



Deliverable D6.4 – Final version operational toolbox online
**WP6 – Support to implementation and upgrade of framework
and tools**

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HORIZON-MISS-2021-CLIMA-02-01 - Development of climate change risk assessments in European regions and communities based on a transparent and harmonised Climate Risk Assessment approach

Document Information

Deliverable Title	Final version operational toolbox online
Brief Description	The CLIMAAX CRA toolbox includes all improvements made in Task 6.2 and is accessible as an online handbook (handbook.climaax.eu). All source code is available on GitHub and Zenodo . This deliverable declares v2026.04.1 as feature complete, though maintenance and uptake of external contributions will continue.
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0.1	13/04/2026	Christopher Polster	Initial version.
1.0	29/04/2026	Christopher Polster	General revisions after review.

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Abbreviations and acronyms

Abbreviation / acronym	Description
CRA	Climate risk assessment
DOI	Digital object identifier
WP	Work package



Executive summary

This deliverable presents a feature-complete version (v2026.04.1) of the CLIMAAX climate risk assessment toolbox, delivered as part of the open-access online handbook.

The handbook integrates the CRA framework developed in WP1 with an operational toolbox consisting of 14 executable workflows covering a broad range of climate hazards and risk applications. The workflows are embedded in the handbook alongside guidance, examples and instructions for execution in different computing environments. The handbook further includes resources such as links to relevant providers of European- and global-scale datasets, information on how to access support from the project, and documentation tailored to users with varying technical backgrounds. All content and software are maintained in an open-source GitHub ecosystem, with releases versioned, documented and citable via Zenodo.

With major feature development concluded, focus shifts to maintenance and uptake of community-driven features and applications.



1 Introduction

The climate risk assessment (CRA) handbook developed by the CLIMAAX project was first released to the public in June 2024 (milestone M3.4; version v2024.06.0) and has been continuously developed since.

This deliverable marks version v2026.04.1 of the CLIMAAX CRA handbook as feature complete in the context of task T6.2 (Improvement of the Toolbox and Framework). While major developments by the project partners are thus concluded, WP6 will continue to provide maintenance and bugfixes for the handbook and engage in the take-up of community-driven additions, leveraging CLIMAAX's open-source approach for the handbook and the surrounding software and content ecosystem.

The online version of the handbook is the demonstrator of the feature complete version. A brief overview of the handbook and its implementation is provided in the following.

2 The CLIMAAX CRA Handbook

The handbook is accessible as a public website at handbook.climaax.eu (Figure 1).

2.1 CRA framework

The handbook contains a description of the CRA framework developed in WP1¹. This description is a condensed user-friendly version of deliverable D1.4.

The framework is presented on the website with text blocks, info boxes, illustrations, tables, cross-references and external references to additional relevant online material, e.g. from the IPCC and Climate-ADAPT. Each of the five framework steps is accompanied by an introduction video and guiding questions that support practitioners in applying the framework.

2.2 Toolbox with workflows

The risk analysis toolbox² in the handbook provides users with workflows to select, access, process, combine and visualise hazard, exposure and vulnerability datasets from open providers. These workflows present a starting point for users to create a quantitative assessment of climate-related risk at the local and regional scale. They further encourage and allow for the integration of local data to increase regional relevance beyond what is possible with datasets from providers of global- or European-scale information alone.

