ONLINE SURVEY
ON HEAVY RAIN RISK MANAGEMENT IN PILOT / PARTNER REGIONS

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Acknowledgements

This document contains the results of an online survey on heavy rain risk management in the RAINMAN partner regions. The outcome is a result of the effort of all RAINMAN partners to develop and distribute the online survey. We would like to thank all respondents of the survey for supporting the development of the RAINMAN project by participating in the online survey.
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1. Context and goals of this study

1.1. 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.

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 will be included in the RAINMAN-Toolbox, a set of five transferable tools and methods for municipalities and regional stakeholders.

Before developing the toolbox an online survey has jointly been developed by the project partners. With the survey, information regarding two important inputs for the conception of the toolbox is gathered. On the one hand experiences with heavy rain in different regions are evaluated, on the other hand the stakeholders indicate their wishes and demands to improve heavy rain risk management. The results serve as a basis for the concept of the RAINMAN-Toolbox and its comprising methods and tools.

1.2. Goals

The RAINMAN partnership conducted the online survey to tailor the toolbox to the needs of the stakeholders and end-users. In addition, with conducting the survey other important aims were supported. The four main goals of the survey can be summarized as follows:

1. to assess risk awareness,
2. to determine the status of heavy rain risk management,
3. to find out about the demands for heavy rain risk management tools and the needs for the toolbox,
4. to raise awareness for the project and the toolbox;

More detailed the four goals include the aspects described in the following:

Content wise the online survey was designed to gather information about the state of risk awareness and the status of heavy rain risk management in the four work packages. The four thematic work packages are

- WP1: Tools and methods for the assessment and mapping of heavy rain risk
- WP2: Risk reduction measures to reduce damages of heavy rain
- WP3: Pilot actions to test an improve the developed methods for risk assessment and prevention
- WP4: Risk reduction “RAINMAN-Toolbox”

The survey was an integrated part of the pilot activities in WP 3, so that regional knowledge is brought into the development of the toolbox, see activities on heavy rain risk management status and target group survey in Saxony (T3.1.2), South Bohemia (T3.2.2), Styria (T3.3.2), Jasz-Nagy kun-Szolnok (T3.4.2), Zagreb / Istria (T3.5.2), Lower Silesia (T3.6.2) and Upper Austria (T3.7.2).

Moreover, the survey also helps to involve the target group in the development of the toolbox tools and to find out about the demands for heavy rain risk management tools and the needs for the toolbox. With doing the design and content of the toolbox tools can be tailored to the customers’ needs (see WP4). The questions of the survey are designed to gather knowledge especially regarding tools and methods for the assessment and mapping of heavy rain risk (RAINMAN tool 1, see WP1) and regarding the demands for the risk reduction tool to select and implement heavy rain risk mitigation measures (RAINMAN tool 2, see WP2).
In addition, the survey also targets to raise awareness for the project, the toolbox and the need to reduce heavy rain risks.

1.3. Approach and structure

This report summarizes and evaluates the findings of the RAINMAN online survey. Therefore the whole content builds on the results that were collected by conducting the online survey in 2018.

The results are presented as follows: In chapter 2 we present the basis of the further analysis: a description of the set-up and structure of the online survey. The report then focuses on the analysis of the overall results of the survey, see chapter 3. In this chapter key findings are summarized for each part of the survey. Important country specific findings were supplemented, especially such country specific findings that differ significantly from the total results. Chapter 4 then focuses on the conclusions that can be drawn for different activities within the project and for the further development of the RAINMAN-Toolbox. For each work package individual conclusions are presented. To conclude, chapter 5 summarizes the highlights of this report.

For this report we put a focus on the presentation and evaluation of the total results of the survey. Depending on the issue that users of the results would like to address, the additional information is very relevant and therefore attached to the report. First of all the answers to the open questions are listed in annex I. When evaluating the answer we had a closer look at these answers and considered these in the evaluation. Secondly, for each participating country the corresponding results have been summarized and presented as posters that are attached in annex II.
2. General description and structure of the online survey

In 2018, an online survey was jointly developed by the project partners before developing the toolbox (see activity T4.1.1, January 2018 - December 2018). With the survey, information regarding two important inputs for the conception of the toolbox is gathered. On the one hand experiences with heavy rain in different regions are evaluated, on the other hand the stakeholders indicate their wishes and demands to improve heavy rain risk management. The results serve as a basis for the concept of the RAINMAN-Toolbox and its comprising methods and tools.

The survey questions were jointly developed in English and coordinated by the Saxon State Ministry of the Interior. The local project partners translated the content into the local languages. The translated questions were then implemented in two online platforms. For the German survey the “Beteiligungsportal”, a participation portal site in Saxony, was used to conduct the survey, for all other language versions the online survey tool LimeSurvey was used. The estimated duration for answering all questions is 15 to 20 minutes.

The survey was distributed between February 2018 and May 2018 by the project partners. They provided information about the survey to all stakeholders in the six countries of the consortium, to the associated partners in the seven pilot activities and any further institution that could deliver a valuable input.

With the survey the RAINMAN partnership involves the target group / end users in the tool development process for the RAINMAN-Toolbox regarding tools and methods for the assessment and mapping of heavy rain risk, which are mainly local public administration or local government and regional public administration. Further target groups are research institutes, universities, associations and private individuals.

The survey is structured in different thematic parts. The structure looks as follows.

- **Personal information**
- **Part A: Experiences with heavy rain including questions regarding knowledge about heavy rain hazards and risks, e.g. databases (see chapter 3.2 for the evaluation of this part)**
- **Part B: Practical use of early warning systems (see chapter 3.3 for the evaluation of this part)**
- **Part C: Assessment of heavy rain hazards and risks (see chapter 3.4 for the evaluation of this part)**
- **Part D: Measures to mitigate heavy rain risks (see chapter 3.5 for the evaluation of this part)**
- **Part E: Demands and wishes (see chapter 3.6 for the evaluation of this part)**

The survey closed with the option to provide contact information to stay in touch with the project and register for the RAINMAN newsletter.
3. Results and conclusions of the online survey

In 2018 the return of 367 questionnaires from six RAINMAN partner countries were evaluated. The main findings from the different parts of the online survey are presented in this chapter. The results will be analysed and considered against the background of the findings of different RAINMAN activities (for example available scoping studies).

3.1. Results and conclusions of part “personal information”

Key findings

In total we received 367 completed questionnaires. The main target groups and target region were reached: We got 85% of the answers from local public administration or local government and regional public administration and around 87% of the answers came are from pilot regions.

The project partners used different approaches to contact possible participants. As a consequence, the participants differ with regard to the level of expertise from experts to municipalities without any experience in the topic so far. Also the number of respondents differs between countries.

A high proportion of the respondents are experts from planning disciplines like spatial planning, urban planning, building permissions, environmental planning and nature preservation and respondents working in the field of water management / flood risk management. Only few participants are stakeholders in the field of meteorology / weather forecast and agriculture. These areas of activities are therefore underrepresented in the results and conclusions of the survey compared to their practical relevance with regard to heavy rain risks. The relatively small number of respondents from these disciplines reflects that both are not a focus of the RAINMAN project and its activities. Nevertheless, the practical relevance should not be underestimated.

Results

The following figures summarize the results of part “personal information” of the online survey. Comments and observations regarding the figure are added below the respective figure:

- In total we received 367 completed questionnaires.
- Main target groups were reached: around 85% of the respondents are working in local public administration or local government and regional public administration.
- The share of the main target groups within the partner regions differs between 31% and 97% (see country specific results in the annex).
- In addition to the provided options, most of the respondents indicated to work for other public bodies (i.e. ministries), fire departments or civil protection institutions (see answers to the open questions in the annex).
The sample size varies from one partner country to the next.

The sample size as well as composition of the sample (type of institution) needs to be considered when drawing conclusions for the RAINMAN activities.

Main target regions were reached: Around 87% of the answers came are from pilot regions, especially from South Bohemia, Saxony (including Lausitz) and Jasz-Nagy kun Szolnok (Hungary).

The share of the respondents from pilot regions is even higher as 44 respondents chose the option “other” although some of the mentioned regions are part of the options above.
A high proportion of the respondents are experts from planning disciplines like spatial planning, urban planning, building permissions, environmental planning and nature preservation (see first three options in the figure above).

Another important share is respondents working in the field of water management / flood risk management.

Noticeable 134 respondents chose the option “other”. A high number of these persons indicate to work as mayor, in a local council or in the field of public administration. From the remaining answers a high proportion could be assigned to the other provided options, especially to “technical infrastructure, architecture” and to the planning disciplines.

3.2. Results and conclusions of Part A: Experiences with heavy rain

Key findings

In general most respondents (>90%) have experienced heavy rain events. More respondents state that they have experienced damages caused by flooding than damages caused by mass movements. However, there is no outstanding difference in the assessment of the type of damage that was caused: Respondents experienced especially damages on urban infrastructure, on private buildings and on cultivated land.

Most participants are concerned about consequences of climate change and think that heavy rain events will increase in the future. This underlines the need to provide guidance for heavy rain risk management.

Regarding building precautions only one third of the respondents think that private house owners are mainly responsible for risk prevention. In Germany, Croatia, Hungary and Poland the share was even lower. In turn, most respondents agree that more activities by public authorities are needed for risk prevention. These findings confirm that the RAINMAN-Toolbox needs to target public authorities. At the same time, other entry points to the toolbox are useful, as for example for private persons.

Results

The following figures summarize the results of part “Experiences with heavy rain” of the online survey. Comments and observations regarding the figure are added below the respective figure:
In general, most respondents (>90%) have experienced heavy rain events. This result meets the expectations as most respondents come from the RAINMAN pilot regions which were selected due to the practical relevance of the topic “heavy rain” in the respective region.

Compared to the other countries, more participants in the Czech Republic responded “no” - saying that they did not experience heavy rain events (nearly all answers from South Bohemia). This does probably not show that there were fewer heavy rain events in the Czech Republic but might be a result of the distribution approach (see above). In the Czech Republic the survey was sent to all municipalities in South Bohemia whereas in most other countries the online survey was distributed especially in the pilot regions which were selected due to their experiences with heavy rain events.

Respondents have more often experienced damages caused by flooding than damages caused by mass movements. However, only the result for Austria is different from this observation: Out of 32 respondents 31 experienced damages by flooding and 28 experienced damages caused by mass movements.

The kind of damages the respondents experienced by flooding or by mass movements is similar in all countries. Flooding and mass movements caused especially damages on urban infrastructure, on
private building and on cultivated land. Each of these three choices was selected by more than half of the respondents.

- As most respondents state to be concerned about the consequences of climate change and even more think that the risks of heavy rain events will increase in the future the importance of RAINMAN and the practical relevance of the project’s outputs is emphasized.
- Only parts of the respondents think that private house owners are responsible for preventive measures.
- Activities by public authorities are needed, especially according to participants in Austria and the Czech Republic (see annex for country specific results).

3.3. Results and conclusions of Part B: Practical use of early warning systems

Key findings

In the perceptions of the respondents from different countries and municipalities warning for heavy rain events are hardly predictable. The evaluation of the respondents reflect that heavy rain events have only a very short warning time (only 60% of the participants state that warnings reach them in time) and are limited to a certain location (25% state the warnings turn out to be correct). These results are not surprising but reflect the general problems regarding early warning systems for heavy rain events. Experiences seem to be similar in different countries and municipalities.

A comparison of the country specific results shows that the opinions regarding the needs for improvements of the early warning systems vary between the countries. Especially respondents from Germany and Austria see the need to improve early warning. At the same time these are the two of three countries that are focused at in the RAINMAN project with regard to early warning.

According to the respondents, improvements of early warning systems should especially include accuracy of meteorological forecasts and hydrological forecasts for small water bodies. Moreover, respondents also indicated the need of more and better information in this regard (see answers to the option “other”).

Results
The following figures summarize the results of part “Practical use of early warning systems” of the online survey. Comments and observations regarding the figure are added below the respective figure:

- Only about half of the respondents know an early warning system. This could be an indication that a high proportion of the participants is not working in the field of heavy rain management or is at least not dealing with early warning systems at all.

- The shares of participants knowing an early warning system for extreme events is even smaller in HU, DE, AT compared to the overall results.

- Information about heavy rain events are mostly provided by public services. Depending on the country specific organisation this might be a meteorological or hydrological service.

- The indicated names of the early warning system differ in the respective countries. The most often named systems are:
  - Most Austrian participants named the “Central institute for meteorology and geodynamics”.
  - For Croatia most respondents state Croatian Meteorological and Hydrological Service DHMZ and Meteoalarm of The Network of European Meteorological Services EUMETNET.
  - Czech participants named most often the system Czech Hydrometeorological Institute. Also local warning systems are mentioned by a lot of the participants.
  - For Germany participants mentioned federal systems of the German National Meteorological Service DWD and also regional systems like the flood early warning system of LfULG.
Nearly all of the Hungarian respondents named “weather forecast”. A high proportion of the respondents does not enter any further details. Others specified the answer, i.e. www.met.hu, www.idokep.hu.

For Poland no clear conclusion can be drawn as different systems are mentioned, i.e. the weather service of IMGW-PIB.

Even though most respondents agree or partly agree that the warnings are correct, on time, and reach the person, a closer look to the numbers reveals:

- Depending on the country, participants assess warnings different.
- Only 60% of the participants state that warnings reach them in time, 25% state the warnings turn out to be correct. This might reflect that warnings are often issued for large areas but that the heavy rain event only hits a small part of this area. The size of the selected warning area is often to large due to the uncertainty of the spatial location of the heavy rain event. In the perceptions of the respondents from different countries and municipalities warning for heavy rain events are hardly predictable.

The opinions concerning the improvement of the systems vary. More than 80 percent of the respondents from Austria and Germany agree or partly agree that the early warning systems need to be improved whereas only around 15% of the Hungarian and Croatian participants, around 30% of the Polish participants and around 50% of the Czech participants agree or partly agree to this statement. In contrast to the other countries considered, Austria and Germany have a publicly accessible hydrological (flash flood) early warning system.
For improving early warning systems, the respondents set a focus on accuracy of the meteorological forecast and hydrological forecasts for small water bodies.
3.4. Results and conclusions of Part C: Assessment and mapping of heavy rain risks

Key findings

The three most common methods used are “analysis of the drainage system”, “systematic documentation of heavy rain events”, and “analysis of the topographic conditions”. More detailed, the key findings regarding different analysis applied to assess heavy rain risks are:

- **Systematic documentation of heavy rain events** is applied in most partner countries and seems to be the easiest way of assessing heavy rain risks.
- In all partner regions the most frequently named historic data for the risk assessment based on historic data are rain measurements, time series and event databases.
- The most common analysis of topographic conditions that the respondents / their institutions have done is by identification of surface flow path. The results regarding other options (identification of area depressions, identification of flood channels, and identification of inflow from neighbouring areas) do not give a consistent impression.
- The source for the analysis of precipitation data is in most cases station data. Around 28% of the respondents use radar data and only few base their analysis on satellite data.
- The analysis of the drainage system is a conventional task for the design of urban drainage systems.
- The integration of the assessment of heavy rain risks seem to be useful. No clear trend is visible when it comes to the analysis of the drainage system (weak spots).
- The analysis of the building structure and infrastructure is rarely used to assess heavy rain risks compared to the other types of analysis. In most cases the availability of free spaces is the main focus of the analysis.
- Modelling: The development of hazard and risks maps in the institutions of the respondents is especially build on GIS analysis or 2D-modeling.

Although most participants are aware of heavy rain risks, nearly 50% have not conducted any heavy rain risk assessment yet. According to the results of the online survey the provision of knowledge, data and financial resources would help to start mapping and assessing heavy rain risks.

Results

The following figures summarize the results of part “Assessment and mapping of heavy rain risks” of the online survey. Comments and observations regarding the figure are added below the respective figure:
Online survey on heavy rain risk management in pilot / partner regions

- Only about 50% of the respondents have dealt with heavy rain risk. The result supports the presumption that a high proportion of the participants is not working in the field of heavy rain management (see also the analysis of question B01).
- The distribution of the results varies in the partner countries. As most respondents have experienced heavy rain events, differences in the field of expertise might be a reason for the variations (see question PI 05 in chapter 3.1).

![](chart1.png)

- A variety of methods to assess heavy rain risks is available. All proposed methods are used by a relatively high number of the participants.
- The two most named methods are “analysis of the drainage system” and “systematic documentation of heavy rain events”. At least one of these methods is one of the three most named options in the partner countries.

![](chart2.png)

- In all partner regions the most frequently named historic data for the risk assessment based on historic data are rain measurements, time series and event databases. Participants added reports, interviews and journalism as further sources for the assessment (see option “other”).
Participants who indicate that they assess heavy rain risks with the help of topographic conditions are mainly from Germany and Austria. Thus, the overall results regarding the analysis method are reflected by the results of German and Austrian respondents. For additional information regarding the implementation in the respective country see annex I.

All of the given options are chosen quite often so no clear favourite method could be identified.

For additional information regarding the implementation in the respective country see annex I (question C5).

The most common source for analysing precipitation data are station data, followed by radar data. Only few of the participants use satellite data.

For additional information about data sets / models in the respective country see annex I (question C7). Mostly, statistical evaluations from national (hydro-) meteorological services build the basis for heavy rain analyses.
Participants who assess heavy rain risks with the help of the drainage system apply different methods, mainly the analyses of weak spots or the investigation of the run off behaviour of sealed / unsealed surfaces.

The analysis is hardly applied by the respondents from Croatia, Poland and Hungary.

For additional information regarding the implementation of other analyses of the drainage system in the respective country see annex I (question C9).

According to the respondents, the assessment of heavy rain risks is rarely done by an analysis of the building structure compared to the other analyses.

For additional information regarding other implemented analyses of the building structure and infrastructure in the respective country see annex I (question C11).
The development of hazard and risks maps is especially implemented by Austrian and Czech participants.

Most of the modelling to develop hazard and risks maps is done by GIS analysis or 2D-modeling.

For additional information regarding other analyses to develop hazard and risks maps in the respective country see annex I (question C13).

Participants that have not conducted any heavy rain risk assessment yet, identified a lack of personal and financial resources as well as missing experiences as the main reasons.
For improving the situation and supporting the assessment or mapping of heavy rain risks, the respondents indicated the following needs:

- know-how regarding heavy rain risks in general and methodologies
- data, including statistics of precipitation, model data, data on land use, sewage system capacities and so on
- financial resources for data acquisition or experts/studies

### 3.5. Results and conclusions of Part D: Measures to mitigate heavy rain risks

**Key findings**

A high share of the respondents’ institutions have already planned or implemented mitigation measures. Nevertheless, an integrated risk management planning process is only implemented or planned by < 20% of all respondents. Also the different proportion of experienced respondents regarding different fields of activity (see especially part B and C regarding assessment and mapping or early warning systems) indicate that a systematic planning process does not seem to be widely implemented. A variety of stakeholders is named as being involved in the risk management process. Not surprisingly the option “water management” is most often named.

Different kinds of measures are valuable to reduce heavy rain risks. The distribution of the respondents’ answers to the type of measures indicates a mix of different types of measures planned or implemented in the countries. A focus of the implemented or planned measures is on technical measures as well as on preventive measures in a built environment and outside of settlement structures. At the same time other measures which are an important part of risk management, are rarely applied (i.e. less than 25% of the respondents selected aftercare measures to be planned or implemented, also soft measures like “information to stakeholders” are mentioned by comparatively few respondents). The measures that are planned or implemented by most of the participants’ institutions are also consistent with the measures the participants assess to be most effective. These are preventive measures in a built environment / urban area, preventive measures outside of settlement structures and technical protection measures.

Reasons for not having implemented or planned any measures yet are similar to the reasons given for not having dealt with heavy rain risk assessment and mapping yet. Around 50% of the respondents state that...
it is due to a lack of experience and financial resources. Conversely, financial resources / funding options and the availability of information / guidance on the selection of measures are the most frequently selected options that would support the implementation of heavy rain risks. But also the other available options (more political acceptance, more personal resources) are assessed as being helpful for the institution to implement further measures to reduce heavy rain risks.

Results

The following figures summarize the results of part “Measures to mitigate heavy rain risks” of the online survey. Comments and observations regarding the figure are added below the respective figure:

- Around 65 % of the respondents have planned or implemented measures to mitigate heavy rain risks. This share is higher than the share of respondents’ that deals with assessment and mapping or that knows early warning systems.

- Thus, it can be assumed that a high proportion of the participants is not directly working in the field of modelling or assessing heavy rain risks but is involved in the management process. It could also mean that some participants do not properly assess heavy rain risks before implementing or planning mitigation measures. The implementation or planning of mitigation measures might rather be a reaction to past heavy rain events. However, a question that would answer exactly this connection was not part of the survey.

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**D01. Has your institution planned or implemented measures which can prevent or reduce damages of heavy rain events?**

- Yes: 118
- No: 249

**n = 367**

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**D02. Which measures to reduce heavy rain risks has your institution planned or implemented? (multiple answers possible)**

- Integrated risk management planning process: 65
- Preventive measures in a built environment / urban area: 139
- Preventive measures outside of settlement structures: 107
- Information to stakeholders / public relations: 67
- Technical protection measures: 152
- Emergency response and protection: 95
- Aftercare measures: 57
- No measures implemented or planned: 10

**n = 241**
A variety of measures was implemented or planned by the respective institutions - different kinds of activity are valuable to reduce heavy rain risks. The distribution of the respondents’ answers also indicates a mix of heterogeneous measures leaving none of the options unselected.

