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Gorostiza Langa, Santiago
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POTASH EXTRACTION AND HISTORICAL ENVIRONMENTAL CONFLICT IN THE BAGES REGION (SPAIN)

Santiago Gorostiza Langa¹

Centro de Estudos Sociais
Universidade de Coimbra

ABSTRACT

Potash extraction in the Bages region (Spain) is the cause of historically significant environmental impacts, such as the salinisation of the Cardener and Llobregat rivers. Recently, several projects that will increase the production of brine and salt tailings in the near future have been announced. Following Martínez-Alier, in this paper I characterize the struggle around potash extraction and its socio-environmental impacts as an ecological distribution conflict and I argue for a historical approach that brings together the analysis of water, potassium and chlorine flows. Despite the relevance of potassium as an irreplaceable plant nutrient together with phosphorus and nitrogen, research about potash extraction related conflicts remains mostly unaddressed. In this case, archival and statistical sources are used to present potash extraction in the Bages in relation to the increase of water salinity in Barcelona during the 20th century. I devote special attention to the technological infrastructures developed in order to technically fix the problem of water salinisation, such as the brine collector or reverse osmosis filters, while highlighting the power relations behind the choice of such technologies. The historical approach to this case study shows that Martínez-Alier's definition of externalities as cost-shifting successes applies to the economic burdens related to the environmental remediation, mostly covered by public budgets.

Keywords: Potash mining, ecological distribution conflicts, political ecology, environmental history, water quality

RESUMEN

La extracción de potasa y el conflicto ambiental histórico en la región del Bages (España).

La extracción de potasa en la región del Bages (España) ha sido la causa de importantes impactos ambientales a lo largo de la historia reciente, como muestra la progresiva salinización de los ríos Cardener y Llobregat. Recientemente, varios proyectos que aumentarán la producción de salmueras y las escombreras de residuos salinos han sido anunciados. Siguiendo a Martínez-Alier, en el presente artículo caracterizo los conflictos alrededor de la extracción de potasa y sus impactos socio-ambientales como conflictos de distribución ecológica, y propongo un acercamiento histórico que tenga en cuenta los flujos de agua, potasio y cloro. Pese a la importancia del potasio como un nutriente imprescindible para el crecimiento de los vegetales, junto al fósforo y el nitrógeno, los conflictos relacionados con la extracción de sales potásicas han recibido relativamente poca atención. Para el presente caso de estudio, se utilizan datos estadísticos y fuentes de archivo para mostrar la extracción de potasa en relación con el aumento de la salinidad del agua en Barcelona a lo largo del siglo XX. Se dedica especial atención a las infraestructuras tecnológicas desarrolladas para dar una solución técnica al problema de la salinización de las aguas, como el colector de salmueras o los filtros de ósmosis inversa, a la vez que se destacan las relaciones de poder

Contacto: sgorostiza@gmail.com

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detrás de la elección de estas tecnologías. El acercamiento histórico a este caso de estudio muestra que la definición de las externalidades como éxitos en la transferencia de costes, defendida por Martínez-Alier, resulta adecuada para los costes económicos relacionados con la remediación ambiental de las minas del Bages, básicamente cubiertos por fondos públicos.

Palabras clave: Minería de potasa, conflictos de distribución ecológica, ecología política, historia ambiental, calidad del agua

1. INTRODUCTION

In February 2013, regional Catalan media marvelled at an unusual legal battle that was confronting two radically different actors. On one side there was Sebastià Estradé, a 90-years old former science-fiction writer with a PhD in Law, living at a retirement home in a village of central Catalonia. And on the other, *Iberpotash*, a mining company wholly owned by the transnational *Dead Sea Works*, the world's fourth largest producer and supplier of potash². The Catalan Superior Tribunal of Justice (*Tribunal Superior de Justícia de Catalunya*) had accepted two relevant aspects of the lawsuit presented by Estradé against the environmental permits that the Catalan government had conceded to *Iberpotash*, operating in the Bages region. First, the company had to substantially increase the legal financial deposits paid to the Catalan government for future environmental remediation, and it also had to immediately start restoring *El Cogulló* mine tailing (*La Vanguardia*, 18 February 2013). However, some relevant factors remained unaddressed in the pieces of news published. Not the least of them was the historical trajectory of the controversial impacts of the mining activity. Protests against potash mining were not new. Since mining activity had started in the late 1920s, it had been challenged by local population, associations, and other water users. A varied movement of fishers, workers and even the Barcelona water company had mobilized during the short democratic period of the Second Republic, protesting against the pollution and salinisation of river water caused by potash production. The long period of the dictatorship had silenced this story, which remained to be unearthed.

In this paper I explore the historical dimension of the environmental conflict that emerged in the Bages region during the 1920s and continues today, in order to unveil how the burden of the socio-environmental costs associated with potash mining has been successfully shifted from the private mining companies to the public sphere. The sources used include the statistical annual reports from the *Consejo de Minería* and a wide press review, both from historical sources and present-day newspapers. However, primary archival sources have been fundamental to critically assess the history of the struggles associated to potash salts extraction. The archives consulted include the private water company of Barcelona (*Sociedad General de Aguas de Barcelona*), the Catalan National Archives (*Arxiu Nacional de Catalunya*, Sant Cugat del Vallès), the Administrative General Archives (*Archivo General de la Administración*, Alcalá de Henares) and the Archive of the Subdelegation of the Spanish Government in Barcelona province (*Arxiu de la Subdelegació del Govern*, Barcelona).

