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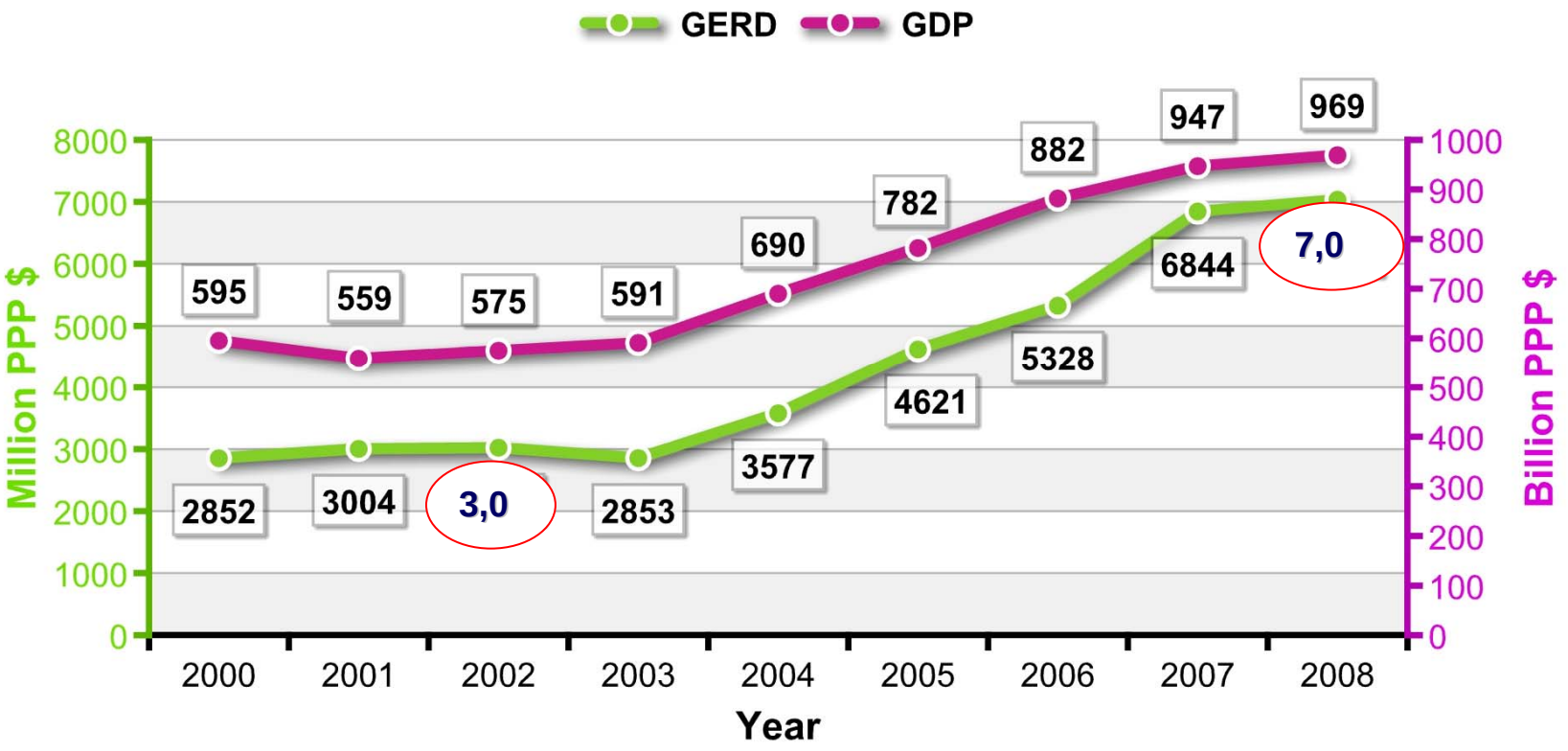
Science, Technology and Innovation Policy & Implementation in Turkey

