GSCESD-2021

4TH GRADUATE STUDENT CONFERENCE ON ENERGY AND SUSTAINABLE DEVELOPMENT

8 October 2021

Kadir Has University
Center for Energy and Sustainable Development
Online Event

PROGRAM & ABSTRACTS

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PROGRAM

09:00-09:30	**Opening Session** Salihe Kaya, Organizing Committee Chairperson Prof. Dr. Ahmet Yücekaya, Scientific Committee Chairperson Prof. Dr. Volkan Ş. Ediger, Honorary Chairperson
Session I	**Sustainable Energy Development** **Moderators and Discussants:** Prof. Dr. Volkan Ediger, KHAS Center for Energy and Sustainable Development Assoc. Prof. Dr. Eser Selen, KHAS Center for Energy and Sustainable Development
09:30-09:45	Renewable Energy Strategies as a Tool Towards Energy Transition in the United Arab Emirates Eman Abusaada, Project Management and Infrastructure Intern, UNOPS, Denmark
09:45-10:00	Renewable Energy Policies of European Union with the Lens of Sustainable Development Goals Hazal Mengi Dinçer, Kadir Has University
10:00-10:15	Cancelled
10:15-10:30	Women in Energy Poverty and Energy Justice: Neutrality of SDG 7 Özlem Dilara Gültaş, Kadir Has University
10:30-10:45	Designing Carbon Sequestration in a Depleted Oil Reservoir Considering Sustainability Aspects Deniz Çelik, Fadime Bolat, Mehmet İrfan Güler, Emre Artun, Istanbul Technical University
10:45-11:15	Discussions
11:15-11:30	Break
Session II	**Renewable and Alternative Energy Technologies** **Moderators and Discussants:** Prof. Dr. Şener Oktik, Kadir Has University, Faculty of Engineering and Natural Sciences Dr. John V. Bowlus, KHAS Center for Energy and Sustainable Development
11:30-11:45	Effect of Alkaline Pretreatment on the Biomethane Production of Hemp Hurd Alpcan Arıç, Sadık Can Karagöz, Tuba Ceren Öğüt, S. Tuğçe Dağlıoğlu, Gözde Duman, Jale Yanık, Nuri Azbar, Ege University
11:45-12:00	Conversion of Hemp Wastes to Solid Fuel Müzeyyen Eser Peker, Gözde Duman, S. Tuğçe Dağlıoğlu, Nuri Azbar, Jale Yanık, Ege University
12:00-12:15	The Challenges for Commercialization of Perovskite Solar Cells Burak Erdogan, Kadir Has University
12:15-12:30	First Nuclear Power Plant in Turkey; Akkuyu Nuclear Power Plant Mahmut Cüneyt Kahraman, Yalova University
12:30-13:00	Discussions
13:00-14:00	Break

Session III	**Green Economy and Legislation** **Moderators and Discussants:** Assoc. Prof. Dr. Sumeyra Duman, Dokuz Eylül University, Business Administration Dept. Dr. Okan Yardımcı, Energy Expert, EPDK
14:00-14:15	Do Carbon Trading Markets Work? Taquioullah Malainine, Kadir Has University
14:15-14:30	A New Tool in the Fight against Climate Change: Green Bonds Ayşegül Uçkun Özkan, KTO Karatay University
14:30-14:45	Relation between Oil Prices and Renewable Energy Investment Salihe Kaya, Kadir Has University
14:45-15:00	The Legal Necessity of Hydrogen in Turkey in the Light of the EU Hydrogen Developments Seher Çırak Ateş, Hacettepe University
15:00-15:30	Discussions
15:30-15:45	Break
Session IV	**Decarbonization and Resilience** **Moderators and Discussants:** Assoc.Prof.Dr. Gökhan Kirkil, KHAS Center for Energy and Sustainable Development
15:45-16:00	Are Decarbonization Targets of the European Green Deal Realistic? Erkan Tan, Kadir Has University
16:00-16:15	Decarbonization Applications in the Industry Sector Begüm Ünlü, Kadir Has University
16:15-16:30	Investigating the Efficiency of Carbon Capture Methods to Mitigate Climate Change and to Reach 2°C Goal of the Paris Climate Agreement Onur Alp Kaya, Middle East Technical University
16:30-16:45	Energy Optimization in Case of Emergency: Case Study for Thrace Basin, Turkey Fatih Avcı, Kadir Has University
16:45-17:15	Discussions
17:15-17:30	**Closing Remarks** Prof. Dr. Volkan Ş. Ediger, Director, CESD, Kadir Has University Prof. Dr. Ahmet Deniz Yücekaya, Scientific Committee Chairperson

