

Water Accounting in Economia Aziendale

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Abstract

In response to calls for more in depth exploration of the state and prospect of research on accounting for sustainability, this paper presents an extensive review of the “accounting for water” literature to examine how research on these issues has evolved over time in the Accounting, Management and Organisation fields. In the first part, we provide a conceptual and theoretical background of the issues investigated. The second part introduces the methodology, which was adopted. Our analysis shows that the publication on ‘accounting for water’ developed and evolved through three stages, namely: i) the *beginning era* (1970s-1989s), where ‘water-issues’ started to appear as a novel topic of research. ii) The *diffusion era* (1990s – 2007) when ‘water-issues’ gradually became a recognizable research topic; and iii) the *proliferation era* (2007–2017) where research on ‘water-issues’ became an established and consolidated area of investigation in the fields of Accounting, Management and Organisation.

Keywords: water, water accounting, social and environmental accounting, literature review.

1. Introduction

Attention to the social, environmental and ethical aspects related to the economic activities of organisations has gradually moved from the periphery to the center of debate in management and accounting disciplines. In the specific context of accounting, the term social and environmental accounting (SEA hereafter) has been

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proposed to widely refer to the integration of the issues related to society and the environment in the most traditional considerations in accounting (Contrafatto, 2009; Rusconi, 2013; Gray, Owen & Adams, 2014; Bebbington & Larrinaga-Gonzales 2014). Over the last two decades or so, SEA has evolved and consolidated to become a relevant field of research in management and accounting studies. The scope of this field of research has increasingly expanded, among others, in terms of focus, issues/topics addressed and methodologies adopted. With regard to the focus, attention has gradually moved beyond the initial interests in accounting-related issues, i.e. 'how' to *account for* (e.g. means for accounting/reporting) to include consideration of the processes involved in the "reporting", "controlling" and "managing" of these issues (Contrafatto & Burns, 2013). In addition, research in SEA has also benefited from the contribution provided by several methodologies and research strategies, such as for example engagement-based strategies and qualitative-infused approaches (see for example Adams & Larrinaga-Gonzales, 2007). This range of alternative methodologies and approaches, which have more recently emerged in the SEA literature, has enriched the theoretical and empirical understanding of some of the complexities related to the decision-making about social and environmental accounting. Finally, with regard to the issues, research on SEA has widened to include new topics, issues and areas of consideration, which have over time emerged in the academic debate. For example, attention has been devoted to issues related to 'sustainability' (Bebbington, Unerman & O'Dwyer 2014; Gray, 2010), 'biodiversity' (Jones, 2003), 'knowledge' (Contrafatto & Rusconi, 2012), 'ecology' (Russell, Milne & Dey, 2017) and more recently to 'human rights' (McPhail & Ferguson, 2016) and 'water' (Hazelton, 2014). As a result of this expansion in the focus and issues investigated, a substantial body of research in management and accounting has emerged. In this paper, we focus on the so-called "accounting for water" or "water accounting" literature, i.e. the research which has attended to the inter-relationships between 'water-issues' and 'accounting and control'. In particular, we have carried out an extensive review of the management and accounting literature with the purposes of 'mapping' (Thomson, 2014) the developments and trends in the 'accounting for water' studies, i.e. 'how' and 'under what patterns' research on these issues has developed over time. Our literature-based analysis provides two main contributions. First, we provide a 'heuristic taxonomy' (Contrafatto, 2011) for classifying and organizing the literature which has over time emerged. Second, we identify areas for development in the field of 'accounting for water' by proposing new research venues. The paper is organized as follows. In the second section, we briefly review the social accounting literature to provide a theoretical background for understanding the evolution of water accounting. In the third section, we provide a definition and conceptualization of water accounting. In the fourth section, we present our methodology, by explaining how the review of the literature has been carried out. In sections 4 and 5, we respectively provide the results of our analysis and propose some concluding remarks.

2. Social Accounting and Water Accounting

In this section, we briefly review the social, environmental and/or sustainability accounting literature to provide a theoretical background, which is useful to contextualise the role and position of water accounting in this literature. Social accounting has been defined in several, and not always consistent, ways with different users (academics, practitioners, public regulators and business actors) providing a specific definition or conceptualisation (Contrafatto, 2009; Rusconi; 2006; Gray, Owen & Adams, 2014). Nowadays, the term “sustainability accounting” is widely used to refer to this varied body of studies. It may be argued that a relevant contribution towards the emergence and consolidation of this term was provided, among others, by the works of practitioners and standard-setters (e.g. GRI, IIRC). For example, the emergence of the so-called Triple Bottom Line (TBL) at the end of 1990s, which includes the Economic, Social and Environmental aspects and performance related to business activities, played an important role (Elkington 1997). Despite its limitations, TBL’s approach was important because it induced managers and entrepreneurs to enlarge the focus of their operations and activities to consider not only the economic aspects (i.e. profit, costs) but also the environmental and social results. A similar approach was followed by GRI (Global Reporting Initiative), another important professional body in the field, according to which “a sustainability report is a report published by a company or organization about the economic, environmental and social impacts caused by its everyday activities [...]. Sustainability reporting can be considered as synonymous with other terms such as non-financial reporting; triple bottom line reporting, corporate social responsibility (CSR) reporting, and more. It is also an intrinsic element of Integrated Reporting: a more recent development that combines the analysis of financial and non-financial performance”².

A superficial or a-critical application of TBL’s view and approach could be risky and detrimental for at least three reasons:

- 1) TBL uses an incomplete definition of what is “economic”, as it tends to consider “economic” as only financial, i.e. only the results of the annual account. In doing so, therefore, the key indirect economic aspects of environmental/social issues (e.g. economic externalities) are excluded from the analysis;
- 2) the risk of restricting the “social” dimension to the employee-related issues or to the social investment activities or philanthropy;
- 3) a rigid interpretation of TBL might limit the understanding of the actual ‘interdependence’ between the economic, social and environmental aspects. This is because it would be difficult to adequately speak about social impacts, without taking into consideration their effects on the economic and environmental aspects, and vice versa.

² Source: GRI, <https://www.globalreporting.org/information/sustainability-reporting/Pages/default.aspx>, accessed on August 2017

In the context of this paper, it may be argued that the “original” perspective of social accounting seems to be the most appropriate because some of the pioneering proposals and approaches of the ‘70s and ‘80s were already including in the “social dimension” of the impacts that corporations may have on their (internal or external) stakeholders.

From this perspective, therefore, it seems appropriate to consider the issues related to “accounting for water” as an integral part of/to the social accounting tradition. Water, which is the most important resource for the survival of human and non-human life on the planet (Bergoglio, 2015), and the issues related to its “management” and “control” have implications that affect the economic, ecological and social dimensions. On the other hand, it is important to discuss ‘how’ and ‘to what extent’ water accounting relates to social accounting but also to financial accounting.

