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Dear Readers,

There are some years that allow risk to be observed from a distance. Then there are others, such as 2025, where risk shifts in form before our eyes: it swells in the seasons that no longer follow expected patterns, and it weaves itself into overlapping crises, changeable geopolitical contexts, fragile territories and decisions that must be taken quickly and responsibly.

It is within these circumstances that CIMA Research Foundation has continued doing what it sees as necessary: turning knowledge into capabilities to guide action – at both local and global levels – thus strengthening the connection between knowledge and response, between early warning and early action. This has always been our approach, and in 2025 it became a solid presence alongside those operating in the world's most complex contexts.

In Port Sudan, thanks to a joint effort bravely supported by the Italian Agency for Development Cooperation and by the Italian Ministry of Foreign Affairs and International Cooperation, we assisted in making the National Council for Civil Defense situation room operational, providing it with analytical expertise and decision-making support within one of the world's most serious humanitarian crises, amidst armed conflict.

Yet this contribution was not only an emergency response but was part of the longer-term Africa Multi-Hazard Early Warning and Early Action System (AMHEWAS) programme and the Early Warnings for All initiative. Here, together with the Italian Civil Protection Department and the Italian cooperation sector, we created an 'Italian system' in capacity building for multi-risk early warning systems on the continent most exposed to the climate crisis. Within this framework and through co-design with the African Union Commission, we contributed to developing the Africa Drought Watch – a valuable tool for monitoring and predicting drought across the continent.

These experiences have confirmed an already clear awareness: there can be no effective risk management without a multi-risk perspective and significant investment in institutional capacity. Projects such as Ready2Act in Mozambique – led by our Civil Protection Department and involving top-level interaction, such as Luisa Meque's official visit to Italy as Director General of Mozambique's National Institute for Disaster Risk Management – together with the work underway in Burkina Faso and the experience in the Horn of Africa all illustrate how early warning system quality is measured by its ability to translate as concrete preparedness, coordination and action, thanks to close interinstitutional collaboration.

This operational commitment has gone hand in hand with a growing active presence in international discussion. We took part in all the major world forums in 2025 – such as the Global Platform for Disaster Risk Reduction in Geneva – and also contributed to the debate leading up to COP30 in Belém, with climate resilience and early warning systems increasingly central in global agendas.

In parallel, we went on observing and studying the effects of climate change on ecosystems and territories. Within the ever more fragile relationship between winter and summer, between snow, extreme rainfall and drought, we analysed how the climate is fundamentally reshaping the way natural systems work, especially in mountain regions. This was carried out for the Alps as well as for the Ethiopian river basins, working on integrating national water resources, while in Vietnam we strengthened water resource governance. We have even expanded to space, with projects opening new perspectives to constantly observe the water cycle and improve early warning systems.

At the same time, we consistently reinforced the connection between applied research, innovation and the local area in Italy too. Above all in the various day-to-day activities we conduct as Centre of Competence in the national civil protection system. But also through projects such as RETURN, NBFC and RAISE, which have been important opportunities to contribute to building a more resilient, sustainable and innovate Italy, where we have developed tools and approaches bringing together risk, biodiversity, artificial intelligence, essential infrastructure and climate services. Alongside these, initiatives such as PrevenzioneComune in Liguria demonstrate how this work can be converted into practical operational support tools for local administrations, strengthening systemic capacity precisely there where decisions become actions.

And then there is another factor that 2025 made even clearer: risk is not only technical in nature, but also cultural, social and institutional. This is why we remain convinced that scientific knowledge must engage with the public sphere. The initiatives organized at the Priamar Fortress, such as Climate in Projections and the seminars open to citizens, remind us that knowledge really does grow when it is a shared asset.

Because risk is a reality that needs to be understood, communicated and governed together.

Enjoy your reading!



LETTER FROM THE PRESIDENT

Luca Ferraris
President of CIMA Research Foundation



WE ARE

01

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CIMA Research Foundation is more than a research centre: it is a point of reference in building a safer and more resilient future.

OUR FOUNDATION

Sudden storms, rivers that overflow, forests in flames, once fertile lands that become arid: climate change has made these events ever more common and destructive. This is the context CIMA Research Foundation operates in, to understand, forecast and mitigate the risks brought by extreme natural events, with the goal of protecting the environment and communities.

Our research is based on data, mathematical models and artificial intelligence – essential tools in predicting natural disasters and assessing their impact. But science alone is not enough: we believe in the value of involving people. This is why we work with communities to develop participatory civil protection plans, so that awareness and preparedness can reduce the impacts of an emergency.

Alongside research and prevention, we also address the legal aspects of risk, assessing national and international regulations, responsibility frameworks and legal compliance issues in managing emergencies. In fact, risk is not only environmental, but also institutional and societal.

CIMA Research Foundation's roots date from the 1980s, when Giuseppe Zamberletti, Minister of Civil Protection at the time, entrusted the development of landslide and flood-risk mitigation strategies to Franco Siccardi. That project led to creation of the Inter-university Centre for Environmental Monitoring, which became CIMA Research Foundation in 2007, thanks to support from the Italian Civil Protection Department,

Liguria Regional Administration, the University of Genoa and Savona Provincial Administration.

This network gradually expanded, with the Liguria division of the Italian Regional Environmental Protection Agency (ARPA) and Valle d'Aosta Autonomous Regional Administration also joining.

Since 2012, we have been a Competence Centre in the Italian civil protection system for meteorological, water-related and wildfire risk as well as for the legal aspects of civil protection. We have been an operational arm of the Italian Civil Protection Department since 2018. We work with ItaliaMeteo, are members of the COSMO and CI3R consortiums, and operate from several sites: Savona, our headquarters; Tirana in Albania, active since 2011; and our two new bases in Genoa and Bari, which opened in 2024.

Over the years, our research field has expanded to all climate change-related risks, and includes monitoring, forecasting, assessment, mitigation and impact analysis. Our Situation Room is the operational heart, and is active 24 hours a day, 365 days a year, providing support to civil protection both in and outside Italy.

Our missions take us all over the world, from Africa to Latin America, and from the Balkans to Asia. We work with governments, local authorities, communities and international institutions, with support from the United Nations, European

OUR FOUNDERS

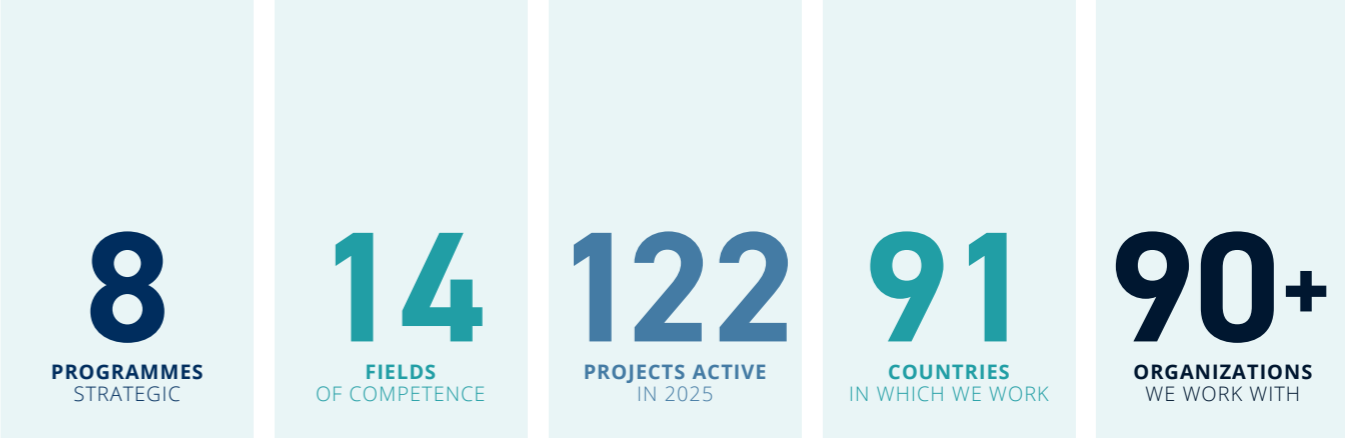


Union, Italian Ministry of Foreign Affairs and International Cooperation (MAECI), Italian Agency for Development Cooperation (AICS), European Space Agency and World Bank.

CIMA Research Foundation is more than a research centre: it is a point of reference in building a safer and more resilient future. Because risk cannot be eradicated, but it can be understood, addressed and, above all, prevented. Our know-how stems from our experience of environmental risk – especially floods and wildfires – in Liguria, which presents a fragile and complex environment that has taught us to interpret and manage multi-faceted events. But risks do not respect borders: we live in a global ecosystem, where local occurrences can cause knock-on effects on an international scale.

This is why our work stretches beyond the actual area of origin, extending to Europe and other parts of the world, with an ever greater focus on the African continent. With its exceptional geographical and climatic diversity, Africa stands as a crucial challenge and an important opportunity for research and action.

Debate with researchers from all over the world is at our mission's core: each project becomes a space for exchanging and integrating knowledge, to develop innovative solutions and build a more resilient future, by applying the lessons learnt in Liguria to other, diverse contexts.



OUR RESEARCH

Firmly at the heart of the CIMA Research Foundation scientific mission, our strategic programmes trace out our direction in research and innovation. Eight interlacing routes guide our response in addressing the challenges posed by climate change, risk management and technological development, all with one shared goal: to build a more resilient and sustainable future.

The power of data in climate change
The programme **Intelligent Data Use in a Changing Climate** explores the potential of advanced data analysis and high-resolution climate modelling. Spanning from real-time forecasts to long-term climate models, this programme adopts an information-sharing approach to connect research with application, integrating data and knowledge of the local area to improve risk forecasting and adaptation strategies.

Artificial intelligence and technological innovation
The programme **Technological Development in the Digital Twins Era** is designed to strengthen and innovate the CIMA Research Foundation technological services by developing integrated solutions for monitoring, data management and decision-making support. It fosters new ICT expertise, and promotes use of AI and the Acronet model (www.acronet.cc), while expanding environmental monitoring applications and drone-based assessment in natural risk management.

Biodiversity and resilience: an emerging link
Climate change is threatening ecosystems and communities, yet biodiversity may hold a key for resilience. **The Emergent Nexus: Risk Resilience, Biodiversity and Ecosystem Functioning** focuses on this link, exploring strategies to protect ecosystem services and to provide support during the ecological transition. By introducing a new approach to risk assessment, we take into account the adaptation capacity of sustainable businesses, so that a balance between development and conservation may be built.

Capacity building for the challenges ahead
Adapting to climate change requires knowledge and readiness. **Capacity Development for Resilience & Climate Adaptation** draws on the experience accrued in emergency management centres, to strengthen disaster prevention and response capabilities. This programme contributes to reaching the goals of the United Nations' Early Warning for All initiative, ensuring that the expertise developed through our projects translates into lasting outcomes for the most vulnerable communities.

Predicting to protect: early warning systems and impact forecasting
Risk forecasting is not only a question of data but also of the real impacts on people and the environment. **Impact-based Early Warning Systems of Climate Threats**



aims to enhance early warning systems through increasingly detailed forecasting models capable of accurately estimating the effects of extreme weather events such as floods, drought and wildfires. The aim is to transform simple weather forecasts into real decision-making support tools for civil protection authorities and communities.

Data-driven policies for integrated risk management

Policy-making needs to be based on reliable and up-to-date knowledge. **Multi-Risk Assessment and Data-Informed Policies** develops tools for addressing climate risks through an integrated perspective, analysing not only the single hazards but also their interactions. From a local to an international level, this programme endeavours to ensure consistency between risk analysis and policy, contributing to a more effective approach based on solid data.

