CRITERIA AND METHODS
FOR RISK IDENTIFICATION AND CLASSIFICATION
AND FOR IDENTIFICATION OF APSFR
2nd part of the Methodology under Article 187(2)(6) of the Water Act
The “Criteria and methods for risk identification and classification and for identification of APSFR” are the result of implementation of public contract №D-30-62/18.04.2012 with the following scope: "Methodology for flood hazard and flood risk assessment according to the requirements of Directive 2007/60/EC", where texts from the 2nd interim report of the "Floods" working group experts, composed on the ground of Order №866/16.11.2012, and of the experts from the Adoption Commission, appointed pursuant to order №RD-416/29.05.2012, amended with order №RD-646/16.08.2012 of the MOEW, have been selected and consolidated.
1. Directive on the assessment and management of flood risks and its transposition to the Water Act with respect to APSFR

The Directive on the assessment and management of flood risks 2007/60/EC (the Floods Directive - FD) and the Water Act (WA) envisage development of Flood Risk Management Plans (FRMP) for each river basin water management region in the Republic of Bulgaria, where this process is implemented in several basic stages.

During the first stage of the directive application and development of the FRMP, information shall be provided about areas with identified potential significant flood risk or for which a likelihood of such risk may be foreseen (APSFR) under Article 5, chapter II of FD and Article 146d of the WA).

According to the Directive, the identification of these regions shall be based on the results from the preliminary flood risk assessment (PFRA), where the requirements for this are stipulated in Chapter II, Article 4 of the Directive.

Areas with potential significant flood risk (APSFR) shall be identified for each basin water management region and if there is an international river basin on the territory of the respective river basins/management units, then the identification of the APSFR shall be coordinated with the respective neighbouring member states.

The identification of the areas with potential significant flood risk is an integral part of the Preliminary Flood Risk Assessment (PFRA) and constitutes its final stage. At the same time, this constitutes baseline information for the second stage of the Directive implementation, which is identification of the areas for which flood hazard maps and flood risk maps will be developed (Article 6, chapter III).

Chapter VII, article 13 of the FD states that member states may decide not to undertake PFRA, if they have already undertaken some measures for risk assessment and have concluded that a potential significant flood risks exists for certain areas, or if they have decided to to prepare maps and management plans for these areas. In this case, Bulgaria does not have detailed mapping of flood risk that meets the scope and level of detail envisaged in the FD and therefore Article 13 is inapplicable.
According to Article 146d of the Water Act, APSFR shall be identified based on the presence of potential significant flood risk or likelihood for potential significant flood risk, without provisions for any specific requirements as to the method for their identification. Similarly, the FD also gives discretion to member states to identify the APSFR by themselves, according to a set of criteria specific for the territory of the member state.

The accurate identification of APSFR is very important, because the second stage of the Directive will only apply to the territory of these areas, particularly: development of flood hazard maps and detailed flood risk maps (chapter III; respectively, Section III of the Water Act). The development of the maps is the next stage of drafting the FRMP. The final stage of drafting the FRMP is the identification of measures to mitigate the flood risk. According to the dates envisaged in the Directive and the WA, the FRMP shall be drafted and adopted by the end of 2015. This is followed by a 6-year period of application of the first plan and its revision, when all stages of the development of the FRMP will be implemented again.

Further supplements and revision of the APSFR will take place by 22.12.2018 as part of the revision of the FRMP and then will take place every 6 years after that. This provision of the Directive shall be taken into account in the identification of APSFR, since the further development of the maps and plans is a time-consuming and costly process. Since there are no detailed analysis of the flood risk in the country, it is recommended to adopt criteria for significant risk that identify only the areas that are actually high-risk, so that the respective plans for mitigating this flood risk for each river basin management region can be developed. The inclusion of low-risk areas could be postponed for the second period of revision under the Directive, in order to provide the necessary resources for mitigation of the risk.

2. Requirements for information about APSFR according to the reporting documents

The Directive specifies the detailed requirements for reporting APSFR in the so-called reporting documents or Floods Reporting Database v3.mdb. This is the official document, where all past and potential future floods and APSFR are described in a standardised method.
The information that shall be provided in the reporting document shall enable the European Commission to:

- validate the compatibility of the PFRA of the member state with the requirements of the Directive, particularly:
  - that the definition of "potential significant risk" is sufficiently clear and transparent;
  - that the identification of APSFR is sufficiently clear and transparently done and described;
  - that there is coordination between neighbouring member states in the case of an international river basin or management region;
- compare the methodologies and the use of information between member states, river basins and water management regions, including the international ones;
- assess the compliance of the application of Article 13.1(a) with respect to the requirements of Article 4 and 5, as well as Article 13.1(b) of the Directive;
- compile digital archives at European level of the locations of APSFR.

During the verification of the above aspects, the European Commission will use the following criteria:

- completeness of the assessment with respect to the geographic area it shall cover and with respect to the different types of floods;
- transparency of the procedures, methodologies and reports used and information provided to the public and the neighbouring member states;
- adequacy of the identification of the respective risk indicators and metrics (human health, economic activity, environment and cultural and historical heritage)

In order for the European Commission to be able to make these analyses, the baseline information shall be taken from the reporting documents (a detailed description of their attributes is given in chapter 6 of the report), as well as from supplementary data, particularly:

- **Geographic information**: Data that allow the development of the following types of maps is required from the member states:
  - Maps of the entire territory of the river basin or management region, indicating areas selected based on one of the following options:
Areas assessed as areas with potential flood risk under Article 4 and Article 5, or
Areas that have been subject to assessment or identification as APSFR according to Article 13.1(a), or
Areas within the scope of Article 13.1(b), for which a decision has been taken for mapping the floods and development of a flood risk plan, in accordance with sections III and IV, without making a preliminary assessment.

- Maps of the river basin or water management region, where the areas with potential significant flood risk are marked. (APSFR may be indicated as entire segments of river/coastal areas, polygons or entire river basins.)

- **Attributive data:** Details about each APSFR necessary for assessment of the applicable indicators:
  - Name of the river basin, sub-basin and/or coastal area or other areas associated with each APSFR;
  - Type(s) of floods: the reporting document presents a list of already identified types of floods;
  - Type(s) of potential consequences (human health, environment, cultural and historical heritage and/or economic activity, based on which the risk is identified as high).

- **Summary:**
  - Description (<20000 characters) of the methodology (including criteria for identification of high risk, reasons and criteria for exclusion or exclusion of areas in the APSFR and how the consequences for human health, the environment and the economic activity have been reflected) for identification of APSFR;
  - Description (<5000 characters) of international coordination carried out between the respective member states for international river basins or water management regions.

- **Other information:**
  - Hyperlink to more detailed documents on the methodology, external sources of information, etc.
The proposed methodology for defining APSFR takes into account the requirements set out above and the final results during the different technological steps, which cover the specific requirements of the reporting documents under the Directive. During the description of the individual steps of the methodology, it has been indicated the requirement to which the respective result applies to, where the format and specifics required by the directive have been observed.

3. Preliminary Flood Risk Assessment (PFRA) in Bulgaria and elaboration of methodology for defining APSFR

The approaches applied in the elaboration of methodology for identification of APSFR reflect the current status of information availability in the different member states and not all of them are directly applicable to the conditions in the Republic of Bulgaria.

At this stage, the documents available in the country in this respect are as follows:

- Methodology for Preliminary Flood Risk Assessment for the main river basins of the Republic of Bulgaria - methodology for flood risk assessment according to the requirements of Directive 2007/60/EC;
- The results reported to the EC on the PFRA with respect to significant past and potential future floods;
- The databases used for the development of PFRA.

The approach for identifying APSFR has been developed based on an analysis of the existing approaches and methods related to the initial steps for identification of significant past and potential future floods and APSFR in these main documents and available data, which have been used, the approach for identification of significant past and potential future floods and the availability of analyses with respect to identification of areas of potential significant risk for each basin water management region.

4. Identification of APSFR

The technological process of identification of APSFR shall rely on and use only easily accessible and available data in the PFRA along with methodologies that will allow rapid and simple method of identification of APSFR. Due to this reason, it is planed to use final criteria and thresholds for identification of the level of risk from the data about the
significant past and potential future floods, based on information from the PFRA and the accompanying databases used during their development.

