

# **Annex**

## **Technical Facts of Each Country**

### **WP4 Output 4.1**

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## 1 Introduction

This document gives an overview about the existing data exchange systems of national data providers as well as country specific needs and requirements.

The information has been derived from the Country Fact Sheets (part of Output 3.1) and technical information forms filled out by data providers. These technical facts have been the basis for the implementation of the common data exchange platform.

## 2 Technical Facts

### 2.1 Austria

#### Technical capabilities

##### *Hydrology*

All data on the water cycle in Austria is collected and prepared by the Hydrographical Services at the Offices of the Provincial Governments and processed in a summary procedure by Division I/4 –Water Budget (Hydrographical Central Office) at the Federal Ministry of Sustainability and Tourism.

Real time data from all hydrological measuring points are entered in the hydrographical database called HyDaMS. Acquisition, processing and controlling of hydrological data is be done consistent in all Provinces and in the Central Office. The provinces as well as the Central Office are using the “Hydrographisches Daten-Management-System”

[https://www.bmnt.gv.at/wasser/wasser-wasserkreislauf/hydrographische\\_daten/HyDaMS.html](https://www.bmnt.gv.at/wasser/wasser-wasserkreislauf/hydrographische_daten/HyDaMS.html)

All hydrological stations selected for DAREFFORT are connected online. The update interval for the water level, discharge and water temperature is every 30 minutes.

Information on ice periods is not available in real time, but in hydrological yearbooks.

The data is stored in a relational data base. Unchecked data is replaced by checked data after a while.

##### *Meteorology*

Several operators run meteorological networks in Austria. Beside the Hydrological Service the Central Institute for Meteorology and Geodynamics (Zentralanstalt für Meteorologie und Geodynamik, ZAMG) and the large power station companies are to be mentioned as main network operators. Storage precipitation gauges (totalizers), non-recording gauges (ombrometers) and recording gauges (ombrographs) are used to measure precipitation.

Real time precipitation data (from the hydrographic monitoring network) are available on the internet at [www.ehyd.gv.at](http://www.ehyd.gv.at) (themes map: "aktuelle Daten"). The update interval for precipitation is 30 minutes. Grid data is not published in real time.

The data is stored in a relational data base. Unchecked data is replaced by checked data after a while.

## Metadata

Metadata about each measuring station is included in the water level output file which is available via a Web-API.

## Current data delivery method

### *Real time hydrological data*

Real time hydrological data is available via web-service WFS. Technical documentation is provided in 20190213\_WFS-Dienst.pdf

Current capabilities of the web-service can be retrieved by calling <http://gis.bmlfuw.gv.at/wmsgw/?key=ACCESSKEY&VERSION=1.0.0&REQUEST=GetCapabilities&SERVICE=WFS>

Real time hydrological measurement data can be accessed by calling <http://gis.bmlfuw.gv.at/wmsgw/?key=ACCESSKEY &VERSION=1.0.0&REQUEST=GetFeature&SERVICE=WFS&TYPENAME=pegelaktuell>

Currently via web-service WFS only water level is accessible.

Example:

```

▼<gml:featureMember>
  ▼<ms:pegelaktuell fid="pegelaktuell.157">
    ▼<gml:boundedBy>
      ▼<gml:Box srsName="EPSG:31287">
        ▼<gml:coordinates>
          564532.000000,335883.000000 564532.000000,335883.000000
        </gml:coordinates>
      </gml:Box>
    </gml:boundedBy>
    ▼<ms:msGeometry>
      ▼<gml:Point srsName="EPSG:31287">
        <gml:coordinates>564532.000000,335883.000000</gml:coordinates>
      </gml:Point>
    </ms:msGeometry>
    <ms:gid>157</ms:gid>
    <ms:dbmsnr>6001132</ms:dbmsnr>
    <ms:hzbnr>211847</ms:hzbnr>
    <ms:gewasser>Mur</ms:gewasser>
    <ms:hd>Steiermark</ms:hd>
    <ms:messstelle>Mellach (ohne Muehlkanal)</ms:messstelle>
    <ms:land/>
    ▼<ms:internet>
      http://app.hydrographie.steiermark.at/bilder/Hochwasserzentrale/HZB/Q3500.htm
    </ms:internet>
    <ms:parameter>Q</ms:parameter>
  </ms:pegelaktuell>
</gml:featureMember>

```

```

<ms:dbmsnr>6001132</ms:dbmsnr>
<ms:hzbnr>211847</ms:hzbnr>
<ms:gewasser>Mur</ms:gewasser>
<ms:hd>Steiermark</ms:hd>
<ms:messstelle>Mellach (ohne Muehlkanal)</ms:messstelle>
<ms:land/>
▼<ms:internet>
  http://app.hydrographie.steiermark.at/bilder/Hochwasserzentrale/HZB/Q3500.htm
</ms:internet>
<ms:parameter>Q</ms:parameter>
<ms:herkunft>F</ms:herkunft>
<ms:wert>156</ms:wert>
<ms:zp>2015-04-20 05:30:00</ms:zp>
<ms:typ>0</ms:typ>
<ms:farbe>2</ms:farbe>
<ms:datum>2015-04-20 08:05:00</ms:datum>
<ms:symbol>3</ms:symbol>
<ms:gesamtcode>230</ms:gesamtcode>
<ms:old_geom/>
<ms:geol>15,493889</ms:geol>
<ms:geob>46,902500</ms:geob>
<ms:wertw_cm>275.0</ms:wertw_cm>
<ms:prognose>false</ms:prognose>
</ms:pegelaktuell>
</gml:featureMember>

```

For DAREFFORT an access key is provided.

The data may only be used in the project DanubeHIS. A sale to third parties is not permitted.

#### *Real time meteorological data*

Precipitation real time data is expected to be available in 2020 through the WFS web service. The data exchange format will be similar to that of the hydrological data.

#### *Processed hydrological data*

Processed hydrological data are available on the internet with the link: [www.ehyd.gv.at](http://www.ehyd.gv.at) (themes map: "Messstellen und Daten").

#### *Processed meteorological data*

Processed meteorological data are available on the internet with the link: [www.ehyd.gv.at](http://www.ehyd.gv.at) (themes map: "Messstellen und Daten").