Professor Omer Cebeci
Vice-President - TUBITAK

25 August 2010 - Alpbach

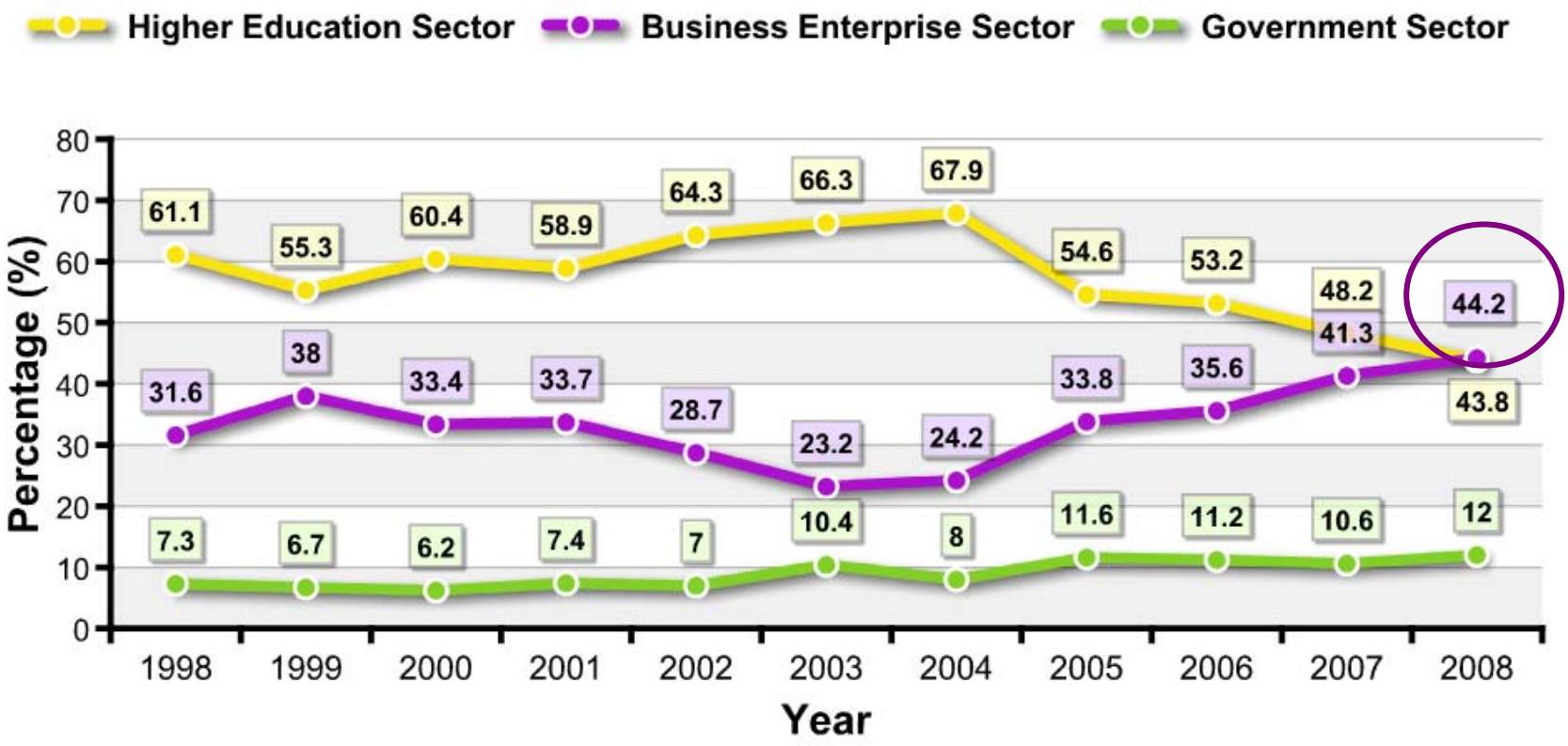
R&D Expenditures



Increased to 2.3 folds during 2002-2008

Source: TurkStat

GERD by Sector of Performance



Share of business enterprise sector surpassed the other sectors for the first time in 2008

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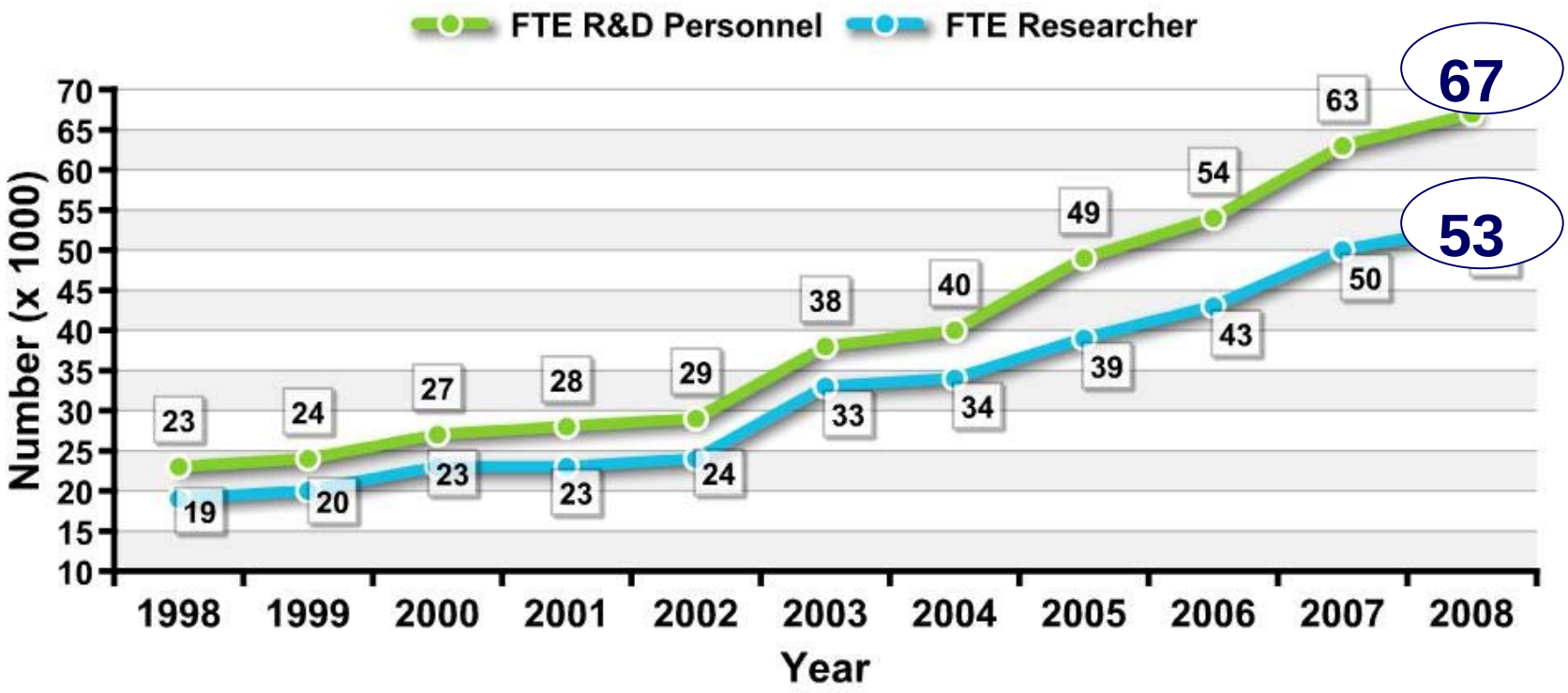
FTE R&D Personnel



Increased to 2.3 fold during 2002-2008
TR Target 150 000 by 2013

Source: TURKSTAT

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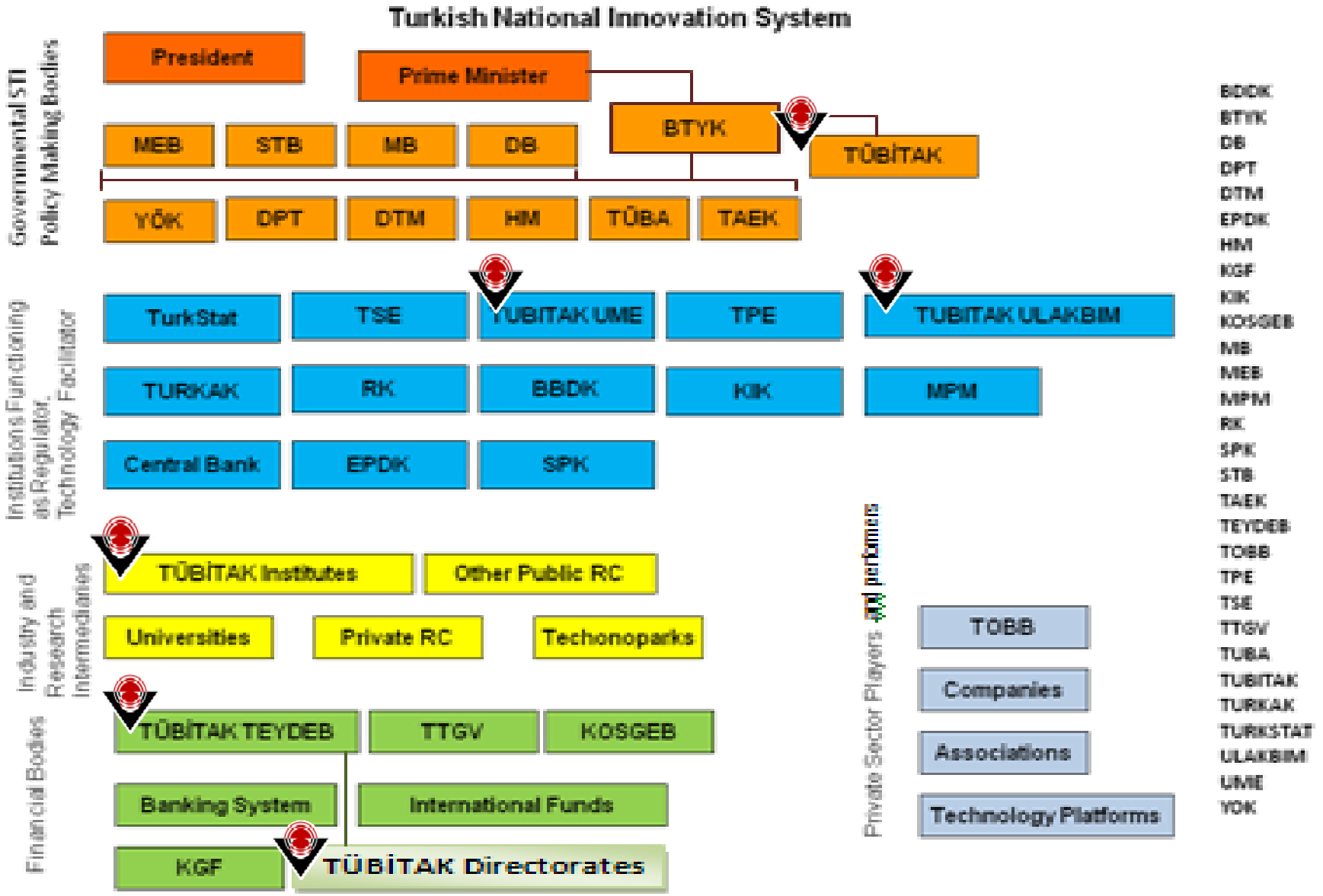
Turkish National R&D & Innovation System



