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Environmental Accounting and State Power in the Grand Duchy of Tuscany (1537-1621)

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Abstract

- **Purpose.** The study investigates the use of early forms of environmental accounting in the implementation of environmental strategies in the Grand Duchy of Tuscany between the 16th and 17th centuries.
- **Design/methodology/approach.** The study adopts the Foucauldian concept of *raison d'État* to shed light on the ways in which environmental accounting practices were used by Tuscan Grand Dukes to form a detailed knowledge of the territory to be governed and act accordingly.
- **Findings.** Financial and non-financial information relating to environmental issues enabled the Grand Dukes to 'visualise' the territory to be managed as an enclosed disciplinary space whereby the conduct of people living therein could be decisively influenced. Accounting practices as a tool for the implementation of environmental strategies did not merely aim to protect the environment but were a means to reinforce the power of the State.
- **Research implications.** The paper can inform future works that investigate the ways in which environmental policies and accounting are used to pursue far-reaching governmental goals. It encourages scholars to examine further the origins of environmental accounting and its early forms.
- **Social implications.** The study documents how environmental strategies and the related use of accounting can have a significant influence on how individuals are allowed to conduct themselves. It also shows that environmental accounting practices can be an important tool in a State's machinery of power.
- **Originality/value.** The study offers a novel perspective on the use of environmental accounting information as a tool in the exercise of State power. It explores explicitly the interrelations between accounting, sustainability and power. It also adds new evidence to historical research that has engaged with early forms of environmental accounting.

Keywords: Environmental accounting, Foucault, *Raison d'État*, Power, Sustainable development.

Introduction

Investigations of the interrelation between accounting and sustainability are becoming increasingly important in the accounting literature. Studies of accounting have sought to identify how accounting tools can contribute to giving prominence to environmental matters and influence the operations of private businesses in the achievement of long-term sustainable development (Atkins *et al.*, 2014; Corvino *et al.*, 2021; Doni *et al.*, 2019; Vollmer, 2021). Governments and public administrations at large are also deeply involved in the process of promoting sustainable development, as testified by recent interventions such as the United Nations Sustainable Development Goals (Barut *et al.*, 2016; Schneider *et al.*, 2014; Sobkowiak *et al.*, 2020). Alongside this body of work, alternative perspectives on environmental accounting practices have started to investigate the latter as technologies that can be employed for the enactment of programmes of government (Lai *et al.*, 2019; Russell and Thomson, 2009; Thomson *et al.*, 2014). This research has sought to problematise the use of accounting information to promote governmental strategies that seek to protect the environment. Rather than being a tool which provides neutral information, environmental accounting practices may cause the formulation of policies which fail to engage with public health and environmental issues whilst focusing on what can be easily measured or promote the goals of powerful actors.

Environmental issues and the contributions of accounting to promoting sustainable development have also started to attract the attention of accounting historians. Although this stream of literature is still in its infancy, pioneering studies have focused on less obvious accounts, including diaries, scientific reports and poems as early forms of environmental accounting and reporting, which were used to raise awareness of the need to promote a form of economic development that respects local flora and fauna (Atkins and Maroun, 2020, Atkins and Thomson, 2014; Solomon and Thomson, 2009). Historical research, most especially by drawing from the work of Foucault, has shown how accounting can be used to act on distant people and places in less obvious and unseen ways (Álvarez-Dardet *et al.*, 2002; Antonelli *et al.*, 2020; Baños *et al.*, 2005; Bigoni *et al.*, 2018, 2021a; Sargiacomo, 2008). Nevertheless, historical studies of environmental accounting have yet to explicitly investigate the latter's interrelation with the exercise of governmental power. Consistently, much is still to be learnt about the dynamics and purposes surrounding the use of environmental accounting in framing a calculable space that makes the natural environment knowable and informs governmental strategies ostensibly oriented towards the achievement of long-term sustainability, but which can have a 'hidden agenda'. The present study aims to address this oversight by answering Russell *et al.*'s (2017, p. 1443) call to "critically examine historical and contemporary case studies of calculative practices that mediate human-nature relations". To do so, the study explores the governing of the environment in the Grand Duchy of Tuscany in central Italy between the 16th and 17th centuries, when it was under the domination of the Medici Family. It focuses on the rule of Cosimo I, Francesco I, Ferdinando I and Cosimo II de Medici (1537-1621), who are recognised as the rulers under whom the Grand Duchy reached the zenith of its splendour (Diaz, 1976). They intervened in detail in environmental matters to protect the territory of their State and the population living therein.

The paper draws on the concept of *raison d'État*, a new 'art of government' which started to develop in the 16th and 17th centuries (Foucault, 1991; 2007). Foucault's understanding of *raison d'État* is used to investigate the ways in which accounting reports enabled the Grand Dukes to implement an environmental strategy for the preservation of the hydrogeological conditions of their territory, most especially Pisa and its countryside.

Pisa had been significantly affected by wars against Florence, which took a high toll in terms of human lives and left in the background the dramatic conditions of the Pisan territory. This caused hydrogeological instability, stagnation of water and unsanitary living conditions in the city, which affected the health of the population and their economic activity (Baldini, 1578; Gasperini *et al.*, 2015). The Grand Dukes sought to tackle the degradation of the territory and its impact on human life by means of an extensive use of written information in the form of laws, regulations, rescripts, letters and, crucially, accounting reports. This approach to government was characterised by detailed interventions in the everyday life of the State and its citizens, which in turn required knowledge of the phenomena to be managed (Foucault, 2007). Nevertheless, environmental strategies informed by accounting information did not merely aim to protect the territory and promote sustainable development. The Grand Dukes' ultimate goal was enabling the population to grow, which, as in the rationality of *raison d'État*, would have meant strengthening the State and helping it to compete against neighbouring countries. Early forms of environmental accounting were used to make environmental issues calculable, thereby enabling the centre to understand and 'visualise' the condition of the territory and its resources, which in turn allowed the Grand Dukes to intervene with orders, letters and regulations. Control enacted by means of accounting ensured that human action would be consistent with the need to protect the environment against excessive exploitation and make the territory safer, less liable to flooding and healthier, thereby helping the population to grow and, as a result, making the State stronger.

The paper is based on an extensive analysis of primary sources located at the State Archive of Pisa, especially laws, statutes, regulations, rescripts and accounting reports. Consistent with Atkins and Maroun (2020), this study considers as early forms of environmental accounting any form of reporting which involves observing, identifying, naming and counting. Thereby, this concept is not limited to reporting financial information but covers a wide range of environmental information, both financial and non-financial. The study also conceives of accounting as a technology of government, a device which makes governmental problems visible and thinkable. Technologies of government "can measure the number and characteristics of individuals, but also their acts, movements, production and consumption, expenses and receipts or even the features of a territory" (Antonelli *et al.*, 2020, p. 380). Accounting as a technology of government has the potential to enable those in power to intervene and act upon events and individual behaviour, it is not a mere technique that is limited to mirroring reality in a neutral fashion. The paper contributes to the accounting history literature that has drawn upon Foucault in investigating the role of accounting as a technology of government. It does so by providing an explicit historical analysis of environmental policies and related accounting practices as a means to exercise power and achieve goals that are not limited to the protection of nature. The work also offers a novel perspective on the first forms of environmental accounting which adds to the nascent stream of literature that seeks to understand the roots of environmental accounting. Moreover, the paper broadens the compass of previous research that has explored accounting in the Grand Duchy of Tuscany. Maran *et al.* (2014, 2019) explored the contributions of accounting to the 18th century municipal reform enacted by Peter Leopold of Habsburg-Lorraine, who sought to modernise his State and decentralise authority and responsibility. Bigoni *et al.* (2018) focused on how accounting practices were enlisted by the Medici Grand Dukes to curtail the freedom of students at the University of Pisa, an institution which was supposed to be self-governing according to its statute. The present work adds a new dimension to these studies, that of environmental strategies and related accounting practices as a tool for the exercise of power.

The remainder of the paper is organised as follows. The next section presents a review of the literature that has engaged with early forms of environmental accounting and accounting as a tool in the exercise of power. This is then followed by the theoretical framework informing the study and an explanation of the method used in carrying out this research. After an historical introduction to the Grand Duchy of Tuscany, the environmental policies inaugurated by the Grand Dukes are presented, along with the accounting practices which underpinned them. The last section offers a discussion of the findings of the work and some brief conclusions.

