cmcc
Centro Euro-Mediterraneo
sui Cambiamenti Climatici

Annual Report 2013

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MISSION

To investigate and model our **climate system** and its interactions with **society** to provide reliable, rigorous, and timely **scientific results**, which will in turn stimulate sustainable growth, protect the **environment**, and **develop science driven** adaptation and **mitigation policies** in a **changing climate**

VALUES

CMCC is committed to scientific integrity and independence, to foster scientific progress and innovation.

CMCC is committed to encourage discipline convergence to promote new and creative ideas and to ensure that environmental observations, analyses, predictions, and services effectively meet the needs of society.

CMCC is an equal opportunity employer, actively promoting diversity in the workplace.

CMCC is committed to inform and facilitate the dialogue between scientists, decision makers, and the general public to support decisions and actions for the benefit of society and the environment.

CMCC is a non-advocacy institution.

THE GLOBAL COMPACT
WE SUPPORT

Since February 2012, CMCC participates in Global Compact, the United Nations' initiative for the creation of a worldwide network of bodies, institutions and businesses companies ready to undertake commitments in the area of human rights, employment, environment and the fight against corruption.

CMCC

Science, climate and interactions with society and the ecosystems

CMCC (Centro Euro-Mediterraneo sui Cambiamenti Climatici: Euro-Mediterranean Center on Climate Change) is a research organization that conducts and promotes scientific and applied activities within the scope of international climate change research. CMCC aims to gain in-depth knowledge on climate variability, its causes and its consequences, through the development of high-resolution simulations using global models of the Earth System as well as regional models, focusing in particular on the Mediterranean area.
The specific objective of these research studies is to provide scientifically reliable, rigorous and updated results that will help to investigate, know and represent the interactions between the climate system, the marine and terrestrial ecosystems, and society.

The Center is organized in the form of a network distributed throughout the country with locations in Lecce, Bologna, Capua, Milan, Sassari, Venice, Viterbo and Benevento, which involves and connects public and private entities working together on multidisciplinary studies concerning issues of interest to the climate sciences.

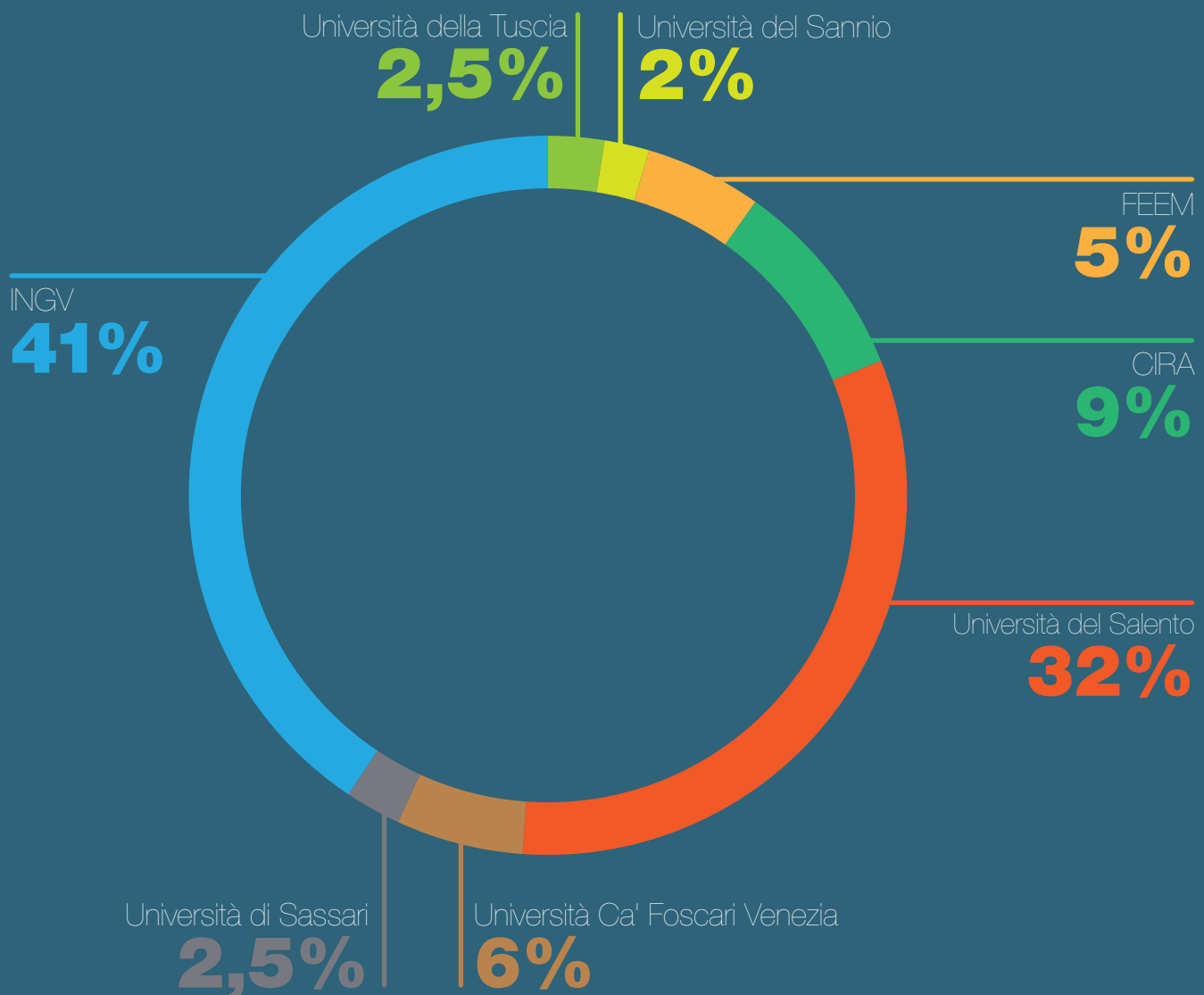
CMCC was created in 2005 with the financial support of the Ministry of Education, University and Research (Ministero dell'Istruzione, dell'Universita` e della Ricerca - MIUR), the Ministry of the Environment, Land and Sea (Ministero dell'Ambiente e della Tutela del Territorio e del Mare - MATTM), the Ministry for Agricultural and Forestry Policies (Ministero delle Politiche Agricole e Forestali - MIPAF) and the Ministry of Finance (Ministero delle Finanze - MEF). It is a non-profit research center that acts as an institutional reference point, both at national and at international level, for policy decision makers, public bodies as well as public and private entities, whenever they require technical-scientific support.

GOVERNANCE

The Center's research lines and activities are implemented through the active involvement of the CMCC's consortium members and through the sharing of their internal resources.

CMCC relies on the extensive and established research experience of the eight consortium members.

CMCC Shareholders



The general meeting of Shareholders appoints:
- the **Board of Directors (Board)**, with ordinary and extraordinary management powers, which has a three-year term of office and is composed of 11 members;
- the **Executive Committee**, to which the Board delegates technical and financial matters

The **Scientific Advisory Panel (SAP)** is appointed by the Board and is made up of highly qualified experts selected among the international scientific and academic community. The SAP has a three-year term of office and provides advice on CMCC's research activities, strategic plan and organization, as well as support on specific matters raised by the Chairman of the Board.

Board of Directors

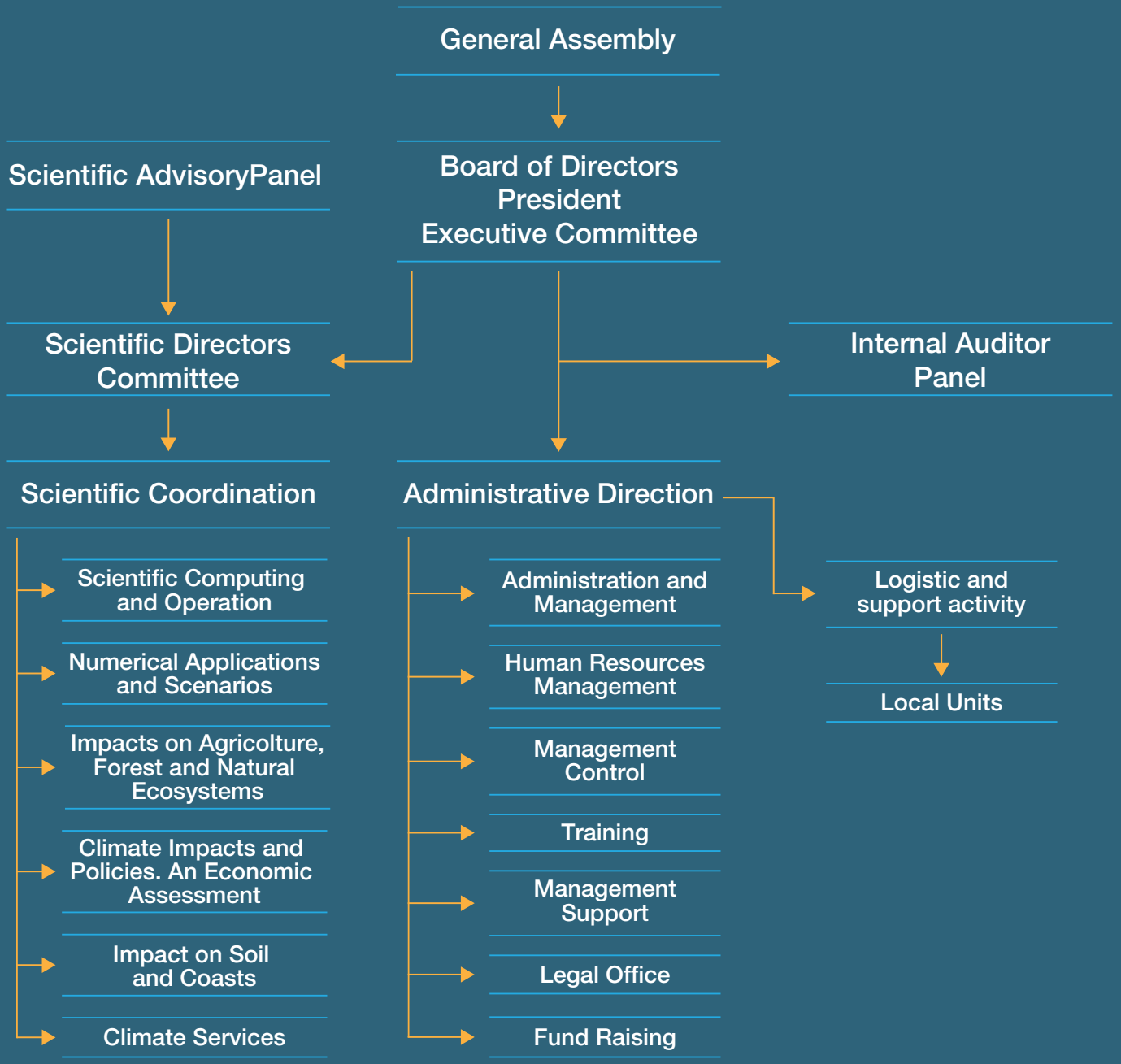
Dr. **Antonio Navarra** – INGV (Chair)
Prof. **Giovanni Aloisio** – Università del Salento
Prof. **Carlo Carraro** – Università Ca' Foscari Venezia, FEEM
Prof. **Riccardo Valentini** – Università della Tuscia
Dr. **Fabio Florindo** – INGV
Dr. **Massimo Ghilardi** – INGV
Prof. **Piero Lionello** – Università del Salento
Prof. **Antonio Marcomini** – Università Ca' Foscari Venezia
Dr. **Pasquale Schiano** – CIRA

