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# Coal

## A Significant Factor in Germany's Defeat in World War I

JOSEPH ZELLER

*Abstract: More than a hundred years have passed since the outbreak of the World War I, but there are still fundamental gaps in our understanding of the conflict. It has been generally recognized that the British blockade of Germany played the central role in bringing about Germany's surrender. The German economy, industry and military came to suffer as a result of domestic shortages of all kinds, but especially of coal. In the gridlock of devastation and military force that had developed by 1916 coal came to represent a most effective tool of British allied force that Germany could not counter and so became a decisive factor in Germany's collapse by 1918.*

**M**ORE THAN ONE HUNDRED YEARS have passed since the outbreak of the World War I, but there are still fundamental gaps in our understanding of the conflict. It has been generally recognised that the British blockade of Germany played the central role in bringing about Germany's defeat. However, modern histories of the blockade are often preoccupied with the naval elements of Britain's blockading efforts. Attention must also be given to the commercial system of

shipping control that contributed to the tangible and quantifiable results affecting Germany's defeat.<sup>1</sup>

This paper asserts that Germany was defeated, not only because of losses on the battlefield, but because the British blockade weakened the nation to the point where it could no longer fight. Coal fueled that blockade. Coal control by Britain further harmed Germany domestically, even as its redirection and leverage strengthened the British war effort.

As the blockade progressed, German military planning and its economic and industrial affairs became increasingly defined by lack of international access and domestic shortages of all kinds, including coal. In the gridlock of devastation and military force that developed by 1916, coal came to represent the one effective tool of the British allied forces that Germany were unable to counter. Thus, coal became one of the most decisive, war-ending assets used to defeat Germany in 1918.

This article traces the impact that British coal-born commercial dominance had on German military affairs before exploring the implications that system had on wartime maritime affairs. It then examines the domestic cost of the blockade on Germany. Overall, the result of the British blockade was much as Julian Corbett had anticipated it would be three years prior to the war in 1911:

By closing his [Germany's] commercial ports we exercise the highest power of injuring him which the command of the sea can give us. We choke the flow of his national activity afloat in the same way that military occupation of his territory chokes it ashore. He must, therefore, either tamely submit to the worst which a naval defeat can inflict upon him, or he must fight to release himself[...]. In the long run a rigorous and uninterrupted blockade is almost sure to exhaust him before it exhausts us, but the end will be far and costly.<sup>2</sup>

<sup>1</sup> This article follows the 2015 publication, Joseph Zeller, "British Maritime Coal and Commercial Control in the First World War: Far More Than Mere Blockade," *Canadian Military History* 24, 2 (2015) It continues from the British blockade infrastructure previously established and goes on to explore the impact of that system on Germany over the course of World War I. It incorporates additional material based, in part, on the author's completed doctoral dissertation: Joseph Zeller, *Control of Coal: The key to power in the Age of Steam* (University of New Brunswick, 2016)

<sup>2</sup> Julian Stafford Sir Corbett, *Principles of Maritime Strategy* (Mineola, N.Y.: Dover, 2004), 187.

## GERMAN MILITARY AFFAIRS

From the German perspective, World War I began on 1 August, 1914 with Germany's declaration of war on Russia.<sup>3</sup> This declaration of war represented the culmination of decades of military preparation and enormous investment on the part of the German government, and it was a decision strongly supported by the vast majority of German citizens at the time. Germany had, after all, been unified, in no small measure, by the military endeavors of the Prussian army. The continued application of military force since that time had successfully increased Germany's territories and global prominence. For Germany, war was good; and Germany, in turn, was very good at war.<sup>4</sup>

At the outbreak of war in August 1914, the German army was arguably the most powerful and well-equipped military force in the world.<sup>5</sup> It also outnumbered its enemies on the battlefield. A quick mobilisation plan, foreknowledge of the conflict, and a highly developed and exceptionally efficient transportation network saw approximately 1.5 million (1,485,000)<sup>6</sup> German soldiers successfully advance into foreign soil against a French force of about two thirds its size (1,071,000)<sup>7</sup> as well as hastily assembled British and Belgian forces, each less than one-tenth of Germany's army.<sup>8</sup> This state of affairs was hardly surprising since Germany was the most populous, industrialised and prosperous nation in Western Europe. Germany could mobilise more men and materials towards its war effort using its large reserves of money and material to fight harder and longer than any of its rivals—at least on paper.

To Germany's east, Russia could theoretically gather together a far larger army from among its massive population and vast territory,

<sup>3</sup> Hew Strachan, *The Oxford Illustrated History of the First World War* (Oxford: Oxford University Press, 2014), 24.

<sup>4</sup> Aleksei Alekseevich Brusilov, *A soldier's notebook, 1914-1918* (London: Macmillan, 1930), 1-3.

<sup>5</sup> Theodore Ropp and Alex Roland, *War in the modern world* (Baltimore: The Johns Hopkins University Press, 2000), 241; J.R. Hill and Bryan Ranft, *The Oxford Illustrated History of the Royal Navy* (New York: Oxford University Press, 1995), 29; and Arthur Banks and Alan Palmer, *A Military Atlas of the First World War* (London: Heinemann Educational, 1975), 4.

<sup>6</sup> Banks and Palmer, *A Military Atlas of the First World War*, 30.

