

CBRN Weapons

Core Concepts, Security Challenges,
and Their Control

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Introduction to core concepts

- What is '*CBRN*'?
- What are '*Weapons of Mass Destruction*'?
- What are the principal *international control regimes*?
- What does '*proliferation*' mean?
- What does '*non-proliferation*' entail?
- What is the '*dual-use*' concept?

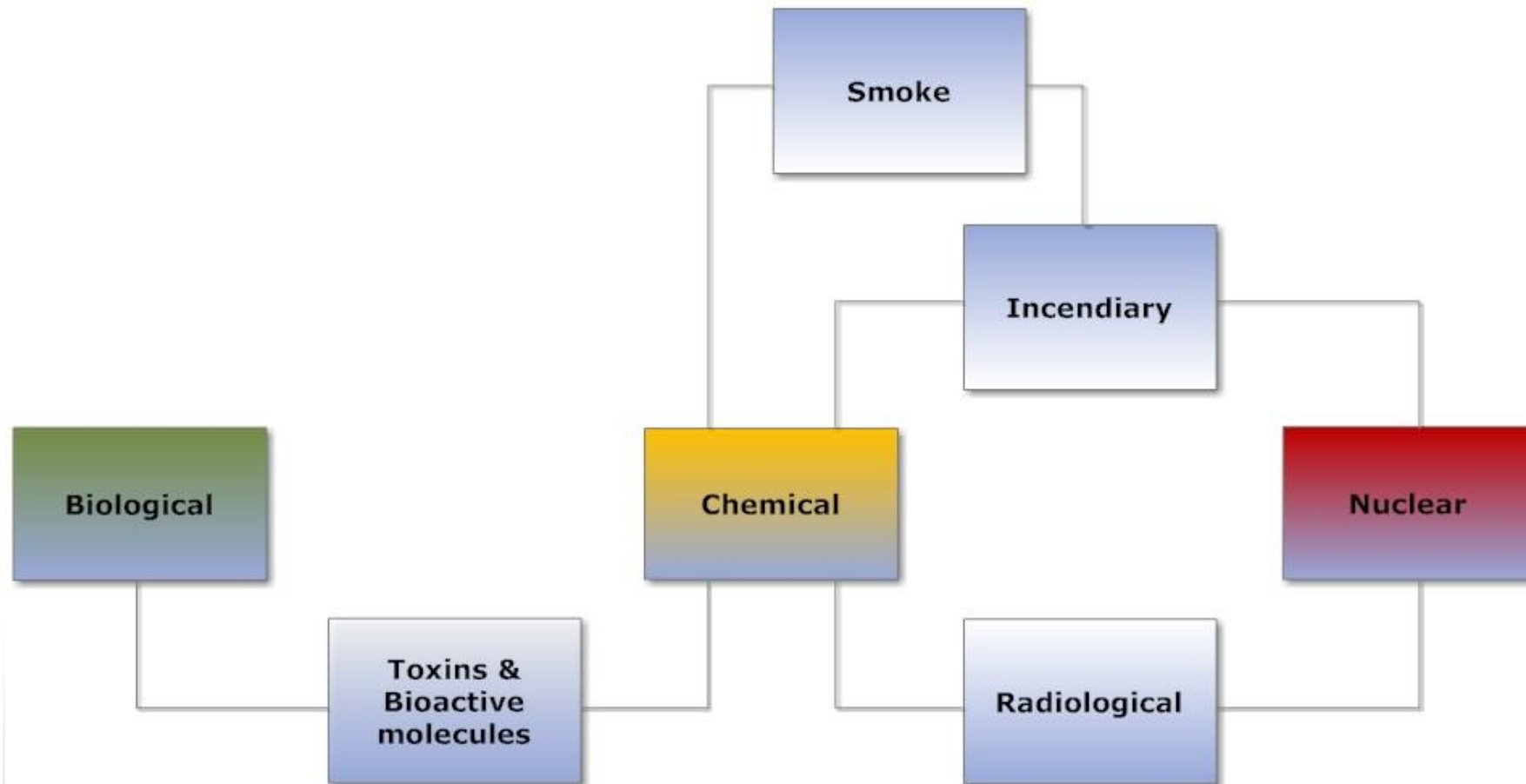
Part 1

WHAT IS '*CBRN*'?

An acronym never to forget

- CBRN: a collective term for 4 distinct weapon categories
 - **C**hemical weapons
 - **B**iological weapons
 - **R**adiological weapons
 - **N**uclear weapons
- Nevertheless, the boundaries between the weapon categories are fuzzy
 - Certain weapon types share characteristics with two of more main weapon categories, e.g.
 - Toxins, radiological weapons, smoke, incendiary weapons
 - Weapon evolution and history of military organisation have had an impact on the delineation of categories, e.g.
 - Why are CBW often uttered in the same breath?
 - Why do many people view smoke and incendiary weapons as CW?
 - Why are toxins covered by two major disarmament treaties?
 - Why are RW viewed as a main category?

The CBRN spectrum



Understanding the spectrum – 1

- **Chemical weapons**
 - Ranges from irritants (e.g. lachrymatory agent) and incapacitants (e.g. BZ & fentanyl) to the most toxic nerve agents (e.g. sarin & VX) or toxins (e.g. ricin & saxitoxin)
 - Core aspects of the CW definition in *Chemical Weapons Convention*:
 - Any toxic chemical which through its chemical action on life processes can cause death, temporary incapacitation or permanent harm to humans or animals (Plants not mentioned!)
 - Also covers precursors to such toxic chemicals
 - Delivery systems and specialised equipment
 - CWC definition is based on the *General Purpose Criterion*
 - Covers past, present *and* future toxic substances
 - Does not distinguish methods of synthesis or whether an agent may be naturally occurring
- **Biological weapons**
 - Ranges from incapacitating agents (e.g. salmonella) to lethal ones (e.g. anthrax bacteria or smallpox virus) or toxins (= overlap with CWC)
 - Core aspects of the BW definition in *Biological and Toxin Weapons Convention*:
 - Microbial or other biological agents, or toxins (human, animal and plants)
 - Weapons, equipment or means of delivery
 - Understanding evolves through common understandings reached at 5-yearly Review Conferences (e.g. inclusion of subcellular particles and bioactive molecules)
 - BTWC definition is based on the *General Purpose Criterion*
 - Does not distinguish between origin or method of production
 - Covers any relevant development in synthetic biology, genetic engineering, etc.

