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From Silver Mining in the Early Modern Age to Present Rights of Nature: An Environmental History of Bolivia through Two Case Studies (16th – 21st Centuries)

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RIASSUNTO

Questa tesi esamina la storia ambientale della Bolivia attraverso due casi studio, uno riguardante l'età moderna, l'altro quella contemporanea. La metodologia proposta dalla disciplina della Storia Ambientale mi ha ispirato a prendere in considerazione un arco temporale molto ampio, che riunisce questi due periodi storici. La Storia Ambientale mette infatti in luce la necessità di operare sul lungo periodo, studiando lo svolgersi dei fenomeni nel corso dei secoli, al fine di comprenderne gli impatti e le evoluzioni a livello ambientale.

La prima parte della tesi analizza i risvolti ecologici della produzione di argento nella Bolivia coloniale, concentrandosi sulla famosa città mineraria di Potosí, fondata dagli spagnoli verso la metà del sedicesimo secolo. La seconda parte dell'elaborato invece si sposta nel presente, riflettendo sul dibattito circa i "Diritti della Natura", una novità in campo legale che ha trovato terreno fertile nei paesi andini, Bolivia ed Ecuador in particolare.

L'obbiettivo di questo lavoro è duplice. In primo luogo, l'elaborato punta a comprendere e delineare gli effetti ambientali dell'estrazione dell'argento in ambito coloniale, unendo saperi scientifici e ricerca storica. Dall'altro lato, la tesi si propone anche di mettere in luce come un paese come la Bolivia, storicamente legato allo sfruttamento delle risorse naturali, sia stato anche in grado di adottare politiche ambientali decisamente innovative, diventando uno dei primi stati al mondo a riconoscere esplicitamente l'esistenza di diritti per il mondo naturale.

La storia ambientale della Bolivia, dal sedicesimo secolo sino ai tempi odierni, unisce episodi di profondo degrado ambientale e sfruttamento intensivo a coraggiosi tentativi di salvaguardia. Si tratta di una storia ricca di sfaccettature, spesso contraddittoria, in cui si intrecciano dinamiche e interessi distinti e contrapposti. L'elaborato, infatti, non prende in considerazione esclusivamente l'aspetto ambientale, ma riflette anche sul ruolo economico e finanziario che l'argento sudamericano ha avuto nella prima età moderna, nonché sui risvolti sociali provocati dalla sua estrazione. Nella parte finale, il lavoro tenta di tracciare un cauto bilancio del riconoscimento dei diritti nella Natura in Bolivia, riflettendo sulla modesta efficacia delle misure adottate, pur riconoscendone il valore altamente simbolico, specialmente in ambito internazionale.

Il mio interesse per la storia ambientale è maturato nel corso del primo anno di studi, seguendo le lezioni di Storia Globale tenute dalla Prof.ssa Giulia Delogu. Durante le prime ricerche bibliografiche mi sono imbattuta nel caso di Potosí, che mi è sembrato un buon punto di partenza per comporre un'analisi storica sul lungo periodo, che riflettesse su dinamiche passate per mettere in luce determinati aspetti del presente. Un elaborato sviluppato nel secondo anno

di studi, che esplorava la questione dei diritti della natura e la poneva in relazioni a vari testi costituzionali, mi ha portato a conoscere più approfonditamente il caso della Bolivia. Da questa consapevolezza è nato il mio tentativo di collegare due epoche storiche lontane tra loro e due argomenti solo all'apparenza distinti, tentando in ultima analisi di offrire alcuni spunti di riflessione per il futuro.

La tesi, prendendo ispirazione dalle metodologie di ricerca proposte dagli storici ambientali, utilizza fonti e documenti che pertengono a diversi ambiti accademici, tentando di fondere assieme informazioni e saperi di varia natura. Il risultato è dunque un approccio fortemente interdisciplinare. Vengono considerati documenti di natura storica e storico-economica, ma anche lavori di stampo scientifico, nonché saggi che trattano di politica ambientale e diritto ambientale.

Sebbene i casi studio analizzati riguardino la dimensione regionale e nazionale, questo lavoro riflette anche sulla dimensione internazionale, prendendo in considerazione e analizzando dinamiche transcontinentali e interazioni globali. Gli eventi locali e nazionali, nello specifico l'inquinamento nell'area di Potosí in epoca coloniale e le politiche ambientali adottate in epoca contemporanea, sono infatti messe in relazione con eventi e forze molto più ampie, che concernono la dimensione internazionale. In questo modo, il lavoro mira anche a riflettere su come dimensione locale e dimensione globale siano fortemente interconnesse, influenzandosi a vicenda sia nel passato che nel presente.

La tesi segue un approccio storico, di natura dunque qualitativa. Si basa sulla raccolta di dati, fonti ed informazioni, attraverso la ricerca d'archivio, nonché sulla revisione della letteratura esistente. Le fonti usate sono sia di natura primaria che secondaria. Vengono infatti analizzati racconti storici originali, articoli costituzionali, e leggi che trattano di protezione ambientale, oltre che saggi accademici, monografie e articoli di riviste scientifiche. Dato che questo lavoro si concentra in particolare sulla Bolivia, ho anche provveduto a consultare e incorporare nel testo risorse e fonti in lingua spagnola. Questo è particolarmente evidente nell'ultimo capitolo, dove vengono usati articoli di quotidiani boliviani e sudamericani in generale, report di agenzie non governative e scritti di autori di madrelingua spagnola.

Il primo capitolo propone un'introduzione sulla disciplina della storia ambientale, sulle sue origini accademiche e sulle metodologie di ricerca adottate dagli studiosi che decidono di dedicarsi a questo ambito. Questa prima parte sottolinea in particolare la forte tendenza interdisciplinare della storia ambientale. Il suo tratto più innovativo è infatti la capacità di avvicinare la storiografia tradizionale, di stampo umanistico, alle scienze naturali, ad esempio la biologia, la chimica e la zoologia. Questo porta gli storici ambientali a collaborare con

esponenti della comunità scientifica, spesso adottandone le fonti e addirittura i metodi di ricerca. Oltre alle scienze naturali, le scienze sociali come l'economia, la sociologia, l'antropologia, nonché la geografia e l'archeologia, sono tutte discipline utili agli storici dell'ambiente. La disciplina predilige inoltre una storia improntata sul medio-lungo periodo, che tiene conto delle interazioni tra passato e presente, nonché dei collegamenti tra macro e micro, dunque tra dimensione globale e dimensione locale.

Il capitolo iniziale presenta anche un quadro concettuale, chiarendo il significato di tre termini chiave, tutti collegati agli eventi discussi nei capitoli seguenti. I termini in questione sono antropocentrismo, Antropocene e Scambio Colombiano.

Il secondo capitolo si apre con una breve panoramica sulla prima età moderna, che è il periodo storico in cui è inserito il primo caso studio, quello della miniera d'argento di Potosí. Si tratta di un tempo storico particolarmente interessante da analizzare, dato che proprio a cavallo tra quindicesimo e sedicesimo secolo è possibile captare i primi segnali di un mondo globalizzato. Viene inoltre presentato un brevissimo resoconto della storia coloniale della Bolivia, nonché del successivo processo di indipendenza dalle autorità spagnole.

Il resto del capitolo è dedicato al caso studio di Potosí. Vengono analizzate le conseguenze ambientali dell'estrazione dell'argento, mettendo in luce l'alto tasso di inquinamento che interessò la zona, derivante dall'utilizzo dell'amalgama di mercurio durante il processo di raffinazione. Partendo da studi che utilizzano un programma denominato AERMOD, viene proposta una stima delle quantità di emissioni inquinanti che hanno interessato la città boliviana, dal 1570 all'inizio del 1800. Dai camini utilizzati nella miniera, il mercurio si dissolveva nell'aria, raggiungendo l'atmosfera, e nell'acqua, contaminando fiumi e organismo acquatici. L'inquinamento da mercurio interessò anche il terreno, che ancora oggi presenta livelli molto alti di tossicità. Entrando a far parte della catena alimentare, il mercurio entrava anche nell'organismo umano, provocando ingenti danni alla salute. Inoltre, l'esposizione ai vapori delle miniere, intrisi di microparticelle di mercurio, aveva un effetto deleterio sulla salute dei nativi che lavoravano all'estrazione dell'argento. Recenti studi hanno evidenziato come l'intossicazione da mercurio possa provocare sintomi quali febbre, spasmi muscolari, sudorazione eccessiva, difficoltà di movimento, perdita di memoria e persino improvvisi scatti d'ira. Queste condizioni sembrano trovare un riscontro nei racconti dei contemporanei dell'epoca, che notarono la violenza e le cattive condizioni di salute che interessavano gli abitanti della zona. L'inquinamento non fu inoltre un fenomeno isolato alla sola città di Potosí, ma si estese fino a molti chilometri di distanza, interessando anche siti come quello di Huancavelica, nell'attuale Perù, che forniva il mercurio necessario al processo di amalgama.

La vicenda di Potosí dimostra chiaramente come, già nel sedicesimo secolo, l'attività umana stesse causando danni ambientali quasi irreversibili, dal momento che gli effetti dell'inquinamento da mercurio perdurarono nei secoli, arrivando fino ai giorni nostri.

Il terzo capitolo posiziona l'argento di Potosí in un più ampio contesto internazionale, focalizzandosi sulle interazioni globali messe in moto dal commercio dell'argento sudamericano, gestito, non senza difficoltà, dall'Impero spagnolo. Dal nuovo mondo l'argento raggiungeva infatti sia l'Europa che il continente asiatico, arrivando fino alla corte della Cina imperiale, che ne domandava grandissime quantità. Il collegamento diretto tra Cina e Sudamerica, stabilito a partire dal 1571, viene considerato da molti storici come il segno definitivo della nascita del commercio globale. L'argento sudamericano, di cui una grande parte proveniva proprio dalla miniera di Potosí, giocò dunque un ruolo decisivo per l'economia del mondo moderno. La grande quantità di argento proveniente dalle Americhe ebbe anche effetti monetari notevoli, dato che fu parzialmente responsabile di livelli di inflazione decisamente elevati, sia in Europa che in Cina. Tracciando le rotte del commercio dell'argento è dunque possibile rintracciare i primi segnali di un mondo globalizzato.

Il capitolo si conclude con un parallelismo tra l'argento nell'età moderna e i combustibili fossili nel tempo presente. Viene infatti presentata una riflessione su come questi due elementi abbiano da un lato provocato ingenti danni ambientali a livello locale e regionale, ma dall'altro abbiano beneficiato l'economia internazionale, facendo la fortuna dei paesi esportatori. Nonostante questo risultato positivo, il caso della Spagna, che per troppo tempo fece affidamento sui ricavati delle attività minerarie per sostenere il proprio sforzo imperiale, ci ricorda che l'attuale dipendenza dai combustibili fossili come fonte di energia e di reddito non è sostenibile in chiave futura, sia da un punto di vista ambientale che economico. La forte specializzazione sull'industria estrattiva da parte di molti stati, tra cui figura anche la Bolivia, rappresenta perciò un rischio a lungo termine, nonostante queste attività abbiano comportato una reale crescita economica in molti paesi in via di sviluppo. Il terzo capitolo invita dunque il lettore a riflettere su quanto determinate dinamiche passate trovino ancora un riscontro nel presente.

L'ultimo capitolo dell'elaborato si sposta nel tempo presente. Una breve parentesi sulla storia recente della Bolivia conduce il lettore alla successiva analisi del caso contemporaneo dei diritti della Natura nel contesto Andino. Seguendo infatti l'esempio dell'Ecuador, la Bolivia è diventata una delle prime nazioni al mondo a riconoscere una nuova categoria di diritti, quelli che riguardano l'ambiente, all'interno del suo ordinamento. La costituzione del 2009, all'articolo 33, sancisce il diritto ad un ambiente sano, a favore degli esseri umani ma anche di "altri esseri viventi", aprendo dunque le porte al riconoscimento di diritti specifici per il mondo

naturale. Questo primo passo verso una concezione biocentrica della vita ha poi trovato un ulteriore riscontro nella successiva *Ley De Derechos de la Madre Tierra* del 2010. La legge recupera il concetto di Natura come "Madre Terra" o "Pachamama", un'entità brulicante di vita, da cui l'essere umano dipende, così come tutti gli esseri viventi. La legge riconosce esplicitamente la Madre Terra come portatrice di alcuni diritti, tra cui il diritto al ripristino.

Queste innovazioni in campo giuridico trovano profonda ispirazione nella cosmovisione dei popoli andini, e nel concetto di *Buen Vivir*, che rappresenta un ideale di vita condotta in armonia con l'ambiente e la comunità circostante. Tali proposte si differenziano non di poco dall'impostazione spiccatamente antropocentrica che caratterizza le società occidentali in particolare. La filosofia di vita andina, così come l'attivismo da parte delle tante comunità indigene boliviane sin dai primi anni 2000, hanno giocato un ruolo determinante nell'emergere di un vero dibattito nazionale su questi temi. L'ex presidente Evo Morales si è posto come un modello in questo senso, sia all'interno dei confini del paese, sia nel panorama internazionale, ribadendo l'importanza della dimensione indigena nella lotta al degrado ambientale e al cambiamento climatico di natura antropica. Nonostante questi coraggiosi tentativi di salvaguardia, il governo Morales, così come i successivi governi boliviani, hanno continuato a scommettere sull'industria estrattiva come principale motore di crescita economica. Ad oggi, il paese rimane fortemente ancorato allo sfruttamento intensivo delle risorse naturali, e i diritti dell'ambiente non sono stati in grado di proteggere specie ed ecosistemi a rischio a causa di tali attività. Aree protette come parchi e riserve naturali, molto spesso abitati anche da comunità native, continuano così ad essere negativamente interessate dalle attività minerarie. La parte conclusiva del capitolo riflette dunque sui risvolti pratici delle politiche ambientali boliviane, facendo uso anche di report da parte di ONG e articoli di giornali locali.

In ultima analisi, i diritti della Natura in Bolivia rimangono molto forti sulla carta, ma hanno sinora prodotto risultati modesti a livello pratico. Resta comunque elevato il loro valore simbolico. Il paese ha saputo ispirare un acceso dibattito su questi temi a livello internazionale, mettendo così in luce la necessità di adottare misure innovative per salvaguardare il pianeta. Altri paesi hanno seguito l'esempio di Ecuador e Bolivia, e attualmente i diritti della Natura sono un argomento discusso anche a livello delle maggiori istituzioni internazionali.

La storia ambientale della Bolivia, che il presente lavoro ripercorre focalizzandosi su due casi studio specifici, si propone come ricca di spunti di riflessione, anche in ottica futura. La tesi tenta di mettere in luce diversi aspetti legati agli eventi discussi, interrogandosi sui collegamenti e le somiglianze tra passato e presente, prendendo in considerazione sia la dimensione locale che quella internazionale.

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INTRODUCTION

This thesis examines the environmental history of Bolivia through two case studies, pertaining on one hand to the Early Modern Age, and on the other to the contemporary period. The methodology of environmental history inspired me to examine a time frame that brings together these two different historical periods. Indeed, this discipline highlights the need to conduct long-term analysis, paying attention to the unfolding of specific phenomena over the centuries to understand environmental impacts and evolutions.

The first part of this work analyses the environmental consequences of colonial silver mining in the Andes region, taking the well-known mine of Potosí as a case study. The city was founded by Spanish colonisers in 1545 and soon became home to one of the most prolific silver mines of the early modern period. The second part of the thesis is instead set in the contemporary age. It provides a reflection on the current debate on the Rights of Nature as an innovative legal instrument to protect the environment from anthropogenic degradation and pollution. Bolivia offers in this sense an interesting case study, as here the debate on Nature's rights has produced some results starting from 2009. In this sense, the country set an inspiring example for other members of the international community.

This work has, in this sense, two main objectives. Firstly, it aims at understanding and outlining the effects that silver extraction had on the local Andean environment during the colonial period. It attempts to do so by bringing together classic historical research and scientific knowledge. Secondly, the thesis also aims to highlight how a country like Bolivia, historically dependent on the intensive exploitation of its natural resources, has been able to adopt innovative policies in terms of environmental protection. Indeed, Bolivia was one of the first countries in the world to officially recognise Nature's rights within its legal system.

Bolivia's environmental history, from the 16th to the 21st century, brings together episodes of profound environmental alterations and brave efforts towards environmental safeguard. It is a rich and sometimes contradictory history, in which different and often conflicting interests come to light. This work does not only pay attention to the environmental aspect, but, on the contrary, also reflects on broader commercial, financial, and social dynamics, taking into consideration the local as well as the international dimension.

The thesis also attempts to reflect on the complex and ever-evolving relationship between Nature and human populations, as well as on the historical intertwinement of environmental degradation, social security issues, and economic interests.

As already noted, the two case studies discussed pertain to two different historical periods. In particular, the events analysed in the first three chapters are set in the Early Modern Age, a pivotal time for transcontinental interactions, innovations, and deep cultural, ecological, political and economic transformations. This historical period is particularly interesting for historians. Indeed, it is precisely between the 15th and the 16th century that the first signals of a globalized world can be noticed.

According to the methodology proposed by environmental historians, this work attempts to bring together various academic backgrounds, exploring themes related to different domains, including colonial history, natural science, economics, and environmental law. Reading the works of several environmental historians inspired me to adopt an interdisciplinary approach in my research. To do this, I tried to incorporate scientific knowledge into historical analysis, to shed more light on the events taken into consideration.

In addition, although the dissertation focuses on Bolivia as a case study, it also pays attention to global interactions and international dynamics. Following the methods of investigation proposed by global historians, local events – in this case, local environmental pollution in Potosí – are in fact put in relation to wider international trends. This is done to investigate how local and global events mutually influence each other.

This work was inspired by Professor Giulia Delogu's university course on global history and by a subsequent academic paper I wrote on the recognition of the Rights of Nature in constitutional texts around the world. The case of Bolivia and of the silver mine of Potosí offered me the possibility to explore the topic of historical environmental degradation and put it in relation to recent trends that aim at overcoming classic anthropocentric approaches and formulating new propositions to safeguard our planet.

The thesis follows a historical and therefore qualitative approach. It relies on the method of data gathering and literature review, through archival and desk research, to collect all the necessary sources and information concerning the chosen topic. This work makes use of primary sources such as constitutional articles, national laws, reports, and historical accounts, and secondary sources such as academic papers and articles from scientific journals. Furthermore, given the focus on Bolivia, I attempted to consult and incorporate Bolivian and Latin American primary sources, especially for what concerns the last chapter, where I used local newspaper articles and NGO reports.

The thesis first provides a historical and methodological background on the discipline of environmental history. This first part emphasizes the interdisciplinary approach of the field, which integrates traditional historiography with data and modes of analysis pertaining the

natural sciences, as well as other fields of knowledge. This discipline is oriented towards long-term analyses, which can shed light on the interaction between the past and the present. This chapter also includes a brief overview of the main characteristics of Latin American Environmental History, which highlights the main themes and the main representatives of the discipline in this geographical context. A conceptual framework follows afterwards. The chapter provides an explanation and a brief reflection on three key terms, which are linked to the different themes and dynamics discussed in the dissertation. The three key terms are anthropocentrism, Anthropocene, and Colombian Exchange.

The second chapter opens with a general overview of the Early Modern Age, emphasizing the dynamism and the global interactions that characterized this historical period. A very brief historical account of colonial Bolivia is also presented, focusing in particular on the country's reliance on silver extraction and refining since the early 16th century. The chapter then moves to an in-depth analysis of the environmental consequences of silver extraction in Potosí. Mercury amalgamation, a refining technique introduced by the Spaniards towards 1570, increased the mine's overall productivity but also produced extremely negative consequences for the environment. Indeed, the site of Potosí was affected by widespread mercury air, soil and water pollution. Relying on existing studies that use a computer model denominated AERMOD, an estimate of the mercury emissions that polluted the city in the course of the colonial period is presented. The health complications resulting from mercury intoxication are also mentioned and discussed. This chapter attempts to combine historical analysis with scientific research, data and sources, in order to provide a comprehensive overview of the phenomenon of mercury contamination in the Andean region.

The third chapter then situates the case study of Potosí in a broader, international context, focusing on the global interactions that resulted from the South American silver trade. Indeed, Spanish American silver played a pivotal role in the emergence of global trade. The direct commercial link established in the 16th century between imperial China and South America was indeed crucial for fostering transoceanic interactions and exchanges. New modes of investigation have been developed by historians and scientists to study the distribution of silver along the main commercial routes, and this has allowed scholars to gather new evidence on this phenomenon. This section also provides a personal reflection on past and present economic dependencies, drawing a parallelism between silver in the Early Modern Age and fossil fuels in the contemporary period.

The last chapter explores the innovative legislation that Bolivia has implemented to protect the environment, focusing on articles from the 2009 Constitution and from the 2010 *Ley De*

Derechos de la Madre Tierra. Bolivia was one of the first countries in the world, together with Ecuador, to officially recognize Nature's Rights, moving forward towards a biocentric approach to life and setting a powerful example for other members of the international community. The Andean cosmovision and philosophy of life, the concept of *Buen Vivir* and indigenous activism in the early 2000s played a pivotal role in the emergence of a new sensibility towards ecological issues. The final part of the chapter is dedicated to the practical implications of the recognition of this new category of rights. A reflection on the difficulties of putting such innovative principles into practice is provided. On paper, Bolivian policies on Nature's Rights are extremely courageous. At the current state of things, however, these efforts must be balanced against the country's growth needs.

In conclusion, the thesis offers a picture of Bolivia as a country historically dependent on environmentally harmful extractive activities, but at the same time open to brave innovations in the field of environmental protection. In this sense, Bolivia's environmental history provides some interesting insights and possibilities for reflection, also in a future perspective.

1. THE DISCIPLINE OF ENVIRONMENTAL HISTORY

For the sake of this dissertation, it is essential to dedicate a few pages to retrace the origins and the academic evolution of environmental history as a field of study, as well as to explain its main modes of operation and methods of research. This initial introduction to environmental history will in fact help the reader to have a clear understanding of the academic context in which this research is developed. This knowledge is important in order to gain a full comprehension of the chosen subjects and of the phenomena and events under analysis. Indeed, environmental history serves as the academic and methodological background against which this work is developed.

To do this, the first part of this paragraph will attempt to define what exactly environmental history is. Then, the paragraph will delve into the cultural and social preconditions that preceded the establishment of the discipline. Subsequently, it will outline the main methods and modes of procedure adopted by environmental historians, while also mentioning some points of critique that have been moved to the field. After having remarked the relevance of environmental history in the current academic and social context, the paragraph will conclude by providing a brief overview of the current state of art of South America's environmental history – given the focus of this work on Bolivia.

1.1 What is Environmental History? Attempting a Definition

When writing about a certain subject, the first and most logical step usually seems that of providing a clear and exhaustive definition of the chosen theme. On a general level, environmental history is considered a subfield of academic historiographic research that focuses on the study of the mutual relationship between human societies and the natural environment. As historian J.R. McNeill notes in fact, "human history has always and will always unfold within a larger biological and physical context".[1] In this sense, the main aim of environmental history is that of displaying how human activities and vicissitudes on one hand, and environmental transformations on the other, are deeply intertwined.[2] William Cronon, one of the founding fathers of modern environmental history, also offers a charming definition of the field when stating that "environmental history tries to reconstruct the endless layers of change that we and the earth have traced upon each other".[3] One last, updated definition that captures

[1] MCNEILL, J.R. "Observation on the Nature and Culture of Environmental History", *History and Theory*, vol. 42, no. 4, 2003, p. 6.
[2] MOSLEY, Stephen. *Storia Globale dell'Ambiente*, Il Mulino, Bologna, 2010, pp. 8-9.
[3] CRONON, William. "The Uses of Environmental History*", Environmental History Review*, vol. 17, no. 3, 1993, p. 19.

the essential features of the discipline is provided by the Oxford Handbook of Environmental History: "[the discipline] understands the environment in a historical context, while at the same time understanding human history in an environmental context".[4]

The peculiarity of environmental history, as highlighted by the definitions provided, is its focus on the interrelation between humans and nature. These two elements are not viewed as rigidly separated, but instead as correlated and interdependent. In this sense, this kind of historiography puts at the center of its research no single subjects or occurrences, but, rather, a mutual and evolving relationship, the one between human populations and the natural world. This very long and complex *co-evolution* has been neither stable nor linear, but rather continuously in the making. It has taken different forms in the course of history; developing sometimes as a collaboration and others as a violent clash.[5]

At this regard, it is also essential to remember that "not every human intervention is in itself an element of disturbance or even a destruction for nature" [6] and that human interventions are not exclusively negative phenomena. This point is very relevant for current environmental historians, also to avoid reiterating some past trends, which didn't appear beneficial for the development of the discipline. In fact, especially the first generation of environmental historians attracted some criticism, both inside and outside the academic world, for their tendency to mainly focus on degradation narratives, centered around loss and environmental pessimism. This, together with the risk of producing environmental deterministic accounts, were two of the main weaknesses that early environmental history had to solve, in order to produce more complex, comprehensive and constructive works, leaving aside over-simplifications, value judgements and hasty conclusions.

In addition, environmental history reminds us that the very idea of "nature" that we hold could be the product of our own cultural and historical background. Usually, we tend to use the adjective "natural" to refer to uncontaminated landscapes and environments, untouched by the human hand. However, historical and archaeological evidence indicates that most current ecosystems have undergone significant anthropogenic modifications and are therefore considered sub-natural or semi-natural. Uncontaminated environments seem thus very hard to

[4] ISENBERG, Andrew C. *The Oxford Handbook of Environmental History*, Oxford University Press, New York, 2014, p. 6.

[5] ARMIERO, Marco and BARCA, Stefania. *Storia dell'Ambiente*. *Una introduzione,* Carocci, Roma, 2004, page 55-57; MCNEILL, J.R. "The State of the Field of Environmental History", *Annual Review of Environment and Resources*, vol. 35, 2010, p. 347.

[6] RADKAU, Joachim. *Storia Globale dell'Ambiente*, LEG Edizioni, Gorizia, 2020, p. 386.

find in the 21st century.[7] Taking this into account, the adjective "natural" should not be used lightly and should always be contextualized.[8]

One of the tasks of environmental history is also reintroducing subjects of historical analysis that were long forgotten, such as forests, rivers, lakes, animal populations and terrains. This is done in order to correct the direction of mainstream history, and to overcome the anthropocentric view we hold towards the past. The challenge is ambitious, yet tremendously stimulating; allowing nature to regain its place in history, in this way "questioning the entire epistemological statute of classical historical sciences".[9]

In doing this "environmental history ought to give us [human beings] a dose of humility: we ought to accept that we are only one species among many and should gracefully share top billings at times with bisons, tsetse flies and El Niño".[10]

On a general and absolutely non-exhaustive way we could say that the main subjects of interest for environmental historians include: deforestation and the ecological evolution of forests, species extinction and species invasions, soil erosion and pollution due to human activities, exogenous-anthropogenic landscape transformations, air and water pollution, the ecological implications of urbanization and industrialization processes on specific areas or regions, the implications of natural disasters on the environment and on human societies. Each one of this themes is historically contextualized and usually studied in a comparative perspective, in an effort to link local events to wider environmental consequences. Such approach can be particularly useful not only to better understand the past, but also to uncover the causes and dynamics at the basis of today's environmental upheavals.[11]

Drawing on Donald Worster's classification,[12] many authors agree that the discipline can be divided into three main areas of inquiry.[13]

The most immediate one is *material environmental history*, that entails an in-depth study of the natural ecosystems of planet Earth, and of the physical and biological transformations that have characterized them during the course of history. Material environmental historians are therefore interested in narrating how the environment evolved over the course of time, both following its own internal rhythms and shaped by human interventions. Researchers of this field often cross

[7] RADKAU, J. *Storia Globale dell'Ambiente,* p. 15.
[8] ARMIERO, M. and BARCA, S. *Storia dell'Ambiente,* p. 62.
[9] Ivi, pp. 9-10 (translation provided by the author)
[10] MCNEILL, J.R. "Observation on the Nature and Culture of Environmental History*"*, p. 36.
[11] MOSLEY, S. *Storia Globale dell'Ambiente*, p. 12.
[12] WORSTER, Donald. *The Wealth of Nature: Environmental History and the Ecological Imagination*, Oxford University Press, 1993.
[13] MCNEILL, J.R. "Observation on the Nature and Culture of Environmental History", pp. 347-348, MOSLEY S. *Storia Globale dell'Ambiente* p.9, ARMIERO M., BARCA S. *Storia dell'Ambiente*, pp. 38-48.

borders with scholars belonging to different disciplines, such as geographers and natural scientists. An example of this exact mode of operation can be found in *History of the Countryside* (1986), written by English historian Oliver Rackham, which offers a long-term analysis of the British landscape, from prehistory to the late twentieth century. As we will see in the next paragraph, the question of which timescale to adopt is a pressing one for environmental historians.

The second area of inquiry is *socio-economic environmental history*, that focuses its attention on the connections between technological advancements, economic and social dynamics, and the environment. A good illustration, in this case, is given by the book *Dust Bowl* (1979) by Donald Worster. In this landmark work, the author explores the correlation between the violent sandstorms that interested the great American plains during the 1930s, and the wider economic and social panorama that characterized the United States at the time, attempting a direct link between the natural disaster and the Great Depression. The greatest merit of Worster, in this case, was that of being able to reinterpret major issues, such as economic recession and modes of production, under a new light, offering new modes of analysis and new sources for historians.[14] Environmental historians interested in the socio-economic dynamics use, in fact, a variety of different sources, including reports by agronomists and geologists, primary sources from government agencies, economic surveys and statistical data, as well as pools and newspaper articles.

The third and last area of inquiry is that of *cultural environmental history*. It focuses on the study of the various ideas, values, and sensibilities that human societies have attached to nature in the course of their history. This field analyses how these have changed throughout the centuries and across different geographic contexts. Among the research strands followed by cultural environmental historians we find the study of the ideological constructions that different populations have attributed to natural elements, the representations of nature in visual arts, in music and in religious traditions, the history of ecologists' movements, the adoption of national and international environmental policies as well as the history of natural sciences. In this case, the sources used by scholars are predominantly written: theological and scientific treaties, environmental laws and declarations, poetry collections, memorials, legends and folktales, but also paintings, sculptures and musical texts. *The Death of Nature: Women, Ecology and the Scientific Revolution* (1980) by Carolyn Merchant and *Man and the Natural*

[14] ARMIERO M. and BARCA S. *Storia dell'Ambiente*, p. 42.

World. Changing Attitudes in England 1500–1800 (1983) by Keith Thomas are two examples of cultural environmental history.

These three areas of inquiry can be complemental, meaning that they can be explored together. Some scholars on the other hand decide to focus on one specific area.

This work takes into consideration all three of these aspects. In the following three chapters in fact, the material consequences of environmental pollution due to silver mining will be linked to broader economic and financial dynamics. A reflection on current environmental policies in Bolivia and on the emergence of a new approach to valuing nature will also be provided, thus paying attention to the cultural aspect of environmental history.

In the present day-scenario, a pressing yet exciting challenge for environmental historians is that of integrating the environmental perspective with other categories of analysis, such as matters of ethnicity, gender, class, labor, consumption and modes of production, law and borders among many others. The gender perspective in particular seems to adapt quite well to environmental studies. Pursuing a gender analysis inside environmental history means on one hand uncovering women's role in ecological transformations and female sensibilities towards the environment over the course of history. On the other hand, a gender perspective analysis also offers scholars the possibility to review human-nature relations under a new category; that of dominion. In this way, a parallelism between the dominion of man over nature and the dominion of male bodies over female bodies can be drawn.[15] A clear link between gender and feminist studies and environmental history exists. Many works on the subject have already been produced, including *The Death of Nature* by Merchant, which was already cited in the previous page.

Taking into consideration all these different aspects and allowing them to enter the historical and environmental discourse certainly enriches the discipline, linking it even more closely with contemporary cultural and social sensibilities.[16]

Moreover, another recent novelty brought forward within the discipline is the reflection on issues of environmental justice.[17] Historical research on this topic, which is also explored by disciplines such as environmental law and social studies, has been a subject of interest for US-based historians for quite some time. In this sense, many scholars have repeatedly highlighted

[15] ARMIERO M. and BARCA S. *Storia dell'Ambiente*, pp. 35-36.
[16] ISENBERG, Andrew C. *The Oxford Handbook of Environmental History*, p. 10.
[17] MCNEILL, J.R. *The State of the Field of Environmental history*, p. 358.

how Indigenous and African American communities have often been the primary subjects of environmental injustices.[18]

Considering the size and seriousness of current climatic and environmental issues at the international level, it seems highly probable that the relevance of environmental history, both inside and outside academia, will remain constant, if not greater, in the foreseeable future. Of course, the task of environmental historians is not to find definitive solutions to the present climate crisis. However, in a very likable context of increasing extreme natural phenomena, environmental historians might be among the many other experts encouraged to share their knowledge and methods to a wider audience, to spread ecological and environmental awareness through their work.[19]

In this respect, we can clearly see the potential of an environmental history which addresses not only the academic sphere of experts and professionals, but also finds compelling ways to speak to the general public. The work of environmental historians could also be extended to national policy makers, representatives of international and transnational organizations, and environmental activists, in a shared effort to collaborate and put history at the service of not only human beings, but of the planet itself. If the demand for historical accounts grow, so will the public interest and engagement in environmental issues and dynamics. This also means that, as time goes by, environmental historians will be called upon to learn and to master increasingly complex skills. This will be required so as to provide even more accurate and acute analyses and results. From this point of view, the interdisciplinary character of the discipline and its close alliances with members of the scientific community, natural scientists in particular, seems destined to expand.

1.2 The Intellectual and Social Roots of the Discipline

The first glimpse of what would later become the discipline of environmental history can be traced back to the second part of the twentieth century, to be more precise, between the 1960s and 1970s. These two decades marked in fact an important turning point. For the first time, issues such as pollution, environmental degradation, climate change and species extinction entered the social and political sphere at the global level. In these years, a new and widespread

[18] On this point see for instance REED, T. V. "Toxic Colonialism, Environmental Justice, and Native Resistance in Silko's Almanac of the Dead.'" *MELUS*, vol. 34, no. 2, 2009, pp. 25–42., SMITHERS, Gregory D. "Native Ecologies: Environmental Lessons from Indigenous Histories." *The History Teacher*, vol. 52, no. 2, 2019, pp. 265-290.

[19] MYLLYNTAUS, Timo. "Methods in Environmental History" in *Thinking through the Environment. Green Approaches to Global History*, The White Horse Press, Cambridge, 2011, p. 11.

ecological sensibility arose among the civil society. As a consequence, associations and NGOs focused on various environmental issues began to appear. In this same time frame, reflections on the intrinsic value of nature prompted the emergence of radical propositions such as that of *Nature's Rights*.

Inspired by these new ideas and sensibilities, the first generation of environmentalist writers made its debut. Among the most well-known works of the period, we find books such as *Silent Spring* by Rachel Carson (1962), *The Closing Circle* by Barry Commoner (1971) and the article *Tragedy of the Commons* by Garret Hardin (1968).

This shared sentiment led to the first protests in favor of nature protection in various regions of the world, first and foremost in Europe and North America. Following this wave of social awareness, nature entered the political agenda with the creation of the first-ever national agencies for environmental protection. This novelty was not, of course, restricted to the national scale: at the international level, various intergovernmental bodies were soon established. This is the case for instance of the United Nations Environment Programme (UNEP), issued from the 1972 Stockholm Conference on the Human Environment.[20] This was the first-ever world conference to consider the environment as a global issue, that required global solutions. The subsequent oil shocks in 1971 and 1973 profoundly touched global economy in general and western countries in particular. Human societies began to realize that those natural resources on which they had unquestioningly relied on ever since the first industrial revolution were not unlimited, and that unconditional economic growth was a rather illusionary idea.[21]

These novelties at the social, cultural, and political level influenced the academic world. It is precisely between the 60s and 70s that we witness the emergence of a new field of historical investigation, in which the natural world began to emerge as a veritable subject of analysis, and not simply as the mere background of human activities.[22]

Yet, environmental history as an academic field did not solely stem from the ecological thinking and activism of the 60s and 70s. The discipline has in fact deeper intellectual roots, that can be traced back into the 19th century.[23] The tradition of the *École des Annales* and the historiographic research developed by US-based writers such as George Perkins Marsh,

[20] United Nation Conference on the Human Environment, https://www.un.org/en/conferences/environment/stockholm1972
[21] ARMIERO, M. and BARCA, S. *Storia dell'Ambiente*, p. 24.
[22] MOSLEY, S. *Storia Globale dell'Ambiente*, pp. 7-8.
[23] RADKAU, J. *Storia Globale dell'Ambiente*, p. 13.

Frederick Jackson Turner, and Walter Prescott Webb laid the necessary academic preconditions upon which environmental history would then develop later into the 20th century.[24]

In Europe, French historians Marc L.B. Bloch and Lucien Febvre founded, in the interwar period, the influential journal *"Annales d'histoire économique et sociale,* which marked a decisive turning point for history as an academic discipline. A critique was moved to the so-called *evenemential* way of doing history, based on single events such as military and institutional occurrences, and short periods. The Annales School favored, instead, a historical research based on the long run, in which political, economic, social, geographic, and cultural events came together as subjects of interest. The task of the historian was then that of analyzing all these different elements, following a comparative approach, to understand their relevance in the course of history.[25] The Annales School had the merit, in this respect, to suggest new fields of investigation.

