E-Cargo Bikes: Investigation of Innovative Bike Frame Materials - Wood vs. Carbon Fibre and the Impact of Pro-Environmental Attitudes, Age, and Gender

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Abstract: E-Cargo bikes are often promoted in the context of climate change and sustainability as a great alternative to cars. Even though the number of E-Cargo bikes increases worldwide, it is unclear whether innovative bike frame materials such as wood and carbon fibre may play an important role for interested cyclists. Hence, we conducted an exploratory cross-sectional online questionnaire study and collected data from 292 participants in Germany (147 female, 144 male, one diverse; age range: 18 to 88 years). They completed scales, such as a semantic differential and buying intention, both for E-Cargo bikes made of wood and carbon fibre, respectively, as well as a questionnaire on environmental attitudes. We found that respondents who reported greater values on pro-environmental attitudes favoured wooden E-Cargo bikes. However, we observed no preference between E-Cargo bikes made of wood vs. carbon fibre. Additionally, we uncovered a gender effect for pro-environmental attitudes. Therefore, we conclude that cyclists do not prefer wood or carbon fibre as a bike frame material for E-Cargo bikes. Women seem to be more interested in wooden E-Cargo bikes than men, while articulating more pro-environmental attitudes that could impact environmental campaigns on green mobility.

1 INTRODUCTION

Given global challenges like climate change and accelerating urbanisation, developing sustainable concepts is essential (Hess and Schubert, 2019; Kreye et al., 2024). The transport sector is particularly critical here, as it accounts for a considerable proportion of greenhouse gas emissions (Kreye et al., 2024). Consequently, mobility solutions that reduce greenhouse gases are becoming increasingly relevant (Hess and Schubert, 2019). One notable example is an E-Cargo bike, which combines traditional cargo bikes with electric assistance (Hess and Schubert, 2019). E-Cargo bikes are an important part of the transport transition, offering an alternative to motorised vehicles in private settings (Carracedo and Mostofi, 2022). They provide numerous benefits, including the potential to reduce emissions, air pollution, and noise (Athanasopoulos et al., 2024; Vasiutina et al., 2021). In urban traffic, E-Cargo bikes can help alleviate congestion and parking issues, and they may enable quicker journeys (Athanasopoulos et al., 2024). They also offer high transport capacity and can be used by individuals without a driver's license (Hess and Schubert, 2019; Mantecchini et al., 2025). Economically, they often have lower purchase and operating costs than motorised vehicles (Dybdalen and Ryeng, 2022).

Despite these advantages, E-Cargo bikes face several challenges that hinder widespread adoption. These include inadequate infrastructure, such as a lack of dedicated cycle paths and suitable parking spaces, along with safety concerns in road traffic (Hess and Schubert, 2019; Marincek et al., 2024). Operational limitations, such as restricted range,

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speed, load capacity, and dependence on weather conditions, can affect their attractiveness and efficiency (Dybdalen and Ryeng, 2022; Riggs, 2016). Furthermore, acquisition costs and insufficient information can affect acceptance among potential users (Carracedo and Mostofi, 2022; Heinrich et al., 2016). While pragmatic factors are well-documented, this study explores how the material itself influences user perception. Therefore, this study compares the materials wood and carbon.

1.1 Wood vs. Carbon

The growing emphasis on sustainable practices has driven a re-evaluation of materials in production systems (Hegab et al., 2023). This shift is particularly relevant for material selection, where environmental benefits are gaining importance, especially for consumers with stronger sustainability values (Graf, 2021). Consequently, wood, as a vital renewable and biodegradable resource, is increasingly central to a future bioeconomy (Gold and Rubik, 2009; Goldhahn et al., 2021). The perception of wood among consumers is frequently favourable, encompassing associations with aesthetics, contributions to well-being, and eco-friendliness, leading to common descriptions of the material as warm and soft (Gold and Rubik, 2009; Kaputa et al., 2021). Despite these favourable perceptions, concerns regarding its durability and maintenance persist (Gold and Rubik, 2009; Harju, 2022).

