FRAGILE WORLD FOUNDATION

Saving mankind through strategic measures against extreme global hazards

---

2013

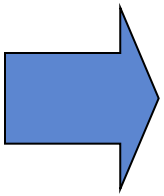
EXECUTIVE SUMMARY

- The world is in danger from natural hazards
  - **NEO**: Near earth object impact → More probable than being killed in a plane crash
  - **VIRUS:** New and emerging microbial pathogens (viruses, bacteria)
  - **GEO**: Natural catastrophes, resulting from plate tectonics (e.g., volcanic eruptions or earthquakes, generating large tsunamis)
- The FRAGILE WORLD FOUNDATION, FRAGILE or FWF represents a "fire-insurance" for humankind – fire is unlikely but it makes a lot of sense to be insured. However, the premium needs to be invested into **prevention**. Because after a "total loss" non-replacement is possible.
- Fighting terror is a prevention attempt with high means on low probability events similar to FRAGILE topics, the latter with little means (yet).
- The probabilities of counter measures against these three sources of danger are related to each other, as demonstrated by non-linear dynamic studies.
- A team of worldwide leading scientists and experts is supporting the Foundation. FRAGILE will build on the research of all institutes involved and **act as a synergy point and project leader** for developing and implementing prevention strategies.

FRAGILE - an "insurance" to prevent global natural disasters

VISION OF FRAGILE WORLD FOUNDATION

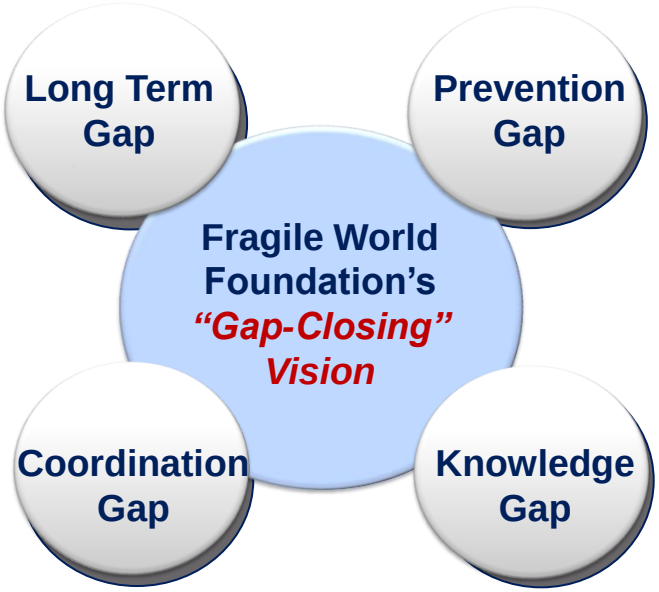
- Focus on global abrupt catastrophes involving dangers impacting the lives of millions or even the existence of mankind
- Provide a synergy point for collecting and co-ordinate research of affiliated institutes in the selected threat areas
- Initiate missing new research and develop prevention measures
- Finance, e.g. with a minute fraction of a small part of the world's defence budgets.
- Prevent global catastrophic events to enable mankind to react to
  - Near Earth Object Impacts (NEO)
  - Fatal microbial epidemic (virus)
  - Devastating earthquakes/tsunamis/volcanos (quake)
- Identify new global threat areas



Prevention is as good as it can use lead time

TO SHED LIGHT ON THE 4 BINDSPOTS OF SOCIETY

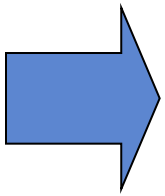
- **Reaction** overrides **Prevention**
- **Short term** overrides **Long term**
- **Central Power** overrides **Coordination**
- **Creating knowledge** overrides **applying knowledge** - if it is not yet generating profit nor attracting voters e.g. NEO deflection?



These gaps make mankind myopic about potential catastrophes

PETER SLOTERDIJK: “Spheres-Trilogy ”

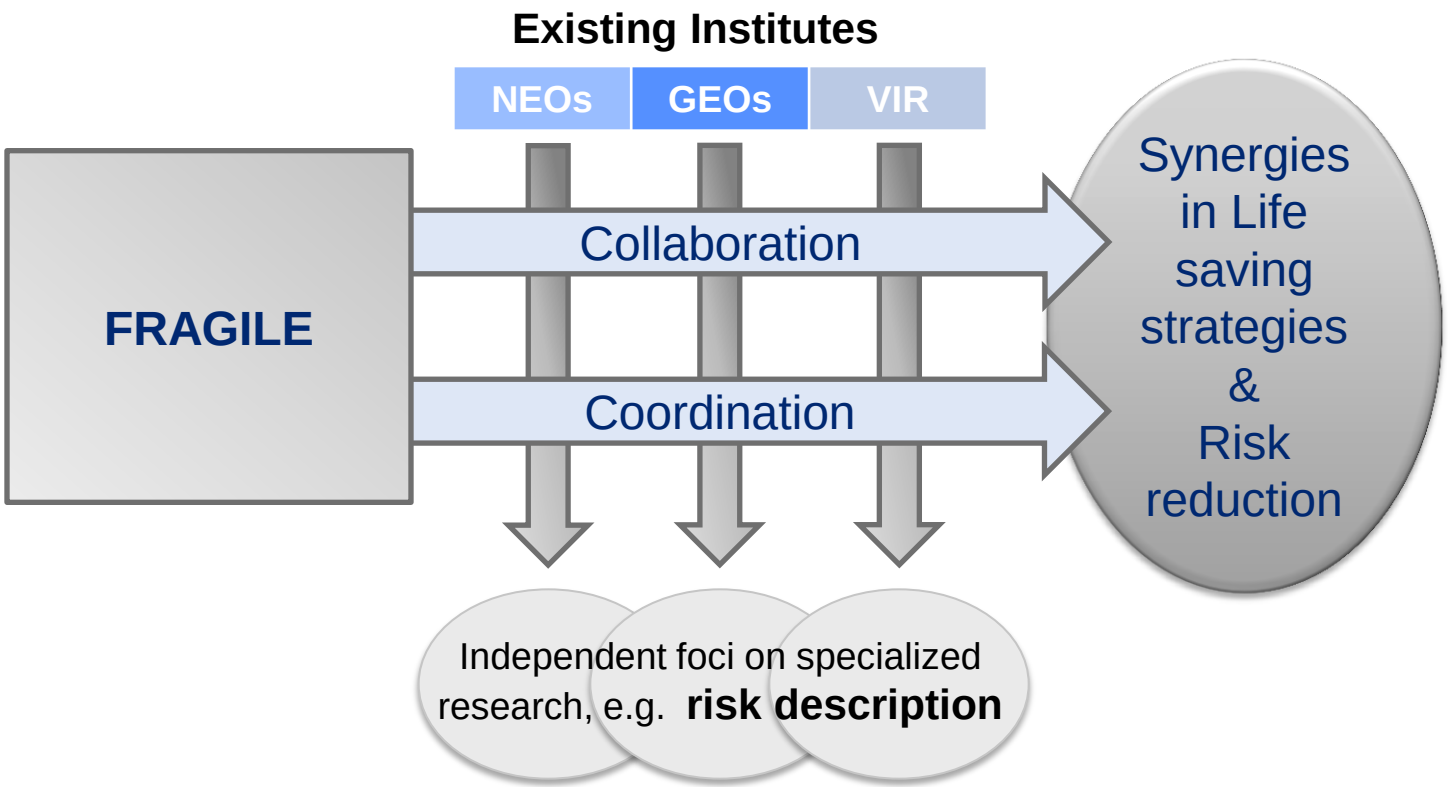
- With Copernicus’ heliocentricity begins a series of exploratory forays into the deserted outside, lost to the inhumanly far distant galaxies and the spookiest components of matter.
- Through exploration and realisation does man become the idiot of the cosmos; he has sent himself into exile and expatriated himself from the immemorial security of his self-spun cocoon of illusion, futility, non-relevance, and self-obsession.
- With the illusion of the central position of his homeland in the Universe that the imagination comfortably takes, the Earth is encased in spherical shells like warm celestial cloaks.



