

Action Plan

Spanish National
Research Council

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1 | Prologue and introduction



Emilio Lora-Tamayo D'Ocón,
President of the CSIC

On drawing up a new Action Plan for the CSIC State Agency, we must assess the former Plan and consider the current scenario and circumstances as the contextual platform on which to build this future Plan.

Accordingly, the first part of this document analyzes the results of the previous Action Plan and describes the current situation and the CSIC. The introduction summarizes many aspects of our recent history, which the rest of the document discusses in detail.

The current situation is characterized by the fact that the Spanish Ministry for Science and Innovation (MICINN) was abolished at the end of 2011, and consequently the CSIC has new departmental affiliation. Currently the Agency comes under the

Ministry for Economy and Competitiveness (MINECO) through the Ministry for Research, Development and Innovation (SEIDI). This period has also been subject to a sharp decline in budget revenues, ongoing since 2009, which has not abated but points to the possibility of a firm reversion, but as of late 2013. This situation is further immersed in an economic downturn, which we expect will also reverse in the coming years, as well as in a strong globalization of R & D, placing hopes in the coming H2020 EU programme that will provide greater economic funding than the previous Framework Programmes.

Once the very difficult economic situation of these recent years has been overcome, the two problems that hamper CSIC performance and threaten its mission most are: the depletion and aging of its workforce; and the lack of flexibility and scope in its current structure and management capacity. This makes it increasingly difficult for the CSIC to compete with its peer institutions, not only internationally, but also nationally, as some of the latter are equipped with more modern structures and flexible management systems even though, like the CSIC, they are partially financed with public resources.

Without going into the specific strategies and actions proposed in this Action Plan, there is a patent need to try to solve or, at least, alleviate these two problems. This will be our compass, guiding us during this four-year journey.

The last two years, and especially the last one, have been very difficult for the CSIC. Not only the support from the Ministry but also from the vast majority of our staff, have helped us to succeed despite these complicated circumstances. Now with this difficult outlook, but real chances of success, we still need the same support and the same dedication, to overcome discouragement and carve a path of continuity in the history of the CSIC, moving into a phase of greater commitment to society. The CSIC's Mission is in tune with the present times, and if there were no CSIC I think we would have to create it.

1.1. Preamble

The CSIC is the largest public research organization in Spain. CSIC staff represents 6% of those devoted to scientific research in Spain, it generates about 20% of national scientific production, leads financial return of European research funds and patenting in the public sector, it efficiently manages its large infrastructure and advises dozens of public and private entities, competing with the best institutions in the world.

The CSIC plays an active role in developing the European Research Area (ERA), coordinating its own strategies with other European research organizations (CNRS, CNR and Max- Planck). As an institution, the CSIC participates with European organizations to design science policy, participating in the definition of objectives, tools and actions for European cooperation through the European Science Foundation (ESF) –which is about to disappear –, the Committee of Presidents of European research (EUROHORCS) – which no longer exists- , and Advice and Science Europe (SE). The latter organization brings together funders and/or performs research in member countries of the European Union. As a result of its participation, the CSIC holds sixth place in the ranking of participation in the Seventh Framework Programme, and is the Spanish research organization to participate and obtain most under European funding programmes.

During the period 2004-2012, covering the VI and VII Framework Programme, CSIC researchers have participated in, or coordinated, 976 projects, with a total budget of 280 M €. Funding obtained in the period 2010-2013 averaged 41.5 M € per year, compared to 23.7 M €/year, accrued during the 2006-2009 period.

Since the programme started in 2007 and up until the present, a total of 21 researchers have been awarded the ERC “Starting Grant” (16% of total grants collected by Spanish entities) while 17 researchers have been awarded the ERC advanced Grant (21% of those achieved by Spanish entities). In the 2004-2012 period, a total of 329 “Marie Curie” awards were won, representing almost 20% of those achieved by Spanish organizations and about 2.5% of those achieved by European organizations.

Because of its size, its multidisciplinary nature and geographical distribution, the CSIC represents the axis of scientific research in Spain. This role is reflected in its ability to capture 20 % of the resources provided by calls under the State Plan for Scientific and Technical Research and Innovation (formerly the National Plan), and to lead 37% of the CONSOLIDER projects and participate in 60 of the 78 projects approved between 2006 and 2010. That privileged position is also shown by the fact that four research centres have been awarded the “Severo Ochoa Centre of Excellence” accreditation.

Similarly, the CSIC is present on many Campus of International Excellence and Campus of Excellence at the Regional Level. In particular, one such initiative, the UAM-CSIC International Campus of Excellence, now houses the largest number of Research Groups in the CSIC.

1.2. The Action Plan

The current legal status of the CSIC is established under the Law on State Agencies. This legal framework was adopted in 2007 to address issues related to management, modernization and the lack of flexibility inherent to the CSIC, although none have been resolved within this structure.

The Statute of the CSIC State Agency notes that its activity must be developed in accordance with the Annual Action Plan and the Multi-Year Action Plan, “under the term in force and under the relevant Management Agreement” as well as “The Steering Committee, presided by the President, approves the Action Plan for the current year, based on available resources and before the 1st of February each year”.

This is the third Action Plan presented by the CSIC. The Management Agreement referred to in the statute has never been approved, which forces to use the Multi-Year Action Plan as a reference, modulated by the characteristics presented by the current economic situation, as it influences the funds allocated to enable this Action Plan to be executed.

Unlike the first CSIC Action Plan (2006-2009), which was drawn up during a period of budgetary expansion, the 2010-2013 Action Plan was designed in an economic context of inflection, between the boom and the recession, although the latter condition was not taken into account in its formulation. The trends in the economic situation could not be foreseen accurately, so many of the proposed strategies have not been properly accomplished. Thus the average achievement of objectives of the Action Plan 2010-13 is around 43%.

This Plan aims to be more realistic, without being unduly linked to needs or resources that are not guaranteed, although recognizing the current difficulties and those foreseen in the near future.

The SWOT analysis presented in the Action Plan enables us to identify the strategic objectives to be addressed through specific programmes and actions:

- Strengthen the CSIC structure, modernize the internal organization and adapt operating protocols.
- Maintain and improve the level of scientific production and quality of research to address societal challenges.
- Increased dedication to public-private commitment to contribute to industrial leadership.
- Promote synergies and alliances with other national and international institutions.
- Promote scientific and technological culture, and train the next generation of scientists and technologists.

The Action Plan presented here describes the CSIC as a whole, including global strategies and those established by their disciplines in the respective Action Plans for Areas (Annexes I- VIII). Groups, institutes, Scientific-Technical Areas and the CSIC Central Organization Managerial Bodies have all participated in coordinating and conducting their own analysis, and formulating proposals.

Many of these ideas were also analyzed and shaped during the months of May-July 2013 in a series of meetings held by the CSIC Steering Committee and the Coordinators of Scientific and Technical Areas, together with the Institutional Coordinators. Meetings were held at different CSIC centres, in order to analyze the situation of institutional relations and institutes, both from the point of view of their current situation and scientific capacity, as well as the connections and collaborations with the private sector. Furthermore, the Plan has benefited from contributions made by many experts, who have formed a think-tank and added their views.

Although this document may not reflect verbatim the hundreds of pages of Action Plans that have been drawn up and discussed by Groups, Institutes and Centres, Areas and horizontal units of the central organization, it does include the main points. The Action Plan also incorporates the recommendations of the Scientific Advisory Committee and the Steering Committee.

Novelties, compared to the previous Action Plan 2010-2013, include:

- *Research Group* is the basic unit of CSIC Institutes.
- *Research Service* is the functional and instrumental support unit.
- Research Groups, Research Services, Institutes and Centres will be evaluated and monitored during the course of the Action Plan (see Annex IX).
- The proposed objectives and their fulfilment are decoupled from the pre-allocation of resources.

The Action Plan 2014-2017 values the structure of the **Research Group** as a basic research unit. Research groups are funded through competitive project calls to develop scientific and technological objectives, projects are drawn up with a view to maintaining certain temporal stability, train researchers and technicians, ensure technology transfer, provide expert advice, and promote scientific culture, among other activities.

1.3. Action Plan preparation procedure

The procedure began in September 2012, with the corporate design and development of an essential tool to identify and define the actual situation of the CSIC, the **Application Groups** (AG) (Annex IX). In a second stage, **1,521 Research Groups** have contributed to the work, specifying their special characteristics, activity, ability to attract competitive funding and their scientific and technological objectives. Accordingly, **125 institutes** have provided details of their strengths and weaknesses, and proposed strategic actions which have been endorsed by their respective Boards. These Action Plans have been prepared following a corporate application developed for this purpose, the Implementation-Institutes Action Plan (**Aplicación Plan de Actuación-Institutos/APA- I**) (Annex IX). Through their coordinators and committee members, all **eight Areas** have participated in the **Area Action Plans**, which have been discussed and agreed upon in meetings with those in management.

In parallel, the **Units of Central Organization** have proposed their own Action Plans, to be found in a collection of actions combined with suggestions made by the groups, institutes and Areas, forming the basis of the Strategic Programmes. Finally, the Action Plan draft was discussed by the Area Coordinators, by members of the Scientific Advisory Committee, by those in managerial positions at the Institutes, before reporting to the Steering Committee.

2 | Current situation of the CSIC

2.1. The CSIC State Agency

The CSIC is the largest public institution devoted to research in Spain. CSIC researchers account for 6% of the workforce devoted to research tasks in Spain, generating about 20% of national scientific production, a leader of patents in the public sector, it efficiently runs numerous important infrastructures and provides advice to dozens of public and private organizations.

First established in 1939, the CSIC took over the infrastructure and staff comprising the *Junta para Ampliación de Estudios e Investigaciones Científicas* (Board for Advanced Studies and Research), dating back to 1907. Since its inception, it has passed through a number of legal structures and organizational models, currently being assigned to the State Agency under the Ministry for Economy and Competitiveness (MINECO), part of the Ministry for Research, Development and Innovation (SEIDI).

The basic legal framework governing the institution comprises its Statutes, approved by Royal Decree 1730/2007 of 21 December, and Law 14/2011, of 1 June, related to Science, Technology and Innovation. Article 23 of the Statute states that, among other measures, its activity will be run under a Multi-Year Action Plan or Action Plan, and subject to a Management Agreement. The Management Agreement should set



Central Building of the Spanish National Research Council

goals, establish plans and the resources needed to achieve them, and also indicators to evaluate the results properly.

Since becoming a State Agency and although the corresponding Action Plans have been timely, the Management Agreement has never been approved, thus limiting planning and action to mid-term. The State Agency has not met the expectations initially foreseen not been given the agility or efficiency required for its scientific activity to become competitive globally. However, the CSIC has continued to contribute to the scientific and technological development of Spain, in a socially responsible way.

2.2. CSIC mission, goals and functions

The CSIC is the General Government's scientific-technical multidisciplinary organization, responsible for the promotion and implementation of fundamental and applied research, in cooperation with other public and private centres performing science and technology, to achieve priority goals in accordance with Spanish society.

Among these multidisciplinary and updated research goals we highlight the following:

- the advancement of knowledge
- technological development resulting from the application of scientific advances
- the transfer of results to industry and other areas of society
- managing large scientific facilities
- advising the government on matters within its competence
- the training of scientific and technical staff
- articulating a scientific reference system for governance
- prospective exploration of trends in scientific advancement
- promoting scientific and technological activities required by Spanish society

Spanish society should see the CSIC as a scientific and technical research organization of reference and quality, capable of effectively and responsibly using public and private funds to ensure the

CSIC FUNCTIONS (Statute of the CSIC, Royal Decree 1730/2007, 21 December)

- Perform scientific and technological research and, where appropriate, contribute to its development.
- Transfer results of science and technology to public and private research institutions.
- Provide scientific and technical services to central government as well as other governmental bodies, and public and private institutions.
- Promote the creation of research institutions and technology companies.
- Contribute to the creation of entities able to manage technology transfer and implementation.
- Train researchers.
- Train experts through highly specialized courses.
- Promote scientific culture in society.
- Manage scientific and technical facilities assigned to providing services for scientific research and technological development.
- Participate in national and international boards and organizations entrusted by the Ministry to which it is ascribed.
- Participate in the design and implementation of scientific and technological policies of the Ministry to which it is ascribed.
- Collaborate with other institutions, both national and international, in the promotion and transfer of science and technology, as well as in the creation and development of centres, institutes and units of scientific and technological research.
- Collaborate with universities in scientific research and technological development and post-graduate education.
- Inform, assist and advise public and private entities on science and technology.
- Train experts in the management of science and technology.
- Collaborate in updating the knowledge of non-university educators in science and technology.
- Support the implementation of sectoral policies defined by Central Government through the development of technical studies or applied research activities.
- Any other activities to enhance scientific and technological research pursuant to applicable legislation or entrusted by the Government.

development of fundamental issues in which science can improve the welfare of our society. It should adopt a coordinated approach at the state level and in cooperation with other state agencies (autonomous regions, public research institutions and universities) resolve complex scientific and technical problems demanding solutions, and substantially contribute to the scientific progress of Spain.

Details of the CSIC *Mission and Vision* are listed in the Statutes and are the guidelines for the Institutional Action Plan. The same detailed Statute lists all the functions of the CSIC in order to adequately achieve these goals.

2.3. Structure of the CSIC

Governance and Management Bodies

The CSIC is organized around its governing and management bodies. The governing bodies are:

- The Presidency, with executive functions
- The Steering Committee

Both have the support of the Internal Control Committee, the Scientific Advisory Committee, Inter-Territorial Committee and the Ethics Committee, as collegiate bodies.

The function of the Scientific Advisory Committee, composed of scientists and technologists of the various knowledge areas, is to inform and advise the CSIC Presidency and Steering Committee on scientific-technological aspects. In particular this must be done for the Management Contract and multi-year Action Plans or other Action Plans. The Ethics Committee, of an advisory and permanent nature, is a think-tank, issuing reports and making recommendations on the ethical and deontological principles governing research activity. Other advisory and control

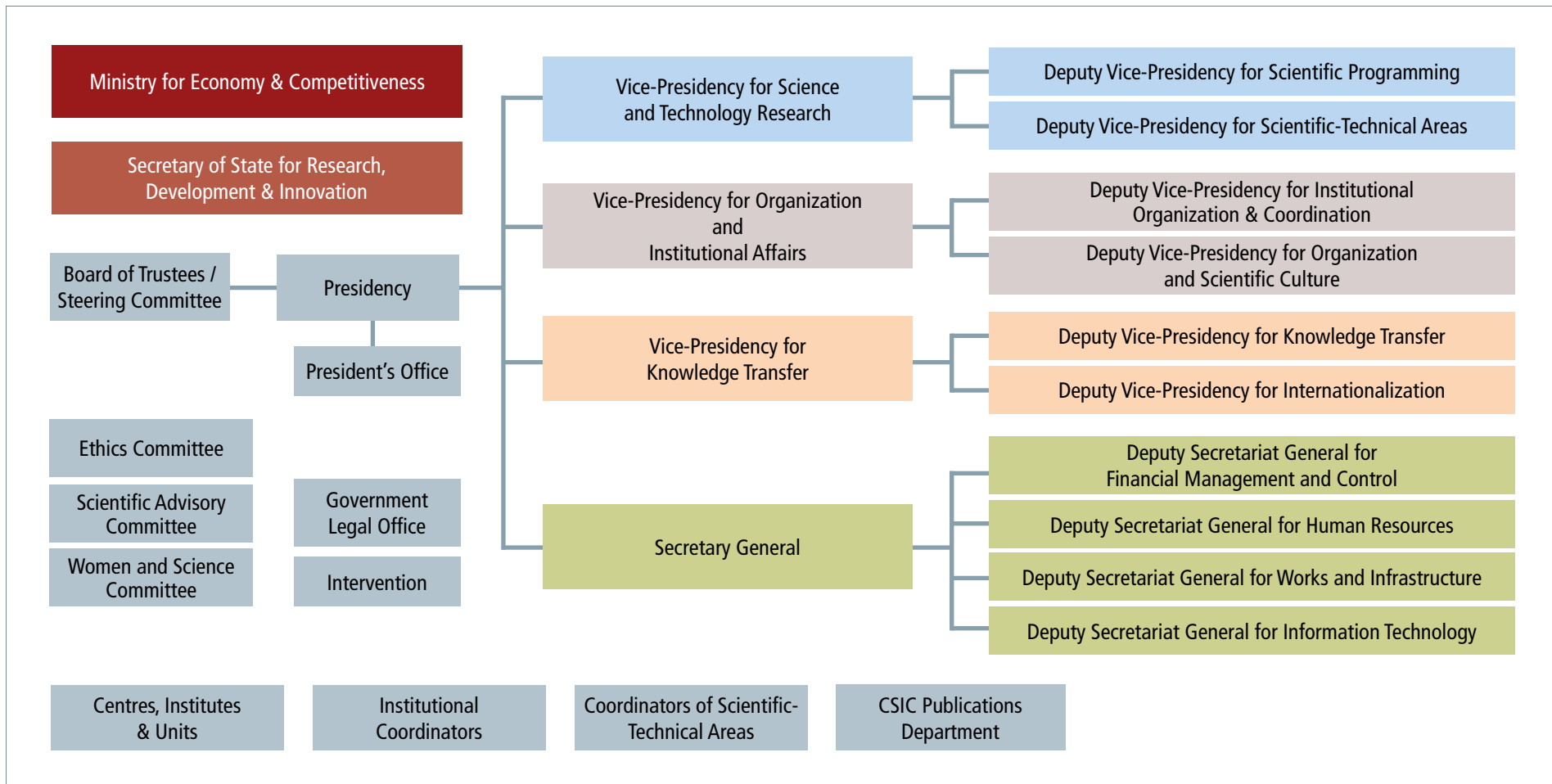
entities that also support the actions of governmental bodies are the Committee on Women and Science, the State Bar and the General Comptroller of State Administration (IGAE).

Organizational chart of the CSIC: Governing bodies and horizontal management units.

The CSIC Management Bodies are the following:

- Vice-presidency for Scientific and Technical Research (VICYT)
 - Deputy Vice-presidency for Scientific Programming (VAPC)
 - Deputy Vice-presidency for Scientific-Technical Areas (VAACT)
- Vice-presidency for Organization and Institutional Relations (VORI)
 - Deputy Vice-presidency for Institutional Organization and Coordination (VARI)
 - Deputy Vice-presidency for Scientific Culture (VACC)
- Vice-presidency for Transference and Internationalization (VITRI)
 - Deputy Vice-presidency for Knowledge Transfer (VATC)
 - Deputy Vice-presidency for Internationalization (VAI).
- General Secretariat (SEGE)
 - Deputy General Secretariat for Economic Management (SGAAE)
 - Deputy General Secretariat for Human Resources (SGARH)
 - Deputy General Secretariat for Works and Infrastructures (SGAOI)
 - Deputy General Secretariat for Information and Communication Technology (SGAI)
- President's Office.

Organizational chart of the CSIC: Governing bodies and horizontal management units.



2.4. Scientific organization of the CSIC

According to the “Regulatory law” passed in June 2013, the CSIC scientific organization based on two types of organizational units, *Research Units and Research Support Units*. Among the former are the *Scientific-Technical Areas, the National Research Centres, Scientific Networks, Institutes, Departments and Research Groups*. The *Support Units* category comprises Institutional Delegations, Service Provision Centres, Centre and Institute Managerial Units, Administrative Units, and Technical Service Units.

Scientific Technical Areas: The multidisciplinary nature of the CSIC

The scientific and technical areas are comprised of researchers who work in CSIC institutes in a particular area of research. Their function is to plan, coordinate and evaluate scientific activity. The Areas depend organically and functionally on the Vice-presidency for Scientific and Technical Research (VICYT), and each is headed by a coordinator, supported by a committee formed by research staff members pertaining to both CSIC and the institutions that form the joint centres.

The CSIC runs its activity around eight major scientific and technical areas, which cover most areas of human knowledge, from basic knowledge to complex technological developments. The eight scientific and technical areas are:

- Area 1. **Humanities and Social Sciences**
- Area 2. **Biology and Biomedicine**
- Area 3. **Natural Resources**
- Area 4. **Agricultural Sciences**
- Area 5. **Physical Science and Technology**
- Area 6. **Materials Science and Technology**
- Area 7. **Food Science and Technology**
- Area 8. **Chemical Science and Technology**

CSIC Scientific-Technical Areas. The diagram shows the number of institutes assigned to each main Area, while parentheses indicate centres assigned to Areas other than the main Area. The figures on the number of researchers reflect only the staff of Institutes pertaining to the Area. The groups assigned to each Area include all groups assigned to that research Area regardless of which centre they belong to.

Humanities and Social Sciences		Natural Resources		Physical Science and Technology	
Centres	17	Centres	21 (+3)	Centres	22
Researchers	289	Researchers	510	Researchers	532
Groups	124	Groups	152	Groups	165

Food Science and Technology		Biology and Biomedicine		Agricultural Sciences	
Centres	6 (+2)	Centres	20	Centres	16 (+8)
Researchers	217	Researchers	585	Researchers	522
Groups	134	Groups	459	Groups	182

Materials Science and Technology		Chemical Science and Technology	
Centres	11	Centres	12
Researchers	481	Researchers	411
Groups	171	Groups	134

Source: Bases de datos del Sistema de Gestión de Entidades y Personas (GEP Management Database). Data obtained on 15 October 2013.

