From Wood to Coal: The Energy Economy in Ottoman Anatolia and the Balkans (1750-1914)

Alaaddin Tok

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Abstract

"From Wood to Coal: The Energy Economy in Ottoman Anatolia and the Balkans (1750-1914)"

Alaaddin Tok, Doctoral Candidate at the Atatürk Institute for Modern Turkish History at Boğaziçi University, 2017

Prof. Dr. Nadir Özbek, Dissertation Advisor
Prof. Dr. Şevket Pamuk, Co-advisor

Focusing on wood fuel and coal, this dissertation examines the evolution of energy economy of the Ottoman Empire between 1750 and 1914. Ottomans depended exclusively on traditional sources of energy before the introduction of fossil fuels. After inconclusive efforts in the eighteenth century, coal became part of the Ottoman energy economy in the 1830s. This dissertation argues that, in line with the slow and late industrialization, energy transition in the country was gradual and limited. The low energy consumption path of the Ottoman economy was partly related to unfavorable conditions regarding natural energy endowments. Forests, distributed unevenly in the country, were not sufficiently rich to support industry. Moreover, coal reserves were mostly of inferior types and suffered from geological drawbacks. As manifested in coal mining and the adoption of steam engines, technological backwardness further hampered energy transition. This study attributes to the state a decisive role in the energy economy. For a long time, the Ottoman government closely supervised fuel production and fuel logistics, especially when the needs of Istanbul and public services were at stake. With the increasing liberalization of the economy in the second half of the nineteenth century, state control over energy eroded. An important part of the Ottoman energy economy was British coal imports which made the country a part of the global energy network. British coal not only met some domestic needs but also turned Istanbul an international coaling station.

77,000 words

Özet

"Odundan Kömüre: Osmanlı Döneminde Anadolu ve Balkanlar'da Enerji Ekonomisi (1750-1914)"

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Prof. Dr. Nadir Özbek, Tez Danışmanı
Prof. Dr. Şevket Pamuk, Eş Danışman

Bu tez, Osmanlı İmparatorluğu'nun 1750 ve 1914 yılları arasında evrilen enerji ekonomisini odun ve maden kömürü üzerinden incelemektedir. Osmanlılar fosil yakıtlardan önce sadece geleneksel enerji kaynaklarını kullanmaktaydı. Onsekizinci yüzyıldaki sonuçsuz girişimlerden sonra, kömür 1830'larda Osmanlı enerji ekonomisinin bir parçası haline geldi. Bu tezin temel iddiası, ülkedeki enerji dönüşümünün, yavaş ve geç sanayileşmeye paralel bir şekilde, tedrici olduğu ve hayli sınırlı kaldığıdır. Osmanlı ekonomisinin düşük enerji kullanımı kısmen doğanın enerji kaynakları konusunda cömert olmaması ile ilgiliydi. Ülkede eşitsiz şekilde dağılmış olan ormanlar, endüstriyel üretimi destekleyecek kadar zengin değildi. Bunun yanında, kömür rezervleri çoğunlukla düşük kalitede olup, madenler bazı jeolojik sorunlarla maluldü. Kömür madenciliğini ve buhar makinelerinin benimsenmesini sekteye uğratan teknolojik gerilik enerji dönüşümünü daha da zorlaştırdı. Bu çalışma Osmanlı enerji ekonomisinde devlete belirleyici bir rol atfeder. Osmanlı hükümeti uzunca bir süre yakıt üretimi ve lojistiğini özellikle İstanbul'un ve kamu hizmetlerinin gereksinimleri söz konusu olduğunda sıkı bir şekilde denetim altında bulundurdu. Fakat ondokuzuncu yüzyılın ikinci yarısında giderek liberalleşen ekonomide devletin enerji üzerindeki denetimi gevşedi. Osmanlı enerji ekonomisinin önemli bir bileşeni de, ülkeyi küresel enerji ağının bir parçası haline getiren İngiliz kömürü ithalatıydı. İngiliz kömürü iç talebin bir kısmını karşılamakla kalmamış, İstanbul'u uluslararası bir kömür istasyonuna dönüştürmüştür.

77,000 kelime

Curriculum Vitæ

ALAADDIN TOK

Born 4 March 1985
Silifke, Turkey

EDUCATION

Ph.D.	Atatürk Institute for Modern Turkish History Boğaziçi University 2011-2017
M.A.	Atatürk Institute for Modern Turkish History Boğaziçi University 2008-2010
B.A.	Political Science and International Relations Boğaziçi University 2003-2008

PUBLICATIONS

- *The Ottoman Mining Sector in the Age of Capitalism: An Analysis of State-Capital Relations (1850-1908)*. Saarbrücken: Lambert Academic Publishing, 2011.

CONFERENCE PARTICIPATION

- "The Economics of Firewood and Charcoal in the Ottoman Empire (1839-1914)." In Proceedings of the Second Annual International Conference on Social Sciences (AICSS), vol.2, 413-24. Istanbul, 2016.
- "İmparatorluğun Son Döneminde Istanbul'da Tuğla Üretimi ve Ticareti (1839-1914)." In Osmanlı Istanbulu-III (III. Uluslararası Osmanlı Istanbulu Sempozyumu Bildirileri), 769-79. Istanbul: 29 Mayıs Ünivesitesi Yayınları, 2015.

- "Küresel Çağda Avrupa'ya Maden Satmak: Ergani'den İngiltere'ye Bakır İhracatı (1866-1914)." Paper presented at Uluslararası Osmanlı Araştırmaları Kongresi, Sakarya-Turkey, 14-17 October 2015.
- "The Fight against Locust Infestations in Ottoman Cyprus in the Nineteenth Century." Paper presented at Rural History Conference, Girona-Spain, 7-10 September 2015.

RESEARCH EXPERIENCE

- Research assistant (Yıldız Technical University, 2009- present)

LANGUAGES

- Turkish – Native Speaker
- English – Fluent
- French – Intermediate
- Ottoman Turkish – Advanced reading skills

To the memories of my 'grand' mothers…

Table of Contents

List of Tables

List of Figures

List of Photographs

List of Maps

NOTE: The in-house editor of the Atatürk Institute has made recommendations with regard to the format, grammar, spelling, usage, and syntax of this dissertation in compliance with professional, ethical standards for the editing of student, academic work.

1

Introduction

This dissertation examines the history of energy in the late Ottoman Empire from an economic point of view. I document and analyze the traditional energy structure of the country and its partial transformation with the introduction of fossil fuels. The dissertation deals with the story of energy in an economy that experienced a slow, limited process of industrialization. Instead of a holistic approach to the energy economy in which all kinds of sources of energy are taken into account, this study is confined to the analysis of fuels due to their importance for the overall energy framework and due to the availability of historical sources to conduct thorough research. My research answers the questions how Ottomans exploited forests for energy production, how they made use of traditional fuels for domestic and industrial purposes, how the introduction of coal influenced the energy economy and why the energy transition remained limited in the Ottoman case. In line with these questions, the dissertation explores the supply and demand sides of energy, the relationship between industrialization and energy, the technological aspects of a fuel economy, commercial fuel networks, and agents in the energy economy including the state, private institutions, and individuals. To show the long-term historical processes pertaining to energy, my research covers the long period between 1750 and 1914. Nevertheless, more attention is paid to the decades following 1830 on the grounds that the major technical and economic changes related to energy took place in this period. Geographically, the

dissertation focuses on Anatolian and Balkan territories of the empire where the historical trajectories of traditional and modern fuels can be clearly observed.

Energy is one of the key concepts that shapes the history of humanity. The development of civilization is closely linked to the availability of energy.[1] Many of the historical phenomena that people call "progress" today are those that enabled man to harness more energy. The controlled use of fire, for example, as "the main conquest in the history of energy"[2] not only provided more food to early human groups but also allowed mankind to heat their shelters and, in later periods, smelt minerals. The domestication of plants and animals also helped to increase the availability of energy. Likewise, a vast number of technical developments in history that gave birth to the modern world had repercussions for energy.[3] Energy has been either a catalyzing or a limiting factor for societal change throughout history.[4]

Energy and economy are closely related to each other. In the last few decades, the historical foundations of the energy-economy relationship have attracted many scholars. Among them, economic historians examined the economic aspects of energy in various contexts. The central themes to which this literature frequently refers are energy transition, industrialization, economic growth, resource management, and technological change. This dissertation

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1 The introduction of energy to social theory dates back to the nineteenth-century texts of Herbert Spencer. He was the first thinker who attributed a central position to energy in social organization and societal differences. Spencer draws parallels between organic and social evolution where the energy is a defining principle See Herbert Spencer, *First Principles* (London: William and Norgate, 1867*); The Principles of Sociology I-II-III* (New York: Appleton, 1898).

2 Paolo Malanima, "Energy in History" in *The Basic Environmental History, eds.* M. Agnoletti and S. Neri Serneri (Springer, 2014), 7. http://www.springer.com/us/book/9783319091792, 27.10.2016.

3 Lewis Mumford, *Technics and Civilization* (New York: Harcourt, Brace and company, 1934). Mumford divides the last millennium into three "overlapping and interpenetrating" epochs: eotechnic, paleotechnic and neotechnic. Mumford stresses that each of these epochs have specific characteristics for the generation and utilization of energy. For him, the amount and form of energy were central to the economic and social change.

4 For a review of sociological works that attribute to energy a central role in social change, see Eugene A. Rosa, Gery E. Machlis and Kenneth M. Keating, "Energy and Society," *Annual Review of Sociology* 14 (1988): 149-72.

builds upon the scholarly accumulation of this developing field and contributes to it. The ensuing chapters focus on the history of production, transportation, trade, and consumption of fuels and energy technologies in Ottoman lands.

The traditional sources of energy for use by humanity have been, for most, food for men and fodder for draft animals. These organic sources not only ensure the continuity of metabolism but also provide energy for the generation of muscle power. Productive activities in organic economies strongly depended on these sources as animal and human labor were among the major inputs in agriculture and traditional industry. Other organic energy carriers widely used by humankind for centuries are firewood and its derivative, charcoal. The thermal energy provided by these fuels supported life in unfavorable conditions by heating human dwellings and rendered the utilization of metals possible. With their extensive use, firewood and charcoal were indispensable elements of material life in preindustrial societies. With minor contributions to the overall energy composition, running water and wind were other traditional energy carriers. They were of central importance in transportation and in operations that required high amounts of power. All preindustrial economies relied on these sources of energy to varying degrees determined by natural resource endowments and ability of humans to utilize them.

Energy in preindustrial economies rested on renewable sources that convert solar radiation into organic material. The centrality of plants in these energy systems made agriculture and forestry the most important economic activities. These economies were areal, which means that energy sources were obtained from an extended field. People in preindustrial economies spent much of their time harnessing energy from the aforementioned sources. Since the leading carriers were organic, energy availability in these economies was closely related to climate. This made traditional societies vulnerable to climatic variation. Economies in preindustrial epochs suffered from poor energy efficiency. Humans and working animals could convert only a small percentage of energy inputs into useful energy. Burning firewood was even less efficient than biological converters. Moreover, the maximum level of power

attainable via traditional resources was low.[5] Overall, energy in preindustrial economies was characterized by scarcity, costliness and low productivity.[6]

Even in the best climatic conditions, there were natural limits for the growth of the preindustrial economies of the past due to photosynthetic constraints. When population pressure on land increased, these economies frequently suffered from energy supply bottlenecks. An important condition for moving beyond the limits of an organic economy was an alternative to animal and vegetable raw materials - something not subject to the diminishing returns of land.[7] Therefore, fossil fuels were crucial for the emergence and maintenance of more developed economic structures. Among the fossil fuels, coal stimulated the early transformation of traditional economies. Coal supplied great amounts of thermal and mechanical energy that could not be produced by traditional sources. Its utilization saved large tracts of land that would otherwise have been exploited for wood.[8] The shift to this new fuel with a higher energy density also enhanced the power capacity in the economy. To elaborate, steam engines based on coal enabled people to handle tasks that could not be tackled under traditional circumstances. Thus, it would not be an exaggeration to state that one of the building blocks of the modern world is coal.

The relationship between energy and industrialization is one of the central themes in the history of energy. Beginning with John Nef, economic historians like Fernand Braudel, Carlo Cipolla, and Edward Anthony Wrigley point out energy changes in industrial development and regard coal to be the essential

5 Paolo Malanima, "Energy in History" in *The Basic Environmental History,* eds. M. Agnoletti and S. Neri Serneri (Springer 2014): 1-29, http://www.springer.com/us/book/9783319091792, 27.10.2016.

6 Astrid Kander, Paolo Malanima and Paul Warde, *Power to the People: Energy in Europe over the Last Five Centuries* (Princeton, NJ: Princeton University Press, 2015), 37.

7 Edward Anthony Wrigley, *Continuity, Chance and Change: The Character of Industrial Revolution in England* (New York: Cambridge University Press, 1988), 25.

8 See Rolf Peter Sieferle, *The Subterranean Forest. Energy Systems and the Industrial Revolution* (Knapwell, UK: White Horse Press, 2001).

resource behind the Industrial Revolution.[9] Kenneth Pomeranz argues that accessibility to a coal supply is essential to explain differential industrial performances of Britain and China.[10] However, it is admitted that cheap and abundant coal did not guarantee industrial growth on its own. As Wrigley proposes, the switch from traditional energy to coal was a necessary but not sufficient condition for the Industrial Revolution.[11] Based mostly on cliometric studies, the role of coal in industrialization and economic growth is still debated among scholars. Clark and Jacks are among those scholars who downplay the role of coal in the Industrial Revolution. They argue that, instead of coal, traditional sources could well have supplied the energy necessary for British industrialization.[12] On the other hand, in line with Pollard who points out the overlapping maps of the British Industrial Revolution and coalfields,[13] Fernihough and O'Rourke propose that geographical proximity to coal strongly correlate to industrial and urban growth.[14] According to Robert

9 John Nef, *The Rise of the British Coal Industry* (London, Routledge & Sons, 1932); Fernand Braudel, *Civilization and Capitalism, 15th-18th Century: The Structure of Everyday Life* (New York : Harper & Row, 1985); Carlo M. Cipolla, *The Economic History of World Population* (Baltimore: Penguin Books, 1964); Edward Anthony Wrigley, "The Supply of Raw Materials in the Industrial Revolution," *The Economic History Review, New Series* 15, no. 1 (1962): 1-16, -- *Energy and The English Industrial Revolution* (Cambridge: Cambridge University Press, 2010).

10 Kenneth Pomeranz, *The Great Divergence: China, Europe and the Making of the Modern World Economy* (Princeton: Princeton University Press, 2000). Pomeranz points to coal as one of the key factors in the divergence of European economies from others. He states that whereas coal sources in Britain were abundant and sufficiently accessible to support industrial growth, the coal reserves of China were in remote parts of the country and thus had little impact on the economy.

11 Wrigley, *Energy*, 23.

12 Gregory Clark and David Jacks, "Coal and the Industrial Revolution, 1700–1869," *European Review of Economic History* 11 (2007): 39-72.

13 Sidney Pollard, *Peaceful Conquest: The Industrialization of Europe 1760–1970* (Oxford: Oxford University Press, 1981), 4.

14 Alan Fernihough and Kevin O'Rourke, "Coal and the European Industrial Revolution," *University of Oxford, Discussion Papers in Economic and Social History* 124 (2014). These scholars review discussions of the energy-industrialization relationship in detail. For them, energy debates about the nineteenth century are centered around two approaches: the growth hypothesis and the location hypothesis. While the arguments of the first group highlight the role of

Allen, in a British economy, characterized by high wages and low coal prices during the Industrial Revolution, technological innovations were designed to replace expensive labor with cheap fuel.[15] Overall, most scholars, in some way or another, acknowledge the significance of coal for British industrialization.

Technology has been a key phenomenon in the history of energy and mattered bot for its production and utilization. With a specific emphasis on the role of the Enlightenment in the accumulation of scientific knowledge, Joel Mokyr prioritizes technology in the making of the Industrial Revolution. For him, cheap coal in Britain was a function of technological change that introduced novel transportation facilities.[16] Accentuating the diffusion of technical change in the market and society, Kander et al. propose that energy contributed to economic growth through macro-, meso-, and micro innovations.[17] During the First Industrial Revolution, steam engines and metallurgical developments were the leading macro-innovations fueled by coal. Coal-based technologies spread around the world throughout the nineteenth century and contributed to the development of non-industrialized nations. The Danish example shows that together with cheap coal imports, employment of proper technological facilities could foster economic growth even in agrarian economies.[18]

Recent scholarship on the history of energy focused mostly on the trajectories of countries that achieved high economic growth performances during

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coal in economic growth by emphasizing the shift from traditional sources of energy to fossil fuels, those in the second group claim that the locations of industrial centers were closely related to the availability of coal.

15 Robert C. Allen, *The British Industrial Revolution in Global Perspective* (Cambridge; New York: Cambridge University Press, 2009).

16 Joel Mokyr, *The Enlightened Economy: An Economic History of Britain, 1700-1850* (New Haven: Yale University Press, 2010), 270.

17 Kander et al., *Power to the People,* 26.

18 Sofia Teives Henriques and Paul Sharp, "The Danish Agricultural Revolution in an Energy Perspective : A Case of Development with Few Domestic Energy Sources," *Economic History Review, Economic History Society* 69, no.3 (2016): 844-69. At the end of the nineteenth century, steam powered dairy production became the motor of economic growth in Denmark. Although the country had no coal deposits, it took advantage of its physical proximity to Newcastle.

the First or Second Industrial Revolutions. In other words, the bulk of the scholarly literature in the field deals with Europe and North America. In most of these studies, the shift from traditional energy carriers to coal or other modern energy sources is considered to be one of the major components of economic development. Yet there are few studies concentrating on the energy histories of less developed countries that remained dependent on traditional sources of energy.

With respect to energy, the Ottoman economy before World War I was comparable to contemporaneous Southern European countries. The divergence between Northern and Southern Europe, which began with the shift of the economic focus of Europe from the Mediterranean to the Atlantic, manifested itself in the field of energy, as well.[19] During the century before the World War I, Spain, Italy, and Portugal – like the Ottoman Empire - lagged behind the industrialized countries economically, which implied limited utilization of coal-based technologies and lower consumption of coal. In other words, traditional sources of energy were intensely used in the economies of all of these countries. Spain had some domestic coal mines and took advantage of cheap British coal along its northern coast. These resources supported the development of a modest iron industry and, to a certain extent, promoted the utilization of steam engines for various tasks.[20] In Italy, a country with no significant coal mines, the high price of imported coal did not allow for advanced productive systems, compelling it to focus on less dynamic sectors that required less energy.[21] The energy composition of Portugal was even worse than

19 For a detailed comparison of a southern European country with England in terms of energy, see Paolo Malanima, "Energy Consumption in England and Italy, 1560-1913. Two Pathways toward Energy Transition," *The Economic History Review* 69 (2016): 78-103. Also see Ben Gales, Astrid Kander, Paolo Malanima and Mar Rubio, "North versus South: Energy Transition and Energy Intensity in Europe over 200 Years," *European Review of Economic History* II (2007): 219-53.

20 Alan S. Milward and S. B. Saul, *The Economic Development of Continental Europe 1780-1870* (Totowa, N.J.: Rowman and Littlefield, 1973), 240-43.

21 Carlo Bardini, "Without Coal in the Age of Steam: A Factor-Endowment Explanation of the Italian Industrial Lag Before World War I," *The Journal of Economic History* 57, no. 3 (1997):

that of Spain and Italy. The scarcity of coal and other ores gave it little chance to develop ironworks and other steam-powered industries. Coal-based technologies were concentrated only in certain regions and were very small scale.[22] While examining the history of energy in the Ottoman Empire, many parallels can be drawn with the cases of these countries.

As in other agricultural societies, production and transportation in the Ottoman territories relied on traditional sources of energy up until the introduction of coal to Ottoman industry in the 1830s. Even after the introduction of coal, the Ottoman economy largely remained agricultural through the end of the empire. This meant that traditional energy prevailed in the country until the demise of the empire. Despite the centrality of traditional energy carriers in the Ottoman economy and in the daily lives of imperial subjects - and despite remarkable changes caused by coal - discussions of energy issues in Ottoman historiography are confined to a limited number of studies.

First, little effort has been spent on investigating Ottoman forests as the sources of organic fuels.[23] Most works dealing with firewood and charcoal concentrate on the fuel needs of the capital city.[24] Moreover, two major

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633-53. The switch to the hydroelectric energy supported Italian industrialization after World War I.

22 Sofia Henriques, *Energy Transitions, Economic Growth and Structural Change: Portugal in a Long-run Comparative Perspective* (Lund: Lund University, 2011).

23 Economic aspects of forests including the production of organic energy carriers and the fuel trade are also neglected. For a valuable analysis of forests and forestry in the late Ottoman Empire, see Selçuk Dursun, "Forest and the State: History of Forestry and Forest Administration in the Ottoman Empire" (PhD diss., Sabancı University, 2007).

24 Salih Aynural "The Provision Of Wood and Coal For Istanbul in the 18th Century" in *The Great Ottoman Turkish Civilisation*, vol. 2, ed. Kemal Çiçek (Yeni Türkiye Yayınları, Ankara, 1999): 156-60; Muharrem Öztel, "Tanzimat Dönemi ve Sonrasında Istanbul'un Temel İhtiyaçlarından Odun ve Kömür'ün (Mahrukat) Üretim Sürecinde ve Arz Piyasasında Yaşanan Problemler," *Uluslararası Sosyal Araştırmalar Dergisi* 6, no.24 (2013): 283-305 and "Istanbul'un Temel İhtiyaçlarından Mahrukâtın (odun ve kömür) Önemi ve Mahrukât Arz Piyasası (1789-1918)," *Turkish Studies - International Periodical For The Languages, Literature and History of Turkish or Turkic* 8, no.7 (2013): 487-505.

document compilations[25] obliquely refer to traditional energy carriers and shed light on some unilluminated areas of Ottoman energy history. Some works on different subjects include short discussions about wood fuel, too. [26]

Regarding coal, there is a richer literature in Ottoman historiography owing to the existence of a large coalfield at the heart of the imperial territory.[27] Despite its modesty on the world scale, the Ereğli region was one of the richest mineral deposits in the Near East. The unique character of the Ereğli coalfield for the whole of Ottoman geography motivated many scholars to explore the history of mining in this area. Early works are by local researchers rather than professional historians. Although these writers provide valuable information about social and economic life around the mines, their political motivations make them biased against the Ottoman period in the coalfield.[28]

Studies concentrate mainly on the administration of the coalfield, the mining facilities themselves, and the labor processes in the collieries. Indeed, the region is a good laboratory in Ottoman lands where the interplay of the state, capital, and labor can be manifestly observed. However, none of these studies tackles Ottoman coal from a broader perspective that prioritize its economic aspects. With its local focus, the present literature has little to say about overall structures based on coal. For example, increasing demand for coal and its technological basis contracted less attention than the coal mines themselves.

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25 Halil Kutluk, *Türkiye Ormancılığı ile İlgili Tarihi Vesikalar 893-1339 (1487-1923) (Istanbul: Osmanbey Matbaası: 1948);* Eftal Şükrü Batmaz, Bekir Koç, and İsmail Çetinkaya, eds. *Osmanlı Ormancılığı ile İlgili Belgeler [Documents on Ottoman Forestry], 1-4* (Ankara: TC Orman Bakanlığı Yayın Dairesi, 1999).

26 See, for example, Suraiya Faroqhi, *Towns and Townsmen of Ottoman Anatolia: Trade, Crafts and Food Production in an Urban Setting, 1520-1650* (Cambridge [Cambridgeshire]; New York: Cambridge University Press, 1984), 78-81.

27 Hamdi Genç, "Ereğli Kömür Madenleri (1840-1920)" (PhD diss., Marmara University, 2007); Donald Quataert, *Miners and the State in the Ottoman Empire: The Zonguldak Coalfield, 1822-1920* (New York: Berghahn Books, 2006); Hüseyin Fehmi İmer, *Ereğli Maden Kömürü Havzası Tarihçesi* (Zonguldak: Zonguldak Halkevi Yayınları, 1944); Ahmet Naim Çıladır, *Zonguldak Havzası: Uzun Mehmet'ten Bugüne Kadar* (Istanbul: Hüsnütabiat matbaası, 1934); İsa Tak, "Osmanlı Döneminde Ereğli Kömür Madenleri" (PhD diss., Atatürk University, 2001); Ekrem Murat Zaman, *Zonguldak Kömür Havzasının İki Yüzyılı* (Ankara: TMMOB Maden Mühendisleri Odası, 2004).

28 Quataert, *Miners and the State*, 14-15.

With few exceptions, related studies are not concerned with the transportation and distribution of coal in the empire. Moreover, though incomparable to those of Ereğli in quality and production volume, there were other coal reserves in the country that were occasionally exploited. Thus, there is a gap in Ottoman historiography regarding the energy economy of the country.

Based on comprehensive research on fuels in the Ottoman Empire, the present work contributes to the history of energy literature and to Ottoman historiography. This dissertation concentrates on commercial energy involving the production and transportation of fuels by actors who are independent of final consumers. To put it differently, energy procurement by peasants for their own needs is of little concern for the purposes of this research. Thus, the project deals more with towns and cities than rural areas where most households obtain fuels by their own means.

Some scholars question the necessity of coal for industrial development. By examining the Finnish case, Kunnas and Myllyntaus show that industrialization is possible without coal when renewable indigenous energy sources are abundant.[29] Similarly, the American example suggests that wood fuel could support modern economic growth where forests are plentiful.[30] In the production sectors of the Ottoman economy, traditional sources of energy featured only in textile manufacturing and smelting. As Donald Quataert shows, traditional handicrafts developed mostly in landlocked regions with no access to coal.[31] From an energy point of view, this meant that Ottoman weaving was

29 By exploiting its vast forestlands, Finland could support the industrial development especially in the latter half of the nineteenth century. See Jan Kunnas and Timo Myllyntaus. "Postponed Leap in Carbon Dioxide Emissions: The Impact of Energy Efficiency, Fuel Choices and Industrial Structure on the Finnish Energy Economy, 1800–2005," *Global Environment* 3 (2009): 154–89.

30 Sam H. Schurr and Bruce Carlton Netschert, *Energy in the American Economy 1850- 1975: An Economic Study of Its History and Prospects* (Baltimore: The Johns Hopkins Press, 1960). In the midst of the nineteenth century, firewood consumption in steam transportation was very common in the US. Moreover, almost half of the thermal energy in the iron industry came from charcoal in this period.

31 Donald Quataert, *Ottoman Manufacturing in the Age of the Industrial Revolution* (Cambridge; New York: Cambridge University Press, 1993).

powered by muscle, wood, and water. In the field of metallurgy, there were a few successful cases fueled by firewood and charcoal. Lately, some adopted coal technology while others, failing to bear the increasing costs, closed.

While discussing energy in the Ottoman Empire, it is necessary to refer to industrialization efforts in the country.[32] The Ottoman economy between 1750 and 1914 can be characterized as agrarian with limited success in industrialization. As part of the poor periphery, the empire failed to establish and maintain large factories - with a few exceptions. The first attempts by European experts in the government's service to adopt coal-based smelting technologies in the eighteenth century did not yield results. The occasional adaptation of steam engines to a few workshops in the 1830s was followed by an ambitious industrialization project in the following decade. Especially on the outskirts of Istanbul, numerous factories were established in the 1840s. However, foreign competition with respect to manufactured goods was fierce. Most state-owned enterprises failed to produce cheaper or better goods than European goods and were closed because of organizational and technical troubles.[33] Quataert criticizes the argument that the invasion of European manufactured goods into Ottoman markets led to the total collapse of industry in the country. In the Ottoman case, like in many peripheral countries of the nineteenth century, industrial production took place in small manufacturing enterprises instead of in large mechanized factories. In the second half of the nineteenth century, private factories burgeoned and developed especially in the textile and food industries. Nevertheless, most of these were small-scale ventures with limited production capacities.

Early studies on the Ottoman industry pay little attention to the energy infrastructure of factories and foundries. In the nascent stage of coalmining in the Ereğli region, state plants were powered mostly by British coal. Ereğli

32 For a detailed examination of the Ottoman industries, see Zafer Toprak, "Sanayileşme," in *Tanzimattan Cumhuriyete Türkiye Ansiklopedisi*, vol.5 (Istanbul: İletişim Yayınları, 1986): 1340-59.

33 Edward C. Clark. "The Ottoman Industrial Revolution," *International Journal of Middle East Studies*. 5, no. 1 (1974): 65-76; Mehmet Seyitdanlıoğlu, "Tanzimat Dönemi Osmanlı Sanayii (1839-1876)," *Ankara Üniversitesi DTCF Tarih Araştırmaları Dergisi* 28, no.46 (2009): 53-69; Ömer Celal Sarç, "Tanzimat ve Sanayiimiz," in *Tanzimat* I (Istanbul: Maarif matbaası, 1940).

coal contributed little to the energy supply of public factories. Private enterprises burned foreign coal when possible; however, there are some cases in which local coal and lignite reserves supplied energy to nearby factories.

This dissertation shows that the Ottoman Empire followed a path of low energy consumption in the long nineteenth century. I argue that the limits of industrial development determined the pace and intensity of energy transition. As the industrialization experienced by the Ottoman economy was gradual and limited, there was little incentive to shift from traditional sources of energy to coal. In addition to internal obstacles, the terms of trade in the open economy long hampered the development of manufacturing. When economic conditions were suitable for manufacturing, enterpreneurs sought the cheapest energy for production, which was mostly from sources other than coal.

Since industrialization was closely linked to technological developments, the failure of the empire to industrialize implied limited adoption of coal technologies. The transfer of coal-based iron and steel technologies was confined to a few enterprises. Throughout the nineteenth century, smelting around mines was fueled exclusively by wood fuel. The employment of steam in the manufacturing sector remained limited because of its high cost. The common economic interests of the Ottomans and European powers helped steam transportation to develop in the country; still, the impact of the transportation revolution was limited and partial.

Technological problems not only plagued the demand side but also troubled the advancement of coal mining in the Ereğli region and other parts of the country. While technological backwardness contributed to the reduced outputs of Ereğli coalfield, numerous deposits also remained idle in the absence of technical equipment to extract them. Overall, the level of industrialization and technological change was decisive in shaping the energy transition in the empire both from the supply and demand sides. Gradualism in industrialization was also manifest in the field of energy.

Nature is one of the determinants of the energy economies of countries. This dissertation demonstrates that the Ottoman Empire was unfortunate in terms of energy sources. I argue that neither traditional fuels nor coal were abundant enough to support industrial activity in the empire. In other words, the gradual and limited transformation of Ottoman production sectors was

partly related to natural constraints. In forest-rich provinces, the greater part of domestic and artisanal energy needs was met by wood fuel. Forests in these parts of the country also fueled small-scale industry but the majority of production plants suffered from fuel shortages throughout the nineteenth century. Needless to say, energy was a perpetual problem in regions with poor plant cover. Indeed, there were a great number of coal mines around the country. However, the majority of these were lignite mines, the inferior rank of coal. The Ereğli region, with the richest coal reserves of the empire, had geological drawbacks, and it was but a modest coalfield on the world scale.

The present history of energy literature has little concern for the role of the state in the making and regulation of energy economics of the past. Due to the internal dynamics of the Ottoman economy, the state deserves much emphasis in the examination of Ottoman energy policies. I argue that, in a regressive trend throughout the period under consideration, the state assumed a decisive role in the energy economy of the empire. With respect to traditional fuels, state regulation continued until the last decades of the nineteenth century. Regarding the energy transition, the state had a catalyzing effect on the demand side and a limiting effect on the supply side. While the Ottoman government pioneered and promoted the adoption of coal-based technologies, it failed to efficiently operate the best domestic coal mines under the state's monopoly.

Mehmet Genç defines three main principles for the classical Ottoman economy: provisionism, fiscalism, and traditionalism. In an economy in which productivity was relatively low and transportation was underdeveloped, the most important principle among the three was provisionism. The central idea of this principle is that the goods and services for domestic use should be abundant, of good quality, and cheap. Favoring the consumer side, the Ottoman government pursued economic policies that made basic goods easily available and affordable.[34] Since fuel was a basic need for both ordinary people and artisanal production, provisionist policies were necessary to ensure a cheap and continuous energy supply to society.

34 Mehmet Genç, *Osmanlı İmparatorluğu'nda Devlet ve Ekonomi* (Istanbul: Ötüken, 2000), 60-61.

Sam White points out that Ottoman provisionism was neither a command economy nor statism. However, Ottoman administrators did not trust free market forces to supply goods for vital public functions.[35] As far as wood fuel was concerned, the supply of thermal energy to state enterprises like the country's arsenals, iron foundries, and smelters was strictly regulated by the government. The same rationale was in force regarding coal, and given low societal demand, the energy requirements of public services were prioritized. The government possessed best coalfield of the country and supervised both the production and distribution of domestic coal.

Provisionist policies in the empire allowed and encouraged the import of basic goods and established certain obstacles for their export.[36] However, there is no evidence of large-scale imports of firewood and charcoal. Thanks to forestlands, most Anatolian and Balkan territories of the country remained self-sufficient regions in terms of wood fuel up until the end of the empire. As for the export of wood fuel, certain restrictions were imposed by the government. Yet, these limitations were lifted as the liberalization of the Ottoman economy proceeded. Until the 1880s, the coal trade was a perfect example of a provisionist mindset. While British coal was received with no trade barriers, coal exports were prohibited before 1882 and partly permitted in the following period.

Some scholars criticize provisionist explanations of the Ottoman economy by questioning the scope of such policies. It is argued that the notion of provisionism tends to generalize economic policies that pertained to the capital city.[37] For Pamuk, the archival bias made some historians exaggerate the extent of provisionism. Accordingly, the state intervention and regulation mentioned in archival documents were perceived as the norm, though most of the time,

35 Sam White, *The Climate of Rebellion in the Early Modern Ottoman Empire* (New York: Cambridge University Press, 2011), 22.

36 Genç, *Devlet ve Ekonomi*, 61-62.

37 See Şevket Pamuk, "Ottoman Interventionism in Economic and Monetary Affairs," *Revue d'histoire maghrebine* 25 (1998): 364 and Edhem Eldem, Daniel Goffman, and Bruce Masters, *The Ottoman City between East and West: Aleppo, Izmir, and Istanbul* (New York : Cambridge University Press,1999), 141.

markets operated on their own. Hence, in his words, "Ottoman policy towards trade and the markets is best characterized not as permanent and comprehensive interventionism but as selective interventionism."[38] When wood fuel needs of cities are considered, there is little evidence that the government regulated the energy trade in urban areas other than Istanbul. Even in the capital city, - in line with the "selective interventionism" argument- provisionist policies were on the agenda primarily in crisis conditions. However, since the energy needs of the public factories and smelters were of great importance for the maintenance of production, the provisioning of wood fuel was regulated by the government up until the closing of enterprises. The same was true for the energy needs of public transportation and for state enterprises based on coal technologies.

The classical Ottoman economic system experienced a profound transformation in the nineteenth century. Among other factors, the permeation of capitalism in the Ottoman economy was the most significant phenomenon that changed the economic system based on the mentioned three pillars. Genç notes that the principle of provisionism began to be challenged starting in the 1840s and lost its dominance in the 1860s.[39]

Indeed, from the second half of the nineteenth century up until World War I, firewood and charcoal were increasingly commodified. From the 1860s on, the development of scientific forestry went hand-in-hand with the development of new wood fuel markets. Consequently, domestic and overseas trade of wood fuel rose dramatically with less state intervention. Furthermore, as most public enterprises were closed or underwent technological changes, state intervention for fueling industries became unnecessary. Provisionist policies were no longer decisive in the wood fuel trade by the end of the nineteenth century. The changes regarding coal started in the 1880s. However, capitalist pressures on the government won only a minor victory over state control of the domestic coal trade.

After leading to huge increases in the production capacities of Britain and other European countries, coal and coal-based technologies helped Western

38 Pamuk, "Ottoman Interventionism," 365.

39 Genç, *Devlet ve Ekonomi*, 93.

powers to dominate other parts of the world in the nineteenth century. Steamships and railroads became the key transportation facilities in coal-assisted colonization. Consequently, a new world economy emerged with a global division of labor.[40] Part of this process concerned the increasing British economic and political influence in the Middle East - what On Barak calls as "coalonialism."[41] Despite the fact that the Ottoman Empire did not become a colony proper in political terms, the influence of coal and related technologies were salient in the economic realm.

A major gap in Ottoman historiography regarding the age of "coalonialism" concerns coal imports. As demonstrated in the following chapters, a significant part of the coal consumed for Ottoman transportation and industrial production was of foreign origin. Like in other parts of the world, Britain supplied millions of tons of coal to the Mediterranean basin. The Ottoman Empire was not an exception. The British coal could be delivered to Ottoman ports cheaply and sold for reasonable prices. This made British coal the sole competitor and substitute for local reserves. It was preferred especially for tasks that required high quality coal. Furthermore, as a major coaling station in the energy networks of the nineteenth century, Istanbul assumed an important role in procuring British coal for transit steamers. Since British coal is absent from historical discussions of the Ottoman economy, a thorough examination of coal imports is necessary to better understand the energy structure of the empire.

In this dissertation, I occasionally engage in discussions on transportation which was a serious challenge for the fuel economy. The movement of bulky energy carriers from their source to consumers required a substantial amount of energy itself. In the absence of proper roads in rural areas, draft animals were key for conveying firewood out of the forests. Pack animals were also commonly employed in urban areas to deliver fuel to houses and ateliers. However, such inefficient means of transportation pushed up energy costs, especially when the distance between the source and target was long. A major

40 Bruce Podobnik, *Global Energy Shifts: Fostering Sustainability in a Turbulent Age* (Philadelphia, Temple University Press, 2005).

41 On Barak, "Outsourcing: Energy and Empire in the Age of Coal, 1820–1911," *International Journal of Middle East Studies* 47, no.3 (2015): 425-45.

reason for the closing of some mines in the nineteenth century was deforestation around the smelters which brought about additional transportation expenses. While traditional transportation was time-consuming, regression of forests resulted in more working hours for peasants and their animals.

Water had always been the cheapest means of transportation. Floating them down rivers helped the movement of organic fuels downstream, but this method had limits due to geographical features and seasonal variations. On the other hand, sea transportation was an indispensable part of the empire's fueling networks. Sea connections provided Istanbul with a vast wood fuel hinterland along the coasts of the Sea of Marmara and the Black Sea. It was the good fortune of the empire that the most productive coalfield in the country was positioned along the seashore. This was a great advantage for the distribution of Ereğli coal. Nevertheless, much of the coal reserves in inner regions suffered from transportation problems and could only be utilized locally if extracted.

When the energy-transportation relationship is approached from another angle, it is clear that the shift to coal went hand-in-hand with unprecedented developments in transportation technologies. As coal and iron became cheaper due to technological improvements, markets for steam engines and coal widened around the world. Kander et al. note that a country did not necessarily need "great metallurgical industries" like Western Europe possessed to become wealthy; however, a country did need "a modern transport sector burning coal and the significant presence of steam power."[42] After the arrival of the first steamer at the end of 1820s, Ottoman waters witnessed increasing steamship traffic throughout the nineteenth century. Despite limited success compared to Western counterparts, the introduction of railway transportation in the 1850s and its further expansion in the following decades implied an increasing dependency on coal for transport. Novel transportation facilities boosted the mobilization of people and goods to an extent that could never have been realized under the conditions of the traditional energy economy. This was ensured not only by higher speeds but also by the higher cargo capacities of the vehicles. Thus, in parallel with most countries around the world,

42 Kander et al., *Power to the People,* 211.

steamers and trains contributed much to the economic development of the Ottoman Empire by promoting the circulation of goods and services. Though it is difficult to measure the exact influence of coal-based transportation systems on economic development, utilization of steam-powered vehicles for public purposes appears as a limiting factor. This point particularly pertains to maritime transportation. For decades, the vast majority of steamers in the empire belonged to the government. They were employed either in naval operations or for postal services. In other words, the government's steam vessels did little to stimulate economic activity.

The subject of the first chapter is the traditional fuel economy of the Ottoman Empire. I begin by examining the forests of the empire as the sources of firewood and charcoal. A detailed qualitative and quantitative analysis of forests is followed by a discussion of the production of organic fuels in woodlands. Then I move on to the demand part of the story and discuss the consumption of wood fuel. This section clearly shows that wood fuel always played a key role in meeting the thermal energy needs of society and the government. Finally, the process between the production and consumption of firewood and charcoal is scrutinized. Transportation of the fuel, commercial organization, and state regulation are the main concerns of this last part.

Chapter 2 deals with the organic fuel network of the capital city. As the largest urban center of the empire, Istanbul required a continuous thermal energy supply that was closely supervised by the government. Thus, the beginning of the chapter is a brief discussion of the provisioning of fuel for the city. After that, the centrality of organic fuels for space heating and for many industrial and artisanal production processes is emphasized. The following part involves a detailed investigation of the hinterland of the city in terms of wood fuel. This discussion provides not only quantitative data about the firewood and charcoal supply but also insights about labor organization in the production and logistics of wood fuel. The importance of seaborne transportation for Istanbul's organic fuel is highlighted. Trade within the city was another dimension of the organic fuel economy. Firewood and charcoal sales, problems regarding prices, fraud, and government's endeavors to regulate the market are the major themes of the last part.

In chapter 3, my focus shifts from organic sources of energy to fossil fuels. First, this chapter discusses the introduction of coal to the Ottoman Empire. After the failure of early attempts to exploit and utilize coal in the eighteenth century, the Ottoman government realized the significance of this new energy carrier with the reach of the steam technology in the 1830s. The explorations for indigenous coal mines throughout the nineteenth century constitutes the first half of the chapter. The second half addresses the demand side of coal - that is, the uses of coal in the empire. I examine the transfer of emerging coal-based technologies. It is shown new smelting facilities, gas production, steam powered transportation and to a limited extent, coal-fuelled space heating.

Chapter 4 looks at local coal sources and their place in the Ottoman economy. At the center of this section is Ereğli coal which was the most important domestic energy source in terms of quality and quantity. The administration of the Ereğli coal mines and their production are the first issues examined. The differences between the periods of government monopoly and government-private capital coexistence are accentuated by quantitative data about production levels. The Ottoman government was the major consumer of domestic coal. The steamers and factories belonging to the government were fueled via a complex distribution network, described thoroughly in the following part. After paying specific attention to the post-1880 period during which Ereğli coal appeared on the free market and was even exported, other minor coal sources are analyzed. It is demonstrated that there were numerous coal mines around country that were occasionally exploited by local consumers.

The subject of chapter 5 is foreign coal imported into the Ottoman Empire. Like in the ports of other Mediterranean countries, Ottoman ports received substantial amounts of British coal. This was closely linked to the development of free trade in the nineteenth century, which is discussed in the beginning of the chapter. The ensuing quantitative analysis shows the centrality of British coal in the Ottoman energy economy. On the other side of the coin, it will be pointed out that Istanbul was a key location in the coaling network that fueled transit steamships. The coal trade in the city is described thoroughly. The next section involves comparison of British and Ereğli coal in terms of quality and price. At the end, the Ottoman government's policies regarding foreign coal are scrutinized, showing that British coal led to international disputes when

the interests of coal traders, steamship companies, and the government conflicted. The conclusion of the dissertation, in which I make a general evaluation, follows this chapter.

Before closing this section, I would like to discuss the sources of my project. Long-term historical study of a vast geography requires exhaustive archival research. Moreover, when the subject of inquiry is energy -which has so many ramifications- the number and variety of historical materials rise further. The major source of the documents used in my research is the Prime Ministry Ottoman Archives (Başbakanlık Osmanlı Arşivleri-BOA). I used many dispatches from various collections but the most helpful catalogs were those belonging to İradeler, Bab-ı Ali Evrak Odası, Meclis-i Vala and Şura-yı Devlet. The registers and dossiers classified under the Ministry of Forestry, Mining, and Agriculture were useful especially for the exploration of firewood and charcoal. The Archive of the Naval Museum (Deniz Müzesi Arşivi-DMA) was another source from which I collected official documents. Because of the Ottoman naval forces' leading role in the adoption of the steam powered technology and the Ministry of the Navy's control over the Ereğli mines and fueling network, the DMA provided valuable information about indigenous coal. Last, my research in The National Archives (TNA) of the United Kingdom contributed to the project by offering data about British coal in the Ottoman Empire.

Besides archival documents, printed publications were of capital importance for the dissertation. Based on data given in the economic pages of *The Levant Herald and Eastern Express*, I constructed long-term series of coal prices in Istanbul. Furthermore, records about coal traffic in Istanbul port are also available in most issues. *Takvim-i Vekayi* and *Sabah* are two other newspapers through which I traced the early days of the Ereğli coalfield. With respect to materials focusing solely on economic issues, *Dersaadet Ticaret Odası Gazetesi* and the monthly journal of the French Chamber of Commerce, *Revue Commercial du Levant,* were very helpful especially for the post-1880 period. The first journal contains market reports that provide data about the coal trade and prices in Istanbul. The latter has detailed articles about the Ereğli coalfield and the fuel business in the empire.

British and American commercial reports prepared by their agents, the travel accounts and memoirs of foreigners, statistics prepared by the Ottoman government and compilations of transcribed documents published by different institutions were among the other sources used.

2

The Economics of Wood Fuel in the Ottoman Empire

Since the beginning of the controlled use of fire by human beings, wood and its derivations have been among the most essential materials for humanity. Thermal energy obtained from wood fuel – firewood and charcoal - has saved humanity from freezing, facilitated its nourishment, and paved the way to prosperity through the smelting of metals. All early civilizations and political entities owed much to the energy derived from forests. Without the technological developments fueled by firewood and charcoal, none of the civilizations in world history could have prospered. Before the nineteenth century, wood fuel was the major source of thermal energy in most of the world including in the Ottoman Empire. The nineteenth century witnessed the coexistence of wood fuel and fossil fuels in the context of a global energy transition. Coal replaced traditional sources of energy for many tasks, but the transformation occurred at different paces based on individual countries' natural, technological, and economic characteristics. Though firewood and charcoal lost their central position in the energy composition of the contemporary world, people still commonly use these organic fuels for various purposes in daily life, especially in developing countries where traditional societies are highly concentrated.

Focusing on the Ottoman Empire, this chapter discusses the generation of energy from forests and its consumption from an economic perspective. My research covers a long period - of roughly the 150 years before World War I. In

other words, the story encompasses both the preindustrial era and the coal age in the empire. There are two main arguments of the chapter. First, it is proposed that, in line with the dissertation's premise of slow and limited industrialization, the centrality of firewood and charcoal in the Ottoman energy composition lasted until the end of the empire - well after the introduction of coal. Most daily tasks and productive activities that traditionally depended on wood fuel for thermal energy continued to burn firewood and charcoal instead of coal. Second, despite wood fuel kept supplying a considerable level of the thermal energy required for the Ottoman economy, the state's view of fuel provisioning changed gradually. Bureaucratic modernization, technological novelties, and the development of capitalist relations transformed provisionist tendencies in the trade of wood fuel into more liberal structures. The transformation took place as an integral part of general changes in the Ottoman economy caused by internal and external factors.

In this chapter, I first discuss Ottoman forests based on qualitative and quantitative data. Then, the production of firewood and charcoal in these forests is analyzed in relation to technical aspects of the business and supply management policies. The next section sheds light on the consumption of wood fuel for domestic and industrial purposes. The means of transporting fuel, the regulatory policies of the government vis-à-vis the fuel trade, and the impact of the development of rational and scientific forestry on the fuel economy are scrutinized in the second half of the chapter. Changes in provisionist policies that occured in the second half of the nineteenth century are highlighted at the end.

§ 2.1 Forests in Anatolia and the Balkans

The geography over which the Ottoman Empire ruled had a wide range of climatic characteristics. Historically, most of its Arab territories suffered from a scarcity of vegetation due to the arid climate.[1] On the other hand, material

1 For a useful discussion of wood in Ottoman Egypt, see Alan Mikhail, *Nature and Empire in Ottoman Egypt: An Environmental History* (Cambridge: Cambridge University Press, 2011).

conditions on the Balkan Peninsula and in Anatolia offered better living conditions for their inhabitants.[2] From early on, forest resources gave the Ottoman dynasty a great natural advantage for the expansion and maintenance of its rule. Besides supplying timber for the construction of buildings and ships, vast forestlands in the Balkans and Anatolia made large amounts of energy available for the Ottoman people.

Exact information about the quality, geographical distribution, and scale of Ottoman forests in the premodern period is lacking. The development of scientific forestry in the empire in the mid-nineteenth century introduced the first modern researches on the Ottoman forests.[3] Even modern studies fall short of providing exact quantitative data on the forests of the Ottoman Empire. Various estimates about the extent of Ottoman forests lands emerged in the course of this research. According to a document from the Ottoman archives dated 1881, the total size of the forests of the empire was estimated at about 7.5 million hectares.[4] Another document mentions that there were more than 10 million hectares of forests in the country in 1891.[5] The official statistics of 1897 gives a total area of forests as 9.5 million hectares.[6] These differences may be the result of changes to the definition of the term "forest" or to deforestation, which became a serious problem in the empire in the nineteenth century. However, the lack of effective survey methods in the empire's vast geography is the main reason behind the differing numbers.

2 For forests in the ancient Mediterranean World, see J. V. Thirgood, *Man and the Mediterranean Forest: A History of Resource Depletion* (New York: Academic Press, 1981).

3 French forest experts prepared a detailed report on Ottoman forests in the 1860s. See Louis Bricogne, "Les fôrets de l'empire Ottoman," *Revue des Eaux et Fôrets Annales forestières* (16 July 1877) : 273-89 and (16 August 1877) : 321-33.

4 BOA Y.PRK.OMZ 1/9 1298 (1881).

5 BOA Y.PRK.OMZ 1/33 29 B 1308 (4.11.1891).

6 Tevfik Güran, ed., *Osmanlı Devleti'nin İlk İstatistik Yıllığı 1897 = The First Statistical Yearbook of the Ottoman Empire* (Ankara : Başbakanlık Devlet İstatistik Enstitüsü, 1997), 177.

Table 2.1 Surface Area and Distribution of Ottoman Forests in 1907

Province	Surface area (Ha)	Forest area (Ha)	%
Edirne	4,250,000	426,878	10.04
Izmit	1,205,000	334,800	27.78
Shkodra	1,080,000	88,300	8.01
Adana	4,000,000	420,655	10.5
Ankara	7,500,000	215,625	2.87
Aydın	5,700,000	929,208	16.3
Beirut	3,050,000	47,000	1.54
Biga	750,000	169,000	22.53
Aegean Islands	1,450,000	49,218	3.39
Çatalca	190,000	50,455	12.93
Aleppo	7,860,000	81,900	1.04
Hüdavendigar	5,130,000	907,362	17.68
Salonica	4,000,000	1,146,170	28.65
Syria	10,000,000	72,875	0.72
Sivas	8,370,000	302,075	3.6
Trabzon	3,130,000	496,000	15.88
Karesi	1,710,000	495,000	28.94
Kastamonu	6,000,000	1,316,076	21.93
Kosovo	3,290,000	379,000	11.52
Konya	9,160,000	480,368	4.15
Manastır	2,850,000	352,800	12.38
Istanbul	250,000	43,000	17.2
TOTAL	91,125,000	8,803,765	9.66

SOURCE: 1323 Senesi Orman İstatistiği (Forests Statistics of 1907)

Table 2.1, taken from the official statistics of 1907, provides detailed data on the extent of Ottoman forests. These statistics indicate that the total forest area in 1907 was 8,803,765 hectares.[7] Relying on this number and taking deforestation into consideration, it can be concluded that forests in the empire covered not less than 9 million hectares throughout the nineteenth century. The geographic distribution of the forests can also be inferred from the table. According to the figures, Aydın, Hüdavendigar, Salonica and Kastamonu were the

7 *1323 Senesi Orman İstatistiği* (Istanbul: Dersaadet Mahmut Bey Matbaası), 4.

richest provinces in terms of forests. When the proportion of forests to the total area of the province is considered Izmit, Karesi, and Biga should also be added to this list. Not surprisingly, these *sancak* (district) and *vilayet*s (provinces) were all coastal regions with suitable climatic conditions for forest vegetation. On the other hand, interior regions like Konya, Ankara, and Sivas had the poorest vegetation, together with the Arab provinces. As the table demonstrates, the share of Ottoman land covered by forests at the beginning of the twentieth century was 9.66 percent. However, when Arab provinces are controlled for, the figure for the regions on which I focus – Anatolia and the Balkans - becomes 12.3 percent, slightly more than the overall average.

When the forests are examined in detail, it is seen that climatic and topographic variation led to the diverse flora of the Anatolian peninsula and the Balkans. Table 2.2 shows the composition of forests in each province around the empire. The dominant species in Ottoman forests were pine and oak. Statistical data shows that more than half of the forests were composed of pine and oak trees with proportions of 36.7 percent and 13.7 percent, respectively.[8] Since these species were among the most suitable for use as sources of energy, the Ottoman people with access to oak and pine were at an advantage in terms of fuel. Besides these, there were many other species in Ottoman woodlands. Especially, the forests close to the Sea of Marmara and the Black Sea comprised diverse species including fir, beech, hornbeam, linden, ash, hawthorn, chestnut, and sycamore. These trees were also extensively consumed as fuels.

8 *1323 Senesi Orman İstatistiği,* 5.

Table 2.2 Tree Species in the Provinces

Province	Species
Izmit	hornbeam, black pine, chestnut, oak, linden, sycamore, elm,
Adana	pine, fir, hemlock, juniper,
Kastamonu	pine, oak, fir, beech, hornbeam, chestnut, alder
Hüdavendigar	white pine, black pine, fir, oak, beech, hornbeam, linden, Scotch pine, ash, hawthorn, elm, alder
Trabzon	hornbeam, pine, fir, beech, chestnut, oak, elm, linden
Aydın	pine, oak
Edirne	oak, hornbeam, beech, linden, pine, alder
Konya	pine, black pine, oak, juniper
Salonica	pine, oak, chestnut, beech, scotch pine
Manastır	pine, oak, beech
Kosovo	pine, oak
Biga	pine, oak
Aegean Islands	pine
Shkodra	pine, oak
Erzurum	pine, oak
Ankara	pine, oak

SOURCE: "Memalik-i Şahane Ormanlarının Vüs'at ve Cesameti," *Orman ve Maadin Mecmuası*, no.3, 31 Eylül 1305 (13 October 1889): 73-84.

