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CLIMATE TECHNOLOGIES



INTERVIEW

**COOPERATIVE METHOD FOR
STARTUPS CAN BE TRIED**

DR. EMRE EREN KORKMAZ



INTERVIEW

**HIGH COST POSES A PROBLEM, INCENTIVE
MECHANISM IS CRUCIAL BUT CCUS IS NOT
A SILVER BULLET**

DR. RİFAT ÜNAL SAYMAN

DID COP29 SERVE THE DEVELOPMENT OF CLIMATE TECHNOLOGIES?

The COP (Conference of Parties), officially known as the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), first held in 1995, is an annually organised conference of the United Nations (UN) on climate change. In addition to the representatives sent by UN member states to participate in the negotiations, delegates of observer organisations, industry representatives, climate scientists, NGO representatives, activists and lobbyists, who are political persuaders, also participate in the COP.

We attended the COP29 held in Baku between November 11-22, 2024, this time as a stakeholder of the Sustainable Future Platform. As the Technology Development Foundation of Turkey, we were the main speaker under the title “Are Climate Technologies an Obligation or an Opportunity?” before the panels in the Green Zone area on 15 November. Well, what was discussed in Baku, what were the creative ideas and what needs to be developed? What kind of an organisation was there? I would like to evaluate these issues.

- Azerbaijan, which is highly motivated and eager to undertake major organisations, was well organised for COP29 and almost reorganised Baku for the 2-week-long COP29.
- The most important agenda of COP29 was financing. Naturally, the negotiations on this issue were also quite intense.
- While the emphasis on making decisions to facilitate access to finance for all countries and to provide more support to developing countries in climate-related activities was highlighted, the announcements of various large and small funds for achieving net zero / low carbon targets and climate adaptation by countries and organisations during the event also attracted attention.



Dr. E. SERDAR GÖKPINAR

TTGV Innovative Technology Programmes
Director



- As a result of tough negotiations, a last-minute consensus has been reached to provide USD 300 billion for climate finance per year for the next 10 years. While this figure falls short of the USD 1 trillion target demanded by developing countries, it is 3 times the previous annual commitment amounting to USD 100 billion.
- One of the main topics of discussion this year was how to create financial means to assist developing countries to adapt to climate change. It was also discussed that more efforts need to be made to support vulnerable communities, especially “Small Island Developing States” and “Least Developed Countries”.
- Within the scope of Article 6.4 of the Paris Agreement, the operating mechanism of a new global credit mechanism has been approved.
- The need to increase renewable energy and address non-carbon dioxide emissions, such as methane, and to submit National Contribution Declarations (NDCs) by the year 2025 were reiterated to the participants.
- Additional rules under the Article 6.2 of the Paris Agreement have been also adopted. This framework allows countries and companies to trade carbon credits with each other.
- Targets for tripling renewable energy capacity and doubling energy efficiency by the year 2030 have been set.
- Unfortunately, a clear commitment to reduce the use of fossil fuels has not been included in the text.
- It has been evaluated that sufficient progress has not been achieved in Agriculture and Food Systems, Oceans/Seas and Methane emissions. In this regard, it seems that the spotlight will be on Brazil, the host of the 2025 COP30.

Türkiye is a Candidate for COP31

In terms of the number of participants, Türkiye was the third largest national delegation to COP29, following Azerbaijan and Brazil (COP30 host). Among the many announcements and developments that took place at COP29, I can list the most noteworthy headlines that we have selected as follows:

- Türkiye announced its Long Term Climate Strategy and Roadmap at COP29.
- The “Declaration on Tripling Nuclear Energy”, which was signed by 25 countries at the COP28 in Dubai in 2023, received the signatures of 6 more countries this year, including Türkiye. Thus, a commitment has been made to work jointly to triple the global nuclear energy installed capacity in 2050 compared to 2020. Türkiye has also announced plans to build two more large nuclear power plants in Sinop and Thrace regions in addition to Akkuyu, and also to build a next generation of small modular reactors.
- By reiterating its 2053 net zero emission target, Türkiye has committed to reduce its greenhouse gas emissions by 32 percent by 2030.
- Türkiye has announced that it intends to be a candidate to host COP31, which is planned to be held in the year 2026.

An interesting detail about the COP is:

- On November 15, it was announced by various NGOs that 1.773 lobbyists acting on behalf of fossil fuel interests were granted access to the event. This figure can actually be considered as the 4th largest number of delegations after Türkiye. While talking about the transition from fossil fuels, such developments are quite confusing.

Humanity Fails to Reach The Goals

While the speeches, negotiations, discussions and statements made at the COP continue, we perhaps need to take a look at the progress we, as humanity, have made so far on the issue of climate. With the Paris Agreement that was adopted at the COP21 in Paris in 2015, it was agreed to limit the increase in global surface temperature to 2°C and preferably 1.5°C below pre-industrial levels. While it is observed that this increase was realised as 1.49°C in 2023, it is predicted that the target to limit the increase to 1.5°C will be exceeded in 2024. It should not be forgotten that in 2024, global daily average temperature records were broken one after another. Let's leave everything aside, this is the critical point: as humanity, we have failed to pass the class.

Despite the long speeches given and negotiations held, the failure to meet the targets and the disorganised and confusing developments at the COP events have led many people to characterise the COP summits as a “waste of time”.

Regarding the Technology Dimension

Climate transformation is not a “rhetorical” issue. The change we have been facing is both very difficult and complex. We are speaking about the reversal of the production and consumption system that humanity has established in a few hundred years since the beginning of the industrial revolution. Even though no one knows the exact figure, the projections of the financial resources to be spent in the next 30 years reach hundreds of trillions of US dollars. As a footnote, in the present day, the flow of financial resources can be provided largely under the leadership of the states.

This transformation is in essence a very comprehensive techno-economic transformation, and some of the technologies that will form the scope of the transformation are already available at a ‘scalable level’. In addition to scientific research and technology development, the dissemination and scaling of technological innovations must also be included in the discussions and studies. So, what can be said about climate technologies (ClimateTech)?



- Climate technologies are the subject of the field of Deep Tech, which covers scientific and engineering-based technological innovations. Such technologies require advanced research and development to solve complex problems. This is rendered possible by the regular and patient flow of “smart money”.
- We have made significant progress in renewable energy, and in particular in electricity generation from solar and wind. These technologies have reached cost parity with fossil-based alternatives. While this is considered as a positive development, let us not lose sight of the fact that it took time to reach this stage. This will also be the case for other emerging technologies.

