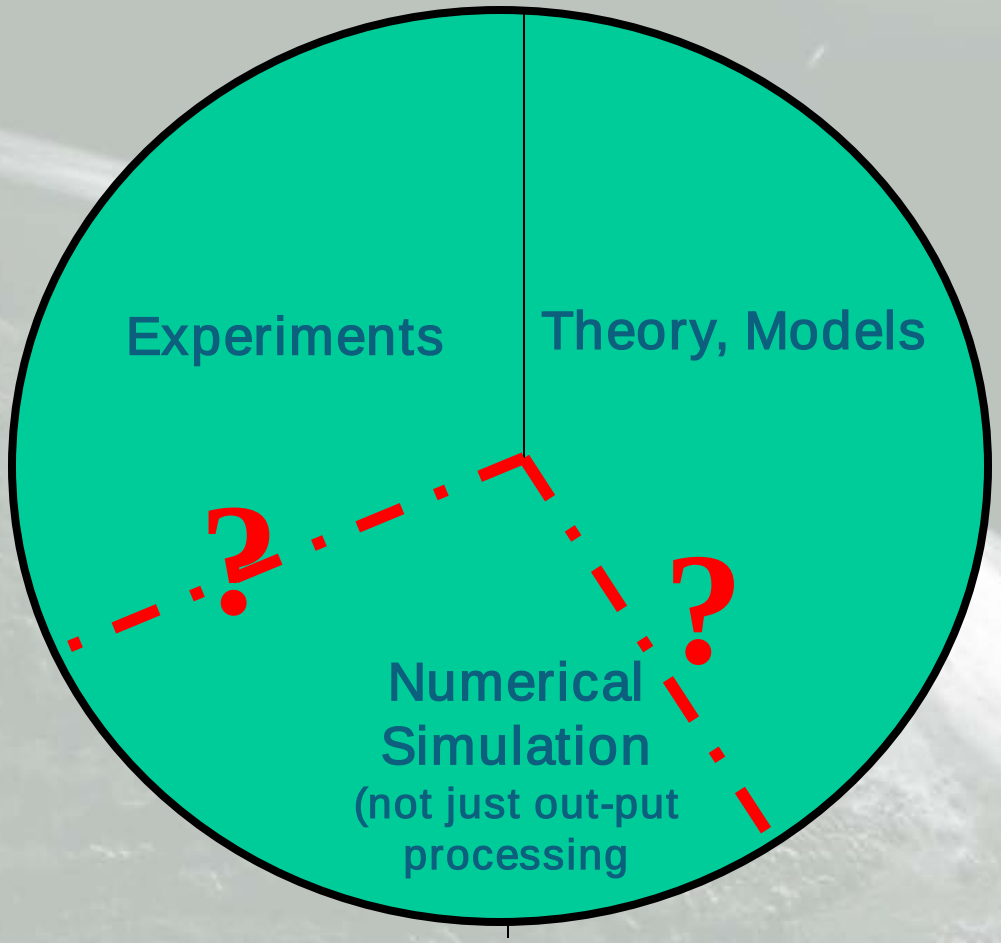
GLOBAL RISK FORUM
GRF DAVOS

# *"Risks, Disasters, Crisis and Global Change – From Threats to Sustainable Opportunities"*

Walter J. Ammann

President GRF Davos, Switzerland

# On the role of numerical simulation



# Content

- Introduction and overview
- Integrative risk management – Risk concept
- Vulnerability and resilience
- Conclusions/ Recommendations

# Definition

- **„Risk“** = Hazard x Damage
- **“Hazard”** describes the probability of occurrence and related intensity of a certain event or scenario
- **„Vulnerability“** expresses the degree of damage in function of the hazard‘s impact
- **„Damage“** = vulnerability x values exposed to hazard resulting and countable effect due to the hazard‘s impact (direct and indirect). Counting: deaths, injuries, homeless, $, etc.
- **„Risk aversion“** expresses the emotional attitude to risk (dominated by the number of deaths)

# Disaster Risk Reduction DRR

- Risk Reduction
- Disaster Management
- Integrative Risk Management (not only natural hazards)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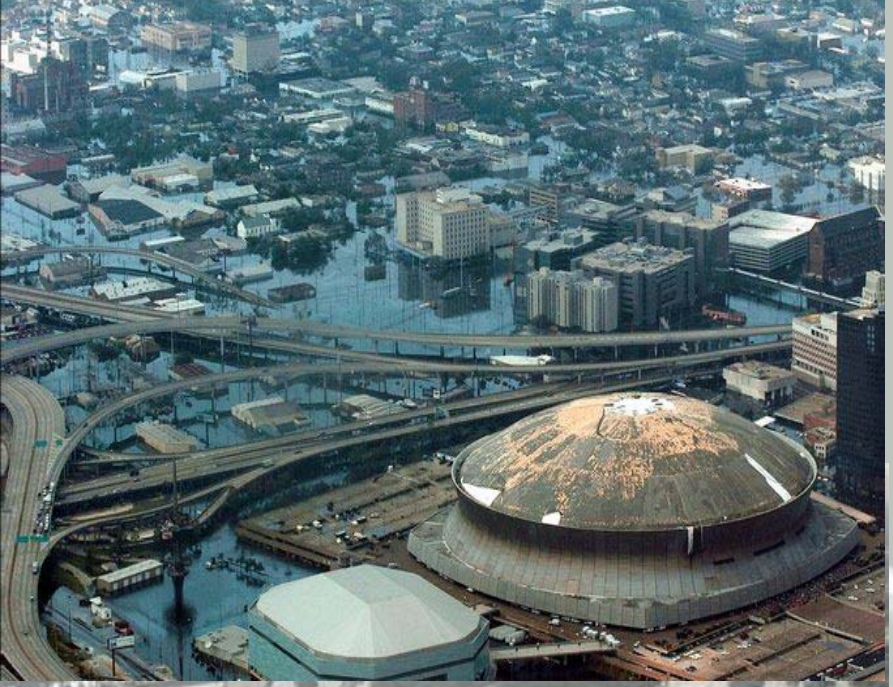


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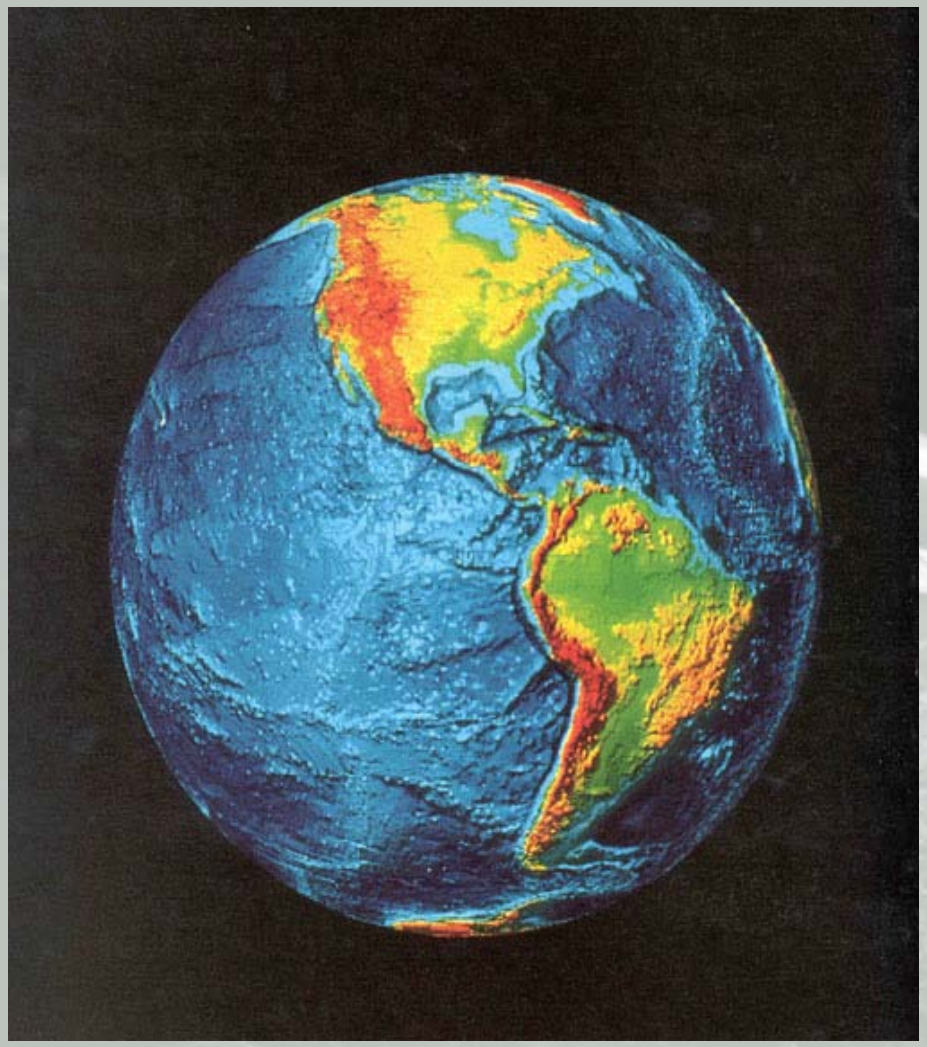
- Disasters are a problem of the poor and marginalised (therefore so is reconstruction)
- Rare instances of the middle/ upper class being primary victims

# Mean annual losses due to natural hazards



- 100‘000 deaths
- 150 bn US $
- 800 Mio affected

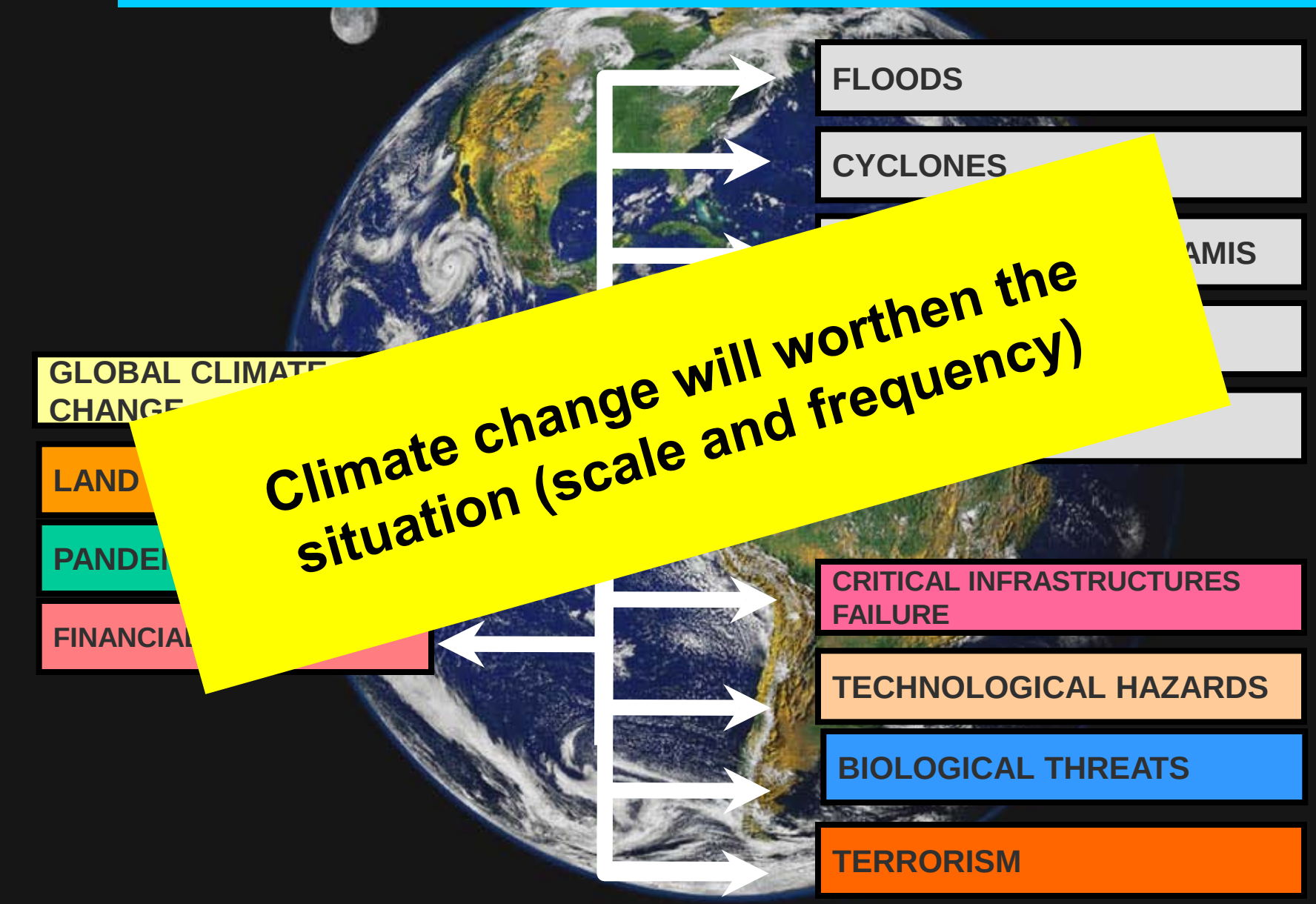
**Gap between industrialized and developing countries**

