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ANNEX V

to the Commission Implementing Decision on the Annual Action programme in favour of Türkiye for 2023
Action Document for Boosting Green and low-carbon Hydrogen in Türkiye

ANNUAL ACTION PLAN

This document constitutes the annual work programme in the sense of Article 110(2) of the Financial Regulation, and an annual action plan in the sense of Article 9 of IPA III Regulation and Article 23(2) of NDICI - Global Europe Regulation.

1. SYNOPSIS

1.1. Action Summary Table

Title	Boosting Green and low-carbon Hydrogen in Türkiye Annual action plan in favour of Türkiye for 2023
OPSYS	OPSYS business reference: ACT-62305
ABAC	JAD.1311172
Basic Act	Financed under the Instrument for Pre-accession Assistance (IPA III)
Economic and Investment Plan (EIP)	No
EIP Flagship	No
Team Europe	N/A
Beneficiar(y)/(ies) of the action	The action shall be carried out in the Republic of Türkiye
Programming document	IPA III Programming Framework
PRIORITY AREAS AND SECTOR INFORMATION	
Window and thematic priority	Window 3 Green agenda and sustainable connectivity Thematic Priority 2: Transport, digital economy and society and energy
Sustainable Development Goals (SDGs)	SDG 7: Affordable and Clean Energy Other significant SDGs: SDG 13: Climate Action

DAC code(s)	230- Energy (100%) 231- Energy Policy (100%) 23110 - Energy policy and administrative management 50% 23181 - Energy education/training 25% 23182 - Energy research 25%			
Main Delivery Channel	Recipient Government - 12000			
Targets	<input checked="" type="checkbox"/> Climate <input type="checkbox"/> Gender <input type="checkbox"/> Biodiversity			
Markers (from DAC form)	General policy objective	Not targeted	Significant objective	Principal objective
	Participation development/good governance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Aid to environment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Gender equality and women's and girl's empowerment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Reproductive, maternal, new-born and child health	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Disaster Risk Reduction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Inclusion of persons with Disabilities	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Nutrition ¹	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RIO Convention markers	Not targeted	Significant objective	Principal objective
	Biological diversity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Combat desertification	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Climate change mitigation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Climate change adaptation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Policy objectives	Not targeted	Significant objective	Principal objective
	EIP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	EIP Flagship	YES <input type="checkbox"/>		NO <input checked="" type="checkbox"/>
	Tags:		YES	NO

¹ Please check the [Handbook on the OECD-DAC Nutrition Policy Marker](#).

Transport	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Energy	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Environment and climate resilience	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Digital	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Economic development (incl. private sector, trade and macroeconomic support)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Human Development (incl. human capital and youth)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Health resilience	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Migration and mobility	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Agriculture, food security and rural development	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Rule of law, governance and Public Administration reform	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Other	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Digitalisation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tags	YES	NO	
digital connectivity	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
digital governance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
digital entrepreneurship	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
digital skills/literacy	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
digital services	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Connectivity	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Tags	YES	NO	
digital connectivity	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
energy	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
transport	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
health	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
education and research	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Migration	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduction of Inequalities	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COVID-19	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

BUDGET INFORMATION

Amounts concerned	Budget line: 15 02 02 01 Total estimated cost: EUR 3 000 000 Total amount of EU budget contribution EUR 3 000 000
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MANAGEMENT AND IMPLEMENTATION	
Implementation modalities (management mode and delivery methods)	Project modality Direct management through procurement
Final Date for conclusion of Financing Agreement	At the latest by 31 December 2024
Final date for concluding contribution / delegation agreements, procurement and grant contracts	3 years following the date of conclusion of the Financing Agreement, with the exception of cases listed under Article 114(2) of the Financial Regulation
Indicative [operational implementation] period	72 months following the conclusion of the Financing Agreement
Final date for implementing the Financing Agreement	12 years following the conclusion of the Financing Agreement

1.2. Summary of the Action

The overall objective of the Action is to support the establishment of a green and low-carbon hydrogen² ecosystem in Türkiye.

The Action will contribute to the specific objective of the **IPA III Thematic Priority 2: Transport, digital economy and society and energy within the Window 3 Green agenda and sustainable connectivity** which is: *to accelerate the shift towards a low-carbon, climate resilient economy, promote clean energy transition and a European integrated energy market.*

In line with the global climate movement and to reduce emissions, **the energy sector has started turning to clean energy sources. One of the clean energy sources in question is hydrogen produced on the basis of renewable energy.** Renewable hydrogen stands out among other clean energy sources thanks to its long-term substitutability for natural gas. For this reason, renewable **hydrogen has an essential place in the agenda of countries that turn to clean energy.** It will play a critical role as an energy carrier in hard-to-abate sectors

² In this Action “clean hydrogen”, “renewable hydrogen” and “green hydrogen” are understood as synonyms and refer to hydrogen produced by the electrolysis of water using electricity only from renewable sources and therefore emits almost no greenhouse gases during its production. Regarding clean as a synonym of renewable it is also in line with the “EU hydrogen strategy for a climate-neutral Europe” (COM (2020) 301 final). Low carbon is understood in this Action Document as a non-renewable hydrogen with 70% GHG emission savings.

such as industry and transport. In this context, significant developments have been made in Türkiye as well. Establishing a clean and low-carbon hydrogen industry has become one of Türkiye's strategic priorities.

The action's specific objectives are: the development of a Green and low-carbon Hydrogen Ecosystem in Türkiye and increased institutional capacity of relevant authorities on hydrogen, as well as to assess the compatibility and availability of BOTAŞ infrastructure to accommodate hydrogen for storage as well as to prepare a Hydrogen Master Network Plan. That will serve not only Türkiye's aim for green energy, in line with the **European Green Deal**, but will also contribute to **SDG 7**, "*ensure access to affordable, reliable, sustainable and modern energy for all*," and **SDG 13**, "*take urgent action to combat climate change and its impacts*".