Governance and responsibility in civil protection

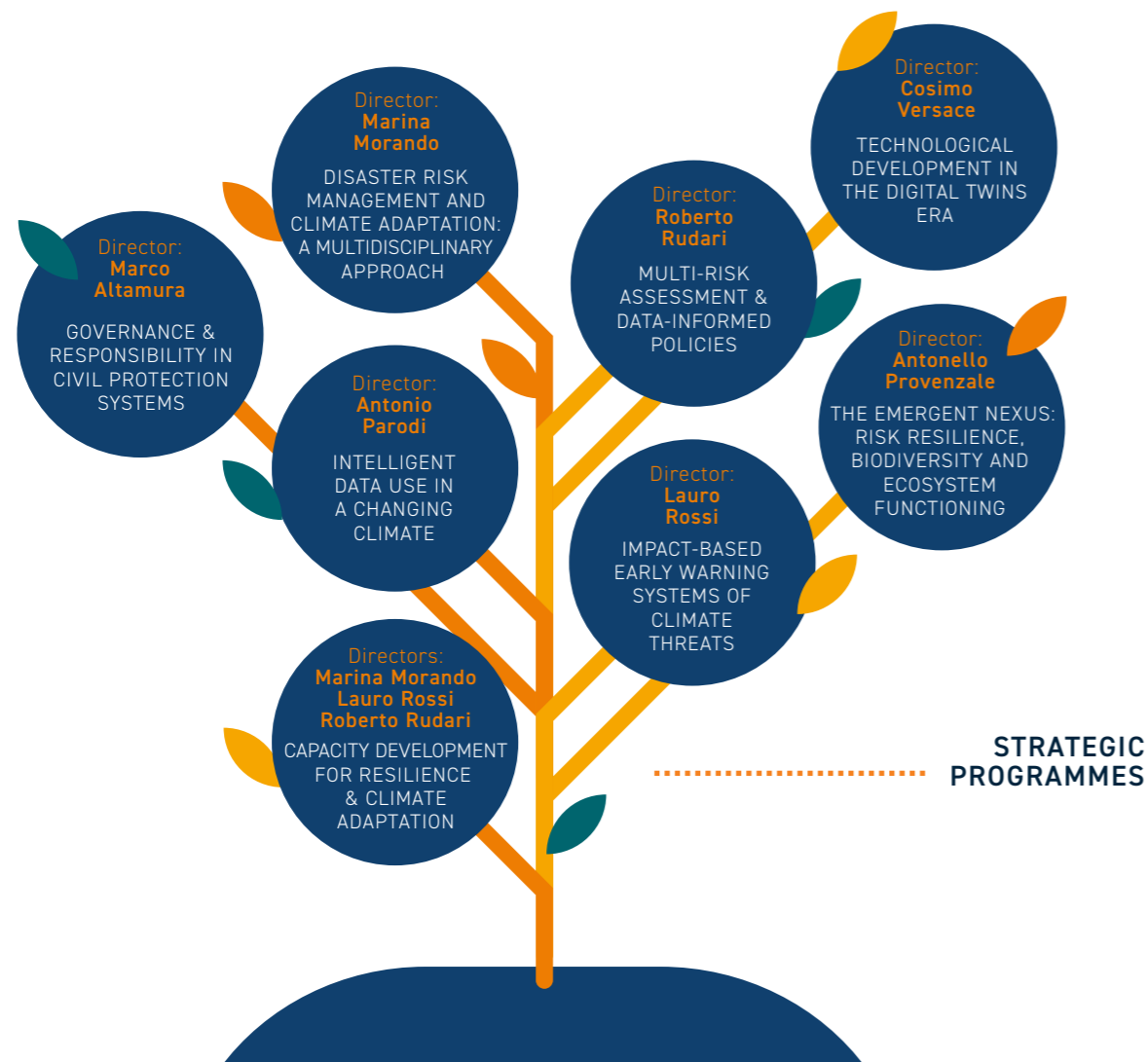
Risk management is not only an operational matter but also a regulatory one. **Governance & Responsibility in Civil Protection Systems** deals with the issue of legal accountability

in civil protection action, and is working towards definition of regulatory tools for adaptation to climate change in Italy. From the national through to the local scale, the programme explores the administrative and legal challenges, aiming to foster more effective and accountable governance.

A multidisciplinary approach to risk management

Risk management requires a broad vision, one capable of melding the so-called 'hard sciences' with social sciences, communication and community participation. **Disaster Risk Management and Climate Change Adaptation: a Multidisciplinary Approach** is our most cross-cutting and holistic programme, bringing together scientific expertise and social know-how in order to strengthen adaptation strategies. We investigate how civil protection systems can evolve to meet the new climate challenges, converting emergency planning into a prevention and resilience tool.

Eight programmes, one direction: placing science at the service of society today, to build responses to the environmental challenges of tomorrow.



164
HUMAN RESOURCES
FROM VARIOUS COUNTRIES
MADE UP OF:

137
EMPLOYEES

16
PHD STUDENTS

4
INTERNS

7
RESEARCH FELLOWS
AND CONTRIBUTORS

THE VALUE OF PEOPLE

Our research does not stop at abstract theory, but has emerged and evolves in close contact with people's daily lives and local areas. It is thanks to the passion, dedication and curiosity of those who work with us that ideas are converted into tangible and measurable results, day after day. Behind each goal reached – however great or small – is the joint work of a tight-knit expert team, which embodies our core value.

This is why investing in work-environment quality is a constant priority for us. We believe that people's well-being is a vital prerequisite for ensuring excellent results. Therefore, we adopt welfare policies devised to respond to the needs of a constantly evolving society. We offer flexible working hours to foster a better work-life balance, encouraging remote working as a good tool for combining productivity, autonomy and responsibility. We provide specific company services such as cafeterias and accommodation, as well as broad private healthcare coverage, designed to bring peace of mind and security to our personnel and their families.

We firmly believe in individual potential and constant professional growth. For this reason, we invest in training, and devote particular attention to the younger generations: we offer internships and structured training opportunities to enable our team members to develop skills, draw on their talents and build solid foundations for their career futures.

Central in this is an inclusive vision oriented to promoting equal opportunities and creating a work environment where nobody is left behind. This commitment is expressed in tangible action: the Gender Equality Plan was adopted in 2021, Linee Guida del Linguaggio Inclusivo (inclusive language guidelines) was published in 2023, and specific training on inclusion and diversity has been organized.

In 2025, in relation to implementation of the Gender Equality Plan, we also established the GEDI Observatory for dialogue, listening and action aimed at fostering Gender Equality, appreciation of Diversity and an increasingly Inclusive organizational culture (GEDI).

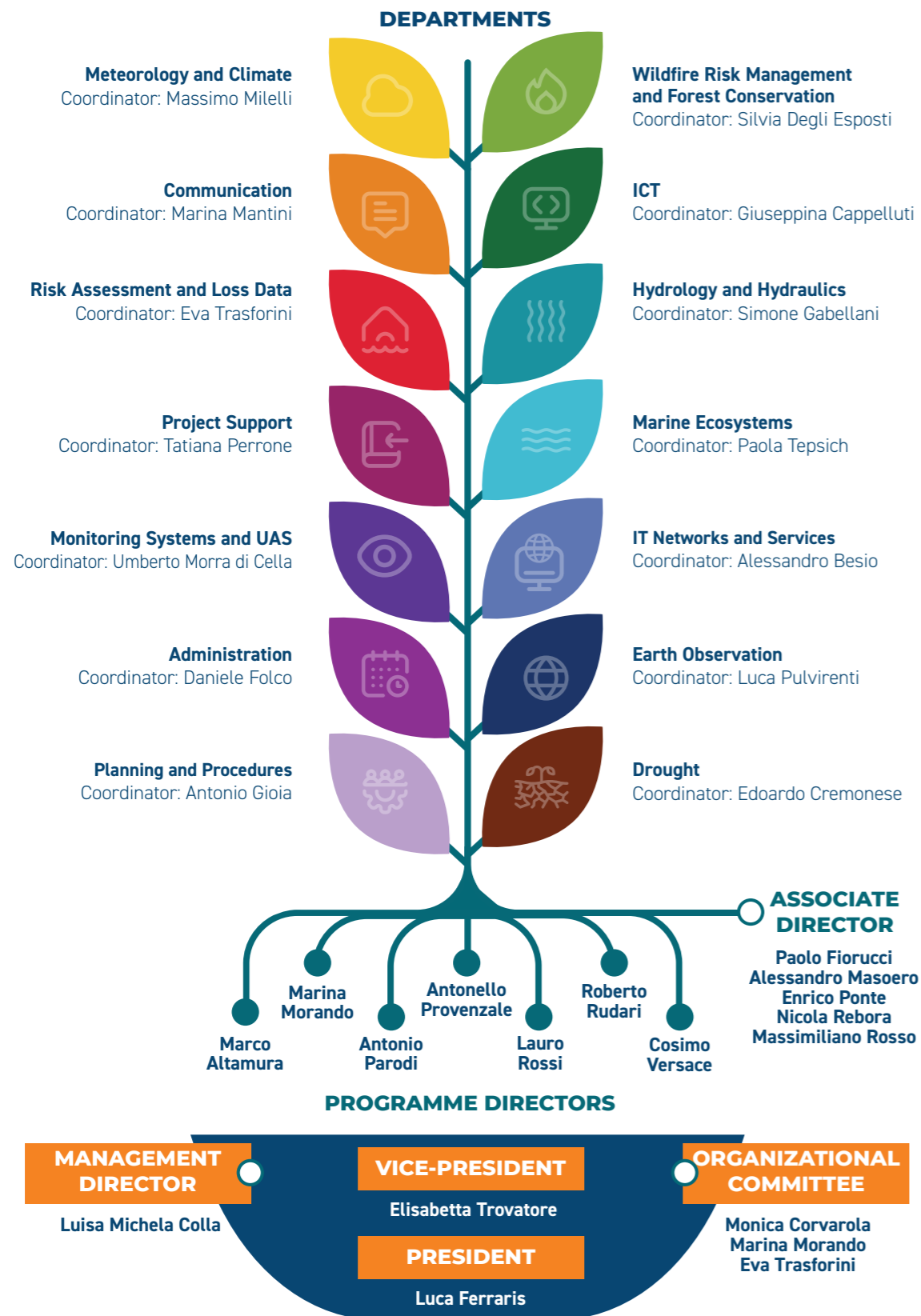
Today our team comprises 164 people (68 women and 96 men), who work on global-level innovation and research projects, and are in constant dialogue with institutions, communities and stakeholders.

CIMA Research Foundation is first and foremost a community of people, brought together by shared values, a sense of responsibility for the present and a joint commitment to a better future.



TO GET TO KNOW US:
<https://www.cimafoundation.org/en/human-resources/>

INTERNAL ORGANIZATION



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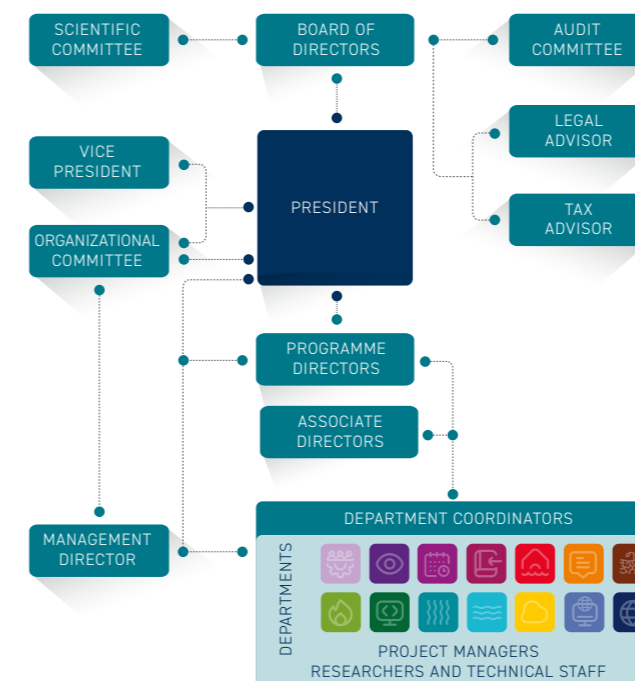
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ORGANIZATIONAL COMMITTEE

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ORGANIZATION STRUCTURE



FINANCIAL STATEMENT 2025

REVENUE 2025

Revenue from projects	13,960,755.00 €
Revenue from donations and 5xMille tax allocations	4,493.00 €
Total revenue	13,965,248.00 €

EXPENSES 2025

Consumables (a)	382,971.00 €
Services (b)	3,177,349.00 €
Rentals (c)	287,796.00 €
Personnel (d)	9,045,341.00 €
Other operating expenditure (e)	736,951.00 €
Total expenditure (a+b+c+d+e)	13.630.408.00 €

PROFIT 2025 (NET OF TAXES)

