

Future Disarmament Challenges for Chemical & Biological Weapons

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The Trench

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Part 1

WHAT IS CHEMICAL AND BIOLOGICAL WARFARE?

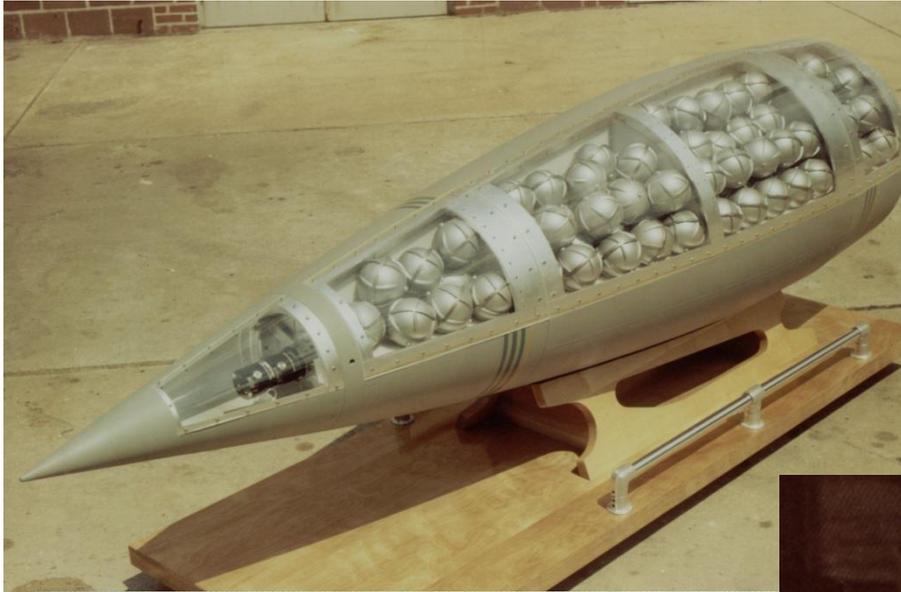
What is chemical warfare?

Intentional application for hostile purposes of toxic substances against humans and their environment

- *Blood agents*: prevention of oxygen transfer to tissues (e.g. phosgene)
- *Choking agents*: interfere with breathing (e.g. chlorine)
- *Nerve agents*: attack the central nervous system (e.g. sarin)
- *Vesicants*: produce blisters (e.g. mustard agents)

- *Incapacitating agents*: induce temporary physical disability or mental disorientation (e.g. LSD, BZ, Fentanyl)
- *Irritating agents*: induce temporary irritation (e.g. tear gas)
- *Anti-plant agents*: herbicides, growth inhibitors, etc.

