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Pierre Bitard

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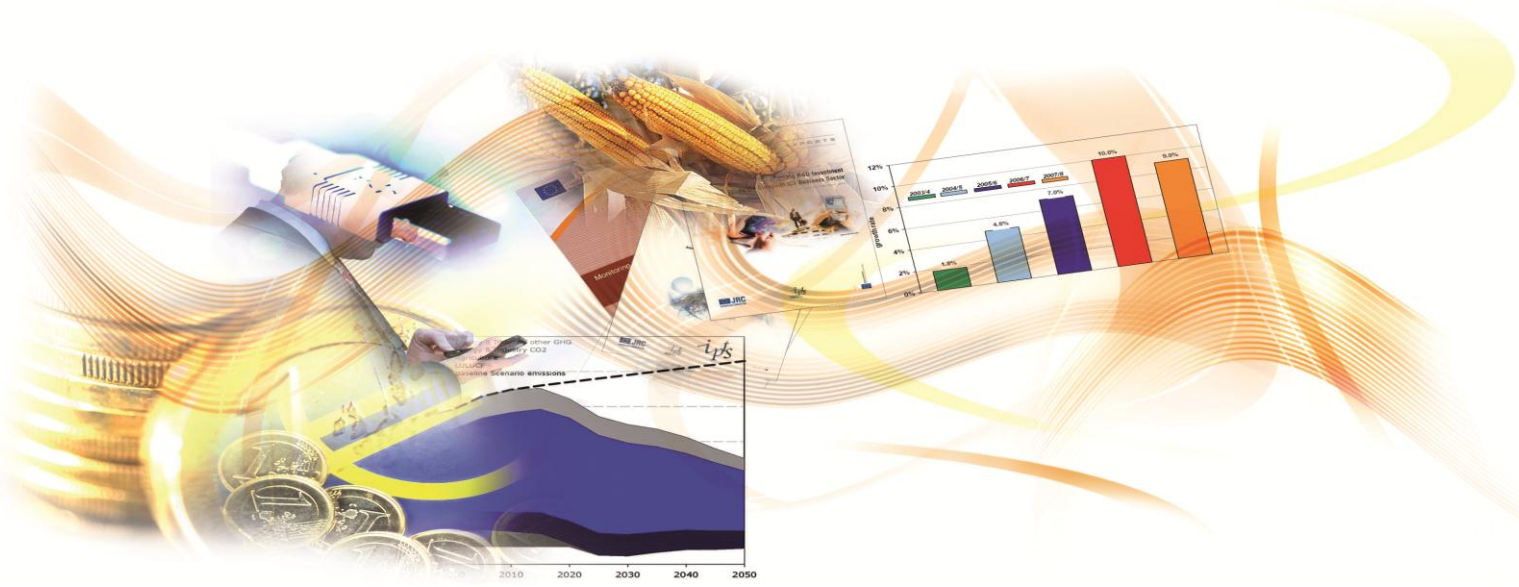

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Abstract

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;
- national progress in addressing the 5 ERA priorities;
- the progress at Member State level towards achieving the Innovation Union;
- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);
- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.
The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

ACKNOWLEDGMENTS AND FURTHER INFORMATION

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). ERAWATCH is a joint initiative of the European Commission's Directorate General for Research and Innovation and Joint Research Centre.

The Country Report 2013 builds on and updates the 2012 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of Gérard Carat from JRC-IPTS. The contributions and comments from DG-RTD and Martine Roussel of Ministère de l'Enseignement supérieur et de la Recherche are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

EXECUTIVE SUMMARY

The EW 2013 France report follows the prescribed structure and revolves around five main sections.

Section 1 gives an overview of the basic characterisation of the French research and innovation system. France's GERD has kept growing since 2006 to reach €46bn in 2012, which represents 17.2% of total EU28 expenditures. GBAORD has been decreasing since 2009, from €17.5b to slightly below €15b in 2013. In terms of percentages of GDP, a steady decrease is observable over the same period, from 0.93% to 0.73% in 2013. Nevertheless, unlike most countries, France has increased its R&D effort during the crisis (+1.9% in 2008 and +3.5% in 2009). France's research and innovation system is characterised by a satisfactory level of public investment and a relatively low level of investment by companies. The latter is explained by French industrial structure. A key objective of recent research and innovation, coupled with the need to reach a higher competitiveness level, is to better link public and corporate research. A specific focus is also placed on improving the support for the exploitation of research outcomes in a business perspective. At the policy making level, two main government ministries share the responsibility for research and innovation policy in France; namely, the Ministry of Higher Education and Research (MESR, to which Education at large has been added in late March 2014) and the Ministry for Productive Recovery (MRP). In addition, under direct authority of the Prime Minister, the highly endowed Commissariat-General for Investment plays a complementary structuring role. Governance evolutions, including sequels of the new Law on higher education and research (promulgated on 22nd July 2013) stem from the diagnosis according to which France-based research and innovation stakeholders do not develop synergetic enough relationships. The competitiveness imperative adds on this, and has pushed towards a funding distribution on a competitive basis. The French research and innovation system is structured around a small number of agencies: the National Research Agency (ANR), bpifrance, (which replaced OSEO) the new public investment bank (as of 31 December 2012), provides support for R&D and innovation projects to businesses, especially SMEs, Agency for Environment and Energy Management (ADEME) was created in 1991 to support and fund environment and energy research on a partnership basis. Besides, the CGI (Commissariat Général à l'Investissement) has implemented the Investments for the Future Plan. Public research organisations (PROs) also contribute to policy implementation. Research and innovation policies are also defined and implemented at the regional level. As part of the European cohesion policy for 2007-2013, each French region has developed its own regional innovation strategy (SRI) with the aim of ensuring a more effective steering of its regional innovation system.

Section 2 describes recent developments of the French research and innovation policy and system. The new law on research and higher education, promulgated on the 22nd of July 2013 includes the formulation of a new National Strategy for Research, incorporated into "France Europe 2020"strategic agenda for research, technology transfer and innovation. Research and innovation have become the building stones of many policies aiming at regaining competitiveness. The rise of competitive funding is a noticeable feature of the French RIS since 2005. The establishment of the ANR, Agence Nationale de la Recherche, in 2005 has been pivotal in this transformation; and so has been the implementation of the Investments for the Future Plan. As a consequence, competitive funding of public research is steadily increasing. France is characterised by a remarkably high level of R&D indirect government funding; it nonetheless preserves a good balance in terms of sizes and types of firms. The proportions of

thematic *vs* generic funding for research can be but observed *ex post*, given that a coherent national research strategy implementation is forthcoming (preliminary version is expected by first semester 2014, including multi-annual programming). Through budgetary lenses, about one-third of the €14bn funding goes to thematic areas, whereas two thirds are unspecified or multidisciplinary. The current evolution of the legal policy context, designed against the background of the European research policy framework, transforms many traits of the French RIS, which continues its moulting started roughly 10 years ago. Research institutions' staff and governance bodies at large get more and more accustomed with the idea of participating in a system that has to be effective; society demands it. A consensus is emerging on two specific issues where there is room for improvement: autonomy of the various components of the R&I system; evaluation institutions and processes.

Section 3 proposes an assessment of the performance of the national Research and innovation system and identifies four structural challenges faced by the national innovation system. France has an average innovation performance in Europe, and it has been so for many years. This is a mediocre ranking given the national investments and efforts. According to international recurrent rankings that account for innovation inputs to monitor global economic and innovation performance, the country performance can be described as declining. As a consequence, there has been a profound renewal of the research and innovation policies. Noticeable changes have occurred in policymakers' mind in the last two to three years in terms of the approach to this problem. First, the whole system is responsible: there is not one single detectable cause: systemic issues require systemic policy measures (cf. report "Innovation, a major challenge for France" of April 2013). Second, competitiveness is deemed a vital economic objective, as stated in the National Pact for Growth, Competitiveness and Employment. The connection with the innovation and research system is explicitly made as is visible in the 'France Europe 2020' strategic agenda (May 2013). We identify four structural challenges and matching policy action lines: insufficient culture of innovation (including risk-aversion and lack of trust); unsatisfactory relationships between the education system and the business and industrial world; lack of efficiency of technology and knowledge transfers to industry; limited use of evaluation and assessment tools to monitor socio-economic impacts of research and innovation policies.

Section 4 assesses national progress made as regards innovation union key policy actions, i.e. in terms of (i) strengthening the knowledge base and reducing fragmentation; (ii) getting good ideas to market; working in partnership to address societal challenges; (iii) maximising social and territorial cohesion; and (iv) international Scientific Cooperation. According to the assessment, huge progress is being made, with simplified organisations, augmentation of financial efforts and formidable change in trajectories to reach the innovation union ambitious objectives. These good results are especially visible when it comes to getting good ideas to market, a long-lasting well-known weak point of the French research and innovation system.

In **Section 5**, national progress towards realisation of ERA is evaluated, with specific focuses on the effectiveness of the national research system; the improvement in transnational co-operation and competition; the opening up of the labour market for researchers; gender equality and gender mainstreaming in research; and the facilitated circulation, access to and transfer of scientific knowledge including *via* digital ERA. Great efforts are being made on these five areas of progress, with particular emphasis on effectiveness of the RIS. As regards gender equality, awareness has improved a great deal (cf. number and quality of the actions implemented). The country expert stresses that on this matter, more than any other, there is a strong need of financial support to implement major scientific investigations, both quantitative and qualitative

so as to be able to demonstrate progress, little by little, year after year. Evaluations, on comparative bases, are to be developed.

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1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

With 66 million inhabitants by end 2013, France is the second largest country of the EU27 after Germany. It is home to 12.9% of the total EU27 population. The 2008 economic crisis has affected France's Gross Domestic Product (GDP) growth rate, as it has in other EU countries, albeit less severely. In 2007, the GDP growth rate was 2.3%, but this fell sharply to 0.1% in 2008 and even plunged to -2.7% in 2009. But, unlike other countries which quickly recovered after the plunge, France's GDP growth was null in 2012 and almost remained so in 2013 (0.1%). Foreign trade contribution to GDP growth stood at 1% in 2012 but decreased and even turned negative in 2013, at -0.3%.

In terms of R&D expenditures, France's GERD has kept growing since 2006. Within the EU28, France ranks second (Germany is first). France's GERD stood at €42.7b in 2009, €43.4b in 2010, €45b in 2011 and €46b in 2012, which represents 17.2% of total EU28 expenditure (as compared with the share of Germany: 29.2%).

The GERD to GDP ratio was 2.26% in 2012. France ranks 7th, above the EU27 average (which was 2.04% in 2011 and 2.06% in 2012); even though R&D intensity has sharply decreased since the 1990s (it stood at 2.38% in 1992). GBAORD has overall been decreasing since 2009, from €17.5b to slightly below €15b in 2013. In terms of percentages of GDP, a steady decrease is observable over the same period, from 0.93% to 0.73% in 2013.

In most OECD countries, the impact of the crisis resulted in a decline in the real growth rate of R&D expenditures in 2008 (-8.6% for Japan, -2.9% for Finland, -0.6% for the UK, and -0.4% for Germany). France is one of the two OECD countries (the other one being South Korea) that have increased their R&D effort during the crisis (+1.9% in 2008 and +3.5% in 2009).

France's research and innovation system is characterised by a satisfactory level of public investment and a relatively low level of investment by companies. A key objective of recent research and innovation, coupled with the need to reach a higher competitiveness level, is to better link public and corporate research. A specific focus is also placed on improving the support for the exploitation of research outcomes in a business perspective. Reasons for this disappointing level of private investment relate to two main causes:

- French industrial specialisation, with R&D intensive sectors insufficiently represented in the productive structure ;
- A lack of enterprises of intermediary size (ETI) which to many accounts are likely to depend very much on research and innovation to continue to grow;

The branches which invest most in R&D are the automotive, the pharmaceutical and the aerospace construction; they altogether account for 37% of French BERD (2011 figures). Concentration can also be expressed in terms of company size: French companies with more than 25,000 employees contribute about 89% of R&D expenditures in France, compared to 83% in the EU, and 64% in the USA, which shows that France suffers from a lack of R&D-intensive SMEs and mid-tier companies.

In 2012, 31% of Government budget outlays for research and development (GBAORD) was focused on four objectives: defence (7.1%), the exploration and exploitation of space (9.5%), health (7.4%), transport and telecommunications and other infrastructures (6.7%). French spending on the first two objectives is especially high compared to the EU average and represents a national characteristic (Eurostat).

Research and innovation governance

The governance of the French research and innovation system has been continuously evolving over the last ten years with the objective of clarifying the systems functions so as to improve its performance. According to analysts, this clarification would rest on three clear separate levels of action, namely: i) policy making, ii) implementation (funding and programming) and iii) execution (enforcement of regulation). Thanks to simplified missions of execution components at each level, evaluation may also be streamlined. A specific mission of Evaluation of Innovation Policies has been assigned to the Commissariat-General for Strategy and Foresight by the Prime Minister, on 4 November 2013; a dedicated Committee is installed. Even though it is (obviously) a high level policy function, in practice, evaluators shall be present at each level.

At the policy making level, two main government ministries share the responsibility for research and innovation policy in France. In addition, under direct authority of the Prime Minister, the highly endowed Commissariat-General for Investment plays a complementary structuring role.

- The Ministry of Higher Education and Research (MESR) designs and co-ordinates research policy. It is assisted by consultative bodies including the Strategic Research Council (established on 19 December 2013, thereby replacing the High Council for Science and Technology – HCST - and the Higher Council for Science and Technology - CSRT).). It should be noted that, according to the new law on higher education and research (July 2013), the implementation of the National Research Strategy will drive the system's evolutions for years to come (cf. a multi-annual programming). It will be developed with the support of the Strategic Research Council. The Council is responsible for proposing the broad national strategy for research and the Parliament for evaluating its implementation. It is normally chaired by the Prime Minister (or by delegation by the Minister of Research), which shall guarantee a cross-ministerial coverage.

- The Ministry for Productive Recovery (MRP) is responsible for industrial research and plays a specific role in relation to private sector research. Innovation policies are under its responsibility (together with the Ministry for Higher Education and Research), with a Secretary of State dedicated to SMEs, Innovation and the digital Economy.

The fundamental channel for research and innovation funding is the general budget of the Research and Higher Education Inter-ministerial Mission (MIRES). The MIRES brings together funding from the Ministry of Research and Higher Education, the Ministry for Economy, Finance, the Ministry for Productive recovery as well as funds from several other ministries (Defence, Culture and Communication, Ecology, Energy, Sustainable Development and Sea, Food and Agriculture and Fishing). The Ministry for Higher Education and Research is the leading ministry within the MIRES and is responsible for implementing the agreed budget plan. It proposes public policy priorities for all research programmes by defining, on an annual basis, objectives and the means necessary to achieve them. In addition, a fiscal measure is influential: the R&D tax credit. Finally, research and higher education sectors are the main beneficiaries of the Investments for the Future Plan, seating with a specific dedicated body, the Commissariat-General for Investment.

Governance evolutions, including sequels of the new Law on higher education and research (promulgated on 22nd July 2013) stem from the diagnosis according to which France-based research and innovation stakeholders do not develop synergetic enough relationships. It is therefore one of the dominant objectives underlying recent modifications in research and innovation structures and governance. The competitiveness imperative adds on this, and has pushed towards a funding distribution on a competitive basis. In recent years, there has been a wealth of new groupings, often public-private, combining knowledge creation and knowledge

transfer, university education and training and business activities. Emulating the knowledge triangle is part of the solution sought by the French research and innovation policymakers.

On the research and higher education side, this movement is well illustrated with the creation of Research and Higher Education Clusters (PRES), strengthened by the Communities of Universities and Institutions (CUE, Communautés d'Universités et d'Etablissements) in the new 2012 law on Higher Education and Research (July). These Communities, larger than one single university, shall be better able to develop real strategies; they will also simplify greatly contractual relationships with central government in reducing the number of agreements to 30 (as compared to a hundred beforehand). A similar concern underpinned the launch of the 'Pôles de compétitivité' in 2005, as novel form of industrial policy. Since 2010, there are many schemes with the same aim, many of them under the responsibility of the Commissariat-General for investments. And this proved independent from political majorities. Autonomous collaborations between research, higher education and innovation organisations gave birth to many new long-lasting project-like structures such as: 'Excellence Initiative (Idex), Excellence facilities (Equipex), Excellence Laboratories (Labex), University-Hospital Institutes (IHU) dedicated to cancer research, Institutes of Technological Research (IRT), Institutes for the energy transition (ITE) to quote some.

Pure co-ordination bodies were also created such as the five research Alliances (2010)[1], covering large scientific domains: environment research, energy research, digital research, health and well-being research, social sciences and humanities. They were solicited (together with the CNRS) in 2013 for a new mission: to participate in the design and prioritisation of national research and innovation grand challenges so as to assist in the implementation of the new National Research Strategy[2].

At operation level, the French research and innovation system is structured around a small number of agencies.

