



An Assessment of the EMAS Standard in Developing an Effective Environmental Strategy: An Analysis of Certified Companies in Italy

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Abstract

Purpose: The study provides an overview of the Eco-Management and Audit Scheme (EMAS) standard and its potential in helping a company to improve its environmental performance. The work aims to investigate company's perception towards the implementation of the EMAS environmental management system with the benefits and the critical areas derived from it, the overall assessment of the certification and its possible future developments.

Methodology: The study develops an empirical analysis of Italian EMAS III certified companies, through the administration of a questionnaire to all those Italian companies that were EMAS certified and that provided a valid e-mail address on the EMAS register. Overall, 231 Italian companies took part in the survey.

Findings: The results confirm the heterogeneous effects of an Environmental Management System (EMS) depending on the company profile and highlight the positive influence of certification on environmental management. It emerges how the EMAS certification is approached more for internal reasons, and therefore gives more internal benefits to companies that implement it. Moreover, the time from which companies have been certified turns out to be a relevant factor for obtaining environmental and organizational benefits connected with EMAS certification.

Originality: The recent decrease in EMAS registrations has not been sufficiently studied, leaving unsolved questions for scholars, practitioners and policy-makers. Previous studies used a negativist perspective, identifying the barriers that led to the non-renewal of the certification. The present study aims to focus on the positive factors, which have led still active companies to renew the certification.

Key words: Environmental Management, ISO 14001, Sustainability, Quantitative methods, Quality Management, Management Systems.

1. Introduction

Nowadays an important element of discussion in the literature concerns the environment and the dimensions of emergency and complexity that characterize it. This evolution has led to a progressive and profound transformation in the Business-Environment relationship, setting new constraints and opening unexpected opportunities (Bedi and Puri, 2019). It is well established that to compete in the actual globalized market scenario, companies have to go beyond the purely economic objective, developing also social and environmental strategies (Freeman, 1984) in order to satisfy all the requirements of its internal and external stakeholders. As for environmental aspects, in order to meet stakeholder interests, companies have to introduce environmentally related measures, integrating environmental management into their operations (Martin-Pena et al., 2014). Bocken et al., (2014) found that in order to face global issues, companies need to develop new business models for environmental sustainability, changing the way organizations create value. Environmental Management Systems (EMSs) are a way in which companies can internalize environmental problems (Steurer et al., 2005), demonstrating a proactive approach to sustainable development. At the same time, obtaining an environmental certification represents a relevant achievement for an organization,

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3 since it demonstrates its commitment to environmentally sustainable production processes
4 (Canestrino et al., 2020).

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6 Therefore, the aim of this study is to investigate how the EMAS certification, an EMS settled by the
7 European Union, fits into the companies that have obtained it and, ultimately, whether it is a valid
8 tool to improve its environmental performance. From the 70's the European Commission has begun
9 to trace the path of a Community Environmental Policy through the creation of several Environmental
10 Action Programs. The growing importance of the environment lead companies to re-evaluate the
11 relationship with it, since the economic development could not proceed if it was not accompanied by
12 a progressive environmental awareness (Dunkley and Franklin, 2017; <http://ec.europa.eu>).

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14 The Eco-Management and Audit Scheme (EMAS), Regulation (EU No. 1221/2009), is a European
15 Environmental Management System established in the mid-1990s. It is one of the voluntary
16 instruments set up under the European's Fifth Environment Action Program. The regulation was
17 adopted for the first time by the European Council on June 29th 1993. In two amendments after that,
18 the EMAS regulation was opened to the non-productive sector (EMAS II, 2001) and extended to
19 commercial locations outside the EU (EMAS III, 2009). A central component of the EMAS regulation
20 is the ISO 14001 international environmental management standard (Murmura et al., 2018). In
21 addition to the main content of the regulation on the implementation of an EMS, the EMAS regulation
22 focuses primarily on measurable improvements in operational environmental protection and
23 environmental performance. The main purpose of EMAS is to promote improvements in the
24 environmental efficiency of industrial activities allowing a company to set its objectives and to
25 communicate to the public the commitments made towards the Environment. Since the adoption of
26 the EMAS regulation, Italian companies have excelled among European countries through a large
27 number of participants that has increased over the years. According to EMAS official statistics at
28 April 2020 in total in Europe there were 3652 organizations and 12515 sites certified with EMAS
29 scheme, and Italy is at the second place with 991 organizations and 4918 sites, preceded only by
30 Germany with 1134 organizations and 2214 sites (EMAS, 2020). However, recently from the study
31 of Matuszak-Flejszman et al., (2019) and Daddi et al. (2018) the necessity to review the effectiveness
32 of EMAS emerged, due to the fact that many organisations do not renew their EMAS certificates.
33 The study of Matuszak-Flejszman et al (2019) showed how in countries such as Italy, Spain and
34 Germany, a negative trend (considered as the difference between new registrations and
35 abandonments), in the number of EMAS certifications has been noticed (Merli and Preziosi, 2018,
36 Merli et al. 2018; Alina 2019). It was also found that the majority of companies that have left the
37 certification between 2010 and 2015 were small-sized organizations (54.18%), while they account
38 for 30.71% of active registrations (Merli et al. 2018). The trend of decertification may be influenced
39 by the financial and economic difficulties organizations faced during the latest economic crisis. In
40 fact while many organizations are driven by a short-term orientation, investments generally have
41 long-term return (Heras-Saizarbitoria et al., 2016). Other studies that will be considered in the
42 literature review section have tried to evaluate this phenomenon, however this recent decrease in
43 EMAS registrations has not been sufficiently studied, leaving unsolved questions for scholars,
44 practitioners and policy-makers. While these studies used a negativist perspective, identifying the
45 barriers that led to the non-renewal of the certification, the present study aims to focus on the positive
46 factors, which have led still active companies to renew the certification. This study tries to give a
47 contribution to the literature and to managers evaluating which factors were perceived as absolutely
48 positive by the certified companies and which prompted them to want to renew the EMAS
49 certification. This study has tried to fulfill the gap underlined by Merli and Preziosi (2018), who said
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3 that further investigation would be needed to identify which variables determine the predisposition to
4 maintain EMAS.

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6 Therefore, the following investigation was conducted with the aim of addressing this gap, giving a
7 contribution to the contradictory findings of the literary landscape by evaluating the implementation
8 of the EMAS system within the organisation; identifying the EMAS advantages recognized by the
9 participants and the overall perception on the certification itself and identifying the success factors
10 that have led and will lead to the renewal of the EMAS certification. This will lead to the identification
11 of potentials for the future structuring of the EMAS system and the areas of improvement considered
12 most relevant for the participating companies.

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14 Therefore, the research questions that the paper investigates are:

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17 *RQ1: What is the profile type of EMAS III certified companies?*

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19 *RQ2: What are the main motivations for EMAS III adoption, and what advantages do companies*
20 *obtain from it?*

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22 *RQ3: What are the main success factors that lead to the renewal of the EMAS III certification?*

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24 The paper is structured as follows: section two carries out an analysis of the main EMSs; focusing on
25 the reasons that led companies to obtain EMAS III certification and on the main benefits obtained;
26 section three describes the methodology used; section four presents the main results and discusses it
27 while section five draws conclusions, underling the main practical and theoretical implications of this
28 study and define the main limitation of it.

31 **2. Literature Review**

32 *2.1 Environmental Management Systems*

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34 In recent years, the ecological environment keeps deteriorating and environmental problems are
35 receiving global increasing attentions (Ingold et al., 2019).

