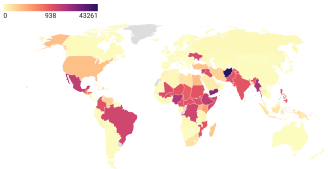
Quantum Technologies and their Consequences for Peace and Conflict

Fatalities due to state-related conflict since January, 2021



Visualization of ACLED data with the inclusion of fatalities since January 2021 - April 2022 due to the following types of conflicts:

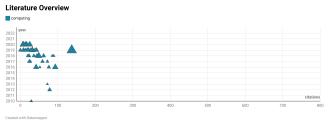
Strategic developments: Contextually important events which may contribute to a state's political disorder and/or may trigger future events.

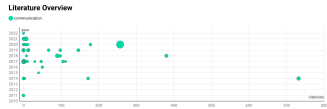
While it is rare for fatalities to be reported as a result of such events, they can occur in certain cases, such as the suspicious death of a high-ranking official, accidental detonation of a bomb resulting in the bomber being killed, etc.

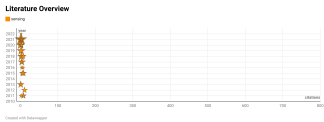
Battle: A violent interaction between two politically organised armed groups at a particular time and location.

Explosions/Remote Violence: One-sided violent events in which the tool for engaging in conflict creates asymmetry by taking away the ability of the target to respond.

Violence against Civilians: Violent events where an organised armed group deliberately inflicts violence upon unarmed non-combatants. By definition, civilians are unarmed and cannot engage in political violence.







In the literature we see different developments:

Publications on **Quantum Sensing** existed comparatively quite early, but the topics are very diverse, and both the citations and the referencing of other works are not very pronounced. One of the key authors in this field is Siwen Bi of the Institute of Remote Sensing and Digital Earth in China.

Quantum Computing is one of the newer topics that has seen increased publication in 2018-2020. Since most of the works are similar in perspective, they often refer to each other and get medium attention, as evidenced by their citations. Two frequent authors are Laszlo Gyongyosi and Sandor Imre from the Budapest University of Technology and Economics.

The topic of **Quantum Communication** has also seen a significant increase in the number of papers published since 2017, with citations in this area being by far the highest and publications receiving a high level of attention. This can also be seen in the fact that even highly cited papers do not contain many references. The two main authors together with their respective teams are Xu Liu and Juan Yin, both of whom are doing research at different Chinese universities, Juan Yin in Shanghai and Xu Liu in Beijing.

Quantum and Conflict

Impact of Quantum Technology on Drivers of Conflict

	Gender Inequality	Increasing Complexity	Intracability of Conflicts	Weak Leadership and Governance	Exclusive Politics	Economy and Environment	Land and Water	Population Growth and Environmental Degradation	Spillover of Contemporary Conflicts	Criminal Networks	Fragile Central State	Authorization
Communication		Medium	High	Low		Medium				High		High
Computing	Low	Medium	Medium			High	High		Low			Medium
Sensing		Medium	High		Low	High	High	Medium	Medium			High

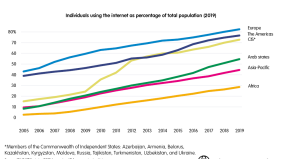
Created with Datawrapper

We started by adopting the twelve challenges for sustaining peace identified in the 2015 review of the United Nations Peacebuilding Architecture and classifying whether the impact of different types of Quantum Technology (Computing, Sensing, and Communication) is high, medium, or low. We then narrowed our scope by grouping suitable high impact challenges together and researching how quantum technology influences our three focus areas.

Intractable Conflicts and Quantum Communication

Factors, such as the rise of violent extremism, links to illicit markets and organised crime, and the proliferation of small arms and light weapons, lead to an increase in intractable conflicts. With the rise of new quantum communication tools, there will be further challenges. The Shor-algorithm would be able to decrypt the classic RSA algorithm and other public key encryption algorithms. For this reason, in 2016, the U.S. National Institute of Standards and Technology (NIST) announced a competition to select new quantum-resistant public key encryption algorithms to replace current ones. In addition to possible decryption, secure communication for extremist groups also poses a new threat to maintaining national and international security against terrorism.

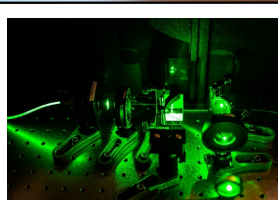
In the graph below, you can see that more and more people are using the internet and thus will probably have access to other technological achievements, like the quantum internet:



In ten years, access to quantum technologies will further exacerbate the global power imbalance between countries.
While economic powers use these new encryption methods to keep banking transactions and state secrets secure, economically weak countries are spied upon. This also impacts diplomatic efforts and international relations. Transparency is only one-sided and revives historical prejudices and suspicions, fueling existing conflicts and igniting new ones. In addition, the threat from terrorism and extremist groups has intensified, as their communications are unimpeded and their actions are therefore unpredictable. The world is disintegrating politically into individual nations again, held together only barely by optimized international trade.

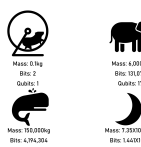
Sensing of Natural Ressources and Climate Change

Quantum sensing technologies enable us to better track and study environmental targets and our progress towards them by gathering large amounts of data to make more reliable decisions regarding the environment. Moreover, by detecting minor meteorological disturbances, quantum sensing technologies play a vital role in natural disaster preparedness and adaptation. The constant and reliable monitoring of these environmental factors allows for more environmental security. On the other hand, employing these technologies in surveillance improves our ISTAR (Intelligence, Surveillance, Target Acquisition, and Reconnaissance) capabilities and renders it a valuable military tool.

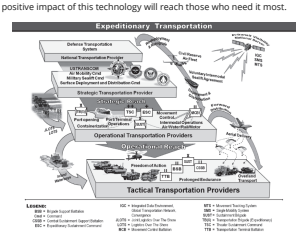


While quantum technologies can improve monitoring the environment, the information acquired from them might work as a conflict catalyst. In a scenario where quantum climate information indicates a worse climate situation than what our current technologies simulate, conflicts related to national commitments on climate targets might arise. The improved capabilities for detecting underground and undersea natural deposits, especially in regions where state borders are not clearly defined, could not only deepen the information gap between nations with access to these technologies and the ones that do not, but could also create new regional clashes and intensify existing ones.

Quantum Computing and Optimisation



Quantum computing could have an immense impact on the efficiency of many productive processes essential to society. In theory, the application of this technology could improve the efficiency with which humanity builds, ships, creates and consumes. However, the dual-use nature of quantum computing implies that this computational power could be employed to increase our destructive capabilities. Likewise, it is not clear whether the positive impact of this technology will reach those who need it most.



Five years after quantum computing reaches maturity, it is likely that its use will be reserved to a few powerful actors. Militaries which become overly reliant on quantum-optimised logistics could struggle when deprived of these capabilities. While this technology promises to improve society's productive efficiency, it is unlikely that the lion's share of these benefits will be shared with wider society. Likewise, instructions generated through quantum computing coupled with current digital management/surveillance techniques could lead to a hyper-rationalisation of human economic activities, further alienating the human workforce. It will be crucial to develop humane applications for quantum computing and to guarantee access to these capabilities for less developed nations. A feasible model for the latter recommendation could be inspired by UN-SPIDER.

References

Nicolas Ayala Arboleda, Omar Thaleb, Sarah Ekker