FRAMING PROMOTIONAL MESSAGES FOR HOUSEHOLD ENERGY EFFICIENCY UPGRADES

A quantitative study applying the goal-framing theory to the promotion of heat pumps in Dutch households

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ABSTRACT

Energy consumption is a major contributor to global warming, while increasing household energy efficiency is recognised as a proven tool to decrease greenhouse gases emissions. However, a lot of responsibility for improving energy efficiency lies on individual households and is rooted in their behaviours. Therefore, it is essential to study what drives individuals to act pro-environmentally and how the acceptance of energy efficiency devises can be influenced and increased. Building on the studies in environmental psychology, and the goal framing theory in particular, this research examines how the incorporation of difference motives in promotional messages impacts the effectiveness of these messages reflected in the attitude towards energy efficiency upgrades and the intention to adopt them. Additionally, it studies the effects of the three types of environmental concern on attitude towards and intention to engage in pro-environmental behaviour after the exposure to different motives. To answer the research questions, an online experiment was conducted. The experimental groups were exposed to three different messages with activated goal frames, namely hedonic goal, gain goal and normative goal. The effect of the messages was measured on attitude and intention scales. The data for the analysis was collected from 123 participants recruited in the Netherlands in April-May 2022.

The results of the analysis demonstrated that the inclusion of gain and normative goal frames has a direct positive effect on attitude towards implementing energy efficiency upgrades, namely, installing a heat pump. Additionally, the incorporation of gain goal positively affects the intention to install a heat pump. Egoistic, biospheric and socio-altruistic environmental concern were found to be positively correlated with attitude, while biospheric and socio-altruistic types also positively correlated with intention. Moreover, biospheric concern moderated the effect of gain goal frame. In particular, the participants with a greater level of biospheric environmental concern had less positive attitude towards installing a heat pump after being exposed to gain goal message, compared with those with a lower level of biospheric concern. These findings have practical implications for mass communicators and marketing professionals as they can improve communication campaigns about household energy efficiency upgrades and encourage efficiency behaviour.

KEYWORDS: goal framing theory; environmental concern; promotional messages; energy efficiency; pro-environmental behaviour

Table of contents

1. Introduction

Increasing household energy efficiency is recognised as a vital tool to combat climate change (Mastrucci et al., 2021), both on global and national levels. In the Netherlands, in particular, the government has set ambitious climate goals, aiming at reducing CO2 emissions by 49% by 2030, compared with the 1990 level (Rijksoverheid, 2021). At the same time, the need to involve citizens in climate action was emphasised. This, however, requires behavioural change as well as certain financial investments from the citizens' side, whereas studies have shown that the behavioural change implying compromising on personal interests is challenging to achieve (Karlin et al., 2014).

Apart from mitigating climate change, the Netherlands have additional reasons to reduce the reliance of fossil fuel-based energy consumption. Starting from late 2022, the Dutch government has decided to phase out the production of gas in Groningen due to the risk of earthquakes in the populated area (Rijksoverheid, 2022a). At the same time, in 2019, 92% of Dutch households were reliant on natural gas for cooking and heating (Het Centraal Bureau voor de Statistiek, 2021). The government thus is implementing various policies to reduce dependence on gas, for example offering subsidies for households to implement energy efficiency upgrades and financial incentives for housing corporations to bear the costs of, for example, wall insulation and heat pump installation (Rijksoverheid, 2022b).

However, households willing to increase their energy efficiency still need to invest a significant amount of money in the upgrades because the subsidy compensates only half of the costs at best, while economic benefits will only pay off in the long run (Milieu Centraal, 2022). In addition, studies have shown that the so-called 'hassle factor', namely the stress associated with implementing various measures to make a household more sustainable, serve as a significant reason to delay "green" decisions (de Vries et al., 2020).

Nevertheless, there is scientific evidence that people can be persuaded to adopt environment-friendly practices despite the aforementioned factors. There are three overreaching categories of motives affecting pro-environmental behaviour: affective, cost and benefits-based, and normative, or moral (Steg & Vlek, 2009). Bamberg and Möser's (2007) research concluded, for example, that pro-environmental behaviour can be impacted by various factors among which the most prominent are self-interest and moral (social) norms. Hence, by embedding these motives into promotional messages about household energy efficiency appliances, the adoption of pro-environmental practices can be increased.

This research will therefore explore the effectiveness of different persuasive messages to motivate residents of the Netherlands to install energy efficiency appliances in their houses. In particular, it will apply the goal-framing theory (Lindenberg & Steg, 2007) to an advertisement

of a company that installs heat pumps. The goal-framing theory suggests that environmental behaviour is guided by three motives (goals) – hedonic (to feel better right now), gain (to increase ones' resources) and normative (to act appropriately). In addition, this research will explore to what extent the effectiveness of different promotional messages correlates with the pre-existing level of environmental concern in people and whether environmental concern has a moderating effect on the goal frames. The environmental concern is defined in this paper as a belief that an environmental condition has negative consequences for the self, other people or the biosphere (Stern et al, 1993).

The installation of a heat pump can be attributed to efficiency behaviour, namely infrequent structural changes and/or those requiring financial investment or costly purchases (Karlin et al., 2014). The heat pump is a device that can be used to either heat or cool an enclosed space by transporting the heat from a cool place, which is in case of warming process situated outside the house, to a warm place. In the cooling mode, the process is reversed, thus a heat pump serves both as a heater and an air conditioner. There are three main types of heat pumps available on the Dutch market: fully electrical (allows a household to disconnect from gas pipelines), hybrid (gas heater is still used as a backup source) and ventilation pumps (extracts heat from ventilation systems). Depending on the type of pump, they are able to reduce the household CO2 footprint by 25-55% while saving on average €400-550 a year on energy costs (Milieu Centraal, 2022). The number of heat pumps installed in Dutch households has been rapidly growing in the past years, reaching 240,000 in 2020 (Milieu Centraal, 2022). Thus, studying this type of household energy efficiency appliances is both relevant for the Dutch market and for the climate goals that the country has pledged to achieve.

The research question goes as follows.

RQ: To what extent does communicating hedonic, gain or normative goals in promotional messages influence purchasing attitudes and intentions for heat pumps in Dutch households?

Sub-question: To what extent does the level of environmental concern in Dutch residents moderate the effects of communicating hedonic, gain and normative goals on the attitude and intention to install heat pumps?

To answer the research question, a quantitative experimental method is used. The experiment has a unifactorial design with factors activating hedonic, gain and normative goal frames in promotional messages about heat pumps. By this, the study aims to analyse the extent to which each of these motives affects the willingness to and attitude towards installing a heat pump. Furthermore, the ability of the level of environmental concern to serve as a moderator for

the aforementioned factors is explored. The data for analysis is collected from house owners and long-term tenants in the Netherlands through an online experiment tool distributed with snowball sampling.

This research is relevant to academia, as it applies goal framing theory to previously unstudied empirical conditions, namely heat pumps and the Dutch households. The research on pro-environmental behaviour to date has been mostly focusing on curtailment behaviour (Bamberg & Möser, 2007; Klöckner, 2013; Stern, 2011), which implies compromising on personal interests in order to achieve a goal, for example, intentionally lowering the temperature inside the house. Conversely, the efficiency behaviour (Karlin et al., 2014) in relation to large and costly household appliances has not been studied in such detail yet. In addition, this thesis will contribute to the knowledge about pro-environmental behaviour by exploring a possible link between the level of environmental concern in people as well as specific types of this concern and the willingness to involve in pro-environmental behaviour in response to promotional messages. Stern et al. (1993) suggest that such a connection indeed exists. However, previous research was mostly dedicated to values, which, according to the value-belief-norm theory (Stern, 2000), are the basis of environmental concern, whereas the link between environmental concern itself and consumer practises has not been studied extensively. Additionally, those studies that do focus on environmental concern tend to explore its influence on curtailment behaviour while the connection to efficiency behaviour is left understudied.

The societal relevance of this research lies in the practical implications of promotional messages about energy efficiency. Discovering the most effective motive can contribute to improving the quality and efficacy of energy efficiency promotional messages. The results of this study can be directly incorporated into strategic mass communication campaigns aiming at involving citizens in climate action or marketing strategies of firms specialising in installing household energy efficiency appliances. As it has been mentioned, the Dutch government is actively incentivising pro-environmental practices while more and more Dutch households are exploring the opportunity to install a heat pump. Thus understanding what motivates Dutch households to install these upgrades can be highly beneficial for multiple stakeholders in the current circumstances.

In the following chapters, starting from Chapter 2, the theoretical framework is provided to give an overview of concepts explored in the current paper, namely attitude/intention, normative, hedonic and gain goals, as well as their relation to and influence on pro-environmental behaviour. In addition, the notion of environmental concern is explanted. Chapter 3 explains the research method employed this study. It elaborates on research design and procedure as well as describes the sample characteristics and the measurement of concepts.

Chapter 4 presents the results of the tests of hypotheses. Chapter 5 discusses the findings and gives an answer to the research question. This part also includes implications, limitations of the study and suggestions for future research. Finally, a brief conclusion ends this paper.

2. Theoretical Framework

Installing a heat pump falls into the category of efficiency behaviour, characterised by a one-time costly investment to permanently improve energy efficiency (Karlin et al., 2014), which is a part of the concept of pro-environmental behaviour. Pro-environmental behaviour has been widely studied over the past years, with several approaches taking the lead. Overall, scholars tried to explain and predict pro-environmental behaviour by identifying specific factors influencing decisions to act pro-environmentally. As such, the theory of planned behaviour (TPB) developed by Ajzen (1985, 1991) identified intention based on attitude, subjective norm and perceived behavioural control as key predictors of human actions. In addition, the value-belief-norm (VBN) theory (Stern, 2000) explored the meaning of values as determinants of norms which, for their part, justify decisions to act in favour of environment. This research is, however, focused on the goal framing theory (GFT) (Lindenberg & Steg, 2007) which recognises three groups of motives influencing pro-environmental behaviour: hedonic, gain and normative. The choice of the focal theoretical approach is justified by the fact that GFT has combined multiple approaches to explaining pro-environmental behaviour and, therefore, more comprehensive that VBN theory and TPB considered separately. This assumption will by further elaborated in the following sub-sections.

This section is dedicated to the review of academic literature and theoretical approaches relevant for the current study. It starts with exploring the concept of pro-environmental behaviour and continues with two of its key determinants: intention and attitude. Because these two notions are widely studied in many disciplines, only studies including it in the context of pro-environmental behaviour are considered in this review. Further, the review elaborates on the goal framing theory as well as each of three motives – hedonic, gain and normative. In the next part, the GFT is linked to pro-environmental behaviour with an overview of empirical studies which applied it to different conditions. Finally, the notion of environmental concern is explained and connected to environmentally significant actions. The relevance and the value of the current study in comparison with other works on the focal topic is also included in this section. Finally, the section contains hypothesises distilled on the basis of existing academic literature.

