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Executive Summary

Poland's R&D system has undergone significant changes over the last ten years. In particular, the adoption of recent reforms of the science and higher education system led to significant changes. Particularly, moving towards competitive-based funding, creating two governmental R&D agencies for applied and basic research, putting in place new provisions for the research institutes, and overcoming fragmentation of R&D efforts by concentrating the funding on the best performing institutions are among the most important recent changes. The rationale behind legislative changes introduced as part of science and higher education reform package was the desire to create a more transparent and better performing R&D system. It was clear from the beginning that one has to have a prioritisation. To this end, a system of rewarding institutions achieving better results and concentrating limited sources of funding was put forward and introduced into the relevant legislative acts, which came into force in the course of 2010 and 2011.

The governance system has also undergone some important evolution and led to the establishment of two new advisory bodies, notably the Committee for Science Policy (KPN) and the Committee for Evaluation of Scientific Institutions (KEJN). Building upon the first years of functioning of the National R&D Centre (NCBiR), established in 2007 to oversee the management of strategic R&D programmes, the recent changes have certainly strengthened the competences and powers of the agency that had been previously centralised at the Ministry of Science and Higher Education.

In summary, the following conclusions can be drawn from this analysis of Poland's R&D system.

First of all, the available data confirms that the Poland's performance on the main research, development, and innovation indicators is weak. The EU-27 countries spend on average 2% of GDP on R&D activities, according to the latest (2010) available data. In comparison, Poland's GERD is estimated only at 0.74%, which places Poland on the 20th position in the group of EU-27 countries.[1] Calculated per capita, there are four countries incurring less R&D expenditure than Poland (€68.3), namely Lithuania, Latvia, Romania, and Bulgaria. Poland also lags behind on other indicators like BERD estimated in 2010 at 0.2% of GDP, compared to the EU-27 average of 1.23%. In reality, this means that the business R&D investments in the group of EU12 countries are lower only in Romania and Cyprus (Eurostat, 2012).

Benchmarking against the EU-27 shows that Poland is performing better on the indicator of tertiary educational attainment some indicators. In percentage, this level is estimated at 35.3% against EU-27 average of 33.6% (Eurostat, 2011). Most importantly, a central argument of the present report concerning the assessment of overall performance is that despite a large gap still to be bridged between Poland and EU leading countries, the developments that have taken in the course of last ten years are not negligible. The upward trends recorded (since 2000) both in the GERD and BERD are concrete examples.

Secondly, this report demonstrates that among the main underlying factors of the current performance are the legacy of the previous R&D system, the socio-economic

[1] Data for Greece is not available.

situation, the magnitude of challenges due to the size of the R&D system, the dominance of micro-enterprises in the economy, the absence of links between FDI and national stakeholders, weak science-industry co-operation due to the limited absorptive capacity of companies, the absence of system of incentives to technology transfer and commercialisation of R&D results, IP issues as well as cultural aspects.

Based on the analysis of performance and the main underlying factors of the current performance, the key challenges faced by the national innovation system are the following:

1. Ensuring that the recent reforms of the science system bring desirable changes;
2. Designing and putting in place more effective support programmes to secure growth and jobs in the long-term;
3. Concentrating the financial contribution on key strategic areas;
4. Improving the skills for innovation; and
5. Introducing anchoring mechanisms between foreign investors and other stakeholders of the national innovation system.

Generally, due to a favourable economic situation and substantial support received from the EU Structural Fund interventions, the public investment in support of RDI activities has recorded an upward trend over recent years. Nonetheless, the socio-economic situation makes it more difficult to significantly increase in a short period of time the level of funding.

In terms of research and innovation priorities, the main policy objectives are defined in two documents, namely the 2020 Innovation and Effectiveness of the Economy Strategy (SIiEG)[2], which is expected to be adopted shortly, and the 2020 National Research Programme (KPB). The analysis undertaken in the framework of this assignment shows that both the scope and focus of the SIiEG have been extended to new areas and tailored to new actions in line with Europe 2020 Strategy. It is also worthwhile pointing out that in comparison with the preceding programme, the KPB contributed to establishing a more precise definition of priorities, although there has been no major shift in relation to the past priorities.

Despite a match between priorities set out in the strategic documents and identified structural challenges the main criticism is that prioritisation has not been sufficiently reflected in the two strategy documents, meaning that areas with the highest potential for development have not been identified. It is important to also explain that the work concerning specific action plans on the basis of which the SIiEG will be delivered are in a preparatory phase, while the NCBiR launches R&D programmes based on the KPB.

Since the EU Structural Fund interventions are among the main instruments in support of RDI activities and implemented over a seven-year perspective, there have been no major changes in the policy mix. There are also a number of smaller-scale national initiatives, including for instance tax incentives. Certainly, the most important recent trend is the intensification of activities by the NCBiR, following the recent

[2] http://www.mg.gov.pl/files/upload/12707/SIiEG_konsultacje_02.2011.pdf

changes to the legislative framework and appointment of new management of the Centre.

Next, the findings of the present report suggest that there have been great strides made over recent years to implement policies in response to the identified challenges, however, further improvements are need to introduce structural (long-term) changes to the national innovation system. One of the main issues currently discussed relates to the rules outlined recently in the draft of Ministerial decree prepared by the Committee for Evaluation of Scientific Institutions (KEJN). The main bottleneck appears to be the absence of criteria allowing objective assessment of scientific research institutions' impacts on the innovativeness of economy and it is argued that it penalises research institutions vis-à-vis higher education institutions. This issue was brought by the Main Council of the Research Institutes (known also as RGIB).

With regard to the overall directions of the possible evolution of the Poland's innovation policy, is the present analysis recommends that the emphasis of future policy responses is placed on strengthening debt-financing instruments, putting more effective forms of support including among others tax incentives, revisiting instruments in support of clusters, establishing greater prioritisation of funding and ensuring better multi-level governance co-ordination.

Finally, it can be concluded that the recent reforms have been mainly carried out to introduce structural reforms into the science and higher education system. Due to the scope and extent of existing challenges some elements of ERA can be identified in the recent reforms, however, they have not been exclusively developed to meet the ERA objectives. In concrete terms, the focus of Poland's policy has been primarily on developing the labour market for researchers, research infrastructures, concentrating funding on leading scientific research institutions, fostering science-industry co-operation, and to a much lesser extent on cross-border -, international co-operation, and knowledge circulation.

This section still needs explanation on:

1) the rationale of current changes/transformations
2) the industry-science relations / cooperation
3) crisis & Poland: general economic situation and its reflection to the RDI system.
4) more perceptible explanations (e.g. some examples/justifications).

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• Introduction

You should start with a short paragraph defining the position of Poland in Europe (supported by the main indicators; population, GDP, growth rate etc).

Poland has a population of some 38m inhabitants, which represents roughly about 7.6% of the total population in the EU-27. In terms of GDP, it is the 7th largest economy, accounting for almost 3% of EU-27 total GDP. During recent years, Poland has experienced rapid economic growth. Since 2000, the economy has grown by 53%. Most recent data (2011) shows that the annual GDP growth rate reached a level of 4.3% (Eurostat, 2012).

According to the latest available data for 2010 the industry and construction gross value added (GVA) was estimated at 25% and 10%, respectively (Central Statistical Office, 2012). The remaining contribution came mainly from the service sector. In terms of employment, it is important to point that the manufacturing sector, agriculture and construction generate two-fifth of total employment (Central Statistical Office, 2011b).

By the most recent count (2009), it is estimated that Poland has altogether 102 public universities, 243 public research organisations, the employment in scientific R&D activities is at about 121,000, the number of students reached a level of 1.9m, including almost 36,000 PhD students (Central Statistical Office, 2011). All this indicates that the size of the R&D system is considerable in comparison with some other EU countries.

Comparatively, the Poland's performance on the main R&D indicators benchmarked against EU average is weak (in 2010: GERD as a percentage of GDP: 0.74% and BERD as a percentage of GDP: 0.2%). The EU-27 average on those two indicators is 2% and 1.23% of GDP, respectively. However, a problem in interpretation of the Poland's data lies in the exchange rate, which has changed roughly from 3.48 PLN to the Euro in 2008 to 4.35 PLN to the Euro in 2009. This actually has an impact on the results when the figures are expressed in Euro. Based on the national currency the GERD increased during the 2008-2009 period by almost 18%, whereas BERD recorded an upward trend of 8% in the same period.

Despite the upward trend in R&I investments, the major problems are that there has been no change in structural (long-term) indicators. It is important to point out that innovation investment in the manufacturing sector declined by almost 10% during the period 2008-2009, mainly due to decline in capital expenditure on fixed assets. This means that either companies are concentrating on maximising their returns on investments or simply reflects the changes between the two most last EU Structural Funds programming periods, meaning that the investments realised with the support of 2007-2013 Structural Fund interventions which began to be implemented with 1-2 year delay have not been captured by the current statistics.

It is important to also note limited research outputs. According to the latest data (2009) 1,536 patents were granted by the Poland's Patent Office. Comparatively, the number of patents granted to foreign applicants in the same year was 2,442. In terms of number of citations per publication, Poland was ranked on the 20th position (Central Statistical Office, 2011).

Figure 1 illustrates Poland's research, development, and innovation (RDI) governance system. As noted in the previous analysis (Walendowski, 2011) the Economy

Department of the Ministry of Economy and the Strategy Department of the Ministry of Science and Higher Education continue to be the main actors responsible for the design of RDI policy.

The governance system has recently undergone some important evolution. The Science Council ceased its activities at the end of December 2010 as it had been foreseen by the reforms in the science sector initiated back in 2008. The two key executive agencies are: the National R&D Centre (NCBiR) responsible for the management and implementation of strategic scientific research and development programmes and the National Science Centre (NCN) overseeing the basic research projects. Respectively, those agencies have been operating since July 2007 and October 2010. It is worth underlining that the NCBiR gained new powers and competences as a result of the science reform which entered into force in the autumn of 2010 (Walendowski, 2011).

With regard to advisory bodies, two committees have been recently established at the Ministry of Science and Higher Education, notably the Committee for Science Policy (KPN) and the Committee for Evaluation of Scientific Institutions (KEJN). Among the main responsibilities of the former is to support the Minister in preparation of documents concerning the development of science, technology and innovation policy, to draft the State budget and financial plan for funding science. In addition, it delivers opinions concerning the activities realised by the National R&D Centre and the National Science Centre and undertakes their assessments. The Committee is composed of twelve members representing different scientific fields and types of scientific research institutions.