ABSTRACTS

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Graduate Student Conference on Energy and Sustainable Development
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Renewable Energy Strategies as a Tool Towards Energy Transition in the United Arab Emirates

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ABSTRACT

Energy regimes have shifted from one source to another throughout history. The world is currently in a transitional period from a fossil fuel-dominated regime to a more sustainable one. Past experiences reveal that energy transitions are complicated and require considerable effort. The present-day transition will be even more difficult for the oil and gas-exporting Gulf Cooperation Council (GCC) countries because most of their budget revenues come from hydrocarbon-export income. Their domestic consumption is increasing rapidly, and their resources are continuously depleting. However, the renewable energy transition in the United Arab Emirates (UAE) appears to be on the verge of taking off. The UAE has a special place by hosting the permanent headquarters of the International Renewable Energy Agency (IRENA) and supporting scientific research and development and promoting the shift towards sustainable renewable energy sources (RES). Significant steps have been taken in policymaking, initiatives, strategies, green-energy plans, and even the rise of green parties, all of which will enable a future transition.

There is no doubt that regulatory support, including renewable energy laws and national targets, have been pivotal in contributing to the expansion of the UAE's renewables sector. The UAE states have already undertaken some policies, projects, and sector-wide efforts to contribute to domestic energy security and long-term economic and environmental sustainability. It is expected that after implementing these policies, the investment will rise and its effect on the environment will be apparent. The UAE has launched initiatives that are of potentially pivotal importance for the overall success of the country's renewable energy efforts.

Many attempts and plans have been made in relation to people's awareness, and the most recent one is a flagship public awareness campaign under the name 'My Energy, My Responsibility' Besides that, in May 2018, as part of the Integrated Awareness Strategy (IAS) 2022 in Dubai.

Yet, to date, there have not been enough concrete steps towards implementing these plans. Many of these policies and plans still exist on paper only. The share of RES in the total energy mix remains negligible (only 0.2% of the total primary energy consumption) and has thus not succeeded in stopping or even limiting the burning of fossil fuels to generate electricity in any sector of the economy in any material way.

The transition to renewables could reduce the carbon footprints in the UAE and mitigate the adverse effects of climate change. This adaption should begin in kindergarten and primary school, as these children will be the future generations who will be most affected by climate change. Suppose citizens are educated at an early age about the costs and negative effects of using fossil fuels as well as the benefits of using RES. In that case, they will make environment-friendly choices about energy in the future and create a better life and a more protected environment.

The efforts currently underway are being done systematically. Programs and initiatives are progressing on a daily basis, which shows the intention of the country to shift to the more significant usage of RES in the coming years. However, a deep transition to RES still requires more developed methods and more extensive support from the government and municipality.

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Renewable Energy Policies of European Union with the Lens of Sustainable Development Goals

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ABSTRACT

Energy has always been a significant element for the development and survival of humanity. Since the Industrial Revolution, fossil fuels have been used as the dominant energy source. However, since the end of the 20th century, renewable energy has started to attract new attention. Therefore, new policies have been formulated to be implemented to support the use of renewable energy. One of the United Nations Sustainable Development Goals (UN SDGs) aims at increasing governments' use of renewable energy. SDG 7.1. aims to increase the share of renewable energy in the world energy basket. Renewable energy policies are among the most discussed issues of the European Union (EU) in recent years.

The interest of the European Union (EU) members and the European Commission in renewable energy policies continues with incremental momentum in recent years. The EU sets determined targets for reducing greenhouse gas emissions and increasing the share of renewable energy in the energy basket of the member countries. The EU is defined as a leader in renewable energy and climate policies.

Although the definition of leadership is seen as controversial, the clear and binding targets set by the EU on energy in parallel with the UN SDGs and the Paris Agreement are an indication that the community has taken serious steps. For this reason, academic studies in the fields of international political economy and international relations have started to approach the EU's institutional understanding of energy, its strategies in using fossil resources, and its developments in climate and renewable energy policies.

