Reducing the global catastrophic risks from Nuclear War

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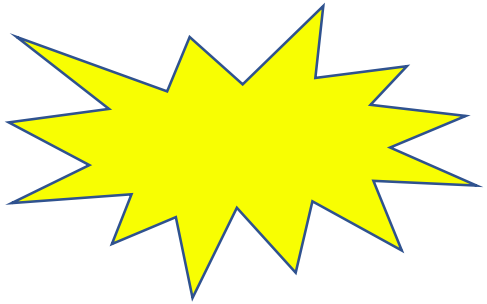
www.medact.org

What nuclear weapons do

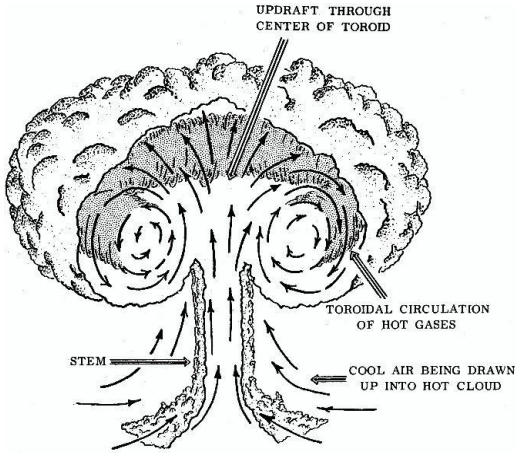
Nuclei of U^{235} and/or Pu^{239} atoms fission to give products (FP) which include clinically relevant radioisotopes (e.g, I^{131}, Sr^{90}, Cs^{137}) and neutrons.

Energy is released as

1) a highly radioactive flash of photons (c 5%);
2) intensely hot fireball (c 35%),
3) explosive burst (45-50%) of hurricanes severely damaging concrete buildings, killing and injuring thousands;
4) the radioactivity in FPs (10-15%).



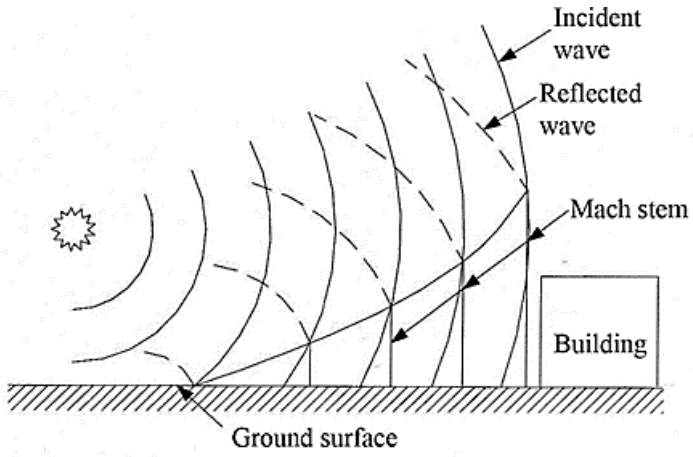
Fireball sucks in air which rises like gales to form the ‘mushroom cloud’.



Ground-bursts’ take up particles, absorb FPs and **fall-out** downwind.

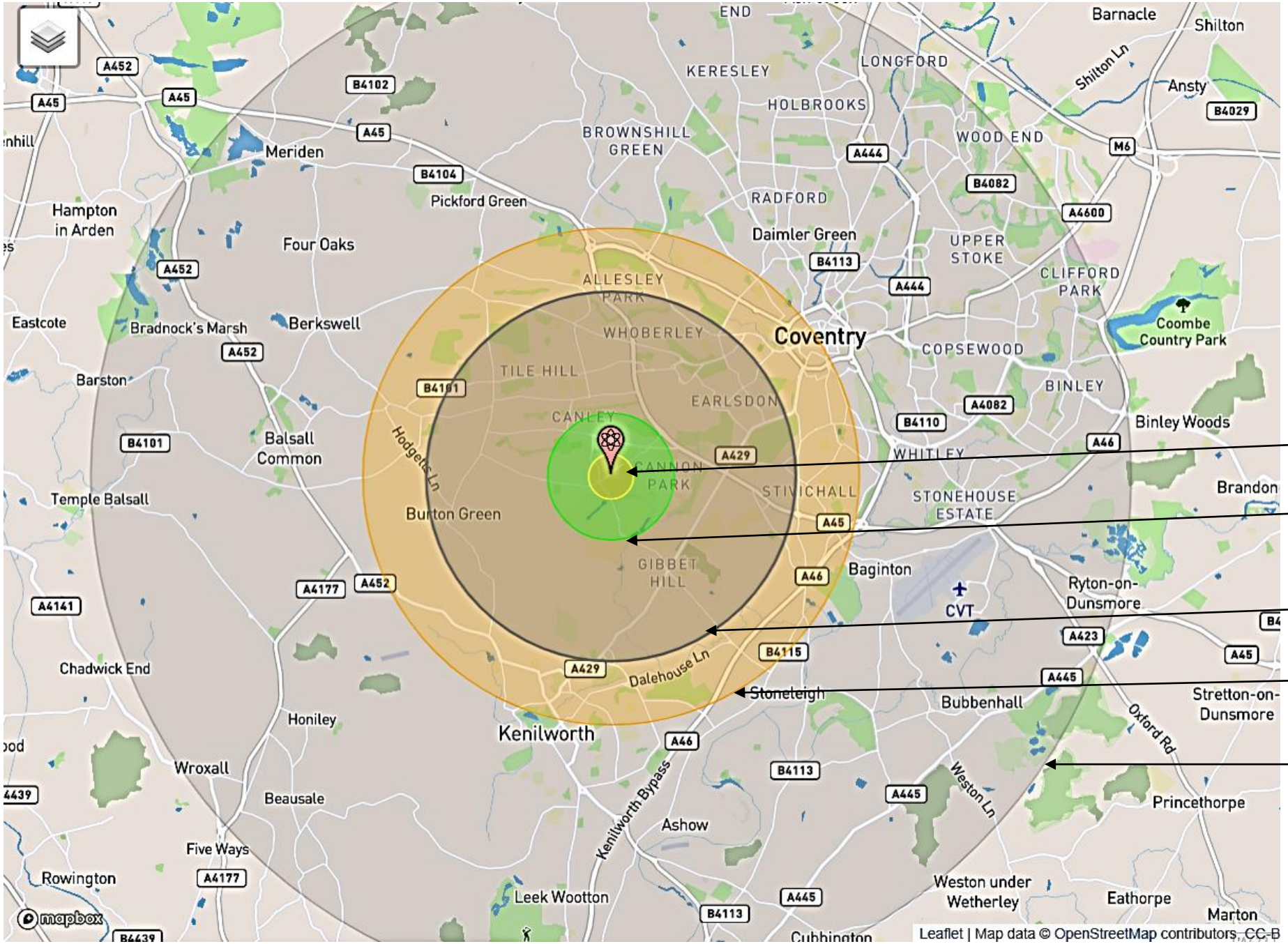
Radioactivity in affected areas is intense at first and dominated by very unstable FPs, so going outside for a few hours could be lethal. contaminated land be carcinogenic for years.