Scientific Advisory Panel

Dr. **Paul Messina** – Argonne Leadership Computing Facility, Argonne
Dr. **Nadim Farrokh** – International Centre for Geohazards, Oslo
Dr. **Ghassem Asrar** – World Climate Research Programme, World Meteorological Organization, Geneva
Dr. **Ottmar Edenhofer** – Potsdam Institute for Climate Impact Research, Potsdam
Dr. **Giulio Boccaletti** – The Nature Conservancy
Prof. **Robert Socolow** – Princeton University, Princeton
Prof. **Laurence Tubiana** – Institute of Sustainable Development and International Relations, Paris

Executive Committee

Prof. **Giovanni Aloisio**
Prof. **Carlo Carraro**
Dr. **Massimo Ghilardi**
Dr. **Antonio Navarra**



CMCC has obtained the Certiquality and IQNet certifications, attesting that the Center meets the UNI EN ISO 9001:2008 Quality Management System standards.

RESEARCH DIVISIONS

The research network is distributed among six research divisions that share different knowledge and skills in the field of climate science.

Simulating the climate system

Based in Bologna, the Numerical Applications and Scenarios (ANS) Division focuses on the study of climate variability, the physical-biogeochemical interactions in the climate system, and the implementation of a pre-operational system for short-term ocean forecasting, especially through numerical simulations. Numerical models of different complexity characterize the tools used by the ANS Division, from global and regional scale ocean models (Mediterranean and Adriatic in particular) to wide-ranging atmosphere, ocean, sea-ice, vegetation, and marine biogeochemistry coupled models.

OceanLab

The Ocean Lab (Operational Coastal Oceanography Laboratory) was created in 2012 in Lecce. The Laboratory is part of the activities of the ANS Division, and houses a team of scientists who use advanced technologies applied to the study of coastal seas and the development of tools for supporting the activities performed at sea. Inaugurated concomitantly with the launch of the projects IONIO (IONian Integrated marine Observatory) and Tessa (TEchnologies for Situational Sea Awareness), the Ocean Lab performs activities that combine applied technological, engineering and scientific components to areas of intervention including, among others, prevention and control of pollution, sustainable fishing, and transport safety. The work carried out at the Ocean Lab generates products and services such as, for example, the development and production of short term ocean forecasts, models and applications in the field of maritime safety (i.e. oil spill modelling and decision support system development), coastal modelling (i.e. sediment transport) and climate impacts assessment in the coastal area.

Translating climate change in policy and in economic values

The Climate Impacts and Policy (CIP) Division develops the social-economic research carried out at CMCC. This division translates the analysis of the scenario provided by ANS Division's climate dynamic models and the consequent quantification of climate change impacts delivered in economic values by the ISC and IAFENT Divisions. The economic assessment is fundamental to design appropriate emissions policies regarding mitigation and adaptation to climatic change. There are two CIP Division offices, which are based in Milan and Venice.

Focusing on agriculture and ecosystems

The activities of the Impacts on Agriculture, Forest, and Natural Ecosystems (IAFENT) Division focus on the diagnosis and forecast of climate change impacts on agriculture, as well as natural and semi-natural Earth ecosystems, mainly within a Mediterranean climate but also within the entire globe's climate. Based in Viterbo and in Sassari, IAFENT research produces climate risk scenarios for natural and agricultural ecosystems and provides models which present the dangers of climate change, fire, and desertification, pertaining to agricultural and forest areas.

Climate risks for soil and coasts

The Impacts on Soil and Coasts (ISC) Division is based in Capua and in Venice. The Capua Unit focuses on the hydrogeological risks connected with climate change and integrates climate models at the regional scale with the analysis of risks related to extreme events and their impacts (such as landslides and floods).
A correct evaluation of the risks is a first and fundamental step to line up strategies for the adaptation and mitigation of hydrological risks due to climate change. The Venice Unit aims to develop and apply methodologies to analyze environmental impacts and risks correlated with climate change and natural hazards. The team also focuses on the impact of climate change regarding pollution at the regional and global scale in order to identify its potential effects in modifying the bioavailability to toxic chemicals.

Supercomputing for climate change research

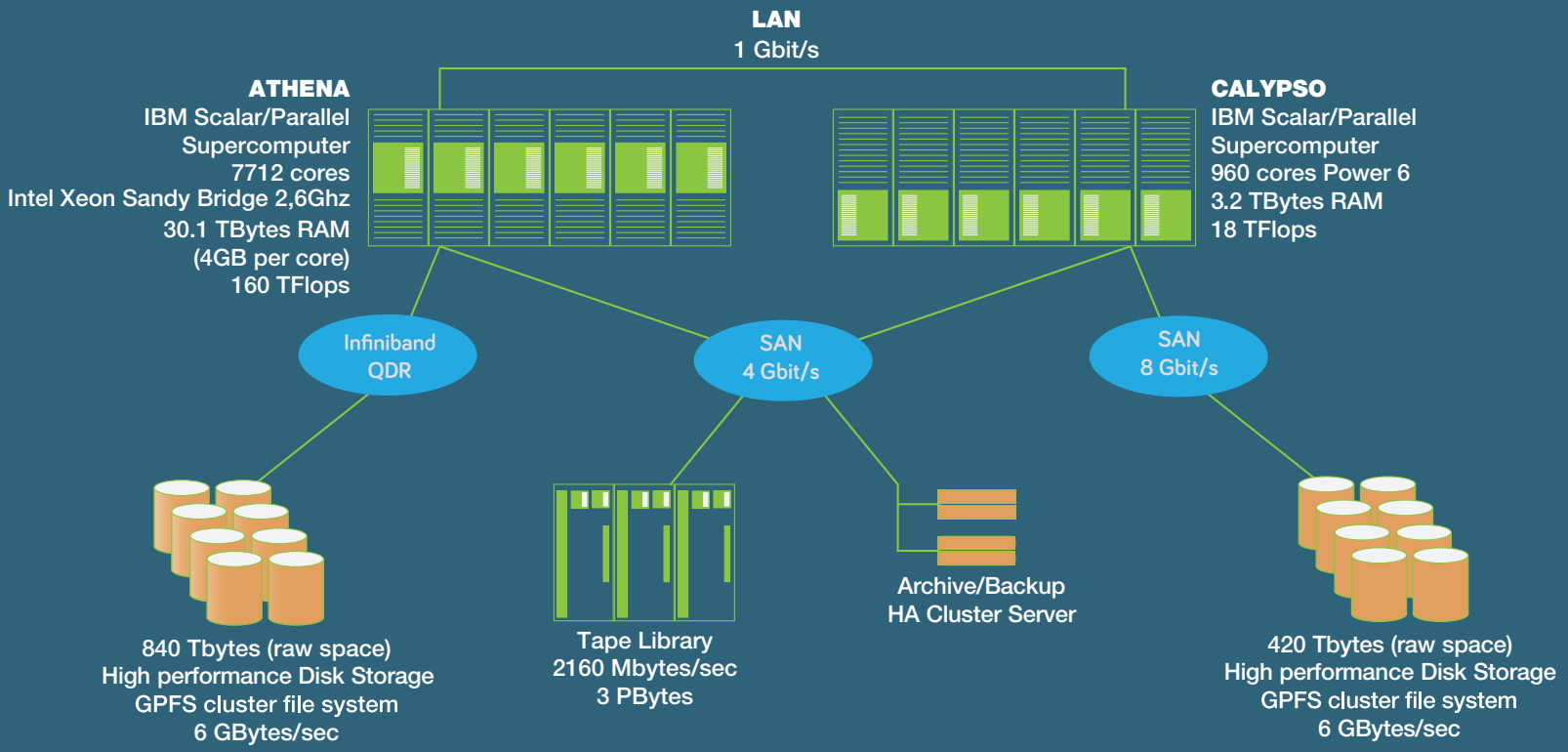
The Scientific Computing and Operations (SCO) Division carries out Research & Development activities on Computational Science applied to climate change. In particular, it focuses on the optimization of HPC architecture numerical models and the management of large volumes of scientific data regarding exascale scenarios. The team works on the optimization and the parallelization of numerical models for climate change simulations (both climate and impact models) as well as the design and implementation of open source solutions addressing efficient access, analysis, and mining of scientific data in climate change. Based in Lecce, the SCO Division also deals with the management system of the High Performance Computing facilities owned by CMCC Supercomputing Center and the research on Green Computing for an efficient (energy driven) use of computational resources.