- The **National Research Agency** (ANR) was created in 2005 to fund research projects on a competitive basis and through public/public and public/private partnerships. The ANR received a budget of €686.6m for 2013 (a €80 million fall as compared with 2012). The ANR covers basic research, applied research, innovation and technology transfer. It was designed to give a new impulse to the French research and innovation system through: i) the development of new concepts through exploratory research with the so-called "white programmes" ('programmes blancs') which are non-thematic calls, ii) the encouragement of research on economic and social priorities through thematic calls for projects; iii) the promotion of collaboration between public and private research through collaborative research, and iv) the increase of international partnerships. Since 2010, the ANR is also the operating agency of the Commissariat-General for Investment, in relation to the actions of the Investments for the Future Plan in the field of higher education and research.
- **bpifrance**, (which replaced OSEO) the new public investment bank (as of 31 December 2012), provides support for R&D and innovation projects to businesses, especially

[1]Cf.http://cache.media.enseignementsup-recherche.gouv.fr/file/2010/84/2/5_alliances_pourameliorer_la_reactivite_du_systeme_147842.pdf ; see also http://www.senat.fr/rap/r10-453/r10-4531.pdf

[2]As an illustration of the contributions,, here is a link towards that of ANCRE (French National Alliance for Energy Research Coordination): http://www.allianceenergie.fr/iso_album/ancre_snr.pdf [in French]

- **SMEs**. This unique national agency has benefited from a €21 billion endowment in 2013. It is dedicated to promoting and supporting the industrial development, growth SMEs, through innovation and to promote technology transfer. A network of regional correspondents and private financing partners complements the public bank organisation.
- The **Agency for Environment and Energy Management (ADEME)** was created in 1991 to support and fund environment and energy research on a partnership basis (with a budget of €1b in 2010). ADEME is a dedicated public agency with a remit to promote innovation in the field of environment. ADEME's missions consist in promoting, supervising, coordinating, facilitating and carrying out activities aiming at protecting the environment and improving energy savings.
- **Public research organisations (PROs)** such as the National Centre for Scientific Research (CNRS, €3.3b budget in 2012), also contribute to policy implementation.

Research and innovation policies are also defined and implemented at the regional level. Even though regions have increased their budgets dedicated to research, technology transfer and innovation by 60% since 2003, regional funding remains limited when compared with national funding. In 2012, French regions dedicated approximately €930m to research and technology transfer; that was about 70% of total spending of all local authorities. Regional and local authorities have their own budgets, they have been granted autonomy for deciding the amount they spend on R&D support.

As part of the European cohesion policy for 2007-2013, each French region has developed its own regional innovation strategy (SRI) with the aim of ensuring a more effective steering of its regional innovation system. The design of RDI policies at sub-national level is in the remit of Regional Councils, which are usually supported in the implementation stages by Regional Innovation Agencies. Regions are allowed to develop a Regional Research Strategy (SRR) or a Regional Research and Higher Education Strategy (SRESR).

In practice, relationships between the regional authorities and the central government are organised through seven-year contracts called a State-Region Projects Contract (CPER). A CPER sets out the financial aid provided by the central government to meet regional policy objectives. One chapter of these contracts is dedicated to research. The design of the new generation of CPERs has been synchronised with the European Structural Funds programmes (2007–2013; 2014-2020). CPERs focus on competitiveness, on attractiveness of territories as places to do business, on the promotion of sustainable development and on territorial and social cohesion.

Research performers groups

The main public research performers (in terms of funds) are higher education institutions (HEI), which comprise a group of about 80 universities (2012-2013) and a smaller number of "Grandes Ecoles". The latter are a specific trait of the French higher education system. The new Law on Higher Education and Research strongly encourage university-grouping so that there will probably be about 30 (larger) universities in the very coming years.

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Public research is mainly carried out by the Higher Education sector. In 2012, they spent roughly €9.6 b, which stood for about 21% of GERD. On the other hand, government sector's research represented €6.3 b, i.e. 14% of GERD. Institutes and research centers in this latter group are of foremost importance to French research. They often collaborate with HEIs (see below). Among them, the National Centre for Scientific Research (CNRS) had a budget of about €3.3 b in 2012, while the Alternative and Atomic Energy Commission (CEA) spent €4.3 b in 2012 (60% of which on civilian research alone). Other large PROs include the National Institute for Agronomic Research (INRA), the National Institute for Computer Science and Automation (INRIA), and the National Institute for Health and Medical Research (INSERM).

Knowledge production

The production of scientific knowledge is the core function that a research system must fulfil. The French research and innovation system can be characterised by a rather high level of public investment (especially when considering indirect funding, see infra) and by a relatively low business counterpart. A major policy goal therefore is to better link public and private research, and in particular to increase support for the exploitation of research outcomes.

In 2012, France's world share of scientific publications (cf. OST 2013 treatments of WoS and Thomson Reuters data), in Material and life sciences (incl. multidisciplinary journals) stood at 3.7%, at third rank in Europe, below Germany (5.2%) and the UK (4.7%). France held the same rank when it comes to its share in citations (in a 2 years moving window), with 4.1% as compared to 6.5% for Germany and 6.4% for the UK. These shares have been declining since 1999, as a consequence of the entry of newcomers on the international scientific stage such as China, India or Brazil. With regard to patents, in 2011, France ranked 2nd European member state, according to the European system (8.0% of European patent applications at EPO ; almost twice as much as the UK at third rank with 4.1%, the first holder being Germany with 22.4%) and 2nd European member state according to the American system (2% of US patents granted, equal to that the UK). In both systems, France's overall share has been declining since 2004. This decrease is due to the rise of new 'players' such as China or South Korea.

Revenues from intellectual property (IP) are decreasing and are highly concentrated between three research organisations, namely the CNRS, the CEA and the Institut Pasteur, which account for 90% of national revenues from IP. Universities and other HEIs suffer from a lack of historic institutional capacity in terms of research and patents, resulting in an absence of IP strategies. In order to overcome these weaknesses, the 2011 national policy is geared towards i) awareness raising and promotion of IP policies to public research performers and ii) the identification of a single IP manager in case of co-ownership (as set out in the Decree published in 2009[3]) specifically dedicated to CNRS-University common research units (90% of CNRS research units).

3 http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000020719576&dateTexte=&categorieLien=id

2. RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

This section highlights policy and system developments that have occurred since late 2012.

2.1 National economic and political context

François Hollande's election as President of Republic on 6 may 2012 has quickly started to affect the research and innovation system. Most changes result from the new law on research and higher education, promulgated on the 22nd of July 2013; the latter notably includes the formulation of a new National Strategy for Research, included in "France Europe 2020", the overarching strategic agenda. In addition to these direct developments, research and innovation have also become the building stones of many policies aiming at regaining competitiveness. So, even though France is facing an excessive public budget deficit and a high level of debt, the government has chosen to maintain the high level of public investment in RDI, and even increase it, notably with a PIA2 (Investments for the Future Plan 2), for as much as €4.1billion. Many of those investments were suggested in the National Pact for Growth, Competitiveness and Employment (November 2012). First and foremost, the Tax Credit for Employment and Competitiveness (CICE) is to be mentioned since innovation expenses are supposed to be the core of the eligible scope; implemented as of January 2013, it represented €10 billion in 2013, and will amount to €15 billion in 2014 and €20 billion in 2015. Other key measures were the creation of a national public investment bank, including an innovation branch, bpifrance, the shift of the Competitiveness clusters policy towards new products and services (vs. new projects). Last but not least, "34 Plans for Industrial Reconquest"[4] were launched by the Minister of Industry, on the 7th of October 2013; it is a by-product of the "Filières strategy" which is implemented by the National Industry Council. The '34 plans' partially rely on the Investments for the Future's budget.

This variety of research and innovation oriented measures aims at recovering competitiveness through a reduction of the cost of labour, while being compliant with the objective of bringing the deficit below 3% of GDP by end-2015. Hence the use of tax credits and of large loans conditional to return on public investment.

2.2 Funding trends

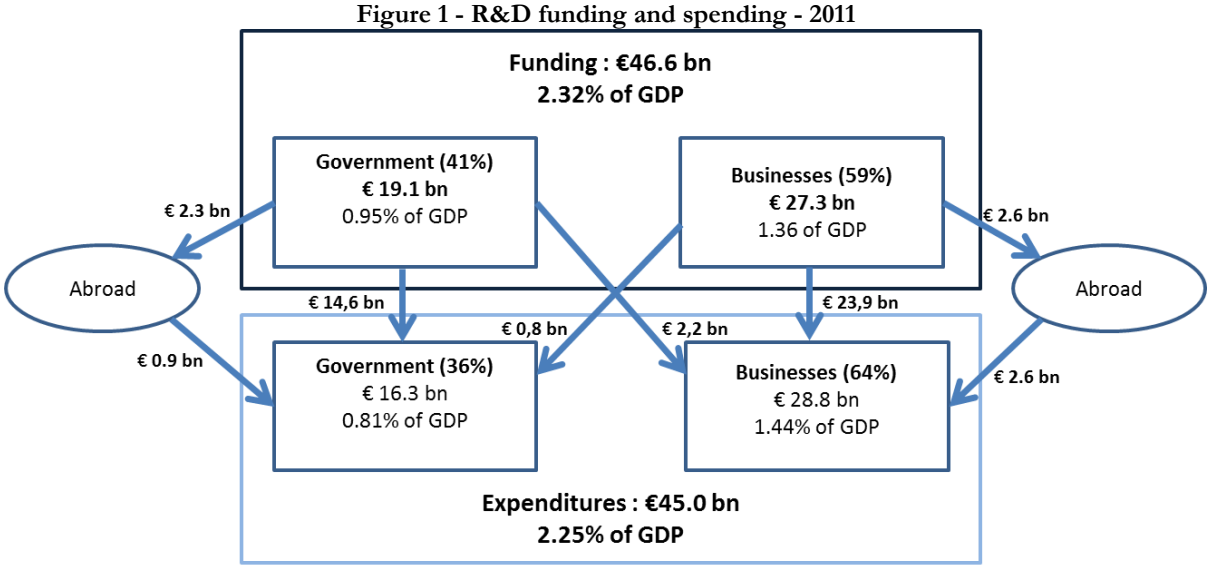
2. 2.1. Funding flows

France's GERD stood at €42.8b in 2009 and reached €45.9b in 2012, thus contributing to slightly more than 18% of EU resource mobilisation. To be more specific, in France, in 201, business expenditures on research and development grew at a quicker - and accelerating- pace than public expenditures: 3.4% in volume between 2010 and 2011, from 2.9% between 2009 and 2010, 1.9% between 2008 and 2009 and 1.5% between 2007 and 2008.

4 : http://www.redressement-productif.gouv.fr/files/nouvelle_france_industrielle_english.pdf

As regards R&D financial flows, hereafter is presented a simplified version of the **circuit of funding and expenditures** within the French system as of 2011[5]:

Figure 1 - R&D funding and spending - 2011



Sources : Excerpt from Note d'information 13.06, Ministère de l'enseignement supérieur et de la recherche, juillet 2013 ; *MESR-SIES Pôle Recherche et Insee; own translation*

Table 1 below complements the picture of the trends of R&D expenses in France, as compared with EU (for year 2011 or 2012 when available).

Table 1. Basic indicators for R&D investments

	2008	2009	2010	2011	2012	EU (2011* /2012
GDP growth rate		-2.7	1.7	2.0	0.0	-0.4
GERD (% of GDP)		2.27	2.24	2.25	2.26	2.06
GERD (euro per capita)		665.7	672.3	692.8	703.9	525.8
GBAORD - Total R&D appropriations (€ million)		13 693	13 955	15 670	14 057	86 309
R&D funded by Business Enterprise Sector (% of GDP)		1.19	1.1.2	1.24	-	1.12*
R&D performed by HEIs (% of GERD)		20.8	21.6	21.0	20.8	23.8
R&D performed by Government Sector (% of GERD)		16.3	14.0	13.9	13.7	12.4
R&D performed by Business Enterprise Sector (% of GERD)		61.7	63.2	63.9	64.2	62.9
Share of competitive vs. institutional public funding for R&D	6.4*	7.4*	7.0*	7.6*	10.9*	n/a
Venture Capital as % of GDP (*Eurostat table code tin00141)*	0.059	0.049	0.044	0.036	0.032	0.025
Employment in high- and medium-high-technology manufacturing sectors as share of total employment *(Eurostat table code tsc0011)*	5.3	5.0	4.8	4.8	4.7	5.6 (2011)

5 2012 figures unavailable to complete the corresponding circuit for 2012.

Employment in knowledge-intensive service sectors as share of total employment (*Eurostat table code tsc00012)*	**42.8**	**43.5**	**43.6**	**44.5**	**44.5**	**38.9** (2011)
Turnover from Innovation as % of total turnover *(Eurostat table code tsdec340) – last available year 2008*	**13.2**	**n/a**	**n/a**	**n/a**	**n/a**	**13.3**

*: "of public research" cf. Anne-Cécile Ollivier, 2013, « Modalités de financement public de la RDI : recherche sur projet », in: *La recherche et l'innovation en France*, Odile JACOB.

2.2.2. Funding mechanisms

2.2.2.1 Competitive vs. institutional public funding

Although BERD accounts for about 2/3 of French GERD, business R&D is far from the 2% initial Lisbon target despite strong public support (e.g. the research tax credit as it is since fiscal year 2008 and the Competitiveness clusters policy). It remains stable around 1.42% of the GDP. It should nonetheless be reminded that France was, together with South Korea, the only OECD country whose business R&D did not diminish as a consequence of the 2008-2009 crisis (OECD, S&T Policy Outlook 2012).

In spite of critiques, the rise of competitive funding is a noticeable feature of the French RIS since 2005. The establishment of the ANR, Agence Nationale de la Recherche, in 2005 has been pivotal in this transformation. It received a €686,6m budget for 2013, which is a €80 million fall as compared with 2012. This was compensated for through an increase of direct funding of the large research organisations. ANR also plays an important role because it is responsible for steering the Investments for the Future Plan's competitive selection process: €21.9 billion are dedicated to higher education and research, out of which €17.9 billion are to be allocated on a competitive basis. This programme shows the new significance of competitive funding in the French RIS. And indeed, competitive funding of public research is steadily increasing, from 7.4% in 2009 to close to 11% in 2012 (for total expenses of about €13 billion in 2012, according to ANRT-FutuRIS calculations). This estimate is comparable to that of the Minister of research and higher education (cf. *Note d'information* 13.06, juillet 2013), though slightly lower.

Compared to other OECD countries[6], France turns out to be a very modest user of competitive funding. For instance, national public project funding represents more than 50% of public funding to national performers in a number of European countries (e.g. Ireland, Belgium or Finland). Limitations of measurement are numerous, and include the lack of categories and classifications that would be needed for policy analysis… In most countries, the distinction between project and institutional funding is blurred, and delineation tricky. In the French case for instance, project funding does not cover salaries of permanent staff but project activities. Thus, the influence of project funding on public research activities may in reality correspond to twice as much as indicated in table 1 (i.e. roughly 22%). Without sound international comparisons of the effectiveness of the various competitive/institutional funding mixes, averages tend to be poorly significant. The standard – not to mention an optimal– mix relative to impacts of RDI is still unknown.

[6] Steen, J. v. (2012), "Modes of Public Funding of Research and Development: Towards Internationally Comparable Indicators", OECD Science, Technology and Industry Working Papers, 2012/04, OECD Publishing. Nota: France is not included in this study.

2.2.2.2 Government direct *vs* indirect R&D funding[7]

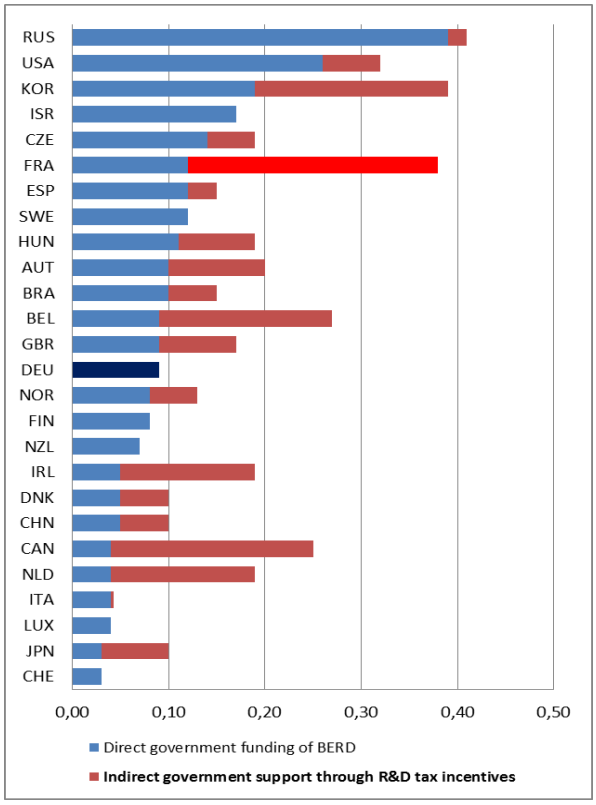
France is the OECD country with the highest level of indirect government funding of R&D. Not only is French R&D tax credit[8] the most advantageous for companies performing R&D activities, but as OCDE (2013) analysed, it is also well designed, favouring SMEs over large groups and addressing 'gazelles' needs (with the 'young and growing enterprises' scheme). Its complementarity with the CIFRE scheme (public support for public-private PhDs) is also noticeable.