Using the threshold values of criteria leads to identification of three risk levels: low, medium and high.

**4.1. Justification of the criteria for identification of APSFR**

The criteria for identification of APSFR may be divided into two groups:

- unified criteria for classification of risk in three levels, according to the floods location
- grouping criteria for locations with significant risk in APSFR

The criteria are derived based on the available documented information from the PFRA and possibilities for application and synchronisation of different metrics for risk assessment.

During the analysis of data according to the respective indicators used in the PFRA, certain peak values have been excluded because they are not characteristic. Based on the maximum value for the respective indicator determined in this way, which is used in the PFRA for assessment of significant floods (for which there are digital data in the PFRA), the threshold values for the respective indicator have been calculated.

For the identification of risk, a unified table is accepted, irrespective of the use of data from past or potential future floods for each river basin management region. The analysis of data about past floods and about potential future floods has been carried out in the abovementioned method, where, after comparison of the results, one of them is accepted for the risk assessment. (In most cases this is the result about past floods as more reliable data). Where the indicators have values of zero, the respective indicator is ignored.

The criteria with defined threshold values in 3 levels - low, medium and high risk - are given in the following table.
Table 1. Unified criteria for classification of risk for identification of preliminary APSFRs

<table>
<thead>
<tr>
<th>№</th>
<th>Criteria by category</th>
<th>Unit measure</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inhabitants affected (suffering damages)</td>
<td>Number</td>
<td>300</td>
<td>1 500</td>
<td>3 000</td>
</tr>
<tr>
<td>2</td>
<td>Affected elements of the critical infrastructure or affected buildings of public significance (hospitals, schools, etc.)</td>
<td>Number</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Wells and pumping stations for public drinking water supply</td>
<td>Number</td>
<td>4</td>
<td>18</td>
<td>38</td>
</tr>
</tbody>
</table>

**Economic activity**

| 4  | I and II class highways, railways, bridges, airports, transmission networks and other linear infrastructure | Number       | 1     | 5       | 10     |
| 5  | I and II class highways, railways, bridges, airports, transmission networks and other linear infrastructure | m            | 1 000 | 5 000   | 10 000 |
| 6  | Agricultural land affected                                                            | decares      | 6 000 | 30 000  | 65 000 |
| 7  | Summarised economic value of damages (for past floods)                                | BGN          | 700 000 | 3 000 000 | 7 000 000 |

**Environment**

| 8  | Sewage of urban areas - discharge of municipal sewers or municipal waste water treatment plants | number       | 1     | 2       | 5      |
| 9  | Protected territories affected: drinking waters, zones under the Protected Territories Act, Natura 2000 | number       | 1     | 2       | 5      |
| 10 | IPPC and SEVESO enterprises, etc. (PRTR) from the Executive Environmental Agency, MOEW, BD strips | number       | 0     | 0       | 1      |

**Cultural heritage**

| 11 | UNESCO cultural and historical monuments and monuments of national significance       | number       | 0     | 0       | 1      |

### 4.2. Identification of risk by indicators
The areas with significant floods include in the PFRA shall be evaluated for each indicator, for which there is information in PFRA, by defining the level of risk: low, medium or high according to the adopted threshold values for the indicators under point 4.1. In the cases where there are several significant floods in one area, for the purpose of the risk assessment, the data with the highest reported values for each indicator from all events for which there is data available shall be used.

4.3. Identification of risk for each category: human health, economic activity, environment, cultural and historical heritage

After identification of the level of risk for each indicator for which there is data available in the PFRA, the level of risk for the respective category shall be defined: human health, economic activity, environment and cultural and historical heritage. The level of risk for each category corresponds to the highest risk identified for the indicators of the respective category.

4.4 Assessment and classification of the risk by area

The risk for an area is identified as a combination of the risk identified by categories, by observing the following principles:

- If high risk is identified for each river basin management region for any category, the area is identified as high risk.
- In case of medium risk in three categories, the area is classified as high risk.
- In case of medium risk in two categories, the area is classified as medium risk.
- In case of medium risk in two categories, when these categories are human health and economic activity, the area is classified as high risk.
- In case of medium risk in one category and low risk in the remaining categories, the area is low risk, except for the cases where the medium risk applies to the human health category.

The final level of risk for the area may not be lower than the risk level identified for the human health category.

4.5 Identification of APSFR
The identification of APSFR is based on the risk identified for the areas by the PFRA. The final identification of the boundaries of the APSFR will be developed in 2 versions:

1. APSFRs that include only high risk areas.
2. APSFR that include high risk and medium risk areas.

5. Methodology for identification of APSFR

This section describes the methodology for the second major part of the identification of APSFR - combining sites and areas with significant flood risk in summarised areas with a view to their assessment during the second state of the implementation of the FD - detailed mapping of the hazard and detailed mapping of the risk. The main idea of the methodology is based on the standard definition for risk, hazard and adverse consequences. Since there is no evenly distributed database about the flood hazard on the territory of the country, the main source of information are the significant past and potential future floods already reported before the European Commission through the PFRA. The proposed method is based on the visual interpretation of the hazard location and its combination with elements of the risk classification criteria.

An important consideration in the development of the methodology is the obligation to identify as APSFR only areas where there is actually significant risk and to take out areas with significant floods in the past and where, however, this risk would be eliminated in case of a stricter assessment. The mapping and identification of specific measures for protection or mitigation of the impact of floods in areas with relatively low risk would lead to a need to apply measures and restrictions in the economic and social development of these areas.

Thus, the methodology does not replace the significant past and potential future floods already reported, but it considers their characteristics in territorial aspect, for the purpose of identifying them in areas where there is potential significant flood risk or likelihood of potential significant risk.

The methodology also accounts for the status of the information base that would ensure its application. The first step, of course, is the information reported before the European Commission about significant past and potential future floods. For the territorial risk assessment, the data and GIS layers developed during the drafting of the PFRA are also used.
Therefore, it is necessary for the available source information about the river basin management areas (RBMA) to be structured in a database.

**5.1 General scheme of the technological process**

The methodology for identification of APSFR may be divided into 4 general stages. Each of them is characterised by certain incoming information and processing and analysis of data, after which the source data are prepared, which are the basis for the work during the next stage. The scheme with the proposed main stages of the Methodology, with the sub-steps for each of them, is presented in the figure below.

![Diagram of the technological process for identification of APSFR](image)

**Fig.1. General scheme of the technological process for identification of APSFR.**
5.1.1. First stage - identification of APSFR

During the first stage, the identification of the preliminary areas with potential significant flood risk (PAPSFR) takes place by using purely geographic methods. The initial step is integration of the information layers for significant past and potential future floods in one standardised database, with extraction of the information necessary for the subsequent risk analysis. During the next analysis, the PAPSFR are marked according to the defined adjacency rules described below.

The identification of areas with potential significant flood risk is based on the presence of centres with significant flood risk that are close to each other, which could be considered in combination, rather than individually, and the assessment of which does not demand significant investment for collection and processing of risk information. On the other hand, during this step of the technological process, some of the places in the larger areas may be divided based on specific indicators only, without any need to carry out risk assessment.

The purpose of this step is for the analyst to focus on areas where there is grouping of significant floods, which have occurred close to each other and which are likely to have similar causes. The implementation of this step is the basis for the vision of what would happen after the final stage and what the respective APSFR would look like.

