Is a Comparison of Different Biological Risks Possible?

SECB

Swiss Expert Committee for Biosafety

Dr. Isabel Hunger-Glaser

Overview

1. What we do
2. Who we are
3. **Comparison of risks:** Methodology
4. **Comparison of risks:** Hazard identification Risk analysis
5. **Comparison of risks:** Result

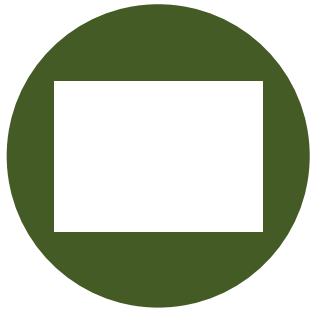
What we do

We give advice in the field of humans, animals and the environment

Our tasks

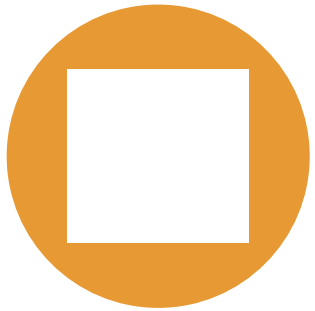
give advice

We advise the Federal Council, ministries and scientists



impart

We impart between authorities and all working in biotechnology



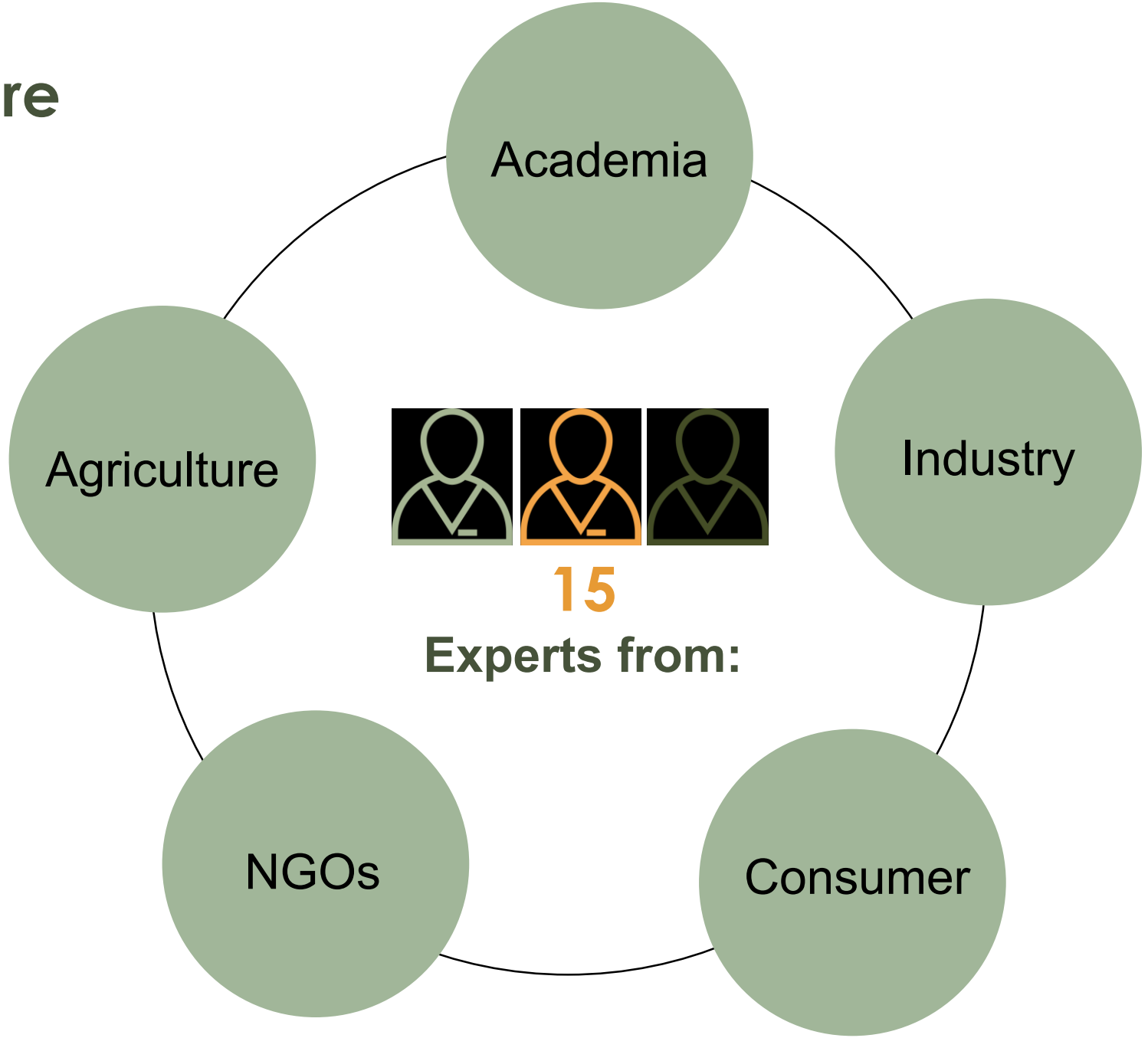
inform

We inform about new potential risks

Who we are