Chemical warfare



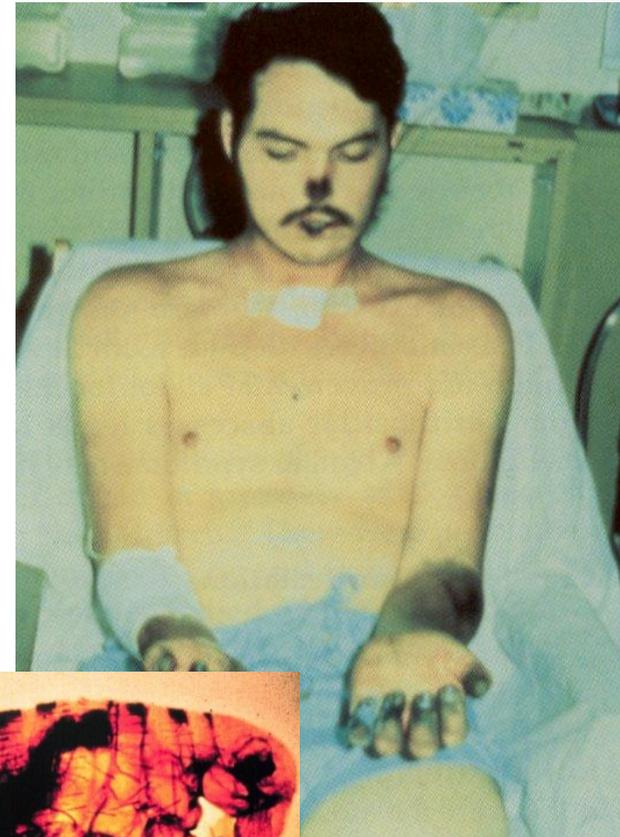
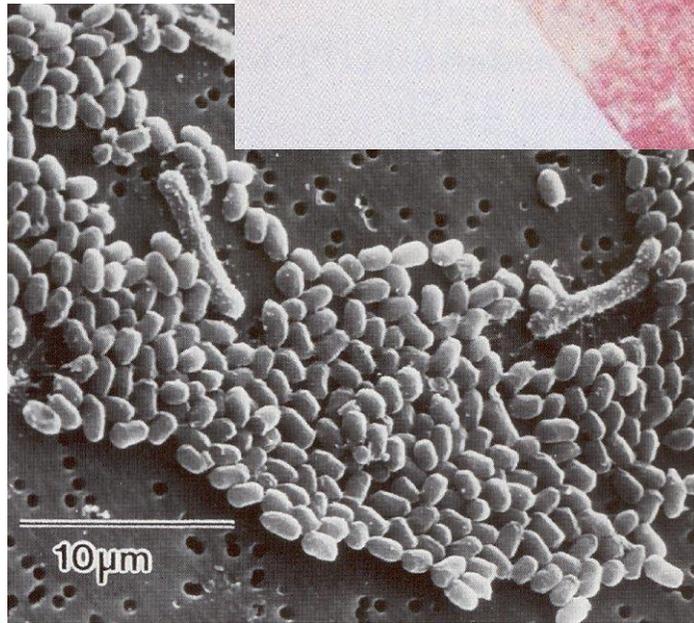
What is biological warfare?

Intentional application against humans, animals or plants for hostile purposes of

- *Disease-causing micro-organisms* (e.g. bacteria);
- *Other entities that can replicate themselves* (e.g. viruses, infectious nucleic acids and prions)
- *Toxins*, poisonous substances produced by living organisms (and their synthetically manufactured counterparts), including
 - micro-organisms (e.g. botulinum toxin),
 - plants (e.g. ricin derived from castor beans), and
 - animals (e.g. snake venom)

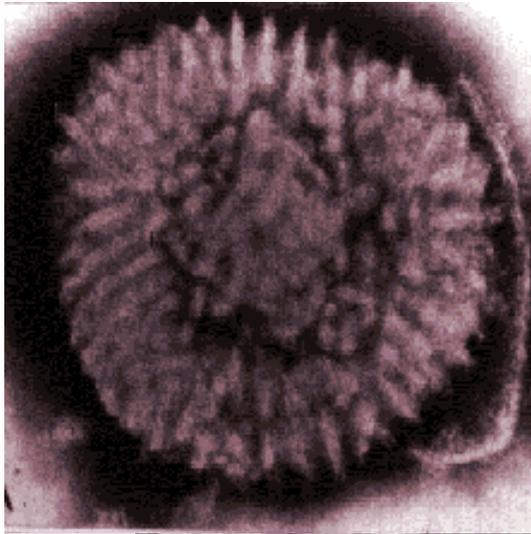
Visions of Biological Warfare

Anthrax



Plague

Visions of Biological Warfare – 2



Smallpox

The CBW threat spectrum

- War scenarios
- Terrorism
- Criminal acts

- Each will consider and have the availability of different CB agents, with different degrees of pathogenicity or toxicity
 - Depends on *intent*
 - Depends on *availability*
 - Depends on *technical skills* and *structure* of the organisation

