IPCHEM - Information Platform for Chemical Monitoring

Quick reference guide for end-users

Version 02 (09.02.2018)

https://ipchem.jrc.ec.europa.eu
# Table of Contents:

1 Introduction to the IPCHEM platform ......................................................... 4
2 Terms of use .................................................................................................. 6
3 Getting started ............................................................................................. 7
4 IPCHEM main components ........................................................................ 10
5 IPCHEM Advanced Map Viewer ............................................................... 21
6 Case studies .............................................................................................. 28
7 IPCHEM Tutorial videos ............................................................................ 29

Credits ............................................................................................................ 30

# Table of Figures:

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IPCHEM home page</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Workflow of IPCHEM actions</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Common filters of the ‘Search’ page</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Additional info and access to further IPCHEM functionalities</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>‘Metadata Info’ page</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>‘Database Console’</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>Example of data picking-up for further processing</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>Example of bulk transfer of data for further processing</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td>Organised view of selected data in the ‘Basket’</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>Example of processed picked-up data</td>
<td>16</td>
</tr>
<tr>
<td>11</td>
<td>Example of not processed bulk data</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td>Example of processed bulk data</td>
<td>17</td>
</tr>
<tr>
<td>13</td>
<td>Data (picked-up) as displayed into the ‘Viewer’</td>
<td>19</td>
</tr>
<tr>
<td>14</td>
<td>Basic statistics of bulked data as displayed into the ‘Viewer’</td>
<td>20</td>
</tr>
<tr>
<td>15</td>
<td>Selection of the area of interest by entering a specific location name.</td>
<td>22</td>
</tr>
<tr>
<td>16</td>
<td>Measurement in an area defined by geographical coordinates.</td>
<td>22</td>
</tr>
<tr>
<td>17</td>
<td>Total measurements in the area of interest, selected by creating a region.</td>
<td>23</td>
</tr>
<tr>
<td>18</td>
<td>‘Media selection’ tool</td>
<td>23</td>
</tr>
<tr>
<td>19</td>
<td>‘Chemical selection’ tool</td>
<td>24</td>
</tr>
<tr>
<td>20</td>
<td>‘Database selection’ tool</td>
<td>24</td>
</tr>
<tr>
<td>21</td>
<td>‘Data filtering’ tool</td>
<td>25</td>
</tr>
<tr>
<td>22</td>
<td>Data represented by ‘Chemical Compound’</td>
<td>25</td>
</tr>
<tr>
<td>23</td>
<td>Data represented by ‘Measurement’</td>
<td>25</td>
</tr>
<tr>
<td>24</td>
<td>‘Clustered’ data</td>
<td>26</td>
</tr>
<tr>
<td>25</td>
<td>Each compound represented separately, in ‘bubbles’</td>
<td>26</td>
</tr>
<tr>
<td>26</td>
<td>Open Street Map of measurements refined by media and chemical compound</td>
<td>26</td>
</tr>
<tr>
<td>27</td>
<td>Data filtering and retrieval</td>
<td>27</td>
</tr>
<tr>
<td>28</td>
<td>‘Data download’ Tool</td>
<td>27</td>
</tr>
<tr>
<td>29</td>
<td>Feedback window for IPCHEM end users</td>
<td>29</td>
</tr>
</tbody>
</table>
1 INTRODUCTION TO THE IPCHEM PLATFORM

Aim

IPCHEM - the Information Platform for Chemical Monitoring is a single access point for locating and retrieving chemical occurrence data across various media (e.g. environment, human, food/feed, indoor air and products) in the European Union¹. IPCHEM is being operated by the European Commission Services and the European Union Agencies.

IPCHEM addresses one of the major gaps in our knowledge base for chemical policies, which is the lack of information on exposure to chemicals and their burden in the human body and the environment. To this purpose, IPCHEM supports a coordinated approach for collecting, storing, accessing and evaluating data related to occurrence of chemicals and chemical mixtures. "This would help identify links between exposure and epidemiological data in order to explore potential biological effects and lead to improved health outcomes" as it is stated in the EC Communication "The combination effects of chemicals – Chemical mixtures" (COM/2012/0252 final).

