



# Workshop on evaluating the reliability and relevance of environmental exposure data

Olivia Tran, Arjen Marcus, Adam Peters, Yves Verhagen, John Wilkinson, Brett Sallach, Graham Merrington, Leonard Oste, Steve Lofts,



# Welcome



# Agenda



- Session 1 – A summary of the CREED approach
- Discussion
- Lunch
- Session 2 – Perspectives on CREED
- Discussion
- Break
- Session 3 – Some examples of applying CREED
- Summary

# Administration





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# Criteria for Reporting and Evaluating Ecotoxicity Data (CRED)

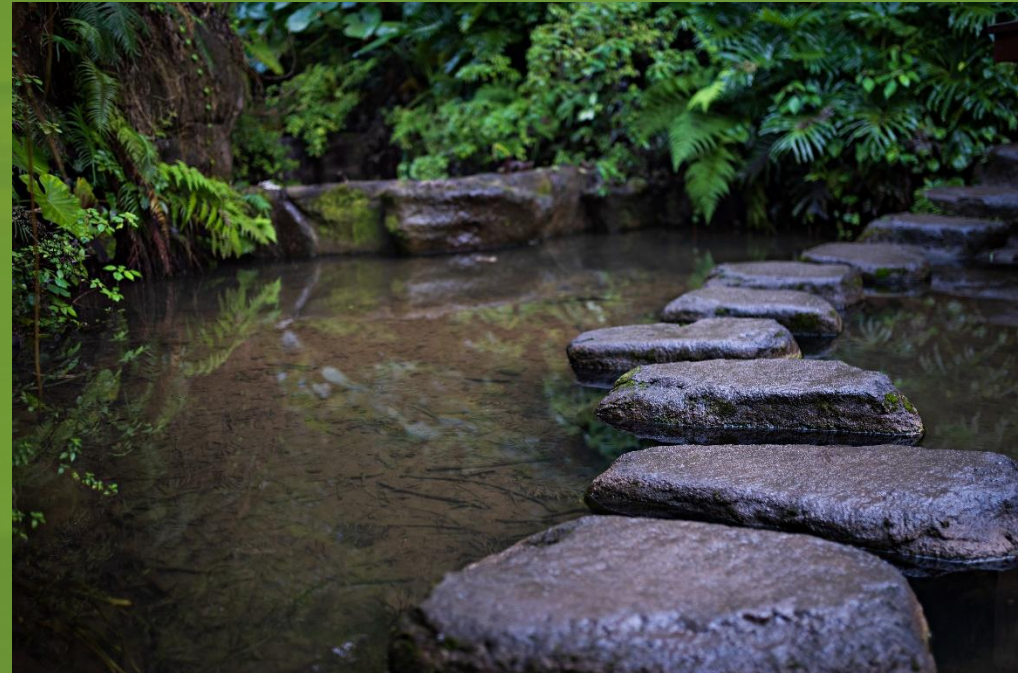
Olivia Tran



# Outline of presentation



- How did it start?
- What is CRED for?
- What does it entail?
- The benefits of CRED



# How did it start?



- Klimisch et al. (1997): A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data
- Scoring system:
  - » 1: Reliable without restriction
  - » 2: Reliable with restrictions
  - » 3: Not reliable
  - » 4: Not assignable



# What is CRED for?



- More accurate, applicable, consistent and transparent assessment of data amongst reviewers
- Criteria to improve study design and reporting
- Spreadsheet tool for evaluation
  - » Not a tick-box exercise, expert judgment is essential!

**Environmental Toxicology and Chemistry**

Hazard/Risk Assessment | Open Access | CC BY-NC-ND

**CRED: Criteria for reporting and evaluating ecotoxicity data**

Caroline T.A. Moermond , Robert Kase, Muris Korkaric, Marlene Ågerstrand

First published: 24 September 2015 | <https://doi.org/10.1002/etc.3259> | Citations: 247

**Volume 35, Issue 5**  
May 2016  
Pages 1297-1309

This article also appears in:  
REACH, 10 Years In: Research Driven by and Driving the REACH Process

# What does CRED entail?



- Relevance criteria: What is your objective?
  - » Biological relevance
  - » Exposure relevance
- Reliability criteria: Inherent quality of findings
  - » Test setup
  - » Test item
  - » Test organism
  - » Exposure conditions
  - » Statistical design and biological response
- Reporting recommendations



# The benefits of CRED



- Systematic assessment – consistency between reviewers
  - » CRED and Klimisch frameworks adopted by EU regulators
- Regulatory use – data must be reliable
  - » Key information to be reported
  - » Identify limitations for use
  - » Allows for transparent decision-making
- Criteria have also been developed for other data types (toxicology, *in vitro* assays, epidemiology)
  - » SciRAP.org





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# Deltares

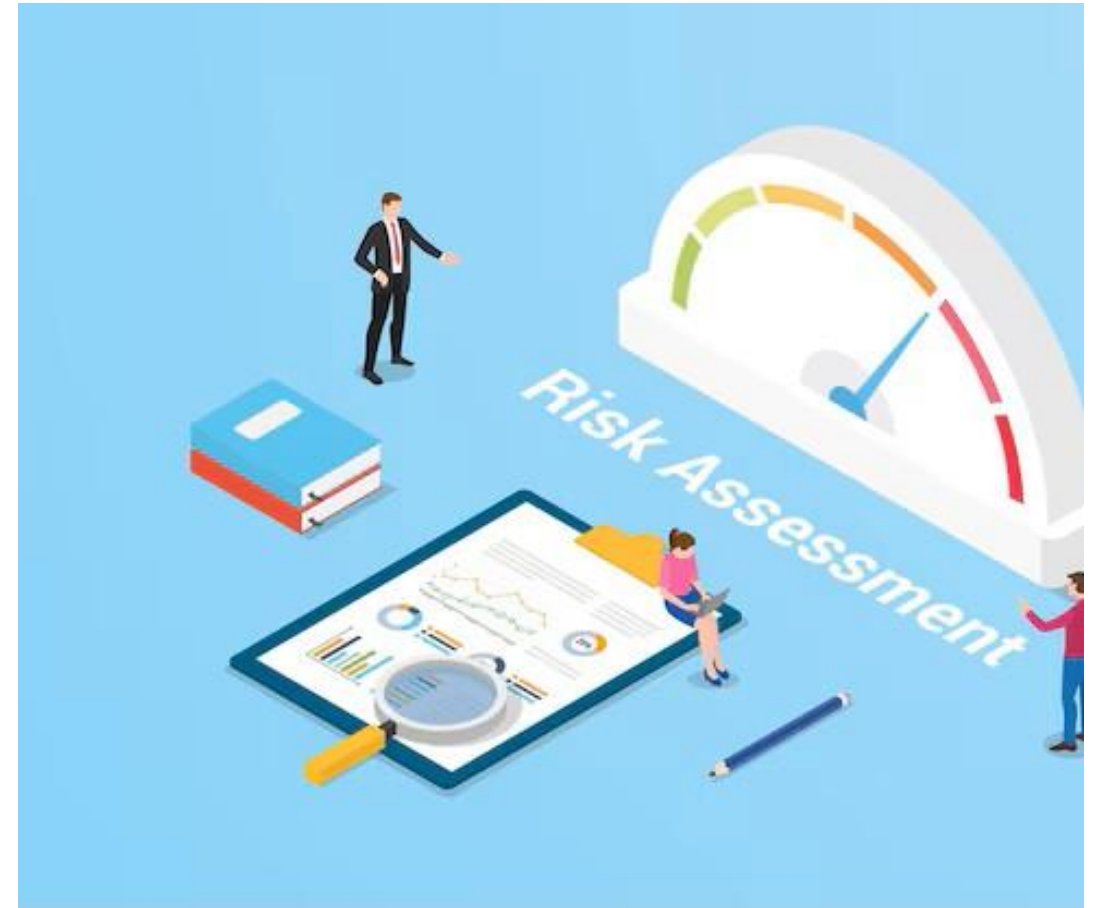
## CREED: Reliability of datasets



Arjen Markus (Deltares), Michelle Hladik (USGS), Dennis Helsel (Practical Stats), Lisa Howell (USGS), Stefano Polesello (CNR IRSA), Heinz Rüdell (Fraunhofer IME), Drew Szabo (MMK), Iain Wilson (WCA)

# Aim of CREED

- Provide a uniform and reproducible method for assessing the suitability of environmental datasets or studies for risk assessment:
  - **Reliability** – mostly “inherent” to the dataset
  - **Relevance** – first define the purpose of the risk assessment



# Overview: two steps ...

- Gateway: quick check – is it worthwhile to consider the dataset?
- Detailed checks: examine it for 19 criteria

- Does it pass the gateway criteria?

