



ERAWATCH COUNTRY REPORTS 2012: Turkey

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ACKNOWLEDGEMENTS 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 2012 builds on and updates the 2011 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 2012 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 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

Turkish economy ranks 18th in the 2011 list of world economies with \$774,983m (€598,997m¹) of total Gross Domestic Product for current prices (IMF, 2012)². The country has a population of 74.7m³ (TURKSTAT, 2012), would be accounting for 14.87% of the population of the EU-27 (EUROSTAT, 2012)⁴. 67.4% of the population are between 15-64 years of age and half is younger than 29.7. The gross domestic product (GDP) per capita in 2011 was €7,137 (TL17,553).⁵ While the annual average growth rate was 4.2% between 2009 and 2011 in real terms, Turkey achieved a GDP growth of 8.5% in 2011 with constant prices (The GDP realised in the first three quarters of 2012 was €37,732m (TL87,655m) with a growth rate of 2.6% (TURKSTAT, 2012).⁶

The R&D intensity in Turkey was 0.86% in 2011⁷ (TURKSTAT, 2012). While it is below the EU-27 average of 2.03% (EUROSTAT, 2012)⁸, the gross expenditure on R&D increased by 20.4% compared to previous year. According to TURKSTAT, 45.8% of R&D expenditures were financed by business enterprises, 29.2% by government sector, 20.8% by higher education sector, 3.4% by other national sector and 0.7% by foreign funds in 2011.⁹ The Business Expenditure on Research and Development (BERD) undertaken in Turkey in 2011 was €1,958.8m (TL4,817.3m).¹⁰ It was increased by 58%¹¹ in real terms since 2008. In 2011, the Higher Education R&D (HERD) was €2,063m (TL5,073.4m). This represents an increase of €835m (TL2,053m) since 2008 (a 68% increase in real terms). Government Expenditure on R&D (GOVERD) stood at €429m (TL1,263.5m) in 2011 representing an increase of €100m (TL247m) since 2008 (a 30% increase in real terms) (TUBITAK, 2012). The government earmarked an amount of €1.2b¹² (TL2.8b) for funding R&D in 2013¹³. The number of full-time equivalent (FTE) R&D personnel increased to 92,801 in 2011 from 67,244 in 2008, according to TURKSTAT.¹⁴ The private sector employs 45,408 FTE R&D staff and universities employ 35,644 FTE R&D personnel while 11,749 FTE R&D personnel are employed by the public sector.

The main changes in the research and innovation system in 2011 that still have impacts in 2012 were 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

¹ €1=\$1.2938 (Central Bank of Turkey's effective sale rate for 30.11.2011)

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

³ <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=10736>

⁴ http://epp.eurostat.ec.europa.eu/portal/page/portal/population/data/main_tables

⁵ At 1998 prices, €1=TL2.4593 (Central Bank of Turkey's effective sale rate for 30.12.2011) http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1221

⁶ Constant prices, €1=TL2.3231 (Central Bank of Turkey's effective sale rate for 28.09.2012) <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=10955>

⁷ <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=10931>

⁸ http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/main_tables

⁹ http://www.turkstat.gov.tr/HbGetir.do?id=10931&tb_id=2

¹⁰ €1=TL2.4593 (Central Bank of Turkey's effective sale rate for 30.12.2011)

¹¹ www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1

¹² €1=TL2.3363 (Central Bank of Turkey's effective sale rate for 30.10.2012)

¹³ http://www.tbmm.gov.tr/butce/2013/konusma_30_Ekim_2012.pdf

¹⁴ http://www.turkstat.gov.tr/HbGetir.do?id=10931&tb_id=3

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.

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).

In addition to the National Science, Technology and Innovation Strategy 2011-2016, at the BTYK meeting in December 2011, the following new items were identified for the improvement of the research and innovation performance of the country:¹⁵

- Setting up a coordination board to secure integration, 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.

In accordance with The National Science, Technology and Innovation Strategy 2011-2016 and decisions taken in December 2011, in the 24th meeting of BTYK in August 2012, the new decisions mainly directed towards increasing the quality of educational infrastructure. In the 25th meeting of BTYK in January 2013, six new decisions mainly on the e-government infrastructure have been taken. Moreover, in this meeting, it is decided to include health as an S&T priority area

Based on the key indicators and issues, the following challenges are identified for Turkey:

¹⁵<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksekkurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksekkurulu-23toplantisi-27-aralik-2011>

- 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

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.

The process of the harmonisation with the EU *acquis* contributes to above efforts, as it did so far. Although not a Member State yet, Turkey's strategies and efforts in the field S&T and innovation are, to a large extent, in line with the ERA 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 BTK 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 new targets set for 2023 will contribute to the enrichment of the policy mix with the design and implementation of new instruments.

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1 INTRODUCTION

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The number of full-time equivalent (FTE) R&D personnel increased to 92,801 in 2011 from 67,244 in 2008, according to TURKSTAT.²⁹ The private sector employs 45,408 FTE R&D staff and universities employ 35,644FTE R&D personnel while 11,749 FTE R&D personnel is employed by the public sector.

In Turkey, 168³⁰ universities of which 65 is privately owned employ around 118,839³¹ academic staff and the total number of students is around 4.4 million³² (OSYM, 2012). There were 1,978,343 female and 2,375,199 male students attending higher education institutions in the

¹⁶ €1=\$1.2938 (Central Bank of Turkey's effective sale rate for 30.11.2011)

¹⁷ <http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx>

¹⁸ <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=10736>

¹⁹ http://epp.eurostat.ec.europa.eu/portal/page/portal/population/data/main_tables

²⁰ At 1998 prices, €1=TL2.4593 (Central Bank of Turkey's effective sale rate for 30.12.2011) http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1221

²¹ Constant prices, €1=TL2.3231 (Central Bank of Turkey's effective sale rate for 28.09.2012) <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=10955>

²² <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=10931>

²³ http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/main_tables

²⁴ http://www.turkstat.gov.tr/HbGetir.do?id=10931&tb_id=2

²⁵ €1=TL2.4593 (Central Bank of Turkey's effective sale rate for 30.12.2011)

²⁶ www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1

²⁷ €1=TL2.3363 (Central Bank of Turkey's effective sale rate for 30.10.2012)

²⁸ http://www.tbmm.gov.tr/butce/2013/konusma_30_Ekim_2012.pdf

²⁹ http://www.turkstat.gov.tr/HbGetir.do?id=10931&tb_id=3

³⁰ <https://www.yok.gov.tr/content/view/full/527/222/lang.tr/>

³¹ <http://www.osym.gov.tr/dosya/1-60406/h/2ogretimelemanlarisayozettablosu.pdf>

³² <http://www.osym.gov.tr/dosya/1-60395/h/1ogrencisayozettablosu.pdf>

academic year of 2011-2012. The numbers of female and male students attending PhD degree programmes in the same period were 22,083 and 29,385, respectively.³³

The public research institute 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.³⁴ 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 it belong to universities and 39 of it belong to other government institutions³⁵ (BTYK25, 2013).

