

Article

Environmental Management in German Hospitals—A Classification of Approaches

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Abstract: This paper analyzes organizational environmental performance and environmental management approaches in German hospitals. Based on data from an online survey and a subsequent cluster analysis, three groups of hospitals are identified: traditionalists, pragmatists, and environmentalists. The clusters differ regarding their organizational environmental performance, i.e., the environmental management elements adopted (policy, goals, structures, processes, and monitoring) and the environmental issues addressed (energy, water, material consumption, waste, emissions into water and air). The environmental management approaches hospitals adopt range from least to most active. Despite perceived stakeholder pressure being generally low, differences between the clusters can be observed. The most relevant stakeholders are internal ones, i.e., management and owners, rather than external ones. Furthermore, some organizational characteristics distinguish the clusters. This paper adds knowledge in the under-researched setting of hospitals and discusses managerial possibilities for the types of hospitals to increase their organizational environmental performance and to pursue a more holistic environmental approach.

Keywords: corporate environmental performance; organizational environmental management; stakeholder pressure; hospital; survey; cluster analysis

1. Introduction

Due to the fact that environmental issues rank increasingly higher on the public and political agenda, as witnessed by social movements such as Fridays for Future or international treaties such as the Paris Agreement, organizations in most sectors are facing more and more pressures to reduce their environmental footprint. Addressing environmental issues through an organization's management not only contributes to an environmentally sustainable development, it has also been shown to create considerable other benefits for the organization, such as cost savings or improved public image [1,2]. So far, especially manufacturing and other highly polluting industries are shown to be active (e.g., by means of environmental certification, see [3]) and address increasing demands by researchers, politicians, media, NGOs, and others. However, some research extends the attention beyond the highly polluting industries and considers more 'hidden' actors, i.e., service actors such as consulting companies [4] or hotels [5,6], and their potential contribution to sustainable development.

Despite the potentially severe environmental impacts of hospitals (see literature review by McGain and Naylor [7]), they have been long overlooked in the sustainability debate [8]. Moreover, and perhaps as a result, the sector is said to give low priority to environmental issues and calls for action have

emerged [9,10]. Some studies have researched environmental impacts of hospitals and investigated their organizational performance based on single environmental aspects, such as for material [11,12], water [13] and energy use [14], waste [15,16], carbon emissions [17], or wastewater [18]. Most of these studies conclude that a more active *management* of the aforementioned aspects offers potential for performance improvements. However, studies considering more than one environmental aspect are rare and, thus, conclusions regarding the environmental performance of hospitals remain unclear.

According to Trumpp, Endrikat, Zopf, and Guenther [19], organizational environmental performance is a multi-dimensional construct comprising an environmental *operational* performance dimension and an environmental *management* performance dimension. However, few existing empirical studies explicitly consider both dimensions, i.e., multiple environmental aspects and environmental management elements. For the purpose of this study and by building on this research, organizational environmental management (EM) is defined as the interplay of five managerial elements (policy, objectives, processes, structures, monitoring) to increase environmental operational performance regarding six main environmental aspects (material, energy, water, waste, emission into air and water) with the ultimate aim to improve the overall organizational environmental performance (OEP). Moreover, the organizational environmental management (EM) approach is characterized by the implementation level of managerial elements with regard to the above-mentioned environmental aspects.

The scientific literature does not provide sufficient information regarding hospitals' management of environmental issues. In this sense, no previous study encompasses and researches all EM elements as previously presented. Some possible *measures* that hospital managers could implement to address their hospitals' negative environmental impacts have been summarized by Seifert and Guenther [20]. Limited research on more comprehensive environmental management *initiatives* in hospitals exists, e.g., regarding environmental analysis [21], implementation of voluntary environmental programs [22], the adoption of proactive EM strategies [8], or an EM system's validation according to Eco-Management and Audit Scheme (EMAS) ([23–26]). Thus, initial insights into some possible measures and initiatives that hospital managers could adopt to increase the OEP of their hospital are prevalent. However, these are only initial insights *researching single facets of the aforementioned EM elements of a limited number of pioneering organizations*. Deeper insights in the EM approaches of the actors in the sector are missing.

This suggests profound knowledge gaps regarding the *overall* OEP of hospitals. What the scientific community does not yet know is what the actual OEP of hospitals is and whether hospitals differ especially regarding their adoption of EM elements and, thus, in their overall EM approaches. So far, in health care sciences, it has been discussed whether *management* in general is relevant for the sector and which practices matter for performance [27]. Whether this also applies to *environmental* issues and what influences hospitals regarding their adoption of a certain EM approach remains unclear. A comprehensive overview of the sector, its environmental orientation, and the determinants is missing. Therefore, in this study, these knowledge gaps are closed and the following research questions addressed:

- What is the organizational environmental performance of hospitals?
- Based on the hospitals' organizational environmental performance, what classifications of EM approaches exist?
- What determines the EM approach?

This paper makes the following contributions to existing literature. First, it empirically researches hospitals from an EM point of view through a large-scale survey. So far, such a larger empirical examination has only been done by Pinzone et al. [8] in an Italian region. This research is not only expanded by a differing country context but also by focusing on the measurement of OEP and a detailed investigation of EM approaches and their determining factors beyond stakeholder pressure. In this regard, the power of stakeholder theory in explaining organizational behavior in this under-researched hospital context is questioned. Second, this paper adds to the research on typologies of organizations

regarding EM by deriving types of EM approaches from a unique data set from a service-oriented sector and demonstrates the value of the OEP construct and its operationalization as presented in Trumpp et al. [19]. From a practical point of view, this paper adds knowledge by discussing and recommending possibilities for managerial action for different types of hospitals to increase their OEP and pursue a more holistic environmental approach. The conclusions are also valuable for the design of novel and targeted policies that can support hospitals in speeding up the transition to environmental sustainability.

The paper is structured as follows. First, it presents an overview of scientific literature on organizational EM, displays existing typologies of EM approaches, highlights some relevant influencing factors for organizational activities, and describes the practical context of this study. Subsequently, it describes the methodology for data collection and analysis, followed by the results and their discussion. Finally, the conclusions for managers and researchers are presented.

2. Review of the Literature

In this section, an overview of scientific literature on organizational EM is presented as well as some existing EM approaches in organizations and relevant influencing factors. Finally, the section describes the particularities of the German hospital sector that represents the practical context of this study.

2.1. Organizational Environmental Management

There are several ways through which managers can contribute to environmental sustainability in their organization. This study follows Trumpp et al. [19], who provide a comprehensive conceptual framework for corporate environmental performance, state the elements a comprehensive management should encompass, and describe how its implementation could be measured. Subsequently, the EM elements (i.e., policy, objectives, structures, processes, and monitoring) and their interrelation are described (see also Table 1).

Table 1. Conceptualization of Organizational Environmental Performance (based on [19]).