In addition, even if they did not regard themselves as environmental historians,[26] the environment was nevertheless present in various works of major Annales members. This is the case for instance of *La Terre et l'évolution humaine: introduction géographique à l'Histoire* (1924) by L. Febvre or *Les Caractères originaux de l'histoire rurale française* (1931) by Marc Bloch. In these works, the strong ties that the Annales historians established with experts of human geography, rural, urban, and economic history are quite evident. It is therefore possible to note how these academic figures, belonging to different fields and subfields, laid the necessary disciplinary and cultural foundations upon which environmental historiography was later built.[27]

On the other side of the Atlantic, a similar pattern can be retraced. According to many scholars in fact, the historiography of the American frontier, carried out, in particular, by F. J. Turner (*The Significance of The Frontier in American History,* 1893) represented a valuable reference for later environmental historians in the United States. Turner and his colleagues were among the first ones to grasp the importance of linking the institutional and political context of a nation to its ecological context. Moreover, Turner was also one of the first professional historians to highlight the need to transcend the traditional divisions between disciplines, and to borrow

[24] ISENBERG, Andrew C. *The Oxford Handbook of Environmental History*, p. 4.
[25] Ivi, p. 4, ARMIERO M. and BARCA S. *Storia dell'Ambiente*, p. 21.
[26] MCNEILL, J.R., "The State of the Field of Environmental History", p. 349.
[27] ARMIERO, M. and BARCA, S. *Storia dell'Ambiente*, p. 23.

perspectives and methodologies from the emerging social sciences, economics, and sociology in particular.[28]

Following his legacy, historians of the western frontier such as Webb (*The Great Plains*, 1931), James C. Malin (*History and Ecology. Studies of the Grassland*, 1984) and ecologist such as Aldo Leopold (*A Sand County Almanac*, 1966) will bring forward the innovative trend of blending together historical research and social and natural sciences.[29]

The *Annnalistes* and the generation of Marsh, Tuner and Webb presented some differences. Nevertheless, these two strands of historical research also shared important similarities in their approach to history, that were left as a legacy to the discipline of environmental history. First of all, both groups were deeply favorable to adopting an expansive disciplinary approach, that encompassed not only history but also included emerging social sciences as economics, sociology, anthropology and geography. In the second place, the two groups shared a similar skepticism towards the idea of history as solely centered on single events and individual deeds, instead advocating for a long-term and comparative perspective.

In brief, it is certainly true that environmental history has had a very close link with environmentalist and ecologist movements born halfway between the 60s and 70s. Indeed, many environmental historians also consider themselves proud environmentalists, and regard their work also as a useful tool to engage in environmental activism.[30] Nevertheless, the intellectual roots of the discipline run much deeper, and environmental historians have revised methodologies, subjects and dynamics already prepared by previous generations of scholars, in particular by representatives of the Western History in the US and by the Annales tradition in France. To reach a comprehensive understanding of this field of history then, its interdisciplinary origins ought not to be forgotten.[31]

The first generation of proper environmental historians was predominantly of US citizenship. This group included scholars such as Roderick Nash, John Opie, Donald Worster, Alfred Crosby and Donald Hughes.[32]

Among the foundational texts of environmental history are surely some major works published in the United States. *The Columbian Exchange* (1972) by Crosby is a well-known example. This work enjoyed a vast success, at the extent that the term became a standard vocabulary for

[28] ISENBERG, Andrew C., *The Oxford Handbook of Environmental History*, p. 4. ARMIERO M., BARCA S. *Storia dell'Ambiente*, p. 20.
[29] Ibidem.
[30] CRONON, W. "The Uses of Environmental History", p. 2.
[31] ARMIERO, M. and BARCA, S. *Storia dell'Ambiente*, p. 55.
[32] MCNEILL, J.R. "The State of the Field of Environmental History", p. 349.

environmental historians all over the world. *Dust Bowl* (1979) by Worster and *Changes in the Land* (1983) by William Cronon are also listed among the sacred texts of environmental history. An important step of academic recognition for the field was certainly the inclusion of environmental history courses and programs in university curriculums. The first universities to do so were American universities in Kansas, California, and Wisconsin, but also the university of Bern in Switzerland, St. Andrews University in Scotland and the Australian National University.[33]

The discipline first gained official recognition predominantly in North America. Here, the first nucleus of environmental historians joined forces to create, in 1976, the American Society for Environmental History (ASEH), that, from the 1980s onwards, started to host regular conferences. Among the presidents of the ASEH we find notable names such as Carolyn Merchant, Susan L. Flander (*Thinking like a Mountain,* 1994) and Donald Worster.

Outside the United States, the institutionalization of environmental history followed a slower path. The European Society for Environmental History (ESEH) began to meet on a regular basis only starting in 2001. It was followed by the Sociedad Latinoamericana y Caribeña de Historia Ambiental (SOLCHA) in 2003 and by the Association of South Asian Environmental History (ASAEH) between 2007 and 2008. Other regional environmental history organizations emerged in the period 2006-2008 and all came together in the 2009 Copenhagen World Congress of Environmental History, the first global meeting for scholars in the field. This institutional path clearly shows us how, starting from its first experimental attempts, environmental history has gradually reached worldwide academic recognition. With time, the field started to attract scholars coming from every corner of the world, in this way overcoming that strong American intellectual preeminence that had marked its initial phase.[34] Since the 1980s, an extensive and wide network of environmental historians has formed. With time, historians from different geographical backgrounds have been more and more encouraged to communicate and cooperate with one another. This has provided a clear stimulus towards an internationalization of the field and has created a comprehensive literature that produces comparative environmental histories on a global scale.[35]

[33] MCNEILL, J.R. "Observation on the Nature and Culture of Environmental History", p. 12.
[34] MCNEILL, J.R. "The State of the Field of Environmental History", pp. 350-351.
[35] MOSLEY, S. *Storia Globale dell'Ambiente*, p. 11.

1.3 Sources, Methods, and Modes of Inquiry

One of the many novelties that environmental history was able to bring to classical historiographic research is its strong tendency towards an interdisciplinary as well as comparative approach. Indeed, "Influenced by the holistic nature of ecology, it has strived from the outset to be inclusive and collaborative".[36] Terms such as holism, synergism, inclusion, disciplinary collaboration and contamination are all very much present in nearly every introductory essay and book on environmental history. These are in fact the most recognizable and immediate features of the discipline's methodology.

Those who pursue the path of environmental history will often cross path with scholars belonging to a variety of different fields, including biogeography, archeology, sociology and history of economics, but also related to the sphere of natural sciences such as biology and zoology, ethology, epidemiology, climatology and genetics. In addition, speech analysis and linguistics can also offer precious insights, especially for scholars working in the field of cultural environmental history. As Italian environmental historian M. Armiero notes, him and his colleagues are called to be a *know-it-all* kind of historian [37] or are at least expected to work in team with a variety of experts.

By acquiring the useful habit of collaborating and exchanging notions with other disciplines, environmental history has successfully managed to approach two realms that for the longest time have been rigidly kept aside: that of humanities on one side and scientific disciplines on the other.[38] "Arguably, it is this attempt to combine science and the humanities that provides environmental history with its energy and intellectual niche. Environmental history works against the compartmentalization of knowledge which so many disciplinary traditions rely upon; nowhere does it do this more directly than in its integration of the insights of the sciences into its scholarship"[39]

As it was already highlighted in the previous section, the strong tendency towards cross-contamination of knowledge is also due to the close past that environmental history shares with rural and agrarian historians, as well as scholars interested in the history of technology and the history of science.

This interdisciplinary tendency is reflected in the range of sources environmental historians work with. Devoted to the arduous task of intertwining nature and history, it is somehow a

[36] Ivi, p. 9.
[37] ARMIERO M. and BARCA S. *Storia dell'Ambiente*, p. 93.
[38] Ivi, p. 32.
[39] LEWIS, Michael. "And all was light? – Science and Environmental History" in ISENBERG, A. C. *The Oxford Handbook of Environmental History*, p. 207.

necessity for them to resort to sources and data of scientific nature. These sources are then complemented by written documentary of historical nature. When these last ones are few or even lacking however, data retrieved from modern scientific technologies such as dendrochronology, pollen analysis, satellite imagery, GIS mapping [40], genetic evidence and epidemiologic research, reveal themselves particularly useful. These sources can be used to unlock precious information on the past of our planet, allowing historians to draw valuable conclusions on forgotten dynamics between human societies and their natural environment.[41]

It is for this reason that, in order to conduct a critical and detailed analysis of the sources at his or her disposal, the environmental historian must master at least some basic scientific skills and knowledges. Conducting an environmental type of history thus means being able to compare information coming from different disciplinary backgrounds and, at the same time, being always up to date with new investigation methods and technological advancements.[42]

Nevertheless, it is important to highlight that, on a general level, environmental historians do not contribute to create new scientific evidence. For the most part in fact, they rely on existing scientific notions, sources and methods and try to efficiently incorporate them in their researches and works, which is no easy task itself.[43]

Precious sources for environmental historians are, for instance, ice cores analysis, through which scholars can derive helpful insights on temperature fluctuations over the course of time. These fluctuations are important since they have direct repercussions on human dynamics, as the current climate crisis and sea level rise has very clearly showed us. Data coming from spore and pollen analysis are used to retrace deforestation in different geographical context, thereby assisting historians in finding new evidence regarding human settlement construction and agricultural patters.[44] Understanding how the vegetation of a specific area changed over time and what were the implications of this change for human activities is also possible through pollen analysis. Recent advancements in the fields of microbiology and genetics have the potential to say something about migration patterns in the distant past. Epidemiology studies and genomic analysis, on the other hand, come at the service of those environmental historians interested in diseases and past epidemics. Such topics are very relevant areas of inquiry when

[40] "Geographic Information System", a particular type of software able to integrate the features of a map with those of databases, in order to make it easier for researchers, executives and decision makers to retrieve precious information about locations and populations. For more on the topic refer to the following link: https://www.ordnancesurvey.co.uk/business-government/tools-support/gis/what-is-gis

[41] MOSLEY, S. *Storia Globale dell'Ambiente*, p. 10.

[42] ARMIERO, M. and BARCA, S. *Storia dell'Ambiente*, p. 48.

[43] MCNEILL J.R. and AGNOLETTI M. "Where is Environmental History going?" *Global Environment,* vol. 7, no. 2, 2014, pp. 521-522. LEWIS, M. "And all was light? – Science and Environmental History", p. 207.

[44] MOSLEY S. *Storia Globale dell'Ambiente*, p. 10.

writing about the Columbian Exchange and colonization patterns more in general. Lastly, developments in applied sciences have revolutionized the way archeological research is conducted, meaning that "the geo-archives of the earth itself, and the bio-archives of human remains […] are open to consultation as never before".[45]

Many environmental historians were self-trained in the natural sciences, and this is especially true for the first generations of scholars. This has meant that, at times, some of their work relied on data and evidence that the scientific community already considered outdated. Subsequent revisions were therefore needed to avoid simplifications or mistakes. This is indeed one of the implicit risks of this interdisciplinary approach to history: not being able to handle scientific knowledge with the necessary care and ability. More in-depth communication and collaboration with the producers of scientific knowledge, scientists themselves, could perhaps help historians to make better use of science in the future.[46]

The close connection that environmental history has established with natural sciences also allows historians of the field to borrow notions, categories and metaphors generally used by biologists and ecologists. This is the case for key concepts such as ecosystem, sustainability, and entropy. For instance, environmental and urban historian Joel A. Tarr [47] has successfully made use of the concept of metabolism, a term widely used in biology, to describe the complex relation existing between rural and urban areas, with the city considered as a sort of parasitic organism that depends upon agricultural areas to assure its livelihood. [48]

The method of field-research, widely used by archeologists for instance, is sometimes useful also to those environmental historians focusing their research on topsoil and forests analysis.[49]

In addition, while classical historians are traditionally *lone wolfs*[50], the habit of team working is another of the novelties brought forward in the last decade or so. Environmental historians learned this technique from environmental scientists, in particular ecologists.

On a general basis then, "the methods used tend to be more numerous and versatile in environmental history than in other fields of historical research".[51] Through the course of time, environmental historians were able to develop some methods and modes of analysis that pertains exclusively their discipline, while being very little used by other historians.

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[45] MCNEILL, J.R. "Observation on the Nature and Culture of Environmental History", p. 40.
[46] LEWIS, M. "And all was light? – Science and Environmental History", p. 207.
[47] TARR, Joel A. *The Search for the Ultimate Sink: Urban Pollution in Historical Perspectives*, The University of Akron Press, 2011.
[48] MOSLEY, S. *Storia Globale dell'Ambiente*, p. 10.
[49] ARMIERO M. and BARCA S. *Storia dell'Ambiente*, p. 38.
[50] MCNEILL J.R. and AGNOLETTI M. "Where is Environmental History going?" p. 522.
[51] MYLLYNTAUS, T. "Methods in Environmental History", p. 2.

To put it briefly, through their work and their cooperation with a wide range of experts and scientists, current environmental historians are dismantling disciplinary borders, showing how humanities, natural sciences and historiography can come together in the exploration of the complex system of nature-human relations in the course of time.

The last point to mention when reflecting on the intellectual liaison environmental history has been building with natural sciences, is that scholars of the discipline also approach science as a culturally constructed and culturally situated system of knowledge. Historians are not only interested in the latest scientific discoveries, but also in the history of science, in the role it played in different epochs. Approaching science from this other direction helps historians to retrieve precious notions on the social, cultural, and political background that produced that specific scientific knowledge. This is, in turn, reflected on the way in which populations approach and consider the material world around them. "In other words, at different moments […] environmental historians use science as a tool – a source of information about the natural world in the present and past – or as an object of study itself – an intellectual system for producing culturally situated knowledge".[52] These two approaches are not incompatible and can be incorporated by scholars even in single books, treaties or essays, so as to "historicizing not just the method, but also the evidence produced"[53]

That of time scale and spatial scale is another point that needs to be addressed when reflecting on the peculiarities of environmental history.

Among the legacies left by the Annales School is the concept of *longue durée*, pioneered by Fernand Braudel in his work on the Mediterranean.[54] Considered his most influential work, here Braudel reasons on different timescales; the endless time of geology, the longtime of cultural, economic and social history, and the so called *Histoire Événementielle*, marked by individual dates and names.

Drawing inspiration from Braudel, most environmental historians agree on the importance of conducting *longue durée* historical analyses. On the other hand, there are also environmental historians who decide to focus on short-term dynamics, such could be for instance the short-term environmental effects of the first Industrial Revolution. However, on a general level, the discipline tends to favor an approach oriented towards very long-time scales. Nature's timescales and processes are vastly different from human rhythms. Landscapes, environments, and ecosystems undergo changes over millennia and geological ages, driven by orogeny,

[52] LEWIS, M. "And all was light? – Science and Environmental History", p. 208.
[53] Ibidem.
[54] BRAUDEL, F. *La Méditerranée et le Monde Méditerranéen à l'Epoque de Philippe II*, Paris, 1949.

erosion, and gradual geographical transformations.[55] For this reason, the study of the mutual relation between human populations and the environment presents historians with a great methodological challenge. That of rethinking traditional chronologies and durations and learning to interact which subjects of analysis whose evolution is not marked by classic political or military events, but rather by nature's rhythm. In this respect, opting for a long duration history also appears in agreement with the desire, expressed by environmental historians, to overcome the anthropocentric character of mainstream history. Moreover, adopting a *longue durée*-approach could also prove useful to trace comparisons between different epochs. This thesis for instance deals with the Early Modern Age and with the present, linking them through environmental history.

The veritable challenge for this kind of historiography is finding a balance between nature's long chronologies and time-restricted human events, bringing them closer, to dig deeper into the history of the planet and of the populations that inhabited it in the course of time.[56]

The choice of operating on longer time frames becomes almost a necessity once you consider the difficulty of retracing precise start dates for environmental, climatic and ecological transformations. A certain phenomenon, take for instance the case of soil pollution, is not immediately perceived, and the consequences it generates are long-lasting and only recognizable after a lengthy period. In addition, relevant data are likely to be much more recent than the phenomenon itself. Hence the choice of reasoning on extremely dilated time frames. In fact, only in the long run it can be possible for scholars to gather relevant and comprehensive conclusions concerning ecological changes and consequent effects on humans (and vice versa).[57] In this sense, "environmental history [is] by definition a history that revolves around processes rather than events".[58]

There are, nevertheless, ecological issues that are distinctly more recent than others. Take the case of pollution from radioactive waste for instance, a problem for which a fairly precise time of appearance can be estimated. In cases such as this, an environmental history focused on a shorter time scale is also possible. It is up to scholars to locate and explore new points of reference in order to produce innovative environmental histories.

[55] ARMIERO, M. and BARCA, S. *Storia dell'Ambiente*, p. 26.
[56] Ivi, p. 27.
[57] Ivi, p. 28.
[58] Ibidem, translation provided by the author.

Connected to the matter of time is the choice of which spatial and geographical scale to adopt when tracing environmental histories. Traditionally, a classic unit of analysis for academic history has been the nation-state. It is indeed very common, when approaching environmental history's wide literature, to find many works covering national environmental histories.[59]

The choice of opting for the nation-state as the preferred research unit is also explained by the fact that, over the course of the last few centuries in particular, we have witnessed a sort of nationalistic appropriation of nature. In many cases in fact, landscapes have come to be associated with a specific population, thereby becoming part of its cultural heritage. Among the five main characteristic of a modern state, German historian and sociologist Max Weber enlisted the notion of unitary territory. Under the push of nationalistic movements and sentiments that unitary territory acquired a strong identity meaning for national populations, who started to identify themselves and their shared past in an ensemble of common elements, including specific landscape features. In addition, the profession of the historian emerged as an academic pursuit in the 19th century, a period marked by the rise of nations and national movements.[60] It should therefore not come as a surprise that the majority of historians, and among them environmental historians as well, have traditionally chosen to focus their attention on the national scale, and to draw sources from national archives and libraries.

Despite the long tradition of national histories, the holistic nature of environmental history seems to fit poorly with this nation-centered approach, even though it may appear the easiest frame to consider.[61] Environmental phenomena are, in fact, usually very trans-national and inter-national in their nature: flora and fauna can move across political borders, and so can do diseases, genes, and polluting particles. To reach a comprehensive understanding and to trace the history of a certain environmental phenomena, only focusing on a specific nation seems in some way restricting. Rather, it would seem more logic to take into consideration a whole region or ecosystem, or at least large geographical areas, to better understand the implications of the phenomena under analysis as well as their correlation with human stories.[62] Adopting a comparative perspective is also a good technique to achieve the same result. The fact that natural events have a clear cross-border character is most seen within the current climatic crisis,

[59] See for instance: BEVILACQUA, Piero. *Tra Natura e Storia. Ambiente, economie, risorse in Italia*, 1996, MERCHANT, Caroline, *Columbia Guide to American Environmental History*, 2002, TAL, Alon, *Pollution in a promised land. An Environmental History of Israel*, 2002, and ELVIN, M. *The Retreat of the Elephant: An Environmental History of China*, 2004.

[60] ISENBERG, Andrew C., *The Oxford Handbook of Environmental History*, p. 13, CONRAD Sebastian, *What is Global History?* Princeton University Press, United Kingdom, 2015, p. 21.

[61] MOSLEY, S. *Storia Globale dell'Ambiente*, p. 11.

[62] MCNEILL, J.R. *The State of the Field of Environmental History*, p. 359.

which has shown us how local questions can be deeply influenced by global trends, and vice versa.

This is true not only for material environmental history, but also for cultural environmental history, as cultural trends that deliver a specific view of nature have long moved from one place to the other over the course of time. Environmental movements and policies have also been rather transnational in their character. This will be highlighted in chapter four of this thesis, while reflecting on how the "good practice" of recognizing Nature's rights in the Andean region has influenced similar legal developments in other countries.

"Nothing appears more global than the environment itself" correctly notes historian Marco Armiero. As a consequence, "Environmental history should be the least nationalistic of all kinds of history".[63]

In this sense, environmental history has had the merit to bring to the attention of the academic world a global approach to history. This approach overcomes traditional political borders between states and populations and offers, instead, a more comprehensive and wide-spectrum portrait of human-nature relations. Environmental history is not the only subfield of history that tends to reason on a global scale. However, the themes and the questions addressed by environmental historians are, by their nature, particularly well suited with the methods and the perspectives proposed by global history.[64] Already John R. McNeill at the beginning of the 2000s had stressed how "it makes excellent sense to study environmental history on a global scale".[65]

From the 90s onwards, global history as an academic trend has gained significant recognition. Books, treaties, academic journals, seminars and study groups have been created on the subject, both in the American continent and in Europe, but also in Japan and China. Global history has also entered education, with courses entirely dedicated to it in many universities across the world.[66]

Global history proposes itself as a way to overcome the traditional focus on the Euro-Atlantic area, which is featured in mainstream history. It is an approach that strives to overcome Eurocentrism and every kind of centrism, and, in this sense, takes a clearly innovative direction from the realm of traditional academic history.

[63] ARMIERO, M. and BARCA, S. *Storia dell'Ambiente*, p. 30 (translation provided by the author).
[64] CONRAD, S. *What is Global History?,* p. 150.
[65] MCNEILL, J.R. *Observation on the Nature and Culture of Environmental History*, p. 33.
[66] CONRAD, S. *What is Global History?,* p. 17.

To verify this last observation, it is enough to think about our personal experience with history in schools and, at some extents, also in universities. Most history books tend to focus on national-scale history, and very rarely mention something relevant about the history of other civilizations. In Italy, for instance, university courses on modern and contemporary history tend to focus predominantly on Italy, Europe, and the US. Some occasional hints to other continents are present, but events and facts are predominantly narrated from the Western point of view. Personally, it was only when I took a course in Japanese history that I was able to gain knowledge on the history of the Asian continent. This example shows us how the mainstream approach to history is still very much focused on the single nation-state as the preferred unit of analysis.

On the other hand, global history frames events and processes in a global context. This does not mean that the field of investigation is always the entire planet. Rather, it means that, when tracing the history of bounded geographic areas, historians focus in particular on the cross-border relations that link a specific place or event to a wider global network. At the centre of global history research are influences, interconnections and exchanges among different areas of the planet, so as to avoid a plain and self-centric description of the world.

Global history is among the fastest-growing research fields within academic history. After the end of the Cold War in particular, the interest in events with a clear universal reach grew rapidly. In addition, the cultural debate on the historical roots of globalization inspired historians to adopt a global perspective to study the past. The advent of computers, and the diffusion of the internet connection, combined with increasing international mobility, made it possible for scholars to quickly access transnational sources and stop relying solely on national archives and data.

Among the main starting points of global history is the interconnection that characterises planet Earth, which can be retraced across decades and centuries. Indeed, distant local events have been shaped by wider global political, economic and cultural contexts all across human history.[67]

Among the challenges undertaken by this historical approach is that of overcoming traditional nation-centred models of historical interpretation, so as not to be restricted or confined by the geographical and political barriers posed by nation-states and empires.[68]

The themes tackled by global historians are various, and among them are classical themes such as colonization and migration patterns, economic crises, empire formations and political

[67] CONRAD, S. *What is Global History,* pp. 17-19.
[68] Ivi, p. 21.

revolutions. Such themes are then revised from a global perspective, underlining the connections and influences across different areas and domains.[69]

Considering the current pace of international and transnational exchanges, and the increasing interconnectedness of every aspect of human life, it seems rather likely that a global approach to academic history will acquire even more relevance in the foreseeable future.[70]

Doing environmental history following a global perspective does not mean forgetting about local events. On the contrary, it means adopting them as case studies to uncover wider, systemic evidence. This is for instance what this thesis aims to do with the case study of Potosí silver mining, which is put in relation with wider, international dynamics. In fact, making use of regional histories and putting several local case studies in correlation with one another allows historians to draw a bigger picture, and ultimately bring useful conclusions pertaining to global environmental trends into light. In other terms, studying the micro-scale could serve to draw macro-scale conclusions.[71]

In any case, the choice of which spatial scale to adopt always needs careful consideration so as to be appropriate and coherent with the subject under analysis. A good example of a comprehensive and cohesive global environmental history was provided by German historian Joachim Radkau in *Nature and Power: A Global History of the Environment* [72] published for the first time in 2000.

To conclude, in accordance with the methodological indications offered by the *Annalistes*, environmental historians adopted the notion of *longue durée* history as their own, making use of very long-time scales to approach their subjects of analysis. Far from being considered a simple stage for human vicissitudes, the environment moved to the front row. This required historians to decelerate the rhythm of their work, transcending events such as battles, coronations, treaty signing, and revolutions, to instead focus on a much longer course of events. Distinguishing itself quite a bit from the classic history we all studied in school, environmental history stretches not just through centuries, but millenniums, ages, and eras. A slow kind of history, just as slow yet constant has been the pace of the planet's development.

Another point of divergence with traditional historical analysis is the choice, adopted by some environmental historians, to operate on a global geographical scale, pursuing a comparative

[69] Ivi, pp. 22-27
[70] Ivi, p. 28.
[71] ARMIERO, M. and BARCA, S. *Storia dell'Ambiente*, p. 32.
[72] RADKAU, J. *Natur und Macht: Eine Weltgeschichte der Umwelt*, C.H. Beck, 2002.

approach. This is done to emphasize the connections between local events and wider global contexts. In this regard, environmental history and global history are particularly close.

Nevertheless, despite being well suited to this kind of approach, not all environmental history works follow a global perspective. Scholars sometimes focus on reconstructing the environmental evolution of single regions or nations, or of single ecosystems – the Amazon rainforest for instance – or even of a set of ecosystems, such as the Mediterranean area. A thematic perspective is also possible. In this case, scholars decide to analyze a certain economic and social activity, such as hunting for instance, and its environmental consequences, both in a bounded area or following a comparative approach that brings together different regions of the planet. [73]

1.4 Latin America: a New Frontier for Environmental Historians

As stated at the beginning of this chapter, the discipline of environmental history first gained momentum in the Euro-Atlantic area, especially in the United States, where the majority of academic scholars were located. Since the 70s however, things have changed, and nowadays environmental historians are present all around the world.

Some areas of the planet, in particular, have been defined as "active frontiers" for environmental history. This means that in these areas lie some of the environmental themes and case studies with the highest potential. Among these active frontiers, we find Southeast Asia and Latin America. Given that the case study this dissertation will discuss in the next chapters is located in Bolivia, this last paragraph will delve deeper into the topic of environmental history in South America. The aim of this section is to offer a brief and general overview of the current state of art of the discipline in this area of the world. South America attracts environmental historians as well as natural scientists so much also because it constitutes one of the world's most biologically diverse regions, with an infinite number of endemic species and a big share of the planet's biodiversity being found here.[74]

The first Spanish-written articles on environmental history were written in the late 70s and early 80s. Among the main themes addressed by historians was the environmental impact of colonialism and neocolonialism in South American countries. This theme was then put in

[73] See for instance: RICHARDS, John F. *The World Hunt: An Environmental History of the Commodification of Animals*, 2014 for a comparative history of hunting or ISENBERG, Andrew C. *The Destruction of the Bison: An Environmental History 1750-1920*, 2000, for a regional focus on North America.

[74] BOYER, Christopher R. "Latin American Environmental History", *Oxford Research Encyclopedias*, 2016, p. 1.

relation with broader social, cultural and economic dynamics. Authors such as L. Vitale [75] and W. Dean[76] particularly emphasized the correlation between environmental issues and economic interests in a colonial and neo-colonial setting. Given the profound impact of European colonialism in Latin American countries, colonial conquest and colonial settlements, and the wider ecological transformations these implied, have been among the most pressing issues to analyse. Furthermore, the work done by Crosby on the Columbian Exchange also pushed historians to further investigate this theme, given its direct link with the geographical area of South America and the Caribbean islands.

The theme of pre-Columbian environmental history also attracted historians. Scholars have in fact been interested in understanding and estimating the extent of the ecological transformations operated by Amerindian populations. Given the time period, in this case, environmental historians have to work closely with archaeologists, and results are often open for interpretation.[77] The environmental history of pre-Columbian civilizations helped dismantle the myth according to which early indigenous populations were sorts of "ecological angels", living in perfect harmony with nature. In fact, although their impact on the environment was limited by the extent of their population and their technologies, ancient civilizations too intentionally altered their natural surroundings in the course of their history. It is however true that their ecological footprints were rather small in comparison with those of later European colonizers.[78]

Later generations of environmental historians have focused on other challenging subjects such as the history of environmentalist movements, the ecological implications of industrialization and urbanization patterns and the political efforts to nature conservation on the part of local governments.

Latin America is one of the most urbanized regions of the planet, with a big percentage of the population living in cities and metropolitan areas. As a consequence, the field of urban environmental history has acquired particular importance. At the beginning of the 90s for instance, Mexican historian Exequiel Ezcurra published a comprehensive work on Mexico City, offering a chronology of the ecological evolution of the city from the Aztec empire to the

[75] VITALE, L. *Hacia una historia del ambientee en América Latina: De las culturas aborigenes a la crisis ecológica actual,* Caracas, 1983.
[76] DEAN, Warren. *Brazil and the struggle for rubber: an Environmental History*, New York, 1987.
[77] MCNEILL, J.R. "Observation on the Nature and Culture of Environmental History", p. 23.
[78] BOYER, C. R. "Latin American Environmental History", pp. 4-5.

twentieth century.[79] Other similar works regarding the cities of Saõ Paulo and Bogotá have also been produced.[80]

Other thought-provoking areas of inquiry are related to the ecological implications of the colonial economy, with particular attention being paid to cattle farming, monocultures, and plantations. Mining and extraction activities also attract the attention of environmental historians, due to their drastic environmental implications, which started in the colonial period and are still underway to these days.[81] The work done by Nicholas Robins on the environmental and social effects of colonial mining in the Andean region goes in this direction and is among the sources used by this dissertation.[82]

Deforestation is another relevant theme for environmental historians in Latin America, with particular regard to the Amazon Rainforest.[83]

New paths of research for historians in the area could be directed towards the study of the first attempts to institute national programs for nature conservation as well as towards climate history, which can include the ecological history and impacts brought forward by El Niño.[84] Some environmental policies in particular have been particularly bold in South American states, leaving room for debate and reflection. This, as we will see, is the case of Ecuador and Bolivia. In Europe and North America, the strong political commitment that characterized the early stages of environmental history is now less emphasized. In Latin America instead, this remains a distinctive feature of the discipline.[85] This is also because, at its early stages, environmental history inserted itself in the leftist tradition of social criticism, reasoning according to the framework of *raubwirtschaft* [86] and dependency theories. This tradition was also reflected in a strong political and social commitment from the part of environmental historians. Indeed, they saw in this emerging discipline a chance for moral engagement and were inspired by the desire

[79] EZCURRA, E. *De las chinampas a la megalopolis: El medio ambiente en la cuenca de Mexico,* Mexico City, 1990.
[80] BELTRÁN, J.P. et al. *Historia ambiental de Bogotá, siglo XX: Elementos históricos para la formulación del medio ambiente urbano,* Bogotá, 2005*,* MARTINEZ, PH. *Historia ambiental paulista. Temas, frontes, métodos*, Saõ Paulo, 2007.
[81] BOYER, C. R. "Latin America Environmental History", p. 7.
[82] ROBINS, Nicholas, *Santa Bárbara's Legacy: An Environmental History of Huancavelica*, Peru, Leiden, Brill Publishers, 2017 and *Mercury, Mining and Empire: The Human and Ecological Cost of Colonial Silver Mining in the Ande*s, Bloomington, Indiana University Press, 2011, both translated in Spanish.
[83] DEAN, Warren. *Broadax and Firebrand: The Destruction of the Brazilian Atlantic Rainforest*, 1995.
[84] MCNEILL, J.R. "The State of the Field of Environmental History", p. 357.
[85] Ivi, pp. 364-365.
[86] Literally, "looting economy", i.e. a colonial economy based on the exploitation of the colony's natural resources and local labour.

to uncover new and useful evidence about the past to help their countries better progress in the future.[87]

Today Latin American countries remain a turbulent yet profoundly interesting area of inquiry for environmental historians. This is due to important dynamics these states are currently experiencing, such as the need to find a balance between economic growth and environmental protection, the presence of large rural indigenous communities fighting to preserve natural ecosystems and the wide ecological impact of colonial and neocolonial activities.

Finally, other areas of the planet that remain partially unexplored by environmental historians include the Middle East, the Caucasus region, Russian steppes, and Central Asian deserts. The integration of these areas by scholars of the discipline could therefore help environmental history to enhance its global reach. More attention to the intersections between the environment and migrants and migratory patterns could also provide new intellectual stimulus for historians.[88]

This first paragraph has outlined the academic path of environmental history and has provided the reader with an overview of its methods of research and peculiarities. The points of intersection between environmental history and global history have also been discussed. Finally, a brief overview of the current state of the art of South American environmental history has been provided, given that this dissertation focuses on Bolivia's environmental history through two case studies. The notions presented in this paragraph are aimed at helping the reader to better understand the framework upon which the current research has been inspired and will be developed.

1.5 Conceptual Framework

Environmental history adopts a terminology that may not be familiar to the general reader. In the following pages, an explanation of some key terms, which are used in the realm of environmental history, is provided. Firstly, the concept of "anthropocentrism" is discussed. The philosophical positions that have emerged as critiques og this view are also briefly mentioned. Knowing the meaning of this term will be helpful to better understand the contents discussed in the fourth chapter. The last chapter of this dissertation will indeed consider a new legal approach to overcoming anthropocentric positions and analyse it in the context of Bolivia.

Secondly, an explanation of the meaning of "Columbian Exchange" is provided. The knowledge gained from this explanation will prove useful in understanding the context in which

[87] MCNEILL, J.R. "Observation on the Nature and Culture of Environmental History", pp. 23-24, 34.
[88] MCNEILL, J.R. "The State of the Field of Environmental History", p. 365.

the events discussed in the second chapter unfold. Finally, the concept of the "Anthropocene" is also discussed, together with its relation to the Columbian Exchange. This term will be mentioned several times in the following chapters, and its meaning will help the reader to better contextualise the conclusions of this work.

Anthropocentrism

Translated literally, the word means "human-centred" or "human at the centre". This term is generally used to refer to the philosophical view according to which only human beings are deemed worthy of intrinsic values and rights. Humans, seen as the centre of the universe, are the only ones possessing moral standings. As a consequence, ethics can only be applied to them, and not to other, non-human beings, which acquire value only in relation to the utility humans might derive from them. In this sense, other species and the environment as a whole are regarded as "means to human ends" and only considered for their instrumental value.[89] For some, this is the only ethical approach possible, since the human species alone is capable of producing moral judgments, while for others this should not prevent us from uncovering the value in other beings.

Anthropocentrism sees nature and humanity as separate and distinct. The environment and its resources, along with all the species which inhabit it, are not considered valuable and worthy of protection and preservation for their very existence, but only and always in relation to their utility to humans. On the contrary, biocentric and eco-centric approaches [90] refuse this point of view, noticing how anthropocentrism is "[the] ontological inversion of a part (Anthropos) claiming the whole (the biosphere)".[91] These approaches do not separate humans from nature, but instead adopt a holistic point of view, considering human beings as part of a bigger picture, as a species among the many that constitute the planet's biosphere. Non-human beings, as well as natural elements such as rivers, forests and entire ecosystems, are thus seen as valuable in themselves, for the sake of their existence, and should be protected accordingly. This is where the debate on the Rights of Nature comes into play.[92] As the last chapter of this thesis will explain, the proposition to grant natural elements some specific rights is an attempt to overcome anthropocentrism, in this case in the legal sphere, and move closer to holistic approaches to life.

[89] GORALNIK, L. and NELSON, M. P. "Anthropocentrism" in CHADWICK, Ruth, *Encyclopedia of Applied Ethics*, Second Edition, vol 1. Academic Press, San Diego, 2012, p. 145.
[90] Ibidem. Biocentrism and ecocentrism are ethical beliefs according to which all living beings have an inherent value, a characteristic which is not limited to the human sphere.
[91] CRIST, E. and KOPNINA, H. "Unsettling Anthropocentrism", *Dialect Anthropology*, vol. 38, no. 4, 2014, p. 389.
[92] PAGANO, Piergiacomo. *Filosofia Ambientale*, Mattioli 1885 Editore, Fidenza, 2005, p. 17.

Scholars usually distinguish between different forms of anthropocentrism. Since this is not the place to construct a comprehensive analysis of every anthropocentric position, it will suffice to just list the two of them: strong anthropocentrism and weak anthropocentrism.

On one hand, strong anthropocentrism starts from the premise that only humans possess the inherent right to use nature and exploit its resources, adopting, therefore, a clear opportunistic behaviour towards the environment. This position does not take into consideration the possibility of imposing any kind of limit or restriction on human behaviour. This version of anthropocentrism is often referred to as the "frontier ethic" [93] since its foundations and motives are similar to those that moved the behaviour of the first settlers who ventured to explore the *Old Wide West*, seen in the past as an area to be exploited and colonised. This is, of course, a rather radical position, anchored on a firm faith in human capabilities to best manage the planet's resources. Moreover, strong anthropocentrism relies heavily on technology and sees the market economy as the best possible allocator of resources, capable of regulating any disequilibrium that may arise from economic competition.[94]

Given the radicality of this position, strong anthropocentrism is nowadays regarded as anachronistic. This is because, in the present, ecology, as well as natural sciences, have demonstrated how natural resources are not unlimited and that the well-being of other species and the environment as a whole is strictly correlated to the well-being and survival of humankind.