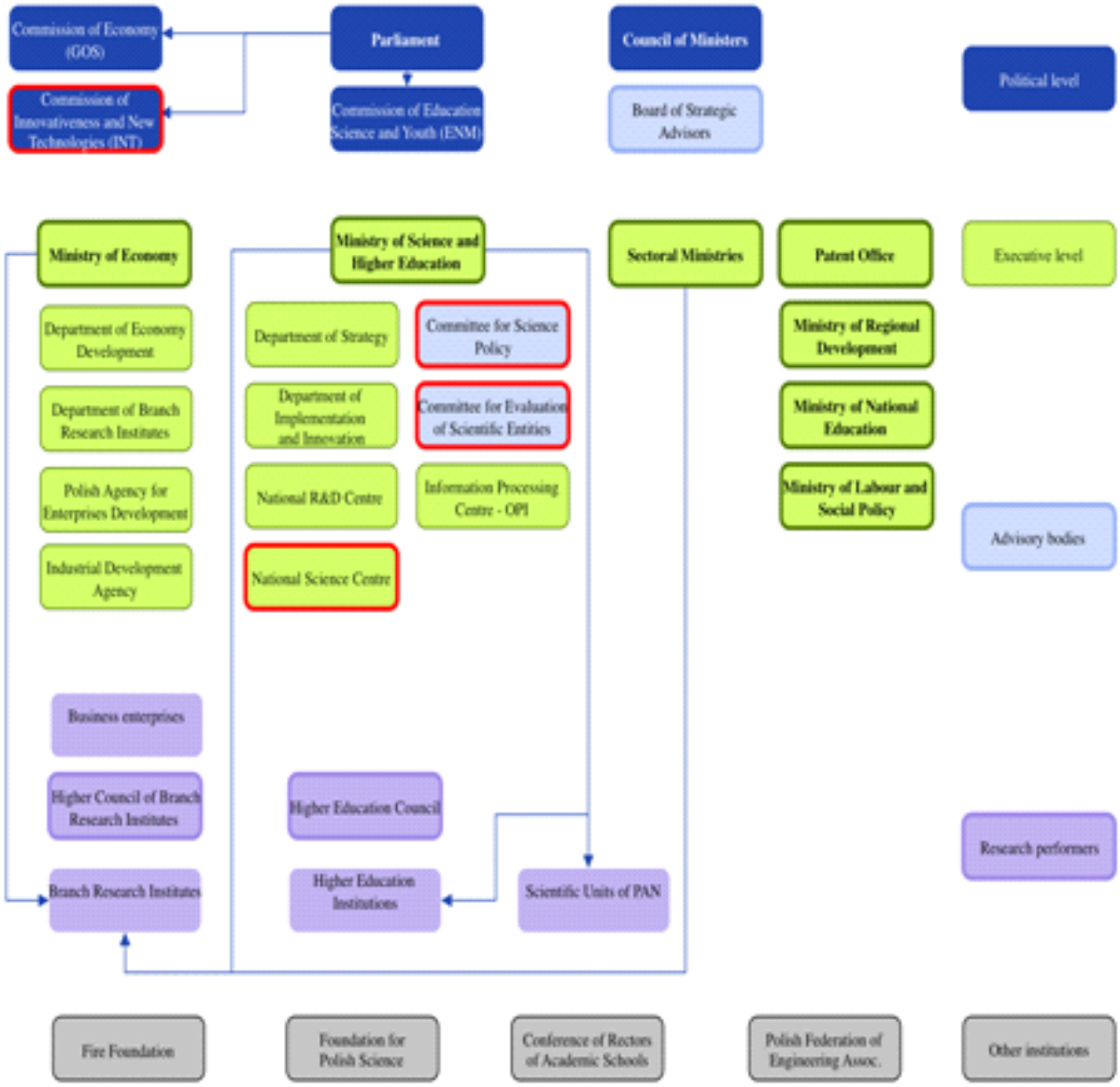
The KEJN is tasked with the evaluation of scientific institutions. It consists of four committees, notably concerning Human and Social Science, the Exact Science and Engineering, Health, and Art Science. The Minister of Science and Higher Education has responsibility for appointing the new members. The underlying difference is that the candidates to the KPN are submitting applications themselves, whereas in the case of KEJN the eligible entities to put forward the candidatures are best performing scientific research institutions (category A), and other socio-economic institutions, including among others the Polish Federation of Engineering Associations – NOT, the Polish Bank Association – ZBP, and the Polish Chamber of Commerce – KIG, etc. Each organisation can propose two candidates for each of the four scientific fields. To encourage that the scientific research institutions name candidates from other institutions, it is specified that only one candidate can be the employee or member of science council of the institution proposing the candidate. The role of the KEJN is very important to achieve one of the goals of the recently introduced reforms, notably is to focus the funding on the best performing institutions (Walendowski, 2011).

The present report puts a spotlight on the possible future evolution of the Poland's innovation policy mix. In particular, it suggests strengthening debt-financing mechanisms based on the lessons from the programming and implementation of the instrument, known as the Technology credit of the Operational Programme 'Innovative Economy' 2007-2013. It is also viewed necessary to deploy more effective instruments in support of research and innovation activities within companies. This would require, for example, drawing lessons from the implementation of existing tax incentives, which have been considered as a weak form of support. Changes to networking and cluster initiatives are also needed. Above all, establishing greater prioritisation of funding and ensuring better multi-level governance co-ordination is required. Otherwise, the

opportunities for introducing structural changes to the national innovation system will be missed.

In this section three dimensions are **missing**: i) general position of Poland in the context of EU, ii) the information supporting research inputs/outputs (publications, citations, patents etc), and iii) economic specialisation of the country.

Figure 1: Poland's RDI governance system



Source: Walendowski, J. (2011) Mini Country Report: Poland.

• Structural challenges faced by the national system

The overall performance on the main research, development and innovation (RDI) indicators is bleak. In 2010, GERD reached a level 0.74% of GDP, compared to the EU-27 average of 2%. Among the EU12 Member States, Poland has one of the lowest GERD per capita estimated at €68.3. This means that there are only three EU countries spending less, namely Lithuania, Latvia, Romania and Bulgaria. According to the latest available data for 2010 the share of State funding in GERD was 60.9%, compared to the EU-27 average of about 34.9% in 2009 (Eurostat, 2012).

BERD measured as percentage of GDP is estimated for 2010 at 0.2%, compared to the EU-27 average of 1.23% (Eurostat, 2012). Sales of low-tech and medium-low tech in the manufacturing sector (private) account respectively for 39% and 26.8% of total sales, whereas medium-high technology and high technology represent 28.6% and 5.7%, respectively (Central Statistical Office, 2011) showing to some extent the level of innovativeness of economy.

Science industry co-operation continues to be viewed as one of the major weaknesses. The share of business enterprises funding in R&D expenditures of R&D units is estimated only at 15.4% (66% comes from the State funding). With regard to technology transfer, only 363 companies purchased R&D results in 2009 (Central Statistical Office, 2011). In total, it is estimated that some 2450 companies purchased technology in 2009, mainly investing in means for automating and consulting services, which is a low result comparing to the number of existing enterprises. In order to give a sense of proportion, the number of trading companies was estimated in 2009 at 1.6m (Local Data Bank of the Central Statistical Office)[3].

A recent report prepared by the National Contact Point - KPK (2011) put a spotlight on a limited number of FP funded projects led by Polish institutions. During the period 2007-2011, 158 of these kinds of projects were identified. The number of supported projects is estimated at 1,146, which places Poland on the 11th position. This raises the issue of the capacity of Polish R&D institutions to compete with their European counterparts and the return of Poland's contribution to the FP programme. Poland is the net payer to the FP7.

The 2011 Innovation Union Scoreboard, Poland is one of the moderate innovators with a below average performance. Relative strengths are in Human resources, Finance and support, Firm investments and Economic effects. Relative weaknesses are in Open, excellent and attractive research systems, Linkages & entrepreneurship, Intellectual assets and Innovators.

Poland performs better on indicators such as tertiary education attainment and human resources in science and technology as a share of labour force. In 2010 these were 35.3% and 36.3% respectively, compared to the EU-27 average of 33.6% and 40.5%. However, recent trends reveal that while the number of graduates increased by 4.5%, the number of S&T graduated declined from 76,800 in 2008 to 76,700 in 2009, which represents 17.4% of all graduates (Central Statistical Office, 2011).

On the other hand, it ought to be underlined that the developments that have taken place during the last ten years in the national innovation system are impressive. The

[3] http://www.stat.gov.pl/bdl/app/strona.html?p_name=indeks

establishment of the National R&D Centre (known also as the NCBiR) in 2007 to oversee the management of strategic RDI programmes, the adoption of recent reforms of science and higher education system, and the upward trends recorded in GERD (+89.1%) and BERD (+49.3%) during the last decade (since 2000) are concrete examples (Eurostat, 2011).

One of the main underlying factors of such weak performance on the majority of RDI indicators is **the legacy of the previous R&D system** with its laws, rules and practices. It is widely known that in the aftermath of the collapse of the Soviet Union, the system underwent a radical downsizing (DG RTD Assessment, 2011) and was the subject of major structural reforms that have been taking place during the last 20 years.

With regard to the level of GERD, **the socio-economic situation** makes it more difficult to significantly increase in a short period of time the level of funding. In order to give a sense of proportion, the 2011 Science Budget (without the Structural Fund interventions) is estimated at PLN 4.62b or €1.02b[4], compared to PLN 15.81b or €3.49b for the Agricultural Social Insurance Fund (known also as KRUS) an institution established to realise tasks connected with servicing of farmers' social insurance and PLN 44.57b or €9.84b for the Social Insurance Institution (known also as ZUS) responsible among other things for collecting social insurance contributions, paying pension benefits, collecting health insurance contributions and their transfer to the National Health Fund, contributions to the Labour Fund which is used to finance unemployment benefits, etc.

Among the main obstacles to introducing the structural reforms are the dominance of State funding, a limited number of FP funded projects led by Polish research teams, the deficit of skills for innovation, and **the size of the national innovation system**. Altogether there are 102 public universities, 243 public research organisations, employment in scientific R&D activities is estimated at 121,000, 1.9m students, and almost 36,000 PhD students (Central Statistical Office, 2011)[5]. It is naturally more difficult to introduce structural reforms in large systems, which can be characterised as fragmented and often representing different interest groups due to a large number of institutions involved.