Independent experts from different (bio)safety backgrounds interested in safe and pragmatic solutions

Who we are


Academia
Industry
Consumer
NGOs
Agriculture
15
Experts from:

Our topics

Health

Pathology, Hygiene,
Epidemiology,
Gene therapy
Animal health

Gen- and Biotechnology

Molecular biology,
Microbiology,
Genetics

Environment

Ecology, Botany,
Zoology, Agronomy

History

No regulation

Law and ordinances in CH
- Gentechnology (GTG),
- CO (ESV),
- Protection (SAMV),
- Deliberate release (FrSV)

INTER-NATIONAL

SECB

1970
first BSC

1975
Advisory Committee on Experimental Genetics
(Prof. Werner Arber)

1983
WHO Biosafety Manual

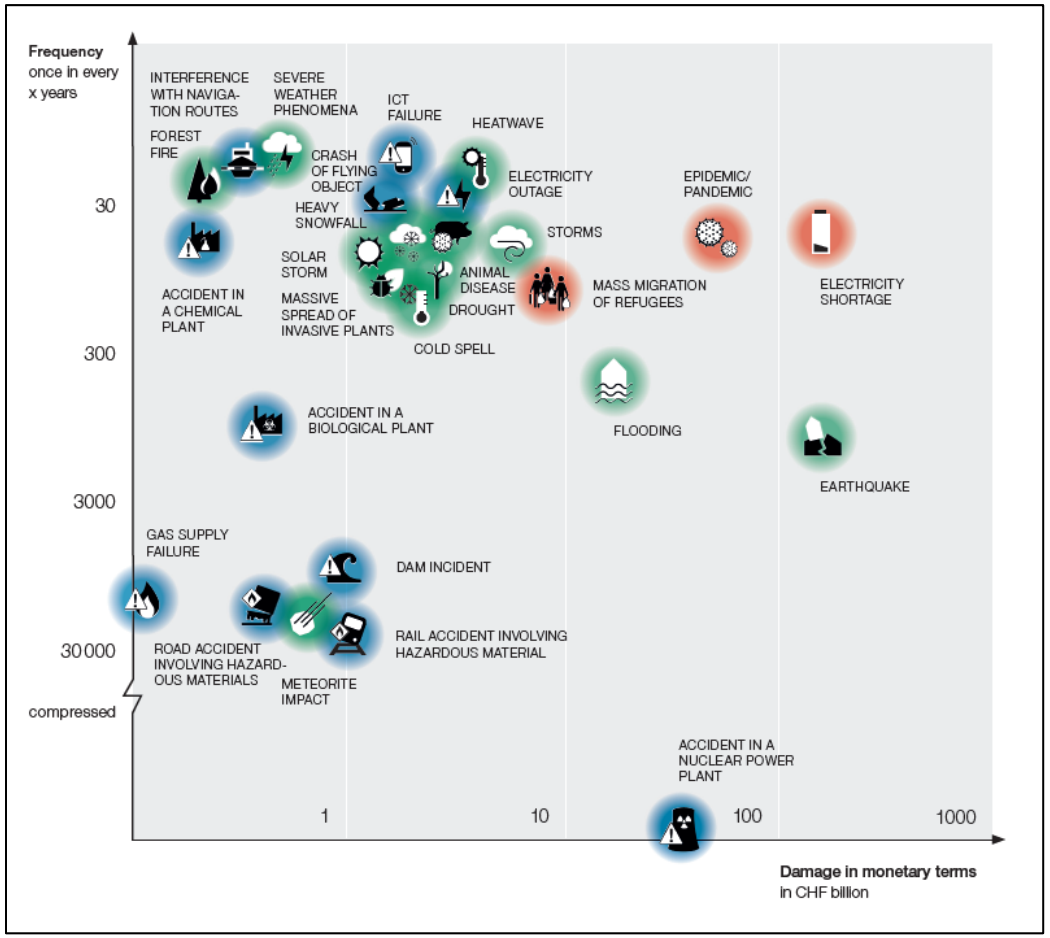
1986
Swiss Interdisciplinary Committee for Biosafety in Research and Technology

