COMPASS

COMPOUND EXTREMES ATTRIBUTION OF CLIMATE CHANGE: TOWARDS AN OPERATIONAL SERVICE

NEWSLETTER
ISSUE NO. 4 – APRIL 2026

IN THIS ISSUE:

1. EDITORIAL

Dear Reader,

We are excited to share the fourth COMPASS Newsletter, designed to update you on the progress and results of our project activities, along with other significant developments in the field of extreme events and impact attribution. Our goal is to provide valuable insights to a broad audience, including the scientific, policy, and business communities, while encouraging your feedback and helping to build a strong COMPASS Community.

COMPASS "Compound extremes attribution of climate change: towards an operational service" is a collaborative project funded under the Horizon Europe Research and Innovation Programme. The project began in January 2024 and will run for 3 years. The COMPASS project aims to develop a harmonised, yet flexible, methodological framework for climate and impact attribution of various hazard types, which is a crucial initial step towards the deployment of a European Operational Service. COMPASS will innovate by going from the attribution of single-driver extremes to the attribution of more complex extremes (including compounding, sequential and cascading hazard events) and enabling a shift from a hazard-centred analysis to an impact-centred perspective. Main novelties include event-based hazard and impact modelling using a multi-scale approach, the use of weather type analysis for better understanding the physical drivers that give rise compound extremes, and the use of contextualized storylines to communicate attribution results. Our framework will be validated and applied to a set of Use Cases that cover historical extremes for various hazard types and impact context, as well as extreme events happening during the project.

In this newsletter, we highlight our recent achievements and outputs (section 2), provide updates on news and advancements within the weather and climate community (section 3), introduce you to the scientists working on the project (section 4), and extend an invitation to engage with and connect with the COMPASS team (section 5).

For more information about the project please visit our website **WWW.COMPASS-CLIMATE.EU**, and feel free to send us specific inquiries using the available **CONTACT FORM**. A short **COMPASS VIDEO** is also now available.

2. INSIDE COMPASS: UPDATES ON OUR ACTIVITIES

During the past period, various activities have been implemented. Below we present brief summaries of the following COMPASS activities:

- **COMPASS research presented at European and International flood risk meetings**
- **Counterfactual dataset of tropical cyclone-affected areas**
- **COMPASS Policy Attribution Brief II**
- **Storylines connecting hazard, exposure, vulnerability and impacts to decision-making for Phase I**
- **New open-source workflow improves climate data processing for extreme event attribution**
- **Highlights from the COMPASS 3rd General Assembly, 13-14 October 2025, Chania Greece**
- **AGU25 Annual Meeting – COMPASS presentations**
- **MYRIAD & XAIDA Projects Final Event – COMPASS presentations**

▪ COMPASS research presented at European and International flood risk meetings

The COMPASS project's recent scientific publication, *"Attribution of flood impacts shows strong benefits of adaptation in Europe since 1950"*, was presented at two high-level expert meetings in October and November 2025 by Dr. Dominik Paprotny.

The first presentation took place at the 37th Meeting of the Working Group Floods, organised by Directorate-General for Environment of the European Commission on 24 October 2025 in Horsens, Denmark (hybrid format).

The meeting brought together 79 registered participants, including flood risk experts from EU Member States, Norway and Turkey, as well as representatives from NGOs, business associations and various European Commission services.

The second presentation was delivered on 12 November 2025 at a virtual meeting of the Expert Group HIRI of the International Commission for the Protection of the Rhine. The meeting gathered approximately 20 flood risk experts from Germany, the Netherlands and France.

Both presentations highlighted key findings of the COMPASS study, demonstrating the significant role that adaptation measures have played in reducing flood impacts across Europe since 1950. The discussions provided valuable opportunities to engage with policy experts and river basin authorities, further strengthening the science–policy interface central to the COMPASS project.

COMPASS continues to contribute to European and international dialogues on climate risk attribution and adaptation policy through evidence-based research and stakeholder engagement.

▪ Counterfactual dataset of tropical cyclone-affected areas

The COMPASS project recently released a "Counterfactual dataset of tropical cyclone-affected areas".