Delivering climate science outputs to stakeholders

Based in Bologna, the Climate Services (SERC) Division was established in 2011 and is responsible for the production of climate predictions, climate change projections, and the communication of obtained results and information to a broad range of users: decision makers, industry stakeholders, private companies, political bodies, public administration, scientists, and researchers. Climate predictions on seasonal and multi-annual scales and climate change projections on decadal and centennial scales are based on CMCC high-resolution global and regional models. In addition, the SERC Division coordinates research on adaptation policies to climate change and provides technical and scientific support to institutions involved in climate change multilateral negotiations (EU, IPCC, UNFCCC).

Super Computing Center: the CMCC technological heart

The core of the technological infrastructure that allows CMCC to design and develop scenarios and models on the future of the climate is located in Lecce. Specifically, the Ecotekne complex houses the Supercomputing Center, whose next-generation computers are used by one of the main structures in Europe. Scientific computing is a very important part of climate research, requiring increasingly complex computational capabilities and powerful machines to develop simulations and models able to provide more accurate, detailed and better defined results. This is why the CMCC's Supercomputing Center has recently renovated its infrastructure, strengthening its computing and data storage capabilities.
A new next-generation IBM iDataplex supercomputer based on Intel E5-2670 multicore architecture and InfiniBand interconnection has been added along with the scalar system composed of IBM nodes based on Power6 processors. Currently, thanks to the use of highly advanced technologies, the CMCC's Supercomputing Center has a computing capability of over 160 TFlops (160,000 billion operations per second).
The new system is integrated with two DDN sfa10000 storage subsystems in cluster architectures with an IBM GPFS file system to allow efficient and reliable access to data. The design of the computing architecture, comprised of the IBM dx360M4 server cluster, the InfiniBand interconnection network and the storage subsystem, accelerates research activities and improves the quality of research activities for the development of future climate change scenarios and impacts: from the economy to agriculture, from coastline profiling to marine and terrestrial ecosystems, from the hydrogeological cycle to health.



PEOPLE

The people who work at CMCC are an essential resource that provides and ensures the quality of scientific research, the effective performance of administrative and organizational activities, and the maintenance and development of technological structures and equipment. Therefore, CMCC's main goal is to make the most of the potential and talents of those who work for the CMCC. The Center is also committed to developing and increasing the skills and knowledge of its employees in their respective areas, in order to achieve research objectives as well as to enrich the global community.

Because of the Center's structure and the type of activities it carries out, individual skills must promote cooperation within work groups, where the skills of each member contribute to teamwork and integration. A proactive and flexible spirit is encouraged by initiatives that include advanced training, brainstorming and group activities. The interdisciplinary approach that characterizes CMCC's work requires and contributes to the creation of specializations that are not easily available in the external market, and their growing value encourages the Center to make increasing investments in the quality of the processes related to the management of human resources.

The procedures for the management of human resources, in accordance with the requirements of UNI EN ISO 9001: 2008, include documentation systems of the training of employees who work in the center to ensure that the staff, including the administrative staff, may be equipped with the updated and adapted skills necessary for the activities of CMCC.

Regarding the recruitment and selection of new employees, the most important innovation of 2013 is undoubtedly the JAM - Job Application Manager, the online tool, which allows one to submit their CV to the CMCC website.

Taking into account the growth of the image, visibility, and the activities of the Center, there is an increase in the flow of information from people who respond to open professional positions or spontaneously submit their candidacy.

Designed and built to handle this flow of data in an efficient and integrated manner, the JAM is the heart of a system that allows a rapid and productive storage and sharing of data within the divisions, avoiding the diffusion of information and creating a database of skills shared between everyone at CMCC.

Achieving a quantitative analysis of the staff who contributed to the activities of CMCC during 2013 means to consider many types of contracts and collaborations whose duration does not always coincide with the calendar year. For this reason, in order to integrate this complexity into a coherent account with reality, we have perfected the calculation of full-time equivalent (FTE) considering a single number of hours per year for all types of contracts with CMCC employees.

The FTE is calculated by dividing the total number of hours worked by an employee with the number of hours a full-time employee would work in one year. For example, if 1,744 is the total number of hours a full-time employee would work in one year, an employee who works 872 hours would be a 0.5 FTE.
During 2013, according to calculations made with the policy described above, the number of people who worked at CMCC is equal to 119 FTE.

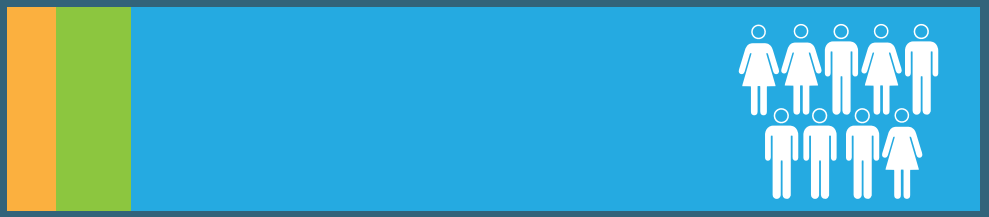
As in most of the research centers, the percentage of independent contractors is predominant compared to other types of contracts. People who carry out scientific and technical activities prevail, while 22% of the staff perform administrative roles and carry out communication activities.

CMCC confirms its vocation as a research institution that places great confidence on the younger generation: in fact the percentage of under-40 is more than 73%, while those who are over 50 are just over 8%. This is particularly significant, and has more value when seen along with the percentage (nearly 52%) of those who hold a PhD, which shows that CMCC is a research institution that has a young staff with high levels of training.

	Total	M	W
CMCC staff	**119**	**63**	**56**
CMCC permanent staff	13	6	7
Permanent staff from partner institutions	6	3	3
Other	100	54	46
AREA			
Administration, management and communication	26	9	17
Scientific / Technical	93	54	36
AGE			
Under 30	27	11	16
31 – 40	60	32	28
41 – 50	22	14	8
Over 50	10	6	4
NATIONALITY			
Italian	102	50	52
UE – non Italian	7	5	2
Extra UE	10	6	4
POSITION			
Senior	29	17	12
Junior	90	46	44

PEOPLE at CMCC
by numbers

STAFF



5%
permanent (from partner insitutions)

7.7%
permanent (CMCC)

87.3%
non permanent

AREA

21.8%
administration, management and communication

78.2%
scientific and technical

GEOGRAPHICAL DISTRIBUTION

86%
Italian

8%
extra UE

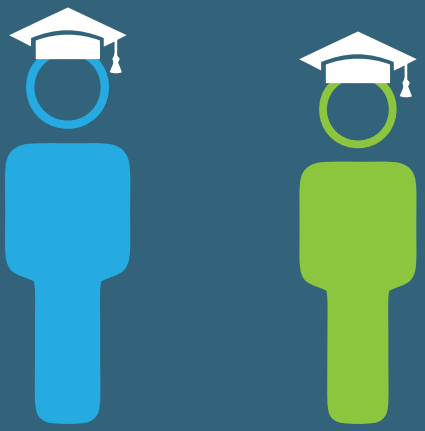
6%
UE non Italian

POSITION

24%
senior

76%
junior

EDUCATION



51.7%
PhD

48.3%
non PhD

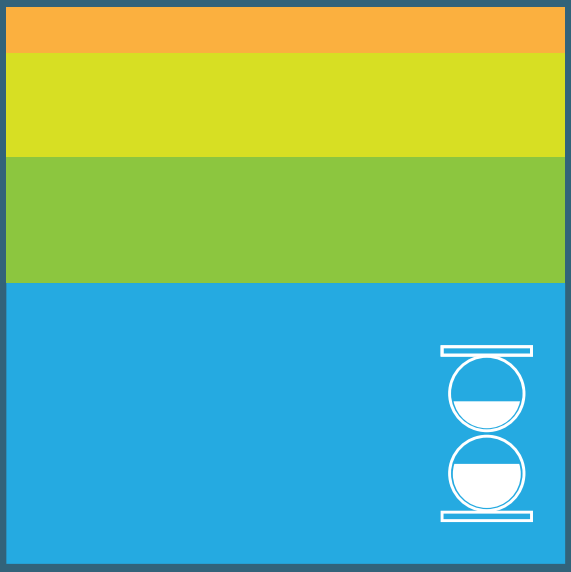
WOMEN AT CMCC

47%
of people working at CMCC

41.4%
of senior positions

41%
of people with PhD

AGE



8.4%
over 50

18.5%
41- 50

22.7%
under 30

50.4%
31- 40

RESEARCH PROJECTS

The research and development of scientific projects have been the core of CMCC's activities since it was established.