<sup>7</sup> *ibid*

<sup>8</sup> *ibid*

but it lacked the industry or transportation system to equip those soldiers or bring them together in a timely and effective manner. To Germany's west, there seemed to be no reason why Germany's overwhelming military might would not defeat the far weaker French forces before anyone else could intervene.

Judged by the usual metrics applied to military forces, the great mystery of World War I should be how the more powerful, better prepared, better trained and better equipped German army ever lost such a conflict. It is true that French resistance proved more determined than many had expected, resulting in Germany's alliance having to fight an active war on two fronts for more than two years. However, that second front collapsed, along with the Russian Empire, more than a year before the war's end. Even if one includes the massive number of Russian soldiers, Germany and its allies kept pace.

The German-aligned Central Powers mobilised approximately 25 million soldiers during the hostilities, a number that was on par with the combined forces mobilised on the European mainland from the forces of the Triple Entente (Britain, France, and Russia). However, the additional fifteen million overseas troops available only to the Triple Entente offers a persuasive explanation for Germany's decline and subsequent defeat. In a conflict infamous for its lack of decisive war-winning battlefield victories, it was the side best able to sustain the unrelenting need for ever more manpower and resources that was going to win.<sup>9</sup> This meant people and supplies needed to traverse a sea; a British sea, fuelled by British coal and coaling stations.

## **GERMANY AND THE HIGH SEAS OF COMMERCE**

Before the war, Germany attempted to preserve access to material relief abroad in several ways that eventually proved insufficient in overcoming Britain's logistical control of international shipping. Germany championed the Declaration of London in 1909 in order to ensure that the free-flow of commercial traffic was an absolute right

<sup>9</sup> R. Ernest Dupuy and Trevor N. Dupuy, *The Encyclopedia of Military History: From 3500 B.C. To the Present* (New York, Harper & Row: 1977), 990.

guaranteed by international law. That effort failed, as nations such as Great Britain chose not to ratify the proposed measure.<sup>10</sup>

Germany even constructed the second largest navy in the world, part of Germany's decades-long heavy investment in wartime preparations—a force built to rival Britain's while ushering in a new age of German ascendancy on the world stage. These ambitions also led to territorial acquisitions so that, by 1914, Germany controlled almost the entire Baltic Sea as well as numerous colonial holdings, including colonies in Africa, islands in the Pacific and territory in China.<sup>11</sup> However, Germany knew its colonies would be swiftly overrun at the outbreak of war, and its naval units forced to scramble for survival. While Germany had only 180 ocean-going warships Britain had 313.<sup>12</sup> Britain also had more well-developed communication systems to coordinate its naval affairs.<sup>13</sup> In the end, affairs were much as the German Vice-Admiral Wolfgang Wegener later summarised in 1926 when he addressed the value of Britain's geographic position and control of trade routes.

England found herself simply in a brilliant strategic position at the outbreak of the war. The arteries of her commerce lay in the Atlantic, unreachable by the German fleet from the Elbe. The German trade routes[...]could easily be severed in the Channel and off Scotland. The North Sea, through which no trade route any longer went, became a dead sea. The strategic position was so perfect that England never once felt the need to improve her position throughout the entire course of the war[...]the primary mission of the English fleet consisted of defense of England's strategic position, from which she controlled the important commercial arteries in the Atlantic...<sup>14</sup>

Vice-Admiral Wolfgang went on to aptly explain how that position influenced British military strategy over the course of hostilities.

<sup>10</sup> W. Arnold-Forster, *The Blockade. 1914-1919* (Oxford, Clarendon Press: 1939), 6.

<sup>11</sup> Holger H. Herwig, *'Luxury' Fleet: The Imperial German Navy 1888-1918* (London: Allen & Unwin, 1980), Appendix: Table 20.

<sup>12</sup> Paul G. Halpern, *A Naval History of World War I* (London: UCL Press, 1994), 7-20.

<sup>13</sup> Javier Ponce Marrero, "Logistics for Commerce War in the Atlantic During the First World War: The German Etappe System in Action," *The Mariner's Mirror* 92, 4 (2006): 455-64.

<sup>14</sup> Wolfgang Wegener, *The Naval Strategy of the World War* (Classics of Sea Power) (Annapolis, Md.: Naval Institute Press, 1989), 14-15.

In the broadest sense, England was prepared to do battle as soon as her defensive mission required[...]. Since this attack never materialized, England saw no reason to fight. One does not need to fight for the command of the seas that one possesses—and England possessed unrestricted command of the seas in the Atlantic—until that control is challenged. We did not make the slightest encroachment upon it. The British will to fight, the unavoidable precondition for a battle in the North Sea, thus did not exist...<sup>15</sup>

Germany's attacks in 1914 took place within an increasingly more restrictive area of operation, as fewer neutral coaling stations became accessible to Germany as a base from which German ships could operate. Both Germany and Britain possessed warships able to voyage great distances, but only Britain could be sure of securing the fuel required to return. The importance of British coal served to constrain Germany's formidable maritime assets, relegating the German warships to a benign role and swiftly driving German merchant shipping from the high seas.