Traditionally, many sporting goods, and by extension other products requiring specific characteristics, have relied on wood and wood composite products to meet demands for lightweight and rigidity (Zhang, 2013). Notwithstanding, carbon fibre reinforced composite materials have gained attention as an alternative with mechanical properties that are generally higher than those of wood (Zhang, 2013).

1.2 Age and Gender Effects

The use of cargo bikes varies with demographic factors such as age and gender (Carracedo and Mostofi, 2022). A study found gender-specific differences in the use of privately owned cargo bikes for trips involving children (Riggs and Schwartz, 2018). Their findings show that while 56 per cent of men utilise cargo bikes for these family-related journeys, a higher percentage of 78 per cent of women do the same (Riggs and Schwartz, 2018). This trend highlights that women are more likely to rely on cargo bikes for transportation needs associated with family activities (Riggs and Schwartz, 2018). Meanwhile, a research paper suggests that E-cargo bike users are typically male, highly educated, and in their late thirties or early forties (Carracedo and Mostofi, 2022). They often belong to households with children and cars, representing an upper-to-middle-class socioeconomic stratum (Carracedo and Mostofi, 2022).

These differences in attitudes toward new technologies between genders and age groups may stem from women and older individuals being more cautious in their evaluations (Weigl et al., 2022). They often rate the positive aspects of these technologies lower, show reduced tendencies to early adoption, and express more concerns compared to men (Weigl et al., 2022). Additionally, women typically exhibit lower levels of trust and higher levels of distrust in vehicles, coupled with significantly higher instances of non-clinical anxiety when compared to men, which could exacerbate their safety concerns (Weigl, 2020).

1.3 Present Study

The first research objective of the present cycling study was to investigate different bike frame materials, such as *wood* vs. *traditional bike frame materials* (e.g., carbon fibre), of E-Cargo bikes in the context of buying intention, environmental attitudes, and cycling per week. The second objective was to study any age or gender effects (or a possible interaction) on the aforementioned factors of both wood and traditional bike frame materials. Hence, we postulated the following three research questions (RQs):

1. RQ1: How are the associations of the perceptions of different bike frame materials, such as wood vs. traditional bike frame materials (e.g., carbon) of E-Cargo bikes, with buying intention, environmental attitudes, age, and cycling per week?
2. RQ2: How are the ratings of different bike frame materials, such as wood vs. traditional bike frame materials (e.g., carbon) of an E-Cargo bike?
3. RQ3: How is the influence of age and gender, or a potential interaction effect, on the factor mean scores of the semantic differential for wood and traditional cycling material, and environmental attitudes?

2 METHOD

2.1 Participants

We collected data from 292 respondents in Germany (147 female, 144 male, one diverse) with an age range from 18 to 88 years (M = 41.54 years, SD = 18.36).

All participants were fluent in German and had normal or corrected-to-normal vision. Sixty-nine were unmarried or single, 80 in a relationship, 114 married, 14 divorced, and three widowed (twelve gave no answer). One hundred fifty resided in a big city (> 100.000), 83 in a medium city (20.000 to 100.000), 27 in a small town (5.000 to 20.000), 15 in a small town or village (< 5.000 inhabitants), six near a city, and eleven in the countryside. Two hundred and ninety-one reported that they were able to cycle, and 268 were in possession of a valid driving licence. Eighty-five commuted by public transport, and 115 by car. Six used ride-sharing frequently, and 30 only seldom (256 never used it). Car-sharing was often used by two, and seldom by 24 (266 did not use it). Two hundred eighty were German citizens. Forty-eight participants had completed vocational training (14 a vocational-company training (apprenticeship) and 34 a vocational-school training). Ninety-nine had achieved a higher education entrance qualification, 13 had a high school diploma, 42 held a bachelor's degree, 74 had a master's degree, 12 had a doctorate, and one had completed a postdoctoral qualification (habilitation). Three were not educated.

