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TURKEY'S 2023 OBJECTIVES IN SCIENCE AND RESEARCH

Deniz SERVANTIE
IKV Junior Researcher

ECONOMIC DEVELOPMENT FOUNDATION
www.ikv.org.tr

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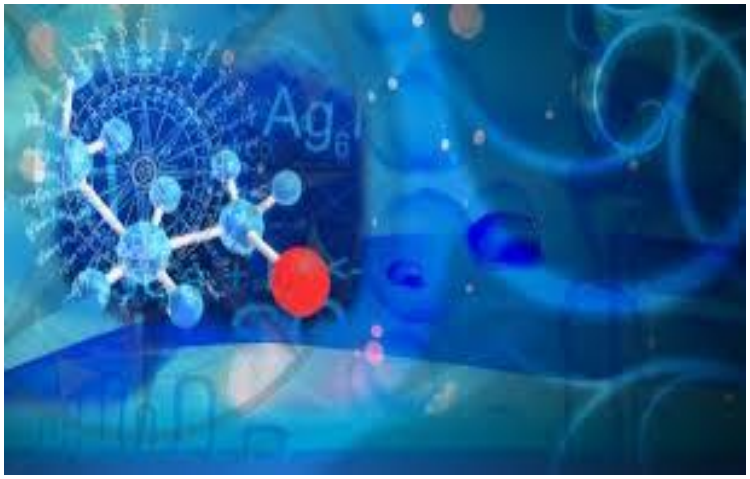


Key Findings

- ✓ Turkey's science and research policy was revamped in the 1960s with the creation of TÜBİTAK (The Scientific and Technological Research Council of Turkey);
- ✓ Turkey has been substantially increasing its investments in terms of research and science in the last 10 years;
- ✓ In the context of the strengthening of the capacity of national science and research policies, 57 new research centres have been opened in Turkey;
- ✓ Since 2002, Turkey is actively participating to the research and innovation programmes of the EU in the context of the Framework Programmes;
- ✓ The 2023 objectives Turkey has determined with respect to science and research can be described as follows: increasing Turkey's competitiveness in the world stage in terms of science and research by promoting specific products and innovations; increasing the living standard of ordinary citizens, creating an economy with support and promotion of sustainable development, which is information-centred and providing benefits to all and reshaping the national economy and its subsequent societal gains.
- ✓ According to the 2017 Global Innovation Index (in cooperation between Cornell University, INSEAD and World Intellectual Property Organisation), Turkey ranks 43rd in terms of innovation.

A Short History of Turkey's Science and Research Policy

Turkey's science and research policy was revamped in the 1960s within the framework of the State Planning Organisation (*Devlet Planlama Teşkilatı*, DPT). Indeed, with the support of that organisation, TÜBİTAK (The Scientific and Technological Research Council of Turkey) was founded in 1963 during the first five-year plan (1963-1967) by the then Turkish President Cemal Gürsel who had first formed a scientific council under

the guidance of the Ministry of Defence in that respect[1]. The overarching reason behind the creation of TÜBİTAK was to have an institution which would have a leading role in shaping and forging Turkey's science and research policy and would act as a catalyst in terms of projects and further research in a variety of areas and applications. At the time of its establishment, the main objectives of TÜBİTAK included lending a concrete support to basic and applied academic research as well as encouraging careers in science by providing incentives to young researchers in that respect. This was notably the case in natural sciences such as medicine, agriculture and animal husbandry.

In the following years after the implementation of the first five-year plan, it was explicitly mentioned that the emphasis would be put upon technological progress and transfers in that respect. This was notably the case during the fourth five-year plan between 1979-1983 where it was indicated that technological policies would be integrated within industrial, economic growth and investment objectives[2].

However, one should indicate that the main policy during the 1960s and 1970s in terms of science and research consisted in enhancing research in terms of natural resources. In the 1980s, a document entitled "Turkish Science Policy: 1983-2003" which was prepared in cooperation between DPT, TÜBİTAK and over 300 scientists and researchers was published where it gave details as regards the implementation of a comprehensive science and research policy. At that time, a new institution in charge of this area was set up with the participation of the concerned ministries along with top bureaucrats as well as with representatives from non-governmental organisations entitled the High Council for Science and Technology (*Bilim ve Teknoloji Yüksek Kurulu*, BTYK).

