CLimate University for Virtual EXchanges

– C L U V E X –

Web-based tools for climate related data & lessons learnt

***Alexander Mahura**, Stefen Fronzek, Risto Makkonen*

16 Jun 2026, CLUVEX e-Final-meeting

Co-funded by the Erasmus+ Programme of the European Union

Outline of Presentation:

- Communication + Collaboration + Education (Platforms)
- Virtual Exchange (VE) Weeks for students – main activity with tools
- VE Week programme and tools
- Web-based tools in VE Weeks
- ERA5 Past Climate Explorer
- Shared Socioeconomic Pathways
- IPCC Interactive Atlas
- After introducing tools
- Extras to visualize, analyze and interpret climate-related data
- CLUVEX lessons learnt
- Earned bonuses for students

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VE Week – Work in Groups on Climate Horizon

Learning + Communication + Collaboration Platforms (★)

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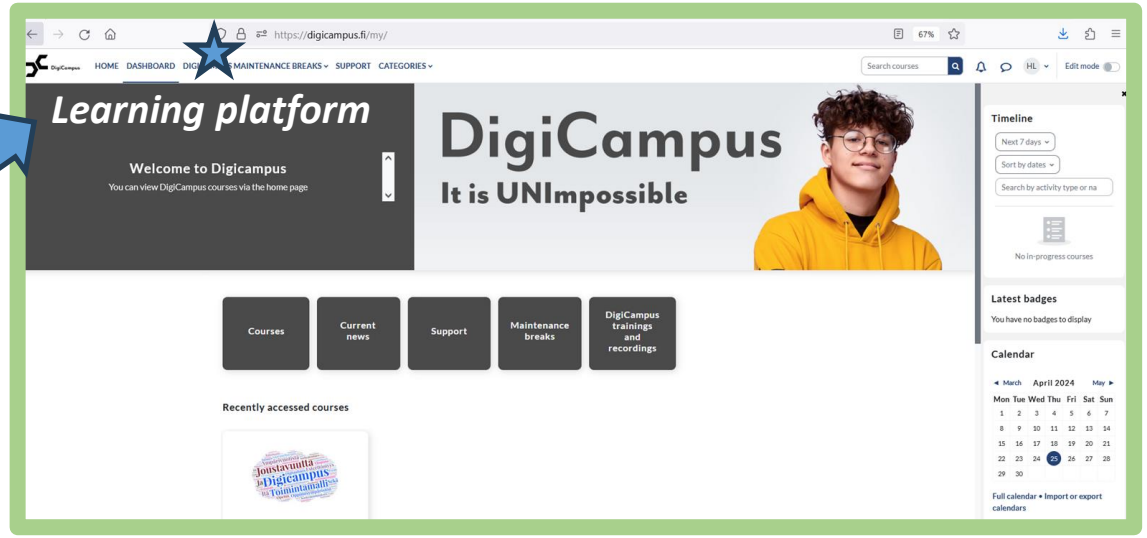
Communication platform

zoom

Collaboration platform

miro

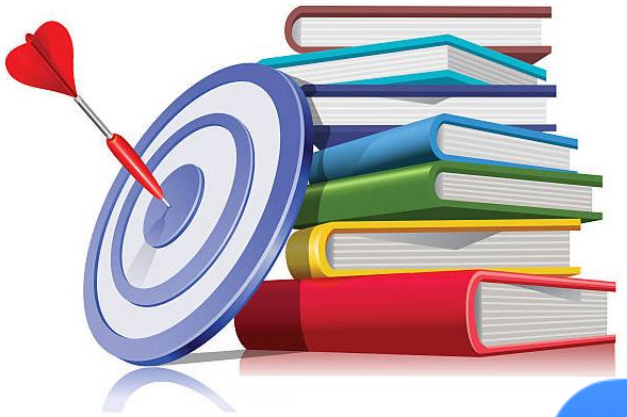


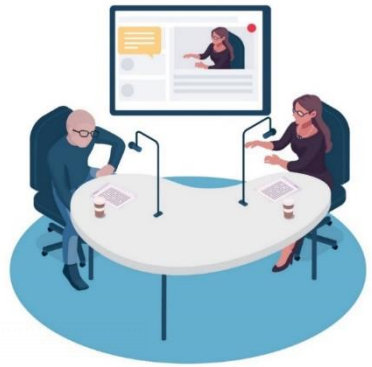
DigiCampus for sharing materials for students & moderators:

- VEG – Virtual Exchaneg Guidebook
- CLG – Climate Literacy Guidebook
- CMC – Climate Messenger Code of Conduct
- Videos+slides of 8 lectures &
- 3 web-based tools for climate-related data analysis
- Group Exercise ”Climate Horizon” & linking to SDGs
- Questionaries

CLUVEX: VE Weeks for Students

Main Activity





- 5 VE Calls & organize interactive online trainings called "VE Weeks-for-students" (1 ECTS credit point) in Oct 2024, May 2025, Oct 2025, Feb 2026, Apr 2026

- VE Weeks online in Zoom with plenary sessions (lectures, introductory talks and demonstration of web-based tools for visualization, analysis and interpretation of climate related data) + work in small groups of students discussing specific topics of climate change, working/practicing with tools and working with Individual and Collaborative "Climate Horizon" exercises.

- Small groups in Zoom break-out-rooms are guided by educated CLUVEX moderators & questions/help on tools in the room "HelpDesk"

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VE Week for Students – Programme / Tools

Programme of the Virtual Exchange Week

All times are given in EET (i.e., in Finnish time)

❖ **1st Day: 20 April 2026 (14:00 – 17:00, 3h online)**

14:00 – Welcoming words from the Hosts
Introduction into CLUVEX project & Virtual Exchange *(Hanna K. Lappalainen, UH)*
L8: Towards Sustainable Future Utopia *(Antti Rajala, UH)*
L5: Impacts of Climate Change and Future Outlook *(Hasmik Movsesyan, YSU)*
L2: Climate Change, Disasters, Carbon Neutrality and UN SDGs *(Alexander Baklanov, UCPH)*
L7: Artistic Res. & Critical Thinking at Intersection of Art, Science & Society *(Yvonne Billimore, BioArt)*
Introduction into Climate Horizon exercise *(Julia Karhumaa, Laura Riuttanen, UH)*
15:45 – Breaking students into groups & Introduction round in groups & pre-task sharing (**1+ hour**)
17:00 – End of the day

