



# Citizens and cities facing new hazards and threats

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SESSION 4: COVID-19

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## How to reconsider impact profiling of biological events after COVID19

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## Policy and decision makers addressing the CBRN events

Challenging tasks:

- PREVENTION/PREPAREDNESS - **To define strategies and select investments** to address potential events and mitigate their impacts
- RESPONSE - **To implement actions and use resources** to promptly face short-term direct and indirect effects of the event
- RECOVERY - **To restore the normal-life conditions** in the shortest time **reducing social-economic losses** in the medium and long term (including indirect effects on citizens' health, e.g. health service costs).

## Policy and decision makers addressing the CBRN events (before COVID19)

**Communication COM(2009) 273 final, on Strengthening Chemical, Biological, Radiological and Nuclear Security in the European Union – an EU CBRN Action Plan (24 June 2009)**

*“... it is clear that no public authority can afford to ignore this threat given its potentially very significant consequences in terms of **human life** and its **economic effects**. There is also a consensus amongst experts that the case of a somewhat limited attack needs to be carefully considered because the **psychological, health and economic effects on the population** of even a **small scale attack** using such materials would be significant”.*

**Communication COM(2017) 619 final, Action Plan to enhance preparedness against chemical, biological, radiological and nuclear security risks (18 October 2017)**

*“The EU is currently facing a range of terrorist threats and attacks of a violent nature, from both networked groups and lone actors. Both terrorist groups and radicalised individuals have sought to carry out mass-casualty attacks in the EU with the aim of maximising both the **number of victims and the psychological and economic impact on society**”.*

*“Even at a **small scale**, a CBRN attack may have a **considerable impact on the societies and economies** against which they are used, resulting in significant and lasting disruption, widespread fear and uncertainty. Both the human and financial costs associated with attacks, involving for instance a radioactive dispersal device (also known as dirty bomb) or an anthrax attack using unmanned aerial systems, could be extremely high.”*

## **B** events as one of the types of CBRN threats (before COVID19)

**Chemical, Biological, Radiological and Nuclear (CBRN) events** increasingly gained positions in the **priority agendas of the policy makers** in most of the countries of the world.

Attention to three types of events:

- a) caused accidentally by **human error** (e.g. Chernobyl),
  - b) generated by **technological disasters** (e.g. Seveso),
  - c) determined intentionally as **criminal/malicious/terroristic acts** (e.g. Tokyo).
- **Human-centric view?** Focus on human activities/actions leading CBRN events
- *“chemical, biological, radiological and nuclear (CBRN) materials are **produced, transported and handled** under many different circumstances, posing a risk to society; while so far major incidents involving CBRN materials, including terrorist acts, have been relatively few, the consequences of such an incident could be devastating”* (Council Conclusions 15505/1/09 rev.1)
- Factors affecting **severity of the potential impact** range from density of population of the affected area to the type of the dispersed material, from the health-care response efficiency to the weather/climate conditions at the time of the events.

# Approaches to assess the impact of CBRN events (before COVID19)

- Kaufmann et al. (1997). Analyses of a **theoretical biological post-attack due to three classic agents of biologic warfare** (*Bacillus anthracis*, *Brucella melitensis*, and *Francisella tularensis*) released as aerosols in the suburb of a major city (the population exposed amounting to 100,000 person). In each case, the economic impact was proxied by **cost of hospitalization and outpatient visits**.
  - Limit. Only persons with symptoms (i.e., case-patients) were considered. Time in the response phase has a crucial role.
- RAND Corporation (2005). Analysis of the **possible insured losses** related to **two different types of Anthrax attack: a) inside a single large building; b) widely dispersed outdoor**.
  - Limit. Time-independent factors considered. E.g. property damages, workers' compensation

## A way to profile impact of CBRN events (before COVID19)

Ramseger et al. (2009) proposed **four categories of economic impacts generated by all type CBRN events**. Costs for:

- a) first response measures
- b) recovery, reconstruction, restoration
- c) indirect damages
- d) macro-economic losses

Cavallini et al. (2014) proposed to highlight a second dimension of the **economic impact generated by biological events** in addition to the “**large-scale effects**” defined in Ramseger et al. (2009) → **persistence of effects**.