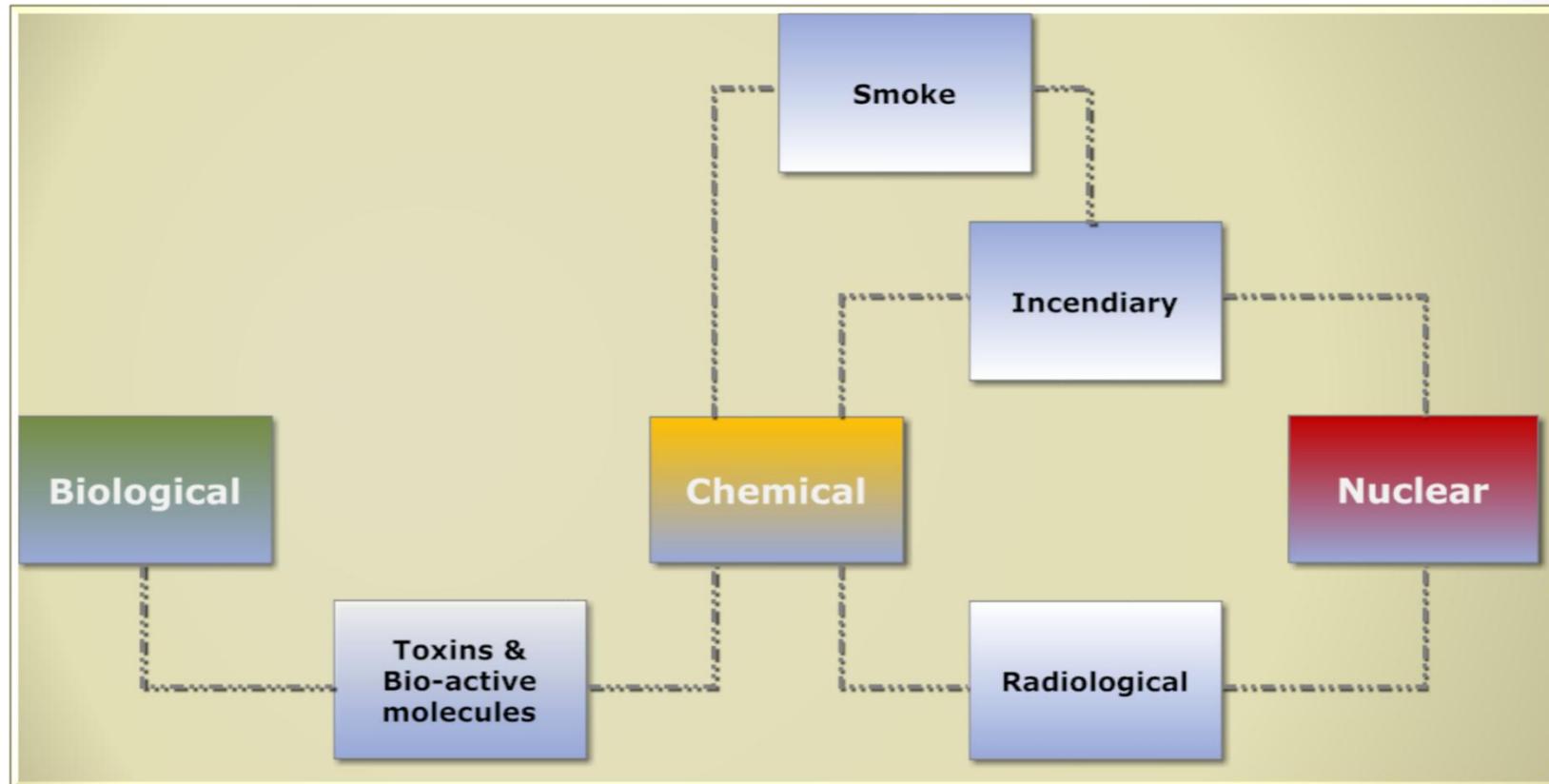
Alternative uses of CB agents

- **Against humans**
 - Potential for mass casualties exists, but not necessarily most likely scenario as agents difficult to acquire
 - Incapacitation
 - Wider range of agents available
 - Easier to collect from nature and cultivate
 - Delivery uncomplicated
 - Lower requirements for skills and functional specialisation
- **Against animals and plants**
 - Economic impact
 - Agents easier to acquire; less of a risk to perpetrator
 - Easy to deploy
 - Many vulnerabilities in the food chain
- **Economic and societal disruption**
 - Goal is to disrupt functioning of utilities, commercial enterprises, public agencies
 - Wider range of CB agents available
 - Several can be commercially obtained
 - Exploitation of fear and lack of adequate preparations
 - Effectiveness of hoaxes