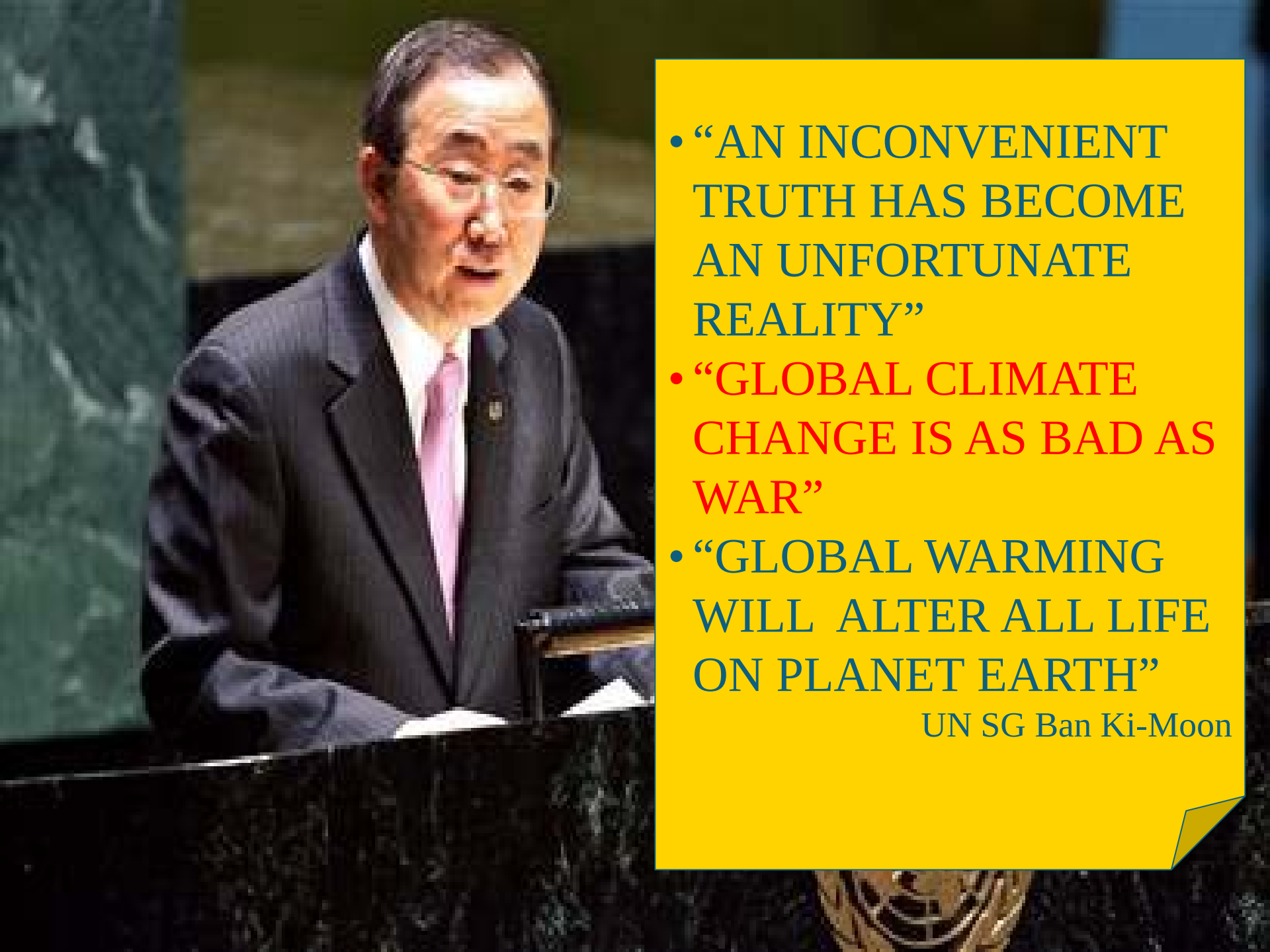

Social injustice

# Future challenges

- Accellerated urbanisation (coastal areas, 30 Mega Cities in 2020)
- Increasing vulnerability (globalisation, mobility, information, critical infrastructures and services)
- Virtual markets (financial – real economy)
- Food safety
- Water scarcity

# Multi hazard/ multi risk approach needed

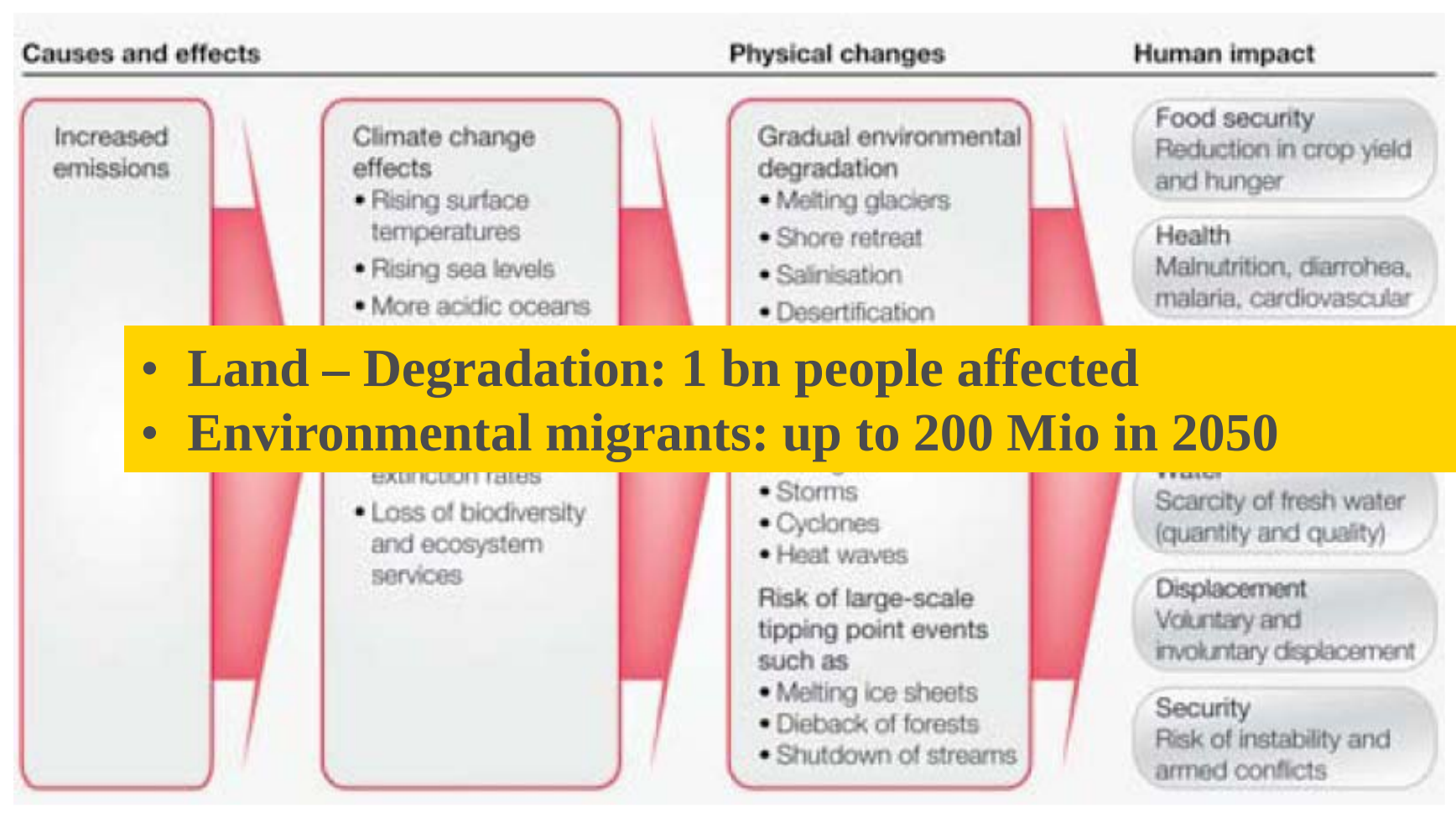




- “AN INCONVENIENT TRUTH HAS BECOME AN UNFORTUNATE REALITY”
- “GLOBAL CLIMATE CHANGE IS AS BAD AS WAR”
- “GLOBAL WARMING WILL ALTER ALL LIFE ON PLANET EARTH”

UN SG Ban Ki-Moon

# Climate change and its effects and impacts




- **Land – Degradation: 1 bn people affected**
- **Environmental migrants: up to 200 Mio in 2050**

Source: Climate Change – The Anatomy of a Silent Crisis, Global Humanitarian Forum 2009, Geneva

# Climate change: annual costs (bn $)

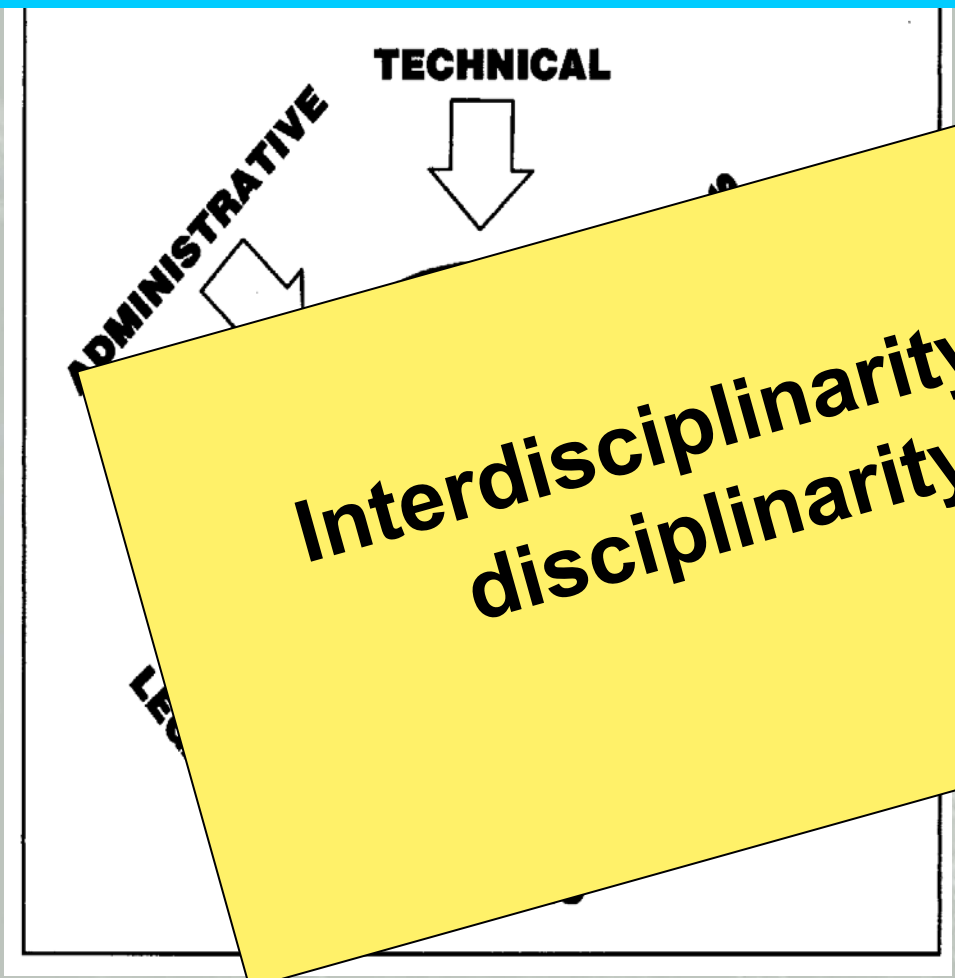
| Sector | Costs Global | Industr. countries | Develop. countries |
|---|---|---|---|
| **Agriculture** | 14 | 7 | 7 |
| **Water** | 11 | 2 | 9 |
| **Health** | 5 | No estimates | 5 |
| **Coastal areas** | 11 | 7 | 4 |
| **Infrastructures** | 8 to 130 | 6 to 88 | 2 to 41 |
| **Total** | **49 to 171** | 22 to 105 | 27 to 66 |

**Source: UNFCCC 2007**

# IRM - Multi stakeholders approach

- Politics
- Governments, Administration
- Business world
- Science, education
- Technology
- Practitioners
- People, Society as a whole.

# IRM - Multi sectors and disciplines approach




**Interdisciplinarity and trans-disciplinarity needed**

**Scientifi**

al,

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matters of technology, engineering practice and implementation.

