Prospects for cooperative investigations into the origin of COVID-19

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On 7 July 2020, the World Health Organisation (WHO) announced that a team of experts would travel to China to lay the groundwork for an international mission researching the zoonotic origins of the COVID-19 pandemic.

This move came on the heels of a landmark resolution on the response to the global COVID-19 pandemic passed in May by the 73rd meeting of the World Health Assembly (WHA), the governing body of the WHO. Among the various recommendations, the resolution requests a review of the WHO's response to the pandemic and mandates the organisation to keep working on ascertaining its origin.

Questions on the pandemic's origin

The origin of SARS-COV-2, the virus responsible for COVID-19, has been the subject of a significant and often politically charged debate since the early days of the outbreak. The most vehement statements have come from US President Donald Trump and Secretary of State Mike Pompeo, who claimed repeatedly that the virus originated from a Chinese laboratory, possibly as a human-engineered agent. The US intelligence community has been more cautious in its declarations.

The scientific community has reached a broad consensus in concluding that the virus is natural in origin, and not the product of genetic engineering or other human manipulation.[1] However, this alone does not explain how the virus first infected humans.

This could have happened naturally, with humans infected by an animal, possibly a bat or pangolin. Initial suspicion centred around a market in Wuhan, China trading in seafood, and wild and domestic animals, where conditions permit cross-species virus transmission. Markets of this kind have been discussed as possible origin sites of past outbreaks, including SARS, another coronavirus related to COVID-19.

Wuhan, however, also hosts biological laboratories carrying out research on infectious diseases. One of these is the only Biosafety Level 4 (the highest standard, used for the most dangerous pathogens) in China. These laboratories research bat-related coronaviruses, and host a wide archive of bat coronavirus strains. On this basis, a number of biosafety experts have raised the possibility of a laboratory release, caused by a lapse in safety procedures—or possibly even by a malicious act.

Requests for an investigation and the WHA resolution

Several countries and independent experts have called for an international investigation into the origins of COVID-19. A proposal by Australia, for example, announced before the WHA convened, recommended a significant reorganisation of the WHO and the establishment of

an international inspectorate with powers akin to weapons inspectors under arms control and disarmament treaties. The proposal also called for an independent inquiry covering both the origins of the outbreak, and its handling by China and the WHO.[2] This sparked strong opposition by China, and was reportedly met with reluctance by other countries, including some key EU member states.

A new proposal, led by EU member states in consultation with Australia, found broader support. The text was presented to the WHA with more than 130 co-signatories, including China, and was adopted by the governing body in May. The resolution includes a review of the pandemic handling, but in a significant change from the Australian language, this will focus only on the role of the WHO. However, a reference to the International Health Regulations may be used to scrutinise China's behaviour.

The resolution also requests the WHO Director-General to "continue to work closely" with states and other international organisations to "identify the zoonotic source of the virus and the route of introduction to the human population (. . .) including through efforts such as scientific and collaborative field missions".[3] This builds on previous WHO activity, including two visits to China in the early stages of the pandemic that recommended researching the origins of the virus for prevention purposes.[4]

Key concerns for an investigation

The July visit to China by WHO experts is intended to establish the scope and terms of reference of a "WHO-led" international mission researching the origins of SARS-COV-2. Not much is known of the current plans for the mission.

Timing is one of the key concerns: as time goes on, biological evidence may degrade or disappear, and it may become difficult or impossible to track down key individuals such as medics treating the first cases or their relatives. However, both China and the WHO have stated on separate occasions that a broader investigation may have to wait until the pandemic is beaten, or at least reduced to non-emergency levels across the world. The WHO Director-General's special envoy for COVID-19 noted that the organisation is investing its resources in fighting the epidemic, and is cautious about the prospect of diverting them to an epidemiological investigation.

The scope and methods of an investigation are crucial, too. So far, not much has been disclosed about the WHO's plans, and it is likely the issue is still a matter of negotiation. According to the WHO statement the goal would be "identifying the zoonotic source of the SARS-COV-2 virus". Some experts have read this as keeping a narrow focus on epidemiology and animal transmission, and excluding an investigation of the hypothesis of a laboratory release. A 'limited' mission that does not investigate all known hypotheses would likely fall short of the expectations of both states and international experts, and may open China and the WHO to further accusations of hindering transparency.

It is important to note that a broad and comprehensive mission aiming to ascertain how the virus entered circulation among humans would have to draw on a range of methods. An epidemiological investigation would want to look at a range of issues and areas that could help determine the origin of the outbreak. The mission would need to carry out a range of activities, including collecting, analysing and comparing records and documentation on the early stages of the outbreak; identifying and interviewing those infected, medical practitioners, and government officials involved in the response; and inspecting locations of interest, and taking samples for analysis. It would also need to look at laboratory biosafety and biosecurity features and procedures.

The transport and analysis of samples is a significant issue, that is complicated by safety concerns, international regulations on the transport of dangerous goods, including biological and infectious substances, and the need to ensure chain of custody to preserve the integrity of the samples. Moreover, samples would need to be analysed by one or (ideally) several independent laboratories, possibly located in different countries, to build confidence in the results. These laboratories would also need to be accepted by all relevant stakeholders; at the moment, no such internationally-recognised certification scheme exists.

Existing international instruments

The international framework for investigations of disease outbreaks, whether of unintentional or deliberate origin, is relatively underdeveloped, compared to similar frameworks in the nuclear and chemical realm. One approach that experts have pointed to is the peer review system established by the States

Parties to the Biological Weapons Convention (BWC). While the BWC lacks a verification system, states parties have engaged in peer review and transparency for confidence-building, including multilateral reviews of operations at high-biosafety level laboratories. These experiences could be drawn on for methods and good practices, particularly as the hypothesis of a safety lapse at one of the Wuhan laboratories would need to be investigated.

The BWC also includes a clarification mechanism under Article V. This applies broadly to "problems which may arise in relation to the objective of, or in the application of the provisions of, the Convention", and allows both for consultations between states parties, and for calling on procedures "within the framework of the United Nations". While this mechanism is not a full verification and compliance mechanism, it could be an avenue for discussion and clarification, and its breadth may make it easier to invoke than the provisions in Article VI, which are specific to breaches of the convention. However, given the acute sensitivity of the debate and the national positions that have emerged so far, further tethering the discussion to the realm of biological weapons may be seen as extremely provocative and likely counterproductive by many, including several supporters of a broad investigation.

Similar sensitivities are likely to apply to considerations surrounding the United Nations Secretary-General's Mechanism for Investigation of Alleged Use of Chemical and Biological Weapons (UNSGM). While the mechanism is the key international instrument for investigating alleged use of biological weapons, its mandate and the related institutional processes have a specific and explicit focus on cases of alleged use of biological weapons. Given that discussions on the origin of COVID-19 have predominantly focused on the hypotheses of a natural outbreak or a – likely accidental – laboratory release, it is difficult to envision the UNSGM being called upon at this stage; moreover, any attempt to do so would likely undermine current efforts to build up UNSGM operational capabilities.

Nevertheless, the UNSGM remains an important point of reference for a possible WHO investigation, due to the capacity-building work carried out under its banner and the lessons learned from previous applications. While the UNSGM has never been deployed for biological investigations, its experience of investigating alleged uses of chemical weapons offers lessons that can be applied beyond the chemical realm.

UNSGM investigations in Mozambique and Azerbaijan in 1992 encountered obstacles due to the poor preservation of evidence of the alleged attacks. This underscores the need to act quickly to identify and preserve evidence for a future mission. More recently, the UNSGM investigation of the 2013 chemical weapon attacks in Syria has highlighted a score of very important operational and logistics lessons on the best ways to organise, conduct and support an investigation, especially in complex political environments.

VERTIC has carried out research on lessons learned from past UNSGM missions, and identified some of the key needs for enhancing the mechanism's future capacity and preparedness. These findings, which are to be published in a forthcoming volume, are arguably relevant beyond the framework of UNSGM, and could be applied to a mission on the origins of COVID-19. Indeed, many of the basic skills required for a UNSGM investigation are relevant too for any mission looking into the origins of an outbreak of infectious disease; the key differences are the context and the politics of the mission, rather than technical elements.

