

Governance of dual-use technologies: From the international to the individual level (*Part 1: The international level*)

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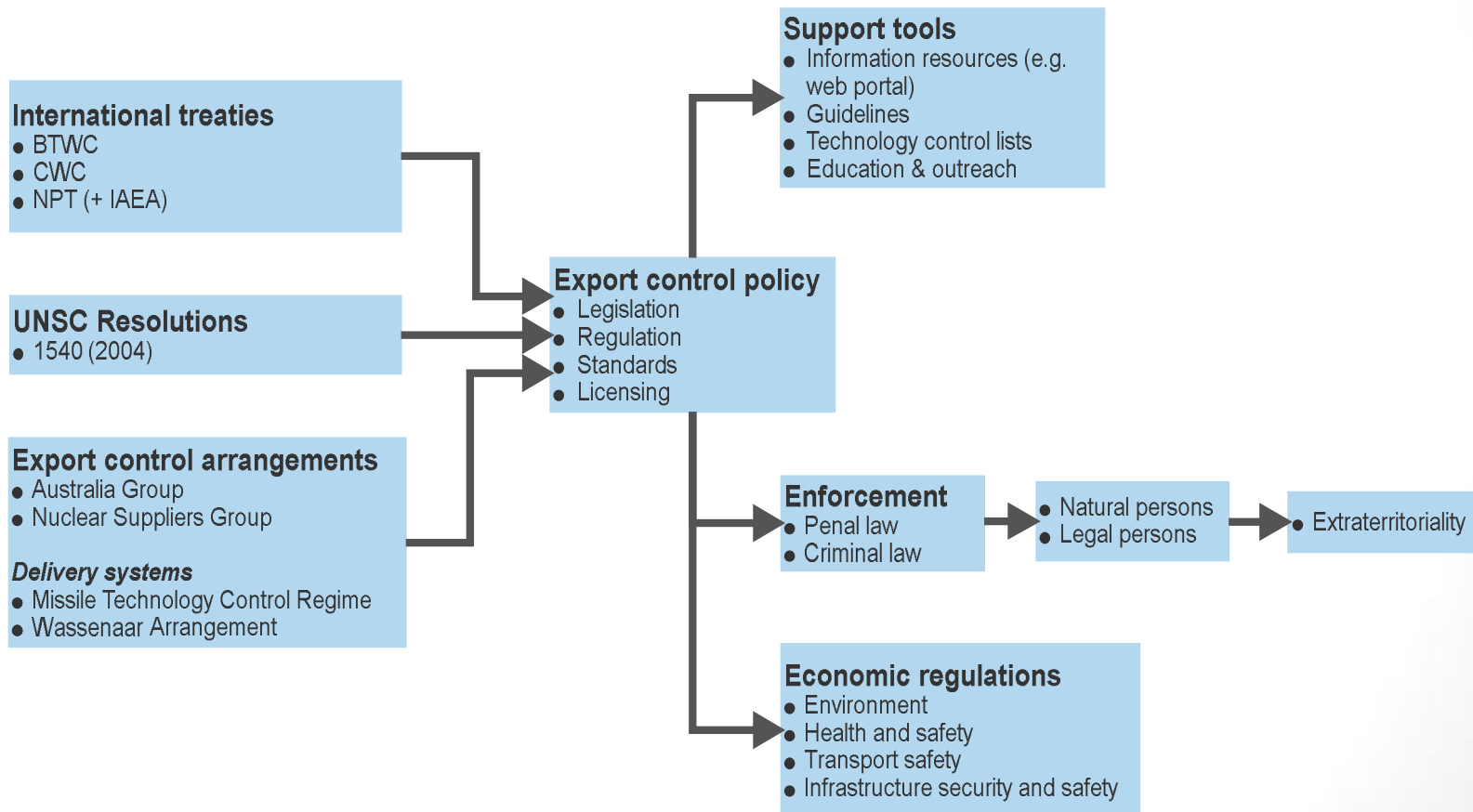
Part 1