Environmental Management Performance	
Environmental policy	Any overarching organizational philosophy or principle regarding environmental issues
Environmental objectives	Any organizational targets or objectives regarding environmental issues
Environmental processes	Considering environmental issues within operations, e.g., applying environmental criteria or life-cycle assessment
Organizational structures	Allocation of responsibilities and tasks, employee education/training, ISO 14001 or EMAS certification
Environmental monitoring	Collection and analysis of environmental indicators
Environmental Operational Performance	
Material consumption	Any material that is utilized
Energy consumption	Any energy that is utilized
Water consumption	Any freshwater that is utilized
Wastes	Any undesired outputs emerging
Emission into air	Any releases into air, such as smell or CO ₂
Emission into water	Any releases into water, esp. after wastewater treatment

First of all, managers may create organizational *environmental policies* including mission or vision statements in which the overarching direction for the organization concerning environmental issues

is stated. Furthermore, they can set concrete organization-wide *environmental goals* that shall be achieved by departments and the respective employees. Whereas the former instrument is situated on a strategic level and aims to communicate the organizational mission and vision to employees and other stakeholders so they can align their actions accordingly, the latter translates the policy into more operational targets. However, the goals need to be manifested in concrete rules and specifications for organizational procedures to ensure their fulfillment. Environmental training of employees communicates the environmental idea and should assure environmentally friendly individual behavior in line with the organizational policy and goals. Thus, routine *processes* in specific departments can be optimized, such as in purchasing (e.g., by considering more environmental criteria for supplier selection) or in waste treatment procedures (e.g., by training employees on waste separation). Environmental accounting methods, such as Life Cycle Assessment (LCA) or Material Flow Cost Accounting (MFCA) can help to determine the environmental impacts of products and processes in order to derive recommendations on where to initiate changes and optimize existing procedures [28–31]. Thus, conducting LCA studies itself can be an organizational signal for a lived environmental process that displays managerial efforts to assess and consider environmental issues within management. Overall, adapted rules and procedures (e.g., derived from environmental impact analyses) should contribute to the fulfillment of the organizations' environmental goals and missions.

The consideration of environmental issues often requires a responsible person (e.g., an environmental officer) or group (e.g., environmental committee or department) within the organization who can serve as contact point for managers, employees, and external stakeholders. Such an institution can initiate data collection and build up a *monitoring* system of key figures, such as water or energy consumption (compare also Table 1 for environmental operational performance indicators), so that trends can be observed and corrective measures be taken. Creating such positions within existing organizational *structures* means assigning responsibilities and allocating financial resources. It also signals top management's acknowledgement of the relevance of environmental issues to the members of the organization and other stakeholders.

A way to holistically address organizational environmental issues in practice is the implementation of an environmental management system (EMS) that encompasses the aforementioned EM elements. EMSs are a "part of the general management system which includes the organizational structure, planning of activities, responsibilities, practices, procedures, processes and resources for developing, implementing, carrying out, reviewing and maintaining the organization's environmental policy" [32]. An organization's EMS can be certified or validated according to internationally accepted and widely applied standards such as ISO 14001 and the Eco-Management and Audit Scheme (EMAS) (for more information see, e.g., [33–38]). Such standards can assist organizations in implementing environment-related policies, goals, procedures, monitoring, and structures. Usually, the implementation of an EMS represents an extensive organizational environmental management approach aiming to increase OEP. However, also some more local initiatives (e.g., Ökoprofit in Germany, e.g., [39]) can represent a starting point for improvements regarding OEP. Participation in such voluntary environmental initiatives (VEI) and the implementation of measures and practices may be used for internal and external communication, e.g., via disclosure of OEP within environmental reports [40,41]. Thus, organizational stakeholders would be informed.

2.2. Existing Environmental Management Approaches in Organizations

Apart from the different management elements that can be adopted, EM has several manifestations with regard to the level of organizational activity, meaning that organizations can choose the types and number of instruments, measures or initiatives to be adopted as well as the degree to which they are implemented. Several scholars have developed classifications of EM, either based on theoretical reasoning [42,43] or empirical data [44–46]. A popular way of categorizing EM is the stage-model approach, which entails mapping EM along a continuum reaching from reactive, i.e., compliance-oriented reactive organizational responses, to proactive EM, where organizations

voluntarily exceed regulatory obligations [43,44]. Proponents of the stage-model view also adopt a temporal perspective by claiming that organizations' EM evolves along this continuum over time [47]. Recent studies have refined the stages of EM maturity by suggesting that when implementing EM, organizations initially focus on improving or changing internal processes, proceed with altering management structures, subsequently adapt their products and supply chain practices, and eventually communicate their EM approach externally, e.g., through environmental reports [48,49]. Another way of looking at EM is to reveal patterns in the way EM instruments are adopted by organizations [42,50]. Such typology-based evaluations adopt a more static perspective and stipulate that there is not a single ideal solution to deal with environmental issues, but that high EM performance can be achieved through a variety of combinations of various management instruments [47].

Table 2 provides an overview of the most popular classifications of EM and their underlying research approaches, while acknowledging that there are several additional classifications proposed by other scholars. Although a number of studies have attempted to classify EM approaches, the majority of empirical research relies on cross-sector analyses, thereby neglecting patterns in EM that may be specific to particular industries [47]. Therefore, in line with Kallio and Nordberg [51], it can be argued that the question whether theoretical categorizations of EM approaches are congruent with actual organizational practice still needs further scholarly attention. Especially service-oriented industries like the healthcare sector remain under-researched [8,49,52] and, to our knowledge, there is no research that categorizes EM approaches of hospitals. It is the aim of this study to identify EM approaches in hospitals based on their OEP, their aforementioned EM elements and considered environmental aspects.

2.3. Practical Background: The German Hospital Sector and Its Stakeholders

Regardless of the sector, one reason for the adoption of environmental measures is seen in exposure to stakeholder pressure [53]. A stakeholder is any individual or group affected by or affecting an organization [54]. Stakeholders can be classified into internal (e.g., owners, top-level management, employees) and external stakeholders (e.g., regulators, customers, competitors, media, non-governmental organizations (NGOs), local interest groups). Organizations align their business activities with the expectations of such stakeholders. Mitchell, Agle, and Wood [55], in their model of stakeholder salience, classify stakeholders according to their power, urgency, and legitimacy. Managers and their perception of salience are important elements of this model as they identify and assess the relevant stakeholders [46,56]. Understanding stakeholder expectations and demands is crucial for an organization to ensure its long term survival, since unrecognized demands may imply negative consequences for organizations [57], e.g., through law suits in case of non-compliance with environmental regulations or a loss of reputation due to a scandal related to local environmental pollution. Furthermore, maintaining good stakeholder relationships can lead to benefits for the organizations [58].

How organizations perceive and react to pressures may vary with the industry context (e.g., [59,60]). Especially service industries that differ from manufacturing industries, where the focus in research has lain thus far, are said to require more attention [61]. Aiming to understand the drivers for organizational environmental behavior means considering the respective institutional setting as the importance of stakeholders for driving organizational EM may vary from sector to sector. In the following, the German hospital sector with its most relevant stakeholders is described, i.e., regulators, suppliers, top managers, employees, federal states, suppliers, insurance companies, owners, patients, and their relatives.

Table 2. Popular categorizations of organizational environmental management (EM) and underlying research approaches.