One key finding is that a successful investigative team requires a set of skills and expertise that goes beyond the technical. Practical experience in field operations is also crucial, as well as a strong sense of team spirit and cohesion. Moreover, team members need to have a solid 'investigation mindset'. They need to understand how to collect, preserve and analyse possible evidence, as well as how to evaluate available information in context and notice gaps in information and evidence. These skills are crucial to ensure the integrity of the investigation, and protect it from accusations of bias. The team needs to include specialists with deep, practical expertise on a range of subjects. In the case of a COVID-19 mission, this would include epidemiology, forensics, animal and public health, and much more besides.

Another lesson learned from past experience is that the team needs to be provided with various forms of support. These include analytical laboratories (mentioned above) and field equipment, but also other elements, such as robust and flexible logistical arrangement for the transportation of samples, instruments and personnel; processes and resources (including personnel) to support the team's safety and security; infrastructure for secure communication, data analysis and

data storage both in field and remote; and constantly available legal advice. This has emerged both in the context of international investigations, and of response to disease outbreaks and public health emergencies.

It is also crucial to navigate political sensitivities effectively. The experience of practitioners involved in previous missions indicates that it is important to keep technical issues as insulated as possible from political and diplomatic discussions, and to navigate the latter with sensitivity. This, it was found, relies both on having strong support from the investigation's international headquarters, and expert leadership on the ground.

Overall, the experiences of previous international investigations show that a mission needs to be carried out at the highest levels of capacity and professionalism. A series of initiatives in recent years have been devoted to building preparedness for biological investigations so that they can operate at the required level. These include learning lessons from domestic cases such as the 'Amerithrax incident' and the response to Ebola outbreaks; identification of qualified experts; resources on training field investigators; protocols for communication between the investigative team and various stakeholders, including international organisations, government officials in the host country, and the media; as well as protocols for handling the complicated logistics of deploying and supplying a field investigation, sourcing and delivering equipment, moving samples, and more. Many of these resources could be adapted for use in the slightly different context of a WHO investigation.

Another element of contemporary UNSGM operations, clearly applicable in this case, is the practice of including participation from relevant international organisations. The UNSGM mission (chemical) in Syria, for example, included personnel from the Organisation for the Prohibition of Chemical Weapons (OPCW) and the WHO. The World Organisation for Animal Health (OIE) is expected to participate in possible investigations regarding a zoonotic agent, and hence would be an obvious partner in the WHO investigation. A 2012 Memorandum of Understanding between the UN and OIE outlines the ways in which OIE could contribute to an UNSGM investigation; these include (among others) training, supply of qualified experts in zoonotic diseases and animal public health, and access to the network of OIE Reference Laboratories.

These OIE-UN cooperation protocols—and the lessons learned from applying them, including those highlighting where cooperation could be improved—would clearly be useful to draw on, as the WHA resolution explicitly mentions OIE and the UN Food and Agriculture Organization as contributors to the research on the origins of COVID-19.

The need for a co-operative way forward

A key aspect worth highlighting of both the UNSGM and the instruments offered by the BWC is that these are cooperative measures, intended to be undertaken with the consent, and indeed the cooperation, of the host state. The same will most likely be true for a WHO field mission to Wuhan, as was the case for the two previous missions on COVID-19 undertaken in early 2020. Cooperation with government stakeholders is key to mission success, and experience shows that even when there are conflicting priorities, or issues caused by political sensitivities, investigators have been able to use problem-solving approaches to identify practical solutions. This was the subject of a tabletop exercise (TTX) run by VERTIC, rooted in the experience of previous national and international investigations and focusing on possible future biological investigations under the UNSGM. The report from the TTX has been published and is available from VERTIC.

In the absence of a deeper reform of the WHO's mandate and structure, like that proposed by Australia, multilateral cooperation will need to be at the centre of any investigation on the origins of COVID-19. And indeed, there can be legitimate concerns that involving the WHO in highly politicised, binding—if not adversarial—inspection operations could damage its standing as an impartial global health body, and limit its ability to provide assistance and care in emergencies worldwide.

The debate on the origins of COVID-19 has certainly reflected these concerns. While some have framed the investigation as a mechanism for apportioning blame and possibly even asking for reparations for the damage wrought by the pandemic, others have warned that this approach creates additional obstacles to achieving multilateral cooperation.[5]

Thorough research on the origins of the COVID-19 pandemic is necessary for various reasons, chief of which is helping to prevent future outbreaks. This has been recognised by a range of experts and the WHA resolution itself. Supporting

an investigation could be in China's interest, too. It could help China to rebuild goodwill in this sector and address the criticism it received over its alleged lack of transparency in the early stages of the outbreak. The international community can also offer a range of incentives, and could frame the investigation as part of a broader set of initiatives aimed at improving global biosafety and biosecurity. Even the scrutiny of China's biosafety laboratories could be used as a springboard for new initiatives on international biosafety standards and training measures – something China itself has advocated in the past.

It is important to remember that verification and transparency are crucial instruments to enable cooperation in times of tension and low trust.

Endnotes

1 Andersen, K.G., Rambaut, A., Lipkin, W.I. et al, 'The proximal origin of SARS-CoV-2', *Nature Medicine,* vol. 26, 2020, pp. 450–452.

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3 Seventy-third World Health Assembly, Agenda item 3, COVID-19 response, WHA73.1, 19 May 2020.

4 Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19), 16-24 February 2020.

5 Mara Hvistendahl, 'In its zeal to blame China for coronavirus, the Trump administration is thwarting investigations into the pandemic's origins', The Intercept, 19 May 2020.

Further reading

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Filippa Lentzos, 'Will the WHO call for an international investigation into the coronavirus's origins?', Bulletin of the Atomic Scientists

Richard Guthrie, 'Distinguishing deliberate disease from natural events or accidental releases', BWPP Covid Impact Reports

'Report on Tabletop Exercise on UNSGM Investigation of Alleged Biological Weapon Use', VERTIC Verification Matters

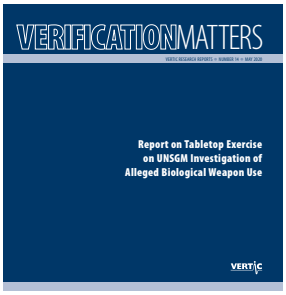
Daniel R. Lucey, 'COVID-19: Eight questions for the WHO team going to China next week to investigate pandemic origins' IDSA Global Health Science Speaks

Jon Cohen, 'A WHO-led mission may investigate the pandemic's origin. Here are the key questions to ask', Science Magazine

VERTIC Publications

In May, VERTIC published a report on a Tabletop Exercise on UN Secretary General Mechanism (UNSGM) investigations of alleged biological weapon use (Verification Matters No.14, May 2020). The report is based on the main conclusions and lessons identified during an interdisciplinary tabletop exercise (TTX) run by VERTIC on 31 October – 1 November 2019. The exercise was part of an ongoing study on current UNSGM capabilities to respond to alleged use of biological weapons and on ways to support and build these capabilities in the future.

The report includes a discussion of some practical challenges that a deployed UNSGM investigation team may face, and of possible strategies to mitigate and overcome them, as well broader recommendations to develop and maintain capacity within the UNSGM to conduct investigations of alleged use of biological weapons. The report, as well as the TTX, are part of a project funded by the US State Department Bureau of Arms Control, Verification and Compliance.