Taking these premises into consideration, anthropocentric positions have evolved into what we can define as weak anthropocentrism. According to this ethical belief, human societies have the right to regard the environment as something to be owned and exploited but must also refrain from overexploiting resources and depleting ecosystems. In this sense, supporters of this approach show a clear awareness of the ecological issues contemporary human societies are experiencing and praise a prudent and wise use of nature as part of the solution to it. This is, of course, a rather partial view of the problem, and the solutions proposed are therefore not exhaustive. According to both weak and strong anthropocentrism, a possible cultural revolution is not seen as a pressing need or a possible solution. Expanding the discourse of ethics and rights to include the natural world is thus deemed unnecessary.

[93] Ivi, p. 48.

[94] This last point is, in my opinion, brings strong anthropocentrism very close to liberalism and neoliberalism in economics, since both theories rely heavily on market economy and the capacity of the *homo economicus* to manage resources efficiently. Both theories also reject the possibility of any kind of public intervention or regulation to limit or at least mitigate human behaviour in the market (liberalism) and in the environment (anthropocentrism).

The idea of preserving the environment by granting new rights to natural elements and considering nature as having an intrinsic value is very distant from the core principles of anthropocentrism, according to which only humans possess value *per se*. A deep faith in human capacities, combined with a clear rejection of discourses on the Rights of Nature and preservation attempts, are principles shared by all forms of anthropocentrism. For weak anthropocentrism, the conservation of landscapes, environments and ecosystems is important, but only in relation to the use that can be drawn from them. They must not be exhausted, but only because they are to be used and enjoyed by generations of humans, and not because they have value in themselves or because they are vital for other, non-human species.

Some authors have noted that the concept of sustainability [95] is in itself close to weak anthropocentrism. The idea of sustainable development is largely praised to be part of the solution by the international community and is generally well-received by governments and enterprises. However, this principle does not question the human-centred foundations of (western) societies, instead promoting a wiser use of strategic resources as the way forward. Nevertheless, the concept of sustainable development has helped to spread ecological awareness among the public and has encouraged political agendas to pay greater attention to environmental dynamics. [96]

Critiques of anthropocentric positions are common among contemporary thinkers and intellectuals but have ancient roots. Starting from the 1960s and 1970s, the limits of the anthropocentric approach have been highlighted multiple times, but critical approaches to this ethical position had appeared long before that. Indeed, between the 17th and the 18th century, various philosophers, scientists, and intellectuals expressed their scepticism towards the idea of placing human beings at the centre of the universe.[97]

Columbian Exchange

The term was invented by the environmental historian Alfred Crosby. It was introduced in his first book on the subject, published in 1972. [98] Since then, it has become part of historians'

[95] "Sustainability is the practice of using natural resources responsibly today, so they are available for future generations tomorrow". "Sustainability" in *National Geographic*, Education Section, https://education.nationalgeographic.org/resource/sustainability/.
The United Nations define sustainable development as an "(…) integrated approach that takes into consideration environmental concerns along with economic development". "Sustainability", *United Nations*, https://www.un.org/en/academic-impact/sustainability.
[96] PAGANO, Piergiacomo, *Filosofia Ambientale*, p. 106.
[97] Ivi, p. 20
[98] CROSBY, Alfred W. *The Columbian Exchange; Biological and Cultural Consequences of 1492*, Greenwood Pub. Co., Westport, 1972.

vernacular. It refers to the transatlantic transfer of people, plants and seeds, animals, pathogens, cultural values, ideas, and technologies that was initiated by Columbus' accidental discovery of the American continent in 1492.

At the time of publication, Crosby's modus operandi represented a real novelty in academic history. He was in fact one of the very first historians to make extensive use of scientific sources and data to draw historical conclusions. This unusual method was probably part of the reason why Crosby's work went unnoticed by many fellow historians, in a period where academic history made use of classical investigation methods, and scholars mainly focused on the analysis of political, institutional, and biographical aspects. As mentioned in the first paragraph, the trend initiated by Crosby has gained momentum in the realm of environmental history. Contemporary environmental historians make frequent use of scientific sources in their works.

In his book, Crosby explores the ecological and cultural consequences of the discovery of the American continent. As Columbus set foot in present-day Bahamas, two continents, which had been separated for approximately 12,000 years, suddenly reconnected. The implications of an event of such magnitude were numerous.

Domesticated livestock, which was unknown in the Americas, were brought by ship from Eurasia, carrying viruses and diseases to the New World. Never having been exposed to diseases such as smallpox and influenza, native populations lacked the necessary immune defences to survive and died in millions.[99] This microbial catastrophe, combined with the casualties due to warfare, led to a drastic drop in the number of native people, with an estimated mortality rate of 70% to 90%, according to scholars. This meant that Europeans, who saw these populations as a potential labour force, lacked labour power. As a result, they started shipping slaves from the African continent which came accompanied by other diseases unknown to indigenous peoples, namely yellow fever and malaria.[100]

Crosby used the concept of *ecological imperialism* to explain how this pathogenic contamination favoured the colonisers, who took advantage of the high mortality rate among native communities and eventually succeeded in taking control of their territories. Technology and weaponry, as well as large mammals such as horses, also served as an advantage to Europeans in their colonisation efforts.[101]

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[99] Diseases introduced to the Americas by colonizers included influenza, measles, rubella, smallpox, yellow fever, scarlet fever, pneumonia, pertussis, typhus and malaria. COOK, D. "The Columbian Exchange" in J. Bentley, S. Subrahmanyam, & M. Wiesner-Hanks (Eds.), *The Cambridge World History*, pp.103-134.

[100] LEWIS S. L. and MASLIN, M. A. *The Human Planet. How We Created the Anthropocene*, Yale University Press, New Haven, 2018, p. 156.

[101] See CROSBY, Alfred. *Ecological Imperialism, the biological expansion of Europe 900-1900,* Cambridge University Press, 1986.

Not only did people and diseases travel across continents, but so did plants, seeds, and animals. Species moved from their ecological niches and were introduced into new ecosystems, where they encountered, and in some cases collided with autochthonous species. This event resulted in "a globalization and homogenization of the world's species, which continues today".[102]

The Columbian Exchange also resulted in a drastic revolution in human diets and farming techniques. Crops travelled across the oceans and reached distant continents; such was the case with tomatoes and potatoes in Europe, bananas in the Americas and chilli peppers in Asia.[103] These changes interested every corner of the planet, and even remote communities came in contact with seeds and crops coming from far away. More and diverse crops available meant more choices for farmers, who could suddenly rely on more resilient plantations to sustain themselves, their household, and their communities. In this sense, the Columbian Exchange also resulted in the birth of a "single globalized farming culture".[104]

In addition, the first global trade circuits were created, and continents became linked by extensive commercial agreements and exchanges. Among the most prominent examples of intercontinental trade established starting from the 16th century, we find that of silver, which was extracted from Bolivian and Mexican mines and shipped eastwards, and the infamous transatlantic triangular trade between Africa, Europe, and the Americas.

The availability of new foods coming from distant places contributed to changing people's behaviours. Households reduced their domestic production, and more and more individuals entered the market in order to earn a wage, thus expanding their consumption possibilities. This *Industrious* Revolution established the necessary social preconditions for the 18th-century *Industrial* Revolution, as well as for a new, capitalist mode of producing and living.[105]

The biological and environmental consequences of the Columbian Exchange were so profound that they "set Earth on a new evolutionary trajectory".[106] Entire ecosystems were radically transformed by the arrival of new species, and this happened not only on the planet's surface but also in the depths of the oceans. Indeed, transoceanic journeys moved masses of water and marine organisms, bringing together separate ocean basins. The overcoming of geographical barriers by species also resulted in the emergence of new hybrid species. Genetic materials from

[102] LEWIS S.L. and MASLIN M. A. *The Human Planet,* p. 158.
[103] Ivi, p.159. Crops such as grapes, bananas, rice, sugar and wheat, and large domesticated animals such as horses, pigs, cattle, goats, and sheep travelled from Europe, Africa, and Asia to the Americas. Meanwhile, maize, potatoes, beans, tomatoes, tobacco, and cocoa came to Europe, Africa, and Asia from the New World.
[104] Ibidem.
[105] DE VRIES, J. "The Industrial Revolution and the Industrious Revolution", The Journal of Economic History, vol. 54, no. 2, 1994 and The Industrious Revolution: Consumer Behavior and the Household Economy, 1650 to the Present, Cambridge University Press, 2008.
[106] LEWIS Simon L., and MASLIN Mark A., *The Human Planet,* p. 164.

different parts of the world recombined, creating "a new Pangea"[107], in which genetic diversity was partly lost, and habitats and ecosystems became more and more homogeneous. As writer Charles C. Mann observes: "To ecologists, the Columbian Exchange is arguably the most important event since the death of the dinosaurs".[108]

The almost disappearance of indigenous communities due to the arrival of European colonisers and their pathogens had another ground-breaking consequence: it contributed to changing the climate of the early modern world. As mortality reached its peak some decades after Columbus' first arrival [109], vast areas of land that were previously farmed gradually returned to being forests over the following decades.[110] As scientists teach us, forests can store massive quantities of carbon dioxide (CO_2). When vegetation is destroyed to make way for edible crops, carbon dioxide is released into the atmosphere. The death of millions of native peoples, followed by the restoration of large forest areas in the American continent, is theorized to have removed enormous quantities of CO_2 from the atmosphere since the carbon dioxide was absorbed by the new trees. This event, according to the theory, would have caused a drastic drop in average temperatures across the Atlantic area for a sustained period of time.

This possibility seems to be confirmed by geological evidence. Analysing ice cores extracted from the West Antarctic Ice Sheet (WAIS) and the Law Dome, scientists have found evidence of a distinct drop in atmospheric CO_2 levels in the period 1570-1610, caused by the sequestration of carbon dioxide from the land.[111] Geological archives such as ice cores and lake sediments also show that this sharp reduction of carbon dioxide was then followed, as expected, by a prolonged cold period in both the northern and the southern hemispheres, between 1594 and 1677.[112] Scientific studies seem to confirm that the reforestation that followed the massive deaths of American indigenous populations and the abandonment of previously cultivated land could indeed account for these atmospheric CO_2 fluctuations and the resulting drop in

[107] Ivi, p. 166.

[108] MANN, C.C, *1493: How Europe's Discovery of the Americas Revolutionized Trade, Ecology and Life on Earth*, Granta, London, 2011.

[109] Lewis and Maslin estimate that a minimum of around 50 million native people died because of the arrival of European Colonizers. This estimate includes both those who perished because of warfare as well as those killed by Old World diseases.

[110] Before the arrival of Columbus, the most populous groups of Native Americans were concentrated in the central and southern parts of the continent, where proper empires, such as the Inca Empire, were created. These geographic areas were characterized by a tropical kind of vegetation, which, according to biologists, is particularly fast-growing and can store large quantities of carbon. According to Lewis and Maslin, this kind of vegetation only takes between twenty and sixty years to recover to its primal status after having been converted to farmland.

[111] AHN, J. et al. "Atmospheric CO_2 over the last 1000 years: A high-resolution record from the West Antarctic Ice Sheet (WAIS) Divide ice core", *Global Biogeochemical Cycles*, vol. 26, 2012.

[112] NEUKOM, R. et al. "Inter-hemispheric temperature variability over the past millennium", *Nature Climate Change, vol.* 4, 2014.

temperatures.[113] This phenomenon was added to the exceptionally cold temperatures experienced by Europeans during the Little Ice Age (roughly 15th-19th centuries). The result was a long period of global cooling between the end of the 16th century and the beginning of the 17th century. The Columbian Exchange had therefore not only major economic, biological, and cultural consequences, but it also, possibly, affected global climate as well.[114]

The Columbian Exchange does not have a real ending, as Crosby highlights in the last chapter of his book.[115] The cross-contamination and the exchange of pathogens, flora and fauna persisted well into the 20th century and is still an ongoing phenomenon today. While in the 15th and 16th centuries, this constituted an absolute novelty, nowadays human populations have grown accustomed to a never-ending stream of ecological, economic, political, and cultural exchanges. The COVID-19 pandemic is just one of the many examples of pathogenic agents that, travelling along commercial and communication routes, have managed to contaminate every part of the planet.

Even considering the many positive effects that the Columbian Exchange has generated, Crosby concludes his work on a rather pessimistic note, reflecting on how much the world's genetic heritage has been drastically impoverished ever since Columbus set foot on the American continent.[116] A drastic reduction of genetic diversity across ecosystems can be cause for concern, as species specialization and homogenization lead to decreasing chances of future variations, which are essential for survival. Just as Crosby had first predicted in 1972, this trend has endured over time. As we are all well aware today, biodiversity loss and species extinction, caused by a mix of causes, including habitat loss and invasion by alien species, are among the most pressing issues for the current international scientific community.

This reflection on the Columbian Exchange has highlighted the profound ecological transformations that interested the American continent in the Early Modern Age. This overview should help the reader to better contextualize the events that will be discussed in the following chapters. The pollution resulting from silver mining in the Andes should in fact be placed in a broader context of drastic environmental changes happening in the whole continent, initiated by the arrival of the Europeans.

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[113] NEVLE, R. et al, "Neotropical human–landscape interactions, fire, and atmospheric CO2 during European conquest", *The Holocene*, vol. 21, no. 5, 2011.
[114] LEWIS S. L., and MASLIN M. A., *The Human Planet*, pp. 184-185.
[115] CROSBY, Alfred. *The Columbian Exchange*, pp. 208-222.
[116] Ivi, p. 221.

Anthropocene

Anthropocene is a technical term coined by combining the Greek roots for "human" – *Anthropos* – and for "recent" or "new" – *kainos* –, making an analogy with the world Holocene.[117] It describes the most recent epoch in our planet's history, divided by geologists in hierarchical portions of time, which are calculated from the composition of rock layers. As scientists Lewis and Maslin explain, "The stratigraphic view of geological time looks at Earth's history largely in the light of visible changes to life captured by rocks. It is a chronicle of life, formalized as the Geological Time Scale (GTS)".[118] According to this system, the 4.5 billion years that constitute our planet's history are divided into ever finer portions of time: Eons, Eras, Periods, Epochs and Ages.[119]

The concept of Anthropocene was formally popularised in 2000 by meteorologist and engineer Paul Crutzen, at a meeting of the International Biosphere-Geosphere Programme (IGPB), an international body of experts called upon to study global changes and their environmental repercussions. According to Crutzen and ecologist Eugene F. Stoermer, the Anthropocene refers to the current geological epoch, in which the humankind acts as a force of nature. Indeed, humans are capable of altering the planet's geology and ecology in multiple ways, including natural resources exhaustion and species extinction, transformation of landscapes, direct modifications of the atmosphere's composition and substantial climatic alterations.[120] The permanent transformations resulting from human activity are visible in geological sediments, allowing scientists to postulate the beginning of a new phase in Earth's history.[121]

As Crutzen and Stoermer explained, the idea of a human epoch was not born suddenly in the 21st century. Instead, it was the result of a long debate dating back centuries. Accounts of major human impact on the environment already appeared in works from the 18th century, including *Les Époques de la Nature* by naturalist and mathematician Georges-Louis Leclerc, Comte de Buffon, who presented the idea of an *Époque de l'Homme* as the latest stage of the planet's evolution. The French author wrote that "La puissance de l'homme s'est réunie à celle de la Nature est c'est étendue sur la plus grande partie de la Terre" [122]. In short, the idea of the

[117] Officially, the current geological period is defined as "Holocene". It is estimated to have begun approximately 11,000 years ago, at the end of the last glacial period. "Anthropocene", *National Geographic*, *Education Section*, https://educationEducation.nationalgeographic.org/resource/anthropocene/

[118] LEWIS S. L. and MASLIN M. A. *The Human Planet,* p. 74.

[119] For more on this subject refer to "Chapter Two: How to Divide Geological Time" in Ivi. pp. 45-78.

[120] CRUTZEN P. J. and STOERMER E. F. "The Anthropocene", *IGBP Global Change Newsletter 41*, 2000, p. 17-18.

[121] LEWIS S.L. and MASLIN M. A. *The Human Planet,* p. 75.

[122] " The power of man has joined forces with the power of nature, and has expanded over most of the Earth" DE BUFFON, Georges Louis Leclerc, *Les Époques de la Nature*, Imprimerie Royale, Paris, 1778, pp. 183-184 of the digitalized version, accessible at: https://archive.org/details/lespoquesdelana00buffgoog.

Anthropocene was widely debated centuries ago, and most geologists and scholars discussing the subject seemed to agree with the classification of humanity as a major transformative force.[123]

Despite being geologically recent human agency has come to be so powerful that we are not only influencing the Earth's present dynamics but also, perhaps more importantly, producing effects that will determine the direction of our planet's future.[124]

In a very short period of time – at least from the point of view of geologists – humans have managed to profoundly alter the planet's internal dynamics. Since the Industrial Revolution, human-correlated activities have been the cause of a 44 per cent increase in atmospheric carbon dioxide levels. Human activities have also been the direct or indirect cause of massive species extinctions, up to the point where, nowadays, only 4 per cent of the world's biomass accounts for wildlife. Humans account for approximately 30 per cent of the total while almost two-thirds of the planet's biomass is composed of livestock raised to feed humans.[125] The human population has grown at an extraordinary rate, reaching one billion in 1804 and 7 billion in 2011.[126] At the same time, the global economy has increased even faster, producing a veritable explosion in terms of environmental impacts and resource usage.[127] The extent of human domination on planet Earth is therefore clear, and every living creature is nowadays directly affected by the consequences of human actions. After a phase of overall stable environmental conditions that began 10.000 years ago, the planet has now entered a new phase, which features extreme events as well as intense environmental and climatic variability.

Lewis correctly underlines the magnitude and complexity of this event when stating that "It is […] difficult to grasp the reality of a human epoch. Can we even conceive of environmental changes driven by us that will last longer than our species has existed?".[128] The fact that the human species could become extinct while its influence on the planet will continue is quite

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Other example of early reflections on the Anthropocene can be found in:
Lesson in Geology XLIX by Welsh professor and geologist T.W. Jenkyn (1854), where the author reflected on naming the present day as the "Anthropozoic Epoch" given the vast human influence on the environment.
Corso di Geologia, Volume 2 by Italian geologist Antonio Stoppani (1873), where the author locates the beginning of the human epoch, which he refers to as the *Era Antropozoica,* in the year 1827. He notes how the humankind constitutes "una nuova forza tellurica, che, per la sua potenza e universalità, non sviene in faccia alle maggiori forze del globo", p. 782, Chapter XXXI: Periodo Primo dell'Era Antropozoica.

[123] LEWIS S. L. and MASLIN M. A. *The Human Planet,* p. 34.

[124] Ivi, p. 3.

[125] Ivi, p. 4. For accurate data concerning the planet's biomass see RITCHIE, H. "Wild Mammals make up only a few percent of the world's mammals", *Our World in Data*, December, 15, 2022, https://ourworldindata.org/wild-mammals-birds-biomass.

[126] See RITCHIE, H. and ROSER, M. "How has world population growth changed over time?", Our World In Data, June 1, 2023, https://ourworldindata.org/population-growth-over-time

[127] LEWIS S. L. and MASLIN, M. A. *The Human Planet,* pp. 6-7.

[128] Ivi, pp. 5-6

astonishing, and it makes us understand the enormous powers humans have acquired throughout their short existence on the planet. [129]

The story of the Anthropocene is worth telling since its dynamics have direct consequences not only for natural ecosystems but also for human populations. Indeed, matters of security, health, prosperity, and migration are all extremely interconnected to environmental concerns and the current climateic crisis is already generating complex dynamics that decision-makers cannot afford to ignore for much longer. [130]

The beginning of the Anthropocene has been a topic of debate. According to Lewis and Maslin, the history of our planet has been marked by four major transitions. The first one began around 10,500 years ago, with the advent of farming and agriculture. The result was a modification of landscapes and of the climate itself, that stabilized over the long run, creating the perfect conditions for the development of large-scale civilizations. This was followed by an organisational transition, beginning with the Columbian Exchange in the early 16th century, which led to the emergence of a globalised economy and a new global ecology.[131] The Industrial Revolution of the 18th century marked the third, major transition. As societies unlocked the use of fossil fuels, enormous quantities of energy suddenly became available, enabling large-scale production and urbanisation patterns. From this moment onwards, carbon dioxide emissions into the atmosphere began to increase exponentially, directly mitigating the planet's climate. Finally, the fourth transition, after the Second World War, again led to an important reorganisation of global dynamics. Environmental historians usually refer to this phase as the *Great Acceleration*, as global exchanges of goods and people became commonplace, the global economy enjoyed a boost and new international organisations and bodies were created. Each transition saw the emergence of new societies, that become increasingly dependent on energy supplies, information availability and greater consumption of natural resources.[132]

At what point in this long history did the Anthropocene begin? There is no unanimity in the scientific community. On the one hand, Crutzen and Stoermer place the beginning of the human era in the last half of the 18th century, when glacial ice cores first showed evidence of high atmospheric concentrations of CO_2. [133]

On the other hand, Lewis and Maslin propose a revised approach to the question, based on the analysis of geological sediments. By locating chemical and biological changes in sediments in

[129] Note that, in geological terms, humans are a fairly recent species, which emerged about 200.000 years ago.
[130] LEWIS S. L. and MASLIN, M. A. *The Human Planet,* pp. 8-9.
[131] Ivi, p. 11.
[132] Ivi, p. 14.
[133] CRUTZEN P.J. and STOERMER, E.F., *The "Anthropocene"*, pp. 17-18.

different areas of the world, the pair has been able to identify what they call an *orbis spike;* a marker that signals the opening of a new phase for planet Earth, which they locate in the year 1610. [134]

Starting from this date in fact, geological deposits at different latitudes started to carry the traces of human activity, which in this particular case took the form of exchanges between old and new world. [135] From a historical point of view, placing the beginning of the Anthropocene not so far from the beginning of the Columbian Exchange also reaffirms the significance of the encounter between the two continents, which enlarged global horizons and marked the start of a new, profit-driven, mode of living and production.[136]

Despite diverging periodisation, scholars generally agree on the existence of an Anthropocene stratum, formed by layers of sedimentary rocks that bear witness of the most recent epoch in the planet's history.[137]

Lastly, how will the Anthropocene evolve? As with all geological epochs, scholars seem to agree on the fact that it will probably last millions of years.[138] For some, the current era represents the peak of humanity's journey, which has been made possible by remarkable advancements in technology and in the economy. For others instead, it represents the prelude to a phase of great instability or even collapse.[139] Experts are still debating, and much will probably depend on the choices as well as on the actions the international community will adopt in the coming years.

The power of human agency over the environment is thus clear from these premises. From this awareness, and from the evidence of how the onset of the Anthropocene has impacted the planet, comes a willingness to find new ideas and proposals for adapting to climate change and mitigating environmental damage. Adaptation and mitigation are key strategies for protecting natural ecosystems, improving the health and safety of human communities, especially the most vulnerable, and preserving our planet for the benefit of future generations. Among the most recent strategies to protect the environment, we find the discourse on the Rights of Nature, which will be discussed in the last chapter of this dissertation. New proposals such as this one

[134] This ecological and historical point break has been labelled "Orbis Spike" since, due to the Columbian Exchange, the west and east hemisphere were reconnected after having been separated for thousands of years. Taken from Latin, *Orbis* means "world", and the adjective points to the fact that, in this period, a new economic and ecological world system emerged.
[135] LEWIS S. L. and MASLIN M. A. *The Human Planet.* pp.13, 310-320.
[136] Ivi, p. 320.
[137] Ivi, pp. 301-304.
[138] Ivi, p. 321.
[139] Ivi, p. 369.

arise from the realisation that, in a geological era which is very different from the previous ones, “drastic” solutions might need to be discussed and taken into consideration in order to achieve common goals.

The conceptual framework presented has had the objective of introducing the reader to three key terms frequently used by environmental historians. The knowledge gathered from these pages will prove useful in reaching a more comprehensive understanding of the case studies analysed in the following chapters.

2. THE ENVIRONMENTAL CONSEQUENCES OF COLONIAL SILVER MINING

The present chapter is divided into three parts. First, the chapter provides an introduction to the Early Modern Age, which is the time period in which the events discussed take place. This is followed by a brief history of colonial Bolivia. This part highlights some social and political dynamics which characterized the country for a very long time, being present even at the beginning of the 21st century. The knowledge gathered should help the reader to better contextualize the case study under analysis. The rest of the chapter is dedicated to the detailed analysis of the environmental implications of colonial silver mining in the Andes region, taking the city of Potosí as a case study. This part will show how the site of Potosí was affected by large-scale mercury pollution, becoming one of the most notable examples of ecological degradation in the early modern world. The human and health costs of this activity are also discussed in the concluding pages.

2.1 The Early Modern Age and the First Wave of Globalization

The story we are about to tell took place in the Early Modern Age, a time frame that encompasses four centuries, starting in the 15th century with the accidental "discovery" of the American continent and ending roughly at the end of the 18th century. This was a period characterized by large-scale transformations, interaction processes and discoveries that significantly altered the structure of all human societies. Among the most pivotal events, we find the emergence of vast empires and extensive commercial routes, large-scale migrations and urbanization, biological and epidemiological exchanges across oceans, and the diffusion of cultures, values, and innovative ideas. In addition, growing interconnectedness within human societies also meant a deeper and wider impact on the natural world and its resources.

One of the peculiarities of this historical period is the absence of a true superpower. Indeed, although several empires emerged across Eurasia, none of them managed to prevail. It is, therefore, a mistake to consider it an era under the sign of European domination, since Western countries were not the only empire builders, nor were they the only ones to make geographical discoveries.[140]

The Early Modern Era established the necessary economic, cultural, political, and social foundations for the first wave of globalization, which is generally characterized as a l*ongue-*

[140] PARKER, Charles. *Global Interactions in the Early Modern Age*, Cambridge University Press, New York, 2010, pp. 3-4.

durée process involving increasing interconnectedness across different regions of the planet.[141] After 1492, all known continents, except for Oceania, became linked through a complex interplay of commercial, biological, and cultural exchanges. Geographical horizons were suddenly widened, and this meant that people's mental horizons expanded as well, as it became possible to think of "the world" as a whole. This process was eventually completed in the 18th century, when the Pacific was explored and integrated into transcontinental sea routes.[142] Moreover, the encounter between different civilisations and cultural systems created the conditions for the emergence of new philosophical and ethical debates. Such is the case, for instance, of the debate that arose during the Spanish conquest of South America, when Spanish intellectuals pondered the legitimacy of subjugating native populations. Their reflection on whether to consider the natives as civilised human beings with natural rights or not was instrumental in the emergence of pivotal concepts such as those of equality and universality, which will eventually come together in the idea of Human Rights.[143]

The Early Modern Age saw the rise of powerful empires, as well as the advent of colonialism. In this period, empires across Eurasia figured as prominent actors of change, as their birth entailed cross-cultural interactions as well as global exchanges of people, goods, and information.[144]

On one hand, Europe witnessed the emergence of a cluster of powerful sovereign states, that strove to subdue religious authorities and aristocratic interests and gain control over both internal and external forces. Via the creation of extensive bureaucracies, functioning fiscal systems, and powerful armies, a series of European states succeeded in becoming competitive and organized entities, able to build vast overseas empires. A notable aspect, in the European case, was also the close alliance between business elites and central governments. Indeed, in order to financially support their conquests overseas, monarchs often stipulated agreements with various economic actors, such as merchants, lending institutions and investors.

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[141] A comprehensive definition of globalization is provided by Manfred B. Steger: "Globalization is about shifting forms of human contact' leading towards greater interdependence and integration, such as that the time and space aspects of social relations become compressed, resulting in 'an intensification of the world as a whole'." in *Globalization. A very short introduction*, Oxford University Press, 2003.

[142] CONRAD, S. *What is Global History?* p. 104.

[143] Bartolomé de Las Casas and Francisco De Vitoria are among the scholars that took part in this debate. Las Casas' most renowned works include *Brevísima relación de la destrucción de las Indias* (1542) and *Historia de Las Indias* (1553) in which he denounced the atrocities committed against the Amerindians by Spanish conquistadores. He is remembered as one of the first to openly defend the rights of South American native populations. De Vitoria, regarded as one of the fathers of international law, adopted a similar position, stating that the *Indios* were rightful owners of their land, denying the applicability of the legal concept of *res nullis* by the Spanish.

[144] CONRAD, S. *What is Global History?* p. 14.

Mercantilism served as the theoretical framework upon which modern states based their extensive colonial projects, relying on overseas resources to promote transcontinental trade and expand their national wealth. Spain and Portugal were the first to emerge in the 1500s, while the Netherlands, France and England followed suit in the 1600s and 1700s. Due to their translational character, maritime empires served as prime engines for the exchange of goods, plants, pathogens, technologies, and ideas.[145]

On the other hand, the process of empire-building did not take place only in the western part of the world. Highlighting this last point is essential to overcome the traditional Eurocentric view adopted by academic history. Vast empires arose in the east, conquering provinces and regions with powerful armies and establishing elaborate bureaucracies and intricate webs of political and diplomatic relations to govern their territories. In imperial China, the Ming and Qing dynasties gained control over Tibet, Mongolia, Yunnan and Guizhou. Romanov Russia expanded beyond the Ural Mountains to conquer the entire Siberian territory. The Safavid dynasty firmly governed present Iran, unifying the provinces of the Persian region. Moghul emperors controlled almost all of India, Pakistan, and Bangladesh as well as parts of Afghanistan. Finally, Turkish sultans forged the long-lasting Ottoman Empire, that, at its peak, encompassed Anatolia, western Asia, North Africa and much of south-east Europe.[146]

From the 16th century onwards, new patterns of trade emerged, resulting in the birth of an early modern global economy. Continents became linked together via new commercial routes, both on land and in the high sea. Along these routes, goods like sugar, tea, spices, cotton, and silver travelled from region to region, contributing to the creation of a consumer society. Given the transcontinental character of these exchanges, the geopolitical implications of commerce began to emerge, as regional economies became interconnected, influencing one another.

In addition, the opening of free ports in the Mediterranean also contributed to global integration. Port cities became in fact important laboratories of commercial, as well as individual liberties, and served as communication nodes.

The early modern world also saw the birth of the first mercantile associations, built to manage the risks associated with intercontinental trade. These were the precursors of more organized corporations, such as Dutch and English East India companies, which were established at the beginning of the 17th century. Merchants could also count on improved financial technologies such as the check and the bill of exchange. As a result, the merchant class enjoyed unparalleled levels of prosperity and proved to be a source of dynamism and innovation. However, increased

[145] PARKER, C. *Global Interactions in the Early Modern Age*, pp. 13-37.
[146] Ivi, pp. 39-65.

levels of trade and incipient consumerism also implied negative consequences, as they were often linked to various forms of violence, such as piracy at sea, commercial wars, enslavement and forced labour.[147]

In addition, this epoch was marked by several migration flows, which were instrumental in the creation of future multiethnic societies. In the western hemisphere, Europeans relocated to North and South America. European colonizers also initiated the flow of African slaves to the new continent. These people came accompanied by their languages, their social customs and their rituals, which often blended with those of the native Americans. At the same time, settlers from Siberia and Russia migrated eastward, while Chinese immigrants resettled in Southeast Asia. Among the main drivers of early modern migrations, we find the search for new trade and commercial opportunities and the imperial desire to increase agricultural output. These migrations facilitated the exchange and the blending of languages, cultures, religions, and ethnicities. The ultimate result was the emergence of more diverse and interconnected societies across the planet. In South America for example, Spanish and Portuguese colonizers married native and African women. This led to the emergence of a multicultural, although strongly polarized, south American society, which is still visible today.[148] Although these dynamics might appear rather obvious to contemporary readers, in the early modern world these events were a veritable novelty and were often accompanied by social and cultural debates.

As noted in the paragraph dedicated to the Columbian Exchange, early modern migrations implied numerous environmental and biological consequences.[149] The exchange of crops, plants and farming animals between Europe and the Americas, followed by an intensification in agricultural activities, favored population growth in various regions of the world. In 1500 humans were roughly 400 million. Already at the of the 1800s the word population had grown to 950 million. This massive expansion produced complex ecological results, such as deforestation, loss of wildlife and natural habitats, and intense pollution due to urbanization, ranching, mining and hunting. The exploitation of natural resources – timber, stones and precious metals, furs, whales and other wild animals – did not take into consideration the possibility of exhausting them. These resources were in fact believed to be unlimited.

[147] Ivi, pp. 68-106.
[148] Ivi, pp. 111-131. The creation of a mixed society is an important signal of change and dynamism. Nevertheless, the reader must remember that Latin American society was, and still is to some extent, hierarchical and discriminatory.
[149] Refer to Ivi, pp. 36-40.

Nonetheless, this certainty began to be questioned towards the end of the early modern era, when the first effects of overexploitation began to emerge.[150]

Not all scholars agree on labelling the Early Modern Age as the beginning of globalization. Economic historian De Vries for instance, highlighted how, although remarkable, early modern trade and commercial advancements are not enough to use term *globalization* in this historical context. For this reason, De Vries prefers to adopt the term "soft globalization", noting how some dynamics were still not present.[151]

In the 19th century, Marx was one of the first scholars to recognize the historical relevance of the Early Modern Age as a time of change, that marked a clear break with the Middle Ages.[152] According to Marx, in addition to being an era characterized by dynamism, discoveries and innovations, this period also "signalized the rosy dawn of the era of capitalist production"[153]

As a result of these changes, the world was radically transformed. In the 19th century, the planet looked very different from what it had appeared at the beginning of the 15th century.

Towards the end of the Early Modern Age, Asian empires entered a phase of structural decline, while European hegemonies consolidated their power. England and France in particular emerged as the main political actors of the time.[154] In addition, Europe also became the centre of a rapid industrialization process, that began in England but interested also France, Belgium and the United States. The accumulation of African and American wealth in the form of precious metals, natural materials and raw products that had taken place from the 1500s to the 1700s served as the fuel for European factories during the Industrial Revolution.[155] A new chapter of human history began. This new period was characterized by innovative technologies and scientific discoveries, but also by an increased reliance on polluting energies and serious environmental damage.

Given the dynamism that characterized the Early Modern Age, this historical period has proven an interesting time for historical analysis. Environmental historians too have focused on this time frame. They have highlighted how the relationship between human societies, nature, and its resources was also characterized by deep transformations. To further investigate this topic, the rest of this chapter focuses on the environmental history of early modern Bolivia, home to

[150] Ivi, pp. 223, 146-180.
[151] DE VRIES, Jan, "The limits of globalization in the early modern world", *The Economic History Review*, vol. 63, no. 3., 2010, pp. 710-733.
[152] MARX, Karl. *Capital*, Vol. III, p. 327: "…In the 16th and 17th centuries the great revolutions, which took place in commerce concurrently with the geographical discoveries […] constitute one of the principal elements in the transition from the feudal to the capitalist mode of production…".
[153] Ivi, Vol. I, p. 751.
[154] PARKER, Charles. *Global Interactions in the Early Modern Age*, pp. 223, 232-235.
[155] Ivi, p. 235.

one of the most prolific silver mines of the time. Potosí silver mine will be taken as a case study, and its environmental consequences will be outlined and discussed. This case will successively be used to reflect on how environmental pollution, social degradation and economic progress have coexisted for centuries. Finding a harmonious balance between economic growth and environmental preservation remains a challenge to be solved by present and future generations.

2.2 Colonial South America and the Emergence of Contemporary Bolivia

In order to gain a fuller understanding of the phenomenon under analysis, an introduction to the history of Bolivia during the Early Modern Age is essential. What follows is therefore a short account of the history of colonial Bolivia. The process of independence from the Spanish authorities will also be included. The following pages will highlight how, from the very beginning, the history of the Bolivian territory was closely linked to the discovery and exploitation of its natural resources. As we shall see in fact, Upper Peru, the ancient name for what is now Bolivia, was first and foremost a mining area for the Spanish conquistadores. The conquest of this region was initiated in order to take possession of its mineral riches, which were strategic for Spain's financial and economic health. After acquiring independence, newly born Bolivia remained anchored to extractive activities. This marked a point of continuity between the colonial and the post-colonial period. The legacies of this reliance at the economic and industrial level are visible yet today, as the final chapter of this dissertation will note. In addition, the following pages will also highlight the social fragmentation and the isolation of the indigenous communities that have interested the country since the arrival of the first colonizers. These issues persisted in the 20th century, and they were finally addressed by Bolivian policymakers at the beginning of the 2000s.

The establishment of a Spanish royal government in the New World was a gradual process. The conquest began towards the end of the 15th century, following the arrival of Columbus in Hispaniola, and was finally completed around 1570. The Caribbean were the first area to be colonized, followed by Mexico and the isthmian region of Central America.

Motivated by the desire to explore and potentially discover new sources of gold or other precious metals, Spanish conquistadores Pizarro and Almagro embarked on a quest for *Birú* or Peru, which was rumoured to be rich in minerals. After having found evidence of an organized

civilization around 1527,[156] Pizarro and his men reached the coast of Ecuador. From here the two made their way south to arrive in Cajamarca, in the northern Andes.

