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Artificial Intelligence in Energetics

Artificial intelligence is a broad term that is used more and more often to describe sophisticated tech. There is no single widely accepted definition of AI because the concept of it is very complex, new, and continuously developing.

The utilization of steam power to automate production guided the world into the industrial age by launching the first of several industrial revolutions. However, electricity utilization has significantly changed the world and enabled an era of mass production, fostering revolutionary advances in transport, telecommunications, and manufacturing, now called the Second Industrial Revolution. The Third Industrial Revolution started in the digital age, widespread computer use, and, in particular, the Internet and the widespread use of computer technology to automate production.

However, another profound change follows - the fourth industrial revolution whose digital change of the world in terms of speed, scope, and impact on systems should be unique from past encounters. It will be portrayed by scientific and technical breakthroughs that will strongly change existing industries and, along these lines, influence the advancement of society. One of its key drivers is artificial intelligence (AI).

Defining what and how AI will function additionally depends on its end application. In principle, AI enables the automation of processes and activities performed by people today, positively affecting execution, productivity, and proficiency. In doing such, AI is heavily dependent on data. Specifically, from one viewpoint, AI utilizes structured data, such as those from machine sensors, and then again unstructured data, such as manuals, maintenance records, climate, market, and business data, to empower advanced decision-making. To master this effectively, AI utilizes machine discovery that envelops a few ideas, including characteristic language processing, profundity learning, and neural organizations. Machine learning (ML) is presently the most utilized piece of AI, and it is tied in with examining PC algorithms guided by data that are automatically improved by experience.

In recent times, another type of AI is being created, and that is automated machine learning. It is the ultimate process of automated machine learning application to real-world problems, such as data preparation, engineering features, and model selection. It is also increasingly interesting in energetics since it has been seen that there is an issue with organizations lacking expertise in the application of machine learning methods. Many energy specialists point out that maybe the best advantage of AI will be its capacity to effectively exploit huge amounts of operational data when energy is battling various distinctive huge business impacts, including decarbonization, decentralization, and digitization.

Some energy and IT experts state that today's AI tools offer the best potential to take care of certain problems utilizing, for example, images, such as applications, to facilitate the time-consuming and tedious review measure. In energy, each facility or plant must be inspected, and the measure of such activities that can be computerized utilizing AI is extremely large. In large time series. Such data is examined to foresee future conduct, maintenance needs, or potential impending hazards, so understanding these patterns is critical. It is normal that the fruitful implementation of AI around there could fundamentally decrease energy costs, assisting with taking out various bottlenecks.

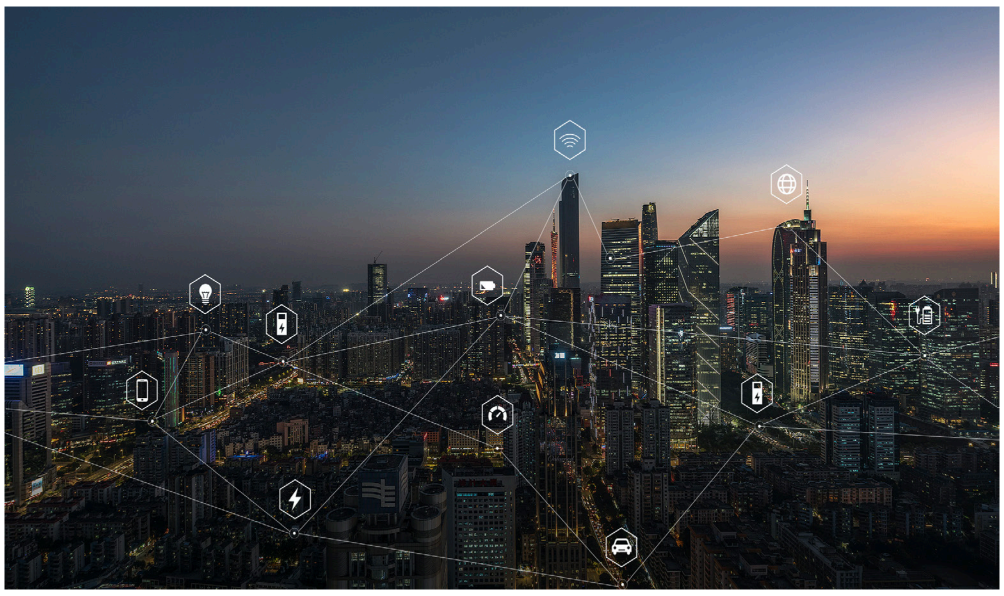
In spite of the fact that there are numerous particular cases in energy organizations where AI or ML (machine learning) alone can be applied, the following huge advance in the application of AI will be to change the focus from watching, for instance, the exhibition of a production facility or plant to the presentation of the production unit, analyzing the activity of the whole power network- from production to consumption. The potential of AI to improve predictive and prescriptive capabilities is especially significant today as creation has gotten essentially more complex because of the large portion of energy production and distribution from solar or wind power plants. In addition, AI can take current simulations to a higher level, e.g., to help utilities with finding unstable network areas and increase the safety of field workers.