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37 An EMS is a worldwide instrument that can be applied by any type of organization in order to improve
38 the management of their environmental aspects and achieve a continuous improvement of
39 environmental performance. The adoption of EMSs as frameworks for integrating corporate
40 environmental protection policies, programs, and practices is growing among both domestic and
41 multinational companies (Morrow, Rondinelli, 2002; Heras and Arana, 2010). The potential benefits
42 associated with the adoption of environmental management systems make it a key tool among the
43 environmental tools that a policy maker should use in an integrated way to combine environmental
44 protection and more sustainable consumption and production (Boiral et al., 2018). In addition,
45 Member States and local authorities are supporting the adoption of EMAS and ISO 14001 through
46 various regulatory reduction and incentive measures such as extending the duration of environmental
47 permits, reducing inspections, tax benefits, etc (Erauskin-Tolosa et al., 2019). The international
48 standard ISO 14001 together with the European Eco-Management and Audit Scheme (EMAS) are
49 the main reference standards in terms of EMS (Murmura et al., 2018). Certification according to ISO
50 14001 is not mandatory, but is the result of the voluntary choice of the organization that decides to
51 establish, implement, and improve its own environmental management system. EMAS as ISO 14001
52 is a voluntary certification tool designed by the European Union, with the aim of pursuing continuous
53 improvement of the environmental performance of organizations. EMSs offer the same guarantees:
54 they are equally reliable and very similar, although EMAS is more restrictive (Álvarez-García and de
55 la Cruz del Río Rama, 2016).

EMAS was introduced for the first time in 1993 by EC Regulation no. 1836/1993, after which it underwent two successive revisions: the first, called EMAS II in 2001 through the EC Regulation no. 761/2001 and the second in 2009 through the EC Regulation no. 1221/2009, which introduced the so-called EMAS III. One of the main peculiarities of the latest EMAS review concerns the geographical extension of the scope of the regulation outside the borders of the European Union.

This choice was prompted by requests from some multinational companies motivated by the need to overcome the "trade barrier" function of certification, which was not accessible to companies located outside the European Union before the 2009 revision. In addition to the need to open the Regulation to the global market, the 2009 revision was also motivated by the lack of recognition by the institutions of the registration obtained by the organizations (in terms of stakeholders and regulatory and administrative simplification) and the need to simplify the bureaucratic registration process, particularly complex especially for small / medium-sized enterprises (SMEs) (<https://eur-lex.europa.eu>).

Since 2001, the EMAS Regulation has incorporated the requirements of an EMS according to the ISO 14001 standard; for this reason, the innovations introduced by the latest ISO 14001:2015 revision have also been recently incorporated into the EMAS Regulation. Nevertheless, it is also possible to highlight significant differences between them. Preziosi et al., (2016) argue that generally, the adoption of the two standards is motivated by different factors: the adoption of ISO 14001 is more motivated by external factors, such as pressures from industry associations and customers; on the other hand, the adoption of EMAS seems to be driven more by internal reasons.

Another difference relates to the main objective of the EMS, namely the improvement of environmental performance: although both systems have a positive impact in energy-intensive sectors, ISO 14001 was more effective in the short term (de Vries et al., 2012), while EMAS achieves better results in the long run (Merli et al., 2018).

Furthermore, the two EMSs differ in terms of the perception of added value. Preziosi et al., (2016) underline that one of the main reasons why some organizations have chosen not to renew their EMAS registration is linked to the lack of perception of the added value of certification with respect to ISO 14001, especially due to the fact that the latter is most requested by customers. From the same study mentioned above it was found that one of the main problems faced by SMEs when considering the possibility of EMAS registration is the existence of some undefined costs, mostly related to the implementation phase of the system (Iraldo, et al., 2010). The study conducted by Preziosi et al. (2016) showed that starting from 2012 a negative trend in EMAS registrations was observed for the first time, especially by small-sized companies located in Southern Italy. This phenomenon can only be partially explained by the conditions of the Italian economic system in those years, since the diffusion of ISO 14001 in Italy in the same period saw a growing trend (Merli and Preziosi, 2018, Merli et al. 2018; Matuszak-Flejszman et al., 2019).

The reasons for this decrease in registrations are to be found, according to the authors, in the evidence of the literature on the subject, which recognize the presence of barriers to the adoption of an EMS linked to the lack of human and financial resources to invest. Moreover it seems that companies have no incentives to be certified, since customers are not interested to this certification and public institutions do not give the necessary recognitions to it (Merli et al. 2018; Matuszak-Flejszman et al., 2019). Moreover, small companies have shorter-term plans and fail to see the long-term benefits of investing in sustainability (Preziosi et al., 2016).

2.2 EMAS III: main drivers of adoption and advantages obtained from the certification

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3 In many countries the national legislation stimulates the choice of the EMAS system. Past researches
4 showed that organizations with EMAS recorded superior results for eco-management in comparison
5 with other systems and can benefit from a preferential treatment in the selection procedures for
6 contracts, loans granting, closing insurance contracts, accessing European funds (Álvarez-García et
7 al., 2018). Institutional pressure is a relevant factor in EMAS adoption: Daddi et al., (2016) found
8 that the performance of EMS was associated with different types of institutional pressures and Testa,
9 Boiral and Iraldo (2018a) revealed that in general this pressure strengthens EMAS adoption.

10 Another relevant contribution was provided by Rennings et al. (2006): through a survey of 1277
11 EMAS-registered German facilities and 12 in-depth case studies, the authors found that
12 environmental managers consider the implementation of EMAS to be a substantial contribution to
13 the introduction of environmental innovations, especially organizational ones. The study by Daddi
14 et al. (2011) analysed the trends in environmental performance of a sample of 64 Italian companies
15 from six different industrial sectors that have achieved EMAS registration for at least three years. In
16 particular, the authors analysed the influence of the EMAS registration on the improvement of
17 environmental performance, and the ability of this tool to move forward continuous improvement,
18 which is a fundamental principle of the systems of certifications of environmental management. The
19 data obtained indicate that EMAS positively influences performance on some environmental aspects
20 like water consumption, waste and emissions into the atmosphere.

21 Research studies have found that joining EMAS results in many advantages for companies such as
22 increased knowledge about the impact of company activities on the environment (Novelli et al., 2020)
23 and continuous compliance and updating on environmental laws and regulation (Merli et al., 2018;
24 Novelli et al., 2020). Moreover, EMAS permits the rationalisation of activities through a set of
25 procedures and operational instructions that systematically reorganize the ways of proceeding and
26 increase the company's efficiency (the objectives are clearer, the responsibilities better defined, the
27 procedures are simpler etc). This also allows a company to respond more quickly to market changes
28 (Testa et al., 2014). Preziosi et al., (2016) found that EMAS was perceived as an ecological distinction
29 for enterprises and non-commercial institution, that EMAS certified organizations are among the
30 companies who defined the best solutions in the field of environmental protection and eco-innovation,
31 and are considered a benchmark for assessing environmental performance.

32 Among other benefits perceived from EMAS implementation there is the improvement of the
33 relations with the stakeholders and the local community (Álvarez-García et al., 2018; Novelli et al.,
34 2020); the growth in the motivation of employees and their participation, with a consequent reduction
35 of internal conflicts (Steyrer and Simon, 2012); cost savings, in particular energy, raw materials,
36 waste disposal, personnel (thanks to the optimization of processes) (Nikolaou et al., 2016; Daddi et
37 al. 2018); accident risk reduction with the identification of areas of inefficiency of production
38 processes (Merli et al., 2016) and the gain or maintenance of market shares especially for companies
39 that export to countries with a strong environmental culture (Testa et al., 2018b; Merli and Preziosi,
40 2018). It is also relevant the improvement of the corporate image, due to the use of the EMAS logo
41 and to the environmental declaration as public documents (Testa et al., 2014).