Of all the advantages the British navy enjoyed on the eve of war, coal was the only one in which Germany was unable to compete.<sup>16</sup>

These British fuel-derived powers had widespread and direct ramifications of global significance as described by Lloyd George (then British Minister of Munitions) in 1915: "Coal is the most important element in the industrial life of this country. The blood which courses through the veins of industry in the country is made of distilled coal. In peace and in war King Coal is paramount Lord of Industry. It enters into every article of consumption and utility; it is our real international coinage. When we buy goods, food, and raw material abroad, we pay not in gold but in coal."<sup>17</sup> By 1913, coal made up more than 80 per cent of Britain's exports by weight

<sup>15</sup> Ibid, 15.

<sup>16</sup> Rep 450 Mel, No. 732 Supply of fuel, timber, peat and coal 1916-1921, Niedersächsisches Landesarchiv-Staatsarchiv Osnabrück.

<sup>17</sup> R. A. S. Sir b Redmayne, *The British Coal-Mining Industry During the War* (Oxford: Clarendon Pr., 1923), 2.

and constituted a central facet of the economy allowing international commerce to function.<sup>18</sup>

Because of the central role British fuel and depots played in international commerce, German vessels and merchantmen found little comfort, even in supposedly neutral harbours. Of the roughly 6,200,000 tons of shipping owned and operated by Germany and Austria-Hungary, almost one-half (about 2,875,000 tons) was interned in neutral ports during the first five months of war.<sup>19</sup>

Neutral countries were now supporting the British power they could not do without.<sup>20</sup> All of Germany's foreign-based warships were either destroyed or neutralised within a year of the war's start. Each ship was seriously constrained by its inability to access coaling facilities. Many were destroyed while attempting to coal.<sup>21</sup> Even the formidable German High Seas Fleet was kept bottled up in home waters, and not just by its British opponents, but by its inability to secure reliable bases or facilities anywhere else. Wegener described the situation:

Every war at sea revolves around freedom of the seas for one's own shipping.

We lost this freedom through geographical position upon England's declaration of war, for only he who by virtue of his geographical position controls the trade routes, obtains his freedom in time of war. The "Grand Fleet," which deprived us of the freedom of the seas, brought us to our knees solely by maintaining its strategic geographical position.<sup>22</sup>

<sup>18</sup> For more extensive coverage and context of Britain's sizable coal fuelled power of commercial dominance see: Joseph Zeller, "British Maritime Coal and Commercial Control in the First World War: Far More Than Mere Blockade," *Canadian Military History* 24, 2 (2015): page range?; Isador Lubin, Helen Everett, and Institute of Economics, *The British Coal Dilemma: The Institute of Economics Investigation in Industry and Labor* (New York: The Macmillan company, 1927), 25; Max E. Fletcher, "From Coal to Oil in British Shipping," *The Journal of Transport History* 3, 1 (1975), 6; and Charles Campbell McLeod and Adam Willis Kirkaldy, *The Trade, Commerce, and Shipping of the Empire* (London: W. Collins Sons & Co., 1924), 166-67.

<sup>19</sup> Louis Guichard and Christopher Rede Turner, *The Naval Blockade, 1914-1918* trans. By Christopher R. Turner (London: P. Allan & Co., 1930), 10.

<sup>20</sup> Ibid

<sup>21</sup> E.B Potter, ed., *Seapower: A Naval History* ([S.l.]: Prentice Hall International, 1960), 202-06.

<sup>22</sup> Ibid, 37.



Much has been said of Germany's unrestricted submarine campaigns, but for this article it is enough to point out that they failed to provide any substantive relief of Germany's supply issues. The German adoption of mass U-boat attacks served mainly to expend more resources abroad for very limited returns.<sup>23</sup>

The initial German plan in 1914 intended to sidestep the inevitability of Britain's seaborne dominance and to attempt to swiftly conquer European enemy territory while doing enough damage to force a favorable diplomatic settlement before supplies became an issue. Germany's initial military activities reflected these goals. Germany mobilised its workforce to create an army as large as possible and then sent a sizable portion of that force through neutral Belgium to catch French forces off-guard and force the quick settlement to the conflict. However, Germany's carefully crafted military plans did not achieve the desired decisive resolution.

Unlike Germany, Britain managed to carry out its military goals rather well. With the powerful logistical support provided by its coal and coal stations, the British navy swiftly secured its most important transportation hubs and stations from foreign interference, ensuring safe passage for as much commercial activity and Commonwealth support as could be arranged, sweeping the seas of any rival forces and shipping. While not without incident or setbacks, Britain succeeded in achieving its primary objective of controlling international trade by the end of 1914, thus creating quite a problem for Germany. Britain's control over transportation and supply channels became central to the war's outcome because it not only permitted British supplies through but it also prevented German supplies from any access to those routes.

<sup>23</sup> U-boats generally expended fuel and munitions in operations that destroyed shipping without securing any form of material benefit for Germany. There are two notable exceptions. First, two U-boat cargo vessels were created to evade British Blockade efforts and engage in trade with the United States, but after three voyages in total, in which one of the ships was lost, that idea was discarded. Second, Germany derived benefit from an indeterminate amount of shipping within the Baltic and North Sea that it confiscated, rather than destroyed, by surface vessels and U-boat operations during the war. However, the amount of such shipping appears to have been minimal, although exact figures have proven difficult to identify.