❖ **2nd Day: 21 April 2026 (14:00 – 17:00, 3h online)**

14:00 – L1: Navigating Planetary Boundaries: Blueprint for Sustainable Future *(Inna Khomenko, ONU)*
L3: Climate Change Impact on Water Resources *(Sergiy Snizhko & Olga Shevchenko, TSNUK)*
L4: Nature Hazards – Floods *(Valeriya Ovcharuk, ONU)*
Tool for Environment and Data Visualization | Past & Present | *(Alexander Mahura, UH)*
Detailed Introduction into Climate Horizon exercise *(Julia Karhumaa, Laura Riuttanen, UH)*
15:30 – Breaking into same groups & working with tool and individual Climate Horizon (**1.5 hour**)
17:00 – End of the day

❖ **3rd Day: 22 April 2026 (14:00 – 17:00, 3h online)**

14:00 – L6: Climate Change: Mitigation and Adaptation Strategies *(Hasmik Movsesyan, YSU)*
Tool for Socio-Economic Drivers of Climate Change | Past & Future | *(Stefan Fronzek, SYKE)*
Detailed Introduction into Climate Horizon exercise *(Julia Karhumaa, Laura Riuttanen, UH)*
14:30 – Breaking into same small groups & working with tool and individual Climate Horizon (**2.5 hour**)
17:00 – End of the day

❖ **4th Day: 23 April 2026 (14:00 – 17:00, 3h online)**

14:00 – Tool for Climate Scenarios | Future | *(Risto Makkonen, FMI/UH)*
Detailed Introduction into Climate Horizon exercise *(Julia Karhumaa, Laura Riuttanen, UH)*
14:30 – Breaking into same groups & working with tool and individual Climate Horizon & discussing and drafting collaborative Climate Horizon (**2.5 hour**)
17:00 – End of the day

❖ **5th Day: 24 April 2026 (14:00 – 17:00, 3h online)**

14:00 – Breaking into same small groups & working/ finalizing collaborative Climate Horizon (**2 hour**)
16:00 – Summary by Hosts, demonstration for all groups the collaborative Climate Horizon exercises
Questionnaire with feedback about VE Week
Reminders about Climate University online courses & reports in DigiCampus & ECTS credits
Wrap up & closing the VE Week
17:00 – End of the day | End of the Virtual Exchange Week for students

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Virtual Exchange Call for Students

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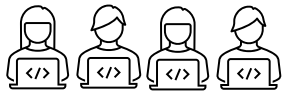
Up to 450 students

Virtual Exchange Week

Up to 450 students + up to 50 moderators + tech. support staff

students

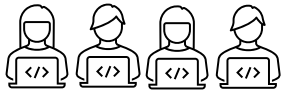


Plenary session

Monday

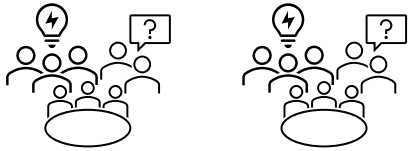
Plenary session

students



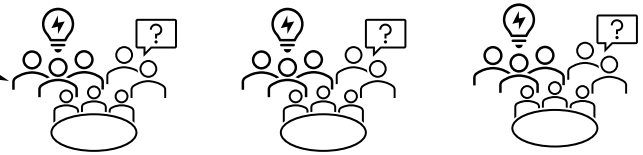
Tuesday

Introducing tool new tool



Wednesday

Introducing tool new tool



work in groups (1 moderator & 10 students) on e-platform on groups' projects

work in groups (1 moderator & 10 students) on e-platform on groups' projects

Thursday

Introducing tool new tool

Friday

Group's projects/ presentations & discussions

Group's projects/ presentations & discussions

VE Week – Web-based Tools

User-friendly tools to examinate regions from local to global scales

Tue, Tool #1 | Past & Present | Environment and Data Visualization

Lecturer: Alexander Mahura, University of Helsinki, Finland

ERA-5 Past Climate Explorer (PCE) tool: https://era5.lobelia.earth

- *Questions for environment/ climate conditions/ society/ pollution …*

Wed, Tool #2 | Past & Future | Socio-Economic Drivers of Climate Change

Lecturer: Stefan Fronzek, Finnish Environment Institute, Finland

Shared Socioeconomic Pathways (SSP) Database: https://tntcat.iiasa.ac.at/SspDb

Historic Time-Series of Socio-Economic Indicators: https://data.worldbank.org/indicator

- *Questions for historical/ political/ social/ natural causes that lead into current situation …*

Thu, Tool #3 | Future | Climate Scenarios

Lecturer: Risto Makkonen, Finnish Meteorological Institute, Finland

IPCC Interactive Atlas: https://interactive-atlas.ipcc.ch

- *Questions for historical/ political/ social/ natural causes that lead into current situation …*

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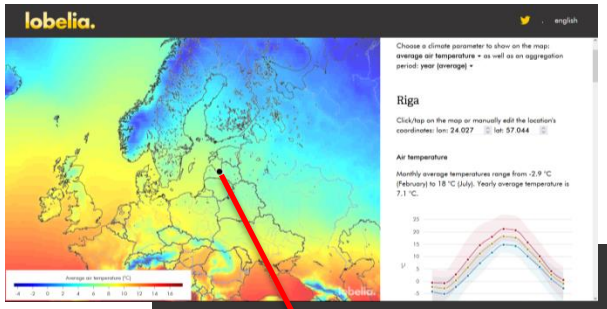
Tool #1 | Past & Present | ERA5 PCE



Past Climate Explorer

Source: ERA5 dataset, 1981-2010

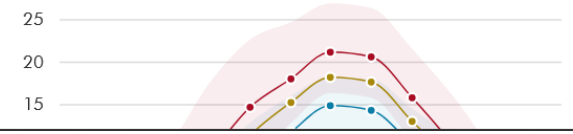
Choose a climate parameter to show on the map: **average air temperature** as well as an aggregation period: **January**