Grouping close regions with significant floods cannot be done randomly by just outlining such close areas. Therefore, it is proposed to use the following basic adjacency rules

<table>
<thead>
<tr>
<th>Rule code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN_01</td>
<td>One PAPSFR may only include significant floods from one river basin</td>
</tr>
<tr>
<td>RN_02</td>
<td>Excluding PAPSFR, for which there is no information about significant past and potential future floods identified during the PFRA.</td>
</tr>
<tr>
<td>RN_03</td>
<td>Regarding sea floods, coastal areas where the prerequisites for floods are identical play the role of independent PAPSFRs.</td>
</tr>
</tbody>
</table>

For basic polygon sites having the role of PAPSFR in these initial steps of the methodology, the polygons of the H_Catchment layer from the database from the JICA project are used. This layer constitutes the water catchment areas in Bulgaria as a polygon class of sites.
The reasons for the initial selection of a polygon site - water catchment areas, where the significant floods can be examined, rather than outlining one, are as follows:

- the proposed GIS layer is standardised for all basin directorates;
- the water catchment areas cover territories with similar hydrological conditions;
- the water catchment areas give a clear idea of the river system and the water catchment area in the given polygon;
- the water catchment areas are presented for all major confluents from the river systems;
- the area of the available polygons is suitable for the initial steps of the methodology;
- during the application of the methodology, different contractors will work with a unified GIS layer and this will prevent any differences in the initial identification of the scheme of PAPSFR.

Before starting the verification of the criteria for significance, it is necessary to perform one more revision of the borders of PAPSFR for the purpose of more precise regionalisation of the area with significant potential flood risk.

For this purpose the following **basic region-based rules** shall be applied

<table>
<thead>
<tr>
<th>Rule code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN_04</td>
<td>Revision of the borders of PAPSFR according to information about related events</td>
</tr>
<tr>
<td>RN_05</td>
<td>Revision of the borders of PAPSFR according to the scope of the urban areas</td>
</tr>
<tr>
<td>RN_06</td>
<td>Revision of the borders of PAPSFR according to the homogeneity of the sub-catchment areas with respect to the flow forming factors (e.g. lower, medium stream, mountain area).</td>
</tr>
<tr>
<td>RN_07</td>
<td>Rule in case of complex dams</td>
</tr>
</tbody>
</table>

- **RN_04: Rule for link between events**
  This rule checks whether there are places in adjacent PAPSFR, which have been subject to one and the same flood. Data about this is available in the tables for reporting the significant past and potential future floods.

- **RN_05: Rule for the scope of the urban area**
Under this rule, it is checked whether there are urban areas at the borders of adjacent PAPSFR that fall within two PAPSFR. This is a common case, since there are rivers in many urban areas and different water catchments are located there. If this is the case, the border of the PAPSFR is corrected so that the urban area falls in a PAPSFR that is located upstream. If there is no PAPSFR upstream, it is combined to the one located at the lower stream.

If the urban area falls in different water catchments, it is joined to the PAPSFR identified for the water catchment of greater significance with respect to floods and by considering the relief.

- **RN_06: Rule for homogeneity of water catchments**
  According to this rule, adjacent water catchments characterised by similar flow forming characteristics are combined. These can be mountain areas, medium and lower streams. This analysis also checks whether the respective water catchments belong to main flows. The purpose is to reduce the number of PAPSFR by combining similar water catchments, however, without combining water catchments belonging to different main flows to the main river.

- **RN_07: Rule in case of complex dams**
  The period of active construction of dams is the 60s and the seventies and there are very few new hydrotechnical facilities constructed after 1985. If a flood has happened before 1985 and it has not repeated after that, then the border of the polygon is revised by excluding the respective area from the PAPSFR.

The application of these rules will allow to define the working PAPSFR clearly and transparently and will help the transition to the next stage assessment.

### 5.1.2 Second stage - application of unified criteria for classification of risk for identification of PAPSFRs

During the second stage, based on the identified criteria for risk classification in Table 1 and the rules regarding the floods characteristics, the scope of the PAPSFR is specified
and at this stage some of the areas may be excluded and others may undergo changes in their scope. The final result from this stage is defining the list of APSFRs.

The criteria are applied in several ways:

- For areas with significant past floods, the values for each criterion are obtained from the data available from the PFRA;
- For areas with significant potential future floods, the values are obtained from the data available from the PFRA;

After calculation of the quantitative characteristics for each criterion (presented in Table 1), it is determined whether they exceed the threshold values. First, the exceeding over the risk threshold for each area is checked. The areas that correspond to this threshold are marked as areas that qualify for the APSFR.

The assessment of the characteristics of the respective locations by each of the defined criteria is carried out according to the presented approved Table 1 with threshold values in three levels.

The areas with risk level below the threshold values for significant risk level (3rd grade or equivalent to significant medium level - 3rd grade) for all criteria are excluded from the PAPSFR. The remaining areas form the APSFR, whose borders undergo subsequent processing, described in the next chapter of the Methodology. If there are no areas or other sites within the PAPSFR with values above the thresholds for risk according to the criteria, this area is excluded from the list of APSFR.

5.1.3. Third stage: detailing the borders of APSFR - identification of the final APSFRs

This stage aims to detail the borders of the APSFR according to certain rules for proximity of risk elements. Those APSFRs, for which the change in borders is significant, may undergo the activities under point 5.1.2 once again.

Regarding the scope of the APSFR, the Floods Directive allows definition of significantly broader borders from the ones within which a flood may occur.

For detailing the borders of the APSFR, it is proposed to apply rules for identification of the starting point and the end point of the APSFR.

**Rules for defining the starting point and the end point of the APSFR:**
In the cases where there is an urban area at the border of the APSFR, the APSFR covers the entire urban area with a certain buffer from it, depending on:

- **the type of urban area:** for larger urban areas, where future growth is expected, the buffer is larger, whereas for smaller urban areas with declining functions, its size is minimum;
- **type of floodplain terrace:** in case of broad floodplain terraces along the river before or after the urban area, the buffer is larger, whereas in case of higher slopes, where the speeds are higher and there is no spill, this place may be considered a breakpoint of the area;
- **type and configuration of the available risk elements:**
  - if there are pollutants beyond the borders of the urban area and they include elements from the environmental criteria nearby, the borders are extended to cover them;
  - if there are large enterprises or industrial zones before or after the borders, the buffer will also cover them;
  - if there are agricultural lands with proven intensive agriculture (greenhouses, etc.) before or after the borders, the buffer will also cover them - it is marked in a field;
  - if there are important elements under criteria 2,3,4,5,8 and 11 nearby, before or after the borders, the buffer shall also cover them.

The buffer shall be determined according to an expert evaluation.

After the final detailing of the borders of APSFR, their linear equivalent shall be created, which is the final representation of APSFR.

### 5.2. Basic requirements toward the data when applying the Methodology for identification of APSFR

In order to identify the APSFR according to this methodology, the following shall be used:

- the data from PFRA reported before the European Commission;
- the data used in the PFRA process during the identification of the significance of the floods consequences;
- other data available in BD.
The set of minimum required layers, besides the ones reported under the PFRA before the European Commission, are:

- **for "Human Health" category:**
  - number of inhabitants at the level of Unified Classifier of Administrative-Territorial and Territorial Units;

- **for "Economic Activity" category:**
  - republican transport network, including road network, railway network and airports;
  - industrial and economic infrastructure;
  - urban infrastructure, including wells and pumping stations for public drinking water supply, waste water treatment plants;
  - data representing summarised economic value, such as BEAM;
  - critical infrastructure, including public buildings, such as hospitals, schools, etc.

- **for "Environment" category:**
  - sewage for urban areas and urban WTTP;
  - protected territories according to the Protected Territories Act;
  - NATURA 2000 areas;
  - drinking water areas;
  - IPPC and SEVESO companies (only if they generate water pollution);
  - other industrial activities (outside IPPC and SEVESO) that are sources of (water) pollution according to the Priority Substances Directive and the Directive on hazardous and harmful substances.

- **for "Cultural Heritage" category:**
  - cultural and historical monuments of global significance, included in the list of UNESCO; cultural and historical monuments of national significance according to Article 50(1) of the Cultural Heritage Act.

The input and output data from the identification of APSFR is structured in a single unified format. The attributive information shall be in line with the requirements for reporting before the European Commission.

Coordinate system WGS 84, UTM Zone 35N is used during the identification of APSFR for the spatial data.
For the purpose of reporting to the European Commission, the results obtained in GIS format are transformed into ETRS89 coordinate system.

The resulting APSFR shall be marked with a unique code.

