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Document Version

Publisher's PDF, also known as Version of record

Citation for published version (Harvard):

Jackson, S 2016, 'The phosphate archipelago: imperial mining and global agriculture in French North Africa', *Jahrbuch für Wirtschaftsgeschichte*, vol. 57, no. 1, pp. 187-214.

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Simon Jackson

The Phosphate Archipelago: Imperial Mining and Global Agriculture in French North Africa

Abstract: This article analyzes the network of phosphate producing sites in French colonial North Africa in the twentieth century. By tracing phosphate flows across the region between mining sites, and by placing the North African network into imperial and global perspective, the article develops the concept of a phosphate archipelago, capable of recognizing the shared specificities of the phosphate mines as extractive spaces and of describing their insertion into adjacent local and regional dynamics. Drawing on political-economic writings after World War One, the article focuses mainly on phosphates' role in the colonial politics of economic autarky, but also touches on labour migration, the role of phosphates as an actor, and the trajectory of the phosphate archipelago in North Africa across the watershed of independence in the 1950s and down to the present day, when it plays a key role in the politics of global nutrition and food security.

JEL-Codes: N 17, N 470, N 570, O 13, Q 17

Keywords: North Africa, phosphates, mining, colonial empire, Morocco, Tunisia, global agriculture, World War One

DOI 10.1515/jbwg-2016-0009

1 “Khouribga is *Phosphatville*”

Khouribga¹ is in the El Borouj region of Morocco, on the Oulad Abdoun plateau some 120 km south-east of Casablanca. High grade rock phosphate first emerged there in 1921, when 8,232 tons were mined. By 1924 that figure had risen to

¹ Archives Nationales d’Outre Mer, Aix-en-Provence, France, (ANOM), BIB AOM 20464, France-Eurafrique 142, May-June 1963, p. 22.

430,000 tons.² From then on production rose rapidly, and after World War Two and independence from France in 1956, Morocco became the world's leading exporter of rock phosphate, as well as the country that controlled the largest global reserves, including those at Bu-Craa in Western Sahara, and, as Lino Camprubí has recently shown, a dominant player in world phosphate geopolitics.³

The extraction of rock phosphate from the ground and its transformation into crop fertilizer is a critical, if relatively unknown, component of contemporary global agriculture and food production. Along with nitrogen and potassium nutrients, its use in the twentieth century expanded rapidly, as Moroccan production attests. Phosphate-based fertilizer became a pivotal agent of agrochemical systems during the “Green Revolution” and continues in that role today. Phosphate, in a nutshell, has helped foster radically increased crop yields and the feeding of a large and growing human population – not for nothing does the Moroccan state phosphate company (OCP), prominently feature adjacent, ticking world population and arable land counters on its website.⁴ But compared to paradigmatic extraction systems such as the oil industry, phosphate, for all its potential as a symbol of environmental catastrophe – impossible to manufacture artificially, vital to world food production, scheduled to be decisively depleted in the coming half century according to some estimates – has traditionally received relatively little scholarly attention and less public attention. That has changed somewhat in the last decade, in part thanks to high prices for rock phosphate in the commodities markets and a growing awareness of its importance to world food security.

Social scientific analysis since 2008 has focused in the main on the debate, initiated by Dana Cordell among others, about “peak phosphorous” and the potential ramifications for farming and planetary human demography of a decline in phosphate production.⁵ Couched in an inter-disciplinary mode towards policy solutions, this view warns of the exhaustion of phosphorous resources. It has portrayed global fertilizer-driven agriculture, despite its

² R. Goepfert, *Les Phosphates Algériens et l'Agriculture Française. L'Exploitation du Gisement du Djebel Onk* (PhD. Diss.), Paris 1925, p. 40.

³ L. Camprubí, *Resource Geopolitics. Cold War Technologies, Global Fertilizers, and the Fate of Western Sahara*, in: *Technology and Culture* 56, 2015, p. 677.

⁴ <http://www.ocpgroup.ma/> (1/11/2015).

⁵ K. Ashley/D. Cordell/D. Mavinic, *A Brief History of Phosphorus: From the Philosopher's Stone to Nutrient Recovery and Reuse*, in: *Chemosphere* 84, no. 6, 2011, pp. 737-46.

enormous technological and social momentum, as a system whose days are numbered – unless a fix is found through re-cycling and technical advances.⁶

For their part, historians of agrochemical commodity circuits and the life-worlds that form and dissolve around them have tended to embrace increasingly oceanic and global spatial frameworks. They have done this partly to identify and better trace the sprawling violence of the social relations underpinning production. For instance, Edward D. Melillo, in his work on the trans-Pacific making of the global nitrogen fertilizer trade, has described the horrific working conditions that prompted many Chinese workers to kill themselves on the Chincha guano islands off Peru in the late nineteenth century.⁷ And, in a mode reminiscent of the wider preoccupation with the anthropocentric rupture in environmental historiography, historians have also embraced larger scales so as to underline the irreversible changes wrought by industrial agriculture and a globalized plant nutrition circuit.⁸ Vandana Shiva, Frank Uekötter and others have therefore emphasized the way that the fertilizer-seed packages of the mid-twentieth century “Green Revolution” and its precursors pushed many farmers across the world into dependency and despair.⁹

6 P. Déry/B. Anderson, Peak Phosphorus, in: *Energy Bulletin*, 2007; criticisms include R.H.E.M. Koppelaar/H.P. Weikard, Assessing Phosphate Rock Depletion and Phosphorus Recycling Options, in: *Global Environmental Change* 23, 2013, pp. 1454-1466; R.W. Scholz/F.-W. Wellmer, Approaching a Dynamic View on the Availability of Mineral Resources. What We May Learn from the Case of Phosphorus?, in: *Global Environmental Change* 23, 2013, pp. 11-27; D. Cordell/J.-O. Drangert/S. White, The Story of Phosphorus. Global Food Security and Food for Thought, in: *Global Environmental Change* 19, 2009, pp. 292-305. I am indebted to Frank Uekötter for pointing me to these sources. See also M. Dixon, Phosphate, Fertilizers, and French North Africa: 1830s Through the Interwar Period, Unpublished paper presented at the conference “Global Commodity Flows”, Institute for Historical Studies, University of Texas, April 17th, 2015.

7 E.D. Melillo, The First Green Revolution. Debt Peonage and the Making of the Nitrogen Fertilizer Trade, 1840-1930, in: *American Historical Review* 117, 2012, pp. 1028-1060. See generally R. Miller/R. Greenhill, The Fertilizer Commodity Chains. Guano and Nitrate, 1840-1930, in: S. Topik/C. Marichal/Z. Frank (Eds.), *From Silver to Cocaine. Latin American Commodity Chains and the Building of the World Economy, 1500-2000*, Durham 2006, pp. 228-270.

8 On the anthropocene see representatively C. Otter et al., Forum. Technology, Ecology, and Human Health Since 1850, in: *Environmental History* 20, 2015, pp. 710-804; W.J. Belasco/R. Horowitz, *Food Chains. From Farmyard to Shopping Cart*, Philadelphia 2009.

9 V. Shiva, *The Violence of the Green Revolution. Third World Agriculture, Ecology and Politics*, Penang 1991; F. Uekötter, *Die Wahrheit ist auf dem Feld. Eine Wissensgeschichte der deutschen Landwirtschaft*, Göttingen 2010. For a critique of analysis of farmer suicide in India see D. Münster, Farmers' Suicides and the State in India. Conceptual and ethnographic notes from Wayanad, Kerala, in: *Contributions to Indian Sociology* 46, 2012, pp. 181-208.

Such approaches have much to offer. But often lost in them are the lives of specific extractive sites, and especially their regional situation in connective networks of similar extractive activity, networks I describe in this article as “archipelagos”. The occlusion of these specific histories – and their underpinning “archipelagic” regional geographies – is an empirical problem, neglecting actors and everyday power dynamics critical to extractive processes, or else privileging particular iconic sites in isolation. Spatially it also marginalizes intermediate economic spaces in favour of a presupposed global unit. Analytically, finally, neglect of specific sites and their archipelagic relationships reinforces nature-culture dualisms in which the non-human is cantonized simply as a more-or-less plentiful resource that is discovered, extracted, transported, refined, marketed, applied and perhaps recycled.¹⁰ In fact phosphate itself, far from existing merely as a “natural resource”, strongly influenced the mix of local specificity and archipelagic similarity that developed between the varied phosphate “islands” I describe.