A potentially critical part for AI could be later on the integration of the power business, for example, by exploiting low-carbon resources, improving forecasting, and strengthening autonomy. Simulator capabilities could likewise be increased to improve their ability and ultimate network synchronization capabilities.

In practice, some leading energy companies have already started working with AI.

In addition to the oil giants analyzing huge amounts of exploration and propulsion data from large oil fields, the American giant General Electric (GE) has applied neural networks and edge controls in its advanced combustion management systems to optimize distribution fuels for gas and aerodynamic turbines. The result is reduced emissions of nitrogen oxides and carbon monoxide and improved overall performance of these turbines. Also, AI at GE provides production planning advice to help dealers and selected designers understand the capabilities of a day-ahead and real-time combined cycle plant, allowing them to better prepare for commitments and to plan nomination and fuel shipments. At the network level, GE has applied ML in analytics to better link inertia to network operators with known and predictable values such as conventional rotating inertia and load.

However, IT and energy experts also agree that at the moment, for most energy companies, there is still a long way to go before they can be widely used and take advantage of any AI. The development of AI is still in the early stages of implementation, and the biggest challenge is data. Everything that AI does requires both background context data and drive data from the process being analyzed. To obtain data, collaboration with others is necessary in order to obtain real and useful data sets. As such, data becomes more accessible over time, so do models evolve and become smarter. Where AI is currently already being implemented, it is actually



parts of larger models of AI and experimental and pilot projects of its application, where various energy actors are testing their capabilities or demonstrating their capabilities. However, from what is happening in practice, it cannot be concluded that this is a real adoption of AI in energy.

The key solution is to truly understand the problems that need to be solved before deciding which method to solve them. Then, once the problems are sufficiently articulated, and it is shown that AI or ML is the optimal solution to a given problem, then they must be scaled in a digital environment with appropriately cleaned, modeled, and orchestrated data. That is why some experts point out that the turning point will come when models of bulk collection and organization of data on the model of networked plants and processes such as AI can be adopted in everyday work operations, and not when only the most sophisticated algorithms are developed.

Insiders point to another problem, and that is that there are relatively few experts in the energy companies themselves who can successfully manage the range of operational data necessary for AI advancement. Thus, in addition to finding partners with the necessary expertise in AI and software, energy companies should perhaps undergo a workforce transformation and develop a culture of collaboration between workers and technology. They should integrate AI into their strategic planning and long-term business plans and understand the opportunities that come with them to successfully reshape the company culture, minimize risk, and reap the most benefits from such technical solutions.

On the other hand, government or professional bodies for digitalization of industry should, in that case, define some standard operational problems in energy and establish a methodology for solving them with appropriate data sets so that AI tool vendors can test their solutions on these selected data sets. This would likely allow both an impartial and technically correct assessment of AI solutions and their capabilities, which is crucial for the industry. At the same time, energy companies would get a better idea of how some AI tools, and data sets work together to solve a specific problem.

Mihael Gubas

European Green Deal vs Common Agricultural Policy

Last week, the Council of the EU and the European Parliament announced their negotiating mandates regarding changes that will be made to the EU's Common Agricultural Policy (CAP) under the new budget that will run from 2021 to 2027. While these two mandates have important differences, they seem to be united in how they have failed to meet expectations that the new and reformed CAP would be adjusted to become more aligned with the European Green Deal.