7,520.00 €

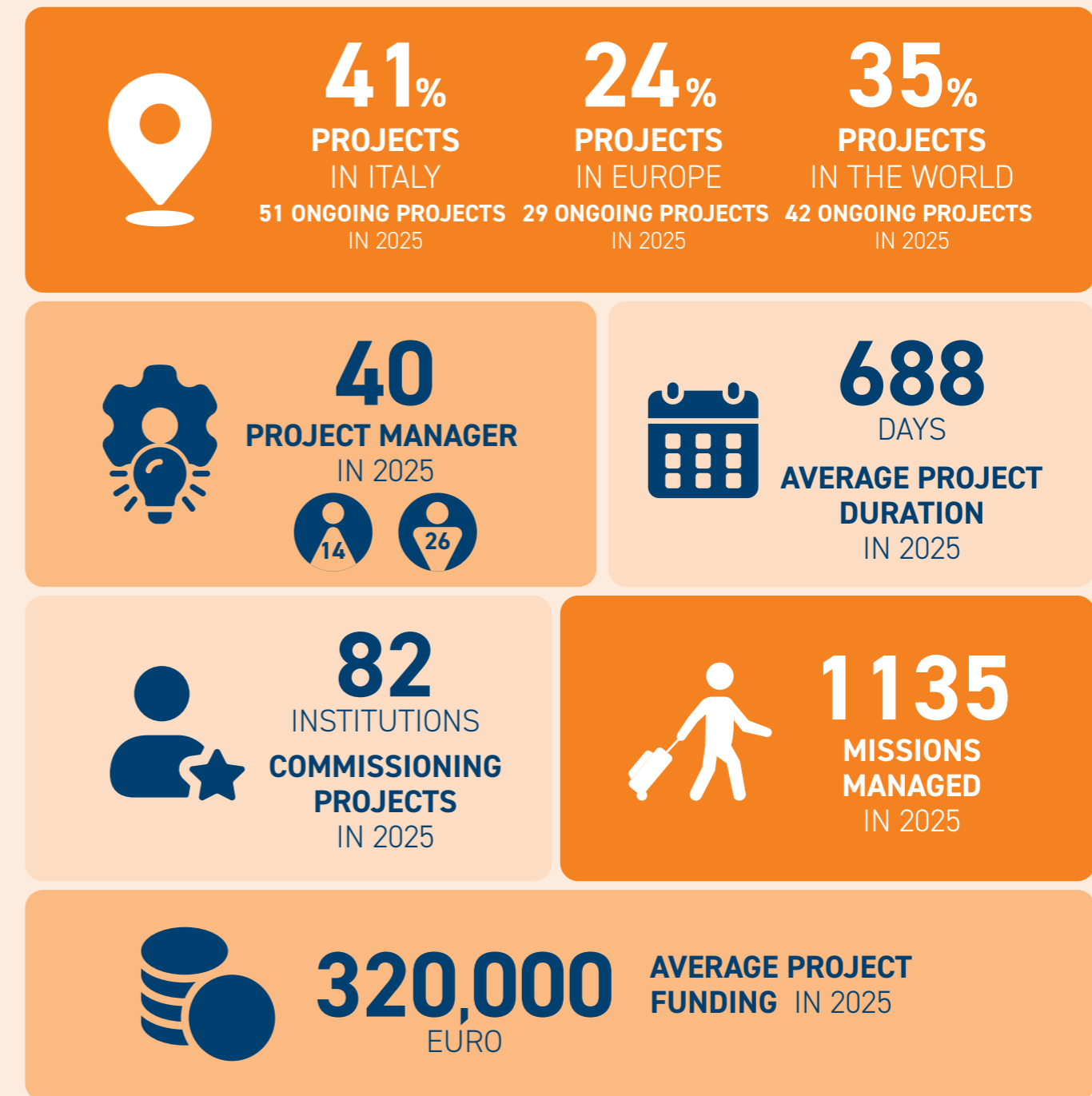


HIGHLIGHTS

02

THE PROJECTS IN NUMBERS

The CIMA Research Foundation projects emerge from the combination of scientific research, technological innovation and cooperation with institutions and communities. Through initiatives developed at local, national and international levels, we work to understand, prevent and manage natural risks by turning knowledge and data into practical tools to safeguard people and ecosystems while strengthening territorial resilience.



Risk forecasting and prevention in Mozambique

Funded by the Italian Agency for Development Cooperation (AICS), **Ready2Act** is a project to reinforce coordination mechanisms and preparedness for natural disasters in Mozambique. It is part of the United Nations' Early Warnings for All initiative, where the overall aim is both ambitious and urgent: to ensure everyone on Earth is effectively protected from natural disasters through the use of early warning systems (EWS) by 2027.

Within this framework, Ready2Act is led by CIMA Research Foundation, with local support from WeWorld and strategy guidance from the Italian Civil Protection Department. The project stems from a well-structured partnership with the Mozambique Disaster Management Institute (INGD), and sees continuation of the integrated process of technology transfer, training and strengthening of institutions. It aims to increase the speed and effectiveness of converting information into action, especially when addressing water-related risks.

Ready2Act consists of two main components. The first centres on **improving inter-institutional coordination in readiness for and in response to emergencies**. It involves the sharing of experiences and good practices, while also providing support during the modernization of the National Emergency Operations Centre (CENOE) and the operations room in Beira. Continent-wide links have also been strengthened, through the SADC Humanitarian and Emergency Operations Centre (SHOC) in the AMHEWAS network, thus fostering data exchange and the sharing of early warnings and procedures.

Instead, the second component **reinforces monitoring, forecasting and early warning capacity regarding extreme hydro-meteorological events**. By means of a nationwide flood forecasting operational chain for the Mozambique National Directorate of Water Resources Management (DNGRH) and strengthening of the myDEWETRA platform (version 3.0), the project integrates new risk data with tools to assess scenarios in real-time, to issue warnings and to support civil protection planning. Because early warnings save lives only when underpinned by effective readiness. The simulation exercises organized for this purpose – with the Italian Civil Protection Department and our Planning and Procedures section – are therefore essential.

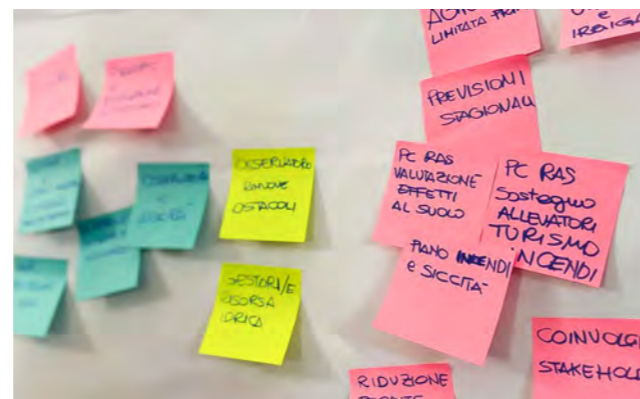


A cross-border alliance against flooding and drought

Building on the experience gained in the previous editions, **PROTERINA4Future** is continuing its international contribution in disaster preparedness and response to the impacts of climate change, in the Italy-France cross-border area. By encouraging an integrated approach to flood risk reduction and with particular attention for drought, the project combines mitigation, adaptation, response and recovery, while also promoting participatory and inclusive decision-making processes within an ever more unstable climatic context.

At PROTERINA4Future's heart is the improvement of **coordination between local authorities responsible** for climate risk prevention and management, to strengthen their capacity to anticipate emergencies and manage these more effectively. One expected result is creation of joint pilot actions to facilitate the exchange of expertise and scientific know-how between the partners and to test replicable operational solutions, with the accent on a multi-risk and multi-level perspective since this is essential for complex and interconnected areas such as those crossing borders.

A key project feature is its focus on involving the younger generations and raising awareness. As lead partner, CIMA Research Foundation is committed to **climate risk governance** that includes all sectors of society. It is with this goal that awareness-raising and educational activities become core to strengthening risk culture and cooperation among citizens, technical experts, public administrations and students.

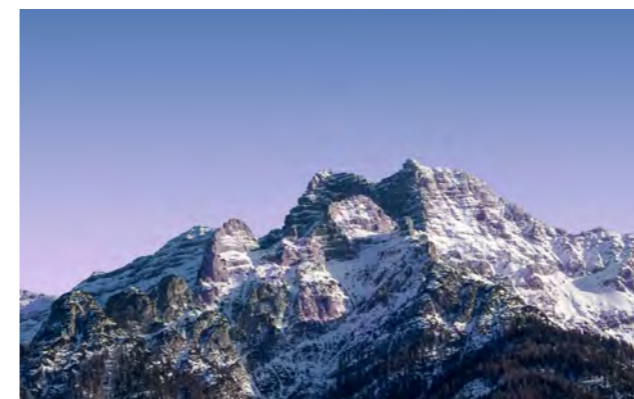


Addressing drought in the Alps with technological innovation and data management

The Alps stand as one of the largest and most complex mountain ecosystems in Europe: they protect biodiversity, regulate the climate and ensure essential water resources for communities and businesses. However, this balance is growing increasingly fragile today. Rising temperatures, less snowfall and greater climate variability are making drought an urgent challenge even in mountain areas. This is the context to creation of the **A-DROP** project, which aims to improve Alpine capacity to address periods of drought and to ensure sustainable water resources management.

A-DROP involves eleven partners from five countries in the Alpine area of Europe. It develops tangible solutions to manage drought risk, **tailoring monitoring and forecasting tools specifically for the Alps**. The project generates high-resolution climate and hydrological data that can be accessed and integrated with local systems, thus contributing to construction of a drought forecasting system for the entire Alpine area. A-DROP also uses climate models to predict the future effects of climate change, and supports decision-making and adaptation action in five pilot areas, underpinning training and awareness-raising activities to encourage the adoption of effective strategies for water governance.

As a main project partner, CIMA Research Foundation contributes expert know-how for the collection and analysis of climate data and for the development of innovative tools, such as the pan-Alpine model for assessing snow water equivalent (S3M Alps). In addition, it works on validation of combined drought indices and on assessment of seasonal forecasts, with the goal of detecting critical situations months in advance. This is happening in the Valle d'Aosta area, for instance, where the project provides support, converting complex data into useful information, making this available on local platforms and supplying it to the regional water-shortage observatory. Because monitoring the local area means safeguarding it and protecting the safety of all.



Water, resilience and development: the role of drainage basins in Ethiopia

Despite the progress achieved in recent years, the pressure on natural resources remains high in Ethiopia: soil degradation is still widespread, per-capita water availability is decreasing, and agricultural yield – particularly on a small scale – remains low. In many parts of the country, food and nutritional insecurity is chronic, while access to energy and water, sanitation and hygiene (WASH) is still inadequate. These issues are compounded by water pollution and the growing impact of climate change, which is intensifying droughts and water shortages. Yet Ethiopia possesses significant renewable energy and water resources, which offer a tangible opportunity to reduce poverty and improve the nation's health and living conditions in the 'cradle of humanity'.

To reinforce drought resilience and reduce vulnerability to climate change, the European Union has funded the project **Integrated Water Resources Management (IWRM)**, with the Italian Agency for Development Cooperation (AICS) as executive partner, and CIMA Research Foundation and the Italian National Research Council (CNR) as technical-scientific partners. IWRM aims to improve integrated water resources management in the Webi Shebele, Lower Awash and Danakil river basins, in coordination with other international programmes and initiatives, to support small-scale agriculture, which accounts for about 90% of national production and is largely rainfall-dependent.

More specifically, CIMA Research Foundation contributes to **strengthening institutional capacity at both federal and river basin level by providing advanced monitoring infrastructure, forecasting tools and planning expertise**. Working in conjunction with the Ethiopian Ministry of Water and Energy (MoWE) and the Basin Development Offices, its activities include: hydrological modelling for flood and drought forecasting; modernization of the hydro-meteorological network, also through drone-based environmental surveys and mapping; and creation of monitoring rooms and interoperable dashboards for near-real-time data integration. A strategic investment to convert knowledge into action and to ensure sustainable water management, which is essential for the country's development.



Governance of water resources for a more resilient Viet Nam

Water is a vital resource for social and economic development in Vietnam, but it is also a source of ever greater vulnerability. Floods, droughts and climate variability are putting river basin management under growing strain, making it increasingly urgent to strengthen regulatory, operational and technological tools capable of guiding effective decision-making. Funded by the Italian Ministry of Foreign Affairs and International Cooperation (MAECI) through AICS, in conjunction with the Vietnamese Department of Water Resources Management (DWRM) and with the involvement of the Italian Central Apennine River Basin Authority (AUBAC), the project **Technical Assistance on Strengthening the Regulatory Framework of the Water Sector: real-time multi-basin operations in Viet Nam** assists the country's ministry for water in consolidating its legislative framework governing water resources management.

On the one hand, **analysis of the systems to support decision-making in river basin management** enables detection of existing shortcomings as well as formulation of practical recommendations, where a core element is the transferral of experience from Italy – a country whose river basin authorities stand as a well-established water governance model. By comparing the two systems, replicable good practices that may be adapted to the Vietnamese context can be identified. On the other hand is the commitment to **improving forecasting capacity**, with tools to predict extreme weather events and reduce their impact on the population, agriculture and infrastructure, while also developing a case study to test operational solutions.