expatriated from the security of his self-spun cocoon of illusion

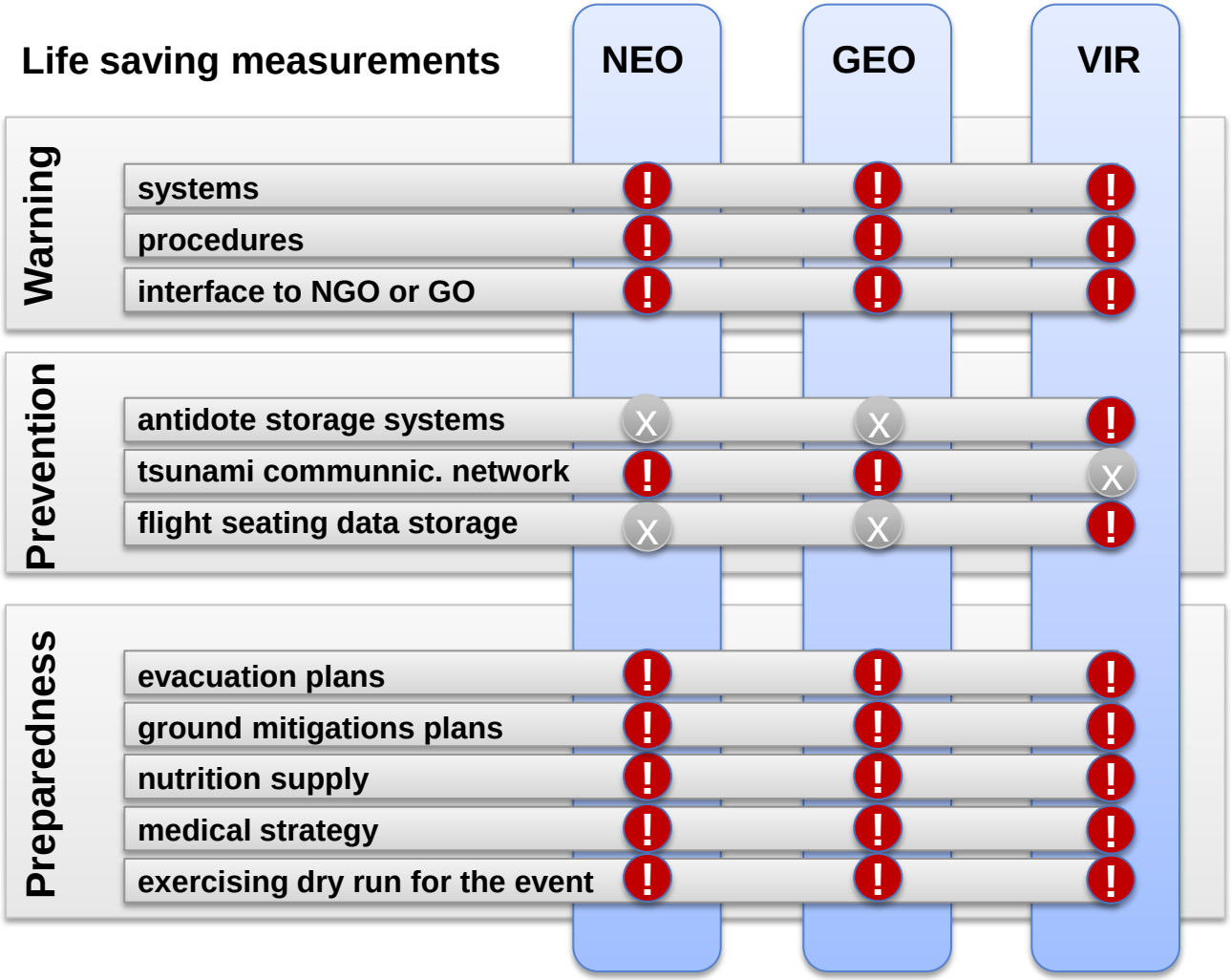
FRAGILE'S FOCUS

FRAGILE WORLD FOUNDATION is using the research of the dedicated institutes for NEOs, GEOs, Virus in order to create the vital synergies between these areas to safe lives and develop risk reduction strategies