TUBITAK`s Budget

Total ~$700 million / year

- Funding (~$400 million/ year)
  - ✓ Academic research project grants (~$100 million)
    (< 4000 proposals; > %30 selected for funding)
  - ✓ Industrial, R&D and innovation grants (~$270 million)
    (<2000 proposals; >%30 selected for funding)
  - ✓ People support-Scholarships & Fellowships (~ $40 million)
- Research – Institutes (~ 3000 Researchers,
  ~ $120 million contract research revenue)

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Vision 2023: Science and Technology Strategies

Technology Foresight Project was conveyed based on two methodologies:

- Technology Foresight Panels
  - ✓ Had the task of building visions and imagining desirable futures
  - ✓ *Around 200 panel meetings and enlarged workshops took place*
- Two Staged Delphi Survey
  - ✓ Aimed at addressing the likelihood of achieving the envisaged technological developments as well as testing the Delphi statements against a set of criteria (Delphi variables)
  - ✓ *7,000 experts from academia and the industry had the opportunity to partake in the Delphi survey*

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Foresight Panels of Vision 2023

10 Socio-Economic and 2 Thematic Panels

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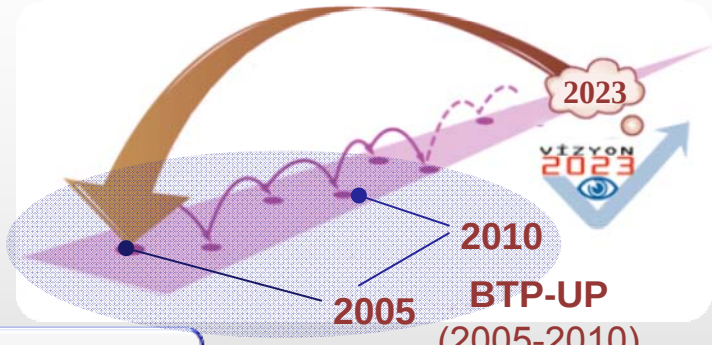
BTP-UP (S&T Policy - Implementation Plan)

The first plan aimed to springboard the country towards the long-term aims for 2023 based on Vision 2023.



Strategic Objectives

1. Increase S&T awareness in society and improve STI culture
2. Advance the quality and quantity of human resources for S&T
3. Support high quality, result-oriented research
4. Enhance the effectiveness of STI governance
5. Boost the S&T performance of the private sector
6. Improve the research climate and research infrastructure
7. Further the effectiveness of national and international networks

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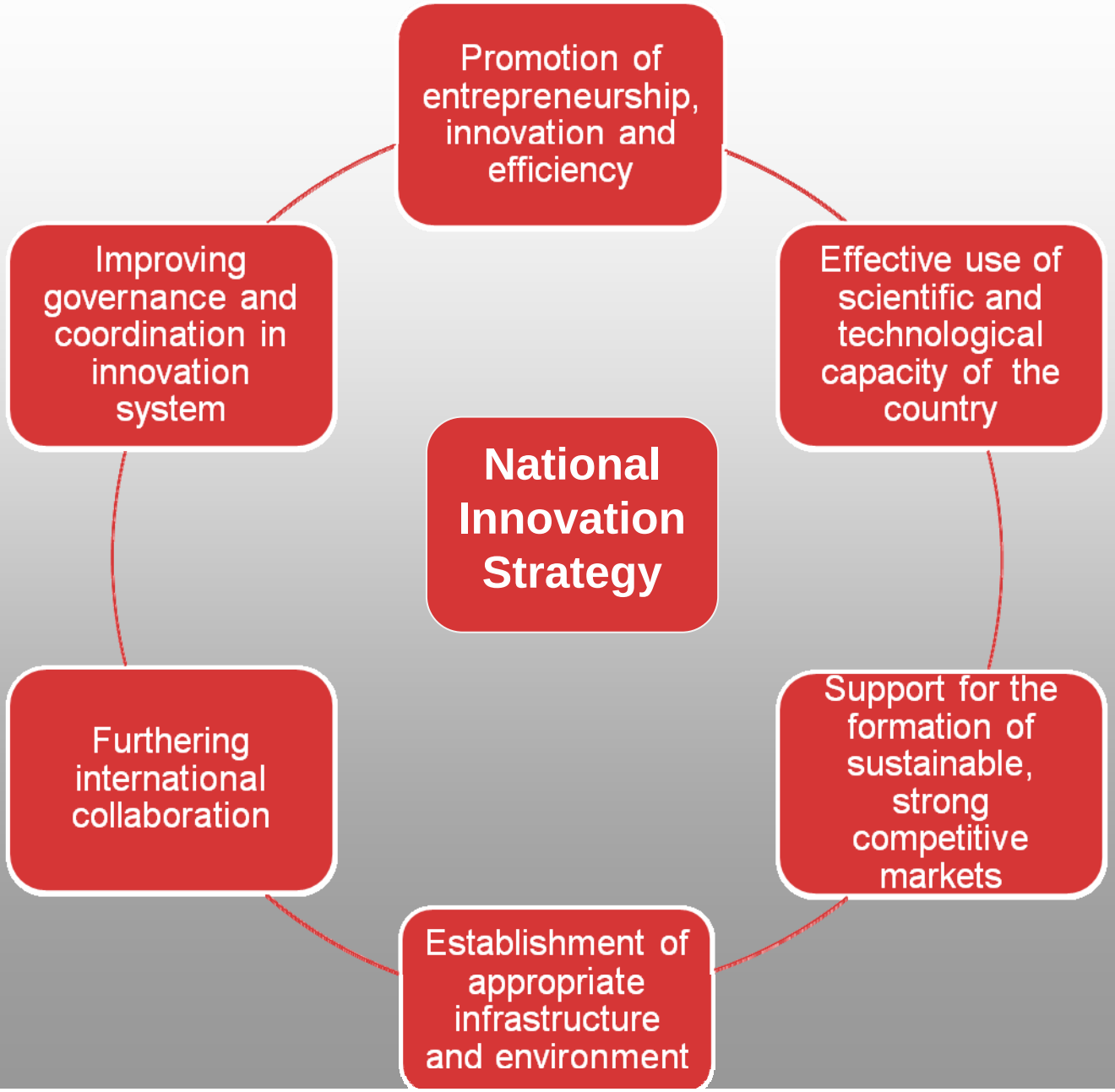
National Innovation Strategy (2008-2010)