2.1. Pro-environmental behaviour

According to Stern (2000), environmental behaviour is defined by its impact, or the "extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself" (Stern, 2000, p. 408). However, for practical studies like the current one, a concise definition given by Steg and Vlek (2009),

who describe environmental behaviour as actions that significantly affect the environment, seems more appropriate. Thus, in the current study, pro-environmental behaviour (PEB) is considered as actions that significantly affect the environment in a positive way, thus promoting environmental quality (Steg et al., 2014). Stern (2000) divides environmental behaviour into public actions which include environmental activism, and private sphere action, for example, separating waste and reducing energy consumption. Unlike public sphere actions, private behaviour has a direct environmental impact, with some actions being more impactful than others. Moreover, pro-environmental behaviour is generally studied as rational, based on awareness of environmental problems (Gardner & Stern, 2008) and susceptible to the influence of interventions (Steg et al., 2014; Trewern et al., 2022)

Environmental behaviour is a subject of interest of environmental psychology which started developing in the 1980s (Klöckner, 2013). Over the past years, environmental psychologists have come to the conclusion that environmental behaviour can be indeed predicted and influenced by interventions. However, there have been developed contrasting approaches to this issue. Overall, the researchers agreed that pro-environmental behaviour is either altruistic and is performed out of care for the biosphere and/or other people, or self-serving and pursued because of apparent pleasure and/or potential economic gains (Klöckner, 2013; Lindenberg & Steg, 2007; Stern, 2000). Because of these different dimensions, pro-environmental behaviour is dependent on context and personal factors, such as peer pressure, wealth, habits, etc., which have been studied quite intensively over the past years. There are also relatively unstudied factors forcing people to act pro-environmentally, such as health and safety issues (Truelove & Gillis, 2018).

Three dominating theoretical approaches explaining and predicting PEB have been developed over the past years: the value-belief-norm theory (Stern, 2000), the theory of planned behaviour (Aijzen, 1985, 1991) and the goal-framing theory (Lindenberg & Steg, 2007). These three will be elaborated on in the following sub-sections. The current sub-section provides a brief overview of older theoretical approaches which laid the ground for the current understanding of PEB.

The protection motivation theory (Rogers, 1983) suggests that people weigh the costs and benefits of behaviour both harmful and beneficial for the environment as a result of consideration based on threat appraisal and coping appraisal. The former concerns the perceived risks and benefits of harming nature as well as one's perceived vulnerability to these risks. The latter involves perceived self-efficacy as well as perceived efficacy and costs of pro-environmental actions. If both threat appraisal and coping appraisal are on a high level, individuals are more likely to act in favour of the environment.

The norm activation model (Schwartz 1977; Schwartz & Howard, 1981) explains the behaviour that implies high costs and efforts by proposing that PEB results from the activation of personal norms which are a feeling of moral obligation to take or refrain from certain actions. Personal norms are activated by such factors as the awareness about an environmental problem, ascription of responsibility, perceived outcome efficacy evaluation, and perceived ability to perform an action (self-efficacy). Thus, the activation of personal norms is most likely when people are aware of environmental problems and are conscious about their personal responsibility for them.

The aforementioned theories study and consider PEB as a whole, suggesting comprehensive models to explain any kind of PEB. However, environmental behaviour is multi-dimensional and includes various sub-categories. Energy conservation behaviour which is considered the most relevant for this study is one of them. A significant part of the energy consumed by humans is a result of a process emitting CO2 that belongs to greenhouse gases (Mastrucci et al., 2021). Greenhouse gases are, for their part, the cause of human-induced global warming which poses a significant danger to the world population (The Intergovernmental Panel on Climate Change, 2015). Therefore, conserving energy contributes to slowing the process of global warming and reducing the adverse effects of climate change (Karlin et al., 2014).

The study by Karlin et al. (2014) identifies two types of energy conservation behaviour: curtailment and efficiency. The former implies frequent low-cost actions that contribute to energy conservation. Although they have a lower engagement threshold, they may involve hassle and compromising on personal comfort as well as require constant repetition. Some examples of curtailment behaviour are reducing the use of household appliances and biking to work instead of using a car. In contrast, efficiency behaviour comprises actions that require one time but higher cost investment to increase energy efficiency in the longer term. Installing a heat pump as well as insulating the walls of a house falls into this category.

A growing body of research identifies efficiency behaviour as more impactful than curtailment behaviour, with much of the responsibility lying on private households (Gardner & Stern, 2008). However, people often feel disoriented about the impact of their actions on the environment (Gardner & Stern, 2008) and hold misperceptions. For example, the majority of respondents perceive efficiency behaviour as more inconvenient than curtailment behaviour (Truelove & Gillis, 2018). It was found that the need to repeatedly perform an energy-saving act over a long period of time may not be considered a major hindrance because it gradually becomes habitual. Conversely, people are less willing to engage in efficiency behaviour because it implies a hassle factor (de Vries et al., 2020), requires retrieving information on efficiency upgrades, finding and installing a device, etc.

Meta-analyses of different approaches have shown that TPB and VBN theories can overlap when explaining pro-environmental behaviour (Bamberg & Möser 2013; Klöckner, 2007; Li et al., 2019). In other words, personal and societal norms, habits, attitudes and intentions are all able to contribute to pro-environmental behaviour, with some of them being prevalent depending on the case. These findings are linked to the goal-framing theory which recognises different groups of motives as having sometimes mutually non-exclusive effects on pro-environmental actions and thus prove the relevance of this approach to the research question of the current study.

Based on the aforementioned findings, it seems especially relevant to study factors encouraging efficiency behaviour because it has a significant impact on the environment but, as we see, is not pursued by default with many existing psychological barriers. Therefore, identifying the most effective promotional strategy will greatly benefit society. At the same time, because of the cost or hassle factor, efficiency behaviour is scarcer than curtailment behaviour and, for this reason, relatively understudied.

2.2. Attitude and intention

Numerous studies identified intention and attitude as some of the predictors of pro-environmental behaviour (Bamberg & Möser, 2007; Klöckner, 2013; Li et al., 2019). Klöckner (2013), for example, recognises intention as a direct predictor of behaviour. Attitude, for its part, serves as a dominant predictor of intention (Li et al., 2019). Intention is defined by Ajzen (1985) as an active state of readiness to involve in action. Attitude is regarded in this paper according to Li et al. (2019) definition, namely as the degree to which an individual recognises a certain behaviour as favourable or unfavourable. Most researchers agree that attitude to a larger extent determines the intention to act pro-environmentally. The more favourable attitude towards environmentally-friendly practices a person has, the most likely they are to engage in them (Li et al, 2019).

According to the theory of planned behaviour, (Ajzen, 1985, 1991), certain behaviour is a result of an intention based on rational choice. As Ajzen (1991) states, the stronger the intention to engage in action, the more likely this action is to happen. The translation of intention into action is, however, only possible when a person believes that they are capable to perform an action, in other words, when perceived behavioural control is activated. Therefore, behaviour is a combination of intention and the ability to perform an action (Ajzen, 1991). The theory of planned behaviour also includes a third factor influencing intention, namely subjective norm, which is a perceived societal pressure to act in a certain manner.

The latest empirical studies offered support for the applicability of the theory of planned behaviour (TPB) to various types of sustainable behaviour (Dutta & Hwang, 2022; Sloot et al., 2022). The intention to engage in pro-environmental action have been well predicted by a combination of subjective norm, perceived behavioural control and attitude regardless of whether it means engaging in energy saving schemes (Sloot et al., 2022) or making a rather costly purchase, namely, an electric car (Dutta & Hwang, 2022).

Applied to this research, the theory of planned behaviour indicates that intention can be a strong predictor of installing a heat pump in house owners with a high income because these variables constitute a high degree of control over decisions about large and costly household energy efficiency appliances. At the same time, long term tenants and households with a lower income may lack perceived behavioural control over the situation.

As found by a study by Van Prooijen and Sparks (2014), initial attitudes towards the effects of humanity on the environment can influence the acceptance of messages about climate change. This effect is also noted by Klöckner (2013) who recognises personal norms as having an impact on intention. Among factors influencing environmental attitudes, Li et al. (2019). name having opportunities to act pro-environmentally, having related knowledge and not having deterring factors such as, for example, being unable to afford more expensive "green" products.

There are, however, studies indicating that a pro-environmental attitude does not necessarily translate into intention, especially when the process requires a change of habits or there is a lack of perceived behavioural control (Li et al, 2019), while intention, despite being a strong predictor, does not always lead to actions (Bamberg & Möser, 2007). One of the reasons for these disconnections is psychosocial barriers among which is perceived hassle (de Vries et al., 2020) and ignorance about a problem (Gifford, 2011). It is therefore beneficial to study how providing information about the benefits of pro-environmental behaviour affects attitude and intention to act pro-environmentally, which increases the value of the current study.

Because most of the studies on the topic found intention and attitude as key components in the prediction of pro-environmental behaviour, they are taken as dependent variables in this research. The differences in recorded attitude and intention to install a heat pump will be therefore considered as a criterion of effectiveness of promotional messages with different activated motives. In this way, this study will identify if there are any differences between the effectiveness of different activated motives and, if so, which of them has the most effect on pro-environmental behaviour.

2.3. Goal-framing theory

This study is based on the goal-framing theory developed by Lindenberg and Steg (2007). In essence, it is a synthesis of previous theoretical and empirical works on environmental behaviour such as VBN theory and TPB. The scholars suggest that multiple, sometimes conflicting motives drive people's behaviour in relation to environmental action. More precisely, peoples' actions depend on how they tend to view a particular situation, in other words, in which "frame" they put it. Thus goal frames are defined as "the way in which people process information and act upon it" (Lindenberg & Steg, 2007, p. 117). When a goal is activated, it comprises a motive and a knowledge structure supporting it. It is important to note that attempts to explain environmentally significant behaviour by more than one motive at a time were made before Lindenberg and Steg (2007) both on theoretical and empirical level (De Young, 2000), however, the goal-framing theory presented them in a more comprehensive and systematised manner. As such, GFT used the elements of TPB to explain behaviour based on rational considerations (gain goal frame) while also emphasising that some aspects of VBN are better in explaining behaviour based on norms and values (normative goal frame). In addition, GFT incorporated studies of affective behaviour to complete the model by explaining behaviour based on emotions.

One group of motives constitute a hedonic goal frame, which promises to improve how an individual feels right now and may include seeking pleasure or avoiding inconvenience. Its time frame is short and in most cases implies immediate satisfaction. The second group is defined as the gain goal frame, which is related to the conservation and growing of personal resources. One example of this frame is saving money or investing in financial stability. Finally, the normative goal frame includes motives related to appropriateness such as acting in a moral way, being an example for others, and acting in accordance with societal values (Lindenberg & Steg, 2007).

Multiple goal frames can be activated at the same time. In this case, one goal becomes "focal" and the other(s) are considered background goals. They may enter in supportive or conflicting relationships (Lindenberg & Steg, 2007). For example, while pondering on insulating the walls of a house, a family may have a normative goal in mind because all their neighbours have already done this. However, the background gain goal supports their intentions because they are also concerned about rising gas prices. On the contrary, when the economic resources of a family are scarce, investing in an expensive upgrade that will pay off only in the longer term can become a hindrance. In that case, the background gain goal frame contradicts the normative goal frame.