Author(s)	Categories of Organizational EM Approaches	Derived From		Empirical Context	EM Elements Considered in Empirical Analysis
		Theory	Empirical Data		
Roome [43]	<ul style="list-style-type: none"> • Non-compliance • Compliance • Compliance plus • Commercial and environmental excellence • Leading edge 	X		-	-
Hart [50]	<ul style="list-style-type: none"> • Pollution prevention • Product stewardship • Sustainable development 	X		-	-
Aragón-Correa [44]	<ul style="list-style-type: none"> • Environmental excellence • Leading edge • Compliance • Compliance plus • Non-compliance 		x	105 Spanish companies from various sectors	<ul style="list-style-type: none"> • Information and education • Traditional/regulated correction • Modern/voluntary prevention
Henriques and Sadorsky [46]	<ul style="list-style-type: none"> • Reactive • Defensive • Accommodative • Proactive 		x	750 Canadian firms from various sectors	<ul style="list-style-type: none"> • Environmental plan • Written plan • Plan communicated to employees • Plan communicated to shareholders • EHS unit • Environment committee
Buysse and Verbeke [45]	<ul style="list-style-type: none"> • Reactive strategy • Pollution prevention • Environmental leadership 		x	450 Belgian companies from various sectors	<ul style="list-style-type: none"> • Conventional green competencies • Employee skills • Organizational competencies • Management systems and procedures • Strategic planning process
Hart and Dowell [42]	<ul style="list-style-type: none"> • Pollution prevention • Product stewardship • Clean technology • Base of the pyramid 	X		-	-

In total, 1942 hospitals are located in the 16 federal states of Germany and are tasked with ensuring the treatment of sick people, delivering babies, and treating psychological diseases [62]. For these hospitals, some environmental issues are put on the management agenda by the regulator. For example, German hospitals are obliged to follow strict rules for waste handling, e.g., regarding (non) hazardous wastes. They instruct waste disposal companies concerning its final treatment. The waste fees hospitals are required to pay for this service vary with the classification and amount of waste hospitals produce. Furthermore, hospitals pay wastewater charges according to the amount of water consumed and wastewater discharged. Often, the wastewater streams from hospitals are treated together with community wastewater in public wastewater treatment plants. Energy issues are increasingly important for hospitals not only due to increasing energy supply cost but also due to the 2015 adopted Energy Services Act, which defines which organizations need to perform energy audits. This applies to hospitals that fall into the category of “large companies” with either more than 249 employees, annual turnover of more than 50 million, or balance of more than 43 million euros. Not fulfilling the obligation can result in a fine being imposed. Hospital operating facilities and equipment that use hazardous substances as defined by the Chemicals Act must establish a hazardous substance register and follow operating instructions in accordance with the Ordinance on Hazardous Substances. Overall, many environmental issues are connected to work safety. Regular trainings for certain issues are required. Sometimes, the federal state encourages environmentally friendly public procurement and disposal within guidelines. However, economic criteria are often ranked higher than environmental protection when deciding on suppliers or disposal companies.

Hospitals in Germany are either publicly owned and run by local or federal state authorities (28.8%), owned by private for-profit organizations (37.1%), or voluntary charitable hospitals run by German Red Cross organizations or churches (34.1%) [62]. Due to increasing financial pressures from government bodies, a trend towards privatization can be observed [62–64], which is meant to improve the hospitals’ economic efficiency. Overall, calls for an adequate ratio of costs and treatment quality are prevalent. This represents a great challenge for top managers in hospitals, i.e., the board of directors, which is usually comprised of a managing director, a clinical director, and a nursing director.

With 1.2 million employees [62], hospitals are an important pillar of the healthcare sector. Hospital employees are central elements for delivering the service. Orientating themselves within the complex hierarchical structure of a hospital, in which doctors, nurses, and other staff members operate and have clear internal responsibilities, could be demanding for patients and other outsiders. Implementing organizational change in professional organizations such as those found in the healthcare sector can be difficult for the top management [8]. For the employees, delivering care in an adequate way is the main task and presents manifold challenges, both physically and mentally [65].

Hospitals vary in size not only regarding their employee numbers but also regarding numbers of beds and, thus, possibilities to offer healthcare services for patients. In Germany, the numbers of offered beds differ depending on ownership. Most hospital beds are offered by public hospitals (48.0%), followed by voluntary charitable hospitals (33.2%), and private hospitals (18.7%), meaning that public hospitals, with on average 426 beds, are three times as large as private hospitals, which have capacities of 129 beds on average. On average, hospital bed occupancy rate is 77.8% [62].

Hospitals’ financial resources are directly connected to patient numbers. Hospitals operate under a dual funding system. First, the costs for the treatment of patients are covered by insurance companies through compulsory health insurance contributions from their beneficiaries. Second, capital costs (e.g., buildings or infrastructure) are usually covered by the respective federal state government on an annual basis. However, these investments are decreasing [66], which is why hospitals are increasingly in search for other funding sources for their investments [64]. The federal states create hospital plans and are responsible for the creation of new and the closure of existing healthcare institutions. It is their responsibility to ensure the availability of healthcare services for the citizens, in rural areas as well as in large cities. Most hospitals in Germany are listed in the hospital plan and receive funding within this dual system.

The current economic constraints [63] lead to a more competitive setting in which the hospitals operate. Neighboring hospitals can be perceived as competitors in a way as they compete for well-trained staff and professionals or investment grants from the respective state. Usually, the federal state ensures with its hospital plan that an over-supply is avoided and the number of hospitals is limited. Thus, within certain spatial boundaries, hospitals are monopolies.

In German hospitals, 19.4 million patients receive medical treatments per year, spending on average 7.3 days in this institution [62]. Customers play a central role for organizations. They buy a service or product that the company or the competitor offers and, thus, directly impact the sales and revenues. It lies within their power to actively boycott organizational offers. Patients, the customers of hospitals, have distinct characteristics that traditional customers in other sectors do not necessarily exhibit [65]. Their choice of the service is mainly based on medical need and usually not on a voluntary consumption decision. Patients are physically and mentally vulnerable and the decision process for a hospital service can be accompanied by pain and negative emotions like fear. Sometimes their life is at risk. They can be reluctant to seek treatment. Due to these strenuous conditions, patients may exhibit limited rational decision-making. Often, patients lack knowledge regarding their sickness and the treatment. Therefore, they have to trust the expert groups in the hospital. The decision for a hospital is strongly guided by criteria such as equipment of the hospital, recommendations from doctors or family and friends, or distance to home and family. Furthermore, hospitals and patients are de-coupled from the process of payment for the service as public health insurances negotiate and cover most treatment cost.

Different forms of stakeholder pressure can lead to different organizational reactions, such as EM approaches. Whereas normative pressure from internal stakeholders is said to contribute to substantive actions within EM (meaning an actual environmental commitment manifesting in concrete actions), pressure from external stakeholders can drive symbolic actions (actions aiming to ensure legitimacy and increase an image or appearance of commitment) [67]. For the healthcare sector, studies by Pinzone et al. [8] and Seifert and Guenther [26] research stakeholder pressure. The former shows that the overall pressure influences proactive environmental strategies in the Italian healthcare setting. The latter demonstrates how hospital managers attribute their stakeholders low interest regarding the hospitals' voluntary environmental management initiative, i.e., no or very low pressure regarding the implementation of an environmental management standard according to Eco-Management and Audit Scheme (EMAS) in Germany. Whether the pressure from single stakeholders shapes EM approaches of German hospitals will be explored within this study.

3. Research Design

In this section, the research framework and survey development as well as the methods applied for data collection and analysis are presented. In addition, the underlying sample is described.

3.1. Measurement and Survey Development

In order to answer the research questions, an online survey among all hospitals in Germany was conducted. The survey items were deduced from existing literature and comprise questions on EP, stakeholder pressure, general organizational performance indicators, and hospital and respondent characteristics. Overall, about 50 questions were included with a planned duration for completing the questionnaire of about 15 minutes. They relevant questions from the survey are attached in the Appendix A.