## GERMANY AND THE MOUNTING COST OF COAL

In 1918, Britain's Government Committee on the Treatment by the Enemy of British Prisoners of War received a report of inhumane conditions and forced labour from prisoners of war in German mines. This account from Private John Devany described how soldiers "had driven picks into their feet"<sup>24</sup> rather than continue to work such long hours with little food and in hazardous conditions as mines in increasing disrepair were dug deeper for less and less reward.<sup>25</sup> The report was corroborated by a compilation of similar reports submitted to the committee and the War Office in April of that year as part of an investigation by the committee's secretary, Dame Adelaide Livingston.<sup>26</sup>

The mines were only one of many locations in which prisoners of war were being forced to work.<sup>27</sup> The circumstances of their work, and the diminishing production towards which they contributed symbolised the state and degradation that Germany had undergone over the several years of Britain's blockade. Their experiences also offer another window through which the conditions in Germany can be viewed.. As one British Private, Ernest Evanson, reported:

When working in the mines I often spoke to the civilian labourers there about food conditions. It was their constant talk and they also complained of the dearness of things and the impossibility of getting clothes. They would buy even our prison clothes with the yellow stripes or our hats and they would pay anything for soap or boots. I got into touch with an Austrian who had been engaged in smuggling things in from Holland and I gave him some soap in exchange he gave me two shirts, two collars and two ties. I had already got two compasses and a map for which I had given soap. I bribed a Serbian Tailor to alter our

<sup>24</sup> Employment of British Prisoners in Coal and Salt Mines: File 60206, 3: Prisoners: Germany File 303 (P.P. 60203-82851) of War Reports FO 383/390 British National Archives.

<sup>25</sup> Ibid, File 60948, 6; and File 60953, 2.

<sup>26</sup> Ibid, File 60206, 1-5.

<sup>27</sup> Prisoners: Germany File 303 (P.P. 60203-82851) of War Reports FO 383/390 British National Archives in its entirety

prison clothes so as to hide the stripes and on the 23<sup>rd</sup> of February I and an Australian soldier got away[...]<sup>28</sup>

Many reported along similar lines how Germany's mines represented only one facet of the nation's worsening circumstances and poor conditions for workers of all stripes.<sup>29</sup> Although the use of forced labour was a practice shared by all the major powers involved in the conflict, the scale and poor treatment of this force within Germany is notable.<sup>30</sup> The agricultural sector alone lost 60 per cent of its workforce to the German war effort.<sup>31</sup> As these three million people left their work because of the war, up to 900,000 prisoners of war and 430,000 migrant workers imprisoned by the German government were forced to work the land in their stead.<sup>32</sup> The mining industry was no different and at least 350,000 of those imprisoned in Germany were forced to work in industries, including mining, as Germany sought to meet its increasing demands with ever greater manpower.<sup>33</sup>

The British blockade impacted Germany profoundly, affecting every aspect of day-to-day life, and the shortages created impacted the lives of every single person within its borders, not just the prisoners of war. In 1913, prior to war, Germany relied on foreign trade for more than 40 per cent of its gross national product.<sup>34</sup> As the

<sup>28</sup> Report by Private Ernest Evanson: Treatment of British Prisoners in German Hands April 6, 1918: File 60948, 6: Prisoners: Germany File 303 (P.P. 60203-82851) of War Reports FO 383/390 British National Archives. Note: Prisoners were able to receive intermittent aid packages from their home government depending on circumstance and these aid packages could provide the soap, boots or even surplus food by which they could sometimes barter.

<sup>29</sup> Ibid, File 60953, 8. In which Canadian Private Horace Robinson reported much the same regarding unpleasant mining conditions and also how "There were German civilian's working with us. We used to give them food, and we got compasses and files from them. On March 16th, 1918 I escaped..." These stories are also representative of the approximately two million forced labourers used within the German war effort (Isabel Hull, *A scrap of paper: breaking and making international law during the Great War* (Ithaca: Cornell University Press, 2014), 125.

<sup>30</sup> Ibid, 70, 127-28.

<sup>31</sup> Avner Offer, *The First World War: an Agrarian Interpretation* (Oxford: Oxford University Press, 1989), 27.

<sup>32</sup> Offer, *The First World War: an Agrarian Interpretation*, 62.

<sup>33</sup> Leo Grebler and Wilhelm Winkler, *The Cost of the World War to Germany and to Austria-Hungary* (New Haven: Yale University Press, 1940), 30.

<sup>34</sup> M. Vego, *Austro-Hungarian Naval Policy, 1904-1914* (New York: Routledge, 2013), 32.

war progressed, this number fell to less than one-fifth of that original value, leaving an unfilled shortage of materials.<sup>35</sup>

Avner Offer's *The First World War: An Agrarian Interpretation* focuses on problems of food supply, heavily implicating the British blockade as a contributing factor in preventing any form of external relief to the peoples' hardships.<sup>36</sup> When discussing Germany's policies, trade agreements, and agricultural efforts, Offer points out that, "It is wrong therefore to blame the German food crises on mismanagement alone. Blockade made them almost inevitable."<sup>37</sup> Offer had little difficulty in identifying the importance of raw materials, including coal, in the German war effort. He noted Germany's serious decline in coal production: "By the last year of the war the effective output per worker within many of Germany's various industries, including coal mining, had dropped by 30 per cent to 40 per cent."<sup>38</sup>

German industrial might was still based on coal and iron[...]With the growth of industrial strength and with the passing of the "iron age" of German industry, its entire structure became increasingly dependent on foreign raw materials. Imports of raw materials for manufacture and of semi-finished products amounted to 1,310,300,000 marks in 1887 and to 5,882,600,000 marks in 1912, and their ratio to total imports (excluding gold and bullion) increased from 42 to 55 per cent.<sup>39</sup>

Prewar, Germany imported almost a quarter of its agricultural produce,<sup>40</sup> having to make do with its own supplies as two-thirds of

<sup>35</sup> Offer, *The First World War, an Agrarian Interpretation*, 62.