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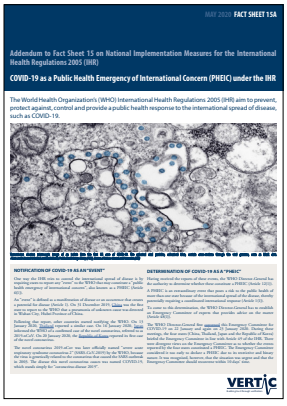

Verification Watch

Parties to Open Skies Treaty contemplate consequences of US withdrawal

Alberto Muti

On 21 May, the United States announced its intention to withdraw from the Treaty on Open Skies. Signed in 1992 and entered into force in 2002, the treaty allows for observation flights between its member states. These are conducted by a joint aircrew composed of personnel of the observing and observed states, using certified sensors and equipment. The announcement came after more than a year of rumours that the Trump administration was planning such a move. In accordance with the treaty provisions, the United States will formally exit the agreement 6 months after its announcement. The declaration also appears to defy an order by the US Congress to provide advance notification of 120 days.

At the core of the United States declared reasons for leaving Open Skies are accusations of Russian non-compliance: two separate disputes under the treaty have seen Russia unilaterally impose limitations to Open Skies observation flights. First, since 2014, Russia has been imposing a 500 km distance limit to overflights of the Kaliningrad region. This was in response to an Open Skies overflight of the small region by Poland, which Russia claims caused severe disruption to civilian air traffic. No treaty provision allows Russia to impose such limitations, and the US imposed unilateral limitations on overflights of Hawaii in turn.

Russia has also denied flights near the borders of South Ossetia and Abkhazia. This is a more complicated dispute, as it is rooted in general principles of international law. The two territories declared their independence from Georgia in 2008, and Russia recognises them as independent states, and therefore non-parties to the treaty. The treaty requires that flights maintain a distance of at least 10 km from borders of non-state parties, and Russia has demanded that this limitation be applied. Georgia and other parties to the treaty do not recognise South Ossetia and Abkhazia as independent states, and have argued that abiding by the 10 km limitation would be a de facto recognition.

Most experts consider that both of these disputes, while complicated, could be solved by negotiation, and neither has prevented other operations under the treaty from continuing. Indeed, one of the disputes recently saw progress: in February 2020, Russia allowed a joint flight by the United States, Lithuania and Estonia to fly beyond the 500 km limit over Kaliningrad.

The Trump administration also made other claims, for example that Russia used Open Skies flights to observe US critical national infrastructure. It is worth noting that this is permitted under the treaty.

US allies in Europe have reacted with dismay at the announcement. Eleven NATO countries issued a joint statement where they state they "regret" the US decision, commit to keep implementing the treaty, and call on Russia to continue negotiating with Open Skies state parties to resolve outstanding disputes.

In accordance with treaty provisions, a conference of state parties has been called for 6 July by the treaty depositaries, Canada and Hungary. The aim of the conference is to discuss the impact of US withdrawal. The conference will take place via teleconferencing due to the impact of the COVID-19 pandemic. As such, having in-depth negotiations may be particularly difficult.

One of the consequences of the US withdrawal is that active and passive flight quotas – the number of observation flights a member state can undertake and is bound to accept – may have to be redrawn. This may require some careful negotiation; it is unclear yet whether this is on the agenda for the upcoming conference of state parties, or whether it will be left for discussion in the Open Skies Consultative Commission (OSCC), the treaty's ruling body where quotas are usually negotiated.

The US decision also entails a loss of capacity for the NATO alliance, as not all countries have their own Open Skies-approved aircraft and sensors. The treaty allows for joint flights, and NATO member states have been using this provision extensively. After the US announcement, some scheduled joint flights have already been cancelled.

Moreover, some areas are too vast to cover using the type of military transport planes used by many states parties

to the treaty. This is the key reasons why some, like Germany, Russia, and indeed the US, have chosen wide-body jets to carry out overflights. With the US withdrawal, no such aircraft will be available to NATO member states until a new German plane, a converted Airbus A319CJ, enters into service in early 2021.

The CTBT and the risk of resuming nuclear testing

Elena Gai

According to media reports, on 15 May a group of senior US national security officials discussed resuming explosive nuclear testing, an activity the United States has not undertaken since 1992 and no other states, with the exception of North Korea, have carried out since 1998.

Several people within the Nuclear National Security Administration (NNSA) and the State Department apparently raised objections to this suggestion to resume testing, which would potentially trigger a crisis for the survivability of the Comprehensive Nuclear Test-Ban-Treaty (CTBT). Even though the CTBT has yet to enter into force, it plays an important role in ensuring the resilience of the non-proliferation architecture. As pointed out by the CTBTO's Executive Secretary, Lassina Zerbo, "any actions or activities by any country that violate the international norm against nuclear testing, as underpinned by the CTBT, would constitute a grave challenge to the nuclear non-proliferation and disarmament regime, as well as to global peace and security more broadly".

This high-level US discussion would seem to be the consequence of political considerations, rather than technical ones. In fact, the Executive Summary of the 2020 US Government's *Compliance Report* states that China's activities at the Lop Nur nuclear weapons test site throughout 2019 "raise concerns regarding its adherence to the 'zero yield' standard adhered to by the United States" and "finds that Russia has conducted nuclear weapons experiments that have created nuclear yield and are not consistent with the U.S. 'zero-yield' standard".

Although a US resumption of nuclear testing seems unlikely, the attention to this issue provides an opportunity to re-think more broadly the significance of the CTBT to advancing disarmament and how the debate on its entry into force might be reenergized. The six North Korean nuclear tests (2006-17) showed to the world the readiness and technical sophistication of the CTBTO's verification regime. The CTBTO's laboratories and monitoring stations also enhance other scientific research activities worldwide, and the organisation even provided personal protective equipment to medical staff in developing countries as part of the COVID-19 response. Finally, as VERTIC has highlighted previously , the experience of the 'Ad Hoc Group of Scientific Experts to Consider International Co-Operative Measures to Detect and Identify Seismic Events' which, gathering from 1976 to 1996, laid the foundation of the CTBT, could be mirrored by a new Group of Scientific and Technical Experts (GSTE) that may be established under the auspices of the Group of Governmental Experts (GGE) to consider the role of verification in advancing nuclear disarmament that will gather again in 2021.

The resilience of international verification mechanisms during the Covid-19 pandemic

Elena Gai and Grant Christopher

Covid-19 presents unique challenges to international governmental organisations (IGOs) responsible for implementing verification and monitoring of arms control agreements. The array of challenges range from human resource issues, such as changes in working practices while handling confidential data, to continuing on-site inspections in remote regions of the globe. For example, the existing logistical challenge of securing an agreed site visit with a member state is now compounded by air travel and border restrictions. IGOs have found themselves having to prioritise some types of inspection activities and postponing non-essential inspections until the pandemic is over or new virus-transmission mitigation measures are in place.

IGOs, like any other organisation, must comply with host country measures, protect the health and wellbeing of their staff while simultaneously continuing to carry out their mission. Key staff may not be available for time-sensitive operations due to self-isolation when displaying symptoms or because they or a member of their family are in a COVID-19 high-risk group. Staff will also face the same general challenges as the rest of the population, such as providing childcare and the cumulative mental health toll of being in lockdown for an extended period.

The International Atomic Energy Agency's response

The new Director General of the International Atomic Energy Agency (IAEA), Rafael Grossi, has stated that "Inspections safeguarding nuclear materials all over the world will not stop for a single minute". The IAEA is continuing its inspection regime in an environment where international travel has virtually halted and IAEA staff in Vienna altered working practices to implement social distancing. In order to fulfil its mandate, the agency has to continue to review safeguards information securely, coordinate between teams that would primarily conduct business in person pre-COVID-19 and travel to conduct inspections.

The continuation of most in-field verification activities have been guaranteed by the IAEA. To this end, the agency even chartered a plane for the first time in its history using extra-budgetary support from member states. Other non-essential equipment installation and maintenance visits have been postponed, however. Central activities, including processing of State reports and declarations, and the evaluation of nuclear materials balance information, have continued as per related obligations. The recruitment and induction of staff have also continued with some adjustments. Both the Vienna headquarters and the IAEA's regional offices, with the collaboration of national authorities and agencies, have been essential in continuing the Agency's verification activities.