Upon the request of the government, a report was produced by a commission in charge of science and research at the Istanbul Technical University (*İstanbul Teknik Üniversitesi - İTÜ*) with respect to promoting modern technologies and further investments. Its first meeting was held on 9 October 1989 but, unfortunately, it did not lead to a concrete conclusion as the projects included within the framework of the report were not implemented. A new period began on 3 February 1993 where all actors committed themselves to further enhance Turkey's science and research policy by working in cooperation with the aim of increasing the number of projects in a variety of fields.

One can safely say that from the early years of the Republic till the 1990s, the main priority for the Turkish government has been to enhance and develop its science and research policy and try to catch up with more developed economies, notably those of the West. However, it can be said that as a result of limited infrastructure and know-how in this area, technological development has all but been rather limited. In the initial years of the Republic, Ataturk engaged in important and extensive reforms with a view to starting a period of intense industrialisation. Factories were built in various cities of Turkey and universities were being strengthened in order to establish a basis for research and scientific advancement. Ataturk's maxim "Every factory is a castle" attests to the importance he attached to industrialisation in the Republican era.

[1] Maxwell J. FRY, "Turkey's First Five-Year Development Plan: An Assessment", The Economic Journal, Vol. 81, No. 322, June 1971.
[2] Güneri AKALIN, "The Turkish Economic Development Since 1923: Achievements and Failures", Turkish Public Administration Annual, Vol. 20-21, 1994-1995.

With the opening of the Turkish economy to the outside world, and increasing productivity and exports, the focus on science and research has also been strengthened. This focus increased ever since the end of the 1970s but during that period, progress was also limited as a result of an inadequate environment for competition and the difficulty to bring new technologies from abroad to Turkey.

The policy which was pursued after 1993 envisaged not only the creation of the appropriate and adequate facilities in order for research to be increased but also with the emphasis on the larger public which may thus benefit from the technological innovations in that respect. Indeed, a special attention was given on having a policy which also benefits the services sector and thus increases not only the quality but adds further value to Turkish exports abroad. Moreover, the need to further protect the environment and create policies with a positive and constructive impetus to health and prosperity were envisaged. As such, this was notably implemented through the decision of the government of 25 August 1997 where a central role was given to TÜBİTAK.

In the last twenty years, there has been a significant development with respect to Turkey's science and research policy. Indeed, a special emphasis has been consistently put on increasing the budget allocated to research, enhancing infrastructural capacities and strengthening education opportunities. The most important institution which has been shaping that policy has been the Science, Technology and Innovation Policies Council (*Bilim, Teknoloji ve Yenilik Politikaları Daire Başkanlığı*, BTYPD).

What are the 2023 Objectives in Science and Research?

Since the early 2000s, Turkey has devoted an increasing importance to investment regarding science, technology and innovation. As a result, government funding for R&D and innovative activities has consistently been increased. This growing political commitment regarding this area had been reflected within the framework of the Ninth Development Plan which was pursued between 2007 and 2013 and which had identified the importance of further improving performance in terms of science and technology in order to build upon Turkey's economic growth and competitive advantage in that respect. In a strategy entitled "National Science, Technology and Innovation Strategy" which covered the period 2011 to 2016 and which had been approved by the Supreme Council of Science and Technology (BTYK) in December 2010, it had been underscored that the Turkish government was ready to further enhance the country's research capacities and focus more on areas of science, technology and innovation. This approach has been pursued throughout these years, also thanks to Turkey's participation in EU programmes such as the 6th and 7th Framework Programmes.

In the last decade, thanks to an increase in investments in terms of science and research, Turkey has achieved important progress in terms of its science and research policy. In the context of the 100th anniversary of the proclamation of the Turkish Republic in 2023, the Turkish government has included a number of objectives to be met at that juncture:

- Increasing the competitiveness of Turkey and its products by enhancing its share in international trade;
- Increasing quality standards and prosperity for all citizens;
- Ensuring sustainable development;

- Creating a knowledge and information-based economy which also focuses on innovation and entrepreneurship;
- Devote at least 3% of Turkey's total GDP to R&D activities of which two-thirds would stem from the business sector;
- Increase the number of researchers in order to reach 300,000 full-time researchers of which 180,000 would be employed by the private sector[3].

In order to meet these objectives, the Turkish government has underscored the necessity to enhance the budget allocated to science and research. These targets can be deemed as ambitious, and in the event that Turkey would effectively attain these goals – at least in terms of human resources and budget – the overarching objective would be to have an innovation capacity which is approximately comparable to that of France or Germany in that respect.