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International STI Strategy (2007-2010)

1. Establishing strong STI relations with countries of political, economic, commercial, cultural, strategic etc importance for Turkey
2. Developing concrete, effective and sustainable cooperation frameworks with advanced countries in STI, taking steps to improve existing relations
3. Creating effective communication channels with scientists abroad, facilitating and encouraging their participation in STI activities in Turkey
4. Providing convenience for the firms active in STI to collaborate and invest with their international counterparts
5. Ensuring coordination in the STI activities of the TARAL stakeholders composed of public and private institutions, universities and NGOs.

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Examples of Policy Instruments

Industrial R&D Projects Grant Program (TUBITAK/DTM)

- The largest grant program for the R&D and innovation projects of the private companies (both large enterprises and SMEs)
- The grant ratio provided by this program can be up to 60% of a project's budget and the support duration of the projects is a maximum of 3 years
- Aiming to increase technology development capability, innovation culture, and competitiveness of Turkish companies

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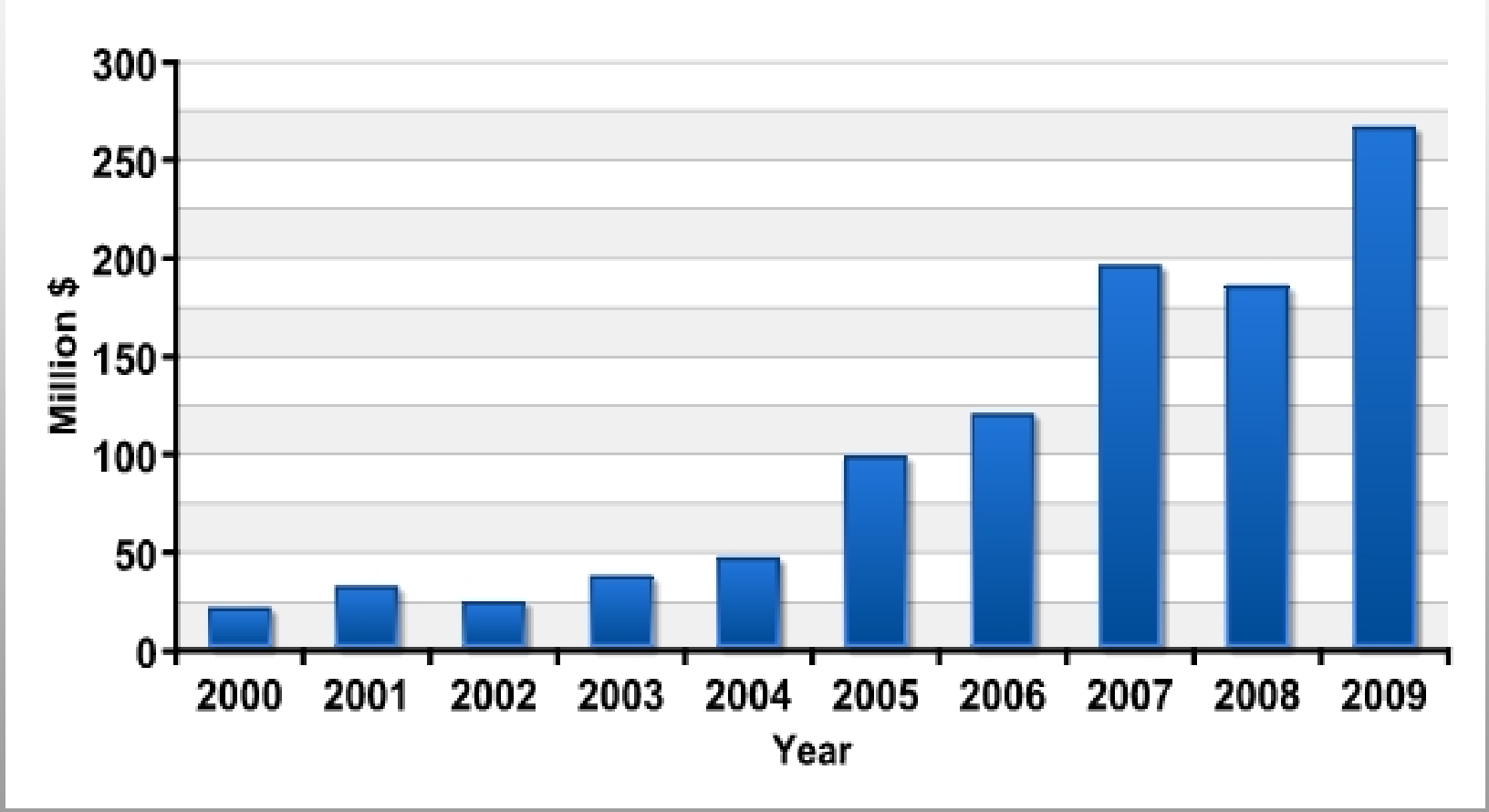
Examples of Policy Instruments

Industrial R&D Projects Grant Program (TUBITAK/DTM)



Distribution of total grants during 2000-2009 for all grant programs of TUBITAK-TEYDEB

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Examples of Policy Instruments

Strengthening Demand for R&D and Innovation Through Public Procurement

- **Public Research Agenda:** within the frame of SCST decree (2005/5), aiming "to satisfy the R&D needs of public institutions and to foster R&D demand at societal level," public institutions are to develop research programs, including detailed content on schedule and cost.
- **Funding Program for Research Projects of Public Institutions :** aiming to address public institutions' R&D needs by encouraging partnerships between the industry, academia, and public research institutions.

