

Research Paper

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# Nuclear Disarmament

## The Missing Link in Multilateralism



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## Summary

*This is an updated version of a paper first published by Chatham House in October 2016.*

The purpose of this paper is to outline the connections between nuclear disarmament and some of the key issues facing humanity today. So far, enormous effort has been invested in tackling these challenges, for example, in climate change prevention and mitigation, socio-economic development, and establishing and implementing the rule of law. Furthermore, recent efforts over the protection of cultural heritage in conflict, stemming the rise of terrorism, developing cybersecurity, understanding gendered impacts and addressing urgent public health issues have all benefited from energized governmental and non-governmental diplomatic actions.

A single detonation of a nuclear weapon would have disastrous impacts on these important issues, yet the possibility of nuclear weapons use is rarely factored into policymaking in these areas. Experts and officials working on these headline issues are often unaware of the dangers that nuclear weapons still pose. There is a persistent belief that the risks associated with nuclear weapons are no longer as high as they were during the Cold War. There is also a belief that nuclear disarmament is underway and therefore no longer requires the same level of attention. Furthermore, perhaps because of these beliefs, there seems to be a lessening of interest in the connections between nuclear disarmament and sustained human progress.

This paper explores how the detonation of nuclear weapons would impact the following headline issues and how they connect to nuclear disarmament: 1) climate change; 2) development; 3) international law; 4) gender; 5) protection of cultural heritage; 6) public health; 7) non-state armed groups; 8) humanitarian action; and 9) cybersecurity.

The paper concludes that nuclear weapons pose overwhelming dangers to global health, development, climate, social structures and human rights. The detonation of nuclear weapons – whether accidentally, inadvertently or deliberately – would have disastrous immediate and long-term consequences both in the location of the detonation and also in many others parts of the world. As the new UN Secretary-General, António Guterres, stated on taking the oath of office in December 2016:<sup>1</sup>

We must create a common thread for peace that links conflict prevention and resolution, peacekeeping and peacebuilding, and development ... Humanitarian response, sustainable development and sustaining peace are three sides of the same triangle.

It is time that the international community linked the issues in a coherent multilateral, high-level approach, in which human security and survival of the species is placed at the centre of international decision-making.

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<sup>1</sup> UN Peacebuilding (2016), 'Antonio Guterres Stresses Focus on Sustaining Peace and Conflict Prevention in Speech upon Taking Oath of Office', <https://un-peacebuilding.tumblr.com/post/154383089710/antonio-guterres-stresses-focus-on-sustaining>.

# 1. Introduction

Member states of the UN have made steady and meaningful progress on important and urgent issues in recent years. From international action on climate change to the 2015 agreement on the sustainable development goals (SDGs), resources are being husbanded and the determination to solve them is palpable. And yet there is a blind spot in the united global responsibility discourse: nuclear disarmament.

Dwarfing the impact of conventional weapons, the use of nuclear weapons – even in a limited regional war – could instantaneously destroy millions of people, their cities, their culture and their histories. The long-term effects are estimated to have the potential to kill, more slowly and with immense suffering, a further two billion people<sup>2</sup> through radioactive debris and climate change affecting water, air, crop production, and animal and human life. All that has been built in terms of relationships between countries, international law, human rights, environmental care, and the norms and confidence to build a safer and secure world are currently being placed in jeopardy owing to the international failure to address nuclear disarmament and non-proliferation effectively.

Sidelining nuclear disarmament while addressing all the other important issues is a high-risk decision. Leaving nuclear disarmament and non-proliferation obligations unfulfilled could impact on the efforts under way to address environmental issues, SDG implementation, gender equality, public health measures and so on. Legal loopholes are also of significance to other interconnected issues, and vulnerable areas have opened up that could further undermine the rule of law and even serve to unravel other parts of the global legal infrastructure.

September 2016 marked 20 years since the Conference on Disarmament (CD) negotiated a treaty.<sup>3</sup> Despite significant progress on the nuclear non-proliferation and nuclear security fronts since the 2010 Non-Proliferation Treaty (NPT) Action Plan<sup>4</sup> was agreed, very little progress has been made on the nuclear disarmament side in the last seven years. Hoping that nuclear disarmament and non-proliferation measures will somehow fall into place without sustained attention and diplomatic progress is wishful thinking. Just as all of humanity is interconnected – genetically, geographically, historically and emotionally – so are all of the major global concerns and their legal frameworks. Failure to address nuclear disarmament and non-proliferation with the urgency and energy it deserves puts everything else at risk.

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<sup>2</sup> Helfand, I. (2013), *Nuclear Famine: Two Billion People at Risk? Global Impacts of Limited Nuclear War on Agriculture, Food Supplies, and Human Nutrition*, International Physicians for the Prevention of Nuclear War, <http://www.ippnw.org/pdf/nuclear-famine-two-billion-at-risk-2013.pdf>.

<sup>3</sup> The Comprehensive Nuclear-Test-Ban Treaty (CTBT), <http://ctbto.org/the-treaty/>.

<sup>4</sup> See for example: Gandenberger, M., Irsten, G. and Acheson, R. (2015), *NPT Action Plan monitoring report March 2015*, Reaching Critical Will, <http://www.reachingcriticalwill.org/resources/publications-and-research/publications/5456-npt-action-plan-monitoring-reports>; Mukhatzhanova, G. (2015), *2015 Monitoring Report: Implementation of the 2010 NPT Action Plan, Disarmament Actions 1–22*, James Martin Center for Nonproliferation Studies, Middlebury Institute of International Studies, <http://www.nonproliferation.org/2015-npt-monitoring-report-disarmament/>; and Evans, G., Ogilvie-White, T. and Thakur, R. (2015), *Nuclear Weapons: The State of Play 2015*, Centre for Nuclear Non-Proliferation and Disarmament, Crawford School of Public Policy, ANU College of Asia & the Pacific, <https://cnnd.crawford.anu.edu.au/publication/cnnd/5328/nuclear-weapons-state-play-2015>.

In his video address to the Conference on Disarmament in January 2017, UN Secretary-General António Guterres said:

Disarmament can play an important role in ending existing conflicts and preventing the outbreak of new strife. Disarmament and arms control processes provide the breathing space for confidence to be built, stability to be strengthened and trust to be established ... The need for a breathing space is urgent. Global tensions are rising, sabres have been rattled and dangerous words spoken about the use of nuclear weapons.<sup>5</sup>

This paper explores the proposition that all those who are concerned about the survival of the planet and the betterment of humanity need to be equally concerned about nuclear weapons and nuclear disarmament. The purpose of the paper is to highlight some of the connections across the issues<sup>6</sup> and explore ways in which continuing nuclear weapons possession affects attempts to tackle critical humanitarian challenges – particularly where the possibility of nuclear weapons use is rarely discussed or factored in to policymaking.

The far-reaching international commitments that countries have made on urgent global issues including climate change, SDGs, protection of cultural heritage, international law, gender equality, humanitarian action, public health and cybersecurity are inextricably linked to the international commitments on nuclear weapons. Leaving nuclear disarmament and non-proliferation obligations unfulfilled could have severe impacts on all the efforts under way to address climate change, SDG implementation, international law, gender equality, humanitarian action, public health measures and cultural heritage protection. Nuclear weapons and the legal framework pertaining to them are fundamentally connected to the full range of top-tier concerns and form the missing link in multilateralism.

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<sup>5</sup> UN Secretary-General (2017), 'Secretary-General's Video Message to Opening of the 2017 session of the Conference on Disarmament', 24 January 2017, <https://www.un.org/sg/en/content/sg/statement/2017-01-24/secretary-generals-video-message-opening-2017-session-conference>.

<sup>6</sup> For an excellent paper on these connections, see Fihn, B. (ed.) (2013), *Unspeakable suffering: the humanitarian impact of nuclear weapons*, Reaching Critical Will, <http://www.reachingcriticalwill.org/resources/publications-and-research/publications/7422-unspeakable-suffering-the-humanitarian-impact-of-nuclear-weapons>.

## 2. Risks

Risk is calculated by multiplying the range of potential consequences by the range of predicted probabilities. In all fields of risk calculation, the understanding of risk is constantly changing and needs continual reassessment. This is also true for the risks associated with nuclear weapons, which change over time on the basis of new understanding, particularly of the consequences and likelihood of potential use, whether by accident or intent.

Nuclear weapons differ from other types of explosive weapons in four respects: the size and scale of the explosion; the total amount of energy released as the blast, light and heat; the release of radioactive energy and materials; and long-term climate change impacts.

Most of the damage caused by a nuclear weapon detonation is due to the blast effects of the shockwave and subsequent high-velocity winds. In most nuclear explosions, these account for 40–50 per cent of the energy released. The second largest effect of the explosion is in the intense heat and fires caused by thermal radiation, which accounts for approximately 35–45 per cent of the total energy of the weapon. The rest of the energy (5–15 per cent) lies in the ionizing radiation that is released immediately in the form of gamma rays, neutrons, small nuclei and electrons. Radioactive debris in the form of heavier isotopes such as radioactive iodine, caesium and strontium will spread into the atmosphere depending on wind and weather conditions, falling later as radioactive fallout. In addition, if 100 or more medium-sized nuclear weapons were detonated in highly populated cities, the resulting global spread of carbon could produce severe climatic and environmental effects. These would include ozone depletion, radioactive contamination, severe frosts and global famine for decades.

The explosive power of nuclear weapons is measured in equivalent tonnes of TNT. A 15-kilotonne (kt) weapon is designed to produce a yield equivalent to 15 million kg of TNT, compared with conventional bombs, which are between one-millionth and one-thousandth less in explosive power. The effects of a nuclear explosion depend on the yield, design, whether it occurs in the air or on the ground, surrounding weather conditions, the topography of the landscape and the number of inhabitants living in the target vicinity.

Over the last 70 years, new information has allowed better understanding of the consequences of nuclear weapons use. Long-term health effects on the survivors of attacks on Hiroshima and Nagasaki in 1945 – the Hibakusha – and continued studies on the effects of nuclear weapons testing programmes on the health of Downwinders, including in the United States, the South Pacific islands, Kazakhstan and Australia, reveal increased vulnerability to primary and secondary cancers, and significantly differentiated impacts on population groups according to gender and age. Changing population patterns such as urbanization, with significantly more people now living in

large cities, have meant that there are new realities and limits for the humanitarian and medical responses to a nuclear weapons attack.<sup>7</sup>

The understanding of the probabilities of use have changed since the end of the Cold War, partly because new information has been revealed about how close humanity has come to nuclear weapons use owing to accidents and miscalculations throughout the Cold War.<sup>8</sup> In addition, there are now more nuclear weapons possessors than there were during the Cold War, some in regions of high tension and conflict. As the risks of large-scale regional and global conflict change, the probability that nuclear weapons will be used in war is also changing. Traditional ideas associated with Cold War nuclear stability – whether credible or not – therefore cannot be simply imported into this new era.

