

# There Are No Small Nuclear Weapons

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Vienna Conference  
on the Humanitarian Impact of Nuclear Weapons  
June 20, 2022

# The explosive power of nuclear weapons


“Yield”, measured in 1000 tons conventional explosive-equivalent (**kT**)

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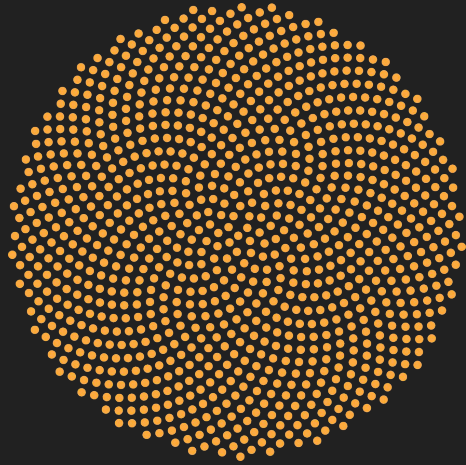
1 ton  
of TNT



10 tons  
of TNT  
(biggest conventional  
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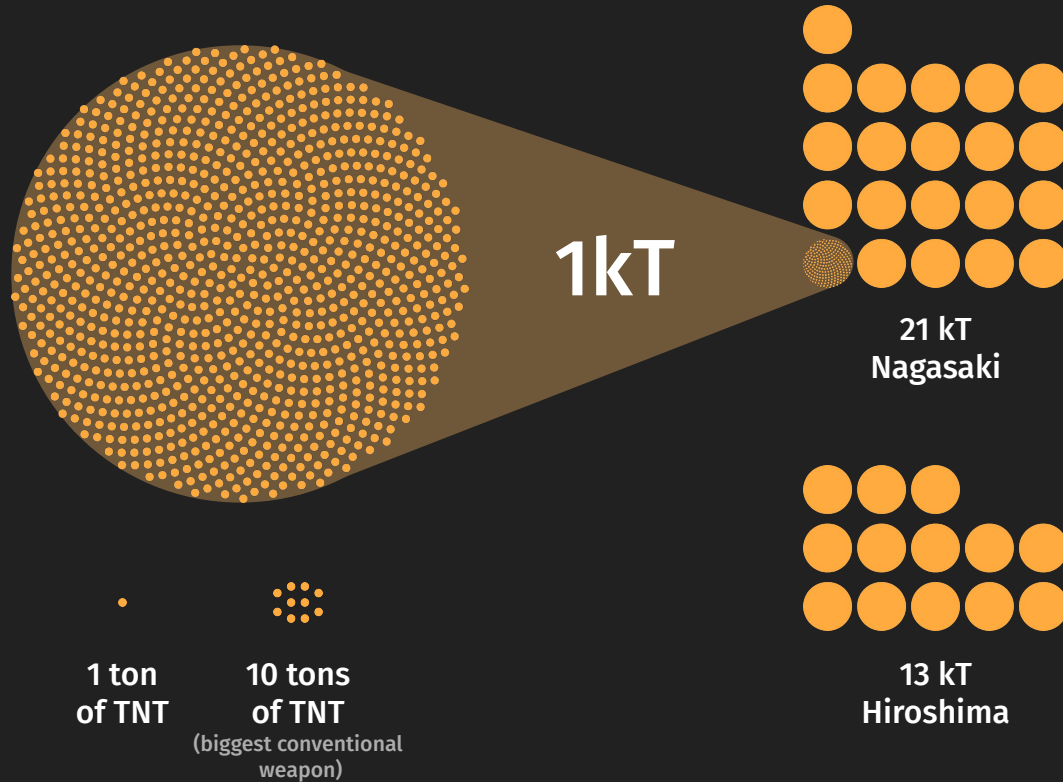
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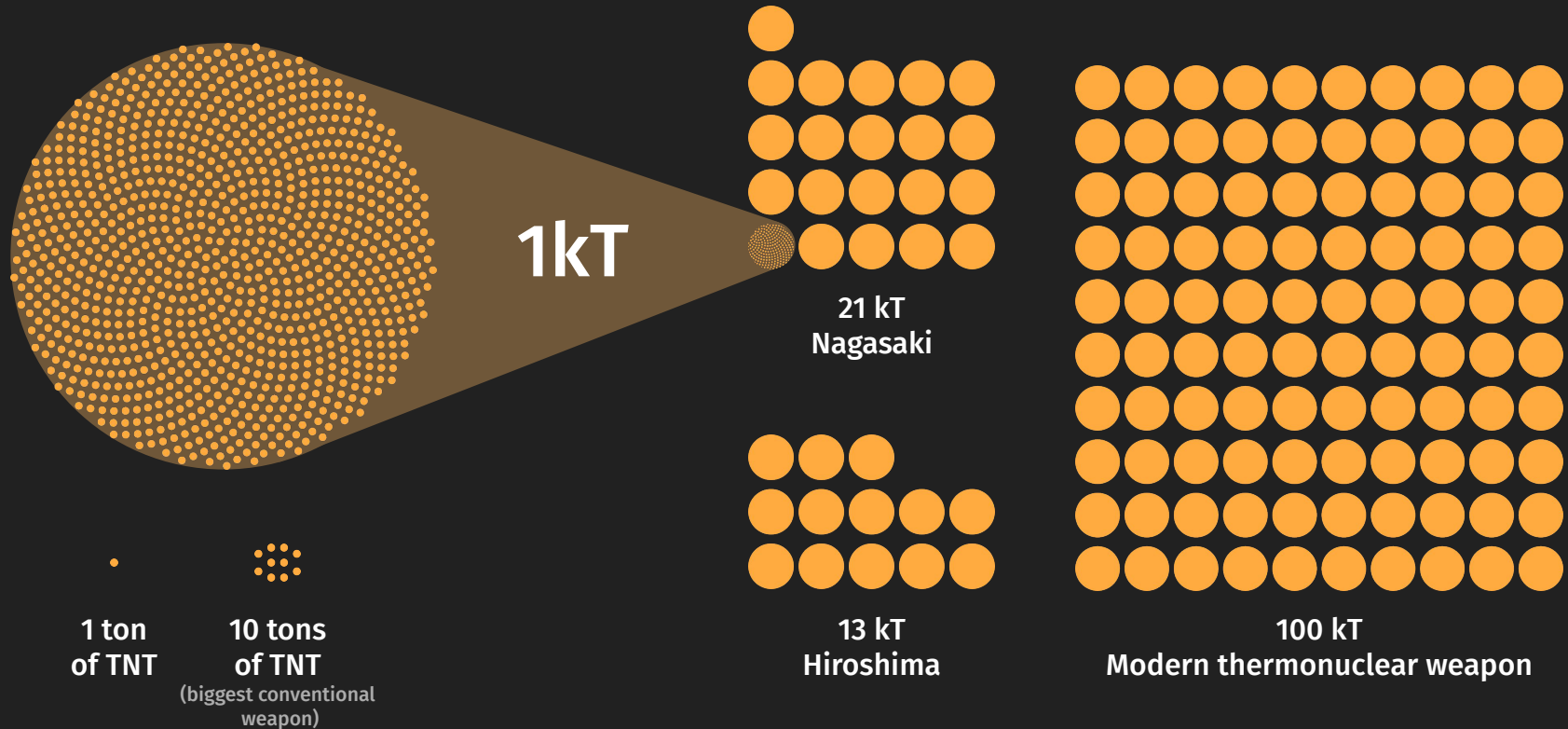
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# Effects of a 1 kT nuclear weapon