In this study, the targets set by the EU to increase the share of renewable energy and the process leading to the preference of renewable resources in the Union are examined in detail. For this reason, the energy outlook of the EU and the "Accessible and Clean Energy" performance of the UN SDGs regarding energy, the development of the EU's renewable energy policies, eco-socialism, and green capitalism approaches are discussed respectively. The policy and preferences of the Union on the subject were examined with eco-socialism and green capitalism approaches.

As a result, the EU's policies, and targets to increase renewable energy have been successful. However, it was seen that the reason for this success was not only the concerns about climate change but also the aims of ensuring energy security and reducing dependence on imported energy.

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Women in Energy Poverty and Energy Justice: Neutrality of SDG 7

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ABSTRACT

The current energy system is based on fossil fuels. There are some critics of this system, such as being not sustainable and creates injustice. One-third of the world's population faces energy poverty because of the uneven distribution of energy resources and inadequate access to these resources. Besides, fossil fuels cause carbon emissions and affecting climate change. Many different national and international proposals and action plans have been prepared to find solutions.

Energy is a crucial element for all people. There are many regulations for energy; an example of this is SDG 7 in Agenda 2030. SDG 7 is about to ensure affordable, reliable, sustainable, and modern energy for all. Nevertheless, many studies on energy poverty and energy justice have proven that women and men are affected differently. The differences between women and men are access to energy, use of energy, participation in energy policies, and representation in procedures. Gender is generally emphasized in SDGs. However, SDG 7 is a gender-blind policy, although it is fundamental for women and men.

Energy poverty is one of the significant challenges today. Worldwide, 1.4 billion people do not have access to electricity. Besides, 2.7 billion people depend on wood, charcoal, and traditional biomass for their energy households (Sovacool and Dworkin, 2014). Energy poverty does not only differ by geography, but it also affects genders differently. Energy justice is a new and crosscutting concept. Energy poverty creates energy justice problems (Jenkins et al., 2016).

In this study, firstly, concepts of energy poverty and energy justice will be evaluated. Secondly, women's position will be argued in energy poverty and energy justice. After that, SDGs will be discussed in detail and will be explicitly focused on SDG 7. Finally, it will be emphasized SDG 7 neutrality, which uses the concept of all in its targets. The main argument of the paper is that "is the gender problem in energy poverty and energy justice resolvable with SDG 7?".

For this study, the reports of institutions such as the UN, UN Women, International Energy Agency (IEA), World Health Organization (WHO) written on the relationship between women and energy were analyzed.

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Designing Carbon Sequestration in a Depleted Oil Reservoir Considering Sustainability Aspects

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ABSTRACT

CO2 is one of the most important greenhouse gases which cause climate change. To mitigate the effects of climate change, many countries worldwide have recognized the Kyoto Protocol and the Paris Agreement, which aim to keep the atmosphere's average temperature at a certain level. This study aimed to design CO2 sequestration and storage in a depleted oil reservoir by considering the sustainability of the process.

To investigate economic, environmental, and social aspects and find the best design scenario, 24 different cases were defined by considering uncertainty in reservoir characteristics (net pay thickness, porosity, and permeability), different well architectures (vertical vs. horizontal) and different oil production and CO2 injection periods.

A commercial reservoir simulator (CMG-GEM) was used to construct the models and study the aforementioned design scenarios. These models have been compared among themselves concerning parameters such as Net Present Value, Tax Credit owing to CO2 sequestration, GHG emissions and employment opportunities.

The best design scenario has been recommended considering sustainability from economic, environmental, and social perspectives. The chosen model has 20 horizontal wells and 10 years of production and injection period with favorable reservoir characteristics due to increased volume of production and injection and the high number of active wells.

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Effect of Alkaline Pretreatment on the Biomethane Production of Hemp Hurd

Alpcan Arıç[a], Sadık Can Karagöz[a], Tuba Ceren Öğüt[a], S. Tuğçe Dağlıoğlu[b], Gözde Duman[c], Jale Yanık[c], Nuri Azbar[a]

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ABSTRACT

Population and economic growth worldwide are one of the global issues that causes existing fossil fuels. To avoid the devastating effect of greenhouse gas concentrations from the overuse of fossil fuels lignocellulosic biomass, an easily available, economical, and sustainable basic raw material can be utilised as biofuel, an alternative to fossil fuel by biotechnological methods. Hemp (Cannabis sativa) is a durable, versatile, perennial, and recyclable product with high dry matter content. Hemp hurd is the inner lignocellulosic portion of hemp.