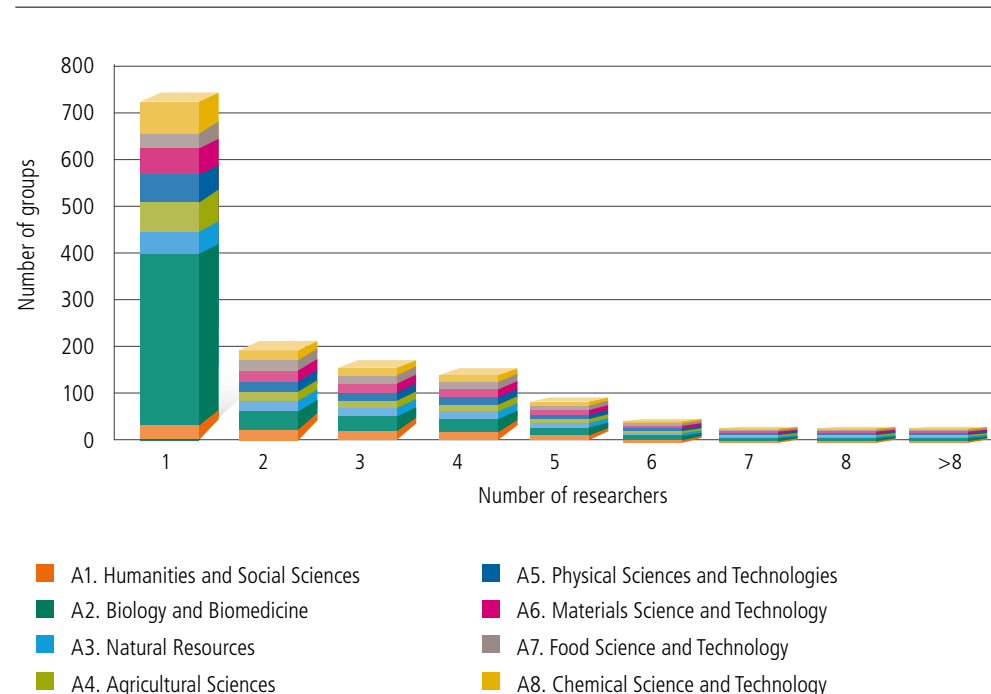
Each Area has developed an Action Plan according to its specific situation, gathers information on its component centres and institutes and their members, and made strategic proposals for the period 2014-2017. These Action Plans, summaries of which are included in Chapter 7, can be found in Annexes I to VIII of this document, and the ideas contained therein have contributed to the set of strategies developed and presented in Chapter 5.

Research Groups, institutes and service centres

The Research Groups are the basic units of a specific nature, created to achieve scientific objectives through implementation of research projects, funded through competitive calls and contracts with public or private entities. Group goals include: the generation of new knowledge, the training of research and technical personnel, technology transfer, management of services, popularization of science, provision of expert advice, and any other goals that facilitate or contribute to achieving the general mission and objectives of the CSIC.

The CSIC has 1,521 Research Groups working in Social Sciences and Humanities, Life Sciences, and Physical Sciences and Engineering, subject-related fields in 8 scientific Areas. Of these groups, 48% comprise one tenured researcher and persons occupationally linked to the CSIC and other institutions. This composition based on one "senior" researcher varies from 23 % for the Area of Humanities and Social Science, to 88% for the area of Biology and Biomedicine. The Research Groups are the backbone of the CSIC and are responsible for securing funding and for the implementation of projects and contracts.

Distribution of the CSIC Research Groups in terms of the number of members (tenured research staff and PhD-holders contracted under "Ramón y Cajal" or similar contracts).



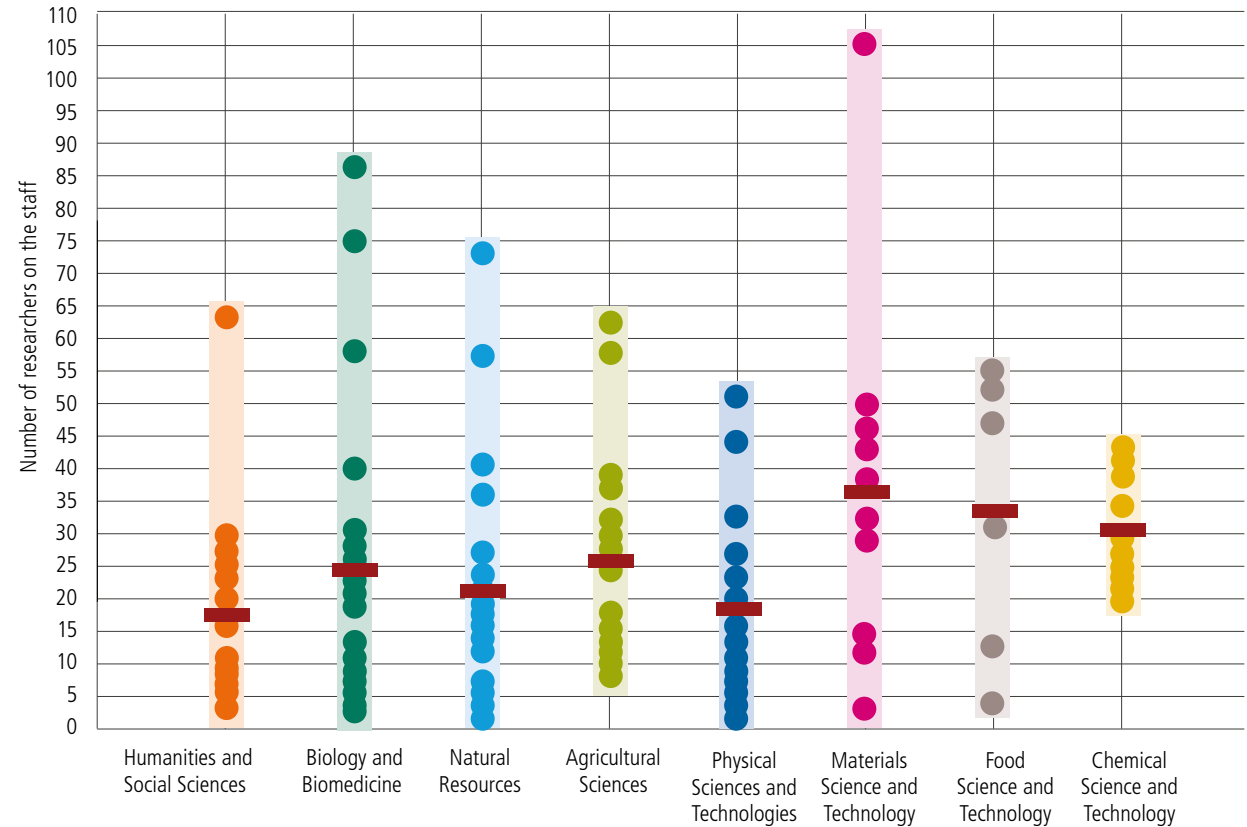
Source: Aplicación Grupos.

The Research Groups are located at 125 institutions, of which 71 are CSIC institutes and 54 are joint centres. The joint institutes are formed by researchers of the CSIC and other institutions, and are regulated by working agreements. There is an average of less than 24 CSIC researcher staff per institute, and there are currently more than 28 institutes with fewer than 10 researchers on the staff. Some institutes receive support from a service centre (which provides common services such as administration, library, maintenance, etc.), as well as research support services and other support units. At present, the CSIC has 8 centres providing such services, catering to between two to six institutes.

Service support centres (as of 31 December 2012)

- Centro de Química Orgánica Lora-Tamayo (CENQUIOR)
- Centro de Tecnologías Físicas Leonardo Torres Quevedo (CETEF)
- Centro de Física Miguel A. Catalán (CFMAC)
- Centro de Investigaciones Científicas Isla Cartuja (CICIC)
- Centro de Investigación y Desarrollo Josep Pascual Vila (CID)
- Centro Mediterráneo de Investigaciones Marinas y Ambientales (CMIMA)
- Centro de Química y Materiales de Aragón (CEQMA)
- Centro de Ciencias Humanas y Sociales (CCHS)

Number of CSIC research staff at Institutes in each Scientific Technical Area



Source: GEP Management Database

Special Scientific Facilities and Installations (ICTS)

The CSIC provides services to the scientific community through its management of Special Scientific Facilities (ICTS), recognized by the Ministry for Economy and Competitiveness. The ICTS require a large investment, involve costly maintenance and are available to both the national and international scientific community. The scientific and social importance and impact of large installations is recognized and supported by the European Union. Furthermore, the CSIC has other special facilities that cater to the national scientific community.

Special Scientific Facilities (ICTS) managed by the CSIC [<http://www.csic.es/web/guest/grandes-instalaciones>]

- Antarctic research station: Base Antártica Española Juan Carlos I
- Ocean vessel: Buque Oceanográfico Sarmiento de Gamboa
- Research vessel: Buque de investigación oceanográfica Hespérides
- European Synchrotron Radiation Facility (ESRF)
- Max von Laue-Paul Langevin Institute (ILL)
- Calar Alto Astronomic Observatory (CSIC - Max Planck)
- Nature Reserve-Estación Biológica de Doñana
- Integrated Micro and Nanoelectronics Clean Room



Calar Alto Astronomic Observatory (CSIC - Max Planck) is located in the Sierra de Los Filabres in northern Almería (Andalucía, España). It is operated jointly by the Max-Planck Institute (Germany) and the CSIC (Spain).



The ocean vessel "Sarmiento de Gamboa" is considered to be a special scientific facility and incorporates cutting-edge research equipment and navigation systems.

Source: Unidad de Tecnología Marina (CSIC).



Nature Reserva-Estación Biológica de Doñana



Integrated Micro and Nanoelectronics Clean Room and associated laboratories for microsystem processing, encapsulation and electrical characterization at the Instituto de Microelectrónica in Barcelona. The Spanish Ministry for Economy and Competitiveness classifies it as a Special Scientific Facility.

2.5. Geographic organization of the CSIC

The CSIC has centres in all the Spanish Autonomous Regions. Madrid, Andalusia, Catalonia, Valencia and Aragon have most centres (in descending order). While this geographic distribution plays a structural role in the CSIC's mission, it also represents an element of complexity, requiring additional organizational effort to achieve a balance between centralized management, coordination, and decentralized executive management of the institutes and centres.

CSIC institutional relations in some Autonomous Regions, or with some private companies located therein, is channelled through institutional delegations, directed by Institutional Coordinators. The CSIC also has two external delegations, located in Rome and in Brussels.

Geographic distribution of CSIC research institutes, differentiating joint centres.



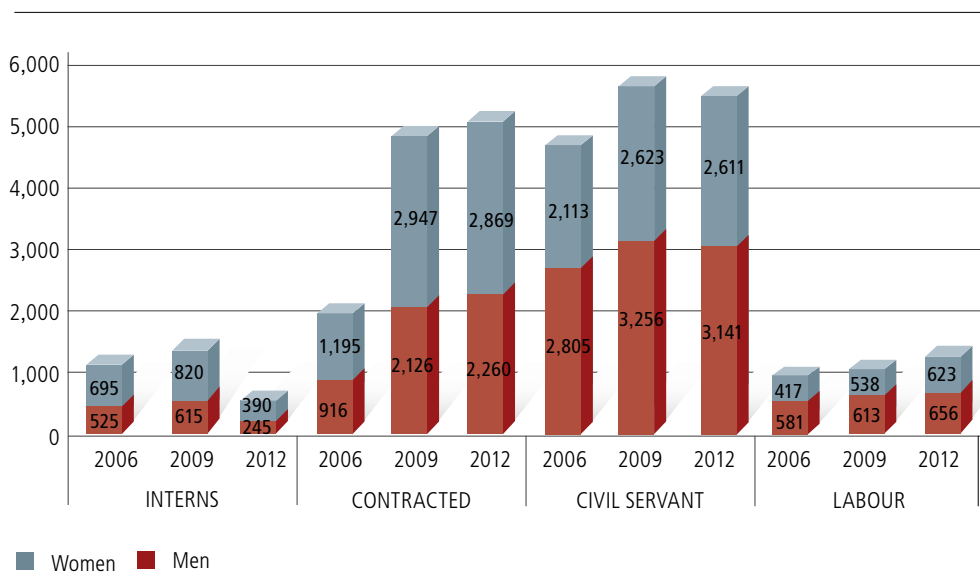
Source: GEP Management Database

It also coordinates through a network of so-called associated units, collaborative units that provide a stable framework for the CSIC group to facilitate their relationship with other public research organizations, universities and hospitals. At the end of 2012 there were 135 CSIC Associated Units.

2.6. CSIC staff

At the end of 2012, the CSIC staff numbered 12,795 people counting tenured staff, hired staff and interns. Additionally, there are another 4,830 staff members pertaining to other institutions belonging to joint CSIC centres.

Staff trends at the CSIC during 2006, 2009 and 2012, according to contract type.



Source: Sistema Analítico de Información del CSIC (SCAP Data analysis system).

The largest percentage of CSIC staff (45.3%) belong to centres and institutes in the Comunidad Autónoma de Madrid. The other three autonomous regions with a greatest number of staff were Andalusia (17.1%), Catalonia (14.1%), and Valencia (7.4%). The CSIC centres and institutes located in the regions of Andalusia, Catalonia and Valencia have the greatest number of staff pertaining to other institutions while in the Comunidad Autónoma de Madrid less than 10 % of staff does not belong to the CSIC because there are few joint centres in this region.

Staff gender distribution is almost equal, with women comprising 50.7%, when all types of staff are considered globally. The breakdown in terms of the percentage of women is as follows: management and administration 60.5%; technical and support staff 55.1%; scientific staff 41.7% (including tenured research staff, contracted PhD-holders, interns and trainees). Regarding research staff ranking, the percentage of women staff is as follows: tenured scientists 41.0%; research scientists 34.2%; and research professors 23.4%. Compared to 2006, these percentages have increased by 2.3% for tenured scientists; 2.2% for research scientists; and 4.5% for research professors. With respect to institutional managerial positions, only 20% are held by women, and women are absent from the managerial positions within the Areas of Physical Science and Technology and of Materials Science and Technology.

Staff represents the main asset, the pillar upon which all activities carried out at the institution rest. However, the current cessation of recruitment programmes at the CSIC, and the drastic drop in public employment (Oferta de Empleo Público/EPO) has caused a significant decrease since 2011. Between 2011 and 2012 there was a decline of more than 1,200 CSIC staff and at the end of 2013, another thousand people cut ties with the institution. This sharp decline, mainly among the hired staff and interns, jeopardizes the functioning of many Research Groups, as well as units and services that are essential to the proper running of scientific activity.

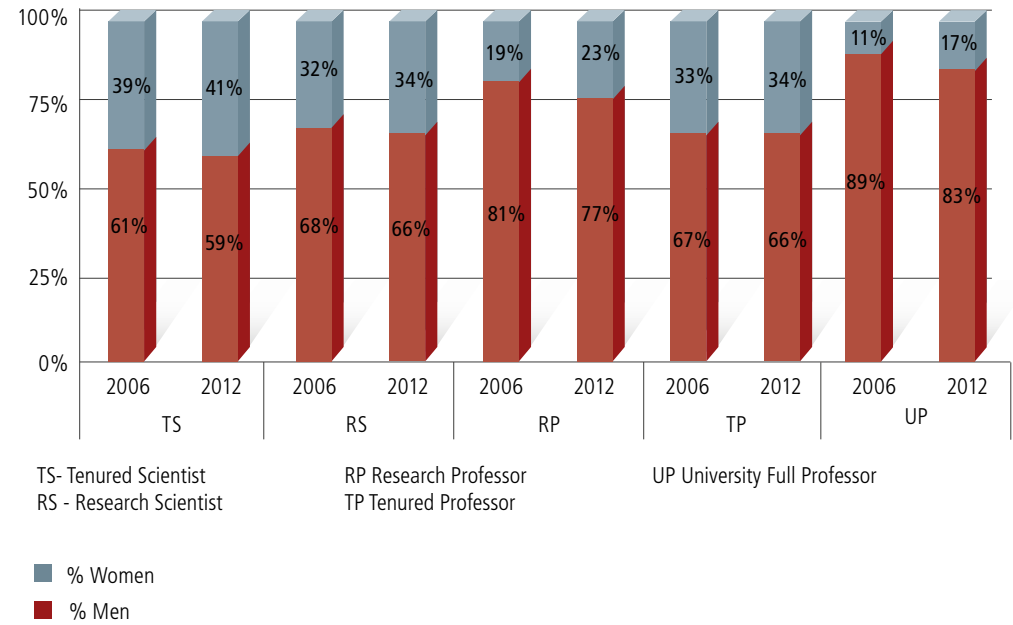
Therefore, the reorganization and strengthening of institutions, groups, services and support units should be seen as a key element of the Action Plan 2014-2017. A side effect of the drop in grants and contracts is the decline in the percentage of foreign staff at the CSIC, mainly in the categories of research fellows and postdoctoral contracts, which fell to 13% at the end of 2012.

The aging of the workforce is another consequence of this downsizing. Right now the average age of CSIC scientific staff is 53, and this problem will clearly worsen in the current scenario of problematic generational takeover. Analyses in the 2013 Action Plan indicate that this problem can only be mitigated by annual calls for about 100 tenured scientists' positions, repeated over a number of years. Similar studies for other staff ranks underscore the urgent need to undertake a policy of creating new positions, with leeway to allow for the current economic circumstances.

Special mention should be made of the significant downsizing of administrative and service staff, and technicians. This sector had already experienced a decline in previous years, like other staff sectors, and has also been affected by the lack of public calls and non replacement of retired staff over the past three years.

Besides the problem of staff aging and generational takeover, we must address the issue of technical and scientific career aspects. Pursuant to the new Law on Science, Technology and Innovation, this Action Plan will endeavour to provide an outline of scientific and technical careers that will remain stable over time.

Staff trends at the CSIC during 2006, 2009 and 2012, according to contract type



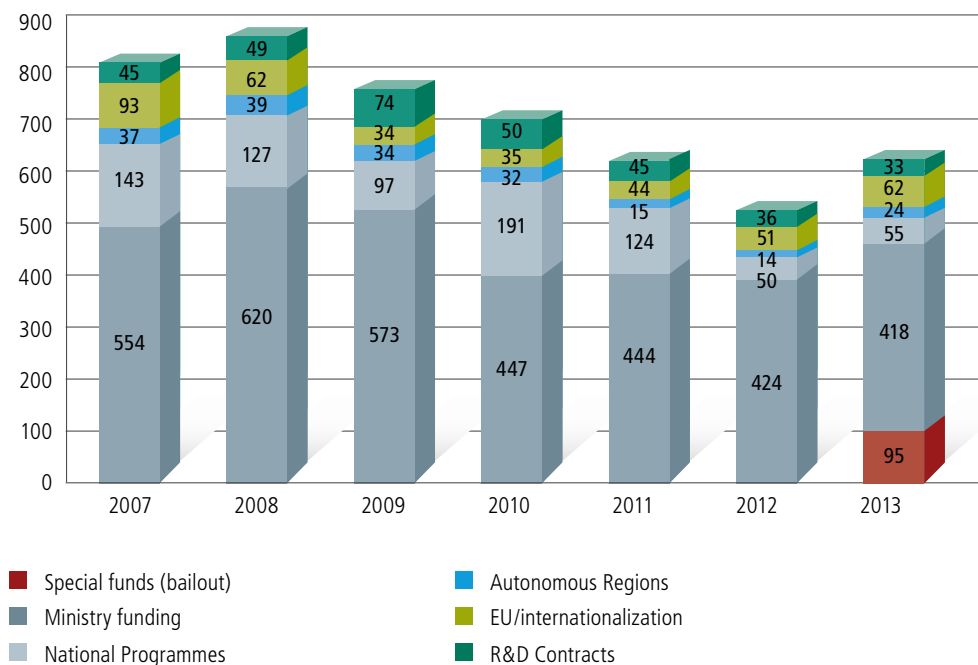
Source: SCAP Data analysis system

2.7. CSIC funding

The CSIC, like other public research organizations, depends strongly on economic allocations provided by the Ministry to which it belongs (currently MINECO). During 2004-2013, the percentage of the total budget expenditure covered by funds transferred directly from the Ministry ranged between 55% and 71%, with an average value close to 64%. The remaining funds were obtained primarily through two sources, firstly, CSIC research staff's participation in different competitive calls within the framework of the State Research Plan and the Autonomous Regions of Spain, and the European Union and, secondly, through contracts with the private sector or public administrations. During the 2004-2012, the average weight of each of the different sources of funds with respect to the total CSIC budget was 21.1% corresponding to calls within the State Plan, 1.7% to calls Autonomous Regions, 7.4% to calls within the Framework Programme and other EU calls and, finally, 12.5% for different types of contracts.

The total CSIC budget continued to rise until 2008, when the ministerial transfers peaked. From that year until 2013, the CSIC budget has fallen by 32%, mainly in line with the decrease in ministerial funding which decreased by 36% for the same period. This decline was not offset by the income gained through from competitive funding sources. In fact, funding through competitive calls has followed similar trends, peaking in 2010 and undergoing a rapid decline of almost 49% over three years. This was motivated partly by the collapse of the State Plan budget and falling economic activity of enterprises and administrations that previously contracted projects and services with the CSIC.

Trends in CSIC budget revenues during 2007-2013. Yearly amounts reflect income from the Ministry, projects within the State Plan, Autonomous Regions, projects funded under the European Union Framework Programme, and contract research and technology to various entities. The figures corresponding to 2013 are provisional, and include the extra transfer of 95 M €.



Source: SGAAE.

The MINECO commitment regarding CSIC feasibility (led largely by efforts undertaken by the Agency in its Feasibility Plan Commitments 2013-2015) led to an increase of ministerial allocations amounting to 95 M € in 2013, through the Council of Ministers' adoption of a royal decree whereby the CSIC was granted loan supplements of 25 and 70 M €.

To the abovementioned special payment made in 2013, we must add the fact that the MINECO will make departmental funding available to the CSIC during 2014, to be consolidated in future budgets, with an increase of 50 M € compared to 2013. This represents an overall increase in the MINECO contribution to the CSIC funding of 12% compared to 2013. With this increase, the ministerial allocations to the CSIC will reach 453 M € in 2014, which is much higher than 2010 (433 M €) but reaches 2009 levels (541 M €).