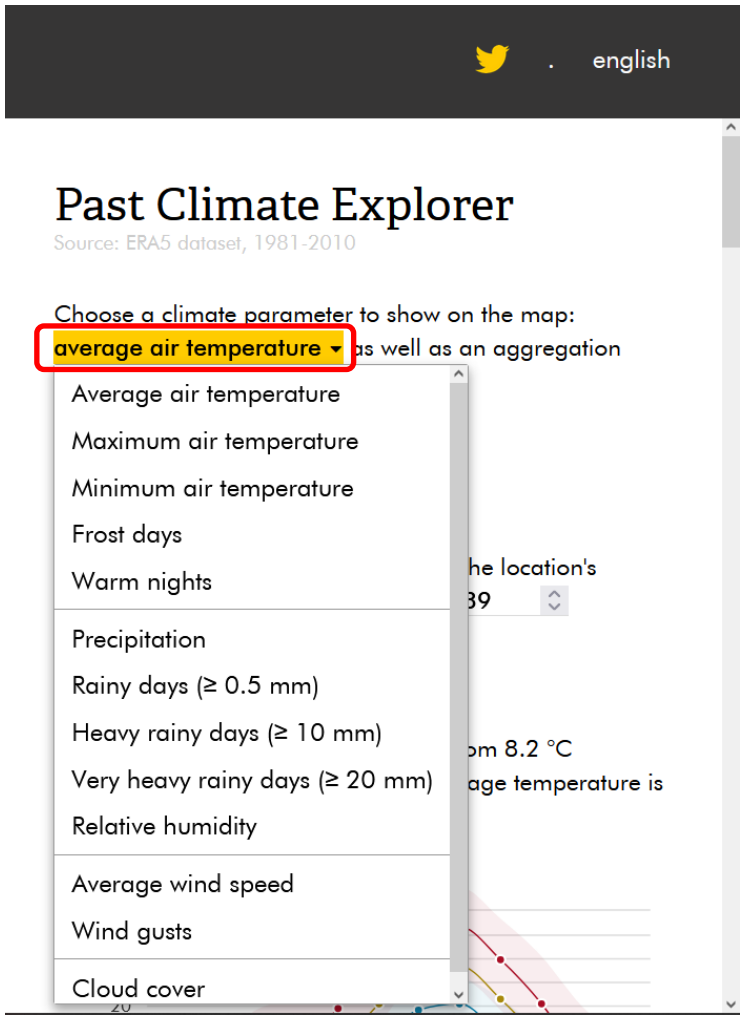
Riga

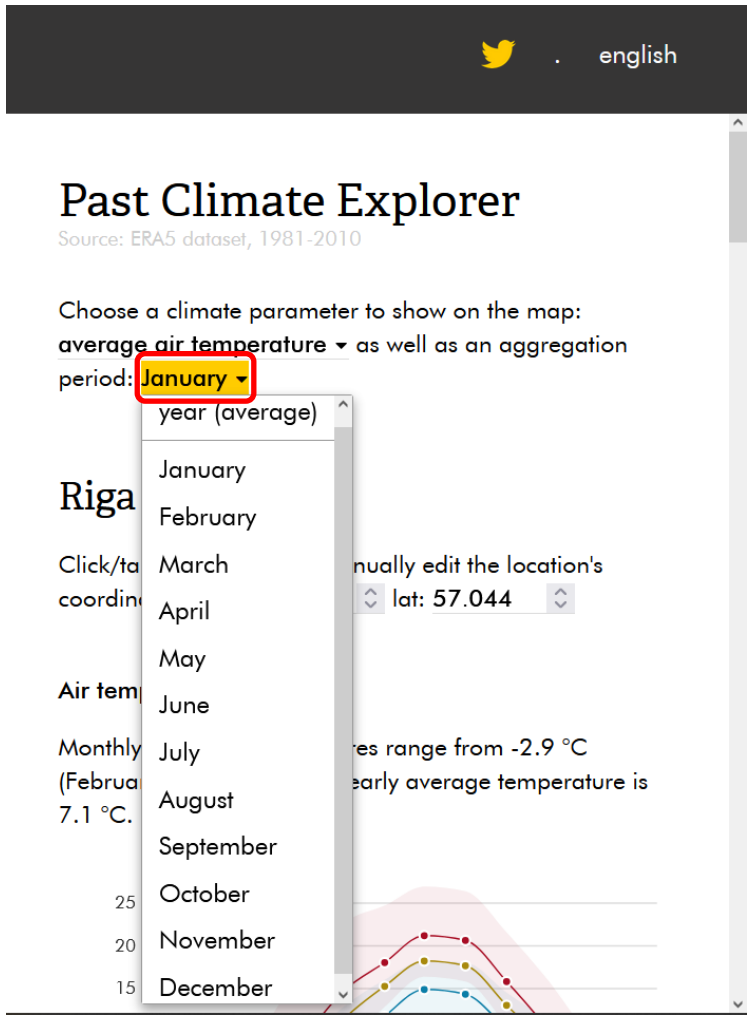
Click/tap on the map or manually edit the location's coordinates: lon: 24.027 lat: 57.044

Air temperature

Monthly average temperatures range from -2.9 °C (February) to 18 °C (July). Yearly average temperature is 7.1 °C.







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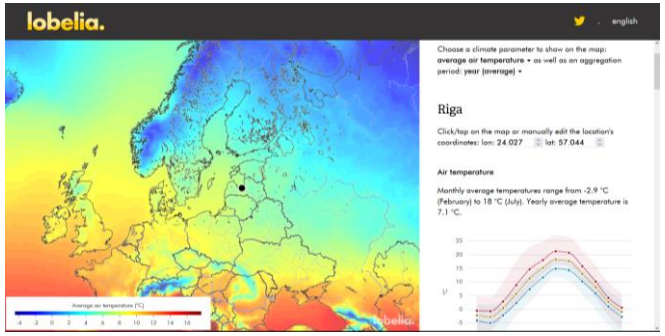
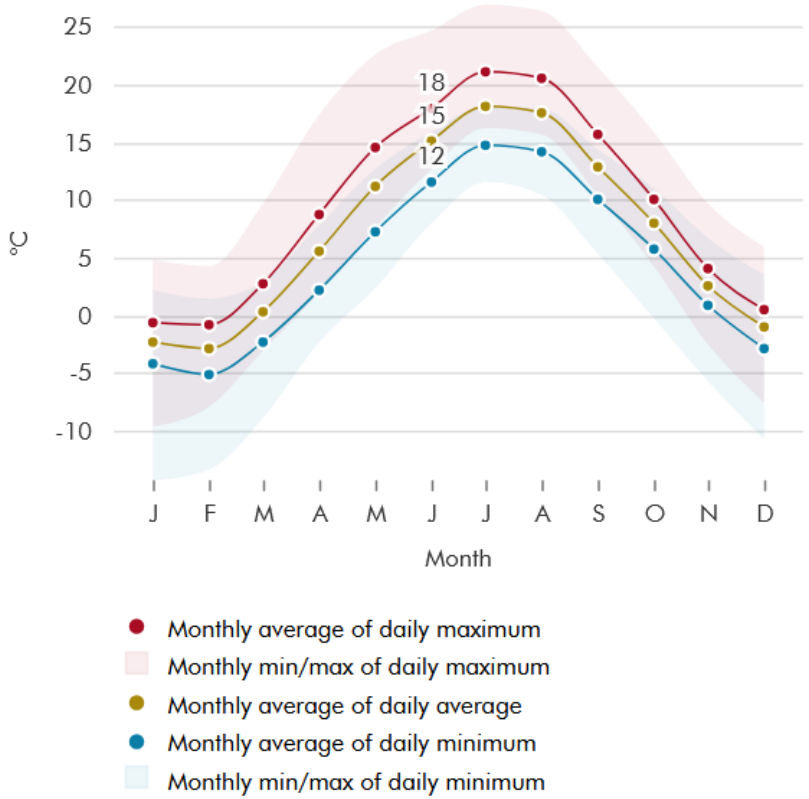
Tool #1 | Application | Riga
Air temperature & Warming stripes