<sup>36</sup> *Ibid*, 68.

<sup>37</sup> *Ibid*, 68.

<sup>38</sup> *Ibid*, 34.

<sup>39</sup> *Ibid*, 12.

<sup>40</sup> Grebler and Winkler's 1940 work, *The Cost of the World War to Germany and to Austria-Hungary*, quantifies this reliance on foreign imports as follows: "According to the German *Reichsarchiv*, average domestic production in the period 1903-1913 varied between 75 and 80 per cent of total consumption of agricultural products while imports ranged between 20 and 25 per cent. The import share of dairy products was as high as 50 per cent, of eggs 33 per cent, of wheat 30-40 per cent, of barley 40-55 per cent, of vegetable fats 85 per cent, of fish 65 per cent." According to Skalweit, "three-fifths of the consumption of legumes were imported. Rice, tea, and coffee came, of course, entirely from abroad. Ninety-five per cent of all the meat consumed was supplied from domestic production, but about one-third of that production was dependent on imported fodder." See, Grebler and Winkler, *The Cost of the World War to Germany and to Austria-Hungary*, 9.

its agricultural workforce marched off to war.<sup>41</sup> The mining industry was also hit hard, as the study *Economic and Social History of the World War*, commissioned by the Carnegie Endowment for International Peace in 1923, makes clear:

The need for men in the army was urgent; but urgent, too, was the need for men in the mines. There were at this time over 1,000,000 work-people employed above and below ground at the collieries. Up to the end of March 1916 there had flocked, voluntarily, to the army 282,200 men, the very pick of the man power of the mining industry, and even when it was found necessary to take steps to prevent more men from leaving the mines, leakage continued.<sup>42</sup>

While Germany's enemies were able to seek relief from internal shortages by importing goods from abroad, Germany could not. As the prominent naval writer, wartime British naval officer and eventual Baron, Stephen King-Hall wrote:

The blockade upon the peoples of the Central Powers was cumulative and widespread in its effects. It had a direct influence upon the efficiency of their military machine by cutting off the supplies of essential munitions of war, such as copper, tin, rubber, nickel, and cotton, and lowered the physical resistance and morale of the civil population by cutting off supplies of the necessities of life... which eventually caused even the well-disciplined and patriotic German people to turn in despair and lift the cup of defeat to their lips.<sup>43</sup>

Wartime impacts of the resulting shortages have been the subject of numerous studies, but among the most modern and extensive is Roger Chickering's 2007 publication *The Great War and Urban Life in Germany: Freiburg, 1914-1918*. Although focused on the city of Freiburg, the study nonetheless provides an important perspective of wartime activities that underscores the mounting cost of blockade-enforced isolation. Chickering describes the effect of the blockade:

<sup>41</sup> Offer, *The First World War, an Agrarian Interpretation*, 62.

<sup>42</sup> Carnegie Endowment for International Peace. Division of Economics and History, *Economic and Social History of the World War. British Series* (Oxford: The Clarendon Press, 1923), 257.

<sup>43</sup> Stephen, Baron, King-Hall, *The War on Sea, 1914-1918* (London, 1929), 72.

The war strangled German agriculture. ‘Imports from abroad, on which the German food supply had to a great extent relied, were cut off by the blockade,’ as the economist August Skalweit summarized the dilemmas that he had faced as a leader in the central bureaucracy in Berlin. ‘An increase in Germany’s own agricultural production to compensate for these losses to even a small degree was impossible, because the effort would have claimed so many human and material resources that the country’s military power would have suffered.’[...]The crisis surfaced in shortages that became more debilitating the longer the war continued, albeit in various degrees of severity<sup>44</sup>

In order to supply its prewar needs, Germany had established the second largest merchant marine in the world with a combined tonnage of more than a quarter the size of Britain’s and 1,897 vessels of more than 100 tons. Germany depended on these vessels for luxury items, fertilizer, animal feed, horses, industrial materials, food<sup>45</sup> and, of course, coal.<sup>46</sup> Chickering explains:

The combined shortages of food and fuel exacerbated urban misery during the final two years of the war. Oversight of the fuel supply was only a little less complex and critical to the city’s survival than the administration of foodstuffs. It compounded the regulatory burdens and increased the administrative costs, adding innumerable new complications to a bureaucratic enterprise that had taken on grotesque proportions.<sup>47</sup>

While Germany had many coal mines of its own, the demands of war quickly outstripped its internal capacity. Coal was needed by industry for manufacturing weapons of war, supporting troops and maintaining civilian infrastructure. Coal was also required to secure the needs of allies and the nations of Scandinavia, as described in a 1916 British intelligence report:

<sup>44</sup> Roger Chickering, *The Great War and Urban Life in Germany: Freiburg, 1914-1918* (Cambridge: Cambridge University Press, 2007), 217.

<sup>45</sup> Offer, *The First World War: an Agrarian Interpretation*, 62.