2.2 Study Design

We conducted an online questionnaire study using an exploratory, cross-sectional within-subjects design to compare two different E-Cargo bike frame materials: wood and carbon fibre. Therefore, we collected the data using the questionnaires listed in the following subsection (cf. 2.3) and assessed demographic questions, such as age, self-reported gender, and the frequency of cycling per week (cf. more details in section 2.1). The two categorical variables were two age groups (18-39; 40+) and gender (female, male), yielding a 2 × 2 between-subjects design (e.g., for studying environmental attitudes as in RQ3). However, for the main investigation of RQ3, a repeated-measures MANOVA was applied to the factor mean scores of the semantic differential, with the bike frame material serving as the within-subjects (repeated-measures). Hence, we employed a 2 × 2 × 2 between-within-subjects design for the repeated-measures MANOVA analysis, focusing on the three categorical variables: age groups (18-39; 40+ years) and gender (female, male), both as between factors; wood vs. carbon (within). The dependent variables (DVs) were the mean factor scores of the questionnaires, specifically the semantic differential and buying intention, for both wood and carbon fibre, as well as environmental attitudes.

2.3 Materials

To address the research questions, this study employed previously validated scales established in the literature. All items were translated into German using the back-translation method to ensure linguistic and conceptual equivalence. Mean scores were computed for each scale, with higher values indicating higher levels of the respective construct, except for purchase intentions, which were reverse-coded.

Perception and Evaluation. The perception of the two E-Cargo bikes (wooden and conventional) was assessed using a semantic differential scale based on Graf (Graf, 2021). Participants rated eight bipolar adjective pairs (e.g., "robust - fragile") on a 5-point scale ranging from -2 to +2. These items captured both general and environmentally relevant product attributes. The internal consistency of the scale was high (Cronbach's $\alpha = .86$). To ensure that the evaluation differences could be attributed solely to the presented material, participants were shown corresponding images of the two E-Cargo bikes without any price or performance information.

Environmental Attitudes. Environmental attitudes were measured using a validated short scale developed by Geiger and Holzhauer (Geiger and Holzhauer, 2020), consisting of nine items covering environmental knowledge, concern, and self-reported behaviour (e.g., "Human-caused environmental problems such as deforestation or plastic in the oceans upset me"). Responses were recorded on a 5-point Likert scale (1 = do not agree at all to 5 = fully agree). The scale showed satisfactory reliability (Cronbach's $\alpha = .71$).

Purchase Intentions. Participants' purchase intentions for both the wooden and conventional E-Cargo bikes were measured using a scale adapted from Kaushal and Kumar (Kaushal and Kumar, 2016), comprising four items per bike type (e.g., "I intend to buy a wooden E-Cargo bike"), rated on a 7-point Likert scale (1 = strongly agree to 7 = strongly disagree). Previous studies reported satisfactory internal consistency for this scale (Cronbach's $\alpha = .82 - .92$).

Besides demographic questions, we applied another questionnaire, which is beyond the scope of the present study.

For presenting the E-Cargo bike with a wooden bike frame, we used the original picture from bicycle manufacturer rethink. This cycling company creates and develops E-Cargo bikes with a wooden bike frame in Germany. This original picture was used, and a layer with carbon fibre was placed on the wooden bike frame to mimic a carbon E-Cargo bike.

2.4 Procedure

This study was administered via SoSci Survey (Leiner, 2024). Data collection took place between December 2023 and January 2024. The questionnaire required approximately 20 to 25 minutes to complete. Participants were recruited through personal invitations within student social circles, with efforts made to ensure an almost gender- and age-balanced sample. Access to the survey was restricted via personalised access codes, allowing only invited and authorised individuals to participate. Contact persons were available throughout the survey period to answer questions or provide technical support. Ethical standards were strictly adhered to: participation was voluntary, anonymous, and could be discontinued at any time without consequences. No deception, coercion, invasive procedures, or risks to participants' well-being were involved. Only adults (18+ years) were eligible to participate. No sensitive data were collected, and no financial incentives were offered. As all ethical requirements were met, no formal ethics approval was deemed necessary.