‘Airbursts’ (AB) not touching the ground produce less fall-out but do more damage than GBs as they bounce from the ground. FPs get dispersed in the atmosphere.



High altitude ABs release strong **electro-magnetic pulses** damaging electronic devices across borders *severely disrupting communications.*

A nuke’s ‘yield’ is expressed as tons or kilotons (kt = 1,000 tons) of **TNT equivalents**. At Hiroshima and Nagasaki the respective yields were c 15kt and 21kt; cf current 100 + kt.



100 kt AB bomb on Warwick University main campus

29,490 fatalities

118,480 injuries

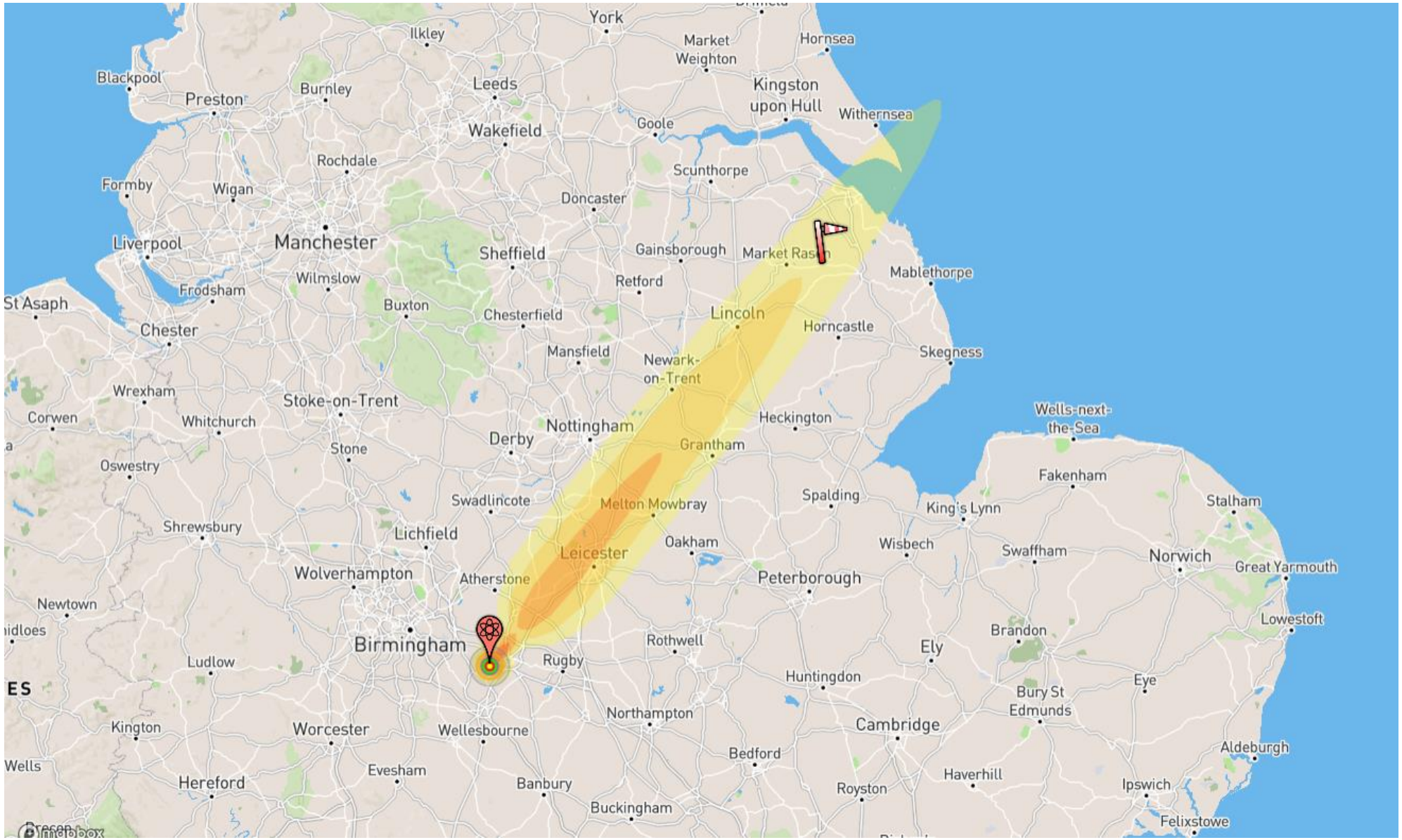
Fireball radius 380m

5Gy radiation radius 1.11 km

5 psi blast radius 3.26 km

3rd deg burn radius 4.38 km

1 psi damage 9.18 km



100 kt GB bomb on Warwick University main campus

Casualties, not including those in the fall-out zone

14,790 killed

43,090 injured

Casualties in Westminster (HoP) & Coventry; AB & GB of 10kt & 100kt compared

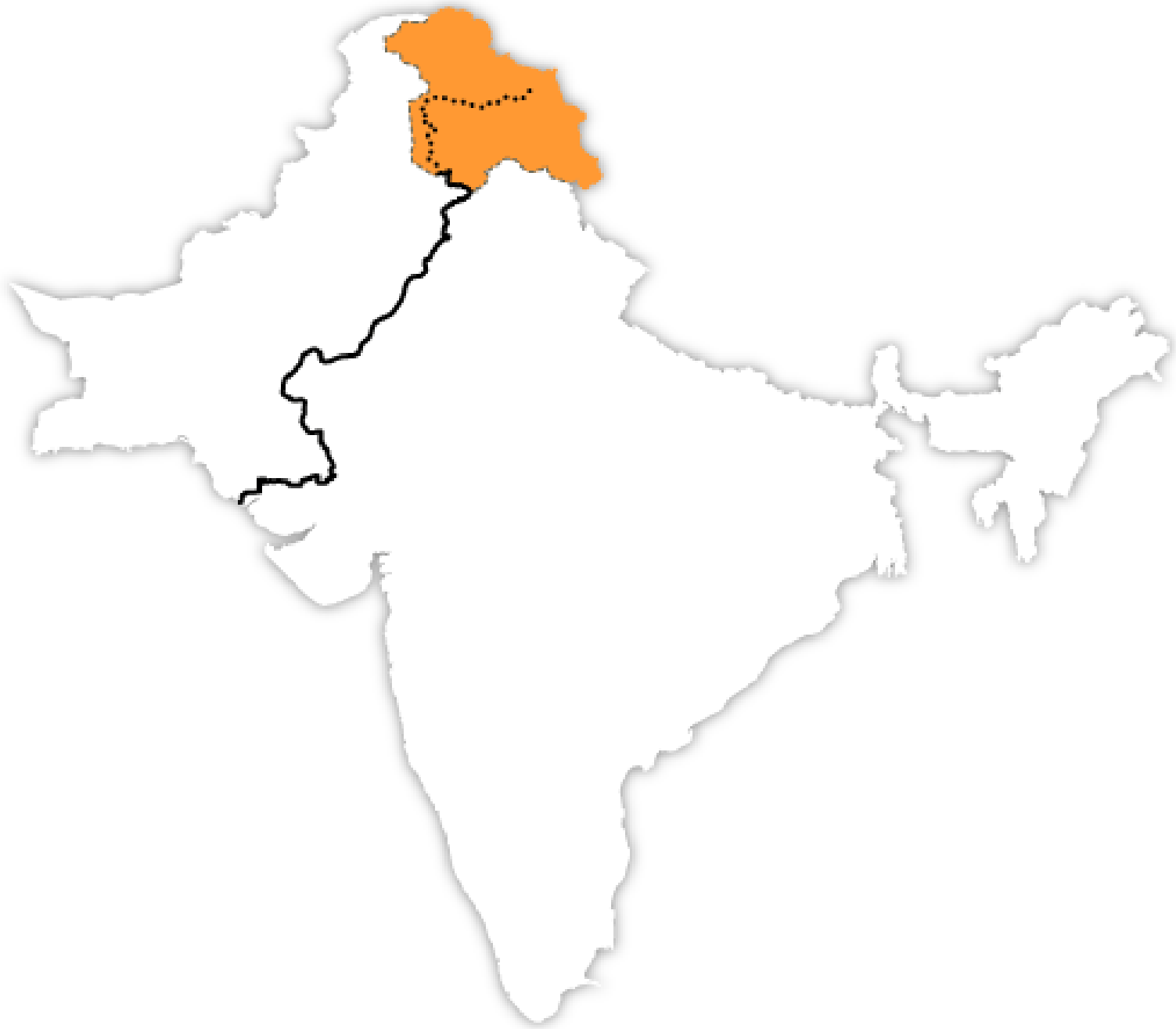
At any site, blast-force-radius breaking all windows (<1 psi) would be;-