Literature review

Recent studies have sought to expand the focus of environmental accounting to embrace less obvious forms of accounting which are not limited to financial information. Accounting historians have begun to investigate the roots of environmental accounting, by focusing on environmental crises in the mid-17th, 18th and 19th centuries. This body of literature emphasises the lack of interest by central governments in taking environmental problems into account, which led to the emergence of forms of external accounting by non-accountants, such as writers, journalists and technicians, who sought to draw the public's attention to the gravity of the damage being done to the environment and the health of citizens (Atkins and Maroun, 2020). Solomon and Thomson (2009) found early evidence of environmental accounting in a 19th century scientific report produced by a civil engineer which aimed at raising awareness about a threatened river. Through the description of pollutants and the identification of commercial sites and individuals responsible for releasing harmful substances into the river, the report drew attention to environmental problems and the need to mitigate damage arising from industrial growth in a period when there were no regulations against pollution. Further evidence of early forms of environmental accounting has been found by Atkins and Thomson (2014) in the 19th century writings of William Morris, who engaged in a campaign to defend Epping Forest in England. By means of letters, public lectures, poems and novels, Morris contributed to making natural damages visible and educating local businesses on their responsibilities to the environment (Atkins and Thomson, 2014). Early forms of accounting for biodiversity were identified by Atkins and Maroun (2020) in Gilbert White's 18th century *Naturalist's Journals*, which offered a snapshot of the diffusion of different species of flora and fauna (Atkins and Maroun, 2020). Recent research by Atkins and McBride (2022) explored John Evelyn's *Fumifugium* as an early example of environmental external account drawn up as part of a political struggle against industrial pollution in 17th century London. This account gave emphasis to a wide range of environmental damages and their dramatic effects on the ecosystem, human health, air quality and urban aesthetics, and offered potential solutions, such as tree planting and businesses relocations. These studies show how the first forms of environmental reports were not drawn up by public bodies or for-profit organisations and predate corporate social and environmental reporting. Evidence of how corporate environmental reporting is a relatively recent phenomenon has been found by Guthrie and Parker (1989) in one of the very few studies on historical environmental reporting by a private concern. By analysing annual reporting from 1885 onwards by a major Australian mining and manufacturing company, Guthrie and Parker (1989) showed how of environmental disclosure was limited and patchy, and started to properly develop since the 1970s.

Along with work on early forms of environmental accounting, research into the interrelations between accounting and power is relevant to this study. The work of Michel

Foucault has enabled accounting historians to investigate the intricacies of power and the contributions that accounting practices can make in creating and reproducing power relations. Studies drawing from Foucault have challenged the view of accounting as a neutral technique and identified the ways in which accounting creates partisan visibilities that have a significant impact on how those subjected to them think and act. Foucault-informed accounting history research can be broadly traced back to three main sites of investigation: the factory, the Church and the State.

The factory is perhaps the most obvious setting in which accounting can be expected to be studied, given that issues of profit maximisation and efficiency are at the heart of the discourses it promotes and sustains (Cooper, 1995). Carmona *et al.*'s (1997, p. 412) investigation of cost accounting at the 18th century Royal Tobacco Factory of Seville showed how this tool was not simply a means to maximise profit, but was “part of regimes of calculation and associated discursive practices that operate as a scheme of surveillance”. When the factory moved to new premises outside the city, the combination of new architectural arrangements and the use of cost accounting practices ensured that spaces and the individuals who occupied them were made visible (Carmona *et al.*, 2002). Financial and non-financial information in factories is therefore seen by Foucault-inspired literature as a technology that seeks to depict human selves in written form in the creation of a more malleable workforce, thereby maximising their utility to the business (Edwards, 2018; Fúnez, 2005; Hoskin and Macve, 1986).

Historical studies of accounting and power have also focused on the Catholic Church which, to Foucault (1991, 2007), is the site where modern forms of power grew and matured. Researchers have drawn from the Foucauldian concept of pastoral power to investigate the use of accounting as a means for the Church's top officials to control individuals and institutions that depended on them. Despite being an apparently secular tool, accounting practices have been employed to control the dedication of priests to their sacred responsibilities (Bigoni and Funnell, 2015) and even to shape an inquisitor's subjectivity and ensuring he would internalise self-discipline in the discharge of his duties (Bigoni *et al.*, 2021a). Control by the Church enacted by means of accounting also extended to institutions such as universities operating in the Papal States which, despite being social enterprises, were expected to further the Church's mission (Madonna *et al.*, 2014). Historical research employing Foucault's understandings of power has therefore shown the potential of accounting to ensure detailed accountability for personal and organisational action in the centralisation of power (Gatti and Poli, 2014; Yayla, 2011). Nevertheless, Magliacani and Di Pietra (2019) have demonstrated that accounting practices can be used in deceptive ways to protect local prerogatives and limit central power.

Particularly relevant for this paper, accounting historians mobilising Foucault's ideas have devoted significant effort in identifying the ways in which accounting practices have supported the exercise of power by States. Research has shown how political rationalities, the main goals and beliefs which inform government action, and programmes of government, which are calculated plans for achieving the former, depend on the representational possibilities offered by accounting technologies (Rose and Miller, 1992). Accounting technologies in the form of “techniques of notation, computation and calculation along with procedures of examination and assessment or surveys and presentational forms such as tables” are powerful tools to make government goals thinkable and achievable by their ability “to render behaviours visible and to disseminate a new vocabulary based on numbers and ‘economic objects’” (Antonelli *et al.*, 2020, p. 380). These properties have enabled those in power to exercise ‘control at a distance’ as accounting reports can travel and be accumulated in ‘centres of calculation’ to be

processed, compared and stored (Robson, 1992, 1994). Studies have therefore identified how these properties were activated to ensure that rulers and governments can reach objectives as diverse as maximising tax receipts and tackling fraud (Sargiacomo, 2008), enacting far-reaching municipal reforms (Maran *et al.*, 2014), and centralising power by silently removing the prerogatives of local elites (Di Cimbrini *et al.*, 2020; Maran *et al.*, 2016). Government intervention by means of accounting has extended to the management of territories in the achievement of specific goals. This is evident in the field of agriculture. Financial and non-financial information can make agriculture visible and, therefore, allow its characterisation as an economic sector (Murdoch and Ward, 1997). In the agricultural domain, research by Álvarez-Dardet *et al.* (2002), Baños *et al.* (2005) and Sargiacomo *et al.* (2016) focused on the use of accounting for controlling individuals, most especially those responsible for crops and productivity, identifying the ways in which accounting practices can have an impact on how natural resources are managed. The adaptability of accounting is such that it can also be used not simply for managing a territory, but also to ‘visualise’ a distant territory by bringing home its main features when decisions need to be made. This is exemplified by Lai *et al.*’s (2012) investigation of a proposed barter between the Duke of Mantua and the King of Spain. Detailed accounting reports identified the main groups of inhabitants and the wealth of the territory under consideration for the barter, which led to the rejection of the proposal.

As an implement of government, accounting was employed to ensure control of key institutions which did not depend directly on the ruler or the central government. This included universities, which played a crucial role in educating the future ruling classes (Bigoni *et al.*, 2018; Papi *et al.*, 2019), but also cultural organisations which could spread partisan values and messages in unseen ways (Bigoni *et al.*, 2021b). Accounting was used by States to ensure the smooth functioning of institutions that were expected to ensure that ‘undesirables’ would not threaten social order. In pre-unitary Italy, accounting practices were a means to ‘teach’ prison inmates liberal values, most especially the importance of looking after oneself, working and saving for one’s future (Bigoni *et al.*, 2020). Accounting tools in mental asylums were widely employed to describe, classify and give visibility and measurability to the ‘deviance’ of the insane, thereby representing an important tool in the creation of a scientific discourse of madness (Funnell *et al.*, 2017, 2018). Accounting practices were used as a tool to legitimate the role in society of charitable entities (Stacchezzini *et al.*, 2021), but also to discriminate between ‘deserving’ poor who could access municipal aid and those who were excluded whilst enforcing forms of punishment against beggars to protect society from the dangers created by pauperism (Servalli, 2013).

Studies of accounting and power informed by Foucault have therefore highlighted the potentialities of accounting as a technology of government that can travel across different sites and epochs in the achievement of a wide array of goals. Despite the richness of this stream of literature, the interrelation between environmental accounting, the main goals of which are mainly concerned with the protection of nature, and the exercise of power is yet to attract the attention of accounting historians.

Theoretical framework: governing a population and a territory according to *raison d’État*

In Foucault’s (2007) genealogy of the modern State, the 16th and 17th centuries are pivotal for they saw the development of the first forms of government which were based

on an extensive knowledge of the phenomena to be administered. Events such as the dismantling of feudal structures, colonialism, the centralisation of power in the hands of the sovereign and his bureaucrats, religious dispersion and dissidence led to the decline of the traditional 'State of justice' and the rise of the 'administrative State' (Foucault, 2007). It became clear that States would be in a situation of constant competition within an indefinite time, hence, a new 'art of government' had to be developed, one which would ensure a balance between the different forces at play. Notably, this idea of a balance developed in Italy, which in the 16th century was characterised by the presence of several small states in constant competition (Foucault, 2007, p. 384).