Major challenges were identified in State evaluation activities and the development of new State-level safeguards approaches due to the obligation to guarantee the security of highly confidential information that is required to be processed in a secure integrated safeguards environment. Another challenge has been sourcing adequate supplies of personal protective equipment (PPE) during a global shortage of such equipment. The long-term impact of COVID-19 on travel will further stretch the IAEA's well-documented flat budget without sustained extra-budgetary support. Reducing what constitutes necessary travel by increasing reliance on installed sensors and improving remote transmission of safeguards data across state borders could reduce the burden on the agency, but these solutions will not meet the agency's immediate challenges.

Beyond its safeguarding activities, the IAEA expanded its support to member states to continue safe operation of nuclear facilities by maintaining its existing information-sharing systems and adding the newly established nuclear power plant COVID-19 Operating Experience Network. Other areas of IAEA support to nuclear power plant operation, such as safety regulation reviews and emergency preparedness exercises, were moved online.

The responses of other arms control IGOs

The Organisation for the Prohibition of Chemical Weapons (OPCW) has the responsibility to conduct on-site inspections and an array of broader activities to support the Chemical Weapons Convention. The organisation has confirmed that inspections of old and abandoned chemical weapons have been postponed indefinitely, and inspections of former chemical weapons facilities have been delayed until later in the year. However, higher priority inspections, such as verification of chemical weapons destruction, will continue. No recent update was available on Article VI inspections, (otherwise known as industry verification inspections) which had been postponed pending a decision on 1 June. The 241 remaining scheduled article VI inspections are unlikely to be completed this year.

The most high-profile cases that the OPCW is currently investigating are in Syria, and all of the inspections there have been postponed. This is a significant blow to investigation activities in Syria. According to the last report by the OPCW Director General released on 24 April, the OPCW Secretariat informed the Syrian Government that all deployments and missions were postponed until further notice.

As the Comprehensive Test Ban Treaty (CTBT) is not in force, the CTBT Organisation (CTBTO) does not yet conduct on-site inspections. However, it has continued training participants for when the treaty enters into force. Given the recent debate in the United States about resuming nuclear testing, the political obstacles to the treaty entering into force will not be overcome during the pandemic. The CTBTO has used online tools to ensure training continues. Cutting-edge technology and engineering associated with the International Monitoring System showed its full operability in a challenging crisis. Beyond core activities, the organisation has provided PPE for some of its member states to aid them in slowing the spread of COVID-19. Specific lessons from dealing with COVID-19 were elaborated by a Working Level Task Force that was set to review CTBTO's Business Continuity Plan.

All of the above-mentioned IGOs operating during COVID-19 have continued to fulfil their mandates in the short term by demonstrating flexibility and in some cases prioritising certain activities and postponing non-essential tasks. While the future trajectory of the virus remains uncertain, IGOs will likely be confronted with a new set of challenges. First, for those organisations that have delayed activities, they must consider how to restart them, potentially in the face of sustained disruption. Second, each organisation must continue to update working practices to mitigate the cumulative effects of extended lockdowns on staff in order to ensure a frictionless continuation of operations. Third, in the long term, organisations must understand what the world will look like for them post-COVID-19. There will likely be increased costs associated with travel, which will stretch already strained budgets without permanent budget increases by member states. Recruiting and inducting new staff is likely to be problematic, especially if travel restrictions remain. Where staff remain distributed outside of the HQ there is danger of isolation straining team coherence. Online training will in many cases not be a practical substitute for hands-on learning for inspectors.

As organisations begin planning for a post-COVID-19 world, organisational strategic planning will seek to incorporate pandemic resilience. The IGO's tasked with international monitoring and inspections have successfully navigated a very challenging period. Yet the pandemic is not over. As it enters its next phase, the challenges organisations face will move from firefighting to a long-term response.

Verification and Implementation 2019

VERTIC is pleased to announce the publication of its latest verification yearbook. The five essays that make up this short collection of analyses on verification and implementation of international agreements for security and development were all written in 2019, before the coronavirus outbreak. Authored by five leading practitioners and experts in nuclear safeguards, biological and chemical threats and the regulation of fishing, the articles explain and appraise the verification and national implementation mechanisms that make the selected international arrangements work in practice. The essays also throw light on how emerging developments in technology, industry, society and geopolitics may impact these fields, both in terms of new risks to international agreements and new opportunities to strengthen them. An introduction sets the essays in the context of the ongoing global public health emergency.

Introduction: Verification and national health insecurity – Ian Davis

Chapter 1: IAEA safeguards: Emerging challenges and opportunities – Jenni Rissanen

Chapter 2: The operationalization of Article VII of the Biological Weapons Convention: Efforts to enhance assistance capacities in response to deliberate bio-events – Alex Lampalzer and Valeria Santori

Chapter 3: Future verification challenges for the Chemical Weapons Convention – Ralf Trapp

Chapter 4: Twenty-one years of OPCW inspector training – Brendan Whelan

Chapter 5: Developments in implementing port State measures to combat illegal, unreported and unregulated fishing – Judith Swan

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Implementation Watch

The International Health Regulations and state responses to COVID-19

Yasemin Balci

The World Health Organization's (WHO) International Health Regulations (IHR) constitute the main rules for dealing with the international spread of disease. While almost all states are currently facing unexpected challenges posed by COVID-19, states had anticipated that the international spread of disease was a risk that warranted an international set of rules to manage it. In 2005, states substantially revised the IHR, which were adopted in 1969, in order to reflect the international threat posed by the emergence of disease and in recognition of increasing global trade and traffic. The IHR are legally binding on 196 states and contain provisions to prevent, control, protect against and respond to the spread of disease (also see VERTIC Fact Sheet No.15, April 2020, and its addendum).

Under the IHR, states are required to report any "event" to the WHO that may constitute a "public health emergency of international concern", also known as a PHEIC (Article 6(1)). An "event" is defined as a manifestation of disease or a potential occurrence of disease (Article 1(1)). A PHEIC is an extraordinary event, that poses a risk to the public health of more than one state because of the international spread of the disease, thereby potentially requiring a coordinated international response (Article 1(1)).

China first reported a disease of an unknown cause to the WHO on the last day of 2019. Within a month, three other states reported similar cases of a novel coronavirus. According to the IHR, it is the WHO Director-General who decides whether these events constitute a PHEIC (Article 12(1)), but he takes advice from the Emergency Committee. This committee of experts advises on the determination of a PHEIC and proposes temporary recommendations. Following the Emergency Committee's advice on 30 January 2020, the WHO Director-General declared that the spread of COVID-19 constituted a PHEIC and issued temporary recommendations to states to manage its spread.

The goal of these temporary recommendations is to prevent or reduce the international spread of the disease while minimising interference with international traffic. However, states are allowed to take their own measures, so-called additional measures, provided these achieve the same or greater level of health protection than the WHO recommendations (Article 43). If these additional measures significantly interfere with international traffic, states are obliged to give the public health rationale and related scientific information for these measures to the WHO within 48 hours of their implementation. The WHO may review this information and request a state to reconsider its measures. States are in any case required to review these measures themselves within three months, taking into account the advice of the WHO and the conditions in Article 43.

A month after the determination of COVID-19 as a PHEIC, on 29 February 2020, 38 states reported additional measures to the WHO that significantly interfered with international traffic. By 11 April 2020, however, this number had increased to 167 states parties. On the one hand, these figures show that an overwhelming majority of states parties chose to deviate in one way or another from the temporary recommendations issued under the IHR. On the other hand, temporary recommendations are not legally binding, and these figures also demonstrate that most of the states that made use of their options under Article 43 complied with the corresponding obligation to report their additional measures to the WHO.

According to the WHO, the additional measures reported by states mostly concern "the denial of entry of passengers from countries experiencing outbreaks, followed by flight suspensions, visa restrictions, border closures, and quarantine measures". States have also provided the public health rationale for these measures. These are of a scientific and medical nature, focussing on the unknowns about the new coronavirus and the disease that it causes, along with the lack of any vaccine or treatment. However, states have also provided capacity issues as part of their rationale, mentioning weaknesses in their public health capacity, the risk of overburdening it, and limited capacity to quarantine travellers. These reasons highlight another key obligation of the IHR: the requirement to develop and maintain core capacities to be able to respond to events and PHEICs (Articles 5, 13 and Annex 1A). In its resolution of 19 May 2020 on the COVID-19 response, the World Health

Assembly, the WHO's decision-making body, underscored the need for support to states parties to strengthen and maintain these capacities.