Understanding the spectrum – 2

- **Radiological weapons**
 - Ranges from radioactive offal from hospitals or radiological centres to materials from the core of nuclear reactors
 - No formal international legal definition; there may be definitions of radioactive materials in national (criminal, environmental, health, etc.) law
 - With a few exceptions, RW were never really considered as a military tool
 - Impact of terrorist action with RW is seen as limited, even though one cannot ignore psychological or economic consequences
 - Decontamination would be complex and potentially costly (also in view of public concerns)
- **Nuclear weapons**
 - Ranges from portable nuclear demolition charges to the 50Mt Vanya hydrogen bomb (Tsar Bomba)
 - No universally accepted legal definition
 - Some definitions are included in regional *Nuclear Weapon-Free Zones* (but phrasing may differ)
 - Southeast Asia Nuclear Weapon-Free Zone Treaty and Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean define '*nuclear weapon*'
 - African Nuclear Weapon Free Zone Treaty and South Pacific Nuclear Free Zone Treaty define '*nuclear explosive device*'
 - Central Asian Nuclear-Weapon-Free Zone defines '*nuclear weapon or other nuclear explosive device*'
 - Legality of NW possession essentially regulated via *Nuclear Non-Proliferation Treaty*
 - Equipment and materials regulated via Safeguards Agreements administered by the *International Atomic Energy Agency* (different treaty from NPT) to ensure their application to peaceful purposes
 - Nuclear Weapon States as defined under the NPT have a different legal status from Non-nuclear Weapon States

Part 2

WHAT ARE

'WEAPONS OF MASS DESTRUCTION'?

On the origin of a concept

- UN documents

- UNGA, 1st Committee, Resolution 1 (I). Establishment of a Commission to Deal with the Problems Raised by the Discovery of Atomic Energy (24-01-1946)
 - 5. Terms of reference (... make specific proposals)
 - (c) for the elimination from national armaments of atomic weapons and of all other major weapons *adaptable to* mass destruction;
- Resolution of the Commission for *Conventional* Armaments (12-08-1948)
 - The Commission for Conventional Armaments resolves to advise the Security Council:
 - 1. that it considers that all armaments and armed forces, *except* atomic weapons and *weapons of mass destruction*, fall within its jurisdiction and that *weapons of mass destruction* should be defined to include *atomic explosive weapons, radio active material weapons, lethal chemical and biological weapons, and any weapons developed in the future which have characteristics comparable in destructive effect to those of the atomic bomb or other weapons mentioned above.*

- For consideration:

- List of what should be considered a WMD is not limitative
- Commission for Conventional Armaments defines WMD in function of what it will *not* consider
- Atomic (nuclear) weapons always itemised independently
- Lethality is no longer a criterion in the definition of CBW
- RW were then seen to be of far greater military utility than today
- Weapons were considered in the context of major war between states

What is a WMD?

- Used to be synonymous with NW
 - Since end Cold War (1990), increasingly chemical, biological and radiological weapons too
 - Concept is still expanding (explosives, etc.)
- Very awkward term to use
 - No accepted international legal definition
 - Which weapon categories are included; which ones not?
 - Each weapon category falls under a different (type of) legal regime
 - The respective legal regimes determine the *formal scope* of the weapon category
 - CW and BW formally defined in treaties (CWC; BTWC) → more than just lethal agents
 - RW and NW lack universally accepted legal definitions
- Very amorphous concept
 - Focusses on consequences of use
 - Hides specific characteristics of individual arms categories
 - Threat inflation: Blends the destructiveness of one category (NW) with the ease of acquisition of another (e.g. CW) in political discourse

Alternative terminology

- Non-conventional weapons
- Term focusses on specific status, rather than consequences of use
 - Only highest political authorities decide when to release weapons for use
 - Applies to any type of political regime
 - Authorisation for use not pre-delegated to military commanders (in contrast to 'conventional' weapons)
 - First task of arms control is prevention of 'conventionalisation'
- Difference with 'unconventional' weapons
 - Weapons outside of legal regimes
 - Unusual weapons (e.g., designed for very specific role or operation)

Part 3

WHAT ARE THE PRINCIPAL

INTERNATIONAL CONTROL REGIMES?

Main prohibitions against CBW

- 1925 Geneva Protocol
 - Prohibits the use in war of CBW
 - Marginalised CBW in military doctrine → foundation for disarmament
- 1972 Biological and Toxin Weapons Convention (BTWC)
 - Comprehensive ban on development, production and possession of BW and toxin weapons
 - 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
 - Also covers toxin weapons

Single Integrated Treaty System (SITS)

- Defines the weapon under consideration
 - Demarcates applicability of treaty
 - Lays foundation for the verification system
- Covers all dimensions of the ban on development, acquisition and possession
 - Backward-looking dimension (destruction of weapons & related infrastructure)
 - Forward-looking dimension (prevention of future armament)
 - Application of the *General Purpose Criterion* in the definition
 - Prohibits use under any and all circumstances
 - Covers inter-state behaviour, as well as terrorism and crime
 - Demands national implementation, including national criminalisation and penalisation of international prohibitions
- Operates tools to enhance transparency, monitor and enforce compliance (incl. verification), and resolve concerns and conflicts

Characteristics of SITS

- **Multilateral → inclusive treaties**
 - Any country can join if it so desires
 - Equal obligations and rights for all parties to the treaty
- **Other issue-specific tools will tend to draw on or reinforce the SITS**
 - UN Secretary-General's investigative mechanism
 - UNSC Resolution 1540 with regard to CBW
 - Australia Group control lists → from plurilateral tool to increasingly accepted standard for national legislation on CBW
 - Ability for adaptation to special circumstances
 - E.g., OPCW-UN Joint Mission for CW elimination in Syria
- **Ability to build functional lateral links to other treaty systems or international organisations**
 - BTWC → FOA, OIE, WHO
 - CWC / OPCW → UN, WHO
 - CWC – BTWC interaction on science and technology conversion