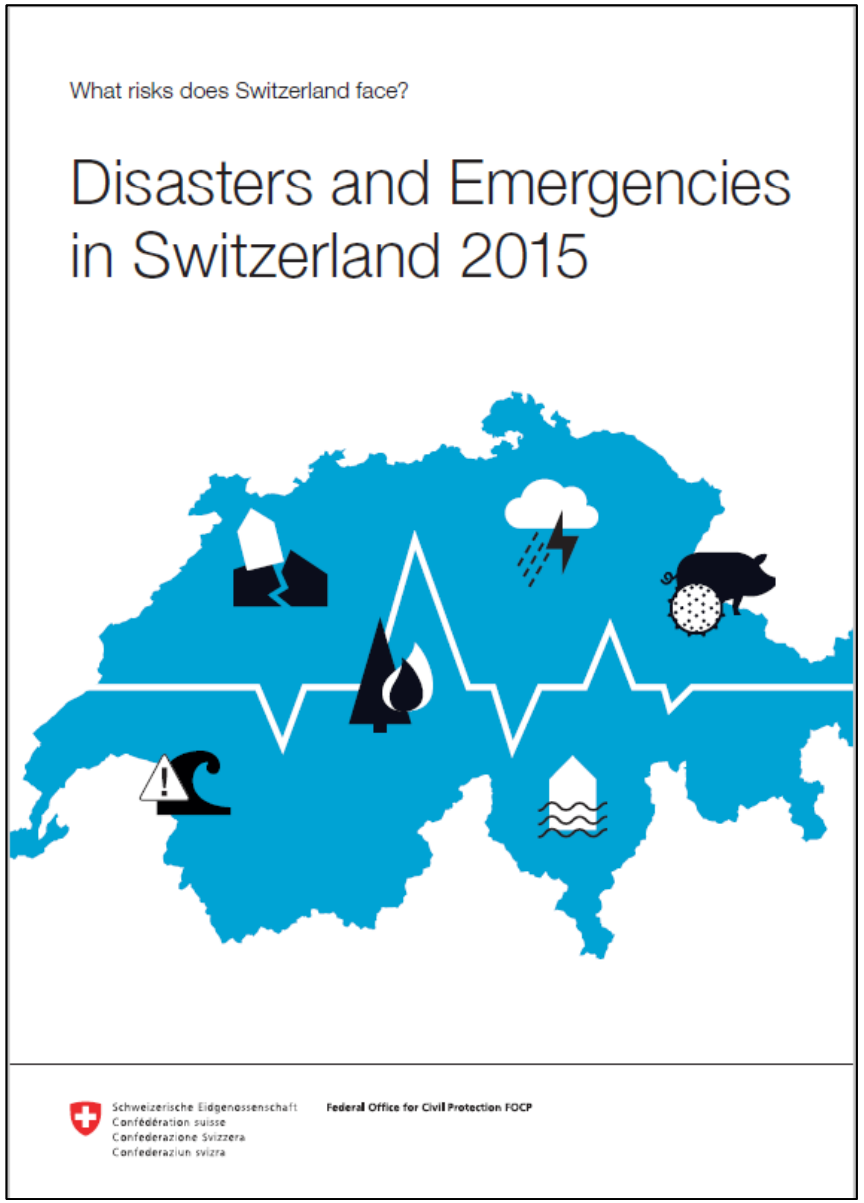
1997
SECB

1999

Comparison of risks

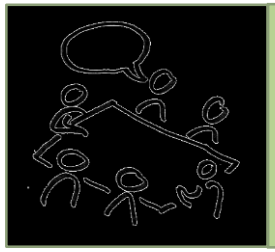
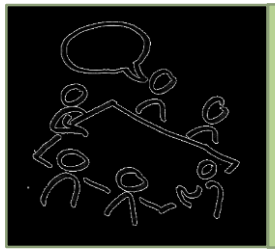
Methodology



