CERIC

Central European
Research Infrastructure
Consortium

Report

2018

ERIC established by the European
Commision Implementing Decision
392/2014/EU

Open for Science

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Providing Open Access to Excellent Researchers

Jana Kolar
CERIC Executive Director

Dear Reader,

The Annual Report before you, the fifth since our establishment, showcases the variety of activities over the past year.

Our main business is to enable excellent science, and the use of CERIC's facilities offered through our open access has led to discoveries in many different fields, including health, environment and climate change, energy and many more. Read in the report about the science potentially leading towards the development of new cancer treatments and more efficient osteoporosis treatments, increased efficiency of the artificial photosystems, and a better understanding of electrochemical processes of modern electrocatalysts.

These achievements of our users were complemented by the research undertaken within five internal research projects, co-funded by CERIC's various Partner Facilities and CERIC's central budget.
Last year was a successful one. The number of papers published in prestigious journals such as, among others, Nature Materials and Nature Chemistry, significantly increased over 2017, as did the number of applications submitted to our open calls, testifying to the increased attractiveness of CERIC to users.

While science is our main business, this report also highlights many other achievements, including in the field of education, communication and industrial liaison, and our efforts aimed at better management. Beyond our core business, we have also contributed to the development of European policy, most notably with the keynote speech at the European Council's to the High Level Working Group on Competitiveness and Growth and the organisation of a workshop with a focus on accounting and VAT issues of ERICs.

The functioning of CERIC is made possible by the considerable support from the Italian government and the in-kind contributions by our Member Countries, pooling resources in order to support CERIC's operations. On a project basis, our activities were supported by several of the Member Countries, the European Commission, European Structural and Investment Funds and Regional Funds of Friuli Venezia Giulia, demonstrating how such funds can be used in synergy in the activities performed by CERIC.
The progress of CERIC during the past year would not have been possible without the dedication, commitment, support and expertise of the people involved, and I would like to express my sincere thanks to the scientists from our Partner Facilities and their Directors, members of the Scientific and Technical Advisory Committee, members of the General Assembly and my colleagues in the administration for their contributions.

I hope you enjoy reading the Annual Report.

Executive Summary

CERIC* had a successful year in 2018, as evidenced by the headline indicators presented in Table 1. A significant increase in value can be observed for all indicators.

Headline Indicators	2015	2016	2017	2018	% Change 2018-2017
Proposals received	108	119	195	234	20
Number of papers	4	21	37	55	48,7
Average IF**	2,79	5,80	5,60	6,4	14,29
Projects' funding (CERIC)	0	21,323.00	382,159.75	509,041.99	33,2
Invited talks (reimbursed)	6	10	18	14	-22
Students and researchers trained	30	79	126	282	124

Table 1 Headline indicators for 2015-2018 and changes in the last reported year

**IF: Impact Factor of the journals where the researchers' results are published

Excellent Science

In 2018, CERIC continued to provide access to its research infrastructure and contribute to the advancement of science. Its call for open access attracted 234 proposals, requesting the use of 369 instruments, a 20% increase over 2017. Proposals came from 38 countries and 5 continents.
The scientific output has also increased since 2017, which is reflected in the 49% increase in the number of scientific publications. In addition to more publications, the average Impact Factor (IF), at 6,4, was 14% higher than in 2017. IF is used as an indicator for the last time, since it is a poor proxy for scientific excellence, but the young age of CERIC prevents us from using an indicator based on citations.
CERIC internal research projects aimed at the integration of national multidisciplinary facilities into a unique EU-level distributed Research Infrastructure, progressed with positive results. The current four three-year projects are being implemented through joint co-funding of the involved parties (in-kind, € 5.659.474), while the top-up is provided from funds for strengthening CERIC allocated by the Italian Ministry of Education, Universities and Research (MIUR, € 1.750.530). A fifth CERIC internal research project, "Nanoanalytics for pharmaceutics¨, has further contributed to strengthening collaboration with industry, for possible applications in the pharmaceutical sector.
In order further to develop CERIC's instrumental capabilities, stimulate the development of CERIC's Research Infrastructure Roadmap and contribute to the integration of CERIC's facilities, the General Assembly (GA) approved investment in CERIC's Research Infrastructure. To follow-up the decision taken in 2017, the Consortium, with the support of the CERIC International Scientific and Technical Advisory Committee, started the evaluation of proposals submitted by the Members of the Consortium in response to an internal call published in 2017, meant for the development of instruments available in the PFs.
The quality of CERIC's instrumental and scientific support must be continuously monitored in order to assure its top quality. To this end, the first international periodic evaluation of the Czech and Romanian partner facilities (PFs) took place in 2018.

Training, Industrial Liaison, Communication, Projects

Training and up-skilling at all levels is strongly prioritised by CERIC. Seventy-one school pupils from the Italian Region Friuli Venezia Giulia were taken step by step through the stages of a scientific experiment, from planning managing, executing and evaluating a research project, to disseminating its results. CERIC also contributed to HERCULES school training of 90 Ph.D. students, while four industrial training sessions provided 80 PhD students with new knowledge about the strategies and tactics to create a business-research network and a robust collaborative environment.
Outreach activities, aimed at training the users of tomorrow from less R&D developed regions, included the organization of an outreach event at the University of Belgrade, targeting the local research community, with the goal of raising awareness about the opportunities and services offered by CERIC. CERIC's operational and marketing strategy in the industrial liaison domain was further developed throughout 2018, as well as procedures of industrial access to the Partner Facilities, based on the different services needed by industry. In addition, networking with the main actors of the innovation system and promoting CERIC's offer was a continuous activity throughout the year.
In the field of communication, following the approval of the new visual identity of the Consortium, a new website was designed and published, and the social media strategy was fine-tuned and further implemented in 2018.
In addition to ordinary funding, CERIC also received funding for regional and European projects (i.e., PaGES3 and PaGES4, H2020 ACCELERATE, H2020 E-RIHS, H2020 PaNOSC), in total amount exceeding 0.5 mio EUR, which is a 33.2% increase over 2017. A new Horizon 2020 project PaNOSC started, aiming to contribute to the realization of a data commons for Neutron and Photon science, providing services and tools for data storage, analysis and simulation, for the many scientists from existing and future disciplines using data from photon and neutron sources. In addition, ERIC FORUM project proposal, bringing together all ERICs, was submitted and positively evaluated.
The ACCELERATE project, which aims to support the long-term sustainability of large-scale research infrastructures (RIs) through the development of policies and legal and administrative tools for more effective management and operation of RIs, with special focus on ERICs and CERIC in particular, continued, as did ERIHS. The latter is a preparatory project aimed at a creation of a solid base for the future operation of E-RIHS ERIC, in the field of cultural heritage.

Contribution to Policies

In 2018, a review of the approaches to performance monitoring in research infrastructures took place, with the contribution of the ERF and its members. In addition to monitoring, CERIC has commenced with the preparation of its societal return report, following a methodology based on the Theory of Change, developed by the Rathenau Institute, to be applied for the first time by research infrastructures. Work to solve ERICs' common challenges in the field of VAT exemption has continued throughout 2018, as shown in the conclusions of the workshop on ERIC's implementation and VAT issues held in Brussels in June 2018.
In addition, CERIC continued to build bridges with other initiatives across Horizon 2020 and Horizon Europe, contributing to the European policy on research and innovation, and to the debate on the long-term sustainability of RIs, mutual learning and roadmapping, university-research-industry collaboration, public-public- partnerships, competitiveness and growth, and monitoring and impact assessment.

Operations and Finance

In March 2018, the General Assembly of CERIC adopted the Monitoring Framework for the Consortium, to be used internally as a management tool, and externally, to demonstrate the effectiveness, efficiency and accountability of the Consortium.
In June 2018, the GA reconfirmed Prof. Carlo Rizzuto as its Chair, and Jana Kolar as Executive Director of the Consortium, and appointed Prof. Marek Stankiewicz as Vice-Chair of the GA. During the year, CERIC further implemented and strengthened activity of promoting the opportunities for researchers worldwide (fast track access) and from target countries (promotional open access), in order to contribute to bridging the research and innovation divide. In the field of human resources, transparent and merit-based recruitment policies continued to be implemented.
Finally, the Methodology for Accounting In-kind Contributions adopted in 2016, was implemented for the collection of data for 2018, as shown in the Notes to the Financial Statements. The final section presents the financial and economic situation of the Consortium, outlined through statements presented under the accrual basis of accounting according to the International Public Sector Accounting Standard.

CERIC Overview

CERIC-ERIC is an integrated multidisciplinary research infrastructure for basic and applied research in all fields of materials, biomaterials and nanotechnology. Located in 8 countries in Europe (Austria, Croatia, Czech Republic, Hungary, Italy, Poland, Romania and Slovenia), it is open to researchers from all over the world. It offers a single access point to state-of-the-art facilities and techniques based on the use of electrons, ions, neutrons and photons. Each Member Country contributes to CERIC a high-quality PF which is available to researchers, depending on a positive review from the International Scientific and Technical Advisory Committee (ISTAC) of CERIC.

*For an overview of CERIC and its main goals and activities, see chapter 5 "CERIC Overview"

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Excellent Science

Main Achievements

1. **Implementation of 2 calls for free open access** to which 234 proposals, requesting the use of 369 instruments, were submitted. This is a 20% increase over the previous year.
2. **Proposals came from 38 countries and 5 continents**
3. **A 42% increase in the number of scientific publications**
4. **Positive evaluation of two CERIC Partner Facilities** by the international team of experts led by CERIC's International Scientific and Technical Advisory Committee (ISTAC)
5. **Positive evaluation of the progress of three CERIC internal research projects**

Open Access

CERIC's main aim is to enable excellent science, both as an in-house activity and as a service to international users. This is achieved mainly by providing open access to its research facilities.

In 2018, CERIC launched two open access calls for proposals to use the Consortium's research infrastructure; 234 proposals were received (Figure 1). Due to their multi-technique character, this corresponded to 369 single instrument proposals, which is a 20% increase over 2017. There were 187 experiments approved. The number of allocated experiments increased significantly, by 16% in comparison to the previous year (Figure 2). This number corresponds to a total of nearly 19,000 hours of measurements.

The majority of applicants requested access to multiple facilities, which is still the distinguishing and most appealing characteristic of CERIC.

Figure 1
Number of proposals and requested methods

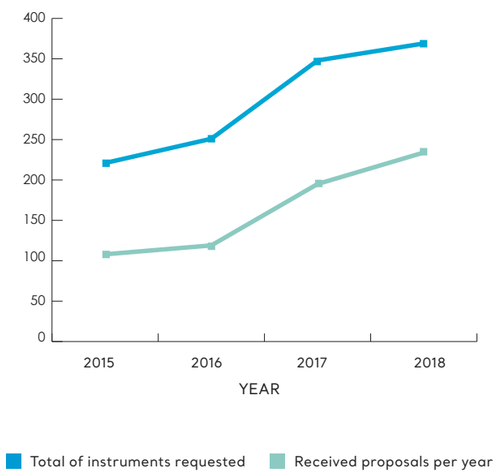
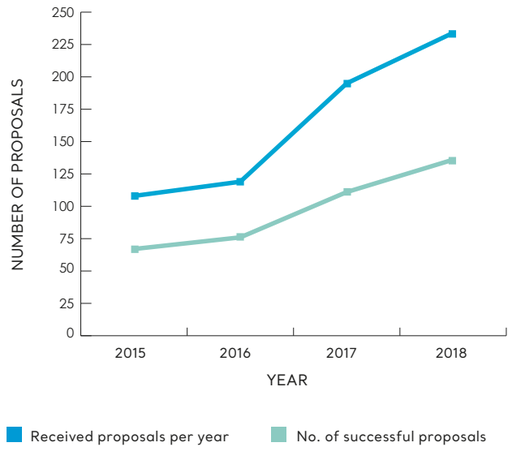


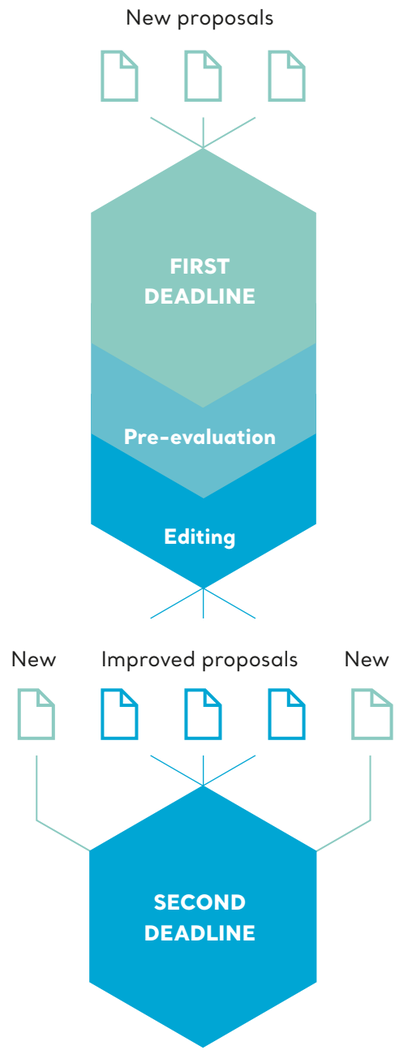
Figure 2
Number of received and successful proposals per year



CERIC remains a highly internationalised research infrastructure, with principal investigators from 38 countries and five continents in 2018 (Figure 3). Following the same trend of the previous year, 50% of proposals came from non-EU countries.

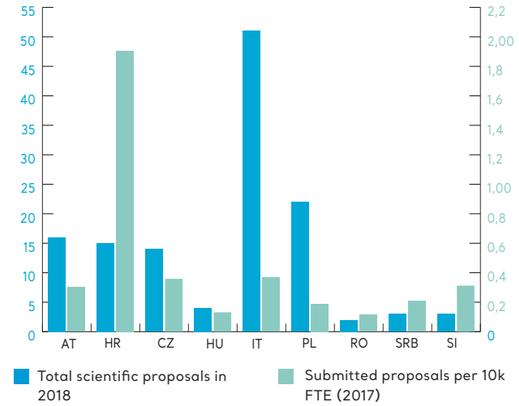
Figure 3
No. of proposals by country

- **2 calls for proposals**
- **234 proposals received**
- **Research groups from 38 countries**
- **187 allocated requests**



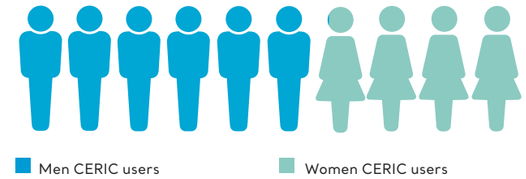
Nevertheless, the majority (55%) of submitted proposals came from CERIC Member Countries. This is to be expected, since CERIC is a recent addition to the European research infrastructure landscape and is still not well known beyond its Member Countries. The most active users, in terms of fulltime employees in Research & Development in a country, are from Croatia, followed by Italy and the Czech Republic.

Figure 4
Proposals per 10K full time employees in R&D in Member Countries



In 2018, 30% of the principal investigators and 39% of the researchers who performed the measurements at the facilities were women (Figure 5).

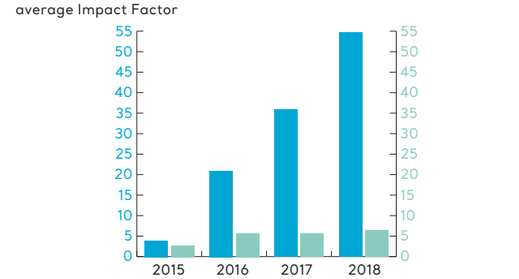
Figure 5
Gender distribution of CERIC users



Quality of the Output

In 2018, the number of publications stemming from measurements taken at the CERIC facilities increased by 48,7%, while the average Impact Factor (6.4) increased by 14,29% in comparison to the previous year (Figure 6).

Figure 6
Number of scientific publications* in 2015, 2016, 2017 and 2018 and average Impact Factor



*This number comes from the CERIC's publication database, so it may be lower than the actual number of papers published.

International Scientific and Technical Advisory Committee - ISTAC

The purpose of the International Scientific and Technical Advisory Committee of CERIC-ERIC is to provide the CERIC General Assembly (GA) with recommendations on scientific and technical issues that bear on the full and effective utilization of CERIC-ERIC as a state-of-the-art research infrastructure, and on developments required to maintain its scientific productivity at the highest possible level and ensure its relevance to the requirements of the international scientific community. In particular, the ISTAC evaluates proposals for new partner facilities, and the operation of existing ones, advising the General Assembly on acceptance and continuation.

The second periodic evaluation of the Czech and Romanian partner facilities (PFs) took place in May 2018 (see p. 23).

In the same year, ISTAC member Ingolf Lindau ended his mandate, after having diligently contributed to the development of the CERIC infrastructure for four years since its very start. ISTAC welcomed a new member with expertise in the same scientific area as his predecessor: Karsten Horn, staff scientist at the Fritz Haber Institute of the Max Planck Society in Berlin – Germany, and adjunct Professor of Physics at the Freie Universität Berlin.

Scientific Publications

Fifty-five articles were published in 2108, with a cumulative impact factor of 312.9 (versus 182.44 in 2017) and an average impact factor of 6.1 (versus 5.70 in 2017):

(1) *Hydration properties and water structure in aqueous solutions of native and modified cyclodextrins by UV Raman and Brillouin scattering* Bottari C., Comez L., Paolantoni M. ,Corezzi S., D"Amico F., Gessini A., Masciovecchio C., Rossi B., Journal of Raman Spectroscopy, 2018.

(2) *Graphene-like layers as promising chemiresistive sensing material for detection of alcohols at low concentration,* Gargiulo V., Alfano B., Di Capua R., Alfé M., Vorokhta M., Polichetti T., Massera E., Miglietta M.L., Schiattarella C., Di Francia G., Journal of Applied Physics, 123 (2), 2018, p 24503.

(3) *Effect of Ti speciation on Catalytic performanmce of TS-1 in the Hydrogen Peroxide to Propylene Oxide reaction,* Signorile M., Crocellà V., Dain A., Rossi B., Lamberti C., Bonino F., Bordiga S., The Journal of Physical Chemistry C, 122 (16), 2018, pp 9021-9034.