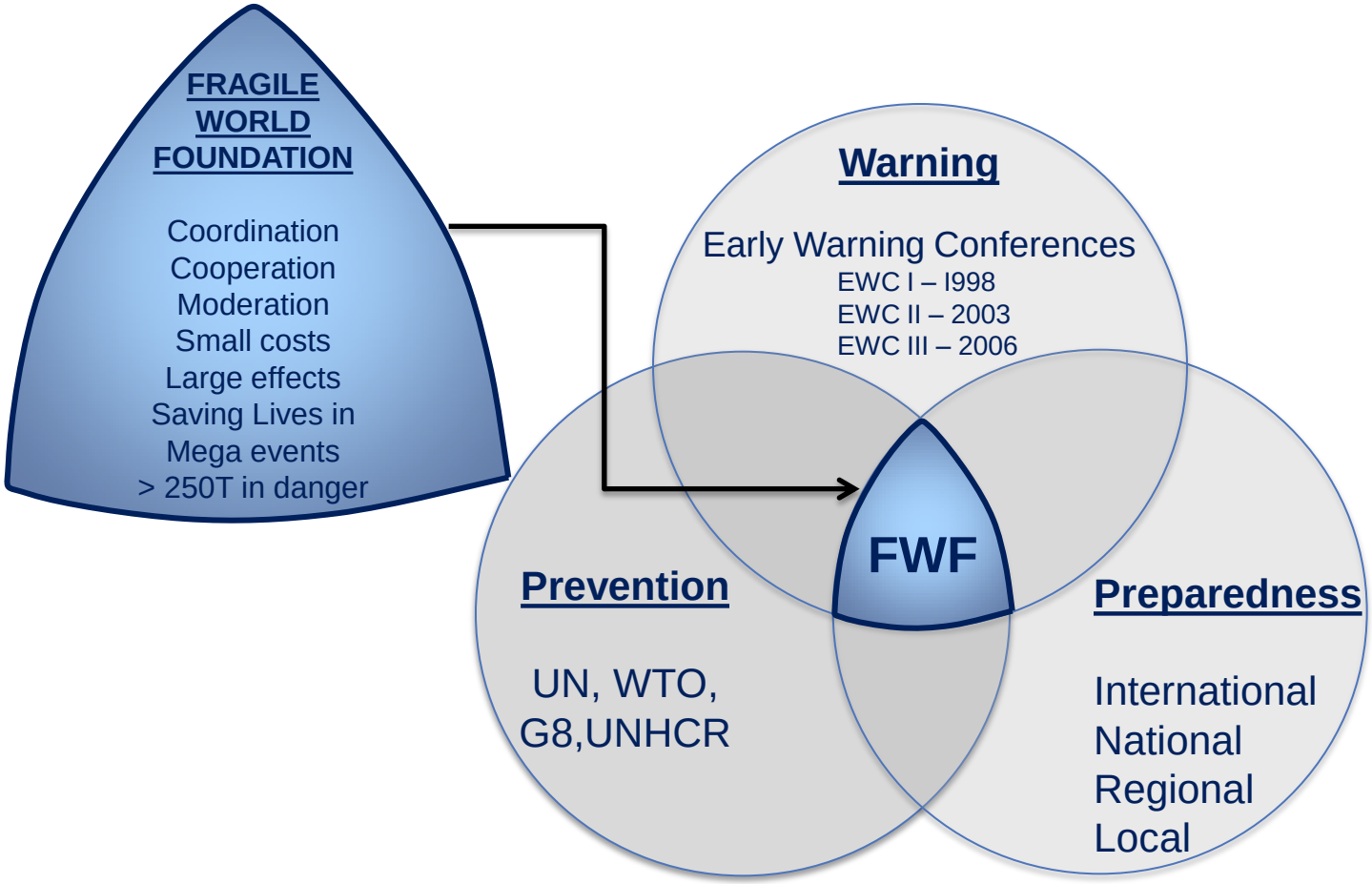
FRAGILE'S LIFE SAVER LEVERS CUT ACROSS

- The warning/prevention/preparedness instruments of saving lives are very similar across all danger zones