Based on the framework proposed by Trumpp et al. [19], OEP was measured with respect to the management of environmental issues by asking for the implementation of its five elements, as presented in the previous section: environmental policy (POL), environmental objectives (OBJ), environmental processes (PRO), environmental structures (STR), and environmental monitoring (MON). For each of the EM elements, it was asked whether this element is implemented based on six commonly used environmental aspects related to inputs and outputs. The input aspects comprise material, energy,

and water consumption. The output aspects cover undesired releases in the form of waste and emissions into air (e.g., CO₂) or water (e.g., containing pharmaceutical residues). Thus, the respondents faced 30 possible combinations (five EM elements each for six environmental issues) and an equal number of closed questions.

In line with previous literature in the field [45,68], the questions were related to perceived pressure from stakeholders regarding the adoption of EM based on a six-point Likert scale (ranging from ‘very low pressure’ to ‘very high pressure’). The stakeholder groups included in the questionnaire were derived from Freeman [54] and were complemented by additional stakeholders identified in pre-tests. Specifically, questions regarding pressure from the following stakeholders were asked: owners, hospital management, patients (customers), relatives of patients, employees, suppliers, competitors, health insurance companies, insurance companies, financiers/banks, media, regulators, environmental NGOs, local interest groups, and hospital associations. The respondents were given the opportunity to add stakeholders.

Some additional factors were included in the questionnaire in order to understand how hospitals’ EM approaches differ (see also [69]). Information was collected on hospital size (number of employees), ownership (public, private, voluntary charitable hospitals), participation in voluntary environmental initiatives (VEI), environmental training provided to employees, and organizational performance indicators (return on assets, return on sales, employee growth, sales growth, asset growth, debt-to-equity, innovation performance, overall organizational performance, bed occupancy rate). Furthermore, personal data of the respondents was obtained, such as job position, hospital experience, education, sex, and age. Figure 1 presents the research framework and the constructs surveyed through the questionnaire.

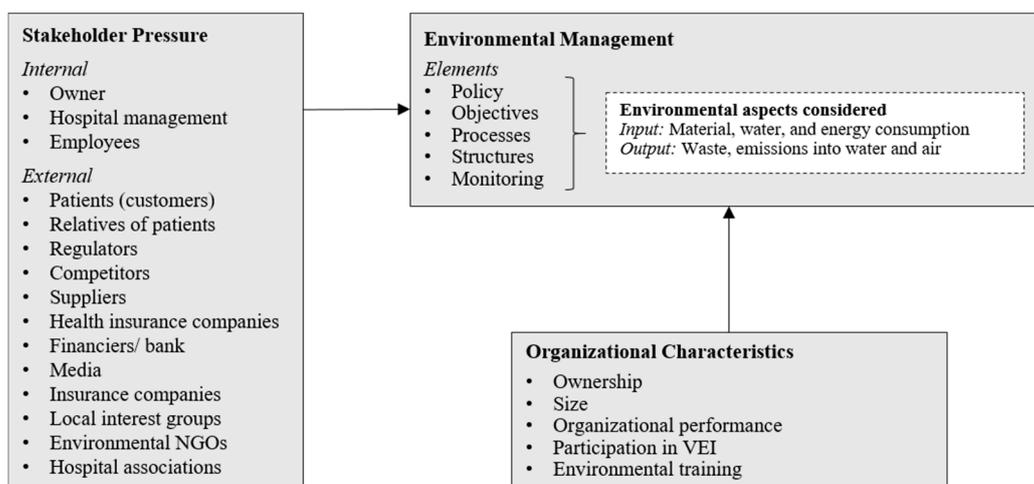


Figure 1. Research framework.

Before conducting the actual survey, the online questionnaire was pre-tested with experts from hospitals, management consultancies, and researchers in telephone interviews in order to reveal potential difficulties respondents might encounter. The method applied was a “think aloud” procedure [70,71] i.e., respondents were asked to comment on any issue that came to mind when answering the questionnaire. Thus, confusion with the questions or answers can be observed. Furthermore, after completing the questionnaire, the participants were asked for their overall experience and perceived problems with the questions and answers as well as the structure and appearance of the survey. The structure of the questionnaire and wording of the questions was adapted according to the feedback. The online questionnaire was designed with the software package LimeSurvey.

3.2. Data Collection and Sampling

Based on directories provided by different German institutions and organizations (e.g., Deutsches Krankenhausverzeichnis), a comprehensive database of hospitals in Germany was created, resulting in a list of 1723 hospitals. Next, all hospitals from the list were invited via e-mail to take part in the survey. Primarily managing directors were contacted. Since the survey was based on a census approach, the sample represented the population of hospitals in Germany. The survey took place between the end of July 2018 and October 2018 in 6 waves. In case a notification about the departure of a managing director from a certain hospital was received, the contact details of the respective hospital management were updated. Even after updating contact information in the list of hospitals, 134 hospitals were unreachable.

In total, 115 usable questionnaires were returned, corresponding to a response rate of 7.2%. This low number of replies is similar to other studies in the field of EM (e.g., [8,72]) and could be an indicator of increasing questionnaire fatigue among respondents of business surveys, as has been observed by Saunders, Lewis, and Thornhill [73]. Furthermore, the sample was compared with the total population of German hospitals. The composition of the sample in terms of ownership (42.6% public, 35.7% voluntary charitable hospitals, and 21.7% private hospitals) roughly resembles the characteristics of the whole population with a slight overrepresentation of public and underrepresentation of private organizations [62]. Table 3 summarizes the characteristics of the respondents.

Table 3. Characteristics of respondents.

Job Position	Number	Percentage
Managing director/assistance	66/6	62.6%
Environmental or sustainability manager	16	13.9%
Waste manager	4	3.5%
Energy manager	4	3.5%
Facility or technical manager	9	7.8%
Quality manager	4	3.5%
Others	6	5.2%
Average years of experience in ...		
this hospital	12.2	
this position (this and other hospitals)	11.6	
this hospital and this position	8.2	
Educational background		
Business and management	48	41.7%
Engineering/natural sciences	32	27.8%
Medicine	4	3.5%
Others	12	10.5%
No answer	19	16.5%
Sex		
Male	76	66.1%
Female	29	25.2%
No answer	10	8.7%
Age		
20–29	3	2.6%
30–39	16	13.9%
40–49	29	25.2%
50–59	50	43.5%
>60	12	10.4%
No answer	5	4.4%

Since the online survey software ensured that respondents could only submit the questionnaire if all questions regarding the key aspects of interest were answered (i.e., EM and perceived stakeholder pressure), missing values did not represent an issue. The sample was tested for non-response bias to ensure the validity and generalizability of our results. A Mann–Whitney U test was performed to compare 25% early and 25% late respondents. There were no significant differences concerning responses to the questions on EM. Therefore, it can be assumed that a non-response bias does not exist as early and late respondents seem similar [74].

3.3. Data Analysis

OEP was measured by looking at how many environmental aspects (material, energy, water, waste, emissions to air, wastewater) were addressed in the different management dimensions (policy, objectives, processes, structures, monitoring). In total, a company could score a maximum of 6 points in each management element category if all aspects were addressed and a minimum of 0 points in case none of the aspects were addressed. Under the assumption that all aspects are equally important, no weighting was applied when calculating the score for each company.