•***10kt*** *AB 2.5, GB 1.5 miles* ***100kt*** *AB 6, GB 3.5 miles*

	HoP AB killed	HoP AB inj'd	HoP GB killed	HoP GB inj'd	Cov. AB killed	Cov. AB inj'd	Cov. GB killed	Cov. GB inj'd
10 kt	55,000	225,000	23,000	80,000	5,870	25,990	8,650	2,490
100 kt	**260,000**	**900,000**	132,000	350,000	**29,490**	**118,480**	14,790	43,090

https://nuclearsecrecy.com/nukemap

Nagasaki Medical College a few days after the bombing on 9 August 1945
At least 35,000–40,000 people in Nagasaki were killed and 60,000 others injured.
72 years later, there is still an excess of blood dyscrasias among survivors.



NUCLEAR WINTER

Catastrophic humanitarian consequences globally for a decade;
a nuclear war might bring a reverse climate change

India and Pakistan are Regional military rivals. A not implausible war using all their 200-or-so nukes of 10-30kt each could create firestorms.

On top of immediate casualties, expert analyses show that ***billions across the world*** *will* ***starve to death*** *as trade and communications are disrupted.*

- **5 megatons (Tg) black carbon enters atmosphere, absorb sunrays; eventually washedout**
- **A year later, surface temperature on Earth falls by 1.1 deg C. By 5 yrs it is 3 deg colder**
- **Earth's cooling reduces rainfall; by 5 yrs to 91% of usual; recovering by 26 yrs to 95.5%**
- **In years 2 to 6 after the war, the frost-free crop growing season *shortens* by 10 to 40 days**
- **Oxidants reduce the UV-light-protecting ozone layer. By 5 yrs, the ozone is 20 - 25% thinner**
- **Decreased UV protection reduces plant growth and destabilizes crop DNA; as well as causing more sunburns and skin cancers**
- ***World has c 4,000 nukes ready to fire, many over 100kt, nuclear winters could be worse***

https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2013ef000205

By late January 2020, forest fires in Australia had affected an unprecedented 27 million acres, severely threatening biodiversity.

Three million acres of forest in British Columbia suffered fire storms in 2017. Yu et al (2019) from satellite observations found smoke with an estimated 0.006 Tg of Black Carbon particles, had been

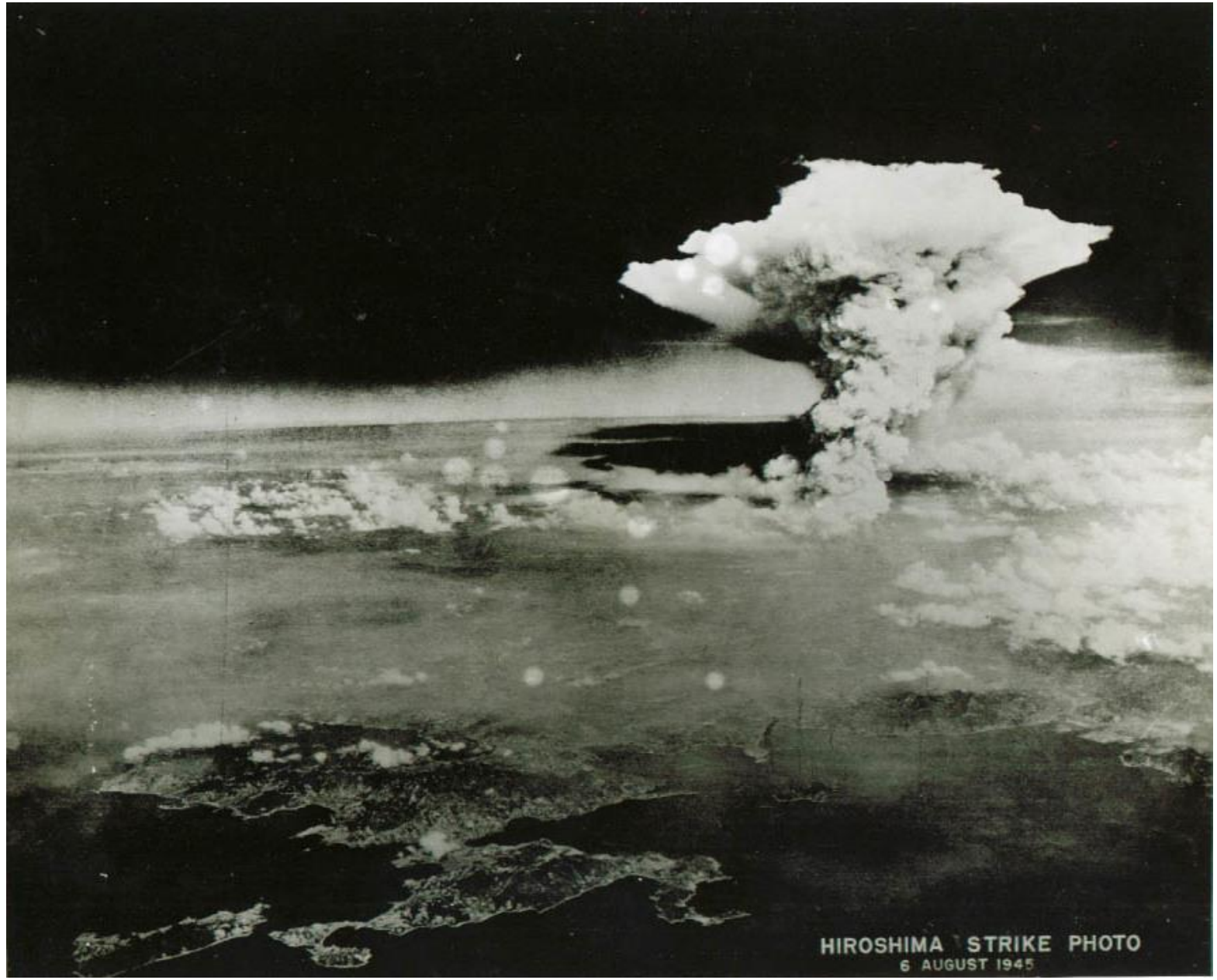
lofted 23 km into the stratosphere and disseminated world-wide,

