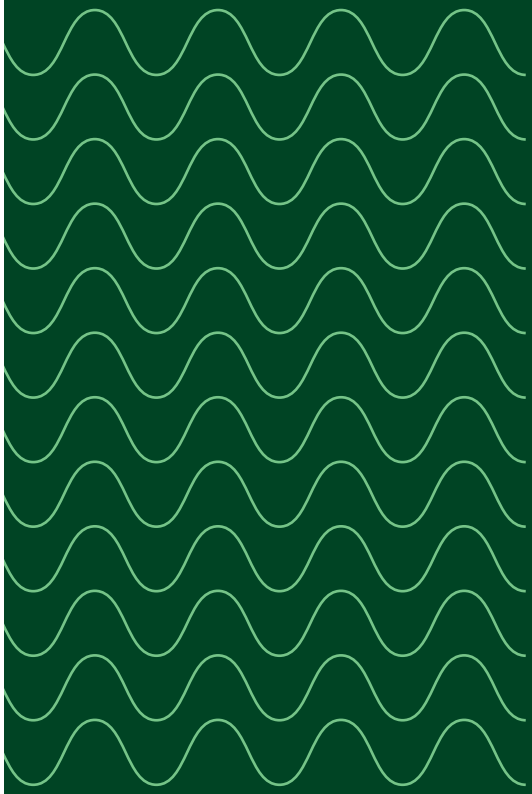

Annual Report 2017

cmcc
Centro Euro-Mediterraneo
sui Cambiamenti Climatici

Annual Report 2017

CMCC Annual Report 2017

Edited by
Mauro Buonocore

Contributors
Giulia Gallucio (Research Projects)
Loredana Cocola De Matteis (People)

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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

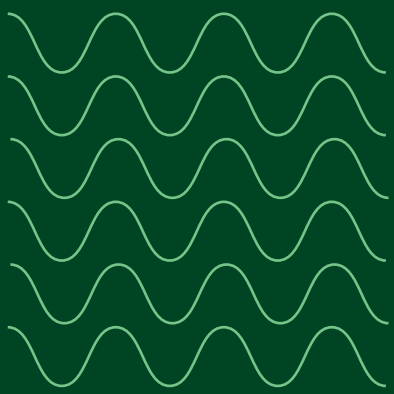
CMCC IS committed to encourage discipline convergence to promote new and creative ideas and to ensure that environmental observations, analyses, predictions, and services effectively meet the needs of society.

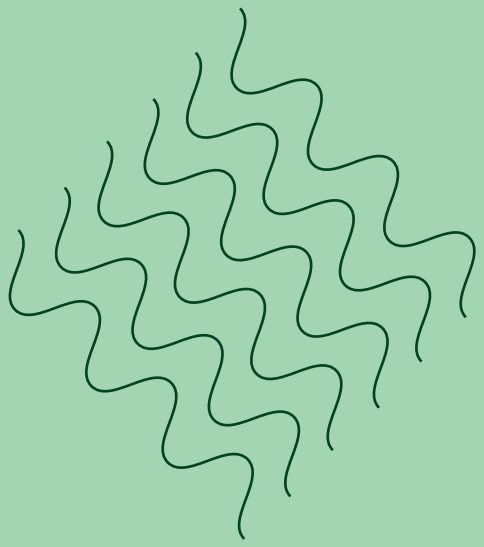
CMCC IS committed to scientific integrity and independence, to foster scientific progress and innovation.

CMCC IS a non-advocacy institution.

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 Foundation

CMCC: origins and aims

Cutting-edge research to investigate and to address the Climate Change Challenge.

CMCC Foundation (Fondazione 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, understand and represent the interactions between the climate system, the marine and terrestrial ecosystems, and society.

CMCC was created in 2005 with the financial support of the Ministry of Education, University and Research (Ministero dell'Istruzione, dell'Università 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.

On 10th December 2015 the Center became a Foundation, therefore, representing CMCC's legal status, its contents, aims and operational modalities.

The network

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

Governance

The CMCC Foundation'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.

The CMCC Foundation relies on the extensive and established research experience of the seven members and institutional partners:

- **Istituto Nazionale di Geofisica e Vulcanologia (INGV)**
- **Università del Salento**
- **Centro Italiano di Ricerche Aerospaziali (CIRA S.c.p.a.)**
- **Università Ca' Foscari Venezia**
- **Università di Sassari**
- **Università della Tuscia**
- **Politecnico di Milano**

The general meeting of Shareholders appoints:

- **Board of Directors (Board),** with ordinary and extraordinary management powers, which has a three-year term of office and is composed of 9 members

- the **Executive Committee**, to which the Board delegates technical and financial matters

Board of Directors

Antonio Navarra – INGV (CMCC President)
Fabio Florindo – INGV
Antonio Marcomini – Università Ca' Foscari Venezia
Riccardo Valentini – Università della Tuscia
Alessandro Coletta – CIRA
Marino Gatto - Politecnico di Milano
Giuseppe Grassi - Università del Salento
Luigi De Bellis - Università del Salento