Objectives

The main objectives of the IPCHEM platform are:

- Assisting policy makers and scientific communities to discover and access existing and future chemical occurrence data across various matrices and media;
- Hosting data currently not readily accessible (e.g. outcomes of EU research projects, off-line stored monitoring data, etc.) including data on new, emerging and less-investigated chemicals that will be accessible through the platform;
- Providing chemical monitoring information of defined quality concerning spatial, temporal, methodological and metrological traceability.

Bearing these objectives in mind, IPCHEM was designed and implemented as a distributed infrastructure (web portal and related tools), providing when feasible remote access to existing chemical monitoring data. In parallel, it offers data hosting capacities if requested by Data Providers/Data Owners.

While Data Providers/Data Owners maintain the structure of their own databases, the provision of data therein is harmonised in order to be accessible, retrievable and comparable through a common interface. This creates greater visibility and promotes a wider use of chemical monitoring data, thus increasing the knowledge base for sound risk assessment, management and communication.

Combining information and chemical data from different sources across various environmental media, consumer products and food/feed, and ultimately from human beings themselves will provide the

¹ https://ipchem.jrc.ec.europa.eu/
knowledge base for better understanding and assessing the effects of exposure to chemicals and chemical mixtures and ultimately support the effective implementation of EU chemical policy.

**Challenges**

The main scientific and technical challenges for the IPCHEM project are: 1) how to handle in a transparent way the heterogeneity of data related sources, formats and policies; 2) how to improve the comparability across multi-source data and 3) how to ensure interoperability with other existing relevant information systems in EU and also globally.

**Benefits**

- **IPCHEM as improver:**
  - Promotes the generation of good quality chemical monitoring data and reporting;
  - Helps identifying priority substances in environmental legislation (e.g. SVHCs for REACH, priority substances for Water Framework Directive, POPs nomination);
  - Supports an enhanced exposure and risk assessment analysis of chemicals and chemical mixtures;
  - Supports the validation of chemical exposure and deposition models.

- **IPCHEM as enabler:**
  - Acts as an early warning system for emerging chemical pollutants in various media (e.g. environment, human, food/feed, indoor air and products) thus helps undertaking subsequent informed policy actions;
  - Enables an overall evaluation of the state of environment with respect to burden of chemicals and their impact;
  - Enables evaluating the effectiveness of chemical policies/legislation in reducing the impact of chemicals in the environment and understanding their effects on human health;
  - Helps tracing pathways of chemical exposure and analysing the correlations among chemicals occurrence and effects on the environment and human health.

- **IPCHEM as resource saver and promoter:**
  - Helps European Commission and Member States saving resources and reducing administrative burden by:
    - Providing a tool which facilitates the co-ordinated retrieval, accessibility, storage and reporting of chemical monitoring data;
    - Facilitating targeting the scope and better planning of chemical monitoring campaigns;
    - Sharing knowledge about analytical methodologies and tools related to chemical monitoring and reporting;
    - Promoting the use of harmonised procedures and standards for chemical monitoring and analysis.
2 TERMS OF USE
The information available in the IPCHEM platform (which is owned and managed by the European Commission) is subject to a disclaimer, a copyright notice and rules related to personal data protection, as stated in the following link: http://ec.europa.eu/geninfo/legal_notices_en.htm

The access, use and re-use of the data available through the IPCHEM platform, is governed by the terms and conditions specified in the IPCHEM Data Policy which is accessible online and can be downloaded from the IPCHEM website (https://ipchem.jrc.ec.europa.eu).

Below are reported the objectives and scope of the IPCHEM Data Policy as stated in Article 1 of the corresponding document.

