

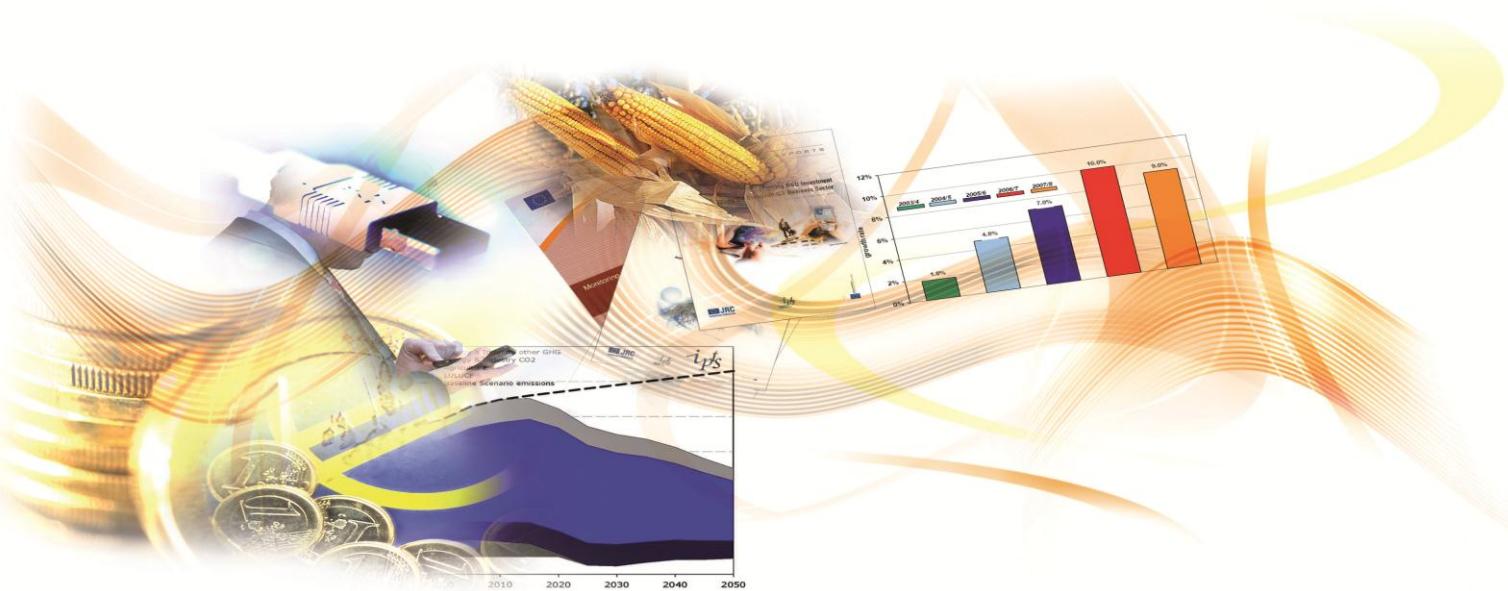


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Dilek Çetin and Erkan Erdil

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Contact information

Address: Edificio Expo. c/ Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954488318
Fax: +34 954488300

<https://ec.europa.eu/jrc>
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Abstract

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

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

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.

The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

ACKNOWLEDGMENTS AND FURTHER INFORMATION

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

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

The first draft of this report was produced in December 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of Nida Kamil Özbolat from JRC-IPTS. The contributions and comments from DG-RTD are also gratefully acknowledged.

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

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EXECUTIVE SUMMARY

In 2012, Turkish economy ranked 17th in the list of world economies with a total Gross Domestic Product of \$783,064m (€593,545m¹) for current prices (IMF, 2013)². The country has a population of 75.6m³ (TURKSTAT, 2013), would account for 14.96%⁴ of the population of the EU-28 (EUROSTAT, 2013)⁵. 67.6%⁶ of the population is between 15-64 years of age and half of it is younger than 30.⁷ The gross domestic product (GDP) per capita in 2012 was €8,014 (TL18,914 or \$10,497)⁸. In 2012 Turkey achieved a GDP growth of 9.1% and 2.2% with current and constant prices, respectively. The annual average growth rate was 6.7% for the last three years.

The R&D intensity in Turkey was 0.92% in 2012⁹ (TURKSTAT, 2013). While it is below the EU-28 average of 2.06% (EUROSTAT, 2013)¹⁰, the gross expenditure on R&D increased by 17.1% compared to previous year. In 2012, Gross Domestic Expenditure on R&D (GERD) is €5,534.5m (TL13,062.3m) According to TURKSTAT, 46.8% of R&D expenditures were financed by business enterprises, 28.2% by government sector, 21.1% by higher education sector, 3.4% by other national sector and 0.6% by foreign funds in 2012.¹¹ The Business Expenditure on Research and Development (BERD) undertaken in Turkey in 2012 was €2,496.3m (TL5,891.2m¹²). In 2012, the Higher Education R&D (HERD) was €2,429.7m (TL5,734.1m). This represents an increase of €804.4m (TL1,895.5m) since 2009 (a 49.5% increase in real terms). Government Expenditure on R&D (GOVERD) stood at €608.9m (TL1,436.9m) in 2012 representing an increase of €178m (TL420.4m) since 2009 (a 41.4% increase in real terms) (TURKSTAT, 2013)).

Central government's budget for R&D is approximated €1,916.5m (TL4, 523m) in 2012. The initial budget appropriations for 2013 are €2,021.2m (TL4, 770m). GBAORD increases 2.2% in 2012 compared to previous year while it rises 25.2% compared to 2009. The share of GBAORD in GDP is 0.34%. The largest share of GBAORD devoted to "General advancement of knowledge: R&D financed from General University Funds (GUF)" with 41.2% for 2013¹³.

The number of full-time equivalent (FTE) R&D personnel increased 43% from 73,521 in 2009 to 105,122 in 2012, according to TURKSTAT.¹⁴ The private sector employs 52,233 FTE R&D staff and universities employ 40,801 FTE R&D personnel while 12,088 FTE R&D personnel is employed by the public sector. Male dominance is observed in total FTE R&D personnel with

¹ €1=\$1.3193 (Central Bank of Turkey's cross rate for 31.12.2012)

² <http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx>

³ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=1595

⁴ Germany has the highest proportion of EU-28 countries with 15.9% (<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00005&plugin=1>)

⁵ <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00001&plugin=1>

⁶ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=1588

⁷ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=1589

⁸ At current prices, €1=TL2.36 (Central Bank of Turkey's effective sale rate for 31.12.2012) http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1504

⁹ <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=13630>

¹⁰ http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/main_tables

¹¹ <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=13630>

¹² €1=TL2.36 (Central Bank of Turkey's effective sale rate for 31.12.2012)

¹³ €1=TL2.36 (Central Bank of Turkey's effective sale rate for 31.12.2012), <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=15856>

¹⁴ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=3

70%. The highest share of FTE R&D personnel is university graduates with 42.5% while PhD holders share is only 23.2%¹⁵.

The main change in the research and innovation system in 2011 that still has impacts in 2012 was the reorganisation of three key ministries: The Ministry of Science, Industry and Technology (MoSIT) replaced the former Ministry of Industry and Trade after the elections in June 2011. The science, technology and innovation-related duties of the MoSIT are defined as the development, implementation and coordination of the S&T and innovation policies, and the promotion of the R&D and innovation projects, activities and investments. The Ministry of Development (MoD) replaced the former State Planning Organisation and is responsible for providing advice to the government and preparing national plans, policies, strategies and programmes, and coordinating regional development agencies, among other things. The newly created Ministry of Economy (MoE) is responsible for developing and implementing of foreign trade and foreign direct investment policies, and investment incentives, among others. These ministries along with the other high-level bodies in the national innovation system are represented in the Supreme Council of Science and Technology (BTYK), which is responsible for the overall coordination of the national innovation policy.

The structural challenges of Turkish research and innovation system can be summarized as follows:

- Promoting research commercialisation from universities
- Increasing the number of innovative high-growth start-ups
- Increasing R&D and innovation capabilities of the private sector (in particular, micro, small and medium enterprises (MSMEs))
- Focusing on sectors and thematic areas of importance
- Increasing availability and quality of research personnel

National R&D targets of Turkey for 2023 were agreed by the BTYK on 27 December 2011. These are as follows:

- Achieving an R&D intensity of 3% (from 0.84% in 2010)
- Increasing business R&D expenditure as a percentage of GDP to 2% (from 0.36% in 2010)
- Increasing the number of FTE researchers to 300,000 (from 64,341 in 2010)
- Increasing the number of FTE researchers in the private sector to 180,000 (from 25,342 in 2010).

The National Science, Technology and Innovation Strategy 2011-2016 adopted in December 2010 by the BTYK focuses on human resources development for science, technology and innovation, transformation of research outputs into products and services, enhancing interdisciplinary research, highlighting the role of SMEs, R&D infrastructures and international cooperation. It also identifies automotive, machinery and production technologies, ICT, energy, water, food, security and space as focus areas. In line with this, the strategy puts special emphasis on keeping the balance between focused areas and bottom-up research (TUBITAK, 2010 and IUC, 2011).

¹⁵ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=4

In the 25th meeting of BTYK in January 2013¹⁶, the following six new decisions mainly on the e-government infrastructure have been taken:

- To monitor the highly-gifted individuals strategy of 2013-2017,
- To carry out studies on e-government management model,
- To complete the firm accreditation system for public procurement of e-government applications,
- To carry out studies on the establishment of National Database Centre,
- Public procurement of software needs of public institutions,
- To determine health as an S&T priority area.

In the 26th meeting of BTYK in June 2013¹⁷, the following seven new decrees were adopted relevant to the theme at the meeting focusing on enhancement of usage of national energy sources in energy mix and development of national energy technologies through public-private partnerships:

- Development of National Design and Manufacturing Capability for Thermal Power Plants (MİLTES)
- Development of Hydroelectric Energy Technologies (MİLHES)
- Development of Wind Energy Power Plant Technologies (MİLRES)
- Adaptation of Solar Energy Technologies (MİLGES)
- Development of National Design and Manufacturing Capability for Thermal Power Plant Flue Gas Treatment Technologies (MİLKAS)
- Development of Coal Gasification and Liquid Fuel Production Technologies
- Increasing Energy Efficiency

In Turkish R&D and innovation policy, there is a clear shift from horizontal focus to sectoral focus. Another remarkable shift is the move from research to innovation. In general research and innovation started to play more important role in the overall national/regional policy mix and there is now an increased commitment to develop and implement strategic, coherent and integrated policy framework.

All of the efforts mentioned above, contribute to the process of the harmonisation with the EU *acquis communautaire*. Although not yet a Member State, Turkey's strategies and efforts in the field S&T and innovation are, to a large extend, in line with the ERA pillars/objectives. Moreover, the national progress is almost in line with Innovation Union Commitments with the exceptions of screening key regulatory frameworks, eco-innovation action plan and monitoring innovation. In addition, R&D objectives of Turkey are analogous with the ERA targets. The ERA developments have been closely followed by the policy-makers and the BTYK launched the "Turkish Research Area" (TARAL) in 2004 with inspiration from the ERA.

For the short and medium term, it is important that innovation is placed at the heart of the development and growth process, and is integrated and embedded in each policy area. It is expected that the new governance system and existing high-level commitment for achieving the

¹⁶<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-25toplantisi-15-ocak-2013>

¹⁷<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-25toplantisi-15-ocak-2013>



new targets set for 2023 will contribute to the enrichment of the policy mix with the design and implementation of new instruments.

TABLE OF CONTENTS

| | |
|--|-----------|
| ACKNOWLEDGMENTS AND FURTHER INFORMATION | 1 |
| EXECUTIVE SUMMARY..... | 2 |
| TABLE OF CONTENTS | 6 |
| 1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM | 7 |
| 2. RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM..... | 10 |
| 2.1 <i>National economic and political context.....</i> | 10 |
| 2.2 <i>Funding trends</i> | 10 |
| 2.2.1 Funding flows..... | 11 |
| 2.2.2 Funding mechanisms..... | 12 |
| 2.2.3 Thematic versus generic funding..... | 13 |
| 2.2.4 Innovation funding..... | 13 |
| 2.3 <i>Research and Innovation system changes.....</i> | 13 |
| 2.4 <i>Recent Policy developments</i> | 14 |
| 2.5 <i>National Reform Programme 2013 and R&I.....</i> | 15 |
| 2.6 <i>Recent evaluations, consultations, foresight exercises</i> | 15 |
| 2.7 <i>Regional and/ or National Research and Innovation Strategies on Smart Specialisation (RIS3)....</i> | 15 |
| 3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM..... | 17 |
| 3.1 <i>National Research and Innovation policy</i> | 17 |
| 3.2 <i>Structural challenges of the national R&I system</i> | 19 |
| 3.3 <i>Meeting structural challenges</i> | 21 |
| 4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS | 23 |
| 4.1 <i>Strengthening the knowledge base and reducing fragmentation.....</i> | 24 |
| 4.2 <i>Getting good ideas to market.....</i> | 27 |
| 4.3 <i>Working in partnership to address societal challenges</i> | 28 |
| 4.4 <i>Maximising social and territorial cohesion</i> | 28 |
| 4.5 <i>International Scientific Cooperation.....</i> | 29 |
| 5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA | 30 |
| 5.1 <i>More effective national research systems.....</i> | 30 |
| 5.2 <i>Optimal transnational co-operation and competition.....</i> | 31 |
| 5.3 <i>An open labour market for researchers</i> | 33 |
| 5.4 <i>Gender equality and gender mainstreaming in research</i> | 33 |
| 5.5 <i>Optimal circulation, access to and transfer of scientific knowledge including via digital ERA</i> | 34 |
| ANNEX 1. PERFORMANCE THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM..... | 36 |
| ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS | |
| 41 | |
| REFERENCES | 48 |
| LIST OF ABBREVIATIONS | 51 |

1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

In 2012, Turkish economy ranked 17th in the 2012 list of world economies with a total Gross Domestic Product of \$783,064m (€593,545m¹⁸) for current prices (IMF, 2013)¹⁹. The country has a population of 75.6m²⁰ (TURKSTAT, 2013), would account for 14.96%²¹ of the population of the EU-28 (EUROSTAT, 2013)²². 67.6%²³ of the population is between 15-64 years of age and half of it is younger than 30.²⁴ The gross domestic product (GDP) per capita in 2012 was €8,014 (TL18,914 or \$10,497)²⁵. In 2012 Turkey achieved a GDP growth of 9.1% and 2.2% with current and constant prices, respectively. The annual average growth rate was 6.7% for the last three years.