In this article, I place phosphates themselves at the centre of the analysis, and trace the phosphate archipelago across the borders of colonial territories and later national states, though with a primary focus on the colonial 1920s. The metaphor of the archipelago helps this tracing process in several ways, for instance showing how phosphate flowed from the various mining nodes towards a network of ports and out to an imperial and global distribution and consumption chain, as input-intensive industrial agriculture increasingly dominated food production in the era of late colonial rule and decolonization. But, drawing mainly on French colonial legal sources, I also suggest that the local political-economic life of phosphate, whether in Gafsa in Tunisia or on the Oulad Abdoun plateau in Morocco, emerged in close connection to other trans-Maghreb and trans-imperial sites of the phosphate archipelago, as jurisprudential models flowed back and forth, often via the central legitimizing legal and political institutions in Paris.

2 Archipelagos

The spatial and analytical concept of the archipelago is a venerable one in the social scientific and historical literature across diverse subfields, and my usage here is inspired by developments of the idea by scholars as diverse as J.G.A.

¹⁰ *Camprubí*, *Resource Geopolitics*, p. 677.

Pocock, Vanessa Ogle and Tom Boellstorff.¹¹ Rooted in the geographical notion of a set of physical islands more or less related by proximity or shared geological characteristics, the concept has served to navigate across existing analytical boundaries, often national, in historical and social scientific literatures. By allowing for the identification of shared characteristics or mutually constitutive dynamic inter-connections between non-contiguous spaces, the metaphor of the archipelago helps us develop historical interpretations that are not reliant on the presupposition of sharp external boundaries – whether between nations, empires, or at the edge of mining towns – and yet are still able to recognize and describe “islands of difference”.¹²

In the case of phosphates, an archipelagic approach allows us to trace inter-connections and similarities between specific sites of extraction and consumption, which helped detach such sites from their immediate surroundings to a degree, while also recognizing the durable embedding of each individual site in proximate social and political contexts, for example in terms of labour politics or geology. In addition, by identifying a “phosphate archipelago” we can trace a network of relationships that links not just sites within North Africa but that also connects the Pacific phosphate islands with those of North Africa.¹³ Such a view places into transversal dialogue regional systems usually treated by historians within separate vertical systems of imperial exploitation. From the point of view of commodity chain analysis, moreover, an archipelagic framework insists on the salience of sub-oceanic and sub-imperial systems of extraction, even as such systems contributed to the elaboration of larger entities, including “global” commodity chains.¹⁴

Let us examine these possibilities in greater detail. First, laying an archipelagic cartography of interconnected insularity onto the superficially contiguous climatic, imperial and national spaces of twentieth century North Africa re-problematizes and integrates the history of phosphate mining in North Africa

11 J.G.A. Pocock, *British History. A Plea for a New Subject*, in: *The Journal of Modern History* 47, 1975, pp. 601-21. Pocock argues for an understanding of British history in terms of an Atlantic archipelago rather than the British Isles alone. See also Vanessa Ogle’s groundbreaking current research project on tax havens and de-territorialized offshore political economy in the twentieth century, which identifies the inter-relationship between varied sites of off-shore fiscal politics in both continental and insular tax jurisdictions: *Archipelago Capitalism: Tax Havens, Eurodollars, and the Other International Political Economy, 1870s-1980s*.

12 T. Boellstorff, *The Gay Archipelago. Sexuality and Nation in Indonesia*, Princeton 2005, p. 7.

13 Thanks to Mat Paskins for helping me on this point.

14 G.T. Cushman, *Guano and the Opening of the Pacific World. A Global Ecological History*, New York 2013, p. 19; S.C. Topik/A. Wells, *Commodity Chains in a Global Economy*, in: E.S. Rosenberg et al. (Eds.), *A World Connecting. 1870-1945* Cambridge MA 2012, pp. 685-815.

with the paradigmatic case of the Pacific. Gafsa and Khouribga are brought into dialogue with much-studied island sites such as Nauru or Banaba. This is important because the spectacularly devastated ecologies of the Pacific's island mines, the notorious labour regimes and displacements inflicted on their indig-indigenous peoples, and their coeval relationship with trans-Pacific settler agriculture and colonial-era international law have made of them, thus far, the pre-dominant site of analysis for historicization of phosphate mining.¹⁵ But this pre-eminence has also detached the Pacific phosphate islands from wider connections, even in studies as epistemologically and methodologically innovative as Katerina Martina Teaiwa's recent work on Banaba/Ocean Island. Teaiwa simply notes, for instance, the simultaneous re-institutionalization of post-war imperial mining in North Africa and the Pacific in 1920:

"the governments of Australia, New Zealand, and the United Kingdom bought out the Pacific Phosphate Company and created the British Phosphate Commissioners (BPC), tasked with mining Nauru and Ocean Island in the Pacific and, later, Christmas Island in the Indian Ocean. Across the seas, the Cherifian Phosphates Board [...] today the world's major phosphate supplier, was established in Morocco in the same year."¹⁶

The network of insular cultures and extractive economies associated with Pacific phosphate mining therefore offers a new way to think about North African phosphates as an archipelago. And this in its turn helps us dialogically rethink the much heralded possibilities of the Pacific Ocean as a unit of historical and economic geography.¹⁷ Such a trans-global nexus has precedents: as Joel Barnes has lately pointed out, J.G.A. Pocock's own concept of Britain within an "Atlantic archipelago" was dialogical, drawing explicitly on Australasian insular networks to theorize "a network of relationships in which each part was envisaged as another self of all the others", and placing the Pacific world into a clear dialogue with comparable dynamics at work elsewhere.¹⁸ Khouribga and Nauru are, in this sense, not so far apart.

¹⁵ M. Williams/B. Macdonald, *The Phosphateers. A History of the British Phosphate Commissioners and the Christmas Island Phosphate Commission*, Melbourne 1985; K.M. Teaiwa, *Consuming Ocean Island. Stories of People and Phosphate from Banaba*, Bloomington 2014; A. Anghie, *Imperialism, Sovereignty and the Making of International Law*, Cambridge 2007, p. 2; C.N. McDaniel/J.M. Gowdy, *Paradise for Sale. A Parable of Nature*, Berkeley 2000.

¹⁶ Teaiwa, *Consuming Ocean Island*, p. 1.

¹⁷ D. Armitage/A. Bashford (Eds.), *Pacific Histories. Ocean, Land, People*, Houndmills, Basingstoke, Hampshire, New York 2014; S. Perera, *Australia and the Insular Imagination. Beaches, Borders, Boats, and Bodies*, New York 2009.

¹⁸ J. Barnes, *The View from the Margins: John Pocock and the Antipodean Origins of Four Nations History*, in: *Four Nations History Network*, <https://fournationshistory.wordpress.com/>

I turn now to the question of blurred frontiers and insular difference in an archipelagic analysis. The concept of a phosphate archipelago emphasizes spaces of extraction and production that were both locally embedded in socially and politically influential hinterlands, and yet increasingly resembled one another through the intensive exchange of knowledge, labour and technological practices. This allows us to think about phosphate extraction not simply as an aspect of imperial ecology, and then a key force in the spatial production of post-imperial nation-states like Morocco, but as a sustained networked regional system. This system connected simultaneously “upward” into imperial and global scales of industrial agriculture, and “downward” into national and local social and productive systems. In other words an archipelagic geography draws to our attention the role of specific dynamics of exchange and similarities of practice in building up shared characteristics across a regional scale of economic life that intermediates between more familiar national, imperial or global units.

In North Africa, where post-independence borders rapidly became critical sites of national state building, inter-state dispute and political-economic arbitrage, the alternative spatialization and the questioning of naturalized imperial – and then national – economic spaces is useful.¹⁹ In this way the phosphate archipelago productively reframes the spatial geography of colonial North Africa, in a vein recently suggested by Judith Scheele and James McDougall. Influenced by the theorization of maritime space, they have presented the Sahara as a region defined by its logics of sustained communication, which means, in keeping with an archipelagic view, that “regions can sometimes include places situated at considerable distances from one another while excluding neighbouring areas”.²⁰ In the case of the phosphate archipelago, which connects to a global agro-chemical commodity chain, the importance of following actors across political boundaries is still more relevant. As Mimi Sheller has lately shown, for example, in the case of transnational networks of aluminium production and consumption, “internal cultural contestations and rhetorical frames” are inadequate to understanding the relation of a commodity to a given imperial polity (in that case the United States). Instead we need to look at “wider cultures of technological regimes, embeddedness in institutions [...] global struggles for economic and military predominance, and competition

2015/09/28/the-view-from-the-margins-john-pocock-and-the-antipodean-origins-of-four-nations-history/; 5/10/2015.