The proposed activities aim to advance the green and low-carbon hydrogen industry in Türkiye by addressing various aspects of its development. These include forecasting **future demand and supply trends**, analysing existing **standards and regulations**, assessing **organisational capacity and stakeholder engagement**, evaluating **human resource needs**, detecting potential production regions geographically and conducting benchmarking visits to learn from EU countries with significant expertise in the renewable hydrogen sector. Additionally, the activities seek to determine the feasibility of repurposing existing storage facilities for hydrogen and hydrogen derived fuels, benchmark different **storage methods**, analyse the feasibility of a **green** and low-carbon **hydrogen production**, identify regions suitable for **hydrogen blending** into the natural gas transmission system, conducting **tests on equipment for hydrogen suitability** to recommend hydrogen blending levels, analyse safety and operational impacts, including leaks, evaluate environmental impacts and propose techno-economic solutions for effective integration as well as develop a clean and low-carbon hydrogen **master network plan** for hydrogen transportation, distribution, and storage.

The outcomes of these activities will provide valuable insights and input for industry stakeholders and policymakers, enabling effective and sustainable development of the clean and low-carbon hydrogen sector in Türkiye. This will also support the country's energy strategies and contribute to its transition and climate-neutral economy by 2053 to a low-carbon economy aligned with Türkiye's announced climate objectives and the EU Green Deal. Through trainings, workshops and seminars, knowledge and awareness in the hydrogen sector will be enhanced, fostering expertise and promoting collaboration among key stakeholders in Türkiye and the EU.

Overall, these activities represent a comprehensive approach to boost the clean and low-carbon hydrogen industry in Türkiye, facilitating its integration into the energy landscape, fostering innovation and investment, and driving the country towards a greener and more sustainable future.

1.3 Beneficiar(y)/(ies) of the Action

The action shall be carried out in the Republic of Türkiye.

2. RATIONALE

2.1. Context

After the Paris Climate Agreement was ratified, Türkiye announced its ambition to reach net-zero emissions by 2053. Türkiye aims to combine its significant potential in renewable energy sources such as wind and solar power with hydrogen technology. In this direction, the **Hydrogen Roadmap** was published by the Ministry of Energy and Natural Resources (MENR) and declared one of the priority areas for **green** and low-carbon **hydrogen**.

In this context, the European **Green Deal**, the EU hydrogen strategy for a climate-neutral Europe, the **Paris Agreement**, the UN 2030 Agenda for Sustainable Development, the 11th National Development Plan (2019-

2023) and the MENR Strategic Plan (2019-2023) are all strategic documents that form the framework in this action document.

The "**Türkiye Hydrogen Technologies Strategy and Roadmap**" report was published by MENR on 19 January 2023, including targets and priorities in line with the EU policies. The Strategy and Roadmap are guiding:

- (i) analysis of hydrogen value chain elements such as production, transmission, storage, trade opportunities and usage in transportation and industrial sector
- (ii) review the legislative framework and make appropriate adaptations for "hydrogen production, transportation, storage and use,
- (iii) increasing the share of production and use of renewable energy to increase the production of green and low-carbon hydrogen,
- (iv) reducing carbon emissions from carbon intensive sectors such as steel, glass, chemicals, and refineries with use hydrogen produced from renewable sources,
- (v) exporting surplus green and low-carbon hydrogen to the world, especially to the European market with domestic technologies.

The Action is coherent with, and will support the effective implementation of, the **Türkiye Hydrogen Strategy**.

Green and low-carbon Hydrogen as an energy carrier and feedstock will be one of the energy sources of Türkiye in achieving its climate targets. The **Türkiye 2022 Report of the European Commission** has already mentioned that renewable energy is one of the main pillars of the EU energy policy, together with energy efficiency, and security of supply. Türkiye has already made remarkable progresses on renewable energy policies, achieving a 54% share of renewables in the country's installed capacity and 41,95% in electricity generation by the end of 2022. It is therefore essential to continue supporting renewable energy in Türkiye, promoting alternatives like green and low-carbon hydrogen and related feasibility studies. The suitability of hydrogen for use in the energy system remains a common challenge for the world and Türkiye.

As stated in the **IPA III Strategic Response, the Medium-Term Programme (MTP) 2022-2024** highlights the policies and measures regarding the transition to a green economy. Türkiye has prepared and published its **Green Deal Action Plan (2021)** in the Official Gazette, including activities related to a green and circular economy, a clean, affordable, and secure energy supply, and combating climate change. In this regard, the Action will enhance and promote the Green Agenda by increasing environmental protection and quality contributing to mitigation and accelerating the shift towards a low-carbon and circular economy.

The IPA III Programming Framework underlines the importance of hydrogen "*The potential to decrease the carbon intensity of gas network should be assessed, methane leakage avoided, and all new gas infrastructure needs to be future-proof and, over the medium to long term, shifted from transporting natural gas to renewable gas or hydrogen*" and "*The long-term objective of climate neutrality should be kept in mind and with it the role that renewable gas and hydrogen can play*".

Within the framework of **the UN 2030 Agenda for Sustainable Development Goals (SDG)**, it is considered that this Action will contribute to **SDG-7**, "*ensure access to affordable, reliable, sustainable and modern energy for all*" and **SDG 13**, "*take urgent action to combat climate change and its impacts.*"

The EU aims to step up its efforts to ensure that the policies relevant to the European Green Deal and 2020 EU Hydrogen Strategy are effectively implemented. The Action is consistent with the priorities under these strategies such as:

- (i) Supplying clean, affordable and secure energy;

- (ii) Decarbonising the energy system to reach climate objectives in 2030 and 2050;
- (iii) Support production and demand;
- (iv) Creating a hydrogen market and infrastructure;
- (v) Research and cooperation and international cooperation.