With regard to low intensity of R&D investments by the business sector, the underlying factor is **the dominance of micro-enterprises** in the economy. As much as this represents a challenge, it can be considered also as an opportunity because smaller companies tend to generate ideas for more radical innovations that are subsequently taken-up and roll-out by larger companies. In 2009, there were about 95.9% of companies employing less than nine persons (Central Statistical Office Local Data Bank, 2011). Besides that, the fact that **foreign direct investors** are not sufficiently connected with other actors in the national innovation system also explains the low level of BERD.

With regard to weak science-industry co-operation[6], one of the main issues is **the limited absorptive capacity of companies**. There is also the absence of system of

[4] Exchange rate: December 2011 (1 EUR is equal to 4,527000 PLN).

[5] http://www.stat.gov.pl/cps/rde/xbcr/gus/PUBL_nts_nauka_i_technika_2009.pdf

[6] According to the latest available data (2009), business investments in HE institutions account only for 3.3% of total investments in this sector (Central Statistical Office, 2011).

incentives to technology transfer and commercialisation of R&D results, whereas **IP issues** are regulated only in some HEIs. On the top of this, **cultural aspects** play a detrimental role and are among the main causes of weak science-industry co-operation. Primarily the issue is that the scientists are interested in carrying out R&D activities, whereas the business sector is mostly keen on maximising its profitability and shortening the transfer of R&D results into the production to the strict minimum.

In summary, the following SWOT analysis can be drawn from this assessment.

Table 1: SWOT analysis

Strengths	Weaknesses
High tertiary education attainment	Low level of R&D investments Dominance of low-tech companies Science-industry co-operation Cultural aspects as an inherent problem in relation to weak science-industry co-operation Limited number of FP7 funded projects Socio-economic situation
Opportunities	**Treats**
Number of S&T graduates Establishment of the NCBiR Recent reforms of science and higher education system Growing R&D investments (both public and private) Dominance of micro-enterprises	Difficulty to carry out reforms due to the size of the nation innovation system Missing the opportunity to anchor FDI investments in the long-term

Based on the analysis of performance and the main underlying factors presented above, the key challenges faced by the national innovation system are identified and discussed below.

Key challenge 1: Ensuring that the recent reforms bring desirable changes.

The reforms undertaken over the last years have been important and can be considered as steps in the right direction. A concrete example of a positive change is the Act on the Research Institutions of 30 April 2010[7]. One of the most important changes is a possibility for research institutes to use income they have generated to finance R&D activities focused on the implementation and application of results in practice. Among other changes introduced by the Act on the Principles of Financing Science of 30 April 2010 was the establishment of a link between the quality of scientific research undertaken by the institutes and the level of funding. In practice, the recently proposed criteria by the Committee for Evaluation of Scientific Research Institutions (known also as KEJN) are considered by the Main Council of the Research Institutes (RGIB), which is the elective representative body of research institutes, as contradictory to the initial directions of reform within the science sector. In particular, the Council underlined in its letter addressed to the Minister dated 1

[7] http://www.bip.nauka.gov.pl/_gAllery/95/11/9511/20100430_ustawa_o_IB.pdf

December 2011, the lack of transparent principles for assessing the scientific research institutions and the absence of criteria allowing real assessment of impacts of such institutions on the innovativeness of economy. In the opinion of RGIB, the adoption of proposal in the current form would have negative consequences on many institutions that undertake both applied research and development activities (RGIB, 2011). This requires that a suitable solution to be found without unnecessary delays.

Key challenge 2: Designing and putting in place more effective support programmes to secure growth and jobs in long-term.

So far, the policy support has led to short-term outcomes in terms of a number of supported projects and as often presented increase of employment, although for the moment it has not led to significant structural changes in the innovation system. While there has been a surge of RDI investments during the last ten years, the long-term (structural) indicators such as the share of State funding in GERD, the 2011 Poland's TrendChart report underlined that the share of R&D investments in total innovation expenditures in the manufacturing sector remained largely the same as ten years ago. Section 3.2 discusses more in detail the Poland's performance on the main RDI indicators.

Key challenge 3: Concentrating the financial contribution on key strategic areas.

Primarily, this is the main task of the National R&D Centre (NCBiR). It is still a young institution, even though it was officially established in the summer of 2007. The reform of the science sector which entered into force in the autumn 2010 has provided the Centre a greater freedom to use the funding in the framework of Research Strategic Programme (KPB) which was adopted by the Council of Ministers during the summer of 2011. So far, the policy has not managed to tackle the fragmentation of R&D efforts. However, the recent reforms aim at concentrating the funding on best performing institutions, which is particularly justified by the current economic situation across the EU countries. Most importantly, it has been recognised that Poland cannot be competitive in all areas, and therefore more tailored-funding is required. This represents a significant change in policy direction because until recently the allocation of public funding for R&D activities was done through so called block funding system, which did not take sufficiently into account achievements of a particular scientific research institution but favoured equal distribution of funding across all institutions. The block funding has not allowed achieving a critical mass but also led to duplication of efforts.

Key challenge 4: Improving the skills for innovation.

One of the main issues of concern is the supply of S&T graduates. The recent trend reveals a decline which should be carefully monitored. Despite various programmes of support, there is still a mismatch between the skills provided by the education system and industry needs. A general view voiced by the stakeholders is that the skills shortages relate mainly to innovation, although improving the skills of researchers is also required. This has been a long-standing challenge and different policy responses have been adopted over the recent years. The way forward would be to promote new forms of support to foster closer co-operation between the business sector and HEIs, improve the mobility and career development of researchers.

Key challenge 5: Introducing anchoring mechanisms between foreign investors and other stakeholders of the national innovation system.

The inflow of foreign direct investment (FDI) in 2009 amounted to €9.9b. This represents a decline compared to the previous year by 2%. In 2010, according to the preliminary estimates, Poland attracted €7.5b investment (Polish Information and Foreign Investment Agency, 2011). Taking into account that the Special Economic Zones which provide the income tax relief for companies investing in the zones (investment/labour costs) are operating until the end of 2020, there is a need of strategic approach. Establishing links between foreign investors and other actors of the innovation system are required to ensure sustainable co-operation in the future.

This section needs more reference to sources pointed out in the guidelines (IUC Report and IU Scoreboard).

It also needs to fulfil the requirement "assessment of structural bottlenecks for R&I should appropriately combine elements of the SWOR analysis of four policy domains" (The Guidelines, pp.4).

Empirical supports for the claims would be good, as well.

• National research and innovation priorities

• *National research and innovation priorities*

The Poland's research and innovation priorities are defined in two documents, namely the **2020 Innovation and Effectiveness of the Economy Strategy** (SIiEG)[8] and the **2020 National Research Programme** (KPB)[9]. The SIiEG is expected to be formally approved in the coming months.

The origins of the preparation and development of the SIiEG date back to the Plan adopted by the Council of Minister in November 2009, which set to review the National Development Strategy. More specifically speaking, it was proposed to limit the number of strategies from 42 to nine, one of which would be the SIiEG. To illustrate this, the decision was taken not to adopt the 2015 Science Strategy, work on which had started in 2008 and had been completed in 2009.

As a result some science aspects have been incorporated into the SIiEG, and it is interesting to note that the work relating to the preparation of the Science Development Programme (PRN) continues. Apart from the need to re-organise the strategic documents, it was also required to update the Strategy for Increasing the Innovativeness of Economy, which had set out the time horizon until 2013.

The KPBNiPR was prepared following the entry into force of the Act on the National R&D Centre (NCBiR) and the Act on Principles of Financing Science, both adopted in June 2007. Subsequent changes introduced by the reform of the science system, which entered into force in October 2010, led to the consolidation of the position of the Centre by extending its competences. Under the current provisions, the NCBiR Council prepares and presents to the Minister of Science for approval proposals of

[8] http://www.mg.gov.pl/files/upload/12707/SIiEG_konsultacje_02.2011.pdf

[9] http://www.bip.nauka.gov.pl/_gAllery/15/21/15212/20110816_zalacznik_KPB.pdf

strategic scientific research and development programmes. In the past, this was the task of the Minister, which proved to be ineffective and led to significant delays in launching programmes.

These have been very important changes explaining the process that led to the adoption of the KPB, although they do not explain as such the need to design the new programme. What has played a role in **the decision to prepare the KPB includes both external and internal factors**. Certainly, the Europe 2020 Strategy and the KPBNiPR evaluation triggered the process of elaborating the KPB. Besides that, the KPBNiPR was prepared among other stakeholders by the Committee of Scientific Policy and Science and Technology of the Science Council (KPNiNT). This specific body ceased functioning in December 2010 as an outcome of recent reforms, and that also to some extent underpinned the decision to change the programme.

The SIiEG is currently subject to final inter-, and intra-ministerial consultation within the Ministry of Economy, and it is expected that the final Strategy will be announced in coming months. The KPB is an officially binding document setting out strategic research orientations, which was adopted by the Council of Ministers in August 2011.

Following the overview of the process and rationale for developing the two strategic documents, namely the SIiEG and the KPB, we turn here to the national research and innovation priorities.

According to **the SIiEG,** Poland of 2020 should be an open and expansive economy, offering new jobs, based on mutual trust and co-operation, constantly growing as a result of innovation and high effectiveness in the use of resources, which will guarantee an increase in living standards and the competitiveness of enterprises on the international markets.

The strategic objective of the Strategy is defined as developing highly competitive economy (innovative and effective) based on knowledge and co-operation. Among the five operational objectives set out by the Strategy are: (1) strengthening framework conditions affecting business activities, (2) stimulating innovation, (3) developing enterprises, (4) establishing low-emission and sustainable economy, and (5) developing the economy through internationalisation.

The priorities of the SIiEG are structured around nine priority areas. Among the main RDI priorities, the following can be distinguished[10]:

- Priority 1.1 Re-orientation of the public expenditure structure towards pro-development investments, and ensuring an increase of R&D and innovation expenditure.
- Priority 4.1 Supporting the establishment and development of R&D infrastructure.
- Priority 5.1 Increasing the level and effectiveness of science in Poland and increasing its international competitiveness.
- Priority 5.2 Establish the framework for effective innovation policy.
- Priority 5.3 Supporting the co-operation within the innovation system.

[10] For the sake of clarity the priority numbering corresponds to the above-mentioned priority areas.