At 31 December 2013, CMCC's project portfolio consists of 111 projects, 55 of which are coordinated by CMCC.

The below funds are over and above the initial financing granted by: the Italian Ministry of the Environment, Land and Sea, the Ministry of Education, University and Research, the Ministry for Agricultural and Forestry Policies and the Ministry of Finance.

ORIGIN OF FUNDING	TOTAL	COORDINATED	ONGOING	CLOSED
EU FP6 & FP7	33	4	20	13
Other European funds	28	13	12	16
National funds	26	18	7	19
Other	24	20	2	22
TOTAL	**111**	**55**	**41**	**70**

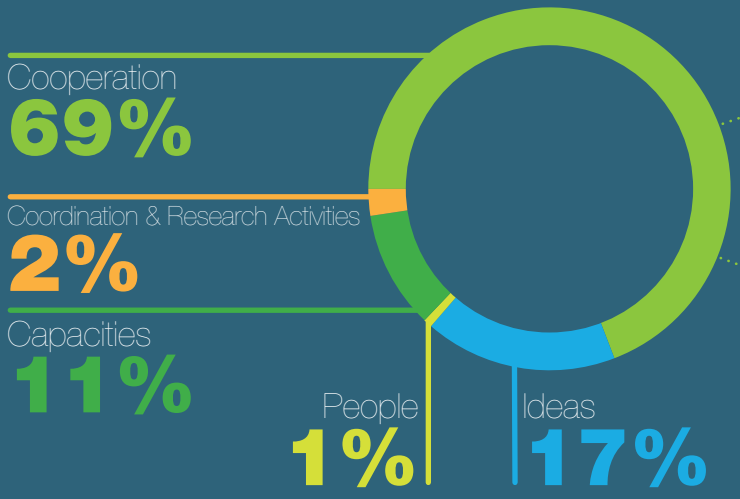
A national leader in scientific research on climate change, today CMCC is a top player in Europe, with a virtually equal proportion of domestic and international financers. In particular, 73% of acquired projects are due to CMCC's ability to compete successfully at the European level.

Origin of projects funding (per budget)

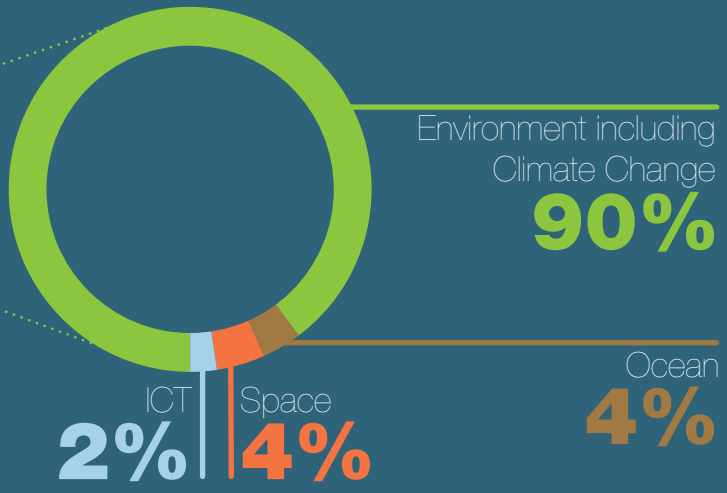
More specifically, CMCC's portfolio includes projects financed by the 7th Framework Programme (FP7) for Research and Technological Development 2007-2013.

2013 constituted a key year for CMCC to assess the success achieved within the seven-year FP7 program coming to its end, with many new calls answered by and project awarded to CMCC. The consolidated results as part of the 'Environment including climate change' theme of the "Cooperation" Programme are shown below.
2013 also represents the starting point for a new strategy to address the new challenges and expectations of the forthcoming Horizon 2020 programme, the new European financial instrument implementing the Union Flagship Innovation Initiative as well as the European Research Area to be launched in 2014.

FP7 Programs
(per budget)



FP7 COOPERATION Program
(per budget)



Although most of the projects in CMCC's portfolio (more than 90% of the budget) come from research project grants, CMCC also provides studies and analyses in the environmental area in support of the community, stakeholders and policy decision makers. These activities, funded through service contracts, testify a growing ability to acquire such resources over time, as shown below in the 2012 and 2013 graphs.

Type of funding per n. projects

Type of funding per budget

PUBLICATIONS

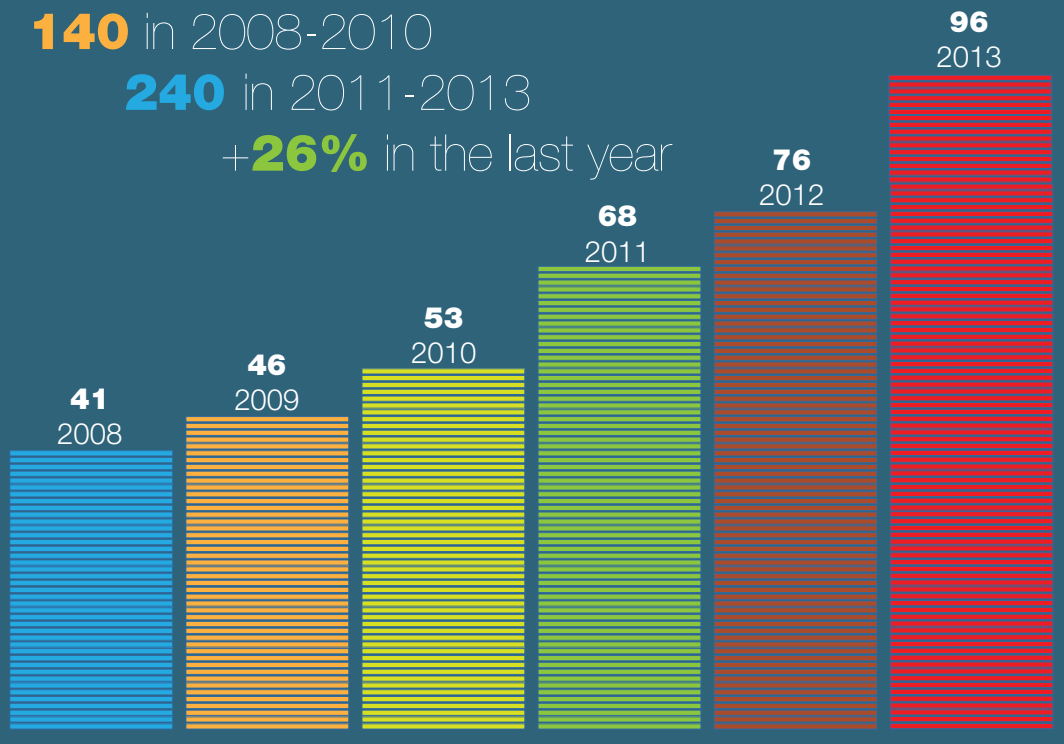
CMCC's editorial production is addressed to a diverse audience that includes the scientific community, policy decision makers, opinion leaders, and a general public interested in staying abreast on issues related to climate change research and policies. Therefore, the different types of publications issued by CMCC take into account the different recipients of the published information in terms of form and content.

Refereed papers

Intended for an expert and specialized readership, scientific publications are one of the main tools used to disseminate the results of CMCC's activities among the international scientific community.

Works considered for publication include articles and papers published by CMCC researchers in peer reviewed journals, many of which are included in the Journal Citation Report (JCR). The selected papers represent a tangible indicator of the quality of the Center's scientific production, resulting from multidisciplinary interaction between research divisions and from collaborations with major international institutions.

Refereed paper published by CMCC authors



Research Papers

As with the papers published in refereed journals, CMCC's Research Papers are intended for the scientific community and contain the results of research activities performed by the Center's divisions. These papers are published in a special collection available online at www.cmcc.it. The works published in the Research Papers series are also available for consultation and can be downloaded from the SSRN (Social Science Research Network) platform.

Social Science Research Network

Approximately **10,000** downloads of **Research Papers** since the **CMCC**'s inception

The increasing prduction of CMCC's Research Papers

+68% from 2011 to 2013

28 2011 **36** 2012 **47** 2013

Climate Policy News

Climate Policy News is a weekly column containing updates on international climate policies and news on energy markets and technology legislation. It also provides weekly updates on the carbon market in Europe. The publication is available on the CMCC website and is also distributed via e-mail.

International Climate Policy and Carbon Market

International climate negotiations, measures adopted by individual States to face climate change, and recent research studies on climate economics and policies are the subjects of this bimonthly column available on the CMCC website and also distributed via email to newsletter subscribers.

Climate Policy News *and* ***International Climate Policy and Carbon Market*** *are the result of CMCC's partnership with Fondazione Eni Enrico Mattei and with the International Center for Climate Governance.*

TRAINING PROGRAMS

Education programs are a very important part of the wide range of activities carried out by CMCC. The Graduate Programs, as well as the summer schools and winter schools, have earned an outstanding reputation over time within the climate change scientific community, thanks to the high level and international breadth of their offering and to partnerships with European universities, international institutions and world famous experts participating as professors and guest speakers.

Addressed to researchers already engaged in scientific activities with CMCC as well as to external students, the Center's educational initiatives aim to improve the participants' research performance, provide opportunities for professional growth and take full advantage of the energy and motivation of the younger generations - a valuable resource for an institution that operates in the area of advanced research.

Graduate Programs

CMCC Graduate Programs were inaugurated in 2008, in collaboration with three Italian universities (Università Ca' Foscari Venezia, Università del Salento e Università di Sassari) with the objective of promoting and coordinating advanced studies on the impacts of climate change and climate policies. The programs offer advanced courses and research activities, with special focus on themes concerning innovative management strategies, both from a physical and a socioeconomic perspective, for phenomena related to the climate and its changes.

