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Contribution by Türkiye

to the CSTD 2025-2026 priority theme on "Science, Technology and Innovation in the age of AI"

PRIORITY THEME 2: Science, Technology and Innovation in the age of AI

United Nations Commission on Science and Technology for Development (CSTD)

Dear CSTD Member

The 28th CSTD annual session selected "Science, Technology and Innovation in the age of AI" as one of the priority themes for its 29th session (2025-2026). This theme directly addresses SDG 9 "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" at the 2030 Agenda.

The rapid rise of frontier technologies and the surge in data generation are transforming research and development. Artificial intelligence, as a general-purpose technology, will further accelerate this transformation. These changes in research and development practices offer significant opportunities for inclusive industrialisation and innovation, which are the core objectives of SDG 9.

Under this theme, the Commission could discuss how the use of AI and data would impact research and development processes in science and industry and identify the institutional and policy conditions required to harness these technologies for inclusive and sustainable industrialization and innovation. In this context, the Commission can examine the challenges and opportunities specific to countries at different levels of development; identify good practices and policies to support domestic technological development, research and innovation; and explore ways to leverage international cooperation to bridge the uneven technological capabilities and steer technological progress toward sustainable development.

The CSTD secretariat is in the process of drafting an issue paper on the theme to be presented at the CSTD inter-sessional panel meeting to be held in November 2025. In this context, we would like to solicit inputs from CSTD member States on this theme. We would be grateful if you could kindly answer the following questions based on your experience in your country.

1. Can you provide some successful examples of how AI and data are being used to advance science and innovation in your country? *(Please describe how these applications transformed research and development practices and their impacts)*

   Türkiye, within the framework of the National Artificial Intelligence Strategy (2021–2025), has made significant progress by effectively utilizing artificial intelligence (AI) technologies and data-driven approaches in scientific research and innovation processes.

   In this context, under the coordination of the Ministry of Industry and Technology of the Republic of Türkiye, the "Pre-Competitive Cooperation Projects – Turkish Large Language Foundation Model Sectoral Adaptation Call" is being implemented. Through this call, sector-specific AI solutions with Turkish natural language processing capabilities are being developed in various fields including finance, education, health, industry, and public services. Large language models are being enhanced with capabilities covering multiple data types such as text, audio, image, and video processing, thereby achieving high efficiency in areas such as automation, data analysis, content generation, and decision support systems in R&D processes. Within the scope of the call, each project is eligible for a grant of up to USD 1.23 million (50% support rate), and more than 20 large-scale project applications are expected.

   Within TÜBİTAK BİLGEM, the Artificial Intelligence Institute has been implementing the "1711 Artificial Intelligence Ecosystem Calls" since 2022. These calls bring together companies, universities, and public research centers to form consortia aimed at developing innovative AI solutions tailored to industry needs. Projects are carried out in thematic areas such as smart education, smart agriculture and food, financial technologies, smart manufacturing systems, climate change, and sustainability. Between 2022–2024, a total of 43 projects have been supported with a budget exceeding USD 5.31 million.

   The Turkish National Science e-Infrastructure (TRUBA), hosted by TÜBİTAK ULAKBİM, provides GPU-supported high-performance computing (HPC) infrastructure for AI research, including large language models, robotics, and deep learning studies. It accelerates model development processes and reduces R&D costs.

In addition, the “Turkish Large Language Model”, developed under the leadership of BİLGEM, is the first foundation model fully trained on Turkish data, taking into account the cultural context of the language. It offers domestic and culturally aligned solutions for many R&D processes such as data analysis, automated reporting, content creation, and knowledge discovery.

Under the Artificial Intelligence Supercomputer Investment Program, the ARF Supercomputer has been commissioned to support the rapid development of the AI ecosystem. ARF, with over 80,000 processor cores, 312 GPU cards, and 14 Petabytes of high-performance storage capacity, is Türkiye’s most powerful supercomputer. It provides computing power equivalent to approximately 40,000 high-end laptops, enabling groundbreaking opportunities in scientific research. The program also includes the planned procurement of a quantum computer based on a superconducting qubit architecture, with at least 20 physical qubits. Furthermore, through the EuroHPC Program, TÜBİTAK ensures national access to the MareNostrum5 supercomputing infrastructure in Spain.