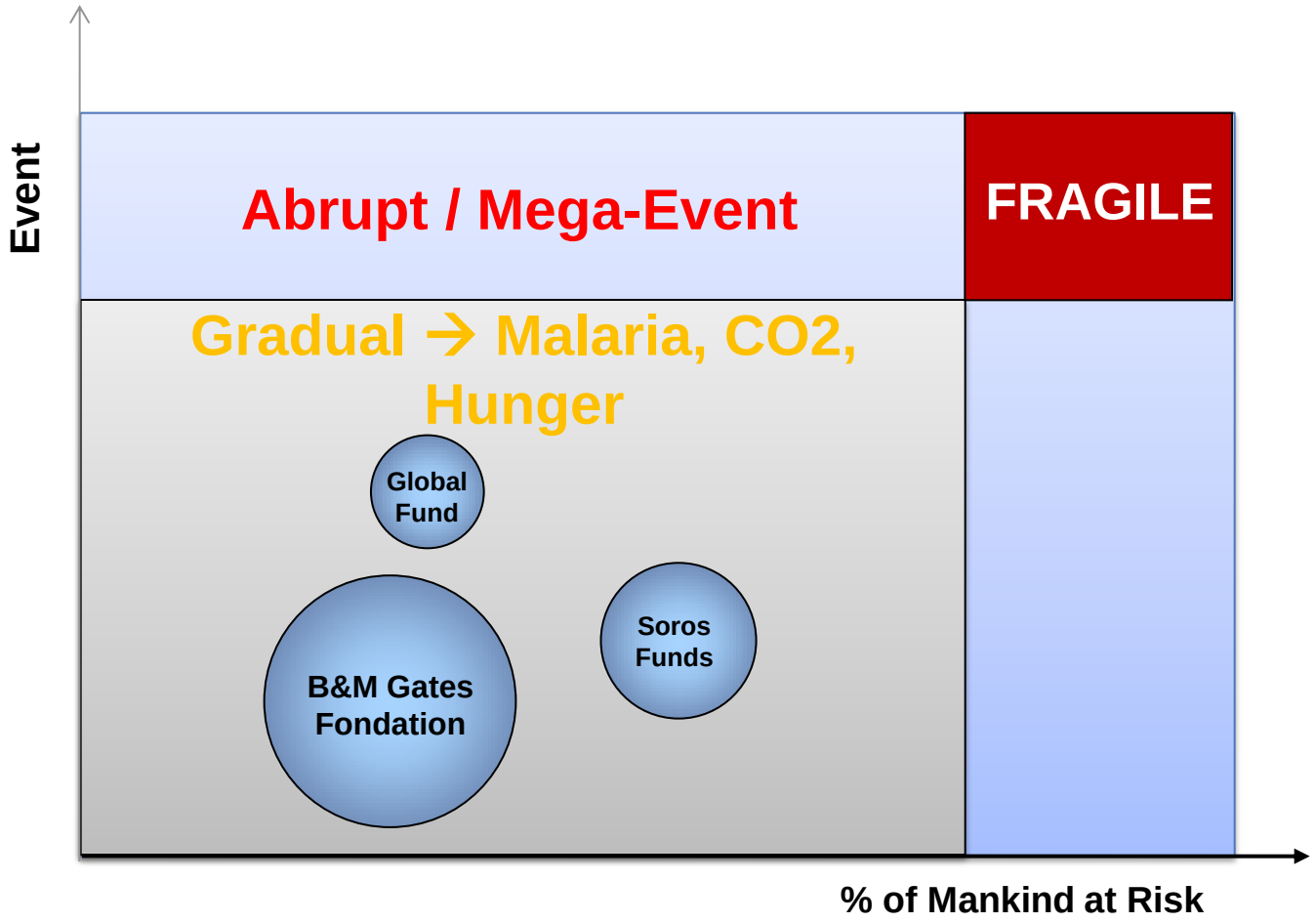
FRAGILE WORLD FOUNDATION'S POSITIONING

- FRAGILE is a private initiative combining warning, prevention and preparedness to save lives after mega event



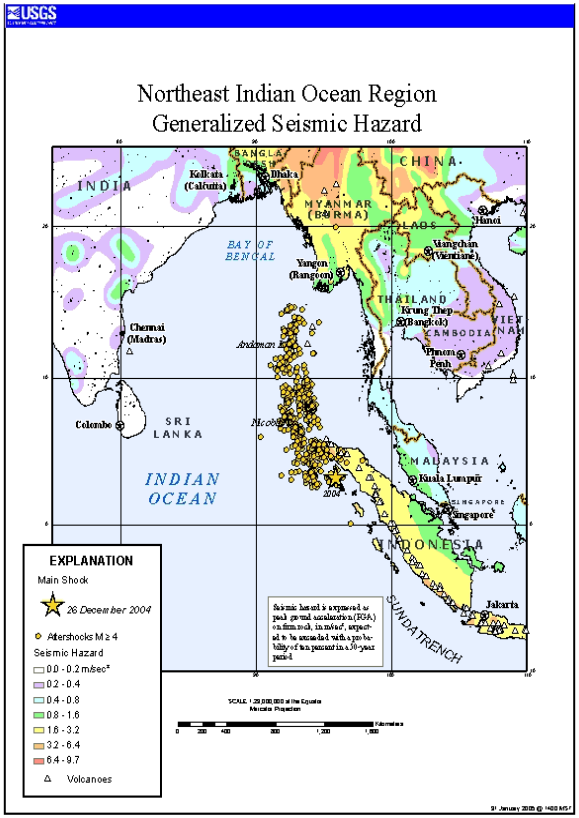
FRAGILE WORLD FOUNDATION'S DISASTER SEGMENTATION

- FRAGILE differentiates from others in two ways: focus on abrupt occurring mega events with more the 250.000 lives in danger



ONE IMPORTANT LESSON LEARNED FROM THE 2004 TSUNAMI

- The earth quake was measured precisely at 00:58:53 by the USGS
- **2004 December 26 00:58:53 UTC** US-GS NEIC (WDCS-D)
- **A few hours before the wave hit the coasts**
- Magnitude 9.0 – Sumatra-Andaman Island (West Coast of Northern Sumatra)



Although simple, it was not possible to inform 40 countries in real time about the danger. The technology existed - but the coordination and communication lagged to save 300.000 lives

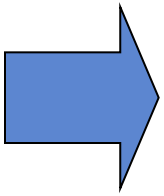
CHAOS BEGINS WHEN THE CATASTROPHE IS INEVITABLE

- Our legal, ethic and moral system base is in essence on a fixed-term contract: “if you do this today, that’s what will happen to you tomorrow”.
- What will happen to our society if it looks as if there will be no tomorrow?
- Chaos and anarchy will reign if e.g. a NEO impact is predicted for the near future leading to a total “write-off”.
- This can only be prevented by providing mankind with a perspective beyond the prediction time.
- FRAGILE offers a future and solid hope that a solution can be found in such a situation. This already helps prevent chaos early on at the moment of disaster prediction.
- Preventing chaos is a necessary focus of FRAGILE even if the prediction is proved to be wrong

FRAGILE provides a perspective for a solution and **prevents chaos** from arising long before the (right or wrong) impact prediction date

A JOINT GLOBAL PERSPECTIVE

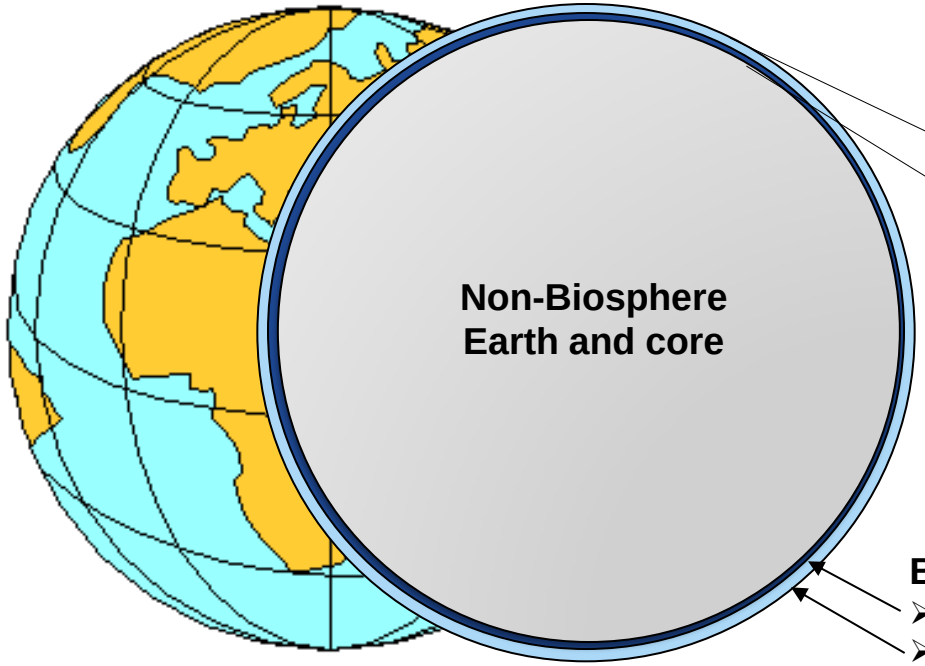
- Many local conflicts become irrelevant if a distant danger of larger magnitudes would be approaching. The existence of an institute like FRAGILE would make mankind more conscious about these global catastrophes and that by working together solution to avoid could be developed.
- Imagine: the 2nd world war might have ended in 1941 if a devastating, civilisation ending NEO impact would have been predicted e.g. for 1942
- The more minds share the perspective about our vulnerable “spaceship” earth and help to keep ît afloat (in one piece), the better for the world and “the world will become a better place”.