→ Score on detailed criteria

→ → Overall score:

1. Reliable without restrictions
2. Reliable with restrictions
3. Not reliable
4. Not assignable



All criteria should  
Be met!



At least the required  
criteria should be met

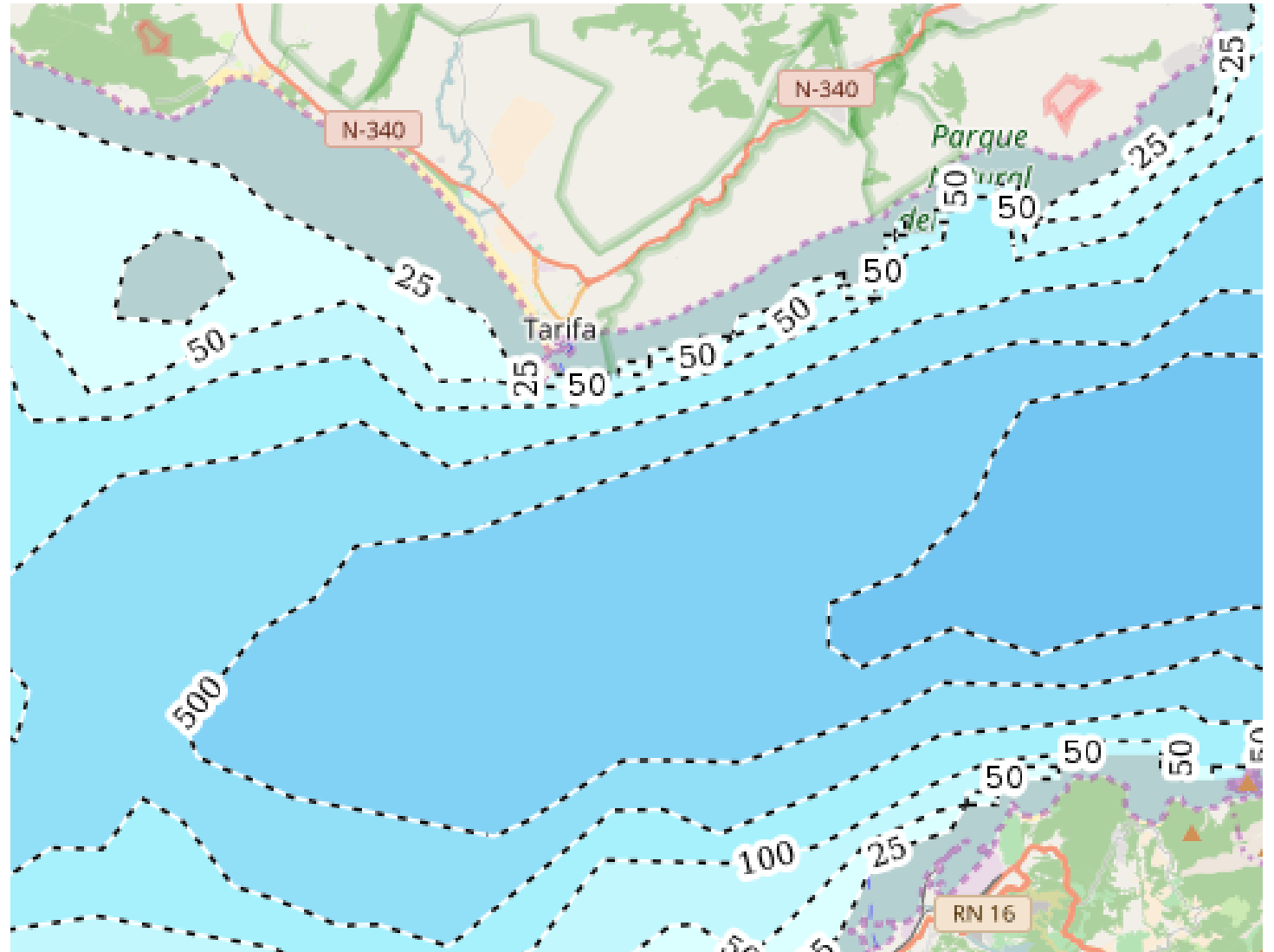
# Required and recommended criteria

- All criteria are met – “gold”
- All required criteria are met, but some recommended ones may not be met – “silver”
- Pragmatic distinction
- Help from the scorecard

Class	No.	Title	Criterion	Conclusion (drop-down)	Reliability Limitations/Restrictions (free-text)	Status
Media	RB01	Sample Medium/ Matrix	Was the sampling medium/matrix reported in detail (for water: dissolved fraction or whole water; for sediment: sieved or whole; for soil, grain size; for biota, species, age, sex, tissue type), and was the matrix appropriate for the analyte of interest?	Not Reported		Required
	RB02	Collection Method/ Sample Type	Was the sample collection method reported? Examples include grab, depth- and width-integrated, discrete, composite, or time-integrated samples, or continuous monitoring.	Not Reported		Recommended
	RB03	Sample Handling	Was information reported on sample handling (transport conditions, preservation, filtration, storage)? Was the type of container suitable for use with the analyte of interest? (i.e., no loss or contamination)	Not Reported		Recommended
Spatial	RB04	Site Location	Were the site locations reported?	Not Reported		Required
Temporal	RB05	Date and Time	Were the date and time of sample collection reported?	Not Reported		Required
	RB06	Analyte(s) Measured	Was the analyte(s) of interest suitably and definitively identified?	Not Reported		Required
	RB07	Limit of Detection and/or Limit of Quantification	Were limits of detection and/or quantitation provided?	Not Reported		Required
	RB08	Accreditation/ Quality Management System	Were the laboratory and method accredited for all or almost all samples? Several national and international accreditation bodies are available (e.g. ISO, UKAS); Was that laboratory and/or method certified to these standards? Was a quality system (such as e.g. ISO 17025) adopted? If these criteria are 'Fully Met', please proceed to No. RB13. If not, please proceed to additional questions Nos. RB09-RB12.	Not Reported		Required
Analytical	RB09	Method	Was the method sufficiently described or referenced, such that it can be reproduced if necessary? Was method validation included?	Not Reported		Required
	RB10	Lab Blank Contamination	Was method blank contamination assessed with laboratory blanks?	Not Reported		Recommended
	RB11	Recovery/ Accuracy	Were method recovery/accuracy and/or uncertainty assessed by recovery of standard reference material (SRM) and/or were lab spike samples assessed?	Not Reported		Recommended
	RB12	Reproducibility/ Precision	Were method reproducibility and/or uncertainty assessed with lab replicates and long-term control recoveries?	Not Reported		Recommended
	RB13	Field QC	Were quality control (QC) samples collected during field sampling (such as field blanks, spikes, replicates) to demonstrate the method performance for a given field study?	Not Reported		Recommended

# The Gateway criteria

- Sampling medium or matrix?
- Analyte?
- Spatial location?
- Year?
- Units?
- Data source and/or citation?
  
- A simple example:
  - What are the units?
  - Where is it?
  - What is the “analyte”?
  - When was this?
- ➔ Is there any metadata?



# Reliability criteria – the individual scores

Each criterium can be rated according to the following five possibilities:

- Fully met
- Partly met
- Not met or inappropriate
- Not reported (additional information?)
- Not applicable (criterium itself does not apply)



# Reliability criteria – the categories

- RB1-3: medium
  - Sampling medium/matrix – properly described? Appropriate for the analyte?
  - Collection method or sample type – do we have any information?
  - Sample handling – how transported, stored, type of container?
  - Think: contamination? Filtration?
- RB4: spatial
  - Where were the samples collected?
  - (Upstream samples may not be useful, in the situation to the right)



# Reliability criteria – the categories, part 2

- RB5: temporal
  - When were the samples taken?
  - At what time (if the system is dynamic)
- RB6-8: analytical
  - Is the analyte clearly defined or only operationally?
  - What methods were used to measure it?
  - What are the limits (LOD and LOQ) of the method?
  - RB8: shortcut possible!