42 Previous studies (e.g., Daddi, et al., 2011; Testa et al., 2014; Erauskin-Tolosa et al. 2020) have
43 underlined that time is an important variable in evaluating the benefits of implementing an EMS; in
44 detail, firms that are certified from more time have greater awareness of the opportunities that could
45 gain from environmental improvement.

46 A peculiar and very important driver, which differentiates the EU scheme from other forms of
47 certification such as ISO 14001 is represented by the communicational dimensions of EMAS. As
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3 reported by the relevant literature on environmental reporting and EMAS statements (Neugebauer,
4 2012; Testa et al., 2014;), the willingness to communicate with the stakeholders could be a powerful
5 driver for EMAS registration. Some studies underline that, in some cases, EMAS has been preferred
6 over ISO 14001 due to the possibility to use and diffuse credibly validated environmental information
7 (Searcy et al., 2012; Testa et al., 2014). Nevertheless, it has also been noticed that in contrast with
8 this motivation, few companies are proactively using the EMAS environmental statement as a
9 communication tool towards the stakeholders and the market.

10
11 Other recent studies, based on the analysis of environmental statements published by EMAS-
12 registered companies, such as those of Testa et al., (2018b) and Heras-Saizarbitoria et al., (2020)
13 show, on the contrary, that EMAS implementation and certification “does not generate significant
14 environmental performance improvements, and that this instrument is a form of symbolic
15 environmentalism” (Testa et al., 2018b, p. 64). The increase in the number of organizations that
16 decide to not renew the EMAS registrations is recent (Heras-Saizarbitoria et al., 2016) and the reason
17 behind decertification remained largely unexplored as underlined by Merli et al. (2018). It seems that
18 EMAS certification is more adopted in these sectors where there is a wider regulatory relief (Daddi
19 et al., 2014), and that some organizations do not renew the registration due to the lack of recognition
20 by the market and other external stakeholders (Daddi et al., 2018). In other cases, it seems that it is
21 the lack of additional regulatory relief and incentives, followed by the decision to use other
22 environmental management tools as the main motivations not to renew the standard (Merli et al.,
23 2018). Therefore, it seems very relevant to understand what are the factors that positively distinguish
24 EMAS certification, which could consequently lead companies to improve their organizational and
25 environmental performance and remain certified.
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35 **Methodology**

36 *3.1 Data collection*

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38 The research was conducted through the administration of a questionnaire: the organizations invited
39 to participate to the survey have all been EMAS certified in 2018 (starting date of the investigation)
40 and that provided a valid e-mail address on the EMAS register.

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42 The identification of the EMAS certified companies operating in Italy was made possible owing to
43 the consultation of the European Commission register, available at the website:
44 <http://ec.europa.eu/environment/emas/register/>. As stated in EMAS regulation, the list of
45 Organizations that are EMAS certified is public and therefore accessible to anyone who wants to
46 consult it. The questionnaire was sent precisely to 839 Italian addresses.

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48 The questionnaire has been administered by email, following a two-step administration, that is, it has
49 been sent again 2 weeks after the first submission, in order to give the possibility to those companies
50 that did not have fill it out, to do this.

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52 The survey began on December 13th, 2018 and responses were accepted until February 28th, 2019.
53 The initial deadline for completing the questionnaires was scheduled for January 14th 2019, but it was
54 extended since some companies requested more time for answering the survey since they found
55 problems in compiling it because of their computer security system; therefore, it was then sent in .pdf
56 format to those who requested it.

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58 At the beginning of the survey, companies were asked to have the person who is responsible in
59 managing the EMAS III certification to answer to the survey in order to have reliable answers.
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3 Overall, 231 Italian companies (27,5% of the total of Italian addresses) took part in the survey.
4 Considering the investigations conducted in the previous years, it should be emphasized that the
5 number of organisations involved and the response rate has remained quite high. Accredia, the Italian
6 National Accreditation Body operating under the vigilance of the Ministry of Economic
7 Development, indicate that for this kind of investigation, a response rate around 10% can be
8 considered as a good result (Scipioni et al., 2015).
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11 The questionnaire administered was divided into four sections: section 1 collected general
12 information of the companies such as the business sector, geographical location, company's turnover,
13 number of employees and the reference market. Section 2 considered companies' experiences in
14 implementing EMAS. In this section, companies were asked about the implementation of the EMAS
15 system within the organization as for example the drivers that lead the company to obtain the
16 certification, the amount of time necessary to fulfil EMAS requirements, the financial costs, the
17 necessary personnel and the years of certification. Subsequently section 3 took into consideration of
18 advantages and incentives associated to EMAS. Questions from this section focused on the economic,
19 organizational and environmental benefits and incentives linked to the certification. Finally, section
20 4 evaluated the overall satisfaction of companies with EMAS system and the future structuring of
21 EMAS, considering companies decision whether to continue or not with the EMAS system and
22 wishes in terms of improvement. The questionnaire can be found in its full form in Appendix A.
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25 The questionnaire has been developed with Google Forms format and was sent to the e-mail address
26 provided by the company on the EMAS register, together with a letter of presentation of the research
27 and its scope. The methods of conducting the survey made it possible to exploit Internet
28 communication, which is simpler and more immediate, thus it can favour the participation of
29 organizations and increase the percentage of responses.
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32 To translate the theoretical domain empirically (Forza, 2002), questionnaire items were constructed
33 following the main findings in the literature about motivations to implement an EMS and the main
34 benefits and incentives obtained from its implementation. Table B1, in Appendix B shows the
35 relationship between the main items of the questionnaire and the reference literature.
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39 40 *3.2 Data analysis*

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42 The aim of the research was to develop an exploratory analysis (Malhotra and Grover, 1998) using
43 an inductive research approach (Eisenhardt, 1989), in order to analyze the main motivations, benefits
44 and incentives to the implementation of an EMAS III EMS.

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46 Descriptive analysis was performed to describe the sample profile of respondent companies. A five-
47 point Likert scale was used to evaluate companies' perceptions on EMAS III. A pilot survey
48 (Malhotra and Grover, 1998; Forza, 2002) has been developed before proposing the questionnaire to
49 the whole sample of companies, owing to the help of five companies of the sample that agreed to test
50 the survey. The companies were chosen randomly; they have been phone called, explaining them the
51 research objective and the need to test the survey. The survey items were then revised based on their
52 feedback. A set of tests compared respondents who answered to the questionnaire during the first and
53 the second administration, in order to exclude non-response bias (Armstrong and Overton, 1977). All
54 t-test comparisons between the means of the two groups showed insignificant differences ($p < 0.1$
55 level).
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58 The reliability of the items has been tested using the Cronbach's alpha test, taking account only values
59 greater than 0.60 as suggested by Markowski, Markowski, (1990).
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The analysis of Pearson's correlation was performed to evaluate the relationship between socio-demographic features of certified companies, the time and employees needed, and costs held to implement EMAS III.

Finally, a logistic regression model has been used (Bowen and Wiersema, 2004; Hoetker, 2007) to assess which benefits obtained and which motivations in the corporate decision contribute to continue using the EMAS system in the future by companies.