Overall, despite geographical differences in terms of the accessibility of forests, the government and most of Ottoman society took advantage of available woodlands in Anatolia and the Balkans as fuel for their daily needs and industrial activities. The next section delves into the procurement of fuels from woodlands.

§ 2.2 Firewood and Charcoal Production in Ottoman Lands

Firewood and charcoal were the core elements of thermal energy in all preindustrial societies. Easy accessibility to firewood and the relative simplicity of its processing and transportation fostered its widespread usage as fuel. Charcoal - a derivative of wood - was used for more specific purposes. Though its

production was more laborious and its transportation required caution, every year millions of tons of charcoal provided heat in preindustrial economies.[9]

The energy content of charcoal is about 50 percent higher than that of dry wood. Given its low sulfur and phosphorus, and relatively higher energy content, it was the best fuel in preindustrial societies.[10] Ottoman subjects produced charcoal in all locations where woodlands existed. However, the level of production and organization differed across the empire, mostly depending on the availability of markets. Salonica, Edirne, Izmit, Teke, and Aydın were the most important locations where charcoal production was centered due to the plentiful forests and the marketing opportunities. The regions around mines and smelters were also among the places where charcoal was produced in high quantities.

Charcoal making was laborious work. Its production necessitated leveling the ground, setting up a central pole, stacking the cut wood, and covering the pile before burning.[11] Ottomans called the dirt kilns in the charcoal-making sites *torluk*. My research shows that none of the technological developments in charcoal making were transferred from other countries.[12] In other words, *torluk*s remained same for centuries throughout Ottoman history.

In the mid-1850s, during the Crimean War, a French forest expert hired by the Ministry of the Navy observed the fuel shortages and high fuel prices. He prepared a report in which he made comments on wood fuel production in Ottoman lands. According to him, the main reasons for the shortages were the mismanagement of forests and poor logging and charcoal-making techniques. He noted that the use of axes instead of saws to chop was considerably inefficient. The total loss of wood, it was argued, reached 20 percent. Furthermore,

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9 See, for example, George Hammersley, "The Charcoal Iron Industry and Its Fuel, 1540-1750," *The Economic History Review, New Series* 26, no. 4 (1973): 593-613, Denis Woronoff, ed., *Forges et Forêts. Recherches sur la Consommation Proto-industrielle de Bois* (Paris : Editions de l'Ecole des Hautes, 1990).

10 Vaclav Smil, *Energy in World History* (Boulder: West View Press, 1994), 116.

11 Smil, *Energy in World History*, 118.

12 For an American account of charcoal production in brick beehive and sheet metal kilns, see Edward Begligner and Edward G. Locke, "Charcoal: Its Manufacture and Use," *Economic Botany* 11, no.2 (1957): 160-73.

chopping consumed 10 percent more time than sawing.[13] The report seems exaggerated, but still, the expert points out certain facts about wood logging in the country. My archival research supports the argument that saws were not used in firewood production but were used to cut lumber. Therefore, lumberjacks in Ottoman forests depended exclusively on axes for the preparation of firewood. Undoubtedly, an axe consumes more wood than a saw in the cutting process. However, the amount of wood wasted due to the use of axe appears to be an overstatement on the part of the French expert.

The expert also criticized the productivity of charcoal making in Ottoman woodlands. He expressed that while 100 units of wood were turned into nineteen to twenty-two units of charcoal in the kilns of French public forests, only nine to eleven units of charcoal were derived from the same amount of wood by Ottoman colliers. The reason for this was underdeveloped techniques of charcoal making.[14] Several archival documents challenge this proposition. A report dated 1858, examined in detail below, stated that the productivity in the Ottoman charcoal business was around 20 percent.[15] Likewise, an Ottoman forest officer indicates the efficiency of Ottoman charcoal production as 17 percent.[16] Though the numbers vary, the difference in the levels of productivity of the French and Ottoman charcoal-making industries in the nineteenth century was not so significant.

Under normal circumstances, the beginning of the wood fuel production season was spring. To fell trees, peasants were arriving at the forests with their draft animals and carts in March.[17] There was also a time constraint for the burning of wood in charcoal production.

13 BOA, HR.TO 421/39 (16.11.1855).

14 BOA, HR.TO 421/39, (16.11.1855).

15 BOA, İ.MMS 12/523, 24 L 1274 (07.06.1858).

16 Ali Rıza, *Ormancı Cüzdanı* (Istanbul: Mihran Matbaası, 1884): 137.

17 BOA, C.BLD 38/1890, 1231 (1816).

Figure 2.1 Illustration of a *Torluk* and Instructions for Charcoal Making (*Orman Mekteb-i Âlisi Mecmuası*, no.10, Mayıs 1334 (May 1918))

Weather conditions and the life cycles of trees were the two major reasons that confined production to certain periods. As can be imagined, winter was not an appropriate time for charcoal making.[18] Snow, rain, and wind easily hampered burning operations in winter. According to a professional account, April, May, September, and October were the best months for charcoal production in Ottoman forests.[19] The age of the trees was a significant criterion in logging for charcoal-making purposes, and producers spurned older trees. Instead, they made charcoal from young pines due to the better carbonization of their thinner branches.[20] Trees should be turned into charcoal within a few months of being felled and dried. According to experienced people in this profession, the making of charcoal from wood cut more than one year before burning process did not cover the production expenses. The reason is that the product would be low in amount and of poor quality.[21]

An official report dated 1909 indicates the sizes of Ottoman charcoal kilns in Thrace. The height of earthen kilns in this region were about sixty to eighty centimeters. The perimeters of the circular mounds ranged from thirty and forty-two meters. The volume of the majority of these tumulus-like kilns were estimated to be 400 cubic meters while some were reported to be 350 cubic meters. The amount of the charcoal in the kilns varied even though most had the same volume. One possible explanation for this was the differing qualities of the burning processes in the kilns.

2.2.1 *Volume of Wood Fuel Production*

Ottoman sources provide little data about wood fuel production in the country. The available data cover only a few years in the latter decades of the empire. Based on statistics prepared by the Ottoman government, Table 2.3 shows annual amount of firewood and charcoal production and their monetary value for specific years.

18 BOA, DH.MKT 1494/68, 2 B 1305 (15.03.1888).

19 Ali Rıza, *Ormancı Cüzdanı*, 138.

20 Kutluk, *Türkiye Ormancılığı*, 115.

21 BOA, ŞD 1173-D/43, 6 Ra 1297 (17.02.1880).

Table 2.3 Annual Wood Fuel Production in the Ottoman Empire

	Firewood		Charcoal	
	Amount (tons)	Value (piasters)	Amount (tons)	Value (piasters)
1897	398,931		207,680	
1906	2,582,419	73,580,685	157,539	67,604,147
1907	2,805,663	83,069,162	149,912	65,104,125
1909	300,090	13,498,314	82,499	36,218,860

SOURCE: Tevfik Güran, ed., *Osmanlı Devleti'nin İlk İstatistik Yıllığı: 1897*, 1323 Senesi Orman İstatistiği and 1325 Senesine Mahsus Orman Istatistiği.

According to available data, there were remarkable variations in the yearly production of wood fuel. The firewood production levels in 1906 and 1907 were far higher than other years. Given the extreme winter conditions in the country in 1906 and 1907,[22] one can argue that climate was a decisive factor in firewood production. Charcoal production had a downward trend, but the variation was limited in comparison to that of firewood. The reason charcoal production did not increase during years of crisis might be related to the difficulties of making it. Presumably, in emergency cases, people sought the simplest way of obtaining fuel which was to cut firewood.

Regarding the status of wood fuel sources, most of the wood fuel in the country was extracted from *miri* (state) forests and forests belonging to private people took second place. The *baltalık*s (coppices) allocated for the use of local villagers and forests belonging to pious foundations supplied less fuel compared to the others.[23] According to the forest statistics of 1909, oak, hornbeam, beech, and pine were the leading species burned as firewood. These were also commonly used for charcoal production.[24]

22 BOA, BEO 3020/226470, 13 S 1325 (28.03.1907).

23 *1323 Senesi Orman İstatistiği*, 14.

24 *Memalik-i Osmaniye'nin 1325 Senesine Mahsus Orman Istatistiğ*i (Istanbul: Mahmut Bey Matbaası, 1329 [1913/14]).

§ 2.3 Consumption of Firewood and Charcoal

In the course of history, people relied on various sources to capture thermal energy. Peat, for instance, was predominant in the eighteenth-century Holland and lead to the country's great economic success.[25] Straw, bark, and twigs have always been alternative sources of energy especially for households.[26] Dried dung was widely consumed in different parts of the world - including the Ottoman lands - in the absence of other alternatives.[27] However, due to the availability of forests in most parts of the Balkans and Anatolia, wood and charcoal were always the major source of thermal energy in the Ottoman Empire until the coal age. Nevertheless, it is difficult to say that coal reduced the importance of firewood and charcoal. Trees continued to provide a high share of energy to Ottoman households and industries until the end of the empire.

2.3.1 *Household Consumption*

Domestic consumption of wood fuel aimed to meet the need for energy for cooking and heating. Sedad Hakkı Eldem notes that the fireplace was "the dominant feature of the room in all Turkish houses."[28] For heating their houses, Ottoman peasants living in rural areas relied mostly on fireplaces in which they burned firewood.[29] In urban centers where housing conditions

25 See Jan de Vries and Ad van der Woude, *The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500-1815* (Cambridge; New York: Cambridge University Press, 1997).

26 Smil, *Energy in World History*, 115.

27 Wolf-Dieter Hütteroth, "Ecology in the Ottoman Lands," in *The Cambridge History of Turkey: the Later Ottoman Empire 1603-1839*, vol.3 (Cambridge: Cambridge University Press, 2006): 26.

28 Sedad Hakkı Eldem, *Türk Evi: Osmanlı Dönemi = Turkish Houses: Ottoman Period,* vol.3 (Istanbul: Türkiye Anıt, Çevre, Turizm Değerlerini Koruma Vakfı, 1987), 67. It is noted that Turkish fireplaces were smaller than European counterparts of the same period. According to Eldem, European versions were suitable for burning logs, but Turkish fireplaces, which were rarely more than one meter in width, were used for ventilation or throwing off the smoke of the charcoal burned in braziers. However, this was the case only in urban residences.

29 Lavish use of firewood and logs in fireplaces by the peasants of forest-rich villages was a matter of complaint. See Kutluk, *Türkiye Ormancılığı*, 218.

were much better, people preferred to burn charcoal. However, contrary to Eldem's argument, most wooden houses in cities did not have fireplaces and charcoal was burned in room after being lit outside. Being smokeless and providing three times more energy than firewood made charcoal more favorable. Little changed over several decades with respect to house heating. The following sentences from an article in the forestry school journal prove that Ottoman households depended on wood fuel for space heating even until the end of the empire:

> In the industrialized countries like European ones and the United States, the means of heating are not confined to firewood and charcoal; coal, oil, and town gas are consumed to provide thermal energy, as well. In Ottoman lands, particularly in Istanbul, due to the lack of proper methods for the utilization of coal and town gas, space heating depends exclusively on firewood and charcoal.[30]

Stoves were not widely used in the Ottoman Empire for space heating until the first decades of the twentieth century. Even after the introduction of these devices in urban centers, only a few number of people belonging mostly to upper classes, used tiled or cast-iron stoves that burned firewood.[31] As seen in the following chapters, some stoves were designed for burning coal.

Similar to households, there was a substantial need for firewood for daily use by soldiers. A document dated 1768, for example, ordered 9000 cartloads of firewood for foot soldiers, which is 1000 tons given that each cart could carry a load of 110 kilograms of wood.[32] Similarly, Sultanhisarı and the villages around it were assigned to the provisioning of fuel to be burned to bake bread for the naval forces and other military units in the Aegean region.[33] Regarding

30 Süleyman Azmi, "Mahrukat Meselesi," *Orman Mekteb-i Âlisi Mecmuası (OMAM),* no.7, Şubat 1334 (February 1918): 196.

31 Emre Yalçın. "Pastırmacı Yokuşu No: 7, Balat-Istanbul: The Story of a Mansion during the Nineteenth and Twentieth Centuries," in *The Illuminated Table, the Prosperous House*, eds. Suraiya Faroqhi and Christoph K. Neumann (Würzburg: Ergon in Kommission, 2003), 249.

32 BOA, C.AS 308/12735 1182 (1769).

33 BOA, C.AS 239/10061, 17 R 1231 (17.03.1816).

fuel procurement for the army, little changed throughout the century. Even at the beginning of the twentieth century, almost all brigades relied on wood fuel energy for heating and cooking. In the unfavorable winter conditions of Manastır, for instance, the daily firewood consumption of the barracks was about twenty-five tons. In addition, the soldiers burned substantial amount of charcoal.[34] Overall, it can be concluded that wood fuel played a decisive role in meeting the daily thermal energy needs of the Ottoman people.

2.3.2 *Industrial Consumption*

Firewood and charcoal were of great importance in many large industries that required thermal energy. Smelting, ironwork, glassmaking, pottery, and lime production were among the main professions that consumed vast amounts of organic energy sources. In the Ottoman Empire, almost all large-scale production plants were run by the government. The Imperial Arsenal (*Tophane-i Âmire)*, the Imperial Dockyard (*Tersane-i Âmire)*, the Imperial Mint (*Darphane-i Âmire)*, gunpowder mills, iron foundries, and furnaces around mines were the major public enterprises that depended heavily on thermal energy derived from firewood and charcoal. Even after the introduction of coal technology, these organic fuels continued to supply energy for many industrial establishments around the country.

2.3.2.1 Defense Industry

The defense industry of the empire was a major consumer of wood fuel. There were ironworks and arsenals around the country, and the manufacture of weapons and ammunition was a government monopoly. Iron foundries in Samako and Samakocuk[35] and arsenals in Istanbul and Erzurum[36] were the

34 BOA, TFR.I.MN 57/5626, 10 Za 1324 (26.12.1906).

35 See Mehmet Yıldırım, "Osmanlı Demir Çelik Sanayiinde Atölyeden Fabrikaya Geçiş (1830-1870)" (PhD diss., Istanbul University, 2015).

36 For detailed information about the Erzurum Arsenal, see Serdal Soyluer, "Doğu Anadolu'da Bir Osmanlı Top Dökümhanesi: Erzurum Tophanesi ve Yeniden Yapılandırılması Teşebbüsleri" *Osmanlı Tarihi Araştırma ve Uygulama Merkezi Dergisi (OTAM)* 40 (2016): 355-84.

major hubs of military production. Moreover, numerous small-scale foundries and arsenals in the Balkans and Anatolia had served the army and navy throughout the centuries.[37]

The Imperial Arsenal in Istanbul was one of the biggest consumers of firewood and charcoal. They were used in different operations that required different amounts of energy. While firewood fueled simple pieces of work, the tasks that required high levels of thermal energy consumed charcoal. Pine was the preferred species of firewood supply at the arsenal. In the first decade of the nineteenth century, Boğazhisarı and Lapseki were charged with providing hundreds of tons of pinewood to the arsenal annually,[38] which was probably a small share of the total annual requirement of the plant.

As for charcoal, the favored types were those made of shrub and pine. The reason for the preference for these kinds of charcoal was presumably the higher quality of shrub and pine charcoal compared to other kinds. According to a document on the purchase of charcoal for the arsenal, the price of one sack of shrub charcoal was 250 *para*s, but the same unit of shrub charcoal mixed with arbutus was worth just 218 *para*s.[39] The lower price of the second type points to the fact that the quality of charcoal was downgraded when mixed with an inferior kind.

Gunpowder production, again a government monopoly, was another significant operation that consumed high amounts of wood fuel. After the spread of cannons and firearms, the government established many powder mills in the capital city and around the empire to meet the needs of the military forces. The powder mills of Atmeydanı, Kağıthane, Okmeydanı, and Şehremini were the major workshops for gunpowder production before the eighteenth century. More recently, Azadlu mill on the western periphery of Istanbul, had become the most significant site.[40] In addition, Gallipoli, Salonica, Baghdad,

37 Salim Aydüz, *XV. Ve XVI. Yüzyılda Tophane-i Amire ve Top Döküm Teknolojisi* (Ankara: Türk Tarih Kurumu, 2006), 49-72.

38 BOA, C.AS 179/7762, 17 N 1222 (18.11.1807).

39 BOA, C.AS 1083/47757, 29 B 1261 (03.08.1845).

40 See Yunus İnce, "Osmanlı Barut Üretim Teknolojisinde Modernleşme: Azadlu Baruthanesi (1794- 1878)" (PhD diss., Selçuk University, 2013).

Budin, Izmir, Cairo, Timisoara, and Bor were other powder production centers. There was also small-scale gunpowder production taking place in certain castles.[41]

Although charcoal and firewood were both employed in the production of gunpowder, only firewood was used for energy purposes. Rather than as a source of energy in the production process, charcoal dust was used as a component of gunpowder itself. The best species for gunpowder charcoal were willow and poplar.[42] During gunpowder production, firewood was burned to refine saltpeter and sulfur.[43] For each *kantar* (56.4 kg) of gunpowder, the consumption of 2 *çeki*s (450 kg) of wood was the official standard in the second half of the eighteenth century. However, most of the time this standard could not be achieved.[44]

2.3.2.2 Iron Foundries and Smelters

Ottoman mining did not benefit much from technological developments in metallurgy that had taken place in Europe. In Britain and France, coal and coke were already in use in ironworks and other smelting industries.[45] However, Ottomans continued to rely on wood fuel for smelting, especially in landlocked regions. The smelting of metal ores around mines depended entirely on heat energy provided by charcoal and firewood.

As with the weapons industry, most strategic mines - such as those of iron, copper, gold, silver, and lead - were under the control of the Ottoman government. To ensure the smelting of extracted ores in these mines, the government

41 Zafer Gölen. *Osmanlı Devleti'nde Baruthane-i Amire (XVIII. Yüzyıl)* (Ankara: Türk Tarih Kurumu, 2006), 3-25.

42 Ibid., 142.

43 Gábor Ágoston, "Gunpowder for the Sultan's Army: New Sources on the Supply of Gunpowder to the Ottoman Army in the Hungarian Campaigns of the Sixteenth and Seventeenth Centuries," *Turcica* 25 (1993): 86.

44 See Gölen, *Baruthane-i Amire,* 145-46.

45 David Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* (London: Cambridge University Press, 1969), 91 ; Alan S. Milward and S. B. Saul, *The Economic Development of Continental Europe 1780-1870* (Totowa, N.J.: Rowman and Littlefield, 1973), 97.

went to great pains to secure a flow of fuel to mining cites from the surrounding forests. The gold and silver mines of Bulgardağı and Gümüşhacıköy and copper deposits in Küre, Ergani, and Keban were the most important locations where wood fuel assumed a strategic role.

Archival documents and the secondary literature on Ottoman mines offer valuable information about fuel consumption in smelting. For example, British consul Gifford Palgrave reported that, in 1869, there were thirty-four furnaces around the silver-lead mines of Şebinkarahisar, all of which were fueled by charcoal. Of the furnaces, twenty-six were used for calcining, four for smelting, and four for refining.[46] The high thermal energy requirement of the smelting business necessitated high amounts of wood and plenty of charcoal in other mines, as well.[47] There were, however, certain temporal limitations on the smelting business with regard to the energy supply. At the end of the eighteenth century, for example, Ergani mines could be operated only between May 6 (called *ruz-ı hızır*) and November 7 (called *ruz-ı kasım*). Due to weather conditions, it was impossible to cut wood and make charcoal in the mountains in the cold, snowy winter season.[48]

A detailed document on the Ergani mines sheds light on the fuel consumption of the furnaces. At the end of 1870s, a mining engineer called Vitalis, who was a member of the science commission of the Ministry of Forestry, Mining, and Agriculture, prepared a report on the copper mines around Ergani. Among other things, the report discussed the issue of fuel for smelting. The wood fuel was provided by peasants living in the region in a system regulated by the government. Since the furnaces were located at the foot of the mountain, firewood that arrived at the smelting site was gathered in repositories dug into the mountain. Vitalis stated that the cost of the firewood burned in a furnace over a twelve-hour period was 700 piasters. Given that the cost of each *batman* (7.697 kg) of firewood was one piaster, the total fuel consumption

46 *Reports from Her Majesty's consuls on the manufactures, commerce, & c. of their consular districts,* vol.8 (London: Harrison and Sons, 1870), 530.

47 BOA, T.OMİ 1472/37, 1293 (1876).

48 Fahrettin Tızlak, *Osmanlı Döneminde Keban-Ergani Yöresinde Madencilik, 1775-1850*, (Ankara: Türk Tarih Kurumu, 1997), 108.

of a furnace in a single operation of twelve hours was 700 *batman*s or about 5.6 tons.[49]

2.3.2.3 The Imperial Mint

Coin production in the Imperial Mint also depended on energy provided by charcoal. In 1840, the amount of charcoal that arrived at the mint annuall was 20,000 *ayar*s.[50] I was unable to determine the weight of the annual fuel supply in contemporary units since the measure of one *ayar* of charcoal is unknown. The favored charcoal was that made from pine trees. Special officers working for the mint were responsible for the procurement of charcoal from the forests of Iznikmind.[51] After the modernization of the imperial mint in the midst-nineteenth century, charcoal was replaced by coal.

2.3.3 *Artisanal Consumption*

In preindustrial economies, traditional fuels were the only sources of thermal energy for artisanal production. Like their counterparts around the world, Ottoman bakers, dye producers, lime, tile and brick makers, smiths, tanners, glassmakers, and proprietors of public baths maintained their business due to firewood and charcoal. Among these, public baths were the leading consumers

49 BOA, T.OMİ 1480/96, 1295 (1878). The main concern of the engineer was reducing high fuel costs. For Vitalis, what should be done first was to construct new roads to facilitate the transportation of firewood from forests to furnaces. Construction of these roads would reduce the fuel costs by half. According to Vitalis's account, the fee paid to peasants for each *batman* of firewood was 10 *para*s. When another 10 *para*s of transportation cost per *batman* was added the total came to 20 *para*s. This was the half of the current price (one piaster=40 *para*s) at the time. Furthermore, the stockpiling of fuel on one hand and the transportation of firewood from stores to furnaces on the other were additional expenses. Vitalis suggested constructing a 300-meter- long wall at the meander of the river that flowed near the smelting site. This would form a space of around 10,000 square meters for fuel storage. If firewood was conveyed to the smelters from this store via wheelbarrows or light railway, a significant amount of money used to supply energy to the furnaces would be saved.

50 *Ayar* was the special sack in which charcoal was transported.

51 Ömerül Faruk Bölükbaşı, "XVIII. Yüzyılın İkinci Yarısında Darbhâne-i Âmire" (PhD diss., Marmara University, 2010), 94.

of wood fuel especially in densely populated cities. The baths mostly burned bulky logs weighing up to 150 kilograms.[52] Probably because of its higher quality, firewood used in public baths was more expensive than that used in households.[53]

Baking was the most critical business that required organic fuels. At the end of the eighteenth century, the bakers of Istanbul were given priority with respect to firewood that arrived in the city. Accordingly, other artisans like halva and brick makers were permitted to take firewood once the annual fuel need of bakers was met.[54] Bakers mostly used small limbs of hornbeam called *elleme*.[55] For Istanbul, the leading source of *elleme* was the Anatolian coasts of the Black Sea.[56] Since bread was the basic foodstuff, bakers burned large sums of firewood, second after the public baths.

It is difficult to document the level of wood fuel consumption in other crafts. For example, some Jews who specialized in the production of vial bottles burned wood, but the amount of fuel consumed is unknown.[57] Likewise, ateliers in İncirköy required a considerable amount of firewood for glassmaking for which no quantitative data is determinable.[58] Every year a considerable amount of Greek charcoal from Mount Athos was consumed by the artisans of Istanbul. This coal, which was not appropriate for heating because it burned too slowly, was sought by tradespeople for specific uses.[59] Again, there is no data available about its amount. The documents examined, however, suggests that no crafts consumed as much wood fuel as public baths and bakeries.

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52 Ernest Giraud, "Combustibles," *Revue Commerciale du Levant- Bulletin Mensuel de la Chambre de Commerce Française de Constantinople*, no. 109 (April 1896): 129.

53 Kutluk, *Türkiye Ormancılığı*, 96.

54 BOA, C.BLD. 4/194, 22 Z 1207 (31.07.1793).

55 Osman Nuri Ergin, *Mecelle-i Umur-ı Belediyye*, vol.2 (Istanbul: İBB Kültür İşleri Daire Başkanlığı Yayınları, 1995), 800.

56 Kutluk, *Türkiye Ormancılığı*, 127.

57 Robert Walsh, *A Residence at Constantinople: During a Period Including the Commencement, Progress, and Termination of the Greek and Turkish Revolutions* (London: F. Westley & A.H. Davis, 1836), 246.

58 BOA, A.MKT.NZD 133/39, 27 Ca 1271 (15.02.1855).

59 Cuinet, *La Turquie d'Asie,* vol. 4, 623.

2.4.4 Deforestation due to Wood Fuel Consumption

Deforestation due to excessive use of fuel was a common problem in the countries that relied on firewood and charcoal to maintain production. Especially, the growing smelting industry, which required high amounts of energy, led to extensive deforestation around the world. The wasteful nature of traditional charcoaling together with inefficient smelting techniques were the catalyzing elements of this deforestation.[60] For example, the annual consumption by English iron producers in the first quarter of the eighteenth century reached 1100 square kilometers of forest.[61]

The Ottoman government and society suffered from the degradation of forestlands, too. Unlike European counterparts, much of the deforestation in Ottoman lands stemmed from clear-cuts and the timber business. The influence of fuel consumption on the exhaustion of woodlands was limited. In any case, deforestation due to wood fuel production is discussed for the purposes of this study.

Since the leading activity that necessitated high amounts of energy was smelting, deforestation was observed mainly in regions providing firewood and charcoal for this industry. For instance, the charcoal production that supplied the needs of the Imperial Dockyard and the Imperial Mint eroded all the pine trees in the mountains of Akhisar, Geyve, and Iznik in the early decades of the nineteenth century. This pushed the government to seek new sources in order not to hamper production, and alternate forestlands were assigned.[62] Though this did not amount to a total depletion of the forests, it is clear that fuel consumption could clear out a species from a defined region.

The destruction of woodlands around Ergani and Keban in the 1840s due to metallurgical activities in the copper mines best exemplifies how an industry could swallow up the forests. After the depletion of nearby forests, officers began to seek new sources of fuel. The forests of Karacadağ, twelve to fifteen hours from Ergani, became an alternative. According to a note written to the

60 Smil, *Energy in Nature,* 375.

61 Smil, *Energy in World History*, 150-51.

62 Kutluk, *Türkiye Ormancılığı*, 114,

governor of Harput, these forests could fuel the Ergani mines for a few centuries if properly regulated. The remaining woodlands should be preserved and divided into parcels, which would be cut in succession. One matter of concern was the preservation of the roots of the trees in order to maintain the vegetation.[63]

In the first decade of the twentieth century, about half of the total firewood arriving in Balıkesir was consumed by steam mills in the town. The level of fuel consumption was so high that there were no available trees for fuel near the town center. It took eight to ten hours to reach the closest woodlands. When people started to complain about the difficulties of obtaining fuel due to the deforestation, the local administration ordered the mills to stop burning firewood in the steam engines for the sake of the forests and the households. Finally, millers who had no legal ground for consuming wood, were forced to use coal.[64]

In another instance, excessive exploitation of forests stemmed from export-oriented wood fuel trade. As seen in the following pages, Ottoman wood fuel exports increased gradually in the decades before World War I. In the early twentieth century, many people from Janina engaged in the wood fuel business and destroyed both private and public forests in order to export charcoal to Malta and Greece. Indeed, a notable pasha of the province pioneered the fuel trade and the destruction. The administrative council of the province stated that the locals were having difficulty getting firewood and charcoal because of these greedy merchants. Admitting the financial benefits of the logging, the council warned the central government that the source of this revenue would perish if necessary measures concerning deforestation were not taken.[65]

63 BOA, A.MKT.MVL 48/21, 17 S 1268 (12.12.1851).

64 Though mill owners claimed that licenses they obtained before starting their businesses permitted them to use firewood, they could not prove it when the licenses were requested by the government. When technical experts were sent to examine the mills, it was revealed that the boilers of the steam engines had once been designed for coal burning; the owners of the mills only recently converted them into wood burners. See, BOA, ŞD 3122/42, 25 Ra 1332 (21.02.1914).

65 BOA, BEO 3184/238763, 27 Ş 1325 (05.10.1907).

After the development of scientific forestry in the country, the Ottoman forest administration tried to slow deforestation by using modern techniques in the supply management. For example, in the summer of 1914, a forest expert was sent to Kavakalanı village near Biga to determine the commercial value of its adjacent forestlands. According to the report, the forests were comprised of oak trees and there had been no logging at least for the last fifteen years. None of the trees could be used as timber. Though certain parts of the forests were not available for logging, 250 hectares of land could be exploited. The expert povided average measures of the trees including their volumes and heights. Assuming 1200 to 1500 trees per hectare, the total number of trees in the region was estimated 300-375,000.

In order not to fully destroy the forest, it was proposed that the region should be divided into sections that would be exploited in different years. Among these sections, the expert examined a 38-hectare are of forest for fuelwood production. According to this expert, the volume of the trees in this part of the forest was 1893-1946 cubic meters and the amount of the wood that can be extracted from this volume was 12,859-13,662 *kantar*s (726-771 tons). Such a quantity could produce 3000 *kantar*s (170 tons) of charcoal in a two-year period.[66]

Afforestation as a solution to the issue of degraded woodlands was not a common practice in the Ottoman Empire. Still, there were local attempts to grow woodlands when people faced difficulties procuring fuel, especially in cold areas. In the first half of the 1850s, with the encouragement of the local administration of Erzurum, more than 300,000 saplings were planted to ease the fuel problem.[67] A half century later, a similar instance occurred in Kayseri. Due to ongoing deforestation in the region, the 8000 inhabitants of the city were confronted with a fuel shortage. The solution offered by the local government was to grow a forest in a vacant field three to four hours outside the city center. According to the plan, entrepreneurs would be encouraged to grow trees on a 750-hectare tract of land. The central government in Istanbul welcomed this venture. The project would not only solve the fuel problem for the

66 BOA, T.OMİ 1704/11, 7 N 1332 (30.07.1914).

67 BOA, A.MKT.MHM 756/46, 16 N 1269 (19.06.1853).

locals of Kayseri but also encourage other people in different provinces to imitate the project.[68] It is not certain whether the project was realized. What these cases indicate is that the fuel needs of people destroyed many forestlands, and while afforestation was entertained as a possible solution, it was not commonly practiced.

§ 2.4 Firewood and Charcoal Trade

There were two types of wood fuel commerce in the Ottoman Empire: regulated trade and free trade. While regulated wood fuel trade was the dominant form up until the 1880s, liberal trade was more important in later decades. In accordance with the previously discussed principle of provisionism, the Ottoman government was cautious about keeping the wood fuel supply and distribution under its control, especially where state enterprises, the army, and the capital city were concerned. At the end of the nineteenth century, most industrial plants operated by the government either disappeared or began to use coal as an energy source. As a result, government regulation of wood fuel procurement was not as necessary as in prior decades. Furthermore, the development of a free market economy in the empire liberalized wood fuel commerce. This section sheds light on classical Ottoman methods of provisioning fuel and the development of a long-distance firewood and charcoal trade with special references to merchants, prices, and volumes of trade. Before this, the means of transportation that made the trade possible should be clarified.

2.4.1 *Wood Fuel Transportation*

Means of transportation have always been essential for the proper working of fuel markets. Ottomans employed three major methods to transport these materials in bulk: land transportation conducted through using draft animals and carts, water transportation on both sea and rivers, and later railway transportation in certain regions. If the target market was close to the source of the wood fuel, one of these three sufficed. For long-distance trade, however, two of these methods were generally employed together.

68 BOA, T.OMİ 1703/25, 1 Za 1329 (24.10.1911).

2.4.1.1 Land Transportation via Draft Animals

Since firewood and charcoal were produced in forestlands in mountainous areas, use of animal power was a necessity. All kinds of draft animals including donkeys, mules, camels, oxen, and water buffalos were actively employed around the country for wood fuel transportation. Camels were used exclusively for charcoal carriage.[69] Donkeys and mules were more important for the transportation of wood,[70] probably due to their body size and maneuverability. The average amount of firewood that a mule could carry was about 170 kilograms.[71]

Photograph 2.1 Camel Caravan Transporting Charcoal to Istanbul c.1880. (Photograph by Guillaume Berggren)

Oxen and water buffalos were employed to pull carts, loaded with both firewood and charcoal. The higher loading capacity than that for a single draft animal made these cards preferable for bulk transportation. There was no standard shape or loading capacity of these carts. Their features varied depending on geographic conditions. For example, a cartload of firewood was

69 BOA, C.BLD 108/5357, 29 Ş 1228 (27.08.1813).

70 BOA, C.BLD 38/1890, 1231 (1816).

71 Ali Rıza, *Ormancı Cüzdanı*, 136.

assumed to be about 113 kilograms in the second half of the eighteenth century.[72] While carts in Çorlu were expected to carry loads of about 450 kilograms of firewood at the beginning of the nineteenth century, those used in the same region in the 1850s had a loading capacity of 1280 kilograms of fuel.[73] Vital Quinet described the carts that transported firewood to Üsküdar as follows:

> The araba/chariot of firewood built basically by stowing of very same wood by very long logs without any nails or cords. While delivering wood to the buyer, one pulls two of these logs and everything tumble down; the woods falls onto one side, the wheels on the other. Then, heavy chariot only coupled with two oxen or two buffalos becomes lightened and easily take back the forest. [74]

One of the disadvantages of land transportation for wood fuel concerned the frailty of charcoal.[75] Given the lack of proper roads in Ottoman lands, the vibration of the carts led to great losses of charcoal. The charcoal pieces turned to dust, decreasing the fuel's quality. Thus, long hours of overland transportation of charcoal was not preferred. To minimize losses, some people in the business chose to make charcoal near the piers instead of burning the wood in remote corners of the forests.[76]

2.4.1.2 Water Transportation

Fernand Braudel once wrote that due to the bulky form of wood "it was ruinous to transport it more than thirty kilometres - unless, that is, it could float

72 BOA, C.AS 308/12735, 24 C 1182 (05.11.1768).

73 BOA, C.AS 1162/51721, 29 Z 1218 (10.04.1804), BOA, İ.MMS 12/523, 24 L 1274 (07.06.1858).

74 Vital Cuinet, *La Turquie d'Asie : Géographie Administrative, Statistique, Descriptive et Raisonnée de Chaque Province de l'Asie-Mineure,* vol. 4 (Paris : E. Leroux, 1894), 622.

75 John Perlin, *A Forest Journey: The Story of Wood and Civilization* (New York; London: W.W. Norton, c1989), 236.

76 BOA, T.OMİ 1694/13 1315 (1899). Due to the lack of local skilled labor in Muğla, fuel traders employed Greek charcoal producers from the island of Ikaria. After cutting trees in nearby forests, local peasants transported wood to the coast. Greek colliers made the charcoal near the piers.

on its own by a waterway or sea."[77] Regarding wood fuel transportation, the peninsular form of the Balkans and Anatolia together with the concentration of forests along the coastal regions were great advantages for the Ottoman Empire. Like its counterparts, water transportation occupied a central place in Ottoman firewood and charcoal trade, especially near the seaside. Sailing vessels dominated the maritime transportation of wood and charcoal until the end of the empire. The most popular kind of vessels was the sailing boats called *çenber*. According to an archival document, these ships carried both wood and charcoal and were able to be loaded with fifty-six tons of wood.[78] Moreover, use of *çekeleve*s - sailing crafts with two short masts that lean forward [79] - was widespread in wood fuel transportation.

Though the ascendancy of sailboats in the firewood and charcoal trade was maintained until the end of the empire, steam transportation was employed on certain occasions. Steamers or tugboats were secondary, but they were used to maintain fuel transportation when natural obstacles prevented the use of sailing vessels. Undesired winds were the major drawback of sailboats. As early as 1855, the help of steamers was sought to pull sailboats carrying firewood and charcoal when the wind direction hindered their movement.[80]

Steamers themselves engaged in wood and charcoal transportation in times of scarcity. When the demand for fuel increased in the cold winter of 1858, for example, a public steamship called *Tair-i Bahri* was sent to Salonica to bring fuel to Istanbul. The steamer completed its mission when it transported fifty tons of charcoal for use in the capital city.[81] This practice continued in the following decades at an increasing pace. In the early years of the twentieth century, numerous steamers were employed to transport wood fuel.[82]

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77 Fernand Braudel, *The Structures of Everyday Life: Civilization and Capitalism, 15th-18th Century,* vol.1 (London: Phoenix Press, 2002), 365.

78 BOA, C.BLD 73/3628, 29 Z 1255 (04.03.1840).

79 Sir James W. Redhouse, "Çekeleve" *A Turkish and English Lexicon*, new edition (Beirut: Librairie du Levant, 1987).

80 BOA, A.MKT.MHM 75/22, 29 Z 1271 (12.09.1855).

81 BOA, A. MKT.MHM 127/56, 21 B 1274 (07.03.1858).

82 BOA, DH.MKT 987/3, 12 Ca 1323 (15.07.1905); BOA, DH.MKT 2682/20, 19 Za 1326 (13.12.1908); BOA, BEO 3178/238350, 30 N 1325 (06.11.1907).

Throughout history, the buoyancy of water together with the flow of rivers helped societies to easily transport timber. Likewise, people transported fuels via rivers when available. Firewood burned for candle and soap making in Yozgat was conveyed from the mountains via the Kızılırmak River in the mid-nineteenth century.[83] Logs cut to supply the baths of Istanbul from the mountains of Düzce and Zonguldak were floated to the Black Sea via Melen and Filyos rivers.[84] All the forest products of Tavas, including the wood fuel, arrived at Aydın on the Akçay tributary of the Maeander River.[85] The rivers around mining sites assumed a significant role for the procurement of fuel. Copper mines in Ergani took advantage of the Tigris. Logs used in the pits and burned in the furnaces were conveyed there on a stream, which saved a considerable amount of time and labor.

River transportation was not limited to firewood. A regional transportation system based on waterpower played an important role in supplying charcoal to the Ergani and Keban mines. The vessel used on the rivers was a kind of raft called *kelek* which was made of inflated sheepskins and branches. There were forty to sixty sheepskins on each *kelek* that were tied under a frame of branches.[86] Each of the *kelek*s employed along the Euphrates could carry twenty-five sacks of charcoal. The system was maintained and supervised by peasants appointed by the state called *kelekçi*s. They were charged with taking charcoal from certain points upstream and transporting the fuel downriver to Keban. Since there was no other way to keep the system running, rafts were dismantled after being unloaded and to build new *kelek*s, the members were transported back upstream on camels or other draft animals.[87]

2.4.1.3 Railway Transportation

Transportation of firewood and charcoal by railway was widespread in the Balkan territories of the empire. Since the carriage of these bulky materials was

83 BOA, A.MKT.DV 223/6, 22 Za 1278 (01.05.1862).

84 Azmi, "Mahrukat Meselesi," OMAM, no.7, 201.

85 Cuinet, *La Turquie d'Asie,* vol. 3, 367.

86 Cengiz Orhonlu-Turgut Işıksal, "Osmanlı Devrinde Nehir Nakliyatı Hakkında Araştırmalar, Dicle ve Fırat Nehirlerinde Nakliyat," *Tarih Dergisi*, no.17-18 (1963) : 86-87.

87 Tızlak, *Keban-Ergani Yöresinde Madencilik*, 178.

challenging, trains greatly facilitated the fuel trade in the interior provinces. The wheat factories in Skopje, for example, were leading consumers of firewood, and trains assumed an important role in the supply of fuel to the steam engines employed in the mills. Fuel merchants rented railcars from the railway company to transport firewood to Skopje from neighboring towns like Orhaniye and Kaçanik. The rental of five wagons by a merchant for transporting firewood to Skopje shows that tons of fuel could be conveyed in a single run.[88] Exportation of 600 wagonloads of wood annually from the forests of Kaçanik indicates the significance of railway transportation for the firewood trade.[89] In 1893, the Oriental Railway Company carried 30,600 tons of firewood and 16,000 tons of charcoal in the European lands of the empire.[90]

Railways also became an important means of supplying fuel to Istanbul in the beginning of the twentieth century, which is discussed in detail in the next chapter. In this trade, trains were employed mostly to transport charcoal from Thrace.[91] The Anatolian Railway Company transported small quantities of wood fuel, as well. The amounts of firewood and charcoal carried in 1893 were forty-five tons and fifty-five tons respectively.[92] In conclusion, the railways, despite being a latecomer to the Ottoman transportation system, facilitated the carriage of firewood and charcoal in the empire. Balkan railways carried a higher volume of wood fuel compared to Anatolian railways.

Overall, the distribution of firewood and charcoal was closely correlated with transportation opportunities. Means of transportation, used in various combinations ensured the provisioning of fuel for urban populations and industries. Having described the agents of conveyance, the following section discusses the commercial webs of wood fuel.

88 BOA, TFR.I.TF 1/14, 10 Z 1320 (10.03.1903).

89 BOA, BEO.AYN.d.1701, 27 Ra 1312(28.09.1894).

90 "Trafic des Chemins de Fer Orientaux,"*Revue Commerciale du Levant- Bulletin Mensuel de la Chambre de Commerce Française de Constantinople*, no.98 (May 1895): 47.

91 BOA, DH.MKT 987/3, 12 Ca 1323 (15.07.1905).

92 "Trafic du Chemin de Fer D'Anatolie" *Revue Commerciale du Levant- Bulletin Mensuel de la Chambre de Commerce Française de Constantinople,* no.113 (August 1896): 27.

2.4.2 *Regulated Wood Fuel Trade*

The most common method in the Ottoman Empire for ensuring the supply of fuel to strategic industries like mines, smelters and ironworks was to assign certain groups of people to fuel production and transportation. Usually peasants living in villages around the production sites were obliged to carry out this business, but such kind of an obligation should not be considered as slavery. The main tools of the government to mobilize peasants were certain tax exemptions. Moreover, the business provided a guaranteed and permanent income to the peasants assigned by the government.

For example, a special group of skilled axemen in Ergani were charged with cutting trees and preparing charcoal for the furnaces in the mine. For the transportation of the fuel, they worked in coordination with unskilled peasants from the villages around the forests. The preferred tree for charcoal production was oak.[93] The daily obligation of a peasant was to deliver half mule load of charcoal. If a peasant had a mule, he had to transport one complete load.[94] All public industries were fueled by similar methods. The following section offers a detailed analysis of wood fuel regulation for one such state enterprise.

2.4.2.1 A Case Study: Wood Fuel Provisioning of Tokat Smelter

The business organization that supplied the Tokat smelter is a good example that illustrates regulated fuel trade. From the second half of the seventeenth century onwards, Tokat hosted a lively copper industry. The increase in copper extraction in Ergani in the mid-eighteenth century and the appointment of Tokat as an alternate location for the processing of these copper ores further advanced the smelting industry there.[95] Tokat remained a prominent center

93 Tızlak, *Keban-Ergani Yöresinde Madencilik*, 116.

94 Tızlak, *Keban-Ergani Yöresinde Madencilik*, 172; Hasan Yüksel, *Osmanlı Döneminde Keban-Ergani Madenleri: 1776-1794 Tarihli Maden Emini Defteri* (Sivas: Dilek Matbaası, 1997), 45.

95 Mehmet Genç, "17.-19. Yüzyıllarda Sanayi ve Ticaret Merkezi Olarak Tokat," in *Türk Tarihinde ve Kültüründe Tokat Sempozyumu* 2-6 Temmuz 1986, (Ankara: Gelişim Matbaası 1987): 163-68.

for copper works until the 1910s and it was fueled exclusively by firewood and charcoal.

Bulky forms of wood and charcoal provided the heat energy that was the core of the smelting industry in Tokat. Logs transported to the smelters from neighboring forests were called *omca.* In 1876, there were fifteen villages appointed for the provisioning of logs to the plant.[96] The villagers were responsible for both the cutting and transportation of the firewood. In a one-month period in the summer of 1878, the total number of logs arriving at the smelter reached 1,536,700. A single village could transport more than 400,000 a month. Yet the number of the logs supplied by various villages and the sum paid for each unit of fuel varied.[97] The distance between a given village and the smelter led to the price variation.

Archival documents indicate that a special depot at the smelter site called an *omcalık* was used to store the logs conveyed by the peasants. Here, lumberjacks employed by the smelter administration cut the logs into smaller pieces and stacked them according to size.[98] The records mention six kinds of omca, *which* were categorized according to size: *kebir, paşmak, altlık, kırıklık, mertek,* and *çalık.* The unit used to measure the weight of the logs is not clearly stated in the records, yet relying on the accounts, it is possible to make a comparison among the sizes. According to the monthly tables of the smelter, a *kebir* was the largest classification of log and cost 0.5 piasters. A *paşmak* was half of a *kebir* log and had a price of 0.25 piasters. The prices of *altlık, kırıklık, mertek,* and *çalık* were 0.15, 0.08, 0.04, and 0.02 piasters, respectively.[99]

96 BOA, T.OMİ 1468/40, 1294 (1877).

97 BOA, T.OMİ 1479/91, 1295 (1878).

98 BOA, T.OMİ 1470/23, 1293 (1876).

99 BOA, T.OMİ 1479/91, 1295 (1878). Interestingly enough, the smelter supplied firewood to the inhabitants of Tokat, too. Mostly, smaller kinds of firewood, namely *altlık, kırıklık, mertek,* and *çalık*, were sold to city-dwellers. It is unclear whether the fuel was provided to the coppersmiths of the city for artisanal purposes or only to households for heating. However, since records indicate no sales in the summer months, it can be stated firewood was sold for space heating, which was necessary only in winter. Whatever the case, the supply of fuel for ordinary people by a state enterprise was an unusual practice in the Ottoman Empire.

Each kind of log was employed for specific purposes. The types consumed for obtaining heat energy in the smelter were *kebir* and *paşmak*. These were burned in the furnaces called *kâl fırınları* in which the first stage of the smelting operation held. In other words, these fuels were employed for the initial, rough processing of copper ores transported from the Ergani mines. This stage of the smelting was costly in terms of thermal energy. According to the archival records, the furnaces burned 34,200 *kebir* and 17,100 *paşmak* logs in one month in the spring of 1876.[100] Though the fuel consumption fluctuated from month to month, the number of logs needed were not less than thousands. In the absence of an advanced commercial system to supply enough fuel, this large energy requirement was met only by assigning the procurement of fuel to certain people.

As mentioned, the smelting operation required charcoal, too. Like the logs for the smelter, charcoal was produced and transported by peasants called *kömürkeş reaya* who were exempt from taxes, compulsory military service, and other obligations imposed by the government.[101] Due to its superiority in terms of energy density, charcoal was used in the second stage of the smelting operation in which the copper pieces were processed at higher temperatures in special, smaller ovens called *zemberek ocakları.* The monthly charcoal consumption of these ovens between 13 March and 12 April 1879 was 4394 *küfe*s (pannier).[102] Unfortunately, the exact measure of a *küfe* could not be determined.

Wood fuel provisioning for the smelter is well documented. Examination of a particular account allows a better understanding of the organization of fuel procurement in Tokat. According to a record dated *Teşrinevvel* 1292 Rumi (12 October to 13 November 1876), the total amount of the charcoal arriving at the smelting site that month was 827 *küfe,* 3 *çaryek*.[103] Seventy-five individuals from *kömürkeşan* villages who were paid seven piasters for each *küfe* provided this sum of fuel. The total cost of the charcoal for this month was 5794 piasters.

100 BOA, T.OMİ 1468/42, 17 Ra 1293 (12.04.1876).

101 BOA, MVL 326/31, 24 L 1266 (02.09.1850).

102 BOA, T.OMİ 1468/42, 17 Ra 1293 (12.04.1876).

103 1*Küfe* = 4 *Çaryek.*

Almost all of charcoal suppliers for the smelter were Muslims peasants. Unlike the active role of non-Muslim subjects in the charcoal business in various other regions of the empire including closer to the Ergani mines, the participation of non-Muslims in fuel provisioning in Tokat remained limited. Furthermore, beyond being from the same villages, names in the accounts indicate that many suppliers were from the same families. Halil, Yusuf, Kadir, and Abdullah from the Gökçeoğlu family were, for example, either brothers or cousins.

The capacities of *kömürkeş* peasants differed. Some could provide more than thirty *küfe*s and others contributed only a few loads to the fuel supply. According to the accounts, the largest provider conveyed more than forty-five *küfe*s of charcoal to the smelter. On the other hand, the amount transported by some others was only one or two *küfe*s. The average amount of charcoal per person provided to the smelting business in a month's time was about eleven *küfe*s.[104] Appendix A provides more details about charcoal provisioning in this period.

The charcoal records for the prior two months show that fuel consignments to the smelter were very low compared to those of *Teşrinevvel.* The amount of charcoal was 180 *küfe*s in August[105] and sixty-five *küfe*s in September.[106] One possible explanation for these relatively low numbers concerns the agricultural obligations of *kömürkeş* peasants. Since these months constituted the harvest season for agricultural products, many peasants applied much of their labor to agrarian works. Only after the end of threshing could peasants prioritize charcoal making and transportation.

Unlike in other areas of the empire, fuel provisioning in Tokat was more resistant to bad weather conditions. Records show fuel deliveries even in the winter season. Nevertheless, work was suspended in January and February, which are the coldest months in Anatolia. The last loads arrived at the smelter in *Kanunuevvel* (December), and the next season for charcoal trade started in March. Archival research reveals that a hardwork in charcoal procurement at

104 BOA, T.OMİ 1470/60 Teşrinevvel 1292 (1876).

105 BOA, T.OMİ 1470/14, 1294 (1877).

106 BOA, T.OMİ 1470/21, 1294 (1877).

the beginning of spring compensated for the two-month break in the fuel supply. The total amount of charcoal transported to Tokat for the smelting business in March and April 1292 Rumi (spring 1876), for instance, was 14,316 *küfe*s.[107]

2.4.2.2 Prices in Regulated Trade

The prices of fuels were determined in negotiations between the Ottoman administrators and peasants. The prices were aimed to endure for a long time. Yet the fuel provisioning system suffered from inflation and natural obstacles that occasionally led to demands on the part of providers for increases in fuel prices. As a result, tension between the officers and fuel suppliers with respect to prices was commonplace. For example, in 1857 the villagers around Vize, who were obliged to procure the necessary charcoal for ironworks in Samakocuk, asked for a raise in the price citing the distance between the forests and the production plant. Instead of increasing prices, the government decided to assign the provisioning of charcoal to new villages from which transportation costs would be less. Since naval transportation was cheaper than overland transportation, the new villages were to be chosen from among the ones in coastal regions. The fuel would be provided to the Samakocuk foundry at its current price.[108] In this case, the presence of alternative supply regions strengthened the government's hand, and the price of the charcoal was pegged for some time.

Likewise, in Tokat, one *küfe* of charcoal was being sold to the smelter for 3.5 piasters in May 1866. Proposing that this price was lower than they deserved, the *kömürkeşan* asked for additional some. The officers had no alternative supply of charcoal, and consequently, the price for one *küfe* was raised to four piasters.[109] However, this did not help fix the problem. Due to continuous inflation, the price for the same unit of charcoal had reached seven piasters by 1876.[110]

107 BOA, T.OMİ 1468/41, 1293 (1876), T.OMİ 1469/27, 1293 (1876).

108 BOA, A.MKT.UM 295/73, 7 Ra 1274 (26.10.1857).

109 BOA, A.MKT.MHM 355/83, 28 Z 1282 (14.05.1866).

110 BOA, T.OMİ 1470/14, 1294 (1877).

Narh (price ceilings) were no longer functional instruments for regulating the wood fuel market by the end of the nineteenth century. The determination of prices by the government led to undesired consequences, ruining the market equilibrium. When local administrators in Edirne set a price of fifteen *para*s for each *kıyye* (1.282 kg) of charcoal, merchants slowed the transport of charcoal, interrupting the fuel trade in the city. Due to the decrease in supply, residents could only buy fuel from shopkeepers charging fifty to sixty *para*s for each *kıyye*. Since such a high price for fuel was unacceptable in a city so close to forests, the local government was forced to step back and negotiate with charcoal merchants.[111]

2.4.3 *Free Wood Fuel Trade*

Until the second half of the nineteenth century, exports of wood fuel were restricted to protect urban population from fuel shortages. These restrictions deferred the development of trade in firewood and charcoal as well as in other forest products. The liberal spirit of the Tanzima*t* era together with increasing fiscal needs of the state following the Crimean War forced the Ottoman government to find new revenue sources. The natural wealth of the country, including forests were immediate sources of income that could alleviate the fiscal crisis. From the 1860s onwards, as Dursun aptly states, "oscillations between protectionist-interventionist and liberalist-free tradist economic policies" shaped forests management until the end of the empire. [112]

The opening of the Ottoman economy and the development of international trade paved the way for the increasing marketization of forest products. Forest-rich regions of the country engaged with new commercial networks that considerably increased the volume of wood fuel trade. As a result, by the turn of the century, the Ottoman Empire had become a net exporter of firewood and charcoal.

Official statistics prepared for the year 1897 provide insights into the production, consumption, and trade of wood fuel. According to the figures, at the end of the nineteenth century, total charcoal production was 203,000 tons and

111 BOA, BEO 123/9184, 27 Ca 1310 (17.12.1892).

112 Dursun, "Forest and the State," 83.

total firewood production was 441,425 tons. Provinces which were both forest-rich and had reliable markets for wood fuel did better than others in terms of fuel production and fuel trade. Table 2.4 demonstrates that the volume of the wood fuel business in the Balkan provinces was far higher than that of Anatolian provinces with the exception of Aydın and Izmit. Better marketing opportunities for fuels in the Balkans made its forests more open to commercialization.