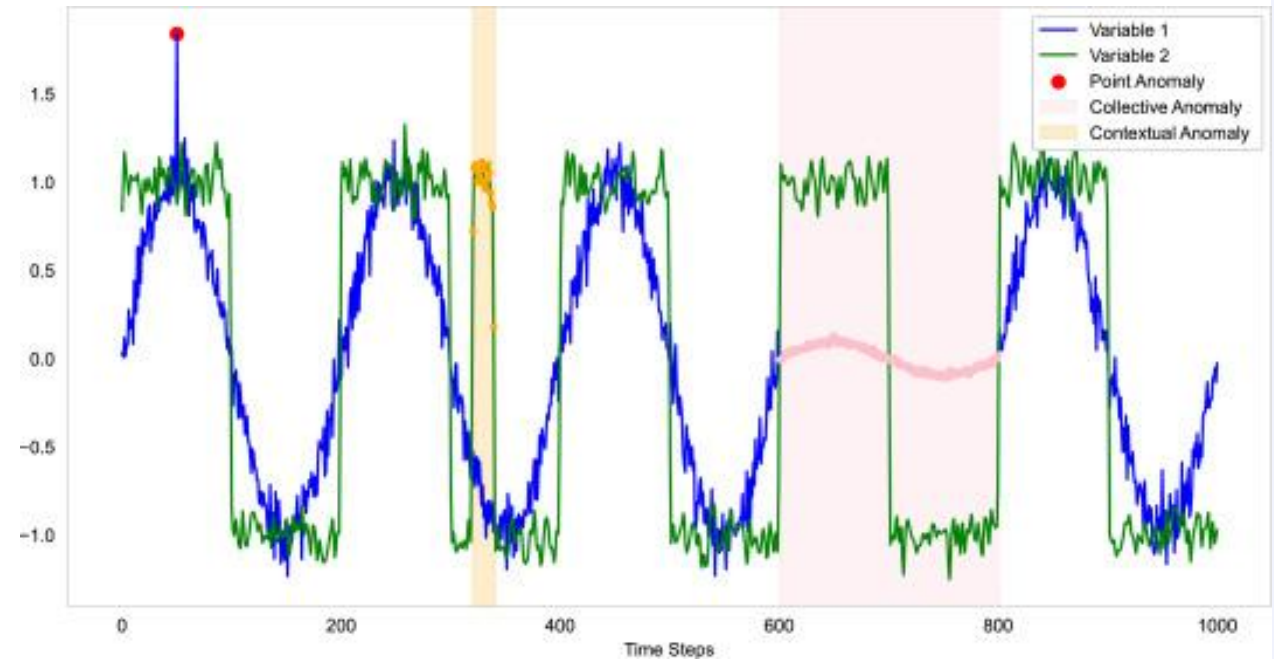
# Criteria for the analytical methods

- RB8: if the method used was not accredited (or the laboratory itself), we need to check additional criteria.
- RB9-13:
  - Sufficient details in the description?
  - Recovery and accuracy according to standards?
  - Reproducibility and precision documented?
  - Quality control in the field (blanks, replicates, ...)?



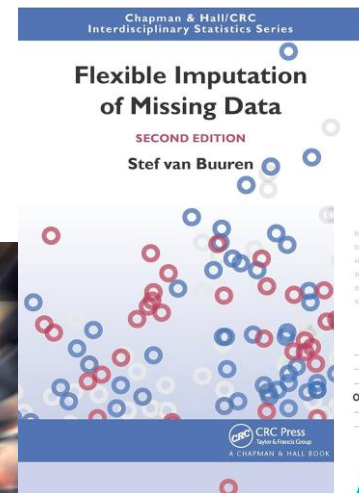
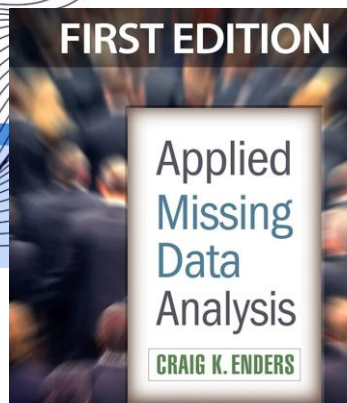
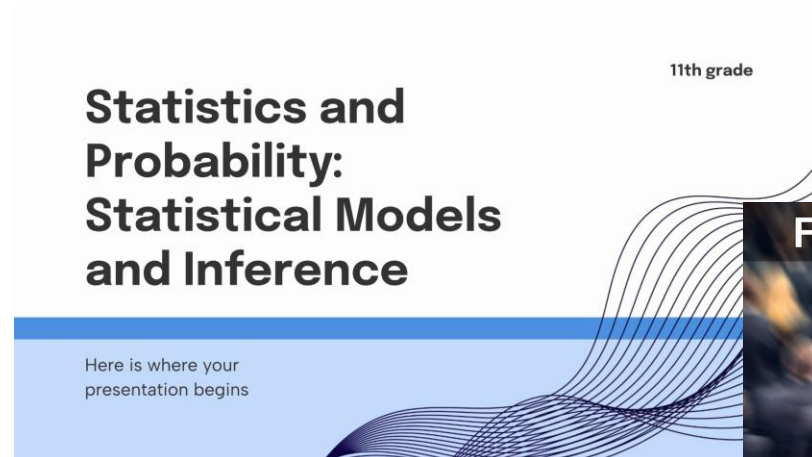
# Reliability criteria – the categories, part 3

- Some criteria are specific to particular circumstances
- RB14-18: data handling and statistics
  - Are the calculations correct? (all underlying data available, calculations themselves documented)
  - Values reported with correct significant figures?
  - How are outliers treated?
  - What about censored data?
- RB9: supporting parameters
  - Some analytes require additional parameters for interpretation. Are these available?  
Treated correctly?



# Details on data handling and statistics

- The dataset/study should report all measurements:
  - Outliers may contain valuable information. If they are the results of errors in the measurement, then that should be documented.
  - Values below limits of quantisation or detection should be **kept** and **not be replaced** by, say, zero or half the LOD. They should be recognisable.
  - Summary statistics is influenced by this type of data, but robust methods should be used to handle them.

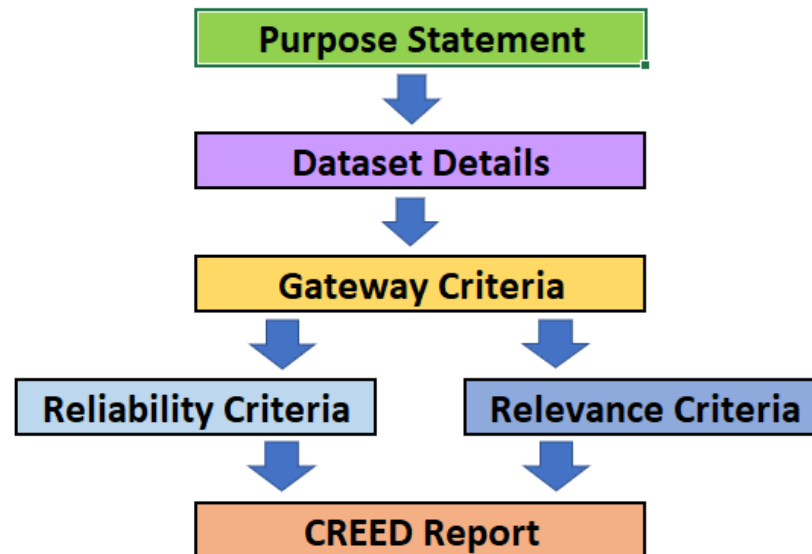


# Scoring the dataset/study for reliability



## CREED Scoring Tool\* version 1.01

**Workflow** (Click buttons to enter appropriate tabs)



CLEAR ALL TABS

Instructions

Abbreviations

Definitions

Version History

# Contact

 [www.deltares.nl](http://www.deltares.nl)

 [@deltares](https://twitter.com/deltares)

 [linkedin.com/company/deltares](https://www.linkedin.com/company/deltares)

 [info@deltares.nl](mailto:info@deltares.nl)

 [@deltares](https://www.instagram.com/deltares)

 [facebook.com/deltaresNL](https://www.facebook.com/deltaresNL)