# IRM - integrative risk management: Goals

- Reducing the risk level where necessary
- Preventing new risks and deficiencies to occur
- Be prepared for the „unexpected“
- Effective and efficient allocation of financial means for the optimised reduction of risks.
- Guarantee of a widely accepted level of safety (uniform principles needed).

# IRM - Holistic risk concept: Key Questions

## How safe is safe enough?

**What can happen?**

***Hazard analysis (hazard intensity and exposure analysis, vulnerability assessment, Scenarios important***

**What is acceptable to happen?**

***What is an accepted safety level? (Protection goals, acceptable risk levels)***

**Risk Analysis**

**Risk Assessment**

**What has to be done?**

**Measures to be taken**

# Holistic risk concept: Key Questions

**How safe is safe enough?**

## Understanding

- **Hazard analysis (event and impact analysis, hazard maps)**
- **Exposure analysis (identification, objects, vulnerability, existence)**
- **Analysis of impacts (likelihood and degree of damage)**
- **Risk analysis and presentation of results**

**What can happen?**

*Hazard analysis (haz intensity and exposu analysis, vulnerabili assessment, Scenaric important*

**Risk Analys**

**What is acceptable to happen?**

*What is an accepted safety level? (Protection goals, acceptable risk levels)*

**Risk Assessment**

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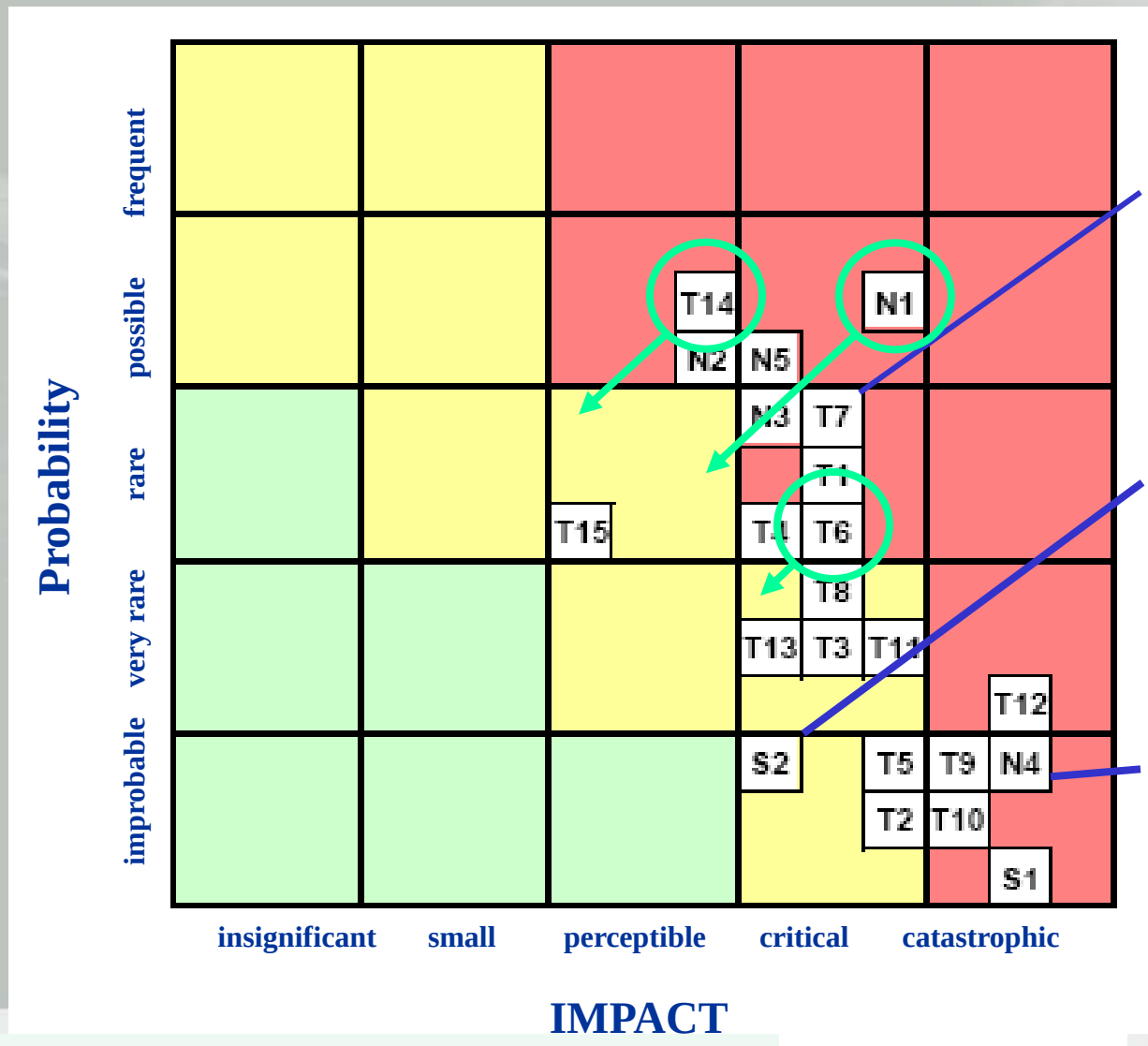
# Risk categories






# Holistic risk concept: Key Questions

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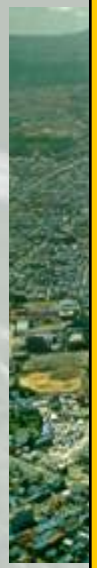


## Understanding

- **Protection goals (individual and collective risk, risk of material damage)**
- **Risk categories**
- **Risk aversion**

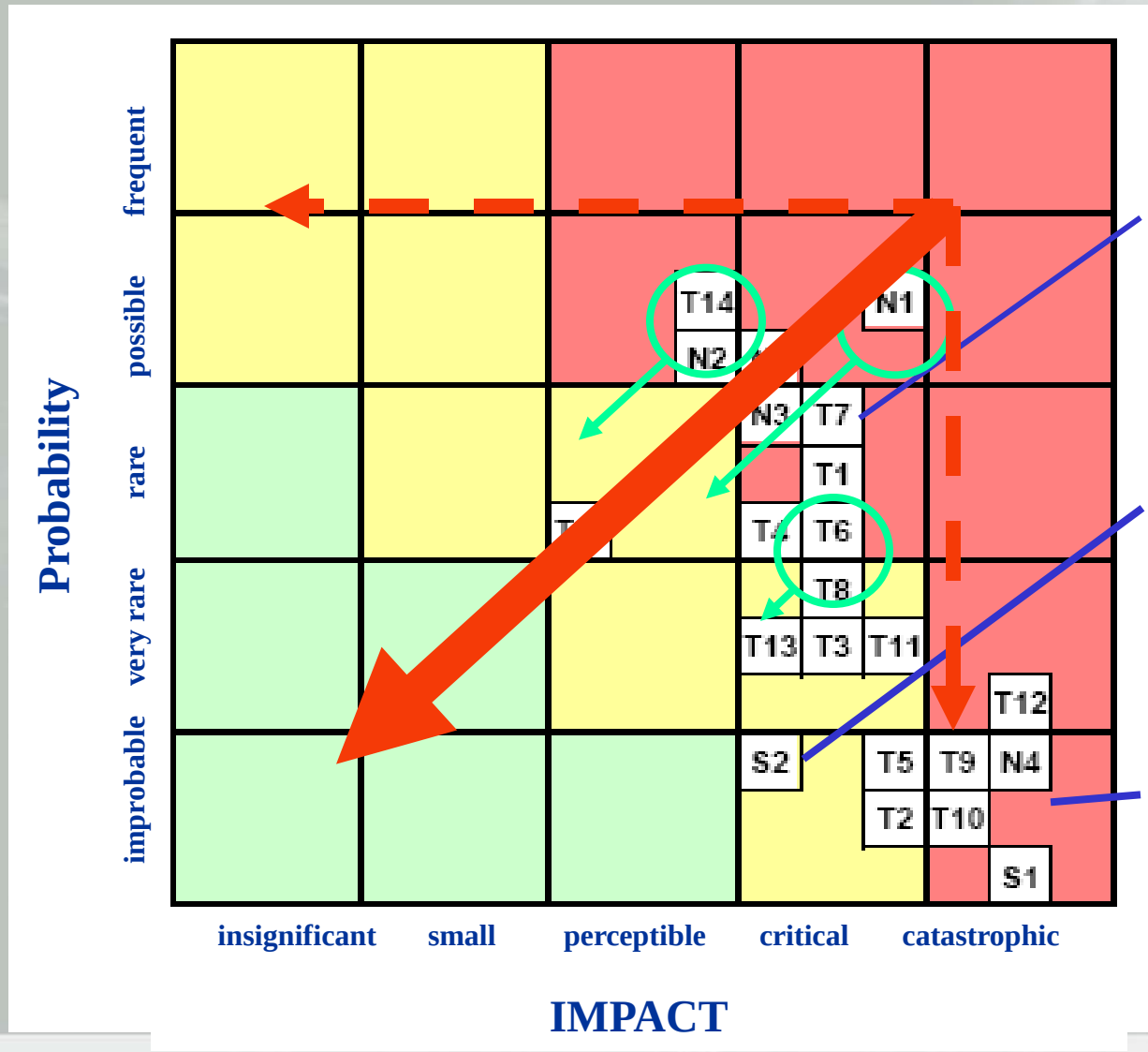
**What is acceptable to happen?**

***…t is an accepted safety …l? (Protection goals, …ptable risk levels)***

**Risk Analysis**

**…k Assessment**

# Risk categories and safety limits






# Holistic risk concept: Key Questions

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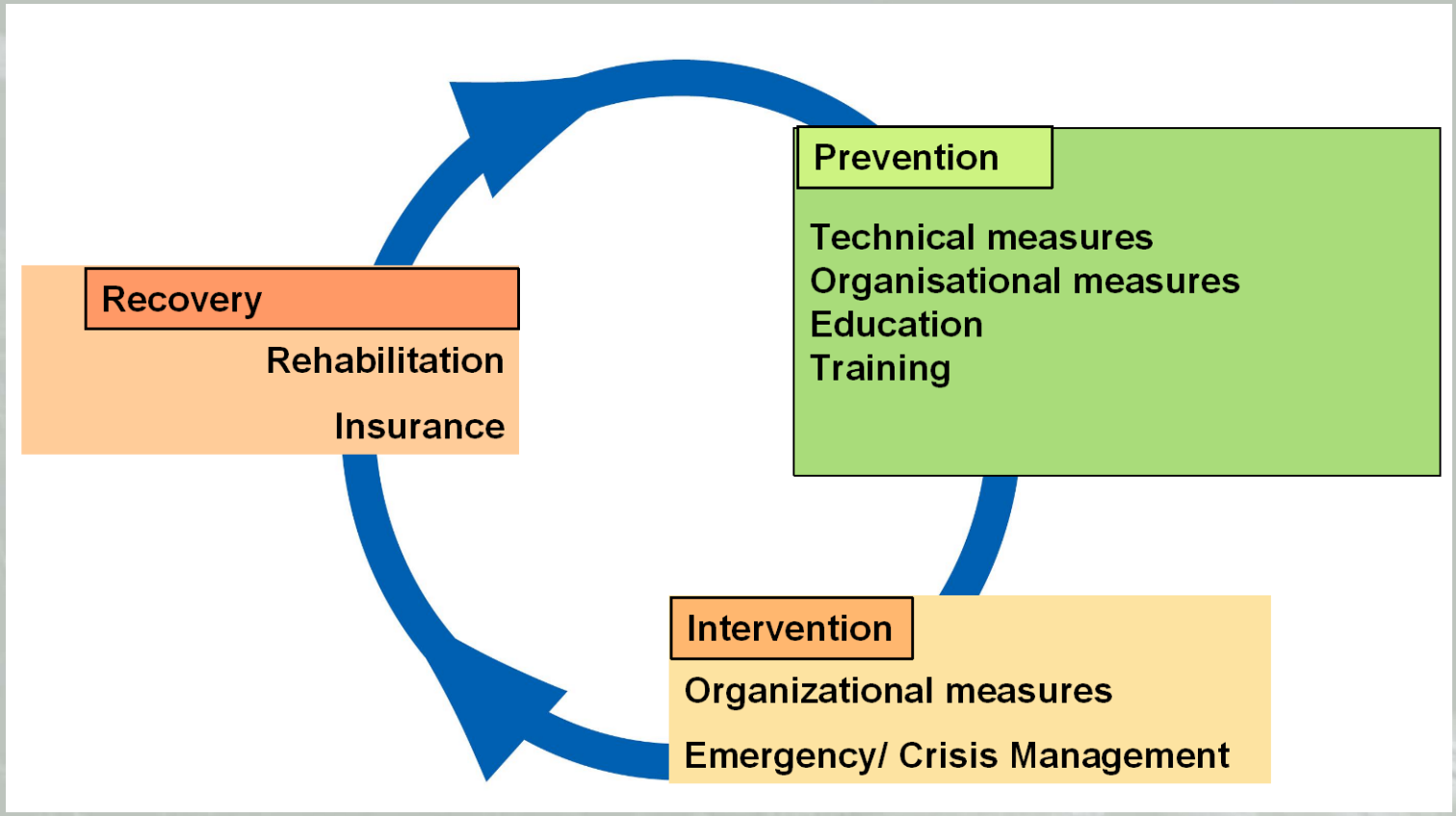
**Risk A** ... **ssment**