The Action will complement and support hydrogen agendas in the EU and Türkiye. The supply chain is complex for hydrogen and other energy sources like natural gas, electricity, etc. Transmission and storage of hydrogen are essential elements of the chain for developing the hydrogen economy in Türkiye.

2.2. Problem Analysis

Short problem analysis

In order to create a functional hydrogen market within the energy ecosystem, relevant legislation should be created, and the feasibility of production and use of hydrogen should be ensured. Therefore, legal, technical and economic obstacles need to be tackled and uncertainties removed.

1. Despite the promising developments for the near future, hydrogen production technologies are in an early development phase across the world. Therefore, technological know-how is highly concentrated in advanced countries and diffusion of this knowledge across the world takes time. In parallel, studies for regulatory and economic aspects of hydrogen network and development operations are limited for the large-scale use of hydrogen. Standards are lacking and legislation is underdeveloped in the majority of the countries including Türkiye. Besides, competent human resources and organisations for the green hydrogen ecosystem are currently insufficient, including institutional capacity in terms of legislation, organisations and the development of human resources.
2. Developing a green and low-carbon hydrogen industry requires also storage options. Despite being a promising alternative energy carrier/feedstock, hydrogen's widespread adoption is hindered by the lack of efficient, safe and cost-effective storage solutions. Repurposing existing storage facilities and infrastructure can be a cost-effective and efficient way to upscale green hydrogen technologies. Research and development efforts are ongoing to address these challenges, but more work is needed to develop the necessary hydrogen storage capacity. Continued investments in research, innovation, infrastructure development and also evaluation of potential environmental impacts are needed.
3. Assessing the feasibility of establishing a green and low-carbon hydrogen generation complex is of utmost importance due to the growing demand for clean and sustainable energy sources. As countries worldwide strive to achieve a sustainable energy transition and reduce carbon emissions, green and low-carbon hydrogen emerges as a promising solution. The objective is to conduct a comprehensive technical, economic, and financial analysis to evaluate the viability of producing green and low-carbon hydrogen in proximity of the Tuz Gölü Underground Storage Facility and integrating it into the existing energy network. This analysis addresses key challenges such as assessing the available renewable energy potential, identifying hydrogen supply sources, analysing the characteristics of a potential salt cavern for storage, evaluating the required infrastructure for hydrogen distribution, and supporting economic viability amidst substantial investment requirements. The ultimate goal is to offer valuable insights that will guide decision-makers in harnessing the potential of sustainable and low-carbon hydrogen production and facilitating its seamless integration into the energy system.
4. Türkiye's ambition to produce and possibly export Green and low-carbon Hydrogen and become a mature Hydrogen player faces several challenges due to the absence of a comprehensive hydrogen master network plan. Without a well-defined plan, there is an uncertainty surrounding green and low-carbon hydrogen production strategies, the placement of renewable power plants, and the establishment of adequate

hydrogen storage, export infrastructure, and transportation routes. Additionally, limited awareness among end users and fragmented decision-making processes hinder the growth of the hydrogen market, while missed economic and environmental benefits result from a lack of clear investment priorities and strategies. To overcome these challenges and realise its vision, Türkiye must prioritise the development of a comprehensive hydrogen master network plan that encompasses all aspects of the hydrogen ecosystem, enabling efficient resource utilisation, attracting investments, and capitalising on the growing global demand for green hydrogen, ultimately contributing to a sustainable and prosperous future.

5. The EU hydrogen strategy for a climate-neutral Europe (COM (2020) 301 final) clarifies that hydrogen is a key priority to achieve the European Green Deal and Europe's clean energy transition. Renewable electricity is expected to decarbonise a large share of the energy consumption, but not all of it. Hydrogen has a strong potential to bridge some of this gap, as a vector for renewable energy storage, alongside batteries, and transport, ensuring back up for seasonal variations and connecting production locations to more distant demand centre. The blending of hydrogen in the natural gas network at a limited percentage has been discussed in view of decentralised renewable and low-carbon hydrogen transportation through local networks in a transitional phase. However, blending is less efficient and diminishes the value of hydrogen. Blending also changes the quality of the gas consumed and may affect the design of gas infrastructure, end-user applications, and cross-border system interoperability. Therefore, there is a need to study and assess the feasibility of hydrogen blending into the existing Natural Gas Transmission Network in Türkiye compared to its re-purposing of building a new dedicated hydrogen network.

The Action is designated to address the four main problems/improvement described above.

Identification of leading stakeholders and corresponding institutional and organisational issues (mandates, potential roles, and capacities) are to be covered by the Action.

A considerable number of institutions govern the Energy Sector in Türkiye. **The lead institution** in the context of the Instrument for Pre-Accession Assistance (IPA) sector approach is the **MENR** which is responsible for the development of policy, legislation, and enforcement of legislation in all areas of the sector. The purpose and the future role of the MENR are to help define targets and procedures related to energy and natural resources in a way that serves and guarantees the defence of the country, security, welfare, and strengthening of the national economy. Furthermore, it seeks to ensure that energy and natural resources are researched, developed, generated, and consumed in a way that is compatible with the defined targets and policies.

The Petroleum Pipeline Corporation (BOTAŞ) is a related institution of MENR. Because of Türkiye's increasing need for diversified energy sources, BOTAŞ has expanded since 1987 its original purpose of transporting crude oil through pipelines to cover natural gas transportation and trade activities. Therefore, it has become a trading company. BOTAŞ is a state-owned company with almost 50 years of experience. And today, BOTAŞ owns and operates a 23 000 kilometres pipeline network for both crude oil and natural gas, including the Baku-Tbilisi-Ceyhan, TANAP, and TürkStream pipelines. Therefore, BOTAŞ has extensive experience managing and maintaining pipelines of various sizes, from 6 to 56 inches.