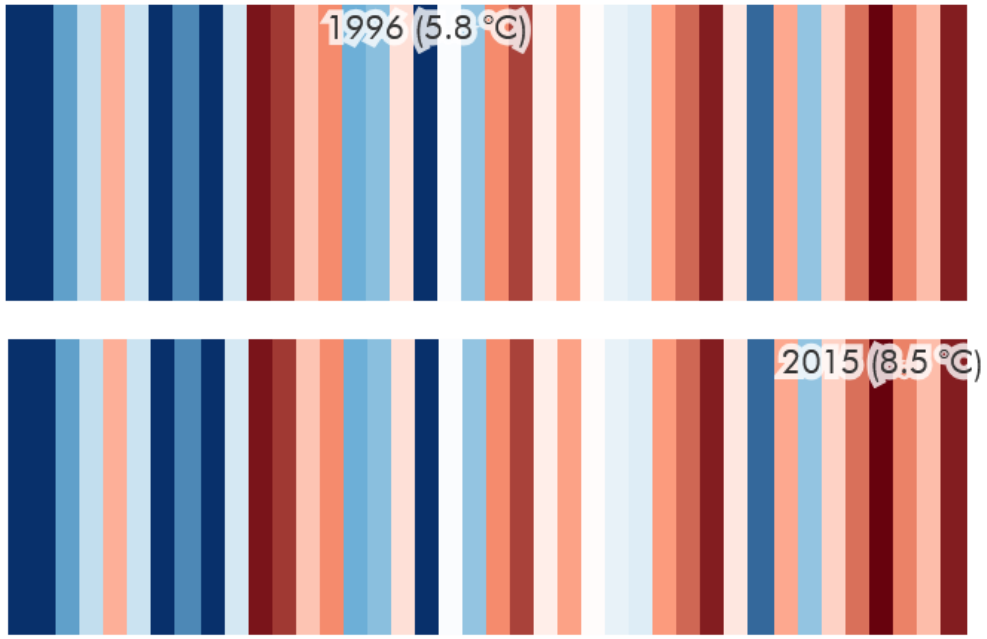


Monthly average temperatures range from -2.9 °C (February) to 18 °C (July). Yearly average temperature is 7.1 °C.



Warming stripes (sometimes referred to as climate stripes, climate timelines) are data visualization graphics that use a series of coloured stripes chronologically ordered to visually portray long-term temperature trends

Warming stripes for the extended period 1979-2018 (what's this?):



progression from blue (cooler) to red (warmer) stripes portrays annual increases of global average temperature intuitively convey global warming trends to non-scientists.

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Tool #2 | Past & Future | Socio-Economic Drivers of Climate Change

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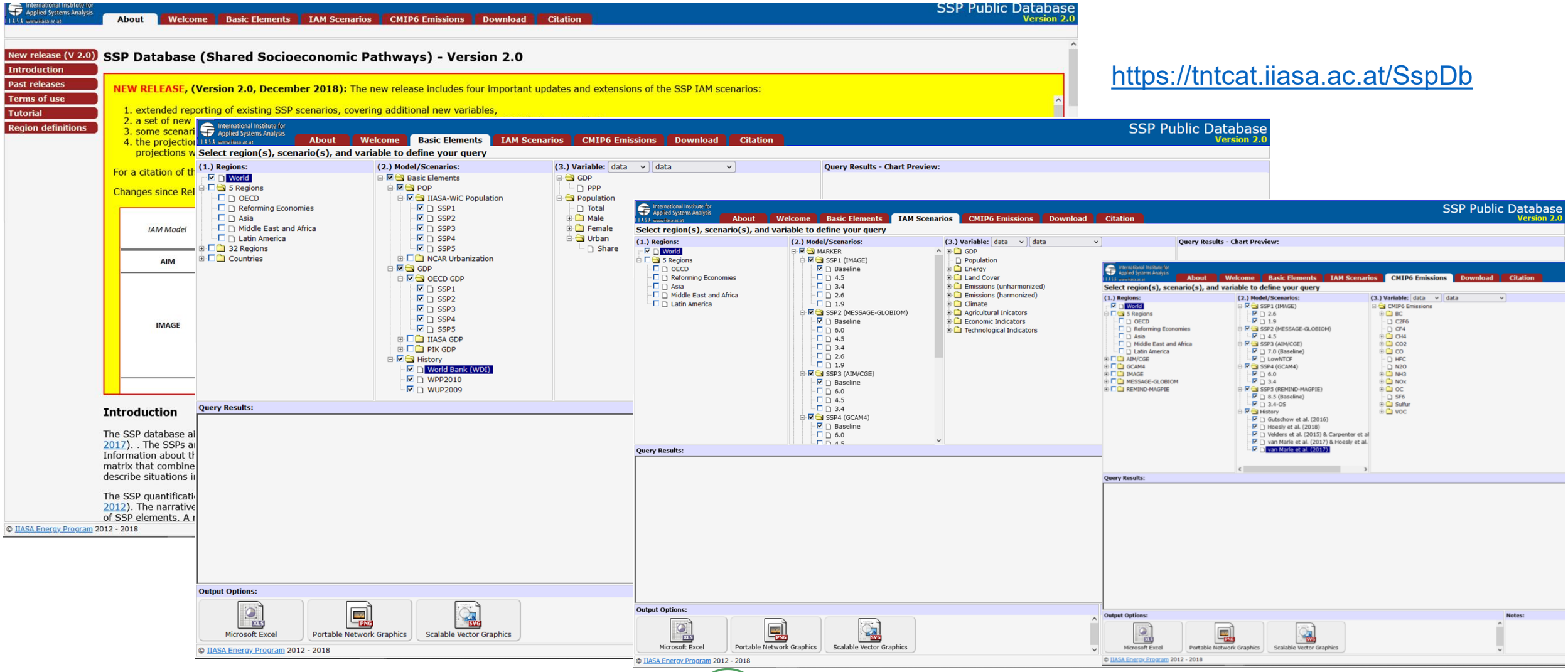
https://tntcat.iiasa.ac.at/SspDb



