

overlooked issue: soft alliances. These are alliances of convenience that can shift or dissolve in response to political events.

Finally, certain taboo enemy figures remain unspoken. Yet they deserve serious consideration. One example is gender conflict. A powerful fictional treatment of this theme is offered by Clémence Dargent in the anthology *Black Trends* (Éditions Les Équateurs, 2023). Her story features a disturbing group of Magdalens waging war on men in response to centuries of accumulated abuse. Comparable taboos surround other potential conflict archetypes that also warrant exploration, such as generational warfare, but also class conflict, a central science fiction theme since the genre's inception in the 19th century.

2.5. Profiling Tomorrow's Wars

The grammar of military confrontation has historically evolved in step with new inventions. From positional warfare to blitzkrieg, military thinking has always engaged with innovations – both technological and organizational – to conceptualize new types of conflict. Over the past decade, several of these conceptualizations have appeared repeatedly: hybrid warfare, cyber warfare and remote warfare are recurring themes, possibly even somewhat overshadowing other visions for the future and obscuring a reality that is obviously more complex, with forms of conflict that may be just as decisive for the future. In light of this, are tomorrow's conflict types being reinvented? What are the main concepts they embrace?

2.5.1. Hybrid, Remote and Cyber as the Three Mainstays

The analysis of the corpus enabled us to identify 15 distinct conflict typologies. Figure 5 presents the leading categories, revealing that the six most frequently occurring tags – "hybrid warfare", "remote warfare", "cyber warfare", "proxy warfare", "irregular warfare" and "systemic warfare" – are each referenced in at least half of the 109 reports examined. This concentration provides further evidence of strong convergence within the corpus, despite its apparent diversity.

Hybrid warfare emerges as the most prevalent form of conflict in the sample, appearing in 99 out of 109 reports (91%). While this result appears unequivocal, it offers limited analytical insight. The concept of hybrid warfare is inherently characterized by the combination of multiple, distinct military strategies and dimensions, involving conventional operations, cyberattacks, asymmetric engagements, etc. However, the absence of a clear definition renders the concept ambiguous. Coupled with its contemporary relevance, this definitional fluidity is instrumental in its prominence in strategic foresight assessments. The malleability of the concept allows it to fit a wide array of conflict morphologies.

Ranked second in frequency is remote warfare, cited in 84 of the 109 reports (77%). Our analysis suggests that the war in Ukraine was not the watershed moment we had anticipated on this subject. We initially thought that the extensive use of remote operations by both Russia and Ukraine would significantly influence the appeal of this conflict type. However, the data indicate that remote warfare had already garnered substantial attention and critical engagement well before 2022.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Remote warfare is a recurring theme in the fictional works chosen for this study. It notably relies on technologies such as conflict simulation, modelling of movements across operational theatres, and artificial intelligence to assist decision-making processes. A striking example is *Codename: Delphi* (NATO), in which a female operator oversees missions carried out by various units deployed thousands of miles away from her and her office. She coordinates their movements and tactics and provides them with real-time information. A more technologically imaginative example is found in *From a Remove* (NATO), where operators remain physically on Earth while remotely piloting missiles and/or satellites in space through a first-person view (FPV) interface.

Cyber warfare ranks third in frequency (77/109, or 71%). A particular challenge encountered here lies in the conceptual overlap between cyber warfare and hybrid warfare. Both terms are overrepresented in the corpus according to the coding conducted by the research team, but their porous boundaries mean that they need to be considered carefully. Moreover, cyber serves both as an operational domain and as an operating method. This dual function may account for the high number of references to cyber warfare.

INSIGHTS FROM STRATEGIC COMPETITORS

Once again, reports produced by strategic competitors do not reveal any significant differences, as shown in Figure 6. This study would benefit from a comparative analysis involving an equivalent number of reports authored by strategic competitors. In its current form, our corpus allows only for the formulation of hypotheses.

2.5.2. Other Types of Conflict

Beyond the leading trio, the corpus reveals conflict typologies that stem from one very simple strategy: avoiding direct and full-scale confrontation. It highlights the possibility that future conflicts may be outsourced through the use of proxies (59/109 reports, or 54%), thereby delegating violence to third-party actors to circumvent direct engagement. When hostilities do occur, they may manifest through irregular (53/109, or 49%) and/or asymmetric (36/109, or 33%) approaches. This forms a cluster that could be characterized as one of "avoidance", where direct confrontation is eschewed but strategic competitors are nonetheless actively challenged.

Interestingly, high-intensity warfare – despite its prominence in public discourse across certain Western nations since the onset of the war in Ukraine – ranks only tenth in frequency (16/109, or 15%). It is even surpassed by space warfare (20/109, or 18%), which may come as a surprise. Notably, this conflict type rises by only one position after 2022, underscoring the significant divergence between public narratives and expert perspectives. Several hypotheses may account for this discrepancy. The resurgence of mass-scale operations may be perceived by the authors of the analysed publications as a statistical outlier, despite the events of 2022. There may also be a form of media bias that prevents a comprehensive understanding of the phenomenon. For instance, articles on FPV drones are far more prevalent in the media than those addressing artillery logistics (e.g. production, employment, etc.).

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Are automated and environmental warfare the future of military conflict? They are certainly among the dominant visions conveyed by institutional science fiction. Cyber warfare is featured extensively, often depicted through multi-level blackout scenarios – ranging from a head of state's personal phone to specific civilian or military equipment, and even entire cities or nations. On this point, it is worth noting that science fiction authors have long been fascinated by hackers and cyber conflicts, dating back to the publication of Neal Stephenson's *Snow Crash*[12] and the release of the 1983 film *WarGames*.[13] This thematic focus enables the portrayal of attacks by individuals or small groups with disproportionately large impacts in the real world. Scenarios involving this type of conflict can sometimes take little account of actual technological capabilities and should therefore be understood in the light of this longstanding fascination. Other recurring themes in institutional science fiction include environmental warfare. From Green War (DSTL, UK Ministry of Defence) to *P-Nation and Après la nuit carbonique* ("After the Carbonic Night" – French Ministry of Armed Forces), numerous authors have explored the nature of conflict in environments radically transformed by climate disruption, as well as the conditions under which warfare might be conducted with minimal environmental impact.

12 One of the defining novels of the cyberpunk universe, where the plot unfolds primarily in cyberspace.
13 A teenage geek manages to break into a highly secure military computer. He soon discovers that what he believed to be a wargame – a simulated conflict – actually has very real consequences.

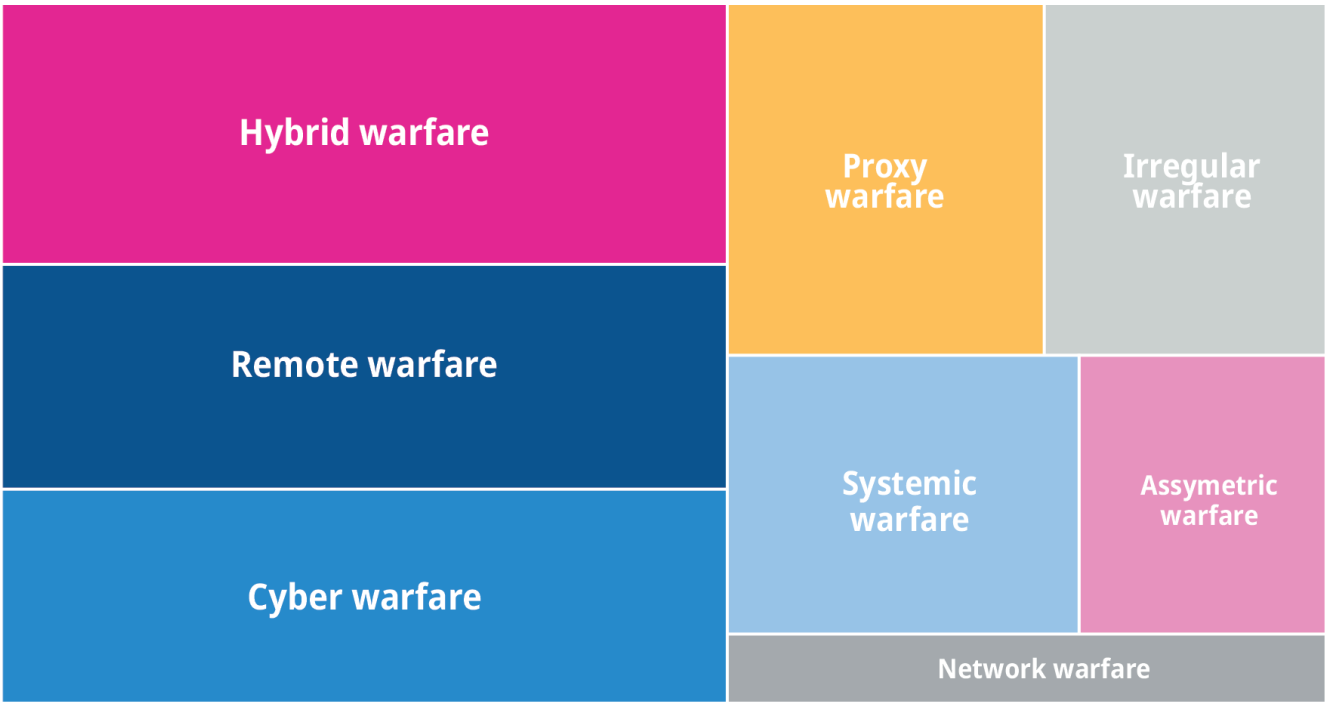


Figure 5 – Three types of conflict dominate representations of the future of warfare. Visual based on 109 foresight reports on future wars. Size of box equivalent of frequency on occurrence in these reports.