Prior to participation, individuals received a brief introduction outlining the study's purpose and a general overview of the topic (E-Cargo bikes). Participants were required to give informed consent and confirm acknowledgement of the data protection policy. Then, they entered a personalised participant ID and verification code to validate their eligibility and ensure data integrity. The main survey began with a semantic differential scale (Graf, 2021), followed by an additional questionnaire beyond the scope of the present study. Next, environmental attitudes were measured using a validated short scale (Geiger and Holzhauer, 2020). Following this, purchase intentions were assessed separately for both the wooden and the conventional E-Cargo bikes (Kaushal and Kumar, 2016). At the end of the questionnaire, participants provided sociodemographic information (e.g., age, gender, cycling habits).

2.5 Statistical Analyses

We set the overall significance level to $\alpha = .05$ and reported the results with $p < \alpha$ as statistically significant. For the correlational investigations, we applied the Bonferroni-Holm approach (Holm, 1979). Hence, we applied IBM® SPSS® Statistics, version 29.0.1.0 (IBM Corp., 2023) for analysing the data.

It is worth noting that the collected data using the Likert scale response format should commonly be analysed with nonparametric statistical procedures. Nevertheless, since we did not directly use the raw data, but the aggregated mean scores, we applied parametric statistical analyses for our analyses of this pilot study. In future studies, the visual analogue slider scale response format (Weigl and Forstner, 2021) should be applied.

For the MANOVA analyses (Pillai, 1955) *Pillai's trace* was applied, which is considered to be more robust and powerful, especially for departures from homogeneity of variance-covariances, and for uneven groups (i.e., unequal groups) and small cell sample sizes and because not all statistical prerequisites were met (Ateş et al., 2019; Seber, 1984). However, the MANOVA enables the testing of two or more DVs without inflating the familywise error rate (Type I error), while investigating interaction effects at the same time. Further statistical analyses are described in more detail in the results section. The data set and pictures of the E-Cargo bike (wood and carbon fibre) included in the online questionnaire are shared via the Open Science Framework (OSF): https://osf.io/r8mpw/ .

3 RESULTS

Initially, the factor mean scores for the semantic differential and buying intention, for both wood and carbon, were computed, as well as for environmental attitudes. Then, the statistical prerequisites were studied. Although normality was not met when using Shapiro-Wilk test (which is likely to depart from the approximation of the normal distribution, especially for fairly large data sets), the additional test statistics, such as skewness and kurtosis (i.e., skewness and kurtosis were satisfactory and between -1.96 and +1.96 (Field, 2013)), box and QQ plots, indicated a relatively reasonable distributional assumption of normality, except for buying intention.

3.1 RQ1: Correlational Findings for Different Bike Frame Materials: Wood vs. Carbon

Based on the results of the investigation of the statistical prerequisites, we applied Spearman's nonparametric rank-order correlation coefficient to obtain the correlational findings, as shown in Table 1. Because of multiple testing, we applied the Bonferroni-Holm corrected α level (Holm, 1979) on the obtained p values using an online calculator for α adjustment (Hemmerich, 2016) to control the familywise error rate. Ultimately, we identified a reasonable negative correlation between the ratings of the semantic differential

for wood and the buying intention of wood, as well as between the semantic differential for carbon fibre and the buying intention of carbon fibre. Furthermore, we uncovered a negative correlation between environmental attitudes and the buying intention of a wooden E-Cargo bike. It is worth noting that the ratings on the semantic differential scale range from 1 (negative) to 5 (positive), and for buying intention, from 1 (yes) to 7 (no). Hence, a negative correlation indicates a positive association. Additionally, we observed a positive association between environmental attitudes and the ratings of the semantic differential of a wooden E-Cargo bike, as well as between the buying intention of a wooden E-Cargo bike and one with a carbon frame. Finally, we found a positive association between the factor score of the ratings of the semantic differential of wooden E-Cargo bikes and age.

Table 1: Bivariate correlations (nonparametric, Spearman) of the factor mean scores of the semantic differential and buying intention, both for wood and traditional cycling frame materials, respectively, as well as environmental attitudes, age, and cycling per week.