The logistic regression model considers the benefits and motivation to predict the positive judgment and it is estimated as follows:

$$Pr (FA=Yes) = \text{logit} (\beta_0 + \beta_1 COMP_ADV + \beta_2 CUST_SUPP + \beta_3 WORK + \beta_4 EFF + \beta_5 ECON + \beta_6 INCENT + \beta_7 PROM + \beta_8 MARK + \varepsilon) \quad (1)$$

Where:

- FA (Future Adoption) is 1 if the subjective assessment was "Yes, absolutely", while it is 0 if the subjective assessment was "Probably" or "I do not know".
- TYPE_COMP is a dummy variable that is 1 if the company is a service company, while it is 0 if it is a manufacturing one.
- B1 is the improvement of the company's environmental performance, assessed by a five-points Likert scale.
- B2 is the compliance with environmental legislation / minimization of liability risks, assessed by a five-points Likert scale.
- B3 is the participation and involvement of employees, assessed by a five-points Likert scale.
- B4 is competitive and image advantages, assessed by a five-points Likert scale.
- B5 is costs saving, assessed by a five-points Likert scale.
- B6 is identification of ecological products and process innovations, assessed by a five-points Likert scale.
- B7 is better cooperation with the authorities, assessed by a five-points Likert scale.
- B8 is financial advantages, assessed by a five-points Likert scale.
- MFUT1 is continuous improvement of environmental performance, assessed by a five-points Likert scale.
- MFUT2 is philosophy and corporate image, assessed by a five-points Likert scale.
- MFUT3 is greater compliance with environmental legislation, assessed by a five-points Likert scale.
- MFUT4 is employee participation, assessed by a five-points Likert scale.
- MFUT5 is high level of awareness, assessed by a five-points Likert scale.
- MFUT6 is advantages deriving from the environmental declaration, assessed by a five-points Likert scale.
- MFUT7 is financial / tax advantages, assessed by a five-points Likert scale.
- MFUT8 is growing market pressure, assessed by a five-points Likert scale.
- MFUT9 is differentiation from ISO14001, assessed by a five-points Likert scale.

For data processing SPSS 23.0 program, Statistical Package for Social Science has been used.

3. Results and discussion

3.1 Profile of EMAS III certified companies and factor of importance in its adoption

Table 1 shows the profile of EMAS III certified companies participating to this study; they are in majority (61.9%) service companies, of small (42.4%) and medium (35.9%) size, with a turnover between 1-10 million euros (38.5%) and 11-50 million euros (30.7%). These companies are located mainly in the northern and central regions of Italy (58.0%) (the Italian Lombardy region 19.9%; Emilia Romagna 13.9% and Tuscany 12.1%) and have their national market as main reference market (57.1%). The 91.8% of respondents are at least certified with another management system standard; of these, four respondents out of five are ISO 14001 certified (88.3%), 66.7% have the quality management system standard ISO 9001 and 49.8% have the occupation health and safety system

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3 standard OHSAS 18001 that will be superseded in 2021 by the new ISO 45001 already owned only
4 by 0.4% of respondents. This result is in line with previous studies which indicate that the majority
5 of EMAS certified companies have an integrated management system for quality and safety and
6 almost all are at least ISO 14001 certified too (Murmura et al., 2018)

7
8 On average the respondents of the sample are certified from 8,87 years, underling that the EMS
9 adopted by Italian companies are long-lasting and well established (Bravi et. al., 2020). As for the
10 person responsible for the management of the EMAS certification in the company, 36.8% of
11 companies give this responsibility to the environmental manager, 20.3% to the quality manager,
12 13.9% to a technical manager, while 10.9% are employees that run this activity.

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18 Subsequently, the correlation between socio-demographic aspects of companies and EMAS
19 implementations elements has been analyzed, to see if these factors would have influenced the
20 adoption of this standard. From Table 2 it can be seen that companies that have a higher turnover
21 (.288 **), a greater number of employees (.231 **) and are open to international markets (.189 **)
22 have been certified for the longest time with EMAS. This allows to affirm that the size of a company,
23 understood as financial capacity, human resources and importance on the market, is a factor that
24 positively influences the adoption of certification. The studies of Bravi et. al., (2020) and Bravi and
25 Murmura (2021) confirm this result, demonstrating that companies of major dimension are certified
26 for longer time than those of a smaller size that have only approached certification in more recent
27 times. Not by chance, the majority of non-renewals of EMAS certification concern small-sized
28 organizations, due to the major difficulties encountered (Merli et al. 2018). This is especially true for
29 Italy, where Merli and Preziosi (2018), found a negative trend in EMAS registration among small-
30 sized companies located in the South of Italy starting from 2012.

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32 On the contrary, it seems that the time required to implement EMAS certification within one's own
33 organization is not strictly interconnected with any of the factors previously mentioned. This allows
34 to highlight how the certification process for smaller companies is not necessarily more complicated
35 than for larger ones. As it could have been logical, obviously if the company manages to employ a
36 greater number of employees in the certification process, its implementation times are reduced (.204
37 **). Therefore, it seems that the bureaucratic registration process, particularly complex especially for
38 SMEs has been correctly simplified in the 2009 revision process as planned (Preziosi et al., 2016).

39
40 The survey shows how the activities that are more time spending are the redaction of the
41 environmental declaration (mean: 5.54 in a 7-point Likert scale), data collection (mean: 5.46) and the
42 time for filling the documentation, including the environmental management manual (mean: 5.23).
43 Furthermore, 51.9% of respondents answered that they spent from 7 to 12 months for EMAS
44 implementation, followed by 24.2% of companies that spent no more than 6 months for it.

45
46 As for the costs of certification (start-up and maintenance), it seems that these increase, both as the
47 size of the company increases (in terms of turnover, number of employees and opening of the
48 markets), but they seem positively connected, albeit to a lesser extent, to the number of employees
49 participating in the activities (.163*), and above all the results show that they are higher for companies
50 certified for the longest time.

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52 Therefore, it appears that the role of the costs varies significantly, due to the size of the organization
53 (meant as number of employee) and has its relevance for all the categories of companies.

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55 This is in line with the results of Daddi et al., (2018), that found how particularly for smaller
56 organisations, costs can still be a significant factor when deciding whether or not to leave the scheme,
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3 and sometimes it is also difficult to estimate them since there are some undefined costs, mostly related
4 to the implementation phase of the system as found by Iraldo et al., (2010).

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6 [Insert Table 2 here]
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10 3.2 Motivations, benefits and incentives of EMAS III adoption

11 Subsequently, the main motivations for EMAS adoption have been investigated (Table 3). The main
12 reason why companies say they are certified is the willingness to have compliance with environmental
13 legislation (4.55), followed by the improvement of environmental protection (4.48), transparency for
14 corporate environmental policy (4.35), more resource efficiency (4.16), a better impact on customer
15 and suppliers (4.07) and a better competitive advantage and image (4.06). The results show that
16 among the main motivations for EMAS implementation, the two main ones are internal motivations,
17 concerning environmental improvements, even if at the same time there are also external reasons,
18 aimed at improving the image of the company on the markets and its competitiveness. This is partially
19 in line with the studies of Preziosi et al., (2016), Neugebauer (2012), Boiral (2011) and Grolleau,
20 Mzoughi, and Thomas (2007) that found how the adoption of EMAS seems to be driven more by
21 internal reasons, while ISO 14001 adoption is more pushed by external factors (Preziosi et al., 2016).
22 In any case corporate image remains a relevant factor, in fact EMAS thanks to the possibility to use
23 the EMAS logo and to the environmental declaration as a public documents is a good showcase for
24 corporate image, as indicated by Testa et al., (2014).