### **Future developments**

Currently there are no concrete plans for system / software improvements in the foreseeable future which could have an impact on the data exchange within the project and for DanubeHIS in the future.

## **2.2 Bulgaria**

### **Technical capabilities**

The National Institute of Meteorology and Hydrology (NIMH) ([www.meteo.bg](http://www.meteo.bg), <http://www.hydro.bg>) is a research institute of the Ministry of Education and Science and the official meteorological and

hydrological service in Bulgaria. The structure of the institute is preserved - the headquarters (Sofia) and four branches (Pleven, Varna, Plovdiv and Kyustendil).

#### *Hydrology*

At NIMH the software product HYDRA has been developed. This software calculates average daily minimum and maximum water levels for the month. HYDRA also calculates the respective water quantity by the velocity-area-method as well as dynamic and geometric characteristics in the stream.

All hydrological stations selected for DAREFFORT are connected online and have an update interval of once a day for water level and discharge. The water temperature is not measured. The ice cover is visually observed near the hydrometric stations. Real time data is stored in a relational data base and available since 2001.

#### *Meteorology*

All stations selected for DAREFFORT are connected online and have an update interval of once a day for precipitation. No grid data is available. Real time data is stored in a relational data base and available since 2001.

#### **Metadata**

Information about metadata is stored in different files and needs to be combined to be used for HyMeDES.

#### **Current data delivery method**

##### *Real time hydrological data*

At the moment the most appropriate data format for exchanging the data is discussed at NIMH and it is planned to transfer the data by an FTP-Server. The access to the data to be used in HyMeDES (DanubeHIS in the future) is only given for the continuation of the main goals of the project. The usage of data currently is restricted to tasks within the project aims. The restrictions will be different for the future use, and have to be discussed.

##### *Real time meteorological data*

At the moment the most appropriate data format is discussed, and it is planned to transfer the data by a FTP-Server. For real time meteorological data, the same access restrictions apply as for hydrological data (see above).

##### *Processed hydrological data*

Only real time data will be provided.

##### *Processed meteorological data*

Only real time data will be provided.

#### **Future developments**

Currently there are no concrete plans for system / software improvements in the foreseeable future which could have an impact on the data exchange within the project and for DanubeHIS in the future.

## 2.3 Croatia

### Technical capabilities

Croatian Meteorological and Hydrological Service (DHMZ) is a state administrative and a scientific research legal entity headed by a director, appointed by the government and responsible to the government. Croatian Meteorological and Hydrological Service is the official source of hydrological and meteorological data and information.

#### Hydrology

DHMZ is the main actor tasked with all activities on the collection, processing, archiving and distribution of hydrological data in the Republic of Croatia.

All selected stations for DAREFFORT are connected online and have an hourly updating frequency. Water temperature is not measured at every hydrological station. The data is stored in a relational data base with no time limit. No real time ice data is available. Croatian Waters has some historical reports.

#### Meteorology

All stations selected for DAREFFORT are connected online. The update interval of the precipitation, air temperature and snow cover is hourly. No grid data is available.

### Metadata

Metadata for hydrological stations is provided via <https://hidro.dhz.hr/hidroweb/skripte/hidrobazahtml.py?funkc=puninfopost&kpost=XYZ>. XYZ should be replaced by the code of the station. An example for station codes can be seen below.

STATION NAME	RIVER NAME	MSHISStCode	Internal db code
CRNAC	SAVA	3020	55
DAVOR C.S.	SAVA	3179	58
JASENOVAC	SAVA	3219	65
MAČKOVAC USTAVA	SAVA	3207	68
RUGVICA	SAVA	3096	71
SLAVONSKI ŠAMAC	SAVA	3101	73

Meteorological Metadata are available via [https://meteo.hr/infrastruktura/popis\\_osnovne\\_mreze\\_meteoroloskih\\_postaja.xlsx](https://meteo.hr/infrastruktura/popis_osnovne_mreze_meteoroloskih_postaja.xlsx)

### Current data delivery method

#### Real time hydrological data

The data format of the hydrological data will be the same as for the exchange for SAVA HIS. It is a csv file with hourly data in the following columns:

```
Station name; Station code (MSCD_HISST); Timestamp (UTC+1); Water level (relative, cm); Discharge; Temperature
```

9999.9 is the code for missing data.

Example:

```
AKUMULACIJA PAKRA;3399;2019-08-01 09:00;327;9999.9;9999.9
AKUMULACIJA PAKRA;3399;2019-08-01 10:00;327;9999.9;9999.9
AKUMULACIJA PAKRA;3399;2019-08-01 11:00;327;9999.9;9999.9
BAČICA;2514;2019-07-31 00:00;9999.9;9999.9;9999.9
BAČICA;2514;2019-07-31 01:00;9999.9;9999.9;9999.9
BAČICA;2514;2019-07-31 02:00;9999.9;9999.9;9999.9
BAČICA;2514;2019-07-31 03:00;9999.9;9999.9;9999.9
BAČICA;2514;2019-07-31 04:00;9999.9;9999.9;9999.9
BAČICA;2514;2019-07-31 05:00;9999.9;9999.9;9999.9
```

The data is provided via ftp server every hour: <ftp://radar.dhz.hr/>. For the project purposes of DAREFFORT a login has been provided.

After the project, the same restrictions as during the project should apply for data access.

#### *Real time meteorological data*

The data format of the meteorological data will be the same as for the exchange for SAVA HIS. It is a xml file with hourly data. An example can be seen below:

```
<?xml version="1.0" encoding="UTF-8" ?>
- <data id="Croatia_latest_weather">
  <Copyright>DHMZ - meteo.hr</Copyright>
  <Copyright_URL>meteo.hr</Copyright_URL>
- <DateTime>
  <DateValid>2019-07-29 12:00:00</DateValid>
  <DateIssued>2019-07-29 12:37:07</DateIssued>
</DateTime>
- <Weather>
- <station>
  - <station_data>
    <station_id>Bjelovar</station_id>
    <station_number>14253</station_number>
    <station_name>Bjelovar</station_name>
    <lat>45.910</lat>
    <lon>16.869</lon>
    <altitude_m>141</altitude_m>
  </station_data>
  - <meteo_data>
    <temp_air_C>25.3</temp_air_C>
```

The data is provided via ftp server every hour. <ftp://radar.dhz.hr/>. For the project purposes of DAREFFORT a login has been provided.