Executive Committee

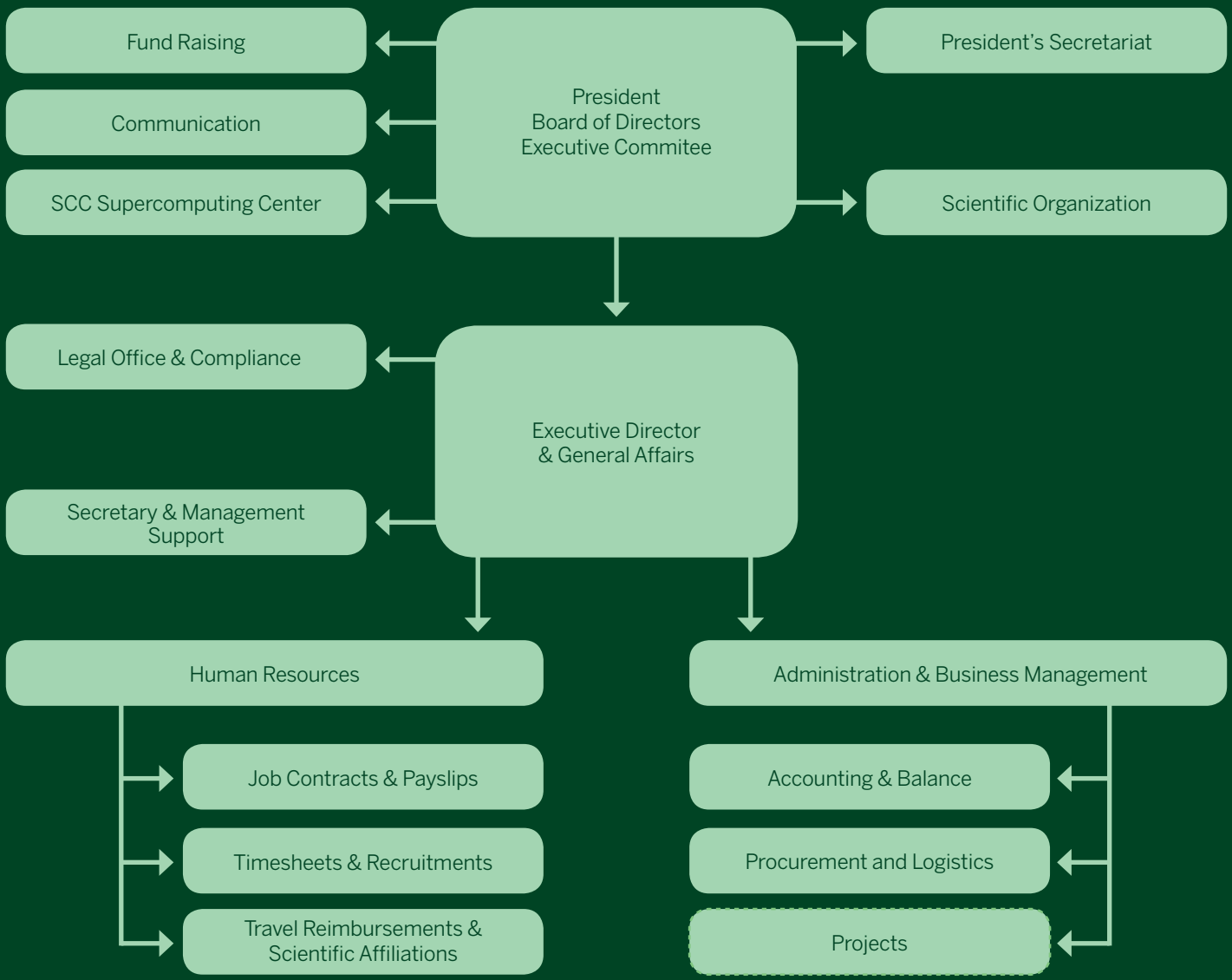
Giovanni Aloisio
Massimo Ghilardi
Antonio Navarra