Prosecuting COVID-19 offences under biological weapons legislation in the United States

Thomas Brown

As the COVID-19 pandemic spreads across the world, national law enforcement agencies and prosecutors have been confronted with a new problem: the wilful spread of the disease by individuals to one another.

To combat this threat in the United States, Deputy Attorney General Jeffrey Rosen circulated a memo informing Department of Justice officials that they should consider prosecuting certain COVID-19-related offences under biological weapons legislation. According to the memo, "because coronavirus appears to meet the definition of a 'biological agent' under 18 [U.S. Code] §178(1), such acts potentially could implicate the Nation's terrorism-related statutes". For example, under section 175 of Title 18 it is prohibited to conduct activities with biological agents "for use as a weapon", defined as certain activities "for other than prophylactic, protective, bona fide research, or other peaceful purposes". This provision was originally a codification of the 1989 Biological Weapons Anti-Terrorism Act, legislation drafted to implement the Biological and Toxin Weapons Convention (BTWC). It implements the general-purpose criterion found under BTWC Article 1 by defining biological weapons on the basis of purpose.

Since this memo was issued, a number of people have been charged with federal biological weapons-related hoax offences in the US involving SARS-CoV-2 as the alleged biological agent. In one example, a man in Florida was charged with perpetrating a biological weapons hoax on 21 May 2020 by a grand jury at the US District Court, Middle District of Florida, Tampa Division. According to the affidavit in support of the criminal complaint, the accused spat at and coughed on police officers on two occasions, while claiming to be infected with the coronavirus. He was charged with a biological weapons-related hoax under section 1038 of Title 18 of the US code. Similarly, in Texas a federal complaint was filed on 8 April 2020 against a man under section 1038 of Title 18. The man allegedly posted a threat on social media claiming to have paid someone to spread coronavirus at grocery stores in the San Antonio area. The FBI were made aware of the threat and arrested the man after an investigation. If found guilty, both of these men could face up to 5 years in prison under section 1038 of Title 18.

At the state level, prosecutors have also invoked biological weapons legislation to address such circumstances since the onset of the pandemic. Two days after the circulation of the Deputy Attorney General's memo, state authorities in Pennsylvania charged a woman with threats to use weapons of mass destruction under Pennsylvanian state law for coughing and spitting on food items in a grocery shop whilst claiming to be infected with the virus.

The US approach contrasts with that taken by prosecutors in other countries. In England and Wales, the Crown Prosecution Service has charged those accused of similar offences with assault. In particular, due to a plethora of incidents involving offences against emergency workers, the Assaults on Emergency Workers (Offences) Act 2018 has been regularly invoked. A comparable approach has been taken in the Netherlands and New Zealand, where such offences have generally been prosecuted under laws prohibiting threats and assault respectively. However, the Commissioner of the New Zealand Police has publicly raised the possibility of charging those spreading COVID-19 with "infecting with disease" under section 201 of the Crimes Act 1961, which carries a maximum penalty of 14 years imprisonment.

Prosecutors play a central role in the administration of justice and retain the ultimate discretion to decide whether or not to prosecute an individual and the appropriate crime to charge them with. When exercising such discretion, they must weigh a number of considerations including the available evidence and the likelihood of success, and in scenarios involving the spread of SARS-CoV-2 there may be challenges in proving that the accused was infected with the agent and that the particular agent reached the victim. In the cases analysed here, prosecutors are yet to bring charges for actual use of a biological weapon, and so far have only brought charges for biological weapons-related hoaxes and for threatening to use a biological weapon as a weapon of mass destruction. Nevertheless, the prosecutorial strategy espoused by the US Deputy Attorney General provides federal authorities with a mandate to use biological weapons-related legislation to address the wilful spread of the SARS-CoV-2 agent by individuals to one another.

Compliance Watch

The humanitarian impact of sanctions during a pandemic

Cristina Rotaru

The coordinated implementation of international sanctions is challenging at the best of times. Ensuring that such sanctions do not impede humanitarian assistance is a further complication. What then are the consequences of a paradigm-shifting global health crisis that is sending shockwaves throughout the global economy on an international sanctions framework that can have a direct impact on several already-existing global humanitarian crises? The question of how to provide humanitarian aid to the most vulnerable without compromising international legal obligations under a sanctions regime becomes central to balancing international security and international welfare efforts.

Several humanitarian groups have claimed that some sanctions are impeding certain low-income countries from obtaining the necessary medical supplies to respond effectively to the global health crisis. Similarly, the UN has called for several sanctions regimes to be eased in the current circumstances, claiming on several occasions that medical work in Cuba, Iran, North Korea, Sudan, Syria and Venezuela is being hindered by the restrictive measures. On 30 April 2020, for example, the UN Human Rights Special Rapporteurs released a joint statement calling on the United States to lift its economic embargo on Cuba amid the coronavirus pandemic, arguing that the "export and re-export of goods to Cuba requires a cumbersome and expensive licensing process because of the US embargo, which undermines the efficiency of buying medicine, medical equipment and technology". Additionally, the UN High Commissioner for Human Rights, Michelle Bachelet, also called for international sanctions on Sudan to be lifted to help the country to fight the coronavirus pandemic and "prevent a humanitarian disaster".

On 13 May 2020, the UK's House of Commons published a briefing paper, 'Coronavirus: sanctions and humanitarian crises', discussing the implications of Covid-19 on the humanitarian aspect of sanctions. Inter alia, the paper recognises that international sanctions can impede the global fight against the pandemic and calls for immediate sanctions relief for humanitarian groups. It states that "the potential for sanctions to cause more harm to the populace than the ruling elite has been recognised at least since sanctions contributed to the humanitarian crisis in Saddam's Iraq during the 1990s". The report further cites the exemptions provided for in the UN sanctions regime against North Korea as a positive example of how to provide sanctions in times of extraordinary humanitarian risk. Since February 2019, the UN has granted exemptions to several humanitarian groups, organisations and Member States delivering medical supplies and assistance to North Korea to help fight the pandemic, including SAM Care International, Médecins Sans Frontières (MSF), the International Federation of Red Cross and Red Crescent Societies (IFRC), UNICEF, the European Banking Federation (EBF), the World Health Organization (WHO), Ireland and Switzerland.

The UK Commons report further cites INSTEX (or the Instrument for Supporting Trade Exchanges) as a possible mechanism to facilitate legitimate humanitarian trade with Iran. The instrument was designed to allow European firms to continue to trade with Iran despite the existence of US sanctions after its unilateral withdrawal from the Joint Comprehensive Plan of Action (more on this in the Compliance Watch section of Trust and Verify #163). The first of such transactions using INSTEX as a payment mechanism was announced on 31 March 2020 for the export of humanitarian goods to Iran to help in its fight against the pandemic.

Meanwhile, Switzerland announced on 27 February 2020 that it had set up its own special payment system for humanitarian trade with Iran: the Swiss Humanitarian Trade Arrangement (SHTA). The SHTA was reportedly developed "in close cooperation with the relevant authorities in the USA and in Iran, as well as with selected Swiss banks and companies", and is currently available to Swiss companies in the food, pharmaceutical and medical sectors.

In April 2020, the Governor of the Central Bank of Iran (CBI) requested that the IMF approve $5 billion in emergency loans to assist Iran with the outbreak of Covid-19. The

CBI suggested that the loans be processed via INSTEX or the SHTA. To date, the IMF is still assessing Iran' request, although reports suggest that the United States is blocking it.

Although the effectiveness and feasibility of these and other humanitarian exemption mechanisms is yet to be measured accurately, the coronavirus pandemic has placed renewed attention on the unintended effects of sanctions in an interconnected world where global health cannot be separated from the global economy. It remains to be seen whether the international sanctions landscape will emerge unchanged post-COVID-19, or whether it will need to adapt, alongside most other fields, to a new reality brought about by the pandemic.