1. The IPCHEM Data Policy:
   a) Defines and formulates the principles and conditions that govern provision, management, access, use and re-use of chemical monitoring data and metadata retrievable through the IPCHEM platform, to increase their accessibility and to facilitate their wider use and re-combination, across and beyond thematic modules of IPCHEM in order to better understand the overall exposure of environment and humans to chemicals and chemical mixtures;
   b) Lays down rules for effective and efficient implementation of such principles and conditions applicable to chemical monitoring data and metadata retrievable through the IPCHEM platform;
   c) Promotes transparency and good governance practices in order to enable and facilitate a coordinated and integrated approach for the access, use and re-use of chemical monitoring data and metadata;
   d) Promotes and implements the overarching principles of free, full, open and timely access to all kinds of chemical monitoring data where possible, whilst recognizing and respecting relevant legislative provisions and government guidance regarding the data ownership and intellectual property rights that apply to such data.

2. The IPCHEM Data Policy ensures compliance with the following principles:
   a) Protecting the integrity, transparency, and traceability of chemical monitoring data, and of the use of the data for analysis and forecasts;
   b) Recognising and respecting data protection legislation, both at the European Union and national levels;
   c) Recognising and respecting intellectual property rights of IPCHEM Data Providers and Data Owners as defined in agreement with them;
   d) Using European or international standards and services on data interoperability and the principles set out in the INSPIRE Directive and in the Shared Environmental Information System (SEIS).

3. The IPCHEM Data Policy lays down the Open Data principles as the default regime for making chemical monitoring data retrievable through the IPCHEM platform for further use and re-use, and outlines the conditions that allow Data Providers and Data Owners to impose special accessibility regimes to restrict access to their data"
3 GETTING STARTED

The IPCHEM home page at a glance

Figure 1: IPCHEM home page

The home page gives access to six key features of the IPCHEM platform (Figure 1):

- ‘Main toolbar Menu’: allows access to the IPCHEM main functionalities;
- ‘Search Chemical Monitoring Data’: allowing direct access to the page for searching chemical monitoring data (via the chemical’s name or CAS number);

...
- ‘Search Multi-Chemical by location’: it allows displaying and accessing data collected inside a Geographical Area defined by the user;
- ‘Video tutorials’: for an overview of the IPCHEM capabilities and functionalities;
- ‘More IPCHEM web pages’: to obtain additional information (e.g. Data Providers, Governance, Projects and Collaborations, Type of Data available, Tutorials, Presentations and Case Studies);
- ‘EU Login’: manages restricted access to data reserved to certain User Groups or enables saving and accessing results in subsequent working (browser) sessions.

**IPCHEM workflow scheme**

The IPCHEM platform is designed to allow for searching, retrieving and comparing chemical monitoring data that may be hosted in one or different databases.

Operations, starting from the ‘Search Page’, are logically streamlined via five steps, according to the following general IPCHEM workflow scheme (Figure 2).

*Figure 2: Workflow of IPCHEM actions*
Searching for a specific chemical and the subsequent selection of a specific database (containing concentration measurements of the chemical of interest) are performed via the ‘Search page’ (‘Selecting’ action). It is also possible to access the Metadata info page for an overview of the specific database’s content (e.g. the data monitoring reasons, the methods adopted for the data sampling and analysis, the contact point, etc.).

With the ‘Filtering’ action, performed via the ‘Search page’ or at a later stage from within the ‘Database Console’, it is possible to explore the selected database and refine the search criteria according to general and/or database specific related filters in order to prepare the subset of data to be placed into the ‘Basket’ for further processing (i.e. creating the folder containing the subset of data of interest and performing basic statistics on the selected data).

The ‘Collecting’ action is used for the data selection in the ‘Database Console’, where a subset of data for each selected database are displayed and made available for transferring them into the ‘Basket’ for further processing.