The table shows that Salonica, Edirne, Izmit, Aydın, and Çatalca maintained their central position in charcoal production. As mentioned previously, with their vast forestlands, these provinces had for centuries assumed important roles in the supply of wood fuel either for the army or for the capital city. In these provinces, fuel merchants transported the vast majority of their charcoal to other places, leaving only a small share for local consumption. However, exact information about the final destination of this charcoal loads is lacking. It can be inferred from archival documents that almost all the fuels produced in Edirne, Izmit and Çatalca supplied Istanbul. Though Salonica occasionally sent wood fuel to the capital, the main fuel trade in this province was oriented to Egypt.[113] Likewise, the province of Aydın provided considerable amounts of wood fuel to both Cyprus and Egypt.[114]

113 BOA, DH.MKT 987/3, 12 Ca 1323 (15.07.1905); BOA, BEO 3102/232640, 5 C 1325(16.07.1907).

114 BOA, BEO 3872/290376, 24 Ra 1329(25.03.1911).

Table 2.4 Wood Fuel Production and Consumption in the Provinces in 1897

Province	Production (tons)		Consumption (tons)	
	Firewood	Charcoal	Firewood	Charcoal
Salonica	103,900	69,200	103,900	5170
Edirne	40,800	51,750	40,800	22,770
Izmit	86,500	14,900	86,500	6600
Aydın	18,250	19,100	16,750	7900
Çatalca	750	21,120	750	9300
Shkodra	9750	5800	9750	2600
Manastır	15,000	6300	15,000	2800
Adana	7100	380	7100	.
Konya	23,000	8100	.	2500
Biga	17,650	1900	17,650	800
Kosovo	28,750	1400	28,750	600
Sivas	3100	500	3100	200
Kastamonu	50,750	200	47,500	85
Trabzon	17,250	650	17,250	300
Hüdavendigar	10,000	1100	10,400	500
Aegean Islands	7750	600	7750	250
Ankara	1125	.	1125	.
Total (tons)	441,425	203,000	414,075	62,375

SOURCE: Tevfik Güran, ed., *Osmanlı Devleti'nin İlk İstatistik Yıllığı: 1897*.

Another conclusion that can be drawn from the table is that almost all the firewood cut in certain districts were consumed by their own inhabitants. There are few provinces that exported firewood to other regions. The main reason for this was the lower economic value of firewood vis-à-vis charcoal. According to the table, only Kastamonu - the richest Ottoman province in terms of forests - and Adana – which exported fuel to Beirut and Egypt[115] - had remarkable firewood trades. Yet compared to charcoal exports, the volume of the firewood trade was modest. Thus, it can be concluded that the long-distance wood fuel trade in the Ottoman Empire consisted primarily of the trade of charcoal rather than firewood.

115 BOA, T.OMİ 1696/1, 2 M 1327 (24.01.1909).

2.4.3.1 Rising Exportation of Wood Fuel

On paper, the export of firewood and charcoal to foreign countries was forbidden in the Ottoman Empire. The thirteenth article of the trade regulation of 1885 explicitly prohibited it.[116] However, the prohibition had little impact on practice. Fuel merchants continued to export firewood and charcoal, especially from the forests in the Balkans. According to archival documents, Greece was the leading importer of wood fuel together with Malta.[117] The availability of maritime transportation in this geography promoted and facilitated the fuel trade. Captains, together with the merchants, were the major actors in the business.[118]

A striking example of the expansion of the fuel trade in the post-1880 era was the growing export of wood fuel to Egypt. The lack of forests in Egypt compelled this country to become a prominent buyer of firewood and charcoal. Forests along the southern coast of Anatolia and even those in the Balkans provided considerable amounts of fuel for Egyptians. Fuel trade between the Balkans and Egypt became particularly lively at the beginning of the twentieth century. A single contract signed between Egyptians and fuel merchants in Salonica, for example, involved about 600 tons of charcoal.[119] The table below provides details on the annual wood fuel exports of the Ottoman Empire in 1325 Rumi (March 1909-March 1910).

116 See "Sevahil-i Şahane Ticaret-i Bahriyesinin Tevsi' ve Terakkisi Hakkında Nizamname" in *Düstur,* I. Tertip vol.5 (Ankara: Başvekalet basımevi, 1937).

117 See BOA, BEO 2724/204271, 23 L 1323 (21.12.1905); BOA, BEO 3184/238763, 22 Ş 1325 (30.09.1907).

118 BOA, BEO 3088/231581, 18 Ca 1325 (29.06.1907).

119 BOA, BEO 3102/232640, 5 B 1325 (14.08.1907).

Table 2.5 Wood Fuel Exports in 1325 Rumi (March 1909 - March 1910)

Country	Charcoal		Firewood	
	Amount (tons)	Value (piasters)	Amount (tons)	Value(piasters)
Austria	388	285,901	245	14,025
Britain	522	384,841	3570	178,620
Italy	144	105,160	802	41,400
Bulgaria	.	.	739	28,797
Lebanon	.	.	264	14,654
Russia	.	.	5467	217,400
Romania	.	.	518	24,920
Cyprus	10	5775	334	24,133
Crete	.	.	1.5	650
Egypt	8102	5,376,389	24,684	1,627,164
Greece	174	54,046	87	9060
Other	420	226,374	2487	189,402
Total	9760	6,438,586	39,199	2,368,425

SOURCE: *Memalik-i Osmaniyenin 1325 Senesine Mahsus Orman Istatistiği* (İstanbul: Mahmut Bey Matbaası, 1329 [1913/14])

The table explicitly shows the central position of Egypt in Ottoman fuel exports. Fuel consignments to Egypt constituted 83 percent of the total charcoal exports and 63 precent of the total firewood exports. Britain and Russia were other significant importers of Ottoman fuels. While fuel exports to neighboring countries is understandable, Britain appearance on the list is odd. Continuous shipping trade between Britain and the Levant probably made fuel exports to this country possible.

The provisionist tendencies in the Ottoman economic mindset were still evident even at the beginning of the twentieth century. The government tried to block the international trade of firewood and charcoal when Ottoman subjects were in dire need. For example, when people in Alasonya complained about fuel shortages they faced one cold winter due to the high level of fuel exports to Greece, the administrative council banned fuel trade with foreigners. Yet in the following year when the winter was more benign, the prohibition was lifted. An official document stated that blocking commercial activities of merchants and reducing job opportunities for workers were not

acceptable.[120] This characterization demonstrates a change in the official perspective in that the interests of the merchants and workers were began to taken into account.

§ 2.5 Taxes on Wood Fuel

In the Ottoman Empire, there was a complex tax policy with respect to forest products which underwent changes over time. The major criterion for taxing the products was whether they were for commercial purposes. Peasants were never taxed for wood fuel prepared for their own use. All taxes on the wood fuel trade of the country were lifted by the sultan in 1842. However, the decision was not implemented in some places such as Izmir. Customs officers in the city continued to tax wood fuel until 1849, by taking twenty *para*s for each load of firewood and charcoal. When the central government was informed of the situation, the order of the sultan was reiterated and the amount collected over the previous seven years was offset by reductions in other taxes.[121]

The first article of the customs and tax regulation on timber and wood fuel was as follows:

> The taxes levied on timber, firewood, and charcoal are categorized in two groups. One group of taxes is *orman hakkı* (forest taxes) taken from timber, firewood, and charcoal extracted from public and *evkaf* (pious foundation) forests, and the other group consists of *aşar* (tithes) collected from all kinds of timber and *pul resmi* (stamp taxes) received from firewood and charcoal produced in the private forests and *baltalık*s (coppices) of villages.[122]

The ensuing articles of the regulation provide more detail about taxation procedures. The key criteria for taxing wood fuel concerned their commercialization and amount. More precisely, firewood and charcoal were taxed only when sold in high quantities for commercial purposes. According to the third

120 BOA, BEO 2724/204271, 23 L 1323 (21.12.1905).

121 BOA, İ.MVL 154/4365, 25 Z 1265 (11.11.1849).

122 BOA, İ.MMS 54/2397, 19 S 1293 (16.03.1876).

article, there was no tax on the trees cut by peasants for domestic purposes from the coppices around their villages. Even fuels, conveyed by villagers to markets in cities and towns were tax-free. Forest taxes and stamp taxes were levied either when fuels were sold in large quantities to commercial enterprises like factories and quarries in large quantities or when they were traded in quays and railway stations.[123] Which is to say, the Ottoman government tried to obtain revenue from the increasing trade in wood fuel in the second half of the nineteenth century; however, the taxation system favored peasants by granting certain exemptions unless their firewood and charcoal was sold in bulk to industries.

The regulation imposed the same amount of tax for every forestland with no discrimination among regions. This policy was criticized when deforestation accelerated in certain regions. As a matter of course, people in timber and fuel businesses choose to cut trees mostly from woodlands in coastal regions. Since maritime transportation was the easiest and cheapest means of conveying forest products, supply areas intensified around port cities and available wharfs. Yet according to the forests administration, forestlands close to the sea were diminishing day by day, and one reason for this was that taxes were not levied on the basis of distance. The solution offered was a progressive tax system based on the distance from the origin of forest products and their destination.[124]

After 1880, the development of scientific forestry and the commercialization of forest products introduced new taxes on fuels. All wood fuel conveyed to cities and towns by carts or with draft animas started to be taxed with no differentiation between fuels for commercial and domestic uses. In other words, in addition to fuel merchants, households were obliged to pay taxes on fuels they prepared and transported for their own use. The purpose of taxing non-commercial wood fuel was to create financial resources for local municipal activities, yet the imposition of this new tax gave rise to grievances throughout the country. Upon the notification of the governor of Sivas, who

123 BOA, İ.MMS 54/2397, 19 S 1293 (16.03.1876).

124 BOA, İ.MMS 54/2397, 19 S 1293 (16.03.1876).

pointed out the inconvenience of the new tax for the poor, the central government abolished the fuel tax for households.[125]

§ 2.6 Conclusion

The preindustrial Ottoman economy, like its counterparts, was fueled by firewood and charcoal. While certain countries managed to transform their energy composition in the nineteenth century via fossil-fuel-driven industrialization, the empire lagged behind early industrializers with respect to energy transition. Despite the increasing consumption of coal after the introduction of steam engines at the end of the 1820s, wood fuel did not lose much importance for domestic heating, smelting, and artisanal activities until the end of the empire.

Uneven distribution of forests resulted in different fueling networks in the provinces. While Arab provinces relied on wood fuel imports, forests in Anatolia and the Balkans provided fuel not only for local people and industries but also for foreigners via commercial networks. It was easier to procure fuel in coastal regions where forest cover was dense. The inner lands suffered from poor vegetation which generated additional transportation costs. Pack animals, various watercraft and eventually trains were employed to convey wood fuel around the empire.

Wood fuel was strategic in the eyes of Ottoman administrators. The political elite closely supervised the provisioning of fuelwood to the capital city, army, and state enterprises like the Imperial Arsenal, the Imperial Dockyard, and smelters around the country. However, from the 1860s onwards, the principle of provisionism was challenged by the liberalization of Ottoman economy. Restrictions on fuel exports were lifted increasing export-oriented wood fuel production. Furthermore, the closing of many state enterprises and technological changes in the industrial plants that remained made wood fuel regulation unnecessary. State intervention in the provisioning of fuel for Istanbul was kept as an alternative policy in emergency cases. Showing both the centrality of wood fuel in the largest city of empire and the changing energy

125 BOA, İ.MMS 91/3857, 12 L 1304 (04.07.1887).

policies throughout the nineteenth century, the next chapter discusses the wood fuel economy of Istanbul.

3

Firewood and Charcoal Supply of Istanbul

The city of Istanbul - comprised of the old city, Pera, and the villages along the Bosphorus as well as Üsküdar and Kadıköy on the Anatolian side was the largest city of the Ottoman Empire. There have been few cities comparable to Istanbul in terms of size and population throughout history. As a densely populated urban setting, the city was a giant body devouring large amounts of basic foodstuffs, fuel, and other consumer goods. Using a common expression from the Ottoman documents, these materials were among the *havaic-i zaruriye* (essential needs) and received the special attention of Ottoman administrators.

Focusing on Istanbul and its hinterland, this chapter shows the significance of firewood and charcoal in the energy economy of the capital city. The availability of cheap wood fuel was an important reason for the limited energy transition in the most developed city of the empire. Historically, the government supervised the wood fuel trade to ensure a cheap energy supply for the city. The provisionist policies regarding the wood fuel needs of Istanbul were transformed in the mid-nineteenth century. However, this had no tangible impact on the energy composition of the city, and wood fuel remained the major energy source especially for space heating and artisanal production.

Many historians of the Ottoman Empire have inquired how basic consumption goods were procured for the palace, central army and, inhabitants of the capital city. Thus, the numerous studies on the provisioning of Istanbul

in the course of its history constitute a substantial literature.[1] Partly due to the central place of food in the life of the city - and partly because of the abundance of archival sources on foodstuffs – the majority of the research addresses food supply.[2] Compared to the vast literature on the foodstuffs, studies devoted to the provisioning of fuel for the capital city are few in number.

This chapter, first, delves into wood fuel consumption patterns in the capital city. In Istanbul, households, imperial residences, public industrial plants, and almost all businesses that required thermal energy were fueled by firewood and charcoal. This section briefly examines the features of domestic and industrial use of wood fuel and traces the quantitative aspects of the consumption.

In the following section, Istanbul's wood fuel sources are addressed. This part starts with geographical information and sheds light on the production processes and labor organization in the forestlands. Available quantitative data indicate the level of wood fuel production in the provinces providing fuel for the capital city. In addition, the major drawbacks that negatively influence the production in the hinterland will be tackled.

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1 For a review of the studies on the provisioning of Ottoman Istanbul, see Ahmet Uzun, "Osmanlı Devleti'nde Şehir Ekonomisi ve İaşe," *Türkiye Araştırmaları Literatür Dergisi (TALİD)* 3, no. 6 (2005): 211-35.

2 Most of the studies examined the provision of grain and bread to Istanbul. See, for example, Lütfi Güçer "XVIII. Yüzyıl Ortalarında Istanbul'un İaşesi İçin Lüzumlu Hububatın Temini Meselesi," *İÜ İktisat Fakültesi Mecmuası* 11, no.1-4 (1949): 397-416; Tevfik Güran, "Istanbul'un İaşesinde Devletin Rolü (1793-1839)," *İÜ İktisat Fakültesi Mecmuası* 44, no. 1-4, (1986): 245-75; Rhoads Murphey, "Provisioning Istanbul: The State and Subsistence in the Early Modern Middle East" *Food and Foodways* 2 (1988): 217-64; Oya İklil Erefe, "Bread and Provisioning in the Ottoman Empire,1750-1860" (MA thesis, Bilkent University, 1997); Lynne M. T. Şaşmazer, "Provisioning Istanbul: Bread Production, Power and Political Ideology in the Ottoman Empire, 1789-1807"(PhD diss., Indiana University, 2000). Some studies focused on the specific methods of meat provision. See Antony Greenwood, "Istanbul's Meat Provisioning: A Study of the Celepkeşan System" (PhD diss., University of Chicago, 1988); Ahmet Uzun, *Istanbul'un İaşesinde Devletin Rolü - Ondalık Ağnam Uygulaması 1783-1857* (Ankara: Türk Tarih Kurumu, 2006); Sait Türkhan, "18.Yüzyılın İkinci Yarısında Istanbul'un Et İaşesinin Temini: Hassa Kasabbaşılık Kurumu" (MA thesis, Marmara University, 2006).

Next, wood fuel trade between the primary areas of production and the city center is investigated. General features of the fuel trade are delineated with reference to logistics and agents in the business. Moreover, specific attention is paid to problems in wood fuel logistics and corruption in wood fuel trade.

Finally, the role of government in the wood fuel supply of the capital city is scrutinized. This section focuses on institutions responsible for supervising the provisioning of fuel for Istanbul and government policies to increase the fuel supply and keep prices low. The change to the provisionist mindset and its impact on the provisioning of wood fuel for Istanbul are underscored.

In the literature of European history, there are a few examples that examine the fuel networks and energy consumption of certain capital cities from various perspectives.[3] In Ottoman historiography, Suraiya Faroqhi and Selçuk Dursun touch upon the wood fuel supply for Istanbul in a few pages of their works. While Faroqhi deals briefly with the wood fuel prices and the fuel needs of the palace in the seventeenth century, Dursun points out the government's central position in the provision of wood fuel and gives specific examples from the fifteenth and nineteenth centuries.[4]

Three articles focus exclusively on the provisioning of wood fuel for Istanbul.[5] One of the studies, written by Salih Aynural, discusses the hinterland in terms of energy and the transportation of fuel from the provinces to the capital with a specific emphasis on the actors that organized and supervised the service. Since the scope of the article is confined to the eighteenth century, it

3 See James A. Galloway, Derek Keene and Margaret Murphy, "Fuelling the City: Production and Distribution of Firewood and Fuel in London's Region, 1290-1400," *The Economic History Review, New Series* 49, no.3 (August 1996): 447-72; Javier Hernando and Gonzalo Madrazo. "Firewood and Charcoal Consumption in Madrid during Eighteenth Century and Its Effects on Forest Landscapes." in *Environmental History in the Making*, eds. Estelita Vaz, Cristina Joanaz de Melo, Lígia M. Costa Pinto (Dordrect-Heidelberg-New York- London: Springer, 2016), 321-40 and Eunhye Kim and Sabine Barles, "The Energy Consumption of Paris and Its Supply Areas from the Eighteenth Century to the Present," *Regional Environmetal Change* 12 (June 2012): 295-310.

4 See Faroqhi, *Towns and Townsmen*, 78-81; Dursun, "Forest and the State," 59-63.

5 See Aynural "Provision of Wood and Coal," 156-60; Öztel, "Odun ve Kömür'ün (Mahrukat) Üretim Süreci.." 283-305 and "Mahrukâtın (odun ve kömür) Önemi …," 487-505.

reflects traditional forms of fuel provisioning that underwent certain changes in the nineteenth century.

The other two articles belong to Muharrem Öztel who examines the production of charcoal and firewood around Istanbul and the fuel market in the city. Searching for answers regarding the supply side of the wood fuel economy, Öztel's research provides valuable information about the provisioning of wood fuel for Istanbul in the nineteenth and early twentieth centuries. He discusses the reasons for fuel supply problems in detail and emphasizes the central administration's role in regulating the trade of firewood and charcoal.

Despite the valuable contributions of these articles, the energy provisioning of the capital city deserves further research. For example, the demand side of the wood fuel economy in the capital city has not been discussed in detail up to now. Likewise, previous studies provide little quantitative data, which would present a better picture of the fuel provisioning of the city. This chapter discusses not only the supply side of the fuel economy but also the demand side. Moreover, my study includes quantitative data extracted from both primary and secondary sources.

Making use of not only of official Ottoman documents but also various printed materials and travel accounts, this chapter offers a broad, detailed analysis of Istanbul's fuel provisioning from the second half of the eighteenth century to the early twentieth century. Though wood fuel procurement remained the duty of a governmental institution on paper until the end of the empire, the scope and extent of state intervention in the wood fuel trade shrank over time. In the aftermath of the Tanzimat Edict, the traditional provisioning system became more market-oriented due to certain fuel-related administrative reforms. From this time forward, wood fuel producers and merchants grew stronger vis-à-vis the state which is evidenced by their bargains with governmental agencies and the removal of price ceilings. In the second half of the nineteenth century, full-fledged state intervention in Istanbul's wood fuel trade became an exception limited to times of crisis.

§ 3.1 Wood Fuel Consumption in Istanbul

Firewood and charcoal were strategic materials for meeting the energy needs of Istanbul. The introduction of coal had little impact on the traditional energy structure of the capital city which was based on wood fuel. Only in the last decades of the nineteenth century did Ottomans gradually become familiar with coke for heating. Nevertheless, its impact on firewood and charcoal consumption remained limited. Every year up until the end of the empire, house heating, artisanal and industrial manufacture, the palace, and public buildings consumed thousands of tons of wood fuel to generate thermal energy.

3.1.1 *Consumption in Houses and Imperial Residences*

While discussing house heating in Istanbul, a French traveler at the end of the eighteenth century noted that "in Turkey the inhabitants do not warm themselves at the fire of chimneys, but at that of *tandour*s and *mangal*s, for which charcoal is required."[6] *Mangal*s (braziers) were "of copper and brass, splendidly polished, and generally shaped like a rose" but "some of them were long quadrangular ones standing on four feet."[7] These braziers were not only used for heating but also for cooking and preparing hot drinks. Most of the wood fuel in the city was consumed by households. At the end of the nineteenth century, it is estimated that about 95 percent of city-dwellers relied on charcoal for cooking and heating.[8]

6 Guillaume Antoine Olivier, *Travels in the Ottoman Empire, Egypt, and Persia : undertaken by order of the government of France, during the first six years of the Republic,* vol.1 (London: Printed for T.N. Longman & O. Rees, Paternoster-Row; and T. Cadell Jun. and W. Davies, in the Strand, 1801), 239.

7 James Porter*, Turkey: Its History and Progress,* vol.1 (London: Hurst & Blackett, 1854), 49.

8 Giraud, "Combustibles," 126. Gas or oil burning stoves were rarely used in Pera. See 130.

Table 3.1 Wood Fuel Distributed by *Hatab Ambarı* in 1279 AH*

Place	Firewood (tons)	Charcoal (tons)
Mabeyn-i hümayun	482	167
Imperial harem	11,413	327
Some imperial pavilions	56	23
Aviary, bakery, and patisserie	3200	108
Some vegetable and lemon stores	612	0
Some divisions, farms, Tarabya Palace etc.	833	48
Theater, heaters for birds and lions and depot for construction materials	16	14
Pasha and harem eunuch's divisions	0	277
Dorms of boatmen	0	99
Guesthouse	802	43
Harems of *Topkapı* and *Saray-ı Cedid*	1590	42
Sadabad pavilion	718	65
Imperial kitchen and vegetable store	2475	15
Küçükçekmece farm	38	6
Total	22,235	1234

*(June 1862-June 1863)

SOURCE: BOA, HH.HTA 3/67, (1862-1863)

Not only the dwellings of ordinary people but also imperial buildings depended on organic fuels. The palaces, kiosks, and their extensions in which members of the dynastic family resided relied mostly on wood fuel. Warming these relatively large spaces and cooking for large groups of people in the imperial kitchens required a considerable amount of firewood and charcoal. There was a special unit called a *hatab ambarı* (firewood depot) by which the fuel provisioning of the imperial residences were organized by a special officer called the *hatab emini*. Table 3.1 is an annual wood fuel account prepared by the officers of the *hatab ambarı*.

The table shows that various units and divisions of Dolmabahçe Palace and other imperial residences around Istanbul consumed a considerable sum of wood fuel. The annual amount of firewood burned was 22,235 tons, more than half of which was consumed by the imperial harem. The total amounts of

charcoal and resinous wood were 1234 and sixteen tons respectively. This fuel distribution shows that the majority of the wood fuel was used for heating rather than cooking. Besides imperial residences, the *hatab ambarı* provided fuel for some poor people, but this was not high compared to the consumption at the palace.[9] The favored kinds of firewood purchased by the *hatab ambarı* were oak and hornbeam. Most of the charcoal came from Silivri either in sifted form or as unscreened with the name of *sıra*.[10] The second type was obviously of poorer quality.

The annual imperial fuel consumption increased in time and reached 25,340 tons of firewood and 2690 tons of charcoal by 1877.[11] Presumably, this trend continued as the family grew and new residences were built. Though mentioned in various archival records, coal consumption in imperial residences remained limited until the end of the empire.[12]

3.1.2 *Consumption at the Public Buildings and Plants*

There are numerous mentions in the Ottoman archives of the fuel requirements of public buildings and production plants. Ministry offices,[13] treasury bureaus,[14] public schools,[15] and military buildings[16] were among the major wood fuel consumers. The industrial plants in Istanbul - like the Imperial Arsenal and the Imperial Mint, which were discussed in the previous chapter - consumed substantial amounts of charcoal, too.

As in private houses, braziers were the most popular means of heating offices. However, though limited in number, tiled stoves were already in use by

9 BOA, HH.HTA 3/38,1284 (1867).

10 BOA, HH.HTA 6/43, 1293 (1876).

11 BOA, HH.HTA 6/51, 1294 (1877).

12 Most of the coal was used as an energy source for water pumps. See, for example, BOA, HH.HTA 7/81, 6 B 1299, (24.05.1882).

13 BOA, İ.DH 670/46633, 18 Ca 1290 (13.08.1873).

14 BOA, İ.ML 23/ 1315/C-05, 07 C 1315 (03.11.1897).

15 BOA, İ.DH 264/16461, 08 Ra 1269 (20.12.1852).

16 In 1857, one third of the charcoal that arrived in Istanbul was reserved for the army. See BOA, A.MKT.NZD 242/61, 4 R 1274 (22.11.1857).

the 1860s in certain offices like those of the Ministry of Foreign Affairs.[17] The Sublime Port's demand in winter 1867 for twenty-five tons of firewood and 115 tons of charcoal suggests that stoves and braziers coexisted in public buildings.[18] Overall, the firewood and charcoal burned to heat the officers constituted a considerable sum in the total fuel consumption of the capital city.

3.1.3 *Consumption in Baths*

The high level of fuel consumption in public baths was sometimes regarded as a cause of fuel shortages in the city. In 1768, the building of new public baths in the city was prohibited by the government.[19] It was claimed that the existing number of bathhouses was sufficient and that additional ones would lead to the waste of wood fuel. More than a century later, using a similar logic, an official report proposed shutting down one-fifth of the city's public baths as a possible precaution against fuel shortages.[20] In the 1910s, more than 160 public baths[21] burned about a quarter of the total firewood brought to the city.[22]

3.1.4 *Estimates of Total Wood Fuel Consumption and Per Capita*

Given the limited data, it is very difficult to construct a long-term series showing the total wood fuel consumption of Istanbul, though consumption figures are available for specific.

17 BOA, HR.MKT 360/36, 6 C 1277 (20.12.1860).

18 BOA, A.MKT. MHM 384/73, 13 S 1284 (16.06.1867).

19 Kutluk, *Türkiye Ormancılığı*, 76.

20 BOA İ.DH 775/63088 , 23 L 1295 (20.10.1878).

21 *1329 Senesi Istanbul Belediyesi İhsaiyat Mecmuası* (Istanbul: Matbaa-i Arşak Garivyan, 1330 [1914]), 170.

22 Süleyman Azmi, "Mahrukat Meselesi," *OMAM,* no.5, Kanunuevvel 1333 (December 1917): 130.

Table 3.2 Annual Wood Fuel Consumption in Istanbul

Year	Firewood (tons)	Charcoal (tons)
1878	225,000	42,490*
1895	152,000	86,400
1910	129,150	102,400

*Consumption in private houses and in imperial residences

SOURCES: Süleyman Azmi, "Mahrukat meselesi," *Orman Mekteb-i Âlisi Mecmuası (OMAM)*, no.5, Kanunuevvel 1333 (December 1917): 130; *OMAM,* no.7, Şubat 1334 (February 1918): 199, BOA İ.DH 775/63088, 23 L 1295 (20.10.1878), BOA, HH. HTA 7/7, 1297 (1880)

Based on the rare data that could be compiled during my research, Table 3.2 shows the level of firewood and charcoal consumption in specific years. A report dated 1878 shows that the annual amount of firewood burned in the capital city that year was around 225,000 tons. The total amount of charcoal used exclusively by households was given as 39,740 tons.[23] When charcoal consumption in the imperial residences is included the total becomes 42,490 tons. At the end of the nineteenth century, the total annual firewood consumption in the city is estimated at between 146,000 and 158,000 tons, and the estimated annual charcoal consumption for the same period was between 83,200 and 89,600 tons.[24]

In 1910, a member of the general assembly of the governorate wrote that the annual firewood requirement of the city was around 129,150 tons and that charcoal consumption had reached 102,400 tons. Every year 56,250 tons of firewood and 20,480 tons of charcoal were burned in public buildings. The public baths of the city consumed 33,750 tons of firewood a year. By this account, household wood fuel consumption at the turn of the century was comprised of 56,250-67,500 tons of firewood and 62,720-69,120 tons of charcoal.[25]

The trajectories of consumption of firewood and charcoal over the given period were inverse. While the total amount of firewood used declined, a

23 BOA, İ.DH 775/63088, 23 L 1295, (20.10.1878).

24 Azmi, "Mahrukat Meselesi," OMAM, no.7, 199.

25 Azmi, "Mahrukat Meselesi," OMAM, no.5, 130.

significant increase in charcoal consumption occured. With regard to total wood fuel consumption, there was always an upward trend presumably because of the increasing population of the city. Table 3.3 shows the changes in Istanbul's population.

Table 3.3 Various Estimates of the Population of Istanbul (1794-1916)

Year	Population
1794	426,000
1829	359,000
1864-1875	490,000-796,000
1877	606,000-722,000
1884	895,000
1896-1897	1,117,000
1901	1,159,000
1914-1916	1,600,000

SOURCE: Karpat, *Ottoman Population*, 103.

The population data allows a per capita consumption estimate for city dwellers for 1878, 1895, and 1910. According to my calculations, the amount of

firewood consumed in Istanbul was 1.8 kilograms per person per day in 1878. This figure decreased to 1.5 and 1.2 kilograms per person per day in 1895 and 1910, respectively. The decreasing per capita consumption can be attributed to the use of coal and coke in some industries and to some extent, for home heating.

§ 3.2 Wood Fuel Sources of the Capital City

Ottoman Istanbul was strategically situated in terms of easy access to forest products. Dense forest vegetation in surrounding regions comprised of species like oak, hornbeam, beech and chestnut, sufficiently supplied wood fuel for both public and civilian needs throughout history. Thus, the city never experienced fuel shortages due to the inadequacy of resources but because of meteorological or organizational factors.

3.2.1 *Geography of the Wood Fuel Sources*

Much of the area in the immediate vicinity Istanbul was covered by various species of trees. Especially regions to the north and east of the city had vast woodlands. Belgrad and Düzdağı forests[26] on the European side and Alemdağ and Beykoz forests[27] on the Anatolian side were the most significant forest covers. However, there were certain limitations on the exploitation of these resources. The government was cautious not to deplete forests close to the city center. When thirty-nine colliers from Edirne came to Alemdağ to make charcoal in 1891, for example, the government blocked their production stating that forests and coppices around the capital would be preseved to meet the fuel and timber needs of Istanbul in case of war.[28]

The immediate wood fuel resources was well preserved until the mid-nineteenth century. Despite protectionist policies that limited fuel and timber extraction from these nearby woodlands, the surface area of northern forests decreased from 13,000 hectares to 8200 hectares over a forty-year period between the 1840s and 1880s.[29] In any case, the proportion of wood fuel produced around the city center remained limited with respect to the total firewood and charcoal supply to the city.

All the forests along the southern coast of the Black Sea and along the Sea of Marmara were potential wood fuel sources for the capital city throughout the centuries. At the end of the eighteenth century, French naturalist Guillaume wrote:

> All the wood used for fuel and cooking in the houses of private persons, in some manufactories and especially for the baths, comes from

26 "Ormanlarımız," *Orman ve Maadin Mecmuası*, no.1, 1 Temmuz 1300, (13.07.1884): 20.

27 BOA, Y.PRK.ŞH 14/32, 16 N 1325 (23.10.1907).

28 BOA, Y.MTV 51/87, 25 Za 1308 (02.07.1891).

29 "Istanbul ve Liva Hakkı Ormanları," *Orman ve Maadin Mecmuası*, no.1, 1 Temmuz 1300, (13.07.1884): 21.

> the south part of the Propontis and coasts of the Black Sea, situated from the Bosphorus as far as Sinope.[30]

In addition, Aegean coasts and islands and the forests around Salonica provided firewood, charcoal, and resinous wood for Istanbul, too.[31]

There was a kind of division of labor by which certain regions specialized in the production of either wood or charcoal. While the Istranca Mountains, Salonica, and some villages around Izmit were the centers of charcoal production, the Anatolian coasts of the Black Sea and the south Marmara region mostly produced firewood and resinous wood.[32]

3.2.2 *Quantitative Distribution of Wood Fuel Supply*

The traditional energy networks of Istanbul still existed in the first decade of the twentieth century with no remarkable change. The fuel hinterland of the capital city was so wide that even remote regions like Aydın and Janina sent charcoal, though in low quantities. It should also be noted that, not only public forests in the provinces but also forests belonging to *evkaf* (pious foundations) were exploited for the wood fuel needs of Istanbul. However, their contribution to the overall wood fuel supply remained low. Table 3.4 below presents the distribution by province of firewood and charcoal supplied in 1906 and 1907.

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30 Guillaume-Antoine Olivier, *Travels in the Ottoman Empire, Egypt, and Persia: undertaken by order of the government of France, during the first six years of the Republic,* vol 1. (London: Printed for T.N. Longman & O. Rees, Paternoster-Row; and T. Cadell Jun. and W. Davies, in the Strand, 1801), 238-39.

31 BOA İ.DH 775/63088, 23 L 1295 (20.10.1878).

32 Habesci makes similar observations in the 1780s: "…One branch of their (Turks') trade consists in the navigation of the Black Sea, with two kinds of vessels, Caiques and Voligues: the cargoes of these differ according to the ports for which they are destined. The trade to the coasts of Asia, in the vicinity of the river Fasii, is confined chiefly to wood for fuel and for building. For the European coasts the cargoes consists of coals…" See, Elias Habesci, *The Present State of the Ottoman Empire*, (Translated from the French manuscript of Elias Habesci) (London, R. Baldwin, 1784), 424.

Table 3.4 Wood Fuel Provisioning of Istanbul in 1906 and 1907

Source	1906		1907	
	Firewood	Charcoal	Firewood	Charcoal
Edirne	10,628	28,911	10,960	30,878
Salonica	.	8849	844	7395
Izmit	72,756	16,300	66,332	17,775
Aydın	.	.	.	44
Belgrad forest	8466	15,841	8410	18,741
Hüdavendigar	5699	4259	7307	4827
Biga	3499	2003	1636	3193
Karesi	160	.	95	.
Kastamonu	26,303	.	33,176	11
Yanya	.	.	.	200
Gallipoli waqf forest	1237	.	1062	581
Aynaroz waqf forest	.	989	.	68
Total (tons)	128,748	77,152	129,822	83,713

SOURCE: 1323 Senesi Orman İstatistiği (Istanbul: Mahmud Bey Matbaası, 1325 [1907])

The table indicates that the forests of Izmit were the most important source of firewood for Istanbul. According to the figures, more than half the total was provided by the province of Izmit. Kastamonu and Edirne were the other key providers of firewood, supplying almost one third of the total. Edirne took the lead in charcoal supply. As discussed previously, the Istranca Mountains in the province of Edirne were the most important location of charcoal production. About 37 percent of the total charcoal transported to Istanbul came from this province. According to the table, other prominent charcoal sources were Izmit and the Belgrad forest near the city center.

An article written by an Ottoman forest specialist indicates the measure of forest surface that could support the wood fuel needs of Istanbul. According to the article, the average duration for the regeneration of a given forestland was ten to fifteen years. Furthermore, the annual yield of one hectare was 2.5 tons of firewood or 500 kilograms of charcoal. By this accounting, the annual firewood need of the capital city could be obtained from around 57,500

hectares of forestland; about 200,000 hectares were needed for charcoal production.[33]

According to the specialist, forests around the capital city could supply enough fuel for the city dwellers. The total area of the forests used as fuel sources for Istanbul was slightly more than 3 million hectares. Around 2.7 hectares of these were state forests, which were the primary source of wood fuel. If a ten-year cycle is taken to consideration, forests in the hinterland were quite sufficient for meeting the needs of the city. According to the specialist, forests should be divided into ten equal sections and every year logging should take place in one of these.[34] The proposed policies represented the solutions of developing scientific forestry in the empire, but they were never put on the agenda.

3.2.3 *Labor Organization in the Production Areas and Transportation*

The production and transportation of thousands of tons of wood fuel to the most populated city of the empire required a large organization composed of peasants, colliers, carters, boatmen, and weighmasters. Considering regional differences, I examine the details of firewood and charcoal production in the hinterland.

Woodcutting was undertaken mostly by peasants living around the forestlands. For most of these people, wood chopping was a secondary occupation that supplemented agriculture and stockbreeding.[35] However, if the level of commercialization was high, woodcutters spent more time in this work. Since water transportation was the cheapest and easiest way to convey wood fuel, cuttings took place mostly in coastal regions. Ideally, the transportation from a production area to a wharf did not take more than four hours.[36] In the first decades of the nineteenth century, more than twenty wharfs along the northern coast in Thrace specialized for firewood commerce.

33 Azmi, "Mahrukat Meselesi," OMAM, no.5, 134.

34 Ibid., 134-35.

35 Azmi, "Mahrukat Meselesi," OMAM, no.7, 201.

36 Ibid., 208.

Every year a large group of axemen from surrounding towns and villages were mobilized to prepare the necessary firewood for Istanbul. Each wharf was served by about 100 axemen under the leadership of a *kocabaşı*.[37] According to a record dated 1816, the average number of woodcutters working in this region was around 1500. They went to woodlands in March with their own draft animals and carts, and spent several months cutting trees and transporting firewood to the wharfs.[38] Though the woodcutting itself was conducted in a similar fashion in other locations, the labor was not as organized as in this region.

Charcoal was produced mostly by professional colliers due to the technical requirements of the work. Colliers who burned charcoal for distribution to Istanbul were concentrated chiefly in northern Thrace, Salonica and some villages around the Gulf of Izmit. In these regions, hundreds of colliers were occupied with charcoal making in hundreds of *torluk*s in the forestlands. Charcoal production took place close to the coasts just as with loggings. Charcoal making was generally an inherited profession. The colliers of Istranca, for example, stated that their families had been doing the job for 150 years.[39]

In 1858, two notables from Istranca, one of whom was the mukhtar, were asked to report on the ongoing production of charcoal in the Istranca Mountains. The statement filed with the *Şehremaneti* (Municipality) of Istanbul illuminates the labor organization and financial aspects of charcoal making in this area. According to the report, there were 250 *torluk*s in the woodlands of this region. The total population of the charcoal makers were around 1470 comprised of 1200 unskilled, 150 average and 120 skilled workers. An average kiln run by two experienced charcoal makers and two unskilled apprentices could produce about 100 tons of fuel annually. These workers were responsible for cutting wood for six months and burning charcoal the other half of the year. On a daily basis, each of these workers could cut a cartload of wood which

37 *Kocabaşı*s were notable people who represented non-Muslim communities in their relations with the state. See *Türkiye Diyanet Vakfı İslâm Ansiklopedisi*, vol.26, s.v. "Kocabaşı" (Ankara: Türkiye Diyanet Vakfı, 2002).

38 BOA, C.BLD 38/1890, 1231 (1816).

39 BOA, MVL 89/19, 25 C 1266 (08.05.1850).

corresponded to 1280 kilograms. The report stated that the amount of charcoal that could be produced from a cartload of wood was 256 kilograms.[40] Thus, the proportion of charcoal to wood in the burning operation was 1:5, which was the universal average.[41] The means of transporting charcoal was camel or cart.[42] A single driver could lead a convoy of up to ten carts. In 1856, the number of carts that delivered charcoal to Silivri wharf each day was 150.[43] It was reported in 1858 that each kiln employed four carts in average for transporting charcoal from the kilns to the quays. In addition to the burners of the charcoal, two other workers were required to drive these carts which were pulled by oxen. One of the drivers was employed on a yearly basis and the other for only six months, probably in the busy season of spring and summer. Overall, each kiln was operated by six workers on average composed of four producers and two transporters.

Besides the organization of labor, the report included a detailed analysis of production costs. The annual wage of a professional charcoal maker was 3000 piasters; for an inexperienced one it was 2500 piasters. The annual amount paid to a cart driver was 3000 piasters - equal to the wage of a professional collier. If the driver was employed only six months, the wage was halved. Thus, in a single production season, the total for six workers came to 15,500 piasters. When the basic needs of the workers, the costs of the draftt animals, equipment, and other fees were added, the total annual cost of a kiln was calculated at about 31,660 piasters.[44]

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40 BOA, İ.MMS 12/523, 24 L 1274 (07.06.1858).

41 Vaclav Smil, *Energy in Nature and Society: General Energetics in Complex Systems* (Cambridge, Massachusets: MIT Press, 2008), 188. Smil notes that "charcoal yields were just 15%–25% of dry wood charge by weight, and 1:5 was probably the best approximation of the typical charcoal: wood ratio during the preindustrial era."

42 BOA, C.BLD 108/5357, 1223 (1808).

43 BOA, MVL 302/78, 29 Ra 1273 (27.11.1856).

44 BOA, İ.MMS 12/523, 24 L 1274 (07.06.1858). For a single worker employed year-round, the annual food and footwear expenses were as follows: 1440 piasters for 720 *kıyye* (924 kilograms) of bread, 360 piasters for one unit of food, fifty piasters for five pairs of sandals and seventy-five piasters for three pairs of shoes called yemeni. These rough estimates show that a sum of 1925 piasters was needed to meet the basic needs of a worker for a year.

Another report, prepared by Ottoman forest officers concerned charcoal production sites at four particular locations in 1909: Aya Todori, Tarabya, Aksicim, and Aya İlya, all of which were located around Vize in Thracia. As Appendix B shows in detail, there were forty-two charcoal kilns in these forests. The report hints at the production capacities of Ottoman charcoal kilns. Depending on the size of the mounds, levels of production in the kilns varied. Some mounds, in which the final product amounted to only four to five tons, were relatively smaller. There were, however, kilns that were five to six times larger. Particular kilns could produce eighteen, nineteen and even twenty-three tons of charcoal in a single operation. The average charcoal production in the mounds of this region was about ten tons.

Names recorded in the report show that nearly all the people engaged in charcoal production and the fuel trade in this particular area were Greek subjects. The density of the Greek population in the region can be a possible explanation; however, charcoal making had always been dominated by non-Muslim subjects in various locations of the country. Therefore, the Greek majority in charcoal business in Thrace is unsurprising.

While some earlier accounts indicate that charcoal makers and transporters were one and the same people[45] - and while the aforementioned document includes transporters among the workers - this report mentions two separate groups of people in the charcoal business. One group burned the wood into charcoal and the other group was responsible for the transportation and marketing of the fuel. In other words, producers and intermediaries were categorized separately. Indeed, few peasants would have had both the technical knowledge to produce charcoal and business competency. Such division of labor was even more necessary when the market was distant from the production sites.

The report shows that each charcoal maker operated one or two kilns. They did not have enough time and sufficient production factors to maintain production in more than two kilns at a time. The output range of a single producer was between four tons and 35.5 tons. The people that dealt with the transportation and marketing of the fuel had diverse business capacities, too.

45 See for example BOA, A.MKT.UM 300/23, 18 R 1274 (06.12.1857).

On one hand, there were merchants who worked with only one collier, and on the other, there were richer ones who conducted business with three or more kilns. One merchant, for example, owned forty-nine tons of charcoal produced in four different kilns, while another one had only five and a half tons of fuel from a single mound. Overall, at the local level, colliers and merchants had different production and trade capacities, and there was no monopoly or oligopoly in the charcoal business.

The vivid commercial life due to the fuel trade demanded various professions around the wharfs. For example, the volume of the trade necessitated the employment of numerous porters at the wharfs who carried the charcoal sacks. When the fuel was mixed with dust and dirt, it was processed by sifters. Furthermore, there were weighmasters at each wharf who determined the amounts of the loads before shipment. Sometimes another person was charged with recording the measures.[46]

3.2.4 *Challenges for Wood Fuel Production and Transportation*

The fuel provisioning of the capital city could not be maintained properly due to problems hindering production in the hinterland. Weather conditions and labor scarcity were major obstacles to a smooth production process.[47]

Because woodcutting and charcoal making were outdoor activities, wood fuel production was closely related to weather conditions. As mentioned before, winter was a dead season for fuel making due to the cold weather. Thus, logging generally began in March and the fuel production continued until November, but extreme rainfall could hurt charcoal making and fuel transportation in any season. For example, rainy and stormy weather obstructed fuel procurement in the summer of 1895, especially from the coasts of the Black

46 BOA, MVL 302/78, 29 Ra 1273 (27.11.1856); BOA, MVL 177/13, 19 Ra 1273 (17.11.1856).

47 Öztel defines four groups of problems in the provision of fuelwood to Istanbul: Issues with the administrative system, weather conditions and infrastructural problems, profiteering and monopolistic tendencies, and other indirect factors like wars, fires in the capital city, and banditry. See Öztel, "Odun ve Kömür'ün (Mahrukat) Üretim Süreci.,.": 287-303.

Sea.[48] Following heavy rain, earth roads turned to mud which made transportation hard for the cart drivers.[49]

Wood fuel production around Istanbul suffered occasionally from labor scarcity, too. The lucrativeness of logging for lumber or the coercion of the axemen by the powerful merchants to cut for lumber instead of firewood exacerbated the labor shortage.[50] Yet the government was cautious to maintain the work force for fuel production. Local officials were continuously warned not to allow woodcutters to work in the lumber business.[51]

Since a clear majority of the woodcutters were peasants from villages who also engaged in agriculture, labor scarcity was acute in the harvest seasons. Farmers had to devote a considerable portion of summer to reaping and threshing which lasted until mid-August.[52] Thus, fuel production and transportation in most places were conducted at times "before sickle and after threshing."[53] Due to the decrease in wood fuel production during the harvest season, firewood and charcoal were categorized by fuel merchants as summer and autumn firewood and charcoal.[54] Although Ottoman administrators were insistent about increasing the fuel supply in the production areas, they did not interfere with agricultural labor even during fuel crises.[55]

Labor scarcity was also related to the vulnerability of peasants with respect to security. Especially during the chaotic atmosphere of the eighteenth century, forests were insecure places. Moreover, peasants were helpless against the cruelties of other actors in the fuel business. The flight of 1000 of 1300 peasants from the cutting zone in 1767 best illustrates the difficulties faced by the

48 Azmi, "Mahrukat Meselesi," OMAM, no.5, 204.

49 BOA, MVL 318/83, 5 Ca 1274 (22.12.1857).

50 BOA, C.BLD 143/7119, 29 B 1203 (25.04.1789) and BOA, C.BLD 38/1890, 1231 (1816).

51 BOA, C.BLD 33/1628, 29 Ra 1218 (19.07.1803).

52 Azmi, "Mahrukat Meselesi," OMAM, no.4, Teşrinsani 1333 (November 1917): 113.

53 Azmi, "Mahrukat Meselesi," OMAM, no.5, 201.

54 Ibid. While summer firewood/charcoal denoted the wood fuel produced before the harvest season, the other involved wood fuel production after mid-August.

55 BOA, İ.DH 775/63088, 23 L 1295 (20.10.1878).

workers. A related document points out that bandits in the mountains and oppression by the boatmen were the reasons for this collective flight.[56]

The labor problem in the hinterland became more serious when woodcutters were conscripted for military campaigns. In 1787-1792, the period during which the Ottoman Empire was fighting against Russia and Austria, the conscription of peasants interrupted the wood fuel business in the areas of primary production. Because of the insufficient labor force, the desired amount of wood fuel could not be prepared and delivered to the wharfs. Consequently, some ships sent from Istanbul to transport wood fuel returned empty.[57]

Not only insufficient human labor but also the inavailability of animal labor, which was indispensable for the wood fuel trade, occasionally caused problems. Epidemics of murrain, which caused death of numerous working animals, for example, interrupted the land transportation of firewood and charcoal.[58] Moreover, the claims of other businesses on draft animals deteriorated wood fuel transportation. In such cases, the government had to intervene in the local trade to reserve beasts of burden for the fuel business.[59]

§ 3.3 Wood Fuel Trade in the City and Its Hinterland

The wood fuel needs of the capital city necessitated a voluminous trade organization and a well-functioning logistical system. There were various agents in the wood fuel trade network that supplied firewood and charcoal to the city. This section discusses the evolution of trade mechanisms and the means of transportation in the course of history.

3.3.1 *General Features of the Wood Fuel Trade*

Aynural defines three means of fuel consignment to Istanbul in the eighteenth century. First, tradesmen specializing in the wood fuel business in Istanbul went directly to fuel sources. They either bought firewood and charcoal from

56 BOA, C.DH 205/10242, 1181 (1768).

57 BOA, HH. 11619 (1204) in Batmaz et al., *Osmanlı Ormancılığı*, vol.1, 53.

58 Azmi, "Mahrukat Meselesi," OMAM, no.7, 209.

59 BOA, A.MKT.UM 199/4, 06 L 1271 (22.06.1855)

peasants or produced the fuels themselves. The transportation of the products from woodlands to wharves and from wharves to Istanbul was accomplished by the tradesmen. Second, peasants conveyed wood fuel they produced to wharves by their own means and sold it to boatmen who transported the loads to Istanbul. Third, peasants from the surroundings of Istanbul transported wood fuel directly to the city by means of animals and carts and sold it themselves.[60]

This was the conventional scheme for the wood fuel provisioning of the capital city, and it continued in part throughout the nineteenth century. Loggings in this traditional system took place mostly in common or private woodlands. Moreover, some forests were allocated for the public use – such as the fuel needs of the palace or public production plants, within a system called *ocaklık usulü*. In the traditional provisioning system, *narh* (price ceilings) was an influential tool by which the government supplied wood fuel to the city dwellers at affordable prices, especially before the 1850s.

The beginning of the Tanzimat era in 1839 was a turning point for fuel procurement. The *ocaklık* system was abolished and from this time forward, wood fuel necessary for public buildings and production plants was purchased from fuel merchants on the open market.[61] In the 1840s, prices started to be determined through negotiations between government agencies and wood fuel merchants. Around 1860, merchants' reluctance to deliver firewood and charcoal at fixed prices led the government to retreat from the *narh*. Finally, in June 1865, *narh* was abrogated for the retail of all basic goods with the exception of bread.[62]

The second half of the nineteenth century witnessed the emergence of larger merchants in the wood fuel business called *mültezim*s. These merchants made contracts with the government for the delivery of considerable sums of firewood and charcoal and tended to monopolize the fuel markets in which they did business.[63] However, smaller fuel producers and merchants managed to take part in the wood fuel trade up until the end.

60 Aynural, "Provision of Wood and Coal," 157.

61 BOA, İ.MVL 1/22, 18 S 1256 (21.04.1840).

62 Ergin, *Mecelle-i Umur-ı Belediyye*, vol.1, 449-50.

63 BOA, ŞD 766/29, 14 R 1310 (05.11.1892).

3.3.2 *Wood Fuel Logistics*

Marine vessels were the most important means of transporting wood fuel to Istanbul. Ships and boats like *çekdirme*, *çekeleve*, *çenber*, *mavna* and *kayık* were the major kinds of cargo vessels that carried wood fuel. In addition to sea borne fuel provisioning, draftt animals and later, railway transportation conveyed considerable amounts of firewood and charcoal to the city.

Early in the nineteenth century, each wharf that specialized in the fuel trade was monopolized by a certain group of boat owners. Most of these captains directly engaged in commercial activities. In other words, they were not confined to the transportation of wood fuel to Istanbul but rather they purchased goods from the hinterland and sold in the city center. Table 3.5 shows that twenty-two *çenber*s and two *kayık*s navigated between Midye and Istanbul in 1808.

The table shows that most captains transporting wood fuel from Midye resided in various quarters along the Golden Horn and Bosphorus. They were concentrated in Tophane, Unkapanı and Balat. While some captains operated a single vessel in the fuel business, some owned two or three. Around the same time, the number of çenbers in the Thracian coastal town of Ahtabolu was twenty-three, and there were ten in Vasilikoz, a relatively smaller village.

Table 3.5 Boat Owners Working between Midye and Istanbul (1808)

Residence	Name	Type of vessel	Number of vessels
Galata	Hacı Osman	Kayık	2
Balat	?	Kayık	1
Balat	Adetin?	Çenber	1
Balat	Yorgaki	Çenber	1
Balat	Yorgi	Çenber	1
Tophane	Hacı İbrahim	Çenber	1
Tophane	Paşa	Çenber	1
Tophane	?	Çenber	1
Unkapanı	?	Çenber	2
Unkapanı	Yemandi?	Çenber	1
Unkapanı	İbrahim	Çenber	2
Unkapanı	Hacı Mahmud	Çenber	3
Unkapanı	Peraşkoh?	Çenber	1
Unkapanı	Tarnus?	Çenber	1
Fındıklı	Mustafa	Çenber	1
Salıpazarı	Kethüdazâde Recep	Çenber	1
Bahçedere	Kömürcü Küçük Ali	Çenber	2
Midye	Hacı Mahmud-Papazoğlu	Çenber	1

SOURCE: BOA, C.BLD 73/3628, (1808)

The maintenance of fuel transport via sailboats was highly dependent to weather conditions. As in the case of production of firewood and charcoal, sailing was generally a non-winter activity. The boats working in firewood and charcoal transport could sail to fuel sources around the Sea of Marmara up until November. Weather conditions on the Black Sea were more arduous which further limited the transportation period. Since works along the southern coast of the Black Sea suffered occasional storms after August, sailing was deemed dangerous in autumn.[64] Unpleasant weather conditions could hinder fuel transports to the city even in summer. In 1897, for example, northern winds that unexpectedly began to blow in June detained sailors conveying

64 BOA, MVL 263/33, 22 M 1270 (25.10.1853).

wood fuel from Black Sea forests. The windy period lasted two months during which not a single boat could sail.[65] Another issue for sailing ships and boats that pertained to winds concerned passing through the Bosphorus. Adverse winds made it difficult especially for vessels sailing from south to north.[66] There was no solution to this problem before the steam engine reached the empire. In other words, fuel transportation to the capital city via boats was heavily influenced by the natural conditions.

