RAINBO

Deliverable 2.4
Crowd sourcing application

Action C2 – Study, design and implementation of the new monitoring infrastructure

Comune di Bologna

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Document Summary
This document reports the link of the software deliverable related to the Crowd sourcing component and a short description of the work done.

Summary

Introduction

The RainBO project foresaw the implementation of a module to collect and share meteorological information coming from citizens, or better from people without any technical skills.

The development of a new application, or a plugin to an existing one, were as well considered.

Beside the capabilities of the RainBO platform to provide rainfall data coming from Microwave data, as we see in the previous deliverables, we want to enrich the RainBO database with other qualitative information regarding the present weather and its impact.

Crowd-sourcing application software deliverable

The software implemented by MEEO represents a fork of the Rmap (*http://rmap.cc/*) existing code and it has been stored under the "python" folder of the following github repository:

https://github.com/moris626/rmap

Further developments and evolutions will be done during the C3 action in order to adapt it to the RainBO Prototype implementation and, after that, it will be merged with the referring Rmap project.

The graphical user interface to access the developed application is available at the following web address:

https://partecipa.rainbolife.eu/

with the demo user

rainbo/rainbolife

A short description of it in the next paragraphs.

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Rmap4RainBO

During the C2 action, a first investigation was carried out to assess whether existing application could be useful to the project. During an exchange of view with Arpae staff, we considered the idea to join the Italian Participative Environmental Monitoring Network - Rmap.

Rmap is a participative monitoring and exchange system developed by Arpae, based on open hw and sw infrastructures.

It defines a set of standards for the meteorological data sensing (security, reliability, elaboration)

and for the transmission data system (transmission protocols, data formats, metadata formats etc).

The Rmap project has been promoted by Arpae-SIMC (*https://www.arpae.it/sim/*) since some years, as it is an interesting project with the objective to define methods, protocols and formats to collect and share environmental data. The project is also promoted by Arpa Veneto (*http://www.arpa.veneto.it/*), Cineca (*https://www.cineca.it/*) and the computer science department of the University of Bologna (*http://www.informatica.unibo.it/it*) and the RaspiBO network (*http://www.raspibo.org/wiki/index.php?title=Pagina_principale*).

The Rmap project adopts a scientific approach based on standards defined by the WMO – World Meteorological Organization (*https://www.wmo.int/pages/index_en.html*), in particular using their elaboration and classification process.

The Rmap application is mainly addressed to technical people with meteorological domain expertise and collects automatically data coming from standard hardware devices and weather observation manually uploaded.

The RainBO crowd sourcing application, called Rmap4RainBO, is developed as evolution and improvements of the Rmap functionalities for the uploading and visualization of the observed weather and keeps the WMO standard in the weather code [see the table at p. 105 of the attached WMO document (WMO306_vl2_BUFRCREX_CodeFlag_en.pdf)].

The RainBO crowdsourcing component, differently from the Rmap one, aims to address citizens, and people

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without any technical skills, so it was developed as intuitive and smart application that can be accessed through the RainBO project homepage (https://partecipa.rainbolife.eu).

The choice to develop it as customization of the existing Rmap comes with the following mutual benefits to both the RainBO and Rmap consortia:

- RainBO crowd module is maintained and kept updated by Arpae Rmap team
- Users DB is the same for Arpae and RainBO-crowd so synchronization is not needed
- The Rmap data DB and Lepida DB are already aligned thanks to AMQP configuration
- A 1st level domain on Arpae Rmap server is enough to share the same webserver and to share the users registration (a new RainBO-crowd user is in the same DB of the Rmap ones)
- Rmap benefits of a new smarter GUI for the data visualization and data upload
- Rmap DB is enriched by RainBO-crowd data
- Concrete evidence, to EU LIFE commission, of the scalability and application of the RainBO project

The requirements imposed by Rmap development team are listed below.

Rmap Requirements:

- MQTT to be used as communication protocol
- The new collected data are compliant with Rmap standard
- Data are free and covered by Open Data License – IODL/PDDL/ODBL
- WMO BUFR standards for the exchanges of meteorological data and JSON standard.