The paper is organized as follows. First, I briefly describe the current situation of potash extraction in Bages, its socio-environmental impacts in the region, and the leading role of the public administration (central government, regional government and European funds) in remediating such impacts. Second, I characterize the struggle around potash extraction as an ecological distribution conflict and point at the lack of political ecology and environmental history literatures regarding the conflicts associated to potash mining. Further I explore how a historical approach can throw light over significant aspects of the struggle which are relevant for present-day debates. The final section highlights the case study as an example of successful cost-shifting process from private companies to the public sphere.

2. CURRENT POTASH EXTRACTION AND WATER POLLUTION IN BAGES

The economic crisis has brought a renewed interest in extractive activities to Spain. Apart from continued interest in fracking in the Basque Country and Cantabria, recent news include references

2 Dead Sea Works Ltd. Webpage <http://www.iclfertilizers.com/Fertilizers/DSW/Pages/AboutUs.aspx> Last accessed 3 November 2011.

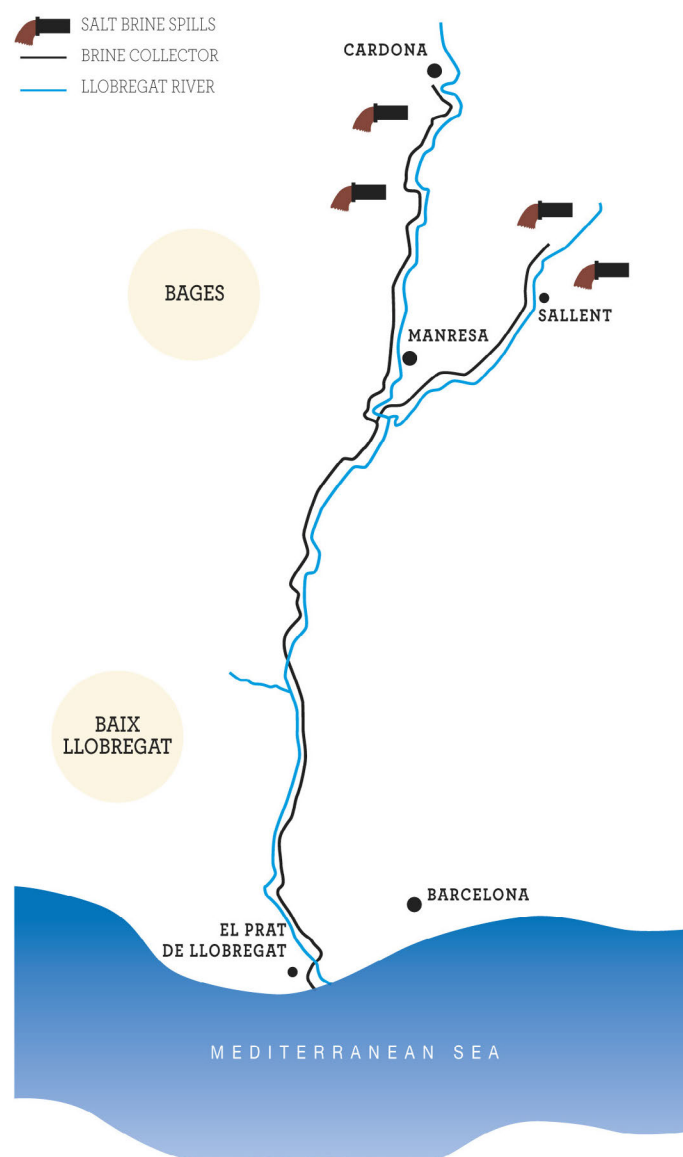
to exploration of gold and tantalum mines in Galicia, reopening of iron mines in Andalucía, and an ambitious expansion of the potash mines in the Bages region, in central Catalonia (Ara, 25 April 2011; *El País*, 14 October 2012, 12 November 2012, 11 March 2013, 22 April 2013, 16 May 2013).

Potash salts were discovered in Catalonia in 1912, and extraction began in the following decade (Fàbrega Enfedaque, 2009, 2012). True still today, the Bages region was the only part of Spain where potash was produced, extracted out of deposits that originated due to the evaporation of inland seas millions of years ago. The mineral is processed and used to produce agricultural fertilisers, 70% of which are exported, mainly to Europe but also to Asia, North Africa and Latin America. During the manufacturing process, taking place next to the extraction sites, liquid and solid waste (brine and tailings) are produced (Lottermoser, 2010). In the Bages region, approximately 3 kg of waste salt are produced for each kg of potash obtained (Ara, 25 April 2011; 8tv, 18 May 2013). These solid residues are stored in open locations near the mines, resulting in artificial mountains that (re)shape the regional landscape. *El Cogulló* mine tailing, for example, is the biggest accumulation of industrial waste of Catalonia, accounting for an area of 48 Ha with at least 50 million tonnes of mine waste products (*El Periódico*, 9 May 2013). When rain dissolves these salts, they may enter nearby rivers and permeate into groundwater tables, increasing chlorine concentrations and affecting water quality and aquatic ecosystems (Cañedo-Argüelles *et al.*, 2012; Lloret, 2004; Prat & Rieradevall, 2009). In addition, other components found in potash mine tailings have been related to human health. The presence of bromide ions in the waste contributes to the increase of its concentrations in surface waters. When waters containing organic matter are chlorinated for human consumption, trihalometanes (THM) are generated as sub-products, and the presence of bromides influences some of its mutagenic and carcinogenic properties (Villanueva, 2003). A similar phenomenon was observed in Bremen (Germany), under the influence of a relevant potash mine in Weser River (Bätjer *et al.*, 1980).