Goal frames can also have differing strengths. Lindenberg and Steg (2007) consider the hedonic goal the strongest because seeking pleasure and avoiding inconvenience is in human nature. On the contrary, a normative goal requires external enhancement, in other words, an individual must be informed of what the norm is. For this reason, many strategic mass communication campaigns are focused on the latter.

This theoretical approach has been chosen because it provides a comprehensive model of explaining pro-environmental behaviour. In this regard, it suits well the main goal of this study, namely finding the most effective promotional message to increase household energy efficiency. The following sections will elaborate on hedonic, gain and normative goals and link them to relevant studies on the topic.

2.3.1. Hedonic goal

As has been mentioned above, a hedonic motive implies feeling good right now, increasing personal comfort and sense of satisfaction (Lindenberg & Steg, 2007). It postulates the dominating role of emotions in environmental decision-making and is based on studies of affection. Rational factors retreat to the background when a person frames their actions in the hedonic goal: in this case, they are guided by personal affection. One example of an activated hedonic motive in pro-environmental behaviour is installing a heat pump in a house to achieve a more comfortable internal temperature. Also, when the hedonic goal is dominant, individuals can more easily reconcile with additional costs of behaviour that brings them positive emotions.

The dimensions of pleasure and satisfaction are many. For example, by acting appropriately, that is, activating normative goal, people can also extract a self-fulfilling sense of belonging to a group of good citizens, of being “green”, which is to a certain extent hedonic (Tao et al, 2021). It was proven that meaningful environmental action produces positive emotions (Venhoeven et al., 2020). Moreover, generally more expensive “green” goods or costly household energy efficiency appliances can be considered a luxury (De Young, 2000) and thus also framed as hedonic.

It is the strongest goal frame as some studies indicate that people engage in pro-environmental behaviour when it brings pleasure or at least does not bring discomfort. (Steg et al., 2014). It has also been long neglected by environmental psychologists as a factor that can allegedly only hinder pro-environmental behaviour. However, a growing body of research (De Young, 2000; Lindenberg & Steg, 2007; Steg & Vlek, 2009) suggests that this motive can in fact unlock pro-environmental behaviour. In particular, Steg et al. (2014) recommend eliminating or reducing the conflict between hedonic and gain goals, on the one hand, and hedonic and normative goals on the other to encourage pro-environmental behaviour. This can be done by,

for example, introducing subsidies for buying energy efficiency appliances, a practice already used by the Dutch government (Rijksoverheid, 2022b).

2.3.2. Gain goal

Gain goal constitutes a group of motives that are focused on preserving and growing of personal resources, mainly financial, but also concerning such factors as time and status. When this goal is activated, people become especially sensitive to various incentives appealing to their rationality (Lindenberg & Steg, 2007). Gain goal frame is premised upon TPB (Ajzen, 1985, 1991) which postulates that behaviour is a result of intention born out of rational considerations. An example of an activated gain goal frame is buying energy-saving bulbs or reducing the use of household appliances in order to reduce the utility bill.

People sensitive to financial incentives can be especially effectively targeted with the promotion of economic gains, for example, subsidies or information about money-saving opportunities (Steg et al., 2014). It is therefore helpful that energy-saving practices that benefit the environment also allow for reducing households' energy costs. It was also found, that financial incentives are above average effective tools to motivate households to increase their energy efficiency by investing in energy storage (Tao et al., 2021).

However, there is some evidence that a financial incentive does not have a long-lasting effect and does not lead to a profound behavioural change (De Young, 2000). In other words, once the incentives cease to exist, for example, a government-sponsored subsidy programme comes to an end, people abandon the environmentally-friendly practices that they engaged in only because of financial gains. However, this adverse effect only appears with regards to curtailment behaviour (Karlin et al., 2014), because efficiency behaviour concerns making one-time investments leading to irreversible changes.

Therefore, the gain goal is especially relevant to study in relation to installing household energy efficiency appliances. As the amount of energy saved as the result of installing a heat pump is easily quantifiable, so is the amount of money saved. The exact estimated amount of financial savings based on current energy prices have been mentioned in the introduction to this study.

2.3.3. Normative goal

Normative goal frame encompasses a group of motives related to the concern for the environment as well as the desire to act in accordance with social norms, to benefit other people and future generations (Lindenberg & Steg, 2007; Steg et al., 2014). It refers to altruistic values (Stern, 2000) as individuals in this goal frame act with no evident self-interest, although gain and

hedonic goals can at the same time serve as background motives. Normative goal frame also refers to the subjective norm, which is, according to Ajzen (1991), a strong predictor of pro-environmental behaviour. In this regard, the normative goal also includes peer pressure, or herd effect, (Tao et al., 2021) which has proved to be a significant predictor of PEB.

Lindenberg and Steg (2007) suggest that the normative goal frame plays a very significant role in pro-environmental behaviour and positively correlates with the level of environmental concern. This assumption is valid for both adults and children (Zeiske et al., 2021). At the same time, it rarely appears by default and heavily depends on the awareness of environmental problems. For example, it was discovered that the role of normative goal in "green" decision-making is higher for participants with higher income and education levels who are more likely to be aware of environmental issues (Tao et al., 2021). For this reason, most of the mass communications campaigns aiming at encouraging pro-environmental behaviour have been aimed at enhancing a normative mind-set. At the same time, this goal was studied more extensively than others (De Young, 2000), primarily in the framework of VBN theory.

However, as Lindenberg and Steg (2007) argue, the normative goal has been usually regarded as opposed to egoistic motives, while in fact, they can interact and enhance each other. Moreover, according to the scholars, VBN theory and normative goal frame respectively are the most successful in explaining low-cost but frequent behaviour such as switching off the lights more often. On the contrary, when it comes to significant financial investments, various psychological barriers hurdle the activation of this goal. In other words, when the costs are high or benefits for the environment are not clear, the gain goal comes to the forefront. However, the adherence to the normative goal frame is the strongest among the three because it does not depend on mood or cost minimisation – which are volatile – but on the intrinsic values that hardly change over time (Steg & Vlek, 2009).

Lindenberg and Steg (2007) argue that normative motives constitute the so-called smart norms, which are less dependent on circumstances, unlike hedonic and gain goals, and can be adapted in accordance with what is defined as pro-environmental action. To increase the acceptance of smart norms, the scholars suggest implementing environmental labelling and moralising process in which the desired behaviour is linked to positive emotions while the undesired is described as disgust provoking.

Steg et al. (2014) suggest that the opposition between hedonic and normative goals can be weakened by strengthening the normative goal. This can be done by a systematic promotion of biospheric values, by making them part of the context in which a target group makes decisions. Another way of strengthening the normative goal is by increasing perceived peer pressure, for

example, by informing people about the percentage of households that already adopted pro-environmental practices (Tao et al., 2021).

2.4. Goal framing theory and pro-environmental behaviour

The goal-framing theory states that hedonic, gain and normative motives have an influence on attitudes and intentions, which results in pro-environmental behaviour. A meta-analysis conducted by Bamberg and Moser (2007) indicated that pro-environmental behaviour is a combination of self-interest and pro-social motivations. Therefore, the goal-framing theory has practical implications for various parties aiming at a large-scale behavioural change in relation to the environment, such as governments, municipalities, non-profits, advocacy groups, etc.

When it comes to implementing goal frames, promotional messages can serve as a primary medium strengthening them and removing conflicts between the three. The relevance of the goal-framing theory to promotional interventions has been shown by various studies. As such, a study by Tao et al. (2021) has found that all three motives conveyed through promotional messages positively affect the purchasing intention related to household energy storage facilities.

Pro-environmental behaviour can be encouraged not only by incentives but also with limitations, the so-called "sticks and carrots" (Westin et al., 2020), and the goal-framing theory can be equally applied to punishing policies such as increased car park fees. A study by Westin et al. (2020) have shown a positive effect on acceptance of increased park fees for all three experimental groups who were exposed to promotional messages with an activated hedonic, goal and normative motives, compared to the control group. The expressed acceptability of higher fees was the strongest in the group receiving the normative goal message.

The research by Mingolla et al., (2020) suggests that the incorporation of self-serving and social-altruistic motives into promotional messages about household energy efficiency positively influences the willingness to adopt energy conservation behaviour. In this experimental research, the normative goal was represented by the information about other households being already engaged in energy conservation, while the gain goal was activated through information about financial benefits.

Additionally, the research conducted by Fornara et al. (2016), which applied value – belief – norm theory to household energy efficiency attitudes and intentions, indicates a direct link between biospheric values and moral norms, thus suggesting that promotional messages with an activated normative goal will more likely affect efficiency behaviour in those with a higher degree of biospheric environmental concern. Overall, this paper revealed that moral norms have a greater influence on pro-environmental behaviour than social norms. Another

important result of Fornara et al.'s (2016) research is the proof of the link between the attitude towards a certain behaviour and behavioural intentions.

The goal-framing theory postulates that multiple motives can be adopted by the same individual at the same time and support each other when influencing environment-related decisions. However, there is some evidence that, when applied to promotional messages, single motives have a greater effect on environmental attitudes than mixed motives. For example, in the research by Van den Broek et al. (2017), those participants who received messages with single normative or gain motives showed more interest in paper saving (measured in a number of paper-saving tips requested and time spent on reading them) than those who were exposed to messages with both motives. The researchers suggest that single motives can enter in corresponding and mutually-enhancing relations with people's values, whereas adding other motives can also add contradiction between values and lead to a decreased response. Therefore, in the framework of the current research, it was decided to explore the effect of single motives, as they are, apparently, more likely to produce significant response than mixed motives.

In addition, hedonic values have proved to contradict normative (biospheric) values under certain conditions. As found by Tolppanen and Kang (2021), only groups that combine biospheric and altruistic values are significantly more willing to decrease their carbon footprint, while those who combine biospheric and hedonic values stand far lower on this scale.

Despite the existing research into the goal-framing theory applied to promotional messages, the current study is believed to be able to make a notable contribution to the academic literature on the topic. In this regard, it is important to mention the unique context of this study. It is conducted in the Netherlands, the county which is among the most involved in energy-saving practices across the EU with a relatively small share of education and training as a tool to increase compliance with its residential green building policies (Jabbour, 2020). At the same time, the basis of policies in this field consists of legislative and financial measures. Therefore, the study will explore the relevance of the goal-framing theory to the context, where citizens have been primarily incentivised by subsidies while limited in their freedom of action by legislation. In addition, the papers mentioned above mostly studied low cost and frequent behaviours, while the current study is focused on one time large investments.

Drawing on the findings of the scholars mentioned above, it is clear that hedonic, goal and normative goals incorporated in promotional messages positively affect the adoption of environmentally-friendly practices (Tao et al. 2021; Tolppanen & Kang 2021; Van den Broek et al. 2017; Westin et al., 2020). The activated normative goal frame, as well as biospheric values, are the strongest predictors of pro-environmental behaviour compared with the goal and hedonic frames (Lindenberg & Steg, 2007; Steg et al., 2014; Tolppanen & Kang, 2021; Van den Broek et

al., 2017). Mixed motives have not been studied extensively, however, the research available suggests that single motives applied to promotional messages, both in text and pictures are more effective than mixed motives (Van den Broek et al., 2017). Based on these findings and theoretical grounds, the following hypothesises are suggested:

H1. Inclusion of the goal frames into promotional messages about household efficiency upgrades will positively affect (a) the attitude towards adoption and (b) the intention to adopt these upgrades in comparison with no goal frames included.