The type and structure of the information for application of the approach and criteria for identification of APSFR described above and the work algorithm are given in Annex 1, which constitutes an integral part hereof.
STRUCTURE OF THE INFORMATION AND WORK ALGORITHM FOR APPLICATION OF THE APPROACH AND CRITERIA FOR IDENTIFICATION OF APSFR

1. Information structure and content

The annex presents the structure of geo database, where the information necessary for the application of the Methodology is entered and processed.

The individual elements of the standardised database and the work with them are further clarified in the process of description of the different stages of applying the algorithm.

In the proposed GIS database, the information is organised into 3 thematic categories:

- Data obtained from the PFRA for past and potential future floods
- Data about APSFR
- Baseline data used for risk assessment according to the adopted criteria

1.1. Data set from PFRA

This thematic group includes vector layers and tables with the reported information about significant past and potential future floods as follows:

1. PFRA_ArticleApplied
2. PFRA_AssociatedFloodLocations
3. PFRA_ConsequenceFatalities
4. PFRA_FloodEvent
5. PFRA_FloodLocation
6. PFRA_FloodLocationWFD_SWB
7. PFRA_FloodTypes
8. PFRA_FloodTypesOther
9. PFRA_SpecificArea
10. PFRA_TypeofConsequence
11. FDCCommon
The information in these tables may be imported directly from the reporting database.

In addition to the above information, an additional table \textit{PFRA\_FloodEvent\_Criteria} is used, which combines the data from table \textit{PFRA\_FloodEvent} and the data based on which the identification of the significance of past and potential future floods has taken place. An empty template of this table is created in the database, which should be filled in after that. The table structure is described below.

\textbf{Table 1. Description of the scheme of table \textit{PFRA\_FloodEvent\_Criteria}}

<table>
<thead>
<tr>
<th>№</th>
<th>Name of field</th>
<th>Type of field</th>
<th>Description of the field content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>\textit{FloodEventCode}*</td>
<td>String 50</td>
<td>Unique identifier of the event</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The field is a primary key of the table.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The field is included in the reporting database.</td>
</tr>
<tr>
<td>2</td>
<td>\textit{AssociatedFloodEventCode}</td>
<td>String 50</td>
<td>Code of related events</td>
</tr>
<tr>
<td>3</td>
<td>\textit{FloodLocationCode}*</td>
<td>String 50</td>
<td>Unique identifier of the event location</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The event location may be presented as a point, linear or polygon site.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Therefore, the field is an external key to the layers with spatial data in PFRA data set.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The field is included in the reporting database.</td>
</tr>
<tr>
<td>4</td>
<td>\textit{AssociatedFloodLocationCode}</td>
<td>String 50</td>
<td>Code of related places</td>
</tr>
<tr>
<td>5</td>
<td>\textit{NameOfFloodEvent}*</td>
<td>String 250</td>
<td>Event name</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The field is included in the reporting database.</td>
</tr>
<tr>
<td>6</td>
<td>\textit{FloodLocationName}*</td>
<td>String 250</td>
<td>Location name</td>
</tr>
<tr>
<td></td>
<td><strong>Field</strong></td>
<td><strong>Type</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------</td>
<td>----------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 7 | **CategoryofFlood**                       | String 50| There are two possible values for this field:  
- past - when the event is related to a past flood  
- future - when the event is related to a potential future flood                                                                                                                                       |
| 8 | **DateofCommencement**                    | String 50| Event starting date  
The field shall be filled in if the event is related to a past flood.  
The field is included in the reporting database.                                                                                                                                                  |
| 9 | **DurationofFlood**                       | String 50| Event duration  
The field shall be filled in if the event is related to a past flood.  
The field is included in the reporting database.                                                                                                                                                  |
|10 | **Area**                                 | String 50| Area of the flooded territory  
The field is included in the reporting database.                                                                                                                                                                                        |
|11 | **Area_Urban**                            | String 50| Area of the flooded urban territory                                                                                                                                                                                                                                                                               |
|12 | **Length**                               | String 50| Area of the flooded territory  
The field is included in the reporting database.                                                                                                                                                                                        |
|13 | **Depth**                                | String 50| Depth of the flooded territory                                                                                                                                                                                                                     |
|14 | **Depth_Urban**                           | String 50| Depth of the flooded urban territory                                                                                                                                                                                                                |
|15 | **Recurrence**                            | String 50| Average number of years between floods of equal size                                                                                                                                                                                                     |
|16 | **Frequency**                             | String 50| Statistical forecast for years between floods of equal magnitude.                                                                                                                                                                                      |
|17 | **OtherRelevantInformation**              | String 2000| Other relevant information                                                                                                                                                                                                                       |
|18 | **SummaryFloodEvent**                    | String 2000| Description of the flood                                                                                                                                                                                                                          |
|19 | **HH_01**                                | String 50| Number of people that have died  
The field shall be only filled in for past floods (i.e. the value in field CategoryofFlood is past)                                                                                       |
|20 | **HH_02**                                | String 50| Number of people affected  
The field shall be filled in for past and potential future floods.                                                                                                                                                                  |
|   |   |   | People affected according to housing affected  
The field shall be only filled in for past floods (i.e. the value in field CategoryofFlood is past) |
|---|---|---|---|
| 21. | HH_03 | String 50 | Number of affected elements of the critical infrastructure or affected buildings of public significance (hospitals, schools, etc.)  
The field shall be filled in for past and potential future floods. |
| 22. | HH_04 | String 50 | Number of affected wells and pumping stations for public drinking water supply  
The field shall be filled in for past and potential future floods. |
| 23. | HH_05 | String 50 | Number of affected economic sites  
The field shall be only filled in for past floods (i.e. the value in field CategoryofFlood is past) |
| 24. | EA_01 | String 50 | Number of roads affected - I and II class highways, railways, bridges, airports, transmission networks and other linear infrastructure  
The field shall be filled in for past and potential future floods. |
| 25. | EA_02 | String 50 | Agricultural land affected  
The field shall be only filled in for past floods (i.e. the value in field CategoryofFlood is past) |
| 26. | EA_03 | String 50 | Economic sites affected; property affected  
The field shall be only filled in for past floods (i.e. the value in field CategoryofFlood is past) |
| 27. | EA_04 | String 50 | Summarised economic value  
The field shall be only filled in for potential future floods (i.e. the value in field CategoryofFlood is future) |
<table>
<thead>
<tr>
<th></th>
<th>ENV_01</th>
<th>String 50</th>
<th>Number of sewage systems for urban areas and urban WTTPs affected The field shall be filled in for past and potential future floods.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ENV_02</td>
<td>String 50</td>
<td>Number of protected territories affected: drinking waters, zones under the Protected Territories Act, Natura 2000 The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td></td>
<td>ENV_03</td>
<td>String 50</td>
<td>Number of IPPC and SEVESO enterprises affected, etc. (PRTR) from the Executive Environmental Agency, MOEW, BD The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td></td>
<td>ENV_04</td>
<td>String 50</td>
<td>Number of industrial activities affected (outside IPPC and SEVESO) that are sources of pollution according to the Priority Substances Directive and the Directive on hazardous and harmful substances. The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td></td>
<td>CH_01</td>
<td>String 50</td>
<td>Number of affected cultural and historical UNESCO monuments and monuments of national significance The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td></td>
<td>SummaryCriteria</td>
<td>String 2000</td>
<td>Information about the flood, if available</td>
</tr>
<tr>
<td></td>
<td>Comment</td>
<td>String 250</td>
<td>Other comments</td>
</tr>
</tbody>
</table>

*For fields marked with “The field is included in the reporting database”, more detailed information is available in the reporting documents (http://icm.eionet.europa.eu/schemas/dir200760ec/resources ).

The vector layers are organised in the PFRA dataset. Three layers for each are planned, which describe the significant past and potential future floods: one with point,
one with linear and one with polygon geometry. There is no need to have input data in all three layers. The scheme of the attributive table is the same for all of them. The differences are only related to the geometry of the layers, i.e. the linear layers will have an additional attribute for length, whereas the polygon ones will have one for perimeter and area.