(4) *Direct observation of a surface resonance state and surface band inversion control in black phosphorus* Ehlen N., Sanna A., Senkovskiy B.V., Petaccia L., Fedorov A.V., Profeta G., Grüneis A., Physical Review B, 97 (4), 2018, p 45143.

(5) *Bulk Hydroxylation and Efective Water splitting by Highly reduced Cerium Oxide: The role of O vacancy coordination,* Dvorak F., Szabova L., Johanna V., Farnesi Mellone M., Stetsovych V., Vorokhta M., Tovt A., Skàla T., Matolinova I., Tateyama Y., Myslivecek J., Fabris S., Matolin V., American Chemical Society, 2018, pp 4354-4363.

(6) *In Situ DRIFTS and NAP-XPS Exploration of the Complexity of CO2 Hydrogenation over Size-Controlled Pt Nanoparticles Supported on Mesoporous NiO,* Sàpi A., Halasi G., Kiss J., Dobo D.G., Juhàsz K.L., Kolcsàr V.J., Ferencz Z., Vàri G., Matolin V., Erdöhely A., Kukovecz A., Kónya Z., The Journal of Physical Chemistry C, 122 (10), 2018, pp 5553-5565.

(7) *Quasi-two-dimensional thermoelectricity in SnSe,* Tayari V., Senkovskiy B.V., Rybkovskiy D., Ehlen N., Federov A., Chen C.Y., Avila J., Asensio M., Perucchi A., di Pietro P., Yashina L., Fakih I., Hemsworth N., Petrescu M., Gervais G., Gruneis A., Szkopek T., Physical Review B, 97, 2018, p 45424.

(8) *TiO2-SiO2-PDMS nanocomposite coating with self-cleaning effect for stone material: Finding the optimal amount of TiO2,* Crupi V., Fazio B., Gessini A., Kis Z., La Russa M.F., Majolino D., Masciovecchio C., Ricca M., Rossi B., Ruffolo S.A., Venuti V., Construction and Building Materials, 166, 2018, pp 464-471.

(9) *Position Accuracy of Gold Nanoparticles on DNA Origami Structures Studied with Small-Angle X-ray Scattering,* Hartl C., Frank K., Amenitsch H., Fischer S., Liedl T., Nickel B., Nano Letters, 2018.

(10) *Interplay between bandwidth-controlled and filling-controlled pressure-induced Mott insulator to metal transition in the molecular compound [Au(Et-thiazdt) 2],* Brière B., Caillaux J., Le Gal Y., Lorcy D., Lupi S., Perucchi A., Zaghrioui M., Soret J.C., Sopracase R., Ta Phuoc V., Physical Review B, 97 (3), 2018.

(11) *Magnetization reversal and domain nucleation in ultra-thin Co/Re(0001) capped by graphitic C* Genuzio F., Menteş T.O., Locatelli A., IEE Transactions on Magnetics – Conferences, September 2018.

(12) *Magnetic Patterning by Electron Beam-Assisted Carbon Lithography,* Genoni P., Genuzio F., Menteş T. O., Santos B., Sala A., Lenardi C. and Locatelli A., ACS – Applied Materials and Interfaces, 10(32), 27178–27187 (2018).

(13) *Annealing induced effect on the physical properties of ion-beam sputtered 0.5 Ba(Zr0.2Ti0.8)O3–0.5 (Ba0.7Ca0.3)TiO3- ferroelectric thin films,* Oliveira M. J. S., Silva J. P. B., Veltruská K., Matolín V., Sekhar K. C., Moreira J. A., Pereira M., Gomes M. J. M., Applied Surface Science, 443, 2018, pp 354-360.

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(17) *Coordination environment of Zn in foraminifera Elphidium aculeatum and Quinqueloculina seminula shells from a polluted site,* De Giudici G., Meneghini C., Medas D., Buosi C., Zuddas P., Iadecola A., Mathon O., Cherchi A., Kuncser A.C., Chemical Geology, 2018, 477.

(18) *Effects of nanofeatures induced by severe shot peening (SSP) on mechanical, corrosion and cytocompatibility properties of magnesium alloy AZ31,* Bagherifard S., Hickey D.J., Fintovà S., Pastorek F., Fernandez.Pariente I., Bandini M., Webster T.J., Guagliano M., Acta Biomaterialia, 2018, 66, 99-108.

(19) *Stimulated CO Dissociation and Surface,* Graphitization by Micro-Focused X-ray and Electron Beams, Genuzio F., Genoni P., Menteş T.O., Santos B., Sala A., Lenardi C., and Locatelli A., ACS J. Phys. Chem. C., October 24, 2018.

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(21) *Branch-like NiO/ZnO heterostructures for VOC sensing,* Kaur N., Zappa D., Ferroni M., Poli N., Campanini R., Negrea R., Comini E., Sensors and Actuators B-Chemical, 2018, 262, 477-485, DOI

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(27) *The influence of Si in Ni on the interface modification and the band alignment between Ni and alumina,* Yoshitake M., Nemšàk S., Skàla T., Tsud N., Matolin V., Prince K.C., Applied Surface Science, 2018, 442, 164-169.

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(29) *Decomposition of methanol on mixed CuO–CuWO4 surfaces,* Blatnik M., Drechsel C., Tsud N., Surnev S., Netzer F.P., Journal of Physical Chemistry B, 2018, 122, 679-688.

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(37) *Formation of highly ordered liquid crystalline coatings – an in situ GISAXS study,* Salentinig S., Zabara M., Parisse P., Amenitsch H., Physical Chemistry Chemical Physics, 2018, 20 (34), 21903-21909.

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(45) *Structure of human telomere G-quadruplex in the presence of a model drug along the thermal unfolding pathway,* Bianchi F., Comez L., Biehl R., D'Amico F., Gessini A., Longo M., Masciovecchio C., Petrolio C., Radulescu A., Rossi B., Sacchetti F., Sebastiani F., Violini N., Paciaroni A., Nucleic Acid Research, 2018.

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Scientific Highlights

The tie between the ActD molecule with DNA structures rich in guanine inhibits the production of tumour cells[1]

Defeating cancer with a hug is possible. Science has suggested it, in an article published in the prestigious international journal *Nucleic Acids Research*.
Scientists observed that the "embrace" between the antitumor molecule Actinomicin D (ActD) with some structures of our DNA can inhibit the activity of enzymes linked to the replication of cancer cells, through a stabilizing action, providing valuable information for the development of new treatments.
The discovery is the result of the work of a group of researchers from the University of Perugia and the Institute of Materials of the National Research Council (IOM-CNR), as part of international collaboration. It provides useful data for the development of drugs directly targeting the diseased cells, thus reducing the need to resort to chemotherapy.
The research group studied the interaction of the ActD molecule with G-quadruplex – structures of quadruple helix DNA rich in guanine - located at different points of the chromosomes and, in particular, in their terminal parts, the telomeres. These regions are particularly critical because their length is strongly dependent on the activity of telomerase, a fundamental enzyme for cell growth and replication. In more detail, the activity of telomerase is associated with the number of times a cell can divide, playing an important role in the immortality of cell lines, such as cancer cells. In fact, this enzyme, which acts through the addition of telomeric repeats to the ends of chromosomal DNA, is involved in the generation of immortal cancer cells: there is a strong correlation between telomerase activity and malignant tumours or cancerous cell lines.
The formation of quadruplex, however, is able to switch off the telomerase functionality. The aim of the research, coordinated by Alessandro Paciaroni and Lucia Comez was to find a way to stabilize the G-quadruplex of the terminal regions of the chromosomes, to inhibit the action of the telomerase and interrupt the process of uncontrolled proliferation of the tumour cells.
To achieve this, the ActD binding molecule was used. A combination of different techniques at the synchrotron at the Italian CERIC partner facility Elettra (UV Resonant Raman scattering at IUVS), at the Heinz Maier-Leibnitz Zentrum (MLZ) in Munich (SANS at KWS2), and at the Jülich Centre for Neutron Science (JNCS) in Jülich (SAXS-pace Kratky camera), has provided information on the way this molecule works, towards promising results.
ActD – which appears in the form of a plate with two arms – in the interaction with the G-quadruplex, places itself on it, putting the arms respectively above and below the structure. This bond produces a chemical reaction that leads to stabilization of the G-quadruplex through its dimerization. The stabilized structures inhibit telomerase, blocking the process of tumour formation.
The options for further research development include a deepening of the knowledge of this molecular "embrace", and exploration of the possibilities of changing the nature of the ActD molecule's arms, to observe the behaviour and verify its effectiveness.


Alessandro Paciaoni

"Our research allowed to retrieve valuable information on the way the ActD molecule, which is already used in clinics for cancer therapy, interacts with G-quadruplex structures and inhibits the uncontrolled proliferation of tumour cells."

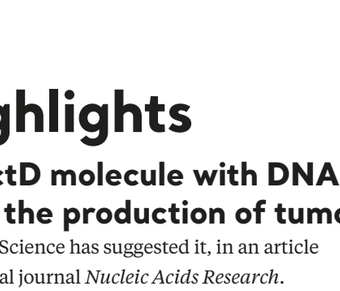


Figure 7
Interaction between G-quadruplex and ActD. The ActD molecule induces a partial dimerization of the G-quadruplex structures favouring their stabilization.


Lucia Comez

[1] *Structure of human telomere G-quadruplex in the presence of a model drug along the thermal unfolding pathway*, Bianchi F., Comez L., Biehl R., D'Amico F., Gessini A., Longo M., Masciovecchio C., Petrolio C., Radulescu A., Rossi B., Sacchetti F., Sebastiani F., Violini N., Paciaroni A., *Nucleic Acids Research*, 2018. DOI: 10.1093/nar/gky1092

Research makes a new step towards the production of environmentally friendly photosystems inspired by nature[2]

Photosynthesis is a vital reaction for our planet. Not only does it keep our green landscape alive, converting CO2 into valuable biomass, it is also the primary source of oxygen in the atmosphere. At the heart of the photosynthetic mechanism, there is one of the most difficult reactions to accomplish: water splitting, i.e., the cleavage of the very stable bonds of the water molecule into its elements: hydrogen and oxygen. For this first step of the photosynthesis reaction, plants use a highly specialised protein complex, designated Photosystem II (PSII), which collects sunlight and uses its energy to split water through the light-absorbing molecule chlorophyll, and an enzyme that contains manganese, as the catalyst.

In recent years, the ability to split water using sunlight as the energy source has also become more and more interesting for technical applications. The possible wider use of fuel cells in, e.g., cars, requires an energy-efficient and environmentally friendly method of hydrogen production from water.
Although it is nowadays possible chemically to synthesise molecules and materials that can use sunlight to split water with a similar mechanism as plants do, the efficiency of existing artificial photosystems is way lower than their natural templates. One reason is that in plants, the light-absorbing chlorophyll surrounds the PSII like antennae.
Within one antenna, molecules are chemically connected in a way that enables them to transport the energy coming from the sun via chemical transportation to the core of the PSII, where it can be used for the water splitting reaction. Such a structure, if included in artificial photosystems, would lead to a considerable increase in the efficiency of these systems.

The research team, led by **Marcella Bonchio** from the University of Padua, recently made a fundamental step in this direction.
In a study published in the prestigious journal *Nature Chemistry*, an international team of researchers used a new combination of a large light-harvesting molecule of the type perylene-bisimide (PBI) and a metallic catalyser based on polyoxyruthenate (Ru_4POM). "*We went back to the very first principles of the problem, reading the earliest studies of Emerson and Arnold (1932) and Park and Biggins (1964), and we started our quest for the quantasome particles*", says Bonchio. *"The quantasome is the minimal photosynthetic unit responsible for the 'quantum' solar energy conversion. We made it by integrating a synthetic antenna to capture the solar radiation and a totally inorganic catalyst that can split water using visible light*".
The group conducted a complicated structural analysis using a combination of light scattering and small-angle X-ray scattering, both available at the Austrian CERIC partner facility, and found that the system in water assembles in a structure that is similar to natural PSII. Complementary tests on the performance in splitting water show increased efficiency that clearly depends on the structure of the synthesised photosystem. This knowledge on how the structure of an artificial photosystem correlates with photosynthetic functionality is an important step towards the development of photosystems that imitate natural examples and could lead to environmentally-friendly hydrogen production in the future.


Marcella Bonchio

"Self-assembly of individual photosynthetic particles into ordered arrays forming a multi-lamellar architecture, is exciting as Nature uses the same strategy to enable solar energy conversion"

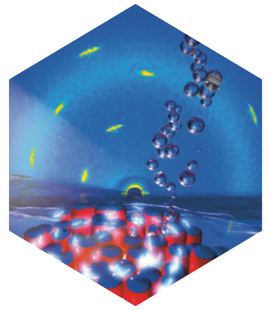


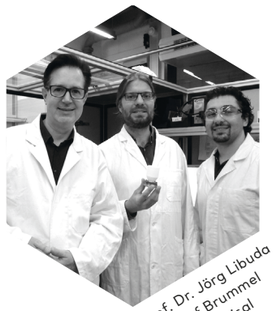
Figure 8
Model representation of the quantasome self-assembly into a 2D photosynthetic membrane, showing a biomimetic hexagonal-like pattern of the artificial photocomplexes in water, evolving oxygen upon absorption of visible light.

[2] *Hierarchical organization of perylene bisimides and polyoxometalates for photo-assisted water oxidation*, Bonchio M., Syrgiannis Z., Burian M., Marino N., Pizzolato E., Dirian K., Rigodanza F., Volpato G.A., La Ganga G., Demitri N., Berardi S., Amenitsch H., Guldi D.M., Caramori S., Bignozzi C.A., Sartorel A. & Prato M., *Nature Chemistry*, 2018, DOI:10.1038/s41557-018-0172-y

Breakthroughs towards understanding of electrochemical processes of modern electrocatalysts[3]

The global transition to a clean, renewable energy system is stimulating the development of new technologies for the conversion of chemical energy to electricity. Many emerging technologies, including fuels cells, water splitting and energy storage devices, are based on the principles of electrocatalysis. Essentially, electrocatalysis is a catalytic process that occurs at the surface of a solid electrode immersed in a liquid electrolyte. The electrolyte is an electrically conducting aqueous solution to which chemical reactants are added. The chemical reaction is driven by applying a potential to the electrode. In order to increase the reaction speed of an electrochemical process, the surface of the electrode is plated with an electrocatalyst. To date, the most active and efficient electrocatalysts contain nanoparticles of noble metals, on supports. The activity of such electrocatalysts critically depends on the structure of the adsorption sites. The rational design of an active electrocatalyst requires the identification of the most active sites. However, a large variety of adsorption sites in real electrocatalytic materials makes it difficult to establish a link between the activity and the structure of the adsorption site. A general approach to overcoming this problem is to use structurally well-defined model systems of real electrocatalytic materials. Model systems of different structural and chemical complexity can be prepared in an ultra-high vacuum (UHV), ranging from simple surfaces such as metal single crystals to complex ones using supported metal nanoparticles. However, the transfer of model systems from the UHV to a liquid environment is a major challenge. Specifically, such a transfer must be carried out under conditions that preserve the well-defined structure and cleanliness of the model systems. For example, exposure of the model surfaces to air results in contamination and deactivation of catalytically active sites. In the field of electrochemical surface science, the catalyst surface is often cleaned by means of flame annealing. While this cleaning procedure can be used with single metal crystals such as platinum, e.g., Pt(111), it causes irreversible damage to more complex systems, such as supported metal nanoparticles.

The research team around **Prof. Dr. Jörg Libuda** from the University of Erlangen-Nuremberg in Germany made a breakthrough in this direction. In an article published in the prestigious journal *Nature Materials*, they describe **a new strategy by which it is possible to study a complex model catalyst in the form of Pt nanoparticles supported on well-ordered cobalt oxide Co3O4(111) films in a liquid environment**. To this end, they used a special setup that allows the transfer of the model catalyst from UHV into a liquid electrolyte, without exposing its surface to air. Numerous techniques were applied in the study, including Synchrotron Radiation Photoelectron Spectroscopy (SR-XPS) at the Material Science Beamline and X-ray Photoelectron Spectroscopy (XPS) coupled with an electrochemical cell at the CERIC Czech Partner Facility in Trieste and Prague, respectively. The researchers proved the potential of the concept, which makes available a systematic approach to building complex, but atomically defined model electrocatalysts for fundamental electrocatalytic studies. This novel strategy might pave the way towards the development of more effective, stable and cost-efficient catalysts to be applied, among other things, in systems producing clean energy.