To identify different types of EM approaches, a cluster analysis in the software package SPSS was conducted. Using the scores of the five EM elements (policy, objectives, processes, structures, monitoring) as input variables, it was first tested for existence of multicollinearity between the selected variables. An inspection of Spearman's rho correlations coefficients showed that none of the variables are highly correlated with any of the other variables. In a next step, hierarchical cluster analysis was applied to identify the optimal number of clusters. Since all variables were measured on the same scale (1-5), no standardization was applied. The Ward method as the clustering algorithm was chosen and squared Euclidean distance as the distance measure. The Ward approach has been shown to be among the most efficient methods for clustering datasets with ordinal variables [75]. Subsequently, the change in heterogeneity was plotted in each stage of the clustering procedure in a scree plot and the elbow criterion applied, leading to three clusters as the optimal solution. This solution was confirmed by SPSS' proprietary TwoStep clustering procedure, which automatically determines the number of clusters. In a last step, a non-hierarchical cluster analysis (k-means) was used to assign the companies to the three clusters [76]. By using the cluster memberships as independent and the EM variables as dependent variables, it was tested for significant differences between the three clusters regarding the EM variables by performing a Kruskal–Wallis H test. A significant Chi-square-statistic confirmed the suitability of a three cluster solution. In addition, a Mann–Whitney U test was applied to investigate statistically significant differences between the clusters. Cluster stability was examined by changing the order of observations in the dataset three times and by repeating the k-means clustering procedure for each new ordering criterion. On average, only 11.3% of the observations were classified differently, which indicates good cluster stability [76].

To reveal further differences between the identified clusters concerning the variables not considered in the initial cluster analysis, profiling as suggested by Hair et al. [76] was applied. Apart from looking at the distribution of observations across the identified clusters with regard to ownership and participation in voluntary environmental initiatives (VEI), it was tested whether stakeholder pressure, hospital size, organizational performance, and environmental training differs significantly between the groups. For this, a Kruskal–Wallis H test was performed in case of the ordinal stakeholders and organizational performance variables and a one-way ANOVA for the continuous hospital size variable. Additionally, Mann–Whitney U and independent sample t-tests were conducted in order to reveal significantly different characteristics when comparing clusters one by one.

4. Results and Discussion

In this section, the results from the survey are presented. It starts with a summary of the descriptive results regarding OEP and EM elements (policy, objectives, processes, structures, monitoring) grouped along the considered environmental aspects (material, energy and water consumption, waste, and

emissions into air and water). Second, the results of the cluster analysis are discussed in regards to cluster characteristics, potential determinants for EM approaches, as well as the role of stakeholder pressures.

4.1. Descriptive Statistics

Figure 2 presents the results regarding the OEP of hospitals in Germany in relation to the different environmental elements and environmental aspects considered.

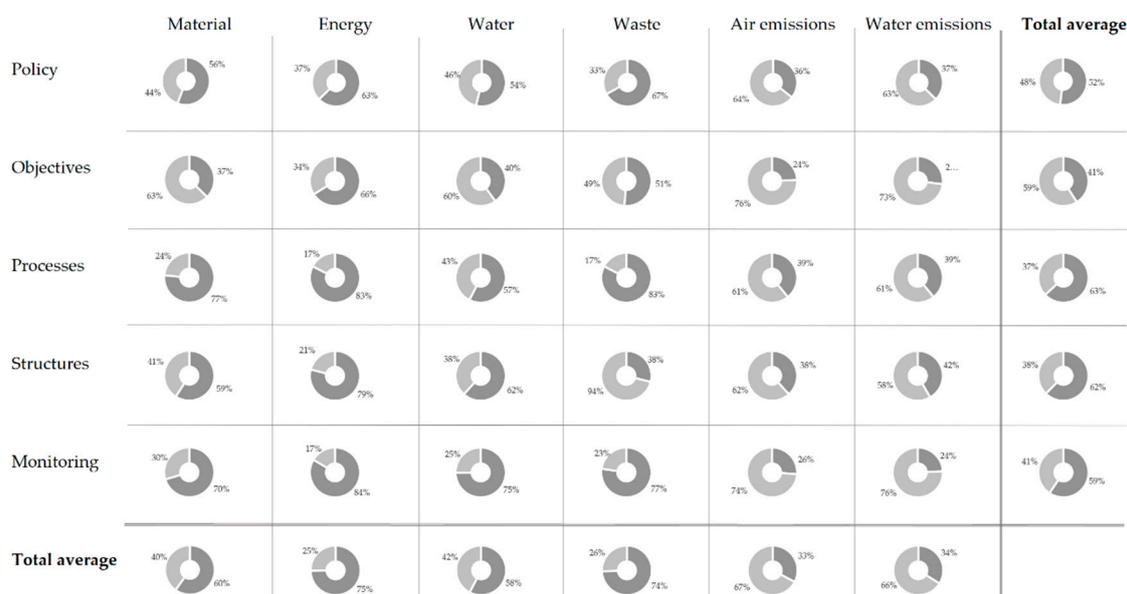


Figure 2. Organizational environmental performance (OEP), environmental management elements, and environmental aspects addressed (percentage of hospitals).

In their formulation of an organization-wide environmental policy, the majority of hospitals address waste (67.0%) and energy issues (62.6%) as well as material (55.7%) and water consumption (53.9%). Emissions into water and air are only addressed by slightly more than one third of the hospitals. Overall, only half of the hospitals have an environmental policy.

A similar ranking of environmental aspects can be observed in the context of environmental objectives. Here, energy consumption (66.1%) and waste (51.3%) rank higher than water and material consumption, which are of medium importance. Emissions into water and air receive less attention. On average, the setting of environmental objectives receives less attention than the formulation of respective policies, since only about 40.0% of the hospitals adopted environment-related targets. This is not the case for energy issues, where objectives and policies are almost equally important.

On average, regarding the existence of environmental processes, more hospitals are active in comparison to the formulation of a policy or the setting of objectives. This is especially the case for energy (82.6%), waste (82.6%), and material consumption (76.5%), which seem to be highly relevant issues. The environmental aspects of water consumption and emissions into air and water are slightly more often addressed by hospitals in processes than they are integrated in a respective policy.

In terms of organizational structures, waste (93.9%) ranks over energy (79.1%) among hospitals. Notably, organizational structures for waste management are implemented by almost all hospitals. According to our survey, assigning management responsibilities for water and material consumption (approx. 60% each) is more important than for emissions into air or water (approx. 40% each). On average, setting environmental structures is of similar importance as implementing processes. Both management elements rank highest among all.

Regarding the monitoring of environmental issues, again, energy (83.5%) and waste issues (77.4%) receive most attention, followed by water (74.8%) and material (70.4%) consumption. Notably, all

input aspects receive high levels of attention within monitoring. On the output side, emissions into air and water are only relevant for about one quarter of the hospitals. Here, the percentages of hospitals setting goals and performing monitoring do not deviate much. For the other environmental aspects, the monitoring was much more important than the setting of goals. This is interesting as the absence of goals for certain aspects could bring the effectiveness of their monitoring into question.

Overall, energy and waste issues receive the most attention (on average around 74%), whereas emissions into air and water receive the least (on average around 33%). Water and material consumption is of medium importance (on average around 59%).

4.2. Cluster Analysis

Table 4 depicts the cluster centers (mean values of the five EM elements) of the three identified types of EM approaches in the surveyed hospitals. Looking at the mean values of the total sample, environmental issues are most extensively addressed in processes, organizational structures, and monitoring procedures. However, in general, not even four environmental aspects are integrated into these management instruments. A policy exists for around three environmental issues on average, while objectives are set for only about two topics. Considering the individual scores of the different clusters, the results of the Kruskal–Wallis H test indicate that the groups are significantly different from each other. Moreover, based on the average scores across all EM elements, the clusters can be mapped along a continuum ranging from least active (traditionalists) to most active (environmentalist). This is in line with previous literature, e.g., Buysse and Verbeke [45] or Hart [50].