Additional benefits from SITS

- Emerging issue areas become integrated into SITS
 - Biosecurity & -safety in BTWC + development of lateral functional links (WHO)
 - Chemical security & safety in CWC
 - Helps to build regional dynamics in support of the convention
 - Overcomes politically sensitive issue of prepositioning emergency assistance equipment in certain regions
 - Supports training, capacity-building and other aspects of international cooperation for peaceful purposes
 - Close monitoring of scientific & technological developments
- One negotiation; single ratification / accession process
- Other institutions will draw on the central prohibitions in SITS to develop own specific actions
 - E.g. Interpol, WCO, professional and academic associations, etc.
 - Widens and deepens multi-level stakeholdership → reinforcement of the core norm against CBW

Not all SITS are born equal

- CWC

- OPCW as independent international organisation with Technical Secretariat
- Elaborate verification machinery
- Investigation of alleged CW use

- BTWC

- Implementation Support Unit, integrated into UNODA
- Efforts at enhancing transparency
 - Hampered by conviction of unverifiability by some parties
- Rudimentary mechanisms to address compliance concerns
- Call by individual states on UN Secretary-General's Investigative Mechanism in case of alleged BW use

Scattered approach in NW control

- No definition of a NW
- No formal prohibition on NW use
- Multiple additional initiatives, but no integration:
 - Bilateral treaties (e.g., SALT, INF, START, ...) between USA – USSR/Russia
 - Plurilateral initiatives, often with informal status (technology transfer arrangements, Global Partnership, nuclear security summits, ...)
 - UNSC resolutions (1540, nuclear terrorism, ...)
 - Unilateral drawdown of nuclear forces, but with modernisation of remaining weapon holdings (mostly in terms of delivery systems)
- Radioactive materials: under nuclear umbrella or not?
- What about investigation of (NW; RW) use?

An unfulfilled NW control agenda

- Report by US Deputy Secretary of Defense Ross Gilpatric (January 1965):
 - Negotiate an international non-proliferation agreement
 - Supplement it with:
 - A comprehensive test ban
 - Nuclear free zones
 - Safeguards for programmes for peaceful purposes, and
 - Fissile material controls
- **Agenda still not fully achieved, now almost 50 years later**
 - Hampered by multiple negotiations; multiple ratification processes in each country
 - Frictions in individual treaty implementation → carried over into parallel forums

Non-Proliferation Treaty (1968)

- **Principal provisions**

- Nuclear Weapon States (NWS) shall not transfer NW or NW-related technology to Non-Nuclear Weapon States (NNWS)
- NNWS commit themselves not to develop or otherwise acquire NW
- NNWS obtain the right to receive nuclear technology for peaceful purposes
- External organisation (IAEA) responsible for administering safeguards

- **Gaps from a weapon control perspective**

- No weapon elimination or limitation
 - Commitment to pursue good-faith negotiations towards disarmament
- There are 'nuclear-armed states' (i.e. not recognised NWS)
- No verification of NW programmes in NWS
- Discriminatory regime between NWS and NNWS

Nuclear Weapons Ban (2017)

- **Principal provisions**
 - Prohibits threat of use and use in armed conflict
 - Complete elimination of NW stockpiles
 - Bans NW development, production, testing, acquisition, stockpiling, transfer and deployment of NW from another state on territory of a state party
 - Conflict resolution framework
 - National implementation requirements
 - Non-discriminatory
- **Gaps from a weapon control perspective**
 - Not yet in force (59 signatories; 11/50 required ratifications as of 5 July 2018)
 - No verification provisions (except for IAEA comprehensive safeguards obligation, including for non-diversion of nuclear materials following weapon destruction)
 - No international implementation organisation foreseen
 - No explicit transfer controls
 - Which are the incentives for NWS and nuclear-armed states to join treaty?
 - Not a SITS

Nature of arms control and disarmament agreements

- **Global (multilateral)**

Partial Test Ban Treaty (PTBT, 1963), Outer Space Treaty (1967), Non-Proliferation Treaty (NPT, 1968), Seabed Treaty (1971), Biological and Toxin Weapons Convention (BTWC, 1972), Moon and Other Celestial Bodies Agreement (1979), Chemical Weapons Convention (CWC, 1993), *Comprehensive Test Ban Treaty (CTBT, 1996), Mine Ban Convention (1997), *Nuclear Weapons Ban (2017)

- **Regional (multilateral)**

Antarctic Treaty (1959), Conventional Armed Forces in Europe Treaty (CFE Treaty, 1990), Nuclear Weapon Free Zones: Tlatelolco (1967), Rarotonga (1985), Bangkok (1995), *Pelindaba (1996), *Semipalatinsk (2006)

- **Bilateral**

Anti-Ballistic Missile Treaty (ABM Treaty, 1972), Strategic Arms Limitation Treaty I (SALT I, 1972), *Strategic Arms Limitation Treaty II (SALT II, 1979), Intermediate Range Nuclear Forces Treaty (INF Treaty, 1987), Strategic Arms Reduction Treaty I (START I, 1991), Strategic Arms Reduction Treaty II (START II, 1993), Strategic Offensive Reductions Treaty (SORT, 2002), New START (2010)

Part 4

WHAT DOES '*PROLIFERATION*' MEAN?

Proliferation studies

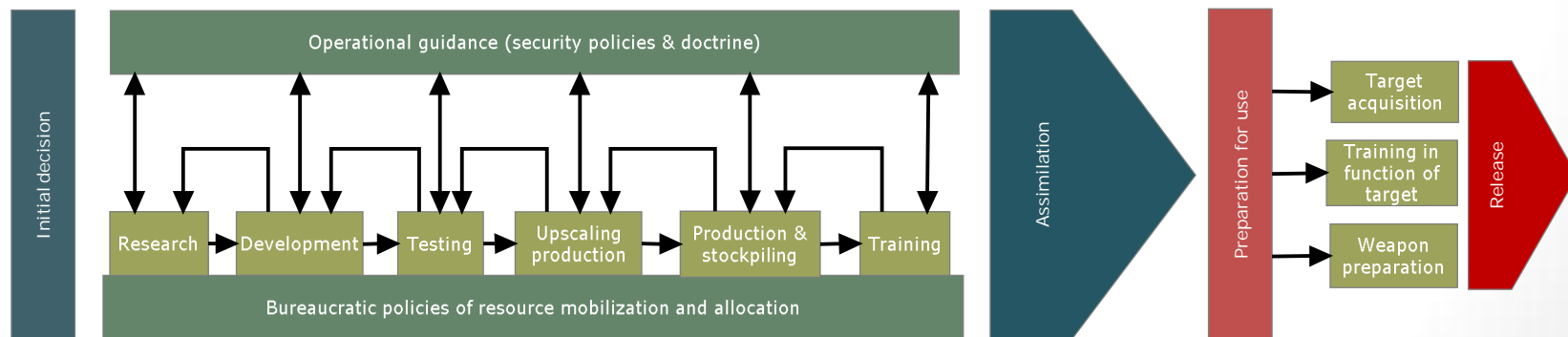
- Very few definitions of the phenomenon given
- View of proliferation as a lateral spread of weapons and technology
 - Impact of the 1968 NPT
 - Is seen as negative (a threat)
- Suggestion of a continuum
 - Technology acquisition leads to weapon development and deployment, and possibly to use
- Once proliferator, always proliferator?
 - How does knowledge of past programmes influence perceptions of current state behaviour?