Soft measures (information to stakeholders) that can be easily implemented are selected comparatively rarely, guidance documents could support this.

The focus of planned / implemented measures is on technical protection measures (152 out of 241) and preventive measures in a built environment / settlement structures.

A variety of stakeholders is included in the risk management process according to the participants.

The distribution of the answers reflects the areas of expertise the respondents are working in (see question PI05).

Measures in a built environment that are implemented or planned by the highest share of respondents are connected to decentralized rainwater management, in specific to an increase of infiltration areas/basins/ditches.

In contrast “avoiding of surface sealing” and “decentralized rainwater management by multifunctional areas” are the measures that are planned or implemented comparatively less frequently.

For additional information regarding measures that are planned or implemented by the respondents’ institutions see annex I (question D05).
Measures outside of settlement structures are rarely implemented or planned than in a build environment. The top two answers of the participants consider flow path that are kept free as well as retention areas that are planned.

For additional information regarding measures that are planned or implemented by the respondents’ institutions see annex I (question D07).

Only 67 out of the 367 participants of the online survey have planned or implemented measures regarding public relations or raising awareness (see question D02).

The most common approach to raise awareness seems to be the information within the administration and of political representatives as well as the implementation of information campaigns for house owners.

For additional information regarding measures that are planned or implemented by the respondents’ institutions see annex I (question D09).
The information provided describes especially different types of measures (technical as well as preventive measures but also information on emergency measures). Also information about risk analyses is often distributed.

In all participating countries the respondents state that the information is provided via events like public hearings, podium discussions, etc. The results regarding the other communication ways vary significantly between the partner countries (see country specific results in annex II).

According to the respondents, rainwater storage facilities but also walls and dikes are the most often technical protection measures planned and implemented.

For additional information regarding measures that are planned or implemented by the respondents’ institutions see annex I (question D13).
According to the respondents various protection measures are planned and implemented. Most participants of the online survey state that their institution planned / implemented emergency management plans.

For additional information regarding measures that are planned or implemented by the respondents’ institutions see annex I (question D15).

Only 57 participants stated that their institution planned or implemented aftercare measures (see question D02). These measures are often connected to plans for event-based waste things, like waste, sandbags, etc. Less than 30 of the participants state that they have a plan for power failures or oil leakage.

For additional information regarding measures that are planned or implemented by the respondents’ institutions see annex I (question D17).
The online survey did not only reveal which of the measures have been planned or implemented but also asked which of the measures the participants assess to be effective. It turned out that the respondents of the survey agreed / partly agreed for all of the types of measures to be effective.

Most participants agreed that preventive measures in a built environment / urban area, preventive measures outside of settlement structures and technical protection measures are most effective.

It should also be noted that soft measures and measures in the field of aftercare are not only least planned or implemented by the respondents (see question D02) but also assessed to be least effective compared to the other options.

Reasons for not having implemented or planned any measures yet are especially a lack experience and financial resources.
Financial resources / funding options and the availability of information / guidance on the selection of measures would support the implementation of heavy rain risks.

Nearly all of the available options are assessed as being helpful for the institution to implement further measures to reduce heavy rain risks.

3.6. Results and conclusions of Part E: Demands, wishes

Key findings:

The participants of the online survey confirm that the proposed information and materials would support the management of heavy rain risks.

A high proportion of the participants would personally need online information / material (more participants than those who ask for printed information) - the online toolbox of the RAINMAN project will definitively satisfy this need of the respondents.

Content-wise the toolbox will cover different topics that have been assessed as being relevant by the respondents. In detail:

- The respondents ask for guidance on how to establish a heavy rain risk management process. The RAINMAN project covers this issue by pilot actions.

- Respondents state that they would need guidance for the assessment and mapping of heavy rain risks. The RAINMAN-Toolbox covers this in tool 1.

- The respondents ask for a list / catalogue of available heavy rain risk reduction measures. The RAINMAN-Toolbox covers this in tool 2.

- Guidance on adapting emergency planning to heavy rain risks would support the management of heavy rain risks of the respondents. This issue will be looked at in a subtool covering the topic “emergency response”.

Other demands / wishes cannot be covered by an online toolbox, as for example workshops / seminars or training. Nevertheless, the RAINMAN project covers these needs in additional activities.
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Summing together the toolbox includes a large part of the demands and wishes so far. Furthermore, the section “demands and wishes” also reveals a blind spot of the RAINMAN-Toolbox: information on financing or funding options for the implementation of measures are not included in the toolbox.

Results

The following figures summarize the results of part “Demands, wishes” of the online survey. Comments and observations regarding the figure are added below the respective figure:

- For nearly all of the given options a high share of the Participants stated that the respective kind of information / material would support the management of heavy rain risks (answers “I agree” and “I partly agree”).
- In addition to the provided options, respondents indicated for example
  - the need for information / material that make the topic clear for the general public and that raise awareness (i.e. film material, measures for private persons to protect their buildings, interactive and attractive materials, material for social media during an event),
  - the need for providing free data and models (see answers to the open questions in the annex),
  - and the need for education and training.
4. Conclusions for the RAINMAN project and the RAINMAN-Toolbox

The results of the online survey and the conclusions for different activities were discussed within the RAINMAN partnership.

Selection of participants that answered the survey

Most respondents have experienced heavy rain events so the survey was distributed to appropriate stakeholders that are aware of heavy rain risks and have experienced events before. Respondents experienced especially damages on urban infrastructure, on private buildings and on cultivated land - no matter if the damage is caused by flooding or by mass movements.

Confirmation of the target group

Moreover the online survey could confirm the determination of the toolbox’ target groups which are especially public authorities. At the same time, other entry points to the toolbox are useful, as for example for private persons to inform about preventive measures to protect private properties and buildings.

Differences between the participating countries

In general the analyses of some questions indicated of course some differences between the participating countries. The more specific the question is the more heterogeneous are the results. At the same time only few participants gave answers to very specific questions so that generalizations are not in every case possible. Especially when it comes to the more content specific questions (for example in part “assessment and mapping”) the results do represent a reliable statement but can help to guide the way to a user friendly and valuable toolbox. Nevertheless, the online survey reveals no substantial differences in the different partner countries, for example regarding the experiences with heavy rain risks, so that the evaluation of the survey confirms the development of one toolbox for all participating countries supplemented with country-specific contents. A country specific differentiation of the toolbox contents was neither planned nor does it seem to improve the value of the toolbox in specific countries which might be due to a very different knowledge base or very different experiences with the topic so far.

Conclusions from the online survey for WP1 - Tools and methods for the assessment and mapping of heavy rain risks

The evaluation of the survey results (part C) showed that a variety of methods is available and applied for the assessment of heavy rain risks. A clear distinction between important / non-important methods is not possible. The results of part C of the online survey were considered against the background of the scoping study on available methods and approaches as well as demands (D.T1.1.1) and support the results of the scoping study. In conclusion the toolbox needs to give guidance regarding different kinds of assessment methods but should not aim to harmonize. Users of the toolbox need to select a method / an approach according to their special circumstances.

Conclusions from the online survey for WP2 - risk reduction tool to select and implement heavy rain risk mitigation measures

The analysis of part D of the survey indicated that a high share of the respondents’ institutions have already planned or implemented mitigation measures. It can be noted that stakeholders put a focus on planning or implementing structural measures, like technical measures. Other non-structural measures, like “information to stakeholders” are comparatively rarely applied. Also structural measures have been assessed as being more effective. Considering these results against the background of the scoping study on “Collection and development of risk reduction measures” (D.T2.1.1), it can be concluded that on the one hand more information on the variety and effectiveness of different kinds of measures is needed. According to the scoping study different catalogues of measures exist in the RAINMAN partner regions but
Online survey on heavy rain risk management in pilot / partner regions

with limited scope. When developing a catalogue of measures for the RAINMAN-Toolbox not only the results of the scoping study should be taken into account but also the answers to the online survey should be checked again. On the other hand not only a catalogue of measures would support stakeholders in Central Europe but also guidance on how to select these measures would be needed. It can be assumed that an integrated risk management planning process has not widely been implemented or planned until now (only by less than 20 % of the respondents).

Conclusions from the online survey for WP3 - Pilot actions

The online survey was distributed to stakeholders in the RAINMAN Pilot Actions to ensure that the joint results are tailored to the needs of local and regional target groups. However, additional feedback from the pilot actions during the further development will support the toolbox development.

The aim of conducting the online survey, was to deliver expectations and requirements on the methods and tools from the potential users. As the online survey indicated, stakeholders need more information and guidance with regard to the management of heavy rain risks. At the same time the selection and application of a specific method and approach depend on regional and local conditions and specific needs.

Pilot activities in all participating partner regions are implemented to test the developed joint methods and tools and to prove their feasibility and applicability. Outputs are 7 pilot actions, with different characteristics to give a wide range of application conditions. The pilot actions will represent specific sets of environment and serve as best practise examples for different results in the toolbox.

Conclusions from the online survey for WP4 - Development of the RAINMAN-Toolbox

According to the results of the online survey the main reasons for not having conducted any heavy rain risk management yet or for not having implemented or planned risk reduction measures yet are in particular a lack of experiences and a lack of financial or personnel resources. Reversely, this means (and is also confirmed by the results) that the provision of knowledge, information, guidance and data in an online toolbox would support the stakeholders.

The results of the online survey will be considered in the “Conception and realisation of the RAINMAN-Toolbox for heavy rain risk reduction” (Output O.T4.1). This means the toolbox concept and structure will be adjusted to the survey results and outcome of consultations with external experts and stakeholders.

Furthermore, the survey is one part to ensure the participation of the stakeholders and toolbox users for assuring transferability of RAINMAN-Toolbox to other regions in Central Europe. The revealed heterogeneous experience of participants will be considered by including different levels of detail of the content. In addition to regional and local public administration the RAINMAN-Toolbox will also contain some information for private persons as private mitigation measures could have a significant impact on heavy rain risk reduction.

Blind spots of the toolbox

The toolbox includes a large part of these demands and wishes so far. But the section “demands and wishes” also reveals a blind spots of the RAINMAN-Toolbox: information on financing or funding options for the implementation of measures are not included in the toolbox. The RAINMAN partnership will consider the additional content for the further development of the toolbox. A first discussion showed that the information are very specific in the respective countries (also regional and local funding options exist) and must be checked at regular intervals. Both requirements cannot be fulfilled by the RAINMAN-Toolbox so the additions will be carefully checked.
5. Summary and outlook

5.1. Summary
The main results of the survey have been outlined in the thematic chapters for each part of the survey (see chapter 3). Conclusions for the project have been drawn in chapter 4.

The aim of the online survey was to gather information regarding experiences with heavy rain in general and heavy rain risk management in different regions as well as regarding wishes and demands to improve heavy rain risk management.

With the analysis of the survey results the approach of the RAINMAN project and the toolbox has been confirmed again. Stakeholders dealing with heavy rain risks do not only need information on details (for example on a single method, a single measure etc.) or information about specific fields (for example the individual tools, the catalogue of measures etc.) but guidance in the different activities (for example guidance on how to select measures) and the overall integrated management process. The results of the online survey confirm that the approach of the RAINMAN-Toolbox should be promoted further. With the RAINMAN-Toolbox the consortium aims to develop an easy accessible online tool that gives guidance for the integrated management of heavy rain risks and that comprises the whole process: from assessment and mapping of heavy rain risks (tool 1) though the selection of risk reduction measures (tool 2) and risk communication (tool 3) to governance (tool 4).

The results of the online survey have already been implemented in the concept of the RAINMAN-Toolbox and its comprising methods and tools.

5.2. Outlook
The results of the online survey will help to structure and design the RAINMAN-Toolbox according to the needs and demands of local and regional stakeholders. Also the activities in the different thematic work packages will consider the analysis of the experiences, status-quo, demands and wishes in their future work.

The RAINMAN partnership will continue to involve the participating cities and regions in the development process of the toolbox. For doing so they will be asked for evaluation and feedback of the results of the toolbox. They will also be trained on the tools.

Another online survey will be designed as an ex-post survey (see. T4.4.1). The ex-post survey will be conducted as soon as a first draft of the toolbox is ready so that adjustments of the toolbox can be done for the final toolbox version.
6. Annex I

The following table summarizes the answers of the participants to the open questions of the survey. Answers were given in national language and translated to English by the RAINMAN consortium. The overview differentiates the answers from the respective countries so that further conclusions for the RAINMAN partners are possible. The general assessment of the answers is included in the analysis of the online survey (see main part of this deliverable). If the exact answer was given by several participants the respective number is given in brackets.

<table>
<thead>
<tr>
<th>Country</th>
<th>Entry</th>
</tr>
</thead>
</table>
| AT      | Climate change adaptation model region (Förderprogramm Anpassungsmaßnahmen Österreich)  
          Fire department |
| CR      | Water supply company (2)  
          Government enterprise  
          Public enterprise  
          Water management  
          State administration  
          Croatian Waters is a legal entity for water management founded by the Republic of Croatia |
| CZ      | state administration (government) (2)  
          Ministry  
          Ministry of Environment  
          national (state) organization |
| DE      | Aid organisation/civil protection  
          Head of fire department  
          Technisches Hilfswerk  
          Fire department |
| HU      | public body |
| PL      | municipal company  
          private person |

PI01. Which type of institution are you working for?

PI03. Region

AT   | Tirol  
     | Graz  
     | Ennstal |

CR   | Primorje-Gorski Kotar County (2)  
     | Zagreb County  
     | Osijek-Baranja County  
     | Slavonia |

CZ   | Prague (2) |
<table>
<thead>
<tr>
<th>Country</th>
<th>Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>The South Moravian Region (3)</td>
<td>The South Bohemia Region</td>
</tr>
<tr>
<td>DE</td>
<td>North Saxony (2)</td>
</tr>
<tr>
<td>HU</td>
<td>Heves (2)</td>
</tr>
<tr>
<td>PL</td>
<td>No answers</td>
</tr>
</tbody>
</table>

**Q1. Which area of expertise are you working in?**

<table>
<thead>
<tr>
<th>Country</th>
<th>Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>Geology (2)</td>
</tr>
<tr>
<td>CR</td>
<td>Environmental and nature protection</td>
</tr>
<tr>
<td>CZ</td>
<td>Village mayor (15)</td>
</tr>
</tbody>
</table>
- 1*state forest administration; 2*air environment; 3* the authority to control the removal (taking out) of agricultural land from the agricultural land fund
- state administration (government)
- 1*waste management, 2*air management, 3*animal protection
- City Council (government)
- Vice-mayor
- Retired person (pensioner)
- industry
- Public authority
- Road administration
- Transport (road administration)
- Municipality
- Food industry
- logistics
- Construction
- Official, clerk, office worker
- Department of Economic Governance and Investment
- Management of the municipal office (local assembly)
- All (:-))
- Public administration
- hydrology
- Land consolidation
- climatology
- State administration
- Education and research
- Municipal office Hlavatce

<table>
<thead>
<tr>
<th>DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mayor (3)</td>
</tr>
<tr>
<td>Fire department (2)</td>
</tr>
<tr>
<td>Local government (4)</td>
</tr>
<tr>
<td>Building authority (4)</td>
</tr>
<tr>
<td>Operational planning/Head of operations/ Expert advice</td>
</tr>
<tr>
<td>Fire and civil protection</td>
</tr>
<tr>
<td>Defensive fire and civil protection</td>
</tr>
<tr>
<td>Municipality</td>
</tr>
<tr>
<td>Public order office</td>
</tr>
<tr>
<td>Administration civil engineering, water</td>
</tr>
<tr>
<td>Central office</td>
</tr>
<tr>
<td>Administration/Mayor</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Public order office/Fire department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water protection</td>
</tr>
<tr>
<td>Water supply/Sewage disposal</td>
</tr>
<tr>
<td>Fire protection, emergency service, civil protection</td>
</tr>
<tr>
<td>Civil engineering</td>
</tr>
<tr>
<td>Local building authority</td>
</tr>
<tr>
<td>Administration</td>
</tr>
</tbody>
</table>

**HU**
- mayor
- public administration
- urban management & development
- Project tendering, Project management
- urban management
- local council
- county-level protection
- urban management, investment
- polity
- Technical
- authority

**PL**
- giving opinions on local planning documents
- Volunteer Fire Service
- career counseling
- inhabitant

**AT**
- Location of emergency forces (e.g. fire department)
- Streets outside of settlement areas
- On rural infrastructure (national roads, municipal roads, forest roads,...)

**CR**
- High water levels in the existing watercourses, flooding of the urban parts of settlements, accumulation of considerable quantities of sediment in the existing retention basins
- Waste disposal sites
- Buildings, plants, pumping station
- Industry, watercourses
- Rising water levels and overflowing in lower elevations
- Wells and sources

**CZ**
- movable assets/property, movables
- Pond, dams
- ponds

**DE**
- On transport infrastructure
- Water 2nd order, Public swimming pool

---

* A|02. Which consequences of heavy rain events have you experienced? Damages caused by flooding...
### A|03. Which consequences of heavy rain events have you experienced? Damages caused by mass movement (e.g. landslides, rockfall)... 

<table>
<thead>
<tr>
<th>Country</th>
<th>Consequences</th>
</tr>
</thead>
</table>
| AT      | Sewer section  
On rural infrastructure (national roads, municipal roads, forest roads,...)  
Rural infrastructure, energy supply companies |
| CR      | Strong erosion processes, sedimentation at the mouth of the Raša River, i.e. in the Bršica port basin  
Industrial facilities, beaches, watercourses  
The cellars of family houses flooded along the very edge and beyond the borders of the protected area  
Regular water supply rendered more difficult |
| CZ      | none  
Flooded objects  
None information  
ponds |
| DE      | Water (2)  
On transport infrastructure  
On streams  
Water 2nd order, Public swimming pool  
Sport facilities  
Other  
Streams |
| HU      | I don’t have similar experience in “Mezőtúr” town  
No  
Not typical  
Didn’t happen similar |
| PL      | lack  
damage of the weir on the river  
trees breaking |

### B|03. What is the name of the early warning system? 

<table>
<thead>
<tr>
<th>Country</th>
<th>Early Warning System</th>
</tr>
</thead>
</table>
| AT      | Central institute for meteorology and geodynamics  
Analysis- and Nowcasting system INCA of the central institute for meteorology and geodynamics  
Weather warnings central institute for meteorology and geodynamics, Morecast Ubimet (weather app) |
### CR
- Meteoalarm (2)
  - It has no special name, but if there are forecasting conditions for short-lasting heavy rain events, DHMZ website, from which news is taken over by the media, announces potential flash flood events.
- Flood Defence Master and Implementation Plans.
- DHMZ forecasts by means of e-mail notices from the competent services of Croatian Waters.
- DHMZ.
- EWS.
  - There is a meteorological radar for rainfall detection installed at the Faculty of Civil Engineering in Rijeka, as well as several weather stations in the wider Rijeka area.
- Meteoalarm and hydro alarm, Flash Flood guidance System, EFAS (European Flood Awareness System).