## Acting

- **To include all possible measures**
- **Embedding of safety measures in overall concepts with a focus on sustainability**
- **Optimised allocation of means due to marginal costs**

# Integrative risk management: risk circle

Approach concentrates equally on all phases of the risk circle, on prevention, intervention and recovery



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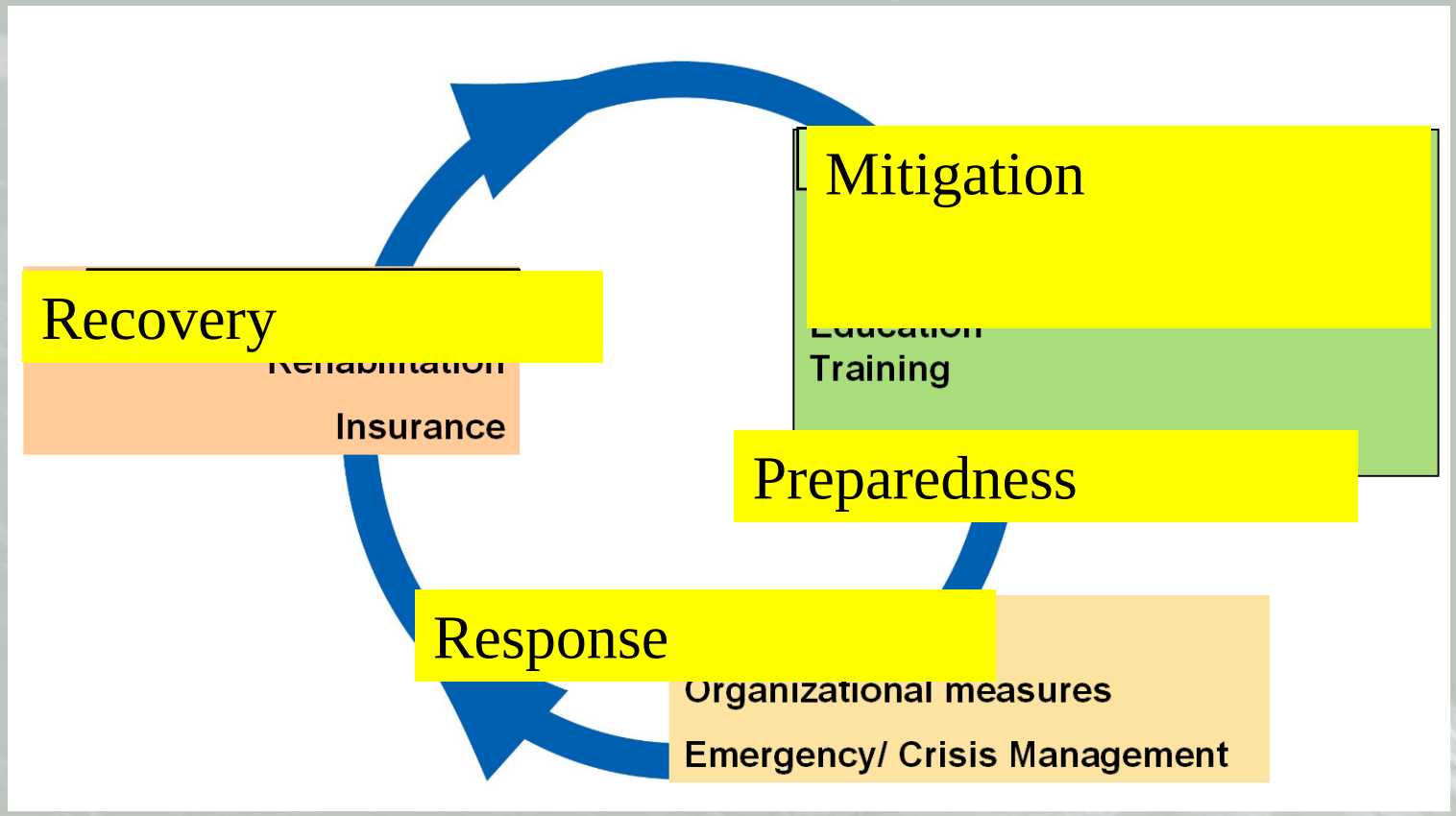
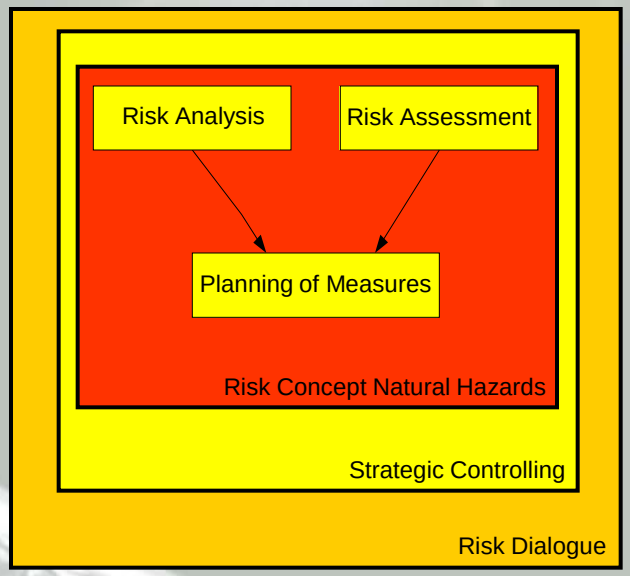


# Integrative risk management: Strategic levels

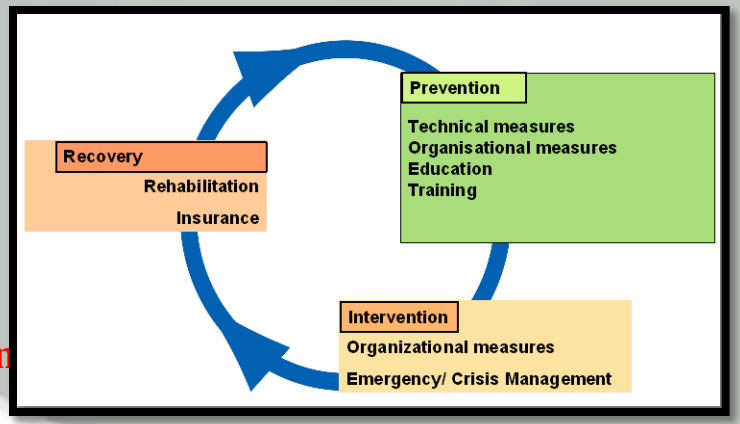
Risk Concept

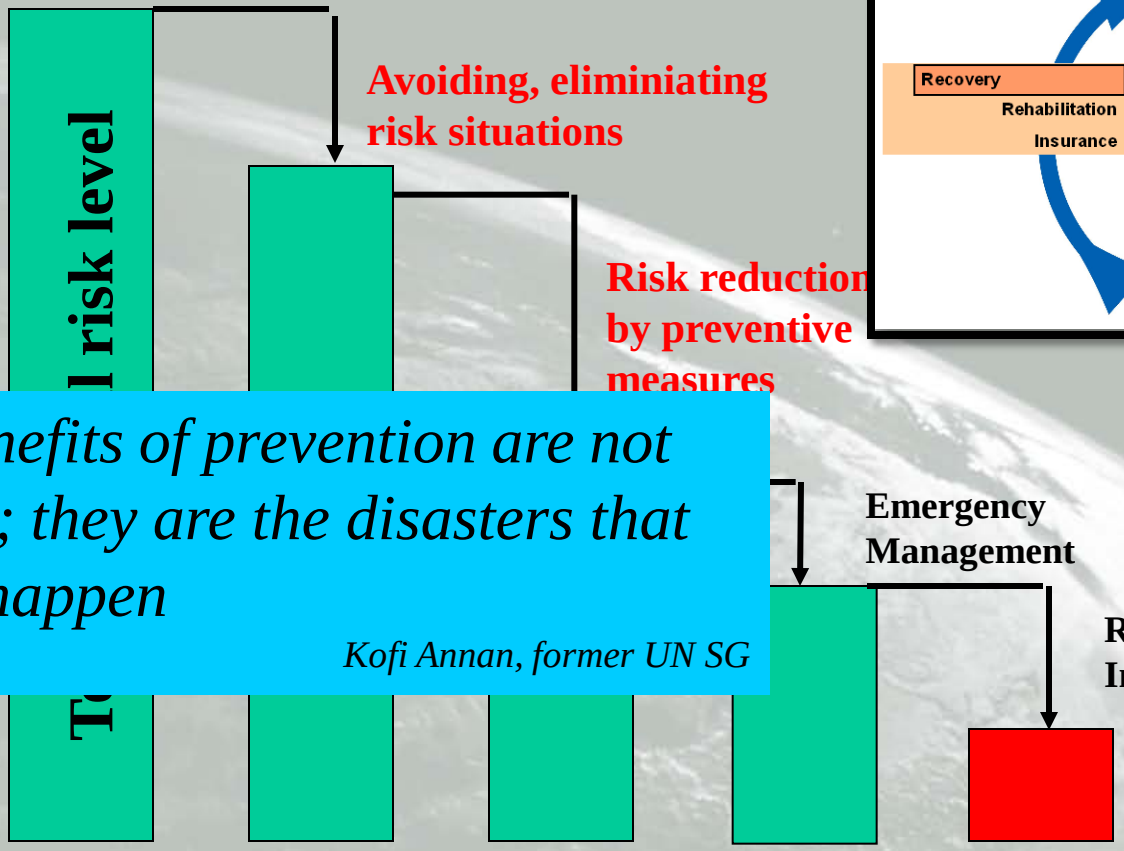



Paradigm shift in handling threats and natural hazards:

- from a reactive “defense against danger mentality” to a pro-active culture of integrative risk management

# Risk reduction - What possibilities exist?

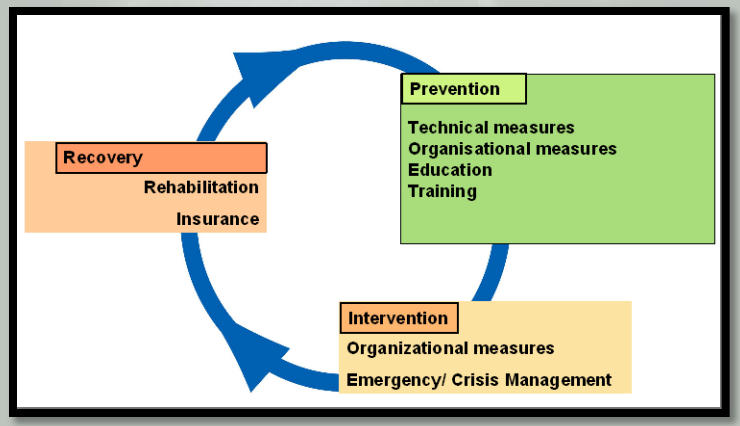


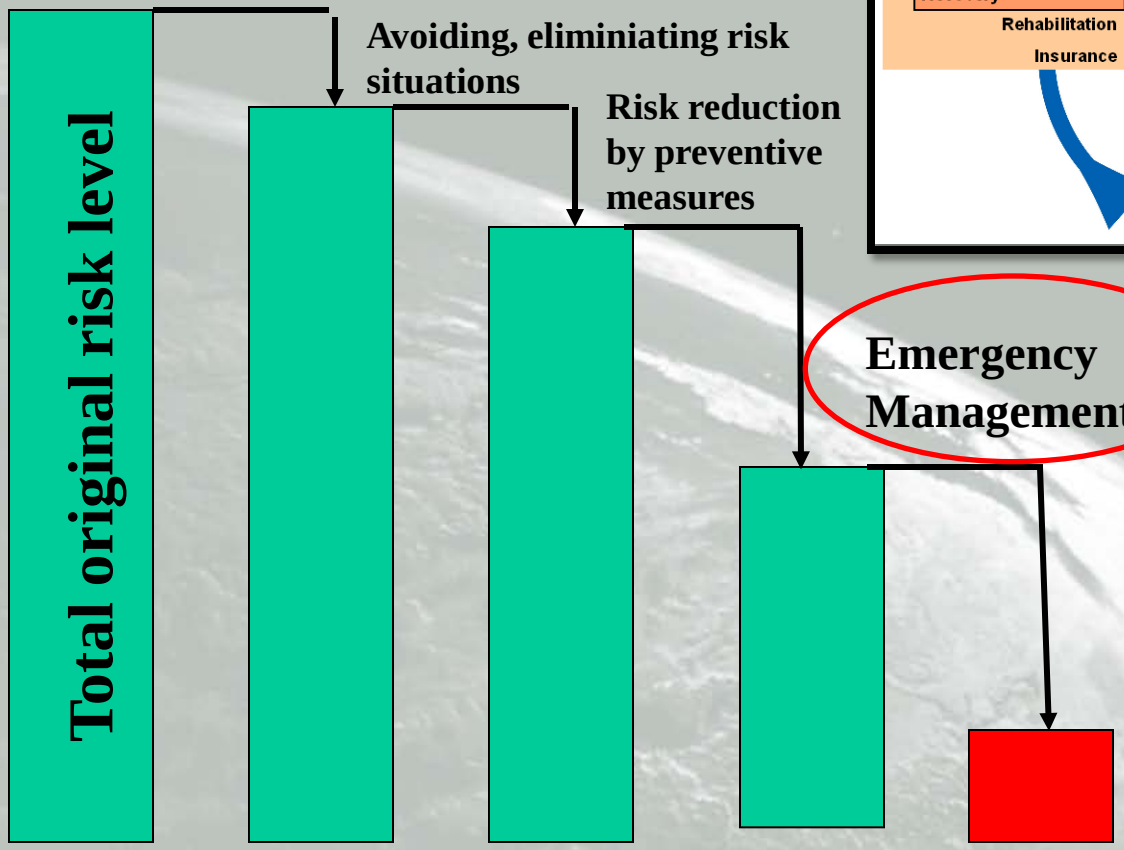




*„The benefits of prevention are not tangible; they are the disasters that did not happen*