Turkey ranked 18th³⁶ in 2010 with a 95%³⁷ increase in scientific publications per million populations. In 2011, the total number of publications made from Turkey is 28,989³⁸ and the scientific publications are 23,165³⁹. The national patent applications to the Turkish Patent Institute (TPE) increased remarkably from 454 in 2003 and to 3,962 in 2011⁴⁰. PCT patent applications of the Turkish citizens have also increased in the same period from 35 in 2003 to 43⁴¹ in 2011. In 2010, Turkey ranked in the 15th place in OECD countries with 323 patent applications to EPO⁴².

Micro enterprises dominate the private sector (93.8% of firms in manufacturing industry and 99.1% of those in services sector are enterprises with less than 10 employees) (OECD 2010). The sub-sectors with the highest percentage of BERD are “Computer Programming, Consultancy and Related Activities (€346.4m)”, “Architectural and Engineering Activities, Technical Testing and Analysis, Scientific Research and Development (€287.8m)” and “Manufacture of Motor Vehicles, Trailers and Semi-Trailers (€265.9m)” with around 46% of total expenditures (TURKSTAT, 2012)⁴³.

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 meets 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. In Figure 1, main actors of the national research and innovation system is summarized.

³³ <http://www.osym.gov.tr/dosya/1-60395/h/1ogrencisayozettablosu.pdf>

³⁴ Data provided by the Ministry of Development in January 2012

³⁵ http://www.tubitak.gov.tr/sites/default/files/btyk25_gelismeler.pdf

³⁶ http://www.tubitak.gov.tr/tubitak_content_files/BTYPD/istatistikler/BTY70.pdf

³⁷ http://www.tubitak.gov.tr/tubitak_content_files/BTYPD/istatistikler/BTY65.pdf

³⁸ According to ISI web of sciences,

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

³⁹ According to ISI web of sciences, http://www.ulakbim.gov.tr/cabim/yayin/bilimsel_yayin/makale_sayisi.uhtml

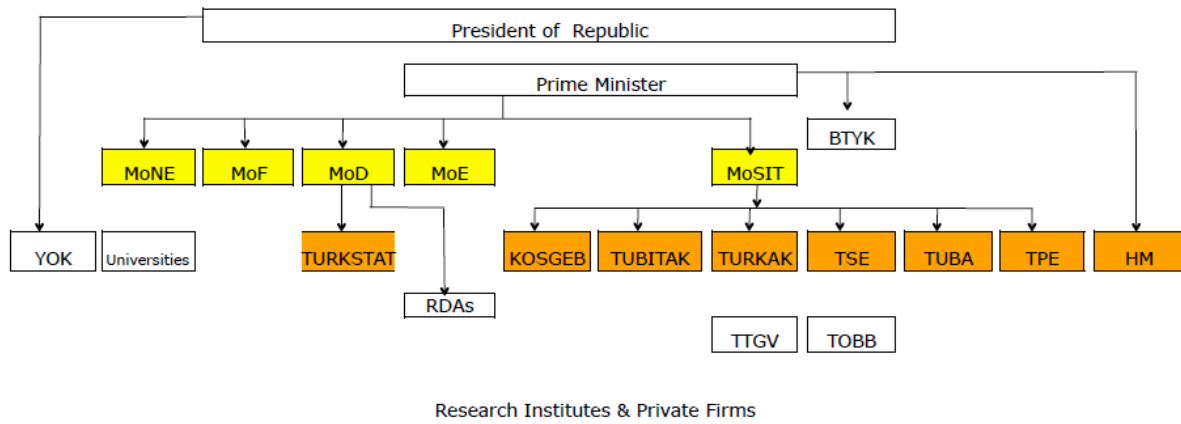
⁴⁰ http://www.turkpatent.gov.tr/dosyalar/istatistik/patent/Patent_basvuru_yillara_gore_dagilim.xls

⁴¹ http://www.tubitak.gov.tr/sites/default/files/btyk25_gelismeler.pdf

⁴² http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Patent_applications_to_the_EPO_and_patents_granted_by_the_USPTO,_2001-2010.png&filetimestamp=20121016060342

⁴³ http://www.turkstat.gov.tr/HbGetir.do?id=10931&tb_id=8

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 |

2 Recent developments of the research and innovation policy and system

2.1 National economic and political context

The most important change 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) with a decree law 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 (TURKAK) 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 amendment promulgated in the legislation of TUBITAK in July 2012. The recent amendment in TUBITAK legislation⁴⁴ aims to increase functionality of TUBITAK in commercialization of R&D output in TUBITAK's research centres. Moreover, the amendments' another purpose is to support venture capital funds. TUBITAK has focus on R&D intensive start-ups and commercialization of potential inventions (TUBITAK Legislation, 2012).

2.2 Funding trends

Total gross expenditure on R&D (GERD) of Turkey has increased more than 10 times from 2000 to 2011 on TL basis reaching €4,535m (TL11,154m) in 2011 according to the Turkish Statistical Institute (TURKSTAT). In 2010, GERD was €4,657.08 (TL9,267m). GERD/GDP ratio which is around 0.85 over the last years is far behind the EU average of 2.03. One explanation of the situation is the higher GDP growth rate of Turkey. The average of last two years GDP growth rate is 8.85% which is six times higher than the EU average. To increase the GERD/GDP, the growth rate of GERD should be higher than the GDP growth rate. Also, another explanation for this situation is that the increase in GDP does not result an increase in GERD. 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. 46% of R&D is done by HEIs in Turkey; this rate is only 24% for EU countries. In EU, 62% of the R&D is achieved by business enterprise sector; this rate is 43% for Turkey.

The government earmarked an amount of €1.2b⁴⁵ (TL2.8b) for funding R&D in 2013⁴⁶. The national R&D targets of Turkey are set for the year 2023, which were agreed by the 23rd meeting of BTK on 27 December 2011. The main R&D target for 2023 is to increase R&D intensity to 3% which is set by the Lisbon/Barcelona objectives. Moreover, the goal for the business R&D expenditures is to increase 2% of GDP. The target for the FTE researchers is to increase to 300,000 and for to private sector, to 180,000.

⁴⁴ http://www.tubitak.gov.tr/tubitak_content_files//mevzuat/yonetmelik/KANUN_278_temmuz-2012.pdf

⁴⁵ €1=TL2.3363 (Central Bank of Turkey's effective sale rate for 30.10.2012)

⁴⁶ http://www.tbmm.gov.tr/butce/2013/konusma_30_Ekim_2012.pdf

In 2011, 45.8% of R&D expenditures were financed by business enterprises, 29.2% by government sector, 20.8% by higher education sector, 3.4% by other national sources and 0.7% by foreign funds.