Besides, BOTAŞ has 2 Floating Storage Regasification Unit (FSRU) and 1 LNG import terminal, and in total, Türkiye has 3 FSRU and 2 LNG import terminals, including private sector investments. In terms of underground storage, one of the most significant storage projects in salt caverns is the Tuzgolu Project. Another underground storage facility is the Silivri Underground Natural Gas Storage.

BOTAŞ has been experiencing growing demand in all segments of the energy sector. Besides natural gas and oil activities, hydrogen emerges as a new work area of BOTAŞ thanks to its ability to be substituted for natural gas in the long term. Hydrogen is vital for the transition to clean energy due to low carbon emission and can provide decarbonisation in sectors such as transportation and industry (petro-chemistry, iron-steel, etc.). In

addition, Türkiye is currently underway to develop 1 MW PEM electrolyser capacity by using domestic and national resources accompanied by a consortium of leading companies such as the Scientific and Technological Research Council (TUBITAK), SOCAR³, ASPILSAN⁴ and the Turkish Energy, Nuclear and Mining Research Institution (TENMAK). These organisations are implementing research projects in the hydrogen field. In the context of the Action, their research capacities will be used to identify BOTAS's potential for scaling up a green hydrogen ecosystem.

Industry stakeholders will make a significant contribution to the green energy transition. These organisations are currently conducting hydrogen research. With this Action, synergy will be created for future research. Seventy-two distribution companies are operating in the Turkish natural gas distribution sector, assuming the critical stakeholders in the distribution of hydrogen to end users.

2.3. Lessons Learned

The most important **lessons learned** from the last two decades covering IPA I and IPA II periods are continuous improvement and systematic performance monitoring of the institutional capacity building activities with a holistic view of ecosystem and focusing on the full compliance with EU energy legislation, market and network. In particular, the following lessons learned are worth mentioning as well:

- Improved compliance with EU legislation;
- Need for rapid adaptation to the European Green Deal regulations;
- Need for an institutional capacity dedicated to the transformation of the energy ecosystem;
- Need for improved human resource capacity in public institutions in the energy sector;
- Raised awareness and learning by doing with pilot renewable energy projects;
- Improved the dialogue and strengthen cooperation with the European Commission and various energy sector stakeholders.

Under the lessons mentioned above, the MENR has accelerated the implementation of the projects and programmes in the sector towards **the transition to a green** and low-carbon **hydrogen economy** in close cooperation with the sector stakeholders. Therefore, the capacities of the MENR and critical institutions have been improved, and their coordination and relationships have been strengthened. The MENR published the Türkiye hydrogen technologies strategy and roadmap on 19 January 2023. Important vision proposals in the roadmap include reducing the cost of green and low-carbon hydrogen production to below 2.4 US/kgH by 2035, below 1.2 US/kgH by 2053, and to increase the installed power capacity of the electrolyser to 2 GW by 2030, increasing it to 5 GW by 2035 and to 70 GW by 2053.

TENMAK, which is affiliated with the Ministry of Energy and Natural Resources, has recently published a "**Hydrogen Call**" including "*Hydrogen Production and Fuel Cell Technologies, Carbon Capture, Utilization and Storage Technologies*" within the scope of R&D projects. In the framework of the Hydrogen Call, up to six projects are planned to be funded by TENMAK.

Türkiye's first Hydrogen Valley project, "South Marmara Hydrogen Coast Valley Project," funded by the European Union (EU) under Horizon Europe, in which the South Marmara Development Agency is the coordinator, has been approved in 2023. The Project includes 16 domestic and foreign stakeholders. It is aimed at producing at least 500 tons of green hydrogen per year within the scope of the Project at the Bandırma Energy Base of Enerjisa Production.

³ The State Oil Company of the Republic of Azerbaijan

⁴ <https://www.aspilsan.com/en/kurumsal/hakkimizda/>

3. DESCRIPTION OF THE ACTION

3.1. Intervention Logic

The Overall Objective/ (Impact) of this action is to support the establishment of a green and low-carbon hydrogen ecosystem in Türkiye.

The Specific Objectives/ (Outcomes) of this action are:

- 1- Green and low-carbon Hydrogen Ecosystem as well as Increased institutional capacities of relevant authorities on hydrogen developed;
- 2- Technical and economic feasibility of blending of hydrogen into the Natural Gas Transmission Network and for storage assessed;
- 3- Hydrogen Master Network Plan prepared.

The Outputs to be delivered by this action contributing to the corresponding Specific Objectives (Outcomes) are described below:

For Outcome 1:

Output 1: Increased awareness, knowledge and technical capacity on the potential of Hydrogen demand and supply, on the use of green and low-carbon hydrogen and on its role for low-emission industry/transport including the assessment of Türkiye's potential for green and low-carbon hydrogen production geographically, taking into account specific challenges such as availability of water;

Output 2: Identified standardisation, regulation and legislation in line with EU requirements and standardisation priorities;

Output 3: Identified Hydrogen Ecosystem, Capacity of Ecosystem and Human Resources and appropriate raising awareness activities.

For Outcome 2:

Output 1: Conducted technical and economic feasibility of availability and repurposing storage facilities for hydrogen (mainly green and low-carbon hydrogen) and identified convenient storage technologies including evaluation of potential environmental impacts;

Output 2: Conducted feasibility for green and low-carbon Hydrogen Generation in the Tuz Gölü Complex and appropriate awareness raising activities.

For Outcome 3:

Output 1: Conducted assessment of technical and economic feasibility of Hydrogen (mainly green and low-carbon hydrogen) blending with Natural Gas in sections of the existing Transmission Network in line with EU practices and standards compared to re-purposing or building a new dedicated hydrogen infrastructure;

Output 2: Conducted Green and low-carbon Hydrogen Master Network in line with ENTSO-G including Investment and Impact Analysis.