The spread of steamers in Ottoman waters played a pivotal role in overcoming natural obstacles regarding wood fuel transportation. Steamships were employed either to pull sailing vessels through the Bosphorus or to transport wood fuel from distant regions. Archival evidence shows that boats began to be assisted by steamships at the end of the 1850s. When charcoal vessels failed to navigate the Bosphorus in 1858, for instance, a steamer from the Imperial Dockyard tugged them to the Black Sea.[67] This method was frequently mentioned in ensuing decades as a last resort in times of crises.[68]

Steamers transported both firewood and charcoal to the capital when sailboats failed to meet the city's needs. The government regarded steamships as an alternative to sailing vessels especially during adverse weather conditions.[69] Consequently, the seasonal time span for wood fuel transportation to Istanbul was extended. To exemplify, in 1858 the *Tair-i Bahri* steamer conveyed fifty tons of charcoal to the capital city from Salonica at the beginning of March, which was not a suitable time for sailboat navigation.[70] In the first decade of the twentieth century, larger steamers conveyed higher amounts of wood fuel from various points of the hinterland.[71]

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65 Azmi, "Mahrukat Meselesi," OMAM, no.4, 116.

66 BOA, A.MKT.MHM 75/22, 29 Z 1271 (12.09.1855).

67 BOA, A.MKT.MHM 126/62, 8 B 1274 (22.02.1858).

68 BOA, İ.DH 775/63088, 23 L 1295 (20.10.1878); BOA, BEO 3149/236151, 13 Ş 1325 (01.10.1907).

69 BOA, MVL 318/98, 23 R 1274 (11.12.1857). The government ordered the local administrators of Salonica to use steamships if the weather was not suitable for sailing.

70 BOA, A.MKT.MHM 127/56, 21 B 1274 (07.03.1858).

71 BOA, DH.MKT 987/3, 12 Ca 1323 (15.07.1905). For example, the *Asir* steamer's load bearing capacity was not lower than 7500 tons.

Railway transportation emerged as an alternative means of transportation for wood fuel in the 1870s.[72] Though both the Anatolian and Rumelia railways reserved wagons for fuel transportation, the role of trains in charcoal transportation from Thrace was more significant. After being produced in the Istranca Mountains, charcoal was transported to nearby railway stations like Çatalca, Kabakça, Sinekli, and Çerkesköy.[73] The charcoal that piled up around the stations belonged to the merchants who transported it to Istanbul occasionally.[74]

In the early twentieth century, with the development of steam transportation, the flow of wood fuel to the city continued year-round, yet in smaller quantities in winter compared to other seasons. Figure 3.1 shows the seasonal distribution of wood fuel arriving in the city in 1906. Firewood and charcoal shipments were intensified in different periods. While about 70 percent of firewood was delivered between April and June, the busiest period for charcoal transportation was between June and October. The main reason for this difference was the time-consuming, laborious nature of charcoal making.

72 BOA, ŞD 686/10, 26 Z 1294 (01.01.1878).

73 BOA, DH.MKT 2410/116, 9 C 1318 (04.10.1900).

74 BOA, DH.MKT 987/3, 12 Ca 1323 (15.07.1905).

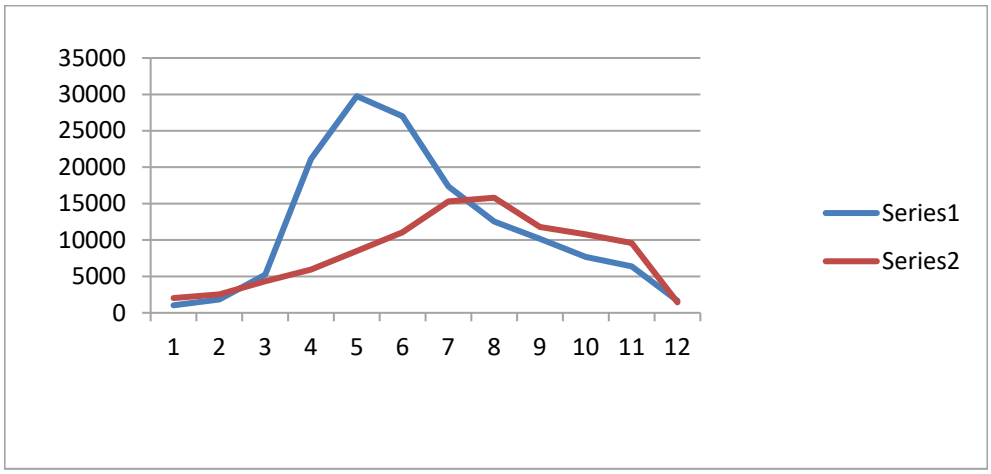


Figure 3.1 Wood Fuel Arrivals to Istanbul in 1906 (BOA, Y.PRK.UM, 79/72, 28 M 1325 (13.03.1907))

The need to dry felled trees for a few months and the slow carbonization process delayed the annual shipment of charcoal. The highest amount of firewood was about 30,000 tons arrived in the city in May, and the lowest was 1000 tons in January. The highest and lowest figures for charcoal were 15,800 tons delivered August and about 1500 tons delivered in December.

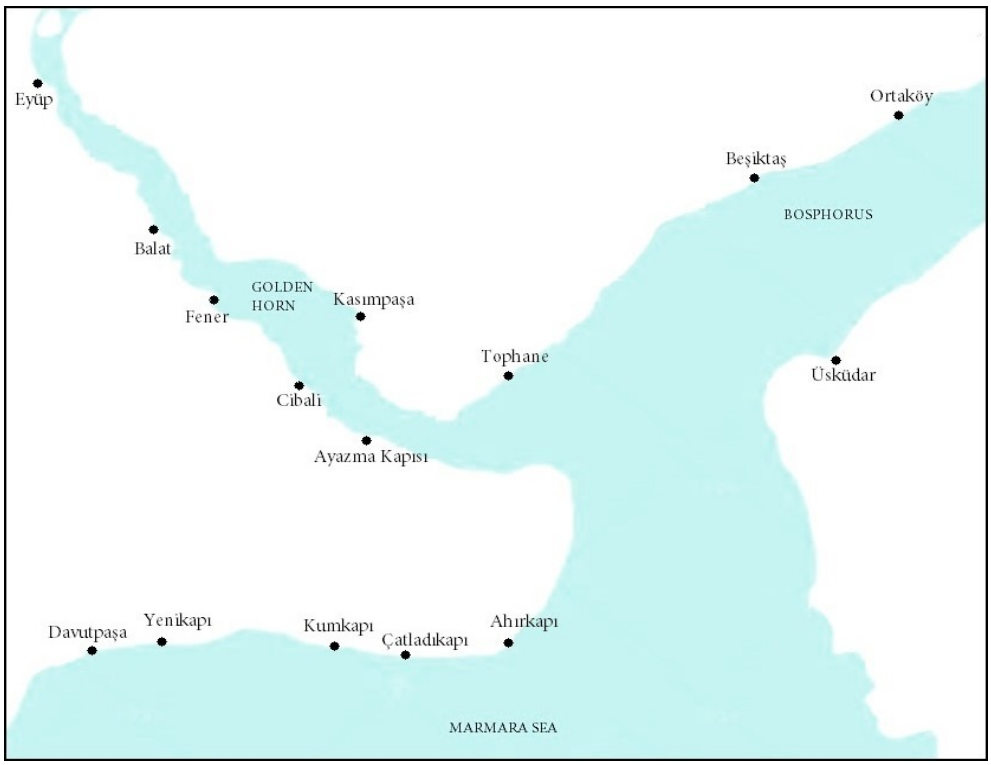
3.3.3 *Wood Fuel Trade in the City Center*

Loads of firewood and charcoal conveyed to Istanbul by sea were unloaded in different parts of the city. In the 1840s, the wharfs of the Golden Horn situated in Ayazma, Kasımpaşa, Odunkapı, Fener, Balat, Cibali, and Eyüp were the major locations for the discharge of wood fuel. On the other side of the Sarayburnu peninsula, Yenikapı, Ahırkapı, Çatladıkapı, Kumkapı, and Davutpaşa assumed the same role.[75] In addition, districts along the Bosphorus like Beşiktaş, Ortaköy, and Üsküdar were other significant hubs for wood fuel shipments. In the 1890s, large deposits of firewood and charcoal in Tophane and Fındıklı were functional in meeting the fuel needs of the city.[76]

75 BOA, A. MKT 116/18, 16 R 1264 (22.03.1848); BOA, A.MKT. 116/29, 17 R 1264 (23.03.1848).

76 Giraud, "Combustibles," 127.

The arrival points, for both sea and land transportation were important locales for wood fuel trade. Vital Cuinet draws a detailed picture of the traditional fuel trade on the Asian side of Istanbul in the 1890s. Üsküdar was the major hub of the wood fuel trade where firewood and charcoal from various sources were sold. Sales were made in two main areas. One was at the upper side of the district, adjacent the Armenian cemetery. Each Friday and Sunday around 300 carts of charcoal and twenty to thirty carts of firewood were gathered there. In the 1890s, the price of charcoal at this market varied from 160 to 300 piasters per cart, with an average of 220 piasters. One cart of firewood was sold for between forty to piasters, with forty-eight piasters being the average. The annual sales are estimated to have been 31,200 carts of charcoal and 2600 carts of firewood.



Map 3.1 Major Wood Fuel Wharfs in Istanbul

The second location for the sale of firewood and charcoal in Üsküdar was the vast space between the Mihrimah Sultan Mosque and the two jetties for the steamers of *Şirket-i Hayriye*. This square was a well-maintained firewood yard

and storage space for lumber and logs. The average price of a *çeki* (225 kilograms) of firewood was nineteen piasters. With an average sixty-eight tons of sales each day, the total annual value of firewood sold there exceeded 2 million piasters. There were always large charcoal boats situated along the shore. The loads of the boats are estimated at forty tons, which were worth 11,250 piasters. Accounting for twenty such shipments a year, the total value of charcoal conveyed solely by boats reached 225,000 piasters. Charcoal was sold directly from the boats at lower prices.[77]

Photograph 3.1 A Firewood Dealer and Woodpiles in Ahırkapı (c.1880) (Photograph by Sebah & Joaillier)

Besides sales at the quays and marketplaces, a group of tradesman called *kömürcü esnafı* sold charcoal in urban areas. After buying charcoal from the producers, they transported fuel to shops either by their own means or by renting boats. The shops they owned were designed as warehouses. After storing fuel until the late autumn, they sold the fuel wholesale or retail during the winter. Since fuel was a general need, they maintained their businesses in various locations around the city. Kasımpaşa, Tophane, Üsküdar, and Ortaköy

77 Cuinet, *La Turquie d'Asie,* vol. 4, 621-23.

were among the leading places for charcoal storage and retail.[78] Yenikapı and Galata were also two important locales where charcoal sellers gathered.[79]

Lastly, there were street peddlers who would carry two sacks of inferior charcoal on their backs and sell the fuel by shouting their presence in.[80] Since firewood was conveyed to Istanbul as bulky pieces, it needed to be cut before being sold. Most firewood arriving in the city was about 1.5 meters long and of various diameters. For stoves, branches were cut into pieces approximately 30 centimeters long. For other uses, like to boil water for washing, pieces were about 75 centimeters. Cutting the firewood down was done by Muslim axemen who could cut up to five tons a day. Often this took place in the streets in front of buyers' houses.[81] Thus, wood fuel sale and related processes took place in every corner of the city.

3.3.4 *Malpractices in the Wood Fuel Trade*

The ideal of Ottoman economic philosophy was the well-being of society, which could be attained by putting the desire for profits aside, especially in the trade of basic goods.[82] However, it is hard to say that this idealized world matched reality. Ottoman commercial life was characterized by various forms of malpractice especially in times of crises. Black marketeering, hoarding and profiteering were common practices in the Ottoman economy, that are frequently discussed in archival documents.[83]

78 BOA, MVL 814/90, 13 S 1275 (22.09.1858).

79 BOA, DH.MKT 1602/42. 5 B 1306 (07.03.1889) and BOA, MVL 396/55, 13 S 1279 (10.08.1862).

80 Giraud, "Combustibles," 128.

81 Giraud, "Combustibles," 129.

82 Kemal Karpat, *Ottoman Population, 1830-1914: Demographic and Social Characteristics*. (Madison, Wis: University of Wisconsin Press, 1985), 89.

83 The umbrella term for these illegal actions in the Ottoman economy was *ihtikâr*. For an analysis of *ihtikâr* in the nineteenth and early twentieth centuries, see Muharrem Öztel, "Tanzimat Devri ve Sonrasında Osmanlı Piyasalarında İhtikâr Sorunu," *International Journal of History Studies* 5, no.2, A Tribute to Prof. Dr. Halil İnalcık, (March 2013): 303-325. For his more detailed discussion of *ihtikâr* in the wood fuel trade see Öztel, " Odun ve Kömür'ün (Mahrukat) Üretim Süreci..,": 283-305.

Fuel as a basic need for life was subject to frequent skulduggeries. The problems concerned the physical condition of the fuels and the monopolistic and speculative behaviors of merchants. A common grievance regarding wood fuel was the dust content of charcoal. It was difficult for Ottoman colliers to produce dustless charcoal since production took place in earthen kilns. Taking the nature of production into consideration, the government allowed up to 10 percent of foreign matter in the charcoal piles. However, because of the rapacity of some intermediaries in the business, dust content could reach up to 50 percent, which was not an acceptable level.[84]

In the mid-nineteenth century, the government tried to tackle this problem by making the sifting of charcoal obligatory. Though the policy was limited Thrace, the sifters placed in the wharfs contributed to cleaner charcoal. When charcoal piles in Silivri were processed, for instance, the amount of a load sometimes decrease by 35 percent, from twenty-eight to eighteen tons.[85] This clearly shows the level of duplicity by which certain people made unlawful fortunes.

Charcoal was sometimes further adulterated in the city center. Taking advantage of insufficient inspections, charcoal sellers added various materials to the fuel. A prominent journalist, Basiretçi Ali Efendi, reported in 1874 that some retailers carried sacks of sand and soil to their stores at nights. Wetting the fuel was another form of fraud, widely employed to increase the apparent weight. Gravel and small pieces of tile were also materials mixed with charcoal.[86] Thus, it was a challenge for city dwellers to find clean fuel, especially during shortages, which strengthened the hand of sellers.

The market had always suffered from the profiteering of the fuel merchants. In the eighteenth century, middlemen obtained all fuel either by purchasing firewood and charcoal directly from producers or from boats in the Bosphorus before their arrival at the city center. To take the advantage of higher prices, they did not put their wood fuel on the market until winter.[87]

84 BOA, A.MKT.UM 20/38, 16 Ş 1266 (27.06.1850).

85 BOA, MVL 302/78, 29 Ra 1273 (27.11.1856).

86 Basiretçi Ali Efendi, *Istanbul Mektupları,* ed. Nuri Sağlam (Istanbul: Kitabevi, 2001), 266.

87 Aynural, "Provision of Wood and Coal," 160.

Black market activities continued in a similar fashion in the nineteenth century. Hiding charcoal or firewood in stores in order to mark up the price was a common form of abusing the system by wood fuel sellers.[88] Investigations conducted by government agencies in 1855 revealed that racketeers stockpiled around 40,000 tons of firewood at various points around the city to sell the fuels at higher prices in winter.[89] This considerable amount indicates the severity of the problem.

Profiteering could be observed not only in the city center but also in the hinterland. Wharfs along the southern coast of Thrace, for example, were notorious for occasional manipulations of the fuel market in the mid-eighteenth century.[90] Wood fuel merchants in the nineteenth century inherited this chicanery from their predecessors and put it into practice whenever there was a suitable environment for corruption. In one such case, a group of local merchants at the Sultançiftlği wharf stored around 160 tons of charcoal that should be delivered to Istanbul at the earliest opportunity.[91] Overall, these illegalities made government supervision of the fuel trade necessary.

§ 3.4 The Role of the Government in Istanbul's Fuel Supply

The strategic value of firewood and charcoal for the capital city necessitated governmental organization, which endured for centuries. As cited in many archival documents pertaining to Istanbul's fuel supply, "protection of servants of Allah from shortages and poverty"[92] was among the major duties of the administration. Though there were differences at the practical level, this discourse guided Ottoman officals until the end of the empire.

Archival research shows that wood fuel provisioning was closely supervised by the government until the 1840s, reflected in the yearly orders issued

88 BOA, A.MKT.MHM 61/52, 23 S 1271 (15.11.1854).

89 BOA A.MKT.NZD 165/17, 19 M 1272 (01.10.1855).

90 Ahmet Tabakoğlu, ed., *Istanbul Ahkâm Defterleri/ Istanbul Esnaf Tarihi,* vol.1 (Istanbul: İBB Istanbul Araştırmaları Merkezi, 1997), 53.

91 BOA, MVL 302/78, 29 Ra 1273 (27.11.1856).

92 The original statement is "*ibadullahın müzayaka ve zaruretten vikayesi.*" See, for example BOA, A.MKT.UM 73/35, 5 Za 1267 (01.09.1851).

to administrators of the areas of primary production. The frequency of correspondence between the central government and local administrators diminished in ensuing decades. It was then mostly in times of crises that the government intervened in the wood fuel trade and adopted strict measures to provide city dwellers with enough fuel at affordable prices. Throughout history, the Ottoman government regulated the fuel provisioning of Istanbul via the institutions discussed below.

3.4.1 *Istanbul Ağası*

Before 1826, ensuring the wood fuel supply of the capital city was the task of a Janissary officer called *Istanbul Ağası*. Among his main duties were procuring firewood for the palace and regulating the distribution of wood fuel to city dwellers. Soldiers under his command were employed either to escort fuel shipments along the Bosphorus or to unload of the boats.

Though this institution was expected to ensure Istanbul's fuel supply, it is hard to say that the system worked properly. According to Osman Nuri Ergin, one of the main reasons for early fuel shortages in the capital city was the Istanbul Ağası himself. Especially cruelties against sailors discouraged them from transporting firewood to the city. Most of the firewood that arrived in the city was seized by the *ağa* at reduced prices and registered as *derya mübâyaası* (purchase at sea). Consequently, to protect themselves from shortages, some groups of artisans cooperated, built ships, and obtained wood fuel from the hinterland themselves.[93]

If the *ağa* did not fulfill his duties to provision fuel, the sultan could discharge him. When Mehmed Ağa fell short in providing firewood for the palace and the city dwellers in 1801, for example, he was not only dismissed from his

93 Ibid., 797-99. For example, at the beginning of the nineteenth century, artisans producing red dye in Langakapısı took action to obtain their own firewood themselves. Accordingly, these artisans hired nine lumberjacks from Katırlı village near Yalakabad (Yalova) who were to cut trees in the mountains there and transport them with nineteen mules. They also employed a sailor to transport the fuel to their workshops in Istanbul on a boat, with a payload capacity of about twenty tons. See BOA, C.BLD 35/1709, 1219 (1804).

position but also exiled to Cyprus.[94] This shows that failure in wood fuel provisioning was an inexcusable from the government's point of view.

3.4.2 *İhtisab Nezâreti*

After the disbandment of the Janissary corps in 1826, fuel procurement began to be supervised by the newly established İhtisâb Nezâreti.[95] Though wood fuel provisioning was not directly cited as a primary duty in the regulations of the *nezâret*, archival evidence shows that this institution played an active role both in the procurement and retail sale of firewood and charcoal.[96] However, it is hard to say that the *nezâret* generated a proper solution to the overall fuel problems of the city.[97]

Unlike the Istanbul Ağası, who dominated boatmen, the *nezâret*'s power vis-à-vis wood fuel merchants seems to be eroded by the 1840s. In 1848, due to a fuel shortage in the previous year, officials under the İhtisâb Nezâreti organized a meeting with forty-four colliers and charcoal merchants in the city. They were asked about the current stock of charcoal and the condition of the fuel market. After detailed talks, a price ceiling was determined to which both merchants and city dwellers consented. The fuel merchants signed a covenant promising to provide a sufficient amount of charcoal to the inhabitants of the city. The charcoal would be of high quality, pure, and dry. In case of a fraud like selling charcoal for higher prices or adding dust or dirt to the fuel, they

94 BOA, HH. 15920 (1800-1801) in Batmaz et al., *Osmanlı Ormancılığı,* vol.I, 63.

95 The *ihtisâb* institution has Islamic roots, and its history in the Ottoman Empire can be traced to the reign of Osman Gazi. Though the institution had more religious concerns in the Islamic World, its Ottoman manifestation focused more on the daily practices of commercial life. See Ziya Kazıcı, *Osmanlı'da Yerel Yönetim (İhtisab Müessesesi)* (Istanbul: Bilge Yayıncılık, 2006) and Ergin, *Mecelle-i Umur-ı Belediyye*, vol.1, 325-47.

96 BOA, A.MKT.MVL 11/33, 11 Z 1264 (08.11.1848).

97 In 1839, the bakers of Istanbul were having difficulties finding firewood on the market, especially in winter. Given the inadequacy of the fuel, bread could not be cooked properly at times. The solution to the problem was to construct two boats, one by the chamberlain of bakers and the other by the light bread makers, which had load capacities of ninety tons. These boats were not to be used for any other business except for the provision of fuel, and they were to continously provide firewood for the bakeries. See BOA, HAT 681/33191, 29 Z 1254 (15.03.1839).

consented to serious punishments like being put in a galley as a rower.[98] Thus, while the state maintained a regulatory function in the provisioning of fuel, talks with producers and dealers indicate the increasing bargaining power of these agents.

3.4.3 *Şehremaneti*

In 1854, İhtisâb Nezâreti was replaced by a new municipal organization called the Şehremaneti. This new institution inherited certain traditional duties of the previous body. According to the sixth article of the municipal regulation, the Şehremaneti was charged with the proper procurement of the vital needs of city dwellers.[99] The fuel provisioning of the capital city was thus regulated by the Şehremaneti until the end of the empire. This institution adopted the tools of previous institutions like making contracts with wood fuel merchants, supervising production and transportation in the hinterland, and coordinating various branches of the central government and local administrations. Despite having better technological instruments, Ergin notes that the Şehremaneti like previous institutions, failed to develop a well functioning system. In the first decade of the twentieth century, only 5 percent of the charcoal necessary for the city could be procured through municipal agencies.[100]

3.4.4 *Government Intervention during Crises*

As the population increased, the provisioning of fuel for the city became a more challenging task. Cold winters exacerbated fuel shortages, which put an additional burden on the government. The government had to pay more attention to procuring enough firewood and charcoal during crises. 1848, 1858, 1898, and 1907 were major crisis or post-crisis periods during which governmental supervision of the fuel issue was intense.

States of emergency can easily be traced in the correspondence within and among the central government and local administrations. Research shows that

98 BOA, İ.MVL 126/3252, 18 L 1264 (17.09.1848).

99 İlber Ortaylı, *Tanzimat'tan Sonra Mahalli İdareler (1840-1878)* (Ankara: Türkiye ve Ortadoğu Amme İdaresi Enstitüsü Yayınları, 1974), 118-19

100 Azmi, "Mahrukat Meselesi," OMAM, no.5, 131.

prior to the 1850s, government intervention was not directed at solving problems during times of shortage, but rather took place the following year as a precaution against a possible second crisis. In other words, unexpected crises could not be tackled by the administrators timely and led to vigorous efforts to insure against a possible shortage of fuel the following year. Taking lessons from the severe fuel shortage of winter 1848, the state tried to take full control of the wood fuel flow to the city for the next winter. In May 1848, the sultan himself ordered the appointment of officials to the key forest regions. These officials were to supervise the production and transportation of wood fuel.[101]

As mentioned, unpleasant winters easily led to shortages if the fuel stock was insufficient. One such season distressed city dwellers in 1857-1858. Ahmet Cevdet Paşa, a statesman and historian of the late Ottoman Empire, narrated this extraordinary winter as follows:

> The weather turned rainy and stormy in August and remained inclement. It started snowing on the twentieth day of December and became freezing cold. Older people stated that they had never witnessed such a long, hard winter … That year snow continued three months and instead of *cemerât,*[102] snowflakes fell. Ultimately, snow turned to rainfall on the twentieth day of February."[103]

The inclement weather as early as August alerted the government to the wood fuel issue in autumn. The central government stimulated local administrators of major fuel producing regions like Izmit, Biga, Silivri, Salonica, and Varna to closely monitor the production and trade of firewood and charcoal.[104] Sending staff to the major wharfs was one measure to regulate wood fuel flow to

101 BOA, İ.MVL 120/3011, 2 C 1264 (06.05.1848).

102 Plural form of *cemre*, which connotes the warming of the weather, water, and soil in Turkish mythology.

103 Ahmet Cevdet Paşa, *Tezâkir* (13-20), ed. Cavid Baysun (Ankara: Türk Tarih Kurumu Basımevi,1986), 46.

104 BOA, A.MKT.UM 298/48, 5 R 1274 (23.11.1857).

the capital city.[105] A special officer was sent to Varna to oversee the fuel business and prevent firewood exports to foreign countries.[106]

The emphasis of the central government on the fuel provisioning of Istanbul was reflected at a practical level. In Izmit, ordinary peasants who had nothing to do with charcoal making were encouraged by local administrators to produce fuel.[107] In Thrace, renting carts from the neighboring farms became necessary since the production of the charcoal kilns accelerated.[108] For the first time in Ottoman history, steamers became an alternative means of wood fuel transportation to the capital city from distant regions.[109]

The government became more involved in fuel procurement after noting the increase in fuel prices in 1897. In order to investigate the reasons for the increases in firewood and charcoal prices, a private inspector, Hoca Ali Rıza Efendi, was sent to the Anatolian coasts of the Black Sea the following year. The inspector visited all wharfs down to Bartın to estimate the amount of firewood that could be prepared by the peasants. His primary goal was to compare that year's total with that of previous years. It was determined that the total volume of the firewood could surpass the average if necessary measures were taken.[110]

According to Ali Rıza Efendi, the major reason for the expensiveness of the firewood was not insufficient supply but the rapacity of fuel merchants. The price of wood in production areas was not different from previous years. Firewood merchants were paying local producers five and a half to six piasters for each *çeki* of firewood and selling the same amount for twenty to twenty two piasters in Istanbul. There was no sound reason for these high prices considering the huge discrepancy between the numbers. Merchants were intentionally slowing down the flow of firewood to the city center to keep prices

105 BOA, A.MKT.NZD 237/52, 4 S 1274 (24.09.1857).

106 BOA, MVL 317/47, 4 R 1274 (22.11.1857).

107 BOA, MVL 318/42, 21 R 1274 (09.12.1857).

108 BOA, A.MKT.UM 300/23, 18 R 1274 (06.12.1857).

109 BOA, MVL 318/98, 23 R 1274 (11.12.1857).

110 Azmi, "Mahrukat Meselesi," OMAM, no.4, 111.

high.[111] Though the perpetrators of the fuel problem were identified, the government fell short of providing effective solutions.[112]

Winter 1906-1907 was another hard season that led the government to closely monitore the firewood and charcoal supply of the capital city. To organize and supervise fuel procurement, a special commission was established under the presidency of the Minister of the Interior.[113] This commission worked in coordination with the Ministry of Forests, Mines, and Agriculture. One of the first steps taken by the commission was to find funding for ministry officials assigned to ensure the proper functioning of the fuel trade mechanisms in the hinterland. *Ziraat Bankası*, the financial institution for forestry revenues, granted a loan of 9000 lire to be spent for fuel provisioning. As in the previous cases, officials sent to the fuel producing areas were expected to supply enough firewood to the market to keep the prices low.

Numerous records sent to the Ministry of the Interior from wood fuel provinces indicate that this was the most serious campaign of the Ottoman government to provision fuel for the capital city. The governors of the provinces prepared detailed reports, which involved the amounts of wood fuel in production areas, production costs, and transportation opportunities in the hinterland. The contents of the documents hint at the level of mobilization incited by the government.

According to a paper written by the governor of Edirne, the railway company occasionally assigned six or seven wagons for fuel loads from the Sinekli railway station of Çatalca. From March to July, eighty-seven wagons of charcoal were transported from this station to Istanbul. The total amount of charcoal sent from this station in one year is estimated at 9500 tons, which would have been carried by around 700 wagons. Furthermore, several steamships belonging to the navy were frequently employed to ship firewood from coastal regions.[114]

Another important step taken by the government to ensure the firewood and charcoal supply of the capital city was the prohibition of wood fuel

111 Azmi, "Mahrukat Meselesi," OMAM, no.4, 116-17.

112 Azmi, "Mahrukat Meselesi," OMAM, no.4, 131.

113 BOA, İ.OM 12/25, 2 B 1325 (11.08.1907).

114 BOA, DH.MKT 987/3, Ağustos 1323 (August 1907).

exports. In June 1907, the Minister of Forests, Mines and Agriculture issued an order to fuel exporting provinces regarding the prohibition. Pointing to the fuel shortage in Istanbul the previous winter, he warned local administrators to block flows of wood fuel to neighboring countries like Greece and Romania.[115] The prohibition was considered a general order that concerned all Anatolian provinces including Teke, Menteşe, and Adana which exported firewood and charcoal to Egypt. However, subsequent correspondence clarified that the prohibition was confined to provinces that supplied fuel for Istanbul.[116]

§ 3.5 Conclusion

In the Ottoman Empire, which experienced limited industrial development and little technological change, gradualism with respect to energy transition was the norm - even in the most developed regions. Given its low energy consumption path, firewood and charcoal remained the main sources of thermal energy for Istanbul until the demise of the empire. Lower prices were the most important reason for the preference of wood fuel.

Firewood and charcoal were supplied from various forestlands located in Anatolia and Rumelia. Vegetation-rich regions in the hinterland sufficed for the thermal energy needs of the capital city. Produced by ordinary peasants or professional colliers, wood fuel was transported to Istanbul by fuel merchants chiefly by water vessels. The fuels were generally sold at the wharfs, in certain squares around the city, and in the depots owned by the *kömürcü esnafı.* Despite the abundance of forestlands nearby, the city suffered from occasional fuel shortages due to problems in the organization of the trade and sometimes, due to unexpectedly cold winters.

The high population of the city, the fuel needs of imperial residences and the presence of various industrial plants and artisanal workshops that relied on thermal energy necessitated a continuous flow of wood fuel to the city, which had traditionally been undertaken by the state. In different periods, the

115 BOA, BEO 3089/231606, 13 Ca 1325 (24.06.1907).

116 BOA, DH.MKT 987/3, 12 Ca 1323 (15.07.1905).

government relied on various institutions, charged with providing sufficient firewood and charcoal at reasonable prices. In chronological order, *Istanbul Ağalığı*, *İhtisâb Nezareti,* and lastly the *Şehremaneti* undertook the regulation of the wood fuel business both in the hinterland and in the city center. While state intervention was intended to ensure a sufficient level of production and proper transportation of the goods from the hinterland, the main goal in the city center was to keep prices down by preventing speculation on the part of merchants.

The traditional provisionist understanding was no longer functional in the second half of the nineteenth century. Structural changes like the abolition of *ocaklık usulü* and *narh* denoted the collapse of two significant pillars of Ottoman provisionism. The government directly intervened in the wood fuel business only in times of crisis and in the form of general mobilization. Overall, even though the energy composition of the city changed little, the state's role in the energy economy was eroded in the nineteenth century.

4

Coal and the Steam Engine in the Ottoman Empire

Coal was in use for centuries in various parts of the world prior to the Industrial Revolution. Ancient China was the first geography in which coal was burned to obtain thermal energy. Europeans were among the early exploiters of this fossil fuel. Utilization of coal in Belgium can be traced to the twelfth century. With its rich coal deposits, England became the first country to exceed the limits of plant fuels in the sixteenth and seventeenth centuries. Most technological developments fostering the economic value of coal also took place in this country.[1]

Compared to Western Europe, coal was a latecomer in the Ottoman energy economy. The first encounter with coal occured in the late 1820s, and the first proper operations in domestic coal mines began in the 1840s. Yet the introduction and spread of coal and coal-fueled technologies took place more or less concurrently with other Mediterranean countries and the empire's northern neighbor, Russia. Starting in the first half of the nineteenth century, coal consumption in these countries gradually increased at different paces. Like other countries, Ottomans depended on coal imports from Britain and in addition to domestic sources.

This chapter discusses the introduction of coal as a novel source of energy in the Ottoman Empire, the utilization of this new fuel for various purposes,

1 Vaclav Smil, *Energy in World History* (Boulder: West View Press, 1994), 158-160.

and the technologies that made use of coal. Coal came to Ottoman lands as a "European" substance in both scientific and economic terms. The development of coal mining and the technical knowledge regarding the industrial use of coal in the country owed much to European personnel hired by the Ottoman government. However, there were strong constraints on an economic transformation based on coal and its technologies. In this chapter, I argue that scientific and technological backwardness were major obstacles for a successful energy transition in the country. On the supply side, deficiencies in scientific and knowledge led to belatedness in coal explorations, inefficacy in the examination of samples, and inefficiency in the operation of mines. On the demand side, limited adoption of coal-based technologies led to a low energy consumption path for the Ottoman economy.

The first part of this chapter examines the geological and mineral aspects of coal in the empire. Early discoveries, coal exploration around the country, and tests of coal samples are the main points of inquiry. The second part discusses the consumption of coal in the country distinguishing between thermal and mechanical uses of the energy. Like people in other parts of the world, Ottomans burned coal for various tasks like space heating, smelting, lime making, and generating motion via steam engines. Indeed, steam engines employed in transportation and industries consumed the lion's share of the country's coal consumption.

§ 4.1 Introduction of Coal to the Ottoman Empire

Early attempts to exploit and utilize coal in the Ottoman Empire can be traced to the eighteenth century. These initial quests were related to European technological developments that adapted coal for the smelting industry. The first coal mine discovered in Ottoman territories was one in Bosnia. Searching for mineral wealth in the Balkans, Comte de Bonneval (Humbaracı Ahmet Paşa) expected to find gold when this coal mine was excavated in 1731. It was a short-lived venture; the workers left the mine reproaching Bonneval regarding the

discomfort of their families.[2] Thus, this incidental discovery ended with no benefit.

Archival evidence indicates that there were efforts to mine coal and burn it for smelting in the second half of the eighteenth century. The pioneering figure in these early attempts was a French officer of Hungarian origin, Baron de Tott. In an age of military restructuring, a coal mine was opened on his initiative, probably to fuel the foundries of the Imperial Arsenal. Located in Yedikumlar, a coastal region in the north of Istanbul, this mine was active by 1773. However, due to problems in the extraction and transportation of coal, operations in the mine did not last long.[3]

A second wave of attempts to extract coal in the same region came in the 1790s. There was a request dated 1794 made by the *Kapudan Paşa* (Chief Admiral) to operate the aforementioned colliery and other coal mines that might be discovered in this area.[4] The request was initially declined, but another appeal followed two years later. This time the general of the bombardiers, (*Humbaracıbaşı*) Campbell Mustafa Ağa[5] asked for these coal mines. Similar to the proposal of Baron de Tott, the coal was to be used in military industry. He explicitly stated that cannon and musket balls produced in the arsenal were inferior to those of the English since charcoal made from trees could not provide the same heat energy as coal. For him, the coal of Yedikumlar could be used for candle and tile making, public baths, and - most importantly - in the arsenals for producing better-quality ammunition. The sultan responded to the request saying, "Let him extract coal, it is nice!"[6] Despite the fact that the

2 This information was given by a Venetian extraordinary ambassador. See Albert Vandal, *Une Ambassade Française en Orient Sous Louis XV: La Mission du Marquis de Villeneuve* (Paris : E. Plon, Nourrit et cie, 1887), 145.

3 BOA, AE.SMST.III 314/25224, 29 C 1187 (17.09.1773); BOA, HAT 240/13416, 29 Z 1210 (05.07.1796).

4 BOA, HAT 197/9882, 29 Z 1208 (28.07.1794).

5 For details about Campbell Mustafa Ağa's life, see Christopher Ferrard, "İngiliz Mustafa: A Scotsman in the Service of the Ottoman Empire," in *Yücel Dağlı Anısına: "geldi Yücel, gitti Yücel, bir nefes gibi…"*, eds. Evangelia Balta, Yorgos Dedes, Emin Nedret İşli and M. Sabri Koz (Istanbul: Turkuaz Yayınları, 2011), 232-39.

6 BOA, HAT 240/13417, 29 Z 1210 (05.07.1796).

Ağa was permitted to operate the mine and burn coal in the foundries, there is no record of him exploiting the coal. In 1795, the mines were granted to Küçük Hüseyin Paşa, the Chief Admiral of the period. After his death, another public official, Mahmud Raif Efendi, obtained the mines, but it seems that none of these men managed to put the Yedikumlar coal mines into operation.[7]

These examples demonstrate that coal was introduced to the Ottoman Empire in the eighteenth century as an integral part of early military reforms. The leading figures mentioned above were all Europeans employed by the Ottoman government to modernize the army. Thus, the Ottoman world became familiar with this alternative fuel via technological transfers pertaining to military reorganization.

§ 4.2 Searching for Coal

4.2.1 *Explorations Conducted by the Government and Private Entrepreneurs*

After about three decades, coal reached the country together with steam technology. The fuel needs of steam engines directed Ottoman administrators to find domestic sources to replace imported coal. The interest of Sultan Mahmut II in the mineral wealth of his dominion led David Urquhart to arrange an excursion around 1830 in Thrace where there were believed to be lignite veins. He found some specimens and tried to present them to the sultan. When officers moved away these samples, the sultan ordered the shipment of coal specimens from around the country to England for analysis. Yet, little progress was made on this promising project.[8]

The Ottoman government emphasized the minerals of the country from the 1830s onwards. As an integral part of the transfer of modern science and technology, the government began hiring foreign mining engineers who were

7 Kahraman Şakul, "Osmanlıların İlk Maden Kömürcülüğü Girişimi: Yedikumlar Kömür Madeni Mukataası," *Osmanlı Bilimi Araştırmaları*, XVIII/1 (2016): 43-46.

8 David Urquhart, *Turkey and Its Resources: Its Municipal Organization and Free Trade* (London: Saunders and Otley, 1833), 176-77.

expected to improve working mines and explore for new mineral sources around the country.[9] Along with other British technical staff, a mining engineer from Northumberland was employed in the late 1840s exclusively to search for coal and open mines in the country. The engineer was ambitious in his efforts to find coal beds and operate mines. He asserted that he would begin working in the coal mines situated near Lapseki or on the island of Mytilini if the government would give him permission and provide the necessary means for coal prospecting. Although the government had employed this man and other mining engineers with knowledge of coal as experts, little progress was made in Ottoman coal mining in the 1840s, mainly due to the ignorance and narrow-mindedness of officials. Despite being professionally competent and practical, the aforementioned coal expert was not provided with the necessary laborers and technical equipment to commence with explorations. Moreover, when he wanted to build a road connecting a coal mine to the sea fifteen miles away, officials did not take it kindly, asserting that it would be very costly for the government. Instead, officials proposed that he could transport coal to the coast with mules and donkeys.[10] Despite these endeavors, it is hard to say that these engineers could fulfill expectations regarding coal and other minerals, especially in the first half of the nineteenth century.

From the 1860s on, Ottoman mining took a new turn. The soaring fuel demands for steam transportation and mechanized factories urged the Ottomans to find new coal reserves. The number of foreign mining engineers increased, which intensified geological explorations in the country. The

9 Gustave de Pauliny was the first mining professional to serve the Ottoman state. While his main mission was to rehabilitate state-run mines, he also took charge of mineral explorations including those of coal. See Charles Issawi, *The Economic History of Turkey, 1800-1914* (Chicago: University of Chicago Press, 1980), BOA, C.DRB 51/2505, 11 R 1264 (17.03.1848).

10 Charles MacFarlane also mentions an American mining engineer, Dr. L Smith, who worked for the Ottoman government in the 1840s. Though he discovered several mines in a short geological excursion, the government agents, the Dadians, did not use his talents effectively. When the engineer asked to conduct additional explorations, Dadians did not allow it, stating that it would better for him to stay in Istanbul. He spent more than two years doing nothing related to his profession. See Charles MacFarlane, *Kismet, or, the Doom of Turkey* (London: Thomas Bosworth, 1853), 315-16.

government assigned mining engineers to the major provinces. Moreover, in order to train local engineers, the government opened a school of mining in 1874.[11] The new regulations prepared the groundwork for further improvement of Ottoman mining.

Table 4.1 Number of Coal and Lignite Discoveries in the Ottoman Empire

Province	1840-1876	1877-1889
Istanbul	16	20
Hüdavendigar	21	2
Trabzon	4	2
Kastamonu	2	10
Edirne	6	4
Salonica	3	7
Konya	3	1
Adana	2	0
Aydın	2	6
Archipelago	2	0
Karesi	0	9
Sivas	0	1
Aleppo	0	1
Van	0	1
Mount Lebanon	1	1
Total	62	65

SOURCE: *Orman ve Maadin Mecmuası*, no.1, 31 Temmuz 1305 (12 August 1889): 11.

In the last decades of the nineteenth century, Ottoman lands witnessed the flow of foreign capital for the discovery and exploitation of the empire's rich underground resources, including coal.[12] The outcome can be partly observed in Table 4.1, which shows the number of coal and lignite mines discovered in the country before 1889. The table shows that coal prospecting in Ottoman

11 Özkan Keskin, "Osmanlı Devleti'nde Yabancı Maden Mühendislerinin İstihdamı ve Osmanlı Madenciliğine Hizmetleri" *Yakın Dönem Türkiye Araştırmaları*, no.11 (2007): 83-87.

12 See, Alaaddin Tok, "The Ottoman Mining Sector in the Age of Capitalism: An Analysis of State-Capital Relations (1850-1908)" (Master's thesis, Boğaziçi University, 2010).

lands was quite succesful. Mining experts employed either by the government or by private entrepreneurs explored coal in almost every corner of the country, but especially in Anatolian provinces. The table indicates that, Istanbul and Hüdavendigar were the richest provinces in terms of coal. However, the high number of coal discoveries in these provinces can be attributed to their central position in the empire. Instead of rich coal deposits, the availability of mining experts made Istanbul and Hüdavendigar the leading provinces in terms of coal discoveries. Private entrepreneurs obtained numerous coal concessions at the end of their endeavor,[13] yet most of these mines remained idle after the granting of concessions.

4.2.2 *Discovery of the Ereğli Coal Basin*

Located along the western end of the Black Sea coast of Anatolia, the Ereğli basin was the richest coal source in the Ottoman Empire. In the related literature, the discovery of coal in the Ereğli region is attributed to a local man called Uzun Mehmed who found coal samples near his village in 1829.[14] Texts narrate Uzun Mehmed's story in slightly different ways, but notably, none refer to reliable historical sources.[15] Donald Quataert points out that each of the

13 Şerife Yorulmaz, "Türkiye'de Kömürün Keşfi ve Kömür İşletme İmtiyazları (1829-1937)," in *Türkiye 11. Kömür Kongresi Bildiriler Kitabı (Proceedings of the 11th Coal Congress of Turkey), June 10-12, 1998*, (TMMOB Maden Mühendisleri Odası Zonguldak Şubesi Yayını, 1998): 283-303.

14 The story of Uzun Mehmed takes its roots from a 1903 issue of Sabah newspaper. According to the article on the Ereğli mines, Sultan Mahmud II, anticipating the existence of coal in a mineral-rich country, encouraged his subjects to explore for coal and promised reward for favorable samples. After hearing the news, Uzun Mehmed devoted himself to the search for the "black stone." He accidentally discovered coal in the fire he lit while waiting for grinding at a mill. Taking with him a sack of these black stones, he went to Istanbul and delivered the samples to the Imperial Mint. When the tests revealed the high quality of the coal, he was rewarded with 5000 piasters and received a government salary. See *Sabah,* 6 Şevval 1321 (December 26, 1903).

15 Later works resemble the first version in many respects. However, there are major differences including Uzun Mehmed's military background, the way he discovered the coal samples and further incidents he experienced after receiving reward. See İmer, *Ereğli Maden Kömürü*

versions of the story are constructed on the basis of their writers' ideological orientations.[16]

Although there are historical references to the incidental discovery of coal, available archival evidence neither suggests the discovery of coal in Ereğli in the 1820s or nor any operations in this region in the 1830s. Scholarly works on the history of the Ereğli coal basin do not provide exact dates and failed to explain why the mines were not operated given the government's need for coal. The earliest archival document that mentions the exploration of Ereğli coal during the reign of Sultan Mahmud II was dated 1904,[17] which is very late. My investigation suggests that coal deposits in this part of the county were unknown until 1840.

The first issue of *Ceride-i Havadis*, one of the earliest newspapers of the empire, first heralded the discovery of coal in Ereğli in 1840. The article reports that explorations for coal were ongoing in the country since it was required for steamers. Indeed, the "burning stones" were discovered in many parts of the empire but they were not exploited. When coal appeared in Ereğli, it was examined and tested by engineers and mariners. They stated that the coal was strong and durable like that from Britain and other foreign countries. If the deposits were rich, it would be beneficial for steamers. Likewise, these deposits could provide fuel for prospective factories relying on steam power.[18]

After a few months, the newspaper touched on Ereğli coal again. The newspaper had an optimistic view of this fuel. The article stated that the coal extracted in Ereğli was of the best quality, similar to British hard coal. The article also highlighted that this coal could be used for making coke. According to the newspaper, 2800 tons of coal had been extracted in a short time with relative ease. If a quay was constructed near to the shafts and if efforts were made to extract more coal, not only would the steam engines in Ottoman public production plants be fueled by the local sources, but the steamers

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Havzası Tarihçesi, (Zonguldak: Zonguldak Halkevi Yayınları, 1944), Ahmet Naim Çıladır, *Zonguldak Havzası: Uzun Mehmet'ten Bugüne Kadar*, (Istanbul: Hüsnütabiat matbaası, 1934)

16 Quataert, *Miners and the State, 9-15.*

17 Genç, "Ereğli Kömür Madenleri," 8-9.

18 *Ceride-i Havadis*, 1 C 1256 (July 31, 1840).

navigating to Istanbul as well. Thus, a large-scale local fuel trade could emerge in the capital city, and there would be no need to import coal from abroad.[19]

Another early source that mentioned the discovery of coal in Ereğli is John MacGregor's Commercial Statistics, which has been neglected by historians writing on the issue. MacGregor noted that John Ford, an Englishman working as the superintendent of the sultan's steamboats, tried the coal out and found that it was bituminous coal of good quality. There were British surveys in the region just after its discovery. The discovery attracted the attention of Mr. Anderson, who came to Istanbul as the director of the Oriental Steam Navigation Company. With the intent to operate the Ereğli mines, he wanted to make a thorough investigation of the region. With the permission of the Ottoman government, he went to Ereğli with a group of people including two friends -Dr. Davy and Granville Withers - who would then write two separate reports on the coal and the coalfields.

As echoed in stories in the later works, MacGregor wrote that a Turkish peasant from Anatolia had brought a sample, which he thought to be coal, to the Imperial Arsenal in early 1841.[20] Withers' words describe the incidental discovery of coal in Ereğli as follows:

> The finding of coals on that coast is of recent date; it was quite an unlooked for circumstance and purely accidental. The ground has been travelled over by scientific men who are really judges of such things, but their description of the geological formations of Asia Minor encouraged the belief that no fossil coal existed in that part of the Turkish dominions. This arose, no doubt, from a too hasty survey; because the strongest indications of the presence of coal present themselves, so as not to be mistaken, for more than forty miles along the coast from Penderaclia, eastward. It happened fortunately for the truth that a rich vein of this precious mineral thick, black, and inviting, was

19 *Ceride-i Havadis*, 1 Zilhicce 1256 (January 24, 1841).

20 John MacGregor, *Commercial Statistics; A Digest of the Productive Resources, Commercial Legislation, Customs Tariffs ... of All Nations, Including All British Commercial Treaties with Foreign States,* vol.2 (London: Whitetaker and Co., 1850), 182-84.

> accidentally exposed in a situation where it could not escape observation, by a rupture which separated and threw down a large mass of strata composed of very coarse sandstone, shale, clay, coal, &c.[21]

The group examined four major locations and found that the coal was similar in quality. The samples were "remarkably pure, even within a few inches of the surface."[22] Moreover, the coal beds were found to be very extensive. With the proposition that the yield of the mines could be increased fourfold, the company requested a thirty-year concession but this was rejected by the government and it stayed in the hands of the state.[23]

4.2.3 *Other Explorations*

Egypt's increasing fuel needs during its modernization process under the rule of Muhammad Ali Pasha triggered the idea of exploring for new coal sources in Ottoman territories. In 1845, an enthusiastic proposal was made by the pasha for coal expected to be discovered in the Tauris Mountains of southern Anatolia. Accordingly, he planned to send mining engineers to Içel, Alaiye, and Marmaris to make explorations and if coal was discovered, a certain portion of it would be allocated for the needs of Egypt. The pasha supported his request with a religious motive. Instead of paying high prices for European coal, he argued that it would be better to circulate money within Muslim countries. Nevertheless, the sultan took a dim view of the proposed campaign explaining that permitting the Egyptian administration to undertake explorations would violate the rights of the company that had been given the concession for all coal mines in the country.[24] Thus, the first attempt to explore for new coal sources in the country ended before it began.

Having its eye on Anatolian coal, the Egyptian administration made another appeal in 1862. The rationale was similar: growing fuel demand for

21 Ibid., 184.

22 MacGregor, *Commercial Statistics*, 183.

23 Sir James Porter, *Turkey: Its History and Progress,* vol.1 (London: Hurst & Blackett, 1854), 46; vol.2, 308.

24 BOA, İ.MVL 62/1180, 25 Z 1260 (05.01.1845).

steamships and railroad transportation was leading to increasing spending on British coal which should be replaced by alternative sources. Again, the Egyptian governor targeted the southern coast of Anatolia for mining exploration. This time the answer was affirmative. The Ottoman government allowed engineers sponsored by Egypt to conduct research in Ottoman territory and agreed to grant licenses for coal mines if the explorations proved fruitful.[25] However, early results were disappointing in that the black material thought to be a sign of coal, was found to be basaltic rocks.[26]

Despite this failure, the Egyptian governor was insistent about finding coal in Ottoman lands. With official permission, the administration broadened the scope of its explorations and asked to examine additional regions. These included Avlona and Scutari in Albania, Salonica, the islands of Samothrace and Crete, two locations in Beirut, and in Şarköy on the coast of the Sea of Marmara. The central government agreed to the project and sent dispatches to local administrators of these regions ordering them to support the engineers to prospect for coal.[27] Yet, there is little information on the outcomes of these searches.

In the Balkans, close to frontier, there were also Austrian efforts to discover coal. To meet the fuel needs of steamers navigating the Danube, an Austrian company asked for the permission of the Ottoman government to search for coal in the province of Vidin in 1857. In his excursions around the river, one officer of the company discovered coal in several villages. These mines were so far from the river that it would take sixteen hours to transport the coal to the closest quay. For this reason, the Austrians abandoned the idea of operating these mines. [28]

4.2.4 *Examining Discovered Coals*

When a new seam was dug out, the coal needed to be examined to estimate its economic value. The Ottomans employed both practical and chemical

25 BOA, İ.MTZ (05) 19/749, 23 Ca 1279 (16.11.1862).

26 BOA, MVL 768/58, 12 Ca 1280 (25.10.1863).

27 BOA, İ.MTZ (05) 19/777, 25 M 1281 (30.06.1864); BOA, A.MKT.MHM 305/7, 1 S 1281 (06.07.1864).

28 BOA, A.MKT.UM 286/9, 29 L 1273 (22.06.1857).

methods to evaluate newly discovered coals. Though rudimentary experiments and scientific analysis usually went hand in hand, the former was more common especially in the early decades of the coal age in the empire. Due to limited scientific knowledge in the country with respect to mineralogy, it was difficult to determine the content and energy value of the samples in calories or joules. Practical methods were employed both to observe whether the coal of a certain mine could run steam engines and to compare certain types of coal with others.

Tests were usually conducted in the capital city. When sending samples to Istanbul was not practical, available steam engines in the immediate vicinity of the coal source were employed. Mostly the experiments were undertaken on steamships. For example, an Austrian steamer was used to compare coal found in Lom district of Vidin with other varieties in 1863. The tests demonstrated that the fuel requirement for the engine for one hour was twenty-six *kantar*s of British coal and thirty-two *kantar*s of Austrian coal, but it burned forty *kantar*s of the Ottoman coal which demonstrated its inferiority.[29] In another instance in 1883, newly discovered coal in the Albanian city of Scutari was examined on a public steamer in Lake Scutari in the presence of naval officers. They intended to see whether the fuel could run the engines. In the trial, it became clear that the coal was strong enough to be burned in the steam engines.[30]

Chemical analysis was generally conducted as a secondary step in order to observe the actual makeup of the coal samples. In the mid-nineteenth century, the examination of samples was undertaken by the imperial mint. Officials called *çeşni memuru* were responsible for determining the content of the specimens. The workshops of the mint received samples from various regions of the country. For example, when some material thought to be coal was sent from Yemen, the analysis in the Imperial Mint revealed that they were stones with some naphtha content.[31]

29 The explanation for its inferiority was that the samples have been taken from the surface. It was believed that the coal in deeper parts of the mine were stronger. See BOA, MVL 970/75, 19 R 1280 (03.10.1863).

30 BOA, Y.PRK.TNF 1/36, 20 Ş 1300 (26.06.1883).

31 BOA, A.MKT.MHM. 37/65, 18 Z 1267 (14.10.1851).

In the later decades, engineers produced more exhaustive reports based on chemical methods. A French engineer employed by the Ottoman government for mining exploration called Moreau made several excursions to the country in the 1870s. He analyzed coal samples from Sofia, Adana and Vidin. As Appendix C shows in detail, his reports included a general description of the coal analyzed, the percentage and names of the components under the headings fixed and volatile materials, and personal observations on samples.[32] Many similar reports were provided by engineers in the following decades.