- As each sector, region and country will be different in terms of its impact on and vulnerability to climate, specific solutions will be needed to be developed for each sector, region and country. This suggests that it will not be possible to proceed with copy and paste strategies and plans, and that it will require a large number of technology demonstrations, trials and pilots to identify what will actually function.
- Considering the targets set, our performance so far and the timetable, the transition from the laboratory to scale-up needs to be exponential, not linear as we have been accustomed to so far.
- Sectors that are trendy attract more funding. For example, power systems, electric vehicles and hydrogen are more favoured than many other technology areas. This phenomenon is also driven by investor psychology, or more precisely FOMO (fear of investors to miss an opportunity).
- The materials and metals, especially rare earth elements, that innovative technologies will require are likely to constitute a bottleneck in the scale-up phase. Mining, materials and metallurgy may also require the strengthening of applications such as recycling and reuse.
- The shortage of human resources and talent, both in terms of quality and quantity, is being severely felt, even in rich ecosystems.
- Finally, while almost everyone talks about cooperation and collaboration, in practice it is not possible to argue that this is the actual case. In fact, it may not be wrong to say that work has been carried out in isolation and competition rather than cooperation.

When we put all these together, it remains crucial to carry out technology studies in a more inclusive manner and to ensure that everyone possible contributes to these studies. It can be very problematic to wait for someone else to develop technologies and then purchase them, without engaging in technology development, as it has been done comfortably in the past.

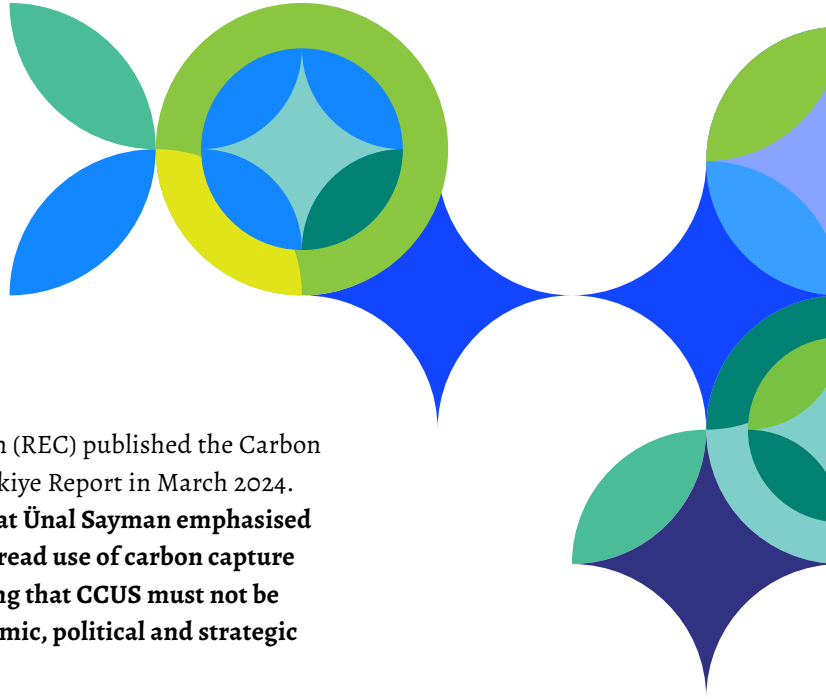
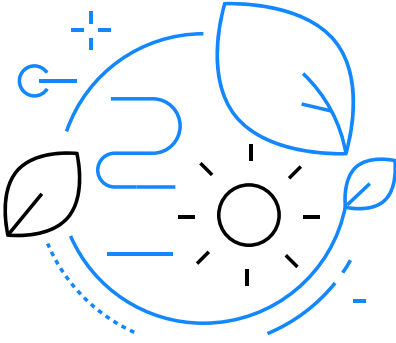
HIGH COST POSES A PROBLEM, INCENTIVE MECHANISM IS CRUCIAL BUT CCUS IS NOT A SILVER BULLET



DR. RİFAT ÜNAL SAYMAN
Chairperson of REC Board of
Directors

INTERVIEW: Esra YAZDIÇ DEMİR
TTGV Corporate Communications and
Media Manager

Studies carried out all over the world for technologies that can play an important role in meeting global energy and climate targets are being shared with the public one after another. As in many other fields, the experts of the business express their own opinions on the positive and negative applications regarding carbon capture technologies. Understanding, interpreting and producing is one thing, but the incentive mechanisms of the country in which they are located are the most challenging factors for organisations or individuals working on climate issues.



The Resource, Environment and Climate Association (REC) published the Carbon Capture, Utilisation and Storage Potential of Türkiye Report in March 2024. **Chairperson of the REC Board of Directors, Dr. Rifat Ünal Sayman emphasised that the most important factor limiting the widespread use of carbon capture technologies is the high costs, while also underlining that CCUS must not be perceived as a silver bullet. We discussed the economic, political and strategic processes of the CCUS with Mr. Sayman.**

We need to reach the “net zero emission” target by 2050 in order to limit the impacts of the climate crisis and keep global warming at 1.5°C, but it seems that this degree limit will be reached only in 2024. So, what would be the impact or contribution of the CCUS to the climate in the following period? What is the potential of the CCUS in combating the climate crisis?

I would like to start this interview with a minor correction. The fact that average temperatures exceeded 1,5 degrees Celsius this year does not mean that the 1,5-degrees limit has been permanently exceeded. However, the current situation clearly demonstrates that this limit is being approached rapidly compared to the pre-industrial period. Natural climate events such as El Niño can cause temperatures to rise temporarily in some years and exceed the threshold of 1,5 degrees. Scientific analyses reveal that the probability of exceeding this threshold permanently in the coming years is quite high. For this reason, it becomes more critical than ever to take rapid and decisive steps in the combat against climate change.

Strategic instruments such as energy efficiency and renewable energy need to be at the focal point in order to reduce greenhouse gas emissions in Türkiye. The contribution potential of CCUS technologies is quite limited under current conditions. In 2022, Türkiye emitted approximately 250 Mt CO₂ equivalent of greenhouse gas emissions that can be subject to CCUS. The known carbon storage capacity in our country is

well below this amount. The total storage capacity in oil and natural gas fields is calculated as only 108 Mt CO₂.

This is not annual, but total capacity. It is estimated that there may be a much higher capacity in our aquifer areas. Detailed research to determine this potential has still not been carried out.

Once the storage areas are clearly identified, the utilisation of CCUS in sectors where there are limited technical alternatives to achieve net zero emissions, especially in the manufacturing industry, could be considered. Nevertheless, current costs indicate that even the applications in these sectors will remain quite limited.

We observe that CCUS is employed worldwide as a tool that from time to time delays the implementation of emission reduction measures. In other words, there is an attempt to create the perception that CCUS will solve all problems like a silver bullet. Türkiye must absolutely avoid such approaches. CCUS may be utilised to some extent after 15 years to contribute to the reduction of Türkiye's emissions. However, we need to be prepared for the fact that this technology may play a limited role in total emissions and we must not rely solely on CCUS.