The Binary Universal Form for the Representation of meteorological data (BUFR) is a binary data format maintained by the World Meteorological Organization (WMO).

BUFR was designed to be portable, compact, and universal.

Any kind of data can be represented, along with its specific spatial/temporal context and any other associated metadata.

In the WMO terminology, BUFR belongs to the category of table-driven code forms, where the meaning of data elements is determined by referring to a set of tables that are kept and maintained separately from the message itself.

 The RainBO requirements requested by RainBO consortium are listed below.

RainBO Requirements

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- Citizens have to easily access Rmap collected information and upload new data, so a smart interface is needed
- Focus on sight observations instead of instrumental measurements
- Each observations has a code in the code-table
- The observation can be related to:
  - Physical events (rain, snow, etc.)
  - Effects (flood, fallen trees, etc.)
- Only for mobile users (the RainBO "station" concept has not to be used)
- As in Rmap, webservices are used to extract data from the DB
- Disclaimer on cookies has to be kept

In RainBO we aim at making Rmap app suitable to citizens, by simplifying the interaction (function "Participate" of the app) and the upload of meteorological information without requiring a meteorological background. Moreover, we aim to improve the visualization interface of the collected data in order to foster citizens involvement.

Other improvements:

- Improvement of the data visualization: http://rmapv.rmap.cc/showdata/
- Improvements of the data upload: http://rmapv.rmap.cc/insertdata/manualdata

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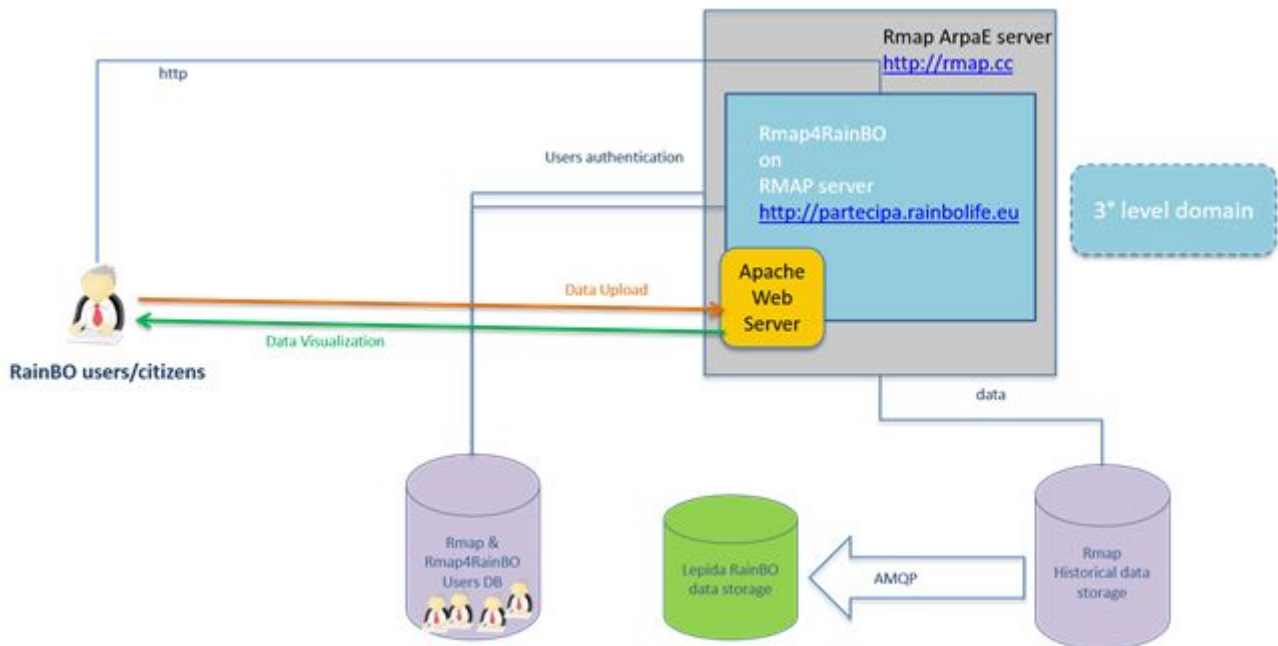instrument of the
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Figure 1: The architecture

