

The History of Coal in Turkey and the Story of its Origins

CONTACTS

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Overview

In the somber autumn of 1829, the reformist Sultan Mahmud II was grieving about the humiliating terms of Edirne Treaty which he reluctantly signed with his foe Tsar Nikolai I. On the other hand, in a Black Sea village, a few hundred kilometers East of Istanbul, a young mariner who was recently disbanded from the Navy was finally living the joy and pride of his discovery which he had been searching all over the mountains in his region for some time. He was appointed by the the Sultan's writ and was motivated by the promised prize of fifty gold coins.



Sultan Mahmud II

It was October and on the Northern coast of Black Sea, the victorious Russian Navy was discarding the old galleons and replacing them with steamboats. The Ottoman Navy which was almost totally destroyed by the allied

Russian-British fleets two years ago at Navarino was also forced to face this modernization, but they didn't have the necessary technology, personelle and the fuel to sail the boats.

That fuel was coal and that mariner was Mehmet. Also known as Tall (Uzun) Mehmet.

As an educated person, Sultan Mahmud most probably didn't know how this organic rock was formed but he knew that this burning rock was mentioned in the ancient writings of Chinese, Greeks and Romans and that they had used it in blacksmith stoves. But it wasn't the fires of the blacksmiths that Sultan was curious about. His concern was the military advances of his Western rivals and his main foe in the North and these advancement was rapidly increasing because of a new invention that was called the steam machine.

On the other hand Mehmet was unaware of this rock or at least its importance until the Navy officer gave hand samples of coal to every disbanded mariner with the writ of the Sultan. They were ordered to search for this black, burning rock in their own counties.

Story of Tall Mehmet

Tall Mehmet was from the Kestaneci Village of Ereğli. He directly returned to his village after being disbanded and quickly started to search the region he was familiar to, for his Sultan and the prize. One day he was waiting in a mill to grind wheat. He was bored of waiting and had a short walk to the river shore without a purpose. Though he was unaware his subconscious was in a continious search for the mentioned stone. At that very moment he saw a black piece of rock on the river shore and remembered the sample in his bag. He took the stone and compared it with the sample. They looked quite similar. He wasn't confined so he waited for the

sample to dry and secretly entered the mill and threw the stone in the stove. It was burning. Tall Mehmet finally found what he was looking for. Now it was time to find the source of the burning rock. His luck and will helped him. It was November. The cold Black Sea winter was coming. But Tall Mehmet wasn't cold. Because in his stove he was burning coal. Mehmet had found the source and hit the first dig.

According to the story Mehmet spent the winter in his village and when he was called back to Navy he went with a sample of coal in his bag. He showed the sample to his officers and when it was proved that the sample was really coal the news flew to the Sultan himself. The Sultan was very happy. He gave Tall Mehmet the promised prize and did more. He employed Mehmet for the mine with a salary of six golds per month.



Historical Town of Ereğli

Sultan Mahmud had his goal but Tall Mehmet couldn't see this. Just before he started his journey back home, he was either poisoned or choked at an inn called Leblebici in İstanbul where he was hosted as a guest. As far as known the murderers were the men of Hacı İsmail Ağa who was the feudal lord of Ereğli. İsmail was probably unaware of the Sultan's writ and he was angry because a commoner inhabiting his land directly went to Sultan without in-

forming him. Maybe his anger was due to the cancellation of a probable profit source. Whatever the reason was, Tall Mehmet was the first victim of the coal cause. Unfortunately he wasn't the last victim.

The historians are divided into two opposing groups on the reality of this story. While some accept the story, others point to the chronological conflicts in the story and claim the story and its heroes as fiction; excluding Sultan Mahmut II. According to their opinion this story was deliberately faked up in 1930s in order to give hope to the citizens of the young Republic and ignite their nationalism. They say there is no writ either. But whatever they say coal is still where it was meant to be. There are several similar stories too. For example there is an other story about a man from Elvan village (in Ereğli) named Black Hüseyin. It is said that in 1840 he showed the coal samples in his bag to the authorities on the wooden wharf which will be mentioned below. After that these samples are taken to İstanbul and foreign scientists surveyed the Ereğli-Amasra region. There is a similar story to Tall Mehmet from the 17th century Belgium about a blacksmith called Houillos, too. That shows how coal ignites the imagination of people in history.