The three universities contribute to the Graduate Programs through four distinct doctorate programmes: Science and management of Climate Change (Università Ca' Foscari Venezia), Agrometereology and Ecophysiology of Agricultural and Forestry Eco-Systems (Università di Sassari), Energy Systems and Environment and Climate Change Sciences (Università del Salento).

Advanced School on Data Assimilation

is the name of the course organized and hosted by CMCC every two years. Through theoretical lectures and practical exercises, the course focuses on the fundamental methods and techniques used in the Data Assimilation and state of the art applications. On 23-28 June, 2013 the third, the third edition of the course took place with the participation of lecturers and students from Europe and USA.

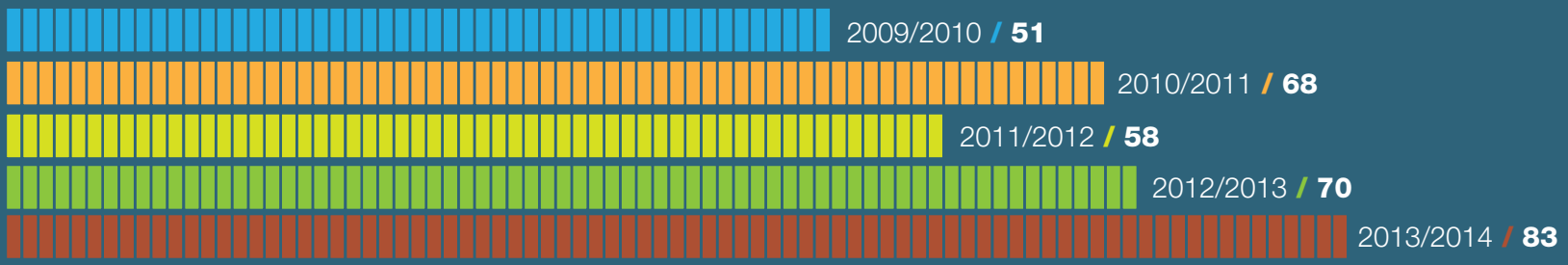
Climate Change Impacts and Policy in the Mediterranean Basin

The **Climate Change Impacts and Policy in the Mediterranean Basin course** took place in Venice on 24 and 25 May, 2013 with the participation of teachers and students from USA, UK, Italy, Switzerland, Germany, Tunisia, Greece, and Korea. A joint initiative by CMCC and ICCG, the School investigated its main topic by fostering the necessary interaction between various disciplines with the objective to enhance a real awareness among students, policy makers, governments and representatives of the local communities involved in the field.

OTTIMA - Operational Oceanography and Computer Technologies for Maritime Safety

OTTIMA is a training course aimed at mapping out and providing an education path that will allow students to master the methodological and operational aspects of basic sciences, operational oceanography, technology and engineering applied to oceans and seas. In 2013, the Operational and Safety Oceanography course was held, in which students learnt about the methods, techniques and equipment of the basic operating systems and infrastructure that are essential in oceanographic and coastal operational research, the monitoring, protection and exploitation of marine resources, and maritime safety. During the second pathway, held in 2014, there was a course in Information technology for maritime safety.

CMCC Graduate Programs: number of students



EVENTS

CMCC organizes different types of events to build and maintain an active dialogue with interlocutors including the scientific community, students, policy decision makers, public bodies, companies, the public opinion in general, and the media. Throughout the Center's activities, events have proven to be an excellent vehicle to disseminate the contents of research activities, exchange opinions with the outside world, find new themes and areas of interest, strengthen existing collaboration relationships and start new ones with national and international research centers.

Seminars

Intended mainly for a specialized audience, students of the Center's educational initiatives and the scientific community with the aim to encourage discussion and debate on frontier themes relating to climate research and policies.

Conferences

Large scale events addressed to the public at large, with the participation of renowned international speakers in the area of climate research and policies.

For detailed information on some of the most relevant events organized by the CMCC in 2013, go to pag. 28 in the section "Activities Highlights"

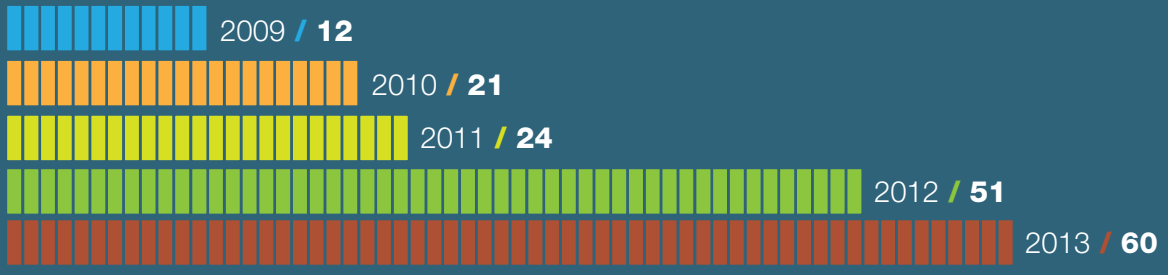
Meetings

Usually set up within the scope of scientific research and partnership projects, for the purpose of launching a project, defining technical aspects or disclosing scientific results.

Workshops

Dedicated to CMCC researchers, they offer opportunities for brainstorming and updates on ongoing activities.

CMCC events



INTERNATIONAL DIMENSION

Since its inception, CMCC has played an active role in the international climate change research arena and has provided assistance to public decision-makers and international institutions. The Center has entered into partnership agreements with some of the most authoritative climate science research centers, with which it has conducted international research projects for years.

CMCC collaborates with **center** and **institutions** based in more than **70 countries**

Climate Think Tank Ranking

CMCC featured as one of the best think tank in the world in the ICCG Climate Think Tank Ranking. The research cosidered more than 200 think tanks specialized in the field of climate change economics and policy, and was based on an innovative methodology that incorporates a set of 15 indicators to measure the influence and effectiveness of research findings.

The methodology allowed a more accurate and detailed analysis while building two different rankings: the Standardized Ranking (that standardized all the think tank activity outputs in 2013 by the number of their researchers, following the criteria of per capita productivity) and the Absolute Ranking (that considered all the think tank activity outputs produced in 2013 in absolute terms).

The CMCC showed an excellent positioning in both of the rankings: among the top twenty in the Absolute Ranking and among the top fifty in the Standardized Ranking.

IPCC Focal Point

Since August 2006, the Euro-Mediterranean Center on Climate Change has hosted the IPCC Focal Point for Italy. The National IPCC Focal Point participates in the plenary sessions and meetings of IPCC, represents the IPCC in Italy, and carries out communication and education activities concerning IPCC activities.

The activities of the IPCC FOCAL POINT for Italy include:

- the collection of information and documentation on national technical and scientific activities related to the issues dealt with by the IPCC: climate science and climate changes (observations, models, vulnerability studies, impact estimates, adaptation and mitigation measures);
- nationwide dissemination of IPCC's activities and results through the website, meetings, conferences and dedicated workshops; identification and designation of experts or national representatives at meetings, workshops and plenary sessions of IPCC and the related work groups;
- reporting to IPCC on the major activities carried out throughout the country.

AR5 – The Fifth Assessment Report on Climate Change

The IPCC AR5 - 5th Assessment Report on Climate Change is one of CMCC's most relevant contributions to the international community of climate research and policy. A selection of CMCC's leading researchers and scientists who have a range of views on climate change contributed to the IPCC AR5 - 5th Assessment Report on Climate Change. The report publication started in September 2013 with the Summary for Policy Makers of the Working Group 1 "The Physical Science Basis". CMCC contributed to the first volume of IPCC AR5 providing data and experiments in the framework of CMIP5 (the fifth phase of the Coupled Model Intercomparison Project), which is an initiative that promoted a new set of coordinated climate model experiments involving major climate modeling groups from around the world. (*See more at pages 28-29*)
In Working Group 2 (Impacts, Adaptation and Vulnerability), Riccardo Valentini is Coordinating Lead Author in chapter 2 - "Europe" and several CMCC scientists contributed as Contributing authors. In Working Group 3 (Mitigation of Climate Change), Carlo Carraro, is the Review Editor for chapter 16, "Cross-cutting Investment and Finance Issues". Emanuele Massetti was selected to be Lead Author in the same chapter. Other Lead Authors in WGIII include Valentina Bosetti "Integrated Risk and Uncertainty Assessment of Climate Change Response Policies" in chapter 2, Massimo Tavoni "Assessing Transformation Pathways" in chapter 6, and Alessandro Lanza "Industry" in chapter 10. Sergio Castellari, who is the IPCC Focal Point for Italy, participated in all the IPCC meetings and the delegation that approved the final version of the AR5 Report.

ACTIVITY HIGHLIGHTS

Climate Change, the physical science basis and the CMCC contribution to IPCC AR5

The Fifth Assessment Report (AR5) of the (Intergovernmental Panel on Climate Change) started publication on 27 September, 2013, when the Summary for Policymakers of the Working Group I, was released in Stockholm.