As is widely known, financial accounting is aimed at providing all stakeholders (with a specific attention to the investors) information about the economic/financial results and the survival/development prospects of the business in the market. By definition, financial accounting does not measure the impacts of the organisational activities that have not direct or indirect market evaluations, with all the limitations of accounting principles and legislations. In the annual financial accounts, thus, a specific water accounting could be useful in providing information about the costs and expenditures that a firm may incur when water is used in its business operations. In addition, financial accounting could provide information about the risks for damage or fines that are related to ineffective water policies. With regard to this, Barton (2010) and Morrison & Schulte (2012) have emphasized how accounting is pivotal in providing (financial and non-financial) information for ‘governing’ the risks (e.g. operational and reputational) related to managing water. However, as mentioned before, annual financial accounts can only include, as required by the existing accounting principles, strictly financial/market oriented effects and results.

On the other hand, social and environmental accounting provides a strong foundation for justifying the role and potential contribution of water accounting (Hopwood 2009). In much of the SEA tradition, impacts of the business’s activities on stakeholders are seen in a synergic way, where the economic, social and environmental effects are intertwined and, in many regards, integrated. From this perspective, an “accounting” which is able to provide techniques for *accounting for and controlling* the interrelated aspects related to water seems to share many of the characteristics of social and environmental accounting (Russell & Thomson 2009; Hopwood et al., 2010; Bebbington et al., 2014). In this sense, therefore, water accounting could be considered as an extension and enlargement of the traditional social accounting with a specific focus and emphasis on water and its management-related issues.

3. Water accounting: definition and conceptualization

Debate about water, its consumption, its long-term sustainability and related socio-ecological risks are nowadays central to many public constituencies (e.g. regulators, politicians, business, societal actors). Existing data show that more than 2 billion of people are currently suffering the direct or indirect effects of the scarcity of water, because they live in desert or semi-desert areas or because they are affected by limited water resources (CDP 2014; WWC 2014). Consumption and demand for water are influenced by different factors such as population growth, urbanization, food and energy security, increase in production and consumption (WWC 2014). All these factors, in one way or another, affect and are implicated in the way in which “water” is (or should be) managed and controlled. There is a need for systems which are able to provide mechanisms, techniques and information for “governing” (i.e. managing and controlling) water. In this context, accounting-based information about water and related issues (i.e. consumption, availability, etc.) is essential. This information represents the key component of any “governing” system and regime through which to account for, manage and control water. From this perspective, therefore, it is essential to identify accounting-based mechanisms and techniques through which to generate, collect and disclose water-related information.

Water accounting has different origins and objectives. In the management and accounting literature there is no unique definition of what is and should be water accounting. In the management and accounting literature, the term ‘accounting for water’ or ‘water accounting’ is used to indicate the set of accounting-infused mechanisms/techniques. In particular, water accounting indicates “the process of [accounting] and communicating water resources related information and the services generated from consumptive use in a geographical domain” (Wateraccounting.org). A similar definition is also used to describe the activities of disclosure as the act of collecting and making available data on the current state of water management (Morrison & Schulte 2012). Accounting for water can be considered as a vehicle, or a mechanism, through which water users can discharge accountability (Russell & Lewis 2014).

Water accounting, as mentioned above, represents a relatively new field of domain and space in the management and accounting disciplines (Tello et al., 2016; Hazelton 2013; Chalmers et al., 2012a). In more recent years, an embryonic but relevant body of studies has gradually emerged in the management and accounting literature. In the accounting literature (see for example Cashman, 2011; Chalmers, Godfrey & Potter, 2012a; Signori & Avondo Bodino, 2013; Chalmers, Godfrey & Potter, 2012b; Egan, 2014a; Egan, 2014b; Egan, 2014c; Hazelton, 2013; Daniel & Sojamo 2012; Allan 2012; Larrinaga & Chamorro 2008), the focus of research on water-issues has been mainly on the reporting aspects and processes, which are defined as the “methods of recording and reporting water information” (Godfrey & Chalmers, p. 4, 2012). The focus on the *reporting*, which has a long tradition in the SEA research (Contrafatto 2004; 2009, Rusconi & Contrafatto 2013, Rusconi 1988; 2013), is relevant because it is through this process that it is possible to *render-*

conto, i.e. to provide accounting-based information about the responsibilities for the actions, accounts and accessibility of the accounts (Contrafatto & Signori, 2012) related to the government of water. This reporting process is supported by specific accounting systems (e.g. General Purpose Water Accounting systems; Water Footprint; Water Management Systems), which as suggested by Hazelton (2013) and Hoekestra (2006), are those systems that generate and provide the information for the water accounts and reports.

In this paper, in response to calls for mapping the domain of SEA (Thomson 2007; 2014, Lewis & Russell 2011, Bebbington & Larrinaga, 2014), we carry out an extensive literature review to investigate 'how' and 'under what patterns' studies of water accounting developed as they did.

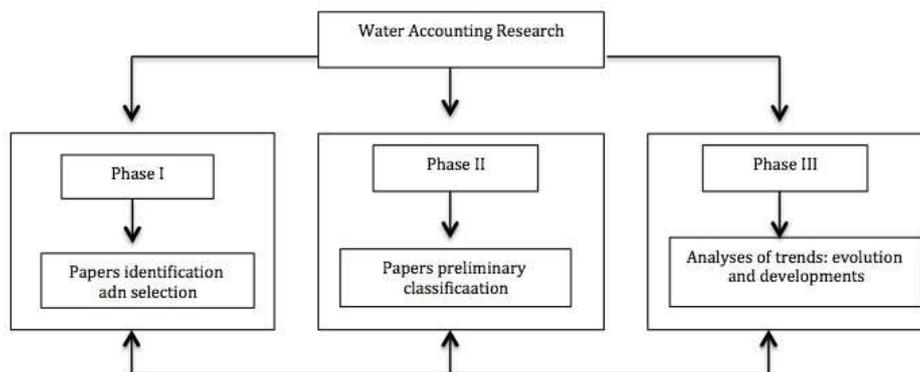
4. Methodology and methods

As mentioned above, in this paper we adopted a literature-based methodology to map the state of the art of water accounting studies in the existing management and accounting literature. We argue that a literature-based methodology provides useful insights to understand 'how' and 'why' an emerging field of research, such as the 'water accounting', evolved to become a recognizable domain of academic knowledge and debate. In addition, a literature-based methodology helps to identify possible areas for future research developments. Our analysis draws on the works of Parker (2005; 2011), Contrafatto (2011) and Thomson (2014), which have carried out a review of the SEA literature from the 1980s³.

Our analysis has followed a systematic and rigorous protocol, which has involved three different yet interrelated stages (each stage will be discussed below): i) papers' identification and selection; ii) Papers' preliminary classification; and iii) analysis of the trends of evolution and developments. Drawing on Dumay et al., (2016), we provide a graphic representation of these phases (Fig 1).

³ These studies provide useful methodological insights to identify the scope, boundaries and elements of our analysis.

Figure 1. Representation of the stages of evolution of ‘water accounting’ research.



