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RESEARCH ARTICLE

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Sustainability among Norwegian maritime firms: Green strategy and innovation as mediators of long-term orientation and emission reduction

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Abstract
This study investigates the relationships between emission reduction, long-term orientation, green strategy, and green innovation among maritime vessel-owning firms of various sizes in the Norwegian maritime sector. A change from the utilization of fossil fuels and move toward more sustainable sources of energy demand substantial financial investments and behavioral changes but are fundamental to preventing further climate change. This study examines the greening of the Norwegian fleet through a structural equation model based upon 246 survey responses. Although our model does not show a significant direct relationship between long-term orientation and emission reductions, we do find that long-term orientation is indirectly related to emission reductions because of its relationships with green strategy and green innovation. Moreover, as mediators, green innovation and green strategy share direct associations with firms' reductions of greenhouse gases and environmentally harmful emissions. Implications for practitioners and policy makers are proposed.

KEYWORDS
environmental innovation, environmental strategy, greenhouse gas emissions reduction, maritime sector, sustainable shipping, temporal orientation

1 | INTRODUCTION

Public and policy concerns connected to greenhouse gas (GHG) emissions have steadily been increasing. Nevertheless, although there is an urgent need for society to act quickly to avert more serious long-term effects associated with global warming, it is not easy for firms to invoke actions that incur short-term costs if they do not reap short-term benefits. Because companies are often concerned with short-term performance, the delayed effects of climate initiatives typically mean that organizations are not incentivized to take immediate actions to reduce their carbon footprint (Keith, 2009).

In this respect, it is prudent to consider the temporal orientation of firms, because they face a dilemma associated with sustainability initiatives such as reducing GHG emissions (Slawinski & Bansal, 2015). That is, by investing in technologies and practices that can decrease emissions, firms may have to forego near term profits. However, having a long-term orientation can help overcome the focus on short-term rewards that often prevents businesses and their leaders from investing in and implementing environmentally friendly initiatives (Wang, 2017).

Long-term oriented firms are characterized by prioritizing future-oriented strategies and investments. This is in contrast to short-term oriented firms who target low-cost immediate returns. Firms with a long-term orientation may be more likely to prioritize reducing their GHG emissions because they are prone to focus resources on environmental efforts even if they do not contribute to immediate benefits for the firm (Sternad & Kennelly, 2017; Wang, 2017).

The significance of a long-term orientation is relevant to the maritime sector, where emission reduction and time are both pertinent elements to the issue of climate change. Recent years have seen an increase in rules and regulations specifically geared toward limiting GHG emissions in the maritime sector, and Norway has some of the strictest standards (Norwegian Shipowners' Association, 2020). However, in the near term, reducing emissions does not necessarily provide a competitive advantage to maritime firms, even for those who operate in Norway. This is because the majority of the targets are far into the future, meaning that many firms will not act until absolutely necessary. Thus, in this context, one may assume that firms with longer time perspectives are more likely to prioritize the reduction of GHG emissions.

Sustainability often requires firms to act with a longer time horizon, so it makes intuitive sense that firms with a long-term orientation are more likely to implement green initiatives. However, there is limited evidence that it actually contributes by itself to green outcomes, such as the reduction of GHG emissions. A long-term orientation may in reality be beneficial to environmentally friendly initiatives because of its relationship with other capabilities. More concretely, it may be helpful to reduce emissions because of its relationships with green strategy (Dou, Su, & Wang, 2019; Durach & Wiengarten, 2017) and green innovation (Liao, 2016).

The purpose of this study then is to identify how firms' long-term orientation relates to emission reduction, and the degree to which this is explained by green capabilities at the firm level. Indeed, a longer temporal perspective may not be enough by itself to reduce GHG emissions, so we specifically investigate how maritime organizations' green strategies and innovation mediate the relationship between long-term orientation and emission reduction priorities. In doing so, we advance the literature on temporal orientation and green initiatives. We propose that a transition from fossil fuels to more sustainable alternatives is benefited by a long-term perspective, and it also requires an environmentally focused strategic and innovative commitment by the firm.

1.1 | Empirical context—Emissions and the Norwegian maritime sector

As in other sectors, climate change is an issue of concern in the maritime sector. This sector includes firms that own and operate fishing vessels, passenger ships, offshore supply boats, and cargo ships. The maritime sector is highly important for the transportation of goods and people throughout the world and is especially important in the coastal nation of Norway.

Shipping accounts for close to 3% of global anthropogenic emissions (IMO, 2020), and if not addressed, it is expected that these emissions will increase further due to a greater dependence on maritime vessel-related activity. More recent decades have seen growing emissions due to increased international trade, mobility demands, population growth, and the exceeding use of natural resources. Carbon dioxide (CO_2), sulfur oxides (SO_x), nitrogen oxides (NO_x), and particulate emissions (PM) are the most prevalent sea-going vessel emissions, and they have a detrimental impact on air quality and the environment. These substances are characterized as direct or indirect GHG emissions, which increase global warming. They can also pollute on a more local basis with adverse effects on marine habitats and nearby communities. The reduction of emissions related to these substances is therefore of high value for limiting climate change and preventing further environmental degradation.

In April 2018, the International Maritime Organization (IMO) published their plans for the phasing out of GHG to reach a low- or zero-carbon (LoZeC) footprint by 2100 and cutting the global fleets' consumption of fossil fuels in half by 2050 (IMO, 2018). Moreover, the Norwegian maritime sector has recently provided even shorter timeframes for these cuts, proposing a halving of the maritime sector's GHG emissions by 2030 and a climate neutral fleet by 2050 (Norwegian Shipowners' Association, 2020), whereas the Norwegian government and more than 60 private partners have implemented an accelerated transition to LoZeC energy solutions in maritime vessels (GL, 2019). Further, IMO and collaborators have recently initiated a major international project for additionally reducing GHG emissions (IMO, 2019). The maritime sector is thus facing ambitious goals to turn their operations—which are currently heavily dependent on fossil fuels—into environmentally sustainable practices in the future.