lingering for at least 8 months causing

detectable reduction of sunlight, stratospheric heating and ozone depletion.

This study gave better insight into the photochemistry and clearance rate of carbon particulates lofted by firestorms into the stratosphere and supports the concept of a ‘nuclear winter’.

The amount of BC emitted by the Australian fires approximates to that from a nuclear firestorm in one city.


HIROSHIMA STRIKE PHOTO
6 AUGUST 1945

Deterrence is the theory that “nukes have kept us safe since 1945”, **based** on **mutually assured destruction (MAD).**

Unverifiable unless/until it fails to avert a nuclear war, but the actions of the Nuke-possessing States indicates that they don’t believe in it

- Modernisation
- Missile defence shields (which can never be foolproof)
- Re-emergence of concept of limited nuclear war
  - Led to abrogation of the US-Russian **Intermediate-Range Nuclear Forces Treaty** (**INFT)** of 1988 which banned all their land-based ballistic missiles, cruise missiles, and missile launchers with ranges of 500 5,500 Km.

Country	Deployed Strategic	Deployed Nonstrategic	Reserve/ Nondeployed	Military Stockpile	Total Inventory
Russia	1,600	0	2,730	4,330	6,500
United States	1,600	150	2,050	3,800	6,185
France	280	n.a.	20	300	300
China	0	?	290	290	290
United Kingdom	120	n.a.	95	215	215
Israel	0	n.a.	80	80	80
Pakistan	0	n.a.	140-150	140-150	140-150
India	0	n.a.	130-140	130-140	130-140
North Korea	0	n.a.	?	20-30	20-30
Total	**~3,600**	**~150**	**~5,555**	**~9,330**	**~13,890**

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Nuclear war and public health: preparedness, protection and the case for prevention

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ABSTRACT

Background According to the Stockholm International Peace Research Institute, the year 2018 saw a continuing 'drift into global instability' in which 'both the USA and Russia are on a path of strategic nuclear (weapons) renewal' with 3750 nuclear bombs globally deployed 'ready to fire'. Treaties are being abrogated with increasingly aggressive language exchanged, and discredited tactics such as 'limited use' revived. These developments risk an amplifying cascade of nuclear weapon fire, whether started by intent, miscalculation or unintentionally.

Results A nuclear war would cause immediate and massive loss of human life, unprecedented damage to societal infrastructures and climatic disruption resulting in a 'nuclear winter' or 'nuclear famine'.

Conclusions The systems defending national territory against nuclear warhead missiles do not guarantee protection, and neither would hastily erected domestic shelters. Any post-survival world would be utterly different and severely challenging. The only effective preventative measures require nuclear disarmament through treaty.

Keywords disaster and emergency planning, nuclear weapons, prevention, public health