The ultimate goal of this new art of government, which Foucault labels *raison d'État*, was ensuring that a State could grow and become stronger so that it could successfully compete against other powers. To Foucault (2007) reinforcing the State was profoundly different from merely defending the feeble link between the sovereign and their domain, which was the fundamental end of a State of justice. What was relevant was no longer the personal riches and possessions of the ruler, but rather the wealth of the State as a political unit, which was separate from the sovereign themselves and would continue to exist even after their departure. Consistently, in an administrative State characterised by *raison d'État* "government is the right disposition of things arranged as to lead to a suitable end" (La Perriere, quoted in Foucault, 2007, p. 134). Government is not simply exercised on a territory and, indirectly, on those inhabiting it, but on a complex of 'things' which includes natural resources, commercial possibilities, infrastructure, population, the characteristics of the territory such as its climate, fertility and dryness: all of which constitute the 'wealth' of the State (Foucault, 2007).

Among the elements on which the wealth of the State rests, the population is crucial (Foucault, 1991, 2007). The population is an element of the State that affects all the others because it provides soldiers for the army, workers for agriculture and manufacturing, and buyers for products and services, which enables the circulation of money and sustains a State's economy (Foucault, 2007, p. 97). To ensure that the population can be a decisive element in the reinforcement of the State, it has to be enabled to thrive and its action channelled towards the goals of government. To this purpose, a State informed by the rationality of *raison d'État* has to set up an apparatus that takes the name of 'police' (Foucault, 2007). Foucault does not use the term police to mean, as today, the institution whose main goal is law enforcement. In the 16th and 17th centuries, police represented a set of interventions aimed at "increasing the state's forces to the maximum while preserving the state's good order" by 'multiplying life' (Foucault, 2007, p. 410). The main goal of police was ensuring that there would be as many individuals as possible for the State's strength is tightly linked to the number of its inhabitants. Police therefore has the duty to ensure that the subjects of the State have sufficient means of sustenance by promoting agriculture and enabling them to access foodstuffs. At the same time, police has to protect the health of the population by promoting healthy living conditions. Another key objective of police is ensuring that the population is 'put to work' and can therefore sustain the economy of the State. To further stimulate the development of the economy and the prosperity of the population, police must become concerned with the circulation of goods, thereby attending to the construction of roads and the navigability of waterways (Foucault, 2007, pp. 417-419).

Police is not simply concerned with the population and its number *per se*, but also with its link to the remaining forces of the State, most especially the characteristics and natural resources of its territory. Nature and a State's territory are central in Foucault's analysis of power, so much so that Braun (2000, p. 12) noted that "Foucault's suggestion that one of the unique aspects of modern forms of political rationality was that the

problem of population and its improvement necessarily brought the state directly into contact with its territory - and more precisely, with the qualities of this territory". There is a mutual relationship between the population and the State's territory. The activity of individuals on the 'milieu', which is the set of natural and artificial givens in the form of rivers, marshes, mountains, forests, villages and tilled fields (Foucault, 2007, p. 36), helps to increase the wealth of the State. To Foucault (2007), the elements of the milieu are so interconnected that when one of them is affected it will have cascading effect on others. For example, marshy lands will generate miasmas, which will trigger more disease, which in turn will cause more deaths, which will mean more cadavers to be dealt with to avoid further miasmas and so on. Nature and the characteristics of a territory need to be carefully known and managed as they have an impact on the lives of populations. Consistently, the sovereign has to deal with "nature, or rather with the perpetual conjunction, the perpetual intrication of a geographical, climatic, physical milieu with the human species" (Foucault, 2007, p. 38). A constant intervention on the territory is therefore crucial:

it is up to the government to change the air temperature and to improve the climate; a direction given to stagnant water, forests planted or burnt down, mountains destroyed by time or by continual cultivation of their surface, create new soil and a new climate. The effect of time, of occupation of the land, and of vicissitudes in the physical domain, is such that the most healthy districts become morbidic (Moheau, 1778, quoted in Foucault, 2007, p. 37).

Marshy lands must be reclaimed to tackle miasmas, the flow of rivers must be managed to avoid flooding, towns must be planned in a way that enables the circulation of clean air to prevent disease. The sovereign will have to "exercise power at that point of connection where nature, in the sense of physical elements, interferes with nature in the sense of the nature of the human species" (Foucault, 2007, p. 38). Consistent with the rationality of *raison d'État*, by acting on the territory the ruler will act on the lives of their citizens and will create the right conditions for the population to stay healthy and grow and for the power of the State to increase.

Raison d'État cannot allow a merely episodic involvement of the sovereign in the affairs of the State and its population, but a constant, day by day monitoring and intervention through the apparatus of police. For this purpose, new tools are needed which cannot be limited to high-level, generic laws. The constant intervention in the multitude of activities that characterise the life of a population and its relationship with a territory require quick action and a great level of detail. As a result, tools such as highly detailed laws, ordinances, instructions and rescripts coming directly from the sovereign and their bureaucratic apparatus are much more appropriate for "matters of police are things of every instant, which usually amount to but little; scarcely any formalities are needed. The actions of police are quick and the police is exerted over things that recur every day" (Montesquieu, 1989, p. 517). With *raison d'État* "we are in a world of indefinite regulation, of permanent, continually renewed and increasingly detailed regulation" (Foucault, 2007, p. 442), the issuing and enforcement of which requires the sovereign to form a thorough knowledge of the phenomena to be governed if their subjects are to be disciplined according to the ruler's will (Foucault, 1977). In the 16th and 17th centuries, statistics, understood as the science of the State, started to develop to provide those in power with information on the strengths and weaknesses of a State in the form of its population, available wealth, balance of trade as well as mines, forests and other natural resources. In a clear break with the old State of justice, with *raison d'État* "it is no longer the corpus of laws or skills in applying them [that matters], but a set of technical

knowledges that describes the reality of the state itself” (Foucault, 2007, p. 354). Moreover, if in the State of justice the sovereign was supported in the exercise of power only by his most direct advisors, with *raison d’État* a new bureaucratic apparatus has to be formed to assist the sovereign in making decisions, to gather information needed and to ensure that any decision by the ruler is promptly enacted. When a State evolves into one informed by the rationality of *raison d’État* it becomes necessary “to think about an administrative apparatus that did not yet exist but which would be such that it would be possible to know exactly what is taking place in the realm at any moment” (Foucault, 2007, p. 355). The use tools of in the form of tables, reports, and, crucially, accounting records are an essential feature of this new knowledge-based form of government.

Method

This paper adopts a qualitative method, involving the analysis of rich primary and secondary sources relating to the case of the environmental strategy enacted by Cosimo I and his successors, and an interpretive methodology. Consistent with de Loo and Lowe (2017, p. 1796), this approach involves “the use of conversations, narratives, and stories from ‘the field’” which “provide the objects around which representations are constructed”. This means that in performing interpretive analyses researchers, rather than being an external observer of an objective reality that is ‘out there’ as in positivist studies, are ‘inside’ the research and interpret documents and events based on their own epistemological beliefs and worldviews (Maran *et al.*, 2022).

The study has paid particular attention to the work of Cosimo I, Francesco I, Ferdinando I and Cosimo II, who inaugurated most of the environmental regulations which would characterise life in the Grand Duchy under the Medici rule. We focused on the Pisan territory, where the impact of environmental policies was more visible since Pisa and its countryside “were at the centre of the attention of the Grand Dukes” (Gasperini *et al.*, 2015, p. 7). Pisa had been for a long time a restless part of the Florentine dominion, one which was often neglected by the ruling elites in Florence (Fiaschi, 1998). The situation changed with the advent of Cosimo I. This paper uses both primary and secondary sources to develop an interpretation of the way in which financial and non-financial information enabled the Grand Dukes to reinforce their State via the protection of its territory and of its population. Primary sources were found at the State Archive of Pisa (henceforth AsP), where all the documents relating to the management of the Pisan territory are stored. Particularly important has been the collection *Fiumi e Fossi* (henceforth AFF), which includes materials that provide evidence of the ways in which environmental issues affecting Pisa and its countryside were dealt with. These materials were examined by performing a qualitative text analysis involving three main stages (Kuckartz, 2014). At the beginning of each stage, relevant materials were read separately by each of the authors, which informed discussions on the goals of the environmental strategies promoted by the Grand Dukes and the related role of accounting information. In case of disagreements, the authors went back to the original documents, which informed another set of more focused discussions.