After the project, the same restrictions as during the project should apply for data access.

#### *Processed hydrological data*

Separate csv files for each station and parameter can be produced. First line denotes parameter, second station id.

Example of water level data: Vodostaj (cm)  
SIFRA;;3026  
2013-01-01 00:00;72  
2013-01-02 00:00;32  
2013-01-03 00:00;6

Processed data is not available online. The DHMZ is the official provider of hydrological data for Croatia and should be contacted for data reusability.

#### *Processed meteorological data*

Text file can be generated for separate station and parameter. Example of precipitation data:

“.” marks a day without precipitation. 0.0 marks a day with trace precipitation.

REPUBLIKA HRVATSKA – DRŽAVNI HIDROMETEOROLOSKI ZAVOD  
KLIMATOLOSKO METEOROLOSKI SEKTOR  
ZAGREB-GRIC 3

```
Postaja:  BJELOVAR
ddmmgggg  PREC (mm)
01012018  .
02012018  11.6
03012018  0.1
04012018  0.2
```

Processed data is not available online. The DHMZ is the official provider of hydrological data for Croatia and should be contacted for data reusability.

### **Future developments**

Implementation of WISKI7 (Water information system, Kisters AG) is planned in the next few years. Development of web services for hydrological data exchange is also recognized as a necessity and shall be considered for development in the near future.

## **2.4 Czech Republic**

### **Technical capabilities**

The national hydrological and meteorological service is ensured by the Czech Hydrometeorological Institute (CHMI).

#### *Hydrology*

All selected stations for DAREFFORT are connected online and have an updating frequency of once per 10 minutes for water level, discharge and temperature. The data is stored in a relational data base which has no limit of storage.

The operational discharge is derived from the consumption curve – the relationship between water level and discharge. Rating curves are prepared by hydrologists based on regular discharge measurements.

The ice cover is observed from October to April. If the water level measurement is influenced by ice, the data is labelled as influenced.

### *Meteorology*

All stations selected for DAREFFORT are connected online. Precipitation is updated every ten minutes, air temperature, humidity and air quality hourly and snow cover once a week. The data is stored in a relational data base without a time limit.

Grid data is available. The provider is CHMI and the data covers the Czech Republic area. The data is stored in a relational data base in the data formats dbf, txt, csv. Some data is published on the CHMI website in jpg.

### **Metadata**

Some information about gauging stations and measurement can be found for example on following webpages:

[hydro.chmi.cz/hpps/hpps\\_prfbk\\_detail.php?seq=307007](http://hydro.chmi.cz/hpps/hpps_prfbk_detail.php?seq=307007)

[hydro.chmi.cz/hpps/hpps\\_prfbk\\_detail.php?seq=307372](http://hydro.chmi.cz/hpps/hpps_prfbk_detail.php?seq=307372)

[http://portal.chmi.cz/files/portal/docs/poboc/OS/stanice/ShowStations\\_CZ.html](http://portal.chmi.cz/files/portal/docs/poboc/OS/stanice/ShowStations_CZ.html)

### **Current data delivery method**

#### *Real time hydrological data*

CHMI will export data in WaterML 2.0 format. CHMI plans to share only data that is free for use, so there will be no restrictions in the future.

#### *Real time meteorological data*

Same as for real time hydrological data (see above)

#### *Processed hydrological data*

Same as for real time hydrological data (see above)

#### *Processed meteorological data*

Same as for real time hydrological data (see above)

### **Future developments**

Currently there are no concrete plans for system / software improvements in the foreseeable future which could have an impact on the data exchange within the project and for DanubeHIS in the future.

## **2.5 Germany**

### **Technical capabilities**

#### *Hydrology*

For Danube River in Germany the main responsible hydrological service is Bavarian Environment Agency LfU in Augsburg, supervised by the Bavarian State Ministry of the Environment and Consumer

Protection. The LfU uses LAMP (Linux, Apache, MySQL, PHP) server systems. In Baden-Wurttemberg, the hydrological service is a unit of the State Office of Environment (Landesanstalt für Umwelt) which is subordinated to the Ministry of the Environment, Climate Protection and the Energy Sector.

The hydrological stations selected for DAREFFORT are connected online. The water level is updated once per 15 minutes, discharge and temperature range between 15 and 60 minutes. The update interval for the water quality and sediment transport also ranges between 15 and 60 minutes, but is not available via web interface.

The height of the ice and the water equivalent is measured (not all stations cover both parameters). Additionally, there are many observers who measure once a day or only during the snow season.

The hydrological real time data is stored in a relational data base. Water level and discharge is stored for one year and one month, water temperature for one month.

### *Meteorology*

The meteorological service is the German Meteorological Service (Deutscher Wetterdienst/DWD) and is, in contrast to the hydrological service, a higher federal authority. It is within the scope of business of the Federal Ministry of Transport and Digital Infrastructure.

All stations selected for DAREFFORT are connected online and have an update interval for precipitation of once per hour.

Grid data for Germany is provided by the DWD. The binary format RADOLAN is available free of charge. The update interval is 5 minutes, hourly or total values every 24 hours. RADOLAN data for Central Europe is also available for clients. Additionally, processed data are published yearly.

The data is stored in a relational database.

### **Metadata**

Hydrological metadata is available online:

<https://www.hnd-daten.bayern.de/webservices/export.php?user=XXX&pw=XXX&pgr=STATIONNUMBER&metainfo=1>

Meteorological metadata for a particular station is automatically downloaded when precipitation data for that station is downloaded.

### **Current data delivery method**

#### *Real time hydrological data*

Hydrological data can be retrieved by html-web-api: <https://www.hnd-daten.bayern.de/webservices/export.php?user=XXX&pw=XXX&pgr=STATIONNUMBER>

**Water level:** web-api-parameter: "werte=W"

**Discharge:** web-api-parameter: "werte=Q"

**Temperature:** web-api-parameter: "werte=WT"

The default format of the data is csv, but data can also be retrieved as xml or zrx (text).