Developments

The new code implemented by MEEO for Rmap4RainBO to customized and improve Rmap visualization and uploading functionalities is under the phyton folder, at the following link:

https://github.com/moris626/rmap

The python folder contains the following ones:

📁 phyton

    📁 rainbo

    📁 insertdata

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📁 showdata

· The folder *rainbo* contains the code related to the new landing page, developed by using bootstrap libraries.

· In the folder *insertdata* you can find the application developed for the participative section of the module ("Partecipa" on the web page), to allow the data inserting.

· In *showdata* you can find the the application developed for the visualization section of the module ("Visualizza" on the web page), to allow visualization of the uploaded data.

The landing page (https://partecipa.rainbolife.eu/) is available and accessible by using the following demonstration account, registered also on Rmap:

> *User ID: rainbo*

> *User password: rainbolife*

The landing page of this crowdsourcing application was developed as full responsive website adapting layout and content to any device (Desktop, tablet, smartphone).

Implementation steps

Download of the Rmap software Development kit and analysis of the existing application
- Implementation of the new Django application (Rmap4RainBO) with Python on Rmap server
- Registration of a RainBO demonstration user on Rmap system (rainbo/rainbolife)
- Improvements of the insertdata interface
- Improvements of the visualization interface

The final deploy on the RainBO system will be done during the C3 action with the implementation of the system prototype.

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Technology used

- Django web framework through Python
- JSON: data exchange format (report with a set of data)
- JavaScript, Ajax, CSS, HTML for the templates implementation.

Rmap4RainBO interface

Some screenshots of the developed interface are introduced in the pictures below.

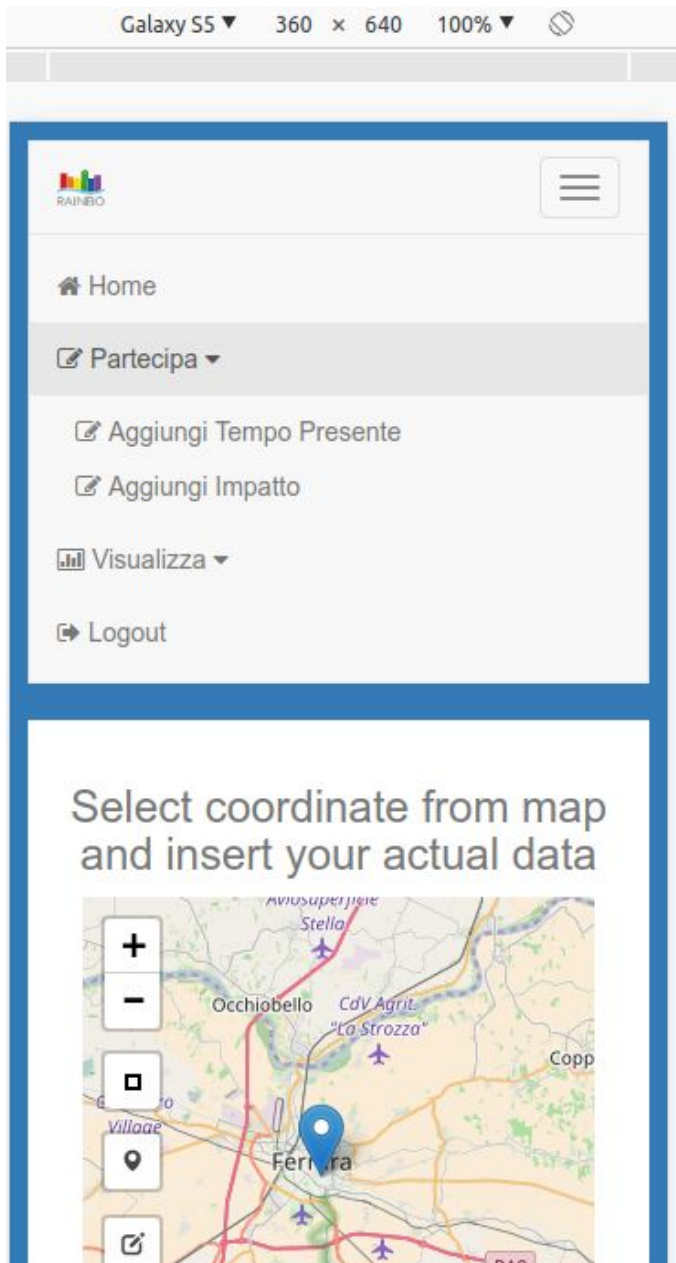Figure 2: The landing page from a PC with the two main sections