A joint global cause might make the world also more peaceful

THE BIOSPHERE IS ONLY LIKE THE PAIL OF AN APPLE OR LIKE THE CONDENSATION FILM ON A COLD POOLBALL

If the volume of the biosphere – where all live (and all pollution) actually happens – would be reduced into a sphere it would translate into our "real sized world" of only 1% of the volume of the Earth



Real Sized World (Life's Biosphere)

- Radius like from **Washington to Miami**
- Bio-Sphere volume is only **1% of Earth**

liveable Biosphere is only 1%! of volume and only 0.1% of the weight of the earth

Biosphere Envelope:

- 10km ocean (depth)
- 10km atmosphere (slowly evporating into space)

20km thickness to 6378km Earth radius (0.03%)

Our FRAGILE WORLD is significantly smaller than perceived

THREE MOST EARTH CHALLENGING NATURAL DANGERS

- FRAGILE WORLD FOUNDATION will initially focus on three major natural catastrophes for mankind:

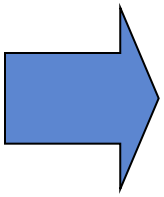
VIRUS, GEO & NEO

- Weather is also a threat with a view to global warming, but the impact will not be as abrupt
- The world's societies face a number of other threats which are not dealt with by FRAGILE such as:

•terror attacks	•pollution
•global economic crisis	•hunger
•energy shortage	•Ozone
•water shortage	•CO_2
	•war

OTHER SYNERGIES IN CATASTROPHE PREPAREDNESS

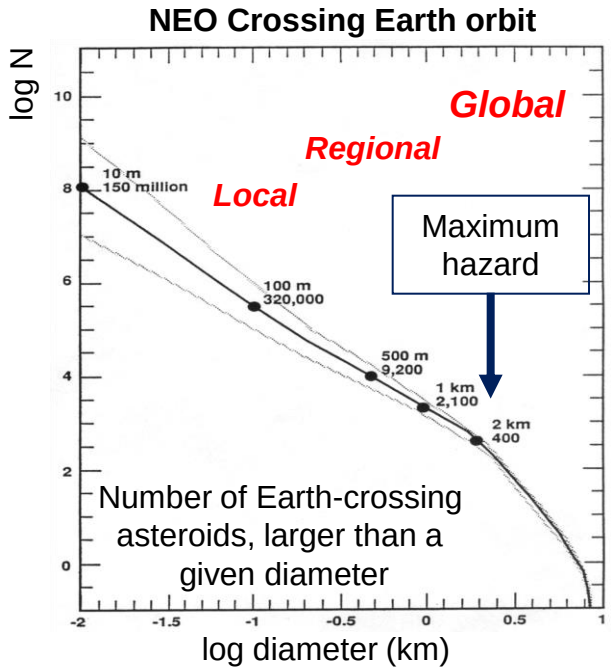
- Coordinated research and interaction is inspiring all the fields
- Political implications are similar
- Networking the countries is required in all cases
- Prevention strategies against chaos and
- Project plans are related: evacuation plans, food supplies, shelter constructions
- International effective communication structures in the case of sudden break out or impact are similar – i.e. was unfortunately not in place at the Tsunami catastrophe
- Other measures



Early preparation could protect the lives of billions

NON-LINEAR DYNAMICS: RELATED THREATS – e.g. NEO CASUALTY RISK IS HIGHER THAN BEING KILLED IN A PLANE CRASH[1)]

- A common aspect of NEO-, GEO- Virus-, and events is the mathematical description
- Far from equilibrium these systems follow similar global patterns of non-linear dynamics



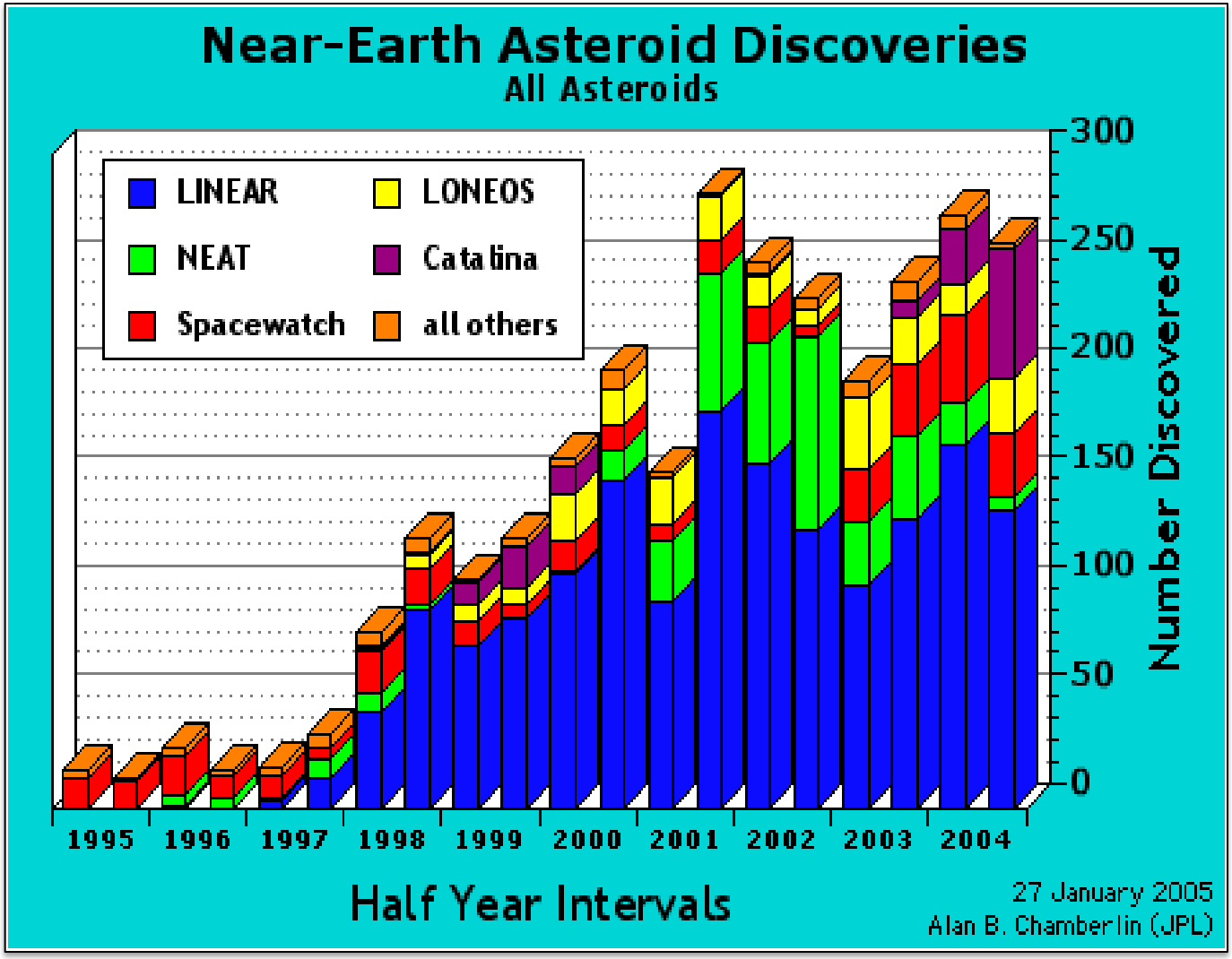
Predictions of non-linear dynamics:

- Small, local events occur frequently
- Large, global events are unlikely. **But they can happen anytime**
- Outside of a short time window the occurrence of an event is **unpredictable**

Small events occur frequently.
Big events are unlikely, but they can happen anytime!

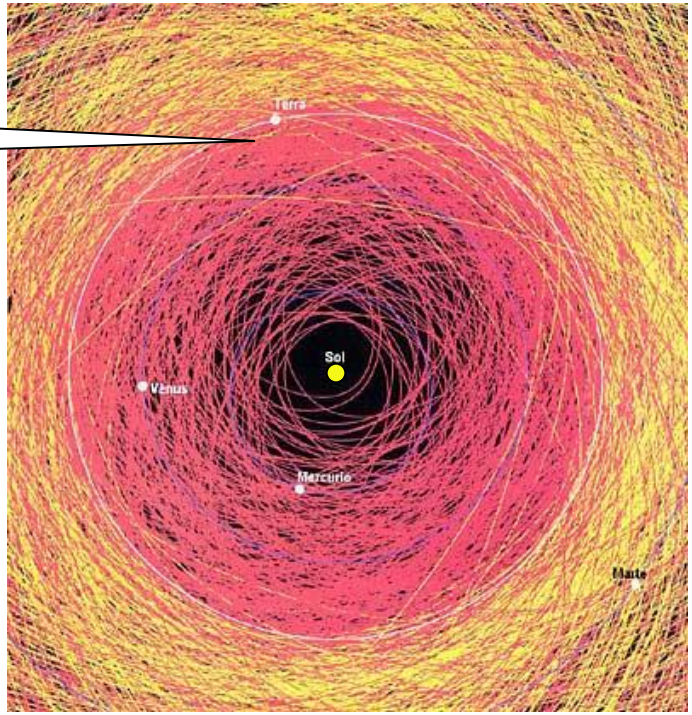
[1)] 1 billion NEO-casualties in 1 million years is on aver. 1000 casualties per year – similar to casualties by plane accidents

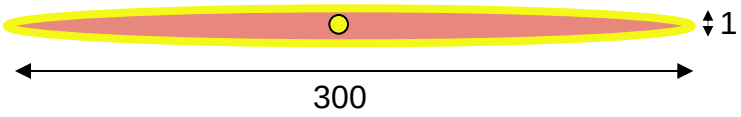
ASTEROID RESEARCH – ONE THIRD NOT YET DISCOVERED



NEAR EARTH OBJECTS – CIRCLING IN AN ALMOST FLAT AREA, INCREASINGLY ELLIPTICAL

- The simulation shows orbits of identified asteroids
  circling in a 1/300 flat “discus” with elliptical trajectories
- There is a 1/700 chance of a 300m impact (1000 MT) in the next century





DR. CLARK CHAPMAN

Email to the FRAGILE WORLD FOUNDATION team, July 2005

- "For a large NEO (say >1 km), it is ten times more likely that we will have "decades" of advance warning rather than only "years". For this reason, some people argue that we should do nothing (other than search for dangerous NEOs) until an actual threat is known.

- On the other hand, there is a "chance" that a moderate or large NEO will be discovered and might impact only a decade or two from now. In that case, we **would be better off to have made advance preparations - studied the nature of NEOs, studied possible technologies for deflecting NEOs, perhaps even practised deflecting NEOs, studied warning systems/evacuation procedures/on-the-ground mitigations (and especially how those required for NEOs differ from those in place for other kinds of disasters)..."**

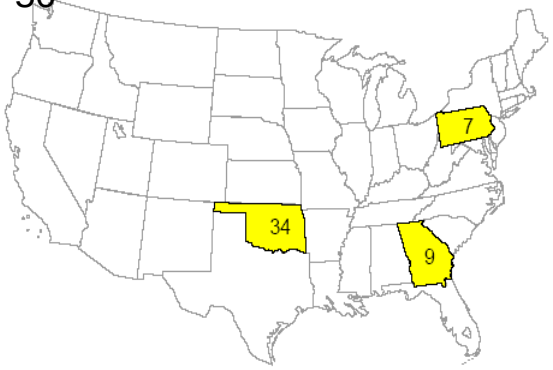
Curriculum Vitae

Dr. Clark R. Chapman is an Institute Scientist at the Boulder, Colorado, office of Southwest Institute Research. He is also an Adjunct Professor in the APS Dept. at the University of Colorado (Boulder). In the early 90s, he was the first Editor of *Journal of Geophysical Research--Planets.* He is a member of the Imaging Team of the Galileo mission to Jupiter, currently still orbiting in the Jupiter system. He is also a member of the MSI/NIS (imaging/spectrometer) Team of the Near Earth Asteroid Rendezvous (NEAR) mission to Eros, which was launched in February 1996, went into orbit around Eros on Valentine's Day, 2000, and successfully landed on the surface of Eros on Feb. 12, 2001.