Following table shows an example reply of the web-api in formatted text:

```
-----
Messtelle      | 18454003 | 15207507 | 10053009 | 14006000
-----
14.08.2019 00:00 |      169 |      239 |      386 |      55
14.08.2019 00:15 |      171 |      239 |      386 |      55
14.08.2019 00:30 |      172 |      239 |      387 |      55
14.08.2019 00:45 |      175 |      239 |      387 |      56
14.08.2019 01:00 |      176 |      239 |      387 |      56
14.08.2019 01:15 |      177 |      239 |      388 |      56
14.08.2019 01:30 |      178 |      239 |      388 |      56
14.08.2019 01:45 |      179 |      239 |      388 |      56
14.08.2019 02:00 |      180 |      239 |      388 |      56
14.08.2019 02:15 |      180 |      240 |      388 |      56
14.08.2019 02:30 |      181 |      240 |      388 |      56
14.08.2019 02:45 |      181 |      240 |      387 |      60
14.08.2019 03:00 |      182 |      240 |      387 |      63
14.08.2019 03:15 |      183 |      240 |      386 |      64
```

For the project purposes of DAREFFORT a login has been provided.

The data will be made available to a personal user after the conclusion of a user agreement. The usage agreement is not limited to a certain period of time. It contains a list with the desired measuring points as well as the temporal extent.

#### *Real time meteorological data*

Documentation in English is available via:

[https://opendata.dwd.de/climate\\_environment/CDC/observations\\_germany/climate/hourly/precipitation/recent/DESCRIPTION\\_obsgermany\\_climate\\_hourly\\_precipitation\\_recent\\_en.pdf](https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/hourly/precipitation/recent/DESCRIPTION_obsgermany_climate_hourly_precipitation_recent_en.pdf)

The data can be retrieved in various ways. One option free of charge and freely accessible is via <https://opendata.dwd.de>. At <https://maps.dwd.de>, various data sets can be accessed as OGC-compliant (Open Geospatial Consortium) services. Another option is a secure supply where individual requirements are also possible.

Example for hourly precipitation for the station ID 87:

```
STATIONS_ID;MESS_DATUM;QN_8; R1;RS_IND;WRTR;eor
87;2018022400; 3; 0.0; 0;-999;eor
87;2018022401; 3; 0.0; 0;-999;eor
87;2018022402; 3; 0.0; 0;-999;eor
87;2018022403; 3; 0.0; 0;-999;eor
87;2018022404; 3; 0.0; 0;-999;eor
```

#### *Processed hydrological data*

Processed hydrological data is available via

<https://www.hnd-daten.bayern.de/webservices/export.php?user=XXX&pw=XXX&pgnr=18454003&diskr=60&layout=SPALTE&leerweg=1>

For the project purposes of DAREFFORT a login has been provided.

```
Messstelle;18454003  
2019-09-02 01:00:00;162,5  
2019-09-02 02:00:00;171  
2019-09-02 03:00:00;185,5  
2019-09-02 04:00:00;190,5  
2019-09-02 05:00:00;196  
2019-09-02 06:00:00;197
```

The data will be made available to a personal user after the conclusion of a user agreement. The usage agreement is not limited to a certain period of time. It contains a list with the desired measuring points as well as the temporal extent.

#### *Processed meteorological data*

Information about processed meteorological data will be provided.

#### **Future developments**

It is planned to make the data available at [gkd.bayern.de](http://gkd.bayern.de) via an interface. There will be historical data, processed data as well as data on chemistry and biology available.

## **2.6 Hungary**

#### **Technical capabilities**

##### *Hydrology*

Hydrology and water management issues are dealt with by General Directorate of Water Management (OVF). OVF is an independently operated and managed central budgetary authority under the Ministry of Interior. OVF coordinates and supervises the professional activities of the twelve regional Water Directorates.

All stations selected for DAREFFORT are connected online. The update interval for the water level, discharge and water temperature is once per hour.

The data is stored in a relational data base. A continuous dataset of water levels and discharge is available since 1983.

The percentage of the surface covered with ice, the thickness of the ice cover and the duration of the ice cover are typically measured from 1 December to 31 March. The ice cover is updated once per day.

### *Meteorology*

Meteorological issues belong to the authority of Hungarian Meteorological Service (OMSZ), which operates under the Ministry of Agriculture.

All stations selected for DAREFFORT are connected online. The update interval for the precipitation, air temperature, wind speed and wind direction is once per hour and for the snow cover it is once per day.

The data is stored in a relational data base. A continuous dataset is available since 1981.

### **Metadata**

Metadata can be found in native language via <http://www.vizugy.hu/?mapModule=OpVizallas&SzervezetKod=0&mapData=VizmerceLista#mapModule>. In English metadata of hydrological stations can be found in the excel document *metadata\_gauging\_stations.xlsx* attached to technical information form. Metadata of meteorological stations can be found in the excel document *metadata\_met\_stations.xlsx*.

### **Current data delivery method**

#### *Real time hydrological data*

OVF receives data from many sources in many forms. For data exchange the FTP protocol, web, e-mail, CSV, formatted TXT, XML and DBF are the most commonly used at OVF. When it comes to sending data, OVF is able to supply data in the requested form.

#### *Real time meteorological data*

OVF receives data from the Hungarian Meteorological Service in many forms. OMSZ provides data via FTP protocol, meteorological bulletins (SYNOP, CQ) and e-mail. CSV, formatted TXT are the most commonly used data formats. OVF is going to transmit meteorological data to the DanubeHIS in the requested form.

#### *Processed hydrological data*

Processed data is available at the server of OVF and parts of the data is online at <http://www.hydroinfo.hu/archivum.html>.

#### *Processed meteorological data*

Processed meteorological data is available at the server of OVF and OVF is going to transmit these data to the DanubeHIS in the requested form.

### **Future developments**

Currently there are no concrete plans for system / software improvements in the foreseeable future which could have an impact on the data exchange within the project and for DanubeHIS in the future.