The underlying intervention logic for this action is that if the activities are undertaken and the assumptions hold, then the outputs will be produced. If outputs are delivered, and the assumptions at the level of outputs have, then the outcomes will be realised because institutional capacity will be increased, and green and low-carbon hydrogen supply chain evaluation will be possible with the documents to be prepared, feasibility and engineering studies to be carried out, workshops and site visits.

If the outcomes are achieved, and the assumptions at this level hold, then the action will contribute to the desired impact. With the storage process, Türkiye will have made a new move in energy diversification based on green and low-carbon hydrogen. It will both obtain a resource that will contribute to the zero-emission target in the Paris Agreement and gain a new power that supports its position in the energy geopolitics in the region, thanks to its export opportunities. In particular, determining suitable salt caverns for hydrogen storage will contribute to the supply security of both Türkiye and Europe. Another important area to consider is adapting existing infrastructure to accommodate hydrogen. Modifying the existing infrastructure in Türkiye could support and contribute to the global energy transition in line with the Paris Agreement and provide economical solutions toward a green-based hydrogen economy.

Through the Action “Boosting Green and low-carbon Hydrogen in Türkiye” the following results will be expected:

- Transition to Green and low-carbon Hydrogen economy and production of Green and low-carbon Hydrogen in Türkiye will be assessed and policy, financial, technical recommendations will be done.
- Türkiye will benefit from the development of the transportation and storage infrastructure for hydrogen.
- The capacity of relevant staff of crucial institutions will be increased in the hydrogen sector.
- The compatibility of a hydrogen ecosystem and feasibility of adaptation of the existing gas transportation and storage facilities will be determined in line with EU practices.
- The establishment/development of the green and low-carbon hydrogen infrastructure will be accelerated.
- Domestic and foreign green and low-carbon hydrogen investments will be encouraged because stakeholders will be able to better evaluate Türkiye’s green hydrogen potential.

Most importantly, the Action will not facilitate nor support the creation of Local Content Requirements.

3.2. Indicative Activities

Component 1: Capacity Building

Activity 1.1: Green and low-carbon Hydrogen Market Demand and Supply Projection, including the assessment of Türkiye potential for green and low-carbon hydrogen production, including investment needed and specific challenges such as the availability of freshwater.

Activity 1.2: Requirement Analysis for Standardisation, Regulation and Legislation in line with EU requirements and standardisation priorities.

Activity 1.3: Hydrogen Ecosystem Modelling and Organisational Capacity Requirement Analysis

Activity 1.4: Requirement Analysis for Human Resources and provision of related capacity building activities

Activity 1.5: Organisation of Internship Programme

Activity 1.6: Study Visit

Activity 1.7: Organising of Green and low-carbon Hydrogen Summit

Activity 1.8 Communication and Visibility

Component 2: Compatibility Analysis of Existing Facilities for green and low-carbon Hydrogen Storage

Activity 2.1: Technical and Economic Feasibility Study for Repurposing Storage Facilities for green and low-carbon Hydrogen

Activity 2.2: Technical and Economic Feasibility Analysis for Tuz Gölü (Aksaray Province) Underground Storage Facility green and low-carbon Hydrogen Generation Complex

Activity 2.3: Study Visit on Hydrogen Storage Facilities

Component 3: Analysis of Existing Natural Gas Infrastructure in view of its use and adaptation for hydrogen transportation and storage.

Activity 3.1: Technical and Economic Feasibility Analysis of Natural Gas Transmission Network for green and low-carbon Hydrogen Blending, repurposing of the existing infrastructure and/or construction of new-dedicated hydrogen infrastructure.

Activity 3.2: Preparation of green and low-carbon Hydrogen Master Network in line with ENTSO-G.

Activity 3.3: Hydrogen Network Symposium

3.3. Mainstreaming

Environmental Protection, Climate Change and Biodiversity

The programme envisages activities directly targeting the environment, climate change, and the transition to a green and circular economy. It will improve the technical capacities and quality of information necessary for further progress in implementing EU Environment and Climate Change legislation and thus directly contribute to enhanced environmental protection and climate action.

The Activity will increase public awareness of the low-carbon economy, climate change, and environmental issues.

Extreme weather events resulting from global climate change and human-induced global warming pose a risk to many living species. Biodiversity is critical to human health, economic well-being, and the planet's sustainability. This project will contribute to biodiversity in line with its goals of protecting the ecosystems in the regions where its facilities are located and minimising the environmental damage caused by its activities.

Within the scope of the Tuz Gölü Natural Gas Storage, the freshwater supplied from the Hirfanlı Dam dissolves the underground salt masses, and the caves formed as a result of the dissolution are used to store natural gas. The saltwater released during the process is discharged into Tuz Gölü via pipelines, increasing the lake's water. In addition, with activities in the scope of this Action, biodiversity practice will continue.

Gender equality and empowerment of women and girls

11th National Development Plan (2019-2023) (NDP) refers not only to the Environment but also to the economic and social fields, including human development which allow stronger and prosperous Türkiye.

This Action Document will contribute to the objectives and the policies of 11th NDP, putting equal opportunities between men and women as an integral part of its design, implementation, monitoring and evaluation.

Also, the participation of female employees in all project activities will be encouraged.

Disability

As per OECD Disability DAC codes identified in section 1.1, this action is labelled as D0. This implies that the action is not considered relevant for inclusion of persons with disabilities. Yet the disabled people shall be provided the same level of access to the project as all other participants, via a sensitive design of activities.

Human Rights

This Action will ensure responsible business behaviour by keeping human rights at a high level in its policies and activities. It continues to implement its policies with an international effort, which it commits to all its stakeholders, including vulnerable groups.