The first stage aimed at identifying the key goals and priorities the Grand Dukes sought to pursue in their intervention in environmental matters. An analysis of secondary sources in the form of books on the history of the Grand Duchy enabled an understanding of the ways in which the Grand Dukes sought to reinforce their power and create a unitary, absolute State. This was then followed by a more focused analysis of one of the policies

enacted by the Grand Dukes, namely that relating to the protection of the environment and the management of the territory to promote the health of the population and protect communities against natural disasters. Consistently, we analysed the laws issued by the Medici rulers, which were found in a collection of Medicean laws edited by Lorenzo Cantini (Cantini, 1808). This examination showed the importance placed by the Grand Dukes on environmental matters and the main areas in which the Medici rulers sought to intervene. Among these, the hydrogeological management of the territory and the protection of trees against economic exploitation were particularly important. Also relevant were books written by the Medici family's *protomedico* (chief medical officer) Baccio Baldini, which offered insights into the rationality that informed Medicean environmental strategies (Baldini, 1578, 1586). The analysis of secondary sources and environmental laws enabled us to identify the bureaucratic apparatus set up by the Grand Dukes for the implementation of their environmental strategy. The main bureaucratic body set up in Pisa was the *Ufficiali de' Fossi*. The statutes of this body were carefully analysed to understand its composition and its main tasks (law 29.04.1547; law 19.08.1583; law 24.04.1587).

The second stage of analysis mostly focused on accounting reports, along with communications between the Grand Dukes in Florence and the *Ufficiali de' Fossi* in Pisa. Particularly important for this study were the reports prepared by the *Ufficiali de' Fossi* to document their activity and allow control by the Grand Dukes. We analysed the books *Partiti e Deliberationi* (Book of Decisions and Deliberations, AsP, AFF, 10; AsP, AFF, 30) and *Campione de Pini* (Pine Tree Inventory, AsP, AFF, 454). The former was used to record in minute detail the decisions and orders relating to public works to be done, along with fines issued and permissions granted by the *Ufficiali de' Fossi*. The latter was kept to account for the regulated cutting of pine trees in the Pisan territory following a reform issued by Cosimo II in 1610. Information in these books was then complemented by an examination of letters (AsP, AFF, 121; AsP, AFF, 120) and pleadings (AsP, AFF, 98) sent from the *Ufficiali de' Fossi* to the Grand Dukes and the related replies of the rulers. These letters also shed further light on the resources available to the *Ufficiali de' Fossi* and the investments made by them in safeguarding the environment. Unfortunately, although it was clear that the *Ufficiali de' Fossi* were required to draw up a book of revenue and expenses, this does not seem to have survived. This analysis allowed identification of the different actors involved in the implementation of environmental policies in the Pisan territory and their inter-relationships. Also investigated was the content and structure of the reports prepared by the *Ufficiali de' Fossi* as an early form of environmental accounting which involves "observing, identifying, naming and counting" nature and its phenomena (Atkins and Maroun, 2020, p. 1839). This enabled an understanding of the function of these reports, which included both financial and non-financial information, as an implement of the Grand Dukes' environmental strategy. The exchange of letters between the Grand Dukes and their local magistrates helped to reconstruct the flow of information between Pisa and the centre of the State, along with direct interventions by the Grand Dukes in environmental matters.

In the last stage of the research, we interpreted Ducal environmental policies and the flows of information through the understandings of *raison d'État* (Foucault, 1991; 2007), thereby seeking to explain action and the ways in which social order is produced and reproduced (Chua, 1986). Foucauldian approaches pursue "the methodical problematisation of the given, of the taken for granted" (Dean, 1992, p. 216), which in the context of the paper involves challenging the view of environmental accounting practices as banal, neutral tools that provide an unbiased, uninterested depiction of reality. Our analysis and interpretation of environmental accounting practices sought to unveil

“how power is exercised through the use of disciplinary discourses and through associated administrative routines of surveillance, individualisation, exclusion, and ultimately through normalisation” (Kearins and Hooper, 2002, p. 736). In particular, the analysis has endeavoured to unveil how environmental accounting information provided the Grand Dukes with a clear understanding of whether and to what extent their policies had been implemented and abided by, which enabled the rulers to ensure that any deviation from the norm would be immediately identified and acted upon, thereby shaping human behaviour.

Background: the Grand Duchy of Tuscany and its environmental strategy

The building of an absolute State

Following their rise to power in 1434, the Medici family ruled over Tuscany for almost three centuries. Cosimo I and his heirs contributed to the evolution of the State of Florence towards a strong dynastic regional State, which was expanded by extending the influence of Florence over neighbouring territories and by military conquest. This led to the coexistence within the boundaries of the State between different, often belligerent city-States. To ensure long-lasting power and the consent of the ruled, institutional reforms were issued by Cosimo I and his heirs to centralise power, thus creating an absolute State, but without completely removing the prerogatives and functions of local elites (Diaz, 1976; Greco, 2020). Thus, new bureaucratic bodies were created. These new bodies were the *Pratica Segreta* (1545), the *Consulta* (1560) and the *Nove conservatori della giurisdizione del dominio fiorentino* (1560). The *Pratica Segreta* was a council of *Auditori*, who served as the Grand Duke’s ministers, each of them responsible for specific matters. The *Consulta* was a body created to support the Grand Duke in the administration of justice. The *Nove conservatori della giurisdizione del dominio fiorentino* represented the main link between local communities and Florence, the capital city. It was responsible for overseeing the administration and financial management of local communities, and resolving local disputes (Diaz, 1976; Greco, 2020).

The Grand Dukes sought to intervene in every aspect of their new State’s life, including the promotion of a common culture, the ‘keeping of the peace’, the creation of a new judicial system and, crucially, the safeguarding of the environment. So successful were interventions by the Grand Dukes that not only was their State larger than pre-existing city-states and even other regional States in the Italian territory, it achieved greater economic development and social cohesion. The Grand Dukes managed to transform a territory that had been devastated by the long decades of “horrendous wars of Italy” into an economically and politically stable regional State, resilient against the traumatic events of the 17th century, such as climate change, recurring famines, pandemics and economic challenges (Gasperini *et al.*, 2015, p. 4).

Environmental policies in the Pisan territory

Interventions by the Medici rulers had a significant impact on the way in which people in the Grand Duchy lived. In particular, environmental policies succeeded in protecting the State’s territory and thus its population against hydrogeological instability and unhealthy living conditions (Gasperini *et al.*, 2015). This strategy was consistent with

protomedico Baccio Baldini's understanding of the influence of the environment on human life. Baccio Baldini shared Hippocrates's beliefs about the relationship between the environment and human health, which emphasised the crucial role of geographic and climatic factors in determining the health and wealth of a population (Baldini, 1578, 1586). The Grand Dukes' environmental strategy was an innovative programme, which sought to improve the quality of air, water and land fertility in the territory, thereby safeguarding the health of those living therein.

The Valdarno area and the city of Pisa were the focus of the Grand Dukes' environmental strategy. Conquered by Florence in 1406 but never fully tamed, Pisa regained its independence in 1494 with a popular uprising. The struggle between Florence and Pisa reached its climax in 1509 when, following a debilitating siege, the Florentines captured Pisa. The city had 15,000 inhabitants in the years preceding the siege, following which their number fell to just 5,000 (Gasperini *et al.*, 2015). In addition to its dramatic cost in terms of human lives, the devastation caused by wars had worsened the hydrogeological conditions of Pisa. The city was left to its own devices as punishment for having resisted Florentine domination, with the new rulers neglecting interventions in maintaining the territory, most especially its waterways. As a result, marshes had spread and many arable lands had been abandoned, which had a detrimental impact not only on the economy of the city but also on the health of its people, with many forced to emigrate (Baldini, 1578; Fiaschi, 1998).

Cosimo I and his successors centre-staged the Pisan territory. Not only would this have benefitted the economic growth of the Grand Duchy, but also ensured peace and a more ready acceptance of the rule of the Medici (Gasperini *et al.*, 2015). The Grand Dukes ordered the construction of new sewers to collect and remove drainage and wastewater, reclaimed vast marshy lands and built a system of ditches and canals to ensure protection against flooding. Additional interventions in the hydrological structure of the territory were implemented to better link Pisa with the rest of the Grand Duchy and create new trade routes, including major works to straighten the river Arno and facilitate crossing (Fiaschi, 1998). An integral part of the Grand Dukes' environmental strategy was the planting of new trees and the protection of existing ones. Not only would trees increase the stability of the soil in mountainous areas and along riverbanks, thus preventing flooding and landslides, they would also improve air quality. Consistent with Baccio Baldini's advice, Cosimo I and Ferdinando I regulated the plantation of trees along rivers, ditches and roads so that trees would protect banks and "break the winds, and with their fragrant flowers and leaves tackle bad smells and improve the bad quality of the air" (Baldini, 1578, p. 33). Cosimo I reconfirmed a special ducal right on pine trees, the *Servitù dei Pini*, which meant that landowners could not cut down pine trees, even within their properties. Since the Middle Ages all pine trees were considered a property of the State, which used them as timber for shipbuilding and other public needs. Cutting down pine trees without the ruler's permission was considered a serious crime (law 06.09.1569). Reconfirming this right did not simply serve the purpose of ensuring that the State arsenal would have plenty of building materials, it was part of the Grand Duke's strategy to protect the environment and avoid the removal of trees for private gain. The Grand Dukes' policies enabled the city to prosper and its population to grow, reaching 15,461 inhabitants in 1622 (Baldini, 1578; Cantini, 1808; Fiaschi, 1998; Gasperini *et al.*, 2015), thereby returning the city the splendour it enjoyed before the Florentine siege.