4.1 First stage: Papers’ identification and selection

The first step of our literature review was the identification and selection of main papers. This task was proceeded by the choice of the academic fields and journals to take into consideration. With regard to the “journals”, we included the journals ranked in the list proposed by the Association of Business School (ABS) in 2015⁴. With regard to the “fields” and “disciplines”, we focused on the “Accounting”, “Management” and “Organisation” domains of research. Overall, we identified 19 journals of Accounting, 38 of Management and 7 of Organisation. The list of journals was classified by research fields (Accounting, Management and Organization), which has been deduced from our preliminary analysis of the journals (See Appendix). Once we selected the main journals, we proceeded by identifying the main papers in the existing literature. In order to do so, we undertook web-based scrutiny of the papers published in each journal from the period 1970-2017⁵. In particular, we conducted a preliminary search for the word ‘water’ in the title, abstract and/or keywords.

⁴ ABS is the association of UK’s business and management education sector. We decided to take into consideration the ABS ranking list because this represents the most notable and influential list in the context of the UK business schools. The ABS’s list is a “guide to the range, subject matter and relative quality of journals in which business and management academics publish their research.” (ABS Guide, 2015, p. 5). The Guide includes a total of 1,401 journals based on three impact factors related to citation information: i) JCR; ii) SJR; iii) SNIP. Information is available in <https://charteredabs.org/academic-journal-guide-2015>

⁵ The process of selection of the papers was undertaken by scrutiny of the specific web site of each single journal. In addition, we decided to focus on the period from 1970 because the first paper on water was published in 1970.

4.2 Second stage: Papers' initial classification

As a result of this preliminary analysis, a first set of relevant articles was identified. Overall 219 papers were initially identified for the three domains of research. In particular, 68 papers were identified in the field of Accounting, 114 in Management and 37 in Organisation.

Among the Accounting journals, the highest proportion of papers, 15 papers, was published in the Accounting, Auditing and Accountability Journal (AAAJ) and 13 in the journal Public Money and Management (PMM). In AAAJ the first paper, Harte et al., "Environmental Disclosure in the Annual Reports of British Companies: A Research Note", appeared in 1991. On the other hand, the most recent paper to be published was the Jolland et al., (2017) paper, "Politicising the sustaining of water supply in Ireland – the role of accounting concepts". In PMM the first paper was Green et al., (1983) "French contracts, Is water really a nationalised industry?", and the most recent was Mbuvi et al., (2013) "The politics of utility reform: a case study of the Ugandan water".

In Management area the journal with the highest number of papers is Expert System of Applications (ESA), with 31 papers, and Information Management (IM) with 8 papers. In ESA, one of the first paper published was Lu et al., (2010), "Effects of data normalization and inherent-factor on decision of optimal coagulant dosage in water treatment by artificial neural network", and the last paper published is "A framework for water loss management in developing countries under fuzzy environment: Integration of Fuzzy AHP with Fuzzy TOPSIS", Shaher et al., (2016).

In the field of Organization, the journal Organisation and Environment (OE) was the journal with the highest amount of published papers (13), and Systemic Practice and Action Research (SPAR) was the second in importance with 7 papers. In OE the first paper was Gaard (2001), "Women, Water, Energy. An Ecofeminist Approach". The most recent paper was Martinez (2015), "A Three-Dimensional Conceptual Framework of Corporate Water Responsibility". On the other hand, the first paper in SPAR was Gu et al., "Designing a Water Resources Management Decision Support System: An Application of the WSR Approach", published in 2000. Rammelt (2014)'s paper, "Participatory Action Research in Marginalised Communities: Safe Drinking Water in Rural Bangladesh", was the most recent published.

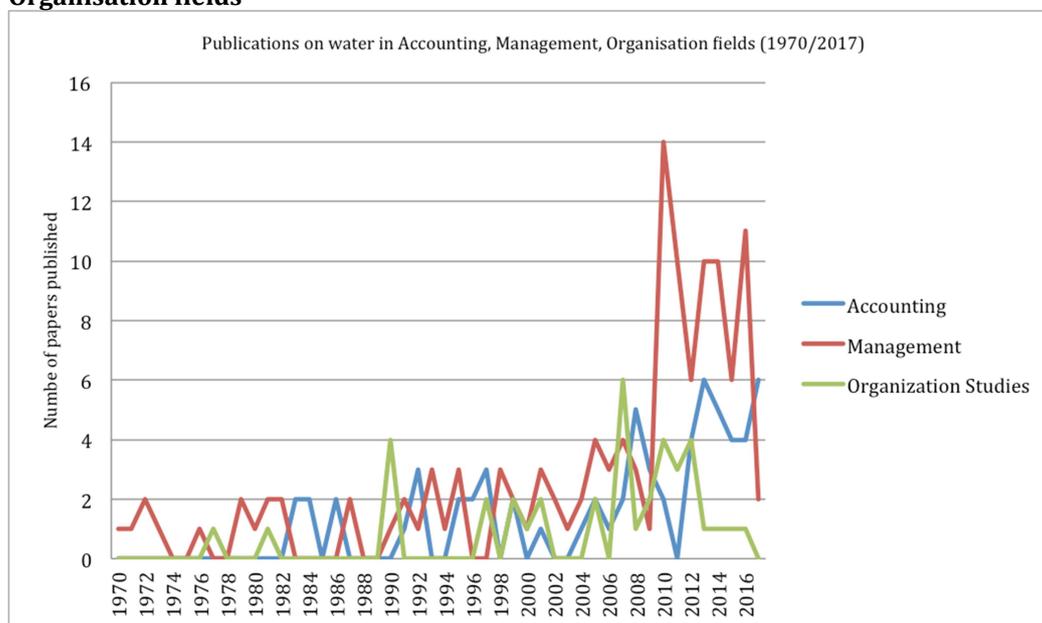
4.3 Third stage: Analysis of the trends of evolution and development

In this subsection, we will focus on the period of publications of the main papers to ascertain common patterns of evolution and trends. Two preliminary observations need to be made. First, there is discrepancy about the emergence of research on "water-issues" between the different fields/disciplines of Accounting, Management and Organisation. With regard to this, interests for water-issues emerged considerably later in Accounting than in Management and Organisation. In the fields of Management/Organisation the first academic publications on "water" emerged during the 1970s, with the publication of Beattie et al.,' paper on "Planning

deep-water ports" (1970) which was published in the Management Decision journal (MD).

On the other hand, in the Accounting field the first publication on "water" appeared in 1983, with the publication, in the Public Money and Management (PMM) journal, of the work "*Is water really a nationalised industry?*" (Green et al., 1983), whose main focus was on the issues-related to the nationalisation of water supply. However, this was only a sporadic publication, which did not promote, at that time, any wider scholarly debate on "water and accounting". It would be important to speculate on the factors that might help to explain this observed time-related discrepancy. It may be plausible that this difference between Management/Organisation and Accounting could be explained by considering that during the 1970s and the early 1980s, the focus of Accounting scholars was more directed to financial-economic aspects of business's operations rather than to their impacts on society and environment (Burchell et al., 1980; Rusconi, 1988). From this perspective, it may be argued that the debate in the "Management/Organisation" fields was perhaps more matured, and thus more pro-active, to embrace novel and to some extent innovative topics. However, it would be useful to undertake more historical-infused research, which would help to investigate the factors and conditions that influenced the emergence of the interests on "water" in these three different disciplines.