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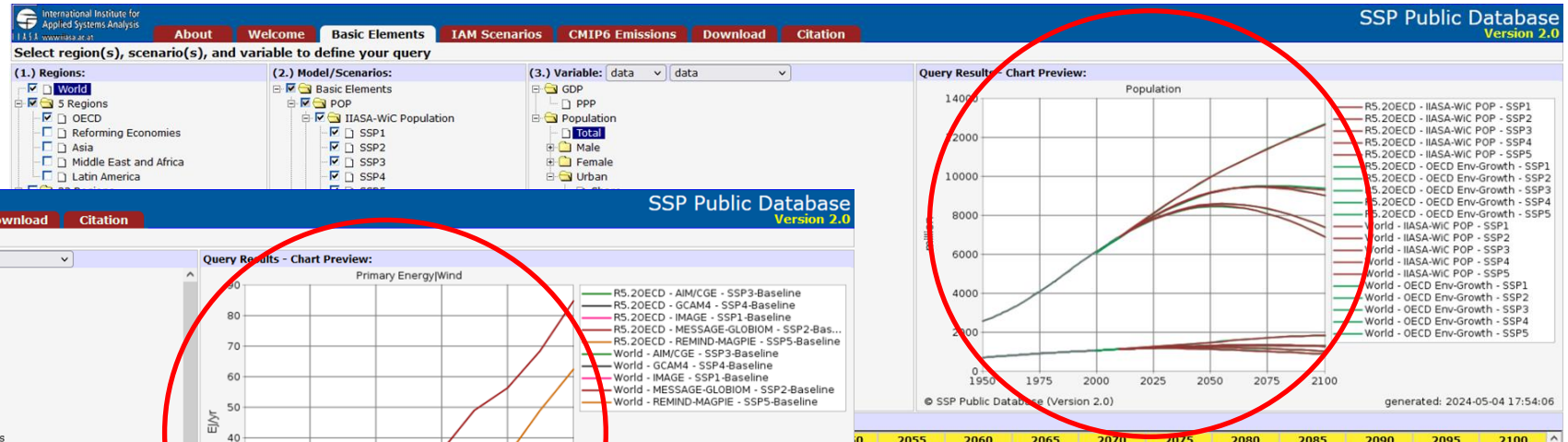
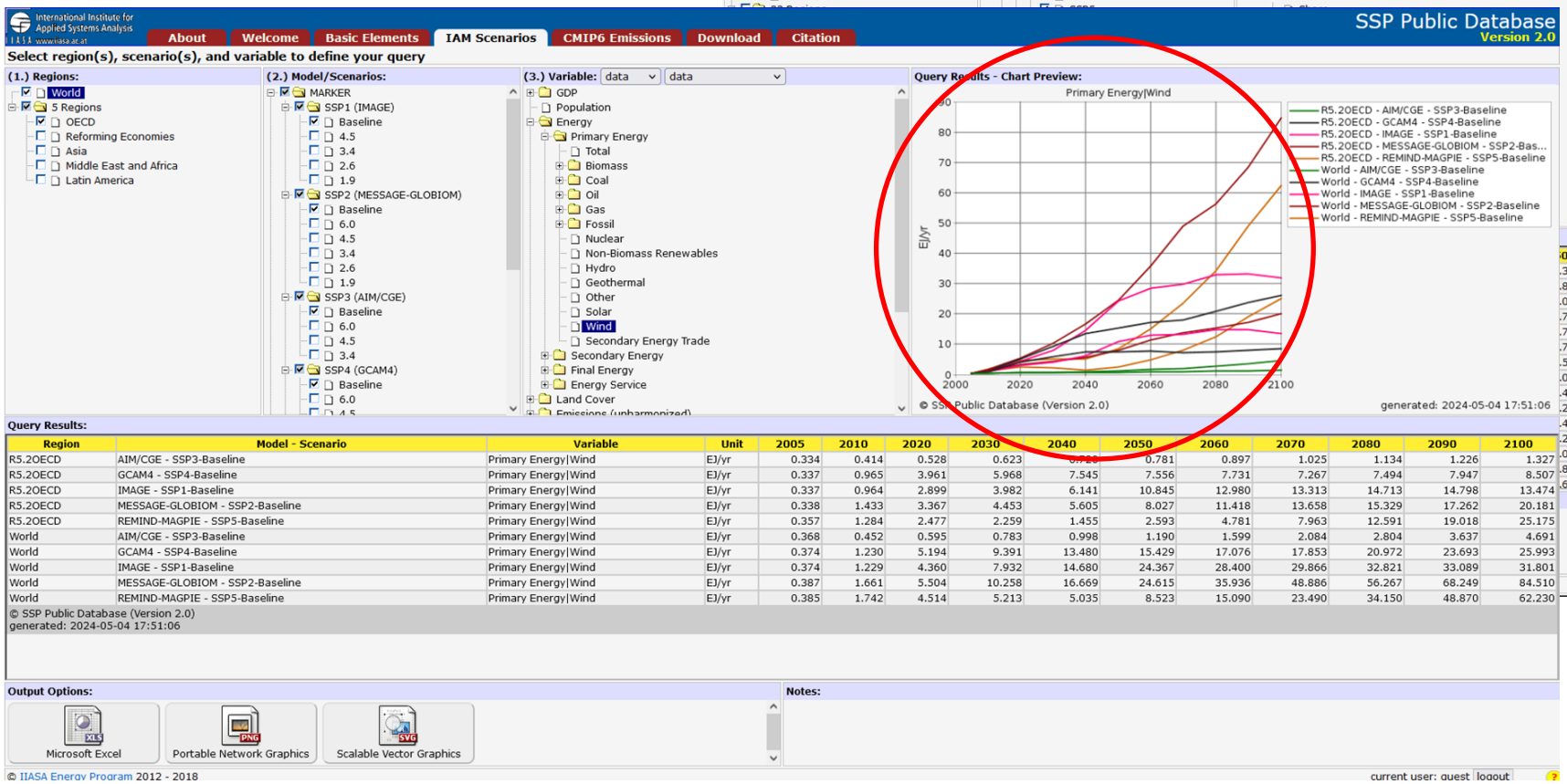
Tool #2 | Shared Socioeconomic Pathways

Basic Elements



IAM Scenarios



Source: https://tntcat.iiasa.ac.at/SspDb

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Tool #3 | Future | IPCC Interactive Atlas

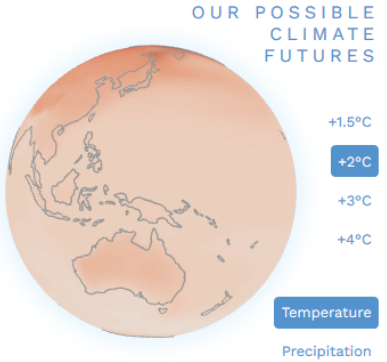
https://interactive-atlas.ipcc.ch

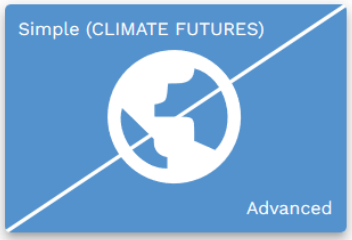
IPCC Working Group I (WGI): Sixth Assessment Report

IPCC WGI Interactive Atlas

A novel tool for flexible spatial and temporal analyses of much of the observed and projected climate change information underpinning the Working Group I contribution to the Sixth Assessment Report, including regional synthesis for Climatic Impact-Drivers (CIDs).