In conclusion, in order for the effective implementation of CCUS, firstly, the geological storage potential needs to be investigated, the necessary infrastructure needs to be developed, and a strategy in line with energy transition policies needs to be adopted.



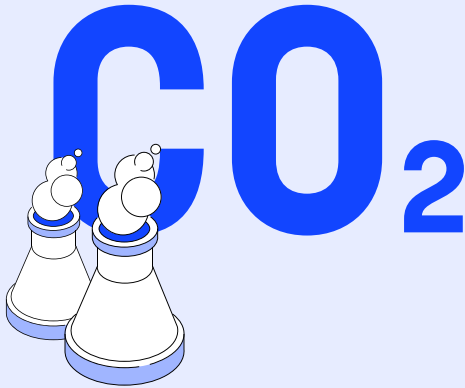
Cost, Cost, Cost, Merely Cost...

What are the obstacles to carbon capture technology?

The most important factor which limits the widespread adoption of carbon capture technologies is their high cost. CCUS technologies consist of a three-stage process involving the capture, transport and storage of carbon. In this process, most of these costs are incurred during the CO₂ capture phase. The average cost of CO₂ CCUS solutions is over 100 Euros per tonne, making it severely challenging to be economically viable.

The International Energy Agency categorises the challenges to the implementation of CCUS under four main headings. The first one is that carbon capture technology has not yet been sufficiently developed in sectors such as cement and iron and steel, where emission reductions are difficult. The second one is the lack of suitable storage sites, which constitutes a major constraint. The third one is that storage sites do not geographically overlap with CO₂ emission sources, increasing logistics costs and risks. Finally, transboundary CCUS applications pose additional challenges due to the complexity of international administrative processes.

For these reasons, in order for CCUS technologies to become widespread, costs need to be reduced, technology infrastructure needs to be developed, and regulations to facilitate international cooperation need to be implemented.



At what stage are carbon capture technologies in Türkiye?

We observe that CCUS is still in its infancy stage not only in Türkiye, but also in the rest of the world. In fact, the technology has reached a certain level and is now commercialised. Nevertheless, since it is a very expensive technology, there is currently no commercial application in Türkiye.

“In order for the effective implementation of CCUS, firstly, the geological storage potential needs to be investigated, the necessary infrastructure needs to be developed, and a strategy in line with energy transition policies needs to be adopted.”

Long-Term Trade Agreements Have Critical Importance

How do carbon capture technologies progress? What are the investment trends, financing and application examples of these technologies?

Capture technology should not be taken into account in isolation, this process also encompasses logistics and storage stages beyond the capture of carbon. We are talking about very large quantities, millions of tonnes. A logistics infrastructure, such as tankers or pipelines, needs to be established to transport the captured carbon to storage sites and storage facilities need to be built. This is where the “chicken and egg” dilemma arises.

It is critical for large emitting facilities to conclude long-term agreements with the storage facilities. Unless you can guarantee the amount of carbon to be stored, no one will be interested in investing in a storage facility. Likewise, if you have not received a guarantee that the gas you capture will be stored safely, it does not make sense to invest in the capture process.

There are currently some cross-border applications in the world. For example, a project between Norway and Denmark and joint projects of Australia and South Korea are remarkable in this field. Nevertheless, these projects are far from being replicable or widely applicable in Türkiye owing to their high costs.

Consequently, carbon capture and storage processes need to be planned together, logistics and storage infrastructure needs to be established, and long-term cooperation mechanisms based on trust between facilities need to be developed. Otherwise, these high-cost solutions will remain as an option for Türkiye.

Incentives have an impact on progress

It is quite difficult for CCUS technologies to progress without any incentives. In this sense, can you make a comparison between Türkiye and other countries?

It remains really critical that incentive mechanisms are put in place in order for CCUS technologies to become economically viable. There are various examples of such incentives abroad. For example, the United States of America provides a tax incentive of 85 dollars per tonne for CO₂ storage. In the European Union, the pricing of carbon emissions within the emission trading system serves as an indirect incentive. In the European Union, the price per tonne of CO₂ emissions has now reached around 100 Euros. These types of direct or indirect regulations play an important role in rendering the high costs of CCCUS technologies affordable.

Currently, there is no similar mechanism to promote CCUS technologies in Türkiye. Furthermore, there is neither a pricing system for carbon emissions nor direct incentives are available. This constitutes one of the biggest obstacles to CCUS investments in Türkiye. Therefore, Türkiye needs to develop policies that either determine a price for carbon emissions or incentivise CCUS applications in order to overcome the current high costs.

In conclusion, while incentives provided in this field abroad increase the applicability of CCUS technologies, the lack of such a mechanism in Türkiye severely limits progress. I would like to conclude my response with a question: With energy efficiency and renewable energy applications so widespread, does Türkiye really need to pay the high costs of CCUS?



ECONOMIC AND ENVIRONMENTAL POTENTIAL OF CARBON UTILISATION TECHNOLOGIES: MILESTONE FOR THE GREEN ECONOMY OF THE FUTURE



DR. GÜNİZ GÜREL

TTGV Pioneer Project
Program Specialist



The global climate crisis has become one of the greatest threats to humanity with its environmental, economic and social dimensions. Since the industrial revolution, anthropogenic practices such as excessive use of fossil fuels, agricultural and animal husbandry practices, deforestation and industrial activities have rapidly increased the concentration of carbon dioxide (CO₂) in the atmosphere and triggered “anthropogenic”, which also known as “human-induced” climate change. Global greenhouse gas emissions reached a level of approximately 53 billion tonnes of CO₂ equivalent (GtCO₂) in 2023, 75% of which is CO₂ [1]. An urgent solution is needed to limit the global temperature increase and avoid the devastating effects of climate change. The Paris Agreement, which was approved at the Conference of the Parties (COP), which is regarded as the decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC), to which Türkiye became a party in 2021, aims to limit the increase in global average temperature to 2°C compared to the pre-industrial period and, if possible, to keep this increase below 1.5°C [2]. As stipulated in the Paris Agreement, emissions need to be reduced by 45 percent by the year 2030 and to achieve net zero emissions by the year 2050 in order to keep global warming

below 1.5°C. Approximately 1.4 billion tonnes of CO₂ anthropogenic CO₂ emission reductions are required annually to achieve these targets [3]. Carbon Capture, Utilisation and Storage Technologies (CCUS), which are among the solutions aiming to significantly reduce carbon emissions in a wide range of industries ranging from industries that are difficult to reduce emissions (cement, iron-steel, chemical production, etc.) to the energy sector, constitute one of the cornerstones of global climate policies. The basic principle of “Carbon Capture and Utilisation (CCU)” Technologies, which are evaluated within the scope of CCUS, is to capture CO₂ either from point sources or directly from the air, transport it to the area of utilisation by compressing it through pipelines, and then utilise this carbon directly or by converting it into useful products. As it can be seen in Figure 1, CO₂ has the potential to be utilised directly, in greenhouses/algae cultivation process/fertiliser production, as a solvent in enhanced oil recovery to increase efficiency, as a heat transfer fluid in cooling