### CZ
- Flood Information System (3)
- Czech Hydrometeorological Institute Warnings (4)
- I don’t know (4).
- Flood Forecasting Service (Czech Hydrometeorological Institute) (4).
- Integrated alert system (3).
- Operations and Information Centre of the Fire brigade (4).
- Fire Rescue Service of the South Bohemia Region (2).
- Hydro meteorological monitoring of the Vltava river basin.
- Email and mobil phone.
- The Czech Hydrometeorological Institute.
- Integrated rescue system.
- Info channel of Czech Hydro meteorological Institute.
- National information system of Integrated Rescue System Service.
- Crisis management authorities ORP (=municipality with extended competences) Strakonice - early warning system.
- National television channel.
- Czech Hydrometeorological Institute.
- Information channel for the municipality Český Krumlov of Czech Hydro meteorological Institute.
- Integrated Rescue System Service.
- Warning system on Czech Hydro meteorological Institute website.
- 1*Rain gauge (pluviometer), 2*level meter on the flow (flowmeter).
- Sirens, mobile broadcasting (radio).
- District crisis team (management).
- Warning of possible heavy rain events.
- Local warning system.
- Flash Flood Guidance.
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<table>
<thead>
<tr>
<th>Country</th>
<th>Services and Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DE</strong></td>
<td>Local broadcasting warning system, municipal warning system</td>
</tr>
<tr>
<td></td>
<td>Integrated alert system (cooperation with CHMU)</td>
</tr>
<tr>
<td></td>
<td>2<em>Operations and Information Centre of the Fire brigade - getting sms on our mobil phone, 3</em>ALADIN = numeric model for weather forecasting</td>
</tr>
<tr>
<td></td>
<td>Weather app “WarnWetter” of the German national meteorological service (DWD) (3)</td>
</tr>
<tr>
<td></td>
<td>BIWAPP disaster warning and information app (3)</td>
</tr>
<tr>
<td></td>
<td>Flood information system (Saxon flood centre) (2)</td>
</tr>
<tr>
<td></td>
<td>German national meteorological service (DWD) (3)</td>
</tr>
<tr>
<td></td>
<td>Flood early warning (2)</td>
</tr>
<tr>
<td></td>
<td>Flood warning of flood centres</td>
</tr>
<tr>
<td></td>
<td>Flood information system</td>
</tr>
<tr>
<td></td>
<td>Flood early warning system LfULG</td>
</tr>
<tr>
<td></td>
<td>Flood news service Saxony</td>
</tr>
<tr>
<td></td>
<td>Flood early warning system (Saxon State Ministry of Environment and Agriculture)</td>
</tr>
<tr>
<td></td>
<td>Flood early warning system Saxony</td>
</tr>
<tr>
<td></td>
<td>Storm forecasting of the German national meteorological service (DWD)</td>
</tr>
<tr>
<td></td>
<td>NINA Federal emergency information and news app (Federal Office of Civil Protection and Disaster Assistance)</td>
</tr>
<tr>
<td></td>
<td>HWIMS flood information system (Saxon flood centre)</td>
</tr>
<tr>
<td></td>
<td>Weather warning</td>
</tr>
<tr>
<td></td>
<td>Fire department-weather information system (DWD)</td>
</tr>
<tr>
<td></td>
<td>Storm warning of the German national meteorological service (DWD), Flood news service Bavaria</td>
</tr>
<tr>
<td></td>
<td>Alerting system</td>
</tr>
<tr>
<td></td>
<td>Warn and information system (App)</td>
</tr>
<tr>
<td></td>
<td>BIWAPP disaster warning and information app, NINA federal emergency information and news app (Federal Office of Civil Protection and Disaster Assistance)</td>
</tr>
<tr>
<td></td>
<td>Saxon flood centre</td>
</tr>
<tr>
<td></td>
<td>Emergency service for flood</td>
</tr>
<tr>
<td></td>
<td>Federal emergency information and news app (Federal Office of Civil Protection and Disaster Assistance)</td>
</tr>
<tr>
<td><strong>HU</strong></td>
<td>weather forecast, radar</td>
</tr>
<tr>
<td></td>
<td>weather forecast <a href="http://www.idokep.hu">www.idokep.hu</a> (2)</td>
</tr>
<tr>
<td></td>
<td>weather forecast <a href="http://www.idokep.hu">www.idokep.hu</a> (3)</td>
</tr>
<tr>
<td></td>
<td>weather forecast, hazard forecast</td>
</tr>
<tr>
<td></td>
<td><a href="https://www.met.hu/idojaras/veszelyjelzes/index.php?c=a">https://www.met.hu/idojaras/veszelyjelzes/index.php?c=a</a></td>
</tr>
<tr>
<td></td>
<td>Országos Meterológiai Szolgálat, weather forecast <a href="http://www.met.hu">www.met.hu</a> (3)</td>
</tr>
<tr>
<td></td>
<td>weather forecast <a href="http://www.eumet.hu">www.eumet.hu</a>, <a href="http://www.metnet.hu">www.metnet.hu</a></td>
</tr>
<tr>
<td></td>
<td>News</td>
</tr>
<tr>
<td></td>
<td>weather forecast</td>
</tr>
<tr>
<td></td>
<td>VÉSZ - a mobil application which give information about accidents and meteorological emergency</td>
</tr>
<tr>
<td></td>
<td>disaster management directorate, local defense committee, weather forecast <a href="http://www.met.hu">www.met.hu</a></td>
</tr>
</tbody>
</table>
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| PL   | Regional Warning System (RSO)  
|      | early warning system  
|      | Weather service IMGW-PIB  
|      | National Warning System  
|      | Institute of Meteorology and Water Management  
|      | Antistorm.eu  

**B|04. Who is operator of this system?**

| AT   | Insurance  
|      | Fire department, Uniqa insurance  
| CR   | Croatian Waters - Section for Protection from Adverse Effects of Water  
|      | Faculty of Civil Engineering in Rijeka  
|      | MeteDHMZ, Meteorological and Hydrological Service  
| CZ   | The Czech Hydrometeorological Institute (2)  
|      | Fire Rescue Service of the Czech Republic  
|      | National information system of Integrated Rescue System Service  
|      | I don’t know  
|      | Depends on the extent of the territory and monitoring level  
| DE   | Federal state Saxony (2)  
|      | Public meteorological service, hydrological service/flood forecasting centres  
|      | Federal office for civil protection and disaster assistance  
|      | Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.  
| HU   | ministry of the interior  
| PL   | No answers  

**B|06. In your region and from your professional point of view: How can early warning systems improve?**

| AT   | Insurance  
|      | Fire department, Uniqa insurance  
| CR   | All of the above, more or less automated gauging stations  
| CZ   | Not to issue albistic warnings  
|      | No need of improvement  
|      | I don’t know  
|      | Raise awareness of the hazards of dangerous outflows from torrential rainfall (heavy rain)  
| DE   | Don’t switch off VHF radio for economic reasons - this warning option works without access to mobile communications and internet, such as radio in case of power failure - DAB or internet radio don’t do that.  
|      | Increase the density of monitoring network/measuring stations  
|      | Ensure the drainage  
|      | Well organised, secure information channels  
|      | Warning of heavy rain events  
|      | Better information about existing early warning systems  

### C|03. Which historic data for risk assessment has your institution analysed?

<table>
<thead>
<tr>
<th>Country</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>No answers</td>
</tr>
<tr>
<td>CR</td>
<td>No answers</td>
</tr>
<tr>
<td>CZ</td>
<td>Archival sources, journalism</td>
</tr>
<tr>
<td>DE</td>
<td>Interviews on site</td>
</tr>
<tr>
<td></td>
<td>Eyewitness reports</td>
</tr>
<tr>
<td></td>
<td>Flood maps</td>
</tr>
<tr>
<td></td>
<td>Flood events referred to districts</td>
</tr>
<tr>
<td></td>
<td>Already occurred mixed water leakage from sewer system</td>
</tr>
<tr>
<td>HU</td>
<td>a separate company does this</td>
</tr>
<tr>
<td>PL</td>
<td>No answers</td>
</tr>
</tbody>
</table>

### C|05. Please name other analyses of topographic conditions implemented by your institution.

<table>
<thead>
<tr>
<th>Country</th>
<th>Analysis Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>Sediment &amp; debris potential</td>
</tr>
<tr>
<td></td>
<td>Flood control reservoir by the municipality</td>
</tr>
<tr>
<td></td>
<td>Nationwide GIS preparation of flow paths with correction of DGM</td>
</tr>
<tr>
<td></td>
<td>Slope water maps</td>
</tr>
<tr>
<td>CR</td>
<td>Additional detailed surveying of terrain</td>
</tr>
<tr>
<td>CZ</td>
<td>No answers</td>
</tr>
<tr>
<td>DE</td>
<td>On-site visit within the training of civil protection volunteers</td>
</tr>
<tr>
<td></td>
<td>Sighting of existing digital maps on slopes which are vulnerable to erosion (e.g. regional plan: category “area with potentially high risk of erosion by water”)</td>
</tr>
<tr>
<td></td>
<td>Deform of water profile because of e.g. buildings like retaining walls, bridges, development</td>
</tr>
<tr>
<td></td>
<td>Scan flights and evaluation after attachment</td>
</tr>
<tr>
<td></td>
<td>Measurement</td>
</tr>
<tr>
<td></td>
<td>nWAP</td>
</tr>
<tr>
<td>HU</td>
<td>No answers</td>
</tr>
<tr>
<td>PL</td>
<td>No answers</td>
</tr>
</tbody>
</table>

### C|07. Which data / model did you use?

<table>
<thead>
<tr>
<th>Country</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>Analysis- and Nowcasting system INCA, station data</td>
</tr>
<tr>
<td></td>
<td>Heavy rain analysis, eHYd hydrographic information AT</td>
</tr>
<tr>
<td></td>
<td>WegenerNet data portal (project of university Graz)</td>
</tr>
<tr>
<td></td>
<td>Civil engineering office</td>
</tr>
<tr>
<td></td>
<td>Hydrographic yearbook, analysis of hydrography Styria</td>
</tr>
<tr>
<td>CR</td>
<td>Statistical analysis of time series of rain data from stations, period of 30 years and more</td>
</tr>
<tr>
<td></td>
<td>Hydrological data analysed within different divisions of Croatian Waters, existing (old) design documents, old studies</td>
</tr>
</tbody>
</table>
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- DHMZ database
- ALADIN, HEC-HMS
- NWP, re-analyses, global and regional climate models.

<table>
<thead>
<tr>
<th>CZ</th>
<th>n-year flows based on CN curves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>simple rainfall runoff model</td>
</tr>
<tr>
<td></td>
<td>Publicly available data sets (CHMI)</td>
</tr>
<tr>
<td></td>
<td>DesQ-MaxQ, HEC-HMS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DE</th>
<th>DGM2 digital terrain model, Hydro AS simulation of watercourses and surface run off</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>HU</th>
<th>precipitation gauges, radar</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PL</th>
<th>No answers</th>
</tr>
</thead>
</table>

C|09. Please name other analyses of the drainage system implemented by your institution

<table>
<thead>
<tr>
<th>AT</th>
<th>Systematic analysis of personal information and perceptions of affected persons and observers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tabulation, numerical analysis</td>
</tr>
<tr>
<td></td>
<td>Flood documentary after disaster events</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CR</th>
<th>Coincidences of events</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CZ</th>
<th>Building a polder</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DE</th>
<th>Analyses of care measures with adjustments to prevailing conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hydraulic calculation sewer system</td>
</tr>
<tr>
<td></td>
<td>Hydrodynamic calculations</td>
</tr>
<tr>
<td></td>
<td>Monitoring of conditions of water bodies (“Gewässerschauen”)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HU</th>
<th>investigation of drainage system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>systematic check of drainage system of maintained</td>
</tr>
<tr>
<td></td>
<td>troubleshooting of congestion of drainage system, exchange of narrow diameter drains</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PL</th>
<th>No answers</th>
</tr>
</thead>
</table>

C|11. Please name other analyses of the building structure and infrastructure implemented by your institution

<table>
<thead>
<tr>
<th>AT</th>
<th>Laser scan analysis of buildings</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CR</th>
<th>Functionality and age/condition of built infrastructure</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CZ</th>
<th>No answers</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DE</th>
<th>Adjustment land-use planning, inspect building plans for adjustment requirements</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>HU</th>
<th>No answers</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PL</th>
<th>No answers</th>
</tr>
</thead>
</table>

C|13. Please name other analyses to develop hazard and risk maps implemented by your institution

<table>
<thead>
<tr>
<th>AT</th>
<th>1D modeling</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CR</th>
<th>Land use, impact on spatial planning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I have (theoretically) dealt with maps of hazards and risks of geohazards and flood flows.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CZ</th>
<th>No answers</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DE</th>
<th>Use of existing data of LfULG for spatial planning determinations</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>HU</th>
<th>No answers</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PL</th>
<th>No answers</th>
</tr>
</thead>
</table>
### Online survey on heavy rain risk management in pilot / partner regions

- **Modellings in collaboration with engineering offices**
- A research project is currently in progress (HiOS). One of the objectives is the development, testing and optimization of procedures for determination of hazards by surface run offs as a result of heavy rain. Different levels of detail are examined. From a bavarian reference map (GIS based) to detailed coupled hydrological-hydrodynamic simulations with different models.
- 1D-modelling, according to Lutz (1984)

<table>
<thead>
<tr>
<th>Modellings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HU</td>
<td>Flood risk management</td>
</tr>
<tr>
<td></td>
<td>pluvial flood risk assessment map</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CR (C14)</th>
<th>Question</th>
<th>Why not? (multiple answers possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>No answers</td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td>We are not directly in charge of such type of activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I am not familiar with that</td>
<td></td>
</tr>
<tr>
<td>CZ</td>
<td>Is not our competence (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This is (heavy rain) an exceptional situation - addressed in the framework of flood protection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low frequency, minimal damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The degree of danger is low, we can respond in time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The question is not relevant to my institution (employer - university)</td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td>Question of competence</td>
<td></td>
</tr>
<tr>
<td>HU</td>
<td>No answers</td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td>Risk assessment is beyond our competence, such data is necessary for proper creation of spatial development, especially in the context of rainwater management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This is not in our competence</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CR (C15)</th>
<th>Question</th>
<th>What would you need for a heavy rain risk assessment or mapping?</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>No answers</td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td>More detailed monitoring of rainfall using radars and a number of new automatic rain gauging stations in the greater Zagreb area. Only 3 automatic rain gauges aren’t enough for the City of Zagreb.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A little bit from everything mentioned above</td>
<td></td>
</tr>
<tr>
<td>CZ</td>
<td>Terrain survey + evaluation of narrow points</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevention</td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td>Basis/order</td>
<td></td>
</tr>
<tr>
<td>HU</td>
<td>Money, money... for building drainage systems in rural and urban areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not relevant</td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td>No answers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CR (D03)</th>
<th>Question</th>
<th>Which of the following stakeholders are included in the integrated risk management planning process in your institution?</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>Municipalities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>National geology</td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td>No answers</td>
<td></td>
</tr>
</tbody>
</table>
Online survey on heavy rain risk management in pilot / partner regions

| CZ | Crisis management (2)  
| Research institution, state institution  
| a unit of volunteer firefighters (local organisation in the village Roudné)  
| The Vltava river basin |

| DE | The state of Bavaria is currently promoting the development of integral concepts for municipal flood risk management as part of a special support programme. Recipients of the subsidies are Bavarian municipalities, which should also initiate dialogues with stakeholders in the risk management process as part of the concept development process. |

| HU | No answers |

| PL | No answers |

| D05. Which other preventive measures in a built environment / urban area has your institution planned or implemented? |

| AT | Planned/partly implemented: creating awareness, information of all stakeholders and population, preparation of information sheets for emergency and disaster events, communication training for relevant stakeholder, educational offer for all ages (from kindergarten to adult education)  
| Information and provisions for flood free +/- 0,0 levels on buildings  
| Decentralised rainwater usage  
| Retention basin |

| CR | Construction of retention basins to regulate peak rain discharges. Stimulating rainwater infiltration as close to the place of their formation as possible.  
| Construction of larger retention basins to receive major water waves. Informing the public about the consequences of floods if such retention basins are not built, because the local population in the vicinity of which such retention basins, reservoirs, barriers, etc. are planned to be built are always against their construction. If a flood occurs, everything is forgotten by the summer.  
| Water sensitive urban design tools |

| CZ | anti-flood wall (dam) in the northern part of the village  
| There is a need of mapping (survey) of the taken measures; I sent an email to the competent department:  
| Colleagues and colleagues, I am sending you a cover letter. You do not have to read it all but you can, just the first two paragraphs. Since you also have this issue in your grievances, especially the OŽP (Department of the Environment), I ask you to send the documents and your observations as follows:  
| Where in our town and associated municipalities do we have areas where torrential rains and flash floods occur (to confirm or supplement)? I am attacking at random - (from the top of the Dusík river with the brook to the river) - Děkanský Creek from the forest to the river - Háma Street via Vinařické square (although there are probably no such problems after the adaptations) - Away down - Tyršova street from above via Namestí Miru - Mostecká Street - part of Na Brodech street before slaughter - in Nuzice, Netěchovice, Předčice, Koloděje, Vesce - do you have some more details?  
| What measures would be best in these areas to mitigate damage and increase protection for citizens and property? Then I will fill out the questionnaire.  
| Answer of Head of the Department of the Environment: Hello, your list of areas with heavy rain threats is almost complete for the city. I would probably add to Ke Hradu Street, Jiráskova Street "Peklo" - there is a problem with a clogged drainage grid, Račina brook (cottages and lower residential buildings) on Hlínka - Hlíněcká Street in the section behind the cultural center, where water flows to Peklo and the sloping section of Komenský Street under Blanice. On the Bohunická Street, especially the section from the collection of raw materials and Svazarm, both branches of Husova Street and Havlíčkova Street with insufficient sewerage capacity. From the associated villages Nuzice - the insufficient capacity of the passage under the Týn - Bechyňe road is connected with flooding of the village square, Předčice - the water from the fields above the village threatens a new development on the road to Týn and on the way from the top of the Veselská Road to |
the trailer and home under the way. Koloděje u mostu - danger from Hostecký brook. Koloděje Vesce threat from the fields above the chapel - partially solved by a low spike along the field path. The recreational area near Lužnice is also threatened by the Bílinský brook. Hněvkovice - the possibility of a flood from the fields on the way to the village. Netěchovice + Jarošovice have not yet reported any major problems. Measures can be taken quite hard, in some cases (Nuzice - dry polder above the village of 6-8 milion CZK) unsolvable due to ownership relations to suitable plots (estate). Here is the problem also in the intervention of the property of the region (the passage under their roads) and in addition the construction of about 100m of the capacitive pipeline under the Nuzice village square. The Hostecký brook valley in Koloděje - can only be solved by limiting (enhancing) the flow profile under the communication between the individual objects. Předčice - it is possible to try to divert the water from the fields of the original (now ravaged) field paths back to Račina, but this will increase the flow in Račanský Creek, which is not very desirable (again according to the current capacities of Račina river bed). Generally throughout the city and associated municipalities, this issue would require assessment and calculation by a hydrologist, including an estimate of implementation costs.

- Best regards Ivan Palma

DE
- Optimisation of operational emergency response and aftercare
- Flood prevention concept
- Distress waterway
- Clearing of draining streams
- Adaptation of street drainage
- Demolition of sea walls/Application of slopes
- Preparation flood map for the district Krebs
- Opening of channels to ditches, rainwater retention basin built
- Infiltration of rainwater from private land and new development areas at the place of accumulation
- Preparation of storage trenches

HU
- Modification and full restoration of all pumping station to the maximum discharges. Total restoration of main canals. Total restoration of surface drains (one sides of streets) on 2/3 part of settlement.
- systematic cleaning of closed drains
- maintenance of ditches and culverts
- annual maintenance of drainage systems
- maintenance of ditches
- modification of total drainage system of part of the settlement, renewal according to projects

PL
- In the spatial development plan of the Lower Silesian Region, as well as in the spatial development plan of the Wroclaw city we provide (describing briefly because of the survey limitations) activities increasing the retention capacity of the Odra basin, and the maximum retention of rainwater in places where they fall, and we postulate for the designation of areas exposed to the risk of rainfall, especially in the urban areas of the Lower Silesia Region (Voivodship).

D|07. Which other preventive measures outside of settlement structures has your institution planned or implemented?

AT
- Planned or partly implemented: awareness raising, information of all stakeholders and public, creation of information sheets for emergency / catastrophe events, communication education for relevant stakeholders, education offers for all ages (nursery to education of adults)

CR
- Construction of multi-purpose systems to receive rainwater and their use in agriculture; higher rate of rainwater infiltration as close to the place of their formation as possible.
- Better engagement on the regulation of torrents, watercourses, erosion protection (preparation of erosion and landslide maps); analysis of the overall catchment area and identifying the needs and priorities in that area; perform works in larger section; define in a regulation return periods for the dimensioning of watercourses
Online survey on heavy rain risk management in pilot / partner regions

<table>
<thead>
<tr>
<th>Country</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>CZ</td>
<td>Only proposals, no planning (it is meant that no plan -project, has yet been elaborated, I guess)</td>
</tr>
<tr>
<td>DE</td>
<td>Coordination processes with higher authorities (without success so far)</td>
</tr>
<tr>
<td>HU</td>
<td>Appropriate ground condition, maintenance of drains, canals, water structures</td>
</tr>
<tr>
<td></td>
<td>Continuous reaping of out of town ditches</td>
</tr>
<tr>
<td></td>
<td>Maintenance of dirt roads</td>
</tr>
<tr>
<td></td>
<td>Increasing storage capacity of the ground</td>
</tr>
<tr>
<td></td>
<td>Maintenance of ditches of councils</td>
</tr>
<tr>
<td>PL</td>
<td>No answers</td>
</tr>
</tbody>
</table>

D|09. Other activities regarding publicity, raising awareness of stakeholders and public:

<table>
<thead>
<tr>
<th>Country</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>Information at mayor conferences</td>
</tr>
<tr>
<td></td>
<td>Town meeting, local journal</td>
</tr>
<tr>
<td></td>
<td>Press release in local media, interviews, facebookpages with appropriate information on model regions, workshops with relevant participants and experts (disaster protection and infrastructure, land, forestry and water economy)</td>
</tr>
<tr>
<td>CR</td>
<td>Inform the public through the media, presentations and round tables about the performed flood defense works in this catchment area and about the planned future flood defense activities.</td>
</tr>
<tr>
<td>CZ</td>
<td>No answers</td>
</tr>
<tr>
<td>DE</td>
<td>Introduction water weir</td>
</tr>
<tr>
<td></td>
<td>Participation in the administrative procedure</td>
</tr>
<tr>
<td></td>
<td>Event-related letters to citizens</td>
</tr>
<tr>
<td></td>
<td>Consultation by employees of the building authority, in particular for preventive flood protection; Information events (in particular for riparian landowners) by independent associations, ongoing trainings of employees of building authorities/building yards</td>
</tr>
<tr>
<td>HU</td>
<td>No answers</td>
</tr>
<tr>
<td>PL</td>
<td>Appointing committees and estimating damages caused by heavy rain at farms (agricultural areas).</td>
</tr>
</tbody>
</table>

D|10. Which information war or will be provided?

<table>
<thead>
<tr>
<th>Country</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>No answers</td>
</tr>
<tr>
<td>CR</td>
<td>Explanation of design documents, studies, spatial plans, etc.</td>
</tr>
<tr>
<td>CZ</td>
<td>No answers</td>
</tr>
<tr>
<td>DE</td>
<td>Information about water maintenance</td>
</tr>
<tr>
<td>HU</td>
<td>No answers</td>
</tr>
<tr>
<td>PL</td>
<td>As part of the developed regional planning documents</td>
</tr>
<tr>
<td></td>
<td>Public aid</td>
</tr>
</tbody>
</table>

D|11. How was the information provided?