The R&D intensity in Turkey was 0.92% in 2012²⁶ (TURKSTAT, 2013). While it is below the EU-28 average of 2.06% (EUROSTAT, 2013)²⁷, the gross expenditure on R&D increased by 17.1% when compared to the previous year. In 2012, Gross Domestic Expenditure on R&D (GERD) is €5,534.5m (TL13,062.3m) According to TURKSTAT, 46.8% of R&D expenditures were financed by business enterprises, 28.2% by government sector, 21.1% by higher education sector, 3.4% by other national sector and 0.6% by foreign funds in 2012.²⁸ The Business Expenditure on Research and Development (BERD) undertaken in Turkey in 2012 was €2,496.3m (TL5,891.2m²⁹). It was increased by 49.4%³⁰ in real terms since 2009. In 2012, the Higher Education R&D (HERD) was €2,429.7m (TL5,734.1m). This represents an increase of €804.4m (TL1,895.5m) since 2009 (a 49.5% increase in real terms). Government Expenditure on R&D (GOVERD) stood at €608.9m (TL1,436.9m) in 2012 representing an increase of €178m (TL420.4m) since 2009 (a 41.4% increase in real terms) (TURKSTAT, 2013)). The government earmarked an amount of €1.2b³¹ (TL2.8b) for funding R&D in 2013³².

The sub-sectors with the highest percentage of BERD are “Computer Programming, Consultancy and Related Activities (€475.4m)”, “Architectural and Engineering Activities, Technical Testing and Analysis, Scientific Research and Development (€363.4m)” and “Manufacture of Motor Vehicles, Trailers and Semi-Trailers (€334.2m)” with around 47% of total expenditures (TURKSTAT, 2013)³³.

The number of full-time equivalent (FTE) R&D personnel increased 43% from 73,521 in 2009 to 105,122 in 2012, according to TURKSTAT.³⁴ The private sector employs 52,233 FTE R&D

¹⁸ €1=\$1.3193 (Central Bank of Turkey's cross rate for 31.12.2012)

¹⁹ <http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx>

²⁰ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=1595

²¹ Germany has the highest proportion of EU-28 countries with 15.9% (<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00005&plugin=1>)

²² <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00001&plugin=1>

²³ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=1588

²⁴ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=1589

²⁵ At current prices, €1=TL2.36 (Central Bank of Turkey's effective sale rate for 31.12.2012) http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1504

²⁶ <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=13630>

²⁷ http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/main_tables

²⁸ <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=13630>

²⁹ €1=TL2.36 (Central Bank of Turkey's effective sale rate for 31.12.2012)

³⁰ http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1

³¹ €1=TL2.3363 (Central Bank of Turkey's effective sale rate for 30.10.2012)

³² http://www.tbmm.gov.tr/butce/2013/konusma_30_Ekim_2012.pdf

³³ At current prices, €1=TL2.36 (Central Bank of Turkey's effective sale rate for 31.12.2012) http://www.turkstat.gov.tr/HbGetir.do?id=13630&tb_id=8

³⁴ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=3

staff and universities employ 40,801 FTE R&D personnel while 12,088 FTE R&D personnel are employed by the public sector. Male dominance is observed in total FTE R&D personnel with 70%. The highest share of FTE R&D personnel is university graduates with 42.5% while PhD holders share is only 23.2%³⁵. 78% of FTE R&D personnel employ as a researcher.

In June 2013, TURKSTAT announced for the first time the statistics of the Central Government Budget Appropriations (GBOARD) for the 2008-2013 period. Central government budget for R&D is approximated €1,916.5 m (TL4,523m) in 2012. Initial budget appropriations for 2013 is €2,021.2 m (TL4,770m). GBAORD increased 2.2% in 2012 when compared with the previous year while it rises 25.2% when compared to 2009. The share of GBAORD in GDP is 0.34%. The largest share of GBAORD devoted to "General advancement of knowledge: R&D financed from General University Funds (GUF)" with 41.2% for 2013³⁶.

In Turkey, 195³⁷ universities of which 72 are privately owned employ around 127,441³⁸ academic staff and the total number of students is around 5 million (YOK, 2013; OSYM, 2013). There were 2,268,753 female and 2,706,937 male students attending higher education institutions in the academic year of 2012-2013³⁹. The numbers of female and male students attending PhD degree programmes in the same period were 25,563 and 34,200, respectively⁴⁰.

Public research institutes and private research centres established in and out of technology parks are among the significant stakeholders for knowledge production in the Turkish research system. 137 R&D centres are active (MoSIT, 2013) with 1,098 researchers. There are 69 public research institutions in the country.⁴¹ The most active public research institutes are those established by the Scientific and Technological Research Council of Turkey (TUBITAK), the research institutes of the General Directorate for Agricultural Research of the Ministry of Agriculture and Rural Affairs (TAGEM). In 2012 Investment Plan, there are 81 thematic priority research centre projects where 42 of them belong to universities and 39 belong to other government institutions⁴² (BTYK25, 2013). According to the evaluation report of Framework Programmes (FPs), Turkey's participation and performance is appreciable.

Turkey ranked 18th⁴³ in 2012 in terms of the total scientific publications all over the world. In 2012, the total number of publications from Turkey is 31,457⁴⁴ and the scientific publications are 24,610⁴⁵. The number of scientific publications per million inhabitants is 331⁴⁶. The national patent applications to the Turkish Patent Institute (TPE) almost doubled in last three years from 2,473 in 2009 to 4,360 in 2012⁴⁷. In 2011, patent applications to EPO per million habitants is 6.11 whereas the average of EU-28 is 106.5648. In 2012, the number of patents granted to EPO is 134 with an increase of 41.1% while the previous year reaching only 9549. Thomson Reuters'

³⁵ http://www.turkstat.gov.tr/PreIstatistikTabelo.do?istab_id=4

³⁶ €1=TL2.36 (Central Bank of Turkey's effective sale rate for 31.12.2012), <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=15856>

³⁷ <https://faaliyet.yok.gov.tr/KATALOG/raporlar/tumUniversitelereAitIletisimBilgileri.zul?raporTipi=xls>

³⁸ <http://osym.gov.tr/dosya/1-69399/h/10ogretimelemanakdgrvsay.pdf>

³⁹ <http://osym.gov.tr/dosya/1-69398/h/1ogrencisayozettablostu.pdf>

⁴⁰ <http://osym.gov.tr/dosya/1-69398/h/1ogrencisayozettablostu.pdf>

⁴¹ Data provided by the Ministry of Development in January 2012

⁴² http://www.tubitak.gov.tr/sites/default/files/btyk25_gelismeler.pdf

⁴³ http://www.tubitak.gov.tr/sites/default/files/bty70_0.pdf

⁴⁴ According to ISI web of sciences,

http://www.ulakbim.gov.tr/cabim/yayin/bilimsel_yayin/top_yayin_sayisi.uhtml

⁴⁵ According to ISI web of sciences, http://www.ulakbim.gov.tr/cabim/yayin/bilimsel_yayin/makale_sayisi.uhtml

⁴⁶ www.tubitak.gov.tr/sites/default/files/10.xls

⁴⁷ http://www.turkpatent.gov.tr/dosyalar/istatistik/patent/Patent_basvuru_yillara_gore_dagilim.xls

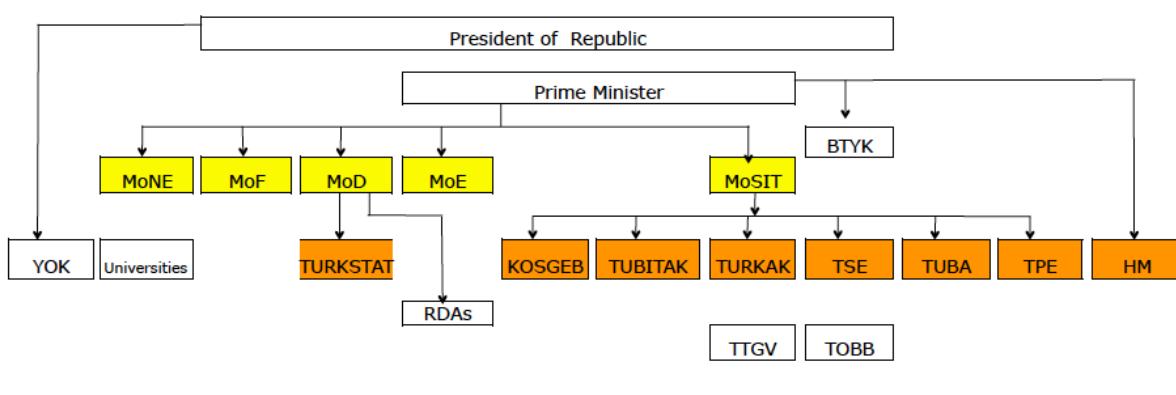
⁴⁸ <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsc00032&plugin=1>

⁴⁹ <http://www.epo.org/about-us/annual-reports-statistics/annual-report/2012/statistics-trends/granted-patents.html#>

state of trademark report in 2012 identifies Turkey as the biggest growth leader besides United Kingdom among the top ten registrars with a growth of 8% in its activity⁵⁰.

Turkey has a well-organized national research and innovation system which is led by the Supreme Council of Science and Technology (BTYK), a legally formalised body chaired by the prime minister. The BTYK determines, directs and co-ordinates research and innovation policies. It is composed of 18 permanent members including the prime minister from leading bodies of the national innovation system. The BTYK takes place twice a year. In total, over one hundred different actors from the governmental bodies, higher education and business enterprise sectors are represented in the meetings. The Scientific and Technological Research Council of Turkey (TUBITAK), affiliated to the Ministry of Science, Industry and Technology (MoSIT), acts as the secretariat of the BTYK. 26 Regional Development Agencies (RDAs) which are affiliated to Ministry of Development (MoD) are established to encourage R&D and innovation on regional scale. The detailed structure of the research and innovation system of Turkey could be seen in Figure 1.

Figure 1: Overview of the Turkey's research and innovation system governance structure



| | | | |
|--------|--|-----------|---|
| BTYK: | Supreme Council of Science and Technology | TUBITAK: | Scientific and Technological Research Council of Turkey |
| MoF: | Ministry of Finance | KOSGEB: | SME Development and Support Organisation |
| MoSIT: | Ministry of Science, Industry and Technology | HM: | Undersecretariat of Treasury |
| MoNE: | Ministry of National Education | YOK: | Higher Education Council |
| MoD: | Ministry of Development | TUBA: | Turkish Academy of Sciences |
| MoE: | Ministry of Economy | TSE: | Turkish Standards Institute |
| | | TURKSTAT: | Turkish Statistical Institute |
| | | RDAs: | Regional Development Agencies |
| | | TTGV: | Technology Development Foundation of Turkey |
| | | TURKAK: | Turkish Accreditation Agency |
| | | TPE: | Turkish Patent Institute |
| | | TOBB: | Union of Chambers and Commodity Exchange of Turkey |

⁵⁰ <http://thomsonreuters.com/press-releases/042013/766460>

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

2.1 National economic and political context

The most important change registered in the political context is the establishment of Ministry of Science, Innovation and Technology (MoSIT) which replaces the existing Ministry of Industry and Trade (MoIT). The establishment of MoSIT happened after the publication of a law decree published in the Official Gazette on 3 June 2011. The science, technology and innovation-related duties of the MoSIT are defined as the development, implementation and coordination of the S&T and innovation policies, and the promotion of the R&D and innovation projects, activities and investments. All main actors in the system, including the Scientific and Technological Research Council of Turkey (TUBITAK) and the Turkish Academy of Science, are connected to the MoSIT. The Turkish Patent Institute (TPE), the National Metrology Institute (UME), the Turkish Accreditation Agency (TÜRKAK) Turkish Academy of Science (TUBA) and the Turkish Standards Institute (TSE) which are government institutions related to R&D polices, are also affiliated to the MoSIT.

The Ministry of Development has started a project called "Information Society Strategy Renewal Project⁵¹" which will constitute the new information society structure. This project started on November 13th, 2012 and it was finalized on June 10th, 2013. The project included eight main subjects: IT sector; broadband infrastructure and sectoral competition; qualified HR and recruitment; social transformation; data security; personal data protection and secure internet; ICT based innovative solutions; internet entrepreneurship and e-commerce; and, finally user oriented and efficient public services. With this project, four outputs will be provided: Current Status Report; Global Trends and Country Benchmarking Report; Macroeconomic Projections and Opportunities Report; and, Needs Assessment and Proposition Reports. Under the coordination of the Ministry of Development, that supervises the main outputs of the project, strategies are being developed to form an information society structure (MoD, 2012).

2.2 Funding trends

Total gross expenditure on R&D (GERD) of Turkey is increased more than 10 times from 2000 to 2012 on TL basis reaching €5,534.5m (TL13,062.3 m) in 2012 according to the Turkish Statistical Institute (TÜRKSTAT, 2013). The GERD is increased 61.5% and 17.1% compared to 2009 and 2011, respectively⁵². GERD/GDP ratio which is around 0.92 over the last years is far behind the EU average of 2.06. Both the nominal value of BERD and the rate of BERD/GDP are far behind the EU average. In Turkey, higher education institutions (HEIs) still have higher share in performing R&D. 43.9% of R&D is done by HEIs in Turkey; this rate is only 23.8% for EU-28 countries⁵³. In EU-28 countries, 63% of the R&D is achieved by business enterprise sector; this rate is 45.1% for Turkey⁵⁴. The government earmarked an amount of €1.2b⁵⁵ (TL2.8b) for funding R&D⁵⁶ in 2013⁵⁷.

⁵¹ http://www.bilgitoplumustrejisi.org/en/node/about_us

⁵² http://www.turkstat.gov.tr/PreIstatistikTabelo.do?istab_id=1620

⁵³ <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>

⁵⁴ http://www.turkstat.gov.tr/HbGetir.do?id=13630&tb_id=1

In 2012, 46.8% of R&D expenditures were financed by business enterprises, 28.2% by government sector, 21.1% by higher education sector, 3.4% by other national sources and 0.6% by foreign funds⁵⁸.

2.2.1 Funding flows

R&D intensity which is GERD/GDP is increased to 0.92% in 2012 from 0.85% in 2009. BERD intensity which is defined as BERD/GDP is raised from 0.34% in 2009 to 0.42% in 2012. Both intensities are far behind the EU-28 average which are 2.06% for GERD/GDP and 1.3% for BERD/GDP.