Innovative enterprises by economic activity and size (2008-2014, %)

Economic activities	Enterprises with technological innovation	Product and/or process innovative enterprises	
	2008-2010	2010-2012	2012-2014
Services	33,8	23,9	33,5
Wholesale trade, except of motor vehicles and motorcycles	35,7	23,4	35,3
Transportation and storage	26,8	21	28,7
Publishing activities	51,7	-	-
Telecommunications	35,6	-	-
Computer programming, consultancy and related activities	61,9	-	-
Information services activities	41,3	-	-
Financial and insurance activities	27,7	24	31,6
Architectural and engineering activities; technical testing and analysis	32,8	21,8	27,2
Scientific research and development	76,2	81	68
Advertising and market research	-	24,5	35,2
Size			
Enterprises with 10 employees or more	35,2	27	38
10-49	32,8	24,8	36,4
50-249	44,2	34,4	42,4
250+	55,9	46,4	54,5

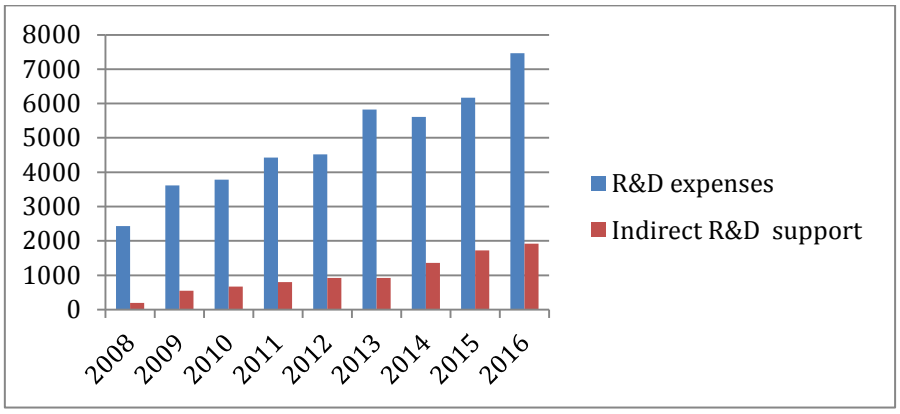
Source: TÜİK

[3] European Commission, "Research and Innovation Performance in Turkey Country Profile 2013", 2013.

As one can see in the table above, there has been a noteworthy increase in the economic activities of innovative enterprises in Turkey. As such, indeed, the government has substantially increased support for such enterprises, whether terms of scientific research and development, computer programming, publishing activities, information services or wholesale trade and telecommunications. Furthermore, one can also see that more than 50% of enterprises realising technological innovations comprise above 250 employees which is testimony of the vitality of the entrepreneurial spirit regarding technological innovations in Turkey. Nonetheless, one should recollect that there has been a slowdown in product or process innovative enterprises in terms of scientific research and development between 2010-2012 and 2012-2014.

As such, one should add that it is of utmost importance for the authorities to continue to strive to increase the research and development budget as envisaged within the framework of the 2023 objectives. Indeed, according to the Prime Minister-led Supreme Council of Science and Technology (BTYK), the Turkish government has vowed to devote at least 3% of Turkey's GDP towards research and development activities, of which approximately two-thirds should come from the business sector and also drastically increase the number of full-time researchers towards reaching a goal of 300,000 employees, of which 180,000 would be private-sector employed.

Level of Support Granted to R&D Activities
from the Central Administration Budget (2008-2016, in million TL)



Source: TÜİK

As it can be clearly seen above, from 2008 to 2016, there has been a significant increase in the expenses regarding R&D. Indeed, whilst in 2008, the total expenses in terms of R&D amounted to almost 2.5 billion TL; this number reached almost 7.5 billion TL in 2016. The fact that there has also been an increase in investments from EU countries to Turkey has notably contributed to the expansion of R&D.

Turkey's Level of Alignment with the EU in Science and Research and Contribution to the EU's Science and Research Policy

Chapter 25 of the EU *acquis* which is Science and Research was opened to negotiations on 12 June 2006 during the Austrian Presidency and closed provisionally on the same day. Till this day, it has been the only chapter that has been closed within the framework of the accession negotiations between Turkey and the EU. In the 2016 Progress Report on Turkey published recently by the European Commission, it has been noted that

Turkey's level of preparation in that area is "well advanced"[4]. All Member States and candidate countries can benefit from the EU's research programmes and Turkey is no exception in that matter. In that context, the report also indicated that Turkey's progress in strengthening its research and innovation capabilities at the national level aimed at further facilitating its full integration into the European Research Area (ERA). Nonetheless, the report also explains that important financial resources will have to be deployed for Turkey to be able to reach its own 2023 targets and to also improve its ranking in the Innovation Union Scoreboard. Therefore, the report makes the following recommendations to Turkey for the upcoming year:

- Strengthen the role of universities in the organisation of research and innovation, in particular through stepping up the cooperation with the industrial world and SMEs;
- Increase national funding and allocate it in line with ERA actions and principles[5].