The Green Deal lays out the Commission's commitment to have the EU become climate neutral by 2050. Still, it also goes beyond this, including stipulations regarding binding reductions in the use of pesticides and fertilizer by 2030, to strengthen biodiversity.

The CAP is seen as a critical part of reaching these goals, given that the agricultural sector accounts for approximately 10% of the EU's total greenhouse gas (GHG) emissions. Critics of the CAP also point out that such a high proportion of emissions is particularly problematic given that the sector contributed just 1.1% to the EU's GDP in 2018.

The overarching obstacle in bringing together the CAP and the Green Deal seems to be that the CAP, as the EU's largest subsidy scheme, has the fundamental aim of bolstering the productivity of farms, which may clash with environmental concerns, such as being able to use more land to sequester carbon. Moreover, these environmental concerns have only recently begun to be included within the CAP framework, posing yet another challenge.

As such, it was hoped that the outcome of the ongoing CAP reform would address these difficulties. However, the emerging deal's main elements between the various EU stakeholders may not live up to expectations.

The focus of the main debates regarding the emerging deal can be divided into four elements: eco-schemes, loopholes and derogations, governance, and biodiversity targets.

Eco-schemes refer to ring-fencing a certain amount of EU funds for green projects in agroecology, agroforestry, and carbon farming, which are meant to be mandatory for the EU Member States, though farmers get to choose whether or not they will join them. While the Council has proposed 20% of the direct payments budget for these eco-schemes, the Parliament's proposal is set at 30%.

Though a compromise may be found at around 25%, the issue lies in the debate's second element: loopholes and derogations. The idea of a long transition seems to be gaining consensus. Under such an arrangement, the eco-schemes will not be in effect during the first two years of the CAP, which will be treated as a 'transitional period.' This means that these measures will be delayed until at least 2023. Even after that, in the next two years (2023 and 2024), funds that are not spent on these eco-schemes by the end of 2024 will be diverted back to conventional (non-green) projects.

Furthermore, there is another loophole in the making for the 2024-2027 period. The structure of the CAP has two pillars, the core (pillar 1) direct payments budget, which these eco-schemes are being linked to at the moment, and the smaller rural development funds (pillar 2). In this loophole, the Member States that spend upwards of 30% of their pillar two rural development funds on green projects would be able to include that spending in their 20% (or 25%/30%) eco-scheme spending target in pillar 1. This, in effect, would reduce the actual level of ambition in the central pillar of one project.

Another derogation that is emerging, particularly in the Parliament's position, is the stipulation that eco-schemes need to contribute

to environmental and climate objectives of the CAP, as well as guarantee its "economic objectives," which may limit the scope and potential environmental impact of these schemes.

The Parliament's mandate also includes an accounting trick. While the Parliament has stated that 35% of the pillar two rural development budget should contribute to environmental and climate objectives, it also states that 40% of spending in "areas of natural constraint" that are difficult to farm in, like mountains and remote moors, should be counted toward this 35%. The ecological value of such areas is questionable and thus allowing spending on them to count toward the overall minimum spending of 35% risks undercutting potential environmental and climate benefits.

The third element, governance, relates to how much oversight there will be by the Commission concerning the national strategic plans of the Member States. The Commission had put forth a structured dialogue wherein it would review the Member States' plans for how farm subsidies would be spent and be able to make recommendations prior to approval, especially bearing in mind environmental objectives. This idea, however, was rejected by the Council in its mandate. Biodiversity targets, the fourth and last element of the debate, relate to the watering down of the Commission's proposed target where 10% of the agricultural land in the EU would be safeguarded as nature-friendly havens. The Council, instead, is furthering its proposal of safeguarding 5% of arable land, which constitutes a much smaller area than agricultural land. There are further derogations. This minimum of 5% can further decrease to 3% if "productive features," such as catch crops or nitrogen-fixing crops (grown without pesticides), are cultivated in the other 2%. The Parliament mostly accepts the Council's position with some additions of its own that also water-down the Commission's proposal.