19 See for example *J. McDougall, History and the Culture of Nationalism in Algeria*, Cambridge 2006.

20 *J. McDougall/J. Scheele (Eds.), Saharan Frontiers. Space and Mobility in Northwest Africa*, Bloomington IN 2012, p. 13.

with other transnational actors and industries for resources, energy and labour.”²¹

Finally, the concept of the phosphate archipelago, with its emphasis on the mutual influences between sites where phosphate rock was mined in North Africa, forces a focus on the social-natural production of agrochemical – and specifically phosphate – circuits. We might think of this as part of what Theodore R. Schatzki calls a ‘practice-arrangement nexus’: in this case the nexus of interlaced mining practices and geological arrangements that characterized them.²² The result is to render rock phosphate somewhat less of an external resource – as the narrative of peak phosphorous would have it, one discovered in more or less well-known circumstances of colonial exploitation and agro-chemical epochal rupture, exploited, and then exhausted or (perhaps) husbanded. Without denying the importance of phosphate’s role in the shift to “input-intensive farming practices based on one-way patterns of production, consumption and waste”, an archipelagic view of interconnected *Phosphatvilles* helps us to position phosphates as a contingent co-actor in the production of extractive spaces and agro-chemical systems.²³ The phosphate archipelago concept thereby reduces the analytical subordination of a dispersed chain of comparably operating local spaces of extraction to a powerfully moralized historiographical narrative focused on the unsustainable industrial exploitation of inert “natural” resources.²⁴

3 Gafsa: Heart of the Archipelago

In 1900, as scholars of settler colonial agriculture and Pacific history have noted, rock phosphate extraction, for example on the Great Barrier Reef, was already proliferating as guano resources fell away: twelve coral mines opened off the Queensland coast that year, to console the increasingly acidic soils in the

²¹ M. Sheller, *Aluminum Dreams. The Making of Light Modernity*, Cambridge MA 2014, p. 8.

²² T.R. Schatzki, *Nature and Technology in History*, in: *History and Theory* 42, 2003, pp. 82-93.

²³ Cushman, *Guano and the Opening of the Pacific World*, p. 52; see for a Marxist approach to this change B. Clark/J.B. Foster, *Ecological Imperialism and the Global Metabolic Rift Unequal Exchange and the Guano/Nitrates Trade*, in: *International Journal of Comparative Sociology* 50, 2009, pp. 311-34; F.M.L. Thompson, *The Second Agricultural Revolution, 1815-1880*, in: *The Economic History Review, New Series*, 21, 1968, pp. 62-77.

²⁴ Sheller, *Aluminum Dreams. The Making of Light Modernity*; for such a narrative see M. Levene, *Climate Blues. Or How Awareness of the Human End Might Re-Instil Ethical Purpose to the Writing of History*, in: *Environmental Humanities* 2, 2013, pp. 153-73.

onshore hinterland.²⁵ The farmers of that Australian state, and their dealers in the fertilizer industry, trailed behind their counterparts in another settler-influenced imperial formation however: French North Africa. By 1900 the mining basin of Gafsa in central Tunisia was already an established phosphate production centre and, as the oldest node of the North African phosphate archipelago, it would play a paradigmatic role in the massive regional expansion of phosphate rock production over the following decades.²⁶

The Gafsa mines' operation rapidly produced fatal effects as demand swelled, and it is worth examining this fact in empirical detail, both to underline the local and intimate forms of violence the mines fostered against mine workers in particular, and the forms of partiality governing the colonial archive in this respect.²⁷ On October 30th 1900, at the Gafsa mine of Metlaoui, operated by the *Compagnie des Phosphates et du Chemin de Fer de Sfax-Gafsa* (CPG), the dominant Tunisian phosphate company, the pillars holding up the roof of the mine galleries collapsed, causing large blocks of limestone rock to fall through several levels of the mine along a distance of more than 200 metres. Outside the mine a deep rumble was heard around 12:10 pm, and a white cloud gouted from all the gallery entrances, followed over the next ten minutes by the noise of further collapses. Though a few were pulled living from the mine, the disaster killed 32 men, all "Arabs or Sicilians", whose names, symptomatically, figure only briefly in the colonial state's account.²⁸ Some 27 of the dead were buried underground, under tons of limestone and phosphate ore, and a further 34 were injured.²⁹

25 B. Daley/P. Griggs, Mining the Reefs and Cays. Coral, Guano and Rock Phosphate Extraction in the Great Barrier Reef, Australia, 1844-1940, in: *Environment and History* 12, 2006, pp. 395-433. Frank Uekötter drew my attention to this article. See also on guano's limited impact on British farming *Cushman*, Guano and the Opening of the Pacific World, p. 51

26 On Protectorate Tunisia's political structure and the Beylical state see M.D Lewis, *Divided Rule. Sovereignty and Empire in French Tunisia, 1881-1938*, Berkeley 2013.

27 For an introduction to the CPG see N. Dougui, *Histoire d'une grande entreprise coloniale. La Compagnie des phosphates et du chemin de fer de Gafsa, 1897-1930*, Tunis 1995.

28 On this general topic see A.L. Stoler, *Along the Archival Grain. Epistemic Anxieties and Colonial Common Sense*, Princeton 2009. By the 1920s Italian workers in the Tunisian phosphate mines were often there as part of a French-Italian deal that exchanged labour for phosphate supplies. See the *Unione* newspaper of Tunis, July 5th 1923, The Truth about Tripolitan Phosphates, which reported that since almost none of the mineral had been found in Italian Libya, there was a deal in place to export Tunisian phosphate to Italy in exchange for Italian labour sent to the Tunisian mines.

29 Diplomatic Archives Nantes, France, (CADN), 1TU/1/V/Carbon 1278: Concession des Phosphates de Gafsa, 1896-1919, Mine de Metlaoui, Catastrophe du 30 Octobre 1900, Rapport de l'Ingenieur des Mines.

The Director-General of the CPG, a French engineer named Prost, rushed to the site by train, to assist in the search and rescue operation. But after a couple of days, he committed suicide as described in a lengthy judicial account in the colonial archive that contrasts illustratively with the very brief discussion of the miners killed in the collapse:

“He left Metlaoui on the 8 November, on the morning train headed for Sfax where he was supposed to embark for France. Arriving at the station at Meknassi, half way to Sfax, around nine in the morning, Mr Prost got off the train during the halt at the station, wrote a few words on a sheet of paper, took a few steps down the platform, and suddenly, such that no-one could anticipate his intention, threw himself beneath the wheels of a train manoeuvring in the station; he was killed instantly.”³⁰

Prost’s suicide became the lens through which the colonial authorities investigated the case, seeking to protect his and his family’s reputation and forestall legal challenges by vindicating the technical management of the mine. The prosecutor’s office, in its presentation of the facts of the Metlaoui collapse to the Minister of Justice, emphasized the rigour with which the Company followed the safety protocols prescribed by the Tunisian Public Works Administration. Interrogated by the investigating magistrate, the consensus of the witnesses, including master miners, stabilized around the idea that the collapse of the mine’s galleries had likely been provoked by a ‘slippage of phosphates’. The mining method employed, of ‘abandoned pillars’ – leaving supporting pillars behind to hold up the roof of the gallery as miners moved back out of exhausted galleries – was one of three standard procedures and had been approved by the Administration of Public Works in Tunisia. As official correspondence showed, it had been chosen in part because of the massive rock formations that characterized the geology at Metlaoui, as opposed to the lighter, crumbling phosphate rock type found at Tbessa just across the border in Algeria. At Tbessa the rock allowed for mining by “controlled collapse”, as pillars were removed by miners as they moved backwards down exhausted mine galleries, in a technique called “éboulement”. The phosphate ore and its geological arrangement therefore played a key, active role at Metlaoui. But “abandoned pillars” was also chosen as the mining technique at Metlaoui because of the engineers’ perception that miners in Tunisia were too inexperienced to work with a third possible method – known as “remblayage” –