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29 [Insert Table 3 here]
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32 Considering the benefits obtained from EMAS implementation (see Table 4), the two most perceived
33 are of an internal nature and consider the compliance with environmental legislation, that permits the
34 minimization of liability risks (4.09) and in a lesser extent the improvement of environmental
35 performance (3.77). This is perfectly in line with the study of Merli et al., (2016) that found how
36 EMAS is a tool that can be used for the identification of inefficiency of production processes, and
37 permits the reduction of accident risks. This is in line also with the study of Preziosi et al., (2016),
38 that underlined how EMAS companies are considered a benchmark for assessing environmental
39 performance.

40 As for the incentives obtained from EMAS adoption (Table 4), companies underline as the most
41 relevant, the recognition by national (4.54) and European (4.45) authorities, followed by the raise in
42 public awareness of the EMAS system (4.42), confirming the fact that EMAS certified companies
43 can benefit from a preferential treatment in the selection procedures for contracts, loans granting,
44 closing insurance contracts and accessing European funds (Álvarez-García et al., 2018).

45 Moreover, another benefit perceived is the improvement of competitiveness and market potential
46 (4.03), and this is in line with the results of Testa et al., (2014) that found how EMAS also allows a
47 company to respond quickly to market changes.

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52 [Insert Table 4 here]
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56 Afterwards, motivation to maintain certification in the future has been investigated. Respondents
57 underlined as the major reason to continue being EMAS certified, the advantage of following EMAS
58 philosophy that enhance corporate image (4.33), the ability of certification to ensure environmental
59 compliance (4.29) and its continuous improvement (4.27) and the fact that the EMAS certification
60 raises the business level of environmental awareness (4.00). These results contrast with the literature

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3 which indicates that EMAS certification is adopted only for symbolic purposes (Testa et al., 2018b),
4 since the main reasons that lead companies to continue to maintain this certification are mainly
5 internal, to improve their environmental performance. However, environmental compliance is the
6 second most relevant motivation to continue adopting the standard, therefore it seems to be true that
7 EMAS certification is a more useful tool for companies in those sectors where there is a wider
8 regulatory relief (Daddi et al., 2014)

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11 [Insert Table 5 here]

12 13 14 *3.3 Logistic regression: factors of importance in future EMAS III adoption by companies*

15 Finally, a logistic regression model has been developed to assess which factors positively affects the
16 willingness to maintain the EMAS certification in the future. The tests carried out to verify the
17 goodness of the model (see Tables 6, 7 and 8) indicate its effectiveness (Omnibus test sig. < 0.05;
18 Nagelkerke R-square >.40 and Hosmer and Lemeshow test >0.05). The probability expressed by the
19 model amounts to 78.8% (see Table 9).

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22 [Insert Table 6 here]

23 [Insert Table 7 here]

24 [Insert Table 8 here]

25 [Insert Table 9 here]

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29 Table 10 shows the results of the regression model. The model shows how 5 elements significantly
30 affect the willingness of companies to maintain the certification in the future: among these factors
31 there is the possibility of obtaining through the certification compliance with environmental
32 legislation and the minimization of liability risks (B2) and also the fact that owning EMAS
33 certifications permits to companies to gain financial advantages (B8). Therefore, despite that costs of
34 certification are seen as a barrier to maintaining the certification itself (Iraldo, et al., 2010; Preziosi
35 et al., 2016), Italian companies that decide to keep it do so because from an environmental point of
36 view the certification allows to have financial advantages, underlining how the authorities, both
37 national and European, try to encourage its use, giving related benefits (Álvarez-García et al., 2018).
38 It is also true that, as found by Testa, Boiral and Iraldo (2018a), institutional pressure seems to
39 strengthen EMAS adoption and maintenance over the years.

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44 Among the other factors that influence companies to maintain certification over time there is the
45 willingness to continuously improve their environmental performance (MFUT1), to have compliance
46 with environmental legislation (MFUT3) but also to follow EMAS philosophy and therefore improve
47 corporate image (MFUT2). These results permit to state that companies which continue to use the
48 certification are strongly convinced that this allows them to have corporate improvements for
49 environmental issues, in line with the studies of Daddi et al., (2011), Merli et al., (2018) and Novelli
50 et al., (2020) and that this tool is useful for being in line with environmental laws and constraints.
51 Certainly, organizational improvements can be obtained in longer times, compared to image
52 improvements and this confirms the fact that ISO 14001 has been found as more effective in the short
53 term, while EMAS achieves better results in the long run (Merli et al., 2018).

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57 [Insert Table 10 here]

58 59 60 **4. Conclusion, limitations and future research directions**

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3 The study provides the analysis of Italian EMAS III certified companies, providing expectation and
4 consideration of the EMAS system. The study offers insights and provides basis for further analysis
5 towards the EMAS certification and, overall, towards Corporate Environmental Performance,
6 identifying those winning factors in convincing companies to keep their environmental certifications
7 active in the future. The results of the research give a contribution to the contradictory findings in
8 literature on the reasons behind the recent decrease in EMAS registrations identified; the perspective
9 used is a positive one, evaluating the positive factors which prompted companies to renew the EMAS
10 certification.
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13 This paper is consistent with the increasing body of literature that do not question the effectiveness
14 of certifiable EMS, but debates its heterogeneous effects depending from the implementation context.
15 Secondly, it provides suggestions for further scholarly research, and thirdly, a discussion of
16 implications for practitioners and public decision makers is provided.
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19 The findings of the study confirm the heterogeneous effects of EMS depending on the company
20 profile and highlight the positive influence of certification on environmental management. It emerges
21 how the EMAS certification is approached more for internal reasons, and therefore gives more
22 internal benefits to companies that implement it. Of course, companies having more experience with
23 certified EMS are more likely to find opportunities for environmental improvement, therefore the
24 duration of the certification is a relevant element as suggested by previous researches (Daddi, et al.,
25 2011; Testa et al., 2014). In this regard, this study shows that larger companies, above all, have had
26 the opportunity to be certified for the longest time, due to their higher financial capacity, human
27 resources capability and importance on the market. For this reason, a part of small and medium-sized
28 enterprises, which have been certified more recently, may have decided to withdraw the certification
29 in the last period because they have not obtained significant improvements in their environmental
30 performance in the short term. Therefore, the time from which companies have been certified turns
31 out to be a relevant factor for obtaining environmental and organizational benefits connected with
32 EMAS certification, such as to lead companies to want to continue to maintain the certification in the
33 future as also suggested by the work of Heras-Saizarbitoria et al., (2016).
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36 The results of this study have relevant theoretical and managerial implications. First of all, this study
37 underlines how managers should consider that obtaining benefits from the implementation of an EMS
38 is subject to various company characteristics, including size and turnover and above all by the internal
39 motivations that drive companies to become certified, as also suggested by previous studies of
40 Vílchez (2016) and Boiral et al., (2018).
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43 Moreover, public institutions should play an important role in making the EMAS scheme an efficient
44 tool for making businesses achieving a competitive advantage and efficiency improvements. The
45 EMAS regulation, compared to ISO 14001 has some peculiarities related to environmental reporting
46 and legal compliance checks, and it would be relevant that public institutions and member states
47 would enhance the added value of these elements as peculiarities of EMAS and not in contrast to ISO
48 14001, as also underlined by previous studies (Daddi et al., 2018; Merli and Preziosi, 2018).
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51 Italy has tried to do so by approving law n. 221/2015 for Green Public Procurement, which state that
52 EMAS III certified companies could have reduced financial guarantees when the want to access
53 public tenders.
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56 The results of this study also show that EMAS could be considered a good tool not only to access to
57 public investments, but it could also be used as a strategic tool for the implementation of an efficient
58 environmental strategy, according to sustainable principles of circular economy.
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3 In conclusion, the research has revealed a quite good satisfaction of the standard among those
4 companies adopting it, but the achievement of good results depends on the proactive approach of the
5 company in the implementation of the scheme itself. If adopted with the right approach, EMAS could
6 raise awareness of the environmental impact of organizations' processes, being also a good tool to
7 communicate of the business environmental performance as also suggested by the study of Merli, et
8 al., 2018)