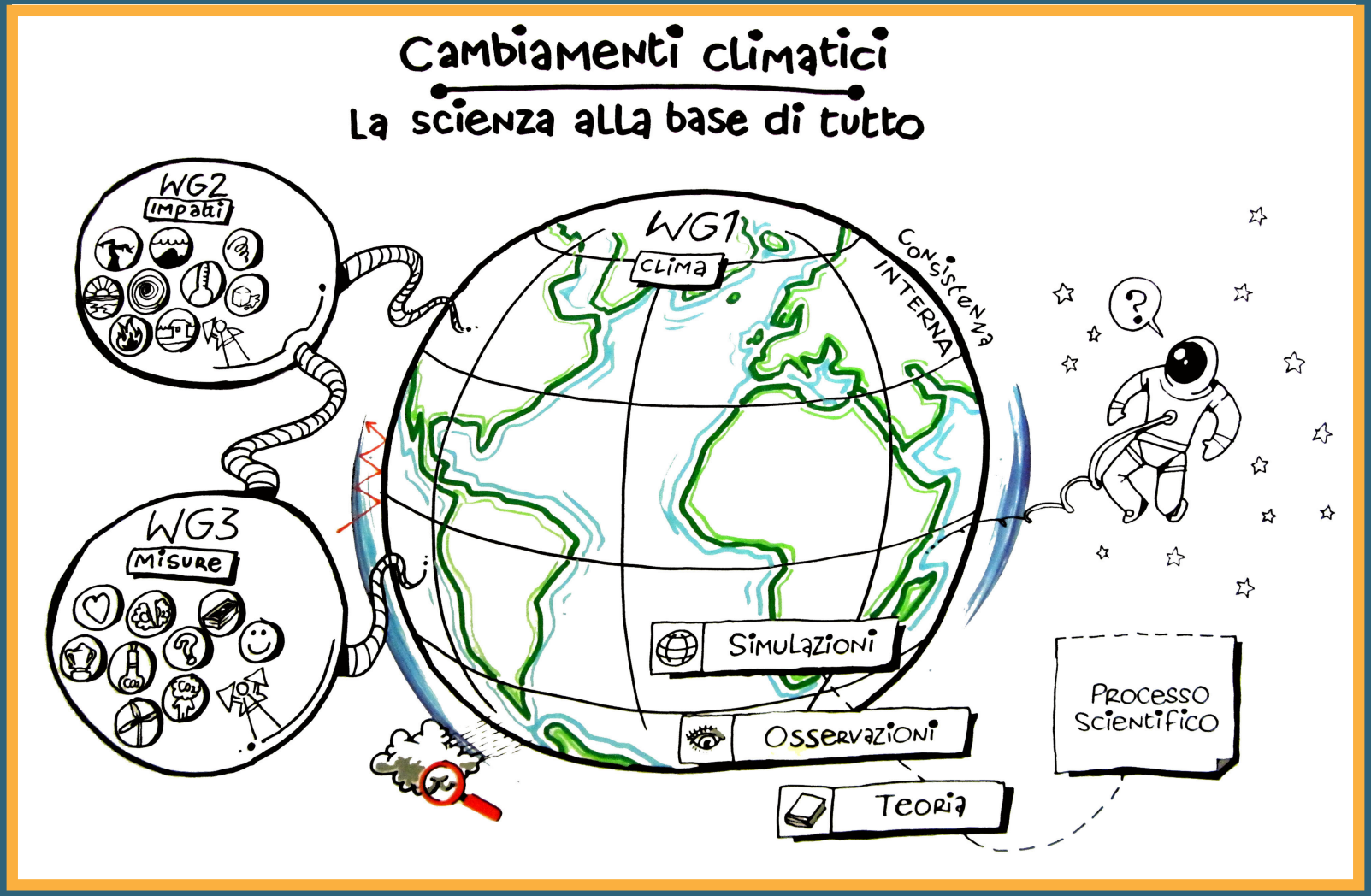
The publication of the IPCC AR5 WGI is considered one of most important events in the international debate on climate change sciences in recent years because it is the most comprehensive assessment of the physical science basis of climate change, drawing on the scientific literature accepted for publication up to 15 March 2013.

As a result of the larger amount of data available and of the advances in climate sciences, the WGI contribution to AR5 provides more accurate information and reduces uncertainty compared to the previous report. It considers new evidence of climate change based on many independent scientific analyses from observations of the climate system, paleoclimate archives, theoretical studies of climate processes and simulations using climate models. Projections of climate change are based on a new set of four scenarios of future greenhouse gas concentrations and aerosols, spanning a wide range of possible futures.

CMCC actively contributed to the IPCC Report supporting the set of simulations required by CMIP5, the fifth phase of the Climate Model Intercomparison Project (http://cmip-pcmdi.llnl.gov/cmip5), a framework program for the coordination of climate simulations, adopted by the leading global climate study centers, which has provided the scientific modeling bases for the preparation of the Fifth IPCC Report (AR5).

In the framework of CMIP5, which was promoted by the Working Group on Climate Modeling of the United Nations' World Climate Research Programme to answer the questions raised by the fourth assessment report of the Intergovernmental Panel on Climate Changes (AR4), CMCC supported the set of simulations required by CMIP5 with a series of experiments performed through its specific climate model, implemented in several configurations.

CMCC also contributetd to communicate and to disseminate AR5 contents to the italian public opinion. Just after the official presentation of the Summary for Policy Makers that was held by the IPCC Secretariat in Stockholm on 27 September, more than 100 people joined the meeting “IPCC AR5 – WGI for Italian Journalists” held by CMCC. After the presentation of the video “Climate change: everything you need to know about the IPCC Assessment Report” with interviews to Italian authors of the IPCC Report, Sergio Castellari, the IPCC Focal Point for Italy, illustrated the key messages of the AR5-WG1 to the Italian audience. The Italian version of the video, along with the Italian translation of the Summary for Policy Makers, infographics and further documentation are available online at www.clima2014.it; the website also contains a collection of videos and other supporting materials that explain the IPCC Report.



Picture by Neva©, taken from www.clima2014.it

The impacts of climate change in the Mediterranean, the RACCM report

"Regional Assessment of Climate Change in the Mediterranean" (ed. Antonio Navarra, Laurence Tubiana, *Springer Netherlands*, 2013) is the five-volume report that was published after the CIRCE project activities were terminated.

The main objectives of CIRCE were to predict and to quantify the impacts of climate change in the Mediterranean, which were analyzed in their oceanographic, meteorological, ecological, economic and societal dimensions. The project focused particularly on the direct economic impacts for crucial sectors, such as health, tourism, energy demand, agriculture, water and human migration.

The Mediterranean Sea basin has unique vulnerabilities from the climate and societal point of view that can go critical under climate change. Nevertheless, the region has been rather under-investigated in recent years and comprehensive analyses of the region are rare. The Regional Assessment Climate Change in the Mediterranean (RACCM) report provides the first comprehensive assessments of climate change and its impacts in the region. Composed of five parts, the CIRCE RACCM Report describes changes in the progress in the atmosphere and in the basin and how these changes affect water availability, agriculture and ecosystem services. It presents the impacts on social and economical dimensions, concerning economic trends, health, energy, tourism, and migrations. Strategies on green growth and sustainable development are also proposed and discussed. A large part of the project was devoted to case studies regarding the eleven places in the Mediterranean region, which are expected to be particularly affected by the impacts of climate change.

Negative emissions: an international study with a notable contribution from Italian research

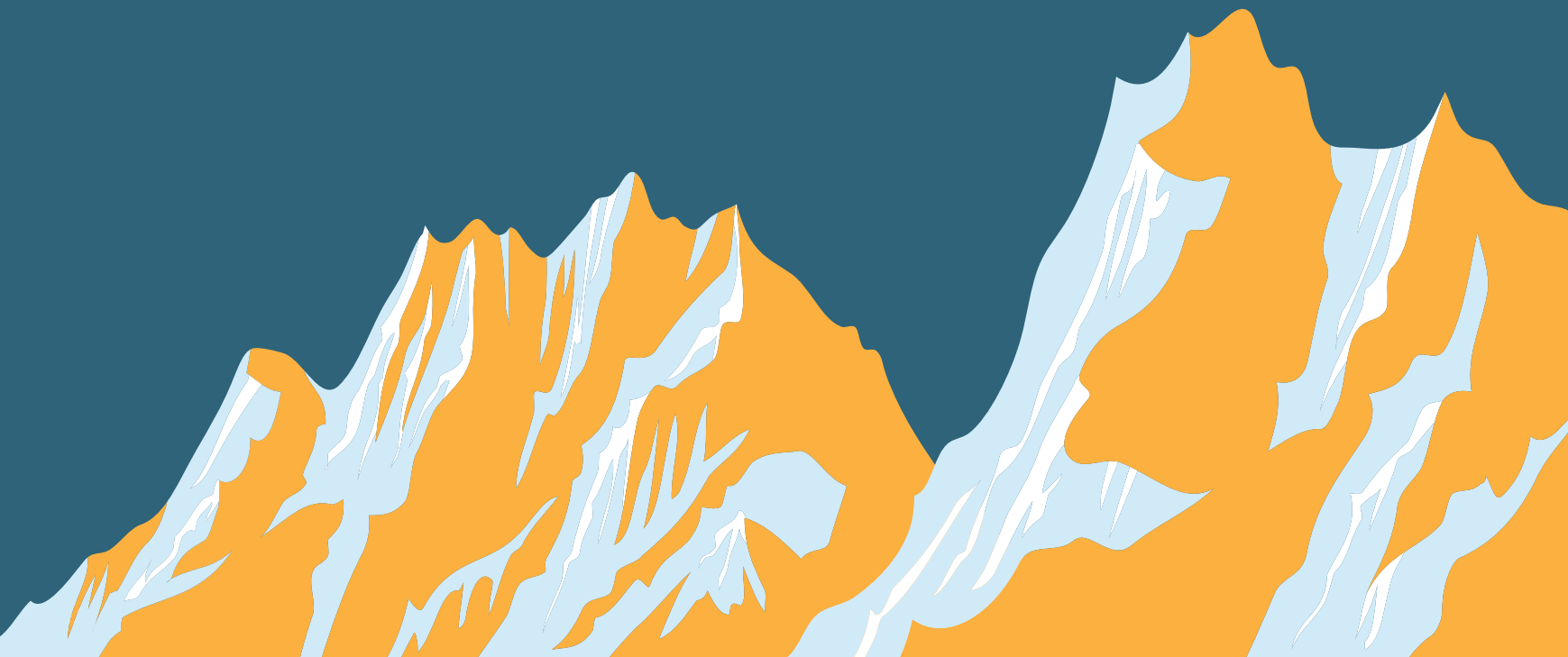
What is the role of future technologies, which eliminate more CO_2 from the atmosphere than is absorbed in the natural carbon cycle? The prestigious journal, “Climatic Change”, has devoted a special issue to negative emissions, with a particular focus on the integrated work of modeling experts whose studies analyze mathematical models for the integrated assessment of possible future scenarios. This issue also highlights scientists whose analyses focus on the specific effects of the CO2 removal systems from various viewpoints of different disciplines.