## 2.7 Moldova

### Technical capabilities

#### *Hydrology*

The State Hydrometeorological Service is a public institution subordinated to the Ministry of Environment. Its activity is regulated by the government. Administration of the Service is ensured by its director, appointed by the Government. Currently, the service has three main areas of activity: Meteorology, Hydrology and Environmental quality monitoring. The supreme governing body of the service is the Technical-Scientific Council, headed by the director of the State Hydrometeorological Service.

All twelve hydrological stations selected for DanubeHIS are connected online. The water level, discharge and the water temperature are updated every 15 minutes and data is stored continuously. Different ice parameters are measured: the percentage of surface, the thickness of ice cover and the duration of ice cover. They are observed once in five days between November and April.

#### *Meteorology*

The following departments are included in the centre's structure: Meteorological Forecasting Centre, Centre of Meteorology and Climatology, Agrometeorological Monitoring Centre, Information Management Centre and National Meteorological Observation Network. The main tasks of the centre are the

- organization, development and methodical management of the state system of meteorological and agrometeorological observations
- elaboration of forecasts of public interest and warnings regarding unfavourable meteorological phenomena, which are regularly transmitted to the central and local public administration bodies and the mass-media services
- providing economic agents with specialized information on the basis of contracts concluded according to the scheme plans coordinated by the Ministry of Environment and others

All meteorological stations selected for DAREFFORT are connected online. The parameter precipitation, air temperature, humidity, air pressure, wind speed and wind direction are updated in real time, air quality is updated twice a day and snow cover daily.

No grid data is available.

### Metadata

Metadata is available in electronic format and printed on paper.

To receive access to this data, a written request to the service administration is necessary. The provision of data for commercial purposes is performed according to Government Decision Republic of Moldova no. 330 of 03.04.2006.

## Current data delivery method

### *Real time hydrological data*

In general, real time data are transmitted in HYDRA. Real time hydrological data can be retrieved via <http://hydrodata.meteo.md/index2.php>.

Example:

```
Costesti; 25057
```

```
Labels:; Level PLS; Wather Temp; Level CBS; Accu voltage; LevelPLS SAT; LevelCBS SAT
Units:; m; °C; m; V; m; m
26.08.2019 08:10:00; 87,39; 23,90; 87,39; 13,8; ;
26.08.2019 08:20:00; 87,39; 23,90; 87,39; 13,8; 87,39; 87,39
26.08.2019 08:30:00; 87,39; 23,90; 87,39; 13,8; ;
26.08.2019 08:40:00; 87,39; 23,90; 87,39; 13,8; 87,39; 87,39
26.08.2019 08:50:00; 87,39; 23,90; 87,39; 13,8; ;
26.08.2019 09:00:00; 87,39; 23,90; 87,38; 13,8; 87,39; 87,39
```

### *Real time meteorological data*

In general, real time data are transmitted in HYDRA. Real time meteorological data can be retrieved via <http://hydrodata.meteo.md/index2.php>.

Example:

```
meteo Briceni; 25070
```

```
Labels:; Rain Int.; SYNOP; Radar reflec; Visibility
Units:; mm/h; -; -; m
20.08.2019 23:10:00; 0,0; 0; 0; 9999
20.08.2019 23:20:00; 0,0; 0; 0; 9999
20.08.2019 23:30:00; 0,0; 0; 0; 9999
20.08.2019 23:40:00; 0,0; 0; 0; 9999
```

### *Processed hydro- / meteorological data*

The systematic hydrometeorological observations carried out on the territory of the Republic of Moldova for 50-100 years made it possible to generalize and publish hydrological data in the form of hydrological guides and monographs such as the "Hydrological Yearbook", the "Multiannual Data on Resources and Surface Waters" and the "State Water Cadastre". Their information shall be used for the planning and implementation of measures against the harmful effects of dangerous and hazardous phenomena and for the protection of the environment.

Processed hydrological data is available in electronic and paper format. To receive access to this data, it is necessary to write a request to the service administration. The provision of data for commercial purposes is performed according to Government Decision Republic of Moldova no. 330 of 03.04.2006.

## Future developments

In the future the Republic of Moldova wants to improve the data exchange through the intervention of different international projects.

## 2.8 Romania

### Technical capabilities

#### *Hydrology*

The National Institute of Hydrology and Water Management (NIHWM) is a public institution and a subunit of the Romanian Waters National Administration, the national authority in hydrology, hydrogeology and water management. The National Hydrological Network within the Romanian Water National Administration is administrated by the eleven Water Basin Administrations, organized based on the main River Basins as follows: Somes-Tisa, Crisuri, Mures, Banat, Jiu, Olt, Arges-Vedea, Buzau-Ialomita, Siret, Prut, and Dobrogea-Litoral.

The data that will be provided from the stations selected for the scope of DanubeHIS will be based on manual observations. During normal conditions, the water level and discharge manual observations updating frequency is once or twice a day. During flood events if the first flood defence threshold is exceeded the observation frequency is in general every three hours, and if the second flood defence threshold is exceeded the observation frequency is in general every hour.

In general, between December and February the percentage of surface covered by ice, the thickness of ice cover and the duration of ice cover are measured. The time period can differ depending on the rivers and winter.

The data is stored in a relational data base for at least one month.

#### *Meteorology*

The National Meteorological Observation Network within the National Meteorological Administration (NMA) is administrated by 7 Regional Meteorological Centres (RMC): North Transilvania (Cluj), South Transilvania (Sibiu), Banat-Crişana (Timişoara), Oltenia (Craiova), Muntenia (Bucureşti), Moldova (Iaşi) and Dobrogea (Constanţa).

Hydrological stations will be also used in the DAREFFORT project for providing the meteorological data, for the scope of DanubeHIS. This may change in the future. The update interval for precipitation and air temperature from manual observations on hydrological stations is every 12 or 24 hours.

Grid data is available as net cdf or grib files and other specific formats.

The data is stored in a relational data base for at least one month.

## Metadata

Metadata is not available online. The NHWM will provide metadata as xls or csv file on the FTP-Server 82.78.133.2. For the project purposes of DAREFFORT a login has been provided.