- Priority 5.4 Creating the environment conductive to the creation, the use and the protection of knowledge.
- Priority 5.5 Developing international scientific and education co-operation.
- Priority 6.2 Developing modern scientific personnel.
- Priority 7.1 Facilitating the access to funding for enterprises.
- Priority 7.2 Support the investments in innovation and new technologies.
- Priority 7.3 Taking into account global challenges in the investment decisions concerning innovation and new technologies.
- Priority 8.1 Transforming the socio-economic system towards so-called 'green path' of development.
- Priority 8.2 Developing environmental-friendly industries.
- Priority 8.3 Developing sustainable construction.
- Priority 9.2 Supporting the inflow of innovative and responsible FDI and developing incentives for re-investing profits in Poland.
- Priority 9.3 Supporting the process of internationalisation of innovative enterprises.

In total, there are six new priority areas in the SIiEG that had not been included into the preceding Strategy for Increasing the Innovativeness of Economy (2007-13). Those newly defined priority areas concern, especially ensuring better macro-economic conditions, creating a better legal-institutional system, creating high quality administration in the field of economy, increasing the effectiveness of labour, increasing the effectiveness in the use of natural resources and raw materials, and increasing the internationalisation of the economy. Hence, establishing high quality infrastructure, increasing the effectiveness of knowledge (support to the development of R&D and transfer of knowledge), and facilitating the access to funding had been already mentioned among the priorities of the previous Strategy.

The emerging conclusion is that **the scope and focus of the SIiEG have been extended to new areas and tailored to new actions in line with Europe 2020 Strategy**. The document contains an analysis of the strengths and weaknesses at a national level, while the regional dimension is missing. It also deserves to be mentioned that the public consultation on the SIiEG took place between February and March 2011 with the involvement of major stakeholders.

The KPB contains seven strategic, inter-disciplinary scientific research and development priority areas. Those can be summarised as follows:

- Priority Area 1 New technologies in the field of energy.
- Priority Area 2 Civilisation diseases, new pharmaceuticals, and regenerative medicine.
- Priority Area 3 IT and mechatronic advanced technologies.
- Priority Area 4 Modern material technologies.
- Priority Area 5 Environment, agriculture and forestry.

- Priority Area 6 Poland's socio-economic development during the globalisation of markets.
- Priority 7: State security and defence.

In comparison with the preceding programme (i.e. KPBNiPR), the KPB contributed to establishing a more precise definition of priorities. For instance, the previously defined research area was 'health' and the current programme refers to 'civilisation diseases, new pharmaceuticals, and regenerative medicine'. Among the new areas introduced to the KPB are: IT and mechatronic advanced technologies, forestry, State security and defence. On the whole, there has been no major shift in relation to the past priorities. Particularly, the first two priorities of the KPB are closely connected to the grand challenges. It is import to also mention that the document was subject to consultation with the main stakeholders.

Increasingly the attention is focused on societal challenges, however, the 'hot' topic in national R&I policy concerns the implementation aspects of recent reforms. In concrete terms, the discussions are concentrated on the assessment criteria of scientific research institutions especially in terms of their impacts on the innovativeness of economy. This is a very important issue because the level of financial contributions is linked to the assessment results.

With regard to recent findings from appraisals of R&I policy, Walendowski (2011) noted that several evaluations have been completed. In summary, the main lessons are the following:

- There has been a positive impact of support measures of the Sectoral Operational Programme Increasing the Competitiveness of Economy (2007-2013) in terms of number of jobs created and growth of income among the beneficiaries (Młodożeniec and Bigoszewski, 2010).
- The co-operation with the implementing institutions is assessed positively, although the main issue of concern raised by the beneficiaries was the bureaucracy (Młodożeniec and Bigoszewski, 2010).
- The support for enterprises during the 2004-2006 programming period was positively assessed, however, the support was directed towards companies in better financial situation (Institute for Structural Research, 2010).
- There is a need to promote certain themes as defined in strategic documents (e.g. R&D projects related to new energy sources and new technologies in the health sector) especially in measures that are highly popular (PSDB, grupa WYG, 2010).
- The Innovation voucher programme had a positive impact on cooperation between micro and small enterprises and scientific units. The problems to which attention was frequently drawn related to the duration of projects, considered too short as well as to the lengthy contracting procedures (Policy & Action Group, and Uniconsult, 2010).

Since the EU Structural Funds, which are the main source of funding for RDI span over a long period until 2013, there have been no changes in the overall policy mix. There are a number of smaller-scale national initiatives, and the most important recent change is the intensification of activities undertaken by the NCBiR. Launched in November 2011, GRAF-Tech is the most recent support programme in support of

R&D activities on grafephene, the overall budget of which is €12.3m during a 36-month period[11].

In conclusion, there is a match between priorities set out in the strategic documents discussed and identified structural challenges. However, one of the main issues of concern is that prioritisation has not been sufficiently reflected in the two strategic documents under review. During the consultation of the KPB, RGIB (2011) underlined the absence of identification of the Poland's specialisation in niche areas. On a more positive note, it is mentioned in the SIiEG that the results of the ongoing technology foresight (known also as InSight 2030)[12] will be used in the preparation of the next (2014-2020) programming period. Another ongoing project "National Foresight Programme – implementation of results"[13] which was led by the Central Mining Institute (GIG) aims at developing tools for assessment of scientific-technological potential. The project's duration is between 2011 and 2015.

As highlighted at the beginning, section 3.1 needs

1) to be tied up.
2) better focus on the RDI priorities and innovation system
3) reshuffling of the content intra-section and inter-sections.

- ***Trends in R&D funding***

Comparatively, the Poland's performance on the main R&D indicators benchmarked against EU average is weak. There is just one indicator on which Poland scores better than the EU average and this is the growth of GDP. According to the latest available statistics, the GDP in the third quarter of 2011 was 4.3% higher than in the same period of last year (Eurostat, 2012). A typical problem in interpretation of the Poland's data lies in the exchange rate which has changed roughly from 3.48 PLN per Euro in 2008 to 4.35 PLN in 2009. Based on the national currency, GERD increased during the 2008-2009 period by almost 18%. With regard to BERD, the annual growth during the same period is estimated at 8%.

Apart from the fact that the level of R&D investments is low (in 2010: GERD 0.74% and BERD: 0.2%), one of the main issues is that the share of State funding in total R&D expenditure accounts for more than 60.9% (Eurostat, 2012). The R&D investments in the manufacturing sector represent a small proportion in the total innovation expenditure (in 2009: 9.9%). Besides that, enterprises employing > 499 employees account for 66.7% of total R&D investments in the manufacturing sector and only 16.6% in the case of enterprises employing 50-249 persons (Central Statistical Office, 2011).

[11] http://www.ncbir.pl/gfx/ncbir/pl/defaultaktualnosci/524/836/1/program_graf_tech_rc.pdf

[12] The main objective of the recently completed project 'Industrial technological foresight until 2020' (known also as InSight 2030) was to identify the key technologies of strategic importance, the development of which will be priority for the Poland's manufacturing sector in the next 20 years. As a result of the project, 34 technology priorities across nine research areas like Biotechnology, Nanotechnology, Advanced systems of production, ICT, Micro-electronics, Photonics, Clean coal technologies, Energy, Modern equipment for mining industries, Technologies related to extraction of natural resources.

[13] http://npf.gig.eu/

While there has been no change in those long-term indicators, it is important to point out that innovation investment in the manufacturing sector declined by almost 10% during the period 2008-2009. The decline of innovation investments trend can be actually explained by the fact that, following the initial investments, companies are looking currently to increase the return of their previous investments, but also reflects the changes between the programming periods in the EU Structural Fund interventions (Walendowski, 2011). Particularly, this is the issue because it shows a high level of dependence on the external sources of funding but also a cyclicality of innovation investments, meaning that in times of economic downturn companies tend not to invest in risky and innovative projects.

According to the 2011 Science budget, the institutional funding accounts for roughly about 48.4% of total financial allocations. Taking into account the reform introduced in October 2010, increasing the competitive funding via the NCBiR and establishing a link between the performance and level of funding is certainly among the top priorities of the Ministry of Science and Higher Education (MNiSW).

The importance of the EU Structural Fund interventions is considered as high. By the most recent count it is estimated that this source of funding accounts for 14% of the 2011 Science budget (MNiSW, 2011). In terms of R&D funding, the Central Statistical Office estimated that in 2009 the ratio of EU funding to total amount of funds on R&D at 3.6%.

The Operational Programme Innovative Economy (2007-2013) is by far the most important programme in support of R&I activities in Poland (total budget: €9.7b). The importance of regional operational programmes in support of R&I is naturally lower than the national support measures, however, it is not negligible. For example, the annual regional innovation investments are estimated at €112m in Mazovia and €78m in Śląskie, which represent on average 25% of the Regional Operational Programmes (Walendowski, 2011).

The overall importance of the EU Structural Fund interventions is considered as high, but it is important to remember that a relatively small number of existing companies receive the financial support. Until September 2011, it is estimated that more than 19,000 applications were submitted in the framework of the Operational Programme 'Innovative Economy' 2007-2013 and agreements were concluded with 7,000 entities. This number contains not only companies but also other stakeholders like business intermediary organisations, research institutes, debt and VC financing institutions, etc. Comparatively, the number of trading companies in 2009 was more than 1.6m (Central Statistical Office, Local Data Bank).

Table 2: Basic indicators for R&D investments in Poland

	2008	2009	2010	EU average 2010
GDP growth rate	5,1	1,6	4,3	2,0
GERD as % of GDP	0,6	0,68	0,74	2.0
GERD per capita	57,6	55	68,3	490.2
GBAORD (€ million)	1,064,207	1,015,713	N.A.	92,729.05

	2008	2009	2010	EU average 2010
GBAORD as % of GDP	0,29	0,33	N.A.	0.76
BERD (€ million)	678,711	597.26	694,295	151,125.56
BERD as % of GDP	0,19	0,19	0,2	1.23
GERD financed by abroad as % of total GERD	5,4	5,5	11,8	N/A[14]
R&D performed by HEIs (% of GERD)	33,6	37,1	37,2	24.2
R&D performed by PROs (% of GERD)	35,3	34,3	35,9	13.2
R&D performed by Business Enterprise sector (as % of GERD)	30,9	28,5	26,6	61.5

Source: Eurostat, 2012. Data extracted on 11 April 2012.