Table 1 Trends in publications on "water" in Accounting, Management and Organisation fields

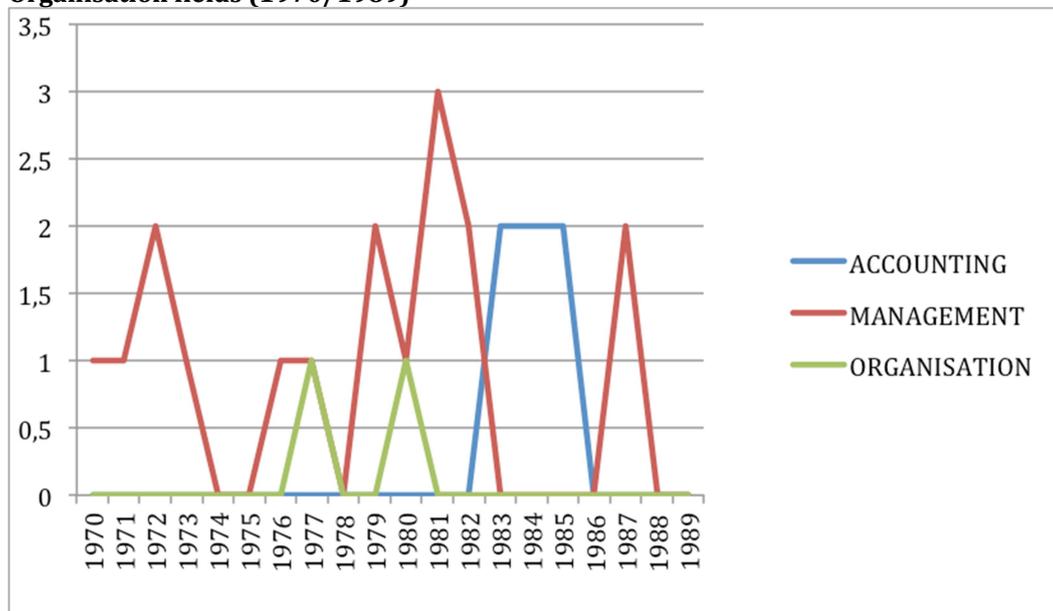


A second observation that we can draw from our preliminary analysis is that the trends of publication on water-related issues has not been linear from 1970 to 2017. In particular, as shown by Table 1, it is possible to identify three main publication-related phases. The first one, starting from 1970s until the end of the 1980s, was characterized by the emergence of the first works on water. The second phase, from the 1990s until 2006/2007, was characterized by an increase and gradual consolidation of “water-related issues”, as a recognizable domain of research. The third phase, starting from the 2007 until now, is characterized by a considerable diffusion and proliferation of published articles on water. In the remainder of this paragraph, we will discuss in more detail the patterns of evolution in these three identified phases.

The first phase, which we name the *beginning era*, saw the appearance of the first pioneering publications on water-issues and accounting. However, only a very small and niche literature in Management, Organisation and Accounting emerged out of these first publications. Overall, in this period 25 papers were published. Our analysis shows that relatively speaking, Management was, in this period, characterized by a larger number of articles than Accounting and Organisation (see Table 2). In particular, in Accounting only 6 articles were published in the beginning era and 2 articles in the Organisation field. In particular, in the Accounting area, the first two articles to be published were the Million's (1983), “*Is water really a nationalised industry?*”, and Green et al., (1983), *Debate: French contracts: Is water really a nationalised industry?*, & Collins et al., (1984), “*Investigating public industries: How has the monopolies & mergers commission performed?*”. In the Organisation field, the first papers to be published were Arcuril (1977), “*You Can't Take Fingerprints Off Water: Police Officers' Views Toward "Cop" Television Shows*”, in Human Relation (HR), and Godschalk (1981), “*Making Waves: Public Participation in State Water Planning*”, in the Journal of Applied Behavioural Science (JABS), whose focus was on the public participation for planning water.

In contrast, in the field of Management 17 papers were published, from the 1970s to 1982, in 5 different journals: Academy of Management Review (AMR), California of Management Review (CMR), Business Horizons (BH), Management Decision (MD), Industrial Management on Data System (IMDS). The first paper is Beattie et al., “*Planning deep-water ports*”, published in 1970. The focus of these early papers was on the issues-related to the planning and control of water. With regard to this, of particular relevance were the papers of Byrum (1981), “*Testing the political waters downstream*”, and of McKee (1972), “*Water Pollution Control: A Task for Technology*”.

Table 2 "Beginning era" of publications on water in Accounting, Management and Organisation fields (1970/1989)



The second phase, which we have named the *diffusion era*, water-issues and water-accounting increasingly put their feet down embedded, and gradually spread, in the Accounting, Organization and Management literature. In particular, as shown in Table 3, 68 papers were published overall, 28 in Management, 22 in Accounting and 18 in Organisation.

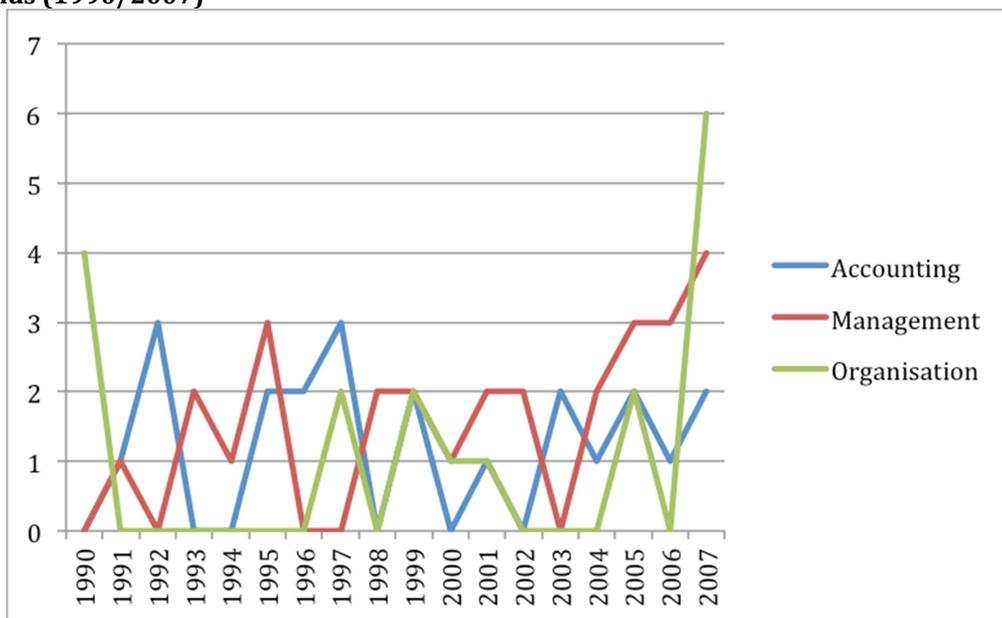
In Accounting, papers were published mainly during the 1990s. Notable in this period were the works of Harte et al., (1991), "*Environmental Disclosure in the Annual Reports of British Companies: A Research Note*" published in the Accounting, Auditing and Accountability Journal (AAAJ); Rubenstein (1992), "*Bridging the gap between green accounting and black ink*", published in the journal Accounting, Organisation and Society (AOS); Shaoul (1997), "*The power of accounting: reflecting on water privatization?*", published in AAAJ; and Shaoul (1997b), "*A Critical Financial Analysis of the Performance of Privatised Industries: The Case of the Water Industry in England and Wales*", published in the journal Critical Perspective on Accounting (CPA).