H2: Compared to hedonic and gain goal frames, the inclusion of normative goal frame into promotional messages about household efficiency upgrades will have a greater positive impact on (a) the attitude towards adopting and (b) the intention to adopt these upgrades.

2.5. Environmental concern

In the context of explaining and predicting pro-environmental behaviour, many studies have found a link between concern for the environment and the intention to engage in actions protecting it, including by making "green" purchases and engaging in energy-saving practices (Chen et al., 2022; De Young, 2000; Fornara et al., 2015; González-Rodríguez et al., 2019; Hidalgo-Crespo et al., 2022). Consequently, measuring environmental concern in the framework of this study can potentially lead to valuable insights into environmental behaviour.

In an approach named value – belief – norm theory (VBN), Stern (2000) explains what he calls "environmentally significant behaviour" in a way that individuals take action when they believe that their valued objects are threatened but a certain behaviour can alleviate negative outcomes. According to VBN theory, pro-environmental actions are the result of personal norms based on value orientations.

The three types of values (value orientations) in the VBN theory – egoistic, socio-altruistic and biospheric – correspond with the three types of environmental concern suggested in an earlier work by Stern (1993) and elaborated by Schultz (2001). Environmental concern is defined as a belief that a certain environmental condition has adverse effects on things they value (Stern et al., 1993). Thus, in the framework of VBN theory, environmental concern arises from value orientation. If a person has an egoistic value orientation, they are more likely to be concerned for the self, while biospheric value orientation will lead to the concern for other species and socio-altruistic value orientation will result in the concern for other people (Onel & Mukherjee, 2017; Stern, 2000). The correlation between the three types of values and the three clusters of environmental concern was found in several empirical studies (De Groot and Steg, 2007b; Stern and Dietz, 1994; Stern et al, 1998), while Schultz (2001) regarded different values

as possible predictors of environmental concern. Nevertheless, despite this correlation, a certain value orientation does not necessarily lead to only one type of concern; in fact, all three types of concern can have a strong presence in one individual (Schultz, 2001).

Liobikiene and Poškus (2019) suggest to extent VBN theory by replacing value component with environmental knowledge. The researchers argue that values can hardly change over a short period of time and, in this regard, VBN theory offers little value to policymakers whose aim is to shift people's behaviour over a shorter time span. At the same time, the awareness about environmental problems can directly create concern, contribute to developing and transforming norms and, eventually, behavioural change. As found in their study, awareness about the consequences of human activities on the environment positively affects environmental responsibility.

The current study takes into account the remarks of Liobikiene and Poškus (2019) and, therefore, measures not values but the three types of environmental concern, which can be manipulated more easily, for example, by creating awareness. In addition, this decision is justified by some evidence that values are dependent on national and cultural context (Pagliuca et al., 2022), and thus can hardly be measured with a high degree of generalisability. Consequently, measuring concern increases the generalisability of results. Finally, the link between GFT and environmental concern has not been studied so extensively as the link between value orientation and goal frames, therefore, the decision to measure concern instead of values increases the value of the current study. However, it is important to mention that both concepts – value orientation and environmental concern – proved to be related to PEB, with biospheric concern/values having the most impact (Chen et al., 2022; Fornara et al., 2015; Pagliuca et al., 2022).

The research into "green" hotels established a positive significant relationship between the level of self-reported environmental concern in customers and their readiness to pay a higher price for environmentally-friendly accommodation (González-Rodríguez et al., 2019). There is also evidence that biospheric type of environmental concern has a statistically significant relationship with supporting the reasons for switching from gasoline-powered scooters to electric ones (Chen et al., 2022). The researchers, however, established that two other types – egoistic and social-altruistic – do not play a significant role in reasoning in favour of electric scooters. At the same time, a study by De Groot and Steg (2007b) yielded contrasting results, showing that all three types of environmental concern are positively related to attitudes towards PEB.

As we can see, although most studies agree on the significant effect of biospheric concern on PEB, the relationships between the socio-altruistic type, the egoistic type and PEB are less clear. However, most of the studies group socio-altruistic and biospheric values and concerns in

one concept called self-transcendence while opposing it to self-enhancement which includes egoistic values (e.g. Stern, 2000; Schultz, 2000, Schultz et al., 2005).

Therefore, H3 goes as follows:

H3: Environmental concern correlates with attitude towards and intention to adopt household energy efficiency upgrades. The participants who have a) a lower degree of egoistic concern, b) a higher degree of socio-altruistic concern, c) a higher degree of biospheric concern will have a more positive attitude and a greater intention to install a heat pump.

Steg and Vlek (2009) note the role of contextual and motivational factors in moderating the effect of goal frames on PEB as well as suggest further research into this topic. Indeed, numerous studies indicate that environmental concern can serve as a moderator of the influence of various factors on different kinds of pro-environmental behaviour. As such, a study by Sreen et al. (2021) found that consumers with a higher level of environmental concern express more brand love towards sustainable brands in relation to reasons for consuming natural products. In addition, a high level of environmental concern emerged as a moderator of the effect of perceived greenwashing on green purchasing intention. More precisely, Zhang et al. (2018) found that the higher the level of environmental concern is, the stronger the effect of perceived greenwashing on purchasing intentions. In other words, people who are seriously concerned for the environment will be also seriously discouraged from buying products of companies involved in greenwashing, while for less concerned individuals perceived greenwashing is less of an obstacle to buying intentions. Further, in a study by Xu et al. (2015), the effect of environmentally framed messages on attitudes towards energy saving was greater for those participants with a moderate level of environmental concern, compared to those with a low level of EC. In contrast, economically framed messages did not show the same association with environmental concern.

In addition, many studies have indicated that pro-environmental beliefs, intentions, and behaviour are positively correlated with biospheric and altruistic values and concerns, and negatively correlated with egoistic values and concerns (Chen et al., 2022, De Groot & Steg, 2007b; Onel & Mukherjee, 2017; Schultz et al., 2005). Therefore, it seems reasonable to assume that the normative goal frame, which encompasses intentions to protect the environment, will have a stronger effect on attitude and intention for those participants who have a higher level of biospheric and altruistic environmental concern and will be weaker for those with a higher level of egoistic concern. Therefore, the following hypothesises are suggested.

H4: The effects of frames on attitude and intention toward household energy efficiency upgrades are moderated by the egoistic environmental concern: when participants have a lower degree of egoistic environmental concern, the effect of a normative frame on (a) attitude and (b) intention compared to hedonic and gain frames is stronger.

H5: The effects of frames on attitude and intention toward household energy efficiency upgrades are moderated by the socio-altruistic environmental concern: when participants have a higher degree of socio-altruistic environmental concern, the effect of the normative frame on (a) attitude and (b) intention compared to hedonic and gain frames is stronger.

H6: The effects of frames on attitude and intention toward household energy efficiency upgrades are moderated by the biospheric environmental concern: when participants have a higher degree of biospheric environmental concern, the effect of a normative frame on (a) attitude and (b) intention compared to hedonic and gain frames is stronger.

3. Method

The following chapter explains the research method chosen to answer the research questions. It starts with elaborating on the research design and describing the sample and continues with explaining the procedure of the data collection. Further, the scales employed to measure each of the concepts of the current study provided. This section concludes with describing validity and reliability of the research method.

3.1. Research design

To answer the research questions and test hypotheses, a quantitative research method was applied. As this study intends to analyse the effect of different motives on the purchasing intention and attitudes of Dutch households, large-scale data collection is needed to ensure the reliability of the results, while quantitative methods allow collecting a large and systematised body of data as well as exploring the relationships between variables (Matthews & Ross, 2010).

More precisely, this study employs an experiment with a unifactorial design. It contains four conditions: three experimental conditions with manipulated hedonic, gain and normative motives and one control condition. This method is the most appropriate to answer the research question because the current study aims at exploring the impact of promotional messages on attitudes and intentions. That is, it implies establishing causal relationships between dependent and independent variables, while an experiment is a method that is able to test and gather evidence about causal relationships (Neuman, 2014) and proves to be especially effective in answering explanatory research questions and testing hypothesises (Babbie, 2013). Because the aim of the study is to apply the goal-framing theory (Lindenberg & Steg, 2007) to certain conditions, the experiment can be described as theoretically based. Hence, the variables are determined by the theory in question and correspond with the goal frames.

By exposing each of the experimental groups to a message with an activated hedonic goal, or a message with an activated gain goal, or a message with an activated normative goal, or a control message without activated goals and subsequently comparing the measured attitude and intention in each of these groups, H1 and H2 can be tested. To test H3, the correlation between the level of environmental concern and attitudes/intentions in all groups is studied. To test H4, H5 and H6, the interactions between the three types of environmental concern and conditions are explored.

When designing the promotional messages for motives manipulation, creating a mock advertisement for a company specialising in installing heat pumps was considered a suitable solution. First, installing a heat pump is a form of efficiency behaviour (Karlin et al., 2014), which has a significant positive impact on the environment but requires additional academic

research due to the aforementioned research gap. Second, a fully electric type of heat pump allows households to disconnect from gas pipelines (Milieu Centraal, 2022), which is in line with the officially set climate targets of the Netherlands (Ministry of Interior and Kingdom Relations, 2022), therefore studying the attitude of Dutch citizens towards this device and the intention to install it is beneficial for society. Third, the characteristics of heat pumps provide the ground for emphasising all three goals. A heat pump can ensure a more comfortable in-house temperature as an additional source of warmth or air conditioner, especially for households currently without air cooling systems, thus appealing to the hedonic frame. It also possesses proven and measurable economic and environmental benefits, allowing to emphasise gain and normative frames.

3.2. Sample

Households in the Netherlands were invited to participate in this study through a combination of non-probability snowball sampling and random sampling. Because the installation of household energy efficiency appliances requires an ability to make important decisions about real estate, the sampling criteria included house owners residing in the Netherlands. However, renting a house does not necessarily mean that a tenant is unable or demotivated to make decisions about energy efficiency appliances. In addition, unlike wall insulation, a heat pump can be relocated to another property. For this reason, it was decided to also include in the sample long-term tenants who consider themselves able to make decisions about energy efficiency upgrades. It was also recognised that the participants may not own the house they live in themselves but are able to make important decisions about it. This includes living with the owner who is a spouse, parent or another relative. Thus, the sampling criteria are the following:

- 18 years or older;
- Citizen or permanent resident of the Netherlands;
- Owns a house, or lives with the owner of the house (spouse, parent, relative), or a long term tenant (lives in the current accommodation for at least three years and intends to live there for at least another three years).

Nevertheless, efforts were made, including by distributing paper leaflets, to recruit as many house owners as possible. Therefore, they represent a majority of the sample (61.8%). 8% of the participants lived with a house owner who was their spouse, 8.9% shared an owned house with (a) parent(s) and 22.8% were long-term tenants.