Table 1. Basic indicators for R&D investments

| | 2009 | 2010 | 2011 | 2012 | EU (2012) |
|---|---------|-------------|-------------|-------------|--------------|
| GDP growth rate | -4.8 | 9.2 | 8.8 | 2.2 | -0.4 |
| GERD (% of GDP) | 0.85 | 0.84 | 0.86 | 0.92 | 2.06 |
| GERD (euro per capita) | 52.4 | 63.2 | 61.1 | 73.2 | 525.8 |
| GBAORD - Total R&D appropriations (€ million) * | 1,530.5 | 1,604. 2 | 1,875. 4 | 1,916. 5 | 86,309.5 |
| R&D funded by Business Enterprise Sector (% of GDP) | 0.34 | 0.36 | 0.37 | 0.42 | 1.3 |
| R&D performed by HEIs (% of GERD) | 47.4 | 46 | 45.5 | 43.9 | 24 |
| R&D performed by Government Sector (% of GERD) | 12.6 | 11.5 | 11.3 | 11.0 | 12 |
| R&D performed by Business Enterprise Sector (% of GERD) | 40.0 | 42.5 | 43.2 | 45.1 | 63 |
| Share of competitive vs. institutional public funding for R&D | - | - | - | - | - |
| Venture Capital as % of GDP (<i>Eurostat table code tin00141</i>) | - | - | - | - | 0.025 |
| Employment in high- and medium-high-technology manufacturing sectors as share of total employment (<i>Eurostat table code tin00141</i>) | 3.0 | 3.0 | 3.0 | 3.0 | 5.6** |
| Employment in knowledge-intensive service sectors as share of total employment (<i>Eurostat table code tsc00012</i>) | 18.5 | 18.3 | 18.4 | 19.8 | 38.9** |
| Turnover from Innovation as % of total turnover (<i>Eurostat table code tsdec340</i>) | | | | | |

*€1=TL2.36 (Central Bank of Turkey's effective sale rate for 31.12.2012)

** 2011 value

Source: TURKSTAT (2013), EUROSTAT (2013), s: estimate values

⁵⁵ €1=TL2.3363 (Central Bank of Turkey's effective sale rate for 30.10.2012)

⁵⁶ No statistics are available for innovation funding.

⁵⁷ http://www.tbmm.gov.tr/butce/2013/konusma_30_Ekim_2012.pdf

⁵⁸ http://www.turkstat.gov.tr/HbGetir.do?id=13630&tb_id=2

In 2012, the main R&D funder is the business enterprises with their support accounting for 46.8% of the GERD. The second funder of the R&D is the government with 28.2%. Finally, higher education's share contribution is 21.1%. Moreover, other national funds share is 3.4% while the share of funds from abroad is only 0.6%. The main difference between the funders of R&D in the EU and Turkey is the role of HEIs. Only 24% of the R&D is funded by HEIs while this share is 43.9% in Turkey. In EU countries business sector is the main funder of R&D with a 63% but this share is only 45.1% in Turkey. On the other hand, the share of BERD/GERD in Turkey is ascended from 40% in 2009 to 45.1% in 2012.

2.2.2 Funding mechanisms

2.2.2.1 Competitive vs. institutional public funding

The existing support programme focuses on defence, security, space, energy, automotive and mechatronics research⁵⁹ along with support to generic R&D projects. With the new National Science, Technology and Innovation Strategy 2011-2016, priority thematic areas were identified and strategies for three of them (energy, water and food) were developed and approved. In addition to these developments, stimulating innovation in traditional sectors and addressing societal challenges such as climate change mitigation and health through specific measures is also under consideration. Turkey has been using EU framework funds since the sixth FP. Moreover, Turkey has access to IPA funds.⁶⁰

- IPA Component I (Transition Assistance and Institution Building)
- IPA Component II (Cross-Border Cooperation)
- IPA Component III (Regional Development)
- IPA Component IV (Human Resources Development)
- IPA Component V (Rural Development).

Turkey implements IPA funds itself, under the Decentralised Implementation System. Turkish authorities are in charge of procurement, contracting and payments for IPA projects with prior appraisal by EU Delegation in Ankara.

2.2.2.2 Government direct vs indirect R&D funding⁶¹

Government support mechanism mostly stands on the direct R&D funding mainly via TUBITAK. 82.6% of total R&D funding is direct support. The government earmarked €2,021m (TL4,770 m) which is 5.2% higher than the previous year. Indirect R&D supports cover the tax incentives and exemptions based on several laws⁶². For instance with Law 5746, institutions would fully discount their R&D expenditures from their corporate tax for the current year since 2008⁶³. Before 2008, the discount rate was only 40%. Indirect R&D support is €426.7m (TL1,007 m) and is 9.4% higher than previous year in 2013.

⁵⁹ <http://www.tubitak.gov.tr/tr/cagri-arsivi>

⁶⁰ http://ec.europa.eu/enlargement/instruments/funding-by-country/turkey/index_en.htm

⁶¹ **Government direct R&D funding** includes grants, loans and procurement. **Government indirect R&D funding** includes tax incentives such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.

⁶² Namely Law 193, 5520, 4691 and 5746.

⁶³ http://www.gib.gov.tr/fileadmin/user_upload/Tebliğler/5520/10.html

2.2.3 Thematic versus generic funding

41.2% of the GBAORD⁶⁴ budget which account for €833.6m (TL1,967.4m) is used to finance the socio-economic objective of "General advancement of knowledge: R&D financed from General University Funds (GUF)" in 2013. This objective has a share of 46.9% from 2012's budget. The second highest budget earmarked is for the objective of "Defence" with 20.4%.

Health is chosen as priority area in the 25th BTYK meeting. €32.3m (TL76.3m) is earmarked for health sector. Energy which is targeted as a priority area in the 26th BTYK meeting has only 2.5% share from GBAORD with €50.9m (TL120.1m).

2.2.4 Innovation funding

In Turkey, R&D funding is the main funding channel for academics, business and government nevertheless no specific innovation funding is used. Innovation funding is side funding of entrepreneurship, start-up vs.. Moreover, spin-off funding is not used in Turkey, neither. The sub-call is open for "electrical vehicle technologies"⁶⁵ under the "Priority Areas Research Technology Development and Innovation Funding Program" for both academics and businesses. These attempts may be counted as innovation funding activities but still they are incomplete and far from triggering national innovation activities.

2.3 Research and Innovation system changes

TUBITAK announced four new support programmes⁶⁶ in 2012: The first measure is the "Support Programme for Individual Entrepreneurs" which is a multistage programme aiming to support individual entrepreneurs to transform their technology and innovation focused business ideas into enterprises. The other two measures are directed to improve R&D performance in priority research areas. The "Support Programme for Research, Technological Development and Innovation Projects in Priority Areas" targets private sector companies whereas the "Programme for Supporting R&D Projects in Priority Areas" was directed towards researchers from both academia and private/public research centres. Furthermore, TUBITAK revised its "Support Programme for Research and Development Projects of Public Institutions" in the same period. The programme is now accepting project applications to specific calls announced by TUBITAK regarding public institutions' needs. For this aim, TUBITAK has invited the public institutions to determine their priority needs that can be resolved by R&D projects. Finally, "Support Programme for Technology Transfer Offices" aims to commercialize knowledge and technology in universities, to establish collaboration between universities and the private sector and to produce knowledge and technology demanded by the industry. This new programme was announced in November 2012 and the deadline for applications was at the end of December 2012. Around 40 applications have been received to this call (BTYK, 2013). 10 TTOs were supported in the first call. Further 10 TTOs were also supported in the second call by the end of 2013. These 20 TTOs will be supported for at most 10 years with an annual budget of 1 million TL (Euros 339,662)⁶⁷.

⁶⁴ http://www.turkstat.gov.tr/HbGetir.do?id=15856&tb_id=3

⁶⁵ <http://www.tubitak.gov.tr/en/news/high-level-consideration-meeting-of-electrical-vehicles>

⁶⁶ <http://www.tubitak.gov.tr/tr/destekler/sanayi/ulusal-destek-programlari>

⁶⁷ €1=TL2.9441 (Central Bank of Turkey's effective sale rate for 31.12.2013)

2.4 Recent Policy developments

In Turkey, main R&D policy decisions are taken in the BTYK meetings. BTYK meetings are two times a year with the presidency of the prime minister.

25th meeting of BTYK was on the 13th of January, 2013 and the last meeting which was the 26th one was on the 11th of June, 2013. The new decisions of the 25th BTYK were focused mainly on the e-government related issues. Furthermore, health became a priority area in S&T policies. The new decrees of the 26th BTYK meeting are targeted one specific sector: energy. The decisions taken aim to promote the national energy resources.

In the 25th meeting of BTYK in January 2013⁶⁸, the following six new decisions mainly on the e-government infrastructure have been taken:

- To monitor the highly-gifted individuals strategy of 2013-2017,
- To carry out studies on e-government management model,
- To complete the firm accreditation system for public procurement of e-government applications,
- To carry out studies on the establishment of National Database Centre,
- Public procurement of software needs of public institutions,
- To determine health as an S&T priority area.

In the 26th meeting of BTYK in June 2013⁶⁹, the following seven new decrees were adopted due to its relevance to the theme discussed at the meeting. The focus of the meeting was on the enhancement of usage of national energy sources in energy mix and development of national energy technologies through public-private partnerships:

- Development of National Design and Manufacturing Capability for Thermal Power Plants (MİLTES)
- Development of Hydroelectric Energy Technologies (MİLHES)
- Development of Wind Energy Power Plant Technologies (MİLRES)
- Adaptation of Solar Energy Technologies (MİLGES)
- Development of National Design and Manufacturing Capability for Thermal Power Plant Flue Gas Treatment Technologies (MİLKAS)
- Development of Coal Gasification and Liquid Fuel Production Technologies
- Increasing Energy Efficiency

⁶⁸<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-25toplantisi-15-ocak-2013>

⁶⁹<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-25toplantisi-15-ocak-2013>

2.5 National Reform Programme 2013 and R&I

Energy, water, food, defence, space, machinery, automotive and ICT were decided as priority areas⁷⁰ in previous meetings of BTYK. In the 25th meeting of BTYK, health sector was also set as an S&T priority area⁷¹. Health sector is the highest performing R&D sector in the world. In Turkey, the products are limited with the given R&D expenditures. Nevertheless, the ratio of exports to imports is very low compared to developed countries in the pharmaceutical and medical device industries. Since it was decided to encourage R&D and innovation in the health sector in order to produce its own medicine and medical devices, the health sector has been added to priority areas.

2.6 Recent evaluations, consultations, foresight exercises

In the EU accession progress of Turkey, the “Science and Research” chapter is the only part that was open to negotiation and temporarily closed. The main factor in the cohesion process of this part is the participation to the FPs. Turkey participated FP7, which was in process between 2007 and 2013, as an associated country. TUBITAK is the responsible organization in the participation of Horizon 2020⁷² which will be effective between 2014 and 2020. The Ideas Programme, in which the emphasis is on a gradual increase in the number of researchers, will have a much prominent role in Horizon 2020. To increase the number of researchers is also targeted in Vision 2023 Policy Document. Therefore, Turkey should and probably would take an action to increase the number of researchers especially FTEs.

Neither a mechanism for the evaluation of R&D policies nor a foresight exercises has been determined yet. Moreover, systematic evaluation of the applied policies has not carried out yet. Only the evaluation of the 7th Framework Programme⁷³ is available. According to this report, the performance of Turkey in the Framework Programmes is noteworthy and in the progress report of 2011, the success of Turkey in FPs is appreciated.

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

Turkey is a unitary state where all policy fields, including research, are under the responsibility of the central government. The Turkish regional administrative hierarchy consists of provinces, counties, towns and villages which have all been equal in power and responsibility since 1925. In the 1950s Turkey was divided into seven geographical regions, where each one contained about 10 provinces and did not have any governance component. In 2002, in an attempt to harmonise with EU regulations, a new regional distribution was created according to the NUTS classification. According to the new classification, 81 provinces are grouped into 26 NUTS II clusters, provinces are considered as NUTS III level and 12 new adjacent province groups are labelled as NUTS I level. All regions in the country have the same status in terms of overall powers and responsibilities.

The government established [26 regional development agencies \(RDAs\)](#) at NUTS II level in order to accelerate regional development through enhanced co-ordination and co-operation between all stakeholders. RDAs, which operate under the coordination of the MoD, design and implement programmes for stimulating R&D and innovation in their regions. The RDAs have

⁷⁰ http://www.tubitak.gov.tr/sites/default/files/2211_oncelikli_alanlar_2013.pdf

⁷¹ http://www.tubitak.gov.tr/sites/default/files/btyk25_yeni_kararlar_toplu.pdf

⁷² http://www.tubitak.gov.tr/tubitak_content_files//BTYPD/BTYK/btyk24/54_2012_109.pdf

⁷³ http://www.fp7.org.tr/tubitak_content_files//GenelHaber/7CPRaporTemmuz2012.pdf, page 4

also started to take initiatives to develop and implement regional innovation strategies by 2011. According to [the law of RDAs](#) which was enforced in 2006, the research/innovation-related duties of the agencies include (among others):

- Implementing and supporting research for the identification of the natural, economic and human resources, and increasing economic development and competitiveness of the region;
- Promoting the business and investment potential of the region at national and international levels in co-operation with the relevant institutions;
- Supporting small and medium sized enterprises and start-ups in terms of management, production, promotion, marketing, technology, finance, organisation and human resources training in co-operation with relevant institutions;
- Promoting activities in bilateral or multinational programmes in which Turkey participates in the region, and contributing to the efforts of project development in that respect.

The co-ordination of the agencies at a national level is carried out by the [Ministry of Development](#). All 26 RDAs follow the same structure defined by the law: they have a 'Development Board' (formed by the stakeholders in region from the private and public sectors, academia and NGOs) and a 'Board of Directors' (formed by the governor, major, the president of the provincial council, president of chambers, etc.). The operational unit of an RDA is the 'General Secretariat'. The RDAs also creates 'investment promotion offices' under the general secretariat. Currently, no research programmes are being implemented at regional level. [The Small and Medium Enterprises Development Organisation \(KOSGEB\)](#) is the only agency implementing centrally designed R&D programmes through its regional branches.

Regional administrative structures do not have responsibility for regional R&D policy. On the other hand, the regional development agencies (RDA) take actions on regional R&D policies. The RDAs include the stimulation of R&D and innovation in their regional development strategies. TUBITAK launched the 'Province Level Innovation Platforms' support in 2011, under the ['Support Programme for the Initiative to Build Scientific and Technological Cooperation Networks and Platforms'](#). However, this programme is under revision and new Project applications are not accepted.

Besides the RDAs policy, no smart specialisation strategy for research and innovation was so far specified for regional or national level in Turkey. Turkey and its regions also is not a member of the S3 platform⁷⁴. Turkey has only a participant in an OECD project on smart specialisation⁷⁵. However, Turkey has access to IPA⁷⁶ comment III (regional development).

⁷⁴ <http://s3platform.jrc.ec.europa.eu/home>

⁷⁵ <https://community.oecd.org/community/smartspecialisation>

⁷⁶ http://europa.eu/legislation_summaries/agriculture/enlargement/e50020_en.htm

3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

3.1 National Research and Innovation policy

Turkey is considered as a “modest innovator with a below average performance” in the Innovation Union Scoreboard (IUS) 2013⁷⁷. In terms of average economic growth, Turkey has 2.2% real GDP growth in 2012 which is considerably high above the EU-27 average (-0.4%). For Turkey, the improvement of innovation performance from previous year has been well above the EU-27 average in IUS 2013 with a value of 3.6%. According to the IUS 2013, the relative strengths are in ‘Innovators’ and ‘Economic effects’. However, the relative weaknesses are listed as ‘Human resources’ and ‘Firm investments’. The Innovation Union Competitiveness (IUC) Report⁷⁸ also highlights a specific relative strength of Turkey in the quality of its scientific production, with an annual growth rate of 8.2% of its scientific publications among the top 10% of those most cited worldwide (IUC, 2013). IUC (2013) points out that Turkey is behind countries with similar knowledge capacity and economic structure in human resources with new graduates in science and engineering and new doctoral graduates showing especially low averages.