With the ‘Processing’ action, performed inside the ‘Basket’, data are prepared for being downloaded and for creating basic statistics; successively, the data can be used for offline analysis and ready for employing the ‘Comparing’ capability which is performed under the ‘Viewer’.

An extended explanation of the IPCHEM capabilities and functionalities is provided separately in the IPCHEM Specifications Guide.
4 IPCHEM MAIN COMPONENTS

‘Search’ page

End-users may search for a chemical compound via its name and CAS registry number. It is possible to refine the search by combining one or more filtering criteria such as the IPCHEM thematic module, the measured matrix/media, the spatial extension (coverage) of the database. (Figure 3).

When a specific chemical has been searched, all available databases containing concentration measurements of this chemical are then listed in the same page.

For each of the listed databases a number of additional functionalities are available, e.g. access to the ‘Metadata info’ page of each database, access to the ‘Database Console’, access to the ‘Chemical structural information and properties’ window, etc. (Figure 4):
‘Metadata info’ page

The ‘Metadata info’ page summarises the relevant information about a specific database (Figure 5) including the data collection process and methods and the data accessibility, use and re-use regimes. When available, direct links to the specific database’s website or web application are provided. Contact data for the data owner/data provider are also provided as well as links to official technical and scientific documentation related to the specific database (via the tab “Related resources”).

The Metadata information for each specific database available in IPCHEM can also be consulted independently from the process of selecting a specific chemical.
‘Database Console’

The main control board of the IPCHEM functionalities is represented by the ‘Database Console’ (Figure 6); all concentration measurements which are available in a specific database that was searched are displayed inside the ‘Database Console’ and can be further filtered according to specific database filters. Measurements are reported into a table (each row of which represents a measurement record across specific attributes such as location, sample source, sampling date, concentration value, unit of measure, LOD, LOQ, media/setting, level of aggregation) and represented into a map (where sampling source locations are geometrically represented). Data could then be picked-up (Figure 7) or bulk transferred (Figure 8) into the ‘Basket’ for further processing.
Figure 6: ‘Database Console’

The data picking-up process allows for selecting from the entire database the data records of interest; these are selected by clicking (i.e. picking-up) on the check boxes of the corresponding rows or, clicking on the first check box on the top of the first column for multiple rows selection.

During the data picking-up selection, the overall number of the selected (picked-up) rows is displayed on the right part of the header; by clicking over, the selected data are transferred into the Basket (Figure 7).
The bulk transfer of data allows selecting the entire bunch of data that were resulted from the search performed for a specific chemical.

By clicking on the right part of the header (i.e. ‘Request Full Table’ function), the full table of data for the selected chemical are transferred into the Basket (Figure 8).

Figure 7: Example of data picking-up for further processing

Figure 8: Example of bulk transfer of data for further processing
‘Basket’ tool

The ‘Basket’ tool allows performing different functionalities. The first part of the ‘Basket’ page provides an organised overview of the selected data across the following attributes: the searched chemical name, the CAS number, the country in which the chemical monitoring was performed, the name of the source database, the selected filtering criteria that were chosen into the ‘Database Console’ and the status of the data selected (either picked-up data or full data table –bulk- transferred) (Figure 9).

Picked-up data are by default in "ready" status, meaning that they are ready to be directly displayed into the 'Viewer'. The data can be previewed also in tabular format and saved as PDF format (Figure 10).

Bulk transferred data (i.e. transfer of the full data table) is still in "to process" status and not yet processed; this data category cannot neither be displayed into the 'Viewer' nor be previewed in tabular format (Figure 11).