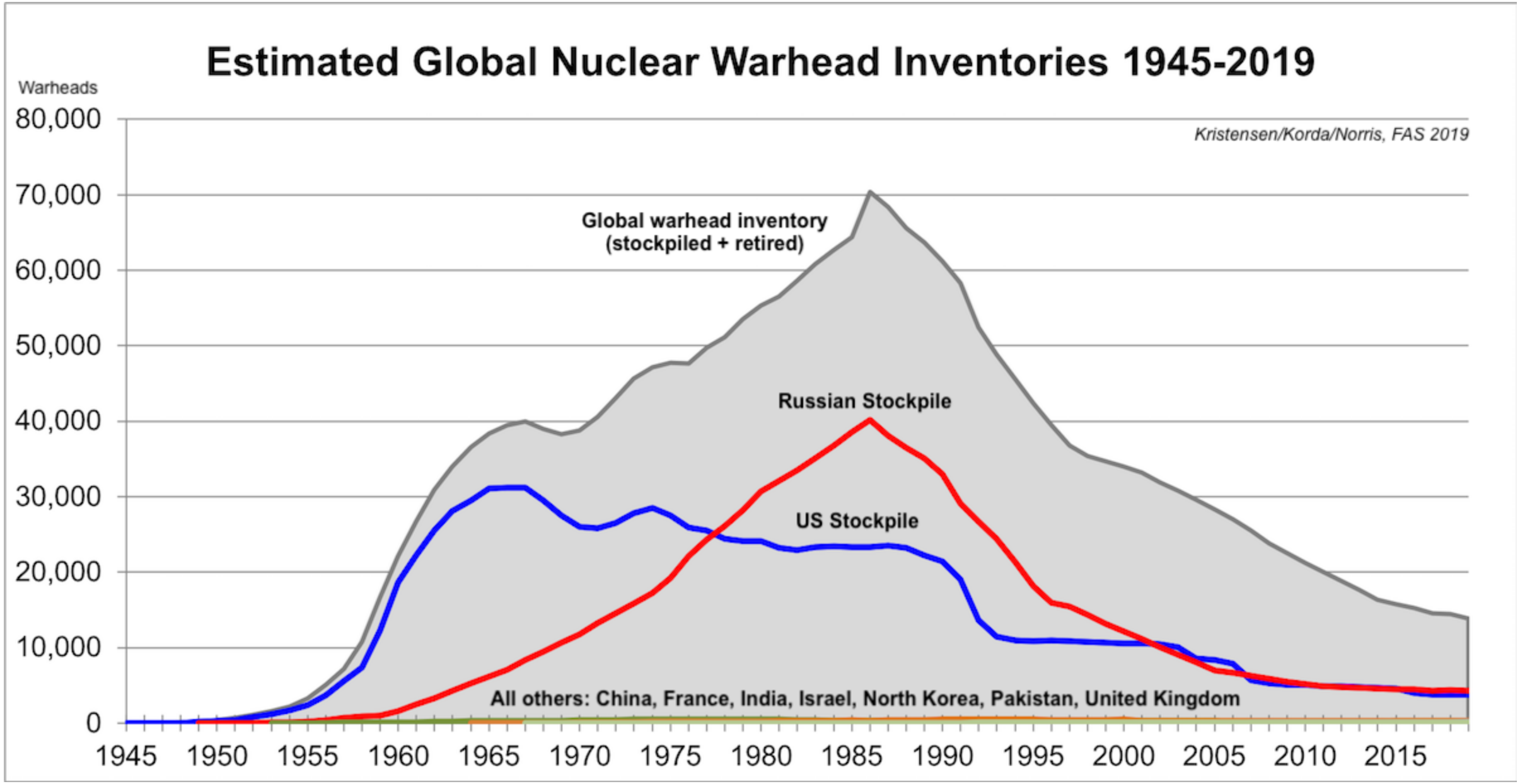
The T P N W, and the N P T

TPNW prohibits developing, testing, producing, stockpiling, stationing, transferring, threatening to use and using nukes. NWSs could start disarming immed. *after* ratifying it.

Motivated by ICAN and the *catastrophic consequences* (nuclear winter), UNGA approved by 122 to 1 in 2017; 69 no vote - P5 (China, France, Russia, UK, US); Israel, India, Pak, NK; NATO

To come into force TPNW needs **50** states to **ratify** it: so far, 33 have, but not the P5 who, while supporting the **NPT** (in force since 1970) won't honour its disarmament obligations, claiming the '*TPNW would undermine it'*.

A crucial NPT conference in 2020 requires patience and a 'listening' dialogue from nuclear disarmers, otherwise the P5 etc would continue building more nukes while non-nuke states with civil nuclear industries would breach *their* NPT obligations by making military nukes from their civil reactor fuels.


Estimated Global Nuclear Warhead Inventories 1945-2019
Warheads
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Kristensen/Korda/Norris, FAS 2019
Global warhead inventory
(stockpiled + retired)
Russian Stockpile
US Stockpile
All others: China, France, India, Israel, North Korea, Pakistan, United Kingdom
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015

UK Trident

4 submarines (boats) providing a ‘CASD’ – usually one sub at a time. Based at Faslane RN base, Scotland

Each sub carried 8 ICBM intercontinental ballistic missiles, with an average of 8 Mk 4A W76 thermonuclear warheads with variable yields up to 100 kt

Subs and warheads built in UK to US design; Missiles rented from US

UK Parliament agreed in 2016 on a replacement programme estimated to cost c £300 billion over 30 years, starting in 2020 and going on until 2060’s


Trident II (D5) missile
Payload
44ft
(13m)
Motor and
guidance
systems
Vanguard class submarine
4 Spearfish
torpedo
tubes
8 Trident
missile tubes
132 crew
Boeing 747
231ft (70m)
Vanguard
492ft (150m)

Parsons is one of nine awardees on a potential $249m contract to support the US Navy’s multi-domain operations. The agreement includes life cycle services for software and hardware of new and existing C4ISR systems and networks.