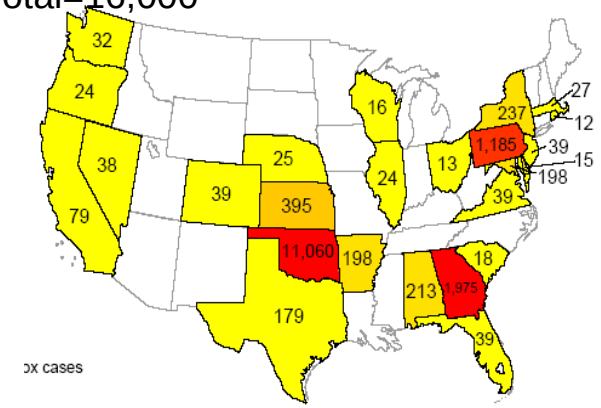
EXPONENTIAL VIRUS SPREAD: "Dark Winter" Exercise

Smallpox outbreak in Oklahoma city. Accidental or intentional release of virus.

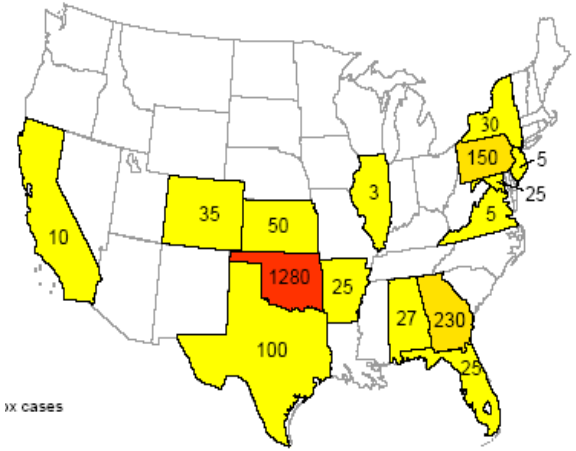
- Cases reported December 9 2001: Total 50



- Cases reported December 22: Total=16,000



- Cases reported December 15: Total=2,000



- Projected epidemic:

  Jan 20 – 300,000 cases, 100,000 deaths
  Feb 6 – 3,000,000 cases, 1,000,000 deaths

EXPONENTIAL EFFECTS

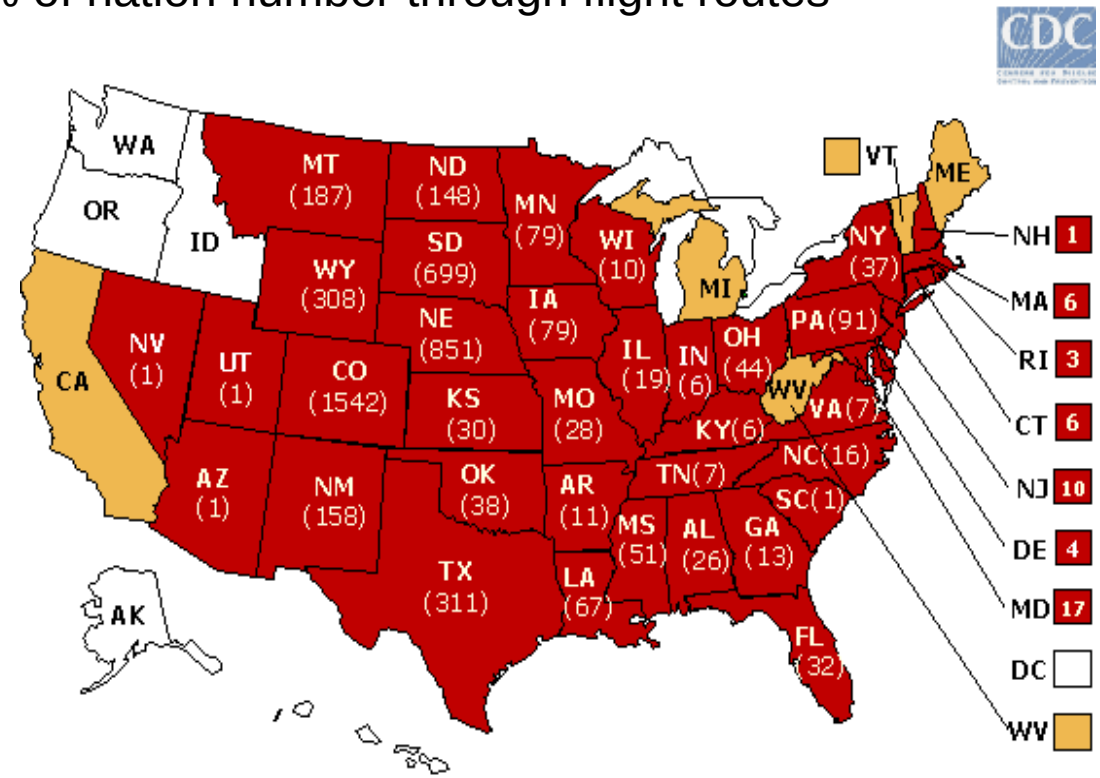
- A pond with a water lily. This lily will reproduce itself once a day. After 180 days half the pond is covered with water lilies. In how many day the whole pond will be covered completely?