With respect to the 7th Framework Programme, it is noteworthy to add that Turkey has participated to it from the beginning. Indeed, as such, TÜBİTAK participated to a number of projects funded and supported by the Commission, notably aimed at increasing the research capacity as well as scientific excellence. Moreover, Turkey has pursued a policy of active cooperation with its European partners within the framework of the Joint Research Centre (JRC), notably through the participation of Turkish researchers to JRC workshops, events as well as projects, thus enhancing Turkey's networks in that area. Furthermore, one should note that Turkey had launched in June 2010 an online consultation process with the aim of targeting the Turkish research community in order to determine the national positions regarding the 8th Framework Programme that is Horizon 2020. Turkey had determined as such to enhance its level of funding for R&D projects and increase the level of employment in that area.

Among a variety of projects which were conducted within the context of the 7th Framework Programme, one could note a project regarding mobile technologies developed and organised by Bilkent University in Ankara[6]. The project entitled "3DPHONE" was aiming to develop technologies and core applications enabling a new level of mobile 3D experience, by developing an all-3D imaging mobile phone. Thanks to the technologies that will be developed, users will be able to take 3D photos or make 3D video calls with their mobile phones. It was a project which included a budget of approximately 5 million euros, of which the EU contributed 3.5 million euros. Among the project partners were Telefonica, one of the largest mobile operators in Spain and the world, and Helsinki University, one of the best universities in Finland. Patents to be developed under the project are expected to compete against technologies developed by companies such as Sony and Samsung.

In 2010, it was indicated that the total size of the portfolio including Turkish organisations and companies within the 7th Framework Programme increased to 1.1

[4] European Commission, *Turkey 2016 Report*, 2016.
[5] Ibid.
[6] Bilkent University, "Avrupa Topluluğu Üç Boyutlu Telefon Projesi", Basında Bilkent, Dünya Gazetesi, http://www.bilkent.edu.tr/bilkent-tr/general/basin/bb-haber210209.html Date retrieved: 19.04.2017

billion euros of which 82 million had been directly spent within Turkey[7]. Furthermore, five years later, in the Turkish magazine "Ekovitrin", it was revealed that Turkey had contributed a total of 360 million euros within the abovementioned programme but in the 5 year period of the programme, a total of 145 million euros had been granted to Turkish projects. These funds were allocated to a total of 308 projects, which is well below many Member States such as the UK (17,978), France (13,855), Germany (8,701) and Italy (8,701)[8].

EU Grants to Projects Within the 7th Framework Programme (2007-2013)

Country	Number of Projects
UK	17,978
France	13,855
Germany	13,669
Italy	8,701
Netherlands	6,608
Spain	6,252
Belgium	4,958
Greece	2,885
Denmark	2,442
Sweden	2,142
Ireland	1,734
Austria	1,682
Portugal	1,579
Switzerland	1,263
Finland	1,239
Norway	1,023
Israel	930
Poland	664
Hungary	456
Turkey	308
Czech Republic	288

Source: Ekovitrin, August 2015

As it can be seen, the largest number of projects within the 7th Framework Programme were realised in the largest economies of the EU (i.e. UK, France, Germany and Italy). As such, it is not a surprise that the most important number of EU grants were allocated to projects within these countries. In contrast, Turkey's performance with a little more than 300 projects which were granted EU funds is far from being satisfactory, given the country's potential for further growth in R&D. It can be said that the fact that a limited amount of universities fully participated to the programme may have led to such a less than satisfactory result. Indeed, if participation had been broadened, one may assume that the figures may have been higher.

