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Motivations behind the EMAS stagnation and enabling measures to stimulate new registrations: characterization of Public Administrations and Private-owned organizations

MERLI R.^a, LUCCHETTI M.C.^a, PREZIOSI M.^a, ARCESE G.^b

^a Department of Business Studies, Roma Tre University, Via Silvio D'Amico 77, 00145, Roma, Italy.

^b Ionian Department of Law, Economics and Environment, University of Bari Aldo Moro, Italy.

*Corresponding Author: Roberto Merli, roberto.merli@uniroma3.it

Abstract

The Eco-Management and Audit Scheme (EMAS) is a voluntary Regulation that defines a management instrument developed by the European Commission for companies and other organisations to evaluate, report, and improve their environmental performance. Today the EMAS is undergoing a revision process, in order to fit organizations' and stakeholders' requirements and increase its diffusion. Italy accounts for roughly 1,000 of the 4,000 certified European organizations, and, especially during the last five years, a growing number of organizations have not renewed the certification. This context determined a stagnation in the number of EMAS registered organizations. Thus, the aim of the survey is to investigate why a growing number of Italian organizations have dropped out of EMAS, and to identify which enabling measures would be more effective in order to encourage organizations to move back to the certification. The target of the questionnaire were the 339 Italian organizations that did not renew their EMAS registration between 2010 and 2015, there were 99 respondents. In this paper, certified Public Administrations and private-owned organizations are compared in order to delineate significant differences between the two groups. Concerning motivations for not renewing EMAS, implementation costs were the key reasons for both groups. Conversely, considering the possible enabling measures, while private-owned organizations demand long term tax benefits, Public Administrations prefer a greater consideration of EMAS in public funding. This paper systematically addresses the phenomenon for the first time, contributing to reducing the existing gap in literature, and providing an input to decision-makers who are overseeing the EMAS revision process.

Keywords: EMAS; Environmental Management Systems; ISO 14001; EMAS barriers; public Organizations.

1. Introduction

Among voluntary instruments of environmental policy, Environmental Management Systems (EMSs) emerged during the 90s (Angell and Klassen, 1999; Steurer et al., 2005). To disclose reliability, EMSs should be certified by an independent third party (Berry and Rondinelli, 1998). Up to now the two main voluntary international standards are the ISO 14001 and the Eco-Management and Audit Scheme (EMAS). While numbers of ISO 14001 are constantly increasing, EMAS registrations have been slowing down in the last years. The most recent figures show that about 4,000 organizations are EMAS registered. Italy and Spain are the leading countries with roughly 1,000 organizations each (European Commission, 2016). In Italy over 17,000 firms are ISO 14001 certified, representing the second country worldwide (Scipioni et al., 2015). Concerning EMAS, in the last years, the growth rate has stated to decline. Between 2010 and 2013 EMAS registrations decreased by nearly 20% (Heras-

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Saizarbitoria et al., 2015b; Preziosi et al., 2016b). Given the recent difficulties in the diffusion of EMAS, especially among Italian organizations, and due to the forthcoming revision of the Regulation by the European institutions, we carried out a survey through a questionnaire, developed in cooperation with ISPRA (The Italian National Institute for Environmental Protection and Research), the competent Italian body for EMAS. The main goal was to figure out motivations behind the decision to abandon EMAS and which enabling measures would be more effective to re-encourage organizations to implement EMAS. In this paper we investigated the Public Administration (PA) sector to understand if there are significant differences with private-owned organizations. Our assumption is that, given the robust difference existing between the aim and scope of a PA and that of a private-owned organization, we can simultaneously find discrepancies with respect to the attitude toward EMAS implementation. We structured the paper as follows. First, literature review concentrates on the phenomenon of decertification, with specific focus on EMAS. Moreover, we propose a review of investigations dealing specifically with the implementation of EMSs and EMAS in the PA (mostly municipalities). In Section Three, we present the survey. Finally, the results and discussion are provided in Section 6 and 7.

2. Literature review and research questions

This section summarizes conclusions by scholars who investigated critical aspects of EMSs implementation among private organizations and PAs. We dedicated special attention to EMAS, highlighting all previous studies that focused on organizations that decided to drop out this voluntary scheme. Finally, we reviewed papers on EMAS drop out motivations and EMAS application in PA.

2.1 Barriers and constraints to EMSs implementation

Failure to achieve the expected positive outcome is a critical barrier, and has been emphasized by many authors (Delmas, 2000; He et al., 2015; Hillary, 2004; Moors et al., 2005; Morrow and Rondinelli, 2002; Vernon et al., 2009). One of the main constraints faced by firms are the costs of implementation (Babakri et al., 2003; Martin-Pena et al., 2014;). Other barriers relate to higher operational complexity (Campos, 2012; Darnall et al., 2008), low commitment of management (Hillary, 2004; Jenkins, 2006; Martin-Pena et al., 2014; Massoud et al., 2010), and legislative compliance (Iraldo et al., 2013, 2005; Schylander and Martinuzzi, 2007). Specific studies on EMAS, mainly identify as its weak aspects the low level of supply chain partners and consumer recognition (Ahsen et al., 2004; Merli et al., 2014; Skouloudis et al., 2013; Vernon et al., 2009) and a widespread preference for the ISO 14001 certification (Iraldo et al., 2013, 2009; Vernon et al., 2009). Often organizations have complained about the low level of regulatory relief linked to EMAS (Ahsen et al., 2004; Iraldo et al., 2005; Meima and Starkey, 2000; Merli et al., 2014; Vernon et al., 2009). Finally, small firms especially have signaled costs of implementation and maintenance as a major barrier to EMAS renewal (Hillary, 2004; Iraldo et al., 2013, 2005, Merli et al., 2016, 2010; Vernon et al., 2009).