- ***Evolution and analysis of the policy mixes***

Poland provides support to R&I through a series of instruments, the majority of which is co-financed by the EU Structural Fund interventions. The total annual national funding is estimated at about €1.1b.

The focus on R&I support instruments is primarily on the **Priority 2 Research and Technologies**. Within this priority the projects concern strengthening the capacity of scientific research organisations, infrastructure related projects, applied research projects undertaken by the science sector, business R&D projects, IP rights, tax incentives for R&D performing organisations, commercialisation of R&D results and providing access to external sources of funding through debt financing instruments.

Among the main measures are: Creator of innovativeness, Development of centres with high research potential, Investment relating to science IT infrastructure, Investments related to R&D activities within enterprises, Patent Plus, Status of R&D Centres, Support to applied research projects undertaken by science institutions, Support to the creation of joint research infrastructure of science entities, Support to the implementation of R&D results, Support to goal-oriented projects, Technological initiative/Ini-tech, and Loans for innovation.

The total 2010 budget of measures belonging to this priority is estimated roughly at about €497.7m or 44.6% of the total budget in support of R&I.

The next area of importance is the **Priority 4 Creation and growth of innovative enterprises.** The projects eligible for funding within this priority provide support to innovative early-stage companies, and relate to other activities like the purchase and implementation of new technologies, the entry of young innovative companies on the Warsaw Stock Exchange market, the support for the creation and development of science-technology parks, other business intermediary organisations, VC funding and subsidies innovation loans.

[14] 8.4 (2009), 9.04 (2005)

The total 2010 budget of measures belonging to this priority is estimated roughly at about €341.1m or 30.6% of the total budget in support of R&I.

The **Priority 3 Human Resources** is the third area in terms of importance. The main activities supported by those instruments concern the development of qualifications of R&D personnel, life-long learning, scholarship for S&T students, mobility of researchers and incentives to participate in the IDEAS programme of the European Research Council.

The main instruments include: Development of R&D personnel qualifications and raising awareness of the role of science in economic development, Lifelong learning, Strengthening and developing HEIs academic potential as well as increasing the number of graduates at courses of strategic importance for the development of knowledge-based economy, Strengthening potential of science staff, Mobility Plus, and Ideas Plus.

The total 2010 budget of measures belonging to this priority is estimated roughly at about €161.2m or 14.4% of the total budget in support of R&I.

The **Priority 1 Governance & horizontal research and innovation policies** comes next. Overall, the focus within this priority is on projects related to the activation of private investors and increase the investment readiness among young innovative companies, cluster initiatives, foresights, as well as the support for institutions delivering advisory services and training to companies.

Among the key initiatives are: Creation of the system facilitating investments in SMEs, Support to cooperation linkages at national level, Support to scientific research for building the knowledge-based economy, and Support to the system for the adaptability of personnel.

The total 2010 budget of measures belonging to this priority is estimated roughly at about €110.4m or 9.9% of the total budget in support of R&I.

Within **Priority 5 Markets and innovation culture**, the support includes fiscal incentives, IP rights, and raising awareness activities through the organisation of annual (national) innovation competition.

There are three instruments identified, such as Fiscal incentive, Management of intellectual property rights, Polish Product of the Future. This meant that the total 2010 budget of measures belonging to this priority is estimated roughly at about €5.5m or 0.5% of the total budget in support of R&I.

The most recent trend is the intensified activity of the National R&D Centre (NCBiR). Subsequently, those programmes confirm a shift towards competitive-based funding, which will also give further prominence of research and technologies/strategic applied research policies.

Taking into account the experience with the management and implementation of the EU Structural Fund interventions, there is a growing interest in financial engineering schemes. This is believed to be more effective form of support that would also allow reducing the costs associated with the project cycle management. According to the most recent estimate the success rate of application submitted in the framework of the 2007-2013 Operational Programme 'Innovative Economy' is roughly about 36.5%. In practice it means that the contractual agreements were concluded with

only 7,053 contractors out 19,297 submitted applications (Ministry of Regional Development, 2011)[15].

- ***Assessment of the policy mix***

The overall directions of the 2010 science sector reform are supported by all the major stakeholders of the national innovation system. Improving the quality of Polish science, fostering science-industry co-operation, aligning the funding system to international standards and increasing the participation of young scientists are among the main objectives of this reform. These objectives will be delivered especially by reforming the Polish Academy of Science, creating legislative framework adapted to the current context in which the Research Institutes operate, creating the two agencies notably NCBiR and the National Science Centre (NCN), increasing the competitive-based funding, introducing considerable changes to the assessment of scientific research institutions' performance as well as institutional and organisational changes of the science system[16]. The most recent changes related to the competences of the NCBiR are discussed in Section 3.1.

Despite the positive developments, one of the issues of concern relates to the new rules outlined in the draft of Ministerial decree concerning the assessment criteria and procedure of the scientific R&D institutions' performance, recently prepared by the Committee for Evaluation of Scientific Institutions (KEJN). In the letter addressed to the Minister of Science and Higher Education dated 1 December 2011, the Main Council of Research Institutes (RGIB) provided a negative opinion.

Altogether, the RGIB submitted 80 detailed comments to the draft proposal of Ministerial decree on the assessment of performance of scientific research organisations. More specifically, it pointed to the following issues:

- The lack of transparent principles, especially criteria to assess the real impact of scientific research institutions on the innovativeness of economy.
- Te proposed criteria by the KEJN are contradictory to the overall directions of reforms.
- The absence of synergies with the strategic directions set out by the KPB.
- The assessment criteria should be linked to the competences defined by the relevant legislative act. With regard to the research institutes, their main tasks relate to undertaking R&D activities, adjust R&D results for application, and implement R&D results.
- The proposed system is also considered as not being transparent and overly complex.
- The preparation of assessment criteria is foreseen actually at the end of assessment period.

[15] http://www.poig.gov.pl/AnalizyRaportyPodsumowania/poziom/Documents/Sprawozdanie_POIG_I_polrocze_2011.pdf

[16] http://erawatch.jrc.ec.europa.eu/erawatch/export/sites/default/search/countryprofiles/country_profile_PL.pdf

The issue concerning the assessment of scientific R&D institutions was discussed in detail on 5 January 2012 between the Board of the Main Council of Research Institutes and the Minister of Science and Higher Education. According to our interview sources, the Ministry investigates this issue in order to find a suitable solution.

Having said this, it can be concluded that concerted efforts are needed that the recently introduced reforms bring desirable changes.

With regard to the design and effectiveness of policy mix, previous assessments such as the 2009 TrendChart report pointed that there have been certainly improvements in the existing support measures compared to the 2004-2006 programming period. However, it also noted that there was certainly a scope for developing new and more effective forms of support to ensure growth and jobs in the future. This is considered as the necessity to ensure faster and sustainable structural changes. Recently, it has been argued that apart from the increase of investment intensity, there is generally no change in terms of structural indicators. The report puts also a spotlight on the demand-side policies which are at the early stage of development (Walendowski, 2011).

Since the KPB was officially adopted mid-August 2011, it is still too early to appraise to what extent the Programme will actually contribute to the concentration of funding on the newly established priority areas. In its opinion submitted in July 2011 to the MNiSW, the RGIB underlined that the objective of the KPB should be to indicate the priorities in terms of research and implementation of the applied research results in the scope of programmes prepared by the Steering Committee of the NCBiR.

The major criticism is that the KPB is a repetition of the former programme (known as the KPBNiPR), however, in the view of the Ministry this is not the case because the KPB makes an important distinction between the competences of the Minister and the NCBiR Steering Committee. The Minister is responsible for setting long-term strategic directions of scientific R&D, whereas the Committee draws up strategic programmes taking into account mid-term objectives.

Due to the fact that the preparation of the technology foresights as well as the 2020 Innovation Strategy are ongoing, it is too early to appraise to what extent the funding will be concentrated on key strategic areas in the forthcoming programming period. Increasingly, there is a growing importance of concentrating the funding on key strategic areas.

The uptake of existing support instruments in the area of improving the skills for innovation confirms a general interest among the potential beneficiaries, i.e. researchers, including young scientists. There is certainly a scope for developing new forms of support, especially taking into account the experience of the Polish Science Foundation (FNP), which is currently implementing one support measure on behalf of the MNiSW.

Despite the unsuccessful attempt to introduce fiscal incentives for foreign R&D Centres through the instrument, known as the Status of R&D Centre, and Special Economic Zones which are expected to expire by the end of 2020, it can be concluded that the current support instruments do not provide mechanisms to anchor foreign direct investment and foster co-operation with the local companies and scientific research organisations.

Table 3: Assessment of the policy mix

Challenges	Policy measures/actions[17]	Assessment in terms of appropriateness, efficiency and effectiveness
Ensuring that the recent reforms bring desirable changes	The 2010 science sector reform.	• Overall, a positive assessment of the main directions of reform among the main stakeholders. • The main issue relates to the rules outlined recently in the draft of Ministerial decree prepared by the Committee for Evaluation of Scientific Institutions (known also as KEJN).
Designing and putting in place more effective support programmes	Instruments in support of R&I activities.	• General improvement of policy responses to support R&I activities compared to the previous (2004-2006) programming period. • As for the future, there is a need to design new and more effective forms of support for post-2013 programming period.
Concentrating the financial contribution on key strategic areas	KPB Taking into account the forthcoming results of the national technology foresight (planned)	• It is still too early to appraise the impacts of the newly implemented and planned actions • Concerns were raised about the degree of prioritisation. The stakeholders pointed to the lack of sufficient degree of prioritisation, while the Ministry underlined the general nature of the KPB, the objective of which is to set out strategic orientations of scientific R&D.
Improving the skills for innovation	Support measures implemented in the framework of the Operational Programme 'Innovative Economy' and 'Human Capital' 2007	• A need to introduce new forms of support in this area, building upon the identified good practices. • Certain concerns arose during the implementation of the 2007-2013 programming period because the instruments in place have also had negatively influenced the market in the area of training. To receive the financial support, the organisations delivering training had to adjust their offers according to the eligible activities for funding, which did not always reflect the priorities of those institutions and market demand.
Introducing anchoring mechanisms between foreign investors and other stakeholders of the national innovation system	Special Economic Zones/Science and Technology Parks	• In general, the absence of successful instruments to respond to the identified challenge.