Findings: bureaucracy and accounting practices for enacting the environmental strategy

The *Ufficiali de' Fossi*

A crucial role in the implementation of the Grand Dukes' environmental policy was played by the *Ufficiali de' Fossi* (Officials of ditches, henceforth the Magistracy). The Magistracy was established in Pisa in 1547 by Cosimo I and was entrusted with the duty to manage public works and perform controls on ditches and waterways. Its remit was constantly augmented over time and by the end of the 16th century it extended to improving the hydrogeological stability of the entire Pisan territory and ensuring healthy living conditions for the latter's inhabitants. The main duty of the Magistracy was constructing and maintaining embankments, dams, bridges, ditches, gutters and performing any other activity needed to improve air and water quality and land fertility. The reformed statute issued by Ferdinando I in 1587 regulated in detail the technical and administrative aspects of the activity of the Magistracy. In the introduction to the statute the ruler clearly stated that through the reform he

wished ... to attend to the provision of healthy air, to agriculture and fertility and to the population of the city and countryside of Pisa. He knows that there is no better way to do so than maintaining ditches, embankments gutters and [ensuring that the territory is] free of stagnant waters (law 24.04.1587).

The Magistracy (see Figure 1) was composed of the two *Consoli del Mare*¹, one *Provveditore* and three *Ufficiali*. The *Ufficiali* were appointed by lot among the most renowned Pisan citizens and held their office for two years. Nevertheless, their appointment had to be approved by the Grand Duke. The *Provveditore* was directly appointed by the ruler and had life tenure. Although the Magistracy regularly engaged with one of the State's main bodies in Florence, the *Nove conservatori della giurisdizione del dominio fiorentino*, the *Provveditore* acted as the real *trait d'union* between the Magistracy in Pisa and the Grand Duke in Florence by keeping him informed about the activities of the Magistracy and ensuring that the orders of the ruler were duly implemented. The Magistracy could then count on several bureaucrats, most of whom were directly appointed by the Grand Duke. The *Sotto Provveditore*'s main duty was to support the work of the *Provveditore* by acting as his deputy. Moreover, the *Capomastri* were engineers who supported the Magistracy by offering technical advice, whilst the *Assessore* offered legal advice (law 24.04.1587).

As far as record keeping is concerned, the *Camarlengo* was responsible for the financial management of the institution and kept a book to account for revenues and expenses related to the activities of the Magistracy. This accounting book was periodically sent to the Grand Duke's bureaucrats in Florence, who were in charge of auditing the Magistracy's accounts (Fiaschi, 1998). Although none of these accounting books seems to have survived, other primary sources show how the main revenues for the Magistracy related to compulsory contributions from owners of lands and civil authorities benefitting from the works carried out by the Magistracy itself. These contributions totalled 65,000 Ducats between 1576 and 1584, and 45,000 Ducats between 1584 and 1593, very significant amounts for the time (AsP, AFF, 120, c.88v). Following Ducal

¹ The *Consoli del Mare* were responsible for settling maritime disputes, defending Pisa and its ports, constructing and provisioning fortresses, recruiting and paying the militia.

approval, the Magistracy could also take out loans (AsP, AFF, 120, c.91r) and retain the proceeds of fines imposed on those who broke environmental laws (AsP, AFF, 10, c.6r). The *Cancelliere* acted as the notary of the *Ufficiali de' Fossi* and collected all the documents relating to the activity and decisions of the Magistracy in a book dedicated to this purpose, the *Libro di Partiti e Deliberationi* (law 24.04.1587).

Insert Figure 1 here

The Magistracy met every Wednesday and Saturday to ensure that any matter under their care would be promptly addressed. The Magistracy's decision-making was informed by frequent inspections, which represented very early forms of environmental audits and contributed to providing extensive knowledge of the conditions of the Pisan territory. The statute under which the Magistracy operated stated that the *Provveditore*, together with a *Capomastro*, was required to inspect the entire Pisan territory at least once a year to identify any potential problems and prepare plans for ordinary and extraordinary maintenance of ditches, waterways and bridges. Ordinary audits should have been carried out by 15 March each year, and after each inspection a report had to be prepared that indicated any work to be done, its duration, its cost and who will be responsible for financing it (law 24.04.1587). Moreover, specific audits could have been ordered by the Magistracy whenever circumstances so required.

The 1551 law regulated the financing of works ordered by the Magistracy. The cost of maintaining the main ditches and the building and strengthening of embankments would be borne by the Magistracy, the municipalities and the owners of the lands in which these structures were located. In order to avoid any potential conflict of attribution, the law identified in detail the sections of the rivers in the Pisan territory, and for each the bodies responsible for the related expenses:

for the embankments of the river Arno, from the sea to the river Era, all the communes, villas, farms or houses located between the Arno's mouth and the Era's mouth, and between the river Era's mouth to the mountain and then to Stagno following the road to Livorno, and then on from San Pietro in Grado to the river Arno, the following municipalities will be responsible (a list follows) (law 01.05.1551).

Further specific tasks were allocated by the Grand Dukes to the Magistracy as deemed necessary, especially following new environmental laws. The Grand Dukes intervened in environmental matters by means of very detailed regulations, which prescribed specific behaviours and actions that the local population was expected to adopt. Laws forbade digging or damaging the embankments of rivers and other waterways and obstructing in any way the flow of waters. The law even forbade keeping animals on the embankments for they could have damaged the latter. Moreover, any activity which could have potentially affected the embankments of the rivers should have been authorised by the Magistracy (law 31.08.1561). Francesco I regulated the cutting of trees along the embankments of major rivers (law 23.02.1587). Trees near or on the embankments were to be protected to strengthen the embankments themselves and protect lands and villages against flooding. As such, the law clarified that "within sixty arms of the riverbed" tree cutting was prohibited, unless expressly authorised by the Magistracy (law 23.02.1587). The Magistracy retained the power to reduce further the area where tree cutting was permitted for safety reasons. The importance of trees for strengthening the soil and improving air quality was such that the Grand Dukes intervened to regulate

the circumstances under which they could have been cut even if they were far from embankments. It was therefore forbidden to cut trees within the property of other people or in religious places (law 18.02.1562; law 24.01.1568). Further, environmental laws forbade anyone from cutting pine trees without the Grand Duke's permission. Those wishing to cut trees were requested to plant three for each tree that had been removed (AsP, AFF, 10, c.160r). The laws required the Magistracy to perform specific audits aimed at accounting for the pine trees that had been cut (law 18.08.1601).

Early forms of environmental accounting in the Grand Duchy of Tuscany

All the activities carried out by the Magistracy were recorded in detail in the *Libro di Partiti e Deliberationi*. This book offers insights, into the way in which environmental matters were carefully investigated and decision made and actioned. The issuing of new regulations was recorded in the *Libro di Partiti e Deliberationi*. The Magistracy intervened in the matter of preventing flooding by requiring all peasants in the Pisan territory to dig ditches in their lands and along public or communal roads. Moreover, the Magistracy had the right to commandeer citizens into contributing through their free work to the annual maintenance of each public ditch and waterway (AsP, AFF, 98, c.92r). Rules to promote hygiene in the city were issued, aiming at keeping streets and public places clean. The Magistracy prohibited discharging wastewater into existing gutters and building new sewers in private houses which directed waste into the city streets or other public places. The Magistracy also intervened to put an end to the widespread and unsanitary practice of discharging liquids or rubbish into the streets and even forbade the introduction of poultry and manure into the city (Fiaschi, 1998). The Magistracy could issue orders relating to a particular work to be carried out, such as digging a ditch, the length and width of which was determined by the Magistracy itself (AsP, AFF, 10, c.145v). It could also impose works on municipal authorities, such as restoring a bridge (AsP, AFF, 10, c.140r; AsP, AFF, 10, c.145r).

Through constant environmental audits which kept the state of the territory under close control, the Magistracy ensured that rules were strictly followed. Whenever a potential breach of the environmental regulations was found, the matter was investigated and the findings recorded in the *Libro di Partiti e Deliberationi*, along with any decision made. The Magistracy could impose fines, restoration works or even acquit the accused party should allegations be found unsubstantiated. Any decision was discussed by the members of the Magistracy and decided by means of a secret ballot². The decisions reported in the *Libro di Partiti e Deliberationi* contained a detailed description of the damage caused to the environment by the guilty party and identified the penalty to be imposed (AsP, AFF, 10, c.3v; AsP, AFF, 10, c.4r). Further details on trials were included in other books, such as the *Riscontro d'Inquisizione* (Book of Investigations), which included information on how the trial had been conducted and evidence assessed. Nevertheless, this wealth of detail was then recapped in the *Libro di Partiti e Deliberationi*, which made it very easy for any reader to understand how the Magistracy had acted and why the resulting decision was made. Crucially, the extent of the damage was always carefully quantified and recorded, and the penalty was proportional to it. An example of how decisions were made by the Magistracy and recorded in the *Libro di Partiti e Deliberationi* can be found when a citizen was fined after his animals damaged trees on embankments:

² Each magistrate would put into the ballot box a black broad bean to convict or a white one to acquit.