2.2 EMAS drop outs

The phenomenon of EMAS registrations reduction is recent, thus not many scholars have focused on this specific topic. The first work that dealt with the lack of success of EMAS among European organizations dates back to 2002. Despite having been written a decade after the enactment of the Regulation, it was noticed that the comparison with ISO 14001 was strongly negative. Authors stressed that the success of EMAS was intimately linked with the regulatory relief for registered companies. According to the authors, this peculiar characteristic would lead to a negative future for EMAS (Glachant et al., 2002). Even if narrowed to the Italian context, these findings have been confirmed by Daddi et al. in 2014 and by Preziosi et al. in 2016. (Daddi et al., 2014; Preziosi et al., 2016a).

In 2009, some authors interviewed 25 European organizations that had dropped out of EMAS. Unclear benefits were the first reason for not renewing EMAS, followed by the preference for another EMS and the lack of managerial culture (Vernon et al., 2009). In 2012, a survey from Spanish EMAS organizations revealed that 11% of them would not renew EMAS, while 45% expressed doubts on the future renewal. Costs are not a significant predictor of organizations future behavior toward EMAS. Also in this case, findings confirm that public incentives are a strong driver toward renewal of the certification (Heras-Saizarbitoria et al., 2015b). In Italy, during 2012 and 2013, other authors asked EMAS organizations if they intended to renew the certification. Over 84% declared the intention to renew EMAS, whilst over 15% were not sure about it. In this case, small and micro sized organizations had the higher rate of abandonment intention (Merli et al., 2016).

2.3 Critical aspects of the implementation of EMS and EMAS in PA

Not many studies have investigated the impact of EMAS in PA. In 2002, 43 PAs across Europe were interviewed, and main motivations for the certification were the reduction of environmental impact and the consequent savings due to process efficiency, together with the participation in Local Agenda 21. Organizations complained about the low participation and motivation of employees, and high costs of implementation (Clausen et al., 2002). In 2003, Von Malmborg emphasized that an EMS implemented in a PA is not just a tool to reduce the pressure on the environment, but may also enhance communicative action and co-operation (Von Malmborg, 2003). Given the important role of PA in environmental planning, EMAS gives them the opportunity to have significant positive environmental impact on the territory (Ridolfi et al., 2008). The EMAS evaluation study EVER (2005) identified as main drivers to PA registration political consensus, improvement in local stakeholders and communities' relations, the increased chance to reach environmental goals, the local Agenda, and leading by example. Benefits mainly concern better management of environmental performance and economic savings. On the other hand, constraints were mainly difficulties in implementing the requirements and low motivation of employees (Iraldo et al., 2005). Lozano and Vallés (2007) investigating EMAS in a Spanish municipality, affirmed that the EMS may provide economic and environmental advantages that overcome the economic costs of the system. (Lozano and Vallés, 2007). Another critical aspect of EMS implementation in PAs is that, frequently, indirect environmental aspects are not considered as part of the system. In fact, PAs, despite their role in planning and exercising authority, do not consider the EMS as a tool to address economic activities of their territory in a more sustainable manner (Emilsson and Hjelm, 2007). In 2009, a study on European EMAS registered organizations analyzed the responses of nearly 90 certified PAs. The main motivations for the certification were savings from improved process efficiency, legislative compliance, and management culture. In addition, PAs implemented EMAS to improve their image and present a positive example to other organizations. Concerning the benefits of implementation, PAs declared important savings in terms of energy, electricity and paper consumption (Vernon et al., 2009). Analyzing EMAS in the Italian PA, Mazzi et al. (2012) pointed out the low capability of environmental indicators implemented in terms of ability to enhance transparency, benchmark, and to support decision making processes (Mazzi et al., 2012). In 2014, an investigation on Portuguese municipalities found out that main motivations toward the EMS were: improvement of environmental performance, the demonstration of PA commitment toward sustainability, and reputation enhancement towards local stakeholders (Nogueiro and Ramos, 2014). In Italy, a survey conducted by Merli et al. analyzed drivers, barriers and difficulties of EMAS implementation in over 80 Italian municipalities. Leading strategic drivers were the improvement of PAs image and relationship with local stakeholders, while major strategic benefits were related to image, legislative compliance, and internal organization improvements. Considering economic drivers and benefits, the most important were energy savings. The authors identified difficulties related to staff and consultancy costs as the main constraints to EMAS implementation. Finally, they found that over 87% of PAs intended to renew the registration in the future, while only 73% of private organizations intended to renew (Merli et al., 2016).