Vienna International Center for scale comparison



5 minute walk from marker

# Effects of a 1 kT nuclear weapon

## Vienna International Center for scale comparison



Overpressure causes  
building damage,  
98% of people will die  
immediately  
(Radius for overpressure of 12psi/0.8 bar)

Burst height 210m, optimized for 12 psi overpressure, radii calculated with Alex Wellerstein's Nukemap: <https://nuclearsecrecy.com/nukemap/>

Overpressure lethality from U.S. OTA, "The effects of nuclear war", 1979.

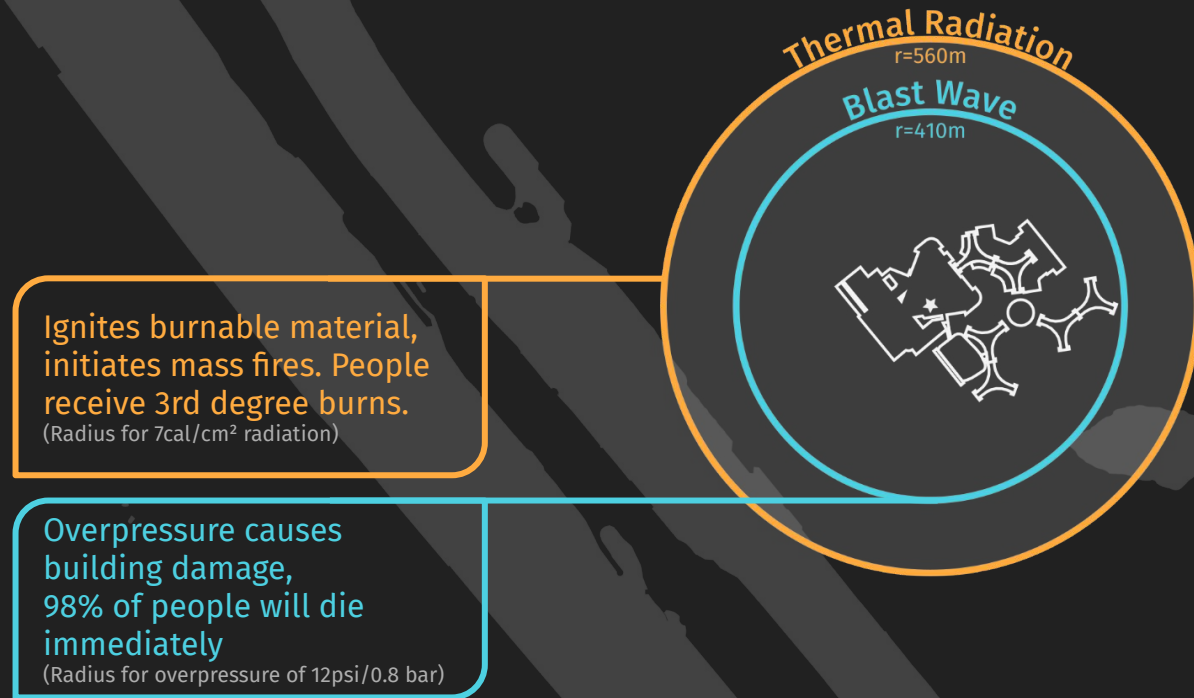
Austrian burn center capacity from FFUERwehrOBJEKTIV 6/2010

Lethal Dose LD 50/30 from U.S. Nuclear Regulatory Commission (upper bound 5 Sv = 500 rem)