The fields in the attributive table for these layers are described in the following table:

**Table 2. Description of the scheme of table PFRA\_pnt\(_{pln,pgn}\)**

<table>
<thead>
<tr>
<th>№</th>
<th>Name of field</th>
<th>Type of field</th>
<th>Description of the field content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>EU_CD_FL</td>
<td>String 50</td>
<td>Unique identifier of the event location. The field is an external key to the layers with spatial data in PFRA dataset. The field is included in the reporting database</td>
</tr>
</tbody>
</table>

The figure below schematically presents the elements in the GIS database related to this thematic category and their interrelations.
Fig. 1. Schematic presentation of the elements in thematic category PFRA data.

1.2. Dataset for ASPFR

This thematic group includes data related to the identification of APSFR, including:
- **PASPFR_pgn**—preliminary APSFR with polygon geometry, obtained as a result of the implementation of the first group of steps for identification of APSFR
- **ASPFR_pln**—final version of APSFR, obtained as a result of the implementation of all steps foreseen in the methodology - linear layer
- **ASPFR_pgn**—final version of APSFR, obtained as a result of the implementation of all steps foreseen in the methodology - polygon layer
- **ASPFR_pnt**—the final version of the APSFR, corresponding to **ASPFR_pln** and/or **ASPFR_pgn** (centroids) - point layer
- **ASPFR_PopulatedPlace/ASPFR_FloodLocation**—layer with location of reported events (PFRA) - points, lines or polygons.

The final version of APSFR may be presented in two layers - with linear or polygon geometry (**ASPFR_pln** and **ASPFR_pgn**). The linear layer contains all river streams where the APSFR are identified. The lines will follow exactly the water bodies identified in the river network by JICA, where they can be part of them, and their endpoints will touch the borders identified during step "Detailing the borders" at the third stage of this methodology.

Description of the scheme of the attributive table for each of the layers in this thematic group is given in the tables below.

### Table 3. Scheme of the attributive table of layer PASPFR_pgn

<table>
<thead>
<tr>
<th>№</th>
<th>Name of field</th>
<th>Type of field</th>
<th>Description of the field content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PAPSFRCode</td>
<td>String 40</td>
<td>Unique identifier of preliminary APSFR. The field is a primary key of the layer. The field is mandatory</td>
</tr>
<tr>
<td>2</td>
<td>RiverBasin_bg</td>
<td>String 50</td>
<td>Name of the main water basin from layer H_Catchment of JICA</td>
</tr>
<tr>
<td>3</td>
<td>Name_bg</td>
<td>String 50</td>
<td>Name of the sub-catchment from layer H_Catchment of JICA</td>
</tr>
<tr>
<td>4</td>
<td>HH_02_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>5</td>
<td>HH_04_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>HH_05_RL</strong></td>
<td><strong>String 1</strong></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>EA_02_RL</strong></td>
<td><strong>String 1</strong></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>EA_03_RL</strong></td>
<td><strong>String 1</strong></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>EA_04_RL</strong></td>
<td><strong>String 1</strong></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ENV_01_RL</strong></td>
<td><strong>String 1</strong></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ENV_02_RL</strong></td>
<td><strong>String 1</strong></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ENV_03_RL</strong></td>
<td><strong>String 1</strong></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>CH_01_RL</strong></td>
<td><strong>String 1</strong></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Comment</strong></td>
<td><strong>String 250</strong></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Other notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

28
Table 4. Scheme of the attributive table of layer ASPFR_pln

<table>
<thead>
<tr>
<th>№</th>
<th>Name of field</th>
<th>Type of field</th>
<th>Description of the field content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>EUUOMCode</td>
<td>String 50</td>
<td>Unique EU code for the management region. A two-character ISO country code is added to the unique code of the member state for the respective area.</td>
</tr>
<tr>
<td>2.</td>
<td>APSFRCCode</td>
<td>String 50</td>
<td>Unique EU code for APSFR A two-character ISO country code is added to the unique code of the member state for the respective area. The field is mandatory</td>
</tr>
<tr>
<td>3.</td>
<td>PAPSFRCode</td>
<td>String 50</td>
<td>Unique identifier of preliminary APSFR. The field is a primary key of the layer. The field is mandatory</td>
</tr>
<tr>
<td>4.</td>
<td>LAT</td>
<td>String 50</td>
<td>Width in ETRS89 of the APSFR centroid. When linear or aerial sites are presented as points (centroids), these shall be the geometric centroids, meaning that the points shall fall within the borders of the polygon, or, for linear sites, the point shall be on the line</td>
</tr>
<tr>
<td>5.</td>
<td>LON</td>
<td>String 50</td>
<td>Length in ETRS89 of the APSFR centroid. When linear or aerial sites are presented as points (centroids), these shall be the geometric centroids, meaning that the points shall fall within the borders of the polygon, or, for linear sites, the point shall be on the line</td>
</tr>
<tr>
<td>6.</td>
<td>GeneralAdditionalComments</td>
<td>String 250</td>
<td>If necessary, additional information may be entered for explanation of the data provided</td>
</tr>
<tr>
<td>7.</td>
<td>SummaryofMethodology</td>
<td>String 2000</td>
<td>If Article 4 and/or 13.1 a /not mandatory for article 13.1b) is applied, there shall be a description (&lt;20,000 characters) of the methodology (including the criteria used for identification of APSFR, the reasons and criteria for including or excluding the areas and how the consequences on human health, the environment, the cultural and historical heritage and economic activity have been evaluated) for identification of APSFR.</td>
</tr>
</tbody>
</table>
If Article 4 and/or 13.1a is applied and if APSFR is not a part of an international APSFR /not mandatory for Article 13.1b/, there shall be a description (<5000 characters) of the international coordination between the respective member states within the international river basin or management region.

Hyperlink or reference to associated metadata. 2000 characters may be used for description or, as an alternative, a reference or hyperlink with associated metadata may be indicated. It shall be used if restrictions in the data use are defined.

URL for integration of the proprietary (member state's) internet-based information.

Other notes

Table 5. Scheme of the attributive table of layer ASPFR_pnt

<table>
<thead>
<tr>
<th>№</th>
<th>Name of field</th>
<th>Type of field</th>
<th>Description of the field content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>APSFRCode</td>
<td>String 50</td>
<td>Unique EU code for APSFR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A two-character ISO country code is added to the unique code of the member state for the respective area. The field is an external key of the layer and a link to layer ASPFR_pgn. The field is mandatory</td>
</tr>
<tr>
<td>2</td>
<td>LAT</td>
<td>String 50</td>
<td>Width in ETRS89 of the centroid of APSFR. The values are identical to the ones in ASPFR_pln</td>
</tr>
<tr>
<td>3</td>
<td>LON</td>
<td>String 50</td>
<td>Length in ETRS89 of the centroid of APSFR. The values are identical to the ones in ASPFR_pln</td>
</tr>
</tbody>
</table>

Table 6. Scheme of the attributive table of layer ASPFR_PopulatedPlace/ASPFR_FloodLocation

<table>
<thead>
<tr>
<th>№</th>
<th>Name of field</th>
<th>Type of field</th>
<th>Description of the field content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EKATTE/FloodLocationCode</td>
<td>String 5</td>
<td>Unique identification number of the urban area / Unique code of location of significant floods from the PFRA</td>
</tr>
<tr>
<td></td>
<td>APSFRCode</td>
<td>String 50</td>
<td>Unique EU code for APSFR</td>
</tr>
</tbody>
</table>
A two-character ISO country code is added to the unique code of the member state for the respective area. The field is an external key of the layer and a link to layer ASPFR_pgn. The field is mandatory.