At the time, the Inca Empire was in turmoil due to a dynastic war of succession between Atahualpa and Huascar, the two contenders of the Inca throne. Internal divisions ultimately proved an advantage for the Spaniards, as they succeeded in conquering Cuzco, the centre of the Inca kingdom, in 1533.[157] Lima, the new capital city, was founded two years later. The exploration of Southern Incan territories – which are now part of Bolivia [158] and Chile – continued, although delayed by an internecine conflict between Pizarro, Almagro and their supporters over the control of the ancient capital Cuzco. Spanish authorities were finally able to pacify the region through the intervention of Pedro de la Gasca, a diplomat sent by the Crown, who became the first Viceroy [159] of Peru. After having regained control over the Andes, the Spaniards continued their exploration of the southern territories. Nuestra Señora de La Paz was founded in 1548 while Santa Cruz de la Sierra was established in 1561.[160]

Once the exploration process was complete, the Castille monarchy established a wide web of administrative institutions to exert control over the newly acquired territories. Provinces were the main administrative units. Each of them was headed by a governor and was answerable to an *audiencia*, i.e. a court of law managing civil as well as criminal cases, located in capital cities such as Lima.[161] All the audiencias were placed, in their turn, under the jurisdiction of the two viceroyalties, that reported directly to the *Consejo de las Indias,* the supreme administrative body of the Spanish Empire for the American continent. The Spanish crown imposed taxes and duties on American territories, which were collected by royal agents.

Indigenous communities had their own municipalities and offices and were governed by local chieftains until the mid-16th century. Later, an administrative reform was implemented, and

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[156] Pre-Columbian Andean societies were highly organized and included a variety of different peoples, with unique cultural and linguistic characteristics. Quechua (also Kichwa) and Aymara were among the most spoken languages of the region. For a detailed account of Andean societies before the Spanish conquest, refer to MURRA, John. "Andean Societies before 1532", in BETHELL, L. *The Cambridge History of Latin America*, vol. I. pp. 59-90, Cambridge University Press, 1984.

[157] ELLIOT, J.H. "The Spanish Conquest and the Settlement of America" pp. 183-187 in BETHELL, L., pp. 147-206.

[158] At the time, the region became known as *Upper Peru* or *Audiencia y Cancillería Real de La Plata de los Charcas.*

[159] Political and administrative office in Spanish America. The Viceroy represented the King of Spain's interests in the New World. The *Indes* were first divided into two viceroyalties, the Viceroyalty of New Spain with headquarters in Mexico City, and the Viceroyalty of Peru, administered from Lima. Through these political structures and a vast bureaucracy, the Spanish monarch exercised absolute power over these dominions. See ELLIOT, J. H. "The Spanish Conquest and the Settlement of America, in BETHELL, L. pp. 205-206.

[160] WAGNER, M. L. "Conquest and Colonial Rule, 1532-1809" in HUDSON, R. A. and HANRATTY, D. *Bolivia, a country study*, 3rd edition, 1989.

[161] ELLIOT, J. H. "Spain and America in the Sixteenth and Seventeenth centuries" in BETHELL, L. pp. 296-297.

"Indian" sectors were divided into multiple *corregimientos*, i.e. administrative units. Each *corregimiento* was headed by a *Corregidor de Indios*, a Spaniard mayor who administered justice, collected tributes and was responsible, at least in theory, for the overall well-being of the natives. In practice, however, this position was often used to extort wealth from these local groups, and abuses against the natives were unfortunately very frequent.[162] The *encomienda* system [163] also produced numerous abuses, which were frequently denounced by various Spanish intellectuals.[164]

Throughout the colonial period, native communities continued to be administered separately. Although this was theoretically done to spare indigenous peoples from mistreatment, it ultimately resulted in a strongly polarized society, where power was concentrated in the hands of the Spaniards and the Creoles.[165] Political and social exclusion of native peoples will remain a long-lasting issue in the region and will create tensions between the different social groups, sparkling revolts and division well into the 20th century.

Issues of inclusion and participation were however not a priority for Spanish authorities, as colonial territories were primarily seen "as bases for extraction of desired goods".[166] As previously noted, Upper Peru had indeed significant economic potential due to its rich mineral deposits, particularly silver. The region was rapidly integrated into the transatlantic trade network that connected it to the motherland, and from the 1540s, silver became its main export. Soon, Spain's dependence on American silver began to manifest, as royal finances greatly benefitted from this influx of precious metals.[167] This dynamic had a significant impact on the development of future South American countries. Indeed, these territories long remained an ensemble of export-oriented, often monocultural economies, that could prosper only with the help of importing countries. This legacy continued well after independence, and the effects of economic dependence are still visible to this day.

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[162] Ivi, pp. 310-312.

[163] *Encomenderos* were individuals who were granted plots of land by the Crown, and they had the right to take control over the native people inhabiting the area. *Encomenderos* could count on these people as labour force, but, for their part, had the duty to protect and educate native "vassals". The system was however unjust, as denounced by Bartolomé de Las Casas. Indeed, powerful *encomenderos* often neglected their educational duties and solely focused on exploiting the native peoples under their control. The *encomienda* system was partially modified by Charles V in 1542, when the rights of inheritance of the encomienda were withdrawn by the monarchy. ELLIOT, J. H., "The Spanish Conquest and settlement of America", in BETHELL, L. pp. 165-167.

[164] See page 47 of this thesis for more references.

[165] ELLIOT, J. H. "Spain and America in the sixteenth and seventeenth centuries", p. 314.

[166] MACLEOD, M. J., "Spain and America: The Atlantic Trade, 1492-1720" in BETHELL, L. p. 386.

[167] ELLIOT, J.H. "Spain and America in the sixteenth and seventeenth centuries", pp. 321-322.

Towards the end of the 16th century, the Crown's financial and military weakening led to a loosening of the strong economic ties between metropolitan Spain and the colonies.[168] From the 17th century onwards, the Upper Peruvian colonial society gradually acquired more autonomy and an influential Spanish American ruling class composed of Creole elites soon emerged.

In these circles, the first signs of the revolution began to appear. By the end of the century, creole elites became increasingly dissatisfied with the constraints and limitations imposed by the monarchy. During the 1770s and 1780s, indigenous communities too demanded greater liberties and fairer treatments from authorities. However, their protests proved largely unsuccessful, even though the memories of these events endured over time.[169]

In the meantime, creoles elites, taking inspiration from the principles of the Enlightenment and the cases of the Haitian and French Revolution, requested more political autonomy. An anti-Spanish sentiment slowly emerged, and finally exploded after the French invasion of the Iberian Peninsula in 1808. The political confusion that followed created social tensions inside Latin American regions, divided between royalist and independentist forces. The 1820 Cadiz mutiny hastened the process of independence. In Upper Peru, the viceroy lost control of the territory, and royalist forces were overruled. The same gradually happened in other areas of the continent. In the struggle between the two factions, a strong leader emerged: Simón Bolívar, a Venezuelan general who played a pivotal role in the liberation campaigns in Colombia, Venezuela, and Peru. Bolívar assigned the task of completing the independence process in Upper Peru to one of his lieutenants, Antonio José de Sucre. On the 6th of August 1825, a newly formed constituent assembly adopted a declaration of independence. Soon after, Upper Peru was renamed Bolivia in honour of Bolívar. The newly born country was constituted as a republic, in the territory that once formed the *audiencia* of Charcas.[170]

In November 1826 Bolívar revised the constitution written the previous year by the constituent assembly.[171] As we will see in the final chapter, the constitutional texts drafted in the following two centuries were not fully representative. Indeed, the texts were often regarded as a reflection of the values of a few elites rather than those of the majority of Bolivian citizens. Only at the

[168] Ivi, p. 335.
[169] LYNCH, J. "The origins of the Spanish American Independence" in BETHELL, L., Volume III, p. 38.
[170] BONILLA, H. "Peru and Bolivia from Independence to the War of the Pacific" in BETHELL, L. Volume III, p. 564. The process of the South American independence is covered extensively in BUSHNELL, D. "The Independence of Spanish South America" in BETHELL, L. pp. 95-156.
[171] WAGNER, M. L. "Independence and Early National Period 1809-1839" in HUDSON, R. A. and HANRATTY D. M. *Bolivia, a country study*, pp.15-19.

beginning of the 21st century, the requests for a new, fully representative constitutional text were finally met.[172]

After the independence process, the country found itself rather isolated. Indeed, it experienced a physiological decline in its silver mines' productivity towards the 1830s and this resulted in a break in the transoceanic ties that had linked Bolivia to overseas economies. This isolation was a clear demonstration of the risks associated with the dependence on natural resource exploitation. Mining activities began to resurge only in the 1870s when the economy could enjoy a new increase in silver and tin production. In this way, the international connections were re-established once again.[173]

From a social point of view, Bolivia remained divided, and protests by indigenous communities were recurrent towards the end of the century.[174] In addition, an unstable political situation worsened social insecurity. Several leaders served very short terms, and many of them were overthrown by their opponents in coups d'états. The term *caudillos bárbaros* (i.e. barbarian warlords) was often used to describe government leaders during this period.[175] Several among them enforced oppressive measures against native communities, imposing high tributes and seizing large tracts of native land to increase agricultural output.[176]

By the 1880s, large native groups had migrated to the city centres, seeking more opportunities and more social inclusion. The result was a growing percentage of *mestizos* – or *cholos* –. Even these groups remained marginalized.

The War of the Pacific (1879-1884) was a decisive turning point for the country. Bolivia's citizens were particularly touched by the defeat, and a lively debate arose within the civil society. As a result, new political parties were created, such as the *Partido Conservador*, formed by an alliance of mining entrepreneurs, and the *Partido Liberal*. Both parties favoured similar growth strategies based on an open economy, but neither of them was able to increase social cohesion within national borders.

Between the end of the 19th century and the beginning of the 20th century, social and political participation remained controversial issues. Elected governments represented in fact only a small minority of the population, composed of Spanish-speaking white citizens. Most

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[172] For references see the following link: https://constitutionnet.org/country/constitutional-history-bolivia#:~:text=Bolivia's%20constitutional%20history%20can%20be%20traced%20back%20to,judicial%20branches%20based%20on%20the%20United%20States%20model. The 21st century update of the constitution will be mentioned in chapter 4.

[173] BONILLA, H. "Peru and Bolivia from Independence to the War of the Pacific", pp.564-566, 576-577.

[174] Ivi, p. 575.

[175] WAGNER, M.L. "Independence and Early National Period 1809-1839", p. 19.

[176] Ivi, pp. 20-21.

indigenous peoples and mestizos continued to be excluded from the political life of the state. This proved highly detrimental to social cohesion. These problems will inspire later indigenous activism and protests, which will ultimately reach a peak at the beginning of the 21st century.[177] Despite remaining a highly traditional, export-dominated economy, Bolivia will also prove to be a laboratory for innovative ideals and revolutionary political forces.[178]

The final chapter of this thesis will mention how prolonged social and political exclusion ultimately produced complex consequences, and served as the basis for creating a new, more inclusive Bolivian society.

2.3 The Environmental Consequences of Silver Mining in Potosí

As we have seen in the previous pages, South American silver mines were extremely important for the economic and financial well-being of the Spanish monarchy, especially in the first part of the early modern age. Nevertheless, extractive activities also produced complex environmental and social consequences. The following sections will explore this topic. The famous silver mine of Potosí will be taken as a case study to investigate the effects of colonial silver mining on the environment. The health and relational implications of this economic activity will be also mentioned in the last part of this chapter.

Located in the Andes, in the southern part of Bolivia, the city of Potosí was founded in 1545.[179] After its foundation, Potosí soon became famous for its rich mines and the prosperity of its population. It reached 160,000 inhabitants in 1650[180] and was even quoted by Miguel de Cervantes in his *Don Quixote*. The popular Spanish expression *"valer un Potosí"* is still used today to describe something of great value.[181] Given its importance from an economic point of view, the city was also awarded the title of "Villa Imperial" by Charles the 5th, King of Spain in 1559.[182]

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[177] KLEIN, H. S. "Bolivia from the War of the Pacific to the Cacho War, 1880-1932" in BETHELL, L. vol. V, pp. 559-560.

[178] Ivi, pp. 585-586.

[179] An early account of Potosí history and mining activities can be found in the writings of José de Acosta, a Spanish Jesuit and writer. See ACOSTA, José, *Historia Natural y Moral de las Indias*, vol.1, Chapters VI- XII, Sevilla, 1590. Acosta describe the geographical position of Potosí and the process of silver extraction. A digitalized version of a 1792 edition of the *Historia* can be accessed at the following link: https://archive.org/details/historia-natural-y-moral-de-las-indias-vol-1/page/194/mode/2up

[180] BURKE, Peter, "Patters of Urbanization, 1400 to 1800", in BENTLEY, J.H., et al. *The Cambridge World History*, Cambridge University Press, 2015, p. 127.

[181] HUGUET, P. g. Huguet, "¿De dónde viene la expresión 'valer un Potosí'?", *National Geographic,* August 28, 2020, https://historia.nationalgeographic.com.es/a/de-donde-viene-expresion-valer-potosi_15128#:~:text=%22Este%20chico%20vale%20un%20Potos%C3%AD%22.%20Cuando%20alguien%20emplea,decir%20que%20algo%20o%20alguien%20es%20muy%20valioso

[182] LANE, K. "Potosí Mines" in *Oxford Research Encyclopedia of Latin American History,* May 4, 2015, https://oxfordre.com/latinamericanhistory/display/10.1093/acrefore/9780199366439.001.0001/acrefore-9780199366439-e-2

Potosí was built in a wide valley topped by a volcanic peak that the natives called *Sumaj Urku* or "beautiful mountain" and the Spaniards later renamed *Cerro Rico*, meaning "rich hill" (Figure 1). Colonizers soon discovered that the mountain was extremely rich in silver veins. [183] The silver extracted from the Cerro Rico would make the city one of the epicentres of silver mining in the early modern world, contributing to the success of the Spanish monarchy in the 16th and 17th centuries. As we shall see in the next chapter, Potosí silver was traded between different regions of the world and became the main means of payment for international trade. The international circulation of American silver would eventually contribute to the emergence of an early globalised economy.

Extracting activities on the Cerro Rico of Potosí commenced well before the arrival of European colonizers. The Incas were in fact the first ones to develop mining and metallurgic techniques in this region. They extracted gold, silver, and copper from the Andean mineral deposits, with which they made tools and jewellery. After the conquest of Upper Perú, Spanish conquistadores took control of the area and created new mining infrastructures to exploit the silver deposits at their full capacity. A royal tax, known as the *quinto real*, was levied on the silver produced. This allowed the Spanish Crown to profit immensely from the mining activities in Potosí.[184]

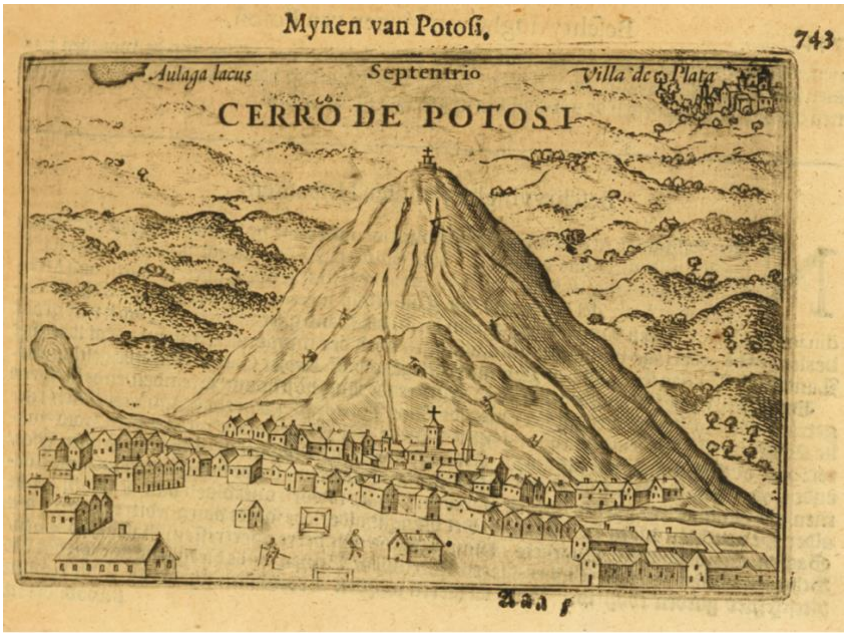

Figure 1: An English Reproduction of a 1553 draw of Potosí by the Spanish explorer Pedro de Cieza de León, 1581. John Carter Brown Library at Brown University. Reproduced in LANE, Kris, "Potosí". p. 29.

[183] LANE, K. "POTOSÍ" in THURNER, M, and PIMENTEL, J. *New World Objects of Knowledge*, University of London Press, 2021.
[184] BRANDING D.A. and CROSS, Harry, "Colonial Silver Mining: Mexico and Peru", *The Hispanic American Historical Review*, vol. 52, no. 4, 1972, p. 561.

Mining activities were for the most part carried out by indigenous workers, employed in both free and unfree labour. On one hand, natives were in fact subject to a tributary work system named *mita*. This system was originally established during the Inca period and was later adopted and reorganized by the Spanish colonizers to gain labour force. In the case of Potosí, *mita* workers were obliged to work in the mines for a certain period of time, usually one year. Men were recruited from different villages and settlements up to 500 kilometres from the Cerro Rico. This system was first introduced by the Viceroy of Perú, Francisco de Toledo, in the 1570s, and lasted for more than two centuries. It was finally abolished by law only in 1812.[185] Under this system, male native workers aged between eighteen and fifty were forced to move to Potosí to work in the mines and often took their spouses and families with them. The whole process was monitored by local native representatives who responded to Spanish authorities. The *mita* system was obligatory. Workers did indeed receive a small wage, but this was merely enough to support them and their families and to pay their tributes to the Crown.

On the other hand, the mita coexisted with a system of free labour that took the name of *minga*. Free-range workers were also present in Potosí throughout the colonial period.[186] *Mitayos* were typically assigned the most difficult and dangerous tasks, such as that of transporting the ore to the surface. Due to their precarious working conditions, their almost non-existent salary, and the misery in which they lived, the indigenous people subject to the mita system suffered the direst consequences.[187]

As it can be seen in Figure 2, mining in Potosí did not always proceed at a rapid pace. The production process experienced several setbacks, for instance in the early 1570s. What truly contributed to the mine's ultimate success was the introduction of an ancient mining technique that arrived in Upper Perú towards the end of the 16th century. This technique was labelled as mercury amalgamation – or patio process.[188]

[185] Ivi, p. 557.
[186] BARRAGÁN, Rossana. "Extractive Economy and Institutions? Technology, Labour, and Land in Potosí, the Sixteenth to the Eighteenth Century" in *Colonialism, Institutional Change and Shifts in Global Labour Relations* edited by Karin Hofmeester and Pim de Zwart, Amsterdam University Press, 2018, pp. 218-222.
[187] MONTERO, Raquel G. "Free and Unfree Labour in the Colonial Andes in the Sixteenth and Seventeenth Centuries"*, International Review of Social History*, vol. 56, 2011, pp. 297-318.
[188] LANE, Kris, "Potosí Mines".

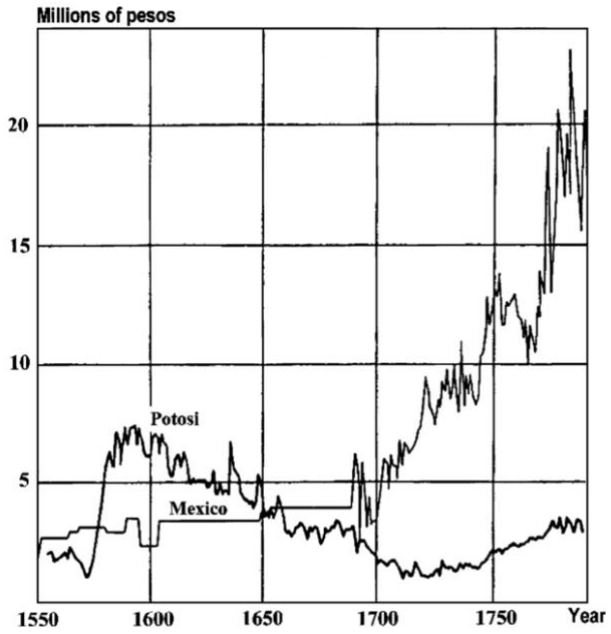

Figure 2: The production curves of silver Mexican and Peruvian mines in the Early Modern Age (1550-1800). Cited in Guerra, M.F. "The circulation of precious metals in Brazil at the end of the 17th century". Original source: Braudel, F. *La Méditerrannée et le Monde Méditérranéen à l'Époque de Philipphe II,* A.Collin, Paris, 1966.

Mercury – designated as Hg in the periodic table – was used to separate silver (Ag) from the rest of the ore body. Silver is in fact often found in nature as a compound – silver sulphide or silver chloride – but very rarely in its purest form. For this reason, refining techniques are needed to remove the remaining by-products. This technology had most likely been employed in mining extraction already by the Phoenicians and Carthaginians and was later widespread by the Romans around 50 A.D. The Romans were also the first ones to notice the detrimental effects that Hg had on human health and on the environment.[189]

The patio process proved highly efficient for extracting precious metals at low costs of production. For this reason, it long remained the most used refining method in South and Central America and was still being used towards the end of the 19th century.[190]

This thesis focuses not on mercury amalgamation per se, but rather on the effects that this pre-industrial activity had on the environment and on local communities. For this reason, a detailed description of the patio process would go beyond the scope of this thesis. It is thus enough to know that silver mining in Potosí was a complex and arduous process that could potentially last

[189] DE LACERDA, L. D. and SALOMONS, W. "The Use of Mercury Amalgamation in Gold and Silver Mining" in *Mercury from Gold and Silver Mining: A Chemical Time Bomb?* Environmental Science, Springer, 1998.
[190] NRIAGU, J. O. "Mercury pollution from the past mining of gold and silver in the Americas", *The Science of the Total Environment* n.149, 1994, pp.168-172.

months. Amalgamation consisted of at least six different stages and entailed a high degree of coordination and expertise, as well as a constant supply of water, food, wood, and other goods that had to be brought from distant locations.[191] In the colonial period, the means of production were almost exclusively controlled by the Spaniards, while the majority of the physical work was carried out by *mita* and *minga* native workers.[192]

Amalgamation was introduced in colonial America by the Spanish merchant Bartolomeo de Medina, and it was first employed in New Spain, now Mexico, in 1555. From there, the knowledge of this technique reached Upper Perú, where it was introduced to the Spanish Viceroy Francisco de Toledo by Pedro Fernández de Velasco. As a result, mercury amalgamation replaced cupellation, another refining technique, in Potosí around the late 1570s.[193]

The new technique improved production, and Potosí mines were able to function at full capacity yet again. Professor Nicholas Robins, who has consecrated his research to Andean social and environmental history, has estimated that, between 1550 and 1800, Latin American mines produced around 136,000 metric tons of silver, which accounted for over half the world's production during that period.[194]

The use of Hg was therefore pivotal for the smooth functioning of Upper Peruvian mines. Mercury came to Potosí from Huancavelica, Perú, a settlement already inhabited in pre-Columbian times, where rich deposits of cinnabar were found.[195] The Santa Barbara mine in Huancavelica, established in the second half of the 16th century, would remain the only mercury mine in the American continent until the discovery of Hg deposits in California in the 1800s. On one hand, mercury amalgamation resurrected the colonial economy of Potosí and the entire Upper Peruvian region. On the other, however, this technique produced deleterious environmental consequences, contributing to large-scale pollution in the Andes region. Moreover, native communities too were negatively impacted by the introduction of mercury amalgamation, as they were among the ones suffering the direst health implications resulting from prolonged exposure to Hg. Mercury is in fact extremely toxic for humans, and chronic exposure to high levels of mercury can even prove fatal. According to the WHO, "the inhalation

[191] MONTERO, Raquel G. "Free and Unfree Labour in the Colonial Andes in the Sixteenth and Seventeenth Centuries", p. 298.
[192] For a detailed description of the extraction and amalgamation procedure the reader should refer to BRANDING and CROSS and BARRAGÁN.
[193] GUERRA, M. F. "The circulation of precious metals in Brazil at the end of the 17th century", *Journal of Archeological Science* (31), 2004, 1225-1236, p. 1233.
[194] ROBINS, Nicholas. *Mercury, Mining, and Empire: The Human and Ecological Cost of Colonial Silver Mining in the Andes*, Indiana University Press, 2011, p. 4.
[195] Cinnabar, also known as mercury sulfide (HgS) is one of the most common sources of mercury.

of mercury vapour can produce harmful effects on the nervous, digestive and immune system, lungs and kidneys". Furthermore, "neurological and behavioural disorders may be observed after inhalation, ingestion, or dermal exposure of different mercury compounds. Symptoms include tremors, insomnia, memory loss, neuromuscular effects, headaches, and cognitive and motor dysfunction".[196]

Today these notions are part of common knowledge, and mercury exposure is regulated by precise health rules.[197] As we can imagine, however, the situation in 16th-century Bolivia and Perú was completely different. Potosí and Huancavelica residents were exposed to Hg daily, and mercury vapours permeated the surrounding environment, as well as the food and water people ate and drank. As a result of extraction processes, minuscule Hg particles were released into the atmosphere. These particles then return to earth in the form of rainfall, in a process defined by scientists as *wet deposition*.[198]

Scholars interested in this subject have resorted to a wide variety of sources and methods to estimate the total amount of quicksilver dispersed in the environment in the course of the colonial period. In our case, the sources used by scientists and environmental historians included mercury and silver production figures for Huancavelica and Potosí respectively, which were kept by Spanish authorities, as well as meteorological and topographical data, and digital air dispersion models. By combining ancient historical records with present-day models and figures, scholars were able to understand the overall ecological cost of colonial silver extraction in Upper Perú.[199] The following pages will attempt to outline the effect that this activity had on the Andes natural environment relying on existing historical and scientific research. Furthermore, a few pages will also be dedicated to the human costs of silver mining, paying particular attention to the health issues experienced by labourers in the colonial period.

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[196] "Mercury and Health", *World Health Organization*, March 31, 2017, https://www.who.int/news-room/fact-sheets/detail/mercury-and-health

[197] The *Minamata Convention on Mercury* is an international agreement signed in Japan in 2013 that aims to protect the environment and human health from anthropogenic Hg emissions. The convention deals, among other issues, with Hg mining and exports. It binds state parties to implement appropriate measures and safety controls to prevent the release of mercury into the environment. Article 7 requires state parties to reduce and possibly eliminate the use of mercury in mining and extractive activities. Bolivia and Perú ratified the convention in 2016. Text and Annexes can be accessed at the following link: https://minamataconvention.org/en/about

[198] During this process, aerosol particles return to the ground as atmospheric precipitation. In our case, the mercury released into the atmosphere is collected by droplets and is deposited on the planet's surface when raindrops hit the ground. Definition of wet deposition provided by VINER, Brian, "Coming and going: Transport and Tracking", Conceptual *Boundary Layer Meteorology*, 2023, pp. 217-241.

[199] ROBINS, Nicholas., *Mercury, Mining, and Empire,* p.101.

2.3.1 Silver Mining and the Environment

Even without mercury amalgamation, silver mining had and continues to have serious environmental consequences, such as the clearing of forests and vegetation, pollution from scrap materials, and soil, and water contamination.

Before the arrival of the Spaniards, ancient mining activities on the *Cerro Rico* had disrupted subterranean water streams and cleared local vegetation, which was used by Incas to power furnaces.[200] Nevertheless, the scale of mines, blast furnaces and overall infrastructures increased considerably when Spanish colonizers took control of Potosí. This meant that environmental degradation and pollution became more serious and widespread starting from the 16th century.[201]

One of the most visible impacts of silver mining on the natural environment was the widespread deforestation that affected both the immediate surroundings of the mountain as well as more distant locations. Enormous quantities of wood were required to be used as fuel and building material for underground machinery, furnaces, and surface buildings. This resulted in the rapid disappearance of indigenous Andean plants and bushes, such as the *ichu* grass, the *kenua* trees and the *yareta* moss, which all became relatively scarce from the 1560s.[202]

Spanish contemporaries noted this phenomenon, as large portions of terrain were converted into pastureland.[203] Overgrazing and loss of vegetation altered the landscape but also produced more subtle consequences. Some natural components in fact, such as the *yareta* moss, acted as soil stabilizers in the dry environment of the Andes, and their disappearance thus resulted in desiccation and soil erosion.[204] Something similar happened in other mining regions of South and Central America, for instance in the *Valle de Mezquital*, in present-day Mexico.[205]

The most hazardous type of environmental pollution during colonial times resulted from the vaporisation of mercury used in the amalgamation process. The following pages will therefore focus on mercury contamination, but it is however interesting to note that silver mining used a wide range of other polluting substances. Lead and zinc, for instance, which were used in silver smelting, were both harmful to the surrounding environment.[206]

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[200] LANE, Kris, "Potosí Mines", *Oxford Research Encyclopedia of Latin American History*.
[201] COOKE, Colin A. et al. "Over three millennia of mercury pollution in the Peruvian Andes", *PNAS* vol. 106, no. 22, 2009, pp. 8832-8833.
[202] Ibidem, ROBINS, Nichola. *Mercury, Mining, and Empire.* p. 178.
[203] ACOSTA, José de, *Historia Natural y Moral de las Indias*, vol.1, Chapters VI- XII, Sevilla, 1590.
[204] LANE, Kris. "Potosí Mines".
[205] PARKER, Charles H. *Global Interactions in the Early Modern Age, 1400-1800*, p. 172-173.
[206] LANE, Kris. "Potosí Mines"

According to existing records that range from the 1570s, when amalgamation was adopted in Upper Perú, to the end of colonial rule in Latin America, about 26,000 metric tons of silver were produced in Potosí. To achieve such production, approximately 50,600 metric tons of mercury, in the form of cinnabar ore, were extracted and refined in Huancavelica. Mercury was then transported to the mines in Potosí, where it was employed to obtain purified silver.[207] In the course of the Early Modern Age, Latin America alone accounted for almost 80 per cent of the total world production of silver.[208] These however are only partial numbers, as a certain percentage of silver and mercury production escaped registration by Spanish authorities and was smuggled along illegal routes. According to Jesuit José de Acosta, a significant portion of the silver produced was dispersed through contraband.[209]

Mercury vapours were the most dangerous form of contamination. In this regard, scholars were able to calculate mercury concentration levels in the air of Potosí and Huancavelica, in different moments of the Spanish colonial rule. The analysis was conducted with a computer-based modelling program denominated AERMOD. This model is used by scientists to simulate the atmospheric impact of a specific industrial source that emits polluting substances. The system was first adopted by the US Environmental Protection Agency (EPA) in 2005.[210] In our case, it was used to study mercury vapours emitted by chimneys in the mines. The results achieved depended on several different factors, including average temperatures, chimney height, topographical characteristics, and wind patterns. The result was an approximation of mercury concentration levels at specific times. Furthermore, an error threshold should be taken into consideration, as the levels of mercury pollution were also influenced by a series of meteorological factors such as wind direction and wind speed, as well as temperature and precipitation levels.[211]

In aggregate, pollution from mercury vapours was more pronounced in Potosí than in Huancavelica. In fact, in Upper Perú, a large percentage – nearly 85 per cent – of the mercury

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[207] GARNER, Richard. "Long-term silver mining trends in Spanish America: a comparative analysis of Peru and Mexico" *The American Historical Review*, vol. 93, issue 4, 1988, pp. 898-935. BAKEWELL, Peter, "Registered silver production in the Potosi district, 1550-1735" *Jahrbuch fur Geschichte von Staat, Wirtschaft und Gesellschaft Lateinamerikas* 12, 1975, pp. 93-100. CROSS, Harry E. "South American bullion production and export 1550-1750" in *Precious Metals in the Later Medieval and Early Modern Worlds*, edited by RICHARDS, J.F, Carolina Academic Press, 1983, p.422.

[208] FLYNN, D. and GIRALDEZ, A. "China and the Manila Galleons", in LATHAM, A. J. H. and KAWAKATSU, H. *Japanese Industrialization and the Asian Economy,* Routledge, London and New York, 1995, p.71.

[209] ACOSTA, José de, *Historia Natural y Moral de las Indias*, vol.1, Chapters VI- XII.

[210] For more information concerning the AERMOD Modelling System refer to "AERMOD Modeling System Development, *United States Environmental Protection Agency*, https://www.epa.gov/scram/aermod-modeling-system-development

[211] ROBINS, Nicholas. *Mercury, Mining, and Empire,* p. 115.

used in the amalgamation process was ultimately vaporized, in this way being released in the air. In Huancavelica instead, smaller percentages of Hg vapors were released, being mostly the result of the inefficiency of the machinery used.[212]

The results of the AERMOD analysis showed the toxic conditions that interested both mining centres. These results confirmed the presence of high levels of pollution that negatively affected both the environment and the local community.

Pollution was at its worst in the opening phase of production, between the second half of the 16th century and the 1680s, when silver extraction and refining peaked.[213] Considering silver production levels from the 1570s to 1810, approximately 165 metric tons of mercury vapours were emitted from Potosí each year. This resulted in a total of around 39,000 metric tons of mercury emissions during the colonial period.[214] Emissions in Huancavelica were lower, with an average of around 69 metric tons of mercury released annually. This is also due to the smaller size of the production site.[215]

As previously stated, after being vaporized by chimneys, Hg particles released in the atmosphere returned to the surface in the form of precipitation. Once back on the ground, mercury could either volatize a second time or penetrate the soil or other organic materials such as vegetation, thereby becoming part of their chemical composition. Studies conducted in 2010 have confirmed the presence of very high levels of mercury in the soil around Potosí. Several soil samples were selected and analysed, and the results obtained highlighted how mercury concentrations were "among the highest […] reported for surface soil in the scientific literature".[216]

In addition, mercury particles could also settle in rivers and streams, accumulating in aquatic plants and animals, upsetting the water pH balance. [217] In this way mercury became part of the food chain, eventually entering the human body once people ate contaminated fish or drank contaminated water. The American shad, a type of migratory fish present in South America, was probably among the contaminated aquatic species that contributed to the dispersion of mercury residues in the environment. Mercury spills due to mining operations affected both the *Rio Pilcomayo* in Potosí and the *Ichu River*, in Huancavelica. Today, these rivers continue to

[212] Ivi. p. 109
[213] Ivi. pp. 116-130
[214] HAGAN, Nicole et al. "Estimating historical atmospheric mercury concentrations from silver mining and their legacies in present day surface soil in Potosí, Bolivia" *Atmospheric Environment*, issue 45, 2011, p.7619.
[215] ROBINS, Nicholas. *Mercury, Mining, and Empire*, pp. 130-131.
[216] HAGAN, Nicole et al. p.7626. To understand the magnitude of soil contamination it is sufficient to know that this study highlighted "average toral mercury concentrations in Potosí were approximately 20-30,000 time greater than in uncontaminated soils", in other locations taken as reference, such as the city of Sucre. (p. 7625)
[217] LANE, Kris. "Potosí Mines".

be polluted by refinery runoff, which contains a mix of mercury, salt and other dangerous solvents.[218]

Furthermore, native and imported animals – alpacas, livestock and pigs – were exposed to contamination, in this way poisoning also the people who consumed them. Domesticated animals such as horses and dogs became intoxicated by polluted air and forage, experiencing symptoms such as inflammation and birth defects. Hg-contaminated water was also used by natives and Spaniards to irrigate crops. This suggests that pollution affected both edible and non-edible plants, meaning that, in this way, mercury was further dispersed in human bodies and herbivorous animals.

Cinnabar ore was carried by llamas and mules from Huancavelica to Potosí, and a certain percentage of mercury was very likely dispersed along the way. This resulted in even more widespread environmental pollution.[219] During this transportation phase, in fact, the ores were placed in leather bags, which often broke, in this way disseminating mercury in the nearby environment.[220]

Finally, being mercury a highly volatile element, deposited Hg could easily be re-emitted in the air, for example, due to strong wind patterns. This means that the same mercury particles could potentially be cycled in the atmosphere for prolonged periods of time, in a pattern similar to what happens with pesticides such as PCB and DDT. This made scientists interested in the subject hypothesise that "Spanish American silver mines were partly responsible for the high background concentration of mercury now being reported in the global environment".[221] This particular aspect is very difficult to demonstrate on a practical level. Nevertheless, these scientific hypotheses are still interesting to remember and take into consideration when dealing with historical mercury pollution in the Andes.

These different dynamics were of course all interrelated. Once Hg had penetrated a portion of the soil or was dispersed in a single water stream, then the entire local environment was polluted, and so were the organisms and species that inhabited that location. Being Potosí a large settlement, connected to other major centres in the region by commercial links and economic interests, polluting residues reached distant locations, situated many kilometres away from the Cerro Rico. Something very similar also happened to mercury particles that flowed into the wind. These microparticles were transported hundreds of kilometres away from the

[218] Ibidem.
[219] ROBINS, Nicholas. *Mercury, Mining, and Empire,* pp. 102,106, 109, 110.
[220] NRIAGU, Jerome O, "Mercury pollution from the past mining of gold and silver in the Americas", p. 173.
[221] Ivi, p. 179.