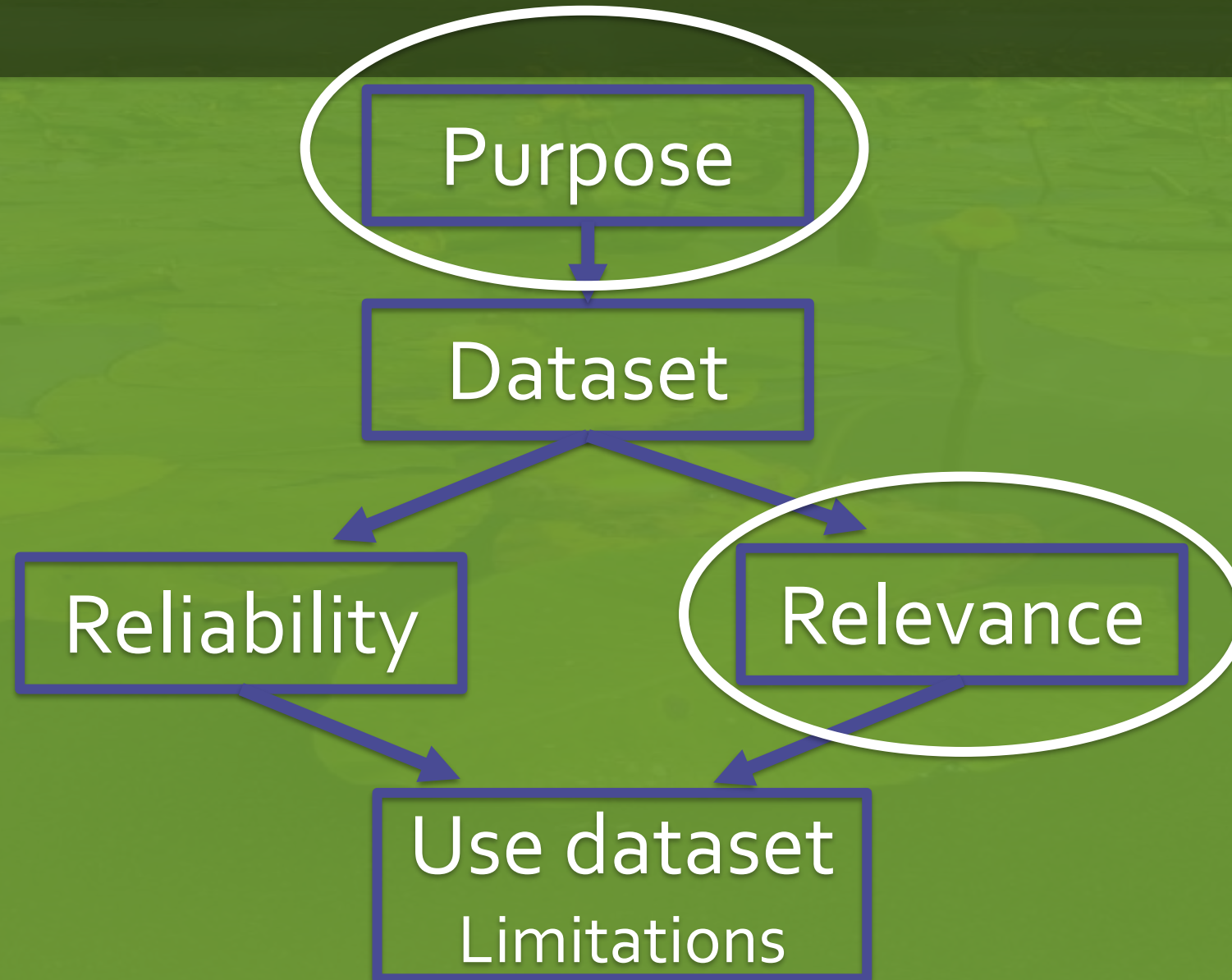


# Criteria for Evaluating the Relevance of Environmental Exposure Datasets

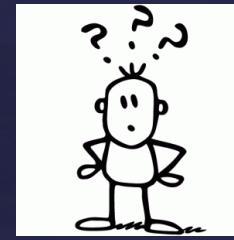
Adam Peters, Claus Svendsen, Leonard Oste, Michael Beking, Steve Lofts, Andrew Harford, Jeanne Vuaille, Rochelle Bohaty, Thomas Backhaus, Derek Wallace, Mick Hamer, Chuck Peck



# CREED



# Relevance?



- Exposure datasets are often used for purposes other than what they were collected for
- Datasets could be relevant for some purposes, but not relevant for other purposes
- Some flexibility may be required in the assessment when optimal datasets are not available
  - » Would result in limitations on how the data can be used or acknowledgement of the uncertainties



# Defining the Purpose



- Clearly defining the purpose of the assessment that the dataset will be used for is critical
- The purpose needs to establish the appropriate thresholds for the assessment criteria
- The level of detail is important for consistency and transparency
- Ambiguity leads to uncertainty, variability, and inconsistency in assessment of datasets, and risk assessments or other applications

# Example Purpose



- Do concentrations of Pb in UK surface waters comply with the EQS in 2020?
  - » Substance, medium, spatial and temporal scales broadly defined
  - » EQS may further define sampling requirements (e.g., type, frequency, and averaging periods)
- Greater specificity in the purpose statement improves consistency and transparency in the assessment

# LoD and Censored Data



- Is the LoD sufficient to assess compliance against the EQS (or other threshold)?
- How much censored data are acceptable?
- If the LoD is low (e.g. relative to the EQS) then a high proportion of censored data is acceptable
- If the LoD is high (e.g. relative to the EQS) then even a limited proportion of censored data can introduce significant uncertainty
  - » How many sites would actually pass the EQS?

# Suitable samples?



- Secondary poisoning risks to top predators?
- Ideally collect lots of samples of top predators
  - » Protected species, ethics issues, etc...
- PBMS uses carcasses of dead birds found by members of the public
  - » Avoids these problems, but limits what conclusions can be drawn from the data
- Assessments may need to use data that is less than ideal, and **account for this appropriately**

# Defining Requirements



- Criteria requirements for fully or partly met
- Dissolved Cr(VI) concentrations (Fully met)
- Total Cr concentrations (Partly met)
  - » EQS will be met if total Cr < EQS Cr(VI)
- Availability of required supporting parameters
  - » Criterion may be partly met if they can be estimated
- Important to consider any limitations where criteria are only partly met
  - » Total Cr > EQS Cr(VI) is not necessarily an EQS failure

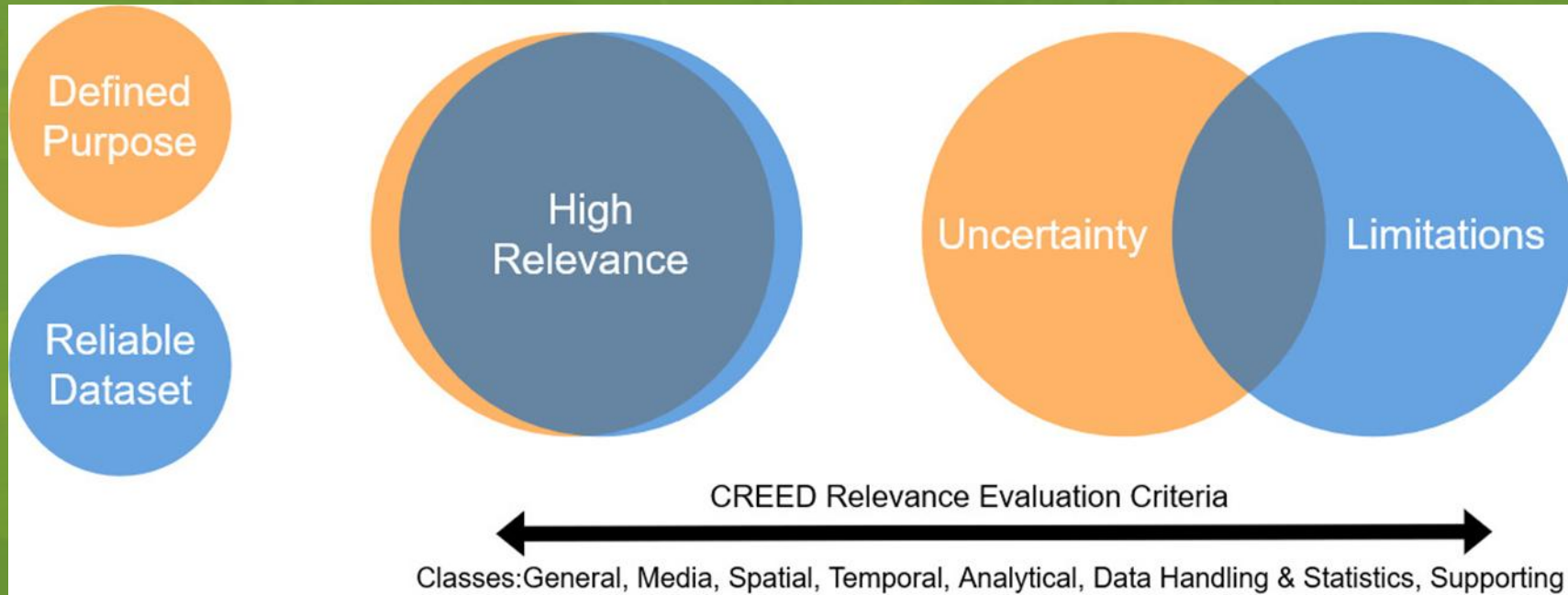
# Limitations of Datasets



- If criteria are not fully met there will be limitations of the dataset that affect its use
- Limitations must be recorded
- The impact of the data limitations will depend on the use of the data
  - » Limited spatial or temporal coverage
  - » Lack of supporting parameters
  - » Inadequate analytical sensitivity
  - » Uncertainty about types of sites sampled