In order to tackle the negative impacts of potash mine tailings and river salinisation, the Catalan Water Authority (*Agència Catalana de l'Aigua*) invested almost 200 million euros in different projects between 2008 and 2011 (*Agència Catalana de l'Aigua*, 14 January 2011; *El Periódico*, 1 November 2012). The most symbolic and expensive investment was the installation of energy-intensive reverse osmosis filters in the area of Barcelona's water treatment stations, which ensured the technical compliance of regulations on THM. However, over one quarter of the money allocated (62 million euros) went to enlarge a key central infrastructure: the brine collector. This ambitious public work, first proposed in 1932 and finally built between 1983 and 1989, is a 120 km long pipeline that runs parallel to the rivers affected by salinisation, collecting brine from potash processing and mine tailing filtration, and taking it to the sea. Upon opening in 1989, under the management of Barcelona's private water company (*Sociedad General de Aguas de Barcelona*), water quality improved significantly (Martín-Alonso, 1994). However, by 2001, the collector was working at almost full capacity (Badia, 2001) and a few years later, in 2008, reached its saturation point. Needless to say, since it went into operation the brine collector has broken over 400 times, pouring extremely salt-saturated water into the environment. When operating the brine collector transports huge loads of wastewater to the sea, but the Llobregat River still carries a very significant share dissolved in its waters. As potash extraction increases, the brine collector enlargement becomes insufficient and the problem remains as a long lasting danger to Barcelona's water supply (see Figure 1).

Despite the limitations of the brine collector, two industrial projects that will increase the generation of brines have been recently announced. First, the private mining company established in Súria, *Iberpotash*, is carrying out works that will permit increasing ore extraction by 30-40% (*La Vanguardia*, 19 October 2012). Second, the private company Gas Natural is exploring the creation of subterranean gas deposits in the region. In order to be formed, such cavities will require a regular input of water to dissolve underground salts and will produce brines for ten years (*La Vanguardia*, 11 July 2012). Although it is apparent that the brine collector would need enlargements to tackle with both projects, the improvement works – depending on public funds – remain at a standstill in the current context of economic crisis.

Figure 1. Llobregat River, brine collector and potash mine tailing sites.



Source: Adapted from Lloret, 2004.

3. POLITICAL ECOLOGY AND ENVIRONMENTAL HISTORY OF POTASH EXTRACTION IN THE BAGES REGION

3.1. Potassium flows and ecological distribution conflicts

As presented in the previous section, the case of potash salts extraction shows how water, potassium and chlorine flows are inextricably related. However, the political ecology of potash mining and socio-environmental conflicts related to this extractive activity haven't been studied in the literature, despite the fact that recent research on environmental pollution points to the salinisation of rivers as a global and pressing ecological problem and to mining activities as one of its causes (Cañedo-Argüelles *et al* 2013). Such lack of attention is in stark contrast to the continuously growing potash mines worldwide. Only in 2011, about 170 potash mining projects were under way around the world. Being an irreplaceable fertilizer nutrient – 90% of the world production is used as a fertilizer – potash production and consumption is

expected to remain growing during the following years (US Geological Survey, 2013) pointing out an increase in global social metabolism caused by this activity.

In this paper, I intend to apply Joan Martínez Alier's characterization of ecological distribution conflicts to the potash-related struggles in the Bages region. Martínez-Alier has defined ecological distribution conflicts as "struggles over the burdens of pollution or over the sacrifices made to extract resources, and they arise from inequalities of income and power" (Martínez-Alier *et al*, 2010:154). Political Ecology, in Martínez-Alier's interpretation, is the interdisciplinary field that studies such conflicts related to the intensification of global social metabolism. Social metabolism in his definition refers to the society's organization of energy and material flows (*ibid.*) Crucial to this framework is the consideration of economic externalities "not as market failures, but as cost-shifting successes that might give rise to environmental movements" (Martínez-Alier, 2002:257). These externalities usually affect the commodity frontiers, where usually both resource extraction and waste disposal take place. Fuelled from the international scale by the continuously growing demand of fertilizers during the 20th century, the increase in potassium and chlorine flows related to potash extraction in Bages since the 1920s can be interpreted as an ecological distribution conflict, where the local externalities are the salinisation of Barcelona water supply, together with the adverse landscape and health impacts. The Bages region, being another commodity frontier close to the city of Barcelona together with the Llobregat River supplying the metropolitan region, became exposed to negative externalities caused by increasing global social metabolism and private companies' pursuit of shifting their costs to public budget. The mining activity has been occurring mainly for the benefit of some groups at the expense of other existing or future ones leading to further struggles in the region. In a similar manner, the final decision regarding the system of water remediation adopted – a brine collector running parallel to the river and end-of-pipe reverse osmosis filters in water treatment plants, both financed with public funds – certifies a decision that benefited certain actors while excluding some other. A historical approach to the birth of this remediation system can help analysing the evolution of the different actors, and to explain how the final decision was taken, how power was exercised, and which actors were excluded.

The importance of the ever-growing demand of fertilizers during the 20th century, including potash, is a major factor fuelling the extraction of mineral in Bages. As mentioned before, potassium is an irreplaceable fertilizer nutrient for food production – together with phosphorus and nitrogen they are the primary nutrients of plants. The importance of flows of phosphorus and nitrogen in the context of the emergence of industrialized agriculture during the 19th century has been highlighted by John Bellamy Foster, who, building upon Liebig and Marx's ideas, argues that the intensification of agriculture in Europe created a metabolic rift in the nutrient cycle (Clark & Foster, 2012). The soil's nutrients were exhausted and were not returned from the city to the countryside, but lost in the form of excrements. In order to overcome this rift, guano and nitrates (rich in nitrogen and phosphorus) were extracted in Peru and Chile and brought to countries where industrialized agriculture was thriving. In this way, the metabolic rift became global, and the conflicts associated to the appropriation of these nutrients characterised the "ecological imperialism" of European countries (Clark & Foster, 2012).