The positions reached by the two EU institutions, especially that of the Parliament, have received heavy criticism. Indeed, efforts to bring the Green Deal and the CAP closer in line seem to have encountered the obstacle that is the agri-industry lobby, one of the EU's most powerful interest groups, as well as the push back from large agricultural countries.

Though the negotiation process is not over, with the Member States in the Council, the Commission, and the Parliament needing to come to a final deal, nobody seems to be keeping their hopes up for a last-minute environmental reorientation of the CAP.

As Senior Green MEP, Bas Eickhout, stated following the vote in the Parliament, "As far as agriculture is concerned, you can already say that the Green Deal has failed."

Selin Kumbaracı

BRENT OIL	38.30 $/BL	GASOLINE	6.79 ₺/LT
USD/TRY	8.89	DIESEL	6.18 ₺/LT
EUR/TRY	9.81	FUEL OIL	3.65 ₺

Nuclear Energy and Turkey

Nuclear energy is a subject that has been on the world agenda for years. According to the International Atomic Energy Agency (IAEA) data, there are 449 nuclear reactors active in 30 countries in the world today. The construction of 56 new reactors continues in 15 countries. These power plants can generate a very large amount of electricity. Besides, nuclear energy, which is quite economical in this sense, also causes less damage to the environment than coal and natural gas alternatives. Nuclear energy is actively discussed in Turkey since around 1970 years. We can often observe these discussions in the political arena. Nuclear power began to be spoken by establishing Turkey's Atomic Energy Commission in 1956 Turkey. Since the year when it first came out of the discussion, nuclear energy production venture located in Turkey, it has undergone unfortunately failed in this attempt. Turkey is a growing economy with a developing industry and has a young population. At this point, nuclear energy is a very important issue for Turkey. The majority of the electricity consumed by Turkey, which is produced with the resources imported from abroad. Turkey is a country largely dependent on foreign energy sources. Every year we spend billions of dollars on energy resources. For this reason, various governments have expressed their desire to establish a nuclear power plant for many years and tried to take steps in this regard. Today, there are three nuclear power plant projects, one under construction and two in the planning phase. These projects are not projects that have been put forward in recent years but are exactly the product of a deep-rooted state policy.

Nuclear energy is a form of energy that is a mystery, whether it is harmful or harmless. We all know that the world has experienced disasters like Chernobyl and Fukushima. There are lessons to be learned from these disasters. However, making these disasters our main point and completely opposing nuclear energy can be considered wrong. The concerns at this point are understandable because even the smallest mistake can lead to a disaster that can affect dozens of generations. The effects of the Chernobyl disaster can still be observed in Ukraine today. At this point, the important point is the correct use of nuclear energy. When managed by advanced and trained staff, nuclear energy is far less harmful than natural gas and coal alternatives. At this point, nuclear energy is a great opportunity for emerging economies, Turkey's nuclear energy if properly evaluated.

At this point, the Akkuyu Nuclear Power Plant project will show us Turkey's seriousness on this issue. It will be made by one of the subsidiaries of the Russian state nuclear power company ROSATOM. Turkey lacks the trained workforce for this, the first nuclear power plant made by foreign experts, of course normal. Besides, Turkey's policy, the construction of future nuclear power plants, to be carried out entirely by Turkish engineers. The agreement signed between the two states in 2010, which enables young Turkish engineers to be trained in Russia to train expert staff, proves this state policy.

Under this agreement, young Turkish engineers, who have been educated in Russia for many years, are now working in Akkuyu. Simultaneously, localization, in other words, nationalization of the materials used, continues to increase. This project, built by the Russian company, Turkey, is expected to meet 6% of the electricity needs when completed. This is an important amount for the beginning. The first reactor at the power plant is expected to be operational in 2023.

The second nuclear power plant is planned to be built in Sinop, and the third is planned to be built in Thrace. This is stated to be its proximity to the Marmara Region, which is our region with the highest electricity demand and hosts the majority of industrial production in the country.