## Relevance of persistence in **B** events (before COVID19)

### Elements characterizing CBRN materials

	Biological material	Chemical material	Radiological material	Nuclear material
Symptoms displays	Delayed	Rapid	Rapid and delayed	Immediate and delayed
Casualties appearance	Gradual and in a spread way	Simultaneous and concentrated	Simultaneous, gradual and in a spread way	Simultaneous, gradual and in a spread way
Persistence in the environment	High	Low	Very high	Very high

Source: Cavallini et. al. Elaboration based on Garcia et al. (2011)

### Factors affecting persistence

	Biological material	Chemical material	Nuclear/radiological material
Onset	Slow	Rapid	Rapid
Transmission/infectivity	Slow, agent dependent	Fast, agent dependent	Particulate only, fast
Detection	Difficult	Easier	Easier
Resource consumption	Gradual, long term	Rapid, short term, some long term	Rapid, short and long term
Public health involvement	Short and long term	Short term	Short and long term
Bed use	Mixed	Hospital	Hospital
Decon. requirements	Agent dependant	Critical for all	Critical for particulate
Antidote	Agent dependant	Class dependant	None

Source: Cavallini et. al. based on Kollek (2006)



# Relevance of persistence in **B** events (before COVID19)

**Categories of costs of events generated by B material taking into account persistence**

Type of cost	Short term	Mid term	Long term
First response measures	<ul style="list-style-type: none"> <li>• Rescue of injured and threatened people</li> <li>• Evacuation</li> <li>• Registration of contamination</li> <li>• Immediate decontamination</li> <li>• Measures to cordon off the contaminated area</li> </ul>	<ul style="list-style-type: none"> <li>• Blocking the spread of dangerous biological materials</li> </ul>	
Recovery, reconstruction, restoration	<ul style="list-style-type: none"> <li>• Health care for injured people</li> </ul>	<ul style="list-style-type: none"> <li>• Cleaning up measures and thorough decontamination</li> <li>• Resettlement and relocation</li> <li>• Restoration of infrastructure: transport system, public services (water supply, electricity)</li> <li>• Gathering of infected animals</li> <li>• Clearance of contaminated cadavers and plants (Biological waste management substances)</li> </ul>	<ul style="list-style-type: none"> <li>• Costs for the deceased (medical forensics, funerals, life insurances)</li> <li>• Pensions, etc. for disabled people</li> </ul>
Indirect damage cost	<ul style="list-style-type: none"> <li>• Loss of earnings caused by loss of consumer confidence</li> <li>• Loss of earnings caused by decline in tourism</li> <li>• Loss of earnings resulting from injuries/sicknesses or death of Employees</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of earnings because of state of emergency (regional and international)</li> <li>• Loss of earnings caused by (preventive) culling</li> <li>• Economic impact of temporary infrastructure breakdown: transportation system, public services (water supply, electricity, telephone network)</li> </ul>	<ul style="list-style-type: none"> <li>• Economic impact of temporary infrastructure breakdown: transportation system, public services (water supply, electricity, telephone network)</li> </ul>
Macroeconomic loss		<ul style="list-style-type: none"> <li>• Consequential costs from loss of income (multiplier effects)</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of investor confidence/propensity to save</li> </ul>

Source: Cavallini et. al. based on elaboration of Ramseger et al. (2009)

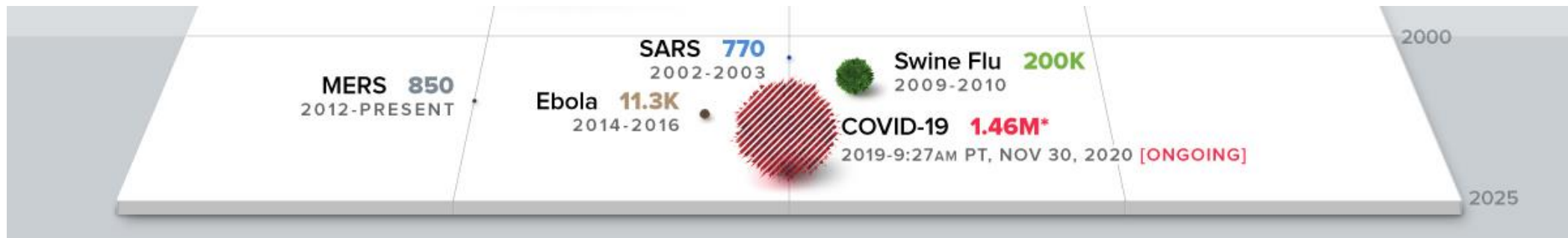
*“By far the greatest number of studies found deal with costs relating to biological threats. Figures for **first response** (some tens of billions of dollars) and for **indirect costs** (up to several hundred billion dollars) are in the same region as those for the chemical threats. Sums for **direct costs of recovery and reconstruction**, however, are **more than ten times larger than those for chemical and radiological hazards** (in the billions). **Prevention and protection costs** are likewise in the same region as those for chemical threats, i.e. several billion dollars for prevention, and tens of billions for protection.”*