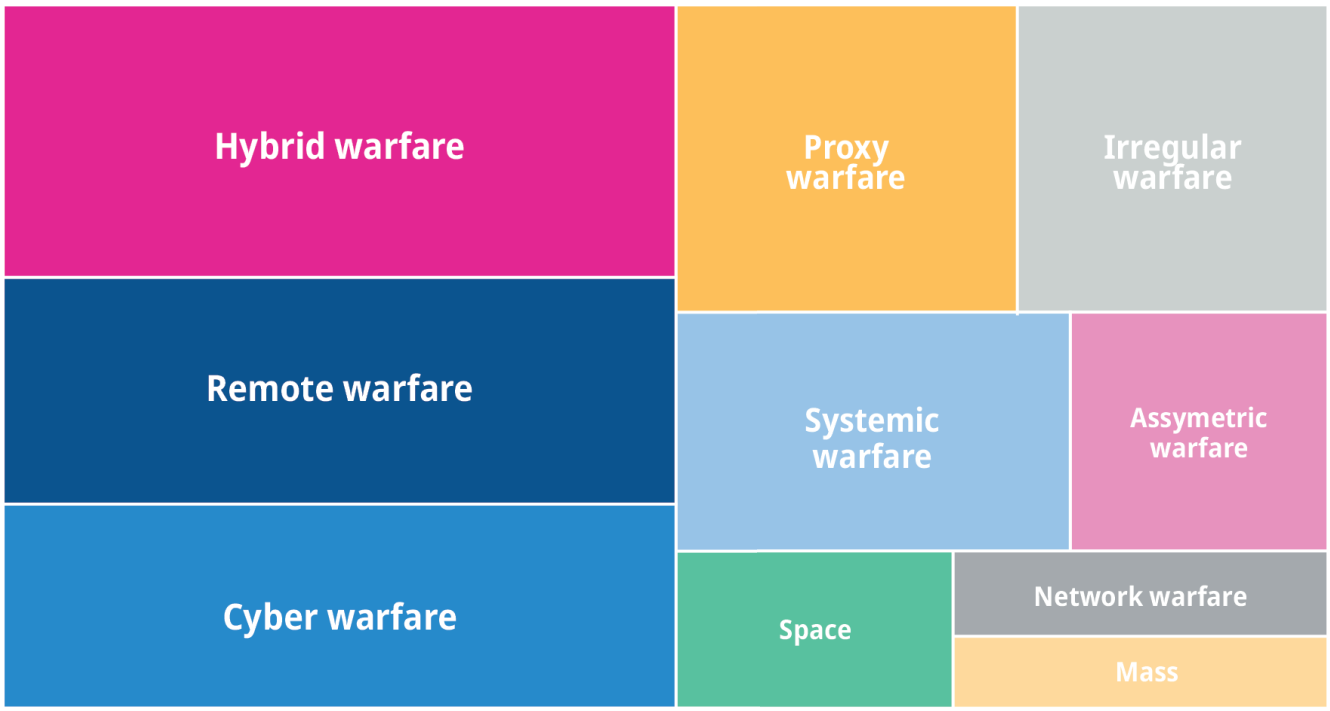
The two most original themes among the top-ranked topics are undoubtedly automated warfare and environmental warfare. The former explores the hypothesis of conflict initiation and escalation driven by automated and autonomous offensive and defensive systems. Again, this hypothesis is not new – consider, for instance, the film *Colossus: The Forbin Project*, released in 1970.[14] However, it has gained renewed relevance as a result of recent developments in artificial intelligence. The latter theme highlights the issues surrounding environment militarization and its implications for future conflicts. As previously noted, the scope of analysis regarding environmental warfare remains limited, often confined to operational constraints within rapidly changing environments. The lessons offered by institutional science fiction in this area should be taken seriously: the leprous forests depicted in *Guerre écosystémique* ("Ecosystemic Warfare" – produced by the French Ministry of Armed Forces) may appear extreme, yet militarized natural elements can pose a genuine threat. Consider, for example, a scenario involving pollen – already ubiquitous today – and increasing pollen concentration as atmospheric CO_2 levels rise. Such a situation, if manipulated with malicious intent, could rapidly spiral out of control and pose a danger.

2.5.3. Blind Spots

One particularly striking observation derived from analysing the corpus is the absence of lethality in the wars of tomorrow. Indeed, high-intensity conflict features relatively low in the frequency ranking. Moreover, violence is almost systematically downplayed or entirely omitted. Yet what would a war waged with unfettered violence look like? Not necessarily a war with high-intensity combat or mass mobilization, but rather a conflict marked by acts of extreme violence. The question is far from trivial. The rise in societal violence remains disputed within the scientific community; it is therefore impossible to assume with confidence that violence is increasing. Nevertheless, the issue of disinhibition raises concerns, as it challenges the persistence of our moral constraints over time – and those of our adversaries, which may differ significantly. For instance, as Russia publicly discusses warfare in the anthroposphere (i.e. all dimensions of human activity), the use of bacteria that would be modified to target humans and their activities may be deemed acceptable by

14 Adapted from the novel Colossus by Dennis Feltham Jones, published in 1966, this film envisions a supercomputer capable of autonomously managing the security of an entire nation. But as it fulfils its defence mission, the U.S. supercomputer eventually encounters its Soviet counterpart, and events spiral beyond all human control.

Types of conflict in Western documents



Types of conflict in non-Western documents

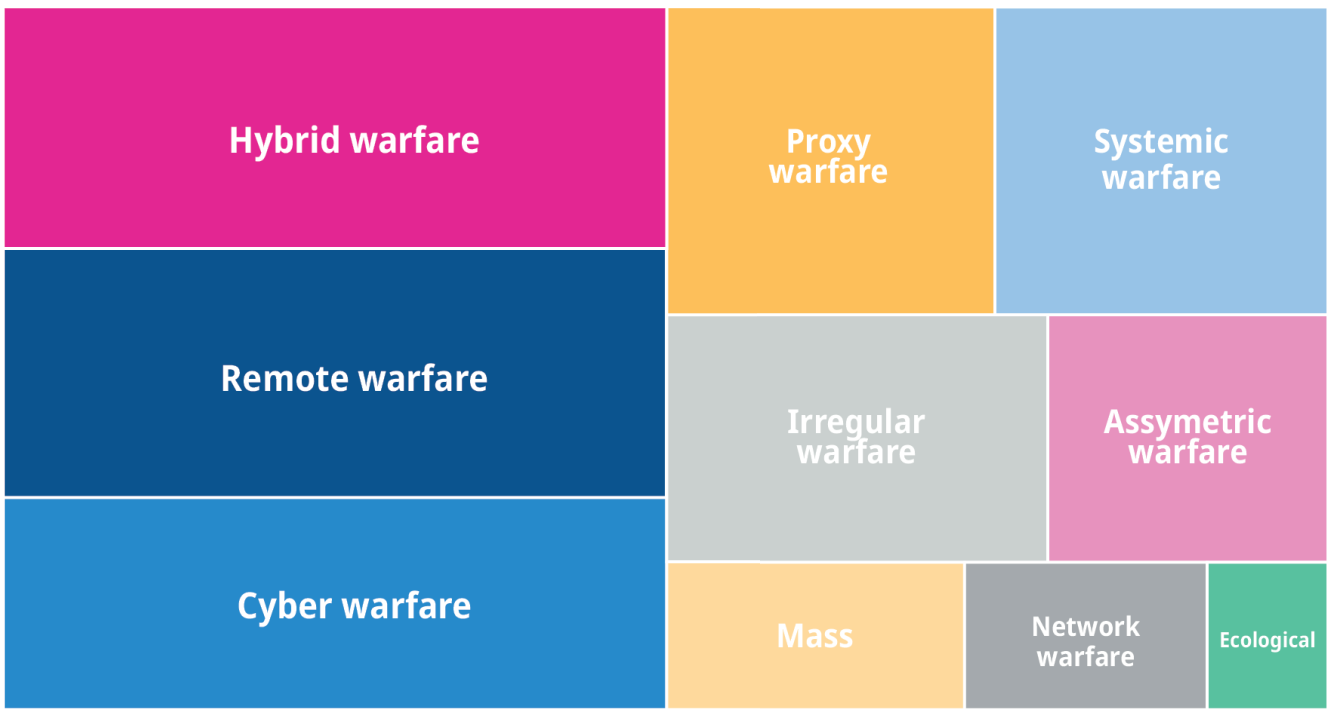


Figure 6 – Converging views between Western and non-Western strategic competitors on future types of conflict. Visual based on 109 foresight reports on future wars. Size of box equivalent of frequency on occurrence in these reports.

our competitors. This calls for a re-evaluation of our own taboo regarding chemical, biological, radiological and nuclear (CBRN) weapons.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

A particularly thought-provoking source of inspiration on this subject can be found in military science fiction. The RADAR programme, developed by the Directorate General of Armaments within the French Ministry of Armed Forces, offers a narrative that is quite unlike the 54 works of fiction analysed. Entitled *Epiplastie* (France, 2024), it draws upon current scientific research and societal aspirations to construct its storyline. The premise centres on a plastic-eating bacterium, engineered and enhanced in a laboratory to combat pollution, particularly in the oceans. However, the bacterium's scope of action proves uncontrollable: it multiplies rapidly and spreads from the oceans to land environments. All human activities are affected – industry, transport, defence, food production, and even human health. What captured our attention was the choice of a bacterium to damage or disable equipment and infrastructure. This amounts in essence to repurposing a CBRN agent, a technique which could become widespread in the future. Indeed, ambiguity was deliberately built into the portrayal of the bacterium within the scenario: as a threat, but also as a genuine opportunity, if harnessed correctly.