Table 1: Funding Trends in Turkey

	2009	2010	2011	EU average 2011
GDP growth rate	-4.8	9.2	8.5	1.4
GERD as % of GDP	0.85	0.84	0.86	2.03s
GERD per capita	52.4	63.2	61.12	510.5s
GBAORD (€ million)	-	-	-	87,507.52s
GBAORD as % of GDP	-	-	-	0.74s
BERD (€ million)	1,495.7	1,981.4	1,958.8	159,975.937s
BERD as % of GDP	0.34	0.43	0.37	1.26s
R&D performed by HEIs (% of GERD)	47.4	46	45.5	23.99
R&D performed by PROs (% of GERD)	12.6	11.4	11.3	12.68
R&D performed by Business Enterprise sector	40.0	42.5	43.2	62.354

Source: TURKSTAT (2012), EUROSTAT (2012), s, estimate values

2.3 New policy measures

TUBITAK announced four new support programmes⁴⁷ 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 is announced in November 2012 and deadline for applications was the end of December 2012. Around 40 applications have been received to this call (BTYK, 2013).

2.4 Recent policy documents

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. 24th meeting of BTYK was in on the

⁴⁷ <http://www.tubitak.gov.tr/tr/destekler/sanayi/ulusal-destek-programlari>

7th of August, 2012 and the last meeting which is the 25th one is on the 13th of January, 2013. The new decisions of the 24th BTYK is focused on increasing the quality of primary and secondary education, restructuring of graduate scholarship programmes abroad, restructuring of university entrance system and preparation towards participation to Horizon 2020. Furthermore, two additional decisions related with the previous decisions were taken, namely the establishment of a coordination committee for integrity, harmonization and target orientation in R&D, innovation and entrepreneurship support mechanisms and improvement of public procurements to support innovativeness. The new decisions of the 25th BTYK are focused mainly on the e-government related issues. Furthermore, health becomes a priority area in S&T policies.

In the 24th meeting of the BTYK in August 2012⁴⁸, nine new and two supplementary decisions have been taken. The new nine decisions are,

- To make studies directed to the evaluation of the situation to increase the quality of education,
- To develop and access of the digital content appropriate for the primary and secondary education,
- To encourage and access of the development of digital lecture content for the undergraduate level,
- To make studies on the revision of the education programs and design education contents directed to the aim for the students to gain essential competent more efficiently,
- To make studies on the foreign language education system of the primary and secondary education and to develop alternative education methods,
- To restructure the scholarship programs for graduate study abroad,
- To organize science fairs for students of the primary and secondary education
- To restructure the university access system,
- To perform the preparation of the participation to the EU Framework Program Horizon 2020.

Two supplementary decisions of the 24th BTYK meeting are,

- To form a coordination board for ensuring integrity coherence and target focus in the mechanism of R&D, innovation and entrepreneurship,
- To improve allowance of the rights of the government purchase and usage for to encourage innovation, naturalization and technology transfer.

In the 25th meeting of BTYK in January 2013⁴⁹, 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.

⁴⁸<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksekkurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksekkurulu-24toplantisi-7-agustos-2012>

⁴⁹<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksekkurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksekkurulu-25toplantisi-15-ocak-2013>

2.5 Research and innovation system changes

Food, energy and water are decided as the priority areas in previous meetings of BTYK. With the 25th meeting of BTYK, health sector is determined as an S&T priority area⁵⁰. 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 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 contains about 10 provinces and does 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 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 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, mayor, 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,

⁵⁰ http://www.tubitak.gov.tr/sites/default/files/btyk25_yeni_kararlar_toplu.pdf

no research programmes 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 specialization strategy for research and innovation is specified for regional or national level in Turkey yet. Nor she is not a member of S3 platform⁵¹. Turkey is only a participant in an OECD project on smart specialization⁵².

2.7 Evaluations, consultations

In EU accession progress of Turkey, the "Science and Research" part is the only part that is 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 is in the process between 2007 and 2013, as an associated country. TUBITAK is the responsible organization in the participation of Horizon 2020⁵³ which will be effective between 2014 and 2020. The Ideas Programme will have much prominent role in Horizon 2020 with emphasis on a gradual increase in the number of researchers which is also targeted in Vision 2023 Policy Document, therefore, Turkey could take an action to increase the number of researchers especially FTEs..

No mechanism for the evaluation of R&D policies has been determined yet. Moreover, systematic evaluation of the applied policies has not carried out yet. Only the evaluation of the 7th Framework Programme⁵⁴ 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.

⁵¹ <http://s3platform.jrc.ec.europa.eu/home>

⁵² <https://community.oecd.org/community/smartspecialisation>

⁵³ http://www.tubitak.gov.tr/tubitak_content_files//BTYPD/BTYK/btyk24/54_2012_109.pdf

⁵⁴ http://www.fp7.org.tr/tubitak_content_files//GenelHaber/7CPRaporTemmuz2012.pdf, page 4

3 Structural challenges facing the national system

Turkey is treated as a “modest innovator with a below average performance” in the Innovation Union Scoreboard (IUS) 2011⁵⁵. In terms of average economic growth, Turkey has 8.5% real GDP growth in 2011 which is considerably high above the EU27 average (1.5%). For Turkey, the improvement of innovation performance from 2010 has been well above the EU27 average (1.1%) in IUS 2011 with a value of 2.4%. According to the IUS 2011, the relative strengths are in ‘Open, excellent and attractive research systems’, ‘Finance and support’, ‘Innovators’ and ‘Economic effects’. However, the relative weaknesses are listed as ‘Human resources’, ‘Firm investments’ and ‘Intellectual assets’. The Innovation Union Competitiveness (IUC) Report⁵⁶ also highlights a specific relative strength of Turkey in the quality of its scientific production, with 6.9% of its scientific publications among the top 10% of those most cited worldwide (IUC, 2011). IUC (2011) points out that in terms of human resources intensity and knowledge intensity of the economy, Turkey is behind the countries with similar industrial structure and knowledge capacity. It is mentioned that “Turkey's R&D profile is weaker than that of the EU average, in particular new doctoral graduates and patenting activity”⁵⁷.

Both the IUS 2011 and IUC 2011 reports underline high growth for ‘Business R&D expenditure’, ‘PCT patent applications’ and ‘Community trademarks’. The annual growth rate for ‘business R&D expenditures’ is 1.3% for EU27, while it is 12.8% in Turkey. This growth rate represents the highest growth performance among the countries studied in IUS 2011. Such a trend is also observed for ‘PCT patent applications’. Turkey has the third highest growth rate (8.8%) in this indicator while EU27 average has a declining rate with 0.8%. 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 for 2011. The 25th BTYK meeting convened in January 2013 decided to include health as an S&T priority area. According to IUC 2011, “PCT patent applications in societal challenges may not reflect the patenting dynamics of Turkey”. The annual growth in ‘community trademarks’ is 12.8% in Turkey as compared to EU27 average of 8%. However, the growth performance in ‘community designs’ is the worst among all indicators. It decreases by 6.2% being one of the worst performances among the countries in IUS 2011.

The IUS 2011 underlines that growth performance in ‘Human resources’, ‘Open, excellent and attractive research systems’, ‘Finance and support’ and ‘Firm investments’, is above average. Growth in the main research and innovation indicators between 2000-2009 (R&D intensity, business R&D expenditures on R&D, public expenditures on R&D, new doctoral graduates, scientific publications within the 10% most cited scientific publications worldwide and PCT patent applications), except for patent activity in societal challenges, is reported in the IUC 2011.