systems, as a propellant in the pharmaceutical industry or in the food/beverage industry [4]. In recent years, thanks to factors such as the rise of renewable energy and the search for energy security, the utilisation of CO₂ in the context of CCS has started to attract attention. CO₂ is converted into useful products by employing three basic methods: biological, chemical and mineralisation [5]. In the biological conversion, microorganisms (e.g. microalgae) rapidly absorb CO₂ and use sunlight to convert it into a final product such as a chemical or fuel [6]. In chemical conversion, the carbon-oxygen bond is broken and carbon is bonded to other elements (hydrogen) to produce the final product. In this process, CO₂ is used as reactant or feedstock for the synthesis of commodity chemicals and fuels [6]. In mineralisation or carbonation, CO₂ reacts naturally with minerals containing calcium or magnesium to produce valuable building/construction materials. In this method, CO₂ can be integrated into the final product (concrete/aggregate) and stored as solid carbonates [7].

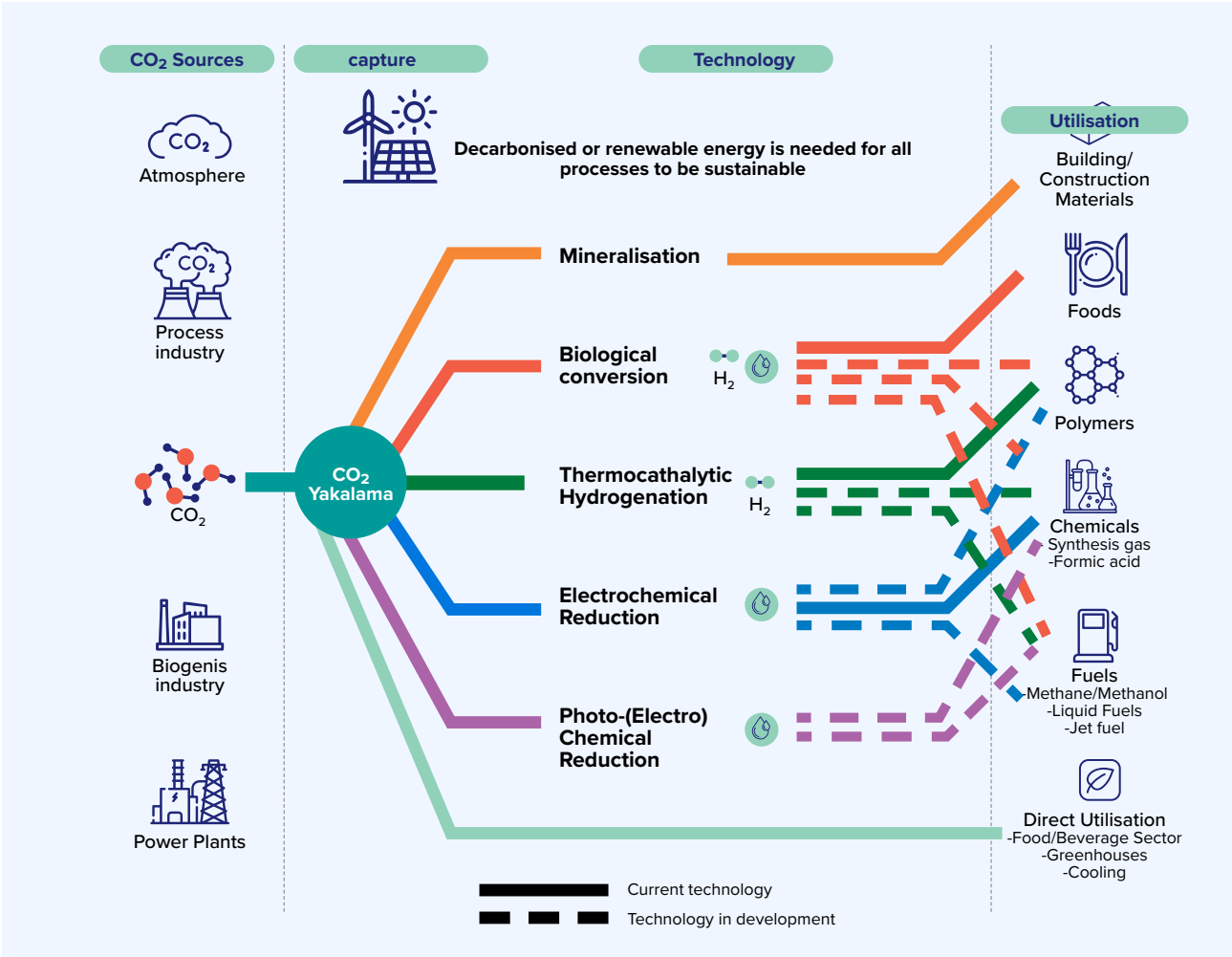


Figure 1: CCU Process and CO₂ Conversion Methods [4]

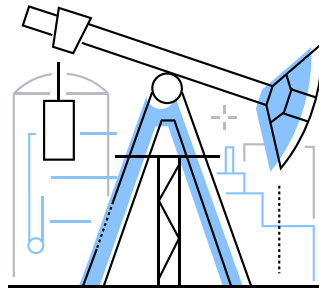


Carbon Utilisation Technologies contribute to the removal of CO₂ from the atmosphere on a scale of Gigatonnes (Gt), while also serving as a source of raw materials for many key products made from carbon. Therefore, carbon utilisation technologies have the potential to create an innovative business model. Carbon credits and carbon markets play a critical role in the financial sustainability of carbon utilisation technologies and are seen as a tool to incentivise projects to reduce carbon emissions. The amount of carbon reduced by the implementation of carbon utilisation projects can be converted into carbon credits and sold in carbon markets. For example, an establishment with high carbon emissions converts waste CO₂ into a useful product such as synthetic fuel, chemical substance, building/construction material and not only achieves emission reduction but also finds the opportunity to sell this reduction in the market as carbon credits. By selling these credits, industrial facilities can earn additional income beyond avoiding carbon tax.

CO₂ utilisation applications are considered as a strong driving force not only in the combat against climate change, but also in line with the goals of circular economy and sustainable development. The

main steps that countries must take in the field of CCU technologies are listed below:

- Legislation and legal arrangements compatible with carbon economy in general and carbon utilisation in particular need to be developed.
- In addition to national carbon pricing mechanisms such as emission trading system (ETS) or carbon tax; financial structures such as incentives and subsidies need to be established.
- Trade regulations and international standards need to be determined in line with the Carbon Border Adjustment Mechanism (CBAM).
- Public and private sector supported research and development (R&D) programs need to be established.
- Pilot projects need to be designed and implemented to test CCU technologies, especially in sectors where emission reductions are difficult (cement, iron-steel, chemistry).
- A support and incentive system needs to be established for the development of ecosystem and qualified human resources, and labour investments need to be enhanced.