Prof. Dr. Jörg Libuda
Dr. Olaf Brummel
Dr. Firas Faisal

"The use of well-defined oxide-based model catalysts in the field of electrocatalysis provides new insight into the nanoscale phenomena that govern the properties of complex electrocatalytic materials"

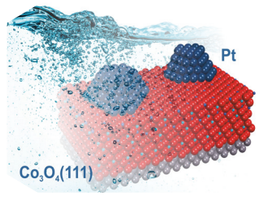


Figure 9
Introducing well-defined model electrocatalysts into the field of electrochemistry

[3] *Electrifying model catalysts for understanding electrocatalytic reactions in liquid electrolytes*
Faisal F., Stumm C., Bertram M., Waidhas F., Lykhach Y., Cherevko S., Xiang F., Ammon M., Vorokhta M., Šmid B., Skála T., Tsud N., Neitzel A., Beranová K., Prince K.C., Geiger S., Kasian O., Wähler T., Schuster R., Schneider M.A., Matolín V., Mayrhofer K.J.J., Brummel O., Libuda J., *Nature Materials*, 2018, 17, 592-598, DOI: 10.1038/s41563-018-0088-3

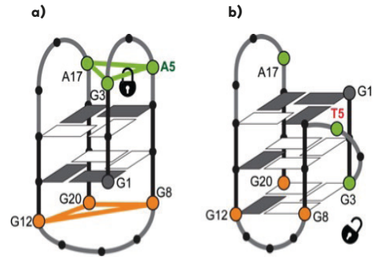
Formation of unusual DNA folds in the regulatory region of the RANKL gene associated with osteoporosis[4]

Osteoporosis is the most common chronic metabolic bone disease, characterized by increased bone fragility. According to the International Osteoporosis Foundation, it causes more than 8.9 million fractures annually worldwide. The pathogenic conditions that lead to osteoporosis disrupt the tightly regulated balance between bone resorption and formation. One of the key regulators of bone homeostasis is the **RANKL protein**, expression of which is considerably upregulated in osteoporosis. Molecular mechanisms by which expression of a RANKL gene could be regulated have not yet been fully explained. A study published by CERIC users in 2018 aimed to uncover new therapeutic strategies, which could lead to more efficient osteoporosis treatments. One of the potential ways of gene regulation on the transcriptional level is by the formation of unusual secondary DNA structures that are rich in guanine (i.e., one of the nitrogen-containing bases composing DNA, together with A-adenine, T-thymine and C-cytosine), such as G-quadruplexes (G4), in the regulatory regions of a particular gene. The most characteristic structural element of G4 is G-quartet, a planar arrangement of four guanines. G-quartets stack on top of each other to form the G4 core, while residues of other bases, which connect guanine planes, form so-called "loops" of different sequences, lengths and orientations. Formation of G4 in gene regulatory regions, where they can act as activators or repressors of gene transcription, has so far been connected with diseases such as cancer and neurodegenerative disorders. For the first time, a team of researchers including **Martina Lenarčič Živković**, **Jan Rozman** and **Prof. Janez Plavec**, from the Slovenian NMR Centre in Ljubljana, showed that G4 structures can form in the RANKL gene, considered responsible for the development of osteoporosis. In particular, they observed that the G-rich DNA sequence d(GGGTAGGGAGCGGGAGAGGG) from the RANKL gene regulatory region (RAN4), folds into a G4 with only two G-quartets (Fig. 10a), although a three-quartet G4 (i.e., three G-quartet stacks, as in Fig. 10b) was expected to form based on a RAN4 sequence that possesses four GGG tracts. In contrast to protein structures, which can be more accurately predicted based on the sequence, predictions of G4 structures are not so reliable, especially due to the diverse roles of loop residues in the process of folding (they can, for example, either stabilize or prevent the formation of particular structures). How a single loop residue can influence the final structure that a particular G-rich sequence will occupy, was clearly shown in the case of RAN4. Analysis of the RAN4 high-resolution structure determined with NMR spectroscopy at the Slovenian partner facility of CERIC, the Slovenian NMR in Ljubljana, uncovered the decisive role of a single loop adenine A5 which, by forming a base triad outside the quartet, led to a distinctive two-quartet G4 structure. These results indicate that specific loop interactions involving an adenine residue can critically influence the structure of a G4, and provide insights into the complexity of intricate interactions that can guide the folding process of G-rich sequences. The study showed that the RAN4 sequence is able to form G4 structure(s) *in vitro*. However, the next step of the research will focus on evaluation of the formation and potential influence of the observed structure in the cell. The study is the first to suggest that expression of the RANKL gene may be regulated by folding of its G-rich region into unusual DNA structures, such as G4 and, as such, represents a novel idea towards the development of potential G4-mediated osteoporosis therapeutic strategies.

Martina Lenarčič Živković

"Our structural study is the first to gain insights into the potential correlation between G-quadruplex formation and osteoporosis, which opens new horizons in therapeutic strategies of bone-related diseases"

Figure 10
Structural switch between two-quartet (left [a], RAN4) and three-quartet (right [b], RAN4A5T) G-quadruplex depends on interactions of adenine A5 from A•G•A base-triad, where it forms hydrogen bonds with G3



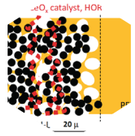
[4] *Adenine-driven structural switch from a two- to three-quartet DNA G-quadruplex*
Lenarčič Živković M., Rozman J., Plavec J., *Angew. Chem. Int. Ed.* 2018, 57 (47), 15395-15399, DOI: 10.1002/anie.201809328

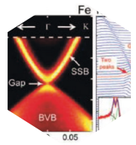
Internal Research Projects

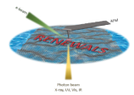
Four projects selected within the frame of the 2016 Call for Research Grants were funded between 2017 and 2018, to an amount up to 150,000 EUR/12 months, for a 3-year period. Funding is allocated by CERIC each fiscal year, subject to a positive outcome of the yearly progress evaluation made by CERIC in consultation with ISTAC. The overall contribution of MIUR for the abovementioned projects amounts to € 1,750,530. The partners have contributed inkind a total amount of € 5,659,474.

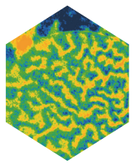
The goal of the funding is to foster the integration of national multidisciplinary facilities into a unique EU-level distributed research infrastructure for the analysis and synthesis of materials and for sample preparation, towards its development and upgrade.

The projects funded are the following:
CEROP (Deciphering single-atom catalysis in Pt/ceria systems via advancing the CERIC operando methods) aims at developing in-operando experimental methods to study the process of heterogeneous catalysis under realistic conditions. This will enable a deeper insight into catalysis and will help in designing more efficient catalysts.
Dyna Chiro (Spectroscopy and Dynamics of Chiral Systems) focuses on the development and construction of special synchrotron-suitable instrumentation to investigate the chiral and dynamic properties of matter. The results of this investigation have a wide range of applications, from synthesis of new polymers to drug design.
RENEWALS (Graphene for Water in Life Sciences) focuses on the development and construction of special synchrotron-suitable instrumentation to investigate the chiral and dynamic properties of matter. The results of this investigation have a wide range of applications, from synthesis of new polymers to drug design.
MAG-ALCHEMI (Magnetic Anisotropy Grafting by Means of Atomic Level Chemical Engineering at Film Interfaces) focuses on magnetic materials and aims at developing tools to control thin magnetism via interfacial engineering. The main goal is to devise novel means of tuning the magnetic state of matter by appropriately modifying the interface chemistry, towards further developments in the architecture and performance of various devices.









The progress of all projects was positively evaluated by the International Scientific and Technical Advisory Committee - ISTAC of CERIC in 2018.

Another CERIC internal research project is "**Nanoanalytics for Pharmaceutics**", with Dr. **Aden Hodzic** as principal investigator. In the project, various nano-analytical techniques are used to develop drug formulations and release them in solid, liquid-crystal and liquid states, enclosed in active pharmaceutical ingredients (APIs). The work is based on a methodology based on nano-analytics, which predicts the dissolution and structural properties of tested drugs in a time range of minutes. Once applied, the research will impact the therapeutic performance of nano-systems.

Writing magnetism by irradiating carbon monoxide with electrons[5]

Magnetic materials are a keystone in a modern, information-based society. They are used in a multitude of data storage systems, hard disks and MRAM devices, to name just a few. Regardless of the particular type of device, the principle of operation of a magnetic memory relies on the ability to control the magnetization locally. Typically, on writing, the magnetic moments [1] of all atoms contained within a well-defined microscopic region of the magnetic medium are forced to align parallel to one another. These regions, known as magnetic domains, permit us to code information in the form of unit bits, depending on whether the magnetization points up or down. Naturally, for the "read and write" processes to occur reliably, one has to engineer the physical properties of the magnetic material precisely.
Magnetic thin films and artificially fabricated heterostructures are ideally suited to this purpose. Their reduced volume is key to obtaining energy-efficient operation and high storage density. It also brings huge economic and environmental benefits, which come from the diminished consumption of materials that are often rare and difficult to extract. Artificial heterostacks also allow the magnetic properties to be tuned through layer thickness and interfacial interactions. In this respect, the combination of ferromagnetic layers with 2-dimensional materials, such as graphene and transition metal dichalcogenides, is researched intensively. For instance, graphene-Co stacks are known to exhibit enhanced perpendicular magnetic anisotropy [2], which allows closer magnetic domain spacing and improved stability, a feature that is especially important in non-volatile memories.
The team around the principal investigator of the CERIC research project **MAG-ALCHEMI**, **Andrea Locatelli** from the Italian CERIC partner facility at Elettra Sincrotrone Trieste, together with colleagues from the Universities of Trieste and Milan, have devised a new method of grafting chemo-magnetic patterns by depositing atomic carbon. To do this, they took an ultra-thin cobalt film and exposed it to carbon monoxide (CO) while irradiating the surface with an intense, micro-focused low energy electron beam. During irradiation, CO molecules readily dissociate, that is, they split into fragments. This process, which is accompanied by the desorption [3] of oxygen, favours the accumulation of carbon at the cobalt surface up to a coverage of one atomic layer. Most notably, it was found that this overlayer can be converted to graphene, a honeycomb network of a single atomic layer of carbon, with simple thermal treatment. As demonstrated by magnetic sensitive microscopy, the irradiated and non-irradiated surface regions exhibit out-of-plane and in-plane magnetic anisotropy, respectively. This provides proof-of-principle that arbitrary magnetic patterns can be lithographically grafted in cobalt. Importantly, this is done without interrupting the lateral continuity of the cobalt film, by simply depositing surface carbon.
The research team is now developing this method of magnetic nano-patterning. Several applications are envisaged, from the fabrication of spin wave devices and filters to complex heterostacks comprising different ferromagnetic layers, whereby the magnetic coupling is tuned by an interposed graphene spacer.

[1] A magnetic moment is a quantity that represents the magnetic strength and orientation of a magnet or other object that produces a magnetic field.
[2] Anisotropy is the property of being directionally dependent, which implies different properties in different directions, as opposed to isotropy.
[3] Desorption is a phenomenon whereby a substance is released from or through a surface.

Andrea Locatelli

"By depositing carbon using electron beams we locally tune the magnetic properties of ultra-thin ferromagnetic films. This opens new pathways to engineer artificial materials with desired functionality"

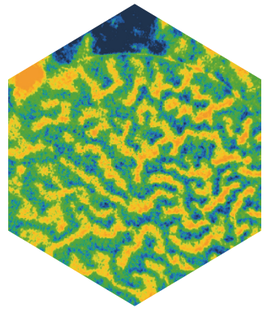
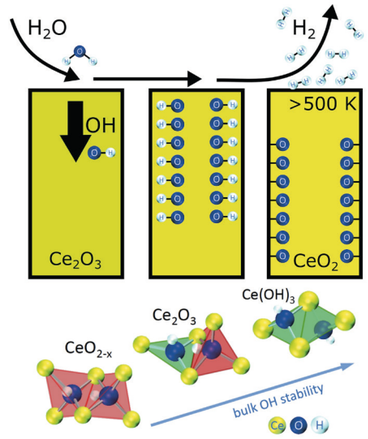


Figure 11
Synchrotron based microscopy reveals the magnetic state of ultra thin cobalt. The disk-shaped structure (diameter of 5 microns) was lithographically fabricated upon irradiating the surface with low energy electrons in CO ambient. It corresponds to the surface area covered by graphene. The stripe pattern indicates that the magnetization is oriented in the out-of-plane direction.

[5] *Magnetic patterning by electron beam-assisted carbon lithography*
Genoni P., Menteş T.O., Santos B., Sala A., Lenardi C., and Locatelli A., *ACS J. Phys. Chem. C.*, 2018, DOI:10.1021/acs.jpcc.8b09043

New discoveries made on the role of Cerium Oxide in Hydrogen production[6]

In times of increased personal mobility, air-pollution in large cities and urban areas is becoming a major problem for public health. One possible solution is to equip vehicles with low emission and thus less polluting engines. Hydrogen fuel cells are one of the possible options, and the first fuel cell cars are on the market. A hydrogen fuel cell produces electrical energy from a chemical reaction, in this case the combination of hydrogen and oxygen to pure water. A car with such a fuel cell would cause no pollution because its only waste product would be pure water. A major drawback of hydrogen fuel cells is the energy-intensive production of their fuel, hydrogen. Hydrogen is usually produced by splitting water into hydrogen and oxygen, which usually takes a lot of energy. Researchers are working on new efficient strategies, e.g., thermochemical water splitting over oxygen-deficient media.



In the frame of the CERIC internal research project **CEROP,** a team from CNR-IOM in Trieste, NIMS in Tsukuba, and the CERIC Czech representing entity, Charles University in Prague, has made an important step towards more efficient hydrogen production. They investigated the behaviour of cerium oxide (ceria), a common medium in thermochemical water splitting.

In particular, they paid special attention to the role of the oxygen vacancies, i.e., holes, within the ceria samples in the reaction with water.
The scientists compared the performance of different types of cerium oxide with various stoichiometry (from CeO_2 to Ce_2O_3) in hydrogen production by water splitting. It was shown that the hydrogen production rate increases with an increasing amount of oxygen vacancies in ceria. A tremendous increase was observed with Ce_2O_3.
To understand the reason behind this behaviour, scientists combined surface science experiments at the Surface Physics Laboratory in Prague and at the Materials Science Beamline in Trieste, with theoretical calculations performed at CNR-IOM DEMOCRITOS and GREEN NIMS. They found that Ce2O3 contains specifically ordered oxygen vacancies (next-nearest neighbour vacancies), which allow water molecules to split and incorporate into the bulk of the samples as hydroxyl groups (OH). The hydroxyl groups in the bulk of ceria represent a massive source of hydrogen, which can be released by heating the sample, while the remaining oxygen oxidizes the ceria.
These results illustrate that the spatial coordination of oxygen vacancies in ceria is an important parameter to be considered in understanding and improving the utilization of ceria for the production of hydrogen as a clean fuel.

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Charles University
Czech Republic

Figure 12
Top: schematic of water splitting over oxygen-deficient ceria.
Bottom: next-nearest neighbour oxygen vacancies in Ce2O3 allow incorporation of OH in ceria bulk in a favourable threefold coordination (green) as in Ce(OH)3. Isolated oxygen vacancies in CeO2-x force OH to unstable fourfold coordination (red).

"We combined surface science experiments and theoretical calculations and discovered new and efficient pathway for hydrogen production by water splitting on ceria containing nearest-neighbour vacancy pairs."

[6] *Bulk Hydroxylation and Effective Water Splitting by Highly Reduced Cerium Oxide: The Role of O Vacancy Coordination*, Dvorák F., Szabová L., Johánek V., Farnesi Camellone M., Stetsovych V., Vorokhta M., Tovt A., Skála T., Matolínová I., Tateyama Y., Mysliveček J., Fabris S., Matolín V., *ACS Catal.*, 2018, 8 (5), pp 4354–4363, DOI: 10.1021/acscatal.7b04409

Infrastructure's Evaluation and Upgrade

ISTAC evaluation of CERIC's Czech and Romanian PFs

The CERIC Statute mandates ISTAC periodically to advise the General Assembly on the acceptance and continuation of the operation of the CERIC facilities. The purpose is to ensure the continuous high quality of the instruments and techniques of the CERIC's offer. The second international periodic evaluation of the Czech and Romanian partner facilities (PFs) took place in May 2018, four years after the establishment of CERIC. After site visits to Prague, Trieste and Magurele, the evaluators positively assessed the technical and scientific capacity of the facilities and their role within CERIC.
At the **Czech PF**, ISTAC members **Ingolf Lindau** (Stanford and Lund - synchrotrons), **Giorgio Paolucci** (Scientific Director of SESAME Synchrotron) **Maria Grazia Betti** (Sapienza University of Rome) and **Bruno Domenichini** (Laboratoire Interdisciplinaire Carnot de Bourgogne) evaluated the Surface Physics Laboratory in Prague and the Materials Science Beamline in Trieste. The facility was positively evaluated for both user service and scientific excellence. The main recommendation is to make some progress towards the better integration of the facility with the overall CERIC infrastructure.
At the **Romanian PF**, the Committee evaluated the scientific and technical quality of the High-resolution Transmission Electron Microscopy (HRTEM) and the Electron Paramagnetic Resonance (EPR/ESR) offered to the community of CERIC users. ISTAC members **Luis Fonseca** (CSIC in Barcelona - nanoscience and nanomaterials) and **Guy Schoehn** (IBS, Institute de Biologie Structurale in Grenoble), and external experts **Cécile Hébert** (EPFL) and **José Vidal Gancedo** (Centre of Nanotechnology and Molecular Materials) concluded that the PF provides a good service to users. The evaluators recommended an upgrade in the software for data acquisition and processing of the EPR instrument, to encourage more extensive use by the CERIC scientific community. In addition, it was suggested that the PF takes a more active role in attracting new users, by increasing the promotional activity of the calls.

Evaluation of the proposals submitted to the CERIC call for infrastructure's upgrade

As a response to the CERIC internal invitation for the submission of proposals for the development of the CERIC Research Infrastructure, two proposals were submitted by the partner facilities, in the fields of cultural heritage and life sciences, respectively. The ISTAC welcomed both proposals, since they target research fields in which CERIC is not yet completely developed.
Both proposals, which involve two or more members, were evaluated by the International Scientific and Technical Advisory Committee (ISTAC). As an outcome of the evaluations, the ISTAC recommended the General Assembly to consider the funding of the proposal addressing the field of life sciences, subject to the condition that the proposal is upgraded, addressing ISTAC's comments, by 2019, for a re-evaluation by ISTAC for a final recommendation of approval or rejection.
The aim of the internal invitation to collect proposals from CERIC members was further to develop CERIC's instrumental capabilities, stimulate the development of CERIC's Research Infrastructure Roadmap, and contribute to the integration of CERIC's facilities. The foreseen amount of the investment is up to 2,000,000 EUR.

2

Training, Industrial Liaison, Communication, Projects

Main Achievements

1 **Educational projects**
Successful implementation of the 3rd edition of the training programme for high schools (PaGES 3), funded by the Italian Region Friuli Venezia Giulia.

2 **Training**
of PhD and post-doc students.

3 **Publication of the new CERIC website**

4 **Further development of the strategy for IL&TT**

5 **Organization of events**
to increase awareness of CERIC's services among both the scientific and the industrial communities.

6 **Transnational cooperation**
in four EU-funded projects.

Training Activities

CERIC pays particular attention to skills development and exchange of know-how among pupils, scientists, administrative staff and managers. The promotion of training activities has been therefore widely supported by CERIC through the organization of and attendance at various schools, lectures, workshops, staff exchanges and master programmes. Below is a list of some of the actions implemented in 2018.