3. The EMAS stagnation

Italy, by the end of 2015, recorded nearly one thousand EMAS registrations. Nevertheless, in recent years, the ratio between new registrations and withdrawals has been negative. In 2012, for the first time, withdrawals (121) exceeded new registrations (79), determining a negative growth trend. This negative trend was observed also in 2014 and 2015 (Figure 1).

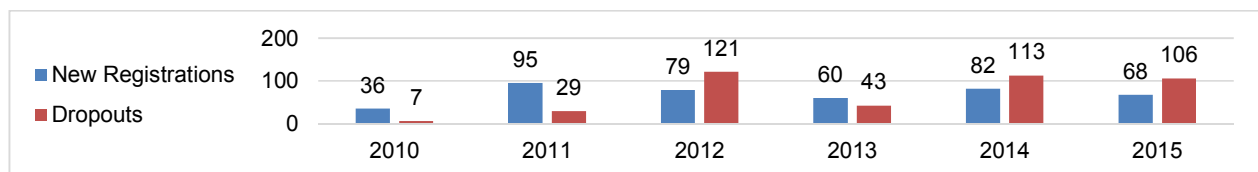


Figure 1. Comparison of new EMAS registrations and non-renewals in Italy between 2010 and 2015. Source: Authors' elaboration based on ISPRA dataset.

Between 2010 (year of effective entry into force of EMAS III – Regulation EC 1221/2009) and the end of 2015, 419 organizations dropped out of EMAS, while 420 activated a new registration. Thus, while

for ISO 14001 there has been a generalized growth, EMAS in the last lustrum has substantially remained in a steady state (ISPRA (Italian National Institute for Environmental Protection and Research), 2015). Considering the activity sector using the NACE codes, organizations that did not renew EMAS belong mainly to the NACE code 84, corresponding to PA (20.29%). Of these all of the organizations are represented by NACE code 84.11, corresponding to “General public administration activities”(European Parliament, 2006). Second and third activity sectors are “Manufacture of food products” (9.79%) and “Electricity, gas, steam and air conditioning supply” (7.64%). Considering active registrations, the most widespread activity sectors are “Waste collection, treatment and disposal activities; materials recovery” (22.83%), PA (18.01%), and “Electricity, gas, steam and air conditioning supply” (12.01%) (ISPRA (Italian National Institute for Environmental Protection and Research), 2015).

4. Research questions

Both at European and Italian level, the EMAS is living a period of crisis. As it is an important part of the European strategy for sustainable development and Circular Economy implementation, it is crucial to understand why organizations are dropping out of it, and how to encourage these organizations to come back EMAS is implemented by all kinds of organizations, regardless of the sector. Therefore, there might exist significant differences with regard both to motivations for dropping out of it and demand for enabling measures. In Italy, PA represent the second most widespread EMAS sector, with over 180 Municipalities. Moreover, this sector has experienced the majority of abandonments since 2010, with 72 organizations. Given the different scope and aim that a private-owned organization has compared to a PA, it is relevant for the general purpose of this study to understand if there are significant difference between these two groups. Thus, two main research questions arise.

RQ1: Is there a significant difference in the motivations for dropping out of EMAS and the nature of the organizations (PAs and private-owned organizations)?

RQ2: Is there a significant difference in the measures that would re-encourage organizations to resume EMAS registration and the nature of the organizations (PAs and private-owned organizations)?

5. Materials and methods

In order to answer these research questions, we conducted a survey, targeting all Italian organizations that did not renew the EMAS registration between 2010 and 2015. The list of organizations was provided by ISPRA. We decided to select organizations since that dropped out between 2010 and July 2015, because in 2010 the last revision of the Scheme (EMAS III) entered effectively into force, and, moreover, a strong growth of drop outs was firstly observed.

The survey was built on the main findings of some focus groups that took place in February 2015 at ISPRA. The goal was to figure out the critical aspects of EMAS implementation and to propose enabling measures to re-launch EMAS, considering the forthcoming revision of the Regulation. Thus, the items proposed in the questionnaire where based on findings of the previously conducted focus groups (Capra et al., 2015). The questionnaire is divided in three main sections. In the first, the potential motivations of EMAS drop out were listed. In the second, we placed the potential measures to be implemented in order to re-encourage organizations to resume EMAS in the future. On a Likert scale ranging from 1 to 6 (1 = “not important” and 6 = “very important“.), organizations were asked to indicate the level of importance of EMAS drop out motivations and the level of appreciation for the enabling measures proposed. In the last section, general information about the organizations was sought: size, NACE code, location, and years of EMAS registration.