On the other hand, the lignocellulosic materials in the AD process have low bioconversion efficiency due to the exacting hydrolysis of their chemical composition (lignin, hemicellulose, and cellulose). Therefore, chemical, and thermal pretreatment methods are studied to increase biogas efficiency and to remove lignin.

This study aims to compare the effect of alkali pretreatment methods on AD performance of hurd. NaOH and KOH combined with the thermal process were investigated for two varieties Narlısaray (NS) and Futura 75 (F).

KOH pretreatment was used for the first time in this study for raw hemp hurd. Biomethane content in the 0.5 M NaOH + thermal (20 m) pretreatment and the 0.5 M KOH + thermal (20 m) pretreatment were the same in the F variety (272 mL CH4/g VS). For the NS variety, 0.5 M NaOH + thermal (20 m) biomethane production was 218 mL CH4/g VS, and after KOH pretreatment was 216 mL CH4/g VS.

The results showed that alkaline pretreatment with thermal process increased the biomethane production of hurd of two varieties. The results were similar in NaOH and KOH pretreatment. Therefore, an environmental and economic dimension should be considered in larger productions.

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Conversion of Hemp Wastes to Solid Fuel

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ABSTRACT

Biomass energy is becoming increasingly important, owing to the decreasing supply of fossil fuels and growing environmental problems. The aim of this study was to comparatively evaluate the effect of hydrothermal carbonization (HTC) conditions on the yield and the fuel properties of hydrochar obtained from hemp (Cannabis sativa) hurd and its digestate (HD). HTC, one of the hydrothermal processes, has received increasing attention for producing a coal-like solid product from wet biomass. Hemp hurd can be used mainly in the paper industry, building materials industry, or bioenergy production. Therefore, governments have turned to hemp cultivation and industrial use once again with its worldwide development in recent years.

In this study, HTC experiments were carried out at temperatures between 200 and 275 °C for 1h with a biomass/water ratio equal to 15:100. The yields and characteristics of hydrochars exhibited a dependence on HTC conditions. As expected, mass yields decreased as increasing of temperature. On the other hand, in the case of hemp hurd, energy yield decreased by increasing temperature from 225 to 250 °C, while energy yield did not significantly change by temperature for digestate. The mass and energy yields of hydrochar from hurd were found between 36.2 and 66.4 %, 55.9 and 73.9 %, respectively, under tested conditions.

For hydrochar derived digestate, mass and energy yields were between 61.3 and 73.0 %, 72.7 and 82.8 %, respectively. Based on both mass and energy yields, optimum temperature and duration were selected as 225 °C for hurd and 250 °C for FD.

By comparison, hydrochar with higher mass and energy yield was obtained from digestate than that from hurd. The reason would be due to the decomposition of hemicellulose in hurd during anaerobic fermentation, which leads to an increase in the lignin content HTC feedstock and accumulated inorganics of digestate on hydrochar.

In contrast to previous studies related to HTC of biomasses, 27 -43 % of inorganics in hurd and 72-100 % of inorganics in digestate were accumulated within the hydrochars. This could be attributed to the combination of high calcium, potassium, and magnesium concentrations to form insoluble salts entrapped on or within growing hydrochars. Due to their high ash content, low O/C and H/C atomic ratios of hydrochars were found to be in the range of peat.

In conclusion, this study provided a new concept to biofuel production from hemp (Cannabis sativa) hurd by integrating anaerobic digestion and a thermal conversion process.

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The Challenges for Commercialization of Perovskite Solar Cells

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ABSTRACT

The paper provides the need-to-know information regarding perovskite materials and their place in the solar energy market. Perovskite solar cells have caught the attention of academics and researchers worldwide, thanks to its excellent photovoltaic performance. Perovskite solar cells are undoubtedly the future of photovoltaic technology since they can generate better efficiencies than the leading silicon solar cells. This statement can be backed up by the fact that perovskite solar cells have shown significant growth in the last decade since it has been conceived, sharply increasing efficiency from 3.8% to 25.2%. Furthermore, this increase doesn't seem to be stopping.

The paper focuses on the shortcomings of perovskite solar cells that are facing right now. Perovskite solar cells have lifetime issues stemming from instability, and the stability issue stems from various other problems.