The dataset contains high resolution simulations of factual and counterfactual maximum (across time of the event) flood depth and derived flooded areas associated with storm surges induced by tropical cyclones. The factual simulations are based on observed relative water levels, i.e. accounting for long-term sea level rise over the historical period. The counterfactual dataset is created by removing the long-term sea level rise from the water level inputs (Treu et al., 2024). In both cases, the information about TC tracks and wind intensities is derived from the International Best Tracks Archive (IBTrACS) covering the period from 1950 to 2024 To put

the historical increase in flooded areas into perspective, we additionally provide data assuming 1m of relative sea level rise along all coastlines. All spatial maps are provided at a 30 arcsec (~1 km) spatial resolution and in netCDF format.

This dataset will be used for the second set of Use Cases (UCs) focusing on tropical cyclone attribution in the United States. More generally, we foresee this dataset to be of use for the broader scientific community interested in tropical cyclone attribution studies. It is particularly added to the climate-related forcing of the impact model evaluation and impact attribution part of the third phase of the Intersectoral Impact Model Intercomparison Project (ISIMIP3a).

The dataset (currently v1.0) is available in the ISIMIP repository (doi: 10.48364/ISIMIP.693793).

More information can be found in the following COMPASS project Deliverable:
Mengel, M. (2025): Counterfactual dataset of tropical cyclone-affected areas. Horizon Europe project COMPASS. Deliverable D2.6.

- **COMPASS Policy Attribution Brief II**

Extreme climate event attribution allows us to assess the relative contribution of human carbon emissions and resulting global climate change to the probability and intensity of climate extremes such as extreme rainfall, wind speeds, and heat. Extreme climate event attribution methods have developed significantly over the past decade with approaches ranging from unconditional correlations with global warming through to strongly conditional perturbed event simulations (Cotterill et al., 2024). The methods focus on the climate change signal: how much human induced climate change has altered hazard characteristics such as rainfall intensity, peak wind speed, heat extremes, or storm surge, and how much climate change has altered the probability of such an event occurring. While this analysis is central to event attribution, attribution use case results from the EU HORIZON project COMPASS show that this provides only a partial explanation of real-world impacts.