*Kofi Annan, former UN SG*

# Risk reduction - What possibilities exist?



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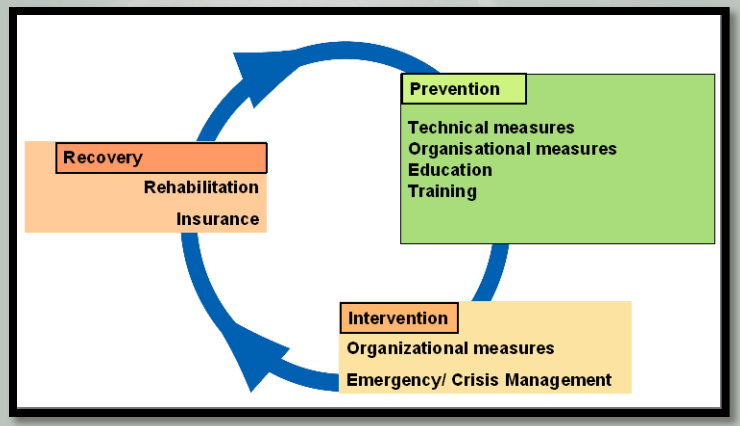
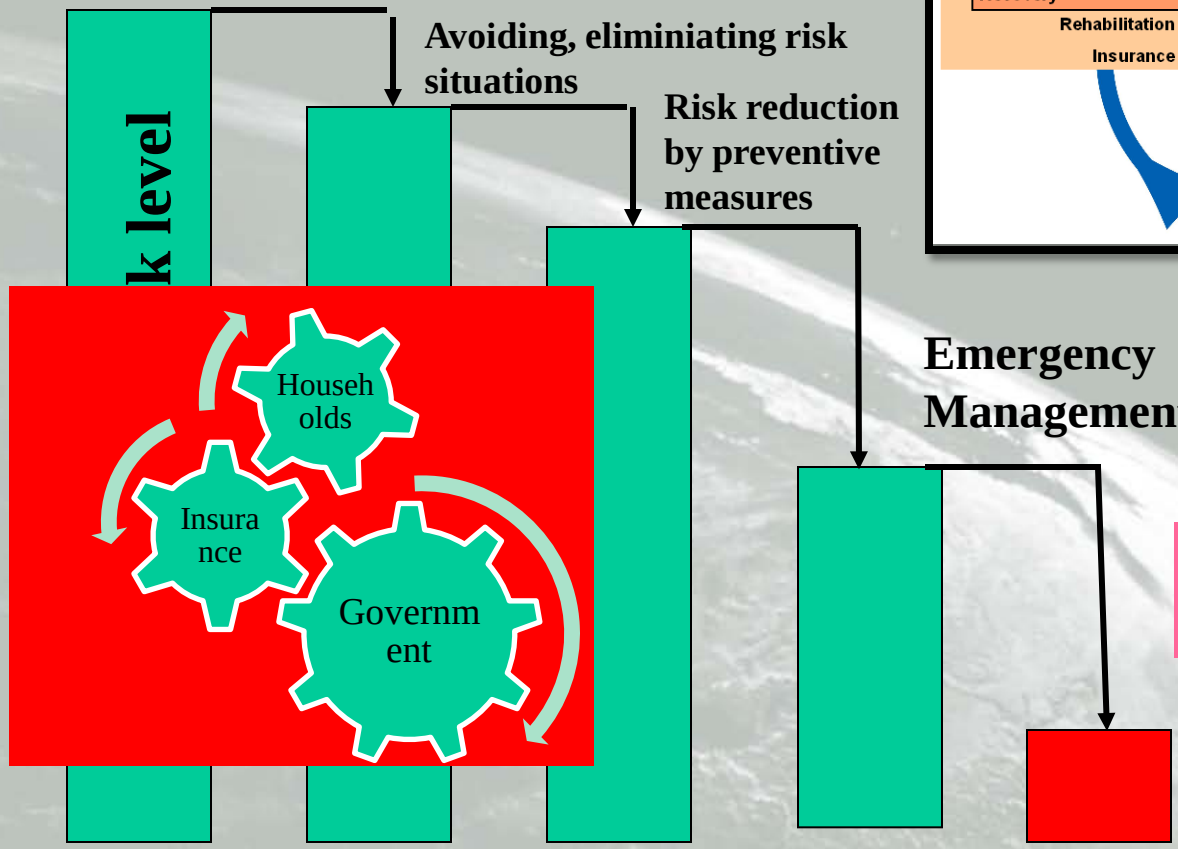
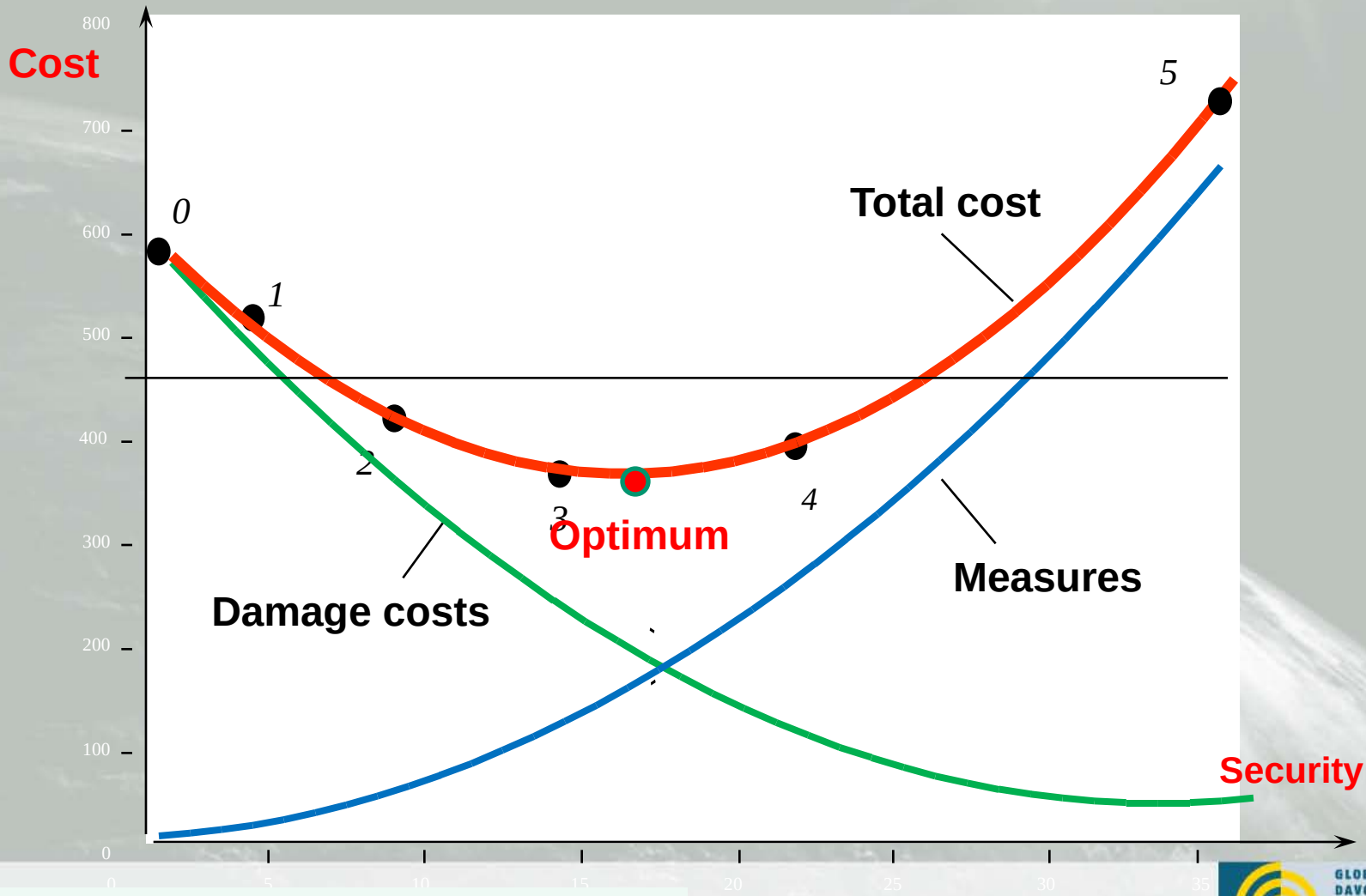


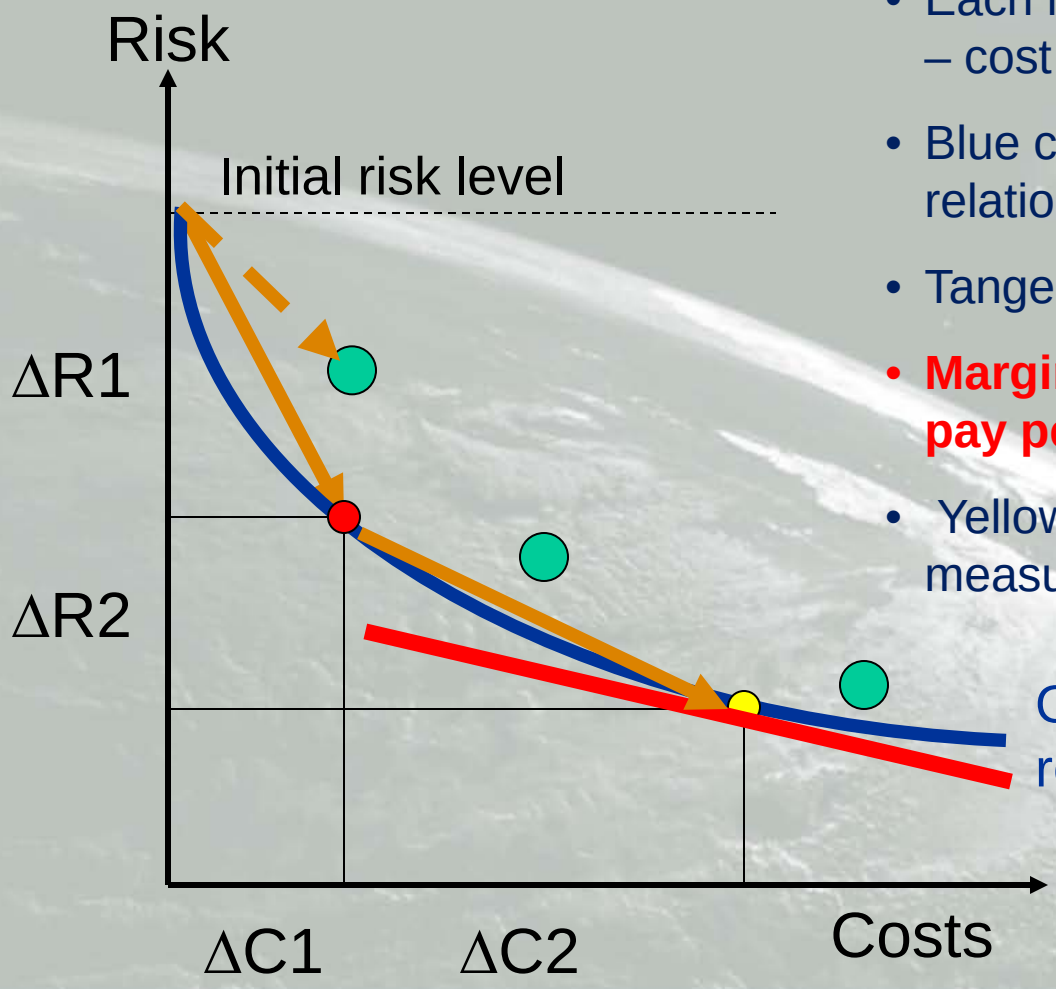

**Risk Transfer: Insurance**

**Self-Responsibility (Residual Risk – need for a risk dialogue )**

# Cost effectiveness of measures



# Acceptable level of safety (protection goals)




- Each measure has a risk reduction – cost relationship (green dots)
- Blue curve: maximum possible relationship
- Tangential red line: marginal costs
- **Marginal costs (willingness to pay per life saved)**
- Yellow dot: optimal set of measures to be taken.