Armament versus proliferation

- **Armament:**
 - Quantitative or qualitative enhancement of military capacity
 - Essentially a domestic process
 - Internal process for criminal or terrorist entities
- **Proliferation:**
 - Transfer of technology from a possessor to a non-possessor
 - '*Horizontal proliferation*': lateral spread
 - '*Vertical proliferation*': weapon acquisition and improvement (= armament?)
 - Essentially a trans-national process
 - May be domestic in case of transfers to criminal or terrorist entities

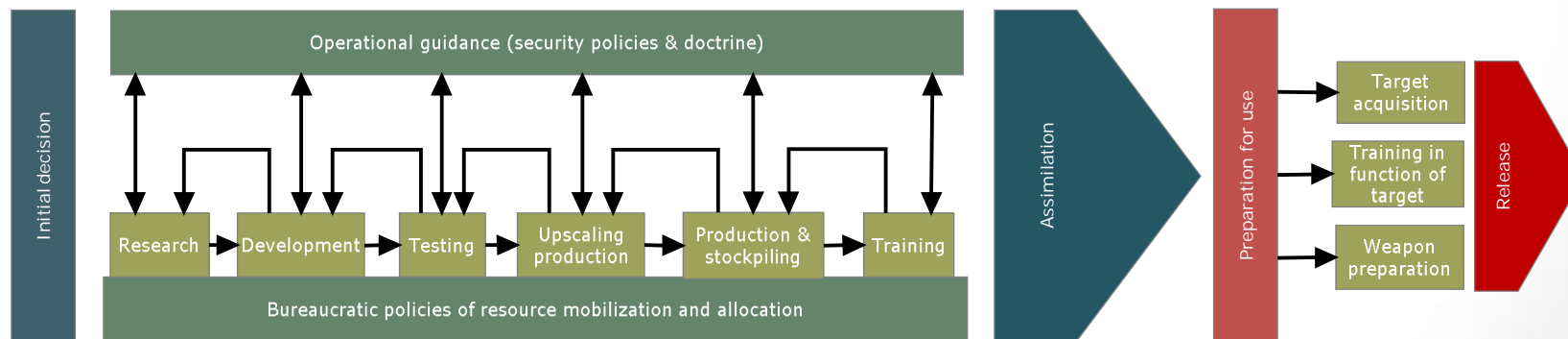
Armament

- What is armament?
- Is there finality to armament?