Although most experts and governments working to reduce and eliminate nuclear weapons are cognizant of the changing risks, other expert communities are unaware of the dangers that nuclear weapons still pose. Experts and officials who work, for example, on development and environmental issues are for the most part unengaged with nuclear disarmament and non-proliferation efforts, perhaps believing the connections are tenuous or that nuclear weapons issues are being successfully addressed and no longer require attention.

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<sup>7</sup> Borrie, J. and Caughley, T. (2014), *An Illusion of Safety: Challenges of Nuclear Weapon Detonations for United Nations Humanitarian Coordination and Response*, UN Institute for Disarmament Research, <http://www.unidir.org/illusionofsafety>.

<sup>8</sup> Schlosser, E. (2014), *Command and Control: Nuclear Weapons, the Damascus Accident, and the Illusion of Safety*, London: Penguin Books; Lewis, P., Aghlani, S., Pelopidas, B. and Williams, H. (2014), *Too Close for Comfort: Cases of Near Nuclear Use and Options for Policy*, Chatham House Report, London: Royal Institute of International Affairs, <https://www.chathamhouse.org/publications/papers/view/199200>.

## 3. Interconnected Issues

### Interconnected Issue 1: Nuclear weapons and climate change

Climate change has potentially overwhelming consequences for the future of the planet and the life it sustains. Likewise, nuclear weapons have the potential to wreck the climate and trigger global famine.

Climate change is one of the most significant global strategic threats to humanity. It will increase global stresses such as severe weather events, food production security, fresh water scarcity and migration. The most recent synthesis report from the Intergovernmental Panel on Climate Change (IPCC)<sup>9</sup> outlines the effects of climate change on water availability, food production and economic development, which are likely to increase the instability of populations, displacement and migration, and to amplify drivers of violent conflict. It predicts that violent conflict would increase the range of vulnerabilities to climate change. Other research demonstrates that violent conflict increases the impacts of climate stress on vulnerable populations<sup>10</sup> and that climate change itself could cause instabilities and undermine already fragile governments,<sup>11</sup> thus escalating conflict; in some circumstances this could lead to a nuclear conflict.

Enormous efforts have been made by governments, industries, experts and activists to address and reduce the likely escalation of climate change. The 2015 Paris Agreement,<sup>12</sup> in which 196 states adopted a universal, legally binding global treaty aimed at limiting average global warming to less than 2°C above pre-industrial levels, demonstrates how major global threats can stimulate urgent and concerted action, even during difficult political times. If nuclear weapons were to be used again in a conflict, then all of the work and achievements of the climate change negotiators would be rendered useless; the climate would change for other reasons and in a completely different manner.

In a ground-breaking study, a climate science group<sup>13</sup> examined the global impacts of a regional nuclear war. The study employed atmospheric chemistry, ocean dynamics and interactive sea ice and land components in the system modelling. The team created a scenario of a limited, regional nuclear war in Asia in which 100 Hiroshima-size (15 kt) nuclear weapons were detonated. The calculations showed that this scenario could produce approximately 5 teragrammes (or 5 million tonnes) of black carbon. The carbon would spread globally through the stratosphere, producing a sudden drop in surface temperatures and intense heating of the stratosphere.

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<sup>9</sup> Intergovernmental Panel on Climate Change (2014), *Climate Change 2014 Synthesis Report*, Geneva: IPCC, [https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5\\_SYR\\_FINAL\\_SPM.pdf](https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf).

<sup>10</sup> Kloos, J., Gebert, N., Rosenfeld, T., and Renaud, F. (2013), *Climate change, water conflicts and human security: regional assessment and policy guidelines for the Mediterranean, Middle East And Sahel*, UNU-EHS Institute for Environment and Human Security, <http://collections.unu.edu/view/UNU:1848#viewAttachments>.

<sup>11</sup> CNA Military Advisory Board (2014), *National Security and the Accelerating Risks of Climate Change*, [https://www.cna.org/cna\\_files/pdf/MAB\\_5-8-14.pdf](https://www.cna.org/cna_files/pdf/MAB_5-8-14.pdf).

<sup>12</sup> The Paris Agreement, [https://treaties.un.org/doc/Treaties/2016/02/20160215%2006-03%20PM/Ch\\_XXVII-7-d.pdf](https://treaties.un.org/doc/Treaties/2016/02/20160215%2006-03%20PM/Ch_XXVII-7-d.pdf); see also the 22 April 2016 UN signing ceremony: <http://www.un.org/apps/news/story.asp?NewsID=53756#.Vxs4QWOhjzL>.

<sup>13</sup> Mills, M., Toon, O., Lee-Taylor, J. and Robock, A. (2014), Multidecadal global cooling and unprecedented ozone loss following a regional nuclear conflict, <http://climate.envsci.rutgers.edu/pdf/MillsNWft224.pdf>.

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The climatic and environmental effects would include unprecedented ozone losses of 20–50 per cent over populated areas, and increases in UV indices of 30–80 per cent over mid-latitudes in the summer months that would damage human and animal health, agriculture, and terrestrial and aquatic ecosystems. In addition, severe frosts would reduce growing seasons by an estimated 10–40 days per year over five years. Over a 25-year period, surface temperatures would decline, with continuing reductions in food production resulting in global famine and subsequent massive loss of life. More recent work has uncovered a wider range of catastrophic effects such as the long-term impacts on agricultural production in China<sup>14</sup> and the United States.<sup>15</sup>

The new evidence on the long-term climate effects of nuclear weapons has led to calls to address the applicability of environmental law to the development, possession and use of nuclear weapons.<sup>16</sup> In a recent comprehensive study on nuclear weapons under international law, experts propose three legal perspectives for the protection of the environment from nuclear weapons: i) apply environmental norms within international humanitarian law (IHL); ii) examine the application of multilateral environmental treaties within a conflict and iii) consider nuclear weapons as complex regulatory objects that pollute the environment on production, deployment and detonation.<sup>17</sup> Connecting the expert and diplomatic communities that work on nuclear weapons and climate change could yield new perspectives and understanding, with the potential for generating practical ideas on ways to move forward.

## Interconnected Issue 2: Nuclear weapons and development

One of the most important international developments in recent years has been the success of the 2000–15 Millennium Development Goals (MDGs<sup>18</sup>) and the subsequent establishment of the Sustainable Development Goals. The 2015 agreement to move forward with the ambitious 2030 Agenda for Sustainable Development, and the 17 SDGs and 169 targets<sup>19</sup> – and all of the progress since<sup>20</sup> – are a testament to the determination of the UN, its member states and the NGOs that collectively implement the development goals.

The 2015 SDGs make a specific connection between peace and development and include: 1) ending poverty in all its forms everywhere; 2) ending hunger, achieving food security and improved nutrition, and promoting sustainable agriculture; 3) ensuring healthy lives and promoting wellbeing for all at all ages; 4) ensuring inclusive and equitable quality education and promoting

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<sup>14</sup> Xia, L., Robock, A., Mills, M., Stenke, A. and Helfand, I. (2015), 'Decadal reduction of Chinese agriculture after a regional nuclear war', *Earth's Future*, pp. 337–48, <http://climate.envsci.rutgers.edu/pdf/XiaChinaAgro.pdf>.

<sup>15</sup> Özdoğan, M., Robock, A. and Kucharik, C. (2013) 'Impacts of a nuclear war in South Asia on soybean and maize production in the Midwest United States', *Climatic Change*, 116, pp. 373–387, <http://climate.envsci.rutgers.edu/pdf/OzdoganNuclearWinterMidwestPrint.pdf>.

<sup>16</sup> Robock, A. and Toon O.B. (2016), 'Let's End the Peril of a Nuclear Winter', *New York Times*, 11 February 2016, [https://www.nytimes.com/2016/02/11/opinion/lets-end-the-peril-of-a-nuclear-winter.html?utm\\_source=huffingtonpost.com&utm\\_medium=referral&utm\\_campaign=pubexchange\\_article&\\_r=0](https://www.nytimes.com/2016/02/11/opinion/lets-end-the-peril-of-a-nuclear-winter.html?utm_source=huffingtonpost.com&utm_medium=referral&utm_campaign=pubexchange_article&_r=0).

<sup>17</sup> Kunz, M. and Vinales, J., (2014), 'Environmental Approaches to Nuclear Weapons', in Nystuen, G., Casey-Maslen, S. and Golden Bersagel, A. (eds.) (2014), *Nuclear Weapons under International Law*, Cambridge: Cambridge University Press, pp. 269–291.

<sup>18</sup> The measured achievements of the 15 years of action since the establishment of the MDGs were substantial, including: reducing the number of people living in extreme poverty and under-five mortality rate by over 50 per cent; diminishing the proportion of undernourished people in developing areas and maternal mortality worldwide by nearly 50 per cent.

<sup>19</sup> Transforming our world: the 2030 Agenda for Sustainable Development,

<https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>.

<sup>20</sup> UN Department of Economic and Social Affairs (2016), *The Sustainable Development Goals Report 2016*, New York: United Nations, <https://unstats.un.org/sdgs/report/2016/>.

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lifelong learning opportunities for all; 5) achieving gender equality and empowering all women and girls; 6) ensuring availability and sustainable management of water and sanitation for all; 7) ensuring access to affordable, reliable, sustainable and modern energy for all; 8) promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all; 9) building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation; 10) reducing inequality within and among countries; 11) making cities and human settlements inclusive, safe, resilient and sustainable; 12) ensuring sustainable consumption and production patterns; 13) taking urgent action to combat climate change and its impacts; 14) conserving and sustainably using the oceans, seas and marine resources for sustainable development; 15) protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, and halting and reversing land degradation and halting biodiversity loss; 16) promoting peaceful and inclusive societies for sustainable development, providing access to justice for all and building effective, accountable and inclusive institutions at all levels; 17) strengthening the means of implementation and revitalizing the Global Partnership for Sustainable Development.<sup>21</sup>

In Article 26 of the UN Charter, member states undertake to promote ‘the establishment and maintenance of international peace and security with the least diversion for armament of the world’s human and economic resources’. In 1987, an international conference was held on the relationship between disarmament and development. It focused particularly on the scale and impact of military expenditure on the world economy and on development, and on steps to set free the resources that were – and remain – needed for development through disarmament.

