EMERGENCY RESPONSE PLANNING FOR HEAVY RAIN RISKS

General information & application assistance

Thomas Huber[1], Albert Schwingshandl[1], Ines Fordinal[1], Raimund Heidrich[1]

[1] RIOCOM – Office for Water Management and Environmental Engineering

EMERGENCY RESPONSE PLANNING FOR HEAVY RAIN RISKS

General information & application assistance

Version 1.0	05 April 2020
Authors	Thomas Huber[1] ,Albert Schwingshandl[1], Ines Fordinal[1], Raimund Heidrich[1]
	[1] RIOCOM – Office for Water Management and Environmental Engineering

Contracting authority

Amt der Steiermärkischen Landesregierung
Abteilung 14 – Wasserwirtschaft, Ressourcen und Nachhaltigkeit
Mag.ᵃ Cornelia Jöbstl, DI Rudolf Hornich
abteilung14@stmk.gv.at

Created by

INGENIEURBÜRO FÜR KULTURTECHNIK & WASSERWIRTSCHAFT
DI Albert Schwingshandl, Handelskai 92, A-1200 Wien

Tel.: +43 (01) 494 16 87-0   E-Mail: office@riocom.at
Fax.: +43 (01) 494 16 87-30   Web: www.riocom.at

Inhalt

Preface

RAINMAN

The Interreg CE project RAINMAN aims to reduce damages caused by heavy rain in urban and rural regions. The project establishes tools for dealing with heavy rain risks for local, regional and national public authorities. The partners jointly develop a transferable toolbox with various tools. The toolbox is available on www.rainman-toolbox.eu.

Emergency Response Toolkit

One tool is the emergency response toolkit. It supports local and regional authorities with manuals and templates in creating emergency response plans for heavy rain events.

The toolkit is available in two different versions:

SINGLE DOCUMENTS

Here specific topics are available as 8 single downloads.

➔ IMPORTANT: Please note the references between the individual documents.

📄	General information & application assistance
📄	Recommendations (.pdf)
Step 1 – Review of the existing hazard analysis	
📄	Manual (.pdf)
📄	Templates (.zip)
Step 2 – Review of the existing vulnerability analysis	
📄	Manual (.pdf)
📄	Templates (.zip)
Step 3 – Define suitable measures	
📄	Manual (.pdf)
📄	Templates (.zip)

COMPLETE VERSION

Here all documents are available as 1 complete download.

➔ IMPORTANT: Please note that the numbering of the chapters differs from the version of the single documents.

📄	Emergency Response Toolkit (.zip) Content of the ZIP-File Part A – Recommendations & Process flow Part B – Templates

RIOCOM
FLOWING COMPETENCE

1. Context and goals

a) Project context

Heavy rain events are a major environmental risk in Europe: they can hit any location with only very short warning time. Every year people die, thousands lose their homes, and environmental damages like water pollution occur. And the risks of heavy rain events are increasing all over Europe. In the project RAINMAN, partners from 6 countries have joined to develop and test innovative methods and tools for the integrated management of heavy rain risks by local, regional & national public authorities. These are included in the RAINMAN-Toolbox, a set of transferable tools and methods for municipalities and regional stakeholders.

This report presents a toolkit for emergency response planning for heavy rain risks. It addresses local authorities who are in charge to set up plans to minimize risks caused by heavy rainfall events. With this toolkit the persons in charge get an overview about the necessary steps to develop such plans. This toolkit is closely related to the *"RAINMAN Tool Assessment and Mapping"*, which provides general information on how to generate hazard and risk maps for heavy rainfall events. Further information concerning the hazard and risk maps can be found in *"RAINMAN Tool Assessment and Mapping – Expert Corner"*, which is particularly addressed to experts in the field of hydrological and hydrodynamic analysis.

b) Goals

This toolkit aims to support those, who are in charge to develop emergency response plans for heavy rain risks. A flowchart shows the overall process of building up emergency response plans and a manual helps to work through the single process steps. Additionally, general recommendations for emergency response planning are given.

As this toolkit is considered to be a part of the RAINMAN Toolbox, frequent links to other RAINMAN deliverables are used, especially concerning the creation of hazard and risk maps, which is not part of this toolkit.