Command, Control, Communications, Computers, Combat Systems, Intelligence, Surveillance & Reconnaissance

HACKING UK TRIDENT:

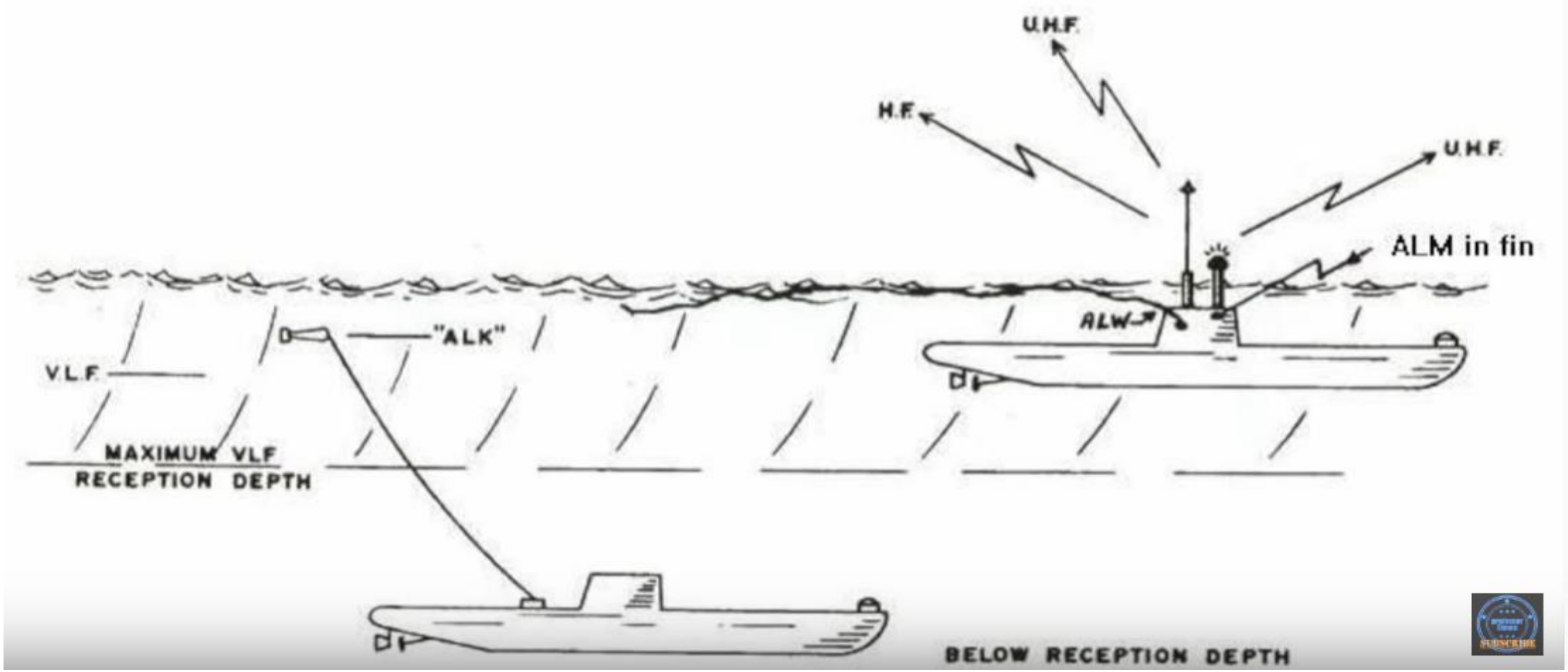
A Growing Threat

BASIC

JUNE 2017

Communicating with a submarine requires transmission of very low frequency VLF radio-waves from very powerful (energy-sapping) land stations covering very large areas.

A deeply submerged vessel with an antenna and buoy on a long cable. The buoy just below the surface requires transmissions to be brief and coded. Swarms of automated underwater enemy drones linked to AI and ‘Big Data’ are under development.



The threat of fully autonomous weapons

https://www.stopkillerrobots.org/learn/

The Problem

Fully autonomous weapons would decide who lives and dies, without further human intervention
If left unchecked the world could enter a destabilizing robotic arms race.
Fully autonomous weapons would make tragic mistakes as they lack human judgment
Who would be held responsible for any unlawful act?

The solution

The development, production and use of fully autonomous weapons must be banned.
Retain meaningful human control over targeting and attack decisions
by prohibiting development, production, and use of fully autonomous weapons.
Legislate the ban through national laws and by international treaty.

All countries, all technology companies and organizations and all individuals working to develop **artificial intelligence and robotics** should **pledge never to contribute** developing fully autonomous weapons.

An additional / alternative approach to security and nuclear disarmament

Possessing nukes is a *political* tool favouring a view of security based on inducing fear in potential enemies.

Anti-nuke views regard nukes as general fear-amplifiers.

TPNW advocates who stigmatise NWSs risk stalling disarmament; so the fears **and** the nukes should be addressed.