§ 4.3 Types of Coal Extracted and Used in Ottoman Lands

Coal exploited by the Ottomans differed in terms of their physical and energy qualities. The most calorific and valuable coal, anthracite, did not exist in Ottoman lands. With the exception of the Ereğli basin, in which bituminous coal of various qualities was extracted,[33] most of the coal discovered in the country was of the worst kind - lignite. For understandable reasons, the Ottoman state and private entrepreneurs paid more attention to bituminous coal mines instead of lignite mines. Thus, the vast majority of coal produced and consumed in the empire was bituminous.

Most of the time bituminous coal was consumed as a lump, yet a considerable amount of coal was turning into dust during extraction and transportation, making technological improvements necessary to burn such slack. In 1890, aware that some European factories and ship engines were burning coal dust, Ottoman officials decided to burn this fuel in their steamers and investigated the technology being used in some steamships of foreign navigation companies. The same machinery was then set up in one Ottoman steamboat, *Cidde* and tested on an expedition to the Black Sea. The result was favorable. It was reported that coal dust could be burned in the steamers on the condition that the slack was of refined, first-rate Cardiff coal or coal of similar quality.[34]

32 BOA, T.TTEK 498/29, (1873-1875).

33 BOA, HH.d.. 24943, 1300 (1883).

34 DMA, Fabrikalar 16245-5, (24.08.1890).

Though not as widely consumed in the empire as bituminous coal and lignite, coke was another fuel burned on certain occasions. The majority of the coal varieties in the Ereğli basin were suitable for making coke.[35] The first coke production in the empire can be traced back to 1854 - that is, during the Crimean War. There were coke ovens in Aynalıkavak that were probably built with the support of allies. In the 1880s, the number of coke kilns in the Ereğli region was not less than eight. These were old-fashioned and employed technology that had been used by Europeans 150 years before. The main providers of coke were plants in the Ereğli region and a few gasworks in major cities. Sometimes workers of the gasworks received their salaries in coke.[36]

There were also efforts to make coal briquettes from slack. An early proposal to turn coal dust from the Ereğli mines into compressed blocks was submitted by an entrepreneur in 1863, but its fate is unknown.[37] Naval registers show that the Ereğli mines were providing steamboats with coal briquettes in the early 1880s.[38] A government report prepared at the end of the 1880s tackled briquette production more seriously. Utilizing coal dust to produce briquettes was regarded as a necessity because rains were carrying tons of slack from the collieries to the sea in both Kozlu and Ereğli.[39] A few years later, the government sent a military officer to London charging him with learning how to make briquettes from coal dust.[40] Ottomans continued producing coal briquettes in the Ereğli region in the 1890s, nevertheless, they failed to make it at the desired quality.[41] An official record from 1908 reported that this kind of coal was not strong enough to run engines properly. The infeasibility of coal briquettes for naval vessels was proven when a cruiser failed to cruise faster than ten miles per hour.[42]

35 BOA, HH.d.. 24943, 1300 (1883).
36 Giraud, "Combustibles," 126.
37 BOA, MVL 423/17, 19 B 1280 (30.12.1863).
38 DMA, Bahriye 9988-8, (1883).
39 BOA, Y.PRK.OMZ 1/23, 29 Z 1305 (06.09.1888).
40 DMA, Mektubi II 636-169, (09.02.1891).
41 DMA, Mektubi II 852-156, (09.07.1894).
42 BOA, İ.HUS 167/41, 15 Ca 1326 (15.06.1908).

§ 4.4 Uses of Coal in the Ottoman Empire

Unlike in European countries or China, where coal was widely used before the nineteenth century and even in ancient times, this fuel was almost nonexistent in the Ottoman economy until the introduction of steam engines to the country. From the 1830s onwards, most imported coal was used for motive power. With the adoption of novel smelting technologies in certain production plants, coal consumption in smelting increased as well. Despite its limited use, space heating was also a coal-consuming task in the empire. The following pages uncover the demand side of coal by examining coal-based technologies and their uses in detail.

4.4.1 *Smelting, Space Heating, and Artisanal Uses*

The first attempts to exploit coal in the country burned the fuel for smelting purposes. However, coal did not replace charcoal for smelting in the eighteenth century. There was an increasing demand for coal in state-led smelting activities in the capital city throughout the nineteenth century. Numerous archival documents mention coal purchases by the imperial mint, arsenal, dock, and other facilities. Although it is not possible to determine the extent to which coal was burned for smelting, archival evidence shows that production of various cannons and other metal objects depended on this energy converter. Workshops on the docks, for example, were producing copper boilers in the late 1830s probably with coal energy.[43] In autumn 1847, a blast-furnace was put in the foundry to cast cannons, yet it bore little fruit and was abandoned due to the high cost of English coal that was used to fuel the ironworks at that time.[44]

Technological advancements in Ottoman military industries continued in the second half of the nineteenth century. The furnaces and other smelting equipment were all European products that used coal as fuel. From 1886 to

43 John Reid, *Turkey and the Turks: Being the Present State of the Ottoman Empire*, (London, R. Tyas, 1840), 272.

44 Charles MacFarlane, *Turkey and Its Destiny: The Result of Journeys Made in 1847 and 1848 to Examine into the State of that Country*, vol.2 (Philadelphia: Lea and Blanchard, 1850), 612.

1898, the Southgate Engineering Company of London installed a steel foundry with a six-ton open-hearth steel furnace, a gun plant for the manufacture of guns of various calibers, a Siemens-Martin steel plant capable of producing thirty tons of steel ingot, and a plant for the manufacture of ammunition like steel shot and shells.[45] In these steelmaking furnaces supervised by the imperial dock, Ottomans built ironclad ships and cast technologically-advanced cannons.[46] The new industrial plants were also instrumental for the production of necessary items like the crank shafts utilized in ships.[47] Coal-based smelting was also used on the docks of Izmit, Suda and Basra.[48]

In the 1890s, some of the workshops in the Süleymaniye neighborhood of Istanbul burned coal to cast iron.[49] The civilian use of coal for smelting was more significant in Izmir. Workshops specializing in ironworks first emerged after the introduction of railway transportation to Western Anatolia.[50] In the 1880s, there were sixteen firms in the city that engaged in smelting. Among them, workshops belonging to British citizens M. Rankin, S. Watkins, G. J. Papps, J. Clarke, theRice brothers, and D. Issigonis were the largest. These enterprises mostly fabricated auxiliary equipment for factories in the region. Indeed, Rankin and Issigonis were able to produce complicated devices like steam engines, internal combustion engines, and other kinds of machinery required in the factories.[51] Given the scale of ironworks in Izmir, the city was the leading consumer of coal for smelting in Ottoman Anatolia.

Unlike in the ironworks located in major cities, coal was not utilized to smelt metal ores extracted from mines around the country. The coal energy was advantageous only when equipment used in smelting could withstand high temperatures. In Vitalis's report on the Ergani mines in the 1870s, lignite

45 TNA, FO 195/2009, (03.10.1898).

46 Şakir Batmaz, "II. Abdülhamit Devri Osmanlı Donanması" (PhD diss., Erciyes University, 2002), 160-173.

47 DMA, Fabrikalar 38/6, (23.04.1890).

48 Batmaz, "Osmanlı Donanması," 174-77.

49 BOA, BEO 74/5494, 29 S 1310 (22.09.1892).

50 Abdullah Martal, *Değişim Sürecinde İzmir'de Sanayileşme: 19. Yüzyıl* (Izmir: Dokuz Eylül Yayınları, 1999), 138.

51 Orhan Kurmuş, *Emperyalizmin Türkiye'ye Girişi* (Ankara: Savaş Yayınları, 1982).

was cited as useless for purifying ores,[52] probably because of the unsuitability of the furnaces for elevated temperatures. Moreover, even if the furnaces were technologically capable of burning coal, the transportation of the fuel would be costly unless the coal mines were nearby. Given the fact that most copper, iron, and silver mines and smelters were situated in mountainous areas, supplying coal to their furnaces was nigh impossible. Thus, most smelters and foundries in the countryside continued to burn charcoal even in the first decades of the twentieth century.

Coal was not widely used for space heating in the empire. In 1850, the governor of Erzurum, Mehmet Hamdi Bey, made one of the earliest proposals to use coal in space heating. When coal was discovered in one of the city's districts, this fuel was considered as an alternative to firewood which was growing more expensive. On the request of the governor, the central government permitted the local administration to exploit the mine and provide coal for the military and the public. However, afraid of accidents due to the lack of experienced miners, local administrators did not dare to produce coal in the mine.[53] There were other attempts to burn coal in the city in the following decades. According to a dispatch dated 1910, a private entrepreneur had started supplying fuel to city dwellers from coal mines in Tercan and Narman. Likewise, another mine two hours from Erzurum was providing coal for military use.[54]

At the beginning of the twentieth century, the government considered promoting coal-fired domestic heating throughout the country. In August 1907, the Ministry of the Interior sent a dispatch pertaining to the use of lignite in houses to the Ministry of Forests, Mines, and Agriculture. Emphasizing fuel-related problems in Anatolian provinces, the ministry stated that lignite could be a useful alternative to other fuels. To set a course to achieve this goal, the ministry sought for information about the locations of lignite mines, their current production levels, and the means to increase production. The

52 BOA, T.OMİ 1480/96, 1295 (1878).

53 BOA, A.MKT.UM 28/29, 19 L 1266 (28.08.1850); BOA, A.MKT.NZD 61/15, 3 M 1269 (17.10.1852).

54 The price of coal supplied by local sources was found high due to the difficulties of transporting it. See BOA, DH.İD 105-1/5, 4 Za 1328 (07.11.1910).

ministry's plan involved installing coal stores in Istanbul and other city centers as required and distributing the fuel from these hubs. The expected price of lignite in such a distribution system was among the issues about which the ministry was curious. The ministry also had questions about the devices used for space heating, asking whether lignite could be burned in iron stoves designed for Cardiff coal and coke. The means of obtaining stoves and their prospective prices were related matters in question.

The answer came from the Scientific Committee of Mines which was under the Ministry of Forests, Mines, and Agriculture. According to the committee, the friability of lignite was a major drawback of using this fuel for space heating. Most lignite was turned to dust during transportation even when conveyed on light railways with little vibration. If the lignite were stored in the form of dust, it could emit firedamp, which made it dangerous to keep in city centers. Moreover, because lignite mines were mostly located in the country's inner regions the transportation costs would increase the price of lignite to that of Ereğli coal. Thus, storing lignite in central coal depots and selling it to people to warm their houses was not a sound idea.[55]

Istanbul was the leading city that took advantage of coal for space heating. Still, even in the capital city, coal was mostly consumed in public buildings. The *Ticaret-i Bahriye Mektebi* (School of Maritime Commerce), for example, relied on coal-burning stoves in the 1880s.[56] The heating system of *Darülaceze* (the Almshouse) was adapted to coal at the turn of the century.[57] The central naval hospital was also among coal burning buildings.[58] Around 1907, the annual amount of coal, which was mostly burned in Salamander stoves, constituted less than 4 percent of the total coal consumed in the city.[59] During World War I, 20 percent of the fuel used in Istanbul for space heating was coal.[60] All

55 BOA, DH.MKT 1185/35, 10 B 1325 (19.08.1907).

56 DMA, Muhasebe 1006/5, (02.02.1887).

57 BOA, DH.MKT 2377/46, 24 Ra 1318 (22.07.1900)

58 In 1912, 100 tons of coke were purchased from *Gazhane-i Amire*. DMA, Mülga Bahriye 724/176-177 (04.11.1912).

59 Ernest Giraud, "Houille et Mines de Houille," *Revue Commerciale du Levant- Bulletin Mensuel de la Chambre de Commerce Française de Constantinople*, no.259, (October 1908) : 651.

60 BOA, DH.İ.UM 98-2/159, 21 N 1334 (22.07.1916).

in all, coal-fired heating in the empire was confined to a few cities that had access to this fuel.[61] Coal began to be used as an alternative fuel for heating in the 1880s and spread slowly. The share of overall coal consumption for space heating remained limited even at its peak.

Some small-scale industries that required thermal energy began to use coal after its introduction to the country. One early example of burning coal for production purposes was lime making. In the early 1850s, several limekilns along the Bosphorus burned coal to heat the stones. This led to grievances because of its stench, so the government banned the use of coal in the limekilns in 1853.[62] The prohibition did not last and a few years later, coal was allowed along certain parts of the Bosphorus.[63] In the late 1860s, lime producers were buying Ereğli coal from the store of the *Dersaadet Kömür İdaresi* (Istanbul Coal Administration).[64] Coal was still in use in some limekilns in the first decade of the twentieth century.[65] More than a half century later, coal discovered in the Albanian town of Görice was allocated to candy shops and to nearby brick, tile, and limekilns.[66]

4.4.2 *Coal Gas and Electricity Production*

The convertibility of coal and its energy to different forms made it available for various usages. Early coal gas technology was developed in the eighteenth century with the contributions of several European scientists. Coal gas was first used in some English cotton mills around 1806. Gas illumination in Europe gained currency in the same period.[67]

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61 Proximity to inorganic fuel sources did not necessarily lead to new heating methods. In Niş, for example, which had abundant coal mines, there was no stove designed for burning coal in 1864. See BOA, MVL 983/65, 16 L 1280 (28.03.1864).

62 BOA, A.MKT.MVL 65/29, 19 Za 1269 (24.08.1853).

63 BOA, A.MKT.NZD 276/62, 3 B 1275 (06.02.1859).

64 DMA, Müteferrik 16201-1, 28 N 1285 (12.01.1869).

65 BOA, DH.MKT 1275/65, 19 B 1326 (17.08.1908).

66 BOA, T.OMİ 1572/28, 9 Za 1324 (25.12.1906).

67 Elton, Arthur, "Gas for Light and Heat" in *A History of Technology, vol. IV The Industrial Revolution c 1750 to c 1850*, eds. Charles Singer, et al (Oxford: Clarendon Press, 1954-84).

The first gasworks in the Ottoman Empire was built in 1853 in Dolmabahçe to light the new palace.[68] Furnished with British equipment, this gasworks was managed by the Sultan's Treasury (*Hazine-i Hassa*) for about two decades. In addition to the palace, gas was used to light the streets. The gas of Dolmabahçe began to illuminate the *Grand Rue de Péra* in 1856. Between 1874 and 1890, the gas plant was run by the municipality. Coal gas was extended to Beşiktaş, Beyoğlu, Galata, and the European coast of Bosphorus under its administration. In 1890, the gasworks was given to the Imperial Arsenal, which operated the plant for more than two decades.[69]

In addition to the public production of coal gas, the private sector entered the business in the last decades of the nineteenth century. After various attempts, French entrepreneurs established a gasworks in Yedikule in 1880. Following this, another was put in service Kadıköy in 1892, again with French capital.[70] In the 1910s, many districts of Istanbul relied on coal gas for lighting and, to some extent, for heating. Istanbul was not the only city that took advantage of coal gas. Many other port cities including Izmir, Salonica, and Beirut enjoyed coal gas lighting.[71]

Coal fired electricity production was a late technological transfer to the empire. The Ottoman government decided to establish a thermal power plant in Silahtarağa that went up for tender in 1910. The contractor initiated construction of the power station in 1911 and completed it in 1914. The plant was comprised of six boilers, three turbine generators, and related components. Fueled by Ereğli coal, the plant's production capacity was 13,400 kilowatts per hour. It started to provide electricity for tramway transportation and private consumers in February 1914.[72]

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68 Ergin, *Mecelle-i Umur-ı Belediyye*, vol.5, 2593.

69 Huriye Sevcan Tekin, "Dolmabahçe Gazhanesi'nin Kuruluşu ve İşletmesi" (Master's thesis, Marmara University, 2006), 26-27.

70 M. Rıfat Akbulut and Cem Sorguç, "Gazhaneler," *Dünden Bugüne Istanbul Ansiklopedisi,* vol.3 (Istanbul: Ana Basım, 1994), 377-78.

71 R. Sertaç Kayserilioğlu, Mehmet Mazak, Kadir Kon*, Osmanlı'dan Günümüze Havagazının Tarihçesi* (Istanbul: İGDAŞ Genel Müdürlüğü, 1999).

72 *Silahtarağa Elektrik Santralı 1910-2004* (Istanbul: Istanbul Bilgi Üniversitesi, 2007), 1.

4.4.3 *The Steam Engine in the Ottoman Empire*

The vessel advancing towards the north while "the wind was blowing hard down from the Black Sea" and "the current was running with its eternal violence," was a "miracle" in the eyes of the people of Istanbul. This first steamboat in the Ottoman Empire, the *Swift*, was the means by which Charles Macfarlane, the writer of these words, arrived at Istanbul in 1828.[73] The *Swift* heralded the steam age in the empire.

The steam engine would gradually defuse to the country. Enthusiastic efforts to modernize the navy with steam engines were followed by the poering of public factories with coal. Thus, the first wave of steam modernization took place on the initiative of the government. Civilian use of steam power advanced in the second half of the nineteenth century. Many industrialists installed steam engines in their factories and some obtained steam vessels. The section below discusses the use of steam engines in the Ottoman Empire in detail.

4.4.3.1 Steamships

A short time after her arrival in Istanbul, the *Swift* was purchased by the Ottoman government and became the personal steamer of Sultan Mahmut II. A Scottish steamboat, *Hylton Jollife* followed, joining the Ottoman navy in 1829. Both vessels were paddle steamers with 80 and 100 horsepower steam engines respectively.[74] Yet, the engines of both steamers were old and described as "interesting specimens of the infancy of the art."[75] These two steamers were renamed *Sağir* (small) and *Kebir* (big) and served the Ottoman government by pulling sailboats and transporting some cargo.[76] The *seraskier* of the Ottoman

73 Charles MacFarlane, *Constantinople in 1828: A Residence of Sixteen Months in the Turkish Capital and Provinces* (London: Saunders and Otley, 1829), 490.

74 Nurcan Bal, "XIX. Yüzyılda Osmanlı Bahriyesi'nde Gemi İnşa Teknolojisinde Değişim: Buharlı Gemiler Dönemi" (Master's Thesis, Mimar Sinan Fine Arts University, 2010), 12-13,

75 James Ellsworth De Kay, *Sketches of Turkey in 1831 and 1832*, (New York: J. & J. Harper, 1833), 314-15.

76 Levent Düzcü, "Yelkenliden Buharlıya Geçişte Osmanlı Denizciliği (1825-1855)" (PhD diss., Gazi University, 2012), 157.

army stated that the coal required for these first steamboats could be procured from the mine in Büyükdere.[77] However, this was an optimistic view with no grounding in reality. Given the lack of local coal sources, the steam engines of these vessels depended on British coal throughout the 1830s.

After the destruction of the Ottoman armada at the Battle of Navarino in 1827, rebuilding the navy became a necessity. Employing foreign technical staff and skilled workers of various origins, the government intended to construct modern warships, not ones powered by steam. The two steamboats mentioned above were not more than "amusing toys" in the eyes of the Sultan Mahmut II. Yet, he changed his mind in 1837 when two foreign steamers saved the frigate taking him from Izmit to Istanbul from running aground during a storm. A short time after this incident, he allowed the foreign shipbuilders - those willing to construct steamers in Istanbul - to initiate their project.[78]

The pioneer of steamship building in the Ottoman Empire was Forster Rhodes. He was one of the leading figures of the American mission on the Ottoman docks in the 1830s, along with Henry Eckford and Charles Ross. The Americans constructed several sailing warships in novel styles. By 1835, Rhodes had installed steam engines in the Imperial Dockyard and intended to construct ships powered by coal.[79] With the permission of the sultan after the incident mentioned above, Rhodes launched the first Ottoman-made steamship, *Eser-i Hayr*, in November 1837. *Mesir-i Bahri* and *Tair-i Bahri* followed this in 1838 and 1839, respectively.[80] While these wooden ships were built in Ottoman shipyards using domestic timber, their machinery and the majority of the mechanical parts were imported from Britain. All three were powered by steam engines built by Robert Napier. However, they differed in some

77 BOA, HAT 569/27922, (1830).

78 Bernd Langensiepen and Ahmet Güleryüz*, The Ottoman Steam Navy: 1828-1923*, (London: Conway Maritame Press, 1995), 1.

79 Ibid.

80 Emir Yener, "Iron Ships and Iron Men: Naval Modernizaton in the Ottoman Empire, Russia, China and Japan from a Comparative Perspective 1830-1897" (Master's thesis, Boğaziçi University, 2009), 70.

technical respects.[81] None of these functioned as warships; rather they were used as yachts or merchant ships.[82]

Besides building steamboats itself, the Ottoman government ordered a steamship from abroad. In 1837, *Peyk-i Şevket*, a side-paddle steamboat made in Toulon, was purchased from France.[83] As with other steamships in this period, it was used to convey dispatches and escort the fleet on its cruises.[84] The transition to steam power in the Ottoman navy accelerated in the second half of 1840s. Steamers increased not only in number but also in size and power. In 1846, the government ordered a steamer from Britain that was relatively larger than previous ones. It was called *Vasıta-i Ticaret* and was driven by a 600 horsepower Maudslay steam engine.[85] By 1847, the government owned six steamboats, three of Ottoman origin and three of foreign origin.

A real Ottoman steam navy started to be formed in 1847 with the construction of four paddle frigates called *Mecidiye, Taif, Saik-i Şadi and Feyza-i Bahri*. Along with *Muhbir-i Sürûr,* a screw warship donated by Khedive Abbas Pasha, the Ottoman Empire started its fight against Russia in Crimean War with five steam warships that accompanied sailing vessels. After coming to the throne, Sultan Abdülaziz launched a passionate project to renew the Ottoman navy. First iron-hulled ships ordered from Britain arrived in Istanbul in 1868.[86] As more ships entered service, the new, ironclad Ottoman navy became the fourth largest in the world. Despite interning the navy in the Golden Horn, Sultan Abdülhamit II continued ordering various ships from abroad. Thus, the coal consumption potential of the Ottoman navy increased tremendously. However, most of the time the only steamboats burning coal were patrol boats that provided coastal security.

The advent of steam navigation in the nineteenth century also facilitated communication by sea. From the 1840s onwards, postal services offered by foreign steamship companies connected the Ottoman capital city with major

81 Langensiepen and Güleryüz, *Ottoman Steam Navy*, 171-72.

82 Yener, "Iron Ships," 70.

83 Bal, p.24

84 Reid, *Turkey and the Turks,* 273.

85 Bal, "Buharlı Gemiler Dönemi," 25.

86 Yener, "Iron Ships," 74-96.

port cities in the Mediterranean and the Black Sea. Ottoman postal services based on steamships developed in the 1850s. Ubicini noted that in 1853, there were five regular services from Istanbul to other major port cities of the empire that took place weekly or biweekly. The destinations were Izmir, Salonica, Izmit, Gemlik, and Trabzon. These mail steamers belonged to Armenian bankers and received no direct government subsidy, but had free use of the docks and coal.[87]

The 1850s witnessed the development of civilian steam transportation around the capital city. Starting out with six steamers, Şirket-i Hayriye became the first joint-stock company in the empire. The corporation expanded its fleet in the following decades. From its foundation to the beginning of World War I, the company had owned seventy steamers, the majority of which were British-made side-wheelers.[88] In 1914, the company possessed thirty-nine steamers with diverse technical characteristics.[89] Appendix D provides the names of the vessels, their power, coal consumption per hour, and fuel capacities.

87 Abdolonyme Ubicini, *Letters on Turkey: An Account of the Religious, Political, Social, and Commercial Condition of the Ottoman Empire; the Reformed Institutions, Army, Navy, etc. etc.*, vol.1 (London: John Murray, 1856), 277-278.

88 Eser Tutel, *Şirket-i Hayriye* (Istanbul: İletişim Yayınları, 1994), 189-206.

89 *Boğaziçi: Şirket-i Hayriye: tarihçe, salname,* (Istanbul: Ahmet İhsan ve şürekası, 1330 [1914]), 61-62.

Photograph 4.1 Steamships in the Port of Istanbul (c. 1900) (http://www.levantineheritage.com/constantinople.htm, Photograph by Guillaume Berggren)

The number of commercial steamships and maritime traffic increased in time. Monroe noted in 1907 that the Ottomans had a mercantile navy of 1023 ships, 107 of which were steamers.[90] In addition to Osmanlı Seyr-i Sefain İdaresi, which belonged to the government, the commercial almanac of 1913 mentioned thirteen steamship companies of Ottoman origin: Şirket-i Hayriye İdaresi, Haliç Dersaadet Vapur İdaresi, Adalar Osmanlı Şirket-i Bahriyesi, Hilal Osmanlı Anonim Vapur Şirketi, Gümüşciyan Vapur Şirketi, Beykoz Vapur Şirketi, Selanik Osmanlı Anonim Şirket-i Bahriyesi, Erdekli Rasim Şirketi, Trabzon Necat Vapur Şirketi, Trelye Vapur Şirketi, Mudanya Vapur Şirketi, Kırlangıç Vapur Şirketi, and Terakki Vapur Şirketi. These companies and a few individual entrepreneurs held seventy-three steamers in total.[91]

90 Monroe, *Turkey and the Turks,* 157.

91 *Bahriye-i Ticariye Salnamesi* (Istanbul: Matbaa-i Bahriye, 1329 [1913]), 72-80.

4.4.3.2 Factories and Industrial Establishments

At the beginning of the nineteenth century, the Ottoman manufacturing sector was comprised of traditional handicrafts and a few industrial establishments owned by the state. The inflow of European manufactured goods to the Mediterranean periphery after the Napoleonic Wars posed a serious threat to native producers, first in coastal areas then in inland regions.[92] Pamuk and Williamson point out that -induced by improvement in the terms of trade- the de-industrialization forces remained strong in the Ottoman lands until the 1860s.[93] In the first half of the nineteenth century, state-led factories in Istanbul and Egypt challenged the de-industrialization forces. While the central government failed at running most of its enterprises because of high input costs, managerial inexperience and bureaucratic interference, Muhammad Ali's industrialization project in Egypt was relatively successful despite its heavy cost.[94]

With the easing of the de-industrialization forces, the decades after 1870 witnessed gradual industrial progress pioneered by private capital. While the number of factories increased in time, their output remained less than that of handicrafts.[95] The limited industrialization of the country was also characterized by geographical heterogeneity. Compared to landlocked and mountainous provinces, lowlands in coastal regions had better conditions for profitable industrial production.[96] Therefore, factories were gathered around port cities like Istanbul, Izmir, Salonica, and Beirut and in the provinces with sea connections like Bursa and Adana.

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92 Charles Issawi, *An Economic History of the Middle East and North Africa* (New York: Columbia University Press, 1982), 152.

93 Şevket Pamuk and Jeffrey G. Williamson. "Ottoman De-industrialization: Assessing the Magnitude, Impact and Response," *Economic History Review*, 64, S1 (2011): 168.

94 Roger Owen, *The Middle East in the World Economy 1800-1914* (London: I.B. Tauris, 1993), 62-63; Laura Panza and Jeffrey G. Williamson. "Did Muhammad Ali Foster Industrialization in Early Nineteenth-century Egypt?," *The Economic History Review* 68, no. 1 (2015): 98.

95 Şevket Pamuk, *The Ottoman Empire and European Capitalism, 1820-1913* (Cambridge [Cambridgeshire] ; New York : Cambridge University Press, 1987), 127.

96 Pamuk and Williamson, "Ottoman De-industrialization," 164.

The use of coal and steam in Ottoman industry began just after the arrival of the first steamships in the country. As with the case of steamers, the state assumed the pivotal role of applying steam power to production processes. Steam technology was first transferred to public production plants as an integral part of the state-led industrialization mentioned above. Since these enterprises were not market-oriented, their development depended on state support.[97] In the early 1830s, government agents were preparing to employ steam engines for three purposes: for boring musket barrels in *Tüfenkhane* (the rifle atelier) and for sawing wood and rolling copper in the arsenal. Moreover, arrangements were made to use steam power to empty the dry docks in the Imperial Dockyard. Each of these tasks had been performed with animal power with great difficulty. The dry docks, for example, took two days to drain with horses.[98] By replacing muscle power, steam engines facilitated the work and saved time. Steam power installed in the workshop at Dolmabahçe was a successful example that increased the efficiency of production. The engine here ran six turning and twelve boring machines and had the capacity to process three hundred musket barrels a day.[99]

Around 1837, new machinery and engines made by Messrs. Rennie, Maudslay, and Field were installed in the small-arms factory.[100] In 1838, the government ordered a steam engine and machinery from London to produce sugar from beetroot. After not being employed for this purpose, the engine was ultimately placed at a gunpowder mill. In the same year, the sultan promoted steam-powered weaving and grinding but neither of these early projects got off the ground.[101]

Some experiments regarding steam technology took place in the empire in the first decades of the steam age. In 1838, the leading engineer in the

97 Elif Süreyya Genç, *Osmanlı İmparatorluğu'nda Yenileşme ve Buhar Makineleri* (Istanbul: Doğu Kitabevi, 2010), 109.

98 James Ellsworth De Kay, *Sketches of Turkey in 1831 and 1832* (New York: J. & J. Harper, 1833), 311.

99 Reid, *Turkey and the Turks*, 275.

100 William Pole, *The Life of Sir William Fairbarn Bart* (London: Longmans, Green and co., 1877), 169.

101 Reid, *Turkey and the Turks*, 276-77.

Dolmabahçe workshops tried to build a small steamer with an engine of four horsepower and a boiler. He managed to finish the steamer and boiler, but could not complete the engine because he was dismissed from government service.[102] Early engines and steamers were repaired in an engineering workshop in the Imperial Dockyard. There was no technological capacity to make steam engines, but there was for boilers. Two copper boilers started being built in the workshop in 1838 and were completed in 1839. They were put into a steamer just after their completion; however, they sunk along with the ship a short time later.[103]

The adaptation of steam engines to different industries increased throughout the 1840s. The Ottoman government launched an ambitious industrialization project in the early years of the Tanzimat. Public enterprises established in this era were called *fabrika-i hümayun* (imperial factories).[104] In 1841 and 1842, numerous manufacturing facilities were built in the western part of Istanbul. Zeytinburnu became an industrial hub with a textile factory and ironworks, both of which had steam-driven machines. A steam engine was installed in Feshane, where fez and military clothes had been produced for decades. During this government program, steam-powered stamping machines replaced the older machines in the imperial mint.[105]

The establishment of factories in this wave of industrialization was not confined to the capital city. In 1843, the government opened a modern baize factory in Izmit with the latest technology. Another investment was the establishment of a cotton mill that was turned into a silk textile factory in the late 1840s in Hereke, a small town close to Izmit. According to an official record from 1848, the steam engine in the factory was comprised of a boiler, a big furnace, six perforated copper plates, a steam reservoir with copper pipes, and

102 Ibid., 278.

103 Ibid., 272.

104 Tevfik Güran, 'Tanzimat Dönemi'nde Devlet Fabrikaları" in *150. Yılında Tanzimat*, ed. Hakkı Dursun Yılmaz (Ankara, TTK Yayınları, 1992), 235-57.

105 Clark, "Ottoman Industrial Revolution," 69.

a wheel. This engine could provide twelve horsepower.[106] Whatever the reason for the placement of a steam engine, it was found unnecessary because of the availability of waterpower. The engine was not used in the 1840s and was covered with dust and dirt.[107]

Having spent large sums of money on steam engines and machinery, the Ottomans attempted to build their own engines in the late 1840s. The factory in Zeytinburnu was established with the ambitious goal of making various iron and steel tools and, ultimately, steam engines. The project would be accomplished with foreign personnel who were expected to train the Ottoman technicians. Despite the employment of qualified staff and the procurement of the necessary machinery, the project ended up a fiasco.[108] Ottomans continued to import steam engines from Europe until the end of the empire. Yet, they could manage to make some components of the engines, like boilers.

The number of steam-powered industrial establishments in the empire gradually increased in the mid-nineteenth century. Besides the increasing mechanization of public factories, the 1840s witnessed the opening of private factories powered by steam engines. Silk reeling was among the leading industrial activities adapted to steam technology. In cooperation with an Ottoman Armenian, the Austrian consul in Bursa founded a steam-powered factory in 1845. In 1851, there were eight filatures in the Bursa region, four of which possessed steam engines.[109] In this part of the empire, private entrepreneurs had opened at least twenty-one steam reeling mills by 1868.[110]

The silk industries in Izmir and Lebanon followed a similar path. In 1845, the British consul of Izmir opened a steam-powered mill, which was followed

106 Abdülkadir Buluş, "Osmanlı Tekstil Sanayi Hereke Fabrikası" (PhD diss., Istanbul University, 2000), 213-14.

107 Macfarlane stated that the stream in Hereke was so powerful that it could run fifty factories. Installation of the steam engine by the Dadians, who were leading early industrialization attempts, was unreasonable. See Macfarlane, *Kismet*, 291.

108 Macfarlane, *Kismet*, 302-303.

109 Quataert, *Ottoman Manufacturing*, 118.

110 Halil İnalcık and Donald Quataert, eds., *An Economic and Social History of the Ottoman Empire*, vol. 2 (Cambridge: Cambridge University Press, 1994), 901.

by four other large mills.[111] British-sponsored improvements in cotton agriculture in Western Anatolia gave rise to the development of a cotton industry. By 1870, there were thirty-four steam-powered factories in this region employing more than 700 cotton gins.[112]

As mentioned previously, a second wave of industrialization took place in certain parts of the empire in the last quarter of the nineteenth century. Unlike attempts at industrialization in the 1840s, the agents of this wave were private entrepreneurs. Ottoman and foreign capitalists invested chiefly in sectors in which they could procure raw materials domestically. In this process of reindustrialization, textile manufacturing took the lead in terms of mechanization.

In an environment of reduced raw material prices and increasing demand for yarn, Western Anatolia was considerably successful in the textile industry.[113] However, the employment of steam was rare even in this relatively developed part of the empire. In 1892, a French family founded a large steam mill in Izmir that operated 28,000 spindles by the beginning of World War I.[114] In Adana, large steam-powered mills that could process either silk or cotton were in use in the late 1880s.[115] In the Balkans, a few steam mills in Salonica competed with the spinning mills of Karaferia, Niausta, and Wodena, which employed water-power.[116]

Towards the end of the nineteenth century, the use of steam power for the production of basic consumption goods also increased. In 1895, there were thirteen steam-driven flourmills in Istanbul.[117] The Allatini mill in Salonica was rebuilt after a fire in 1898. Employing a 650 horsepower steam engine, it

111 Quataert, *Ottoman Manufacturing*, 118.

112 Kurmuş, *Emperyalizmin Türkiye'ye Girişi*, 67.

113 Laura Panza, "De-industrialization and Re-industrialization in the Middle East: Reflections on the Cotton Industry in Egypt and in the Izmir Region." *The Economic History Review* 67, no.1 (2014): 163.

114 Quataert, *Ottoman Manufacturing*, 42-43.

115 Inalcik and Quataert, eds., *Economic and Social History*, vol. 2, 903.

116 Quataert, *Ottoman Manufacturing*, 45.

117 Ernest Giraud, "Farines," Revue Commerciale du Levant, *Bulletin Mensuel de la Chambre de Commerce Française de Constantinople*, no.99 (June 1895): 145.

became the empire's largest food processing factory.[118] Mostly owned by British entrepreneurs, the number of such mills in Western Anatolia reached thirty by 1900. In addition, the olive and soap industries in this region employed a considerable number of steam engines.[119] Since these basic goods had ready markets, steam-powered establishments were seen everywhere in the country where there was access to fuel. Photograph 4.2 illustrates a modern flourmill in Gallipoli that was managed by a Greek subject

Photograph 4.2 Steam Flour Mill in Gelibolu (1907) (http://www.levantineheritage.com/gallipoli.htm)

Mechanization could also be observed in the production of construction materials. Brick plants in Istanbul began to employ steam engines in the 1870s.[120] An archival account shows that one such plant founded in 1880 installed a Hertel brickmaking machine that was powered by steam. The steam engine was quasi-stationary, produced fifteen horsepower, and had been imported

118 Donald Quataert, "The Industrial Working Class of Salonica, 1850-1912," in *Jews, Turks and Ottomans: A Shared History, Fifteen Through the Twentieth Century*, ed. Avigdor Levy (Syracuse: Syracuse University Press, 2002), 203.

119 Kurmuş, *Emperyalizmin Türkiye'ye Girişi*, 116-17.

120 BOA, ŞD 499/35, 2 Za 1290 (22.12.1873).

from Anvers.[121] The brick kilns in Sütlüce and Çobançeşmesi, which were managed by the Sultan's Treasury were occasionally given coal for their steam engines.[122]

Table 4.2 Industrial Establishments in the Sixth Municipal Division of Istanbul Employing Steam (1879)

	Owner	Industry	Engine	Power (hp)
1	Borikoğlu Achadir	Foundry	Locomobile	3
2	Ahmet Efendi	Foundry	Locomobile	2
3	Zino	Foundry	Locomobile	2
4	Antonis Lougo	Foundry	Locomobile	3
5	Vasili Kilomenoglu	Foundry	Locomobile	3
6	Minas	Foundry	Locomobile	3
7	Michel	Foundry	Locomobile	3
8	Stefano Linardo	Foundry	Locomobile	4
9	Yerassimo	Foundry	Locomobile	3
10	Morisson	Forges and machine tools	Fixed	6
11	Eastou	Forge and machine tools	Fixed	6
12	Jones	Forges and machine tools	Fixed	3
13	Jean Fontani	Foundry and machine tools	Fixed	4
14	Chousery	Foundry and machine tools	Fixed	8
15	Hacı Vasili	Gas lemonade factory	Locomobile	8
16	Emmanuel Parma	Macaroni factory	Locomobile	8
17	Eşref Efendi	Mill	Fixed	45
18	Papakiriaso	Mill	Fixed	12
19	Joseph Kavafian	Mill	Fixed	45
20	Manuel Kavafian	Mill	Fixed	45

SOURCE: BOA T.TTEK 498/42 (1879)

Steam power was not unique to large factories. Smaller workshops with access to coal installed steam engines when possible. Table 4.2 shows the utilization of steam engines in various workshops and factories in Beyoğlu and Galata, which were the most advanced districts of Istanbul. The table shows that

121 BOA, HR.TO 524/40, (01.04.1880).

122 DMA, Muhasebe 10/20, (20.10.1883).

producers owned two types of engines with different power capacities. Locomobiles - moving machines - produced less power and were used mostly in foundries. The power range of fixed engines was wider. While those with lower capacities were utilized in the forging business, stronger machines were favored in mills.

According to industrial statistics of 1915, the total driving power in the Ottoman industry was not less than 21,000 Brake Horse Power (BHP). This total included power generated by steam engines, internal combustion engines, electric motors, and water wheels. Despite the gradual development of new technologies providing alternative means of motion, the steam engine ranked first, producing 75.9 percent of the total power. The textile and food industries together with construction material production were the leading sectors powered by coal. The majority of these engines burned Ereğli coal which could provide 7000-7500 calories per kilogram.[123]

Despite the gradual progress in the adaptation of coal technologies to manufacturing, industrial demand for coal in the Ottoman economy remained relatively low. In Anatolia, industrialization based on large factories was partly achieved in 1930s and partly after 1960.[124] In the nineteenth century, however, manufacturing took place mostly in small enterprises instead of heavily mechanized production plants, and manual labor prevailed in industrial production. Moreover, waterpower occasionally substituted for coal.

4.4.3.3 Trains

The introduction of railway transportation in the Ottoman Empire can be traced back to the mid-1850s. The earliest lines were those between Alexandria and Cairo in Egypt, between Chernovoda and Constanza in the Balkans, and between Izmir and Aydın in Anatolia - all of which were constructed by British

123 Gündüz Ökçün, ed., *Osmanlı Sanayii: 1913-1915 İstatistikleri* (Istanbul: Hil Yayın, 1984), 29-30. Focusing on Western Anatolian provinces and Istanbul, the statistics do not consider other regions. For example, industrially-developed provinces like Adana and Beirut are not included.

124 Şevket Pamuk, *Türkiye'nin 200 Yıllık İktisadi Tarihi* (Istanbul: Türkiye İş Bankası Kültür Yayınları, 2014), 188-89 and 237-38.

entrepreneurs.[125] Together with the administrative and strategic concerns of the Ottoman government, the economic interests of European states in Ottoman lands led to the gradual development of railway transportation in the country in the sixty-year period before World War I.[126] From the 1850s onwards, forty lines of various lengths were constructed with foreign capital.[127] Moreover, the Ottomans themselves built the Haydarpaşa-Izmit line and the Hejaz railway.[128] From the introduction of railway transportation to the end of the empire, the Ottomans constructed a railway network of 8343 kilometers.[129]

125 Vahdettin Engin, *Rumeli Demiryolları* (Istanbul: Eren Yayıncılık, 1993), 36-40.

126 Muhteşem Kaynak, "Osmanlı Ekonomisinin Dünya Ekonomisine Eklemlenme Sürecinde Osmanlı Demiryollarına Bir Bakış," Yapıt, no.5 (1984): 66-84.

127 Necla Geyikdağı, *Foreign Investment in the Ottoman Empire* (London: I.B. Tauris 2011), 89.

128 For a detailed analysis of these railways, see Murat Özyüksel, *Osmanlı-Alman İlişkilerinin Gelişim Sürecinde Anadolu ve Bağdat Demiryolları* (Istanbul: Arba Araştırma Basım Yayın, 1988) and _____, *Hicaz Demiryolu* (Istanbul: Tarih Vakfı Yurt Yayınları, 2000).

129 Ali Satan, "Osmanlı Devri Demiryolu Kronolojisi," in *Osmanlı'da Ulaşım,* eds. Vahdettin Engin, Ahmet Uçar and Osman Doğan (Istanbul: Çamlıca, 2012), 338.

Photograph 4.3 A Sharp Stewart Locomotive of the Ottoman Railway Company (http://www.trainsofturkey.com/w/pmwiki.php/Steam/33011, Photograph by Alan Swale)

In the mid-1890s, the number of locomotives in use in the Asian part of the empire was not less than 134. There were fifty-one locomotives on the Izmir-Aydın line and twenty-two on the Izmir-Kasaba line. The Anatolian Railway Company owned thirty-three locomotives of German origin, thirteen of which were purchased from the old Haydarpaşa Railway. The short Mersin-Adana line had six locomotives. Others belonged to railways in Arab provinces.

Table 4.3 Locomotives in the Ottoman Empire

Year(s)	Manufacturer	Type	Quantity
1874	Krauss	Tank	1
1885	Dick Herr	Tank	1
1888-1911	Stephenson	Tank	8
1889	Sharp Stewart	Tank	4
1896	Esslingen Saronno	Tank	3
1905/09	Borsig	Tank	8
1909-12	Maffei	Tank	20
1913	Hanomag	Tank	3
1872	Hanomag	Tender	8
1884-1889	Sharp Stewart	Tender	14
1890	Esslingen Saronno	Tender	16
1890	Neilson	Tender	2
1889-1912	Maffei	Tender	23
1911/14	Hanomag /Borsig	Tender	22
1905	Cail	Tender	5
1897	Wiener Neustadt	Tender	3
1906	Stephenson	Tender	4
1909-1910	Henschel	Tender	26
1912	Humbolt	Tender	12
1874/1912	La Meuse	Narrow gauge	2
1893	Krauss	Narrow gauge	7

SOURCE: http://www.trainsofturkey.com/w/pmwiki.php/Steam.Steam

The majority of the locomotives were tender locomotives and the others were tank locomotives.[130] Table 4.3 provides detailed information about the locomotives used in Ottoman railways. Despite being a significant steam technology in the empire, Ottoman railway transportation was not as developed as in Europe or the United States. For a few decades, railways were confined to coastal regions that were under foreign influence. Later, railroads reached the country's inner plains. The highlands remained devoid of this technology

130 *Report by Major Law on Railways in Asiatic Turkey* (London: Harrison and Sons, 1896), 9-23.

until last. The railway network determined the geography of coal technology in the inland.

4.4.3.4 Other Machinery

Coal-based technology spread in different realms throughout the nineteenth century. Water pumps, disinfectors, and some agricultural machines were the major devices powered by fossil fuel, but the energy consumption of these machines was small overall. Yet, coal consumption was not confined to steam engines used for industry and transportation.

These machines appeared in the second half of the nineteenth century. The first was a water pump installed in Kağıthane in the 1870s.[131] The imperial factory situated at Zeytinburnu also possessed a water pump,[132] probably for industrial purposes. Some of the buildings belonging to the dynasty also enjoyed steam-powered pumps. Besides the huge engine near Yıldız Palace, another device supplied water to the kiosks in Maslak.[133] In 1886, an entrepreneur received a concession to extract water by means of a pump on Büyükada.[134] The Ottoman government tried to take advantage of steam-powered pumps for agriculture, and there were plans to import water pumps to improve cotton agriculture.[135]

Disinfection facilities became a popular means of fighting epidemics in the second half of the nineteenth century. The Ottoman government established many quarantine stations around the country and installed disinfectors in these stations and in some public buildings like hospitals.[136] The rationale for these devices was to kill germs via high-pressure steam. To obtain sufficiently

131 BOA, İ.MMS 51/2230, 28 M 1292 (06.03.1875).

132 BOA, İ.DH 864/69156, 11 Za 1299 (24.09.1882).

133 BOA, HH.HTA 7/81, 6 B 1299 (24.05.1882).

134 BOA, İ.MMS 82/3564, 22 C 1303 (28.03.1886).

135 BOA, BEO 2654/199002, 28 C 1323 (30.08.1905).

136 For a detailed discussion of disinfectors and their production in the Imperial Dockyard, see Nuran Yıldırım, "Tersane-i Amire Fabrikalarında Tebhir Makinesi/Etüv Üretimi ve Kullanımı" in *Dünü ve Bugünü ile Haliç Sempozyumu Bildirileri, 22-23 Mayıs 2003*, ed. S. F. Göncüoğlu (Istanbul: Kadir Has Üniversitesi Yayınları, 2004), 421-31.

high temperatures, coal was the best and most frequently used fuel in these stations.[137]

Ottoman agriculture developed during the last decades of the nineteenth century. This involved its mechanization partly through the employment of steam engines - especially in regions where cash crops were cultivated. By 1880, farmers in Çukurova started to use modern technology for agriculture after importing American reapers. Among other early machines were three steam engines, one steam plow, and a threshing machine, all of British origin.[138] Though limited in number and at a relatively later date, there were also efforts to employ modern machinery in inner Anatolia. In 1908, the government planned to purchase four threshing machines for Konya, Karaman, Ereğli, and Aksaray.[139] Around those years, a foreign company decided to bring a steam-powered hoeing machine to the Konya plain and asked permission from the government to procure coal from the Anatolian Railway company until the end of 1912.[140] In the following decades, internal combustion engines fueled by oil replaced coal-based agricultural technologies.

§ 4.5 Conclusion

Putting the exceptional and futile cases of the eighteenth century aside, the real encounter of the Ottomans with coal took place in the first half of the nineteenth century. Unlike Chinese and European civilizations, which had been burning coal for centuries for smelting and space heating, this fuel entered Ottoman lands together with steam technology at a relatively late date.

The history of coal in the Ottoman Empire is shaped by the transfer of scientific knowledge and technology from the western world. The first attempts to open coal mines in Ottoman territories and burn it for industrial purposes were piloted by European military specialists in the eighteenth

137 For an example of coal consumption in disinfectors, see BOA, A.MKT.MHM 554/3, 18 Ra 1312 (19.09.1894).

138 Donald Quataert, *Anadolu'da Osmanlı Reformu ve Tarım, 1876-1908* (Istanbul: Türkiye İş Bankası Yayınları, 2008), 140.

139 BOA, ŞD 1218/29, 9 S 1326 (04.03.1908).

140 BOA, ŞD 1234/25, 1 Za 1329 (24.10.1911).

century. After a three-decade interval, coal arrived in the country on one of the vessels powered by coal itself. The coal consumed until the discovery of the Ereğli basin were all European products. Even after the development of domestic coal mining, a considerable amount continued to be imported from Britain. European steam engines dominated the Ottoman industry and coal-based transportation until the end of the empire. European engineers played a pivotal role in coal exploration and the development of coal mining in the country. Numerous foreign technicians and workers were employed in coal extraction and coal-related technologies. Ottoman students and officials received education on coal and steam in Europe. Thus, Ottomans owed much to European civilization to use coal and its technology.

Without getting into quantitative detail, this chapter reveals that from its introduction until World War I, coal permeated the Ottoman economy at an increasing pace. The spread of steam engines in various industries, the transformation of transportation systems, and new technologies for smelting and space heating led to an upward trend in coal consumption. Yet in a country the industrialization of which was imperfect, higher demand came from transportation powered by steam engines. The gradual adoption of coal-based technology in other realms resulted in a limited transition from traditional energy sources to fossil fuels. The moderate Ottoman coal demand was met by the country's own sources and by British coal imports. The coming chapters analyze the economic aspects of this fossil fuel with quantitative data.

5

Domestic Coal in the Ottoman Economy

Ottomans depended exclusively on imported foreign coal for more than a decade after the introduction of steam technology to the empire. Domestic sources became available in the early 1840s and from that time on met a considerable share of the country's thermal energy need. This chapter focuses on the development of Ottoman coal mining and the economy of domestic coal. My discussion includes not only the production of fuel in coal mines but also its distribution and consumption.

The richest coalfield of the empire was located along the coasts of northwestern Anatolia, namely around Ereğli and Zonguldak. This region supplied fuel for Ottoman steam navigation, for factories, and to some extent, for space heating. The history of Ereğli coal is characterized by two distinct periods. From the beginning of production there up until the early 1880s, the state had strict control over the coalfield and consumed all output. After 1880, capital-owners challenged state domination over Ereğli coal. With respect to the production and consumption of Ereğli coal, this chapter highlights the differences between these two periods. Moreover, comparisons are included to place Ottoman coal in the global picture.

Besides the Ereğli basin, this chapter focuses on other coal mines around the country to which the current literature has paid little attention. These mostly lignite mines became important towards the end of the nineteenth century and were mostly operated for local consumption. The majority of these

mines were operated with foreign capital and produced limited amounts of fuel.

This chapter shows that coal reserves were not plentiful in the country and moreover that the Ottomans did not succeed in operating the existing mines properly. Despite improvements in coal mining over time, domestic sources did not meet domestic need. Compared to leading coal producers in the world, the output remained modest even at best. Based on these facts, it is argued that the mismanagement of the country's best coalfields by the state was the major obstacle for the improvement of the coal industry in the Ottoman Empire. The government provided neither enough capital nor sufficient labor to develop coal mining in the Ereğli basin. Moreover, the government ignored other coal mines in its domains which could have supplied a considerable proportion of the energy need of the country. The Ottoman coal industry only developed in the hands of private entrepreneurs who engaged in the business from a market-oriented perspective.

§ 5.1 Ereğli Coal Mines

The Ereğli coalfield is situated in a belt of sixty kilometers on the Asiatic coast of the Black Sea. It lies between Filyos in the east and Ereğli in the west, 135 nautical miles from the capital city.[1] The region is disadvantaged from topographic and geologic aspects. A chain of hills and mountains running parallel to the sea are cut by numerous gorges. Coal seams are scattered and irregular, which together with the region's geographical formations makes mining difficult.

5.1.1 *Administration of the Ereğli Coalfield and Miners*

The coal mines in the Ereğli region were discovered in 1840 and began to be exploited the following year. The Ottoman state maintained strict control over the coalfield from the beginning up until the gains of capitalists in the 1880s.

1 Hagop A. Karajian, *Mineral Resources of Armenia and Anatolia* (New York: Armen Technical Book Co., 1920), 102.

In March 1841, the coal mines were conceded to a company called the *Ereğli Kömür Madeni Kumpanyası* (Ereğli Coal Mines Company), and its operations started in November 1842.[2] The company was owned by six shareholders comprised of five statesmen and the brother of one of them. In early 1846, Sultan Abdülmecid became a partner in the company by obtaining half of the twelve shares. This company operated the mines independently for about five years. After the short-lived management of the mines by the Imperial Mint, their administration was undertaken by the Sultan's Treasury between 1850 and 1865. As coal production failed to meet the needs of the state under this institution, the coalfield was assigned to the Ministry of the Navy that governed the mines until 1909. In the last years of the empire, the region was managed by the Ministry of Commerce.[3]

The emphasis on the state in the literature notwithstanding, the economic and labor-related aspects of the mining business in the basin should not be downplayed.[4] Although the coalfield was managed by government agencies, the operators in the field were contractors who mined the coal in rented collieries. For many decades until the emergence of large mining companies, most miners were Ottoman citizens. The vast majority of these small mine owners in the basin had little or no capital with which to initiate their ventures. Even if they managed to start operations, they tried to run the business with little technical knowledge of coal mining. Thus, the majority of colliers were abandoned. In 1911, it was reported that only eighty mines were active even though the government had granted 393 licenses up to that date.[5]

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2 Ahmet Öğreten, "Ereğli Kömür Madeni Havzasında İlk Üretim," *A.Ü. Türkiyat Araştırmaları Enstitüsü Dergisi* 31 (2006): 143.

3 Genç, "Ereğli Kömür Madenleri," passim.

4 In his historiographical discussion on Ereğli coalfield, Donald Quataert criticizes the state-oriented periodization common in the literature. Rather, he emphasizes certain turning points like authorization for the free sale of coal in 1882, the little of restrictions on labor in 1906, and the civilianization of the mining administration in 1910. See Quataert, *Miners and the State,* 16.