The process of generating emergency response plans is highly complex and often an expert assessment seems to be indispensable. Hence, certain process steps require a quite high own initiative and eventually further studying of relevant literature. Nevertheless, all the process steps are described in a way that also allows non-experts to apply the toolkit.

c) Structure

The toolkit consists of the following parts:

- General information & application assistance
- Recommendations
- Manuals
    - Review of the existing hazard analysis
    - Review of the existing vulnerability analysis
    - Definition of suitable measures
- Templates
    - B1: Process Workflow (B1.1, B1.2)
    - B2: Stakeholder Participation (B2.1, B2.2, B2.3, B2.4 and B2.5)
    - B3: Risk Analysis (B3.1)
    - B4: Warning and Alarm Tool (B4.1)
    - B5: Checklist Process Workflow (B5.1)

RIOCOM
FLOWING COMPETENCE

- o B6: Emergency Response Plan – Text Document
- o B7: Emergency Response Plan – Intervention Map

2. How to read the manual?
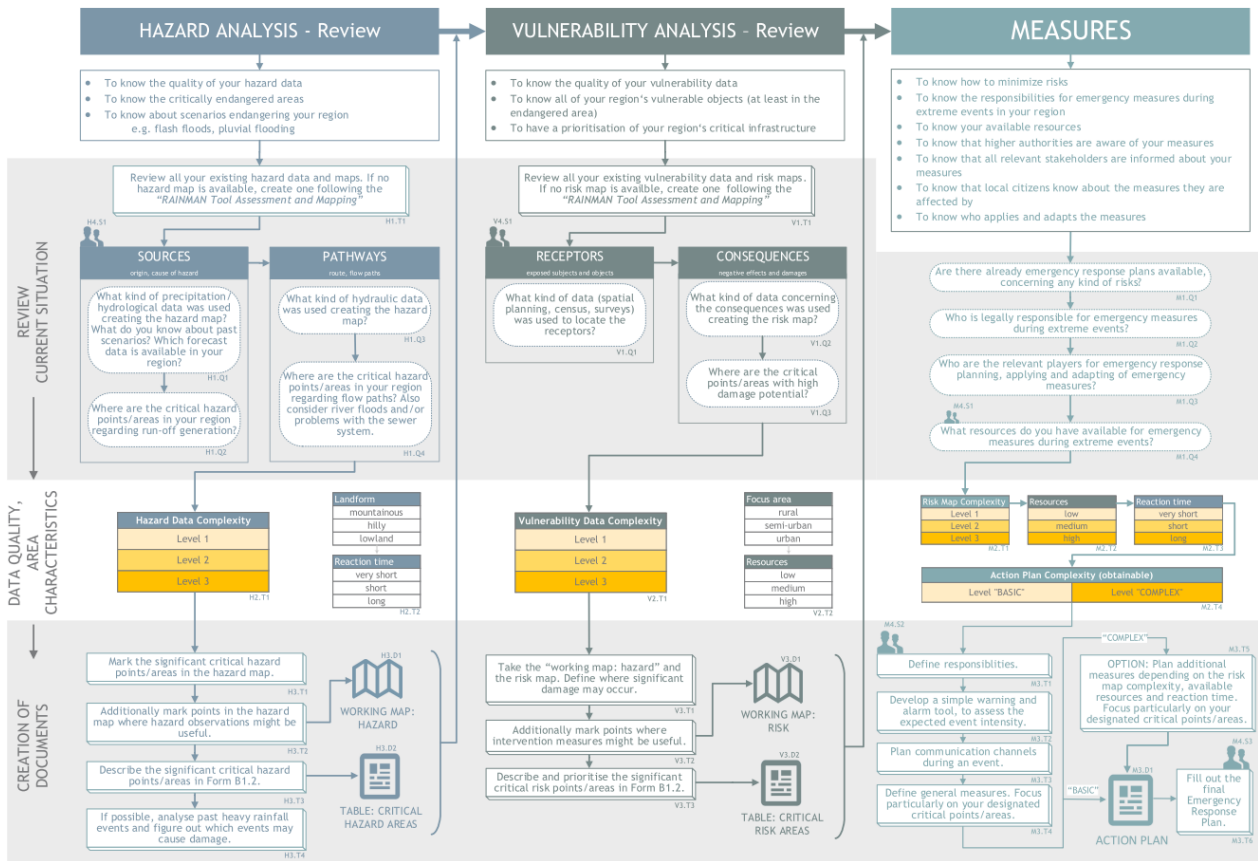
Figure 1: Process Workflow to build up an emergency response plan for heavy rainfall risks (Supplement **Fehler! Verweisquelle konnte nicht gefunden werden.**)

a) General

This section aims to explain the manuals general structure, to summarize the single process steps and to give guidance for the application of the developed toolkit.