Another example of project is regarding SMEs. Indeed, as means of example, one can say for example that the project entitled FutureSME (Future Industrial Models for SMEs) is an interesting example of cooperation between the Member States and Turkey with the aim of increasing the growth and performance of SMEs in both parties[9]. In the context of this project, a variety of research activities have been realised with the objective of

[7] TÜBİTAK AB Çerçeve Programları Ulusal Koordinasyon Ofisi, "AB 7. Çerçeve Programı (7.ÇP) Ülke Performansı", Ankara, December 2010.
[8] Ekovitrin, "AB'nin Hibe Fonları KOBİ'leri Bekliyor: Yarış Başladı", August 2015, http://www.ekovitrin.com/dergi2015/agustos/7.fatih.pdf Date retrieved: 18.04.2017
[9] European Commission, "FutureSME", CORDIS, http://cordis.europa.eu/project/rcn/89922_en.html Date retrieved: 19.04.2017

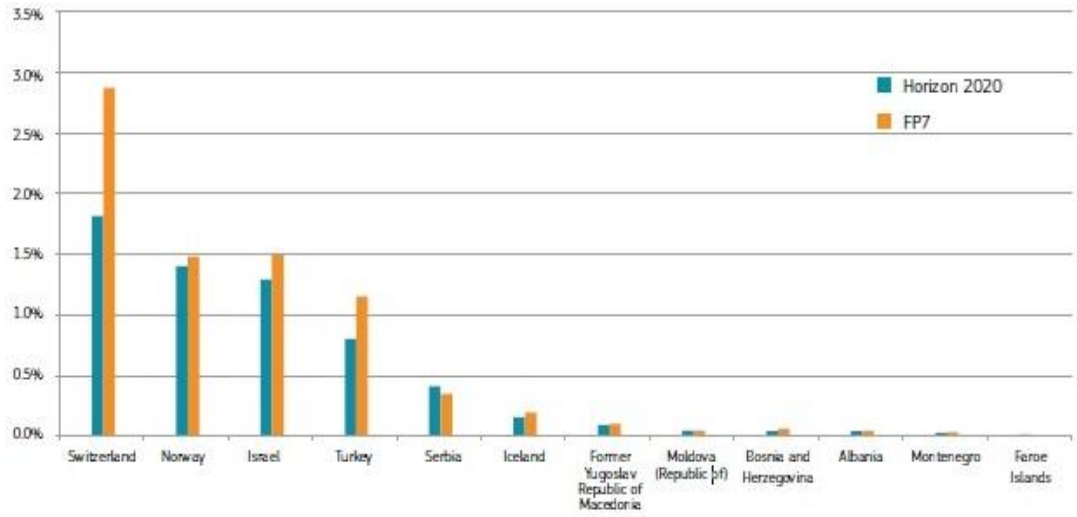
strengthening the capacity of SMEs and to give them advice regarding manufacturing policies. The project which began in January 2009 lasted a total of 48 months with a total budget of 8 million euros. The contribution of the Turkish partners was estimated at 160,000 euros.

As such, it should be added that Horizon 2020 provides a new window of opportunity to increase even more Turkey's participation as well as presence in these areas. Enhancing Turkey's participation in Horizon 2020 as an associated country would undoubtedly be of critical importance in further contributing to its alignment with EU legislation in the area pertaining to science and research. As such, in its progress reports, the Commission did praise Turkey's efforts in this specific area but also indicated the need to further improve Turkey's presence in areas such as societal challenges and also the necessity to involve SMEs in a more systematic way and achieve more success in the first pillar of Horizon 2020 which is devoted to Scientific Excellence. The report also commends Turkey's actions in stimulating and supporting transfer of technology but deems that such policy actions are as of yet not "sufficiently in line with ERA principles and actions" and thus need further boost[10].

In that context, it is reminded that the current level of investment in terms of research in Turkey accounts to approximately 0.95% of its GDP which is well below the EU average which corresponds to 2.07%. One should note though that Turkey's objective in that respect within its 2023 targets is to reach 3% by 2023. As regards to the Innovation Union, the report notes Turkey's actions in terms of contributing to further stimulation and cooperation between academia and industry and reminds that the Innovation Union Scoreboard for 2015 described Turkey as "modest innovator" in comparison to its EU counterparts[11]. As regards the Ministry for EU Affairs, in its National Action Plan for EU Accession (Phase 2: June 2015-June 2019), it underlines the necessity to pursue the work on monitoring, assessing and supporting the participation in the Horizon 2020 Programme[12]. The overarching aim is to contribute in maximising the benefits for Turkey of its participation in the programme. These activities are coordinated by the Ministry for EU Affairs and the Scientific and Technological Research Council.

[10] Ibid.
[11] Ibid.
[12] Ministry for EU Affairs of the Republic of Turkey, "National Action Plan for EU Accession (Phase 2: June 2015-June 2019)", 2014.