Participate in the user testing survey | Errata and problem reporting





REGIONAL INFORMATION

REGIONAL SYNTHESIS

DOCUMENTATION

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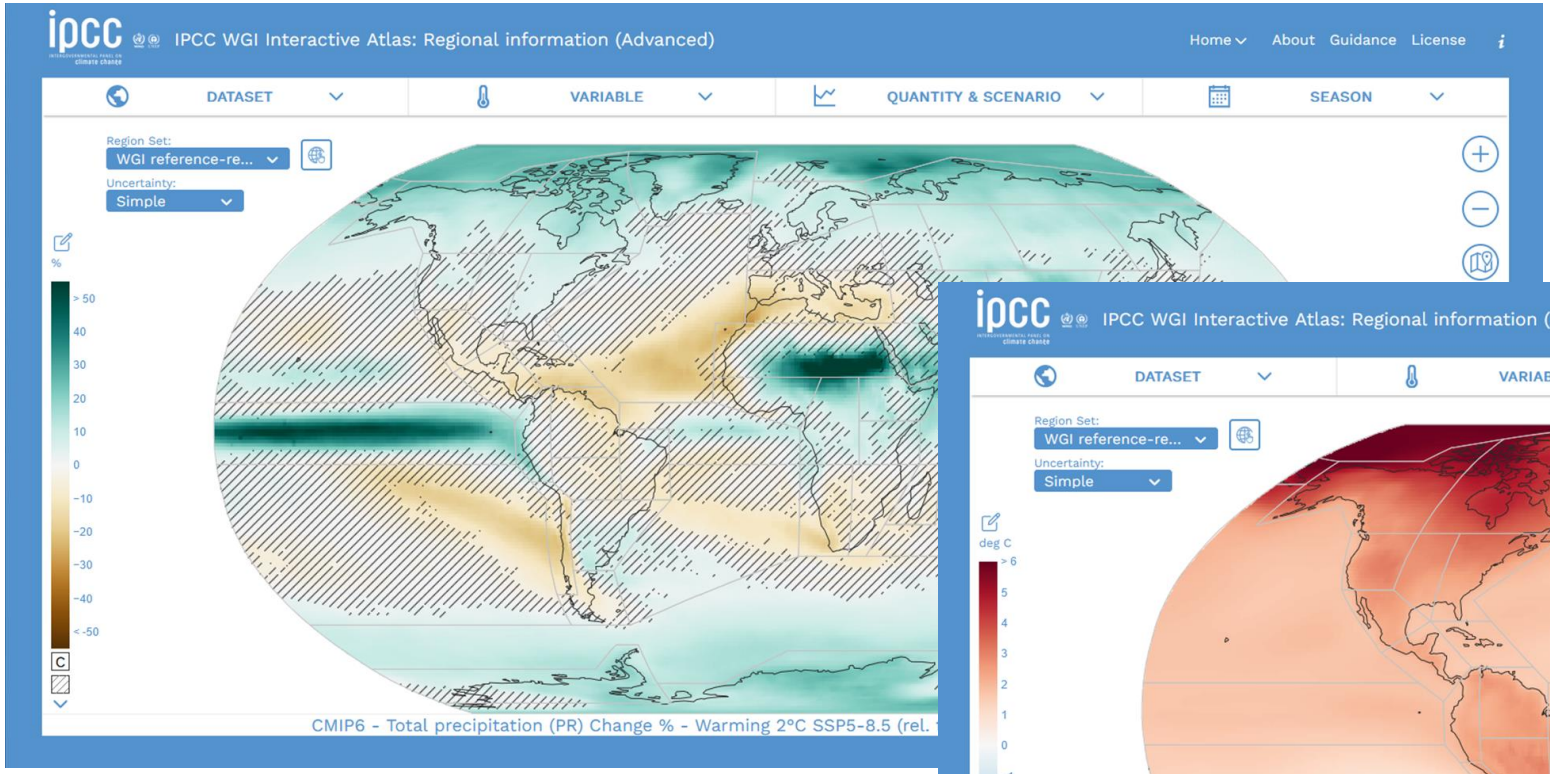
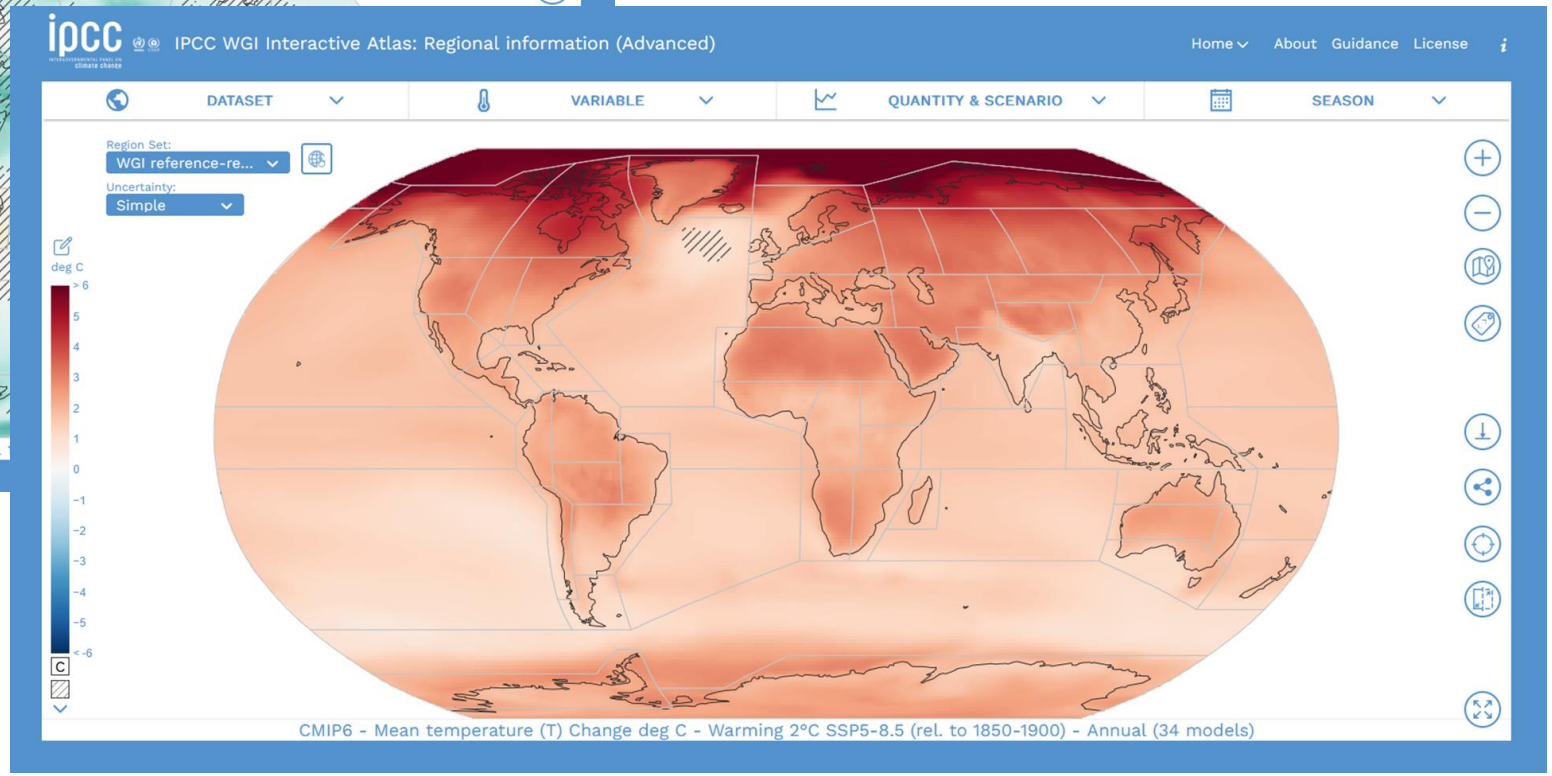
Tool #3 | Future | IPCC Interactive Atlas