Edited by Massimo Tavoni (CMCC), and Robert Socolow (Princeton University), this collection brings together contributions which consider the objectives of the concentration of greenhouse gases that are in line with an increase in the average temperature of the Earth’s surface between 2 and 2.5 °C, and analyze the possible results of CDR strategies (Carbon Dioxide Removal). After having presented assessments on what we can expect from the application of such methods in the scenarios considered, authors address the issue from the viewpoints of ecology, the study on the carbon cycle, chemical engineering, and political science. The result is a multidisciplinary analysis that sheds light on many aspects of the complex issue.

Investigating the largest Eurasian glaciation

The Swedish Nuclear Fuel and Waste Management Company (SKB) is planning to build a geological repository for spent nuclear fuel in Forsmark (East Sweden). In the framework of the safety assessment carried out for the Forsmark area, CMCC was asked to investigate the largest Eurasian glaciation known on record, i.e. the Late Saalian glaciation (~192 - 135 thousand years before present, kyrs BP). More specifically, CMCC was asked to produce an ensemble of ice thicknesses and corresponding bedrock depression derived from this particular glaciation for the Forsmark site. Those data would be used to determine the resistance of the underground repository to extensive future glaciations in surface. To this aim, CMCC simulated the Late Saalian glacial maximum climate that was then used to feed a thermo-mechanical ice-sheet model. Internal physical ice-sheet parameters were varied at once to produce a statistically robust ensemble of ice thicknesses. The ice-sheet simulations were produced at a 20 km horizontal resolution over Eurasia and in total, 140 univariate simulations were performed. In the complete set of sensitivity experiments, the ice-sheet thickness in the Forsmark region ranges from 2650 meters to 3472 and the corresponding bedrock depression increases from 632 meters to 822 meters.

The results of the project “Long-term safety of a planned geological repository for spent nuclear fuel in Forsmark, Sweden: estimate of maximum ice sheet thicknesses” have been published in an official SKB technical report that can be found at: www.skb.se/upload/publications/pdf/TR-14-21.pdf



Toward climate-resilient development in Nigeria

Nigeria needs to protect itself from climate-related shocks. The 2012 floods were an abrupt reminder of the vulnerability of its communities and infrastructure to natural disasters.

For the past two years, the Federal Government of Nigeria and the World Bank have collaborated to analyze the specific challenges posed by climate change in agriculture and water resources management.

The book “Toward Climate-Resilient Development in Nigeria” summarizes the final results of the analysis, with a sobering message on the climate change impacts that can be expected if timely actions are not taken. Such partnership also led to the implementation of the project “Nigeria – Climate Risk Analysis”, which involved a team of CMCC scientists from different divisions and local consultants, who worked together during 2011 and 2012.

The book provides a comprehensive overview of the likely impacts of climate change on sectors that are strategic for the growth of Nigeria’s economy, such as agriculture, livestock, and water resource management, while highlighting the promising opportunities to build resilience. The book proposes 10 practical short-term priority actions, as well as complementary longer-term initiatives and methodological innovations.

Edited by CMCC’s Riccardo Valentini and Monia Santini with Roberto Cervigni (World Bank), the publication was launched in Abuja (Nigeria) on June 10th, 2013, at an event co-convened by theFederal Government of Nigeria and the World Bank.

Climate change and its implications on ecosystem services and society

The Italian Society for Climate Sciences (SISC) was established in early 2013 to promote an interdisciplinary platform and to foster the convergence of single traditional disciplines in something new that could be defined as Climate Sciences. As one of SISC institutional members, CMCC actively contributed to the organization of the First Annual SISC Conference (Italian Society for Climate Sciences), which took place in Lecce (Italy), on 23 and 24 September, 2013.

The Conference, entitled, *Climate Change and its Implications on Ecosystem Services and Society*, involved scientists, researchers, and policy makers, whose activities closely affect aspects of climate change and their relationships on environmental and socio-economic systems.

Scientific presentations were divided into plenaries, parallel and poster sessions and addressed three main topics: Advances in Climate Science, Implications on ecosystem services, Climate policy and economic assessments. Special events were focused on a debate with scientists and media experts on how to communicate climate science to the public. There was also a Science Theatre show for kids. Angela Liberatore (European Commission), who gave the opening talk, explained the EU policy on climate change, its effort to foster multilateral climate protection and what it has meant for the EU to define climate change as a security issue.

The Proceedings of the Conference were published by CMCC and are available for download on the SISC website (www.sisclima.it). The book is a collection of all the contributions presented at the Conference (including the presentation that won the SISC award for young scientists) and testifies the vast interdisciplinary character of climate change.

Società Italiana per le Scienze del Clima

SISC

Integrating climate knowledge into planning: CMCC at the COP19 in Warsaw

CMCC participated in the 19th Session of the Conference of the Parties (COP19) held from 11 to 22 November 2013 in Warsaw, Poland.

Experts, professional consultants, and people curious about climate change visited the CMCC exhibit where they had the opportunity to find materials about research on climate change carried out at CMCC such as case analyses and recent publications relevant to climate science, climate modeling, climate change impacts and policies.

CMCC, in collaboration with the Lombardy Foundation for the Environment, organized the side event "Integrating Climate Knowledge into Planning, Orientgate and other case studies in SEE". The event took place on 21 November and brought together scientists, policy advisors and policy makers to share their experience in integrating their expertise and knowledge in addressing the climate adaptation issue through case studies, project activities and concrete strategies at the EU, national and regional levels.

CMCC experts were also invited to participate and to give talks in side events organized by others institutions on relevant topics of the climate change international debate such as the transition to Low Carbon societies, the territorial collaboration on mitigation and adaptation strategies, the costs and the benefits of adaptation to climate change and the sustainability of public finance in the EU.

Antonio Navarra, CMCC President, took part in Be the Movement, a workshop organized by Connect4Climate in cooperation with the University of Warsaw parallel with COP19. The workshop brought together a variety of climate change professionals such as educators, the youth, civil society organizations, private sector representatives and Connect4Climate partners. Together they discussed in order to identify practical and useful strategies for igniting a more energetic, robust global movement to combat climate change.

COP19/CMP9
UNITED NATIONS
CLIMATE CHANGE CONFERENCE
WARSAW 2013

Science and innovation technologies for oceanographic forecasts and studies

Scientists leading the scientific development of the major ocean analysis and forecasting systems for generating real-time operational ocean forecasts, hindcasts, and reanalysis, gathered in Lecce from 4 to 7 February, 2013 for the "2nd International Workshop of the GODAE OceanView Coastal & Shelf Seas Task Team".

The Global Ocean Data Assimilation Experiment (GODAE) aims to establish an effective and efficient infrastructure for global operational oceanography and to develop practical and robust operational activities for oceanography with great benefits for society. The primary purpose of this team is to accelerate the improvement and exploitation of the systems through the exchange of information and expertise and the coordination of joint assessments.

Hosted by CMCC, the meeting brought together experts and scientists from the main operational and research institutions involved in global ocean analysis and forecasting. The main objectives of the workshop were to review ongoing coastal ocean forecasting projects in the world coastal oceans (with a particular focus on system updates, progress and challenges since the first workshop held in Miami on January 2012), to discuss background scientific advances in Miami in January 2012), to discuss background scientific advances and decide common actions in some particular areas, as well as to enhance international collaboration and regional alliances. During the workshop, priority themes, such as integrated coastal observations and data assimilation, downscaling to coastal regions, and coastal applications, were discussed.

Open source, modular and available to the scientific community: BFM - Biogeochemical Flux Model

The BFM (Biogeochemical Flux Model) website was officially released on 19 March 2013 with the “official BFM release meeting”. The Euro-Mediterranean Centre on Climate Change, Bologna University, and the National Institute of Oceanography and Experimental Geophysics (OGS) joined forces to develop, use and disseminate this open source marine biogeochemical numerical model fully usable in coupled mode with ocean general circulation models. In order to develop and promote its use by the largest possible audience, the three institutions formed a consortium aimed to improve, manage and distribute the model, which is a non-commercial research product: it is written in FORTRAN90 (UNIX systems) and made available to the scientific community. The coding is highly modular and allows changes in the food web configuration and easy integration of new functional groups.

During the meeting, which was held in Bologna and live-broadcasted via web, experts and participants illustrated the model characteristics, provided highlights about the underlying theory and assumptions adopted to describe and simulate the marine biogeochemical cycling, the technicalities of the computer code and explored the possibilities for increasing the users audience and the potential Consortium Members.