2.6. Ubiquitous, but Predominantly Virtual War?

The concept of multi-domain warfare has dominated thinking over the past ten years. Conflict is now conceived as taking place everywhere – even extending into public opinion through information warfare and the ever-pressing news cycle. This already expansive notion appears even broader in foresight writings: physical domains stretch ever further (from the underwater realm to outer space), while virtual domains become more diverse (from cyber to cognitive).

2.6.1. From "Air, Land and Sea" to the New Physical–Virtual Continuum

Since the late 1990s, the concept of theatres of operations has undergone a transformation in both scale and nature. To the three traditional air, land and sea domains, one must now add cyberspace, the informational and cognitive spheres, and even outer space. This evolution is clearly reflected in the data analysed, where the cyber and informational spheres dominate, closely followed by space. This order of preference comes as no surprise, as it is in line with trends in current strategic debates – particularly those post-2010 concerning multi-domain operations. Cognitive warfare, for its part, has remained a central theme for several years. However, the predominance of "non-physical" domains in strategic discourse raises questions when compared to the very tangible and human realities of ongoing conflicts, not least the Russia-Ukraine war. Indeed, while the significance of these domains is beyond doubt, they appear to be used as add-ons to high-intensity operations, serving as effect multipliers rather than genuine substitutes.

Virtual operational environments are clearly identified as key to future conflicts. Within the "type of operational environment" category, three of the ten tags developed by the research team relate to virtual spaces. What is striking is the frequency with which they are mentioned in the corpus. Cyberspace – the most frequently cited operational domain across all tags – is almost universally referenced in the reports (98/109, or 90%). In second place, and only slightly less prominent, comes information warfare (90/109, or 83%), followed closely by cognitive warfare (73/109, or 67%).

INSIGHTS FROM STRATEGIC COMPETITORS

The distribution of tags is broadly consistent across the strategic visions outlined by competing powers. The operational domains of future confrontations thus appear to be clearly delineated among potential adversaries, as illustrated in Figure 7.

2.6.2. Maritime and Coastal Environments: A Differentiated Return to the Forefront

A more noteworthy point concerns the differentiated presence of maritime and coastal environments among the ten most frequently cited domains. The distinction between maritime and coastal environments is intentional, reflecting the differences observed within the corpus, with reports distinguishing seas and oceans from coastlines as theatres of military operations.

The interest shown in seas and oceans (42/109, or 38%) can partly be attributed to heightened geopolitical tensions in two well-known regions: the Arctic Ocean and the Indo-Pacific area. Maritime issues thus mirror ongoing rivalries, turning these areas into potential flashpoints for conflict in which naval capabilities would play a strategically decisive role. These conceptions currently underpin some expeditionary doctrines and the ambition to project power over long –sometimes, very long – distances, as well as to exert control over Sea Lines of Communication (SLOCs). However, this focus on seas and oceans conceals two pitfalls. The first stems once again from the research methodology employed. The macroscopic tagging of future conflict morphologies does not allow for sufficient granularity to address the differences between various maritime environments. Yet not all seas are equal when it comes to warfighting. Since the 1990s, and following naval doctrine development work in the United States, naval personnel have routinely distinguished between three types of seas: blue-water (deep oceanic domains), green-water (distant coastal zones) and brown-water (coastal and inland waters).

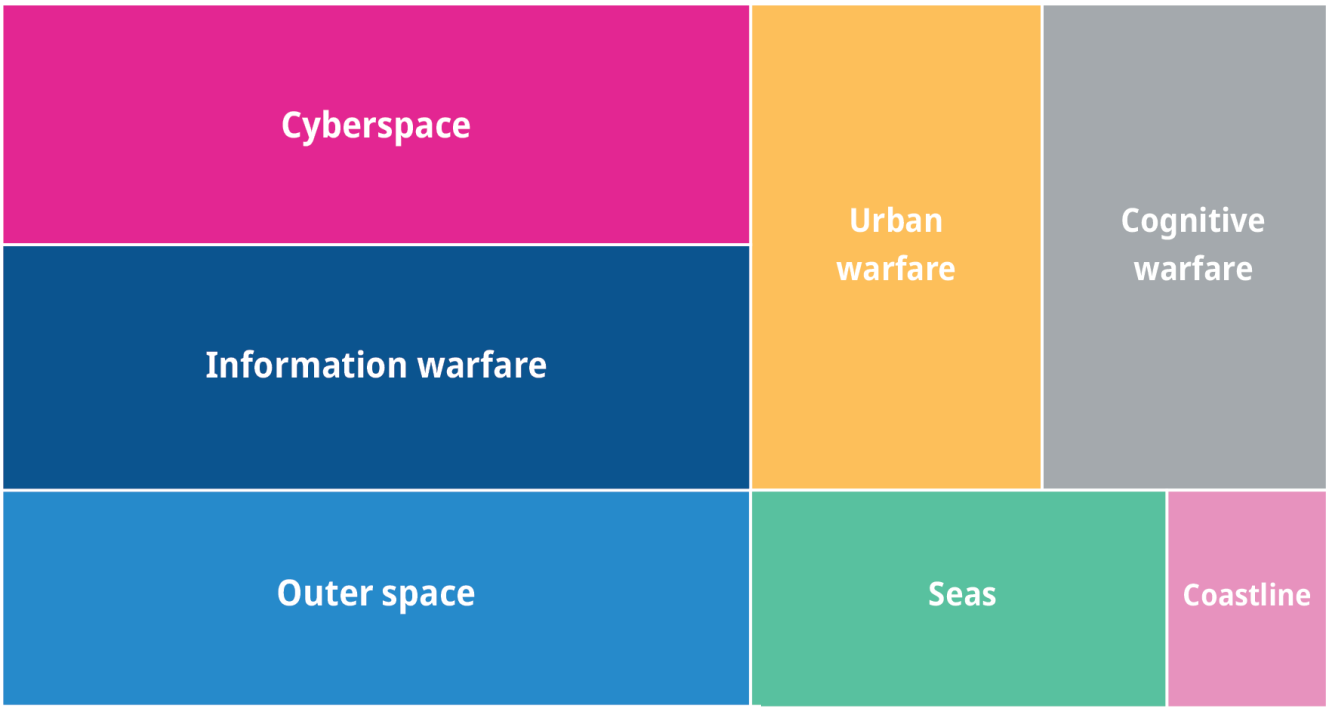
This threefold classification points to a significant omission within the corpus, which constitutes the second pitfall: no mention whatsoever is made of inland waters, such as rivers and estuaries. Yet inland waters can be of considerable strategic importance, particularly in relation to conflicts in border areas (often delineated by waterways), or for logistical and force transportation activities.

As for coastal areas – defined as the interface between land and sea, and partially overlapping with brown-water domains, their significance is rooted in two main factors. Firstly, rising sea levels are expected to generate substantial tensions in these areas as expanding waters reduce available land and inundate critical human infrastructure (such as port facilities). Secondly, demographic experts anticipate the migratory pressures induced by climate change to be concentrated predominantly in coastal regions. This is already true in France, notably in Calais: the coastline serves as a transit area for migrants, thereby concentrating numerous challenges and threats associated with the constant or sporadic influx of highly vulnerable populations – emotionally, physically and economically. From this perspective, coastal zones are literally seen as the frontlines of climate change impact, while also functioning as socio-political buffer zones. These areas therefore represent potential hotspots for future military operations. Moreover, as the nexus between maritime and land operations, coastal zones have historically posed a key challenge for inter-service coordination, testing military models across the globe for decades. Very few armed forces are able to conduct large-scale amphibious landings and operations with ease. Technological parity in this field has not been adequately addressed. Yet the operational capabilities of the Houthis – who are able to manoeuvre and land with remarkable ease using "low-tech" equipment, while simultaneously possessing missiles and heavy weaponry – ought to prompt serious reflection.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

In contrast to these findings, institutional science fiction pays scant attention to maritime or coastal zones. Rather, it is markedly focused on the aerial domain, driven by the creative potential of emerging automation technologies. *A Drink for Jakko* (U.S. Army, 2022), for instance, imagines the emotional bond between a U.S. Air Force pilot and his co-pilot, who is entirely autonomous and automated. Other narratives explore the conditions under which pilots are expected to operate in future: an almost visceral connection with their aircraft, enhanced by sensation-based communication between the aircraft systems and the human operator; or FPV remote piloting extending into outer space.