“Carbon dioxide utilisation applications are considered as a strong driving force not only in the combat against climate change, but also in line with the goals of circular economy and sustainable development.”

- Participation in international projects for joint technology development, technology transfer and capacity building activities needs to be ensured.

An in-depth analysis study conducted by the Technology Development Foundation of Turkey (TTGV) on CCUS Technologies, Carbon Dioxide Removal (CDR) solutions and carbon markets has evaluated the current status and development potential of the sector. The results of the study revealed that CCUS technologies are still in the process of becoming mature and it is critical to reduce their costs and increase their scalability to enable their widespread adoption. Moreover, given that implementation processes are highly dependent on legal and regulatory frameworks, the ecosystem is still open for improvement. Therefore, it remains important to strengthen national strategies for CCUS technologies and to implement the necessary regulations at the policy level. With the steps to be taken in the field of CCUS technologies, while contributing to global climate goals, Türkiye can also achieve significant opportunities in terms of energy security, industrial transformation and economic development.

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COOPERATIVE METHOD FOR STARTUPS CAN BE TRIED



DR. EMRE EREN KORKMAZ

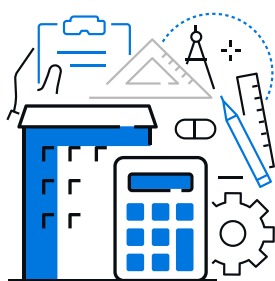
Lecturer at the Department of
International Development,
University of Oxford

INTERVIEW: Esra YAZDIÇ DEMİR
TTGV Corporate Communications and Media Manager

“Many valuable ideas are lost because they cannot find investment. 10 times profit is as unlikely as finding a unicorn, and yet it prevents sustainable businesses from being supported.”

Today, when the consequences of the climate crisis are starting to be experienced more frequently, many startups are attempting to produce new solutions in this field. Nevertheless, one of the most challenging issues for these initiatives is the problem of access to dialogue and finance. **Dr. Emre Eren Korkmaz**, Lecturer at the Department of International Development at Oxford University, who works on climate initiatives, data analysis and security, reminds us of past experiences in this sense and draws attention to alternative business, ownership and company methods such as the cooperative method.

We had an interview with Korkmaz, who emphasised that different modelling and strategies are needed especially for the visibility of initiatives working in the field of climate technologies, **on public awareness of climate technologies, difficulties in accessing finance in these areas, and impact evaluation frameworks for climate technology initiatives.**



You conduct studies on technology, innovation, migration, climate crisis and international development. As a political scientist, could you first explain the effects of the climate crisis in terms of sociology?

A vast literature on the climate crisis has been produced by scientists. It can be said that we are scientifically aware of the issue. However, this is not merely a problem that concerns societies in the future. We see the consequences of the climate crisis even today in our daily lives. We are experiencing unusual weather events, storms, floods and droughts. The floods in Valencia in Spain and Florida in the USA in recent months are two examples of such events. For the first time ever, the Philippines was hit by 4 hurricanes in a row within a month. We observe that these have led to loss of life and migration. Furthermore, they have hit agriculture, the economy and small businesses. And of course, these events have political consequences. So much so that this situation had an impact on the elections held in the United States of America. The government was protested in Spain. It is also possible to trigger wars and conflicts due to drought and other natural disasters. Therefore, it is important for political scientists to analyse the climate issue and its political and economic consequences.

Finance is the focal point of the problem

The development of benchmarking models and impact evaluation frameworks for climate technology initiatives in Africa, Europe and beyond, driven by a determination to bridge the gap between academia and real-world applications, constitute the main thrust of your study. Could you explain this study and the reasons behind it?

Recently, I have been focusing on the challenges that startups are facing in the field of climate technologies, partly in terms of access to finance, investment and markets, but also in terms of accelerating the flow of climate finance to developing countries in the so-called “Global South”. While investments in climate finance and climate technology startups have increased significantly, they are concentrated in a few sectors, such as energy and mobility, and in North America and Europe.

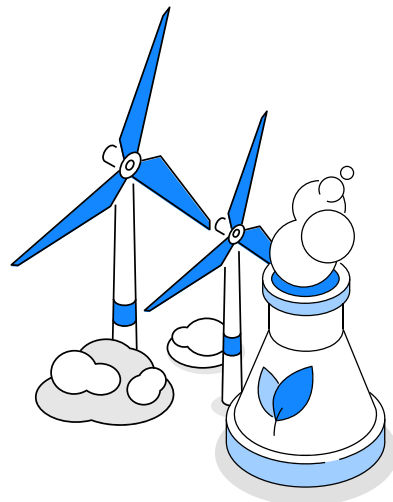
The scientific literature on the climate crisis is rich and we have a large number of solutions and technological innovations. This is very positive. It can be said that in terms of regulations, there is no serious problem. Then why we cannot act quickly and the crisis is deepening? The main problem here is finance. The classical and traditional investor approach and financial institutions do not sufficiently invest in this area due to their business definitions and profit-oriented approaches, and those that do either prioritise online platforms or invest in solutions that can generate short-term profits. Investors hold back from investing in these areas due to the risks associated with both the development of technological solutions that require long-term investment and the risks associated with investing in developing countries.



Many Valuable Ideas Are Lost Because They Cannot Find Investment

Therefore, we have set out to create a benchmark in this field. We will start the first steps with a European Union fund in the energy sector in January 2025. Here we aim to analyse the technical, social and environmental impact of startups and innovative solutions. At the same time, it is observed that the impact of the VC model that dominates this field is limited and does not cover the vast majority of startups. Many valuable ideas are lost because they cannot find investment. 10 times profit is as unlikely as finding a unicorn, and yet it prevents sustainable businesses from being supported. Public resources bring investments only to the MVP stage. For this reason, while creating this model, we will also bring alternative business, management and ownership models to the agenda. We will examine cooperatives, doughnut economics, post-growth entrepreneurship, and steward ownership models and present a road map to entrepreneurs or, more accurately, to investors. Moreover, we will determine and indicate to the entrepreneurs with which business and ownership model they can bring their product to the market and reach their customers.

“We offer an end-to-end solution for sustainability reporting in our country, especially from the supply chain to data collection.”



Data Scarcity and Security is a Major Problem

You emphasise the issue of data scarcity. We would like to get information about your new organisation Impactox. Why did you need this initiative?