Takeaways from the new UN Panel of Experts report on North Korea

Cristina Rotaru

On 13 April 2020, the UN Panel of Experts on North Korea, established pursuant to UN Security Council Resolution 1874 (2009), published its latest report on the implementation of sanctions on North Korea, including the country's sanctions evasion activities over the past year.

In particular, the Panel reported that in 2019, North Korea continued to develop its illicit nuclear and ballistic missile programmes, including by conducting 13 new missile tests and launching at least 25 missiles, of which several were new types of short-range ballistic missile and one new submarine-launched ballistic missile. The Panel also noted an increase in North Korea's capacity and infrastructure for those programmes, which are said to be increasingly relying on illicit external procurement.

Secondly, North Korea is reported to have again increased its illicit imports of refined petroleum products, particularly through ship-to-ship transfers and through direct deliveries of prohibited products by foreign-flagged vessels. These evasive activities are reported to be continuously growing in scale and sophistication, with both North Korea and its trading partners becoming increasingly overt in their evasions. Based on imagery, data and calculations provided to the Panel by the United States, it is estimated that the UN-imposed annual import cap of 500,000 barrels of refined petroleum products was exceeded by at least three, and possibly as many as eight times in 2019.

The Panel also noted that illicit exports of prohibited products, notably coal and sand, have been growing over the observed timeframe, and the report provides extensive documentation of several ship-to-ship transfers of such maritime commodities. North Korea is also said to have started shipping directly to China in large bulk carriers, including by making use of a ghost ship—a vessel purchased to be scrapped, and which officially appears to have been dismantled, but in actual fact is continuing to ship coal.

Meanwhile, North Korea's import of luxury goods and other sanctioned items, including luxury vehicles, alcohol and robotic machinery, is said to be continuing. The Panel also provided information on North Korea's increasingly sophisticated cyber operations and involvement in cryptocurrency evasion and theft, and reported on the elaborate ways North Korea continues to access international banking channels in violation of sanctions, mainly by using foreign facilitators.

Finally, the Panel recommended a series of designations and practical measures to address these challenges and shortcomings in the implementation of the sanctions resolutions.

EU paves way for comprehensive anti-money laundering and terrorist financing strategy

Cristina Rotaru

On 7 May 2020, the European Commission adopted a six-point Action Plan to strengthen the EU's policy on preventing money laundering and terrorism financing.

The 12-month Action Plan, which includes a proposal to create a centralised Anti-Money Laundering/Countering the Financing of Terrorism supervisory body, builds on six pillars: the effective implementation of existing rules; maintaining a single EU rulebook; EU-level supervision; a support and cooperation mechanism for financial intelligence units; better use of information to enforce criminal law; and a stronger EU in the world. These actions are based on previous findings of the anti-money laundering package that were published in 2019, including fragmentation of rules, uneven supervision and limitations in the cooperation among financial intelligence units across the EU.

The Commission has announced its intention to deliver on all the actions outlined in the Action Plan by early 2021. It also launched a public consultation to gather the views of citizens and stakeholder on these measures. The consultation will remain open to the public until 29 July 2020.

Science & Technology Scan

Quantum sensors

Grant Christopher

The subatomic quantum world is strange. Quantum phenomena are so odd that the science of the small is dubbed Quantum Weirdness. This weirdness, combined with the properties of cold atoms, will underpin the next generation of sensing technology: quantum sensors. This technology will improve radar, magnetic sensing, gravity mapping, and inertial guidance. More fundamentally, it will underpin the next generation of communications technology. For state competition in the 21st century the quantum technology race is as critical as the races in artificial intelligence and cyber warfare.

Quantum computing (see Trust and Verify No. 164) is just one application of quantum technology—the technological application of quantum weirdness. Billion-dollar quantum technology research and development programmes are being undertaken in the USA, China, Europe, East Asia and South Asia. These programmes are responsible for both the basic science research on the quantum phenomena and for developing the supply chain for quantum technology.

The significance of quantum sensors for arms control has been discussed only in the context of strategic stability; but it will likely also play a significant role in verification regimes. Some regimes already make use of sensors that will be improved by quantum technology. For instance, on-site inspections of the Comprehensive Test Ban Treaty (CTBT, which is not yet in force) include gravitational and magnetic field mapping. Quantum technology could be used in other regimes via satellites equipped with quantum sensors that enable the detection of treaty-relevant information, which could be complementary to, or in lieu of, ground access.

Underground maps can be developed by measuring gravity with sufficient accuracy. Small shifts in the Earth's gravity are imperceptible to humans, but tiny variations detectable by sensors can reveal the existence of heavier or lighter objects underfoot. Local gravity measurement equipment is currently used by the oil and gas industry to identify deposits by lowering gravity sensors into boreholes. From space, NASA's GRACE satellite produced maps every 30 days of the entire large-scale gravitational field of the Earth from 2002-2017, for applications in climate monitoring.

For the future of quantum gravity sensing there are two areas of development: sensors that can be deployed in the field that can map underground infrastructure and improvements in space-deployed sensors. Ground-based sensors are particularly sought after for applications in construction to map the subsurface. The development and deployment of quantum gravity sensors are likely a decade away, with longer needed for space-based sensors.

The current generation of gravity sensors are large and lack sufficient sensitivity for treaty applications. With strides in sensitivity a satellite could be used to find clandestine activity, such as tunnels and other underground facilities as they are constructed. A satellite would be able to circumvent access restrictions by a state. Not only could this be used to detect underground construction, but also the changes in rock formation that occur after a nuclear test.

Beyond gravity sensing quantum technology will enable other sensors relevant for arms control. Development is occurring for quantum radar, to counter stealth; quantum LIDAR (light detection and ranging) to detect in low light and through smoke; and quantum multispectral imaging. Magnetic sensors, which detect and monitor any object that creates an anomaly in the Earth's magnetic field, will also be in line for a quantum upgrade.

The improvements that quantum technology provide for communications will rest on developing quantum enhancements to the humble timepiece. The best clocks today are accurate to greater than one second over the current age of the Universe. In this light, seeking yet more accurate clocks using quantum technology seems like overkill. However, the applications for more accurate clocks are numerous and include navigation, detection of slow moving objects like drones, satellite navigation, provision of high-speed internet and time-stamping of financial transactions.

Great power competition is no stranger to competition for more accurate timekeeping. European nations offered prizes in the 16th-18th centuries to stimulate private research in accurate clockmaking. The goal then was to improve maritime navigation to gain mastery of the seas. Britain ultimately won this race and its Navy possessed a significant advantage after John Harrison won the prize offered by Parliament in the 1714 Longitude Act.

The international race for quantum supremacy encompasses more technologies than timekeeping, but the geopolitical stakes mirror the 18th century timekeeping competition. The dynamics that quantum technology will bring to great power competition are unknown. However, there will be corresponding benefits by deploying this technology for arms control.

Space debris and behaviour in space: Debris from Chinese rocket may have landed in Cote d'Ivoire

Anuradha Damale

There is a growing debate around safety and responsibility of objects in, and launching into, space. Given the increase in the number and type of space actors and missions, and lack of clear, consistent and universal debris mitigation guidelines, the risk faced in space and on Earth from space debris is becoming more tangible by the day. As such, the importance of establishing clear norms of behaviour in space is becoming more urgent.

The first launch of China's Long March 5B rocket came into scrutiny on 11 May after large pieces of space debris—allegedly part of the Chinese rocket—landed in the Atlantic Ocean and the Cote d'Ivoire after uncontrolled re-entry.

Harvard Smithsonian astrophysicist Jonathan McDowell had been tracking the event for two days. McDowell refers to a 'TIP' (Tracking and Impact Prediction) message on 'Space-Track' (a US project within the US-led Combined Force Space Component Command (CFSCC), a command formed under United States Space Command).