3.4. Risks and Assumptions

Category	Risks	Likelihood (High/Medium/Low)	Impact (High/Medium/Low)	Mitigating measures
2- Risks related to planning, processes and systems	Challenges due to newness of the hydrogen technologies.	Medium	High	Knowledge and Training Programmes International Collaboration Testing Infrastructure
3 - Risks related to people and the organisation	Insufficient number of experts participating to the project activities from stakeholders Limited number of qualified competent experts to provide input to the contract	High	High	More Trainings, workshops and site visits.
1 - Risk related to external environment	Unwillingness of foreign institutions to disclose their knowledge and experience in study visits	Medium	High	Improvement of bilateral cooperations and networks

External Assumptions

- High political ownership, national willingness and interest in the Green and low-carbon hydrogen ecosystem
- Willingness of stakeholders to participate and cooperate throughout the actions.
- Increased awareness of hydrogen due to increase on natural gas price.
- Increased consumption of Green and low-carbon hydrogen due to coming into force of CBAM (Carbon Border Adjustment Mechanism)

3.5 Indicative Logical Framework Matrix

Results	Results chain: Main expected results [maximum 10]	Indicators [it least one indicator per expected result]	Baselines (values and years)	Targets (values and years)	Sources of data	Assumptions
Impact	To support the establishment of the green and low-carbon hydrogen ecosystem in Türkiye	Rate of replacement of consumed grey and blue hydrogen with green hydrogen	% 0 (2023)	%5 (3 years after the end of the implementation)	Reports produced by private sector representative. EMRA Energy Sector Reports BOTAŞ Annual Reports BOTAŞ Sustainability Report	<i>Not applicable</i>
Outcome 1	Green and low-carbon Hydrogen Ecosystem as well as Increased institutional capacities of relevant authorities on hydrogen developed.	1. Türkiye’s Green and low-carbon Hydrogen Market Structure, Supply Projection and Geographically Production Potential has been determined. 2. Regulations and Legislations for Hydrogen Market has been identified. 3. Responsible Institutions has been determined. 4. Human Resources Capacity has been enhanced.	1. No (2023) 2. No (2023) 3. No (2023) 4. No (2023)	1. Yes (by the end of the implementation) 2. Yes (by the end of the implementation) 3. Yes (by the end of the implementation) 4. Yes (by the end of the implementation)	BOTAŞ/MoENR Annual Reports BOTAŞ/MoENR Sustainability Report	<ul style="list-style-type: none"> • High political ownership, national willingness and interest in the hydrogen economy • Willingness of stakeholders to participate and cooperate
Outcome 2	Technical and economic feasibility of blending of hydrogen into the Natural Gas Transmission Network and for storage assessed	1. The compatibility of Natural Gas Storage Facilities with Green and low-carbon Hydrogen Storage in Türkiye and potential environmental impacts has been determined.	1. No (2023)	1. Yes (by the end of the implementation)	EMRA Energy Sector Reports Hydrogen Storage Licence	

					BOTAŞ Sustainability Report	throughout the actions.
Outcome 3	Hydrogen Master Network Plan prepared	1. Türkiye’s Green and low-carbon Hydrogen Production Capacity and Generation Locations Has Been Determined	1. No (2023)	1. Yes (by the end of the implementation)	EMRA Energy Sector Reports BOTAŞ Network Code, -Hydrogen Transmission Licence	<ul style="list-style-type: none"> Increased awareness of hydrogen due to increase on natural gas price.
Output 1 related to Outcome 1	Increased awareness, knowledge and technical capacity on the potential of Hydrogen demand and supply, on the use of green and low-carbon hydrogen and on its role for low-emission industry/transport including the assessment of Türkiye’s potential for green and low-carbon hydrogen production geographically, taking into account specific challenges such as availability of water;	<ol style="list-style-type: none"> Green and low-carbon Hydrogen Market Demand and Supply Analysis Report, including the assessment of Türkiye potential for green and low-carbon hydrogen production geographically Total Number of Trainings Total Number of Trainee Internship Programme 	<ol style="list-style-type: none"> 0 (2023) 0 (2023) 0 (2023) 0 (2023) 	<ol style="list-style-type: none"> 1 (by the end of the implementation) 15 (by the end of the implementation) 150 (by the end of the implementation) 2 (by the end of the implementation) 	EMRA Energy Sector Reports Progress and Final Reports of Project	<ul style="list-style-type: none"> Increased consumption of green and low-carbon hydrogen due to coming into force of CBAM (Carbon Border Adjustment Mechanism)
Output 2 related to Outcome 1	Identified Standardisation, Regulation and Legislation in line with the EU requirements and standardisation priorities;	1. Report on Standards, Regulations, and Legislation in line with EU requirements	1. 0 (2023)	1. 1 (by the end of the implementation)	EMRA Energy Sector Reports	
Output 3 related to Outcome 1	Identified Hydrogen Ecosystem, Capacity of Ecosystem Organisations and Human Resources	<ol style="list-style-type: none"> Hydrogen Eco System Strategy Report Green and low-carbon Hydrogen Summit 	<ol style="list-style-type: none"> 0 (2023) 0 (2023) 	<ol style="list-style-type: none"> 1 (by the end of the implementation) 1 (by the end of the implementation) 	EMRA Energy Sector Reports BOTAŞ Annual Reports	