REGULATORY FRAMEWORKS IN A DYNAMIC ENVIRONMENT

Legal foundations of an export control system

International instruments

State-level implementation



A dynamic environment

- Treaties govern inter-state behaviour; new dynamics are less state-centric
 - Impact on verification requirements in international treaties
 - New forms of technology transfers
 - Difficult to capture under current transfer control regimes
 - Emphasis on national implementation
- Individualisation of threats and threat perceptions
 - A major consequence of terrorism
 - Increasingly, governments frame responsibilities for individual economic actors and professionals

New security actors

- Intent on harm
 - Criminals & terrorists
 - Have potential interest in CBRN materials
- Economic imperatives have replaced security imperatives
 - Sub-state economic units.
 - Industry, shipping agencies, etc.
 - Research institutes
 - Researchers, students, etc.
 - Transnational economic units
 - Multi-national corporations
 - State (agencies)
 - International organisations

Fragmentation of the global system (*polycentrism*)?

- Different levels of decision making
 - economic units ... governments ... transnational actors ... international organisations
- Values and future impact on international law
- Growing emphasis on the region, including for security dynamics
- Different languages and discourses
- Different organisation and oversight of R&D & production
 - E.g. research teamwork in the cloud (members from different countries working in different countries)

Part 2

GOVERNANCE CHALLENGE:
FAST EVOLVING SCIENCE AND TECHNOLOGY IN A
RAPIDLY CHANGING ECONOMIC AND SECURITY CONTEXT

Chemical Warfare: Confluence of several trends

- **Emergence of chemistry as a science**
 - End 18th century; rapid development in 19th century
 - Development of new analytical and production methods
 - Toxic chemicals are manufactured; not derived from nature
- **Discovery and synthesis of new chemicals**
 - *Chlorine*: first preparation in 1774
 - *Phosgene*: first preparation in 1811
 - *Mustard gas*: compound first described in 1822; first useful synthesis process of sulphur mustard in 1886
- **Industrialisation**
 - Second industrial revolution in the 2nd half of the 19th century
 - Commercial application of chemistry
 - Integration of science and large-scale production based on economic rationale
- **Education**
 - Permeation of science and technology throughout society
 - Impact on problem identification, analysis, and application of technical solutions in all sectors of society
- **World War 1**
 - Industrialisation of warfare (total war)
 - Forced integration of science, industry and military art

Foundations of biological warfare

- Three critical characteristics of disease uncovered in late 19th century:
 - Infectious disease is caused by an agent (pathogen)
 - The agent can be transmitted from one living organism to another (infectiveness)
 - One agent is responsible for one disease only
- Furthermore, it requires the ability to manipulate the pathogen
 - Isolation
 - Cultivation (while maintaining its infectiveness)
 - Production in large quantities
 - Effective dissemination

Potential for future BW development

- Biology and biotechnology allow for the manipulation of disease on the sub-cellular level (genes, biochemical processes, etc.)
 - May make the effects of biological agents more controllable
 - May produce agents with higher infectivity or ability to overcome medical defences
- Interference with the natural immune system rather than dissemination of pathogen may become new mode of attack
- Improvements in analytical and production processes:
 - Higher quality & higher quantities in smaller units
 - Technologies become common place (classroom equipment; bio-hacker laboratories)
 - DNA data exist as digital information on computers and in databases
 - Additive manufacturing (3D-printing) to construct synthetic tissue (incl. pathogens)
- Possible application of synthetic biology and nanotechnology in agent design or dissemination technology, as well as in defence, protection and prophylaxis
- May contribute to novel ways of agent dissemination
 - Aerosol techniques
 - Targeting of specific genes

New confluences in science and technology

- Convergence of several scientific and technological domains:

- Biology and chemistry
 - Development of new generation of incapacitating agents
 - Manipulation of biochemical processes on sub-cellular levels
- Nanotechnology (chemistry and physics)
 - Construction of artefacts on the level of individual molecules or atoms
 - May also be useful for new CBW defence technologies, protection or detection
- Informatics
 - Computer-assisted creation of new compounds and study of their properties
 - Increasingly fast design of new molecules / gene sequences
 - 250,000 new genes sequenced/day; 15,000 new chemicals registered (CAS)/day
 - Simulation of processes
- Engineering and process designs