## Current data delivery method

### *Real time hydrological data*

Real time hydrological data will be available via FTP: 82.78.133.2. For project purposes of DAREFFORT a login has been provided.

The data restrictions will correspond to the agreements with the ICPDR. Most probably data for DanubeHIS will be public data.

### *Real time meteorological data*

Real time meteorological data will be available via the same FTP-server as real time hydrological data (see above).

### *Processed hydrological data*

Processed hydrological data will be available via the same FTP-server as real time hydrological data (see above).

The format will be xls or csv. The processed data will be updated once a year.

### *Processed meteorological data*

Processed meteorological data will be available via the same FTP-server as real time hydrological data (see above).

The format will be xls or csv. The processed data will be updated once a year.

## Future developments

It is planned to test a web service in the future, but the FTP will be kept for the next years.

## 2.9 Serbia

### Technical capabilities

#### *Hydrology*

RHMS of Serbia, as a special organization within the framework of state administration performs professional tasks and state administration activities. At present the RHMS hydrological network consists of 5 regional centres. New technology is adopted during the last years for discharge and water level measurements. For hydrological data management purposes, RHMS of Serbia uses the information system WISKI (Water Information System Kisters) from Kisters.

The stations selected for DAREFFORT are all connected online. Water level, discharge, and water temperature are updated hourly.

Ice Cover percentage, thickness and duration are updated daily, and they are measured from November until March.

Real time data is stored in a relational data base for the DAREFFORT project for seven days.

### *Meteorology*

At present the RHMSS meteorological network consists of 28 principal meteorological stations, about 90 climatological stations and about 420 precipitation stations. Measuring and observation at the principal meteorological stations are performed according to the synoptic program. All principal meteorological stations are equipped with automatic weather stations and there are additionally 11 automatic weather stations.

All stations selected for DAREFFORT are connected online. The update interval for precipitation, air temperature, humidity and snow cover is once per hour. For Serbia, no grid data is available.

### **Metadata**

Metadata for hydrological stations are available on the RHMSS website via:

[http://www.hidmet.gov.rs/eng/hidrologija/povrsinske/pov\\_stanica.php?hm\\_id=42010](http://www.hidmet.gov.rs/eng/hidrologija/povrsinske/pov_stanica.php?hm_id=42010)

The link is an example for the hydrological station Bezdán on the river Danube – national id = 42010.

After a detailed discussion which metadata are needed it can be provided as an excel sheet.

### **Current data delivery method**

#### *Real time hydrological data*

Real time hydrological data will be provided via [http://www.hidmet.gov.rs/korisnici/danube\\_his/](http://www.hidmet.gov.rs/korisnici/danube_his/).

This is the example file danube\_his\_201908010700.csv:

```
SRBIJA,42010,DUNAV,BEZDAN,45.8542,18.86,47,8,1500,,,  
SRBIJA,42020,DUNAV,BOGOJEVO,45.5302,19.079,104,2,2130,25.4,,  
SRBIJA,42035,DUNAV,NOVI_SAD,45.2551,19.8552,88,0,2343,25.0,,  
SRBIJA,42045,DUNAV,ZEMUN,44.8491,20.4121,214,2,,25.0,,  
SRBIJA,42050,DUNAV,PANČEVO,44.8536,20.6368,249,2,,,,  
SRBIJA,42055,DUNAV,SMEDEREVO,44.6668,20.9207,440,0,3223,,,
```

No login is necessary and there will be no restrictions for future use. The best solution would be to use the same delivery method as for SAVA HIS.

#### *Real time meteorological data*

Real time meteorological data will be provided via [http://www.hidmet.gov.rs/korisnici/danube\\_his/](http://www.hidmet.gov.rs/korisnici/danube_his/).

In the following, the content of an example file is shown:



## 2.10 Slovakia

### Technical capabilities

The Slovak Hydrometeorological Institute (SHMÚ) is a specialized organization providing hydrological and meteorological services at national and international level. It is a state-subsidized organization currently operating under the Slovak Ministry of Environment. The SHMÚ obtains most of its data on the quantity and quality of air and water from various monitoring facilities of the state hydrological and meteorological network.

#### *Hydrology*

From 1989 onwards, fully automatic monitoring devices of new generation MARS (Measuring And Registration Station) were implemented. MARS stations use a pressure sensor that reads a water level which is digitally recorded.

Hydrological stations selected for DAREFFORT are all connected online. Water level, discharge and water temperature is updated every 15 minutes.

Ice cover is observed every day at 6:00 a.m. local time manually. The months are not strictly specified. Ice cover phenomena are observed when they occur.

The data is stored in a relational data base for 30 days.

#### *Meteorology*

All meteorological stations selected for DAREFFORT are connected online. The update interval of precipitation, air temperature, humidity, snow cover, air pressure, wind speed and wind direction are updated every five minutes. The current web service covers only precipitation data in one hour frequency.

Grid data will not be provided for the DAREFFORT project.

### Metadata

Metadata information is provided in the word file web\_services\_DAREFFORT.docx, provided attached to technical information form.

### Current data delivery method

#### *Real time hydrological data*

Real time data is provided by an api-server: <http://www.shmu.sk/feeds/shmu.php>

**api**= unique API key

**type=hydro\_data\_full\_15**– function name: access to 15minutes full hydrological data

**query**=station id, if not entered, data for all (allowed) stations will return

**dt**=date time format in ISO 8601 (*example. 2017-06-28T08:00*) – *if not entered, latest available will be given*

Example:

```

▼<shmundata>
  ▼<request>
    <requestdt>2019-08-16T15:16:34+02:00</requestdt>
    <type>hydro_data_full_15</type>
    <query nil="true"/>
    <dt nil="true"/>
  </request>
  ▼<response>
    ▼<dataitem>
      <station>5085</station>
      <stationname>Zahorska Ves</stationname>
      <rivername>Morava</rivername>
      <dtmeasure>2019-08-16T15:00:00+02:00</dtmeasure>
      <waterlevel>57</waterlevel>
      <waterflow>31.75</waterflow>
      <watertemp>24.1</watertemp>
    </dataitem>
  </response>
</shmundata>

```

For the project, using data is allowed only for specified and agreed purpose: (Not agreed yet).  
Restriction: Not for commercial use, not for redistribution to other parties/bodies without permission.