In the Management field, published papers were spread all over the decade with an increasing number during the last period from 2004 to 2007. Notable were the publication of Tan (2005), "*Venturing in turbulent water: a historical perspective of economic reform and entrepreneurial transformation*", published in the Journal of Business Venturing (JBV) and Nwankwo et al., (2007), "*Social Investment through Community Enterprise: The Case of Multinational Corporations Involvement in the Development of Nigerian Water Resources*", published in the Journal of Business Ethics (JBE).

Compared to Accounting and Management, relatively less papers were published in the Organisation field. However, from our analysis is possible to observe, that there has been a notable increase in the amount of papers which have been published over the most recent years of this period. With regard to this, the works of Fayard et al., (2007), *“Photocopiers and Water-coolers: The Affordances of Informal Interaction”*, published in Organisation Studies (OS), Maclennan (2007), *“Indigenous Water, Industrial Water in Hawaii”*, published in Organisation and Environment (OE), and Metcalf (2007), *“Ancient Hawaiian Water Rights, and Some of the Customs Pertaining to Them”*, published in Organisation and Environment (OE), are relevant.

Although, this period saw the advancement of interests and attention on water-accounting issues, the topic did not become a widely and recognizable field of research until last decade or so. It was over the last decade, that we can observe a notable proliferation of articles and papers on water-accounting.

Table 3 "Diffusion era" of publications in Accounting, Management and Organisation fields (1990/2007)



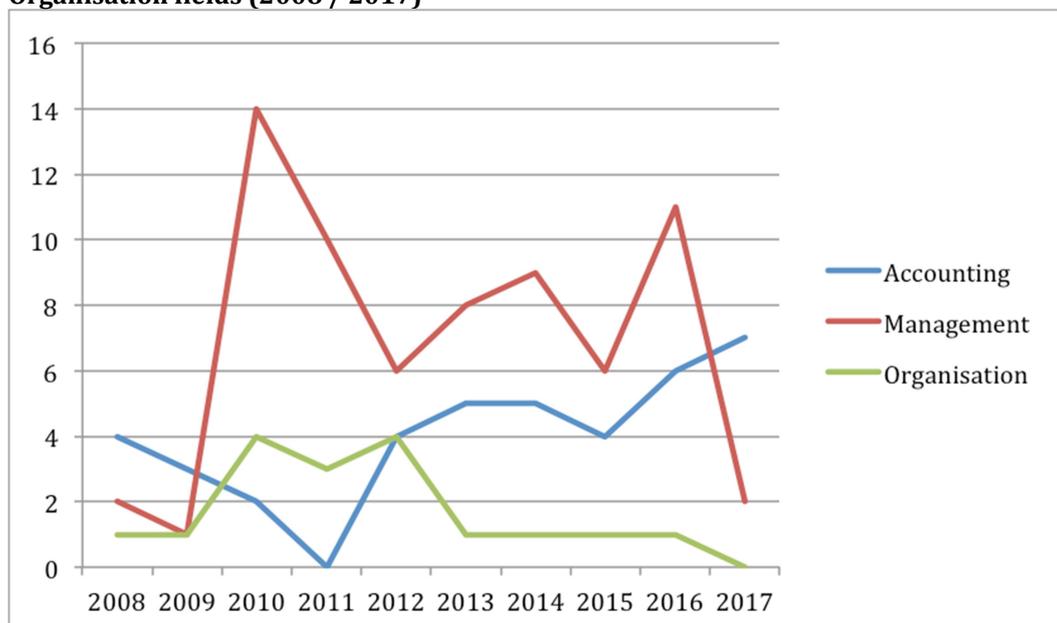
Water-related issues and water-accounting have increasingly become a more specific and consolidated field of studies and research in the Management and Accounting disciplines. We have named this phase, “proliferation era”. In particular, in Accounting, “water-issues” have attracted increasingly more attention by scholars and space within the main journals. With regard to this, our analysis shows that 126 papers were published overall in this last period. In particular, 40 papers in Accounting, 69 in Management and 17 in Organisation.

Among the papers in the Management field, most were published during 2009 and 2010. Examples are the papers published by Soltani et al., (2010), “*Developing operating rules for reservoirs considering the water quality issues: Application of ANFIS-based surrogate models*” in the journal Expert System and Applications (ESA); De Waal et al., (2010), “*A performance management readiness review framework for governmental service providers*”, in the journal Business Horizon (BH); and Davis et al., (2010), “*Is Blood Thicker Than Water? A Study of Stewardship Perceptions in Family Business*”, in the journal Entrepreneurship Theory and Practice (ETP).

Comparably less papers appeared in the Organisation field. However, as shown in Table 4, the trend is similar to that in the Management field, which has seen a considerable increase in 2010. An example is the Kurland’s (2010) paper, “*Water and Business: A Taxonomy and Review of the Research*”, which was published in the Organization and Environment journal.

In the Accounting field, our analysis shows a decrease in the number of publications during 2011, followed by an increase of papers from 2012. Most of the works have been published in the Accounting, Auditing and Accountability Journal (AAAJ) and Sustainability Accounting, Management and Policy Journal (SAMPJ). Examples are the papers of Hazelton (2013) “*Accounting as a human right: the case of water information*”, Egan (2014b) “*Making water count: water accountability change within an Australian university*”, Jolland et al., (2017) “*Politicising the sustaining of water supply in Ireland – the role of accounting concepts*”, and Christ et al., (2016) “*Towards environmental management accounting for trade-offs*”.

Table 4 "Proliferation era" in publications on water in Accounting, Management and Organisation fields (2008 / 2017)



5. Conclusion and final remarks

In this paper, we have undertaken a literature review-based methodology for mapping and classifying the existing “water accounting” literature in the Accounting, Management and Organisation disciplines. The purpose of our analysis has been to ascertain ‘what is’ the state of the art in this literature and to identify ‘how’ studies on water-issues and water-accounting emerged and developed over time in these three disciplines. Water accounting emerged in the 1970s. However, the first publications were only pioneering works, which did not mobilize a wider scholarly debate in the Management, Accounting and Organisation disciplines. In the 1990s, water accounting studies gradually developed and diffused, although these were still a niche area of research. It was only in the third phase, which we have named “proliferation”, that water accounting gradually consolidated. Our analysis has shown that only in more recent years, and specifically over the last decade or so, “water accounting” has gradually proliferated to become a consolidated and recognizable area of research in Management and Accounting (see Table 1).