30 CADN, 1TU/1/V/Carton 1278: Concession des Phosphates de Gafsa, 1896-1919, Parquet de la Cour d’Assises et du Tribunal de Sousse to Minister of Justice, Paris, January 7th 1901. All translations are the author’s own unless noted.

in which waste rubble was used to support the gallery roof as miners retreated from worked-out phosphate ore veins towards the surface.³¹ Despite this official vindication, Prost wrote in his suicide note, addressed to his subordinate Bur-Bursaux, about the extension of the mine: “I declare that I acted senselessly and that neither you nor anyone else should be held responsible for the catastrophe caused by the method of exploitation followed. In extending (the mine) as it was after a limited and insufficient test, I committed the most monstrous act of madness ever made”.³²

Working methods such as the use of the “abandoned pillar” and “controlled collapse” techniques circulated not just across the border between the Tunisian Protectorate and the phosphate-rich adjacent south-eastern corner of the Algerian department of Constantine (administratively part of metropolitan France). Discussions of working methods also encompassed the French metropole, such as the chalk mines of the Paris basin, and even iron mining in the United States. But in this network Gafsa, not least through its working methods, its control of its own rail line to the sea, and its political influence in Tunis and Paris, would become the paradigm for the phosphate archipelago across French North Africa, as rock phosphate production rapidly expanded in the first decades of the twentieth century. By 1913 Gafsa produced 1,355,103 tons a year and Tunisia as a whole some 2,071,772 tons, while French North Africa’s total was around 2,635,463 tons – second only as a world producer to the USA’s Florida and Tennessee mines, which produced 3,117,970 tons, substantially oriented to the domestic US market where North African phosphate went mainly to export.³³ World consumption of rock phosphate on the eve of World War One was some 6,740,266 tons: the war, however, would durably re-institutionalize and powerfully extend the phosphate archipelago, in ways we now address.³⁴

31 CADN, 1TU/1/V/Carton 1278: Concession des Phosphates de Gafsa, 1896-1919, Tunisian Public Works Directorate to Investigating Magistrate, November 24th 1900.

32 CADN, 1TU/1/V/Carton 1278: Concession des Phosphates de Gafsa, 1896-1919, Prost suicide note copied by Procureur de la Republique, Sousse, March 22nd 1902.

33 CADN, 1TU/1/V/Carton 1278: Concession des Phosphates de Gafsa, 1896-1919, Report of Chief Engineer of Mining Service on phosphate exploitation 1917, July 31st 1918. Aggregate N. Africa figures, world consumption figure and USA tonnage are from *Goepfert*, *Les Phosphates Algériens*, p. 36.

34 Note the considerable discrepancy with *Cordell et al.*’s figures in *The Story of Phosphorus*.

4 The Ties that Bind: Archipelagic Regional Connectivity

The sites of the phosphate archipelago in North Africa were related to one another through a connectivity that took various specific forms. Through these connections the spaces of the phosphate archipelago came to resemble one another, as islands of shared practice, sociability and politics, and thus to detach themselves to a degree, but never entirely, from their surrounding regions. Of these forms of connectivity, the most fully discussed here will be the knowledge of legal experts, such as French lawyers specialized in mining and quarrying, whose views on North African phosphates furnish much of the evidence I rely on below. Their jurisprudence was not the only type in play, however. North African Islamic jurists, who pronounced on the granting of mining concessions in commonly held *habous* land in Tunisia, for example, also played important roles. But numerous other forms of connectivity also helped bind the archipelago. One was the heavily regulated but very considerable labour mobility of French engineers and of North African and Mediterranean miners, for instance drawing miners from the Moroccan Atlas mountains and from Algeria to Gafsa in the early years of the mine's operation around 1900.³⁵ Another was political-economic cartelization across sites, despite the varied role of the state in individual mining concessions and practices. Massively stimulated by World War One and by the initiation of new mines in Morocco, the North African phosphate archipelago gained renewed institutional form in a series of formal cartel arrangements in the interwar period, including the *Comptoir de Phosphates de l'Afrique du Nord*.³⁶ These arrangements, although constantly disputed by the cartel members and dominated by Tunisian and Algerian firms, traversed the colonial frontiers of Tunisia, Algeria and Morocco, and became a major force in the French imperial agricultural and export economy. They also played a growing role in the world agricultural system, including in the Pacific, as its products even reached Japan and New Zealand in

³⁵ On Saharan migration see B. Rossi, *Kinetocracy. The Government of Mobility at the Desert's Edge*, in: D. Vigneswaran/J. Quirk (Eds.), *Mobility Makes States. Migration and Power in Africa*, Philadelphia 2015, pp. 223-256.

³⁶ *Camprubí*, *Resource Geopolitics*, pp. 687-688; D.A. Messenger, *Rival Faces of France. Refugees, Would-Be Allies, and Economie Warfare in Spain, 1942-1944*, in: *The International History Review* 27, 2005, p. 39.

the 1920s.³⁷ Finally the major North African mines also exchanged practices of spatial production, such as patterns of housing for workers, and of labour management, such as the anthropometric registration of workers through fingerprinting.

This continuing relationship to proximate hinterlands, and the deep importance of intra-regional connections in the Maghreb, even as global networks deeply penetrated the region, supports an archipelagic focus that can attend to North African spaces, as well as to the journey phosphates from mines there made outward across the globe. As E. Ann McDougall has argued, in a critique of analysis in which the global occludes rather than complements the regional, Saharan “transregional trade, with either Europe or Mediterranean North Africa, always had to tie back into regional patterns and connections in order to be sustainable. And these regions, while certainly responsive to outside influences, were Saharan in structure”.³⁸ Equally, like the racialized spatial politics US oil firms transposed from Texas and Venezuela to the oil towns of Saudi Arabia, the North African phosphate centres were certainly “company towns” of a sort, in which mining companies set out to create similar environments and systems.³⁹ But we should be cautious with this label: the phosphate islands of North Africa were also connected by far more than shared or similar corporate orders. The *Phosphatvilles* were crucibles of colonial and anti-colonial union activity, sites for experimentation and production of scientific knowledge about mining and miners, and strategic locations in rising nationalist campaigns. Though they resembled one another and were connected, as we have seen, by multiple forms of archipelagic connectivity, they also dramatically shaped the political economies of the Tunisian, Algerian, and Moroccan national state formations, and of the French imperial system at large before independence.⁴⁰ And of course they fed the increasingly intense superphosphate-based fertilizer demand of a large part of global agriculture.

37 Despite the high transport costs usually cited by scholars to confine their analysis to Pacific-produced phosphates consumed in those countries. See *D.L. Oliver*, *The Pacific Islands*, Cambridge 1951, p. 216 cited in *Teaiwa*, *Consuming Ocean Island*, p. 19.

38 *E.A. McDougall*, *On Being Saharan*, in: *McDougall/Scheele (Eds.)*, *Saharan Frontiers*, p. 47.

39 *R. Vitalis*, *America's Kingdom. Mythmaking on the Saudi Oil Frontier*, Stanford CA 2006.

40 See *R. Medina-Doménech*, *Scientific Technologies of National Identity as Colonial Legacies Extracting the Spanish Nation from Equatorial Guinea*, in: *Social Studies of Science* 39, 2009, pp. 81-112; cited in *Camprubí*, *Resource Geopolitics*, p. 697.

5 From War Materiel to Raw Material: Phosphatvilles and World War One

Crucial to the expansion and legal-political consolidation of the archipelago was World War One. The war re-compartmentalized the relatively liberally imbricated pre-1914 European continental economy, separating the French and German economies especially, and creating far stronger national economic spaces, influenced by the legacy of planned wartime production.⁴¹ Colonial officials and lobbies in all the European empires sought to leverage hostilities and the salience of colonial troops and resources to the war effort, to make the case for renewed colonial investment and for greater imperial self-sufficiency, at least in case of the advent of another conflict, which many deemed imminent.⁴² Thus the British, for example, tried to make Mandate Palestine into a beacon of industrial development that would lead the British Middle East forward regionally as an imperial resource, by enhancing its port facilities and transport networks, and by establishing major potash mines on the Dead Sea that would be available to the imperial war effort in case of renewed hostilities.⁴³ In the Pacific, as several historians have noted, phosphate islands such as Nauru were consolidated in Japanese, British, Australian and New Zealander hands, and through the British Phosphate Commission in 1919, which was established to exploit Nauru especially, settler crops in the otherwise ill-suited soils of Australia benefited particularly.⁴⁴

41 É. Schnakenbourg, *La fin d'une illusion ? Le droit de la neutralité maritime à l'épreuve de la Première Guerre mondiale*, in: *Relations internationales* 160, 2014, pp. 3-18; C. Didry/P. Wagner, *La nation comme cadre de l'action économique. La première guerre mondiale et l'émergence d'une économie nationale en France et en Allemagne*, in: B. Zimmermann/C. Didry/P. Wagner (Eds.), *Le Travail et la nation, Histoire Croisée de la France et de l'Allemagne*, Paris 1999; J.A. Tooze, *Imagining National Economies. National and inter-national economic statistics, 1900-1950*, in: G. Cubitt (Ed.), *Imagining Nations*, Manchester 1998, pp. 90-125.