Over many years, hard evidence from studies on human development has led to the understanding that development flows from security and stability, provided for by good governance.<sup>22</sup> In the 1990s, the resurgence of several frozen conflicts<sup>23</sup> demonstrated that investment in development – and the progress made as a result – would all be in vain. If there were no resources invested in conflict prevention and disarmament. All the hard-won progress, efforts and resources dedicated to education, human rights and poverty eradication are all undermined once weapons begin to flow back into a country with unresolved conflicts. Indeed, it could be even worse than sliding back to zero; the exhaustion and despondency that result from the return to the cycle of violence could potentially set efforts back by generations.

The links between disarmament, conflict prevention and development may be complex but they are clear. Much has been built on the understanding of the strong connections between disarmament and development.<sup>24</sup> Although the connections between nuclear disarmament and development have

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<sup>21</sup> Ibid.

<sup>22</sup> See also the 1987 International Conference on Disarmament and Development and UN General Assembly resolution 57/65, 22 November 2002, <http://www.unidir.org/files/medias/pdfs/general-assembly-resolution-eng-o-118.pdf>.

<sup>23</sup> Ciobanu, C. (2008), *Frozen and Forgotten Conflicts in the Post-soviet States: Genesis, Political Economy, and Prospects for Solution*, Virginia State University: US Institute for Peace.

<sup>24</sup> The 1997 Mine Ban Treaty states that anti-personnel mines ‘obstruct economic development and reconstruction, inhibit the repatriation of refugees and internally displaced persons, and have other severe consequences for years after emplacement’. The 2001 UN Programme of Action on the Illicit Trade in Small Arms and Light Weapons refers to the serious threat that SALWs pose to ‘peace, reconciliation, safety, security, stability and sustainable development’ and the 2008 Convention on Cluster Munitions states that ‘cluster munition remnants kill or maim civilians, including women and children, obstruct economic and social development, including through the loss of livelihood’. Ever further, the Arms Trade Treaty acknowledges ‘that peace and security, development and human rights are pillars of the United Nations system and foundations for collective security’ and recognizes that ‘development, peace and security and human rights are interlinked and mutually reinforcing’. All these treaties are put into practice through a concrete set of measures to sustain development, such as demining and

not been as fully accepted as those for conventional or chemical and biological weapons, the detonation of nuclear weapons in regional or global conflicts would have the potential for devastation far beyond the impact of any conventional war.<sup>25</sup> With the exception of a possible improvised nuclear device in a terrorist attack, the detonation of one or more nuclear weapons would most likely be in the context of an inter-state conflict that would initially be fought with conventional weaponry. The continuum from conventional to nuclear weapons can be understood through the perspective of their humanitarian impact.<sup>26</sup> Indeed, the link between conventional weapons control and nuclear disarmament has been stressed repeatedly by the possessors of nuclear weapons.<sup>27</sup> This link is also significant for developing countries, not least with regard to their knowledge and expertise, and their participation in nuclear disarmament forums.<sup>28</sup>

Military expenditure and the related diversion of funds away from development create a paradox, especially given the high priority that has to be accorded to development after a conflict.<sup>29</sup> Large numbers of reserved armed forces and expanded medical corps would be needed in the event of a single nuclear detonation targeting troops. Moreover, the costs of such weapons are not limited to their production and storage but are also in the delivery and targeting systems, and in maintenance of their command-and-control systems.<sup>30</sup> In a seminal study, Susan Willett<sup>31</sup> examined the basis for the costs of armaments relative to the costs of disarmament, investigating whether expenditure on nuclear disarmament increases security more cost-effectively than the equivalent expenditure on military force. The study concluded that nuclear arms competitions exact high socio-economic costs including high environmental costs. In diverting resources away from poverty alleviation, nuclear weapons possessors could be inadvertently increasing the levels of internal insecurity and conflict.

The impact of the detonation of nuclear weapons is not simply an issue for the states that possess them. Even countries without nuclear weapons and located far from regions that may be potential nuclear battlefields will suffer the consequences of nuclear detonations such as radioactive debris and climate disruption. Throughout the era of atmospheric nuclear weapons tests, atmospheric mixing from the northern to the southern hemisphere spread radioactive isotopes that affected water sources and food crops and the health of humans and animals. Countries that host large-scale sporting or cultural events such as the football World Cup or the Olympics have to consider the full range of possibilities for terrorist attacks. In preparing for the 2010 World Cup, South Africa's first-responders developed response plans for a wide range of terrorist attacks, including WMD

mine clearance activities, clearance of cluster munitions from areas, protection of civilians by marking and putting signs on areas with cluster munitions.

<sup>25</sup> Sara Sekkenes, Challenges in addressing the long-term effects of nuclear explosions, Conflict Prevention and Recovery Adviser UNDP, presentation to the Second Conference on the Humanitarian Impact of Nuclear Weapons, Nayarit, Mexico 2014.

<sup>26</sup> The connections between conventional and nuclear weapons impacts are well expressed in *Weapons: ICRC statement to the United Nations*, 15 October 2015, <https://www.icrc.org/en/document/weapons-icrc-statement-United-nations-2015>.

<sup>27</sup> For example, recent statements on nuclear disarmament in the context of general and complete disarmament such as: Statements by Jean-Hugues Simon-Michel, France, 2015 NPT Review Conference, 1 May 2015,

[http://www.reachingcriticalwill.org/images/documents/Disarmament-fora/npt/revcon2015/statements/1May\\_France.pdf](http://www.reachingcriticalwill.org/images/documents/Disarmament-fora/npt/revcon2015/statements/1May_France.pdf); and by Ambassador Mikhail I. Uliyanov, Russian Federation, 2015 NPT Review Conference 1 May 2015,

[http://www.reachingcriticalwill.org/images/documents/Disarmament-fora/npt/revcon2015/statements/1May\\_Russia.pdf](http://www.reachingcriticalwill.org/images/documents/Disarmament-fora/npt/revcon2015/statements/1May_Russia.pdf).

<sup>28</sup> Article 36 (2016), 'Disarmament, development and patterns of marginalisation in international forums', <http://www.article36.org/wp-content/uploads/2016/04/A36-Disarm-Dev-Marginalisation.pdf>.

<sup>29</sup> Reaching Critical Will, 'Disarmament and Development: Fact Sheet', <http://www.reachingcriticalwill.org/resources/fact-sheets/critical-issues/4646-disarmament-and-development>.

<sup>30</sup> Schwartz, S. (ed) (1998), *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons Since 1940*, Brookings Institution Press.

<sup>31</sup> Willett, S. (2004), *The Costs of Disarmament*, UNIDR, [www.unidir.org/programmes/security-and-society/the-costs-of-disarmament](http://www.unidir.org/programmes/security-and-society/the-costs-of-disarmament).

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scenarios.<sup>32</sup> No country can consider itself exempt from the potential consequences of nuclear weapons detonations and the impact on human development.

### **Interconnected Issue 3: Nuclear weapons and international law**

Nuclear disarmament has been at the heart of international law since the very first UN General Assembly resolution called for the elimination of atomic weapons.<sup>33</sup> The risks of nuclear weapons run contrary to the framework of human rights<sup>34</sup> and the right to freedom from fear outlined in the United Nations Millennium Declaration.<sup>35</sup> In 1984, the UN Human Rights Committee addressed the issue of nuclear weapons, stating that the designing, testing, manufacture, possession and deployment of nuclear weapons are among the greatest threats to the right to life that confront mankind today. This threat is compounded by the danger that the actual use of such weapons may be brought about, not only in the event of war, but even through human or mechanical error or failure. Furthermore, the very existence and gravity of this threat generates a climate of suspicion and fear between states, which is in itself antagonistic to the promotion of universal respect for and observance of human rights and fundamental freedoms in accordance with the Charter of the United Nations and the International Covenants on Human Rights. As such, in order to tackle the current critical humanitarian challenges, the production, testing, possession, deployment and use of nuclear weapons should all be prohibited and recognized as crimes against humanity.<sup>36</sup>

In reaffirming that promoting respect for human rights is a core purpose of the UN, and recognizing the ‘systemic failure’ in meeting UN responsibilities, the Human Rights up Front initiative<sup>37</sup> was established to ensure that the UN system takes early and effective action to prevent or respond to large-scale violations of human rights or IHL. The initiative promotes system-wide analysis, early warning and action in response to situations of concern and to address complex risks, protect human rights and prevent conflict. In particular, it is aimed at ‘the urgent need to react early and to take effective action before situations get out of control, leading to immense human suffering’.<sup>38</sup> Human Rights up Front addresses six main areas of action that ‘place the protection of human rights and of people at the heart of UN strategies and operational activities’. These include: 1) fully integrating human rights throughout the work of the UN; 2) providing member states with candid information with respect to peoples at risk of, or subject to, serious violations of human rights or humanitarian law; 3) ensuring coherent strategies and responses; 4) clarifying and streamlining procedures, enhancing communication and facilitating early, coordinated action; 5) strengthening the UN’s human rights capacity; and 6) developing a common UN information management system on serious violations of human rights and humanitarian law.

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<sup>32</sup> 2010 FIFA World Cup Response Capabilities, Col Mark Pillay at Third Conference on the Humanitarian Impact of Nuclear Weapons, 2014, [www.bmeia.gv.at/fileadmin/user\\_upload/Zentrale/Aussenpolitik/Abruestung/HINW14/Presentations/HINW14\\_S3\\_Presentation\\_Mark\\_Pillay.pdf](http://www.bmeia.gv.at/fileadmin/user_upload/Zentrale/Aussenpolitik/Abruestung/HINW14/Presentations/HINW14_S3_Presentation_Mark_Pillay.pdf).

<sup>33</sup> Establishment of a Commission to Deal with the Problems Raised by the Discovery of Atomic Energy, A/RES/1(I) 24 January 1946, [http://www.un.org/en/ga/search/view\\_doc.asp?symbol=A/RES/1\(I\)&referer=http://www.un.org/depts/dhl/resguide/r1\\_resolutions\\_table\\_eng.htm&Lang=E](http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/1(I)&referer=http://www.un.org/depts/dhl/resguide/r1_resolutions_table_eng.htm&Lang=E).