There are great reactions from some segments of the society, especially environmentalists, for the plants built and planned to be built. Environmentalists especially express that foreign dependency will increase because we do not have nuclear fuel facilities. They oppose nuclear power plant projects by stating that the plant can reduce investment in renewable energy sources. However, we must admit that nuclear energy, which is now used in many countries worldwide, is very important for our developing country. We should not forget that nuclear energy can be used safely as long as there are no extreme situations. At this point, nuclear energy may be crucial for Turkey's policy to provide energy needs independent from foreign sources. Energy Minister Fatih Dönmez said in a previous statement that an investment of 10 billion dollars in nuclear energy until 2023 might save 30 billion dollars by 2033. These amounts are very vital for a country like Turkey, which has a high current account deficit.

To sum up, Turkey may significantly contribute to the country's economy by using nuclear energy. With the savings obtained from there, the budget can be created for investment in other necessary areas. We hope that Turkey will get closer to economic independence by taking place in nuclear energy in the coming years.

Atahan Tümer

Asteroid Mining Overview

Ever since the first space mission in 1961, our species have never stopped wondering about the mysteries of space and tried to unravel it. The idea of space and its wonders has attracted people both scientifically and fictionally. Lots of movies have been made about this hot topic that is space. Although the real process of spaceflight for space exploration and product manufacturing in space for use on Earth is much more challenging than what we've seen so far on the screen.

Day by day, Earth's precious metals' supply chain is decreasing, and according to some studies, some essential elements for the modern industry could run out within 50 to 60 years. Therefore private investors and scientists have begun to search for a source that would make up for the shortage of these minerals or maybe even replace it.

When asteroids are scrutinized, results have revealed that asteroids contain Earth-based minerals like gold, platinum, silver, copper, iron, etc. These metals have been crucial to the mining industry, which is tied with the economic growth of modern society.

The exploitation of raw materials from asteroids to make it available and profitable for use on Earth is called Asteroid Mining. An asteroid prospection step must be implemented to perform mining activities, which is the characterization of target asteroid/s. After the identification, mineral values in the target asteroid/s, number of Near-Earth-Asteroids will show the extraction and transportation process.

Different from regular mining methods, in asteroid mining, the operations are being controlled by mining stations built in Low-Earth-Orbits. For the extraction and transportation of the ore extracted from NEA's, a spacecraft of robots and automated haulers would be used. Also, to keep the operation stable, other robots would be needed for the maintenance of the mining and hauling vessels and machines. Another thing about the operation is, more than one orbital platform would be needed to control dock, offload, and refuel steps.

To make asteroids available for use on Earth, ground studies and samples from asteroids must be examined. So, NASA has gone on some missions to serve his purpose. According to their report, "Out of millions of known asteroids, Earth's Spacecraft have visited only 12 asteroids and managed to land on only 2." This means there are thousands of asteroids waiting to be visited. With that being said, all of these missions require a long period of time and a lot of money.

For example, the mission Hayabusa was launched in 2003, ground samples returned to Earth in 2010. The landing was only a few seconds, and the collection phase started in 2005. And Hayabusa was only a "Touch and Go" mission. Hayabusa's mission cost $170 Million. Another planned" Touch and Go" mission is called OSIRIS-REx, launched in 2016, aimed to probe the asteroid 1999 RQ36. In 2019, it reached the asteroid and will bring the collected sample back to Earth in 2023. Samples that were collected were for further studies. OSIRIS-REx cost $750 Million.