Andes, perhaps reaching the Atlantic Ocean.[222] It is thus possible to argue that silver mining in the Viceroyalty of Peru had ecological implications not only at a regional level but also globally, even if these cannot be entirely quantified. Furthermore, if we take into consideration the fact that Potosí silver travelled across the main commercial routes to reach almost every corner of the world, then its environmental footprint becomes enormous. According to John Richards, a leading figure in environmental history, "It is likely that mercury pollution from the silver mines […] of Peru constituted the single largest source of pollution in the entirely early modern world".[223]

Contemporary readers will be well accustomed to these dynamics since the transboundary effects of pollution can now be detected nearly everywhere. Today, microplastics are abundantly found in oceans, rivers, and lakes, reaching every corner of the world.[224] Toxic residues from factories and industries pollute the air and are discharged into waterways. The examples are numerous and describe a global situation which requires complex and comprehensive solutions. The case of Potosí and Huancavelica is relevant since it shows us an early example of widespread anthropogenic pollution caused by pre-industrial economic activities. Those who are not interested in environmental history often associate the emergence of pollution with the onset of the first Industrial Revolution and the construction of large factories in northern Europe. While this is of course true to a certain extent, silver mines in Potosí offer us a complex case of severe environmental degradation in the early modern world. This case study is a reminder that already in the 16th century, clear signs of the Anthropocene were present. The arrival of conquistadores in the Andes, the establishment of large smelting centres and the implementation of the amalgamation process drastically changed the equilibrium of the region. These effects were also happening in a context where profound changes had already happened due to the onset of the Columbian Exchange. As we shall see in a moment, the harmful effects of silver and mercury mining did not exclusively regard the natural environment. Communities and human relations too were affected by severe repercussions.

[222] PARKER, Charles H. *Global Interactions in the Early Modern Age, 1400-1800*, p. 174.
[223] RICHARDS, John F., *The Unending Frontier: An Environmental History of the Early Modern World*, University of California Press, Berkley (2003), p.369.
[224] KURNIAWAN, S.B. et al, "Microplastic Pollution in the Environment: Insights into Emerging Sources and Potential Threats", *Environmental Technology & Innovation*, Issue 23, 2021.

2.3.2 Silver Mining, Human Health, and Human Relationships

The preceding pages have highlighted the high levels of environmental mercury pollution in both Potosí and Huancavelica. This phenomenon did not solely produce detrimental effects on the surrounding natural environment but exposed the communities inhabiting these areas to serious health hazards.

Mercury used in the amalgamation process entered the human body through inhalation, and through the skin, in this way penetrating cellular membranes. Hg is a toxic element for the human body, and the harmful effects of mercury poisoning on people's health at the end of the were already known by 15th-century physicians.[225] In Potosí workers – miners and refiners – as well as their families were constantly exposed to Hg vapours. [226] In this way, they inhaled and ingested mercury sulphide particles, and this led to mercury poisoning. Mercury poisoning has been proven to produce a wide range of symptoms, including tremors, fever, difficulty in walking, sweating and tunnel vision, loss of memory and hearing loss. In the most serious cases, difficulty in speaking might occur, accompanied by muscle spasms and facial contortions.[227] Once mercury penetrated the human organism, it also affected the immune system, making exposed people particularly vulnerable to allergies and infections of various natures.[228] In addition, mercury contamination implied dire consequences for pregnant women as well. Even if not directly involved in the refining process, women were exposed to mercury vapours as they often helped their male relatives clean the ovens used for amalgamation. As a result of this indirect exposure, women could experience fertility issues and menstrual cycle irregularities.[229] In the case of pregnancy, mercury toxins were able to penetrate the placenta and, in this way, endanger the health of the foetus. As a result, new-born babies were more likely to present severe physical malformations and mental development abnormalities, if they ever survived pregnancies.[230] These conditions were noted by contemporaries such as Bartolomé Arzáns de Orsúa y Vela. He lived in Potosí in the early 18th century and reported numerous cases of birth defects and stillbirths among the population of the city.[231]

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[225] ROBINS, Nicholas. *Mercury, Mining, and Empire,* pp.102-104

[226] Mining activities did not stop, and mines remained active 24 hours a day as reported by HAGAN, Nicole et al. "Estimating historical atmospheric mercury concentrations from silver mining and their legacies in present day surface soil in Potosí, Bolivia" in *Atmospheric Environment*, p. 7625.

[227] ROBINS, Nicholas. *Mercury, Mining, and Empire,* pp.105-108.

[228] HAGAN, Nicole et al. "Estimating historical atmospheric mercury concentrations from silver mining and their legacies in present day surface soil in Potosí, Bolivia", p. 7620.

[229] ROBINS, Nicholas. *Mercury, Mining, and Empire,* p.136.

[230] ROBINS, Nicholas. and HAGAN, Nicole A. "Mercury Production and Use in Colonial Andean Silver Production: Emissions and Health Implications" *Environmental Health Perspectives*, vol. 120, no. 5, 2012, p.628.

[231] ARZÁNS DE ORSÚA Y VELA, B. *Historia de la Villa Imperial de Potosí*, Hanke L., Mendoza G. eds, Brown University Press, Providence, 1965.

According to scholars, the health implications resulting from mercury environmental pollution were worse among indigenous workers and their families, as they accounted for the majority of workers in the smelters and mills used for amalgamation. They were therefore exposed to a greater level of contamination.[232] In addition, native families' houses were also located in close proximity to ovens and other machineries, meaning that even when not working they still suffered from indirect exposure.[233] Finally, native people's immune systems were already weakened by the diseases and pathogens introduced by the colonizers with the Columbian Exchange. This meant that health damages were greater and more severe in this population group.

Such deleterious effects on human health have been confirmed, in recent times, by studies conducted both on animals and humans.[234] With the help of these studies, historians were able to gain a better understanding of the health problems experienced by workers in Potosí and Huancavelica.

An interesting point to notice is that mercury pollution did not only affect physical health. It also had an impact on the psychological well-being of the subjects exposed to its vapours. Because of prolonged exposure, symptoms such as irritability, personality alterations, depression, psychoses, anxiety, and neurotic behaviours might occur, accompanied by a general tendency towards violence and hostility.[235] All these symptoms are likely to affect the way people relate with one another, inside social communities and families. In this sense, according to experts, historical mercury contamination in the Andes is most likely to have had a disruptive effect on people's relations as well.[236]

This knowledge could explain the harsh violence that seemed to permeate society in Potosí and surrounding districts. Indeed, contemporaries often refer to outbreaks of violence and social conflict in the area, often happening between different ethnic communities. The city was particularly violent in the years 1593-1600 and again from 1622 to 1624. These were also periods of intense mining activities and high production – as can be seen by looking at the graph

[232] ROBINS, Nicholas. *Mercury, Mining, and Empire,* pp.130-131.
[233] Ivi, p.136.
[234] MILIONI, Ana Luiza V. et al. "Neurotoxic impact of mercury on the central nervous system evaluated by neuropsychological tests and on the autonomic nervous system evaluated by dynamic pupillometry", *Neurotoxicology,* issue 59, 2017, pp. 263-269. The study confirms the toxicity of mercury for the human central nervous system, investigating the occurrence of neurophysiological dysfunctions in former workers who had been exposed to Hg vapours for a prolonged period. Scholars also noted signs of depression and damaged cognitive functions.
[235] HAGAN, Nicole et al. "Estimating historical atmospheric mercury concentrations from silver mining and their legacies in present day surface soil in Potosí, Bolivia", p. 7620.
[236] ROBINS, Nicholas A. *Mercury, Mining and Empire*, pp. 105-108.

on page 60.[237]

Studies conducted to estimate the levels of historical mercury pollution in the area between the late 15th century and the early 18th century have concluded that "the entire community [of Potosí] was estimated to have been exposed to levels of mercury vapour that exceed present-day acute inhalation reference values for the general public".[238] This means that, under present health regulations, Potosí colonial residents would have been evacuated for safety reasons. This did not happen, and nowadays people still live and work in Potosí. According to scientists, present-day communities inhabiting the area are still partly affected by historical mercury contamination, as they are exposed "to some of the highest soil concentrations of mercury that have been identified for an urban area".[239] In this regard, Robins remarks how "Far from being relegated to the past, the human and environmental tool of historic mercury and silver mining continues to this day".[240]

In conclusion, the case study of Potosí tells a story where anthropogenic environmental damage intersects with social injustice, poor health conditions, economic ambitions, and widespread violence.[241] Readers will probably find these dynamics rather topical, as scenarios such as this one are present today in many regions of the planet, especially in developing countries. The case of Potosí, therefore, stands as a paradigm, to remind us how powerful our humans' actions can be, and how pressing issues such as pollution, social security and environmental injustice have much older records than one might imagine.

The next chapter will situate Potosí silver in a broader international context. It will explore its role in the emergence of an early modern globalized economy and its journey along the main transoceanic commercial routes, which linked Upper Perú to the rest of the known world. By doing so, the chapter will attempt to demonstrate how environmental and social degradation in Potosí were linked with wider international economic interests.

[237] ROBINS, N. and HAGAN, N. A. "Mercury Production and Use in Colonial Andean Silver Production: Emissions and Health Implications", p. 628.
[238] HAGAN, Nicole et al. "Estimating historical atmospheric mercury concentrations from silver mining and their legacies in present day surface soil in Potosí, Bolivia", p. 7619.
[239] Ivi, p. 7625.
[240] ROBINS, Nicholas. *Mercury, Mining and Empire*, p. 9
[241] Ivi, pp. 147.

3. POTOSÍ SILVER AND THE EMERGENCE OF GLOBAL TRADE

The previous chapter has introduced the famous mine of Potosí, in present Bolivia, and has outlined the ecological consequences of silver mining in the Andes, as well as the health costs paid by native miners employed in the mita-labour system. As previously anticipated, a large portion of the silver produced in South America did not remain in the continent but instead travelled across the oceans to distant locations. Studying the global circulation of Potosí silver allows us to become aware of the increasingly complex commercial networks that were established across America, Europe and Asia starting from the 16th century.

In this chapter, the case study of Latin American silver will serve to underline the intricate web of connections and interdependencies between continents in the Early Modern Age, as well as the pivotal economic role played by silver in early globalization trends. Indeed, through the connection of Upper Peru with Spain, Potosí silver, along with other American precious metals, entered the European monetary system. Moreover, silver bullions also crossed the Indian and Pacific Oceans, eventually reaching the imperial courts of Ming and Qing China. In this way, silver facilitated connections between East and West, becoming the main means of payment used in transcontinental exchanges and laying the foundation for an early globalized economy. As economic historians Flynn and Giráldez noted, by the mid-17th century, "the entire world was entangled in a global silver web".[242]

Paying attention to these ancient monetary patterns is therefore pivotal for the story we are trying to narrate. Understanding the wide reach that the Potosí silver trade had at a global level provides clear evidence of how economic interests and commercial dynamics were closely linked to environmental degradation and pollution, as early as the 16th century. In this sense, the ecological footprint of silver produced in Potosí becomes somehow bigger if we take into consideration the global reach of this commodity. This chapter therefore deals with silver world trade, outlining the commercial links between the American continent and the rest of the world as well as the role and influence exercised by silver as a means of payment.

As previously mentioned in the second chapter, the development of global trade relations was made possible by the existence of some important preconditions, such as the emergence of centralized states able to collect taxes and establish bureaucratic apparatus. The appearance of transnational companies such as the East India Companies and the creation of the stock exchange also allowed trade relations between different parts of the world to increase and

[242] FLYNN, Dennis and GIRÁLDEZ, Arturo. "Cycles of Silver: Global Economic Unity through the Mid-Eighteen Century", *Journal of World History*, vol. 13, no. 2, 2002, p. 405.

become more consistent.

Potosí and the whole viceroyalty of Upper Peru were linked to Spain through the *Carrera de Indias*, the major commercial artery that ensured Castille a constant flow of goods coming from its overseas dominions. The trade between America and the motherland was organized as a monopoly, overseen by the *Casa de la Contratación*, established via a royal decree in 1503. This institution made sure royal financial interests were safeguarded. South American silver was crucial to Spain, and strict controls were enforced to prevent smuggling.[243] The Spanish Empire managed to control silver flows in the Atlantic, as silver-laden galleons were carefully guarded as they crossed the ocean to reach Europe.

Nevertheless, it is widely accepted among historians that a considerable amount of silver was also smuggled, as merchants resorted to illegal commercial routes to avoid taxes such as the *Quinto real*.[244] Smuggled silver travelled from the Andes to Buenos Aires, to the Chilean harbour of Arica, and northwards to Sacramento, where it was often exchanged for African slaves and European manufactures.[245]

American silver was the driving force of the Spanish Empire during the 16th and 17th centuries, as it provided an essential source of liquidity for the Crown. Peruvian and Mexican silver was used to finance military expeditions and imperial projects, at a time when the Castilian monarchy figured among the most prominent actors on the international stage.[246] Being the true source of Spanish wealth, the silver trade with the Americas was therefore a common target for all of Spain's political opponents. In an attempt to weaken the trade link between the colonies and the motherland, pirates were often recruited, by the French and the British in particular, to attack the Spanish vessels sailing along the *Carrera de Indias*.[247] In this sense, South American silver acquired a significant political value in Europe, as monarchs were aware that a sudden

[243] FLORES, Jorge. "The Iberian Empires, 1400 to 1800", in BENTLEY, J. H. et al. *The Cambridge World History,* Cambridge University Press, 2015, p.284.

[244] The term *quinto real* translates to 'royal fifth' in English. It refers to a tax imposed by the Spanish monarchy on mineral-based commodities, such as silver. This tax amounted to 20 per cent of the ore's total value. The quinto real was a major source of revenue for the Spanish crown during the colonial period due to the abundance of mines in South and Central America. VON METZ, Brígida, "La Plata y La Conformación de la Economía Novohispana" in FICKER, S. K. *Historia Económica General de México: De la Colonia a Nuestros Días*, El Colegio de Mexico, 2010, pp. 131-132.

[245] FLYNN, Dennis and GIRÁLDEZ, Arturo. "Cycles of Silver", p. 405. ROBINS, Nicholas. *Mercury, Mining and Empire*, p. 111.

[246] MARICHAL, Carlos. "The Spanish-American Silver Peso: Export Commodity and Global Money of the Ancien Regime, 1550-1800" in TOPIK, Steven et al. *From Silver to Cocaine, Latin American Commodity Chains and the Building of the World Economy 1500-200*, Duke University Press, 2006, p. 37. BONALIAN, Mariano and HAUSBERGER, Bernd. "Condideraciones sobre el comercio y el papel de la plata hispanoamericana en la temprana globalización, siglos XVI-XIX", *Historia Mexicana*, vol. 68, no. 1, 2018, pp. 222- 229.

[247] PÉREZ, Milton Z., "Piratas, Piratería y Comercio Ilícito en el Caribe: la Visión del Otro (1550-1650)", *Universidad del Atlántico, Historia Caribe, Barraquila* (Col.), no. 12, 2007, pp. 52-53.

scarcity of this metal could alter the balance of power in the Atlantic area. In addition, the continuous reliance, on the part of the Spanish monarchy, on the profits derived from silver extraction and trade ultimately proved detrimental to the economy of the Iberian empire. In fact, Spain's reliance on extraction and refining discouraged economic diversification and investments in other sources of income. This exposed Spain to the risk of financial and economic fragility. The result was a reduced tendency towards economic innovation and dynamism, which ultimately resulted in a loss of competitiveness. This became evident towards the beginning of the 1600s when the crown showed clear signs of decadence.[248] Silver flowed eastward in the form of bullions or bars, as well as in the form of coins. The *Real de a ocho* [249], also known as "piece of eight" in English, was introduced towards the end of the 15th century, following a Spanish monetary reform. It soon became an international currency in the 16th and 17th centuries.[250] The mint of Potosí, established in 1572, was among the few Spanish American mints to coin pieces of eight (Figure 3), which were then distributed all across America, Europe and Asia.[251] Silver coins were exchanged in port cities in northern Europe as well as in the Mediterranean. Being placed under Spanish control until the mid-17th century, the port of Antwerp received part of the flows of silver coming from the New World, and, as early as the 1550s, most commercial transactions were carried out in silver *reales*.[252] From Europe, Potosí silver coins travelled eastward towards Moghul India and Imperial China, where they were exchanged for Indian textiles and Chinese manufactures. Silver pesos were also very much present in North America, where they circulated as a currency well after the War of Independence. The piece of eight was so well-known and used that it was even taken as an inspiration for what later became the U.S. silver dollar.[253]

[248] ROBINS, Nicholas. *Mercury, Mining and Empire*, pp. 5-6., BONALIAN, Mariano and HAUSBERGER, Bernd. "Consideraciones sobre el comercio y el papel de la plata hispanoamericana en la temprana globalización, siglos XVI-XIX", p. 235.
[249] The terms *silver pesos* or *silver real* are also used as synonyms.
[250] SUMNER, W. G. "The Spanish Dollar and the Colonial Shilling", *The American Historical Review*, vol. 3, no. 4, 1898, p.608.
[251] MARICHAL, Carlos. "The Spanish-American Silver Peso", p. 33.
[252] Ivi, pp. 36-37.
[253] IRIGOIN, Alejandra and MILLMORE, Bridget. "Piece of Eight" in THURNER Mark and PIMENTAL, Juan. *New World Objects of Knowledge*, University of London Press, London, 2021, p. 43.

Figure 3: Piece of eight minted in Potosí, ca.1663, British Museum. Source: IRIGOIN, Alejandra, MILLMORE, Bridget, "Piece of Eight" in Thurner Mark, Pimental Juan, *New World Objects of Knowledge*, University of London Press, London (2021), p. 41.

This currency was reliable and abundant, and it soon became the first global means of payment for early modern empires and states. It circulated in most of the known world and was extensively used by private merchants and companies for international exchanges.[254] American silver circulated extensively not only as a means of payment but also as a commodity, in the form of bullions or bars.

According to Flynn and Giráldez, silver played a pivotal role in the birth of global trade and in the creation of a highly integrated economy starting from the 16th century.[255] Indeed, different regions of the planet became linked and interdependent through a complex system of diplomatic and trade relations, and silver was one of the most exchanged goods in the Early Modern Age.[256] Upper Peru and Mexico represented the main producers of silver in the early modern period, and their mines covered approximately 80 per cent of the total world production between the 16th century and the beginning of the 19th century.[257] When explaining the major impact that silver had on the birth of a highly integrated global economy, the reference for production is thus Latin America and the Potosí mine in particular.

[254] MARICHAL, Carlos. "The Spanish-American Silver Peso", pp. 36-37.
[255] FLYNN, Dennis and GIRÁLDEZ, Arturo. "Born with a Silver Spoon: The Origin of World Trade in 1571", *Journal of World History*, Vol. 6, no. 2, 1995, p. 202.
[256] FLYNN, Dennis, GIRÁLDEZ, Arturo, "Cycles of Silver", p.392.
[257] CROSS, Harry. "South American Bullion Production and Export, 1550-1750" in RICHARDS, J.F. *Precious Metals in the Later Medieval and Early Modern Worlds*, Carolina Academic Press, Durham, 1983, p. 397.

3.1 The Commercial Ties between Potosí and China

Europe was not the only epicentre of this commercial revolution. A leading role in the emergence of early modern global trade [258] was played by Ming (1368-1644) and Qing (1636-1912) China. During the Early Modern Age, the country was not a distant, isolated empire. On the contrary, Chinese ruling dynasties established diplomatic and economic relations with other countries, taking advantage of the great demand for eastern luxury goods such as porcelain, silk, spices and opium, that came from European wealthier classes in particular.[259] The empire was therefore well aware of external political and economic dynamics. It also knew of the existence of rich mines in South America (Figure 4).

Figure 4*:* a 1602 map of the American continent realised by Jesuit Matteo Ricci and his assistant Li Zizhao, for the Ming court. Positioned at the centre of South America, the Cerro Rico Mountain is marked by the inscription "Bei Du Xi Shan", meaning *Potosí Mountain*. Maps such as this one are important signs of transnational awareness and of an interconnected world. Source: LANE, Kris, "Potosí" in THURNER, M. and PIMENTEL, J. *New World Objects of Knowledge*, 2021, p.33. originally retrieved from *James Ford Bell Library*, University of Minnesota, USA.

[258] "Global trade emerged when all important populated continents began to exchange products continuously – both with each other and indirectly via other continents – and in values sufficient to generate crucial impacts on all trading partners" FLYNN, Dennis. and GIRÁLDEZ, Arturo. "Born with a Silver Spoon", p. 201.
[259] SUN, L. et al. "Global circulation of silver between Ming-Qing China and the Americas: Combining historical texts and scientific analysis", *Archaeometry,* vol. 63, no. 3, 2021, p. 628.

Starting from the 16th century, imperial China became one of the preferred destinations for American silver, as the country acted as a "suction pump" [260] for the precious metal. China on its part exported its goods and manufactured products – namely silk and other textiles, tea, spices, porcelain and lacquerware – to meet the growing demand coming from Europe and the Americas.[261]

After having relied on paper money and copper for the first half of the Ming dynasty, China significantly increased its use of silver as a means of payment in the late 16th century. This was due to a fiscal reform, formally known as the "Single Whip Tax Reform", that was promulgated throughout the empire in 1581.[262] The reform aimed at simplifying the tax system and silver was chosen as the main unit of taxation. Using silver in fiscal and commercial transactions was a way to avoid the high rates of inflation that could derive from issuing large quantities of paper money. Indeed, this problem was well known to the Ming dynasty, as China had experienced hyperinflation and subsequent fiscal collapse earlier in the 1430s.[263]

Silver became the official monetary medium in China, but domestic production proved insufficient to meet the empire's internal demand. For this reason, silver needed to be imported from abroad. According to Flynn, "China's *silverization* fostered immense global repercussions".[264] The Chinese empire was very vast and was home to around 155 million people in the 16th century and over 268 million 150 years later. This huge population needed silver to pay taxes and purchase goods, and this implied high pressure coming from the demand side. This is what attracted South American silver to Chinese internal markets.[265]

Due to high demand, the market value of silver within Chinese territories increased significantly, to the extent that silver was actually overvalued compared to the rest of the world.[266] To understand the spectacular price premium of silver, it is enough to know that, in the 16th century, the average gold/silver ratio stood at 1:12, while in China the ratio lowered to 1:6. This means that merchants could purchase gold within Chinese markets using fewer ounces of silver since silver had a much higher value in China. This price premium remained high in the 1540s and 1640s, and from 1700 to 1750.[267]

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[260] The figure of the "suction pump" is used by Flynn to explain the economic mechanism that attracted American silver into China. FLYNN, Dennis. "Silver in a global context, 1400-1800" in BENTLEY, J. et al. *The Cambridge World History* Vol.VI, Part 2, 2015, Cambridge University Press, pp. 224-225.
[261] Ivi, p. 217.
[262] GOLDSTONE, Jack *Revolution and Rebellion in the Early Modern World*, Berkley and Los Angeles, University of California Press, 1991, p. 369.
[263] SUN, L. et al. "Global circulation of silver between Ming-Qing China and the Americas", p. 629.
[264] FLYNN, Dennis and GIRÁLDEZ, Arturo. "Cycles of Silver", p.400.
[265] Ibidem.
[266] FLYNN, Dennis. "Silver in a global context, 1400-1800", p. 225.
[267] FLYNN, Dennis and GIRÁLDEZ, Arturo. "Cycles of Silver", p. 393.

Overvaluation of silver in China was the necessary precondition for the arrival of enormous quantities of this metal within the empire's borders. Indeed, merchants realised that substantial profits could be made by purchasing silver in Spanish America and European markets such as Antwerp and Amsterdam and then transporting it to China. Here the value of silver greatly exceeded its extraction costs in Upper Peruvian mines. In this sense, price disparities between Ming China and the rest of the world served as an incentive for merchants to travel eastward and trade bullions and coins with Chinese and Southeast Asian merchants, who were offering higher prices.[268]

China's robust demand for silver ensured the continued operation of Spanish American mines, in this way indirectly strengthening the Spanish Empire, which profited enormously from silver taxation.[269]

These were the clear signs of a growing interconnectedness between East and West. Indeed, the value of silver in the Far East had an economic and political influence in both Latin America and Europe. Silver trade linked economies, and political systems together, in an intricate network of relations, interests and affairs. These new patterns represented a novelty for early modern societies, as the world was just starting to experience globalization.

In 1571, Spain established the port of Manila, in the Philippines, as a transition hub for goods coming from the New World. The port city thus became the preferred receiving point for American silver, which from here could eventually reach China, its final destination. In this way, a cross-pacific maritime route was created, and a direct link between the distribution site and the production site of Potosí was established.[270] For this reason, Flynn and Giráldez indicate 1571 as the year of the birth of global trade. For the first time in history, a stable and direct link between the newly discovered lands in the American continent and Asia was put in place.[271]

From Potosí, silver was shipped to the Peruvian port of Callao, and from there it reached Acapulco, in the Viceroyalty of New Spain. The port city was directly connected to Asia through the Manila Galleon, a trading ship that sailed along the Pacific route, transporting approximately two million silver pesos to the Philippines every year. The ship also carried Chinese silk and other luxury items to the viceroyalties, where these products were very much in vogue among the wealthier classes. [272]

[268] SUN, L. et al, "Global circulation of silver between Ming-Qing China and the Americas" pp. 629-630.
[269] FLYNN, Dennis O., "Silver in a global context, 1400-1800", p. 216.
[270] SUN, L. et al, "Global circulation of silver between Ming-Qing China and the Americas", p. 628.
[271] FLYNN, Dennis and GIRÁLDEZ, Arturo. "Cycles of Silver", p. 393.
[272] MARICHAL, Carlos. "The Spanish-American Silver Peso", pp. 44-45. FLYNN, Dennis. "Silver in a global context, 1400-1800", p. 228.

This was not the only commercial route for American silver, that also travelled through Panama and Havana to reach the motherland. From Spain, silver travelled across Europe, and was redistributed among different locations. A large percentage was destined for the Far East via the Cape of Good Hope and the Indian Ocean. American silver was also traded through minor trade routes in the Baltic region, the Mediterranean, the Red Sea and the Persian Gulf.[273]

Furthermore, although China remained the preferred destination for silver in Asia, smaller percentages were also destined for the Bengal region of Mogul India, another densely populated area.[274] Within China, an important port city for silver trade was Canton, where Europeans exchanged goods relying exclusively on silver as a means of payment.[275]

European merchants were however not the only ones exchanging silver for manufactured products. Armenians, Jews, Ottomans, and Persians also engaged in trade relations with Indian and Chinese merchants, using silver as a medium of exchange to obtain textiles, gold, pepper and other products.[276]

Chinese silver prices remained high for decades, but gradually declined and eventually reached an equilibrium point around 1640, when bimetallic ratios converged worldwide. This aspect was noted by classical economist Adam Smith in *The Wealth of Nations* (1776).[277] As a result, trade profits were reduced, and in the latter half of the 17th century, less silver was shipped eastwards from South America.[278] This decline in the value of silver posed a challenge for the Spanish Empire. As previously stated, tax revenues from the silver industry had been a significant source of income for the Crown. In this regard Flynn and Giráldez note that "since extraordinary silver profits from America had provided the fiscal foundation of the Spanish Empire, elimination of excess profits from silver mines necessarily implied a decline in Spanish power".[279]

According to historians, the decline in silver purchasing power had even more widespread consequences, as it implied less revenues for governments that collected taxes using silver. Such was the case for both the Ottoman and the Ming empires. The result was that, by the mid-

[273] BONALIAN, Mariano. and HAUSBERGER, Bernd. "Consideraciones sobre el comercio y el papel de la plata hispanoamericana", p. 219.
[274] MARICHAL, Carlos. "The Spanish-American Silver Peso", p. 45
[275] Ibidem.
[276] FLYNN, Dennis. "Silver in a global context, 1400-1800", p. 227.
[277] SMITH. Adams. *The Wealth of Nations*, 1776, p. 201: "[…] Silver would gradually exchange for a smaller and smaller quantity of goods. Its price would sink lower and lower till it fell to its natural price; or to what was just sufficient to pay in order to bring it from the mine to the market. In the greater part of the silver mines in Peru, the tax of the king of Spain, amounting to a tenth of the gross produce, eats up the whole rent of the land. […] it seems to be universally acknowledged that profits, which were once very high, are now as low as they can well be […]"
[278] FLYNN, Dennis and GIRÁLDEZ, Arturo. "Cycles of Silver", p. 395.
[279] Ivi, p. 404

17th century, these entities faced a challenging period, marked by crisis and instability.[280] Internal factors such as social conflicts and disorders, coupled with fiscal troubles resulting from inflation and the loss of silver purchasing power, contributed to this situation.[281]

In addition, since most monetary systems in Europe were based on silver, a general rise in prices was experienced in many countries during this period. Silver had gradually lost part of its value, which was initially incredibly high due to high demand. As a result, more units of silver were required to purchase goods and commodities. Many countries experienced inflation and mining activities faced higher extraction costs and reduced profits.[282]

Silver prices within the Chinese dominions surpassed world values again towards the beginning of the 18th century, thereby starting a new phase of increased profits and trade volumes.[283]

The introduction of American silver in China did not only have monetary and economic effects but also profound ecological consequences. Silver-laden vessels introduced the Chinese population to new American crops, such as maize and sweet potatoes. These crops played an important role in the exponential growth of the empire's population. This unprecedented growth had real economic consequences. Indeed, Chinese demand expanded, and the country came to require huge quantities of goods and commodities from the rest of the world.[284]

It is interesting to note how the silver trade between the East and the West set in motion a series of connections that influenced global economic dynamics, but also produced demographic, cultural and environmental consequences. These results are all interrelated and, to some extent, still visible in the present.[285] "Indeed, legacies of global economic linkages that emerged by the end of the sixteenth century are visible yet today".[286]

Studying history from a comparative perspective is crucial to uncover new evidence of the past. In this sense, patterns of interrelation between continents must be taken into consideration, as these could help historians gain a deeper understanding of specific events. In our case, following the journey of silver across different regions of the world was pivotal to acknowledging the existence of interconnected economic and ecological forces, which operated at a global level already at the beginning of the Early Modern Age.

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[280] Ivi, p. 405.
[281] GOLDSTONE, Jack. *Revolution and Rebellion in the Early Modern World*, pp. 360-375.
[282] This event is known as the Price Revolution, a period when Europe in particular experienced high rates of inflation, with a general rise in prices, which historians generally attribute to the large quantities of precious metals from the New World introduced into Europe by the Spanish trade. The Price Revolution is estimated to have ended around 1640. FLYNN, Dennis. "Silver in a global context, 1400-1800" p. 229. ROBINS, Nicholas. *Mercury, Mining and Empire*, p. 4.
[283] FLYNN, Dennis. and GIRÁLDEZ, Arturo. "Cycles of Silver", p. 395.
[284] FLYNN, Dennis. "Silver in a global context, 1400-1800", p. 230.
[285] Ivi, pp. 230-231.
[286] FLYNN, Dennis and GIRÁLDEZ, Arturo. "Cycles of Silver", p. 405.

Historical research on the global diffusion of South American silver in the early modern world has been recently enriched by new scientific sources and techniques, which historians borrowed from natural sciences and archaeology. The next two pages offer the reader a brief outline of these new modes of inquiry, to make this chapter more interesting and comprehensive.

3.2 New Techniques for Studying the Distribution of South American Silver

As described in the first chapter, environmental historians have been integrating scientific sources and research methods in their work for decades, taking advantage of innovative techniques to uncover new evidence from the past. This is done by economic historians and archaeological historians as well.

As we have seen, silver extracted from the Cerro Rico travelled worldwide. Starting from the 90s, chemical analysis of silver coins has been used to understand more about South American silver distribution in the Early Modern Age.[287]

An important contribution was made by M. Guerra and her co-workers.[288] Using geochemical data, the team discovered that silver extracted from Potosí contained small percentages of indium (In), a chemical element.[289] Thanks to this indicator, they were able to trace Bolivian silver and differentiate it from silver coming from other sources, such as Mexico or Europe. Researchers also discovered that, while European and Mexican silver ores contained a high concentration of gold (Au), in Potosí silver, gold was only present in small percentages. This difference was noticeable in the chemical analysis of ancient coins coming from the Andean region, that were present across Europe.[290]

In this way, historians have been able to estimate with sufficient precision the moment in which Potosí metal was first used to coin Spanish currencies, thereby making its entrance into the Old World's economy. The coins which were analysed for this research came from different collections, including those of the *Cabinet des Medailles de la Bibliotheque Nationale* in Paris, the *Musée Joseph Puig* in Perpignan and the Bourgeay Private Collection.[291]

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[287] SUN, L. et al. "Global circulation of silver between Ming-Qing China and the Americas" p. 630-631.

[288] GUERRA, M. F. Barrandon, J. N., Colin, B., Ladurie, E., and Morrison, C., 1991, "The diffusion of the silver from Potosi in the 16th century Spanish coinage: A new analytical method" In *Archaeological Sciences 1989: Proceedings of A Conference on the Application of Scientific Techniques to Archaeology*, Bradford, (1989), pp. 28–35

[289] Silver coins were analyzed following a technique named Moderated Neutrons Activation Analysis (TFNAA), a method of analysis that relies on nuclear processes.

[290] GUERRA M.F. et al, "The diffusion of the silver from Potosí in the 16th century Spanish coinage: A new analytical method" in BUDD, P. et al. *Archaeological Sciences 1989*, p. 28.

[291] Ivi, p. 31.

According to results, the arrival of Potosí silver in Spain appears to have taken place during the second part of King Philip II's reign (1556-1598), around 1570. This result also appears coherent when taking into consideration the fact that the amalgamation process was introduced around the same time allowing silver production to surge.[292]

Geochemical analysis has also been used to retrace Andean silver in French coins for instance, and the results showed that the American metal arrived in France around 1575.[293]

Not all the silver extracted in Potosi was destined for external markets in Europe and Asia. Indeed, together with Mexican ores, part of ancient Peruvian silver travelled inside South America, to reach, for instance, Brazil. Chemical analysis of ancient Brazilian coins has confirmed the presence of silver coming from Potosi in Brazil, starting from the second half of the 17th century. This metal was then mixed with other metals coming from different parts of South and Central America to mint Brazilian coins.[294]

The same geochemical analysis could be applied to study ancient Chinese silver coins but, unfortunately, no studies have been yet done in this regard.[295] Future chemical analysis will indeed prove useful to gain more detailed information concerning the arrival and distribution of Potosí silver in ancient China.

In conclusion, this paragraph has highlighted how, starting from the 16th century, silver became an extremely precious substance and played an important role in the early modern economy. Its circulation across oceans and continents proved to be one of the key drivers of early globalisation and the overall expansion of international trade. Silver trade was in fact happening along sea routes connecting all continents, except for Oceania and Antarctica.[296] Moreover, the creation of a direct commercial link between Potosí and imperial China proved to be crucial for the emergence and development of global trade. Potosí silver travelled extensively across different areas of the world, becoming a true global good. Silver also provided the financial basis of powerful empires, such as in the case of the Castilian Monarchy and Ming China. On one hand, this metal proved extremely beneficial for both exporters and importers. On the other, however, a continuous reliance on silver, as both a source of income and as the basis of the internal fiscal system, exposed states to some degree of fragility. In short terms, the economic

[292] Ivi, p. 35.
[293] LADURIE, Emmanuel Le Roy et al. "Sur les traces de l'argent du Potosí", *Annales. Histoire, Sciences Sociales*, vol. 45 Année, no. 2, 1990, p. 499.
[294] GUERRA, M. F. "The circulation of South American precious metals in Brazil at the end of the 17th century" *Journal of Archeological Science* 31, 2004, pp. 1225-1236.
[295] SUN, L. et al, "Global circulation of silver between Ming-Qing China and the Americas", p. 637.
[296] FLYNN, Dennis. and GIRÁLDEZ, Arturo. "Cycles of Silver", p. 399.

impact of South American silver was wide, just as wide and complex were the environmental and social consequences of its extraction and amalgamation.

The paragraph has finally provided the reader with a brief overview of innovative research techniques used by historians to uncover new and precious information on early modern silver trade.

The next paragraph will attempt a parallelism between the importance of silver in the Early Modern Age and the equal, if not greater, importance of fossil fuels for present economies. In addition, the paragraph also presents a personal reflection on how, in both cases, international economic and political interests are closely intertwined with environmental and social implications.

3.3 A Reflection on the Current Global Dependence on Fossil Fuels

The previous paragraph has highlighted the importance of South American silver in the early modern world. Its wide circulation along the main commercial routes contributed to the emergence of global trade. More in detail, the direct link between the site of production of Potosí and China was critical for the strengthening of trade relations between these two regions, which before 1571 had never been so strongly connected. As already noted, the silver trade was driven by profits. Indeed, merchants started relocating the precious metal to the Chinese market, which offered higher earnings, due to silver's higher purchasing power of silver. In this way, silver became a true global good, exchanged in every known continent, both as a commodity and as a means of payment. In addition, silver was also pivotal for national economies, as in the case of the Spanish Empire. Indeed, the Spanish Crown relied on the high profits, in the form of taxes, derived from silver production. These profits were very beneficial for the empire's finances, allowing Castille to afford its military expeditions. The vast success of silver at the international level was however paralleled by local dynamics of environmental pollution and social degradation. The second chapter of this thesis has called attention to the ecological consequences of silver mining in Potosí, where the amalgamation process produced large-scale mercury pollution. Pollution was detrimental not only to the natural environment but also for native communities, which experienced severe health issues. In this regard, the case study of Potosí has highlighted how, as early as the 16th century, international economic dynamics were closely associated with environmental matters and issues of social security and exploitation.