In summary, 2013 has achieved an increase in the State's contribution to the CSIC of 145 M €, of which 95 M € have served to overcome the critical situation of 2013 and restore the treasury funds, and the other 50 M € will be consolidated in the CSIC Budget from 2014 onwards.

These measures, together with the CSIC's Feasibility Plan, approved in January 2013, will ensure the following:

- I. I. The consolidation of the CSIC accounts, and subsequently there will be no budget deficit in 2013 and 2014, for the first time since 2009.
- II. II. CSIC revenue and expenditure will be balanced, allowing for structural revenues to cover operating cost, and thus unspent research funds will not be used for operating expenses.
- III. III. The way will be paved for the CSIC's financial and operational stability, avoiding any foreseeable deficit or the threat that projects awarded cannot be executed, which hampers research activity.

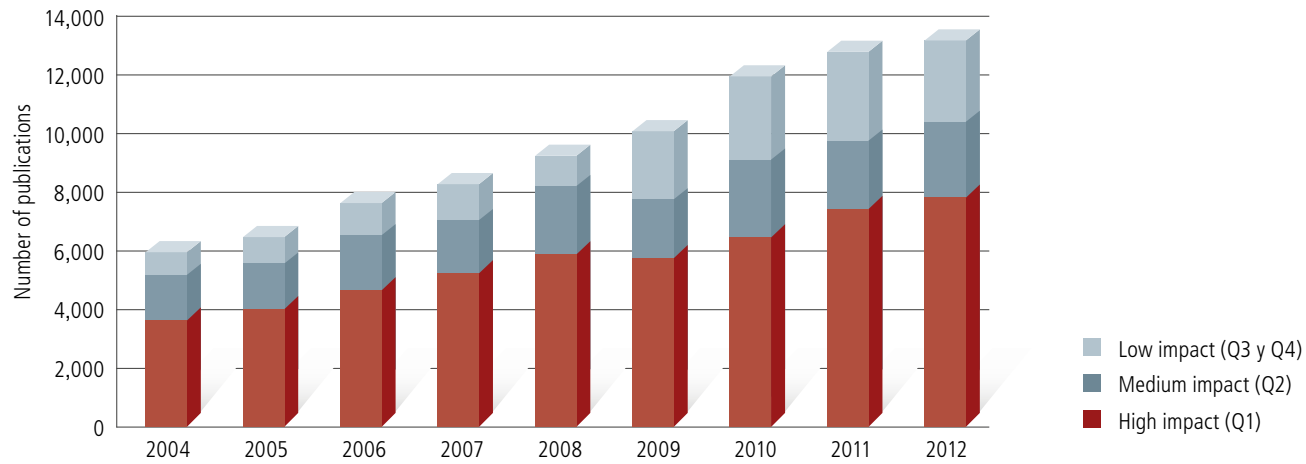
2.8. Scientific production

Despite the reduction in budget, the CSIC's scientific production has increased by an average of 8.7% annually over the last 5 years. Furthermore, the percentage of articles published in high impact journals (Q1) in different disciplines has grown at a rate of 6% per year, currently accounting for 61% of the total. In summary, despite increasing budget and workforce-related problems, the CSIC is not only publishing more but better quality. This apparent contradiction can be explained by the logic of scientific activity, as there is a lag between investment and achievement of results and their publication. However, this trend cannot be sustained over time and these indicators are expected to fall over the 2014-2017 period (see section 6.5).

Indicators of production in terms of books, book chapters and conference participation appear to have peaked in 2011, but experiment a downward trend in 2012. This phenomenon is logical because, due to the lack of resources, Research Groups are more selective and prefer to focus their efforts on the publication of articles in international journals.

Overall the CSIC scientific production is high quality. Taking the total number of items according to indicators of scientific production, SCIMAGO World Ranking 2013 ranks the CSIC in eighth position of the 2,744 centres analyzed worldwide, based on the period 2007-2011. This means that according to this classification system, the CSIC climbed two positions with respect to the period 2006-2010. Ahead of CSIC are, for example, the Centre National de la Recherche Scientifique (CNRS), the Universities of Harvard (USA) and Tokyo (Japan), and the Max Planck Research Centre (Germany). By contrast the next Spanish institution in this ranking takes 163rd position.

Trend in the number of articles published by CSIC researchers during 2004-2012, The articles are shown according to the impact factor of the journals in which they were published,



Sources: CSIC Analytical Information Systems "Sistema Analítico de Información" (SCAP), conCiencia data base, goal achievement application "Aplicación de la Productividad por Cumplimiento de GOALS (PCO)" for the CSIC Action Plan 2010-2013.

Table comparing international Public Research Organizations similar to the CSIC (data for 2012)

INSTITUTION	CNRS	MAX-PLANCK-GESELLSCHAFT	CSIRO	CSIC
Country	France	Germany	Australia	Spain
Organism on which it depends	Ministry of Higher Education & Research	Non-profit Association	Statutory Authority of the Australian Government	Ministry of Economy and Competitiveness
Staff numbers	34.000	21.831	6.492	12.795
Research staff	11.000	5.470	1.948	3.034
Budget (M€)	3.415	1.530	892	731
Scientific-technical Areas	10	5	12	8
Institutes/Centres	10 institutes & 1.130 research units	82	60 hubs with Institutes	125
Foreign presence	Brussels, Hanoi, Malta, Moscow, New Delhi, Beijing, Pretoria, Rio de Janeiro, Santiago de Chile, Tokyo, Washington	Palm Beach (Florida), Florence, Nijmegen, Luxembourg	NO	Brussels, Rome
Prizes, awards & recognitions	18 Nobel Prizes, 11 Fields Medals	17 Nobel Prizes	-	-
Publications 2007-2011 and percent of high impact Q1 (SIR 2013 World Report–SCIMAGO Ranking)	215,261 (Q1: 54.02%)	54,202 (Q1: 68.53%)	15,654 (Q1: 55.04%)	49,873 (Q1: 65.98%)
World Ranking (SIR 2013 World Report – SCIMAGO Ranking)	1	6	183	8
Nature Publishing Index - 2012 Global Top 200	5 (246 articles)	3 (186 articles)	> 200	60 (47 articles)
Patents filed (2009+2010)	353	107	117	256
Spin-offs created	305 (2002-2012)	46 (2002-2012)	34	86 (2002-2012)

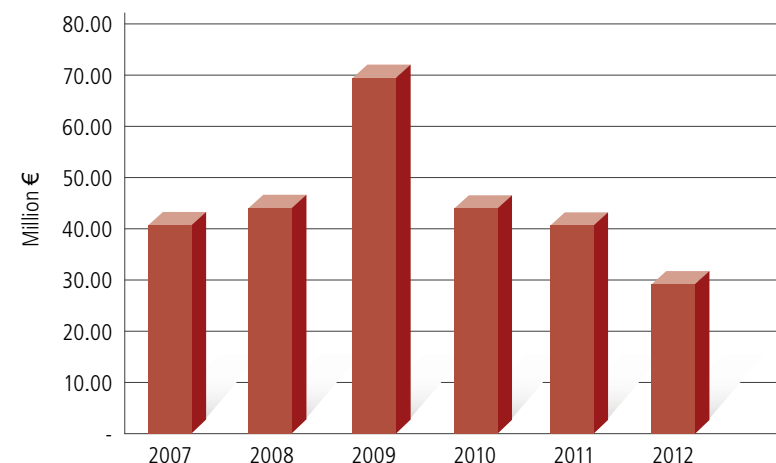
2.9. CSIC-company collaboration and technology transfer

The CSIC holds a reasonable position in terms of transferring the knowledge it generates, ranking as the first Spanish public entity in patent applications. In 2005, the CSIC filed 3.8% of priority applications for patents filed in the Spanish Patent and Trademark Office (SPTO), and 4.2% in 2011. This represents 18.2% of patent applications filed by the public sector and places the CSIC at the head of Spanish entities registering international patent applications through the PCT system (source: World Intellectual Property Organization, 2010 and 2011).

These patents are transferred to industry by means of out-licensing agreements with both Spanish companies and companies from other countries. Between 2011 and 2012, the CSIC licensed 150 patents, representing a milestone in this respect. These data are the result of the implementation of various initiatives, such as the launch of the JAE-Transfer programme, which trained transfer experts in research institutes, and the promotion of participation in national and international technology fairs. Moreover, between 2002 and 2012, there were 86 technology company spin-offs from the CSIC. Businesses require a period of time to become competitive in the industrial sector, and therefore the commercial success of these spin-offs cannot be assessed with accuracy.

The CSIC is the Spanish public entity that has entered into most contract agreements with local companies. According to data collected in the report on the socio-economic impact of CSIC project activities entitled *Impacto socio-económico de las actividades del CSIC: Una estrategia de aproximación* (IMPACT Project), which analyzed the relationship between the CSIC and its economic environment, the demand for business activities were related mainly to the manufacturing industry in the service sector and, within this, low-tech companies, the majority of which

Trends in the resources obtained by the research staff of the CSIC during 2007-2012 through research contracts for research and development, technological support, etc.



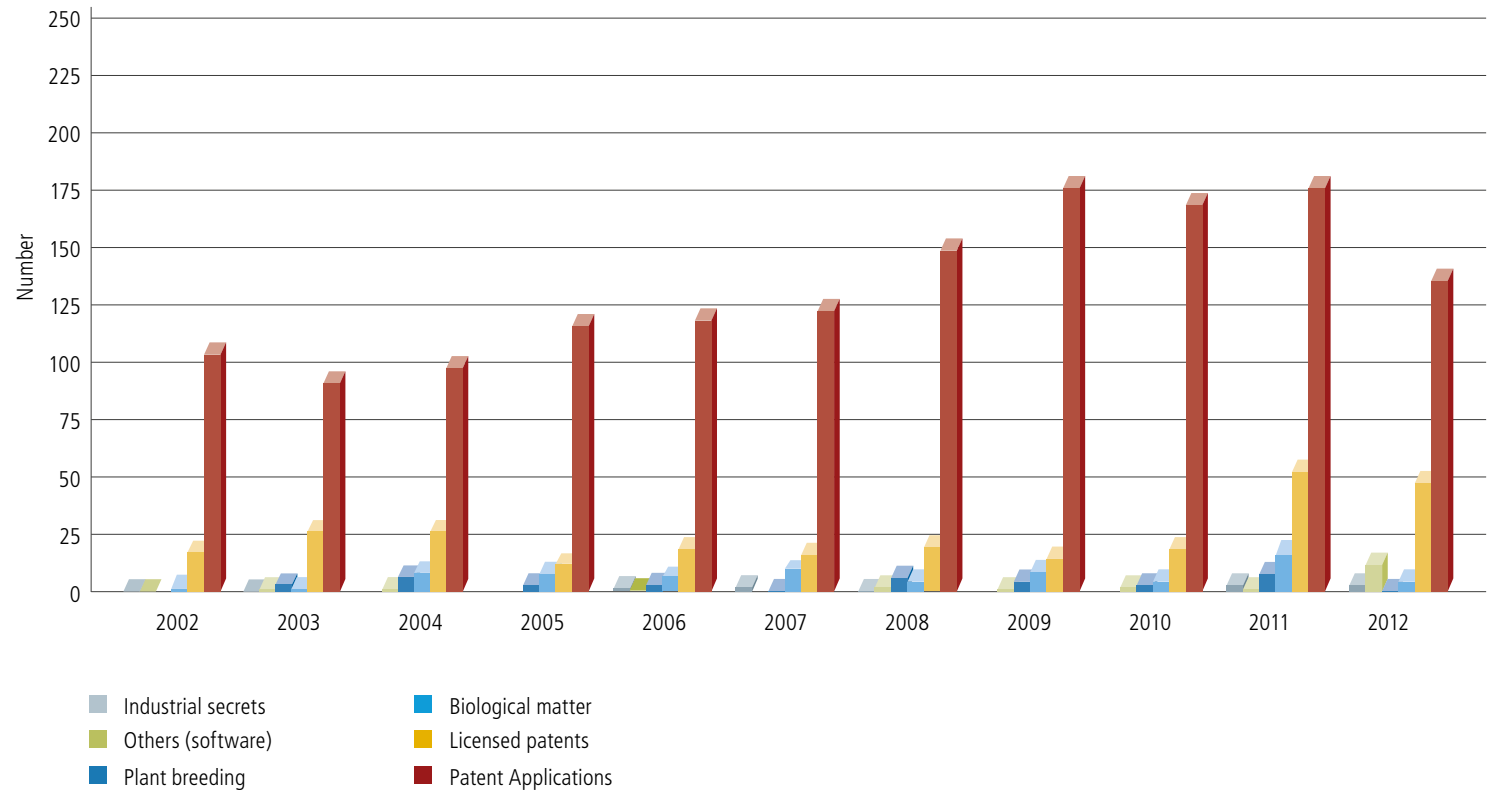
Source: SGAAE.

are national. Significantly, Project Impact highlights a core of large innovative companies within high-tech sectors, which are still in favour of their own R & D, or contract R & D in order to remain competitive in international markets, and collaborating with these companies represents a challenge for the CSIC.

In recent years there has been an increase in the number of contracts with companies, although this has slowed down significantly. The emergence of technology centres, similar to businesses but more agile in terms of their different legal structure and operation, is an additional factor to be taken into account when defining new strategies regarding Spanish companies.

Knowledge transfer, as well as being a source of economic income, is an activity that makes the CSIC "brand" more valuable, and can show society the usefulness of public investment in the institution more directly. This Action Plan will focus on these activities, which require careful design, adequate resources and need to be managed by highly qualified staff. It is in this area of activity that collaboration with the foundation *Fundación General CSIC* can be of great value.

Trends during 2002-2012 in the number of patent applications and licences, as well as other ways of protecting intellectual property.



Source: VATC.

2.10. The CSIC in the national context

Due to its size, its multidisciplinary nature and geographical distribution, the CSIC is the hub of scientific research in the Spain. This leading role is reflected in its ability to capture 20 % of the funding provided under calls within the framework of the State Plan for Scientific and Technical Research and Innovation (formerly known as the National Plan), and lead 37% of CONSOLIDER projects and participate in 60 of the 78 projects approved between 2006 and 2010.

This privileged position is also highlighted by the fact that four research centres have been accredited the “Severo Ochoa Centre of Excellence” in the programme launched by the Government of Spain in 2011, with the aim of promoting Spanish research centres that are leaders in their respective fields. The four

“Centres of Excellence Severo Ochoa” belonging to the CSIC are: the *Instituto de Ciencias Matemáticas* (Institute of Mathematical Sciences, a joint centre with the Autonomous University of Madrid, Complutense de Madrid and Carlos III); the biological research station *Estación Biológica de Doñana*; the theoretical physics centre *Instituto de Física Teórica* (joint centre with the Universidad Autónoma de Madrid) and the chemical tech centre *Instituto de Tecnología Química* (joint centre with the *Universitat Politècnica de València*).

Similarly, the CSIC participates in many Campuses of International Excellence, Campuses of Excellence at the Regional Level. In particular, one such initiative, the International Campus of Excellence UAM -CSIC, now houses the largest number of Research Groups at the CSIC.

Table comparing the CSIC and the first 10 Spanish universities according to the Shanghai 2013 ranking
<http://www.shanghairanking.com/World-University-Rankings-2013/Spain.html>

INSTITUTION	Research staff (2012) Teaching staff (2013) ¹	Articles (2007-2011)*	% Articles Q1 (2007-2011)*	National patent applications presented by CSIC or with University participation (2005 – 2012)**	Patent applications PCT presented at the OEPM (2005 – 2012)**	ERC Advanced Grants*** (2008-2012)
CSIC	3,034	49,873	65.98	1,167	789	11
Universidad Autónoma de Barcelona (UAB)	3,262	14,624	55.08	89	38	3
Universidad Autónoma de Madrid (UAM)	2,581	11,610	55.62	147	36	3
Universidad Complutense de Madrid (UCM)	6,868	14,499	47.98	144	68	1

Continue

Table comparing the CSIC and the first 10 Spanish universities according to the Shanghai 2013 ranking
(<http://www.shanghairanking.com/World-University-Rankings-2013/Spain.html>)

INSTITUTION	Research staff (2012) Teaching staff (2013) ¹	Articles (2007-2011)*	% Articles Q1 (2007-2011)*	National patent applications presented by CSIC or with University participation (2005 – 2012)**	Patent applications PCT presented at the OEPM (2005 – 2012)**	ERC Advanced Grants*** (2008-2012)
Universitat de Barcelona (UB)	4,715	16,913	58.19	119	61	3
Universitat Politècnica de València (UPV)	2,843	9,699	39.42	195	80	-
Universidad de Granada (UGr)	3,761	10,239	45.79	157	66	-
Universitat Pompeu Fabra (UPF)	1,197	4,002	57.60	10	2	8
Universitat de València (UV)	3,347	11,911	53.08	67	23	1
Universidad del País Vasco (UPV-EHU)	4,956	8,843	49.51	119	49	1
Universidad de Zaragoza (UZ)	3,715	8,568	49.60	120	59	1

¹ Fundación para la proyección internacional de las universidades españolas - Universidad.es (<http://universidad.es/es/universidades>)

* SCIMAGO LAB. SIR Global 2013 – Rank: Output 2007-2011
<http://www.scimagoir.com/pdf/SIR%20Global%202013%200.pdf>

** Spanish Patent Office
http://www.oepm.es/es/sobre_oepm/actividades_estadisticas/estadisticas/estudios_estadisticos/index.html

*** European Research Council
<http://erc.europa.eu/erc-funded-projects>

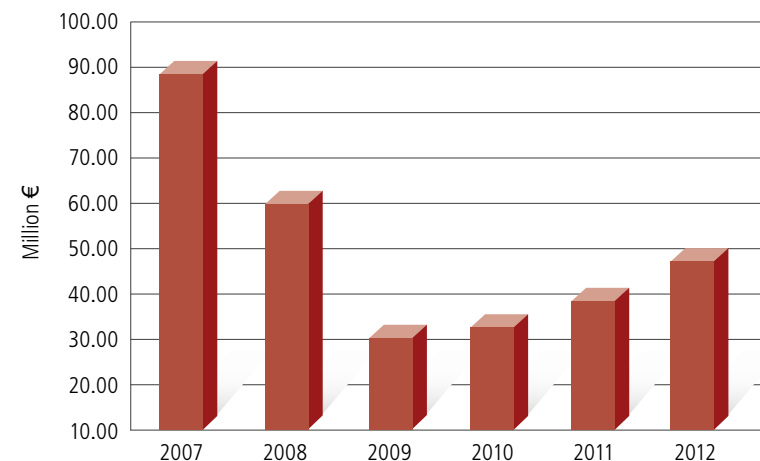
2.11. The CSIC in the international context

The CSIC in Europe

The CSIC plays an active role in the European Research Area (ERA), helping to coordinate strategies with other European organizations that are also implementing research (CNRS, CNR and Max-Planck). The CSIC participates in European consultative bodies, taking part in the design of science policy, contributing to the definition of goals, tools and actions for European cooperation through the European Science Foundation (ESF) – about to disappear- and the former Presidents Committee of the European Research Board (EUROHORCS), and Science Europe (SE), this latter bringing together institutions that fund and/or perform research in European Union member countries. As a result of this activity, the CSIC is in sixth place in the ranking of participation in the Seventh Framework Programme instruments, and is the Spanish RDT organization with greatest participation in European programmes and acquisition of funding thereof.

During 2004-2012, period corresponding to the VI and VII Framework Programmes, CSIC researchers participated in or coordinated 976 projects with a total budget of 280 M€. Funding obtained during the 2010-2013 period averaged 41.5 M€ per year, compared to 23.7 M€/year obtained during the 2006-2009 period. According to reports by the *Centro para el Desarrollo Tecnológico Industrial* (Centre for Industrial Technological Development/CDTI) for the period 2007-2010, the CSIC ranked number one among Spanish centres in FP revenues in the areas of Health, Food, Agriculture and Fisheries, Biotechnology, Environment and Climate Change. It also ranked second in the fields of Nanoscience and Nanotechnology, Nanomaterials and New Production Technologies, and sixth in Socioeconomic Sciences and Humanities; but lagged in areas of Information Technology and Telecommunications, Energy, Space, Security and Transportation.

Trends in annual revenue obtained by CSIC research staff through Framework calls during the 2007-2012 period.



Source: SGAAE.