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Examples of Policy Instruments

Stimulating R&D activities: New R&D Law

The new tax regime provides vast incentives for business R&D:

- Tax allowance has been increased from %40 to %100.
- R&D expenditures can be depreciated in the following 5 years by 100%.
- Additional allowance is provided to R&D centers employing more than 50 R&D personnel on a performance basis.
- Exemptions in income tax for R&D personnel employed in the private enterprise sector.
- Allowance is 90% for PhD holders, otherwise 80%
- The grant received from public or international R&D funds is exempt from income tax.

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From 2002 to 2007 Turkey Outpaced

- Two countries regarding GERD (Finland, Denmark)
- Six countries regarding FTE R&D Personnel (Finland, Denmark, Belgium, Austria, Greece, Romania)
- Five countries regarding FTE Researchers (Finland, Denmark, Belgium, Austria, The Netherlands)
- Four countries regarding Scientific Publications (Belgium, Poland, Taiwan, Israel)

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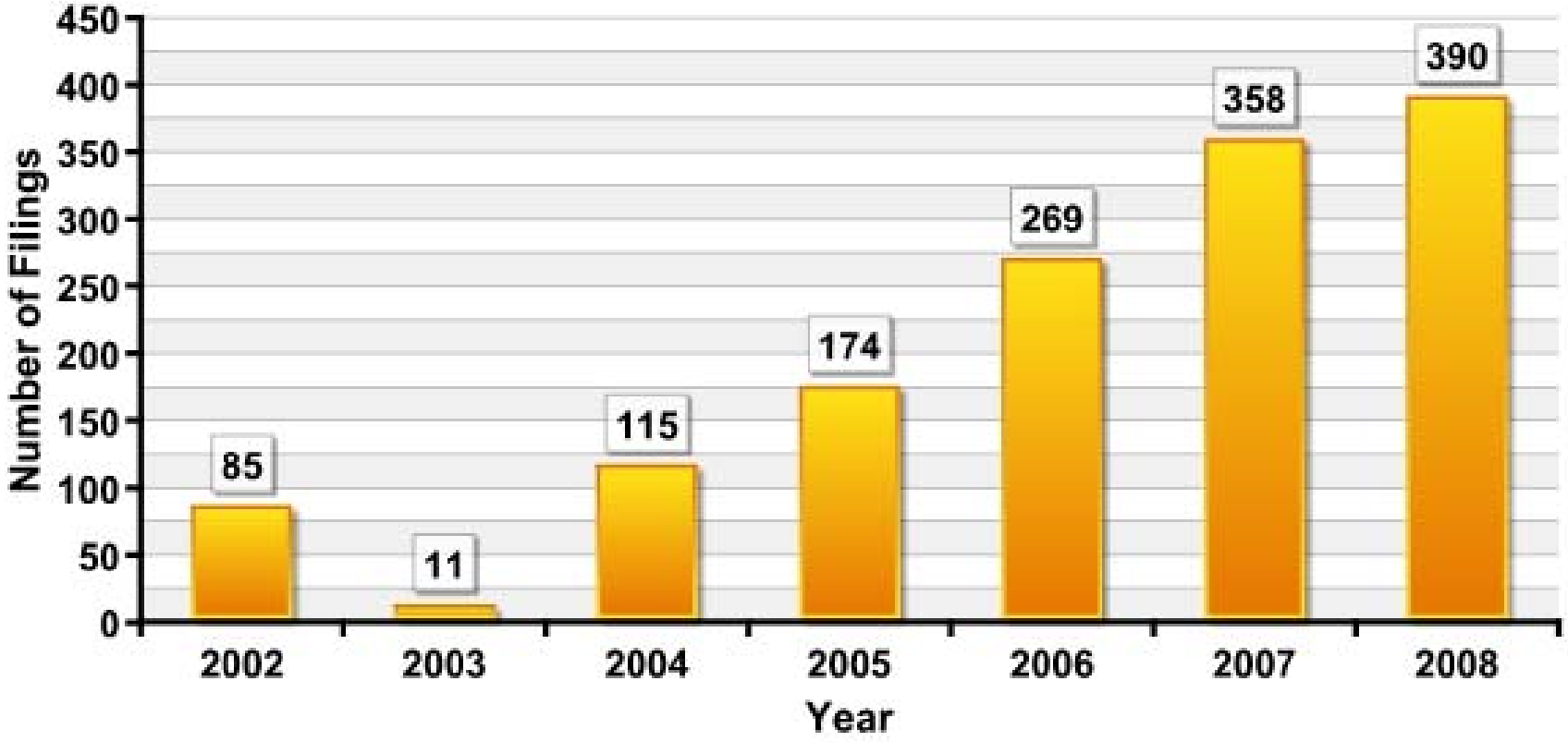
Patent Applications From Turkey Within the Framework of Patent Cooperation Treaty (PCT)



Moreover, from 2002 to 2008 the number of domestic patent filings and grants increased respectively to 5,4 and 4,6 folds.

Source: Turkish Patent Institute and WIPO

Attracting Multinational R&D

The new tax regime provides vast incentives for multinational R&D:

•Tax allowance has been increased from %40 to %100.

• R&D expenditures can be depreciated in the following 5 years by 100%.

• Additional allowance is provided to R&D centers employing more than 500 R&D personnel on a performance basis.

• Exemptions in income tax for R&D personnel employed in the private enterprise sector.

  - Allowance is 90% for PhD holders, otherwise 80%

• The grant received from public or international R&D funds is exempt from income tax.

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Bilateral Cooperations with the Participant Countries

Ukraine:

TÜBİTAK has bilateral cooperation agreements with:

- The Ministry of Ukraine for Science and Technology and
- The National Academy of Sciences of Ukraine (NASU)

There are 11 ongoing bilateral projects jointly supported by TÜBİTAK and the Ministry of Science and Technology. There are 5 ongoing bilateral projects jointly supported by TÜBİTAK and (NASU).

Bosnia-Herzegovina and Serbia:

TÜBİTAK does not have active bilateral cooperation with these two countries. The process of signing a bilateral cooperation agreement with Bosnia-Herzegovina has been started. Same process is planned to be initiated with Serbia.

Austria:

TÜBİTAK does not have active bilateral cooperation with Austrian Institutions. Some initiatives for having a bilateral agreement with Austrian Academy of Science were started by TÜBİTAK. However, Academy couldn't sign an agreement with TÜBİTAK since they already have an agreement with another Turkish institution namely, Turkish Academy of Sciences.