Operational environments in Western documents



Operational environments in non-Western documents

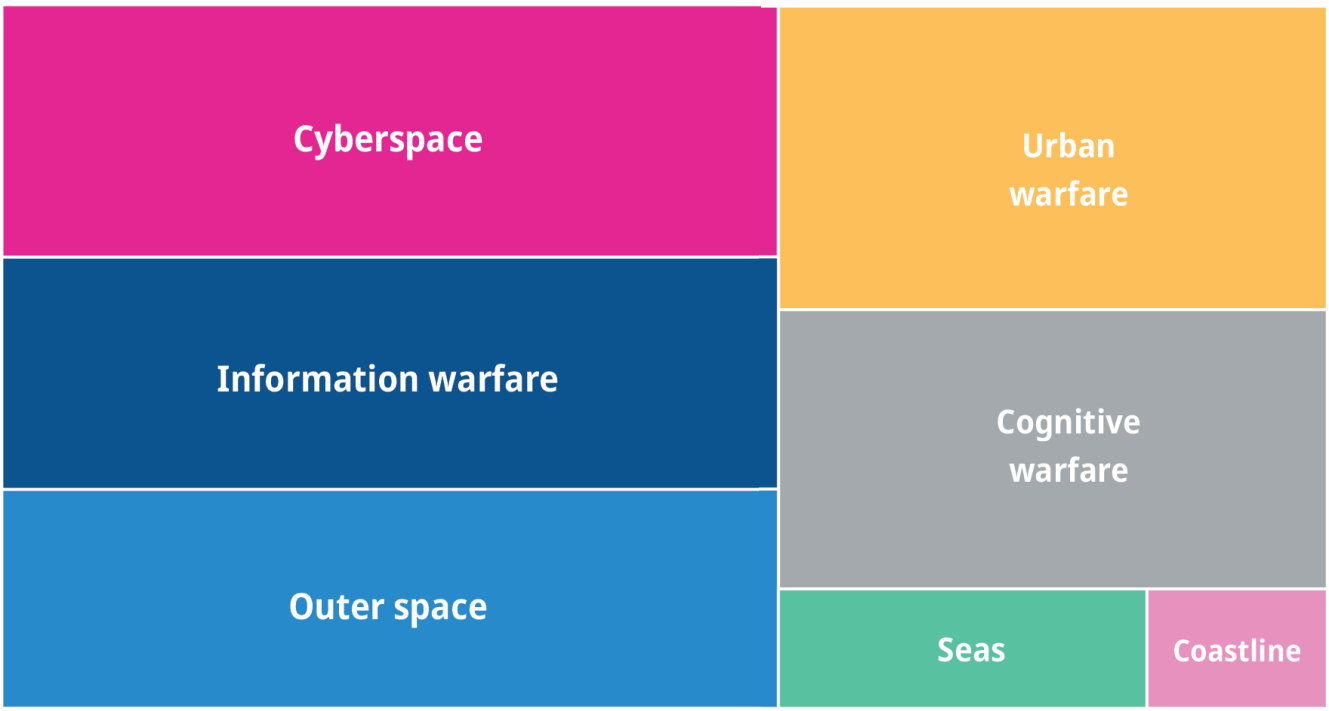


Figure 7- General agreement among Western and non-Western strategic competitors on future operational environments. Visual based on 109 foresight reports on future wars. Size of box equivalent of frequency on occurrence in these reports.

2.6.3. Urban Warfare: Population Density and Tactical Asymmetry

Urban warfare also stands out in this ranking (mentioned in 76 reports out of 109, or 69%). Its prominence must be analysed in light of current and future trends in urbanization. More than half of the global population now resides in urban areas, and this proportion continues to grow.[15] Urban spaces, however, present both threats and opportunities. They are often not only political, economic and social centres of power, but also particularly demanding operating environments for the military. Some actors enjoy a significant and often irreversible advantage in such terrains: defenders, who protect and maintain control over a given area and often benefit from a clear tactical edge; and local inhabitants, whose intimate knowledge of the city's morphology is invaluable.

Combat in urban areas is especially harsh on human participants and poses numerous challenges, including entanglement, the presence of civilians and the proliferation of infrastructure within the theatre of operations. Several factors therefore combine to make urban areas strategic operational hotspots in future conflicts: expanding urban sprawl, its increasing demographic, economic and political density, and the extension or emergence of military conflicts within urban settings.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

The strategic importance of urban areas is especially reflected in institutional science fiction. Notably, many of the narratives envision the spillover of military conflict into civilians' daily lives, with particular attention given to the blackout of civilian infrastructure, as depicted in *A Stopped Clock* (Atlantic Council, 2013) and *Silent Skies* (UK Ministry of Defence, 2023). However, these fictional accounts primarily portray operating methods more akin to terrorism than conventional military confrontation in urban environments. Some narratives do address urban combat, such as *Après la nuit carbonique* ("After the Carbonic Night" – French Ministry of Armed Forces, 2022) and *Codename: Delphi* (NATO, 2013), although the combat scenes envisioned in these offer little originality compared to the well-established literature on urban warfare.

Urban operational environments gain strategic relevance where actors from organized crime groups or terrorist organizations are taken into account. These entities typically operate within cities and possess an acute understanding of urban morphology and infrastructure. A French example is the DZ Mafia, a criminal community structured around a strong cultural identity and the management of illicit activities, including arms and drug trafficking. It is particularly active in Marseille, where it controls entire buildings and neighbourhoods.

Envisioning the future of urban combat requires foreseeing the cities of tomorrow. A counterintuitive point here is that, according to experts, the cities of the future will largely resemble those of today – as they are already built, except in some regions of the Middle East or Asia that have remained relatively "unspoiled". Infrastructure, utilities, buildings and networks will remain broadly similar, with only marginal evolution and the potential addition of a service-oriented layer (as promised for years in discourse on smart cities). In other words, all conditions are already in place to start preparing now for the urban conflicts of tomorrow.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Several institutional science fiction narratives imagine city centres swarming with logistic and delivery drones. Urban skies are thus described as buzzing with robotic, autonomous and automated equipment. Frequently, these stories build their plots around the hacking of such systems by cyber terrorists, turning them against the civilian population.

A more original approach to urban environments in times of conflict is presented in *Discord* (NATO, 2016). Enemy forces manipulate crowd movements in city centres to create traffic congestion and/or dangerous situations for civilians. A technology is then employed to translate these movements into music. The subtlety of this approach lies in the ability to analyse musical patterns

15 See the World Bank's Urban Development studies, available online: https://www.worldbank.org/en/topic/urbandevelopment/overview.

– their rhythms and intensity – to detect any manipulation attempt and anticipate danger. A designated individual is charged with analysing the musical signals and informing the security and defence forces as necessary.

2.6.4. From Jungles to Outer Space

The expression "concrete jungle"[16] is sometimes used to refer to urban military operational areas, which draws our attention to the very materials, such as concrete, found in these terrains: they are hard, sturdy, opaque and non-friable. These material characteristics are not found in other operational environments discussed within the corpus. We have already looked at fluid and shifting terrains, with aquatic environments. Others are mentioned, albeit far more sporadically, such as jungles and tropical regions (7/109, or 6%) and mountainous areas (4/109, or 4%).

One operational environment that may surprise by its prevalence is outer space (86/109, or 79%). However, this domain is most often addressed within the corpus in terms of limitations and technological dependency rather than from the operational viewpoint. Indeed, the questions raised regarding space are primarily related to communication and navigation capabilities, rather than how to develop forces capable of conducting military operations in zero gravity or on satellites and planets within our solar system. In sum, space is approached through a capability-oriented lens. Behind these references lies a highly topical concern: namely, the existing or anticipated dependency of military institutions on actors, whether private firms or governments, that have moved fast to gain a foothold within the space technology sector and may come to dominate the market entirely. This hypothesis appears to be corroborated by the prominence of the tag "reliance on outer space" identified within the "constraints" category (19/109, or 17%).

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Institutional science fiction has fully embraced the space theme, imagining numerous scenarios involving military operations in extraterrestrial environments. *From a Remove* (NATO, 2013) envisions missile and satellite piloting by operators remaining on Earth, yet projecting themselves with the equipment through FPV technology. *La ruée vers l'espace* ("The Space Rush" – France, 2023) depicts sub-threshold confrontations between two mutually opposed private companies whose economic interests escalate into power struggles, leading to various acts of sabotage in space – including a physical altercation between two astronauts on the Moon, followed by the threat of a nuclear explosion in outer space. NATO has even dedicated an entire graphic novel to this theme, in *NATO 2099* (published in 2024), which explores, among other issues, international governance of space and celestial bodies, addressing both their political and military dimensions with clarity. It even introduces a new role, that of SACSPACE, responsible for commanding all of the organization's space operations.

One point merits particular attention: although space is clearly approached as a military operational environment, it is not seen as an opportunity to rethink already established operating methods and doctrines. On the contrary, space seems to be the domain in which confrontations already familiar on Earth, such as sub-threshold malign actions and espionage, can be replicated, albeit through different technologies.