Evidently, decarbonization of the maritime industry is challenging, similar to other industries such as aviation or heavy industry, as it is characterized by high-capital intensity, low profit margins, and international competition (Victor, Geels, & Sharpe, 2019). Although there are similarities between the maritime sector and other capital-intensive industries, there are differences that can make the industry even more challenging when it comes to tackling emission reduction. For instance, the maritime shipping industry comprises a broad range of segments, including coastal maritime transport and deep-sea shipping, which have different operational profiles, sailing distances, and vessel sizes. Battery-electric solutions, for example, are most suitable for short-range vessels such as coastal fishing vessels and passenger ferries because of their range capacities and frequent charging requirements, but they are not compatible for long-distance deep-sea vessels. Thus, not all solutions are relevant for every segment, so tailored alternatives are necessary rather than a one-size-fits-all approach.

Diversity in maritime segments is not the only challenge with alternative fuel implementation, and consequently, there are often long time frames associated with their adoption. Specifically, there exist multiple alternatives to typical fossil fuels across segments, but they differ in their technological maturity and adoption readiness. Liquified natural gas (LNG), biodiesel, and battery-electric are existing alternatives in some contexts whereas hydrogen, ammonia, and biogas are examples of promising future LoZeC-fuels. Therefore, the desire to adopt fuels to reduce emissions is dependent on whether they are appropriate for a particular ship, if the technology is sufficiently developed, and if the necessary infrastructure is in place. Ultimately, the implementation of LoZeC energy solutions has implications for ship design, operations, and infrastructure.

In addition to adopting LoZeC fuels, shipowners also have several other options to reduce emissions. For instance, changes to design and construction (e.g., sleeker hulls and lightweight materials) when building new vessels can reduce emissions. However, like the adoption of alternative fuels, these modifications often require long lead times. Other examples of emission-reducing modifications include end-of-pipe solutions such as installing marine scrubbers to reduce SO_x, increasing maintenance to reduce drag of moving vessels, or implementing environmental operations such as lower sailing speed or more effective routing. These typically require less extensive investments and shorter time horizons, making them easier to implement.

Despite improvements in emission standards, most targets are still a long way off, and the sector has been plagued by a sub-par environmental track record. Although Norway is a forerunner in the development of LoZeC technologies such as battery-electric and hydrogen solutions for maritime vessels (Bach et al., 2020), the Norwegian Shipowners' Association's emissions targets—some of the most ambitious maritime emissions reduction targets in the world—are still at least 10 years in the future. Furthermore, these targets do not apply to many of the maritime firms in Norway, including the coastal fisherman which are the largest contingent of maritime vessel owners. Thus, although adopting technology and operations that reduce emissions will almost certainly increase costs in the near term, the competitive benefits for maritime firms are uncertain. It is more likely that the benefits of reducing emissions can be realized in the long-term, that is, over 10, or even 20 years from now. So it logically follows that the upfront costs of reducing emissions may be considered unrealistic or imprudent by many maritime firms.

Emission reduction in the maritime sector is complex and difficult to understand and predict. For a shipowner, regardless of segment, an investment in a LoZeC energy solution is typically a major investment that requires rebuilding an existing vessel or ordering a new vessel, and in some cases, waiting for a future alternative may be deemed superior to adopting current alternatives. The high complexity and unpredictability of emission reduction in the maritime sector requires substantial time horizons. Consequently, a long-term orientation can prove beneficial in the green transition.

2 | THEORY AND HYPOTHESES

2.1 | Temporal orientation and its consequences

Scholars have observed that both individuals and organizations make decisions based on temporal points of reference, and these time-related orientations can have consequences for organizational processes and outcomes (Mosakowski & Earley, 2000). One of the most common frameworks relating to temporal perspectives is the long-term versus short-term orientation dichotomy (Laverty, 1996). In many aspects, firms need to choose between decisions that affect their short-term goals—such as stock market valuation—and decisions that affect development of long-term growth—such as investments in new technologies.

When firms' short-term goals compromise long-term returns, they are labeled "short-termist" (Flammer & Bansal, 2017). Short-term orientation is typically attributed to either myopic behavior at the individual level, or organizational conditions. Individual managers largely prefer short-term results over higher long-term rewards due to career concerns, market expectations, employee bonuses, and stakeholder motivations (Graham, Harvey, & Rajgopal, 2005). At the organizational level, resource limitations will strengthen a preference for short-term results because long-term projects typically bind up company resources for an extended period, which puts pressure on resource-constrained firms to reduce the time horizon. Firms typically focus on the short term at the expense of the long term, even if it means sacrificing future performance (Laverty, 1996). Short-termism can also lead to negative consequences for society and the environment (Hoffman & Bazerman, 2007).

In contrast to short-term oriented companies, firms with a *long-term orientation* have "the tendency to prioritize the long-range implications and impact of decisions and actions that come to fruition after an extended time period" (Lumpkin, Brigham, & Moss, 2010). Furthermore, firms with a long-term orientation embrace "priorities, goals, and most of all, concrete investments that come to fruition over an extended time period, typically, 5 years or more, and after some appreciable delay" (Le Breton–Miller, & Miller, 2006). A long-term orientation then signifies that firms prioritize long-term goals and are keen to view their actions with a future perspective.