5 S. Stassinopoulos, "Le Bassin Houiller d'Heraclée," *Revue Technique d'Orient (RTO),* no.8 (April 1911): 6.

There were several foreign attempts to operate the Ereğli coal mines, especially in the second half of the nineteenth century. Besides the short-term venture of a British company in 1860, from which neither the state nor the investors benefited,[6] the first significant attempt came in 1871 from a French businessman named Lusignan. The government and the investor agreed upon the establishment of the Heraclian Limited Company through which the two parties would operate the mines jointly. However, after conflicts regarding the regulations, the project failed in 1872. A few years later, in 1878, a French mining engineer named Meynier came up with a new proposal to operate the mines for fifty years. This venture as well as another request for a ninety-nine year concession that was made around the same time were also fruitless. The *Bank-ı Milli-i Osmani* group founded by Meynier and his partners came close to operating the Ereğli coal mines around 1880; however, the bureaucrats opposed to foreign investments blocked them. Although additional Dutch and British requests were made for large-scale operations, small miners dominated the basin until the establishment of the Ereğli Coal Company.[7]

5.1.2 *Production in Ereğli Coalfield*

For many decades, Ottoman coal mining suffered from technological backwardness which caused low output at high cost. In 1841, just after the discovery of coal in Ereğli, Granville Withers, who owned a coal mine in Belgium and had practical knowledge of coal mining, wrote:

> The reason of this enormous cost price … is entirely owing to the utter ignorance of those who direct the mining operations. Besides the total want of practical knowledge of the art of mining, there are neither tools nor funds for commencing and carrying on the work systematically. These causes combined have kept, and I am afraid will keep, for a

6 Genç, "Ereğli Kömür Madenleri," 34.

7 For a detailed discussion of foreign demands on the Ereğli basin, see Genç, "Ereğli Kömür Madenleri," 47-64.

> considerable time to come, this important treasure in a state of unproductiveness- an incalculable loss to the commerce of the country.[8]

Withers turned out to be right in that coal mining in Ereğli improved at a slow pace with a few exceptional leaps forward. Significant progress took place when British miners came to the Ereğli region during the Crimean War. With the help of geologists who were aware of the value of the Ereğli region, the British sought to solve the fuel problems of the navy by operating mines themselves.[9] While leaving some collieries to the Ottoman government, Britain wanted to mine the coal in the richest regions of the basin. After making a deal with the Ottomans, the British government signed an agreement with France in summer 1854, according to which England was "either to work or to cause the coal mines at Heraclea (Ereğli) to be worked."[10] Though the progress of coal production is difficult to document, foreign operations certainly introduced novelties to the basin. British personnel left mining equipment to the Ottoman Empire when the war ended.[11] A foreign observer noted that in the early 1860s there were forty collieries in the Ereğli basin. The average annual output was estimated 200,000 tons, which was extracted by 200 Slavic miners and 1000 unqualified workers.[12] However, government accounts do not concur with this estimation. In 1865, the amount of coal produced in the basin did not reach even 100,000 tons.[13]

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8 Macgregor, *Commercial Statistics*, 182-84.

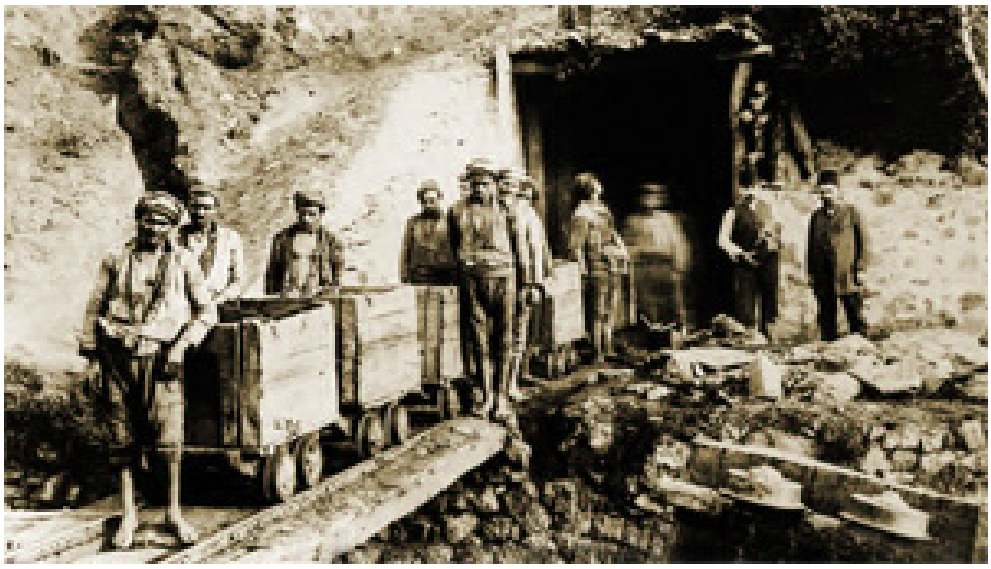
9 Robert A. Stafford, *Scientist of Empire: Sir Roderick Murchison, Scientific Exploration and Victorian Imperialism* (Cambridge: Cambridge University Press, 2002), 101

10 TNA, FO 93/33/57, (03.08.1954). The second article of the agreement which mentioned the distribution of coal reads as follows: "The coals obtained shall be shared in common in such manner, that one half shall be destined for the use of French navy and the other half for the use of the British navy. The coals will be furnished alternately to the two navies on conditions of perfect equality with respect to price and quality."

11 Genç, "Ereğli Kömür Madenleri," 32.

12 Xavier Heuschling, *L'empire de Turquie* (Bruxelles: C. Muquardt, 1860), 147.

13 Genç, "Ereğli Kömür Madenleri," 89.



Photograph 5.1 Coal Miners at Kozlu (Abülhamid Collection)

The Ereğli coalfield always suffered from labor shortages. The labor force in the region was comprised of diverse technical staff and workers with varied ethnic backgrounds. When production commenced in the 1840s, experienced Montenegrin and Croatian workers were brought to the region. Indeed, from the beginning up until World War I, European technicians and engineers were always present in the coalfield. Unskilled workers for both underground and aboveground tasks were mostly from local communities. As the free labor force did not produce the desired amount of coal, the government introduced compulsory work, which lasted from 1867 until 1921.[14] Despite state policies to ensure sufficient labor for coal mining, output was never satisfactory.

In 1878, mining engineer Meynier, who conducted scientific research in the Ereğli mines, prepared a report about the coalfield. In the report, Meynier summarized the defects that paralyzed the exploitation of coal in the basin. First, almost all licenses were in the hands of inexperienced miners. They opened countless galleries that were managed poorly and, hence, were causing the mountains in the basin to crumble. Second, the forced work system was incompatible with keeping the number of miners stable. Third, deforestation around the mines was a serious problem. Unregulated logging left insufficient

14 Quataert, *Miners and the State*, passim.

wood for the galleries within twenty kilometers of the collieries. Fourth, the lack of railway tracks, communication and other necessary equipment caused a 40 to 60 percent loss. Fifth, the lack of a proper port limited the flow of coal to consumer centers to a period of just three or four months a year. This led to the accumulation of coal which subsequently deteriorated.[15]

The establishment of the Ereğli Coal Company was a turning point in the history of the coal basin. The enterprise was founded in 1896 with French capital and three major goals: to build a port in Zonguldak, to construct railways in different parts of the basin, and to exploit various mines until their deposits were completely exhausted. The majority of the mines were the stowed by the Ministry of the Navy, while some were purchased from other operators in the basin. All the mines were registered in the name of two Ottoman subjects, Pangiri and Cartali.[16]

With a market-oriented understanding, the company installed modern facilities in the basin. Two washeries with Schüchtermann and Kremer systems had a daily preparation capacity of 1000 tons. In two batteries of fifty coke ovens each, metallurgical coke was produced for blast furnaces.[17] Such facilities together with better mining technologies led to an increasing trend in coal sales from the basin. However, not all novelties introduced by the company were successful. For example, a coal briquette factory that was opened to compete with the British coal from the Black Sea could not be maintained due to the high production costs. Modern equipment in the new port like cranes helped increase the loading capacity in Zonguldak. By 1910, the amount of coal that could be loaded onto ships was between 2000 and 3000 tons per day.[18]

15 BOA, HR.TO 465/5, (01.08.1879).

16 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO,* no.8, 7.

17 Ibid. These washeries were active in 353 days a year. In 1911, the average proportion of coal output after processing was around 63 precent. See also "Société Ottoman d'Héraclée, Assemblée Générale Ordinaire du 18 Juin 1913, Rapport du Conseil d'Administration," *La Gazette Financière (LGF)*, no. 201 (05.08.1913) : 498.

18 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO,* no.8, 7.

In 1901, the daily output of the whole basin was approximately 800-850 tons. With the employment of more workers and better mining technologies, the daily production capacity rose to 1500 tons by 1911. In this year, the number laborers working for the Ereğli Coal Company was 2800, comprised of 1800 miners working underground and 1000 others doing surface work.[19]

Better mining technologies were employed in three other collieries in addition to the mines of the Ereğli Coal Company. These mines were those owned by Rombaki and Panopoulos, *La Banque de Mételin,* and the Sarıca brothers. Rombaki and Panopoulos, who were both Ottoman citizens, operated a colliery four kilometers from the coast in Kerpiçlik. While the annual production was less than 15,000 tons in the early years of their business, it exceeded 100,000 tons after improvements made in the first decade of the twentieth century. Installing a large ventilator in the mine was an important step for air-conditioning the underground works. The miners also constructed a washery that could process thirty tons of coal per hour.

The mines of *La Banque de Mételin* first belonged to the Courdji Company and were later ceded to the bank. Though there were certain technological advancements in some of its mines, the majority of the equipment was outdated. Despite drawbacks, there was considerable output from these mines, reaching 90,000 tons per year around 1905. The annual production per worker was 580 kilograms. The relatively satisfactory production was attained by proper management and regular progress in the working conditions.[20]

The Sarıca brothers were the first Turkish entrepreneurs who tried to install a properly working system in their collieries. They started exploiting coal at the turn of the century.[21] Their mines were located in Kandilli, Alacaağzı, and Kozlu, and they extracted Çamlı coal, the best variety in the Ereğli basin. The annual production per worker was 400 kilograms in Kandilli and 600 kilogram in Kozlu. In the 1900s, the annual production in these mines was around 80,000 tons.[22] Collieries belonging to the Karamahmutzade brothers,

19 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO*, no.9, 13.

20 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO,* no.8, 6.

21 Genç, "Ereğli Kömür Madenleri," 247.

22 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO,* no.8, 7.

Boyacıoğlu, Bodosaki, Ahmet Efendi, and Gregovitch were other noteworthy mines that produced at least 8000-10,000 tons of coal annually.[23]

Though the Ereğli Coal Company generated the lion's share of overall coal production in the basin, other producers mined substantial sums. In 1912, mines operated by other companies and entrepreneurs produced around 220,000 tons of coal. The places from which this amount was obtained were as follows: 93,000 tons from Kozlu, 27,000 tons from Zonguldak, 25,000 tons from Kandilli and 18,000 tons from Kilimli.[24]

Figure 5.1 shows the progress of coal production in the Ereğli coalfields. As the graph suggests, for more than a half-century the output remained below 200,000 tons. Genç states that annual production in the region significantly increased after the market transition;[25] however, production data does not support this argument. Higher prices in the free market seem not to have motivated the producers to extract more coal. For about fifteen years after the open to the free market, the change in the annual output of the mines was insignificant. After 1897, production increased sharply and doubled in just three years. As mentioned above, the main reason for the expansion of production capacity was the establishment of a large company that took advantage of its significant capital and modern mining practices. As the company intensified its operations in the first decade of the twentieth century, production boomed and surpassed one million tons in 1912.

23 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *Revue Commerciale du Levant*, *Bulletin Mensuel de la Chambre de Commerce Française de Constantinople*, no.259 (October 1908): 524-28.

24 "Le charbon en Turquie," *LGF*, no. 188 (06.05.1913) : 277.

25 Genç, "Ereğli Kömür Madenleri," 89.

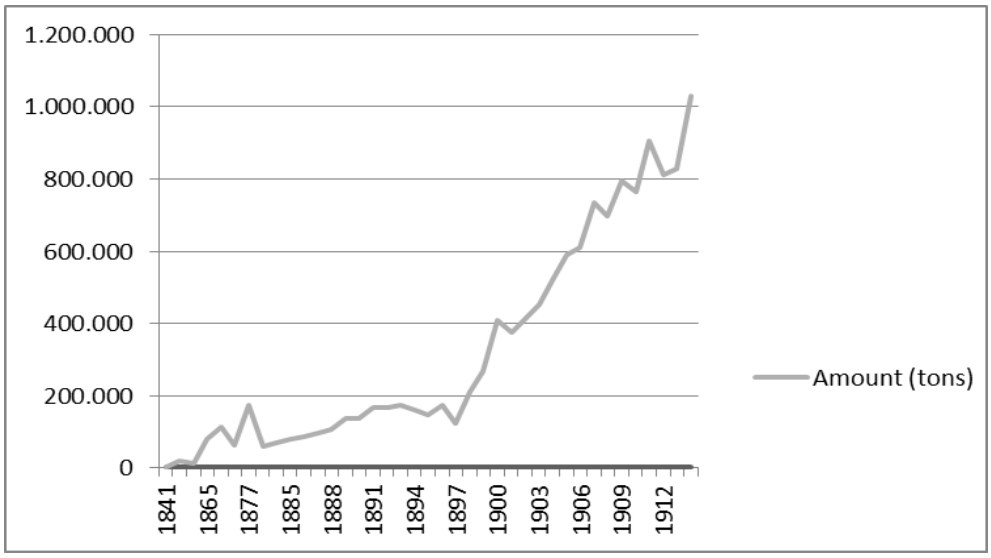


Figure 5.1 Annual Output in the Ereğli Coalfield. (Source : BOA HH.d.. 21171 ; Genç, "Ereğli Kömür Madenleri," 89; *Revue Commerciale du Levant*, no.259, 544)

Despite being the richest of the Ottoman Empire, the output of the Ereğli coalfield remained well below that of the mines of most European countries and Russia. In 1845, while Ottoman coal mining was still nascent, British coal production was about 34,750,000 tons. In the mid-1840s, anuual production levels in continental Europe were as follows: 4,960,000 tons in Belgium, 3,650,000 tons in Prussia, 4,140,000 tons in France, and 660,000 tons in Austria.[26] Ottoman production only matched the least of these in the twentieth century. The Ottoman coal industry produced around one million tons at its peak. The production of leading coal producers in the world at the end of the nineteenth century was unimaginable for the empire. In 1898, coal production was estimated 221,000,000 tons in the United States, 220,000,000 tons in Britain,

26 Richard C. Taylor, *Statistics of Coal: including mineral bituminous substances employed in arts and manufactures, with their geographical, geological and commercial distribution, and amount of production and consumption on the American continent: with incidental statistics of the iron manufacture* (Philadelphia: J.W. Moore, 1855), 29-30.

133,000,000 tons in Prussia, 34,000,000 tons in France, and 22,000,000 tons in Belgium.[27]

In the first decade of the twentieth century, the outputs of major coal producers in Asia were also higher than Ottoman production. Around 1905, the annual coal production estimations were as follows: 11,500,000 tons in Japan, 8,500,000 tons in India, and 2,000,000 tons in Asian territories of Russia. In Asia, only the 700,000 tons per year produced by China was comparable to the low level of Ottoman coal output.[28] While it met a considerable share of its own fuel needs with its own sources, the Ottoman Empire did not utilize its coal mines efficiently and produced only a minuscule share of the total coal production in the world.

5.1.3 *Consumption of Ereğli Coal*

There were two different periods with respect to the consumption of the domestic coal. The first period was characterized by government interventionism and the second by the liberal tendencies.

5.1.3.1 Public Consumption

For about four decades, the Ottoman government had exclusive rights over the consumption of Ereğli coal which implied a monopsony in the coal market.[29] The output in the first year was only 3900 tons and the coal was given to public production plants and factories like the imperial dock, the imperial arsenal, and the tanning yard at Beykoz.[30] The annual amount of Ereğli coal necessary to meet the need of the imperial dock in 1860 was 17,000 tons.[31]

27 Ernest Giraud, "Houille," *Revue Commerciale du Levant, Bulletin Mensuel de la Chambre de Commerce Française de Constantinople,* no.157 (April 1900) : 625.

28 Louis de Launay, *La géologie et les richesses minérales de l'Asie : historique, industrie, production, avenir, métallogénie : Sibérie, Oural, Caucase, Turkestan, Mer Égée, Asie Mineure, Perse, Inde, Insulinde, Indo-Chine, Chine*, (Paris : C. Béranger, 1911), 53-55.

29 Genç, "Ereğli Kömür Madenleri," 73.

30 BOA, HH.d.. 21171, (c.1845).

31 BOA, A MKT.NZD 320/13, 13 M 1277 (01.08.1860)

Table 5.1 exemplifies how coal was distributed in the early years of steam navigation in the empire. The steamers in the table were employed either for the transportation of goods and troops or for postal services. The total amount of coal needed for Ottoman steamships over a six-month period was 65,930 tons. This total was shared among nineteen vessels with varying energy requirements. While eight vessels were given less than 2000 tons, some were allocated 7000-8000 tons. About 1000 tons of coal was reserved for the workshops of the imperial dock in addition to the ships. The total value of the fuel was 7,490,000 piasters.[32]

Table 5.1 The Amount of Coal Allocated to Ottoman Steamers (13 April-12 October 1849)

Steamer	Amount (tons)
Vasıta-i Ticaret	8770
Medar- Ticaret	7310
Nümayiş-i Ticaret	5850
Hamidiye	5570
Taif	5570
Savn-ı Bari	5360
Eser-i Cedid	4460
Mesir-i Bahri	2230
Tair-i Bahri	2230
Peyk-i Ticaret	2190
Pesendide	2190
Ereğli	1980
Eser-i Ticaret	1950
Peyk-i Şevket	1640
Eser-i Hayr	1490
Hümapervaz	1460
Girit	1460
Vesile-i Ticaret	1110
Eser-i Nüzhet	1110
Total	65,930

SOURCE: BOA, İ.DH 191/10718, 2 R 1265 (26.01.1849)

32 BOA, İ.DH 191/10718, 2 R 1265 (26.01.1849).

Not only public navigation but also civilian steamer-transportation was fueled by domestic coal when foreign coal was not available. In 1854, the annual coal need of the Şirket-i Hayriye was around 4500 tons. The company and the Sultan's Treasury made a contract for coal provisioning. Since it was during the Crimean War and British coal was not available on the free market, the fuel for the company's steamers was supplied exclusively by the Ereğli basin.[33]

Coal consumption in the empire increased as steam transportation intensified in the second half of the nineteenth century. While public steamers ventured only to nearby ports in earlier times, from the 1860s onwards, they began to make voyages to distant port cities like Tripoli, Alexandria, Beirut, and Scutari.[34] The coaling accounts of the *Vasıta-i Ticaret*, one of the steamers that belonged to the *İdare-i Mahsusa*, hint at the coal consumption of Ottoman vessels. In the year from 13 June 1861 to 12 June 1862, this steamer burned 4775 tons of coal, 3690 tons of which was from Ereğli. The ship was loaded with coal in five places: four times in Istanbul, three times in Ereğli, twice in Izmir, twice in Trabzon, and once in Sinop. The amount of coal and its unit price varied even in the same place. For example, while the unit price for the first load of coal from Trabzon was 7 piasters, the price paid for each unit the second time was 11.5 piasters.

A considerable share of Ereğli coal was burned by the domestic consumers even after 1882. No longitudinal data about the consumption of domestic coal is available, yet Table 5.2 based on the official mining statistics of the Ottoman Empire provides some quantitative data about the domestic consumption in around 1910. Despite shedding light on a very short period, this table is valuable given the scarcity of sources on coal consumption

33 BOA, MVL275/24, 26 B 1270 (24.04.1854).

34 Ali İhsan Gencer, *Türk Denizcilik Tarihi Araştırmaları* (Istanbul: Türkiye Denizciler Sendikası, 1986), 20-21.

Table 5.2 Domestic Consumption of Ereğli Coal (1908-1912)

Years	Coal		Fine Coal	
	Amount (tons)	Value (piasters)	Amount (tons)	Value (piasters)
1908-1909	341,980	20,519,000	25,780	773,000
1909-1910	675,330	47,836,000	14,290	483,000
1910-1911	538,060	28,265,000	22,470	515,000
1911-1912	616,800	42,968,000	29,830	744,000

SOURCE: *Memalik-i Osmaniye'nin 1325,26,27 Senelerine Mahsus Maadin İstatistiği* (Istanbul: Matbaa-i Osmaniye, 1330 [1914]), 210-11.

In the statistics, the fuel was categorized according to its physical condition. Despite the considerable consumption of fine coal, the majority of the fuel was burned in coarse form. According to the figures, the annual amount of coal used domestically fluctuated between 360,000 and 690,000 tons. Vedat Eldem cites higher numbers than those given in the official statistics. He notes that the total amount of Ereğli coal consumed in 1911 was 734,000 tons. The details of the consumption were as follows: 303,000 tons were consumed by steamers, 239,000 tons by railway transportation, 153,000 tons by factories and 39,000 tons by the Ministry of the Navy.[35]

5.1.3.2 Ereğli Coal in the Free Market

After the decades-long state monopoly over the coal products of the Ereğli region, capitalist pressures on the government led to a limited liberalization of the market. In 1881, after facing serious financial problems stemming from the state's irregular and insufficient payments, mine operators in the coalfield offered a new arrangement in which they would sell 60 percent of the coal to the state and the rest on the free market. The following year, the government came to terms with the miners and approved the sale of 40 percent of the output to private buyers.[36] This meant the removal of the price ceiling, at least for a considerable portion of the output.

35 Vedat Eldem, *Osmanlı İmparatorluğu'nun İktisadi Şartları Hakkında Bir Tetkik* (Ankara: Türk Tarih Kurumu Basımevi, 1994), 50.

36 Genç, "Ereğli Kömür Madenleri," 68.

Being opened up to the free market did not bring immediate success to Turkish coal. Ereğli coal had long had a bad reputation in both domestic and foreign markets. Not only were operations in the coalfield inefficient but mechanical preparation was absent. Miners sold their coal without sorting out schist and removing soil which could constitute up to 20 percent of the product.[37] In this respect, the construction of coal washeries by the Ereğli Company in Zonguldak and Kozlu in 1897 and 1903 was a turning point for the marketing of Turkish coal.[38]

Another improvement that boosted the sales of Ereğli coal on the free market was the construction of the Zonguldak port. After the construction of the port, Zonguldak became the most important location from which coal could be loaded onto steamers either for transport to other places or for their own needs. Thus, a considerable portion of coal was sold directly to the consumers near the coalfields. In 1912, the Ereğli Coal Company vended about 514.000 tons of coal in Zonguldak. When the sales of other producers are considered as well, the total amount marketed in this port was even higher.

The major internal market for Ereğli coal was Istanbul and its surroundings. In the first decade of the twentieth century, the annual amount of coal delivered to Istanbul from local sources reached almost 200,000 tons. More precisely, the yearly amounts of coal supplied to the capital city by the Ereğli coalfields in 1904, 1905, and 1908 were 174,000, 188,000, and 199.000 tons, respectively.[39] By 1910, however, the amount of coal transported to Istanbul was reported to be just 130,000 tons indicating the considerable loss of this market.[40] With a subsequent market recovery, the deliveries to the city were 214,500 tons in 1911 and 273,000 tons in 1912.[41] As discussed in the previous

37 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO*, no.8, 6.

38 Genç, "Ereğli Kömür Madenleri," 204.

39 Giraud, "Houille et Mines de Houille," 649.

40 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO*, no.9, 13

41 "La Société d'Héraclée," *LGF*, no. 177, (18.02.1913): 101. In another issue of the same journal, the amount of coal delivered to Istanbul in 1912 was recorded as 186,000 tons. See "Le charbon," *LGF*, no. 188, 277. However, given the increasing importance of Ereğli coal in the domestic market during the Balkan Wars, higher numbers seem more realistic.

chapter in detail, Ereğli coal was used in houses, steamers, mills, trains, gasworks, and some other facilities.

In the Aegean, the Ereğli Coal Company delivered coal to the quay of Akçay for the mining operations of the Balya-Karaaydın Company. Izmir was among the major destinations to which around 25,000 tons of sifted coal was delivered annually. Maritime companies there were the chief clients of Turkish coal.[42] In 1912, the amount of Ereğli coal sent by the company to Izmir exceeded 60,000 tons. Salonica and Dedeağaç were also supplied with 17,250 and 2500 tons, respectively.[43]

The dominance of the Ereğli Coal Company in the free market did not imply that all output was sold to private agents. The company also signed contracts with public institutions and companies for large amounts of coal. Just after its foundation in 1897, the company agreed to supply 25,000 tons of coal to *Idare-i Mahsusa* and 10,000 tons to the imperial arsenal, deliverable within a year. The price in these two sales agreements was 19 piasters per ton.[44] An American writer stated that in the first decade of the twentieth century "all vessels flying the Ottoman flag and all railways in the empire are obliged to purchase 75 percent of their entire consumption of coal from Turkish mines."[45] However, in my research I found no information about such a compulsory policy.

The difficulties of importing foreign coal during the Balkan Wars made indigenous coal sources more significant. The Ottoman navy maintained its operations on account of the Ereğli coalfield. Likewise, economic life and civilian transportation were not seriously influenced following the substitution of domestic coal.[46]

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42 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO*, no.9, 13.

43 "Le charbon," *LGF*, no. 188, 277.

44 *Dersaadet Ticaret Odası Gazetesi (DTOG)*, 11 M 1315 (June 12, 1897) and 3 S 1315 (July 4, 1897).

45 Will Seymour Monroe. *Turkey and the Turks: an account of the lands, the peoples, and the institutions of the Ottoman Empire* (Boston: L.C. Page and Co., 1907), 153.

46 "Le Bassin Houiller d'Héraclée," *LGF*, no.219 (09.12.1913) : 784.

5.1.4 *Export of Ereğli Coal*

Although the Ottoman government approved the opening of domestic coal to the free market in 1882, there is no evidence of its exportation in the early years. The earliest document I have found mentioning coal exports is a passage from the Journal of the Istanbul Chamber of Commerce published in August 1888. It was stated that the majority of the exported coal was delivered to eastern Rumelia, but problems with customs interrupted sales.[47] In the following decade, due to improvements in its quality, domestic coal became more preferable. Cleaner Ereğli coal better competed with foreign products. As a result, Ottoman coal exports increased significantly at the turn of the twentieth century. In 1898 and 1899, annual exports were about 22,000 tons and 38,500 tons, respectively. In 1900, the amount considerably increased to 53,500 tons. Not only the quantities but also the reach of exports was extended in time. By 1910, Turkish coal was sent as far as Marseille in the Mediterranean market.[48]

Table 5.3 provides valuable information about the export of Ereğli coal around 1910. The table explicitly shows that the main market for Ereğli coal was Europe. Though in differing amounts, Turkish coal had reached almost all European countries by the first decade of the nineteenth century. The closest countries to the Ereğli region - Bulgaria, Romania, and Russia - were the major importers of coal along with Greece, another neighboring country. Italy, Germany, Holland, France, and Britain were other significant buyers of Ereğli coal, especially after 1910. The remarkable increase in Ottoman coal exports to these countries was caused by mass strikes in British coal mines. Ottoman coal miners took advantage of their competitors' situation and doubled exports within two years. Though not given in the table, official statistics also indicate that foreign steamers consumed a considerable amount of Ereğli coal. In the 1908-1909 period, 187,400 tons of coal were sold to foreign vessels.

47 *DTOG*, 25 Z 1305 (August 12, 1888).

48 Giraud, "Houille et Mines de Houille," 644.

Table 5.3 Ottoman Coal Exports (1908-1912)

Country	1908-1909	1909-1910	1910-1911	1911-1912
Spain	.	.	730	1230
Germany	890	190	12,020	21,200
United States	.	.	.	640
England	3900	2460	6160	16,700
Austria	4260	3180	450	5520
Italy	12,200	3250	21,560	11,870
Belgium	540	.	.	1240
Bulgaria	29,400	37,220	21,940	36,500
Denmark	.	150	320	630
Russia	1300	290	22,000	37,000
Romania	34,580	45,800	39,150	44,930
France	.	.	11,240	11,750
Holland	.	.	17,720	19,680
Norway	590	.	.	.
Greece	42,660	26,940	35,260	32,090
Total (tons)	130,320	119,480	188,550	240,980

SOURCE: *Memalik-i Osmaniye'nin 1325, 26, 27 Senelerine Mahsus Maadin İstatistiği* (Istanbul: Matbaa-i Osmaniye, 1330 [1914]), 210-11.

In addition to coarse coal, Ottomans exported fine coal dust. As in the case of coarse coal, neighboring countries constituted the main market for fine coal. Almost all this fuel was shipped to Romania, Bulgaria, and Greece. According to Ottoman mining statistics, between 1908 and 1912 the total amount of fine coal exported to these countries was 68,350 tons that valued at 1,969,000 piasters. Among the three, Romania was the largest consumer with 50,860 tons. It was followed by Bulgaria which imported 15,500 tons of Ottoman fine coal. Having imported 2000 tons, Greece had a small share in the overall export volume.

Ottoman consular reports provide details about the trade of Ereğli coal in foreign countries. In the Black Sea, Ereğli coal competed with the Russian coal of the Donetsk basin and various British coals. However, the coal did not permeate in interior regions and was sold mostly in places open to water

transport.[49] The most detailed market report is from Romania, which was a leading buyer and a gateway for Serbia and Hungary. The consul there noted that the major destination for coal imports to Romania was the Danube. Ereğli coal could thus reach the interior of the Balkans up to Vidin. The coal was delivered to the depots in Braila, Galati, and Constanta. In 1907, 56,500 tons of coal and 3670 tons of coke were delivered to the Romanian port of Constanta.[50] The Ottoman coal that was in demand was that extracted from Kandilli, Çamlı and the Courdji company's colliery number 8. However, Zonguldak coal was gradually replacing these after the introduction of the coal washing process. The three coals mentioned were faced with the danger of losing theirs market because of their soil content. With its better products, the Ereğli Company supplied coal to the gasworks in Galati in the early 1910s.[51]

The annual average amount of Ottoman coal sold along the Danube was approximately 35,000 tons. It was reported by the consul that if the coal market was expanded to Hungary with affordable prices, overall exportation could reach 200,000 tons. On the international market, there were certain disadvantages for Ereğli coal related to the physical characteristics of the fuel. Ottoman coal produced a thick smoke and left too much ash after being burned. Given the narrow chimneys of the houses in Romania, they were not preferred for domestic use. The impurity of Ereğli coal necessitated additional sifting costs if the coal was to be sold to households. Yet with their proper equipment, industrial plants could burn Ottoman coal smoothly.[52]

The other obstacle to the improvement of the Turkish coal trade in the Romanian market was the dishonest commercial behaviors of Ottoman tradesmen. Most of the time buyers were cheated by the intermediaries in the coal trade. As a result, demand for Ereğli coal was decreasing. The solution offered by the consul to prevent fraud and to win the trust of Romanian clients was either to collect all small collieries under an umbrella company or to establish a syndicate to organize all coal trade with the help of a trustworthy

49 de Launay, *La géologie,* 54.

50 *Ticaret Layihaları*, vol.2 (Istanbul: Selanik matbaası, 1910), 119-20.

51 Genç, "Ereğli Kömür Madenleri," 117.

52 *Ticaret Layihaları*, vol.2 ,134.

officer. If miners would build coal depots in Sulina, Galati, and Braila, they could take the advantage of bulk deliveries on large steamers which would decrease freight costs. In this way, intermediaries would be eliminated and sales would be made directly.[53]

In Bulgaria, the major destination for Turkish coal was to the port of Varna. In 1908 and 1909, more than 50,000 tons of coal was shipped there. For a long time, coal was transported from Ereğli to Varna exclusively by sailboat, but after 1905 steamers began to be employed for this task.[54] For example, in 1910 a Greek tradesman brought 1400 tons of Turkish coal to Bulgaria on two steamers flying Greek and British flags, respectively.[55] This shows that in addition to Ottoman merchants, foreigners were engaged in the export of coal from the Ereğli region. Yet according to the Ottoman consul at Varna, steam transportation and the employment of sailboats with capacities of 30-40 tons would increase coal prices because of higher freight rates. For him, it would be favorable if Turkish coal was conveyed by large sailboats that could carry 500-600 tons.[56] Burgaz was another Bulgarian destination for Turkish coal. Coal from Çamlı mines was the most demanded fuel in this port because of its high calorific value.[57]

Along Aegean coasts, the Greek cities of Laurium and Pire imported 25-30,000 tons of coal from Ereğli each year. While the coal was used to fuel mining operations in Laurium, it was stored in depots in Pire and sold to passing steamers.[58] Despite the long distance, Turkish coal was also sold in Trieste, one of the most important destinations for Turkish coal in the Adriatic Sea. Britain was by far the most important supplier of this region, but Turkish coal together with American and Dutch coals were among other fuels imported to the port in small quantities. In the first decade of the twentieth century annual coal exports to this port amounted to only 2500 tons, which was a little when

53 Ibid., 132-33.

54 *Ticaret Layihaları*, vol.2, 9.

55 *Ticaret Layihaları*, vol.3 (Istanbul: Matbaa-i Hayriye ve şürekası, 1910), 238.

56 *Ticaret Layihaları,* vol.2, 9.

57 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *RTO*, no.9, 13.

58 Stassinopoulos, "Le Bassin Houiller d'Heraclée," RTO, no.9, 13.

compared to the volume of the Ottoman coal trade around the Black Sea. According to the Ottoman consul in Trieste, Ereğli coal was considered superior to Newcastle coal, and it was cheaper. For him, Ottoman merchants should endeavor to bring more coal to Trieste and should obtain depots in there. Moreover, instead of in a mixing coal and coal dust, selling them separately would give Turkish merchants an advantage.[59]

§ 5.2 Coal Network of the Ottoman Government

For many decades before the construction of the Zonguldak port, coal was loaded to sea vessels from small quays located in several bays along the coalfield. Kozlu, Kilimli, and Çatalağzı were the significant hubs for loading. Although these were relatively safer places, loading was extremely difficult even in these quays, especially in winter. Therefore, they were useless for almost half the year.[60] To ensure the fuel supply for its steamers and factories, the Ottomans set up a coaling network and improved it over time.

As discussed in detail in the previous chapter, the Ottoman navy was the pioneer of steam technology in the empire. In addition to steam powered ships and workshops, the Ministry of the Navy's imperial dock implemented coal-based smelting technology at an early stage of the coal age in the country. The Golden Horn as the natural harbor of the capital city had always been the principal venue for the storage and distribution of coal. The Ottoman government had a large coal depot in the Golden Horn which was managed by the imperial dock. This depot was critical for supplying fuel for steamers and factories. Its domain was not confined to Istanbul but covered a vast geography. In addition to direct shipments from the Ereğli coalfield, most coal delivered to the various regions of the country was distributed from the imperial dock.

59 *Ticaret Layihaları*, vol.4 (Istanbul: Matbaa-i Hayriye ve şürekası, 1911), 36.

60 Stassinopoulos, "Le Bassin Houiller d'Heraclée," *Revue Commerciale du Levant*, no.259, 530.

Table 5.4 Distribution of Ereğli Coal in 1284 Rumi (1868-1869)

	Amount (tons)	Unit cost (pias.)	Total value (pias.)
Imperial Dock	2422	115	278,530
	16,263	160	1,870,245
Crete	7890	228	907,350
	21,590	222	2,482,850
Samos	453	208	52,095
Chios	707	207	81,305
Cyprus	284	275	32,660
Izmit	164	168	18,860
Sinop	332	164	38,180
Çanakkale	2117	181	243,455
Lesvos	573	194	65,895
Izmir	409	203	47,035
Rhodes	1838	226	211,370
Patmos	343	198	39,445
Çeşme	1170	200	134,550
Salonica	2940	215	338,100
Bodrum	880	206	101,200
Govina	327	307	37,605
Preveze	340	307	39,100
Vidin	469	168	53,935
Morto	984	307	113,160
Total	62,495	4459	7,186,925

SOURCE: DMA, Müteferrik d. no.4: 51, 3 N 1286 (07.12.1869)

The steamers that procured fuel from the imperial dock varied in terms of their qualifications. Though most of the vessels belonged to the navy, private steamers hired for public services could obtain coal there. For example, a merchant ship could be provided with coal when it pulled military ships to the dock.[61] Among the public production plants fueled by this depot were the ironworks of the dock, a rolling mill, the imperial fez factory, Yalıköşkü factory, and the imperial baize factory. For example, between 13 June and 12 July

61 DMA, Müteferrik defter no: 16201, p.2 (1868).

1869, the ironworks received 2865 tons, the rolling mill received 1040 tons, and the baize factory received 1070 tons of Ereğli coal from the depot.[62] Table 5.4 provides an overview of the coal network of the empire prior to 1870.

Ereğli coal was delivered to nineteen locations around the empire in 1868. As the table indicates, the leading destinations were the imperial dock in the Golden Horn and Crete, which was the chief naval base of the Ottoman navy in the Mediterranean. These two received more than 75 percent of the coal distributed in the given span of time. Çanakkale, Salonica, and Rhodes were relatively important recipients compared to other locations. The modest amounts distributed to other places indicate that they were of minor importance for coal traffic.

As indicated, the unit cost of coal varied for different destinations. As can be expected, these differences were due to transportation costs. While the unit cost of coal for places close to Ereğli was around 160 piasters, the cost in remote locations was almost doubled. Coal sent to Govino, Preveza, and Morto in the Ionian Sea and to Cyprus in the eastern Mediterranean were the most expensive. As in the cases of the imperial dock and Crete, the cost of deliveries to a given destination varied depending on the season.

At the end of the 1860s, a government unit in the capital city called the *Dersaadet Kömür İdaresi* (Istanbul Coal Administration) traded in coal for civilian use, too. Archival records show that the majority of the coal stored in the administration's depots was purchased by merchant steamers and artisans. Current and former statesmen were also buying coal from this depot for heating purposes. Sales of coal by the administration for civilian purposes amounted to eighty-seven tons in 1868.[63] This unit was closed in the following years.

Maritime transportation played a pivotal role in the distribution of Ereğli coal around the country. Ereğli coal was distributed either by merchant ships or by the commercial fleet of the Ottoman government. In the early years of its exploitation, the coal was transported to Istanbul on small sailing boats

62 Ibid., 26, 17 R 1286 (22.07.1869).

63 DMA, Müteferrik defter no: 16201, p.1, 31 Kanunevvel 1284 (12.01.1869).

owned by local sailors, the majority of whom were Muslims.[64] In the following decades, boats were replaced by larger vessels, reducing the income of local sailors.[65] Archival documents show that public steamships transported coal only to the imperial dock. Importantly, the freight costs of public vessels were cheaper than that of others. However, as public vessels had other duties, most of the time merchant ships were employed to deliver coal to Istanbul and to other stations. After the Crimean War, the transportation of coal was delegated to contractors who were mostly compotent merchants. In 1869, for example, the government made a deal with Uncuoğlu Apik Efendi to transport 85,000 tons of coal from Ereğli to Istanbul. According to the agreement, the contractor would undertake the shipping of this coal over six months, transporting some 14,000 tons each month from March to August. Most of the coal was conveyed by the contractor to the imperial dock, but the delivery of 230 tons of coal to the Beykoz tannery shows that other public plants received fuel directly from Ereğli.[66]

Ereğli coal was sent to almost every corner of the empire. The farthest place Turkish coal reached was Basra.[67] Delivering coal to remote provinces was costly. According to a contract dated 1872, the cost of transporting coal from Ereğli to Jeddah tripled its value. While the total value of 3000 tons of coal was 3870 Ottoman liras, the amount paid for freight was 7500 Ottoman liras.[68] Foreign steamers were instrumental for shipping coal to depots in distant provinces. In 1885, the government hired a steamer from the Austrian Lloyd company to send coal to two stores in the Red Sea. The steamer delivered 186 tons of coal to Kamaran island and 100 tons to Jeddah.[69]

64 See, for example, HH.d. 14 Za 1270 (08.08.1854).

65 Gencer, *Türk Denizcilik Tarihi*, 22.

66 DMA, Müteferrik defter no: 16201, pp.25-29, 7 R 1286 (17.07.1869).

67 DMA, Defter no: 10276, p.46, 1 Temmuz 1307 (13.07.1891).

68 DMA, Mazbata ve Müzekkire defteri no: 1921, p.72, 14 B 1289 (17.09.1872). The freight cost for the transportation of same amount of coal from Ereğli to Port Said was 1775 Ottoman liras, indicating that freight rates for the Suez Canal and the Red Sea were much higher than those for the Mediterranean.

69 DMA, Muhasebe 853-19, (19.02.1885).

5.2.1 *Ottoman Coal Depots*

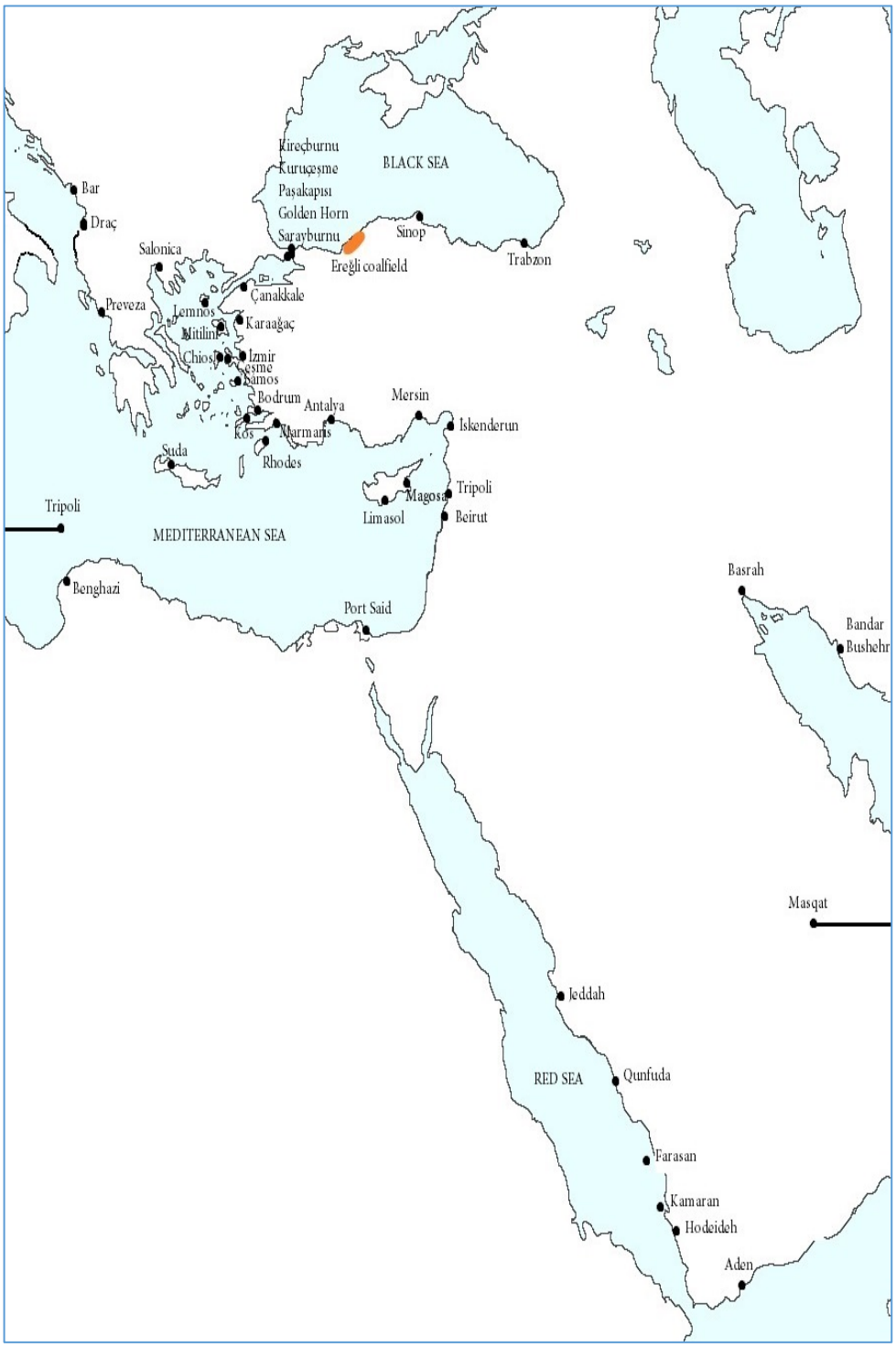
As steam navigation advanced in the empire, storing coal in certain ports became necessary. Like all maritime nations of the time, the Ottomans built coal depots around the country. While coal was stocked only in a few centers prior to 1860, it began to be stored within a large network of coaling stations after the construction of new depots in the following decades. Coal depots were under the control of the Ministry of the Navy. They were managed by the harbormasters of larger ports and by ordinary officers in smaller ones. Instead of cash, transactions with the depots were based on vouchers. When a steamer took coal from a depot it was recorded in an account book and the captain was given a voucher. It was the Naval Council's duty to collect the money.[70]

Coal depots were placed in ports where maritime traffic was relatively intense. The vital importance of coal for steam-run navies made coaling stations militarily strategic.[71] Ottoman coal depots were located Aden, Alexandrette, Antalya, Archipelago (Cezair-i Bahri Sefid), Bandar Bushehr, Basra, Beirut, Benghazi, Bodrum, Çanakkale, Çeşme, Durres, Feresan, Golden Horn, Hodeideh, Istanköy, Shkodra (Bar), Izmir, Jeddah, Kamaran, Karaağaç, Kireçburnu, Kiremitlik, Kunfuda, Kurna, Kuruçeşme, Limasol, Limni, Magosa, Marmaris, Masqat, Mersin, Mytillini, Paşakapısı, Port Said, Preveza (Morto), Rhodes, Suda, Sarayburnu, Sakız, Salonica, Sinop, Sisam, Trablusgarp, Tripoli, and Trabzon.

The depots protected coal from external influences that would deteriorate the fuel. When uncovered, coal could get wet or get mixed with dust and dirt. In arid regions of the empire, fires broke out when coal self-ignited in extremely hot weather.

70 Gencer, *Türk Denizcilik Tarihi*, 21-22.

71 Coal depots were a potential matter of conflict among rival states. In a British military report titled "List of Coaling Stations Desired by Great Powers," Russia and Germany were shown to have designs on Ottoman coal depots at Lemnos, Mithylene, Marmaris, Rhodes, Suda, Alexandretta, and Beirut. See TNA, FO 881/7154 (1899).



Map 5.1 Ottoman Coal Depots

The construction of a proper coal depot in Jeddah, for example, became necessary after a fire that occurred in 1887.[72] Coal depots were not necessarily constructed and owned by the government. At the end of the 1860s, for example, Ereğli coal sent to Trabzon was stored in rented coal yards belonging to private agents.[73]

As mentioned above, depots differed in size and importance. Suda, a town close to Hanya in Crete, was the largest coaling station of the Ottoman steam navy in the Mediterranea. The oldest records of this depot trace back to 1860.[74] In its first five years, from 1860 to 1864, 4600 tons of Ereğli coal was delivered to this coal depot. The amount delivered in 1865 was 13,400 tons, 7820 tons of which was delivered by merchant ships and 5580 tons by public ships. In these years, the majority of coal was provided to the steamers of the imperial dock. The steamers of the *Fevaid-i Osmaniye*, and *Idare-i Mısriyye* were important consumers together with a few foreign vessels.[75] The coaling station was improved over the decades. By 1890, there were six public coal depots in Suda.[76] Table 5.5 is the annual account of the Suda coal depot from March 1890 to February 1891 and provides information about fuel transactions. The table shows that the depot supplied coal to numerous vessels of the Ottoman navy. A total of twenty-five steamers took coal from Suda that year. The steamers varied in terms of their naval characteristics. There were corvettes like *Ismail* and *Beyrut*, gunboats like *Fırat* and *Şat*, and ordinary steamers like *Rodos* and *Nedim*. Not all the steamers given in the table belonged to the Ottoman navy. Some, like *Necid*, *Selanik,* and *Tarsus,* were owned by the *Idare-i Mahsusa.*

72 Mehmet Korkmaz, "XX. Yüzyıl Başlarında Kızıldeniz'de Osmanlı Denizcilik Faaliyetleri" (Master's thesis, Mimar Sinan Fine Arts University, 2012), 68.

73 DMA, Müteferrik defter no: 16201, p.6 (1868).

74 Gencer, *Türk Denizcilik Tarihi*, 25.

75 Gencer, *Türk Denizcilik Tarihi*, 25.

76 Cuinet, *La Turquie d'Asie,* vol. 1, 578.

Table 5.5 Annual Transactions of the Suda Coal Depot (1890-91)

Vessels/ other consumers	Amount (tons)
İsmail	613
Mehmed Selim	379
Fırat	338
Beyrut	317
Rodos	225
Mansure	208
Hasan Paşa	170
Ziver-i Derya	157
Sakarya	135
İstinye	113
Girit	112
Necid	101
Cidde	100
Edremit	93
Şat	80
Gedikler	78
Selanik	72
Sinop	63
Nedim	42
Seyyar	40
Ali Sakıp Paşa	33
İskender	27
Nimet	22
Tarsus	13
Austrian steamer	61
Workshops	202.5
Barracks, baths, hospital	74.5
A local merchant	5
Total	3874

SOURCE: DMA, defter no.10276, 1306 (1890-91)

The transactions of the coal depot were not regular. While twelve public steamers were loaded with coal from the depot in April 1890, only one vessel demanded coal in January 1891. Depending on the size of the steamers and the

frequency of their voyages to the island, the amounts of the fuel provided to the vessels differed. Up to 382 tons was taken by the steamer *Ismail* in December 1890, while the steamer *Rodos* received only four tons of coal in November 1890.

Suda was an important naval base of the Ottoman Empire. There were various military buildings and a military dock located in the city. Therefore, coal depots in the port provided coal for other facilities in addition to the steam navigation. Gencer notes that coal was stored in the depots seperately for the steamers of the imperial dock, the *Idare-i Mahsusa* and other public works.[77] As shown in the table, the workshops on the dock, the barracks, baths, and the military hospital all took coal from the Suda depots. Moreover, the figures indicate that the fuel requirement of the workshops was far higher than that of the barracks, baths, and hospital. While the workshops usually consumed sixty to seventy tons in a month, the others needed at most ten tons of coal.

All coal stored in the depot was used for public purposes with two exceptions. In April 1890, sixty-one tons of coal was sold to an Austrian steamer and five tons to a local merchant. Even earlier, sales were made to a steam mill in Chania, to a blacksmith workshop, and to a French steamer that was hunting for sponges around the island.[78] These sales and a few examples from other depots show that the procurance of Ereğli coal was not necessarily confined to public vessels and buildings. Though only in rare cases, Ottoman coal depots could supply fuel to private demanders.

The total amount of coal that passed through the depot from March 1890 to February 1891 was 3874 tons. The amounts fluctuated from month to month. Sometimes there were sharp changes like the jump from 157 to 703 tons in June 1890 and the decrease from 629 to 16 tons in January 1891.[79] While the calmness in winter was related to inclement weather conditions that affected maritime activities, the changes in other months are circumstantial.

Most coaling stations, unlike the stores on the Suda dock, had only small depots. These were generally peripheral stations located in relatively

77 Gencer, *Türk Denizcilik Tarihi*, 23.

78 DMA, Müteferrik defter no: 16201, 62, 14 Mart 1284 (26.03.1868).

79 DMA, defter no.10276, 1306 (1890-91).

insignificant ports. It is worth examining one such depot to see the differences. Table 5.6 illustrates the limited activity of the coal depot on Samos island.

Table 5.6 Transactions of the Samos Coal Depot (1885-1889)

Year	Vessel	Amount (tons)
1885	*Rodos*	111.5
	Eser-i Nüzhet	12
	Nedim	8.5
1886	*Rodos*	122
	Eser-i Nüzhet	8
	İstanköy	14
1887	*Rodos*	78
	Eser-i Nüzhet	5
	Gemlik	20
1888	*Rodos*	29
	Kamil Paşa	11
	Eser-i Nüzhet	10
	Peyk-i Ticaret	3
	Sulhiye	17
	Musul	37
1889	*Süreyya*	11
	Musul	92
	Sulhiye	15
Total		604

SOURCE: DMA, Müteferrik defter no: 1280, 2 August 1306 (14.08.1890)

Over a five-year period, the number of steamers that were provided with coal from this depot was ten. Only three vessels were fueled annually, with the exception of 1888. Like the number of vessels, the amount of coal supplied by this depot was small. The maximum quantity in a one-year period was 144 tons in 1886. The table shows that most steamers took limited loads of coal from Samos, there were even minuscule amounts like three and five tons. The number of voyages to the island was an important factor that deterrmined the amount of fuel taken from the coal depot. From 1885 to 1887, the vessel called *Rodos* was the leading client. Though not shown in the table above, archival

records indicate that this steamer visited the island numerous times and was fueled there on various dates.

Overall, the Ottomans distributed Ereğli coal through a web of depots spread around the country. The depots were strategically placed in the regions distant from the source. As seen in the next chapter, these depots stored and supplied not only domestic fuel but also British coal.

§ 5.3 Local Coal Sources

In addition to the Ereğli coalfield, there were many coal deposits around the country.[80] However, no place other than the Ereğli region had a nation wide market. The following passage written in 1908 summarizes the reasons for the disuse of coal sources:

> First, the qualities of these coals are generally lower: most are lignite. Then, the means of communication do not exist; transport is horribly expensive. The necessary capital to operate these mines is lacking. Finally, the people involved in these venture are, with few exceptions, unable to carry out the operation of a mine.[81]

Other mines suffered from the same inefficiencies as the Ereğli coalfield. The majority of the production of active local mines was consumed in the immediate vicinity of the collieries. Long-distance trade of lignite -an inferior kind of coal - was not profitable given the high production and transportation costs. In fact, the operations of these mines were mostly "confined to desultory attempts that were scarcely adequate to meet even the limited local requirements."[82]

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80 As with other minerals, the majority of entrepreneurs were interested in obtaining concessions instead of operating coal mines. Mining statistics cite 106 licenses for coal exploration and fourteen licenses for lignite exploration between 1907 and 1909. In the first decade of the twentieth century five concessions were granted for coal and twelve concessions for lignite. See *Memalik-i Osmaniye'nin 1325,26,27 Senelerine Mahsus Maadin İstatistiği* (Istanbul: Matbaa-i Osmaniye, 1330 [1914]).