PaGES 3 Project

The PaGES 3 project took seventy-one high school pupils from the Italian Region Friuli Venezia Giulia step by step through the stages of a scientific experiment, from planning, management, execution and evaluation of a research project, to disseminating its results. Starting from a research idea and a plan of the steps for its implementation, they carried out an experiment in the laboratories at the Italian CERIC partner facility and presented the projects' outcomes to the student community in their schools.
The project contributed to enhanced collaboration among schools in the region and to the development of the skills of participants, and it helped them to make more conscious choices about their future studies and career.

Hercules School 2018

In 2018, too, CERIC contributed to the HERCULES School - Higher European Course on the Use of Largescale Experimental Facilities. CERIC's offer and the steps to apply for open access, were presented to ninety PhD students in Grenoble. An additional contribution to the school's programme was given at the HERCULES Specialised Course at the Italian CERIC representing entity, Elettra, during which a smaller group of students attended a tutorial providing hints and tips on how to write successful multi-technique proposals for CERIC open access, as well as for the recently introduced fast track access.

Training the users of tomorrow

The attraction of new users is crucial for the long-term sustainability of research infrastructures. In January 2018, to further increase its visibility, CERIC - within the frame of the H2020 ACCELERATE project - organized an outreach event at the University of Belgrade, targeting the local research community. The event aimed to raise awareness of the opportunities and services offered by CERIC, also guiding participants in writing successful proposals to get free open access to top-class research infrastructures in Europe. Invited speakers included Ms. Željka Dukić - Senior Advisor at the Ministry of Education, Science and Technological Development of Serbia, and two researchers from the University of Belgrade: the CERIC user Andjelka Bjelajac, and Vera Obradović, a researcher who had taken part in the CONTACT workshop organized by CERIC in 2017, with the funding of the Central European Initiative and ACCELERATE.

Training in Industrial Liaison and Technology Transfer

CERIC also aims to train future promoters - in the industrial realm - in the advantages the industry derives from collaborating with research infrastructures. In line with this strategy, four industrial training sessions for a total of eighty PhD students were organized in 2018 in the frame of the programme "Transversal competences of business interests in the plan of an industrial doctorate", organized by the Consortium of University Services of Catalonia, Spain. The aim of the training was to strengthen students' skills in creating a business-research network and a robust collaborative environment. To achieve this, tangible case studies and examples from companies and research organizations were presented, as well as the model CERIC adopts to collaborate with industry, by showcasing the preparatory steps for the definition of targets, tools and actions needed to set up fruitful collaboration. Network building was also discussed. The training sessions ended with practical exercises, in which the students proposed possible actions to widen the network and increase collaboration with the industrial community.

Industrial Liaison Activities

During 2018, CERIC further developed and put in place its operational and marketing strategy in the industrial liaison domain. Procedures of industrial access to the partner facilities have been developed according to the different services needed by industry. Research and development (R&D) requirements will be addressed through access to instrumentation, contract research, or joint application for projects. Training and support to spin-offs and start-ups are also among the services that can be supplied.
From a marketing point of view, the range of available solutions have been categorized by sector and are presented in a dedicated webpage on the CERIC website. Moreover, actions defined to enlarge the CERIC industrial network and to create additional opportunities to work with industry were deployed throughout the year, taking into account the stage of development of CERIC's partner facilities in the open innovation value chain. In 2018, the CERIC Industrial Liaison Office (ILO) organized and participated in a number of research to business (R2B) events in different European countries (the Czech Republic, the Netherlands and Austria), at which partner facilities were present and/or presented to showcase their industrial solutions, in order to boost opportunities for collaboration with the European industrial sector. In addition, one-to-one meetings with several companies took place in order to present the potential of collaborating with research infrastructures.

CERIC, through the H2020 ACCELERATE project, also intensified its activity in the frame of EARIV, the European Analytical Research Infrastructure Village, by promoting the opportunities available for industry in large-scale RIs.

All these activities permitted CERIC and its partner facilities to be introduced to more than 100 companies. Moreover, five non-disclosure agreements (NDAs) and two service agreements were signed with companies. The latter mainly focus on providing analytical services to companies (access to instrumentation), while NDAs focus on potential contract research.

Already in 2017, capacity building in the industrial liaison and technology transfer (IL&TT) domains was identified as one of the strategic branches considered functional to succeed in the relationship with industry. The exchange of IL&TT best practices among its partners and external experts has therefore been taken into account. To achieve this goal, in September 2018, CERIC organized a capacity building workshop on IL&TT with external experts (participants included, among others, representatives from Philips N.V, European Space Agency and the Fusion for Energy - ITER project).
The workshop had a very positive impact on CERIC's facilities, leading to the definition of a set of needs and common activities for the coming years.
Taking into account the needs detected, a series of webinars on innovation started in November 2018, based on a holistic strategy to support the development of specific skills and tools of the partner facilities, while strengthening a collaborative environment within the Consortium.

CERIC staff and members attended a number of international events, such as:

Nanotechnology R2B
Prague - Czech Republic
16 February 2018

Synergi 2018
Amsterdam - The Netherlands
8 March 2018

Metal Additive Manufacturing Conference MAMC 2018
Vienna - Austria
21-23 November 2018

Communication and Dissemination

Publication of the new CERIC website

Following the adoption of the new CERIC corporate identity in 2017, a new CERIC website has been designed, populated with new content and finally published in July 2018. The new website has been laid out taking into account the needs of CERIC's main target groups: researchers, industry and policy makers, and has been built in a responsive and user-friendly way, showcasing all major activities, events and achievements of CERIC, with regular updates covering topics spanning scientific results, events, updates in the field of science policy and, last but not least, CERIC opportunities and calls for open access.

CERIC Science Picture Contest 2018

In 2018, CERIC launched its third open call for photographic material, the CERIC Science Picture Contest, aiming to give an artistic perspective on the scientific domain in which CERIC operates.
Forty applicants submitted 100 pictures. The authors of the three winning pictures, which were selected by the CERIC staff, received a prize of 400 EUR after tax.

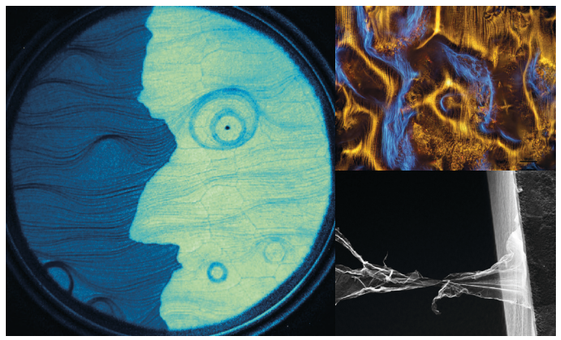


Figure 13
Winning pictures: "Graphene Witch" by Andrea Locatelli (left), "3D Printed Copper Surface" by David Pervan (top right) and "Don't let me go" by Alessia Matruglio (bottom right).

Public Outreach at ESOF 2018

CERIC collaborated with the members of ERF-AISBL actively to take part in the Science in the City Festival at ESOF 2018, where the two youngest users of the Consortium, Mitja Denac and Bor Kolar Bačnik, entertained the public by showcasing the results and methods of their research in the field of cultural heritage, to adults and kids in the ERF booth set up in the central square of Toulouse (France).

Outreach Events

To increase awareness among the scientific community worldwide, about the research opportunities that it offers, CERIC was presented at a number of events, including:

3rd Joint AIC-SILS conference
Rome - Italy, 25-28 June 2018

68th Annual Meeting of the Austrian Physical Society
Graz - Austria, 10-13 September 2018

Advanced Materials days 2018
Graz - Austria, 21 September 2018

Transnational cooperation in cultural heritage science
Veli Losinj – Croatia, 24-25 September 2018

NanoBio Conference 2018
Crete – Greece, 24-28 September 2018

New opportunities of research in materials and life science at Elettra and FERMI
Pisa - Italy, 11-12 November 2018

SciSyn X - Science and applications of synchrotron radiation
Trieste - Italy, 3-4 December 2018

Workshop on High Precision x-ray measurements
Rome - Italy, 17-19 October 2018

Transnational Cooperation

Transnational cooperation is also implemented through CERIC's transnational projects. Three projects were running in 2018:

Horizon 2020 ACCELERATE project

CERIC coordinates the ACCELERATE project, which aims to support the long-term sustainability of largescale research infrastructures (RIs) through the development of policies and legal and administrative tools for more effective management and operation of RIs, with a particular focus on ERICs and CERIC.

In 2018, the following deliverables were achieved:

- **Promotional Open Access**: The pilot scheme aims at increasing the technical quality of proposals from countries with a small or inexperienced user base. Since June 2018, researchers of any nationality working in target countries (Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Estonia, Former Yugoslav Republic of Macedonia, Latvia, Lithuania, Montenegro, Moldova, Romania, Russia, Serbia, Slovakia or Ukraine) have had the opportunity to apply for promotional open access, and to receive additional support in proposal writing, during the measurements and for data interpretation, and for drafting the experimental report.
- **Handbook for Commercial Access:** defines the kinds of services offered by CERIC to industrial users and outlines the coordination procedure between CERIC and its partner facilities. It also contains a list of target sectors that is the basis for marketing activities.
- **IPR Resolution Mechanism:** outlines the legal conflict resolution mechanisms for conflicts resulting from CERIC interactions with industrial clients. It also contains a set of standard forms, such as Non-Disclosure Agreements, to be used as templates.

In the 2018 mid-term review of ACCELERATE, the European Commission evaluated the project as "well managed, with a professional and dedicated management team, providing good indications that the goals set at the beginning and potential impact will be achieved". It is considered that ACCELERATE's potential socio-economic (and political) impact produced along the way with specific activities naturally contributes to a direct impact on CERIC sustainability.

Horizon 2020 E-RIHS PP project

The European Research Infrastructure for Heritage Science Preparatory Phase project started in January 2017, coordinated by the Italian National Research Council. In 2018, CERIC-ERIC, as a partner in E-RIHS, contributed to the achievement of important goals. The first set of legal documents (e.g., Memorandum of Understanding, Statutes) for the establishment and operation of E-RIHS ERIC has been delivered. Various scenarios of funding and cost models have been discussed and are being refined. Moreover, a Stakeholders Advisory Board (SAB), composed of distinguished representatives of decision-making funding bodies, has been established to help strategic, legal and financial planning to converge to commonly agreed solutions. The design of an online catalogue of resources and services provided by E-RIHS has advanced, based on an inventory of services for new communities of users for E-RIHS related to the study and interpretation of cultural heritage by the different communities (e.g., Paleoanthropology, Archaeology, Conservation, Social Sciences and Humanities. The first draft of the Scientific & Technical Description document has been prepared. Other important documents have been drafted and are expected to evolve during 2019, laying the ground for a smooth implementation of E-RIHS ERIC.

Horizon 2020 PaNOSC Photon and Neutron Open Science Cloud

The PaNOSC project, Photon and Neutron Open Science Cloud, brings together six strategic European research infrastructures (ESRF, CERIC-ERIC, ELI-DC, the European Spallation Source, European XFEL and Institut Laue-Langevin, ILL) and the e-infrastructures EGI and GEANT, with the goal of contributing to the construction and development of the EOSC, an ecosystem allowing universal and cross-disciplinary open access to data through a single access point, for researchers in all scientific fields.
PaNOSC has the mission of contributing to the realization of a data commons for Neutron and Photon science, providing services and tools for data storage, analysis and simulation, for the many scientists from existing and future disciplines using data from photon and neutron sources. To achieve this aim, the exchange of know-how and experience is crucial to driving a change in culture by embracing Open Science among the targeted scientific communities. The project therefore works closely with national photon and neutron sources in Europe to develop common policies, strategies and solutions in the area of FAIR data policy, data management and data services.
The project started in December 2018. ESRF is the project coordinator, and CERIC is involved in all work packages (WPs) and is leader of WP7 Sustainability and WP9 Outreach/Communication and Dissemination/Impact.

Horizon 2020 ERIC Forum project

The ERIC Forum was set up in May 2017 with the goal of further intensifying collaboration among ERICs. In particular, its objectives are to identify and develop collective responses to common challenges, contribute to the further development of the ERIC Regulation and ESFRI framework, as well as to the European and international research context, and to foster the visibility, impact and sustainability of ERICs. The ERIC Forum project, starting in January 2019, aims at boosting the Forum's activities, providing a frame and funding to support its actions to achieve its goals. ,
In particular, the ERIC Forum project's objectives are to:

- Strengthen coordination and networking reinforcing the ERIC Forum;
- Support the organization of specific meetings, targeted thematic workshops focusing on shared challenges, such as the development of internal procurement rules, harmonised reporting, VAT exemption practices, insurances and pensions policies, and training of governance bodies' representatives;
- Support ERICs in preparation, based on best practices;
- Support common communication and outreach activities and strengthen external representation of ERICs as a stakeholders in consultations and other policy actions that could affect them.

BBMRI-ERIC is the project coordinator. CERIC is involved in all work packages (WPs) and is leader of WP5 Communication and Dissemination.

3 Contribution to policies

Main Achievements

1. **Review of approaches to performance monitoring of ERICs**
2. **First definition of pathways through which RIs contribute to socio-economic impact development**
3. **Enhanced cooperation with other ERICs' stakeholders**
4. **Definition of next steps on VAT exemption in ERICs**
5. **Pooling of resources**
   from both national and European sources

RIs Performance monitoring

There is little doubt that publicly funded instruments or institutions should have a performance monitoring system in place. Key performance indicators (KPIs), which describe how well an institution or a programme is achieving its objectives, play a key role in this process. They are an indispensable management tool, allowing monitoring of progress, enabling evidence-based decision-making, and aiding in the development of future strategies. They can also significantly contribute to the successful communication of results and achievements, and thus to the financial sustainability of institutions, as well as to increased transparency. In addition, they play a role in the evaluation of socio-economic return.

Due to its importance, performance monitoring is an obligatory activity for many publicly funded bodies and initiatives. It is therefore not new to many RIs. In 2013, ESFRI's expert group on indicators published its Proposal to ESFRI on "Indicators of the pan-European relevance of research infrastructures" [1]. Such indicators were to be used as a toolkit for the evaluation of the pan-European relevance of ESFRI RIs and future RIs applying for inclusion in the ESFRI roadmap. However, the proposal was not taken up by the RIs.

Based on the responses of RIs to the public consultation on the long-term sustainability of RIs [2], there appears to be a general understanding among them that monitoring should be carried out on a regular basis and that KPIs should be used in this context. However, the use of KPIs by RIs is not yet systematic, as shown in 2018 by a first questionnaire initiated by CERIC-ERIC in mid-2018 on the topic, and to which 12 of the 19 established ERICs responded[3] (see Figure 14).

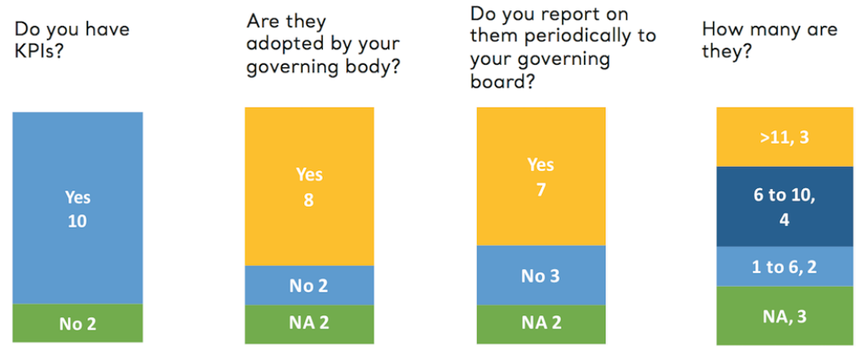


Figure 14
Replies of 12 ERICs to the Questionnaire about KPIs[4].

The result of this first survey indicates that two out of twelve ERICs do not have performance indicators in place, and that the procedures for setting them up vary, as do the number of indicators and the reporting methods. The KPIs common to most of the ERICs are Access Units Delivered, Training Courses Delivered and Publications.

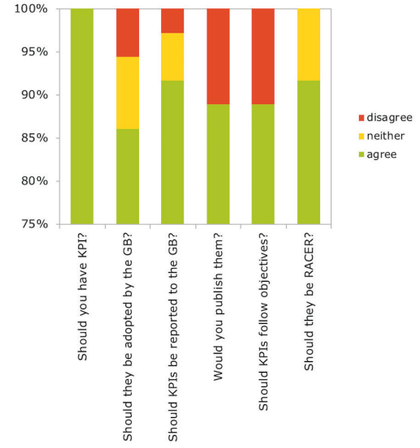
[1] Proposal to ESFRI on "Indicators of Pan-European Relevance of Research Infrastructures", Rossi G. on behalf of the Expert Group on Indicators, October 1st, 2013
[2] Report on the Consultation on the Long Term Sustainability of Research Infrastructures, 2016
[3] BBMRI, CERIC-ERIC, CLARIN ERIC, DARIAH, ECCSEL ERIC, EMBRC, ESS, EU-OpenScreen, Euro-Argo, Euro-BioImaging, European Spallation Source ERIC, Instruct
[4] Prepared in the frame of ACCELERATE project, funded by the European Union Framework Programme for Research and Innovation Horizon 2020, under grant agreement 731112.

The need for improved performance monitoring was also recognised by the European Commission in its staff working document 'Sustainable European Research Infrastructures, A Call for Action', in which action 6 proposes to '*assess the quality and impact of the RI and its services, by developing a set of Key Performance Indicators, based on Excellence principles* [5].'
This was echoed by the Conference Conclusions of the Bulgarian Presidency of the EU Council Conference, Research Infrastructures beyond 2020 – sustainable and effective ecosystem for science and society[6], which indicated that '*there is a need for systemic monitoring and impact assessment of pan-European Research Infrastructures. It should be based on a commonly agreed methodology and process to define the Key Performance Indicators, reflecting the objectives of the various RIs, and to elaborate the socio-economic impact, in order to ensure continuous updating of their scientific and strategic relevance*.'

Based on these inputs, the EU Competitiveness Council invited '*Member States and the Commission within the framework of ESFRI to develop a common approach for monitoring their performance, and invited the Pan-European Research Infrastructures, on a voluntary basis, to include it in their governance and explore options to support this through the use of Key Performance Indicators*'[7].