Executive Director

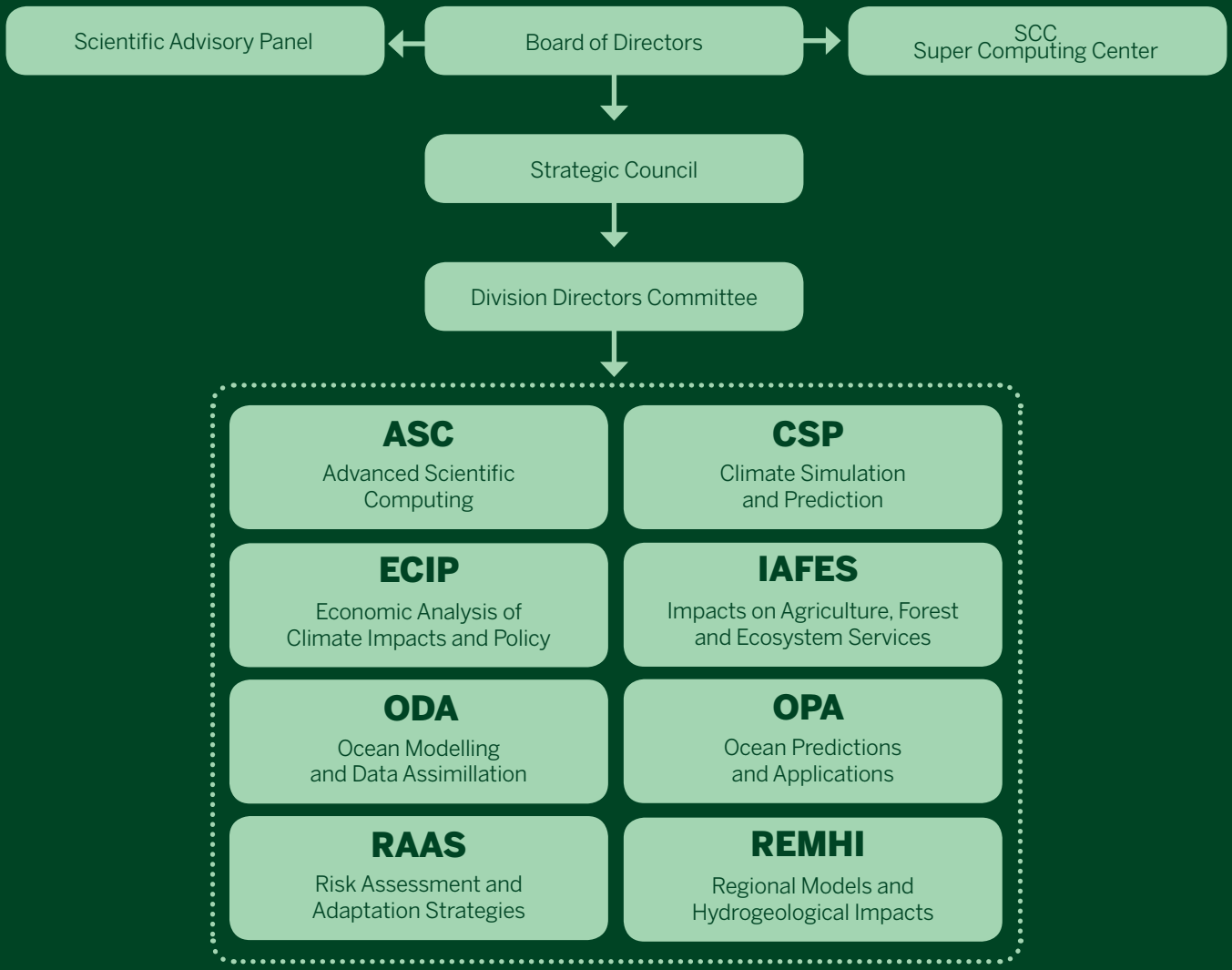
Laura Panzera

CMCC has obtained and implemented a Quality Management System which complies with standards of UNI EN ISO 9001:2008 for the activities concerning the Administrative management of research projects relating to climate change". Certificate N. 18049

Administration and Management



Scientific Organization



Scientific Research

The CMCC Scientific organization aims at enhancing the integration and collaboration among interdisciplinary skills needed to deal with climate sciences related topics.

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The Scientific Advisory Panel (SAP) 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. It is appointed by the Board and is made up of eight highly qualified experts selected among the international scientific and academic community. Members of the SAP are appointed with a rotation mechanism: every three years, four new members are appointed, four of the old members are confirmed and the four old members not confirmed are appointed as "Honorary Fellows".

Scientific Advisory Panel

Ghassem Asrar – Joint Global Change Research Institute, USA
Giulio Boccaletti – The Nature Conservancy, USA
Nadim Farrokh – International Centre for Geohazards, Oslo
Jean-Charles Hourcade – CNRS, France
Daniela Jacob – Climate Service Center, Germany
Sabrina Speich – Ecole Normale Supérieure – France
Ottmar Edenhofer – Potsdam Institute for Climate Impact Research, Germany (Honorary Fellow)
Robert Socolow – Princeton University, Usa (Honorary Fellow)
Laurence Tubiana – Institute of Sustainable Development and International Relations, France (Honorary Fellow)

The **Strategic Council** has a function of strategic direction and supervision. Composed of the Scientific Coordinators of CMCC, the Strategic Council defines scientific strategies and new subject areas and problems, contributing with the experience, creativity and international network of relations of its members. The Strategic Council is appointed by the Board of Directors and identifies its coordinator from within. One of the main tasks of the Strategic Council is to define on a three-year basis CMCC's Strategic Projects.

Strategic Council Members

Giovanni Aloisio
Carlo Carraro
Alessandro Lanza
Antonio Marcomini
Antonio Navarra
Nadia Pinardi
Pasquale Schiano
Donatella Spano
Riccardo Valentini

The **Division Directors Committee** is composed of the Division Directors, who meet on a monthly basis to coordinate their operations. The group appoints a coordinator from within. The Leadership Group relies on the Strategic Council.

Division Directors Committee

Sandro Fiore – Advanced Scientific Computing
Silvio Gualdi – Climate Simulation and Prediction
Francesco Bosello – Economic analysis of Climate Impacts and Policy
Valentina Bacciu – Impacts on Agriculture, Forests and Ecosystem Services
Antonio Bombelli – Impacts on Agriculture, Forests and Ecosystem Services
Simona Masina – Ocean Modelling and Data Assimilation
Giovanni Coppini – Ocean Predictions and Applications
Paola Mercogliano – Regional Models and Hydrogeological Impacts
Jaroslav Mysiak – Risk Assessment and Adaptation Strategies
Silvia Torresan – Risk Assessment and Adaptation Strategies

Research Divisions

The CMCC research network is distributed among eight research divisions that share different knowledge and skills in the field of climate sciences.