Both the IUS 2013 and IUC 2013 reports underline the high growth for ‘Business R&D expenditure’, ‘PCT patent applications’ and ‘Community trademarks’. The annual growth rate for ‘business R&D expenditures’ is 1.9% for EU-27, while it is 4.7% in Turkey. Such a trend is also observed for ‘PCT patent applications’. Turkey has the highest growth rate (0.07) in this indicator while EU-27 average has a declining share with 0.6%. The same tendency is also observed for ‘PCT patent applications in societal challenges’ defined as climate change mitigation and health although these challenges were not in the S&T priority areas in Turkey. The annual growth in ‘community trademarks’ is 19% in Turkey as compared to EU-27 average of 5.2%. The IUS 2013 further underlines that Turkey scores top-5 positions for ‘SMEs introducing marketing or organisational innovations’ and ‘for Sales of new-to-market and new-to-firm products’. According to IUS 2013, the growth rate in ‘new doctorate graduates’ is 18.9% in Turkey which is the second highest growth rate among the countries in IUS 2013. ‘Population completed tertiary education’ indicator has also higher growth rate (7.3%) as compared to EU-27 average (3.6%).

According to the Global Competitiveness Report 2013-2014⁷⁹ of the World Economic Forum, Turkey is in the stage of transition from efficiency-driven economy to innovation-driven economy. In the Global Competitiveness index, Turkey ranks as 44th out of 148 economies. Turkey’s performance in innovation pillar is comparable with other ‘efficiency-driven economies’ with a rank of 47. Under the innovation pillar, Turkey’s scores relatively well in the ‘government procurement of advanced technology products’ (23rd), ‘PCT patent applications per million of population (41st) and ‘capacity for innovation’ (45th). Moderate performance is observed in ‘university-industry collaboration in R&D’ (52nd) ‘availability of scientists and engineers’ (53rd). On the other hand, ‘company spending on R&D’ (68th), and quality of scientific research institutions (63rd) remain areas of concern for the country.

⁷⁷http://ec.europa.eu/enterprise/policies/innovation/files/ius-2013_en.pdf

⁷⁸http://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2012/innovation_union_progress_at_country_level_2013.pdf

⁷⁹http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf

The National Science, Technology and Innovation Strategy 2011-2016 adopted in December 2010 by the BTYK focusing on human resources development for science, technology and innovation, transformation of research outputs into products and services, enhancing interdisciplinary research, highlighting the role of SMEs, R&D infrastructures and international cooperation. It also identifies automotive, machinery and production technologies, ICT, energy, water, food, security and space as focus areas. In line with this, the strategy puts special emphasis on keeping the balance between focused areas and bottom-up research (TUBITAK, 2010 and IUC, 2011).

In addition to the National Science, Technology and Innovation Strategy 2011-2016, at the 23rd BTYK meeting in December 2011, the following new items were identified for the improvement of the research and innovation performance of the country:⁸⁰

- Setting up a coordination board to secure integrity, coherence and target-oriented approach in R&D, innovation and entrepreneurship support mechanisms;
- Developing policy tools to activate and increase the number of R&D intensive start-ups;
- Developing policy tools to trigger innovation and entrepreneurship in universities;
- Promoting entrepreneurship culture;
- Improving public procurement and public right of use in such a way to foster innovation, localisation and technology transfer;
- Promoting science centres;
- Developing policy tools to stimulate domestic patent licensing.

As noted by IUC (2013), “The private sector is considered to be the driving force for many improvements and therefore supportive decrees were adopted both for increasing the private sector’s activities and fostering collaboration between the private sector and universities.” In the 24th meeting of BTYK in August 2012, the new decisions were mainly directed towards increasing the quality of educational infrastructure.⁸¹ In the 25th meeting of BTYK in January 2013, the new decisions were mostly concentrated on the e-government infrastructure.⁸² In the 26th meeting of BTYK in June 2013⁸³, the following seven new decrees were adopted relevant to the focus theme at the meeting, that was set on enhancement of usage of national energy sources in energy mix and development of national energy technologies through public-private partnerships:

- Development of National Design and Manufacturing Capability for Thermal Power Plants (MİLTES)
- Development of Hydroelectric Energy Technologies (MİLHES)
- Development of Wind Energy Power Plant Technologies (MİLRES)
- Adaptation of Solar Energy Technologies (MİLGES)
- Development of National Design and Manufacturing Capability for Thermal Power Plant Flue Gas Treatment Technologies (MİLKAS)

⁸⁰<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-23toplantisi-27-aralik-2011>

⁸¹<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-24toplantisi-7-agustos-2012>

⁸²<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-25toplantisi-15-ocak-2013>

⁸³<http://tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-26toplantisi-11-haziran-2013>

- Development of Coal Gasification and Liquid Fuel Production Technologies
- Increasing Energy Efficiency

Table 2

| HUMAN RESOURCES | |
|---|-------|
| New doctorate graduates (ISCED 6) per 1000 population aged 25-34 | 0.4 |
| Percentage population aged 25-64 having completed tertiary education | 16.3 |
| Open, excellent and attractive research systems | |
| International scientific co-publications per million population | 71 |
| Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country | 6.73 |
| Finance and support | |
| R&D expenditure in the public sector as % of GDP | 0.49 |
| Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies) | n.a. |
| FIRM ACTIVITIES | |
| R&D expenditure in the business sector as % of GDP | 0.36 |
| Venture capital and seed capital as % of GDP | n.a. |
| Linkages & entrepreneurship | |
| Public-private co-publications per million population | 1.7 |
| Intellectual assets | |
| PCT patents applications per billion GDP (in PPS€) | 0.87 |
| PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health) | 0.08 |
| OUTPUTS | |
| Economic effects | |
| Contribution of high-tech and medium-tech products to the trade balance as % of total exports plus imports of products | -2.22 |
| Knowledge-intensive services exports as % total service exports | 18.76 |
| License and patent revenues from abroad as % of GDP | 0.00 |

3.2 Structural challenges of the national R&I system

Based on the discussion above, the following challenges have been identified for Turkey:

- Promoting research commercialisation from universities: This can take place in various forms, such as university start-ups and spin-off, mobility of researchers and students, contract research projects, joint research projects, innovative public procurement, licensing, consulting, trainings, formal and informal networks, competitiveness clusters etc. This fact is also underlined by the Global Competitiveness Index in which Turkey has a relatively weak performance. The above-listed new decisions of the 23rd meeting of BTYK and the National Science, Technology and Innovation Strategy 2011-2016 focus on this challenge. The Entrepreneurial and Innovative University Index has been established in the last two years. Universities included in this index are eligible to apply for support to establish technology transfer offices. In 2013, 10 such offices have been supported. Another 10 are expected to receive the support in 2014. The enrichment of

the policy mix with a variety of measures (financial, non-financial, etc.) will help to address this challenge.

- Increasing the number of innovative high-growth start-ups: This is an important challenge facing the innovation and economic performance of the country. The underdeveloped venture capital and business angels market, as well as limited number and variety of policy measures for start-up creation, are crucial impediments for the establishment and development of innovative businesses in Turkey. It is also a barrier for encouraging educated and qualified human sources to see entrepreneurship as a career option. Insufficient early stage funding is also an obstacle for the development of venture capital industry as it helps generate a large deal flow for venture capital investments. The BTYK decisions of December 2011 recognise this challenge and aim to address through new policy measures. Furthermore, the Undersecretariat of Treasury carries out studies for improving the framework conditions for angel investments, and the 'Entrepreneurship Council' established in January 2012 aims to increase number of innovative and technology-based start-ups⁸⁴.
- Increasing R&D and innovation capabilities of the private sector (in particular, micro, small and medium enterprises (MSMEs)): The low levels of absorptive capacity of the business sector, particularly which of MSMEs, is a barrier to increase R&D and innovation performance. MSMEs constitute 99.9% of the total enterprises and 78% of employment in Turkey, according to KOSGEB. Micro enterprises constitute the majority of MSMEs. They are mainly active in traditional, middle to low-tech sectors, such as garments (14%), furniture (14%), metal products (14%), wood products (10%) and food (8%) (KOSGEB 2011).⁸⁵ There exist policy measures for increasing R&D and innovation investment of the private sector and SMEs, and the National Science, Technology and Innovation Strategy 2011-2016 highlights the role of SMEs. It is important to design and implement specific measures (such as support for R&D/innovation vouchers and knowledge intensive service activities, etc.) for enhancing the learning capabilities, absorptive capacity, and R&D and innovation capabilities of MSMEs and other private sector companies.
- Focusing on sectors and thematic areas of importance: It is important for Turkey to focus on priority sectors, technology areas and specific thematic fields for building capacities and addressing key challenges of today and tomorrow. This requires incentives and measures specifically designed and government funds strategically channelled to these areas. As noted above, with the new National Science, Technology and Innovation Strategy 2011-2016, priority areas were identified. In addition to these areas, stimulating innovation in traditional sectors and addressing societal challenges such as climate change mitigation and health can help increase innovation outputs and outcomes due to the intensity of enterprises in the former, and the size of societal needs in the latter.
- Increasing availability and quality of research personnel: As evident by indicators, Turkey is behind countries with similar industrial structure and knowledge capacity with respect to human resources intensity, and on the knowledge-intensity of its economy (reflecting both manufacturing and services). (IUC 2013). This has long been recognised as one of the challenges of the Turkish research and innovation system by the government and specific interventions have helped improvements in trends. Current strategies and action plans indicate ongoing commitment in this area. Further efforts and diversified measures are needed to develop human resources in a way that the absorptive capacity of

⁸⁴ <http://www.sanayi.gov.tr/NewsDetails.aspx?newsID=2292&lng=tr>

⁸⁵ <http://www.kosgeb.gov.tr/Pages/UI/Baskanligimiz.aspx?ref=23>

companies is enhanced, and the quantity and quality of researchers are increased. The BTYK decisions of December 2011 and August 2012 support the steps to be taken to tackle this challenge.

3.3 Meeting structural challenges

In Turkey, there exist various instruments to tackle these challenges as summarized by the below table. The main shortcoming of all these measures is the inexistence of evaluation studies on these programmes. There is an urgent need to develop an evaluation culture and establish an effective mechanism for systematic evaluation of the policies and policy measures on the basis of internationally recognised criteria. Therefore, evidence-based assessment of these programmes is not possible yet some intuitive assessment can be done.

Table 3

| Challenges | Policy measures/actions addressing the challenge ⁸⁶ | Assessment in terms of appropriateness, efficiency and effectiveness |
|--|---|---|
| 1. Challenge 1. Promoting research commercialisation from universities | Law on Technology Development Zones Establishment of Technology Transfer Offices Industrial Thesis Support Programme (SAN-TEZ) University-Industry Collaboration Support Programme | All of these measures are appropriate but it is not possible to state that desired level of research commercialisation is reached. The enrichment of the policy mix (financial, non-financial, etc.) is needed. |
| 2. Challenge 2. Increasing the number of innovative high-growth start-ups | Law on Supporting Research and Development Activities-Techno-entrepreneurship Support Programme Support Programme for Pre-Competitive Collaboration Projects SME RDI (Research, Development & Innovation) Grant Programme Individual Entrepreneurship Support Programme Venture Capital Support Programme Innovative Entrepreneurship Capacity Enhancement Support | There exist strategies for developing venture capital industry and encouraging early stage investments. However, there is an urgent need to create favourable conditions to foster a growing and robust venture capital market, especially for early stage investments. |

⁸⁶ Changes in the legislation and other initiatives not necessarily related with funding are also included.

| | Programme | |
|---|--|---|
| 3. Challenge 3. Increasing R&D and innovation capabilities of the private sector | Law on Supporting Research and Development Activities Law on Supporting Research and Development Activities Industrial R&D Projects Support Programme R&D, Innovation and Industrial Application Support Programme International Industrial R&D Projects Grant Programme | Research and innovation started to play a more important role in the overall national/sectoral/regional policy mix. There is an increased commitment among the policy-makers to develop and implement strategic, coherent and integrated policy framework. It is an important challenge to achieve and sustain such a policy framework. There is a need to adopt a broad concept of innovation in policies and policy measures (including innovation in services, improvements of processes and organisational change, business models etc.) |
| 4. Challenge 4 Focusing on sectors and thematic areas of importance | Research Technology Development and Innovation Projects in Priority Areas Grant Programme Programme for Supporting R&D Projects in Priority Areas | National Science, Technology and Innovation Strategy 2011-2016, identified priority areas and various measures are implemented toward this end. However, it is early to evaluate their efficiency and effectiveness. Energy, water and food are identified as societal challenges and separate national R&D and innovation strategy documents were developed for them in 2011. Health is also addressed as a priority area in 2013. There is also a need to focus on climate change mitigation as additional challenge to be addressed. |
| 5. Challenge 5 Increasing availability and quality of research personnel | National Young Researcher Career Development Programme Research Fellowship Programme for Returning Turkish Scholars National Post-Doc Research Fellowship Programme International Post-Doc Research Fellowship Programme Co-Funded Brain Circulation Scheme | There exists the National Science and Technology Human Resources Strategy and Action Plan (2011-2016) (HRST strategy) to improve researcher careers. In the last decade, FTE R&D Personnel increased by 176% while FTE Researchers by 148%. There is a need to balance supply and demand in HRST, and to increase the number of S&T graduates. The collaboration with industry for the design of new curriculum should be improved. The number of researcher targets is reached in a relatively short period of time in the recent decade. Nevertheless, the number of researchers, female researchers and, FTE researchers should be further increased with some additional policy measures. |

4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

The process of harmonization of the EU *acquis* contributes to the policy mix coordination efforts, as it has done hitherto. Although not yet a Member State, Turkey's strategies and efforts in the field of S&T and innovation are, to a large extend, in line with the ERA priorities/ pillars/ objectives. In addition, R&D objectives of Turkey are in parallel with the ERA targets. The ERA developments have been closely followed by the policy-makers and the BTYK launched the "Turkish Research Area" (TARAL) in 2004 with inspiration from the ERA. TARAL, a platform for public, private and NGO stakeholders to coordinate future R&D priorities and collaboration, is aimed to be integrated with the ERA. In this respect, Turkey participates in the common programmes and is determined to be involved in the initiatives carried out at the European level. Although the objectives of TARAL are in line with the ERA, the priorities of the Turkish S&T and innovation policy is decided in BTYK meetings which are two times a year. Further improvement of policy coordination across policy levels and in the policy mix would contribute to the alignment with the ERA pillars.