Within the framework of Navigation Systems and AI Applications, it is aimed to develop national navigation systems, search engines, and digital platforms such as social media domestically. This initiative is critical for strengthening technological independence, reducing foreign dependency, enhancing national data security, and ensuring that the economic value generated through these platforms remains within the country. With the widespread use of smartphones, rapid population growth, and urbanization, as well as increasing traffic, the demand for such applications is growing rapidly. In this context, a domestically developed map and navigation application will be created to meet Türkiye’s unique geographical, transportation, urban planning, and cultural needs while also contributing to the digital transformation process. Turkish Large Language Model and AI-powered next-generation applications will be utilized in this process.

The National Omics Platform plays a critical role in understanding diseases at the molecular level, enabling early diagnosis, monitoring disease progression, and developing personalized treatment strategies. By ensuring the reliable and systematic collection, storage, and AI-based analysis of large datasets, the platform aims to provide modern solutions in biotechnology and medicine. Integrated with AI and personalized medicine, it has the potential to form the basis of intelligent healthcare systems centered on systems biology. The platform will foster collaboration between academic and industrial stakeholders, paving the way for innovative and pioneering work in biotechnology. Thus, it will make significant contributions to a wide range of biomedical applications, from cancer treatment to the management of metabolic diseases.

The impact of these efforts on R&D processes has been transformative, accelerating the pace of developing innovative technologies, reducing costs, and shortening commercialization timelines. AI technologies have sped up stages such as modeling, simulation, and data processing, while sector-specific adaptations have delivered high value-added solutions directly addressing institutional needs. Knowledge transfer has been strengthened through university–industry–public collaborations, ensuring holistic development within the ecosystem. Domestic AI infrastructures and models have reduced foreign dependency in strategic areas, reinforcing technological independence.

With these examples, Türkiye has not only transformed its R&D processes but also made significant progress toward building an inclusive, sustainable, and competitive AI ecosystem.

2. What specific challenges, bottlenecks, or failures have you encountered in implementing AI and data for science and innovation? What are the lessons learned?

One of the most significant challenges identified during AI-driven R&D activities has been the quality, accessibility, and interoperability of industry-generated data. Often, industry data sets are fragmented, heterogeneous, and restricted in terms of accessibility. This poses considerable delays in the development and implementation of AI models. YZE has addressed these challenges by deploying dedicated data preparation specialists within projects and establishing standardized processes for data management and integration.

Furthermore, organizational resistance towards AI technologies, primarily due to the perception of "black-box" AI, has emerged as a significant challenge. To mitigate this, YZE emphasizes transparency through interpretable models and conducts extensive educational outreach to

stakeholders, fostering greater acceptance of AI integration. The primary lessons learned include the necessity of prioritizing robust data management processes and the importance of transparent, explainable AI models from the outset.

3. Has your country implemented national strategies or policy instruments to support AI and data for science and innovation? *(Please describe how ethical considerations—such as fairness, transparency, privacy, and accountability—are being incorporated and provide relevant details such as links, budget, evaluation, or other information to characterize them)*

   Türkiye has developed and implemented comprehensive national policy frameworks to support the effective use of artificial intelligence (AI) and data in the fields of science and innovation. In this context, the National Artificial Intelligence Strategy (2021–2025) and the 2030 Industry and Technology Strategy (2030 ITS) have been published. Furthermore, a new artificial intelligence strategy covering the upcoming period is currently under preparation.

   In the first year of the 2021–2025 National Artificial Intelligence Strategy (NAIS), an action plan was adopted and put into effect. Taking into account global trends shaped by the paradigm shift brought by AI in economic and social life, as well as Türkiye's current situation and development goals, 119 measures and policies were identified. Accordingly, the vision of the NAIS was set as *"to generate value on a global scale with an agile and sustainable AI ecosystem for a prosperous Türkiye."* To realize this vision, the NAIS was designed around six strategic priorities, aligned both with national policy needs and recommendations of international organizations:

   Strategic Priority 1: Training AI experts and increasing employment in the field

   Strategic Priority 2: Supporting research, entrepreneurship, and innovation

   Strategic Priority 3: Expanding access to quality data and technical infrastructure

   Strategic Priority 4: Establishing regulations to accelerate socio-economic adaptation

   Strategic Priority 5: Strengthening international cooperation

   Strategic Priority 6: Accelerating structural and workforce transformation

   Within the framework of the NAIS, thematic work has started in areas such as "Data Governance," "Human Resources," "Technical Infrastructure and Platforms," "AI Law and Ethics," "Trustworthy and Responsible AI," "Public AI Ecosystem," and "AI Competence Development Center." Dedicated working groups of experts have been established for each area.