Advanced Scientific Computing
The Advanced Scientific Computing (ASC) division carries out R&D activities on Computational Science applied to the Climate Change domain. In particular, it focuses on (i) the optimization of numerical models on HPC architectures (High End Computing – HEC), (ii) the management, analysis and mining of large volumes of scientific data looking forward at exascale scenarios (Data Science and Learning – DSL), (iii) user-friendly interfaces, workflows and applications (Usable Software and Systems – USS), and (iv) research on innovative digital platforms and tools for the delivery of new services in different sectors, such as agriculture, climate, disaster risk reduction, oceanography, water management, etc. (Production Platforms for Operational Services (PPOS).

Climate Simulation and Predictions
The Climate Simulations and Predictions (CSP) Division contributes to the development of the CMCC climate and earth system models, and uses them to explore and improve our understanding of the mechanisms underpinning climate variability, climate predictability and climate change, by means of numerical simulations.
In collaboration with the ODA Division, CSP produces climate change scenarios, contributing to the World Climate Research Programme (WCRP)'s Coupled Model Intercomparison Project (CMIP) project, to inform the Intergovernmental Panel on Climate Change (IPCC) assessments and in support of emerging climate service activities. Furthermore, CSP produces operational climate forecasts from seasonal to multi-annual time scales.

Economic analysis of Climate Impacts and Policy
The Economic analysis of Climate Impacts and Policy (ECIP) Division aims to characterize economically different climate change scenarios. This consists firstly in the development of economic assessments of climate change impacts.
This research area requires on the one hand to translate, in collaboration with the other divisions of CMCC, the physical impacts of climate change in economic terms. On the other hand, it requires to develop scenarios of social economic development on which climate change will occur. The second research area of the division is the evaluation and design of effective and feasible policies to adapt to climate change.

Impacts on Agriculture, Forests and Ecosystem Services

The Impacts on Agriculture, Forests and Ecosystem Services (IAFES) Division's Lines of Activities focus on the diagnosis and prediction of the climate change impacts on agriculture and on terrestrial natural and semi-natural ecosystems, and on the services they provide, at local to global scale. The activities comprise basic and applied research, up to operational purposes in the context of ecosystem services.
Particular attention is paid to the monitoring, modeling and analysis of:

- Agriculture and the water and nutrients' requirement, including the ecological footprint;
- Carbon cycle through soil-water-vegetation-human environment dynamics, including their feedbacks to the climate system;
- Soil water balance and hydrological cycle at different scales, considering the different uses and services of water resources;
- Land use and land degradation up to desertification;
- Prevention, planning and managing wild fires and the consequent emissions;
- Exposure, vulnerability and risk of vegetation and rural-urban and forest-urban interfaces to the fire danger.

All these activities are supporting strategies for the mitigation of and adaptation to climate change.

Ocean modeling and Data Assimilation

The Ocean modeling and Data Assimilation (ODA) Division focuses on the development and improvement of the CMCC Earth System Model components with a particular emphasis on the physical and biogeochemical ocean models. Another major activity of the ODA division is the development of data assimilation methods for the production of global marine reanalysis and forecasting. Finally, since recently we started to work also on ice-sheet and paleoclimate modeling.

Ocean Predictions and Applications

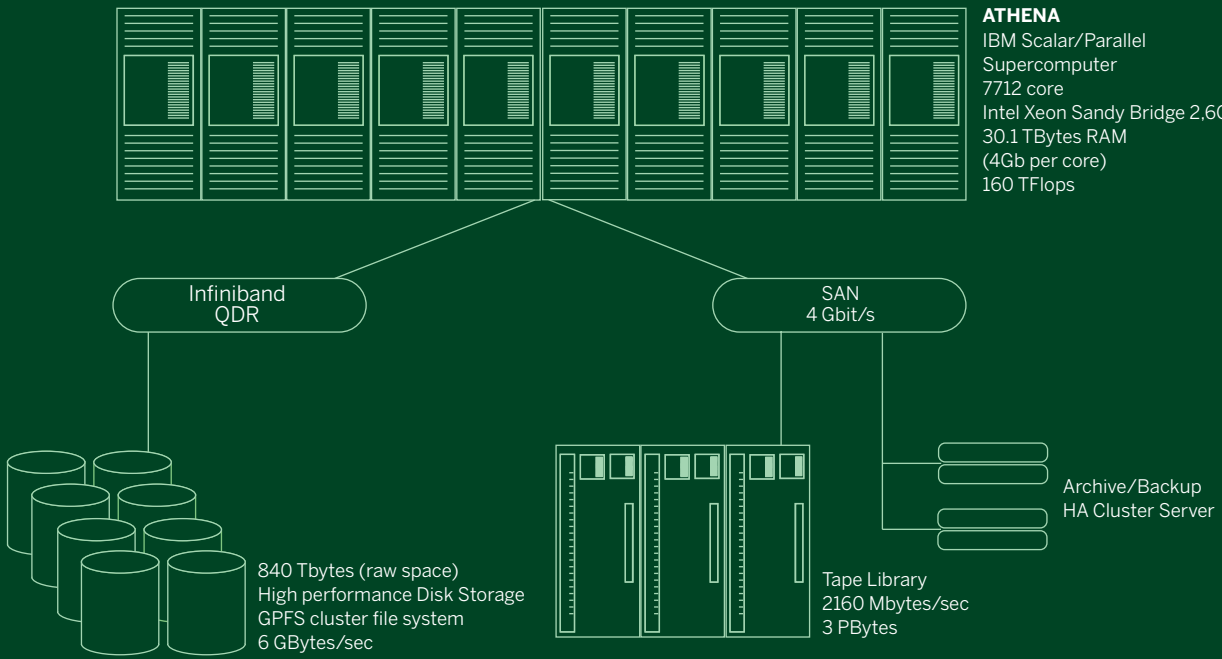
The Ocean Predictions and Applications (OPA) Division deals with the development of models and methods for interdisciplinary research on marine operational forecasting, on the interactions between coastal areas and the open ocean, on the development of services and applications for all maritime economy sectors, including transport, security and management of coastal areas and marine resources, in the context of climate change adaptation problems.