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<p>Output 1 related to Outcome 2</p>	<p>Conducted technical and economic feasibility of availability and repurposing storage facilities for hydrogen (mainly green and low-carbon hydrogen) and identified convenient storage methods technologies including evaluation of potential environmental impacts;</p>	<p>1. Hydrogen Storage Recommendation Report 2. Feasibility Report on Repurposing Storage Facilities for Green Hydrogen</p>	<p>1. 0 (2023) 2. 0 (2023)</p>	<p>1. 1 (by the end of the implementation) 2. 1 (by the end of the implementation)</p>	<p>Progress and Final Reports of Project Sustainability Report</p>	
<p>Output 2 related to Outcome 2</p>	<p>Conducted feasibility for green and low-carbon Hydrogen Generation in the Tuz Gölü Complex and appropriate awareness raising activities</p>	<p>1. Tuz Gölü Green Hydrogen Generation Complex Feasibility Report, including analysis of likely environmental impacts</p>	<p>1. 0 (2023) 2. 0 (2023)</p>	<p>1. 1 (by the end of the implementation)</p>	<p>Progress and Final Reports of Project</p>	
<p>Output 1 related to Outcome 3</p>	<p>Conducted assessment of compatibility and requirements for technical and economic feasibility of Hydrogen (mainly green and low-carbon hydrogen) blending with Natural Gas in sections of the existing Transmission Network in line with EU practices and standards compared to re-purposing or building a new dedicated hydrogen infrastructure;</p>	<p>1. Compatibility and requirement analysis report</p>	<p>0(2023)</p>	<p>1 (by the end of the implementation)</p>	<p>Progress and Final Reports of Project</p>	
<p>Output 2 related to Outcome 3</p>	<p>Conducted Green and low-carbon Hydrogen Master Network in line with ENTSO-G including Investment and Impact Analysis</p>	<p>1. Green and low-carbon Hydrogen Master Network Report 2. Hydrogen Network Symposium</p>	<p>1. 0 (2023) 2. 0 (2023)</p>	<p>1. 1 (by the end of the implementation) 2. 1 (by the end of the implementation)</p>	<p>Progress and Final Reports of Project</p>	

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* Salt caverns are the most efficient storage method for large-scale gas storage. Salt caverns in Salt Lake, located within the borders of Sultanhanı district of Aksaray province, are currently used to store natural gas.

4. IMPLEMENTATION ARRANGEMENTS

4.1. Financing Agreement

In order to implement this action, it is envisaged to conclude a financing agreement with the Republic of Türkiye.

4.2. Indicative Implementation Period

The indicative operational implementation period of this action, during which the activities described in section 3 will be carried out and the corresponding contracts and agreements implemented, is 72 months from the date of conclusion of the financing agreement.

Extensions of the implementation period may be agreed by the Commission’s responsible authorising officer in duly justified cases by amending this Financing Decision and the relevant contracts and agreements.

4.3. Implementation Modalities

The Commission will ensure that the EU appropriate rules and procedures for providing financing to third parties are respected, including review procedures, where appropriate, and compliance of the action with EU restrictive measures⁵.

4.3.1. Direct Management (procurement)

This action will be implemented under direct management and the procurement will contribute to achieving the objectives and the outputs detailed in section 3.

4.4 Scope of geographical eligibility for procurement and grants

The geographical eligibility in terms of place of establishment for participating in procurement and grant award procedures and in terms of origin of supplies purchased as established in the basic act and set out in the relevant contractual documents shall apply, subject to the following provisions.

The Commission’s authorising officer responsible may extend the geographical eligibility on the basis of urgency or of unavailability of services in the markets of the countries or territories concerned, or in other duly substantiated cases where application of the eligibility rules would make the realisation of this action impossible or exceedingly difficult (Article 28(10) NDICI-Global Europe Regulation).

4.5 Indicative Budget

Indicative Budget components	EU contribution (amount in EUR)
Methods of implementation – cf. section 4.3	
Outcome 1: Green and low-carbon Hydrogen Ecosystem as well as Increased institutional capacities of relevant authorities on hydrogen developed;	

⁵ [EU Sanctions Map](#). Please note that the sanctions map is an IT tool for identifying the sanctions regimes. The source of the sanctions stems from legal acts published in the Official Journal (OJ). In case of discrepancy between the published legal acts and the updates on the website it is the OJ version that prevails.

Outcome 2: Technical and economic feasibility of blending of hydrogen into the Natural Gas Transmission Network and for storage assessed; Outcome 3: Hydrogen Master Network Plan prepared Composed of	3 000 000
Procurement (direct management) – cf section 4.3.1	N/A
Procurement - total envelope under section 4.3.1	3 000 000
Evaluation – cf. section 5.2 Audit – cf. section 5.3	may be covered by another Decision ⁶
Strategic Communication and Public Diplomacy – cf. section 6	will be covered by another Decision
Contingencies ⁷	-
Totals	3 000 000

4.4. Organisational Set-up and Responsibilities

A Steering Committee (SC) will be set up at the activity level. SC will be composed of the representatives of the European Union as co-chair, NIPAC, Ministry of Energy and Natural Resources, BOTAŞ, Presidency of Strategy and Budget, CFCU, development partners and IFIs. Additional stakeholders may also be invited to the SC on an ad-hoc basis in close coordination with the EU Delegation.

The SC will monitor the project implementation and approve the progress reports. SC will gather at regular intervals and on ad-hoc basis whenever deemed necessary.

The functions of Sectoral Monitoring Committee are as follows:

- Review at each meeting the progress made towards achieving the specific targets of the Programme on the basis of the progress reports;
- Examine at each meeting the results of implementation, particularly the achievement of the targets set for each priority axis and measures and interim evaluations;
- Examine and approve the implementation reports.

SMC will meet at least twice a year.

As part of its prerogative of budget implementation and to safeguard the financial interests of the Union, the Commission may participate in the above governance structures set up for governing the implementation of the action.

⁶ Where the action is covered by a financing agreement, evaluation should be budgeted in the action. Where the action is not covered by a financing agreement (see section 4.1), put ‘will be covered by another decision’ as it is unlikely that evaluation and audit contracts on this action would be concluded within N+1. These contracts have to be authorised by another Financing Decision.

⁷ Consider that contracts where no financing agreement is concluded, contingencies have to be covered by individual and legal commitments by 31 December of N+1.