After removing incomplete responses (N = 42) and responses with a failed manipulation check (N = 11), the final sample was 123 completed questionnaires. 12 participants skipped the question with the manipulation check but it was decided to keep them in the final dataset to

investigate whether there is any difference in results when their responses are included and excluded. In the final dataset, 48.8% were females, 48,8% were males and 2.4% preferred not to reveal their gender. The participants were aged between 20 and 79 years (M = 40.26., SD = 14.96). The most named education level was a Master's degree (48%), followed by a Bachelor's degree (35%). Regarding employment status, 57.7% of the participants were full-time employed. The highest frequency of income ranged between €4500 and €5999 gross per month (26%). Only 2.4% of households already had a heat pump.

3.3. Procedure

As the first step, the experiment was pre-tested on eight people recruited through a convenience sample using the interview method.

As mentioned above, the majority of the participants were recruited through snowball sampling. There are, undoubtfully, some drawbacks to this sampling method, namely a decreased generalisability of results to a wider population (Neuman, 2014). In particular, there is a chance that a researcher will include in the sample mostly people from their own circle. However, these negative aspects were mitigated by employing people from different domains, for example, from studies, (former) work, and language club, as well as by asking friends, acquaintances, and colleagues to share the questionnaire further with their circle. The questionnaire was also posted in various LinkedIn and Facebook groups to further include people outside the researcher's circle.

Additionally, a total of 80 paper leaflets were distributed into mailboxes of houses located in the North of Rotterdam. These neighbourhoods were chosen due to the high density of independent middle-class houses which have a high likelihood to be owned. The leaflets contained a short description of the study and its purposes and a QR code leading to the online survey. This non-web recruitment approach is a recognised method of recruiting participants for web surveys and experiments and is especially relevant for specific samples (Best & Harrison, 2009). Hence, it benefited the current research. A total of 19 participants accessed the survey through a QR code, therefore, the response rate of this part of the sample was 23.75%. Finally, online platforms for survey distribution such as Survey Circle and Survey Swap were used to further expand the sample.

All these measures ensured that different social groups are represented in the sample and that it can be generalised to a wider population (Biernacki & Waldorf, 1981).

The dataset for analysis was collected from April 13 to May 6, 2022. In the distributed message inviting the participants to take part in the survey, the sampling criteria were listed. When respondents clicked the link or scanned the QR code, they were directed to the beginning

of the experiment which contained a consent form and mentioned sampling criteria once again. The participants were informed that their participation was voluntary and anonymous and that they could only continue if they met the sampling criteria. By clicking the continue button, the participants confirmed their consent and the meeting of the sampling criteria. Next, the participants were asked to answer a set of questions measuring their environmental concern. In the following step, they were asked to read carefully one of four versions of a promotional message of a company specialising in installing heat pumps, which contained an experimental manipulation or a control message. Participants were randomly assigned to one of four groups by the Qualtrics randomisation tool, namely the group with an activated hedonic goal (N = 29), the group with an activated gain goal (N = 27), the group with an activated normative goal (N = 30), and the control group (N = 38). After manipulation, all participants were asked a question checking if they had read and understood the message, thus ensuring that manipulation took place (Neuman, 2014). In the following part, the attitude towards installing a heat pump and the intention to install it within the next few years were measured. Several control variables were checked in the following stage, such as the housing situation, the possession of a heat pump at the moment of taking the survey, and reasons for not intending to install a heat pump. Finally, demographical data of the participants was collected.

3.4. Measurements of concepts

Several variables are measured in the framework of this study to answer the RQ. Attitude and intention are considered dependent variables, promotional messages with activated goal frames are taken as independent variables, and environmental concern serves as a moderator. Existing and scientifically proved scales were employed to measure these concepts. They are elaborated on in the following subsections.

3.4.1. Environmental concern

As mentioned in the section "Theoretical framework", the concept of environmental concern was studied extensively and, to a larger extent, developed by Stern et al. (1993). It consists of three categories: concern for the self, for the others and for the environment, also referred to as egoistic, socio-altruistic and biospheric concern. However, in terms of measurement of this concept, there is some evidence that Schultz's scale (2001) performs better (Snelgar, 2006) and is more widely employed in the latest studies. Therefore, it was decided to use Schultz's scale (2001) in the current study. The scale invites the participants to rate each of 12 valued objects in response to the question "I am concerned about environmental problems because of the consequences for…". The answers are measured on a 7-point Likert scale (1 = not

important, 7 = supreme importance). The items are divided between the three types of environmental concern, with four items measuring each type. In the study by Snelgar (2006), the Cronbach's α for the subscales were .91 for egoistic concern; .85 for socio-altruistic concern; and .91 for biospheric concern.

After running a reliability analysis for the dataset of the current study, Cronbach's α of the whole scale was high (Cronbach's α = .88), which confirms the overall reliability of this scale. Subsequently, reliability analyses for each of the subscales were run to determine the reliability of each scale separately. The results are presented below:

Egoistic concern. This subscale consisted of four items related to the concern about various aspects of the self, such as me, my lifestyle, my health and my future. The Cronbach's α for this scale was high (Cronbach's α = .91) which indicates that all items of this subscale can be preserved.

Socio-altruistic concern. This subscale consisted of four items related to the concern about other people, such as people in my country, all people, children and future generations. The Cronbach's α for this scale was high (Cronbach's α = .88) confirming its reliability.

Biospheric concern. This subscale consisted of four items related to the concern about nature and the environment, such as birds, plants, marine life and animals. The Cronbach's α for this scale was high (Cronbach's α = .92) confirming its reliability.

On the basis of these analyses, three new variables corresponding to the three types of environmental concern were computed and utilised for the tests of hypothesises.

3.4.2. Motives manipulations

Three experimental and one control condition included a mock advertisement of a firm specialising in installing heat pumps (see Appendix B). Messages in all four conditions consisted of a call to install a heat pump, a picture of the device and a short description of its functions. Additionally, experimental conditions contained one more picture and an additional description of the device's benefits with activated motives. As such, the hedonic condition emphasised that the majority of households with a heat pump report the same or greater level of comfort (Milieu Centraal, 2022) and was accompanied by a picture of a person in a comfortable position (Lindenberg & Steg, 2007). The gain condition contained information about money-saving opportunities (Lindenberg & Steg, 2007) based on the current energy prices estimation (Milieu Centraal, 2022) and available data on different types of heat pumps and was shown together with a picture of a person with banknotes. The normative condition informed the participants about the estimated amount of CO2 emissions reduced due to installing a heat pump (Lindenberg & Steg, 2007) and contained a picture symbolising green energy (a light bulb with a plant inside).

The decision to provide more concrete information such as the exact amount of money saved and the CO2 emissions reduced was driven by the Lindenberg and Steg's (2007) study which mentioned that people are sometimes unwilling to engage in pro-environmental behaviour if it is not clear to them how the environment can benefit from their actions. The source of this concrete information was the government-related website milieucentraal.nl. Dutch households that are interested in installing heat pumps are directed to this website by the governmental information service, therefore, the data derived from it can be considered both reliable and up-to-date.

Some of the previous studies successfully incorporated pictures with activated motives (Tao et al., 2021; Van den Broek et al., 2017), indicating that visual information supplements the text and enhances motives. That justified the inclusion of pictures in the manipulated motives of the current study.

3.4.3. Manipulation checks

A question to check whether the manipulation had the intended effect (Neuman, 2014) was added after manipulations. It asked which of the suggested statements is true and offered four options: "the majority of households report the same or greater level of comfort", "a heat pump helps you to save money", "a heat pump reduces the carbon footprint of your house", and "none of the above". It was a multiple choice question, thus the participants had to choose only one of the aforementioned options. If the chosen answer did not correspond with the shown condition, the manipulation check was considered failed and a response was removed from the final dataset during the data clearing.

3.4.4. Attitude

As mentioned earlier, the notion of attitude as well as intention in the context of pro-environmental behaviour has been widely studied in the framework of TPB developed by Ajzen (1984, 1991). Therefore, a scale to measure this concept was adopted from Ajzen and Madden (1986), as it was considered relevant for the current study. The scale consists of seven statements measured on a 7-point Likert scale with extreme positions such as very rewarding-very punishing (replaced the opposition sharp-dull from the original scale), very useful-very useless, very good-very bad, very harmful-very beneficial, very wise-very foolish, very happy-very sad, and very attractive-very unattractive. In Ajzen and Madden's (1986) study, the Cronbach's α for this scale was .86.

Reliability analysis was run for the current dataset to determine the reliability of this scale. As a result, the Cronbach's α was not acceptable (Cronbach's α = .42). However, the

results of the analysis also indicated that if item 7 (very punishing-very rewarding) is deleted, the reliability of the scale will increase significantly and reach an acceptable level (Cronbach's α = .94). For this reason, it was decided not to include this item in the further analyses and compute a new variable on the basis of six items. This variable was considered a measure of attitude.

3.4.5. Intention

The scale to measure intention was adapted from the same study by Ajzen and Madden (1986). This decision helped to maintain the consistency of measurements. According to the adapted version of the scale, three statements related to the intention to install a heat pump were designed, such as "I intend to install a heat pump in my house within the next few years", and the answers were measured on a 7-point Likert scale (1 = totally disagree, 7 = totally agree). In the original study (Ajzen & Madden, 1986), the Cronbach's α for the items was above .78.

Reliability analysis was conducted to determine the reliability of the scale for the current dataset. As a result, the Cronbach's α was very high (Cronbach's α = .98) indicating high reliability of the scale. Consequently, all three items were used to compute a new variable, which was considered a measure of intention.

3.4.6. Control variables

Three questions considered valuable for the objectives of this study were added as control variables. First, the participants were asked whether their house already had a heat pump installed. Second, the respondents were asked about their housing situation for further analysis and the additional check of meeting the sampling criteria. The suggested answers were "I am a house owner", "I live with the house owner who is my husband, wife or registered partner", "I live with the house owner who is my parent", "I live with the house owner who is my relative", "I am a long term tenant", and "Other". Respondents who chose the "Other" option were considered not meeting the sampling criteria and excluded from the final dataset. Finally, those participants who did not intend to install a heat pump were asked about the reasons for their decision. The suggested reasons for not installing a heat pump were "High price", "Hassle", "My house is not suitable for it", "I do not see any reason for it" and "Other" (with an option to type in another reason). This variable was included to better understand the results of the study and contribute to the discussion section as well as to potentially identify directions for future research.

3.4.7. Demographics

In the last stage of the experiment, the participants were asked about their age, gender, level of education, employment status and income. In the question regarding age, the respondents had to type in their age in numbers. The options offered for measuring gender were "male", "female", "third gender/non-binary" and "prefer not to say". For the level of education, the highest level of completed education was measured with the options ranging from less than a high school to a doctoral degree (PhD). The employment status of respondents was assessed through several options, namely employed (full-time), employed (part-time), seeking work, student, housewife or man, and retired. Lastly, there were possible answers to provide information about the participants' gross monthly income, ranging from "less than €1500" to "more than €12000", including an option "prefer not to say".

3.5. Validity and reliability

Several techniques were employed to ensure the validity and reliability of the results. First, to address selection bias, all participants were randomly assigned to four groups via the Qualtrics randomisation tool. Hence, each participant had an equal chance to be exposed to one of four conditions, which increases the internal validity of the experiment by eliminating the researcher's influence on the selection process (Neuman, 2014).