In the first phase, that goes from 1970s to the end of the 1980s (named *beginning era*) we found 25 papers, and only 6 papers were published in the field of Accounting. In the second phase, that runs from the early 1990s to 2007 (called *diffusion era*) from a total of 68 papers, 22 were published in Accounting journals. For the third phase, from 2007s to 2017 (named *proliferation era*), 126 papers were produced and 40 of them were published in Accounting journals.

Out of the total number of published works (i.e. 219), 11% of papers were published in the first phase, 31% in the second and 58% in the third phase. In particular, with regard to the field of Accounting, we observed that there was a notable increase in the papers published after the first phase (from 6 to 40 papers). In the field of Management, 15% of the papers were published in the first phase, while 25% and 60% of papers were published, respectively, in second and third phase. In the Organisation field, 5% of the total number of papers were published in the first phase, 49% and 46% of papers were published in the second and third phase. It would be interesting to expand the analysis by including, for example, other ranking lists of journals in different academic and national contexts (e.g. the AIDEA list) to see how and to what our results are comparable and replicable⁶.

⁶ Arguably, one of the main limitations of our research is that we took into consideration only the journals ranked in the ABS list. It would be useful to extend the analysis by including other journals, which are not listed in the ABS, and/or other publications such as monographs, book chapters and conference proceedings. In addition, it would be interesting to explore water-related issues in the context of Economia Aziendale so as to ascertain ‘how’ and ‘to what extent’ these issues have been implicitly or explicitly studied by Italian scholars (see for example the early works of Miolo Vitali (1978) on the relevance of environmental and ecological costs in the financial accounts). Finally, another limitation of our analysis is that we have used the word “water” for searching and identifying, through a scrutiny of the title, abstract and keywords, the relevant publications. As a result, it might be possible that some works on water-issues have been excluded. With regard to this, it would be useful to extend the search by taking into consideration other related words (e.g. ecological and natural resources) and/or also by focusing on the main text of the papers.

Although, this observed increase in the number of publications and space devoted to these issues in the main Accounting, Organisation and Management journals, “water-accounting” is still in its infancy if compared to the other areas of research in the SEA literature (e.g. sustainability reporting, environmental accounting, etc.). We contend that this opens up the possibilities for expanding the issues that are related to the interaction between “water” and “managing and controlling”. In particular, there are a wide range of possibilities for investigating theoretically and empirically ‘how’ and ‘to what extent’ the management and control systems and techniques, are able to make visible, controllable and thus governable “water” and “related” aspects (e.g. consumption, protection). In this sense, we argue that scholars of Economia Aziendale could provide an important contribution for understanding some of the complexities related to “management, accounting and control” of “water” by proposing theoretical insights, models and practical techniques to help business and society to “govern” water in a more sustainable way. Water is a scarce resource that is essential for the life and survival of life on the planet. The understanding of the ways through which human beings may act, and human-related activities can be undertaken, towards a more sustainable “government” of this precious resource is essential if we wish to ensure the long term survival of our eco-systems, society and business.

6. Appendix

Appendix 1: Lists of journals in Accounting, Management and Organisations studies.

<i>Accounting</i>	
AOS	Accounting, Organization and Society
JAЕ	Journal of Accounting and Economics
CAR	Contemporary Accounting Research
ABR	Accounting and Business Research
AAAJ	Accounting, Auditing and Accountability Journal
CPA	Critical Perspective on Accounting
JAAF	Journal of Accounting Auditing and Finance
MAR	Management Accounting Research
AMA	Advances in Management Accounting
APJAE	Asia-Pacific Journal of Accounting and Economics
AAR	Australian Accounting Review
IJDG	International Journal of Disclosure and Governance
JAOC	Journal of Accounting and Organizational Change
JAEE	Journal of Accounting in Emerging Economies
JAAR	Journal of Applied Accounting Research
JPBAFM	Journal of Public Budgeting, Accounting and Financial Management
MAJ	Managerial Auditing Journal
PMM	Public Money and Management
SAMPJ	Sustainability Accounting, Management and Policy Journal

<i>Management</i>	
ETP	Entrepreneurship Theory and Practice
JBV	Journal of Business Venturing
AMJ	Academy of Management Journal
AMR	Academy of Management Review
BJM	British Journal of Management
BEQ	Business Ethics Quarterly
JMS	Journal of Management Studies
CMR	California of Management Review
JBE	Journal of Business Ethics
JBR	Journal of Business Research
JME	Journal of Management Enquiry
BEER	Business Ethics European Review
BH	Business Horizons
CJAS	Canadian Journal of Administrative Science
EBR	European Business Review
ISIM	International Studies of Management and Organizations
MD	Management Decision
CHB	Computer in Human Behaviour
DSS	Decision Support Systems
ESA	Expert System of Applications
JGI	Journal of Government Information

AMIT	Accounting, Management and Information Technologies
IS	The Information Society
ISF	Information Systems Frontiers
JIT	Journal of Information Technology
JAIT	Journal of the Association and Information Technology
ITD	Information Technology of Development
BIT	Behaviour & Information Technology
CAIS	Communication of the Association of Information System
IMDS	Industrial Management and Data System
ISM	Information System Management
JCIS	Journal of Computer Information System
ML	Management and Learning
ADHR	Advances in Developing Human Resources
IETI	Innovations in Education and Teaching International
JAE	Journal of Accounting Education
JEP	Journal of Education Policy
JME	Journal of Management Education

Organization

HR	Human Relations
OS	Organizations Studies
JABS	The Journal of Applied Behavioural Science
JKM	Journal of Knowledge Management
NJ	Negotiation Journal
OE	Organization and Environment
SPAR	Systemic Practice and Action Research