Total Precipitation

Mean Temperature



Source: https://interactive-atlas.ipcc.ch

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After Introducing the Tool:

Individual work <u>&</u> group work/ discussions, some guiding questions (examples for ERA5 PCE tool):

- What are the mean air temperature, precipitation, etc. in your own city/environment?
- Changes in temperature (see warming stripes) in your city?
- How do you observe climate change in your location?
- How do you think climate change will affect your location?

<u>&</u>

- What do you dream about in life, in general?
- How would you like to see your life in 2050?
- Find similarities or differences between your and others' dreams

Other examples of questions are given in the booklet/ instructions for the Climate Horizon exercises

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Extras to Visualize, Analyze and Interpret Climate Data

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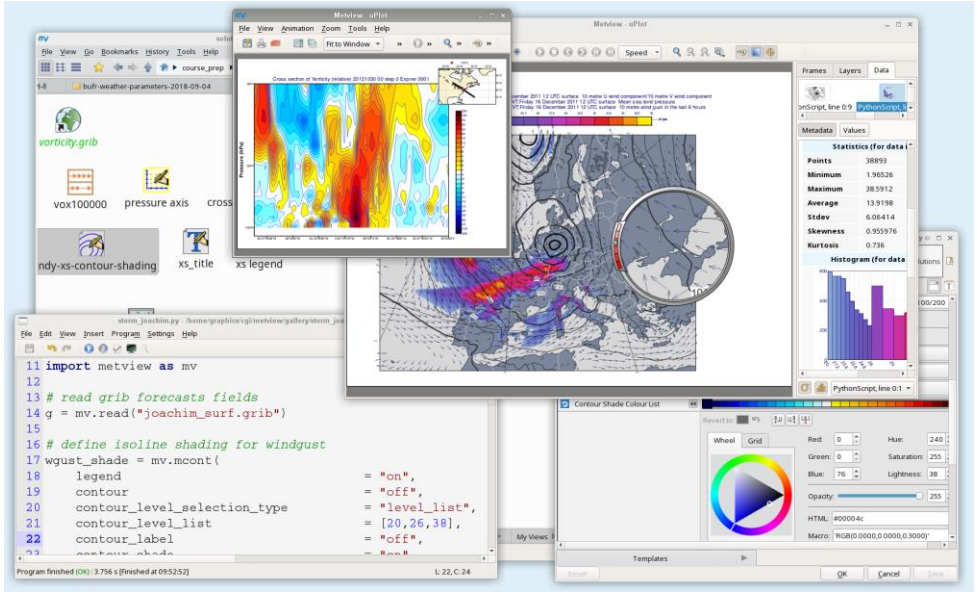
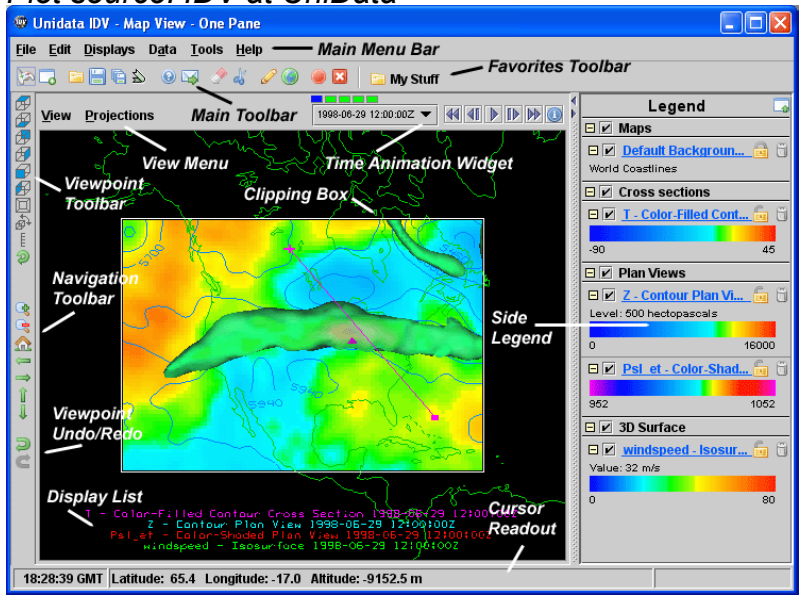
- **Climate Explorer** - tool to investigate the climate related data: https://climexp.knmi.nl/start.cgi & https://climexp.knmi.nl/plot_atlas_form.py)
- **CDO** (Climate Data Operators) - tool set for working on climate and NWP model data: https://code.mpimet.mpg.de/projects/cdo
- **IDV** (Integrated Data Viewer) - 3D geoscience visualization and analysis tool: https://www.unidata.ucar.edu/software/idv
- **Metview** – application incl. powerful data access, processing, visualization: https://confluence.ecmwf.int/display/METV
- **Visualization with Python:** https://matplotlib.org & matplotlib.org/stable/gallery/index.html