Table 4. Cluster and average EM scores.

EM element	Clusters			Total Average	Chi-Square
	1 Traditionalists	2 Pragmatists	3 Environmentalists		
Policy	1.81 [3]	1.31 [3]	5.29 [1,2]	3.12	74.92 ***
Objectives	0.52 [2,3]	1.72 [1,3]	4.12 [1,2]	2.46	55.69 ***
Processes	1.59 [2,3]	4.08 [1,3]	4.73 [1,2]	3.77	46.99 ***
Structures	1.59 [2,3]	4.10 [1]	4.63 [1]	3.74	47.81 ***
Monitoring	1.33 [2,3]	3.69 [1,3]	4.69 [1,2]	3.57	57.04 ***
Average	1.37	2.98	4.69		
Number of cases	27	39	49		
(% of sample)	(23.5 %)	(33.9 %)	(42.6 %)		

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, otherwise not significant. Chi-square statistics based on Kruskal–Wallis H tests. The numbers in brackets show the group number(s) that are significantly different at the 0.05 level based on the Mann–Whitney U tests.

In the following, the three identified clusters, i.e., traditionalists, pragmatists, and environmentalists, are described.

4.2.1. Traditionalists

The first cluster represents 23.5% of the total sample and was termed “traditionalists” because, except from policies, it addresses by far the lowest number of environmental issues in the different EM elements and, thus, represents traditional hospital management thinking where environmental issues are subordinated to other hospital-related issues. Particularly noteworthy is that objectives for environmental issues are almost absent. Although scores remain on a low level and differences between the clusters are not statistically significant, traditionalists have established slightly more extensive environmental policies than the generally more active hospitals in the second cluster (pragmatists). In this regard, traditionalists address about one third of the environmental issues under consideration in their policy. Since policies are also implemented to a higher degree than other EM elements, traditionalists might be in an early stage of establishing their EM. Concrete measures might therefore be still in the planning phase, potentially explaining the comparatively low scores regarding processes,

structures, and monitoring compared to the other two clusters. However, another explanation might be that their policy announcements do not manifest into concrete objectives and are not embedded in daily operations, i.e., these hospitals might not be engaging as much as they are promising regarding environmental aspects.

4.2.2. Pragmatists

The second group of hospitals identified by the cluster analysis has a share of about one third in the total sample. It was named “pragmatists” mainly because of its low score in the policy and objective dimensions, but nevertheless above-average scores regarding the sophistication of processes, structures, and monitoring. Especially in terms of organizational structures, this cluster does not differ significantly from the most active cluster. Hospitals pursuing such an EM approach seem to implement situational measures that manifest into concrete and directly visible practical actions within the organization that have an outright attributed value. However, they do this without defining what the ultimate organizational goal is supposed to be. In such cases, the observed EM approach could be viewed as being instrumental or compliance-oriented and not a result of a clear long-term vision or strategy. Moreover, in the absence of a profound environmental policy, environmental action might originate mainly from bottom-up initiatives from employees rather than top-down oriented leadership. It seems likely that hospitals in this cluster perform substantive actions for most environmental aspects rather than symbolic actions, such as formulating a signaling policy.

4.2.3. Environmentalists

Roughly 43% of the surveyed hospitals belong to the cluster termed “environmentalist”. By including almost five environmental issues on average in their EM approach, environmentalists exhibit by far the broadest management approach. Apart from the existence of similar organizational structures when compared to pragmatists, environmentalists are significantly different from the other two clusters concerning all EM elements and deviate positively from the overall sample mean. Although objectives are not yet established for every environmental issue, the respective hospitals are frontrunners in setting up a comprehensive environmental policy and have adopted appropriate environmental processes, organizational structures, and monitoring procedures for the majority of environmental aspects. These results indicate that the EM of the respective hospitals might go beyond regulatory compliance and that the top-level management might have a long-term perspective on environmental issues.

4.3. Potential Determinants of Environmental Management Approaches

When looking at the variables that were not used in the clustering procedure (i.e., stakeholder pressure, ownership, organizational performance and size, participation in VEI, environmental training), further distinctions between the groups of organizations emerge (see Tables 5 and 6).

Table 5. Clusters and perceived stakeholder pressures for environmental management.

Stakeholder Group	Clusters			Total Average	Chi-Square
	1 Traditionalists	2 Pragmatists	3 Environmentalists		
Internal					
Hospital management	3.33 [3]	3.69 [3]	4.20 [1,2]	3.83	8.17 *
Employees	3.41	3.46	3.43	3.43	0.06
Owner	2.89 [3]	2.92 [3]	3.73 [1,2]	3.26	8.73 *
External					
Regulators	3.70	3.56	3.96	3.77	1.74
Patients	2.81	2.87	2.67	2.77	0.65
Media	2.37	2.38	2.78	2.55	2.48
Relatives of patients	2.63	2.49	2.43	2.50	0.37
Local interest groups	2.11	2.23	2.73	2.42	4.81
Environmental NGOs	1.81 [3]	2.15	2.63 [1]	2.28	4.56
Hospital associations	1.96 [3]	2.05 [3]	2.61 [1,2]	2.27	7.32 *

Table 5. Cont.

Stakeholder Group	Clusters			Total Average	Chi-Square
	1 Traditionalists	2 Pragmatists	3 Environmentalists		
Insurance companies	2.15	2.03	2.51	2.26	2.46
Suppliers	2.04	1.95	2.31	2.12	3.50
Competitors	1.70	1.90	2.10	1.94	0.94
Health insurance companies	1.89	1.56	1.98	1.82	3.11
Banks	1.48	1.41	1.78	1.58	2.46
Average	2.42	2.44	2.79	2.59	

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, otherwise not significant. Chi-square statistics based on Kruskal–Wallis H tests. The numbers in brackets show the group number(s) that are significantly different at the 0.05 level based on the Mann–Whitney U tests.

Table 6. Further cluster characteristics and distribution of hospitals across the clusters.

Characteristics	Clusters			Total Avg.	F Statistic	Chi-Square
	1 Traditionalists	2 Pragmatists	3 Environmentalists			
Ownership						
Public (n = 49)	10.2 %	36.7 %	53.1 %			
Voluntary charitable hospitals (n = 41)	24.4 %	39.0 %	36.6 %			
Private (n = 25)	20.0 %	48.0 %	32.0 %			
Size						
Average number of employees	999	1696	1806	1579	1.06	
Performance †						
Return on assets (n = 73)	3.13	3.04	3.45	3.23		2.32
Return on sales (n = 73)	3.07	3.07	3.43	3.22		2.01
Employee growth (n = 83)	2.89	3.22	3.45	3.24		3.62
Sales growth (n = 78)	3.00	3.13	3.38	3.21		1.52
Asset growth (n = 70)	2.67 [3]	3.08	3.33 [1]	3.10		4.74
Debt-to-equity (n = 73)	2.29	2.50	2.07	2.27		1.66
Innovation performance (n = 77)	2.76 [2,3]	3.41 [1]	3.71 [1]	3.39		14.59 **
Overall organizational performance (n = 77)	3.67	3.55	4.00	3.75		3.16
Bed occupancy rate (n = 82)	3.78	3.31 [3]	3.94 [2]	3.68		8.96 *
Average performance	3.03	3.15	3.42	3.23		
VEI						
None (n = 86)	31.4 %	39.5 %	29.1 %			
ISO (n = 5)	0.0 %	0.0 %	100.0 %			
EMAS (n = 16)	0.0 %	6.3 %	93.7 %			
Others (n = 18)	5.6 %	22.2 %	72.2 %			
Environmental training						
Number of included environmental issues	0.67 [2,3]	1.87 [1,3]	3.29 [1,2]			39.46 ***
No. of cases (% of sample)	27 (23.5 %)	39 (33.9 %)	49 (42.6 %)			

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, otherwise not significant. Chi-square statistics based on Kruskal–Wallis H tests. The numbers in brackets show the group number(s) that are significantly different at the 0.05 level based on the Mann–Whitney U tests. † Please note that information on performance indicators could be answered on a voluntary basis. Therefore, this data is not available for all hospitals. The number in parentheses states the number of responses received.