Antonio di Guido from Vecchiano, a blacksmith, was accused by Pieruccio Ciola from Vecchiano for on 15 August 1567 two of his buffalos were found to be damaging the trees on the riverbank, breaking seven. The accused did not attend court and was defended as per the Book of Investigations marked H, page 98, but he was convicted by a vote of seven black broad beans and none white to pay 42 Liras for the two beasts [found on the embankments, which was forbidden] and 9 Liras for damaging the trees as per the law (AsP, AFF, 10, c.4r).

Also convicted were those citizens who dug up the riverbank (AsP, AFF, 10, c.6r; AsP, AFF, 10, c.6v). When the damage was identified by an official during an inspection, the guilty party could be fined on the spot. For example:

Lello di Nicolaio di Gnese from San Biagio a Cisanello, accused by guardsman Goro as per the Book of Investigations marked H, page 117 for in the month of December he was found to have dug up 17 rods³ of soil out of the bank of the Arno thereby weakening it. The soil was pulled into his field, and this was noted by the officials [during an inspection], who fined him for 25 Scudi as ordered (AsP, AFF, 10, c.6r).

Fines were normally very high, which testifies to the importance placed by the Grand Dukes on safeguarding the environment and the stability of the Pisan territory. In several cases these fines were so debilitating that citizens could not afford to pay them, as was the case of Mr Piero da Zambra who, after having paid one third of the fine, exclaimed that paying the remainder would have meant starving his family to death (AsP, AFF, 98, c.18v)⁴. Penalties were not only pecuniary. Those found guilty of breaking the environmental regulations could have been ordered to undertake remedial work (AsP, AFF, 10, c.140r). This included unclogging a ditch (AsP, AFF, 10, c.140r) or removing soil thrown on the road to allow the water to flow properly into the sewer (AsP, AFF, 10, c.140r; AsP, AFF, 10, c.143r). Following an investigation, accused citizens could have been acquitted and even previously imposed fines cancelled (AsP, AFF, 10, c.8r).

Another important activity carried out by the Magistracy which was carefully documented in the *Libro di Partiti e Deliberationi* was the granting of licences. These licences were granted for activities that could potentially damage the environment and which should have been strictly regulated. Licences were issued following an analysis of the potential damage done to the environment and, when granted, clearly identified the extent of the licensed activity. This was particularly obvious in the case of tree cutting. These licences reported the name of the authorised person and identified precisely the number of trees that could have been cut:

the illustrious gentlemen the commissioner of the city of Pisa and the officials of the ditches [the Magistracy], after having gathered the required information, met and decided, consistent with the laws, to grant Salvatore Quaratesi permission to cut 60 trees in his property provided that they are not located on embankments (AsP, AFF, 10, c.160r).

³ One rod ('pertica') was the equivalent of three metres.

⁴ Such a high fine was issued simply because three of his calves drank from a ditch and slightly damaged it.

The Grand Duke himself was part of the bureaucratic apparatus which oversaw the enforcement of environmental laws and regulations. Even if the Magistracy had full authority on the ordinary management of the Pisan territory, the Grand Duke's opinion was sought in more complex situations. The *Capomastro* consulted the Grand Duke when citizens requested to be pardoned and the penalties they had received to be cancelled, or when the documented damage to the environment had been so limited that it might have been possible not to punish the guilty party. As such, the *Capomastro* provided a detailed description of the case and stated his opinion, which could have been endorsed or not by the Grand Duke (AsP, AFF, 98, c.92r; AsP, AFF, 98 c.93r).

More demanding interventions could not be undertaken directly by the Magistracy, which could not make independent decisions on the extraordinary management of the Pisan territory. This included major works such as deviating the course of a river and any relevant alterations to cities and other public places. The Grand Duke was to be consulted before approving these interventions (Fiaschi, 1998). As a result, following an audit carried out by the *Provveditore* together with a *Capomastro*, a detailed report was prepared describing the state of the territory, the issues at hand and the work needed. Crucially, an estimate of the expenditure required to carry out the work was provided as well. This information enabled the Grand Duke to appreciate the impact of the intervention that was being suggested, but also its costs, so that he would be able to decide on the most appropriate course of action. On 1 December 1601, the Magistracy informed the Grand Duke by letter of the need to rebuild the embankment of the river Arno near the city of Pontedera. The letter described the work to be done and indicated its cost, requesting the Grand Duke's approval (AsP, AFF, 121, c.30r). Once approval was received, the decision was summarised in the *Libro di Partiti e Deliberationi*:

Since it was deemed necessary to rebuild the bank of the Arno in the commune of Pontedera ... for an overall length of 170 rods and a cost of 300 Ducats, as requested by the owners of the lands affected by the work, we have sought approval from His Most Serene Highness (AsP, AFF, 30, c.1r, see Plate 1).

Insert Plate 1 here

The Grand Duke's involvement was not limited to approving the plans set out by the Magistracy. He was also consulted to provide support on how to better implement his environmental strategy. On one occasion the Magistracy informed the Grand Duke that after the *Provveditore* and *Capomastro*'s audit, the *Capomastro* prepared a technical report of the work to be undertaken, one which required the use of materials and techniques that the Grand Duke had not approved in the past. Therefore, the Magistracy asked Ferdinando I to send another engineer, who was meant to propose another, safer technical solution (AsP, AFF, 121, c.33r). The Grand Duke even went as far as directly intervening in the technical aspects of the works by providing detailed instructions in the form of orders and letters (AsP, AFF, 121, c.25r; AsP, AFF, 121, c.53r). For example, when the Magistracy started works to repair a bridge in the city of Pisa, Ferdinando I clearly identified the types of materials to be used, the length of the posts to be used, the distance between each of them and where they should have been placed to strengthen the bridge. The orders were then carefully entered into the *Libro di Partiti e Deliberationi* (AsP, AFF, 121, c.25r).

Another form of accounting which was used to support the Grand Dukes' environmental strategy was the *Campione de Pini*. This was an important tool to mediate between conflicting matters: on the one hand, the economic development of Pisa and the State at large; on the other, the need to pursue the Grand Duchy's environmental strategy by continuing to safeguard trees. In 1610, Cosimo II decided to promote the agricultural development of the Pisan mountains by removing the prohibition to cut pine trees within one's property. This measure aimed at making potentially fertile areas tillable by removing trees sitting therein. Nevertheless, this privilege encountered well-defined limits and the imposition of an early form of environmental tax.

The implementation of this measure was preceded by a survey of the area concerned, which aimed at identifying the zones in which the privilege could be granted, and at providing an estimate of the latter's economic value. This latter point was a crucial part of Cosimo II's policy since landowners applying for permission to cut pine trees in their property were expected to pay an amount equal to one-seventh of the value estimated for the said property during the survey carried out by the Magistracy. Moreover, to ensure that landowners would not profit from damaging the environment, the timber was to be sent to the State arsenal. Only if the latter did not need it, could the owner sell the timber. Following the survey by the Magistracy, a report was sent to the Grand Duke (AsP, AFF, 454, c.1r-c.2r). This was an extremely detailed report which was presented, along with a description of the rationale for the Ducal intervention and the procedures enacted, at the very beginning of the *Campione de Pini*, so that all the work relating to this intervention could be documented.

The thoroughness of this endeavour is evident in the *Campione de Pini*, where the Magistracy bureaucrats entrusted with the duty to clearly mark the areas to which the privilege granted by Cosimo II applied documented their work. These bureaucrats stated that they went

from treetop to treetop, starting from the quarry of Montebianco and then on to all the pine groves to the municipality of Buti which is the last [in the Pisan territory] and borders the municipality of Castel Vecchio di Lucca, [we] visited all towns, marked each boundary with a pile of stones and a peeled pine tree branch and noted down the name of the area. This was done by the Sottoprovveditore Bartolomeo Pettinini, Bernardino also known as 'il Pezza' and forest guard Paulo da Jesa, at the presence of the civil authorities of the municipalities concerned (AsP, AFF, 454, c.1v).