2.6.5. Blind Spots

Significant gaps must once again be highlighted here. No reference is made, for instance, to desert areas. Should this be interpreted as an indication that such areas are of no relevance for future combat, or rather that the military have already gained such extensive experience with them that a dedicated foresight study would be redundant? Foresight exercises are sometimes constrained by a powerful imperative: that of inventing scenarios that *feel* futuristic. In order to do so, studies frequently seek to address novel or previously unexplored topics rather than to shed more light on future scenarios that are already known as plausible. Yet desert environments merit more attention. Tensions within these regions are an ongoing concern and are only intensifying, as evidenced by the situation in 2025 across the Middle East and the Horn of Africa. Furthermore, these areas are poised to under-

16 Flaminia Del Monte, "Concrete Jungle, the Future of Warfare," FINABEL The European Land Force Commanders Organisation, 12 December 2019, https://finabel.org/concrete-jungle-the-future-of-urban-warfare/

go profound transformations in the coming years. As early as 2006, a United Nations study[17] warned of the risks associated with the expansion of desert areas and the disappearance of "sky islands" – humid, vegetated enclaves essential to the survival of local populations. The periphery of these deserts are likely to be gradually engulfed, amplifying urban densification in adjacent areas through the resulting migratory flows. Other, more tangible threats will also arise: as soil friability increases through aridification, will military equipment – particularly land vehicles – prove too heavy to ensure full mobility for deployed forces?

Another type of conflict, although highly topical, is conspicuous by its absence: subterranean warfare. The reason may be that authors subsume it under other categories of warfare, but our macro-level coding methodology does not allow us to verify this hypothesis with certainty. In any case, these environments do appear to be missing from the tags produced by the research team. The focus is therefore directed towards multi-domain warfare, which requires operational proficiency over multiple terrains and, above all, the ability to ensure communication among forces specialized in each. This blind spot also applies to other extreme environments: the seabed, the upper atmosphere, and very low temperature environments – although these are currently a burning issue. Indeed, this particular omission is especially surprising given the perception of mounting tensions surrounding the poles.

However, these environments are associated with operating methods that are markedly distinct from one another. Here again, this does not necessarily mean that stove-piped thinking should be recommended. An avenue worth exploring could be the mapping of potential operational environments in order to test possible commonalities in terms of technologies, equipment, training and applicable doctrine.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Institutional science fiction offers several visions for these extreme environments. *Chasing Glory* (United Kingdom, 2023) follows an autonomous logistics convoy operating in the desert, enabled by neurocomputing and artificial intelligence technologies. *The Solstice Cup* (United Kingdom, 2023) stages a sporting encounter at one of the poles, pitting two units against each other on the front line. The soldiers are equipped with bodily augmentations and suits that not only allow them to survive in extreme cold, but also drastically enhance their physical abilities. *P-Nation* (France, 2020) pushes the concept of maritime and littoral warfare to the extreme by imagining a pirate nation based in international waters as a result of receding coastlines induced by climate change.

However, such narratives remain marginal. Institutional science fiction is primarily concerned with urban conflicts, as well as those in jungle or rural areas. No reference is made to fighting in mountainous terrain, at very high altitudes, or on the seabed – a particularly striking blind spot.

INSIGHTS FROM STRATEGIC COMPETITORS

One of the categories identified and for which tags were developed as part of this research concerns references to the geographical location of future conflicts. This does not relate to environmental typologies, as analysed above, but rather to the specification of regions, countries, and potential theatres of confrontation. The results obtained for the entire corpus (109 foresight reports) provide scant insight. The three conflict zones most frequently envisaged are the Middle East and Central Asia (77/109, or 71%), Central and Eastern Europe (73/109, or 67%), and the Indo-Pacific (53/109, or 49%).

The only noteworthy finding on this point is that the results are broadly similar between NATO and like-minded reports on the one hand, and those produced by NATO's strategic competitors on the other. Furthermore, on both sides, several regions appear to be entirely overlooked, such as Latin America and Antarctica.

17 ONU info, "Les déserts menacés par le réchauffement climatique, prévient un rapport du PNUE," 5 June 2006, https://news.un.org/fr/story/2006/06/93322

Africa receives a degree of attention (30/109, or 27%), although still relatively limited in view of the continent's highly volatile security situation and the ongoing competition, both economic and for general influence, that it is experiencing.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

A striking disruptive development imagined in U.S. institutional science fiction is the displacement of military conflict and terrorist acts onto the American continent and into American cities – a historically rare scenario, yet one that has fuelled anxieties and speculation since 9/11.

2.7. Tomorrow's Constraints or Today's Obstacles?

Of the 11 categories established and examined in this report, the category related to future constraints has proved to be the most substantial. In total, nearly 70 tags were developed, each corresponding to a distinct constraint mentioned in one or more reports within the corpus. This figure is significant in itself: it reflects the perceived complexity of military operations and the many dimensions – whether political, technical, human or structural – that weigh upon future actions. These 70 tags cannot all be discussed in full. We have therefore chosen to highlight only those felt to be most consequential for the future, as well as those that were unexpected.

2.7.1. When Institutions Kill...

The finding that stands out first and foremost is that the most frequently cited constraints are more organizational in nature than technical or geopolitical. Indeed, the three most frequently cited tags in the corpus are institutional rigidity (83/109, or 76%), budget constraints (70/109, or 64%), and governance challenges (67/109, or 61%). This raises a key question: do these findings reflect a genuine anticipation of tomorrow's challenges, or do they merely project today's difficulties into the future? Take the example of military finances. Should this be viewed as a warning signal regarding structural hardships to come, or is it simply the reflection of a current reality – namely, that armed forces are already ill-prepared due to chronic underinvestment? The boundary between projection and grievance is rather thin in this case.

A process that was already described above is once again at hand here: foresight is not solely an illumination of the future but also an argumentation and advocacy tool, serving to place issues on the agenda or to defend budgets. The message seems loud and clear on this point: the lack or inadequacy of preparation for tomorrow's conflicts is not to be blamed on operational difficulties or technological shortfalls, but rather on obstacles of a purely institutional nature.

INSIGHTS FROM STRATEGIC COMPETITORS

Significantly, this view is shared across the entire corpus, including by strategic competitors, despite our endeavours to ensure the greatest possible diversity within the corpus, encompassing a range of institutional realities that reflect the differing structures of armed forces, alliances and military organizations across various regions.

2.7.2. Multi-faceted Constraints

Beyond these organizational constraints, the reports reveal a spectrum of systemic vulnerabilities that can be grouped around several major headings: ambiguity of the strategic environment; sustaining a protracted effort; strategic dependencies; loss of technological superiority; and erosion of nuclear deterrence.

Indeed, numerous analyses emphasize the difficulty of operating in a world whose contours are deemed impossible to pinpoint. The message is that uncertainty and ambiguity prevail to such an extent that they hinder understanding of the environment and, consequently, decision-making. This heading encompasses all tags reflecting such uncertainty, including legal ambiguity (51/109, or 47%), ethical dilemmas (39/109, or 36%), erosion of deterrence (30/109, or 27%), internal rivalries (26/109, or 24%), complexity of defining conflict (24/109, or 22%), and strategic disalignment (22/109, or

20%). Many other tags could be cited here, all contributing to the perception that tomorrow's environment is viewed as particularly complex.

Such pervasive uncertainty constitutes a genuine cognitive and doctrinal constraint. It reflects a global trend evident in foresight analyses across industries. This trend is highlighted by the *World Uncertainty Index*, which visually illustrates the growing tendency to characterize the world and the future as uncertain.[18] From this perspective, the military sector is therefore not unique; it is subject to the same geopolitical evolutions as other sectors. This complexity is partly attributable to the interrelations between domains of transformation and drivers of change – hence the importance, which is confirmed again here, of avoiding stove-piping in foresight work.

The ability to sustain a protracted conflict is also identified as a critical factor. The issues raised are many: human strain (17/109, or 15%) and material strain (9/109, or 8%), capacity for large-scale mobilization (3/109, or 3%), intensification of engagements (4/109, or 4%), demographic decline (4/109, or 4%), and so forth. The tags are numerous and resemble a jigsaw puzzle: many distinct issues can be identified, yet they are dispersed and relatively infrequently cited. Nevertheless, they all converge on a central concern relating to the overall resilience of contemporary societies at war. They also demonstrate the different levels of resilience to be secured, as well as the multi-faceted nature of such resilience. These issues, as has already been shown, are global in scope and contribute to defining the capacity for resistance and survival in the face of a long and intensive military engagement.

The theme of dependencies recurs with high frequency within the corpus, albeit in many different forms. Some reports mention dependency on space, as noted earlier (19/109, or 17%). Immediately following technological dependency (49/109, or 45%), this is the second most frequently cited dependency in the corpus. The last explicitly mentioned dependency is transatlantic interdependence (4/109, or 4%), which is easily understood in view of the composition of our corpus, even though its low frequency may appear surprising. Each of these dependencies is perceived as a weak point likely to restrict the agency of armed forces.

Another major set of constraints relates to the pace of technological change, with two main trends being highlighted: the difficulty of adapting systems (organizational structure, doctrine, education and training), and the ever wider accessibility of technologies, which undermines the traditional superiority of Western powers. For example, reports mention the possibility of having to fight without air superiority, or the proliferation of ultra-low-cost weaponry accessible to non-state or emerging actors.