Share of eligible applications per Associated Country: Horizon 2020 compared with FP7 (%)



Source: European Commission, 2016

As one can see above, among associated countries, Turkey has ranked fourth regarding the share of eligible applications following Switzerland, Norway and Israel. Albeit, the amount of eligible applications, as of 2016 has decreased to less than 1%, there is a broad interest for participation to EU-funded projects among Turkish universities, research centres and the business community.

With respect to Turkey's participation to Horizon 2020, it is noteworthy to reveal some figures in that respect. According to a report by TRT News in March 2017, Turkey is taking part within the framework of the Horizon 2020 programme with a total fund of 451 million euros. Furthermore, it has been revealed that a total of 219 projects based in Turkey have benefited from these funds, but Turkey has only successfully been given back 70 million euros. In contrast, one should add that Horizon 2020 includes a total of 80 billion euros which includes three pillars such as "Excellent Science", "Industrial Leadership" and "Societal Challenges". The structure follows that of the previous framework programme which was the 7th framework programme to the level of the sub-programmes included within the pillars. As such, it was reported that from a total of 9,913 projects realised within the realm of Horizon 2020, a total of 17 billion euros had already been allocated and spent, of which 10 billion euros was granted to Member States such as Germany (3 billion euros), UK (2.6 billion euros), France (1.8 billion euros), Spain (1.5 billion euros) and the Netherlands (1.4 billion euros) in 2016. Moreover, it was indicated that with a total of 300 universities in Turkey, it has lagged behind Greece in terms of allocated funds from Horizon 2020. As for the business community in Turkey which represents the single largest beneficiary of such funds, the report noted that they were granted approximately 2.5 million euros[13].

[13] Ufuk 2020, "TRT Haber Araştırdı: AB Horizon 2020 Hibe Fonundan Türkiye Neden Çok Az Pay Aldı?", 21 March 2017, http://www.ufuk2020.com/haberler/turkiye-horizon-2020-fonundan-neden-az-pay-aldi.html Date retrieved: 18.04.2017

Conclusion

In conclusion, one can say that Turkey's science and research policy can be further strengthened within the framework of its participation in the Horizon 2020 Programme. In that context, it has clear opportunities to also engage other partners such as SMEs and thus also stimulate its own economy through the strengthening of research and development capacity. Taking into account Turkey's participation in the EU Framework Programmes, it should be underlined that Turkey's own 2023 targets can contribute to its better integration into a common European Research Area. Indeed, the 2023 targets include also further opportunities for the industrial world and benefits for SMEs.

Achieving further results in science and research is paramount as Turkey has successfully already completed the chapter entitled "Science and research" within the framework of its accession negotiations to the EU and of the EU Acquis. Success in programmes with respect to science and research would contribute in enhancing the competitive strength of Turkey with respect to innovation, and as such attract further investments in that respect.

One should remind that Turkey's main goal regarding the 2023 targets in terms of research and innovation is to increase its budget allocated in that area by 3% till 2023. One should note that it is indeed an ambitious objective as the EU average is below that number but not beyond reach if the necessary efforts and political will is thoroughly delivered. Furthermore, it also aims at creating 300,000 additional jobs in that sector by that time[14]. Turkey's successful integration to Horizon 2020 will undoubtedly have a tremendous effect at home for its own research and science community. With a highly competitive and growing economy, Turkey has the potential for further progress but it will need to reach its R&D and innovation objectives to be successful. Indeed, in a highly competitive environment in the 21st century, more and more, in order to give an added value to Turkey's exports, it is of utmost importance that it is fully included in the world of new technologies and transform into an information society.

Therefore, in the upcoming years, in order to further progress in the 2023 objectives in terms of science and research, it could be argued that Turkey could undertake the following action, also in the context of its accession membership with the EU:

- Take steps to facilitate its full integration into the European Research Area (ERA);
- Continue to increase significantly its expenditure allocated to R&D;
- Strengthen the role of its higher education in terms of research and innovation, notably by increasing its cooperation with the industry and SMEs;
- Build on public-private partnerships on specific projects relating to research and innovation.

[14] Wedekind, Gerben K., "Turkey's Research, Development and Innovation Targets for 2023: Realistic or Far-fetched?", Vol. II, Issue 8, pp.19-29, Centre for Policy and Research on Turkey (ResearchTurkey), London, October 2013, http://researchturkey.org/?p=4239 Date retrieved: 19.04.2017