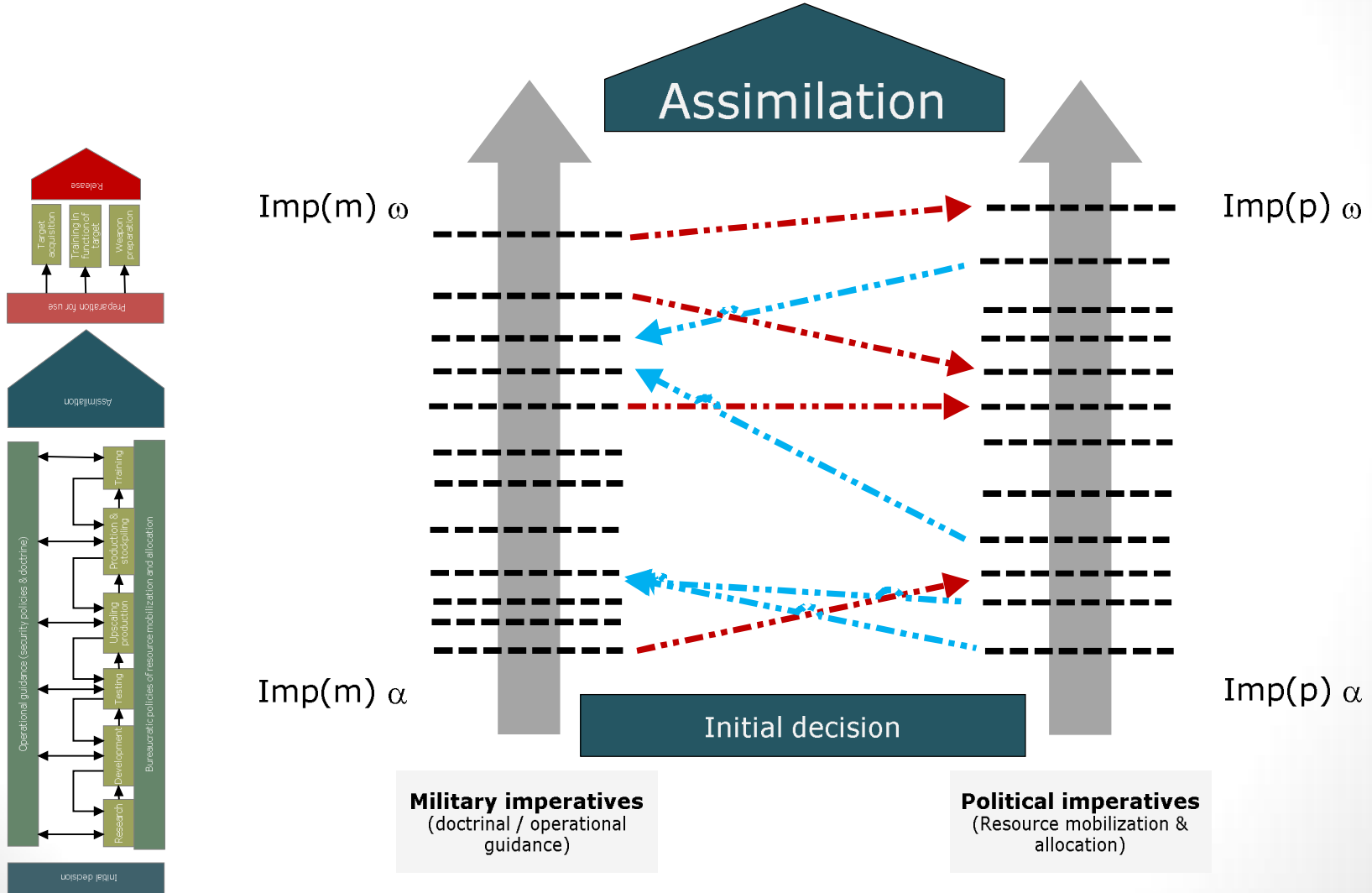


Assimilation

Assimilation is the *process* by which for a particular type of weaponry the *military and political imperatives*, as constrained by the political entity's *material base*, become *reconciled* with each other, so that the weaponry becomes an integral part of *current mainstream military doctrine*.



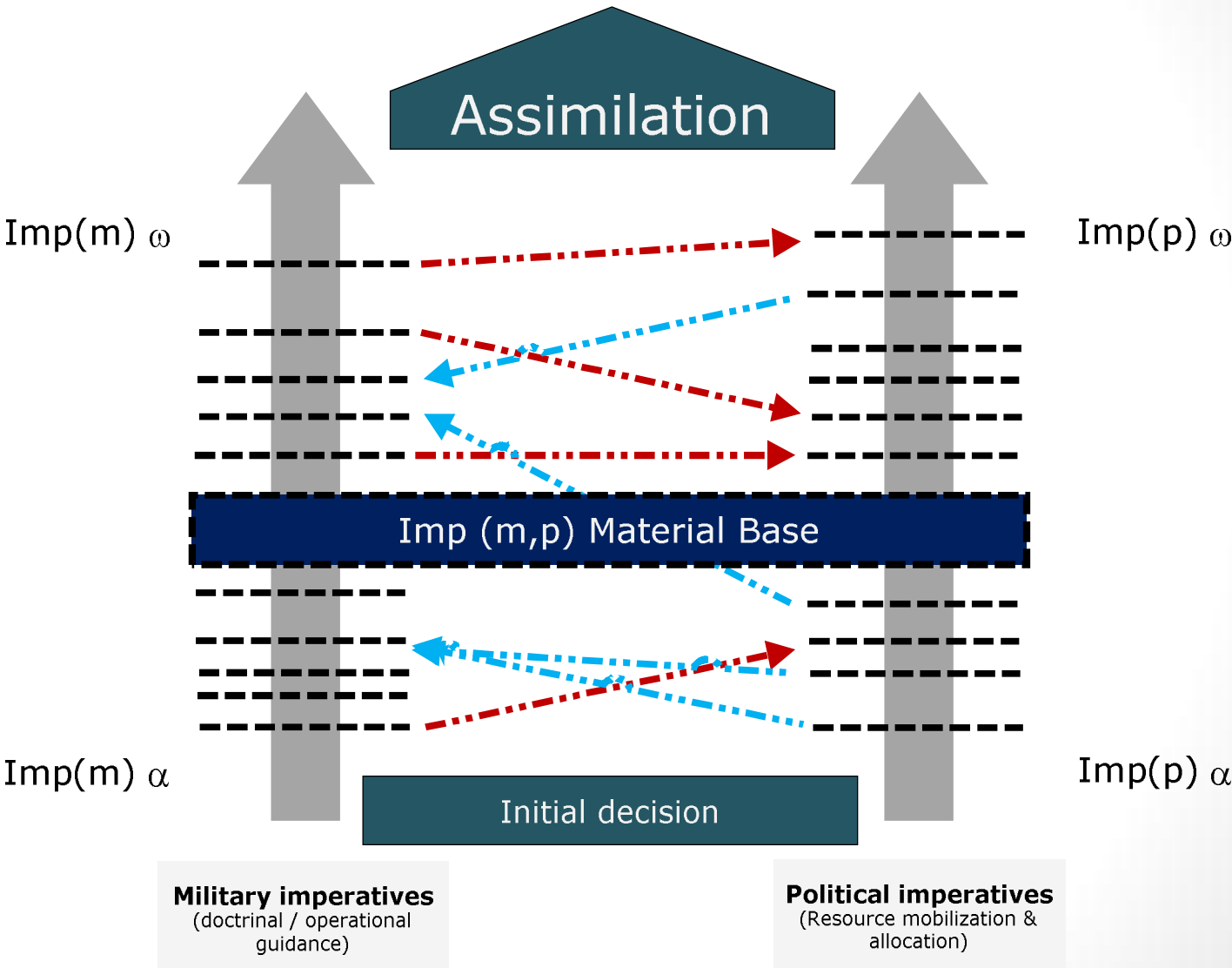
Functioning of assimilation



The material base as an enabler or impediment

- Two major components
 - *Physical base* (essentially unchangeable variables)
 - Geographical location; territorial size
 - Population size
 - Presence of natural resources; easy access to natural resources
 - *Societal base* (variables that can be changed over a long period, but armament @urgency)
 - Political culture
 - Level of education
 - Scientific and technological base
 - Industrial development and economic strength
- Particularly important independent variable as it **cuts through both** the political and military imperatives tracks