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
<td>String 50</td>
<td>Name of urban area / location of flood</td>
</tr>
<tr>
<td>HH_01</td>
<td>String 250</td>
<td>Number of people that have died</td>
</tr>
<tr>
<td>HH_02</td>
<td>String 250</td>
<td>Number of people affected</td>
</tr>
<tr>
<td>HH_02_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>HH_03</td>
<td>String 250</td>
<td>People affected according to housing affected</td>
</tr>
<tr>
<td>HH_04</td>
<td>String 250</td>
<td>Number of affected elements of the critical infrastructure or affected buildings of public significance (hospitals, schools, etc.)</td>
</tr>
<tr>
<td>HH_04_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>HH_05</td>
<td>String 250</td>
<td>Number of affected wells and pumping stations for public drinking water supply</td>
</tr>
<tr>
<td>HH_05_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>EA_01</td>
<td>String 250</td>
<td>Number of affected economic sites</td>
</tr>
<tr>
<td>EA_021</td>
<td>String 250</td>
<td>Number of roads affected - I and II class highways, railways, bridges, airports, transmission networks and other linear</td>
</tr>
<tr>
<td>Column</td>
<td>Value</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>infrastructure</td>
<td>The field shall be filled in for past and potential future floods.</td>
<td></td>
</tr>
<tr>
<td>EA_021_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>EA_022</td>
<td>String 250</td>
<td>Roads affected in linear metres - I and II class highways, railways, bridges, airports, transmission networks and other linear infrastructure. The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td>EA_022_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>EA_03</td>
<td>String 250</td>
<td>Agricultural land affected. The field shall be filled in only for past floods.</td>
</tr>
<tr>
<td>EA_03_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>EA_04</td>
<td>String 250</td>
<td>Economic sites affected; property affected. The field shall be filled in only for past floods.</td>
</tr>
<tr>
<td>EA_04_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>EA_05</td>
<td>String 250</td>
<td>Summarised economic value. The field shall be filled in only for potential future floods.</td>
</tr>
<tr>
<td>ENV_01</td>
<td>String 250</td>
<td>Number of sewage systems for urban areas and urban WWTPs affected. The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td>ENV_01_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information)</td>
</tr>
<tr>
<td>ENV_02</td>
<td>String 250</td>
<td>Number of protected territories affected: drinking waters, zones under the Protected Territories Act, Natura 2000. The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ENV_02_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information).</td>
</tr>
<tr>
<td>ENV_03</td>
<td>String 250</td>
<td>Number of IPPC and SEVESO enterprises affected, etc. (PRTR) from the Executive Environmental Agency, MOEW, BD. The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td>ENV_03_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information).</td>
</tr>
<tr>
<td>ENV_04</td>
<td>String 250</td>
<td>Number of industrial activities affected (outside IPPC and SEVESO) that are sources of pollution according to the Priority Substances Directive and the Directive on hazardous and harmful substances. The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td>CH_01</td>
<td>String 250</td>
<td>Number of affected cultural and historical UNESCO monuments and monuments of national significance. The field shall be filled in for past and potential future floods.</td>
</tr>
<tr>
<td>CH_01_RL</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the set criteria threshold is passed: L (low), M (medium), H (high) and N (no information).</td>
</tr>
<tr>
<td>Risk_Level</td>
<td>String 1</td>
<td>The field contains four types of values depending on whether the cumulative set criteria threshold is passed: L (low), M (medium), H (high) and N (no information).</td>
</tr>
<tr>
<td>Comment</td>
<td>String 250</td>
<td>Other notes.</td>
</tr>
</tbody>
</table>
1.3 Baseline data used for risk assessment according to the adopted criteria

**BASE_DATA**

This group includes thematic layers that are significant for the specification of the preliminary APSFR and the definition of the final ones. These layers are available in the basin directorates. The nomenclature of layers is not strictly fixed and new themes may be added with no restriction. The set of minimum required layers is as follows:

- **for "Human Health" category:**
  - number of inhabitants at the level of Unified Classifier of Administrative-Territorial and Territorial Units;

- **for "Economic Activity" category:**
- republican transport network, including road network, railway network and airports;
- industrial and economic infrastructure;
- water supply and sewage infrastructure, including wells and pumping stations for public drinking water supply, waste water treatment plants;
- data representing summarised economic value, such as BEAM;
- critical infrastructure, including public buildings, such as hospitals, schools, etc.

- for "Environment" category:
  - sewage for urban areas and urban WTTP;
  - protected territories according to the Protected Territories Act;
  - NATURA 2000 areas;
  - drinking water areas;
  - IPPC and SEVESO companies;
  - other industrial activities (outside IPPC and SEVESO) that are sources of pollution according to the Priority Substances Directive and the Directive on hazardous and harmful substances.

- for "Cultural Heritage" category:
  - cultural and historical monuments of global significance, included in the list of UNESCO; cultural and historical monuments of national significance according to Article 50(1) of the Cultural Heritage Act.

2. Sequence of work in the identification of preliminary APSFR (PAPSFR)

At this stage, no evaluation of the area significance is required, but a purely visual rough identification of river flows and their water catchments or coastal areas with presence of significant floods. The detailing of borders of the PAPSFR defined in this way is the scope of subsequent analysis.

The water catchments from polygon layer H_Catchment from the JICA project database are used as baseline polygon sites with the role of PAPSFR in these initial steps of the methodology.
2.1. Entering the input data

**Entering data available from PFRA**

Data that are the result of the PFRA and which are reported under the FD are imported in the empty database as follows:

First, the following tables of databases *FloodsReportingDatabase_v3.mdb* are copied directly to the database:

1. PFRA_ArticleApplied
2. PFRA_AssociatedFloodLocations
3. PFRA_ConsequenceFatalities
4. PFRA_FloodEvent
5. PFRA_FloodLocation
6. PFRA_FloodLocationWFD_SWB
7. PFRA_FloodTypes
8. PFRA_FloodTypesOther
9. PFRA_SpecificArea
10. PFRA_TypeofConsequence
11. FDCommon

Then, in the empty layers of the database (*PFRA_pnt*, *PFRA_pln* and *PFRA_pgn*) the vector layers reported under PFRA are imported. It is not mandatory to import data in all three of them; this shall be done just for the ones, for which there is data. The primary key is field *EU_CD_FL* from the table of the layer.

During the next step, in the **BASE_DATA** set of the database, all available vector layers are copied, which can be used for identification of APSFR. As indicated above, the content of this thematic group is diverse, therefore all available data may be imported, which may then support the identification of the borders of APSFR. There are no strict rules with regard to the attributive information either.
Importing data in table PFRA_FloodEvent_Criteria

Table **PFRA_FloodEvent_Criteria** is created to support the assessment of the reported significant floods in regional aspect. The content of this table can be divided into three main parts. The first part of the fields are the same as the ones in table **PFRA_FloodEvent** and allow addition the general information about all reported events. The second part of the fields is specialised information on the criteria based on which the significance of each event is determined during the PFRA. The third part includes two fields that provide aggregate data about individual locations, which are actually related to one common event. This information is useful for identification of the scope of APSFR. The steps for filling in the table are as follows:

1. In the empty table **PFRA_FloodEvent_Criteria**, the data from table **PFRA_FloodEvent** are imported. During the import, the common fields of the two tables are loaded automatically.

2. Filling in the other fields where there is data about the assessment of the significance. These data are stored in a separate table (.xls), available in each basin directorate. The Excel table consists of two different sheets - one for past floods and a second one for potential future floods. In this case the two tables should be linked.
(PRFA_FloodEvent_Criteria and the Excel table) through their common field FloodEventCode and the fields in table PRFA_FloodEvent_Criteria should be calculated. The table below indicates the correspondence between the fields from table PRFA_FloodEvent_Criteria and the fields from the Excel table.

<table>
<thead>
<tr>
<th>Name of field from the table PRFA_FloodEvent_Criteria</th>
<th>Name of field from the Excel table</th>
<th>type of flood</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH_01 People that have died (number)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>HH_02 People affected (number)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>HH_03 People affected by housing affected (number) - only for past</td>
<td></td>
<td>past</td>
</tr>
<tr>
<td>HH_04 Affected elements of the critical infrastructure or affected buildings of public significance (number/square metre)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>HH_05 Affected wells and pumping stations for public drinking water supply (number)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>EA_01 Affected economic sites (number)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>EA_02 Affected roads - I and II class highways, railways, bridges, airports, transmission networks and other linear infrastructure (number/l.m)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>EA_03 Agricultural land affected (decares)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>EA_04 Economic sites affected; property affected (BGN)</td>
<td></td>
<td>past</td>
</tr>
<tr>
<td>EA_05 Summarised economic value (EUR)</td>
<td></td>
<td>future</td>
</tr>
<tr>
<td>ENV_01 Affected sewage systems for urban areas and urban WTTPs (number)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>ENV_02 Protected territories affected: drinking waters, zones under the Protected Territories Act, Natura 2000 (number/dca)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>ENV_03 IPPC and SEVESO companies affected (number)</td>
<td></td>
<td>all</td>
</tr>
<tr>
<td>ENV_04 Affected industrial activities (outside IPPC and SEVESO) that are sources</td>
<td></td>
<td>all</td>
</tr>
</tbody>
</table>
3. Fields AssociatedFloodEventCode and AssociatedFloodLocationCode are filled in. This is done again by creating the Excel table to the table PRFA_FloodEvent_Criteria through their common field FloodEventCode.