The initial dataset consisted of the 379 Italian organizations that did not renew EMAS between 2010 and July 2015. after the exclusion of 40 organizations that did not exist anymore at the time of the investigation, the potential respondents dropped to 339 organizations. There were 99 respondents, with a response rate of 29.20%. Given the context, the response rate can be considered as satisfactory. and consistent with other major surveys conducted in the field of EMS certification (De Oliveira et al., 2010; Heras-Saizarbitoria et al., 2015a, 2015b; Martin-Pena et al., 2014; Phan and Baird, 2015; Schylander and Martinuzzi, 2007).

5.1 Data analysis

In order to figure out if there exist significant differences between these two groups (PAs and private-owned organizations), we performed the Mann-Whitney U test, that allows comparison between two groups without making the assumption that values are normally distributed, as the variables in the questionnaire are expressed with a categorical scale, which is not normally distributed (Brunner and

Langer, 2000; Corder and Foreman, 2014; Mann and Whitney, 1947; Nachar, 2008). Then to investigate the relationship between groups and variables, we performed a Spearman's Rank-order correlation, a non-parametric correlation (Corder and Foreman, 2014; Spearman, 1904).

6. Results

6.1 RQ1 Motivations for dropping out of EMAS: PA vs. private-owned

RQ1 investigates if there are significant differences between PA and private-owned organizations considering motivations for not renewing the EMAS. Considering dropping out drivers, the Mann-Whitney U Test indicates that for two items there is a significant statistical difference between the two groups. In particular, for internal difficulties within the organization the exact significance level (2-tailed) is associated with a p-value of 0.003, while for lack of exposure due to low public awareness of EMAS the p-value has a significance level of 0.001 (Table 1). This difference is confirmed also through the Spearman correlation, whose coefficient is significant for the same items (Table 2).

Item	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Mann-Whitney U
Internal difficulties within the organization	0.004	0.003	743
Costs of the EMS maintenance	0.875	0.878	1,113.5
Lack of exposure due low public awareness of EMAS	0.000	0.000	653
Lack of permanent bureaucratic and administrative simplifications	0.871	0.873	1,112.5
Lack of improvement in relationships with the competent authorities	0.056	0.056	875.5
Management choice	0.541	0.544	1051.5
Lack of economic savings	0.311	0.314	997.5
Lack of improvement in environmental performance	0.632	0.638	1,069.5

Table 1. Mann-Whitney U test between PA / private-owned and motivations for dropping out of EMAS.

Item	PA1_Private0
Internal difficulties within the organization	.293**
Costs of the EMS maintenance	-0.016
Lack of exposure due to low public awareness of EMAS	-.364**
Lack of permanent bureaucratic and administrative simplifications	0.016
Lack of improvement in relationships with the competent authorities	-0.193
Management choice	-0.062
Lack of economic savings	-0.102
Lack of improvement in environmental	0.048

** Correlation is significant at the 0.01 level (2-tailed). - PA: PA – Private: Private-owned organizations

Table 2. Spearman Rho correlation coefficient between motivations for dropping out of EMAS and PAs / private-owned organizations (PA: 1 – Private: 0).

Table 3 shows the differences between the two groups, confirming that internal difficulties are more related to PAs, while the lack of exposure due to low public awareness of EMAS is more significant for private organizations. Nevertheless, both groups consider costs as a major dropping out driver (PA mean 4.56 – Private mean 4.65). While for PAs cost is the major motivation, for Private companies the lack of recognition about EMAS by the stakeholders is the main driver (mean 4.78).

Item	PA		Private		Difference	
	Score 5-6	Mean	Score 5-6	Mean	Gap %	Gap Mean

Internal difficulties within the organization	44.40%	3.97	22.20%	2.84	22.20%	1.13
Costs of the EMS maintenance	58.30%	4.56	69.80%	4.65	-11.50%	-0.09
Lack of exposure due low public awareness of EMAS	38.90%	3.42	66.70%	4.78	-27.80%	-1.36
Lack of permanent bureaucratic and administrative simplifications	58.30%	4.31	58.70%	4.41	-0.40%	-0.1
Lack of improvement in relationships with the competent authorities	25.00%	3.19	42.90%	3.90	-17.90%	-0.71
Management choice	41.70%	3.58	42.90%	3.81	-1.20%	-0.23
Lack of economic savings	41.70%	3.47	49.20%	3.95	-7.50%	-0.48
Lack of improvement environmental performance	33.30%	3.14	20.60%	2.92	12.70%	0.22
N		36		63		
PA: PAs - Private: Private-owned organizations						

Table 3. Motivations for dropping out of EMAS for PA / private-owned (scores 5-6, mean, difference between groups).

6.2 RQ2 Enabling measures to encourage EMAS registration in PA and private-owned organizations

As above, to answer RQ2 we verified through the application of a Mann-Whitney U Test the significant differences between the two groups. In this case, four items differ significantly (Table 4).