# Outcomes



Dataset is highly suitable for the intended purpose

Dataset has limited suitability for the intended purpose

# Conclusions



- Properly defining the purpose is critical to assessing the relevance of a dataset
- Perfect datasets will never exist for some purposes
  - » Flexibility may be required in the assessment
- Limitations of datasets must be recorded
- Relevance criteria are preliminary and may be updated based on wider experiences



This presentation reflects the views of the authors and not the views of the organisations that they are associated with.



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# How to Use CREED

*Yves Verhaegen (Concawe)  
Adam Ryan (International Zinc Association),  
Carolina Di Paolo (Dow Chemical Company)*

**RSC Workshop on Evaluating the Reliability and  
Relevance of Environmental Exposure Data**

24 March 2026 - London

# Reminder

The purpose of CREED is to provide a harmonized & comprehensive scheme to evaluate & report environmental exposure datasets

It does not perform or automate the evaluation

In the CREED template, it is still up to the user to:

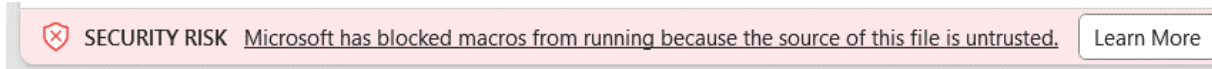
- Define the purpose the dataset will be used for
- For each relevance criterion, define the “Fully Met” & “Partly Met” information requirements
- Evaluate the dataset according to the reliability & relevance criteria
- Summarize the dataset limitations & restrictions

**During this presentation we'll walk through the CREED template**

# The CREED Template

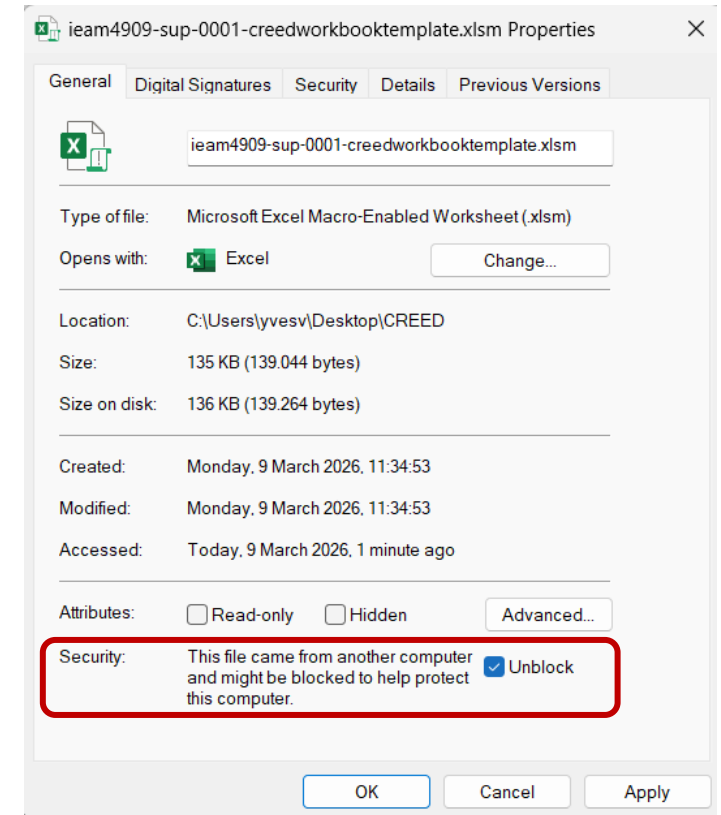
Is a macro-enabled Excel Workbook

*When opening the first time, you may get this warning:*



*‘Unblock’ it via the file ‘Properties’ settings (screenshot):*

*For other warnings, please follow [Microsoft guidelines](#)*



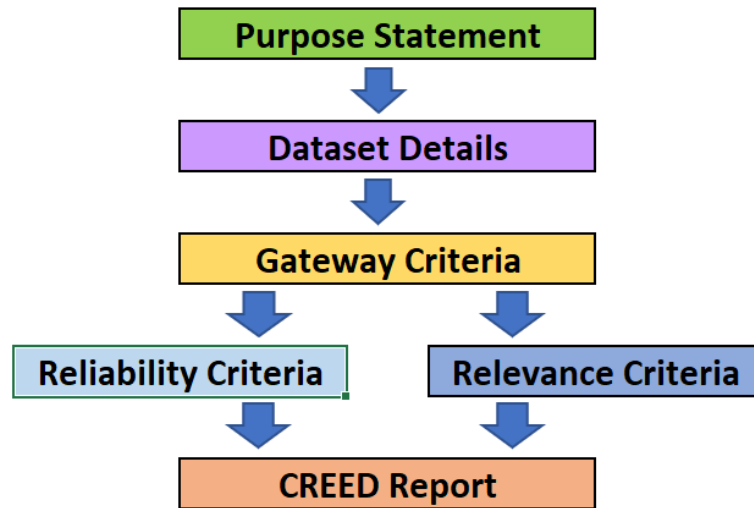
Can be downloaded free-of-charge from SETAC website (*link below*)

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# CREED Scoring - In Practice

CREED Scoring Tool\*  
version 1.0

Workflow (Click buttons to enter appropriate tabs)



\*From: [Di Paolo et al., 2024](#)

## Is Dataset X useable for purpose Y?

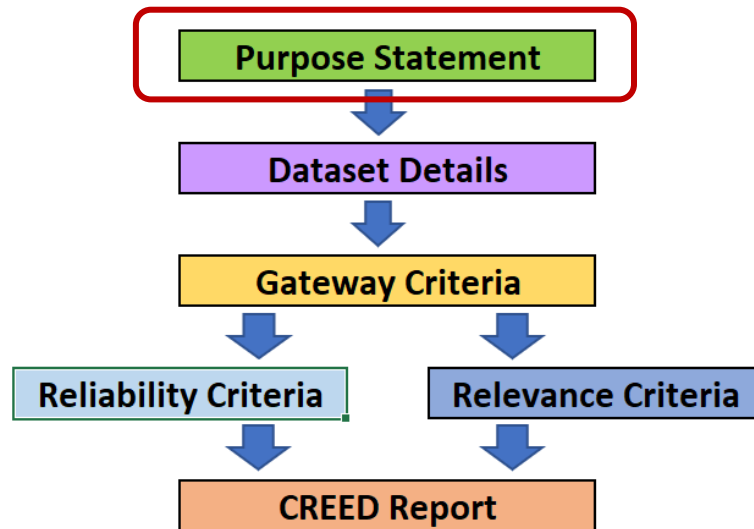
- Purpose statement
- Dataset Details
- Gateway Criteria
- Detailed Reliability & Relevance assessment
- Data Usability Score & Report Card

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# Purpose Statement

## CREED Scoring Tool\* version 1.0

Workflow (Click buttons to enter appropriate tabs)



\*From: [Di Paolo et al., 2024](#)

User to define the specific assessment purpose for which the dataset is to be used

Essential for data relevance evaluation ([Peters et al., 2024](#))

< > data reliability evaluation is independent of the purpose

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# Example: Reduction of atrazine freshwater concentrations in Occitanie (FR) after its EU-wide ban as Plant Protection Product