Scholars have found that long-term oriented companies face less time pressure giving corporate activities and investments more time to generate results (Johnson, Martin, & Saini, 2012), which means that long-term oriented companies are more likely to be involved in activities without immediate returns such as exploratory efforts like R&D (Miller & Friesen, 1982; Venkatraman, 1989), and investments in strategic resources that do not necessarily have value in the near term (Hamel & Prahalad, 1994). Ultimately, this leads to increased firm value and performance in the long run (Flammer & Bansal, 2017). Thus, it is useful to consider the effects of long-term orientation on business processes and outcomes in various contexts, including strategy and innovation, and in relation to environmental measures such as emission reduction.

2.2 | Long-term orientation and emission reduction

Emission reduction is often an element of green performance in other studies (Hajmohammad, Vachon, Klassen, & Gavronski, 2013; Stanwick & Stanwick, 1998), including maritime vessel studies (Yang, 2018; Yang, Lu, Haider, & Marlow, 2013), where higher environmental performance is indicated to the degree that maritime firms actively try to reduce their emissions. As with other studies that show positive effects of longer time horizons on performance in the long run, we assume that maritime firms with a long-term orientation will exhibit higher emission reduction priorities.

Emission reduction is typically different from waste collection and treatment. Where the latter involves the (responsible) handling of waste *after* value creating operations, emission reduction entails the prevention of waste in the first place (Hart & Ahuja, 1996). This is especially true of firms with smaller maritime vessels that do not have the option of installing scrubbers or carbon capture systems to reduce or clean their GHG emissions. Emission reduction requires careful planning and an acceptance of costs to realize future benefits.

A long-term orientation may directly influence firms' priorities for emission reduction through its focus on reaping benefits of investments in the long haul, rather than expecting immediate returns. Prioritizing the future over the present can encourage organizations to overlook the absence of quick results on the financial bottom line and emphasize the environmental "big picture." This more distant perspective has been shown to be conducive to environmental initiatives in previous studies (Sternad & Kennelly, 2017; Wang, 2017).

To be able to reduce emissions is indeed a complex challenge. An orientation towards longer time horizons implies looking at various ways to solve complex problems and taking the time to plan for long term solutions to these challenges. Furthermore, a long-term orientation might imply that firms connect future environmental concerns directly to their operations, which makes long-term oriented firms more likely to invest in new technology and practices to reduce future emission even though the benefits are uncertain.

We therefore hypothesize a positive relationship between long-term orientation and emission reduction.

Hypothesis 1. Long-term orientation is positively associated with emission reduction.

2.3 | Long-term orientation, green strategy, green innovation, and emission reduction

It is also likely that long-term orientation has positive relationships with green strategy and green innovation, which in turn share an association with emission reduction. *Green innovation*, also known as environmental innovation, is innovation that benefits the environment (Lee & Kim, 2011; Liao, 2018). For example, it may refer to novel technology, processes, services, products, or other solutions that help to minimize waste, reduce air pollution, and conserve energy (Tang, Walsh, Lerner, Fitza, & Li, 2018). Additionally, *green strategy* (i.e., environmental strategy) is the degree to which environmental issues are integrated into firms' strategies (Banerjee, Iyer, & Kashyap, 2003; Helfaya & Moussa, 2017). Green strategies may be documented or implemented in various forms, including plans, processes, targets, and reports. First, we will make the case for the relationships involving green strategy before going on to the relationships with green innovation.

To incorporate environmental aspects into business strategy can be a daunting task for many managers. However, environmentally focused strategies have become more common. Whiteman et al. (2013, p. 308) noted: "many companies have progressed from reactive responses to environmental threats in the early years to more proactive business strategies that seek to address sustainability in an integrated, strategic manner." Nevertheless, professing the greenness of a firm is always easier than attaching action to those words.

In contrast to "greenwashing," organizations that implement a green strategy through environmental processes, goals, training, and reporting will have likely gone through an extensive process. This is because a change from "business as usual" to green strategy is likely to involve debate, disagreements, and even struggle—as "whenever new ways of thinking and acting emerge, a struggle occurs—first in an attempt to maintain the hegemony of hitherto dominant discourses, and then as a new discourse gains ascendancy, in an attempt to define its parameters" (Roper, 2012). In this respect, and with support from previous studies (Dou et al., 2019; Lin, Shi, Prescott, & Yang, 2019), firms with a long-term orientation will be more likely to follow through and develop a thorough green strategy.

Green strategies will then ensure that efforts are made to reduce emissions. Firms that have green strategies are more likely to prioritize emission reduction and ultimately reduce their harmful emissions (Czerny & Letmathe, 2017; Florida & Davison, 2001). Ultimately, green strategies will entail more focused environmental efforts and a willingness to adopt greener initiatives, such as emission reduction.

Therefore, we propose the following hypotheses:

Hypothesis 2. Long-term orientation is positively associated with green strategy.

Hypothesis 3. Green strategy is positively associated with emission reduction.

Moreover, we suggest that green strategy is positively related to green innovation. Because climate change and the reduction of emissions should be pursued strategically like any other business threat or opportunity (Porter & Reinhardt, 2007), many companies have implemented proactive environmental or green strategies. These strategies are composed of deliberately chosen environmental practices and activities (Darnall, Henriques, & Sadorsky, 2010), and these strategies are potentially linked with R&D competence and innovation (Ko & Liu, 2017). Strategy helps to focus resources on particular activities and firms that focus resources on green activities increase their potential for green innovation (Chen, 2008; Song & Yu, 2018). Furthermore, firms with green strategies have a proactive stance toward the environment and emission reduction. Instead of solely reacting to governments' environmental policies, companies with green strategies are adept at combining and coordinating their resources for green innovation (Song & Yu, 2018). In line with this, firms with green strategies are prone to exhibit green innovation.