- Evolution of production processes:

- Modular production processes → may pose challenges for verification thresholds in treaties
- Computer-steered production processes: consistent quality, reduced need for cleaning or interruptions for feeding (e.g., incubation or fermentation processes)

Entrance of the *post-proliferation era*? – 1

- **Biological:**

- Biology and biotechnology critical to development & health
- Many developing countries conduct leading-edge research
- Education expanding everywhere:
 - Geographical spread of knowledge to manipulate pathogens, including genetics
 - Banalisation of many research and development processes (e.g., introduction into secondary education; drop in cost of equipment and processes; etc.)
- Biotechnology is essentially information: no physical goods to cross borders
- Corporate acquisition and sell-offs

- **Chemical:**

- Similar to the biological sphere
- Many large (older types of) production facilities with potential for CW manufacture now in developing world
 - Earlier technological monopolies no longer with advanced industrial societies
 - Impact on organisation & cost of verification under the CWC

Entrance of the *post-proliferation era*? – 2

- Nuclear:

- Global warming and growing interest in nuclear energy
- Commercial pressure to access new markets
 - e.g., US-India & US-UAE bilateral agreement; Saudi Arabia forthcoming
- Regional rivalries
 - Will new nuclear-armed states arise?
 - E.g. statements by Brazil, Iran, Saudi Arabia, Turkey

Key points to bear in mind ...