Detailed information was then added in the pages that followed, which clearly identified the areas marked by the Magistracy in each commune around Pisa and clarified who were the individuals responsible for the inspection. So important was this new policy that the wealth of information provided by the Magistracy was further checked by bureaucrats appointed by the Grand Duke himself to ensure that the report provided a reliable picture of the Pisan areas affected by the Ducal policy and to prevent any future disputes when the policy would have been implemented (AsP, AFF, 454, c.5r-c.5v). This also involved further on-site visits by the Grand Duke's bureaucrats, following which the boundaries of each area were finalised and the owner of the land allowed to request permission to cut down pine trees (AsP, AFF, 454, c.5v -c.6v). Each of these requests was documented in the *Campione de Pini*, where each entry recorded the size of the area to be licensed, its location, the name of the owner and the amount to be paid to receive permission to remove pine trees. Crucially, also reported was the number of pine trees to

be cut. An example for the village of Asciano is as follows (AsP, AFF, 454, c.6v, see Plate 2):

Mr Lattantio di Salvestro dal Poggio di Pisa owes as the seventh part of the estimated value of his land for permission to remove pine trees:

For a parcel of land called al Castagno, located in the said municipality, which borders the territory of the city of Lucca, in which 3 big pine trees are located, 10 stiora and $\frac{2}{3}$ ⁵

And he owes for his chestnut groves in the said municipality, in a place called Monte del Castagno, in which 8 pine trees are located, and for the area called il Castellare where 70 pine trees occupy an area of 2 stiora.

Lire 19,2,31

Insert Plate 2 here

Another example can be found in the Campione de Pini for the village of Calci (AsP, AFF, 454, c.20r):

Mr Agostino di Giovanni di Michele Penna owes for lifting the Servitù dei Pini [the prohibition to cut pine trees] in his property:

For a parcel of land called Belvedere, 22 stiora. In the said Belvedere are 29 pine trees which occupy an area of 10 stiora.

Lire 23

Sometimes records were so detailed that even the size of the trees was indicated, as in the case of Sir Adriano Roncioni, who was requested to pay 12 Lire for receiving permission to cut “5 pines as wide as the thigh of a man, and 46 wide as the arm of a man or less” (AsP, AFF, 454, c.154v).

Discussion and conclusion

Raison d'État as a new art of government which emerged in the 16th and 17th centuries represented a new, holistic approach to governmental matters which was based on a detailed knowledge of the phenomena to be mastered (Foucault, 2007). Only by knowing in intimate detail the characteristics of a country, most especially its territory and population, could a ruler effectively act on the weaknesses of their State and further reinforce its strengths. Environmental policies inaugurated by Cosimo I and his heirs in the Pisan territory were an important part of this new knowledge-based approach which aimed at ensuring that the Grand Duchy could grow and compete against other small Italian States. These policies had an obvious anthropocentric focus in that their main goal was not protecting the environment *per se* but rather benefiting human beings. In turn, this was a means to a different end, namely the strengthening of the State. Foucault (2007, p. 418) clarifies the link between a growing population and the power of a State by drawing from the lessons given by the priest of Fleury to the French Dauphin: “we cannot render justice, wage war, raise finance, and so on, without an abundance of living, healthy, and peaceful men. The more of them, the more the rest is easy, and the stronger

⁵ This was the size of the property. One stioro (stiora in the plural) is the equivalent of 562 square metres. The monetary amount at the end of the entry is in Lire, Soldi and Denari. 1 Lira was worth 20 Soldi, each of 12 Denari.

the state and the prince will be". Consistent with chief medical officer Baccio Baldini's studies, the provision of a healthy environment was essential to ensuring that the population of the State could thrive and grow. The management of the territory and the environment was a means to achieve the "urbanization of the territory", which involved "arranging things so that the territory is organized like a town, on the model of a town, and as perfectly as a town" (Foucault, 2007, p. 438). Interventions by the Grand Dukes aimed at managing and perfecting the characteristics of the territory and its link with human activity so that it would be safe and enable the optimal circulation of people and goods. By means of public works aiming at improving the hydrogeological conditions of the territory, and a set of detailed interventions and controls that sought to determine the conduct of individuals so that their activity did not endanger the stability of the territory itself, a balance was found between protection of natural resources and their economic exploitation. The Grand Dukes thereby created the conditions for 'multiplying life' (Foucault, 2007), which, in turn, would have enabled the power of the State to grow thanks to a healthier and larger population.

A crucial step in the implementation of the logics of *raison d'État* is the creation of a new 'apparatus of knowledge' (Foucault, 1991, 2007) which will enable the ruler to form an understanding of the territory to be governed and the results of their decisions. This apparatus of knowledge represents a "formation which has as its major function at a given historical moment that of responding to an *urgent need*. The apparatus thus has a dominant strategic function" (Foucault, 1980, p. 195, emphasis in original). In the environmental domain, this urgent need arose because of the precarious hydrogeological conditions of the Pisan territory which endangered the life of its population by exposing them to marsh-miasma and flooding. The strategic response offered by the Grand Dukes started with the creation of a bureaucratic body, the Magistracy, whose activity was minutely regulated, and its tasks augmented at the Grand Duke's will as new needs emerged. The development of a bureaucratic apparatus is a distinctive feature of *raison d'État*. The creation of new administrative bodies such as the Magistracy, which did not exist during the time of the Florentine republic, testifies to the new, crucial role played by knowledge in the Grand Duchy. This apparatus made it possible "to know exactly what is taking place in the realm at any moment" and it was not "just [an] agent for executing the sovereign's orders [...] but one that at the same time would be an apparatus of knowledge, and here again, as an essential dimension of the exercise of power" (Foucault, 2007, p. 355). As a central element of this new apparatus of knowledge, the Magistracy carried out environmental audits aiming at identifying any breach of environmental laws and understanding whether the territory was kept and maintained consistent with the expectations of the ruler. The results of these audits and of any action taken were then recorded in great detail. In the Grand Dukes' machinery of power informed by *raison d'État* the Magistracy acted as a centre of calculation, a crucial node in the State's power network where 'distant knowledge' was brought home, accumulated, organised and transferred to the ruler (Robson, 1992; 1994).

Setting up a new bureaucratic body was important but not sufficient to ensure an informed management of the territory of the State. Another important element of the new apparatus of knowledge created by the Grand Dukes was the use of tools through which information could travel from the periphery of the State to its centre. It is clear that, before being able to intervene in the management of its territory, the ruler has to be aware of "what is to be governed and how government should be conducted" (Lai *et al.*, 2012, p. 377), which requires knowing the main characteristics of the territory itself (Murdoch and Ward, 1997). The use of early forms of environmental reports such as the *Libro di Partiti e Deliberationi* enabled the Grand Duke and his top bureaucrats in Florence to know

exactly the situation of the Pisan territory, the actions that were taken to preserve and improve it and, at least for the most impactful interventions, their cost. The wealth of detail included in the *Libro di Partiti e Deliberationi* enabled the visualisation and spatial organisation of the territory (Álvarez-Dardet *et al.*, 2002). Even more detailed was the *Campione de Pini*, which focused on a very specific area of the territory under the care of the Grand Dukes and gave visibility and, hence, prominence, to the important issue of preserving pine trees. The book turned this area into an enclosed disciplinary space, which was broken down into its components so that they could be seen and modified by the ruler (Foucault, 1977, 2007). Therefore, by means of accounting “a visibility [was] created whereby judgements invested in accounting rationality can be made concerning the ‘efficiency’ and ‘effectiveness’ of existing spatial configurations, and the desirability of mapping out alternative configurations” (Carmona *et al.*, 2002, p. 242). The ‘reconfiguration’ of the territory made possible by information provided by early forms of environmental accounting, consistent with the rationality of *raison d’État*, took the form of quick and flexible techniques, such as orders, letters, rescripts and regulations (Bigoni *et al.*, 2018; Foucault, 1991, 2007). The ruler became “an architect of the disciplined space” (Foucault, 2007, p. 51) even from his seat of power in Florence.

Nevertheless, accounting tools were not simply a tool for ensuring the safeguarding and improvement of the territory. As in other historical contexts, accounting practices were also a means to monitor the activity of those bodies which were entrusted with duties that were crucial to those in power (Antonelli *et al.*, 2020; Maran *et al.*, 2016; Sargiacomo, 2008). The *Libro di Partiti e Deliberationi* and the *Campione de Pini* could be checked by the Grand Duke and his top bureaucrats, which was a means to make the Magistracy accountable for its work and check its ability to deal with the issues under its care. Further control of the activity of the Magistracy was enacted when the account books of the Magistracy itself were audited by the ruler’s top bureaucrats. As a key tool for exercising disciplinary control on individuals and communities at the same time (Bigoni and Funnell, 2015), accounting practices also affected people’s behaviour. With *raison d’État*, interventions by those in power, including environmental policies, started to focus on life. The sovereign “by wise laws, by useful establishments [...] govern[ed] the physical and moral existence of their subjects” (Foucault, 2007, p. 38). The way in which people interacted with the territory was carefully regulated so that an optimal behaviour was identified. The extreme regulation of State affairs, including human conduct, which characterises *raison d’État* took the form of disciplinary normalization. Interventions by the ruler and very detailed laws posited an “optimal model that is constructed in terms of a certain result, and the operation of disciplinary normalization consists in trying to get people [...] to conform to this model” (Foucault, 2007, p. 85). This model included keeping animals away from ditches, avoiding damaging embankments, abstaining from cutting trees, and taking part in maintenance works as required by the Magistracy. Environmental audits performed by the Magistracy and the recording of their results and any action taken in dedicated written reports ensured that none could escape disciplinary normalization of their conduct, with every deviation from the norm harshly punished. The use of accounting practices was therefore a means to “force individuals to self-regulate by internalising codes of behaviour which are consistent with the ideals and priorities of dominant elites” (Bigoni *et al.*, 2021a, p. 881).