Finally, the issue of eroding nuclear deterrence recurs frequently within the corpus (30/109, or 27%). It would be interesting to determine whether these 30 references originate from nuclear-armed states and, if so, whether they reflect concern over the potential progressive loss of a major and historically decisive strategic advantage. Alternatively, they may come from non-nuclear states and organizations, raising the challenge of an impending paradigm shift regarding the deterrence capabilities of nuclear weapons. This tag thus reflects, in our view, a degree of anxiety about a system that, while central to the current geopolitical balance of power, appears increasingly contested – or, at the very least, whose relevance is being questioned.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Institutional science fiction primarily offers catastrophic visions or deep-dives into the heart of military operations. One narrative stands out for taking the opposite approach: *The Canadian Shield* (NATO, 2024) presents a far more optimistic, almost utopian, vision of the future, featuring global nuclear disarmament and coordinated environmental management efforts, accompanied by space science research. It is important to move beyond a simplistic or naïve reading of this narrative and to realize that it actually underscores threats and sources of conflict that are perceived as insurmountable unless addressed globally and collectively – namely nuclear weapons, climate disruption and human activity in space.

INSIGHTS FROM STRATEGIC COMPETITORS

The six leading constraints are perceived in an almost identical manner across NATO and NATO-aligned publications and those of strategic competitors. The few differences, marginal as they are, concern the relative number of occurrences and their prioritization. For example, budget

18 World Uncertainty Index analyses are available online: https://worlduncertaintyindex.com

constraints rank second in NATO and NATO-aligned publications, but third in the visions of strategic competitors. This divergence is too minor to hazard an explanation, for fear of interpretative overreach. These small divergences notwithstanding, this is a particularly noteworthy research finding: regardless of geographical origin, authors appear to agree on the major constraints ahead. This brings us back to the same difficult question: are these visions strategically short-sighted, or are they simply realistic?

2.7.3. Visions Firmly Anchored in the Present

Addressing – at least in part – the question posed at the beginning of this chapter, findings in this section suggest that the projections made are closely tied to current perceptions and constitute a reflexive analysis rather than a genuinely forward-looking one. To some extent, the authors of these reports tend to project present day-to-day concerns into the future.

Yet this posture could be reframed as an opportunity from a foresight perspective. For example, a contrarian approach to constraints could be adopted, determining that the ideal way forward lies in the ability to pivot or in a radical simplification of administrative processes. This is, of course, implicitly suggested by the authors when highlighting constraints. However, explicitly framing this as both a response and an objective in its own right would likely alter the ownership dynamics.

INSIGHTS FROM INSTITUTIONAL SCIENCE FICTION

Although institutional science fiction often mirrors conventional perceptions, it nonetheless offers two particularly interesting counterpoints. First, they introduce genuine discussions on the ethical challenges of future conflicts. Therein lies the art of the authors: imagining situations that will complicate operations and challenge current doctrines. For instance, *A Model of Peace* (United Kingdom, 2023) explores the significance of proprietary rights over war-related data for feeding the AI systems and simulation models that are expected to proliferate in the future. The story concludes with a profound ethical reflection on such proprietary rights: should priority be given to private actors who enable access to and use of this data, or to governments and international organizations directly involved in decision-making in times of conflict, or else to the populations who suffered material and human losses during the wars from which these data are derived?

Secondly, and remarkably, logistics emerges as one of the most frequently addressed themes in institutional science fiction, despite being largely overlooked by foresight reports. This reflects the approach of these authors, who often seek to identify and dramatize critical issues in future conflicts. Several compelling examples could be cited here, not least those narratives that play with 3D printing (also known as additive manufacturing) technologies. Some push the technical potential to the extreme, imagining on-demand "printing" of drugs from local resources, as in *Balance* (NATO, 2016). Others envisage the threats generated by logistics processes based on 3D printing, such as the theft of equipment blueprints in *Rapid Deployment* (NATO, 2016). The authors go even further in their imaginary projections, suggesting that mere possession of blueprints is not enough: enemy forces replicate and enlarge vehicles at will, creating equipment behemoths that, while formidable in appearance, are poorly designed and assembled, and therefore prone to disintegration when used operationally.

2.8. Convergence of Visions as Short-Sightedness?

Throughout this report, we have repeatedly highlighted the striking convergence of viewpoints: both among actors who had been expected to propose distinct visions, given their cultural differences and respective positions in the current geostrategic landscape; and between foresight reports and institutional science fiction, which, according to its academic definition, was intended to open up new perspectives on future conflicts.

2.8.1. The Roots of a Strictly Conservative Approach

The convergences observed have raised questions throughout. Are they the result of intellectual blinkers – what we might call "blind spots"? By this term, we refer to the unseen – not the unknown, i.e. that which cannot be anticipated given our current knowledge, but rather what could potentially be seen yet remains out of sight because our foresight focuses solely on certain topics. Here, we may recall the well-known foresight metaphor of the car driving at night: the study conducted reveals what is illuminated by the vehicle's headlights. The blind spots are all those subjects and areas of interest that remain in pitch-darkness, although they may play a decisive role in shaping the road ahead as well as our driving. Taking the metaphor further, foresight aims to generate knowledge about future environments precisely in order to enable us to keep our hands on the steering wheel and maintain control of our trajectory.

An easy explanation would be to attribute these convergences to gaps in our corpus, with the lack of diversity in input data leading to unrepresentative results. Alternatively, it could be argued that the inherent limitation in relying exclusively on publicly available foresight reports may restrict access to strategic reflections of interest and deliberately keep certain topics away from the spotlight. We sought to mitigate these potential shortcomings by supplementing the corpus of foresight reports with institutional science fiction narratives, although they too are not fully representative (primarily in terms of number and diversity of commissioning institutions).

Yet, after several months working on these sources, it seems to us that the issue lies more in a structural weakness affecting thinking agendas: within the long tail, there are numerous themes that are neither explored in detail nor shared across the community of thinkers. Moreover, it is easy to imagine that some themes are simply overlooked.

Regarding the first issue, we are likely facing a Stigler-type bias, whereby ideas are rarely attributed to their true originators, or a Matthew effect, which posits that certain scientific works receive a disproportionate amount of attention in relation to others. In our context, this would suggest that numerous weak signals exist but remain unnoticed due to lack of access, translation, or simply interest. From this perspective, military ideas about the future seem to gain traction and credibility when echoed by well-known institutes such as the RAND Corporation or the IISS, which act as amplifiers, dominating discourse and discussions. This visibility – or, conversely, invisibility – bias plays a critical role in the foresight field and may explain why future horizons appear so conservative.

As for the second issue, research has shown that conflict studies can be biased, leading authors to focus on certain types of conflicts while sidelining others. This empirical selectivity bias in the study of civil war and armed conflict is thus said to reflect "(1) institutional entanglements between the field of security studies and Western foreign policy; and (2) sociological factors that shape the formation of scholarly subjectivities and pertain to methodological challenges."[19] In the field of military foresight, this bias may be equally at play.

2.8.2. Breaking Free

The first step is to acknowledge the attention and selection biases we hold, i.e. that by continually focusing our discussions on drones and robots, we are very likely to miss out on the next genuine tactical surprise. This may, in fact, be one of the key contributions of the study we have been conducting: it enables us to list the themes that are widely shared and thus to identify rather precisely the gaps in the net. In design fiction – a discipline that explores the future by blending art, science and fictional work in order to escape stereotypical representations – the expression "future trope" is used to describe objects, technologies, or practices that "feel futuristic". These tropes tend to be used widely whenever there is a need to quickly convey to an audience that a story takes place in the future: transparent screens, blue or violet hues, head-up displays, personal AI embodied as holograms, and so forth. Paradoxically, these tropes narrow the future horizon by focusing attention on a handful of elements that are not the most critical. It is precisely this type of approach that must be challenged.

19 David Brenner, Enze Han, "Forgotten Conflicts: Producing Knowledge and Ignorance in Security Studies," *Journal of Global Security Studies*, Volume 7, First edition, March 2022, ogab022, https://doi.org/10.1093/jogss/ogab022

The second step is to develop a genuine capacity to analyse the many emerging trends that could impact the military field. The notion of drone swarms, for example, gained prominence in discourse following demonstrations by U.S. forces featured in an episode of "60 Minutes" on CBS, which raised public awareness.[20] Yet academic research on social insects long predates this. There was therefore latent interest in the military field before – it merely needed to be disclosed.

The third step is to broaden the disciplinary scope significantly to economics, climate and culture, and to diversify the pool of experts tasked with envisioning the future of conflict. The concept of echo chambers – commonly used today to describe the amplification of information on social media – is of relevance here.[21] In an echo chamber, the way information is disseminated can result in certain messages being amplified within specific communities. In the case at hand, echo chambers appear to be forming among the community of military specialists. It is therefore essential to break these herd-like behaviours. The institutionalization of a foresight counter-perspective could be envisaged through the establishment of civil-military foresight red teams, including experts in the analysis of local grey literature, while ensuring geographical diversity among members (African historians, Asian sociologists, and so forth).

2.8.3. Context is Key

As noted at the outset of this study, there appears to be a recent surge of interest in possible futures, which we describe as the "future effect" (see Figure 8). This is clearly reflected in the breakdown of publications within our corpus by year. A clear inflection point appears in 2019, attributable to a range of probable factors. Whatever the underlying causes, the key takeaway is that we are experiencing a unique period as regards our attitude to future conflict, and this must be acknowledged when addressing this subject.

This observation holds true regardless of the geographical origin of the authors: whether Western or not, the peak of interest in futures is shared across the board.