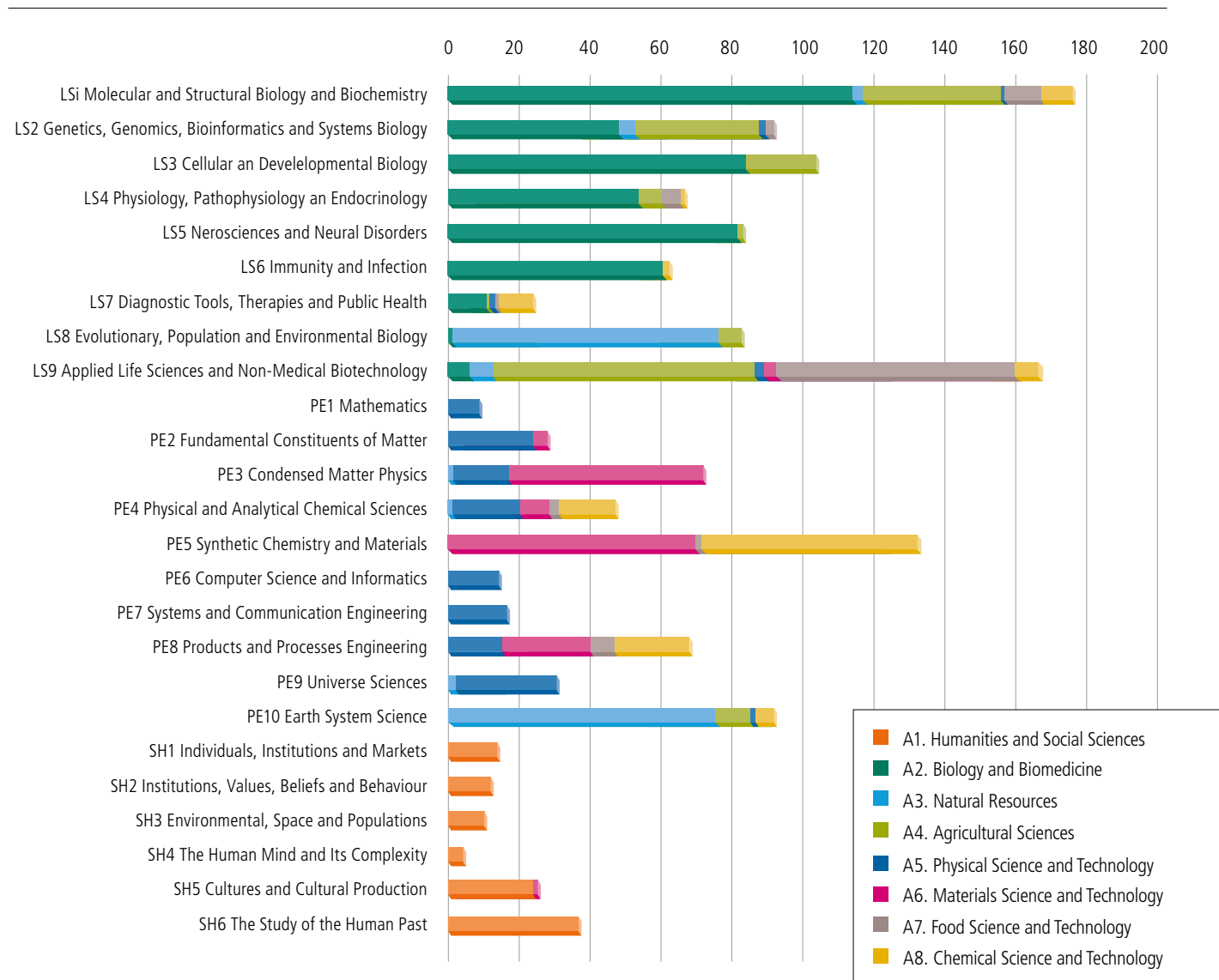
Also noteworthy is the role of the CSIC in the IDEAS programme (ERC), PEOPLE programme, and Infrastructure, Research Potential, Science and Society. During 2007-2013, the CSIC was awarded a total of 21 ERC “Starting Grants” (representing 16% of the total awarded to Spanish entities), and 17 “Advanced Grants” (21% of the total awarded to Spanish entities). In the 2004-2012 period the CSIC was awarded a total of 329 “Marie Curie” scholarships, representing almost 20% of those achieved by Spanish centres and about 2.5% of those awarded to European centres.

The launch of the European Union's next Framework Programme for Research and Innovation, Horizon 2020, represents a new opportunity for the CSIC. H2020 is the instrument through which Europe hopes to achieve the objectives outlined in the Innovation Europe initiative, targeting European competitiveness in a bid to gain a high position globally.

The H2020 Programme emphasizes the need for research to be market-centred. In the process of preparing this Action Plan, we have identified the research activities run by CSIC Research Groups with the potential to qualify for Calls in the three key areas: Science of Excellence, Industrial Leadership and Social Challenges.

As for Science Excellence programme, the CSIC is largely represented in all three fields of knowledge, due to its multidisciplinary nature and wide ranging research areas.

Breakdown of the number of groups according to the specialities of the European Research Council (ERC).

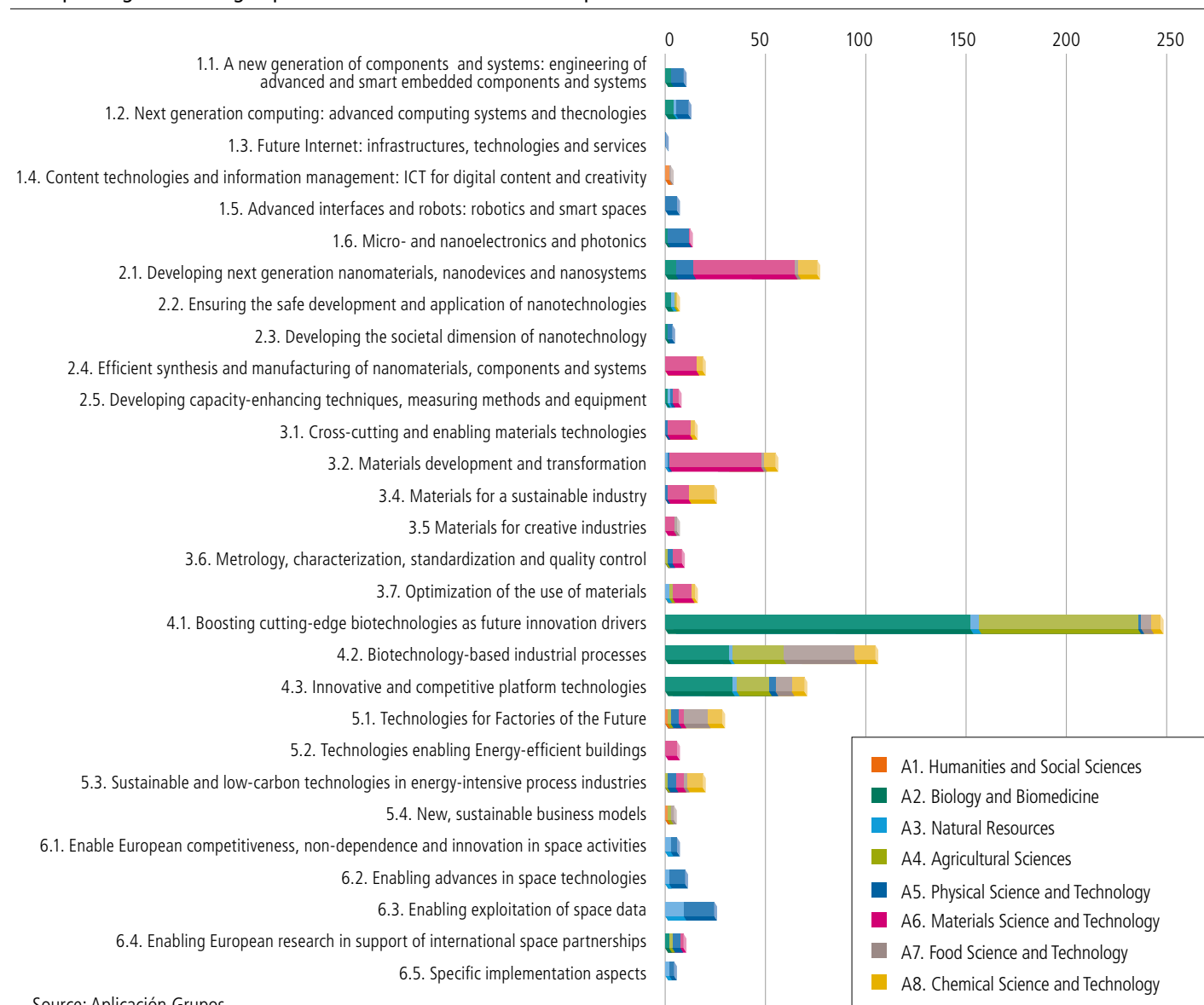


Source: Aplicación Grupos.

Within the Industrial Leadership programme, CSIC Research Groups are mostly identified with activities related to the development and use of biotechnology or nanotechnology as well as the development and transformation of materials. However, 40% of CSIC Research Groups would appear not to be easily linked to areas within this programme.

With regard to Social Challenges, many groups identify with programmes aimed at understanding diseases, and sustainable agriculture, livestock, aquaculture and fisheries, as well as the development of a sustainable and competitive food industry to ensure a safe and healthy eating. Also listed were: understanding health determinants, new knowledge and technology, and sustainable management of natural resources and ecosystems. It is noteworthy that 413 groups (29% of total) found no direct connection with the topics proposed.

Breakdown of the number of groups within the H2020 specialized topic areas – Industrial leadership. The graph does not show data corresponding to the 609 groups that indicated “Others” as their specialization.

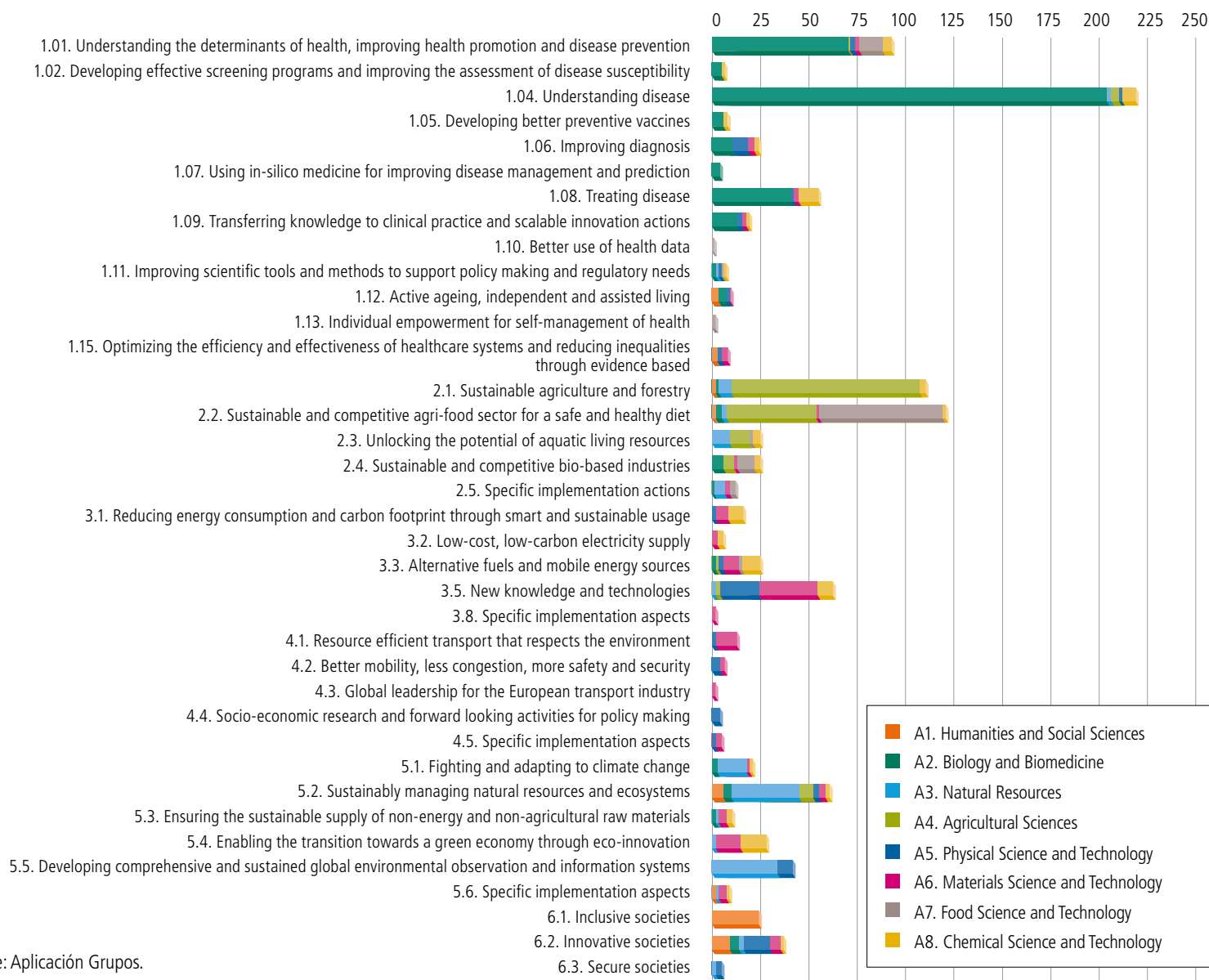


Source: Aplicación Grupos.

An international benchmark

The CSIC is a prestigious and renowned institution among major scientific institutions worldwide. To strengthen its position, the CSIC has been proactive in encouraging its institutional presence through mobility actions, partnership programmes like i-LINK and i-LINK+ and cooperation programmes like iCOOP and i-COOP+. Examples of these actions underway in 2012 are: 60 AECID projects, 39 i-LINK projects, 13 i-COOP projects and 160 scientific activities under agreements with institutions from 18 countries. Since 2010, the CSIC has been coordinating Spanish participation in the Lindau Meeting of Nobel Laureates, and has organized scientific workshops for young researchers in Spain with the British Council. Also there has been increased collaboration with U.S. in the period 2010-2013 with 5 new cooperation agreements and participation in 37 projects corresponding to U.S. competitive calls, with total funding of over € 4M. Moreover, the CSIC has launched the International Laboratory on Global Change (LINCGlobal) in collaboration with the Pontificia Universidad Católica de Chile (PUC), in order to understand and predict the impact of global change on marine and terrestrial ecosystems.

Breakdown of the number of groups corresponding to the H2020 specialized fields– Social Challenges. The graph does not show data corresponding to the 413 groups that stated “Other topics” as their field of specialization.



Source: Aplicación Grupos.

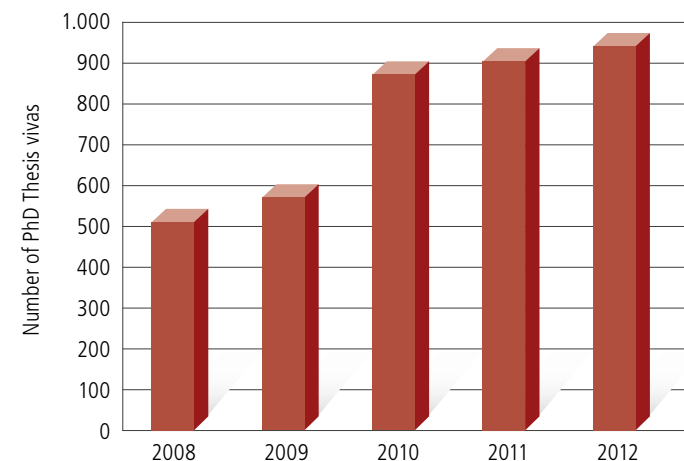
2.12. The CSIC research school

Although the CSIC cannot issue official academic qualifications, a right corresponding to universities, it actively participates in training programmes of various kinds. Thus, more than 1,200 members of the research staff regularly take part in teaching Degrees, Master and Doctoral programmes in over 75 universities, both nationally and internationally.

During the 2008-2012 period the CSIC has provided an average of 63,500 hours of university courses taught annually at different levels. The major contribution in this respect corresponds to joint institutes, but the contribution of the CSIC's own institutes cannot be ignored. In addition, a CSIC- UIMP Official Postgraduate Master and PhD Programme is being run in collaboration with the Universidad Internacional Menéndez y Pelayo (UIMP), which offers six official master programmes awarded Quality recognition by the national quality assessment agency *Agencia Nacional de Evaluación de Calidad* (ANECA) in the following: Plastics & Rubber, Tropical Biodiversity Management and Conservation, Global Change, Crystallography and Crystallization, Renewable Energy, Fuel Cells and Hydrogen, and Phonetics and Phonology, with a total of about 150 students enrolled. Since 2010-11, the Master programme has been extended to a PhD programme, which is also recognized by the ANECA.

Unquestionably, the CSIC's strength lies in its ability to train research and technical staff. A significant proportion of staff (17% in 2012) are recipients of predoctoral fellowships (now predoctoral contracts), and are carrying out PhD studies under the supervision of research staff or contracted staff. Primarily, they are, or have been, financed under three programmes: *Formación Personal Universitario* (university training programme run by the Spanish Ministry of Education, Culture and Sports), *Formación Personal Investigador* (research staff training run by the Spanish Ministry of Economy and Competitiveness), and the JAE-Pre (CSIC). Other sources of funding for the same purpose are the programmes of the Autonomous Regions and the hiring research projects. As a result of these tasks in the period 2010-2012 fought

Graph showing the number of PhD theses presented during 2008-2012.



Source: Sistema Analítico de Información del CSIC (SCAP)

in both public and private universities, almost 2,900 doctoral theses, representing approximately 10% of the arguments made in Spain.

The five universities that have collaborated most with the CSIC in the area of doctoral education are: Universidad Autónoma de Madrid, Universidad Complutense de Madrid, Universitat de Barcelona, Universidad de Granada and Universitat Autònoma de Barcelona. It is noteworthy that the JAE-Pre programme was suspended in 2012, leading to a reduction in the number of doctoral theses in the 2014-2017 period.

2.13. The CSIC: a benchmark of scientific culture

Since it became a state agency, the CSIC has become the driving force of scientific culture in Spain coordinating a network of Scientific Culture Units. More than 4,000 outreach activities have been organized and attended by nearly one million people. Many CSIC institutes and centres are actively involved, including: *El Museo Nacional de Ciencias Naturales*, *Real Jardín Botánico*, *Casa de la Ciencia de Sevilla*, *Residencia de Investigadores de Barcelona* and *the Residencia de Estudiantes de Madrid*, with some of them offering continuous activities and exhibitions of all types. In addition, Web 2.0 hosts, 50 active blogs run by CSIC centres, projects and research staff, over 70 Twitter accounts and 30 Facebook pages corresponding to CSIC centres, projects and units.

These activities are funded by the CSIC with money obtained through public calls or through agreements with private entities. Worthy of special mention are Science Week, and the FOTCIENCIA competition, as well as the Science Citizen (*Ciudad Ciencia*) and Movilab projects.



Photograph of "Movilab".

Aware of the value of science education, the CSIC participates in the special educational programme "*El CSIC y la fundación BBVA en la Escuela*" aimed at training teachers to teach science in Infant and Primary Education. In the field of Secondary Education different programmes are run such as: *El CSIC en el Aula* (CSIC in the Classroom) in Catalonia and Aragon; *EXPER-I- CIENCIA CSIC* in Galicia; *Con-Ciencia* in Valencia, and *PIISA* in Andalusia.

2.14. The visible and invisible CSIC

Activities run by the CSIC are echoed by both the conventional mass media (press, radio, television) and on the Internet (websites, social networks). During 2011 and 2012, the CSIC figured in over 21,600 news items. Thus society has access to information about the CSIC's participation and contribution to large projects such as the *Malaspina Circumnavigation Expedition 2010*, development of Curiosity - the vehicle that explored Mars -, or participation in the European initiative *Graphene Flagship*, among others.

The CSIC not only features in high impact news stories in which its staff participates, but also in many other news reports dealing with aspects of daily life in which research has led to significant improvements in the quality of life. For example, CSIC research is behind the label "gluten-free" on the packaging of food products. Similarly, the CSIC has participated in programmes leading to important genetic improvements in many edible plant species, in the development of food technology (such as processing elvers) or crop improvement and development (Huelva strawberries, Málaga avocados, Almería greenhouses, etc..) in railway infrastructure assays to increase the safety of high-speed trains, and the preservation of biodiversity.

Furthermore, the CSIC collaborates regularly in providing expert advice to public institutions. For example: the Court requests expert opinions on many topics, ranging from defective structures or buildings to the identification of recorded voices; the General Comptroller of the State Administration (IGAE) requests expert reports to audit the management of different Ministries; annual reports on ocean-vessels in transit or cable companies that may pose a risk to the seabed near the

Spanish coasts; scientific intervention in the aftermath of the Aznalcóllar disaster; remediation the Prestige oil spill and its consequences; monitoring volcanic activity on the island of El Hierro, Canary Islands, at the request of the State Committee for the Coordination of volcanic Hazards, etc. The CSIC advisory service also provides expert advice to parliament and its representatives. Between 2008 and 2012 the CSIC participated in counselling 36 project drafts, projects or Law decrees, and scientific and technical support to solve more than 121 parliamentary questions corresponding to both the Congress and the Senate.

This is the "invisible CSIC ", which attracts less media attention but provides great value to scientific knowledge generated by the institution. The CSIC's role as a source of expert advice is possible thanks to the skills of its staff, and this function should be maintained and encouraged.

3 | Analysis of the 2010-2013 Action Plan

Unlike the first CSIC Action Plan (2006-2009), proposed during a period of budgetary expansion, the 2010-2013 Action Plan was drawn up in an economic context of inflection midway between the boom and the recession. However the latter was not taken into account by the Plan as the economic downturn could not be foreseen accurately, thus many of the proposals therein have not been completed properly.

The 2010-2013 Action Plan was organized around five strategic objectives (Targeting, Trans-disciplinarity, Openness, Efficiency and Incentives). The fulfilment of these goals was to have led to structural and functional strengthening of the CSIC. To this end, four Action Pillars formed the so-called OKRE Performance Strategy, defined as follows:

- **Organization:** actions of a horizontal nature, aimed at improving the internal management of the CSIC, its relationship with other national and foreign institutions, and coordination between horizontal units.
- **Knowledge:** actions directly related to the development of research, promoting trans-disciplinary activities and complex topic areas.
- **Responses:** actions related to the CSIC's contribution to economic, social and cultural progress.
- **Experts:** actions aimed at staff training, one of the objectives of the CSIC's Mission.

3.1. Regular income budget

Budgetary requirements described in the 2010-2013 Action Plan were established based on estimates of funding required for both for overheads (including the estimated costs of staff) and deployment of the OKRE Strategy, including a budgetary increase based on an optimistic economic outlook.

The 2010-2013 Action Plan provided for annual increases of 1%, 5%, 7%, and 10% in the Revenue Budget. Accordingly, the Revenue Budget increased from 849 M€ in 2009 to 1,064 M€ in 2013. However, by contrast, the Real Revenue Budgets were progressively reduced, reflecting the decline in ministerial funding and decreasing amounts allocated to the various calls and contracts with the companies. As a result, the actual budget "snapshot" for 2013 is very different to the expected budget, as the total Revenue Budget was 599 M€ (30% less than it was in 2009), although we must add a supplement of 95 M€ in the form of a loan made to CSIC by the Ministry in 2013, and thus the total 2013 income was 694 M€, reducing the difference to 19% less, compared to the budget that the 2010-2013 Action Plan had forecast for 2013.