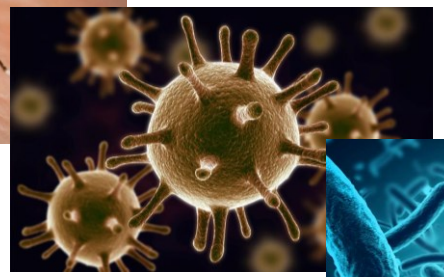


Procedure

«Comparison of Biological Risks»

Hazard dossiers		Definitions, known hazards, tendencies, influencing factors and possible scenarios
⬇		⬇
Risk analysis		Probablity of occurrence and extent of damage assessment
⬇		⬇
Risk matrix		Elaborate risk matrix and compare hazards

Hazard dossiers

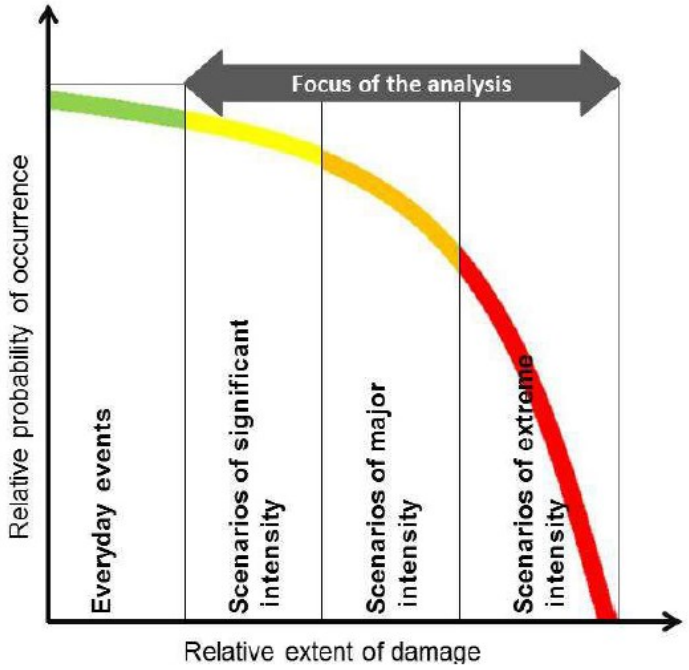
- Vector-borne diseases
- Food-borne infections
- Release of MO from closed systems
- Plant breeding techniques classic
- Plant breeding techniques GMO
- Animal epidemics
- Plant pathogens (*Xylella fastidiosa)*
- Antibiotic resistances

