



Reinforcing civil protection capabilities into multi-hazard risk assessment under climate change



Funded by  
European Union  
Humanitarian Aid  
and Civil Protection

# Introduction to RiskPlan

## A pragmatic tool for risk assessment

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- ▶ 20<sup>th</sup> February 2020, Barcelona



RECIPE

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# Overview

- ▶ What it is
- ▶ Origin
- ▶ Target Users & available publications
- ▶ Case studies
- ▶ Methodology
- ▶ Advantages & Limits of Risk Plan



## RiskPlan

- ▶ is a **calculation and management tool** to assess the risks posed by hazard processes in defined areas and to evaluate the cost-effectiveness of protective measures.
- ▶ enables a **pragmatic** approach to risk management
- ▶ is a planning tool for **integrated risk management**
- ▶ is an excellent instrument for **risk dialogue**
- ▶ is an ideal **tool for learners** who are not familiar with the details of risk assessments

# Origin – reasons RiskPlan was developed (I)

## Two major developments in Switzerland since the 90ties

- ▶ Introduction of risk-based hazard management for natural and technological risks
  - ▶ methodological background
  - ▶ understanding of benefits
  - ▶ guidelines for risk analyses
- ▶ Systematic hazard mapping for natural risks
  - ▶ necessary data for risk assessments
  - ▶ understanding of hazard
  - ▶ Opportunity to calculate risks and to practice risk-based hazard management
  - ▶ Costly
  - ▶ Time-consuming

## Origin – reasons RiskPlan was developed (II)

Alternative to the detailed risk assessment without giving up the methodology of risk-based hazard management

- ▶ Use local knowledge and experience where data are missing
- ▶ Estimate damage where simulations and calculations are not possible or too costly
- ▶ Provide the possibility to assess risks in communities or regions or even catchment areas
- ▶ Provide the possibility to assess the cost-effectiveness of measures
- ▶ Provide the possibility to use risk assessments for risk dialogue
- ▶ Provide a learning tool for risk management and risk dialogue
  
- ▶ Different versions of RiskPlan were developed and continuously tested in real-world case studies.



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## Targeted Users

- ▶ Authorities responsible for (natural) risk management in communities or regions (prevention and/or response)
- ▶ Professionals in engineering and insurance companies
- ▶ Research organisations in (natural) risk management
- ▶ Teachers, students and interested persons

## Publications

**IRK- INTEGRAL REGIONAL PLANNING CONCEPTS IN SELECTED SIDE VALLEYS OF THE WIPPTAL**  
Siegfried Samerstorfer<sup>1</sup>, Rudolf Pöllinger<sup>1</sup>, Hans Peter Staffler<sup>1</sup>, Manfred Riedl<sup>1</sup>, Jochen Knabl<sup>1</sup> and Gebhard Walter<sup>2</sup>

**Integral Risk Management - steps on the way from theory to practice**  
Andreas Rimböck  
Bavarian Environment Agency, Unit 61, 86177 Augsburg, Germany  
andreas.rimböck@be.bayern.de  
Anton Loipenberger  
Bavarian Environment Agency, 86177 Augsburg, Germany

**RiskPlan – Argumente für einen sachgerechten Risikodialog**  
Das IT-basierte Tool zur Einschätzung und Vorbeugung von Naturgefahren.

**Using RISKPLAN for Earthquake Risk Assessment in Sichuan Province, China**  
Yan Shij<sup>1,2\*</sup> and Klaus Seeland<sup>2</sup>

## Case studies

- ▶ 2006 Case study Kam Phuan (tsunami and flooding risk in a region of Thailand) in cooperation with local authorities and ETHZ
- ▶ 2007 – 2008 Pragmatic Risk Management (RiskPlan online)
  - ▶ Case Study Climate Change, Taschinasbach (GR)
  - ▶ ChlimchAlp: Delegation Südtirol
  - ▶ Fallbeispiel Nidwalden
  - ▶ AdaptAlp: Various Case Studies in France, Germany, Austria, Slovenia, Italy
- ▶ 2009 Pragmatic Risk Management (RiskPlan offline - online 2.0)
  - ▶ ParaMount: Application to traffic routes in France, Germany, Austria, Slovenia, Italy



# Methodology (I)

- ▶ RiskPlan is a risk based methodology, which means:
  - ▶ Hazards are described by a set of distinct **scenarios**
  - ▶ Scenarios are described by its **probability or frequency** of occurrence and by its **damages**
  - ▶ Damages are described by damage **indicators** (fatalities and property damage, others are possible)
- ▶ Different damage indicators are aggregated to a total monetized damage through **willingness-to-pay-values** [WTP]





# Methodology (II)

## ▶ System definitions:

- ▶ Spatial grouping: assessment area, divided into regions, subdivided into object areas
- ▶ Hazards: scenarios  $S$  characterised by its intensity
- ▶ Exposures  $E$ , e.g. 3 types: normal / unfavourable / disastrous

## ▶ Parameters to estimate societal risks:

- ▶ Frequency of scenario  $S_i$ :  $H(S_i)$
- ▶ Probability of exposure  $E_j$ :  $p(E_j)$
- ▶ Damage for given indicators  $I_k$  (fatalities, material damage, ...):  $D_k(S_i, E_j)$

## ▶ Further parameters to estimate societal risk values:

- ▶ willingness-to-pay values  $m$  to monetize non monetary damage values (e.g. CHF 5 Mio. to statistically avert 1 fatality)
- ▶ “risk aversion”  $g$  (weighting function depending on damage) to account for “indirect damage” or indicators not used  
→ can be used or disregarded

RiskPlan contains recommended values for these parameters!