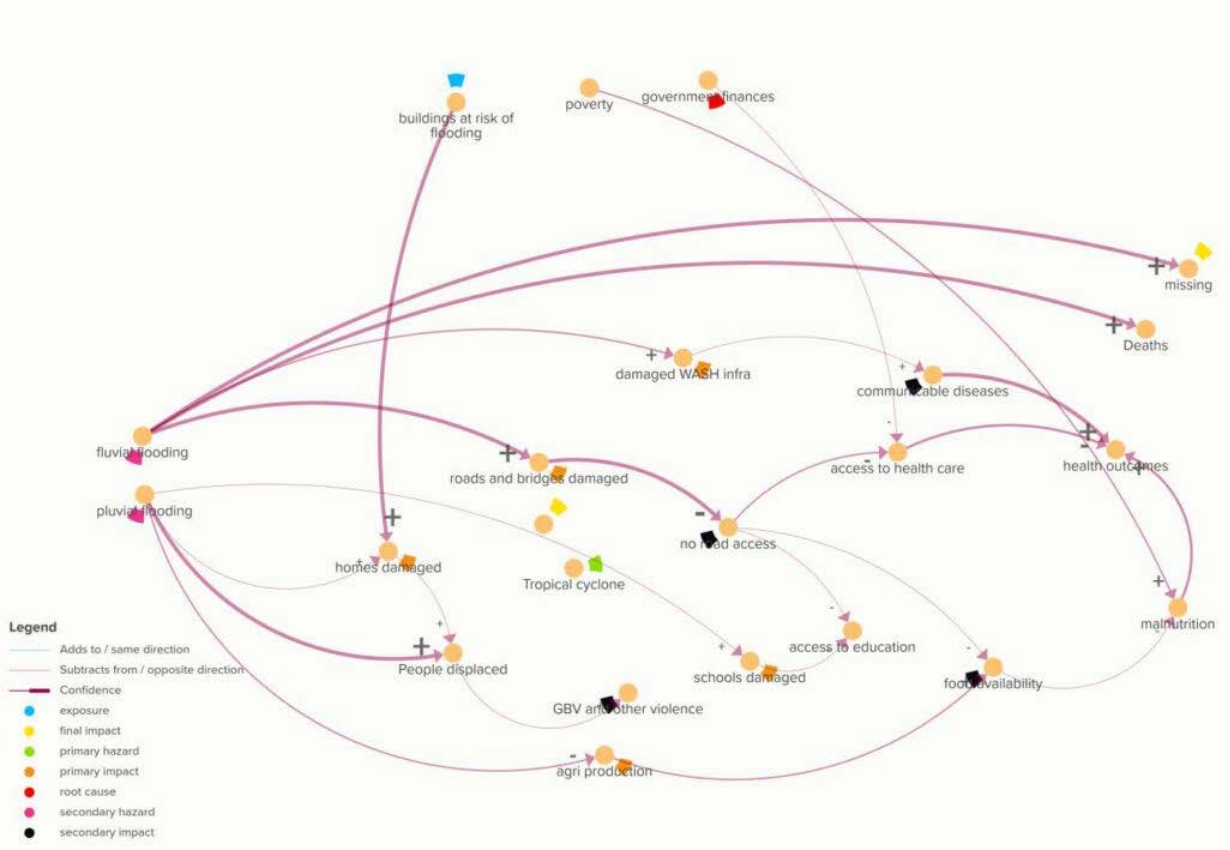


Fig. 1. *Causal map of impact pathways and vulnerability factors based on retrospective analysis of Eta and Iota impacts in Honduras.*

Across COMPASS use cases – from winter storms in the UK to tropical cyclones in Mozambique and Honduras – our findings show that impact attribution must account as rigorously for socioeconomic drivers as for climate change. Factors such as population growth, economic development, spatial planning, inequality, political fragility, and conflict often shape exposure and vulnerability as much as, or more than, anthropogenic climate change. Evidence from Mozambique and Honduras (Fig. 1) highlights how climate extremes can reinforce cycles of exposure and vulnerability. Ignoring these drivers risks overstating climate change's role and misdirecting policy interventions away from where they are most urgent and effective.

This Policy Brief argues that policy-relevant climate attribution must integrate the complexity of socio-economic drivers to avoid misleading conclusions, better target adaptation investment, and support resilience strategies that reduce rather than redistribute risk. Attribution that neglects socio-economic complexity can misdiagnose impact drivers or over-emphasize the role of climate change. Integrating exposure and vulnerability into attribution frameworks is essential for producing policy-relevant insights and avoiding maladaptation.

More information can be found in the following COMPASS project Deliverable:
Jack, C. D. (2025): Policy Attribution Brief II: Why socio-economic complexity must be central in the climate attribution of past extreme events. Horizon Europe project COMPASS. Deliverable D7.6

- **Storylines connecting hazard, exposure, vulnerability and impacts to decision-making for Phase I**

The COMPASS project recently released a report on "Storylines connecting hazard, exposure, vulnerability and impacts to decision-making for Phase I".

This collection of case study stories presents accessible, non-technical narratives derived from the COMPASS technical deliverable D4.1. Spanning diverse hazard and geographic contexts, including winter storms in the UK and tropical cyclones in Mozambique and Honduras, the cases translate complex attribution analyses into clear stories that explain how climate-related hazards lead to impacts, and the role climate change has played in these disasters. Rather than focusing on hazards alone, the narratives highlight how losses and damages emerge through interacting pathways of exposure and vulnerability shaped by socio-economic factors such as population growth, development patterns, inequality, governance, and conflict.

These narratives are designed to support engagement and decision-making by non-technical audiences, including policymakers and practitioners, while remaining grounded in the underlying technical analysis. They are not standalone analyses but simplified story versions that preserve analytical integrity while foregrounding lived experience and systemic drivers of risk. For details on the methodologies, references and more detailed results, please see Deliverable 4.1. In 2026, these narratives will form the foundation for interactive storymaps, enabling further visualisation, exploration, and dialogue based on the COMPASS findings.