<table>
<thead>
<tr>
<th>Country</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>No answers</td>
</tr>
<tr>
<td>CR</td>
<td>Informing the representative/s of local self-government units about the planned works in their region and about the flood risks if such works are not performed</td>
</tr>
<tr>
<td>CZ</td>
<td>Only within the city administration</td>
</tr>
<tr>
<td>DE</td>
<td>Consultation of individuals and public representatives</td>
</tr>
</tbody>
</table>
## D13. Which other technical protection measures has your institution planned or implemented?

### AT
- Concepts on drainage to be implemented in accordance with dedications
- Retention tanks, building development for wild streams etc.
- Flood control reservoirs and linear measures at streams in preparation, blocking debris and linear measures at wild streams in preparation
- Storage canal
- Flood proof gates at access roads and entrances, additional wells and wellsumps in buildings, drainage from the lowest point with alarm systems

### CR
- Civil Protection Headquarters, decision-making and adoption of measures
- Retention area, lateral channels
- We address the impact on buildings, in particular large roof surfaces
- Construction of retention basins, reservoirs, flood relief channels, regulation works

### CZ
- Removing possible problem structures (buildings) to release the flow of fresh water
- “window” type of overflow - passes a controlled amount of clean water (without branches, etc.)
- Drainage gutter for municipalities Debrník, Hlavatce

### DE
- Recovery of natural flooding areas
- Recovery of retention ditches
- Adjustment of infrastructure (e.g. floodable streets)
- Equipment of the water weir
- Demolition of buildings near the shore
- Technical measures at the construction level on buildings and infrastructure
- Renaturation of streams
- Optimization of the sewerage network
- Enlargement of canals, culverts, streams and ditches as well as the construction of storage trenches

### HU
- ready plan: complex development of drainage system in Kenderes (I part)
- Planning closed drains and development of drains in the future
- maintenance of ditches (2)
- infiltration trench, insurance of runoff
- build new ditches, settlement planning plan should regulate criterion of building in pluvial flood areas.

### PL
- *No answers*

## D15. Which other activities regarding emergency response and protection measures has your institution planned or implemented?

### AT
- *No answers*
Online survey on heavy rain risk management in pilot / partner regions

<table>
<thead>
<tr>
<th>CR</th>
<th>Civil Protection Headquarters, decision-making and adoption of measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>CZ</td>
<td>In the city there is an early warning flood warning system - rain gauge (pluviometer) and “local radio”</td>
</tr>
<tr>
<td>DE</td>
<td>Obtaining weather information, possibly early warning</td>
</tr>
<tr>
<td></td>
<td>Provision of remedies in the occurrence of damage</td>
</tr>
<tr>
<td></td>
<td>Flood action plan of the voluntary fire brigade Niederau and its districts</td>
</tr>
<tr>
<td>HU</td>
<td>No answers</td>
</tr>
<tr>
<td>PL</td>
<td>No answers</td>
</tr>
</tbody>
</table>

**D17. Which other aftercare measures has your institution or your region planned or implemented?**

<table>
<thead>
<tr>
<th>AT</th>
<th>Damage repair at water building infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>Readiness to receive a significant share of pollution load in rainwater</td>
</tr>
<tr>
<td>CZ</td>
<td>No answers</td>
</tr>
<tr>
<td>DE</td>
<td>Optimization of the clean-up operations (e.g. Pumping out basements of affected persons on their own initiative)</td>
</tr>
<tr>
<td>HU</td>
<td>Incorrect notation „I don’t know“ removal mud from the road, removal fallen trees</td>
</tr>
<tr>
<td>PL</td>
<td>No answers</td>
</tr>
</tbody>
</table>

**D19. If your institution or region has not implemented any measures (yet), why not?**

<table>
<thead>
<tr>
<th>AT</th>
<th>No answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>We do not deal with the implementation of measures.</td>
</tr>
<tr>
<td></td>
<td>I don’t know an exact answer to this question.</td>
</tr>
<tr>
<td></td>
<td>I have no knowledge of that.</td>
</tr>
<tr>
<td></td>
<td>I am not familiar with that.</td>
</tr>
<tr>
<td>CZ</td>
<td>There was no problem with the pluvial flood yet</td>
</tr>
<tr>
<td></td>
<td>No flood</td>
</tr>
<tr>
<td></td>
<td>There is no need for any measures</td>
</tr>
<tr>
<td></td>
<td>Absence of legislative support</td>
</tr>
<tr>
<td></td>
<td>No relevant question</td>
</tr>
<tr>
<td>DE</td>
<td>No authority to implement measures</td>
</tr>
<tr>
<td>HU</td>
<td>Not relevant “your institution”</td>
</tr>
<tr>
<td>PL</td>
<td>No answers</td>
</tr>
</tbody>
</table>

**D21. What else would help you to implement (further) measures to reduce heavy rain risks?**

<table>
<thead>
<tr>
<th>AT</th>
<th>Competences of spatial planning experts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increased education of building authorities and building surveyors to make aware of heavy rain risks during construction works in town</td>
</tr>
<tr>
<td></td>
<td>Improvement of the relations between participants (neighbors, planners, authorities...)</td>
</tr>
<tr>
<td></td>
<td>Overall risk assessment - discrepancies between risk zone plan and drainage survey are problematic for municipalities (different parameters and effects on spatial planning), different concepts make it hard to explain for citizens and local politicians</td>
</tr>
<tr>
<td></td>
<td>Bigger awareness of all citizens regarding clima protection issues!</td>
</tr>
<tr>
<td>CR</td>
<td>Publicly available data (rainfall, water levels) presented in a way that the majority of the population finds</td>
</tr>
</tbody>
</table>
Online survey on heavy rain risk management in pilot / partner regions

<table>
<thead>
<tr>
<th>Countries</th>
<th>Measures</th>
</tr>
</thead>
</table>
| CZ        | Include measures in flood plans  
Legislation is missing |
| DE        | It’s not just about reacting, but much more about the preventive adjustment  
Legal means for land availability  
Create more incentives for voluntary commitment  
Nationwide registration and expulsion of flooding areas even of waterbodies of 2. Order  
Softening of nature protective guidelines to implement flood protection measures  
Consideration of the polluter pays principle regarding land use and agriculture forms, which encourage wildly flowing off surface discharge  
Understanding of land owners / users or especially agricultural users  
Responsibility of politics, better agreement at funding programs  
Hazard maps based on topography and soil properties  
Equal definition of terms, closing of law gaps (e.g. Usage of traffic areas for discharge); more acceptance and consideration of heavy rain and flooding events at planers, architects, private builders and in administration (municipal, bearers of infrastructure e.g. road construction); over all improved awareness for nature hazards and rationality in nature handling regarding current hazards; acceptance and willingness to assume individual responsibility  
Cooperation between authorities  
Focus on soil erosion, here technical measures can be given up, if an agricultural change in usage (green discharge paths) would be supported politically (agricultural)  
Acceptance between bearers of building of waterbodies of 1. and 2. order  
Adaption of the handling of subsidies at given circumstances and over all funds of preventive flood protection for municipalities and the general public  
Faster edit of requests (water right authorization, deficit of planning permission etc.), processing of funding requests (12 to 24 months)  
Funding programs for the construction of preventive protection in case of heavy rain  
Educational material for the general public with presentation for personal provision |
| HU        | cooperation of settlements  
Drainage systems will be planned not only from the office. More information need from the territory for the planning. |
| PL        | acceptance of changes in the environment and an attempt to adapt to new conditions  
appropriate competences to carry out tasks |

E)02. Other support and additional materials you personally want or need:

<table>
<thead>
<tr>
<th>Countries</th>
<th>Support</th>
</tr>
</thead>
</table>
| AT        | Film material of not spectacular events to improve the identification of affected and responsible persons with problems. Film material which could concern anybody  
Targeted disaster practices in accordance with this topic  
Make the topic clear to the general public - prohibition of ploughing up of grassland in hillslide locations and |
Online survey on heavy rain risk management in pilot / partner regions

<table>
<thead>
<tr>
<th>Country</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>- Available information about rainfall, soil, water levels and discharges, topography, climate, without additional payment&lt;br&gt;- Education and training, specialization (no “bits and pieces”), keeping track of global trends and news in this field and considering the possibility of their application in our conditions&lt;br&gt;- Raise the issues to the national level, into strategic documents of different sectors</td>
</tr>
<tr>
<td>CZ</td>
<td>- In our case, it is necessary to demand from the owners of adjacent plots of land the timely removal of flow-preventing trees and the river basin administrators to give such amount of funds to regularly clean the streams. The water naturally flows and does not accumulate in the crowded places in the village and above.&lt;br&gt;- Temešvár village is one of the driest places in the Czech Republic but once in a while the torrential rainfall really surprises us.&lt;br&gt;- Financial funds&lt;br&gt;- We have most of this, of course. We have prepared the ORP Crisis Plan, the ORP Flood Plan and the City Flood Plan, but we would need up-to-date things, methodologies for citizens to protect their buildings.&lt;br&gt;- It would like to work out, map, prepare measures - best on the spot for your participation, etc.&lt;br&gt;- ** the same letter as above (see D05)</td>
</tr>
<tr>
<td>DE</td>
<td>- Free provision of digital surface models with the possibility of simulations for heavy rain events&lt;br&gt;- Online event databank for Saxony&lt;br&gt;- Not only print educational media! Videos, graphics, interactive and attractive educational material (apps, games, material for scholar education, books for children etc.); material suitable for social media use for the prevention but also during events (e.g. prepared tweets with rules of conduct, hazard of drowning in basements or driving / passing through flooded areas)&lt;br&gt;- Improve general public relations, „exciting” articles in daily journals</td>
</tr>
<tr>
<td>HU</td>
<td>- more financial and more expert support to maintenance and renewal of drainage systems rural and urban areas</td>
</tr>
<tr>
<td>PL</td>
<td>- guidelines for designing, spatial planning, Including protection against such phenomena as heavy rains</td>
</tr>
</tbody>
</table>
7. Annex II

The following handouts present the country specific results of the online survey.
Online survey on heavy rain risk management in pilot / partner regions

7.1. Survey results in Austria

A: EXPERIENCES WITH HEAVY RAIN

A01. Did heavy rain events occur in your region?

A02. Which consequences of heavy rain events have you experienced? Damages caused by flooding... (multiple answers possible)

A03. Which consequences of heavy rain events have you experienced? Damages caused by mass movement (e.g. landslides, rockfall)... (multiple answers possible)

A04. From your personal point of view, please give a feedback:

- Are you concerned about the general consequences of climate change?
- Do you think the risks of heavy rain events will increase in the future?
- Do you think preventive measures for heavy rain are mainly the responsibility of private house owners?
- Are more activities by public authorities needed to prevent damages from heavy rain events?
Online survey on heavy rain risk management in pilot / partner regions

B: PRACTICAL USE OF EARLY WARNING SYSTEMS

B01. Do you know an early warning system for extreme events like heavy rain?

- Yes
- No
- I don’t know

n = 32

B02. How does information about an upcoming heavy rain event reach you?

- Official warnings by meteorological services (e.g. weather forecast)
- Official warnings by hydrological services (e.g. flood warnings)
- Media (e.g. TV news, radio)
- Social media (e.g. Twitter, Facebook)
- I don’t know

n = 34

B03. What is the name of the early warning system?

- ZAMG
- INKA der ZAMG
- Wetterwarnungen ZAMG, Morecast Ubinet
- Dienstleistung der Vorsorgekunde per SMS
- ZAMG, Hydrographie Steiermark
- ZAMG und ÖMZ Steiermark

B04. Who is operator of this system?

- Public meteorological service
- Private meteorological service
- Flood forecasting centres
- Regional public administration
- Local public administration
- Other

n = 34

B05. From your personal point of view, please give a feedback:

- The warnings reach me
- The warnings reach me on time
- The warnings turn out to be correct
- I see the need to improve early warning systems

n = 34

B06. In your region and from your professional point of view: How can early warning systems improve?

- Accuracy of meteorological forecasts
- Hydrological forecasts for small water bodies
- Enhanced warning time
- New ways of distribution (e.g. via social media)
- Integration of other hazards: erosion / landslides
- Other

n = 34

C: ASSESSMENT AND MAPPING OF HEAVY RAIN RISKS

C01. Has your institution dealt with heavy rain risks?

- Yes
- No

n = 32

C02. With the help of which analysis does your institution assess heavy rain risks? (multiple answers possible)

- Systematic documentation of heavy rain events
- Risk assessment based on historic data
- Analysis of the topographic conditions
- Analysis of precipitation data
- Analysis of the drainage system
- Analysis of the building structure and infrastructure
- Modelling: development of hazard and risk maps

n = 22

C03. Which historic data for risk assessment has your institution analysed? (multiple answers possible)

- Rain measurements, time series
- Event database
- Press reports
- Questionnaires
- Other

n = 5

C04. Which analysis of topographic conditions (e.g. mapping of area depressions) has your institution done? (multiple answers possible)

- Identification of area depressions
- Identification of flood channels
- Identification of surface flow paths
- Identification of inflow from neighbouring areas (e.g. agricultural areas)

n = 35
Online survey on heavy rain risk management in pilot / partner regions

C05. Please name other analyses of topographic conditions implemented by your institution:
- Hangwasserkarten
- Hangwasserkarte
- Sediment & Geschiebpotential
- Hochwasserrückhaltebecken durch Gemeinde
- flächendeckende GIS-Erstellung der Fließwege mit Korrektur des DGA (Durchlässe, ...)

C06. Which source of information did you use to analyse precipitation data (e.g. extreme value statistics)? (multiple answers possible)

<table>
<thead>
<tr>
<th>Source</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station data</td>
<td>11</td>
</tr>
<tr>
<td>Radar data</td>
<td>6</td>
</tr>
<tr>
<td>Satellite data</td>
<td>2</td>
</tr>
</tbody>
</table>

n = 12

C07. Which data sets / model did you use?
- Inca, Stationdaten
- Starkregenauswertung, Ethyd.gr.at
- Wegenachweis
- ziviltechnische Auswertung
- Hydrographisches Jahrbuch, Auswertungen der Hydrographie Steiermark

C08. Which analysis of the drainage system (weak spots) has your institution done? (multiple answers possible)

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapping of potential weak spots</td>
<td>7</td>
</tr>
<tr>
<td>List of potential weak points</td>
<td>7</td>
</tr>
<tr>
<td>Analysis of weak spots in the drainage system</td>
<td>11</td>
</tr>
<tr>
<td>Flow path analysis</td>
<td>13</td>
</tr>
<tr>
<td>Investigation of the run off behavior of sealed / unsealed surfaces</td>
<td>10</td>
</tr>
</tbody>
</table>

n = 14

C09. Please name other analyses of the drainage system implemented by your institution:
- Systematische Analyse persönlicher Auskünfte und Wahrnehmungen von Betroffenen und Beobachtern
- Lösungsrechnungen, numerische Analysen
- Hochwasser dokumentation nach Katastropheneignissen

C10. Which analysis of the building structure and infrastructure has your institution done? (multiple answers possible)

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of planned building areas based on hazard maps</td>
<td>4</td>
</tr>
<tr>
<td>Evaluation of land use / adaptation options</td>
<td>2</td>
</tr>
<tr>
<td>Availability of free spaces (e.g. retention, seepage)</td>
<td>4</td>
</tr>
<tr>
<td>Investigation of the degree of sealed surfaces</td>
<td>3</td>
</tr>
<tr>
<td>Investigation of building density</td>
<td>2</td>
</tr>
</tbody>
</table>

n = 5

C11. Please name other analysis of the building structure and infrastructure implemented by your institution:
- Lasercanale Analyse der Gebäude

C12. Which modeling has your institution done to develop hazard and risk maps? (multiple answers possible)

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIS analysis</td>
<td>18</td>
</tr>
<tr>
<td>2D modeling</td>
<td>15</td>
</tr>
<tr>
<td>Drainage system dimensioning</td>
<td>6</td>
</tr>
<tr>
<td>Damage potential calculations</td>
<td>3</td>
</tr>
</tbody>
</table>

n = 20

C13. Please name other analyses to develop hazard and risk maps implemented by your institution:
- 1D Modellierung

C14. If your institution has not conducted any heavy rain risk assessment (yet) - Why not? (multiple answers possible)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are not affected</td>
<td>0</td>
</tr>
<tr>
<td>We have no experience with the topic so far.</td>
<td>1</td>
</tr>
<tr>
<td>There is no data available</td>
<td>1</td>
</tr>
<tr>
<td>The political willingness is low</td>
<td>2</td>
</tr>
<tr>
<td>We have no personnel resources</td>
<td>3</td>
</tr>
<tr>
<td>We have no financial resources</td>
<td>3</td>
</tr>
<tr>
<td>We don’t know any funding options</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

n = 5

C15. In your personal opinion, what would you need for a heavy rain risk assessment or mapping? (multiple answers possible)

<table>
<thead>
<tr>
<th>Resource</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information / know-how on heavy rain in general</td>
<td>1</td>
</tr>
<tr>
<td>Information about methodologies for heavy rain risk assessment and mapping</td>
<td>3</td>
</tr>
<tr>
<td>Statistics on precipitation / past heavy rain events</td>
<td>3</td>
</tr>
<tr>
<td>Climate change projections / model data</td>
<td>1</td>
</tr>
<tr>
<td>Data on land use, settlement structures, sewage system capacities</td>
<td>2</td>
</tr>
<tr>
<td>Digital elevation model</td>
<td>2</td>
</tr>
<tr>
<td>Financial resources for data acquisition or experts / studies</td>
<td>2</td>
</tr>
<tr>
<td>Political awareness of the topic</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

n = 3
D: MEASURES TO MITIGATE HEAVY RAIN RISKS

D01. Has your institution planned or implemented measures which can prevent or reduce damages of heavy rain events?

- Yes
- No

n = 32

D02. Which measures to reduce heavy rain risks has your institution planned or implemented? (multiple answers possible)

- Integrated risk management planning
- Preventive measures in a built-up area
- Preventive measures outside of
- Information to stakeholders / public
- Technical protection measures
- Emergency response and protection
- Afforestar measures
- No measures implemented or planned

n = 25

D03. Which of the following stakeholders are included in the integrated risk management planning process in your institution? (multiple answers possible)

- Special planning
- Water management
- Environmental planning, nature preservation
- Agriculture
- Infrastructure service providers, architects
- Emergency management
- Other

n = 8

D04. Please specify implemented or planned preventive measures in a built environment / urban area!

- Avoiding of surface sealing
- Decentralized rainwater management: increase infiltration areas / basins / ditches
- Decentralized rainwater management: multifunctional areas, e.g. systematically flooded
- Optimized sewage system
- Flow paths are kept clear according to planning law
- Ban of / restrictions for buildings in risk areas
- Road drainage is adjusted to heavy rain events

n = 17

D05. Which other preventive measures in a built environment / urban area has your institution planned or implemented?

- Angaben und Vorgaben für hochwassersichere Gebäude
- dezentrale Regenwasserbewirtschaftung bei Neubauten und Generalanlagen, Theriostrom zur hydraulischen Optimierung des Kanalsystems
- Rückhaltebecken

D06. Please specify implemented or planned preventive measures outside of settlement structures!

- Heavy rain is considered in regional planning / development plans
- Flow paths are kept free
- Retention areas are planned
- Agricultural measures to reduce surface runoff
- Measures improving soil stabilization, e.g. reforestation
- Road drainage is adjusted for heavy rain events
- Adaptation of land use

n = 8

D07. Which other preventive measures outside of settlement structures has your institution planned or implemented?

- geplant sind bzw. teils umgesetzt u.a.: Bewusstseinsbildung, Information aller Stakeholder & der Bevölkerung, Erstellung von Infoblättern für Notfall /
- Katastrophenerignisse, Kommunikationsführung für relevante Stakeholder, Bildungsangebote für alle Altersstufen (Vom Kindergarten bis zur Erwachsenenbildung)

D08. Please specify implemented or planned activities regarding public relations / raising awareness of stakeholders and public!