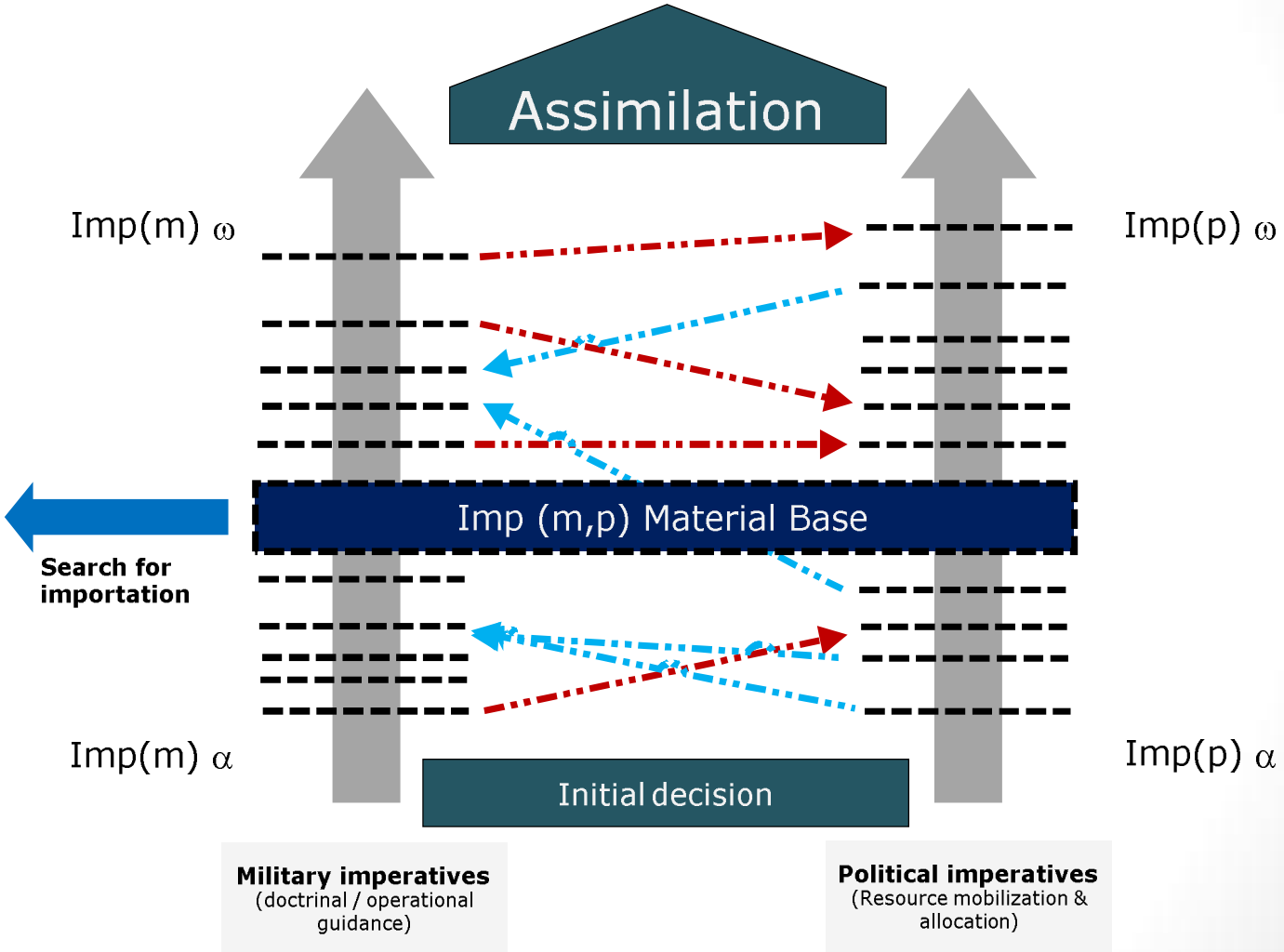
Material base



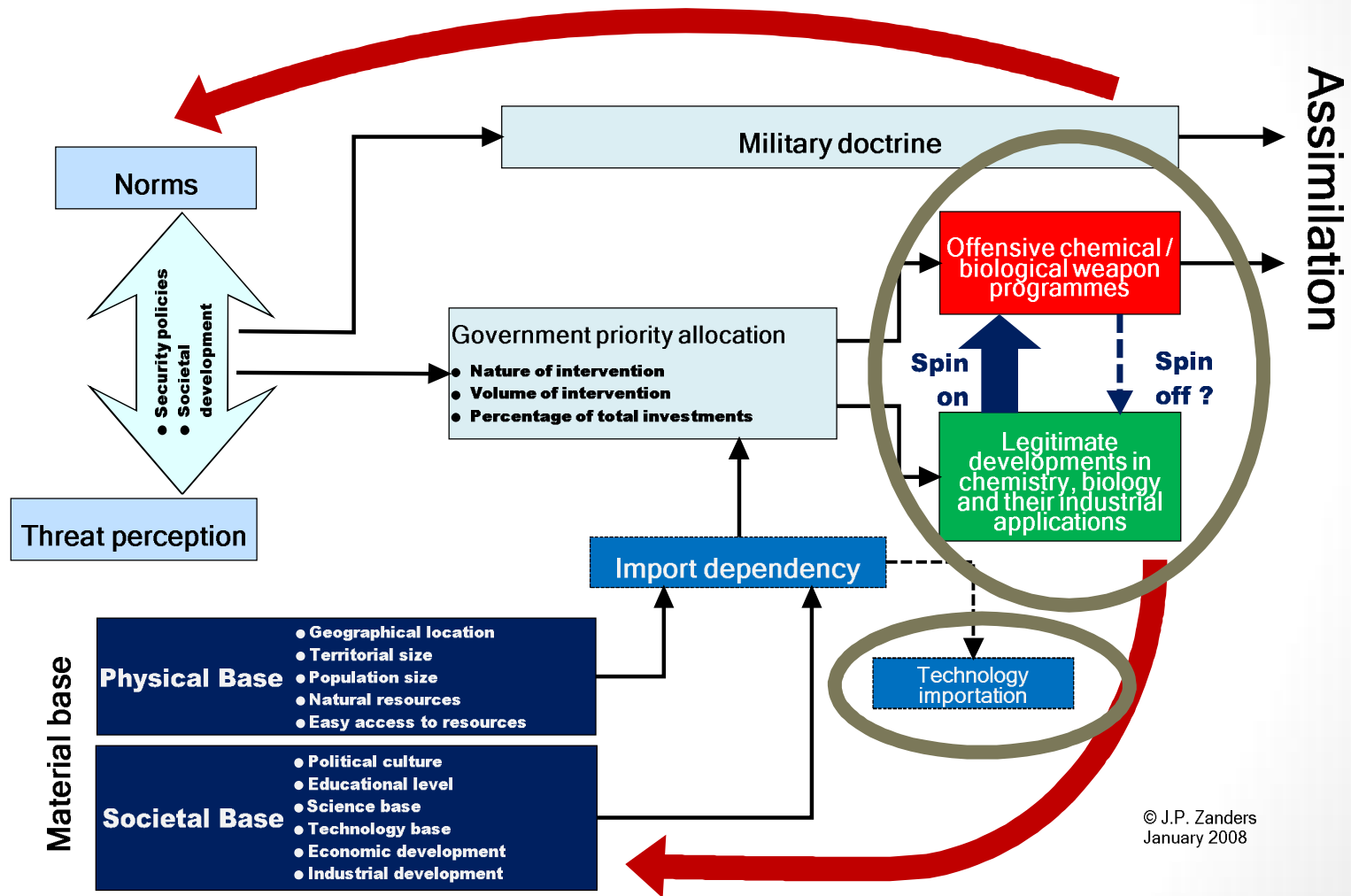
Role of the material base

- Critical to the demand-side understanding of proliferation
- Scarcities of certain resources
 - Certain natural resources
 - Insufficiently advanced educational base; technical skills
 - Insufficient R&D and industrial base
- Two basic options:
 - Develop the missing ingredients indigenously
 - Seek the missing ingredients abroad (legally or illegally)
- However, what about the physical base; time constraints?