81 Giraud, "Houille et Mines de Houille," 649.

82 Karajian, *Mineral Resources,* 99.

Ottoman lignite mines were scattered over a vast geography. Many archival records and geological studies indicate the lignite explorations in various parts of the country. However, only a few - mostly in western territories of the empire - were exploited. Table 5.7 provides details of Ottoman lignite production at the beginning of the twentieth century.

Table 5.7 Lignite Production in the Ottoman Empire (1902-1912)

Years	Istanbul	Edirne	Aydın	Salonica	Sivas	Karesi	Manastır	Total (tons)
1902-1903	.	214	5605	.	.	21,670	.	27,489
1903-1904	.	324	.	.	.	20,950	.	21,274
1904-1905	.	2192	2645	.	.	19,360	.	24,197
1905-1906	.	263	.	929	.	19,930	.	21,122
1906-1907	.	442	.	1125	.	23,740	.	25,307
1907-1908	.	380	4538	950	.	25,570	.	31,438
1908-1909	.	.	300	.	.	26,660	270	27,230
1909-1910	.	307	5600	940	.	29,940	750	37,537
1910-1911	100	697	7075	.	260	34,150	503	42,785
1911-1912	300	.	12,040	1700	375	25,660	490	40,565

SOURCE: *1323 Senesi Maadin İstatistiği* (Istanbul: Mahmud Bey Matbaası, 1325 [1907]): 118-19; *Memalik-i Osmaniye'nin 1325,26,27 Senelerine Mahsus Maadin İstatistiği* (Istanbul: Matbaa-i Osmaniye, 1330 [1914:] 186-87.

The table shows that, in the first decade of the twentieth century, lignite was extracted in seven provinces. With the exception of Sivas, where production was an insignificant, most lignite exploitation took place in relatively developed regions of the country. Foreign capitalists aiming at decreasing production costs in their enterprises played a pivotal role in lignite mining. Foreign entrepreneurs in Karesi and Aydın made these provinces the leading lignite producers. Unsteady production resulted in yearly fluctuations. After 1909, the lignite output increased significantly and it exceeded 40,000 tons in the following years.

5.3.1 *Enterprises Consuming Local Coal*

One of the earliest factories that depended on local coal was owned by the Asia Minor Cotton Company, which was of British origin. In the mid-1860s, the company two ginneries located in Kırkağaç in Western Anatolia and in Serres in the Balkans. For a few years, the ginneries consumed lignite obtained in the vicinity of the towns with the approval of local administrations. It was reported by the officials that none of these coal mines was active before the operations of the company. The lignite in Kırkağaç was affordable for the company until local officials boosted the price fivefold, which made the cost of the fuel close to that of Newcastle coal sold in Izmir. In Serres, the local government blocked mining operations even though there was no problem with the payments to both the government and the landowner. The difficulties of procuring lignite pushed the company into burning firewood to run the engines, leading to remarkable increases in the price of this fuel.[83] The chairman of the company stated that if the issue remained unresolved, it would lose its trade and be obliged to pay indemnities to cotton owners for not ginning their products. In the face of these problems, the company asked for a license from the government in 1868 to exploit the lignite mines. However, the government delayed the permission on the pretext of completion of the bureaucratic procedures after the promulgation of the new mining law.[84]

Another early example of consumption from local coal mines was the silk industry around Bursa. Many silk mills around the city were powered by steam engines. In the 1870s the British consul of Bursa wrote that

> the boilers of these filatures are heated with a small quantity of wood and a much larger proportion of mineral coal, extracted from a deposit four hours away from the town, which I was unfortunately unable to visit. This coal burns well and heats more economically than wood but it is not, properly speaking, coal but rather a kind of lignite in a very advanced stage of formation and thus very close to real coal.

83 BOA, ŞD.NF 495/18, 18 S 1285 (10.06.1868), BOA, ŞD.NF 2390/6, 23 C 1285 (11.10.1868).

84 See Chairman Nathal Buckley's statements in Issawi, *Economic History*, 312.

The consul maintained that lignite deposits may be larger than thought. Mining in the past was conducted at the surface using rudimentary methods. Better lignite could be obtained if excavations went deeper.[85] Unfortunately, no information about the quantitative aspects of the production and consumption of Bursa coal is available.

An important lignite mine was located in Mancılık and operated by *Société Anonyme Ottomane des Mines de Balia-Karaidin,* one of the largest foreign enterprises in the Ottoman Empire that mined argentiferous lead. The lignite mine, which covered 276 hectares, was obtained by the company in 1885[86] and started to be exploited within a few years. The seam in this mine was five kilometers long and had a thickness of ten to twenty meters.[87] Initially, the company burned lignite to heat its smelters and run water pumps. From 1901 onwards, the company also employed lignite for generating electricity in a plant built near the mine.[88] For a few years, the fuel was transported to other pits on camels; however, this was a costly means of transporting fuel. The increasing the fuel demand in the pits and workshops made the construction of a light railway necessary.[89] In 1895, the company asked the government for permission to construct a light railway between the mines.[90] The company not only hoped to reduce transportation costs but also to ensure a sustained fuel supply, as it was being interrupted in winter.[91] Upon official approval, a thirty-six kilometer light railway was opened between Mancılık and Balya. This was followed by the Balya-Osmanlar and Osmanlar-Palamutluk lines, which made the total length of the network about 100 kilometers.[92] Needless to say, the locomotives working these lines were fueled by lignite from Mancılık.

85 Issawi, *Economic History*, 314.

86 Edgar Pech, *Manuel des Sociétés Anonymes fonctionnant en Turquie*, (Paris, ?, 1906), 135.

87 Issawi, *Economic History,* 294.

88 *1323 Senesi Maadin İstatistiği*, 21.

89 *Balya-Karaaydın Madenleri Anonim Şirket-i Osmaniyesi- Meclis-i İdarenin Layihasıyla Müfettiş Efendinin Raporu* (Istanbul: Dersaadet Ticaret Odası Gazetesi Matbaası, 1895), 11.

90 BOA, Y.PRK.OMZ 1/83, 6 L1312 (2.4.1895)

91 *Balya-Karaaydın Madenleri,* 11.

92 *1323 Senesi Maadin İstatistiği*, 21.

In the first decade of the twentieth century, the company became the largest lignite producer in the country. Table 5.8 shows the annual lignite output of the Balya-Karaaydın Mining Company.

Table 5.8 Lignite Production in Mancılık

Year	Amount (tons)
1899	21,196
1900	24,190
1901	27,154
1902	24,875
1903	23,332
1904	21,105
1905	19,428
1906	22,983
1907	25,356
1908	26,665
1909	29,940
1910	34,151
1911	25,662

SOURCE: *1323 Senesi Maadin İstatistiği*; Issawi, *Economic History,* 294.

As seen in the table, production figures differed from year to year. While there was a downward trend between 1901 and 1905, output continuously increased between 1905 and 1910. With the exception of 1905, annual output in Mancılık was always more than 20,000 tons. The average production in this thirteen-year period was 25,000 tons.

British entrepreneurs were among the leading coal exploiters in Western Anatolia. The MacAndrews and Forbes Company, which engaged in licorice production, fueled the steam engines in its factories with lignite. The company had two ninety-nine year concessions for lignite mines located in Söke and Nazilli. Paralelling licorice production, the exploitation of lignite in these mines was seasonal. The Mediterranean Steam, Coal and Iron Company was another large enterprise that operated a lignite mine southeast of Izmir. The remoteness of its mine and poor working conditions made it difficult to attract

laborers. After being exploited for a few years, the mine was abandoned in 1902.[93]

As these examples suggest, the entrepreneurs mining lignite for their own use were foreigners. Their primary motivation was to reduce production costs by procuring cheap fuel for their steam engines. Indeed, they took advantage of lignite when they could extract it properly.

5.3.2 *Local Coal Mines as Substitutes for Wood Fuel*

Local coal sources were sometimes offered as an alternative to firewood consumed in industrial production. At the beginning of the twentieth century, there were many silk mills and distilleries in Edirne that relied on firewood to obtain thermal energy. Excessive fuel consumption in these factories began to threaten forests in the province. Seeing that the threat to vegetation would hurt city-dwellers and villagers, a local man submitted a petition to the city administration about the fuel problem. The document involved a request to prohibit firewood consumption in the factories. Instead, the businesses should be forced to burn coal in the production process. Yet the local administrators did not lean to this proposal. It was stated that coal mines in the province were not operational and that procuring coal from other places would be costly. Entrepreneurs in the province unsurprisingly made use of the cheapest fuel. For the administrators, the number of trees in the forests would increase if the current forest regulations were applied.[94]

A few years later, the same issue arose again. Similar complaints arising from the lavish consumption of firewood occupy a dispatch dated 1905. It was stated that no law or regulation imposed the use of coal in the factories. To preserve the forests and, thereby, the rights of the ordinary people, some lignite mines around the city should be activated to supply fuel for the factories. In the end, the government lifted a ban on coal exploration in the province that had been in force for a few years.[95] Overall, for the local government, coal was not the first choice if forests could adequately supply the necessary fuel.

93 Kurmuş, *Emperyalizmin Türkiye'ye Girişi*, 131-32.

94 BOA, DH.MKT 2350/140, 27 M 1318 (27.05.1900).

95 BOA DH.MKT 940/3, 14 M 1323 (21.03.1905)

Similar to the case in Edirne, the price of charcoal in Manastır rose in the first decade of the twentieth century due to the need for fuel for brick and lime making. To save the forests, it was suggested to open a coal mine close to the city to provide a substitute for charcoal. According to the related document, the mine contained lignite and peat which were unserviceable for steam engines in the factories and on trains. Yet these fuels could be burned in lime, brick and tile kilns.[96] It is unclear whether the request for exploiting this mine was accepted, but some people in society were certainly conscious of the problems concerning fuels.

Ottomans failed to take advantage of local coal sources for space heating. My research offered few instances of the utilization of local coal in houses and public buildings. This was partly due to the technological backwardness that hindered proper excavation and partly to the lack of heating devices designed to burn coal. In Eastern Anatolia, as discussed in the previous chapter, the destruction of forests led to attempts to make use of coal for space heating. Though making a little contribution to the overall fuel supply to the city, coal mines in Erzurum became an alternative fuel source for heating purposes. Table 5.9 indicates the production of the six coal mines in the province of Erzurum that were supplying fuel around 1910. The numbers indicate that two of the pits were larger than the others. The level of production in these collieries was low and irregular. While the total output was 2366 tons in 1910, the figure in the following year declined sharply and became 585 tons. Though these numbers were very modest, Erzurum is nonetheless the best example of the use of local coal mines in space heating.

96 BOA, TFR.I..MKM 22/2103, 28 R 1325 (10.06.1907).

Table 5.9 Production in Erzurum Coal Mines (1910-1911)

Locality	Production (tons)	
	1910	1911
Narman	1300	450
Tercan	86	.
Kükürtlü	120	50
Sivishlu?	860	45
Tazegül	.	20
Charel?	.	20
Total	2366	585

SOURCE: Hagop A. Karajian, *Mineral Resources of Armenia and Anatolia*, (New York: Armen Technical Book Co., 1920), 107.

The Ottoman government was sometimes reluctant to allow ordinary people to exploit lignite for heating their houses except the extraordinary situations. In 1911, due to the lack of nearby forests, the people of Tavşanlı, a town in the Western Anatolia, wanted to mine and burn lignite in the cold winter months. But they were not allowed to do so by the local administration. When five adults and several children died of the cold, the central government interfered and permitted lignite consumption until the end of the crisis.[97] This anecdote indicates that local lignite was considered by the government as a last resort for heating purposes.

§ 5.4 Conclusion

From the 1840s to the end of the empire, the Ereğli basin was the sole domestic coal source with a nation-wide reach given its considerable production. Therefore, Ereğli coal had a central place in the history of Turkish energy. Starting with modest quantities, production in the Ereğli coalfield gradually increased throughout the nineteenth century. The employment of European miners and technical staff, the transfer of novel coalmining technologies, the allocation of more capital for ground and underground works, administrative

97 BOA, BEO 3860/289500, 22 S 1329 (22.02.1911).

improvements, and endeavors to ensure enough labor enhanced coal production in the basin. Despite the minor increases in its production over the decades, it is hard to say that Ereğli coal could properly meet domestic needs. Though the emergence of relatively large mining enterprises at the end of the nineteenth century was an important step for the domestic coal industry, production remained modest on the world scale. Ottomans extracted quite more than one million tons of coal even at their peak.

To meet public needs for coal, the Ereğli coalfield was managed by the government. Until the partial victory of liberal pressures in the 1880s, the government had exclusive rights over the consumption of domestic coal. In this period, the largest share of coal was consumed by navy steamers and the commercial fleet owned by the state. Docks around the country, the arsenal, and numerous imperial factories were also, to a large extent, fueled by the Ereğli basin. To ensure the fuel supply for its fleet and factories, the Ottoman government established a fuel network, storing coal in major ports. For this purpose, from the 1860s onwards, numerous coal depots were built around the country.

When the government allowed miners to sell 40 percent of their production on the free market, private steamers and factories began to burn domestic coal. As its quality was enhanced by technical improvements, the market for Ereğli coal was extended at the turn of the twentieth century. In addition to supplying the domestic market, domestic coal began to be exported to neighboring countries. The Ereğli Coal Company played a crucial role in improving domestic coal mining and the expansion of the coal market.

Though Ottoman lands had rich lignite deposits, this fuel was not utilized efficiently. Western Anatolia took the lead regarding the production and consumption of lignite. Most producers were foreign entrepreneurs who mined lignite for their own use. In very few cases, lignite was burned for space heating, in the regions lacking forests. Total lignite production in the empire remained limited, just passing 40,000 tons annually.

Overall, despite possessing important sources of coal, the Ottomans failed to take advantage of this natural wealth. The underdevelopment of Ottoman coal mining was partly due to the availability of reasonably-priced British coal. A considerable share of public and private fuel needs was met by imported

coal. For decades, Ottoman coal could not contend with British coal in terms of price and quality. The next chapter discusses British coal in the Ottoman economy.

6

British Coal Imports into the Ottoman Empire

Britain was one of the leading coal producers and the largest coal exporter in the world in the nineteenth and early twentieth centuries. British coal was delivered to almost every corner of the world as steam technology spread around the globe. The introduction of its coal in the Ottoman Empire can be traced to 1828, when the first steamer arrived in Ottoman ports.[1] For more than a decade following that, Ottoman steamers and workshops were fueled exclusively by British coal. Ottoman Empire had never been self-sufficient regarding coal. Even after coal mining began in the Ereğli basin, coal imports did not cease. Britain continued to supply thousands of tons of fuel to Ottoman transportation systems and industries until World War I. Thus, similar to other Mediterranean and European countries, British coal occupied an important place in the energy history of the Ottoman Empire.

This chapter discusses British coal in the Ottoman Empire from an economic perspective. Having been overshadowed by the Ereğli mines in the literature, British coal in the Ottoman Empire has attracted little attention in the historiography. In this part of the dissertation, I fill this gap in the literature. In this chapter, I first argue that despite British coal accounted for a considerable portion of the empire's energy - comparable to that of domestic coal - the

1 An Ottoman dispatch dated 1827 reported the sailing of a British vessel from the Bosporus with load of coal prior to the introduction of the steam engine to the empire. This was probably a vessel conveying coal to Russia. See BOA, C.HR 113/5644, 24 Ş 1242 (23.03.1827)

amount was insignificant on an international scale. Low domestic demand for fuel and the presence of cheaper Ereğli coal constrained the import of British coal into the country. Yet without the presence of this foreign coal supply, the empire would have had difficulty in fueling even its limited industrial production and steam transportation. Second, instead of being considered a satisfying market, the importance of the Ottoman Empire from the British point of view was its role in the international coal trade. More British coal was traded among merchants and transit steamers in Ottoman ports than was consumed by Ottoman ships and industries. Istanbul obtained a key position in the British coal trade in the Levant as the empire became an integral part of international energy networks. The global nature of this commodity led to international conflicts regarding coal depots and customs duties.

§ 6.1 Free Trade and British Coal

In the aftermath of the Napoleonic Wars in the nineteenth century, an exceptional expansion of trade occurred between Europe and other continents. The Industrial Revolution established a new global commercial structure based on a center-periphery framework in which manufactured goods flowed from Western Europe to the rest of the world in return for foodstuffs and raw materials. Technological advancements in maritime transportation were important for the further development of international trade. In this global context, the Ottoman Empire was among the peripheral countries the economies of which became increasingly subject to European influence during the nineteenth century via trade, finance, and investments. The Anglo-Turkish trade convention of 1838 and subsequent agreements with other European states manifestated the new economic order in the official realm.[2] The coal trade between the Ottoman Empire and Britain developed in an international economic atmosphere characterized by liberalism.

Without coal, neither the expansion of industrial production capacity nor the revolution in overseas transportation would have been possible. For the

2 See, Şevket Pamuk, *The Ottoman Empire and European Capitalism, 1820-1913* (Cambridge: Cambridge University Press, 2010).

purposes of this chapter, the role of coal in the development of British-led international trade and in the maritime revolution are discussed in detail. For Britain, which championed the Industrial Revolution, coal was the most prominent raw material among its export goods. Coal in the vessels departing from the British Isles provided its shipping merchants a great advantage. Utilization of coal as ballast not only enabled ships to sail properly but also led to substantial decreases in transportation costs on round-trip voyages.[3] There were vessels designed specifically for the coal trade. However, most steamers loaded coal as ballast after embarking other cargo bound for Ottoman and Russian ports.[4] Thus, in Britain's trade with the Levant and other peripheral countries, coal was "the exception that made the rule possible"[5] where the rule was the movement of manufactured goods from the core to the periphery and raw materials vice versa. The following passage from David Alfred Thomas's book explicitly illustrates the necessity of bulk coal shipments for lowering transportation costs of overseas trade:

> More than four-fifths of the weight of our exports consists of coal; without it the great bulk of the shipping bringing corn, cotton, wood, wool, sugar, &c, to our shores would be compelled perforce to clear without cargo, and in ballast. No outward freights would be earned in the majority of instances, and, consequently, in order to earn profit, or, for the matter of that, to make both ends meet, a very much heavier freight would have to be charged on articles of import, which would thereby be heavily increased in price to the consumer. Indeed, it is hardly conceivable that our foreign trade could have reached its

3 Gelina Harlaftis ve Vassilis Kardasis, "International Shipping in the Eastern Mediterranean and the Black Sea: Istanbul as a Maritime Center, 1870-1910" in *The Mediterranean Response to Globalization before 1950*, eds. Şevket Pamuk and Jeffrey G. Williamson (London; New York: Routledge, 2000), 236-37.

4 Giraud, "Combustibles," 125.

5 On Barak, "Outsourcing: Energy and Empire in the Age of Coal, 1820–1911."*International Journal of Middle East Studies* 47.3 (2015): 425-45.

present dimensions had it not been for the outward freight provided by coal.[6]

Second, extensive adoption of steamers for bulk shipping brought about a sharp decline in freight rates. The coal-burning technologies revolutionized maritime transportation. Since new ships powered by coal were no longer dependent on sails, transportation was able to be conducted over a broader period even in the presence of adverse winds. Moreover, the higher speed of new vessels vis-à-vis older ships accelerated the circulation of goods in international trade. By 1870, a steamer could make four or five voyages between Britain and Istanbul in the same period that a sailing vessel could make just one. As in other parts of the world, steamers rapidly replaced sailing vessels in Ottoman waters around 1870. These steamers generally carried coal which was "an article that in former times was exclusively carried by sailing-vessels."[7]

The downward trend in freight rates lasted until World War I, but there was an especially steep decline between the mid-1870s and the mid-1880s. Besides bulk cargoes like grain and cotton, coal took the advantage of lowering freights as well. From a peak of seventeen shillings per ton in 1878, freight rates for coal dropped to five shillings per ton by 1895.[8] Average freight rates per ton from Cardiff and two major Ottoman ports between 1909 and 1911 were as follows: to Istanbul, which was 2929 nautical miles from Cardiff, the rate was six shillings seven pence. The rate per ton per mile was 0.027 pence. To Izmir, a port city located 2777 nautical miles from Cardiff, the freight rate was seven shillings one pence, which means that the rate per ton per mile was 0.031 pence.[9] Why were freight rates for Istanbul lower than for Izmir? The answer concerns the significance of the ports in the international coal trade. Despite being further than Izmir, the key position of Istanbul for Black Sea trade made freight rates to its port lower. Since ships loaded with coal generally returned

6 David Alfred Thomas, *The Growth and Direction of Our Foreign Trade in Coal during the Last Half Century* (London: Harrison and sons, 1903), 16.

7 *Reports from Her Majesty's consuls on the manufactures, commerce, & c. of their consular districts,* vol.10, (London: Harrison and Sons, 1871), 300.

8 Harlaftis and Kardasis," Istanbul as a Maritime Center," 238-41.

9 Herbert Stanley Jevons, *The British Coal Trade* (London: K. Paul, Trench, Trubner, 1920), 685.

with grain, the freight rates for some Black Sea ports were lower than for European ports. For example, the average coal freight cost for the Danube was less than that for Izmir or even for Barcelona and Genoa.[10]

Overall, British coal exports and the expansion of commercial activities in the nineteenth century were closely related to each other. While coal – which served as ballast and as the source of motion power - prepared the groundwork for the advance of international trade, the free trade understanding fostered the prevalence of coal in the energy economy. This relationship must be borne in mind when assessing foreign coal in the Ottoman Empire.

6.1.1 *Quantitative Aspects of Coal Imports to the Ottoman Empire*

Britain was, by far, the largest coal exporter in the world. From the 1850s to the eve of World War, the amount of British coal exported annualy rose from five to ninety-eight million tons. By the mid-1880s, Britain was exporting at least one-fifth of its annual coal output. After 1890, the proportion of coal in total British exports was not less than 7 percent.[11] Among others, European and Mediterranean countries constituted the most important markets for British coal. From 1887 to 1912, 87 percent of British coal exports were shipped to these markets.[12] Ottoman ports also received considerable amounts of British coal that entered the Mediterranean Sea via the Strait of Gibraltar.

According to Macgregor's Commercial Statistics, British "coals, culm and cinders" exports to Turkey and continental Greece dates back to 1831. The declared value of coal exports, which was less than £1000 in the early 1830s, point to the infancy of the coal trade in this period. Following a rapid increase after 1836, coal exports were valued at more than £10,000 around 1840.[13] Macgregor's work also provides data about the quantities of coal arriving at the major ports of the empire. In 1841 and 1842, the amount of coal delivered to Istanbul was estimated at 20,000 and 32,360 tons, respectively. In 1841, the number of British vessels that came to Istanbul's port loaded with coal was

10 Ibid.

11 Ibid., 676.

12 Jevons, *British Coal Trade*, 684.

13 Macgregor, *Commercial Statistics*, vol.2, 73.

sixty-seven and the number of ships departing from the port to the Black Sea with a cargo of coal was sixteen. The major destinations of these vessels were Odessa and Kertch.[14] The most important port city of Western Anatolia, Izmir, began receiving coal vessels concurrently with the capital city. In 1841, of the 129 arrivals to this port, fifteen had coal, and there was only one departure with a load of coal.[15] In 1842, a British vessel delivered coal to Salonica for the use of the Danube Steam Company.[16] As steam navigation spread in the Black Sea, British coal reached Trabzon. Of the nine British ships that arrived to the port in 1841, four had loads of coal. In the following year, it was reported that six out of ten British vessels delivered coal to Trabzon. These vessels were from Newcastle and brought 2680 tons of coal.[17]

During the Crimean War, due to increasing maritime traffic in the Black Sea, there was a substantial need for coal for Ottoman naval steamers. Since the Ereğli coalfield was shared with allies and Ottoman coalmining was yet nascent, British coal assumed a vital role for military transportation. In the autumn of 1855, the government decided to purchase 39,500 tons of British coal. About 28,000 tons was bought in London and the rest in Istanbul. The reason for purchasing the majority of the coal in London was the lower price and the easier terms of transactions. Coal was delivered to Istanbul and distributed to the eight port cities of the Black Sea as follows: 14,000 tons to Istanbul, 5700 to Sinop, 5700 to Sohum, 4000 to Batum, 3400 to Trabzon, 2800 to Gözleve, 1700 to Süzebolu, 1100 for Varna, and 1100 for Balçık.[18]

The coal trade between Great Britain and the Ottoman Empire further developed in the second half of the nineteenth century. Records in the National Archives provide quantitative data about the British coal exports to the Levant. Originally, the related article was given in the export records as "coal, cinders and fuel". Geographically, the empire was divided into three regions: European Turkey, Asiatic Turkey including Syria, and Turkish ports on the Persian Gulf and Egypt. Coal deliveries to the ports at Hedjaz were added to

14 Ibid., 81.

15 Ibid., 102.

16 Ibid., 89.

17 Ibid., 110-12.

18 BOA, İ.MMS 7/291, 24 M 1272 (06.10.1855)

the count after 1880. For the purposes of this project, Egypt, which had an autonomous political trajectory in the nineteenth century, was not taken into account. Figure 6.1 shows the volume of the coal trade.

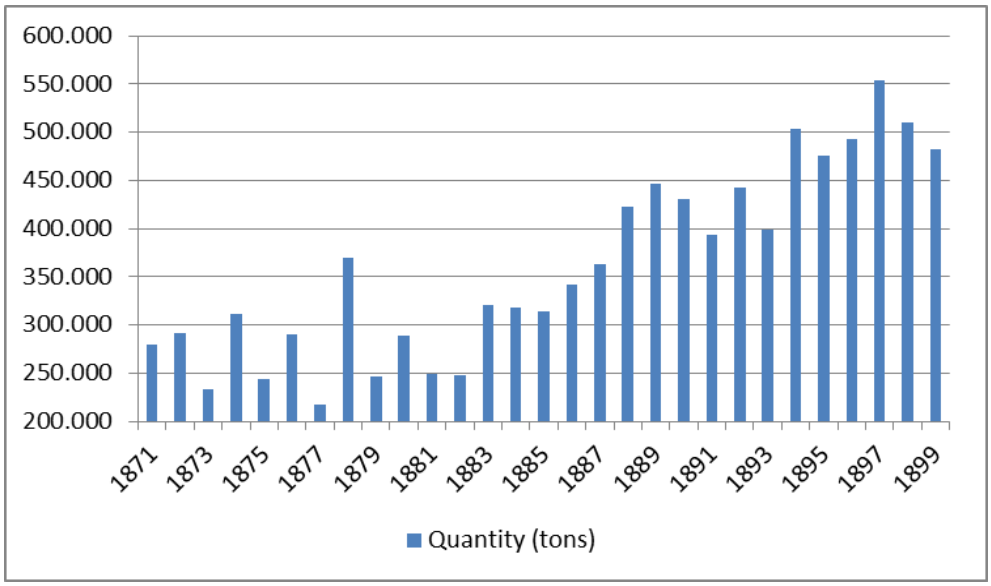

Figure 6.1 Volume of British Coal Exports to the Ottoman Empire (1871-1899) (TNA, CUST 8/112-140 (1871-1899))

The graph indicates that the first and second halves of the given period had different features. From 1871 to 1885, the amount of coal delivered to Ottoman ports oscillated between 220,000-370,000 tons, averaging 290,000 tons. Despite yearly fluctuations, the overall state was steady. Starting in 1886, the second half of the period was characterized by an upward trend that peaked in 1897 at 554,000 tons. The average volume of the coal exports in this half of the period was about 450,000 tons. When the whole period is considered, the yearly average of British coal entering the country was 360,000 tons - far higher than domestic coal production over the same years.

When compared to other nearby countries, however, the volume of British coal exports to the Ottoman Empire was modest. Given that Port Said was one of the largest coaling centers in the world in the nineteenth century, Egypt was receiving not less than 500,000 tons of coal a year by 1872. The exports to Egypt exceeded one million tons in 1884 and reached two million tons in 1899.

By 1880, selected British coal exports were as follows: 1.5 million tons to Russia, 1 million to Italy and 885.000 for Spain. With the great increases over the following two decades, the numbers by the turn of the century were 3.5 million tons to Russia, 5.5 million to Italy and 1.8 million to Spain.[19] These numbers are clearly many times higher than the amount of British coal received by the Ottoman Empire.

Figure 6.2 shows the nominal values of coal as declared by the exporters. The graphic resembles the Figure 6.2 only partly because of significant changes to coal prices over time. Despite lower exports, the monetary totals for the first years of the 1870s were high, pointing to the steep prices. After more than a decade of lower numbers, the value of British coal increased together with the volume of its exports. However, the value data in the last years of the period is not in parallel with the amount of export because of the unsteady prices.

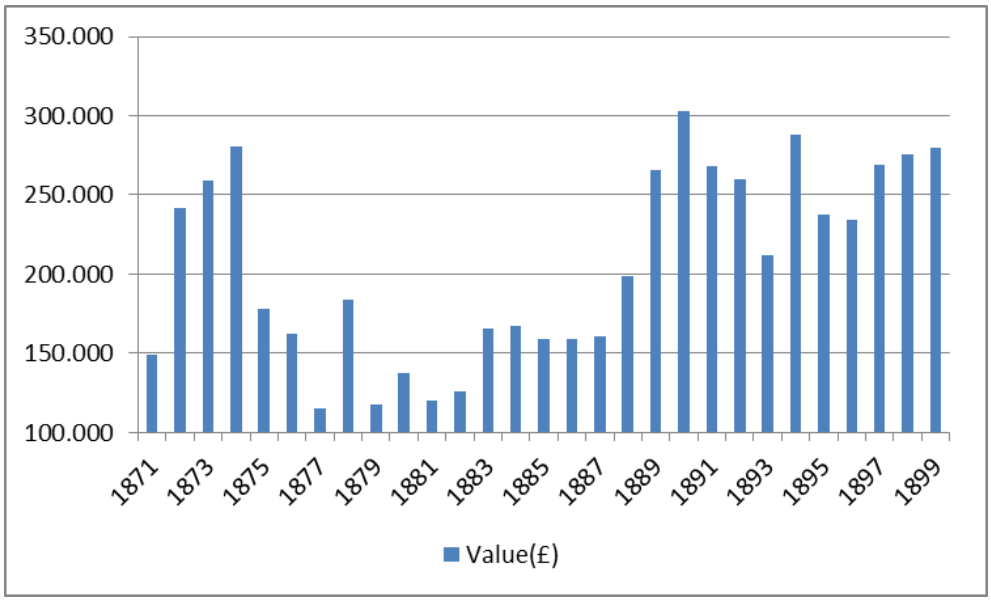

Figure 6.2 Value of British Coal Exports to the Ottoman Empire (1871-1899) (TNA, CUST 8/112-140 (1871-1899))

In the nineteenth century, the majority of coal exported from Britain to the Ottoman Empire was consumed by international steamships. In 1895, half of

19 TNA, CUST 8/112-140, (1871-1899).

British coal delivered to Istanbul was employed by the railways and some factories in the city, while the other half was consumed by foreign steamers.[20] Even in the first decade of the twentieth century, almost half of British coal supplied foreign demand. In 1908, for example, foreign consumption of coal in Istanbul was around 250,000 tons, while 265,000 tons were imported for the domestic market.[21] Since countries had no right to demand customs duties for the coal loaded by transit vessels, Ottoman commercial records only concern coal consumed in the domestic market. Celal Aybar's work on Ottoman foreign trade sheds light on British coal imports to the empire.

As is evident from Figure 6.3, for the three decades between 1878 and 1908 the amount of British coal entering the domestic market ranged between 50,000 and 200,000 tons annually. The annual average of coal imports in the given time span was about 145,000 tons.

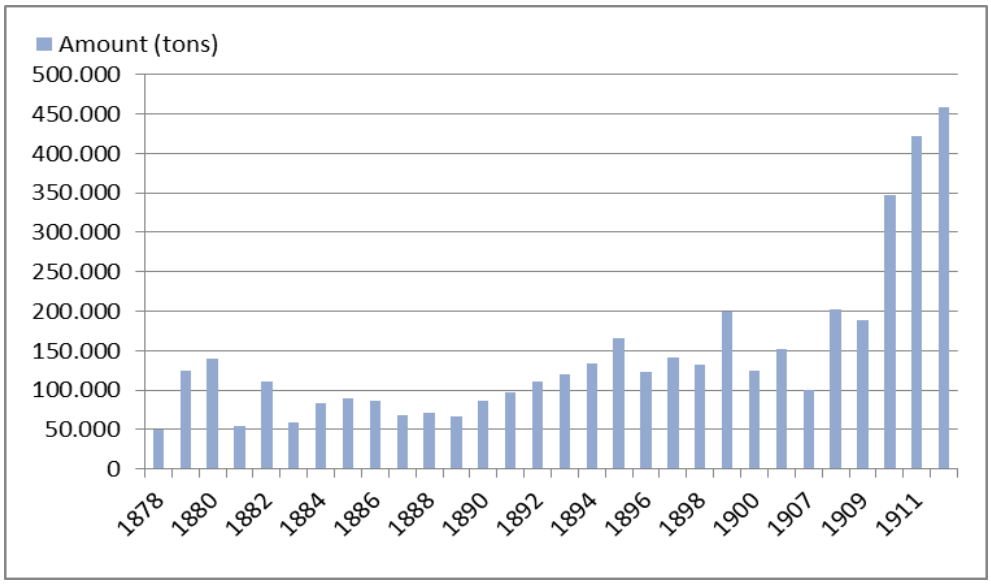

Figure 6.3 British Coal Imports of the Ottoman Empire (1878-1913) (Celal Aybar, *Osmanlı İmparatorluğu'nun Ticaret Muvazenesi* (1878-1913))

Interestingly, imports skyrocketed after 1910 and reached 460,000 tons on the eve of World War I. Yet, it should be noted that 1912 was exceptional; low coal imports that year were due to mass strikes in English coal mines. My research

20 Giraud, "Combustibles," 124.

21 Giraud, "Houille et Mines de Houille," 651.

did not suggest that the boom in the coal trade in these years pertained to domestic demand. The developments on the supply side might account for this rapid increase.

While, on average, 270,000 Ottoman liras were spent for British coal annually, the figure hit a record high in 1913 when the value of coal imports was 825,000 liras. This record high is related to the increase in coal prices due to strikes in England. According to Aybar's reports, the annual proportion of this article in the total import volume ranged between 0.4 percent and 2 percent, which were the numbers for 1878 and 1913, respectively. The average over the thirty-five-year period was slightly more than 1 percent. These figures indicate that coal was of little importance overall when compared to textile products, foodstuffs, and even petroleum. [22]

Gencer argues that British coal was outcompeted by Ottoman coal in the Eastern Mediterranean after French production started in the Ereğli coal mines.[23] However, the qualitative and quantitative data I obtained in my research explicitly shows that this was not the case. De Launay supports my thesis by stating that in 1911 that English coal reigned supreme in the Mediterranean basin as railroads in the region were multiplying.[24] British coal continued to meet a significant proportion of the fuel needs of the Ottoman Empire up until World War I, as well.

§ 6.2 Istanbul as a Coaling Center

"The great bulk of our export" wrote Jevons about coal in 1903, "is for the use of steamships." Use of coal for steam navigation made ports in trade routes major coaling hubs. In the Mediterranean Sea, Gibraltar, Marseilles, Genoa, Malta, and Port Said were the major coaling stations.[25] As the southern gate of the Black Sea, Istanbul had strategic importance international trade.

22 Celal Aybar, *Osmanlı İmparatorluğu'nun Ticaret Muvazenesi (1878-1913)* (Ankara: Zerbamat Basımevi, 1939)

23 Gencer, *Türk Denizcilik Tarihi*, 32.

24 de Launay, *La géologie,* 54.

25 Jevons, *British Coal Trade*, 31.

Assuming the role of "a transit center that responded to the economic developments and choices of far-away markets,"[26] its commercial significance was further enhanced throughout the nineteenth century. As steam navigation improved in the Mediterranean and Black Sea, the city became not only a gateway for the coaltransporting vessels[27] but also a major coaling station. The main ports of departure for coal coming to Istanbul were Cardiff, Newcastle, and Newport.[28]

26 Harlaftis and Kardasis, "Istanbul as a Maritime Center," 249.

27 Ports along the Black Sea received substantial quantities of British coal. For example, in February 1845, two British vessels called *Mary Young* and *Somerville* shipped respectively 242 and 235 tons of Newcastle coal to Odessa, for which the Ottoman government collected a duty. See BOA, A.DVN.DVE 5-B/50, (26.02.1845)

28 Giraud, "Combustibles," 124.

Table 6.1 Vessels Arriving at Istanbul with British Coal during April 1875

	Date	Nationality	Vessel	Origin	Weight (tons)
1	April 1	British	*Buyer*	Sunderland	403
2	"	Austrian	*Giurbro*	Cardiff	517
3	April 2	British	*Evangheline*	Hartlepool	345
4	"	British	*Waterloo*	Blyth	255
5	April 3	British	*Tunis* (steamer)	Cardiff	776
6	April 4	British	*Gladstone*	Newcastle	327
7	"	Greek	*Neos Alexandros*	Marseille	329
8	April 5	British	*Ribston*	Cardiff	319
9	"	Austrian	*Patrizio*	Cardiff	387
10	April 7	Austrian	*Due Figli*	Newport	440
11	"	Austrian	*Jame*	Newport	318
12	"	Greek	*Artemis*	Marseille	246
13	April 8	Austrian	*Slavomir*	Cardiff	397
14	"	Belgian	*Vitessi*	Liverpool	246
15	April 9	British	*Durley* (steamer)	Glasgow	873
16	"	Greek	*Dimitrios*	Syra	242
17	April 21	British	*Himalaya* (steamer)	Middlesborough	499
18	April 23	Russian	*Orion*	Newcastle	235
19	April 24	British	*Ocean Belle*	Blyth	283
20	"	Norwegian	*Livinghton*	Newcastle	222
21	"	Norwegian	*Jury*	Hartlepool	288
22	"	Greek	*Calliope*	Aya Dimitrios	164
23	"	Austrian	*Ida*	Cardiff	428
24	"	Italian	*Paolo*	Cardiff	496
25	"	Austrian	*Ziga*	Cardiff	337
26	April 26	British	*Dencalion*	Sunderland	399
27	"	Norwegian	*Olaf Kyre*	Newcastle	434
28	"	Austrian	*Brunoslava*	Cardiff	327
29	"	Italian	*Francesca Camogli*	Hull	528

SOURCE: *The Levant Herald*, April 7 - May 5 1875.

British coal was conveyed to Istanbul either by sailing vessels or steamers. Table 6.1 exemplifies the shipping of British coal to Istanbul in the mid-1870s in one month. As the table indicates, twenty-nine vessels came to Istanbul in

April 1875 with about 11,000 tons of British coal. Coal was loaded onto the majority of the vessels from British ports in coal mining regions. Still, there were three vessels that originated from two Greek ports and from Marseille. Presumably, these were loaded with British coal, that had been previously stored at these ports. Despite the fact that the majority originated in Britain, vessels were registered under seven different nations. The coal in this month was delivered by ten British, eight Austrian, four Greek, three Norwegian, two Italian, one Russian, and one Belgian ship.

Remarkably the majority of the vessels that brought British coal to Istanbul in this period were sailing vessels. Southern winds were cited as a factor facilitating the transportation of foreign coal to the Ottoman Empire. Taking advantage of this natural phenomenon, more coal vessels arrived at the port cities in the windy season.[29] Out of twenty-nine vessels only three were steamers and they all had British flags. Yet, sailing ships employed in coal transportation were increasingly replaced by steamers in the following decades. Taking the weight into consideration, it can be concluded that steamers had more carrying capacity than most sailing vessels.

Like the Ottoman government, British and other foreign agents stored coal in different parts of the city. The Golden Horn was the core for imported coal. Coal companies owned various depots along the shore of Golden Horn, especially in Unkapanı and Kireçkapısı. From the 1860s onwards, the city had always had thousands of tons of coal stored in these depots. In March 1868, the stock in Istanbul was 22,000 tons comprised of 10,000 tons of Newcastle, 7-8000 tons of Cardiff, and 4-4500 tons of Liverpool coal.[30] In January 1875, it was reported by *the Levant Herald* that the stock on the market was 30,000 tons of British coal of varying qualities and dimensions.[31] The amount of coal

29 *The Levant Herald*, March 23, 1869.

30 *The Levant Herald*, March 17, 1868.

31 *The Levant Herald*, January 13, 1875. The global coal market further improved in the second half of the nineteenth century. Newspapers and trade journals around the world started to publish reports on the market conditions of coal including prices, tariffs, and transportation costs. In the Ottoman Empire, such reports began to be published in *The Levant Herald* at the end of the 1860s.

available in the port was closely related to maritime traffic. As sales surpassed coal imports over the following three months, the stock decreased to 15,000 tons by March 1875.[32] On the other hand, the stock greatly increased when numerous sailing and steam vessels arrived at the port with loads of coal.[33]

In the 1880s and 1890s, nothing changed regarding foreign coal stocks in the capital city with the exception of the introduction of domestic coal to the free market. In the 1880s, the amount of foreign coal in Istanbul oscillated between 9000 and 19,000 tons. Weekly market reports indicate the details of the coal trade. Understandably, the volume of trade in the winter months remained limited given unpleasant weather conditions for maritime transportation. Most of the time, British coal imports ranged between 2000-3000 tons per week, yet there were weeks with no imports and others with more than average – up to 6000 tons.[34] The amount of coal imports generally increased with the coming of spring. In the first week of May 1885, for example, 10,000 tons of British coal was shipped to Istanbul, 6000 tons of which was from Cardiff and 4000 tons from Newcastle.[35] Around 1895, the amount of British coal imported into the capital city was estimated 90-95,000 tons per annum.[36] Table 6.2 provides detailed information about the composition and timing of coal imports. Since the majority of coal imported into Istanbul was consumed for steam navigation,[37] the high proportion of Cardiff coal being imported is unsurprising.

As in previous years, Newcastle coal came in second and Newport coal constituted a considerable proportion of the imports. The spread of steam power for maritime transportation changed the timing of coal imports which have been profoundly influenced by weather conditions in the past. As the table shows, more coal arrived in the winter months compared to summer.

32 *The Levant Herald*, March 3, 1875.

33 *The Levant Herald*, April 14, 1875.

34 *DTOG*, 25 Ra 1302 (January 12, 1885) and 9 R 1302 (January 26, 1885)

35 *DTOG*, 19 B 1302 (May 4, 1885)

36 Giraud, "Combustibles," 124.

37 Giraud, "La Houille," 897.

Table 6.2 Istanbul's Monthly Coal Imports in 1900

Months	Cardiff	Newcastle	Newport
January	11,790	6600	.
February	16,680	9900	.
March	14,190	7560	.
April	21,970	5620	1910
May	16,890	12,600	.
June	10,830	5970	.
July	6660	3420	7370
August	3130	3760	6600
September	5640	6300	.
October	27,470	4930	.
November	20,990	19,400	2110
December	17,870	11,260	2010
Total	174,110	97,320	20,000

SOURCE: Ernest Giraud, "La Houille," *Revue Commerciale du Levant,* no.165 (December 1900): 897

The sales of British coal included both wholesale and retail sales. The primary wholesale clients were government institutions and railway companies. In January 1875, two contracts were signed between coal dealers and railway companies. A contract made in January 1875 involved the sale of 1000 tons of Cardiff coal to the Metropolitan Railway for thirty-seven shillings per ton. The coal was to be delivered at different times over the course of the year, and all delivery expenses were borne by the sellers.[38] Such contracts continued to be made in the following decades. In the summer of 1885, the Ministry of the Navy purchased 10,000 tons of Newcastle coal for 19.5 shillings per ton.[39] In March 1897, the imperial dock purchased 6000 tons composed of differing amounts of Cardiff, Newcastle, and Scottish coal.[40]

38 *The Levant Herald*, January 13, 1875.

39 *DTOG*, 22 L 1302 (August 4, 1885).

40 *DTOG*, 2 L 1314 (March 6, 1897).

The retail sales of coal involved transit steamers and local consumers. The volume of retail trade varied from week to week depending chiefly on maritime traffic. Market reports indicate that weekly sales of British coal in Istanbul generally ranged between 1000 and 3000 tons. However, there were weeks with only 300 to 500 tons of sales and even some weeks with no sales at all, as was the case in the first week of April 1875.[41] On the other hand, retail sales exceeded 5000 tons a month in certain instances. For example, given the numerous steamers passing through the Bosporus for Black Sea ports, the weekly sales of retail coal reached 9000 tons by the end of April 1885.[42]

6.2.1 *Coal Import Companies and Traders in the Ottoman Empire*

Parallel to the development of steam technology, the coal business in the empire accelerated in the last quarter of the nineteenth century. Due to Istanbul's key position in foreign coal trade, the majority of agents in this business congregated in this city. An advertisement in *The Levant Herald* in 1875 reveals that the steamship business went hand in hand with the coal trade. Théodoridi & Co. was defined as both a coal factor and a steamship agent in the advertisement. It was stated that coal was supplied to steamers by the dealers with dispatch. Their office was located at Galata,[43] which would become the heart of the coal business in Istanbul in the following decades. Newspaper archives document the fact that the companies importing machineries also sold coal in the Ottoman market. Another advertisement from 1875, for example, shows that Whitley Partners Limited of Leeds was among these companies. The owners of the company were defined as the "manufacturers of improved steam engines, boilers, pumps, improved mechanical inventions" and "also merchants and exporters of coal."[44] However, the company later pulled out of the coal market.

The 1880s witnessed the emergence of prominent coal agents in Istanbul. One notable agent was the Foscolo & Mango Company, which was formed as

41 *The Levant Herald*, April 7, 1875.

42 *DTOG*, 12 B 1302 (April 27, 1885).

43 *The Levant Herald*, January 6, 1875.

44 *The Levant Herald*, January 6, 1875.

a Greek-Italian partnership. Before going into partnership with the Foscolo family, Anthony Mango had established a chain of coaling stations from Hamburg to the Black Sea. The depots were located in leading ports like Odessa, Novorossiyks, Pireaus, and Istanbul. Since the coal came from British coalfields, Mango opened an office in London and established one of his sons there. While Mango's venture started with the coal trade, his partnership with the Foscolos gave rise to a shipping company that engaged in transportation and the coal trade together, as did most of its counterparts.[45] In the 1890s, the Foscolo & Mango Company was the agent for National Steam Co. Limited, Abercarn Coal Co. Limited, London & South Wales Coal Co. Limited, and Watts Ward & Co.[46] Having "several thousand tons of all descriptions of coal for steaming and bunkering on stock at all times,"[47] Gilchrist, Walker & Co. was another company that operated in the Ottoman market beginning in the 1880s. Glamorgan Company was also one of the oldest suppliers of British coal.[48]

In 1891, seventeen dealers traded British coal in the Ottoman market. Though some merchants and companies replaced others, there was little change in the number of coal dealers over the next ten years. By 1900, there were twenty coal dealers in the capital city. With the exception of Karamanyan and his partners and the Ereğli Coal Company, the other eighteen dealers were trading in British coal. The names cited in the *Annuaire oriental* of 1900 were Sfezzo Agelasto and Co., C. Cavallaro, M. Christidis, T. Couis, Nicolas Critico, V. Dimitriadis, Foscolo & Mango and Co., Walker Gilchrist and Co., Mighirditch Gumuchdjan, Heald and Rizzo, A.A. Hill (agent of the Glamorgan Coal Co. Limited of Cardiff), S. and W. Hoffmann, D. Kurdjian, Y. Mavroudi, J. Oullemitch, Pellegrino Pamphilidis and Co., Rougier and Co., and Thomas Russell and Son. Seven of these were also steamship

45 http://levantineheritage.com/testi25.htm, Accessed in 10.05.2016.

46 *Annuaire Oriental (ancien indicateur oriental) du commerce de l'industrie, de l'administration et de la magistrature. 1891*, (Istanbul: Cervati Fréres & Cie The Annuaire Oriental and Printing Company Limited, 1891), 90.

47 *Levant Trade Review*. (LTR), vol.1 no:2 (November 1911): 161.

48 BOA, DH.EUM.THR 94/6, 26 Z 1327 (08.01.1910).

intermediaries. Like earlier coal agents, the offices of these coal traders were centered in Galata, specifically in Kireçkapısı and Tophane where coal shipments frequently landed.[49] In the absence of mechanical handling facilities in the Golden Horn or along the Bosporus, the coal imported by the companies was unloaded with the cooperation of bargeman and porters called *hamal*s.[50]

Accounts for the following years show that the coal business in Istanbul was competitive. As was the case in previous years, many traders entered into and pulled out of the coal market in short periods of time. Table 6.3 illustrates changes that took place between 1900 and 1904. The yearbook of 1904 introduced a new classification by which coal importers and traders were listed separately. This suggests that some dealers were doing business mostly in the domestic market and had nothing to do with international coal trade except for sales to foreign steamers. According to the table, twelve of twenty dealers mentioned in the yearbook of 1900 were continuing to run their businesses. Eight dealers had left the coal trade and there were seventeen newcomers including importers and traders. Interestingly, the Ereğli Coal Company was also listed as a coal importer in addition to its domestic coal mining operations.[51]

With further expansion of the market, the number of dealers reached forty-six by the eve of the World War I.[52] The major hub for the trade of foreign coal was still Istanbul, but there were also dealers in other port cities. Coal importers listed as the members the American Chamber of Commerce for the Levant in 1913 were as follows: Theo Reppen in Istanbul; F. Cauchi, Isaac

49 *Annuaire Oriental, 1900* (Istanbul: The Annuaire Oriental and Printing Company Limited, 1900), 660.

50 Giraud, "Houille et Mines de Houille," 651. Each company worked with a certain group of porters. The *hamal* groups fought with each other when the interests of a certain group were threatened. To prevent a potential dispute, the Glamorgan Company, which worked with Kireçkapı hamals, asked police to give orders to the chief of the *hamal*s of Oriental Railways not to meddle in their coal business. See BOA, DH.EUM.THR 94/6, 26 Z 1327 (08.01.1910).

51 *Annuaire Oriental,1904,* 839-40.

52 *Annuaire Oriental, 1914,* 823.

Molho and Nico Saltiel in Salonica; Rees & Co. Ltd and Whittall & Co. in Izmir; and Pharaon & Fils in Beirut.[53]

Table 6.3 Coal Importers and Traders in Istanbul in 1904

	Coal Importers		Coal Traders
1	Pericles Abadjis	1	Simon Andoniou
2	Sfezzo Agelasto and Co.	2	Apostolidis and Betsis
3	Socrate Atyhides	3	Ohannes Bedroseff
4	Doros Brothers	4	Serope Bohdjelian
5	Foscolo & Mango and Co.	5	M. Christidis
6	Walker Gilchrist and Co.	6	T. Couis
7	Mighirditch Gumuchdjan	7	Nicolas Critico
8	Heald and Rizzo	8	V. Dimitriadis
9	A. A. Hill	9	M. Gumuchian
10	S. and W. Hoffmann	10	Etienne Lissandrinis
11	Combotecras Kyriakides and Co.	11	T. Nigri
12	C. Lambros, Spanoudis and Co.	12	C.F. Tchalambonis
13	Poyrazoglu and Co.		
14	Rougier and Co.		
15	Ramsay Simirotti and Co.		
16	Ereğli Coal Company		
17	Suttora and Crespin		

SOURCE: *Annuaire Oriental,* 1904, 839-40.

Some coal agents developed direct business relationships with the Ottoman government. In the *Annuaire oriental* of 1891, for example, the merchant H. Sommaripa was mentioned as the coal provider for the Ministry of the Navy and the *Idare-i Mahsusa*.[54] In the following decade, Hoffman Company won a tender to supply 30,000 tons of Cardiff coal to naval steamers.[55] Overall, increasing demand for foreign coal gave rise to a growing business in the capital city and in other major ports, andcoal companies and individual coal

53 "Classified List of Members- American Chamber of Commerce for the Levant," *LTR*, vol.3 no. 3 (December 1913), 5.

54 *Annuaire Oriental, 1891*, 90.

55 BOA İ.HUS 152/71, 9 S 1325 (24.03.1907)

merchants were instrumental in providing fuel for both public and private consumers.

§ 6.3 British and Ottoman Coal in Comparison

While discussing domestic coal, previous chapters refer to British coal either to show how Ottomans evaluated their own sources or to point out competition between these fuels. A detailed comparison of the physical qualities of British coal and Ottoman coal and their economic aspects better explains the coal market in the empire.

6.3.1 *Quality*

In the early years of coal exploitation in the country, finding out the energy content of domestic coal was a difficult task. Since the only other coal types circulating in the Ottoman market were those imported from Britain, Ottoman officers compared domestic fuels with British coal. There are conflicting statements made about the qualities of domestic coal throughout the nineteenth century. Just after hard, black coal was discovered in Ereğli, its heating qualities were compared with those of the best Newcastle coal by tests conducted in steam engines in 1841. The results of this early experiment indicated the superiority of Ereğli coal over the British coal.[56] In another case, in June 1843, two coal samples from Amasra, a town in the eastern part of the coal region, were sent to a steam mill at Unkapanı. In the testing process, domestic samples and British coal of various kinds – of high-quality and average quality - were burned in the furnace of the steam engine for a full day. It was reported that in twenty-four hours, the mill burned 142 *kantar*s of Tarlaağzı coal and 151 *kantar*s of Tekir iskelesi coal from Amasra. The amounts of British coal consumed over the same period were 133 *kantar*s of average quality and 106 *kantar*s of high-quality coal. The first type of domestic coal burned smoothly and slower than the second. Having few impurities like sulfur, both types were useful in that they did not harm the trash screens and the boilers. The results of these examinations revealed that despite their favorable aspects, this

56 Macgregor, *Commercial Statistics,* vol.2, 184.

domestic coal was inferior to British coal. Nevertheless, given the dust and stone content of the Amasra coal, the government ordered another examination for obtaining more accurate results. When a cleaner sample from the same region was tested, the fuel performed better. The mill consumed 114 *kantar* 37 *kıyye*, which suggested that the energy content of Tarlaağzı coal was more than average British coal and close to the high-quality one.[57]

A more scientific comparison came in the second half of the nineteenth century. In 1867, one of the old doctors of the French hospital at Pera, Dr. Verollot, compared the two kinds of coal by conducting chemical analysis on the samples.