By successively clicking on the ‘processing’ icon a zip folder is prepared for downloading. In case of picked-up data the zip folder contains: the picked-up data selected, the summary table reporting the filtering criteria, the basic statistics created from the data processed, the main elements of the Metadata for the specific database and the number of occurrences of the monitoring data that were selected and divided by media and country. All files contained in the zip folder are in csv format which is compatible with widespread used statistical software. The selected data are also provided in GeoJson format (to be displayed into the ‘Viewer’ or further processed in GIS software). At the end of this step the basic statistics and the occurrences of the selected monitoring data are displayed into the same ‘Basket’ page.
A similar process can be followed for the bulk data. In this case the zip folder contains files of similar content as for the picked-up data, however, only basic statistics data can be displayed as geographic layer into the ‘Viewer’. At the end of this step the globe icon changes colour (from grey to blue) to indicate the change of status (i.e. from ‘to process’ to ‘ready’) (Figure 12).

These steps can be repeated to save into the ‘Basket’ the results of searching and selecting different subset of data for the same chemical found in different databases or for different chemicals found in the same or in different databases.

Any Subset of data that have been added into the ‘Basket’ can be removed at any time from it (Figure 10).

Figure 10: Example of processed picked-up data
Full data table transferred with status "to process (bulk)"

Start the data processing

Download the folder with the processed data

**Figure 11:** Example of not processed bulk data

**Figure 12:** Example of processed bulk data
Viewer

The subsets of data, picked-up or bulked, are also available as spatial layers into the 'Viewer'. But while the picked-up data are directly displayed into the 'Viewer', showing the location of each measured sample (Figure 13), as already explained above, the bulked data should be first processed before they are displayed in form of basic statistics by EU Country and media (Figure 14).

For example, it is possible to identify where and how concentration values of a specific chemical in multiple databases exceed a certain threshold value, or whether there is any correlation among chemical occurrences in space and time. Various chemicals from the same or different databases could be analysed in the same way.

End users may customise the map via the ‘Editor Console’ and save it as PDF file. It is also possible to change the base map or overlap pre-defined thematic maps to facilitate the data interpretation.
Figure 13: Data (picked-up) as displayed into the ‘Viewer’
Figure 14: Basic statistics of bulked data as displayed in the ‘Viewer’
5 IPCHEM ADVANCED MAP VIEWER

Background

The ‘Advanced Map Viewer’ was created with the aim to integrate into the IPCHEM platform an advanced search functionality for monitoring data of chemicals based on geo-location, to facilitate/support (among others) the risk assessment of chemical mixtures. Namely: “search for all chemical substances measured in a specific location and/or nearby and further refine the search by media, chemical and data collection”.

This tool allows searching for all concentration measurements available in a specific location that is defined by the end-user without any further refinement. It works independently from the "Single Chemical Search Tool" and in a step-wise approach interactively with the end-user.

Through this interface the end-user will be able to:

- Search for a specific location or navigate into the map;
- Draw a specific area of interest (a circle, or a polygon, or a rectangle);
- Display all chemicals measured inside the area of interest.

Having defined the area of interest it is possible to narrow down the number of concentration measurements/chemicals by restricting the search by:

- Media;
- Chemical;
- Database.
OPERATIONAL STEPS

1. Spatial selection

When choosing the geo-location there are three alternatives:

→ Search for a specific location by typing the name (in the original language of the country) in the 'Enter a location' box.

→ Enter the Geographical coordinates of the area of interest in the 'LAT' and 'LON' boxes.

Figure 15: Selection of the area of interest by entering a specific location name.

Figure 16: Measurement in an area defined by geographical coordinates.
→ Draw a specific area of interest (a circle, or a polygon, or a rectangle).

Concentration measurements data are displayed into the map, where points represent the sampling source location.

2. Selection of media

→ In order to further refine the search select a media from the 'Media Selection' list.

![Media Selection (7)](image)

*Figure 18: 'Media selection' tool.*
3. Selection of chemical(s)

The third step is to select one or more chemical compounds from the 'Chemical Selection' list.

![Chemical Selection Tool](image)

Figure 19: ‘Chemical selection’ tool.

4. Selection of the database of interest

Select one or more databases from the 'Database Selection' list.