7. Reference list

- Adams C. & Larrinaga-Gonzales C. (2007). Engaging with organisations in pursuit of improved sustainability accounting and performance, *Accounting, Auditing & Accountability Journal*, 20 (3), pp.333-355.
- Allan A. (2012). *The role of a water accounting system in the avoidance and resolution of international water disputes*, in Godfrey J., Chalmers K. *Water Accounting. International approaches to policy and decision making*, pp. 236 -254, Edward Elgar Publishing Limited, UK.
- Arcuril A. (1977). You Can't Take Fingerprints Off Water: Police Officers' Views Toward "Cop" Television Shows, *Human Relations*, 30 (3), pp. 237 -247.
- Beattie C. (1970). Planning deep-water ports, *Management Decision*, 4 (4), pp. 55-61.
- Barton. B. (2010). *Murky waters? Corporate reporting on water risk. A benchmarking study of 100 companies*. CERES Report. Available: <http://www.ceres.org/resources/reports/corporate-reporting-on-water-risk-2010>
- Bebbington J. & Larrinaga C. (2014). Accounting and sustainable development: an exploration, *Accounting, Organizations and Society*, n. 39, pp. 395-413.
- Bebbington J, Unerman J. & O'Dwyer B, (2014). *Introduction to sustainability accounting and accountability*, in Bebbington J., Unerman J., O'Dwyer B. (2014). *Sustainability accounting and accountability*.
- Bergoglio F. (2015). *Laudato Si del Santo Padre Francesco Sulla cura della casa comune*, Lettera Enciclica, Libreria Editrice Vaticana.
- Brundtland H. (1987). *Report of the World Commission on Environment and Development: Our Common Future*, UNWCED.
- Byrum C. (1981). Testing the political waters downstream, *Business Horizons*, 24 (1), pp. 25 - 32.
- Burchell S., Clubb C., Hopwood A. & Hughes J. (1980). The roles of accounting in organizations and society, *Accounting, Organizations & Society*, 5 (1), pp. 5-27.
- Carbon Disclosure Project, (2014). *CDP Policy briefing. Safeguarding Europe's water resources*. Available (on October 2016): <https://www.cdp.net/CDPResults/CDP-EU-water-report-2014.pdf>
- Cashman A. (2011). 'Our Water Supply is being Managed like a Rumshop': Water Governance in Barbados, *Social and Environmental Accountability Journal*, 31, (2), 155-165.
- Chalmers K., Godfrey J. & Potter B. (2012a). Discipline-informed approaches to water accounting, *Australian Accounting Review*, 22 (3) , pp. 275-285.
- Chalmers K., Godfrey J. & Lynch B. (2012b). Regulatory theory insights into the past, present and future of general purpose water accounting standard setting, *Accounting, Auditing & Accountability Journal*, 25 (6), pp. 1001 - 1024.
- Christ K., Burritt R. & Varesi M. (2016). Towards environmental management accounting for trade-offs, *Sustainability Accounting, Management and Policy Journal*, 7 (3), pp. 428-448.

- Collins B. & Wharton B. (1984). Investigating public industries: How has the monopolies & mergers commission performed?, *Public Money Management*, 8 (2).
- Contrafatto M. (2004). *Il corporate social accounting and reporting: uno sguardo alla letteratura internazionale*, in AA. VV. (a cura di Rusconi G. e Dorigatti M.) Teoria Generale del Bilancio Sociale ed applicazioni pratiche, collana "Persona, imprese e società". V. II, Franco Angeli, Milano.
- Contrafatto M. & Rusconi G. (2005). Social accounting in Italy: Origin and developments, *Social and Environmental Accounting Journal*, 25 (2), pp. 3-8.
- Contrafatto M. (2009). *Il social and environmental reporting e le sue motivazioni: teoria, analisi empirica e prospettiva*, Giuffrè Editore.
- Contrafatto M. (2011). Social and environmental accounting and engagement research: Reflection on the state of the art and new research avenues, *Economia Aziendale Online*, 2, pp. 273-289.
- Contrafatto M. & Rusconi G. (2012). *Il Knowledge Management e il Social Accounting & Reporting: alcune riflessioni*, in Cardillo E., Caruso G., Leotta A. (eds). *Sistemi manageriali nelle aziende ad elevata socialità. Processi innovativi e rilevanza degli stakeholder*, Aracne, Roma, pp. 143 - 163.
- Contrafatto M. & Signori S. (2012). *Responsabilità, accountability e sostenibilità aziendale: alcune riflessioni*, in Rossi C., Rusconi G., Servalli S., *Saggi di storia delle discipline aziendali e delle dottrine economiche*, Rirea, pp. 309 - 326.
- Contrafatto M. & Burns J. (2013). Social and environmental accounting, organisational change and management accounting: A processual view, *Management Accounting Review*, 24 (4), pp. 349-365.
- Daniel M. & Sojamo S. (2012). From risk to shared value? Corporate strategies in building a global water accounting and disclosure regime, *Water Alternatives*, 5 (3), pp 636 - 657.
- Davis J., Allen M., & Hayes D. (2010). Is Blood Thicker Than Water? A Study of Stewardship Perceptions in Family Business, *Entrepreneurship Theory and Practice*, 34 (6), pp. 1093-1116.
- De Wal A. & Kerklaan L. (2010). A performance management readiness review framework for governmental service providers, *Business Horizons*, 53 (4), pp. 405 - 412.
- Dumay, Bernardi C., Guthrie J., & Demartini P. (2016). Integrated Reporting: a structured literature review, *Accounting Forum*, 40 (3), pp. 166-185.
- Egan M. (2014a). Driving water management change where economic incentive is limited, *Journal of Business Ethics*, 132 (1), pp. 73-90.
- Egan M. (2014b). Making water count: water accountability change within an Australian university, *Accounting, Auditing & Accountability Journal*, 27 (2), pp. 259 - 282.
- Egan M. (2014c). Progress towards institutionalising field-wide water efficiency change, *Accounting, Auditing & Accountability Journal*, 27 (5), pp. 809 - 833.
- Elkington J. (1997). *Cannibals with forks - Triple bottom line of 21st century business*. Stoney Creek, CT: New Society Publishers.
- Fayard A. & Weeks J. (2007). Photocopiers and Water-coolers: The Affordances of Informal Interaction, *Organization Studies*, 28 (5), pp. 605 - 634.

- Gaard G. (2001). Women, Water, Energy. An Ecofeminist Approach, *Organisation and Environment*, 14 (2), pp. 157 - 172.
- Global Reporting Initiative (GRI) (2017). www.globalreporting.org, accessed on August 2017.
- Godschalk D. & Stiffler B. (1981). Making Waves: Public Participation in State Water Planning, *The Journal of Applied Behavioral Science*, 17 (4), pp. 597 - 614.
- Gray R. (2010). Is accounting for sustainability actually accounting for sustainability ...and how would we know? An exploration of narratives of organisations and the planet, *Accounting, Organizations and Society*, 35 (1), pp. 47-62.
- Gray R., Adams C. & Owen D. (2014). *Accountability, social responsibility and sustainability. Accounting for society and the environment*, Pearson, UK.
- Green, D, Topham N., Price C., Whiteing T, & Wainwright C. (1983). Debate: French contracts; Is water really a nationalised industry?, *Public Money Management*, 3 (1), pp. 11-13.
- Gu J., & Tang X. (2000). Designing a Water Resources Management Decision Support System: An Application of the WSR Approach, *Systemic Practice and Action Research*, 13 (1), pp., 59-70.
- Harte G. & Owen D. (1991). Environmental Disclosure in the Annual Reports of British Companies: A Research Note, *Accounting, Auditing & Accountability Journal*, 4 (3), pp. 51 - 61.
- Hazelton J. (2013). Accounting as a human right: the case of water information. *Accounting, Auditing & Accountability Journal*, 26 (2), pp. 267 - 311.
- Hazelton J., (2014). Corporate water accountability - the role of water labels given non-fungible extractions, *Pacific Accounting Review*, 26 (1/2), pp., 8-27.
- Hoekstra A. Y. (2012). *Water footprint accounting*, in Godfrey J., Chalmers K.. *Water Accounting. International approaches to policy and decision making*, Edward Elgar Publishing Limited, UK, pp. 58 - 75.
- Hopwood, A. G. (2009). Accounting and the environment, *Accounting, Organizations and Society*, 34 (3-4), pp. 433-439.
- Jollands S. & Quinn M. (2017). Politicising the sustaining of water supply in Ireland - the role of accounting concepts, *Accounting, Auditing & Accountability Journal*, 30 (1), pp.164-190.
- Jones M. (2003) Accounting for biodiversity: operationalising environmental accounting, *Accounting, Auditing & Accountability Journal*, 16 (5), pp.762-789.
- Kurland N. & Zell D. (2010). Water and Business: A Taxonomy and Review of the Research, *Organization & Environment*, 23 (3), pp. 316 - 353.
- Larrinaga C. & Chamorro V. (2008). Sustainability accounting and accountability in public water companies, *Public Money & Management*, 28 (6), pp. 337 -343.
- Lewis L. & Russell S. (2011). Permeating Boundaries: accountability at the nexus of water and climate change, *Social and environmental accountability journal*, 31 (2), pp.117 - 123.
- Wu G. & Lo S. (2010). Effects of data normalization and inherent-factor on decision of optimal coagulant dosage in water treatment by artificial neural network, *Expert Systems with Applications*, 37 (7), pp. 4974-4983.