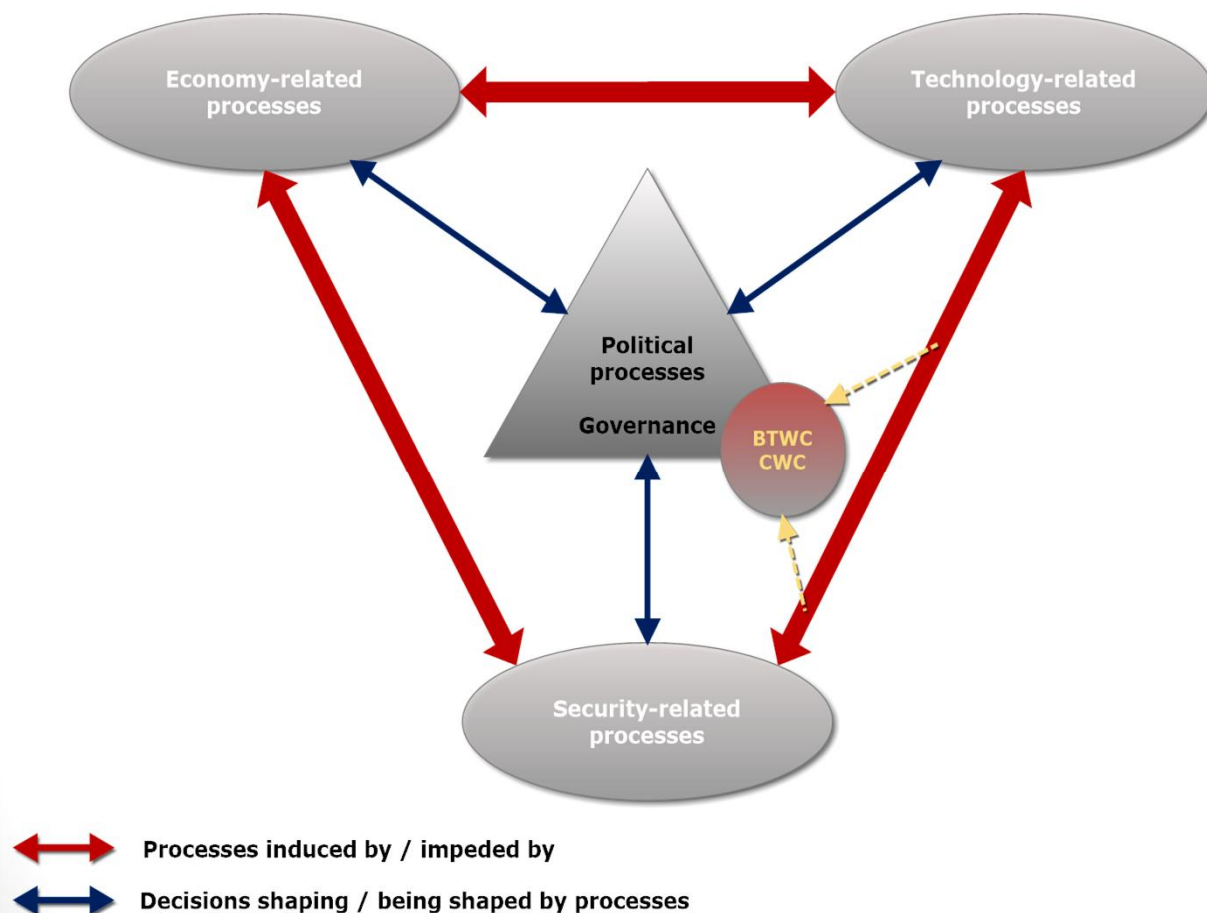
In the prevention of proliferation,

- We are no longer dealing only with weapons and their delivery systems;
- We are looking at the whole range of activities that may contribute to weapon development
 - (Fundamental and applied) research,
 - Technology development, and
 - Technology production
- In the full realisation that
 - Many such activities may today not have any clear bearing on weapon development;
 - The potential utility for military applications of technologies currently under investigation or development may not become apparent until some point in the future; and
 - Most of these contributing activities of potential CBRN relevancy may be taking place outside of military organisations, or weapon-related industries, or the defence sphere in general

Part 3

TOWARDS MULTI-LAYERED GOVERNANCE IN A POLYCENTRIC WORLD

BTWC & CWC in a polycentric world



- § No unified model for governance of weapon control anymore
- § New stakeholders and security actors
- § Increased role of non-state national & transnational actors
- § Shifting relative balances of powers (economy, politics, military) and multiple power centres
- § Geographical decentralisation of business and industry activities
- § South-south trade patterns and impact on technology diffusion
- § *Declining role of states in shaping developments, but many states reject formal governance responsibilities for non-state actors under BTWC & CWC*

Multi-layered & multi-sectorial governance model? – 1

- **Weapon control**
 - Multilateral agreements (Geneva Protocol, BTWC, CWC)
 - Proliferation prevention arrangements (Australia Group, PSI, Global Partnership, etc.)
 - UN agencies: UNSC, UNODA, 1540 Committee, UNEP, UNDA, etc.
 - National laws and regulations (criminal, penal, trade, safety, etc.)
- **Disease prevention**
 - WHO, FAO, OIE + their regional organisations/initiatives
- **Crime and terrorism**
 - UNSC Resolutions (1540, terrorism resolutions, etc.)
 - Interpol, Europol, etc.

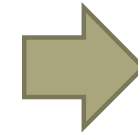
Multi-layered & multi-sectorial governance model? – 2

- International transfers

- WTO, WCO, etc.

- Economic actors

- Companies (national, multinational, transnational)
- Research institutions
- Individuals



Your role!

- Instruments of collective & individual governance

- Codes of conduct; Professional codes; Ethics
- Awareness-raising & education
- Whistle-blower protection schemes

In conclusion:

Education about export controls ...

- Is about changing attitudes of individuals or groups
 - Audiences need to acquire enhanced awareness about the potential implications of their activities and individual actions
 - They must be able to identify and assess short-term and longer-term risks and threats
 - They must acquire situational awareness to maintain standards of responsible behaviour
- Knowledge transfer is insufficient to shape attitudes
 - Audiences need to be engaged
 - They need to discover for themselves *why* the issue area is important / relevant to them
 - They need to discover *how* they can mitigate risks and threats
 - The insights need to become part of the daily professional routine



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