According to IUS 2011, the growth rate in ‘new doctorate graduates’ is 10.7% in Turkey which is the second highest growth rate among the countries in IUS 2011. ‘Population completed tertiary education’ indicator has also higher growth rate (6.8%) as compared to EU27 average (3.8%). In terms of ‘finance and support’, the growth rate of ‘R&D expenditure in the public sector’ in Turkey (9.1%) is also higher than EU27 average of 4%.

⁵⁵<http://www.proinno-europe.eu/inno-metrics/page/innovation-union-scoreboard-2011>

⁵⁶<http://ec.europa.eu/research/innovation-union/pdf/competitiveness-report/2011/iuc2011-full-report.pdf#view=fit&pagemode=none>

⁵⁷http://ec.europa.eu/research/innovation-union/pdf/competitiveness-report/2011/country_review.pdf#view=fit&pagemode=none, page 250

The IUC 2011 report also highlights Turkey's improvement in human resources for research and innovation and in knowledge transfer from public research to business enterprise over the period 2000-2008 as measured by the public sector expenditure on R&D financed by business enterprise as % of GDP. "This is particularly important given the relatively good performance of Turkey in scientific quality output" (IUC, 2011).

According to the Global Competitiveness Report 2012-2013⁵⁸ of the World Economic Forum, Turkey is in the stage of transition from efficiency-driven economies to innovation-driven economies. In the Global Competitiveness index, Turkey ranks as 43 and exhibits a good performance as compared to previous rank of 59. Turkey's performance in innovation pillar is comparable with other 'efficiency-driven economies' with a rank of 55. Under the innovation pillar, Turkey's scores relatively well in the 'government procurement of advanced technology products' (32nd), 'availability of scientists and engineers' (41st out of 144 economies), 'PCT patent applications per million of population (42nd) and 'capacity for innovation' (48th). Moderate performance is observed in 'company spending on R&D (56th). On the other hand, university-industry collaboration in R&D (70th) and quality of scientific research institutions (88th) remain areas of concern for the country.

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).

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:⁵⁹

- 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.

In the 24th meeting of BTYK in August 2012, the following new decisions mainly directed towards increasing the quality of educational infrastructure have been taken:⁶⁰

- Carrying out studies directed to the evaluation of the situation for increasing the quality of education;

⁵⁸ http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf

⁵⁹ <http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksekkurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksekkurulu-23toplantisi-27-aralik-2011>

⁶⁰ <http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksekkurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksekkurulu-24toplantisi-7-agustos-2012>

- Developing and accessing of the digital content for the primary and secondary education;
- Encouraging and accessing of the development of digital lecture content for the undergraduate level;
- 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;
- Carrying out studies on the foreign language education system of the primary and secondary education and developing alternative education methods;
- Restructuring the scholarship programs for graduate study abroad;
- Organizing science fairs for students of the primary and secondary education;
- Restructuring the university entrance system;
- Performing the preparation activities for the participation to the EU Framework Program Horizon 2020.

In the 25th meeting of BTYK in January 2013, the following six new decisions mainly on the e-government infrastructure have been taken:⁶¹

- Monitoring the highly-gifted individuals strategy of 2013-2017;
- Carrying out studies on e-government management model;
- Completing the firm accreditation system for public procurement of e-government applications;
- Carrying out studies on the establishment of National Database Centre;
- Public procurement of software needs of public institutions;
- Determining health as an S&T priority area.

Above-mentioned items are in line with the challenges and weaknesses highlighted in the previous ERAWATCH Country Reports⁶² and TrendChart reports⁶³ of Turkey.

Based on above discussion, the following challenges are 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 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

⁶¹<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksekkurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksekkurulu-25toplantisi-15-ocak-2013>

⁶²http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/reports/countries/tr/report_0005

⁶³<http://proinno.intrasoft.be/index.cfm?fuseaction=country.showCountry&topicID=108&parentID=52&ID=41>

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-ups⁶⁴.

- 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).⁶⁵ 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 2011). 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 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.

⁶⁴ <http://www.sanayi.gov.tr/NewsDetails.aspx?newsID=2292&lng=tr>

⁶⁵ <http://www.kosgeb.gov.tr/Pages/UI/Baskanligimiz.aspx?ref=23>

Table 2: Structure of the S&T system

HUMAN RESOURCES	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.3
Percentage population aged 25-64 having completed tertiary education	15.5
Open, excellent and attractive research systems	
International scientific co-publications per million population	64
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	6.51
Finance and support	
R&D expenditure in the public sector as % of GDP	0.51
FIRM ACTIVITIES	
R&D expenditure in the business sector as % of GDP	0.34
Linkages & entrepreneurship	
Public-private co-publications per million population	1.7
Intellectual assets	
PCT patents applications per billion GDP (in PPS€)	0.72
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	0.04
OUTPUTS	
Economic effects	
Medium and high-tech product exports as % total product exports	38.61
Knowledge-intensive services exports as % total service exports	18.83
License and patent revenues from abroad as % of GDP	0.00

4 Assessment of the national innovation strategy

4.1 National research and innovation priorities

The BTYK approved the National Science, Technology and Innovation Strategy (2011-2016) on 15 December 2010. The continuation of the pace of the improvement of R&D and innovation capacity achieved through the National Science and Technology Policies Implementation Plan for 2005-2010 have been one of the main motives behind the new strategies. 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 the knowledge creation capacity of the Turkish Research Area (TARAL)⁶⁶.

As explained by TUBITAK, in order to meet these aims, 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 in such a way that it comprises of three vertical axes and six horizontal axes that cross-cuts the vertical ones (Figure 2).

The National Science, Technology and Innovation Strategy (2011-2016) define the following strategic areas to focus for increased science, technology and innovation performance:

- Target-oriented approaches in the areas where Turkey has R&D and innovation capacities;
- Demand-oriented approaches where further R&D and innovation efforts are needed;
- Bottom-up approaches (including basic, applied and frontier research).
- The cross-cutting objectives for these three areas are set as follows:
 - Developing human resources for science, technology and innovation;
 - Stimulating the transformation of research results into commercial products and services;
 - Diffusing a multi-actor and multi-discipline R&D cooperation culture;
 - Strengthening the role of SMEs within the national innovation system (NIS);
 - Increasing the contribution of R&D infrastructures to knowledge production of the Turkish Research Area (TARAL);
 - Activating international science, technology and innovation cooperation for the benefit of the country.