Following the Competitiveness Council conclusions, in 2018, CERIC, in the frame of the ERF-AISBL (Association of European-level Research Infrastructure Facilities), led the drafting and distribution of a questionnaire, which was sent to the community of European RIs in order to gain a better insight into how they address (or would address as the case may be) the issue of Key Performance Indicators (KPIs). Thirty-six replies were received (including CERIC's), out of which 12 from ERF members and 23 from ESFRI RIs or ERICs (two being also ERF members). Three other replies were also received.

Figure 15



As shown in figure 15, while half of the respondents already have KPIs in place, the other half agrees that they should have them. Respondents also believe that KPIs should be used in the strategic management of the institutions and, as such, adopted by, and reporting to, the decision-making bodies of the RIs. There is also a strong preference for their publication, although some RIs stress the importance of putting KPIs into context when making them available publicly to ensure clarity, but also because, without such contextual information, the performance cannot be reliably compared across RIs.
The quality of indicators is considered to be highly important by the RIs. Respondents believe indeed that indicators should be "relevant, accepted, credible, easy to monitor and robust", although only three respondents reported that their current KPIs already meet these criteria. The prevailing opinion of the RIs was that KPIs should be linked to the objectives of their institutions. Considering that RIs pursue some objectives that are specific to each of them, a number of respondents warned against prescribing the use of the same indicators by all RIs in a 'top-down' approach. Additionally, some respondents emphasized that, in addition to quantitative KPIs, attention should also be devoted to non-measurable, qualitative performance criteria and proposed that KPIs be accompanied by case studies and other narratives in order to present progress in the pursuit of the objectives of their infrastructure appropriately.

[5] European Commission Staff working document Sustainable European Research Infrastructures, A Call for Action
[6] Conference Conclusions, Research Infrastructures beyond 2020 – sustainable and effective ecosystem for science and society, Sofia, 22-23 March 2018
[7] Council conclusions on "Accelerating knowledge circulation in the EU", 9507/18 , adopted on Brussels, 29 May 2018

Table 2 below shows one possible impact pathway addressing the objective of knowledge creation.

Table 2

Chain Element	Definition	Example
Inputs	The financial, human, and material resources used for the development of the intervention.	Financial resources per year
Activities	Actions taken or work performed through which inputs, such as funds, technical assistance and other types of resources, are mobilised to produce specific outputs.	Number of open calls per year
Outputs	The products, capital goods, and services that result from a development intervention; may also include changes resulting from the intervention that are relevant to the achievement of outcomes.	Average impact factor of publications
Outcomes	The likely or achieved short-term and medium-term effects of an intervention's outputs.	Average impact factor of publications
Impact	Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or uninteded.	Number and share of peer reviewed publications based on the research supported by the RI that are core contribution to scientific fields*

* Adapted proposed long-term scientific pathway indicator of Horizon Europe[8]

As a conclusion to the questionnaire's replies, it is evident that, while the recent Council Conclusions underlined the importance of performance management, care needs to be taken in designing and implementing it correctly. One should consider the principles behind performance management and respect the balance between its objectives and the administrative burden it can impose on staff. Implemented in such a balanced way, KPIs can significantly contribute to the long-term sustainability of a research infrastructure, as funders also base their investment decisions on the results and impacts of the initiatives they fund, and such data can help RI managers deliver what is expected from them. Furthermore, providing quality data on the performance of RIs not only contributes to the notion that they have a credible, output-oriented management in place, but also provides assurance that the various objectives that supported their establishment are indeed effectively pursued.

Impact Assessment

In addition to monitoring, CERIC's statutes mandate it to perform periodic impact assessment.
In the frame of the ACCELERATE project, CERIC commenced with the preparation of its societal return report, following the methodology developed by the Rathenau Institute. The methodology is based on the Theory of Change. While it is already widely used in the evaluation of development aid projects and organisations, this is the first time that it has been applied on research infrastructures.
The methodology is based on pathways, which describe the interventions of CERIC and the changes they provoke to reach the final objectives. The pathways contain narratives, which are supported by indicators wherever possible.
In 2018, the first set of pathways through which the different RIs involved in the ACCELERATE project contribute to socio-economic development was defined.

[8] https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-horizon-europe-regulation-annexes_en.pdf
[9] *Sustainable European Research Infrastructures. A call for action*, European Commission SWD(2017) 323

Further steps on VAT exemption in ERICs

In June 2018, CERIC, in collaboration with ACCELERATE partners ELI-DC and the European Spallation Source, organized a workshop on ERIC's implementation and VAT issues, with a focus on issues spanning implementation of ERIC Regulations, membership, rules and procedures applied by representing entities, tax exemption's implementation, administrative and procurement issues, and audit aspects in different host countries.
Following the discussion, involving internationally renowned experts in the various fields and representatives from ministries, a set of conclusions was drawn up, in particular:

- In reply to the question of whether ERICs are to be considered public or private entities, the majority opinion was that, within their widely diverse structures, they are private entities operating in a public environment.
- The discussion has suggested a coordinated action to develop guidelines and bylaws in coordination between the different ERICs also helping to overcome different national approaches, towards a more coherent framework.
- The authorities to be involved at the national level are those specifically dealing with VAT issues, such as national ministries, departments and agencies responsible for, e.g., research, finance tax administration, foreign affairs.
- With regard to the question of whether national representing entities should procure for the ERIC on behalf, but also in the name, of the member country, it was proposed to provide a set of practical cases and examples to the VAT committee, as a basis for taking action according to the experience and needs of the Members, their RE and the ERICs in the different countries.
- There is not yet a clear framework on the provision of in-kind contributions. Coordination has been proposed of the effort towards extending the guidelines on IKC, with reference to balance, audit statement criteria and administration, while taking into account both international accounting standards for the public sector, and the international standard for audit.

Enhanced cooperation with other ERICs' stakeholders

Building bridges with other initiatives across Horizon 2020 and Horizon Europe is an important goal for CERIC. During 2018, the Consortium intensified collaboration with a wide set of ERIC stakeholders, including policy makers at the national and European level, staff and managers of RIs and ERICs, as well as representatives of different institutions and transnational projects.
In this regard, CERIC staff were invited to several events, to share knowledge and expertise in fields spanning, among others, the long-term sustainability of research infrastructures, governance, performance monitoring and socio-economic impact assessment.

Long-term sustainability

The ESFRI 3rd Exchange of Experience Workshop held in Vienna during the 4th International Conference on Research Infrastructures - ICRI 2018, on "Effective Use of Preparatory Phase Funding", is one of the initiatives that aimed to enable interaction, coordination and networking between ESFRI Projects and ESFRI Landmarks, and in which CERIC actively participated, also to interact with other ERICs and plan future developments in the frame of the ERIC Forum implementation project.

CERIC was also showcased in a number of lectures and practical sessions at the Danube Interreg **RESINFRA@DR** project's Research Infrastructure experts' trainings, held in Banja Luka (BiH) in April 2018 with the support of the Ministry of Science and Technology of Republika Srpska. The event focused on the long term-sustainability and socioeconomic impact of research infrastructures, planning and preparatory steps before establishment, operation, management and monitoring, and hosted 34 participants from BiH, Croatia, the Czech Republic, Hungary, Italy, Romania, Serbia and Slovakia.

Contribution to EU policy on R&I

CERIC cooperation with EU-wide stakeholders has also been possible thanks to CERIC's involvement in a wide number of projects, meetings and events, on strategic topics for European research and innovation, such as the next funding programme, Horizon Europe. In this regard, in January 2019, CERIC's executive director attended the explorative meeting on a challenging EU mission oriented research & innovation policy, in order to contribute to the report on missions by Mazzucato, Special Advisor on Mission Driven Science and Innovation to the EU Commissioner for Research, Carlos Moedas.

University-Research-Industry collaboration

Collaboration with industry, innovation and a stronger link between higher education and the business sector are also key topics in the European strategy and policy for R&I. An important event on the need to strengthen the link between universities and private enterprises was organized in February 2018 by the Bulgarian Presidency in Sofia: the University-Business Forum 2018. Dr. Kolar was invited to give a talk on the importance of entrepreneurial education in universities, as speaker in the high-level panel "University-Business cooperation for modernisation: challenges and opportunities".
In addition, on the occasion of the Bulgarian Presidency Flagship Conference: Research Infrastructure beyond 2020, the CERIC director – member of the event's programme committee – also chaired the session on cooperation with industry, which focused on possible ways and measures to improve the framework conditions for innovation, and on how EU investment should support the whole cycle of research and innovation.

Mutual Learning and Road-mapping

The conclusions of the Bulgarian Presidency Flagship Conference highlighted, among other things, the need to align RI policies and investments at different levels, in order to develop a more robust and coherent funding landscape for RIs and to increase their impact.
Mutual Learning Exercises (MLEs), a part of the Horizon 2020 Policy Support Facility, provide a platform for exchange among policy makers around selected research and innovation policy issues.
A mutual learning exercise can be a useful approach to enabling countries to exchange practices relating to national research infrastructures' road-mapping, leading to enhanced alignment. Dr. Kolar emphasized this at the InRoad validation workshop held in Brussels in October 2018.
CERIC is well acquainted with the possibilities offered by MLEs. In September 2018, Jana Kolar attended the seminar on "How to make the most of policy mutual learning for research and innovation policy under the Horizon 2020 Policy Support Facility", organized in Brussels by the EC DG RTD. Dr. Kolar chaired the concluding session on success factors for effective MLEs and options for the future.

Public-Public-Partnerhips (P2P)

In May 2018, CERIC was invited to present its model to a research partnership on metrology (EURAMET) based on article 185 of the Treaty on the Functioning of the EU. The EURAMET Symposium 2018 on European Networks, held in Bucharest (Romania) is developing the concept of European Metrology Networks, as a mechanism for strengthening the coordination and integration of the association. In this context, the CERIC model was presented as a positive example of a public-to-public (P2P) partnership.
Furthermore, Dr. Kolar is a member of the Advisory Board of ERA-LEARN, a support platform for the P2P community, which helps in bridging the gaps between research and infrastructure partnerships.

Competitiveness and growth

In February 2018, Kolar was invited to deliver a keynote speech on the importance of research and innovation for growth, competitiveness and jobs to the High Level Working Group on Competitiveness and Growth, where she emphasized that strong efficiency gains are possible by connecting and synchronizing EU, national and regional systems across the various policy domains, including RIs. The importance of regulation in support of innovation was stressed, as well as the opportunities for policy learning offered by the Policy Support Facility of H2020.

Monitoring and Impact Assessment

Following the Competitiveness Council conclusions, which mandate ESFRI to develop a common approach for monitoring the performance of research infrastructures (RIs), a questionnaire was sent by ERF-AISBL (Association of European-level Research Infrastructure Facilities) to the community of European RIs in order to gain a better insight into how they address the issue of RI performance monitoring through the use of KPIs. The results of the survey were presented at the ESFRI Workshop on Monitoring of Research Infrastructures, held in Milan (Italy) in November 2018. The event provided a valuable opportunity to exchange questions and best practices among ERICs and European project partnerships, which are working towards the definition of a common methodology for monitoring of RIs, such as RI-PATHs, with which CERIC has also been collaborating in the frame of the H2020 project ACCELERATE.

Pooling of resources

CERIC supports its partners in drawing resources from both national and European sources. In addition to the initiative to develop its scientific and technical offer through the support of internal research projects involving two or more partner facilities, CERIC is also itself a valuable partner when applying for funding dedicated to the development and upgrade of large-scale research infrastructures of European interest. As an example, in 2018, CERIC and its Italian representing entity, Elettra Sincrotrone Trieste, collaborated with Area Science Park in the preparation of a proposal in response to a call launched by the Italian Ministry of Education, Universities and Research, for the upgrade of Research Infrastructures. The call specifically targeted RIs that are considered a priority in the frame of ESFRI, and that have a high impact on the objectives set by the Smart Specialization Strategy towards the capacity building and long-term sustainability of RIs in those Italian regions defined as “less developed” or “in transition”.
The submitted project “Bio Open Lab” aims to have a significant impact in the area of "Health, nutrition, quality of life", and specifically in the following domains:

- E-health, advanced diagnostics, medical devices and mini-invasiveness
- Regenerative, predictive and personalized medicine
- Biotechnology, bioinformatics and pharmaceutical development

The aim of the proposal is to upgrade the CERIC-ERIC distributed infrastructure in the life sciences and precision medicine sectors, through the involvement and upgrade of facilities located at the University of Salento and the University of Salerno, in southern Italy, which may in the medium-term add to the already existing CERIC offer. CERIC-ERIC has already made available to its users a set of techniques and infrastructures for biomedical sciences, ranging from protein production for structural investigation, to crystallographic, nuclear magnetic resonance and low-angle X-ray diffraction analyses for the determination of the atomic structure of macromolecules, and to imaging and characterization techniques for biological samples using the SISSI, SYRMEP and TWINMIC beamlines of Elettra.

However, new scientific and technological developments in the fields of structural biology, genomics and mass spectroscopy require expansion of the existing infrastructures, in order to provide a cutting-edge offering, adapted to the new emerging needs.
The purchase of an electron microscope for the preliminary analysis and three-dimensional reconstruction of macromolecules, the constitution of an infrastructure for holographic microscopy, the installation of a facility for the analysis of proteins in tissues by mass spectrometry and a next-generation sequencing platform will greatly expand the capabilities of CERIC-ERIC. These platforms require the storage and processing of large amounts of data and will therefore be supported by the installation of a powerful data centre, capable of making the most of produced data.

Slovenia also has a dedicated scheme, co-funded with structural funds, to support the infrastructure development of the pan-European research infrastructures on their roadmap. The Slovenian Partner Facility of CERIC was awarded 3.1 million EUR to purchase new 600 MHz and 400 MHz NMR spectrometers, and to upgrade two existing instruments.

Bridging the research and innovation divide

Reducing disparities in research and innovation performance by sharing knowledge and expertise across the EU is an important objective of the European Union. As a corner stone of the European Research Area, the objective is also addressed by the Horizon Europe proposal, which states that it "will help countries and regions that are lagging behind in terms of research and innovation performance, including the EU outermost regions, to attain a competitive position in the global value chains". This applies equally to many countries associated with the Horizon 2020 programme. Furthermore, these countries are also addressed through the European neighbourhood policy, in which research is one of the priorities, where cooperation in research is expected to help the EU and European Neighbourhood Policy partner countries to tackle common societal challenges, such as energy security, health issues, a deteriorating environment and climate change.

Research infrastructures can contribute towards these Community objectives by:

- Enabling access to excellent facilities and support usually not available in these countries, thus enabling excellent research.
- Supporting circulation of researchers, rather than brain drain, enabling professional development of scientists from less R&D developed regions.
- CERIC-ERIC has also defined a specific objective to "increase the share of users from less R&D developed countries". Target countries are Albania, Belarus, Georgia, Moldova, Serbia, the Russian Federation, Turkey and Ukraine.

The following activities were designed between 2017 and 2018 to address the objective:

- **Targeted promotion of CERIC to researchers in specific countries**. To increase the visibility of CERIC among new user communities, several presentations were organized in 2018 in such countries.
- **Outpost in Ukraine**.As a case study for enhanced outreach to new user communities in target countries, in 2017 CERIC set up an outpost at the Uzhhorod University in Ukraine and trained local staff to mediate CERIC outreach to the eastern macro-region effectively. The action had a valuable impact and, as a result, in 2018 the National University of Uzhhorod used the support provided by the H2020 ACCELERATE project for the organization of outreach events primarily targeting research communities in the eastern region of the EU, in Ukraine and other post-Soviet countries.
- **Promotional open access**. Knowledge about the opportunities offered through CERIC has led to an increased number of applicants to the CERIC calls. Nevertheless, their success rate remains low, due to the fact that they are familiar neither with the facilities, nor with the application process. To address this issue, in 2018 CERIC put in place a promotional open access pilot scheme, offering personalised support to researchers from target countries, for the preparation of the proposal and measurements, as well as for data analysis and publication of the results (read more on page 42).

The activities to bridge the research and innovation divide commenced in mid-2017, in the frame of the CONTACT and ACCELERATE projects. In 2018, the first results demonstrate the increase in the share of applicants from target countries (figure 16):

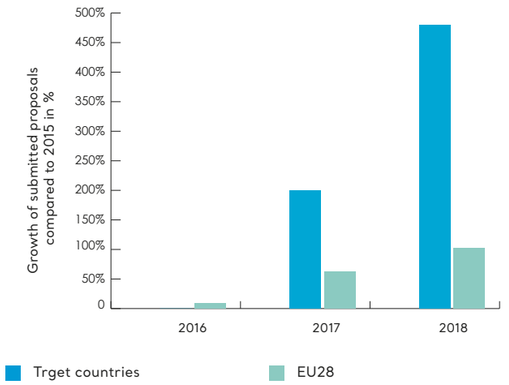


Figure 16
Growth of proposal submissions in % since 2016, from the project's target countries (blue) compared to EU 28 (green).

In 2018, successful proposals from these countries accounted for nearly 9% of all granted proposals. However, the success rate of proposers from target countries has not yet significantly increased (Figure 17).

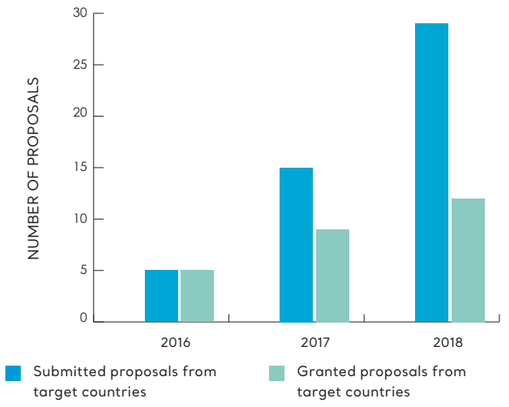


Figure 17
Proposals submitted and granted from Serbia, Albania, Turkey, Belarus, Ukraine, Georgia, Moldova and the Russian Federation. The support activities have started in the second half of 2017.