Risks could be reduced stepwise, starting perhaps by ‘de-alerting’ and being comprehensive and transparent in international cooperation and negotiations

Swedish Government ‘Stepping Stones’ approach
https://www.government.se/statements/2019/06/the-stockholm-ministerial-meeting-on-nuclear-disarmament-and-the-non-proliferation-treaty/

Fear & insecurity factors

among the ‘have-nots’

hunger, deprivation, destitution, despair, sense of injustice,

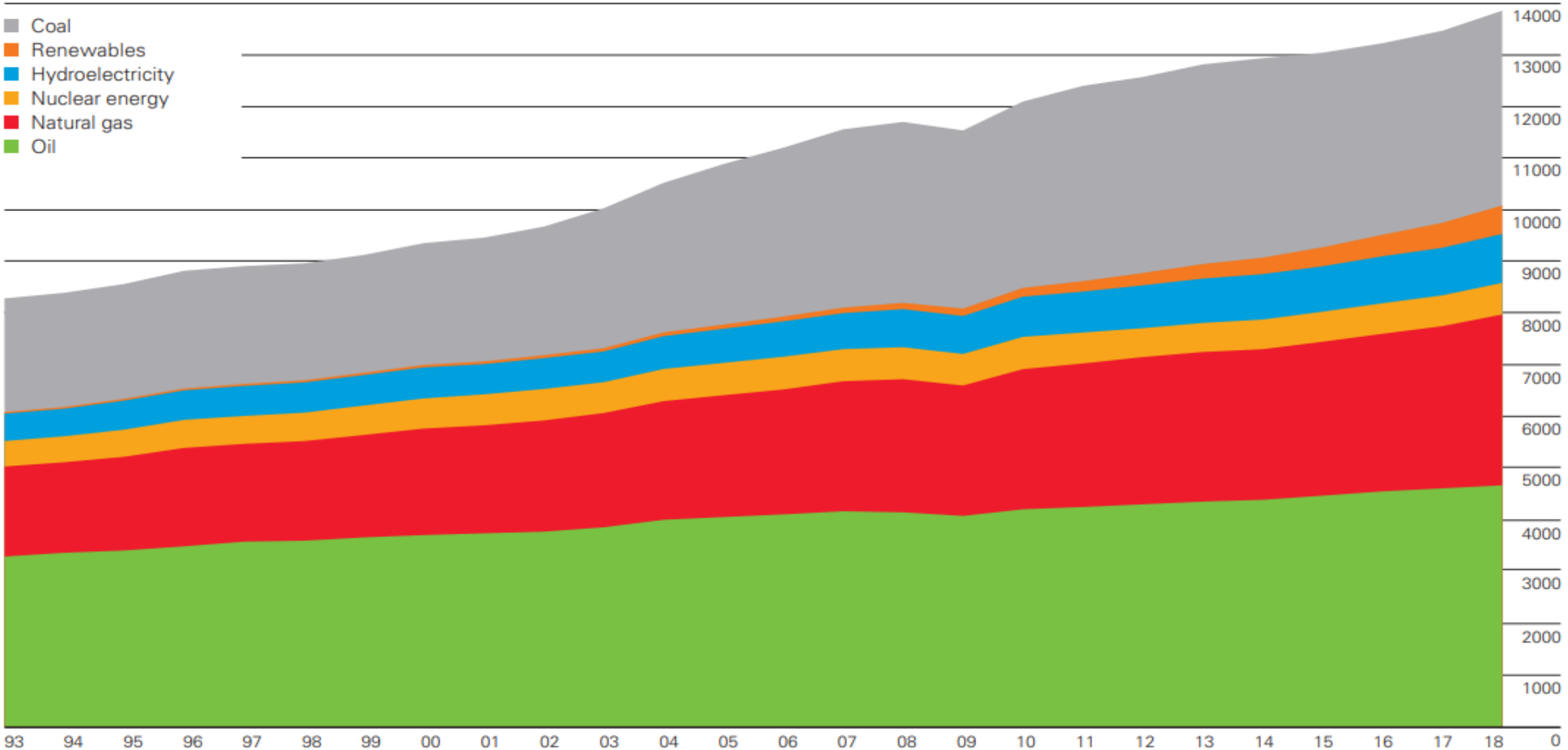
among the ‘haves’

corruption & greed

The world is also hungry for energy to which access is profoundly unequal and supplies dominated by carbon-fuels.

World consumption

Million tonnes oil equivalent



Addressing the inequalities in energy access and political security via improved transparency and international cooperation could also address the climate crisis and achieve **a win-win for disarmament and development** by vastly increasing supplies of renewable fossil and mineral-free low-C energy.

International *dialogue* along such lines offers less confrontation and improved prospects for success characterized by, among other things, respect for cultural diversity and a better balance between individual rights and community responsibilities, gender issues and health care for young and old

Better routes to global security

- Equal access to
  - education and training which encourages
    - respect for cultural diversity and traditions
    - individual development
    - sense of community responsibility and rights of others
- fair access to resources, including clean environment
- wealth redistribution and poverty relief
- equal rights
  - for people of any gender
  - to creative means of generating wealth
  - to health care and welfare
  - to justice based on restorative approaches and legal aid

Negotiating a nuke-free world was never going to be easy

- Hard-wired antagonisms need to be countered
- ‘Failing State’ status is already applying to Russia and beginning to affect US
- Some mid-developing States see nukes as a way of securing their own ‘status’

But we must continue. ‘Mature’, honest and conscientious approaches are called for, underpinned by the universality of human rights and the alleviation of suffering.

Everything that Medact does is in this direction, whether for better access to healthcare, better ways of creating a healthy and fair economy, improving environmental health, countering climate change, or promoting disarmament.

Improving energy use and developing a global energy-generating system solely dependent on renewables and natural bio-fuels would be a major step forward.