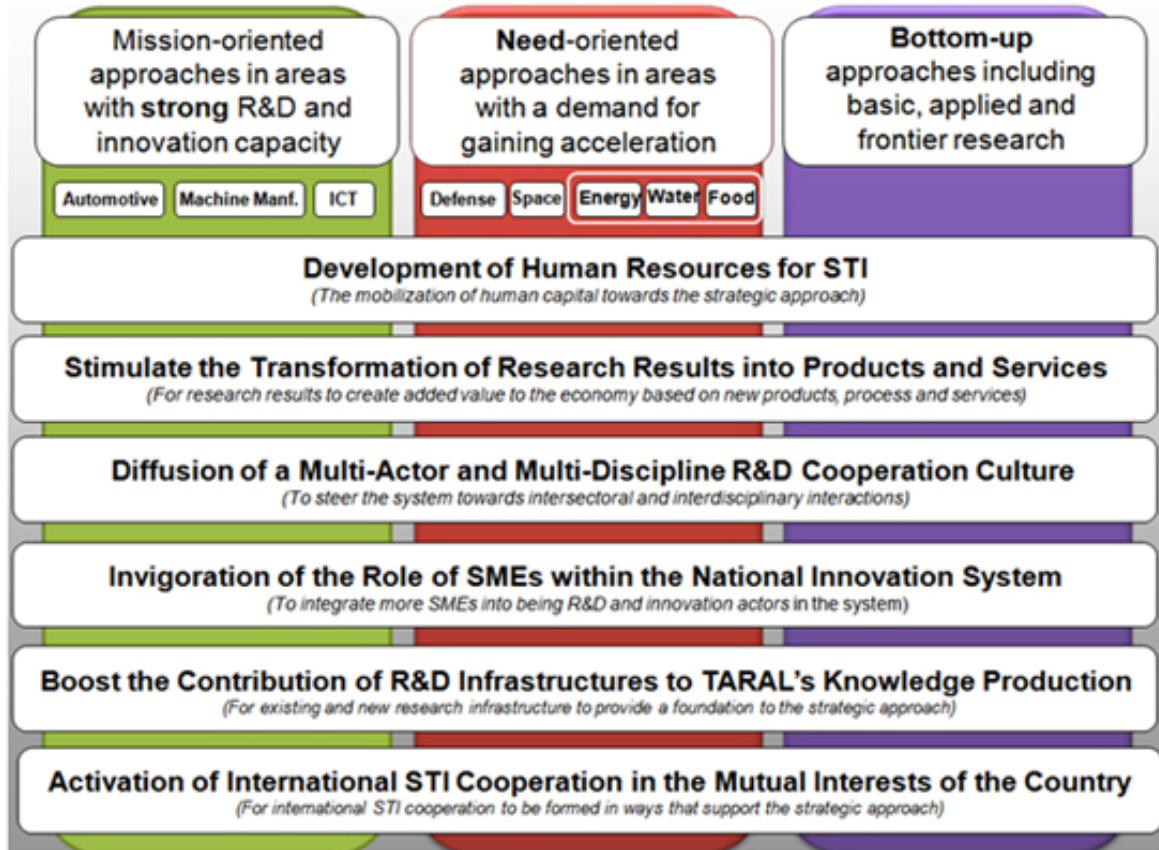
Moreover, the national R&D targets of Turkey for 2023, which were agreed by the BTYK on 27 December 2011, include the following:

- Achieving an R&D intensity of 3% (from 0,84% in 2010)
- Increasing business R&D expenditure as % of GDP to 2% (from 0,36% in 2010)
- Increasing the number of FTE researchers to 300,000 (from 64.341 in 2010)

⁶⁶ <http://www.tubitak.gov.tr/sid/2415/pid/2400/index.htm>

- Increasing the number of FTE researchers in the private sector to 180,000 (from 25.342 in 2010)

Figure 2: Strategic Framework of the National Science, Technology and Innovation Strategy (2011-2016)



Source: TUBITAK (http://www.tubitak.gov.tr/tubitak_content_files/BTYPD/strateji_belgeler/UBTYS_2011-2016.pdf)

As noted above, automotive, machinery and production technologies, ICT, energy, water, food, security and space were identified as priority sectors under the strategy. Health sector is 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 developed and approved for Energy, Water and Food by the BTYK in December 2011. This indicates a clear shift in R&D and innovation policy-making from horizontal to sectoral focus.

Another remarkable shift is the move from research to innovation. While the National Science and Technology Policies Implementation Plan for 2005-2010 was mainly characterised by outlining research oriented strategies, the National Science, Technology and Innovation Strategy (2011-2016) started to discuss aims to transform research outputs into products and services. Finally, the BTYK decisions taken at its meeting on 27 December 2011, as noted above, put high emphasis on innovation, and link innovation with entrepreneurship.⁶⁷

TUBITAK announced four new support programmes 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

⁶⁷<http://www.tubitak.gov.tr/tr/kurumsal/bilim-ve-teknoloji-yuksekkurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksekkurulu-23toplantisi-27-aralik-2011>

into enterprises.⁶⁸ 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.^{69,70} Furthermore, TUBITAK revised its ‘Support Programme for Research and Development Projects of Public Institutions’ in the same period.⁷¹ 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 deadline for applications was the end of December 2012.⁷² TUBITAK received around 40 project applications for this programme (BTYK25, 2013).

The new priorities also include governance improvements. The new decision of the BTYK for the coordination and coherence between policy measures is an important commitment in this respect. In addition, the creation of the new Ministry of Science, Industry and Technology in June 2011, which is given the responsibility for the development, implementation and coordination of the S&T and innovation policies, increases the priority of governance improvements in the policy agenda.

When the national priorities are compared with the structural challenges presented in Section 2, it is observed that the current priorities recognise and address the challenges identified, as explained above.

The new policy changes are not yet reflected on the policy mix of measures as they have very recently been introduced. The characterisation of the policy instruments to foster public and private R&D investment can be summarised under seven routes:

Route 1: Promoting the establishment of new indigenous R&D performing firms

Route 2: Stimulating greater R&D investment in R&D performing firms

Route 3: Stimulating firms that do not perform R&D yet

Route 4: Attracting R&D-performing firms from abroad

Route 5: Increasing extramural R&D carried out in cooperation with the public sector

Route 6: Increasing R&D in the public sector

Route 7: Supporting Innovative Activities

In sum, expected aims and influences of all of the above routes can be summarized as follows:

- Expanding R&D and innovation investments of private sector (public-private sector 50%-50% ratio)

⁶⁸<http://www.tubitak.gov.tr/tr/destekler/sanayi/ulusal-destek-programlari/icerik-1512-bireysel-girisimcilik-asamali-destek-programi>

⁶⁹<http://www.tubitak.gov.tr/tr/destekler/sanayi/ulusal-destek-programlari/icerik-1511-tubitak-oncelikli-alanlar-arastirma-teknoloji-gelistirme-ve-yenilik-p-d-p>

⁷⁰<http://www.tubitak.gov.tr/tr/destekler/akademik/ulusal-destek-programlari/icerik-1003-oncelikli-alanlar-ar-ge-projeleri-destekleme-programi>

⁷¹<http://www.tubitak.gov.tr/tr/destekler/kamu/ulusal-destek-programlari/icerik-1007-kamu-kurumlari-arastirma-ve-gelistirme-projelerini-dp>

⁷²<http://www.tubitak.gov.tr/tr/destekler/akademik/ulusal-destek-programlari/icerik-1513-teknoloji-transfer-ofisleri-destekleme-programi>

- Formation of R&D culture and structure in more firms, especially in SMEs
- Acquiring project and source management skills
- Providing the transformation of covered information to uncovered -codified - information by documenting the profits (tacit to codified knowledge transformation)
- Constituting collaboration between universities and industry
- Increasing the number of successful firms which are able to compete with world markets,
- Improving local products and services to decrease import,
- Increasing productivity and product quality by improving product technologies,
- Getting financial success and new expansion opportunities through project outputs.