More information can be found in the following COMPASS project Deliverable:
Jack, C. D., de Boer, T., Gale, S., Paprotny, D., Muis, S., Goulart, H., Wilson, E., Munday, G., Cotterill, D., Cabrera, V., Doris, V., Couasnon, A., Terefenko, P., Bernie, D., Perks, R., Śledziowski, J., Vogel, M. (2025): Storylines connecting hazard, exposure, vulnerability and impacts to decision-making for Phase I. Horizon Europe project COMPASS. Deliverable D4.3.

- **New open-source workflow improves climate data processing for extreme event attribution**

A new COMPASS open-source software framework — CLIMB: Framework for CLIMate data bias-adjustment and downscaling — has been published in SoftwareX. The tool provides a fully automated pipeline for processing and bias-adjusting high-resolution climate data from reanalysis and observational sources, making it easier to generate daily meteorological datasets tailored for climate impact and attribution studies of floods, droughts, heatwaves, and other extreme events.

Developed by an international team of researchers, who are also COMPASS team members, CLIMB integrates global reanalysis products such as ERA5 and ERA5-Land with high-quality observational datasets. It applies

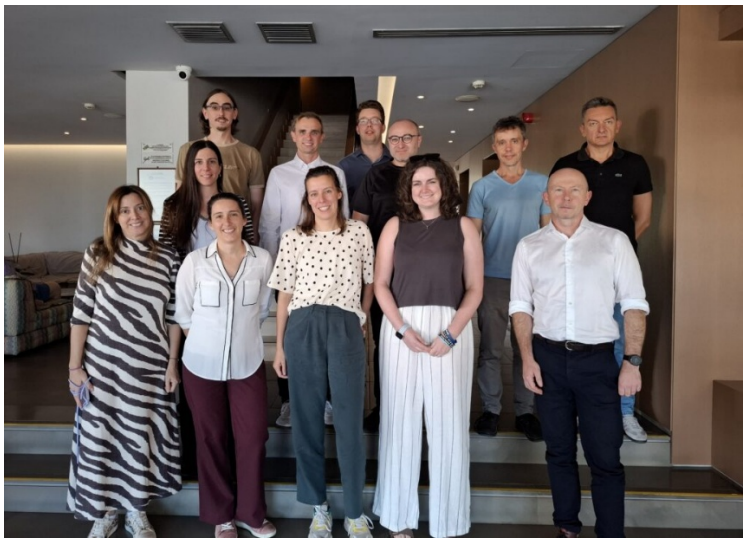
state-of-the-art bias-adjustment and statistical downscaling methods and produces climate indicators in standardized formats suitable for hydrological modelling and extreme event attribution workflows.

The framework is designed for reproducibility and automation, supporting both research and operational applications. By lowering technical barriers and enabling transparent climate data processing, CLIMB contributes to advancing climate impact science and supports ongoing efforts within the COMPASS project to better understand and attribute compound climate extremes.

Read the open-access article:
CLIMB: Framework for CLIMate data bias-adjustment and downscaling, DOI: 10.1016/j.softx.2025.102479

- **Highlights from the COMPASS 3rd General Assembly, 13-14 October 2025, Chania Greece**

From 13 to 14 October 2025, the COMPASS project partners gathered in the city of Chania, Crete, for the 3rd General Assembly. The two-day meeting, hosted by SEVEN, provided an opportunity to review progress, align on next steps, and strengthen collaboration across the consortium.



The assembly opened with a project status update presented and development in the fields of attribution by the coordinator, Sanne Muis. This was followed by detailed progress reports from the work package leaders, showcasing achievements, ongoing activities, and plans for the coming year.

In the afternoon, Patricia de Rosnay from ECMWF introduced the work being carried out in our sister project, CERISE. After that we discussed the selection of extreme weather events for the second set of use cases, led by Christopher Jack from the Red Cross Climate Centres. This session marked a major milestone in shaping the next phase of the project. A major milestone for the project was also reached with Pawel Terefenko from University of Szczecin, presenting the first version of the web-based demonstrator. This tool will play a central role in presenting our use cases to the public.
The second day focused on dissemination plans for the final year of the project, including outreach activities. Partners also engaged in more detailed discussions on the second set of use cases. The assembly completed with a session on financials, planning, and expectations for the months ahead and a discussion on a joint publication.