42 S. Jackson, *What is Syria Worth? The Huvelin Mission, Economic Expertise and the French Project in the Eastern Mediterranean, 1918-1922*, in: *Monde(s)* 2, 2013, pp. 83-103.

43 J. Norris, *Land of Progress: Palestine in the Age of Colonial Development, 1905-1948*, Oxford 2013.

44 Usefully in this context S. Pedersen, *Samoa on the World Stage. Petitions and Peoples before the Mandates Commission of the League of Nations*, in: *Journal of Imperial and Commonwealth History* 40, 2012, pp. 231-61. On phosphates *Teaiwa*, *Consuming Ocean Island; Williams/Macdonald*, *The Phosphateers*. See also *Cushman*, *Guano and the Opening of the Pacific World*, pp. 128-131.

For the French imperial state, anxious to secure continental security against Germany and concerned about their unreliable British and American former allies and current creditors, colonial resources proved appealing. The weakness of the franc and the failure to secure German reparations payments only made dollar and sterling denominated purchases of agricultural produce harder to stomach, against a backdrop of post-war trauma and civilizational angst.⁴⁵ In his 1925 doctoral thesis on Algerian phosphates, which was one of several on the topic defended at the University of Paris Law Faculty in the years after 1918, René Goeppfert built his case for expanded production of North African phosphate within precisely this conjuncture, invoking the spectre of Bolshevik demands for “bread and peace”:

“Though powerfully rich in fertilizer, France does not produce enough wheat. She is forced to rely on special regulation and laws. She is a vassal of foreign countries. Through the influence of our poor exchange rate and the exploitation of foreigners, so cruel after our sacrifices, the wheat we import is ever more expensive, hauling upwards with it the price of both flour and bread. The price of bread is a symbol. It powerfully influences the vacillating and varied spirit of the masses. Exploited by unscrupulous ringleaders the rapid series of price rises could lead to more or less violent crisis.”⁴⁶

Goeppfert justified a pivot towards imperial autarky by reference to the perceived internationalization of the grain market since the war. He quoted the International Agricultural Institute in Rome as saying that, as opposed to the billion quintals of grain produced a year pre-1914, only 730 million had been produced in 1924. Citing the “inexorable” force of the law of “supply and demand” he argued that “France, in the interests of financial stability, has to become independent of the international market and become self-reliant. She can do it through her own production and with the contribution of her possessions in North Africa”.⁴⁷ His argument, and others like it, would help to juridically and politically carve out the phosphate archipelago, and would reinforce forms of archipelagic connectivity that increasingly linked its constituent islands.

Appraising French post-armistice agriculture, Goeppfert acknowledged the transformative force of factors such as the war dead, the appeal of urban life to peasants who had first encountered it during the war, the fragmentation of French farmland and other issues. But he argued that the main factor holding

⁴⁵ B. Cabanes, *La victoire endeuillée. La sortie de guerre des soldats français (1918-1920)*, Paris 2014; M.L. Roberts, *Civilization without Sexes. Reconstructing Gender in Postwar France, 1917-1927*, Chicago 1994.

⁴⁶ Goeppfert, *Les Phosphates*, p. 9.

⁴⁷ *Ibid.* pp. 14-15.

back French agriculture was technical method: fertilizer. “As one member of parliament noted recently ‘the treasure that fertilizes the field is less the sweat of the human brow than the sack of ammonia sulphate’ and we should add, of lime phosphate”. Goepfert lamented the high price of fertilizer, and France’s relative lack of fertilizer application (85 kg of phosphate fertilizer applied per hectare compared to Belgium’s 400 kg). He also worried about the difficulty farmers had in quantifying just how much extra crop production fertilizer would yield: “He knows that in doubling the quantity of fertilizer he doubles his expenditure, however he also knows he won’t double his production. But he knows he will increase it, and the day fertilizer will be cheap he won’t hesitate to use a lot and thus the product of the French soil will be considerably increased”.⁴⁸

As Frank Uekötter has shown, by the mid-1920s enthusiastic single-nutrient mass fertilization campaigns had frequently led to little increased crop production. Such fiascos had prompted major agro-chemical firms, like IG Farben, to develop comprehensive nitrogen, phosphorous and potassium fertilizers, like Nitrophoska in 1927.⁴⁹ In the absence of firm knowledge about precisely how crops absorbed nutrients, the strategy became to blanket them in all the main nutrient chemicals. Particularly at stake here, along the phosphate commodity chain from the sites of the phosphate archipelago in North Africa to crops around the world, was the question of how fertilizer increased agricultural production and to what extent. In this uncertain context, mining companies, industrial actors and their agents in politics and academia struggled to capitalize on the political situation to expand production and maintain the increased capacity of wartime plant created between 1914 and 1918.⁵⁰

In the absence of solid numbers, Goepfert resolved this dilemma through an economic rhetoric, pivoting around the concept of relative cost. Building on a clinching geopolitical argument about Germany’s superior pre-war phosphate and fertilizer-based production of potatoes (160 quintals produced per hectare to the French 90), he argued that: “Our country, to be self sufficient – and we’ve seen how essential that is – must considerably augment its consumption of fertilizer. But that won’t be possible until it is very cheap indeed”.⁵¹

⁴⁸ *Ibid.* pp. 18-19.

⁴⁹ Uekötter, Wahrheit, pp. 183-275; see for a single company study *E. Homburg/A. van Rooij*, Groeien door kunstmest: DSM Agro, 1929-2004, Hilversum 2004.

⁵⁰ For a survey of the recent literature see *H.L. De Winter*, Down to Earth. Historians and the Historiography of Soil Knowledge (1975-2011), *Историко-биологические исследования* 4, 2012, pp. 73-91.

⁵¹ Goepfert, Les Phosphates, p. 20.

Noting that his argument was focused not on the franc price of the product, but on its cost relative to – and as a fraction of – that of agricultural products such as wheat, Goepfert observed that with the return of Alsace-Lorraine after 1918, France had recovered a key source of potash salts, and that though some Chilean nitrates were still imported, North African phosphates completed the “NPK” trio of core fertilizing nutrients. Indeed the product of the North African archipelago would allow France not just to approach self-sufficiency, but, in an exception to autarkic strategy, to “claim first place in the world phosphate market”.

Here Goepfert, against the backdrop of the colonial minister and former governor of Indochina Albert Sarraut’s wide-ranging political efforts at colonial *mise en valeur* in the 1920s, embraced a wider register that discursively sealed off the extraction and mining sites of the archipelago from any more comprehensive or industrial colonial developmental strategy.⁵² He asserted that since the lack of coal, water and electricity meant that Algeria “will never become an industrial country [...] it will have to limit itself to exploiting its mines and become the supplier of raw material to industrial countries”.⁵³ In contributing to the reinforcement of archipelagic connections between the phosphate islands of French North Africa here, and arguing for their development as phosphate extraction sites, Goepfert also detached and differentiated them from their immediate regional and imperial hinterlands. Despite the lived reality of, for example, Gafsa’s embedment in the social and political dynamics of its region, Goepfert’s argument exacerbated the insularity and specificity of the archipelago, seeking to deny the possibility of their integration into wider regional and even national spaces. Crucially it did so by insisting on natural resources as both crucial limiting factors and as a key form of imperial sovereignty, through which metropolitan hegemony was assured.