Part 2

PROHIBITING CHEMICAL AND BIOLOGICAL WARFARE

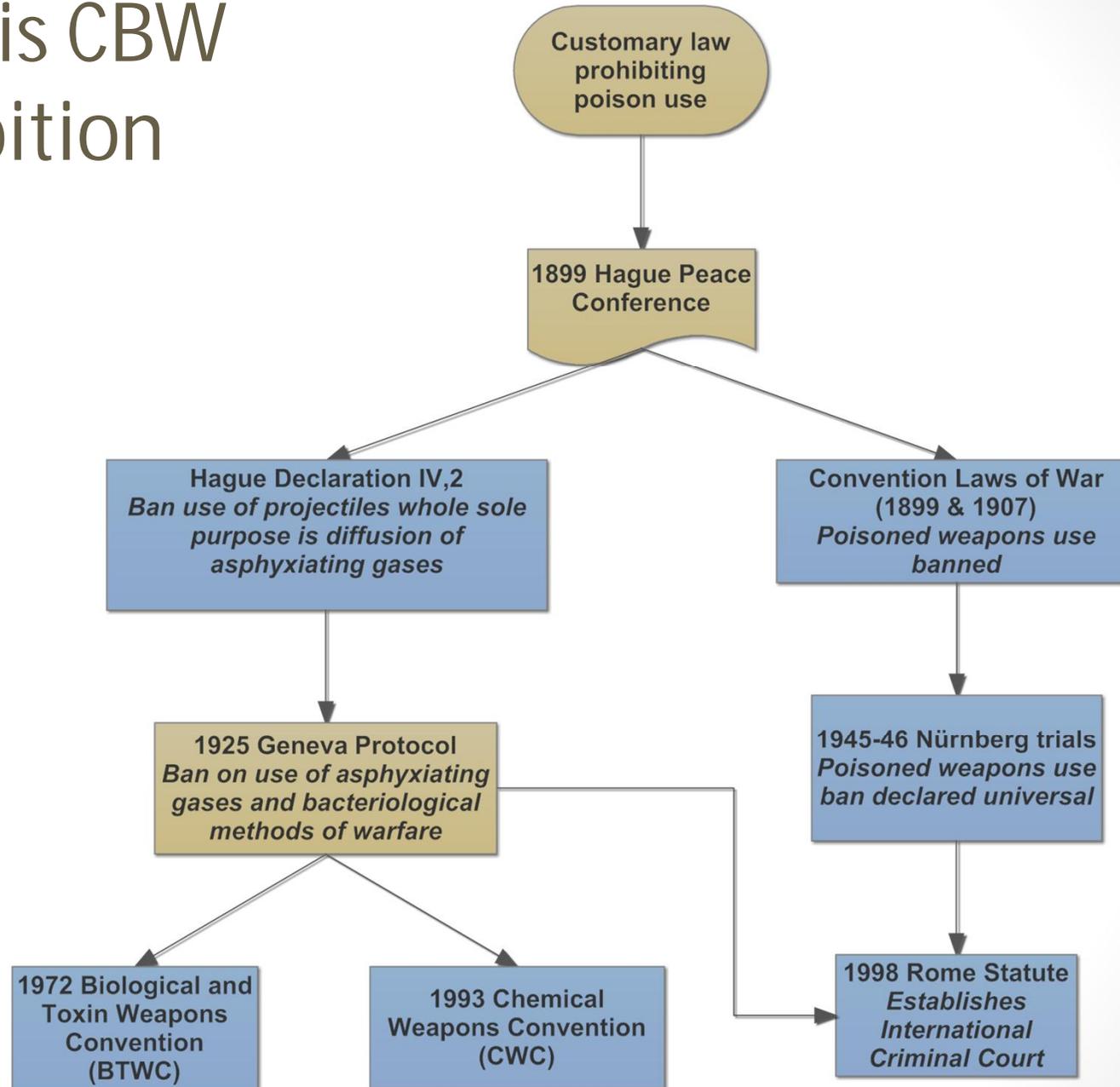
Non-conventional weapons



Main prohibitions against CBW

- 1925 Geneva Protocol
 - Prohibits the use in war of CBW
- 1972 Biological & Toxin Weapons Convention (BTWC)
 - Comprehensive ban on development, production and possession of BW
 - Ban on BW use in Geneva Protocol + Final Declaration of 4th Review Conference (1996)
- 1993 Chemical Weapons Convention (CWC)
 - Comprehensive ban on development, production, possession, and use of CW