Before concluding this work, we wish to highlight another point. While there appears to be an overall convergence in analyses, nuances do emerge upon closer examination – particularly in relation to the type of originator. For example, when looking at the constraints emphasized by national bodies, budget limitations and governance issues are far more prominent than in academic research. Conversely, issues of technological integration are cited far more frequently by academic research than by national institutions (see Figure 9). Unfortunately, this disparity does not seem particularly insightful, as it largely reflects the respective priorities of these different actors. Indeed, for a Ministry of Defence to view budgetary and governance constraints as critical would seem more indicative of a form of ethnocentrism.

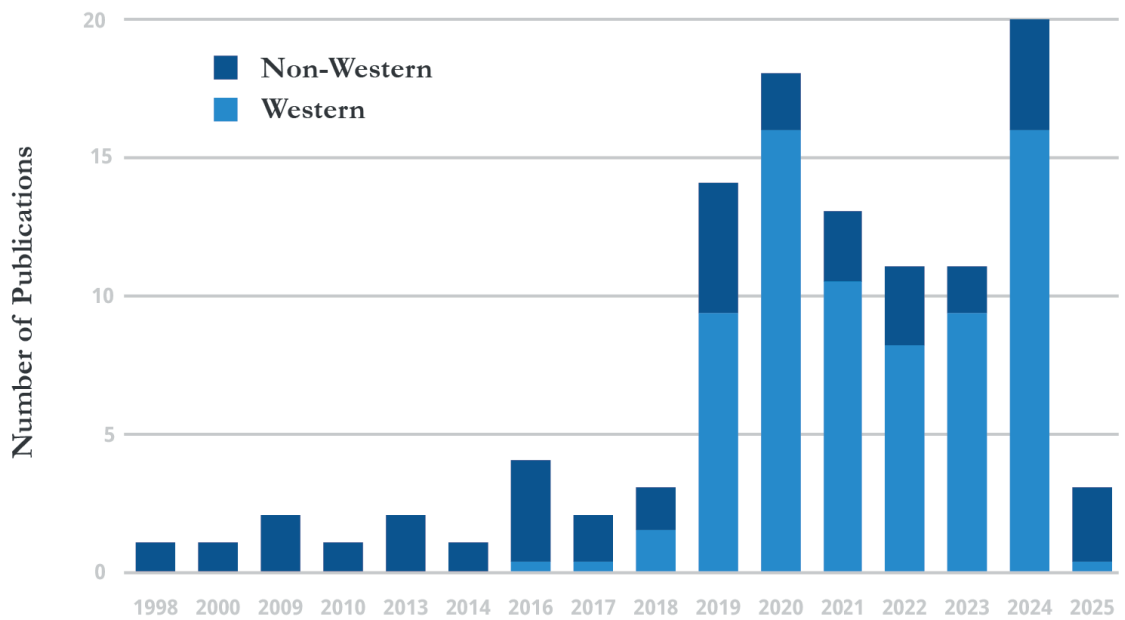


Figure 8 – Breakdown of analysed foresight reports by date of publication

20 U.S. Department of Defense, "Department of Defense Announces Successful Micro-Drone Demonstration," 9 January 2017, https://www.defense.gov/News/Releases/Release/Article/1044811/department-of-defense-announces-successful-micro-drone-demonstration/

21 For more details on this concept, see *Toxic Data* by David Chavalarias (2022).

More interesting insights arise when examining differences in the perception of geographical areas. The Arctic, for instance, is highlighted far more often by think tanks – which appear to explore further horizons – just as they devote greater attention to the Middle East and Central Asia (see Figure 9). This may be a promising avenue for further investigation, as governmental institutions likely find it hard to extend their focus beyond their traditional geographical areas of interest.

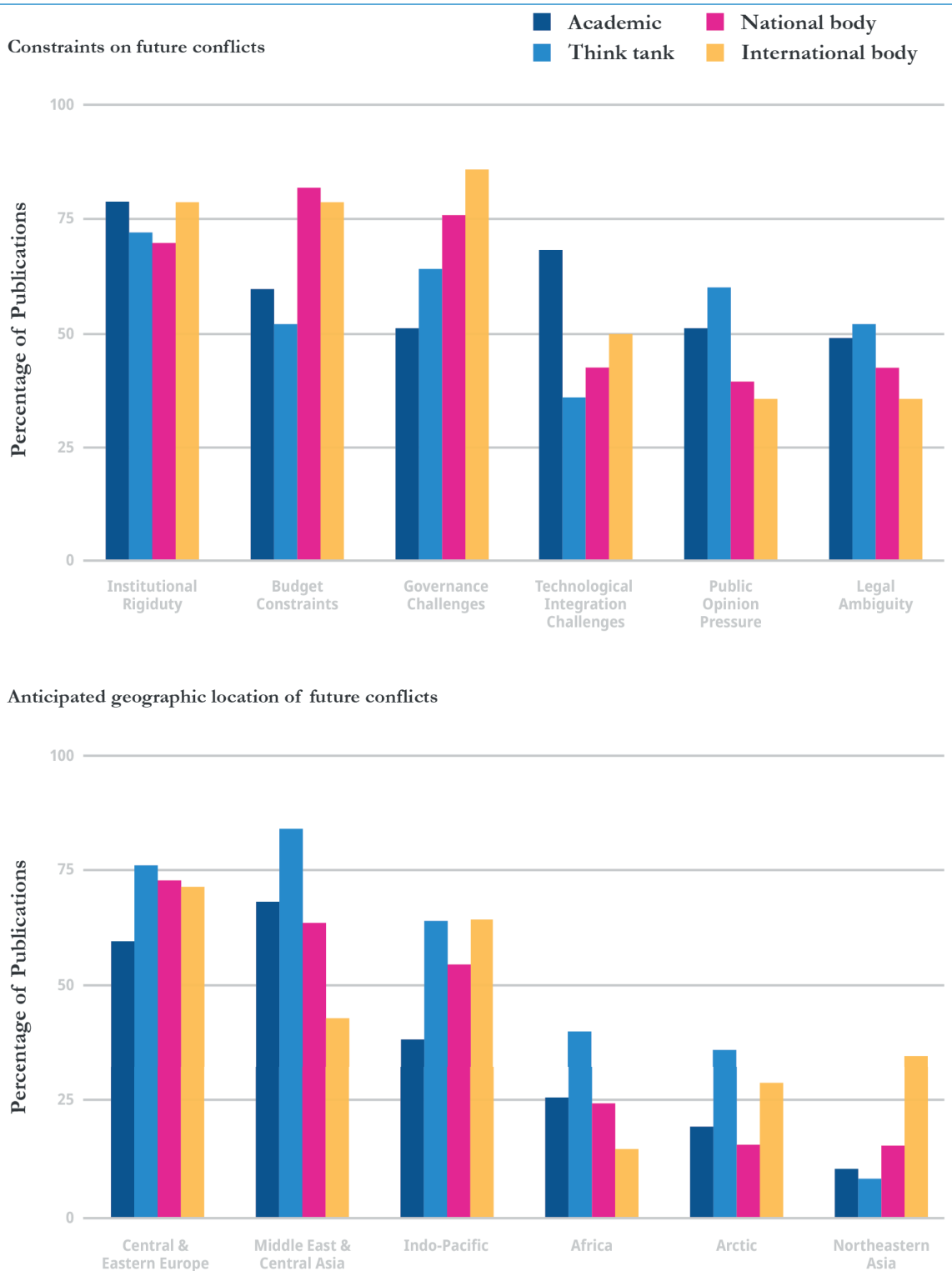


Figure 9 – Breakdown of analysed foresight reports by type of originator, and by two tag categories: constraints on future conflicts and anticipated geographic location of conflicts.

Conclusion

3

Conclusion

After an in-depth review of over a hundred publications on the futures of warfare, we were able to establish that tomorrow's conflicts need to be understood as complex ecosystems in which technologies, actors and constraints are deeply interwoven. Far from the impression of a mere catalogue that might arise from the listing of tags we have provided, it is important to approach forms of combat (hybrid, remote, cyber, proxy, etc.), operational environments (land, sea, space, infosphere, etc.), constraints (budgets, climate, administrative, etc.) and technologies (AI, hypersonic, laser, etc.) as interconnected nodes, thus recognizing that changes in one of them have repercussions on the others.

Yet these dimensions are (too) often examined in isolation, with some analyses even considering technologies individually, in a manner akin to stove-piping. Crucially, such analyses are also (too) often conducted in a linear fashion, without genuine consideration of potential disruptions or unexpected events.

From this deep-dive into foresight exercises, several lessons should be drawn regarding how we approach the future of conflicts:

The **importance of modelling interdependencies** and moving beyond the mere accumulation of trends should be acknowledged. This would, for instance, enable a recognition that a peripheral disruption may impact the entire system, or that the effect of a variable (such as technology) will vary according to the context of use (e.g. AI used in a Western versus a non-Western setting).

Dissonance should be injected by deliberately engaging non-military experts to shed light on some blind spots, particularly cultural ones. As we have seen, visions of the future tend to converge, yet they diverge on a few key elements. The real future is never produced in isolation; it lies somewhere within the duality between our analyses and those of our competitors.