Moreover, a manipulation check was administered to the participants to check their understanding of promotional messages. Responses with a failed manipulation check were cleared from the final dataset (Neuman, 2014).

Concerning external validity, and, more precisely, the so-called ecological validity which reflects how realistic the conditions of an experiment are (Coleman, 2019), the experiment was specifically designed to reflect real-life circumstances. Namely, it was an online experiment that the participants took on their personal devices. Hence, the process reflected a real-life exposure to promotional messages. Further, the promotional messages used in manipulated conditions were specifically designed to mirror real advertisements. However, the mock promotional messages also took into account treatment integrity, meaning that they all had a unified design which differed only in terms of manipulated motives but not in size, colour, font, layout, and other design elements (Lipsey & Hurley, 2009).

Finally, validated scales from previous research with Cronbach's α above .80 were used to measure concepts. This points to the high reliability of employed scales (Pallant, 2016).

4. Results

This chapter demonstrates the results of various analyses of the collected data performed in SPSS. First, to test H1 and H2, a multivariate analysis (MANOVA) was conducted to investigate differences among four conditions in terms of their scores on attitude and intention. Second, six series of hierarchical multiple regression were performed to test H3, H4, H5, H6, namely, to investigate the moderation effect of environmental concern on attitude towards and intention to install a heat pump in response to different activated goal frames in promotional messages. Additionally, a correlation between environmental concern and attitude/intention was investigated in the framework of the aforementioned hierarchical multiple regression analyses. The following subsections will elaborate on the results.

4.1. Attitude and intention

The following hypothesises related to attitude and intention were tested by conducting a MANOVA.

H1. Inclusion of the goal frames into promotional messages about household efficiency upgrades will positively affect (a) the attitude towards adoption and (b) the intention to adopt these upgrades in comparison to no goal frames included.

H2: Compared to hedonic and gain goal frames, the inclusion of normative goal frame into promotional messages about household efficiency upgrades will have a greater positive impact on (a) the attitude towards adopting and (b) the intention to adopt these upgrades.

Prior to conducting MANOVA, preliminary assumption tests were performed to test normality, univariate and multivariate outliers, linearity, multicollinearity, and homogeneity of variance-covariance matrices. A test of normality showed that both attitude (p = .004) and intention (p = <.001) were significant, which indicated that they were not normally distributed. However, this is common for social science research, especially for large samples (Pallant, 2016). To check multivariate normality, Mahalanobis distance was applied. As a result, the maximum value for Mahalanobis distance was 8.46, which is less than the critical value for two dependent variables (13.82). That is, for both attitude and intention variables there were no multivariate outliers in the current dataset. To test multicollinearity, a correlations analysis between intention and attitude was conducted using Pearson product-moment correlation coefficient. The results revealed a significant strong positive correlation between the two dependant variables, r = .72, n = 123, p < .001, meaning the presence of multicollinearity. Finally, in Box's test of equality of covariance metrics, the insignificant value (p =.319) confirmed the MANOVA assumption. Taking into account the aforementioned results, the

MANOVA assumption is not violated, which justifies the use of this type of analysis in the current research.

A one-way between groups multivariate analysis of variance was performed to determine the effect of different motives on attitude towards and intention to install a heat pump. In this analysis, only participants who successfully passed the manipulation check were included. The dependent variables were attitude and intention; the independent variable was motive manipulation. The results showed a statistically significant difference between the groups on the combined dependent variables, $F = (6, 208) = 2.38$, $p = <.001$; Wilk's Lambda = .88, partial eta squared = .06. When the results of the depended variables were considered separately, both differences in attitude (F (3, 105) = 4.01, p = .010, partial eta squared = .10) and intention (F (3, 105) = 3.53, p = .018, partial eta squared = .09) scores reached significance.

Tukey post hoc comparisons revealed that participants in gain condition (M = 5.53, SD = 1.04), had a significantly more favourable attitude towards installing a heat pump than control group (M = 4.59, SD = 0.94), p = .010. In addition, a difference in attitude between normative condition (M = 5.40, SD = 1.29) and control group (M = 4.59, SD = 0.94) reached significance, p = .028. Concerning differences in intention, according to Tukey post hoc comparisons, only comparison between gain condition (M = 3.83, SD = 1.56), and control group (M = 2.57, SD = 1.43) reached significance, p = .009. No other comparison was significant.

After that, another MANOVA was conducted with participants who skipped the manipulation check (n = 12) included. The results showed a statistically significant difference between the four groups on the combined dependent variables, $F = (6, 236) = 2.36$, $p = .031$; Wilk's Lambda = .89, partial eta squared = .06. When the results of the depended variables were considered separately, only differences in the attitude score reached significance, F (3, 190) = 3.55, p = .017, partial eta squared = .08. Differences in the intention score did not reach significance, F (3, 190) = 2.04, p = .111, partial eta squared = .05.

Because the results of the first analysis were made on the basis of a more reliable dataset which included only participants clearly identifying themselves with one of the conditions, they serve as the basis of accepting and rejecting H1 and H2. The aforementioned analysis with attitude as a dependent variable revealed significant differences between normative and control, gain and control conditions but not between hedonic and control conditions. Also, there were no significant differences between normative and other goal frames. Therefore, H1a is partially accepted and H2a is rejected. In addition, with intention as a dependent variable, significant differences between gain and control conditions were identified, but no other comparison reached significance. Therefore, H1b is partially accepted and H2b is rejected.

Subsequently, one more MANOVA was conducted to determine whether the housing situation of the participants has any effect on attitude and intention. The dependent variables were attitude and intention; the independent variable was motive manipulation; the housing situation was entered as covariate. The results revealed no significant differences depending on whether participants own a house, live in rented accommodation or share a living space with a house owner, F (2, 103) = 0.49, p = .646; Wilks' Lambda = .99; partial eta squared = .01.

4.2. Environmental concern

The following hypothesises related to environmental concern are tested in this subsection.

H3: Environmental concern positively correlates with attitude towards and intention to adopt household energy efficiency upgrades. The participants who have a) a lower degree of egoistic concern, b) a higher degree of social-altruistic concern, c) a higher degree of biospheric concern will have a more positive attitude and a greater intention to install a heat pump.

H4: The effects of frames on attitude and intention toward household energy efficiency upgrades are moderated by egoistic environmental concern: when participants have a lower degree of egoistic environmental concern, the effect of a normative frame on (a) attitude and (b) intention compared to hedonic and gain frames is stronger.

H5: The effects of frames on attitude and intention toward household energy efficiency upgrades are moderated by socio-altruistic environmental concern: when participants have a higher degree of socio-altruistic environmental concern, the effect of a normative frames on (a) attitude and (b) intention compared to hedonic and gain frames is stronger.

H6: The effects of frames on attitude and intention toward household energy efficiency upgrades are moderated by biospheric environmental concern: when participants have a higher degree of biospheric environmental concern, the effect of a normative frame on (a) attitude and (b) intention compared to hedonic and gain frames is stronger.

To test H3, H4, H5 and H6, a series of hierarchical multiple regression analyses were conducted to investigate the correlation between various types of environmental concern and attutude/intention as well as to estimate the moderation effect of environmental concern on attitude/intention. The analysis was divided into three stages prior to which three dummy variables were computed (hedonic, gain and normative condition) and the three independent variables (egoistic, socio-altruistic and biospheric concern) were standardised.

First, the effect of the egoistic type of environmental concern was assessed. For that, a hierarchical regression analysis was conducted with *attitude* as a dependent variable. The three dummy variables and a standardised egoistic concern score were entered in the first block as independent variables. Then, to test the moderation effect of egoistic environmental concern, the

interactions between these three dummy variables and the standardised egoistic concern score were entered in the second block. The first model reached significance R^2 =.11, F (4, 118) = 3.54, p = .009, but adding interaction did not improve the predictive value of the model significantly, ΔR^2 = .04, F (3, 115) = 1.97, p = .112. The correlation between egoistic concern and attitude was significant only in the second block (β = .34, p = .022). However, because the correlation was positive, while the hypothesis predicted a negative relationship, this result cannot serve as a basis for accepting H3a. It also indicates that H4a has to be rejected.

Subsequently, a hierarchical regression analysis was conducted with *intention* as a dependent variable. The three dummy variables and the standardised egoistic concern score as independent variables were entered in the first block. The interactions between these three dummy variables and the standardised egoistic concern score were entered in the second block. As a result, the first model was not significant, R^2 = .06, F (4, 118) = 1.75, p = .114, and adding interactions did not improve it significantly, ΔR^2 = .03, F (3, 115) = 1.14, p = .336. Therefore, H3a and H4b are rejected.

Second, the effect of the socio-altruistic type of environmetnal concern was assessed. For that, a hierarchical regression analysis was conducted with *attitude* as a dependent variable. The three dummy variables and the standardised altruistic concern score were put in the first block as independent variables. Then, to investigate the moderation effect of socio-altruistic environmental concern, the interactions between the three dummy variables and the standardised socio-altruistic concern score were entered in the second block. As a result, the first model was significant, R^2 = .13, F (4, 118) = 4.57, p = .002, but adding interactions did not significantly improve its predictive power, ΔR^2 = .03, F (3, 115) = 1.23, p = .303. Therefore, H5a is rejected. The correlation between socio-altruistic concern and attitude was found to be significant in the first block (β = .23, p = .009), which offers support for the first part of H3b.

Next, a hierarchical regression analysis was performed with *intention* as a dependent variable. The three dummy variables and the standardised altruistic concern score were put in the first block as independent variables. The interactions between the three dummy variables and standardised socio-altruistic concern score were entered in the second block. Although the first model reached significance, R^2 = .11, F (4, 118) = 3.61, p = .008, adding interactions in the second block did not improve its predictive power significantly, ΔR^2 = .04, F (7, 115) = 2.98, p = .117. Therefore, H5b is rejected. However, a significant positive correlation was found between socio-altruistic concern and intention in the first block (β = .26, p = .004). Combined with the results of the previous step, with attitude as a dependent variable, H3b is accepted.

Finally, the effect of biospheric type of environmental concern was estimated. For that, a hierarchical regression analysis was conducted with *attitude* as a dependent variable. The three

dummy variables and the standardised biospheric concern score were entered in the first block as independent variables. Then, to investigate the moderation effect of biospheric environmental concern, the interactions between the three dummy variables and the standardised biospheric concern scale were entered in the second block. The first model was significant in itself, R^2 = .10, F (4, 118) = 3.36, p = .012, and adding interactions in the second block improved its predictive value significantly, ΔR^2 = .06, F (7, 115) = 3.16, p = .049. However, only one effect of interactions in the second block reached significance, namely the interaction between gain condition and biospheric concern (β = -.29, p = .009). Therefore, H6a is still rejected. A significant positive correlation between biospheric concern and attitude was found in the second model (β = .36, p = .014), which supports the first part of H3c.

In the final step, a hierarchical regression analysis was performed with *intention* as a dependent variable. The three dummy variables and the standardised biospheric concern score were entered in the first block as independent variables. The interactions between the three dummy variables and standardised biospheric concern score were entered in the second block. The first model reached significance R^2 = .08, F (4, 118) = 2.47, p = .049. However, adding interactions did not improve it predictive power significantly, ΔR^2 = .04, F (3, 115) = 1.90, p = .133. Therefore, H6b is rejected. A significant positive correlation between biospheric concern and intention was detected in the first model (β = .19, p = .039). Taking into account the results of the previous analysis with attitude as a dependent variable, H3c is accepted.