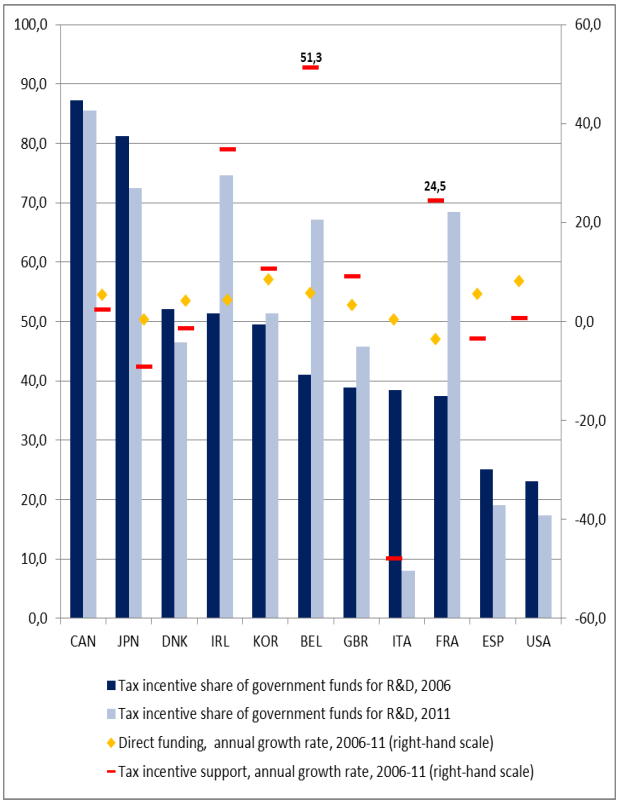
The following two graphs are based on 2012 OECD data. They illustrate French specificities in terms of direct government funding of business R&D and R&D tax incentives (indirect government funding) as percentages of GDP. On the left-hand side, the figure shows the variety of mixes implemented by States to support R&D activities on their territory. France has the highest level of R&D tax incentive. Russia offers the most advantageous system with a very modest fraction of tax incentives. Germany supports business R&D through direct aid only. The figure on the right-hand shows the evolution of forms of support for business R&D for selected countries, through a comparison between 2006 and 2011 (the bars, left-hand scale) and with the average annual growth rate between the two dates (the small red lines, right-hand scale). A majority of countries have increased tax incentives (see number of red lines above zero), some strongly: Belgium, 51% per year, France, 25 %, Ireland nearly 40 % per year. Conversely, Italy has reduced the latter form of incentive of nearly 10% on average each year.

[7] ***Government direct R&D funding*** includes grants, loans and procurement. **Government indirect R&D funding** includes tax incentives such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.

[8] The question of the effectiveness of the French R&D tax credit is crucial; the interested reader can find a thorough discussion on this (in French) at; http://www.ccomptes.fr/content/download/60065/1491770/version/1/file/evolution_conditions_maitrise_credit_imp%C3%B4t_faveur_recherche.pdf; a long awaited comprehensive econometric evaluation the R&D tax credit is expected to be published in the first semester 2014.

Figure 2. Government direct funding *vs.* indirect R&D funding – France compared to a selection of countries





2.2.3 Thematic *versus* generic funding

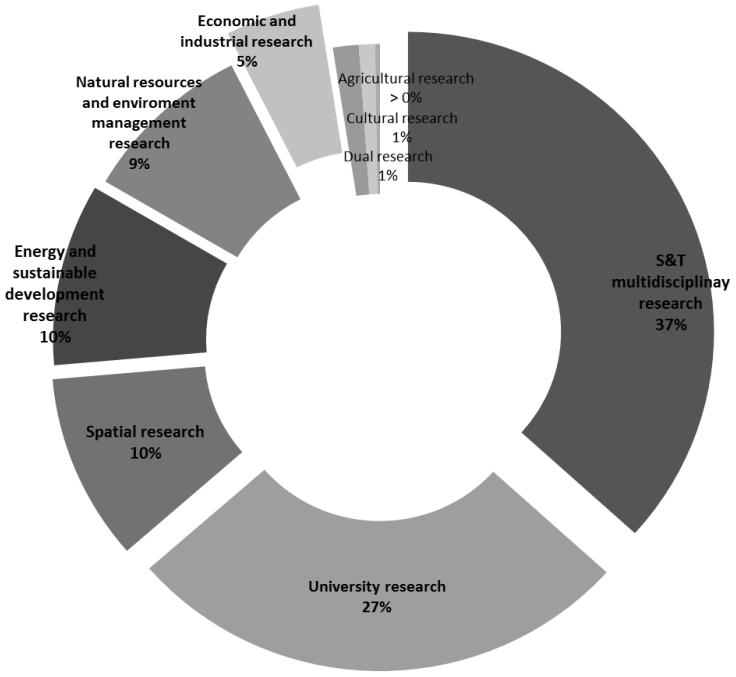
In the absence of a coherent national research strategy implementation – forthcoming as this report is being written –, the proportions of thematic *vs* generic funding for research can be but observed *ex post*. And they would not mean much as high level goals barely translate into actions. Eventually, French HEIs and (especially) PROs are autonomous enough to manage and implement their own decentralised research agendas.

The most generic funding is the (circa) €6bn R&D tax credit, which supports all companies investing in R&D, as long as it is eligible according to the Frascati Manual definition; no choice is being made as regards the Nation's research and innovation priorities for the coming years. Partnerships with public research organisations are encouraged by this scheme (for instance, research externalised to public labs are considered for twice the amount invested, up to a fixed ceiling). This part is the 'easy' part. As for the rest of the government funding of research, it is more difficult to delineate both types.

As far as programming of the National Research Agency is concerned: since 2009, there has been a significant strengthening of the generic programming (labelled 'white' programming). While generic programmes accounted for less than 30% of programming credits ANR until 2008, the government decided to increase their share, which reached nearly €290 million (48.2% of the budget) in 2010 and €278 million in 2011, representing more than half of the programming. It may usefully be noted that the Agency's programming for 2014 is meant to be aligned with the global challenges of the "France Europe 2020" strategic agenda, which relate to Horizon 2020 societal challenges.

Examining the credits allocated to the Interministerial Mission "Research and Higher Education"(MIRES) gives an overall correct representation of the fiscal effort made in favour of the various research themes. The identification of the specific research funding areas is problematic though. Keep in mind that this difficulty has been amplified with the implementation of the Investments for the Future Plan (1 and 2), see infra. The figure below gives a tentative picture of 2013 research credits split by programme. With this simplified view, about one-third of the €14bn funding goes to thematic areas, whereas two thirds are unspecified or multidisciplinary.

Figure 3 –Research credits, split by programme, as planned in 2013 Finance Act: €14bn



Source: Finance Law 2013; own calculations and presentation.

2.2.4 Innovation funding

A short detour can be useful before attempting to single out innovation funding measures in the current French research and innovation system. According to the Oslo Manual (OECD, 2005), "an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations." Innovation policies are therefore a policy mix likely to provide favourable framework conditions to innovators so that they can implement their novelties. Among which policies are those which financially and directly support innovators-to-be. In this category, we find bankers' actions, sustaining their clients when they take risks associated with innovation; they then deliver instant cash to industrialise and sell novelties. This is why **bpifrance**, the public investment bank has been created in the first place (cf. § 4.2 Getting good ideas to market, Improving access to finance). Stimulating demand through innovative public procurement, such as the objective of reaching 2% of public

procurement allocated to SMEs by 2020, (cf. § 4.2 Getting good ideas to market, Public procurement), is another key option.

At least two additional innovation funding measures are worthy of note. The '**34 industrial plans'** [launched in September 2013] are meant to fund high technology readiness levels projects (i.e. as close as innovation as Horizon 2020 can be). The '**Innovation 2030'** Plan [launched in October 2013] has, for the very first time, opened the competition to international companies' project-leaders candidates. Innovation, entrepreneurship and attractiveness are major drivers of competitiveness gains.

Budgets dedicated to the **34 industrial plans that compose the "New Face of Industry in France"** are not known yet since each plan has to be based upon public-private partnerships, and public funding for innovation will derive from the proposed plans[9]. In any case, their "innovative nature is doubtless :"*The initiatives underscore the new face of industry in France but also that of a new environmentally friendly, digital and inclusive society in which progress is shared by all. They are at the nexus of three broad transitions: in energy and the environment; in digital technology; and in technology and society*".

The €300 m Innovation 2030 plan is a noticeable new initiative. To start with, it is a **Worldwide Innovation Challenge**. As the innovative nature of the policy initiative itself is interesting, here's its presentation in the form of excerpts from the English website[10] dedicated to it.

> "In an effort to confront the major challenges of the world of 2030, the Commission singled out a select number of key opportunities with very significant implications for the French economy. Following these efforts, the Commission identified seven goals based on pressing social concerns. These goals can be seen as seven critical pillars to put France on the road to long-term prosperity and employment. This is why the French government is launching a Worldwide Innovation Challenge. The goal is to foster talent and bring out future champions of the French economy. It will accomplish this by identifying and providing support for the growth of both French and foreign entrepreneurs whose innovation projects have significant implications for the French economy. This Challenge will encourage the talents of today in order to create the collective wealth of tomorrow, whether these talents are in France or abroad. The French government thus hopes to attract the world's best talents, so they can complete their projects in France."

In practical terms:

> - On April 18, 2013: the Prime Minister commissioned Anne Lauvergeon to identify technological and industrial challenges that will face society in 2030 and to propose a method to stimulate the creativity of entrepreneurs around these challenges. Most public investment will come from the Commissariat-General for Investment (the structure that runs the Investment for the Future Plan);
>
> - October 11, 2013: The Commission "Innovation 2030" singled out 7 ambitions based on societal expectations and growth sectors: Energy storage, Recycling of metals, Development

[9] Cf. http://www.redressement-productif.gouv.fr/files/nouvelle_france_industrielle_english.pdf

[10] http://innovation-2030.dgcis.gouv.fr/en/

of Marine Resources, Plant protein and plant chemistry, Personalised Medicine, Silver economy, Big data.

- On December 2nd, 2013: launch of the call for proposal, under the Chairmanship of the President: open to all innovators as long as they want to grow their business in France

- On March 20, 2014: 58 projects selected for stage 2 (626 proposals received)

A 3-stage procedure, with an international jury:

Stage 1. "Amorçage" (seeding/priming): up to €200,000;

Stage 2. Accompagnement (coaching): up to 10 times the seeding funds to develop the project further: opening of the specific call for proposal on December 14, 2014

Stage 3. Development (industrialising and marketing): up to 10 times as much as for stage 2.

2.3 Research and Innovation system changes

Over the last two years, the most significant changes of the research and innovation system are intertwined with the current evolution of the legal policy context (see "Recent policy developments" on the law on research and higher education 2013). Indeed, the law touches upon R&D performers which, according to the forthcoming new national strategy for research (dubbed 'France Europe 2020') will have to modify their research priorities in order to better meet societal challenges, in the context of the European research policy framework. The law also touches upon advisory and evaluating bodies, with the removal of the HCST and of the CSRT, replaced by the Strategic Research Council, and with the removal of the AERES, replaced by the High Council for the Evaluation of Research and higher Education (both changes details below in §2.4). The law also aims at improving the university system's organisation, giving university groupings (i.e. 'communities') the power to develop 'site policies'. In addition to these changes that relate to structures and institutions, the new government strengthened the research and innovation policy implemented by the former government with the influential Commissariat-General on the Investments and a preserved R&D tax credit's architecture.

2.4 Recent Policy developments

The essential policy measures are included in the new Law on research and higher education, promulgated on the 22nd of July 2013. The preparation of the law has started with a large consultation process of the interested parties dubbed "les Assises" (i.e. equivalent to round table foundation process) of research and higher education, carried out from July to December 2012. The process resulted in a report used as the key input to the law. The on-going reformation modifies key components of the system's organisation and deal with technology and knowledge transfers.

- The system's organisation is meant to radically change on the following 5 aspects:
    - *A new National Strategy for Research*. There will also be a strategy for Higher Education, the Ministry being responsible for developing both. Through selected abstracts of the law, let us be more specific about the National Research Strategy (dubbed

"France Europe 2020"): "A national research strategy, with a multiannual programming is developed and revised every five years under the coordination of the Minister of research [...]. This strategy aims to meet the scientific, technological, environmental and societal challenges while maintaining a high level of basic research. It includes the valorisation (commercialization) of research results [...] and oversees the development of innovation, technology transfer, capacity and expertise.

Priorities are adopted after consultation with the scientific and academic community, social and economic partners [...] relevant ministries and local authorities, in particular the regions. The Minister for Research ensures consistency of the national strategy *with that developed in the framework of the European Union*[11] and that sensitive information for strategic competitiveness and national interests are preserved.

As regards the set of societal challenges that are meant to drive the National Research strategy, the articulation with Horizon 2020 is rather straightforward as the following table illustrates:

Table 2. Correspondence table: 'France Europe 2020' – 'Horizon 2020' grand challenges

#	FRANCE EUROPE 2020	#	HORIZON 2020
1	Sober resource management and adaptation to climate change	**5**	Climate Action, Environment, Resource Efficiency and Raw Materials
2	Secure, Clean and Efficient Energy	**3**	Secure, Clean and Efficient Energy
3	Stimulating industrial renewal	**KETs2**	Leadership in Enabling and Industrial Technologies [Key Enabling Technologies (KETs)]
4	Health and wellbeing	**1**	Health, Demographic Change and Wellbeing
5	Food Security , Demographic challenge, biotechnologies	**2**	Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the
		KETs3	Bioeconomy
6	Mobility and sustainable urban systems	**4**	Smart, Green and Integrated Transport
7	Information and communication society	**KETs1**	Information and communication technologies
8	Adaptive, inclusive and innovative societies	**6**	Europe in a changing world - Inclusive, innovative and reflective societies
9	A spatial ambition for Europe	**KETs4**	Space
10	Freedom and security in Europe	**7**	Secure societies – Protecting freedom and security of Europe and its citizens

Source: Alain Quevreux, *Lettre Européenne de l'ANRT*, #258, 2013.

The National Research Strategy and the conditions for its implementation are subject to a biennial report of the Parliamentary Office for Evaluation of Scientific and Technological Choices [...], which includes an analysis of the effectiveness of public aid to private research. [...] Multi-year contracts with research organizations and higher education institutions, the programme of the National Research Agency and other public research funding contribute to the implementation of the national strategy for research. The Parliamentary Office for Evaluation of Scientific and Technological [...] contributes to the assessment of the implementation of this strategy."

The national strategies, one for higher education and one for research are presented by the government to Parliament every five years, in the form of a White Paper on

[11] The emphasis is ours.

higher education and research. The preparation of the national research Strategy will be a permanent process, for which a new Council is to be set up: "The Strategic Research Council":

> "The Strategic Research Council is responsible for proposing the broad national strategy for research and [...] involved in the evaluation of their implementation. [It] is chaired by the Prime Minister or by delegation by the Minister of Research."

The Strategic Research Council was established on 19 December 2013, replacing the High Council for Science and Technology (HCST), founded in 2006. The Council will include 16 to 24 members, and will strictly respect gender equality. The Strategic Research Council shall meet at least once a year at the initiative of its President, who determines the meeting agenda. Meetings may also be held at the initiative of Vice-President, including when dealing with a question of the Prime Minister or the Minister for Research.

- *'Site policy' and higher education institution groupings*. PRES (Higher education and research institutions clusters, which used to stand for Pôles de Recherche et d'Enseignement Supérieur) are removed and replaced by Communities of Universities and Institutions (CUE, Communautés d'Universités et d'Etablissements) which consist of a board of directors, an academic council and board members. A single contract per site is to be signed with the Minister. This shall greatly simplify implementation since there will be 30 contracts instead of a hundred today. This "site contract" includes a "common component" and "the specific features of each institution." Three types of groups are planned: the merger, the university community and the association. Current PRES have a year to change status.

- *Roles of regions*. The law transfers to regions both the mission and the budget to develop and disseminate scientific, technical and industrial culture, especially among young audiences. The regions also define "a regional plan for higher education, research and innovation, which determines the principles and priorities of its activities"; the regions' initiatives shall fit into "the context of national strategies". In addition, regions shall be associated with the preparation of the multi-year site contracts.

- *University governance*. One of the most remarkable and much debated novelties is the acceptance of 'externals' as voters – the list of which may evolve over time– for the election of the president of the university. In addition, an Academic Council is established (chaired, or not, by the president of the university); the latter is the reunion of the Scientific Council and of the Board of Studies and University Life, which is given a decisive role. The Academic Council is responsible for the allocation of resources, the adoption of rules for examinations and rules of evaluation of teaching, laboratory operation or examination of individual issues relating to recruitment, placement and career of teachers and researchers. Board composition is rebalanced in favour of students, technicians and support functions. Parity is set for the elections. A board of directors of components (institutions parts of the whole) complement the university governance.

- *High Council of the evaluation of research and higher education*. The Aeres is removed, replaced by a High Council of the Evaluation of Research and Higher Education, as an independent administrative authority. The High Council is responsible for the evaluation of institutions, research units and training and "assesses or guarantees the quality of evaluations conducted by other agencies." Regarding staff evaluation, the high Council shall "ensure that it takes into account all of their missions." It is run by a 30 member-board, consisting of 9 staff proposed by the evaluation bodies, 8 proposed by public research institutions, 2 student representatives, 9 qualified persons (3 of whom must come from private research) and 2 MPs.