In contrast to nitrogen and phosphorus, the international flows of potassium and its political consequences have received less attention. Before being found in mines and extracted from underground deposits to be produced industrially, potash was obtained from the ashes of plants and therefore was related to the carbon cycle³ (Östlund *et al*, 1998). Such systems of production became uncompetitive for global trade when potash salt deposits were first found in Strassfurt (Germany) in 1856. Industrial production of potash became soon a reality, and Germany enjoyed a position of natural monopoly until the end of the First World War (1914-1918), when Alsace potash mines were lost to France (Levy, 1935). In the aftermath of the war, efforts were made to diversify the potash suppliers to the international market, and production started in Russia, the USA and Spain.

3 The word comes from Dutch "potaschen", which literally means "pot ashes". This is related to the original manufacture process of potash, which was "obtained by soaking wood ashes in water and evaporating the mixture in an iron pot". Online Etymology Dictionary, <http://www.etymonline.com/index.php?term=potash> Last accessed 23 May 2013.

3.2. Approaching potash extraction through Historical Political Ecology

Several scholars have highlighted the importance of environmental history in vitalising political ecology (Watts & Peet, 2004) and the relevance that historical research on the environment can have for political ecologists (Robbins, 2004), but the meeting ground between the two disciplines has received relatively little attention (Davis, 2009). Karl Offen has suggested that a historical political ecology approach could be defined “as a field-informed interpretation of society-nature relations in the past (...), how and why those relations have changed (or not changed) over time and space, and the significance of those interpretations for improving social justice and nature conservation today” (Offen, 2004:21).

Following this view, Diana K. Davis has emphasised that historical political ecologists “deliberately relate their research to contemporary situations in order to try to envision / facilitate environmental development that is more socially just and ecologically appropriate” (Davis, 2009:285). For Davis, this emphasis on present-day issues is one of the differences between historical political ecology and the subdisciplines of environmental history and historical geography (Davis, 2009).

Following Davis, I argue that a historical approach to the case study is necessary in order to better understand the present-day debate in relation to the socio-environmental impact of potash salt mining in the Bages region. A historical approach attentive to social metabolism can be relevant in this case study for at least four reasons.

First, as it has been explained in the previous section, by paying attention to the metabolic circulation of nutrient flows – in this case potassium – I connect local events to the international scale. World market demand for potash fertilizers can be interpreted as a geographical fix to the agrarian metabolic rift – and at the same time as the trigger of local socio-environmental externalities. At the local scale, the brine collector and the reverse osmosis filters are technological fixes for pollution in order to alleviate the environmental and social costs caused by the extraction of potash. This is an example of what James O'Connor termed as the second contradiction of capitalism – namely, that capitalism appropriates space and environment in a self-destructive fashion, as private costs are converted into social costs and therefore the total costs of extraction also rise (O'Connor, 1991).

Second, it can contribute to state clearly the anthropic origin of salinisation. Despite the monumental presence of mine tailings in the landscape, the existence of natural saline formations and other sources of salinisation have historically casted doubts on the importance of potash-related pollution. Chemical techniques have partly solved this problem by identifying isotopic compositions in water that are distinctly related to mine tailings (Otero & Soler, 2002), but historical research can contribute rendering further evidence to the general public.

Third, despite the emergence of environmental movements denouncing the consequences of the mining activities since the late 1990s (such as *Montsalat*, in 1997 or, more recently, *Prou Sal!*), there is no narrative connection between the present conflict and the historical struggles against the consequences of potash mining, which were significant before the Francoist dictatorship (1939-1975). By connecting them, a sense of continued struggle of the community can be (re)articulated and enhanced (Armiero, 2011; O'Neill, 2007).

Fourth, the history of the brine collector project in itself presents a critical opportunity to explore the political, economic and social interests that shaped this infrastructure. Infrastructures are too often regarded as simply technical or apolitical, an assumption that has to be problematized (Graham, 2010). Excavating the history of an infrastructure by analysing the evolution of the successive projects prepared by different political regimes can help explicitly highlight the political character and relationships underlying the infrastructure itself. Therefore, archival research offers an opportunity to explore the archaeology of power and “congealed social interests” (Graham, 2010:13) reflected in the brine collector, something that can also vividly expose the environmental and social cost-shifting related to the mining activity from private companies to public administration along time.

These last three arguments are explored and exemplified in the following section.

4. HISTORICIZING POTASH EXTRACTION AND WATER SALINISATION IN BAGES

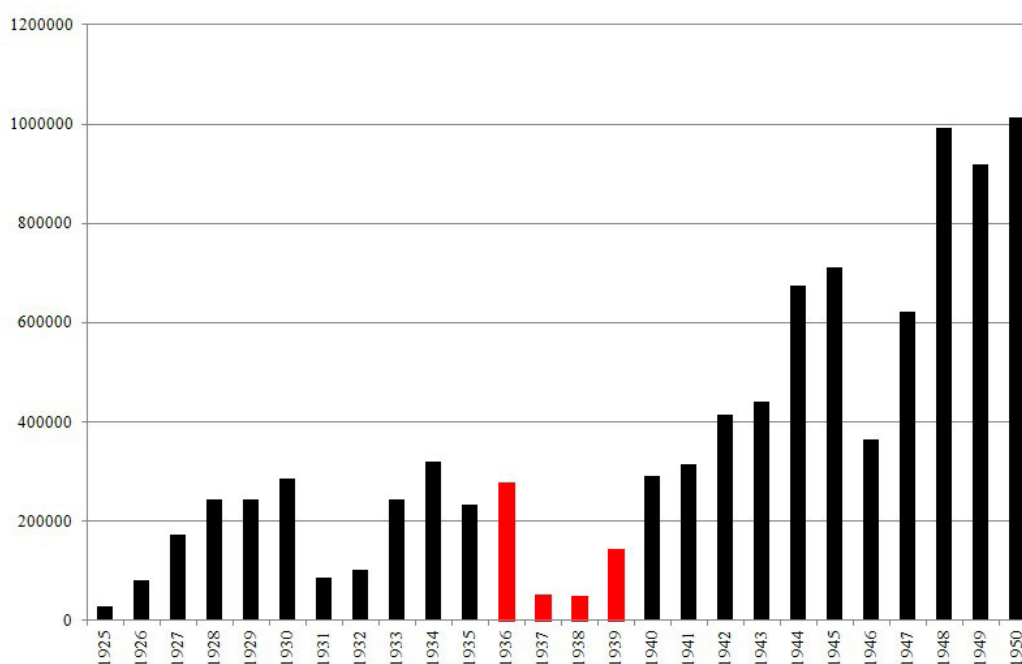
4.1. Water quality before potash extraction and during episodes of disruption