- Information within the administration
- Information of political representatives
- Information campaigns for the public, private house owners
- Information campaigns for the local economy, farmers
- Round tables e.g., with private stakeholders

n = 11

D09. Other activities regarding publicity, raising awareness of stakeholders and public:

- Informationen an Bürgerkonferenzen...
- Bürgerversammlung, Gemeindezeitung
- Pressemeldungen in lokalen Medien, Interviews, Facebookseite mit entsprechenden Informationen zur Modellregion, Workshops mit relevanten Akteur/innen & Expert/innen (Katastrophenschutz & Infrastruktur, Landw., Forst & Wasserwirtschaft)
Online survey on heavy rain risk management in pilot / partner regions

**D10. Which information was or will be provided?**
(multiple answers possible)

- Available risk assessment, studies etc.: 12
- Hazard and risk maps: 13
- Information about preventive measures: 12
- Information about technical protection measures: 12
- Information on risk adapted behaviour, emergency measures: 12
- Campaigns on natural hazards: 6
- Other: 2

**N = 30**

**D11. How was the information provided?**
(multiple answers possible)

- Public hearings, information events, podium discussions etc.: 12
- Information on display in town hall: 6
- Press releases: 5
- Distribution of flyers and other printed information material: 8
- Online information: 5
- Other: 0

**N = 16**

**D12. Please specify implemented or planned technical protection measures!**

- On building level, e.g. elevation of entrances, flood gates for underground garages: 4
- Rainwater storage facilities (e.g. basins, ponds): 2
- Walls / dikes: 3

**N = 19, 20, 20**

**D13. Which other technical protection measures has your institution planned or implemented?**
- Entwässerungsansätze dienens zu dienen sind im Rahmen von Woodings,...
- Retentionsbecken, Wildbachverbauung, etc.
- Hochwasserschutzbecken und Liniaanalmenahmen an Bächen in Vorbereitung, Geschobereinen Linienanalmen an Wildböchen in Vorbereitung
- Speicherkanäle
- Hochwasserschere Tore an Zufahrten und Einfahrten, zusätzliche Pumpen und Pumpenhäuselm Gebäudebereich, Tiefpunktentwässerungen mit Alarmeinrichtungen

**D14. Please specify implemented or planned activities regarding emergency response and protection measures!**

- Emergency management plan (for extreme events in general): 4
- Emergency management plan explicitly for heavy rain events: 1
- Emergency management plan without consideration for heavy rain events: 2
- Surveillance of monitoring points / critical infrastructure: 0
- Involvement of all relevant stakeholders, administrations, enterprises, etc. in the...: 1

**N = 5**

**D15. Which other activities regarding emergency response and protection measures has your institution planned or implemented?**

**D16. Are you prepared for aftercare in your institution or region?**

- Aftercare plan for event-based waste, sandbags, etc.: 0
- Aftercare plan for oil leakage: 0
- Aftercare plan for power failures: 0

**N = 5**

**D17. Which other aftercare measures has your institution or your region planned or implemented?**

- Schaderlebarbeiten an der wasserablaufhichen Infrastruktur

**D18. Please assess the categories of activities according to your personal and professional opinion! Which measures do you personally think are the most effective ones?**

- Preventive measures in a built environment / urban area: 16
- Preventive measures outside of settlement structures: 18
- Public relations / increase of risk awareness: 16
- Technical protection measures: 20
- Emergency response and protection: 10
- Measures for event aftercare: 10

**N = 24**
Online survey on heavy rain risk management in pilot / partner regions

**D19. If your institution or region has not implemented any measures (yet), why not? (multiple answers possible)**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>We have no experience with the topic so far.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>The political willingness is low.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>We have no staff resources.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>We have no financial resources.</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>We don’t know any funding options.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hazard analysis and risk assessment is missing for our region.</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**D20. In your personal opinion, what would help your institution to implement (further) measures to reduce heavy rain risks?**

<table>
<thead>
<tr>
<th>Source of help</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information / know-how on heavy rain in general</td>
<td>15</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guidance on the selection of measures</td>
<td>13</td>
<td>12</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More political acceptance and willingness to react to heavy rain</td>
<td>16</td>
<td>9</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More employees</td>
<td>10</td>
<td>14</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More financial capacities</td>
<td>20</td>
<td>10</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information on funding options</td>
<td>16</td>
<td>8</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**E: DEMANDS, WISHES**

**E01. Which kind of support and materials would you personally want / need for your institution or region? (multiple answers possible)**

<table>
<thead>
<tr>
<th>Type of support and materials</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printed information material (leaflets, brochures) on heavy rain risks for different target groups</td>
<td>14</td>
<td>10</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online information material</td>
<td>16</td>
<td>8</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information / guidance on how to establish a heavy rain risk management process (e.g., checklists)</td>
<td>13</td>
<td>12</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guidance and methodology for the assessment and mapping of heavy rain risks</td>
<td>16</td>
<td>14</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List / catalogue of available heavy rain risk reduction measures</td>
<td>19</td>
<td>9</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guidance on adapting my emergency planning to heavy rain risks</td>
<td>16</td>
<td>12</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workshop/seminar or training on heavy rain risk management</td>
<td>11</td>
<td>12</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information on financing or funding options for the implementation of measures</td>
<td>14</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**E02. Other support and additional materials you personally want or need:**

- Filmdokumente von nicht unbedingt spektakulären Ereignissen zur Stärkung der Identifikation von Betroffenen und Verantwortlichen mit der Problemlage. Also Filmdokumente von Ereignissen die "jeden" treffen können.
- Gezielte Katastrophenübungen zu diesem Thema!
7.2. Survey results in Czech Republic

A: EXPERIENCES WITH HEAVY RAIN

A01. Did heavy rain events occur in your region?

- Yes: 26
- No: 106

n = 125

A02. Which consequences of heavy rain events have you experienced? Damages caused by flooding...

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>On urban infrastructure</td>
<td>86%</td>
</tr>
<tr>
<td>On public buildings</td>
<td>27%</td>
</tr>
<tr>
<td>On private buildings (e.g. flooded cellars)</td>
<td>90%</td>
</tr>
<tr>
<td>On cultivated land (e.g. fields, forests, green land)</td>
<td>79%</td>
</tr>
</tbody>
</table>

n = 305

A03. Which consequences of heavy rain events have you experienced? Damages caused by mass movement (e.g. landslides, rockfall)...

- On urban infrastructure (e.g. streets, underground garages or passageways, bridges): 49%
- On public buildings: 10%
- On private buildings (e.g. flooded cellars): 38%
- On cultivated land (e.g. fields, forests, green land): 42%

n = 68

A04. From your personal point of view, please give a feedback:

- Are you concerned about the general consequences of climate change?: 28% Yes, 51% Not sure, 15% No
- Do you think the risks of heavy rain events will increase in the future?: 36% Yes, 49% No, 15% No
- Do you think preventive measures for heavy rain are mainly the responsibility of private house owners?: 16% Yes, 39% No, 26% No
- Are more activities by public authorities needed to prevent damages from heavy rain events?: 65% Yes, 38% No, 0% No.
Online survey on heavy rain risk management in pilot / partner regions

B: PRACTICAL USE OF EARLY WARNING SYSTEMS

B01. Do you know an early warning system for extreme events like heavy rain?

<table>
<thead>
<tr>
<th>Option</th>
<th>Yes</th>
<th>No</th>
<th>I don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official warnings by meteorological services (e.g., weather forecast)</td>
<td>33</td>
<td>78</td>
<td>15</td>
</tr>
<tr>
<td>Official warnings by hydrological services (e.g., flooding warning)</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Media (e.g., TV news, radio)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Social media (e.g., Twitter, Facebook)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

n = 126

B02. How does information about an upcoming heavy rain event reach you?

<table>
<thead>
<tr>
<th>Source</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official warnings by meteorological services (e.g., weather forecast)</td>
<td>32</td>
<td>35</td>
</tr>
<tr>
<td>Official warnings by hydrological services (e.g., flooding warning)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Media (e.g., TV news, radio)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Social media (e.g., Twitter, Facebook)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

n = 68

B03. What is the name of the early warning system?

- Hydrometeorological monitoring Povodí Vltavy
- OPVS
-™
- Hydrometeorological system integrated into the Hydrological System
- Flood forecast centres
- Regional public administration
- Local public administration
- Other

n = 42

B04. Who is operator of this system?

- Public meteorological service
- Private meteorological service
- Flood forecasting centres
- Regional public administration
- Local public administration
- Other

n = 82

B05. From your personal point of view, please give a feedback:

- The warnings reach me: 51
- The warnings reach me on time: 32
- The warnings turn out to be correct: 63
- I see the need to improve early warning systems: 4

n = 74

B06. In your region and from your professional point of view: How can early warning systems improve?

- Accuracy of meteorological forecasts
- Hydrological forecasts for small water bodies
- Enhanced warning time
- New ways of distributing e.g., via social media
- Integration of other hazards: erosion / landslides
- Other

n = 74

C: ASSESSMENT AND MAPPING OF HEAVY RAIN RISKS

C01. Has your institution dealt with heavy rain risks?

<table>
<thead>
<tr>
<th>Option</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58</td>
<td>68</td>
</tr>
</tbody>
</table>

n = 126

C02. With the help of which analysis does your institution assess heavy rain risks?

<table>
<thead>
<tr>
<th>Analysis</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systematic documentation of heavy rain events</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk assessment based on historic data</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis of the topographic conditions</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis of precipitation data</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis of the drainage system</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis of the building structure and infrastucture</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modelling: development of hazard and risk maps</td>
<td>19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 58

C03. Which historic data for risk assessment has your institution analysed? (multiple answers possible)

- Rain measurements, time series
- Event database
- Press reports
- Questionnaires
- Other

n = 27

C04. Which analysis of topographic conditions (e.g., mapping of area depressions) has your institution done? (multiple answers possible)

- Identification of area depressions
- Identification of flood channels
- Identification of surface flow paths
- Identification of inflow from neighbouring areas (e.g., agricultural areas)

n = 95
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<table>
<thead>
<tr>
<th>C05. Please name other analyses of topographic conditions implemented by your institution:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C06. Which source of information did you use to analyse precipitation data (e.g. extreme value statistics)? (multiple answers possible)</td>
</tr>
<tr>
<td>Station data</td>
</tr>
<tr>
<td>Radar data</td>
</tr>
<tr>
<td>Satellite data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C07. Which data sets / model did you use?</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-lété průzkury na základě CH - límkov</td>
</tr>
<tr>
<td>jednoduše srážkovodový model</td>
</tr>
<tr>
<td>DesQ-MaxQ, MEC - HIPK</td>
</tr>
<tr>
<td>velkým dostupné - číselná apod.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C08. Which analysis of the drainage system (weak spots) has your institution done? (multiple answers possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapping of potential weak spots</td>
</tr>
<tr>
<td>List of potential weak points</td>
</tr>
<tr>
<td>Analyses of weak spots in the drainage system</td>
</tr>
<tr>
<td>Flow path analysis</td>
</tr>
<tr>
<td>Investigation of the run off behavior of sealed / unsealed surfaces</td>
</tr>
<tr>
<td>n = 23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C09. Please name other analyses of the drainage system implemented by your institution:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vybudování POLDRU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C10. Which analysis of the building structure and infrastructure has your institution done? (multiple answers possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of planned building areas based on hazard maps</td>
</tr>
<tr>
<td>Evaluation of land use/ adaptation options</td>
</tr>
<tr>
<td>Availability of free spaces (e.g. retention, sewage)</td>
</tr>
<tr>
<td>Investigation of the degree of sealed surfaces</td>
</tr>
<tr>
<td>Investigation of building density</td>
</tr>
<tr>
<td>n = 16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C12. Which modeling has your institution done to develop hazard and risk maps? (multiple answers possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIS analysis</td>
</tr>
<tr>
<td>2D-modeling</td>
</tr>
<tr>
<td>Drainage system dimensioning</td>
</tr>
<tr>
<td>Damage potential calculations</td>
</tr>
<tr>
<td>n = 12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C13. Please name other analyses to develop hazard and risk maps implemented by your institution:</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are not affected.</td>
</tr>
<tr>
<td>We have no experience with the topic so far.</td>
</tr>
<tr>
<td>There is no data available.</td>
</tr>
<tr>
<td>The political willingness is low.</td>
</tr>
<tr>
<td>We have no personnel resources.</td>
</tr>
<tr>
<td>We have no financial resources.</td>
</tr>
<tr>
<td>We don’t know any funding options.</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>n = 65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C14. If your institution has not conducted any heavy rain risk assessment (yet) - Why not? (multiple answers possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are not affected.</td>
</tr>
<tr>
<td>We have no experience with the topic so far.</td>
</tr>
<tr>
<td>There is no data available.</td>
</tr>
<tr>
<td>The political willingness is low.</td>
</tr>
<tr>
<td>We have no personnel resources.</td>
</tr>
<tr>
<td>We have no financial resources.</td>
</tr>
<tr>
<td>We don’t know any funding options.</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>n = 65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C15. In your personal opinion, what would you need for a heavy rain risk assessment or mapping? (multiple answers possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information / know-how on heavy rain in general</td>
</tr>
<tr>
<td>Information about methodologies for heavy rain risk assessment and mapping</td>
</tr>
<tr>
<td>Statistics on precipitation / past heavy rain events</td>
</tr>
<tr>
<td>Climate change projections / model data</td>
</tr>
<tr>
<td>Data on land use, settlement structures, sewage system capacities</td>
</tr>
<tr>
<td>Digital elevation model</td>
</tr>
<tr>
<td>Financial resources for data acquisition or experts / studies</td>
</tr>
<tr>
<td>Political awareness of the topic</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>průzkum terénu a vyhodnocení</td>
</tr>
<tr>
<td>Sbírání bodů</td>
</tr>
<tr>
<td>Preventive III</td>
</tr>
</tbody>
</table>

| n = 68 |
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D: MEASURES TO MITIGATE HEAVY RAIN RISKS

D01. Has your institution planned or implemented measures which can prevent or reduce damages of heavy rain events?

- Yes
- No

n = 126

D02. Which measures to reduce heavy rain risks has your institution planned or implemented? (multiple answers possible)

- Integrated risk management planning process
- Preventive measures in a built environment / urban area
  - Preventive measures outside of settlement structures
  - Information to stakeholders / public relations
- Technical protection measures
- Emergency response and protection
- Alternance measures
- No measures implemented or planned

n = 76

D03. Which of the following stakeholders are included in the integrated risk management planning process in your institution? (multiple answers possible)

- Spatial planning
- Water management
- Environmental planning, nature...
- Agriculture
- Infrastructure service providers, architects
- Emergency management
- Other

n = 27

D04. Please specify implemented or planned preventive measures in a built environment / urban area

- Avoiding of surface sealing
- Decentralized rainwater management: increase infiltration areas / basins / ditches
- Decentralized rainwater management: multifunctional areas, e.g. systematically flooded
- Optimized sewage system
- Flow paths are kept clear according to planning law
- Ban of / restrictions for buildings in risk areas
- Road drainage is adjusted to heavy rain events

n = 27

D05. Which other preventive measures in a built environment / urban area has your institution planned or implemented? *

* See last page

D06. Please specify implemented or planned preventive measures outside of settlement structures!

- Heavy rain is considered in regional planning / development plans
- Flow path are kept free
- Retention areas are planned
- Agricultural measures to reduce surface runoff
- Measures improving soil stabilization, e.g. reforestation
- Road drainage is adjusted for heavy rain events
- Adaptation of land use

n = 30

D07. Which other preventive measures outside of settlement structures has your institution planned or implemented

- Pouze níže
- nikoli

D08. Please specify implemented or planned activities regarding public relations / raising awareness of stakeholders and public:

- Information within the administration
- Information of political representatives
- Information campaigns for the public, private house owners
- Information campaigns for the local economy, farmers
- Round tables e.g. with private stakeholders

n = 7

D09. Other activities regarding publicity, raising awareness of stakeholders and public:
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D10. Which information was or will be provided? (multiple answers possible)
- Available risk assessment, studies etc.
- Hazard and risk maps
- Information about preventive measures
- Information about technical protection measures
- Information on risk adapted behaviour, emergency measures
- Campaigns on natural hazards
- Other

D11. How was the information provided? (multiple answers possible)
- Public hearings, information events, podium discussions etc.
- Distribution of flyers and other printed information material
- Online information
- Press releases
- Other

D12. Please specify implemented or planned technical protection measures!
- On building level, e.g. elevation of entrances, flood gates for underground garages
- Rainwater storage facilities (e.g. basins, ponds)
- Walls / dikes

D14. Please specify implemented or planned activities regarding emergency response and protection measures!
- Emergency management plan
  (for extreme events in general)
- Emergency management plan explicitly for heavy rain events
- Emergency management plan without consideration for heavy rain events
- Surveillance of rainfall points / critical infrastructure
- Involvement of all relevant stakeholders, administrations, enterprises, etc. in the alarm and emergency planning

D15. Which other activities regarding emergency response and protection measures has your institution planned or implemented?
- In městy je vybudovaný varovny protipovodňový systém včasného hlásení – sláškům je "místní rozhlas"

D16. Are you prepared for aftercare in your institution or region?
- Aftercare plan for event-based waste, sandbags, etc.
- Aftercare plan for oil leakage
- Aftercare plan for power failures

D17. Which other aftercare measures has your institution or your region planned or implemented?

D18. Please assess the categories of activities according to your personal and professional opinion! Which measures do you personally think are the most effective ones?
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D19. If your institution or region has not implemented any measures (yet), why not? (multiple answers possible)

- We have no experience with the topic so far.
- The political willingness is low.
- We have no staff resources.
- We have no financial resources.
- We don’t know any funding options.
- Hazard analysis and risk assessment is missing for our region.
- Other

n = 40

Other:
- zatím nebyl s původními sníženími proběh
- něj poslední opatření
- absence legislativní opory
- otázka není relevantní

D20. In your personal opinion, what would help your institution to implement (further) measures to reduce heavy rain risks?

Information / know-how on heavy rain in general
77
Guidance on the selection of measures
71
More political acceptance and willingness to react to heavy rain risks
44
More employees
22
More financial capacities
81
Information on funding options
52

n = 116

E: DEMANDS, WISHES

E01. Which kind of support and materials would you personally want / need for your institution or region? (multiple answers possible)

Printed information material (flyers, brochures) on heavy rain risks for different target groups
33
Online information material
45
Information / guidance on how to establish a heavy rain risk management process (e.g.,)
41
Guidance and methodology for the assessment and mapping of heavy rain risks
43
List / catalogue of available heavy rain risk reduction measures
47
Guidance on adapting my emergency planning to heavy rain risks
39
Workshop/seminar or training on heavy rain risk management
23
Information on financing or funding options for the implementation of measures
57

n = 112

D21. What else would help you to implement (further) measures to reduce heavy rain risks?

- zahrnut do povědomích plánů
- Chyby legislativy.

E02. Other support and additional materials you personally want or need:*

* see last page
D05. Which other preventive measures in a built environment / urban area has your institution planned or implemented?
- Proprietovaly val in sevemnast clís obce

- Nutně znamená a provedeno opatření, výzvu jsme zaslal kompetentním vedoucím odborům kolegáni a kolegyně. Zaslali vám v případě právního dopingu. Nemusíte ho číst celý, ale můžete, stáči pouze první dvě odstavce. Vzhledem k tomu, že tuto tematiku také měli ve svých gscích, zejména OZP, žádat vás o zasílání podkladů, vašich petičních takto: - Kde v našem městě a přiřučných obcích máme oblast, kde se vyskytují přívalové deště a bleskové povodně (potrubí nebo doplňit) - namátku mne napadá - od shromažďování všechny oblasti až k rece - Dům potrubí od lesa až k rece - Ullice Rámy při vlnném náměstí (i když) po těch úpravách tam asi už jen zeměn povětří
- V našem městě a přiřučných obcích máme oblast, kde se vyskytují přívalové deště a bleskové povodně (potrubí nebo doplňit) - namátku mne napadá - od shromažďování všechny oblasti až k rece - Dům potrubí od lesa až k rece - Ullice Rámy při vlnném náměstí (i když) po těch úpravách tam asi už jen zeměn povětří

E02. Other support and additional materials you personally want or need:
- V našem případě je třeba požadovat od plastůk přiřučných pozemků vodoteče včasné odstranění cíleným brání průtoku a správy povodí dávati takto množství finančních prostředků, aby pravidelně čistili taky. Voda přirozeně odteče a nehmotadí se ve zůstanech místech v obci i nad.
- Obc Těměšáv pošli měri nejvýší místa v JC, ale jednou za čas nás přivádějí srásky opravu překryvů.
- FINANČNÍ PROSTŘEDKY
- Většinou je to samozřejmě máme sprovozoval krajový plán OIP, Povodňový plán OIP a města, a poté zveřejňovaly ochranné aktuální věci, metodiky pro postup občanů při ochraně svých objektů apod.,
- Chcete toto rozporumoven, zpracovat, připravit opatření - nejlepší pomoci na místo za Wačíci azy ped.
- Osvědčili jsme kompetentní vedoucí odborů o zasílání konkrétních údajů:

- Kolegáni a kolegyně, Zaslali vám v případě právního dopingu. Nemusíte ho číst celý, ale můžete, stáči pouze první dvě odstavce. Vzhledem k tomu, že tuto tematiku také měli ve svých gscích, zejména OZP, žádat vás o zasílání podkladů, vašich petičních takto: - Kde v našem městě a přiřučných obcích máme oblast, kde se vyskytují přívalové deště a bleskové povodně (potrubí nebo doplňit) - namátku mne napadá - od shromažďování všechny oblasti až k rece - Dům potrubí od lesa až k rece - Ullice Rámy při vlnném náměstí (i když) po těch úpravách tam asi už jen zeměn povětří
- V našem městě a přiřučných obcích máme oblast, kde se vyskytují přívalové deště a bleskové povodně (potrubí nebo doplňit) - namátku mne napadá - od shromažďování všechny oblasti až k rece - Dům potrubí od lesa až k rece - Ullice Rámy při vlnném náměstí (i když) po těch úpravách tam asi už jen zeměn povětří
- Tvrda ulice od shera přes náměstí Mír
- Odporově zpravodajstvím a požádání vzniklo další pokračování zásadního problému.