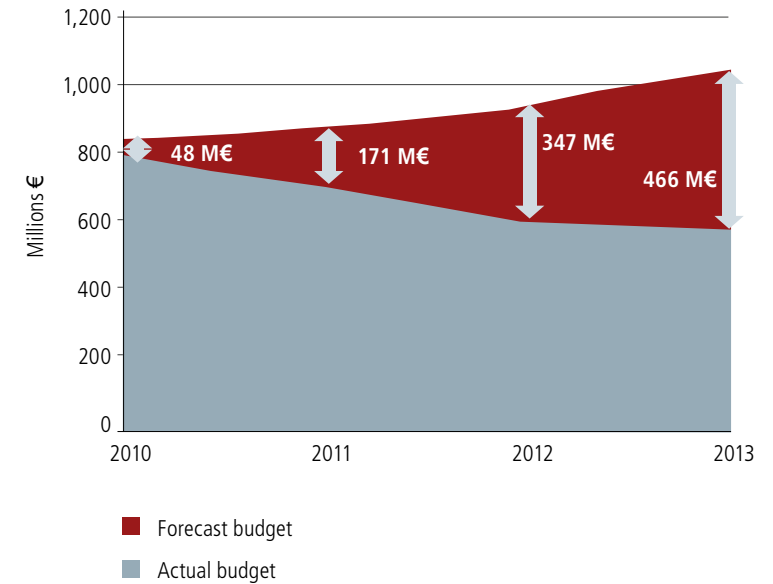
REVENUE BUDGET (IN k€) REAL & FORECAST FOR THE 2010-2013 ACTION PLAN					
		2010	2011	2012	2013*
REVENUE BUDGET M€	FORECAST	857,179	900,038	967,541	1,064,295
	REAL	808,792	728,714	620,202	598,788*
	DIFFERENCE	-48,387	-171,324	-347,339	-465,507
ANNUAL INCREASE	FORECAST	1%	5%	7.5%	10%
	REAL	-4.7%	-9.0%	-14.9%	-3.5%

(*) The amounts corresponding to 2013 are provisional and do not include the 95 M€ provided in the form of a loan made by the Ministry

Source: Secretaría General y Plan de Actuación 2010-2013

Similarly to the Revenue Budget, the CSIC Expenses Budget has been decreasing since 2010. However, the reductions were not efficient due to the inertia resulting from factors such as maintenance prioritization of commitments with contract personnel and completion of remodelling or building projects underway. This budget imbalance was made up for by the Treasury balance until total depletion of funds.

Trends in the CSIC revenue budget, real and forecast by the 2010-2013 Action Plan during 2010-2013.



Source: Action Plan 2010-2013 and Secretaría General.

3.2. Commitment feasibility plan

Given the cash-flow difficulties faced by, with the support of the Steering Committee, the CSIC Presidency adopted a series of measures outlined in the Commitment Feasibility Plan for Economic Commitments during the period 2013-2015, approved by the Steering Committee on January 30, 2013. This Plan aims to reduce spending by 117 million euros during the years 2013, 2014 and 2015, through actions or measures in three areas: workforce, current expenditure and streamlining management. The steps and plans adopted are listed below:

Measures taken regarding workforce

- Suspension of own recruitment programmes (JAES).
- Policy of no re-admittance/renewal.
- Inspection and revision of the administrative situation and permissions granted.
- Establishment of a mandatory 15-day holiday period, with subsequent closure of facilities.

Measures taken regarding expenses

- Policy of not undertaking new work under budgetary spending nor slippage of existing allocations.
- Plan to reduce current expenditure by an additional 10%.
- Increase internal solidarity.
- Review of the contributions and participation in joint CSIC centres, foundations and institutions.
- Policy of not making any calls under the EQUIPA Plan.

Measures taken regarding management

- Optimization Plan for CSIC assets.
- Global, integrated planning, and coordinated with the State, of CSIC assets in order to improve the efficiency and rationality of use, the profitability of investments made, and their potential for economic exploitation.
- Plan to combine management of centres and to rationalize allocation of costs.
- Approval of guidelines for contracting and executing external services.
- Plan to promote knowledge transfer and the creation of spin-offs.
- Plan to recover overdue payments owing to the CSIC.
- Plan to implement computer accounting information systems.

Thus, the Commitment Feasibility Plan and its actions have profoundly changed some of the strategies outlined in the Action Plan 2010-2013. In addition, during 2013 a number of money transfers had to be made by the Ministry of ascription to prevent the CSIC from collapsing due to lack of credit and liquidity, which demonstrates the need for proper management. It should also be noted that this Feasibility Plan covers the period 2014-2015, strongly influencing spending policies of the Action Plan 2014-2017, at least during the first two years.

INCOME AND EXPENSE BUDGETS OF THE CSIC STATE AGENCY FOR THE PERIOD 2008-2013 (in k€)

	2008	2009	2010	2011	2012	2013*
A. INCOME	879,035	858,662	808,793	728,715	620,203	598,789
A-I. MONETARY TRANSFERS (SEC. IV & VII)	588,944	571,017	442,293	438,536	417,873	409,306
A-II. FUNDING OBTAINED THROUGH COMPETITIVE CALLS	267,545	247,527	319,746	233,829	151,146	157,805
A-III. OTHER INCOME (SEC. V, VII, VIII, IX)	22,547	40,118	46,754	56,350	51,184	31,678
B. SPENDING	852,820	935,754	860,286	803,899	730,558	700,419
OPERATING SUBPROGRAMME (F)	617,742	709,758	631,626	587,591	526,056	496,419
BF-I. WORKFORCE (SEC. I, VI Y VII)	378,078	424,203	430,440	433,110	404,133	395,279
BF-II. RUNNING COSTS SECTION II	71,906	77,722	74,479	81,922	68,111	65,631
BF-III. INVESTMENTS	147,608	176,494	109,153	56,925	34,635	26,104
BF-IV. OTHER EXPENSES	20,150	31,340	17,554	15,634	19,466	9,405
PROJECT SUBPROGRAMME (P)	235,078	225,996	228,660	216,308	204,500	204,000
BP-I. WORKFORCE (SECTION VI)	78,971	78,355	81,804	80,680	78,968	80,000
BP-II. RUNNING COSTS (SECTION II)	102,032	105,525	105,216	94,986	99,853	101,000
BP-III. INVESTMENTS (SECTION VI)	30,802	29,541	26,704	28,197	21,998	20,000
BP-IV. OTHERS (SEC.VII, IV, III, ETC.)	23,273	12,541	14,910	12,445	3,681	3,000
C. DEFICIT (A - B)	26,400	-77,093	-51,493	-75,184	-110,682	-101,630
D. TREASURY BALANCE (as of 1 January each year)	318,077	410,111	332,889	275,259	197,155	82,076

(*) the amounts corresponding to 2013 are provisional and do not include the 95 M€ supplement loaned by the Ministry.

Source: Secretary General

3.3. OKRE strategy success rates

The analysis made by the relevant organs of the CSIC reveals that the objectives set out in the Action Plan were met at a rate of 45 %. Specifically, regarding the Strategic Organization by Pillars, 39% of planned goals were met: Knowledge 47%; Responses 58%; Experts 38%. With regard to the objectives of the Strategic Areas, the success rate varies between 12% and 75%. Of the 40 Strategic Actions proposed, 10 have not been carried out (about 20%) as 11 have been met at a rate of 25% and 5 at a rate of 50% compliance.

In some cases the cause of failure was due to financial difficulties (stoppage of work or freezing of purchasing) and structural problems (the impediment of the implementation of public enterprise CSIC, K2B). Regardless of the underlying causes, the gap between the planned actions and those successfully undertaken has made it difficult to consider and assess internal strategic planning, hindering the realization of this Action Plan.

Finally we should highlight the capacity of the institution to propose and implement various initiatives in response to its changing environment. Among these initiatives was the development of complex software tools to track Research Groups and research activity, an action not included in the proposed 2010-2013 Action Plan.

APPROXIMATE SUCCESS RATE OF THE ACTIONS UNDER THE OKRE ORGANIZATION STRATEGY

STRATEGIC AREA	ACTIONS	GOALS	APPROXIMATE SUCCESS RATE (0%-100%)
Processes	STANDARDIZATION OF MANAGEMENT PROCEDURES AND STRUCTURES	Streamline internal administration. Adapt procedures to e-management.	25%
	ELECTRONIC MANAGEMENT	Streamline external management. External management telematics.	100%
	QUALITY	Increase efficiency and effectiveness of the CSIC. Manual of Good Practice CSIC. Promote Quality Culture. Certification ISO9001 quality management of horizontal unit administrative management.	75%
Relations	CSIC DIFUSO	More effective partnerships. Avoid loss of visibility.	25%
	CSIC INTERNATIONAL	CSIC internationalization. More foreign researchers at the CSIC. International collaboration with Max Planck and CNRS. Institutional collaboration with the USA.	50%
	CSIC EXTERIOR	International collaboration. Expansion of the EEHAR headquarters. Increased EU funding. Other institutes abroad. Encourage membership to scientific and technical foreign lobbies.	25%
	INTERNATIONAL CSIC CENTRES	International collaboration. Consolidate the <i>Convivencia</i> unit. Enhance joint scientific production of the LINCG.	50%

Continue

APPROXIMATE SUCCESS RATE OF THE ACTIONS UNDER THE OKRE ORGANIZATION STRATEGY

STRATEGIC AREA	ACTIONS	GOALS	APPROXIMATE SUCCESS RATE (0%-100%)
Cohesion	PCO2010-131	Improve efficiency and cohesion of institutes and horizontal units. New procedure to be extended to horizontal units. Extended to all CSIC staff. Adoption of the procedure by other institutions in joint centres and institutes.	25%
	MANAGING PERFORMANCE	Improve staff efficiency. Individualized staff incentives.	-
	IMPROVE COMPETITIVENESS OF CENTRES AND INSTITUTES	Improve research capacity of institutions. Improve production of beneficiary centres and institutes. Improve staff at beneficiary centres and institutes.	-
	PROFESSIONAL CAREER DESIGN	CSIC career plan. Incentives. New ways to get onto the scientific staff - Tenure Track. Professional profiles for position types. Performance evaluation as merit.	25%
	INTERNAL COMMUNICATION	Promote <i>clan culture among</i> CSIC staff. Publish the CSIC magazine.	-
	SOCIAL ACTION	Staff loyalty. Access to schools. Access to welfare benefits for seniors.	100%
	GENDER EQUALITY	Improve women's status at the CSIC. Plan Develop a gender equality plan for all CSIC staff and put in into action.	100%
	ASEPSIC - PSYCHOLOGICAL COUNSELING	Improve labor relations and staff environment at the CSIC. Improve human relationships and work environment at the CSIC.	-
DESPLACE	MONITORING	Coordinate 2010-13 Action Plan implementation. Action Plan deployment.	-
	2010-13 ACTION PLAN	Improve competitiveness and efficiency of institutes and horizontal units. Preparation, evaluation and monitoring Strategic Plan implementation for the functional units of the CSIC centres/institutes, horizontal units, special scientific facilities (ICTS).	-
	CONSULTANCY	Improve competitiveness of centres institutes. Run advisory panels for centres/institutes.	-

Source: Management

APPROXIMATE SUCCESS RATE OF THE ACTIONS UNDER THE KNOWLEDGE PILLAR OF THE OKRE STRATEGY

STRATEGIC AREA	ACTIONS	GOALS	APPROXIMATE SUCCESS RATE (0%-100%)
Focus	FOCUS PROJECTS	Research focused on strategic pillars or Axes. Fund targeted research.	-
	FOCUS-SATELLITES	Visibility, collaboration and competitiveness of Focus. Production of dissemination materials. Lobby creation/membership. External peer rating of 75% in 4 years.	25%
Equipa	EQUIPA	Apparatus/instrumentation for institutes. Increase competitiveness. Acquisition of instrumentation, increase the competitiveness of centres and institutes. Peer rating (external) 75 % in 4 years	25%
Vértices	INFRASTRUCTURE	New institutes. Concentration of facilities. Building and remodelling centres and institutes. Creating large installations. Peer rating (external) 75% in 4 years.	-
	SIS – SCIENTIFIC INFORMATION SYSTEMS	Storage and distribution of scientific knowledge. Consolidation as a horizontal scientific information service. 75% of CIS scientific production in Digital CSIC.	75%
	ITIC	Improve infrastructure and communications of centres. Standardization and improvement of infrastructure and communications among centres.	100%
	INFORMATION SYSTEM SAFETY	Develop a CSIC Information Safety Plan.	75%
CSIC2.0	CSIC2.0	Collaborative Web Platform.	75%
Inicia	INICIA	Facilitate the initiation of new research activity. Programmes to help new researchers. 75 % user satisfaction (anonymous and external)	25%

Source: Management

APPROXIMATE SUCCESS RATE OF ACTIONS UNDER THE RESPONSE PILLAR OF THE OKRE STRATEGY

STRATEGIC AREA	ACTIONS	GOALS	APPROXIMATE SUCCESS RATE (0%-100%)
Lanzadera	TRANSCEND	Visibility of Knowledge Transfer. Increase number of inventors: 25% more in 4 years. Increased visibility of 75 % of Knowledge Transfer within the CSIC (anonymous and external analysis). Transfer of Knowledge valued on a CV.	65%
	CSIC-SOLUTIONS	Market results and recruit companies. Increase private procurement (15% more in 4 years). Increase licensed patents (25% more in 4 years).	65%
	PATENT & PUBLISH	Increase the number of patents. Increase inventors: 25% more over 4 years (due to programmes). Increase patents: 25% more in 4 years (due to programmes). User satisfaction of 75% (anonymous and external analysis). Internal visibility: 75 % (anonymous and external analysis).	25%
	CSIC-SPIN-OFFS	Promote the creation of spin-offs. Increase creation of spin- offs (25% more in 4 years). User satisfaction of 75% (anonymous and external analysis). Total yield over 10 years (110 %) - only Actions: <i>Pregenera</i> . <i>Invertia</i> . <i>EBC</i> .	25%
	CSIC-K2B	Set up an instrumental company for knowledge transfer.	-
	FOCUS-TRANSFER	Knowledge transfer focused on strategic Pillars/Axes. The same goals as for the rest of the actions targeting the Strategic Axes/Pillars.	25%
	ANALYSIS OF THE ECONOMIC IMPACT OF RESEARCH	Analyse the economic impact of CSIC activity. Know the economic impact of CSIC. Indicators of the economic impact of scientific research.	100%
Difunde	CSIC-INFORMA	Social visibility of the CSIC and its activities. Scientific information. Increase visibility of the CSIC in the media: 10% annually. Electronic CSIC newsletter. Annual increase of subscribers: 25 %. Hits: 100.000/year.	100%
	CSIC-DIVULGA	Scientific dissemination. Publicity materials and organization of events. Increase public visibility of the CSIC (10% year). Programming and coordination of global dissemination of the CSIC. Two types: materials and events.	65%
	ANALYSIS OF THE IMPACT OF DISSEMINATION ACTIVITIES.	Analysis of dissemination potential of the proposed activities. Understanding the impact of CSIC dissemination. Outreach impact indicators.	50%
AID	AID (R&D CONSULTANCY)	Expert R & D consultancy services to public and private entities. Improve response time to external demands for advice and consultation. Coordinate the different units providing expert advice. Create a database of scientific and technical knowledge of the CSIC. User satisfaction 75% over 4 years.	50%

Source: Management

APPROXIMATE SUCCESS RATE OF THE ACTIONS UNDER THE EXPERTS PILLAR OF THE OKRE STRATEGY

STRATEGIC AREA	ACTIONS	GOALS	APPROXIMATE SUCCESS RATE (0%-100%)
JAE Programmes	JAE-INTRO JAE-PRE JAE-DOC JAE-TEC JAE-TRANSFER JAE-SEGUIMIENTO	Encouraging scientific vocations. Training of skilled personnel. 75% satisfaction of beneficiaries (anonymous and external evaluation)	22%
DoCiencia	DOCIENCIA	Training professionals through courses and masters. External staff training through professional masters. 75% satisfaction of students (anonymous and external evaluation).	50%

Source: Management

3.4. Staff indicators and achievement

The Action Plan 2010-2013 indicators relating to staff comprise two different components. On the one hand, staff recruitment for the various areas and levels is pursuant to the Ministry, under the Law on Science, and since 2012 is subject to a maximum replacement rate for civil servants, 10% of retirements. On the other hand, hiring staff under the JAE programme is pursuant to internal CSIC management.

Declining RTD budgets have greatly affected the expected developments in new staff in all areas and at all levels. The number of new places to be created as forecast by the previous Action Plan within the Public Employment Offer during the 2010-

2013 period, at the levels of: research professors, scientific researchers and scientists was 43, 47 and 655 staff respectively. However, there were calls for only 83 places for scientists, representing only 11% of the projected number. Moreover, of the 1,250 posts projected for support staff, only 17 posts were created (1.4%) and of the 1,132 projected posts for administrative staff and information technologists, only 6 posts were created (0.5%).

The JAE programme was discontinued in 2012 due to its dependence on the CSIC's own funding and the Commitment Feasibility Plan for 2013-2015. Considering the relationship between contracts forecast and the actual contracts convened during the period for the JAE programme was approximately 22%.

RATE OF ACCOMPLISHMENT OF GOALS RELATED TO HUMAN RESOURCES DURING THE ACTION PLAN 2010-2013*

		2010	2011	2012	2013	2010-2012	% accomplishment
Scientific staff (civil servants)							
Tenured Scientists	Goal	130	150	175	200	655	12.67
	Achieved	26	30	22	5	83	
Scientific Researchers	Goal	10	12	15	20	57	-
	Achieved	-	-	-	-	-	
Research Professors	Goal	7	9	12	15	43	-
	Achieved	-	-	-	-	-	
Subtotal Scientific Staff	Goal	147	171	202	235	755	10.99
	Achieved	26	30	22	5	83	

Continue

RATE OF ACCOMPLISHMENT OF GOALS RELATED TO HUMAN RESOURCES DURING THE ACTION PLAN 2010-2013*

		2010	2011	2012	2013	2010-2012	% accomplishment
Scientific staff (Contracts JAE Programme)							
JAE-Doc	Goal	250	260	286	315	1,111	24.48
	Achieved	175	97	-	-	272	
JAE-Pre	Goal	250	260	286	315	1,111	37.26
	Achieved	260	154	-	-	414	
JAE-Tec	Goal	350	365	400	440	1,555	14.02
	Achieved	218	-	-	-	218	
JAE-Intro	Goal	350	350	350	350	1,400	17.86
	Achieved	150	100	-	-	250	
JAE-Transfer	Goal	20	20	20	20	80	25.00
	Achieved	20	-	-	-	20	
Subtotal JAE	Goal	1,220	1,255	1,342	1,440	5,257	22.33
	Achieved	823	351	-	-	1174	
Support and administrative staff							
Support staff	Goal	270	295	325	360	1,250	1.36
	Achieved	12	5	-	-	17	
Administrative staff and information technologists	Goal	239	266	300	327	1,132	0.53
	Achieved	2	4	-	-	6	
Subtotal Support and administrative staff	Goal	509	561	625	687	2,382	0.97
	Achieved	14	9	-	-	23	

*The figures for 2013 are not included as they are provisional

Sources: SGRH, VAACT, VATC

3.5. Achievement of scientific and technical goals

Scientific-technical production plays a central role in CSIC’s mission, whereby efficiency is monitored and measured by indicators. Therefore, the Action Plan 2010-2013 proposed a set of indicators for monitoring based on funding through competitive calls (R & D projects), as well as on the quantitative assessment of articles and book chapters (with assessment of quality), complete books, conferences, R & D agreements, patents (applications and licenses), spin- offs, theses, courses (total number of credits by students), events and outreach.

Since December 2010, scientific and technical production indicators are included within the guidelines and evaluations for the implementation of Productivity by Achievement of Goals (Productividad por Cumplimiento de Objetivos, PCO), the goals and measurement of achievements are managed via databases and corporate applications. The analysis of the completion of CSIC’s scientific- technical production has been limited to the three-year interval 2010-2012, since the values of the 2013 indicators are not yet definitive. Overall, the Research Groups met and exceeded the goals set, even though they were modified upward in many of the categories.