What follows is a brief, personal reflection on the current economic dependence on polluting substances and forms of energy, such as fossil fuels. This dependence interests most states in

the world. These last pages are not intended to be exhaustive or extremely detailed. Their main purpose is rather that of providing interesting insights to the reader, to stimulate reflection on how certain past dynamics are still present in our society today. Despite the great innovation of our time and the almost unlimited possibilities offered by ever-evolving technologies, some issues linked to our past remain extremely difficult to eradicate.

Nowadays, most national economies depend on fossil fuels (FF) to produce energy (Figure 5), even though the last few years have seen a steady increase in the use of renewables. The most used fossil fuels today are coal, oil and natural gas, which are burned to obtain energy. These non-renewable resources are typically extracted from sedimentary rock layers and subterranean deposits. This requires a complex process of extraction and refining before they can be used in households and businesses. For instance, oil is extracted from sedimentary rock deposits in its solid state and then heated to produce gasoline, which is essential for most vehicles to function.[297]

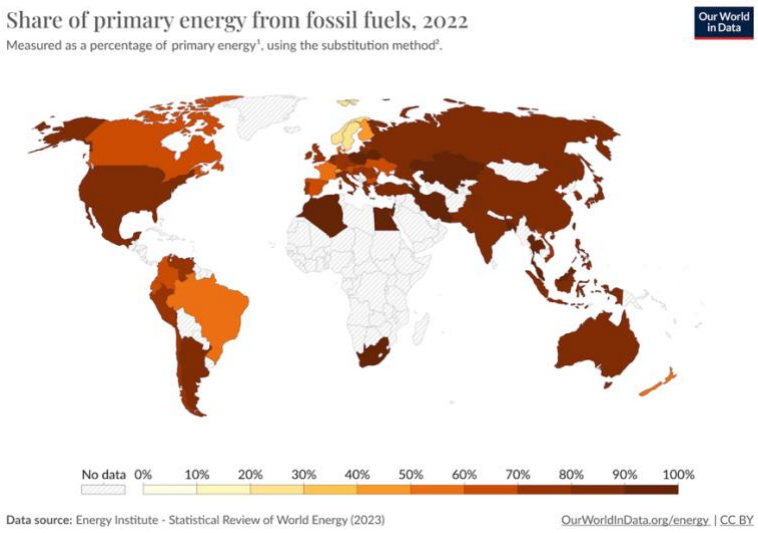

Figure 5: According to experts, a large percentage of primary energy in the world comes from fossil fuels – coal, oil and gas. "Primary energy is the energy available as resources […] Primary energy includes energy that the end user needs, in the form of electricity, transport and heating, plus inefficiencies and energy that is lost when raw resources are transformed into a usable form" Source: RITCHIE, H. and ROSADO, P. "Fossil fuels", *Our World in Data*, October 2022, https://ourworldindata.org/fossil-fuels

At a general level, fossil fuels are used in many distinct economic sectors – to generate electricity, for agricultural production, for transportation, in the industrial sector and in commercial and residential activities –. They provide the energy that runs our factories and

[297] "Fossil Fuels". *National Geographic*, Education section, https://education.nationalgeographic.org/resource/fossil-fuels/

industries, give us electricity, heat our homes, and allow us to use cars, planes, cell phones, and computers.[298]

In brief, economies worldwide are dependent on fossil fuels. The problem is that this reliance produces a wide variety of environmental concerns. Burning fossil fuels implies emissions of greenhouse gases, mainly carbon dioxide and methane. It is widely acknowledged that GHG emissions have severe environmental consequences, as they cause the heating of the earth's atmosphere and subsequent climate change, resulting in rising temperatures on the planet's surface.[299] Climate change consequences include ocean temperature rising and ocean acidification, glaciers melting and sea levels rising, an increased incidence of natural phenomena such as floods and droughts, and a general loss of wildlife and biodiversity. The use of coal, oil and natural gas also causes local air pollution and soil contamination in the site where these substances are extracted and burned.[300]

In addition, humans are negatively impacted by the consequences of climate change, as our health, safety and well-being are jeopardized by the changes happening on our planet.[301] Health hazards resulting from climate change are more likely to affect the most vulnerable: children, and elderly people, but also socially and economically marginalized individuals, such as the homeless, low-income labourers, immigrants, refugees and native communities. Large percentages of the population in low-income countries as well as in developing countries are also expected to endure the hardest consequences.[302]

In addition, the extraction, refining and transportation of fossil fuels has often produced disastrous incidents, with immediate loss of human lives and an aftermath of pollution and extended ecological degradation. Paramount in this regard is the 2010 case of the explosion of the *Deepwater Horizon* oil-drilling platform, that resulted in around five million gallons of oil being released in the Gulf of Mexico.[303] In the Early Modern Age, the extraction and refining of silver, an essential element for early modern economy, also implied devastating ecological consequences, and dire health implications, which affected especially the most vulnerable, namely the native workers in the case study of Potosí.

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[298] CASTANEDA, Christopher J. "Natural Disasters in the Making: Fossil Fuels, Humanity, and the Environment", *OAH Magazine of History*, Vol. 25, No. 4, 2011, p. 25.
[299] ARMSTRONG, Anne K. et al. "Climate Change Science: the Facts" in *Communicating Climate Change: A Guide for Educators*, Cornell University Press, 2018, pp. 9-12.
[300] Ivi, pp. 12-14
[301] Ivi, p. 15.
[302] SOMMER, Alfred. "Burning Fossil Fuels: Impact of Climate Change on Health", *International Journal of Health Services*, Vol. 46, no. 1, 2016, pp. 49-51.
[303] CASTANEDA, Christopher J. "Natural Disasters in the Making", p. 21.

Fossil fuels are important for all national economies, but especially for countries which are rich in natural deposits and strongly rely on the extraction and exports of oil, gas and coal. Recent research by Senior Economist of the "United Nations Development Programme's Global Policy Unit" Lars Jensen, has highlighted that there are at least forty "fossil fuel export-dependent economies" worldwide.[304] In these countries, FF accounts for a significant percentage – 14.3 on average – of the GDP (Gross Domestic Product), covering most exports – 60 per cent on average – and generating approximately more than one-third of total government revenue.[305] To put it briefly, these countries greatly rely on fossil fuel rents to sustain their national economies. They are not concentrated in one geographical area but are instead distributed across different regions – East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, and Sub-Saharan Africa. This detail is important since it suggests that economic dependence on fossil fuels is not a regional issue. On the contrary, it is a global phenomenon, which interests the whole planet. Among the listed economies we find some high-income nations such as Norway and Saudi Arabia, and several middle-income and low-income countries, such as Russia, Colombia, Nigeria, and Yemen. Bolivia is also listed among the forty.[306]

Among these countries, several are at risk of experiencing what economists call the "resource curse". This means "a tendency for communities that rely heavily on certain extractive resources to become *addicted* to these resources and to develop overly dependent or specialized economies".[307] In other words, countries endowed with abundant natural resources may experience reduced economic growth and slow development if their economy is highly specialized and dependent on extraction and refining.

As this chapter has previously mentioned, during the Early Modern Age, the Spanish Empire's reliance on silver profits could be seen as a historical example of the resource curse. Indeed, the Crown did not invest in other sources of income and neglected economic diversification within its dominions. Just as the Spanish empire was negatively affected by the decline in silver value, a future energetic transition will certainly imply some losses for FF exporters, due to

[304] JANSEN, Lars. "Global Decarbonization in Fossil Fuel Export-Dependent Economies, Fiscal and Economic Transition Costs", *Development Future Series Working Papers by the United Nations Development Programme,* New York, 2023, p. 4.
[305] Ibidem.
[306] Ivi, p.7-8. The complete list of fossil fuel-export dependent countries includes Algeria, Angola, Azerbaijan, Bahrain, Bolivia, Brunei Darussalam, Cameroon, Chad, Colombia, Congo (Republic of the), Ecuador, Egypt, Equatorial Guinea, Gabon, Ghana, Iran, Iraq, Kazakhstan, Kuwait, Libya, Oman, Malaysia, Mongolia, Mozambique, Nigeria, Norway, Papua New Guinea, Qatar, Russia, Saudi Arabia, South Sudan, Sudan, Surinam, Trinidad and Tobago, Timor-Leste, Turkmenistan, United Arab Emirates, Uzbekistan, Venezuela, Yemen.
[307] CARLEY, Sanya et al. "Adaptation, culture and the energy transition in American coal country", *Energy Research & Social Science*, vol. 37, 2018, pp.135-136.

diminishing fossil fuel rents and government revenues, deteriorating trade balance and loss of economic growth.[308]

On the opposite side of the spectrum from FF-export-dependent economies are countries that require imported fossil fuels to meet their energy needs. China and India, among other major international players, are net importers of coal, gas, and oil, despite being also producers of these fuels. Their populations are growing rapidly. For this reason, their demand for energy will probably increase in the coming decades. China, in particular, is currently the world's largest importer of fossil fuels, despite producing large amounts of coal, oil and gas annually.[309]

In Europe, EU member states have worked towards reducing their dependence on fuel imports, especially from Russia, following the invasion of Ukraine in February 2022 and the subsequent energetic crisis.[310] For now, however, most world economies, both in export and import countries, remain highly dependent on fossil fuels.

At a global level, the international community has started to take political action to reduce FF emissions to address the climate crisis. The 28th United Nations Climate Change Conference (COP28) of last December, in line with the 2015 Paris Agreements, went in this direction. The 192 parties involved have agreed on the need for a common transition away from fossil energy and a renewed focus on renewables.[311] On paper, the goals are clear. However, the challenge of implementation remains.

Furthermore, the ongoing climate crisis is likely to have negative impacts on the health and well-being of future generations. They will inherit a planet with rising temperatures, fewer natural resources, and diminished biodiversity, bearing the costs of past economic and political decisions.[312] On this last point, another parallelism with the historical case of mercury pollution in Potosí can be drawn. Indeed, this thesis has explained how soil contamination from colonial amalgamation still affects the health of current generations living in the area.

As these last pages have briefly outlined, global economies are still dependable on extraction and refining and to some extent, we could say that fossil fuels are the "silver of the 21st century". Indeed, just as silver was traded and used in every continent during the early modern period, in

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[308] GERASIMCHUK, Ivetta, et al. "Clean Energy Transition Versus Fossil Fuel Path Dependence" in *Beyond Fossil Fuels: Fiscal Transition in BRICS*, International Institute for Sustainable Development (IISD), 2019, p. 9.

[309] Ivi, p. 6.

[310] "In focus: Reducing the EU's dependence on imported fossil fuels", *News Article by the European Commission*, April 20, 22, https://commission.europa.eu/news/focus-reducing-eus-dependence-imported-fossil-fuels-2022-04-20_en

[311] "COP28", *Council of the European Union*, https://www.consilium.europa.eu/en/policies/climate-change/paris-agreement/cop28/

[312] LYBOURN-LANGTON, Laurie, et al. "Environmental breakdown is an overwhelming challenge for younger and future generations" in *Inheriting the Earth? The unprecedented challenge of environmental breakdown for future generations*, Institute for Public Policy Research (IPPR), 2019, p. 5-9.

the present. FF remain pivotal for most countries on the planet. American silver provided the fiscal and commercial basis of powerful empires, as in the case of Spain and Ming China. Today, many countries continue to depend on exports and imports of fossil coal, gas and crude oil to sustain their national economic growth and energy needs. However, both dependencies imply severe risks for the environment and human health. In the case of Potosí, environmental pollution, and social and health impacts were severe, but somehow limited compared to the current climate crisis. Indeed, the environmental consequences of the current climatic crisis will most likely be enormous, if no concrete action is taken. Drastic consequences for human health and security worldwide appear possible. As it has happened in Potosí, future generations will most certainly have to bear the costs of present actions and decisions, in terms of well-being and security. Fossil fuels, which humans began to use at the start of the Industrial Revolution, accompany us in our present days. However, it is evident that they cannot be part of our future.

4. THE RIGHTS OF NATURE IN BOLIVIA

The previous chapters have shed light on historical mercury pollution derived from silver mining in early modern Bolivia, using the famous silver mine of Potosí as a case study. The second chapter of this thesis has outlined the negative ecological and social consequences produced by mercury contamination, highlighting how local environmental degradation was accompanied by serious health issues, that affected native miners and their families in particular. As briefly mentioned in the chapter, legacies of historical mercury pollution continue to this day, since the site of Potosí continues to be affected by soil, water, and air pollution. This issue is present not only in this particular mining centre but also in other mining areas, all across Bolivia. The third chapter has placed Potosí in a broader, international context, focusing on the profound impact that South American silver had on the early modern economy. Silver from Potosí travelled extensively through the main commercial routes of the time, eventually reaching imperial China. Here, the precious metal gained tremendous importance and was demanded in great quantities. At the same time, silver flowing out of South American mines was also pivotal for sustaining Spain's military efforts. Indeed, it provided the financial basis of the Castilian monarchy, which counted on colonial silver to finance its imperial agenda. In summary, silver played a significant role in the emergence of early modern global trade. Fostering international relations between different parts of the planet.

The preceding chapters have shown how, as early as the 16th century, economic dynamics and financial interests were intertwined with environmental and health concerns. These dynamics are still very much present in our contemporary society. Nowadays, new forms of economic dependency are profoundly altering ecosystems all over the planet. Such is the case of fossil fuels, as the last pages of the third chapter have briefly explained. For many countries, balancing economic interests with environmental protection is challenging. Indeed, at the current state of things, many state economies remain dependent on exports of highly polluting materials, such as fossil fuels, hydrocarbons, and minerals. Bolivia, in particular, remains rich in non-renewable resources. The exploitation of such strategic assets has been greatly beneficial to the country's economy, allowing many workers to escape from miserable living conditions and gain a salary. This has nevertheless come at a high environmental price, with widespread pollution, destruction of protected areas and natural reserves, and loss of biodiversity.

In an attempt to balance these two dimensions, the country has been among the first ones in the world to experiment with a new instrument of environmental protection, that of Nature's Rights. Taking inspiration from indigenous activism and ancestral values, Bolivia has produced some innovative national legislation concerning Nature's protection. The practical results of

this “green revolution” remain however difficult to estimate, and the issue of implementation is still highly controversial.

The last chapter of this dissertation will focus on this new frontier of environmental protection, taking Bolivia as a case study. The next pages will provide an overview of the main legal instruments that protect the Rights of Nature at a national level. The chapter will highlight the profound symbolic importance of the legislations introduced but it will also reflect on their limited implications on a practical level. To provide the reader with a better understanding of the themes under analysis, a very short and simple introduction to the meaning of “Rights of Nature” will also be provided.

Bolivia shows how a country historically linked with intensive resource exploitation and widespread environmental pollution was able to rediscover ancient, pre-Columbian values to envision a new approach to our relationship with the natural world. In an era dominated by human dynamics – the famous Anthropocene – radical forms of environmental safeguard might be part of the solution to mitigate the current climate crisis, in this way improving the health of our planet. The case of Bolivia demonstrates that, at a theoretical level, states can adopt these innovative solutions. However, this case study also illustrates the difficulties of implementing such resolutions and translating them into practical and tangible results.

4.1 What are the Rights of Nature?

The human concern for the protection of the environment has ancient roots. Calls in favour of the safeguarding of nature, plants, animals and all living species can indeed be found in ancient philosophies and in almost every world religion. This sensibility towards the natural world is particularly present in religious and cultural systems belonging to ancient indigenous communities across the globe. From the Māori in New Zealand to the Andean peoples in South America, native populations have always occupied an important place for what concerns environmental activism and the struggle against ecological destruction. Nature holds in fact an important meaning in their lives and is often seen as “a mother”, a nourishing entity, upon which all life depends. In addition, the scientific community, especially scholars belonging to the fields of biology, chemistry, and physics, has also much contributed to laying the foundations of modern environmental movements. The work of these scientists has highlighted the essential role that the environment plays in human life, in this way encouraging institutions to take the ecological implications of human behaviours into account.

The safeguarding of planet Earth is a theme that interests many different fields of knowledge, not only natural sciences, but also history, – and this thesis is an example of the link between

history and the environment – philosophy, ethics, and economics. In the legal sphere, environmental law has a clear link with environmental protection. In simple terms, environmental law can be defined as the collection of laws, regulations, norms, institutional arrangements, and soft law instruments that aim to regulate and reduce the impact of human activities on the environment. It operates at both national and international levels. One of its primary objectives is to protect and preserve the planet from harmful human activities.[313]

One of the most striking innovations in the field of environmental law is the development of "Nature's Rights". This concept was proposed for the first time by Professor C. Stone, in a landmark article titled *"Should Trees Have Standings? Toward Legal Rights for Natural Objects"*.[314] The article was published in 1972, in a decade marked by a growing, widespread ecological sensibility among the civil society, as already noted in the first chapter of this dissertation.

According to Stone, just as corporations and businesses can be protected in courts by lawyers, so it should be for Nature. The same happens for instance with children, or mentally disabled persons, whose rights are protected by national and international legislation. In his article, Stone wrote "I am quite seriously proposing that we give legal rights to forests, oceans, rivers and other so-called "natural objects" in the environment – indeed, to the natural environment as a whole".[315]

The extent of this proposal is revolutionary. Indeed, granting legal recognition to nature would mean overcoming classic anthropocentric perspectives, and opening the door to an ecocentric or biocentric approach, declined in this case in legal terms.[316] It would mean acknowledging the fact that an intrinsic value is found in every living creature and in the environment itself, rather than being a feature which only pertains to humans.

There are several contrasting opinions on recognizing Nature's rights. There has been in fact a lot of discussion on this theme, which is linked to different cultural, ethical and philosophical positions. On one hand, some are opposed to this legal development, lamenting the fact that granting legal recognition to natural entities would simply go too far, and would open the door to dangerous forms of "radical environmentalism". Adherents of this view argue that environmental safeguard can be achieved with other, less controversial means, that do not put

[313] RUPPEL-SCHLICHTING, Katharina, "Introducing Environmental Law", in RUPPEL, Oliver C. and KAMYOGO, Emmanuel D. *Environmental Law and Policy in Cameroon,* 2018, pp. 77-92.
[314] STONE, Christopher D. "Should Trees Have Standings? – Towards Legal Rights for Natural Objects", *Southern California Law Review* 45, 1972, pp. 450-501.
[315] Ivi, p. 456.
[316] Regarding this point, please refer to the Conceptual Framework, at the voice *"Anthropocentrism"*, p. 33.

the centrality of humankind in discussion. To others, the discourse over the Rights of Nature is to be categorized as mere "lofty rhetoric". According to this view, these rights are only symbolic, they do not have a real capacity to change how countries and governments approach the theme of environmental safeguarding. This new category of rights should be in this sense considered more an identity flag than a real occasion of change.

On the other hand, however, many scholars view this brave, even radical, proposition as a new and innovative frontier of environmental protection. Recognizing these rights could make a real difference at the national and international level, producing a real change in the way in which humans value the natural world. With time, they would have the capacity to revolutionize cultures, values, and ideas. In addition, Nature's rights could be beneficial not only for the environment but for humans as well. Humans are part of nature, so a more protected and healthier environment would also ensure the health of communities and individuals. Supporters of the Rights of Nature believe that these legal instruments could be the turning point the international community needs to ensure the well-being of our planet, and present and future generations.[317]

The arguments for and against could go on forever. The important point to retain for the sake of this dissertation is that, in the 21st century, two South American countries produced constitutional articles and national laws to recognize Nature's inherent rights, becoming the pioneers of this new frontier of environmental law. These two countries are Bolivia and Ecuador, which share many similarities from a cultural and political point of view. The recognition of inherent rights to ecosystems and natural entities is found in the Bolivian constitution and in two other national legislations: Ley 071 (2010) and Ley 300 (2012). The following paragraph will present an overview of Nature's rights in these three contexts. Although this thesis' primary focus remains Bolivia, a brief mention to the Ecuadorian case is also included in the next pages. This comparison will help the reader to gain a more complete understanding of Bolivia's experience.

[317] BOYD, David R. "Recognizing the Rights of Nature: Lofty Rhetoric or Legal Revolution?", *Natural Resources & Environment,* vol.32, no. 4, 2018, p. 17. ECHEVERRÍA, Hugo, "Rights of Nature: The Ecuadorian Case", *Revista Esmat*, Ano 9, no.13, 2017, pp. 77-86, ZAFFARONI, E.R. "La Pachamama y el Humano" in ACOSTA A. and MARTÍNEZ, E. *La naturaleza con derechos. De la filosofía a la poltica,* 2011, Abya-Yala, pp.25-39.

4.2 Experimenting with the Rights of Nature: The Bolivian Case and a Brief Comparison with Ecuador

The first mention to Nature's rights is found in the Bolivian constitution, whose final version was approved via a referendum on the 25th of January 2009.

The need for a new Bolivian constitution was felt after a long period of social and political turmoil in the 20th century. This phase was in fact characterized by popular uprisings, led especially by native peoples, who had long been excluded from political participation and forced to work and live in precarious conditions – as we have seen in the case study of Potosí.

After having been defeated in the Chaco War (1932-1935) against Paraguay, the country had undergone a phase of military rule, followed by the instauration of pro-US government at the dawn of the Second World War. These events gave rise to a sentiment of revolt inside the Bolivian population, who demanded democracy, human rights and a more representative political panorama, strongly opposing the ruling Bolivian oligarchy. In this phase of social struggles, labor unions, (*sindacatos*) played a pivotal role. They ultimately resulted instrumental for the success of the 1952 revolution, led by the MNR party (*Movimiento Nacionalista Revolucionario*). The new leading party was however not able to maintain a peaceful internal situation. As a consequence, Bolivia underwent decades of deep political and social instability in the 60s, 70s and 80s, characterized by coup d'états and authoritarian leaders. In the meantime, social protests demanding a radical change persisted, with *Aymara* indigenous intellectuals playing an important role in these dynamics. The country finally returned to democracy in 1982. The late 80s and the 90s were then characterized by a "neoliberal phase". Indeed, various economic reforms were implemented to obtain conditioned loans from the IMF and the World Bank.[318]

These reforms were a source of disapproval for a large part of the population. In this context of social discontent, indigenous social movements, supported by NGOs and intellectuals, expressed their desire for a radical change, and more political and social participation. A new political force emerged starting from the mid-1990s; the MAS (*Movimiento al Socialismo*). The party was linked to a wide variety of social forces, such as indigenous social movements, campesinos, women's groups and some native leaders.

[318] The famous "Washington Consensus" interested many South American states. During this period, a series of neoliberal economic policies was implemented. The reforms were mainly centered around the privatization of strategic national resources, massive firing of workers, liberalization of trade and widespread deregulation to increase competitiveness.

In the early 2000s, prolonged popular uprising against the privatization of strategic resources – the 2000 Water War and the 2003 Gas War – ultimately resulted in the resignation of President De Lozada. Taking advantage of this delicate political situation, the MAS, represented by Evo Morales, succeeded in winning the 2005 presidential campaign. Morales was democratically elected and remained president until 2019. In the first phase of his presidency, the MAS tried to implement what was considered by many a radical, transformative political agenda. The programme left space for indigenous activism – Morales was himself of Aymara descent –, respect of the territory and new ways of reframing development through the rediscovery of ancient, pre-colonial values, in accordance with the Andean *cosmovision* (worldview). Nevertheless, in the later phase, Morales focused more on nationalization policies and a strong role of the state in the economy, to promote national growth through exports of natural resources – hydrocarbons in particular.

In 2004, an alliance of indigenous intellectuals, peasants and workers' associations had organized around the *Pacto de Unidad*, demanding a new constitutional assembly to imagine and construct a "New Bolivia". The Pacto wished the new constitution to represent a clear cut from the colonial past of the country, focusing instead on the recognition of the different indigenous groups, their values and philosophy of life.[319] This demand was welcomed by Morales after he had taken office in 2005. A constitutional assembly was then formed in 2006. The new constitution, as already mentioned, was approved in 2009. Although it contained many innovative values and concepts, the constitutional text did not however include all the innovative changes proposed by the *Pacto*. Indeed, the final text was the result of a negotiation between various political forces. It was, however, an interesting starting point.[320] The changes brought by the new constitution were manyfold. This thesis will only focus on aspects pertaining Nature's rights.

One of the most striking innovations noticeable in the new constitutional text is the introduction of the concept of *Sumak kawsay*, a neologism in the Kiwcha language. The term was invented in the early 1990s by South American intellectuals, together with environmentalist and

[319] To this day, Bolivia has the highest percentage of indigenous population in South America, with 36 recognized indigenous peoples. See "Indigenous People in Bolivia", *International Work Group for Indigenous Affairs (IWGIA)*, https://www.iwgia.org/en/bolivia.html

[320] The sources used for this part include KLEIN, H.S. "Bolivia from the War of the Pacific to the Chaco War, 1880-1932" in BENTHELL L. ed. *The Cambridge History of Latin America*, Cambridge University Press, 1986, pp. 553-586, MARIANO, Baptista Gumucio, *Breve Historia Contemporánea de Bolivia*, Fondo de Cultura Económica, 1996, POSTERO, Nancy. "The Emergence of Indigenous Nationalism in Bolivia: Social Movements and the MAS State" and "The Constitutional Assembly: Challenges to Liberalism", in *The Indigenous State, Race, Politics and Performance in Plurinational Bolivia*, University of California Press, Oakland, 2017. WHITEHEAD L. "Bolivia since 1930" in BENTHELL, L. ed, The *Cambridge History of Latin America*, Cambridge University Press, 1991, pp.509-584. ZANATTA, L. *Storia dell'America Latina Contemporanea*, Editori Laterza, 2011.

ecofeminist movements. Their intention was that of advancing new social and economic propositions that could guide the political class of Latin American states.

Sumak kawsay is usually translated as *Vivir Bien* in Spanish.[321] The term is an "umbrella concept" that covers different themes related to culture, society, economic development, and identity. One of its core principles is the importance of living in harmony with the environment and with the community. The link between *Buen Vivir* principles and the Andean philosophy of life is evident, as the philosophical and ethical bases of *Sumak kawsay* are deeply rooted in the ancient indigenous cosmovision.

In the Andean region, native communities have inherited from their ancestors a "*cosmocentric*" view of the world, where everything is interconnected. Human beings are only small entities in the face of the grandeur of the *Pacha*, the space-time reality that surrounds us, i.e. the cosmos as a whole.

Life (*qamaña* in Aymara and *kawsay* in Quechua) is found everywhere, it is not a human prerogative. Indeed, rivers, mountains, rocks and lakes are also "alive", and are thus equally important parts of the *Pacha*. This explains the great importance that native peoples place on the protection of the environment, which is not seen as an ensemble of exploitable resources but is instead considered through a biocentric lens. Human beings and nature are different, but not opposed. On the contrary, they are complementary, interrelated, and interdependent, they are both equal parts of the universe, that exist in constant relation with each other. Human communities need a healthy environment to lead a *good life*.[322]

This vision is very distant from the traditional Western view of life and nature, historically characterized by a marked anthropocentrism. As mentioned in the first chapter, anthropocentrism sees humankind and nature as rigidly separated. The Andean cosmovision goes in the opposite direction. This is an important difference, that well explains why Andean countries have been more open towards the possibility of recognizing Nature's rights in their constitutions and national legislations. Their culture is in fact more akin to an ecocentric approach. The idea of rivers, forests and mountains possessing an intrinsic value, and hence an inherent right, is not labelled as "absurd", but on the contrary, it is accepted and endorsed, as people are usually more prone to recognize the value of non-human life.[323]

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[321] The synonims *Buen Vivir* and *Buena Vida* are also common in Spanish, while in the Aymara language the world used is *suma quamaña*.

[322] PACARI, Nina. "Naturaleza y territorio desde la mirada de los pueblos indígenas", in CAPÍTAN Antonio Luis Hidalgo et al. *Antología del pensamiento indigenista ecuatoriano sobre Sumak Kawsay*, 2014, p. 130.

[323] BALDIN, Serena. "I diritti della natura nelle costituzioni di Ecuador e Bolivia", *Visioni Latinoamericane*, no. 10, 2014, pp. 28-30.

Other core principles of Buen Vivir include social equity and social justice, solidarity, participatory democracy, interculturalism and the inclusion of all ethnic and social minorities in community life. A reference to this last point is for instance found in the idea, present in the Bolivian constitution, of a *plurinational* state, meaning a state composed of several nationalities – of different ethnic groups; natives, Afro-Americans and mestizos – which are all equally important.[324]

In addition, the community and not the individual is placed as the centre, and *Buen vivir* is only accomplishable as a relational project. It focuses on the importance of groups and communities, rather than on the relevance of single individuals. Following this logic, there can be no *good life* if those surrounding us are suffering, if environmental resources are depleted and nature is severely damaged, or if the future of coming generations is compromised by present actions and choices. The idea of human well-being happening to the detriment of the planet is hence unbearable for Andean peoples, as personal growth cannot happen in the context of environmental destruction.[325] For this reason, *Sumak Kawsay* represents an ideal, balanced life, a harmonious co-evolution between human beings and the natural environment.

Given these premises, it comes as no surprise the fact that indigenous intellectuals in Ecuador and Bolivia have often moved a very profound critique of the neoliberal paradigm of growth and development, based on the commodification and privatization of the environment, seen as a commodity rather than a nucleus of life.[326]

In neoliberal terms, economic development is often calculated in quantitative terms, it is for instance associated with a growth of GDP (Gross Domestic Product). Instead, in economic terms the *Sumak Kawsay* philosophy translates into redistribution policies and careful management of natural resources, that should not be depleted for the sake of the planet, and for future generations as well.[327]

It is worth noticing that *Buen Vivir* does not imply a return to the ancestral times, nor it should be confused with the ideal of a pristine Eden Garden, untouched by mankind. On the contrary, it was proposed as an innovative target, a projection towards the future of South America to reach a more sustainable society, and political and economic system.[328] It is seen as a valid

[324] MACAS, Luis. "Sumak Kawsay. La vida en plenitud", *América Latina en Movimiento. Sumak Kawsay: Recuperar el sentido de la vida*, 2010, pp. 14-16.
[325] ESTERMANN, Josef, "Vivir bien" como utopía política", Globethics, 2013, pp. 4-7.
[326] MACAS, Luis, "Sumak Kawsay. La vida en plenitud", pp. 14-16.
[327] BALDIN, Senera, "La tradizione giuridica contro-egonomica in Ecuador e Bolivia", *Boletín Mexicano de Derecho Comparado*, núm 143, 2015, p. 486.
[328] ESTERMANN, Josef, "Vivir bien" como utopía política", p. 10, BALDIN, Senera. "La tradizione giuridica contro-egonomica in Ecuador e Bolivia", p. 524.

alternative to the Western idea of linear, ever-growing progress. In fact, according to its supporters, *Sumak Kawsay* represents a valid proposal in economic, social and political terms for all countries in *Abya Yala*, which is the indigenous, pre-Columbian name of the American continent, with the meaning of "fertile land".[329] Furthermore, some authors also suggest that giving more importance to the *Vivir Bien* principles could also prove an effective strategy for reducing the negative repercussions of climate change, a well-known issue which affects every society in the world.[330]

The inclusion of *Buen Vivir* principles within the Bolivian constitution has been a first measure to safeguard the environment and promote an alternative vision of Nature, in an attempt to move closer to a biocentric approach to life. References to the importance of Mother Earth (*Pachamama*) are found in the first lines of the preamble, which proclaims: "*In ancient times mountains arose, rivers moved, and lakes were formed. Our Amazonia, our swamps, our highlands, and our plains and valleys were covered with greenery and flowers. We populated this sacred Mother Earth with different faces, and since that time we have understood the plurality that exists in all things and in our diversity as human beings and cultures (...)".*[331] Another passage highlights again the pivotal role the Pachamama has for Bolivia, as the preamble further affirms "*We found Bolivia anew, fulfilling the mandate of our people, with the strength of our Pachamama and with gratefulness to God".* These passages highlight the pivotal role that Mother Earth plays in human dynamics.

For what concerns Nature's rights, the most relevant articles are found in Chapter 5 of the constitutional text.[332]

Article 33 states that "*Everyone has the right to a healthy, protected, and balanced environment. The exercise of this right must be granted to individuals and collectives of present and future generations, as well as to other living things, so they may develop in a normal and permanent way."* The reference to the rights of Nature is not explicit in this case. Rather, the constitutional text uses the expression "other living beings" to implicitly recognise that a healthy, protected environment benefits not only human being but also other forms of non-human life, to which a specific right is thus recognised.[333] This is the pivotal innovation present

[329] ESTERMANN, Josef, "Vivir bien" como utopía política", p. 2.
[330] PACARI, Nina, "Naturaleza y territorio desde la mirada de los pueblos indígenas", p. 130.
[331] *Constitución Politica del Estado Plurinacional de Bolivia*, 2009, Preámbulo. English Version: https://www.constituteproject.org/constitution/Bolivia_2009
[332] *Constitución Politica del Estado Plurinacional de Bolivia*, Capítulo Quinto, Seccíon I, Derecho al medio ambiente.
[333] ZAFFARONI, Eugenio Raúl, "La naturaleza como persona: de la Pachamama a la Gaia", in ESPINOSA GALLEGOS -ANDA, C. and FERNÁNDEZ, C., *Los Derechos de la Naturaleza y la Naturaleza de sus Derechos*, 2010, p. 17.

in the constitution, meaning the idea of preserving nature not just for the sake of humanity, but for the sake of the Mother Earth herself. [334] This intention is in line with an ecocentric approach to life.

At this point, a comparison with the Ecuadorian constitution is useful to place the Bolivian Constitution in a broader comparative perspective. Ecuador and Bolivia share in facts many similarities in terms of demographic composition, culture and traditions as well as political and economic development. The 2008 Ecuadorian Constitution was born through a similar process to the Bolivian one and was also inspired by Indigenous movements activism.

In both cases, the philosophy of *Sumak Kawsay* was seen as a powerful tool to overcome the traditional anthropocentric, neoliberal approaches to development, focusing instead on ancestral values, and on a renewed attention on harmony between human and non-human lives.[335] Ecuador was the first country in the world to officially include the rights of Nature in its constitutional text.[336] The constitution makes indeed several references to the importance of the environment, starting from the preamble, which, similarly to the Bolivian one, celebrates Nature and praise the principles of *Buen Vivir* to achieve a new, more harmonious, way of living.

Nature's rights are outlined in Chapter 7 (*Derechos de la naturaleza*).[337] Article 71 states the right of Nature "to integral respect for its existence and the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes".[338] In the article, nature is referred to as the place where "life is reproduced and occurs", thereby conveying the image of nature as a benevolent "mother earth", on which all forms of life depend. Article 72 recognises Nature "the right to be restored" while according to Article 73 "the state shall apply preventive and restrictive measures on activities that might lead to the extinction of species, the destruction of ecosystems and the permanent alteration of natural cycles". Finally, article 74 concerns the right of individuals and communities "to benefit from the environment" in order to lead a good life, according to the principles of *Buen Vivir*.

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[334] CALZADILLA, P. V. and KOTZÉ, L. "Living in Harmony with Nature? A Critical Appraisal of the Rights of Mother Earth in Bolivia" *Transnational Environmental Law*, 7:3, Cambridge University Press, 2018, pp. 401-402.
[335] KAUFFMAN, Craig M. "Why Rights of Nature are Implemented in Some Cases and Not Others: The Controlled Comparison of Bolivia and Ecuador", *International Studies Association Annual Conference*, Toronto, March 29, 2019, pp.1-2.
[336] CAMPAÑA, Farith Simon, "Los Derechos de la Naturaleza en la Costitución Ecuatoriana del 2008: Alcance, Fundamentios y Relación con los Derechos Humanos" *Revista ESMAT*, Ano 11, no. 17, 2019, pp. 231-270.
[337] *Constitucion de la Republica del Ecuador,* 2008, Capitulo Séptimo. Spanish version accessible at: https://www.oas.org/juridico/pdfs/mesicic4_ecu_const.pdf
[338] English version of the Constitution accessible at: https://www.constituteproject.org/constitution/Ecuador_2021

The main difference between the Bolivian and Ecuadorian constitutions is the explicit recognition of Nature's Rights in the latter. In contrast, the Bolivian constitution does not make any explicit reference to Nature's inherent rights, only indirectly referring to the importance of a clean environment for "other living things" in Article 33.

Despite the brief reference found in its constitutional text, Bolivia has taken other legal steps to further institutionalise the protection of Nature's rights. The first step was made through the *Ley de Derechos de la Madre Tierra (Ley 071)* in December 2010.[339] The law officially recognises the rights of Mother Earth and establishes the obligations of the Bolivian State and society towards Nature, as stated in Article 1.

The legislation is based on core principles such as harmony and interculturalism, very similar to those underpinning the *Buen Vivir* philosophy. The law recognizes the importance of exercising caution when interacting with ecosystems and natural resources, stating that public institutions and the society as a whole "must guarantee the necessary conditions to ensure that the diverse life systems of Mother Earth can absorb damages, adapt to disruptions, and regenerate without altering significantly their structural and functional properties, recognizing that life systems have limits in their capacity to regenerate, and that humans are limited in their capacity to undo their actions".[340] This passage is rather interesting, as it acknowledges the limits of the human capacity to restore damaged natural ecosystems, in this way highlighting the need for prevention rather than reparation.