It is expected that the promotional open access, which entered in its implementation phase in 2018, will contribute to an increased success rate of these applicants.

4

Operations and Finance

Main Achievements

1. **Appointment of the Chair and Vice Chair of the CERIC GA, and of the Executive Director**
2. **Update ot the CERIC'S evaluation and monitoring framework**
3. **Implementation of the fast-track access to CERIC**
4. **Implementation of the Promotion Open Access pilot**
5. **Financial and in-kind annual account** for 2018 and estimation of the auditable values to be included in the Annual CERIC Account.

Appointments of the Chair and Vice Chair of the General Assembly, and of the Executive Director

Taking into account the candidates, their statements indicating the main strategic views for their mandate and the results of the ballot for the election of the Chair, in its session on June 27th the General Assembly appointed Carlo Rizzuto as its Chair for the term 28 June 2018 – 27 June 2021, and Marek Stankiewicz as its Vice-Chair for the same term of the Chair.

Based on the positive opinion of the Board of Directors, on June 27th , the General Assembly renewed the mandate of the Executive Director, Jana Kolar, for a further period of three years starting from November 1st, 2018.

Update of CERIC's Evaluation and Monitoring Framework

The General Assembly adopted the Monitoring Framework at its meeting on March 13th, 2016. The objectives of the Monitoring Framework were:

- to be used internally as a management tool and
- externally, to demonstrate the effectiveness, efficiency and accountability of CERIC.

At the time of its adoption, it was indicated that a modification of the framework would be presented once more experience is gained in the collection of the data. After two years, the General Assembly adopted a modified framework in order to increase reliability and relevance, and simplify the reporting burden it represents for the partner facilities.
The new Framework consists of 12 indicators instead of the 21 used previously.

Implementation of Fast-Track Access

Fast-track open access was launched in 2018, as a new fast route to CERIC's instruments, to answer the need to perform quick and short measurements in special cases. It allows researchers to access a set of instruments with a short waiting time (max. 1 month) for short measurements (max. 48 hours). This is possible through a shortened evaluation process.
Application to regular calls is very well established and successful for long and complex experiments, which usually require extensive and profound experimental planning over a long period of time.
However, researchers sometimes need quick access to certain instrumentation. The reason may be not to perform the experiment itself, but rather to do a feasibility study to see whether the chosen technique gives the results required. Another reason might be the verification of prior results for publication or a new proposal.
CERIC has therefore introduced a specific technical procedure for fast track open access, and outlined the instruments available for this option, and the eligibility criteria to be fulfilled for this type of access mode.
In 2018, eleven proposals for the use of the same number of instruments were submitted. Nine proposals were positively evaluated, and access was granted to NMR spectrometers in Ljubljana, and to different synchrotron beamlines in Trieste.

Promotion Open Access Pilot

In the frame of the H2020 ACCELERATE project, CERIC has developed a promotional open access pilot scheme, which was launched in the second half of 2018. Researchers of any nationality working in Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Estonia, Former Yugoslav Republic of Macedonia, Latvia, Lithuania, Montenegro, Moldova, Romania, Russia, Serbia, Slovakia or Ukraine can apply for additional personalised support for the design of the experimental plan and writing the proposal, for measurements and their follow-up, as well as for data analysis, reporting and publication of results.
In 2018, nearly 9% of successful proposals came from the countries targeted through the pilot.
Considered the recent launch of the call, a further increase is expected throughout 2019, after wider promotion of the initiative among the different national scientific communities.

Human Resources

CERIC has implemented transparent and merit-based recruitment policies. Jobs announcements are published in all CERIC's media channels, as well as in well-known online platforms with international outreach, such as Euraxess and EurActiv.
With reference to gender balance in the composition of CERIC staff, CERIC is compliant with the recommendations of the European Charter for Access, by which "Employers and/or funders should aim for a representative gender balance at all levels of staff, including at supervisory and managerial levels [...]". In 2018, nearly 53% of CERIC employees were women.
The CERIC staff, as of 31 December 2018, is composed of 19 people, an increase of 4 employees during 2018. Of them, two were hired in the frame of the H2020 ACCELERATE project, and eight researchers in the frame of the CERIC internal research projects.
Staff distributed in the PFs and working in-kind for CERIC amounted to nearly 300 people, including researchers, PhD students, technicians, managers and administrators.

Financial Statements 2018

Balance Sheet - Assets and Liabilities		
	2018	**2017**
ASSETS	**5,355,957.63**	**3,194,281.30**
Non-current Assets	**256,987.28**	**131,790.31**
Plant, property and equipment	230,908.58	116,721.39
Intangile assets	26,078.70	15,068.92
Investments in associates	-	-
Current Assets	**5,098,970.35**	**3,062,490.99**
Inventories	-	-
Long-term credits	-	-
Short-term credits	40,748.56	34,926.28
Other current credits and receivables	-	-
Cash and cash equivalents	5,051,300.27	3,014,560.28
Prepayments and accrued income	6,921.52	13,004.43
EQUITY AND LIABILITIES	**5,355,957.63**	**3,194,281.30**
Equity	**-**	**-**
Equity	-	-
Capital and other permanent contributions from Members	-	-
Reserves	-	-
Accumulated profits	-	-
Non-current Liabilities	**1,611,783.64**	**601,348.62**
Long-term financial debts and loans	-	-
Other long-term debts and liabilities	-	-
Advance payments for externally funded projects	1,535,053.83	550,887.86
Pensions funds and other benefits for compensation employment	76,729.81	50,460.76
Long-term provisions	-	-
Current Liabilities	**3,744,173.99**	**2.592.932,68**
Short-term financial debts	-	-
Other short-term debts and liabilities	322,560.81	299.692,43
Advance payments for externally funded projects	14,275.43	14.455,08
Debts for contributions in-kind	-	-
Other current payables	294,058.20	69.759,48
Short-term funds	-	-
Deferred income and accrued expenses	3,113,279.55	2.209.025,69

Profit and loss account			
		2018	**2017**
Revenues		**1,924,520.94**	**1,487,370.57**
	National and international grants and contributions	1,801,048.04	1,487,187.12
	Contributions in-kind	122,743.57	-
Other revenues	Other revenues	729.33	183.45
Operating costs		**1,856,891.14**	**1,444,597.57**
	Costs for raw materials, supplies and goods	51,527.74	31,683.48
	Costs for services	480,272.14	417,406.81
	Resources committed in-kind to CERIC from contributors	122,743.57	-
	Staff costs	1,198,010.55	991,909.68
	Costs of rents, concessions and royalties for trademarks	-	-
Other operating costs	Costs for institutional activities	4,337.14	3,597.60
Ebitda (Earnings before Interest, Taxes, Depreciations and Amortizations)		**67,629.80**	**42,773.00**
Depreciation		38,589.93	12,841.96
Write-downs for impairment of tangible and intangible assets		-	-
Ebit (Earnings before interest and taxes)		**29,039.87**	**29,931.04**
Financial income and expenses		**-397.87**	**-306.04**
	Financial income	288.92	130.22
	Financial charges	686.79	-436.26
Income from investments		-	-
Value adjustments to financial assets		-	-
Result before tax		**28,642.00**	**29,625.00**
Income tax		28,642.00	29,625.00
Result for the year		**0.00**	**0.00**

Notes to the Financial Statements as at December 31, 2018

Accounting Criteria

These annual Financial Statements have been compiled in conformity with the IPSAS (International Public Sector Accounting Standards) international accounting standards issued by the International Public Sector Accounting Standard Board (IPSASB), and in process of being adopted by the European Commission within the meaning of Council Directive No 2011/85/EU of 8 November 2011, on requirements for budgetary frameworks of the Member States.
The decision voluntarily to adopt an accounting system that can be connected to international principles is consistent with the process of harmonization started some time ago by the EU Commission, but not yet completed. For this purpose, it is relevant to recall the “Report from the Commission to the Council and the European Parliament towards implementing harmonised public sector accounting standards in Member States. The suitability of IPSAS for the Member States”, published in March 2013.
The IPSAS can in general function as a basis for a harmonised accrual-basis accounting standard passing through its transformation into EPSAS (European Public Sector Accounting Standards). The aforementioned EU Directive states that “by 14 December 2018, the Commission shall make public a review of the sustainability of the Directive" (see art.16).
CERIC-ERIC is set up as an international organization with scopes of general interest typical of an entity referable to the public sector. CERIC-ERIC should therefore be able to relate to its Members in different countries in a common language. This should be adopted in all matters and at all levels, and thus also in the model of presentation of economic-financial topics that support annual accounts and budgets.
The use of international accounting standards referable to the public sector, taking into account the specific character and scopes of CERIC-ERIC, adequately conforming to the legal characteristics of the entity and to its functions and scope, allows the development of well-defined best practices, the impact of which on the financial aspects is measurable and effective. The use of international accounting standards, in fact, allows information on the financial statements to be presented in a common way for users/stakeholders of different nationalities.

It is possible in this way to ensure that:

- The information is relevant, reliable, comparable and understandable;
- The terminology used is common, appropriate and explanatory among Members and for similar international organisations outside Europe;
- The financial statements are auditable by the International Standard of Audit by auditors from different nations;
- A host country change - and thus any site change - is not relevant for the comparability of information and models, books and records of the accounting system;
- The accounting system is able to present the in-kind contribution model, and to provide analytical accounting for projects and separate accounting for economic activities.

The aim of the annual financial statements is to provide information on the assets and liabilities, the profit or loss and changes in the financial structure of the Consortium, useful to a wide range of users. The financial statements are prepared within a general-purpose framework.

The financial statements have been compiled in accordance with the principles of clarity and transparency and provide a correct and exhaustive framework of information on property relations, as well as economic and financial relations implemented by the Consortium in carrying out its activities. It has been compiled taking into account international accounting standards for the public sector (IPSAS), and integrated in order to be consistent with the legal and effective structure of CERIC.
Of the various options allowed by IPSAS 1, the Consortium has chosen to present the layout of the balance sheet distinguishing between current and non-current items, and the layout of the profit and loss account classifying the expenses by nature.

In its drawing-up, the following principles have been observed:

- The items have been evaluated prudently, taking into account the perspective of the continuity of the activities, as well as the economic function of an asset or liability;
- Only incomes and expenditures related to the financial year have been accounted, independently of the day of encashment or payment;
- The risks and losses related to the financial year have been accounted for, even if known after the end of the financial year.

These Notes have been compiled with the aim of clarifying, completing and analysing the information contained in the balance sheet and in the profit and loss account, in addition to providing information on the applied evaluation criteria, on movements that have taken place, and changes in various assets and liabilities.
The explanatory notes are an integral part of the following documents, to present these financial statements, and provide descriptive and schematic information with particular reference to property aspects, as well as economic and financial aspects of the overall management.

The financial statements comprise the following parts:

- Balance sheet
- Profit and loss account
- Explanatory notes
- Management report, including reconciliation between final budget and Annual Accounts, statement of cash flows, trend of the net financial position (NFP) and in-kind contributions (IKC).

Evaluation Criteria

The financial statements have been compiled in accordance with the principles of clarity and transparency and provide a correct and exhaustive framework of information on property relations, as well as economic and financial relations implemented by the Consortium in carrying out its activities. They have been compiled taking into account international accounting standards for the public sector (IPSAS) and integrated in order to be consistent with the legal and effective structure of CERIC.

Balance Sheet

Items in the balance sheet are classified into/distinguished as current/non-current.

Assets

Assets have been classified as current assets when:

- They have been realized during the normal operating cycle of the institution;
- They are cash or equivalent complement not restricted in its use.

Assets realizable within the operating cycle have been classified as current, regardless of whether they have actually been realized within 12 months from the balance sheet date.

Non-current assets include tangible assets (spare parts minor electronic tools), intangible assets (licenses, and in general all assets not related to the operating cycle and realizable after 12 months from the balance sheet date).

Prepayments and accrued incomes

These items include measured incomes and expenses whose competence is advanced or delayed with respect to cash or documentary.

Liabilities

Liabilities have been considered current liabilities when:

a) They are extinct in the course of the normal operating cycle of the institution;
b) Extinction is due within 12 months from the balance sheet date.

Other liabilities, i.e., those not related to the operating cycle and all other institutional liabilities, are classified as current if their extinction is due within 12 months from the balance sheet date.
Otherwise, they are recognized as non-current liabilities.

Deferred Incomes and Accrual Expenses

This item includes the amount of funds received for 2018 and not yet fully used by 31.12.2018 for the purposes for which they were intended. They will therefore continue to provide utility in coming years, for the same purposes. This item represents the carry-over for balances of the subsequent year to that under review. In this regard, the Consortium is obliged to operate in future years in fulfilment of the mandate required by the Italian Ministry of Education, University and Scientific Research, who assigned the financial funds (FOE) under which CERIC activities were carried out in 2018.

In-kind Contributions

Contributions in-kind will be included in the financial statements on the basis of the details contained in the document entitled "Methodology for Defining the Values Involved in CERIC-ERIC Activities, and to Detail In-kind Contributions", under the conditions specified therein and only as a result of auditing procedures carried out by local auditors, which are comparable and verifiable with that of CERIC auditors.

Profit and Loss Account

The drawing-up of the profit and loss account is regulated by the IPSAS, integrated and conformed to be consistent with the characteristics and scopes of CERIC-ERIC.

Incomes

Incomes are increases of benefits connected to the administrative year.

Costs/Expenses

Costs/expenses are decreases of economic benefits of the administrative year. The analysis of costs has been explained in the overview of profit and loss account using a classification based on their nature.

In-kind Contributions

In-kind non-monetary contributions will be distinguished (when realized) between:

1) Those strictly related to the cost of the production factors (exhausting their utilities during the ordinary cycle).
2) Those strictly related to covering investments (in intangible and tangible assets).

Assets
Non-current Assets
Tangible Assets

Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
116,721.39	230,908.58	114,187.19

The following flow chart shows the change in individual items summarized in the present note.

Description	Property	Technical furniture	Electronic office machines	Office furniture	Mobile phone	Advances for the supply of durable equipment	Total
Balance as at 31/12/2017	**0**	**68,969.67**	**12,330.84**	**21,812.21**	**1,408.67**	**12,200.00**	**116,721.39**
Acquisitions during the year	0	81,685.35	8,444.87	1,389.00	-	66,672.37	145,991.59
Increases during the year	0	12,200.00	-	-	-	-	12,200.00
Decreases during the year	0	-	-	-	-	-12,200.00	-12,200.00
Depreciation for the year	0	-23,469.36	-4,236.99	-3,641.31	-456.74	-	-31,804.40
Balance as at 31/12/2018	**0**	**127,185.66**	**16,538.72**	**19,559.90**	**951.93**	**66,672.37**	**230,908.58**

Intangible Assets

Balance as at 31/12/2017	Balance as at 31/12/2018	Difference
15,068.92	26,078.70	11,009.78

Historical costs at 31/12/2018 are as follows:

Description	Balance as at 31/12/2017	Operating increments	Operating increments from assets in progress	Operating decreases	Depreciation for the year	Value on 31/12/2018
Concessions, licenses, trademarks	1,391.65	17,795.31	13,677.27	-	-6,785.53	26,078.70
Intangible assets in progress	13,677.27	-		-13,677.27	-	-
Total	**15,068.92**	**17,795.31**	**13,677.27**	**-13,677.27**	**-6,785.53**	**26,078.70**

Current Assets

Short-term Credits

The balance is divided according to the deadlines of the credits:

Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
34,926.28	40,748.56	5,822.28

The composition of the amount as at 31/12/2018 is as follows:

Description	Within 12 months	Over 12 months	Over 5 years	Total
Advances to suppliers	8,079.30	0	0	8,079.30
Other receivables	2,223.78	0	0	2,223.78
Tax advances	29,625.00	0	0	29,625.00
Credit notes to be received	820.48	0	0	820.48
Total	**40,748.56**	**0**	**0**	**40,748.56**

The balance sheet item "Advances to suppliers" represents the part of the expenses paid to suppliers for activities that will be implemented at the beginning of 2019.

The balance sheet item “Tax advances” refers to the advance payments made in June and November 2018. These advance payments have been calculated on the basis of the fiscal charge for the previous year.

Cash and Cash Equivalents

The balance represents cash at the bank at the end of the financial year. It represents liquid assets and cash equivalents at the end of the year.

Cash deposited at the bank Unicredit Banca Spa:

Description	Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
Bank deposits	3,014,560.28	5,051,300.27	2,036,739.99

In this context, the Consortium is in a credit position towards the Institute Unicredit, Agency of Trieste, where it has opened a current account for financial management. A sum of € 2,404,535.00 was delivered to this account by the Ministry of Education, University and Scientific Research through AREA di Ricerca of Trieste in October 2018, to support the Consortium’s activities for the year reviewed, according to the Collaboration Framework Agreement signed with Elettra-Sincrotrone Trieste S.c.p.A.

In November 2018, CERIC-ERIC received from the EU an amount of € 985,939.52, as interim payment for the ACCELERATE project. The amount received refers to costs claimed for the period January 2017 – June 2018. Part of this amount has been transferred to the other project partners based on EU acceptance of their claimed costs for the same period.

In December 2018, CERIC-ERIC received from the EU an advance payment for the H2020 PaNOSC project, in the amount of € 915,877.40. CERIC-ERIC is acting as project partner within this project.

Prepayments and Accrued Income

Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
13,004.43	6,921.52	-6,082.91

This item measures incomes and expenses whose competence is advanced or delayed with respect to cash or documentary; they disregard the date of payment or collection of related income and expenses common to two or more years and distributable on time. This amount represents prepaid expenses related to costs for annual insurances, to be referred, on an accrual basis, to 2019.