The paper further goes into detail about the shortcomings and if there is any current solution in the literature.

The paper discusses that there are four major factors for the commercialization of perovskite solar cells. These are the performance, cost, stability and scaling up the cell dimensions. While the performance and cost factors favor perovskite solar cells, stability and scaling up dimensions are incredible hurdles that must be overcome to surpass silicon solar cells in the industry.

This paper's last discussion point is that silicon solar cells will continue dominating the solar cell industry until those issues are cleared up.

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First Nuclear Power Plant in Turkey; Akkuyu Nuclear Power Plant

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ABSTRACT

The nuclear story of Turkey has started in the middle of the 1950s. Firstly, the Turkish Atomic Energy Agency (TAEK) was found in 1956. Then, TAEK became a member of the International Atomic Energy Agency (IAEA) in 1957. The intentions were both to use nuclear technology and the generation of electricity from nuclear energy. Even though seven different zone was analysed and Akkuyu was selected for the first nuclear power plant location in 1972, the project could not be implemented due to political reasons.
After the 1980s, the Chernobyl nuclear accident negatively impacted the public and the governments' decisions, which caused another delay in nuclear power plant projects. After the 1980s, Chernobyl nuclear accident negatively impacted the public and the governments' decision, which caused another delay in nuclear power plant projects. Finally, Turkey and Russia signed the agreement of building a Nuclear Power Plant in Akkuyu in 2010.

According to the agreement, four units of Water - Water Energetic Reactor (VVER) will be built by the Russian Nuclear Company, ROSATOM. Each unit is 1200 MWe (VVER-1200) with a total power of 4800 MWe. The first unit (Akkuyu-1) is planned to begin operation in 2023, unit-2, unit 3 and unit-4, respectively, in the following years of 2023. The estimated life span of these units will be 60 years but can be extended to 80 years with new installments. The agreement between Russia and Turkey is a built-own-operate (BOO) type. It is the first BOO project in the nuclear industry and the first for ROSATOM.

Secondly, as a reason of being a new technology for Turkey, many disinformation or misunderstanding in Turkish community about nuclear energy can be found. In this paper, with giving detailed information about Akkuyu Nuclear Power plant project, diminishing of disinformation, and misunderstanding about the project are aimed. As a new type of contract, BOO will be discussed with advantages and disadvantages. Alternative contract types will be discussed for future nuclear power projects. Finally, brief explanation will be given about future nuclear energy projects, feasible candidates countries for these projects will be discussed.

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Do Carbon Trading Markets Work?

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ABSTRACT

Reducing greenhouse gas emissions like CO2 is a crucial component in the fight against climate change. One way governments are trying to tackle this issue and reduce their emissions is through carbon trading.

Starting in 2005 in the European Union (EU), carbon trading has become a powerful tool to reduce greenhouse gas emissions as it gets businesses and industries involved in the process. On the one hand, they are increasing their awareness and allowing them to make a profit when reducing their emissions by being able to sell their unused carbon allowances or units. This market-based system aims to provide economic incentives for countries and businesses to reduce their environmental footprint.

In this paper, I focus on explaining the two major approaches to carbon pricing, the cap and trade and the carbon tax, while also comparing them and coming up with my conclusion as to which would be more efficient.

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A New Tool in the Fight against Climate Change: Green Bonds

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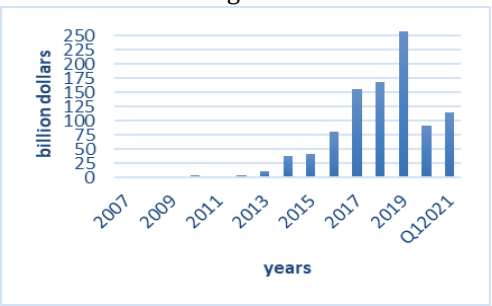
ABSTRACT

There is a reality and danger defined as climate change on the agenda of the world. Climate change poses the greatest threat to humanity. It is obvious that environmental shocks will be more extreme and more frequent. No government or institution can solve this problem alone. Besides, climate risk has now become a financial risk. As such, investors have sought new products across all asset classes that somehow address the challenges of climate change (Jack Morton Auditorium, 2018). Therefore, there was a need for interaction between environmental officials and financial experts, and green bonds, one of the tools of green finance, emerged. Green bonds have been introduced to finance emission reductions, sustainable development, and other cleaner production investments that help achieve the Paris Agreement's 2°C temperature target. Green bonds play an essential role in the fight against climate change because green bonds are used only for environmentally friendly projects. Previous studies have found that investments in environmental protection rarely bring economic benefits to companies. But this view has changed as the economy has improved, and current research shows that green practices can bring profits to companies. For this reason, green bonds are increasingly being applied to finance emission reductions and sustainable development that help achieve the 2° C temperature target of the Paris Agreement.