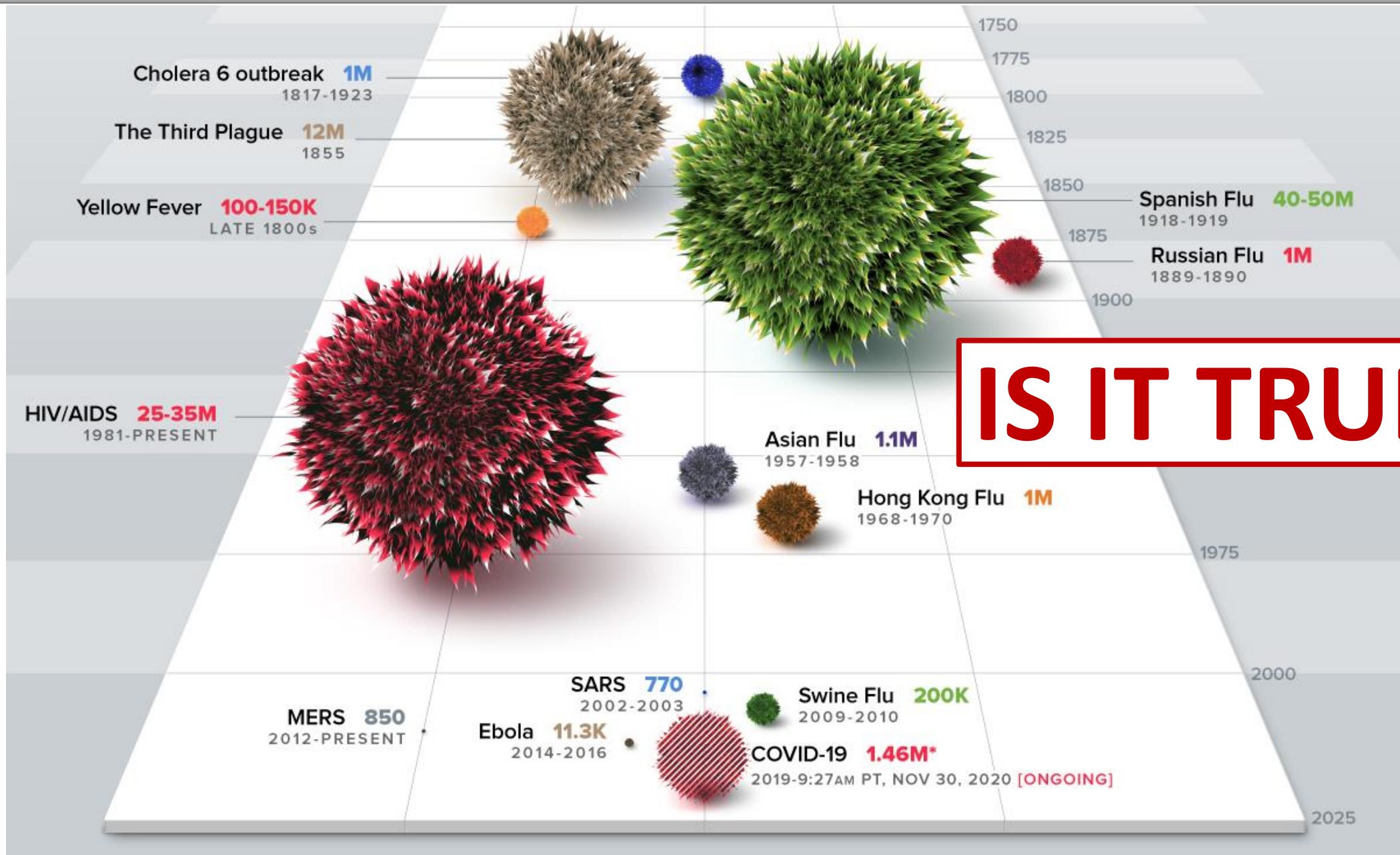
Source: Ramseger et al. (2009)