Statue of Tall Mehmet in Zonguldak

A Brief History of Zonguldak & Ereğli

The importance of the reality of the story may be a matter of discussion but it is certain that Tall Mehmet is a symbol of Turkish mining. Other than his statue, there is even a university called after him in a Black Sea city: Zonguldak. The city of Zonguldak is another symbol of mining in Turkey.

There are several rumours regarding the origins of the name, Zonguldak. Some say that the future French miners of the region call the region jungle due to the dense forests of the region. The local people used to call the region *davdağ* which means "greenwood mountain" in Turkish. The combination of these two may be *jungledag* and in time it may be transformed into Zonguldak. Others claim that the name is transformed from the maps of French miners which refers to a coal zone near a mountain in vicinity named *Göl Dağı*: Zone de Gouldag.

According to the historical records, while Tall Mehmet was living the greatest adventure of his short life, the center of the modern city of Zonguldak was a Black Sea bay near the town of Ereğli in the State of Bolu. The bay had one wooden wharf and was used as harbour for the shipping of the timbers of Middle Black Sea forests to the Haliç dockyards of İstanbul. In the future the coal which was discovered in the region was also going to be shipped from here too. For example there is an Imperial Memorandum dated 1843 about the marketing of the *vapur* (ferry) coal produced in Ereğli and Amasra and the shipped from this bay.



Coal Powered Steam Boat-Swift



Ottoman Galleon

The word *vapur* was probably transformed from French *bateau à vapeur*

which means steamboat. It is known that even in the early times like 1828, when the Ottoman Navy was consisted only of galleons, a merchant named Artemis presented a steamboat named Swift (*Sürât*) to Sultan Mahmut II. as a gift and Sultan sailed from İstanbul to Rhodes and came back with this steamboat.

Sultan Abdülmecid and the Era of Imperial Management

The region and coal remained important during Sultan Abdülmecid, the son and successor of Mahmut. During his time first coal company was founded in the region called Ereğli Coal Mine Company with six partners and started production in 1842. Four years later the number of the partners increased by one with joining of Abdülmecid among them.

In 1848 the borders of the basin was identified for the first time. This year is accepted as the official starting of the hardcoal mining in the country and can be seen in the emblem of TTK (Turkish Hardcoal Enterprises). In the same year by the order of the Sultan the hardcoal basin was given to the Administration of Foundations and was accepted as the property of the Sultan. The management was later given to some British merchants living in Galata with an annual fee of 30.000 pennies. The leasing income was donated to religious foundations. This leasing to British was the first step of foreign dependancy in mining. In 1869 with some regulations in the mining law, the rights of Turkish and foreign mining enterprises became equal.

Back in 1849, the only customer of the British Coal Company was the Navy in those years. In 1850 with the railway equipment and carriages brought from Great Britain, the company managed to build a tram line from Kozlu Basin to the coast. They had equipments and privileges given to them, but the produced coal was below 50.000 tonnes per year. This was far below the Ottoman Navy requirements. So on demand of the company; the British engineers, Barclay Brothers and eight mining supervisors were invited to the mines by the Ministry of Foundations. This resulted of an increase in production.

On June 22, 1853 Russia decided to harden its politics on Ottoman Empire and invaded Wallachia and Moldavia. The European states tried to negotiate between two countries but couldn't succeed. So Ottoman Empire sent a diplomatic note to Russia but could get no reaction. On the War of Crimea broke out and lasted two and a half years. Ottoman Army was successful but the Navy was destroyed in the shores of Sinop. On behalf of Great Britain and France this was a threat on the Straits and Mediterranean. The allies didn't remain unresponsive and with the support of the Kingdom of Sardinia, they joined the war on the side of Ottomans. Because of the primary threat of the Russian Navy on the Straits, they had to overcome them in Black Sea. Using this excuse, in 1854 they demanded the management right of the mines in the Kozlu-Zonguldak regions till the end of the war and used the coal for their Navy needs. During this period the Barclay Brothers built the Zonguldak, Çaydamar, Üzülmüş and Kilimli tram lines. With the help of the allied factions, Russia was defeated. By the end of the war the mine again started to operate for Ottoman Navy benefits. The British Coal Company was still in charge of the business and was going to be monopoly till 1865. During this time an autonomous British bank was also founded to support the company.