CIMA Research Foundation contributed with technical, scientific and capacity-building activities, where the main results were the seasonal forecasts for the Dong Nai River. This also involved support to the national water budget and allocation of resources, integrating these into the myDEWETRA 3.0 platform for visualizing climate and hydrological data in a real-time decision-making system.

In parallel, regulatory support was jointly developed based on the experience of the Italian river basin authorities, and this helped shape the River Basin Organizations required under Vietnamese law.



A new satellite perspective on the water cycle

Constantly observing the water cycle at a high temporal frequency is one of the most urgent scientific challenges in understanding and predicting the impacts of climate change. The **Hydroterra+** project, funded by the European Space Agency (ESA), was launched with precisely this goal: to assess the feasibility and practical application of a new satellite mission based on synthetic aperture radar and proposed as a candidate for Earth Explorer 12. The focus is on rapid water-cycle processes that develop over just a few hours or days: still today they are difficult to monitor with existing satellite missions, since these are often unable to provide data at an adequate regional scale or time resolution.

The Hydroterra+ mission proposes use of a C-band radar in quasi-geostationary orbit, capable of delivering **continuous high-frequency observations in all weather conditions**. The regions of interest comprise Europe, the Mediterranean basin and some parts of Africa, including the Sahel-Volta area. CIMA Research Foundation knows these climate hotspots well because they are increasingly exposed to extreme weather events such as flash floods, landslides and water shortages, with direct impact on ecosystems, infrastructure and communities.

The project is built around four main fields of action: monitoring mesoscale convective systems, which drive severe weather events; quantifying diurnal water balance, with particular attention to soil moisture, irrigation and vegetation; studying cryospheric water balance, related to snow accumulation and melting; and, lastly, monitoring ground movement, which is useful to analysing occurrences associated with earthquakes, volcanoes and landslides.

CIMA Research Foundation is scientific coordinator for the project and is a member of the Mission Advisory Group. Our contribution is central in the development of high-resolution models and integration of satellite observations – such as on soil moisture and column water vapour – into the forecasting models. By testing hypothetical mission data, our work also improves assimilation techniques to make forecasts more accurate and to strengthen early warning systems. This is a stride forward in turning space-based observations into tangible prevention and resilience tools.



Early warnings in the Horn of Africa: from hazard to impact

For early warning systems to be truly effective, knowing whether an event will occur is not enough: it is vital to understand what consequences it might generate and who will be affected. In line with the United Nations' global initiative Early Warnings for All (EW4All), there is growing awareness that optimizing early warning systems (EWS) requires more than weather and hazard information alone. It also means integrating data on exposure, vulnerability and expected impacts, so that support can be provided for faster, more targeted decision-making.

Various early warning tools and initiatives are already in place in the Horn of Africa – a region particularly exposed to disasters caused by hydrological extremes. However, the presence of different approaches makes it necessary to consolidate shared operational methods and applications capable of converting early warnings into real action.

This is the context to the project **Towards actionable impact-based early warning in Africa: integrating exposure and vulnerability into early warning systems – a pilot study in the IGAD region (EWS4IGAD)**. Contributing to the Early Warnings for All goals, the project seeks to expand on today's conventional hazard-based early warning systems and to move towards a model based on impact forecasting. The main focus is on flooding and drought – two hydroclimatic events bringing major impact for populations, infrastructure and food security – while also aiming to build a strategy that can be replicated for other climate-related risks. EWS4IGAD seeks to **co-design and co-develop** a shared approach and method capable of optimizing the decision-support systems and tools already in operation across the region, while also improving their effectiveness.

CIMA Research Foundation is contributing by providing more accurate information on exposure and vulnerability, with the goal of generating more precise projections of the expected impacts of major flooding events. The system FloodPROOFS East Africa (Alfieri et al., 2024) is also to the forefront in this process. This EWS is based on the impact of river flooding in the Greater Horn of Africa, and is a key support tool for making early warnings increasingly 'actionable', i.e. for turning forecasts into timely response.



Monitoring sea mammal health by pairing innovation with empathy

In the heart of the Mediterranean Sea and along Europe's Atlantic coasts, cetaceans are more than just iconic marine species: they are a key indicator of marine ecosystem health. Nonetheless, growing environmental pressures – pollution, shipping traffic, habitat loss and climate change – are making it ever more urgent to improve the scientific tools for monitoring their presence and physical condition. Changes in distribution patterns and individual health status can in fact serve as early alarm bells for population decline, yet such signs often evade conventional acoustic and visual observation techniques, which are heavily influenced by environmental conditions.

One response to this challenge is the **EMPHATIC** project, funded by **Biodiversa+ (the Horizon Europe partnership to safeguard biodiversity for scientific research, to protect ecosystems and to adopt nature-based solutions)** and led by the Marine Research Institute at the Spanish National Research Council (IIM-CSIC). The consortium brings together six partners – one of which is CIMA Research Foundation – from four countries, with the goal of **developing innovative protocols and indicators useful to better understanding cetacean distribution and health status, and making the results available as a support tool for national and European conservation policies and strategies**. EMPHATIC combines advanced yet minimally invasive methods: analysis of environmental DNA to reconstruct species presence and diversity; the study of respiratory tract microbiome and hormone levels to assess health and stress; photogrammetry through images captured by drones (UAVs) to estimate body parameters such as size, shape and physical condition.

CIMA Research Foundation leads the UAV-based sampling activities along the Iberian coast and in the Western Mediterranean, also collecting the condensate exhaled through blowholes. The target species in the Mediterranean include the fin whale and the sperm whale: samples have already been collected from over 30 individuals, also resulting in data on size, parasites and microbiome. In addition, the foundation is developing a Body Condition Index for assessment of this aspect and is coordinating sea-water sample collection across the Mediterranean. Started in 2024 and running through to 2027, EMPHATIC aims to convert scientific research into practical monitoring tools and capacity-building action to protect oceans and biodiversity.

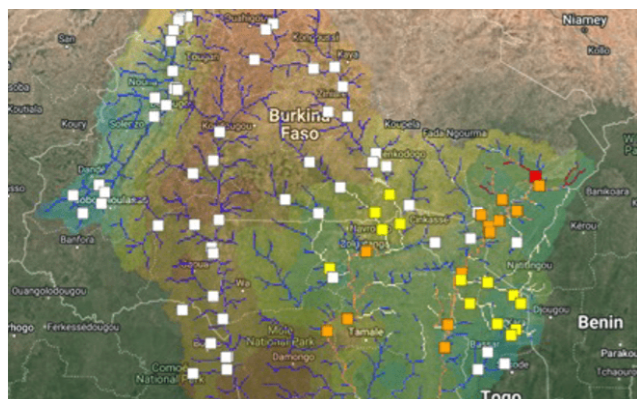


Improving flood warning systems in Burkina Faso

Predicting a flood means much more than just forecasting its arrival. It means building systems capable of converting data and models into timely decision-making, and reducing the impact on people, infrastructure and lands. In this light, CIMA Research Foundation began working with the World Meteorological Organization (WMO) in 2024 on the project **Technical Assistance to Burkina Faso for the implementation of the hydrological component of HYDROMET Burkina Faso**. The goal was to strengthen the nation's operational capacity in hydrological monitoring, forecasting and alert issuance, particularly prior to the 2025 rainy season.

This teamwork is part of a well-tested partnership: since 2019 CIMA Research Foundation has been the leading technical partner in the project Volta Flood and Drought Management (VFDM) promoted by the WMO for the Volta River basin, aimed at improving flood and drought alert systems. Within the VFDM framework, a cross-border regional monitoring and forecasting system – myDEWETRA-Voltalarm – has been implemented, and today covers roughly a third of Burkina Faso. The new initiative seeks to expand the system to nationwide coverage, extending it also into the Niger and Comoé River sub-basins, with the goal of enabling the Burkina Faso Directorate of Water Studies and Information (DEIE) to **generate impact-based forecasts for the entire country**, while assessing performance through comparison with field data and other systems in use. In addition, the system provides support for issuing alert bulletins, thanks to an integrated tool customized to the water directorate's operational needs, and this was tested directly during the rainy season.

A crucial part of the project is competency building: CIMA Research Foundation is responsible for designing and creating training courses for the local institutions involved. One practical example of this action is the technical workshop held in Lomé. Here, CIMA researchers helmed sessions focused on the operational use of the myDEWETRA-Voltalarm platform, the forecasting system based on the CONTINUUM model, and the tool for bulletin generation. This is a step towards increasingly integrated and reliable warning systems oriented to practical action.



A digital platform to strengthen civil protection action by Ligurian municipal authorities

In recent years, Liguria Regional Administration has firmly invested in building a stable collaboration network with the local area, developing shared tools and training paths to address the impacts of climate change more effectively. Within this framework, a central role is played by reinforcement of the region's civil protection system, through training, operational support and technological innovation.

This has resulted in **PrevenzioneComune** – the new digital platform officially presented on 4 December 2025 and operational from 2026. It has been designed to facilitate the work of local authorities and to ensure continuity with the FormazioneComune initiative. The aim is to provide local administrations with a single, well-structured and complete operating environment for support in drafting and updating **local administrations' civil protection plans**, defining risk scenarios, managing emergencies, and coordinating volunteer organizations, while also making practical tools and reliable data available. Its simple and intuitive user interface brings together applications connected with all the civil protection phases, from planning to monitoring ongoing events, through to internal communication in municipal administration systems. Standing out among the main tools is EPICO, devised to manage municipal planning in accordance with Italian regulations.

One particular strength of the platform is its support in **hydrological and floodwater monitoring**: local authorities can access specific information and objective parameters based on the real-world evolution of events – data useful to deciding activation of operational phases. The portal in fact integrates sensors in the OMIRL regional network and data from the local observation networks with open-hardware precipitation gauges and hydrometers. In addition, thanks to the Small River Basins (Piccoli Bacini) model by the Functional Meteorological Centre (CMF), more accurate interpretation of the data will be possible even in the most complex or small-scale contexts. A last distinguishing feature is data digitalization: local authorities will be able to use a single digital environment to enter all the information required by national regulations and to access a regional database already structured to today's standards. A tangible step forward in building a unified system and making civil protection action in Liguria ever more integrated, efficient and resilient.



Innovation and governance to address extreme fires

Wildfires in the Mediterranean area are changing in nature: they are increasingly intense and occurring simultaneously, while also fed by ever hotter and drier climatic conditions.

FIRE-SCENE has been created to respond to this new reality, developing advanced tools and methods for integrated risk management that combines planning, governance and community involvement.

The project centres on three key scenarios, with **fires in peri-urban areas, in high-tourism zones, and in protected or recreational areas**. FIRE-SCENE is testing concrete operational solutions at four pilot sites in Spain, Greece and Italy: solutions range from classifying at-risk areas to planning adaptation action, through to assessing the future impacts of climate change. In Calabria, for instance, advanced hazard-forecasting models are being developed, with support from innovative simulations and rapid emergency risk assessments.

CIMA Research Foundation coordinates activities at the pilot sites and develops specific tools for wildfire risk management. Among these are annual forest-fuel maps formulated using artificial intelligence (AI) techniques and integrating data on vegetation, topography and climate. In addition, drone deployment enables detailed analysis of the most vulnerable tourism areas, to support targeted prevention strategies.

Another core element is development of a daily bulletin system specifically for operations rooms, local stakeholders and communities. This is devised to ensure effective information dissemination and to strengthen risk awareness. Lastly, the project includes training modules and a final stress test to evaluate tourism facilities' capacity to manage emergencies and evacuation.

FIRE-SCENE thus aims to **strengthen resilience in Mediterranean areas**, by turning research and innovation into practical tools for protecting people, ecosystems and local economies.



AMHEWAS: the long-term programme continues

Drought and flooding are reaching critical levels in Africa. Aggravated by climate change, they are generating increasingly severe impacts: food and water insecurity, power blackouts, epidemics, humanitarian crises. In response to this challenge, the African Union Commission, UNDRR and CIMA Research Foundation – thanks to funding from the Italian government – have been working together to develop the **Africa Multi-Hazard Early Warning and Early Action System (AMHEWAS)**. This multi-level network integrates monitoring, forecasts and early action at local, regional and continental scales.

The goal of the programme's fourth phase has been to strengthen institutions' capacity to develop multi-risk warning systems based on impacts, while improving governance, coordination and access to information – an aim in line with the Sendai Framework and the Early Warnings for All initiative. The expected outcomes include: standardized protocols; upgrading of the national situation rooms in Ethiopia, Niger and Tanzania; development of the Centres of Excellence network; and advanced risk analysis for countries in the Sahel area to enable more effective early action.