Hypothesis 4. Green strategy is positively associated with green innovation.

In addition to green strategy, long-term orientation is likely related to green innovation. A greater time perspective is often associated with a greater tolerance for failure (Flammer & Bansal, 2017), which is inherent in innovation because of its uncertainty. Furthermore, firms who are willing to take short-term losses to benefit the future are often disposed to invest in R&D (Ravenscraft & Scherer, 1982) and new technologies (Ortiz-de-Mandojana & Bansal, 2016). Although a short-term or myopic focus goes hand-in-hand with exploitation (Levinthal & March, 1993; March, 1991), long-term, forward-thinking companies are more likely to be creative and innovative (Ford, 2002).

A long-term orientation can be a "key source of uniqueness" (Lumpkin et al., 2010) and stimulate an organization's commitment to green innovation, resulting in environmental product and process innovations (Liao, 2016). Novelty is often perceived as a key aspect of innovation, this might be especially true when it comes to environmental or green innovation where reconceptualizing old assumptions to achieve dramatic improvements in sustainability may be necessary (Hart & Milstein, 1999). Ultimately, these innovations will target "environmental issues related to energy saving, pollution prevention, waste recycling, and eco-design" (Huang & Li, 2017).

Emission reduction is a challenging task, but being open to new ways of thinking, experimenting, and seeking novel solutions to tackle sustainability challenges is necessary and will aid in the process of cutting emissions. Previous studies have shown that green innovation is related to emission reduction (Carrión-Flores & Innes, 2010; Chiou, Chan, Lettice, & Chung, 2011; Zhang, Peng, Ma, & Shen, 2017). This is likely relevant in an array of sectors, including the maritime sector, where reducing emissions requires new and improved technologies and ways of doing things.

Thus, we propose positive relationships between long-term orientation and green innovation and between green innovation and emission reduction.

Hypothesis 5. Long-term orientation is positively associated with green innovation.

Hypothesis 6. Green innovation is positively associated with emission reduction.

2.4 | Green strategy and green innovation as mediators

The previous arguments and hypotheses make the case for an indirect relationship between long-term orientation and emission reduction with green innovation and green strategy as mediators. Conceptually, this makes sense because a forward-looking perspective by itself may not be enough to reduce emissions. That is, other processes and capabilities likely need to occur for the reduction of emissions to take place.

We propose that green innovation and green strategy are necessary mediating elements of emission reduction. We consider green innovation and green strategy as organizational capabilities or behaviors that can stem from a longer time horizon. Furthermore, green innovation and green strategy are necessary to reduce emissions, and they help to connect a long-term orientation with emission reduction. Previous studies have demonstrated that environmental capabilities contribute to environmental performance, including emission reduction (Hajmohammad et al., 2013; Russo & Fouts, 1997). Thus, we expect that firms with a long-term orientation will actively work toward reducing their emissions through the capabilities of green innovation and green strategy.

Hypothesis 7. Green strategy and green innovation mediate the relationship between long-term orientation and emission reduction.

2.5 | Conceptual model with key constructs

In sum, we propose a mediation model for long-term orientation and emission reduction with green innovation and green strategy as mediators. (Our proposed model can be seen in Figure 1.) We believe that a long-term orientation is beneficial to emission reduction because firms will be more likely to consider the long-term benefits of reducing CO_2, SO_x, NO_x, and PM emissions, and they will still prioritize their reduction even though there may be few short-term benefits. Additionally, and perhaps more importantly, a long-term orientation should relate to emission reduction because of its relationships with green innovation and green strategy. Having a future perspective is necessary for implementing green strategies (e.g., environmental procedures, goals, training, and reporting) and green innovation (e.g., novel technologies, services, products, and processes for environmental benefits). In other words, green strategy and green innovation help to explain long-term orientation's relationship with emission reduction.

3 | METHODS

3.1 | Data sample and procedure

We gathered data for this study using an online survey with the survey software program Select Survey. The survey was written in

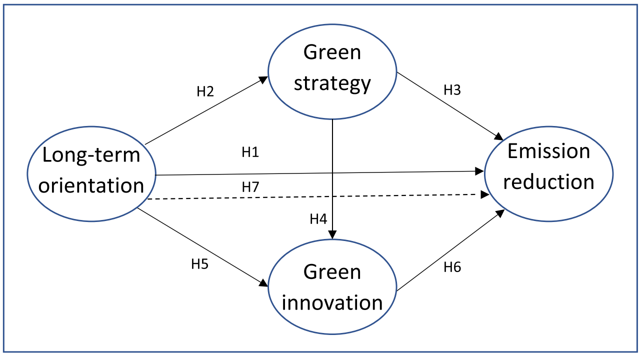

FIGURE 1 Conceptual model [Colour figure can be viewed at wileyonlinelibrary.com]

Norwegian because the intended respondents were predominantly Norwegian nationals living in Norway. We targeted active public and limited liability companies with over 1 million NOK (approximately 0.1 million Euros) in operating income that owned and/or operated seagoing vessels. We identified companies by using Proff Forvalt, an online database of all registered companies in Norway. Furthermore, to gain a more precise estimate of our population, we specified that the companies for our study should be firms listed in the following NACE categories: A.03.111 (marine fishing), A.03.213 (marine aquaculture), H.50 (water transport [including subordinate codes 50.101, 50.102, 50.109, 50.201, 50.202, 50.203, 50.204, 50.300, and 50.400]), H.52.22 (service activities incidental to sea transport), and H.52.29 (ship brokering). This resulted in a list of 2707 firms in total.