Since 2020, we have carried out studies, developed certain methodologies and prepared technical reports for institutions such as EBRD, Google and the World Food Program on overcoming data scarcity in developing countries in the sectors they are related to. Data scarcity constitutes an important issue also in sustainability and ESG reports. Companies have to submit this data due to the new sustainability law that has been enacted in our country and the relevant regulations in the European Union, United Kingdom and the United States. But collecting data, especially from supply chains, poses a serious problem. The reliability of that data also poses a separate problem. To solve this problem, we have established an initiative called ImpactOX in our country, where we have created a wide business network, including environmental experts, sustainability experts, financial advisors and labs. At the same time, we have brought the Komunidad online platform, which has been tested in the Philippines, Singapore and many countries in Europe, which facilitates data collection from SMEs. We have also agreed with Clarity AI, which provides benchmarks and scores. We have also incorporated the methodologies of overcoming data scarcity and impact measurement that we developed at Oxford University. Therefore, we offer a complete solution for sustainability reporting in our country, especially from the supply chain to data collection.



Entrepreneurs Are Actually Inventors

Hackathons offer a great environment to produce creative solutions in a short time. However, these intense processes can sometimes cause teams to focus on short-term solutions instead of sustainable innovation. Do you think hackathons offer a structure that can support innovation culture in the long term? What are the positive or negative aspects?

A doctoral thesis in Oxford claimed that hackathons kill innovation. This may be a bit exaggerated, but events such as hackathons and pitching are areas where participants make serious emotional investments. Lack of interest in their ideas and lack of support can cause a sense of demoralisation. On the one side, these entrepreneurs are actually inventors, and most of them are academicians and engineers. They know their subjects very well. Yet no one has any idea about investment, and they make decisions without any specific reason. I think these funny and bright environments need to change.



The Problem of Finance and Dialogue Needs to be Solved

You remind us of the co-operative system to create an income model in climate technologies. Could you explain this?

Climate technology startups usually focus on getting money from venture capital investors in the early stage. Nevertheless, they can bring different business methods to the agenda in launching their products and reaching customers. Cooperatives can be a method in terms of legal infrastructure and awareness. As far as I know, the cooperative system is not a method tried in this field. In some developing countries, it is applied for so-called nature-based solutions. But its use for technological solutions is not very well known. We want to try these methods. For example, if an online platform needs satellite data, it can get it from another startup and give its solution to an energy startup. For this, instead of waiting for money from investors, they can support each other in a cooperation and put it on the agenda to enter the market. We will try these options.

One-Way PR Speeches Need to Be Set Aside

You emphasise in your speeches on different platforms that you attach great importance to dialogue. In this context, what needs to be done to accelerate social impact in the climate technology and sustainable development sectors?

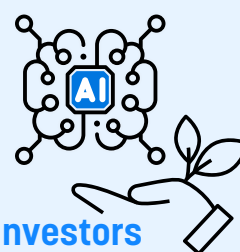
Dialogue is important, however as I see in the United Kingdom right now, talking a lot about the climate crisis and innovation in the events held every day does not yield a good result. The prevailing understanding is just talking a lot. Each week a city hosts a climate week, startups and investors come together there, and every day there is a networking event somewhere, but it is necessary to see the aspects that are no longer working and to take action, to solve the finance problem. For this, it is necessary to set one-way PR speeches aside, establish dialogue and produce solutions.



Climate technology initiatives are gaining a lot of support worldwide. You also have the opportunity to analyse them. What are the prominent areas?

Energy, agriculture, carbon capture, oceans and water form the most prominent issues. There is also a serious sector offering artificial intelligence solutions that support these areas. However, the decisive issue is not the lack of ideas, there are many ideas, but it is the finance that is waiting for a solution. This cannot be solved only from a profit perspective.

“The climate crisis cannot be solved solely through online platforms. We also need concrete solutions. Investors generally prioritise online platforms, believing that there will be a faster return. This understanding needs to change.”



Warning for Investors

What is the current situation regarding artificial intelligence models developed for climate finance and investment in climate technology? What would be your warnings?

There are many investments in this field. These investments are important. But we should not ignore the fact that artificial intelligence, especially LLM, consumes a lot of energy and water and causes damage. These programs are important for examining and manipulating data and making decisions. Nevertheless, the climate crisis cannot be solved solely through online platforms. We also need concrete solutions. Investors generally prioritise online platforms, believing that there will be a faster return. This understanding needs to change.