LEVEL OF ACHIEVEMENT OF GOALS OF SCIENTIFIC AND TECHNICAL PRODUCTION DURING THE ACTION PLAN 2010-2013*						
Item (source)		2010	2011	2012	Accumulated 2010-2012	Achievement 2010-2012 (%)
R+D Projects (M€) (PCO)	Goal	167.07	168.63	192.50	528.20	116.77
	Achieved	229.34	198.80	188.66	616.80	
Articles (conCiencia)	Goal	9,219	9,772	10,611	29,602	127.61
	Achieved	11,740	13,108	12,928	37,776	
Percentage Articles Q1 (PCO)	Goal	59,11	59,66	63,23	60,77	101.05
	Achieved	56,75	59,36	67,71	61,41	
Books (conCiencia)	Goal	259	248	257	764	118.58
	Achieved	295	355	256	906	
Congresses (conCiencia)	Goal	5,551	5,860	5,922	17,333	175.58
	Achieved	10,484	10,974	8,975	30,433	

Continue

LEVEL OF ACHIEVEMENT OF GOALS OF SCIENTIFIC AND TECHNICAL PRODUCTION DURING THE ACTION PLAN 2010-2013*

Item (source)		2010	2011	2012	Accumulated 2010-2012	Achievement 2010-2012 (%)
R+D Agreements (M€) (VATC)	Goal	39	42	45	126	150.79
	Achieved	75	65	50	190	
Patents applied for (VATC)	Goal	212	223	238	673	76.97
	Achieved	181	192	145	518	
Licensed patents (VATC)	Goal	54	75	63	192	97.92
	Achieved	36	78	74	188	
Spin-off (VATC)	Goal	15	12	16	43	58.13
	Achieved	5	9	11	25	
Thesis (conCiencia)	Goal	844	847	962	2.653	107.92
	Achieved	921	947	995	2.863	
Courses (hours) (PCO)	Goal	56,113	64,847	63,717	184,677	92.36
	Achieved	57,317	67,998	45,249	170,564	
Events (Nº) (conCiencia)	Goal	1,485	1,520	1,575	4,580	188.01
	Achieved	2,804	3,256	2,553	8,613	
Resources (Nº) (conCiencia)	Goal	783	805	831	2,419	173.13
	Achieved	1,288	1,508	1,392	4,188	

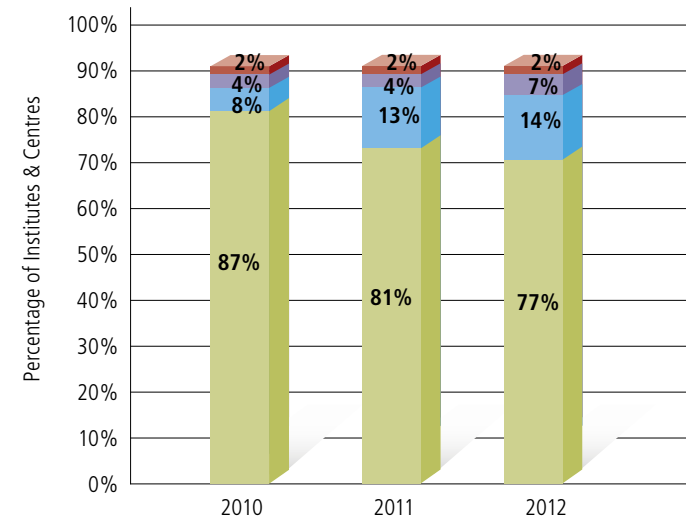
*Data from 2013 is not included as it is still provisional.

Source: conCiencia, Sistema PCO, VATC

Overall, the scientific and technological output rate of achievement was 122%. On the one hand, this success in the scientific-technical production emphasizes the existence of a time lag between investment in RTD and the generation of results, and on the other hand, it shows the tendency for Research Groups to adopt neutralization mechanisms and models to avoid a potential decrease in performance, as well as increased collaboration with other national and international groups.

Regarding achievement of goals by research institutes over the period 2010-2013, the number that achieved 100% of the targets set in the previous PA (using the PCO criteria) has gone from 87% in 2010 to 77% in 2012, which begins to reveal the effects the reduction in income and workforce.

The percentage of Institutes that have fulfilled goals set by the Action Plan 2010-2013 at a rate of 100%, 75%, 50% and 25% during the 2010-2012 period.



- 25% achievement
- 50% achievement
- 75% achievement
- 100% achievement

Source: Sistema PCO.

4 | SWOT analysis

This chapter outlines the main strengths and weaknesses of the CSIC State Agency and the external variables that put it at risk (threats) or which, if exploited, can favour the development of its activity (opportunities). The analysis of all these variables (SWOT analysis) allows the design of strategies that shape CSIC's Action Plan 2014-2017. The description of these variables could be extensive and detailed, so we have selected only those considered most relevant by the CSIC's Management Bodies and the Reflection Group (see 5.2). Some of these were already identified in previous analyses and remain valid, others have disappeared and new ones have been added. The table below shows the summary of all SWOT variables.

INTERNAL VARIABLES	EXTERNAL VARIABLES
<p>STRENGTHS</p> <ul style="list-style-type: none"> • Multidisciplinary. • Research on cutting-edge topics. • Highly qualified institutional staff. • Funding obtained through agreements with companies or via competitive calls. • Well established tradition of research personnel evaluation. • Wide territorial implementation connected with other agents of the State R & D system. • Properly equipped centres, institutes and special facilities. • International prestige and brand image. • Ability to train research and technical staff. • Leading institution in Scientific Culture activities. 	<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> • Reform of the General State Administration. • Changes in the Law on Science, Technology and Innovation. • The new national and international funding of science programmes based on their quality and their social and industrial benefits. • A generation of young people with high scientific training. • Globalizing the value of RTD activity. • Existence of internationally competitive business sectors involved in RTD activities. • Science and technology as driving forces for change of the current economic model.
<p>WEAKNESSES</p> <ul style="list-style-type: none"> • Inadequate internal organization and performance due to the qualitative and quantitative complexity and heterogeneity of the institution. • Research staff with insufficient administrative and management skills. • Loss of skilled human resources, aging workforce and chronic shortage of technical personnel. • Devalued Internal image. • Information and communication systems inadequate to the needs of modern management. • Poor assessment of transfer activities. • Internal coordination difficulties. 	<p>THREATS</p> <ul style="list-style-type: none"> • Reduction of public and private funds for RTD. • Insufficient organizational legal framework. • Goals focused on specific applications in the national and international RTD systems. • Nationwide increase in the number of highly competitive research centres, equipped with more agile and flexible management tools. • Increased competition over funds from the European Union. • New university career models. • Topic drift and dispersion of skills and efforts.

4.1. Strengths

Multidisciplinary. The CSIC researches and innovates in Social Sciences and Humanities, Life Sciences, and Physical Sciences and Engineering. At the CSIC these main scientific and technical topics are organized in eight areas, and the greatest innovation potential is where these topics overlap.

Research on cutting-edge topics. The CSIC research system is based on civil service but the need for self-finance determines the independence of research, the selection of cutting-edge topics and adjustment to funding sources.

Highly qualified institutional staff. CSIC's main asset is its staff. Research and technical staff at the CSIC have excellent qualifications and their scientific-technical level of production is higher than that of most researchers at other public research organizations and universities. It is also worth noting the professional competence of the personnel performing management tasks within the institution and their qualified experience in managing complex environments.

Funding obtained through agreements with companies or via competitive calls. Given the CSIC's is an up and running agency of science, its research staff finances its scientific and technical activities by funding through competitive calls and establishing agreements with companies, with revenues averaging 238 M € per year over the period 2009-2012, which represents 32% of the institution's total revenues.

Well established tradition of evaluation of research personnel. Scientific activity is continuously assessed by peers in an international competitive environment. This evaluation culture has become widespread in recent years.

Wide territorial implementation connected with other agents of the State R & D system. The CSIC is the only public research organization with a presence in almost all the Autonomous Communities, by means of both own and joint centres,

along with over a hundred associated units established with universities and other institutions. This makes the CSIC the entity that provides greatest cohesion to the scientific activity carried out in Spain and it plays an indisputable part in its articulation.

Properly equipped centres, institutes and special facilities. CSIC's large special facilities, some of which are considered ICTS (Unique Scientific and Technical facilities) by the Ministerio de Economía y Competitividad (Ministry of Economy and Competitiveness), are another of CSIC's major assets, providing a competitive advantage over other institutions committed to research. Moreover, in recent years special equipment has been renewed or acquired, therefore helping to maintain the competitiveness of these special centres.

International prestige and brand image. "CSIC" as a brand has established itself as a quality label and enjoys international prestige thanks to the work of its staff who are present in international expert consortia and committees and who are also involved in agreements and contracts with institutions and companies around the world. This is proved by CSIC's active and outstanding participation in specialized agencies and forums like Science Europe.

Ability to train research and technical staff. The CSIC's own training programmes or run in partnership with universities, make CSIC a quality a training centre, perceived as such both inside and outside Spain.

Leading institution in scientific culture activities. After a decade of enhancing outreach activities, the institution has a network of internal and external collaborations and a wide range of activities that bring science to society, as well as providing great visibility. What was a weakness ten years ago is now one of the institution's strengths.

4.2. Opportunities

Reform of the General State Administration. The ongoing reform of the central government in order to optimize and streamline performance provides or enables a set of measures that can strengthen CSIC's organization.

Changes in the Law on Science, Technology and Innovation. The new 14/2011 Law of Science, Technology and Innovation offers new guidelines for developing technical and scientific careers as well as frameworks for collaboration with public and private structures.

The new national and international funding of science programmes based on their quality and their social and industrial benefits. The definition of the European Research Area together with the Horizon 2020 programme will increase the resources devoted to research of excellence, industrial leadership and resolution of major social challenges. Moreover, the State Plan for Technical and Scientific Research and Innovation (Plan Estatal de Investigación Científica y Técnica y de Innovación), although endowed with a smaller budget, is an indisputable opportunity to obtain funding for the CSIC Research Groups and also has a similar focus to that of Horizon 2020. Both systems of funding for RTD enable prioritization of actions related to implementing results and generating tangible short-term benefits.

A generation of young people with high scientific training. Years of collective effort have resulted in a generation of young people with a comparable level to neighbouring countries, and remarkable entrepreneurship qualities.

Globalizing the value of RTD activity. The uneven impact of the market crisis has allowed Latin America and Asia to emerge as growth poles, generating and demanding knowledge. In Latin America, the CSIC is already a reference, and we must move from scientific cooperation towards the coordination of activities. In Asia, the link is weak, and requires a strategy to become closer and to define proposals for collaboration.

Existence of internationally competitive business sectors involved in RTD activities. The crisis has not so seriously affected those companies with a portfolio of high value added products, which are competitive on the global market. It is well-positioned companies in sectors such as agri-food, biomedicine, renewable energy, construction, automotive, aerospace, machine tools, etc., which have tradition in the development of RTD, either with their own means or in collaboration with universities and research centres. These represent a triple opportunity for CSIC: (i) patent exploitation, (ii) engagement in R & D projects and (iii) the possibility of collaborating in different calls, both nationally and internationally.

Science and technology as driving forces to change the current economic model. In society in general and for politicians in particular, there is the conviction that the economic model should be amended by incorporating criteria related to knowledge and technological development as one of the pillars of innovation. In this change, the CSIC must contribute with its leadership by acting as the core driver of concept trials.

4.3. Threats

Reduction of public and private funds for RTD. In addition to the structural budget, the CSIC's mission depends on fund raising by its research staff. The delayed implementation of the 14/2011 Law of Science, Technology and Innovation (Ley 14/2011 de la Ciencia, la Tecnología y la Innovación), the reduction of funds for financing research and aiding research staff training, the delayed grant announcements and resolutions, and the retraction of private investment in R TD, are all factors that contribute to destabilizing the institution's performance.

Insufficient organizational legal framework. The CSIC's current legal status is established in the Law of State Agencies (Ley de Agencias Estatales). Given the need to reorganize the agency's structure after more than five years from its incorporation and from the adoption of the Law of Science in 2011, it was decided to **renew the CSIC Statute** prior to the negotiation of the **Management Agreement**. However, after more than fifteen months from the submission of the first draft its approval is still pending. These are not new difficulties and may extend throughout what is left of the legislature. Stagnation in approving the **new Statute** prevents starting work leading to the Agreement, the maximum essence of which would be to **provide the CSIC with true modern management tools**. Maybe it's time to assess the opportunity to leave the Agency model, referred to with scepticism from various Ministries, and encourage the adoption of a specific law for the CSIC (such as in its creation in 1939) that would certify the CSIC with such entities in the international sphere and would provide a stable and lasting solution for the legal status of an entity with the scale and singularities of the CSIC, that amply exceeds the current scope of a State Agency.

Goals focused on specific applications in the national and international RTD systems. Although it is likely that R & D systems reorganize and their applications develop, the current economical situation may dictate priorities that enter into conflict with the traditionally long term basic research and exclude some applications.

Nationwide increase in the number of highly competitive research centres, equipped with more agile and flexible management tools. In recent years, research and technology centres have been established, many with substantial public funding, provided with more agile and flexible structures. As long as the CSIC is not provided with a similar legal concept, these centres, beneficial to Spanish RTD represent a threat to the CSIC because of their greater ability to manage resources and their staffing policies.

Increased competition over funds from the European Union. The increase in the number of countries eligible to participate in the Programme H2020 leads to increased competitive pressure.

New university career models. The construction of a European Area of Higher Education and the cost of higher education implied by this model, particularly by the masters programmes required to enter doctorate programmes, jeopardize the number of postgraduates who can afford to follow a research career, essential to secure the future of science.

Topic drift and dispersion of skills and efforts. The nature of the CSIC's research and the lack of funding to carry out its own scientific and technical strategies, prevents the development of science policy tools aimed at unifying topics and efforts in a coordinated way, which would positively impact on the institution and state R & D system.

4.4. Weaknesses

Inadequate internal organization and performance due to the institution's qualitative and quantitative complexity and heterogeneity. The CSIC, as part of the General State Administration (Administración General del Estado), follows certain operating protocols that limit its performance. Structural changes have been increasing the system's complexity additively although this has not affected its basic organization. Examples include: the mainstreaming of internal procedures, the excessive number of institutes with insufficiently professionalized governances and management units, lack of coordination between technical services as well as the sometimes confusing organization around the eight different topic areas by the centres.

Research staff with insufficient administrative and management skills. Research personnel at the CSIC are not familiar with many of the regulatory requirements of the Central Government or with their own institution's structure and procedures, and it is therefore necessary to implement the means to overcome this lack, to significantly improve its management.

Loss of skilled human resources, aging workforce and chronic shortage of technical personnel. The cutbacks have caused the suspension of the JAE Programme (Board for Extension of Studies Programme) which allowed the training of research staff, introducing them into a scientific career, the training of laboratory technicians and technology related activities, as well as training in scientific management, communication science and public-private partnerships. Low rates of retired staff replacement, coupled with the limited Public Employment Offer, have resulted in an aging workforce.

Devalued internal image. There is a general feeling that the functioning of the institution needs to be improved. This dissatisfaction, regardless of intrinsically goal-related reasons, is in part due a lack of proper understanding of the structure and performance protocols which, together with a marked individualism, cause a distance between research and management, which are then perceived as opposites when they should be complementary. On the other hand, the weakness of the internal information systems also contributes to this dissatisfaction.

Information and communication systems inadequate to meet the needs of modern management. Although the structure of computer systems, databases and institutional applications have improved, information management structures proper to entities that must function in a global and interconnected context are still unavailable.

Poor assessment of transfer activities. Although the many facets of technology transfer activities have improved in recent years, it is still treated as secondary within the research process. Moreover, those who carry out this task believe that a greater institutional support and greater internal assessment are needed to carry on completing it. Adding to this situation is the failed attempt to launch the company K2B, an alternative to the current model seeking to improve communication with the productive sector.

Internal coordination difficulties. The complexity of modern scientific management in a global context, research funding originating from a diversity of sources, interaction with a multitude of highly diverse entities, a diversity of mixed centres, and the CSIC's geographical dispersion in autonomous communities with different RTD policies and planning, have led to a management system based on highly specialized units that often operate in a compartmentalized way, developing incompatible tools and working protocols without proper cross channel communication.

5 | Strategic planning for 2014-2017

5.1. Main strategic goals for 2014-2017

In 2013 and in accordance with its Statute, CSIC had the opportunity, through its Action Plan, to reflect and to propose the strategies that will govern its activity throughout the 2014-2017 period, therefore allowing the anticipation of change and the strengthening of its scientific and technological leadership.

SWOT analysis allows us to identify the strategic goals that must be addressed through specific actions and programmes.

CSIC's five main goals in this Action Plan are to:

- Strengthen its structure, renew its internal organization and adapt the operating protocols.
- Address social challenges by maintaining and improving the level of scientific production and quality in research.
- Increase engagement with the public-private commitment, contributing to industrial leadership.
- Promote synergies and alliances with other national and international institutions.
- Promote scientific and technological culture and prepare new generations of scientists and technologists.

5.2. Developing the Action Plan

The Action Plan presented here describes the CSIC as a whole, including global strategies and disciplines established by their respective Area Action Plans (Annexes I-VIII). All the CSIC members have been involved in its development. Groups, Institutes, Scientific-Technical Areas and the CSIC's Central Organization Management Organs have produced and coordinated their own analysis and made proposals:

- The development process began in September 2012, with the design and corporate development of an essential tool to identify and define the reality in the CSIC: the Groups Application (AG) (Annex IX).
- In a second step, the Research Groups have contributed by specifying their specialization features, their activity, their ability to attract competitive funds and their scientific and technological goals.
- Then the Institutes detailed their strengths and weaknesses and proposed strategic actions that have been endorsed in their respective Staff meetings.
- The Centres and Institutes Action Plans have been completed using a institutional application, the Application Institute Action Plan) (APA-I) (Annex IX).
- Through their coordinators and committees, the different Areas have joined the Area Action Plans, which have been discussed and agreed in meetings with the people in Management.

- In parallel, the various units in the Central Organization have proposed their own Action Plans that include a collection of actions that constitute the basis of the Strategic Programmes.

Many of these ideas were also analyzed and collected during the months of May-July 2013 in a series of meetings led by the CSIC Steering Committee and the Coordinators of Scientific and Technical Information together with the Institutional Coordinators, held in different Spanish geographic locations, in order to analyze the situation of the institutional relations and the institutes, both from the point of view of their situation and scientific capacity, as well as from the connections and collaborations with the productive sector. Furthermore, they have benefited from the contributions of many experts, who with the creation of a Reflection Group have contributed their views on the CSIC's position.

Although this document cannot reflect verbatim the hundreds of pages of the Action Plans raised and discussed by groups, institutes, horizontal Areas and units of the central organization, it does include its main contributions. The Action Plan also incorporates the recommendations of the Scientific Advisory Committee and the Steering Committee.

The following are the most recent incorporations to the previous Action Plan 2010-2013:

- The Research Group will be the basic unit of the Institute.
- The scientific and technical service will be its functional and instrumental support unit.
- Evaluation and monitoring of groups, services and institutes will be performed during the development of the Action Plan (see Annex IX).
- The proposed goals and their achievement is decoupled from the pre-allocation of funds.

5.3. Strategic Goals and Programmes

Achieving Strategic Goals involves deploying different Strategic Action Programmes throughout the period 2014-2017, which are described below. The corresponding Actions for each goal are detailed in Annex X, specifying the responsible Steering Boards and the main monitoring and/or achievement indicators for each of these Actions.

GOAL 1: To strengthen CSIC's structure, renew and adapt the internal organization and operating protocols.

The State Agency structure was applied to the CSIC in order to provide it with the right conditions to compete with the major centres generating knowledge and science in the world. However, this structure is incomplete because it has failed to incorporate essential aspects such as the Management Agreement. Although embarking on a thorough restructuring in the current economic climate is unadvisable, it is appropriate to begin internal changes that will dictate the course of a regeneration process, which could even include alternative structure proposals based on "ad hoc" policies.

Regardless of its legal status, the CSIC must design a new organizational model to attain the required efficiency and agility. This requires analyzing, questioning and optimizing the number of institutes, their sizes and their management. Similarly, Areas and Delegations should be redefined, increasing their scientific and technological content and strengthen its expert advisory role. The Central Organization and its Units must incorporate simple streamlined operation and coordination protocols that ease their activity processes and improve communication among themselves and the institutes. The administrative and scientific management must incorporate software tools with continuous updates.

This Strategic Goal includes the following Strategic Programme actions:

- **P1.1 : Definition and implementation of a new organizational model.**

To find the right legal framework that ensures the institution's sustainability, preserving and increasing the quality levels, allowing the adaptation and use of the new research framework established by the Law of Science (Ley de la Ciencia) and thus rendering it more efficient. This framework should be strengthened by a Human Resources Plan, the proportionality of which should be dictated by the volume and complexity of the tasks, as well as a Management Agreement or suitable equivalent.

- **P1.2: Definition and implementation of a new model of Scientific and Technical areas.**

To develop a reorganization plan for scientific and technical areas, defining their powers and contents, and promoting their role in the institution's science policy.

- **P1.3: Definition and implementation of a new model of institutional delegations.**

Developing a plan to redefine Institutional Delegations, defining their powers and their contents and promoting their role in the institution's science policy.

- **P1.4: Reordering centres, institutes and units.**

To reorder centres and institutes in order to maximize their stability, minimize their brittleness and improve their capabilities. To do this, the current situation will be studied and an assessment report will be produced, along with a reorganization draft and a science project, which will ultimately be implemented. Optimization of group capability will also be considered through the creation of virtual centres. To perform this action, a study will be made on the reconversion of management units, as well as the centralization

of some services and acquisitions, which benefit from scale economies. Training will also be organized for administrative and management staff, addressing issues required by their respective tasks.

- **P1.5: The CSIC Commitment Feasibility Plan**

To continue the Commitment Feasibility Plan 2013-2015, approved in late 2012 by the Steering Committee. This Plan includes a series of measures to cut down on expenditures, to increase revenues and structural reforms, aiming to optimize the Agency's performance and show CSIC's commitment with its own viability in the context of the country's economic and budgetary situation. This commitment, in its internal dimension, requires a control system to established making it impossible for the CSIC (or anyone on its behalf) to embark upon financial commitments without having a relevant economic and financial technical report beforehand.

- **P1.6: Implementation of the Integrated Financial Management System (Sistema Integrado de Gestión Económica) and adaptation and standardization of CSIC's financial information systems.**

This action will improve the internal economic management by facilitating dialogue between the various external control organs by: (i) implementation of activity sheets in which competencies are identified, (ii) development of project files, (iii) the implementation of SOROLLA 2 system, in collaboration with IGAE, leading a joint project for all Public Research Institutions, and (iv) the adaptation and implementation of IGAE's cost accounting system (CANOE) at the CSIC.

- **P1.7: Review and renegotiate prices for services, acquisitions and construction.**

Structural operating costs will be reduced by CSIC's downward revision of prices of service, equipment purchase and construction agreements, adapting to the current economic climate.

- **P1.8: Plan for ICT Infrastructure at the CSIC.**

As part from this action, CSIC's ICT planning will be designed and the current CSIC Information Systems Plan will be updated. As for infrastructure improvements, it is planned to create a corporate data processing centre (DPC) for CSIC's management systems and scientific calculation, together with the creation of an external storage infrastructure with the data and infrastructure of corporate services, the creation CSIC's corporate Data Centre, the development of the ICT Security Plan for CSIC and the upgrading of the Communications equipment.