5. PERFORMANCE MEASUREMENT

5.1. Monitoring and Reporting

The day-to-day technical and financial monitoring of the implementation of this action will be a continuous process, and part of the implementing partner / beneficiary country's responsibilities. To this aim, the implementing partner / beneficiary country shall establish a permanent internal, technical and financial monitoring system for the action and elaborate regular progress reports (not less than annual) and final reports. Every report shall provide an accurate account of implementation of the action, difficulties encountered, changes introduced, as well as the degree of achievement of its results (Outputs and direct Outcomes) as measured by corresponding indicators, using as reference the logframe matrix (for project modality) and the partner's strategy, policy or reform action plan list (for budget support). The Commission may undertake additional project monitoring visits both through its own staff and through independent consultants recruited directly by the Commission for independent monitoring reviews (or recruited by the responsible agent contracted by the Commission for implementing such reviews).

Roles and responsibilities for data collection, analysis and monitoring:

Monitoring tasks undertaken by the implementing partners/ beneficiary country, under the coordination of NIPAC Office, and NAO Office for financial monitoring, will consist of collecting and analysing data aiming at informing on the use of resources and progress towards planned results, feeding the management of the action's decision-making processes. In that respect, the institution(s) responsible from the intervention are required to share all the relevant information and documents prepared during all phases of the action with the NIPAC and NAO, when requested.

- Monitoring tasks undertaken by the EU Delegation shall complement the implementing partners'/ beneficiary country's monitoring system, especially in key moments of the action cycle. It will also support follow-up of recommendations stemming out of external monitoring and will be used for informing EU management. This monitoring could take different forms and methodologies (meetings with implementing partners, action steering committees, on the spot checks ...), to be decided based on specific needs and resources at hand. Reporting will be done according to methodologies and tools included in DG NEAR guidelines on linking planning/programming, monitoring and evaluation, including the use of standard checklists.

Both types of internal monitoring are meant to inform and provide support to external monitoring:

- External monitoring / Results Oriented Monitoring (ROM)

The Commission and/or NIPAC may undertake additional project monitoring in line with the European Commission rules and procedures set in the Financing Agreement through independent consultants recruited directly by the Commission/NIPAC for independent monitoring reviews (or recruited by the responsible agent contracted by the Commission/NIPAC for implementing such reviews). These reviews might be composed of monitoring of the action, results data collection or any other task that is identified in the most recent EC guidelines.

The Steering Committees will be established at activity level in order to steer the implementation of activities, achievement of results against indicators in the action document, to discuss monitoring findings (including ROM findings) and agree on corrective actions as appropriate. SC will be mainly composed of the representatives of the European Union as co-chair, the NIPAC, Ministry of Energy and Natural Resources, BOTAŞ, Presidency of Strategy and Budget, CFCU, development partners and IFIs. Additional stakeholders may also be invited to the SC on ad-hoc basis in close coordination with the EU Delegation.

5.2. Evaluation

Having regard to the nature of the action, evaluation(s) may be carried out for this action or its components by the beneficiary country via independent consultants. The evaluations will be carried out as prescribed by the DG NEAR guidelines on linking planning/programming, monitoring and evaluation.

The evaluation reports shall be shared with the partner country and other key stakeholders. The implementing partner and the Commission shall analyse the conclusions and recommendations of the evaluations and, where appropriate, in agreement with the partner country, jointly decide on the follow-up actions to be taken and any adjustments necessary, including, if indicated, the reorientation of the project.

5.3. Audit and Verifications

Without prejudice to the obligations applicable to contracts concluded for the implementation of this action, the Commission may, on the basis of a risk assessment, contract independent audit or verification assignments for one or several contracts or agreements.

6. STRATEGIC COMMUNICATION AND PUBLIC DIPLOMACY

All entities implementing EU-funded external actions have the contractual obligation to inform the relevant audiences of the Union's support for their work by displaying the EU emblem and a short funding statement as appropriate on all communication materials related to the actions concerned. To that end they must comply with the instructions given in the 2022 guidance document [*Communicating and raising EU visibility: Guidance for external actions*](#) (or any successor document).

This obligation will apply equally, regardless of whether the actions concerned are implemented by the Commission, the partner country, service providers, grant beneficiaries or entrusted or delegated entities such as UN agencies, international financial institutions and agencies of EU Member States. In each case, a reference to the relevant contractual obligations must be included in the respective financing agreement, procurement and grant contracts, and contribution agreements.

7. SUSTAINABILITY

BOTAŞ considers integrating impacts on all economic, environmental, and social phenomena into a sustainable way of doing business in the long term as a fundamental element to the goal of making a more liveable world. Being aware of the environmental impacts of oil and natural gas, which are non-renewable energy sources, BOTAŞ takes every step with future generations' rights in mind.

Türkiye has a responsibility to ensure the outputs of this action are fully used and to allocate the necessary resources to ensure the sustainability of the action. The relevant stakeholders such as MENR, EMRA and industrial establishments using hydrogen will provide every resource and effort in collaboration with the relevant parties to maintain, and if necessary, further improve, the outcome of this Action.

The MENR is responsible for the preparation and implementation of legal framework accordance with the relevant legislation of the EU in the field of hydrogen.

As it is known, hydrogen is a type of green energy that has been on the agenda in recent years. Therefore, it is an area that needs research and development. The activities on capacity building and training are integrated into this Action. This integration will enhance the project results and will safeguard the impact and sustainability of the project results. The trained personnel will continue to work for maintaining the outcomes of the project in the following years.

For the sustainability of the developed institutional capacity, the developed technical documents, outputs of the project and all training materials and all pieces of data and information gathered that are necessary for continuation studies after the Action, etc. will be kept in a media that can be easily accessed, used and -if necessary- edited by the rest of the staff such as the official web site of the BOTAŞ. Trainers will be trained as part of the project and will continue training and informing activities after the project. The training modules and training documents will be developed within the scope of the project and will be used actively after the completion of the project.

Pilot studies and master plans to be made as a result of this action will always guide Türkiye's strategy in transition to hydrogen economy. It will enable the identification of new investments related to hydrogen.