Industrial potash production in the Bages region began in 1925, and grew significantly during the 1930s. Industrial water users issued the first complaints about mining activities in 1926, joined by the *Sociedad General de Aguas de Barcelona* (SGAB) in 1930. During this period, 80% of Barcelona's water supply relied in the underground aquifers of the Llobregat, and the company laboratory soon registered increasing concentrations of chlorine. In 1931, the newly established Republican government promoted the creation of a public commission to analyse the problem of water salinisation in Llobregat and Cardener rivers. The report produced, where the brine collector was first proposed as an open channel that would collect wastewaters, is conserved at *Arxiu Nacional de Catalunya*. One of the relevant pieces of information it contains is the reference to values of chlorine concentration in Llobregat in 1915, before industrial potash production started. After 1932, the commission became a permanent entity for monitoring chlorine concentrations in river water, and the Catalan regional government enacted a Salinity Law (*Llei de Salinitat*) that established a legal limit of 250 mg Cl/l for river water. Sources of salinisation, however, remained a matter of debate. Mining companies called the results into question and asserted that natural saline formations, the increasing population of the Bages region and sea saline intrusion to SGAB wells should also be considered as causes of the increasing chlorine concentrations (Gorostiza, 2010; Gorostiza *et al*, in prep.; Honey-Rosés, 2012; Lloret, 2004).

During the Spanish Civil War (1936-1939) mining activities decreased significantly. Despite the fact that most of the monitoring system was dismantled, SGAB workers kept one of the monitoring stations functioning throughout the war. By 1939, chlorine concentrations were similar to the levels before 1925. In the opinion of the company managers, the disruptive episode of the war solved the question of the origin of chlorine in the river beyond any reasonable doubt (Gorostiza *et al*, 2012; Gorostiza *et al*, in prep.; Sociedad General de Aguas, 1939).

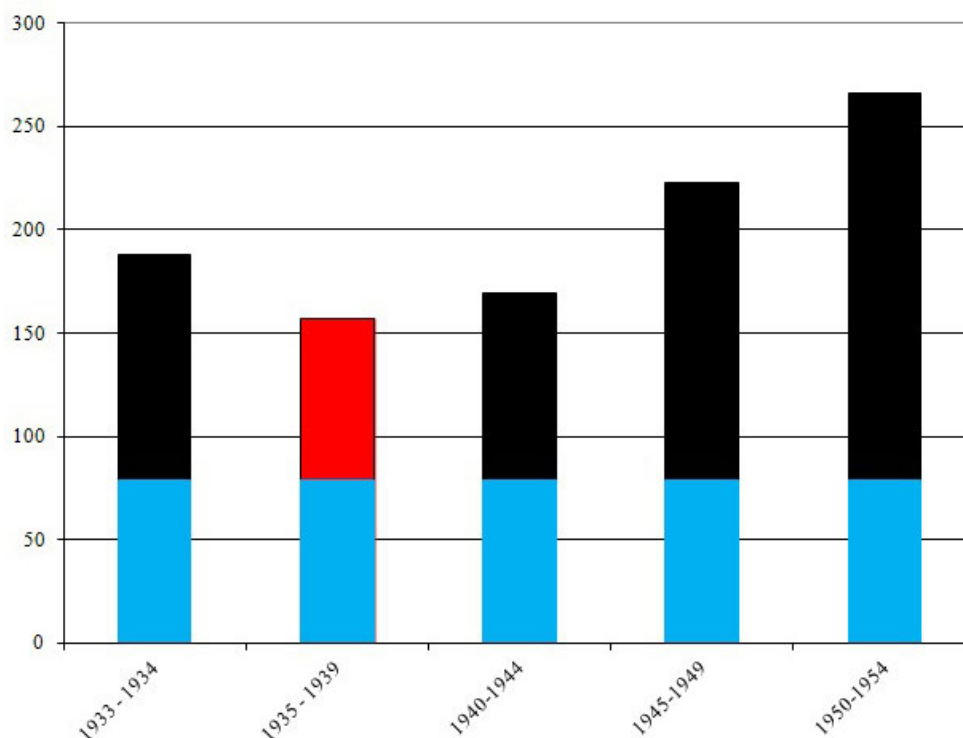
Figures 2 and 3 show a correlation between the evolution of potash extraction in Bages and the chlorine concentration in SGAB wells for the period 1925-1950.

Figure 2. Evolution of potash salts extraction (tonnes) in the Bages region (1925 – 1950). The period of the Spanish Civil War is marked in red.



Source: Own elaboration with data from annual reports of Consejo de Minería (1926 – 1951).

Figure 3. Chlorine concentrations in SGAB wells (mg Cl/l). The blue portion indicates the natural chlorine concentrations before industrial potash extraction started. The period of the Spanish Civil War is marked in red.