Genesis CBW Prohibition



CW: 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

The 'dual-use' challenge

- **Dual-use issues** arise when the attempts to control a particular technology confront the non-military commercial and scientific interests in such technology
- **Non-proliferation**
 - **Control of access to technologies** that may contribute to undesired weapon development in another state or non-state entity
 - Primary policy tool for weapon categories whose use in war or possession has not been wholly delegitimised (e.g., nuclear weapons, ballistic missiles)
- **Disarmament**
 - Total ban on **development, production, transfer and possession** of a weapon and **preparations** for its use in warfare (BTWC, CWC)
 - 'Dual-use' issue emerges when
 - Civilian facilities and installations need to be verified
 - Technologies underlying banned weapons have legitimate applications
 - Need to prevent the (inadvertent) assistance to development of banned weapon by another state or non-state entity
 - Ban of weapon (= single-use technology) is central; control of dual-use technology supports that central goal → use of the concept of the *General Purpose Criterion*

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)

Armament vs. Disarmament

- **Armament**
 - Process of assimilation whereby an arm or arms category becomes fully integrated into military doctrine
 - Political (security policies, bureaucratic interests, etc.) and military (doctrine) imperatives must be reconciled with each other
 - Outcome: weapon technology deployed with military forces → stockpiling, training, etc.
- **Disarmament**
 - Removal of an arms category from military doctrine (Go to zero)
 - Weapon destruction is one facet of disarmament (= backward looking dimension)
 - Prevention of re-armament or re-emergence of weapon technology is also a goal (= forward looking dimension)
 - Outcomes:
 - Removal of pull / push factors that stimulate the armament dynamic
 - Military forces lose capacity to use weapon: no weapon testing, no training, no tactical development
 - A ban on weapon technology and its use becomes a major moral & legal disincentive for future armament (political and societal opposition)
 - Consequence: gap in security policy; has to be addressed by alternative, non-prohibited means
 - Diplomacy; alliance policies; armament with non-prohibited weaponry that performs a similar function in military doctrine
- **(Arms control)**
 - Maintenance of specific levels of weaponry (mostly weapon reductions, but may involve increases)
 - Weapon technology not removed from military doctrine

Disarmament strategies

- **Eliminating destabilising types of weaponry**
 - Armament categories that may contribute to the outbreak of war
 - 1910s: battleships
 - Biological Weapons (BW); Chemical Weapons (CW); Nuclear weapons (NW)
 - Certain types of delivery systems
 - *Current challenges*: cyber weapons; space weapons
 - Armament categories that risk to escalate conflict if they were used
 - CW; Certain sub-categories of NW (e.g. tactical weapons)
- **Removing weapon categories that are excessively injurious (to non-combatants)**
 - Post-conflict weapon recovery and destruction
 - Small arms collection and destruction
 - Demining operations
 - Rendering acquisition, possession and use illegal under international law, with additional requirement to destroy existing stockpiles
 - Landmines; Cluster munitions
 - Nuclear Weapons
 - Lethal Autonomous Weapons (so-called 'Killer robots'); Artificial Intelligence in weapon systems