Proliferation in assimilation model



Operationalising the assimilation model



A definition of proliferation

- **Proliferation** occurs when a political entity decides to acquire a certain weapon capability where such a capability does not yet exist *provided this decision is followed by an armament dynamic.*
- Conversely, **deproliferation** occurs as soon as the political commitment to that decision *ceases to be renewed* or if that political entity *explicitly reverses* that decision.

Part 5

WHAT DOES

'*NON-PROLIFERATION*' ENTAIL?

Value judgement

- *Technology diffusion* is a natural process
 - Archaeological evidence from Palaeolithic; Antiquity, ...
 - Possibility of multiple original sources for same technology
- *Proliferation* includes judgment about desirability
 - Origin from cell biology: 'rapid & repeated production' (often with negative connotation, as in cancer)
 - Judgement about desirability is about *who* obtains the technology
 - Security policy:
 - Negative connotation reinforced from the nuclear field
 - Use of term limited to non-conventional weaponry
 - Compare with the more neutral 'arms trade'

Disarmament / Non-proliferation paradigm shift — 1

- Happened after the end of the Cold War (1990)
- Focus shift from weapon elimination to prevention of capability building
 - Possessor of technology, rather than technology itself, becomes central concern
 - Irrational vs rational actors
 - Focus on 'motive' of an adversary
 - Impact on BTWC (Protocol) and CWC
- 'Proliferation' redefines the threat in function of the dominant power
 - Lack of consensus over threat evaluation
 - Lack of consensus over measures to address threat
 - Tendency to move to national/plurilateral rather than multilateral measures
 - E.g. Informal supplier arrangements (Nuclear Suppliers Group, Australia Group, Missile Technology Control Regime, Hague Code of Conduct against Ballistic Missile Proliferation, Wassenaar Arrangement, ...)

Disarmament / Non-proliferation paradigm shift — 2

- **Objective goals vs. Subjective goals**
 - *Disarmament*: goals specified in treaty and apply equally to all parties (non-discrimination principle)
 - *Non-proliferation*: Different approaches to different countries based on *subjective* judgement of intent (the so-called 'rogues' vs. rational, law-abiding actors)
 - E.g. US and European Union approaches to Iran regarding nuclear technology
- **Lack of finality in non-proliferation**
 - Resolution of one proliferation threat does not affect other ones
 - E.g. Iran vs North Korea
 - Even if all resolved today, there is tomorrow's threat

Part 6

WHAT IS THE '*DUAL-USE*' CONCEPT?

The dual-use concept

- A *CBRN weapon* is a 'single-use' technology
 - It has no other purpose than being a weapon
- CBRN weapon *development* often rests on 'dual-use' technology
 - The core question is: *when is the 'single-use' stage reached* in weapon development?
 - For example:
 - *CWC* places certain toxic chemicals and their precursors in Schedule 1, meaning that they have *no other purpose than being a CW* (= single use)
 - But what about other precursor chemicals of past warfare agents such as chlorine and phosgene?
 - Would you consider the 'Novichock' agent used in an assassination attempt in the UK as single or dual-use in view of its absence in Schedule 1?
 - In contrast, the *BTWC* faces the problem that BW is the only arms category in which the active ingredient can be used for *both attacking and defending* the target
 - Activities in BW defence, protection and prophylaxis are permitted, but hardly distinguishable from BW offence
 - Raises questions about activities that may inadvertently contribute to BW development in the present and the future
 - *RW*: when radioactive source is fixed to an explosive device or upon release?
 - *NW*: when enrichment of nuclear fuel exceeds 20%?

Contexts for 'dual-use' debate

- **Dual-use issues arise** when the attempts to control a particular technology confront the non-military commercial and scientific interests in such technology
- **Disarmament**
 - Total ban on development, production 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
 - 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
- **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 *have not been wholly delegitimised* (e.g., nuclear weapons, ballistic missiles)

What is '*technology*'?

'Technology comprises

- the *ability* to recognise technology problems,
- the *ability* to develop new concepts and tangible solutions to technical problems,
- *the concepts and tangibles* developed to solve technical problems, and
- the *ability* to exploit the concepts and tangibles in an effective way.'

Errko Autio and Tomi Laamanen, 'Measurement and evaluation of technology transfer: Review of technology transfer mechanisms and indicators', *International Journal of Technology Management*, Vol. 10, Nos. 7/8 (1995)

Tangible and intangible technology transfers

- **Tangible objects or artefacts**
 - Pathogens, chemicals, toxins
 - Laboratory equipment
 - Fermenters, production installations
 - Delivery systems, special equipment
 - Etc.
- **Intangible technologies**
 - Data
 - Processes
 - Knowledge
 - Expertise and skills
 - Etc.
- **Transfer types**
 - Across borders between different economic units
 - Across borders within the same economic unit (e.g., intranet)
 - Between economic units inside state borders

The *General Purpose Criterion* (GPC)

- In BTWC [Art. I]
 - Prohibition on acquisition or retention of biological agents or toxins whatever their origin or method of production of *types and in quantities that have no justification for prophylactic, protective or other peaceful purposes.*
 - Very limited list of non-prohibited purposes:
 - Prophylaxis
 - Protection
 - Other peaceful purposes (↳ residual category, but excludes deterrence with BW, open-air testing of BW, etc.)
- In CWC [Art. II, 1(a)]
 - Toxic chemicals and their precursors, except where intended for *purposes not prohibited under this Convention*, as long as the *types and quantities are consistent with such purposes*
 - Very limited list of non-prohibited purposes (CWC [Art. II, 9])
 - Industrial, agricultural, research, medical, pharmaceutical or other peaceful purposes;
 - Protective purposes;
 - Military purposes not connected with CW use and not dependent on the use of the toxic properties of chemicals as a method of warfare;
 - Law enforcement including domestic riot control purposes.