<sup>34</sup> See UN Universal Declaration of Human Rights, <http://www.un.org/en/universal-declaration-human-rights/>; see UN International Covenant on Civil and Political Rights, <http://www.ohchr.org/en/professionalinterest/pages/ccpr.aspx>.

<sup>35</sup> UN Millennium Declaration, [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/55/2](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/55/2).

<sup>36</sup> Nuclear Weapons and the Right to Life, ICCPR General Comment No. 14: Article 6 (Right to Life) Adopted at the Twenty-third Session of the Human Rights Committee, on 9 November 1984, <http://www.refworld.org/docid/453883f911.html>.

<sup>37</sup> Secretary-General statement, <http://www.un.org/sg/humanrightsupfront/>.

<sup>38</sup> UN Deputy Secretary-General Jan Eliasson, 26 January 2016, <http://www.un.org/apps/news/story.asp?NewsID=53115#.VxjtPmOhzJ>.

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The UN was established to ‘save succeeding generations from the scourge of war’. Children are particularly vulnerable to radiation damage. Research at the US National Cancer Institute has found that they were at a higher risk of physical damage due to exposure to radiation than adults during the period of fallout from atmospheric nuclear weapons testing. Children may be subject to higher doses than adults because of higher intake and accumulation, for example, through exposure to iodine-131 in irradiated fresh milk.<sup>39</sup> In addition, radiation damage susceptibility is highest in early childhood (and even more *in utero*), most likely primarily because of the fast rate of cell division in developing tissues. The length of exposure over a lifetime also results in increased chances of repeated exposure and accumulated damage, which will lead to a higher cancer risk for children.<sup>40</sup> Nuclear weapons use inevitably places children directly in danger, and affects their lives well after a detonation. Such a situation jeopardizes the rights of the child and all the work carried out on establishing those rights.<sup>41</sup> Through the Convention on the Rights of the Child,<sup>42</sup> states parties undertake to respect and to ensure respect for rules of IHL applicable to them in armed conflicts that are relevant to the child, and to take all feasible measures to ensure protection and care of children who are affected by an armed conflict.<sup>43</sup>

In 1996, the fourteen judges of the International Court of Justice (ICJ), in their Advisory Opinion about the Legality of the Threat or Use of Nuclear Weapons, concluded unanimously that the principles and rules of IHL apply to the use of nuclear weapons. They added that the use of nuclear weapons would generally be contrary to the principles and rules of IHL.<sup>44</sup> In response, the International Committee of the Red Cross (ICRC) made a statement to the 51st session of the United Nations General Assembly welcoming the ICJ’s emphasis that humanitarian law applies to all weapons without exception.<sup>45</sup> The ICRC drew particular attention to the destructive power of nuclear weapons, which ‘cannot be contained in either space or time ... the radiation released by a nuclear explosion would affect health, agriculture, natural resources and demography over a very wide area. Further, the use of nuclear weapons would be a serious danger to future generations ... In the light of this, the ICRC finds it difficult to envisage how a use of nuclear weapons could be compatible with the rules of international humanitarian law’.<sup>46</sup>

Humanitarian disasters have frequently served as the impetus for the prohibition of weapons and related activities. The 1925 Geneva Protocol and the subsequent banning of chemical and biological weapons under the Chemical Weapons and Biological Weapons Conventions respectively were a direct consequence of the devastating humanitarian impact of the use of poison gas in the First

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<sup>39</sup> Comprehensive Nuclear-Test-Ban Treaty Organization, The United States’ Nuclear Testing Programme, <https://www.ctbto.org/nuclear-testing/the-effects-of-nuclear-testing/the-united-states-nuclear-testing-programme/>.

<sup>40</sup> Children and Radiation, Children’s Health and the Environment, World Health Organization, WHO Training Package for the Health Sector, <http://www.who.int/ceh/capacity/radiation.pdf>.

<sup>41</sup> UNICEF, Fact Sheet, A Summary of the Rights under the Convention of the Rights of the Child.

<sup>42</sup> Article 38 (1), Convention on the Rights of the Child, <http://www.ohchr.org/Documents/ProfessionalInterest/crc.pdf>.

<sup>43</sup> The Convention on the Rights of the Child makes a special reference to the Declaration on the Protection of Women and Children in Emergency and Armed Conflict, which in turn prohibits and condemns attacks and bombings on the civilian population, inflicting incalculable suffering, especially on women and children. Declaration on the Protection of Women and Children in Emergency and Armed Conflict, <http://www2.ohchr.org/english/law/pdf/protectionwomen.pdf>.

<sup>44</sup> International Court of Justice, Legality of the Threat or Use of Nuclear Weapons Advisory Opinion of 8 July 1996, 1.C.J. Reports 1996, p. 226, <http://www.icj-cij.org/docket/index.php?p1=3&p2=4&k=e1&case=95&code=unan&p3=4>.

<sup>45</sup> ICRC statement to the 51st United Nations General Assembly on the Advisory Opinion of the International Court of Justice on the legality of the threat or use of nuclear weapons, 1996, <https://www.icrc.org/eng/resources/documents/article/other/57jncx.htm>.

<sup>46</sup> *Ibid.*

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World War.<sup>47</sup> The 1963 Partial Test Ban Treaty and the subsequent 1996 Comprehensive Nuclear-Test-Ban Treaty (CTBT) were the result of the global demand to end the devastating humanitarian impacts of nuclear weapons tests on people's health, to prevent social, environmental and human rights effects, and to end the nuclear arms race with its potential humanitarian consequences. Under IHL,

combatants are prohibited to use weapons that are inherently indiscriminate or that are of a nature to inflict suffering greater than that required to take combatants 'out of action'. Weapons that violate the 'dictates of the public conscience' may be prohibited on that basis alone. The use of weapons that cause widespread, long-term and severe damage to the natural environment is likewise prohibited.<sup>48</sup>

As the president of the ICRC stated in 2015: 'nuclear weapons are often presented as promoting security, particularly during times of international instability, but weapons that risk catastrophic and irreversible humanitarian consequences cannot seriously be viewed as protecting civilians or humanity as a whole'.<sup>49</sup>

At the 2010 NPT Review Conference the 'catastrophic humanitarian consequences that would result from the use of nuclear weapons' was important in developing the conceptual legal framework for nuclear disarmament.<sup>50</sup> The Humanitarian Impact of Nuclear Weapons initiative (a process to stimulate progress towards disarmament initiated by a group of NPT states parties) has held thus far three conferences: in Oslo in March 2013,<sup>51</sup> Nayarit in February 2014<sup>52</sup> and Vienna in December 2014.<sup>53</sup> The conferences have produced a wealth of fact-based materials and legal analyses and a number of political documents including the Humanitarian Pledge<sup>54</sup> by states to follow the imperative of human security for all and to promote the protection of civilians against risks stemming from nuclear weapons; and to cooperate with all relevant stakeholders in efforts to stigmatize, prohibit and eliminate nuclear weapons in the light of their unacceptable humanitarian consequences and associated risks. The pledge calls on all states parties to the NPT to renew their commitment to the urgent and full implementation of existing obligations under Article VI and 'identify and pursue effective measures to fill the legal gap for the prohibition and elimination of nuclear weapons' and 'cooperate with all stakeholders to achieve this goal'; it also calls on all nuclear weapons possessor states to 'take concrete interim measures to reduce the risk of nuclear

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<sup>47</sup> Lewis, P. (2009), *A New Approach to Nuclear Disarmament: Learning from International Humanitarian Law Success*, ICNND Research Report No. 13, <http://icnnd.org/pages/Research.aspx>.

<sup>48</sup> Weapons and International Humanitarian Law, ICRC, [http://www.icrc.org/Web/Eng/siteeng.nsf/htmlall/section\\_ihl\\_weapons?OpenDocument](http://www.icrc.org/Web/Eng/siteeng.nsf/htmlall/section_ihl_weapons?OpenDocument).

<sup>49</sup> Peter Maurer, president of the ICRC, statement on Nuclear weapons: Ending a threat to humanity, 18 February 2015 <https://www.icrc.org/en/document/nuclear-weapons-ending-threat-humanity>.

<sup>50</sup> 2010 NPT Review Conference Final Document, [www.reachingcriticalwill.org/images/documents/Disarmament-fora/npt/revcon2010/FinalDocument.pdf](http://www.reachingcriticalwill.org/images/documents/Disarmament-fora/npt/revcon2010/FinalDocument.pdf).

<sup>51</sup> The Oslo Conference on the Humanitarian Impact of Nuclear Weapons, 4–5 March 2013, [https://www.regjeringen.no/en/topics/foreign-affairs/humanitarian-efforts/humimpact\\_2013/id708603/](https://www.regjeringen.no/en/topics/foreign-affairs/humanitarian-efforts/humimpact_2013/id708603/).

<sup>52</sup> The Nayarit Conference on the Humanitarian Impact of Nuclear Weapons, 13–14 February 2014, <http://www.reachingcriticalwill.org/images/documents/Disarmament-fora/nayarit-2014/chairs-summary.pdf>.

<sup>53</sup> The Vienna Conference on the Humanitarian Impact of Nuclear Weapons, 8–9 December 2014, <https://www.bmeia.gv.at/en/european-foreign-policy/disarmament/weapons-of-mass-destruction/nuclear-weapons-and-nuclear-terrorism/vienna-conference-on-the-humanitarian-impact-of-nuclear-weapons/>.

<sup>54</sup> The Humanitarian Pledge, [http://www.icanw.org/wp-content/uploads/2015/03/HINW14vienna\\_Pledge\\_Document.pdf](http://www.icanw.org/wp-content/uploads/2015/03/HINW14vienna_Pledge_Document.pdf).