- As regards PhDs, and knowledge and technology transfers :

  - *PhDs*. The law requires that civil servants 'A Class' competitions are adjusted to allow the participation of PhDs and to follow up on this through an annual report to Parliament. A new possibility is also given to PhD holders to access ENA provided that they have at least three years of professional experience, and access ENA internal competition provided that PhD holders were funded through a "doctoral contract". In the private sector, negotiations for the recognition of the PhD in sectoral collective agreements should be completed by 1 January 2016.

  - *Knowledge transfer*. The transfer of research results to the service of society is added to the mission of higher education and research. A new book on transfer activities should complement the Code of Research. It will be added through an order, made within a year after the publication of the law. The law already provides that inventions resulting from publicly funded research should preferably be commercialised through SMEs and ETIs on European territory.

This mix of policy measures ensures that the French R&I system continues its moulting, started roughly 10 years ago. It is not clear yet which of the objectives assigned to the research and innovation system, often too broad and ambitious, will be achieved. Research institutions' staff and governance bodies at large get more and more accustomed with the idea of participating in a system that has to be effective; society demands it. A consensus is emerging on two specific issues where there is room for improvement: autonomy of the various components of the R&I system; evaluation institutions and processes.

2.5 National Reform Programme 2013 and R&I

Assessing the progress made this year for the five domains of NRP recommendations (Sustainable public finances; Competitiveness of French economy costs and non-costs aspects; competition in the services sector and certain networks; Taxation; Labour market) goes beyond the expert's competence and beyond the purpose of this paragraph. The following can nevertheless be emphasised. In line with the NRF recommendations for France, regaining competitiveness on the international scene is a guiding principle for the current government. Notably, following the presentation of the **National Pact for Growth, Competitiveness and Employment** in November 2012, costs and non-costs competitiveness are a must of the President's decisions and of many Ministries' initiatives. This can be illustrated with the R&D tax credit, which will remain stable in its architecture during the whole presidency, in spite of the necessary parliamentary yearly debate. Preserving and improving the attractiveness of the French

research and innovation system are at stake with this simple and efficient tax policy. This was recently acknowledged by the OECD (Supporting Investment in Knowledge Capital, Growth and Innovation, October 2013). In addition, the '**34 industrial plans'** are typically oriented towards R&D high technology readiness levels projects supporting the development of export-oriented networks and partnerships. The Lauvergeon '**Innovation 2030'** Plan has, for the very first time, opened the competition to international companies' project-leaders candidates. Innovation, entrepreneurship and attractiveness are major drivers of competitiveness gains. The French RIS is under a heavy pressure: strong impacts are expected.

2.6 Recent evaluations, consultations, foresight exercises

From a cultural viewpoint, a noteworthy evaluation was launched in November 2012: Jean-Luc Beylat (CEO of Alcatel Lucent Bell Labs France) and Pierre Tambourin (CEO of the Genopole) were entrusted to a mission aiming at optimising the French system of transfer and innovation, which was reported to "*look like an incoherent mille-feuille*". On the beginning of April 2013, the report was submitted to three ministers, the Minister of Higher Education and Research, the Minister for Productive recovery and the Minister Responsible for SMEs, Innovation and the digital Economy. Entitled "**Innovation, a major challenge for France**", it proposes an original reflection on the multiplicity of levers of innovation (including taxation, culture of innovation, support structures, etc.). Although the applicability of the recommendations has been disputed, it nonetheless provides solid evidence of the relevance of a systemic approach on national innovation policy implementation issues. This is first in such a high level report in France.

In July 2012, the French government has launched the so-called 'Assises' (foundation process) on Higher Education and Research. The Assises resulted in a report which was eventually used as a basic input for the law, promulgated on 22 July 2013. The consultation process has involved a wide range of stakeholders. Major French HEIs and PROs have produced contributions. Over the months, 106 institutions' representatives have been auditioned by the National Steering Committee; regional round tables have been organised to debate the propositions; more than 3000 organisations and individuals contributed on the website; finally, on November 26th and 27th, the concluding national round table gathered over 600 people, who debated the propositions that emerged from the regional 'round tables'.

The **law on Higher Education and Research** built on these propositions. Nonetheless, even though it is still too early to form a comprehensive opinion, some preliminary comments may already be put forth about the law "as voted".

As early as June 2014, a first agenda of the new **National Research Strategy** is to be published. It is foreseen that it would build upon foresight exercises and SWOT analyses that the five coordination bodies of public research (health, digital, environment, energy, humanities and social sciences), labelled "Thematic Alliances", and the CNRS have carried out. As a matter of fact, the production process of the National Research Strategy shall rely on contributions from the Alliances, which were submitted to the Ministry of Research in July 2013. Discussing the quality of the material would lead us beyond the purpose of this report. There are on-going efforts, encompassing a wealth of institutions and stakeholders' inputs, aiming at the production of a first version of the National Research Strategy. This should be published by the end of the first semester 2014.

Two additional foresight-based recent policy documents are worth-mentioning: "**34 Industrial Reconquest Plans**" and "**A principle and 7 ambitions for innovation**".

Presented on 12 September 2013 by President Hollande, the **34 sector-based initiatives** were chosen based on a thorough analysis of global growth markets and a detailed examination of the role of France in each of these world markets. The preparation was supported by McKinsey in connection with the Pôles de Compétitivité and strategic committees sectors ("comités de filières") within which companies, social partners, governments and professional associations are active. Each plan will be run like an industrial project, with a project leader coming from the industry (in 80% of the instances) with a direct interest in the commercial success of the endeavour. The "industrial plans" deal for instance with smart grids, the 2-liter-per-100km car or biofuels and green chemistry; in the President's wording the plans will provide "new ways to move around, new ways to heal us, to carry us, new ways of producing, of consuming, to feed us, to dress us...". Whereas the overall budget cannot be fixed beforehand, an estimation made by the Ministry of Industry is €4 billion, when cumulating inputs from various sources, including from the Investments for the Future Plan.

The policy report "**A principle and 7 ambitions for innovation**" results from the Innovation 2030 Committee, chaired by Anne Lauvergeon (former president of AREVA). The Committee was installed by President Hollande on 19 April 2013. The Committee's 'terms of reference' was to identify sectors and technologies where France is likely to occupy leadership positions in 2030, focusing on the activities that meet the future needs of society, create the greatest value and more jobs in France. Published on 11 October 2013, the report suggests seven 'disruptive ambitions': storage of energy; recycling of materials; exploitation of marine resources (metals and desalination of sea water); vegetable proteins and plant chemistry; individualised medicine; silver economy and innovation for longevity; big data. The proposal is also disruptive in its form since it includes an appeal to foreign investors through seven international open competitions. The latter shall be launched on 2 December 2013. Project leaders have three months to file a case. The winners - a few dozen - will then have a year to mature their project, supported by a grant of €200 000. In 2015, the most promising projects, eventually selected, will start. Welcoming foreign holders of projects, provided that they invest in France, is quite a break in France's usual practices. On the whole, public funding will amount to €300 million, coming from Investments for the Future Plans 1(started in 2010) and 2 (as of 2014), in similar proportions.

2.7 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)

In France, interactions of regional, national and European research and innovation policies follow principles that might usefully –though briefly- be recalled. So far, seven-year contracts called a State-Region Projects Contract (CPER) organise most relationships, since CPER set financial credits to meet regional policy objectives. One chapter of these contracts is dedicated to higher education and research; another is dedicated to innovation and economy. These are two different Regional Schemes that need to be adopted by Regional Councils. Regions are currently at it for the period 2014-2020. The design of the new generation of CPERs has been synchronised with the European Structural Funds programmes. CPERs focus on competitiveness, on attractiveness of territories as places to do business, on the promotion of sustainable development and on territorial and social cohesion.

Smart specialisation has become an important concept in French innovation regional policy. In

2013, regional stakeholders ordinarily cite Smart specialisation strategies (S3) as a guiding principle for their innovation strategic plans. The need to formulate regional projects candidate for European regional funding in the framework of a smart specialisation strategy strongly encourages its use; conditionality is an effective means for dissemination.

National public policies have also contributed to the wide spreading of this concept. In the first place, the Interministerial Delegation for Territorial Development and Regional Attractiveness (DATAR) is developing public measures for supporting regions in their shift from former regional innovation strategies (RIS) towards smart specialisation strategies. DATAR has issued in November 2012 a call for proposal for elaborating a didactic and methodological guide on smart specialisation for preparing future operational programmes 2014-2020 in the framework of a strategy of "smart specialisation".

This guide is designed for:
- Introducing the concept of "smart specialisation";
- Clarifying the function assigned to the "S3" in the implementation of the future European policies and the strengthening of their synergies;
- Presenting the logic of "smart specialisation" in the vision of the next generation of policy cohesion and future operational programmes;
- Identifying the evolution from Regional Innovation Strategies to smart specialisation-based innovations strategies;
- Providing step by step methodological elements for developing S3.

Above all, national policies have already laid bases that will foster smart specialisation. The regional innovation strategies elaborated by all French regions in 2008-2009 provide a sound stepping stone for smart specialisation. As the box "Rhône-Alpes' innovation strategy with regard to smart specialization for period 2014-2020 below illustrates, French regions are now focusing on some of sub fields of these areas.

Table 3. Positioning of French regions according to the thematic areas identified in the RIS

Thematic areas	Regions
Biotechnology, Nanotechnology, Life Sciences	Auvergne, Haute-Normandie, Île-de-France, Rhône-Alpes
Preservation of the environment, Management of resources, biodiversity, Risk Prevention	Alsace, Basse-Normandie, Corse, Guadeloupe, Guyane, Île-de-France, Languedoc-Roussillon, Lorraine, Martinique, Midi-Pyrénées, Nord-Pas-De-Calais, Pays-de-la-Loire, Picardie, Provence-Alpes-Côte-d'Azur, Réunion, Rhône-Alpes
Aeronautics and Spatial	Guyane, Île-de-France, Corse, Midi-Pyrénées
construction industry	Île-de-France, Nord-Pas-De-Calais, Picardie, Provence-Alpes-Côte-d'Azur, Réunion
Mobility, Transport	Auvergne, Île-de-France, Haute-Normandie, Nord-Pas-De-Calais, Picardie, Poitou-Charentes, Provence-Alpes-Côte-d'Azur
Innovation through services, Engineering, Social Sciences and Humanities	Alsace, Centre, Guyane, Haute-Normandie, Limousin, Martinique, Nord-Pas-De-Calais, Réunion, Rhône-Alpes
Health Care	Auvergne, Auvergne, Basse-Normandie, Île-de-France, Haute-Normandie, Languedoc-Roussillon, Lorraine, Martinique, Midi-Pyrénées, Nord-Pas-De-Calais, Pays-de-la-Loire, Picardie, Provence-Alpes-Côte-d'Azur, Réunion
Tourism	Corse, Guadeloupe, Languedoc-Roussillon, Réunion

Energy	Centre, Corse, Guadeloupe, Haute-Normandie, Nord-Pas-De-Calais, Pays-de-la-Loire, Réunion, Rhône-Alpes
Materials, Mechanics, Chemistry	Basse-Normandie, Champagne-Ardenne, Guadeloupe, Haute-Normandie, Limousin, Lorraine, Midi-Pyrénées, Nord-Pas-De-Calais, Poitou-Charentes
Agro-food, Agro-resources, Fishery	Limousin, Martinique, Midi-Pyrénées, Picardie, Poitou-Charentes, Réunion
ICT, Informatics, Digital, Complex Software, Electronics	Basse-Normandie, Corse, Guadeloupe, Île-de-France, Languedoc-Roussillon, Limousin, Lorraine, Midi-Pyrénées, Nord-Pas-De-Calais, Pays- de-la-Loire, Poitou-Charentes, Provence-Alpes-Côte-d'Azur, Réunion
Creative industries	Île-de-France, Nord-Pas-De-Calais, Poitou-Charentes

Bourgogne, Franche-Comté and Bretagne regions do not appear in this thematic table as they have chosen cross-functional approaches for supporting innovation for their RIS, such as training, networks building etc.

Through a series of calls of excellence such as IDEX (Initiatives of excellence), launched in the framework of the "Investments for the Future Plan", most regions have already selected the scientific and technological fields they have chosen to specialise in.

In September 2013, Ile-de-France has published a first version of its regional innovation smart specialisation strategy, entitled "Designing the regional version of the S3 to implement the Paris OP 2014/2020". On 4 October 2013, Rhône-Alpes has presented and published its regional innovation strategy with regard to smart specialisation. The document details the method used to construct this strategy with elements of "diagnosis of the regional innovation ecosystem". The following box summarises some of the main dimensions of the strategy.

Box 1. Rhône-Alpes' innovation strategy with regard to smart specialisation for period 2014-2020

In terms of the diagnosis:
Rhône-Alpes hosts 12 clusters and 12 "Pôles de compétitivité", recognized as effective or very effective. The region's support amounts to €15 million euros per year, which led to the completion of more than 350 innovative projects. Other key mentioned qualities are a dense economic network with high potential for technological innovation. However, among the weaknesses are cited a disappointing participation in the Seventh Framework Programme, and room for improvement for investments in public and private R&D, which are still below Lisbon targets. Finally, Rhône-Alpes is the third French region for R&D expenditures (12 % of national spending) and ninth in Europe; with regard to patenting activity, the region is the second largest in France and ranked tenth in Europe.

In terms of the method:
The Rhône-Alpes strategy was built upon the regional innovation ecosystem diagnosis. It was notably carried out through six benchmarks, including three in situ (Baden-Württemberg, Helsinki and Stockholm). As regards consultation and involvement of stakeholders, there have been more than 400 participants, including 20% of companies. 70 written responses were incorporated to the first version of the regional strategy established in July, before sending the final draft to the European Commission in September.

Areas of smart specialisation
Region Rhône-Alpes has chosen seven areas of smart specialization where it has industrial and

scientific critical mass and visibility at European level. They will be regional investment priorities until 2020. And, all public support combined, one billion euros will be spent in total over the six years to develop the innovation strategy of Rhône-Alpes. When selecting the projects to be supported, the region will be cautious to that all stakeholders (universities and research centres, businesses, governments and consumers) are involved. The seven areas of strategic innovation are :

- Personalised medicine, infectious and chronic diseases;
- Industrial and eco-efficient factory processes;
- Networks and storage of energy;
- Intelligent energy-efficient buildings;
- Uses technology and intelligent mobility systems ;
- Digital and caring systems technologies;
- Sports, tourism and development of mountain.

Source: Selected excerpts from « Stratégie d'innovation de la Région Rhône-Alpes au regard de la "Spécialisation Intelligente ". *Innover pour répondre aujourd'hui et demain aux besoins des Rhônalpins », September 2013.*

The other regional innovation strategies with regard to smart specialization will be published in the first quarter of 2014.

2.8 Policy developments related to Council Country Specific Recommendations

The Council recommendations on France's 2013 national reform programme and stability programme for 2012-2017 emphasised a key objective that can be associated with an increase of the performance of the French research and innovation system: the improvement of non-price competitiveness (cost-competitiveness is not excluded though). This relates to the quality of the business environment or, put differently, to the **framework conditions for innovation**.

A wealth of measures has been taken within this area of progress in 2013, many of which will continue to deliver results in the coming years. Many are consequences of the implementation of the National Pact for Growth, Competitiveness and Employment (November 2012). To mention but a few:

- The **Tax Credit for Employment and Competitiveness (CICE),** whereby innovation expenses are supposed to be the core of the eligible scope. It is in place since January 2013, and will represent €10 billion in 2013, €15 billion in 2014 and €20 billion in 2015.
- The creation of a national public investment bank, **bpifrance,** with an endowment of €21 billion dedicated to the improvement of access to finance, in terms of capital-risk and of capital development (including exports) for SMEs and mid-tier companies;
- The **shift of the Competitiveness clusters policy**, whereby the Pôles should become "factories of future products and services (vs. factories of new projects), as described by the Communication of the Council of Ministers on 9 January 2013. The clusters shall also contribute to the strengthening of the relations between SMEs and large groups, paying particular attention to the area of procurement. Efforts and progress will be more carefully monitored for the next six years, with a 'contract of individual performance' for each Pole.
- "34 Plans of Industrial Reconquest" were launched by the Minister of Industry, on the 7th of October 2013, partially relying on the Investments for the Future budget, and as a by-product of the "Filières strategy" of the National Industry Council.

Last but not least, thanks to permanent schemes such as **R&D tax credit (CIR)** and **CIFRE (Conventions Industrielles de Formation par la Recherche)** – and the two are complementary in terms of fiscal benefit– for instance, PhD studies and research experience are being more and more attractive as compared with other large economic regions. They contribute to further fostering linkages between private companies and research institutions.

3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

This chapter is aimed to assess the performance of the national Research and innovation system and identify the structural challenges faced by the national innovation system.

3.1 National Research and Innovation policy

As notably shown in Table 4, France's research and innovation policy is evolving so as to maximise the effectiveness of its long standing scientific strengths. In other words, specific input indicators are positively oriented thanks to dedicated policy actions which so far do not fully translate into output indicators. Hence the evolution of policies described in this report aiming at favouring this translation process: better promotion of research careers, better career opportunities for doctorate holders (especially in enterprises), which are the first steps towards better links between public research and industry, new funding and evaluation agencies and mechanisms, Competitiveness Clusters1, autonomy of universities, amplifi ed Research Tax Credit (CIR), programme Investments for the Future and the strengthening of public– private cooperation and the valorisation of research results.

