Scientific Expertise and the Governance of Nuclear Technologies: The Case of the Limited Test Ban Treaty

Anne I. Harrington, Cardiff University / Matthias Englert, Oeko Institute

Prepared for presentation at the INMM workshop on “Novel Technologies, Techniques and Methods for Safeguards and Arms Control Verification”
30 Aug 2017
Sandia National Labs, Albuquerque, NM
Outline

• Science Diplomacy and Technopolitics
• Case of the Limited Test Ban Treaty
  • Elements of a Limited Test Ban
  • Technical Issues
  • Road to a Comprehensive Test Ban
• Implications for the Fissile Material (Cut-off) Treaty
Science Diplomacy

• What is the role of scientists in arms control agreements?
Science Diplomacy

• What is the role of scientific expertise in determining the outcome of arms control negotiations?

1. Scientists are largely irrelevant; arms control agreements are epiphenomenal of great power interests.

2. Scientists are technical consultants. They advise on the feasibility of monitoring and verification measures.
Science Diplomacy

Great Power Politics

Science and Technology
Science Diplomacy
Science Diplomacy

Great Power Politics

Science and Technology
Science Diplomacy

Technopolitics
Technopolitics (useful shorthand)

Gabrielle Hecht:

“the strategic practices of designing technologies to enact political goals.”

“Instead of a single, discursive decision, we see a complex process whereby political choices are inscribed into technologies, which subsequently favor certain political outcomes over others.”

‘technopolitical’ which she finds “useful shorthand for describing both how politics can be strategically enacted through technological systems, and also how technological systems can be re-appropriated for political ends in ways that were unintended by their designers. The point, really, is to highlight the myriad politics of materiality.”
A Technopolitical Approach to Arms Control

• The strategic practice of designing arms control agreements supported by monitoring and verification regimes to enact political goals.

• It becomes possible to contest political agreements through the development of new technologies.
Elements of a Limited Test Ban

• Worries about the health impact of radiation in the atmosphere in the 1950s

Castle Bravo Test March 1 1954

Lucky Dragon

B (danger zone), W extension, xF Lucky Dragon
Elements of a Limited Test Ban

- Worries about the health impact of radiation in the atmosphere in the 1950s

Atmospheric C14

Thyroid dose per capita from US atm. tests
Elements of a Limited Test Ban

• Worries about the health impact of radiation in the atmosphere in the 1950s
• N-th state problem – Proliferation (Germany)

- Germany considers nuclear option since 1956 (Adenauer, Strauß)
- France offers nuclear partnership 1957
- US talks about atomic weapons in German armed forces
- 1958 Sputnik
- 1960 France nuclear test
- 1961 Berlin Crisis
- 1962 Cuban Crisis
Elements of a Limited Test Ban

• Worries about the health impact of radiation in the atmosphere in the 1950s
• N-th state problem – Proliferation (Germany)

• Allowing for underground tests:
  • Slow down horizontal proliferation while improving arsenal (vertical proliferation)
  • Separate nonproliferation from disarmament
Technical issues

• Discrimination
• Signal strength (e.g. $m=3.9+0.6 \log \text{Yield}$)
• Deception (e.g. decoupling)
• Timeliness (data transfer)
• Location
• On-site inspections

North Korean Tests
Source: CTBTO
Technical issues

- Discrimination
- Signal strength (e.g. $m=3.9+0.6 \log \text{Yield}$)
- Deception (e.g. decoupling)
Underground tests not verifiable? The Group of Scientific Experts

• GSE - Group of Scientific Experts established with mandate by Committee for Disarmament 1976.
• Open-ended Mandate from CD 1980. Nationally funded
• Developed design of IMS, data center, education of experts (for CTBTO) and diplomats
• Technical Tests GSETT 1,2,3 (1984-1994)
• GSETT 3 in 1995
• GSE disbanded 1996

Adapted from Presentation of Ralph Alewine
Group of Scientific Experts (GSE)

• Ola Dahlman: “The GSE work on nuclear test detection is an example of technical work on verification that went on for many years without any political negotiations, or even an agreement to contemplate such negotiations.”

• Restricted itself to purely technical and scientific work not evaluating the adequacy of a monitoring network ("purely scientific responsibility").

• But with the GSETT tests they effectively showed that monitoring is feasible (fabrication of trust).

• Thesis: More diverse role of GSE beyond pure science.

Adapted from Presentation of Ralph Alewine
NRDC dissents with some findings of GSE.

Independence of GSE?

NRDC Experts have no clearance and are able to speak openly.

Open vs. secret. Inside – Outside.

Conducted first publicly funded seismic experiments in Nevada and Soviet Union, despite government opposition.

Adapted from Presentation of Ralph Alewine
Road to Comprehensive Test Ban Treaty

• After being *convinced* by scientific results, experts and diplomats were enabled to establish trust and convince in turn their governments that effective verification of underground testing can be trusted.
Comprehensive Test Ban

• Negotiation started 1993
• Three years discussion in CD (data transfer big issue until today)
• Opened for signature 1996
• US signed, but 1999 rejected ratification
• Experts are contested by dissenting experts. Ratification stalled.
CTBTO Today
Implications for the Fissile Material (Cut-off) Treaty

• Verification challenges:
  • Distinguishing new production from pre-existing material
  • Verifying that production said to be for naval fuel is really being used for that purpose.

• Maintaining objectivity
  • Correctness vs Completeness