#### Real time meteorological data

Real time data is provided by an api-server: <http://www.shmu.sk/feeds/shmu.php>

**api**= unique API key

**type=precip\_1h** – function name: access to 1 hour precipitation data

**query**=station id, if not entered, data for all (allowed) stations will return

**dt**=date time format in ISO 8601 (example. 2017-06-28T08:00) – **if not entered, latest available will be given**

Example:

```

▼<shmundata>
  ▼<request>
    <requestdt>2019-08-16T15:19:52+02:00</requestdt>
    <type>precip_1h</type>
    <query nil="true"/>
    <dt nil="true"/>
  </request>
  ▼<response>
    ▼<dataitem>
      <stationtype>AWSII</stationtype>
      <stationid>11805</stationid>
      <stationname>SENICA</stationname>
      <dtmeasure>2019-08-16T15:00:00+02:00</dtmeasure>
      <precip_1h>0</precip_1h>
    </dataitem>
  </response>
</shmundata>

```

For the project, using data is allowed only for specified and agreed purpose: (Not agreed yet).  
Restriction: Not for commercial use, not for redistribution to other parties/bodies without permission.

#### Processed hydrological data

It's not planned to deliver processed hydrological data.

### *Processed meteorological data*

It's not planned to deliver processed meteorological data.

## **Future developments**

Currently there are no concrete plans for system / software improvements in the foreseeable future which could have an impact on the data exchange within the project and for DanubeHIS in the future.

## **2.11 Slovenia**

### **Technical capabilities**

Slovenian hydrological and meteorological services are organized within the Slovenian Environment Agency (ARSO). The Agency is a body of the Ministry of the Environment and Spatial Planning.

#### *Hydrology*

All stations selected for DAREFFORT are connected online. The update interval for water level, discharge and water temperature is 10 or 30 minutes.

The data is stored in the relational data base ORACLE permanently. Access to real time data through the ARSO website is for the last 30 days.

No ice data is measured.

#### *Meteorology*

All stations selected for DAREFFORT are connected online. Precipitation, air temperature, humidity, precipitation type is updated every 10 or every 30 minutes. This depends on the type of measurement station. The parameter snow cover is updated once a day.

Data is stored in the relational data base POSTGRES and ORACLE permanently. Access to real time data through the ARSO website is for the last 48 hours.

Grid data is available. Radar data are available on <http://meteo.arso.gov.si/met/en/service2/> and grid periodic maps of meteorological variables on <http://meteo.arso.gov.si/met/en/climate/maps/>.

### **Metadata**

Metadata is available online: <http://gis.arso.gov.si/geoportal/catalog/main/home.page>

Some metadata of the hydrological stations are available in files on the link [http://www.arso.gov.si/vode/podatki/arhiv/hidroloski\\_arhiv.html](http://www.arso.gov.si/vode/podatki/arhiv/hidroloski_arhiv.html)

Some metadata of the meteorological stations are available through meteorological data archive

<http://www.meteo.si/met/en/app/webmet/#webmet==8Sdwx2bhR2cv0WZ0V2bvEGcw9ydIJWblR3LwVnaz9SYtVmYh9icFGbt9SaulGdugXbsx3cs9mdl5WahxXYyNGapZXZ8tHZv1WYp5mOnMHbvZXZulWYnwCchJXYtVGdJnOn0UQQdSf;>

## Current data delivery method

### *Real time hydrological data*

The data is freely accessible via [http://www.arso.gov.si/xml/vode/hidro\\_podatki\\_zadnji.xml](http://www.arso.gov.si/xml/vode/hidro_podatki_zadnji.xml). The structure of the data is described in national language in [http://www.arso.gov.si/vode/podatki/opis\\_hidro\\_xml.pdf](http://www.arso.gov.si/vode/podatki/opis_hidro_xml.pdf)

Example:

```
<arsopodatki verzija="1.2">
  <vir>Agencija RS za okolje</vir>
  <predlagan_zajem>5 minut čez polno uro ali pol ure</predlagan_zajem>
  <predlagan_zajem_perioda>30 min</predlagan_zajem_perioda>
  <datum_priprave>2019-06-28 14:31</datum_priprave>
  <postaja sifra="1060" ge_dolzina="16.000253" ge_sirina="46.68151" kota_0="202.34">
    <reka>Mura</reka>
    <merilno_mesto>Gornja Radgona</merilno_mesto>
    <ime_kratko>Mura - Gor. Radgona</ime_kratko>
    <datum>2019-06-28 14:00</datum>
    <vodostaj>122</vodostaj>
    <pretok>174</pretok>
    <pretok_znacilni>srednji pretok</pretok_znacilni>
    <temp_vode>21.2</temp_vode>
    <prvi_vv_pretok>600</prvi_vv_pretok>
    <drugi_vv_pretok>905</drugi_vv_pretok>
    <tretji_vv_pretok>1180</tretji_vv_pretok>
  </postaja>
  <postaja sifra="1070" ge_dolzina="16.059244" ge_sirina="46.648821" kota_0="193.65">
    <reka>Mura</reka>
    <merilno_mesto>Petanjci</merilno_mesto>
    <ime_kratko>Mura - Petanjci</ime_kratko>
    <datum>2019-06-28 14:00</datum>
    <vodostaj>180</vodostaj>
    <pretok>173</pretok>
    <pretok_znacilni>srednji pretok</pretok_znacilni>
    <temp_vode>21.5</temp_vode>
    <prvi_vv_pretok>650</prvi_vv_pretok>
    <drugi_vv_pretok>965</drugi_vv_pretok>
    <tretji_vv_pretok>1250</tretji_vv_pretok>
  </postaja>
</arsopodatki>
```

Publication of information and data must be cited with the information source (Source: Slovenian Environment Agency or abbreviated ARSO). Data policy for hydrological data will be as in the case for the SAVA HIS. Slovenia agrees to use the same delivery method as for SAVA HIS.

### *Real time meteorological data*

Data is freely accessible via the web service <http://www.meteo.si/met/sl/service/> in XML, RSS and HTML format.