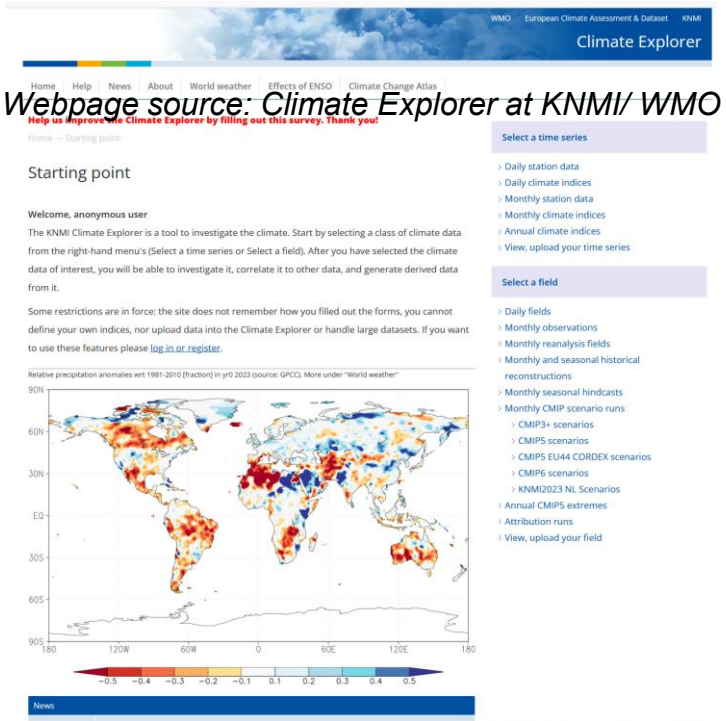
Plot source: Metview at ECWMF



Plot source: IDV at UniData



Webpage source: Climate Explorer at KNMI/ WMO



CLUVEX Lessons Learnt

Importance of online work and be a part of international teams and **manage work with tools through processing of climate-related data by contributing** to elaborating individual and collaborative Climate Horizon exercises

On a poll question "*What has been the most rewarding part of CLUVEX VE Week*? participants chose (**single choice**): … option "**working with different tools**" …
Oct 2024 – **28**%; May 2025 – **22**%, Oct 2025 – **16**%, Feb 2026 – **14**%, Apr 2026 – **15**%

On an extra poll "*How easy it was to understand, practice and use the demonstrated web-based tools in the Climate Horizon exercise*"

The scale included options (1-5): not at all | slightly | somewhat/to some extent | mostly agree | fully agree.
Majority participants "mostly" & "fully" agreed that it was easy to understand, practice and use the tools.

VE Week	ERA-5 PCE,	SPPs,	IPCC Atlas
Apr 2026 –	**77**	**78**	**77%**
Feb 2026 –	74	57	79%
Oct 2025 –	75	59	75%

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CLUVEX Lessons Learnt

(1) Introduction to the tools used in VE Weeks

It was noted that not all were practiced enough, leaving both moderators and students less confident in usage of tools.

To address this issue, **more time** including **self-education** was devoted to **practice-practice-practice** with web-based tools for climate-related data visualisation, analysis, and interpretation (slides and demonstrations /video-recording/ of tools - available in the DigiCampus areas for moderators and students)

& **HelpDesk** break-out-room in Zoom was used **in case of questions for tools** (& join break-out-rooms of groups)

(2) Force-majour situation with the tool

It was noted by moderators before the 1st VE Week (Oct 2024) that the web-based tool (ERA-5 Explorer, hosted by ECWMF) was disconnected from the public service by end of Sep 2024.

To address this issue, **finding suitable replacement** (e.g., ERA-5 PCE) **with free/open public access** instead of previously used tool and redoing presentation and demonstration /video-recording/ was implemented (slides and demonstration /video-recording/ of new tool - available in the DigiCampus areas for moderators and students)

(3) Because all tools are web-based, stable internet connection is required (situation in Ukraine)

(4) If the tool presenter is not available in some VE Weeks, prepared in advance video-recording can be played online

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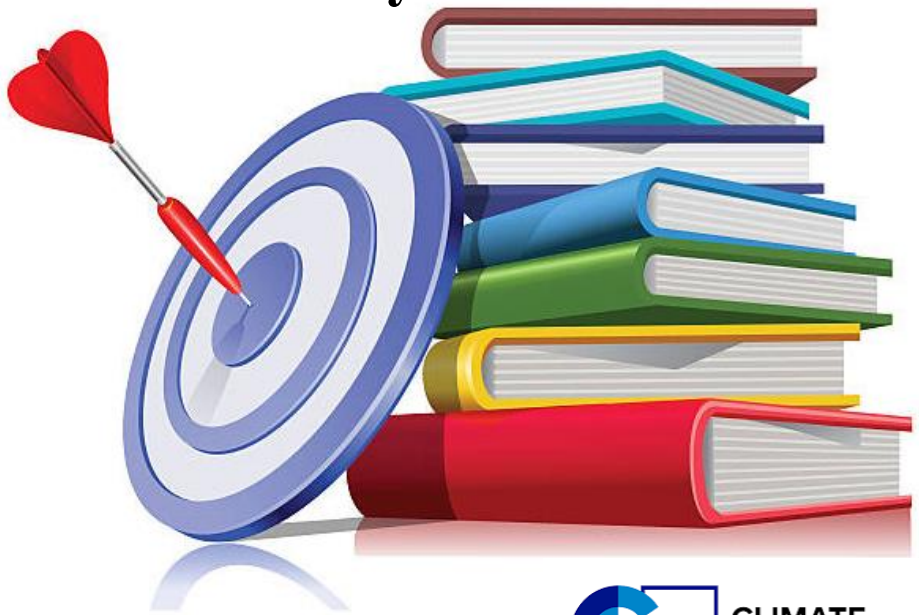
VE Week – Earned Bonuses for Students

Students awarded the following:

- 1 ECTS credit by University of Helsinki
- CLUVEX Certificate
- Status of Climate Messenger
- Welcome to Climate University Online Courses



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