# Changing the paradigm. A natural **B** threat.

**COVID19 IS THE INFECTIOUS DISEASE WITH THE HIGHEST IMPACT IN THE MODERN ERA**

- **Almost 1.5 million fatalities** in less than 1 year.
- Spread **around the world**. In all continents. In all the countries.
- **Still on-going.**
  - The first wave before summer 2020
  - The second wave in the second part 2020
  - The third wave?
- **Vaccine under investigation.** Available at the beginning of 2021(?)





Name	Period	Type/Pre-human host	Death toll
<b>Spanish Flu</b>	1918-1919	H1N1 virus / Pigs	40,000,000-50,000,000
<b>Asian Flu</b>	1957-1958	H2N2 virus	1,100,000
<b>Hong Kong Flu</b>	1968-1970	H3N2 virus	1,000,000
<b>HIV/AIDS</b>	1981-present	Virus / Chimpanzees	25,000,000-35,000,000
<b>Swine Flu</b>	2009-2010	H1N1 virus / Pigs	200,000
<b>SARS</b>	2002-2003	Coronavirus / Bats, Civets	770
<b>Ebola</b>	2014-2016	Ebolavirus / Wild animals	11,000
<b>MERS</b>	2015-Present	Coronavirus / Bats, camels	850
<b>COVID-19</b>	2019-Present	Coronavirus – Unknown (possibly pangolins)	1,450,000

Source: "Visualizing the History of Pandemics", <https://www.visualcapitalist.com/history-of-pandemics-deadliest/>

# COVID19. The impact of a **B** event

## **JOIN(2020) 11 final, Communication on the Global EU response to COVID-19**

*“The coronavirus outbreak has evolved into a global pandemic. It has **killed tens of thousands of people**, straining communities, increasing calls for social protection, **shrinking business activity** and disrupting supply chains. Its consequences will be profound. Having appeared first in China, **the pandemic has now spread in Europe and around the globe**, with a spill over on **social stability and security**.”*

*“This **unprecedented health crisis** will most likely bring **adverse economic and social effects**: these have to be tackled as a matter of urgency to prevent destabilisation. This requires actions on several fronts: cushions in the face of **possible macro-economic shock**, appropriate backing to financial intermediaries, a mix of financing options for the public and private sector. It also includes ensure a protective framework for the work force and incomeless households.”*



# Are there differences respect to other high-impact pandemics?

## Spanish flu (1918 – 1920)



Source: [Indian Press](#), Emergency hospital at Camp Funston, Kansas (USA)  
Photo by Harris & Ewing via Wikipedia Commons)

## COVID19 (2020 – ...)



Source: [El Pais](#), Pavilion 5 of the field hospital of Ifema in Madrid (Spain)  
Photo modified by the author

## Are there differences respect to other high-impact pandemics?

### Spanish flu (1918 – 1920)

*“When the Spanish flu first appeared in **early March 1918**, it had all the hallmarks of a seasonal flu, albeit a highly contagious and virulent strain. One of the first registered cases was Albert Gitchell, a U.S. Army cook at Camp Funston in Kansas, who was hospitalized with a 104-degree fever. **The virus spread quickly through the Army installation, home to 54,000 troops.** By the end of the month, 1,100 troops had been hospitalized and 38 had died after developing pneumonia.”...* ***As U.S. troops deployed en masse for the war effort in Europe, they carried the Spanish flu with them.*** Throughout April and May of 1918, the virus spread like wildfire through England, France, Spain and Italy.”

Source: <https://www.history.com/news/spanish-flu-second-wave-resurgence>

## A way to profile impact of **B** events (after COVID19)

Working on a three-dimension approach.