4.2 Evolution and analysis of the policy mixes

A brief description of the policy mix and its evolution over the last three years is given below:

- Fiscal policies: The government continued to implement two important fiscal incentives, namely the 'Law on Technology Development Zones' and the 'Law on Supporting Research and Development Activities' to stimulate R&D and innovation activities. By the application of the first measure, the number of firms established in technology development zones has reached to 2,037 (496 start-ups) with 17,784 R&D personnel by November 2012. 71 firms are foreign shared companies with €513.53m⁷³ (USD683m) R&D investment.⁷⁴ Human resources policies: The development of human resources for science and technology is high in the agenda of the BTYK. It is the first strategic aim of the National Science, Technology and Innovation Strategy 2011-2016.
- Knowledge triangle policy mix:
 - o Research policies: As noted before, the research policies in the National Science, Technology and Innovation Strategy (2011-2016) attach higher importance to research-innovation linkages. They focus on transforming research outputs into products and services, enhancing interdisciplinary research, further developing R&D infrastructures and bottom-up research, among other things. Innovation policies: Since 2008, the importance of innovation in the policy agenda has grown significantly. Particularly the new BTYK decisions of December 2011 put higher emphasis on innovation indicating an increased commitment of the government.
 - o Education policies: With the emphasis on the development of human resources for research and innovation, the role of Ministry of National Education in the system has strengthened and closer interaction between education, research and innovation has been established.
- Other policies: In addition to above policy areas, the following policies have also started to play an important role in the policy mix.
 - o Regional policies: The regional development agencies (RDAs) in 26 NUTS2 regions in Turkey started to focus on R&D and innovation strategies and programmes. While some RDAs completed studies for the development of regional innovation strategies in 2012, others launched calls to support R&D and innovation projects in their regions.

⁷³ €1=\$1.33 (Central Bank of Turkey's effective sale rate for 30.10.2012)

⁷⁴ http://sagm.sanayi.gov.tr/userfiles/file/GENEL%20BR%C4%B0F%C4%B0NG%2007_01_13.doc

- SME, industrial and entrepreneurship policies: The main policy documents (such as the SME Strategy and Action Plan 2011-2013⁷⁵ and the Turkish Industrial Strategy Document (2011-2014)⁷⁶ recognises the importance of R&D.

Based on the above description of the policy mix and its evolution over the last three years, an analysis is provided below using the Innovation Union self-assessment tool (a description of policy features most commonly found in well-performing research and innovation tools was provided by the European Commission in annex to its Europe 2020 Innovation Union communication⁷⁷) and Guy et al., 2009⁷⁸.

Table 3: Analysis of the policy mix

Policy feature	Analysis
1. Role of research and innovation	
Strategic policy framework	<ul style="list-style-type: none"> • 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.
Focus on societal challenges	<ul style="list-style-type: none"> • 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.
2. Quality of governance	
Governance structure	<ul style="list-style-type: none"> • The new governance structure emerged after the election in 2011 and the role of the new MoSIT defined as the oversight body for research and innovation policies will help improve the quality of governance. • The new BTYK decision aiming to ensure integrity, coherence and target-oriented approach in R&D, innovation and entrepreneurship support mechanisms is an opportunity for enhancing governance. The latest decisions towards e-government management model will enhance the quality of governance. • Achieving better policy coordination is a challenge.
Multi-annual strategy	<ul style="list-style-type: none"> • There exists a multi-annual strategy defining national priorities (National Science, Technology and Innovation Strategy, 2011-2016)
Monitoring system	<ul style="list-style-type: none"> • There exist national targets for monitoring policy implementation. • 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.
3. Scope of innovation policy	
Broad concept beyond RTD	<ul style="list-style-type: none"> • 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. • 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.)

⁷⁵ http://www.sanayi.gov.tr/Files/Documents/KOSGEB_Katalog.pdf

⁷⁶ http://www.sanayi.gov.tr/Files/Attachments/OtherFiles/turkish_industrial_strate-16022011152724.pdf

⁷⁷ http://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication_en.pdf

⁷⁸ <http://ec.europa.eu/research/policymix/userfiles/file/uploadeddocs/task3-methodology%20deliverable-26.03.091.pdf>

Policy feature	Analysis
Demand side aspects	<ul style="list-style-type: none"> • The new BTYK decision aiming to promote public procurement for innovation is an opportunity to increase the demand for innovations and the diffusion of innovations. • There is a need to develop and implement demand-side innovation policies and policy measures in a more systematic manner.
4. Adequacy of public funding	
Budgetary prioritisation	<ul style="list-style-type: none"> • There exists high-level commitment for allocating higher budget for R&D and innovation funding. • There is a need to ensure sustainability of funding in these areas.
Innovative financing solutions	<ul style="list-style-type: none"> • There exist tax incentives for stimulating R&D and innovation. • 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.
5. Pursuit of excellence in research and education	
Share of competitive and project-based financing	<ul style="list-style-type: none"> • Allocation of high share of research funding on a competitive basis is strength and it is important to continue to pursue this strategy.
Evaluation of institutions	<ul style="list-style-type: none"> • There is a need to evaluate research institutions on the basis of internationally recognised criteria.
Selection of projects	<ul style="list-style-type: none"> • There exist procedures for the selection of projects on the basis of quality and expected results and subject to external peer review, and this approach should be sustained.
Portability of funding	<ul style="list-style-type: none"> • There is a need to ensure portability of researchers funding. • Higher importance attached to researchers' mobility at national, sectoral and international levels is an opportunity.
Exploitation of results	<ul style="list-style-type: none"> • There exist measures to stimulate exploitation of results of publicly funded research (protection, publication). • 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.
Autonomy of institutions	<ul style="list-style-type: none"> • At some extent, there exists academic freedom of the academic personnel and the scientific autonomy of the higher education institutions through the protection provided by the Turkish Constitution. However, with the new higher education legislation and constitution, the autonomy of higher education institutions should be enhanced.
Researcher careers	<ul style="list-style-type: none"> • There exists the National Science and Technology Human Resources Strategy and Action Plan (2011-2016) (HRST strategy) to improve researcher careers.
Attraction of world talent	<ul style="list-style-type: none"> • There exists the HRST strategy aiming to create incentives to attract leading international scientists.
6. Education system to produce the right mix of skills	
Supply of graduates	<ul style="list-style-type: none"> • 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. • There is a need to balance supply and demand in HRST, and to increase the number of S&T graduates. • There is urgent need for the revision vocational training system in line with the needs of industry. • The collaboration with industry for the design of new curriculum should be improved.