Item	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Mann-Whitney U
Reduction of costs to obtain EMAS registration	0.521	0.525	1,049
Request of the EMAS registration as a requirement by supply chain partners (customers / suppliers)	0.005	0.005	758
Greater importance of EMAS in public tenders (GPP) compared to ISO 14001	0.605	0.608	1,065
Greater importance of EMAS in the public funding mechanisms compared to ISO 14001	0.602	0.607	1,066
Greater importance of EMAS in obtaining public funding (European, national, regional funding)	0.205	0.206	975
Increasing permanent bureaucratic and administrative simplifications (e.g. Longer Permits and / or simplifications for obtaining approvals and permits)	0.439	0.441	1,038.5
Financial facilities (reduction of fees, charges and rates for inspections, controls, environmental preliminary expenses)	0.127	0.128	943
Increasing tax benefits for the long term (e.g. Reduction of the Italian Regional Tax on Productive Activity (IRAP), reduction of environmental hygiene tax etc.)	0.000	0.000	605.5
Reduction of inspections by the competent authorities	0.004	0.004	749
Greater commitment / investment by the government in the promotion of EMAS knowledge to citizens and consumers	0.038	0.037	855.5

Table 4. Mann-Whitney U test between PA / private-owned and enabling measures.

In addition, the correlation coefficients are significant at 0.01 level for the same items. The greater difference relates to potential long-term tax benefits (Rho -0.424), followed by the reduction of inspections by the competent authorities, the request of the EMAS registration as a requirement by supply chain partners, and a greater commitment / investment by the government in the promotion of EMAS knowledge to citizens and consumers. It has to be underlined that all coefficients are negative, meaning that all items are more significant for private-owned organizations (Table 5).

Item	PA1_Private0
Reduction of costs to obtain EMAS registration	-0.065
Request of the EMAS registration as a requirement by the supply chain partners (customers / suppliers)	-0.282**

Greater importance of EMAS in public tenders (GPP) compared to ISO 14001	-0.052
Greater importance of EMAS in the public funding mechanisms compared to ISO 14001	0.053
Greater importance of EMAS in obtaining public funding (European, national, regional funding)	0.128
Increasing permanent bureaucratic and administrative simplifications (e.g. Longer Permits and / or simplifications for obtaining approvals and permits)	-0.078
Financial facilities (reduction of fees, charges and rates for inspections, controls, environmental preliminary expenses)	-0.154
Increasing tax benefits for the long term (e.g. Reduction of the Italian Regional Tax on Productive Activity (IRAP), reduction of environmental hygiene tax etc.)	-0.424**
Reduction of inspections by the competent authorities	-0.292**
Greater commitment / investment by the government in the promotion of EMAS knowledge to citizens and consumers	-0.210*
** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).	

Table 5. Spearman Rho correlation coefficient between enabling measures and PA / private-owned (PA: 1 – Private: 0).

Item	PA		Private		Difference	
	Score 5-6	Mean	Score 5-6	Mean	Gap %	Gap Mean
Reduction of costs to obtain EMAS registration	47.20%	3.89	55.60%	4.25	-0.36	-8.40%
Request of the EMAS registration as a requirement by the commercial partners (customers / suppliers)	27.80%	3.08	57.10%	4.19	-1.11	-29.30%
Greater importance of EMAS in public tenders (GPP) compared to ISO 14001	36.10%	3.53	50.80%	3.79	-0.26	-14.70%
Greater importance of EMAS in the public funding mechanisms compared to ISO 14001	72.20%	4.61	61.90%	4.44	0.17	10.30%
Greater importance of EMAS in obtaining public funding (European, national, regional funding)	77.80%	5.03	66.70%	4.7	0.33	11.10%
Increasing permanent bureaucratic and administrative simplifications (eg. Longer Permits and / or simplifications for obtaining approvals and permits)	77.80%	4.72	77.80%	5.1	-0.38	0.00%
Financial facilities (reduction of fees, charges and rates for inspections, controls, environmental preliminary expenses)	61.10%	4.42	77.80%	5.19	-0.77	-16.70%
Increasing tax benefits for the long term (eg. Reduction of the Italian Regional Tax on Productive Activity (IRAP), reduction of environmental hygiene tax etc.)	41.70%	3.69	88.90%	5.41	-1.72	-47.20%
Reduction of inspections by the competent authorities	36.10%	3.5	66.70%	4.57	-1.07	-30.60%
Greater commitment / investment by the government in the promotion of EMAS knowledge to citizens and consumers	36.10%	3.75	54.00%	4.46	-0.71	-17.90%
N		36		63		

Table 6. Enabling measures for PA / private-owned (scores 5-6, mean, difference between groups).

Findings presented in Table 4 and Table 5 have been examined in more detail in Table 6. Tax benefits are the most important measure to be implemented for private organizations (score 5-6 88.90%, mean 5.41), and this is the item in which the discrepancy is greater (PA score 5-6 41.70%, mean 3.69). On the contrary, for PAs the chance of obtaining public funding through EMAS is the most important measure (score 77.80%; mean 5.03). Another element to consider is that, for PAs, the reduction of inspection is the lower importance-rated item (score 36.10%, mean 3.5), while for private

organizations it is quite significant (score 66.70%, mean 4.57).