The toolkit is built up using the Source-Pathway-Receptor-Consequences (SPRC) concept, which is a conceptual model commonly adopted in flood risk assessment and suitable to create a better understanding of the elements of risk analysis and hazard, vulnerability and risk (Samuels and Gouldby 2009).

The overall process consists of **three basic steps**, which need to be worked off in order to build up an action plan:

- ▪ HAZARD ANALYSIS - Review
- ▪ VULNERABILITY ANALYSIS - Review
- ▪ MEASURES

These steps are further divided into **four workflow phases**, which show the minimum necessary steps in detail. These phases are:

> Review current situation

> Data quality and area characteristics

> Creation of documents

> Stakeholder

Within the workflow phases, firstly the **current situation** will be reviewed asking precise questions about the planning region. In the next workflow phase a filter is implemented based on the **quality** of available **data** and specific **area characteristics**. This is to filter out which areas should be considered in detail, concerning the application of intervention measures. Then the workflow will lead through detailed process steps in order to **create** the plan **documents** and finally the scenario specific action plans and the emergency response plan for heavy rain risks. **Stakeholder** implementation is considered within the whole process.

The basic steps are coded with different colours to facilitate the orientation in the process. This colour code is kept consistent within the manual.

To control if all steps are done, checklists for the overall process workflow are provided (**Fehler! Verweisquelle konnte nicht gefunden werden.**).

b) Key Numbering

In order to facilitate the orientation in the process and provide a clear linkage between the flowchart (Supplement) and the manual, a key numbering system is introduced. The key numbering system is linked to the basic steps as well as to the workflow phases.

Basic Steps	
H	Hazard Analysis - Review
V	Vulnerability Analysis - Review
M	Measures

Workflow Phases	
1	Review current situation
2	Data quality and area characteristics
3	Creation of documents
4	Stakeholder

Process Step Types	
Q	Question
D	Document
T	Task
S	Stakeholder

In the toolkit, the used syntax looks like this:

X1.Y1

basic-step _ workflow-phase . type _ number

X = H (Hazard Analysis - Review) or V (Vulnerability Analysis - Review) or M (Measures)

Y = Q (Question) or D (Document) or T (Task) or S (Stakeholder)

e.g.:   H3.T1 = hazard analysis - review, creation of documents, task 1

V1.Q3 = vulnerability analysis - review, review current situation, question 3

M4.S1 = measures, stakeholder, stakeholder 1

RIOCOM
FLOWING COMPETENCE

c) Example process step

All process steps are presented using the following layout:

?	**Process Step**	**Question/Task/Document/Stakeholder** **XX.XX**

Additional information regarding the process steps and its applicability.

Detailed assignments to be carried out in the process step.

Input:	*Description of the input (comes from: XX.XX)*
Output:	*Description of the output ⇨ goes to XX.XX*

3. Glossary

Action Plan The plan where all the intervention measures are listed and described.

Basic Step A part of the workflow, in particular the different columns of the flowchart.

Emergency Response Plan (ERP) The final document where all the action plans, intervention maps and preliminary remarks are listed.

Exposed Objects Any objects (in general: buildings) which are in danger to be destroyed during a heavy rainfall event.

Flood Modelling The process of calculating and depicting flooded areas using computational software.

Flowpaths Areas where a significant amount of water flows to a certain target.

Fluvial Flood A flood event in connection with a river.

Hazard The potential to cause harm to a vulnerable target.

Hazard Map The map which shows the hazard situation in specific areas. For heavy rainfall events, mostly inundation areas are depicted.

Heavy Rainfall Event A natural hazard event where significant amounts of rain fall within a short time period and damage on objects or subjects (buildings or persons) is caused.