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weapon detonations'. The Humanitarian Pledge was adopted as UN General Assembly Resolution 70/48 in 2015 with a vote of 139 in favour, 29 against and 17 abstentions.<sup>55</sup>

The Humanitarian Pledge's call for states to 'identify and pursue effective measures to fill the legal gap for the prohibition and elimination of nuclear weapons' refers primarily to the fact that although treaties to prohibit and eliminate chemical and biological weapons are in force, no such global regime has yet been negotiated for nuclear weapons. There is dispute as to whether the use of nuclear weapons is already prohibited under international law.<sup>56</sup> Although the ICJ was unanimous in the applicability of IHL to nuclear weapons, the court did not exclude the legality of the use of a nuclear weapon in 'extreme circumstances of self-defence'. It advised that the possession of nuclear weapons would constitute an unlawful threat only if the particular use of force envisaged would be directed against the territorial integrity or political independence of a state, or would be inconsistent with the purposes of the United Nations, or would violate the principles of necessity and proportionality.<sup>57</sup> Given the 20-year legal and political dispute, and the unacceptable humanitarian consequences of the use of nuclear weapons, the gap in treaty law to control and eliminate nuclear weapons needs to be addressed. In a recent comprehensive legal analysis, an international group of legal experts concluded 'that a multiplicity of international legal regimes governs different aspects of nuclear weapons, and that use of nuclear weapons in most instances would be outlawed. But a clear-cut and comprehensive prohibition of nuclear weapons is still missing.'<sup>58</sup> In October 2016, the 71st session of the UN General Assembly adopted a resolution to convene a UN conference to negotiate a legally binding instrument to prohibit nuclear weapons, leading towards their total elimination.<sup>59</sup> Further to this, an organizational meeting was held on 16 February 2017, and negotiations began in New York on 27–31 March;<sup>60</sup> further negotiations were scheduled to take place from 15 June–7 July.

### Interconnected Issue 4: Nuclear weapons and gender

Not only are women vital to disarmament negotiations – in representing half the world's population – but they also present distinct concerns for nuclear disarmament. Recent studies on the gendered impact of nuclear weapons highlight that girls exposed to harmful radiation are twice as likely as boys to get cancer at some point in their lives, and that lifetime cancer fatalities among exposed adults are disproportionately more harmful to women than to men, in the ratio of 3:2.<sup>61</sup> This disproportionate impact on girls and women has knock-on effects on subsequent generations. As

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<sup>55</sup> Humanitarian pledge for the prohibition and elimination of nuclear weapons UNGA Res 70/48, 2015, <http://www.icanw.org/wp-content/uploads/2015/03/Pledge-Vote-2015.pdf>.

<sup>56</sup> Nystuen, G. and Egeland, K. (2016), 'A 'Legal Gap'? Nuclear Weapons Under International Law', *Arms Control Today*, 6(2): [http://www.armscontrol.org/ACT/2016\\_03/Features/A-Legal-Gap-Nuclear-Weapons-Under-International-Law#note6](http://www.armscontrol.org/ACT/2016_03/Features/A-Legal-Gap-Nuclear-Weapons-Under-International-Law#note6).

<sup>57</sup> Bekker, P. H. F. (1996), 'Advisory Opinions of the World Court on the Legality of Nuclear Weapons', *Insights*, The American Society of International Law, 1(5): <https://www.asil.org/insights/volume/1/issue/5/advisory-opinions-world-court-legality-nuclear-weapons>.

<sup>58</sup> Nystuen, G., Casey-Maslen, S. and Golden Bersagel, A. (eds.) (2014), *Nuclear Weapons under International Law*, Cambridge: Cambridge University Press.

<sup>59</sup> UN General Assembly (2016), 'Taking forward multilateral nuclear disarmament negotiations' to begin negotiations', A/C.1/71/L.41, 14 October 2016, [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/C.1/71/L.41](http://www.un.org/ga/search/view_doc.asp?symbol=A/C.1/71/L.41).

<sup>60</sup> UN (2017), 'United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading Towards their Total Elimination', <https://www.un.org/disarmament/ptnw/pressreleases.html>.

<sup>61</sup> K. Ozasa et al (2012), 'Studies of the Mortality of Atomic Bomb Survivors, Report 14, 1950–2003: An Overview of Cancer and Non-cancer Diseases', *Radiation Research*, 177(3), p. 232.

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stated in a recent study, ‘Women and girls are not a sub-population. Women and girls are an inextricable link in the human lifecycle.’<sup>62</sup>

The 2015 SDGs include achieving gender equality and empowering all women and girls. Since 2000, and the adoption of Resolution 1325, the UN Security Council has adopted seven resolutions on Women Peace and Security.<sup>63</sup> Resolution 1325 specifically addresses the role and importance of women in peace processes and ‘makes the pursuit of gender equality relevant to every single Security Council action, ranging from elections to disarmament efforts’. The resolution calls for women’s equal participation and full involvement in all efforts for the maintenance and promotion of peace and security, and for the incorporation of gender perspective in all areas of peace-building. Resolution 1820 addresses the impact of sexual violence in conflict and acknowledges sexual violence as a weapon of war and a war crime. It mandates UN peacekeeping missions to protect women and children from sexual violence during armed conflict, with the Office of the Special Representative of the Secretary-General on Sexual Violence in Conflict.

The 2013 UN Resolution on women, disarmament, non-proliferation and arms Control adopted by the General Assembly called for all member states to include women in national and international discussions and to ensure equal representation in decision-making processes.<sup>64</sup> Women are biologically more vulnerable than men to the harmful effects of radiation,<sup>65</sup> and therefore they have distinct issues to raise in negotiations – issues that may not otherwise be placed on the negotiating table. As scientists now acknowledge, ‘gender and age have not been factored into official evaluations of radiation impacts to date’, and so ‘harm to human populations has been systematically under-estimated and under reported’.<sup>66</sup>

### **Interconnected Issue 5: Nuclear weapons and protection of cultural heritage**

Over several decades fears about the wilful, deliberate destruction of cultural heritage in times of conflict have been growing. Recent events in countries such as Afghanistan (the destruction of the Buddhas of Bamiyan), Mali and Syria (most notably Palmyra) have highlighted the irrevocable damage that is done to cultural property at times of conflict. Cultural heritage – including property, but also ‘intangible heritage’ such as customs, practices and places – are also lost to conflict through forced migration, environmental damage and post-conflict reconstruction.

So enormous is the impact of nuclear weapons explosions that they are themselves viewed as a unique marker of destruction, ‘tangible testimony of the birth of the Cold War and ... testimony to the race to develop increasingly powerful nuclear weapons’.<sup>67</sup> In Bikini Atoll, testing altered the environment to such a degree that it is now itself considered a UNESCO World Heritage Site: ‘It ...

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<sup>62</sup> Olson, M. (2015), ‘Gender Matters in the Atomic Age’ presentation, United Nations, [www.nirs.org/radiation/radhealth/untalk2015.pdf](http://www.nirs.org/radiation/radhealth/untalk2015.pdf).

<sup>63</sup> United Nations Peacekeeping, <http://www.un.org/en/peacekeeping/issues/women/wps.shtml>.

<sup>64</sup> United Nations General Assembly, Resolution adopted by the General Assembly in December 2013: Women, Disarmament, Non-Proliferation and Arms Control, A/RES/68/33, 9 December 2013.

<sup>65</sup> Dimmen, A. G. (2014), *Gendered Impacts: The humanitarian impacts of nuclear weapons from a gender perspective*, ILPI-UNIDIR Vienna Conference Series, Paper No:5.

<sup>66</sup> Olson, M. (2016), ‘Human consequences of radiation: A gender factor in atomic harm’, in Sullivan, K. (ed.) (2016), *Civil Society and Disarmament 2016: Civil Society Engagement in Disarmament Processes: The Case for a Nuclear Weapons Ban*, New York: United Nations, <https://www.un.org/disarmament/publications/civilsociety/volume-2016/>.

<sup>67</sup> UNESCO World Heritage, <http://whc.unesco.org/en/list/1339>.

bears witness to the consequences of the nuclear tests on the civil populations of Bikini and the Marshall Islands, in terms of population displacement and public-health issues.<sup>68</sup> Nuclear weapons testing can itself have devastating consequences for cultural heritage, including that which is under the sea. Decades of underwater testing – now outlawed by the CTBT, but still to come into force – have put ruins, shipwrecks and submerged caves at risk.

The 1954 Convention for the Protection of Cultural Property in the Event of Armed Conflict<sup>69</sup> was adopted in response to the massive destruction and theft of cultural heritage during the Second World War. The Convention protects ‘immovable and movable cultural heritage, including architectural monuments, archaeological sites, works of art, manuscripts, books and other objects of artistic, historical or archaeological interest, as well as scientific collections of all kinds regardless of their origin or ownership.’ The convention incorporates ‘peacetime safeguarding measures such as the preparation of inventories, the planning of emergency protection measures for protection, and the designation of competent authorities responsible for the safeguarding of cultural property.’ The Convention requires states parties to refrain from any act of hostility directed against such property; consider marking important buildings and monuments with a distinctive emblem; and establish special units within the military forces to be responsible for the protection of cultural property.<sup>70</sup>

Cultural heritage is the common denominator that holds a people and its sense of identity together. In addition to the large number of human casualties, the detonation of even a single nuclear weapon has the potential to devastate a society, erase shared memories, cultural heritage and history. Some of the world’s most important archaeological sites, unearthed artefacts and UNESCO-listed World Heritage Sites are situated within regions widely considered at high risk of a nuclear conflict – East Asia, South Asia, Russia and the United States. For example, 86 World Heritage Sites in China, India and Pakistan, and 31 in South Korea and Japan, are at significant risk of a nuclear conflict in Asia. In the Middle East, which contains some of the world’s most significant religious heritage for the world’s three largest monotheistic faiths, cultural heritage sites have been targeted with conventional weapons in recent conflicts.<sup>71</sup> A single detonation in a country within these regions could erase centuries or even millennia of human civilization. Given the potential impact on cultural heritage and the loss to human history, consideration of the impact of nuclear weapons on important cultural artefacts and ways of preventing such catastrophic damage should be part of the requirement for cultural heritage protection in every country and the subject of informed public debate.

Nuclear weapons need not be detonated in tests or in conflict for them to pose risks for heritage.<sup>72</sup> States that possess nuclear weapons on their territory, or that permit nuclear weapons to be

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<sup>68</sup> Ibid.

<sup>69</sup> UNESCO, The Convention for the Protection of Cultural Property in the Event of Armed Conflict, <http://www.unesco.org/new/en/culture/themes/armed-conflict-and-heritage/the-hague-convention/text-of-the-convention-and-its-1st-protocol/#c284179>.

<sup>70</sup> UNESCO, The Convention for the Protection of Cultural Property in the Event of Armed Conflict <http://www.unesco.org/new/en/culture/themes/armed-conflict-and-heritage/the-hague-convention/#c167451>.