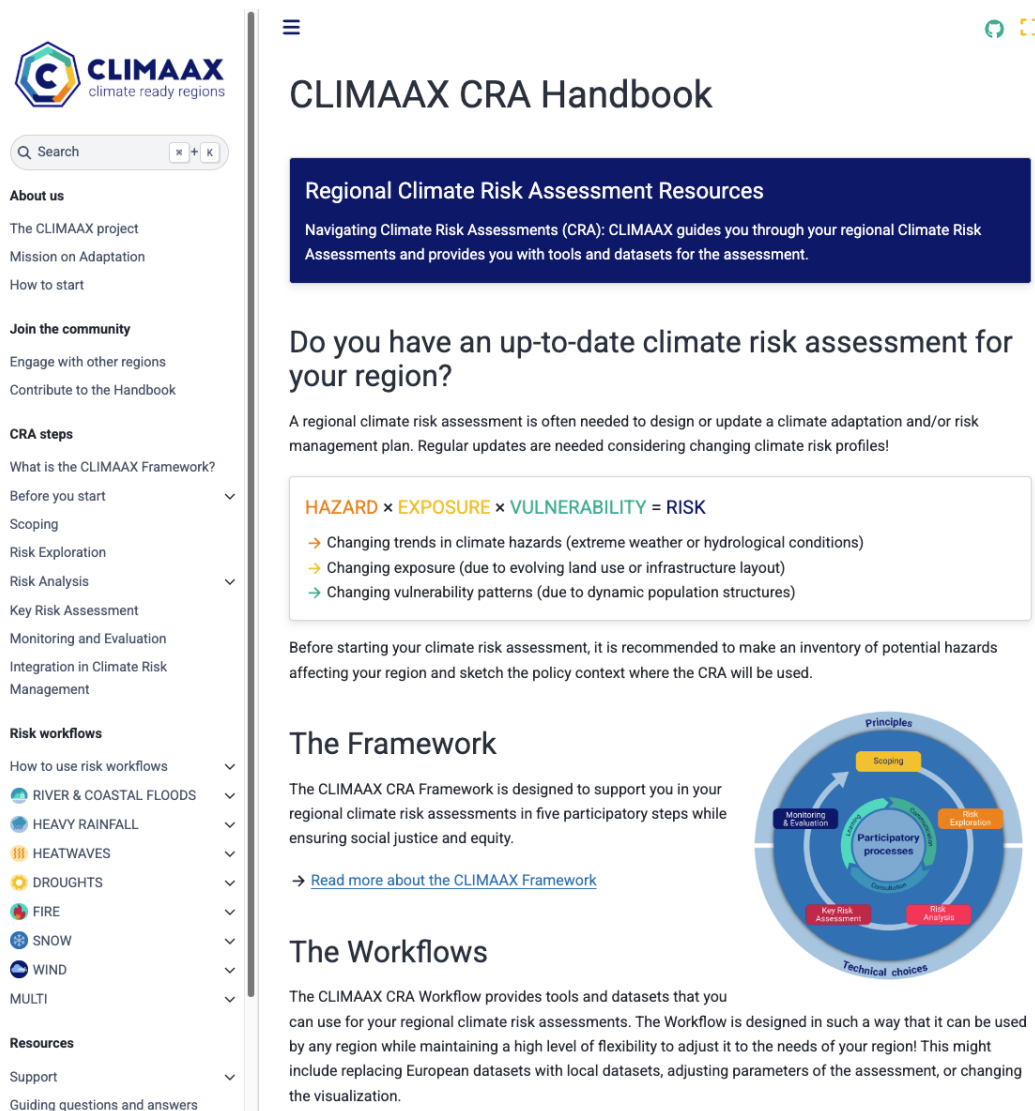
Workflows are implemented as executable Jupyter notebooks, combining text-based descriptions, software components and visual outputs. Static copies of the workflow notebooks, configured with examples of produced outputs, are embedded into the handbook website. Alongside, instructions³ are provided on how to import the notebooks into different computational

¹ handbook.climaax.eu/CRA_steps/framework.html

² handbook.climaax.eu/CRA_steps/analysis/workflows.html

³ handbook.climaax.eu/notebooks/workflows_how_to.html

environments (depending on availability for the user), where they can be customised and executed as software.



The screenshot shows the CLIMAAX CRA Handbook homepage. On the left is a navigation sidebar with sections: About us, Join the community, CRA steps, Risk workflows, and Resources. The main content area is titled 'CLIMAAX CRA Handbook' and features a dark blue banner for 'Regional Climate Risk Assessment Resources'. Below this is a section asking 'Do you have an up-to-date climate risk assessment for your region?' with a formula: **HAZARD x EXPOSURE x VULNERABILITY = RISK**. It lists three factors: Changing trends in climate hazards, Changing exposure, and Changing vulnerability patterns. A circular diagram titled 'The Framework' shows five participatory steps: Scoping, Risk Exploration, Risk Analysis, Key Risk Assessment, and Monitoring & Evaluation, all within a 'Participatory processes' circle, surrounded by 'principles' and 'Technical choices'. Below this is a section 'The Workflows'.

Figure 1: Screenshot of the handbook homepage. <https://handbook.climaax.eu>

14 workflows to assess various climate hazards and/or risks are available in v2026.04.1:

- River floods (flood maps)
- River floods (discharge statistics)
- Coastal floods
- Flood building damage and population exposed
- Extreme precipitation
- Urban heatwaves
- Relative drought

- Agricultural drought
- Wildfire (machine learning approach)
- Wildfire (Fire Weather Index)
- Fire Weather Index response model
- Heavy snowfall and blizzards
- Windstorm
- Heatwave and precipitation risk assessment for infrastructure

2.3 Additional resources

The framework and workflows are accompanied by supporting resources in the handbook to enhance their usability. These consist of information on the support offerings of CLIMAAX⁴, experiences with the framework's guiding questions from the pilot regions, an FAQ and glossary, links to external sources of hazard, exposure, vulnerability and risk data, and information on the software used to implement the workflows, targeted at users that have no or only little experience with these tools.

2.4 Updates and releases

Handbook updates have been delivered continuously since the first release and new releases have been declared at convenient intervals. These updates included

- new and improved workflows and workflow components,
- additional guiding materials for the framework,
- expanded documentation of workflows and supporting resources,
- bugfixes and performance improvements,

and have ensured the operational status of the toolbox through active maintenance of the software environment. Developers prioritised features and fixes based on user requests and feedback collected at the WP6-run service desk and through the GitHub platform.

Releases are assigned a version identifier according to a calendar versioning scheme with structure $vYYYY.MM.n$, where $YYYY$ is the four-digit year and MM the two-digit month of the time of release and n is a counter that starts at zero in a given month and increases by one with every release in that month. E.g., $v2026.04.1$ is the second handbook release in April 2026.