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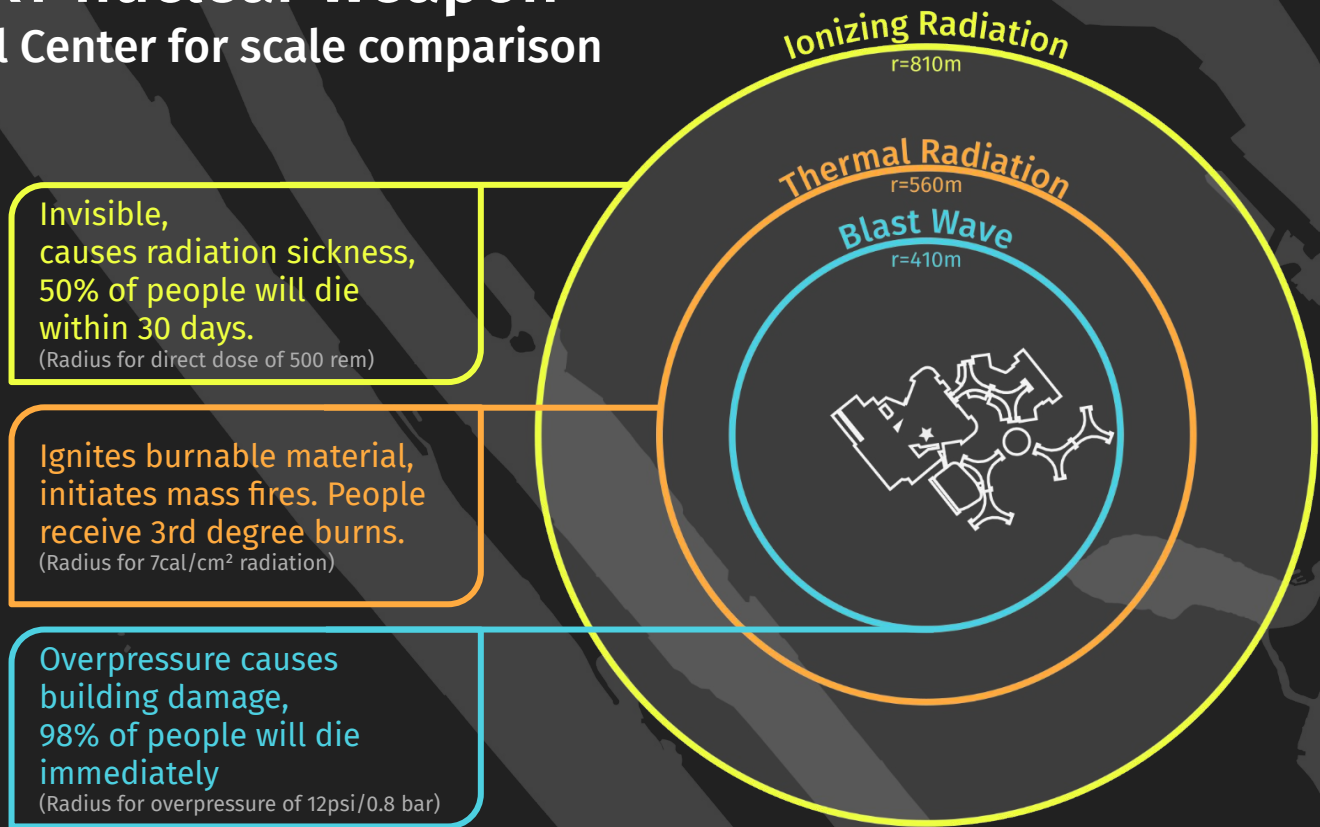
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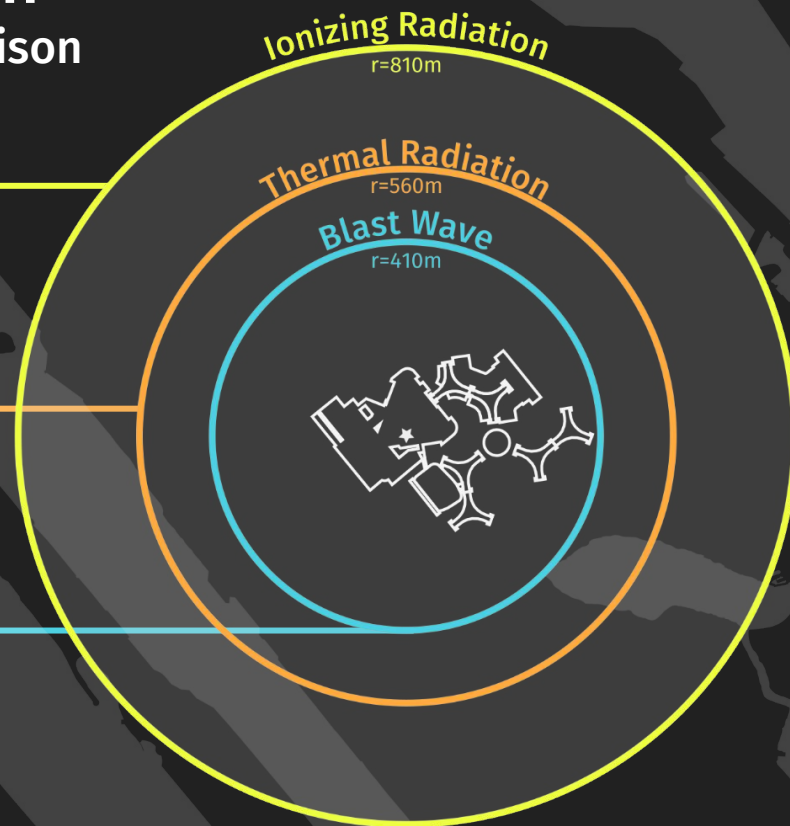
## Vienna International Center for scale comparison

Casualty estimates depend on population density, location of people and available medical care.

Invisible, causes radiation sickness, 50% of people will die within 30 days.  
(Radius for direct dose of 500 rem)

Ignites burnable material, initiates mass fires. People receive 3rd degree burns.  
(Radius for 7cal/cm<sup>2</sup> radiation)