<sup>46</sup> Redmayne, *The British Coal-Mining Industry During the War*, 100.

<sup>47</sup> Chickering, *The Great War and Urban Life in Germany: Freiburg, 1914-1918*, 226.

“coal is Germany’s principal weapon for compelling neutral nations to allow the export of many much-needed commodities. I have[...]referred to the large quantities of coal which find their way from Germany to Sweden, while Switzerland is known to be entirely dependent for her coal on the good-will of her powerful neighbour, imports of coal from Germany to Switzerland averaging well over 10,000 tons a day. Denmark is also now obliged to obtain a certain amount of coal from Germany.”<sup>48</sup>

Coal was used to generate most of Germany’s electricity and fuel its diminishing trade and transportation network.<sup>49</sup> Coal was also central to everyday life as a cooking fuel, a source of light and a central provider of heat in winter. Coal became central to Germany’s ability to sustain what little trade it still possessed with its allies and the nations of Scandinavia. By 1915, acute shortages of fuel were already causing massive transportation blockages nationwide as the need to move men and troops to the front left insufficient fuel for the movement of food, raw materials and, ironically, coal.<sup>50</sup> Coal could not be moved because of the lack of coal and, indeed, in 1917, the construction of several coal mines in Belgium had to be abandoned, also because of lack of coal.<sup>51</sup>

The reason for this seeming absurdity was the existence of many different grades of coal, each used for a specific purpose. The lowest quality and most commonly available grades generated enough heat to cook food and heat homes but higher grades of coal were required to efficiently operate steam locomotion and were far less common. The highest grade, which generated enough heat to melt and process steel, was rarer still. If the right grade of fuel was unavailable, a lower

<sup>48</sup> The Economic Situation in Germany During June 1916, And being The 23rd Month of The War”. Mr. Max Müller, the British Consul-General in Budapest, to Lord Hardinge of Penshurst: British National Archives: CO 323/715, General 1916, 102.

<sup>49</sup> Ibid, 224.

<sup>50</sup> Caroline Ethel Cooper and Decie Denholm, *Behind the lines: one woman’s war, 1914-1918: the letters of Caroline Ethel Cooper* (London: Jill Norman & Hobhouse, 1982), 113.

<sup>51</sup> Grebler and Winkler, *The Cost of the World War to Germany and to Austria-Hungary*, 75.

grade might be substituted, although it worked far less efficiently and left behind far more residue.<sup>52</sup>

The “Turnip Winter of 1916” provides an excellent example of coal’s impact. The German people were hit with an unexpectedly bitter winter and massive shortages that brought about a nation-wide crisis. As its name suggests, relief from hunger was partly resolved by the widely available turnip.<sup>53</sup> Relief from the cold was more difficult to come by. Without coal to heat their homes, almost all suffered, and thousands died. It was the first of many harbingers of defeat suffered by Germany’s civilian population. It was reported from British parliamentary investigations into the the war’s civilian cost of the time that the toll of war and blockade only became more tragic as the war progressed past 1917. By the end of that year the death rate of children between two and six years old increased 49 per cent and the death rate among older children increased 55 per cent.<sup>54</sup> Those studies concluded:

that in November, 1916, the food distributed and obtainable per head in Germany had a calorific value of only 1,431 calories. The Inter-Allied Scientific Food Commission had laid down that the minimum necessary to keep a population in health was 2,772 calories... during the “Turnip Winter” about 30,000,000 Germans were only able to keep alive by using up their own fat tissues, and their average loss of weight was from 15 to 25 per cent...In 1915 the increase in the civil death-rate was 9 per cent.; in 1916 it was 14 per cent.; in 1917 it was 32 per cent[...]When faced with the failure of the submarine campaign at sea, and military defeat in the west, the exhausted German people finally collapsed, 750,000 civilians who, according to pre-war expectation of mortality statistics, should still have been alive in 1918.<sup>55</sup>

<sup>52</sup> Wood and coke also provided viable methods of fuel production and were often substituted for coal, but the logistical complexities of supply and distribution remained substantial; Chickering, *The Great War and Urban Life in Germany: Freiburg, 1914-1918*, 225-26.

<sup>53</sup> Guichard and Turner, *The Naval Blockade, 1914-1918*, 83.

<sup>54</sup> The postwar source refers to a 55 per cent increase among “children of school age” which at the time referred to children between the ages of six and fourteen; however, Germany only raised the mandatory school-going age from twelve to fourteen in 1918 so it may also refer to the ages of six to twelve. See, *Ibid*, 73.

<sup>55</sup> Hall, *The War on Sea, 1914-1918*, 73.