- **P1.9: Simplification, reduction and computerization of administrative processes.**

This action is aimed at simplifying administrative procedures and expediting transactions (staff requests, hiring staff, agreements, contracts, etc.) by means of using databases and corporate applications. Similarly, better coordination and communication with the users of different services will be strengthened.

GOAL 2: Maintain and improve the level of scientific production and quality research to address societal challenges.

The main specific management problem today at the CSIC is related to its staff. Currently it has a stable workforce of almost 3,000 tenured research civil servants (the basic entrance scale with 1,410 associated Scientists; and on the higher scale with 845 research scientists, and 719 research Professors). Being government employees, their income is subject to the limitations of the Public Employment Offer, and only allows a 10% replacement rate.

This limitation substantially impairs CSIC's productivity and competitiveness, because it means the average age of researchers exceeds 53 years of age, and also because pensions cause annual staff loss of nearly 50 researchers (besides the loss of laboratory technicians for the same reasons).

In the light of the Law of Science (and in conjunction with the Management Agreement) an option would be to design a "tenure track" model (the same as in the scientific research bodies in other countries) to incorporate recruitment (meeting the inexcusable requirements of equality, merit, ability and publicity) for five year periods, with scientific assessments both at midterm and at the completion, which could lead to their eligibility as civil servants or as means of obtaining a permanent employment contract, for internal promotion, once the third period has been successfully passed. Obviously, not passing an assessment would result in termination of the contract.

The definition, implementation and management of these professional careers will be managed through the already existing Staff Recruitment Unit which is coordinated together with the Assistant Secretary for Human Resources .This unit must ensure the guidelines for Gender Equality and the fulfilment of the Social Action Plan.

In addition to workforce-related problems, equipment and facilities related to the operation of the scientific-technical services, as well as support units or the special scientific and technical facilities, also begin to show difficulties relating to maintenance and obsolescence, due to reduced investment. As with the Research Groups, the implementation of a Scientific-Technical Services Application will redirect this situation and develop a catalogue of technical services, define and standardize costs, establish common operational protocols, virtual service networks, and identify the parameters that govern the renewal and location of equipment (scientific impact, number of users, maintenance costs).

The Library Networks will adapt to the new digital paradigm, joining the open access strategy (OPEN ACCESS), and promote the management and dissemination of CSIC's historical and archival heritage. The CSIC Editorial should continue its line of progression aimed at achieving greater visibility and internationalization, positioning itself as a prestige brand.

As an executive research organism, the CSIC's activity depends on the ability to raise funds through competitive calls, a process which should be facilitated. The consolidation of a Comprehensive Research Project Management Unit to provide support for the whole process, from project application to final justification, is essential to promote this basic activity.

Within this Strategic Goal the following Actions are considered:

- **P2.1: Unit Analysis, Monitoring and Forecasting of Scientific - Technical Activity.**

Consolidation of the unit responsible for the maintenance and updating of the databases and institutional applications, issuance of institutional analysis reports, monitoring the achievement of goals (PCO), the designing and implementation of methodologies and assessment systems for institutes, groups and services, and the processes associated with the drafting, monitoring and evaluation of the Action Plan.

- **P2.2: Design and Application of the Scientific and Technical Professional Career model adapted to the Law on Science and to institutional capacities and needs.**

Promoting the definition and implementation of the professional scientific and technical career pursuant to the Law on Science, this project will be managed through the existing Staff Recruitment Unit, which works in coordination with the Assistant Secretary for Human Resources.

- **P2.3: Comprehensive Research Project Management Unit.**

Consolidation and implementation of the Unit launched in 2013, covering all the stages of competitive calls, providing support from dissemination and submission of applications, monitoring and project justifications. This Unit will be responsible for defining the needs, integrating the existing procedures in the field and improving on-line communication with the various funding agencies. This Unit will also be responsible for the training of project management in advanced scientific and technical Projects, which will increase the expertise and qualifications of personnel involved in the various administrative stages of projects and in the management of the necessary computer tools.

- **P2.4: Strengthening support for Experts and Consultants.**

To strengthen the visibility of the advisory tasks performed by CSIC and the role of experts in national and international committees and forums, the Coordinators Support Unit (Unidad de Apoyo a Coordinadores) will incorporate the appropriate means for managing and developing both functions.

- **P2.5: Plan to optimize the scientific-technical services in centres, institutes and unique scientific and technical facilities.**

To develop and implement an institutional application that allows for the mapping of scientific- technical services, in addition to its instrumental equipment and performance management so as to achieve a greater efficiency and establish priorities.

- **P2.6: Plan for services of scientific information and bibliographic historical - archival heritage.**

This project includes the development of scientific information services that allow the scientific community to access the library archives (in some cases over-subscribed) as well as regular CSIC Editorial publications in digital format and collections managed by the Library Networks (Red de Bibliotecas). This includes the reorganization of the Library Network service points into a simpler structure according to the digital paradigm, boosting the DIGITAL.CSIC platform and the Open Access policies.

GOAL 3. Increasing public-private commitment to contribute to industrial leadership.

The transfer of knowledge and technology is the fundamental tool for the support and creation of a sustainable and competitive industrial network with continuous innovation. Despite improvements in recent years, this activity is far from achieving the levels expected by an institution of its size and proven quality, which should be ranking as one of Spain's drivers of innovation. Therefore, the CSIC must develop policies that increase researchers' involvement, encourage communication with the private sector and reach emerging markets. In this section, the Foundation called Fundación General CSIC should play an important role in providing complementary actions and support. The actions proposed to achieve this Strategic Goal are:

- **P3.1: Promotion of public-private collaboration and technology transfer.**

This project aims to enhance awareness of technology transfer, publicizing procedures for technology transfer such as the protection of research results, patent management, technology promotion, licensing of exploitation rights and collaboration contracts between the CSIC and companies.

- **P3.2: Improved procedure for application, promotion and exploitation of patents.**

This project aims to improve the technical quality of patent applications, including a previous study of patentability and commercial opportunity. The costs associated with the drafting and submission of patents will decrease, and the management of submitted and internationalized patents will be optimized, tracking and selecting a technology patent portfolio based on its market value. CSIC patents will be actively promoted, participating in international technology fairs, in order to increase the number of patents out-licensed to the productive sector, besides their exploitation. Alternatively, outsourcing all or part of some of the processes involved in the

management and marketing of patents, will be studied in order to achieve greater efficiency. Another object which is part of this action is to obtain ISO 9001-2008 certification by the Unidad de Protección de Resultados (Results Protection Unit).

- **P3.3: Improving contract management and support of entrepreneurs.**

This project aims to improve the management of research contracts, technology support and other types of contracts between CSIC and public and private, national and international companies. In addition, tools will be generated from CSIC's research results to support the creation of Technology Based Companies (TBCs or Spin off), advising entrepreneurs and negotiating frameworks for collaboration between CSIC and the TBCs created.

- **P3.4: Coordination Unit for economic and legal aspects of contracts.**

In coordination with the General Secretary, this Unit will establish efficient procedures in economic management and legal advice of transfer associated activities. The operation includes: (i) The establishment of a protocol that improves the payments associated to agreements on transfers, (ii) Legal review of R & D contracts, technical support contracts, material transfer agreements (MTA), confidentiality agreements, international conventions and framework agreements, (iii) Provide legal and economic support in the creation of new technology-based companies, and (iv) Updating economic data of CSIC's industrial and intellectual property into the corporate database.

GOAL 4. Promote synergies and alliances with other national and international institutions.

The growth experienced by CSIC until recently, has incorporated collaboration as a basic working tool, generating a large number of agreements and memorandums of understanding with both external and internal stakeholders, requiring dynamic management and continuous reviews. Among these, the associated units represent an instrument of scientific collaboration and coordination with one or more public or private institutions, with little economic cost, enhancing the CSIC's capabilities and emphasizing its structural role.

At present, strategies should focus on facilitating participation in the European Union's H2020 Framework Programme, promoting the institution's incorporation in international consortia and boosting cooperative activities in regions that are configured as global poles of economic, technologic and scientific development, also including the goal of promoting their own private financing, through sponsorship and a more active enterprise participation.

The set of actions included in this goal are to:

- **P4.1: Build up partnerships and strengthen synergies.**

This action aims at strengthening and consolidating CSIC's role as the national science and technology system institution. The action will take place during the Plan's entire duration and will include an assessment of the situation, drafting an external organizations participation roadmap (universities, hospitals, etc.), and the criteria for such collaborations.

- **P4.2: Improving the management of Associated Units.**

Associated Units are cooperation and coordination instruments for research activity implementation, with one or more public or private institutions, with little economic cost, enhancing the CSIC's potential. This project aims to optimize the capacity and production of these units.

- **P4.3: Internationalization of the CSIC.**

The goal is to promote and strengthen bilateral relations with foreign strategic scientific institutions, defining new ways of collaboration and scientific cooperation, and sponsorship. Scientific cooperation with Latin America will be considered strategic, as also with the south Mediterranean arc and emerging Asian countries, not forgetting to consolidate our relations with our closest European counterparts as well as institutions from U.S. and Canada. The CSIC's presence will consolidate and increase in international centres such as the CMRST (Mediterranean Centre for Scientific Research and Technology) or the LINCGlobal (International Laboratory for Global Change).

GOAL 5. To promote scientific culture and prepare new generations of scientists and technologists.

Social awareness on the value of science and training of qualified professionals is the foundation to build and consolidate a society based on knowledge and its application. This process is a long journey and requires sustained effort over time.

The CSIC staff is committed to training new generations of scientists and technologists, by getting involved in teaching degrees and master's degrees, by directing final projects in degrees, masters' and doctoral thesis, as well as by training technicians in the support tasks that accompany their research.

Moreover, the CSIC has pioneered a network designed for the promotion of scientific culture, besides a communication plan based on traditional and new media such as social networks, and enhanced their image through participation in numerous events.

To achieve this goal the following actions are proposed:

- **P5.1: Specialized Teaching and scientific training.**

This action aims at adapting the teaching and training activities to the new legal framework of the Laws of Science and Higher Education, promoting CSIC's presence in National and European Doctorate Schools. CSIC- UIMP masters' will be promoted by incorporating corporate sponsorship and international collaboration, both with the teaching board and the students, together with the development of online educational platforms.

- **P5.2: Training in laboratory management and scientific and technical services.**

With the aim of increasing the expertise and qualifications of personnel involved in the various experimental techniques necessary for conducting research projects. Also courses and paid work practice periods of up to two years under the Youth Employment Programme of the European Social Fund are envisaged.

- **P5.3: Training in R & D Proposals.**

In order to facilitate participation and increase funding from international calls (ERC, NIH, HFSP, etc), workshops will be conducted to improve the drafting and submission of R & D proposals.

- **P5.4: Science and Technology Culture and Outreach.**

To bring CSIC's scientific and technological activities closer to the lay public through the promotion of exhibitions, lectures, special seminars, and participation in social networks. This project aims to promote the understanding and participation of society in scientific progress, encourage children to consider scientific vocations, and finally increasing the CSIC's visibility in society through various channels adapted to the audience for which they are intended, using a large variety of formats and media.

6 | Scientific-technical indicators and funding for 2014-2017

6.1. Indicators and possible scenarios

The set of strategies and actions described in the previous section are a summary of the CSIC's initiatives to be implemented to improve organization and functioning, maintain and enhance its scientific potential and increase interaction with other players forming the Science-Technology-Society system.

Annex X defines a set of "micro-indicators" listed in the Strategic Actions described in the previous section. These indicators will be used to monitor the fulfilment/success rates of the CSIC's main goals and targets during 2014-2017. Furthermore, the Action Plan provides for the definition of a set of "macro-indicators" to be analyzed annually and thus reflect the achievement/success of the Agency's Mission. This Action Plan will use similar indicators to those used in the previous Action Plan, with some novelties, in order to maintain historical indicators that enable us to correlate the implementation of strategies and assess improvements in the achievement of the CSIC's Mission and optimize future planning.

The production indicators and trends in CSIC staff were assessed taking into account two different scenarios. The first scenario, called **Scenario A** or **minimum scenario**, represents a recessive economy scenario with highly limited public and private spending on RTD. The second, **Scenario B, represents a more dynamic situation of economic recovery** in 2016 and 2017, resulting in increased revenue from various public calls and industrial contracts, and the slow and cautious recovery of internal recruitment programmes. Since both predictions involve risk, different indicators will be reset through annual monitoring of trends in the real economic scenario.

Moreover, indicators of science and technological production and funding acquisitions forecast by the CSIC Centres and Institutes in their Action Plans will be revised in assessments made by the same Centres and Institutes in 2014 and 2016.

6.2. Estimated income from competitive calls and tenders 2014-2017 (external income)

The following table reflects the estimated revenue for the 2014-2017 period from participation in research projects through competitive calls (State Plan for Scientific and Technical Research and Innovation, plans run by other funding agencies, both national and the Autonomous Regions, H2020 Framework Programme and other international programmes) and obtained through contracts (R & D), technology support, services and patent licensing. For each year a range of minimum and maximum values corresponding to the abovementioned scenarios A and B are defined, reflecting the uncertainty in the estimation of each indicator.

Despite the expected decline in workforce, mainly contracted research staff, it is expected that economic resources from the various national calls will remain constant,

due to the increase in funding allotted to R & D during 2014 -2017. It is considered that the weight of the proceeds from the calls of the Spanish Autonomous Regions will decrease relative to the total income. Funding from the H2020 Programme will gradually increase throughout 2014 -2017, reaching close to those average values achieved in the 2009-2012 period. With respect to companies contracting services and projects, an upturn in economic activity is expected thus allowing levels of contract R & D to recover with the consequent search for solutions to technological problems. This upturn is expected to take place before substantial increases are observed in public funds allotted to the promotion of R & D.

ESTIMATED FUNDING TO BE OBTAINED THROUGH COMPETITIVE PROJECTS AND RTD CONTRACTS (M €)*

ORIGIN	2009	2010	2011	2012	Accumulated 2009-12	2014	2015	2016	2017	Accumulated 2014-17
Calls under the State Plan	97	191	124	50	462	78 - 85	78 - 85	84 - 90	84 - 90	324 - 369
Autonomous Region Calls	34	32	17	14	97	11 - 14	11 - 14	11 - 14	11 - 14	46 - 58
EU Calls & other International Programmes	34	35	44	51	164	30 - 35	35 - 40	44 - 50	55 - 60	165 - 185
RTD and technological support contracts and tenders	74	50	45	36	205	30 - 35	40 - 45	50 - 55	54 - 60	174 - 195
Total competitive income	239	308	230	151	928	149 - 169	164 - 184	180 - 209	204 - 224	709 - 807

* The figures corresponding to 2013 are not included as they are provisional

The source of income with greatest growth capacity is the one corresponding to the EU calls, whose H2020 programme will start in 2014. Under H2020 there is a 37 % increase in the volume of economic resources, with respect to the Seventh Framework Programme.

However, the loss of research staff (stoppage of JAE programme, retirement of researchers and a limited Public Employment Offer) hinders the possibility of presenting projects.

6.3. Fund allocations for the Action Plan

Estimates of external earnings along with forecasts for funding from the Ministry of Science and Innovation and other sources, can be used to determine trends in the economic resources available to undertake Strategic Actions. It is estimated that the cost of implementing all the strategic measures outlined in the Action Plan will be about 80 M € for the period 2014-17. Actions relating to the construction or remodelling of installations and facilities, some of which were frozen in the last 2-3 years due to the difficult economic scenario, will be implemented gradually, to the extent that there are available economic resources and they fall within the programmed and strategic lines outlined by the Action Plan. In the deployment of the Action Plan, those Actions requiring the greatest amount of funding are those that correspond to the recommencement of expert training programmes or recruitment, and those related to the reform and refurbishment of structures and buildings. The deployment of these Actions requires thorough prior economic analysis in order to avoid the Agency from falling back into an unaffordable deficit.

In any event, the economic resources available for the implementation of the various Strategic Actions shall be established annually based on budget availability and reflected in the Annual Action Plans.

Moreover, the possible economic adjustments throughout this period may, at least partially, be applied to recovering funding capacity available to institutes, using factors such as the historical trends in these capacities, and considering the institutes' objectives and assessment thereof in accordance with the Action Plan.

6.4. Estimated trends in the workforce

Staff indicators describe the trends in new positions to be convened by the Public Employment Offer. The following table shows the expected number of positions for the period 2014-2017. This proposal implies a high staff replacement rate, which may help to overcome the decline in the workforce, ongoing since 2010. The total number of positions for tenured scientists considered will enable the stabilization of 15-20% of doctors trained at the CSIC. However, this provision for number of positions will not enable the CSIC to maintain the size of its workforce, nor lower the average age of workers. The latter would require twice the number forecast.

ESTIMATED POSTS UNDER PUBLIC EMPLOYMENT OFFER FOR 2014-2017

(A range of values corresponding to the different scenarios considered is given for the annual value of each scale)

SCALE	2014	2015	2016	2017	Accumulated 2014 - 2017
Research staff (Public Employment Offer)					
Research Scientist (Open Access)	25 - 30	35 - 40	40 - 45	45 - 50	145 - 165
Research Scientist (Internal Promotion)	20 - 25	20 - 25	20 - 25	20 - 25	80 - 100
Research Professor (Internal Promotion)	15 - 20	15 - 20	15 - 20	15 - 20	60 - 80
Research Support Technical Staff (Public Employment Offer, open access)					
Superior Specialized Technicians Public Research Institutions	10 - 15	15 - 20	15 - 10	15 - 20	55 - 75
Specialized Technicians Public Research Institutions	15 - 20	20 - 25	20 - 25	20 - 25	75 - 95
Research Assistants Public Research Institutions	20 - 25	25 - 30	25 - 30	25 - 30	95 - 115
Administrative Staff (Public Employment Offer, open access)					
Total Administrative Staff	8 - 10	9 - 11	10 - 12	11 - 13	38 - 46

The restoration of the JAE programme or implementation of recruitment programmes with similar characteristics are precluded by the limitations set by the CSIC Commitment Feasibility Plan extending to 2015, which excludes this type of internal programme until then. As of 2015, according to the two

possible scenarios, some recruitment programmes may be implemented aimed at alleviating the reduction in personnel in certain lines of strategic research or support units that are key to promoting activities of CSIC groups within H2020 or transfer programmes. The following table lists the corresponding forecast:

ESTIMATED RECRUITMENT FOR 2014-2017					
(For the annual value of each contract type a range of values is given for the different scenarios considered)					
	2014	2015	2016	2017	Total
Research staff (contracted through internal programmes or partial restoration of JAE Programmes)					
Postdoctoral contracts(equivalent to JAE-Doc Programmes)	-	-	25 - 50	35 - 60	60 - 110
Predocctoral contracts (equivalent to JAE-Pre Programmes)	-	-	50 -100	75 - 125	125 - 225
Research staff in training					
Introduction to Research grants (equivalent to JAE-Intro Programme)	-	-	50 - 100	75 - 125	125 - 225
Technical staff (contracted through internal programmes or partial restoration of JAE Programme)					
Technical laboratory staff contracts (equivalent to contracts under the JAE-Tec Programme)	-	-	50 - 100	75 -125	125 - 225
Contracts for technical staff in technology transfer (equivalent to JAE-Transfer contracts)	-	-	5 - 10	8 - 15	13 - 25

Given the different projections presented, the following table shows trends in the CSIC tenured research staff and contracted doctorate staff. Regarding civil service research staff, the scenarios show a mild but steady decline in the number of staff in this category. Another consequence of this decline in workforce is the increasing average age of the workforce, which may vary between 1 and 2 years at the end of the period 2014-2017. Regarding contracted PhD-holders through programmes run by the Ministry of Economy and Competitiveness or the Autonomous Regions, research projects or contracts, it is estimated that the number will drop

to 675-800 staff. These figures are close to the number of doctors employed in 2005-2007, during which the CSIC had similar budgets to those estimated for 2014-2017. However, the real trends in these figures are difficult to assess because the implementation of European and national programmes for training and employment may change these forecasts upward. Furthermore, the revival of RTD investments by companies or increased funding from European projects may stop this downward trend in recruitment through internal programmes.

TRENDS IN TENURED RESEARCH STAFF AND CONTRACTED PhD HOLDERS AT THE CSIC. (For the 2014-2017 annual value, a range of values is given corresponding to the different scenarios considered)												
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
CSIC tenured research staff	2,551	2,765	3,015	3,182	3,158	3,118	3,056	3,031	3,011 -3,016	3,001 - 3,011	2,993 -3,008	2,976 - 2,996
PhD-holders contacted by CSIC	794	953	1,002	1,080	1,205	1,149	1,027	920	825 - 850	750 - 800	700 - 800	675 - 800
TOTAL PhD RESEARCH STAFF (Tenured and contracted)	3,345	3,718	4,017	4,262	4,363	4,267	4,083	3,951	3,836 -3,866	3,751 - 3,811	3,693 - 3,808	3,651 - 3,796

Likewise, the Ministry's initiative to launch a recruitment initiative similar to the "tenure track", as enabled by the current Law on Science for the professional

scientific career, will represent an increase in human resources, which should help improve the expected results achieved by the CSIC.