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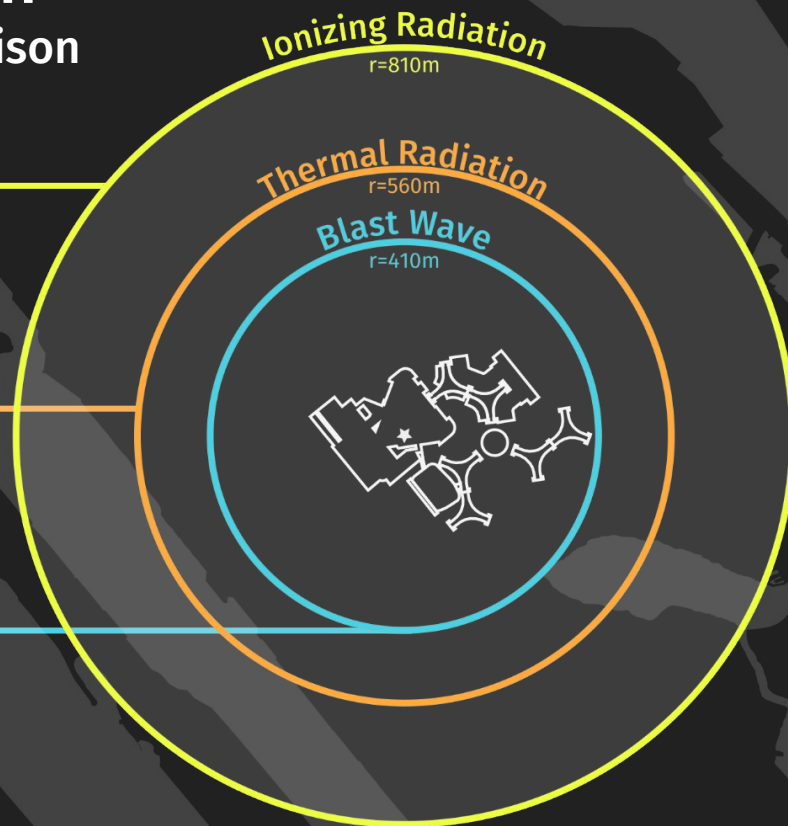
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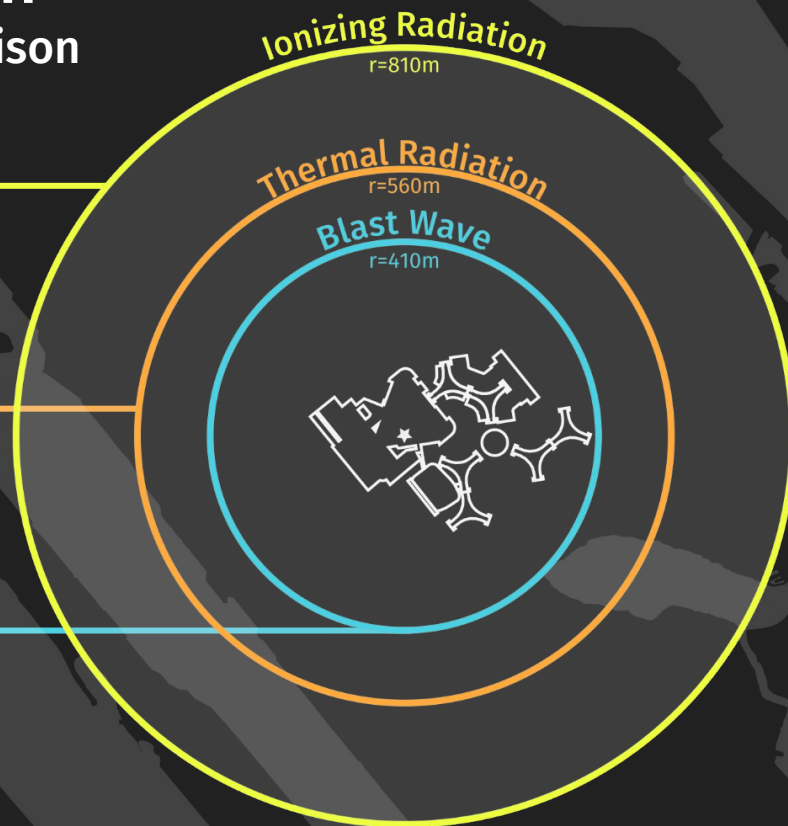
**Thousands** of immediate casualties expected for cities.

Additional health effects after weeks, months & years.