- MacLennan C. (2007). Wai: Indigenous Water, Industrial Water in Hawai'i, *Organization & Environment*, 20, (4), pp. 497 - 505.
- Martinez F. (2015). A Three-Dimensional Conceptual Framework of Corporate Water Responsibility, *Organization & Environment*, 28, (2), pp. 137 - 159.
- McKee J. (1972). Water pollution control: A task for technology, *California Management Review*, 14, pp. 88-92.
- McPhil K. & Ferguson J. (2016). The past, the present and the future of accounting for human rights, *Accounting, Auditing & Accountability Journal*, 29 (4), pp. 526-541.
- Mbuvi D. & Schwartz K. (2013). The politics of utility reform: a case study of the Ugandan water sector, *Public Money Management*, 33 (5), pp. 377-382.
- Metcalf E. (2007). Ancient Hawaiian Water Rights, and Some of the Customs Pertaining to Them, *Organization & Environment*, 20 (4), pp. 506 - 509
- Million G. & Kemp P. (1983). Is water really a nationalised industry?, *Public Money Management*, 3, pp. 12-13
- Miolo Vitali P. (1978) *Problemi ecologici nella gestione delle aziende*, Giuffrè Editore, Milano.
- Morrison J. & Schulte P. (2012). *Corporate water disclosure guidelines. Towards a common approach to reporting water issues*, The CEO water mandate, Pacific Institute. Available (on October 2016): <http://pacinst.org/app/uploads/2014/05/corporate-water-disclosure.pdf>
- Nwankwo E., Philips N., & Tracey P. (2007) Social Investment through Community Enterprise: The Case of Multinational Corporations Involvement in the Development of Nigerian Water Resources, *Journal of Business Ethics*, 73 (1), pp. 91 - 101.
- Parker L. (2005). Social and environmental accountability research, *Accounting, Auditing & Accountability Journal*, 18 (6), pp. 842 - 860.
- Parker L. (2011). Building Bridges to the Future: Mapping the Territory for Developing Social and Environmental Accountability, *Social and Environmental Accountability Journal*, 31 (1), pp. 7-24.
- Rammelt C. F. (2014). Participatory Action Research in Marginalised Communities: Safe Drinking Water in Rural Bangladesh, *Systemic Practice and Action Research*, 27 (3), pp. 195-210.
- Rubenstein B. (1992). Bridging the gap between green accounting and black ink, *Accounting, Organisation and Society*, 17 (5), pp. 501 - 508.
- Rusconi G. (1988). *Il bilancio sociale d'impresa: problemi e prospettive*, Giuffrè Editore, Milano.
- Rusconi G. (2006). *Il Bilancio Sociale, Economia, Etica e responsabilità sociale d'impresa*, Ediesse, Roma.
- Rusconi G. (2013). *Il bilancio sociale, economia, etica e responsabilità dell'impresa*, Ediesse, Roma.
- Rusconi G. & Contrafatto M. (2013). Corporate social accounting and accounts: a duty of accountability, *Impresa Progetto Electronic Journal of Management*, 2, pp. 1- 17.

- Russell S. & Thomson I. (2009). Analysing the role of sustainable development indicators in accounting for and constructing a sustainable Scotland, *Accounting Forum*, 33, pp. 225 – 244.
- Russell S. & Lewis L. (2014). *Accounting and accountability for fresh water. Exploring initiatives and innovations*, Routledge, London, in Bebbington J., Unerman J., O'Dwyer B. Sustainability Accounting and Accountability, pp. 213 – 229.
- Russell S., Milne M. & Dey C. (2017). Accounts of nature and the nature of accounts: Critical reflections on environmental accounting and propositions for ecologically informed accounting, *Accounting, Auditing & Accountability Journal*, 30 (7), pp. 1426 – 1458.
- Shaer H., Kaufmann L., Shaheen H., Samhan S. & Fuchs Hanusch D. (2016). A framework for water loss management in developing countries under fuzzy environment: Integration of Fuzzy AHP with Fuzzy TOPSIS, *Expert Systems With Applications*, 61, pp. 86 – 105.
- Shaoul J. (1997). The power of accounting: reflecting on water privatization?, *Accounting, Auditing & Accountability Journal*, 10 (3), pp. 382-405.
- Shaoul J. (1997b). A Critical Financial Analysis of the Performance of Privatised Industries: The Case of the Water Industry in England and Wales, *Critical Perspective on Accounting*, 8 (5), pp. 749 – 505.
- Signori S. & Avondo Bodino G. (2013). *Water management and accounting: remarks and new insights from an accountability perspective*, in A. Pistoni, L. Songini, C. Herzig. *Accounting and control for sustainability*, Emerald, pp. 115-161.
- Soltani F., Kerachian R., & Shirangi E., (2010). Developing operating rules for reservoirs considering the water quality issues: Application of ANFIS-based surrogate models, *Expert Systems with Applications*, 37, pp. 6639–6645.
- Tan J. (2005). Venturing in turbulent water: a historical perspective of economic reform and entrepreneurial transformation, *Journal of Business Venturing*, 20 (5), pp. 689 – 704.
- Tello E., Hazelton J. & Cummings L. (2016). Potential users' perceptions of general purpose water accounting reports, *Accounting, Auditing & Accountability Journal*, 29 (1), pp. 80 – 110.
- Thomson I. (2007). *Mapping Sustainability Accounting*, in J. Unerman, J. Bebbington and B. O'Dwyer (eds.). *Sustainability Accounting and Accountability*, Routledge, London, UK, pp. 15-29.
- Thomson I. (2014). *Mapping the terrain of sustainability and accounting for sustainability*, in J. Unerman, J. Bebbington and B. O'Dwyer (II eds.). *Sustainability Accounting and Accountability*, Routledge, London, UK, pp. 307-327.
- World Water Council (2014). *Bringing Water to Global Sustainability*, World Water Council Activities.