Goepfert was scarcely alone in this point of view and we should emphasize the degree to which it was shared by the French colonial lobbies in the aftermath of the war, when the difficulties of industrial mobilization in 1915 were made the basis for arguments about the need for a deeper exploitation of colonial territories in terms of raw materials. Edmond du Vivier de Streel, a well-connected colonial business publicist and lobbyist who would later become the President of the Moroccan Mining Commission in the 1930s, made a comparable argument in a series of wartime pamphlets of 1916 and 1917. He argued that:

⁵² Compare here *M.H. Davis*, Restaging *Mise En Valeur*. ‘Postwar Imperialism’ and The Plan de Constantine, in: *Review of Middle East Studies* 44, 2010, pp. 176-86; and *M. Thomas*, Albert Sarraut, French Colonial Development, and the Communist Threat, 1919-1930, in: *The Journal of Modern History* 77, 2005, pp. 917-55.

⁵³ *Goepfert*, *Les Phosphates*, pp. 24-26.

“If there is one mistake that for the last quarter century has falsified our political economy it is our neglect of the problems of production and consumption in favour of the question of the division of wealth, without ever imagining that the problem of division of wealth can only be solved to general satisfaction by facing the problems of production and through low prices for the consumer”⁵⁴

De Streel, an admirer of large Anglo-American concerns such as the United Fruit Company and Standard Oil, argued for the use of large corporations with powerful state backing. He ridiculed free market economic doctrines of competition as unviable in a post-armistice world of harsh international competition and limited resources. Looking forward to the role of the French colonies in providing raw materials and cheap goods after the war, he constantly compared such raw materials to the war *materiel* the French Army had painfully lacked in 1915, and concluded: “we must say and repeat that our economic victory depends on the economic development of our colonial empire – and can only be guaranteed by that empire”⁵⁵

De Streel and Goepfert therefore shared an emphasis on imperial autarky, produced through the expanded consumption, across the metropolitan social classes, of goods made cheap by cheap colonial raw material.⁵⁶ Large private companies with state backing would exploit those raw materials, phosphate among them. The role of the state was a complex one in these accounts, since it was to be deeply engaged in providing legal support and infrastructural investment, and yet would not excessively interfere in markets. Goepfert addressed the issue directly in terms of phosphate mining when discussing a March 1921 meeting at the Ministry of Public Works. At the meeting, optimistic production figures and the Moroccan hope soon to produce a “technically unlimited tonnage able to supply as much as the world needed”, combined with low global demand projections, had encouraged a decision to cap production. Cartelization and limiting the development of new mines became the order of the day. Goepfert lamented this turn, seeking expanded production instead. He conceded that overproduction might lead to the collapse of producing companies, and then to an abusive oligopoly or monopoly of the producers. He acknowledged the risk of an unemployment crisis in such a situation, and of possible extra burdens on the state. But he saw underproduction as the greater

⁵⁴ E. Du Vivier de Streel, *Comment orienter l'effort économique de la France*, Paris 1917, p. 5.

⁵⁵ E. Du Vivier de Streel, *Le Rôle de nos Colonies dans l'après guerre*, Paris 1916, p. 37.

⁵⁶ On interwar Malthusian and ethnocentric thought, *Cushman*, *Guano and the Opening of the Pacific World*, pp. 205-242; A. *Bashford*, *Nation, Empire, Globe. The Spaces of Population Debate in the Interwar Years*, in: *Comparative Studies in Society and History* 49, 2007, pp. 170-201.

risk, and warned against the impact high prices and the slow expansion of the North African archipelago could have on imperial agriculture.⁵⁷

6 Khouribga: The Rise of the “Big Island”

In this view of Moroccan phosphate production, Goepfert was more sanguine than some. Anticipating its status as the global swing producer later in the twentieth century, Moroccan phosphate mining quickly troubled the historic producers of the phosphate archipelago in Algeria and Tunisia with its startling vitality. Mining in Morocco was controlled by the French imperial state through the Cherifian Phosphates Office (OCP), a state-backed monopoly controlled by the Protectorate government in Rabat, but operated on commercial principles by its management. As its production sky-rocketed, a special supplement of the French newspaper *Le Temps* of 1925 wondered, in a manner representative of the wave of anxiety mainly sponsored by the Algerian and Tunisian private phosphaters, “what space will remain on the European market for Algerian and Tunisian phosphates, overwhelmed by a state industry created with capital provided by metropolitan or colonial taxpayers and without any concern for profit margin and uninfluenced by needing to make a return on capital?”⁵⁸ None of this troubled Goepfert however. He advanced several factors to refute the perceived threat from Khouribga. Under-developed production facilities, the possibility of sending the Moroccan surplus to South America, Morocco’s own potential phosphate consumption as a settler agricultural country of the future, and finally the fact that it had started by exploiting its richest mines, which would be exhausted first, all militated, as he argued, against worrying about Moroccan overproduction.⁵⁹

This anxious relationship of the historic Algero-Tunisian (and to a lesser degree French Pacific/Makatea-focused) private mining companies to state action, and in particular to the meteoric rise of the OCP in the 1920s and 1930s, was an essential part of the French juridical and political-economic expertise that

⁵⁷ Goepfert, *Les Phosphates*, pp. 28-31.

⁵⁸ *Le Temps*, Economic Supplement, March 15th 1925.

⁵⁹ Goepfert, *Les Phosphates*, pp. 41-42.

helped shape the phosphate archipelago, due to the close relationship between colonial business interests and metropolitan commercial law specialists.⁶⁰

Another doctoral dissertation written at the Paris Law Faculty, three years after Goepfert's, reflects this. On an early June day in 1928, under the eyes of an examining committee made up of jurists expert in commercial and tax law and supportive of business, Roger Chapus explained his research, which was focused not on Algeria, like Goepfert, but on the "Exploitation of Phosphates in Morocco: the Cherifian Phosphate Office".⁶¹ Nevertheless, his story continued that sketched by Goepfert. Mining had, as we have seen, begun on the Oulad Abdoun plateau only in March 1921, but as Chapus already noted, in 1927 alone 1.2 million tons of phosphate had passed along the military railways of the Protectorate and embarked at Casablanca's increasingly mechanized, 500 metre long phosphates pier,⁶² bound for the booming world market in superphosphate-based agricultural commodities, especially fertilizer. Chapus's exposition, in keeping with his disciplinary commitments, was largely focused on providing a juridical analysis of the Moroccan Phosphate industry. But, in a fashion revealing the disciplinary hegemony of law and the political hegemony of state engineers in the French 1920s, Chapus had also spent time at Khouribga as an engineer, and his thesis had a political-economic chord.⁶³ This was expressed notably in its hostility to the OCP's quasi-public institutional structure, controlled by the Moroccan authorities under the aegis of the French Resident-General, Hubert Lyautey.⁶⁴

In Chapus's eyes, this system was a result of the "influence of syndicalist and socialistic" – legacies of wartime collectivization from 1914-1918. But it also emerged in his view from an anti-liberal state concern to extract taxes and fiscal benefits from the mine, in light of the profits that the state had handed to pri-

60 Jackson, *What is Syria Worth?*; on French political-economy see *M. Fourcade*, *Economists and Societies: Discipline and Profession in the United States, Britain, and France, 1890s to 1990s*, Princeton 2009, p. 11.

61 Chapus'committee was led by Louis Germain-Martin, a jurist at the Paris Faculty of Law, an expert in public finance, banking and taxation, a future Minister of Finance in numerous governments of the 1930s, a defender of big business against the Popular Front in 1936 and a Vichy government official. See *M. Lescure/A. Plessis*, *Banques locales et banques régionales en Europe au XXe siècle*, Paris 2004, p. 262

62 *J. Du Taillis*, *Le Nouveau Maroc*, Paris 1923, pp. 286-287.

63 On varieties of mining engineer see *T.J. LeCain*, *Mass Destruction. The Men and Giant Mines That Wired America and Scarred the Planet*, New Brunswick N.J., 2009, p. 129.

64 On Chapus at Khouribga see ANOM, FR ANOM 123COL161/21, Ministère des Colonies. École coloniale, puis École nationale de la France d'outre-mer, Fonds des mémoires des élèves, Francis Just Louis Jean Nicolas, *Les phosphates du Maroc (1931/1932)*, Bibliography.

vate concessionaires before World War One in the older, established islands of the phosphate archipelago, especially at Gafsa.⁶⁵ And indeed Lyautey himself was on the record as saying, in an established vein of colonial economic rhetoric that obscured the colonizer's own interest, that 'Morocco will keep and immediately exploit its own phosphates. Foreign competitors will only complicate, slow and muddle simple things'.⁶⁶ Though they were 'foreign' in a complex sense, he surely had the masters of the Tunisian and Algerian outposts of the phosphate archipelago in mind.