Table 4. National research and innovation system key indicators of performance

HUMAN RESOURCES		
New doctoral graduates (ISCED 6) per 1000 population aged 25-34	**1.6**	*In 2010 ; + 7% from 2009*
Percentage population aged 25-64 having completed tertiary education	**29**	*In 2010; EU average : 28*
Open, excellent and attractive research systems		
International scientific co-publications per million population	**683**	*2011; + 3% from 2010*
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	**10.3**	*2008; +3% from 2007*
Finance and support		
R&D expenditure in the public sector as % of GDP	**0.81**	*2012; stable*
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)*	**€232 m**	*2012*
FIRM ACTIVITIES		
R&D expenditure in the business sector as % of GDP	**1.45**	*2012; slight increase*
Venture capital and seed capital as % of GDP	**0.032**	*2012; decreasing*
Linkages & entrepreneurship		
Public-private co-publications per million population	**49**	*2011*
Intellectual assets		
PCT patents applications per billion GDP (in PPS€)	**4.2**	*2009*
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health) to the EPO	**0.97**	*2008*
OUTPUTS		
Economic effects		
Medium and high-tech product exports as % total product exports	**4.65**	*2011*
Knowledge-intensive services exports as % total service exports	**32.6**	*2010*
License and patent revenues from abroad as % of GDP	**0.57**	*2011*

*: As measured by **bpifrance** expenditures in capital innovation (capital-risk and seed capital) in 2012

3.2 Structural challenges of the national R&I system

According to IU scoreboard 2013, in terms of innovation performance, France is within the group of 'Innovation followers'[12]. Member States of this group show a performance above or close to that of the EU27 average. This mediocre ranking has not changed at least since EU Innovation scoreboard 2007.

Other recurrent rankings that account for innovation inputs to monitor global economic/innovation performance give an even darker picture: the country performance can be described as declining. France's decline in terms of performance of innovation is reported in Insead Global Innovation Index, to The World Economic Forum's Global Competitiveness Report, or in other specific reports with a multi-factorial approach (cf. e.g. the UNCTAD World Investment report).

As a consequence, over the last years, there has been a profound renewal of the research and innovation policies. Still, much remains to be done and it would be justified to intensify efforts. And indeed two noticeable changes have occurred in policymakers' mind in the last two to three years in terms of the approach to this problem.

In government circles, it has become common knowledge that **the whole system is responsible**: there is not one single detectable cause. As indicated above, the report "Innovation, a major challenge for France[13]" of April 2013 examined the key issues of the research and innovation with a systemic approach. As a result, they require **systemic policy measures,** some of which are listed in the report. The second significant change is the practical recognition of **competitiveness as a vital economic objective**, as stated in the National Pact for Growth, Competitiveness and Employment. The connection with the innovation and research system is explicitly made, as is visible in the 'France Europe 2020' strategic agenda (May 2013):

1. Mobilising research stakeholders on major societal challenges;
2. Remodelling coordination and direction of research in France;
3. Promoting technological research;
4. Developing training and digital infrastructure;
5. Promoting innovation and technology transfer;
6. Internalising scientific culture;
7. Programming research and innovation according to national strategic priorities;
8. Building coherences around research and innovation sites;
9. Increasing the presence of French research at European and international levels.

Each of these nine action lines correspond to a partial answer to some of the most important challenges of the French research and innovation system. 'France Europe 2020' (May 2013) details a set of associated measures. Convergent recommendations were made by the "Innovation, a major challenge for France" (April 2013) report and, earlier on, by the Ministry of

12 Together with Austria, Belgium, Cyprus, Estonia, Ireland, Luxembourg, Netherlands, Slovenia and the UK.

13 Which was submitted to three Ministers, given the crosscutting nature of the topic: the Minister of 'Higher Education and Research', to the Minister for 'Productive recovery' and to the Minister 'Responsible for SMEs, Innovation and the digital Economy'.

Research and Higher Education in November 2012[14]. In a condensed manner, we identify four structural challenges:

1. Insufficient culture of innovation;
2. Unsatisfactory relationships between the education system and the business and industrial world
3. Lack of efficiency of technology and knowledge transfer to industry;
4. Limited use of evaluation and assessment tools to monitor socio-economic impacts of research and innovation policies;

3.3 Meeting structural challenges

Table 5. Structural challenges and potential policy answers

Challenges	Policy measures/actions addressing the challenge [15]	Assessment in terms of appropriateness, efficiency and effectiveness
1. *A culture of innovation.*	>Levers to trigger **cultural changes to improve a country innovation's abilities** include collective actions, supported such as: . the development of associations dedicated to entrepreneurs "rebound", such as those gathered under the umbrella of the web portal " portail du rebond des entrepreneurs, portaildurebond.com" . Organisation of conferences, supported by public policy and HEI such as : "bouncing entrepreneurs",13 January 2014, supported by the Minister for SMEs, Innovation and the Digital Economy . Links with challenge #2.	High level of appropriateness *Both effectiveness and efficiency will be hard to assess (incl. regarding simple questions such as: who, when and how much)*
2. *Closer connections between the education system and the business and industrial world.*	> **Sensitising** pupils and students at all along the educational path to enterprises' functioning and business life and entrepreneurship . cf. first two recommendations of 'Innovation, a major challenge for France' (November 2012): - 1. Revise teaching methods in primary and secondary education to develop innovative initiatives 2. Establish a large-scale program for entrepreneurship learning in higher education	High level of appropriateness *Much remains to be done before any evaluation of the effectiveness and efficiency*
3. *Better science-industry links: efficiency of technology and knowledge transfers to industry.*	> Implementing **open innovation** measures: ."15 measures for a new transfer of public research dynamics, lever for growth and competitiveness" (November 2012; and in the chapter of the France Europe 2020 strategic agenda, May 2013); . IRT (Instituts de Recherche Technologique, with their thematic variant "Instituts pour la Transition Energétique", ITE), public-private technological research labs (IRT+ITE~20) ; . SATT(Sociétés d'Accélération du Transfert de Technologies), national coverage to commercialise research results to companies (SATT~10) . CEA-Tech, network of 5 local units, aiming a bringing the best key enabling technology from CEA Research Centres (Leti, List, Liten) to SMEs in five regions.	High level of appropriateness: *According to Commisariat-General for Investment, apparently rather good effectiveness; too early to assess efficiency* *In any instance : lack of transparency (cf. Challenge #4)*
4. *Use of evaluation of research and innovation policy.*	> Implementing consistent, **independent** and **cross-ministerial evaluations** and **monitoring** of **innovation and research policies**: a whole new **evaluation scheme** including : . The "Evaluation of Innovation Policies Committee" implemented	High level of appropriateness. *Both effectiveness and efficiency*

[14] Entitled "15 measures for a new transfer of public research dynamics, lever for growth and competitiveness", presented at the Council of Ministers of the 7th of November 2012. Nota: The measures are taken on board as such in "France Europe 2020".

[15] Changes in the legislation and other initiatives not necessarily related with funding are also included.

	within the Commissariat-General for Strategy and Foresight (as of 4 November 2013): whose mission to assess the French innovation system as a whole and in its parts, both on the basis of available reports and overseeing new studies; all reports will be made public. . The new High Council of the Evaluation of Research (established 1 November 2013); . Strategic Research Council (installed on 19 December 2013) . Growing number of published R&I evaluations (notably by the Court of Auditors, and other evaluation bodies) benefit from a large public attention.	*are globally improving; too early as regards this new initiative*

4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

4.1 Strengthening the knowledge base and reducing fragmentation

Promoting excellence in education and skills development

According to the Ministry of Research and Higher Education (cf. 'Etat de l'emploi scientifique en France 2013', July), the scientific population represented just over 393,000 full-time equivalents (FTE) in 2010. Between 2000 and 2010, this population increased by 23%. The researchers' part alone amount to nearly 240,000 FTEs, i.e. a 42% augmentation from 2000.

The average annual increase in the number of researchers has been 3.8% over the 2000-2010 period. Germany and the United Kingdom have respectively a growth rate of 2.4% and 4.2%. This growth is mainly explained by the increase of private sector's researchers. Between 2000 and 2010, the number of researchers in the public sector grew by 13.7% whereas over the same period the private sector grew by 72.7%. As a result, in 2010, business researchers represent 58 % of the total researchers' population.

When the number of researchers is compared with the active population, small Nordic countries perform particularly well; such is the case as in Finland and Sweden, with respectively 15.4 and 9.9 researchers per thousand employees. With 8.5‰, France ranks below Japan (10.0 ‰) and the United States (9.1 ‰), but is ahead of Germany (7.9 ‰), the UK (8.2 ‰) and Spain (5.8 ‰) and above the European Union average (6.6 ‰).

The crisis has had no obvious impact on the number of researchers. Between 2000 and 2010, the top five countries in terms of the number of researchers have remained the same, respective positions unchanged. In 2010, the first row are the United States (nearly 1,413 million researchers), China (1,211 million), Japan (656 000), the Russian Federation (442 000) and Germany (328 000), the United Kingdom (256 500) and South Korea (264 000). France has the eighth largest researchers' population in the world with 239,613 researchers (FTE). Without going into the details of the various dynamics, one may notice that the number of researchers has grown by 3.6% per year in France, which is above the European Union average (3%), and far from the United States' (1%) and Japanese (0.1%) annual growth rates.

Measuring the international mobility of researchers is tricky because comparability of indicators across countries is limited. A few basic facts can be put forth. France is an important host country for researchers: in 2011-2012, more than 40% of doctoral students in France are citizens of another country. Even though doctoral students from Asian countries grew very significantly (31% of the population), doctoral students from African countries still remain the major part of the population (36%). Moreover, France is the second European host country after the United Kingdom in terms of PhD students from the European Union.

Hosting capacity of senior researchers as measured by the length of their stays (+/- 3 months) complement this view. In 2011, about 4,600 'scientists visas' have been issued to researchers

from outside the European Union or European Economic Area: 39% were stays shorter than 3 months, 61% for longer stays. Four countries account for nearly half of the scientists visas issued for durations above 3 months: China, India, the United States and Brazil.

The share of foreigners among researchers in French institutions (including university teachers-researchers) also illustrates France's scientific attractiveness. On average, foreign researchers account for about 10% and 15%. This proportion is expected to increase over time because it is higher among winners in recruitment competitions, where it stands at between 15% and 30%.

In terms of the researchers' posts advertised through the EURAXESS Jobs portal, France is in the 'Second League', with 37.5 per thousand researchers in the public sector in 2012 (from 39.0 in 2011). This is slightly below EU average.

When assessed through the adoption of the European Charter of Researchers and Code of conduct for employers and from the obtainment of the label HR Excellence in Research, modest progress is being made, if any. For years, only one French employer of researchers has obtained the HRER label: INRA. If, more recently, over the last 5 years, many organisations have made spectacular progress, there is still room for improvement, notably in adopting more widely the simple and efficient principles laid down in the Charter and the code.

Research Infrastructures

In 2012, the Ministry of Higher Education and Research has implemented a new governance and management system of Very Large Research Infrastructures. Its steering committee is responsible for the preparation of France's participation in major international infrastructure, with the support of the High Council of Very Large Research Infrastructures.

France adopted a national research infrastructure Roadmap 2012-2020, the ambitions of which are:

- to explain the French Government's political orientations regarding infrastructures;
- to draw up a global governance scheme adapted to the coordination requirements of the various operators;
- to propose flexible and reactive annual updating procedures for all of the infrastructures (annual dashboards) together with, for the large infrastructures, an exhaustive financial follow-up concerning all costs.

The Roadmap provides a dashboard of the French collaboration on international research infrastructures:

Table 6. Key figures of French participation in research infrastructures international collaboration programmes

International organisations in which France is involved	CERN, ESO, EMBL
Percentages of ESFRI infrastructures with French participation	100% of the infrastructures in the implementation phase
Number of very large infrastructures (international agreements, European, inter-ministerial)	18
Number of facilities	45
Number of projects	7

Source: "Chiffres clés des infrastructures en France en 2013", Infrastructures de recherche, October 2013.

For its major part, 'Research infrastructures 2012-2020' is a progress report like document, which specifies the projects research domain by research domain (e.g. Materials science and engineering, Digital sciences and mathematics, etc.). Governance is the second dimension of the report; it deals with the participation in the governance of international organisations, and in the governance of very large research infrastructure. Progress is difficult to measure.

4.2 Getting good ideas to market

Improving access to finance

Improving access to finance for R&D and innovation, and particularly for SMEs, is the very purpose of **bpiFrance**, a new public investment bank created by law of 31 December 2012. In July 2013, bpifrance received a total capital of €21 billion. As bpifrance describes them, its most important support activities, basically financial products, are:

- *Equity investment*. It aims at bringing a minority investor in public capital to sustain small companies' business and boost its development;
- *Contract participatory development*. It aims at helping SMEs and ETIs to build their own funds for development projects. .
- *Pre-financing of the research tax credit*. For innovative SMEs to have immediate cash to cover R&D expenses for current fiscal year, an interest rate being applied.
- *Pre-financing of CICE*. same system as with RD tax credit, immediate cash-in;
- *Guaranteed cash loans*. This is the second measure of the National Pact for Growth, Competitiveness and Employment: bpifrance provides guarantees to any bank that lends to medium term (2-7 years) to his SME client to alleviate its short-term debt.
- *Innovation loan*. Aiming at helping SMEs finance their industrial and commercial development in France or abroad, even in the absence of collaterals.
- *Bpifrance export loan*.

Even though there are other measures, bpifrance is a major change: it is a unique centralised entry point to finance for innovative SMEs. It covers all their development needs, from '*caprisk*' to '*capdev'*. As described in the bank documentation, there is a limited number of well-targeted, clearly differentiated, and easy to access support schemes. The funding support is tailored to meet SMEs needs. Selection criteria are straightforward.

Protect and enhance the value of intellectual property and boosting creativity

On several aspects, the French intellectual property framework conditions are both stable and improving.

To start with, it may be usefully reminded that the R&D tax credit framework has rather valuable clauses as regards patents (an equivalent of a "patent box"), which are in many ways eligible expenses:

- the cost of applying to and maintaining patents and Proprietary Variety Certificate;
- the costs of defending patents and Proprietary Variety Certificate;
- the amortisation of acquired patents for research and Proprietary Variety Certificate;
- premiums and contributions or share of premiums and contributions in respect of the legal expenses insurance contracts for the management of expenditure incurred in litigation relating to a patent or a plant variety certificate whose company is holder are included in the limit of € 60,000.

Secondly, INPI (Institut national de la propriété industrielle), the French patent office is entirely self-funded and actively participates in the development and implementation of public policies in the field of industrial property and anti-counterfeiting. INPI is in the decision loop regarding recent initiatives from the Commissariat Général aux Investissements d'Avenir (the governing body responsible for the management of the Investments for the Future Plan) and from the Ministry of Productive recovery. All over the territory, INPI has been very active in recent years in supporting, informing, educating and providing training to innovators. It has developed coaching solutions for SMEs to get their organisations IP-active so that they can fully benefit from their knowledge creation processes; the latter may then be re-designed. This goes as far as providing support for export initiatives, thanks to a large international network of country correspondents. And, on the international side, Inpi adapts and builds industrial property rights, with a strong implication in European and global forums.

Thirdly, recent changes in the French systems are guided by a new attention to creativity and intellectual property value. Most Investments for the Future Plans' funded projects have effects in terms of IP creation, valuation and protection. This is so of "**France Brevets**". Established in March 2010, this experimental sovereign patents fund would benefit from €100 million capital, half from Caisse des Dépots et Consignations, half from the Investment for the Future Plan. The Fund's mission is to support private and public research to better leverage its patent portfolio on the international stage. So far, its investments priority area is ICTs. To be complemented with aeronautics and space, new energy, chemistry, materials, life and environment sciences.

In addition, better valuation from public research performers, among which primarily university research labs, synergising with enterprises, is the key purpose of the creation of SATT (Sociétés d'Accéleration du Transfert de Technologies) and IRT (Instituts de Recherche Technologique), with their thematic variant "Instituts pour la Transition Energétique". Both are pivotal initiatives from the Investment in the Future Plan, with a total public support of €3 billion over ten years (€1 billion go to SATT, €2 billion to IRT), leveraging equal private companies investments. There are about 10 SATT to fully cover national territory in terms of the universities valorisation/commercialisation of research results in society; these private companies with public capital have the exclusive power to commercialise university research property rights. They are multi-thematic by nature. In the framework of Horizon 2020, their specific roles are yet to be defined. In any instance, they are expected to reach financial balance within ten years, mainly through the management of intellectual property rights from public research results.