Hydraulic Data All data related to hydraulic phenomena (e.g. surface conditions, conditions of the fluid, …).

Hydrological Data All data related to hydrological phenomena (e.g. precipitation, run-off, evaporation, infiltration, interception, …).

Intervention Map The map showing the location of the intervention measures described in the action plan. This map is scenario specific.

Intervention Measures Measures which are to be set during heavy rainfall events, in order to minimize risks.

RIOCOM
FLOWING COMPETENCE

Precipitation   Any product of the condensation of atmospheric water vapour that falls under gravity (e.g. rain, snow, drizzle, sleet, graupel, hail).

Process Step   The single question or task in the workflow.

Receptor   A vulnerable subject or object.

Risk   The combination of the hazard endangering an object and the vulnerability of the endangered object. The likelihood of a natural hazard event to happen is also considered in the risk.

Run-off   Water which flows on the ground and is not intercepted by vegetation or infiltrated by the soil.

Stakeholder   A person or group that has a legitimate interest in the course or outcome of a process or project.

Vulnerability   Describes qualitatively how a subject or object is prone to be harmed by a certain hazard.

Warning and Alarm Tool/System   A tool to assess the expected intensity of an event, following different parameters.

Workflow/Flowchart   The depiction of a process.

Workflow Phases   A part of the workflow, in particular the different rows of the flowchart.

4. References

Samuels, P.; Gouldby, B. (2009): Language of Risk–Project Definitions. Edited by FloodSite Consortium (T32-04-01). Available online at http://www.floodsite.net/html/partner_area/project_docs/T32_04_01_FLOODsite_Language_of_Risk_D32 _2_v5_2_P1.pdf.

Sauer, Axel; Olfert, Alfred; Körte, Lisa; Neubert, Marco; Ortlepp, Regine (2019): DT1.2.1 Joint Definitions and Analytical Framework. Edited by Interreg Project RAINMAN.

HAZARD ANALYSIS - Review

- To know the quality of your hazard data
- To know the critically endangered areas
- To know about scenarios endangering your region
  e.g. flash floods, pluvial flooding

Review all your existing hazard data and maps. If no hazard map is available, create one following the *"RAINMAN Tool Assessment and Mapping"*

H4.S1 / H1.T1

SOURCES
origin, cause of hazard

What kind of precipitation/ hydrological data was used creating the hazard map? What do you know about past scenarios? Which forecast data is available in your region?

H1.Q1

Where are the critical hazard points/areas in your region regarding run-off generation?

H1.Q2

PATHWAYS
route, flow paths

What kind of hydraulic data was used creating the hazard map?

H1.Q3

Where are the critical hazard points/areas in your region regarding flow paths? Also consider river floods and/or problems with the sewer system.

H1.Q4

Hazard Data Complexity
Level 1
Level 2
Level 3

H2.T1

Landform
mountainous
hilly
lowland

Reaction time
very short
short
long

H2.T2

Mark the significant critical hazard points/areas in the hazard map.

H3.T1

Additionally mark points in the hazard map where hazard observations might be useful.

H3.T2

Describe the significant critical hazard points/areas in Form B1.2.

H3.T3

If possible, analyse past heavy rainfall events and figure out which events may cause damage.

H3.T4

H3.D1 WORKING MAP: HAZARD

H3.D2 TABLE: CRITICAL HAZARD AREAS
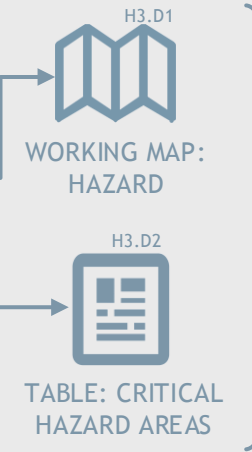
VULNERABILITY ANALYSIS – Review

- To know the quality of your vulnerability data
- To know all of your region's vulnerable objects (at least in the endangered area)
- To have a prioritisation of your region's critical infrastructure

Review all your existing vulnerability data and risk maps. If no risk map is availble, create one following the *"RAINMAN Tool Assessment and Mapping"*

V4.S1 / V1.T1

RECEPTORS
exposed subjects and objects

What kind of data (spatial planning, census, surveys) was used to locate the receptors?