- Doplňte zpravodajstvím a požádání zásadního problému.
- Doplňte zpravodajstvím a požádání zásadního problému.
- Doplňte zpravodajstvím a požádání zásadního problému.
7.3. Survey results in Croatia

**PI01. Which type of institution are you working for?**
- Local public administration or local government: 7%
- Regional public administration: 9%
- Research institute / University: 4%
- Association: 11%
- Private Sector: 11%
- Other: 3%

**PI03. Region**
- Zagreb: 17%
- Istria: 17
- Primorsko-goranska županija: 17
- Zasavacka županija: 17
- Otok: 17
- Other: 17

**PI05. Which area of expertise are you working in?**
- Spatial planning: 0%
- Urban planning, building permissions: 4%
- Environmental planning, nature preservation: 0%
- Water management, flood risk management: 4%
- Technical infrastructure, architecture: 11
- Risk prevention, emergency management: 0%
- Meteorology, weather forecast: 0%
- Agriculture: 0%
- Other: 9%

**A: EXPERIENCES WITH HEAVY RAIN**

**A01. Did heavy rain events occur in your region?**
- Yes: 33%
- No: 67%

**A02. Which consequences of heavy rain events have you experienced?**
- Damages caused by flooding: 14
- Other: 10

**A03. Which consequences of heavy rain events have you experienced?**
- Damages caused by mass movement (e.g. landslides, rockfall): 10

**A04. From your personal point of view, please give a feedback:**
- Are you concerned about the general consequences of climate change? (Yes, No)
- Do you think the risks of heavy rain events will increase in the future? (Yes, No)
- Do you think preventive measures for heavy rain are mainly the responsibility of private house owners? (Yes, No)
- Are more activities by public authorities needed to prevent damages from heavy rain events? (Yes, No)
Online survey on heavy rain risk management in pilot / partner regions

B: PRACTICAL USE OF EARLY WARNING SYSTEMS

B01. Do you know an early warning system for extreme events like heavy rain?

- Yes
- No
- I don’t know

<table>
<thead>
<tr>
<th></th>
<th>n = 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>5</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
</tr>
<tr>
<td>I don’t know</td>
<td>22</td>
</tr>
</tbody>
</table>

B02. How does information about an upcoming heavy rain event reach you?

- Official warnings by meteorological services (e.g. weather forecast)
- Official warnings by hydrological services (e.g. flood warning)
- Media (e.g. TV news, radio)
- Social media (e.g. Twitter, Facebook)
- I don’t know

<table>
<thead>
<tr>
<th></th>
<th>n = 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official warnings</td>
<td>10</td>
</tr>
<tr>
<td>by meteorological</td>
<td></td>
</tr>
<tr>
<td>services</td>
<td></td>
</tr>
<tr>
<td>Official warnings</td>
<td>5</td>
</tr>
<tr>
<td>by hydrological</td>
<td></td>
</tr>
<tr>
<td>services</td>
<td></td>
</tr>
<tr>
<td>Media</td>
<td>0</td>
</tr>
<tr>
<td>Social media</td>
<td>0</td>
</tr>
<tr>
<td>I don’t know</td>
<td>0</td>
</tr>
</tbody>
</table>

B03. What is the name of the early warning system?

- meteoralarm
- nema neko postojeću tim, ali uskoro pojavljivost u oblasti za povratne krakodražnje je istina, oni se uključuju u efikasne obaveze za opuštanje bregova voda
- meteoralarm
- Glavni i povredbeni plan obrane od povratke, a prohodnost Dologa a putem obavijesti radečih službi Hrvatskih voda putem e-maila
- I don’t know

B04. Who is operator of this system?

- Public meteorological service
- Private meteorological service
- Flood forecasting centres
- Regional public administration
- Local public administration
- Other

<table>
<thead>
<tr>
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<td>service</td>
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<tr>
<td>centres</td>
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<tr>
<td>administration</td>
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<td>Local public</td>
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<td>administration</td>
<td></td>
</tr>
<tr>
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</tbody>
</table>

B05. From your personal point of view, please give a feedback:

- The warnings reach me:
  - I agree
  - I partly agree
  - I mainly disagree
  - I disagree

- The warnings reach me on time:
  - I agree
  - I partly agree
  - I mainly disagree
  - I disagree

- The warnings turn out to be correct:
  - I agree
  - I partly agree
  - I mainly disagree
  - I disagree

- I see the need to improve early warning systems:
  - I agree
  - I partly agree
  - I mainly disagree
  - I disagree

B06. In your region and from your professional point of view: How can early warning systems improve?

- Accuracy of meteorological forecasts
- Hydrological forecasts for small rivers
- Enhanced warning time
- New ways of distribution
- Integration of other hazards
- I don’t know

<table>
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</table>

C: ASSESSMENT AND MAPPING OF HEAVY RAIN RISKS

C01. Has your institution dealt with heavy rain risks?

- Yes
- No

<table>
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</thead>
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<tr>
<td>No</td>
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C02. With the help of which analysis does your institution assess heavy rain risks (multiple answers possible)?

<table>
<thead>
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<tbody>
<tr>
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<td>8</td>
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<tr>
<td>Risk assessment based on historic data</td>
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</tr>
<tr>
<td>Analysis of the topographic conditions</td>
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</tr>
<tr>
<td>Analysis of precipitation data</td>
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<tr>
<td>Analysis of the drainage system</td>
<td>3</td>
</tr>
<tr>
<td>Analysis of the building structure and infrastructure</td>
<td>7</td>
</tr>
<tr>
<td>Modelling: development of hazard and risk maps</td>
<td>3</td>
</tr>
</tbody>
</table>

C03. Which historic data for risk assessment has your institution analysed? (multiple answers possible)

- Rain measurements, time series
- Event database
- Press reports
- Questionnaires
- I don’t know

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Rain measurements</td>
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<td>time series</td>
<td></td>
</tr>
<tr>
<td>Event database</td>
<td>4</td>
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<tr>
<td>Press reports</td>
<td>0</td>
</tr>
<tr>
<td>Questionnaires</td>
<td>0</td>
</tr>
<tr>
<td>I don’t know</td>
<td>0</td>
</tr>
</tbody>
</table>

C04. Which analysis of topographic conditions (e.g. mapping of area depressions) has your institution done? (multiple answers possible)

- Identification of area depressions
- Identification of flood channels
- Identification of surface flow paths
- Identification of inflow from neighboring areas

<table>
<thead>
<tr>
<th></th>
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</thead>
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<td>surface flow paths</td>
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<td>0</td>
</tr>
<tr>
<td>inflow from</td>
<td></td>
</tr>
<tr>
<td>neighboring areas</td>
<td></td>
</tr>
<tr>
<td>(e.g. agricultural)</td>
<td></td>
</tr>
</tbody>
</table>
C05. Please name other analyses of topographic conditions implemented by your institution:
- dodatna detaljna snimanja terena

C06. Which source of information did you use to analyse precipitation data (e.g. extreme value statistics)? (multiple answers possible)

- Station data
- Radar data
- Satellite data

n = 8

C07. Which data sets / model did you use?
- statistička obrada nizova oborina s postaja trajanja 30 godina i više
- Obrađene hidrološke podatke unutar različitih službi Hrvatskih voda, postoječa (starome) projektna dokumentacija, stare studije
- Baza DHVZ-a
- ALADIN, HEC-RMS
- HWP, reanalyse, globalni i regionalni klimatski modeli.

C08. Which analysis of the drainage system (weak spots) has your institution done? (multiple answers possible)

Mapping of potential weak spots
List of potential weak points
Analyses of weak spots in the drainage system
Flow path analysis
Investigation of the run off behavior of sealed / unsealed surfaces

n = 4

C09. Please name other analyses of the drainage system implemented by your institution:
- korištenje zemljišta, utjecaj na prostorno planiranje
- Uređeće sam se bavio (više teorijski) kartama opasnosti i rizika od geohazarda i poplavnih tokova.

C10. Which analysis of the building structure and infrastructure has your institution done? (multiple answers possible)

Review of planned building areas based on hazard maps
Evaluation of land use / adaptation options
Availability of free spaces (e.g. retention, seepage)
Investigation of the degree of sealed surfaces
Investigation of building density

n = 3

C12. Which modelling has your institution done to develop hazard and risk maps? (multiple answers possible)

- GIS analysis
- 2D modeling
- Drainage system dimensioning
- Damage potential calculations

n = 6

C13. Please name other analyses to develop hazard and risk maps implemented by your institution:
- korijenje zemljišta, utjecaj na prostorno planiranje

C14. If your institution has not conducted any heavy rain risk assessment (yet) - Why not? (multiple answers possible)

We are not affected.
We have no experience with the topic so...
There is no data available.
The political willingness is low.
We have no personnel resources.
We have no financial resources.
We don’t know any funding options.
Other

n = 20

C15. In your personal opinion, what would you need for a heavy rain risk assessment or mapping? (multiple answers possible)

Information / know-how on heavy rain in general
Information about methodologies for heavy rain risk assessment and mapping
Statistics on precipitation / past heavy rain events
Climate change projections / model data
Data on land use, settlement structures, sewage system capacities
Digital elevation model
Financial resources for data acquisition or experts / studies
Political awareness of the topic

n = 20

Other

- Detaljnije praćenje oborina radarima i uz niz novih obnovljivih izvora na širjem području Zagreba. Sama 3 emisija je premalo za Grad Zagreb.
- Od svega ponalo prethodno navedeno
Online survey on heavy rain risk management in pilot / partner regions

D: MEASURES TO MITIGATE HEAVY RAIN RISKS

D01. Has your institution planned or implemented measures which can prevent or reduce damages of heavy rain events?

- Yes: 15
- No: 20

n = 35

D02. Which measures to reduce heavy rain risks has your institution planned or implemented? (multiple answers possible)

- Integrated risk management planning process: 9
- Preventive measures in a built environment / urban area: 7
- Preventive measures outside of settlement structures: 8
- Information to stakeholders / public relations: 5
- Technical protection measures: 14
- Emergency response and protection: 3
- Aftercare measures: 8
- No measures implemented or planned: 0

n = 17

D03. Which of the following stakeholders are included in the integrated risk management planning process in your institution? (multiple answers possible)

- Spatial planning: 6
- Water management: 8
- Environmental planning, nature preservation: 6
- Agriculture: 1
- Infrastructure service providers, architects: 4
- Emergency management: 7
- Other: 0

n = 9

D04. Please specify implemented or planned preventive measures in a built environment / urban area!

- Avoiding of surface sealing: 3
- Decentralized rainwater management: increase infiltration areas / basins /...: 2
- Decentralized rainwater management: multifunctional areas, e.g.: 1
- Optimized sewage system: 5
- Flow paths are kept clear according to planning law: 1
- Ban of / restrictions for buildings in risk areas: 3
- Road drainage is adjusted to heavy rain events: 2

D05. Which other preventive measures in a built environment / urban area has your Institution planned or implemented?

- IGZgradnja retenica za regulaciju vrtih oborinskih otjecanja, stimulacija infiltracija oborinskih voda što bi se izbjeglo rastezanje vodnih valova.
- IGZgradnja većih retenica za prihvat većih vodnih valova. Otkrivanje površina za ploštu i potrebu za regulaciju vodnih valova.
- IGZupoznavanje javnosti sa učinkovitim održavanjem te retenicama jer je stanovništvo u čijoj se oblasti planira uključiti u održavanje retenicama.
- IGZWater sensitive urban design schemes.

D06. Please specify implemented or planned preventive measures outside of settlement structures!

- Heavy rain is considered in regional planning / development plans: 2
- Flow path are kept free: 4
- Retention areas are planned: 2
- Agricultural measures to reduce surface runoff: 5
- Measures improving soil stabilization, e.g. reforestation: 3
- Road drainage is adjusted for heavy rain events: 2
- Adaptation of land use: 2

D07. Which other preventive measures outside of settlement structures has your institution planned or implemented?

- IGZGradnja višenamjenskih sustava za prihvat oborinskih voda i njihovo korištenje u poljoprivredi. Veći stupanj infiltracije oborinskih voda što bi se izbjeglo rastezanje vodnih valova.
- IGZVeća agnamsju na reguliranje bujica, vodnih tokova, zaštita od erozije, (izrade kratek razmješta kritičnih područja i održavanje potreban i smanjavanje ulaganja na tom području te prilikom izvršenja radova veće el inse, definirati pravilnik ili propisov povratne period za dimenzioniranje vodotokova.

D08. Please specify implemented or planned activities regarding public relations / raising awareness of stakeholders and public!

- Information within the administration: 2
- Information of political representatives: 2
- Information campaigns for the public, private house owners: 2
- Information campaigns for the local economy, farmers: 2
- Round tables e.g. with private stakeholders: 1

D09. Other activities regarding publicity, raising awareness of stakeholders and public:

- IGZUpoznavanje javnosti putem medija, predavanjima, okruglim stolovima o provedenim radovima na oblasti i podneti programi za smanjenje naknada, te planiranim budućim aktivnostima na oblasti i podneti.
D10. Which information was or will be provided? (multiple answers possible)

- Available risk assessment, studies etc. 4
- Hazard and risk maps 4
- Information about preventive measures 3
- Information about technical protection measures 4
- Information on risk adapted behaviour, emergency measures 4
- Campaigns on natural hazards 4
- Other: 1

n = 5

D11. How was the information provided? (multiple answers possible)

- Public hearings, information events, podium discussions etc. 4
- Information on display in town hall 2
- Press releases 4
- Distribution of flyers and other printed information material 2
- Online information 5
- Other: 1

n = 5

D12. Please specify implemented or planned technical protection measures!

- On building level, e.g. elevation of entrances, flood gates for underground garages
  - Measures implemented: 3
  - Measures planned: 4
  - Neither implemented nor planned: 5
  - I don’t know: 1
  n = 12

- Rainwater storage facilities (e.g. basins, ponds)
  - Measures implemented: 4
  - Measures planned: 5
  - Neither implemented nor planned: 2
  - I don’t know: 1
  n = 12

- Walls / dikes
  - Measures implemented: 5
  - Measures planned: 7
  - Neither implemented nor planned: 1
  - I don’t know: 1
  n = 13

D13. Which other technical protection measures has your institution planned or implemented?

- stožeri CZ, odluke i donošenje mjera
  - retencione prostore, lateralski kanali
  - Bavimo se utjecajem na objekte visokogradnje, posebno velikih krovnih površina
  - izgradnja retencija, akumulacija, oteretnih kanala, regulacije

D14. Please specify implemented or planned activities regarding emergency response and protection measures!

- Emergency management plan? (for extreme events in general?)
  - Measures implemented: 6
  - Measures planned: 10
  - Neither implemented nor planned: 2
  - I don’t know: 3
  n = 13

- Emergency management plan explicitly for heavy rain events
  - Measures implemented: 4
  - Measures planned: 1
  - Neither implemented nor planned: 3
  - I don’t know: 4
  n = 8

- Surveillance of relevant points / critical infrastructure
  - Measures implemented: 1
  - Measures planned: 2
  - Neither implemented nor planned: 4
  - I don’t know: 1
  n = 10

- Involvement of all relevant stakeholders, administrations, enterprises, etc. in the alarm and emergency planning
  - Measures implemented: 5
  - Measures planned: 2
  - Neither implemented nor planned: 3
  - I don’t know: 1
  n = 10

D15. Which other activities regarding emergency response and protection measures has your institution planned or implemented?

- stožeri CZ, odluke i donošenje mjera

D16. Are you prepared for aftercare in your institution or region?

- Aftercare plan for event-based waste, sandbags, etc.
  - Measures available: 1
  - Measures planned: 0
  - Neither available nor planned: 2
  - I don’t know: 1
  n = 2

- Aftercare plan for oil leakage
  - Measures available: 2
  - Measures planned: 0
  - Neither available nor planned: 1
  - I don’t know: 1
  n = 3

- Aftercare plan for power failures
  - Measures available: 1
  - Measures planned: 0
  - Neither available nor planned: 1
  - I don’t know: 1
  n = 2

D17. Which other aftercare measures has your institution or your region planned or implemented?

- spremnost za prijem značajnijih dijela tereta onećiranja u obronkim vodama

D18. Please assess the categories of activities according to your personal and professional opinion! Which measures do you personally think are the most effective ones?

- Preventive measures in a built environment / urban area
  - Measures implemented: 16
  - Measures planned: 10
  - Neither implemented nor planned: 2
  - I don’t know: 0
  n = 18

- Preventive measures outside of settlement structures
  - Measures implemented: 15
  - Measures planned: 11
  - Neither implemented nor planned: 1
  - I don’t know: 0
  n = 18

- Public relations / Increase of risk awareness
  - Measures implemented: 15
  - Measures planned: 10
  - Neither implemented nor planned: 3
  - I don’t know: 0
  n = 20

- Technical protection measures
  - Measures implemented: 16
  - Measures planned: 3
  - Neither implemented nor planned: 0
  - I don’t know: 1
  n = 18

- Emergency response and protection
  - Measures implemented: 15
  - Measures planned: 10
  - Neither implemented nor planned: 3
  - I don’t know: 0
  n = 18

- Measures for event aftercare
  - Measures implemented: 10
  - Measures planned: 7
  - Neither implemented nor planned: 0
  - I don’t know: 0
  n = 18
Online survey on heavy rain risk management in pilot / partner regions

D19. If your institution or region has not implemented any measures (yet), why not? (multiple answers possible)
- We have no experience with the topic so far.
- The political willingness is low.
- We have no staff resources.
- We have no financial resources.
- We don’t know any funding options.
- Hazard analysis and risk assessment is missing for our region.
- Other: Nisam upoznata.

n = 14

D20. In your personal opinion, what would help your institution to implement (further) measures to reduce heavy rain risks?
- Information / know-how on heavy rain in general
- Guidance on the selection of measures
- More political acceptance and willingness to react to heavy...
- More employees
- More financial capacities
- Information on funding options

n = 33

E: DEMANDS, WISHES

E01. Which kind of support and materials would you personally want or need for your institution or region? (multiple answers possible)
- Printed information material (flyers, brochures) on heavy rain risks for different target groups
- Online information material
- Information / guidance on how to establish a heavy rain risk-management process (e.g. checklist)
- Guidance and methodology for the assessment and mapping of heavy rain risks
- List / catalogue of available heavy rain risk reduction measures
- Guidance on adapting emergency planning to heavy rain risks
- Workshops/seminars or training on heavy rain risk management
- Information on financing or funding options for the implementation of measures

n = 34

E02. Other support and additional materials you personally want or need:
- Dostupne informacije o oborinama, tlu, vodostajnima i protocima, topografiji, klimi, bez dodatnog placanja
- Školanje, usk specializaciju, ne svaštaranje (obavljaju više vrsta poslova), praćenje svjetskih trendova i noviteta u tom području te razmatranje mogućnosti njihove primjene u našim uslovima
- Problematiku postaviti na nacionalnu razinu, u strateške dokumente računskih sektora
7.4. Survey results in Germany

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**Figure 7.4.1:** Survey results in Germany

**Figure 7.4.2:** Survey results in Germany

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**A03.** Which consequences of heavy rain events have you experienced? Damages caused by mass movement (e.g., landslides, rockfall)...

- **On urban infrastructure (e.g., streets, underground garages or passageways, bridges):**
  - Yes: 63
  - No: 3

- **On public buildings:**
  - Yes: 43
  - No: 4

- **On private buildings (e.g., flooded cellars):**
  - Yes: 49
  - No: 38

- **On cultivated land (e.g., fields, forests, green land):**
  - Yes: 34
  - No: 27

---

**A04.** From your personal point of view, please give a feedback:

- **Are you concerned about the general consequences of climate change?**
  - Yes: 21
  - No: 46

- **Do you think the risks of heavy rain events will increase in the future?**
  - Yes: 42
  - No: 37

- **Do you think preventive measures for heavy rain are mainly the responsibility of private house owners?**
  - Yes: 22
  - No: 29

- **Are more activities by public authorities needed to prevent damages from heavy rain events?**
  - Yes: 31
  - No: 47
  - I don’t know: 6

---

**PI05.** Which area of expertise are you working in? (multiple answers possible)

- Spatial planning: 6
- Urban planning, building permissions: 16
- Environmental planning, nature protection: 7
- Water management, flood risk: 23
- Technical infrastructure, architecture: 7
- Risk prevention, emergency management: 19
- Meteorology, weather forecast: 0
- Agriculture: 1
- Other: 30

---

**A01.** Did heavy rain events occur in your region?

- Yes: 83
- No: 0

---

**A02.** Which consequences of heavy rain events have you experienced? Damages caused by flooding...

- On urban infrastructure (e.g., streets, underground garages or passageways, bridges):
  - Yes: 77
  - No: 10

- On public buildings:
  - Yes: 43
  - No: 10

- On private buildings (e.g., flooded cellars):
  - Yes: 72
  - No: 6

- On cultivated land (e.g., fields, forests, green land):
  - Yes: 66
  - No: 8

---

**PI01.** Which type of institution are you working for?

- Local public administration or local government: 1
- Regional public administration: 2
- Research institute / University: 4
- Association: 5
- Private Sector: 36
- Other: 1
  - Hilfsorganisation/Zivilschutz: 2
  - Verkehrsberater einer Freiwilligen Feuerwehr: 1
  - ...
Online survey on heavy rain risk management in pilot / partner regions

B: PRACTICAL USE OF EARLY WARNING SYSTEMS

B01. Do you know an early warning system for extreme events like heavy rain?

- Yes: 12
- No: 28
- I don't know: 43

n = 83

B02. How does information about an upcoming heavy rain event reach you?

- Official warnings by meteorological services (e.g. weather forecast): 0
- Official warnings by hydrological services (e.g. flood warning): 38
- Media (e.g. TV news, radio): 28
- Social media (e.g. Twitter, Facebook): 7

n = 43

B03. What is the name of the early warning system?