Understanding the *General Purpose Criterion* (GPC)

- The GPC is a critical tool in addressing the 'dual-use' issue
 - Under the GPC the BTWC and CWC *do not prohibit* objects or activities
 - They *prohibit* certain purposes to which they may be applied (i.e. acquisition, retention and use of the proscribed weapons)
- Functioning of the GPC
 - The *default position* is that all applications of biological agents, toxins and toxic chemicals are prohibited
 - Only a restricted set of purposes are '*non-prohibited*'
- Implications of the GPC
 - It covers *any and all* pathogens, toxins or toxic chemicals, whatever their origin or production method – past, present, and yet to be discovered
 - Even if control lists are used, unlisted items still fall under the prohibition
 - Any possession or manipulation of agents that cannot be justified under a non-prohibited purpose is a violation of the law
 - Can play a significant role in '*preventing*' acquisition or '*pre-empting*' use of CBW

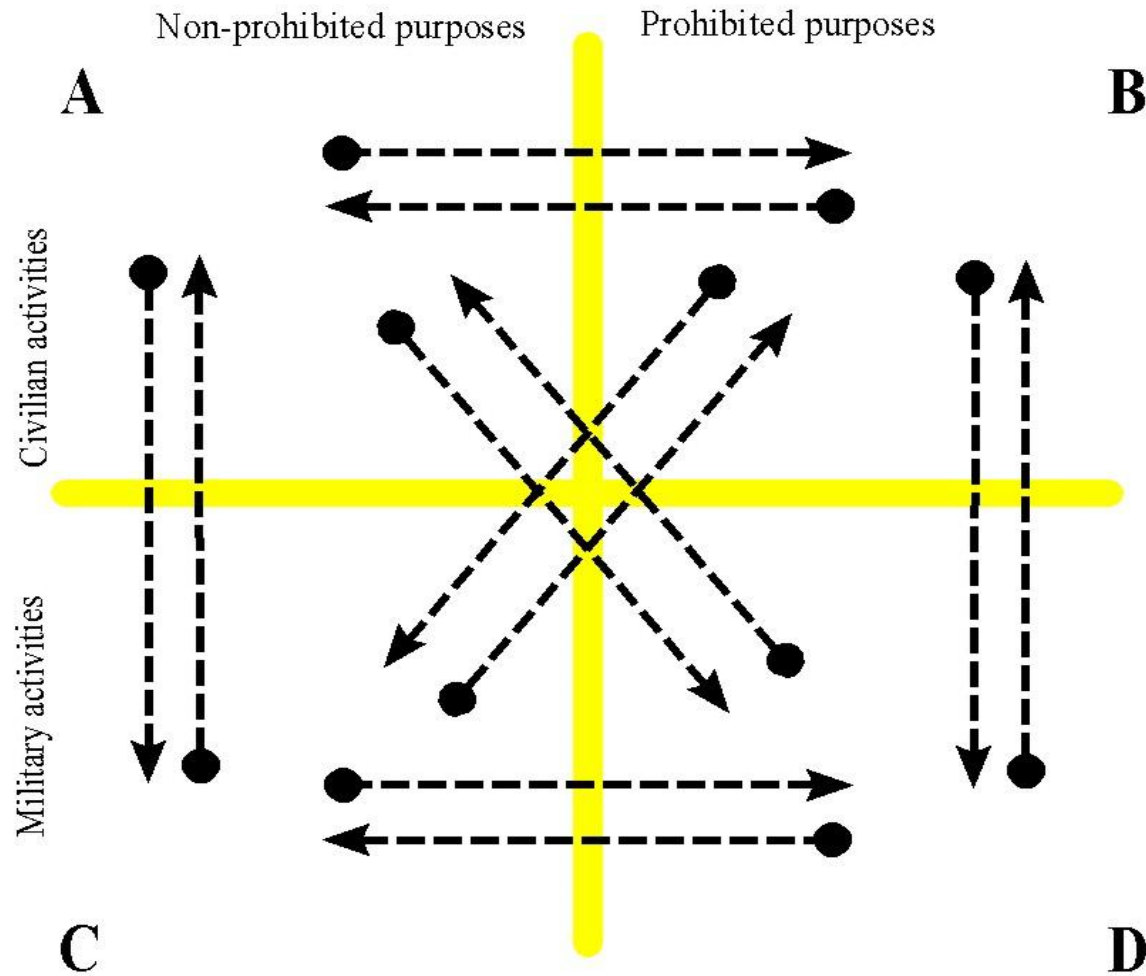
Dual-use technology

- **Dual-use technology**: a technology that has the *potential* to be applied for a purpose other than the one for which it was originally intended
 - *Spin-on*: military application of technology originally intended for civilian purposes
 - *Spin-off*: civilian application of technology originally intended for military purposes
- **Single-use technology**: a technology that lacks such potential (e.g., the weapon itself)

Two views on dual-use technology & purpose

- Dual use is *intrinsic* property of technology
 - Technology itself is threat
 - All technology must be controlled
 - Is prevailing interpretation
- Dual use is an *attribute*, whose *potential* is realised depending on context
 - Context defines threat posed by technology
 - Purpose of technology is defined by context
 - Control is geared towards preventing certain purposes from being realised
 - Allows for different types of transfer controls
 - Operationalisation of the GPC required

Possible dual-use technology transfer flows under the BTWC and CWC



Permitted and prohibited flows

- **Prohibited:**
 - All flows to B or D
 - All flows between B and D
- **Single authorisation**
 - All flows from B and D to A or C
 - Conversion to peaceful purposes after entry into force
- **Permitted flows**
 - Between A and C
 - Is possible between civilian and military activities (e.g. CBW defence, protection, detection, prophylaxis, ...)

Part 7

NEXT STEPS FOR TOMORROW

For tomorrow

- How do these core concepts affect your work?
- How can greater awareness and understanding of the issues be promoted?
- What role exists for education and outreach?
- How can education and outreach support your goals?



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