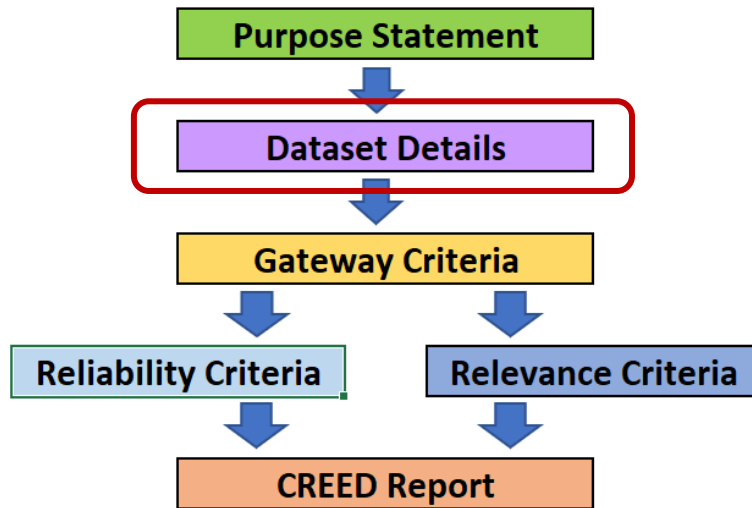
Purpose Statement				
Please describe the objective for which the useability of the dataset is assessed, including the required dataset thresholds				
<b>Purpose Statement:</b>	Assessment of whether atrazine is present at state-of-the-art quantifiable concentrations in surface freshwaters within the Occitanie region, France, between 2017 and 2021, with at least two years of monitoring (fully met) and a minimum of four samples per year at each sampling location (partly met). The dataset should ideally have (high risk) agricultural areas included and a sampling density of one site per 100 km <sup>2</sup> (728 sites, based on the size of the study area). This assessment is aimed to determine if withdrawing atrazine from use in the European Union has resulted in a reduction in its occurrence across the Occitanie region.	(freertext)		
Purpose Summary Table (optional)				
	Fully Met (FM)	Partly Met (PM)		
Enter thresholds for "Partly Met" (minimum information required) and "Fully Met" (optimal information) to fit the assessment purpose. Thresholds can be specific or general, depending on how important a criterion is to the user for the assessment purpose. Also, users can choose not to enter any threshold(s) for "Partly Met", if they want a yes/no decision.				
RV1	The sampling medium/matrix was appropriate for the given purpose.	Surface freshwater	Not applicable	(freertext)
RV2	The sample collection method (e.g., grab, depth- and width-integrated, discrete, composite, or time-integrated samples, or continuous monitoring) was adequate for the given purpose.	All methods accepted	Not applicable	(freertext)
RV3	The study area and number of locations sampled was suitable for the given purpose.	Occitanie: >1 site per 100 km <sup>2</sup>	Occitanie: >1 site per 1000 km <sup>2</sup>	(freertext)
RV4	The rationale for selection of sampling locations was provided and it is suitable for the given purpose.	At least 25% of the samples	Any surface freshwater	(freertext)
RV5	The samples were collected over a time scale that was appropriate for the given purpose.	At least 2 years of monitoring	Not applicable	(freertext)
RV6	Over the timespan, the sampling frequency was appropriate for the given purpose.	At least 12 samples a year	At least 4 samples a year	(freertext)
RV7	Conditions during sampling events were documented and relevant for the given purpose (e.g., baseflow, storm events, planned/unplanned discharges, etc.).	Any sampling conditions	Not applicable	(freertext)
RV8	The analyte(s) reported was/were appropriate for the given purpose.	Atrazine	Not applicable	(freertext)
RV9	The method was sensitive enough for the given purpose (i.e., the LOD and/or LOQ were below the benchmarks or metrics to which concentrations in the dataset will be compared).	At least 90% of the LOQs should be < 0.01 µg L <sup>-1</sup>	At least 90% of the LOQs should be < 0.6 µg L <sup>-1</sup> (EU standard)	(freertext)
RV10	The summary statistics provided (e.g., median, geometric mean, arithmetic mean, percentiles) were appropriate for the given purpose.	Not applicable	Not applicable	(freertext)
RV11	All supporting parameters that were needed to achieve the given purpose were provided.	Not applicable	Not applicable	(freertext)

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# Dataset Details

## CREED Scoring Tool\* version 1.0

**Workflow** (Click buttons to enter appropriate tabs)



\*From: [Di Paolo et al., 2024](#)

Summary of the key attributes of the dataset, for inclusion in the report card

For reporting purposes (it does not influence the assessment outcome)

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

## Example: Reduction of atrazine freshwater concentrations in Occitanie (FR) after its EU-wide ban as Plant Protection Product

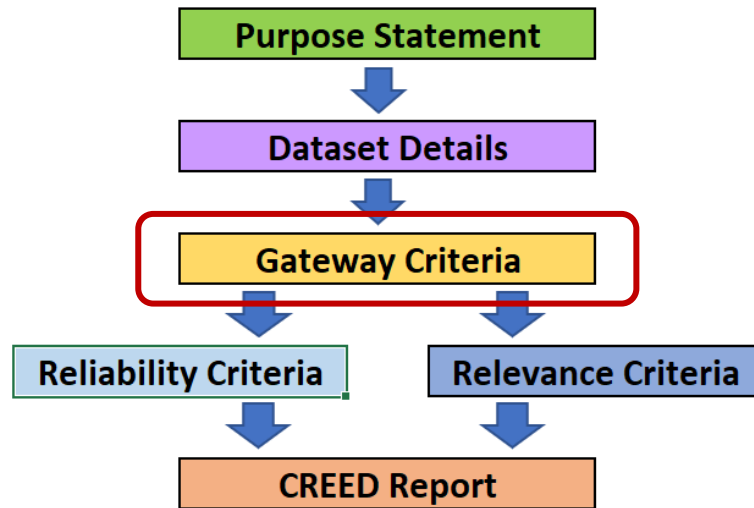
Key Attributes of Dataset Under Assessment		
<b>Source (reference):</b>	French National "EauFrance" Database ( <a href="http://www.naiades.eaufrance.fr/france-entiere#/">http://www.naiades.eaufrance.fr/france-entiere#/</a> )	(freetext)
<b>Reported Analyte:</b>	Atrazine	(freetext)
<b>Sample Medium/Matrix:</b>	Surface freshwater	(freetext)
<b>Sampling Conditions:</b>	variable depth (0.2-49 m)	(freetext)
<b>Study Area:</b>	Occitanie region, France	(freetext)
<b>Number of Sites:</b>	716 sites	(freetext)
<b>Site Density:</b>	more than 1 site per 1,000 km <sup>2</sup>	(freetext)
<b>Number of Samples:</b>	1-137, 93% of sites have > 4 samples per site	(freetext)
<b>Site Type(s):</b>	rivers, streams, lakes	(freetext)
<b>Sampling Period:</b>	2017 to 2021	(freetext)
<b>Sampling Frequency:</b>	1-18 samples per year	(freetext)
<b>Sampling Method(s):</b>	occurrence assessment	(freetext)
<b>Analytical Method(s):</b>	Unfiltered. Either (1) extracted with SPE and analyzed by GC-MS/MS or HPLC-MS/MS; or (2) liquid-liquid extracted and analyzed by GC-MS	(freetext)
<b>Limit of Quantification:</b>	< 0.0017 - 0.013 µg/L	(freetext)
<b>Other Details:</b>	Study duration: 1 sample to 4 years, depending on site	(freetext)

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# Gateway Criteria

## CREED Scoring Tool\* version 1.0

Workflow (Click buttons to enter appropriate tabs)



\*From: [Di Paolo et al., 2024](#)

Is there sufficient information available in or about the dataset to perform a complete CREED evaluation?