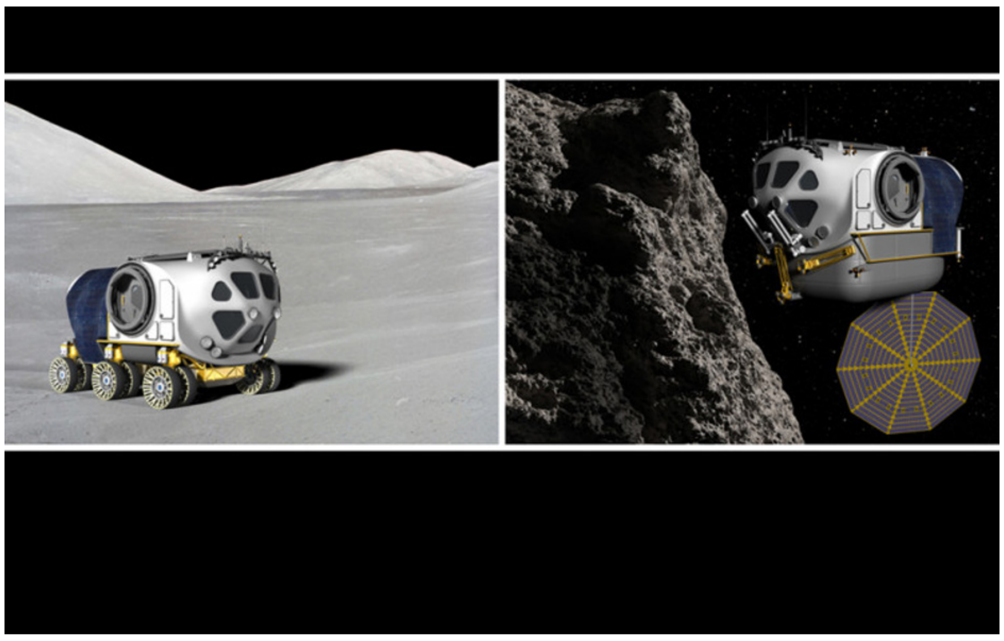


Figure 1: The Multi-Mission Space Exploration Vehicle (MMSEV) as a rover or as a space vehicle. Source: NASA

These capital investments raise the obvious question: is it worth all the money? After taking a look at NASA's latest update about a recently discovered asteroid called 16 Psyche, the answer would be pretty clear. It is a rare and very important asteroid made of metals that are the same as the core of Earth, making 16 Pysche extraordinarily important.

"We've seen meteorites that are mostly metal, but Psyche could be unique in that it might be an asteroid that is made of iron and nickel," said Tracy Becker, one of the study's authors and a planetary scientist at the Southwest Research Institute in San Antonio, Texas.

Given the asteroid's size, its metal content could be worth $10,000 quadrillion ($10,000,000,000,000,000,000), or about 10,000 times the global economy as of 2019.

From another point of view, the current mining techniques damage the natural environment. The chemicals that are being used in operations cause contamination of water and air. The extraction step can cause erosion, hazards, and habitat destruction of animals and not to mention social impacts. By learning these mistakes that the mining industry made on the environment, asteroid mining can shift these burdens off Earth. A new, innovative, and more profitable era can begin.

Hande Mert

Contaminated Fashion

The fashion industry has a significant share of the world economy. Its impact on climate change and the depletion of natural resources is even more significant than initially thought. The fashion industry stands second place in polluting the world's sources, trailing the oil industry. As the industry grows each year, so does the environmental damage it causes.

A high amount of energy is required to produce a garment. There is a complex energy cycle between using electricity and water (also other energy sources). If this cycle is not well optimized during manufacturing clothes, it will have irreversible effects on the natural sources.

The fashion industry has three main effects on world resources, namely, water pollution, carbon emissions, and chemical waste. To begin with, many countries do not have regulations on textile factories. In some countries such as India and Bangladesh, where cheap textile production occupies a large share in local economies, untreated toxic wastewater is dumped directly into rivers and subsequently into the oceans.

20% of industrial water, 200,000 tons of dye, 22,000 liters of toxic waste pollution comes from textiles are being lost to effluents and dumped into rivers treatment & dye every year in Bangladesh every day.

The numbers are vital not only for water pollution but also for water consumption. For producing a garment, Cotton is one of the oldest, most used, and most preferred material when producing a garment. Unfortunately, according to The Guardian, the global average water footprint for 1kg of Cotton is 20,000 liters. It should be noted that it is used only for cotton production. Tons of water is being used over in different areas such as fabric weaving or jean production, and then tons of it become wastewater and cannot be re-used in any way.