Green bonds have similar features to conventional fixed-income corporate bonds (Baulkaran, 2019; Reboredo Ugolini, 2020; Ferrer et al., 2021). The only difference is that green bonds are used for environmentally friendly projects (Fatica & Panzica, 2020). Green bonds are issued to finance climate change solutions - the key is that income goes to green assets. They can be printed issuers such as governments and government - backed entities, financial institutions, and non-financial corporates.

The green bonds were initiated in 2007 by the European Investment Bank that issued the world's first Green Bond, labeled a Climate Awareness Bond (Euro 600 million) (European Investment Bank, 2021). The World Bank followed the European Investment Bank and issued its first green bond in 2008. The green bond market grew from $0.8b in 2007 to $1.197tn cumulative issuance as of 2021 (Climate Bonds Initiative, 2021). Figure 1 shows the growth in this market. There is a huge growth in the green bond market from $10bn in 2013 to $258,9b in 2019. This is an almost 2490% growth in the market. 2016 issuance was virtually double that of 2015. Likewise in 2016, 2017 issuance was almost double that of 2016. It reached its highest value in 2019.

Figure 1: Growth in the green bond market



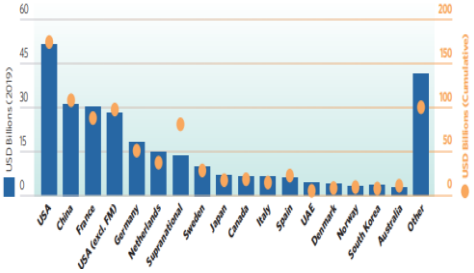
Source: The data for 2016 and beyond were compiled from the Global State of the Market reports prepared by the Climate Bonds Initiative. Other data comes from (Baulkaran, 2019).
*H1 states the first 6 months of the year.

Financial and non-financial corporates have had the largest share in issuer types since 2018. Green bond issuance of the financial corporate was almost double compared to 2017. This is a remarkable achievement. Additionally, green bond issuance of the non-financial corporate was nearly double compared to 2018. In 2013, corporations got into the green bond market using the World Bank and the European Investment Bank's model. Electricite de France was the first publicly traded company to issue green bonds (Baulkaran, 2019).

The country ranking differs in terms of the amount issued and the number of issuers. According to ranking countries in terms of the amount given, the top five countries in 2019 are the USA, China, France, Germany, and the Netherlands. On the other hand, according to the number of issuers, the top five countries are the USA, China, Japan, Sweden, and France, as shown in Figure 2 and 3.

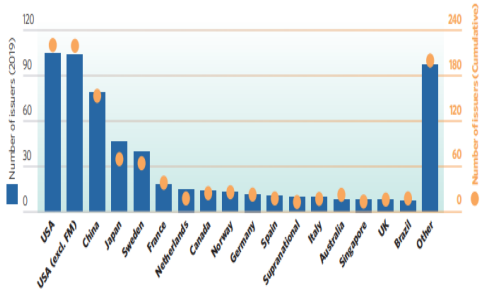
As of the first 6 months of 2020, France and China change place with each other in the rankings. In other words, While France ranks second, China ranks third. G7 countries are in the first 11 countries with ranking countries in terms of green bonds issuance (Climate Bonds Initiative, 2020b).

Figure 2: Top 2019 countries: Amount issued



Source: (Climate Bonds Initiative, 2020a)

Figure 3: Top 2019 countries: Number of issuers



Source: (Climate Bonds Initiative, 2020a)

In many countries, waste/water management services are provided by public sector entities such as municipalities or government-backed entities. On the other hand, non-financial corporates want to invest in Energy and Buildings, for example, non-financial corporates invested in Energy, Buildings and Transport respectively at 52%, 21% and 13% in 2019.

In this study, green bonds will be discussed in all details, advantages-disadvantages will be revealed, information about the development of the green bond market will be given, and the functioning of the green bond market and its effects on companies will be emphasized. In addition, Turkey's position in terms of green bonds will be evaluated.