- **AGU25 Annual Meeting – COMPASS presentations**

Each year, AGU comes up with a unique theme for the Annual Meeting. It starts as a brainstorm among interested parties, and then our design team takes themes and common threads from that brainstorm, and unites it with visuals that we can translate to graphics and signage for the meeting. This year, inspired by the "Connections" and "New Orleans Science" themes from the brainstorm, our incredible design team took those concepts, as well as a 1944 US Army Corps of Engineers report, "The Nature and Origin of the Alluvial Valley of the Lower Mississippi River" which visualized how it had evolved over time. They traced the lower Mississippi River to digitize its path. The squiggles you see on signage throughout the meeting is the digitization of this mighty river that has served as a connection point for millions of people throughout this region, and continues to connect communities and people today. As rivers are points of connection, science is as well. Thus this year's theme: Where Science Connects Us.

Dr. Dominik Paprotny, researcher at Potsdam Institute for Climate Impact Research (PIK) – University of Szczecin (US) and member of COMPASS team, presented the COMPASS project with an invited talk entitled "Improving direct human forcing for CMIP7 earth system modelling and ISIMIP4 climate impact attribution", on Wednesday 17 December 2025 betweeen 14:15 – 14:25.

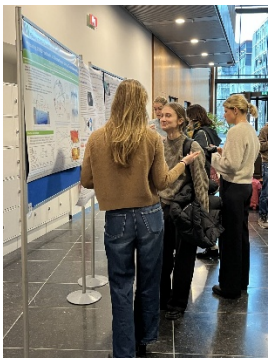
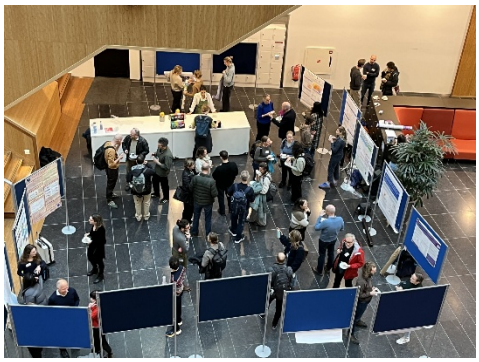
Also, the team of the University of Szczecin (US), presented a poster entitled "Automated Workflow for Climate Data Processing and Impact Attribution Using CDS and EU-Supported Datasets", on Wednesday 17 December 2025 betweeen 14:15 – 17:45.

- **MYRIAD & XAIDA Projects Final Event – COMPASS presentations**

European Horizon Projects MYRIAD-EU and XAIDA Final Event took place on 17–18 December 2025 at Vrije Universiteit Amsterdam (hybrid). The public session on 17 December afternoon welcomed both projects, journalists, and external participants, while 18 December will focus on scientific sessions. The program is available here.

COMPASS project was presented with the two following posters by Deltares:

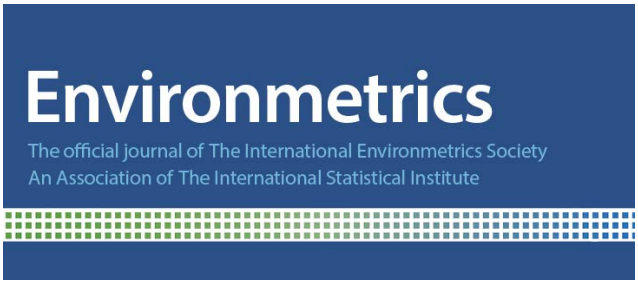
- Poppy Webb, Doris Vertegaal & Sanne Muis, Impact attribution of compound flooding from Tropical Cyclone Idai: Assessing the influence of socio-economic drivers using a mixed -methods approach
- Doris Vertegaal, Bart van den Hurk, Anaïs Couasnon, Dominik Paprotny & Sanne Muis, Climate and exposure drivers of compound flood impacts from tropical cyclone Idai in Mozambique

3. News from the Water and Climate Community

Call for Papers: Special Issue on Extreme Processes and Their Impact on Hazards and Risks

The journal *Environmetrics* has launched a call for papers for a forthcoming special issue titled **"Extreme Processes and Their Impact on Hazards and Risks."** This special issue aims to bring together innovative research on statistical and computational methods to understand, model, and predict environmental extremes and their consequences.