Optimised curve for risk reduction costs

# Risk categories and protection goals

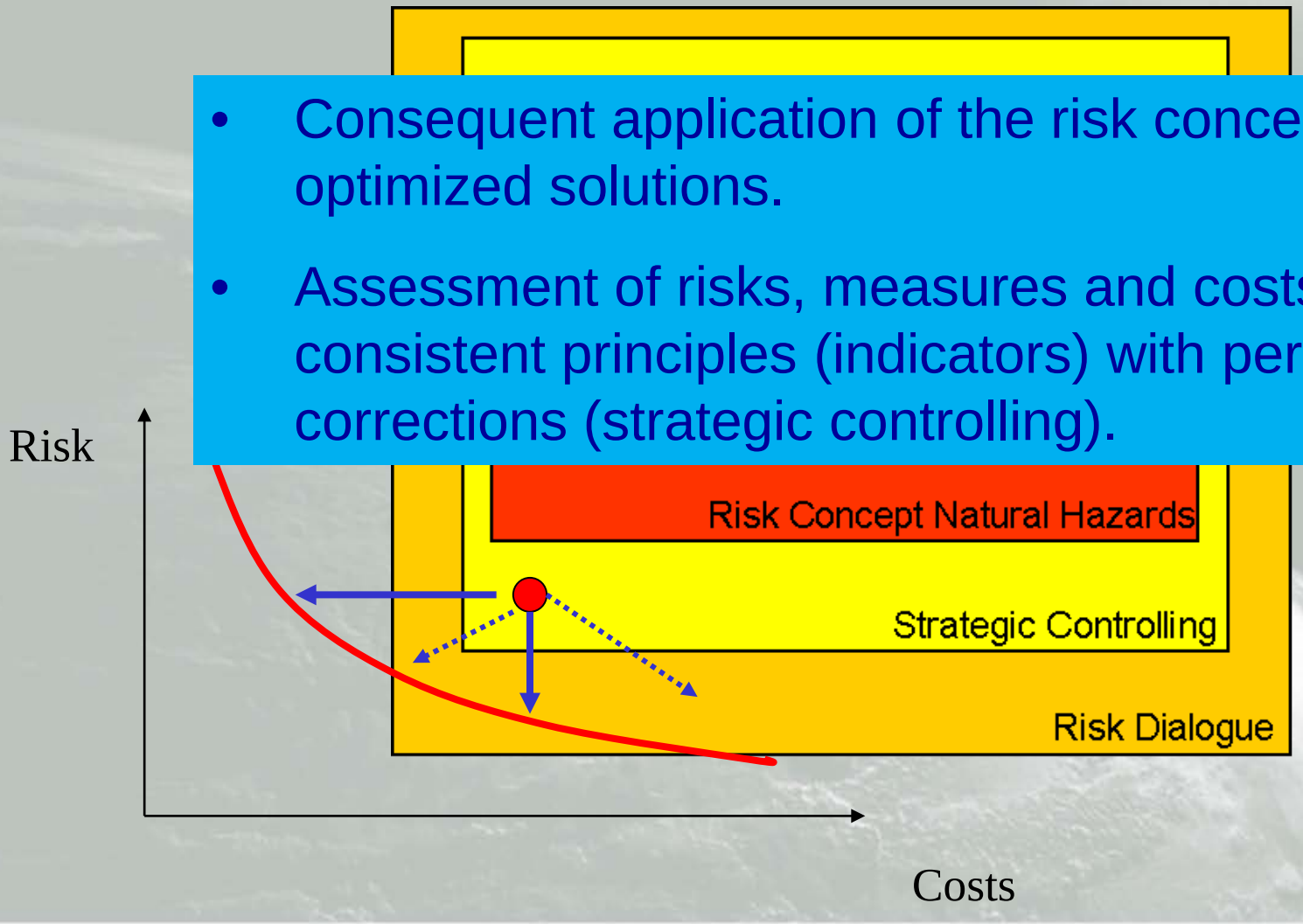
| Risk category | Individual risk<br>Highest value of probability of death per year | Collectiv risk<br>Marginal costs per saved human life (Mio. CHF) | Material damage<br>Costs of measures per unit of damage (x CHF per 1 CHF damage costs) |
|---|---|---|---|
| **Category 1**<br>100 % voluntary | $10^{-2}$ - $10^{-3}$ | 1 - 2 | |
| **Category 2**<br>high degree of personal responsibility | $10^{-3}$ - $2 \cdot 10^{-4}$ | 2 - 5 | |
| **Category 3**<br>low degree of personal responsibility | $2 \cdot 10^{-4}$ - $3 \cdot 10^{-5}$ | 5 - 10 | |
| **Category 4**<br>100 % nonvoluntary | $3 \cdot 10^{-5}$ - $4 \cdot 10^{-6}$ | 10 - 20 | |

Goals/limits to be defined by politics


NATURAL DISASTER REDUCTION
MAKING THE RIGHT CHOICES IS THE KEY TO DISASTER REDUCTION
PREPARATION
PREDICTION
RECOVERY
RESPONSE
INTERVENTION/ SUPPRESSION

# Integrative risk management: Strategic controlling

- Consequent application of the risk concept leads to optimized solutions.
- Assessment of risks, measures and costs following consistent principles (indicators) with periodic corrections (strategic controlling).



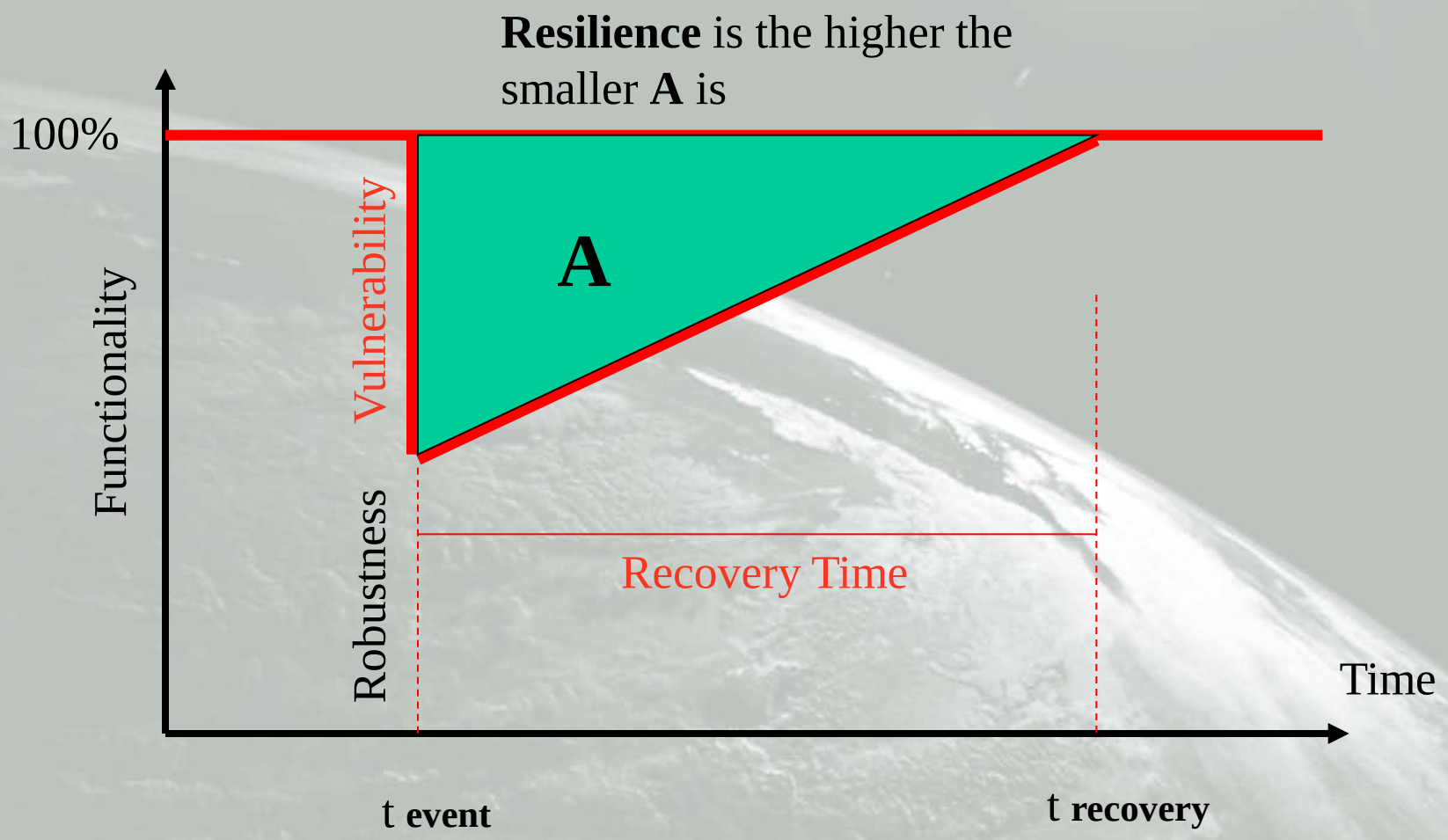
# Integrative risk management: the human factor

Approach equally concentrates on all sectors of the risk circle, on prevention, preparedness, intervention and recovery


Damage as a result of professionalism in intervention, human actions and behaviour

Timely and appropriate intervention influences extent of damage and human behaviour

# Schematic of Resilience



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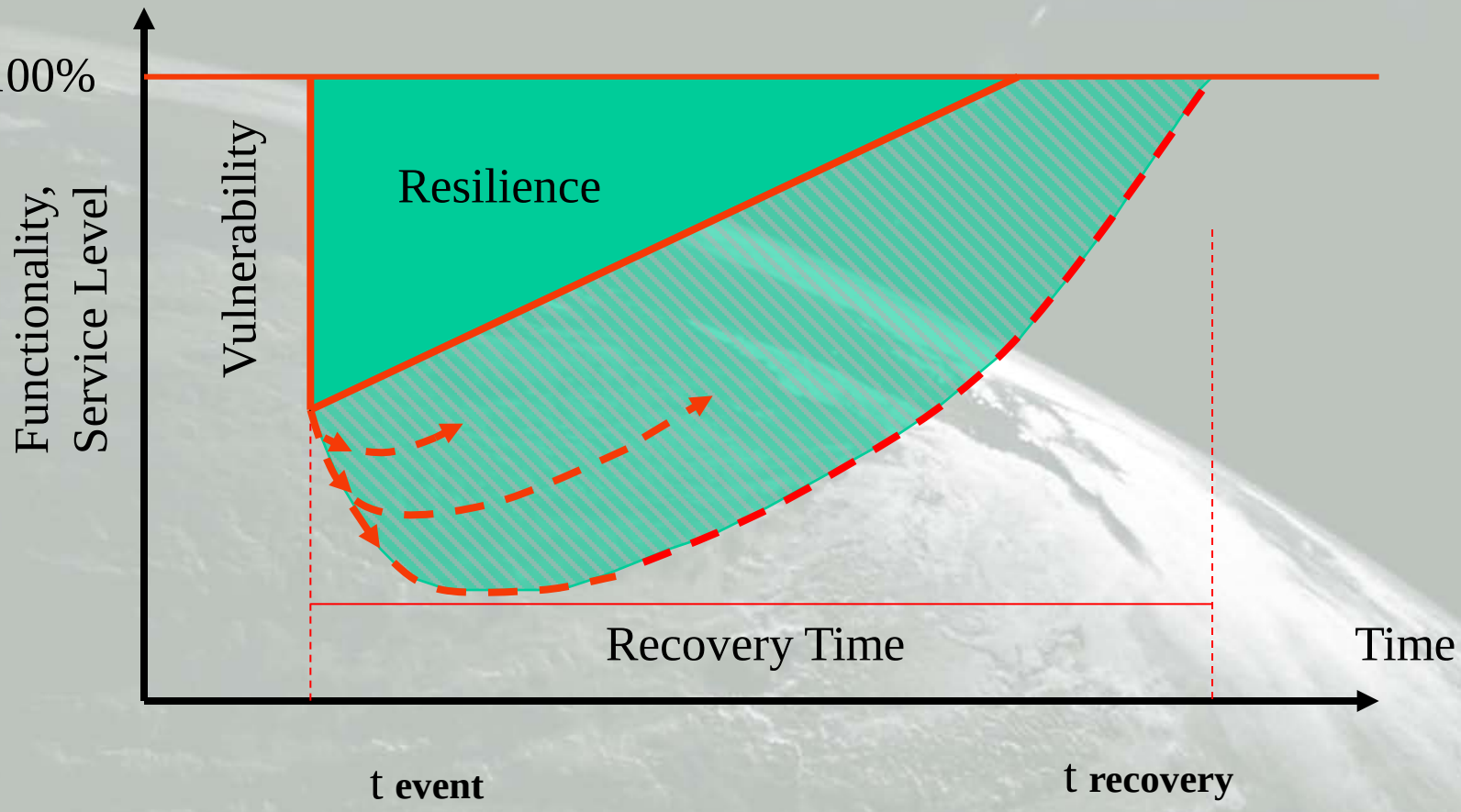