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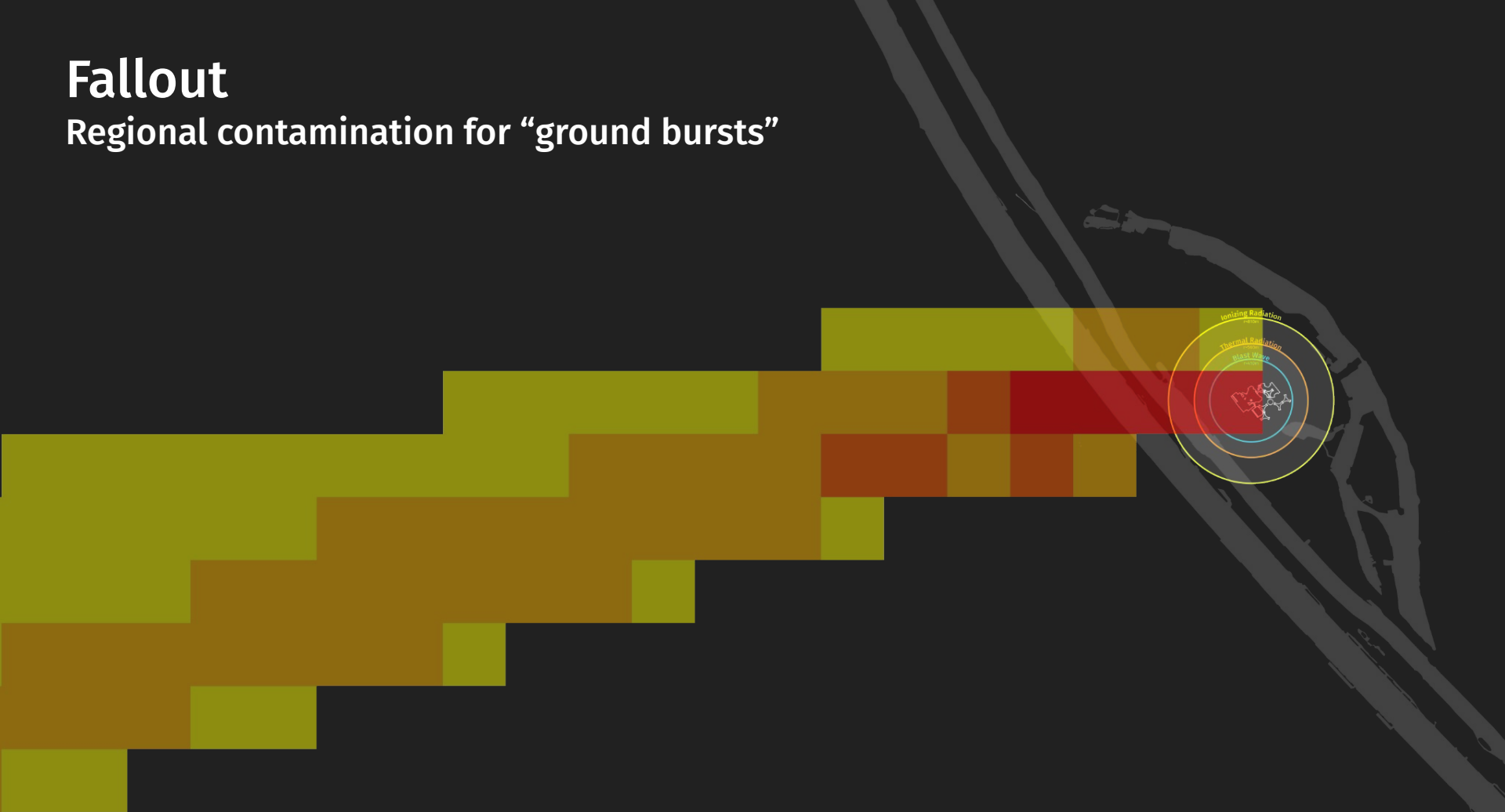
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# Fallout