7. Discussion and conclusion

The paper presents a re-examination of an investigation we conducted, in collaboration with ISPRA, the Italian Competent Body for EMAS, to identify reasons why organizations do not renew their EMAS certification, and to figure out which measures would be more effective to encourage organizations to move back to certification. The analysis embraced both private-owned organizations and PAs viewpoints separately. We decided to make this differentiation because PAs represent the activity sector that was mostly affected by the phenomenon of decertification. The ratio of the research is twofold. On one hand, the recent increase of EMAS missed renewals, especially in Italy, determined the demand for an in-depth analysis of motivations behind this negative phenomenon. On the other hand, this is a crucial moment for the Regulation, because the EMAS refit process is ongoing.

The sample of the investigation well represents the characteristics of the population that dropped out of EMAS, composed mainly of small-sized organizations. On the other hand, PAs are overrepresented: they constitute 36% of our sample, while in the general population of organizations that did not renew EMAS between 2010 and 2015, their share is about 18% of the total.

Considering motivation for dropping out of EMAS costs are significant drivers for both PAs and private-owned organizations, confirming findings of different researches conducted on Italian registered organizations (Merli et al., 2016, 2010; Niro, 2010). Nevertheless, some differences exist. As pointed by Iraldo et al. (2005), PAs have crucial internal difficulties, mainly linked to employees' motivation and competence (Iraldo et al., 2005). While the lack of exposure due to low public awareness of EMAS is the most relevant factor for private-owned organizations (RQ1).

Considering EMAS enabling measures, tax benefits are considered the most relevant measure to be implemented for private organizations, while for PAs it is not among the most relevant requirements. This can partly be explained because PAs collect part of the taxes paid by firms. On the other hand, PAs consider the possibility of obtaining funding through EMAS as the most important measure to be implemented, probably because funding, especially from the EU, would reduce the financial difficulties, due to the recent budgetary constraints introduced by the Italian central government (RQ2).

Although EMAS has not enjoyed significant success in terms of diffusion, many studies have confirmed that it represents an efficient tool by which companies can reduce their environmental impact, contributing to the ambitious European plan toward the circular economy (Daddi et al., 2014; Heras-Saizarbitoria et al., 2015b; Merli et al., 2016; Vernon et al., 2009). The study aims at supporting public decisor in identifying critical aspects of the EMS, and clarify which measure would turn EMAS to a more attractive instrument. The analysis has shown that, for many aspects, difficulties and expectancies are similar for PA and private-owned organizations, but some relevant differences exists. Thus, it should be further investigated the possibility of differentiating the instruments, considering the major differences existing between PA and private organizations.

The main boundary of the present study is its limitation to the Italian context. Future contributions to better define EMAS strong and weak points should compare perspectives from different European Member States. This could support European institutions to refit EMAS on potentially heterogeneous needs of organizations from several European States.

References

- Ahsen, A. Von, Lange, C., Pianowski, M., 2004. Corporate environmental reporting: survey and empirical evidence. *Int. J. Environ. Sustain. Dev.* 3, 5. doi:10.1504/IJESD.2004.004686
- Angell, L.C., Klassen, R.D., 1999. Integrating environmental issues into the mainstream: an agenda for research in operations management. *J. Oper. Manag.* 17, 575–598.
- Ann, G.E., Zailani, S., Wahid, N., 2006. A study on the impact of environmental management system (EMS) certification towards firms' performance in Malaysia. *Manag. Environ. Qual.* 17, 73–93.
- Arena, M., Azzone, G., Platti, M., 2012. ISO14001: Motivations and benefits in the Italian metal industry. *Int. J. Eng. Bus. Manag.* 4, 1–9. doi:10.5772/54786
- Berry, M., Rondinelli, D., 1998. Proactive corporate management: environmental new industrial revolution. *Acad. Manag. Exec.* 12, 38–50.
- Brunner, E., Langer, F., 2000. Nonparametric analysis of ordered categorical data in designs with longitudinal observations and small sample sizes. *Biometrical J.* 42, 663–675.
- Campos, L.M.S., 2012. Environmental management systems (EMS) for small companies: A study in