Dilaver Paşa & The Era of Navy Management

In order to increase the production in the hardcoal basin, the workpower and transportation insufficiencies had to be minimized. So, by the order of Sultan Abdülaziz the successor and brother of Abdülmecid, the management of the Basin is given to the Ministry of Navy in 1865 and Admiral Dilaver Paşa was appointed as the Minister of Mines of Empire with an additional title of Governor of Ereğli. Two years later a constitution was declared by the ministry regarding the management of the Basin and mines. This is also known as the Constitutions of Dilaver Paşa and was operated till 1908. Such regulations were established with the Constitution:

- Licencing became compulsory.
- The transportation issues were regulated.
- Dormitories for the workers were built.
- The purchasing of the poles for underground was regulated and Ereğli forests were reserved for these poles.
- Ereğli became the center of the Basin and here was founded the Ministry of Mining.
- A science commission in Kozlu was founded.
- Officers and mariners were appointed to the mines and a military order was given to the management.
- The work hours were regulated.
- The working age was stated as between 13 and 50 and only men were allowed to work.
- People of 14 towns of Ereğli were forced to work in the mines.



Dilaver Paşa

On May 30, 1876 with a military coup, Abdülaziz was dethroned by Mithat Paşa and Abdülaziz's nephew Murat was elected as the new Sultan. The unfortunate new Sultan could sit on the throne only for 93 days. He was claimed to have a mental disease. The military had to give the throne to his brother Abdülhamid II. His era was the most restless years of the fading Empire. Rebellions, wars, bankrupts and revolutions... Among all

these chaos, the 1877-1878 Ottoman-Russia War was the most important event for the faith of mining. The war ended with the victory of Russia.

In this war the Ottoman Navy was heavily damaged and as a result of the reduced modernized war ships the demand for coal was also decreased. The Imperial Treasury was also in trouble. The miners tried many ways to minimize the effects of this war on them; even sold their properties, but a few could survive in the business. According to the Constitutions of Dilaver Paşa the abandoned mines were State property so only Turkish miners were affected from this problem. The foreign miners were supported from their countries and they formed alliances among each other. Thus they survived.

Constitutionalism and the Era of Ministry of Forestry, Mining and Agriculture

During Abdülhamid's 33 years reign, because of his strict rules he had many opposers. These people then gathered in a political party named İttihat ve Terakki and this party finally dethroned Abdülhamid in 1908. Now it was the time for constitutionalism and the throne was only a symbol now. Also the properties of the Sultan were limited. The party with puppet Sultans were to rule the Ottoman Empire till its collapse. In this era the control of the basin first was given to the Ministry of Public Works. Then in 1909 the Ministry of Forestry, Mining and Agriculture was founded and took the control of the basin. The French were the major group in the Basin now and the French Ereğli Coal Company was the most important company. This advantage helped the French Government to support their future ambitions.

In February 1914, in order to maintain electricity requirement of İstanbul, a power plant was built in Silahtarğa. The resource was hardcoal and was shipped from Zonguldak. This system could only survive for a couple of months because in July 1914 what was feared for so long finally broke out: The First World War. The alliances were already decided in this war and the

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Silahtaraga Power Plant

Ottoman-German alliance was signed a month ago. This affected the coal mines too. The War Coal Commission was founded and the management of the basin was given to Germans. The connection between Zonguldak and Silahtaraga continued for some time but when the Russian Navy sunk the trade ships of Ottomans the power plant had to maintain its demand from the little lignite pits around İstanbul with tram lines.

In 1916 and 1917 the German geologists and mining engineers worked on the basins of Kozlu, Zonguldak, Kilimli and Çatalağızı and stated that the French Ereğli Coal Company was producing 600.000 tonnes of coal per year. When the war was over in November 1918 there was neither an independent Sultan nor a government. The country was under the threat of invasion and separation. French were among the invaders and had a large dominion in Syria and Southeastern Anatolia but they also didn't want to give up their acquisitions in Ereğli. So that in March of 1919 the French army deployed a battalion of 350 soldiers and started to control the mines. In June 1920 this time they decided to control the whole State of Ereğli but couldn't succeed. With the opposing of the National Parliament in Ankara and the resistance of the local people of Ereğli on June 21, 1921 the French army in Ereğli had to

leave from Zonguldak Harbour. This day is still celebrated as the salvation day of Zonguldak. Although the army left the region, the French Ereğli Coal Company continued to manage the operations in the basin till 1937.

The New Republic and Advances in Coal Mining

During the tough days of Independence War the National Parliament in Ankara was also dealing with nonmilitary issues. Mining was among these issues too and many legislations were accepted about mining. Mining was such an important issue for the parliament that during the war about 5000 mine workers were kept in the mining operations and not sent to frontlines for defending the country. In September 1921 the first labour act of the new parliament was about mining: The law regarding the rights of mine workers in Coal Basin.