There are about 10 IRT, and 5 ITE, which are thematic public-private partnerships, encapsulated into common technical research platforms. They shall also reach financial balance through the provision of higher TRL research outputs. IP issues are to be properly dealt with in the consortium agreements. The following table illustrates key features of the IRTs (Technological Research Institute):

Table 7. Technological Research Institutes: location, content and members

Name	Location	Technological research theme	Members
IRT Nanoelectronics	Grenoble	Nano-electronics	Minalogic, ST Microelectronics , Soitec , etc.
IRT AESE	Toulouse	Aeronautics , space and embedded systems	Aerospace Valley cluster , Airbus, Safran , Latecoere , etc.
IRT BIOASTER	Lyon and Paris	Infectious diseases	Lyonbiopôle , Biomerieux , Sanofi , Danone, Institut Pasteur pole , etc.
IRT M2P	Metz, Belfort - Montbéliard , Troyes	Materials , metallurgy and processes	Matéralia , Vehicle of the Future , Microtechnology , Fibre, Saint-

			Gobain , Arcelor -Mittal , etc.
IRT Railenium	Valenciennes , Villeneuve d' Ascq	Railway infrastructures	I- Trans, RFF , Alstom, SNCF , etc.
IRT Jules Verne	Nantes	Composite materials	EMC2, Airbus , STX, DCNS , Alstom, Segula pole , etc.
SystemX	Saclay	Digital Systems Engineering	Alstom, Alcatel-Lucent, Bull, Distene, Systematic, Esterelle Technologies, Inria, Institut Mines Telecom, OVH, Renault, etc.
IRT B- COM	Rennes	Digital networks and infrastructure (pole Images and networks)	Orange, TDF, Thomson Video Networks, Inria, INSA de Rennes, Supélec, Telecom Bretagne, etc.

Sources: from the internet websites.

Public procurement

The key initiative is 'Measure 32' of the National Pact for Growth, Competitiveness and Employment. It encourages innovative public procurement. Through this measure, public procurement dedicated to SMEs shall reach 2% of public procurement in 2020, including purchases of government hospitals for roughly €40 billion, half of which on local authorities.

4.3 Working in partnership to address societal challenges

Interested companies, research laboratories and citizens representative NGOs located on the French territory which have an interest in one or several of the five thematic European innovation partnerships are engaging or have engaged in EIPs. As long as they are able to bring a socio-technical brick to the solution sought, they are welcome in. For instance, this is visible in the case of EIP "Active and Healthy Ageing". Among the 1000+ declared individual and organisations interested, many are of French origin. Where deemed useful and strategic French stakeholders have also taken the lead in the governance of EIPs. This is also true for other grand challenges which are also policy priorities, cf. water, agriculture, raw materials and smart communities and cities. It should be noticed that the new National Research Strategy "France Europe 2020" has made it very clear that participation in European partnerships is a key objective, to which all research and innovation organisations are to contribute (cf. 'Action #9' of the support document, i.e. "A strategic research agenda for research, transfer and innovation", May 2013).

4.4 Maximising social and territorial cohesion

Proposition # of 'France Europe 2020' support document "A strategic research agenda for research, transfer and innovation" of May 2013 specifically aims at maximising social and territorial cohesion. As stated by the Minister of Research states, in its own wording: "by implementing 'site policies', it is intended to gather together all higher education and research local actors around the same scientific ambition and a shared strategy. The objective is to promote the emergence of a more efficient landscape, to better articulate research and innovation ecosystems, in line with the strategy of smart specialization developed by the French regions in the context of the Cohesion policy of the European Union (2014-2020) and its Research Framework Programme "Horizon 2020". Maximising social and territorial cohesion is therefore as high as can be on the research and innovation policy agenda; improvements shall thus follow.

4.5 International Scientific Cooperation

All programmes supported by the National Research Agency, be they thematic or not, are open to transnational research proposals without the prior signature of an agreement between the ANR and a partner funding agency. There are nonetheless minimum requirements. The foreign partner must ensure its own financing, and the project coordinator has to specify:

- whether the activities are carried out with already existing funds;
- whether the foreign partner has already received national funding for its contribution to the proposed project;
- whether the foreign partner requested a national funding for their participation in the project by sending out the same scientific proposal to a funding organisation of in their country.

Coordination of international cooperation at the national level is a real challenge for France because most international agreements are decided at the institutional level. The same challenge exists for cross-border cooperation, where agreements are made at the local level. International cooperation and knowledge circulation across Europe were part of the former National Research and Innovation Strategy (2009-2012). For years to come, the international dimension is also a crosscutting orientation of France's new strategic research agenda 'France Europe 2020' (as of May 2013), with four specific targets:

- Adoption of a proactive attitude, in terms of France's influence policy and of France's use of European research and innovation funding;
- Strengthening of the universities orientations towards international cooperation in site contracts agreements;
- Promoting inward and outward mobility of students and researchers;
- Strengthening of Euro-Mediterranean cooperation

Over the period 2006 to 2012, in terms of co-funding of projects, the National Research Agency's focus areas have been Germany (426 projects), Spain (154), the United Kingdom (103), Italy (81), Austria (67) and China (53).

In 2010, the National Research Agency has dedicated €48 million to co-finance international programs, which is 7.5% of its budget for competitive calls and 11.6% of all projects funded. In 2011, transnational projects accounted for €58.8 million, split in €42.3 million for Europe and €16.5 million for third countries. 25% were dedicated to bilateral projects, 3% to multilateral projects and 72% to European projects. In 2011, 196 transnational projects were funded by ANR, which is a 22% increased as compared to 2010.

5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

5.1 More effective national research systems

The first set of policy actions aiming at increasing the effectiveness of the national research system relates to enhancing competitive funding through calls for proposals and institutional assessments. Many efforts are being done year after year and progress is tangible. There are three dominant sources which have leverage effects at regional levels: the National Research Agency (ANR), the Single Inter-ministerial Fund (FUI) and the Investment for the Future Plan (PIA).

First, the largest source of competitive funding is the **Investments for the Future Plan,** launched in 2010; it is but the latest of the governmental financial efforts made towards enhancing competitive funding in the French research system. It includes €21.9 billion dedicated to higher education and research projects. One may usefully recall that the fund is meant to support ten-year initiatives and that part of the money is directly allocated to finance actions, while the interests yield from another part of the fund are also used. From the participants' viewpoint, setting up the necessary co-ordinations between the projects partners was deemed long and painful but worth it. It should be noted that profoundly cooperative behaviours were required to match the international juries' expectations, that many of the projects supported are public-private by nature, that they all relate to local specialisation dynamics. They correspond to various ambitions and sizes, and hence support different partnerships. So far, 8 'Excellence Initiative (Idex), 93 Excellence facilities (Equipex), 171 Excellence Laboratories (Labex), 20 projects in health-biotechnology, 8 projects biotechnology-bioresources, 2 University-Hospital Institutes (IHU) dedicated to cancer research, 8 Institutes of Technological Research (IRT), and 9 Institutes for the energy transition (ITE) are active. The overall amounts to be allocated are: €1 billion to the Equipex, €1 billion to Labex, € 7.7bn to Idex, €1.5 billion to infrastructure for Health and Biotechnology Research, € 2bn to IRT, € 0.85 billion to IHU, €1 billion to ITE, and €0.5 billion to Carnot Institutes, etc. A second 'Investments for the Future Plan' was announced on 9 July 2013, €3.65 billion of which are singled out to fund higher education and research projects.

Second, the **Single Interministerial Fund (FUI)** is pivotal because it pioneered this trend of competitive collaborative funding, and encouraged public-private R&D partnerships. It corresponds to the Pôles de compétitivité (competitiveness clusters) funding source. Since 2005, roughly 900 collaborative R&D projects have received € 1.7 billion of public money, above €1.1 billion of which from the government only. On the whole, these projects amount approximately to €4.4 billion of R&D to which nearly 15,000 researchers have participated.

Third, the **Agence Nationale de la Recherche (National Research Agency)** also was created in 2005. It has been critical in this on-going transformation. Budget for Y2013 amounted to €686.6m (a €80 million fall compared to 2012's). This was compensated for through an increase of direct funding of the large research organisations.

Three short comments may be added to conclude on this. On the one hand, a number of researchers criticise the intensification of competitive research funding; they observe a

correlation with time spent on setting up research projects (which is detrimental to 'doing real research'). In spite of an average modest share of public research competitive funding as compared with other European countries, it has a significant influence on research activities. Indeed, project funding is used by lab directors as 'a slack' that allows to hire more researchers, everything else being equal – in particular institutional recurrent funding. On the other hand, part of the French academic research community is not yet used to measure the cost of research taking into account researchers' salaries and associated operating costs. This is explained by the fact that most public researchers are public servants, the salary of which does not directly depend on competition. Better management practices are developing thanks to the amplification of the competitive funding mechanism which pushes to account for complete costs of research activities. Finally, although the French system has on this matter room for improvement by European standard, it is common wisdom not to consider competitive funding as the only driver of research excellence. French performance in FP7 for instance illustrates that.

International peer review and international juries are well established practices of the French research system. All projects submitted in response to calls for tender of the Investments for the Future Plan, which are managed by the ANR (and by ADEME) were evaluated by panels of independent international experts. Last but not least, the Innovation 2030 Committee report "**A principle and 7 ambitions for innovation**" identified sectors and technologies where France is likely to occupy leadership positions in 2030. The calls for proposals are open competitions to which foreign investors are welcome.

5.2 Optimal transnational co-operation and competition

The new National Research Strategy is part of 'France Europe 2020', France's strategic Agenda for Innovation, Transfer and Research. It shall rely on a multiannual programming revised every five years under the coordination of the Minister of research. If the priorities are adopted after a consultation including the scientific and academic community, social and economic partners and the regions, the Strategy must be "*coherent with that developed in the framework of the European Union*". And indeed, given the nature and magnitude of the challenges ahead of us, no Member State can efficiently develop solutions alone. Thus, the whole set of European research instruments aiming at favouring the coordination of national efforts such as ERA-NET and ERA-NET PLUS, initiatives developed thanks to Article 185 of the TFEU, as well as public-private partnerships (Joint Technology Initiatives) are vital for the EU and for France. Joining forces help provide common answers to common problems through critical mass and better use of resources.

In order to implement joint research agendas on major challenges, France actively takes part in all 10 Joint Programming Initiatives (JPIs) launched since 2008. Its representatives are co-ordinators of Joint Programme – Neurodegenerative Disease Research (JPND) and of JP 'Agriculture, Food Security and Climate Change' (FACCE), the three-year anniversary of which was held in Paris in October 2013. French participants are partners initiatives, including in Living longer and better (MYBL) (as of 11 of April 2014).

To ensure optimal participation of French research organisations, the Thematic Alliances (thematic research coordination bodies) were requested to represent France in the JPIs' governing bodies while informing the National Research Agency (ANR). Mirrors groups have been set up to favour French stakeholders' involvement in JPIs.

The National Research Agency has notably been established to improve the influence of the French scientific research community by developing transnational collaborations with European and international partners (non-EU). To this end, competitive and transnational projects are supported through two cooperation schemes:

1. Bi- or multi-lateral collaborations joint calls, whereby the text of a joint appeal is negotiated and a common international experts' evaluation committee is established. This applies both to European calls, and to other bi- and multilateral calls (e.g. ANR- DFG, Belmont Forum, Open research area and Open research area plus).
2. Regular national programmes with transnational collaborations, whereby agencies agree on common methods of assessment and funding; the ANR is forging bilateral and multilateral strategic partnerships with foreign counterparts and finance transnational collaborative projects built in areas of common interest.

In 2011, 196 transnational projects were funded by the National Research Agency, which is a 22% increased from 2010.

In February 2013, France has published its second national strategy for research infrastructures, which integrates current and future international commitments, including within Europe. France has also participated in the update of the European Strategy on Research Infrastructures in the context of ESFRI and Horizon 2020. On organisation level, a centralized system of budgetary control on the operation and construction of facilities of national interest have been set up. A new governance system was established, including the presidents of the Thematic Alliances and CNRS under the guidance of the Ministry of Higher Education and Research. A high-level steering committee of very large research infrastructures decides on the national strategy for research infrastructures; it is responsible for multiannual programming and participation in international organisations. It may seek scientific advice from the High Council for very Large Research Infrastructures.

With research infrastructures expenditures of roughly €1.2bn per year, France ranks second in Europe, after Germany.

5.3 An open labour market for researchers

To start with, France ranks sixth in terms of number of publications and, by all accounts, researchers located in France benefits from some of the best research infrastructures in the world. It is an extremely opened country for young researchers since more than 40% of doctoral students in France are citizens from another country; France ranks second in the EU, after the United Kingdom, as far as PhD students from are concerned. In 2012 foreign researchers accounted for about 10% and 15% of the public research institutions workforce. Since this rate is higher among new recruits, where it stands at between 15% and 30%, openness shall increase in the coming years.

Permanent researchers' posts at CNRS for instance require post-doctoral experience in a research centre abroad; recruitment competitions are then open to excellent researcher from any national origin. Similar international experience is a clear 'plus' on the CV to apply to a university position (as a 'Maître de conference', i.e. assistant professor) or to other French public research institution. It should nonetheless be noted that university tenures may be more easily accessed

with a French PhD. It is indeed required that the candidate is "qualified" by the "Conseil National de l'Université" (National University Committee). This national body, composed of both full professors and assistant professors of all the 80 disciplines possible evaluates all candidates willing to apply to university tenures. Obtaining "the qualification" is a pre-requisite to access to local recruitment competitions. In a similar way, irrespective of one's experience and excellence in research, becoming thesis supervisor requires obtaining the accreditation to supervise research (HDR, "Habilitation à Diriger des Recherches"), based on a peer review process. These mechanisms do not facilitate researchers' mobility to French positions.

Researchers from outside the EU can benefit from "scientific visas" and "residence permits for scientists'. These specific procedures are simplified to facilitate scientists' access to researchers' positions within the French research system. Since the entry into force of the Law of 16 June 2011 on immigration, scientists have access to the 'long stay visa' as an equivalent to 'residence permit'. With long stay visas, researchers do not have to go to the prefecture if their stay does not exceed one year. In addition, a circular dated from 10 June 2013 asked the Prefects to issue as a matter of principle multi-annual visas to students engaged in the most advanced training and education and to international researchers.

Researchers and teaching positions proposed by French universities are published on a specific website[16] and automatically transmitted to EURAXESS Jobs portal.

In addition, France is active through the French EURAXESS Service Centres. The centres provide foreign researchers with hospitality and personalised assistance (daily life, education of children, housing search, learning French, and all aspects of cultural integration). There are thirty EURAXESS service centres (employing fifty people) throughout the country which ensure on a daily basis an effective assistance network. From July 2011 onwards, it has the legal structure of an Association and is formally coordinated by the CPU (Conference of the Presidents of Universities); its Board of Directors is composed of key players on mobility issues such as the 'Cité Internationale Universitaire de Paris' or the ABG Intelli'Agence and of elected representatives of service centres. Four working groups aim at facilitating reception and mobility of researchers:

- "Housing". Development of a guide for foreign researchers detailing the French practices in housing;
- "Communication". Development of tools to promote France EURAXESS network;
- "ALFRED". Monitoring of the national database of foreign researchers established by FnAK-CIUP and based on voluntary registration;
- "Best practices and quality". Establishment of a system for the identification and exchange of good practices within the French network.

As a result, in 2010, the EURAXESS France network has assisted over 13,000 scientists from 128 countries, delivering over 30,000 services.

EURAXESS is responsible for the implementation of the "HR Strategy for Researchers" which is the concrete follow up tool aimed at supporting research institutions and funding organisations in their adoption of the Charter & Code in their policies and practices. The "HR Excellence in Research" logo identifies the institutions and organisations as providers and supporters of a stimulating and favourable working environment. Since the adoption of the Commission Recommendation on the Charter & Code in 2005, more than 100 organisations in

[16] https://www.galaxie.enseignementsup-recherche.gouv.fr/ensup/emplois_publies.html

Europe obtained the "HR Excellence in Research" label. Even though a few French organisations are in the process of obtaining the label, INRA is still the only French research organisation which has obtained it (in 2010).

Through CIFRE (Conventions Industrielles de Formation par la Recherche), 1400 new doctoral students are hired by companies to prepare their PhDs in-house, with a close academic co-supervision. This 30-year old scheme is deemed an excellent tool to develop public-private research partnerships. For instance, half the employer companies are SMEs. Its efficiency has increased thanks to its articulation with the R&D tax credit (which offers complementary advantages).

Many of the 300 doctoral schools [responsible for the 73,000 doctoral students in France] develop close links with all potential recruiters of PhDs, including companies that are employers of researchers, and provide high quality training and learning services to their young talents. Thanks also to the AERES' evaluations of doctoral schools, PhD programmes are becoming very professional education and training institutions, the overall quality of the doctoral programmes is remarkably increasing.

5.4 Gender equality and gender mainstreaming in research

No country can afford to be deprived from women's talents. All efforts shall thus be done to aim at parity between women and men and especially in science: girls are still less pushed towards science than boys and they also often lack role models.

As a preliminary diagnosis, let's start with a few basic facts about gender equality.

- In 2009, the proportion of females among new PhDs in France was inferior to the OECD average (43% vs 46%), slightly above that of Switzerland (41%) or Belgium (41%) but significantly below that of Sweden (48%), Spain (49%) and Iceland (63%). Male assistant professors and full professors have an average pay higher than their female colleagues of the same category. The difference is bigger within the largest university teachers and researchers' group, the assistant professors'.

- In 2012, in France, the longer the studies, the lower the proportion of female students: 56.5 % with a BA and 47.7 % female PhD students. Females represent only 30.1% in scientific and prestigious courses (i.e. in preparatory classes for the Grandes Ecoles).