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11 As for the main limitations of the study, first of all, some areas of interest, such as the difference
12 perceived by companies between the EMAS system and the ISO 14001 has not been particularly
13 remarked by the participants of this survey. It would be important that future research considers also
14 the parallel perception of the two EMSs, for those companies that adopt them both, to understand if
15 they are superimposable or complementary. Moreover, it would be relevant that future research would
16 give a specific focus and attention to small organizations, which represent over 95% of European
17 firms and are those that show most of the problems in carrying out this certification scheme.
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Appendix A – Questionnaire addressed to EMAS certified companies

The following questionnaire is aimed at all Italian companies that are currently (December 2018) EMAS certified. Its purpose is to collect data and information - which will be analyzed in an anonymous and aggregate form. The questionnaire consists of 25 questions which we kindly ask you to answer as truthfully as possible.

SECTION 1 OF 5 - General information

1. Please indicate the type of company:

- Manufacturing company
- Service company

2. Please indicate your business sector:

3. Please indicate company turnover:

- <1 million euros
- €1 million - €10 millions
- €11 millions - €50 millions
- > 50 million euros

4. Please indicate the number of company employees:

- 1-9 employees
- 10-49 employees
- 50-249
- Over 250 employees

5. Please indicate the Italian Region you belong to:

6. Please indicate your reference market:

- Italy
- Italy and European markets
- International markets

7. If the target market is international, please select the geographical areas in which the company operates:

- North America
- Central-South America
- Asia
- Australia-Oceania
- Africa

8. Does the company have other international standards in addition to EMAS?

- ISO 9001
- ISO 14001
- OHSAS 18001
- SA8000
- No other standard besides EMAS
- Other: _____

9. What role does the EMAS contact person play within the company?

SECTION 2 OF 5 - EMAS system implementation

10. How many years has the company been EMAS certified?

11. Indicate how important each of the following aspects was in the firm's decision to implement the EMAS system (reply by providing a value from 1 to 5 where: 1 = Not important at all; 2 = Few important; 3 = Indifferent; 4 = Quite important; 5 = Very important)

- Transparency regarding corporate environmental policy
- Creation of new partnerships
- Better impact on customer and suppliers
- Market pressure
- Environmental protection improvement
- Resource efficiency
- Employee participation
- Compliance with environmental legislation
- Competitive advantage and image
- Cost savings
- Identification of ecological products and process innovations
- Better cooperation with the authorities
- Financial advantages
- Differentiation from ISO14001

12. How long did it take to implement the EMAS system, from the decision to obtain certification to the completion of registration?

- 1- 6 months
- 7-12 months
- 13-24 months
- More than 2 years

13. How much staff was approximately required for the implementation of the EMAS system?

14. What are the total financial costs (including validation, external consultancy and internal expenses) required to implement the EMAS system?

- Less than € 2,500
- From € 2,500 to € 5,000
- From € 5,001 to € 10,000
- From € 10.001 to € 15,000
- From € 15.001 to € 20.000
- From € 20.001 to € 30.000
- From € 30.001 to € 50.000
- From € 50.001 to € 75.000
- From € 75.001 to € 100.000
- Over € 100,000
- No cost

15. Please enter the following activities according to the time required for the implementation of the EMAS system (classify the following activities from 1 to 7, where 1 indicates the shortest time required and 7 the most time required. Do not attribute the same value to activities different)

- Data collection
- Compilation of documentation, including the environmental management manual
- Drafting of the environmental declaration
- Preparation of the environmental policy, environmental objectives and environmental program
- Compliance with relevant regulations

- Evaluation of environmental aspects
- Training and information for employees

16. In your opinion, is EMAS certification a valid tool for the sustainable management of resources?

- Yes, very good
- Yes, with limitations
- I do not know
- No

17. To draw up which company reports is the EMAS environmental declaration also used as an aid tool?

- Environmental balance
- Annual report on company management
- Corporate Social Responsibility Report (CSR)
- None, the environmental statement is not used to draw up other company reports
- Other: _____

SECTION 3 OF 5 - Advantages and incentives associated with EMAS certification

18. Please evaluate the advantage derived from the implementation of the EMAS system in your company in the following aspects (Respond by assigning a value from 1 to 5 where: 1 = None; 2 = Small; 3 = Moderate 4 = Enough large; 5 = Large)

- Improvement of the company's environmental performance
- Compliance with environmental legislation / minimization of liability risks
- Participation and involvement of employees
- Competitive and image advantages
- Costs saving
- Identification of ecological products and process innovations
- Better cooperation with the authorities
- Financial advantages

19. Please estimate the amount of cost savings in implementing the EMAS system for your company in the following areas (Respond with a value from 1 to 5 where: 1 = None; 2 = Small; 3 = Moderate; 4 = Enough large; 5 = Large)

- Energy
- Emissions
- Waste
- Waterfall
- Raw material

20. Does EMAS offer your company an advantage in responding to invitations to tender?

- Yes
- No
- I don't know, the company has never participated in public tenders

SECTION 4 OF 5 - Overall evaluation of the EMAS system

21. What is the overall assessment of the company regarding the EMAS system

- Excellent system, no modification needed
- Good system, need for improvement in individual points
- Inadequate system with important improvement needs

SECTION 5 OF 5 - Future developments of the EMAS system

22. In which of the following areas would your company appreciate further regulatory simplification measures?

- Simplification or acceleration of the permit application procedures (for example if the company is already ISO14001 certified)
- Extension of the validity of permits / authorizations

- 1
- 2
- 3 ○ Reduction of reporting and monitoring obligations
- 4 ○ Reduction of inspection frequencies
- 5 ○ Green Public Procurement (i.e., enhancement of EMAS certification in public tenders / procurement)
- 6 ○ Financial support
- 7 ○ Tax concessions
- 8 ○ Reduction of administrative costs
- 9

10 23. In your opinion, how important is it to improve the EMAS system in the following areas? (Reply by providing a value
11 from 1 to 5 where: 1 = Not important at all; 2 = Few important; 3 = Indifferent; 4 = Quite important; 5 = Very important)

- 12 ○ Raise public awareness of the EMAS system
- 13 ○ Improve competitive and market potential
- 14 ○ Recognition by the authorities
- 15 ○ Recognition of the EMAS system in EU environmental legislation
- 16 ○ Reduction of legal monitoring and reporting obligations
- 17 ○ Structure and clarity of the regulation
- 18 ○ Key indicators of environmental performance
- 19 ○ Development of guidelines for the structure for the compilation of environmental declarations
- 20 ○ Priorities for public procurement
- 21 ○ Options for using the EMAS logo
- 22 ○ Use of the environmental verifier for other environmental activities within the company
- 23
- 24

25 24. Will your company continue to use the EMAS system in the future?