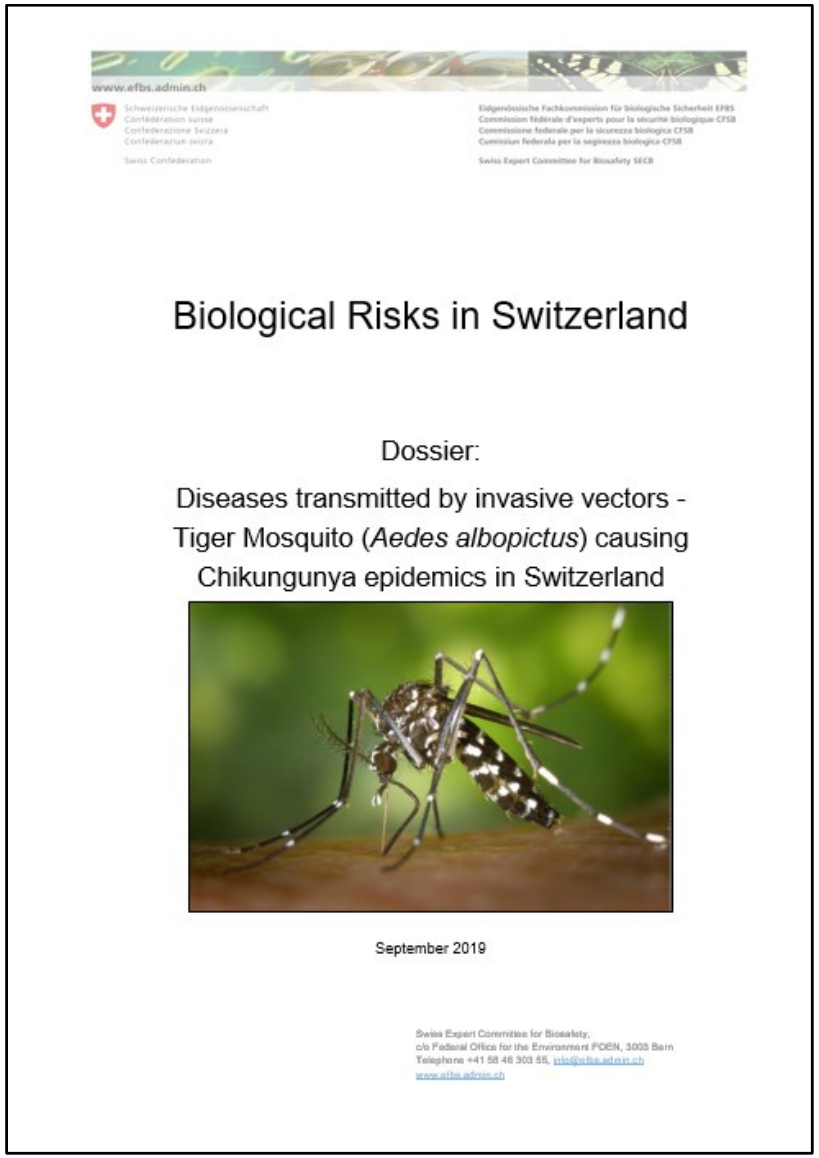


Hazard dossiers

Content of dossiers:

- Introduction and definition
- Known events and development
- Influencing factors
- Risk analysis
  1. Scenario minor
  2. Scenario major
  3. Scenario extreme
- Conclusions





Likelihood of occurrence

Likelihood: assesses the probability that an event will happen

- 0 – 100%

Likelihood:

Class	Occurrence in the next 10 years
4	Very likely
3	Likely
2	Unlikely
1	Very unlikely

Damage indicators

Damage area	Indicator	Entity
Individuals	Fatalities	Number
	Causalities / sick people	Number
	Individuals in need of assistance	Persons days
Environment	Damaged ecosystems	km^2 x year
Economy	Asset losses and cost of coping	CHF/Euro
	Reduction of economic performance	CHF/Euro
Society	Supply shortfalls and disruptions	Days
	Disminished public order and domestic security	Days
	Reputational damage	Intensity x time
	Loss of confidence in state / institutions	Intensity x time
	Reduction of territorial integrity	Intensity
	Damage to and loss of cultural goods	Number x significance

Quantification of the damage

Damage area	Indicator	Entity	A1	A2	A3	A4	A5	A6	A7	A8
Individuals	Fatalities	nr	<10	11-30	31-100	101-300	301-1'000	1'001-3'000	3'001-10'000	>10'000
	Causalities / sick peolpe	nr	<100	-300	-1'000	-3'000	-10'000	-30'000	-100'000	>100'000
	Individuals in need of assistance	persons days	<200'000	-0.6 Mio.	-2 Mio.	-6 Mio.	-20 Mio.	60 Mio.	200 Mio.	>200 Mio.
Environ-ment	Damaged ecosystems	km^2 x years	<150	-450	-1'500	-4'500	15'000	-45'000	-150'000	>150'000

Quantification of the damage

Damage area	Indicator	Entity	A1	A2	A3	A4	A5	A6	A7	A8
Society	Reputational loss	Intensity x time								

A1	Few days of medium importance (negative coverage in foreign media)
A3	Few weeks of medium importance (negative coverage in foreign media)
A5	Several weeks with impact on country's standing and international cooperation
A8	Lasting damage to reputation, leading to irreversible loss of reputation and impact on international cooperation