For instance, it takes about 2,000 gallons of water to produce a pair of jeans. That's more than enough for one person to drink eight cups per day for ten years, according to the United Nations Economic Commission for Europe (UNECE) 's statistics. In India's case, producing 1kg of Cotton consumes 22,500 liters of water on average, according to research done by the Water Footprint Network. In other words, these 22,500 liters of water cannot be used for anything else later, as it is either contaminated or evaporated during the process. It is significant to note that more than 100 million people in India do not have access to safe water. According to Forbes, 1.5 trillion liters of water are used by the fashion industry each year, and 2.6% of the global freshwater is used to produce Cotton. The waste of energy is tremendous and dangerous for natural sources on the planet.

The fashion industry's impact on climate change leads to water consumption and pollution and has a severe role in carbon emissions worldwide. The industry has a 10% impact on global carbon emissions during the production of garments, manufacturing, and transportation of millions of clothes in one year. Significantly, in the last two decades, with the use of materials such as nylon, synthetic, and polyester in addition to Cotton, the level of gas emission has increased. Additionally, these materials are made a form of fossil fuel; therefore, it leads to increased energy consumption compared to natural fibers in the production process. In China, Bangladesh, and India, a massive amount of garment production is powered by coal, and their share in the market is tremendous compared to European countries. Therefore, its effects on the environment are hugely detrimental in terms of carbon emissions.

Moreover, according to UNEP (United Nations Environment Programme) 's statistics, the fashion industry leads to more carbon emission than international flights and maritime shipping in the whole world.
Many other examples may be cited regarding the fashion industry's chemicals and their adverse effects on the environment. The fashion industry has a substantial adverse impact on the planet.

What makes the fashion industry the way it is then? First, people tend to buy more and consume more than they used to in the old days. The environmental impact of the fashion industry has been increasing year by year. We have five times more clothes than our grandmothers had in their closets. Many reasons can be cited leading to this point, including the fact that fashion industry employs more workers with cheap labor price, creating more production at lower prices, leading to lower prices that appeals to bigger consumer masses.

Thirty years ago, a limited number of garments were on the market, and they were not easy to access. Today, however, people

can buy more with fewer thanks to fast fashion brands, such as ZARA, H&M, GAP, Stradivarius, selling high fashion brands' (Dior, Chanel, etc.) clothes at lower prices, thus, allowing people from different economic classes to have further opportunities to buy clothes. Moreover, social media has become a new showroom for garments. People who follow influencers who wear clothes or use products to make a commercial severely impact shopping habits. Generally, people start to think about buying, wearing, and using the same product as influencers. They want to feel that they have the purchasing power like influencers, and if customers use those products, they can have luxury brands like them. Social media have an impact on both people's decision-making for consumption and marketing in the fashion industry.

However, maybe the most critical impact of the fashion industry is increased garbage proportion with increased consumption. Garments are one of the most challenging materials to recycle. Social media significantly effect fast fashion dynamics, such as one brand has twenty-four collections in one year. Twenty-four times one brand create millions of garments. According to BBC News, globally, an estimated 92 million tons of textile waste is produced each year, and the equivalent of a rubbish truck full of clothes ends up on landfill sites every second. By 2030, it is expected that a total of more than 134 million tons of textiles a year will be discarded. The problem is that garments do not dissolve in nature by themselves; they must be recycled.

If we wear a garment five times instead of fifty times, it turns into the garbage, and only a small part of them are recycled. Some brands switched to renewable and recycled material policies. One of them is H&M. In 2013 launched a global garment collecting program in all of its stores and has set a goal of having all clothing sold in its stores be made from recycled or sustainably sourced materials by 2030. That figure currently stands at 57%, according to the company.

Last week H&M announced that the first in-store recycle machine will be used in Sweden, where H&M was founded. New technological devices turn the old, used, discarded clothes into something new in five hours, with the whole process visible to the Stockholm store's shoppers. In this process, machines do not consume water, chemicals, and electricity to be environmentally friendly. Customers can choose one of three items to be made, and they can buy them for a discounted price ranging between $11 to $16

When people do not wear the same clothes more than seven times, every piece of garments causes water pollution, gas emissions, water consumption, and garbage waste if they are not recycled. All brands can take H&M's steps for environmentally friendly production and recycling. The fashion industry's carbon footprint and its damage to nature can be controlled in the long term.

Başak Bozoğlu

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