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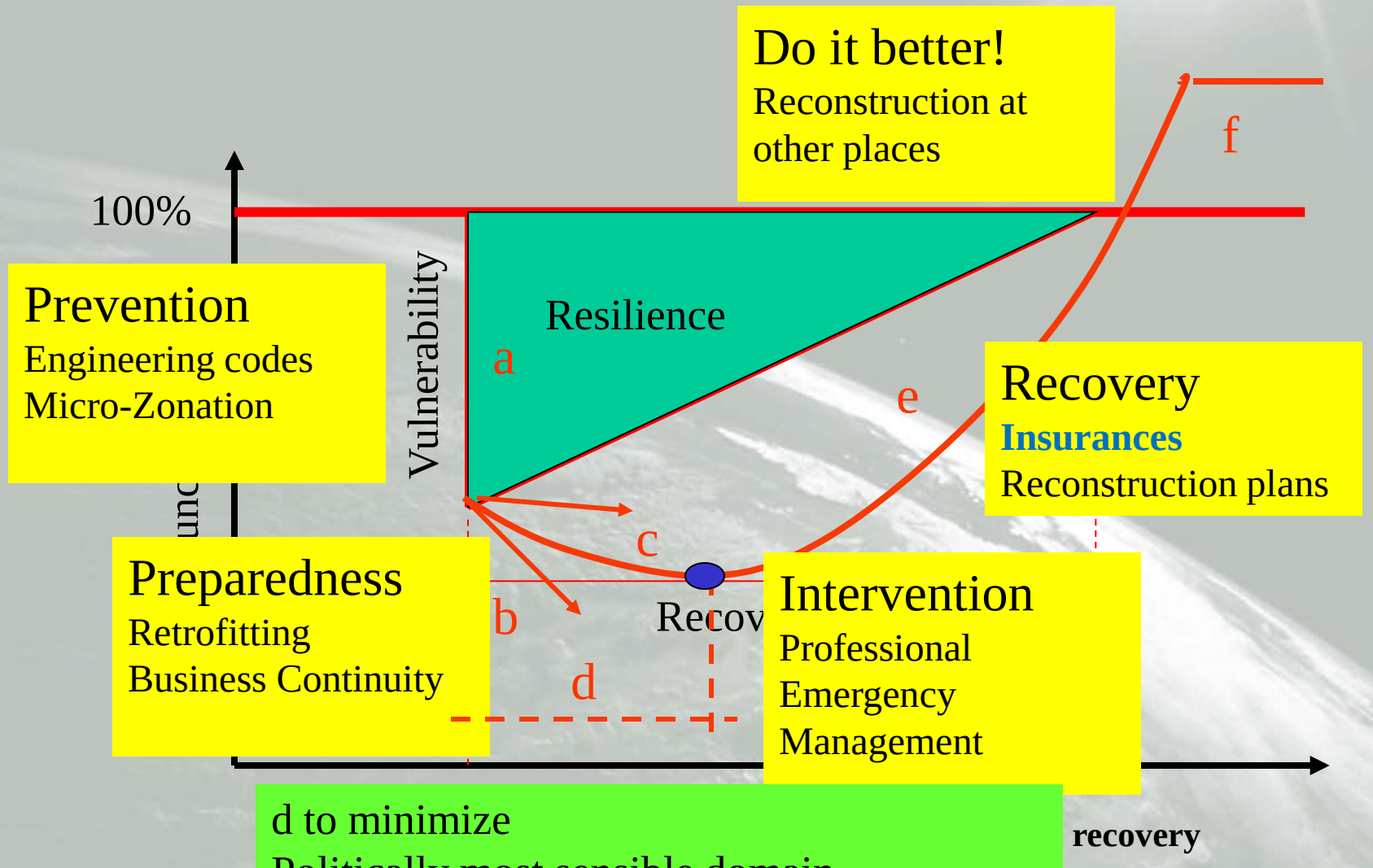
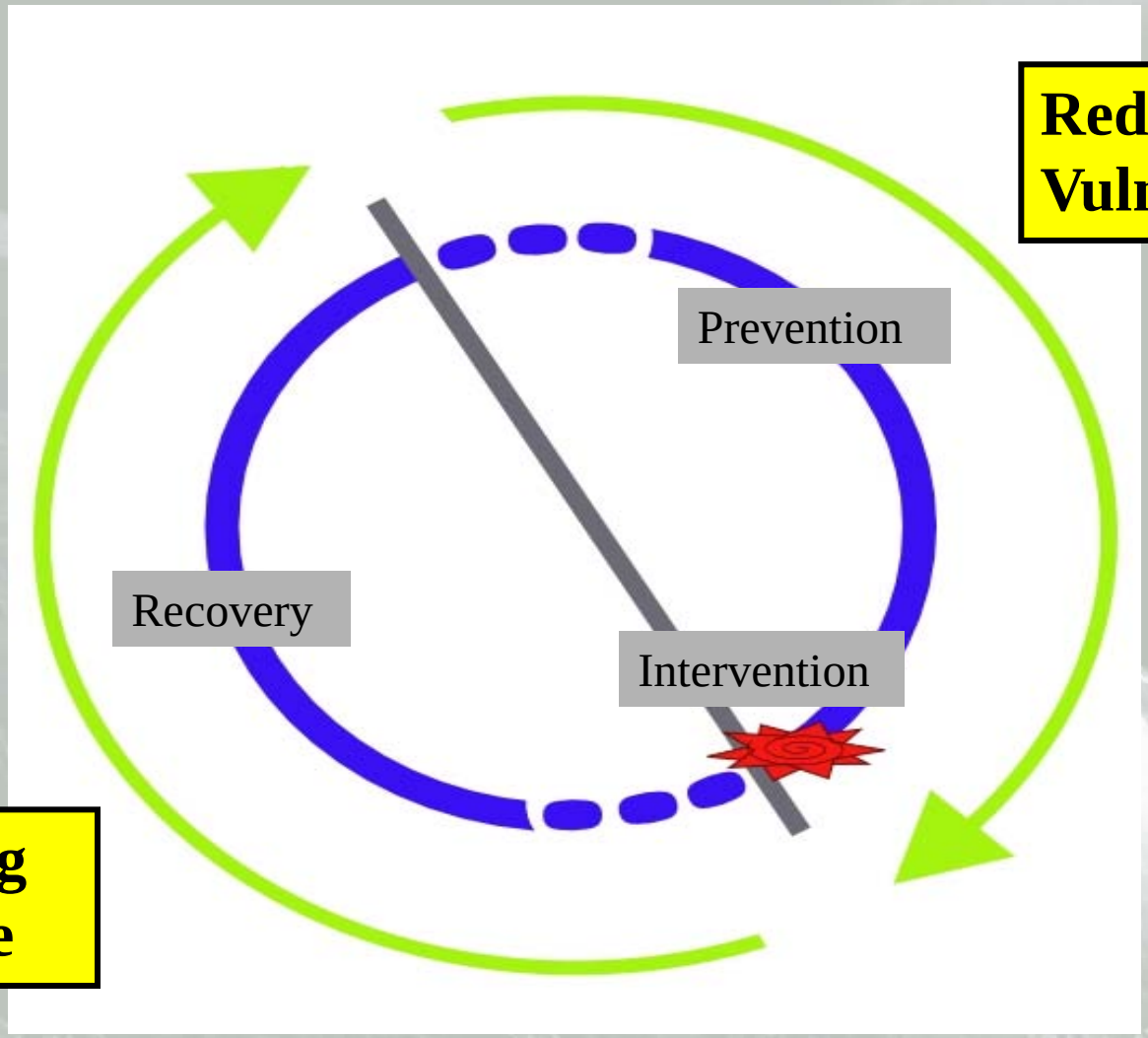