<sup>71</sup> Isakhan, B. (2013), ‘Bombing mosques and spikes in violence in Iraq: Heritage destruction and ethno-sectarian violence, 2006-7’, Cambridge Heritage Research Group Seminar Series, International Institute for Conservation of Historic and Artistic Work.

<sup>72</sup> Lewis, P., Williams, H., Pelopidas, B. and Aghlani, S. (2014), *Too Close for Comfort: Cases of Near Nuclear Use and Options for Policy*, Chatham House Report, London: Royal Institute of International Affairs,

transferred across their territory, would be especially susceptible to accidents that could put heritage at risk in peacetime. In the UK, for instance, convoys routinely carry nuclear warheads on major motorways, and through or near densely populated cities, with the potential for serious mishaps.<sup>73</sup>

## Interconnected Issue 6: Nuclear weapons and public health

The recent outbreaks of Ebola<sup>74</sup> and Zika<sup>75</sup> diseases highlight the enormous complexities associated with responding to sudden public health crises in a globalized world.

The catastrophic effects of a nuclear explosion would overwhelm public health systems – even those in developed countries.<sup>76</sup> In addition to the large number of immediate casualties from a nuclear blast, government authorities and health services would be expected to address other indirect consequences of the explosion, including acute radiation sickness, malnutrition, disease and emergency prenatal or postnatal care. These public health concerns relate to a number of SDGs, such as food insecurity and water sanitation. Radioactive fallout and long-term radioactive isotope pollution would also cause long-term water and sanitation degradation. In addition to primary health effects, such as immune system damage and non-infectious diseases such as cancer and heart disease, the problems with water, sanitation and hygiene (WASH) systems would lead to secondary outbreaks of infectious diseases in the long term. Even in areas not directly affected and in locations far from the sites of nuclear detonations, public health infrastructure (human, medical and physical) could be severely strained and unable to provide basic healthcare, let alone adequate responses to severe public health emergencies. As part of the climate impacts outlined above, food shortages – due to low temperatures, low sunlight levels and radioactive pollution – would develop over time, leading to price rises. Famine, leading to an increased incidence of malnutrition and related diseases, would be likely to result. The wealthy might be able to buy or barter the scarce food available in the competition for limited resources – exacerbating further the growing social unrest that would be likely to develop among those most severely affected.<sup>77</sup>

The long-term psychosocial impacts that a nuclear detonation would cause for human populations are also crucial to consider in the event of a detonation. Experiences of the Hibakusha from Hiroshima and Nagasaki indicate that those who survive nuclear explosions can suffer immense psychological trauma, and are often stigmatized owing to the fear in society of exposure to radiation.<sup>78</sup> It is also likely that many survivors would misdiagnose themselves as experiencing the

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[https://www.chathamhouse.org/sites/files/chathamhouse/field/field\\_document/20140428TooCloseforComfortNuclearUseLewisWilliamsPelopidasAghlani.pdf](https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20140428TooCloseforComfortNuclearUseLewisWilliamsPelopidasAghlani.pdf).

<sup>73</sup> Rob Evans (2016), 'UK nuclear weapons convoys 'have had 180 mishaps in 16 years'', *Guardian*, 21 September 2016, <https://www.theguardian.com/uk-news/2016/sep/21/uk-nuclear-weapons-convoys-have-had-180-mishaps-in-16-years>

<sup>74</sup> World Health Organization, Ebola virus disease outbreak, <http://www.who.int/csr/disease/ebola/en/>.

<sup>75</sup> World Health Organization, Zika Virus Disease, <http://www.who.int/csr/disease/zika/en/>.

<sup>76</sup> Williams, H., Lewis, P. and Aghlani, S. (2015), *The Humanitarian Impacts of Nuclear Weapons Initiative: The 'Big Tent' in Disarmament*, Research Paper, London: Royal Institute of International Affairs, [https://www.chathamhouse.org/sites/files/chathamhouse/field/field\\_document/20150331nuclear.pdf](https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20150331nuclear.pdf).

<sup>77</sup> Helfand (2013), *Nuclear Famine: Two Billion People at Risk?*

<sup>78</sup> Wilson, N. and Baker, M. (1995), 'Nuclear Weapons Illegality: The Public Health Case', *Medicine and Global Survival*, <http://www.ippnw.org/pdf/mgs/2-2-wilson.pdf>, p. 116.

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symptoms of radiation sickness, putting additional early strain on already stretched public health services.

Public health concerns have been central to disarmament efforts for decades thanks to the sustained work of organizations such as International Physicians for the Prevention of Nuclear War.<sup>79</sup> A renewed interaction between the nuclear disarmament expert community and public health experts would benefit the dialogue and assist diplomatic efforts in ascertaining the full set of health risks posed by nuclear weapons use.

## Interconnected Issue 7: Nuclear weapons and non-state armed groups

The risks of nuclear weapons detonations are not limited to state-to-state conflicts; non-state actors, particularly terrorist groups and lone actors, have shown clear interest in obtaining and threatening the use of WMD. Although making a nuclear device requires very specific knowledge, as well as fissile material, the capacity of non-state armed groups (NSAGs) to do this should not be underestimated.<sup>80</sup> Over the last two decades, international, regional and national efforts have yielded tangible but limited and uneven progress, and responses to new risks are lagging behind.<sup>81</sup>

A number of serious attempts to smuggle nuclear materials have been intercepted in recent years.<sup>82</sup> In 2011, six people were arrested in Moldova for smuggling uranium-235 estimated to be worth £18m from Russia.<sup>83</sup> In addition, it is not beyond the bounds of possibilities that an NSAG could acquire a nuclear warhead through theft, an insider assistant or a state willing to sell.<sup>84</sup> Despite the low likelihood of such an event, the consequences would be severe and so it is deemed a high-risk event. As President Obama warned in Prague in 2009: ‘One terrorist with one nuclear weapon could unleash massive destruction.’<sup>85</sup>

This concern has been at the heart of the annual Nuclear Security Summit (NSS) since 2010.<sup>86</sup> Concerns are increasing about the smuggling of nuclear materials and the possibility of NSAGs acquiring fissile materials and their capability to make improvised nuclear devices. Most countries have taken the threats of NSAG attacks on nuclear facilities seriously and are taking steps to secure their nuclear facilities against any type of attack. However, nuclear power plants and nuclear weapons sites around the world remain vulnerable, particularly to insider threats and cyber threats.

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<sup>79</sup> International Physicians for the Prevention of Nuclear War, <http://www.ippnw.org>.

<sup>80</sup> Sokova, E. and Fitzpatrick, M. (2015), ‘How can we push for tighter security for nuclear weapons?’ World Economic Forum, 2 June 2015, <https://www.weforum.org/agenda/2015/06/how-can-we-make-our-nuclear-weapons-more-secure/>.

<sup>81</sup> Sokova, E. K. (2017), ‘Non-state Actors and Nuclear Weapons’, in Eds. Borrie, J., Caughley, T., and Wan, W. (eds) (2017), *Understanding Nuclear Weapon Risks*, UNIDIR, <http://www.unidir.ch/files/publications/pdfs/understanding-nuclear-weapon-risks-en-676.pdf>.

<sup>82</sup> BBC News (2015), ‘Nuclear smuggling deals “thwarted” in Moldova’, 7 October 2015, <http://www.bbc.com/news/world-europe-34461732>

<sup>83</sup> *Telegraph* (2011), ‘Six People Arrested in Moldova over Bomb-grade Uranium’, 29 June 2011, <http://www.telegraph.co.uk/news/worldnews/europe/moldova/8607235/Six-people-arrested-in-Moldova-over-bomb-grade-uranium.html>.

<sup>84</sup> Unal, B. and Aghlani, S. (2016), *Use of Chemical, Biological, Radiological and Nuclear Weapons by Non-State Actors: Emerging trends and risk factors*, Emerging Risk Report – 2016, Chatham House and Lloyds, [https://www.lloyds.com/~media/files/news%20and%20insight/risk%20insight/2016/cbrn.pdf](https://www.lloyds.com/~/media/files/news%20and%20insight/risk%20insight/2016/cbrn.pdf).

<sup>85</sup> Remarks by President Barack Obama in Prague, 5 April 2009, <https://www.whitehouse.gov/the-press-office/remarks-president-barack-obama-prague-delivered>.

<sup>86</sup> Washington Communiqué (2016), NSS 2016, <http://www.nss2016.org>; Hague Communiqué (2014), [http://nuclearsecuritymatters.belfercenter.org/files/nuclearmatters/files/the\\_hague\\_nuclear\\_security\\_summit\\_communique\\_final.pdf](http://nuclearsecuritymatters.belfercenter.org/files/nuclearmatters/files/the_hague_nuclear_security_summit_communique_final.pdf); Seoul Communiqué (2012), <http://www.state.gov/documents/organization/236996.pdf>; Washington Communiqué (2010), <http://www.state.gov/documents/organization/237037.pdf>.

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From the beginning states participating in the NSS reaffirmed the ‘fundamental responsibility of States, consistent with their respective international obligations, to maintain effective security of all nuclear materials, which includes nuclear materials used in nuclear weapons, and nuclear facilities under their control’.<sup>87</sup> However, for the most part, the participating states have addressed only civil nuclear materials and facilities, which account for an estimated 15 per cent of all nuclear materials, thus leaving the nuclear security risks posed by military nuclear materials – some 85 per cent of the whole<sup>88</sup> – not debated at the NSS.

The most recent and final NSS stated that the threat of nuclear and radiological terrorism ‘remains one of the greatest challenges to international security, and the threat is constantly evolving’.<sup>89</sup> States participating took the opportunity to reaffirm their commitments to nuclear disarmament, nuclear non-proliferation and peaceful use of nuclear energy and to reducing the threat of nuclear terrorism and strengthening nuclear security.

The 2016 NSS presented a range of collaborative joint statements including a statement on the Comprehensive Approach to Nuclear Security<sup>90</sup> and a set of agreed collaborations on a range of issues: high-density fuel development; HEU minimization; LEU fuel bank; security of high activity radioactive sources; global nuclear security architecture; transport security; nuclear detection architecture; countering nuclear smuggling; consolidated reporting; implementation of UNSCR 1540; nuclear terrorism preparedness and response; maritime supply chain security; forensics in nuclear security; cybersecurity; and insider threat mitigation.