Values for costs

Indicator	Marginal costs per unit
I1 - Fatalities	4 Mio.
I2 - Casualties/sick people	400‘000 CHF
I3 - Individuals in need of assistance	250 CHF
En1 - Damaged ecosystems	11‘500 CHF
Ec1 - Asset losses and cost of coping	1 CHF
Ec2 - Reduction of economic performance	1 CHF
S1 - Supply shortfalls and disruptions	500 CHF
S2 - Diminished public order and domestic security	300 CHF
S3 - Reputational damage	Mean of the corresponding class in Ec1*
S4 - Loss of confidence in state/institutions	Mean of the corresponding class in Ec1*
S5 - Reduction of territorial integrity	Mean of the corresponding class in Ec1*
S6 - Damage to and loss of cultural goods	Mean of the corresponding class in Ec1*

Risk analysis

Diseases transmitted by invasive vectors:
Tiger Mosquito (*Aedes albopictus*) causing Chikungunya epidemic in Switzerland

Scenarios

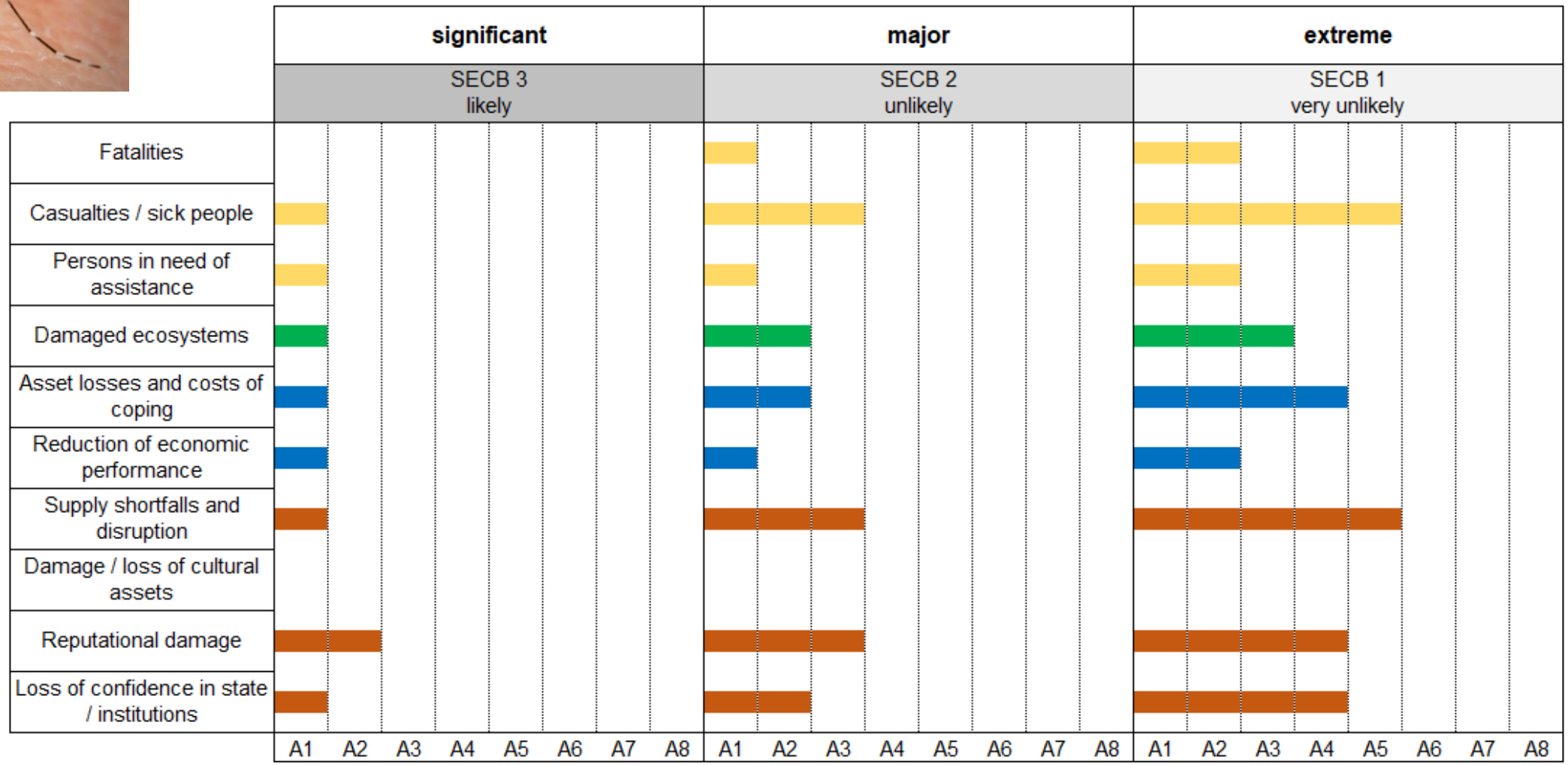
Minor: 100 persons get infected with Chikungunya, 8 persons get hospitalised, no deaths, costs for mosquito control, reputational damage