Figure 3: The menu of the uploading section "Partecipa" from a mobile device

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Figure 4: The menu of the visualization section

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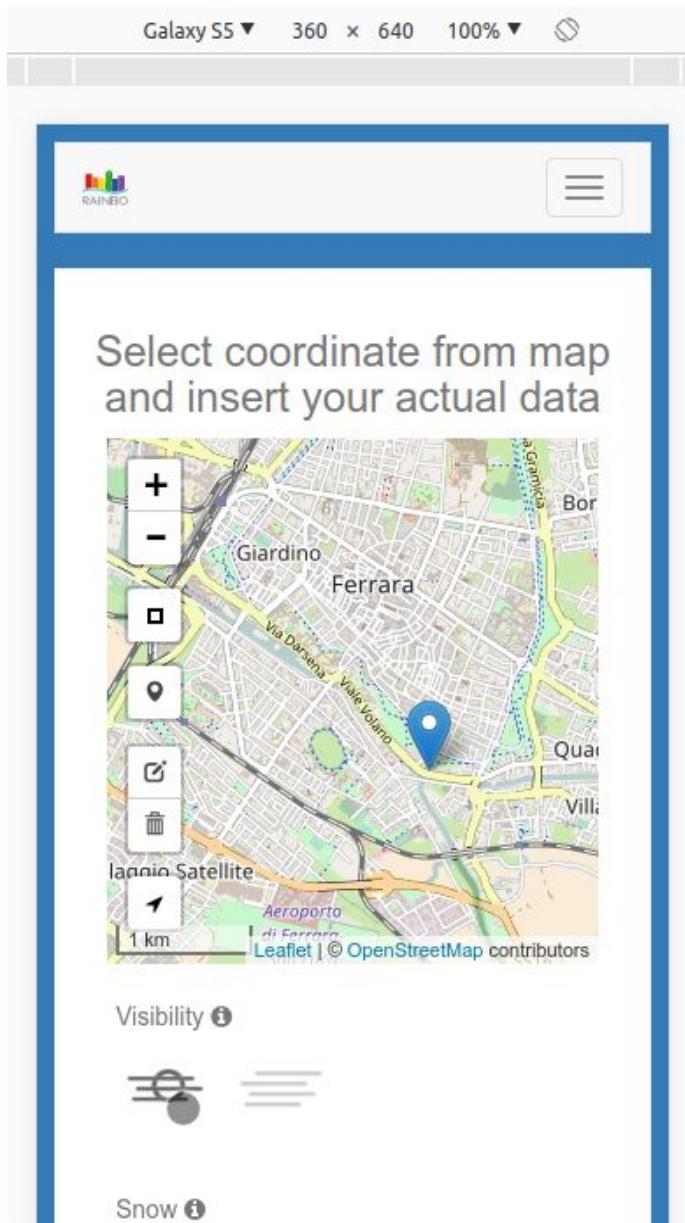
Figure 5: The location selection on the map (it can be retrieved also automatically)