4.3. Additional analyses

To better understand the outcomes of the current study, participants who had previously indicated that they did not intend to install a heat pump were asked to indicate what prevented them from doing this, on a scale from 1 to 7 (1 = does not prevent at all; 7 = absolutely prevents). There was a possibility to select multiple factors at a time. As a result, 52.9% of respondents (M = 5.25, SD = 1.71) replied that a high price is a deterring factor for them; 35% (M = 3.92, SD = 1.91) replied that a hassle factor deterred them; 43.9% of respondents (M = 4.57, SD = 2.20) considered their houses not suitable for this type of device; 39,9% simply did not see any reason for it (M = 4.34, SD = 2.24). In addition, several respondents specified other deterring factors relevant to them, including “I do not get bothered with in-house climates”; “I live in a flat”; “The noise, and I want to open my window at night”; “Does not pay off”; “It is no (sic!) sustainable solution”; “Ik (sic!) have city heating”; “Availability”; “Noise” (2 times); “We live in an apartment building. A cooperative approach seems wist (sic!)”; “Use woodstove”; “Not profitable”; “It makes noise and it is a big installation. Our house is small”. “I need the house to be well insulated first. It is an old house so heat is easily lost”.

5. Discussion

The following section presents and discusses key findings of the current study conducted to answer the following research questions.

RQ: To what extent does communicating hedonic, gain or normative goals in promotional messages influence purchasing attitudes and intentions for heat pumps in Dutch households?

Sub-question: To what extent does the level of environmental concern in Dutch residents moderate the effects of communicating hedonic, gain and normative goals on the attitude and intention to install heat pumps?

Along with answers to these questions, possible explanations of the finding are suggested. In addition, this section elaborates on implications of the results of the current study, discusses its limitations and suggests directions for further research.

5.1. Key findings

Previous empirical research applying the goal-framing theory indicated that the inclusion of hedonic, gain and normative motives into promotional messages has a positive effect on attitude towards various kinds of pro-environmental behaviour and intention to engage in it (Tao et al., 2021; Van den Broek et al., 2017; Westin et al., 2020). However, the results of the current research found that only the inclusion of gain and normative goal frames causes a significantly more positive attitude towards a form of PEB (installing a heat pump) in comparison with no goal frames included. As to the intention to engage in the aforementioned form of PEB, only the inclusion of gain goal frame produced a significantly more positive response in comparison with control group. Therefore, H1 was only partially accepted.

The existing studies on the goal-framing theory found the normative goal frame to have the greatest impact on PEB (Lindenberg & Steg, 2007; Van den Broek et al., 2017; Westin et al., 2020; Zeiske et al., 2021). In contrast with these findings, the current research did not find the comparison between the normative goal's effect and the effects of other goal frames to be significant. In fact, the inspection of mean scores of attitude and intention as well as the results of the aforementioned comparison with the control group indicate that a promotional message with the gain goal included produces a better response than a promotional message with the normative goal included. Therefore, H2 was rejected.

Taking the abovementioned findings into account, communicating normative and gain goals in promotional messages significantly influences purchasing attitudes for heat pumps in Dutch households, while communicating the gain goal also significantly influences purchasing intentions. Communicating the hedonic goal does not significantly influence purchasing attitudes and intentions.

Further, the current study investigated the link between environmental concern and purchasing attitudes and intentions for heat pumps in Dutch households. Previous research indicated that socio-altruistic and biospheric types of concern are positively related to pro-environmental behaviour while egoistic concern can either have no effect on PEB or be negatively related to it (Chen et al., 2022; Fornara et al., 2015; Pagliuca et al., 2022; Onel & Mukherjee, 2017; Tolppanen & Kang; 2021). The results of the current study were mostly in line with these findings. To be more precise, it found that people with a higher level of biospheric and socio-altruistic environmental concern have a more positive attitude towards installing a heat pump in their houses and a greater intention to do so. At the same time, the level of egoistic concern was found to be positively correlated with attitude but had no significant relationship with intention. Therefore, H3a was rejected and H3b, H3c were accepted.

Finally, the current study tested the moderation effect of egoistic, socio-altruistic and biospheric concern on the attitude towards and intention to install heat pumps through communicating different motives. Contrary to the hypothesises and previous research (Chen et al., 2022; De Groot & Steg, 2007b; Onel & Mukherjee, 2017; Schultz et al., 2005), the three types of environmental concern did not moderate the effect of the normative goal frame on the attitude towards installing a heat pump and the intention to do so. Therefore, H4, H5 and H6 were rejected.

However, an unexpected moderation effect of biospheric concern on the impact of gain goal frame was identified. Namely, participants with a higher degree of biospheric concern had a less positive attitude towards installing a heat pump in response to a message with the gain motive included. Nevertheless, this finding is in line with some of the previous studies which indicated that the disparity between an individual's values and the message they receive can decrease the persuasive power of a message (Tolppanen & Kang; 2021; Van den Broek et al., 2017). Biospheric concern is the result of adopting biospheric values while the gain goal appeal can be attributed to egoistic values (Stern, 1993, 2000; Schultz; 2001). In this regard, the aforementioned finding contributes to a body of research suggesting the alignment of values with the effect of interventions. It is also consistent with the paper of De Groot and Steg (2007a) who found that environmental concern has a direct effect on pro-environmental attitudes but not intentions.

There are several possible explanations for the unexpected moderation effect of the biospheric concern on the gain goal frame's effects. Firstly, as mentioned in previous sections, the focus of academics so far has been mostly on the curtailment behaviour that constitutes low-cost frequent actions (Karlin et al, 2014). Efficiency behaviour, on the contrary, has not been studied extensively. Therefore, it may be the case that this type of behaviour diverges from

curtailment behaviour to the extent that different behavioural patterns apply to it. Indeed, installing a heat pump is a costly investment, and communicating information about the financial benefits of this device could have mitigated this perception thus reducing psychological barriers and leading to the increased effects of the promotional messages. This assumption is supported by some scientific evidence, for example, a study by Schueftan et al. (2020) revealed that financial incentives play the most significant role in the Chilean household's decisions about investments in energy efficiency. Additionally, research by Laes et al. (2018) adds to the evidence suggesting a positive impact of financial incentives and subsidies on the probability of implementing energy efficiency improvements.

Secondly, the current study was conducted exclusively in Dutch households while most of the reviewed studies investigated pro-environmental behaviour in other countries. As found by Pagliuca et al. (2022), identical conditions can lead to different outcomes depending on the country. As such, the scholars identified that efficacy beliefs played a significant role in determining PEB in France and Germany but not in Britain where the concept of concern provided more insight into citizens' environmental behaviour. Therefore, the national context might be one of the contributing factors to the diverging results of the current study. This assumption is also supported by one of the rare studies into efficiency behaviour applied to the Dutch context. As such, Li et al. (2017) found that monetary incentives emerged as the biggest motivating factor in the willingness of Dutch citizens to adopt smart grid devices such as smart dishwashers and smart refrigerators.

Finally, various psychological barriers and pre-existing biases may have stood in the way of the promotional messages in the current research and had an effect on its results (Gifford, 2011). As mentioned in the results section, for a notable part of the participants, such factors as a high price, hassle, suitability of their houses and others can have a deterring influence. In addition, the participants listed some other reasons such as noise and availability. All in all, these findings are aligned with previous research which noted the hassle factor as an important psychological barrier (De Vries et al. 2020). In addition, Steg et al. (2014) suggest that people are likely to act pro-environmentally as long as it brings them pleasure and profit, while noise and a high price contradict these intentions. With regards to pre-existing biases, as one of the respondents framed it, the households may not consider heat pumps a sustainable solution due to the lack of awareness. The lack of proper information about pro-environmental action (Gifford, 2011) as well as a notable reliance on informal sources such as friends and neighbours (Fornara et al., 2014) can be some of the other factors reducing the persuasive effect of different goal frames included in promotional messages on household energy efficiency. All these possible psychological barriers must be considered when interpreting the results of the current study.

5.2. Implications

The current study contributes to the body of academic literature focused on pro-environmental behaviour, in particular, efficiency behaviour. Its results add to the previous findings emphasising that the inclusion of goal frames in promotional messages has a positive effect on their adoption (Tao et al., 2021; Van den Broek et al., 2017; Westin et al., 2020). In addition, it pinpoints an important divergence from existing literature in a way that only the inclusion of the gain goal frame leads to the increased intention to install a household energy efficiency upgrade compared with no motives included. By that, the study highlights the existence of different dimensions of pro-environmental behaviour and points to the need to conduct further research into efficiency behaviour, which may have unique behavioural patterns and psychological barriers (Gifford, 2011; Karlin et al., 2014). Moreover, this study contributed to the academic literature on environmental concern, establishing the link between this concept and PEB. Previous studies tended to focus on values rather than environmental concern, while the link between efficiency behaviour and environmental concern has not been sufficiently studied so far. Therefore, this study contributed to filling this academic gap. In particular, it was found that biospheric and socio-altruistic concerns serve as predictors of PEB. At the same time, egoistic concern emerged as a predictor of attitude towards PEB but not intention to engage in it. Finally, a moderating effect of biospheric concern on PEB was found, leading to practical implications discussed in the following paragraphs.

The societal and national context of the current study cannot be overlooked when interpreting its results. In the period of data collection, a dramatic increase in gas prices compared with the previous year was recorded, which was one of the factors leading to heightened inflation (Business Insider Nederland, 2022) and rising food prices (Algemeen Dagblad, 2022). That could have led to the increased concern over the financial situation of households and partly justified the effectiveness of the gain motive included in manipulations. Although a causal relationship between the economic situation in the Netherlands and the outcomes of this research cannot be established based on the measurements employed, it is important to keep in mind when explaining and applying its findings.

After the data for the current study was collected and analysed, it was announced that, starting from 2026, Dutch households must install at least a hybrid heat pump when upgrading their heating systems or consider another sustainable option (Van Soest, 2022). This fact underscores the recognised importance of increasing energy efficiency of households with the installation of heat pumps but also raises a question about the applicability of the findings of this research: if installing a heat pump is rather an obligation than a behavioural choice, will it be

necessary to conduct mass communication campaigns in order to increase acceptance of these devices? This paper argues that, in fact, the aforementioned legislation changes only highlight the societal relevance of the study.

First of all, public acceptance is a crucial part of implementing policies related to energy production and consumption. Tailored mass communications campaigns, for their part, are some of the effective tools to increase public acceptance (Lucas et al., 2021). At the same time, public opposition to environmental policies can be a major obstacle to implementing them (Wicki et al., 2019). Therefore, a public awareness campaign is needed to ensure that the upcoming obligation will not be met with opposition from the households' side. The results of the current study can play a role in the development of such campaigns and will help to tailor-made their messages. For example, they indicate that the promotional messages about installing household energy efficiency devices should be accompanied by arguments emphasising their environmental and financial benefits as this increases their effectiveness.