4.3.1. Stakeholder Pressure

Table 5 summarizes the degree of perceived stakeholder pressure regarding organizational EM. The descriptive statistics illustrate that the perceived stakeholder pressure is generally on the lower end of the scale (similar results were previously obtained in a study conducted in Germany [26]). Internal stakeholders are perceived as exercising more and above-average pressure on hospitals than external ones when it comes to implementing EM. Moreover, hospitals in clusters with a higher OEP generally see themselves exposed to a slightly higher degree of overall stakeholder pressure. Environmentalists are notable in this regard, exhibiting a slightly higher score than the average.

Two internal stakeholders seem to be the most influential in terms of EM: the top-level management and the owner of the hospital. Although perceived pressure from these two stakeholder groups

is relatively similar and below average in the first two clusters, environmentalists are exposed to significantly higher and above-average levels of pressure in this regard. This is in line with previous literature stating that top management commitment is a relevant factor contributing to proactive environmental strategies as managers allocate resources and coordinate different departments from the top [53]. Furthermore, the perception of internal pressure for EM has been shown as a determinant of substantive actions that should contribute to improved OEP (compare [67]). This could apply to the environmentalists cluster that performs well and substantively in all EM dimensions regarding all environmental aspects.

In terms of external stakeholders, regulators are generally viewed as being of the highest importance by far. Yet, the perceived pressure due to environmental regulations seems not to shape the characteristics of the EM approach. Therefore, currently existing legislation does not seem to promote a more comprehensive environmental behavior among all hospitals surveyed. Yet, regulation might be effective in determining organizational behavior if it goes hand in hand with organizational leadership that is aware of the potentially negative consequences of not responding to such demands for environmental protection. The important role of such leadership in exercising pressure on hospital managers is supported by our data, which shows that the three clusters do not vary significantly in terms of perceived regulatory pressure, but managers from the most proactive group of hospitals, i.e., environmentalists, perceive a distinctively higher pressure from top-level management and owners. Therefore, top-level managers and owners might act as mediators of regulatory pressure.

Although, again, the perceived pressure is relatively low, there are only two external stakeholders that seem to shape the environmental behavior of the analyzed hospitals: environmental NGOs and hospital associations. In both cases, environmentalists represent a group with a significantly higher level of perceived stakeholder scrutiny. All other external actors are of relatively low importance for the surveyed hospitals. In contrast to other business sectors, it is particularly noteworthy that the media, customers (i.e., patients), suppliers, and competitors are nearly irrelevant for the implementation of EM in hospitals. According to previous research, the existence of external pressures could provoke symbolic actions that could increase the image of the organization without substantially performing measures to really improve the OEP (see [67]). This pre-condition seems not to exist in the hospital setting.

4.3.2. Ownership

There is no clear-cut answer with regard to the role of ownership. According to the descriptive results depicted in Table 6, independent voluntary charitable hospitals mainly belong to the two more active clusters, i.e., pragmatists and environmentalists. Yet, some hospitals from this category are also traditionalists. In case of public ownership, slightly more than half of the hospitals belong to the cluster with the most comprehensive EM, while only one tenth can be described as traditionalists. Private hospitals mainly fall into the pragmatists category, but a large share also belong to the other two clusters. All in all, public ownership seems to promote the most comprehensive EM approaches, followed by voluntary charitable and private ownership, which can be almost equally ranked.

4.3.3. Organizational Performance and Size

Table 6 additionally shows that the clusters with higher EP are characterized by a generally higher organizational performance and are also larger in size. Having said this, the latter result needs to be treated with caution, since an ANOVA and independent samples t-tests indicated that the groups are not significantly different from each other. Nevertheless, there are performance categories in which some of the clusters are distinct. First, environmentalists exhibit a significantly higher growth in assets in comparison to traditionalists. Environmentalists might therefore possess more financial and human resources to implement EM, explaining their higher overall OEP. Second, traditionalists score significantly lower in terms of innovation performance when compared to the other two clusters. This finding is in line with Hart [50], suggesting that organizations that invest more in research and development generate valuable resources that in turn positively influence the adoption

of environmental practices. Lastly, pragmatists exhibit a below-average bed occupancy rate, which is significantly lower than that of the third cluster. This would support our previously stated assumption that larger hospitals tend to be better-situated in terms of human and financial resources and, thus, perform better in EM.

4.3.4. Participation in VEI

Considering the participation in VEI, our results show that especially the adoption of an EMS according to ISO14001 or EMAS standards facilitates a more comprehensive EM approach (Table 6). Nearly all hospitals following such standards belong to the cluster environmentalists. Being part of other VEIs (e.g., Ökoprofit) also seems to promote a sophisticated EM approach, since about one fifth of hospitals that follow such initiatives fall into the category of pragmatists. Although 30% of the hospitals not being part of any initiative belong to the group of traditionalists, about 70% are evenly distributed across the other two more active clusters. Therefore, the participation in VEIs and the adoption of management standards might represent a sufficient condition for a high OEP, but not a necessary one.

4.3.5. Environmental Training

Another aspect in which the clusters vary significantly is the level of environmental training provided to employees (Table 6). Hospitals that belong to the traditionalists cluster offer only rudimentary training by addressing not even one environmental issue on average, while pragmatists sensitize their workforce to about two environmental topics and environmentalists to around three. The comprehensiveness of environmental training provided therefore seems to go hand in hand with a more sophisticated EM approach. This is in line with the literature (e.g., [50]), which states that investments in the skills of employees can be a signal of greener organizations. However, as three issues integrated in environmental training only covers half of the environmental aspects under study, education and awareness raising seems to be an issue that needs further improvement.

5. Implications

This paper is among the first to present a classification of EM approaches of hospitals. Based on data from a large survey in Germany, it sheds light on the relatively unexplored setting of service-oriented organizations and hospitals in the healthcare sector in particular. It reveals the relevant environmental aspects and characterizing determinants for EM approaches.

The data analysis reveals three clusters into which the comprehensiveness of hospitals' EM approaches can be grouped: traditionalists, pragmatists, and environmentalists. Similar to previous studies (e.g., [45,50]), the OEP of these clusters can be depicted on a continuum ranging from hospitals that are forerunners and those that lag behind their peers. Moreover, the different groups of hospitals tend to prioritize different EM elements. The study also demonstrates that hospitals perceive a generally low level of stakeholder pressure. Regarding internal stakeholders, only top management and owners seem relevant, whereas environmental NGOs and hospital associations are among the most influential external stakeholders significantly impacting the environmental management approach adopted by hospitals. Furthermore, public ownership, the participation in VEI, and the provision of environmental training seem relevant determinants for the identified clusters. Regarding size and organizational performance, no clear results were produced.