Article 3 provides a clear definition of Mother Earth, which is "the living dynamic system formed by the indivisible community of all life systems and living creatures, interrelated, interdependent and complementary, which share a common destiny".[341] The use of the adjectives "interrelated", "interdependent" and "complementary" clearly refers to the *Buen Vivir* framework, to the idea that all living beings are connected and are part of the *Pacha*, so parts of Mother Earth. The principles of the Andean cosmovision, which influenced the drafting of the constitution, are also evident in this innovative legislation. Article 3 also highlights the

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[339] *Ley 071, Ley de Derechos de la Madre Tierra*, Asemblea Legislativa Plurinacional, 21 de diciembre de 2010, http://www.planificacion.gob.bo/uploads/marco-legal/Ley%20N°%20071%20DERECHOS%20DE%20LA%20MADRE%20TIERRA.pdf

[340] *Ley 071*, Capítulo I: Objeto y Principios, Artículo 2. Text in English: https://static1.squarespace.com/static/5e3f36df772e5208fa96513c/t/5fbd121959465c722a5727c7/1606226459629/Bolivia+Rights+of+Mother+Earth+Law+2010+English+%281%29.pdf

[341] Article 4 further defines the notion of "life systems", which are "*complex and dynamic communities of plants, animals, micro-organisms and other beings and their environment, where human communities and the rest of nature interact as a functional unit, under the influence of climatic, physiographic, and geological factors (...)"* Note the article's focus on the concepts of dynamism and complexity. Nature is not seen as static or simply a background for human activities. Instead, it is acknowledged as a dynamic and heterogeneous system that is constantly evolving, in which humans play only a small part.

sacred nature of Mother Earth from the perspective of indigenous native communities.[342] Article 7 enlists the "*derechos"* enjoyed by Mother Earth:

- *A la vida* (the right to life): "It is the maintenance of the integrity of life systems and natural processes that support them, as well as the capacity and conditions for their regeneration".
- *A la diversidad de la vida* (the right to the diversity of life): "It is the preservation of differentiation and variety of beings that form Mother Earth, without being genetically altered nor modified in their structure in an artificial manner, so as to threaten their existence, functioning and future potential".
- *Al agua* (the right to water): "It is the preservation of the functionality of the water cycles, its existence in the quantity and quality necessary to sustain life systems, and its protection from pollution, for the reproduction of the life of Mother Earth and all its components".
- *Al aire limpio* (the right to clean air): "It is the preservation of the quality and composition of the air for the sustainability of life systems and their protection against pollution, for the reproduction of the life of Mother Earth and all its components".
- *Al equilibrio* (the right to balance): "It is the maintenance or restoration of the interrelationship, interdependence, complementarity and functionality of the components of Mother Earth, in a balanced way for the continuation of their cycles and the reproduction of their vital processes".
- *A la restauración* (the right to restoration): "It is the timely and effective restoration of the life systems affected by human activities, either directly or indirectly".
- *A vivir libre de contaminación* (the right to live free from pollution): "It is the preservation from contamination of any of Mother Earth's components, as well as from toxic and radioactive residues generated by human activities".[343]

Nature is thus entitled to a series of inherent rights, the enjoyment of which should protect it from major damages caused by anthropogenic activities. Particularly interesting, in my opinion, is the right to restoration, which is also found in the Ecuadorian constitution. The idea of restoration implies that not only human activities should attempt not to destroy natural environments, but also that, if the destruction does indeed happen, adequate measures should

[342] *Ley 071,* Capítulo II: Madre Tierra, Definición y Carácter, Artículo 3: "*La Madre Tierra es considerada sagrada, desde las cosmovisiones de las naciones y pueblos indígena originario campesinos*".
[343] *Ley 071,* Capítulo III, Derechos de la Madre Tierra. Artículo 7.

be undertaken in order to repair the damage.

Article 8 (*Obligaciones del Estado Plurinacional*) defines the obligations that pertain to all state institutions, among which we find the obligation to "develop public policies and systematic actions of prevention, early warning, protection, and precaution" in order to prevent and mitigate human activities that could irreparably destroy natural species, ecosystems as well as cultural systems, which are all part of the Pacha Mama (Point 1). It is worth noticing the constant reminder of the fact that humankind and nature are not separated and can only exist in relation to one another. Cultural systems, particularly ancestral indigenous cultures and traditions are seen as interconnected with the natural world and therefore must be safeguarded in the same way that natural ecosystems are preserved.

The state has also the duty of "develop balanced forms of production and patterns of consumption", limiting the risk of weakening "the regenerative capacities and the wholeness of the cycles, processes and vital balances of Mother Earth" (Point 2); the duty to protect nature from "overexploitation" and "commodification" both at the national and international level (Point 3); the obligation to focus on renewables forms of energy (Point 4) and to "promote the recognition and defence of the rights of Mother Earth at multilateral, regional and bilateral levels of international relations" (Point 7).

In line with the importance that the principles of *Buen Vivir* place on the community, all Bolivian citizens are urged to protect and honour the Rights of Nature *(Artículo 9: Deberes de las personas).* Communal and personal duties include that of "actively taking part in the generation of proposals" for environmental safeguard as well as that of "denouncing all acts that violate the rights of Mother Earth, her life systems, and/or their components".[344]

In 2012, Law 300 *(Ley Marco de la Madre Tierra y Desarrollo Integral para Vivir Bien* or *The Framework Law of Mother Earth and Integral Development for Living Well)*[345] was promulgated to operationalise Law 071.

Mother Earth's rights are reiterated in Article 7. In addition, the law envisages the creation of two institutions, responsible for the protection and respect of these rights. On one hand, the *Defensoria de la Madre Tierra* (Mother Earth Ombudsman's Office), to monitor and investigate alleged violations of nature's rights. On the other the *Autoridad Plurinacional de la Madre*

[344] *Ley 071,* Capítulo IV, Obligaciones del Estado Y Deberes de la Sociedad, Artículo 8 y 9.

[345] *Ley 300, Ley Marco de la Madre Tierra y Desarrollo Integral para Vivir Bien*, October 15, 2012, Asemblea Legislativa Plurinacional, https://bolivia.infoleyes.com/norma/4126/ley-marco-de-la-madre-tierra-y-desarrollo-integral-para-vivir-bien-300

Tierra (Plurinational Mother Earth Authority), a state organ responsible for developing and overseeing national environmental research, programs and projects (Article 52).

Law 300 represented the final significant step of the restructuring program that had begun with the 2009 Constitution. The Bolivian government aimed to revolutionize its legal system by integrating it with the ancestral philosophy and principles of native Andean peoples. This integration was an attempt to create a more balanced legal system, that reflected ancestral values and beliefs beneficial to the natural environment and the community as a whole.

Law 071 and Law 300 officially recognise Nature's rights within the Bolivian territory and indicate a series of fundamental steps to respect and protect them. Together with the 2009 Bolivian constitution, they aim at achieving *Buen Vivir*, meaning a peaceful coexistence between human and non-human lives.

The advent of Nature's rights in Ecuador and Bolivia has captured international interest. As already noted, the discourse concerning this new category of rights remains controversial. These legal novelties have thus attracted some fierce critiques. Some labelled the Bolivian and Ecuadorian cases as dangerous experiments, at the point of even being detrimental to the human species.[346] Others were instead more cautious, recognizing the innovative scope of these measures.[347]

As time passed, the idea of granting Nature some specific rights became more and more accepted. Since the 2010s many have advocated in favour of their recognition, highlighting the need for "systemic changes to better protect the natural world from human impacts". [348]

In conclusion, the symbolic significance of these legal initiatives was enormous and extended well beyond national borders. In fact, the Bolivian initiative and the Ecuadorian constitutional text of 2008 set a powerful example for South America and the international community. These two countries proved that the discourse over the rights of Nature can indeed become a reality. They also demonstrated that these rights could serve as important constitutional and legislative principles. In this respect, Andean countries were laboratories for constitutional and legal experimentation and innovation, becoming the first ever countries to explicitly recognize and protect Mother Earth's rights. This model has since then served as a powerful precedent for

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[346] SMITH, Wesley J. "Beware the "rights of nature", *The Daily Caller*, December 30, 2011, https://dailycaller.com/2011/12/30/beware-the-rights-of-nature/

[347] VIDAL, John. "Bolivia enshrines natural world's rights with equal status for Mother Earth", *The Guardian*, April 10, 2011, https://www.theguardian.com/environment/2011/apr/10/bolivia-enshrines-natural-worlds-rights KEIM, Brandon. "Nature to Get Rights in Bolivia", *Wired*, April 18, 2011, https://www.wired.com/2011/04/legal-rights-nature-bolivia/ Expansion, "Bolivia crea una ley quie considera a la Madre Tierra un Sistema vivente", October 15, 2012, https://expansion.mx/planetacnn/2012/10/15/bolivia-crea-una-ley-que-considera-a-la-madre-tierra-un-sistema-viviente

[348] BOYD, David R. "Recognizing the Rights of Nature: Lofty Rhetoric or Legal Revolution?" p.17.

other international contexts. However, the real extent of these courageous initiatives remains controversial. Indeed, their practical implications are still difficult to quantify. The last pages of this thesis will demonstrate how, although being a remarkable example of innovation for environmental safeguard, the Bolivian state remains highly dependent on the mining industry and other economic sectors, which pose a threat to Nature and her rights.

4.3 Between Great Aspirations and Limited Results

The 2009 constitution and the subsequent national laws on Mother Earth's Rights have had significant symbolic importance for Bolivia. Nevertheless, the protection of the environment and indigenous communities has not always been the primary public policy concern on the part of the Morales government. This last paragraph will attempt to demonstrate that, although some limited beneficial results were indeed achieved, Nature's rights in the Bolivian context remain a controversial topic. In many cases, environmental protection has been overshadowed by more immediate growth needs.

On paper, the Bolivian legislation on Nature's rights is, together with the Ecuadorian one, among the strongest and most innovative in the world. For this reason, the country has often been praised for its brave environmental laws by international media and activists.[349] The former president Morales has long cultivated an international reputation as a committed Rights of Nature advocate. In 2009 he passionately argued against the excessive exploitation of natural resources and in favor of a broader recognition of this new category of rights before the United Nations General Assembly. In his speech he highlighted how "Mother Earth gives life, water, natural resources, oxygen and everything that supports the wellbeing of our people (…) If we do not defend the rights of Mother Earth, there is no use in defending human rights (…) we must protect what gives us life"[350]

The Bolivian government has also been the promoter of the *People's World Conference on Climate Change and the Right of Mother Earth* held in Cochabamba in 2010. The conference brought together more than thirty thousand participants from 140 countries to discuss international issues related to climate change.[351]

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[349] KAIJSER, ANNA, "Tensiones y utopías: Las políticas ambientale bolivianas bajo el mandato de Evo Morales", *Ecología Política*, 2016, pp.76-72, See also VIDAL, John. "Bolivia enshrines natural world's rights with equal status for Mother Earth" *The Guardian*, April 10, 2011.

[350] MORALES, Evo. *Adress by H.E. Mr. Evo Morales Ayma, the President of the Plurinational State of Bolivia, General Discussion on the Occasion of the 64th Session of the General Assembly of the United Nations*, September 23, 2009.

[351] KAIJSER, ANNA. "Tensiones y utopías: Las políticas ambientale bolivianas bajo el mandato de Evo Morales", pp.76-72. For international media coverage see for instance GERHARDT, Tina, "Bolivia People's Conference

This extended effort towards the rights of Nature and environmental protection at the international level was, however, not paralleled with an equal commitment at the domestic level.

In the last decade, the executives guided first by Morales and then by Arce, have focused on pursuing an economic policy still very much tied to the exploitation of hydrocarbons and other strategic resources. The two presidents have often highlighted the importance of such activities for poverty reduction and national growth. In this sense, a deep contradiction between the green ideals of the Bolivian government and the economic national reality was indeed noticed by activists and intellectuals.[352]

Already in 2011, the government was heavily contested for the so-called TIPNIS Case. The case concerned the construction of a road in the middle of the *Isiboro Sécure* National Park. The park is a protected natural area. The works had started without either environmental impact analysis nor prior consultation of the indigenous groups inhabiting the area, obligations that are clearly outlined in the constitutional text.[353] Numerous protests by indigenous communities and environmental activists followed the granting of the building permit.[354] At first, President Morales was forced to renegotiate a joint solution with affected native groups, but the project was eventually completed in 2017.

Currently, the Bolivian economy is still heavily dependent on highly polluting activities. Since 2009, the country has succeeded in reducing extreme poverty and expanding inclusion policies for indigenous communities. However, these positive results have also implied a continued reliance on extractive economies. This has often implied an overlooking of the environmental consequences of these activities. Natural gas and lithium deposits figure, for instance, as strategic sectors. A large part of these commodities is exported both within the Andean region – especially to Chile, Ecuador, Peru and Venezuela – as well as overseas. The mining industry has continued to play a key role. Silver, alongside tin and zinc, is still extracted, refined and shipped overseas and "mining continues to be at the contentious centre of environmental degradation and social conflict in much of the Andes".[355] Moreover, Bolivia is home to most

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calls for systemic change, not climate change" *Grist*, April 26, 2010, https://grist.org/politics/2010-04-25-bolivia-peoples-conference-anti-capitalism-climate-change/

[352] KAIJSER, ANNA. "Tensiones y utopías: Las políticas ambientale bolivianas bajo el mandato de Evo Morales", pp.76-72.

[353] PERRIER BRUSLÉ, L. "*Le conflit du Tipnis et la Bolivie d'Evo Morales face à ses contracditions: analyse d'un conflit socio-environmentake", EchoGéo*, 2012, pp.1-21.

[354] ACHTENBERG, Emily, "Bolivia: Indigenous groups to march against TIPNIS Highway" *Nacla,* August 12, 2011, https://nacla.org/blog/2011/8/12/bolivia-indigenous-groups-march-against-tipnis-highway

[355] FABRICANT, Nicole and GUSTAFSON, Bret. "The Political Economy of Gas, Soy and Lithium in Morales Bolivia", *Revista de Estudios Bolivianos*, vol. 25, 2019, p. 53.

of the world's lithium reserves, making lithium extraction another pivotal economic sector.[356] Lithium deposits are mainly concentrated around the *Salar de Uyuni*, in the department of Potosí, which, as previously shown, has a very ancient mining tradition. The lithium sector is set to become even more important in the foreseeable future. Indeed, this element is essential in the production of the batteries that power mobile phones, computers, as well as electric cars. In recent years, the Bolivian government has heavily invested in the lithium industry. While this industry has the potential to generate huge profits at the public level, it also has negative environmental implications on a regional level. Harmful effects include the release of toxic chemicals, water, soil and air contamination.[357] Chemical spills released during the extraction process also pose a threat to the health of nearby communities, similar to what occurred with mercury spills at the Cerro Rico.

In general, these strategic assets have increased the national treasury – through hydrocarbon taxes for instance –. They have generated economic growth and an increase in government revenue and government spending at the national, regional and local level. However, civil society organizations and NGOs have frequently criticized the environmental effects of an economy that depends on mining and extraction. In many communities, the social desire for a better standard of living remains at odds with the menace of poisoned water and air. In brief, an effective balance between economic needs and environmental protection remains complex to achieve.[358]

Internal divisions among Bolivian indigenous groups poses another obstacle to the implementation of Nature's rights in the country.

On one hand, a great majority of urban native communities often live in precarious economic conditions. In their effort to overcome poverty, they support government-led projects of extraction and mining and pay little attention to the consequent environmental damage. Indeed "the majority of Bolivians, and that include many indigenous people, are proud of the nationalization [of natural resources] … [and] they *want* lithium to be developed, and they want their standard of living to improve".[359] On the other hand, native people living in rural areas tend to be more committed to the protection of the environment. This is because the land they inhabit, which is often targeted by extractive industries, is an integral part of their identity. For

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[356] *U.S. Geological Survey, Mineral Commodity Summaries*, January 2022, https://pubs.usgs.gov/periodicals/mcs2022/mcs2022-lithium.pdf

[357] FABRICANT, Nicole and GUSTAFSON, Bret. "The Political Economy of Gas, Soy and Lithium in Morales Bolivia", p. 55.

[358] Ivi, pp 48, 55-57.

[359] POSTERO, Nancy, "Living Well? The Battle for National Development", in *The Indigenous State: Race, Politics and Performance in Plurinational Bolivia*, University of California Press, Oakland, 2017, p.111.

these communities, safeguarding nature is synonymous with protecting their culture and way of life. As a result, the environmental movement is more strongly felt within rural areas – as the TIPNIS case showed – while it is often ignored in urban communities. This conflict of interest hindered the advancement of the environmental cause and the attainment of extended consensus concerning Nature's rights within civil society.[360]

Added to this is the lack, within Bolivian borders, of an organized web of environmental movements and non-governmental organizations. This is coupled with the absence of a solid group of well-trained environmental lawyers. In addition, the relationship between the Bolivian government and national environmental NGOs has been conflictual in the recent past. These organizations have been strongly criticized and obstructed by members of the executive, and sometimes even labelled as "foreign agents" trying to sabotage the country's effort to promote national growth. [361]

A report published by CEDIB, one of Bolivia's main NGOs, highlighted how, in 2023, many activists and environmental defenders have been subject to physical violence and arbitrary arrests by police forces, as well as by irregular armed groups.[362]

In the meantime, their protests against the extractive industry within protected areas remained unheard, as mining activities continued. The *Pilón Lajas Biosphere Reserve* for instance, a precious area for biodiversity situated in the eastern Andes, has been recently negatively affected by mining activities and dam construction. Indigenous communities native to the area – *Mosetenes* and *Tsimanes* – have also denounced serious damages to their ecosystems.[363] The Río Pilcomayo is another ecosystem which is dangerously contaminated by heavy metals, with analysis underlining that current concentrations well surpass international parameters.[364] In Potosí, t*he Lagunas de Kari Kari*, built in the late 16th century to provide water to the city, are still impacted by chemical spills, due to often non-regulated mining activities. This poses a prolonged health risk to the local population.[365] These cases provide just a few examples of

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[360] KAUFFMAN, Craig M., "Why Rights of Nature are Implemented in Some Cases and Not Others: The Controlled Comparison of Bolivia and Ecuador", pp. 18-19.

[361] HILL, David, "Top Bolivian NGO facing eviction – given just days to move archive" *The Guardian*, April 8, 2017, https://www.theguardian.com/environment/andes-to-the-amazon/2017/apr/08/top-bolivian-ngo-faces-forced-eviction.

[362] *Reporte sobre los derechos humanos en Bolivia*, CEDIB Informa, March 2023.

[363] ANF, *Reserva del Pilón Lajas: Mosetenes y tsimanes vivien amenazados por la minería y la represas*, February 19, 2023. https://www.noticiasfides.com/nacional/sociedad/reserva-del-pilon-lajas-mosetenes-y-tsimanes-viven-amenazados-por-la-mineria-y-las-represas-420906

[364] Los Tiempos, *Contaminación: Hallan metales pesados por encima de lo saludable en el río Pilcomayo*, January 23, 2023. https://www.lostiempos.com/actualidad/pais/20230123/contaminacion-hallan-metales-pesados-encima-saludable-rio-pilcomayo

[365] El Potosí, *Cresce riesgo de contaminación del agua de lagunas del Kari Kari*, January 12, 2023. https://elpotosi.net/local/20230112_crece-riesgo-de-contaminacion-del-agua-de-lagunas-del-kari-kari.html

how extractive activities are still creating serious environmental degradation in Bolivia, coupled with health concerns for native groups in particular.[366] To this date, the *Derechos de la Madre Tierra* framework has not fully succeeded in protecting the environment from massive exploitation and commodification of its resources.

Nevertheless, some actions have been undertaken at the national level to curb the negative effects of the mining industry. In January 2023 for instance, the Bolivian government presented two projects to reduce the use of mercury used in gold mining – the *Plan de Acción Nacional* (PAN) and the *Proyecto planetGOLD Bolivia* –. The execution of these initiatives will be led by the UN Industrial Development Organization in collaboration with the Bolivian government.[367] As this thesis has previously outlined, mercury contamination has historically been the cause of widespread environmental and social degradation and continues to pose serious threats to present communities and ecosystems.[368] (Figures 6 and 7)

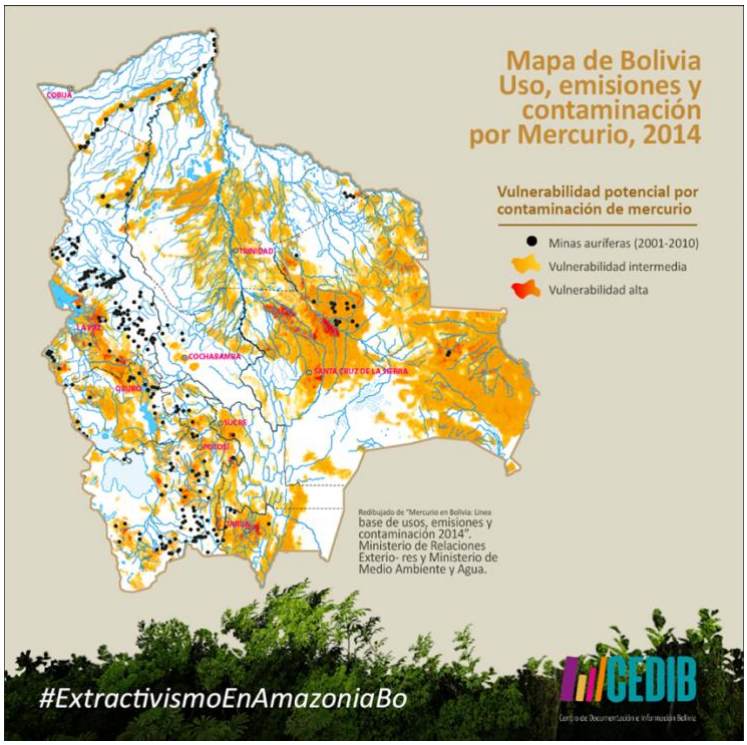

Figure 6: Map of Bolivia: mercury use, emissions and pollution, 2014. The areas characterized by intermediate vulnerability to mercury contamination are colored in orange while the areas exposed to high contamination levels are marked in red. Source: *Mapa Emiciones de Mercurio en Bolivia*, CEBID, October 2022.

[366] For more on Bolivian current environmental struggles see TAMAYO, Iván Peredes, "Los desafíos ambientales de Bolivia en 2023: invasiones y deforestación, ríos contaminados, sequías y gestion de áreas protegidas" *Mongabay, Periodismo Ambiental Independiente en Latino América*, January 2023.

[367] PlanetGold, *Nota de Prensa: Gobierno presentó proyectos para contribuir a reducir el uso de mercurio en la minería aurífera*, January 17, 2023, https://www.planetgold.org/nota-de-prensa-gobierno-presento-proyectos-para-contribuir-reducir-el-uso-de-mercurio-en-la-mineria

[368] ARRIAZA, Miguel, *El dilema del mercurio, el metal que da de comer y envenena a la Amazonia Boliviana*, El País, May 2, 2023. For more on the subject see also: GONZALES Oscar Campanini, *El Negocio de Mercurio en Bolivia*, LALIBRE Proyecto Editorial, Cochambamba, 2020.

Figure 7: The photograph depicts an aerial view of the *Kaka River*, which is a site of concentrated, often unregulated, gold mining activities. The river's waters are highly polluted due to mercury contamination, and mercury particles flow for several kilometers before ultimately reaching the *Madidi National Park* in the Department of La Paz. The park is one of the most biodiverse protected areas on the planet. Source: Photograph by Manuel Seoane, in ARRIAZA, Miguel, "El dilema del mercurio, el metal que da de comer y envenena a la Amazonia Boliviana", *El País*, May 2, 2023.

Other minor results have also been highlighted. A study published in 2022 [369] has attempted to quantify the effects of the *Buen Vivir* framework and of the *Ley de Derechos de la Madre Tierra* (Ley 071) on deforestation patterns in Bolivia. Forests cover a large part of the national territory, around 47 per cent of the country's total land.[370] The period taken into consideration ranged from 1992 to 2018. The study applied a data-driven methodology named the Synthetic Control Method (SCM), which allows researchers to measure the effects of a public policy on a specific unit or area.

The results have highlighted how the *Buen Vivir* framework, and the introduction of Ley 071 were beneficial for national forests. Indeed, a decrease in forest cover loss was visible after 2011, the year in which the Law of the Rights of Mother Earth came into force. This suggests that implementing the principles of *Buen Vivir* has proved positive for the environment, helping to reduce deforestation and overexploitation of resources, one of the main anthropogenic environmental damages that affect South America. Nevertheless, the results also underline a

[369] CAPPELLI, F., CARAVAGGIO, N., VAQUERO-PIÑEIRO C., "Buen Vivir and forest conservation in Bolivia: False promises or effective change?" *Forest Policy and Economics*, vol. 137, 2022, pp. 1-15.
[370] FAO, *Global Forest Resources Assessment, Main Report*, Food and Agriculture Organization, Rome, 2020, https://www.fao.org/3/ca9825en/CA9825EN.pdf. Note that, in accordance with the *Vivir Bien* framework, the majority of Bolivian forests are publicly owned.

more complex reality. The increase in forest cover appears in fact very modest (0.13 percentage points in aggregate). More importantly, the positive effects generated by the introduction of the law have not remained constant over time, as in the long run, less and less increase in national forest cover has been observed. The effects were thus only temporary. On one hand, this study highlighted the overall beneficial outcomes of the recognition of Mother Earth's rights in Bolivia. On the other, it also underlined the difficulties encountered by the government to "effectively translates BV (Buen Vivir) principles into coherent and steady policy interventions".[371]

Among the key policy recommendations for achieving a better implementation of the Rights of Nature and *Sumak kawsay* principles are measures such as "tenure devolution", through which local (native) communities are granted the supervision of certain territories or natural resources. This is usually translated into a more efficient management of these important assets and an overall improvement in environmental safeguarding. Moreover, focusing on bottom-up projects at the local and regional level is also considered an effective way to find new environmental management solutions, especially for what concerns developing countries.[372]

At present, the principles of Buer Vivir and the Rights of Nature are acknowledged and safeguarded at the constitutional and legislative levels. Nevertheless, Bolivian policymakers are still struggling to devise meaningful strategies to translate these crucial principles into practical policies and on-the-ground actions.

To conclude the comparison with Ecuador, the latter stands as an example of how it is indeed possible to develop a national dialogue around the Rights of Nature, to integrate the topic into political discussions and even to build an environmental jurisprudence that acknowledges the importance and the potentiality of Rights of Nature.

In Ecuador too, the government has continued to invest in mining infrastructure and has expanded development activities at the expense of protected ecosystems. A mining law to expand mining sites in order to contrast poverty and unemployment was, for instance, passed in 2009, shortly after the constitution was approved. Although faced with strong opposition from police forces and the Ecuadorian government, environmental activists, indigenous groups and civic movements have worked together to expand the implementation of the Rights of Nature. On one hand, programs to educate judges on these rights were promoted by environmental lawyers. This made it possible to overcome the educational gap, which was a

[371] CAPPELLI, F., CARAVAGGIO, N., VAQUERO-PIÑEIRO C., "Buen Vivir and forest conservation in Bolivia", p. 7

[372] Ivi, p.7-8.

great obstacle to successful environmental lawsuits in the country. Moreover, environmental lawyers and NGOs focused on building a Rights-of-nature jurisprudence through minor cases in local courts. They did this to avoid attracting too much attention at the national level and thus avoiding harsh confrontations with the central government. Finally, environmental activists and organizations put great efforts into raising awareness on Mother's Earth rights among the population. In 2013 for instance, *Acción Ecológica*, a non-governmental organization dedicated to environmental protection, garnered significant social support for the Yasuní National Park case. The case involved the government's plan to expand oil drilling within the park's protected territory.[373] Through an extensive media campaign, activists were able to raise awareness of the Rights of Nature at the national level. This forced policymakers to take these into consideration and integrate them into their public discourse and political campaigns, particularly in relation to mining and extractive projects.[374]

Ecuadorian policymakers started to refer to the rights of Nature. Although they often used them in a purely instrumental manner, this nevertheless contributed to an increase in national awareness on the subject. This indirectly strengthened jurisprudence, resulting in a growing number of successful sentences in Ecuadorian courts, already starting in 2019.[375]

A comprehensive analysis of lawsuits aimed at protecting Nature's rights would take very long and would go beyond the scope of this thesis. The key takeaway from these final pages is that, even in a country like Ecuador, which remains reliant on economic activities with a significant environmental impact, a national discourse on the Rights of Nature can be established. Judges in local and national courts can use these rights as a powerful tool to reduce environmental degradation, protect the environment, and safeguard the interests of indigenous peoples. These results were also made possible by the well-organized network of indigenous movements, environmental lawyers, and local and national NGOs within the Ecuadorian territory. Indeed, "the alliance between urban environmental groups and indigenous and *campesinos*'

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[373] Yasunidos, *The Collective Process to Defend Yasuni National Park*, May 29, 2023. https://www.yasunidos.org/the-collective-process-to-defend-yasuni-national-park/

[374] KAUFFMAN, Craig M. "Why Rights of Nature are Implemented in Some Cases and Not Others", pp. 5-8.

[375] See for instance the case concerning the A'I Cofán community, their effort to block mining concessions in the Ecuadorian Amazon Rainforest, and the favorable opinion of the Ecuadorian constitutional court in 2022. Amazon Frontlines, Comunicado de Prensa, *La Corte Costitucional del Ecuador Protege y Desarrolla el Derecho de los Pueblos y Nacionalidades a Decir No a Proyectos Extracivos*, February 2022. Rainforest Rescue, *Ecuador: Constitutional Court backs indigenous people in fight against gold mining*, February 22, 2022. Corte Costitucional Del Ecuador, Sentencia No. 273-19-JP/22, accessible at http://esacc.corteconstitucional.gob.ec/storage/api/v1/10_DWL_FL/e2NhcnBldGE6J3RyYW1pdGUnLCB1dWlkOidjOWE4ODAyZC03Y2E1LTQ4NDItOWIzNS01ZDZjMzZiM2I3ZGMucGRmJ30=

organizations made Ecuador's environmental movement one of the strongest in Latin America".[376]

Within Bolivia instead, the implementation of Mother Earth's rights has not been as successful. As noted above, conflicts of interest between the country's various indigenous groups, coupled with the lack of an organized network of environmental organizations, indigenous movements and environmental lawyers, are all obstacles to the development of a truly national discourse on the topic. Repeated attacks on environmental organizations by the central government have also weakened the cohesion of these actors.[377] In addition, national laws covering these rights appear weaker with respect to their Ecuadorian counterparts. For this reason, individuals and organizations interested in protecting Nature do not have confidence in such a legal basis. They see Law 071 and Law 300 as too vague and general to actually be helpful to their work. They consequently choose to invoke indigenous rights, such as the constitutional right to prior consent, to indirectly protect endangered ecosystems.[378] According to NGO representatives and environmental lawyers, these rights are more likely to attract wider consent from the Bolivian population, which, as already noticed, is sometimes polarized between rural and urban communities. This is also due to the fact that indigenous rights are widely and explicitly recognized in the 2009 Bolivian Constitution. On the contrary, Nature's Rights are only implicitly mentioned in the constitutional text.[379]

To put it briefly, environmental legislation in Bolivia remains weak and has so far not resulted in a significant improvement of environmental standards and policies within national borders. Despite being recognized internationally as a pioneer in innovative ecological protection strategies, Bolivia has still much work to do. To this date, there are still deep discrepancies between the rights written on paper and the practical safeguard of natural ecosystems. For its part, the Bolivian government has prioritized economic and development goals, with the extraction of natural resources being the most straightforward and secure method of reducing poverty and increasing government revenue.[380]

Nonetheless, the Bolivian focus on *Buen Vivir* and the legal recognition of Nature's Rights has also helped to raise international awareness. Bolivia's example has been widely discussed and

[376] KAUFFMAN, Craig M. "Why Rights of Nature are Implemented in Some Cases and Not Others", p. 20.
[377] ACHTENBERG, Emily, CURRENTS Roberts. "What's behind the Bolivian Government's Attack on NGOs?" *Nacla*, September 3, 2015, https://nacla.org/blog/2015/09/03/what%27s-behind-bolivian-government%27s-attack-ngos
[378] KAUFFMAN, Craig M. "Why Rights of Nature are Implemented in Some Cases and Not Others", p. 17.
[379] Ivi, p. 19.
[380] MUÑOZ PRUDENCIO, Lorna S. "Bolivia's Mother Earth Laws, Is the Ecocentric Legislation Misleading?" *ReVista, Harvard Review of Latin America*, February 6, 2023.

analyzed by activists and lawyers, creating collaborative spaces for thinking and debating about the human relationship with the environment and for promoting innovative policies.[381]

In addition, the models set by Bolivia and Ecuador have inspired other countries to follow suit and develop their own national legislation to recognize the rights of Nature. A well-known example is the 2017 *Whanganui River Case* in New Zealand, where the river was granted legal personhood, meaning that it acquired an independent legal status, recognized, and protected by law. The protection of the Whanganui River against any harm or damage was subsequently entrusted to the local Māori community inhabiting the area, thus recognizing the importance that Nature holds for the New Zealand indigenous population.[382]

Something similar has happened in Colombia, where in 2016 the Constitutional Court delivered a groundbreaking judgement, ordering the Colombian government to officially recognize the rights of a river, the Atrato River, situated in the northwestern part of the country.[383]

These are clear signs of the emergence of a new sensibility towards the Rights of Nature at the national as well as international level. Many other countries are following the example of Ecuador and Bolivia, discussing the possibility of implementing similar national laws to safeguard their natural ecosystems.

The final chapter of this thesis has taken Bolivia as a case study to reflect on a new and innovative form of environmental protection – the recognition of Nature's rights. In a country historically tied to mining and refining, innovative laws have been developed to propose new, ecocentric values. This was done to overcome the traditional anthropocentric approach to economic, legal and social matters. The practical implications of the Rights of Mother Earth in Bolivia remain difficult to estimate, but the symbolic importance of this *green revolution* is undeniable.

In an era – the Anthropocene – shaped by human actions, radical proposals such as this one might be more and more needed to effectively counter the repercussions of the climate crisis.

The environmental history of Bolivia offers the interesting account of a country where ecological degradation and economic interests intertwined for centuries, producing a complex web of international implications. In an effort to put its colonial past behind, the government has recently tried to develop radical proposals to ameliorate the lives of its citizens and

[381] KAIJSER ANNA, "Tensiones y utopías: Las políticas ambientale bolivianas bajo el mandato de Evo Morales", 76-62.
[382] O'DONNEL, ERIN L., TALBOT-JONES, Julia, "Creating Legal Rights for Rivers: Lessons from Australia, New Zealand, and India", *Ecology and Society*, vol. 23 no. 1, 2018.
[383] Rio Atrato Case, Decision T-622/2016, Colombia Constitutional Court, 2016.

ecosystems. From the exploitation of the Cerro Rico Mountain in Potosí to the *Ley de Derechos de la Madre Tierra*, Bolivia remains marked by drastic contrasts, but also by a strong tendency towards innovations.

CONCLUSION

The aim of this thesis was to critically reflect on the environmental consequences of colonial silver mining in the Andes region. The silver mine of Potosí was taken as a local case study to investigate the historical relation between environmental degradation and pollution, issues of social and health security and wider international economic patterns. In addition, this work has investigated the efforts done by the Bolivian government and civil society to move forward from harmful natural resource exploitation and achieve increased levels of environmental protection. These two case studies have been used to trace an environmental history of Bolivia, from the Early Modern Age to the contemporary period.

The results achieved showed that the site of Potosí was affected by widespread mercury pollution starting from the 16th century. This was the result of the development of a new refining technique, i.e. mercury amalgamation. Its use resulted in water, soil, and air contamination. The true extent of this contamination is difficult to establish with certainty. Nevertheless, this case provides us with an early example of anthropogenic widespread pollution caused by pre-industrial economic activities. In all likelihood, traces of colonial pollution are still to be found in Potosí to this day. Moreover, these environmental changes were taking place in a region that had also been affected by the drastic transformations brought forward by the Columbian Exchange.

In addition to serious environmental degradation, the population living in the area also experienced health repercussions, given the toxicity of mercury to the human body. Contemporary studies conducted on miner workers appear to confirm the hypothesis, proposed by historians, according to which the colonial population of Potosí suffered from a wide variety of physical as well as psychological side effects. In the most serious cases, the exposure to mercury vapours led to outbursts of violence and erratic behaviours, compromising social security. As is still the case today with the most vulnerable sections of the population, the indigenous workers employed in the *mita* system were, together with their families, the most affected by mercury pollution.

While on one hand mercury amalgamation implied widespread local environmental pollution, on the other it also allowed silver production to surge to incredibly high levels. Spanish American silver greatly benefited the finances of the Spanish Empire and initiated extensive commercial relations. From Upper Peru, silver ultimately travelled to China, greatly impacting the financial system of the Ming and Qing Empires. Its trade along transoceanic routes resulted in increasing global interactions, even facilitating the birth of global trade.