Risk Assessment and Adaptation Strategies
The Division Risk Assessment and Adaptation Strategies (RAAS), brings together research groups with sizable expertise and long-standing experience in climate risk analysis and assessment, and development of adaptation strategies and policies, previously affiliated with other research divisions. The research priorities embrace three major themes that denote the main research units: economic analysis of risk and disaster risk reduction; environmental risk assessment and management; governance of climate related risks and adaptation.

Regional Models and Hydrogeological Impacts
The main activities of Regional Models and Hydrogeological Impacts (REMHI) Division T include studies about: regionalization of the climatic signal through the development and use of statistical and dynamical downscaling approaches, and qualitative and quantitative evaluation of the effects of climate changes and anthropogenic pressure on the geo hydrological hazards (such as landslides, floods and droughts). Furthermore, in the Division are developed and implemented procedures able to optimize the link between climate and impacts models, and tools for the correct quantification of the associated uncertainty.

The Supercomputing Center

High-performance computing to understand the climate of the future



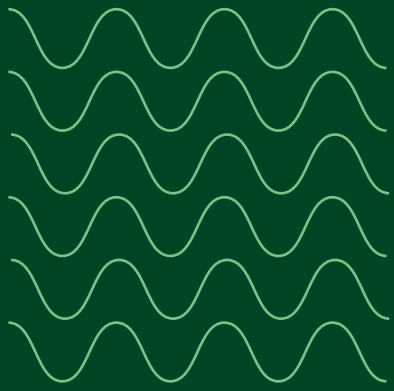
Housed in the Ecotekne complex (Lecce), the CMCC's Supercomputing Center provides the technological infrastructure and the computational capabilities needed in order to develop simulations and models able to provide more accurate, detailed and better defined results.

The main facility of the Supercomputing Center is the Athena system based on 482 IBM iDataPlex compute nodes. Each node is a dual Intel E5-2670 processor working at 2,6 GHz. Athena has a computing capability of 160TFlops (160,000 billions operations per second).

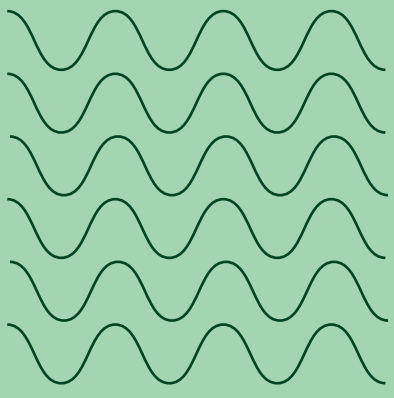
The design of the computing architecture, comprised of the IBM dx360M4 server cluster, the InfiniBand interconnection network and the storage subsystem, accelerates research activities and improves the quality of the scientific research for the development of future climate change scenarios and impacts.

The huge amount of data produced by CMCC researchers is managed by a DLM system based on a hierarchical storage management solution (HSM). HSM allows data storage on different tiers based on specific policies, enabling administrators to migrate and store data on the most appropriate tier and enabling transparent data access.

The CMCC Supercomputing Center, directed by prof. Giovanni Aloisio, is the only computational facility in Italy specializing in Climate Change research.



FACTS and FIGURES



People

People working 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.

The Center structure and interdisciplinary activities carried out at CMCC, promote 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.

Achieving a quantitative analysis of the staff who contributed to the activities of CMCC during 2017 means considering 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*.

During 2017, according to calculations made with the policy described above, the number of people who worked at CMCC is equal to 136 FTE, including both staff and collaborators.

People who carry out scientific and technical activities prevail, while around 28% of the staff perform administrative roles and carry out communication activities. CMCC confirms its vocation as a research institution that places great confidence in the younger generation: in fact, the percentage of people under age 40 is near 60%, while those who are over 50 are less than 10%. The percentage of people holding PhDs is 45, which shows that CMCC is a research institution that has a young staff with high levels of training.

* 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.