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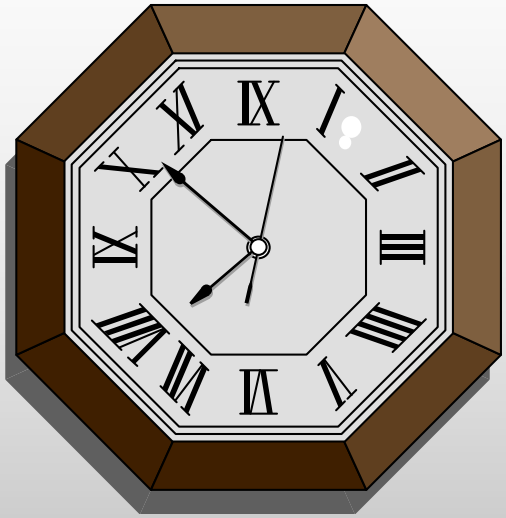

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R&D Performing

Regarding the current and future needs of the country,beside funding R&D, through its research centers and institutes TÜBİTAK also conducts R&D projects with a high risk that cannot be undertaken by the industry.

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History

- Foundation of TÜBİTAK, 1963, Ankara
- Mission; Developing policies for science & technology, Funding and Research.
- Foundation of Marmara Research Center, 1972, Gebze.
- Area, 8000 acres.
- Some Institutes are separated from Marmara Research Center and report directly to the TÜBİTAK Presidency.

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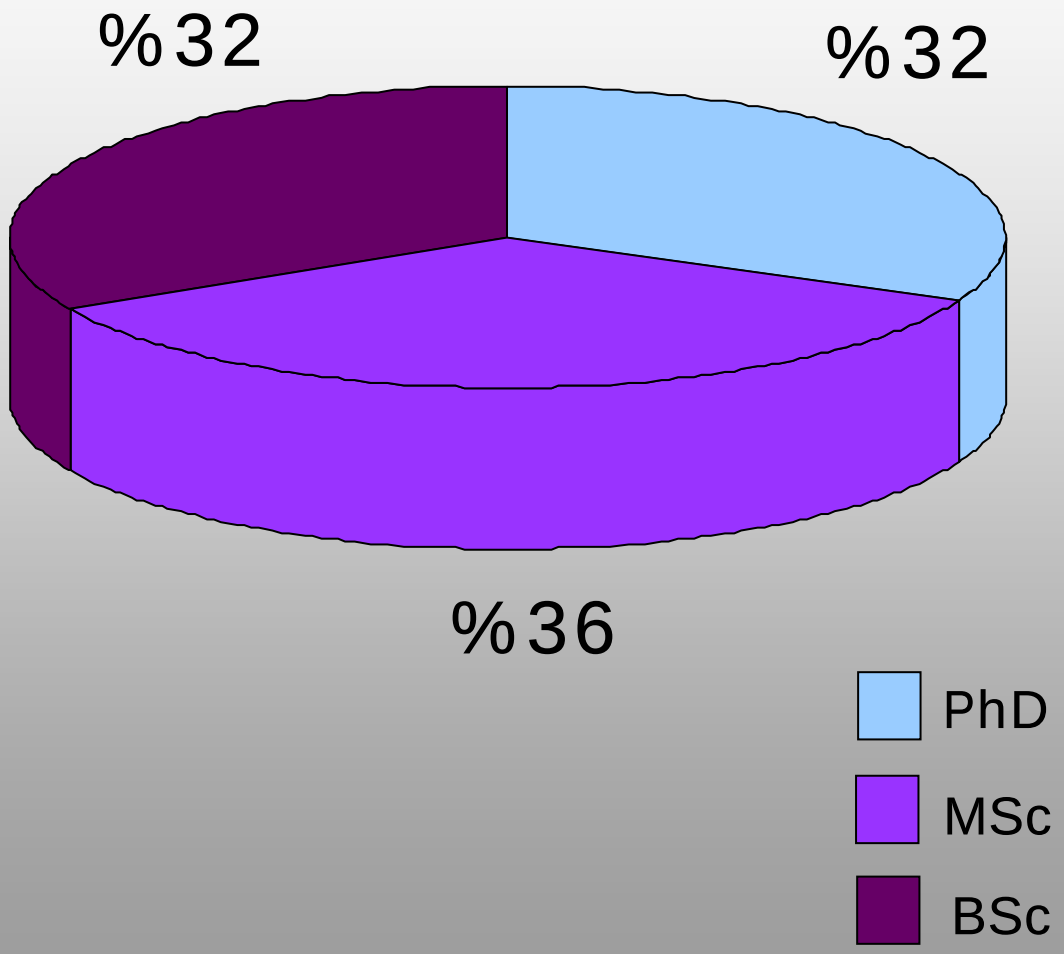
Researcher Profile



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Services

Projects

- **Industrial**
- **Strategic**

Industrial Services

- Testing
- Analysis
- Consultancy
- Training

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RESEARCH CENTERS AND INSTITUTES

- Marmara Research Center (MAM) www.mam.gov.tr
  - Information Technologies Research Institute
  - Chemistry and Environment Institute
  - Energy Institute
  - Food Institute
  - Materials Institute
  - Earth and Marine Sciences Research Institute
  - Genetic Engineering and Biotechnology Research Institute
  - Technopark
- National Electronics and Criptology Research Institute (UEKAE) www.uekae.tubitak.gov.tr
- Defence Industry Research and Development Institute(SAGE) www.sage.tubitak.gov.tr
- Space Technologies Research Institute (UZAY) www.uzay.tubitak.gov.tr

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MARMARA RESEARCH CENTRE - GEBZE

The leading science and technology center in applied research

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MAM – Food Institute

- Food processing technologies
- Food microbiology and biotechnology
- Food preserving and packeting technologies
- Food quality control

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MAM - Information Technologies Research Institute

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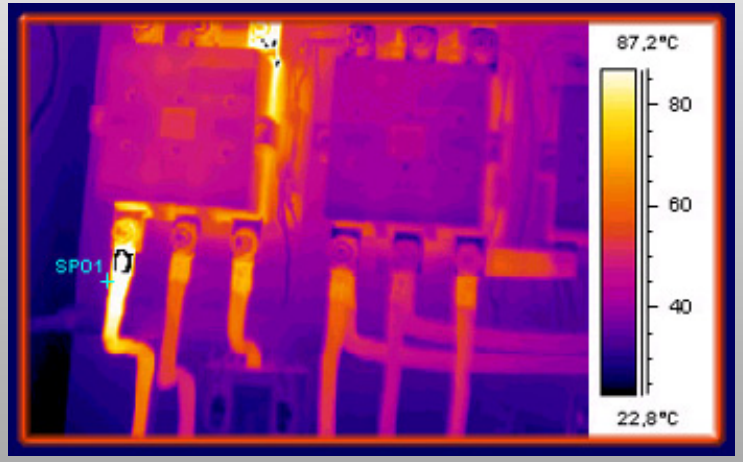
MAM – Energy Institute

- Platform and sensor Technologies
- Advanced energy Technologies
- Fuel technologies
- Power electronics



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MAM – Materials Institute

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MAM – Earth and Marine Science Research Institute

- Earthquake researches
- Marine research
- GPS-sensitive positioning applications

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MAM - Genetic Engineering and Biotechnology Research Institute

The Institute is engaged in

- ✓ research on industrial enzymes
- ✓ plant molecular biology&biotech
- ✓ diagnostics
- ✓ vaccines & transgenic animals

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National Research Institute of Electronics and Cryptology

Research Areas

Information security

Microelectronics

Electro-optics

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MARMARA
TEKNOKENT A.Ş.