We targeted CEOs as respondents because they would likely have the most accurate knowledge of company information and decisions related to our survey content. Some individuals are the acting CEO for two or more registered companies, and we identified a total of 2005 individual CEOs of companies owning and/or operating seagoing vessels. Some email addresses for firms and their associated executives were available in the Proff Forvalt database, whereas additional emails were gathered via phone, online searches, and contacting maritime organizations and alliances. Ultimately, we were able to identify 1045 unique email addresses.

First, the survey was pretested with a pilot group of practitioners to ensure comprehensibility before sending it out to the remaining respondents. Then, during late 2019 we sent the survey to the 1045 email addresses. Respondents were requested to respond on behalf of one of their associated companies so as not to have multiple responses from the same individual. Individual respondents and their respective companies were guaranteed confidentiality, and they were also ensured that collected survey data would only be presented and/or published in aggregate form to prevent the possibility of individual identification. Over the remaining months, companies were followed-up by phone and email to increase the response rate. We employed a conservative cut-off with a maximum of one missing case per response for the study's operative variables. After doing so, we arrived at 246 usable responses out of a possible 1045 (response rate of 24%).

The firms in this study's sample owned on average between one and three vessels, and 62% of the firms owned vessels that were more than 10 years of age. The average organization was 10–20 years old and had between three and five employees. Finally, the majority of firms operated within fishing, followed by the cargo, passenger, aquaculture, and offshore oil and gas segments, respectively.

3.2 | Measures

Scale items with factor loadings for the variables, along with their respective reliabilities and validities can be found in the appendix (Table A1). The items in the following three constructs were measured with a 5-point bipolar Likert scale ranging from 1 (completely disagree) to 5 (completely agree).

Long-term orientation: In this study, a long-term orientation is specified as being concerned with long-term (more than 5 years) goals and strategies, allocation of resources, and competitive advantages. Three items measured a firm's long-term orientation, and these items were adapted from Wang and Bansal (2012). A sample item includes "My firm emphasizes long-term (over 5 years) goals and strategies."

Green innovation: The green innovation-construct was composed of three items reflecting the degree of companies' innovative behavior with specific respect to green or environmental processes, solutions, and products. These items were adapted from innovation measures by (Bell, 2005; Wang, 2008), and a sample item includes "My firm is ahead of our competitors in adopting new green technologies."

Green strategy: Five items measured companies' green strategies in the form of environmental processes, goals, training, and reporting. These items were adapted from Anton, Deltas, and Khanna (2004) and Darnall et al. (2010). A sample item includes "My firm has environmental performance goals."

Emission reduction: The construct concerning emission reduction was composed of four items, measured with a 5-point unipolar scale ranging from 1 (not a priority) to 5 (very high priority), and a question stem of "How high does your company prioritize the following?" The items were inspired by Yang et al. (2013) and Yang (2018). This measure was intended to reflect the degree to which firms are actively reducing CO_2, SO_x, NO_x, and PM emissions from their seagoing vessels.

A note on control variables: Following Becker et al. (2016) among others, we have not included control variables in our analysis. This is because our hypotheses were not formed on the basis of controls, theory does not stipulate the use of them for our model, and the addition of controls could potentially cloud the interpretation of results. Thus, we do not believe the inclusion of control variables is warranted for this study.

3.3 | Common method variance

This study is based on self-report measures collected at a single timepoint meaning that common method bias or variance must be accounted for. Common method variance (CMV) is variance in the collected data that stem from the method of measurement (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003), and it is often difficult to avoid it completely (Chang, Van Witteloostuijn, & Eden, 2010), especially when objective data sources are hard to obtain. Because our data could potentially suffer from CMV, we have tried to limit its severity as outlined below.

To reduce the potential for CMV and other methodological bias, we applied procedural methods as suggested by Podsakoff, Mackenzie, and Podsakoff (2012). Regarding the survey, we tried to ensure that the difficulty of the questions did not exceed the respondents' knowledge or capabilities. We used clear and concise language, avoided complicated and ambiguous syntax, labeled all scale points, and also pretested the survey to ensure that there was no confusion. In addition, we separated the predictor and criterion measures on the survey and used different scales. Finally, we guaranteed respondents' confidentiality and allowed for their anonymity, which can help limit CMV (Konrad & Linnehan, 1995).

We also employed some statistical methods to check for common method variance. First, confirmatory factor analysis demonstrated good fit to the data, providing preliminary evidence that our model had no problem with CMV (Stam & Elfring, 2008). Moreover, we conducted a Harman's one-factor test (Podsakoff & Organ, 1986) where the resulting single factor model showed an explained variance of 36.23% (i.e., less than 50%), indicating that our data do not suffer from CMV considerably. Ultimately, although we cannot rule out that CMV had an effect, we have tried to limit it and believe that it was not a major issue for our model.

3.4 | Missing cases

With respect to the specific variables and responses in this study, only 21 out of 3,690 cases (.006%) were missing. Little's (1988) missing completely at random (MCAR) test (χ^2 = 110.732, *df* = 126, *p* = .832) revealed that data was missing completely at random. We used the full information maximum likelihood (FIML) procedure to handle missing data because it provides unbiased parameter estimates and standard errors and is often used for structural equation analyses (Graham, 2009).

4 | ANALYSIS AND RESULTS

4.1 | Measurement model

To test our hypothesized model, we employed SEM with Stata 16. This statistical technique allows for the testing of multiple relationships simultaneously and also for the estimation of both direct and indirect relationships. To ensure the validity of our findings we first performed a measurement model and analyzed its results before moving on to the structural model (Anderson & Gerbing, 1988).