Leo Grebler and Wilhelm Winkler's *The Cost of the World War to Germany and to Austria-Hungary* provides an even more graphic description of Germany's coal-starved decline as the German government sought to intervene in 1916:

Coal rations were reduced, where possible. On the whole, however, the growing list of industries "essential" to the conduct of the war made discrimination ever more difficult. The discrimination finally was not between essential war purposes and non-essential uses, but between different war purposes; thus it became more and more arbitrary, and increasing shortages enforced restrictions to the detriment even of war production and of military operations.<sup>56</sup>

Some of these shortages include a cotton industry in which only 4 per cent of the 1,700 spinning and weaving mills were able to continue operating in 1918.<sup>57</sup> Even central war industries like the manufacturing of boots and footwear only produced from about half of their production sites by 1917. Three-quarters of German oil mills were forced to close by 1917. For men like the escaping British POW, the closure of 85 per cent of Germany's prewar soap production plants—causing soap shortages nationwide—had been a godsend, allowing him to purchase clothing, compasses and a map. Even Germany's world-renowned breweries were not immune. Of the 3,786 breweries in 1913, less than half were still operational in 1918.<sup>58</sup> Coal shortages consistently hampered these faltering German industries.<sup>59</sup>

A letter from Ethel Cooper, a British woman remaining in Germany, dated 4 February, 1917, provides further proof of such shortages:

Coal has run out. The electric light is cut off in most houses (I have gas, thank Heaven!), the trams are not running, or only in the very early morning, all theatres, schools, the opera, Gewandhaus and concerts and cinematographs are closed—neither potatoes nor turnips are to be

<sup>56</sup> Grebler and Winkler, *The Cost of the World War to Germany and to Austria-Hungary*, 56.

<sup>57</sup> *Ibid*, 57.

<sup>58</sup> *Ibid*, 57.

<sup>59</sup> Of the original 3,786 breweries only 2,192 were still working in 1917 and 1,833, less than half of their prewar numbers, were still operational in 1918." *Ibid*, 58.

had—they were our last resource—there is no fish—and Germany has at last ceased to trumpet the fact that it can't be starved out. Added to that the thermometer outside my kitchen window says 24 deg. Fahr. *below zero*. I have never seen that before.<sup>60</sup>

Coal was the fuel of industry, transportation (both land and sea), power, light and heat. Coal impacted all aspects of the war. Power generators, urban gas works, and the mechanised hammers and forges of industry were all supposed to save on manpower and sustain themselves, but without coal even those functions were suppressed. A British intelligence summary from 1918 detailed the deprivation and suffering in Germany because of the coal shortage:

With the advent of winter the coal shortage has assumed a still more serious aspect. Factories in all parts of Germany are greatly hampered by the lack of coal, and many works have been forced to restrict their output[...]There are daily queues of men and women [...] in front of the coal-dealers' shops in Berlin, but so small are the stocks in hand that they frequently have to go away without any coal after hours of waiting. Dusseldorf, though on the Rhine and within easy reach of the coal-fields, appears to have been particularly badly off for coal and throughout South Germany, and especially in Bavaria, complaints are heard of inadequate coal supplies and of unfair treatment at the hands of the Imperial Coal Commissary...<sup>61</sup>

The report was part of a monthly series which in this case examined the cause of the coal shortage, implicating problems of transportation because of a shortage of trucks.<sup>62</sup> It set out Germany's response to the coal shortage, describing attempts to ration consumption and supplies of coal. It explained measures taken in large towns and cities, including Berlin, Munich, and Dusseldorf to control fuel and gas consumption such as special tickets issued for washing and cooking, limited heating of schools in Berlin, and early closing work hours. Moreover, the report showed that there were reductions in

<sup>60</sup> Cooper and Denholm, *Behind the lines: one women's war, 1914-1918: the letters of Caroline Ethel Cooper*, 144.

<sup>61</sup> The Economic Situation in Germany in November 1917, Being the Fortieth Month of the War. Mr. Max Muller to Lord Hardinge of Penshurst: British National Archives: CO 323/775, General 1918. 180-182

<sup>62</sup> *Ibid*, 181.

fuel use in “factories necessary for war purposes” where a 20 per cent reduction was required.<sup>63</sup> It further explained:

Further evidence of the shortage of coal in Germany is afforded by the falling off in the export, in spite of the fact that Germany is, under various commercial agreements, committed to a certain exportation of coal to neighbouring neutral countries[...]The present export to Switzerland, Denmark, and Holland taken together are said to average less than 500,000 tons a month. The German coal delivered to Switzerland in November is not expected to exceed 120,000 to 130,000 tons, instead of the promised 200,000 tons[...]<sup>64</sup>

The report offered various explanations for the shortage and reiterated the distress of the German people who suffered because of it:

The fact, however, is abundantly clear that coal is really scarce, probably scarcer than ever before during the war; and whether this situation is due to transport difficulties or coal export agreements, or reductions of output due to the growing inefficiency of the miners caused by the poor quality of their nourishment, is of secondary importance, so long as the inconveniences and distress inseparable from a shortage of fuel continue to afflict the German people.<sup>65</sup>

This central message of Germany’s distress and growing paralysis because of lack of fuel and supplies was repeated in many reports, documents and accounts.<sup>66</sup>

By the beginning of 1918, Germany was forced to renege on several of its coal supply contracts with Sweden, Austria-Hungary and Denmark. Germany was the only major supplier of high quality coal still able to function in mainland Europe and, because of Britain’s suppression of coal trade to these countries, Germany was forced to substitute its own coal to fuel the neutral commerce it so desperately needed. While this depleted coal reserves desperately needed at home, it was the only way to maintain even a tenuous

<sup>63</sup> *Ibid*, 182.

<sup>64</sup> *Ibid*, 182.

<sup>65</sup> *Ibid*, 182.

<sup>66</sup> British National Archives: CO 323 designation in entirety

link to the many supplies required to sustain its wartime activities.<sup>67</sup> Germany's eventual inability to sustain that commerce, despite its desperate need for supplies from abroad, certainly signified that its end was near.