- Hochwasserwarnung des Landes Sachsen: 12
- Hochwasserfrühwarnsystem: 12
- Hochwasserwarnzentrum: 2

n = 34

B04. Who is operator of this system?

- Public meteorological service: 1
- Private meteorological service: 1
- Flood forecasting centres: 4
- Regional public administration: 4
- Local public administration: 2
- Other: 5

n = 42

B05. From your personal point of view, please give a feedback:

- The warnings reach me: 31
- The warnings reach me on time: 27
- The warnings turn out to be correct: 12
- I see the need to improve early warning systems: 17

n = 43

B06. In your region and from your professional point of view: How can early warning systems improve?

- Accuracy of meteorological forecasts: 10
- Hydrological forecasts for small water bodies: 27
- Enhanced warning time: 20
- New ways of distribution (e.g. via social media): 13
- Integration of other hazards: 13
- Erosion / landslides: 3

n = 40

C: ASSESSMENT AND MAPPING OF HEAVY RAIN RISKS

C01. Has your institution dealt with heavy rain risks?

- Yes: 20
- No: 63

n = 83

C02. With the help of which analysis does your institution assess heavy rain risks?

- Systematic documentation of heavy rain events: 11
- Analysis of the topographic conditions: 16
- Analysis of precipitation data: 17
- Analysis of the drainage system: 17
- Analysis of the building structure and infrastructure: 29
- Modelling: development of hazard and risk maps: 8

n = 52

C03. Which historic data for risk assessment has your institution analysed? (multiple answers possible)

- Rain measurements, time series: 7
- Event database: 6
- Press reports: 6
- Questionnaires: 2
- Other: 3

n = 13

C04. Which analysis of topographic conditions (e.g. mapping of area depressions) has your institution done? (multiple answers possible)

- Identification of area depressions: 11
- Identification of flood channels: 9
- Identification of surface flow paths: 1
- Identification of water from neighbouring areas (e.g. agricultural areas): 9

n = 29
C05. Please name other analyses of topographic conditions implemented by your institution:
- Vor-Ort-Begehung im Rahmen der Ausbildung der Zivilschutzbeamter
- NWAP
- Sichtung vorhandener digitaler Kartenbestände zu erosionsgefährdeten Hanglagen (z.B. Regionalplan: Klasse "Gebiet mit potentiell großer Erosionsgefährdung durch Wasser")
- Entstehen im Gewässerschutz durch z.B. Bauwerke wie Ufermauern, Brücken, Bebauung
- Befragung und Auswertung nach Befragung
- Vermessung

C06. Which source of information did you use to analyse precipitation data (e.g. extreme value statistics)? (multiple answers possible)

<table>
<thead>
<tr>
<th>Source</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Station data</td>
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<tr>
<td>Radar data</td>
<td>3</td>
</tr>
<tr>
<td>Satellite data</td>
<td>2</td>
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</tbody>
</table>

C07. Which data sets / model did you use?
- DGN2, HydroAS

C08. Which analysis of the drainage system (weak spots) has your institution done? (multiple answers possible)

<table>
<thead>
<tr>
<th>Analysis</th>
<th>n = 27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapping of potential weak spots</td>
<td>13</td>
</tr>
<tr>
<td>List of potential weak points</td>
<td>10</td>
</tr>
<tr>
<td>Analyses of weak spots in the drainage system</td>
<td>17</td>
</tr>
<tr>
<td>Flow path analysis</td>
<td>15</td>
</tr>
<tr>
<td>Investigation of the run off behavior of sealed / unssealed surfaces</td>
<td>13</td>
</tr>
</tbody>
</table>

C09. Please name other analyses of the drainage system implemented by your institution:
- Analyse der Pflegemaßnahmen an Anpassungen an herrschende Bedingungen
- Hydraulische Berechnung Kanalnetzbetreuend
- Hydrodynamische Berechnungen
- Gewässerschäden

C10. Which analysis of the building structure and infrastructure has your institution done? (multiple answers possible)

<table>
<thead>
<tr>
<th>Analysis</th>
<th>n = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of planned building areas based on hazard maps</td>
<td>4</td>
</tr>
<tr>
<td>Evaluation of land use / adaptation options</td>
<td>6</td>
</tr>
<tr>
<td>Availability of free spaces (e.g. retention, sewage)</td>
<td>6</td>
</tr>
<tr>
<td>Investigation of the degree of sealed surfaces</td>
<td>8</td>
</tr>
<tr>
<td>Investigation of building density</td>
<td>2</td>
</tr>
</tbody>
</table>

C11. Please name other analysis of the building structure and infrastructure implemented by your institution:
- Anpassung Flächennutzungsplanung, Prüfung Bebauungspläne auf Anpassungsbedarf

C12. Which modeling has your institution done to develop hazard and risk maps? (multiple answers possible)

<table>
<thead>
<tr>
<th>Modeling</th>
<th>n = 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIS analysis</td>
<td>4</td>
</tr>
<tr>
<td>2D-modeling</td>
<td>4</td>
</tr>
</tbody>
</table>

C13. Please name other analyses to develop hazard and risk maps implemented by your institution:
- Anwendung vorhandener Daten des LTULG für raumplanerische Festlegungen
- Modellierungen in bzw. mit Ingenieurbüros, teilweise 3D

C14. If your institution has not conducted any heavy rain risk assessment (yet) - Why not? (multiple answers possible)

<table>
<thead>
<tr>
<th>Reason</th>
<th>n = 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are not affected</td>
<td>2</td>
</tr>
<tr>
<td>We have no experience with the topic so far.</td>
<td>6</td>
</tr>
<tr>
<td>There is no data available</td>
<td>6</td>
</tr>
<tr>
<td>The political willingness is low</td>
<td>4</td>
</tr>
<tr>
<td>We have no personnel resources</td>
<td>14</td>
</tr>
<tr>
<td>We have no financial resources</td>
<td>12</td>
</tr>
<tr>
<td>We don't know any funding options</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>

C15. In your personal opinion, what would you need for a heavy rain risk assessment or mapping? (multiple answers possible)

<table>
<thead>
<tr>
<th>Resource</th>
<th>n = 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information / know-how on heavy rain</td>
<td>12</td>
</tr>
<tr>
<td>Information about methodologies for heavy rain</td>
<td>13</td>
</tr>
<tr>
<td>Statistics on precipitation / past heavy rain</td>
<td>13</td>
</tr>
<tr>
<td>Climate change projections / model data</td>
<td>8</td>
</tr>
<tr>
<td>Data on land use, settlement structures</td>
<td>8</td>
</tr>
<tr>
<td>Digital elevation model</td>
<td>12</td>
</tr>
<tr>
<td>Financial resources for data acquisition</td>
<td>17</td>
</tr>
<tr>
<td>Political awareness of the topic</td>
<td>12</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>

C16. If you are interested in government funding, have you applied for any funding according to the above criteria? (multiple answers possible)

<table>
<thead>
<tr>
<th>Answer</th>
<th>n = 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>14</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
</tr>
</tbody>
</table>

C17. If you are interested in government funding, have you applied for any funding according to the above criteria? (multiple answers possible)

<table>
<thead>
<tr>
<th>Answer</th>
<th>n = 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>14</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
</tr>
</tbody>
</table>

C18. If you are interested in government funding, have you applied for any funding according to the above criteria? (multiple answers possible)

<table>
<thead>
<tr>
<th>Answer</th>
<th>n = 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>14</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
</tr>
</tbody>
</table>
Online survey on heavy rain risk management in pilot / partner regions

D: MEASURES TO MITIGATE HEAVY RAIN RISKS

**D01. Has your institution planned or implemented measures which can prevent or reduce damages of heavy rain events?**

- Yes: 23
- No: 57

**D02. Which measures to reduce heavy rain risks has your institution planned or implemented? (multiple answers possible)**

- Integrated risk management planning: 18
- Preventive measures in a built environment / urban area: 17
- Preventive measures outside of settlement structures: 14
- Information to stakeholders / public relations: 16
- Technical protection measures: 17
- Emergency response and protection: 16
- Fire emergency measures: 16
- No measures implemented or planned: 7

**D03. Which of the following stakeholders are included in the integrated risk management planning process in your institution? (multiple answers possible)**

- Spatial planning: 15
- Water management: 15
- Environmental planning, nature preservation: 12
- Agriculture: 11
- Infrastructure service providers, architects: 11
- Emergency management: 11
- Other: 3

**D04. Please specify implemented or planned preventive measures in a built environment / urban area?**

- Avoiding of surface sealing: 11
- Decentralized rainwater management: 11
- Increase infiltration areas / basins / ditches: 11
- Decentralized rainwater management: 11
- Multifunctional areas, e.g. systematically floodable areas: 11
- Optimised sewage system: 11
- Flow paths are kept clear according to planning law: 11
- Ban of / restrictions for buildings in risk areas: 11
- Road drainage is adjusted to heavy rain events: 11

**D05. Which other preventive measures in a built environment / urban area has your institution planned or implemented?**

- Abbruch von Ufermauern / Anlegung von Böschungen: 5
- Erstellung HMsF für den Ortsteil Krebs: 5
- Entlastung von Bachläufen außerhalb der Ortschaft, Öffnung von Kanalnen zu Gräben, Regenrückhaltebecken gebaut: 5
- Versickerung von Niederschlagswasser aus privaten Grundstücken und neuen Erschließungsgebieten an Ort des Anfalls: 5
- Anpassung von Straßentopographie: 5
- Herstellung von Stauraumgräben: 5

**D06. Please specify implemented or planned preventive measures outside of settlement structures?**

- Heavy rain is considered in regional planning / development plans: 20
- Flow path are kept free: 21
- Retention areas are planned: 21
- Agricultural measures to reduce surface runoff: 22
- Measures improving soil stabilization, e.g. reforestation: 22
- Road drainage is adjusted for heavy rain events: 24
- Adaptation of land use: 22

**D07. Which other preventive measures outside of settlement structures has your institution planned or implemented?**

- Abstimmungsprozesse mit übergeordneten Behörden (bisher ohne Erfolg): 22

**D08. Please specify implemented or planned activities regarding public relations / raising awareness of stakeholders and public?**

- Information within the administration: 13
- Information of political representatives: 13
- Information campaigns for the public, private house owners: 14
- Information campaigns for the local economy, farmers: 13
- Round tables e.g. with private stakeholders: 12

**D09. Other activities regarding publicity, raising awareness of stakeholders and public?**

- Einführung Wasserwehr: 12
- Beteiligung im Verwaltungsverfahren: 12
- Anlassbezogene Bürgeranschriften: 12
- Beratung durch Bauamtsteilnehmer, insbesondere zu präventivem Hochwasserschutz: 12
- Informationveranstaltungen (insbesondere für Gewässerleiter) durch unabhängige Verbände, laufende Schulung / Arbeitnehmer: 12

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D10. Which information was or will be provided? (multiple answers possible)

- Available risk assessment, studies etc.
- Hazard and risk maps
- Information about preventive measures
- Information about technical protection measures
- Information on risk adapted behaviour, emergency measures
- Campaigns on natural hazards

n = 15

D11. How was the information provided? (multiple answers possible)

- Public hearings, information events, podium discussions etc.
- Information on display in town hall
- Press releases
- Distribution of flyers and other printed information material
- Online information
- Other

n = 15

D12. Please specify implemented or planned technical protection measures!

- On building level, e.g. elevation of entrances, flood gates for underground garages
- Rainwater storage facilities (e.g. basins, ponds)
- Walls / dikes

n = 25

D13. Which other technical protection measures has your institution planned or implemented?

- Rückgewinnung natürlicher Überflutungsflächen
- Wiederherstellung von Abflussgräben
- Anpassung von Infrastruktur (z.B. überflutbare Straßen)
- Ausrüstung der Wasserwehr
- Abriss von Gebäuden in Ufernähe
- technische Maßnahmen auf baulicher Ebene an Gebäuden und Infrastruktur
- Renaturierung von Flächen
- Optimierung des Abwasseretzes
- Vergrößerung von Kanälen, Durchlässen, Bachläufen und Gräben sowie Herstellung von Stauungsböcken

D14. Please specify implemented or planned activities regarding emergency response and protection measures!

- Emergency management plan (for extreme events in general)
- Emergency management plan explicitly for heavy rain events
- Emergency management plan without consideration for heavy rain events
- Surveillance of rainfall / points / critical infrastructure
- Involvement of all relevant stakeholders, administrations, enterprises, etc. in the...

n = 15

D15. Which other activities regarding emergency response and protection measures has your institution planned or implemented?

- Einholen von Wetterinformationen --> ggf. Frühwarnung
- Vorhaltung von Bekämpfungsmitteln bei Schadenseintritt
- Hochwassereinsatzplan der FFH in Hederau und Ortsteile

D16. Are you prepared for aftercare in your institution or region?

- Aftercare plan for event-based waste, sandbags, etc.
- Aftercare plan for oil leakage
- Aftercare plan for power failures

n = 8

D17. Which other aftercare measures has your institution or your region planned or implemented?

- Optimierung der Aufmärkumaarten (z.B. Auspumpen von Kellern in Eigenregie der Betroffenen)

D18. Please assess the categories of activities according to your personal and professional opinion! Which measures do you personally think are the most effective ones?

- Preventive measures in a built environment / urban area
- Preventive measures outside of settlement structures
- Public relations / Increase of risk awareness
- Technical protection measures
- Emergency response and protection
- Measures for event aftercare

n = 50
### E: DEMANDS, WISHES

#### E01. Which kind of support and materials would you personally want / need for your institution or region? (multiple answers possible)

<table>
<thead>
<tr>
<th>Printed information material (flyers, brochures) on heavy rain risks for different target groups</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online information material</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Information / guidance on how to establish a heavy rain risk management process (e.g. checklists)</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>15</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Guidance and methodology for the assessment and mapping of heavy rain risks</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>List / catalogue of available heavy rain risk reduction measures</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Guidance on adapting your emergency planning to heavy rain risks</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Workshop/seminar or training on heavy rain risk management</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Information on financing or funding options for the implementation of measures</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

#### E02. Other support and additional materials you personally want or need:

- Kostenfrei Bereitstellung von digitalen Geländemodellen mit Simulationsmöglichkeiten für Starkregenereignisse.
- Sachenweise onlinebasierte Ereignisdatenbank
- nicht nur gedrucktes Informationsmaterial: Videos, ansprechende Grafiken, interaktives und damit attraktives Informationsmaterial (Apps, Spiele, Material für Schulunterricht, Kinderbücher, etc.); Material, geeignet auch für Social Media
- Anwendungen zur Prävention aber auch im Ereignisfall (z.B. verbesserte Tweets zu Verhaltensregeln, Gefährlichkeitskategorien im Keller oder bei Durchfall oder Durchwaten überfluteter Bereiche)
- allgemeine Öffentlichkeitsarbeit verbessern, ”Spannende” Artikel in Tageszeitungen

### D19. If your institution or region has not implemented any measures (yet), why not? (multiple answers possible)

- The political willingness is low.
- We have no staff resources.
- We have no financial resources.
- We don’t know any funding options.
- Hazard analysts and risk assessment is missing for our region.
- Other

<table>
<thead>
<tr>
<th>Reason</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>The political willingness is low.</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We have no staff resources.</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We have no financial resources.</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We don’t know any funding options.</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazard analysts and risk assessment is missing for our region.</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### D20. In your personal opinion, what would help your institution to implement (further) measures to reduce heavy rain risks?

<table>
<thead>
<tr>
<th>Topic</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information / know-how on heavy rain in general</td>
<td>27</td>
<td>25</td>
<td>23</td>
<td>21</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Guidance on the selection of measures</td>
<td>47</td>
<td>50</td>
<td>53</td>
<td>56</td>
<td>59</td>
<td>62</td>
</tr>
<tr>
<td>More political acceptance and willingness to react to heavy...</td>
<td>36</td>
<td>40</td>
<td>44</td>
<td>48</td>
<td>52</td>
<td>56</td>
</tr>
<tr>
<td>More employees</td>
<td>48</td>
<td>50</td>
<td>53</td>
<td>56</td>
<td>59</td>
<td>62</td>
</tr>
<tr>
<td>More financial capacities</td>
<td>67</td>
<td>70</td>
<td>73</td>
<td>76</td>
<td>79</td>
<td>82</td>
</tr>
<tr>
<td>Information on funding options</td>
<td>42</td>
<td>45</td>
<td>48</td>
<td>51</td>
<td>54</td>
<td>57</td>
</tr>
</tbody>
</table>

#### D21. What else would help you to implement (further) measures to reduce heavy rain risks?

- es geht nicht nur um das Reagieren, sondern vielmehr um das vorbeugende Anpassen
- Rechtliche Mittel für Flächenverfügbarkeit
- mehr Anreize für das ehrenamtliche Engagement schaffen
- Landesweite Erstattung und Ausweisung von Überschwemmungsgebieten auch von Gewässern 2. Ordnung
- Aufweckung von Naturschutzvorschriften zur Umsetzung von Hochwasserschutzmaßnahmen
- stärkere Berücksichtigung des Verursacherprinzips bei Landnutzungs- und Bewirtschaftungsformen, die wildwüchsigen Oberflächenwasserabfluss signifikant begünstigen
- Verständnis der Flächeneigentümer/-nutzer bzw. besonders der landwirtschaftlichen Flächennutzer
- Verantwortung der Politik, bessere Abstimmung einzelner Förderprogramme
- Gefahrenkarten auf Grund Topographie und Bodenbeschaffenheit
- einheitliche Begriffsdefinitionen; Schließung gesetzlicher Regelungslücken (z.B. Nutzung von Verkehrsflächen zur Ableitung); mehr Akzeptanz und Berücksichtigung der Starkregen- und Hochwassertempekt bei Planern, Architekten, privaten Bauherren und in der Verwaltung (Komunalen, Träger von Infrastruktur wie z.B. Straßenbau); allgemein verbessertes Bewusstsein für Naturgefahren und Verantwortung des Mensch (ubergreifende) Akzeptanz und Bereitschaft zur Umsetzung von Eigenverantwortung
- Zusammenarbeit zwischen den Behörden
- Schwerpunkt liegt auf der Bodenerosion, hier könnte auf technische Maßnahmen verzichtet werden, wenn die Landwirtschaftliche Umsetzung (begründete Abflussbehälter) politisch (seitens der Landwirtschaft) unterstützt würde
- Akzeptanz zwischen den Bauausführenden der Gewässer 1. Ordnung und 2. Ordnung
- Anpassung der Fördermittelpraxis an tatsächlich frühen Gegebenheiten und vor allem Förderung des präventiven Hochwasserschutzes für Kommunen und Bevölkerung
- Schnellere Bearbeitung von Anträgen (wasserrechtlich, Genehmigung, Entfall Planfeststellung etc.), Bewältigung von Fördermittelüberschüssen (z. B. 12 bis 24 Monate)
- Förderprogramme zur Errichtung von vorbeugenden Schutz bei Starkregen
- Aufklärungsmaterial für die Bevölkerung mit Daten zu Eigenverantwortung
Online survey on heavy rain risk management in pilot / partner regions

7.5. Survey results in Hungary

PI: PERSONAL INFORMATION

PI01. Which type of institution are you working for?

- Local public administration or local government
- Regional public administration
- Research institute / University
- Association
- Private Sector
- Other
- Klóster Lavát

n = 64

PI03. Region

- Lower Silesia
- Saxony
- South Bohemia
- Upper Austria
- Styria
- Zagreb

n = 64

A: EXPERIENCES WITH HEAVY RAIN

A01. Did heavy rain events occur in your region?

- Yes
- No

n = 64

A02. Which consequences of heavy rain events have you experienced? Damages caused by flooding... (multiple answers possible)

- Damage to urban infrastructure (e.g. streets, underground garages or passageways, bridges)
- Damage to private buildings (e.g. flooded cellars)
- Damage to cultivated land (e.g. fields, forests, green land)
- Other

n = 56

A03. Which consequences of heavy rain events have you experienced? Damages caused by mass movement (e.g. landslides, rockfall)... (multiple answers possible)

- Damage to urban infrastructure (e.g. streets, underground garages or passageways, bridges)
- Damage to private buildings (e.g. flooded cellars)
- Damage to cultivated land (e.g. fields, forests, green land)
- Other

n = 20

A04. From your personal point of view, please give a feedback:

- Are you concerned about the general consequences of climate change?
- Do you think the risks of heavy rain events will increase in the future?
- Do you think preventive measures for heavy rain are mainly the responsibility of private house owners?
- Are more activities by public authorities needed to prevent damages from heavy rain events?
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B: PRACTICAL USE OF EARLY WARNING SYSTEMS

B01. Do you know an early warning system for extreme events like heavy rain?

- Yes 
- No 
- I don’t know

n = 44

B02. How does information about an upcoming heavy rain event reach you?

- Official warnings by meteorological services (e.g. weather forecast)
- Official warnings by hydrological services (e.g. flood warning)
- Media (e.g. TV news, radio)
- Social media (e.g. Twitter, Facebook)
- I don’t know

n = 23

B03. What is the name of the early warning system?

- QMSZ radar
- T...
- Mtvelp
- Mtvelp
- MTY Meteorológiai jelenets
- QMSZ vasutáljelzés
- QMSZ
- met.hu
- mttelp
- etmert, metert.hu
- Országos Meteorológiai Szolgálat

B04. Who is operator of this system?