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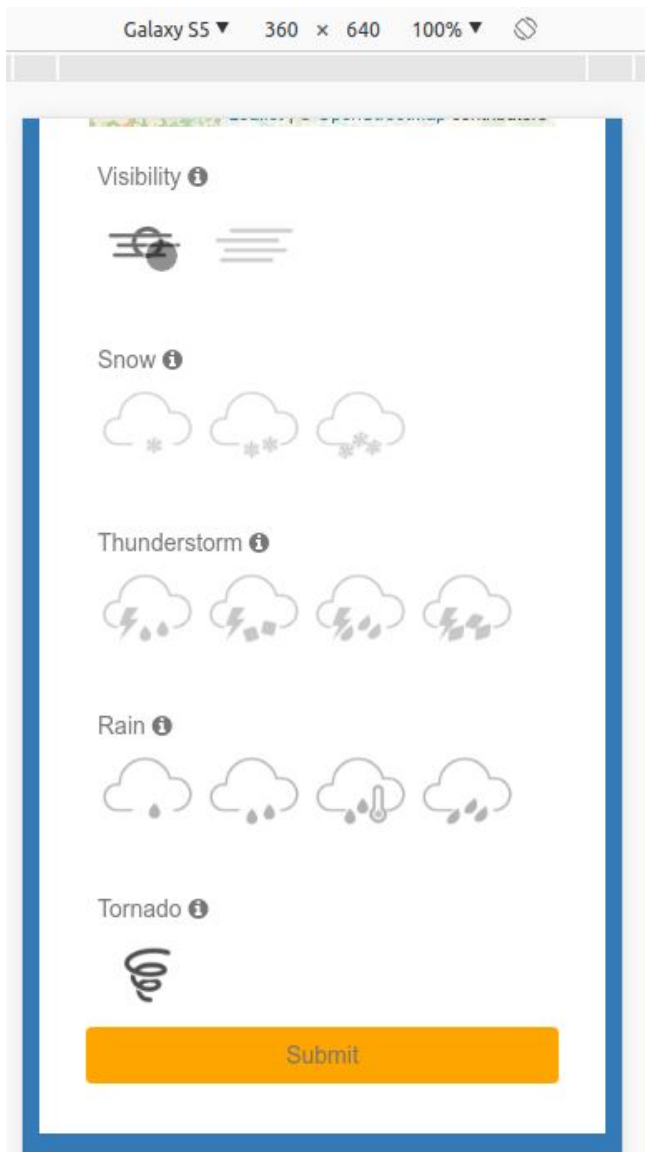instrument of the
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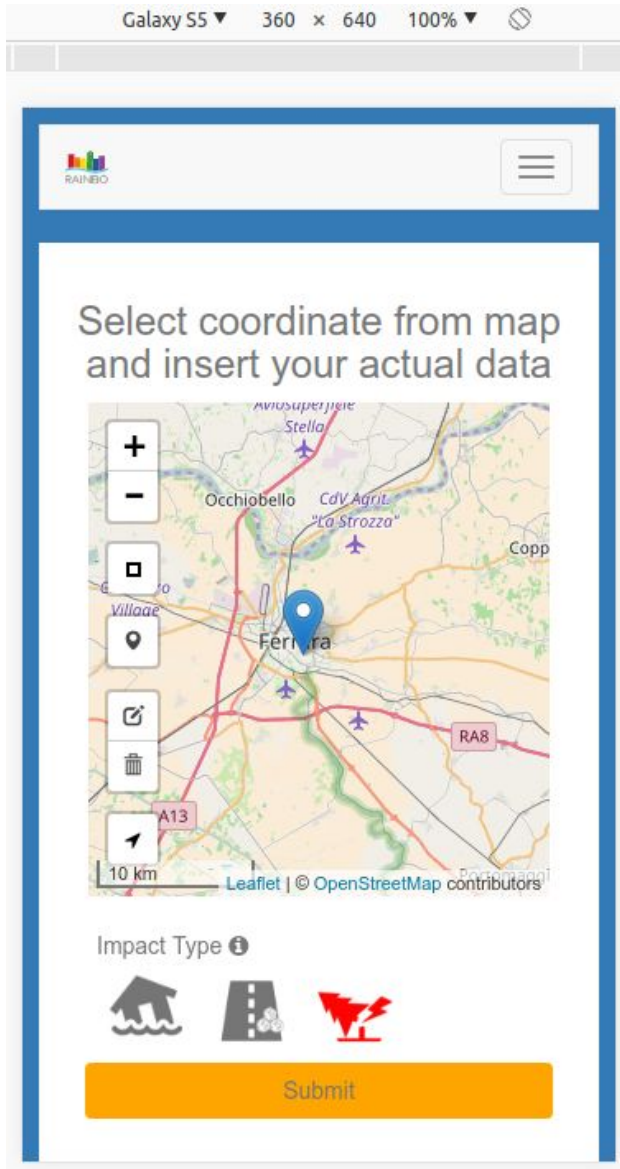Figure 6: The present weather icon selection and its upload