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

• National policy and the European perspective

Based on the findings of preceding sections, the overall directions of possible evolution of the Poland's innovation policy are outlined below. Subsequently, this is complemented by the analysis of alignment of national policies with ERA pillars / objectives. Annex 1 contains more detailed information about the activities undertaken in Poland with respect to ERA.

First and foremost, the existing evidences confirm that debt-financing instruments are not being sufficiently used. They account for a small proportion of all support instruments. The existing evidence also suggests that some forms of support like Loan and Guarantee Funds provide external sources of financing rather to traditional companies and not necessarily to the most innovating ones (cf. Walendowski, 2011). In the future programming period, there is definitely a need to ensure that the problems encountered during the launch and implementation of this type of instruments, as it was the case with the instrument, known as the 'Technological initiatives', are avoided.

Secondly, there is a need for new and more effective forms of support in order to introduce structural changes to the Poland's innovation system. For the time being, the investment grants seem to have an effect on the processes of production, however, there is no observable impact on structural indicators, such for example the level of R&D State funding (in 2009: 60.4%) and the investment innovation intensity by the size of companies (in 2009: 64.7% is accounted for companies employing more than 499 persons).

Thirdly, strengthening the tax incentives should be foreseen as currently they can be considered as a weak form of support (cf. Walendowski, 2011).

Besides that, there is a need to rethink the support measures for networking and cluster type initiatives. Although the instruments are relevant, they are not regarded among the beneficiaries are successful form of support.

Recognising that by only concentrating the funding on the scientific research institutions will not deliver the expected results, the development of new forms of support should be considered with the view of providing more effective mechanism to foster science-industry co-operation.

Based on the experience with the implementation of national and regional operational programmes, it is evident that there should be a system in place to ensure the co-ordination of projects undertaken at different levels of governance.

Last but not least, the gap in support for internationalisation of innovative companies should be tackled with the introduction of new support instrument in the next programming period.

With regard to **the ERA objectives**, Poland has recently re-designed its research and higher education system (six major acts entered into force in October 2010 regulating the science sector and the act on higher education system entered into force in October 2011). The reforms were prepared drawing upon the existing best international practices and are in line with the ERA objectives, however, the national context constituted the basis for preparing the reforms.

In summary, it is important to underline that some elements of ERA can be identified in the recent reforms, but it is evident that different legal acts have

been mainly prepared with the view of laying down the foundations and setting out principles of the new science and higher education system.

Labour Market for Researchers. The emphasis has been on the aspects relating, especially to the supply of human resources for research, open recruitment, adequate training, attractive career prospects and working conditions, but clearly to much lesser extent on cross-border mobility. Increasingly, the focus is placed also on improving young people's scientific education and increase interest in research careers, and promoting the participation of women in science, which is reflected in the initiatives undertaken by the MNiSW and higher education institutions. This largely corresponds to the existing challenges in Poland within this area.

Among the major initiatives are *several instruments to improve the supply of human resources*, the establishment of *the Advisory body* concerning good practices in the science sector which mainly deals with plagiarism cases, the launch of the *'Iuventus Plus' Programme* for young researchers under 35, and the organisation of third edition of *the competition promoting the participation of women in science*.

As noted in the preceding assessment of the ERA law in Poland (Technopolis, 2011) the issues relating to the cross-border movement of researchers are two-fold. Firstly, some Member States (MS) would not agree with the accumulation of social security rights for the researchers working and carrying out their investigations in Poland. This is precisely because of huge differences in the level of salaries between Poland and wealthier EU countries.

Secondly, the position of Polish Ministry of Labour and Social Policy is above all to guarantee the social security rights to the local research community than extending them to foreign researchers. It seems that the issues around the social security rights will not be resolved in a very short period of time, because the actual convergence of researchers employment conditions in terms of the actual remuneration with their peers in other EU countries will still take some time.

Cross-border cooperation. The major challenge in this area concerns the research performers' ability to access funds from another EU MS or international programmes. The MNiSW has recently launched the so-called *'Ideas Plus' Programme*, the objective of which is precisely to increase the interest among the Polish scientists to participate in competitions organised by international institutions, increase the dynamism, creativity and competences of scientific research institutions and stimulate the participation in multi-funding research programmes.

Certainly, a longer-term challenge would be to introduce the principle of cross-border operation of funding. Currently, the government participates in the Joint Programming, although the funding is still allocated to finance the participation of Polish institutions. Hence the identified issue relates to the research performers' ability to participate in cross-border cooperation programmes.

World-class research infrastructures. Polish researchers often use the infrastructure existing in other EU countries and not the other way around. This situation is due to the general lack of such (major) infrastructure in Poland. The main instrument of support to R&D infrastructure is the Operational Programme 'Innovative Economy' 2007-2013. The examples of key strategic projects of the 'Innovative Economy' Operational Programme include: the Centre of Advanced Materials and

Technology, CEZAMAT (359m PLN or €79.3m)[18] and Lower Silesia Centre of Materials and Bio-Materials of the Wroclaw R&D Centre, EIT + (609m PLN or €134.5m). The total funding for Research infrastructure during a seven-year programming period accounts to more than €746m.

One of the most important milestones has been *the development of the Poland's Map of R&D infrastructure projects*.

Research institutions. The 2010 reform of the science sector aimed in particular at the consolidation of scientific R&D institutions, including the Polish Academy of Sciences, Research Institutes (formerly known as JBRs) and higher education institutions. An important change has been *a shift from block funding to competitive-based funding*, which is currently managed by two governmental agencies, namely the NCBiR and NCN. As noted in that analysis, another emerging trend was a concentration of research funding on the best performing institutions (cf. Section 3.4 concerning the criteria and procedure for the quality assessment of public scientific institutions.

The process of *selecting leading scientific research institutions, KNOWs* is viewed to be one of the most important activities of the reform of science and higher education system. The status of such institution can be obtained through competitive-based procedure in the specified areas. The selection process will be undertaken by independent commissions with the participation of international experts. The successful institutions will receive financial supporting during the period of five years with the possibility to extend the funding by additional five years.

Public-private partnerships. Launched in 2008, the Polish Chamber of Commerce for High Technology (IZTECH)[19] is new organisation bringing together companies (representing all branches of national economy), universities and high schools, research institutes as well financial institutions. The IZTECH was established at the initiative of Warsaw University of Technology, Wrocław University of Technology and Warsaw Military University of Technology. In sum, its mission is to promote and develop enterprise and economic activity through strengthening cooperation between science and business sector.

One of the objectives of the Act on Research Institutes was to foster closer co-operation with the private sector. To this end, the institutes were allowed to use the generated income to fund their future R&D activities. This is considered to be an important change because according to the provisions of the Act, the Research institutes have responsibility for undertaking applied R&D activities. Within the existing policy mix, especially two measures of the Operational Programme 'Innovative Economy' aim at fostering science-industry co-operations are: Support to goal-oriented projects, and Support to implementation of R&D results.

Most recent changes discussed at length in Section 3.4 concern *the proposed criteria and procedures to assess the performance of the scientific research entities*. Another emerging trend is *the intensification of activities undertaken by the NCBiR*.

Knowledge circulation across Europe. The MNiSW is currently involved in the preparation of an *Act on Open access to scientific and research information*. The

[18] 1 EUR is equal to 4,527000 PLN. The exchange rate as of December 2011.

[19] http://www.iztech.pl

main objective is to provide open access to all information except naturally those that have a clause of commercial confidentiality. Recently, an important milestone has been the launch of the '*Mobility Plus' initiative*, which provides financial support for researchers participating in scientific R&D undertaken in foreign institutions.

International Cooperation. In relation to the international cooperation, the public research institutions have been given a greater role in fostering international cooperation. According to the existing rules and procedures, the funding of international co-operation is awarded in the form of decision on the application submitted by the scientific research institution within the annual limits of funds available for that purpose.

One of the recent developments was the entry into force *a new Ministerial degree regulating the rules concerning the funding of international cooperation from the Science budget*. Another was the launch of new calls within the initiative, known as *'Grant for Grants'*, which financial support to activities concerning the preparation of project proposal in response to the call for proposals under the EU FP Programme.

It is also worthwhile to underline, the recent developments in the area of higher education. Recently, the University of Technology in Lódz has recently signed with the Minzu University of China the agreement about double degrees for students of Biotechnology at the Technology University. This will be the first type of this document signed between the Polish and Chinese higher education institution.

Table 4 : Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA dimension	Main challenges at national level	Recent policy changes
1	**Labour Market for Researchers**	Ensuring the supply of human resources for research, open recruitment, adequate training, attractive career prospects and working conditions.	• Launch of new initiative 'Diamond Grant'; • Establishment of the Advisory body concerning good practices in the science sector; • Launch of the database containing information about vacancies in the science sector; • Launch of new 'Iuventus Plus Programme'; and • Continuation of the 'Women of the Future' Competition.
2	**Cross-border cooperation**	Consolidating the research efforts and becoming more actively involved in cross-boarder cooperation.	• Launch of 'Ideas Plus' initiative to encourage the participation in the programme of the European Research Council.

	ERA dimension	Main challenges at national level	Recent policy changes
3	**World class research infrastructures**	To develop such infrastructure which is complementary to the existing infrastructure in EU neighbouring countries and regions and ensure the sustainability of new investments.	• The Poland's Map of R&D infrastructure projects. • Continuation of implementation of EU Structural Fund interventions.
4	**Research institutions**	Concentrating the funding on leading scientific research institutions and consolidating the research efforts.	• Selection of leading scientific research institutions, KNOWs. • New proposal prepared by the MNiSW concerning the assessment criteria and procedures of scientific research organisations' performance.
5	**Public-private partnerships**	Fostering closer cooperation with the private sector.	• New proposal prepared by the MNiSW concerning the assessment criteria and procedures of scientific research organisations' performance. • Intensification of activities by the NCBiR.
6	**Knowledge circulation across Europe**	Finding effective solutions to tackle the main barriers of knowledge transfer primarily within the national innovation system and enhancing cross-border mobility.	• Launch of the 'Mobility Plus' initiative. • Preparation of Act on Open access to scientific and research information.
7	**International Cooperation**	Establishing long-term partnerships of international co-operation in strategic areas of R&D.	• Grants for Grants. • New Ministerial degree regulating the rules concerning the funding of international cooperation from the Science budget.