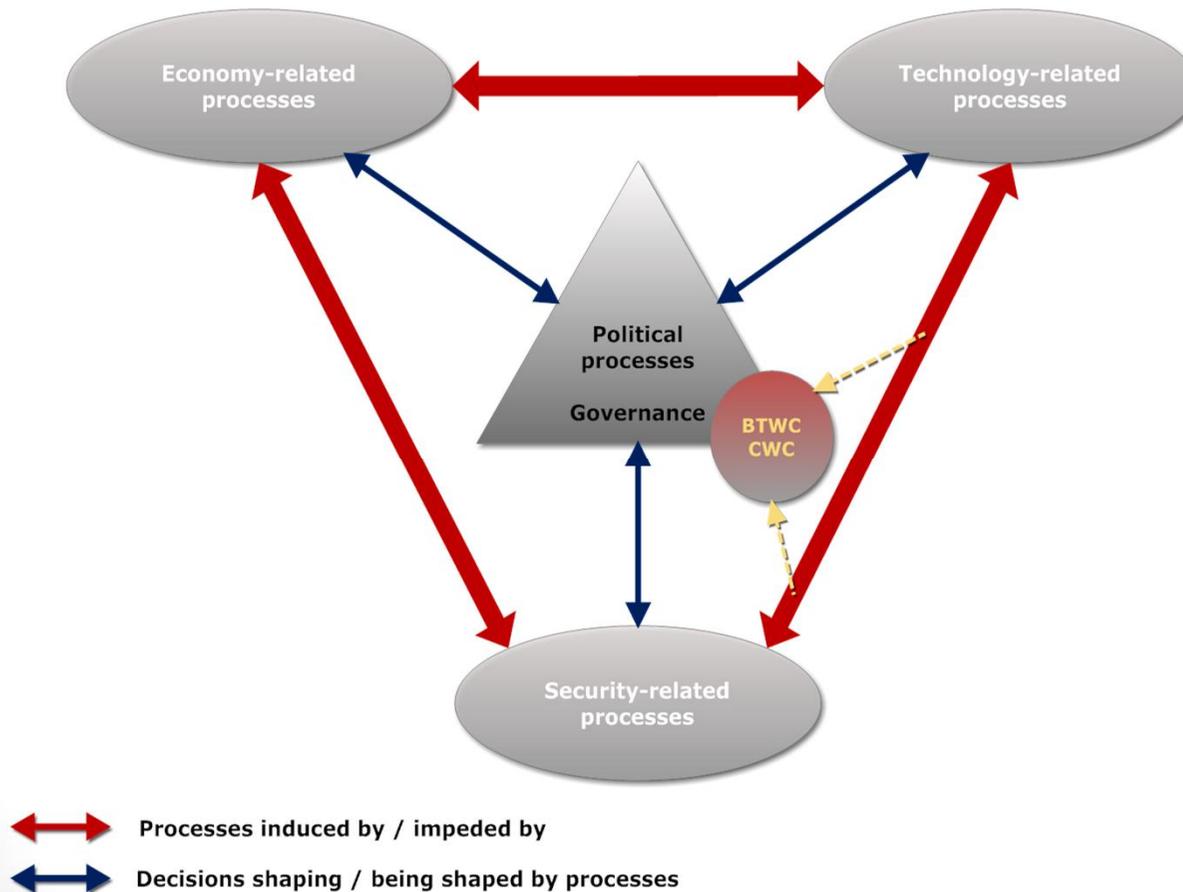
Disarmament / Non-proliferation paradigm shift after 1990

- **Paradigm shift from disarmament to non-proliferation**
 - Focus shift from weapon elimination to prevention of capability building
 - Technology rather than the weapon itself becomes central concern
 - Potential possessor rather than the weapon becomes the issue
 - Impact on BTWC (Protocol) and CWC
 - Objective vs. subjective goals
 - Disarmament: goals specified in treaty and apply equally to all parties
 - Non-proliferation: Different approaches to different countries based on *subjective judgment of intent*
 - Non-proliferation: CBW threat can never disappear
 - Resolution of one proliferation threat does not affect other ones
 - Even if all resolved today, there is always tomorrow's threat
- **Consequences:**
 - Framing of the threat is in function of the dominant power
 - Limited consensus on nature and size of threat
 - Threat appreciation differs according to
 - View of state as global, regional, or local power
 - Acceptance of security dependency (e.g., participation in security alliances)
 - Different perceptions of urgency to take measures and nature of those measures
 - 'Traditional' verification mechanisms no longer seen as adequate

Entrance of the *post-proliferation era*?

- **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 biological
 - Many large (older types of) production facilities with potential for CW manufacture now in developing world (impact on organisation & cost of verification)

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*



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