But Chapus did not just engage in black-letter jurisprudential argument and swipes at state socialism. He gave a brief explanation of phosphate's role in plant and soil life cycles. And he anticipated the recent historiographical emphasis on agrochemical epochal rupture by asserting the momentous consequences of the de-localization of the nitrogen and nitrate cycle through the massive geographical transfer of agricultural products across the planet. This pivotal shift, Chapus argued, "requir(ed) a restitution" of the soil's nutrient balance through mineral fertilizer and was a question, he added portentously, "about which we have only preoccupied ourselves for less than a century".⁶⁷ Though focused in the main on Khouribga's rise as a component of the North African phosphate archipelago, Chapus thereby also attended to the rise of a global network of phosphate extraction and consumption, and to the links between the two, as expressed by French imperial sovereignty. He therefore provided a brief and picaresque commodity genealogy, vulgarizing for policy and academic use the career of nitrate fertilizer as an agent of global agricultural history. In it Chapus jumped rapidly from the thriving Roman markets in bird droppings to the Inca death penalty imposed on those who killed guano-producing birds. In the modern era he noted the ruthlessness of the English powdered bone merchants, who scavenged for their raw material even on the Napoleonic battlefields of Leipzig and Waterloo, and finally the impetus this British skulduggery gave to "sentimental Germany", inspiring Liebig to his transformative advocacy of agro-chemistry. The latter gave birth to the super-phosphate industry, that "intermediary between the mine that produces phosphate and the agriculture that consumes it".⁶⁸ Such a narrative not only provided accessible talking points for phosphate's advocates in Paris politics, but gave the French phosphate system a prestigious world historical pedigree.

⁶⁵ R. Chapus, *L'exploitation des phosphates au Maroc*, Paris 1928, p. 2; pp. 60-61.

⁶⁶ Taillis, *Le Nouveau Maroc*, p. 286.

⁶⁷ Chapus, *L'exploitation des phosphates*, p. 14.

⁶⁸ *Ibid.*, p. 15. On Liebig see W.H. Brock, Justus von Liebig: The Chemical Gatekeeper, Cambridge 1997. Thanks to Frank Uekötter for pointing me to this reference.

Such distant ancestors were less useful for detailed examples of the legal structure of extractive spaces, and in Chapus's legal analysis of Moroccan phosphates in their infancy, precedents from around the French colonial system of the nineteenth century abounded instead. These were generally selected to justify the superiority of private enterprise as against the clumsy hand of the state-as-industrialist. Mines and quarries in New Caledonia, Indochina, Oceania and Guyana were all shown to be open to private capital – so long as it took legal form under French law. These colonial mines had been dug, in Chapus's view, by global capital, but they were propped up and held open by distinctively French legal codes. The role of the state here was to provide robust legal, infrastructural and political-economic frameworks, and then to allow business to proceed. This would secure the French national interest without restraining the impact of private enterprise.

The prime reference point for Chapus' comparative jurisprudence of phosphate mining came from Gafsa, the oldest "island" of the North African phosphate archipelago. By 1926 Tunisia, as we have seen above, was the producer of some 2.7 million of the 9 million tons of mineral phosphate extracted globally. Chapus elaborated on Gafsa's history since phosphate was first discovered there in 1885. He noted that after a decade of concession building and arbitration, Gafsa was in 1898 reframed using jurisprudence on colonial mining established in Algeria, considered for these purposes as part of the French metropole. Here again we see how the local political-economic life of phosphate, whether in Gafsa or Khouribga, emerged in close connection to other trans-Maghreb and trans-imperial sites of the phosphate archipelago, as legal and political-economic frameworks were transposed back and forth, often via the central legitimizing legal and political institutions in Paris. The comparative dimension of such transpositions was crucial, and indeed the tabulation of differences between the phosphate "islands" of North Africa, often based on their local geologies and socio-political hinterlands, intensified the comparative endeavour, thereby unifying the archipelago as a set of similar spaces. The Gafsa sites, for instance, were formally considered quarries by the relevant French jurisprudence, whereas the Moroccan sites became legal mines: such distinctions allowed commentators like Chapus to spin an ever-denser discursive web between the two. In Chapus' eyes, the long process of legal framing and re-framing at Gafsa was intended to establish the Beylical (the Tunisian political authority) and French imperial state's primacy against any prior prospectors' claims. The use of the Algerian model in 1898, for example, secured the Protectorate state's prerogative in adjudicating the right to prospect, the right to establish a concession, and the right to levy a royalty per ton exported regardless of the frequently decisive variation in transport and shipping costs. Major disputes had indeed arisen in

Tunisia in the 1890s over these issues, as in the case of the Kalaa-Djerda phosphate deposits north of Gafsa. There a legal dispute ran for several years over ownership of the deposits between rival mining entrepreneurs, who had worked with tribal groups and Islamic juridical consultants in the region to construct different legal claims to the concessionary exploitation of common *habous* lands.⁶⁹ Islamic legal opinions given by these consultants had catered to their clients' interests but also insisted on the short term of any concessions, for just a handful of years, effectively binding the phosphate mines into their adjacent religious and socio-political spaces. By borrowing the Algerian jurisprudential framework, the imperial state tried to overcome Islamic opinion on *habous* land, and sought to insulate the Tunisian phosphate sites from their surrounding regions, instead placing them into an imperial, pan-North African archipelago.⁷⁰

Further stitching together Gafsa and the rise of Khouribga, Chapus noted in passing that in late 1912 it had been a certain Monsieur Combelas, a former French assistant pharmacist who had practiced in Gafsa but then opened a "mechanical bakery" in Khouribga, who first recognized the presence of phosphates around "native wells" there and reported it to the local authorities. By 1921 this circulation of amateur mineralogical knowledge from Gafsa to Morocco, one acquired not in the mine itself but in an ancillary settler-commercial role in the mining town, had been upgraded. In that year Resident-General Lyautey recruited an experienced phosphate engineer from Gafsa as the Director-General of the OCP.⁷¹ Indeed the physical paradigms of Gafsa phosphates were everywhere at Khouribga. Thus the relative cost of Moroccan phosphate per ton, in Chapus' analysis, derived from its physical properties assessed by comparison with the Gafsa baseline. This involved, for example, the high calcium phosphate content of the ore at Khouribga, and its readily exploitable physical presentation in granular, dust or sandy format as opposed to the harder-to-treat massive rock ore found at Gafsa or in Algeria. It also meant the specificities of its geological arrangement. The new Moroccan sites delivered a thick, exploitable layer, 1.6 metres deep on average, secreted in a surrounding envelope of more or less rich phosphate deposits some 60 metres deep. It was this 'layer number one' that was most apt for immediate exploitation, though Chapus speculated that in the future, layers with a lower phosphate content might also become exploitable, depending on costs. Here the phosphate itself, far from existing merely as a

69 CADN, 1TU/1/V/Carton 1278: Concession des Phosphates de Gafsa, 1896-1919, Bellot/Targe case dossier, translation of Shariah interpretation by Cheikh Ul-Islam; Les Phosphates de Kalaa-Djerda – Historique.

70 Thanks to Sebastian Haumann for clarifying this point.

71 Taillis, *Le Nouveau Maroc*, pp. 286-287.

natural resource, influenced the mix of local specificity and archipelagic similarity developing between the *Phosphatvilles*. And indeed, as Chapus guessed, Khouribga would eventually become a mainly open-mining site, as technological change and the introduction of massive digging and shovelling systems, well adapted to the demands of Khouribga's rich dust, altered the possibilities and re-configured the mine, the environment of which it was an inseparable part, as of the North-African archipelago it increasingly dominated.⁷²

Such forms of geological and political-economic knowledge allowed for comparison between sites in the archipelago, and thereby fostered their connectivity as a distinct set of archipelagic spaces. And yet the archipelago could never be made perfectly distinct from its adjacent spaces, and efforts to do so produced both knowledge and irreducible uncertainties – even foundational types of ignorance. As Frank Uekötter and Robert Proctor have noted, specific forms of ignorance, often coeval with knowledge production, have their own politics, and Chapus's agnotology was no exception.⁷³ Producing comparable data across phosphate producing contexts, and forcing the specificities of the phosphate ore or socio-political context in each node of the archipelago into a manipulable and comparable abstraction required simplification of complex transport infrastructure, and of the power relationships between mining authorities, the state and the workforce in different places. Such hard-to-measure, even unknowable factors, just as much as more easily quantifiable phenomena as the world price of phosphate or the exchange rate situation, determined the potential of Moroccan phosphates in Chapus' view.