TECHNOLOGY VALORISATION WITH A FOCUS ON CLIMATE TECHNOLOGIES



DR. CANKUT KAAAN BOLAT

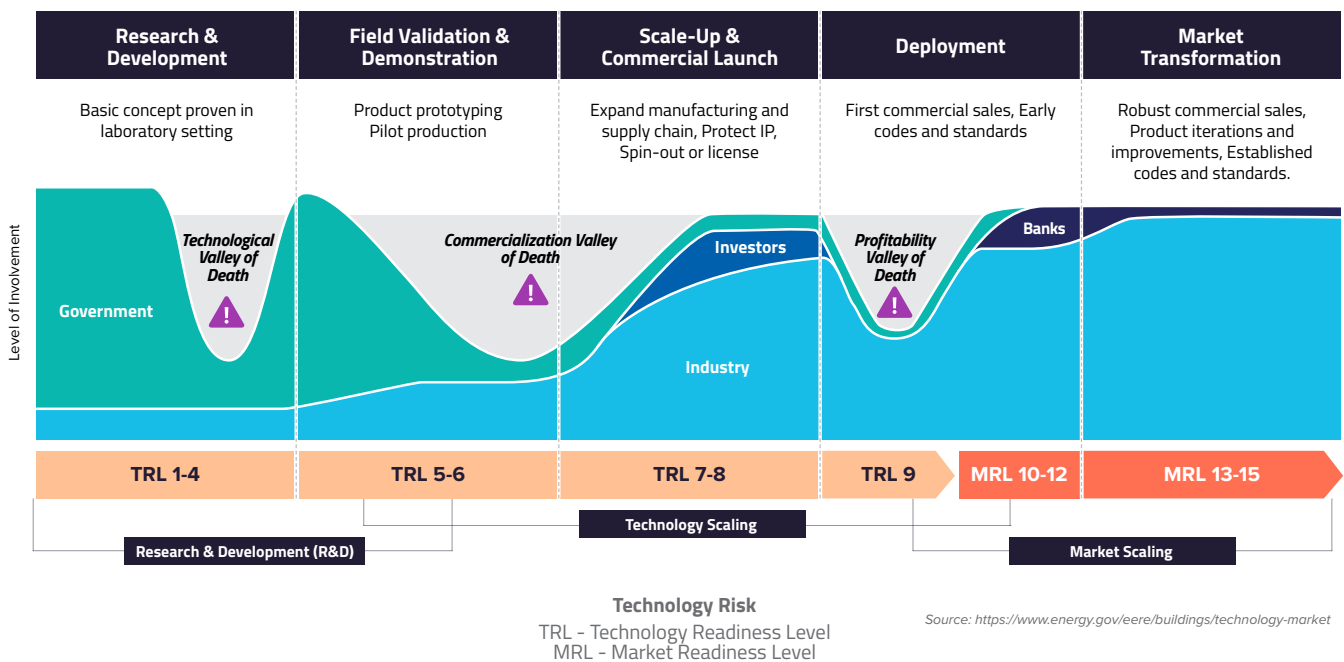
TTGV Pioneer Project Program Specialist



As a non-governmental organisation with the authority in the public sphere to provide technology and innovation support to enable the private sector in Türkiye to scale up competitively in the international arena, TTGV has made its presence felt with its system-shaping touches at many critical turning points within the framework of the strategic technology development mission of Türkiye since its establishment. **TTGV**, which is well aware of the importance of climate technologies within the framework of the climate crisis, which is regarded as one of the biggest debates of the 21st century, and therefore **has focused on climate technologies**, encourages investment in emerging technologies in the world and in Türkiye through its demand-oriented programs, brings all stakeholders together professionally by creating application-based communities through its **supply-oriented** programs, and paves the way for the commercialisation of new technologies and the transition of Turkish industry to clean technologies through other programs. The **“Pioneer Project Seed Program”**, which has emerged in 2018 as a result of the continuation of the Hit Thematic Development Program put forward by TTGV with its unique development methodology, combined with the **“Valleys of Death”** approach which has been adopted by TTGV and extending to climate technologies, specifically aims to ensure that startups and technology owners survive the **Technology Valley of Death**.

The key observation that TTGV has made concretely in the field since shifting its focus to climate technologies is that the development of climate technologies, in addition to the **wide range of opportunities** it offers, involves a number of **structural challenges**. Both the **commercial and technical performance of these technological solutions** are frequently questioned by market players for a number of reasons, such as the fact that the vast majority of these technologies are based on laboratory studies involving basic sciences, that many promising solutions at the laboratory scale rarely turn into a commercial solution, and that by their very nature they can rarely offer solutions that are alternatives to existing conventional technologies. In addition to all these, since the scaling anticipated by the market from these advanced technologies does not occur as fast as expected, the commercialisation process becomes even more problematic. The inability

of scaling and knowledge accumulation to develop at the expected pace, and as the classical understanding of venture capital, which has been in place until today, is oriented towards **software-based solutions** rather than complex and challenging options, make it difficult for these technologies to find funding for development. As a result of all these findings, **as TTGV, we observe that while there is a problem on the supply side of climate technologies, there are also some dilemmas on the demand side**. We believe that the deadlocks related to the demand side can only be solved by **infrastructure investors, operators and policy makers acting collectively**. Precisely for this reason, TTGV planned a series of events aiming to bring all stakeholders together and create the big picture together, called this series of events **REACT (Rethinking Valorisation of Climate Technologies)** and launched this series on November 28, 2024 at Pera Palace in Istanbul.





With its newly designed **Seed Program**, TTGV aims to **identify the technology owners** working on deep technologies in Türkiye, with a special focus on climate technologies, and to collaborate with these technology owners and to **value their technologies**. On the other hand, it is observed that the **Technology Valorisation** approach has not yet been fully adopted in our country. In order for the valorisation perspective to be fully understood and utilised, issues such as better understanding of the main problems in the commercialisation of climate technologies, discussions with stakeholders on **technology acquisition**, and increasing knowledge within the framework of cause and effect relationship are of critical importance. With the **REACT series of events**, TTGV aims to ensure the valorisation of climate technologies in Türkiye by creating a dynamic networking and interactive discussion environment within the framework of these issues. At the launch event, where we hosted technology owners, entrepreneurs and entrepreneur candidates, deep technology investors, commercialised climate technology initiatives, technology transfer offices, policy makers, corporate companies and representatives from institutions working in the field

of **Technology Valorisation** worldwide, the outputs shed light on how a road map can be drawn in the first stage.

In the launch of the REACT event, the concept of **Valorisation** was defined and the process of creating value by supporting knowledge with R&D and the transformation of this value into a new business line was discussed. Then, the Valorisation approach was evaluated within the framework of technology, innovation and climate technologies and the outlines of the discussion were drawn. Strategic approaches in the commercialisation of early-stage technologies from the perspective of **corporate venture capital (CVC)** representatives, first-hand experiences of corporations with technology owners were examined, and the same topic was then evaluated from the perspective of international public institutions and public capital in particular, and a discussion infrastructure was prepared for **the funding of technology valorisation**. In the discussion, which continued through international examples of how corporate companies incorporate external technologies into their organisations within the framework of valorisation, **it was emphasised that investments in climate technologies cannot be**



“Considering the nature of climate technologies, these infrastructure investments seem to pose a very high risk and to be highly costly, yet since fundamental problems cannot be solved without these investments, the approach of corporate companies to the perspective of technology procurement in this field affects all stakeholders.”

limited to **SaaS (Software as a Service)** contrary to prevailing approach today, and it was underlined that **infrastructure investments** are also essential for the solution. Considering the nature of climate technologies, these infrastructure investments seem to pose a very high risk and to be highly costly, yet since fundamental problems cannot be solved without these investments, the approach of corporate companies to the perspective of **technology procurement** in this field affects all stakeholders. The importance of accurate modelling, **digitalisation and digital twins**, which form another important factor in the decision-making mechanism, has also been demonstrated in the discussions, and a holistic discussion perspective has been presented in the field of technology procurement. In the last part of the event, what can be done to survive the **Technology Valley of Death** was discussed with real life examples and the focal point was on how Türkiye can establish a public, institutional and strategic relationship with early stage technology owners and what it can do in valorisation studies.

While the ideas that emerged as a result of many valuable discussions on the launch day of the **REACT series of events**, which looks at the **Technology Valorisation** approach with a focus on climate technologies and aims to bring together different perspectives by creating a discussion environment on this issue, have been the gain of this event, it has been a matter of curiosity how the next event will be held. One of the things that was seen concretely on the TTGV side was that the technology valorisation approach, although it started with the framework of climate technologies, could be evaluated in a broader perspective and focused on **Transformative Technologies**. TTGV, as it has done since its establishment, will continue to **provide technology, innovation and strategy solutions for the needs of the private sector in Türkiye**, and within this framework, **the focus on climate technologies** will remain in finding a solution to a problem that extends from today to the future. In the next phase, **REACT series of events** will take a look at the **Technology Valorisation** approach from the perspective of **Transformative Technologies**, and will continue to develop, discuss and apply the know-how on climate technologies within this perspective.