MARMARA TECHNOPARK

(*MARTEK*)

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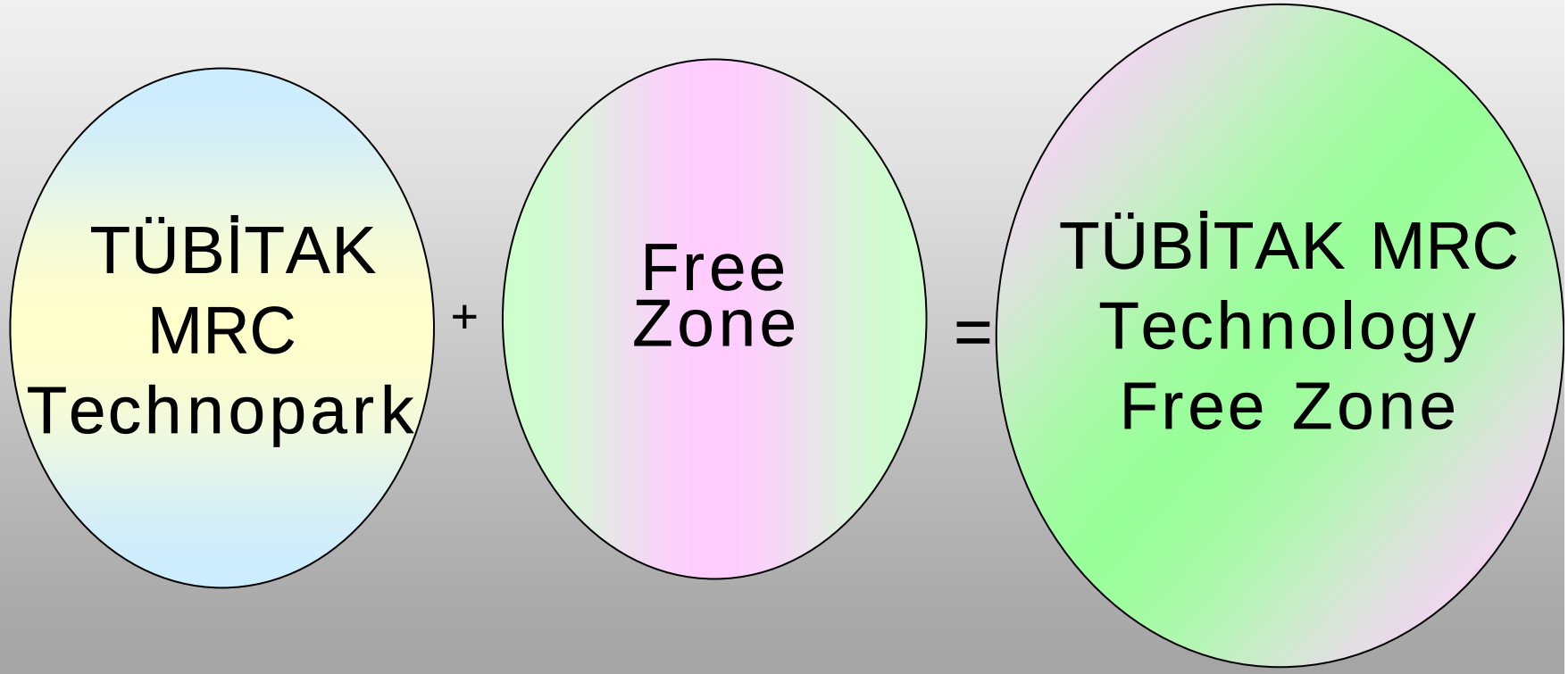
MARTEK

Technopark and Technology Free Zone



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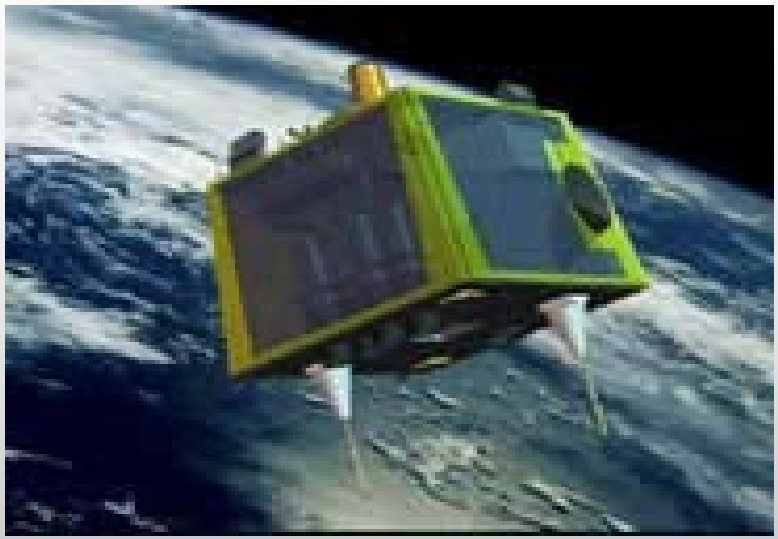
Space Technologies Research Institute - ANKARA



to carry out research mainly on;

- ✓ **computer hardware and software,**
- ✓ **electronics and communications,**
- ✓ **image processing and coding,**
- ✓ **power and control systems related to information technology**

in accordance with the national development plans.