Source: Own elaboration based on data from Oliver Suñé, 1974.

4.2. Narrative discontinuities in the struggle against salinisation

During the democratic period of the Spanish Second Republic (1936-1939), several different groups complained about the effects that potash mines had on water quality and participated in public protests. The first registered protest was some years before, in 1926, by Antònia Burés, the owner of several factories along the river. SGAB, as previously mentioned, joined in 1930. A broad review of the press during these years also shows the mobilization of associations of fishermen, along with prestigious figures of the medical field related to the anarchist movement. Human health is central in the discourses against the salinisation of the river (*La Vanguardia*, 23 April 1935; *El Be Negre*, 24 April 1935; Gorostiza, 2010; Gorostiza *et al*, in prep.; Martí Ibáñez, 1937).

Unsurprisingly, after the Spanish Civil War such references disappear from published press. In fact, during the whole period of the Francoist dictatorship, few references are found in relation to the brine collector project and the efforts to control water quality in the region, something widely discussed during the 1930s. Some archival sources, however, illustrate that the uneasiness among the population remained. The secret reports that the governor of the province of Barcelona received every two weeks include a section on the region being mined, and the discomfort of local population with water quality is mentioned⁴. Besides, relevant actors joining protests during the 1930s, such as fishermen associations, whose livelihoods depended on the river, dissolved during the following decades as the conditions of the environment worsened.

Under Franco's dictatorship, public debate about water pollution was silenced and decision-making spaces became restricted and opaque. While several new projects of brine collector would be elaborated

⁴ Servicio de Información, boletín decenal nº12. Dirección General de Seguridad. Jefatura General de Policía, Barcelona. 23 April 1948. Box 310, Arxiu de la Subdelegació del Govern a Barcelona.

and discussed, public participation was limited to determined actors. The evolution of these projects and their budgets, briefly sketched in the following section, reflects a major trend from private to public funding.

4.3. Excavating infrastructures. The brine collector: from private investment to public responsibility

Before the brine collector was finished in 1989, several projects were prepared. They are all conserved in *Archivo General de la Administración* in Alcalá de Henares (Madrid). While in the 1980s the project was financed by the state, the first drafts prepared during the brief democratic period of the 1930s included a distribution of costs among different agents. The collector was regarded as an investment that would permit full exploitation of the potash mines. Therefore, mining companies had to pay 60% of the cost of the infrastructure, while the state would give 25% of the cost. SGAB and other water companies would pay 10% and municipalities 5%⁵.

The projects shelved in the archives also include relevant comments from the engineers. During the 1940s, one of them argues in a private report that it was widely known that one mining company had prepared plans to build the brine collector assuming full costs. However, such plans were not made public because the company administration considered that this infrastructure could be done by the state in case the issue was properly presented “as a problem of national interest”⁶ (Gorostiza *et al*, in prep.).

5. CONCLUSION

Since the 1920s, increasing flows of potassium have been loaded in cargo trains near the Bages mines, freighted to Barcelona's harbour and shipped around the world to make up for the growing “metabolic rift” in world agriculture. In parallel, first the water flows of the Llobregat and Cardener, and after 1989 also those of the brine collector, have transported chlorine and other substances back to the sea where they once belonged. Part of these materials are now captured in the reverse osmosis filters installed in water treatment stations, but a small part has been also settling in the bodies of water users and other natural organisms for years. Joan Martínez-Alier's definition of externality as a “cost-shifting success” (Martínez-Alier, 2002) proves very appropriate for this case study, when it comes to the long history of the brine collector project and the recent public investments for environmental remediation.

A historical perspective helps ground understandings of current socio-ecological struggles and socio-technical configurations. The fifty years that separate the financing plans of the first brine collector project from the one which was finally carried out during the 1980s illustrate the cost-shifting success of mining companies. But, in addition, since the 1930s the brine collector has represented the promise of a “definite” and “permanent” technological solution to the hazards produced by the mining activity. Nowadays it's reverse osmosis filters that play this role, more visible than the collector due to their novelty. However, both endeavours are examples of “technological fixes” to the degrading conditions of rivers and their potentially harmful effects to human health.

The historical evolution of the conflict not only unveils changes in the financing characteristics of the environmental remediation projects, but also how certain actors involved in the struggle have modified their positions. Fishing associations – an active actor during the 1930s – have lost all prominence today. Barcelona private water company (SGAB) has shifted from being an active promoter of the protection of the Llobregat water supply to become the private manager of the brine collector. New associations, such as non-governmental organizations related to the green movements, have emerged as the main advocates of environmental protection. The presence of the conflict in the public debates of the 1930s, however, can be a relevant asset for present-day activists, for at least two reasons. On one hand, it shows that today's conflict among private mining companies and the public sphere is very similar to the one discussed in

5 Collection 24, box 14511, Archivo General de la Administración.

6 “Proyecto de replanteo y reformado del colector de aguas residuales de las explotaciones mineras de la cuenca del Llobregat. Informe del Ingeniero Jefe, Director de Obras”. Collection 24, box 14.380, Archivo General de la Administración.

the 1930s. On the other hand, maybe more importantly, it connects today's struggles to an earlier concern not only for the environment but also for health.

From another perspective, this case study also illustrates the relevance of water quality in conditioning the water supply of a region. Water histories are usually written from the point of view of the need for a growing supply. Yet for years, quality was a limiting factor for the Llobregat River: water was just too saline to be used. Only recently has desalinisation become an option, and until 1956, there was no reservoir to regulate the river flow during the year. Therefore, the salinisation of the main water source for the area of Barcelona necessarily affected the configuration of the whole water supply system (e.g. Ter water transfer from Girona in the late 1960s).