- Southern Brazil. *J. Clean. Prod.* 32, 141–148. doi:10.1016/j.jclepro.2012.03.029
- Capra, B., D'Alessandro, B., D'Amico, M., Giardi, G., Parrini, V., Tropea, V., Ubaldini, S., 2015. EMAS Forum 2015: success in consultation with stakeholders.
- Chavan, M., 2005. An appraisal of environment management systems: A competitive advantage for small businesses. *Manag. Environ. Qual. An Int. J.* 16, 444–463. doi:http://dx.doi.org/10.1108/14777830510614321
- Clausen, J., Keil, M., Jungwirth, M., 2002. Literature Study : The State of EMAS in the EU The State of EMAS in the EU Eco-Management as a Tool Literature Study, in: *The EU Eco-Management and Audit Scheme – Benefits and Challenges of EMAS II*. Brussels, pp. 1–60.
- Corder, G.W., Foreman, D.I., 2014. *Nonparametric Statistics: A Step-by-Step Approach*, Second. ed. John Wiley & Sons, Hoboken, New Jersey.
- Daddi, T., Testa, F., Iraldo, F., Frey, M., 2014. Removing and simplifying administrative costs and burdens for EMAS and ISO 14001 certified organizations: Evidences from Italy. *Environ. Eng. Manag. J.* 13, 689–698.
- Darnall, N., Henriques, I., Sadorsky, P., 2008. Do environmental management systems improve business performance in an international setting? *J. Int. Manag.* 14, 364–376.
- De Oliveira, O.J., Serra, J.R., Salgado, M.H., 2010. Does ISO 14001 work in Brazil? *J. Clean. Prod.* 18, 1797–1806. doi:10.1016/j.jclepro.2010.08.004
- Delmas, M. a, 2000. Barriers and Incentives To the Adoption of Iso 14001 By Firms in the United States. *Duke Environ. Law Policy Forum* 11, 105–112.
- Dirección General de Calidad y Evaluación Ambiental. Ministerio de Medio Ambiente (Spain), 2006. Opinion poll regarding the process of revision of the EMAS Regulation (In Spanish). Madrid, Spain.
- Emilsson, S., Hjelm, O., 2007. Managing indirect environmental impact within local authorities' standardized environmental management systems. *Local Environ.* 12, 73–86.
- European Commission, 2016. EMAS: and Graphs. Brussels [WWW Document]. URL http://ec.europa.eu/environment/emas/documents/articles_en.htm (accessed 10.1.16).
- European Parliament, 2006. Regulation EC 2006/1893 "establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No 3037/90 as well as certain EC Regulations on specific statistical domains".
- Glachant, M., Schucht, S., Bultmann, A., Watzold, F., Bültmann, A., Wätzold, F., 2002. Companies' participation in EMAS: The influence of the public regulator. *Bus. Strateg. Environ.* 11, 254–266.
- He, W., Liu, C., Lu, J., Cao, J., 2015. China Economic Review Impacts of ISO 14001 adoption on firm performance : Evidence from China. *China Econ. Rev.* 32, 43–56. doi:10.1016/j.chieco.2014.11.008
- Heras-Saizarbitoria, I., Arana, G., Boiral, O., 2015a. Outcomes of Environmental Management Systems: the Role of Motivations and Firms' Characteristics. *Bus. Strateg. Environ.* 89, n/a-n/a.
- Heras-Saizarbitoria, I., Boiral, O., Arana, G., 2015b. Renewing Environmental Certification in Times of Crisis. *J. Clean. Prod.* 2013. doi:10.1016/j.jclepro.2015.09.043
- Hillary, R., 2004. Environmental management systems and the smaller enterprise. *J. Clean. Prod.* 12, 561–569. doi:10.1016/j.jclepro.2003.08.006
- Iraldo, F., Kahlenborn, W., Rubik, F., Hertin, J., Nielsen, B., 2005. EVER: Evaluation of EMAS and Eco-label for their Revision, EVER. Milan, Italy.
- Iraldo, F., Testa, F., Frey, M., 2009. Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European union. *J. Clean. Prod.* 17, 1444–1452. doi:10.1016/j.jclepro.2009.05.013
- Iraldo, F., Testa, F., Frey, M., Anna, S., 2010. Environmental Management System and SMEs: EU Experience , Barriers and Perspectives, Environmental Management. Intech, Rijeka, Croatia.
- Iraldo, F., Testa, F., Tessitore, S., Daddi, T., 2013. The implementation of the EMAS Regulation in Europe : level of adoption , benefits , barriers and regulatory BRAVE Project – Survey on European EMAS. Pisa, Italy.
- ISPRA (Italian National Institute for Environmental Protection and Reseach), 2015. Italy EMAS statistics URL <http://www.isprambiente.gov.it/it/certificazioni/emas/statistiche> (accessed 10.1.16).
- Jenkins, H., 2006. Small Business Champions for Corporate Social Responsibility. *J. Bus. Ethics* 67, 241–256. doi:10.1007/s10551-006-9182-6
- Lozano, M., Vallés, J., 2007. An analysis of the implementation of an environmental management system in a local public administration. *J. Environ. Manage.* 82, 495–511. doi:10.1016/j.jenvman.2006.01.013
- Mann, H.B., Whitney, D.R., 1947. On a test of whether one of 2 random variables is stochastically larger than the other. *Ann. Math. Stat.* 18, 50–60.