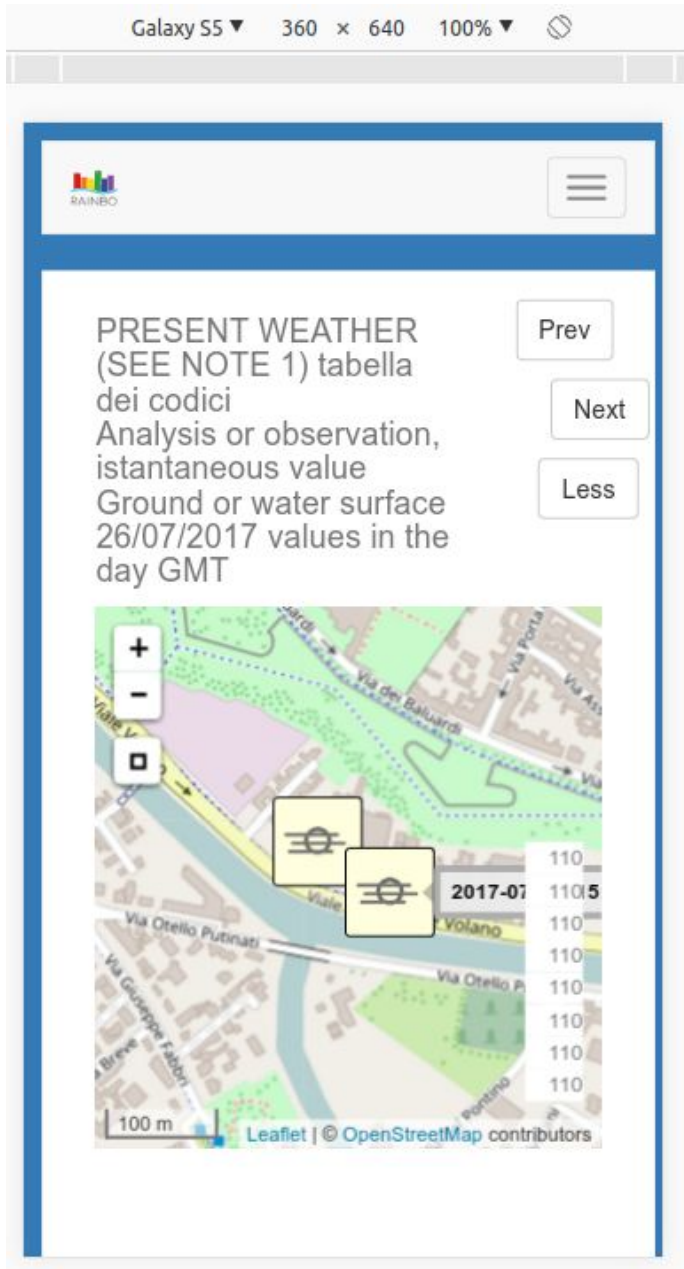Figure 7: The impact selection

Figure 8: The visualization on the map of the uploaded information

ANNEX 1 - WMO Code table

CODE TABLES AND FLAG TABLES ASSOCIATED WITH BUFR/CREX TABLE B

Note: In developing code tables associated with BUFR/CREX Table B to specify units of elements, the following principles should be applied:

(a) Code tables specifying the units for an element which is defined, in the Manual on Codes, by a single symbolic letter shall be compatible with the relevant existing WMO code tables;