Last but not least, the revealing disruptive impact of the Spanish Civil War constitutes a counter-intuitive example of the relevance of the environmental consequences of armed conflicts. Growing literature on environmental histories of war has described different unexpected consequences of armed conflicts for the environment (Cooper, 2008; Laakkonen, 2004; McNeill, 2001). In addition, this case study shows the empirical significance that disruptive episodes such as wars can have for the study of the environmental impact of extractive activities.

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REFERENCES

- 8tv, 18 May 2013, "L'última mina de sal", <http://www.8tv.cat/8aldia/equip-reporters/ultima-mina-de-sal/> Last accessed 21 May 2013.
- AGÈNCIA CATALANA DE L'AIGUA, 14 January 2011. "Actuacions portades a terme per l'Agència Catalana de l'Aigua per la minimització de la incidència dels runams salins de la comarca del Bages i la millora de la qualitat de les aigües superficials i subterrànies de la conca del riu Llobregat", <http://www.lasequia.cat/montsalat/Documentacio/140111%20ACA%20Actuacions%20Bages.pdf> Last accessed 19 May 2013.
- ARA, 25 April 2011, "Iberpotash potencia la mina de Sùria a Europa", 17.
- ARMIERO, M. (2011): *A Rugged Nation: Mountains and the Making of Modern Italy*. The White Horse Press. Cambridge. 228 p.
- BADIA, J. (2001): "La salinització de la conca del Cardoner-Llobregat al Bages". In *Butlletí de la Institució Catalana d'Història Natural*, n°69, pp. 127-138.
- BÄTJER, K., GABEL, B., KOSCHORREK, M., LAHL, U., LIERSE, K. W., STACHEL, B. THIEMANN, W. (1980): "Drinking Water in Bremen: Trihalometanes and Social Costs. A Case Study of Bromoform Formation During Chlorination of River Water Highly Contaminated with Bromide Ions". *The Science of the Total Environment*, n°14, pp. 287-291.
- CAÑEDO-ARGÜELLES, M., GRANTHAM, T.E., PERRÉE, I., RIERADEVALL, M., CÉSPEDES-SÁNCHEZ, R., PRAT, N. (2012): "Response of stream invertebrates to short-term salinization: a mesocosm approach". *Environmental Pollution*, n°166, pp. 144-151.
- CAÑEDO-ARGÜELLES, M., KEFFORD, B.J., PISCART, CH., PRAT, N., SCHÄFER, R.F., SCHULZ, C.J. (2013): "Salinization of rivers: An urgent ecological issue". *Environmental Pollution*, n°173, pp. 157-167.
- CLARK, B. & FOSTER, J.B. (2012): "Ecological Imperialism and the Global Metabolic Rift: Unequal Exchange and the Guano / Nitrates Trade". *International Journal of Comparative Sociology*, n°50, pp. 311-334.

- CONSEJO DE MINERÍA (editions from 1926 to 1951): *Estadística Minera y Metalúrgica de España*. Madrid: Ministerio de Industria y Comercio.
- COOPER, T. (2008): "Challenging the 'refuse revolution': war, waste and the rediscovery of recycling, 1900–50". *Historical Research*, nº81, pp. 710-731.
- DAVIS, D. K. (2009): "Historical political ecology: On the importance of looking back to move forward". *Geoforum*, nº40, pp. 285-286.
- FÀBREGA ENFEDAQUE, A. (2009): *Cum grano salis: la sal i la potassa a Sùria 1185-1982*. Ajuntament de Sùria: Iberpotash. Sùria. 623 p.
- FÀBREGA ENFEDAQUE, A. (2012): *Centenari del descobriment de la potassa: 1912-2012*. Iberpotash: Lunwerk. Barcelona. 218 p.
- EL BE NEGRE, 24 April 1935, 2.
- EL PAÍS, 14 October 2012, "El proyecto de las minas de Alquife enfrenta a Andalucía oriental", http://ccaa.elpais.com/ccaa/2012/10/14/andalucia/1350234803_323354.html Last accessed 19 May 2013.
- EL PAÍS, 12 November 2012, "El Congo ourensano", http://ccaa.elpais.com/ccaa/2012/11/11/galicia/1352660674_703435.html Last accessed 19 May 2013.
- EL PAÍS, 11 March 2013, "España cuenta con recursos de gas no convencional para 39 años de consumo", http://sociedad.elpais.com/sociedad/2013/03/11/actualidad/1363007835_761341.html Last accessed 19 May 2013.
- EL PAÍS, 22 April 2013, "Una mina de plata, plomo y oro amenaza dos reservas de la biosfera", http://sociedad.elpais.com/sociedad/2013/04/22/actualidad/1366658749_012013.html Last accessed 19 May 2013.
- EL PAÍS, 16 May 2013, "La Xunta tramita multiplicar por 10 el área para buscar oro en Bergantiños", http://ccaa.elpais.com/ccaa/2013/05/15/galicia/1368644382_554534.html Last accessed 19 May 2013.
- EL PERIÓDICO, 1 November 2012. "La Generalitat ha invertit 200 milions per pal·liar la pol·lució d'Iberpotash", <http://www.elperiodico.cat/ca/noticias/economia/govern-invertit-200-milions-palliar-pollucio-2239502> Last accessed 21 May 2013.
- EL PERIÓDICO, 9 May 2013, "Fianza "light" a Iberpotash", <http://www.elperiodico.com/es/noticias/economia/fianza-light-iberpotash-2385958> Last accessed 21 May 2013.
- GRAHAM, S., (2010): "When Infrastructure Fails". In: GRAHAM, S. (Ed.): *Disrupted Cities. When Infrastructure Fails*, pp. 1-26. New York, London. Routledge.
- GOROSTIZA, S. (2010): "El conflicto salino en el suministro de agua a Barcelona (1925-1940)". Communication in *Encuentro Científico Salud y ciudades en España, 1880-1940*. Barcelona.
- GOROSTIZA, S.; MARCH, H. and SAURÍ, D. (2012): "Servicing customers in revolutionary times: the experience of the collectivized Barcelona Water Company during the Spanish Civil War (1936-1939)". *Antipode*, nº45 (4), pp. 908-925.
- GOROSTIZA, S.; HONEY-ROSÉS, J. and LLORET, R. In prep.: *Rius de Sal. Una visió històrica de la salinització dels rius Llobregat i Cardener durant el segle XX*.
- HONEY-ROSÉS, J. (2012): *Ecosystem Services in Planning Practice for Urban and Technologically Advanced Landscapes*. PhD Dissertation. Department of Urban and Regional Planning, University of Illinois, Urbana-Champaign.
- LA VANGUARDIA, 23 April 1935, 25.
- LA VANGUARDIA, 11 July 2012, "¿Gas entre sal?", *Vivir magazine*, 1-3.
- LA VANGUARDIA, 19 October 2012, "Iberpotash construye en Sùria el mayor túnel subterráneo de España", 56.
- LA VANGUARDIA, 18 February 2013, "David y la montaña de residuos de sal", *Vivir magazine*, 4.