Space-Track is a Space Situational Awareness (SSA) information sharing platform. SSA refers to the ability to know the nature and position of an object in space, for safety or security purposes. At the time of writing, debates are taking place within the United States as to which US agency should be responsible for SSA. Nonetheless, Space-Track claims to be committed to "promoting a safe, stable, sustainable, and secure space environment through SSA information sharing" through collaboration with space-faring entities amongst other partners.

The Long March 5B is a heavy launch system tasked with launching modules for China's future space station. Rockets of this size usually consist of at least two stages: the first, or core, stage provides most of the force for the first few minutes of launch, detaches, and returns to an ocean on Earth; the second stage, lighter (or with less 'payload') and a thin upper atmosphere, forces the rocket into orbit to carry out a mission. Usually, when small scale stages fall back towards Earth, they burn up in the atmosphere. However, unlike some other two-stage heavy-lift launch vehicles, such as SpaceX's Falcon Heavy, the Long March 5B only had one core stage. At 21 metric tons, this meant that the core returned to a very low and unstable earth orbit for a week, and at least some parts of it were predicted to survive re-entry to Earth's atmosphere.

McDowell noted that an object had re-entered the atmosphere at several different points, passing over land, including New York. The US military confirmed that the object passed over the Atlantic Ocean shortly thereafter. A TIP message from Space-Track was then shared by McDowell, who reported another reentry at location coordinates 20W 20N, which is just west of the coast of Mauritania, Africa. Shortly afterwards, McDowell reported that the object had passed over Mauritania. A few hours later, images and reports on social media began to emerge of a 12-metre-long pipe-like object that had landed in the Cote d'Ivoire.

There were no casualties and confirmation is still awaited as to whether or not the object is part of the Chinese rocket. According to McDowell, residents reported flashes, sonic booms and pieces of debris falling that would be consistent with the object being part of the Chinese rocket. However, it is still unclear what would happen if the part is verified as being part of the rocket. Under the Outer Space Treaty's Space Liability Convention, a state is "absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth(. . .)and liable for damage due to its faults in space". While China acceded to the treaty in 1988, the Côte d'Ivoire has not. This means that the country is unable to hold China accountable.

This is not the first time that China has shown a cavalier attitude to debris from their spacecraft. For example, they often carry out launches over land rather than over sea, even though it is generally understood that sea-based launches (or isolated land launches) avoid the risk of damage to populated areas and interference with other missile and defence systems. International pressure seems unlikely to force China to reconsider its launch systems, but it is an issue of growing importance given that other space actors will also be launching in the immediate to near future. International discussions to develop new norms and rules, as well as a regulatory body, are urgently needed. These discussions will need to encompass a wealth of actors, from industry, academia, government and elsewhere. They will also need to include non-space faring states that benefit from space based assets, but can so clearly be harmed by uncontrolled space debris.

Centre News

National Implementation Measures

Sonia Drobysz, Yasemin Balci, Thomas Brown

The National Implementation Measures (NIM) team has continued to implement project work, adapting its methodologies to meet the challenges presented by the global pandemic.

In March 2020, the team completed its participation in European Union Chemical, Biological, Radiological and Nuclear Risk Mitigation Centres of Excellence (EU CBRN CoE) Project 67 on CBRN waste management in South East and Eastern Europe. Since 2018, VERTIC has worked with national experts in the partner countries to identify their main laws and regulations with regard to CBRN waste management and to discuss legislative improvements. Work has also continued under EU CBRN CoE Project 61 on the management of chemicals in Southeast Asia to develop comprehensive legal analyses of the partner countries' legislation for the sound management of chemicals and their wastes.

The NIM team has begun to implement two new projects. Since November 2019, NIM has been implementing EU CBRN CoE Project 81 on Enhanced Biosecurity in Southeast Asia. Programme Director Sonia Drobysz and Associate Legal Officer Thomas Brown remotely attended a kick-off regional meeting in Nay Pyi Daw, Myanmar in March 2020, during which Sonia presented on NIM's work package, which provides legislative assistance in relation to the Biological and Toxin Weapons Convention (BWC), the International Health Regulations (IHR) and other international instruments related to biosecurity. The project has been officially recognised as part of the EU-ASEAN response to the global COVID-19 pandemic.

NIM is also now implementing a project funded by the Norwegian Ministry of Foreign Affairs to provide legislative assistance for national implementation of the BWC, the Chemical Weapons Convention (CWC) and related provisions of UN Security Council Resolution 1540. NIM staff have begun updating the programme's assistance tools and initiated preparatory work for legislative analysis and legislative drafting in partner countries. The team has begun to consider ways in which awareness-raising and legislative assistance can be delivered remotely, to mitigate the threat caused by the pandemic.

Work has continued on two additional projects, with Sonia Drobysz and Senior Legal officer Yasemin Balci developing a Learning Unit of the EUNPDC e-learning series on non-proliferation and disarmament law, covering national implementation of CBRN instruments, likely to be released in 2021. Further, from 11 May to 5 June 2020, Sonia Drobysz presented eight online lectures as part of a course on CBRN transfer controls of the Master programme 'Economic Security of Entrepreneurship' at Taras Schevchenko National University in Kyiv, Ukraine. This course was supported by the Science and Technology Centre in Ukraine. Finally, in light of the COVID-19 outbreak, NIM published an awareness raising fact sheet on national implementation of the IHR and an addendum detailing how the IHR relates to the pandemic (see Recent publications in this edition of *Trust & Verify*).

Verification and Monitoring

Larry MacFaul, Noel Stott, Grant Christopher, Alberto Muti, Elena Gai and Anuradha Damale

Capacity building for nuclear disarmament verification

The team has continued to engage with partners in Kazakhstan, South America and South Africa on strengthening capacity building on nuclear disarmament verification (NDV), augmenting the workshops held in Pretoria and in Buenos Aires last year. In February, South African nuclear experts met and undertook to help a new generation get involved in NDV debates and activities. Due to the current COVID-related lockdowns, the first meeting in Kazakhstan and the second meetings in South Africa and Brazil are being rescheduled. Ongoing discussions have also taken place with international governmental organisations and partners in the research community on further initiatives to support awareness of the role of NDV and sustaining capacity and involvement in it.

At the end of June, Elena participated in the 'Geneva Dialogue on Nuclear Disarmament Verification' closed online workshop hosted by the Permanent Mission of Germany and the Geneva Centre for Security Policy.

Methodologies for nuclear disarmament verification

This programme has moved forward in refining methodologies to assess the nuclear fuel cycle and its potential for weapons production. This activity forms part of an ongoing project on understanding North Korea's nuclear fuel cycle, including their weapons production capacity. The project is being carried out by VERTIC, the James Martin Centre for Nonproliferation Studies (CNS) and the Royal United Services Institute (RUSI).

In April, the team published an outreach poster as part of the IPNDV Innovations in Nuclear Disarmament Verification Poster Event. The poster, entitled 'Fuel cycle modelling as a disarmament verification tool', presents conceptual work on using modelling to plan verification activities and to explore a range of fuel cycle scenarios. This activity includes the assessment of inconsistencies in assumptions about open source information, and the identification of key facilities, specifically for countries where knowledge of the fuel cycle is limited and uncertain.

Responding to alleged use of biological weapons

In May, VERTIC published a report entitled Tabletop Exercise on UNSGM Investigation of Alleged Biological Weapon Use. The report outlined the main conclusions and lessons identified during a tabletop exercise (TTX) that was run by VERTIC late last year. The TTX explored the possible challenges to an international investigation run under the UN Secretary-General's Mechanism for investigation of alleged use of chemical and biological weapons (UNSGM). The TTX focused on a scenario in which the alleged use of a biological weapon was being investigated (See box on the report for further details). The team continues its research and support for capacity building for responses to alleged biological weapons use.

Other activities

In February Researcher Elena Gai joined a round table discussion on 'A World Without NPT Redux' held at Chatham House, an IISS Event on 'The Politics of Arms Control' featuring US Assistant Secretary Christopher Ford and a Civil Society Event during the P5 Process organised by King's College and the European Leadership Network. She also attended a webinar on 'Gender and Nuclear Security: Challenges and Opportunities for Greater Participation of Women in Nuclear Security' hosted by WINS in Vienna and the seminar, 'Explaining Change in Russian Nuclear Strategy After the Cold War', hosted by the Harvard Kennedy School of Government.