Major: 1'000 cases, 84 hospitalised, one death, supply shortfalls (blood), reputational damage

Extreme: 10'000 cases, 1'000 co-infections with Dengue, 950 hospitalised, 15 deaths, high economic impact and high reputational damage

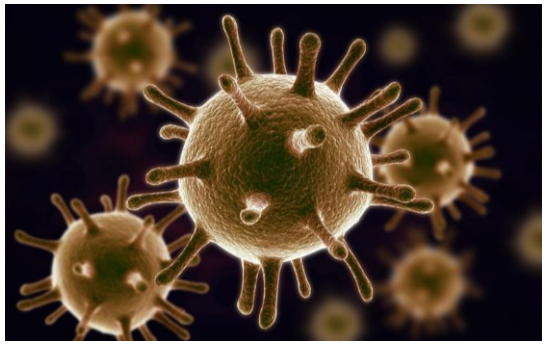
Risk analysis

Diseases transmitted by invasive vectors: Tiger Mosquito (*Aedes albopictus*) causing Chikungunya epidemic in Switzerland



Risk analysis

Food-associated infections



Scenarios

Minor: Openair festival, food contaminated with salmonella

Major: contaminated drinking water of a large city

Extreme: food-associated infection with prions (long incubation period)

Risk analysis

Unintentional release of MO from closed systems

Scenarios

Minor: 2 lab employees infected with brucella

Major: TB strain released (multidrug resistant)

Extreme: highly pathogenic influenza A/H5N1 released into the environment due to defect in ventilation system

Risk analysis

Negative impact of new traits in plant varieties developed using classical or genetically engineered breeding techniques

Scenarios
Classical plant breeding

Minor: strawberries with allergic potential: 500 medical treat.

Major: strawberries with allergic potential: 3’000 medical treat; 500 hospitalised and one death

Genetically engineered plant breeding
Minor: GM oilseed rape: hybridisation with wild plants

Major: GM millet: hybridisation with related plants -> weed problem for agroecosystem

Risk analysis

Animal epidemics

Scenarios

Minor: African swine fever in a few regions in CH

Major: African swine fever in multiple regions in CH

Extreme: new disease spreading fast with zoonotic potential

Risk analysis

Invasive plant pathogens (*Xylella fastidiosa*)

Scenarios

Minor: a few plants of a vineyard get infected

Major: several vineyards in one region get infected

Extreme: almost all vineyards of CH get infected

Risk analysis

Antibiotic resistance

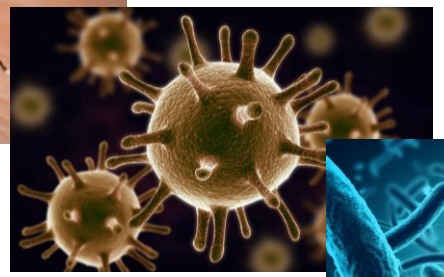
Scenarios

Minor: complications with resistant bacteria

Major: complications and deaths due to resistant bacteria

Extreme: no effective antibiotics left, operations and therapies no longer possible / high losses of lifestock