7 Conclusion

Goepfert and Chapus were French colonial jurists, engineers and mining experts, and though their contributions were one of the forms of connectivity binding the sites of the phosphate archipelago, there were many others. In closing it is worth turning to another form, the labour migration of miners, in order to restore the workers, such as those killed at Metlaoui, to the centre of the stage

⁷² On this point see *LeCain*, Mass Destruction, pp. 132-137.

⁷³ F. Uekötter, Farming and Not Knowing. Agnotology Meets Environmental History, in: D. Jørgensen/F.A. Jørgensen/S.B. Pritchard (Eds.), *New Natures. Joining Environmental History with Science and Technology Studies*, Pittsburgh 2013, pp. 37-50; R. Proctor/L.L. Schiebinger (Eds.), *Agnotology. The Making and Unmaking of Ignorance*, Stanford CA 2008. Thanks to Mat Paskins for pointing this out to me.

from which the colonial archive tends to remove them. In his work Chapus noted that drought had struck Gafsa region in the mid-1920s.⁷⁴ Although for his purposes this meant that the CPG's agricultural revenues were likely to be small compared to its mining activity, the drought affected a local workforce in the Gafsa region that for many years had divided its time between pastoralism and mine work, herding livestock and resisting the mining industry's coercive disciplines. Here phosphates played into a nexus of climate shifts and controlled migratory flux in the 1920s. But the Gafsa miners, partly because of their commitment to farming, had never supplied the entire workforce underground. From the 1890s and 1900s, the Gafsa mines had drawn their workforce largely from Algerian Kabylia – and indeed from Morocco itself. Algerian Kabyles, for instance, represented some 80% of the workforce in 1914. But these workers eventually departed, taking their expertise to other mines – the coal districts in the north of postwar, demographically decimated France in the 1920s. This factor, as well as drought, population rises, and the access to consumer goods afforded by a regular miner's salary and access to credit in company stores, all operated to intensify the lure of the phosphate island as a semi-detached but powerfully influential space in the Gafsa region.

But again, this detachment remained incomplete. Phosphate miners in the Gafsa region continued to work in harvest seasons as farmers in the 1920s, creating a seasonal flux to mining output. The CPG sought to overcome this by continually draining trained miners from across the French colonial Maghreb, and later from Fascist Italy, as part of work-for-phosphate deals. These recruiting tactics intensified the archipelago's connections with other mining sites, but still did not allow the Gafsa basin to escape from the specificities of socio-political practice in its adjacent region: the archipelago's surrounding hinterlands influenced the situation of each of its constituent islands. Tribal (*Arch'*) loyalties and clan (*laa'rouch*) structures continued to make labour organizing around the phosphate mine at Gafsa a mirror of pre-existing affiliations in the interwar period and on into the 1940s and 1950s – even as the mine forced those older loyalties to rearticulate themselves. Hiring decisions, for example, happened on a quota basis proportionate to tribal weight in the region, and, as the miners' union grew in force, a mining monoculture developed which was progressively *tribalized* via the medium of labour organization, especially as autonomous unions began to emerge in the 1930s and 1940s.⁷⁵ The labour regime at Gafsa became a hybrid of union organization and contestation, with connec-

⁷⁴ Chapus, *L'exploitation des phosphates*, p. 261.

⁷⁵ I am indebted to Hamza Meddeb for sharing his research with me on this point.

tions to metropolitan labour politics, and of older tribal structures that adapted themselves to the structures and opportunities of industrial extraction.

In Morocco, likewise, migratory labour from the Atlas mountains and the coastal cities such as Casablanca became a key aspect of the development of the OCP mines at Khouribga and later at Louis-Gentil (Yousoufia after independence). In the 1920s, these migrant workers interacted with corporate labour policies reflecting the racialized settler administration of the protectorate, in which European and “indigenous” workers were treated very differently. Moroccan miners quickly developed techniques for circumventing and adapting aspects of the regime however. For example, since Moroccan miners were recruited on the basis of a few stated details (name, age, region etc.) and given a numbered metal token which was indexed to their personal entry in the register of miners, a secondary market in these tokens rapidly developed. Miners avoided reclaiming the deposit levied on the token, preferring to re-sell it, confident that their European supervisors could not identify them. Only with the introduction of basic anthropometric recruitment in the 1930s (fingerprinting), did the registered labour force begin to coincide to any degree with the people actually working in the mines. Even then, considerable re-sale markets for workers’ anthropometric paperwork flourished. In the 1950s OCP corporate paternalism increasingly informed the Moroccan phosphate islands until the eve of independence, and the conditions of the OCP labour force were used to make a case for the welfarist modernism of late colonial rule, as they were across late colonial Africa as development shaded into decolonization.⁷⁶ In more recent decades, related battles between the state production of insular phosphate spaces and contestatory labour and national politics have emerged at the Bu-Craa mines in Western Sahara, which the Moroccan state turned into “a military camp traversed by sand walls, stones, and barbed wire installed to protect the phosphate” in a context of rising Polisario Front insurgency where some of the “most politically active groups were to found among Bu-Craa native workers”.⁷⁷

Historians of colonial empire have often focused on metropole-colony relations as a binary relationship, or on the rise of anti-colonial nationalism in the different nation-states of the formerly colonized world, treating political-economy in terms of the aggregate levels of exploitation and tax burden, the

⁷⁶ F. Cooper, *Decolonization and African Society. The Labor Question in French and British Africa*, Cambridge 1996. See my ongoing research project on phosphate and French colonial empire in the era of decolonization and the “Green Revolution” for further details on the Moroccan case.

⁷⁷ Camprubí, *Resource Geopolitics*, pp. 694-695.

political weight of major companies and so on.⁷⁸ But by placing phosphates themselves at the centre of the analysis, and by tracing the phosphate archipelago across the borders of colonial territories and later national states this binary tendency can be nuanced. The phosphate archipelago, while remaining distinctively North African in its imperial and then national dynamics, transmitted phosphate from the various extractive spaces towards a network of ports and out to a global distribution and consumption chain far beyond the metropole-colony relationship, as input-intensive one-way industrial agriculture, based on fertilizer and engineered seed, exploded in the era of late colonial rule, the Green Revolution and decolonization.

At the same time, by placing the environmental history of phosphate more squarely into the political and colonial history of French North Africa, for example in the context of the resource jurisprudence provoked by neo-Malthusian and autarkic thinking after World War One, phosphate as an actor – not a mere natural resource – provides a way to bring the tools of environmental history into play in wider historiographical problematics. Much work remains to be done, for example on the lived experience of phosphate mining for North African miners and on the mining companies' journey across the watershed of national independence in the Maghreb. Phosphate's own journey through the refining and marketing process, into sacks and onto fields around the planet, where it would help raise crops to feed a booming population, also deserves more attention. But this article has at least begun to chart some of the connections between the extractive spaces in the phosphate archipelago.

Acknowledgment: I thank the editors of this number – Sebastian Haumann and Nora Thorade – and the journal's anonymous reviewers, for their helpful comments. I also thank Colin Cahill, Valerie McGuire, Vanessa Ogle, Corey Ross and Frank Uekötter for helping me think about resources and archipelagos. I am grateful to Mat Paskins and the participants at the Environmental Histories of Commodities 1800-2000 workshop, held at University College London in September 2015, for their valuable comments on an early draft, and indebted to Hamza Meddeb, with whom I co-presented a paper that developed aspects of this argument, at a workshop on "Making Resources Speak", held at the Institute for Advanced Study, University of Birmingham, June 2015. For financial support I am grateful to the Leverhulme Trust's Early Career Fellowship programme.

78 E. Huillery, *History Matters. The Long-Term Impact of Colonial Public Investments in French West Africa*, in: *American Economic Journal: Applied Economics* 12, 2009, pp. 176-215.

Bionote

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