A measurement model with confirmatory factor analysis (CFA) was used to test the structure and validity of the hypothesized model's constructs. Alpha values, factor loadings and the respective standard deviations are reported in Table A1. Measurement error covariation was allowed within the green strategy-construct due to high modification indices. All but one item loaded significantly onto their respective factors and exhibited loadings higher than 0.5. The only exception was within green innovation, where one item displayed a loading of 0.438. However, this item was included to strengthen construct validity. All factors displayed Cronbach's alphas (α) above 0.8. The average value extracted (AVE) values were all higher than 0.5, and they were higher than the squared factor correlations indicating that our constructs demonstrated satisfactory convergent and discriminant validity. We calculated and investigated several goodness-of-fit-indices (CFI = 0.968; TLI = 0.958; RMSEA = 0.065; SRMR = 0.069), indicating that there is a satisfactory overall fit of our measurement model to the dataset. Information on the variables is found in Table 1, including means and correlations.

4.2 | Structural model

As our measurement model showed satisfactory validity and fit with the dataset, we were able to move on to the structural path model and test our hypotheses. Both direct and indirect relationships were hypothesized and estimated in the model, and Table 2 provides an overview of the hypothesized relationships. As in the measurement model, we allowed for covariation within the construct of green strategy. The structural model showed satisfactory model fit indices (CFI = 0.968; TLI = 0.958; RMSEA = 0.065; SRMR = 0.069). We went on to examine the statistical significance, direction, and size of the path estimates to determine support for the hypotheses. Subsequently, we tested mediation with the medsem package in Stata, which includes a Sobel test (see Table 3). The model results and standardized path values are illustrated in Figure 2 in Section 4.3.

4.3 | Findings

Based on the SEM results, we find that our hypotheses are largely supported with the exception of one hypothesis. Our findings indicate that long-term orientation is not directly associated with emission reduction (β = 0.118, p = 0.169), so we conclude that Hypothesis 1 is not supported. (It should be noted, however, that a model without the mediators showed a significant relationship between long-term orientation and emission reduction [β = 0.374, p < 0.001]). On the other hand, the rest of the hypothesized relationships received support, demonstrated by the statistically significant relationships in the model. Long-term orientation is related to both green strategy (β = 0.392, p < 0.001) and green innovation (β = 0.159, p < 0.001), providing support for Hypotheses 2 and 5. Furthermore, there are strong relationships between green strategy and emission reduction (β = 0.349, p < 0.001) and between green innovation and emission reduction (β = 0.567, p < 0.01), which support Hypotheses 3 and 6, respectively. Finally, we see a significant relationship between green strategy and green innovation (β = 0.128, p < 0.01), lending support to Hypothesis 4.

Regarding mediation of the relationship between long-term orientation and emission reduction, the results from the SEM model (β = 0.256, p < 0.001) support Hypothesis 7. Furthermore, the Sobel test results show that there is a significant indirect relationship going through both green strategy (B = 0.137, p < 0.01) and green innovation (B = 0.090, p < 0.05), whereas the direct relationship between long-term orientation and emission reduction is not significant. According to Baron and Kenny (1986), this is an example of complete mediation, whereas Zhao, Lynch, and Chen (2010) refer to this type of mediation as indirect-only mediation.

TABLE 1 Factor means, standard deviations, average variance extracted, and Pearson's correlations of factor mean scores

Factor	Mean	*SD*	AVE	1	2	3
1. Emission reduction	3.286	1.047	0.784			
2. Green innovation	3.117	0.897	0.667	0.377* (0.163)		
3. Green strategy	3.655	0.905	0.573	0.443* (0.161)	0.408* (0.133)	
4. Long-term orientation	4.140	0.788	0.784	0.288* (0.103)	0.402* (0.160)	0.323* (0.181)

Note. N = 246. Squared correlations of latent variables in parentheses.
*$p < .01$ (two-tailed).

TABLE 2 Test of hypotheses with standardized path coefficients

Hypotheses	Relationships		Standardized estimate	SE	Z value	Support
H1	Direct effect	Long-term orientation → emission reduction	0.118	0.086	1.38	Not supported
H2	Direct effect	Long-term orientation →green strategy	0.392**	0.072	5.47	Supported
H3	Direct effect	Green strategy → emission reduction	0.349**	0.349	3.69	Supported
H4	Direct effect	Green strategy → green innovation	0.128*	0.046	2.81	Supported
H5	Direct effect	Long-term orientation → green innovation	0.159**	0.044	3.63	Supported
H6	Direct effect	Green innovation → emission reduction	0.567*	0.175	3.23	Supported
H7	Indirect effect	Long-term orient. → green strat. Green innov. →emission red.	0.256**	0.054	4.76	Supported

*$p < 0.01$. **$p < 0.001$.

We find broad support for our hypotheses and model. We find that green strategy is most strongly related to long-term orientation, whereas green innovation is the strongest predictor of emission reduction. Ultimately, we can conclude that long-term orientation's effect on emission reduction is explained by its relationship with green innovation and green strategy and consequently their relationship with emission reduction.

5 | DISCUSSION

5.1 | Theoretical contribution

Emission reduction is vital for nature and society, and it is an increasingly essential task for business leaders and their organizations to address. Investigating the antecedents of firms' priorities for emission reduction is important in that it can explain why some firms and not others put greater effort into the greening of their operations. Although our study has focused on the maritime sector, we believe that the results are relevant for organizations in other capital-intensive and hard-to-abate industries outside the maritime sector as well.