   Policy Instruments and Programs under the NAIS:

   - Since 2022, the 1711-AI Ecosystem Call has been launched to transform AI technologies developed by domestic companies into products or solutions that address the needs of other companies in Türkiye. Through these calls, the TÜBİTAK AI Institute (YZE) supported 43 projects prioritizing sectoral collaboration in 2022 and 2024.
   - The Public AI Ecosystem Call, jointly managed by TÜBİTAK KAMAG and the TÜBİTAK AI Institute, encourages AI-based solutions for public sector needs. In 2023, five consortia were supported, while in 2024, projects have been developed to address the needs of six public institutions in areas such as financial technologies, smart manufacturing, agriculture and livestock, climate change and sustainability, e-commerce, and smart education technologies.
   - Additional capacity has been installed in the National Academic Grid Infrastructure (TRUBA), now offering 80,000 CPU cores, 312 GPUs, and 14 PB storage to over 6,000 registered users free of charge, supporting 192 research projects so far. In addition, 192 H200 GPUs have been procured and deployed.
   - Türkiye is a partner of the EuroHPC Joint Undertaking, and active use of the *MareNostrum5* supercomputer in Barcelona has been enabled.
   - Under the leadership of TÜBİTAK ULAKBİM, needs analysis for Türkiye's AI processor infrastructure is being carried out to strengthen national capacity for AI solutions and generative AI models.

- International cooperation has been expanded in the development of Turkish large language models, including initiatives with member and observer states of the Organization of Turkic States.
- The TechVisa Program facilitates attracting AI talents to Türkiye. Since September 2022, 76 AI experts have applied, and 70 were granted technological eligibility. In 2024, 14 AI start-ups received approval under the TechVisa scheme.
- The AI Specialization Program within the National Technology Academy provides essential human capital development. In the 2023–2024 academic year, 500 students completed the specialization stage; in 2024–2025, 560 students are currently continuing their specialization training. Students benefit from mentorship, internships, and hands-on projects, directly contributing to the National Technology Initiative.
- The Sector on Campus Program, implemented jointly with the Council of Higher Education (YÖK), promotes university–industry cooperation. It currently involves 104 companies and 204 universities, reaching over 16,000 students through more than 600 courses, including 59 AI-focused courses that have trained nearly 2,000 students.
- At TEKNOFEST, the world's largest aviation, space, and technology festival, AI has been a central theme in technology competitions. In 2024, more than 14,000 applications were received across 12 AI-related categories, including Health, Transportation, Turkish Natural Language Processing, and T3AI Hackathon.

AI Principles:

The following principles guide both current strategies and future applications of AI in Türkiye:

- Proportionality: AI systems must remain aligned with legitimate purposes and contexts, with risk assessments carried out to prevent harm.
- Safety and Security: AI systems must be robust, reliable, and resilient against risks, supported by secure and privacy-preserving data frameworks.
- Fairness: AI must provide equal and just services, preventing discrimination across different demographic groups, cultures, languages, and vulnerable communities. Oversight and accountability mechanisms must be in place to prevent bias.
- Privacy: AI systems must respect and protect privacy throughout their lifecycle, ensuring data collection, use, storage, and deletion comply with human dignity and data protection rules.
- Transparency and Explainability: AI decisions, data, and models must be transparent and explainable in clear and non-technical terms to stakeholders.
- Responsibility and Accountability: All actors in the AI lifecycle are accountable for proper functioning and compliance with AI principles, with mechanisms for human oversight, risk analysis, and third-party audits.
- Data Sovereignty: The use of data must respect sovereignty rights, comply with international rules, and ensure secure data circulation.
- Multi-Stakeholder Governance: Inclusive governance is vital, involving public institutions, civil society, international organizations, academia, private sector, youth, and other stakeholders, based on open standards and interoperability.

4. Does your country promote open innovation or open data? If not, why? If yes, can you share specific projects and outcomes? *(Please provide relevant details such as links, budget, evaluation, or other information to characterize them)*

Türkiye has institutionalized the approach of open data and open innovation within its national strategy documents. Concrete mechanisms such as the Open Data Portal, the National Data Dictionary, the Public Data Space, and the Türkiye Open Source Platform are being promoted. Measurable targets have been defined in these areas, and monitoring/evaluation mechanisms and implementation steps have been established.