Equity and Liabilities

Equity

Capital and other Permanent Contributions from Members

No values are entered for these items

Reserves

No values are entered for these items

Accumulated Profits

No values are entered for these items

Non-current Liabilities

Other Long-term Debts and Liabilities

Advance Payments received for externally funded projects

Description	31/12/2017	31/12/2018	Variation
Advances	550,887.86	1,535,053.83	984,165.97

The composition of the amount at 31/12/2018 is as follows:

Description	E-RIHS Project	ACCELERATE Project	PaNOSC Project	Total
Balance as at 31/12/2017	42,408.34	508,479.52	-	550,887.86
Advance payment received from the EU during the year	-	958,939.52	915,877.40	1,874,816.92
Transfer of funds to project partners	-	-396,788.61	-	-396,788.61
Accrual progress report for the period Jan-Dec 2018	-37,275.31	-454,017.38	-2,569.65	-493,862.3
Balance as at 31/12/2018	5,133.03	616,613.05	913,307.75	1,535,053.83

- The advance payment related to the interim report of the ACCELERATE project for the period January 2017 - June 2018, submitted by CERIC in August 2018. Part of the total amount received (€958.939,52) was transferred to the other project partners (€396.788,61) in November 2018. The project has a duration of 48 months and will finish in December 2020. CERIC is acting as coordinator.

- The first advance payments related to the PaNOSC Project (€ 915.877,40) funded by the EU. The project has a duration of 48 months and will finish in November 2023. CERIC is acting as project partner.
- With reference to the project E-RIHS, no financial transfers were mede in 2018. The reduction of the initial value is related exclusively to the cost claimed for the period Jan. - Dec. 2018.

The final amount at 31/12/2018 has been reduced on the basis of the progress reports of the projects ACCELERATE, E-RIHS and PaNOSC, calculated with reference to the incurred costs for the period January - December 2018 (€ 493.862,34).
Any advance payment received relates to the implementation of the activities described in the project, and it must be returned only if CERIC does not carry out the project, or if it does not comply with the contractual obligations towards the EU.
Considering that an adequate evaluation cannot be made of the advances referred to the activities that will be carried out in the next 12 months, there is no possibility of splitting the total amount between the non-current and current parts.

Pensions Fund and Other Benefits for Compensation Employment

Severance indemnities for employees.

Description	Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
Severance indemnities for employees	50,460.76	76,729.81	26,269.05

The item is made up as follows:

Description	Initial value 31/12/2017	Plan balance 2018	Severances accrued and paid during the year	Contribution to national funds for employees (FPLD)	Severances paid during the year	End value 31/12/2018
Severance indemnities for employees	50,460.76	43,334.48	-3,544.09	-2,490.77	11,030.57	76,729.81

The severance set aside figure represents the actual debt of the Consortium at 31/12/2018, to employees in force at that date.
The contribution to FPLD is referred to the sum withheld from the severance indemnities of employees in favour of the national social security institutions in order contribute to general social security purposes.
The amount of the severances indemnity paid refers to the expiration of two fixed-term contracts during 2018. As at 31/12/2018, advances have not been required by employees.

Current Liabilities
Other Short-term Debts and Liabilities

Debts

Balance at 31/12/2017	Balance at 31/12/2018	Variation
299,692.43	322,560.72	22,868.29

The composition of the amount at 31/12/2018 is as follows:

Description	31/12/2017	31/12/2018	Variation
Debts to providers	168,778.89	199,539.14	30,760.25
Tax liabilities	82,616.39	79,244.32	-3,372.07
Payables to social security institutions	48,297.15	43,777.35	-4,519.80
Total	**299,692.43**	**322,560.81**	**22,868.38**

“Debts to providers” are stated net of possible trade discounts.
Debts are valued at their nominal value.

The item “Debts to providers” (€199,539.14) includes debts to third parties, mainly related to services purchased on credit. This item appears on the company's balance sheet as a current liability, since the expectation is that the liability will be met in less than a year.
The item "Tax payables" includes liabilities for specific taxes, and is composed of withheld taxes for employees, associates and collaborators amounting to € 43,778.85, together with 6,823.47 of VAT to be paid in 2019, and taxes due by the Consortium (€ 28,642.00). With reference to this last item, an advance payment was made in 2018 to a total amount of € 29,625.00.
“Payables due to social security institutions" includes the amount of social security contributions relating to employees, accrued but not paid as at 31 December 2018, amounting to € 43,777.35.

Advances

The item “Advances" includes advance payments related to the project PaGES4 - Planning, Management and Implementation of a Scientific Experiment in an International Research Infrastructure – funded by the Region Friuli Venezia Giulia for Euro 15,000.00, as the fourth edition of the project PAGES presented in 2015. The amount of the contribution has been reduced by the costs incurred in 2018. This amount is equivalent to the revenues of the project related to 2018 activities. (724,57 euro). The advance payment received at the end of 2017, referring to the third edition of the Project - PAGES3, was reported to Region Friuli Venezia Giulia in September 2018, after the conclusion of the project activities, and participate in forming the annual revenues.

Description	31/12/2017	31/12/2018	Variation
Advances	14,455.08	14,275.43	-179.65
Total	**14,455.08**	**14,275.43**	**-179.65**

The composition of the amount at 31/12/2018 is as follows:

Description	PaGES 3	PaGES4	Total
Balance as at 31/12/2017	14,455.08	-	14,455.08
Advance payment received by the FVG Region during the year	-	15,000.00	15,000.00
Project report for the period Jan-Sep 2018	-14,455.08	-	-14,455.08
Accrual progress report for 2018	-	-724.57	-724.57
Total	**-**	**14,275.43**	**14,455.08**

Other current Payables

"Other current payables" includes remaining debts, which by nature cannot be described above, including amounts due by CERIC to staff for all liabilities accrued to them, in accordance with current legislation and Personnel Regulations, including the value of accrued vacation paid at the time of reporting. This account at 31/12/2018 was as follows:

Description	31/12/2017	31/12/2018	Variation
Other payables	69,759.48	294,058.20	224,298.72

Description	Amount
Payables to employees for holidays and leave not taken	52,826.99
Other payables to employees	4,799.98
Payables to bodies	12,500.00
Other debts of a different nature	223,931.23
Total	**294,058.20**

The item “Payables to bodies” is related to the fee due by the Consortium to an internal auditor.

Debts are evaluated at their nominal value.
The increased value as at 31.12.2018 refers mainly to the additional operational and general services activities provided by Elettra for the statutory seat (€ 208.275,09). In particular these additional activities refer to:

- The development of specific software packages needed to implement the annual programme of CERIC-ERIC and to increase the efficiency of the administration of users, as well as other administrative processes of CERIC (Implementation of the Virtual Unified Office – VUO).
- The involvement of Elettra's operational structure and personnel for other CERIC institutional activities (General Assembly secretariat, legal advice, preparation of collaboration agreements, logistic services, spaces and related utilities, travel costs for scientific users).

Deferred Income and Accrued Expenses

For the accounting of the contribution provided by Italy, the indirect method has been chosen and the stated amount is representative of the contribution portion attributable to future financial years.

Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
2,209,025.69	3,113,279.55	904,253.86

The item breaks down as follows:

Description	Amount
Deferred income	3,113,279.55
Accrued expenses	0,00

The balance sheet item "Deferred income" measures the portion of the contribution funded by the Italian MIUR for the activities of the CERIC statutory seat, deferred to 2019.
The amount of € 3,113,279.55 is derived as follows:

Category	Carry over for 2017	Italian Contribution for 2018	Amendments signed with the Italian RE for 2018	Consortium expenses for 2018 covered by FOE	Carry over for 2019
Deferred income	2,209,025.69	2,404,535.00	208,275.09	1,292,006.05	3,113,279.55

The Italian contribution (FOE) for 2018 (2,404.535,00 €) initially defined in the collaboration framework agreement signed by CERIC and its Italian Representing Entity for the period 2017-2019, was recalculated considering the additional activities performed by Elettra Sincrotrone Trieste S.c.p.A. as reported in the previous table.

The amount of the carry over for 2019 is composed as follows:

Description	Amount
Resources committed to cover the depreciation quotes starting from 2019	190,314.91
Orders (referred to internal projects) issued as at 31.12.2018 but not closed at the end of the year	252,356.53
Resources committed to the call for investment "CERIC infrastructure development"	2.000.000
Reousrces committed to cover the investments for assets not completed as at 31.12.2018	66,672.37
Carry-over committed to ordinary activities	603.935,74
Total deferred income as at 31.12.2018	**3,113,279.55**

Income Statement

Financial Revenues

Revenue items primarily identify the portion of the contribution for the financial year allocated by Italy through the public company Area di Ricerca for the Consortium's activities to cover the expenses of management and other revenues related to projects externally funded.

Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
1,487,370.57	1,801,777.37	314,406.80

The composition of the amount at 31/12/2018 is as follows:

Category	31/12/2017	31/12/2018	Variation
MIUR ordinary contribution	1,105,027.17	1,292,006.05	186,978.88
MIUR contribution for activity of dissemination and training	2,676.54	-	-2,676.54
FVG Region - Project PaGES	15,544.92	15,179.65	-365.27
CEI project	7,694.30	-	-7,694.30
H2020 ACCELERATE project	338,652.53	454,017.38	115,364.85
H2020 E-RIHS project	17,591.66	37,275.31	19,683.65
H2020 PaNOSC project	-	2,569.65	2,569.65
Other incomes	183.45	729.33	545.88
Total	**1,487,370.37**	**1,801,777.37**	**314,407.00**

Contributions for Operating Expenses

The amount of the Italian contribution for the activities of the statutory seat of the Consortium is € 1,292,006.05.
This amount covered the costs for personnel, bodies, consultancies, and other costs of the seat not covered by specific externally funded projects.

Contributions In-Kind

Representing Entity	31/12/2017	31/12/2018	Variation
National Institute of Chemistry (Slovenia)	0.00	122,743.57	122,743.57
Total	**0.00**	**122,743.57**	**122,743.57**

The amount indicated is referred to the Slovenian PF and revenues calculated with reference to the Access costs. The consortium received a statement of the costs incurred by NMR in relation to the activities carried out in accordance to the scientific goals of the common interest between CERIC and NMR. The IKCs' calculation was implemented in accordance with the methodology adopted by CERIC.

Costs

Operating Costs

Costs for Raw materials, Supplies, Consumables and Goods

This category includes costs incurred for the supply of consumables. The increase in the year is a direct result of the increased activities of the Consortium, in particular with reference to internal research projects.

Category	Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
Costs for raw materials, supplies, consumables and goods	31,683.48	51,527.74	19,844.26

Services Costs

It has been decided to divide the item service costs, to facilitate the clarity of the budget, into the following categories of expenses:

Category	31/12/2017	31/12/2018	Variation
Legal, fiscal and administrative consultancy	69,537.05	91,878.84	22,341.79
Technical consultancies	5,402.16	993.00	-4,409.16
Administrative collaborators	4,800.00	20,870.00	16,070.00
Scientific and technical collaborators	50,142.86	58,972.43	8,829.57
Social security contributions of collaborators	25,592.18	30,553.02	4,960.84
Health contribution for collaborators	405.08	397.17	-7.91
ISTAC remunerations	25,134.35	12,714.31	-12,420.04
Travel costs for employees, collaborators, and bodies	114,112.25	128,226.37	14,114.12
Expenses for corporate meetings	6,006.40	2,122.60	-3,883.80
Insurances	13,400.39	10,978.40	-2,421.99
Representation costs	2,842.42	2,062.32	-780.10
Consulting and salaries processing	7,598.82	30,692.75	23,093.93
Mobile phones	9,900.74	9,265.92	-634.82
Annual software licenses	150.09	35.38	-114.71
Workshops, seminars and publications	27,360.79	21,379.67	-5,981.12
Canteen expenses	12,063.50	14,643.00	2,579.50
Bank charges	1,503.24	1,665.11	161.87
Postal charges	2,050.54	2,380.85	330.31
Fellowships	17,420.13	6,042.41	-11,377.72
Maintenances	3,952.80	-	-3,952.80
Training costs	4,976.90	13,109.00	8,132.10
Renting costs	1,151.13	-	-1,151.13
Transportation services	3,831.82	5,794.79	1,962.97
Other costs	8,071.17	15,494.80	7,423.63
Total	**417,406.81**	**480,272.14**	**62,865.33**

The item "Other costs" includes mainly costs related to transportation services, proofreading services, and other minor costs.

Resources committed in-kind to CERIC by contributors

Partner Facility	31/12/2017	31/12/2018	Variation
National Institute of Chemistry (Slovenia)	0.00	122,743.57	122,743.57
Total	**0.00**	**122,743.57**	**122,743.57**

IKCs contributions, have been accounted on the basis of the International Public Sector Accounting Standard No. 23.
This accounting standard is focused on contributions from non-exchange transactions, which have the following three characteristics:

1. are non reciprocal transfers;
2. are transfers to or from entities acting other than as owners
3. are made or received on a voluntary basis.

Personnel Costs

Personnel expenses: breakdown

Category	31/12/2017	31/12/2018	Variation
Wages and salaries	466,462.44	615,960.11	149,497.67
Social security charges	135,524.09	178,280.40	42,950.37
Severance indemnities	30,929.11	43,334.48	12,405.37
Allowances to be paid	35,164.01	56,783.54	21,619.53
Director	129,394.92	130,312.78	917.86
Social security charges of bodies	22,037.85	23,145.18	1,107.33
Auditors and IAEC	172,397.26	150,000.00	-22,397.26
Total	**991,909.68**	**1,198,010.55**	**206,100.87**

Use of Third Party Materials or Property

No values are entered for these items

Other Operating costs

Other operating costs: breakdown

Category	31/12/2017	31/12/2018	Variation
Membership fees	2,000.00	2,096.00	96.00
Rounding	91.62	195.99	104.37
Other taxes	445.66	833.07	387.41
Other expenditures	60.32	212.08	151.76
Donations	1,000.00	1,000.00	0
Total	**3,597.60**	**4,337.14**	**739.54**

Depreciation of Tangible and Intangible Assets

Depreciation is calculated on the basis of the useful life of the asset and its use in production. For the first year of use, the percentages applied have been reduced to half rate.

Intangible Assets

Description	Depreciation Rate	Amount
Concessions and licences	20%	6,785.53
Total amortisation of intangible assets		**6,785.53**

Tangible Assets

Description	Depreciation Rate	Amount
Office machinery	20%	4,236.99
Equipment	15%	23,469.36
Telephony and mobile telephony	20%	456.74
Office furniture	15%	3,641.31
Total amortisation of fixed assets		**31,804.40**
Total amount (intangible and tangible)		**38,589.93**

Taxation

Current tax	Balance as at 31/12/2017	Balance as at 31/12/2018	Variation
IRAP	29,625.00	28,642.00	-983.00
Total	**29,625.00**	**28,642.00**	**-983.00**

The annual tax (IRAP) is calculated on the amount of salaries paid to employees, the amount of fees paid to collaborators and the costs of contracts for temporary employment, with the exception of remunerations paid for researchers engaged in research activities.
The Consortium, in the context of purchases realized, and within the limits following from the Statute, may use VAT exemptions granted on the basis of Article 143(1)(g) and Article 151(1)(b) of Council Directive 2006/112/EC, and in accordance with Articles 50 and 51 of Implementing Regulation (EU) No. 282/2011 of the Council, and on the basis of Article 12 of Directive 2008/118 /EC.

Financial Costs and Revenues

Under “Financial management”, accrued interest income on the bank account of the Consortium is stated as of 31.12.2018.

Interest on Current Account and Rounding and Exchange Rate Costs

The item represents the remuneration of deposits of the Consortium on current account N. 000103334723 opened at Unicredit Banca.

Category	31/12/2017	31/12/2018	Variation
Interest on current account	130.22	288.92	158.70
Exchange rate costs	-436.60	-686.79	-250.19
Total	**-306.38**	**-397.87**	**-91.49**

Management Report

Reconciliation between Final Budget and Annual Account

Starting from the budget for 2018 approved by the GA in October 2017, some changes were necessary as the result of the following:

1. The calculation of the actual carry over for 2018. The budget 2018 was approved in October 2017 by the GA taking into account an estimate of the carry over for the year at closing.
2. The initiation of two new projects, PaGES4 and PaNOSC, in December 2018.
3. The recalculation of the personnel resources involved in externally funded projects during 2018.
4. The anticipation of some activities planned within the CERIC internal research projects consistent with the multiannual project budget.
5. The redistribution of funds provided by the Italian Minstry Of Education, University and Research initially stated in the Collaboration Framework Agreement signed with Elettra-Sincrotrone Trieste S.c.p.A., as detailed above.
6. Additional resources acquired in relation to the refund of some expenses by third parties and interest to the bank.

Costs and Investments

EXPENSES FOR 2018					
Description	**Initial budget**	**Implemented changes**	**Final budget**	**Total expenses**	**Expenditure rate**
CEROP	150,000.00	10,000.00	160,000.00	157,349.50	98,3%
Dyna Chiro	180,000.00	60,000.00	240,000.00	238,429.81	99%,3
RENEWALS	200,000.00	-	200,000.00	140,762.63	70,4%
MAG-ALCHEMI	230,000.00	-	230,000.00	192,264.92	83,6%
Training Projects	73,000.00	-	73,000.00	8,684.51	11,9%
RI Investment	2,039,345.00	-	2,039,345.00	-	0%-
Collaboration Agreement IT PF	3,125,465.00	215,000.00	3,340,465.00	3,333,740.09	99,8%
Bodies - Remuneration	365,000.00	-	365,000.00	330,172.27	90,5%
Remuneration for Employees	640,000.00	(322,500.00)	317,500.00	300,659.55	94,7%
Communication	50,000.00	-	50,000.00	28,910.80	57,8%
Travel Expenses	135,000.00	(21,000.00)	114,000.00	64,925.27	57%
External Services, Consultants, Consumables	404,000.00	(102,679.75)	301,320.25	265,840.89	88,2%
IL&TT	14,000.00	-	14,000.00	1,896.66	13,5%
Fixed Assets	15,000.00	-	15,000.00	6,550.59	43,7%
Taxes	40,000.00	-	40,000.00	29,169.95	72,9%
Support of the Italian RE to the Statutory Seat	100,000.00	(100,000.00)	-	-	-
Estimated vs. Real Carry Over	-	239,025.69	239,025.69	-	0%
ACCELERATE (EU)	95,440.00	280,000.00	375,440.00	360,457.62	96%
E-RIHS (EU)	-	36,000.00	36,000.00	29,820.24	82,8%
PaGES 3	6,000.00	15,698.00	21,698.00	20,944.29	96,5%
CEI_LASER	13,300.00	-	13,300.00	-	0%
PaGES 4	-	1,500.00	1,500.00	724.57	48,3%
PaNOSC (EU)	-	2,500.00	2,500.00	2,055.72	82,2%
TOTAL	**7,875,550.00**	**313,543.94**	**8,189,093.94**	**5,513,359.88**	**67,3%**

Revenues

REVENUES FOR 2018				
Description	**Initial Budget**	**Implemented Changes**	**Final Budget**	**Accrued Revenues**
Carry Over 2017	1,900,000.00	309,025.69	2,209,025.69	2,209,025.69
Contribution CEI_LASER Quota 2018	13,300.00	-	13,300.00	-
Quota FOE 2018	5,530,000.00	-	5,530,000.00	5,530,000.00
H2020 - PaNOSC	-	2,500.00	2,500.00	2,569.65
Contribution PaGES 3	15,000.00	-	15,000.00	14,455.08
Contribution H2020 ACCELERATE	389,750.00	-	389,750.00	454,017.38
Contribution PaGES 4	-	1,000.00	1,000.00	724.57
Active Interests	-	288.92	288.92	288.92
Reimbursements	-	729.33	729.33	729.33
Contribution H2020 E-RIHS	27,500.00	-	27,500.00	37,275.31
Total	**7,875,550.00**	**313,543.94**	**8,189,093.94**	**8,249,085.93**

In financial terms, the main difference between the estimated and the actual amount of the revenues is represented by recognition of the real amount of the carry-over from 2017, higher than the estimated value calculated for approval of the 2018 Budget (+Euro 309.025,69).