- Public meteorological service
- Private meteorological service
- Flood forecasting centres
- Regional public administration
- Local public administration
- Other

n = 23

B05. From your personal point of view, please give a feedback:

- The warnings reach me...
- The warnings reach me on time...
- The warnings turn out to be correct...
- I see the need to improve early warning systems...

n = 24

B06. In your region and from your professional point of view: How can early warning systems improve?

- Accuracy of meteorological forecasts
- Hydrological forecasts for small water bodies
- Enhanced warning time
- New ways of distribution (e.g. via social media)
- Integration of other hazards: erosion / landslides
- Other

n = 25

C: ASSESSMENT AND MAPPING OF HEAVY RAIN RISKS

C01. Has your institution dealt with heavy rain risks?

- Yes
- No

n = 44

C02. With the help of which analysis does your institution assess heavy rain risks? (multiple answers possible)

- Systematic documentation of heavy rain events
- Risk assessment based on historic data
- Analysis of the topographic conditions
- Analysis of precipitation data
- Analysis of the drainage system
- Analysis of the building structure and infrastructure
- Modelling: development of hazard and risk maps

n = 32

C03. Which historic data for risk assessment has your institution analysed? (multiple answers possible)

- Rain measurements, time series
- Event database
- Press reports
- Questionnaires
- Other

n = 3

C04. Which analyses of topographic conditions (e.g. mapping of area depressions) has your institution done? (multiple answers possible)

- Identification of area depressions
- Identification of flood channels
- Identification of surface flow paths
- Identification of inflow from neighbouring areas (e.g. agricultural areas)

n = 1
C05. Please name other analyses of topographic conditions implemented by your institution:

- 

C06. Which source of information did you use to analyse precipitation data (e.g. extreme value statistics)? (multiple answers possible)

- Station data
- Radar data
- Satellite data

C07. Which data sets / model did you use?

- csapadékvizél elérhetőség rendszer környezetének felállítása
- Karpantarthatóság rendszeres ellenőrzése,
- dugalások elhárítása, vékony átmenőjű átterjesztkörejtéje

C08. Which analysis of the drainage system (weak spots) has your institution done? (multiple answers possible)

- Mapping of potential weak spots
- List of potential weak points
- Analyses of weak spots in the drainage system
- Flow path analysis
- Investigation of the run off behavior of sealed / unsealed surfaces

C09. Please name other analyses of the drainage system implemented by your institution:

- A csapadékvizél elérhetőség rendszer környezetének felállítása
- Karpantarthatóság rendszeres ellenőrzése,
- dugalások elhárítása, vékony átmenőjű átterjesztkörejtéje

C10. Which analysis of the building structure and infrastructure has your institution done? (multiple answers possible)

- Review of planned building areas based on hazard maps
- Evaluation of land use / adaptation options
- Availability of free spaces (e.g. retention, seepage)
- Investigation of the degree of sealed surfaces
- Investigation of building density

C11. Please name other analyses of the building structure and infrastructure implemented by your institution:

- 

C12. Which modeling has your institution done to develop hazard and risk maps? (multiple answers possible)

- GIS analysis
- 2D modeling
- Drainage system dimensioning
- Damage potential calculations

C13. Please name other analyses to develop hazard and risk maps implemented by your institution:

- ÁÍK
- Belvíz-veszélyeztetettségi térképezés

C14. If your institution has not conducted any heavy rain risk assessment (yet) - Why not? (multiple answers possible)

- We are not affected.
- We have no experience with the topic so far.
- There is no data available.
- The political willingness is low.
- We have no personnel resources.
- We have no financial resources.
- We don’t know any funding options.
- Other

C15. In your personal opinion, what would you need for a heavy rain risk assessment or mapping? (multiple answers possible)

- Information / know-how on heavy rain in general
- Information about methodologies for heavy rain risk assessment and mapping
- Statistics on precipitation / past heavy rain events
- Climate change projections / model data
- Data on land use, settlement structures, sewage system capacities
- Digital elevation model
- Financial resources for data acquisition or experts / studies
- Political awareness of the topic
- Other

Other: Other Options (e.g., planning, design, etc.)
Online survey on heavy rain risk management in pilot / partner regions

D. MEASURES TO MITIGATE HEAVY RAIN RISKS

D01. Has your institution planned or implemented measures which can prevent or reduce damages of heavy rain events?

<table>
<thead>
<tr>
<th>Measure</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated risk management planning process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventive measures in a built environment / urban area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventive measures outside of settlement structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information to stakeholders / public relations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical protection measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency response and protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aftercare measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No measures implemented or planned</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 50

D02. Which measures to reduce heavy rain risks has your institution planned or implemented? (multiple answers possible)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Measures implemented</th>
<th>Measures planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated risk management planning process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventive measures in a built environment / urban area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventive measures outside of settlement structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information to stakeholders / public relations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical protection measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency response and protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aftercare measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No measures implemented or planned</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 50

D03. Which of the following stakeholders are included in the integrated risk management planning process in your institution? (multiple answers possible)

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Spatial planning</th>
<th>Water management</th>
<th>Environmental planning, nature preservation</th>
<th>Agriculture</th>
<th>Infrastructure service providers, architects</th>
<th>Emergency management</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other stakeholders included in the planning process</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 4

D04. Please specify implemented or planned preventive measures in a built environment / urban area

<table>
<thead>
<tr>
<th>Measure</th>
<th>Measures implemented</th>
<th>Measures planned</th>
<th>Neither implemented nor planned</th>
<th>I don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoiding of surface sealing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decentralized rainwater management: increase infiltration areas / basins / detention ponds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decentralized rainwater management: multifunctional areas, e.g. systematically flooded places</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimized sewage system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow paths are kept clear according to planning law</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ban of / restrictions in flood risk areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road drainage is adjusted to heavy rain events</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 50

D05. Which other preventive measures in a built environment / urban area has your institution planned or implemented?

- Éve karbantartása a kiepített csatornahálózatnak.
- csapadékvíz elvezető árok karbantartása
- területérzékelés teljes vízlevezető rendszer átalakítása, felújítása palyázat alapján (tervezés)

D06. Please specify implemented or planned preventive measures outside of settlement structures!

<table>
<thead>
<tr>
<th>Measure</th>
<th>Measures implemented</th>
<th>Measures planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy rain is considered in regional planning / development plans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow path are kept free</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retention areas are planned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural measures to reduce surface runoff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measures improving soil stabilization, e.g. reforestation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road drainage is adjusted for heavy rain events</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adaptation of land use</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 50

D07. Which other preventive measures outside of settlement structures has your institution planned or implemented?

- megfelelő talajellátó, csatornák, műtárgyak karbantartása
- településről kivezethető csatornák folyamatos kiszállása
- földalak karbantartása
- talajra visszakapcsoló légszennyezési növelése
- önkormányzati tulajdonban lévő belvízlevezető csatornák karbantartása

D08. Please specify implemented or planned activities regarding public relations / raising awareness of stakeholders and public!

<table>
<thead>
<tr>
<th>Activity</th>
<th>Measures implemented</th>
<th>Measures planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information within the administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information of political representatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information campaigns for the public, private house owners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information campaigns for the local economy, farmers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Round tables e.g. with private stakeholders</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 50

D09. Other activities regarding publicity, raising awareness of stakeholders and public!
Online survey on heavy rain risk management in pilot / partner regions

D19. If your institution or region has not implemented any measures (yet), why not? (multiple answers possible)

- We have no experience with the topic so far
- The political willingness is low
- We have no staff resources
- We have no financial resources
- We don’t know any funding options
- Hazard analysis and risk assessment is missing for our region
- Other

D20. In your personal opinion, what would help your institution to implement (further) measures to reduce heavy rain risks?

- Information / know-how on heavy rain in general
- Guidance on the selection of measures
- More political acceptance and willingness to react to heavy rain risks
- More financial capacities
- Information on funding options

D21. What else would help you to implement (further) measures to reduce heavy rain risks?

- települési együttműködése
- Nem csak indokból tervezni a csapadékviz elvezető rendszereket, Sok teremtmunka és helyi információ begyűjtése alapján készüljön a terv.

E: DEMANDS, WISHES

E01. Which kind of support and materials would you personally want / need for your institution or region? (multiple answers possible)

- Printed information material (flyers, brochures) on heavy rain risks for different target groups
- Online information material
- Information / guidance on how to establish a heavy rain risk management process (e.g. checklists)
- Guidance and methodology for the assessment and mapping of heavy rain risks
- List / catalogue of available heavy rain risk reduction measures
- Guidance on adapting my emergency planning to heavy rain risks
- Workshop/seminar or training on heavy rain risk management
- Information on financing or funding options for the implementation of measures

E02. Other support and additional materials you personally want or need:

- A belvízelvezető rendszerek kartantartásához, felújításához mind kül- és belterületen meg, vagy sok szakmai és anyagi támogatásra lenne szükség.
7.6. Survey results in Poland

**A: EXPERIENCES WITH HEAVY RAIN**

**A01. Did heavy rain events occur in your region?**
- Yes: 1
- No: 26

**A02. Which consequences of heavy rain events have you experienced?**
- Impacts on urban infrastructure (e.g., streets, underground garages or passageways, bridges): 21
- Impacts on public buildings: 13
- Impacts on private buildings (e.g., flooded cellars): 24
- Impacts on cultivated land (e.g., fields, forests, green land): 13

**A03. Which consequences of heavy rain events have you experienced?**
- Impacts on urban infrastructure (e.g., streets, underground garages or passageways, bridges): 6
- Impacts on public buildings: 3
- Impacts on private buildings (e.g., flooded cellars): 6
- Impacts on cultivated land (e.g., fields, forests, green land): 5

**A04. From your personal point of view, please give a feedback:**
- Are you concerned about the general consequences of climate change?: 11
- Do you think the risks of heavy rain events will increase in the future?: 10
- Do you think preventive measures for heavy rain are mainly the responsibility of private house owners?: 3
- Are more activities by public authorities needed to prevent damages from heavy rain events?: 17
B: PRACTICAL USE OF EARLY WARNING SYSTEMS

**B01. Do you know an early warning system for extreme events like heavy rain?**

- Yes: 15
- No: 4
- I don't know: 8

**n = 27**

**B02. How does information about an upcoming heavy rain event reach you?**

- Official warnings by meteorological services (e.g., weather forecast): 12
- Official warnings by hydrological services (e.g., flood warning): 1
- Media (e.g., TV news, radio): 5
- Social media (e.g., Twitter, Facebook): 1

**n = 13**

**B03. What is the name of the early warning system?**

- Regionalny System Ostrzegania
- SWO
- Serwis pogodowy INGW-PiB
- KSO
- INGW
- Arktos

**B04. Who is operator of this system?**

- Public meteorological service: 11
- Private meteorological service: 1
- Flood forecasting centres: 2
- Regional public administration: 1
- Local public administration: 0

**n = 15**

**B05. From your personal point of view, please give a feedback:**

- The warnings reach me: 13
- The warnings reach me on time: 9
- The warnings turn out to be correct: 5
- I see the need to improve early warning systems: 4

**n = 15**

**B06. In your region and from your professional point of view:**

**How can early warning systems improve?**

- Accuracy of meteorological forecasts: 8
- Hydrological forecasts for small water bodies: 4
- Enhanced warning time: 2
- New ways of distribution (e.g., via social media): 1
- Integration of other hazards: erosion / landslides: 0

**n = 15**

C: ASSESSMENT AND MAPPING OF HEAVY RAIN RISKS

**C01. Has your institution dealt with heavy rain risks?**

- Yes: 14
- No: 13

**n = 27**

**C02. With the help of which analysis does your institution assess heavy rain risks? (multiple answers possible)**

- Systematic documentation of heavy rain events: 9
- Risk assessment based on historic data: 7
- Analysis of the topographic conditions: 3
- Analysis of precipitation data: 4
- Analysis of the drainage system: 4
- Analysis of the building structure and infrastructure: 3
- Modelling: development of hazard and risk maps: 5

**n = 13**

**C03. Which historic data for risk assessment has your institution analysed? (multiple answers possible)**

- Rain measurements, time series: 4
- Event database: 5
- Press reports: 3
- Questionnaires: 0
- Other: 0

**n = 7**

**C04. Which analysis of topographic conditions (e.g., mapping of area depressions) has your institution done? (multiple answers possible)**

- Identification of area depressions: 2
- Identification of flood channels: 2
- Identification of surface flow paths: 2
- Identification of inflow from neighbouring areas (e.g., agricultural areas): 1

**n = 3**
Online survey on heavy rain risk management in pilot / partner regions

D. MEASURES TO MITIGATE HEAVY RAIN RISKS

D01. Has your institution planned or implemented measures which can prevent or reduce damages of heavy rain events?

Yes: 12
No: 15

D02. Which measures to reduce heavy rain risks has your institution planned or implemented? (multiple answers possible)

- Integrated risk management planning process: 6
- Preventive measures in a built environment: 6
- Preventive measures outside of settlement: 4
- Information to stakeholders / public relations: 8
- Technical protection measures: 6
- Emergency response and protection: 5
- Alertermeasures: 1
- No measures implemented or planned: 0

n = 15

D03. Which of the following stakeholders are included in the integrated risk management planning process in your institution? (multiple answers possible)

- Spatial planning: 3
- Water management: 4
- Environmental planning, nature preservation: 2
- Agriculture: 2
- Infrastructure service providers, architects: 2
- Emergency management: 4
- Other: 0

n = 5

D05. Which other preventive measures in a built environment / urban area has your institution planned or implemented?

- Heavy rain is considered in regional planning / development plans: 1
- Flow path are kept free: 1
- Retention areas are planned: 3
- Agricultural measures to reduce surface runoff: 2
- Measures improving soil stabilization, e.g. reforestation: 2
- Road drainage is adjusted for heavy rain events: 0
- Adaptation of land use: 1

n = 5

D06. Please specify implemented or planned preventive measures outside of settlement structures!

- Heavy rain is considered in regional planning / development plans: 1
- Flow path are kept free: 1
- Retention areas are planned: 3
- Agricultural measures to reduce surface runoff: 2
- Measures improving soil stabilization, e.g. reforestation: 2
- Road drainage is adjusted for heavy rain events: 0
- Adaptation of land use: 1

n = 6

D07. Which other preventive measures outside of settlement structures has your institution planned or implemented?

- Information within the administration: 4
- Information of political representatives: 2
- Information campaigns for the public, private house owners: 3
- Information campaigns for the local economy, farmers: 3
- Round tables e.g. with private stakeholders: 2

n = 6

D08. Please specify implemented or planned activities regarding public relations / raising awarenesses of stakeholders and public!

- Information within the administration: 4
- Information of political representatives: 3
- Information campaigns for the public, private house owners: 3
- Information campaigns for the local economy, farmers: 3
- Round tables e.g. with private stakeholders: 2

n = 6

D09. Other activities regarding publicity, raising awarenesses of stakeholders and public:

- Informing the local residents about the risk of heavy rain events: 4
- Providing information to the public about the need for preparedness: 3
- Organizing workshops and seminars on risk reduction: 2

n = 5
Online survey on heavy rain risk management in pilot / partner regions

D10. Which information was or will be provided? (multiple answers possible)

<table>
<thead>
<tr>
<th>Information Provided</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available risk assessment, studies etc.</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Hazard and risk maps</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Information about preventive measures</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Information about technical protection measures</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Information on risk adapted behaviour, emergency measures</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Campaigns on natural hazards</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other - in ramach oprawczonych regionalnych dokumentów,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pomoc publiczna</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 3

D11. How was the information provided? (multiple answers possible)

<table>
<thead>
<tr>
<th>Information Provided</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public hearings, information events, podium discussions etc.</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Information on display in town hall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press releases</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Distribution of flyers and other printed information material</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Online information</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Other - jeszcze nie zostaly rozpowszechzione, następnie do pobrania w ramach dokumentów przez Zarząd Województwa Dolnośląskiego</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 7

D12. Please specify implemented or planned technical protection measures!

<table>
<thead>
<tr>
<th>Protection Measures</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>On building level, e.g., elevation of entrances, flood gates for underground garages</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Rainwater storage facilities (e.g., basins, ponds)</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Walls / dikes</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

n = 6

D13. Which other technical protection measures has your institution planned or implemented?

<table>
<thead>
<tr>
<th>Measures provided</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures implemented</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Measures planned</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Neither implemented nor planned</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

n = 6

D14. Please specify implemented or planned activities regarding emergency response and protection measures!

<table>
<thead>
<tr>
<th>Activities Provided</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency management plan (for extreme events in general)</td>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Emergency management plan (explicitly for heavy rain events)</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Emergency management plan (without consideration for heavy rain events)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Surveillance of network points / critical infrastructure</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement of all relevant stakeholders, administrations, enterprises etc. in the alarm and emergency planning</td>
<td></td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

n = 5

D15. Which other activities regarding emergency response and protection measures has your institution planned or implemented?

<table>
<thead>
<tr>
<th>Activities Provided</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures implemented</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Measures planned</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Neither implemented nor planned</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

n = 5

D16. Are you prepared for aftercare in your institution or region?

<table>
<thead>
<tr>
<th>Aftercare Measures Provided</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aftercare plan for event-based waste, sandbags, etc.</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aftercare plan for oil leakage</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aftercare plan for power failures</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 1

D17. Which other aftercare measures has your institution or your region planned or implemented?

<table>
<thead>
<tr>
<th>Measures provided</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preventive measures in a built environment / urban area</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Preventive measures outside of settlement structures</td>
<td></td>
<td>10</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Public relations / increase of risk awareness</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical protection measures</td>
<td></td>
<td>11</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Emergency response and protection</td>
<td></td>
<td></td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Measures for event aftercare</td>
<td></td>
<td></td>
<td>11</td>
<td>3</td>
</tr>
</tbody>
</table>

n = 14
D19. If your institution or region has not implemented any measures (yet), why not? (multiple answers possible)

<table>
<thead>
<tr>
<th>Reason</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>We have no experience with the topic so far.</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The political willingness is low</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We have no staff resources</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We have no financial resources</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We don’t know any funding options</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazard analysis and risk assessment is missing for our region</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Other: 0

n = 12

D21. What else would help you to implement (further) measures to reduce heavy rain risks?

- Acceptance of the change and the ability to adapt to new challenges
- Relevant knowledge and skills for implementation tasks

D20. In your personal opinion, what would help your institution to implement (further) measures to reduce heavy rain risks?

<table>
<thead>
<tr>
<th>Category</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information / know-how on heavy rain in general</td>
<td>23</td>
<td>17</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Guidance on the selection of measures</td>
<td>24</td>
<td>16</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>More political acceptance and willingness to react to heavy rain risks</td>
<td>25</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>More employees</td>
<td>26</td>
<td>21</td>
<td>15</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>More financial capacities</td>
<td>27</td>
<td>22</td>
<td>17</td>
<td>12</td>
<td>7</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Information on funding options</td>
<td>28</td>
<td>23</td>
<td>18</td>
<td>13</td>
<td>8</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

n = 28

E: DEMANDS, WISHES

E01. Which kind of support and materials would you personally want / need for your institution or region? (multiple answers possible)

<table>
<thead>
<tr>
<th>Material / Service</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printed information material (flyers, brochures) on heavy rain risks</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Online information material</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Information / guidance on how to establish a heavy rain risk management process (e.g.,…)</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Guidance and methodology for the assessment and mapping of heavy rain risks</td>
<td>23</td>
<td>22</td>
<td>21</td>
<td>20</td>
<td>19</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>List / catalogue of available heavy rain risk reduction measures</td>
<td>26</td>
<td>25</td>
<td>24</td>
<td>23</td>
<td>22</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Guidance on adopting my emergency planning to heavy rain risks</td>
<td>27</td>
<td>26</td>
<td>25</td>
<td>24</td>
<td>23</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Workshop/seminar or training on heavy rain risk management</td>
<td>28</td>
<td>27</td>
<td>26</td>
<td>25</td>
<td>24</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>Information on financing options for the implementation of measures</td>
<td>29</td>
<td>28</td>
<td>27</td>
<td>26</td>
<td>25</td>
<td>24</td>
<td>23</td>
</tr>
</tbody>
</table>

n = 26

E02. Other support and additional materials you personally want or need:

- Assistance in project planning, taking into account the unique challenges faced in regions with heavy rain events

- Knowledge and skills training for professionals involved in heavy rain risk management

- Relevant information and resources for enhancing heavy rain risk awareness

- Guidance on how to implement effective heavy rain risk reduction strategies

- Workshops and seminars focused on heavy rain risk management

- Information on financing options for the implementation of risk reduction measures

n = 25
RAINMAN Key Facts

- Project duration: 07.2017 – 06.2020
- Project budget: 3,045,287 €
- ERDF funding: 2,488,510 €
- RAINMAN website & newsletter registration: www.interreg-central.eu/rainman

Lead Partner

Saxon State Office for Environment, Agriculture and Geology
rainman.lfulg@smul.sachsen.de

Project Partner

- Saxon State Ministry of the Interior
- Environment Agency Austria
- Office of the Styrian Government
- Das Land Steiermark
- Region of South Bohemia
- T. G. Masaryk Water Research Institute, p.r.i
- Middle Tisza District Water Directorate
- Croatian Waters
- Institute of Meteorology and Water Management
- National Research Institute
- Leibniz Institute of Ecological, Urban and Regional Development

Project support

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Professor Böhm und Partner
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