CIMA Research Foundation provides technical assistance to **regional and continental Situation Rooms**, it updates drought monitoring tools and procedures, and develops new wildfire forecasting systems for the SADC region. It also delivers support for training, simulation exercises and implementation of new operational infrastructure.

Since 2025, the programme's fifth phase has aimed to further strengthen the AMHEWAS outputs, also improving the bulletins that are already in operation (Continental Watch and African Drought Watch) through impact-based forecasts and new data on exposure and vulnerability. Additionally, **e-learning modules, participatory workshops, guidelines** to place situation rooms within an institutional framework, and activities in countries such as Mauritius and the Seychelles are taking AMHEWAS to consolidate African autonomy in technical expertise for alert system management, converting risk knowledge into tangible protection capability.



The PNRR and applied research: for a more resilient, sustainable and innovative Italy

Large-scale environmental and climate changes, loss of biodiversity, and technological evolution are redefining priorities in research and public policy. Within this framework, the **Italian Recovery and Resilience Plan (PNRR)** has been a strategic opportunity to improve Italy's ability to address complex risks and speed up the process of bringing innovation to society. This is the context to three national projects that CIMA Research Foundation has actively taken part in: **RETURN, the National Biodiversity Future Center (NBFC) and RAISE** – three different yet complementary initiatives united by the goal of turning scientific knowledge into tangible tools for national and local resilience.

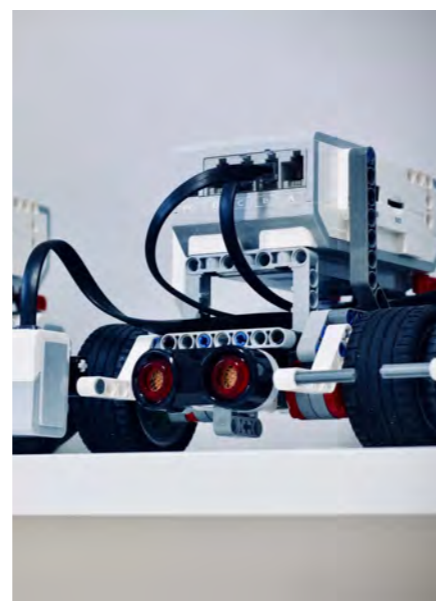
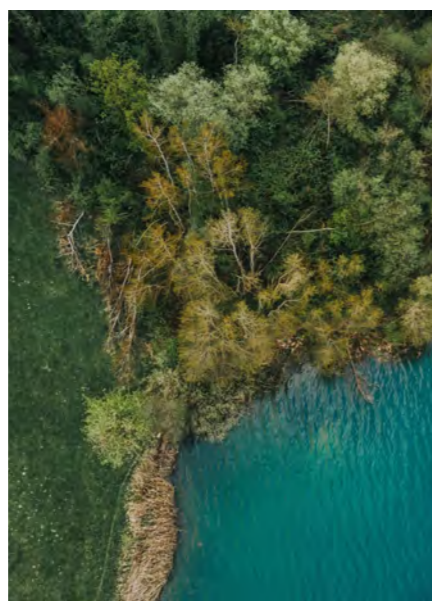
RETURN – Multi-Risk Science for Resilient Communities under a Changing Climate focused on improving the entire management cycle regarding risks brought by natural and human-made disasters. By adopting an interdisciplinary and solution-driven approach, RETURN combined research, technological development and services. CIMA Research Foundation contributed by coordinating activities on drought, floods and environmental degradation, creating tools and developing studies on wildfires, prevention and mitigation, also linked to forest management. In addition, it led dedicated activities for community resilience across social, economic, legal and cultural dimensions, as well as improving the multi-risk resilience of critical infrastructure. It also played a key role in climate services, working to develop decision-support systems and high-resolution climate scenarios.

Alongside risk management, the PNRR also invests in safeguarding natural capital. The **National Biodiversity Future Center (NBFC)** is in fact the first national research centre

entirely devoted to biodiversity. Coordinated by the CNR, it comprised a network of 48 partners and over 2000 researchers. Active from 2023 to 2025, the centre was structured on a hub-and-spoke model and focused on the Mediterranean area as a global biodiversity hotspot, devising strategies to conserve, reinstate and boost marine and terrestrial ecosystems, also through One Health and nature-based solutions. CIMA Research Foundation was involved for activities to map and forecast the distribution of large marine predators, assessing the impact of human activity and studying the effects of wildfires on ecosystems and the soil, with prediction models and monitoring systems useful to climate adaptation strategies.

Lastly, **RAISE - Robotics and AI for Socio-economic Empowerment** stands as the heart of Liguria's ecosystem of innovative robotics and artificial intelligence, helmed by the University of Genoa. The project uses Liguria as a living laboratory to address the needs of the local territory and to speed up the digital and green transition. CIMA Research Foundation is working on an advanced early warning system to improve the forecasting of heavy rainfall: this deploys X-band radar observations, sensors and weather drones, as well as numerical models and data assimilation techniques, with support from AI and algorithms to reduce uncertainty and improve the forecasting of highly localized weather events.

Three distinct projects, following a single direction – to build a future where research, technology and governance work together to protect people, ecosystems and local areas.



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03



SHARING OUR KNOWLEDGE

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MISSION OCEANO: 7 CHALLENGES, 1 SEA TO SAVE

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WIKIPROCESSI - REPORT 2025

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Wiki Processi is a platform owned by the Department of Civil Protection, created and managed by the CIMA Foundation: wikiprocessi.cimafoundation.org



Knowledge is effective only when it becomes a shared asset.

CONFERRING OUR KNOWLEDGE

In an age where climate change is amplifying the intensity and frequency of extreme weather events, knowledge cannot remain confined to a select few. It must circulate, be integrated across disciplines, and become an operational tool.

Imparting our knowledge means taking on the responsibility for turning research into widespread ability – training professionals, supporting institutions, engaging with local communities, combining science with law, and building international networks. This is not an auxiliary goal for CIMA Research Foundation, but a core part of its mission.

The training of risk engineers: the NatRisk course

One of the cornerstones to this commitment is the **partnership with the University of Genoa** for the Master's Degree in Engineering for Natural Risk Management (NatRisk), which has been running since 2017. The course has emerged from the need to **train professionals capable of addressing natural risks systematically**, overcoming the fragmentation between various disciplines by means of solid technical expertise paired with a cross-disciplinary perspective: understanding forecasting models, monitoring methods, warning systems and the civil protection operational framework, and working effectively alongside meteorologists, hydrologists, geologists, public administrators and emergency responders. Not specialists limited to a single field, but facilitators able to connect knowledge.

CIMA Research Foundation contributes by providing workshops, real-life case studies, and expertise gained through years of fieldwork. The last term of the course comes as an internship, in operational contexts with the Italian National Civil Protection Department, or with ARPA or other authorities, so that the final thesis may directly contribute to solving existing issues. This is where the process of knowledge transferral is complete, **becoming an active part of real-world decision-making**. Possible career paths and contexts reflect this approach: the different levels of civil protection and disaster management,

international organizations, development banks, NGOs, the insurance sector and industry. Risk management is now a cross-cutting field of expertise, required by many strategic sectors.

From Degree to Doctorate: shaping researchers for the future

Knowledge conveyance continues with the Doctorate in Security, Risk and Vulnerability, particularly with the curriculum focusing on Risk, Climate Change and Sustainable Development. Here the education level is of the most advanced: **not only are existing tools applied but new ones are developed**. CIMA Research Foundation guarantees specialist instruction, access to scientific and operational infrastructure, scholarship funding and inclusion in international networks to gain joint or multiple qualifications. The aim is to shape researchers able to tackle complex issues, such as risk prevention and mitigation, integration between climate adaptation and safeguarding biodiversity, and the protection of human and animal life. Here, the expertise transferral is two-way: the PhD students learn but also contribute to enriching the scientific community with new ideas, methods and teamwork. Knowledge becomes a dynamic process of exchange and not merely the transfer of information.

Supporting local authorities: when knowledge becomes a Plan

If universities are places for structured education, local administrations are the heart of tangible action. CIMA Research Foundation has, at the request of Liguria Regional Administration, been organizing a **training programme for local authorities since 2016**. This has two goals: to provide monitoring tools and to improve operational skills. Forty-eight local administrations and 150 participants have been involved, with three representatives for each administration: a technical expert, a policymaker and a member of civil society. This choice mirrors a clear vision: **emergencies are not only technical challenges but also involve governance and community engagement**.

The training activities lead to preparation of a rapid-response plan – a first draft of an emergency plan containing the essential components that can be swiftly activated. Specific risk scenarios for schools and healthcare facilities are examined, road network vulnerabilities are identified, and intervention priorities are established. In parallel, a software platform is developed with user-friendly tools for consulting risk data regarding buildings.

Procedure standardization is necessary but application is always calibrated to the specific features of each local context. **This is 'tailored' knowledge, built together with local administrations.**

A culture of marine ecosystem sustainability

Knowledge transferral also means influencing economic and social behaviours. Through the trademark **High Quality Whale Watching® (HQWW®)**, CIMA Research Foundation contributes to encouraging good practices in sea-mammal watching, in conjunction with ACCOBAMS and the Pelagos Agreement. Awarded through voluntary candidacy, this certification ensures compliance with an international code of conduct and promotes responsible marine tourism. Here **scientific knowledge of ecosystems is turned into operating standards for tour operators**, with benefits for biodiversity and for service quality.

The **CETASMUS programme** completes this section, offering students and researchers a training opportunity on cetacean-monitoring methods. Seminars, workshops and seaborne activities enable participants to acquire expertise on species distribution and behaviour. Internship experiences, whether field-based or research-oriented, connect data collection with scientific analysis, fostering the **development of new professional skills in the marine science sector**.

E-learning: multiplying impact

The CIMA Research Foundation e-learning platform has been a vital accelerator for knowledge transferral since 2020. Its course subjects range from civil protection through to early warning systems, and from Earth observation to hydrological models, through to marine ecosystems.

The amalgamation of **synchronous and asynchronous activities makes it possible to engage a wide and varied audience**. The Training of Trainers approach means that content can be replicated in diverse contexts, adapting it to local requirements. In addition, distance learning reduces the environmental impact of travel, in keeping with the principles of sustainability.

Integrating science and law: the WikiProcessi experience

A distinctive feature of the CIMA Research Foundation approach is the **integration between scientific and juridical expertise**. The **WikiProcessi platform**, developed with the Italian Civil Protection Department, brings together and analyses court proceedings related to natural extreme events. Its purpose is not only to act as a library of judgements, but also to convert information into a prevention tool. Analysing about 190 cases makes it possible to identify trends, understand the dynamics of responsibility, and reflect on predictability and preventive measures. The data reveal that less than 7% of cases end in conviction, highlighting the legal complexity of emergency events. WikiProcessi is interactive and accessible: it is an information ecosystem that stimulates debate and fosters a culture of shared responsibility.

Capacity building: co-design and innovation

CIMA Research Foundation possesses sturdy experience in capacity-building activities, intended both as the **development and implementation of operational tools and as the design and creation of training courses**.

In particular, the foundation supports institutions, technical bodies and decision-makers through the introduction of platforms, models and innovative tools for natural risk management, accompanying these processes with targeted training activities.

The training programmes are designed to transfer technical and operational skills, encourage effective use of the tools developed, and strengthen the institutional capacity of the partners involved. Thanks to an integrated approach combining scientific research, technological development and training, CIMA Research Foundation contributes to reinforcing prevention capacities, preparedness and risk management at local, national and international levels.

In a context where natural risks intertwine with social and economic vulnerabilities, building informed communities is the most tangible form of resilience. Sharing our knowledge does not mean simplifying its complexity, but making it comprehensible and manageable.

From further education courses to consultancy for local administrations, from tourism to ecosystems, from e-learning platforms to training, through to juridical analysis of extreme events, one consistent vision emerges: knowledge is effective only when it becomes a shared asset.