Annex 1: Alignment of national policies with ERA pillars / objectives

6. *Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers*

1.1 Supply of human resources for research

While the growth of GERD during the period 2000-2009 was estimated at almost 90%, there is an important decline in the number of R&D employees from 125,614 to 120,923, although a positive change can be noted in the number of researchers which increased from 88,000 to 98,000 during the same period under review. The year 2009 recorded an upward trend both in terms of the number of R&D employees and researchers, respectively by 1% and 0.7%, which is a reverse of a declining trend observed since 2004. Besides that, the share of S&T students represents slightly more than two tenths of the total number of students, which is similar to the situation back in 2000. 2009 was another year (since 2005) during which a decline in the total number of students was recorded. The explanation for that is the demographic trend, i.e. the depression in the number of births was at its peak at the end of 1980s.

In response to that, several support measures have been implemented in the framework of the EU Structural Fund interventions to remedy the situation. Among the main instruments are:

- Development of R&D personnel qualifications and raising awareness of the role of science in economic development (Operational Programme 'Human Capital').
- Lifelong learning (Operational Programme 'Human Capital').
- Strengthening and developing HEIs academic potential as well as increasing the number of graduates at courses of strategic importance for the development of knowledge-based economy (Operational Programme 'Human Capital').
- Strengthening potential of science staff (Operational Programme 'Innovative Economy').

The launch of MNiSW initiative in October 2011, known as Diamond Grant[20] provides research funding for the outstanding students to begin a career in science. Among the main selection criteria is merit-based, scientific value of the project and scientific achievements.

1.2 Ensure that researchers across the EU benefit from open recruitment, adequate training, attractive career prospects and working conditions and barriers to cross-border mobility are removed

[20] http://www.nauka.gov.pl/ministerstwo/inicjatywy-ministerstwa/programy-ministra/program-diamentowy-grant/ogloszenie/

One of the milestones in line with the objective relating to open recruitment has been the Ministerial regulation of 15 February 2011, which led to the establishment of the Advisory body concerning good practices in the science sector[21]. It has competences in formulating opinions and suggestions, which are addressed to the Minister of Science and Higher Education, as regards the peer reviews of PhD research, habilitation, the division of funding for R&D activities, but also breach of IP rights, nepotism, abuse of power, etc.

Apart from providing adequate trainings (cf. Point 1.1, Annex), there have been attempts to develop attractive career prospects for researchers. Particularly, the planned changes[22] foresee increasing the number and quality of scientists with 'habilitation' titles, while at the same time lowering the age for undertaking independently scientific research activities.

To strengthen the competitiveness, openness and transparency of the process of employment at the higher education institutions, the MNiSW has launched on its website the database of information[23] about vacancies of scientific, academic and management posts in the science sector.

Concerning the Charter for Researchers and portability of research grants, the main institutions have signed the charter. As far as portability of research grants is concerned there is no specific restriction imposed, although the financial support available limits the possibility of cross-border co-operation of researchers.

The situation regarding the salaries of researchers is slowly improving. It is also foreseen the annual growth of salaries during the 2013-2015 period.

Table 5: Situation of the salaries of researchers

Position	Minimum salary in PLN			
	2012	2013	2014	2015
Professor	4,145	4,525	4,940	5,390
Senior lecturer	3,310	3,615	3,945	4,305
Assistant	1,885	2,055	2,245	2,450

Source: Ministerial degree concerning the financial conditions for the staff of public research institutions of 5 October 2011.

1.3 Improve young people's scientific education and increase interest in research careers

The most important development has been the launch of the Iuventus Plus programme[24], in June 2011, the objective of which is to provide financial support for projects undertaken by young scientists (< 35 years old), which constitutes the continuation of research that had been published and/or are accepted for publication

[21] http://www.bip.nauka.gov.pl/_gAllery/12/89/12898/20110215_zarzadzenie_14_MNiSW.pdf

[22] http://www.bip.nauka.gov.pl/_gAllery/14/25/14259/20110526_1_projekt_rozporzadzenia_(art._31_).pdf

[23] http://www.nauka.gov.pl/ministerstwo/praca/

[24] http://www.nauka.gov.pl/ministerstwo/inicjatywy-ministerstwa/programy-ministra/iuventus-plus/

by leading scientific journals included in Journal Citations Report (JCR) and the Reference Index for the Humanities (ERIH).

There have been also some initiatives taken to generate interest in S&T among the primary and second level students, although they are sporadic and at early-stage of development.

1.4 Promote equal treatment for women and men in research

Particularly, it deserves to be mentioned here the third edition of the competition organised by the MNiSW in association with the magazine Elle, known as 'Dziewczyny Przyszlosci' (Women of the Future). The candidates include female students from S&T faculties, biology, or medicine and those successful received support in the form of scholarships, and reimbursement of cost related to participation in the renowned scientific conferences in Europe. The policy response to this issue can be considered as adequate.

7. Facilitate cross-border cooperation, enhance merit-based competition and increase European coordination and integration of research funding[25]

So far, the biggest priority has been on enhancing merit-based competition and moving away from the block-funding system, which is reflected in the creation of two governmental agencies, namely the NCBiR (funds strategic applied R&D) and NCN (funds basic research) and adoption of the Act on Principles of funding science, which entered into force in October 2011. It is also expected that by 2015, 50% of science funding will be implemented by these two agencies (Walendowski, 2009).

Besides that, a recently launched programme (known as 'Ideas Plus') provides support and incentives for Polish scientists to participate in the programme IDEAS of the European Research Council.

As regards activities aimed at facilitating cross-border cooperation, Poland participates in the Joint Programming, although the funding is still allocated to finance the participation of Polish institutions. Whilst the foreign institutions co-operate with Polish counterparts in the framework of bilateral agreements, the existing R&D programmes are not open for foreign institutions.

8. Develop world-class research infrastructures (including e-infrastructures) and ensure access to them

The main instrument of support to R&D infrastructure is the Operational Programme 'Innovative Economy' 2007-2013. The total funding earmarked for the Priority 'Research infrastructure' during a seven-year programming period is estimated at about €746m.

- [25] Promote more critical mass and more strategic, focussed, efficient and effective European research via improved cooperation and coordination between public research funding authorities across Europe, including joint programming, jointly funded activities and common foresight.
- Ensure the development of research systems and programmes across the Union in a more simple and coherent manner.
- Promote increased European-wide competition and access of cross-border projects to national projects funding

In response to the demand of science sector and in relation to the ESFRI recommendations concerning the development of national map of R&D infrastructure projects, the MNiSW started in the second half of 2009 the development of the Poland's Road Map of Research Infrastructures.

In February 2011, the MNiSW presented the list of infrastructure research projects included on the Poland's Road Map of Research Infrastructures[26]. The projects are structured around eight strategic areas, such as: the development of science through basic research (astronomy, physics), development of science through interdisciplinary research, high quality of life of society, efficient health protection and effective pro-health activities), increasing the effectiveness of generating, storing, and diffusing the energy, development of advanced materials and technologies, development of intelligent systems and infrastructure, and sustainable development of environment. Altogether there are 33 projects on the list, five of which is linked to ESFRI with a strong Polish component, the other 13 projects are part of the ESFRI projects, and the remaining 15 are submitted by national scientific institutions.

Two important aspects worthwhile to mention here are that the projects included on that list should describe the strategy of establishing the centre consolidating the national research potential in a specific area. The concept should be also based on the principle of open access to the research infrastructure based on the criteria of scientific excellence. Based on the analysis of existing research infrastructure, it was also found that in the majority of cases the research infrastructure consisted of small research equipment, which often is not being used, and similar equipment was often found in other scientific institutions[27].

The coverage of projects includes the majority of largest scientific centres in Poland, including Gdańsk, Katowice, Cracow, Łódź, Poznań, Toruń and Warsaw. According to the available information all three types of scientific research institutions are involved, including 21 higher education institutions, 11 institutions of the Polish Academy of Sciences, and nine Research institutions.

One of the emerging conclusions from the first competition is the insufficient representation of some important scientific areas, such as social-, and food sciences. It is planned that the new competition will be announced particularly targeting the under-represented scientific areas. Finally, another conclusion that was drawn from the first edition of competition was that the main weakness of submitted proposals concerned the management aspects, planning and access to the infrastructure by other institutions.

The establishment of technological platforms initiated in Poland in 2004 can be considered as a positive development, although the existing 29 platforms are at different stages of development. Some of them are actively participating the in the relevant European Technological Platforms, which is important from the point of view of establishing closer co-operation with foreign partners.

9. Strengthen research institutions, including notably universities

[26] http://www.nauka.gov.pl/fileadmin/user_upload/ministerstwo/Inicjatywy/Programy_ministra/20110301_1_Polska_Mapa_Drogowa_IB__23022011.pdf

[27] http://www.nauka.gov.pl/ministerstwo/aktualnosci/aktualnosci/artykul/polska-mapa-drogowej-infrastruktury-badawczej/

The universities are generally considered as autonomous entities (in terms of terms of capacity, designing research agendas and management of assets), while a control function is overseen by the Ministry of Science and Higher Education. The establishment of technology transfer offices and establishing closer co-operation with the private sector indicates an evolution in the mission of universities, although it is necessary to underline that this change is underway relatively for a short period of time.

Apart from the 2010 reform of the science sector, a recent important milestone was the adoption by the Minister of Science and Higher Education of a degree in August 2011 concerning the criteria, conditions and procedures of awarding the status of KNOW[28]. Among the eligible institutions to participate in the competition are: higher education institutions, science centres established based on the agreement with the Polish Academy of Sciences, and Research Institutes, including foreign scientific entities and international institutes, science centres operating within the structures of higher education institutions, and scientific consortia.

According to the most recent competition notice of December 2011, the competition will be announced early January 2012 for institutions specialised in exact science; and medical and health. In each of those two areas, not more than three KNOWs will be chosen.

10. Facilitate partnerships and productive interactions between research institutions and the private sector

Fostering science-industry cooperation has been often presented as a challenge for the national innovation system. In particular, the changes introduced by the Act on Research Institutes have been important in response to tackling the challenge. As reported in the analysis of those institutes (previously known as JBR), their overall assessment in public opinion has not been positive and often considered as institutions of the past, on which public funding should not be concentrated at the expenses of 'real researchers' (Daszkiewicz, 2008).

In practice, the sector of research institutions is essential for science-industry cooperation. By the most recent count, it is estimated that more than 72% of total business R&D funding is performed by those institutions and only 25% by public universities.

The major changes were introduced to the Act on Research institutes, aimed among other objectives to foster science-industry co-operation (Walendowski, 2009). Another important change discussed at length in Section 3.4 concerns the proposed criteria and procedures to assess the performance of the scientific research entities.