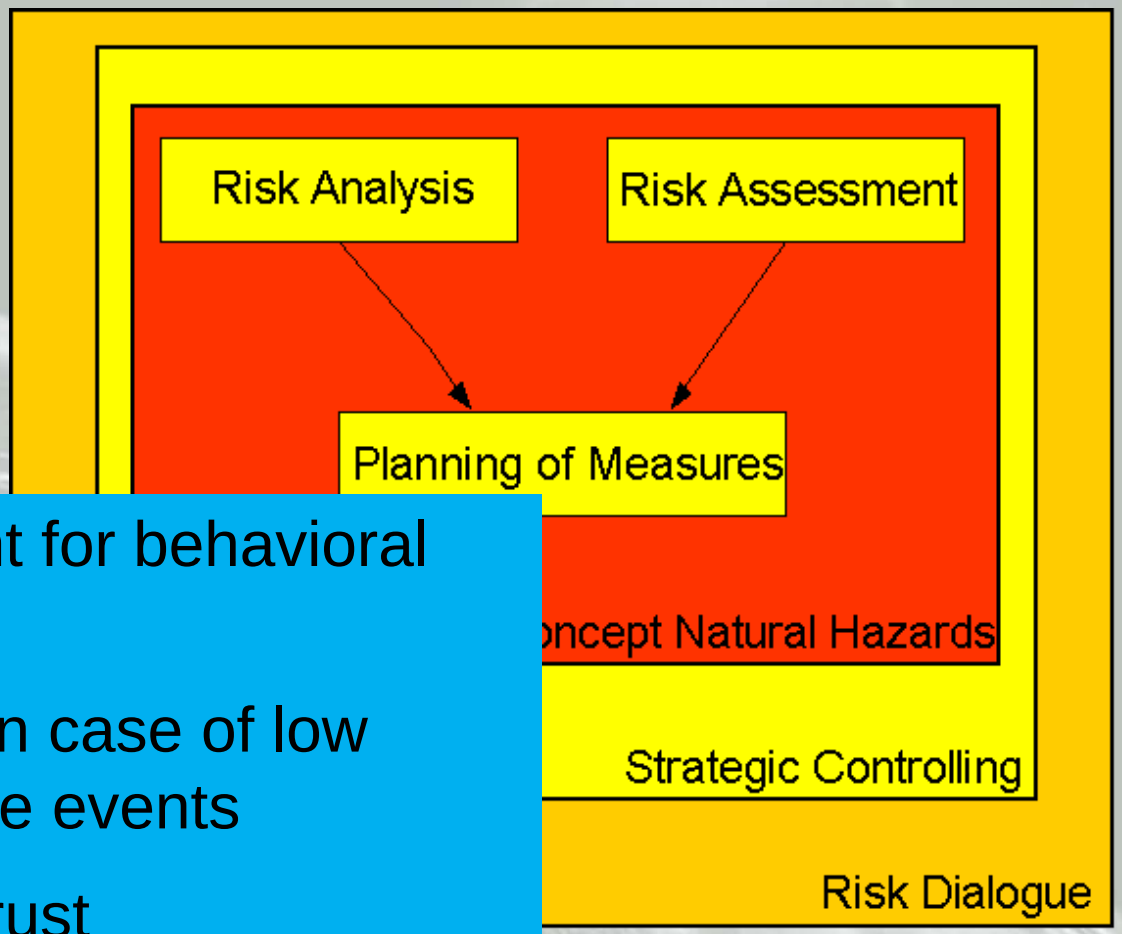
# Integrative risk management




**Reducing Vulnerability**

**Increasing Resilience**

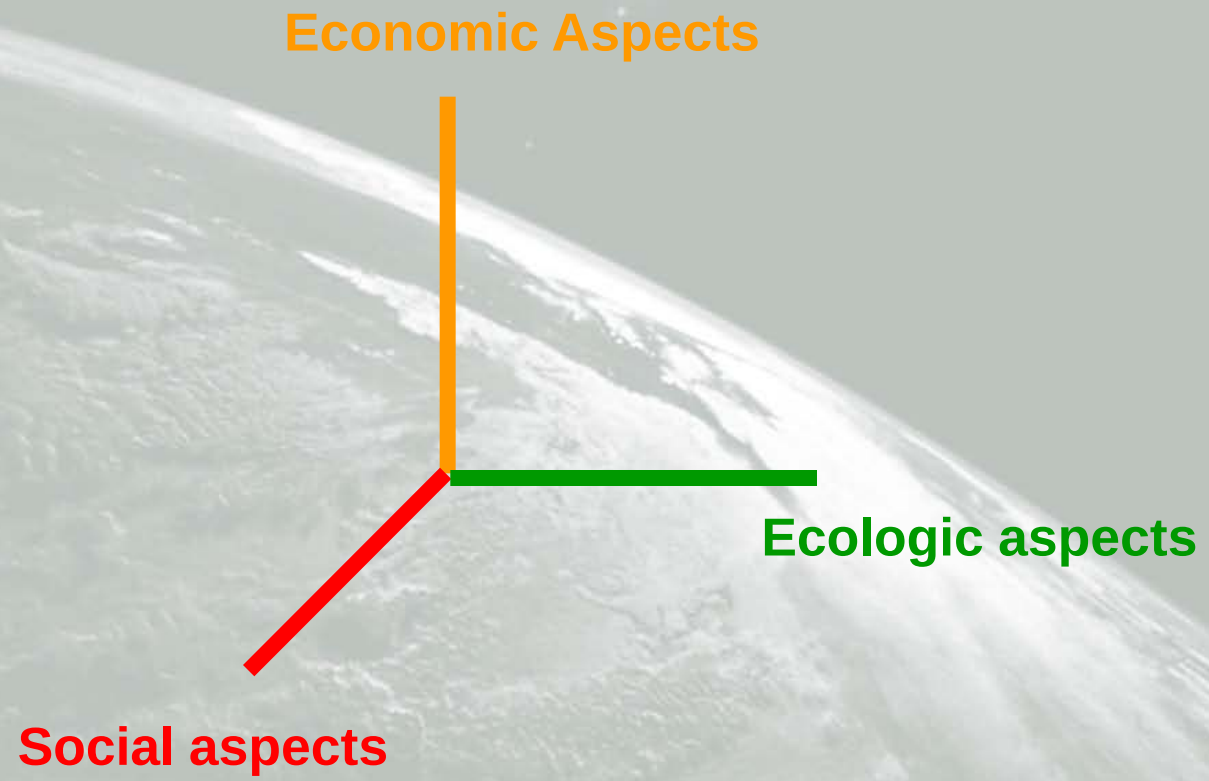
# Integrative risk management: Risk dialogue



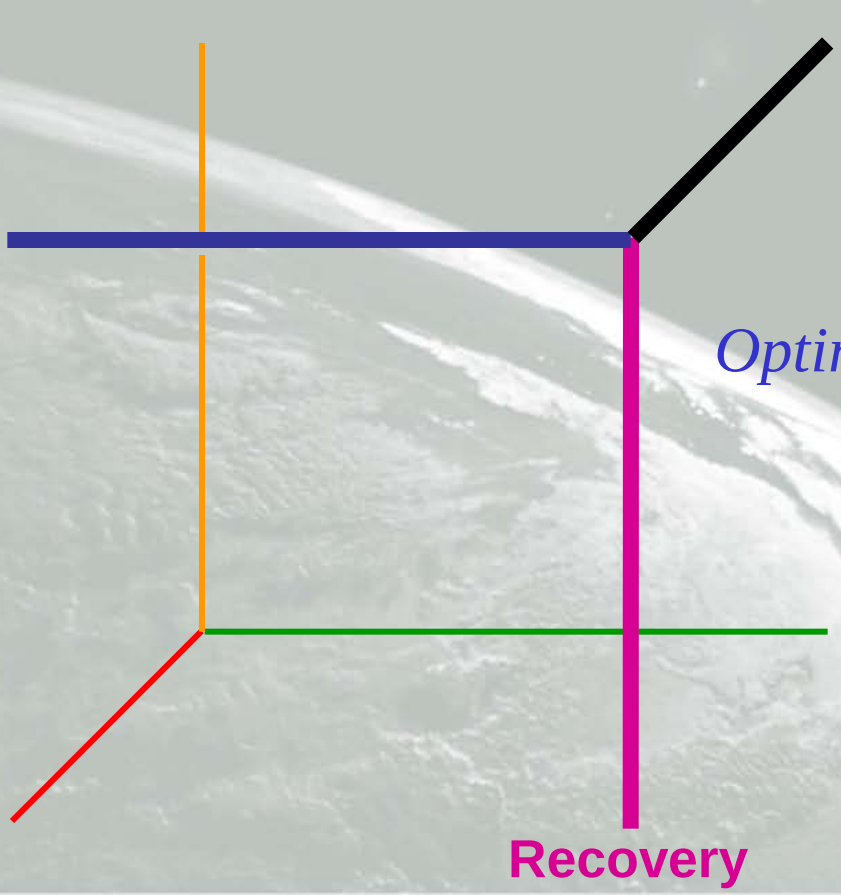

- Risk dialogue important for behavioral change,
- for awareness raising in case of low probability/high damage events
- Important to cultivate trust

# Summary Integrative Risk Management

Sustainability important for measures to be taken



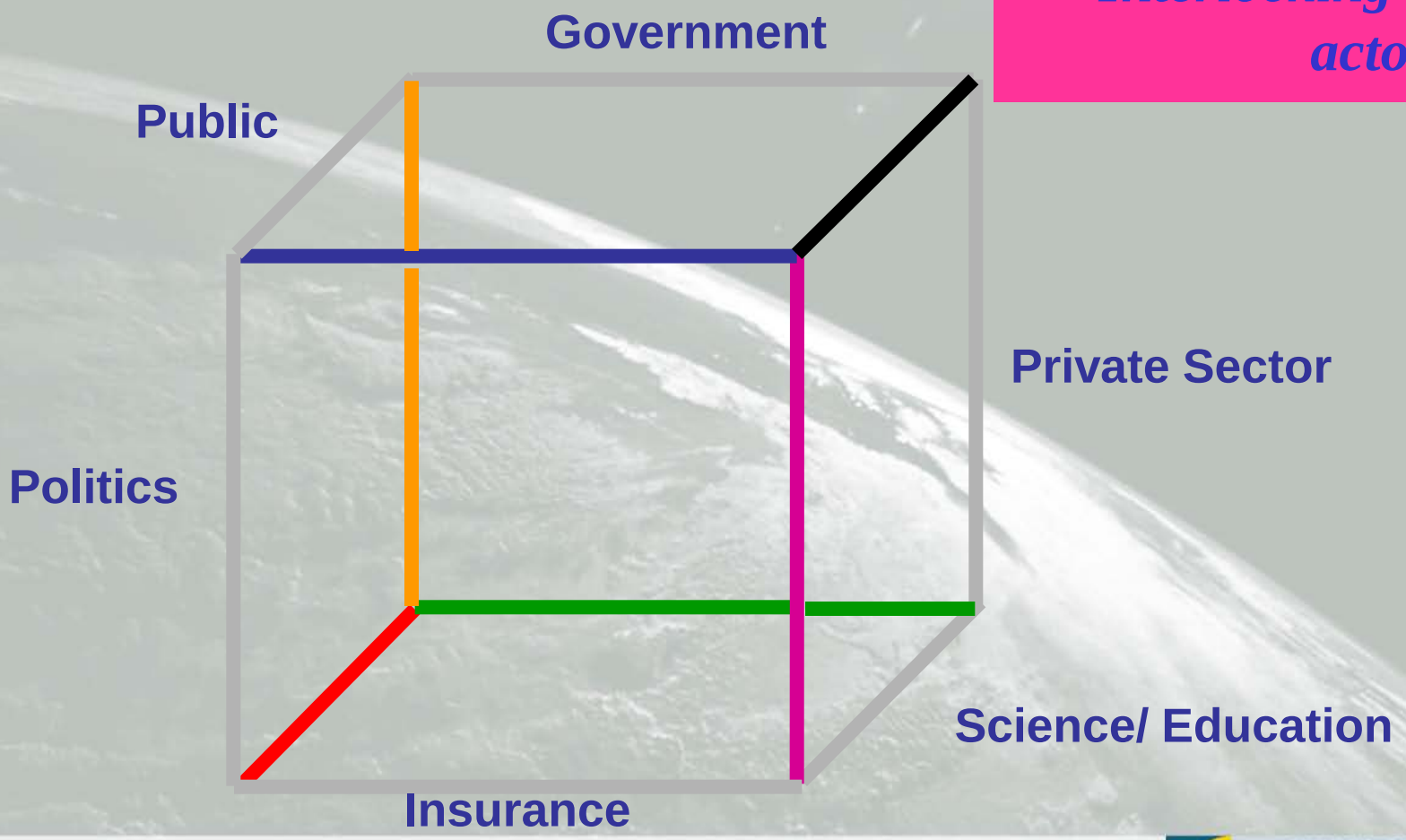
# Summary Integrative Risk Management




*Optimal use of measures*

# Summary Integrative Risk Management

*Interlocking of actors*



# Summary, Recommendations

- Sustainable risk management requires **a paradigm shift**: to move from reactive hazard approach (post-event intervention and recovery) to pro-active risk management (pre-event prevention and preparedness).
- Risk management is a top down responsibility which may not be delegated – **leadership** requested
- Numerous **uncertainties** in the future (globalization, increasing economic interdependencies, mobility, vulnerability of critical infrastructures, etc.)
- changes in risk patterns and need for periodic evaluation of the **risk portfolio**

# Summary, Recommendations

- Risk prevention is also **climate change adaptation** (meteorological hazards)
- **Harmonization** of disaster risk prevention and climate change adaptation important (adaptation measures politically easier to explain than disaster prevention).
- **Risk transfer** by insurance and building up renewal funds can substantially speed up the recovery process (housing, critical infrastructure buildings and services)


# Climate Change Adaptation ?

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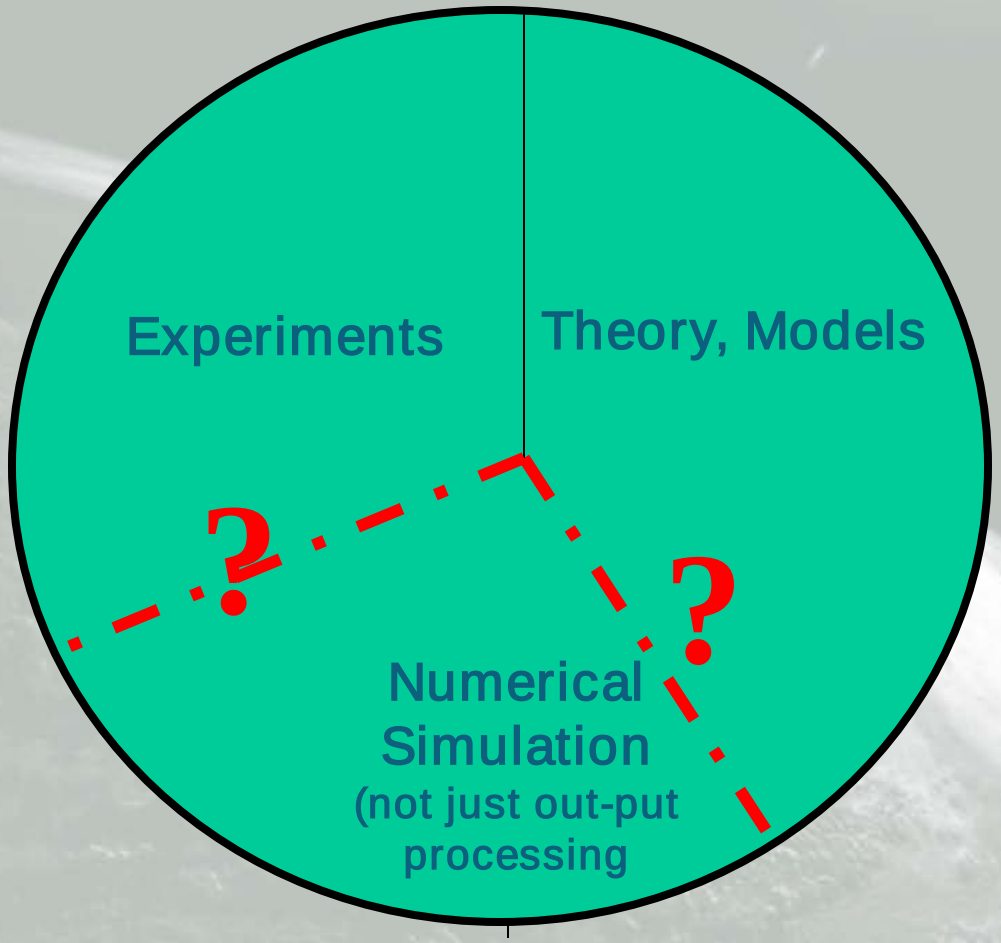
# The role of numerical simulation




*„From Thoughts to knowledge to Action“*

**Thank you for your attention!**

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