In this regard, this work investigated the interrelation between the local and the global dimension, providing an account of how local environmental pollution can prompt and foster international dynamics. Today, finding a balance between the protection of the planet and national and international economic interests is one of the goals of the international community, especially in light of the current climatic crisis.

New instruments of environmental protection have emerged in the 21st century. The proposition of granting Nature some inherent rights is among the most innovative and thought-provoking ones. Andean countries have pioneered this new approach to environmental law. This strategy aims at overcoming anthropocentric approaches to life, moving instead closer to biocentric – or ecocentric – positions.

Since the 2000s, Bolivia – following the example set by Ecuador in 2008 – have recognised the Rights of Mother Earth. This was done at first in an indirect way, with the 2009 Constitution and then more explicitly with the 2010 *Ley de Derechos de la Madre Tierra* (Ley 071). These legal novelties have been inspired by indigenous activism and the Andean philosophy of life, which praises an existence lived in harmony with the community and with the environment (*Sumak Kawsay* or *Buen Vivir*). Moreover, the new constitution represented the attempt, made by the Morales government, to put an end to the deep social divisions inside Bolivia. This problem had indeed characterized the country since the arrival of European colonisers. The aim was to allow indigenous communities to participate in the political life of the country.

The results of Bolivian environmental policies have been modest. On one hand, the country has inspired the international community and encouraged debate on the topic of the Rights of Nature. On the other, the executive has continued to favour the extractive industry over environmental protection. Profits from the exploitation of natural resources have remained in fact pivotal to the Bolivian economy, much like South American silver was to the Spanish Empire during the Early Modern Age.

It will be up to future studies to investigate whether environmental policies recognizing Nature's rights will produce stable improvements in the long run.

Moving from an anthropocentric to an ecocentric approach could allow us to overcome the traditional dichotomy human vs. nature. This could create the basis not only for a legal revolution but for a *revolution of the mind*, for a new way of considering the environment, thus attempting to live in harmony with our planet. In addition, these policies have also the potential to protect rural indigenous communities around the world, given the importance that nature holds for native peoples.

In conclusion, the environmental history of Bolivia, from the Early Modern Age to the present, offers an account of intensive environmental exploitation and brave attempts towards ecological protection. Faced with the drastic changes inaugurated by the Anthropocene, a new generation of rights – Rights of Nature – could help the members of the international community to find a healthier balance between growth needs and the safeguarding of the planet. The implementation of these rights remains however extremely difficult to achieve, especially in developing countries with pressing economic needs.

By incorporating knowledge from different academic disciplines – history, economics, natural sciences and environmental law – this thesis has attempted to follow the methodologies proposed by environmental historians and produced a comparative historical account oriented towards the long run, which takes into consideration current issues and sensibilities.

BIBLIOGRAPHY

Primary sources

ACOSTA, José de, *Historia Natural y Moral de las Indias*, vol. 1, Chapters VI- XII, Sevilla, 1590.

AERMOD Modeling System Development, *EPA, United States Environmental Protection Agency*, available on https://www.epa.gov/scram/aermod-modeling-system-development

CEDIB INFORMA, Reporte "Situación general de los derechos humanos en Bolivia, Enero a Marzo 2023", March 2023, available on https://www.cedib.org/biblioteca/cedib-informa-enero-a-marzo-2023-situacion-de-los-ddhh-en-bolivia/

Constitución Política del Estado Plurinacional de Bolivia, 2009, Spanish version available on https://www.oas.org/dil/esp/constitucion_bolivia.pdf

Constitucion de la Republica del Ecuador, 2008, Spanish version available on https://www.oas.org/juridico/pdfs/mesicic4_ecu_const.pdf

"COP28", *Council of the European Union*, January 15, 2024, https://www.consilium.europa.eu/en/policies/climate-change/paris-agreement/cop28/

Corte Constitucional Del Ecuador, Sentencia No. 273-19-JP/22, available on http://esacc.corteconstitucional.gob.ec/storage/api/v1/10_DWL_FL/e2NhcnBldGE6J3RyYW1pdGUnLCB1dWlkOidjOWE4ODAyZC03Y2E1LTQ4NDItOWIzNS01ZDZjMzZiM2I3ZGMucGRmJ30=

DE BUFFON, Georges Louis Leclerc. *Les Époques de la Nature*, Paris, Imprimerie Royale, 1778, digitalized version available on https://archive.org/details/lespoquesdelana00buffgoog.

FAO, *Global Forest Resources Assessment, Main Report*, Food and Agriculture Organization, Rome, 2020, available on https://www.fao.org/3/ca9825en/CA9825EN.pdf.

GONZALES, Oscar Campanini, "El Negocio de Mercurio en Bolivia, Estudio sobre la comercialización para la minería aurifera en Bolivia", 2020, *LALIBRE Proyecto Editorial,* Cochambamba, Bolivia, available on https://www.cedib.org/wp-content/uploads/2022/06/El-negocio-de-mercurio-en-Bolivia-Interactivo.pdf

"In focus: Reducing the EU's dependence on imported fossil fuels", *European Commission,* Brussels, April 20, 2022, available on https://commission.europa.eu/news/focus-reducing-eus-dependence-imported-fossil-fuels-2022-04-20_en

"Indigenous People in Bolivia*", International Work Group for Indigenous Affairs* (IWGIA), available on https://www.iwgia.org/en/bolivia.html

JANSEN, Lars, "Global Decarbonization in Fossil Fuel Export-Dependent Economies, Fiscal and economic transition costs", *Development Future Series Working Papers* by the United Nations Development Programme, 2023, available on https://www.undp.org/sites/g/files/zskgke326/files/2023-05/Global%20Decarbonization%20in%20Fossil%20Fuel%20Export-Dependent%20Economies.pdf

LAS CASAS, Bartolomé de, *Brevísima relación de la destrucción de las Indias,* 1542.

Ley 071, Ley de Derechos de la Madre Tierra, del 21 de diciembre de 2010, Estado Plurinacional de Bolivia, Asamblea Legislativa Plurinacional
Spanish text accessible at http://www.planificacion.gob.bo/uploads/marco-legal/Ley%20N°%20071%20DERECHOS%20DE%20LA%20MADRE%20TIERRA.pdf
English text available on https://static1.squarespace.com/static/5e3f36df772e5208fa96513c/t/5fbd121959465c722a5727c7/1606226459629/Bolivia+Rights+of+Mother+Earth+Law+2010+English+%281%29.pdf

Ley 300, Ley Marco de la Madre Tierra y Desarrollo Integral para Vivir Bien, de 15 Octubre de 2012, Estado Plurinacional de Bolivia, Asamblea Legislativa Plurinacional
Spanish text available on https://bolivia.infoleyes.com/norma/4126/ley-marco-de-la-madre-tierra-y-desarrollo-integral-para-vivir-bien-300
English text available on https://ecojurisprudence.org/initiatives/law-no-300-the-framework-law-of-mother-earth-and-integral-development-to-live-well/

"Mapa Emiciones de Mercurio en Bolivia", *CEBID,* October 2022, available on https://www.cedib.org/recursos-naturales/rios-de-mercurio/

MARX, Karl, *Capital*, Vol. I and Vol. III.

"Mercury and Health", *World Health Organization,* March 31, 2017, available on https://www.who.int/news-room/fact-sheets/detail/mercury-and-health

Minimata Convention on Mercury, Kumamoto, Japan, October 10, 2013, available on https://minamataconvention.org/en/about

MORALES, Evo. Address by H.E. Mr. Evo Morales Ayma, the President of the Plurinational State of Bolivia, General Discussion on the Occasion of the 64th Session of the General Assembly of the United Nations, September 23, 2009, available on https://gadebate.un.org/sites/default/files/gastatements/64/64_bo_en_24.pdf

PACARI, Nina, "Naturaleza y territorio desde la mirada de los pueblos indígenas", in *Sumak Kawsay Yuyay, Antología del pensamiento indigenista ecuatoriano sobre Sumak Kawsay*, edited by CAPÍTAN Antonio Luis Hidalgo, GARCÍA Alejandro G., GUAZHA. GUAZHA, Nancy D., Huelva y Cuenca, 2014, available on http://dspace.ucuenca.edu.ec/bitstream/123456789/21745/1/Libro%20Sumak%20Kawsay%20Yuyay.pdf

PlanetGold, *Nota de Prensa: Gobierno presentó proyectos para contribuir a reducir el uso de mercurio en la minería aurífera*, January 17, 2023. PlanetGold, available on

https://www.planetgold.org/nota-de-prensa-gobierno-presento-proyectos-para-contribuir-reducir-el-uso-de-mercurio-en-la-mineria

SMITH Adams, *The Wealth of Nations*, 1776.

STOPPANI, Antonio, *Corso di Geologia,* Volume 2, G. Bernardoni e G. Brigola, 1873.

"Sustainability", *United Nations*, available on https://www.un.org/en/academic-impact/sustainability

United Nation Conference on the Human Environment, 5-16 June 1972, Stockholm, available on https://www.un.org/en/conferences/environment/stockholm1972

U.S. Geological Survey, Mineral Commodity Summaries, January 2022, available on https://pubs.usgs.gov/periodicals/mcs2022/mcs2022-lithium.pdf

Secondary Sources

ACHTENBERG, Emily, "Bolivia: Indigenous groups to march against TIPNIS Highway" *Nacla*, August 12, 2011, https://nacla.org/blog/2011/8/12/bolivia-indigenous-groups-march-against-tipnis-highway

ACHTENBERG, Emily and CURRENTS, Roberts, "What's behind the Bolivian Government's Attack on NGOs?" *Nacla*, September 3, 2015, https://nacla.org/blog/2015/09/03/what%27s-behind-bolivian-government%27s-attack-ngos

AHN, J. et al, "Atmospheric CO_2 over the last 1000 years: A high-resolution record from the West Antarctic Ice Sheet (WAIS) Divide ice core" *Global Biogeochemical Cycles*, vol. 26, May 26, 2012, pp. https://doi.org/10.1029/2011GB004247

Amazon Frontlines, "Comunicado de Prensa: La Corte Costitucional del Ecuador Protege y Desarrolla el Derecho de los Pueblos y Nacionalidades a Decir No a Proyectos Extracivos" February 2022. https://amazonfrontlines.org/es/chronicles/corte-consitucional-ecuador-protege-desarrolla-derechos-pueblos-indigenas/

ANF, "Reserva del Pilón Lajas: Mosetenes y tsimanes vivien amenazados por la minería y la represas", February 19, 2023, https://www.noticiasfides.com/nacional/sociedad/reserva-del-pilon-lajas-mosetenes-y-tsimanes-viven-amenazados-por-la-mineria-y-las-represas-420906

"Anthropocene" *National Geographic*, Education Section, https://education.nationalgeographic.org/resource/anthropocene/

ARMIERO, Marco and BARCA, Stefania. *Storia dell'ambiente*, Carocci, Roma, 2004.

ARMSTRONG, Anne K. et al, "Climate Change Science: the Facts" in *Communicating Climate Change: A Guide for Educators*, Cornell University Press, 2018, pp.7-20. https://www.jstor.org/stable/10.7591/j.ctv941wjn.5

ARRIAZA, Miguel, "El dilema del mercurio, el metal que da de comer y envenena a la Amazonia Boliviana", *El País*, May 2, 2023, https://elpais.com/america-futura/2023-05-02/el-dilema-del-mercurio-el-metal-que-da-de-comer-y-envenena-a-la-amazonia-boliviana.html

ARZÁNS DE ORSÚA Y VELA, B. "*Historia de la Villa Imperial de Potosí* edited by Hanke L., Mendoza G., Brown University Press, Providence, 1965.

BAKEWELL, Peter, "Registered silver production in the Potosi district, 1550-1735" in *Jahrbuch fur Geschichte von Staat, Wirtschaft und Gesellschaft Lateinamerikas* 12, 1975.

BALDIN, Serena, "La tradizione giuridica contro-egonomica in Ecuador e Bolivia", *Boletín Mexicano de Derecho Comparado*, núm 143, 2015, pp. 483-530.

BALDIN, Serena, "I diritti della natura nelle costituzioni di Ecuador e Bolivia", *Visioni LatinoAmericane*, no.10, 2014, pp. 25-39.

BARRÁGAN, Rossana, "Extractive Economy and Institutions? Technology, Labour and Land in Potosí, the Sixteenth to the Eighteenth Century" in *Colonialism, Institutional Change and Shifts in Global Labour Relations* edited by Karin Hofmeester and Pim de Zwart, Amsterdam University Press, 2018.

BRANDING D. A. and CROSS, Harry. "Colonial Silver Mining: Mexico and Peru", *The Hispanic American Historical Review*, vol. 52, no. 4, 1972, pp. 545-579, https://www.jstor.org/stable/2512781

BOYD, David R. "Recognizing the Rights of Nature: Lofty Rhetoric or Legal Revolution?" *Natural Resources & Environment*, vol. 32, no. 4, 2018, pp.13-17, https://www.jstor.org/stable/26418846

BOYER, Christopher R. "Latin America Environmental History", *Oxford Research Encyclopedia of Latin American History*, 2016, doi:10.1093/acrefore/9780199366439.013.295

BONALIAN, Mariano, HAUSBERGER, Bernd, "Condideraciones sobre el comercio y el papel de la plata hispanoamericana en la temprana globalización, siglos XVI-XIX" *Historia Mexicana*, vol. 68, n.1, 2018, pp.197-244.

BONILLA, H. "Peru and Bolivia from Independence to the War of the Pacific", in BETHELL, L. *The Cambridge History of Latin Americ*a, Volume III, pp. 539-582.

BURKE, Peter, "Patters of Urbanization, 1400 to 1800", in BENTLEY, J.H., SUBRAHMANYAM, S., WIESNER-HANKS, M.E., *The Cambridge World History,* Cambridge University Press, 2015, pp.107-132.

CALZADILLA, P. V. and KOTZÉ, L. "Living in Harmony with Nature? A Critical Appraisal of the Rights of Mother Earth in Bolivia", *Transnational Environmental Law*, 7:3, Cambridge University Press, 2018, pp. 397-424, doi:10.1017/S2047102518000201

CAMPAÑA, Farith Simon, "Los Derechos de la Naturaleza en la Costitución Ecuatoriana del 2008: Alcance, Fundamentios y Relación con los Derechos Humanos", *Revista ESMAT*, Ano 11, no. 17, 2019, pp. 231-270. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3600166

CAPPELLI, F. CARAVAGGIO, N., VAQUERO-PIÑEIRO C. "Buen Vivir and forest conservation in Bolivia: False promises or effective change?" *Forest Policy and Economics*, vol. 137, 2022, pp. 1-15. https://doi.org/10.1016/j.forpol.2022.102695

CARLEY, Sanya et al. "Adaptation, culture and the energy transition in American coal country", *Energy Research & Social Science*, vol. 37, 2018, pp. 133-139. https://doi.org/10.1016/j.erss.2017.10.007

CASTANEDA, Christopher J. "Natural Disasters in the Making: Fossil Fuels, Humanity, and the Environment", *OAH Magazine of History*, vol. 25, no.4, 2011, pp. 21-25, https://www.jstor.org/stable/23209953

CONRAD, Sebastian, *What is Global History?* Princeton University Press, United Kingdom, 2017.

COOKE, Colin A. et al. "Over three millennia of mercury pollution in the Peruvian Andes", *PNAS*, vol. 16, no. 22, 2009, pp. 8830-8834, https://doi.org/10.1073/pnas.090051710

COOK, N. D. "The Columbian Exchange" in J. Bentley, S. Subrahmanyam, & M. Wiesner-Hanks (Eds.), *The Cambridge World History,* Cambridge University Press, pp. 103-134 doi:10.1017/CBO9781139022460.006

CRIST Eileen and KOPNINA, H. "Unsettling Anthropocentrism", *Dialect Anthropology*, vol. 38, no. 4, 2014, pp. 387-396, https://www.jstor.org/stable/43895114

CRONON, William. "The Uses of Environmental History" *Environmental History Review*, vol. 17, no. 3, 1993, pp. 1–22. https://doi.org/10.2307/3984602.

CROSBY, Alfred W. T*he Columbian Exchange; Biological and Cultural Consequences of 1492*. Westport, CT, Greenwood Pub. Co., 1972.

CROSS, Harry E. "South American bullion production and export 1550-1750" in *Precious Metals in the Later Medieval and Early Modern Worlds*, edited by RICHARDS, J.F. Carolina Academic Press, 1983.

CRUTZEN P. J. and STOERMER E. F. "The Anthropocene", *IGBP Global Change Newsletter* 41, (2000) p.17-18, http://people.whitman.edu/~frierspr/Crutzen%20and%20Stoermer%202000%20Anthropocene%20essay.pdf

DE LACERDA, L.D. and SALOMONS, W. "The Use of Mercury Amalgamation in Gold and Silver Mining" in *Mercury from Gold and Silver Mining: A Chemical Time Bomb?* Environmental Science, 1998, pp.1-13, https://link.springer.com/chapter/10.1007/978-3-642-58793-1_1

DE VRIES, J. “The Industrial Revolution and the Industrious Revolution”, *The Journal of Economic History*, vol. *54*, no.2, 1994, pp. 249-270, https://doi.org/10.1017/s0022050700014467.

DE VRIES, J. *The Industrious Revolution: Consumer Behavior and the Household Economy, 1650 to the Present*, Cambridge University Press, 2008.

DE VRIES, J. “The limits of globalization in the early modern world”, *The Economic History Review*, vol. 63, no. 3, 2010, pp. 710-733, https://www.jstor.org/stable/40929823

ECHEVERRÍA, Hugo, “Rights of Nature: The Ecuadorian Case”, *Revista Esmat*, Ano 9, no.13, 2017.

ELLIOT, J.H. “Spain and America in the Sixteenth and Seventeenth centuries” in BETHELL, L. *The Cambridge History of Latin America*, volume I, Cambridge University Press, 1984, pp. 287-340,

ELLIOT, J.H., “The Spanish Conquest and the Settlement of America” in BETHELL, L. *The Cambridge History of Latin America*, volume I, Cambridge University Press, 1984, pp. 147-206.

El Potosí, “Cresce riesgo de contaminación del agua de lagunas del Kari Kari”, January 12, 2023. https://elpotosi.net/local/20230112_crece-riesgo-de-contaminacion-del-agua-de-lagunas-del-kari-kari.html

Expansion, “Bolivia crea una ley quie considera a la Madre Tierra un sistema vivente”, October 15, 2012. https://expansion.mx/planetacnn/2012/10/15/bolivia-crea-una-ley-que-considera-a-la-madre-tierra-un-sistema-viviente

ESTERMANN, Josef, “Vivir bien como utopía política”, *Globethics* 2013, pp.1-18. https://repository.globethics.net/handle/20.500.12424/192203

FABRICANT, Nicole and GUSTAFSON, Bret. “The Political Economy of Gas, Soy and Lithium in Morales Bolivia”, *Revista de Estudios Bolivianos*, vol. 25, 2019, pp. 45-59, doi: 10.5195/bsj.2019.220

FLYNN, Dennis and GIRÁLDEZ, Arturo, “Born with a “Silver Spoon”: The Origin of World Trade in 1571”, *Journal of World History*, vol. 6, no. 2, 1995, pp. 201-221, https://www.jstor.org/stable/20078638

FLYNN, Dennis and GIRÁLDEZ, Arturo, “Cycles of Silver: Global Economic Unity through the Mid-Eighteen Century”, *Journal of World History*, vol. 13, no.2, 2002, pp. 391-427. https://www.researchgate.net/publication/236812110_Cycles_of_Silver_Global_Economic_Unity_through_the_Mid-Eighteenth_Century?enrichId=rgreq-bf5a84501073c2b5ad3896414aa3d65d-XXX&enrichSource=Y292ZXJQYWdlOzIzNjgxMjExMDtBUzoyNTYyNjc3Njc3NzUyMzNAMTQzODExMDQwNTE0Mw%3D%3D&el=1_x_2&_esc=publicationCoverPdf

FLYNN Dennis and GIRALDEZ, Arturo, "China and the Manila Galleons" in in LATHAM, A. J. H. and KAWAKATSU, H. *Japanese Industrialization and the Asian Economy*, Routledge, London and New York, 1995, pp.71-90.

FLYNN, Dennis. "Silver in a global context, 1400-1800" in BENTLEY J. H. et al. *The Cambridge World History* Vol.VI, Part 2, edited by Jerry H. Bentley et al, Cambridge University Press, 2015, pp. 213-239.

FLORES, Jorge, "The Iberian Empires, 1400 to 1800", in BENTLEY J. H. et al. *The Cambridge World History*, Cambridge University Press, 2015, pp.271-296.

"Fossil Fuels" in *National Geographic*, education section https://education.nationalgeographic.org/resource/fossil-fuels/

GARNER, Richard, "Long-term silver mining trends in Spanish America: a comparative analysis of Peru and Mexico" *American Historical Review*, vol. 93, issue 4, 1988, pp. 898-935, https://doi.org/10.1086/ahr/93.4.898

GERASIMCHUK, Ivetta, et al. "Clean Energy Transition Versus Fossil Fuel Path Dependence" in *Beyond Fossil Fuels: Fiscal Transition in BRICS*, International Institute for Sustainable Development (IISD), 2019, pp. 4-10. https://www.iisd.org/system/files/publications/beyond-fossil-fuels-brics.pdf

GERHARDT, Tina, "Bolivia People's Conference calls for systemic change, not climate change" *Grist*, April 26, 2010. https://grist.org/politics/2010-04-25-bolivia-peoples-conference-anti-capitalism-climate-change/

GOLDSTONE, Jack, *Revolution and Rebellion in the Early Modern World*, University of California Press, Berkley and Los Angeles, (1991).

GORALNIK L., NELSON M. P., "Anthropocentrism" *Encyclopaedia of Applied Ethics* (Second Edition) edited by Ruth Chadwick, Academic Press, (2012), p. 145-155, https://www.researchgate.net/publication/268506880_Anthropocentrism

GUERRA, M. F. "The circulation of precious metals in Brazil at the end of the 17th century", *Journal of Archaeological Science*, vol. 31, Issue 9, 2004, pp. 1225-1236, https://doi.org/10.1016/j.jas.2004.03.018.

GUERRA, M. F. et al "The diffusion of the silver from Potosi in the 16th century Spanish coinage: A new analytical method" *In Archaeological Sciences 1989: Proceedings of A Conference on the Application of Scientific Techniques to Archaeology*, Bradford, 1989, pp. 28–35

HAGAN, Nicole et al, "Estimating historical atmospheric mercury concentrations from silver mining and their legacies in present day surface soil in Potosí", *Atmospheric Environment*, vol. 45, Issue 40, 2011, pp. 7619-7626, https://doi.org/10.1016/j.atmosenv.2010.10.009.

HILL, David, "Top Bolivian NGO facing eviction – given just days to move archive" *The Guardian*, April 8, 2017 https://www.theguardian.com/environment/andes-to-the-amazon/2017/apr/08/top-bolivian-ngo-faces-forced-eviction

HUGUET, Pané Guiomar "¿De dónde viene la expresión 'valer un Potosí'?" *National Geographic,* August 28, 2020*,* https://historia.nationalgeographic.com.es/a/de-donde-viene-expresion-valer-potosi_15128#:~:text=%22Este%20chico%20vale%20un%20Potos%C3%AD%22.%20Cuando%20alguien%20emplea,decir%20que%20algo%20o%20alguien%20es%20muy%20valioso

IRIGOIN, Alejandra and MILLMORE, Bridget, "Piece of Eight" in THURNER Mark, PIMENTAL Juan, *New World Objects of Knowledge*, University of London Press, London, 2021, pp. 41-46. https://www.jstor.org/stable/j.ctv1vbd275.8

ISENBERG, Andrew C. (ed.), *The Oxford Handbook of Environmental History*, Oxford Handbooks, Oxford Academic, 2014.

KAIJSER ANNA, "Tensiones y utopías: Las políticas ambientale bolivianos bajo el mandato de Evo Morales" *Ecología Política*, 2016, pp. 66-72. https://www.researchgate.net/publication/308614837_Tensiones_y_utopias_Las_politicas_ambientales_bolivianas_bajo_el_mandato_de_Evo_Morales

KAUFFMAN, Craig M., "Why Rights of Nature are Implemented in Some Cases and Not Others: The Controlled Comparison of Bolivia and Ecuador", *International Studies Association Annual Conference*, Toronto, March 29, 2019. http://files.harmonywithnatureun.org/uploads/upload861.pdf

KEIM, Brandon, "Nature to Get Rights in Bolivia", *Wired*, April 18, 2011. https://www.wired.com/2011/04/legal-rights-nature-bolivia/

KLEIN H.S., "Bolivia from the War of the Pacific to the Chaco War, 1880-1932" in BENTHELL L., ed. *The Cambridge History of Latin America*, Cambridge University Press, 1986, pp.553-586.

KURNIAWAN S.B. et al, "Microplastic Pollution in the Environment: Insights into Emerging Sources and Potential Threats" in *Environmental Technology & Innovation*, vol. 23, 2021, https://doi.org/10.1016/j.eti.2021.101790.

LADURIE, Emmanuel Le Roy et al., "Sur les traces de l'argent du Potosí", *Annales. Histoire, Sciences Sociales*, vol. 45, no. 2, 1990, pp. 483-505, https://www.jstor.org/stable/27582850

LANE, Kris, "Potosí Mines" in *Oxford Research Encyclopaedia of Latin American History*, 2015, https://doi.org/10.1093/acrefore/9780199366439.013.2

LANE, Kris, "Potosí" in THURNER, Mark. and PIMENTEL, Juan. *New World Objects of Knowledge,* University of London Press, 2021, pp. 23-40. https://www.jstor.org/stable/j.ctv1vbd275.7

LEWIS, Michel, "And all was light? – Science and Environmental History" in *The Oxford Handbook of Environmental History*, Oxford Handbooks, Oxford Academic, 2014.

LEWIS Simon L., and MASLIN Mark A., *The Human Planet. How We Created the Anthropocene*, Yale University Press, New Haven, 2018.

LYBOURN-LANGTON, Laurie, et al. “Environmental breakdown is an overwhelming challenge for younger and future generations” in *Inheriting the Earth? The unprecedented challenge of environmental breakdown for future generations*, Institute for Public Policy Research (IPPR), 2019.

LYNCH, J. “The origins of the Spanish American Independence” in BETHELL, L. *The Cambridge History of Latin America*, volume III, pp. 1-50.

Los Tiempos, “Contaminación: Hallan metales pesados por encima de lo saludable en el río Pilcomayo”, January 23, 2023. https://www.lostiempos.com/actualidad/pais/20230123/contaminacion-hallan-metales-pesados-encima-saludable-rio-pilcomayo

MACAS, Luis, “Sumak Kawsay. La vida en plenitud”, *América Latina en Movimiento. Sumak Kawsay: Recuperar el sentido de la vida*, 2010, pp. 14-16.

MACLEOD, M. J. “Spain and America: The Atlantic Trade, 1492-1720” in BETHELL, Leslie, *The Cambridge History of Latin America*, volume I, Cambridge University Press, pp. 341-388.

MANN, C.C, “1493: How Europe’s Discovery of the Americas Revolutionized Trade, Ecology and Life on Earth”, Granta, London, 2011. https://searchworks.stanford.edu/view/9336983

MARICHAL, Carlos, “The Spanish-American Silver Peso: Export Commodity and Global Money of the Ancien Regime, 1550-1800” in TOPNIK Steven, et al. *From Silver to Cocaine, Latin American Commodity Chains and the Building of the World Economy 1500-200*, Duke University Press (2006).

MARIANO, Baptista Gumucio, *Breve Historia Contemporánea de Bolivia*, Fondo de Cultura Económica, 1996.

MCNEILL, John R., AGNOLETTI, Mauro, “Where Is Environmental History Going?” *Global Environment*, vol. 7, no. 2, 2014, pp. 517-35. https://www.jstor.org/stable/43201717

MCNEILL, J. R. “Observations on the Nature and Culture of Environmental History ” *History and Theory*, vol. 42, no. 4, 2003, pp. 5-43. https://www.jstor.org/stable/3590677

MCNEILL, John R. “The State of the Field of Environmental History”, *Annual Review of Environment and Resources*, vol. 35, 2010, pp. 345-374. https://doi.org/10.1146/annurev-environ-040609-105431.

MILIONI Ana Luiza V. et al, “Neurotoxic impact of mercury on the central nervous system evaluated by neuropsychological tests and on the autonomic nervous system evaluated by dynamic pupillometry” in *Neurotoxicology*, Vol. 59 2017, pp. 263-269, https://doi.org/10.1016/j.neuro.2016.04.010.

MYLLANTAUS, Timo, “Methods in Environmental History” in *Thinking through the Environment. Green Approaches to Global History,* The White Horse Press, Cambridge, 2011.

MONTERO, Raquel Gil, "Free and unfree Labour in the Colonial Andes in the Sixteenth and Seventeenth Centuries", *International Review of Social History*, vol. 56, Issue 19, 2011, pp. 297-318, https://www.jstor.org/stable/44583217

MOSELY, Stephen, *Storia Globale dell'Ambiente*, Il Mulino, Bologna, 2010.

MUÑOZ PRUDENCIO, Lorna S., "Bolivia's Mother Earth Laws, Is the Ecocentric Legislation Misleading?" *ReVista, Harvard Review of Latin America*, February 6, 2023. https://revista.drclas.harvard.edu/bolivias-mother-earth-laws-is-the-ecocentric-legislation-misleading/

MURRA, John, "Andean Societies before 1532", in BETHELL, L. *The Cambridge History of Latin America*, volume I, Cambridge University Press, 1984, New York, pp. 59-90.

NEUKOM, R., GERGIS, J., KAROLY, D. et al. "Inter-hemispheric temperature variability over the past millennium", *Nature Climate Change,* no. 4, 2014), pp. 362–367 https://doi.org/10.1038/nclimate2174

NEVLE, R. et al, "Neotropical human–landscape interactions, fire, and atmospheric CO2 during European conquest" , *The Holocene*, vol. 21, no. 5, 2011, pp. 853-864. https://doi.org/10.1177/0959683611404578

NRIAGU, Jerome O. "Mercury pollution from the past mining of gold and silver in the Americas", *The Science of the Total Environment*, vol. 149, Issue 3, 1994, pp. 167-181. https://doi.org/10.1016/0048-9697(94)90177-5.

O'DONNEL, ERIN L. and TALBOT-JONES Julia, "Creating Legal Rights for Rivers: Lessons from Australia, New Zealand, and India", *Ecology and Society*, vol. 23 no. 1, 2018, https://www.researchgate.net/publication/322517159_Creating_legal_rights_for_rivers_Lessons_from_Australia_New_Zealand_and_India

PAGANO, Piergiacomo, *Filosofia Ambientale*, Mattioli 1885 Editore, Fidenza, 2005.

PARKER, Charles, *Global Interactions in the Early Modern Age*, Cambridge University Press, New York, 2010.

PÉREZ, Milton Z., "Piratas, Piratería y Comercio Ilícito en el Caribe: la Visión del Otro (1550-1650)", *Universidad del Atlántico, Historia Caribe, Barraquila* (Col.) No.12, (2007), pp. 23-56.

PERRIER BRUSLÉ L., "Le conflit du Tipnis et la Bolivie d'Evo Morales face à ses contracditions: analyse d'un conflit socio-environmentake", *EchoGéo*, 2012, pp. 1-21.

POSTERO, Nancy, "The Emergence of Indigenous Nationalism in Bolivia: Social Movements and the MAS State", "The Constitutional Assembly: Challenges to Liberalism" and "Living Well? The Battle for National Development" in *The Indigenous State, Race, Politics and Performance in Plurinational Bolivia*, University of California Press, Oakland, 2017.

RADKAU, Joachim, *Storia Globale dell'Ambiente*, LEG edizioni, Gorizia, 2020.

Rainforest Rescue, "Ecuador: Constitutional Court backs indigenous people in fight against gold mining" February 22, 2022. https://www.rainforest-rescue.org/updates/10569/ecuador-constitutional-court-backs-indigenous-people-in-fight-against-gold-mining

RICHARDS, John F. *The Unending Frontier: An Environmental History of the Early Modern World*, University of California Press, Berkley, 2003.

RITCHIE, Hannah. "Wild mammals make up only a few percent of the world's mammals*" Our World in Data*, December 15, 2022, https://ourworldindata.org/wild-mammals-birds-biomass

ROBINS, Nicholas A., *Mercury, Mining and Empire: The Human and Ecological Cost of Colonial Silver Mining in the Andes*, Indiana University Press, 2011.

ROBINS, Nicholas and HAGAN, Nicole A., "Mercury Production and Use in Colonial Andean Silver Production: Emissions and Health Implications", *Environmental Health Perspectives*, vol. 120, Issue 5, 2012, pp. 627-631, https://doi.org/10.1289/ehp.1104192

ROSER, Max and RITCHIE, Hannah, "How has population growth changed over time?" *Our World in Data*, June 1, 2023, https://ourworldindata.org/population-growth-over-time#article-citation

RUPPEL-SCHLICHTING, Katharina. "Introducing Environmental Law", *in Environmental Law and Policy in Cameroon,* edited by RUPPEL, Oliver C., KAM YOGO, Emmanuel D., (2018), pp. 77-92. https://www.jstor.org/stable/j.ctv941sr6.8

SMITH, Wesley J., "Beware the "rights of nature", *The Daily Caller*, December 30, 2011, https://dailycaller.com/2011/12/30/beware-the-rights-of-nature/

SOMMER, Alfred, "Burning Fossil Fuels: Impact of Climate Change on Health", *International Journal of Health Services*, vol. 46, no. 1, 2016, pp.48-52. https://www.jstor.org/stable/48512864

STEGER, Manfred B., *Globalization. A very short introduction*, Oxford University Press, 2003.

STONE, Christopher D., *"*Should Trees Have Standings? – Towards Legal Rights for Natural Objects", *Southern California Law Review*, no. 45, 1972, pp. 450-501, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj-q7CA2LCEAxXx7gIHHVTSBuwQFnoECA8QAQ&url=https%3A%2F%2Fiseethics.files.wordpress.com%2F2013%2F02%2Fstone-christopher-d-should-trees-have-standing.pdf&usg=AOvVaw2EnEG0QNcUZWzEluX5zpXV&opi=89978449

SUMNER, W.G. "The Spanish Dollar and the Colonial Shilling", *The American Historical Review*, vol. 3, no. 4, 1898, pp. 607-619.

SUN L., YANG G., LIU R. et al, "Global circulation of silver between Ming-Qing China and the Americas: Combining historical texts and scientific analysis", *Archaeometry* 63 (3), pp. 627-640, https://doi.org/10.1111/arcm.12617

"Sustainability" in National Geographic, Education Section, available at the following link: https://education.nationalgeographic.org/resource/sustainability/.

TAMAYO, Iván Peredes, "Los desafíos ambientales de Bolivia en 2023: invasiones y deforestación, ríos contaminados, sequías y gestion de áreas protegidas" *Mongabay, Periodismo Ambiental Independiente en Latino América*, January 2023. https://es.mongabay.com/2023/01/desafios-ambientales-de-bolivia-en-2023-invasiones-y-deforestacion/

VIDAL, John, "Bolivia enshrines natural world's rights with equal status for Mother Earth", *The Guardian*, April 10, 2011 https://www.theguardian.com/environment/2011/apr/10/bolivia-enshrines-natural-worlds-rights

VINER, Brian, "Coming and Going: Transport and Tracking", in HISCOX, April L. *Conceptual Boundary Layer Meteorology,* Academic Press, 2023, pp. 217-241, https://www.sciencedirect.com/book/9780128170922/conceptual-boundary-layer-meteorology

VON METZ, Brígida, "La Plata y La Conformación de la Economía Novohispana" in *Historia Económica General de México: De la Colonia a Nuestros Días*, edited by FICKER, Sandra Kuntz, El Colegio de Mexico, 2010, pp. 113-142, https://www.jstor.org/stable/j.ctv47wf39.8

WAGNER, Marie Luise, "Conquest and Colonial Rule, 1532-1809" in *Bolivia, A Country Study* edited by Rex A. Hudson and Dennis M. Hanratty, 1991.

WHITEHEAD L., "Bolivia since 1930" in BENTHELL L. *The Cambridge History of Latin America*, Cambridge University Press, 1991, pp.509-584.

Yasunidos, "The Collective Process to Defend Yasuni National Park" May 29, 2023. https://www.yasunidos.org/the-collective-process-to-defend-yasuni-national-park/

ZAFFARONI, E. R. "La Pachamama y el Humano", en ACOSTA A., MARTÍNEZ, *La naturaleza con derechos*, Quito, Abya-Yala, 2011, pp. 25-39.

ZAFFARONI, Eugenio Raúl, "La naturaleza como persona: de la Pachamama a la Gaia", in *Bolivia: Nueva Constitución Política del Estado. Conceptos elementales para su desarrollo normativo*, La Paz: Vicepresidencia del Estado Plurinacional de Bolivia, 2010, pp. 109-132, https://edisciplinas.usp.br/pluginfile.php/4482518/mod_folder/content/0/Zaffaroni_-_De_la_Pachamama_a_la_Gaia.pdf

ZANATTA, L. *Storia dell'America Latina Contemporanea*, Edizioni Laterza, 2011.