Previous literature has posited that a long-term orientation is related to proactive environmental initiatives (Dou et al., 2019), environmental performance (Durach & Wiengarten, 2017), and corporate social responsibility (Wang, 2017; Wang & Bansal, 2012). Furthermore, other studies have suggested that a long-term orientation facilitates innovation (Miller & Friesen, 1982; Ruvio, Shoham, Vigoda-Gadot, & Schwabsky, 2014) and business strategy (Flammer & Bansal, 2017; Hamel & Prahalad, 1994). Additional literature has also posited that green innovation and green strategy benefit environmental practices and performance (Hart, 1995; Hart, 1997; Porter & Van der Linde, 1995a). Inspired by these and other studies, we sought to test whether long-term orientation's relationship with emission reduction was mediated by green innovation and strategy.

Hart and Dowell (2011) emphasize that there is a need to determine which resources and capabilities actually lead to emission reduction or pollution prevention and how they relate with each other. In this study, we find that longer time horizons in firms can lead to both green innovations and green strategies, which are associated with emissions reduction. A long-term orientation may incentivize organizations to develop innovative solutions, including both environmental product and process innovations (Liao, 2016). Applying prolonged patience to organizational decision making might also encourage firms to incorporate environmental issues into the very core of their business strategies and help in the reduction of emissions, which may eventually be a source of competitive advantage.

Ultimately, we find that a long-term orientation contributes to emission reduction priorities through both green innovation and green strategy. From a theoretical standpoint this is an important contribution since previous literature has posited that a long-term orientation can lead to environmental performance. Our study shows how this may be the case. In other words, because green strategy and green innovation fully mediate the relationship between long-term orientation and emission reduction, these green capabilities explain how a

TABLE 3 Sobel test results

Mediation of long-term orientation and emission reduction through …	Indirect effect (unstandardized)	SE	Z value
… green strategy	0.137*	0.045	3.058
… green innovation	0.090*	0.037	2.413

*$p < 0.01$.

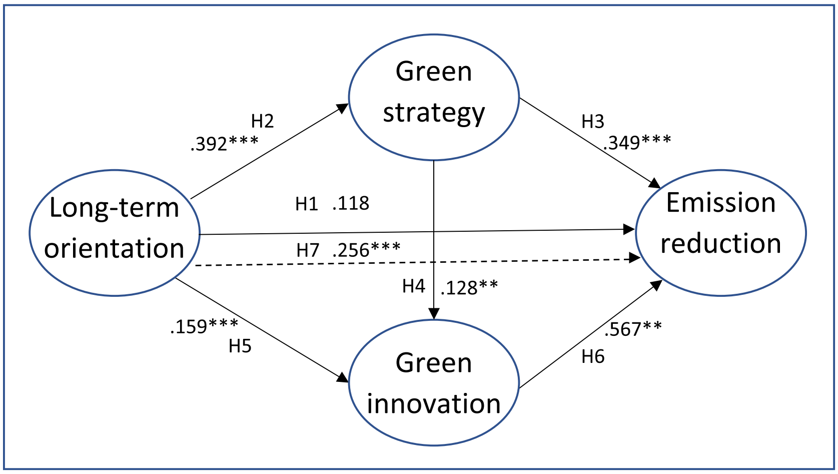

FIGURE 2 Model results with standardized path coefficient [Colour figure can be viewed at wileyonlinelibrary.com]

positive inclination towards longer timelines contributes to the reduction of harmful emissions in the environment. We believe that longer time horizons indeed are important in promoting an environmental awareness in organizations, but our findings show that they primarily contribute to concrete priorities for reductions in harmful substances as long as they are coupled with the green capabilities of innovation and strategy.

It has become increasingly important to understand the variables that affect green innovation (Huang & Li, 2017), as "such research begins to answer the question of why some firms take more proactive environmental stances than others" (Hart & Dowell, 2011). Although innovation is generally perceived as a cost-intensive activity in firms, it also has the potential to generate valuable returns. Green innovation has also been found to contribute with "substantial benefits for firms to enhance business performance and competitive advantage" (Huang & Li, 2017). Additionally, scholars have found that pollution prevention is more likely to generate financial profits if the firm is engaged in green innovation efforts as well (Hart & Dowell, 2011; King & Lenox, 2002).

Further, in the face of rising emissions and accelerating climate change, engaging in green innovations may generate business opportunities for environmentally proactive firms to sell their emission reducing solutions. Green innovation also implies greater capability of generating uniquely tailored emission reduction solutions to their own firms, thus making them more effective. Thus, we argue that in firms where green innovation is prevalent, the organizational priorities for emission reduction will be higher.

In this study, we do not aim to add to the research on the link between environmental performance and competitive advantage or financial performance, but rather we seek to illuminate potential relationships leading up to emission reduction because it is likely to be increasingly important for firms in the years ahead. That said, the prevention of pollution, including the reduction of emissions, can contribute to decreased firm cost due to the avoidance of natural contamination, rather than utilizing resources in cleaning up afterwards (Hart & Dowell, 2011). In their study of whether it "pays to be green," Hart and Ahuja (1996) found that efforts to reduce emissions "drop to the 'bottom line' within one to two years of initiation and that those firms with the highest emission levels stand the most to gain" (p. 30). Emission reduction surely also has a marketing effect, and employment of green solutions to clean energy consumption and/or production processes from harmful emissions "can increase efficiency by reducing the inputs required, simplifying the process, and reducing compliance and liability costs" (Hart & Dowell, 2011), and thereby "realizing overall operating efficiency" (Wang & Bansal, 2012).

5.2 | Managerial implications

This study shows that it would behoove managers to be more long-term oriented because it is directly related to the environmental capabilities of green innovation and green strategy. Furthermore, it is indirectly related to the prioritization of emissions reduction. However, it also shows that even managers who lack a long-term perspective can still reduce their firms' emissions by implementing green strategies and adopting a more innovative stance toward the environment.