Policy Framework and Governance:

The National Artificial Intelligence Strategy (2021–2025) addresses elements of open innovation—such as the expansion of open data sharing, the development of the open-source ecosystem, and crowd participation—at the level of strategic objectives. In this context, the strategy foresees strengthening collaboration in R&D and innovation processes through open

data, common data spaces, and open-source repositories. It also mandates the activation of effective monitoring and evaluation mechanisms to accompany increased public support.

Mechanisms, Platforms, and Initiatives:

National Data Dictionary (NDD): Launched to overcome integration challenges, duplicate and conflicting datasets, and lack of linguistic unity among public institutions' information systems. Under the coordination of the Presidency, the Data Dictionary Portal has been established to standardize data, enhance interoperability, and strengthen data governance across institutions.

Open Data Project: Coordinated by the Presidency's Digital Transformation Office, the project aims to make datasets produced by public institutions accessible to the public through the National Open Data Portal, while respecting personal data and national security restrictions.

- As stipulated in the Eleventh Development Plan, public data is to be shared in line with transparency and accountability principles, supported by necessary regulations and anonymization standards.
- The National Open Data Portal aims to provide citizens and researchers with secure, anonymized datasets in compliance with international standards.

Public Data Space (PDS): Public Data Space (PDS): Developed under the National AI Strategy's priority of "Access to Quality Data and Technical Infrastructure," the PDS Project offers an innovative model for big data management and reuse.

- Inspired by the EU's "data spaces" concept, it adapts the model to Türkiye's dynamics, enabling the processing of public datasets in a unified environment and granting access to authorized researchers for advanced analytics.
- The project is carried out in cooperation with the Presidency's Digital Transformation Office and TÜİK (Turkish Statistical Institute), and includes components such as technical infrastructure, data governance mechanisms, AI-ready environments, and training for public personnel.

Türkiye Open Source Platform and Ecosystem Support: This initiative foresees the development of open-source software and algorithm libraries for AI, the promotion of events and projects supporting crowd participation, and the establishment of sectoral co-development laboratories. The 2030 Industry and Technology Strategy aims to expand open-source solutions (including PARDUS), strengthen educational and research e-infrastructures led by TÜBİTAK ULAKBİM and BİLGEM, and increase the adoption of open-source solutions in the public sector. In this framework, the TÜBİTAK BİLGEM Artificial Intelligence Institute actively promotes open innovation and the use of open data. Its Open Data Portal provides standardized and anonymized datasets accessible to researchers, entrepreneurs, and enterprises. Furthermore, through promotional activities, awareness workshops, and training programs organized under the TEYDEB 1711 call, open innovation practices are being expanded among SMEs, academic institutions, and major industrial players. These efforts have facilitated collaborative R&D projects and contributed to strengthening the open innovation ecosystem in Türkiye.

Targets, Indicators, and Expected Outcomes:

- Open Data: At least 1,000 datasets to be shared on the Open Data Portal; extension of open data practices to all central and local administrations; encouragement of private sector participation in open data sharing.
- Data Spaces: Establishment of at least 10 sectoral cloud platforms; inclusion of at least 50 institutions in the Public Data Space.
- Open Source/Open Innovation: Participation of at least 1,000 unique AI developers within the Türkiye Open Source Platform; expansion of events and projects supporting open innovation.

5. What mechanisms are in place in your country to foster collaboration around AI and data for science and innovation among different stakeholders (e.g., university-industry, or private-public)?

Within the scope of the National Artificial Intelligence Strategy (2021–2025), working groups have been established with the participation of public institutions, private sector, universities, and civil society organizations. These groups operate under thematic areas such as “Data Governance,” “Human Resources,” “Technical Infrastructure and Platforms,” and “AI Law and Ethics,” promoting joint studies and shared governance.