(b) Code tables combining two or more existing WMO code tables to specify the units for an element which is defined, in the Manual on Codes, by a group of symbolic letters shall be compatible with the combined code figures of the relevant group of symbolic letters;

(c) Code tables combining two or more existing WMO code tables to specify the units for an element which is defined, in the Manual on Codes, by different symbolic letters shall be compatible with the code figures of the relevant symbolic letters, with successive tens or hundreds values added, as appropriate;

(d) Code tables and flag tables should only be used for reporting qualitative information. Quantitative information should be reported as observed using entries in Table B. "Data description operators" from Table C should be applied when a "scale change" or "data width change" is required;

(e) Reference to existing specification(s) and code table(s) in the Manual on Codes, with explanation of possible deviations, shall be given in an additional table annexed to the code tables associated with BUFR/CREX Table B.

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ANNEX 2 - Present Weather and Impacts categories

Present weather categories

--Visibilità

> `<ul id="id_visibility_intensity"><li><label for="id_visibility_intensity_0"><input id="id_visibility_intensity_0" name="visibility_intensity" type="radio" value="110" /> 110</label></li>`

`<li><label for="id_visibility_intensity_1"><input id="id_visibility_intensity_1" name="visibility_intensity" type="radio" value="130" /> 130</label></li></ul>`

foschia 110

nebbia 130

--Neve

> `<ul id="id_snow_intensity"><li><label for="id_snow_intensity_0"><input checked="checked" id="id_snow_intensity_0" name="snow_intensity" type="radio" value="185" /> 185</label></li>`

`<li><label for="id_snow_intensity_1"><input id="id_snow_intensity_1" name="snow_intensity" type="radio" value="186" /> 186</label></li>`

`<li><label for="id_snow_intensity_2"><input id="id_snow_intensity_2" name="snow_intensity" type="radio" value="187" /> 187</label></li></ul>`

debole 185

moderata 186

forte 187

--Pioggia

> `<ul id="id_rain_intensity"><li><label for="id_rain_intensity_0"><input id="id_rain_intensity_0" name="rain_intensity" type="radio" value="150" /> 150</label></li>`

`<li><label for="id_rain_intensity_1"><input id="id_rain_intensity_1" name="rain_intensity" type="radio" value="160" /> 160</label></li>`

<label for="id_rain_intensity_2"><input id="id_rain_intensity_2" name="rain_intensity" type="radio" value="165" /> 165</label>

<label for="id_rain_intensity_3"><input id="id_rain_intensity_3" name="rain_intensity" type="radio" value="184" /> 184</label>

pioviggine 150

pioggia 160

pioggia congelantesi al suolo 165

pioggia violenta 184

--Temporale

<ul id="id_thunderstorm_intensity">
<label for="id_thunderstorm_intensity_0"><input id="id_thunderstorm_intensity_0" name="thunderstorm_intensity" type="radio" value="192" /> 192</label>

<label for="id_thunderstorm_intensity_1"><input id="id_thunderstorm_intensity_1" name="thunderstorm_intensity" type="radio" value="193" /> 193</label>

<label for="id_thunderstorm_intensity_2"><input id="id_thunderstorm_intensity_2" name="thunderstorm_intensity" type="radio" value="195" /> 195</label>

<label for="id_thunderstorm_intensity_3"><input id="id_thunderstorm_intensity_3" name="thunderstorm_intensity" type="radio" value="196" /> 196</label>

debole/moderato con pioggia 192

debole/moderato con grandine 193

forte con pioggia 195

forte con grandine 196

---Tromba d'aria 199

<i class="fa fa-info-circle" aria-hidden="true"></i>

<ul id="id_tornado">
<label for="id_tornado_0"><input id="id_tornado_0" name="tornado" type="radio" value="199" /> 199</label>

> </div>

Impact

The internal code numbers related to the impact categories used in the Rmap4RainBO inteface are the following ones:

choices=[(10,'albero caduto'),(20,'strada ghiacciata'),(30,'allagamento'),(40,'buca su strada')]

datavar["B20203"]

The codes used for the Impact are defined internally to the RainBO consortium as any official code was found on WMO standards.