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Relation Between Oil Prices and Renewable Energy Investments

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ABSTRACT

For many years, fossil fuels have been used as the dominant energy source for mass production. Because of the affordable prices of the fossil fuels in comparison between renewable energy, fossil fuel has been used widely. Fiscal shocks in oil prices generally led consumer countries to give different preferences. Some countries have invested in coal and nuclear, while others have started to invest in renewable energy.

In this study, it was elaborated that during the oil price crises, a high rate of investment was made in hydroelectric energy. The main concern of these investments on renewable energy is to access affordable resources rather than mitigation of damages caused by fossil fuels to the environment.

The importance of renewable energy has been more frequently discussed especially because of the global climate crisis.

The share of oil in the total energy mix of countries whose energy policies are starting to take shape in this direction is increasing. In this context, countries have recently started to increase their renewable energy investments. Climate change and similar issues have become effective among the main causes of renewable energy investments.

This study examines the effects of oil prices on renewable energy investments. To analyze the relationship between oil prices and renewable energy investments, answer to the following question will be sought: Is there a relationship between oil price changes and renewable energy investments? The main result of the study is that oil prices in the coming years will not affect renewable energy investments when compared with the historical experiences.

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The Legal Necessity of Hydrogen in Turkey in the Light of the EU Hydrogen Developments

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ABSTRACT

The EU has a clear target for its Hydrogen strategy: EU Green Deal, European hydrogen strategy for a climate-neutral Europe, and Fit for 55 packages. In addition, EU Hydrogen and Decarbonisation Package is expected by the end of 2021.

In contrast to this, there is hardly any hydrogen legislation in Turkey. A separate "Hydrogen" legislation should be prepared. The primary and secondary legislation related to hydrogen energy should be clearly established with future foresight to achieve a competitive market. In this context, the development of technical safety standards compatible with international standards regarding the production, distribution, transmission, storage and end-use processes of Hydrogen in Turkey is important in developing an adequate Hydrogen infrastructure.

Moreover, before making large-scale production decisions, legal regulations need to be clarified. In addition to the aforementioned regulations, national incentive mechanism regulations should also be prepared, since implementing the renewable hydrogen strategy is very costly.

In the transition to the hydrogen economy, international cooperation will facilitate market entry by jointly undertaking costs and risks. Therefore, opportunities for international cooperation in this field should be pursued and evaluated.

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Are Decarbonization Targets of the European Green Deal Realistic?

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ABSTRACT

The European Commission (EC) set a political agenda with an extensive European Green Deal program (EGD). At first glance, it could be seen as a policy against anthropogenic climate change; however, it is a new growth strategy of the European Union (EU) while the purpose is to make Europe the first carbon-neutral continent by 2050. Even though there are some standard policies such as agriculture, law, and security within the EU, a typical energy policy has not been established because the member countries have different positions on energy.

The significance of the EGD is that the member states have a consensus on a climate-based clean energy strategy at a supranational level to become a zero-emission continent by 2050 and energy transition. Decarbonization is one of the tools to achieve these targets. In the EU, the greenhouse gas (GHG) emissions are reduced by 23%, while the economy grew by 61% between 1990 and 2018. Thus, under the business-as-usual policies, GHG emissions will be decreased by 60% in 2050. Since 1990, carbon emissions have declined each year, both per capita and CO2 equivalent in Europe.

European integration is based on a political and economic process. Member states cannot achieve coherent and uniform energy integration due to their capacities, financial strengths, and international position. Therefore, there are differences in the degree of ceding authority of union members at the European level. European tendencies about energy-related issues can be divided into three phases. At first, they concentrate on energy security mainly because of international developments. Then, they focus on the internal energy market, which has been privatized and competitive since 1987. The last phase, concentrate on sustainability and climate policies since the 2000s.

In light of this background, the paper evaluates the EGD's 2030 and 2050 targets based on decarbonization. Then, it will clarify European tendencies about energy-related issues into three stages from 1951 to 2019. Also, it will examine an estimation from European Environment Agency (EEA) on the EU's decarbonization targets. This study aims to reveal whether the EU's decarbonization targets are realistic as a result of the regulations made by the EU, which eagers to be the global leader in the green energy transition.