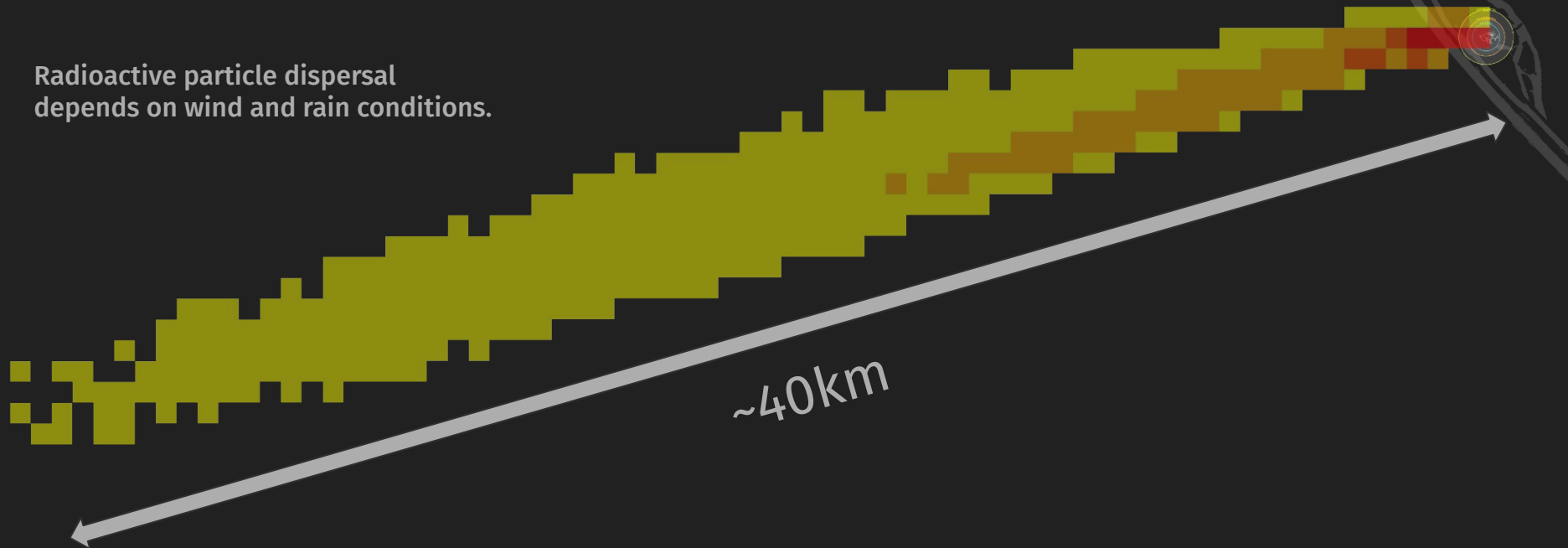
## Regional contamination for “ground bursts”



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Radioactive particle dispersal  
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**Increased  
cancer rates**

(10 rem)

**50% of people die  
within 30 days**

(500 rem)

~40km



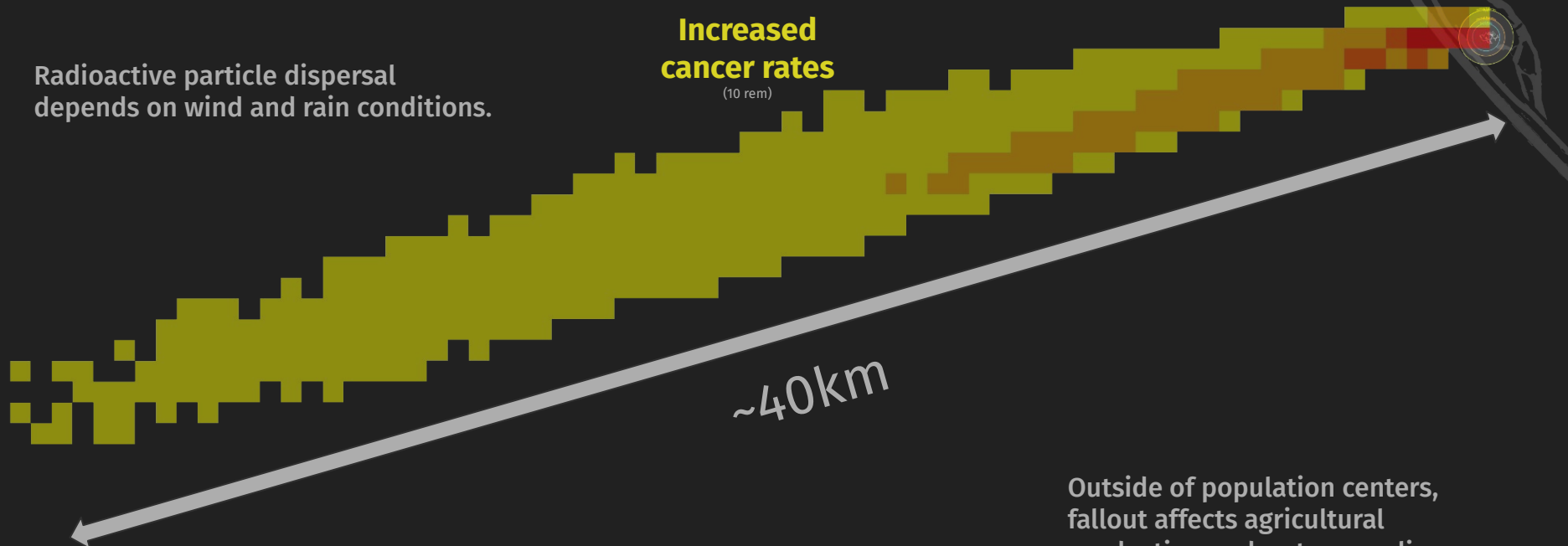
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Outside of population centers,  
fallout affects agricultural  
production and water supplies.