To submit a CV to the CMCC Human Resources Office, join the Job Application Manager:

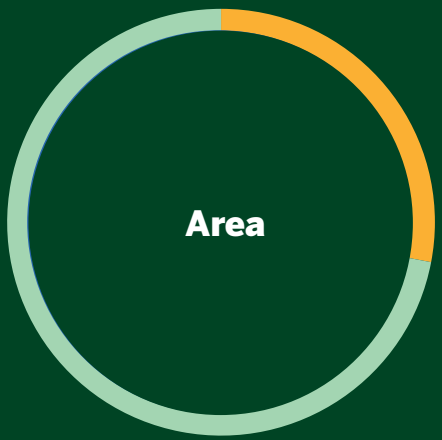
www.cmcc.it/jam

	TOTAL	M	F
People at CMCC	**136**	71	65
AREA			
Administration, management and communication	**38**	11	27
Scientific / Technical	**98**	58	40
AGE			
Under 30	**13**	8	5
31 - 40	**66**	30	36
41-50	**45**	25	20
Over 50	**12**	8	4
NATIONALITY			
Italian	**118**	62	56
EU non Italian	**12**	5	7
Extra EU	**6**	4	2
POSITION			
Senior	**54**	31	23
Junior	**82**	40	42

People at CMCC

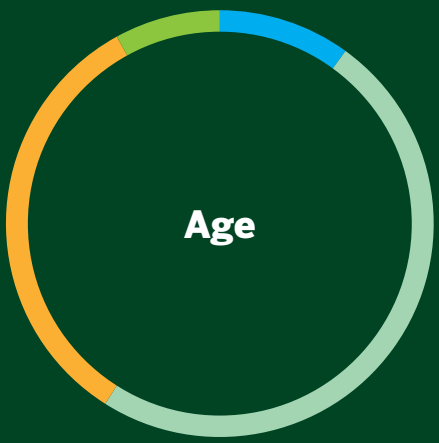
45%
non PhD

55%
PhD



72%
Scientific
and Technical

28%
Administration,
Management and
Communication



8%
over 50

33%
41-51

49%
31-40

10%
under 30

Geographical Distribution

87%
Italian

9%
UE non Italian

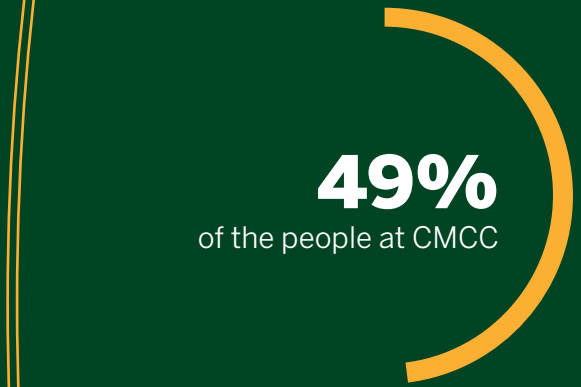
4%
Extra UE

Position

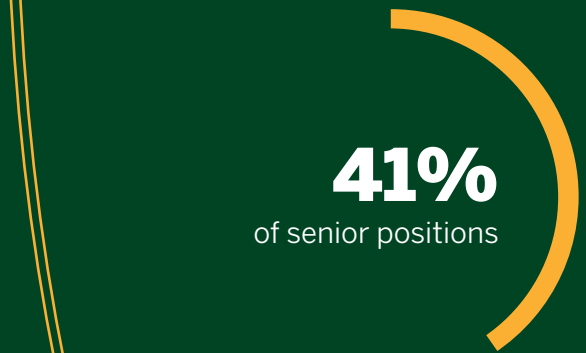
60%
Junior

40%
Senior

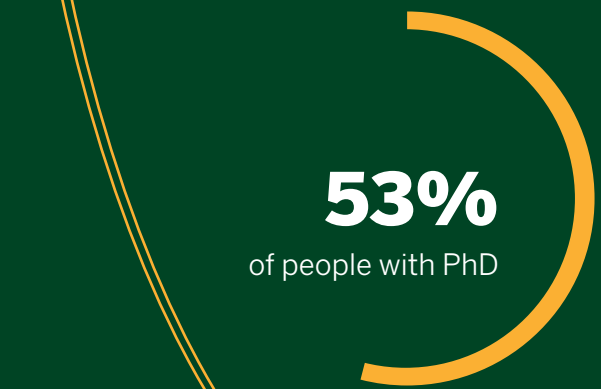
Women at CMCC are



49%
of the people at CMCC



41%
of senior positions



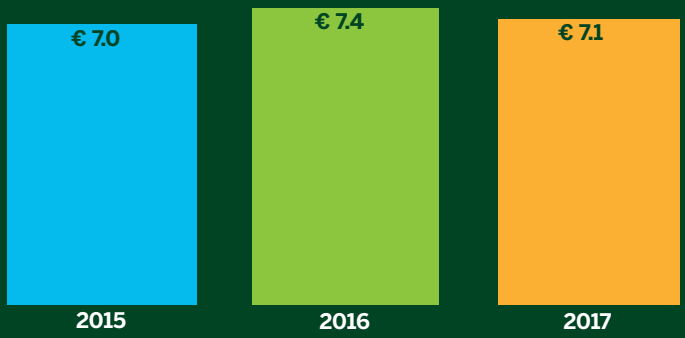
53%
of people with PhD

Research Projects

At 31 December 2017, CMCC's project portfolio consists of 252 projects, 124 of which are coordinated by CMCC.

Fund Raising Capacity: the graph shows CMCC capacity of attracting new funds over the last three years. These funds are over and above the annual operating grants.