Key mechanisms that foster collaboration include:

- TÜBİTAK 1711–Artificial Intelligence Ecosystem Call: This program supports the formation of consortia between universities, research centers, and companies to develop AI solutions, prioritizing academia–industry cooperation. Since 2022, 43 projects have been funded under this call. The consortium-based structure of the TEYDEB 1711 call represents a robust mechanism explicitly designed to foster collaboration among stakeholders. Each supported project must integrate at least one industrial end-user, one technology provider (typically an SME), and one academic or public research institution. TÜBİTAK BİLGEM Artificial Intelligence Institute coordinates these collaborations effectively, organizing regular stakeholder meetings, thematic workshops, and prototype demonstration events to promote sustained and productive cooperation among industry, academia, and public sector entities.
- Public Artificial Intelligence Ecosystem Call: Conducted jointly by TÜBİTAK KAMAG and the Artificial Intelligence Institute, this call supports AI-based solutions for the identified needs of public institutions through projects developed by joint consortia of academia, industry, and government actors. In 2023, five consortia were funded under this program.
- Sector on Campus Program: Implemented in partnership between the Ministry of Industry and Technology and the Council of Higher Education (YÖK), this program institutionalizes university–industry collaboration within higher education. It currently brings together 204 universities and 104 companies, with over 600 courses delivered to more than 16,000 students. In AI-specific areas, 59 courses have been launched in collaboration with 17 leading companies, reaching around 2,000 students.
- National Technology Academy – AI Specialization Program: This program provides students with mentorship from industry experts, hands-on project opportunities, and internships, thereby strengthening the bridge between academia and industry and fostering a skilled workforce.
- TEKNOFEST Competitions: The world’s largest Aviation, Space and Technology Festival includes AI-themed competitions in areas such as healthcare, transportation, natural language processing, and autonomous vehicles. These competitions bring together students, entrepreneurs, and private sector actors to co-develop innovative solutions.
- Pre-Competitive Cooperation Projects: These initiatives foster collaboration among academia, industry, and public institutions in strategic domains such as chip/semiconductor design, satellite technologies, hydrogen energy, and navigation systems. They represent a structured model to strengthen Türkiye’s strategic technology capacity while encouraging joint R&D and innovation

6. Is your country engaged in any bilateral, regional, or international partnership aimed to foster AI for STI? (*Please describe the benefits and challenges of participating in these partnerships)*

Türkiye actively engages in multilateral, regional, and bilateral platforms to advance artificial intelligence (AI)-driven science, technology, and innovation activities. In this context, Türkiye’s membership in the Global Partnership on Artificial Intelligence (GPAI) enables participation in international policy dialogues aimed at ensuring that AI is developed in an ethical, human-centered, and trustworthy manner.

Türkiye has also assumed national coordination for the NATO Defence Innovation Accelerator for the North Atlantic (DIANA) and the NATO Innovation Fund, initiatives that support the application of breakthrough technologies, including AI, in security, defense, and civilian domains.

Within the European Union framework, Türkiye has joined the Digital Europe Programme (DEP) as an associated country, thereby contributing to capacity building in AI, high-performance computing (HPC), cybersecurity, and digital skills. Furthermore, the European Digital Innovation Hubs (EDIHs) initiative facilitates the development of AI-based digital solutions by SMEs and research centers.

In addition, under the European High-Performance Computing Joint Undertaking (EuroHPC), Türkiye is a partner in the “MareNostrum5” supercomputer located in Barcelona, ensuring its effective use. This initiative significantly strengthens Türkiye’s AI research and HPC capacity.

In this process, the TÜBİTAK BİLGEM Artificial Intelligence Institute plays an active role. The Institute participates in European initiatives such as Horizon Europe and EuroHPC, and maintains bilateral partnerships with institutions including the Japan Science and Technology Agency (JST) and the Technical Research Centre of Finland (VTT). Moreover, it is actively engaged in international forums such as the OECD ONE AI initiative, GPAI, the UNESCO Recommendation on the Ethics of AI, and the NATO Data and AI Review Board (DARB). These engagements facilitate global knowledge exchange, the development of international standards, and the implementation of joint R&D projects, thereby enhancing Türkiye’s national capabilities.

The benefits of these partnerships include access to international funding, technology and knowledge transfer, alignment with global standards, integration of researchers into global value chains, and the development of human capital. Challenges involve differences in legal frameworks across countries, concerns over data security and intellectual property rights, divergences in priorities that may prolong coordination processes, and difficulties in establishing sustainable funding mechanisms.

7. How can international cooperation enhance the use of AI and data for science and innovation to support technological capacity building in your country? In what ways can the UN CSTD contribute to this effort?

Please indicate contact person(s) responsible for projects/policies and international collaboration in this context in case we need clarification on the inputs.

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Please send your responses and any further inputs on the theme to the CSTD secretariat (cstd@un.org) by **31 August 2025**. We look forward to receiving your valuable inputs.

Sincere regards,

CSTD secretariat