Ultimately, our study finds that having a long-term perspective is not enough to reduce emissions, but that green strategy and green innovation are key capabilities to achieve emission reduction. This implies that a focus on them is critical, regardless of temporal orientation. These findings are especially relevant for managers in capital-intensive and hard-to-abate industries dominated by large and long-term oriented investments needed to reduce emissions.

Furthermore, our data indicate that the capabilities of green strategy and green innovation are related to each other. Specifically, green strategy likely leads to green innovation, since a firm that implements green strategy is also more likely to create, adopt, and implement green innovations. Although our model shows a greater impact on emission reduction by green innovation, we would not advise managers to only focus on green innovation in isolation. Rather, we recommend that managers devise a green strategy in conjunction with taking a more environmentally innovative position.

5.3 | Policy implications

Technology push mechanisms such as public development contracts and market pull mechanisms such as public procurement are important policy tools for accelerating sustainability and can aid in the transition towards less harmful emission levels at sea. Although firms should be encouraged to participate in the transition towards more sustainable practices themselves, policy changes need to be made to be able to inspire and encourage firms to launch innovative projects and apply green strategies at organizational levels (Porter & Kramer, 2006; Porter & Van der Linde, 1995b). For these policies to be effective, careful consideration, involvement, and coordinated action will be crucial.

As Bouman, Lindstad, Rialland, and Strømman (2017) observe: "No single measure is sufficient by itself to reach considerable sector-wide reductions," and, "more policies and regulations are needed to achieve high emission reductions" (p. 418). A transition to more sustainable business operations at sea requires clear and concise policy regulations from the government on both the national and international levels. A more ambitious aim by the sector is certainly a step in the right direction, but continuous long-term support from policy makers, regarding both technology and market development, is necessary to lead to more substantial emission reductions over the long haul.

5.4 | Limitations and suggestions for future research

This study has limitations which should be considered when interpreting the results, and these limitations also open avenues for new research. First, the type of data used for this study (i.e., cross-sectional) mean that the data are correlational, and causality cannot be determined. However, in line with Spector (1994), we believe that cross-sectional self-report studies provide useful insight, which can be studied further in subsequent studies with other methods and types of data. The findings from this study pave the way for future studies to investigate these variables with time-lagged or longitudinal designs and, perhaps, with objective or multiple report data.

Second, the data are based on responses from maritime vessel owners in the Norwegian maritime sector, which may hinder the generalizability of the results. Nevertheless, we are optimistic that the results are transferable to other organizations in different sectors and countries, particularly to other capital-intensive and hard-to-abate industries, including manufacturing, processing, telecommunications, and other transportation sectors, such as aviation. These are all industries where reducing emissions could be done through different measures that vary in complexity and cost. Yet we cannot be certain about our study's generalizability. Thus, future studies could use data from other industries, sectors, and from different parts of the world to demonstrate external validity.

Third, although we suspect that emission reduction will lead to financial performance and competitive advantage over time, we did not test for it in our study and therefore are unable to make that claim. However, as other research has shown a link between emission reduction and financial performance (Gallego-Álvarez, Segura, & Martínez-Ferrero, 2015; Hart & Ahuja, 1996), we would not be surprised to observe it in firms in the maritime sector. This would be useful to find out though, and therefore, future research could investigate the relationship between emission reduction and financial performance in the maritime sector.

6 | CONCLUSION

In the existing literature, there is limited empirical knowledge on the relationship between long-term orientation and implementation of green initiatives. Our study specifically addresses this gap. Based on a sample of Norwegian maritime vessel-owning firms of various sizes, we investigated how long-term orientation relates to emission reduction priorities via both green strategy and green innovation. We found that green innovation and green strategy play vital roles in firms' priorities for reducing GHG emissions and other harmful substances and that long-term orientation is highly related to both green strategy and green innovation. Long-term orientation affects emission reduction through organizations' capabilities for green strategy and innovation. Thus, a long-term orientation may result in reduced pollution if firms have the capabilities of green strategy and green innovation.

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APPENDIX A.

TABLE A1 Scale items with factor loadings and standard errors

Factors and items	Loadings	SE
Long-term orientation (α = 0.844). 1 (completely disagree) to 5 (completely agree)		
Our firm:		
… is concerned with long-term (more than 5 years) goals and strategies.	0.883	0.028
… emphasizes long-term allocation of resources.	0.796	0.032
… prioritizes long-term competitive advantages.	0.728	0.038
Green innovation (α = 0.811). 1 (completely disagree) to 5 (completely agree)		
Our firm:		
… seeks original solutions to environmental challenges.	0.438	0.053
… is at the forefront of our competition when it comes to applying new green technology.	0.958	0.019
… is at the forefront of our competition in introducing new green products or services.	0.944	0.019
Green strategy (α = 0.863). 1 (completely disagree) to 5 (completely agree)		
Our firm:		
… has environmental procedures.	0.790	0.047
… has environmental goals.	0.937	0.030
… teaches employees to think and work in an environmentally friendly manner.	0.729	0.036
… measures environmental performance.	0.654	0.043
… reports environmental results.	0.636	0.065
Emission reduction (α = 0.936). 1 (not a priority) to 5 (very high priority)		
How high does your firm prioritize to do the following?		
Reduce emissions of carbon dioxide (CO_2)	0.836	0.022
Reduce emissions of sulfur oxides (SO_x)	0.908	0.015
Reduce emissions of nitrogen oxides (NO_x)	0.922	0.013
Reduce particulate emissions (PM)	0.871	0.018