V1.Q1

CONSEQUENCES
negative effects and damages

What kind of data concerning the consequences was used creating the risk map?

V1.Q2

Where are the critical points/areas with high damage potential?

V1.Q3

Vulnerability Data Complexity
Level 1
Level 2
Level 3

V2.T1

Focus area
rural
semi-urban
urban

Resources
low
medium
high

V2.T2

Take the "working map: hazard" and the risk map. Define where significant damage may occur.

V3.T1

Additionally mark points where intervention measures might be useful.

V3.T2

Describe and prioritise the significant critical risk points/areas in Form B1.2.

V3.T3

V3.D1 WORKING MAP: RISK

V3.D2 TABLE: CRITICAL RISK AREAS

MEASURES

- To know how to minimize risks
- To know the responsibilities for emergency measures during extreme events in your region
- To know your available resources
- To know that higher authorities are aware of your measures
- To know that all relevant stakeholders are informed about your measures
- To know that local citizens know about the measures they are affected by
- To know who applies and adapts the measures

Are there already emergency response plans available, concerning any kind of risks?

M1.Q1

Who is legally responsible for emergency measures during extreme events?

M1.Q2

Who are the relevant players for emergency response planning, applying and adapting of emergency measures?

M4.S1 / M1.Q3

What resources do you have available for emergency measures during extreme events?

M1.Q4

Risk Map Complexity
Level 1
Level 2
Level 3

M2.T1

Resources
low
medium
high

M2.T2

Reaction time
very short
short
long

M2.T3

Action Plan Complexity (obtainable)
Level "BASIC"	Level "COMPLEX"

M2.T4

Define responsiblities.

M3.T1

Develop a simple warning and alarm tool, to assess the expected event intensity.

M3.T2

Plan communication channels during an event.

M3.T3

Define general measures. Focus particularly on your designated critical points/areas.

M3.T4

"COMPLEX"

OPTION: Plan additional measures depending on the risk map complexity, available resources and reaction time. Focus particularly on your designated critical points/areas.

M3.T5

M4.S2 / M4.S3

"BASIC"

M3.D1 ACTION PLAN

Fill out the final Emergency Response Plan.

M3.T6

REVIEW CURRENT SITUATION

DATA QUALITY, AREA CHARACTERISTICS

CREATION OF DOCUMENTS

RIOCOM
FLOWING COMPETENCE

Interreg
CENTRAL EUROPE
RAINMAN

RAINMAN Key Facts

Project duration: 07.2017 – 06.2020

Project budget: 3,045,287 €

ERDF funding: 2,488,510 €

RAINMAN website: **www.interreg-central.eu/rainman**

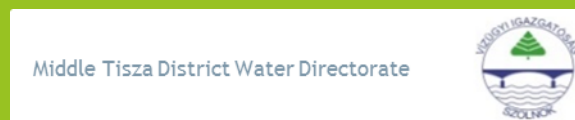**Interreg CENTRAL EUROPE**
RAINMAN
European Union
European Regional
Development Fund

Lead Partner

LANDESAMT FÜR UMWELT,
LANDWIRTSCHAFT
UND GEOLOGIE | Freistaat SACHSEN

Saxon State Office for Environment,
Agriculture and Geology

✉ rainman.lfulg@smul.sachsen.de

Project Partner

Saxon State Ministry of the Interior | STAATSMINISTERIUM DES INNERN | Freistaat SACHSEN

Environment Agency Austria | **umwelt**bundesamt

Office of the Styrian Government | Das Land Steiermark → Wasserwirtschaft

T. G. Masaryk Water Research Institute, p.r.i | VÚV TGM

Region of South Bohemia | The Region of South Bohemia

Croatian Waters | HRVATSKE VODE

Middle Tisza District Water Directorate

Institute of Meteorology and Water Management National Research Institute

Leibniz Institute of Ecological Urban and Regional Development | Leibniz Institute of Ecological Urban and Regional Development

Project support

||| INFRASTRUKTUR & UMWELT
Professor Böhm und Partner

INFRASTRUKTUR & UMWELT
Professor Böhm und Partner

✉ RAINMAN@iu-info.de