In April, Research Assistant Anuradha Damale was a speaker at the Space Society in Context Conference. Anu presented on Space Situational Awareness technologies. She was also an invited keynote speaker at the ICAN, WILPF and Campaign to Stop Killer Robots joint event entitled 'Gender, Power, and Arms: The Interlinkages between International Armament, Masculinities, and Discrimination' in Berlin in February.

On 18 June, Larry MacFaul attended the online 'CBRN Summit – Lessons learned during Covid-19' hosted by the African Center for Science and International Security. Later in June, Larry also attended the online seminar 'Can Cooperation on Missile Defense Avoid a U.S.-China Nuclear Arms Race?' hosted by Carnegie Endowment for International Peace.

Team news

In February, Anuradha Damale was invited to become a member of the Younger Generation Leaders Network, a branch of the European Leadership Network. Anu was awarded the Rising Star award by 'We Are The City' in May for her work in equity, diversity and inclusion in international security and peace. In June, Anu launched and assumed directorship of the UK Branch of Women of Color Advancing Peace and Security.

The team was extremely pleased to be joined by Matthew Albon as an intern from January to April. Matt holds an LLM in Public International Law from the University of Nottingham and a BSc in International Relations from the University of Southampton. Matt's research interests have focused on the verification of arms control treaties, destruction of unexploded ordnance, UNSC peacekeeping and peace enforcement missions. He has work experience at the OPCW and the Tanzania Development Project. During his time at VERTIC, Matt provided valuable contributions to our project on capacity building in nuclear disarmament verification. He also provided support to the National Implementation Measures team, and represented VERTIC at the Chatham House Roundtable discussion on 'A World Without the NPT Redux'. We would like to thank Matt for his important contributions to our projects and wish him well for his future career.

Compliance Mechanisms and Measures

Angela Woodward and Cristina Rotaru

VERTIC's latest strategic plan for the period to January 2022, which was approved by the Board at the charity's Annual General Meeting in March 2020, creates a new Compliance Mechanisms and Measures programme to replace the Special Projects moniker. The new programme stands alongside VERTIC's other two programmes: 'Verification and Monitoring' and 'National Implementation'.

The Compliance Mechanisms and Measures programme works on matters of interpretation, clarification and concurrence. It researches the components of compliance, analyses and enhances the role of compliance processes, promotes exemplar compliance bodies and dispute settlement processes, examines responses to non-compliance, and conducts training on compliance. The projects currently being carried out by the Special Projects team were subsumed into this new programme.

Sanctions-related research and workshops

During the first half of 2020, the Compliance Mechanisms and Measures programme staff continued to work on sanctions-related research and workshops, maintaining a particular focus on states' legal implementation of UN Security Council maritime-related sanctions on North Korea. Programme Director Angela Woodward participated in a national workshop on implementation of UN maritime sanctions concerning North Korea held in Belmopan, Belize during 9-10 January 2020. Angela gave presentations on states' maritime-related obligations under the UN Security Council Resolutions concerning North Korea, and provided training to workshop participants on implementing these requirements in national regulatory frameworks.

Cristina Rotaru attended several online workshops and seminars on sanctions-specific matters, including: a Royal United Services Institute (RUSI) Webinar with Alastair Morgan and Yvonne Yew on the UN Panel of Experts 2020 Report on the Democratic People's Republic of Korea on 22 April 2020; a Korea Project-Cyber Project Joint Speaker Series Webinar titled 'Looking in the Right Places: Using Non-Traditional Datasets to Study North Korea' on 5 May 2020; and an Atlantic Council Webinar on the Four-Month Countdown to the Expiration of the UN Arms Embargo on Iran on 10 June 2020.

As travel for outreach and training activities under these projects was suspended in March 2020, programme staff worked to develop materials for online delivery. During this time, any legislative assistance and training usually provided by the team during in-person workshops was reshaped for remote delivery. This process included the drafting, production and deployment of an online e-learning module in accordance with project aims, and the preparation of course materials and outreach for a webinar with relevant maritime stakeholders. The team also continued to provide legal opinion to the Consortium on trends and gaps in implementing measures for Belize, Cambodia, Comoros, Indonesia, Malaysia, Panama, Philippines, Singapore, Thailand and Vietnam.

Other training and outreach

On 6 March, Angela gave a talk on NGO engagement with Public International Law to a postgraduate law course at the University of Auckland, New Zealand, led by Professor Alison Duxbury of the University of Melbourne Law School. Afterwards, she met with Professor Duxbury, and Associate Professor Treasa Dunworth and Dr Anna Hood of the University of Auckland Law School, to discuss respective research interests.

On 10 March, Angela gave a talk on nuclear disarmament at a New Zealand Parliament Symposium in Wellington to mark the 50th Anniversary of the Nuclear Non-proliferation Treaty, hosted by the Public Advisory Committee for Disarmament and Arms Control and the Under-Secretary for Disarmament and Arms Control, Fletcher Tabuteau. The keynote speaker was Ms Izumi Nakamitsu, United Nations High Representative for Disarmament Affairs, who also gave a public lecture to the New Zealand Institute of International Affairs that evening on the UN Secretary General's Agenda for Disarmament. Angela met with Ms Nakamitsu again the following day, at a meeting for civil society organisations hosted by the Ministry of Foreign Affairs and Trade (MFAT). Angela also met with MFAT officials to discuss UN sanctions implementation during her visit. On 13 March, Angela met with Ambassador Jesus (Gary) Domingo, Philippine Ambassador to New Zealand, to discuss topical arms control and disarmament issues during his outreach visit in Christchurch.

In her role as an Executive Council member of the Disarmament and Security Centre (DSC), based in Christchurch, New Zealand, Angela participated in DSC governance meet-

ings on 17 April and 22 June, via Zoom, and participated in a 'Disarm Kōrero' (discussion) with the New Zealand arms control and disarmament community, organised by the DSC, on 26 May, all via Zoom.

Angela's work was profiled in an article in a New Zealand current affairs magazine during this period (Craig Greaves, 'The Kiwis taking on war criminals, killer robots, overfishing and nuclear bombs', The Listener, 4 February 2020).

Cristina Rotaru participated in a Strategic Trade Research Institute Webinar on Blockchain Technology Applications for Export Controls and Nuclear Safeguards with expert speakers from the Stimson Center on 25 June.

Other Centre news

During the first half of 2020, trustees Dr Sverre Lodgaard and Mia Campbell resigned from the Board. We thank them for their service. We welcomed to the Board Richard Burge, a former Chief Executive of Wilton Park, and Dr John Walker, former Head of the Arms Control and Disarmament Research Unit at the UK Foreign and Commonwealth Office until his retirement in May 2020.

On 10 April 2020, VERTIC shuttered its office in accordance with UK government measures in response to COVID-19, and to protect our staff and visitors. All staff are working remotely and are available by email and video conference. VERTIC outreach continues through its digital channels: website, social media and emails.

In memoriam

VERTIC sends condolences to the family, colleagues and friends of Professor Julian Perry Robinson, who died on 22 April 2020 from COVID-19-related complications. Julian was a pre-eminent scholar on chemical and biological arms control and disarmament, and co-founder, with Professor Matthew Meselson, of the Harvard Sussex Program, with its UK base at the Science and Policy Research Unit at the University of Sussex. Julian supported the burgeoning careers of many new researchers at VERTIC and he is dearly missed by us all.

VERTIC

building trust through verification

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Mission statement

VERTIC is an independent, not-for-profit, non-governmental organisation. Our mission is to support the development, implementation and effectiveness of international agreements and related regional and national initiatives, with particular attention to issues of monitoring, review, legislation and verification. We conduct research, analysis and provide expert advice and information to governments and other stakeholders. We also provide support for capacity building, training, legislative assistance and cooperation.

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