NATRISK MASTER'S DEGREE COURSE

44

STUDENTS ENROLLED ON
NATRISK MASTER'S COURSE
A.Y. 2024/25

72%

STUDENTS RESPECTING
COURSE SCHEDULE
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RESEARCH DOCTORATE IN SECURITY, RISK AND VULNERABILITY

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PHD STUDENTS
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A.Y. 2024/25

13

CIMA TEACHERS
INVOLVED
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E-LEARNING COURSES

77

COURSES
AS OF 2025

8

LANGUAGES
AS OF 2025

2511

USERS
AS OF 2025

100

COUNTRIES
AS OF 2025

+13k

SINGLE LOG-INS
AS OF 2025

47

PROJECTS
AS OF 2025

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THE CETASMUS TRAINING PROGRAMME

12

STUDENTS
IN 2025

4

VISITING RESEARCHERS
IN 2025

5

COUNTRIES OF ORIGIN
IN 2025

44

DAYS ON HEADWIND
IN 2025

29

DAYS ABOARD FERRY
IN 2025

13

DAYS ON THE GAIA BLU SHIP
IN 2025



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HIGH QUALITY WHALE WATCHING®

25

CERTIFIED OPERATORS
AS OF 2024

7

NEW OPERATOR
IN 2024

9

ITALIAN REGIONS
INVOLVED AS OF 2024

36

PEOPLE TRAINED
IN 2024



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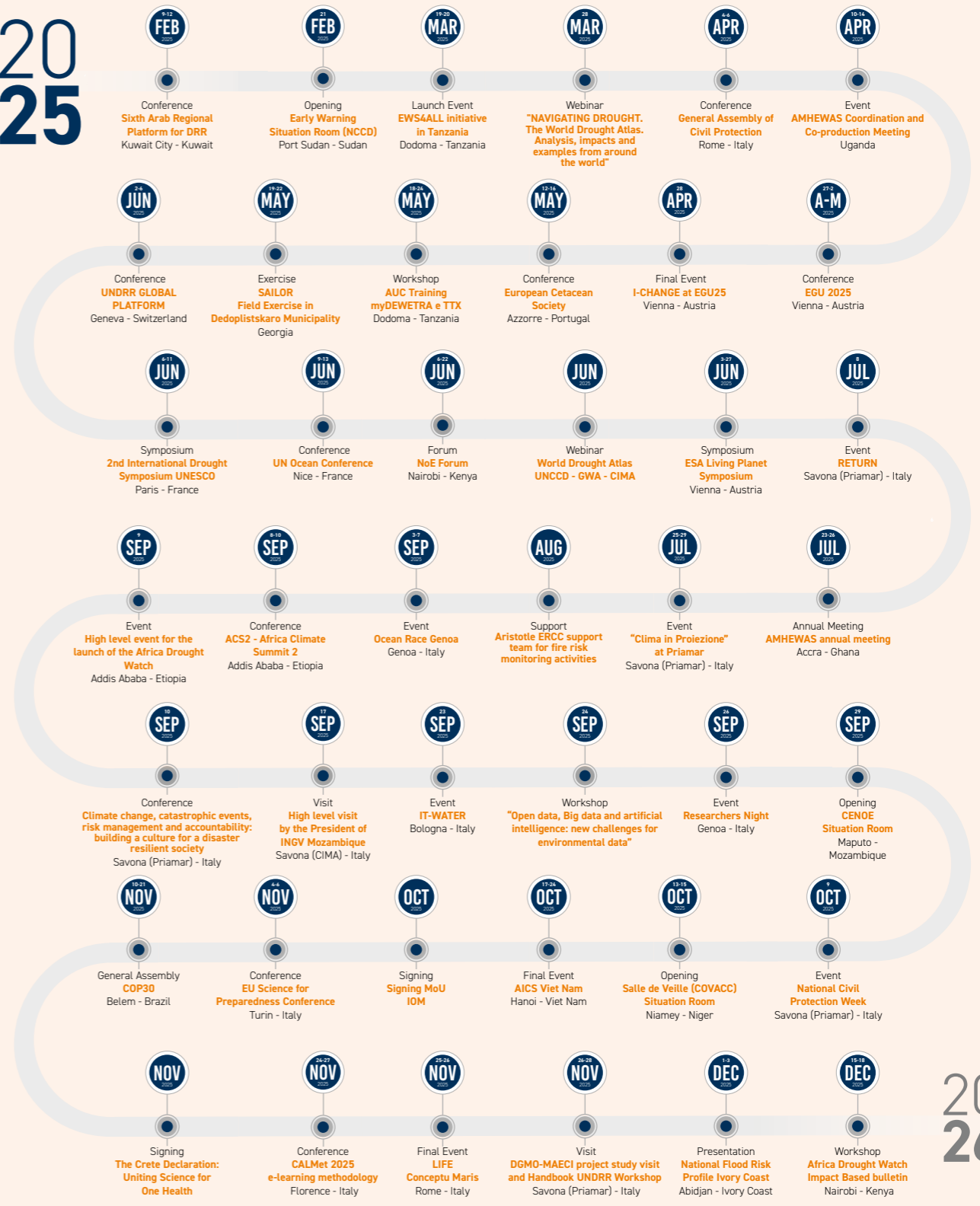
ENGAGING THROUGH OUR KNOWLEDGE



EVENTS

05

2025



2026

CLIMATE IN PROJECTION

STORIES, SCIENCE AND THE FUTURE AT PRIAMAR FORTRESS



Priamar Fortress, encircled by age-old walls and overlooking the sea of Savona, was the venue as summer 2025 began shaping a vibrant new meeting ground for culture and science. 'Climate Projections' – the Cinema at the Fortress special event organised in partnership with CIMA Research Foundation – turned three evenings into a collective culture lab pivoting on climate change. More than just film screenings and conversations, it was the start of a path merging experience, research and participation, to interpret the present and envisage the future.

The sea itself became a mobile observatory under Giovanni Soldini and was the star of the opening evening. The 44,000-plus miles covered during his recent circumnavigation of the Earth revealed the story of oceans undergoing change: shifting currents, more frequent extreme weather events, and ever more fragile balances. Soldini was joined in the discussion by the oceanographer Annalisa Bracco and the geophysicist Antonello Provenzale, head of the CIMA Research Foundation programme, as the adventure intertwined with scientific analysis, demonstrating how **every route today also traces out the climate change underway.**

The second evening – with writer and journalist Ferdinando Cotugno, together with climatologist Elisa Palazzi and Luca Ferraris, President of CIMA Research Foundation – explored **climate as memory and identity.**

Change is not just a curve on a graph but a fracture in landscapes and memories, a metamorphosis weaving through both personal and collective stories. The question "What can I do?" became an invitation to recognize that each of us has a place in this narrative, because climate is the thread running through every other issue.

Lastly, Alex Bellini's return to the Vatnajökull glacier gave shape to **the meaning of limits.** Comparison between the glacier in 2017 and then in 2025 revealed what is retreating and what is vanishing, but also raised questions regarding our choices. In conversation with the researcher Edoardo Cremonese, exploration became shared reflection: going beyond limits does not mean ignoring them, but listening to them and acting together.

Climate Projections is part of a broader project to make Priamar Fortress a Climate Change Citadel, a hub where technical expertise, training and dialogue with the local community meet. Because climate change is not simply a scientific challenge – it is a collective story that calls for awareness, responsibility and action. And it is a story we can choose and write together.



FORTEZZA DEL PRIAMAR SAVONA



25 **GIOVANNI SOLDINI** **INGRESSO LIBERO E GRATUITO**
 LUGLIO 21.30
 TRA SCIENZA E MARE, UN VIAGGIO NEI CAMBIAMENTI CLIMATICI
 Navigatore oceanico, in dialogo con l'oceanoografa Annalisa Bracco e il geofisico Antonello Provenzale, direttore di programma di Fondazione CIMA.

FORTEZZA DEL PRIAMAR SAVONA



27 **FERDINANDO COTUGNO** **A SEGUIRE DALLE ORE 21.30 PROIEZIONE**
 LUGLIO 19.30
 TEMPO DI RITORNO. UN DIALOGO FRA SCIENZA E NARRATIVA **FLOW**
 Giornalista e scrittore, autore di "Tempo di ritorno. Una storia di clima e di fantasmi", insieme alla climatologa Elisa Palazzi e a Luca Ferraris, presidente di Fondazione CIMA.

FORTEZZA DEL PRIAMAR SAVONA



29 **ALEX BELLINI** **A SEGUIRE DALLE ORE 21.30 PROIEZIONE**
 LUGLIO 21.30
 COSA SONO I LIMITI, OSTACOLI O RISORSE? **BEYOND**
 Esploratore e attivista, dialogo con Edoardo Cremonese e Luca Ferraris, climatologo e presidente di Fondazione CIMA.

CLIMATE-DRIVEN DISPLACEMENT AND FORCED MIGRATION

Crop failures, changes in rainfall patterns, rising social tensions, and a feeling that 'the future can no longer be planned for'. It is in this the grey area – caught between the desire to stay and the need to leave – that climate-driven displacement emerges: a form of **forced migration that is moulded by blending environmental impacts** with social vulnerability and political and economic pressures.

The connection between climate change and displacement is clear, and yet it is challenging to isolate: droughts, floods and cyclones hit livelihoods and water and food security, but act within complex systems. Addressing the multi-faceted nature of such contexts requires **tools capable of quantifying without simplifying**, to provide decision-makers with solid foundations for adopting adaptation policies and for management of loss and damage.

This is the direction taken by the **Global Disaster Displacement Risk Model**, presented at COP30 by CIMA Research Foundation together with UNU-EHS, ETH Zurich, Earth Observatory of Singapore and IDMC.

For the first time worldwide, this model provides probabilistic estimates of how many people might be forced to move due to river or coastal flooding, tropical typhoons or drought, under various climate scenarios through to the end of our century. CIMA Research Foundation directly developed the component on river flooding, bringing expertise built from local and global experience and introducing an innovative feature: **integrated vulnerability**, where physical damage is combined with **loss of livelihood**, to better represent the real-world mechanisms driving displacement. Indicators such as average annual displacement and probable maximum displacement therefore become useful parameters for scaling response and reception capacity.

These data matter because effective policies cannot be built without them: climate-driven displacement has gradually become part of the UNFCCC process (from the Bali Action Plan to the Task Force on Displacement, through to the Santiago

Network today), but the challenge is to make this forced migration 'governable' through planning tools. This is also the context to the **Memorandum of Understanding between CIMA Research Foundation and the International Organization for Migration (IOM)**, which strengthens the link between research and field operations, and the work in fragile environments and conflict zones, where early warning systems, forecasting and multi-risk analysis can become humanitarian tools.

Alongside its global modelling, CIMA Research Foundation's work illustrates how these approaches can turn into tangible tools in crisis contexts. In Ukraine, as part of the PPRD East 3 project, a specific **impact-based forecasting system** has been developed with the Italian Red Cross. This system provides support in planning humanitarian action in a context where armed conflict, environmental risks and forced displacement overlap – work that will also continue under **PPRD East 4**.

The heart of the system is the impact-based daily weather bulletin, which is shared with 14 partner institutions. It integrates eight **key meteorological variables with dynamic humanitarian indicators**, such as the presence of internally displaced persons, mobile clinics and refugee centres. The forecasts cover 24 regions of Ukraine and include cross-border areas, enabling responders to predict potentially critical situations for people already in a position of vulnerability. This tool goes beyond 'just forecasting the weather': it provides support for making operational decisions, such as in planning humanitarian operators' movements, protecting temporary infrastructure, allocating resources and minimizing secondary risks for displaced persons.

Assigning numbers to the displacements does not mean reducing lives to statistics. It means building protection. Because forced displacement is not an inevitable fate – it is a risk that can be anticipated, understood and partially averted when knowledge informs decision-making.

FOCUS

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06



ARTIFICIAL INTELLIGENCE, DATA AND MODELLING

Artificial intelligence is radically changing the way we observe, interpret and predict environmental processes. In meteorology, hydrology and risk science, AI does not stand as a shortcut but as an **amplifier for knowledge**, one able to draw greater value from complex data and strengthen conventional physically based modelling. Today's most advanced research emerges from the interplay between algorithms, observations and numerical models.

In the weather forecasting field, AI-based models have shown great progress in terms of speed and predictive capacity, yet the most complex variable – precipitation – still requires a firm grounding in physical principles. This is illustrated by the METEO department's post-processing work on numerical weather prediction forecasts. AI does not replace the models – it merges their information, corrects bias and improves rainfall estimate accuracy through multi-model approaches. The results show significant improvements, especially at low and medium thresholds, nevertheless underscoring a key point: **without high-quality observation data, the potential of AI remains limited.**

A similar principle guides research on AI and hydrology, where machine learning and advanced statistics are used to improve snowfall modelling. By integrating data from ground stations and satellites, and pairing physically based models with statistical emulators, the work aims to build distributed, realistic and computationally sustainable frameworks. Not a replacement of the physical, but a way to **make it more scalable and applicable to complex contexts** such as those in the Mediterranean area.

Artificial intelligence is also playing a role in the study of emerging environmental risks – wildfires for instance. Models such as PROPAGATOR integrate probabilistic approaches, physical simulation and AI to represent fire propagation, forest-fuel evolution and transitions between surface and crown fires. Dynamic forest-fuel maps – updated practically in real-time thanks to large language models – are becoming practical tools for risk forecasting and support to decision-making.