The normalising power of environmental interventions enacted by means of accounting also emerged from Cosimo II’s policy on pine trees. A trade-off was created between potential economic gains from agricultural exploitation of the land and the cost of achieving those gains: the larger the area to be licensed, the higher the expense for the landowner. As a result, individualistic behaviour was curtailed and its impact on the

public good reduced and mitigated by the inflow of resources which could have been reinvested in environmental activities. Self-regulation was also incentivised when local communities and councils were requested to take a role in funding and carrying out extraordinary maintenance works. If the ordinary maintenance of ditches, embankments and waterways were disregarded, eventually larger, more expensive extraordinary works would have been required following audits by the Magistracy, which would have meant a much higher burden to be borne by local communities and municipalities. Local communities were therefore forced to take care of the territory in which they lived, thereby regulating their conduct with little intervention from the centre (Foucault, 1977; Sargiacomo, 2008) and becoming “their own disciplinarian” (Bigoni *et al.*, 2020, p. 3) in the achievement of those environmental goals set out by the sovereign. Environmental policies and their enforcement through accounting documents and audits were not simply a means to protect the environment, but became a disciplinary tool that was used to instil in subjects the need to follow any regulation issued by the sovereign so they would learn to show “total and exhaustive obedience in their conduct to whatever the imperatives of the state may be” (Foucault, 2007, p. 453).

Insert Table 1 here

This paper has presented an investigation of the environmental policies and related accounting tools in the 16th and 17th century Grand Duchy of Tuscany. It has offered three main contributions to the accounting history literature. First, the study has analysed explicitly environmental policies and related accounting practices as an implement of State power. By drawing on Foucault’s (1991; 2007) concept of *raison d’État*, it has identified the ways in which environmental policies can become a tool to act on populations and reinforce the State at times of significant international competition. Far from being limited to protecting the environment, the ultimate goal of these policies was ensuring that the population would increase and economic activity develop. Accounting tools were part of an apparatus of knowledge that started from the population as the root of the State’s power and wealth and came back to the population as an object of government whose growth was to be maximised in the interest of the State itself. This was achieved via a set of interventions on the territory which had significant influence on the way in which individuals conducted themselves. The study has also added to the growing but still scarce literature which has engaged with the investigation of the historical roots of environmental accounting (Atkins and Maroun, 2020; Atkins and Thomson, 2014; Solomon and Thomson, 2009). Second, by focusing on the 16th century and the early 17th century, the paper focuses on an under-researched period as most studies of the roots of environmental accounting consider the 18th century or later periods (Atkins and McBride, 2022). In doing so, the paper has investigated the production of accounts by central governments and related public bodies, thereby adding alternative evidence to research that shows how the first forms of environmental accounting were produced by individuals or political movements who shared a concern for nature. Third, the paper adds a new perspective, that of environmental accounting, to those studies which have started to explore the use of accounting in the Grand Duchy of Tuscany (Maran *et al.*, 2014, 2019; Bigoni *et al.*, 2018).

The study has limitations, most of which relate to the fact that some original documents may have not survived. This is particularly true for the book detailing the revenues and expenses of the Magistracy, which has been lost. It would have assisted in providing more evidence of the resources managed by the *Ufficiali de’ Fossi* and, potentially, identify whether funding policies were another lever actioned by the Grand

Dukes in controlling the latter's activity. Being an interpretive endeavour, the study also suffers from those limitations that are typical of this research methodology. Although interpretive research has the potential to provide detailed insights on specific places and events and problematise taken for granted assumptions, it is "necessarily always contextually bound, partial and temporary ... Other people/researchers could well have drawn different inferences based on the same material, or would have generated or analyzed different materials" (de Loo and Lowe, 2017, p. 1813).

The work can be a starting point for further investigations into the interrelations between accounting practices and environmental matters. It would be useful to analyse other states at the height of *raison d'État* to appreciate the ways in which accounting tools may have contributed to enacting strategies that aimed at safeguarding the environment whilst reinforcing the power of the State. Moreover, this alternative perspective on the links between accounting, environmental strategies and power could be enriched by considering modern States, which are no longer characterised by disciplinary techniques but rather on 'letting things happen' (Foucault, 2007).

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Figure 1. The governance structure of the Ufficiali de' Fossi

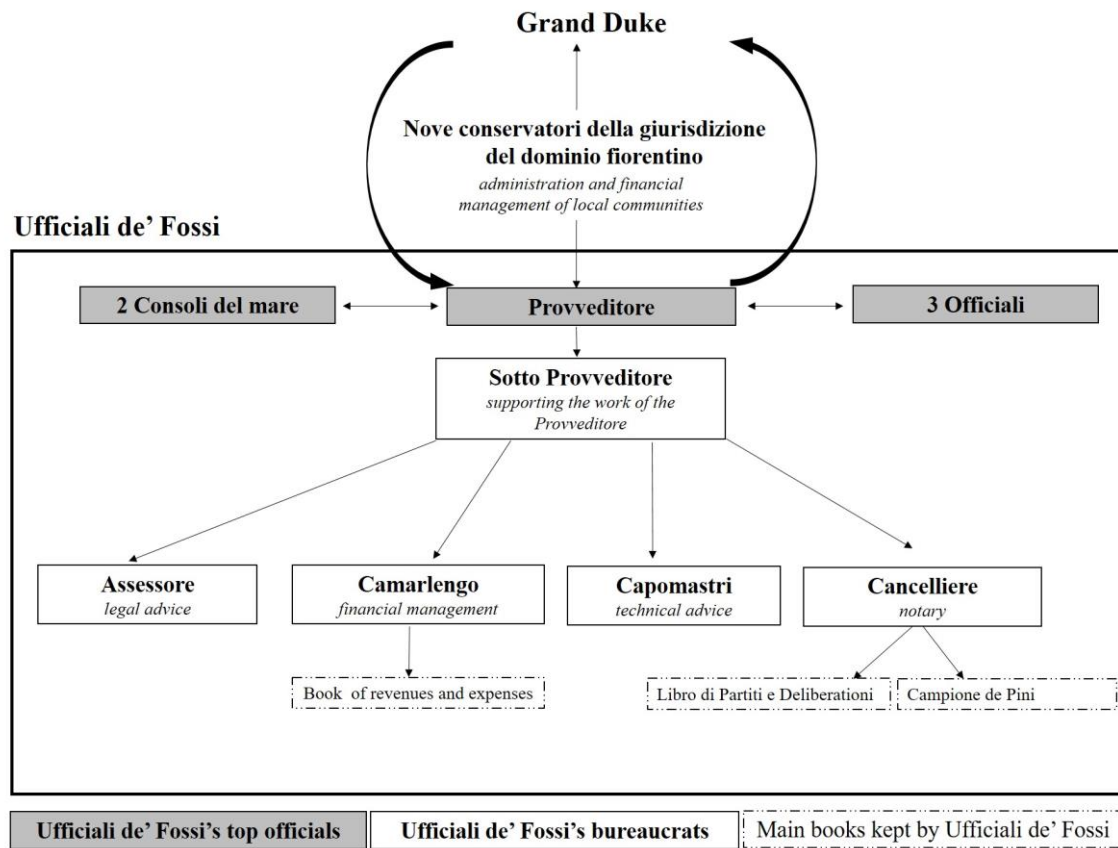


Table 1. Environmental policies in the Grand Duchy of Tuscany as an implement of Raison d'État.

	Apparatus of Knowledge	Territory	Population	State Power
Raison d'État	Creation of an administrative apparatus that did not exist before to know exactly what is taking place in the realm at any moment.	Nature and the characteristics of a territory need to be carefully known and managed as they have an impact on the lives of populations.	By improving the conditions of a territory, the population living therein will grow and thrive and the circulation of people and goods will be smoother.	The more subjects it has, the richer and stronger the State will be.
Environmental policies in the Grand Duchy of Tuscany	A new body, the <i>Ufficiali de' Fossi</i> , was set up to provide information on environmental matters and support the ruler in making decisions. Early forms of environmental accounting enabled the collection and circulation of information.	Intervention through detailed environmental regulations and control by means of early forms of environmental accounting to improve the stability of the Pisan territory and ensure healthy living conditions for the latter's inhabitants.	Environmental regulations implemented by means of accounting had an anthropocentric focus as they created the conditions for the territory to be safer, which enabled the Pisan population to grow.	A growing and healthy population made acceptance of the Medici rule easier and enabled the Grand Duchy to compete with other Italian small States.