The BFM - Biogeochemical Flux Model is available for download and for further information at the website: http://bfm-community.eu/

BFM

BIOGEOCHEMICAL FLUX MODEL

Outstanding partnership, best projects and innovation tools: CMCC awarded research

The **Earth System Grid Federation (ESGF)** – the international collaboration for the software that powers most global climate change research, notably assessments by the Intergovernmental Panel on Climate Change (IPCC) – was awarded as "Outstanding partnership" in the context of the Federal Laboratory Consortium's (FLC) Far West Regional competition.

ESGF manages the first-ever decentralized database for handling climate science data, with multiple petabytes of data at dozens of federated sites worldwide. It is recognized as the leading infrastructure for the management and access of large distributed data volumes for climate change research. It supports the Coupled Model Intercomparison Project (CMIP), whose protocols enable the periodic assessments carried out by the IPCC.

CMCC is a partner within ESGF (CMCC-CMIP5 data are available through the CMCC/ESGF Data node) along with outstanding Centers such as Oak Ridge, Argonne and Lawrence Berkeley national laboratories, NASA's Jet Propulsion Laboratory, the Pacific Marine Environmental Laboratory, the German Climate Computing Center, the British Atmospheric Data Centre, Goddard Space Flight Center, the Geophysical Fluid Dynamics Laboratory, and the Institute Pierre Simon Laplace and the LLNL (Lawrence Livermore National Laboratory) which leads the federation.

The European Commission awarded the **Best of the Best Life Environment project** to the TRUST (Tool for regional – scale assessment of groundwater storage improvement in adaptation to climate change) Project.

The project, funded by the EC in the framework of Life+2007 and by the Ministry for the Environment, Land and Sea, was the only project awarded in Italy.

The TRUST project set out to incorporate climate change into river basin management, and to identify adaptation measures based on artificial aquifer recharge to mitigate the impacts of drought and water scarcity. CMCC was involved in climate modeling, by creating scenarios for the 20th and 21st century and also collaborated for the evaluation of climate change impacts on ground water, by using the analysis of Regional Risk. The degradation of ground water, in terms of both quantity and quality, is a common problem in many parts of Europe and around the world and is exacerbated by climate change. The major causes of the problem of groundwater degradation (i.e. drought and water scarcity, salinity, pollution, etc.) are still the unsustainable use of resources and inappropriate land-use policies, added to the impact of climate change. The award strengthens CMCC's interest and role as a research center aimed at putting in place climate change impact assessments and solutions for a more sustainable use of resources.

The best LIFE Environment and Nature projects of 2012 were honored in Brussels on 5 June 2013.

Clime, the Geographic Information System (GIS) tool for studying climate change impacts on soil developed by CMCC, won the “2013 Innovation and Prevention” award at the 14th Italian Esri Users Conference.

Clime software has been conceived for research activities in order to assist a wide range of users, which belong to the areas of interface and data manager with both meteorological and climate domains, and also features impact analysis utilities. Therefore, it’s possible to analyze and compare multiple series (observations, climate simulations, etc.) and to obtain through filters and internal functions, many kinds of analyses such as trends and seasonal cycles with related statistics. The tool also allows output mapping like climate anomalies (thermal and pluviometric) and bias for whether average or extreme values; in addition, it features some bias correction techniques for climate model results. Ultimately, the goal of Clime is to provide users a simple and fast way to retrieve analysis over climate data and observations within any geographical site of interest (provinces, regions, countries, etc.).

For further information and details about Clime visit the web page: http://tinyurl.com/cmcc-clime

Clime
cmcc

WEB, MEDIA, and PUBLIC OPINION

The results of studies on climate change and interactions between climate and environmental and socioeconomic systems stimulate interest not only in the scientific community but also in a highly diverse audience composed of policy decision makers, sectors of society such as associations and NGOs, journalists and information professionals, as well as the general public. In order to be an active presence in this constantly and rapidly evolving context, CMCC develops a range of communication and information activities through which the Center acts as a reference point in the public debate on issues related to climate change research.

CMCC's information and communication activities are carried out through its website, www.cmcc.it, which serves as a multimedia and multidisciplinary repository of the contents produced by CMCC. The website structure and the activities conducted through it were designed and set up not only to provide access and visibility to CMCC's production (from scientific activities and publications to events and institutional communication), but also to offer access to the broader public debate on climate change research that is ongoing at the international level.

CMCC's website is intended as a reliable, authoritative and easily accessible source of information on the most current and relevant issues related to research on climate change and its effects on the environment, policies, economy and society.

The online magazine edited by CMCC

Climate Science&Policy is an online magazine published by CMCC, featuring contributions from international experts concerning scientific research on climate change and climate policies and economics. Articles, interviews and videos offer visitors the point of view of authoritative scientists and in-depth information on many issues revolving around scientific research on climate change and on the effects of climate and its changes on ecosystems, society and the economy.

Designed and written for a non-specialist and non-exclusive Italian audience, Climate Science&Policy offers a multidisciplinary, well-documented view on climate change in a language that is understandable to the public at large without overlooking scientific rigor in dealing with the different topics.

www.climatescienceandpolicy.eu

CMCC web audience 2013

TEC A blog on the changing climate

www.cmcc.it

Over **100,000** visits

More then **310,000** page visited

Compared to the previous year:

+ 4.3% users

+ 2.9% pages

+ 6.4% sessions

In the media: articles, interviews, op-ed

223	210	360	414
2010	2011	2012	2013

ClimateScience&Policy

Scientists, experts, and opinion leaders discuss crucial topics of international debate on climate change. Interviews and articles are published on the online digital magazine edited by CMCC.

Science story hunters
The job of a journalist consists in reporting what climate science is saying right now and what it continues to say. Our job is not only to provide people with news, but also to provide perspectives. Dealing with climate change is indeed a complex issue, but not a very controversial one. Climate change is now a reality; the entity of its effects is only now under discussion. To deal with climate change honestly, a journalist must avoid a balanced attitude.
Tim Radford, journalist

Let's close the gap
Scientists have been telling us to stay below the 2 degrees limit – which the leaders adopted in Copenhagen – and there is a gap there. The international negotiations should be focusing on the question, "How do we close that gap?" As far as I can see, this is where the added value of an international agreement lies.
Connie Hedegaard, EU Commissioner for Climate Action

India moving forward
India is in a transition from a largely rural and agrarian society to one that is predominantly urban. This process has been going on for several decades and now the energy demand (along with the demand for other commodities) has increased. We need an equitable, sustainable and efficient transformation of Indian settlements. The new issue to solve is how to create a sustainable habitat.
P.R. Shukla, Indian Institute of Management

Let's be prepared
Our societies are not ready to cope with climate extremes and impacts because they are experiencing them for the first time: anthropogenic climate change is actually altering spatial and temporal distribution of climate extremes, increasing their intensity and frequency. I think that the crucial message we must learn from these climate studies is that we have to be prepared. What has happened in the past is not necessarily a guide for what will happen in the future.
Nadim Farrokh, International Centre for Geohazards

FINANCIAL REPORT

BALANCE SHEET: ASSETS	2013	2012
A) Receivables from shareholders for contributions	**124,151**	**281,052**
B) Fixed assets	**5,023,980**	**6,195,313**
I, Intangible fixed assets	53,232	107,718
II, Tangible fixed assets	4,869,259	6,066,106
III: Financial assets	101,489	21,489
C) Current Assets	**38,217,455**	**38,915,332**
I, Inventories (Work In progress - WIP)	31,904,117	33,654,980
II, Receivlables	593,293	648,092
III, Current financial assets	4,000,000	4,000,000
IV, Cash at hand	1,720,045	612,260
D) Prepayments and accrued income	**141,049**	**255,061**
TOTAL ASSETS	43,506,635	45,646,758

BALANCE SHEET: LIABILITIES	2013	2012
A) Net Liabilities	**533,706**	**506,043**
Capital	500,000	474,736
Reserve Funds	31,306	17,771
Profit for the year	2,400	13,536
B) Provisions for risks and charges	**35,000**	**35,000**
C) Employee Severance indemnities	**103,783**	**74,542**
D) Payments from Clients	**19,055,379**	**23,598,446**
E) Accruals and deferred charges	**23,778,767**	**21,432,727**
TOTAL LIABILITIES	**43,506,635**	**45,646,758**

PROFIT AND LOSS	2013	2012
A) Revenues	**13,022,543**	**12,498,182**
Revenues from sales and services	418,351	254,378
Variations in stocks (WIP)	-1,750,863	8,046,948
Other revenues	14,355,055	4,196,856
B) Expenses	**12,685,086**	**12,345,813**
Consumable	270,471	181,415
Services	9,450,065	8,905,838
Leases	465,367	446,622
Personnel	745,879	499,004
Depreciation	1,658,255	2,256,312
Other Operating Expenses	95,049	56,622
Difference between revenues and expenses (A-B)	337,457	152,369
C) Financial income and charges	**-130,080**	**88,638**
D) Impairment on financial assets	**-**	**-**
E) Extraordinary income and charges	**-66,778**	**-173,793**
Results before taxes (A-B±C±D±E)	**140,599**	**67,214**
Income tax expenses - current and deferred	138,199	53,678
a) Current taxes	158,562	83,203
b) Deferred taxes	-20,363	-29,525
Profit (loss) for the year	**2,400**	**13,536**

Design by **Renato**DallaVenezia

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sui Cambiamenti Climatici

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