![Database Selection Tool](image)

Figure 20: ‘Database selection’ tool.
5. Selection of specific ‘filter criteria’

After selecting the database, a specific ‘Filtering Console’ appears on the right side of the screen, or it can be accessed by clicking on the ‘filtering’ icon.

→ Set the specificities of the data set by using filtering criteria so that the selection of chemical compounds is narrowed.

![Data characteristics](image1)

**Figure 21: ‘Data filtering’ tool.**

6. Visualisation of selected data

→ Choose the viewing mode, either by chemical compound or measurement.

![Measurements](image2)  ![Chemicals](image3)

**Figure 22: Data represented by ‘Chemical Compound’.**

**Figure 23: Data represented by ‘Measurement’.**
In a specific sample collection point there might be more than one compound that have been monitored. For that reason 'Cluster' and 'Bubble' are used to help visualize them all together or separately.

→ Select the data viewing mode, either in a ‘cluster’ or individual ‘bubbles’.

→ Choose “Open Street Map” as Basemap layer in the tool bar menu of the ‘Viewer’, to identify the specific sampling data source location.

Figure 24: ‘Clustered’ data.

Figure 25: Each compound represented separately, in ‘bubbles’.

Figure 26: Open Street Map of measurements refined by media and chemical compound.
7. Retrieval of selected data

→ Define the concentration range and obtain data about the selected compound.

8. Download of selected data

→ In order to download the processed data click on the 'Download' icon and an excel file containing all data will be generated for each compound of interest.

Figure 27: Data filtering and retrieval.

Figure 28: 'Data download' Tool
6 CASE STUDIES

Case studies have been prepared with a two-fold objective: to demonstrate the usefulness of the IPCHEM Platform and also to provide guidance to end users for the competence use of the various IPCHEM tools and functionalities via a number of hands-on working examples.

The cases studies that were identified and included here represent typical situations that are often encountered in real-life practices which will help showing how they can be supported by the available IPCHEM datasets, tools and functionalities.

Two case studies are fully described in Annex I of this version of the IPCHEM Quick Reference Guide for End-users, others will become progressively available online via the IPCHEM’s website. The background of these two case studies is summarised below.

Case study #1, Benzene-concentrations in a northern Italian city – Compliance against regulatory/guideline limit value

Using the available data in IPCHEM, identify the city in Northern Italy which did not meet in 2011 the established regulatory/guideline limit value for benzene of 5 µg/m³.

Case study #2, Particulate Matter (PM₁₀) concentrations in Romania – Compliance against regulatory/guideline limit value

Using the available data in IPCHEM, identify those locations in Romania in which the annual mean value for PM₁₀ exceeded 40 µg/m³ in 2008 in rural, suburban and urban areas. Visualize this information for each area (rural, sub-urban and urban) separately with different colours but on the same map. Scale the size of the dots on the map relative to their respective PM₁₀ concentration.

Case study #3, Mercury in bream fish - concentrations in Germany - Compliance against EU Environmental Quality Standards (EQSs)

Using the available data in IPCHEM and its tools, identify European rivers passing across Germany where the concentrations of mercury might exceed the Biota quality standards (QSbiota) value of 20 µg/kg ww, one of the EU Environmental Quality Standards (EQSs) established in the WFD Daughter Directive 2008/105/EC amended by Directive 2013/105/EC-
7  IPCHEM TUTORIAL VIDEOS

Three IPCHEM tutorial videos are accessible from the main page of the IPCHEM website, or from the JRC Channel on YouTube. They provide a quick tour on IPCHEM’s objectives, usefulness and functionalities.

- IPCHEM, Understanding how chemicals interact
  https://www.youtube.com/watch?v=h5IR6CXBPZw
- IPCHEM, Looking for chemicals in people and nature
  https://www.youtube.com/watch?v=Qq5qkHoUz3Q
- IPCHEM, Data sharing for a better European policy on chemicals
  https://www.youtube.com/watch?v=e_kqfV4h1S4
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