# Social & Psychological Effects after the use of a single nuclear weapon

Mental health is considered biggest  
problem of reactor accidents  
Three Mile Island (1979) and Chernobyl (1986).

Neria. and Sullivan (2011) 'Understanding the Mental Health Effects of Indirect Exposure to Mass Trauma Through the Media', *JAMA*, 306(12), pp. 1374-1375.

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Mushroom cloud size and artwork from Alex Wellerstein's Nukemap: <https://nuclearsecrecy.com/nukemap/>. Images from Google Earth Pro.

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News and social media exposure will have overwhelming negative **mental health consequences** (cf. 9/11, Fukushima).

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# Escalation

Single nuclear weapon use is likely not the last step



Princeton Simulation "Plan A"

<https://youtu.be/2iy3IU-ORpo>

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Single nuclear weapon use is likely not the last step

From U.S. wargames:

*“So we played a big exercise [...] how do you think it ends? It ends the same way every time. It does. **It ends bad.** And the bad meaning it ends with **global nuclear war.**”*

Gen. Hyten,

Head of U.S. Strategic Command, 2018

<https://www.stratcom.mil/Media/Speeches/Article/1577239/the-mitchell-institute-triad-conference/>



Princeton Simulation “Plan A”

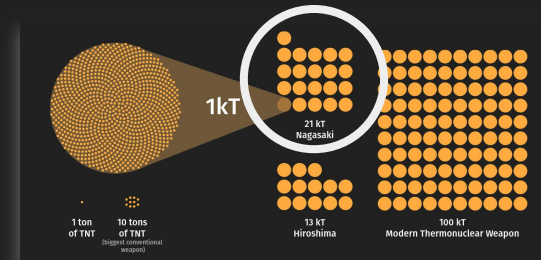
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# Arsenals for a Global Nuclear War

## Ordered by explosive power

Nagasaki yield or less  
( $\leq 21$  kT)

750



Based on  
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<https://missilethreat.csis.org/>

# Arsenals for a Global Nuclear War

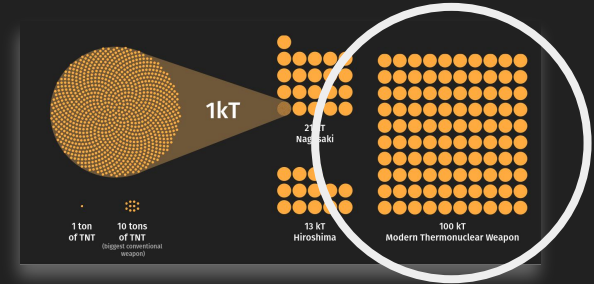
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Yield up to 5 times larger  
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3700

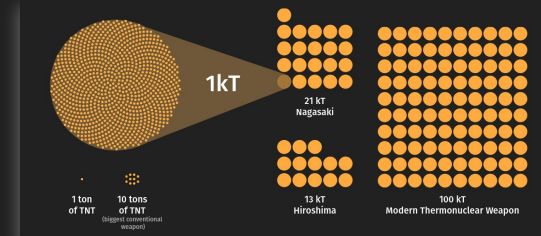


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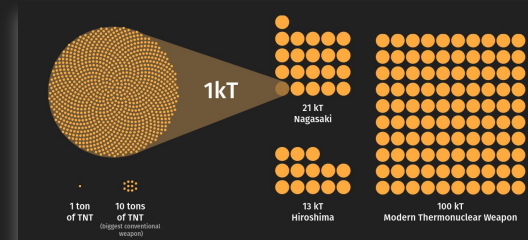
Even bigger  
(150 kT - 5000 kT)

4050

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Unknown

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# Takeaways

There are no small nuclear weapons because

- 1) ... direct effects are catastrophic
- 2) ... of unknown global social and psychological effects
- 3) ... any use likely triggers escalation