Important dates:

- Open for submissions: 1 November 2025
- **Submission deadline: 30 September 2026**

Topics of interest include, but are not limited to:

- Machine learning approaches for studying extreme events

- Sparse models for spatial and spatio-temporal extremes
- Multivariate and graphical models for extremes
- Climate model applications for projecting future extremes
- Detection and attribution of extreme events
- Coastal risk assessment and tropical cyclones
- Applications to heatwaves, flooding, marine heatwaves, and other less common environmental extremes such as ice sheet mass loss

This call provides an excellent opportunity for researchers working on environmental extremes, risk assessment, and related data-driven methods to contribute to advancing the field.

More information: ***Environmetrics – Call for Papers: Extreme Processes and Their Impact on Hazards and Risks***

4. Meet the COMPASS Team

The COMPASS project has a vibrant and multidisciplinary team of scientists and researchers. Let us take this opportunity to introduce to you some of our team members…

Anthi Manali is a senior research assistant at SEVEN Engineering Consultants L.P. and a member of the COMPASS project funded under the Horizon Europe Research and Innovation Programme, where she mainly contributes to dissemination activities. In this role, she supports the communication and outreach strategy of the project, contributing to the preparation, editing, and promotion of deliverables, newsletters, and digital content. She works to translate complex scientific results into clear, accessible messages tailored to stakeholders, policymakers, and the wider public, thereby enhancing the visibility and impact of COMPASS outcomes.

Dr. Anthi Manali is a Chemist, holding a M.Sc. and a Ph.D. from the Technical University of Crete (School of Chemical and Environmental Engineering). She is a 9-year experienced environmental researcher with a strong background in water and wastewater management. Her research interests are focused on wastewater reuse, water reclamation, biosolids conversion into energy, and constructed wetlands, with particular emphasis on sustainable and nature-based treatment solutions. Throughout her career, she has been involved in national and European research projects, contributing to the development and implementation of innovative environmental technologies.

5. Get involved in the COMPASS Community

Subscribe to our Newsletter list

Be the first to know about our latest news and updates, by subscribing to our Newsletter. We value your privacy and promise to handle your email with care. As a subscriber, you'll receive exclusive content and helpful resources delivered right to your inbox. Rest assured that we will never sell or abuse your email address.

Contact us

Send us a direct message via our online contact form and we will promptly reply to your request.

- Follow the **LINKEDIN COMPASS GROUP** to stay tuned
- For general inquiries, cooperation requests, invitation to events, dissemination issues etc., please contact us using the available **CONTACT FORM**
- To receive our Newsletters automatically please subscribe to our Newsletters Recipients in the **NEWS PAGE**
- For information on upcoming events please visit our **COMPASS CALENDAR**
- To download available leaflets, presentations, publications, project deliverables please visit the "**OUTPUT**" section of the COMPASS website and our **COMPASS PAGE ON ZENODO**
- Watch our short **COMPASS VIDEO**

THE PROJECT AT A GLANCE

Title: COMPOUND EXTREMES ATTRIBUTION OF CLIMATE CHANGE: TOWARDS AN OPERATIONAL SERVICE (COMPASS)
Instrument: HORIZON-CL4-2023-SPACE-01, EUROPEAN HEALTH AND DIGITAL EXECUTIVE AGENCY (HADEA)

Total Cost: 2,293,611 €
Duration: 36 MONTHS
Consortium: 6 partners from 5 countries

EC Contribution: 2,293,611 €
Start Date: January 1st, 2023
Project Coordinator: Stichting Deltares

Project Web Site: www.compass-climate.eu

❖ CONTACTS:

Project coordinators: Dr. Sanne Muis, Dr. Anaïs Couasnon
Stichting Deltares
Email: sanne.muis@deltares.nl , anais.couasnon@deltares.nl

Dissemination Officer: Dr. Maggie Kossida
SEVEN Engineering Consultants L.P.
Email: mkossida@seven-solutions.eu

The COMPASS project has received funding from the European Union's HORIZON Research and Innovation Actions Programme under Grant Agreement No. 101135481

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or of the European Health and Digital Executive Agency (HaDEA). Neither the European Union nor the granting authority can be held responsible for them.