The centrality of the coal industry to the German war effort is indicated by the state of collapse in which it found itself at war's end.<sup>68</sup> Near the end of the war, German industry was generally working at about 40 per cent of its prewar efficiency, requiring between two to three times the manpower to accomplish the same tasks.<sup>69</sup> The exhaustive investigation performed by the Carnegie Endowment for International Peace concluded that little of Germany's industry remained salvageable in the postwar environment:

The adjustment of industrial equipment to war production and to the manufacture of substitutes could not fail to depreciate machinery by change of installations and of machinery parts, and by greater wear and tear; frequently complete technical reorganization was required. In the less active industries such as the textile industries, plants deteriorated because they were not used and could not be properly maintained. In other cases, machinery was transferred from the less to the more essential industries, especially under the Hindenburg Program (*Maschinen-Ausgleich*), with resulting dilapidation of equipment in the less essential industries.<sup>70</sup>

The study even documented how this industrial overuse and decay proved especially dire to the coal mining industry on which so much of the German economy industry relied.

‘During the War the [coal] mines, while suffering from lack of material as well as labor, had to produce the highest possible output. Any thought for the future had to be set aside; the machinery was all worn to the

<sup>67</sup> Archibald Colquhoun Bell, *A History of the Blockade of Germany and of the Countries Associated with Her in the Great War: Austria-Hungary, Bulgaria, and Turkey, 1914-1918* (London: H.M Stationary Office, 1937), 351.

<sup>68</sup> Grebler and Winkler, *The Cost of the World War to Germany and to Austria-Hungary*, 34.

<sup>69</sup> *Ibid.*, 27, 30, 33.

<sup>70</sup> Grebler and Winkler, *The Cost of the World War to Germany and to Austria-Hungary*, 40.

outmost limit.<sup>71</sup> As a result of wear and tear, the coal requirements of the mines themselves became larger and larger until they were six million tons more in 1921 than in 1913.<sup>72</sup>

How did Britain's mastery of coal and international access relate to this situation? In a direct sense, Britain's control over massive quantities of the highest quality coals, its geographic accessibility to the sea, as well as its well-developed distribution network worldwide made it an ideal prewar German trading partner. Prior to the war, many of Germany's high-tech industries had been almost entirely reliant on British-Welsh anthracite because the best German coal had already been reserved for the government and its war industries.<sup>73</sup> There had never been enough German high-quality coal to supply all of Germany's needs. Despite Germany's wartime efforts to expand production using the mines of conquered territories and the massive use of prisoners of war as slave labor, these shortages were simply never made up. There are those who place the number of German civilian deaths as a result of Britain's blockade at around 760,000 and others who place that figure far higher, but a reasonable conclusion is that in many cases food might have been available had there been the fuel to transport it.<sup>74</sup>

Coal remained a defining resource of limitation throughout the World War I. Because of Britain's near monopoly over steamship coal and refueling stations, the Triple Entente was supplied with the

<sup>71</sup> Quoted as being from G. Luebsen, "The German Coal Situation," in *Reconstruction in Europe*, ed. by the *Manchester Guardian Commercial*, 1922.

<sup>72</sup> Grebler and Winkler, *The Cost of the World War to Germany and to Austria-Hungary*, 40.

<sup>73</sup> Anthracite has occasionally also been used as a term referencing high efficiency steaming coal, such as within the author's own previous article, Joseph Zeller, "British Maritime Coal and Commercial Control in the First World War: Far More Than Mere Blockade," *Canadian Military History* 24, 2 (2015): 37-57 and historical sources such as British National Archives: CAB 17/4 'Anthracite Coal Supplies for the Navy 1904-1905, and 'On the Anthracite Coal and Coal-field of South Wales' by C. H. Perkins. British Association for the Advancement of Science. *Report of the Annual Meeting* (Office of the British Association, 1880), 220-21. However, the author is grateful to Rear Admiral James Goldrick, Royal Australia Navy (ret) for directing him to current practice which views quality smokeless steaming coal as being closer to mid-quality semi bituminous coals and views it as entirely distinct from the anthracite veins around which it is generally obtained.

<sup>74</sup> C. Paul Vincent, *The Politics of Hunger: The Allied Blockade of Germany, 1915-1919* (Athens: Ohio University Press, 1985), 170.

soldiers and materials needed to maintain its strength. Britain used its chain of coaling stations and control over the fuel of commerce to redirect supplies from across the world to support the British war effort until Germany stood increasingly alone. Denied access to the global marketplace, Germany was forced to subsist on dwindling reserves of materials. Lack of coal meant that Germany was unable to respond domestically to those restrictions because without the much-needed fuel, it was unable make up the necessary materials, industry and infrastructure in both military and domestic realms. Germany's opportunity to win the war suffered as its foreign commerce was eliminated and its people devastated.



#### **ABOUT THE AUTHOR**

**Joseph Zeller** received his doctorate in history at the University of New Brunswick, under the supervision of Dr. M. Milner. His dissertation examined energy transitions and the pivotal role that the British monopoly over coal and coaling stations played in establishing British imperial power during the Age of Steam (1850-1918). He received a Masters in Strategic Studies from the University of Calgary (2009) under the supervision of Dr. H. Herwig. He holds a B.A. (Honours History) from Wilfrid Laurier University.

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