Field Marshall Mustafa Kemal

By the end of 1922 the last remnant of the invaders were wiped out from the country. The victorious commander and the head of the parliament Field Marshall Mustafa Kemal had not shared his Republic idea with the parliament yet, but he was organizing congresses and building the foundations of a young republic. In 1923 between February 17 and March 4 he called for an economical congress in İzmir and in this congress the foundation of national trade banks was accepted. Following this in 1924 Turkish Labour Bank (Türkiye İş Bankası) and in 1925 Turkish Industry and Mining Bank were founded. 1924 is an important year for the Turkish mining industry for another reason too. This year in Zonguldak, Mining and Industry High School started its education. The school continued to serve the nation until 1931. In 1926 and 1927 İş Bankası founded four new Turkish companies including Kömüriş and Türkiş. The following ten years (from 1927 to 1937) were the multinational mining era in the basin. Besides the Turkish and French companies there were also Italian companies in the basin. During this period in 1930 Society of Turkish Mining Engineers was founded. This society is one of the four first members of future Chamber of Turkish Engineers and Architects. Also in 1935 for the exploration of the new mining potentials in Turkey, MTA and for mining facilities, energy production and distribution, Etibank were founded.



Logos of ETİBANK & MTA

Establishment of ETİBANK & the Era of EKİTAŞ

Mustafa Kemal Atatürk visited the mines in the region in these ten years and he decided to nationalize the mining sector. So in 1935 on his demand

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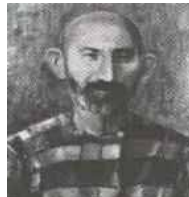
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Etibank and in 1937 under Etibank the Ereğli Coals Enterprise (EKİTAŞ) were founded. After buying all the shares of French and Italian companies, EKİTAŞ was announced to be the only owner of the rights and authority of the mines in the Ereğli Basin. EKİTAŞ continued to control the whole operations until the foundation of Turkish Coal Enterprises (TKİ) in 1957. The same year Zonguldak was connected to Ankara by railway. There were many railroads in the region indeed but most were built only for mining facilities and most of these were compatible only with trams. These lines had to be adapted and linked to main railroads built by TCDD (Turkish State Railways). To support this necessity in March 1941 Karabük Iron and Steel Factory (Kardemir) was founded and the first national iron plate was produced. Kardemir accelerated the innovations and EKİTAŞ managed to build electricity, water, road and railway networks all around the region. In November 1948 by three British companies (Metropolitan-Vickers, Babcock and Wilcox & Holloway Bros) Çatalağzı Thermal Plant (ÇATES) was built and started to operate. In 1950 in Filyos a firebrick factory was built to produce construction materials to be used in mines. Such investments in Zonguldak needed to be protected so EKİTAŞ formed coal regiments for the security of the region and facilities. In 1939 another enterprise was founded by ETİBANK in Manisa. The already known and operated lignite mines of Tavşanlı, Değirmisaz (Kütahya) and Soma (Manisa) were reorganized under

Western Lignite Enterprise (GLİ) based in Soma. The lignite basin in Soma was discovered in 1913 by Osman Ağa from Darkale. Same year two partners called Ragıp and Çimeris founded a company and supplied the army demands during the First World War. Later the mines were operated by French companies until 1922. From that time till the foundation of Etibank, many Turkish companies operated the mines and one of them was the famous journalist and newspaper owner Yunus Nadi. The discovery of lignite in Tavşanlı on the other hand is said to be even older than Soma. The discoveries are dated back to 1906. The discovery was referred to a villager from Tavşanlı named Mehmet. Also known as Akkaş Mehmet, he will later add the surname Tunçbilek after his name. Later the Tavşanlı Mine was going to be called as Tunçbilek Mine to honour the discoverer. In 1978 some mines under the management of GLİ are reorganized under the management of ELİ (Aegean Lignite Enterprise).