In addition, the Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM) came into force on 8 May 2016. The amendment, which was agreed in 2005, makes it a legal requirement that countries protect nuclear facilities and apply that protection to nuclear material in domestic use, storage and transport. The 2005 International Convention on the Suppression of Acts of Nuclear Terrorism, UN Security Council Resolution 1540, the Global Initiative to Combat Nuclear Terrorism and the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction all supplement the efforts of the majority of states that possess nuclear materials to prevent nuclear terrorism. The energy and commitment at the most senior levels of government, industry and civil society that were dedicated to the nuclear security summit process will now be harnessed within the international frameworks – most notably in cooperation with the International Atomic Energy Agency (IAEA). Connecting nuclear security, nuclear disarmament and non-proliferation is the next step and could serve to re-energize nuclear disarmament with the same focus as expressed by President Obama in 2009 when he reiterated the US commitment to seek the peace and security of a world without nuclear weapons and outlined the basis for what became the humanitarian impacts of nuclear weapons initiative: ‘One nuclear weapon exploded in one city – be it New York or Moscow, Islamabad or Mumbai, Tokyo or Tel Aviv, Paris or Prague – could kill hundreds of thousands of people. And no matter where it happens,

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<sup>87</sup> Communiqué of the Washington Nuclear Security Summit, 13 April 2010, <http://www.state.gov/documents/organization/237037.pdf>.

<sup>88</sup> International Panel on Fissile Materials, *Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Stockpiles and Production*, <http://fissilematerials.org/library/gfmr15.pdf>.

<sup>89</sup> Nuclear Security Summit 2016 Communiqué, 1 April 2016,

<https://static1.squarespace.com/static/568be36505f8e2af8023adf7/t/56fef01a2eeb810fd917abb9/1459548186895/Communiqué.pdf>.

<sup>90</sup> Nuclear Security Summit 2016, ‘Joint Statement on In Larger Security: A Comprehensive Approach to Nuclear Security’, 5 April 2016,

<http://www.nss2016.org/document-center-docs/2016/4/1/gift-basket-from-brazil?rq=Comprehensive%20Approach%20to%20Nuclear%20Security>.

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there is no end to what the consequences might be – for our global safety, our security, our society, our economy, to our ultimate survival’.<sup>91</sup>

## **Interconnected Issue 8: Nuclear weapons and humanitarian action**

The humanitarian action community has responded with a strong sense of significance and urgency to the issue of nuclear weapons and nuclear disarmament. Humanitarian emergencies due to natural disasters, terrorism and conflict, have shown how the difficulties in developing preparedness and capacity to respond to complex humanitarian situations, such as overwhelming migration and refugee flows, can prove insurmountable.

Leading the way in terms of understanding the significance of a nuclear weapons attack have been the ICRC and International Federation of Red Cross and Red Crescent Societies (IFRC).<sup>92</sup> Even at the height of the Cold War, when political sensitivity was high, in 1954 the board of governors of the Red Cross called for the prohibition of the use – absolutely and effectively – of all nuclear weapons as well as chemical and biological weapons. The ICRC continued to support nuclear weapons elimination throughout the Cold War and at the turn of the 21st century, following the failure of the CTBT to enter into force and the nuclear tests by India and Pakistan, along with the rise of NSAG terrorism, the ICRC once again took the lead in the humanitarian community.<sup>93</sup>

In 2015, the ICRC called on states that possess nuclear weapons – and their allies – to:

take immediate steps to reduce the role and significance of nuclear weapons in their military plans, their doctrines and their policies. It has become increasingly clear that these devastating humanitarian consequences raise serious doubts as to whether nuclear weapons could ever be used in accordance with the laws of war. This leads us, time and again, to the conclusion that the use of nuclear weapons must be prohibited and the weapons eliminated altogether.<sup>94</sup>

Many other humanitarian organizations have made the connection and have been studying their ability to respond to a nuclear weapon detonation within the humanitarian tradition.<sup>95</sup> The recent overwhelming flows of refugees from conflict or people fleeing from failed states and economic collapse and attempting to settle in Europe gives concerned organizations and governments a sense of how the humanitarian impact of a nuclear weapons attack would swamp all resources and

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<sup>91</sup> Remarks by President Barack Obama in Prague, 5 April 2009, <https://www.whitehouse.gov/the-press-office/remarks-president-barack-obama-prague-delivered>.

<sup>92</sup> Speech by Tadateru Konoé, IFRC President, ‘Towards the realization of a world free of nuclear weapons following the 2015 NPT review conference’, 25th UN Conference on Disarmament Issues, August 2015, <http://www.ifrc.org/en/news-and-media/opinions-and-positions/speeches/2015/25th-un-conference-on-disarmament-issues--towards-the-realization-of-a-world-free-of-nuclear-weapons-following-the-2015-npt-review-conference---ifrc-president-mr-tadateru-konoe/>.

<sup>93</sup> In a note of nuclear irony, the March 2016 updated commentary for Article 17 of the First Geneva Convention states that deaths caused by the parties to the convention should be recorded. This recording should include the identity of the person who died, the date and time of death, the cause of death and the location of death. In the case of a nuclear weapons attack, however, this would have no meaning. The numbers of people dead in one instant and the ability to be able to record would be beyond the capabilities of even the most determined recorder. Every Casualty, <http://www.everycasualty.org/newsandviews/gc-article-17>.

<sup>94</sup> Peter Maurer, President of the ICRC, Nuclear weapons: Ending a threat to humanity, 18 February 2015, <https://www.icrc.org/en/document/nuclear-weapons-ending-threat-humanity>.

<sup>95</sup> Borrie, J. and Caughley, T. (2014), An Illusion of Safety: Challenges of Nuclear Weapon Detonations for United Nations Humanitarian Coordination and Response, <http://www.unidir.org/files/publications/pdfs/an-illusion-of-safety-en-611.pdf>.

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emergency preparedness.<sup>96</sup> Not only is the population displacement likely to be far larger but the immediate physical impact of large-scale burns, radiation sickness, loss of sight, loss of hearing, dehydration, other physical damage and psychological trauma could not be dealt with by any resources at the disposal of international or local humanitarian organizations of the health sector infrastructure. In addition, physical infrastructure, communications, transport, hospitals and blood banks would be destroyed or rendered inoperable and humanitarian workers would be not allowed to enter the worst-hit areas in case they were themselves subjected to radiation damage, thereby adding to the numbers in need rather than remaining a source of assistance.

Despite initial opposition to discussing the humanitarian impact of nuclear weapons at the World Humanitarian Summit,<sup>97</sup> states and civil society organizations succeeded in their efforts to include nuclear disarmament in the programme, providing a model for how these issues should be connected and an opportunity to communicate with a wider set of experts.

### Interconnected Issue 9: Nuclear weapons and cybersecurity

Cyberattacks against nuclear installations, such as the well-publicized Stuxnet worm in 2010, have increased concerns about the cybersecurity vulnerabilities of nuclear facilities in both the civil and military sectors. In addition, cyber criminals, states and terrorist groups have been increasing their cyberattack capabilities. Even if a small-scale cybersecurity incident were to occur at a nuclear facility, particularly at a nuclear weapons facility, it would likely cause serious alarm among the general public both inside the country that possesses nuclear weapons and in neighbouring countries.

In a recent study of the cyber vulnerabilities of the civil nuclear sector,<sup>98</sup> a number of recorded cyber incidents were identified and the report concluded that the cybersecurity risk is growing as nuclear facilities become increasingly reliant on digital systems.<sup>99</sup> The IAEA has taken steps to address cybersecurity. In 2015, it held a major expert conference on ‘Computer Security in a Nuclear World’.<sup>100</sup> At the 2016 NSS, in Washington DC, 29 states plus the UN signed up to a Joint Statement on Cyber Security,<sup>101</sup> which committed the governments to ensuring ‘adequate cyber security at industrial control and plant systems at nuclear facilities’. The states will participate in two international workshops on cybersecurity at nuclear facilities in 2016 that will enable them, and their nuclear sectors, to share good practice in managing risks to industrial control systems at nuclear sites, as well as to examine the impact of using information technology in managing safety and security aspects of plant control systems. The findings from the workshops will be presented at

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<sup>96</sup> For an in-depth study see: Bagshaw, S. (2014), Population Displacement: Displacement in the aftermath of nuclear weapon detonation events, Paper 4, ILPI-UNIDIR Vienna Conference Series, <http://www.unidir.org/files/publications/pdfs/population-displacement-en-619.pdf>.

<sup>97</sup> <https://www.worldhumanitariansummit.org>.

<sup>98</sup> Baylon, C., Brunt, R. and Livingstone, D. (2015), *Cyber Security at Civil Nuclear Facilities: Understanding the Risks*, Chatham House Report, London: Royal Institute of International Affairs, <https://www.chathamhouse.org/publication/cyber-security-civil-nuclear-facilities-understanding-risks>.

<sup>99</sup> See also Gluschke, G. (2015), *Cyber Security at Nuclear Facilities: National Approaches*, an ISS research project in cooperation with the Nuclear Threat Initiative (NTI), [http://www.nti.org/media/pdfs/Cyber\\_Security\\_in\\_Nuclear\\_FINAL.pdf?\\_id=1445548675](http://www.nti.org/media/pdfs/Cyber_Security_in_Nuclear_FINAL.pdf?_id=1445548675).

<sup>100</sup> International Conference on Computer Security in a Nuclear World: Expert Discussion and Exchange, IAEA, Vienna, Austria, 1–5 June 2015, <http://www-pub.iaea.org/iaea meetings/46530/International-Conference-on-Computer-Security-in-a-Nuclear-World-Expert-Discussion-and-Exchange>.

<sup>101</sup> Nuclear Security Summit (2016), ‘The Joint Statement on Cyber Security’, <http://www.nss2016.org/document-center-docs/2016/4/1/joint-statement-on-cyber-security>.

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the ministerial segment of the IAEA International Conference on Nuclear Security in Vienna in December 2016, with the purpose of contributing to IAEA efforts to enhance cybersecurity at nuclear facilities. In addition, the nuclear industry at the NSS in 2016 focused strongly on cybersecurity, an effort that also includes the nuclear risk insurance industry.

In other work,<sup>102</sup> the vulnerability of satellite systems and particularly GNSS (global navigation satellite systems such as GPS) data to hacking and therefore to a spoofing attack has been analysed. These vulnerabilities have major implications for command and control systems for nuclear weapons and their platforms and support facilities.