Policy feature	Analysis
Innovation-oriented education/curricula	<ul style="list-style-type: none"> • 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. • The BTYK decisions aiming at stimulating innovation and entrepreneurship in universities and promoting entrepreneurship culture in general is an opportunity.
Link between education and other sectors	<ul style="list-style-type: none"> • There exists the HRST strategy aiming to promote partnerships between formal education and other sectors. • There is a need to increase and sustain partnerships between formal education and other sectors.
7. Partnerships at all levels/between all actors	
Bridging instruments e.g. clusters, KT platforms, vouchers	<ul style="list-style-type: none"> • There exist policy measures aiming to encourage partnership and collaboration between research and innovation stakeholders. • 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.
Sectoral mobility	<ul style="list-style-type: none"> • There are schemes to stimulate mobility between universities and the private sector. • 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.
IP management rules	<ul style="list-style-type: none"> • There exist strategies and BTYK 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.
Transnational cooperation	<ul style="list-style-type: none"> • There exist strategies to facilitate setting up/operating transnational partnerships and collaborations for research.
8. Business environment promoting private investment	
Policy mix	<ul style="list-style-type: none"> • There exist strategies for promoting private investment in research and innovation.
Venture capital market	<ul style="list-style-type: none"> • There exist strategies for developing venture capital industry and encouraging early stage investments. • There is an urgent need to create favourable conditions to foster a growing and robust venture capital market, especially for early stage investments.
Rules for operating firms	<ul style="list-style-type: none"> • Ongoing commitment to improve the business environment through the Coordination Council for the Improvement of Investment Environment’ (YOIKK) is an opportunity. • There is a need to improve the rules and procedures and streamline processes for starting up, running and terminating a business.
IPR system	<ul style="list-style-type: none"> • There exist policies and policy actions to improve the system for the protection of IP.
Standard-setting system	<ul style="list-style-type: none"> • There is a need to develop efficient standard-setting system supporting innovative products and services.
9. High quality, simple and accessible public support	
Targeted, differentiated, easy to access	<ul style="list-style-type: none"> • There are attempts to develop well targeted, clearly 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. • The BTYK decisions aiming to secure integrity, coherence and target-oriented approach in R&D, innovation and entrepreneurship support mechanisms is an opportunity.

Policy feature	Analysis
Responsiveness to firms' needs notably SMEs	<ul style="list-style-type: none"> • There exist support measures specific to SMEs. • There is a need to enrich the policy mix with support schemes tailored to the needs of companies, particularly SMEs. • In addition to financial supports, there should be supports directed towards knowledge-intensive business services.
International evaluation procedures	<ul style="list-style-type: none"> • There is a need to establish international evaluation procedures.
Support to young innovative firms	<ul style="list-style-type: none"> • There exist support measures and increasing awareness on the need for specific support to young innovative companies. • There is a need to enrich the policy mix with a range of measures supporting young innovative companies.
10. Public sector driving innovation	
Innovative public sector and public services	<ul style="list-style-type: none"> • There exist pilot projects and activities to raise awareness on public sector innovation. • 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. • There is a need to develop policies and incentives to stimulate innovation in the public sector and in the delivery of public services
Innovation-oriented procurement	<ul style="list-style-type: none"> • 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. • 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.
Access to government-owned data	<ul style="list-style-type: none"> • 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.

4.3 Assessment of the policy mix

The existing policy mix of measures in Turkey focuses on six main categories defined by horizontal policy axes:

- Development of human resources for STI,
- Stimulating the transformation of research into products and services,
- Diffusion of a multi-actor and multi-discipline R&D cooperation culture,
- Invigoration of the role of SMEs within the national innovation system,
- Boosting the contribution of R&D infrastructures to TARALs' knowledge Production,
- Activation of international STI cooperation in the mutual interests of the country.

Although there are significant attempts to address these categories, still there exist problems which are not sufficiently addressed by the existing policy mix. There needs of some structural arrangements in NIS since the significant changes and developments in Turkish NIS are in a relatively short period of time.

Activities, structures and organizations of public research organizations and non-profit research organizations should be restructured to have more effective role in NIS. The number of public research organizations in priority areas should be increased and they should be independent, autonomous and self-governing bodies. Strategies and actions of all public sector organizations should be in alignment with BTYK decisions.

Programmes for education and human resources policy should be enhanced. A sound integration of research, innovation and education policies is a must for Turkey. In an environment where entrepreneurship policy is so much pronounced, then entrepreneurship education should be an integral part curriculum. Although there are attempts towards this end, the actions are implemented very slowly. The need for vocational training is frequently declared by the private sector; however, one could not see attempts towards improvement for vocational training. 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 increased with some additional policy measures.

The number of thematic and mission-oriented programs should be increased in line with the vertical priority areas defined by ‘National Science, Technology and Innovation strategy, 2011-2016’ document. There should be attempts for developing the culture of exchange and cooperation between institutions. The reconciliation and cooperation between the institutions need to be improved through some specific support programmes. The mutual dialogue between companies and business associations can be increased by mission, thematic, and project-oriented programmes. The recent attempts towards the establishment of technology transfer offices serves to target of commercialization of research output. However, there is no legal regulation concerning these offices even though the studies towards legislation have been commenced more than a year. Technology transfer offices in Turkey should be considered by taking into account the differences in local and regional needs and conditions. Private, public, non-university research institutes should be more efficiently integrated to the NIS. The market orientation of the research system can be enhanced by the well-functioning of technology transfer offices.

One can observe insufficient venture capital funds and weak business angel structures in Turkey. Both public sector and private sector should inject into venture capital funds. Some tax delays or exemptions can be provided to increase the availability of the funds. Programmes that provide additional funding to increase SMEs innovative capacities should be developed. The manufacturing expertise of SMEs should be supported together with the market-oriented technology funding of innovative SMEs. The cluster strategy should be given a priority. The new amendments in TUBITAK legislation provide some mechanisms for public private partnerships yet tools to enhance public-private collaboration are still weak.

There is an urgent need for innovation-oriented procurement policy. Apart from defence industry and partly ICT needs of government, one cannot observe systematic innovation-oriented procurement policy.

Another important aspect, which should be taken into account, is the regional and sectoral focus of the policy mix. Although given high priority at the moment, these two dimensions have not yet been considered in existing policy measures. It is an important opportunity for Turkey to promote R&D and innovation through specific schemes to be tailored both for traditional and medium to high-tech sectors. With the creation of the regional development agencies, R&D and innovation at regional level have recently started to gain importance. This development brings about a challenge for the governance system: to carefully and successfully orchestrate national and regional policies and policy actions to avoid overlaps.

Another missing component is the non-existence of a regular monitoring and evaluation mechanism for policies and programmes. Both self-evaluation and independent evaluation mechanisms should immediately be defined and implemented in order to learn from the experiences. An independent evaluation institution, like the one in South Korea (KISTEP)⁷⁹, can be established for the needs of monitoring and evaluation.