Hazard dossiers

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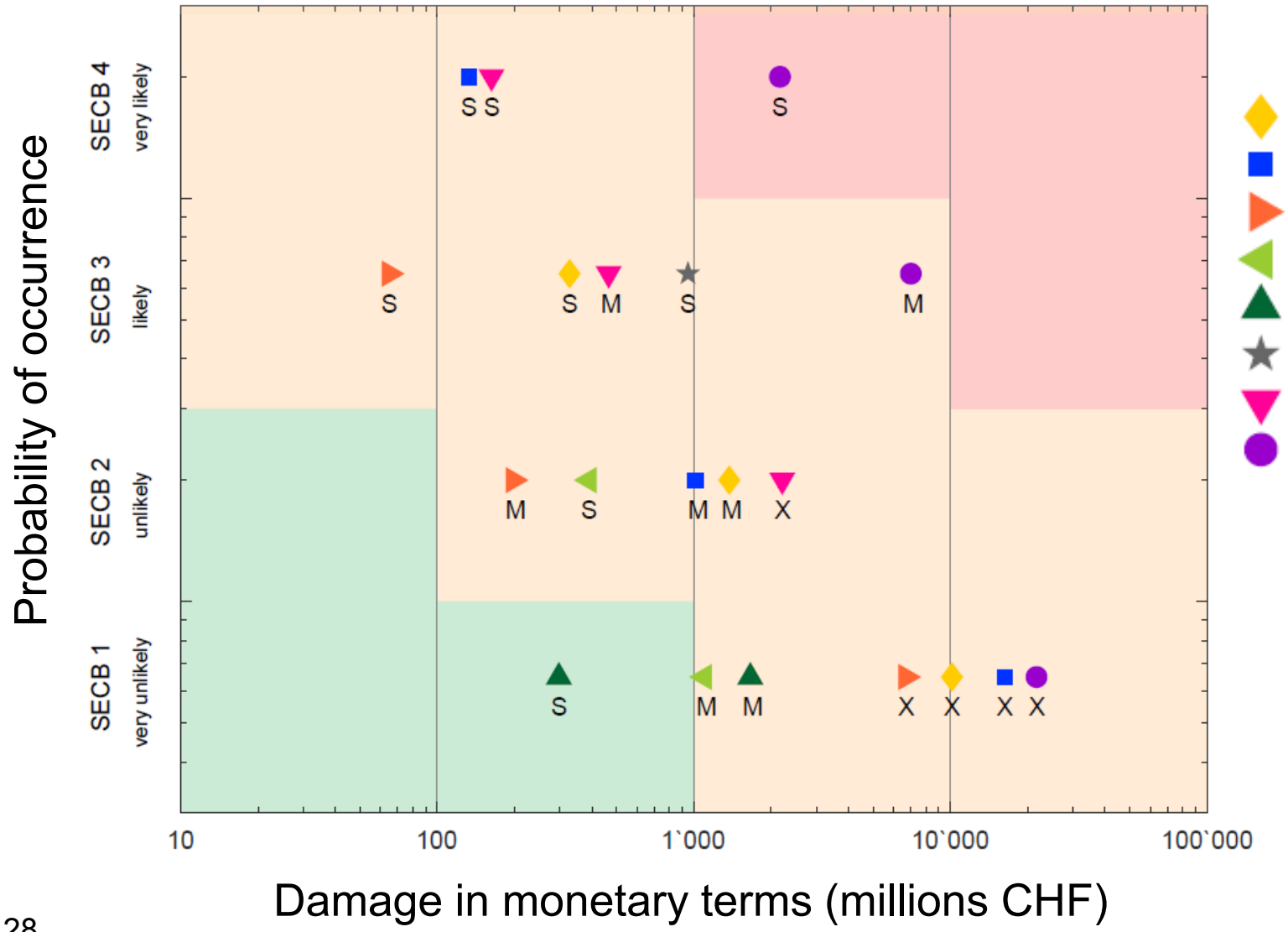
Comparison between hazards



- Vector-borne diseases
- Food-borne infections
- Accidental release of microorganisms
- Classical plant breeding techniques
- Genetically engineered plant breeding techniques
- Animal epidemics
- Plant pathogens
- Antibiotic resistances

X: extreme
M: major
S: significant/minor

Thank you

www.efbs.admin.ch
info@efbs.admin.ch