Fund Raising Capacity (Milion €)

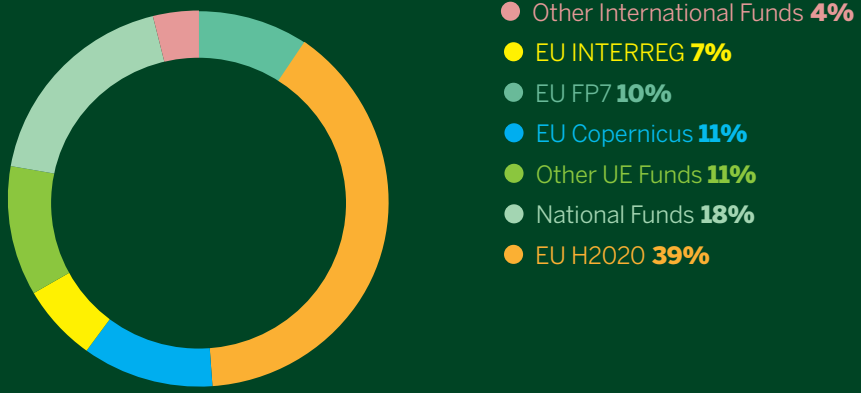


Origin of funding

The pie chart below highlights the funding agencies and programmes of the last five years CMCC's active projects. A considerable part (39%) is represented by research projects funded through the European Horizon 2020 (H2020) programme, which officially started in 2014. Along the same time span, around 10% of active research projects are the last projects funded by the EU Seventh Framework Programme (FP7), the programme being officially closed in 2013.

This confirms the research oriented effort of the Foundation together with the always-growing interest into service oriented Copernicus projects. These funds represent an increasing and sensitive share of CMCC origin of funding along with the – always

Origin of funding (per budget)



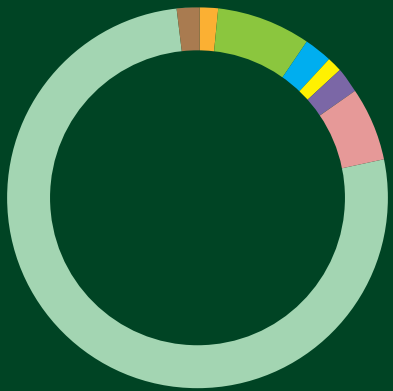
CMCC's capability and success in acquiring new funds from Horizon 2020, the main EU funding programme dedicated to research, has been confirmed in 2017.

As in 2016, CMCC has been involved in all three pillars "Excellence Science", "Industrial Leadership" and "Societal Challenges", and in the main Work Programmes of CMCC interest.

CMCC Participation into H2020 Pillars

- Societal Challenges **87%**
- Excellent Science **9%**
- Industrial Leadership **4%**

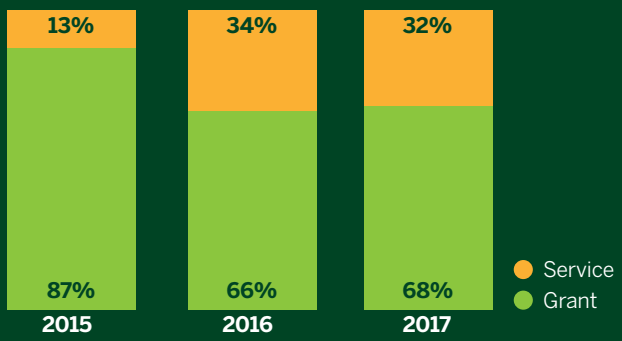
CMCC Participation into H2020 Work Programs



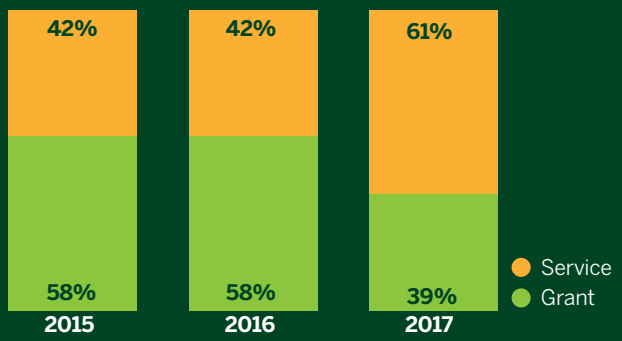
- 5.iii. Space **1%**
- 3. Marie Curie **2%**
- 14. Secure Societies **2%**
- 5.i. ICT **2%**
- 8. Health, demographic change and wellbeing **2%**
- 9. Food security **6%**
- 4. European Research Infrastructures **8%**
- 12. Climate action, environment **77%**

While the technical activities performed by CMCC (funded through service contracts) have been increasing over the last years, and despite the significant increase of awarded service contracts over the last years, CMCC activities funded through research grants still represent the main type of funding and activity for CMCC.