- In 2012, males represent 64.1% of teachers and/or researchers at university and in research and higher education institutions. The difference is even larger among full professors or research directors, with 76.1% of males.

- For a woman, it is still almost impossible to become President of University (10%) or Director of a HEI (12.8%). Even more discouraging, efforts may not pay back: while in 2008 almost 20 % of universities were headed by women (which was a record), the figure is twice lower as a result of the 2012 elections.

The Ministry of Higher Education and Research has recognised the challenges of taking gender into account in a comprehensive manner. Thus, in 2009, it launched the "Mission for Parity

(between women and men) and Fight against Discrimination", as a joint action of both the higher education and research departments. Many policies have also been implemented at institution and establishment levels for years. Notwithstanding the multiple meritorious efforts, reassuring statistics in terms of the efficiency of such initiatives are lacking. The country expert is unable to provide evidence of tangible progress on any of the axes. As measured by the number and quality of the actions implemented, awareness seems to have improved a great deal.

Among the signs of this raised awareness, the Strategic Group on Gender launched by the Ministry of Higher Education and Research in 2011 has published its conclusive report in January 2013. It defines through 20 recommendations the strategic directions for research on gender issues in France. Based on an impartial evaluation of the current situation, the report goes beyond research and its organisation and touches upon many systemic dimensions. The recommendations are structured on 7 main themes:

- Organization of higher education and research;
- Education;
- Training;
- Research funding;
- Publication, distribution and reviews;
- Careers;
- Parity in institutions of higher education and research;

Among the 20 strategic recommendations, one has drawn our attention: "Provide financial support for *major scientific investigations (quantitative and qualitative) including gender data*, such as those proposed by the INED survey on violence Virage". Implementing surveys to gather sound and comparable figures on this essential commitment of ERA is urgent. Because of their systemic nature, changes in this matter take time. Therefore measuring progress little by little is crucial.

In practical terms, the Communication "*Reinforced European Research Area Partnership for Excellence and Growth*" urges member states "*to ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating research programmes*". Significant efforts are being made in France, including with legally binding schemes as necessary.

Hence, the decree of 30 April 2012 made under section 56 of the Law of 12 March 2012 stipulates that in senior management functions, in 2018, there should be at least 40% of nomination for each gender. Failure to progressively comply with this obligation is punishable by a financial penalty proportional to the deficit of appointments observed. From 2013 onwards, these objectives will be applied by the Ministry of Higher Education and Research to all supervisory jobs, beyond those listed in the Decree (jobs universities and public institutions). For instance, from 2013 onwards, there should be at least three women in the upper panels of aggregation (procedure of recruitment of professors in legal, political, economic or management disciplines). The Ministry reminded rectors and university presidents the compulsory balance in selection boards, and co-ordinates a working group that will drive adaptation changes in regulation so that all research organisations comply.

5.5 Optimal circulation, access to and transfer of scientific knowledge including via digital ERA

France is rather active in the field of open access, with hundreds of French open access journals, tens of open disciplinary warehouses and institutional archives, and a handful of platforms. Nonetheless, the latest "Open access in France: state of the art" dates back to 2010, and the august 2013 ScienceMetrix report entitled "Proportion of Open Access Peer-Reviewed Papers at the European and World Levels—2004-2011": France is still below 50% of open access articles, i.e. circa 46%, including 40% of green and hybrid. New policy efforts were therefore deemed necessary. Recent noteworthy high-level initiatives include:

- the creation of the Secretariat-General for Government Modernisation (SGMAP) (Decree of 30 October 2012), under direct authority of Prime Minister and reports to the Minister for State Reform, including Etalab in charge of administrative open data;
- the launch of the "OpenData France association" in October 2013, an association which represent and support local communities in a process of opening up their public data;

In order to ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies, the Investments for the Future Plan funds SATT (Sociétiés d'Accéleration du Transfert de Technologies, Private Companies for Accelerating Technology Transfer), CVT (Consortiums de Valorisation Thématiques) and IRT/ITE (Instituts de Recherche Technologique, Instituts pour la Transition Energétique) which form a continuum of open innovation infrastructures. On the whole, these projects are designed to develop sustainable public-private partnerships over a ten-year period. This substantial investment of €3bn shall deeply modify the French knowledge transfer landscape.

This is key operational objective of the National research Strategy 'France-Europe 2020' (May 2013), through "Action#2" "Enhancing technological research capabilities". Among other, complementary actions are the 5 CEA-TECH platforms, Carnot 3.0, and the new National Research Agency's calls for proposal named "LabCom". The latter initiative aims at the creation of 100 SME-public research joint labs.

It should also be noted that the new law on research and higher education of the 22nd of July 2013 planned to provide, on a comprehensive basis, higher education training services with digital resources and training to use them. As an implementation mode, the Ministry of Higher Education and Research has launched "**France Université Numérique**" (FUN), a MOOC (Massive Open Online Courses) platform. Since October 2013, those HEI who wish to provide their students with training in French and open online educational resources can benefit from FUN-France Université Numérique[17] (part of "France Europe 2020').

By bringing together French universities and schools on this project, it is intended to give international visibility, and enable all public access to various courses and quality anywhere in the world. FUN courses are designed by university professors and their international academic partners. Under the co-ordination of the Ministry of Higher Education and Research, technical inputs come from INRIA for the deployment of the platform, CINES for the design, administration and hosting IT infrastructure, and RENATER for infrastructure networks. As for

[17] https://www.france-universite-numerique-mooc.fr/

the content and functionalities, experts and representatives of teaching staff of the university community participated.

Annex 1. Performance of the national and regional research and innovation system

Feature	Assessment	Latest developments
1. Importance of the research and innovation policy	(+) Guided by the need to recover competitiveness, research and innovation policies have become a key trait of current national policies, both in discourses and in actions. Impressive funding efforts.	. New law on higher education and research (incl. National Research Strategy, Strategic Research Council, High Council for Evaluation); . 'France Europe 2020' Strategic Agenda; . "34 Industrial Reconquest plans"; . "A principle and 7 ambitions for innovation"; . Investments for the Future Plan 1 and 2 . R&D tax credit, architecture preserved.
2. Design and implementation of research and innovation policies	(+) Design has improved through better consultation processes and strategic preparatory reports; implementations are at various stages, diverse implementation qualities.	. Les "Assises de la recherche", the new Law on R&HE . "Innovation, a major challenge for France", "15 measures for research and knowledge transfer", France Europe 2020; . Increasing recourse to public-private partnership and efficiency sought for public funding; . Increasingly competitive funding of public research;
3. Innovation policy	(+) In fact, governance and implementation are quite distinct from research policies. Demanding effectiveness and efficiency criteria, Openness of calls for tenders/proposals; Emphasise on international competitiveness Implementation through bpifrance, through initiatives from the Ministry of Productive Recovery, through the Commissariat-General for Investments; this latter structure combine innovation and research policies.	. bpifrance . Ministry of Productive recovery . Commissariat-General for Investments
4. Intensity and predictability of the public investment in research and innovation	(+) High intensity and excellent predictability of the public investment. Progressive increase of the share of competitive funding and importance of R&D tax credit (generic indirect funding depending only on private investment strategies)	. A high on the agenda priority of the latest Governments; . Continuous augmentation of the public investment in research and innovation . Preserved architecture of R&D tax credit, inflection in the National Research Agency budget offset by an increase of the PROs budget, new Investment in the Future Plan.
5. Excellence as a	(+) Thanks to competitive funding (ANR, CGI) and to	. Budget allocation within

key criterion for research and education policy	evaluation bodies, Excellence remains the driver of French HEIs and PROs.	PROs on excellence basis only; . **'**Excellence Initiative (Idex), Excellence facilities (Equipex), Excellence Laboratories (Labex**)** as their names indicate are allocated to universities and partners on excellence of research and education criterion.
6. Education and training systems	(+) The French higher education and training system still very attractive; on-going efforts to simplify (eg, reduction of the number of Masters' denominations), to adopt the highest quality standards (incl. at Doctoral level), to facilitate university-enterprise relationships, to develop and implement innovative methods incl. MOOC.	According to the new law on higher education and research: - Accreditation of HEIs for the duration of the multi-year contract with the State, during which they must comply to a "national training framework," - Digital: priority to use of FOSS and HEIs must make available, where possible, their education in digital form; a VP dedicated to digital issues and resources shall be appointed within Communities of Universities; - Foreign Students Provisional length of stay for foreign students holding a master from 6 to 12 months - France Université Numérique (FUN), MOOC.
7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level	(++) High level of awareness on this well-known weakness of the French RIS, and therefore implementation of many initiatives aiming at enhancing R&I public-private partnerships. National funding mainly but localised collaborative project-like structures.	Technological Research Institutes/ Energy Transition Institutes, CEA-Tech, Cifre PhDs, ANR international collaborative projects, etc.
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation	(+) As regards components of the research and innovation ecosystems, France does extremely well, cf. Latest developments>. Framework conditions are attractive. Trust amongst stakeholders may subsequently augment.	R&D tax credits, young and innovative companies' specific scheme (JEIs), bpifrance, Investments for the Future Plan initiatives
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	(+/-) Public support to RIS is for its most part, simple, easy to access and high quality. Nonetheless, trust amongst stakeholders remains a weak link. Duration of selection and financing processes would better be reduced; risk-taking would efficiently replace risk aversion and micro-management.	

10. The public sector itself is a driver of innovation	(+/-) Improving through innovative public sector initiatives; but persisting lack of openness and confidence.	. Creation of The Secretariat-General for Government Modernisation (SGMAP) (Decree of 30 October 2012), under direct authority of Prime Minister and reports to the Minister for State Reform . Creation on October 2013 of the "OpenData France association", which represent and support local communities when opening up their data; . FUN, France Université Numérique;

Annex 2. National Progress on Innovation Union commitments

		Main changes	Brief assessment of progress / achievements
1	**Member State Strategies for Researchers' Training and Employment Conditions**	**Cf. The State of scientific employment in France, July 2013. EURAXESS and its initiatives are mentioned and presented.**	(-)The principles of the Charter & Code are known but insufficiently implemented in practice, in spite of young researchers unions positive actions (-)Collective labour agreements insufficiently integrate the Charter & Code principles (-) National authorities insufficiently explain and promote the Charter & Code and its relevance for other national policy initiatives? (-) No performance agreements through which national authorities incentivise the effective implementation of the HRS4R (or its national adaptation) by publicly funded institutions (-) No link to the Charter & Code as a reference framework in other key policy frameworks and documents (including legislative acts) (-) No evaluation of the policy
4	**ERA Framework**		**These are covered by the ERA Communication fiche – last revised in July 2013 and updated as a separate deliverable on Jan. 2014**
5	**Priority European Research Infrastructures**	**National research Strategy 'France-Europe 2020' (May 2013): Research Infrastructures priority (cf. Action#4 "Developing digital infrastructures and training"): particular focus on SMEs / ETI; GENCI (Grand National Equipment for Supercomputing), participation in PRACE (Partnership for advanced computing in Europe), the European program based on enhanced cooperation with Germany.**	(+) Launch or new financial commitments to the construction and operation of the ESFRI Roadmap , and to other global, national RI of pan-European interest
7	**SME Involvement**	**National research Strategy 'France-Europe 2020' (May 2013): cf. Action#2 "Enhancing technological research capabilities": cf. part of the action plan : "KETs / FETs / EIT : better co-ordinate ANR programming with KETS to seek maximum leverage and have a knock-on effect on ecosystems"**	(+) New partnerships between MS agencies and EC on EU R&I programmes with a focus on SMEs
11	**Venture Capital Funds**	**According to European Private Equity and Venture Capital Association, France is #2 rank in Europe as for number of supported companies (3054) and Private equity investment €41.51bn. In Europe, 60% of VC is supported by public money (as compared with only 9% in 2007. Bpifrance is active; e.g. as of September 2013, Bpifrance unites crowdfunding sites on its platform ('tousnosprojets.fr')**	(+) Introduction of favourable taxation regimes for Venture Capital and/or business angels (+) Policies and measures supporting set up business angel networks, to foster early stage capital funds, seed funds, business angels, corporate venturing and crowd-funding.

13	**Review of the State Aid Framework**		**(**+) State aid measures (or related policy initiatives) and classified as aid for innovation clusters in the Community Guidelines for State Aids for R&D and Innovation
14	**EU Patent**	**The Agreement on the Unified Patent Court was signed by 25 EU Member States on 19 February 2013. Still to be ratified by France. Only Austria has ratified so far.**	**(-)** Ratification of the Agreement on a Unified Patent Court pending
15	**Screening of Regulatory Framework**	**On-going evaluations of the French Research and innovation system by OECD (forthcoming); on-going evaluation of the R&D tax credit; on-going evaluations of actions of the Investments for the Future Plan; Thematic public research Alliances contributions to the design of the new National Strategy for Research, contain SWOTs and evaluation of performance; publications of evaluations of the French Court of Auditors on R&D tax credit, on collaborative Research, on publicly funded research, etc.**	Ex-ante or ex-post screening of new or existing regulations regarding their impact on innovation
17	**Public Procurement**	**Cf. National Pact for Growth, Competitiveness and Employment requires that at least 2% of the public sector procurement, its operators and hospitals are made with innovative companies. Cf. also the publication in April 2013 of the "Practical guide to the innovative public procurement".**	(+) Introduction of national target on public procurement of innovative goods and services (+) Public tenders launched that include innovation criteria (+) Public tenders launched for joint public procurement of innovation (+) Updates of national procurement policy with a specific objective of supporting innovation
20	**Open Access**	**France is active in the field, with hundreds of French open access journals, of the tens of warehouses open disciplinary and institutional archives, a handful of platforms. To be noted, the last "Open access in France: state of the art dates back to 2010"; The august 2013 ScienceMetrix report "Proportion of Open Access Peer-Reviewed Papers at the European and World Levels—2004-2011" : France is still below 50% of OA articles :~46%, including 40% of green and hybrid…**	(+) Introduction of policies promoting open access of results from publicly funded research (+) Policies on access and usage for research and education-related public e-infrastructures and for associated digital research services
21	**Knowledge Transfer**	**Cf. Investments for the Future initiatives such as SATT (societies d'accéleration du transfert de technologies), CVT (consortiums de valorisation thématiques), IRT (instituts de recherche technologique); cf. National research Strategy 'France-Europe 2020' (May 2013), Action#2 "Enhancing technological research capabilities", cea-tech platforms, Carnot 3.0, ANR call for proposal "LabCom" (aiming at the creation of 100 SME-public research labs joint labs.**	(+) Policies and instruments launched to protect the results of publicly funded research; (+) Set up of national knowledge transfer(KT) strategies (+) New legal and other regulatory barriers to the transfer of knowledge between the public and the private sector (+) New initiative in support of R&D co-operation projects (including KT) between public/academic/non-profit sector research institutions and enterprises (including specific schemes to encourage the business sector to fund research in research institutions).

			(+) Creation of framework conditions through policies or other measures to incentivise and reward academics engaged in cooperation with industry (+) New 'partnerships' and joint collaborative research agendas signed between the public and private sector (+) Policies and measures that improve recognition and professionalization of KT activities and that strengthen the role played by knowledge transfer offices (KTO) (+) Newly created public funding schemes used to support the commercialisation of innovative ideas (+) New grant-based support schemes for testing commercialisation potential of research results (+) Policies and funding schemes used to encourage open innovation, co-operation and knowledge sharing and to create a more favourable business environment for SMEs, such as innovation/knowledge clusters, knowledge transfer platforms or voucher systems (+) New financial support schemes directed to enterprises or for services aimed at encouraging technology acquisition (licensing, joint ventures, testing, etc.) and knowledge transfer and other cooperation schemes between enterprises that aims to develop or introduce innovations. (+) New measures or schemes directed at public/private organisations in order to provide or coordinate the provision of specific innovation related services to enterprises (including technology transfer/brokerage, strategic and economic intelligence, manufacturing advisory services, quality and design advice, etc.)
22	**European Knowledge Market for Patents and Licensing**	**With France Brevets, France is one of the very very few countries to actively experiment national level action on Knowledge market for patent and licencing. France Brevets is part of a framework which integrates also SATT, CVT and IRT (cf. above).**	**(**+) New policies and instruments for developing knowledge markets for patents and licencing (+) National initiatives in trading platforms that match IP supply and demand and market places to enable financial investments in intangible assets (+) New initiatives providing support (incl. provision of information through road shows, open days, exhibitions, IP to promote business success, patent information centres, training, direct support to IPR) for patenting, trademarks, copyright, design rights and their commercial exploitation.
23	**Safeguarding Intellectual Property Rights**	**Active participation of France in European forums, incl. EPO and CEN activities.**	**(**+) Legislation, policies or other type of measures supporting the use of the Guidelines on Horizontal Cooperation Agreements namely regarding standard-setting agreements
24	**Structural Funds and Smart Specialisation**	**Timing of participation synchronised with national organisation of State-Region agreements (CPERs); Rhône-Alpes has published its regional strategy regarding S3; many are about to follow soon.**	**(+)**Progress in designing the Smart Specialisation strategy.