- LAACKONEN, S. (2004): "War—An ecological alternative to peace? Indirect impacts of World War II on the Finnish environment". In: TUCKER, R. P. & RUSSELL, E. (Eds) *Natural Enemy, Natural Ally: Toward an Environmental History of Warfare*, pp. 175-194. Oregon State University Press. Corvallis.
- LEVY, H. (1935): *Industrial Germany. A study of its monopoly organisations and their control by the state*. Kitchener: Batoche books.
- LLORÉ, R. (2004): "La qualitat de l'aigua del riu Llobregat. Un factor limitant del passat, un element clau per al futur". In: PRAT, N. & TELLO, E. *El Baix Llobregat: història i actualitat ambiental d'un riu*, pp. 92-141. Centre d'Estudis Comarcals del Baix Llobregat. Barcelona.
- LOTTERMOSER, B.G. (2010): *Mine Wastes. Characterization, Treatment and Environmental Impacts*. Heidelberg Dordrecht, London, New York. Springer.
- MARTÍ IBÁÑEZ, F. (1937): *Obra: diez meses de labor en sanidad y asistencia social*. Tierra y Libertad. Barcelona. 212 p.
- MARTÍN-ALONSO, J. (1994): "Barcelona's Water Supply Improvement: The Brine Collector of the Llobregat River". *Water Science and Technology* n°30 (10), pp. 221-227.
- MARTÍNEZ-ALIER, J. (2002): *The Environmentalism of the Poor*. Cheltenham, Northampton. Edward Elgar Publishing Limited.
- MARTÍNEZ-ALIER, J., KALLIS, G., VEUTHEY, S., WALTER, M., TEMPER, L. (2010): "Social Metabolism, Ecological Distribution Conflicts, and Valuation Languages". *Ecological Economics* n°70, pp. 153-158.
- MCNEILL, J. (2001): *Something New Under the Sun: An Environmental History of the Twentieth-Century World*. New York, London. W&W Norton & Company.
- O'CONNOR, J. (1991): "On the two contradictions of capitalism". *Capitalism Nature Socialism*, n°2(3), pp. 107-109.
- OFFEN, K. (2004): "Historical Political Ecology: An Introduction". *Historical Geography*, n°32, pp. 19-42.
- O'NEILL, J. (2007): *Markets, Deliberation and the Environment*. Routledge.
- OLIVER SUÑÉ, B. (coord.) (1974): "La polución de las aguas utilizadas para el abastecimiento de Barcelona y su comarca". *Anales de Medicina y Cirugía*, n°237, pp. 214-254.
- ÖSTLUND, L., ZACKRISSON, O. and STROTZ, H. (1998): "Potash Production in Northern Sweden: History and Ecological Effects of a Pre-industrial Forest Exploitation". *Environment and History*, n°4, pp. 345-358.
- OTERO, N. & SOLER, A. (2002): "Sulphur isotopes as tracers of the influence of potash mining in groundwater salinization in the Llobregat Basin (NE Spain)". *Water Research*, n°36, pp. 3989-4000.
- PRAT, N. & RIERADEVALL, M. (2006): "25 years of biomonitoring in two Mediterranean streams (Llobregat and Besòs basins, NE Spain). *Limnetica* n°25 (1-2), pp. 541-550.
- ROBBINS, P. (2004): *Political Ecology. A Critical Introduction*. Malden, Oxford, Carlton: Blackwell Publishing.
- SOCIEDAD GENERAL DE AGUAS DE BARCELONA (1939): *Memoria Correspondiente al Periodo 1936-1938*. Sociedad General de Aguas de Barcelona. Barcelona.
- U.S.GEOLOGICALSURVEY (2013): 2011 Minerals Yearbook. Potash (Advance Release). U. S. Department of the Interior. U. S. Geological Survey. <http://minerals.usgs.gov/minerals/pubs/commodity/potash/myb1-2011-potas.pdf> Last accessed 2 November 2013.
- VILLANUEVA, C. (2003): *Subproductes de la Desinfecció de l'Aigua Potable i Càncer de Bufeta Urinària*. PhD Dissertation. Bellaterra: Universitat Autònoma de Barcelona.
- WATTS, M. & PEET, R. (2004): "Liberating political ecology", in PEET, R. & WATTS, M. (Eds.), *Liberation Ecologies* (2nd edition), pp. 33-43. London and New York. Routledge.