This dissonance should also help **distinguish between transient, fashionable trends and genuinely critical signals**. In practical terms, the prevailing impression is that many analyses project linear evolutions without reflecting on the unforeseen, the hidden signals or potential disruptions. From this perspective, mapping Technology Readiness Levels (TRLs) to predict the military utility of certain technologies would quickly clarify what belongs to the realm of the obvious in terms of foresight and what pertains to advanced research. Such diversity of viewpoints would be expected to lead to a genuine creative effort – an element that did not transpire from the works analysed, including institutional science fiction, which showed itself to be somewhat conservative.

The **social sciences and humanities** are too often ignored in publications, which is of concern considering that war is – by essence – a profoundly human phenomenon. It seems essential to bring in these approaches in order to produce **scenarios that are far more holistic and complex** than the sometimes simplistic visions currently shared.

In conclusion, it appears more crucial than ever to prepare for the unpredictable. However, this must be done without succumbing to the siren call of fashionable trends. Otherwise, foresight runs the risk of turning into a self-fulfilling prophecy – or worse, into a reassuring mirage.

Annex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Annex

Description of Categories Used for the Analysis

Category #1 – State or organization of origin

This category defines the country of origin of the report under analysis. The country is specified when the report is produced by a ministry, a think tank, or a military institution of that country. In the case of research conducted by an individual and published in an academic journal, the country of the affiliated institution is indicated. For reports published by an international organization, no producing country is named and these sources are instead classified under the originator type "International".

> USA; UK; France; China; Russia; Switzerland; Poland; Netherlands; Qatar; Iraq; Ukraine; Romania; EU; NATO; Hungary; Greece; Japan; Armenia; Lithuania; Spain; South Korea; Azerbaijan; Scandinavia; Sweden; International.

Category #2 – Type of originator

This category indicates the type of organization that originated the publication. Six types were identified during the coding phase:

- academic research; think tank; national body; international body; consulting; industrial.

The publications analysed are primarily academic in nature and produced by think tanks. This is easily explained: war is a subject that has generated a substantial and diverse body of research, enabling numerous authors to contribute. By contrast, national or international publications entail making a viewpoint and underlying assumptions public. Such publications are therefore less frequent, as they require lengthy validation and external communication processes. Moreover, they often have direct implications for national armed forces, making it impractical to repeat the process annually.

Industrial perspectives are far less numerous again. This is largely due to the difficulty of distinguishing between genuine strategic analyses of future conflicts and communications aimed at promoting the products and services of companies within the defence industrial and technological base. From this standpoint, it would likely be more insightful to examine patent filings by industrial actors, as these can be viewed as genuine foresight indicators – perhaps offering a more candid reflection of their perception of future conflict dynamics than sometimes over-publicized reports.

Category #3 – Date of production

This category indicates the date of production of all analysed articles and reports.

- 1998; 2009; 2010; 2013; 2016; 2017; 2018; 2019; 2020; 2021; 2022; 2023; 2024; 2025.

Category #4 – States and international organizations defined as adversaries

This category indicates all the countries and international organizations (including alliances of at least two separate countries) that are explicitly mentioned as declared enemies or strategic competitors.

Russia; China; Iran; North Korea; USA; NATO; EU; Japan; Taiwan; India; Pakistan; Armenia; Ukraine; QUAD; AUKUS; Vietnam.

Category #5 – Non-state actors defined as adversaries

This category lists the non-governmental actors identified as participants or catalysts in conflict situations.

- terrorist; organized crime; proxy; PMC; armed groups.

Category #6 – Geographic location of conflict

This category indicates the geographical areas identified as theatres of military operations. Although numerous highly specific geographical locations are mentioned in the articles analysed – such as the Taiwan Strait or the Shatt al-Arab – collating each of them individually would have generated an excessive number of tags. We therefore opted to consolidate these locations into broader geographical areas in order to ensure the analysis would be sufficiently structured and readable.

- MECA; CEE; Indo-Pacific; Africa; Arctic; North-East Asia; Caucasus; Gulf; South America; North America.

Category #7 – Type of operational environment

This category was created as a complement to category #6 ("geographic location of conflict").

It indicates the types of operational space (not in terms of geographical location, but in terms of type of environment) represented in the corpus, reflecting the growing complexity of contemporary conflicts, which extend over both physical theatres and immaterial domains.

cyberspace; information warfare; outer space; urban warfare; cognitive warfare; seas and oceans; coastline; cross-border.

We have opted to include the tags "information warfare" and "cognitive warfare" in this category rather than under forms of conflict, as they mainly describe specific domains of action in which various types of operations can be conducted, e.g. disinformation, psychological warfare, or manipulation.

Category #8 – Main technologies mentioned

This category brings together all the technologies identified as decisive in future warfare, whether emerging or already established.They reflect the diversity of military innovations, ranging from weapon systems (e.g. hypersonic, nuclear, electromagnetic) to digital technologies (e.g. cyber, AI, sensors), biological technologies (e.g. biotechnology, psychopharmacology), and systemic technologies (connectivity, human enhancement).

> AI; cyber; surveillance system; directed energy weapon; drones; robots; hypersonic; data; quantum; space-based weapon; electromagnetic weapon; ICT; sensor network; biotechnology; human–machine interconnection; unmanned system; human enhancement; nanotechnology; 3D printing; non-kinetic weapon; advanced control system; nuclear weapon; detection; connection; ballistic missile; augmented reality; stealth; self-evolving system; anti-ship system; climate modelling; energy; integrated weapons system; machine learning; psychopharmacology; HAARP (*High-Frequency Active Auroral Research Program*).

Category #9 – Main characteristics

This category details the key elements shaping the forms that future conflicts will take, beyond the realm of technology. It highlights the considerable diversity of perspectives among authors and researchers and is therefore broad in scope. Wherever possible, we have aggregated terms that refer to similar realities. For example, psychological enhancement of soldiers has been grouped under the tag "human enhancement".

> strategic competition; civil-military integration; technological race; multi-domain; multipolarity; anticipation and long-term vision; accelerated tempo; algorithmic domination; grey area; deterrence; doctrinal evolution; C4ISR; dehumanization of combat; disruptive innovation; multiplicity of actors; security continuum; VUCA (*Volatility, Uncertainty, Complexity, and Ambiguity*); disinformation; weaponization of environment; polarization; battlefield transparency; electronic warfare; privatization of violence; precision; self-evolving system; remote strike; tactical efficiency; dynamic; socio-technological convergence; strategic ambiguity; non-linear; speed of change; total neutralization; agility; climate change; intellectual race to innovation; distributed force; force design; interoperability; casualty reduction; shifting combat demographics; detection; intelligence and counter-intelligence; manipulation of information; autonomy; duration; mass destruction; space operations denial; complexity; coordination of forces; dispersion of forces; flexibility; fortification; combat in the anthroposphere; headcount reduction; power of small states; surprise; intensification; wargaming; return to conventional tactics.

In addition, some tags with few or even single occurrences were retained in the analysis due to their distinctiveness. For example, "fortification", which envisages a return to the construction of forts, appeared to us as an original perspective, which contrasts with dispersion.

It is worth noting a difficulty encountered in the analysis, insofar as some characteristics of visions of future warfare also appear in the "constraints" section. This is the case, for instance, with climate change: it will necessitate operating in a harsher environment than at present. While this constitutes a characteristic, it is also a constraint insofar as it will limit the operational capabilities concerned.

Category #10 - Conflict type

This category identifies the main types of future conflicts and confrontations. This is a complex category, as the terms used to describe a form of conflict vary significantly depending on the authors and their national contexts. In French, for example, the term guerre hybride (hybrid warfare) appears to be used primarily to characterize adversary actions, whereas the term stratégies indirectes (indirect strategies) is more commonly employed to describe one's own responses. This semantic ambiguity is difficult to address: we did not wish to impose rigid categories and force each author's assumptions into them, at the risk of misinterpreting their perspectives. We therefore decided to take the designations at face value: when an author refers to "hybrid warfare," we coded the tag as such.

In order to reflect the growing diversity of contemporary and future modes of confrontation, this category seeks to encompass the full range of forms that conflict may assume.

> hybrid warfare; remote warfare; cyber warfare; proxy warfare; irregular warfare; systemic warfare; asymmetric warfare; space warfare; network warfare; mass warfare; intra-state warfare; ecological warfare; economic warfare; lawfare; generational warfare.

Category #11 - Constraints

This category identifies the various obstacles, limitations, and structural or situational challenges that actors will face in future conflicts. It captures a range of sometimes contrasting perspectives, encompassing operational, institutional, technological and economic constraints, as well as political and normative limitations.

> institutional rigidity; budget constraints; governance challenge; technological integration challenge; public opinion pressure; legal ambiguity; technological dependency; ethical dilemma; vulnerability of infrastructure; erosion and complexity of deterrence; resilience; internal rivalries; adaptation to new strategies; complexity of defining conflict; political pressure; organizational constraints; cognitive overload; disalignment; adaptation to new technology: lack of accountability; technological inequality; political fragmentation; reliance on outer space; humanitarian impact; resources; environmental constraints; excessive surveillance; human strain; speed of change; high R&D investment; logistics; cyber; material strain; maintaining nuclear deterrence under constraint; demographic decline; duration; intensification; security continuum; transatlantic dependency; determinism in prediction; enemy A2; technological levelling; smart city; alliances; detection of and response to attacks in grey zones; need for mass; regulation; disruption of supply chains; cheap weaponry; military strength; C2; combat without air superiority.


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