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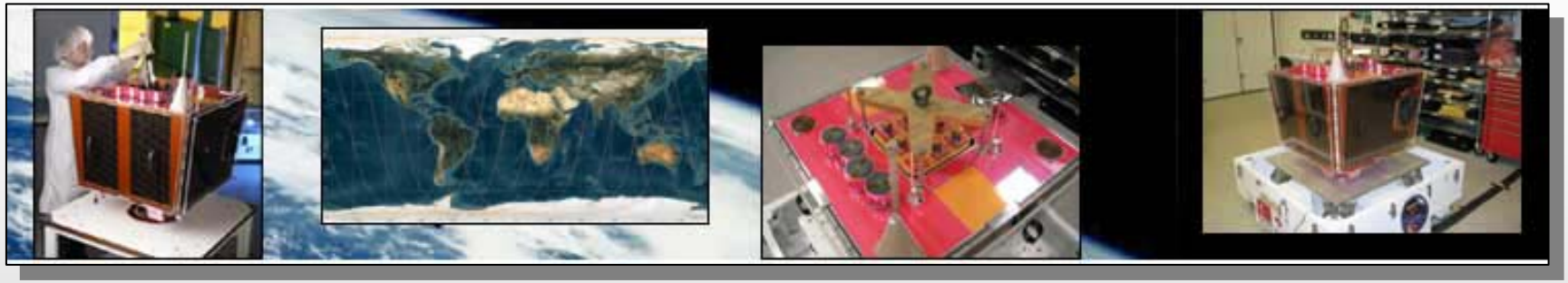
Space Technologies Research Institute - ANKARA



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Defence Industries R&D Institute - ANKARA

The Institute is engaged in research on

- ✓ **composite solid fuels,**
- ✓ **rocket engine design,**
- ✓ **missile aerodynamics and flight mechanics,**
- ✓ **materials, mechanical design methods,**
- ✓ **electro-optics and defence support systems and control systems.**

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Basic Sciences Research Institute - İSTANBUL

- Basic Science Research Institute to promote basic research in the fields of

✓ mathematics

✓ physics

✓ biology

- Others Institutes and Facilities:
  National Academic Network Center
  National Observatory
  National Metrology Institute
  Turkish Industry Management Institute

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National Academic Network Center - ANKARA

- ✓ to establish, operate, enlarge and update a computer network
- ✓ to provide information technologies support to help production of

information.

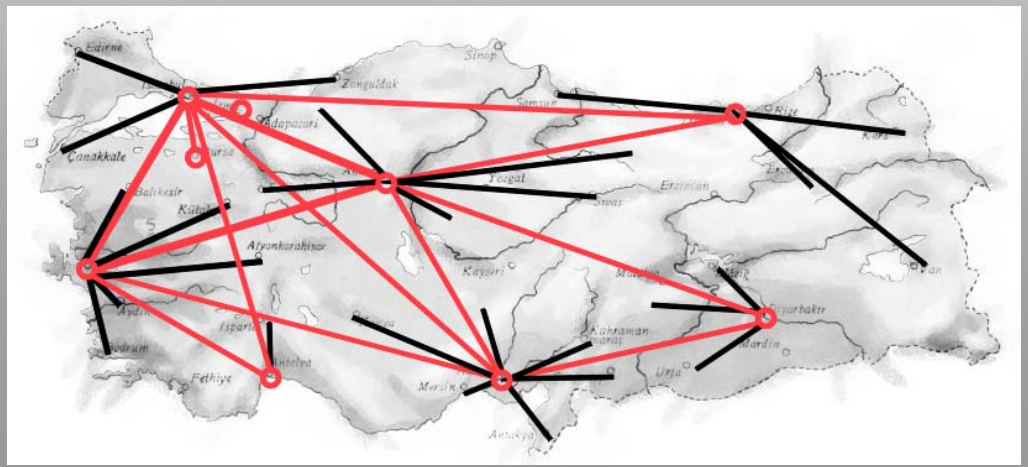
- ✓ this Network provides access to all universities and research

organisations in Turkey, to the global Internet through more than

120 connections.

ULAKNET

National Academic Network



- 235 terminal connections
- Capacity: 155 Mbps

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NATIONAL METROLOGY INSTITUTE - GEBZE

- ✓ Establishing and maintaining national measurements standards
- ✓ Ensuring traceability of national standards to international standards
- ✓ Establishing a national measurement system
- ✓ Assessing the laboratories to join the Turkish Calibration Service
- ✓ Conducting measurement, calibration & metrology research
- ✓ Contributing to the improvement of product quality

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TÜBİTAK National Observatory - ANTALYA

✓encouraging and directing research projects in the areas of astronomy and space

✓The Observatory offers the services of two telescopes (one 1.50 m, the other 400 mm in diameter) and an astrolabe station to the use of Turkish universities as well as other national and international cooperating institutions.

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Test & Analysis Laboratories - **ATAL** & BUTAL





Equipped with sophisticated instruments of chemical analysis, nuclear magnetic resonance spectrometers, atomic absorption spectrometers, ion chromatography, liquid chromatography / mass spectrometer, elemental analysis equipment etc., these laboratories offer service to universities, industry and public institutions.

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Knowledge - R&D & Technology Cost per Kg

Concrete	1 cent
Cement	5 cents
Steel	50 cents
Aluminium	$1.5
Automobile	$10 to $100 - $ 5(materials)
Passenger Aircraft	$100 to $ 1000
Fiberoptical Cable	$ 3000 - $ 1(glass)
Combat aircraft	$ 10 000
Communication Satellite	$ 100 000 - $ 100 (materials)
Microprocessor (Si) Chip	$ 4 000 000 - $1(silicone)

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Technology Widening Rich-Poor Gap

- Technological advances have made the biggest contribution to widening income inequality across the world
- The contribution of globalization is less important (1/5th)
- Trade globalization has helped reduce inequality
- Financial globalization and foreign direct investment (FDI) in particular has tended to increase it

Source: IMF

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Technological Achievement & Diffusion in Developing Countries

- Much of the economic and social progress of the past few centuries has been due to technology
- Technology has been central to both economic growth and many elements of social welfare that are only partly captured by standard measures of gross domestic product (GDP)
- The private sector and the efficient functioning of markets are key to technological progress
- Policy supports technological progress by facilitating the smooth operation of markets
- Active measures to promote technology diffusion and strengthen the linkages between firms and research and development agencies are vital

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Technological Achievement & Diffusion in Developing Countries

- Technological progress at the national level can occur through scientific innovation and invention through the adoption and adaptation of preexisting, but new-to-the-market, technologies; and through the spread of technologies across firms, individuals, and the public sector within the country

- A developing country's ability to absorb and adopt foreign technologies depends on two main factors: the extent to which it is exposed to foreign technologies and its ability to absorb and adapt those technologies to which it is exposed

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Technological Progress and Development

Technological progress can contribute to development in two broad ways:

- By lowering costs, improving quality, creating new products, and helping reach new markets
- By using relatively simple skills for far-reaching development benefit

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Technological Progress and Development

Summary index of technology,

- The extent of scientific invention and innovation
- The diffusion of older technologies
- The diffusion of newer technologies
- The intensity with which foreign technologies are employed in domestic production

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Spread of Technology depends on ...

- Governance and the business climate
- Basic technological literacy
- Financing of innovative firms
- Proactive government policies

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