25	**Post 2013 Structural Fund Programmes**	**Cf. above.**	(+) Which is the status of the design of the new SF programmes
26	**European Social Innovation pilot**	**One of the 9 grand challenges of the French Strategy for Research is on par with European social innovation priority; it is dubbed "Innovative, integrative and adaptive societies" (other objectives are Simple resource management and adaptation to climate change; Clean, safe and efficient Energy; Stimulation of industrial recovery; Health and care; Food security and demographic challenge; Sustainable mobility and urban systems; Information Society and Communication; Spatial ambition for Europe).**	**(**+) Measures and policies adopted that provide support to encourage social innovation including innovation driven by or centred around end- or intermediate users, including support to living labs, design innovation, creative labs, crowd-sourcing, etc.
27	**Public Sector Innovation**	**Cf. National Pact for Growth, Competitiveness and Employment; and on e-government, cf. the creation of The Secretariat-General for Government Modernisation (SGMAP) (Decree of 30 October 2012), under direct authority of Prime Minister and reports to the Minister for State Reform; cf. the creation on October 2013 of the "OpenData France association" : association representing and supporting local communities in a process of opening up their public data.**	(+) Prizes launched by sector/topic, including number of winners and amount of prices, distinguishing ex post and inducement prices (+) Publication of government-owned data to be made available and that can be used as a resource for information
29	**European Innovation Partnerships**	**Each EIP self-organises according to the solutions which combines competences and expertise to meet challenges.**	(+) Active National participation in EIPs
30	**Integrated Policies to Attract the Best Researchers**	**Cf. The State of scientific employment in France, July 2013. Euraxess and its initiatives are mentioned and presented.**	(+) Integrated policies put in place to ensure that leading academics, researchers and innovators reside and work in Europe and to attract a sufficient number of highly skilled third country nationals to work in Europe
31	**Scientific Cooperation with Third Countries**	**Cf. National research Strategy 'France-Europe 2020' (May 2013); France must increase its visibility, encouraging mobility of students and researchers, develop international and European partnerships.**	**(**+) Policies, programmes or other measures promoting Science and Technology cooperation with third countries, definition of geographical priorities and integration in international fora. (+) International cooperation activities conducted in cooperation with other MS.
32	**Global Research Infrastructures**	**France very active; cf. notably ITER (Cadarache), French companies having reaped nearly €2 billion in contracts (including €1,4 billion for regional businesses).**	**(+)** National involvement in agreements on the development of RIs which, owing to cost and / or complexity, can only be developed on a global scale

33	**National Reform Programmes**	**Cf. National Pact for Growth, Competitiveness and Employment (November 2012) and consequences; cf. stability of the R&D tax credit and Investments for the Future plan's programmes; cf. the '34 industrial plans' (October 2013) and Lauvergeon 'Innovation 2030' Plan (October 2013)**	**(+)** Main R&I relevant aspects included in NRP

Annex 3. National Progress Towards Realisation Of Era

ERA Priority	ERA Action	Recent changes	Assessment of progress in delivering ERA
1. More effective national research systems	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	> Investments for the Future Plan 1 and 2; Single Interministerial Fund (FUI), Pôles de Compétitivité 3.0 (2013-2018); Agence Nationale de la Recherche (National Research Agency); noticeable **Innovation 2030** Committee report "**A principle and 7 ambitions for innovation**" which identified sectors and technologies where France is likely to occupy leadership positions in 2030. The calls for proposals are open competitions to which foreign investors are welcome.	(++) Persistence and strengthening of competitive funding practices, increased influence over researchers' projects (++) Generalising practice to more technology matured projects (closer to company technology needs, i.e. high Technology Readiness Levels projects)
	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	Cf. All public bodies	(+) Internally and externally well-established practices
2. Optimal transnational co-operation and competition	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	The new National Research Strategy is part of 'France Europe 2020', France's strategic Agenda for Innovation, Transfer and Research: France's challenges aligned with European's. Ambitious objectives in terms of participation to European research, development and innovation projects and initiatives Complementary approach as regards projects' funding Preference for cross-national co-ordinated initiatives and co-funding such as JTIs and JPIs	(++)Ambitious objectives in terms of participation to European research, development and innovation projects and initiatives (++) Complementary approach as regards projects' funding (++) Preference for cross-national co-ordinated initiatives and co-funding such as JTIs and JPIs
	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions		(+) Evaluations of research projects conform to international standards
	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to		(+) No known barriers, openness is key to excellence in research projects, cf. the ANR policy

	permit joint financing of actions including cooperation with non-EU countries where relevant		
	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	Second national strategy for research infrastructures (February 2013) - New centralized system of budgetary control on the operation and construction of facilities of national interest have been set up; - New governance: presidents of the Alliances under the guidance of the Ministry of Higher Education and Research; - High-level steering committee of very large research infrastructures decides on the national strategy for research infrastructures: multiannual programming and participation in international organisations. It may seek scientific advice from the High Council of very high infrastructures.	(++) New national strategy and improved governance : Research infrastructures expenditures : €1.2 b per year, France ranks second in Europe
	Action 5: Remove legal and other barriers to cross-border access to RIs		(+) No known barriers
ERA priority 3: An open labour market for researchers	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	Circular of 10 June 2013: the Prefects must issue as a matter of principle multi-annual visas to students engaged in the most advanced training and education and to international researchers.	(+/-) Legal efforts
	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants		(+)No known barriers
	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS network	French EURAXESS Service Centres, solid legal structure and professional co-ordinators:	(+)The EURAXESS France network has assisted over 13,000 scientists from 128 countries, delivering over 30,000 services (2010 figures)
	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative	Progress in terms of quality of doctoral training,	(+) Increased quality of Doctoral Schools, aligned with the best European Standards, participation in European doctoral training improvement actions, notably through European University

	Doctoral Training.		Association Council for doctoral education (EUA-CDE)
	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	Framework in place	(+/-) French EURAXESS Service Centres But: only one French PRO with the HR Excellence in Research…
ERA priority 4: Gender equality and gender mainstreaming in research	Action 1: Create a legal and policy environment and provide incentives	Decree of 30 April 2012: in senior management functions, in 2018, there should be at least 40% of nomination for each gender. Failure to progressively comply with this obligation is punishable by a financial penalty proportional to the deficit of appointments observed. From 2013 onwards, these objectives will be applied by the Ministry of Higher Education and Research to all supervisory jobs, beyond those listed in the Decree (jobs universities and public institutions).	(++) Personal involvement of the Minister, Mrs Geneviève Fioraso, and implementation clauses of the New law on higher education and research address parity
	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	The Strategic Group on Gender (Ministry of Higher Education and Research) Conclusive report in January 2013: 20 recommendations the strategic directions for research on gender issues in France	(++) Partnerships in operation with main HEIs and PROs
	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating	Cf. decree of 30 April 2012	(+) Enforcement mechanisms
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including *via* digital ERA	Action 1: Define and coordinate their policies on access to and preservation of scientific information	Digital Open Access platforms well installed and used	(+) Aligned with European Universities and PROs (cf. latest LERU documents, incl. French Universities);
	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	Key dimension of the French Research Strategy to recover Competiveness through Open Innovation: SATT, CVT and IRT/ITE. National research Strategy 'France-Europe 2020' (May 2013), through "Action#2" "Enhancing technological research capabilities": 5 CEA-TECH platforms, Carnot 3.0,	(++) Known weakness of the French RIS on which much tentative effort is being done: to be noted: these are investments for the future, impacts are prospective…

		National Research Agency's "LabCom" (100 SME-public research joint labs)	
	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners	"France Université Numérique" (FUN), a MOOC (Massive Open Online Courses) platform. Since October 2013, those HEI who wish to provide their students with training in French and open online educational resources can benefit from France Université Numérique (part of "France Europe 2020")	(+) The French large MOOC for universities is just a sign of the increased awareness on the action: knowledge pooling and sharing is key for a modern and efficient higher education and research system
	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	-	No opinion.

REFERENCES

Beylat J.L., Tambourin, P. (2013), Innovation, a major challenge for France. Boosting growth of innovative firms, Ministry of Productive Recovery, Ministry of Higher Education and Research, April.

CE (2013), Recommendation for a Council recommendation on France's 2013 national reform programme and delivering a Council opinion on France's stability programme for 2012-2017, COM(2013) 360 final.

Cour des Comptes (2013), L'évolution et les conditions de maîtrise du crédit d'impôt en faveur de la recherche, July.

DATAR (2012), Guide pour la préparation des stratégies de spécialisation intelligente des régions françaises, November.

DATAR, DGCIS (2013), La nouvelle phase de la politique des pôles de compétitivité (2013-2017). Des pôles au service de la croissance des entreprises et de l'emploi, July.

EC (2013), Innovation Union Scoreboard 2013, March.

EC, EU Industrial R&D Scoreboard 2013, http://iri.jrc.ec.europa.eu/scoreboard13.html

ERA webpage: http://ec.europa.eu/research/era/index_en.htm

ERAWATCH Country Reports (2008, 2009, 2010, 2011, 2012); available at: http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/reports/country_rep/index.jsp?count_rep=f035f4cb-79df-11df-8da9-53862385bcfa

JORF (2012), n°0304 du 30 décembre 2012, LOI n° 2012-1510 du 29 décembre 2012 de finances rectificative pour 2012, Article 66 relatif au Crédit d'impôt compétitivité emploi.

JORF (2013), Law #2013-660 of 22 July 2013 on Higher Education and Research

Lauvergeon Innovation 2030 Committee (2013), One Principle and Seven Ambitions, October.

MESR (2012), "15 measures for a new transfer of public research dynamics, lever for growth and competitiveness", presented at the Council of Ministers of the 7th of November.

MESR (2012), Stratégie Nationale. Infrastructures de recherche 2012-2020, October

MESR (2013), Dépenses de recherche et développement en France en 2011. Premières estimations pour 2012 Note d'information, 13.06, July

MESR (2013), Etat de l'emploi scientifique en France 2013, July.

MESR (2013), France Europe 2020, A Strategic Agenda for research, innovation and transfer. Facing societal challenges and contributing to the country's competitiveness, May.

MESR (2013), Rapport 2013 de la France sur la construction de l'Espace européen de la Recherche, September.

Ministère du Redressement Productif (2013), The New face of Industry in France. 34 industrial renewal initiatives, 12 September [English version available at : http://www.redressement-productif.gouv.fr/files/nouvelle_france_industrielle_english.pdf]

Ministry of Higher Education and Research, Couperin (University consortium for digital publication), CNRS-Institut for Scientific and Technical Information (2010), Open Access in France: State of the Art Report, April.

OECD (2013), S&T Policy Outlook 2012.

OECD (2013), Supporting Investment in Knowledge Capital, Growth and Innovation, October.

Ollivier, A.-C. (2013), « Modalités de financement public de la RDI : recherche sur projet », in: La recherche et l'innovation en France, Odile JACOB

Prime Minister (2012) National Pact for Growth, Competitiveness and Employment November, 6th 2012 [available in English at: http://www.economie.gouv.fr/files/PR-competitiveness.pdf]
Quevreux, A. (2013), De la comitologie à l'agenda de recherche stratégique, la France passe à l'heure des pouvoirs renforcés du Conseil et du Parlement européens, Lettre Européenne de l'ANRT, #258,
Région Ile-de-France (2013), « Designing the regional version of the S3 to implement the Paris OP 2014/2020 », first version of its regional innovation smart specialisation strategy, 4 October 2013
Région Rhône-Alpes (2013) « Stratégie d'innovation de la Région Rhône-Alpes au regard de la "Spécialisation Intelligente ". Innover pour répondre aujourd'hui et demain aux besoins des Rhônalpins », September.
République française (2013) Rapport relatif à la mise en œuvre et au suivi des investissements d'avenir, Annexe au projet de loi de finances pour 2013.
République française (2013) Rapport sur les politiques nationales de recherche et d'éducation supérieure, Annexe au projet de loi de finances pour 2013.
République Française (2013), Projet de loi de Finance 2013: Research and Higher Education
ScienceMetrix report (2013), Proportion of Open Access Peer-Reviewed Papers at the European and World Levels (2004-2011), August
Steen, J. (2012), "Modes of Public Funding of Research and Development: Towards Internationally Comparable Indicators", OECD Science, Technology and Industry Working Papers, 2012/04
UNCTAD (2012), World Investment report.
UNCTAD (2013), World Investment report.
World Economic Forum, The Global Competitiveness Report 2012-2013
World Economic Forum, The Global Competitiveness Report 2013-2014

LIST OF ABBREVIATIONS

AERES	Evaluation Agency for Research and Higher Education
ADEME	Agency for Environment and Energy Management
ANR	National Research Agency
AREVA	Public Industrial conglomerate specialized in Energy, especially nuclear power
BERD	Business Expenditures for Research and Development
CEA	Commissariat à l'Energie Atomique et aux Energies Alternatives
CERN	European Organisation for Nuclear Research
CGI	Commissariat Général à l'Investissement/ Commissariat-General for Investment
CGSP	Commissariat Général à la Stratégie et à la Prospective/ Commissariat-General for Strategy and Foresight
CICE	Crédit d'impôt pour la compétitivité et l'emploi / Tax Credit for Employment and Competitiveness
CINES	Centre Informatique National de l'Enseignement Supérieur/ National It Centre for the Higher Education Sector
CIFRE	Conventions Industrielles de Formation par la Recherche / Industrial Research Training Conventions
CNRS	Centre National de la Recherche Scientifique
CNU	Conseil National de l'Université/ National University Committee
CPER	Contrat de Projet Etat-Région/State-Region Projects Contract
CSRT	Conseil supérieur de la recherche et de la technologie / High Council for Research and Technology
ERA	European Research Area
CIR	Crédit d'impôt Recherche/ Research Tax Credit
COST	European Cooperation in Science and Technology
CSR	Conseil stratégique de la recherche/ Research Strategic Council
CUE	Communautés d'universtés et d'établissements
DATAR	Délégation interministérielle au développement territorial et à l'attractivité régionale/Interministerial Delegation for Territorial Development and Regional Attractiveness
DGRI	Direction générale de la recherche et de l'innovation au MESR/General Directorate for Research and Innovation
EIP	European Innovation Partnership
ENA	Ecole Nationale d'Administration
EQUIPEX	Excellence Equipments
ERA-NET	European Research Area Network
ERDF	European Regional Development Fund
ERP Fund	European Recovery Programme Fund
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
ETI	Entreprises de Taille Intermédiaire
FP	European Framework Programme for Research and Technology Development

FUI	Fond Unique Interministeriel/ Single Interministerial Fund (dedicated to Competitiveness Clusters)
EU	European Union
EU-27	European Union including 27 Member States
EU-28	European Union including 28 Member States
FDI	Foreign Direct Investments
FP	Framework Programme
FP7	7th Framework Programme
FUN	France Université Numérique / France Digital University
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
HCERES	Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur/ High Council for evaluation of Research and Higher Education
HCST	Haut Conseil de la Science et de la Technologie / High Council for Science and Technology
HDR	Habilitation à Diriger des Recherches/ Accreditation to Supervise Research
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
ICT	Information and Communications Technologies
IDEX	Excellence initiatives
IGF	Inspection Générale des Finances
IHU	Instituts Hospitalo-Universitaires
INED	Institut National des Etudes Démographiques/ National Institute for Demographic Studies
INRA	Institut National de la Recherche Agronomique/ National Institute for Agronomic Research
INSERM	Institut National de la Santé et de la Recherche Médicale /
IP	Intellectual Property
IRSTEA	Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture/
IRT	Institut de recherche technologique/ Technology research Institute
ITE	Instituts pour la Transition Energétique/Energy Transition Institutes
JEI	Jeune Entreprise Innovante/ Young Innovative Company
JPI	Joint Programming Initiatives
JTI	Joint Technology Initiatives
KT	Knowledge transfer
LABEX	Laboratoires d'Excellence/Excellence laboratories
LERU	League of European Research Universities, consortium of Europe's 21 most prominent research universities
MEDDE	Ministère de l'Écologie, du Développement durable et de l'Énergie/Ministry for Ecology, Sustainable Development and Energy
MESR	Ministry for Higher Education and Research
MIRES	Inter-Ministerial Mission on Research and Higher Education
MRP	Ministère du Redressement Productif/ Ministry of Productive Recovery (Ministry of Industry)

OECD	Organisation for Economic Co-operation and Development/OECD
PIA	Plan Investissements d'Avenir/ Investments for the Future Plan
PRES	Research and Higher education
PRO	Public Research Organisations
R&D	Research and development
R&D&I	Research and Development and Innovation
RDI	Research Development and Innovation
RENATER	Réseau National de télécommunications pour la Technologie l'Enseignement et la Recherche/ Telecom Network for Technology, Education and Research
RI	Research Infrastructures
RIS	Research and Innovation System
S&T	Science and technology
SATT	Sociétés d'accélération du transfert de technologies/ Private Companies dedicated to boosting technology transfer
SF	Structural Funds
SME	Small and Medium Sized Enterprise
SNR	Stratégie Nationale de Recherche/National Research Strategy
SRESR	Regional Research and Higher Education Scheme
SRI	Stratégie Régionale d'Innovation/ Regional Innovation Strategy
SRR	Schéma Régional de Recherche/ Regional Research Layout
SSH	Social Sciences and Humanities
SWOT	Strengths-Weaknesses-Opportunities-Threats
TFEU	Treaty on the Functioning of the. European Union

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