- 26 ○ Yes sure
- 27 ○ Yes, probably
- 28 ○ I do not know
- 29 ○ Probably not
- 30 ○ Surely not
- 31

32 25. How important are the following reasons in the business decision to continue / whether to continue using the EMAS
33 system? (reply by providing a value from 1 to 5 where: 1 = Not important at all; 2 = Few important; 3 = Indifferent; 4 =
34 Quite important; 5 = Very important)

- 35 ○ Continuous improvement of environmental performance
- 36 ○ Philosophy and corporate image
- 37 ○ Greater compliance with environmental legislation
- 38 ○ Employee participation
- 39 ○ High level of environmental awareness
- 40 ○ Advantages deriving from the environmental declaration
- 41 ○ Financial / tax advantages
- 42 ○ Growing market pressure
- 43 ○ Differentiation from ISO14001
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Appendix B – Questionnaire Items

Table B1. Questionnaire items and corresponding reference literature

Motivations to EMAS III implementation	Reference literature
Transparency regarding corporate environmental policy	<i>Searcy et al., (2012); Testa et al., (2014)</i>
Creation of new partnerships	<i>Álvarez-García et al., (2018); Novelli et al., (2020)</i>
Better impact on customer and suppliers	<i>Murmura et al., (2018)</i>
Market pressure	<i>Testa et al., (2014); Testa et al., (2018); Merli and Preziosi, (2018)</i>
Environmental protection improvement	<i>Daddi et al. (2011)</i>
Resource efficiency	<i>Nikolaou et al., (2016); Daddi et al., (2018)</i>
Employee participation	<i>Steyrer and Simon, (2012)</i>
Compliance with environmental legislation	<i>Daddi et al. (2011); Merli et al., (2018); Murmura et al., (2018); Novelli et al., (2020)</i>
Competitive advantage and image	<i>Testa et al., (2014); Murmura et al., (2018)</i>
Cost savings	<i>Nikolaou et al., (2016); Daddi et al. (2018); Murmura et al., (2018)</i>
Identification of ecological products and process innovations	<i>Rennings et al. (2006)</i>
Better cooperation with the authorities	<i>Álvarez-García et al., (2018)</i>
Financial advantages	<i>Álvarez-García et al., (2018); Murmura et al., (2018); Erauskin-Tolosa et al., (2019)</i>
Differentiation from ISO14001	<i>Searcy et al., (2012); Testa et al., (2014)</i>
Benefits to EMAS III implementation	
Improvement of the company's environmental performance	<i>Daddi et al. (2011); Murmura et al., (2018); Novelli et al., (2020)</i>
Compliance with environmental legislation / minimization of liability risks	<i>Daddi et al. (2011); Merli et al., (2018); Murmura et al., (2018); Novelli et al., (2020)</i>
Participation and involvement of employees	<i>Steyrer and Simon, (2012); Murmura et al., (2018); Novelli et al., (2020)</i>
Competitive and image advantages	<i>Testa et al., (2014); Murmura et al., (2018)</i>
Costs saving	<i>Nikolaou et al., (2016); Daddi et al. (2018); Murmura et al., (2018)</i>
Identification of ecological products and process innovations	<i>Rennings et al. (2006); Merli et al., (2016)</i>
Better cooperation with the authorities	<i>Álvarez-García et al., (2018); Erauskin-Tolosa et al., (2019)</i>
Financial advantages	<i>Álvarez-García et al., (2018); Murmura et al., (2018); Erauskin-Tolosa et al., (2019)</i>
Incentives deriving for EMAS adoption	
Raise public awareness of the EMAS system	<i>Novelli et al., (2020)</i>
Improve competitive and market potential	<i>Testa et al., (2018); Merli and Preziosi, (2018)</i>
Recognition by the authorities	<i>Álvarez-García et al., (2018); Erauskin-Tolosa et al., (2019)</i>
Recognition of the EMAS system in EU environmental legislation	<i>Álvarez-García et al., (2018); Erauskin-Tolosa et al., (2019)</i>
Reduction of legal monitoring and reporting obligations	<i>Álvarez-García et al., (2018); Erauskin-Tolosa et al., (2019); Novelli et al., (2020)</i>
Structure and clarity of the regulation	<i>Searcy et al., (2012); Testa et al., (2014)</i>
Key indicators of environmental performance	<i>Murmura et al., (2018); EMAS, (2020)</i>
Development of guidelines for the structure for the compilation of environmental declarations	<i>Testa et al., (2014)</i>
Priorities for public procurement	<i>Álvarez-García et al., (2018)</i>
Options for using the EMAS logo	<i>Searcy et al., (2012); Testa et al., (2014)</i>

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3	Use of the environmental verifier for other	<i>Daddi, et al., (2011); Testa et al., (2014);</i>
4	environmental activities within the company	<i>Erauskin-Tolosa et al., (2020)</i>
5	Motivations to EMAS III future adoption	
6	<hr/>	
7	Continuous improvement of environmental	<i>Murmura et al., (2018)</i>
8	performance	
9	Philosophy and corporate image	<i>Murmura et al., (2018)</i>
10	Greater compliance with environmental legislation	<i>Murmura et al., (2018)</i>
11	Employee participation	<i>Steyrer and Simon, (2012)</i>
12	High level of environmental awareness	<i>Novelli et al., (2020)</i>
13	Advantages deriving from the environmental	
14	declaration	<i>Searcy et al., (2012); Testa et al., (2014)</i>
15		<i>Álvarez-García et al., (2018); Murmura et al., (2018);</i>
16	Financial / tax advantages	<i>Erauskin-Tolosa et al., (2019)</i>
17	Growing market pressure	<i>Testa et al., (2018); Merli and Preziosi, (2018)</i>
18	Differentiation from ISO14001	<i>Searcy et al., (2012); Testa et al., (2014)</i>
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3 **Tables**
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5 Table 1. Profile of respondent companies
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	<i>n</i>	<i>%</i>
Type of company		
Service	143	61.9
Manufacturing	88	38.1
Dimension		
Micro (< 10 employee)	19	8.2
Small (10-49 employee)	98	42.4
Medium (50-249 employee)	83	35.9
Large (> 250 employee)	31	13.4
Income		
Less than 1 million euros	21	9.1
1-10 million euros	89	38.5
11-50 million euros	71	30.7
More than 50 million euros	49	21.2
Location in Italy		
Northern Regions	134	58.0
Central Regions	52	22.5
South and Islands	45	19.5
Reference Markets		
Italy	132	57.1
Italy and Europe	65	28.2
International Markets	34	14.7
Other management systems		
ISO 9001	154	66.7
ISO 14001	204	88.3
OHSAS 18001	115	49.8
ISO 45001	1	0.4
SA 8000	35	15.2
No other QMS standard	19	8.2
Average years of EMAS certification		8,87 years
Region of Italian EMAS III companies		
Abruzzo	7	3.0
Basilicata	2	0.9
Campania	19	8.2
Emilia-Romagna	32	13.9
Friuli-Venezia Giulia	8	3.5
Lazio	13	5.6
Liguria	2	0.9
Lombardia	46	19.9
Marche	9	3.9
Molise	1	0.4
Piemonte	13	5.6
Puglia	10	4.3
Sardegna	2	0.9
Sicilia	4	1.7
Toscana	28	12.1
Trentino-Alto Adige	19	8.2
Umbria	2	0.9
Valle d'Aosta	1	0.4
Veneto	13	5.6

EMAS Manager		
Environmental Manager	85	36.8
Quality Manager	47	20.3
Technical Manager	32	13.9
Employee	23	10.0
Integrated Management System Manager	21	9.1
Chief Executive Officer	16	6.9
Plant Manager	4	1.7
Purchasing Manager	1	0.4
Project Manager	1	0.4
Logistics Manager	1	0.4