Yunus Nadi



Akkaş Mehmet (Tunçbilek)

Before EKİTAŞ (later the name was converted to EKİ) the management of the mines were dominantly under the control of foreigners so we do not know much about the accidents or casualties. An other reason for this is the

low capacity of the mining facilities compared to EKİ era. Bu after EKİ, the accidents and casualties were recorded. Some major accidents and numbers of casualties are as follow:

- Explosion in Kozlu-Kasaptarla pit in 1939 (23 casualties)
 - Explosion in Çamlı pit in 1942 (63 casualties)
 - Explosion in Kozlu-İncirhamamı pit in 1947 (53 casualties)
- Same year the Labour Union of Ereğli Coal Basins Workers was founded but the accidents continued.
- Explosion in Kozlu-İncirhamamı pit in 1954 (13 casualties)
 - Explosion in Gelik pit in 1955 (55 casualties)



The Logo of TKİ

In 1956 the Armutçuk Coal Enterprise (AKİ) was founded. This enterprise was going to be TTK (Turkish Hardcoal Enterprise) in the future. But in 1957 AKİ, EKİ and GLİ were reorganized under one management and the new organization was called as Turkish Coal Enterprises (TKİ). The industrial activities in the region accelerated after that. For example in 1962 Bartın Cement Factory and in 1965 Ereğli Iron and Steel Enterprises (Erdemir) were founded.

Afşin-Elbistan Lignite Basin and Thermal Power Plant

During these innovations in Zonguldak, MTA had a new lignite discovery in Eastern Anatolia. The lignite zone was in Afşin and Elbistan towns of Kahramanmaraş. The calorification of lignite in this zone was poor but the reserves were widespread. So TKİ got involved and together, the two establishments initiated a power plant project in



First Turkish Iron in Kardemir

the area in 1968. With 5000 Mw capacity the plant was planned to be the largest energy producing facility in Turkey. The construction of the plant started in 1973. The plant was constructed in four sectors. The first sector started to produce electricity in 1984. The plant was the highest public investment in the history of Turkey and was fed from the Kışlaköy lignite pit. Following this Afşin-Elbistan A Thermal Power Plant, a second plant was required. The new plant's construction started in 1996. Afşin-Elbistan B Thermal Power Plant started electricity production in 2004.



Kışlaköy Pit



Afşin-Elbistan Power Plant

Founding of TTK and Recent Situation of Coal Mining



The Logo of TTK

This massive growth in both lignite and hardcoal required a new organization. So in 1984 for the operations of hardcoal in Zonguldak, Turkish Hardcoal Enterprises (TTK) was founded under TKİ.

TTK had the control of a couple of mines in the basin but in 2001 the enterprise had control on all harcoal mines. In 2003 the Ministry of Energy and Natural Resources started to control the enterprise. Unfortunately in these progressive years of Turkish mining the accidents and casualties were also increasing. Some major

accidents and numbers of casualties in the TKİ era are as follows:

Explosion in Kozlu-İncirhamamı pit in 1960 (25 casualties)

Explosion in Armutçuk pit in 1967 (17 casualties)

Explosion in Kozlu-İncirhamamı pit in 1968 – 1974 (34 casualties)

Explosion in Armutçuk pit in 1983 (103 casualties)

Explosion in Kozlu-İhsaniye pit in 1983 (10 casualties)

Explosion in Kozlu pits in 1992 (263 casualties)



A historic (1800s) view from port of Zonguldak.

Soma & Ermenek Incidents

The list continues in time both for the state mines and those of the private enterprises until 2014 Soma and Ermenek tragedies. On May 13, 2014 in Soma coal mine a fire broke out from an electricity problem and 301 miners choked due to fume. This was the highest number of casualties in a mine accident in Turkey. After five and a half months this time in Ermenek mine in Karaman, due to water flood 18 miners were trapped underground and none could be saved.



sometimes there are no words left to say...

Even after these two very recent incidents, the mining accidents and casualties are still not over. Although it is said that death is natural in mining, to honour the pioneers of coal mining and those who sacrificed their lives it is our duty to value that life over coal.

References

- www.taskomuru.gov.tr
- www.afeltesa.gov.tr
- www.gli.gov.tr
- www.eli.gov.tr
- www.kardemir.com
- www.erdemir.com.tr
- www.etimaden.gov.tr
- www.tki.gov.tr
- www.ereglihakimiyet.com
- Yrd.Doç.Dr. Alaaddin ÇAKIR: Zonguldak'ın Madencilik Tarihi ve Kültürü Ders Notları (Kasım 2013)
- Cevat Ülkeul: Taş Kömürü Havzasında (İşletmelerinde) Bahriye Nezareti Dönemi (1865-1908) ve Dilaver Paşa Nizamnamesi
- Murat Kara: Osmanlı Devleti'nin Son Döneminde Ereğli Kömür Havzası (1829-1920), History Studies (International Journey of History) ISSN: 1309 4173 (Online) 1309 - 4688 (Print) Volume 5 Issue 1, p. 223-250, January 2013



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