Profiling of the **economic impact generated by biological events** based on:

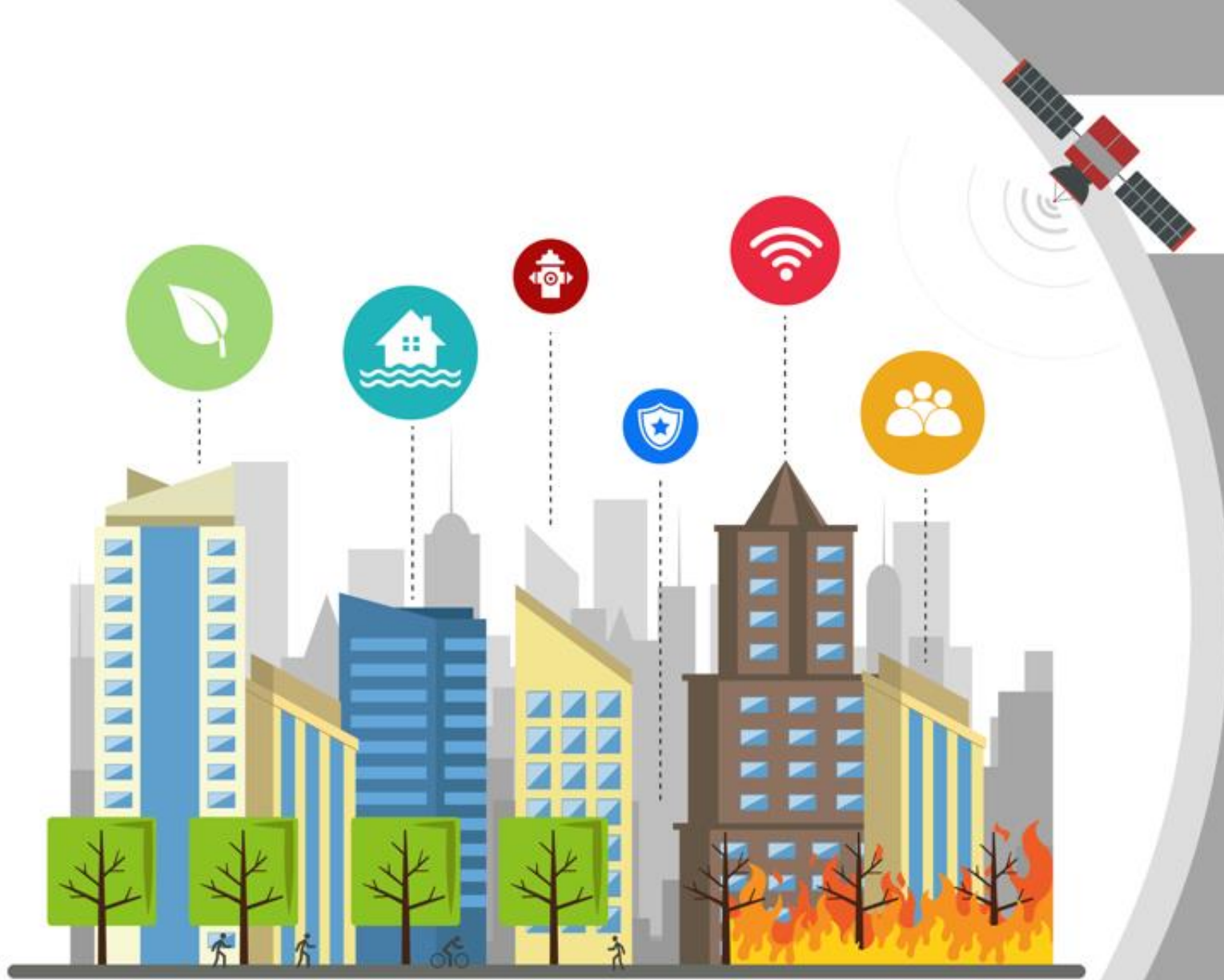
- **large-scale effects**
- **persistence of effects**
- **a multiplier factor** given by the **intensity/frequency of human contacts** (as spreading factor as well as a resilience source)

→ To better support policy and decision makers to design and implement measures addressing B events as pandemics (prevention, preparedness, **response, recovery**).



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**Thank you for your attention!**  
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