6.5. Indicators of scientific and technological production

The CSIC's scientific-technical production reflects the Institution's ability to meet its goal of generating knowledge relevant to scientific progress and which can enhance society. This production will be measured through a series of indicators, standardized worldwide, reflecting the contribution of the Research Groups ascribed to the different Centres and Institutes. The indicators are organized within five topics:

- Scientific production
- Securing competitive resources
- Technology transfer
- Educational activities
- Outreach

Most of the production indicators have been estimated taking into account the expected trends in the CSIC's workforce during 2014-2017, as well as keeping the average production per researcher at similar levels to those obtained in 2010-2012. However, there is significant uncertainty regarding these indicators because they must take into account factors that are difficult to quantify, such as the decrease in the number of younger scientific staff, who represent a significant driving force, and the increasing average age of the permanent CSIC staff. Other complex factors involve the CSIC staff's general malaise due to the uncertain future of science and technology in Spain, declining scientific vocations, difficult student access to Master's and Doctoral programmes, added to the fact that topic areas pursued by some CSIC

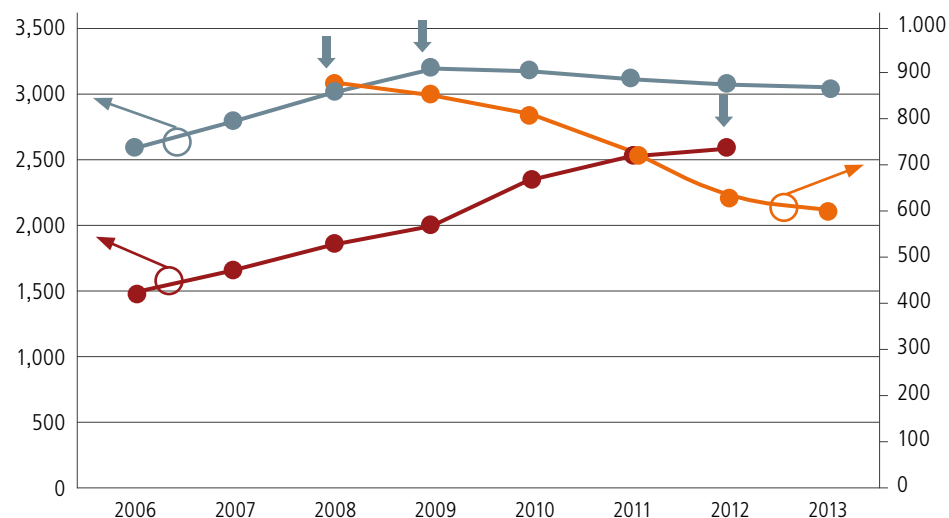
Research Groups do not qualify for the H2020 Programme. All this means that each indicator is accompanied by a range of values defined by a minimum value (Scenario A) and maximum value (Scenario B), which varies between +/- 6 % of the estimated value.

The figure below specifies the last few years, with the shaded green area showing the CSIC's income budget comprising ministerial funds and competitive revenues (National Plan, Autonomous Region projects, European projects and industrial contracts). The maximum value (indicated by a black arrow) corresponds to 2008. The number of people in the research workforce is shown in blue, which begins to decline after peaking in 2009. Finally, the number of publications is shaded in brown (ranked by a factor 1/5 for the whole period in order to show the three curves on the same graph), with a steady upward trend throughout the analyzed period, albeit with a reduction in the growth rate over the last 2-3 years. The maximum output was most likely reached in 2012, as on November 1, 2013 the number of publications for that year reached 8,025.

Consequently, and in view of the fact that data from 2013 are not definitive, we can roughly identify the time lapse which variations in the income budget and research staff numbers have had on the CSIC's results: the downturn in budgets occurred between 2008-2009, and due to these cutbacks and reductionist policies at the EPO, a decline in the workforce began a year later (between 2009 and 2010), while negative effects on production became noticeable three years later, between 2012 and 2013. That is, the continuous reduction on income budget and decline in workforce implies a lack of staff which certainly affects the number of publications.

Therefore we can expect a further decline in scientific production from 2013 onwards, evaluated in terms of consolidated publication figures produced by the decrease in revenue and downsizing. This is noticeable in other indicators of production such as patents, contracts and own competitively-secured income, although modulated by the variables affecting each of these indicators most (new framework programme with more funding, reduced funding under the National Plan, dynamics of economic recovery, etc.).

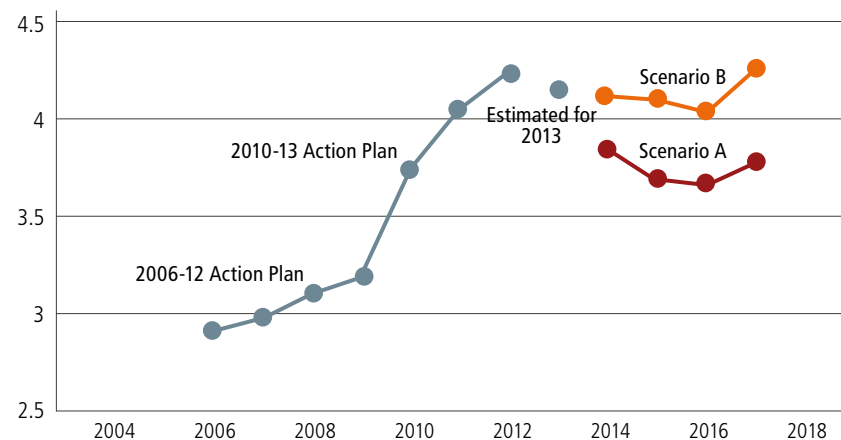
This makes it virtually impossible to provide realistic figures for the indicators, beyond reflecting the effects of any increase or decrease compared to previous figures, and also the time-lapse or delayed effect we have mentioned above regarding publications indicators.



- CSIC workforce
- Publications/5
- Competitive & Ministerial Income

For the same indicator, and a production estimate around 12,000 publications in 2013 (which may have a non-negligible error), we forecast publications per researcher on the staff for Scenarios A and B considered here, reflected in the graph below. It shows a maximum of 4.2 publications per researcher in 2012, a drop (estimated) to 4.17 publications per researcher in 2013, and an even lower forecast for 2014 to 2017, decreasing over time, for both Scenarios A and B.

Publications/staff ratio



This explains the slight decrease in indicators for scientific and technical production expected during the period 2014-2017 compared to the values obtained during 2010-2013. This trend reflects the decline in workforce and funding that the CSIC has been experiencing for some time. Although the economic situation is improving, it will most likely take until 2016 and 2017 to become noticeable, and the effect

of the funds received will begin to perceptible as of 2018, during the next Action Plan. As for the indicators that determine the quality of production, it is foreseeable that they will increase slightly during 2014-2017. Similarly, indicators related to patent application and out-licensing have been calculated to grow slightly due to the improving economy and strengthening of patent commercialization incentives.

TRENDS IN INDICATORS OF SCIENTIFIC-TECHNICAL PRODUCTION AND FUNDING SECURED DURING 2014-2017
(For the annual value, a range of values is given corresponding to the different scenarios considered)

INDICATOR	Yearly average 2010-12	2014	2015	2016	2017	Yearly average 2014-2017	Total 2014-2017
International publications (ISI, SCOPUS)	12,408	11,500 – 12,400	11,200 – 12,300	10,900 – 12,100	11,200 – 12,400	11,200 – 12,300	44,800 – 49,200
% Publications Q1	59	59 - 66	59 - 66	59 - 66	59 - 66	59 - 66	
Books	302	250 - 250	250 - 250	240 - 240	240 - 240	245 - 245	980 - 980
% Books Q1	40	39 - 43	39 - 45	40 - 46	41 - 47	39.75 - 45.25	
Book chapters	1,727	1,500 – 1,700	1,480 – 1,670	1,470 – 1,660	1,460 – 1,640	1,478 – 1,668	5,910 – 6,670
Congresses	10,144	8,800 – 10,000	8,700 – 9,800	8,600 – 9,700	8,600 – 9,700	8,675 – 9,800	34,700 – 39,200
% Congresses Q1	20	19 - 22	20 - 23	21 - 24	22 - 25	20.5 - 23.5	
Doctoral Theses	954	720 - 820	710 - 800	710 - 800	700 - 790	710 - 802	2.840 – 3.210

Continue

TRENDS IN INDICATORS OF SCIENTIFIC-TECHNICAL PRODUCTION AND FUNDING SECURED DURING 2014-2017
(For the annual value, a range of values is given corresponding to the different scenarios considered)

INDICATOR	Yearly average 2010-12	2014	2015	2016	2017	Yearly average 2014-2017	Total 2014-2017
Courses (in hours taught)	56,855	51,700 – 58,300	51,600 – 58,200	51,500 – 58,100	51,200 – 57,800	51,500 – 58,100	206000 - 232400
Outreach - Number of events	2,871	2,500 – 2,800	2,500 – 2,800	2,400 – 2,800	2,400 – 2,700	2,450 – 2,775	9,800 – 11,100
Outreach - Number of materials	1,396	1,000 – 1,100	1,000 – 1,100	1,000 – 1,100	1,000 – 1,100	1,000 – 1,100	4,000 – 4,400
Patent applications	173	145 - 150	150 - 155	155 - 160	160 - 170	152 - 158	610-635
Patents licensed	63	40 - 45	45 - 50	50 - 55	55 - 60	47 - 53	190 - 210
Spin-Offs created	8	3 - 4	4 - 6	5 - 7	5 - 9	4 - 6	17 - 26
Funds secured through R+D contracts (M€)	51	30 - 35	40 - 45	50 - 54	54 - 60	43 - 49	174 - 194
Funds secured through competitive projects (M€)	218	119 - 134	125 - 140	130 - 155	150 - 165	132 - 150	525 - 594
Income from contracts and projects (M€)	269	150 - 169	165 - 185	180- 209	204 - 225	175 - 199	699 - 788

In addition to the indicators shown in the table above, the introduction and monitoring of new indicators to assess CSIC activity as a whole and that of its Institutes and Centres will be considered. These would include the number of

reports issued, teaching activities run in undergraduate and Master's programmes, among others. These indicators will be defined during autumn 2014, following the initial evaluation of Institutes and Groups.

7 | CSIC Scientific and Technological Areas

7.1. Summary

Appendix I

Humanities and Social Sciences Area

- **It undertakes** quality research in historical, social and cultural studies; archaeology and heritage; studies on philosophy and theory of knowledge; linguistic and philological studies; socio-political and economic studies; geographic and demographic studies; science of innovation, management and measurement of science, technology and knowledge.
- **It must** be established as an international benchmark for research in Humanities and Social Sciences, promoting research lines of scientific quality, with relevance and social impact, taking advantage of the multidisciplinary and transversal nature of its activity.
- **It has** 103 Research Groups, including 397 researchers located in 17 research institutes in Barcelona, Cordoba, Granada, Madrid, Mérida, Santiago de Compostela, Sevilla, Valencia and Rome.
- **Its outstanding assets** are its unique ability to generate a critical and reflective analysis on the main currents of thought in modern society, justifying the search for answers to ideological and ethical problems arising in today's world, and contributing to the preservation of cultural and intellectual heritage in all its forms.
- **Its challenge** is to validate itself as a benchmark for research in Humanities and Social Sciences, reinforcing its international presence, the use of innovative methodologies, and its performance on border issues and cross border collaboration.

7.2. Summary

Appendix II Biology and Biomedicine Area

- **It undertakes** quality research aimed at the study of molecular, cellular and physiological properties of living organisms, focusing on an understanding of the molecular basis of life and developing therapeutic solutions and strategies with biotechnological and medical value.
- **It must** be established as an international benchmark for research in biology and biomedicine, establishing new approaches and strengthening its activity in areas such as population aging, biomaterials, infectious and non-communicable diseases, advanced therapies and the impact of food and climate change on our health.
- **It has** 459 Research Groups, located in 20 centres, 12 of them joint centres, where over 585 researchers carry out their activities in immunology, cell signalling, genome structure and dynamics, development and morphogenesis, microbiology, parasitology and virology, neuroscience, cancer, synthetic and systems biology, molecular medicine, environmental biology, structural biology, biophysics and biochemistry.
- **Among its outstanding assets** is its ability to uniquely contribute to basic research, generating groundbreaking results in its fields, contributing to the development of new processes of biotechnological and pharmaceutical interest, as well as the ability to generate business through technology transfer and the creation of spin-offs, and its prestige in structural biology, neuroscience and infectious diseases.
- **Its challenges** are to promote research activities currently demanded by biology and biomedicine, incorporating the latest technology; to promote an effective generational renewal system; undertake technological renewal accompanied by the incorporation of specialized personnel and implement coordination structures destined to take better advantage of funds, technological capabilities, platforms and services; to promote participation in major international research programmes by promoting inter-disciplinary approaches, and to improve its capacity for technology transfer.

7.3. Summary

Appendix III Natural Resources Area

- **It undertakes** quality research focussing on the study of natural diversity, its origin, its destruction and the functioning of natural systems, by concentrating its activity in three major areas: biology of organisms and Earth systems; marine science; and Earth and atmospheric sciences.
- **It must** be reinforced as an Area of reference for a comprehensive understanding of the planet and its inhabitants, and help to achieve a balance between preservation and development by conferring expert advice to enhance environmental policies (environmental legislation, resource prospecting and exploration, monitoring and evaluation of natural accidents and hazards).
- **It has** 152 Research Groups that include 422 researchers spread over 21 research institutes (including 8 joint centres), 2 joint units, 29 associated units and 3 ICTS (Special Scientific and Technical facilities), one of them being the Marine Technology Unit.
- **Its outstanding assets** are its large volume of researchers, with groups and centres of excellence, and an interest in basic research and the development of direct applications, the international prestige and global dimension of its research and its multidisciplinary nature (biosciences, geosciences, technology and engineering) promote integration in multidisciplinary border issue projects, the ability to advise companies and national and international governments, and the use of cutting-edge technologies (high-throughput sequencers, biotechnologies, analytical and geophysical instrumentation, space satellites).
- **The challenges** are to advance in knowledge so as to provide an integrated approach to the functioning of natural systems; define the dynamics of geological processes on different spatial scales; determine the effects of global change on species, ecosystems and biogeochemical cycles; explore and evaluate the sustainable use of natural resources; predict natural geological and biological risks; detect, monitor, mitigate and solve environmental contamination.

7.4. Summary

Appendix IV Agricultural Sciences Area

- **It undertakes** quality research in order to innovate, improve and encourage the production and quality of the agricultural and agro-industrial sector, to support the future population with a sustainable use of natural resources. Its specific objectives are: 1) the management and conservation of productive agricultural systems; 2) the recovery of organic waste; 3) genetic improvement of new plant varieties and animals; 4) to expand the biological and physiological knowledge of plants and animals; 5) the study of interactions between plant/organism and crop yields; 6) the identification of species for biomass production, raw materials and soil bioremediation; 7) production of aquatic and terrestrial species and health-related issues.
- **It must** be consolidated as an Area of reference, enhancing its ability to generate and transfer knowledge, considering agriculture not only in terms of food production but also as a source of raw materials.
- **It has** 182 Research Groups comprising 522 researchers, divided into 24 institutes spread geographically throughout almost all the Spanish territory, working in the areas of: 1) soil and water systems management; 2) agrobiotechnology; 3) plant production and breeding; 4) biology, physiology, biochemistry and plant development; 5) plants-organism interactions; and 6) animal health and production.
- **Its outstanding assets** are its excellence nationally and internationally; its ability to raise funds through competitive national and European projects; the high level of technology transfer, with patents out-licensed to companies; a structure based on multidisciplinary groups; and field work in a basic and globally important sector.
- **The challenges** are to make headway in the transfer of generated knowledge and improve the competitiveness and innovation of the agro-food sector, fostering collaboration between groups to exploit synergies, improving technology transfer and empowering the experimental infrastructures, making them more profitable.

7.5. Summary

Appendix V Physical Sciences and Technologies Area

- **It undertakes** quality research in mathematics; particle, astroparticle and nuclear physics; atomic and molecular physics and physics of aggregates; astrophysics and Space science; optics and photonics; fluid dynamics and acoustics; micro/nano technology and nanoscience; complex systems; robotics, automatics and computer science; production, information and communications technology; medical physics and biomedical applications; and advanced energy instrumentation.
- **It must** establish itself as a strong Area, maintain its national leadership and continue to improve its position on an international level, maintain participation in major international physics and Space science facilities and experiments, consolidating its position as a European benchmark in mathematics, increase the national industries' participation in applied physics and technologies. In experimental and modelling areas, there should be a continued effort to maintain the level of current infrastructure and the know-how acquired, in order to preserve our competitiveness
- **It has** 165 Research Groups, located in 21 centres and institutes and 3 service centres distributed in Barcelona, Granada, Madrid, Palma de Mallorca, Santander, Sevilla, Valencia and Zaragoza. The area has several large facilities (ICTS) (Special Scientific and Technical facilities): the Microelectronics Institute's Clean Room (Sala Blanca del Instituto de Microelectrónica de Barcelona), as well as participation in the German-Spanish Astronomical Centre (Centro Astronómico Hispano Alemán de Calar Alto).
- **Its outstanding assets** are: 1) the quality of groups; 2) cutting-edge equipment; 3) good performance in technology transfer, corporate partnerships and creation of Technology Based Companies; 4) the media impact of advances made in more fundamental issues (Higgs, Mars); and 5) the presence of a large number of groups with additional disciplines in border areas.
- **Its challenges** are to consolidate relevant research in the field of physics, encouraging participation in major international programmes (spatial and physical exploration of the subatomic world); to contribute to resolving mathematical problems in border areas; to develop applications and technologies that result in a better quality of life for citizens and cities; to advance in information, quantum computing and cryptography systems; to develop materials, devices and applications using micro and nanotechnologies; to further knowledge in physical laws on a nanoscale; develop advanced instrumentation for use in physics, space science, medical diagnostics, neuromuscular interfaces and autonomous systems; to transversely expand knowledge.

7.6. Summary

Appendix VI Materials Science and Technology Area

- **It undertakes** benchmark research for scientific and technological progress in materials that serve society, develops innovative technologies and transfers them to companies.
- **It must** establish itself as a strong Area and use its skills and knowledge to: 1) develop materials for diagnosis, for treating diseases and improving quality of life; 2) develop materials and processes for clean, safe and efficient energy; 3) develop materials and devices for applications in information and communications; 4) establish new properties and processes of materials; 5) design and develop advanced instrumentation; 6) study the deterioration, conservation and restoration of historical and cultural heritage; and 7) strengthen technological support to the industrial sector through reports, surveys and certification processes.
- **It has** 171 Research Groups, of which 153 are located in 11 Institutes: 5 CSIC institutes and 6 joint centres, located in Madrid, Barcelona, Zaragoza, Asturias, Guipúzcoa and Sevilla. The remaining groups are active in institutes assigned to other Areas. Also included here is the management of the ICTS (Special Scientific and Technical facilities) such as the Spanish participation in Grenoble's Synchrotron.
- **Its outstanding assets** are a workforce of internationally prestigious research staff present on scientific committees and advisory boards of national and international institutions and agencies, the multidisciplinary nature of its Research Groups, and its interaction with the industrial sector.
- **Its challenges** are to strengthen the transfer of the knowledge it generates and to improve competitiveness and innovation in materials science, integrating research lines and encouraging inter-group collaboration.

7.7. Summary

Appendix VII Food Science and Technology Area

- **It undertakes** quality research on sustainable food production, as well as issues related to health and safety, and consumer acceptance. It provides support and consultancy services to the industrial and productive sectors to promote competitiveness through innovation.
- **It must** establish itself as a strong area that leverages the CSIC's multidisciplinary nature to: 1) produce food and innovative ingredients through biotechnology and new technologies; 2) help increase the added value of traditional foods; 3) help ensure food safety; 4) ensure traceability, i.e., the origin and quality of food; 5) clarify the bases of food-health relationships; 6) develop and validate foods and ingredients to improve nutrition and health; and 7) develop strategies to reduce/recover waste and residues associated with food production, processing, distribution and consumption, and thus increase their added value.
- **It has** 134 Research Groups which include 217 researchers, located in 4 CSIC institutes, 2 inter-area institutes and 2 joint centres, located in Madrid, Sevilla, Valencia, Logroño, Villaviciosa, Vigo and Murcia.
- **Its outstanding assets** are: 1) investigation articulated in three main research lines (food biotechnology, food quality and safety, functionality and nutrition); 2) international position (2nd in the world in its sector); 3) strategic interest; 4) facilities, infrastructure and cutting-edge equipment; 5) proximity to food production, processing and distribution areas and to legislating bodies.
- **Its challenges** are to strengthen knowledge transfer and to improve competitiveness and innovation in the food industry, promoting multidisciplinary approaches and incorporating specialists in nanotechnology, bioinformatics, nutrigenomics, microbiota, toxicology, consumer science, systems biology, and biomarkers related to functionality and health.

7.8. Summary

Appendix VIII Chemical Science and Technology Area

- **It undertakes** research in biological and medicinal chemistry, energy and energy resources, sustainable chemistry and catalysis, environmental technology, synthetic methodologies, reactivity and structure, and chemistry of materials and nanotechnology, for the development of : 1) new drugs to fight diseases; 2) technologies and devices to reduce the CO₂emission; 3) fuel cells and energy storage systems; 4) catalytic processes and catalysts (homogeneous and heterogeneous) for sustainable chemistry; 5) processes and methodologies for the detection, analysis and disposal of pollutants; 6) synthetic methodologies for the preparation of molecules and nanoscale systems.
- **It must** be established as an Area with pioneering contributions in the fields of health; sustainable agriculture; food safety; new materials; nanotechnology; development of clean, efficient and safe energies; intelligent and clean transportation; climate change and the development of more efficient chemical processes that lead to a better use of available resources.
- **It has** 134 Research Groups including 414 researchers, with 9 CSIC institutes, 3 joint institutes and 2 service centres, located in Barcelona, Madrid, Oviedo, Sevilla, Tenerife, Valencia and Zaragoza
- **Its outstanding assets** are: 1) the groups' internationalization, multi-disciplinary approach, and productivity; 2) excellent knowledge and technology transfer ability (132 patents filed/year and 12 % market inclusion); 3) expert training potential (93 PhD Theses vivas annually); 4) the quality of research (position 15 out of 1,070 international institutions).
- **Its challenges** are to strengthen both their equipment and human resources, improve their approach to society and provide solutions to social problems related to energy, sustainability and health and generate technological developments that can be transferred to the productive sector.

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