Importantly, the detected moderation effect of biospheric concern cautions mass communicators from appealing to financial gains in groups of people that are likely to have a higher level of biospheric concern. From the results of the current research, it is clear that this kind of appeal can in fact decrease the acceptance of a message. These demographic groups can be identified with the results of relevant research. For example, a study by Hopwood et al. (2021) has found that the increased environmental concern in Germany is associated with the middle adulthood age bracket and certain personality traits.

In addition, the demand for heat pumps is growing (Milieu Centraal, 2022) in the Netherlands and will predictably grow more from 2026. Therefore, the findings of the current research can be applied to fine-tune marketing and advertisement strategies of firms specialising in installing heat pumps and other comparable household energy efficiency appliances. As the method of this study employed using mock promotional messages, its outcomes can be generalised to the potential buyers of energy efficiency devices.

Finally, this research contributes to the global efforts aimed at climate adaptation and mitigation. According to studies, in reducing global warming, a lot depends on the actions of individuals and communities (Gardner & Stern, 2008; Gifford, 2011). By convincing more households to permanently switch to sustainable energy sources, the emissions of greenhouse gases can be significantly reduced (Gardner & Stern, 2008). Through studying behavioural responses to different promotional messages, this paper adds to the understanding and development of better communication strategies related to climate change and energy conservation.

5.3. Limitations and directions for future research

This study includes some limitations that needed to be taken into account when interpreting and applying its results. First, the number of participants for each condition is close to 30, which represents a relatively small sample. For this reason, the results can be only cautiously generalised to a wider population. In future research, a large sample of participants should be recruited to confirm or refute the findings of this small-scale study.

Second, the participants were recruited through a snowball sampling, which, again, weakens the possibility to generalise the study's results to a wider population and may imply selection bias (Babbie, 2017). Although efforts were made to recruit participants from different domains and the sample was supplemented by randomly distributing survey leaflets, future research should use a random sampling method.

In addition, the survey was conducted online which possibly made it easier to participate for younger respondents but could have created some barriers for the older age groups (Best & Harrison, 2009). Although the oldest person to access the survey through a QR code was 79 years old, it is difficult to estimate how many people were unable to utilise it because of technological barriers. Hence, the future studies which employ primarily house owners should consider using traditional distribution methods such as mail surveys or approaching people directly.

Third, the current experiment did not imply measuring the attitude towards and intention to install a heat pump prior to manipulation. It made the experiment more accessible by reducing the time to complete it as well as threats to external validity such as the reactivity to experimental situation, that is the (unconscious) willingness of participants to help the researcher by giving expected responses (Neuman, 2014). However, the chosen design of the experiment also made it hard to distinguish between the participants who reacted positively to the message and those who already intended to install a heat pump prior to manipulation. Therefore, future research may consider measuring attitude and intention before manipulation to better understand the causal relationships between goal frames and attitude/intention.

Finally, there are numerous psychological barriers and contextual factors which may have moderated the effects of goal frames on attitude and intention, such as ignorance, perceived behavioural control and self-efficacy (Gifford, 2011). The current research made an attempt to estimate some of the deterring factors but they were not its focus. To discover more complex relationships between these factors and PEB, more profound and large-scale research is needed.

Overall, as mentioned above, efficiency behaviour remains an understudied subject. Consequently, it is recommended to conduct more studies into this topic and test the findings of this research on a larger sample and in different countries. Moreover, the sample of similar

studies usually includes only house owners. Meanwhile, a large part of the Dutch housing market totalling 3 million homes is represented by rented property, including social housing. In that case, energy efficiency choices are made by the owners of the property, many of whom (75%) are housing associations (Government of the Netherlands, 2022). The attitudes and behaviour of this type of property owners remain understudied, while their share on the housing market and, consequently, in the collective climate action is problematic to ignore. Therefore, this paper suggests research into the energy efficiency behaviour and attitudes of housing associations and landlords.

Another direction for future research is studying the reaction of households to the obligatory energy efficiency measures similar to those introduced by the Dutch government. Interesting research into this kind of topic was produced by Westin et al. (2020), however, the scholars studied rather a type of curtailment behaviour. A legal obligation to engage in energy efficiency behaviour is a relatively new and rarely applied policy measure, which can be highly beneficial to study.

6. Conclusion

Household energy efficiency has been widely discussed over the past years as a tool to protect the environment and slow down global warming (Mastrucci et al. 2021). In the European context, energy efficiency has also been increasingly seen as a matter of national sovereignty, allowing more energy independence from the suppliers of hydrocarbons (European Commission, 2022). Clearly, the European Union has embarked on an energy transition, which allows assuming that various aspects of energy conservation behaviour and related communication strategies should be studied more extensively to provide academic ground for processes Europe is currently undergoing.

This research is focused on applying the goal-framing theory (Lindenberg & Steg, 2007) to the promotional messages about household energy efficiency appliances. It employed an experimental quantitative method to discover the effects of communicating hedonic, gain and normative goals on purchasing attitudes and intentions for heat pumps in Dutch households. Moreover, it aimed to discover the extent to which the level of environmental concern in Dutch residents moderates the effects of communicating hedonic, gain and normative goals on the attitude and intention to install heat pumps.

The results of the study indicated that the inclusion of gain and normative goals into promotional messages positively affects attitudes towards heat pumps, while only the inclusion of the gain goal affects purchasing intentions. The inclusion of the hedonic goal did not affect the aforementioned variables. At the same time, biospheric and socio-altruistic types of environmental concern were found to be positively related to attitudes and purchasing intentions for heat pumps, while the egoistic type was positively related to attitudes but had no link to intentions. An unexpected moderation effect of biospheric concern was discovered, namely, the participants with a higher level of biospheric concern responded less positively to the gain goal message, as reflected in their scores on attitude and intention.

The results of the current study contribute to the academic literature on efficiency behaviour by applying the goal-framing theory to previously unstudied conditions. In addition, its findings can be used in developing mass communication campaigns aimed at increasing the adoption of household energy efficiency appliances as well as incorporated into marketing strategies of related companies.

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Appendix A

Scales for the measurement of concepts.

Variable	Items	Source
Environmental concern	1. I am concerned about environmental problems because of the consequences for plants. 2. I am concerned about environmental problems because of the consequences for marine life. 3. I am concerned about environmental problems because of the consequences for birds. 4. I am concerned about environmental problems because of the consequences for animals. 5. I am concerned about environmental problems because of the consequences for me. 6. I am concerned about environmental problems because of the consequences for my lifestyle. 7. I am concerned about environmental problems because of the consequences for my health. 8. I am concerned about environmental problems because of the consequences for my future. 9. I am concerned about environmental problems because of the consequences for people in my country. 10. I am concerned about environmental problems because of the consequences for all people. 11. I am concerned about environmental problems because of the consequences for children. 12. I am concerned about environmental problems because of the consequences for future generations.	Schultz (2001).
Manipulations check	1.The promotional message stated that the majority of households with a heat pump report the same or greater level of comfort 2. The promotional message stated that a heat pump helps you to save money. 3. The promotional message stated that a heat pump helps you to reduce the carbon footprint of your house.	No source

	4. None of the above.	
Attitude	1. Installing a heat pump in my house is very bad/bad/somewhat bad/ do not know/ somewhat good/ good/ very good. 2. Installing a heat pump in my house is very useless/useless/somewhat useless/ do not know/ somewhat useful/ useful/ very useful. 3. Installing a heat pump in my house is very harmful/harmful/somewhat harmful/ do not know/ somewhat beneficial/ beneficial/ very beneficial. 4.Installing a heat pump in my house is very foolish/foolish/somewhat foolish/ do not know/ somewhat wise/ wise/ very wise. 5. Installing a heat pump in my house is very unattractive/unattractive/somewhat unattractive/ do not know/ somewhat attractive/ attractive/ very attractive. 6. Installing a heat pump in my house makes very sad/makes sad/somewhat makes sad/ do not know/ makes somewhat happy/ makes happy/ makes very happy. 7. Installing a heat pump in my house is very punishing/punishing/somewhat punishing/ do not know/ somewhat rewarding/ rewarding/ very rewarding.	Aijzen & Madden (1986).
Intention	1. I intend to install a heat pump in my house within the next few years. 2. I am aiming at installing a heat pump in my house in the next few years. 3. I will try to install a heat pump in my house within the next few years.	Aijzen & Madden (1986).
Control variables	1. Do you already have a heat pump in your house? 2. If you do not intend to install a heat pump in your house, what and to what extent prevents you from doing this?	No source

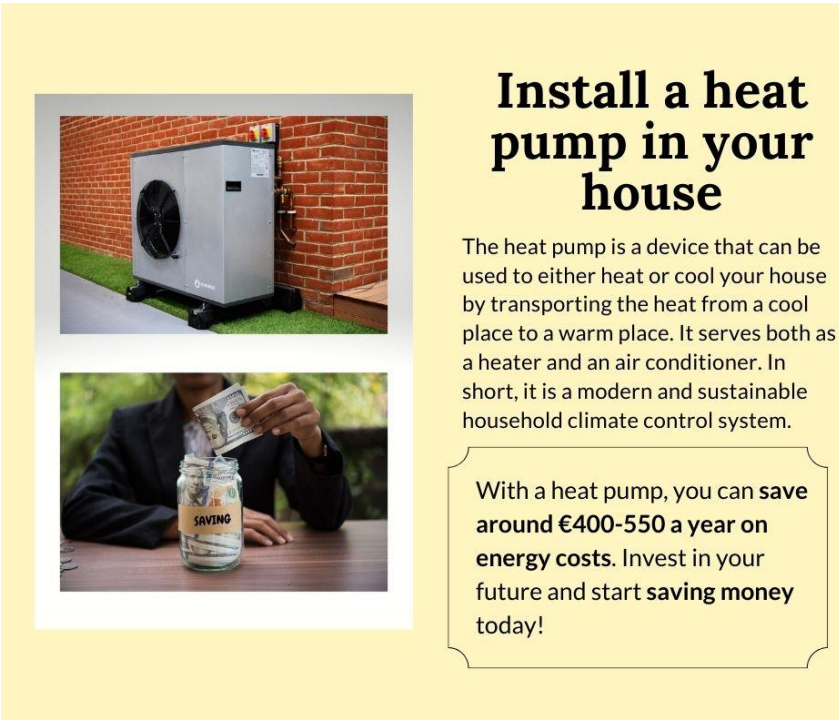
	3. What is your housing situation?	
Demographics	1. Age 2. Gender 3. Educational level 4. Employment status 5. Income	No source

Appendix B

Goal frames manipulations.

1. Hedonic goal frame.

2. Gain goal manipulation.



3. Normative goal manipulation.

Install a heat pump in your house

The heat pump is a device that can be used to either heat or cool your house by transporting the heat from a cool place to a warm place. It serves both as a heater and an air conditioner. In short, it is a modern and sustainable household climate control system.

With a heat pump, you can **reduce the carbon footprint of your house by 25-55%.** Contribute to preventing climate change and protecting the **environment!**

4. Control group manipulation.

Install a heat pump in your house

The heat pump is a device that can be used to either heat or cool your house by transporting the heat from a cool place to a warm place. It serves both as a heater and an air conditioner. In short, it is a modern and sustainable household climate control system.