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Decarbonization Applications in The Industry Sector

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ABSTRACT

CO2, which has the highest share among greenhouse gas emissions, continues to be intensely released into the air in many sectors. For this reason, it is of great importance to implement decarbonization practices, which are among the measures to be taken in the face of the climate crisis. While developed countries around the world make many attempts to achieve decarbonization, developing countries lag behind them.

On the other hand, the policy mechanisms developed by international organizations, which are at the forefront of the fight against the climate crisis, force other countries to take similar steps on a global scale.

For this reason, especially developing countries whose economy is based on the industry should begin trying to keep up with this trend in order not to risk their commercial opportunities.

In this article, which was prepared with a bottom-up approach, decarbonization solutions that can be applied in the industry sector are mentioned. Firstly, studies were determined that covering decarbonization applications based on the industrial sector. Then decarbonization applications were compiled from these studies and classified. It is aimed to give ideas to countries and organizations that want to implement decarbonization practices in the industrial sector.

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Investigating the Efficiency of Carbon Capture Methods to Mitigate Climate Change and to Reach 2° Goal of the Paris Climate Agreement

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ABSTRACT

Climate change has been the most important global issue of the last fifty years. An ongoing increase in greenhouse gases, especially the CO2 concentration of the atmosphere, is the primary driver of the global temperature rise, directly related to climate change. The 2015 Paris Climate Agreement is considered the most comprehensive international agreement that focuses on climate change and possible mitigation methods.

Paris Agreements sets the well-known long-term 2°C goal. Different studies and research are conducted to mitigate climate change, and carbon capture and storage (CCS) is one of these studies. CCS is the overall process of capturing anthropogenic CO2 from the source or the air and injecting it into a geological formation.

It is desired that CO2 stays in there for a long time. It is possible to use captured carbon as a raw material for the production of other materials. This process is known as carbon capture and utilization (CCU). It is possible to stabilize or decrease the CO2 concentration of the atmosphere by using this method.

This study aims to investigate the efficiency of carbon capture methods to mitigate climate change and reach the 2°C goals of the Paris Climate Agreement. Basic concepts of CCS, the economic feasibility of carbon capture projects, potential risks related to them are all investigated. Lastly, the applicability of this project in Turkey is investigated. This has been done by considering the other CCS application that has already been done in the World.

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Energy Optimization in Case of Emergency: A Case Study for the Thrace Basin, Turkey

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ABSTRACT

There is a growing interest in improving resilience in energy systems for unexpected disruptions because of the vital roles of electrical energy and natural gas in economies. Energy resilience is essential for power and gas system planning and operation and critical for the country's energy transition period. This study examined the Thrace basin's power and gas infrastructures (inputs and consumption points) for modeling. In the Thrace basin, all potential infrastructures are available for our analysis, including pipeline input, LNG input, gas storage, power plants, transmission lines, etc. In our model, we analyzed the monthly/daily gas input and power generation contrary to electricity and gas consumption.

The result of different scenarios will confirm the findings of previous studies; generation, transmission and distribution of power and gas systems via critical energy infrastructures should be optimized in case of all possible scenarios. In brief, efficiency drops in power generation or gas leakage in pipelines undermine Turkey's energy supply security and economy, especially given the country's high level of energy-import dependency. It is impossible to design all critical infrastructures in 100% resilient to the environment.

Therefore, the scenarios can be analyzed, and losses can be reduced, and recovery time can be shortened. We strongly recommend that the concept of resilience be considered for high possibility scenarios, like earthquakes, terror attacks, cyber-attacks, etc. During an unexpected incident near or involving an energy infrastructure, it is critical to know how to respond and be prepared to work together with the related operator's representatives for minimum damage and bounce back to normal levels.

Resilience should top the energy agenda in order to enhance supply security and decrease dependence on foreign sources for reducing the economic losses during these kinds of accidents.

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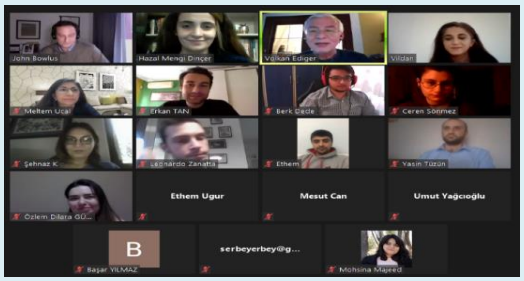

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