- Five new ERA priorities/pillars⁸⁷ were determined in the ERA Communication in July 2012. These priorities, based on the strengths and weaknesses of the research system of Europe, become effective by 2014. The overview of Turkey in terms of ERA priorities is summarized below: Effectiveness of the research system:
 - The effectiveness of national research system in Turkey can be evaluated in two interrelated dimensions: First is the effectiveness of public support system since the government is still the main player to enhance national research system. Second is the supply of and demand for human resources for research. The number of supported projects by TÜBİTAK shows that the diffusiveness of the public support. This further enhances the system. As for the supply for human resources, several policy measures are taken into account for to stimulate the inward and outward mobility of researchers however demand side is weaker. Against all the attempts to improve the human resources in research system, in terms of effectiveness of national systems there is long way ahead.
 - Optimal levels of transnational co-operation and competition:
One of the main channels of transnational co-operation and competition is the 7th Framework Programme of EU. Success rate of applicants from Turkey to FP7 have risen from 12.7% to 18.4% in the period between 2007 and 2011. Turkey has also participated to other transnational programmes and activities such as COST (European Cooperation in Science and Technology), ESA (European Space Agency), EMBC (European Molecular Biology Conference), KEİ (Black Sea Economic Cooperation), EIT (Economic Cooperation Organization), NATO, OECD and UNESCO. The participation of Turkish scientists to these activities are supported and monitored by TÜBİTAK. Among those programmes, the most active one is COST. By the end of 2012, 155 project proposals have been received
 - Openness of labour markets for researchers:

⁸⁷ http://ec.europa.eu/euraxess/pdf/research_policies/era-communication_en.pdf

Two support programmes are used to encourage foreign researchers to come to Turkey by TUBITAK. First programme which is for the guest or sabbatical researchers is called “Fellowship for Visiting Scientists and Scientists on Sabbatical Leave”⁸⁸. The foreign researcher is supported by minimum for three months and maximum for 12 months. The second one is the international experienced researcher mobility support programme which is called “Co-Funded Brain Circulation Scheme”⁸⁹

- Gender equality and gender mainstreaming in research:

30% of the FTEs are female in 2012⁹⁰. The number of female FTEs is 31,626 out of 105,122. The situation of Turkey in 2010 is better than Malta, France, Denmark and Czech Republic⁹¹. 85.4% of female FTEs are working as a researcher. Besides that, 28% of the female FTEs are Ph.D. holders while only 22% of male is. For 2011⁹², in Turkey share of female researchers are 32.4% while in Germany this ratio is only 22.1%. There is no direct support programme for the gender equality.

- Optimal circulation and transfer of scientific knowledge:

In the 25th BTYK meeting, four (out of six) of final conclusions are related to this subject. Till now, no support programmes or direct measure are yet settled. TUBITAK constitutes the “Researcher Information System (ARBIS)⁹³” since 2004. In this system, information about the Turkish researchers from Turkey and other countries exist. The total number of the researcher in the system is 93,342⁹⁴ in December 2013.

In 2013, the main policy decisions of 25th BTYK meeting is closely related to the last ERA pillar of optimal circulation and transfer of scientific knowledge. The amendments of the related laws are revised but not come into effect yet. The success of the labour market openness for researchers is demonstrated by statistics of TUBITAK programmes. 248 Turkish and 167 foreign researchers or academicians prefer to come to Turkey to perform research through the two support programmes.

4.1 Strengthening the knowledge base and reducing fragmentation

4.1.1 Promoting excellence in education and skills development

The number of full-time equivalent (FTE) R&D personnel increased to 105,122 in 2011 from 73,521 in 2009, according to TURKSTAT.⁹⁵ In 2012, there is only 42,4 FTE R&D personnel per 10,000 employees⁹⁶. The private sector employs 52,233 FTE R&D staff and universities employ 40,801 FTE R&D personnel while 12,088 FTE R&D personnel are employed by the public

⁸⁸<http://www.tubitak.gov.tr/en/funds/academy/international-researchers-fellowship-programmes/content-2221-fellowships-for-visiting-scientists-and-scientists-on-sabbatical-leave>

⁸⁹<http://www.tubitak.gov.tr/en/funds/academy/international-researchers-fellowship-programmes/content-2236-co-funded-brain-circulation-scheme-co-circulation-scheme>

⁹⁰ <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=13630>

⁹¹<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=0&language=en&pcode=tsc00006>

⁹²<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=0&language=en&pcode=tsc00006>

⁹³ <https://arbis.tubitak.gov.tr/pages/bilgipinari/index.htm>

⁹⁴ <https://arbis.tubitak.gov.tr/pages/bilgipinari/index.htm>

⁹⁵ http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=3

⁹⁶<http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=13630>

sector. 248 Turkish Researchers who are working out of Turkey turn back to their country through the funds provided by TUBITAK to promote inverse brain-drain⁹⁷.

TUBITAK initiated programmes for foreign researchers/ scientists to come work and do research in Turkey for both short and long periods to increase researchers' mobility. In Turkey, 1,460 foreign teaching staff⁹⁸ is working in the universities. Moreover, graduate scholarships for international students are also available.

Two main support programmes launched by TUBITAK are used to encourage foreign researchers and academicians to come to Turkey. The first programme which is for the guest or sabbatical researchers is called "Fellowship for Visiting Scientists and Scientists on Sabbatical Leave"⁹⁹. The second one for the foreign researchers is the international experienced researcher mobility support programme which is called "Co-Funded Brain Circulation Scheme"¹⁰⁰. The Co-Circulation Scheme, partially supported by the EC-FP7 Marie Curie Actions-People-COFUND and coordinated by BİDEB, aims at increasing and facilitating the international mobility of scientists. It was launched in 2012 for a five year period. The scheme offers 20-24 month support for 100 Turkish and foreign experienced researchers. Universal Researcher Programme (EVRENA)¹⁰¹ was initiated in 2007 for five years. The main aim of the programme was to support the collaboration between Turkish researchers and their foreign colleagues and to enrich the international dimensions of research projects supported by TUBITAK. The researcher living abroad (does not necessarily to be non-citizen) is encouraged to be a part in the projects.

Two programmes are available for graduate scholarship for international students. One is "Graduate Scholarship Programme for International Students"¹⁰² and the other is "Research Fellowship Programme for Foreign Citizens"¹⁰³. In the first programme, the main aim is to support the talented and successful international graduate students. To support the international PhD students or post-doctoral researchers is the goal of the latter one.

4.1.2 Research Infrastructures

Turkey is a member of European Strategy Forum on Research Infrastructures¹⁰⁴, and actively participates in the thematic working groups and in the EU Roadmap Working Groups (in the fields of Biological and Medical Sciences, Physical Sciences and Engineering, Environmental Sciences, and Social Sciences and Humanities). As a part of the ESFRI related activities, the Ministry of Development is in the process of developing the Research Infrastructures Roadmap for Turkey. In the road mapping study, energy, biomedical, physics, engineering and social sciences are given priority. In addition, Turkey is a partner in the ESFRI projects such as the 'European Multidisciplinary Seafloor Observatory' and the 'Partnership for Advanced

⁹⁷<http://www.tubitak.gov.tr/tr/haber/tersine-beyin-gocuyle-248-arastirmaci-turkiyeye-geri-dondu>

⁹⁸www.osym.gov.tr/dosya/1-60459/h/e35yabanciogretimleman.xls

⁹⁹<http://www.tubitak.gov.tr/en/funds/academy/international-researchers-fellowship-programmes/content-2221-fellowships-for-visiting-scientists-and-scientists-on-sabbatical-leave>

¹⁰⁰<http://www.tubitak.gov.tr/en/funds/academy/international-researchers-fellowship-programmes/content-2236-co-funded-brain-circulation-scheme-co-circulation-scheme>

¹⁰¹<http://www.tubitak.gov.tr/tr/destekler/akademik/ulusal-destek-programlari/icerik-1010-evrensel-arastirmaci-evrena-programi>

¹⁰²<http://tubitak.gov.tr/en/scholarship/undergraduatesgraduates/international-programmes/content-2215-graduate-scholarship-programme-for-international-students>

¹⁰³<http://tubitak.gov.tr/en/scholarship/undergraduatesgraduates/international-programmes/content-2216-research-fellowship-programme-for-foreign-citizens>

¹⁰⁴http://ec.europa.eu/research/infrastructures/pdf/esfri/esfri_roadmap/roadmap_implementation_2009/esfri_implementation_report_final2_hidef.pdf#view=fit&pageMode=none

Computing in Europe', and is taking steps to participate in the 'Pan-European infrastructure for clinical trials and biotherapy'. Turkey does not commit funds for the implementation of the ESFRI Infrastructures. Ministry of Development has made significant investments for research infrastructures since 2004 and large-scale research infrastructures started to be established. Thematic research centres and central research laboratories were established in major universities. However, the impacts of these investments have not yet been assessed. Another problem is the sustainability of these research infrastructures. The Ministry does not allocate funds for the sustainability of these laboratories and research centres. In the context of these concerns, Ministry of Development has started initiatives for the improvement of thematic university research centres support programme by the July 2011. The new regulation is expected to be promulgated in the first half of 2013.

Moreover, Turkey has obtained funds for research infrastructures from FP7. According to TUBITAK's report on FP7, Turkey obtained 10,784,335 Euros from research Infrastructures and 11,486,684 Euros from REGPOT programmes by the end of June 2012.

Activities are being carried out by the Scientific and Technological Research Council of Turkey (TUBITAK) to establish collaborations with the International Centre for Genetic Engineering and Biotechnology, European Molecular Biology Laboratory and the European Space Agency (ESA). Among these institutions, collaborations with the ESA are attached higher priority. An agreement was signed in 2004 between Turkey and the ESA on co-operation in the exploration and use of outer space for peaceful purposes. Turkey signed the European Molecular Biology Conference in 1993.

The Turkish Atomic Energy Authority (TAEK) has been in charge of coordination of the activities related to CERN.

4.2 Getting good ideas to market

4.2.1 Improving access to finance

Total gross expenditure on R&D (GERD) reached €5,534m (TL13,062.3m) in 2012. 46.8% of R&D expenditures were financed by business enterprises, 28.2% by government sector, 21.1% by higher education sector, 3.4% by other national sources and 0.6% by foreign funds. Public funding for research and innovation is provided through the Ministry of Science, Industry and Technology (MoSIT)¹⁰⁵, the Scientific and Technological Research Council of Turkey (TUBITAK), the Ministry of Development (MoD), the Ministry of Economy, the Small and Medium Enterprises Development Organisation (KOSGEB) and the Technology Development Foundation of Turkey (TTGV).

R&D investments in firms are mainly stimulated through grants, soft loans and tax incentives. The leading grant programme to promote private R&D investments is the "Industrial R&D Funding Programme" of TUBITAK. Moreover, newly introduced "Support Programme for Research, Technological Development and Innovation Projects in Priority Areas" and "Programme for Supporting R&D Projects in Priority Areas" has potential for the support of R&D activities in critical sectors.

The Small and Medium Enterprises Development Organisation (KOSGEB) provides a mixture of soft loans and grants for the R&D projects of the small and medium-sized enterprises under its "R&D, Innovation and Industrial Application Support Programme". Soft loans for the R&D activities of the private sector are provided by the Technology Development Foundation of Turkey (TTGV) under the [Technology Development Project Support](#) since 1991. TTGV's programmes are partly financed by the Ministry of Economy. TTGV's new programme, 'Advanced Technology Project Supports (ITEP)' also reflects sectoral prioritization objectives of the new era.

In addition to these measures, TUBITAK-TEYDEB carries out a scheme for non-R&D performing SMEs (SME Funding Programme) to start R&D activities. The establishment of new indigenous R&D performing/innovative firms are mainly promoted through seed finance provided under the "Technopreneurship Capital Support Programme" implemented by the MoSIT. In addition, KOSGEB encourages the creation of technology entrepreneurs through its "R&D, Innovation and Industrial Application Support Programme". TUBITAK implements "Techno-entrepreneurship Funding Programme" for the same purpose.

TUBITAK started the "Support Programme for Individual Entrepreneurs" in June 2012. The programme is launched with reference to the decision taken in 23rd meeting of BTYK and its aim is to support individual entrepreneurs to transform their technology and innovation focused business ideas into high-value enterprises.

4.2.2 Protect and enhance the value of intellectual property and boosting creativity

Turkish Patent Institute (TPE)¹⁰⁵ is established in 1994 to fulfil the economic and commercial harmonization to European Union. It is affiliated to Ministry of Science, Innovation and Technology (MoSIT). The main aim of the institution is to protect the intellectual property

¹⁰⁵ http://www.tpe.gov.tr/portal/default_en.jsp

rights, to encourage the innovation and to prepare a sound environment for technological development.

The new amendments about the law on intellectual property rights and industrial design rights opened to signature to the council of ministers on 11th of March 2013. In this draft law, it is proposed to change 92 items¹⁰⁶. The most important change in the law is about the inventions of the university members. The academic inventors and their rights on the invention have been modified in detail. To avoid the arguments between the academic inventor and his institution, the rights of the inventor and institution classified in a more detailed way. In the effective law, the right of the patent application is belong to instructor, however with this amendment this right conveys to the university. Moreover, the university could own a patent. Another important detail is about the penalty on the disobeying the patent rights. The imprisonment of imitation product is envisaged between one to three years.

4.2.3 Public procurement

In 25th BTYK meeting, six new decisions are mainly related to e-government infrastructure. Two of these decisions are associated with the public procurement of e-government and software needs of public institutions. In the last meeting of BTYK, the progress report of the decisions is revealed¹⁰⁷. The necessary regulation on the amendment of the Law on Public Procurement is rearranged for the public procurement of e-government. The software needs of all the public institutions are gathered. The necessary procedure and models are developed for joint procurement of softwares for public institutions not only to avoid the repeated buying but also to use the advantage of low-cost buying.

TUBITAK started a project supporting electrical vehicle production with 100% R&D subsidy in February 2013¹⁰⁸. MoSIT affirms to purchase 200 produced vehicles in 5 years. It is also planned to encourage public procurement of electrical vehicle in the long run.

There is an urgent need for innovation-oriented procurement policy. Apart from defence industry and partly ICT needs of government, there is no systematic innovation-oriented procurement policy in Turkey.

4.3 Working in partnership to address societal challenges

TUBITAK has no direct programme to encourage European Innovation Partnerships (EIPs). Still one project which is about chronic respiratory diseases has been accepted for EIPs on Active and Healthy Ageing at European Meeting in Brussels on 7th June 2013¹⁰⁹.

4.4 Maximising social and territorial cohesion

There is no specified or designed smart specialization strategy in Turkey. Moreover, Turkey is not registered to either smart specialization platform (S3P) or EU structural funds (except IPA).