Table 2. Pearson's correlation between factors of importance in EMAS adoption

		<i>Income</i>	<i>N° Firm Employees</i>	<i>Reference market</i>	<i>Years EMAS certification</i>	<i>EMAS implementation time</i>	<i>N° Staff employed</i>	<i>EMAS costs</i>
<i>Income</i>	<i>Pearson's corr.</i>	1						
	<i>Sig.</i>	-						
	<i>N</i>	230						
<i>N° Firm Employees</i>	<i>Pearson's corr.</i>	.695**	1					
	<i>Sig.</i>	.000	-					
	<i>N</i>	230	231					
<i>Reference market</i>	<i>Pearson's corr.</i>	.307**	.311**	1				
	<i>Sig.</i>	.000	.000	-				
	<i>N</i>	230	231	231				
<i>Years EMAS certification</i>	<i>Pearson's corr.</i>	.288**	.231**	.189**	1			
	<i>Sig.</i>	.000	.000	.004	-			
	<i>N</i>	230	231	231	231			
<i>EMAS implementation time</i>	<i>Pearson's corr.</i>	.019	.062	-.043	.074	1		
	<i>Sig.</i>	.771	.351	.512	.264	-		
	<i>N</i>	230	231	231	231	231		
<i>N° Staff employed</i>	<i>Pearson's corr.</i>	.121	.238**	-.039	-.035	.204**	1	
	<i>Sig.</i>	.067	.000	.553	.600	.002	-	
	<i>N</i>	228	229	229	229	229	229	
<i>EMAS costs</i>	<i>Pearson's corr.</i>	.495**	.404**	.189**	.292**	.085	.163*	1
	<i>Sig.</i>	.000	.000	.004	.000	.200	.014	-
	<i>N</i>	230	231	231	231	231	229	231

** . The correlation is significant at the 0.01 (two-tailed) level.

* . The correlation is significant at the 0.05 (two-tailed) level.

Table 3. Motivations to EMAS III implementation

	<i>N</i>	<i>Mean</i>	<i>St. Dev.</i>	<i>Var.</i>
Transparency regarding corporate environmental policy	231	4.35	0.753	0.566
Creation of new partnerships	231	3.23	1.141	1.302
Better impact on customer and suppliers	231	4.07	0.911	.830
Market pressure	231	3.01	1.015	1.030
Environmental protection improvement	231	4.48	0.715	0.512
Resource efficiency	231	4.16	0.833	0.695
Employee participation	231	3.87	0.855	0.731
Compliance with environmental legislation	231	4.55	0.811	0.658

Competitive advantage and image	231	4.06	0.956	0.913
Cost savings	231	3.52	1.012	1.025
Identification of ecological products and process innovations	231	3.43	1.010	1.020
Better cooperation with the authorities	231	3.90	1.014	1.029
Financial advantages	231	3.37	1.107	1.225
Differentiation from ISO14001	231	3.15	1.019	1.039
Cronbach's Alpha value		0.860		

Table 4. Benefits to EMAS III implementation and incentive to its adoption

	<i>N</i>	<i>Mean</i>	<i>St. Dev.</i>	<i>Var.</i>
Benefits to EMAS III implementation				
Improvement of the company's environmental performance (B1)	231	3.77	0.814	0.662
Compliance with environmental legislation / minimization of liability risks (B2)	231	4.09	0.857	0.735
Participation and involvement of employees (B3)	231	3.36	0.873	0.763
Competitive and image advantages (B4)	231	3.52	1.079	1.164
Costs saving (B5)	231	2.81	1.047	1.097
Identification of ecological products and process innovations (B6)	231	2.88	1.087	1.182
Better cooperation with the authorities (B7)	231	3.28	1.224	1.499
Financial advantages (B8)	231	2.82	1.092	1.193
Cronbach's Alpha value		0.809		
Incentives deriving for EMAS adoption				
Raise public awareness of the EMAS system	231	4.42	0.735	0.540
Improve competitive and market potential	231	4.03	0.887	0.786
Recognition by the authorities	231	4.54	0.696	0.485
Recognition of the EMAS system in EU environmental legislation	231	4.45	0.761	0.579
Reduction of legal monitoring and reporting obligations	231	3.95	0.922	0.849
Structure and clarity of the regulation	231	3.55	0.883	0.779
Key indicators of environmental performance	231	3.74	0.835	0.697
Development of guidelines for the structure for the compilation of environmental declarations	231	3.70	0.933	0.871
Priorities for public procurement	231	3.67	1.152	1.328
Options for using the EMAS logo	231	3.36	1.016	1.032
Use of the environmental verifier for other environmental activities within the company	231	3.30	1.048	1.097
Cronbach's Alpha value		0.808		

Table 5. Motivations for EMAS III future adoption

	<i>N</i>	<i>Mean</i>	<i>St. Dev.</i>	<i>Var.</i>
Continuous improvement of environmental performance (MFUT1)	231	4.27	0.878	0.771
Philosophy and corporate image (MFUT2)	231	4.33	0.799	0.639
Greater compliance with environmental legislation (MFUT3)	231	4.29	0.850	0.722
Employee participation (MFUT4)	231	3.73	0.977	0.954
High level of environmental awareness (MFUT5)	231	4.00	0.821	0.674

Advantages deriving from the environmental declaration (MFUT6)	231	3.71	1.032	1.066
Financial / tax advantages (MFUT7)	231	3.60	1.160	1.346
Growing market pressure (MFUT8)	231	3.27	1.075	1.156
Differentiation from ISO14001 (MFUT9)	231	3.11	1.098	1.205
Cronbach's Alpha value			0.870	

Table 6. Omnibus test of the model coefficients

		Chi-square	gl	Sig.
Phase 1	Phase	43.548	9	.000
	Block	43.548	9	.000
	Model	97.998	18	.000

Table 7. Model summary

Phase	Logarithm of the likelihood -2	Cox and Snell's R-square	Nagelkerke R-square
1	187.043	.346	.488

Table 8. Hosmer and Lemeshow test

Phase	Chi-square	gl	Sig.
1	11,296	8	.185

Table 9. Probability expressed by the model

Observed		Planned			Percentage of fairness
		Future_adoption_EMAS			
		0	1		
Phase 1	Future_adoption_EMAS	0	55	16	77.5
		1	33	127	79.4
	Global percentage				78.8

Table 10. Logistic regression model: factors of importance in the future maintenance of the certification

Variables	B	S.E.	Wald	gl	Sig.	Exp (B)
TYPE_COMP	-.323	.413	.612	1	.434	.724
B1	.373	.346	1.162	1	.281	1.452
B2	.926	.299	9.599	1	.002	.396
B3	.296	.372	.634	1	.426	1.344
B4	.217	.226	.920	1	.337	1.242
B5	-.364	.251	2.096	1	.148	.695
B6	-.112	.230	.236	1	.627	.894
B7	.313	.194	2.606	1	.106	1.368
B8	.724	.248	8.500	1	.004	2.063
MFUT1	.916	.351	6.801	1	.009	2.499
MFUT2	1.002	.339	8.715	1	.003	2.722
MFUT3	.823	.294	7.850	1	.005	2.278

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MFUT4	-.008	.382	.000	1	.984	.992
MFUT5	-.190	.402	.225	1	.636	.827
MFUT6	-.124	.287	.187	1	.666	.883
MFUT7	-.228	.240	.904	1	.342	.796
MFUT8	.068	.286	.057	1	.811	1.071
MFUT9	.140	.233	.362	1	.547	1.150
Constant	-10.112	1.949	26.916	1	.000	.000

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