All 6 Gateway Criteria must be met in order to proceed with CREED evaluation

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

## Example: Reduction of atrazine freshwater concentrations in Occitanie (FR) after its EU-wide ban as Plant Protection Product

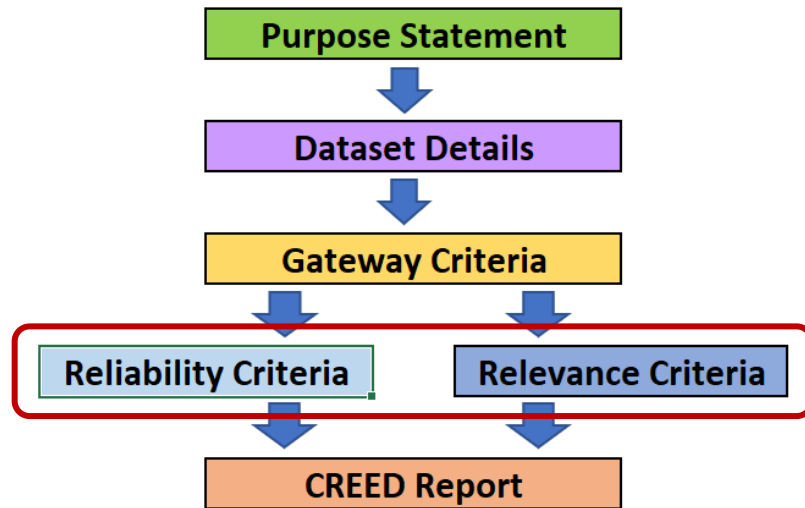
No.	Title	Gateway Criterion	Answer (Yes or No)
1	Sampling Medium/ Matrix	Does the study specify which medium/matrix is sampled?	Yes
2	Analyte	Does the study specify which unique analyte is measured?	Yes
3	Spatial Location	Does the study specify where samples were collected? At a minimum, there is enough information for the given purpose (e.g., country).	Yes
4	Year	Does the study indicate when samples were collected? At a minimum, there is enough information for the given purpose (e.g., sampling year).	Yes
5	Units	Does the study specify units of measurement?	Yes
6	Data source/ Citation	Does the study cite the source of data and/or is a suitable bibliographic reference available for the study?	Yes

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# Reliability & Relevance Criteria

## CREED Scoring Tool\* version 1.0

Workflow (Click buttons to enter appropriate tabs)



\*From: [Di Paolo et al., 2024](#)

Datasets that have passed the Gateway Criteria are evaluated by the user according to the detailed criteria for:

- **Reliability** ([Hladik et al., 2024](#)), &
- **Relevance** ([Peters et al., 2024](#))

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# Reliability & Relevance Criteria

The criteria are grouped into 6 classes: media, spatial, temporal, analytical, data handling / statistics, & supporting parameters

Class	No.	Criterion Title
Media	RB01	Sample Medium/ Matrix
	RB02	Collection Method/ Sample Type
	RB03	Sample Handling
Spatial	RB04	Site Location
Temporal	RB05	Date and Time
Analytical	RB06	Analyte(s) Measured
	RB07	Limit of Detection and/or Limit of Quantification
	RB08	Accreditation/ Quality Management System
	RB09	Method
	RB10	Lab Blank Contamination
	RB11	Recovery/ Accuracy
	RB12	Reproducibility/ Precision
Data Handling & Statistics	RB13	Field QC
	RB14	Calculations (if dataset contains calculated values)
	RB15	Significant Figures (if dataset contains calculated values)
	RB16	Outliers (if dataset mentions outliers)
	RB17	Censored Data (if dataset contains censored values)
Supporting Parameters	RB18	Summary Statistics Procedures (if dataset contains summary statistics)
	RB19	Supporting Data Quality (if supporting parameters are required for the purpose)

Class	No.	Criterion Title
Media	RV01	Sample Medium/ Matrix
	RV02	Collection Method/ Sample Type
Spatial	RV03	Study Area
	RV04	Site Type
Temporal	RV05	Sampling Timespan
	RV06	Sampling Frequency
	RV07	Temporal Conditions
Analytical	RV08	Analyte
	RV09	Sensitivity/ LOD/ LOQ
Data Handling & Statistics	RV10	Summary Statistics Type (if dataset contains summary statistics)
Supporting Parameters	RV11	Supporting Parameters (if supporting parameters are required for the purpose)

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# Reliability & Relevance Criteria

The user evaluates the dataset by assigning 1 out of 5 ratings to each criterion *(see table at the left)*

RATING	DEFINITION
Fully met	All conditions of the criterion are satisfied by the study or dataset
Partly met	Some of the conditions are met for part or all the dataset, or all conditions are met by part of the dataset
Not met/ inappropriate	Data or approach were flawed or inappropriate for the analyte or assessment purpose
Not reported	Insufficient information was provided to evaluate the criterion
Not applicable	The circumstances required for the criterion do not apply to the dataset

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

## Example: Reduction of atrazine freshwater concentrations in Occitanie (FR) after its EU-wide ban as Plant Protection Product

Class	No.	Title	Criterion	Conclusion (drop-down)	Reliability Limitations/Restrictions (free-text)	Status
Media	RB01	Sample Medium/ Matrix	Was the sampling medium/matrix reported in detail (for water: dissolved fraction or whole water; for sediment: sieved or whole; for soil, grain size; for biota, species, age, sex, tissue type), and was the matrix appropriate for the analyte of interest?	Fully Met		Required
	RB02	Collection Method/ Sample Type	Was the sample collection method reported? Examples include grab, depth- and width-integrated, discrete, composite, or time-integrated samples, or continuous monitoring.	Partly Met	Only general info. provided on sample type, without details or reference	Recommended
	RB03	Sample Handling	Was information reported on sample handling (transport conditions, preservation, filtration, storage)? Was the type of container suitable for use with the analyte of interest? (i.e., no loss or contamination)	Not Reported	No info. on sample handling/transport/storage	Recommended
Spatial	RB04	Site Location	Were the site locations reported?	Fully Met		Required
Temporal	RB05	Date and Time	Were the date and time of sample collection reported?	Fully Met		Required
Analytical	RB06	Analyte(s) Measured	Was the analyte(s) of interest suitably and definitively identified?	Fully Met		Required
	RB07	Limit of Detection and/or Limit of Quantification	Were limits of detection and/or quantitation provided?	Fully Met		Required
	RB08	Accreditation/ Quality Management System	Were the laboratory and method accredited for all or almost all samples? Several national and international accreditation bodies are available (e.g. ISO, UKAS); Was that laboratory and/or method certified to these standards? Was a quality system (such as e.g. ISO 17025) adopted? <i>If these criteria are 'Fully Met', please proceed to No. RB13. If not, please proceed to additional questions Nos. RB09-RB12.</i>	Partly Met	Accredited for some, but not all, samples	
	RB09	Method	Was the method sufficiently described or referenced, such that it can be reproduced if necessary? Was method validation included?	Fully Met		Required
	RB10	Lab Blank Contamination	Was method blank contamination assessed with laboratory blanks?	Fully Met		Recommended
	RB11	Recovery/ Accuracy	Were method recovery/accuracy and/or uncertainty assessed by recovery of standard reference material (SRM) and/or were lab spike samples assessed?	Partly Met Not Reported Not Met		Recommended
	RB12	Reproducibility/ Precision	Were method reproducibility and/or uncertainty assessed with lab replicates and long-term control recoveries?	Fully Met		Recommended
	RB13	Field QC	Were quality control (QC) samples collected during field sampling (such as field blanks, spikes, replicates) to demonstrate the method performance for a given field study?	Fully Met		Recommended

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

## Example: Reduction of atrazine freshwater concentrations in Occitanie (FR) after its EU-wide ban as Plant Protection Product

Class	No.	Title	Criterion	Conclusion (drop-down)	Relevance Limitations/Restrictions (free-text)	Status
Spatial	RV03	Study Area	Were the study area and number of locations sampled suitable for the given purpose?	Partly Met	Site density below optimal (1 in 100 km <sup>2</sup> ) but acceptable (>1 per 1000 km <sup>2</sup> )	Required
	RV04	Site Type	Was the rationale for selection of sampling locations provided and was it suitable for the given purpose?	Partly Met	Sites are all surface water, but it is unknown how many sites are in agricultural settings	Recommended
Temporal	RV05	Sampling Timespan	Were the samples collected over a time scale that was appropriate for the given purpose?	Partly Met	Only a subset of sites has 2 or more years of monitoring	Required
	RV06	Sampling Frequency	Over the timespan, was the sampling frequency appropriate for the given purpose?	Partly Met	Only a subset of sites has >12 samples per year; some have >4 samples per year	Required
	RV07	Temporal Conditions	Were conditions during sampling events documented and relevant for the given purpose (e.g., baseflow, storm events, planned/unplanned discharges, etc.)?	Fully Met		Recommended
Analytical	RV08	Analyte	Was/were the reported analyte(s) appropriate for the given purpose?	Fully Met		Required
	RV09	Sensitivity/ LOD/ LOQ	Was the method sensitive enough for the given purpose (i.e., were the LOD and/or LOQ below the benchmarks or metrics to which concentrations in the dataset will be compared)?	Fully Met		Required
Data Handling and Statistics	RV10	Summary Statistics Type <i>if dataset contains summary statistics</i>	Were the summary statistics provided (e.g., median, geometric mean, arithmetic mean, percentiles) appropriate for the given purpose?	Not Applicable		Recommended
Supporting Parameters	RV11	Supporting Parameters <i>if supporting parameters are required for the purpose</i>	Were all supporting parameters provided that were needed to achieve the given purpose?	Not Applicable		Required