Deduced from this research, the following implications for hospitals and their managers can be drawn. However, these implications are also valuable for other organizations. For *traditionalists*, which seem to be most active with regard to formulating environmental policies in their environmental management, it is important to demonstrate that they are actually "walking the talk", i.e., they should deduce clear objectives from their policy and change their routine business according to overarching environmental goals. While a vision and its communication is important and the expressions of intents are commendable, formulating an environmental policy without setting concrete goals and adopting

structures, processes, and monitoring, i.e., really translating the policy into actions, can easily create the impression of “greenwashing” (for more information, see e.g., [77–80]). Managers should avoid this in order to preserve the credibility of their organization. Furthermore, managers who refrain from implementing more comprehensive environmental management might not be able to identify potential for process optimizations in their organization, i.e., they may miss the opportunity to save costs and render their hospital operations more efficient. However, the respective hospitals might not only fail to grasp such opportunities, but also to identify potential risks, e.g., regulatory or liability risks which may lead to future costs.

Managers that belong to the group of *pragmatists* might want to give their organization a more strategic direction, i.e., formulate clear environmental policies and objectives. Without these elements, actions taken in the organization might remain uncoordinated and unfocused and can, in the worst case, be counterproductive. Employees might struggle with aligning their individual actions in the absence of a formulated organizational environmental vision and objectives. Therefore, the risk exists that they make decisions as a reaction to each individual situation and according to personal preferences. From a managerial point of view, this could lead to suboptimal results. Thus, managers could be advised to increase more direct communication in order to anchor expectations that could influence future behaviors. Furthermore, without setting goals, environmental monitoring falls into a void. Adjustments cannot be made when the targets are missing.

Even for *environmentalists*, who address many environmental issues within their management, gaps remain that could be closed, e.g., regarding the setting of more concrete objectives for some highly neglected issues. Especially the issue of wastewater management is a highly sensitive one that could lead to future changes for the hospital setting, e.g., regarding the treatment and discharge of pharmaceutical residues, and awareness regarding such significant impacts could increase [81]. Furthermore, training regarding environmental issues in general could be offered.

Some implications of this research can be seen for policy makers. Since healthcare services are of societal interest and a large share of hospitals in Germany are publicly owned, government authorities might want to build on the potential role model of such organizations in terms of environmental protection. Although more than half of the public organizations in our study already belong to the most active group of hospitals, public authorities could instruct the remaining share of hospitals through top-down governance to follow more comprehensive EM approaches as this contributes to addressing multiple negative environmental impacts. Offering financial incentives for implementation of EM measures and initiatives could encourage hospitals (e.g., smaller or voluntary charitable hospitals) to become active and consider environmental protection within their traditional hospital-related core tasks. Another option for authorities would be to tighten laws, meaning to set and enforce targets for more environmental aspects than the current laws do. Based on our results, it is not only advisable to provide incentives for hospitals to participate in approved VEI, such as ISO 14001 or EMAS, which have been shown to go hand in hand with increased OEP, but also to increase the overall financial resources of the sector for environmental protection measures. Finally, increasing awareness among hospital managers and employees, e.g., by providing more information on environmental impacts and how to reduce them, might also contribute to more environmentally sustainable development of the sector.

6. Limitations and Future Research

Despite the contribution of this paper, the results should be viewed in the context of certain limitations. First, there are potential shortcomings regarding the generalizability of the data. Despite many endeavors, the response rate remained low. However, this is comparable to other studies and might be attributed to an increasing survey fatigue among organizations. Second, managers were asked to state their perception regarding OEP and stakeholder pressure. Although this represents a common way to collect information when data is not publically available, responses might still be biased due to personal characteristics of the respondents. Future studies might want to match secondary data with survey data, if data availability allows for it. Third, the implementation of EM elements was

measured as dichotomous variables, meaning that hospitals stated if they adopted certain measures or not. We followed the conceptualization proposed by Trumpp et al. [19]. Future research could capture EM elements in a more detailed way, e.g., by also looking at the implementation level of certain EM elements regarding different environmental issues, and compare it with quantitative indicators of environmental operational performance. Alternative measurements of OEP and EM can be tested in future research. Lastly, most of the stakeholders seem irrelevant for the EM approach pursued by German hospitals. This is in line with a study conducted in the German hospital setting (see [26]). However, it is in contrast to a large body of literature on stakeholder theory and environmental management. Scholars therefore might want to extend this analysis to case studies in hospitals of different sizes or other countries.

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Appendix A

Survey Questionnaire

Translated from German, selected questions of the online survey

OEP, EM Elements and Environmental Issues

The individual sections contained a description of the environmental management element and an example

Our hospital has a written company-wide **policy** that covers the following aspects . . .

(Please indicate whether the individual statements apply)

- Material consumption
- Energy consumption
- Water consumption
- Wastes
- Air emissions
- Emissions into water

Our hospital has specific environmental **goals** regarding...

(Please indicate whether the individual statements apply)

- Material consumption
- Energy consumption
- Water consumption
- Wastes
- Air emissions
- Emissions into water

Our hospital has **processes** in place to improve/ reduce . . .

(Please indicate whether the individual statements apply)

- Material consumption
- Energy consumption
- Water consumption
- Wastes
- Air emissions
- Emissions into water

In our hospital, we have a **responsible person** regarding . . .
(Please indicate whether the individual statements apply)

- Material consumption
- Energy consumption
- Water consumption
- Wastes
- Air emissions
- Emissions into water

Our hospital **monitors** . . .
(Please indicate to whether the individual statements apply)

- Material consumption
- Energy consumption
- Water consumption
- Wastes
- Air emissions
- Emissions into water

Stakeholder Pressure

Please assess the pressure that the following groups exert on your hospital when considering environmental aspects (Please rate 1 – low pressure to 6 – high pressure, stakeholders were randomly presented in the online questionnaire)

- Owner
- Hospital management
- Employees
- Patients
- Relatives of patients
- Regulators
- Competitors
- Suppliers
- Health insurance companies
- Financiers/ banks
- Media
- Insurance companies
- Local interest groups
- Environmental NGOs
- Hospital associations
- Others (specify)

Hospital and Personal Characteristics

Our hospital can be classified based on the type of ownership as follows: public, private, voluntary charitable hospital. (Please choose)

Please indicate the number of employees in your hospital.

In our hospital, employees are trained on the following topics:

- Material consumption
- Energy consumption
- Water consumption
- Wastes

- Air emissions
- Emissions into water

Does the hospital participate in voluntary environmental initiatives?

(a) EMAS, (b) ISO 14001 (c) others (specify)

- Yes, and we will continue to have it in the future.
- Yes, but we won't have it in the future.
- No, but we are currently planning it for the future.
- No, and we are not currently planning it for the future.
- I do not know.

How do you rate your hospital's performance in relation to the following indicators compared to the national average? (Please rate 1—below average to 5—above average, no answer)

- Return on assets
- Return on sales
- Employee growth
- Sales growth
- Asset growth
- Debt-to-equity
- Innovation performance
- Overall organizational performance
- Bed occupancy rate

What position do you currently have in your hospital? (Please indicate the job title)

How long have you been working in this hospital?

How long have you been working in this position in this hospital?

How long have you been working in your current position in your and/ or other hospitals?

What is your highest level of education or academic degree? (Please specify your background)

Your gender?

Which age group do you belong to?

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