Table 6.4 Dr. Verollot's Chemical Analysis of Ereğli and British Coals

	Ereğli coal	British coal
Carbon (%)	60.26	58.19
Volatile matter (%)	30.9	40.39

SOURCE: Cuinet, *La Turquie d'Asie*, vol. 4, 423.

The table shows that the Ereğli sample had a higher carbon content than the British sample. However, due to differences in other chemical and physical characteristics, Verollot concluded that Ottoman coal was slightly inferior to British coal. He stated that while one gram of pure carbon could increase the temperature of seven grams of water for 1° Celsius, one gram of British coal and Ereğli coal could do the same for 1.6 gram and 1.5 grams of water, respectively.[58] In other words, the energy value of the British coal was slightly higher than that of domestic coal.

Of course, these samples did not represent all coal mined in Britain or in Ereğli. Both areas had coal deposits of various qualities, but there was little difference between the average energy quality of British and Ottoman coal in

57 BOA, DRB.MH 824/22, 8 B 1259 (04.08.1843).

58 Cuinet, *La Turquie d'Asie,* vol. 4, 422-23.

their pure form.[59] For decades, what made the British coal more preferable was Britain's better mining technology and its washing process that produced cleaner coals that were cleaner than Ereğli coal. A market report dated 1896 explicitly stated that deficient mining operations in the Ereğli coalfield made Ottoman coal second quality or, to put it differently, inferior to British coal.[60]

6.3.2 *Markets and Prices*

Data compiled from printed sources allow a long-term analysis of nominal coal prices at the capital of the Ottoman Empire. In this series, not only can the prices of foreign and domestic coal be compared, but also the prices of various kinds of English coal. Besides the Cardiff, Newcastle, and Liverpool coals shown in Figure 6.4, Istanbul imported Scottish, Hartlepool, Troon, Lancashire, Yorkshire, and Hull coal as well. Since data for them were limited and since they comprise only a small share of overall coal imports, this second group of coals were ignored. The prices of coal were listed separately for those sold on ships vis-à-vis in magazines. Expectedly, the prices from magazines were 2-3 shillings higher than those on ships because of storage costs. For my analysis, I used the price of coal free on board (FOB).

The first inference that can be derived from the figure is that the prices of all kinds of coal generally fluctuated in the same manner over time. Parallel lines with few points of intersection show that all kinds of coal were influenced by market conditions similarly. According to the data available, the early 1870s witnessed the highest coal prices of the period under consideration. In October 1872, a record was set when one ton of Cardiff coal was sold for 51 shillings and Newcastle coal for 48 shillings. Though prices were mostly steady within a given year, some specific years were characterized by substantial price variations from month by month. For example, there was an 18-20 shilling difference between the highest and lowest prices in 1872. Likewise, the prices at the end of 1900 were more than 10 shillings lower than at the beginning.

59 It seems that the Ottoman government admitted the equality of the coal quality. An official dispatch for example, labelled Ereğli coal as good as Cardiff and Newcastle coals. See BOA, Y.PRK.TKM 15/11, 16 N 1306 (16.05.1889)

60 Giraud, "Combustibles," 125.

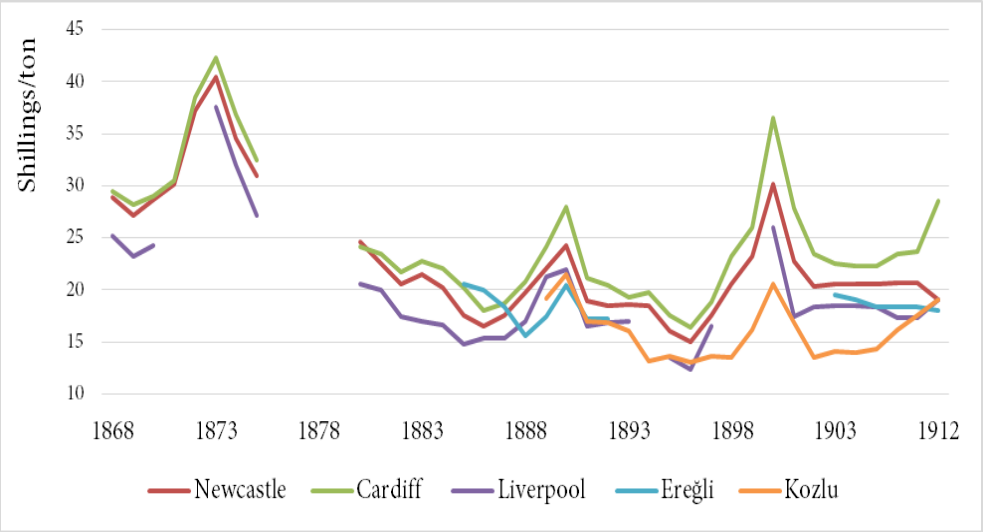

Figure 6.4 Coal Prices in Istanbul (1868-1912). *(The Levant Herald* (1868-1875 and 1880-1883), *Dersaadet Ticaret Odası Gazetesi*, (1884-1912))

Coal prices changed disproportionally when the supply and demand become unbalanced. Most of the time, increases were closely correlated with the global character of British coal trade. Indeed, average prices became highest in 1873 and 1900 due to coal famines in Britain. While the reason for the extreme prices in 1873 was related to the growing consumption of coal for iron production following the Franco-Prussian war, the increasing demand from steam navigation and problems in South Wales accounted for the high prices in 1900.[61]

Similar explanations for changes in the prices are cited in contemporaneous market reports published in journals and newspapers. In August 1872, it was reported that coal imports were expected to decrease because of difficulties occurring in the British coal economy. Moreover, the elevation of the wages of the colliers was expected to make British coal more expensive.[62] In another instance in early 1875, underproduction in the coal regions of Wales due to continuing the strikes in the mines was cited as the cause for increasing prices of all sorts of foreign coal.[63] Despite these abnormal escalations in coal

61 Thomas, *Foreign Trade in Coal,* 46.

62 *The Levant Herald*, August 29, 1872.

63 *The Levant Herald*, March 3, 1875.

prices that can be attributed to external factors in these cases, internal market trends were also important in shaping the prices. As foreign coal was too expensive in the spring of 1875, for instance, buyers purchased little coal which led to a gradual decrease in the prices.[64] Yet, as a final analysis, the developments on the supply side seem to be the principal component that determined prices.

As the graphic shows, Cardiff coal was of the highest quality. Its quality made it popular in many countries around the world with insufficient local supplies, like in the Ottoman Empire. Newcastle coal ranked second in terms of price, but there were exceptional instances when Newcastle coal was more expensive than Cardiff coal.[65] Other kinds of British coal were always cheaper than Cardiff and Newcastle coal due to their inferior qualities.

Since domestic coal have been sold to the government at fixed prices before 1882, we are unable to compare "market prices" of Ereğli and British coals prior to this date. However, some earlier records make comparing the costs and prices of domestic and foreign coals possible. British coal was cheaper than domestic coal for decades after the Ereğli mines were activated. A Belgian observer stated in the early months of operations in the Ereğli coalfield that the price of British coal delivered to Istanbul was half the cost of extracting domestic coal alone.[66] What made British coal more valuable in the Ottoman Empire was in part the bad state of domestic coal mining. During the Crimean War, Adolphus Slade pointed out that the Ereğli mines "are so ill worked, through want of labor, that their produce is undersold at Constantinople by coal brought from Newcastle."[67]

In the second half of the nineteenth century, the pithead price of one kantar of Ereğli coal for government use ranged between 3 and 4 piasters. Adding transportation and handling expenses, the highest cost for the same unit was

64 *The Levant Herald*, April 7, 1875.

65 In the first months of 1875, for example, Newcastle coal was 2 shillings more expensive than Cardiff coal. See, for example, *The Levant Herald*, January 13, 1875.

66 Macgregor, *Commercial Statistics*, vol.2, 184.

67 Adolphus Slade, *Turkey and the Crimean War; A Narrative of Historical Events*, (London: Smith, Elder and co., 1867), 42.

around 7.5 piasters.[68] This equaled 1.3 shillings per ton, which meant a great advantage for the state. When the prices in the free market were compared for the post-1882 period, it can be safely stated that the local varieties were generally cheaper than Newcastle and Cardiff coals. Other inferior kinds were sold for prices closer to the Ottoman coals. In the midst of 1880s, the prices of the British coals were remarkably lower than the Ereğli coal. While one tone of the imported coals was sold for 10-15 shillings in Istanbul, the price of Ereğli coal was about 20 schillings, which made the British coal more favored in the market. According to a merchant operating coal mines in Kozlu, the reason behind the higher prices of the domestic coal was the heavy duties imposed by the government. Despite requests for moderate taxes, the government initially refused to make changes on the duties on the domestic coal.[69] Further pressure on the government, however, led to the removal of internal customs duties, which paved the way for a better price competition between the foreign and domestic coals. [70] As a result, with reverse trends between 1886 and 1888, prices of foreign coals surpassed that of domestic coals.

These prices were not necessarily valid for all transactions. There could be considerable reductions for wholesale sales amounting to thousands of tons. For example, in early 1875 a contract for the purchase of 4000 tons of Newcastle coal was signed by the Haydarpaşa-Izmit Railway at a price of 24.5 shillings per ton, though its market price was 31.5 shillings.[71] In another contract dated May 1875, the Ottoman government made a deal with an Armenian trading house to obtain 5000 tons of double-screened Newcastle coal to meet the needs of its workshops in the imperial arsenal. While the market price was about 33 shillings, the agreed-upon price was slightly less than 30 shillings per ton and this included the customs duty, the costs of transport, and interest.[72]

68 Genç, "Ereğli Kömür Madenleri," 84.

69 BOA, MV 8/91, 29 C 1303 (04.04.1886).

70 BOA, DH.MKT 1391/49, 16 R 1304 (25.01.1887). This document included a discussion about the coal needs of the gasworks in Istanbul, stating that there was no difference between the British and Ereğli coals in terms of quality.

71 *The Levant Herald*, January 13, 1875.

72 *The Levant Herald*, May 12, 1875.

§ 6.4 Competitors of British Coal

British coal encountered serious competition in the Mediterranean and Black Seas at the end of the nineteenth century. In the 1880s, the introduction of Ereğli coal as an alternative in the free market was the biggest challenge for the British coal sales in the Ottoman Empire.[73] According to market reports of the Istanbul Chamber of Commerce, for example, domestic coal totally replaced British coal in domestic industry due to technological improvements in domestic coal processing at the turn of the century.[74] In the Black Sea, due to heavy import duties imposed by Russia, British coal lagged behind Russian coal in the major ports.[75]

Towards the end of the nineteenth century, the United States became the largest coal producer in the world, yet because of high domestic demand and higher transportation costs, its coal exports remained limited. At the turn of the century, the high price of British coal motivated Americans to enter the European market including that long Mediterranean coasts. Major ports like Malta and Genoa received American coal in the first decade of the twentieth century. Austria-Hungary imported 30,000 tons of coal a year from the United States via Trieste.[76]

Notwithstanding its partial success in western Mediterranean countries, American coal had no place in the Ottoman market. A letter dated July 1911 from coal company representatives to the American Consulate-General in Istanbul stated that

> the transportation problem alone has prevented this coal finding a ready market in the Mediterranean as a substitute for Welsh. At the moment we could probably lay down one or two cargoes of Pocahontas coal at the price of 22 shillings c.i.f Constantinople, but this price could

73 *DTOG,* 6 C 1302 (March 23, 1885).

74 *DTOG*, 27 S 1319 (June 15, 1901).

75 Thomas, *Foreign Trade in Coal,* 54.

76 *Ticaret Layihaları*, vol.4, 36.

not be relied upon for any period ahead (as freights usually increase in the autumn).[77]

In 1912, after making an agreement to supply 100,000 tons of coal to the Egyptian State railways, Americans were still hopeful about the Ottoman market. With the start of direct steamship navigation between New York and the Levant, increasing imports of soft and hard American coal to the Ottoman Empire was expected.[78] Nevertheless, American hopes to compete with British coal in the Levant were dashed in the beginning of World War I.

§ 6.5 British Coal and the Ottoman Government

Although, according to a British observer, the Ottoman government sought to drive English coal out of the Levant market in the long-run,[79] the government itself was the major consumer British coal in the empire. This fuel supplied energy for the military industry in the early years of the transfer of the new technologies. The availability of British coal made long-range voyages possible for Ottoman steamers in the first half of the nineteenth century when Ereğli coal was rarely available in distant regions like in the Mediterranean Sea. Ottoman steamships had the opportunity to procure fuel from different ports before the construction of their own depots. For example, in 1844 a public steamer called *Nil* loaded 100 tons of coal from Rhodes, ninety-five tons of which was British product.[80] Five years later, the same steamer purchased British coal from an Austrian vessel in order to carry troops from Jerusalem and Latakia to Istanbul.[81] On another voyage in the Ionian Sea around 1850, the captain of the public steamer *Tair-i Bahri* procured British coal from Corfu. [82]

The government's coal depots around the country not only stored Ereğli coal but also occasionally accepted foreign coal. In March 1869, for example,

77 *LTR,* vol.1, no.2 (November 1911), 140.

78 *LTR*, vol.2 no.3 (December 1912), 234.

79 Porter, *Turkey,* vol.2, 308.

80 BOA, C.BH 125/6080, 2 Ca 1260 (20.05.1844).

81 BOA, A.MKT.MHM 13/87, 12 B 1265 (03.06.1849).

82 BOA, HR.MKT 30/16, 6 R 1266 (19.02.1850).

the government made a contract for three shipments of Newcastle coal to be delivered to Crete at a price of 31 shillings per ton.[83] The proportion of British coal in peripheral depots was even higher. The magazines at Basra and Durres exemplify such depots. Around 1890, all the coal stored in the depot at Tripoli was of British origin.[84]

The palace and other governmental institutions continued to burn British coal throughout the nineteenth century. In 1893, the Ministry of Telegram and Postal Services purchased 142 tons of Cardiff and Newcastle coal via an auction by underbidding. Six merchants including four non-Muslim and two Muslim Ottoman citizens participated in the auction, and an Armenian won the tender by offering 135 piasters per ton of coal. The majority of the coal was taken for the ministry's workshop and steamer. The rest was distributed to post offices and the ministry building for heating purposes.[85] British coal was used in state-led railway transportation, as well. In 1908, the government decided to purchase 13,000 tons of British coal for the Hedjaz Railway. After an investigation of the market, the government made an agreement with a company from Cardiff that was demanding 28 shillings per ton. The coal would be sifted twice in the preparation process and would be delivered on board at Haifa.[86]

The requirement for special kind of coke in the early 1890s exemplifies the procedure of purchasing fuel directly from Britain. In 1892, the Grand Master of Artillery demanded 400 tons of coke from Britain for smelting iron and steel in the imperial factory at Zeytinburnu. Having been informed about the demand, Rüstem Pasha, the Ottoman ambassador in London conducted an investigation of the market and announced a tender to procure the required coal. The embassy received dispatches from various companies and companies located in London and Cardiff offered the best prices. The embassy chose the Gas Light & Coke Company, which asked 33 shillings per ton. After the amount needed by the factory was readjusted, another firm called Girwin, Roper & Company shipped 170 tons of fuel to Istanbul in February 1893.

83 *The Levant Herald, March 9, 1869.*

84 DMA, d.10276, (1891).

85 BOA, İ.PT 2/30, 6 Z 1310 (21.06.1893).

86 BOA, Y.MTV 307/92, 15 S 1326 (19.03.1908).

When the coke delivered to the factory at Istanbul its quality was not found to be as good as expected. It was stated that it could not be employed for smelting purposes. The Grand Master of Artillery indicated that the fuel was gas coke, the calorific value of which was relatively weaker. After being informed of this by the central government, Rüstem Pasha asked the company for an explanation. The company stated that there was no indication in the dispatches that the coke was required for ironworks. If there had been, the company would have informed the embassy that their coke was not suitable for this purpose. It was added that the company procured smelting coke for its own foundry from other firms.

To find proper smelting coke, Rüstem Pasha consulted iron companies including Marshall Sons & Co. Limited, Hund & Lund Limited, and Elswick Works. He asked these companies whether there was a particular quality of coke, specifically used for the melting of steel and iron, and if so, at what price could this coke be provided. Marshall Sons & Co. Limited replied that for smelting purposes, they used Durham coke which was also called "French oven coke." The company gave the names of five coke suppliers based in Newcastle, Sheffield, and Derby. Elswick Works also indicated that the coke for their blast furnaces was obtained from the County of Durham. This company and Hund & Lund Limited recommended other coke companies to the embassy.

Based on the recommendations, the embassy contacted with the Weardale Iron Company, J. E Fisher & Company, Brancepeth Willington and Brandon Colliery Offices, Victoria Garesfield Company, and Pease & Partners limited. These companies were asked about the price per ton either in London or delivered to Istanbul with all expenses like freight and customs duties included. The companies could not provide a cost for delivery to Istanbul, but in London the price of Durham foundry coal varied between 24.5 shillings to 28.5 shillings.[87]

What this case shows is that in the 1890s, despite the presence of coal mines and coke producing facilities in the country, the Ottomans were still dependent on Britain not only for ordinary coal but also for specific kinds.

87 BOA, HR.SFR.3 402/44, (19.01.1893).

Interestingly, though the demand came from the Grand Master of Artillery, the ambassador and other personnel of the embassy in London did not realize that the coke purchased initially was not suitable for ironworks. Given that the name of the firm was the Gas Light & Coke Company, they might have questioned for what purpose the coke was produced.

At the turn of the twentieth century, a cautiousness vis-à-vis British coal emerged in the empire at least at the government level. In 1900, the Ministry of Finance decided to buy forty-nine tons of Newcastle coal for the imperial mint. Though the sultan approved the decision, a warning was sent to the ministry regarding future purchases. Indeed, this order was not specific to the Ministry of Finance, but general. All government offices were encouraged to consume domestic coal as far as possible.[88] Nevertheless, as future purchases of British coal prove, the order was not influential on a practical level.[89]

The preference for British coal on the part of government institutions also led to discontent among businessmen engaged in domestic coal business. In 1911, a group of Ottoman coal miners sent a telegraph to the Ministry of Foreign Affairs and the Ministry of the Navy concerning their complaints. They stated in the petition that the consumption of duty-free British coal in the production of ammunition and in naval steamers was damaging treasury yields as well as the domestic coal industry. As an alternative, the miners requested that their products be purchased by the government.[90]

During the Balkan Wars, the fuel needs of the army and navy increased the significance of British coal. As the Ereğli coalfield could supply only a limited amount of fuel, the Ottoman government looked for alternative, foreign sources of coal. Given the state of emergency, British coal stored in the depots of steam navigation companies became a substitute. In November 1912, the

88 BOA, BEO 1486/111405, 11 M 1318 (11.05.1900).

89 For example, the Ministry of Telegram and Postal Services continued to buy Newcastle and Cardiff coal for its workshops. See BOA, DH.MKT 1171/47, 24 R 1325 (06.06.1907). As the purchase order of Cardiff coal by the Hamidiye Industrial School at Konya shows, British coal even reached government institutions in interior regions of the country. See BOA, BEO 2469/185106, 17 L 1322 (25.12.1904).

90 BOA, BEO 3901/ 292535, 5 Ca 1329 (04.05.1911).

government asked the Lloyd Company to sell its stock of British coal. The agents of company stated that they were also short of coal because of Greek intervention vis-à-vis foreign ships carrying coal. They also planned to get fuel from Ereğli. Yet, the government insisted that the company had enough coal in the depots, and its recent purchase of 4000 tons of Cardiff coal provided it with more fuel. The Ministry of War sent a special officer to the Austrian embassy to convince the company to make the sale lest the Ottoman government seize the coal by force.[91]

§ 6.6 Foreign Coal Depots in the Ottoman Empire

The spread of steam navigation in Ottoman waters was accompanied by the construction of coal stores for the fuel needs of foreign steamship companies. By a contract signed with the Ottoman government, the Austrian Lloyd Company had already owned a coaling station in Soulina by the 1850s.[92] The company eventually owned several coal depots in the Ottoman Empire, which were located at Beirut, Corfu, Vlore, Durres, Crete, Izmir, Salonica, Varna and Trabzon. In addition to Austrian coal, the use of which was obliged by the Austrian government to the company in 1878, the Austrian Lloyd required substantial amounts of British coal stored in these depots.[93] In a similar fashion, French Messageries Maritimes Steamship Company obtained coal magazines in Istanbul, Izmir, Alexandretta, and Beirut in the 1850s, both by building them with its own means or by renting them.[94]

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91 BOA, BEO 4112/308354, 26 Za 1330 (06.11.1912).

92 BOA, HR.MKT 156/90, 25 Z 1272 (27.08.1856). According to the dispatch, when an Ottoman officer seized the Lloyd Company's plot to stage equipment for the construction of a lighthouse, the Austrian embassy asked for the return of the coaling station, pointing to the contract in effect. The Ottoman government ordered the officer to clear the plot and returned it to the company.

93 Mustafa Emre Kılıçaslan, "Avusturya Lloyd Vapur Kumpanyası'nın Osmanlı İskelelerindeki Faaliyetleri" (Phd diss., Ondokuzmayıs University, 2013), 109-13.

94 Süleyman Uygun, *Osmanlı Sularında Rekabet: Mesajeri Maritim Vapur Kumpanyası* (1851-1914) (Istanbul: Kitap Yayınevi, 2015), 292-318.

The central position of Istanbul in maritime trade made its port preferable to other major ports. For example, though coaling facilities were better and the price of coal was less in Malta and Syra, the British favored Istanbul as a coaling station.[95] Thus, the majority of foreign coal depots were located in the capital city. From the 1860s on, foreign coal was stored in bounded or privileged stores. The idea of privileged stores in Istanbul originated from the "desire of the Ottoman government to compensate in some way the French, Austrian, and Russian Steam navigation companies for the services they rendered to the state by conveying the mails."[96] In addition to free postal service, these companies transported Ottoman military personnel, civilian officials and students at half price.[97] These foreign companies were permitted to keep the coal required for their vessels in privileged stores free of import duties. Still, the stores were under the supervision of the customs house. The same privilege was later requested and obtained by the English. To apply for the privilege, there had to be an agent in Istanbul representing the British company or merchant, and the list of their vessels had to be given to the customs house.[98] Both parties had certain interests in the system of privileged depots. A passage from a dispatch sent from the British Consulate to the Sublime Porte in 1874 points out the economic benefits of the coal magazines for the Ottomans:

> It is clear that to encourage depots of coal at Constantinople, is beneficial to the trade- much labor is thus employed and many ships are to stop at his port both to discharge coal and to take it on board and it has various advantages which perhaps the Porte cannot appreciate."[99]

In January 1887, the Ottoman government started to grant licenses to other companies to open coal stores in Ottoman ports. In 1888, there were nine firms in Istanbul that owned coal depots from which their vessels were fueled free

95 TNA, FO 78/4122, (01.05.1888).

96 TNA, FO 78/4122, (01.05.1888).

97 BOA, ŞD 579/62, 2 B 1304 (27.03.1887).

98 TNA, FO 78/4122, (01.05.1888).

99 TNA, FO 195/917, (21.05.1874).

of duties.[100] By 1891, the number of coal depots in the capital city reached twenty-eight, which belonged to eight different companies. Each of these coaling agents fueled at least 400 steamers per year.[101]

Despite its economic benefits, the presence of coal depots in the city threatened public health. In 1888, residents of the quarters around the stores of Foscolo & Mango and the Austrian Lloyd Company began to grumble about the dust arising from coaling facilities. The dust stirred up when the steamers were loading or discharging coal via barges was disturbing. Moreover, the coal stored along the Golden Horn could catch fire, which was a serious threat to neighborhoods of timber frame houses. Informed about the situation, the municipality called representatives from the two companies. The representatives stated that their companies had contracts to store coal at Unkapanı for a certain period of time and that at the end of the contract, the government should offer another option if these depots were to be closed. Thereupon, the government looked for alternative places outside of the city to store this inflammable matter. Former limestone quarries in Beykoz were found suitable for storing coal if a quay could be built for steamers. The cost of building the depots was estimated at 15,000 liras.[102]

To the finance the project, the government levied an additional tax on coal imports demanding 0.5 shilling per ton. Foreign coal merchants did not welcome this policy. The British embassy found the Ottoman proposition unacceptable on the grounds that "large vested British interests of British subjects would be seriously affected thereby and also serious impediment be imposed to the freedom of trade and navigation which guaranteed to Great Britain by ancient and modern treaties." Other foreign missions in Istanbul followed suit and objected to the new plan.[103]

The discussion of the problem lasted a few years and was solved in 1892. In this year, the Council of Ministers decided not to interfere with the coal depots in the city center, proposing that interference would violate prevailing

100 TNA, FO 78/4122, (01.05.1888).

101 BOA, ŞD 579/62, 29 Ca 1309 (31.12.1891).

102 BOA, DH.MKT 1574/56, 11 R 1306 (15.12.1888).

103 BOA, HR.İD 899/1, 14 N 1306 (14.05.1889).

trade agreements. Moreover, it was stated that if the companies were forced to build new depots in alternative locations, they would acquaire new rights that would infringe the warehouse regulations of the sustoms administration.[104] In the end, extant coaling practices were maintained along the Golden Horn until the last years of the empire.

6.6.1 *Duties on British Coal*

In 1851, the Austrian Lloyd Company managed to store coal in the depot at Beirut free of duty, yet this was an exceptional case that did not concern other ports and quays in the country. In 1856, the Lloyd Company applied to the Ottoman government to lift all duties on coal it brought from Britain. To avoid setting a trend, the government made only a 20 percent reduction to the customs duty.[105]

Although the Ottoman government was unwilling to renounce duties on coal, permitting foreign steamers to import coal free of duties for their own usage was an international convention in the nineteenth century. In the Ottoman Empire, British coal used by the foreign steamship companies was officially exempted from import duties on 24 June 1862. The Austrian Lloyd Company had pioneered the exemption. When Izmir Customs officials demanded money from the company for coal it had brought from abroad, the company appealed to the Ottoman government for duty exemption and obtained the immunity together with French and Russian steamship companies.[106]

In 1867, the Ottoman government allowed foreign steamship owners to keep their coal in magazines in Istanbul free of duties. This policy was not confined to Istanbul and was in force in other nearby ports like Odessa, Soulina, and Port Said. The majority of vessels trading in Ottoman waters belonged to large firms, commercial associations, and individual merchants from Britain.[107] Like other vessels, the steamers that traded among England, the Sea of

104 BOA, DH.MKT 1983/10, 11 M 1310 (05.08.1892).

105 Kılıçaslan, "Lloyd Vapur Kumpanyası," 110-11.

106 BOA, ŞD 574/7, 3 Z 1301 (24.09.1884).

107 TNA, FO 195/917, (21.05.1874).

Azof, the Danube, and Odessa were supplied with coal from these stores when necessary.

Becoming a party to the new global energy network led to novel international problems for the Ottoman administration. Duties on British coal became a matter of debate between the two governments when the interests of one were violated. It was reported that the British merchants had no difficulties with the customs authorities until May 1872 when they were refused the customary exemption. Meanwhile steamers belonging to the Messageries Maritimes, the Austrian Lloyd Company, and the Russian Company continued to load coal without paying duty. The Ottoman officers imposed a duty on British merchants which was "due on coal consumed on shore or by Turkish steamers."

In the early years, the customs house asked each agent that provided coal to steamers to submit a ship list. As they all complied with this rule, the customs house started to favor "none but regular agents of regular lines." According to the new circular of the customs house only a "company" could enjoy the privilege regarding coal duties. This company must have a recognized agent in Istanbul, the agent must not be a coal merchant, and the ships of the company must engage in regular trade. From the British point of view, the new policy was arbitrary and unjust. It was stated that partial application of a privilege or - to put it more clearly, "to allow the French, Austrian or Russian vessels to obtain their coal half a crown per ton cheaper than English ships" - was contrary to principle and the Treaty of Commerce of April 1861. It was requested that the Ottoman government to withdraw this action. In the end, Ottoman officials took a step back and complied with British demands.[108]

In 1887, the customs commission came up with a new proposition by which the steamship companies would be exempted from coal duties for one month, would pay 1 percent for the next six months, and 8 percent for the rest of the year. Yet the grand vizierate did not support this idea stating that it was difficult to determine the dates of coal imports and that such a practice would violate international conventions on coaling.[109] It was reported in 1888 that all

108 TNA, FO 195/917, (16.05.1872).

109 BOA, ŞD 579/62, 2 B 1304 (27.03.1887).

British steamers belonging to individuals and companies were loading their bunker coal customs free. [110]

The coal duties again became a matter of debate in 1891. According to the customs administration, the average amount of coal imported to Istanbul per annum around 1890 was 360,000 tons, which could bring in 34,000 liras if subjected to customs duties. However, the actual customs revenue from British coal was 7000 liras, which meant that duties were collected on only 74,000 tons of coal. In other words, every year the Ottoman government was sacrificing 27,000 liras by permitting duty-free coal. Moreover, the customs administration stated that customs procedures were not properly exercised at this date. As new steamship companies emerged and as some coal merchants had started engaging in the steamship business, the concession of duty-free coal was being exploited. Since the customs administration was busy with other articles, the coal trade was supervised by just a single official. In addition, the coal trade was facilitating the smuggling of arms and other prohibited materials. The smuggling took place when steamers were discharging or loading coal, and the smugglers frequently used coal baskets to hide the contraband. The suggestion of the customs administration to solve these problems was to limit the scope of exemptions and to nominate a special unit for the supervision of coal as was already the case for timber, grains, and fruits.[111] Yet, nothing changed regarding customs duty exemptions, and rights of foreigners were safeguarded.

In the first half of the 1870s, Ottoman steamship companies requested the import of duty-free coal, as well. Pointing to foreign steamship companies as a precedent, the *Idare-i Aziziye* and *Tuna Idare-i Nehriyesi* obtained similar exemptions from the government. With the approval of the Grand Admiralty, the *Idare-i Mahsusa* also enjoyed duty-free foreign coal beginning in April 1881. In 1884, Ottoman Courdji Company demanded the same duty exemptions granted to foreign and public steamship companies.[112] After a two-year

110 TNA, FO 78/4122, (01.05.1888).

111 BOA, ŞD 579/62, 13 Ca 1309 (15.12.1891).

112 BOA, ŞD 574/7, 3 Z 1301 (24.09.1884).

delay, this company was given the right to buy British coal without paying duty.[113]

Izmir Hamidiye Steamship Company was among the firms that enjoyed duty-free foreign coal at the beginning of the twentieth century. When some of the imported coal began to be used in the company's workshops, the customs house demanded duties for this coal. The company objected with regard to the amount of the duty. The director of the company stated that they were not only using foreign coal in the workshops but also domestic coal, which was duty-free. It was impossible to determine the share of foreign coal in the total consumption of the workshops. The customs house account, which assumed a ten-year consumption period of 100 tons of coal per year was also found to be problematic. Contrary to official statements, the company claimed to have been burning coal in the workshops only since December 1899.[114] The result of the dispute is unknown, but it explicitly shows that the government was reluctant to grant customs exemptions for foreign coal except for navigation purposes.

§ 6.7 Conclusion

The rich coal deposits in Britain fueled not only the industrial development of that country but also steam engines and smelters all around the world. The Mediterranean basin and its geographical extensions began to be conquered by British coal in the 1830s and were fed by this fuel until the end of the coal age. For decades, Ottoman ports received thousands of tons of Newcastle, Cardiff, and other kinds of coal exported by Great Britain, as well. However, when evaluated from a comparative perspective, the volume of the empire's imports was moderate. Limited industrial demand for fuel in the country and the existence of Ereğli coal were the two major challenges to British coal imports.

In conjunction with the expansion of free trade and the development of steam technologies, global domination of British coal was consolidated in the nineteenth century. A liberal commercial atmosphere formed the basis for the

113 BOA, MV 9/7, 02 B 1303 (06.04.1886).

114 BOA, ŞD 1216/58, 27 L 1320 (27.01.1903).

increasing movement of goods including coal. On the other hand, the utilization of coal as ballast rendered cheaper maritime transportation possible. Furthermore, steamers fueled by coal introduced better transportation to maritime trade.

Imports of British coal into the Ottoman Empire meant that it was party to the world's first global energy network. Both the amount of coal delivered to Ottoman ports and, related to this, coal prices were heavily influenced by changes in coal mining and coal markets in different parts of the world. British coal constituted a significant part of the energy supply for the Ottoman economy. Yet, when compared to coal imports by other countries in the Mediterranean basin and by Russia, the Ottomans had a smaller volume. This stemmed from the lesser demand for coal which was closely related to the backwardness of its industrial production and its underdeveloped transportation systems.

Similar to its central position in the domestic coal network, Istanbul was the most significant city of the empire with respect to the foreign coal trade. The majority of British coal consumed by the Ottomans entered the country through this port. More importantly, coal depots in the city provided fuel for steamers navigating between the Mediterranean and Black Seas. Assuming the role of an international coaling station in the Near Eastern energy network, Istanbul was strategically significant up until World War I. As steam and coal were inseparable, most steamer agents also engaged in the coal business.

Leaving consumption by transit steamers aside, the Ottoman government was the leading client of British coal. In countless incidents, British coal substituted that of Ereğli, which was insufficient for domestic demand and impractical for some specific purposes. Without British coal, the Ottoman government would have had great difficulty fulfilling certain services like maritime transportation and military production. The high-energy needs of smelting in the workshops of the imperial dock and the imperial arsenal were usually met by the best British coal. Moreover, private entrepreneurs purchased these coals for their mechanized factories

The global energy economy entailed the storage of the new fuel, which resulted in the installation of foreign coal depots in Ottoman lands. Since the majority of British coal was consumed by foreign steamship companies,

depots had a privileged status by which their coal was exempted from customs. The conflicting interests of the Ottoman government and foreigners vis-à-vis the coal depots and duties led to permanent international tensions. Yet, pressures from foreign governments left little room for the Ottoman government to implement its own policies regarding the British coal trade.

7

Conclusion

This dissertation studied the energy economy in the Ottoman Empire during the age of the Industrial Revolution. It is the story of an empire that can be portrayed as a preindustrial economy with weak attempts at industrialization. In line with this, it is argued that the Ottoman energy transition was slow and limited. In other words, the energy structure of the country involved more traditional elements than modern fuels. Nature, technology, the state, and international trade were the four major parameters that shaped the Ottoman energy economy. The analysis in this study is based on these parameters.

The nineteenth century witnessed a worldwide energy transition, though the pace and extent of the transformation varied in different geographies. The success in converting traditional energy structures into modern ones was indicative of solid economic performance. The divergence between the West and other countries was closely linked to the increasing use of coal for production and transportation. The Ottoman Empire was among the countries with limited success in terms of energy transition.

The state played a central role in the Ottoman energy economy. The government closely supervised both the production and transportation of fuels, especially when the energy needs for state services, public enterprises, and the capital city were concerned. Like basic foodstuffs, fuels were considered strategic goods and the fuel economy was guided by provisionism, which was one of the pillars of the Ottoman economic mindset. However, this was not an

overarching policy that permeated the daily lives of all the empire's subjects. The government had little concern about the fuel needs of the rural population, nor even those of towns and cities except for Istanbul. Thus, the provisioning policies regarding fuel were selective and prioritized according to the needs of the state and the capital city.

The liberalization of the Ottoman economy throughout the second half of the nineteenth century posed a serious challenge to government regulation of the energy economy. Since numerous public production plants that were previously fueled by firewood and charcoal were closed in this period, state intervention was no more necessary in many production branches. The increasing international wood fuel trade at the end of the nineteenth century suggests that the prohibition of fuel exports was only on paper. In time, strict government control over the provisioning of wood fuel for Istanbul turned into occasional interventions during crises. With respect to Ereğli coal, which was managed and consumed exclusively by the government, its partial opening to the free market in 1882 was a turning point. With an increasing economic power, capitalists in the following decades further contested the state's role in provisioning coal.

There was no uniform energy economy in the Ottoman Empire. There were essential regional differences regarding energy availability. Compared to the interior, coastal regions always had an advantaged position. In terms of traditional sources of energy, relatively opulent forests in the coastal regions rendered better fuels than the poor vegetation of interior regions. Coal was more accessible and affordable in coastal regions due to the lower costs of transportation on water. It was no coincidence that the limited industrialization in the empire took place mostly around port cities. High energy costs hampered the spread of steam technology to interior regions. Western Anatolia and the Balkans were more successful in transiton from traditional energy sources to fossil fuels. Thus, energy was an important factor underlying interregional economic disparities in the country.

In the context of slow and late industrialization, traditional fueling practices of earlier centuries continued in the nineteenth century with little change. At the household level, firewood and charcoal remained key fuels for supplying thermal energy needs for heating, cooking, and boiling water.

Artisans relied on wood fuel in their workshops for a wide range of tasks like forging, tanning and glassmaking. Public production plants like arsenals, docks, and gunpowder mills, as well as smelters around the country, continued to burn wood fuel unless coal-based systems were installed. On the eve of World War I, firewood and charcoal were still the most popular energy sources for Ottoman society. Since industrial pressure on woodlands was ignorable and organic fuels were affordable, there was little motive for an energy transition for house heating and artisanal production until the early decades of the twentieth century.

Leaving preindustrial eighteenth century efforts aside, the real encounter of the country with coal occurred in 1828, when the first steamer came to Istanbul. In the first half of the nineteenth century, the state consumed almost all available coal in the country, either in public production plants or in steamers. Given strong de-industrialization forces, the adoption of steam technology and the level of coal consumption were limited. In the second half of the century, during a re-industrialization process, the number of steam powered factories and mills increased especially after 1880. Yet the industrialization in the Ottoman Empire and number of coal-based factories remained limited until World War I. Together with industrial enterprises, the spread of steam navigation, the construction of railways and the opening of gasworks considerably boosted coal consumption. However, the expansion of coal technology and rise in coal consumption was never comparable to those of industrialized countries.

After a decade of dependency on foreign sources, increasing demand for coal stimulated coal explorations around the country. An early and significant outcome of this endeavor was the discovery of the Ereğli coalfield which became the major supplier to the Ottoman government until the end of the empire. Throughout the nineteenth century, numerous black coal and lignite deposits were unearthed in various parts of the country. Nevertheless, few were exploited and amounts of fuel supplied were inconsequential.

Notwithstanding its importance for the Ottoman energy economy, the Ereğli coal basin was modest on the world scale. Besides drawbacks pertaining to geological structure, mismanagement of the mines under government supervision, technical deficiencies, financial difficulties, and labor shortages

obstructed the development of mining in the coalfield for decades. Even when the government authorized coal miners to sell part of their output on the free market, there was little noticeable progress. It was the beginning of the twentieth century production in the mines increased considerably. Substantial French investments in the Ereğli region not only increased output but also improved the quality of coal. However, compared to most European counterparts, the output was relatively low even at its peak.

Like many other nations, Ottomans began to import coal from Britain in the 1830s. Since domestic production failed to satisfy the increasing demand, British coal was always an important component of the Ottoman fuel economy. Especially after the acceleration of steam navigation in the 1880s, Ottoman ports received substantial levels of British coal. Among the coal of British origin, that coming from Cardiff and Newcastle were most popular. Until the adoption of modern sifting and washing techniques in the Ereğli coalfield, these fuels were superior to domestic coal. The transit trade between the Black Sea and Britain made British coal affordable. Ships delivering foodstuffs and other raw materials to Britain returned with coal, which also served as ballast for the vessels.

British coal was traded by companies and merchants with close connections to international steam navigation. These companies and merchants owned several coal depots along the Golden Horn and Bosphorus. The lively coal trade in Istanbul was a source of frequent disputes between the Ottoman government and European states. The controversies stemmed from customs duties and coal depots. While the Ottoman government wanted to increase customs revenues by manipulating the scope of customs exemptions, foreigners taking advantage of duty-free coal sought the support of their respective states. Moreover, the Ottoman government's attempt to change the location of coal depots for security and sanitary reasons was withdrawn due to Western pressure. Tensions withstanding, British coal, which was the leading fossil fuel of the nineteenth century, occupied an important position in the Ottoman energy economy.

This study demonstrates that Istanbul had a central position in the energy economy. The capital city was both a significant consumer of all kinds of fuels and a major hub for the coal trade. In addition to dedicating a chapter to the

wood fuel provisioning of Istanbul, this dissertation frequently cited the capital city in the discussion of coal. Indeed, Istanbul was the core of the empire's coal economy. Most of the coal in the country was traded and consumed in this city. The majority of coal produced in the Ereğli region was stored in this city and distributed from there. In other words, Istanbul took the lead in the Ottoman government's coal network, which included more than forty coal depots. Moreover, its strategic location made the city one of the leading coaling stations in the Levant.

This thesis examine an important facet of the Ottoman energy economy by focusing on much-used fuels. The other components of the energy economy that supplied considerable levels of energy included human and animal muscle power, flowing water, and wind. While these are disregarded for the purposes of my project, these energy sources were the key elements of many production processes and transportation facilities. Moreover, oil is not included in my analysis. In the last quarter of the nineteenth century, oil appeared in the country as an alternative fuel, but its areas of use were limited. Though not yet exploited, rich oilfields were discovered in different parts of the empire prior to World War I.[1] Further studies should address the other sources of energy in order to provide a broader understanding of the history of energy in Ottoman lands.

The underdeveloped energy structures in the Ottoman economy worsened during the ten-year period of war that started in 1912. Since British coal imports were halted, the Ottoman navy ran short on fuel during the Balkan Wars. World War I was a disaster for the Ottoman economy with bitter repercussions on energy networks. Istanbul's wood fuel provisioning became a serious problem due to the prioritization of the military and black market activities. Labor shortages in the Ereğli coalfield and the Russian threat in the Black Sea exacerbated problems in the fuel economy, which was already suffering from the absence of coal imports. Ottomans tried to substitute Ereğli coal with lignite reserves and managed to increase lignite production,[2] but this did not resolve

1 Volkan Ş. Ediger, *Enerji Ekonomi-Politiği Perspektifinden Osmanlı'da Neft ve Petrol* (Ankara: ODTÜ Geliştirme Vakfı Yayıncılık, 2006): passim.

2 Vedat Eldem, *Harp ve Mütareke Yıllarında Osmanlı İmparatorluğu'nun Ekonomisi* (Ankara: Türk Tarih Kurumu Basımevi, 1994): 78-79.

problems pertaining to the fuel supply. Overall, most of the achievements across the empire regarding energy were lost under the heavy conditions of war.

The new Turkish republic inherited a war-torn energy economy. The new regime obtained the richest coal reserves of the Ottoman Empire, but because of increasing imperialist interests in oil, Britain and Russia did not leave Ottoman oilfields to the republic. The energy composition in the first decades of the republican period did not differ much from that of the empire. Wood fuel and coal dominated the energy market until the 1950s. Therefore, the historical continuity between the Ottoman Empire and Turkey was manifest in the field of energy at least until after World War II.

Appendix A Monthly Charcoal Deliveries to Tokat Smelter (1876)

	Names	Küfe	Piasters		Names	Küfe	Piasters
1	Topal Ali	39.25	274.75	39	Gökçe oğlu Abdullah	3	21
2	Salih oğlu Halil	34.25	239.75	40	Yunus	7	49
3	Ömer	37.75	264.25	41	Ökkeş'in Halil	31	217
4	Cerid oğlu Ali	10.5	73.5	42	Pehlivan oğlu Halil	2	14
5	Deli Abdurrahman	34	238	43	Kocagöz Mehmet	10.25	71.75
6	Abbas oğlu İsmail	24.5	171.5	44	Koca Hüseyin oğlu Salih	17	119
7	Çoban Ahmet	45.25	316.75	45	Gök Hüseyin oğlu Zeynel	10	70
8	Emlik oğlu Halil	37	259	46	Ahmet oğlu Hüseyin	18	126
9	Mustafa	3.25	22.75	47	Demirci oğlu Aşur	10	70
10	Kör İbrahim	13.75	96.25	48	İbiş oğlu Yakup	31.75	222.3
11	İsmail	19.5	136.5	49	Küçük Salih	3	21
12	Kara Ali oğlu Ali	19.5	136.5	50	Pehlivan oğlu Hasan	12.5	87.5
13	Abdullah	8	56	51	Salih Onbaşı	11	77
14	Abaza oğlu Hasan	1.25	8.75	52	Sıraçlı oğlu Hasan	9.5	66.5
15	Ali	18	126	53	Kara Mehmet oğlu Hasan	9	63
16	Gök Ali oğlu Mehmet	1	7	54	Sığırcı oğlu Hüseyin	12	84
17	Ağzıkara oğlu İsmail	8	56	55	Demirci Halil	24	168
18	Feyzi	9	63	56	Himmet Kahya	4	28
19	Canik oğlu Ömer	9.5	66.5	57	Hüsnü	4	28
20	Emlik oğlu Ali	8.5	59.5	58	Karakaş oğlu İsmail	9	63
21	Yeniçeri oğlu	9.25	64.75	59	Kuru Ali oğlu Hasan	3	21
22	Gök Ali oğlu Halil	1.25	8.75	60	Oduncu oğlu Davut	2	14
23	Gökçe oğlu Halil	12.5	87.5	61	Halil oğlu İbrahim	4	28
24	Mehmet oğlu Mehmet	11.75	82.25	62	Dursun Kahya	3	21
25	Gökçe oğlu Yusuf	8.5	59.5	63	Halil oğlu Bektaş	3	21
26	İsmail oğlu	5.75	40.25	64	Mehmet Bey	6	42
27	Hüseyin oğlu Mehmet	7.5	52.5	65	Kösen oğlu Süleyman	1.5	10.5
28	_____oğlu	13.75	96.25	66	Bektaş oğlu İbrahim	1.75	12.25
29	Halil	4.25	29.75	67	Sarı oğlu Yusuf	8	56
30	Kel Bekir oğlu Ahmet	9.5	66.5	68	Sarı oğlu Mahmut	5.75	40.25
31	Akkaş Hasan	5.5	38.5	69	Yani oğlu Dimek	2.25	15.75
32	Gökçe oğlu Kadir	8	56	70	Çengel oğlu Mustafa	7	49
33	Abbas oğlu İbrahim	2.75	19.25	71	Recep	1.5	10,5

Names	Küfe	Piasters	Names	Küfe	Piasters
34 Sadullah Kahya	5.25	36.75	72 Diyarbekirli oğlu Ömer	5	35
35 Kara oğlu İbrahim	2.75	19.25	73 İç ağası	11.25	78.75
36 Emlik oğlu Yusuf	14.5	101.5	74 Tahmaz oğlu Dimek	1.75	12.25
37 Çoban Osman	9.75	68.25	75 Bekdaş oğlu Mehmet	3.5	24.5
38 Sarı Mehmet	5.25	36.75	Total	827.8	5794

SOURCE: BOA, T.OMİ 1470/60 Teşrinevvel 1292 (1876)

Appendix B Charcoal sites in Vize (1909)

	Location	Producer	Transporter/owner	Amount (tons)
1	Aya Todori	Margarit Karanfil	Papa İstanic	8.5
2	Aya Todori	Yani Todoraki Çiri	Topuz and Nikola	9
3	Aya Todori	Yani Todoraki Çiri	Topuz and Nikola	8
4	Aya Todori	Tanas __ Kotardiç	?	11
5	Aya Todori	Palamut Kosta	Küçük Aleks	12
6	Aya Todori	Nikoliko Mihail	İstrato	8.5
7	Aya Todori	Dimitri Konstantin	?	7.5
8	Aya Todori	Yorgi Mihail	?	6.5
9	Aya Todori	İlya Nikoli	İstrato	7.5
10	Aya Todori	_____ Karanfil	_____ Reis	7.5
11	Tarabya	Todoraki Mangalo	İstrato ve Aleks	18
12	Tarabya	_____ Lazar	_____ Nikofor	8.5
13	Tarabya	Yorgi	_____ Nikofor	8.5
14	Aksicim	Dimitri Mavrodi	İstrado Efendi	23
15	Aksicim	Dimitri Mavrodi	Yorgaki Safiyanos	12.5
16	Aksicim	Nikolaki	Yorgaki Safiyanos	15
17	Aksicim	Dimo ____oğlu	İstrado Efendi	18
18	Aksicim	Todori Doroliyo	Yorgaki Safiyanos	17
19	Aksicim	Dimitraki Fotaki	Yorgaki Safiyanos	4.5
20	Aksicim	Dimitri Mosko	İstrado Efendi	18
21	Aksicim	Mavrodi and Tanas	Yorgaki	19
22	Aksicim	Yovan Garacalı	Müncail Ağa	11.5
23	Aksicim	Nikola Kakato	Müncail Ağa	8
24	Aksicim	Nikola Kakato	Müncail Ağa	7
25	Aksicim	Milyo Dimitri	Yusuf Ağa	11
26	Aksicim	Dimitri Nikoli	_____ Nikofor	9
27	Aksicim	Papagir Yazi	Perikli	14
28	Aya İlya	Katrin Direnbuli	Todoroki Korinoğlu	6
29	Aya İlya	Panayot _____	Perikli	10.5
30	Aya İlya	Panayot _____	Perikli	6.5
31	Aya İlya	Zafiraki Panayot	Küçük İlyadi	5.5
32	Aya İlya	_____ Panayotaki	_____ Tekfuridi	5
33	Aya İlya	Tanas Direnbuli?	_____ Tekfuridi	10

	Location	Producer	Transporter/owner	Amount (tons)
34	Aya İlya	Mangalo _____	Perikli	6.5
35	Aya İlya	Manel Yorgici	_____	8.5
36	Aya İlya	_____ Yorgici	_____ Ağa	10
37	Aya İlya	Yorgi Katzin?	Nikoforidi	4
38	Aya İlya	İstavri Sava	Perikli	5
39	Aya İlya	Katzin _____	Andon _____	8.5
40	Aya İlya	Yorgi Kiriyak	İstebance?	12
41	Aya İlya	Nikola Tanas	İstrato	5
42	Aya İlya	_____	İstrato	4
			Total	415

SOURCE: BOA, T.OMİ 1696/66, 24 Haziran 1325 (7 July 1909)

Appendix C Engineer Moreau's Coal Reports

1	Sofia, 1873
	Description: It is a beautiful fossil fuel, with very nice aspects, black and bright. Burns with great flame, strongly igniting, very little or not at all sulfurous. When heated in a closed oven it turns into a kind of light, well-agglutinated coke. When burned, it leaves thin, white-yellow ash.
	Content: Fixed materials- 49.05% (ashes, 1.66% siliceous clay and some ferroxide and 47.39% carbon); Volatile materials- 50.95% (water, carburized gases, oils, bitumen, tar, etc.)
	Engineer's note: In my opinion it is lignite older than those of the tertiary period but younger than the fuels of the coal-bearing epoch. Whatever its origin, it is an excellent fuel in every respect.
2	Adana, 1873
	Description: Black lignite, fairly bright in its appearance, burns with a fairly dazzling flame, giving little sulfuric acid.
	Content: Fixed materials- 54.4% (carbon 39.17%; red ash, clays, silica, ferroxide 15.23%); Volatile materials- 45.6% (water, carburized gases, heavy and light oils, bitumen, tar, etc.)
	Engineer's note: Despite this quantity of ash, I think it is a good lignite if the clayey parts are eliminated.
3	Vidin, 1875
	Description: sulfurous, burns with a good, fuliginous flame, gives well-agglutinated light and hard coke
	Content: Type 1, Fixed materials, coke- 67.14% (carbon 39.62%; ash, clay, limestone 27.52%); Volatile materials- water, carburized gases, tar, various hydrogenes etc. 32.86% & Type 2, Fixed materials, coke- 66% (carbon 50.82%; ash, clay 15.18%; Volatile materials- water, gases, tar, etc. 34%)
	Engineer's note: Fairly good lignite

SOURCE: BOA, T. TTEK 498/29 (1873-1875)

Appendix D Steam Vessels of Şirket-i Hayriye in 1914

Name	Speed (mph)	Power (HP)	Consumption in 24 hours (tons)	Coal capacity (tons)
Suhulet	7	400	12	27.5
Sahilbend	7	500	16.5	22.5
Nusret	10.5	550	16	12
Gayret	10.5	550	16	12
İşgüzar	6	130	5	3.5
İhsan	12.5	600	17	13
Şükran	12.5	600	17	13
Nev-Eser	11	600	12	16
Rehber	11	600	12	16
Metanet	10	600	15.5	19.5
Eser-i Merhamet	10	600	15.5	19.5
İkdam	12	600	15.5	17.5
İntizam	12	600	15.5	17.5
Resan	12	600	15.5	17.5
Rüçhan	12	600	15.5	17.5
Tarz-ı Nevin	10	250	6	10.5
Dilnişin	10	250	6	10.5
Hale	14	960	21.5	21
Seyyale	14	960	21.5	21
Süreyya	10	250	6	10.5
Şahap	10	250	6	10.5
İnşirah	10.5	400	9	30
İnbisat	10.5	400	9	30
Bebek	8	150	3.25	7.5
Göksu	8	150	3.25	7.5
Tarabya	10	250	6	10.5
Nimet	10	230	6	10.5
Kamer	10.5	500	9,5	32
Rağbet	10.5	500	9,5	32
Sultaniye	10.5	500	10	30
Hünkariskelesi	10.5	500	10	30
Sütlüce	10.5	500	10	30

Name	Speed (mph)	Power (HP)	Consumption in 24 hours (tons)	Coal capacity (tons)
Küçüksu	12	540	13.25	26
Sarayburnu	12.5	540	10.75	27.5
Boğaziçi	125	540	10.75	27.5
Kalender	12.5	630	13.5	34
Güzelhisar	12.5	610	13.5	34
Hüseyin Hakkı	12	631	17	23
Ziya	12	625	17	23

SOURCE: *Boğaziçi: Şirket-i Hayriye: Tarihçe, Salname,* (Istanbul: Ahmet İhsan ve şürekası, 1330 [1914]): 61-62.

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