FUTURE OF GREEN ENERGY AND ENERGY STORAGE TECHNOLOGIES



EDİZ KAAAN ÖNEM

TTGV Pioneer Project Program Specialist

Climate change has emerged as a critical issue that radically affects environmental, economic and social balances around the world. According to NASA studies, the global temperature has risen by an average of 1,2°C since 1880, with most of this increase occurring in the last 50 years. Increasing levels of carbon dioxide and other greenhouse gases in the atmosphere cause temperatures to increase, sea levels to rise and severe weather events to become more frequent, triggering social and economic crises such as mass migration, famine and disasters. Within the scope of combating the global problem, many sectors have entered a major transformation process. Energy occupies a special position in this process because greenhouse gases emitted into the atmosphere as a result of the combustion of fossil fuels, which have been used as the main energy source for centuries, accelerate climate change. Renewable energy sources and green energy concepts offer hope in solving these problems and offer a more sustainable and environmentally friendly future. Thus, it is aimed to reduce dependence on fossil fuels and protect the ecological system.



Rise of the Green Energy

Renewable energy refers to energy obtained from sources that are regularly renewed in nature and have a low risk of depletion. Sources such as solar, wind, hydroelectric, biomass and geothermal provide sustainable energy production with much lower environmental impact compared to fossil fuels. Furthermore, the concept of “green energy” covers renewable energy as well as all practices that reduce carbon emissions and increase energy efficiency.

The rapid growth in this area is clearly demonstrated by global investments in renewable energy, which exceeded USD 300 billion in 2023 (BloombergNEF). “Green financing” approaches have also become increasingly important in this investment wave. Different actors such as banks, investment funds, insurance companies and public organisations are not only transforming the energy sector by funding renewable resources and clean technology projects, but also focusing on creating environmental and social benefits. These developments support the expansion of green energy technologies such as solar panels, wind turbines, hydroelectric power plants and biomass systems.

Environmentally friendly energy production thus reinforces security of supply by reducing energy dependency and triggers economic growth. Solutions such as electric vehicles, smart energy management systems, solar panels or heat pumps used in homes have started to change our energy consumption habits in our daily lives. For instance, smart meters and energy monitoring devices minimise unnecessary consumption, while thermal insulation technologies significantly reduce the heating and cooling costs of residences. In industry and industrial applications, green energy has the potential to completely revolutionise production processes. Thanks to the increasing prevalence of carbon taxes and innovative, supportive regulations, businesses are shifting towards cleaner energy infrastructures, thereby gaining cost advantages and reducing negative impacts on the environment. Off-grid industrial applications both increase energy supply security and reduce infrastructure costs in remote areas where renewable resources are available. Thus, it becomes possible to achieve the goals of diversification of energy supply and reduction of carbon footprint faster.



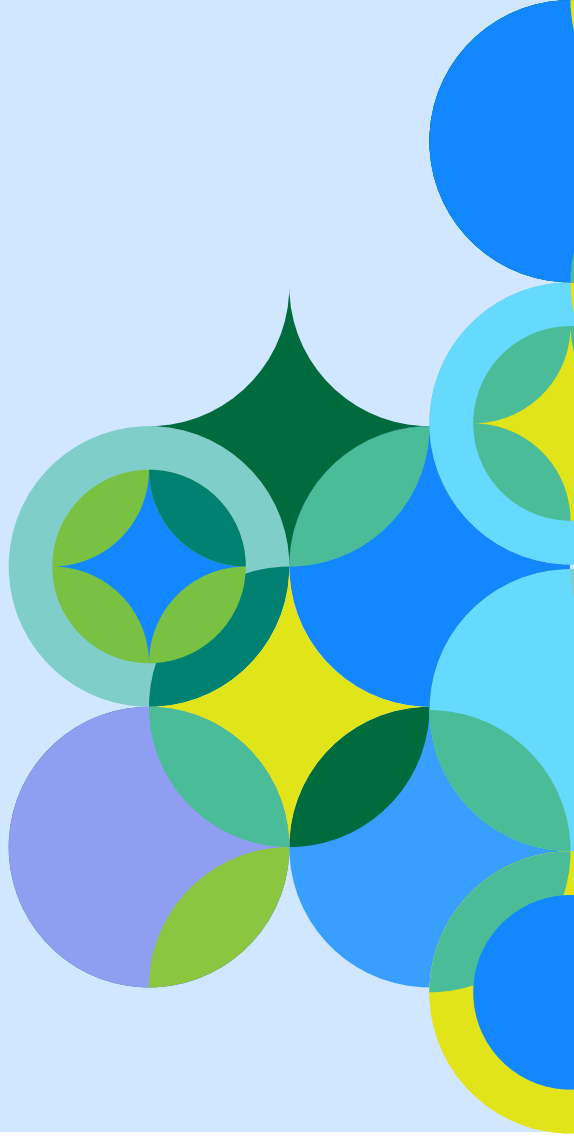
Development and Future of Energy Storage Technologies

One of the main disadvantages of renewable energy sources is interruptions in the generation; for example, solar energy can only generate energy during the day or under certain weather conditions, and wind energy only when the wind is blowing. Therefore, energy storage technologies are vital for the continuity of green energy infrastructure. Storage systems contribute to the security of energy supply by enabling energy to be stored when there is surplus generation and to be switched on during periods when generation falls or demand suddenly increases.

The availability of energy storage solutions is essential for green energy technologies to be stable and sustainable in the long term. While lithium-ion batteries are the most widespread option today due to their high energy density and commercial accessibility, flow batteries, pumped hydroelectricity and thermal storage systems meet the needs for large volume, long-term or heat storage. Moreover, innovative methods such as storage based on the principle of gravity are also creating new opportunities for the energy sector.

As the market size of energy storage technologies exceeded USD 51 billion in 2023 and is expected to reach USD 167,90 billion by 2032 (Persistence Market Research), it points out that this sector will grow exponentially. The increasing expenditures on Research and Development globally, the proliferation of green financing instruments and the development of environmentalist policies have encouraged the implementation of energy storage technologies on a wider scale. Incentive mechanisms developed with innovative and supportive regulations enable more actors to enter the market by reducing the investment risk in large-scale storage projects. The effective implementation of similar policies and financial support in Türkiye will increase competitiveness in the energy sector and make concrete progress in combating the climate crisis.

To conclude, the widespread use of energy storage technologies will hold the key to a sustainable energy future by enabling the uninterrupted utilisation of renewable resources. These steps taken in the combat against climate change aim to shape a cleaner and liveable world while supporting economic development, employment increase and social welfare.



TECHNOLOGY DEVELOPMENT FOUNDATION OF TÜRKİYE

TTGV Merkez / Head Office
CYBERPARK CYBERPLAZA
B Blok Kat: 5-6
Bilkent 06800 ANKARA - TÜRKİYE
+90 312 265 02 72

TTGV İstanbul Temsilciliği / İstanbul Office
ARI TEKNOKENT Arı 2 Binası
A Blok Kat:7
İTÜ Ayazağa Yerleşkesi, Koruyolu
Maslak 34469 İSTANBUL - TÜRKİYE
+90 212 276 75 60

www.ttgv.org.tr
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