⁷⁹ <http://www.kistep.re.kr/eng/main.jsp>

In sum, policy measures to foster innovation in services, non-technological innovation, innovation in the public sector, innovative public procurement, technology transfer between firms, and monitoring and evaluation of policies and programmes are among the areas, which need to be better addressed by the existing policy actions. As noted above, the BTK has recently approved strategies and taken decisions to design and implement new measures. These measures will help enriching the policy mix and help address an important number of these areas.

Table 4: Policy measures and assessments

Challenges	Policy measures/actions ⁸⁰	Assessment in terms of appropriateness, efficiency and effectiveness
Promoting research commercialisation from universities	Industrial Thesis (SAN-TEZ) Projects Support Programme ‘Law of Technology Development Zones’ ‘Technology Transfer Support Programme for SMEs’ ‘Support Programme for Technology transfer Offices’ ‘Amendments in TUBITAK legislation’	The ongoing measures have been instrumental in stimulating research commercialisation. With the implementation of the decisions of the BTK and the National Science, Technology and Innovation Strategy 2011-2016 it is expected that the policy mix will be enriched to address this challenge. Design and implementation of a variety of measures (financial, non-financial, etc.) to promote the whole range of routes for research commercialisation will be helpful.
Increasing the number of innovative high-growth start-ups	‘Technopreneurship Support Programme’ ‘Entrepreneurship Support Programme’ ‘R&D, Innovation and Industrial Application Support Programme’ ‘Support Programme for Technology- and Innovation-focused Entrepreneurship’	The existing measures are useful in stimulating start-up creation. However, the underdeveloped venture capital and business angels market, as well as limited number and variety of policy measures for start-up creation constitute an important barrier. The BTK decisions of December 2011 recognise this challenge and aim to address it through policy measures to be developed. The ‘Entrepreneurship Council’ ⁸¹ established in 2012 is also expected to play a key role in the development of the business angel and venture capital market. A full range of additional measures is needed to address this challenge.

⁸⁰ Changes in the legislation and other initiatives not necessarily related with funding are also included.

⁸¹ <http://cdd.kosgeb.gov.tr/57872a85d1df4eaaab3746546f9c83017f06db7fd3f041a4b8eaaaa1fb7a94567a4ce4574dbb4e12b0c685d743df7f1bc6cdf6e8c00649a7955f096f7c0128e8e076253bb7e24d59891a05db6a70134d/file.axd>

Challenges	Policy measures/actions ⁸⁰	Assessment in terms of appropriateness, efficiency and effectiveness
Increasing R&D and innovation capabilities of the private sector (in particular, micro, small and medium enterprises (MSMEs))	‘Support Programme for Industrial R&D Projects’ ‘R&D, Innovation and Industrial Application Support Programme’ ‘Technology Development Project Support’ ‘Law of Technology Development Zones’ ‘Law on Supporting Research and Development Activities’ ‘SME Funding Programme’ ‘Advanced Technology Project Supports (ITEP)’ ‘Technology Transfer Support Programme for SMEs’ Industrial Thesis (SAN-TEZ) Projects Support Programme	While the existing measures listed here aim to increase R&D and innovation investments in the private sector, they do not focus on the need for developing absorptive capacities in firms. 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. There are also needs for support programmes for the exploration and exploitation activities of enterprises at various scales.
Focusing on sectors and thematic areas of importance	‘Support Programme for Research Projects of Public Institutions’ ‘Support Programme for Research, Technological Development and Innovation Projects in Priority Areas’ ‘Programme for Supporting R&D Projects in Priority Areas’	The existing support programme focuses on defence, security, space, energy, automotive and mechatronics research ⁸² 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 can be considered.
Increasing investment in intellectual assets	‘Programme to Encourage and Support Patent Applications’ ‘General Support Programme’	Existing programmes have helped increase awareness on the subject as well as growth in IPR applications. Current strategies and action plans indicate ongoing commitment in this area. Further efforts and diversified measures would be helpful to increase IP and the ability to create economic value from intellectual assets of firms and universities. The BTYK decision of December 2011 on stimulating domestic patent licensing supports the steps taken to tackle this challenge.

⁸² <http://www.tubitak.gov.tr/tr/cagri-arsivi>

5 National policy and the European perspective

The process of the harmonization of the EU *acquis* contributes to the policy mix coordination efforts, as it did so far. Although not a Member State yet, Turkey's strategies and efforts in the field of S&T and innovation are, to a large extent, 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/pillars⁸³ are determined in the ERA Communication in July 2012. These priorities, based on the strengths and weaknesses of the research system of Europe, will be effective by 2014.

- **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 the TUBITAK 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), KEI (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 TUBITAK. 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:**

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"⁸⁴. The foreign

⁸³ http://ec.europa.eu/euraxess/pdf/research_policies/era-communication_en.pdf

⁸⁴ <http://www.tubitak.gov.tr/en/funds/academy/international-researchers-fellowship-programmes/content-2221-fellowships-for-visiting-scientists-and-scientists-on-sabbatical-leave>

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”⁸⁵

- **Gender equality and gender mainstreaming in research:**

30% of the FTEs are female in 2011⁸⁶. The number of female FTEs is 27,506 out of 92,801. The situation of Turkey in 2010 is better than the Malta, France, Denmark and Czech Republic⁸⁷. 85% 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 2009⁸⁸, in Turkey share of female researchers are 33.4% while in Germany this ratio is only 20.6%. There is no direct support programme for the gender equality.

- **Optimal circulation and transfer of scientific knowledge:**

In the last (25th) BTYK meeting, four (out of six) of the decisions are related to this subject. Till now, no support programmes or direct measure are yet settled. TUBITAK constitutes the “Researcher Information System (ARBIS)⁸⁹” 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 88,489⁹⁰ in April 2013.

In the 24th BTYK meeting, one new decision is taken about the participation process for EU Framework Programme, the Horizon 2020. Turkey is participated the 6th and 7th Framework Programmes actively as an associated country in the EU cohesion process. In the 7th Framework Programme, Turkish partners have taken €145,1m⁹¹ funds (TUBITAK, 2012). For the Horizon 2020, TUBITAK is the responsible organization for the EU negotiations in collaboration with the other public institutions.

⁸⁵<http://www.tubitak.gov.tr/en/funds/academy/international-researchers-fellowship-programmes/content-2236-co-funded-brain-circulation-scheme-co-circulation-scheme>

⁸⁶ http://tuik.gov.tr/PreHaberBultenleri.do?id=10931&tb_id=5

⁸⁷ <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=0&language=en&pcode=tsc00006>

⁸⁸ <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=0&language=en&pcode=tsc00006>

⁸⁹ <https://arbis.tubitak.gov.tr/pages/bilgipinari/index.htm>

⁹⁰ <https://arbis.tubitak.gov.tr/pages/bilgipinari/index.htm>

⁹¹ €1=TL2.3363 (Central Bank of Turkey’s effective sale rate for 30.10.2012)

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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
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
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
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	The National Metrology Institute
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