From storms to wildfires and from snow to rain, a clear message emerges: innovation lies not in replacing models, but in their **intelligent integration**. When driven by quality data and a solid understanding of physical processes, AI becomes a powerful tool for interpreting the complexity of climate change and for converting scientific knowledge into operative capability.

Nonetheless, AI is not only for research. During 2025, we invested in **in-house training on artificial intelligence through two tailored courses**. The basic level introduced the core concepts of AI and its application domains, laying the foundations for a shared language across our organization. Instead, the advanced course focused on large language models, exploring their programmatic uses, agent design, and integration with other systems via a model context protocol. This training has boosted operative skills and critical awareness in the use of AI technologies.

WATER IN THE FRAGILE BALANCE BETWEEN SUMMER AND WINTER

Between the winter and summer of 2025, water resources in Italy showed their complexity and fragility, revealing a pattern made up of contrasts, regional imbalances and knock-on effects. Images of heavy winter snowfall conveyed the impression of a generous season. However, quantitative analysis of the **snow water equivalent** painted a more complex picture: a nationwide **33% deficit was recorded, with marked differences across the various river basins, lakes, reservoirs and altitudes.**

In Northwest Italy, snowfall between late December and early January contributed to a partial recovery, taking the Po River basin back within its year-to-year variability range. Nevertheless, elevation remained a decisive factor: at the highest altitudes, where snow contributes most to supplying summer water reserves, snowpack levels remained below the average. **The case of Prato Nevoso** – which went viral on social media – illustrates how events perceived as exceptional often fall within historical norms: it was not a record event, but simply a 'real winter' – something now increasingly uncommon.

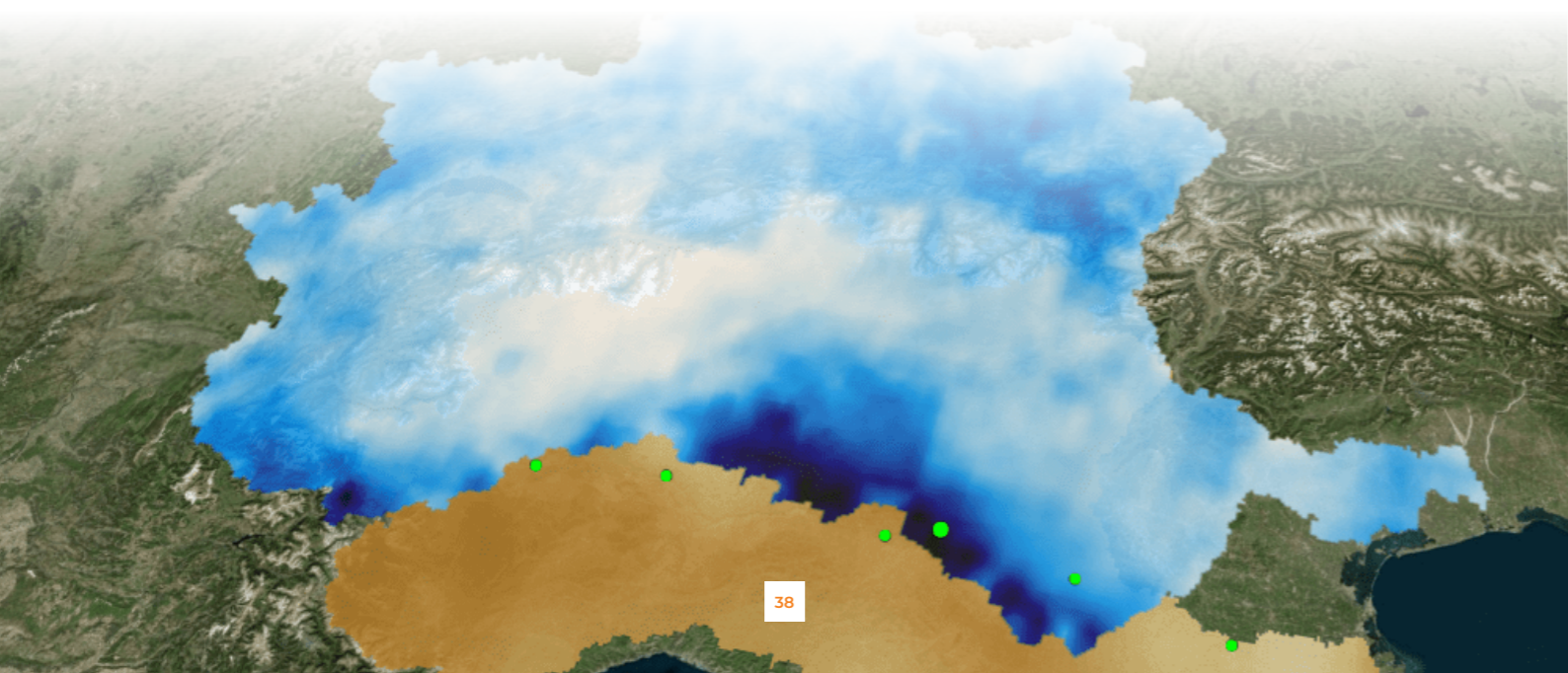
The situation was different in the Northeast, where the Adige River basin kept up a consistent and severe deficit (down by about 67%), **typical of snow droughts**, with little snow even at the highest altitudes and no new snowfall. Likewise, despite some signs of recovery, snow presence remained fleeting in the Apennines, due to above-average temperatures, which restricted the snowpack in acting as a seasonal reserve.

These conditions had direct repercussions on the summer. As the **snow melted early** – up to two months early in Central Italy – it deprived rivers and reservoirs of crucial inflows precisely during the months of greatest demand. Summer 2025 was in fact marked by **persistent heat**, irregular rainfall patterns and **an increase in extreme weather events**, including violent storms, torrential downpours and flash floods, such as in Bardonecchia, Grosseto, parts of Liguria and Milan, with its Seveso River.

Hydrological nowcasting made it possible to predict responses by reservoirs, lakes and rivers several hours in advance, confirming the importance of advanced predictive tools.

In Southern Italy, water shortages were permanent in nature. Reservoirs and lakes in Sicily showed a consistently shrinking surface extent – observed by the Sentinel-2 satellites – as a sign of a constant decrease in the water available to communities and ecosystems.

Overall, water confirmed itself in 2025 as an ever-present issue in ongoing climate change. **What happens in the mountains in the winter is reflected in the rivers, lakes and plains in the summer.** Monitoring this seasonal continuity is today essential for systematically reading climate change and for preparing more effective responses.



A MULTI-RISK APPROACH TO SUPPORT POLICY-MAKING

It is now a well-established fact that risks never occur 'one at a time'. They come in groups, bring knock-on effects and amplify one another. A wildfire may trigger soil erosion and hillside instability, a drought may develop into social and economic crisis, a flood might paralyse essential infrastructure and cause cascading impacts. This is why public policy can no longer be based on readings restricted to a single sector: a multi-risk approach is necessary, to **combine hazard, exposure and vulnerability and then translate these elements into practical choices, investment priorities and timely decision-making.**

This transition was central in the **Technical Workshop on Risk Knowledge for Multi-Hazard Early Warning Systems** organized by UNDRR at the Priamar Fortress in Savona (26-28 November 2025). The workshop addressed a persistent issue: the gap between data and decisions. In many contexts, datasets are too dissimilar, methods are not comparable, and coordination between technical expertise and policy remains fragmented.

The **Training of Trainers** programme, based on the Handbook on Risk Knowledge for Early Warning Systems and co-organized by CIMA Research Foundation, demonstrated how risk knowledge can make alerts truly actionable: it connects indicators and activation thresholds to procedures and windows of opportunity for early action, even building clear actionable messages.

In parallel, the Italian scientific community consolidated multi-risk tools in 2025 through RETURN, the PNRR-funded partnership bringing together over 800 researchers (see page 22). **From integrated management of floods and droughts, to wildfire models** (such as PROPAGATOR), through to analysis of critical infrastructure interdependencies and scenario- and indicator-based climate services, RETURN has reinforced the bridge between science and policy, also incorporating social and legal aspects of risk governance.

At an international level, launch of the EW4All national roadmap in Niger (validated in May 2025) and inauguration of the COVACC situation room in Niamey show how prevention can become public policy, **thanks to co-design, training and interoperability processes, and the AMHEWAS framework.** In Europe, services such as ARISTOTLE-ENHSP provide support to the civil protection system by delivering science-based multi-risk assessments to manage complex emergencies.

The message is a clear one: a multi-risk approach is not a technical exercise but a choice. It is what enables resilience to be built up, priorities to be effectively set, and decision-making to be faster, inclusive and grounded on evidence.

IMPACT-BASED EARLY WARNING SYSTEMS

During 2025, impact-based early warning systems (IB-EWS) reached a watershed moment in disaster risk reduction. They are no longer limited to detecting when an extreme weather event may take place but aim to specify what impacts it will generate, where it will hit and who it will affect, delivering information that can be directly used to **activate early preventive action.** This paradigm shift is today essential in a climate change context amplifying the severity and frequency of floods and drought, which disproportionately affect the most vulnerable groups.

An effective impact-based approach integrates **hazard forecasts with dynamic data on exposure and vulnerability, broken down by gender, age, disability and socio-economic conditions.** The experiences in East Africa show that vulnerability is not spread evenly: during floods, for instance, women and girls face specific barriers hindering early action. These are connected with caregiving responsibilities, limited access to information and unsafe shelter infrastructure. In an IB-EWS, these factors have to be recognized and translated into effective messages, accessible evacuation procedures, and targeted protection measures, to minimize the risk of early warnings being unheard or ignored.

Co-design is a key factor in this evolution.

In keeping with the Early Warnings for All intents, initiatives such as EarlyWarning4IGAD illustrate the importance of involving end users – local authorities, humanitarian aid groups and at-risk communities – in the building of systems. Across the Greater Horn of Africa, co-designing conceptual risk

models alongside small-scale farmers, people with disabilities, women and those living in refugee camps has brought to light 'layered' forms of risk, enabling this knowledge to be integrated into existing operating systems.

In terms of technology, IB-EWS are reaching operational maturity. In Southeast Asia, for instance, impact-based flood forecasting platforms integrate high-resolution hydrological models, flood maps and risk assessments on communities, essential services and infrastructure, which are updated several times daily. The presence of standardized tools for **co-generating early warning bulletins cuts decision-making times and strengthens government authorities' response capacities.**

On a continental scale, initiatives such as AMHEWAS in Africa demonstrate how an impact-based approach can also be applied to drought, by combining climate indicators with customized exposure and vulnerability levels, to evaluate emerging impacts in various sectors. In this light, early warnings become a risk governance tool capable of merging science with policy-making and social equity.

Making early warning systems truly effective in 2025 has therefore meant co-generating knowledge, recognizing vulnerabilities and different capacities, and turning forecasts into inclusive early action. A crucial step not only to save lives but also **to reduce inequalities and to avert the social risks that often accompany climate disasters.**



EARLY WARNING SYSTEMS IN FRAGILE CONTEXTS

In areas affected by armed conflict, political instability and protracted humanitarian crises, an early warning system (EWS) is much more than a mere technical tool: it is a vital factor in protecting the population and in continuing essential services. In countries such as **Sudan, Somalia and Ukraine**, where climate change amplifies already extreme vulnerabilities, ensuring that the EWS remains operational means reducing the loss of human life, supporting humanitarian action and strengthening institutional resilience, also during the most acute phases.

In Sudan, CIMA Research Foundation has been working with the Italian Agency for Development Cooperation (AICS) since 2020 to strengthen local governance and capacities in hydraulic risk management, contributing to flood and drought mitigation. The APIS - Early Warning and Civil Protection for Floods and Droughts in Sudan project, which began in 2021, has seen **implementation of a nationwide EWS based on technological tools, training and operational procedures for civil protection**. When war broke out in 2023, a paradigm shift became necessary: the new goal was **to ensure continuity of the alert service, adapting it to a context of emergency**. Enhanced coordination between civil protection operators, meteorological services and humanitarian stakeholders – in conjunction with regional networks and the Early Warnings for All initiative – has enabled forecasting capacity to be successfully sustained. A milestone moment was inauguration of the National Council for Civil Defense situation room in Port Sudan in February 2025, as this means the nation can have operational infrastructure for managing emergencies.

In Somalia too – a country highly vulnerable to drought and flooding – strengthening EWS is crucial in a context of institutional fragility and insecurity. As part of the CREWS initiative and on behalf of UNDRR, CIMA Research Foundation has provided support to improve meteorological and hydrological services and to develop a nationwide integrated EWS. Through the myDEWETRA.world platform, integration of hazard, exposure and vulnerability data enables delivery of impact-based forecasts, which are essential for connecting alerts with preventive action. Training, co-designing of tools and operative simulations reinforce the Somali authorities' capacity **to turn early warnings into early action**, moving beyond a purely reactive logic.