Importing data in layer ASPFR_PopulatedPlace/ ASPFR_FloodLocation

In the ASPFR part of the database, an empty template of this layer is stored.

- The data about it may be imported from layer A_BgSettle_Point from database JICA_Core_DB.mdb. The EKATTE field (Unified Classifier of Administrative-Territorial and Territorial Units) is the primary key of the layer.

- PFRA_pgn, PFRA_pln and PFRA_pnt are imported in ASPFR_FloodLocation when working with locations.

2.2. Identification of preliminary APSFR (PAPSFR)

Importing data in layer PAPSFR_pgn

During this step, the PAPSFR are identified.

First, all sites from layer H_BgCatchment from the JICA database, which correspond to the river basin, are imported in the empty layer PAPSFR_pgn. During the import, the fields RiverBasin_bg and Name_bg will be automatically filled in. The first field indicates the name of the river basin and the second field indicated the name of the sub-catchment. Then, the unique codes in field PAPSFRCODE should be calculated. (An example of such code may be concatenation of the abbreviation "APSFR", abbreviation of...
the river basin name, e.g. "VT" for Vit River, and serial number, divided by an underscore: ASPFR_VT_01).

The work related to identification of PAPSFR will also involve some revision of the borders of adjacent areas. Therefore, it is recommended to use topology, which will allow easier revision of the common borders between two areas and will prevent eventual errors, such as overlapping of areas.

**Creation of projects in GIS environment**

The identification of PAPSFR is done with a visual review and analysis of the spatial interrelations and attributive values of the data. This necessitates integration of the available data in a common GIS environment. It is mandatory to develop a project, where the available data from the database are visualised properly.

**Creation of relations between the tables from PFRA and the vector layers from the PFRA dataset**

For the assessment of the PAPSFR according to the Methodology, information from the PFRA is necessary. It is already added to the working database and now the respective relations between the tables shall be made in a GIS environment. This step shall not be omitted, because the implementation of the rules during the identification of the APSFR depends on this. Further information about the relations between tables can be found in the reporting documentation under the Floods Directive (http://icm.eionet.europa.eu/schemas/dir200760ec/resources).

A sample description of the relation of tables is given below:

- Table **FDCommon** (Value field) is joined (JOIN) to table **APSFR_TypeofConsequence** (TypeofConsequence field). The aim is to obtain information about the significance of the codes in TypeofConsequence field, indicating the type of consequences.

- Table **FDCommon** (Value field) is joined (JOIN) to table **APSFR_FloodTypes** (TypeofFlood field). The aim is to obtain information
about the significance of the codes in TypeofFlood field, indicating the origin of the flood.

- Table **PFRA_FloodTypes** (FloodEventCode field) is related (RELATE) to table **PFRA_FloodEvent_Criteria**(FloodEventCode field). The aim is to obtain information about the origin of each specific event.

- Table **PFRA_TypeofConsequence** (FloodEventCode field) is related (RELATE) to table **PFRA_TypeofConsequence**(FloodEventCode field). The aim is to obtain information about all described consequences from each specific event.

- Table **PFRA_FloodEvent_Criteria** (FloodLocationCode field) is related (RELATE) to table **PFRA_FloodLocation**(FloodLocationCode field).

- Table **PFRA_FloodEvent_Criteria** (FloodEventCode field) is related (RELATE) to table **PFRA_AssociatedFloodLocations**(FloodEventCode field).

- Table **PFRA_FloodLocation** (FloodLocationCode field) is related (RELATE) to layer **PFRA_pnt**(EU_CD_FL field).

- Table **PFRA_AssociatedFloodLocations** (loodLocationCode field) is related (RELATE) to layer **PFRA_pnt**(EU_CD_FL field).

- Table **PFRA_FloodLocation** (FloodLocationCode field) is related (RELATE) to layer **PFRA_pgn**(EU_CD_FL field).

- Table **PFRA_AssociatedFloodLocations** (loodLocationCode field) is related (RELATE) to layer **PFRA_pgn**(EU_CD_FL field).

- If there are events represented as linear objects (in layer PFRA_pln), tables **PFRA_FloodLocation** and **PFRA_AssociatedFloodLocations** shall be also related (RELATE) to them;
• Point layer `PFRA_pnt` (\textit{EU\_CD\_FL} field) is related (RELATE) to table \textit{PRFA\_FloodEvent\_Criteria} (\textit{FloodLocationCode} field).

• Polygon layer `PFRA_pgn` (\textit{EU\_CD\_FL} field) is related (RELATE) to table \textit{PFRA\_FloodEvent\_Criteria} (\textit{FloodLocationCode} field).

• The last step shall be repeated, if there are events represented as linear objects.

\textbf{2.3 Application of the basic rules for identification of PAPSFR}

Grouping close regions with significant floods cannot be done randomly by just outlining such close areas. Therefore, the following \textbf{basic adjacency rules} are used:

<table>
<thead>
<tr>
<th>Rule code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN_01</td>
<td>One PAPSFR may only include significant floods from one river basin (one draft unit from the PFRA).</td>
</tr>
<tr>
<td>RN_02</td>
<td>Excluding PAPSFR, for which there is no information about significant past and potential future floods identified during the PFRA.</td>
</tr>
<tr>
<td>RN_03</td>
<td>Regarding sea floods, coastal areas where the prerequisites for floods are identical play the role of independent PAPSFRs.</td>
</tr>
</tbody>
</table>

Before starting the verification of the criteria for significance, it is necessary to perform revision of the borders of PAPSFR for the purpose of more precise regionalisation of the area with significant potential flood risk. For this purpose, the following \textbf{basic region-based rules} shall be applied:

<table>
<thead>
<tr>
<th>Rule code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN_04</td>
<td>Revision of the borders of PAPSFR according to information about related events</td>
</tr>
<tr>
<td>RN_05</td>
<td>Revision of the borders of PAPSFR according to the scope of the urban areas</td>
</tr>
</tbody>
</table>
3. Identification of APSFR

During this stage, based on the identified criteria for risk classification in Table 1 of the Methodology and the rules regarding the floods characteristics, the scope of the PAPSFR is specified and at this stage some of the areas may be excluded and others may undergo changes in the cope.

3.1 Application of unified criteria for classification of risk for identification of PAPSFRs

The application of the criteria is done in the attributes table of ASPFR_PopulatedPlace / ASPFR_FloodLocation. During this step, final risk assessment is performed by defining three levels of risk - low, medium and high. This is done for each location in the APSFR.

The identification of the risk level in the respective location is performed based on the criteria applied in Table 1 of the Methodology. In "Database Code" field the name of the field from layer ASPFR_PopulatedPlace/ ASPFR_FloodLocation is indicated, whereas in fields "low", "medium" and "high" the threshold values for the three risk levels are indicated.

In the attributive table of layer ASPFR_PopulatedPlace/FloodLocation there are two fields for each criteria: HH_02 and HH_02_RL. The first one is for entering the specific value for the respective criterion. The second one is for classification of the risk as low (L), medium (M) and high (H). If there is no information about the respective criterion, (N) is entered. Besides the criteria indicated in Table 1, during the assessment of the risk level, other fields are also filled in (Table 2), which could support the assessment.

During the filling of the attributive table of layer ASPFR_PopulatedPlace/ FloodLocation, some specific cases may be also encountered, e.g.: if the value of a certain criterion is not specific, e.g. for the "number of affected" criterion it is indicated
"yes", no risk classification may be performed. Therefore, during the assessment, additional information in field **SummaryFloodEvent** from table **PRFA_FloodEvent_Criteria** shall be sought and if there is no such information, the additional information may be sought from an expert estimation.