Cybersecurity concerns for command, control and communications for nuclear weapons and how nuclear weapons systems will respond to a cyberattack in increasingly taking centre stage in nuclear weapons risks assessments.<sup>103</sup> The uncertainties in ascertaining the impact of cyberattacks could reduce confidence in the command and control of nuclear systems and lead to false alarms or even potentially allow an adversary to take control of a nuclear weapons system. The Defense Science Board (DSB) Task Force on Resilient Military Systems concluded in a 2013 study that the US ‘cannot be confident’ that critical IT systems would work if under cyberattack from ‘a sophisticated and well-resourced opponent utilizing cyber capabilities in combination with all of their military and intelligence capabilities’.<sup>104</sup> In 2015, the US Director of National Intelligence named the cyber threat as the primary strategic threat to the US and the Department of Defense has addressed critical cyber vulnerabilities through the Mission Assurance Program and developed a comprehensive cyber strategy.<sup>105</sup> The UK<sup>106</sup> and other nuclear weapons possessors<sup>107</sup> are likewise seriously addressing the cyber vulnerabilities of their nuclear facilities and equipment.

Missile defence systems, which rely heavily on cyber and electronic transmission of data, are entering a new phase of technical capabilities and risks. The ability to disable missiles before launch – including through cyber means— requiring an earlier infiltration of the adversary’s network, termed ‘left of launch’ capability, is a non-kinetic and less costly approach to missile defence that is currently undergoing application in various scenarios, including in Northeast Asia.<sup>108</sup> The

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<sup>102</sup> Livingstone, D. and Lewis, P. (2016), *Space, the Final Frontier for Cybersecurity?* Research Paper, London: Royal Institute of International Affairs, <https://www.chathamhouse.org/sites/files/chathamhouse/publications/research/2016-09-22-space-final-frontier-cybersecurity-livingstone-lewis.pdf>.

<sup>103</sup> Datto, A. and Ingram, P. (2016), ‘A Primer on Trident’s Cyber Vulnerabilities’, British American Security Information Council (BASIC), Parliamentary Briefings on Trident Renewal, No 2, March 2016, [http://www.basicint.org/sites/default/files/BASIC\\_cyber\\_vuln\\_mar2016.pdf](http://www.basicint.org/sites/default/files/BASIC_cyber_vuln_mar2016.pdf); Chamales, G. (2015), *A New Approach to Nuclear Computer Security*, The Nuclear Threat Initiative, [www.nti.org/media/pdfs/A\\_New\\_Approach\\_to\\_Nuclear\\_Computer\\_Security.pdf?\\_id=1445875704&\\_id=1445875704](http://www.nti.org/media/pdfs/A_New_Approach_to_Nuclear_Computer_Security.pdf?_id=1445875704&_id=1445875704).

<sup>104</sup> Unal, B and Lewis, P. (2017), ‘Cyber Threats and Nuclear Weapons Systems’, in Borrie, J., Caughley, T., and Wan, W. (eds) (2017), *Understanding Nuclear Weapon Risks*, UNIDIR, <http://www.unidir.ch/files/publications/pdfs/understanding-nuclear-weapon-risks-en-676.pdf>.

<sup>105</sup> Defense Science Board (DSB) Task Force Report: ‘Resilient Military Systems and the Advanced Cyber Threat’, <http://www.acq.osd.mil/dsb/reports/ResilientMilitarySystems.CyberThreat.pdf>.

<sup>106</sup> The Department of Defense, Cyber Strategy, April 2015, [http://www.defense.gov/Portals/1/features/2015/0415\\_cyber-strategy/Final\\_2015\\_DoD\\_CYBER\\_STRATEGY\\_for\\_web.pdf](http://www.defense.gov/Portals/1/features/2015/0415_cyber-strategy/Final_2015_DoD_CYBER_STRATEGY_for_web.pdf).

<sup>107</sup> HM Government, ‘National Security Strategy and Strategic Defence and Security Review 2015: A Secure and Prosperous United Kingdom’, [www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/478933/52309\\_Cm\\_9161\\_NSS\\_SD\\_Review\\_web\\_only.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/478933/52309_Cm_9161_NSS_SD_Review_web_only.pdf).

<sup>108</sup> Le Pacte Défense cyber, Ministry of Defence, France, <http://www.defense.gouv.fr/actualites/articles/presentation-du-pacte-defense-cyber>.

<sup>109</sup> A. Futter (2016), ‘The dangers of using cyberattacks to counter nuclear threats’, *Arms Control Today*, July/August 2016, [https://www.armscontrol.org/ACT/2016\\_07/Features/The-Dangers-of-Using-Cyberattacks-to-Counter-Nuclear-Threats](https://www.armscontrol.org/ACT/2016_07/Features/The-Dangers-of-Using-Cyberattacks-to-Counter-Nuclear-Threats); Gartzke, E. and Lindsay, J. (2017), ‘The U.S. wants to stop North Korean missiles before they launch. That may not be a great idea’, *Washington Post*, 15 March 2017, [https://www.washingtonpost.com/news/monkey-cage/wp/2017/03/15/the-u-s-wants-to-stop-north-korean-missiles-before-they-launch-that-may-not-be-a-great-idea/?utm\\_term=.875c93d84926](https://www.washingtonpost.com/news/monkey-cage/wp/2017/03/15/the-u-s-wants-to-stop-north-korean-missiles-before-they-launch-that-may-not-be-a-great-idea/?utm_term=.875c93d84926); Gartzke, E. and Lindsay, J. R. (2017), ‘Thermonuclear cyberwar’, *Journal of Cybersecurity*, 14 February 2017, <https://academic.oup.com/cybersecurity/article/doi/10.1093/cybsec/tyw017/2996537/Thermonuclear-cyberwar>.

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employment of cyberattacks on nuclear weapons systems will reduce confidence in the authenticity and integrity of the information of the most dangerous types of weapons humanity has developed. The certainty of information as regards nuclear weapons operations will be questionable, and therefore the uncertainties in crisis decision-making will increase significantly. This represents a fundamental shift in the risks posed by nuclear weapons, and one that requires urgent attention.<sup>109</sup>

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<sup>109</sup> Unal and Lewis (2017), 'Cyber Threats and Nuclear Weapons Systems'.

## 4. Conclusions

Nuclear disarmament and non-proliferation are a fundamental part of the world's international legal framework. Nuclear weapons pose overwhelming dangers to global health, development, climate, social structures and human rights. The risks are enormous. The international community needs to link the issues in a coherent multilateral approach, in which human security and survival of the species are placed at the centre of international decision-making.

This paper offers the following conclusions for consideration:

- The detonation of nuclear weapons – whether inadvertently or deliberately – would have disastrous immediate and long-term impacts not only in the location of the detonation but also in many other parts of the world.
- It is time to connect up the issues. In the wide range of top-tier global issues progressing at the international level, there is a stark absence of any discussion on the possibility of nuclear weapons use and progress towards nuclear disarmament.
- As a result, the possibility of nuclear weapons use is rarely if ever factored in to policymaking on the full range of issues under scrutiny by the international community despite the potential for devastating impact.
- Experts and officials who are working on global threats in the environmental, developmental, international law, terrorism and cybersecurity sectors would benefit from cross-sector approaches and regular discussion forums.
- Connecting the expert and diplomatic communities that work on nuclear weapons and climate change could yield new perspectives and understanding, with the potential for generating practical ideas on ways to move forward.
- No country can consider itself exempt from the potential consequences of nuclear weapons detonations and the impact on human development. Progress on nuclear disarmament should be factored into monitoring progress on the SDGs.
- The gap in treaty law to control and eliminate nuclear weapons needs to be addressed.
- Because women are biologically more vulnerable than men to the harmful effects of radiation, they have distinct issues to raise in negotiations.
- Consideration of the impact of nuclear weapons on important cultural artefacts and ways of preventing such catastrophic damage should be part of the requirement for cultural heritage protection in every country and the subject of informed public debate.
- A renewed interaction between the nuclear disarmament expert community and public health experts could assist diplomatic efforts in ascertaining the full set of health risks posed by nuclear weapons use.

- Connecting nuclear security, nuclear disarmament and non-proliferation could serve to re-energize nuclear disarmament.
- Humanitarian emergencies such as those emanating from natural disasters, terrorism, and conflict, have shown how the difficulties in developing preparedness and capacity to respond to complex humanitarian situations such as overwhelming migration and refugee flows can prove insurmountable.
- Concerns about the cybersecurity vulnerabilities of nuclear facilities in both the civil and the military sectors are increasing and require urgent attention.
- UN Security Council Resolution 2310,<sup>110</sup> adopted on the eve of the CTBT 20th anniversary in September 2016 – the most recent achievement of the Conference on Disarmament – could serve as a focal point for reflection on ways forward.
- Experts and officials from other Main Committees of the UN General Assembly could be engaged in an annual discussion on cross-sector threats and responses and ways forward linking the issues of development, gender, international law, the environment and terrorism.
- Going further, it ought to be possible to hold regular joint meetings of the Main Committees to discuss issues of common concern and inform the need for action.
- Experts and officials from other fields could be invited to address meetings of the NPT, the Conference on Disarmament and the First Committee of the UN General Assembly to ask and answer questions about the intersection of nuclear disarmament and non-proliferation efforts with their areas of focus and expertise.
- Joint studies could be commissioned between experts in different fields on the full set of impacts that nuclear weapons detonations might have on development in a specific region.
- The issue of the risks of nuclear weapons could be introduced as working papers into the main forums of other global issues, such as the follow-up meetings from the 2016 World Humanitarian Summit, conferences on climate change, discussions on development and cybersecurity.
- The vulnerabilities of and risks associated with nuclear weapons, their infrastructure and their continued existence in the current global context need to be taken into account in all security and emergency planning. A response to nuclear emergencies should be included in all national and international risk management and mitigation processes. This should include an examination of the national and international capacity or otherwise for a humanitarian response, particularly in the states possessing nuclear weapons and those that have nuclear weapons on their territory.

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<sup>110</sup> Resolution 2310 (2016), Adopted by the Security Council at its 7776th meeting, on 23 September 2016, S/RES/2310 (2016), [http://www.un.org/en/ga/search/view\\_doc.asp?symbol=S/RES/2310\(2016\)](http://www.un.org/en/ga/search/view_doc.asp?symbol=S/RES/2310(2016)).

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Cover image: An Iraqi carries a gas mask that he found in the marshes crossing the southern Iraqi town of al-Azeir, April 2007.

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