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# “Required” vs. “Recommended” Criteria

“Perfect” datasets that meet all criteria are rare

< > “Imperfect”, but useable datasets that meet basic criteria are common

All criteria are met => “*Gold dataset*”

All basic criteria are met => “*Silver dataset*”

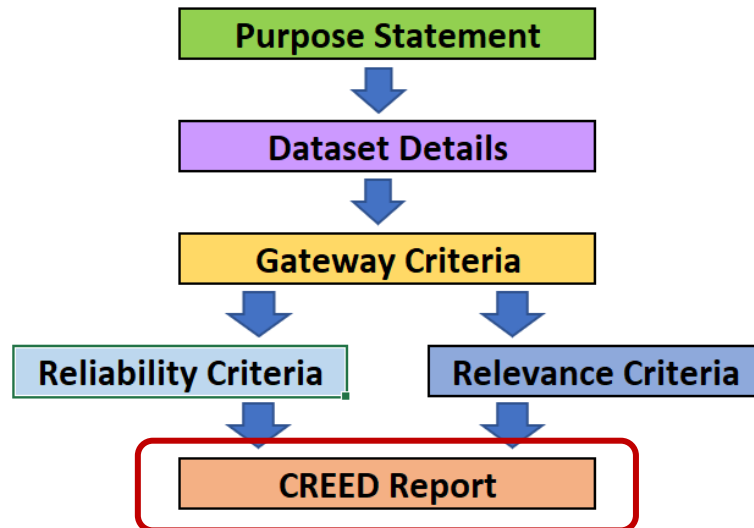
Not all basic criteria are met => dataset is rejected

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# CREED Report

CREED Scoring Tool\*  
version 1.0

Workflow (Click buttons to enter appropriate tabs)



\*From: [Di Paolo et al., 2024](#)

Reliability and Relevance Assessments are reported at 2 levels (“Gold” & “Silver”) as either:

- Reliable/Relevant without restrictions
- Reliable/Relevant with restrictions
- Not Reliable/Relevant
- Not assignable

For both levels, an overall “Data Useability” is concluded

Limitations & Restrictions (if any) for both levels are reported

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# CREED Report

Category	Description	What it means
Reliable/relevant without restrictions	All (Gold or Silver) criteria were met	The study is well designed and performed. It does not contain flaws that affect the study
Reliable/relevant with restrictions	Some (Gold or Silver) criteria are only partly addressed	The study is generally well designed & performed, based on the information reported. Some study characteristics will limit the applicability of the data.
Not reliable/relevant	Not all (Gold or Silver) criteria were met	The study has flaws in design or performance.
Not assignable	Information that is needed to evaluate the study is missing	The study does not give sufficient experimental details (e.g. listed in abstracts or secondary literature) or the documentation provided is not sufficient to evaluate one or more critical aspects.

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>

# Example: Reduction of atrazine freshwater concentrations in Occitanie (FR) after its EU-wide ban as Plant Protection Product

## Data Usability Summary

[Back to CREED Workflow](#)

[PRINT SUMMARY](#)

Assessment Level	Data Reliability	Data Relevance	Data Usability	Interpretation	Limitations/Restrictions
<b>Silver</b> (required level)	Reliable Without Restrictions	Relevant With Restrictions	Usable With Restrictions	Meets minimum requirements with restrictions/limitations	Relevance: Site density below optimal (1 in 100 km <sup>2</sup> ) but acceptable (>1 per 1000 km <sup>2</sup> ) monitoring; Only a subset of sites has >12 samples per year; some have >4 samples per
<b>Gold</b> (recommended level)	Reliability Not Assignable	Relevant With Restrictions	Not Usable	Missing data, so does not currently meet minimum requirements	Reliability: Only general info. provided on sample type, without details or reference; No info. on sample handling/transport/storage; Relevance: Site density below optimal (1 in 100 km <sup>2</sup> ) but acceptable (>1 per 1000 km <sup>2</sup> ); Only a subset of sites has 2 or more years of monitoring; Only a subset of sites has >12 samples per year; some have >4 samples per year; Sites are all surface water, but it is unknown how many sites are in agricultural settings;

**CRITERIA FOR REPORTING AND EVALUATING EXPOSURE DATASETS (CREED) - Report Card**

**DATASET DETAILS - Key Attributes of Dataset**

Source (reference):	France National "eau-Pesticides" Database (http://www.sciensano.be/fr/secteur/pesticides)	Sample Medium/Matrix:	Surface freshwater
Reported Analyte:	Atrazine	Study Area:	Occitanie region, France
Sampling Coordinates:	Occitanie South (20,44°N)	Site Density:	more than 1 site per 1,000 km <sup>2</sup>
Number of Sites:	716 sites	Site Type(s):	non-agricultural, non-urban, industrial, rural
Number of Samples:	3,127, 2016 of sites have 4 samples per site	Sampling Frequency:	3-18 samples per year
Sampling Period:	2017 to 2021	Sampling Method(s):	not applicable
Sampling Method(s):	not applicable	Analysis Method(s):	Difquatim: Either (1) extracted with SPE and analyzed by GC-MS/MS or HPLC-MS/MS or (2) liquid-liquid extraction and analyzed by GC-MS
Level of Identification:	< 0.0017 - 0.033 µg/L	Other Details:	Study duration: 5 samples to 8 years, depending on site

**PURPOSE STATEMENT - Required Attributes for Dataset**

Assessment of whether atrazine is present at sites at the set quantifiable concentrations in surface freshwater within the Occitanie region, France, between 2017 and 2021, with at least two years of monitoring (fully used) and a minimum of four samples per year at each sampling location (partly used). The dataset should ideally have high- and low- agricultural areas included and a sampling density of one site per 100 km<sup>2</sup> (200 sites, based on the size of the study area). This assessment is intended to determine if forthcoming restriction from use in the European Union has resulted in a reduction in the occurrence across the Occitanie region.

Criterion	Requirement	Value from DSD	Result from DSD
R01	The sampling methodology was appropriate for the given program.	Surface freshwater	Not applicable
R02	The sample collection method (e.g., grab, depth, and multi-integrated, discrete, composite, or time-integrated composite) or continuous monitoring was adequate for the given program.	All methods accepted	Not applicable
R03	The study area and number of locations sampled was suitable for the given program.	Occitanie >1 site per 100 km <sup>2</sup>	Not applicable
R04	The methods for selection of sampling locations was provided and is suitable for the given program.	At least 25% of the samples	Any surface freshwater
R05	The samples were collected over a time scale that was appropriate for the given program.	At least 2 years of	Not applicable
R06	Over the lifespan, the sampling frequency was appropriate for the given program.	At least 12 samples a year	At least 4 samples a year
R07	Conditions during sampling events were documented and relevant for the given program (e.g., weather, storm events, unusual/unexpected discharge, etc.).	Any sampling conditions	Not applicable
R08	The analytical method used was appropriate for the given program.	Atrazine	Not applicable
R09	The method was sensitive enough for the given program (i.e., the LOD and/or LOQ were below the benchmarks or metrics to which concentrations in the dataset will be compared).	At least 90% of the LODs should be < 0.01 µg/L; should be < 0.6 µg/L EU	Not applicable
R10	The minimum retention provided (e.g., matrix, generation time, partitioning) was appropriate for the given program.	Not applicable	Not applicable
R11	The reporting parameters (data) were reported to reflect the given program uses provided.	Not applicable	Not applicable

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# Conclusions

Environmental scientists can use CREED as a data requirement 'guidance' or 'checklist' for:

- setting up environmental monitoring programs
- ensuring all relevant metadata are reported

CREED 'compliance' broadens & increases the useability of datasets

Risk assessors can use CREED to ensure their assessment is based on reliable & relevant datasets

- Completed CREED .xlsx templates can be stored, shared & re-used
- CREED .pdf summaries can be attached to scientific articles & reports

<https://www.setac.org/explore-science/methods-and-approaches/data-usability.html>



[www.concawe.eu](http://www.concawe.eu)

**Thank you for  
your attention**

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