Lastly, in Ukraine, the conflict has underscored **how important weather and climate information is also in humanitarian planning**. As part of the PPRD East 3 programme, CIMA Research Foundation has developed an impact-based forecasting system that integrates meteorological variables and humanitarian indicators to support day-to-day operative decision-making by institutions and organizations on the ground. The multi-risk maps – bringing together floods, fires and unexploded mines and devices – allow cascading effects to be detected within a highly complex scenario.

From Africa to Eastern Europe, these experiences demonstrate that, even in contexts of armed conflict, investing in early warning systems means **investing in protection, dignity and resilience, by building bridges between science, institutions and humanitarian action**.

SATELLITE MONITORING: MEMORY FOR THE PRESENT AND FUTURE

Observing the Earth from space means building constant records – a memory – of the processes shaping the planet. In our context of rapid climate change, satellite monitoring has become a fundamental tool for understanding complex occurrences such as extreme precipitation, drought, snowmelt and fluctuations in bodies of water. From history-based reanalysis to next-generation missions, **satellite data now form a bridge between scientific research and operational application**.

A prime example is **CHAPTER** (Computational Hydrometeorology with Advanced Performance to Enhance Realism), the ultra-high-resolution reanalysis presented at the European Meteorological Society Annual Meeting 2025. With a 3-km spatial resolution and hourly data spanning from 1981 to 2022, CHAPTER enables reconstruction of over 40 years of extreme events across Europe, the Mediterranean basin and the North Sea. Thanks to a diagnostic approach, thermodynamic and dynamic elements are separated out within the datasets, highlighting the dominant role of convective processes in intensifying extremes. Therefore, **not only a memory of past climate conditions, but also solid foundations for hydrological modelling and impact assessment**.

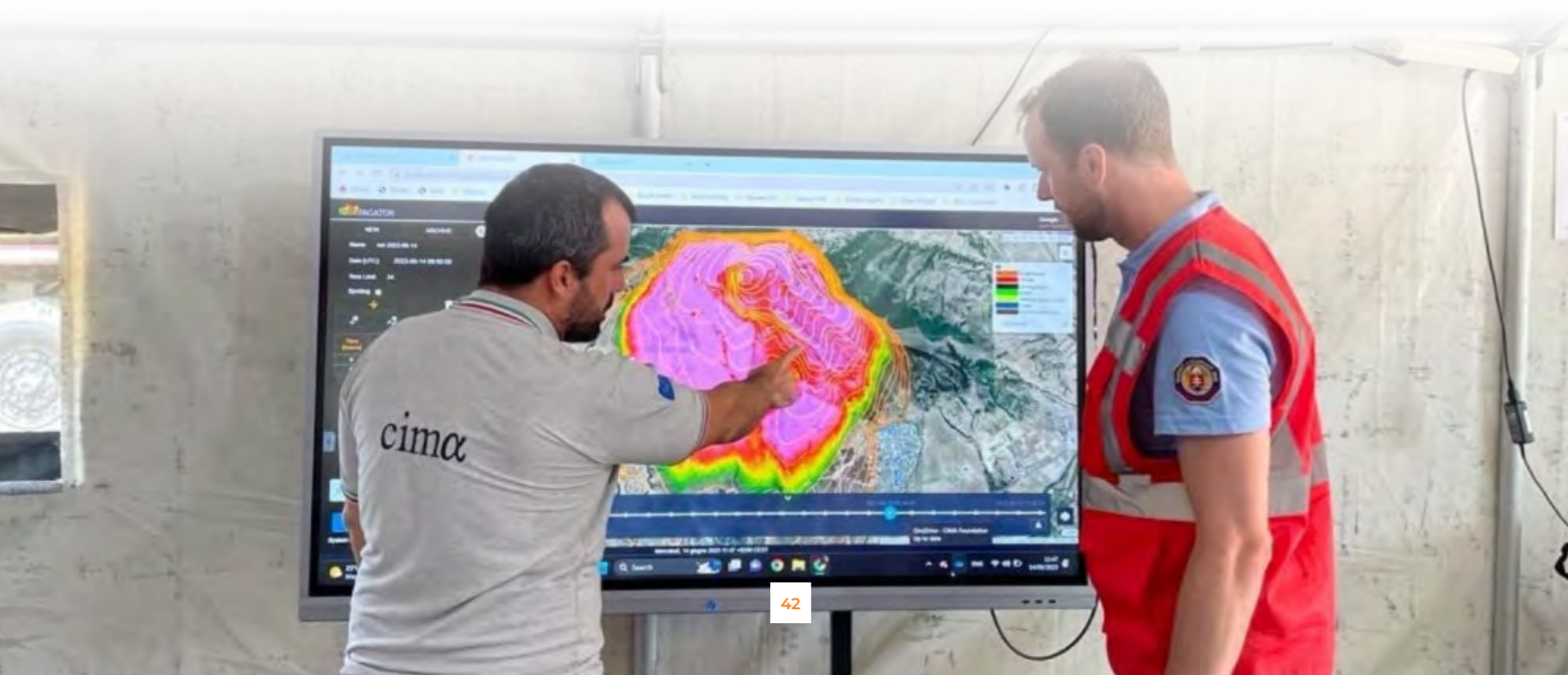
This history-based perspective closely interacts with the future of observational research, as embodied in **Hydroterra+**, the previously mentioned satellite mission proposed as an ESA Earth Explorer candidate. Hydroterra+ involves putting a C-band radar in geostationary orbit to constantly monitor column water vapour, snow and soil moisture from above the Mediterranean basin and the Sahel-Volta area – climate hotspots exposed to extreme weather events. The aim is **to close the gap in observing rapid water-cycle processes, while also improving data assimilation and forecasting capacity**.

Besides large-scale missions, satellite monitoring today is already delivering operational services. In Italy, **CIMA Research Foundation has developed an automated system for mapping water-body extent through Sentinel-2**, with updates provided every 5 days. Its integration with synthetic aperture radar (Sentinel-1 and COSMO-SkyMed) makes it possible to overcome the obstacle of cloud cover and to achieve spatial resolutions of up to 5 metres. The validation exercises conducted in Sardinia, Sicily and Basilicata showed high consistency with official datasets, also underlining the widespread negative anomalies for Sicilian lakes and reservoirs in 2024 – clear evidence of an ongoing water crisis.

In parallel, **algorithms such as AUTOWADE2.0 enable constant near real-time flood monitoring**, with integrated automated classification techniques and radar-based models. Its application in Emilia-Romagna and Tuscany has demonstrated the system's effectiveness in contexts of emergency.

At a continental level, platforms such as Africa Drought Watch **combine satellite data, climate indices and local information** to distinguish temporary episodes from protracted crises, thus strengthening decision-making and early action.

From receding snowlines on the Alps to shrinking water reserves in Sicily, through to space missions to observe atmospheric processes from above – satellite monitoring today is a fundamental knowledge infrastructure. Not only an observation device but also a prevention and planning tool. In an era of growing extremes, looking at the Earth from space means acquiring awareness and converting data into action to safeguard communities and ecosystems.



DRONES: OPERATIONAL EYES ON RISK

In a changing climate, risk does not manifest itself only as sudden extreme events: it often grows silently, season after season. Within this framework, **drones (UAVs - unmanned aerial vehicles) are emerging as key technological devices for turning observations into decisions: they collect high-resolution data rapidly, over areas that are challenging to reach, and translate the data into models, maps and procedures to inform risk management.**

Glaciers: measuring the disappearing water

Drones have revolutionized the scope to interpret ablation and accumulation processes in the mountains. Thanks to a UAV survey campaign in partnership with ARPA Valle d'Aosta, we have built ultra-high-resolution digital models of the terrain on the Rutor Glacier, **monitoring the changes in glacier surface.** These data in turn feed regional hydrological models, **improving estimates on the water available in mountain reservoirs and lakes, and informing tangible water management choices.** The same approach has been used in even more sensitive contexts such as the Bolivian Andes: on the Charquini Sur – a vital water source for the La Paz-El Alto growing urban area – **drone observations have enabled researchers to quantify the shrinking snowpack and changes in the glacier surface.**

Biodiversity: 'non-intrusive' data for protecting ecosystems

Risk management is not only pertinent to civil protection and infrastructure. It also includes the health of ecosystems, since these are natural buffers against instability. **The EMPHATIC project sees drones become minimally intrusive devices for photogrammetry and for sampling the blowhole air of cetaceans in the Mediterranean Sea.** For species such as the fin whale and the sperm whale, the use of UAVs alone means quality data (size, presence of parasites, respiratory tract microbiome) can be collected without disturbing the animals: this information is precious for understanding health status and for predicting vulnerabilities linked with environmental and climate pressures.

Italy's national parks: standardized monitoring to guide conservation. Within the 'ISPRA – drone-based surveys of protected natural habitats' project under the PNRR DigitAP initiative, **UAV technology is used to support habitat mapping in all 24 Italian national parks, and to develop guidelines to document their evolutionary dynamics and pressures** (climate, tourism, human impact). In this context, drones are more than just 'flying cameras': they are a step towards standardizing method and technology, since UAVs enable generation of data that are comparable and repeatable over time – vital for effective conservation policies.

Forest fires: from prevention to action, even beyond borders

It is nevertheless in wildfire risk that the 'drone-model-decision' chain shows its greatest operative strength. In the South Caucasus, **the SAILOR project has integrated drones, weather stations and simulation models (PROPAGATOR)** with cross-border simulation exercises in Georgia and Azerbaijan: under realistic conditions, the combined use of in-situ data and modelling enabled the rapid estimation of fire propagation direction and improved response and communication between operations centres. The same approach is at the heart of **EWRECA**, which seeks to establish a coordinated strategy in the southern Adriatic: **drones and modelling become tools for cooperation, training and early warnings.**

Lastly, **FIRE-SCENE sees drones joining the planning against the 'new' Mediterranean wildfires:** ever more extreme and simultaneous events, often affecting peri-urban, protected or tourism areas. In Calabria, CIMA Research Foundation has developed **annual forest-fuel maps using AI techniques and supported by targeted drone-based surveys of the most fire-prone forests.** The collected data are then converted into bulletins and communication chains tailored to the different users: operations rooms, local stakeholders and citizens.

In essence, **drones are a type of risk management technology because they shorten distances – the distance between land and data, between data and models, and between models and decision-making.** And, in an age of climate extremes, this speed can make **the difference between chasing an emergency and getting ahead of it.**

THE MOST VIEWED NEWS IN 2025

The five most viewed news articles in Italian and the five most viewed in English are featured, along with two 'bonus' items that also ranked among 2025's most viewed but that were published at an earlier date.

THE MOST VIEWED CONTENT IN 2025

The links lead to the three contents performing best for each channel

	TOPIC AND SHORT TITLE	CHANNEL	LINK
Snow	December 2025: First update on snowmelt water resources in Italy 2025/2026	Facebook	https://shortlink.uk/1mkg3
Fires	Research article: "Fuel-aware forest fire danger rating system RISICO: a comparative study for Italy"	Facebook	https://bit.ly/3NePO8x
Technology and tools	December 2025 myDEWETRA course for technicians at Civil Protection Operational Centres	Facebook	https://bit.ly/4b4YaHz
Snow	February 2025 Third update on snowmelt water resources in Italy 2024/2025	LinkedIn	https://bit.ly/4b7y0Ef
We are hiring	#WeAreHiring Recruitment of researchers to strengthen the Hydrology and Hydraulics division	LinkedIn	https://bit.ly/3N4f0yk
AI - Snow	Use of the Long Short-Term Memory neural network for the management of snow-fed water systems	LinkedIn	https://tinyurl.com/yubufrcp
Snow*	December 2025: First update on snowmelt water resources in Italy 2024/2025	Instagram	https://www.instagram.com/p/DSZo7xuDSEH/?img_index=1
Snow*	November 2025 Start of the snow accumulation phase in Italy	Instagram	https://www.instagram.com/p/DRkQNDEjQz9/?img_index=1
Snow*	May 2025 Final overview of surface water resources in Italy 2024/2025	Instagram	https://www.instagram.com/p/DJY1eYdto32/?img_index=1
Human Resources	Human Resources Page	CIMA website	https://www.cimafoundation.org/risorse-umane/
Calls	Open calls Page	CIMA website	https://www.cimafoundation.org/bandi-aperti/
About us	About Us Page	CIMA website	https://www.cimafoundation.org/chi-siamo/

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