In the summarising field **Risk_Level** in the attributive table of layer **ASPFR_PopulatedPlace/FloodLocation**, the risk level is entered. Each location that falls within the PAPSFR should be assessed in this way. The locations with risk level lower than "medium" are excluded from the PAPSFR and they are erased from the specific PAPSFR. The remaining locations form the APSFR, the borders of which undergo subsequent processing.

PAPSFR are excluded from the list with APSFR, if there are no locations with risk level higher than or equal to "medium risk" within the PAPSFR.

### 3.2. Detailing the borders of APSFR - identification of the final APSFR-layer **APSFR_pgn**

This stage aims to detail the borders of the APSFR according to certain rules for proximity of risk elements. The rules of point 5.1.3 of the Methodology are applied. Those APSFRs, for which the change in borders is significant, may undergo the activities under point 5.1.2 once again.

The final result from the operation is the final version of the scope of APSFR with polygon geometry - layer **APSFR_pgn**.

### 3.3. Identification of APSFR and filling in layer **ASPFR_pln**

APSFR is presented in the form of lines. The APSFR obtained as a result of application of point 3.2 shall help for the selection of only these areas of the water bodies, where the flood risk will be mapped at the next stage. This is done through a standard operation in GIS environment of cutting one layer along the borders of another one, where there is transition from polygon geometry to a layer with linear geometry. The layer that will be cut is the linear layer of the river segments from the project JICA database, and the layer, along the borders of which the cutting will take place is **ASPFR_pgn** (obtained by applying point 3-2.). During this operation, the integrity of the river segments is preserved, and where the border intersection does not coincide with the start/end of the river
segment, it is moved so that it coincides. The next step is a procedure of clearing the river sections for which no further study of the flood hazard is planned because of the lack of objects of the risk from the criteria. All river segments from the sections along which there are no close objects from the criteria for risk assessment, or which do not connect urban areas with significant flood risk, are deleted. The deletion is performed so that the other sections within the scope of the APSFR, which are not deleted, form a river network with hydraulic connections.

The obtained linear layer shall be imported in layer **ASPFR_pln** for APSFR created for this purpose. One and the same code in field **ASPFRCode** is allocated to each river segment that belongs to a certain APSFR. It is recommended to calculate the **ASPFRCode** field by following the order of numbering from the estuary along the upstream flow. The resulting lines may be combined in one site, by also keeping the option for a site with river segments.

The last part of this step is the creation of a geometric centre **ASPFR_pnt** for each line of **ASPFR_pln**. Standard GIS operations are applied, where the values for them are put in the respective LAT and LON field. Here, it is important that the geometric centre of the line lies on it. This information is necessary for the preparation for reporting.

4. Generating final database

6.1. Creation of a final database for APSFR

The identification of APSFR is a complex process that requires working with different information for the purpose of unambiguous definition of the borders of areas with significant flood risk. On the other hand, it is necessary for the results obtained to be described in a standard way, laid down in the reporting requirements. Therefore, a sample structure of GIS database is proposed for the identification of APSFR. In addition to meeting the reporting requirements, it also facilitates the work on the identification of the specific APSFR. The figure below presents a scheme of the final database:
Fig.3. Scheme of the database according to the methodology.

6.2. Creation of table information necessary for preparation for reporting under the Directive

The information about APSFR is entered in *Floods Reporting Database v3.mdb* according to the reporting requirements.

For filling in Floods Reporting Database v3.mdb, the necessary data are found in the following tables and fields:

- **For Table: APSFR_AreaofFloodRisk:**
  - Field: EUUOMCode:
    - ✓ Corresponding table: *APSFRR_pln*
    - ✓ Field: EUUOMCode
  - APSFRCode:
    - ✓ Corresponding table: *APSFRR_pln*
    - ✓ Field: APSFRCode
  - NameofAPSFR
    - ✓ Corresponding table: *APSFRR_pln*
✓ Field: NameofAPSFR

- LAT
  ✓ Corresponding table: ASPFR_pln
  ✓ Field: LAT
  ✓ Type: CoordinateType

- LON
  ✓ Corresponding table: ASPFR_pln
  ✓ Field: LON

- GeneralAdditionalComments
  ✓ Corresponding table: ASPFR_pln
  ✓ Field: GeneralAdditionalComments

• For APSFR_Summary:
  - EUUOMCode
    ✓ Corresponding table: ASPFR_pln
    ✓ Field: EUUOMCode

  - Art13_1_bSpatialInformation
    ✓ In this case, this article is inapplicable for the territory of the country

  - SummaryofMethodology
    ✓ Corresponding table: ASPFR_pln
    ✓ Field: SummaryofMethodology
    ✓ Comment: Because in the implementation of the activities related to identification of APSFR, the specific Contractor may modify certain elements of this methodology, the completion of this field shall reflect those changes. Fixing the content of this field may be only used as a sample draft at this moment.

  - SummaryofCoordination
    ✓ Corresponding table: ASPFR_pln
✓ Field: Summary of Coordination
✓ Comment: This field shall be filled in by the contractor for identification of APSFR with the support of the BD after undertaken eventual actions related to identification of international APSFR

  o METADATA
  ✓ Corresponding table: ASPFR_pln
  ✓ Field: METADATA
  ✓ Comment: This field shall be filled in by the contractor for identification of APSFR with the support of the BD after adopting the format of the metadata

  o URL
  ✓ Corresponding table: ASPFR_pln
  ✓ Field: URL
  ✓ Comment: This field shall be filled in by the contractor for identification of APSFR with the support of the BD after specifying the respective URL where the data will be published

• For APSFR_Type of Consequence: an identical table is created in the database with the same structure as the one in the reporting documents – APSFR_Type of Consequence. Information for filling in the fields in it is taken from:
  o APSFRCode
    ✓ Corresponding table: PASPF R_pln
    ✓ Field: PASPF RCode

  o Type of Consequence:
    ✓ Human Health
      – Corresponding table: PASPF R_pln
      – Field: the corresponding fields for criteria in the table (see Table 1). In case of H in the respective category, a code according to the ones described in chapter 5.2.4.1 is taken.
    ✓ Environment
- Corresponding table: `PASPFR_pln`
- Field: the corresponding fields for criteria in the table (see Table 1). In case of H in the respective category, a code according to the ones described in chapter 5.2.4.1 is taken.

✓ Cultural Heritage
- Corresponding table: `PASPFR_pln`
- Field: the corresponding fields for criteria in the table (see Table 1). In case of H in the respective category, a code according to the ones described in chapter 5.2.4.1 is taken.

✓ Economic
- Corresponding table: `PASPFR_pln`
- Field: the corresponding fields for criteria in the table (see Table 1). In case of H in the respective category, a code according to the ones described in chapter 5.2.4.1 is taken.

- OtherConsequenceDescription
  ✓ Other consequences are described, if such are available in the description of floods. See field SummaryCriteria and Comment in table `BG1000_PFRA_FloodEvent`

- Fatalities
  ✓ Corresponding table: `ASPFR_PopulatedPlace`
  ✓ Field: `HH_01`
      - Comment: The sum of all values in HH_01 of the urban areas in the given APSFR

- For APSFR_TypeOfFlood: the table contains the following fields:
  o APSFRCode
      ✓ Corresponding table: `ASPFR_pln`
      ✓ Field: `APSFRCode`

  o TypeOfFlood:
Comment: the relation is done through field FloodEventCode, in which way the information about the floods is transferred in APSFR_FloodEvent. Then, through FloodLocationCode, the information is related to the vector files for past and potential future floods. They are also related to the populated places. All places in APSFR are selected and the codes available for the floods are described.

- **OtherSource**
  - ✓ Identical relation to the one described above, however, the information is taken from Comment in table PFRA_FloodEvent

- **OtherMechanism**
  - ✓ Identical relation to the one described above, however, the information is taken from Comment in table PFRA_FloodEvent

- **OtherCharacteristic**
  - ✓ Identical relation to the one described above, however, the information is taken from Comment in table PFRA_FloodEvent