Other minor increases are due to the initiation of the project PaNOSC (EU funded) and PaGES4 (funded by the Italian Region Friuli Venezia Giulia).

The following table includes an explanation of the difference between the actual carry over resulting from the Financial Statements 2018 and the balance resulting from the final budget 2018.

Reconciliation between final budget and annual accounts	
Description	**Amount**
Total Revenues 2018	8,249,085.93
Total Expenses (Contracts signed, incurred costs and investments)	5,513,359.88
Balance resulting from the final budget 2018	2,735,726.05
(+) Investments made in 2018	163,786.90
(-) Depreciation at 31.12.2017	-38,589.93
(+) Contracts signed but not completed as at 31.12.2018	252,356.53
CARRY OVER 2018 resulting from the Financial Statements as at 31.12.2018	**3,113,279.55**

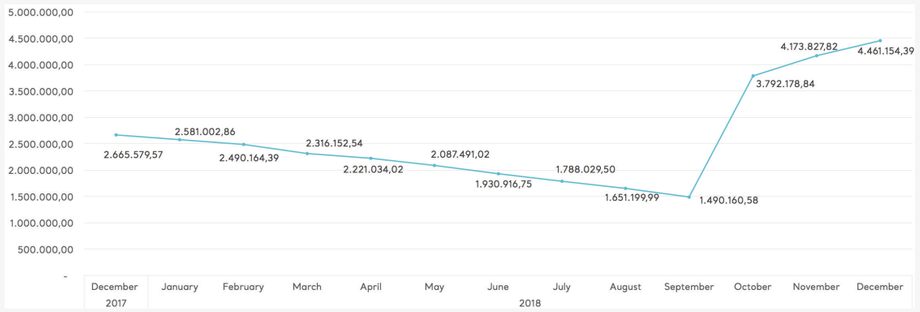
The amount of 252,356.53 Euro refers to 16 supply contracts signed in the last part of 2018 for the implementation of investments planned within CERIC internal research projects.

Statement of Cash Flow

The cash flow statement identifies the sources of cash inflows, the items on which cash was expended during the year, and the cash balance as at the end of the year.
The following table includes the information about the historical changes in cash (and cash equivalent) referred to the operating, investing and financing activities.

Statement of cash flows for the years ending Dec. 31, 2018 and Dec. 31, 2017		
	2018	**2017**
Cash flows from operating activities		
Receipts		
CERIC internal research projects	1,889,816.92	663,849.75
Contribution from the host country	2,404,535.00	2,645,835.00
Interest received	128.34	71.33
Other receipts	7,545.69	4,227.74
Payments		
Payments to staff	1,282,667.02	873,316.84
Insurance Payments	9,059.05	10,674.91
Suppliers	293,563.60	261,467.52
Other payments	123,745.68	187,308.92
Payments to project partners	396,788.61	760,348.33
Net Cash from Operating Activities	**2,196,201.99**	**1,220,867.30**
Cash flows from Investing Activities		
Purchase of plant and equipment	159,462.00	113,346.26
Sale of plant and equipment	-	-
Other	-	-
Net Cash Flow from Investment Activities	**159,462.00**	**113,346.26**
Cash flows from financing activities		
Proceeds from borrowings	-	-
Repayment of borrowings	-	-
Other	-	-
Net Cash Flow from Financing Activities	-	-
NET INCREASE/(DECREASE) IN CASH	**2,036,739.99**	**1,107,521.04**
CASH, BEGINNING OF THE YEAR	**3,014,560.28**	**1,907,039.24**
CASH, END OF THE YEAR	**5,051,300.27**	**3,014,560.28**

Net Financial Position - Trend for the period Jan-Dec 2018



The Net Financial Position represents the net debt position of the Consortium during the year, through the comparison of the following balance items: + cash and cash equivalent + short-term credits - short term debts

In-Kind Contribution included in the Financial Statements

Access cost of the PF xy and/or RE committed in-kind to CERIC				
A. Total actual costs (C) incurred to give the total quantity of access actually provided to the installation over the year (scientific and technical personnel, other direct costs). This corresponds to the total costs for operating/running the installation. All contrubtions to the capital investments must be excluded.		Personnel cost (researchers & technicians)	1,602,874.65	3,114,907.66
	Other direct costs	Consumables	471,379.13	
		Services	243,764.27	
		Travel cost and related subsistence allowance	162,710.42	
		Renting and leasing	11,197.66	
	Overhead	25% or analytical	622,981.53	
B. Total quantity of access (in unit of access) actually provided to all users of the installation (i.e., both internal and external) within the year (expressed in yours/days)				2,690.00
C. Real unit cost = A/B=100/10				1,157.96
D. Total quantity of access (in unit of access) provided to the installation in-kind contributed to CERIC				106.00
E. Real access cost for in-kind committed access = CXD				122,743.57

The basis for the calculation of the costs is represented by salaries, other direct costs and overheads of the total PF. The total amount of access is based on the total number of days actually provided to all users, including CERIC users and excluding industrial activities. The total amount of access (in units of access) provided to the installation contributed in kind to CERIC includes only the total number of days provided to CERIC users through open access.

Additional disclosures on in-kind resources (with reference to Directive 2013/34/EU)

In relation to in-kind contributions, which statutorily constitute a particularly significant element in terms of resources and organization that can be used by the Consortium, it should be noted that it was not possible to acquire all the accounting values for 2018 according to the principles of consistency and auditability on the basis of the revised "Methodology for Defining the Values Involved in the Ceric-Eric Activities, and to Detail In-kind Contributions" approved by the General Assembly in June 2018.
However, it needs to be highlighted that, even before the set-up of the Consortium, some of the concerned PFs manifested themselves through this particular mode of contribution, which then allowed the immediate and consistent start of activities. These values were quantified, albeit with the limitations set forth above, by the various PFs and are shown in the tables below in order to provide supplementary information, which enables a better understanding of the relevance of the total resources used by CERIC in the whole financial year 2018.

Value of the PFs and in-kind contribution. Consolidated data (2018)

Total costs of the ordinary scientific/technical activities of the partner facilities in 2018 - COMMITTED IN-KIND								
	Recurrent costs							
PF	**Personnel costs**	**Travel & accomo-dation**	**Consumables**	**Services**	**Utilities**	**Overheads**	**Technical devaluation & maintenance, lease/rent costs of equipment & spaces**	**Total**
AT	46,785.00	-	-	128,878.47	40,427.40	641,600.00	-	**857,690.87**
HR	-	-	-	-	-	-	35,432.94	**35,432.94**
CZ	177,734.00	35,494.00	130,370.00	63,275.00	81,367.00	104,000.00	-	**592,240.00**
HU	-	-	-	-	-	-	71,804.49	**71,804.49**
IT	186,581.72						4,295,287.24	**4,481,868.96**
PL	-	-	-	-	-	-	272,548.00	**272,548.00**
RO	-	-	-	-	-	24,432.21	44,641.83	**69,074.04**
SRB	-	-	-	-	-	-	102,839.06	**102,839.06**
SI*	-	-	-	-	-	-	122,743.57	**122,743.57**
Total	**411,100.72**	**35,494.00**	**130,370.00**	**63,275.00**	**81,367.00**	**128,432.21**	**4,945,297.13**	**6,606,241.93**

*Included in the financial statements.

5 CERIC Overview

The mission and main purpose of CERIC, in line with the ERIC Regulation (EC No 723/2009), is to establish and operate a multidisciplinary distributed research infrastructure on a non-economic basis.

Mission

CERIC is a research infrastructure integrating and providing open access to some of the best facilities in Europe, to help science and industry advance in all fields of materials, biomaterials and nanotechnology. It enables the delivery of innovative solutions to societal challenges in the fields of energy, health, food, cultural heritage and more.

Vision

CERIC co-creates the European Research Area by enabling the best global researchers to realize their ideas in a multicultural research environment with a worldwide reach. By expanding insight into materials on the nano-scale, CERIC contributes to solving contemporary societal challenges.

CERIC is an integrated multidisciplinary research infrastructure for basic and applied research in the fields of materials, biomaterials and nanotechnology. It integrates leading national research institutes into a unique international infrastructure, having its statutory seat in Trieste – Italy, and its nodes distributed in Austria, Croatia, Czech Republic, Hungary, Poland, Romania and Slovenia (Serbia is currently pending full membership). In each country, a Partner Facility (PF) ensures access and outreach to all national scientific communities and to users from all over the world, who compete for free access to 50 techniques available through a single entry point and based on the use of electrons, ions, neutrons and photons for the analysis and synthesis of materials. This service is also open to commercial users on market-based conditions.

The governing structure involves ministerial representatives of the Member Countries, as well as the directors of the Partner Facilities. CERIC management and research activities are distributed in the participating countries and cover administration, communication, technology transfer and project management. A common support system allows the distributed staff to operate in an integrated way for transnational and cooperative projects and joint ventures.

Each Member Country contributes to CERIC by making available and supporting a high-quality PF, which is continuously improved by being exposed to international users competing for access through peer-review evaluation and selection of their proposals, based on excellence. The PFs are strongly complementary to each other and act as a whole as an international agency providing support to the best researchers and research projects, contributing access to advanced analytical and synthesis facilities.

CERIC's international, pan-European approach, in line with ERIC Regulation EC No 723/2009, avoids duplication and fragmentation in the research system, and increases the integration and competitiveness of the European Research Area (ERA), speeding up East-West alignment in the ERA.

CERIC Partner Facilities, Instruments and Techniques

AUSTRIA

Graz University of Technology

is dedicated to the structural characterisation of nanosystems with scattering techniques covering topics such as advanced materials, (bio-)polymers, proteins in solids, surfaces, liquids and in the gas phase. The facility provides access to its light and X-ray scattering laboratories, as well as to the Austrian SAXS beamline and Deep X-ray Lithography beamline, both at Elettra.

CROATIA

Ruđer Bošković Institute

develops and allows access to ion beam techniques for materials' modification and characterization, such as PIXE and RBS, as well as a heavy ion microprobe, dual beam irradiation chamber with RBS/channeling, and TOF ERDA spectrometer.

CZECH REPUBLIC

Charles University Prague

has expertise in surface analysis, thin film growth and studies of the reaction mechanism on catalyst surfaces. It offers Photoelectron Spectroscopy (XPS, XPD, ARUPS) with Low Energy Ion Scattering Spectroscopy and LEED, Field Emission Gun Scanning Electron Microscope, Near Ambient Pressure XPS and access to the Materials Science Beamline at synchrotron Elettra dedicated to soft X-ray photoelectron spectroscopy and NEXAFS.

HUNGARY

Budapest Neutron Centre

performs and offers R&D in nuclear science and technology, studying the interaction of radiation with matter and doing isotope and nuclear chemistry, radiography and radiation chemistry, surface chemistry and catalysis (PGAA, NAA, RAD). Neutron scattering instruments allow investigation of the microscopic properties of solids, liquids, soft materials, biological objects and condensed matter (PSD, SANS, TOF, GINA, MTEST, BIO, TAST).

ITALY

Elettra Sincrotrone Trieste

covers a wide range of experimental techniques and scientific fields, including photoemission, spectromicroscopy, crystallography, dichroic absorption spectroscopy, x-ray imaging, etc.

POLAND

Polish Ministry of Science and Higher Education

offers techniques based on synchrotron radiation: the PEEM/XAS beamline (200-2000 eV photon energy range) is equipped with PEEM - Photoemission Electron Microscopy - and XAS, devoted to spectroscopy studies by absorption of soft X-rays. The UARPES undulator beamline (8-100 eV photon energy range) is equipped with an ARPES end-station, allowing precise studies on the structure of energy bands of solids and their surfaces.

ROMANIA

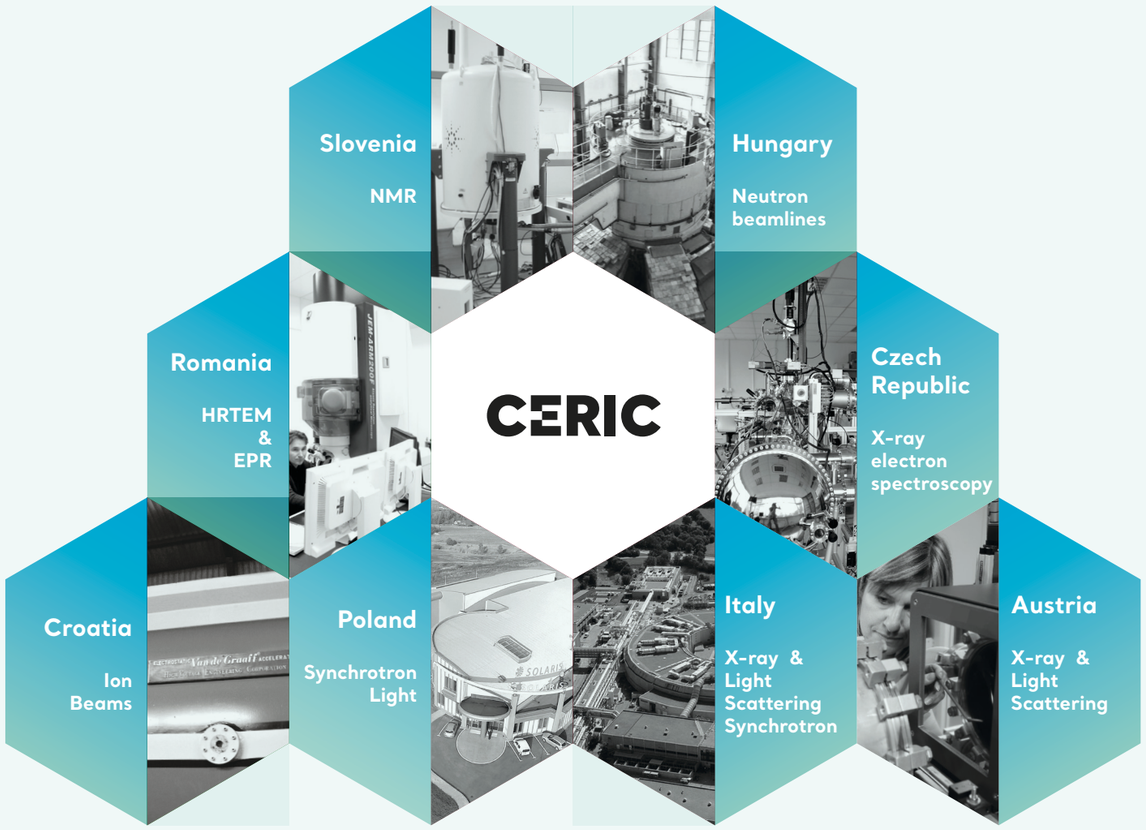
National Institute of Material Physics

offers access to HRTEM and EPR laboratories for research in solid state physics and materials science, including the synthesis and characterisation of advanced materials for applications in microelectronics, catalysis, energy industry and ICT.

SLOVENIA

National Institute of Chemistry

offers NMR spectroscopy for chemical analysis and identification, for determining 3D structures and studying the dynamics of small and larger bio-macro-molecules, for tracking chemical reactions in analytical and bioanalytical procedures, for studying polycrystallinity and identifying metabolites and various amorphous forms.



Abbreviations

BoD	Board of Directors
CERIC	Central European Research Infrastructure Consortium
ERA	European Research Area
ERIC	European Research Infrastructure Consortium, a legal framework created by the European Commission to allow the operation of Research Infrastructures of pan-European interest.
FOE	Fondo Ordinario per il finanziamento degli Enti e istituzioni di ricerca (Ordinary Fund for the Financing of Research Entities and Institutions)
GA	General Assembly
IF	Impact Factor
IL&TT	Industrial Liaison and Technology Transfer
IR	Internal Regulations
ISTAC	International Scientific and Technical Evaluation Committee
MIUR	Italian Ministry of Education, University and Research
PI	Principal Investigator
PF	Partner Facility
RE	Representing Entity
RI	Research Infrastructure
R&D	Research & Development
S&T	Science & Technology

Light scattering at the TU Graz and Elettra
Graz and Trieste
www.tugraz.at

Ion beams at the Ruđer Bošković Institute
Zagreb
www.irb.hr

Surface analysis at the Charles University
Prague and Trieste
http://spl-msb.mff.cuni.cz/

Neutrons at the Budapest Neutron Centre
Budapest
www.bnc.hu

Synchrotron and laser light at Elettra
Trieste
www.elettra.eu

Synchrotron light at Solaris
Krakow
www.synchrotron.uj.edu.pl

Electron microscopy and EPR at the National Institute of Material Physics
Magurele
http://lab50.infim.ro

NMR at the National Institute of Chemistry
Ljubljana
www.nmr.ki.si

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