## ▶ Calculation of societal risk values for an object area $q$ :

$$R_q = \sum H_q(S_i) * p_q(E_j) * D_{qk}(S_i, E_j) * m_k [ * g(D_{qk}(S_i, E_j)) ]$$

# Methodology (III)

► Risk Matrix

Scenario	E1 Probability: 60%		E2 Probability: 35%		Ek Probability: 3%		Ep Probability: 2%	
	Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value
S1 Frequency: 0.0666667	Number of fatalities per event		Number of fatalities per event		Number of fatalities per event		Number of fatalities per event	
	0	0	0	0	0	0	0	0
	Material damage per event		Material damage per event		Material damage per event		Material damage per event	
	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF
								
S2 Frequency: 0.0233333	Number of fatalities per event		Number of fatalities per event		Number of fatalities per event		Number of fatalities per event	
	0	0	0	0	0	0	0	0
	Material damage per event		Material damage per event		Material damage per event		Material damage per event	
	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF
								
Sj Frequency: 0.0066667	Number of fatalities per event		Number of fatalities per event		Number of fatalities per event		Number of fatalities per event	
	0	0	0	0	0	0	0	0
	Material damage per event		Material damage per event		Material damage per event		Material damage per event	
	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF
								
Sq Frequency: 0.0033333	Number of fatalities per event		Number of fatalities per event		Number of fatalities per event		Number of fatalities per event	
	0	0	0	0	0	0	0	0
	Material damage per event		Material damage per event		Material damage per event		Material damage per event	
	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF	0 CHF
								

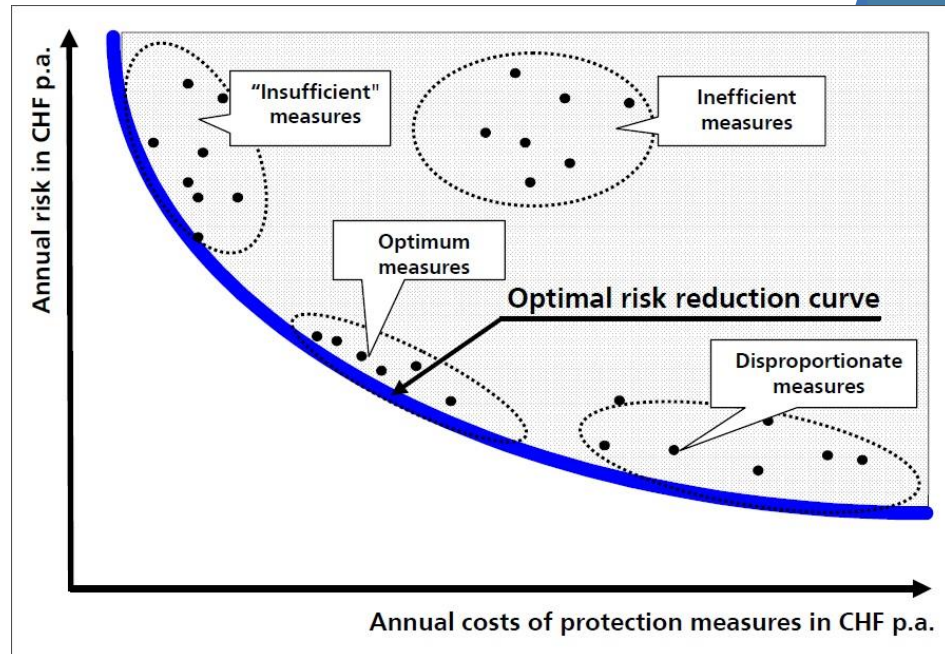
## Methodology (IV)

► RiskPlan is a methodology for assessing safety measures on the basis of cost-effectiveness, which means:

- The effectiveness of possible safety measures (incl. combinations thereof) is assessed in terms of the (yearly) risk reduction.
- The costs of possible safety measures are assessed in terms of the (yearly) cost  $C_a$  derived from investment costs  $C_i$ , operating cost  $C_o$  and maintenance costs  $C_m$  using life span  $t$  [years] and interest rate  $p$  [e.g. 2% →  $p=0.02$ ]:

$$C_a = C_o + C_m + C_i/t + (p \cdot C_i)/2$$

- The optimal safety measures is chosen on the basis of the risk-cost-diagram.





## Advantages of RiskPlan

- ▶ Quick estimate of risk situation in a region (strategic level)
- ▶ Use of experience and expert judgement for risk estimates (e.g. round table)
- ▶ Suitable to lead a risk dialogue involving all stakeholders
- ▶ Tool is flexible with respect to hazards, scenarios, risk parameters etc.
- ▶ Application not limited to natural hazards

## Advantages for RECIPE

- ▶ Common methodology that can be applied to various hazard in projects => comparability
- ▶ Quantitative results
- ▶ Climate change can be included (different hazard processes; with / without CC)
- ▶ Make use of existing data and information
- ▶ Simple
- ▶ Encourage risk dialogue & reach out to other agencies

## Limits of RiskPlan

- ▶ Primary field of application is on the strategic level:
  - ▶ need for additional safety measures
  - ▶ rough prioritization of safety measures → assessment of need for action
- ▶ RiskPlan is not normally used for detailed risk assessments
  - more is needed before investing heavily on additional measures
- ▶ Results between different applications of RiskPlan (by different groups) might not be comparable

## Limits for RECIPE

- ▶ Technical issues (create account, figure out handling)
- ▶ Limited official support (RiskPlan online only till end 2020; RiskPlan offline available, but not updated runs on Windows 10)
- ▶ Preparatory work defines achievable outcomes



# RECIPE

Thanks for your attention

Contact



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