- Martin-Pena, M.L., Diaz-Garrido, E., Sanchez-Lopez, J.M., 2014. Analysis of benefits and difficulties associated with firms' Environmental Management Systems: the case of the Spanish automotive industry. *J. Clean. Prod.* 70, 220–230. doi:10.1016/j.jclepro.2014.01.085
- Massoud, M. a., Fayad, R., El-Fadel, M., Kamleh, R., 2010. Drivers, barriers and incentives to implementing environmental management systems in the food industry: A case of Lebanon. *J. Clean. Prod.* 18, 200–209. doi:10.1016/j.jclepro.2009.09.022
- Mazzi, A., Mason, C., Mason, M., Scipioni, A., 2012. Is it possible to compare environmental performance indicators reported by public administrations? Results from an Italian survey. *Ecol. Indic.* 23, 653–659. doi:10.1016/j.ecolind.2012.05.006
- Meima, R., Starkey, R., 2000. EMAS Survey, EMAS Eastwards. Association des Pratiques du Developpement Durable Sophie Szymkowiak (APDD), St-Etienne, France.
- Merli, R., Lucchetti, M.C., Ippolito, C., 2010. An empirical investigation. The impact of EMAS registration on Italian organizations (in Italian). *Qual.* 3, 54–67.
- Merli, R., Preziosi, M., Ippolito, C., 2016. Promoting Sustainability through EMS Application: A Survey Examining the Critical Factors about EMAS Registration in Italian Organizations. *Sustainability* 8, 197.
- Merli, R., Preziosi, M., Massa, I., D'Amico, M., 2014. EMAS Regulation in Italian Clusters: Investigating the Involvement of Local Stakeholders. *Sustain.* 6, 4537–4557. doi:10.3390/su6074537
- Moors, E.H., Mulder, K.F., Vergrag, P.J., 2005. Cleaner production: barriers and strategies in the base metals producing industry. *J. Clean. Prod.* 13, 657–668.
- Morrow, D., Rondinelli, D., 2002. Environmental Management Systems : Motivations and Results of ISO 14001 and EMAS Certification. *Eur. Manag. J.* 20, 159–171. doi:10.1016/S0263-2373(02)00026-9
- Nachar, N., 2008. The Mann - Whitney U: A Test for Assessing Whether Two Independent Samples Come from the Same Distribution. *Tutor. Quant. Methods Psychol.* 4, 13–20.
- Niro, M., 2010. Interviews with 5 municipalities who dropped out of the EMAS registration (in Italian), Trentino Agency for Environmental Protection. Italy.
- Nogueiro, L., Ramos, T.B., 2014. The integration of environmental practices and tools in the Portuguese local public administration. *J. Clean. Prod.* 76, 20–31. doi:10.1016/j.jclepro.2014.03.096
- Phan, T.N., Baird, K., 2015. The comprehensiveness of environmental management systems: The influence of institutional pressures and the impact on environmental performance. *J. Environ. Manage.* 160, 45–56. doi:10.1016/j.jenvman.2015.06.006
- Pomas, L.E., Fotopoulos, C. V., Kafetzopoulos, D.P., 2011. Difficulties and benefits in implementing the ISO 14001 Environmental Management System. *Manag. Environ. Qual. An Int. J.* 22, 502–521.
- Preziosi, M., Merli, R., Coppola, A., 2016a. An Analysis On The Organizations That Withdrew From EMAS Registration And The Role Of Public Institutions' Measures, in: XXVII Congresso Nazionale Di Scienze Merceologiche Qualità & Innovazione Per Una Economia Circolare Ed Un Futuro Sostenibile. Viterbo, Italy, pp. 512–524.
- Preziosi, M., Merli, R., D'Amico, M., 2016b. Why Companies Do Not Renew Their EMAS Registration? An Exploratory Research. *Sustainability* 8, 1–11. doi:10.3390/su8020191
- Ridolfi, R., Andreis, D., Panzneri, M., Ceccherini, F., 2008. The application of environmental certification to the Province of Siena. *J. Environ. Manage.* 86, 390–395. doi:10.1016/j.jenvman.2006.04.013
- Schylander, E., Martinuzzi, A., 2007. ISO 14001 – experiences, effects and future challenges: a national study in Austria. *Bus. Strateg. Environ.* 16, 133–147.
- Scipioni, A., Mazzi, A., Mason, M., Allegro, R., 2015. Benefits, costs, and expectations from ISO 14001 certification for Italian organizations (in Italian), Cesqua-Sincert.
- Skouloudis, A., Jones, K., Sfakianaki, E., Lazoudi, E., 2013. EMAS statement: Benign accountability or wishful thinking? Insights from the Greek EMAS registry. *J. Environ. Manage.* 128, 1043–1049.
- Spearman, C., 1904. The proof and measurement of association between two things. *Am. J. Psychol.* 15, 72–101.
- Sprent, P., Smeeton, N.C., 2007. Applied nonparametric Statistical Methods. CRC Press Taylor & Francis Group, Florida.
- Steurer, R., Langer, M., Konrad, A., Martinuzzi, A., 2005. Corporations, Stakeholders and Sustainable Development I: A Theoretical Exploration of Business–Society Relations. *J. Bus. Ethics* 61, 263–281. doi:10.1007/s10551-005-7054-0
- Turk, A.M., 2009. The benefits associated with ISO 14001 certification for construction firms: Turkish case. *J. Clean. Prod.* 17, 559–569. doi:10.1016/j.jclepro.2008.11.001
- Vernon, J., Peacoc, M., Belin, A., Ganzleben, C., Candell, M., 2009. Study on the Costs and Benefits of EMAS to Registered Organisations, Milieu Ltd and Risk and Policy Analysis Ltd.
- Von Malmborg, F., 2003. Environmental Management Systems: What is in it for Local Authorities? *J.*