All releases are accompanied by release notes⁵ which provide users with summaries of changes between releases and inform about issues that require their attention. Releases are also citable as publications on Zenodo. The general DOI for the handbook is [10.5281/zenodo.18186357](https://doi.org/10.5281/zenodo.18186357).

⁴ handbook.climaax.eu/resources/support.html

⁵ github.com/CLIMAAX/crbook/releases

2.5 GitHub ecosystem

The Handbook website is the static frontend of a wider interactive and open-source Handbook ecosystem. This ecosystem is anchored in the CLIMAAX GitHub organisation (Figure 2), where all developments take place.

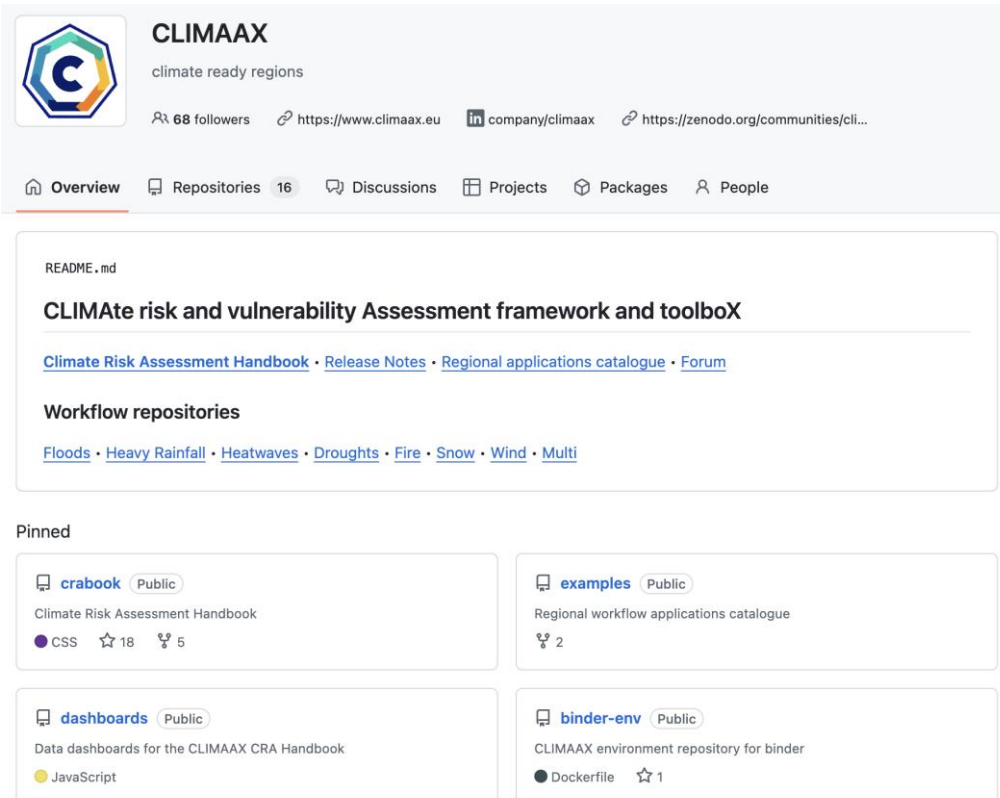


Figure 2: The CLIMAAX GitHub organisation front page. <https://github.com/CLIMAAX>

*CLIMAAX/crabook*⁶ is the central GitHub repository that hosts the handbook source code and website configuration. Changes to this repository by authorised users automatically refresh the handbook website. The workflows are integrated into the *CLIMAAX/crabook* repository from eight hazard-specific repositories, where users can access the notebooks and download them for execution. Also integrated is a repository for data dashboards created specifically for handbook users. References between the handbook website and the handbook repositories link the ecosystem and its frontend for users and developers. A GitHub discussion space is set up as a community forum and issues and pull requests are enabled for all repositories to allow for community contributions. A contribution guide in the handbook additionally steers users to the *CLIMAAX/examples*⁷ repository where advanced users can submit customised workflow applications as inspiration for other practitioners.

⁶ github.com/CLIMAAX/crabook

⁷ github.com/CLIMAAX/examples

2.6 Rationale for the open-source, web-based handbook approach

The presentation of the handbook as a website has proved itself as a practical approach to deliver the framework and workflows to users. It is highly available and accessible for users, easy to update and maintain for developers and allows for flexible organisation of content with integration of various media (text, images, videos, software, interactive dashboards, ...).

Hosting of resources on GitHub provides transparency of developments and tools to collaborate and involve the community. Developers are supported by automation and release management features offered by the platform as well as integration with a wide range of existing online services, e.g., binder, where users can try out CLIMAAX workflows in a temporary executable environment.

3 Conclusions

Release v2026.04.1 of the CLIMAAX handbook marks the end of major feature developments by the CLIMAAX partners. 29 releases have been declared since the initial public launch of the handbook with regular incremental updates to the framework, toolbox and surrounding ecosystem. WP6 will continue to support the handbook with bugfixes and regular maintenance while it operates and welcomes community contributions.

Deliverables D6.1, D6.2, and D6.3 will report in detail on WP6's handbook development activities and associated support activities in the future.