The structure of the data is described in national language in [http://meteo.arso.gov.si/uploads/meteo/help/sl/xml\\_service.pdf](http://meteo.arso.gov.si/uploads/meteo/help/sl/xml_service.pdf).

Example:

```

- <data id="MeteoSI_WebMet_observation_xml">
  <language>sl</language>
  <credit>Agencija Republike Slovenije za okolje</credit>
  <credit_url>http://meteo.arso.gov.si/</credit_url>
- <image_url>
  http://meteo.arso.gov.si/uploads/meteo/style/img/logo/ARSO_vreme_blue_small.png
  </image_url>
  <suggested_pickup>25 minutes after hour</suggested_pickup>
  <suggested_pickup_period>60</suggested_pickup_period>
- <webcam_url_base>
  http://meteo.arso.gov.si/uploads/probase/www/observ/webcam/
  </webcam_url_base>
- <icon_url_base>
  http://meteo.arso.gov.si/uploads/meteo/style/img/weather/
  </icon_url_base>
  <icon_format>png</icon_format>
- <docs_url>
  http://meteo.arso.gov.si/uploads/meteo/help/sl/xml_service.html
  </docs_url>
- <disclaimer_url>
  http://meteo.arso.gov.si/uploads/meteo/help/sl/disclaimer.html
  </disclaimer_url>
- <copyright_url>
  http://meteo.arso.gov.si/uploads/meteo/help/sl/copyright.html
  </copyright_url>
- <privacy_policy_url>
  http://meteo.arso.gov.si/uploads/meteo/help/sl/notice.html
  
```

Publication of information and data must be cited with the information source (Source: Slovenian Environment Agency or abbreviated ARSO). Data policy for meteorological data will be as in the case for the SAVA HIS. Slovenia agrees to use the same delivery method as for SAVA HIS.

#### *Processed hydrological data*

Export of mean daily values of hydrological parameters and monthly extreme values is possible in xls and csv format. [http://vode.arso.gov.si/hidarhiv/pov\\_arhiv\\_tab.php?p\\_vodotok=Sava](http://vode.arso.gov.si/hidarhiv/pov_arhiv_tab.php?p_vodotok=Sava). Some information is on the website [http://www.arso.gov.si/vode/podatki/arhiv/hidroloski\\_arhiv.html](http://www.arso.gov.si/vode/podatki/arhiv/hidroloski_arhiv.html).

Publication of information and data must be cited with the information source (Source: Slovenian Environment Agency or abbreviated ARSO). Data policy for processed hydrological data will be as in the case for the SAVA HIS. Slovenia agrees to use the same delivery method as for SAVA HIS.

#### *Processed meteorological data*

Data is available via

<http://www.meteo.si/met/en/app/webmet/#webmet==8Sdwx2bhR2cv0WZ0V2bvEGcw9ydlJWblR3LwVnaz9SYtVmYh9iclFGbt9SaulGdugXbsx3cs9mdl5WahxXYyNGapZXZ8tHZv1WYp5mOnMHbvZXZulWYnwCchJXYtVGdlJnOn0UQQdSf;>

The documentation can be found via

[http://www.meteo.si/uploads/meteo/help/en/razlaga\\_meritev.html](http://www.meteo.si/uploads/meteo/help/en/razlaga_meritev.html)

Publication of information and data must be cited with the information source (Source: Slovenian Environment Agency or abbreviated ARSO). Data policy for processed meteorological data will be as in the case for the SAVA HIS. Slovenia agrees to use the same delivery method as for SAVA HIS.

## **Future developments**

Currently there are no concrete plans for system / software improvements in the foreseeable future which could have an impact on the data exchange within the project and for DanubeHIS in the future.

## **2.12 Ukraine**

### **Technical capabilities**

#### *Hydrology*

The modern hydrometeorological service of Ukraine is part of the State Emergency Service of the Ministry of Internal Affairs of Ukraine. It is a holistic monitoring organization that has its own network of hydrometeorological observations, representative offices in all administrative authority bodies of the state, relevant technical, technological and scientific divisions.

The observation data are channelled to the centres of forecasting in different ways: mobile communication, by telephone, by e-mail or right away on the WEB-server of UHMC. Information is transmitted in encrypted form via the WEB-server of the UHMC or through regional structural subdivisions to the FTP server of the Ukrainian Hydrometeorological Center.

Two of the 21 stations selected for DanubeHIS are connected online. The water level and water temperature are updated one to two times a day, the discharge once a day. The data is permanently stored from the date of installation.

Different ice parameters are measured: the percentage of surface covered by ice, the thickness of ice cover and height of snow on ice. Ice measurements are carried out from November to March

#### *Meteorology*

The main centre for collecting and processing meteorological information is the Ukrainian Hydromet Center, UHMC and its regional subdivisions. Used in the Forecast Centre AWP (Automated Working Place) - an automated and computerised system for processing and accumulation of meteorological information, allows to effectively and maximum quickly analyse data coming from 165 meteorological stations and meteorological posts. Since the 2000s, information is mostly stored electronically, but most of the information from the past years is in a paper form.

The meteorological stations selected for DAREFFORT are not connected online. Precipitation is measured every six hours, air temperature every three hours, precipitation type daily and snow cover daily during the period from November to March.

### **Metadata**

Metadata is available in Excel or Word.

## **Current data delivery method**

### *Real time hydrological data*

The data will be available via FTP or Web API. The Login for the project purposes will be offered after the development of the method to access the selected project data. The information will be provided only to the extent agreed upon within the project, without transferring it to a third party.

### *Real time meteorological data*

The data will be available via FTP or Web API. The Login for the project purposes will be offered after the development of the method to access the selected project data. The information will be provided only to the extent agreed upon within the project, without transferring it to a third party.

### *Processed hydrological data*

The processed hydrological data is not available online and can be made available on request.

### *Processed meteorological data*

The processed meteorological data is not available online and can be made available on request

## **Future developments**

A transmission system is planned, fitting the needs of DanubeHIS. For the meteorological and hydrological stations an online connection is planned. The data format will be a text file as CSV, via FTP or web-site.

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