Among the main instrument in this area in the Operational Programme 'Innovative Economy' 2007-2013, especially two support measures:

- Support to goal-oriented projects (Operational Programme 'Innovative Economy'); and
- Support to implementation of R&D results (Operational Programme 'Innovative Economy').

[28] http://www.bip.nauka.gov.pl/_gAllery/15/24/15249/Dz._U._Nr_192__poz._1142.pdf

Among the most recent developments is a trend towards intensification of activities undertaken by the NCBiR, which include the launch of a series of new initiatives:

- Graf-Tech[29];
- KadTech[30];
- BroTech[31]; and
- Commercialisation (pilot) initiative[32].

It can be concluded, that there have been different instruments put in place in order to facilitate the partnerships and productive interactions between research institutions and the private sector. There has been also some attempt to improve the researchers' inter-sectoral mobility through regional components of the national programme 'Human Capital' 2007-2013.

11. Enhance knowledge circulation across Europe and beyond

With regard to the regulation of knowledge and technology transfer, there are several barriers identified in this area in the report prepared by Matusiak and Gulinski (2010). Primarily, there are structural barriers because of specificity of industrial-, scientific R&D sectors, intermediary organisations, lack of strategies/policy response, low competences among the public administration and weak development of regional growth poles.

Besides that, there are systemic barriers which include the increase in regulations, a large number of legislative acts. It was noted that the provisions regulating spin-offs and taxation linked to the transfer of non-material goods from the science sector to the economy, hamper the development of academic entrepreneurship. Also it was found that awareness and cultural aspects, and a general lack of competences among the public administration, higher education institutions, enterprises, and business intermediary organisations have a negative impact on enhancing knowledge circulation.

The scope and extent of existing barriers within the national innovation system is the explanation why the national policy focus on the EU dimension is at early stage of development. The measure which supports cross-border co-operation is Strengthening potential of science staff of the Operational Programme 'Innovative Economy' (Programme Welcome)[33], which supports projects undertaken by leading foreign scientists establishing research teams at Polish research institutions.

The Mobility Plus[34] is the initiative of the MNiSW, which provides financial support for researchers participating in scientific R&D undertaken in foreign institutions.

Some efforts have been taken to facilitate the on-line access to national and international knowledge and scientific resources. In particular, the focus in the course of 2011 has been on ensuring the use of digital resources and calculating capacity of

[29] http://www.ncbir.pl/programy-krajowe/graf-tech/

[30] http://www.ncbir.pl/programy-krajowe/kadtech/

[31] http://www.ncbir.pl/programy-krajowe/brotech/

[32] http://www.ncbir.pl/programy-krajowe/komercjalizacja-przedsiewziecie-pilotazowe/

[33] http://www.fnp.org.pl/programy/aktualne_programy_fnp/stypendia_i_subsydia/program_welcome

[34] http://www.nauka.gov.pl/ministerstwo/inicjatywy/programy-ministra/mobilnosc-plus/

the Metropolitan Area Network — MAN network and KDM centres of computers of high capacity. There are currently five KDM centres operating in Gdańsk, Cracow, Poznań, Warsaw and Wrocław established in the end of 1990s.

Concerning the aspects relates to open access, the MNiSW is currently involved in the preparation of Act on Open access to scientific and research information. The main objective is to provide open access to all information except naturally those that have a clause of commercial confidentiality.

12. Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world

Despite that Poland has not adopted a stand-alone strategy for international cooperation, the ongoing activities confirm a growing importance among the policymakers and representatives of scientific research institutions in strengthening cooperation with international partners.

Although it is very difficult to draw conclusions whether specific research fields/ countries are prioritised for the cross-border collaboration, the recent example such as the launch of Polish-German Sustainability Call in the framework of bilateral cooperation confirms that the focus of this specific call is especially on three subject areas, namely climate and energy, sustainable economies and resources, and sustainable land management. This can be considered as a sign of growing focus on priorities addressing global challenges.

The Ministerial degree adopted in January 2011 regulates the criteria and procedures of financial support allocated from the Science budget to fund the international cooperation[35].

Financial support is provided for funding international co-financed projects (FP7, Euratom), activities in support of participation of Polish scientific organisations and other entities in programmes, initiatives and research undertakings (e.g. activities of the Contact Points, supporting the participation in the EU FP), membership fees to the institutions or international organisations resulting from the international agreements, and the national contribution for joint international programme or initiative.

In September 2011, the MNiSW launched the fifth edition of the competition known as 'Grants for Grants'[36], which provides financial support to activities concerning the preparation of project proposals in response to the call for proposals under the EU FP Programme.

Overall, it is viewed that the public research institutions have been given a greater role in participating in international cooperation. They pursue their research cooperation through the support available among others from bilateral research projects.

With regard to the access to the country by third-country researchers, the Act on the Foreigners of 13 June 2003 is the binding document, which requires publishing the name of public research organisations, which concluded contracts with researchers from third countries.

[35] http://www.bip.nauka.gov.pl/_gAllery/12/78/12782/Dz._U._Nr_20__poz._103.pdf

[36] http://www.nauka.gov.pl/ministerstwo/komunikaty/komunikaty/artykul/-441a9ebd49/

References

Central Statistical Office (2012):Communication concerning the updated estimate of GDP in 2010, 26.04.2012.

Central Statistical Office (2011): Science and technology in Poland 2009, http://www.stat.gov.pl/cps/rde/xbcr/gus/PUBL_nts_nauka_i_technika_2009.pdf

Central Statistical Office (2011): Employment in national economy in 2010, http://www.stat.gov.pl/cps/rde/xbcr/gus/PUBL_pw_prac_w_gosp_narod_2010.pdf

Central Statistical Office (2010): Science and technology in Poland 2008, http://www.stat.gov.pl/cps/rde/xbcr/gus/PUBL_nts_Nauka_i_technika_2008.pdf

DG RTD Assessment (2011): Poland, R&D and innovation for competitiveness, growth and jobs.

Daszkiewicz, M. (2008): R&D Institutes as a Source of Innovation in the Economy and Support to SMEs, http://www.parp.gov.pl/files/74/81/194/4361.pdf

Ministry of Economy (2011): Strategy of Innovation and Effectiveness of Economy – 2020, http://www.mg.gov.pl/files/upload/12707/SIiEG_konsultacje_02.2011.pdf

Ministry of Regional Development (2011): Activity report from the implementation of the Operational Programme Innovative Economy, 2007-2013, http://www.poig.gov.pl/AnalizyRaportyPodsumowania/poziom/Documents/Sprawozdanie_POIG_I_polrocze_2011.pdf

Ministry of Science and Higher Education (2011): National Research Programme, http://www.bip.nauka.gov.pl/_gAllery/15/21/15212/20110816_zalacznik_KPB.pdf

Matusiak, K-B., et al. (2010): Recommendations for Changes in the Polish System of Technology Transfer and Commercialisation of Knowledge, http://www.parp.gov.pl/files/74/81/380/9049.pdf

National Contact Point (2011): Poland's Participation in the FP7 Programme: Statistics after 274 completed competitions, http://www.kpk.gov.pl/pliki/11780/Raport_274_konkursy.pdf

Main Council of Research Institutes (2011): The Opinion on the Draft Strategy for Innovation and Effectiveness of Economy,. http://www.rgib.org.pl/images/stories/Dokumenty/89.11.pdf

Main Council of Research Institutes (2011): A set of Comments to the Draft Proposal of the National Research Programme, http://www.rgib.org.pl/images/stories/Dokumenty/221.2011-zal2.pdf

Main Council of Research Institutes (2011): The Position and Comments on the Draft Ministerial Decree concerning the Assessment and Procedures of performances of the Scientific Research Institutions, http://www.rgib.org.pl/images/stories/Dokumenty/412.11.pdf

UNU-MERIT (2012): Innovation Union Scoreboard 2011: The Innovation Union's performance scoreboard for Research and Innovation.

Walendowski, J. (2011): Mini Country Report: Poland, http://www.proinno-europe.eu/trendchart

Walendowski, J. (2009): INNO-Policy TrendChart – Innovation Policy Progress Report, http://proinno.intrasoft.be/extranet/upload/countryreports/Country_Report_Poland_2009.pdf

List of Abbreviations

BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
COST	European Cooperation in Science and Technology
EIT+	Wroclaw R&D Centre, EIT+
ERA	European Research Area
ERA-NET	European Research Area Network
ERP Fund	European Recovery Programme Fund
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP	European Framework Programme for Research and Technology Development
FP	Framework Programme
FP7	7th Framework Programme
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
GUF	General University Funds
GVA	Gross value added
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
IP	Intellectual Property
IU	Innovation Union
IUC	Innovation Union Competitiveness
IZTECH	Polish Chamber of Commerce for High Technology
KEJN	Committee for Evaluation of Scientific Institutions
KIG	Polish Chamber of Commerce
KNOW	National Scientific Leading Centre
KPB	National Research Programme – 2020
KPBNiPR	National Programme of Scientific Research and Development Activities
KPK	National Contact Point
KPN	Committee for Science Policy

KPNiNT	Committee of Scientific Policy and Science and Technology
KRUS	Agricultural Social Insurance Fund
MNiSW	Ministry of Science and Higher Education
NCBiR	National R&D Centre
NCN	National Science Centre
NOT	Polish Federation of Engineering Associations – NOT
OECD	Organisation for Economic Co-operation and Development
PLN	Polish zloty
PRO	Public Research Organisations
R&D	Research and development
R&I	Research and Innovation
RDI	Research development innovation
RGIB	Main Council of Research Institutes
RI	Research Infrastructures
RTDI	Research Technological Development and Innovation
S&T	Science and technology
SF	Structural Funds
SIiEG	Innovation and Effectiveness of Economy Strategy – 2020
SME	Small and Medium Sized Enterprise
VC	Venture Capital
ZBP	Polish Bank Association
ZUS	Social Insurance Institution

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Abstract
The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries. EW Country Reports 2011 identify the structural challenges faced by national innovation systems. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. The annex of the reports gives an overview of the latest national policy efforts towards the enhancement of European Research Area and further assess their efficiency to achieve the targets.

These reports were originally produced in November - December 2011, focusing on policy developments over the previous twelve months. The reports were produced by the ERAWATCH Network under contract to JRC-IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from ERAWATCH Network Asbl.

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