¹⁰⁶ www.basbakanlik.gov.tr/Handlers/FileHandler.ashx?Field=20781

¹⁰⁷ http://www.tubitak.gov.tr/sites/default/files/btyk26_gelismelere_iliskin_degerlendirmeler_0.pdf

¹⁰⁸ <http://www.tubitak.gov.tr/tr/haber/tubitak-elektrikli-arac-uretimine-yuzde-100-ar-ge-detegi-verecek>

¹⁰⁹ gard.org.tr/news/42-gard-turkey-project-has-been-accepted-for-european-innovation-partnership.html

4.5 International Scientific Cooperation

The International Co-operation Department of the Scientific and Technological Research Council of Turkey (TUBITAK) is responsible for the implementation of international research measures. These programmes are divided into three general categories: Bilateral Co-operation; Co-operation with regional and international organizations; and Co-operation with the European Union (EU).

TUBITAK signed 24 bilateral co-operation agreements on research. The EU Member States with which Turkey have bilateral research agreements include the following: Bulgaria, Germany, France, Greece, Hungary, Italy, Romania, Slovakia and Slovenia.

Turkey has also signed co-operation agreements with Belarus, India, South Korea, Macedonia, Mongolia, Pakistan, China, Russian Federation, Syria, Tunisia and Ukraine. In addition, Turkey signed a bilateral research protocol with Albania and issued a 'Joint Declaration on Scientific and Technological Co-operation' with India.

TUBITAK co-ordinates the following multilateral co-operation activities: COST (European Co-operation in the Field of Scientific and Technical Research); ESF (European Science Foundation); EMBO / EMBC (The European Molecular Biology Organisation/Conference); ESA (European Space Agency); ICGEB (International Centre for Genetic Engineering and Biotechnology); ICSU (International Council for Science); INTAS (The International Association for the Promotion of Co-Operation with Scientists from the New Independent States (NIS) of the Former Soviet Union); NATO (North Atlantic Treaty Organisation); WAITRO (World Association of Industrial and Technological Research Organisation); and BSEC (Black Sea Economic Co-operation).

Co-operation with the EU on research is mainly carried out under the research framework programmes of the EU. By the end of June 2012, 0.52% of total FP7 budget are received Turkish researchers. The highest success rates are observed in Capacities (1.79%) and Marie Curie (0.99%) programmes in terms of funds received.¹¹⁰ Turkey is also active in ERA-NET and ERA-NET Plus networks. By September 2013, its rate of participation is higher than other associated countries. Its rank is 14th out of 54 countries.¹¹¹

Despite the government's recent efforts of introducing specific R&D support measures for priority areas, these areas reflect national challenges rather than global ones. Therefore, there exists limited specific research fields prioritized for cross-border knowledge circulation with the purpose of resolving grand challenges. Only through participation to framework programmes and with some bilateral research, these grand challenges are addressed.

¹¹⁰ http://www.fp7.org.tr/tubitak_content_files//GenelHaber/7CPRaporTemmuz2012.pdf

¹¹¹

<http://netwatch.jrc.ec.europa.eu/documents/10180/10648/NETWATCH%20Mapping%20and%20Monitoring%205th%20Exercise?version=1.0&t=1392388535631>

5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

5.1 More effective national research systems

The effectiveness of national research system in Turkey can be evaluated in two interrelated dimensions: First is the effectiveness of public support system since the government is still the main player to enhance national research system. Second is the supply of and demand for human resources for research. In the last decade, there are increasing attempts to improve the effectiveness of public support system. We can describe the effectiveness of public support system through two further axes. First is the extensive impact of the supports in terms of their diffusiveness and second is the contribution of supports in transforming the whole system. In the first axis, we can surely claim that the spectrum of public supports have been seriously enhanced with various tools. In the private sector, the supports are provided by numerous public institutions both towards large scale establishments and SMEs. However, not only the quantity but also the quality of the supports is rising. For instance, in terms of the number of project applications to TUBITAK-TEYDEB projects (one of the most popular direct R&D support scheme), the percentage of SMEs was 45.8% in 2000 while this figure reached to 81% in 2012. On the other hand, total number of TEYDEB project applications in the 2000-2012 period increased approximately by 11 times (TEYDEB, 2013).

The similar tendencies are also observed in terms of sectoral distribution and the number of supported projects. What this example significantly shows is that the diffusiveness of public support system improved in the last decade. This further enhances the effectiveness of the system. Another important attempt is the sectoral prioritization in policy formulation. The National Science, Technology and Innovation Strategy (2011-2016) approved in 22nd meeting of BTYK in December 2010. Automotive, machinery and production technologies, ICT, energy, water, food, security and space were identified as priority sectors under the strategy. Health sector has been also recently added as a new S&T priority sector in 25th meeting of BTYK in January 2013.

The National R&D and Innovation Strategies were also developed and approved for Energy, Water and Food by the BTYK in December 2010. This indicates a clear shift in R&D and innovation policy-making from horizontal to sectoral focus. The rising number of mission-oriented project calls is also an important indicator of this policy shift. These efforts further contributed to the effectiveness of national research system. Apart from direct R&D supports, the supports towards the commercialization of R&D output are on the agenda. The innovation supports, in this context, that ranges from IPR supports to application supports are used as policy tools. The legislative framework of this changing environment was also provided by the policy-makers. Such as the law concerning the Support of R&D Activities, amendments in Technology Development Zones law, the recent amendment in TUBITAK legislation. In addition to TUBITAK's various supports toward private sector, other public supports from various agencies have added further on the effectiveness of national research system. The tools created by MoSIT and KOSGEB, MoD, MoE, Ministry of Energy and Natural Resources, Ministry of Transport, maritime Affairs and Communications, Ministry of Defence, Ministry of Food, Agriculture and Livestock, Ministry of Health, etc. can be noticed in this context. One can also observe new and, sometimes, innovative instruments for the public sector and academic

R&D activities. Contribution of the public sector to R&D activities as a performer is another topic that has been debated for more than a decade.¹¹²

According to the recent BTYK decisions, in the next period, three important concerns to increase the effectiveness of national research system through public support system will be commercialization of R&D outputs by innovation supports; impact assessment of public support system; and support for innovative activities in public services. Turkey is especially suffering from the non-existence of an effective impact assessment system. The establishment of such a system and regular assessment and evaluation activities of policies and programmes at the support-providing institution level, at the sector level and at the national level will enhance the effectiveness of national research system.

The attempts to enhance human resources for research are in the agenda in the last years. A specific strategy and action plan called 'National Science and Technology Human Resources Strategy and Action Plan (2011-2016)' were approved by BTYK in December 2010.¹¹³ ST-HR Strategy has five main targets:

- Increasing the number of ST-HR and improvement of its sectoral distribution,
- Improving research culture, researchers' talents and experiences,
- Improving the work environment of ST-HR personnel,
- Increasing the mobility of researchers,
- Enhancing the employment opportunities of R&D personnel.

As compared to these attempts especially directed towards supply side of ST-HR, the attempts in the demand side is rather weak. The ST-HR needs of industry, public sector and universities are almost unknown. This lack of knowledge is an important barrier for an effective long-term planning in ST-HR. Although MoD planned to carry out such a study for higher education, the public procurement for this project postponed twice and the future of the study is still unclear.

In sum, despite all the attempts to improve ST-HR, there is a long way to take in this issue in terms of the effectiveness of national research system.

5.2 Optimal transnational co-operation and competition

In Turkey, one of the main channels of transnational co-operation and competition is the 7th Framework Programme of EU. A mid-term evaluation report of FP7 participation is published as an annex to the decisions of 24th BTYK meeting in August 2012.¹¹⁴ The report is also expected to produce output pertaining to the participation decision of Turkey to Horizon 2020. In addition to this report, TÜBİTAK has launched a study involving a general impact assessment report of FP7.

The mid-term evaluation report has documented the stylized facts and figures on FP7 participation for the period between January 2007 and June 2012. It also outlines problems and mitigation measures as groundwork for Horizon 2020. By the end of June 2012, Turkish partners obtained 0.52% of total available budget. The highest success rates belong to Capacities (1.79%) and Marie Curie (0.99%) programmes. On average a Turkish partner, either as an individual or organisation depending on the nature of call, obtained 165,076 Euro. There are 879 Turkish

¹¹² Ergun Türkcan, Dünya'da ve Türkiye'de Bilim, Teknoloji ve Politika, 2009, İstanbul Bilgi Üniversitesi Yayımları.

¹¹³http://www.tubitak.gov.tr/tubitak_content_files//BTYPD/strateji_belgeleri/BT_IK_STRATEJI_BELGESI_2011_2016.pdf

¹¹⁴http://www.tubitak.gov.tr/tubitak_content_files//BTYPD/BTYK/btyk24/EK1_7CP_Raporu.pdf

partners in all of these projects. The highest number of partners is observed in Cooperation programme whereas there is only one partner in Ideas programme.

Turkish organizations are especially successful in Marie Curie actions; Turkey is ranked as 15th in terms of the number of host organizations locations. Furthermore she is ranked as 12th in terms of the nationalities of researchers funded under FP7 Marie Curie Actions.¹¹⁵ According to 5th FP7 Monitoring Report of EC, Turkish success rates of applicants have increased from 12.7% to 18.4% in the period between 2007 and 2011.¹¹⁶ On the other hand, success rates in terms of EC contribution has climbed to 14% in 2011 from 8.9% in 2007. The increasing trend can be explained by the learning process of Turkish participants. Another reason is the efficient functioning and organization of the FP7 office in TÜBİTAK. Turkish National Coordination Office is exemplified as an example model for new participants to FPs. Unfortunately, despite all these efforts, these success rates are below the average success rates of 21.6% and 20.4% respectively for the same period.

Turkey has also participated to other transnational programmes and activities such as COST (European Cooperation in Science and Technology), ESA (European Space Agency), EMBC (European Molecular Biology Conference), KEİ (Black Sea Economic Cooperation), EIT (Economic Cooperation Organization), NATO, OECD and UNESCO. The participation of Turkish scientists to these activities are supported and monitored by TÜBİTAK. Among those programmes, the most active one is COST.

Concerning policy objectives and strategies in accessing intergovernmental European infrastructures, a new law is being prepared by the Ministry of Development and is about to be presented to the Parliament for approval in 2014. Commitment or membership to EU and International RI's will be solved through the new law. Moreover, the national roadmap for Research Infrastructures is in the process of preparation by the Ministry of Development.

National Financial Commitment for funding Research Infrastructures is declared by 7 year development plan. At the moment e-Infrastructures, Life Sciences and Environment are the top ranking specialisation areas. The EPOS project will specifically benefit from Earthquakes RIs located in İstanbul. A new study is on-going where mapping of nationally funded Research Infrastructures are linked by ESFRI Roadmap projects by the experts of Ministry of Development. Further actions after the completion of the study will be drawn up in order to strengthen the linkages. There is also an on-going preparation for ERIC regulation in Turkey (for which recently Associate Countries have been included). Additionally Structural Funds (preaccession for the time being) will be studied for possible RI usage locally such as RPFs (Regional Partner Facilities) and as well as in conjunction with South East European Research Area RIs.

In sum, the attempts towards transnational co-operation and competition have been successful to some extent and Turkey takes a way forward as compared to the levels at the beginning of the millennium. However, there are still structural problems to be solved and a long way to reach optimal levels of transnational co-operation and competition.

¹¹⁵http://ec.europa.eu/research/evaluations/pdf/archive/fp7_monitoring_reports/fifth_fp7_monitoring_report.pdf

¹¹⁶http://ec.europa.eu/research/evaluations/pdf/archive/fp7_monitoring_reports/fifth_fp7_monitoring_report.pdf

5.3 An open labour market for researchers

TUBITAK initiated programmes for foreign researchers/ scientists to come work and do research in Turkey for both short and long periods in order to increase researchers' mobility. In Turkey, 1,703 foreign teaching staff¹¹⁷ was working in the universities during the 2012-2013 academic year. Moreover, graduate scholarships for international students are also available. Besides these, with EUREKA and FP7 programmes multinational cooperation is encouraged.

TUBITAK utilizes two support programmes for foreign researchers and academicians to facilitate working in Turkey. The first programme, "Fellowship for Visiting Scientists and Scientists on Sabbatical Leave"¹¹⁸, is for especially senior researchers who are on sabbatical leave. The second programme, "Co-Funded Brain Circulation Scheme"¹¹⁹, is especially for researchers in their early career. For non-citizen graduate students, two programmes are available. Talented and successful non-citizen graduate students are supported with "Graduate Scholarship Programme for International Students"¹²⁰ programme. The non-citizen PhD students or post-doctoral researchers can utilize a fellowship programme called "Research Fellowship Programme for Foreign Citizens"¹²¹. Universal Researcher Programme (EVRENA)¹²² which was initiated in 2007 for five years encourages the collaboration between Turkish researchers and their foreign colleagues for joint research.

The two main international cooperation platforms are EUREKA¹²³ and 7th Framework Programme (FP7)¹²⁴. EUREKA is an international cooperation platform to support firms for R&D projects. The main aim of EUREKA is to increase competitiveness in EU by raising cooperation between the member countries. Big Firms, SMEs, universities and research institutions can utilize research grants. EUREKA provides non-refundable funds for the projects of big firms and SMEs. FP7 are the main program of the EU to support multinational R&D development projects. FP7 is started in 2007 for 7 years. Legal or natural entities can apply for the grant. The main aim of FP7 is to increase cooperation between the member and the associate states for raising industrial competitiveness.

5.4 Gender equality and gender mainstreaming in research

In Turkey, there is no direct measure or support of any public institution to encourage women in research activity. Actually, 30% of the FTEs are female in 2012¹²⁵. The number of female FTEs is 31,626 out of 105,122. The situation of Turkey in 2010 is better than that in Malta, France, Denmark and Czech Republic¹²⁶. 85.4% of female FTEs are working as researchers. Besides that,

¹¹⁷ <http://osym.gov.tr/dosya/1-69428/h/35yabanciogretimeleman.pdf>

¹¹⁸ <http://www.tubitak.gov.tr/en/funds/academy/international-researchers-fellowship-programmes/content-2221-fellowships-for-visiting-scientists-and-scientists-on-sabbatical-leave>

¹¹⁹ <http://www.tubitak.gov.tr/en/funds/academy/international-researchers-fellowship-programmes/content-2236-co-funded-brain-circulation-scheme-co-circulation-scheme>

¹²⁰ <http://tubitak.gov.tr/en/scholarship/undergraduatesgraduates/international-programmes/content-2215-graduate-scholarship-programme-for-international-students>

¹²¹ <http://tubitak.gov.tr/en/scholarship/undergraduatesgraduates/international-programmes/content-2216-research-fellowship-programme-for-foreign-citizens>

¹²² <http://www.tubitak.gov.tr/tr/destekler/akademik/ulusal-destek-programlari/icerik-1010-evrensel-arastirmaci-evrena-programi>

¹²³ www.eureka.org.tr

¹²⁴ www.fp7.org.tr

¹²⁵ www.turkstat.gov.tr/HbGetir.do?id=13630&tb_id=3

¹²⁶ <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=0&language=en&pcode=tsc00006>

28% of the female FTEs are Ph.D. holders while only 22% of males are in the same condition. For 2009¹²⁷, in Turkey the share of female researchers was 33.4% while in Germany this ratio was only 20.6%. In academic life, Turkey is close to achieve an equal gender split¹²⁸ in research. 47.5% of staff at the top five universities is female. This ratio is 36.7% for Sweden, 31.7% for Norway and 31% for Denmark. In Turkey, 42%¹²⁹ of the instructors (including Prof., Assoc. Prof and Asst. Prof) in universities are women¹³⁰.