Water Lilies III by Claude Monet

One more day!
In only one day the cumulated historic development could be replicated

EXPONENTIAL VIRUS SPREAD (II)

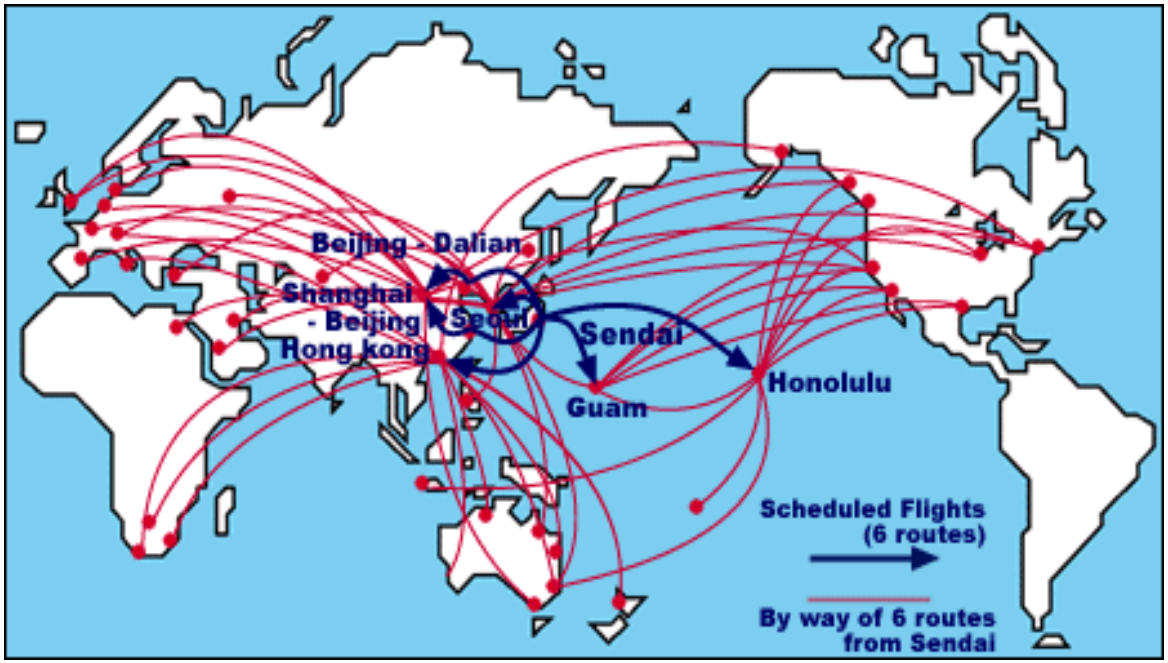
- This image shows the distribution of states infected (90%) in another simulation 60 days after break out – this will translate into a 90% of nation number through flight routes



The 1918/19 influenza killed 30-50m – today such a virus would kill up to 100m because of flight routes and population growth

WORLD WIDE TRANSMISSION THROUGH FLIGHT ROUTES

- An outbreak cannot be contained locally



Following the SARS outbreak, exposed persons at risk could be traced by using flight seating data – which were only accidentally stored.
Simple data storage procedures may have a major impact

THE WORLD JUST WITNESSED THE POWER OF TSUNAMIS

- Earthquakes leading to tsunamis – A significant fraction of the world population of 6.5 billion people live close to coastlines
- Tsunamis are expected to be common outcomes of both NEOs and GEOs
- “Tsunamis” from Hurricanes show that even the first world is un-prepared: Katrina/New Orleans

Tsunami after seaquake off the West coast of Sumatra, Dec. 26, 2004

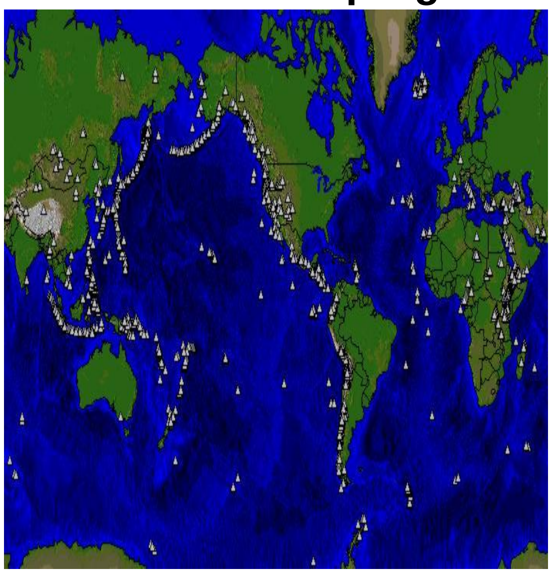
- **283,000 killed**
- **1.1 million displaced**
- **damage approx.**
- **€ 10 000 000 000 000**

December 26, 2004: Tsunami hits Thailand

VOLCANIC ACTIVITIES HAVE A GLOBAL DIMENSION

- The Geological Society: „There are certain natural events which can have major adverse global effects, may seriously threaten the stability of the world economy and order, and could well threaten the lives of billions of people.
- NEO Impacts and eruptions from super-volcanoes are the two prime examples of such potentially disastrous natural events.“

Global volcano program



Lake Toba

Mount St. Helens

The lake Toba eruption 75000 years ago diminished the world population to 5-10 k only – **extremely close to the extinction of mankind**

LEAD TIME IS THE KEY TO PREVENTION

- Example of NEO prevention: ample lead time is necessary
  - Asteroid 2004 MN4 (Apophis), 320 m diameter, 15-20 km/sec, will approach Earth April 13, 2029 within 1/10 of the lunar distance (LD)
  - FRAGILE projects could explore mechanisms to either destroy meterorites (e.g. melting with large mirrors, reflecting sunlight) or to deflect them from Earth-crossing orbits.

- Killer virus prevention: timely research and prevention is the key
  - The next influenza pandemic will kill around 100 million people world-wide, even when appropriate disease control is in place.
  - New, deadly microbes such as the Aids and Sars viruses may emerge any time. The combination of rapid spread (like influenza) and lack of counter-measures (like Sars) could seal the fate of mankind.
  - With the timely development of anti-viral drugs and vaccines, these fatal threats can be converted to manageable situations.

- Geological disaster prevention: lead time is necessary
  - MoD support will enable more measurement points -> better prediction

Concrete prevention strategies are the only method to reduce the risks from latent global natural catastrophes and their preceding chaos

SOUNDING BOARD of FRAGILE WORLD FOUNDATION

■ Steffen Bastian	Fragile Board	Human Care Association
■ Prof. Andreas Burkert	NEO	Chairing Computational Astrophysics, University of Munich
■ Dr. Metin Colpan	Budget	Founder Qiagen
■ Dr. Helmut Hetznecker	Investigation	Co-Author Fragile World book
■ Prof. Heiner Igel	GEO	Director Department of Earth Sciences – Geophysics, University of Munich
■ Prof. Wolfgang Neubert	VIR	Max-Planck-Institut für Biochemie
■ Dipl.Ing. Philipp Schoeller	Fragile World	Member of the Club or Rome (German Section), Founder General Capital Group
■ Gregor Woeltje	Marketing	ex-Chairman .start GmbH, Munich