Type of Funding % per budget



Type of Funding % per n. projects



Publications

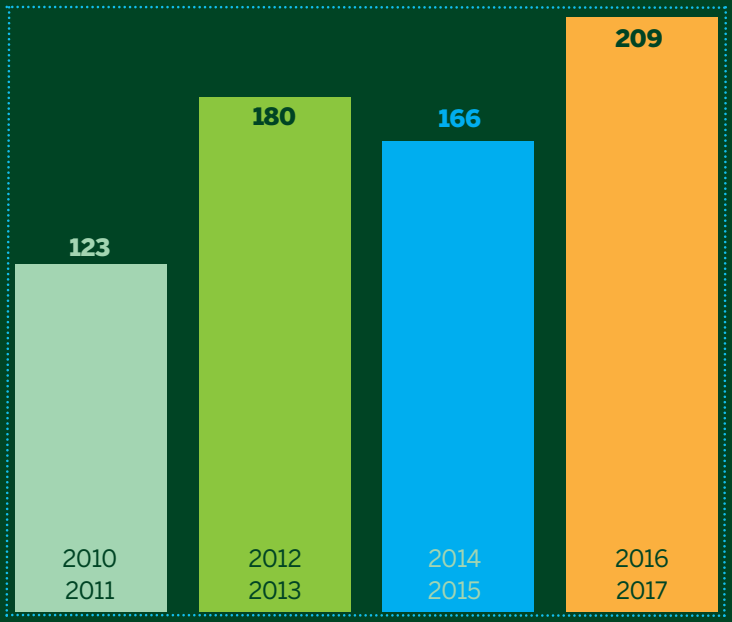
CMCC's editorial production is addressed to a diverse audience that includes the scientific community, policy decision makers, opinion leaders, and a general public interested in staying abreast of issues related to climate change research and policies. Therefore, the different types of publications 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 a multidisciplinary interaction between research divisions and from collaborations with major international institutions.

The increasing trend of publications



97 refereed papers published in **2017**

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.

CMCC Graduate Programs were inaugurated in 2008, in collaboration with three Italian universities (Università Ca' Foscari Venezia, Università del Salento and 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 a special focus on themes concerning innovative management strategies, both from a physical and a socio-economic 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), Agrometeorology and Ecophysiology of Agricultural and Forestry Eco-Systems (Università di Sassari), Energy Systems and Environment and Climate Change Sciences (Università del Salento), Sciences and Biological and Environmental Technologies (University of Salento).

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

81 Students attending the CMCC Graduate Programs in **2017**

Web & Media

In 2017 CMCC was furthermore confirmed by the media as being among the most reliable authorities dealing with climate sciences and climate change interactions between society and the environment.

100,000
visits on the website

Around
300
mentions
in the media

250,000
Twitter impressions

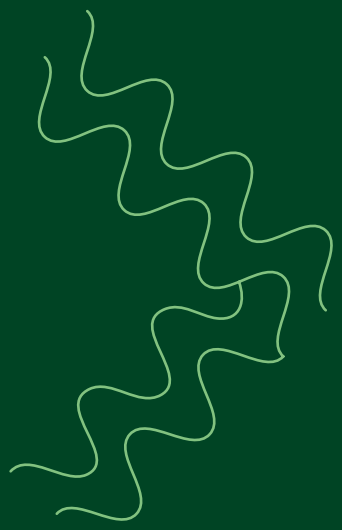
+15%
website users

Official website
www.cmcc.it

Facebook
CMCC Climate

Twitter
@CmccClimate

YouTube Channel
www.youtube.com/user/CMCCvideo



Financial Report

BALANCE SHEET: ASSETS	2017	2016
A) Receivables from shareholders for contributions due	**0**	**0**
B) Fixed assets	**1,529,339**	**1,748,410**
I. Intangible fixed assets	450,657	290,115
II. Tangible fixed assets	602,631	1,270,364
III. Financial assets	476,051	187,931
C) Current Assets	**12,917,566**	**12,733,410**
I. Inventories (Work in Progress - WIP)	8,087,479	9,116,210
II. Receivables	1,037,315	520,199
III. Current financial assets	1,919,000	1,919,000
IV. Cash at hand	1,873,772	1,178,001
D) Prepayments and accrued income	**33,909**	**85,294**
TOTAL ASSETS	**14,480,814**	**14,567,114**

BALANCE SHEET: LIABILITIES	2017	2016
A) Net Liabilities	**4,642,798**	**3,536,696**
Capital	556,000	556,000
Reserve Funds	2,980,696	23,059
Profit for the year	1,106,102	2,957,637
B) Provisions for risks and charges	**119,595**	**55,820**
C) Employee Severance Indemnities	**553,307**	**370,885**
D) Payments from Clients	**8,784,230**	**10,133,543**
E) Accruals and deferred charges	**380,884**	**470,170**
TOTAL LIABILITIES	**14,480,814**	**14,567,114**

PROFIT AND LOSS	2017	2016
A) Revenues	**12,578,572**	**13,307,678**
Revenues from sales and services	2,689,591	2,225,486
Variations in stocks (WIP)	-878,778	-10,706,945
Other revenues	10,767,759	21,789,137
B) Expenses	**11,404,310**	**10,216,464**
Consumables	50,558	50,478
Services	5,426,887	4,826,083
Leases	287,307	302,554
Personnel	4,476,297	3,899,472
Depreciation	885,633	990,026
Other Operating Expenses	277,628	147,851
Difference between revenues and expenses (A-B)	1,174,262	3,091,214
C) Financial income and charges	**-30,096**	**-105,990**
D) Impairment on financial assets	**0**	**0**
E) Extraordinary income and charges	**0**	**0**
Results before taxes (A-B±C±D±E)	1,144,166	2,985,224
Income tax expenses - current and deferred	38,064	27,587
a) Current taxes	32,536	27,587
b) Deferred taxes	5,528	0
Profit (loss) for the year	**1,106,102**	**2,957,637**

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