Although there is no policy applied for gender discrimination in research by TUBITAK, positive discrimination for women and disabled entrepreneurs is implemented by KOSGEB's¹³¹ (Small and Medium Enterprises Development Organization) entrepreneurship support programme¹³². According to this support programme, women and disabled entrepreneurs use 70% and 80% support ratio of non-refunded grants instead of 60% and 70%.

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

In the last (25th) BTYK meeting, six main decisions are taken and four of these decisions are related to the digital era. Till now, no support programmes or direct measure are yet settled. In line with access to and transfer of scientific knowledge, one center (Turkish Academic Network and Information Center (ULAKBIM)) in 1996 and one system (Researcher Information System (ARBIS)) in 2004 were established. Moreover, Turkey has been a member of the Education Roaming (EDUROAM) since 2007.

Turkish Academic Network and Information Center (ULAKBIM)¹³³'s main objectives have been set as operating a high speed computer network enabling interaction within the institutional elements of the national innovation system, and providing information technology support and information services to help scientific production. Four out of ten objectives of the ULAKBIM is to support open access to research publications.

TUBITAK constituted the "Researcher Information System (ARBIS)"¹³⁴ in 2004. In this system, information on the Turkish researchers from Turkey and other countries exists. The total number of researchers in the system is 93,342¹³⁵ in December 2013. The national or foreign researchers working in the universities, public research institutions, public or non-public organizations which perform R&D can become a member of ARBIS.

Turkey is a member of Education Roaming (EDUROAM) since 2007. The users of the member EDUROAM institutions are able to use their username and password to connect to the network of the other national or foreign EDUROAM institutions. National institutions which are using the National Academic Network (ULAKNET) can be a member when they apply for it. In 2013, 69 institutions are registered to the system. EDUROAM Turkey covers 5711 access point at 611 different locations.

¹²⁷ <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=0&language=en&pcode=tsc00000>

¹²⁸ <http://www.timeshighereducation.co.uk/features/the-global-gender-index/2003517.article>

¹²⁹ www.osym.gov.tr/dosya/1-60442/h/e2ogratiemelemanrisayozettablos.xls

¹³⁰ For the reasons of higher female academics in Turkey, check <http://www.newappsblog.com/2013/05/why-are-there-so-many-female-academics-in-turkey.html>

¹³¹ <http://www.kosgeb.gov.tr/Pages/UI/Default.aspx>

¹³² <http://www.kosgeb.gov.tr/Pages/UI/Destekler.aspx?ref=15>

¹³³ <http://www.ulakbim.gov.tr/eng/>

¹³⁴ <https://arbis.tubitak.gov.tr/pages/bilgipinari/index.htm>

¹³⁵ <https://arbis.tubitak.gov.tr/pages/bilgipinari/index.htm>

In the last decade in Turkey, serious attempts (CABIM, ARBIS and EDUROAM) are made to abolish the problems in access to and transfer of knowledge. To fulfil the decisions which are taken in the last BTYK, TUBITAK is supposed to initiate related programs or schemes.

ANNEX 1. PERFORMANCE THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM

| Feature | Assessment | Latest developments |
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| 1. Importance of the research and innovation policy | <p>(+) There is an increased commitment among the policy-makers to develop and implement strategic, coherent and integrated policy framework. It is an important challenge to achieve and sustain such a policy framework.</p> <p>(+) Energy, water and food are identified as societal challenges and separate national R&D and innovation strategy documents were developed for them</p> <p>(-) There is a need to develop innovative financing solutions (e.g. public-private partnerships, equity finance, etc.) and to stimulate private finance (such as angel investments and venture capital) for R&D and innovation is a challenge</p> <p>(-) There is also a need to focus on climate change mitigation as additional challenge to be addressed.</p> | <p>(+) The National Science, Technology and Innovation Strategy (2011-2016) approved by BTYK in December 2010. The strategies aim at disseminating culture of multilateral and multidisciplinary R&D and innovation cooperation, stimulating sectoral and regional R&D and innovations dynamics, encouraging SMEs to become stronger actors within the national innovation system, and enhancing the contribution of research infrastructures to knowledge creation capacity of the Turkish Research Area.</p> <p>mission oriented approaches in areas with strong RDI capacity, need-oriented approaches in areas with a demand for gaining acceleration, and bottom-up approaches including basic, applied and frontier research are identified under the new strategy, and the strategic framework has been set.</p> <p>(-) The decision-making and funding bodies are lacking proactive attitude towards grand societal challenges.</p> |
| 2. Design and implementation of research and innovation policies | <p>(+) There exists a multi-annual strategy defining national priorities (National Science, Technology and Innovation Strategy, 2011-2016)</p> <p>(+) There exist national targets for monitoring policy implementation.</p> <p>(-) There is a need to adopt a broad concept of innovation in policies and policy measures (including innovation in services, improvements of processes and organisational change, business models etc.)</p> | <p>(+) The Ministry of Science, Industry and Technology (MoSIT) replaced the former Ministry of Industry and Trade in June 2011. The science, technology and innovation-related duties of the MoSIT are defined as the development, implementation and coordination of the S&T</p> |

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| | <p>(-) There is an urgent need to develop an evaluation culture and establish an effective mechanism for systematic evaluation of the policies and policy measures on the basis of internationally recognised criteria.</p> <p>(-) There are problems regarding predictable budgetary framework. Sometimes the pressures of interest groups are heavily represented in decision-making process rather than social needs.</p> | <p>and innovation policies, and the promotion of the R&D and innovation projects, activities and investments.</p> <p>The National Science, Technology and Innovation Strategy (2011-2016) started to discuss aims to transform research outputs into products and services.</p> <p>(-) There are coordination problems among different ministries in terms of the implementation of research and innovation policies.</p> |
| 3. Innovation policy | <p>(+) While the scope of current National Science, Technology and Innovation Strategy (2011-2016) does not provide a broad concept beyond RTD the new BTYK decisions imply a broader concept of innovation.</p> <p>(+) The BTYK decision aiming to promote public procurement for innovation is an opportunity to increase the demand for innovations and the diffusion of innovations.</p> <p>(-) There is a need to develop and implement demand-side innovation policies and policy measures in a more systematic manner.</p> | <p>(+) Clear commitment towards support of prioritized sectors, the final BTYK in June 2013 outlines decisions on the energy sector.</p> <p>Health is also determined as a prioritized sector in January 2013 BTYK meeting.</p> |
| 4. Intensity and predictability of the public investment in research and innovation | <p>(+) There exists high-level commitment for allocating higher budget for R&D and innovation funding.</p> <p>(+) There exist tax incentives for stimulating R&D and innovation.</p> <p>(-) There is a need to ensure sustainability of funding in the prioritized areas.</p> <p>(-) There is an urgent need to apply measures for increasing the quality of education especially at primary and high schools.</p> <p>(-) The vocational training system calls for restructuring towards the needs of the market.</p> | <p>(+) Sustained R&D and innovation financing budgets.</p> |
| 5. Excellence as a key criterion for research and education policy | <p>(+) There exist procedures for the selection of projects on the basis of quality and expected results and subject to external peer review.</p> <p>Allocation of high share of research funding on a competitive basis is strength and it is important to continue to pursue this strategy.</p> <p>Higher importance is attached to researchers' mobility at national, sectoral and international levels is an opportunity</p> <p>(+) The legal and financial frameworks for research careers, including doctoral studies, offer sufficiently attractive conditions to both men and women in comparison to international standards</p> <p>(-) The social framework for research careers in terms of equal opportunity on gender basis needs improvement.</p> <p>(-) There is a need to evaluate research institutions on the basis of internationally recognised criteria</p> | <p>(+) Schemes on researcher's mobility on returning researchers seemed to be sustainable.</p> |

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| | (-)There is a need to ensure portability of researchers funding. | |
| 6. Education and training systems | <p>(+)There exists the HRST strategy to ensure a sufficient supply of (post)graduates in science, technology, engineering and mathematics and an appropriate mix of skills.</p> <p>(+)The BYK decisions aiming at stimulating innovation and entrepreneurship in universities and promoting entrepreneurship culture in general is an opportunity.</p> <p>(+)There exists the 'Technology and Design Programme' at primary schools with a strong focus on innovation as a three-year compulsory course in the national education curricula.</p> <p>(+)Entrepreneurship education and training is included in university curriculum. Partnerships between formal education and other sectors are actively promoted to that end. Special training programmes for Entrepreneurship education and training are designed.</p> <p>(-) However, entrepreneurship education and training activities is still immature and lately implemented. (-) There is a need for awareness-raising activities for entrepreneurship education and training among educators and academia.</p> <p>(-)There is a need to balance supply and demand in HRST, and to increase the number of S&T graduates.</p> <p>(-)The collaboration with industry for the design of new curriculum should be improved.</p> <p>(-)There is urgent need for the revision vocational training system in line with the needs of industry.</p> | <p>(+)In the 24th meeting of BYK in August 2012, the following new decisions mainly directed towards increasing the quality of educational infrastructure have been taken:</p> <p>Carrying out studies directed to the evaluation of the situation for increasing the quality of education;</p> <p>Developing and accessing of the digital content for the primary and secondary education;</p> <p>Encouraging and accessing of the development of digital lecture content for the undergraduate level;</p> <p>Carrying out studies on the revision of the education programs and design of education contents directed to the aim for the students to gain essential competences;</p> <p>Carrying out studies on the foreign language education system of the primary and secondary education and developing alternative education methods;</p> <p>Restructuring the scholarship programs for graduate study abroad;</p> <p>Organizing science fairs for students of the primary and secondary education;</p> <p>Restructuring the university entrance system.</p> |
| 7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level | <p>(+)There exists the HRST strategy aiming to promote partnerships between formal education and other sectors. There exist policy measures aiming to encourage partnership and collaboration between research and innovation stakeholders.</p> <p>(+)There are schemes to stimulate mobility between universities and the private sector.</p> <p>(+)There exist strategies and BYK decisions aiming to establish clear rules on the ownership of IPR & sharing and support systems to facilitate knowledge transfer and the creation of university spin-offs and to attract (venture) capital and business angels .</p> <p>(+)There exist strategies to facilitate setting up/operating transnational partnerships and collaborations for research.</p> | <p>(+)“Support Programme for Technology Transfer Offices” aims to commercialize knowledge and technology in universities, to establish collaboration between universities and the private sector and to produce knowledge and technology demanded by the industry. This new programme is announced in November 2012 and 10 TTOs are supported in the first call. The second call is opened for further 10 TTOs in 2013.</p> |

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| | <p>(+)There are no obstacles to setting up and operating transnational partnerships and collaborations.</p> <p>(-)There is a need to increase and sustain partnerships between formal education and other sectors.</p> <p>(-)There is a need to enrich the policy mix with instruments to support the commercialisation of innovative ideas such as innovation/knowledge clusters, creative clusters, knowledge transfer platforms, and voucher systems, notably for SMEs.</p> <p>(-)There is a need to create the legal basis, and design and implement policy measures specifically targeting the stimulation of mobility of researchers and innovators between public and private institutions.</p> <p>(-) The researcher mobility between public and private institutes is very limited especially because of cultural reasons.</p> <p>(-)The new IPR legislation at parliament should be promulgated.</p> | |
| 8. Framework conditions promote business investment in R&D, entrepreneurship and innovation | <p>(+)There exist strategies for promoting private investment in research and innovation.</p> <p>(+)There exist strategies for developing venture capital industry and encouraging early stage investments.</p> <p>(+)Ongoing commitment to improve the business environment through the Coordination Council for the Improvement of Investment Environment' (YOIKK) is an opportunity.</p> <p>(+)There exist policies and policy actions to improve the system for the protection of IPR.</p> <p>(-)There is an urgent need to create favourable conditions to foster a growing and robust venture capital market, especially for early stage investments.</p> <p>(-)There is a need to improve the rules and procedures and streamline processes for starting up, running and terminating a business.</p> <p>(-)There is a need to develop efficient standard-setting system supporting innovative products and services.</p> <p>(-)The rules for starting up and running a business are not simple and designed from an SME perspective. Still heavy bureaucratic applications and red tape are observed.</p> <p>(-)Although the legal framework seems to be transparent and up-to-date. Clientelism is a fact.</p> <p>(-) Willingness to take risks is not promoted. Insolvency regulations do not support the financial re-organisation of enterprises.</p> <p>(-)There is discrimination against entrepreneurs who may have failed the first time around at some extent because of cultural factors.</p> | <p>(+)“Support Programme for Individual Entrepreneurs” started in 2012 which is a multistage programme aiming to support individual entrepreneurs to transform their technology and innovation focused business ideas into enterprises.</p> <p>“Venture Capital Support Programme” is also commenced in August 2013.</p> |
| 9. Public support | (+)There are attempts to develop well targeted, clearly | (+) Sustained commitment |

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| <p>to research and innovation in businesses is simple, easy to access, and high quality</p> | <p>differentiated, and easy to access support schemes in support of business research and innovation. There should be increased in mission-oriented calls for support in priority areas.</p> <p>(+)The BTYK decisions aiming to secure integrity, coherence and target-oriented approach in R&D, innovation and entrepreneurship support mechanisms is an opportunity.</p> <p>(+)There exist support measures specific to SMEs.</p> <p>(+)There exist support measures and increasing awareness on the need for specific support to young innovative companies.</p> <p>(-)Funding schemes are not regularly evaluated and benchmarked against comparable schemes in other countries.</p> <p>(-) Transparency in funding should be enhanced.</p> <p>(-)There is a need to enrich the policy mix with support schemes tailored to the needs of companies, particularly SMEs.</p> <p>(-)In addition to financial supports, there should be supports directed towards knowledge-intensive business services.</p> | <p>to support innovation and entrepreneurship.</p> <p>(+)Funding for entrepreneurship is highly significant in the agenda of the government with various mechanisms.</p> |
| <p>10. The public sector itself is a driver of innovation</p> | <p>(+)There exist pilot projects and activities to raise awareness on public sector innovation.</p> <p>(+)There exists the 'Support Programme for Research Projects of Public Institutions' of TUBITAK for supporting R&D projects of public bodies. The programme is recently revised to prioritize the need of public institutions and to enhance public-private partnership.</p> <p>(+)There exist some measures to stimulate public procurement of innovative solutions to improve public services, including through dedicated budgets and joint procurement. The recent BTYK decisions especially support public procurement in ICT area.</p> <p>(+)The BTYK decision aiming at improving public procurement and public right of use in such a way to foster innovation, localisation and technology transfer is an opportunity.</p> <p>(-)There is a need to develop policies and incentives to stimulate innovation in the public sector and in the delivery of public services.</p> <p>(-)There is a need to have policies, a legal framework and procedures for making government-owned data freely available as a resource for innovation, where possible.</p> | <p>(+) In the 25th meeting of BTYK in January 2013, the following new decisions mainly on the e-government infrastructure and public procurement have been taken:</p> <p>Carrying out studies on e-government management model;</p> <p>Completing the firm accreditation system for public procurement of e-government applications;</p> <p>Carrying out studies on the establishment of National Database Centre;</p> <p>Public procurement of software needs of public institutions.</p> |

ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

| | | Main changes | Brief assessment of progress / achievements |
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| 1 | Member State Strategies for Researchers' Training and Employment Conditions | <p>Continuation of existing programmes for Researchers' Training.</p> <p>Decision taken to monitor the highly-gifted individuals' strategy of 2013-2017.</p> | <p>(+) Considerable amount of funds are available for researchers' training, the programs are in wide variety</p> <p>(-) No evaluation of the policy Coordination problems</p> |
| 4 | ERA Framework | | |
| 5 | Priority European Research Infrastructures | <p>National Financial Commitment for funding Research Infrastructures is declared by 7 year development plan.</p> <p>E-Infrastructures, Life Sciences and Environment are the top ranking specialisation areas. A new study is commenced where mapping of nationally funded Research Infrastructures are linked by ESFRI Roadmap projects by Ministry of Development.</p> <p>Further actions can be taken in order to strengthen the linkages. There is also an on-going preparation for ERIC regulation in Turkey (Structural Funds-IPA (preaccession for the time being) will be studied for possible RI usage locally such as RPFs (Regional Partner Facilities) and as well as in conjunction with South East European Research Area RIs.</p> | <p>(+) Strong commitment from the government side</p> <p>(-) To establish research infrastructures country wide takes time.</p> |
| 7 | SME Involvement | <p>Turkish EUREKA Chairmanship in 2012-2013 period.</p> <p>Participation to EUREKA and EUROSTARS has a potential to enhance SME involvement.</p> | <p>(+) Huge effort for SME involvement on the government side</p> <p>(-) Participation of SMEs is not at sufficient levels mainly because of infrastructural problems.</p> |
| 11 | Venture Capital Funds | <p>Still the underdeveloped venture capital and business angels market in Turkey. Insufficient early stage funding is an obstacle. The BTYK decisions of December 2011 recognise this challenge and aim to address through new policy measures.</p> <p>Furthermore, the Undersecretariat of Treasury carries out studies for improving</p> | <p>(-) Public efforts to enhance venture capital funds are ineffective. Coordination problems. Low interest of private sector funds because of insufficient incentives</p> |

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| | | the framework conditions for angel investments, and the 'Entrepreneurship Council' established in January 2012 aims to increase number of innovative and technology-based start-ups | |
| 13 | Review of the State Aid Framework | More mission-oriented state aid in prioritized sectors and critical technologies. Public procurement. | (+) The public support for critical technologies and prioritized sectors rather than general aids is a step forward. (-) No planned programme evaluation. Terms of public procurement for the output of the programmes are obscure. Weak measures for innovative clusters in these sectors and technologies. |
| 14 | EU Patent | The BTYK decision aiming at stimulating domestic patent licensing and call for technology transfer offices are opportunities to increase exploitation and commercialization of research results. New planned amendments in IPR legislation. | (+) Increasing awareness on EU patents (-) There is still long way to take for the integration of EU patent approaches. |
| 15 | Screening of Regulatory Framework | No major change | (+) For most of the programmes and policy initiatives screening is must. (-) Screening is rarely implemented and lacks innovation content. |
| 17 | Public Procurement | At the BTYK meeting in December 2011, it was decided to improve public procurement and public right of use in such a way to foster innovation, localisation and technology transfer. At the 24 th BTYK of August 2012, it was noted again to improve public procurements to support innovativeness. At the 25 th meeting of BTYK in January 2013, it was concluded to complete the firm accreditation system for public procurement of e-government applications and public procurement of software needs of public institutions. | (+) Decisive approach for innovative public procurement. There exist some measures to stimulate public procurement of innovative solutions to improve public services, including through dedicated budgets and joint procurement. The recent BTYK decisions especially to support public procurement in ICT area. The BTYK decision aiming at improving public procurement and public right of use in such a way to foster innovation, localisation and technology transfer is an opportunity. (-) Terms of public procurement for the output of the programmes are obscure. |
| 20 | Open Access | No major change | No basis for assessment |
| 21 | Knowledge Transfer | Support programmes for technology transfer offices Development of National Design and Manufacturing Capability for Thermal Power Plants (MİLTES) Development of Hydroelectric Energy Technologies (MİLHES) | (+) Significant step forward towards transfer of knowledge and commercialization from universities to private sector. (-) No planned evaluation of the policy initiative on a national basis. Lack of smart specialization content. |

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| | | Development of Wind Energy Power Plant Technologies (MİLRES) Adaptation of Solar Energy Technologies (MİLGES) Development of National Design and Manufacturing Capability for Thermal Power Plant Flue Gas Treatment Technologies (MİLKAS) Development of Coal Gasification and Liquid Fuel Production Technologies Increasing Energy Efficiency Strategy | |
| 22 | European Knowledge Market for Patents and Licensing | No major change | (-)The revised IPR law still in the commission of the parliament. (-) The patens received are owned by the researchers and generally researchers prefer not to patenting but publication because of the pressures of academic promotion. |
| 23 | Safeguarding Intellectual Property Rights | Planned amendments in IPR legislation. | (-) It is on the agenda for a very long time but not promulgated yet. |
| 24 | Structural Funds and Smart Specialisation | Incomplete smart specialization strategy concerning IPA | (-)Besides the Regional Development Agencies policy, no smart specialization strategy for research and innovation is specified for regional or national level in Turkey yet. Nor she is not a member of S3 platform |
| 25 | Post 2013 Structural Fund Programmes | Preparation of 2014-2020 IPA Cross-border Collaboration Programme (Bulgaria, Serbia, Macedonia) Some weak attempts for prioritization in IPA programmes | No basis for assessment |
| 26 | European Social Innovation pilot | No major change | (-)There is no specific support for social innovation. |
| 27 | Public Sector Innovation | No major change | (-)There is no specific support for public innovation. |
| 29 | European Innovation Partnerships | No direct programme to encourage European Innovation Partnerships (EIPs). Still one project on chronic respiratory diseases has been accepted for EIPs on Active and Healthy Ageing at European Meeting in Brussels on 7 th June 2013 | (-)Very limited participation |
| 30 | Integrated Policies to Attract the Best Researchers | Continuation of programmes to attract leading researchers (visiting scientists and experienced researchers mobility programmes). | (+) High commitment for attracting leading researchers. (-) Success is limited. No publicly available programme evaluation. |
| 31 | Scientific Cooperation with Third Countries | Various bilateral and multilateral agreements for scientific cooperation. 24 bilateral | (+) Wide geographical coverage. High success. (-) Only limited with national priorities not with |

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| | | cooperation agreements and multilateral agreements such as COST, EMBO, ICGEB, NAM S&T, NATO SPS, KEI, ESA, EURISY, etc. | grand challenges. |
| 32 | Global Research Infrastructures | No major change | (-) Very limited global RI investments in technology development zones (-) Some collaborations seem to be exist in the defence industry but no detailed information because of confidentiality. |
| 33 | National Reform Programmes | Some reform programmes in R&I relevant aspects by public agencies such as Ministry of Science, Industry and Technology, Ministry of Development, Ministry of Economics, Ministry of Energy, Ministry of Transport, Maritime Affairs and Communication, Ministry of Defence | (+) High commitment for R&I relevant aspects (-) Coordination problems. Funding for similar projects at some cases. Inefficient uses of funds. |

ANNEX 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

| ERA Priority | ERA Action code | ERA Action | Recent changes | Assessment of progress in delivering ERA |
|---|-----------------|---|--|--|
| 1. More effective national research systems | MS01 | Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments | <ul style="list-style-type: none"> -Individual Entrepreneurship Support Programme -Support Programme for Technology Transfer Offices -Support Programme for Competition in Entrepreneurship and Innovativeness -Support Programme for Training and Research Activities in Entrepreneurship and Innovativeness -Support Programme for Activities in Entrepreneurship and Innovativeness -Support Programme for Activities on Project Training | <p>(+) Competitive funding is the main funding channel of TUBITAK.</p> <p>(+) Turkey achieves the proposals but not the assessment in this action</p> <p>(-) Institutional assessment which is not done by any government or non-government organizations is the drawback of TUBITAK policies.</p> |
| | MS02 | Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review | No action at all | <ul style="list-style-type: none"> - The R&D and innovation polices are decided in BTYK meetings. TUBITAK is the main implementer of these decisions. There is no evaluation process of efficiency and effectiveness the actions of TUBITAK. |
| 2. Optimal transnational co-operation and competition | MS06 | Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas | <ul style="list-style-type: none"> - Energy, water, food and health are identified as the priority areas. - Health added to the list in 2013. - Research Technology Development and Innovation Projects in Priority Areas Grant Programme - Programme for Supporting R&D Projects in Priority Areas | <ul style="list-style-type: none"> -177 R&D projects are supported in 2012. |

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| | MS07 | Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions | -One of the problems of R&D and innovation system in Turkey is the lack of evaluation especially funding programmes. | No basis for assessment |
| | MS08 | Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant | -13 bilateral agreements on research are signed with non-EU countries. | No basis for assessment |
| | MS15 | Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes | No action at all | No basis for assessment |
| | MS16 | Action 5: Remove legal and other barriers to cross-border access to RIs | No action at all | No basis for assessment |
| ERA priority 3: An open labour market for researchers | MS24 | Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers | - Fellowship for Visiting Scientists and Scientists on Sabbatical Leave - Co-Funded Brain Circulation Scheme | No basis for assessment |
| | MS25 | Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants | -Co-Funded Brain Circulation Scheme | (-) The maximum number of grants is for 100 Turkish or foreign researchers (-) 6 out of 26 is originally foreign researchers in 2013 |
| | MS26 | Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network | -EURAXESS Turkey | No basis for assessment |
| | MS27 | Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training. | No action at all | No basis for assessment |
| | MS28 | Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code | No action at all | No basis for assessment |
| ERA priority 4: Gender equality and gender | MS39 | Action 1: Create a legal and policy environment and provide incentives | No action at all | No basis for assessment |

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| mainstreaming in research | MS40 | Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender | No action at all | No basis for assessment |
| | MS41 | Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating | No action at all | No basis for assessment |
| ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA | MS45 | Action 1: Define and coordinate their policies on access to and preservation of scientific information | Turkish Academic Network and Information Center (ULAKBIM) | (+)More than 3 million users in 2012 (+)11,503 articles and 12,007 researchers are supported to encourage scientific publications |
| | MS46 | Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies | - University-Industry Support Programme - Industrial Thesis Projects Support Programme - Support Programme on Technology Transfer Offices | No basis for assessment |
| | MS47 | Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners | Researcher Information System (ARBIS) is used for Turkish researchers. | (+)93,342 researcher and 1,169 R&D Institution is registered to the system |
| | MS48 | Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services | Education Roaming (EDUROAM) Turkey | (+)In December 2013, 77 institutions are registered to the system. EDUROAM Turkey covers 5980 access point at 643 different locations. |

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LIST OF ABBREVIATIONS

| | |
|----------|--|
| BERD | Business Expenditures for Research and Development |
| BTYK | Supreme Council of Science and Technology |
| EPO | European Patent Office |
| ERA | European Research Area |
| ERAC | European Research Area Committee |
| ERA-NET | European Research Area Network |
| EU | European Union |
| EU-27 | European Union including 27 Member States |
| EU-28 | European Union including 28 Member States |
| EUREKA | European Research Coordination Agency |
| EUROSTAT | European Statistical System |
| FDI | Foreign Direct Investments |
| FP | European Framework Programme for Research and Technology Development |
| FP7 | 7th Framework Programme |
| FTE | Full Time Equivalent |
| 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 |
| HEI | Higher education institutions |
| HERD | Higher Education Expenditure on R&D |
| HRST | Human Resources for Science and Technology |
| ICT | Information and Communication Technology |
| IPR | Intellectual Property Rights |
| ITEP | Advanced Technology Projects Support Programme |
| IUS | Innovation Union Scoreboard |
| IUC | The Innovation Union Competitiveness |
| KISTEP | Korean Institute of S&T Evaluation and Planning |
| KOSGEB | Small and Medium Enterprises Development Organisation |
| KT | Knowledge-Translation Platforms |
| MoD | Ministry of Development |
| MoE | Ministry of Economy |
| MoNE | Ministry of National Education |
| MoSIT | Ministry of Science, Industry and Technology |
| MoF | Ministry of Finance |
| MSME | Micro, Small and Medium Enterprises |
| NGO | Non-Governmental Organization |
| NIS | National Innovation System |
| NUTS | Nomenclature of Territorial Units for Statistics |
| OECD | Organisation for Economic Co-operation and Development |
| OSYM | Measurement, Selection and Placement Centre |
| PCT | Patent Cooperation Treaty |

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| PPS | Purchasing Power Standard |
| PRO | Public Research Organisation |
| R&D | Research and development |
| RDA | Regional Development Agency |
| RI | Research Infrastructures |
| RTD | Research and technology Development |
| RIS3 | Regional innovation strategies for smart specialisation |
| S&T | Science and Technology |
| SME | Small and Medium Sized Enterprise |
| TAGEM | The research institutes of the General Directorate for Agricultural Research of the Ministry of Agriculture and Rural Affairs |
| TARAL | Turkish Research Area |
| TOBB | Union of Chambers and Commodity Exchanges of Turkey |
| TPE | Turkish Patent Institute |
| TSE | Turkish Standards Institute |
| TTGV | Technology Development Foundation of Turkey |
| TTO | Technology Transfer Office |
| TUBA | Turkish Academy of Sciences |
| TUBITAK | Scientific and Technological Research Council of Turkey |
| TURKAK | The Turkish Accreditation Agency |
| TURKSTAT | Turkish Statistical Institute |
| UME | <u>The National Metrology Institute</u> |
| UNCTAD | United Nations Conference on Trade and Development |
| VC | Venture Capital |
| YOIKK | Coordination Council for the Improvement of Investment Environment |
| YOK | Higher Education Council |
| YPK | High Planning Council |

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