Variable[a]	1	2	3	4	5	6
1. SD W	–					
2. SD T	.13	–				
3. BI W	-.44*	-.02	–			
4. BI T	-.08	-.26*	.59*	–		
5. Env A	.22*	.03	-.20*	-.12	–	
6. Age	.18*	.14	.04	.02	-.07	–
7. Cyc	-.04	.05	-.03	-.08	.13	.06

$N = 292$ [a]Abbreviations of the mean factor scores: SD = semantic differential; BI = buying intention; T = traditional frame material; W = wood; Env A = environmental attitudes; Cyc = cycling per week;
*Significant at the Bonferroni-Holm corrected α level (Holm, 1979) on the obtained p values using an online calculator for α adjustment (Hemmerich, 2016).

3.2 RQ2: Comparison of Different Bike Frame Materials: Wood vs. Carbon

To study RQ2, we applied a dependent two-sample t-test. We found that the ratings of the semantic differential of different bike frame materials of an E-Cargo bike, such as wood vs. traditional bike frame materials (e.g., carbon), did not show a substantial difference ($t(291) = -1.11,\ p = .269$). Although it is in general not necessary to denote the means and the standard deviations in case of a non-significant result, we want to report them because of the quite similar ratings on the mean factor scores such as $M_{(Wood)} = 3.46,\ SD = 0.72$ and $M_{(Carbon)} = 3.51,\ SD = 0.57$. We identified a similar finding for the ratings of buying intention, again, showing no substantial difference between wood and carbon as frame material used for an E-Cargo bike ($t(291) = 0.69,\ p = .493; M_{(Wood)} = 6.18,\ SD = 1.17; M_{(Carbon)} = 6.13,\ SD = 1.34$).

3.3 RQ3: Investigation of Age Groups and Gender Effects

For the investigation of RQ3, we applied a repeated-measures MANOVA on the factor mean scores of the semantic differential, with the bike frame material serving as the within-subjects factor (repeated-measures: for the comparison of both materials, which were presented consecutively). Additionally, we performed an ANOVA on the mean factor score of environmental attitudes. As mentioned in section 2.2, we employed a $2 \times 2 \times 2$ between-within-subjects design for the MANOVA analysis, focusing on the three categorical variables: between factor: age groups (18-39; 40+ years) and gender (female, male); within: wood vs. carbon.

First, we observed no interaction effect for any of the combinations with the within-factor: material * gender ($F(1,287) = 3.78,\ p = .053,\ \eta^2 = .013$), material * age ($F(1,287) = 1.41,\ p = .235,\ \eta^2 = .005$), material * age * gender ($F(1,287) = 3.15,\ p = .077,\ \eta^2 = .011$). However, we revealed an interaction effect for age * gender ($F(1,287) = 5.26,\ p = .023,\ \eta^2 = .018$), with younger women stating larger values than men. This effect changes for females and males older than 40 years, with males reporting slightly larger values than females. Moreover, we observed a main effect for age group ($F(1,287) = 15.22,\ p =< .001,\ \eta^2 = .050$), with older participants reporting more positive values on the semantic differential than younger ones (due to lack of space, detailed descriptive statistics are provided via the OSF repository, cf. section 2.5). Furthermore, we found no main effect for material ($F(1,287) = 1.26,\ p = .263,\ \eta^2 = .004$) and none for gender ($F(1,287) = 2.39,\ p = .124,\ \eta^2 = .008$).

Second, we performed the ANOVA analysis on the mean factor score of environmental attitudes (as a single DV) and observed an interaction effect of age * gender ($F(1,287) = 15.04,\ p =< .001,\ \eta^2 = .050$), with younger men reporting substantially smaller values than women. This effect changes for respondents older than 40 years, with values that are almost the same for females and males (due to space constraints, detailed descriptive statistics are provided in the OSF repository, cf. section 2.5). Furthermore, we revealed a main effect for gender ($F(1,287) = 20.47,\ p =< .001,\ \eta^2 = .067$), with women denoting larger values than men. However, we identified no age group effect

$(F(1,287) = 0.6,\ p = .801,\ \eta^2 = .000)$.

4 DISCUSSION

In this questionnaire study, we aimed to investigate the perception and attitudes towards different bike frame materials of E-Cargo bikes, such as wood and carbon fibre. In doing so, we assessed a semantic differential and buying intention for both wood and carbon fibre (presented as pictures), as well as environmental attitudes and the frequency of cycling per week. Moreover, we investigated the effects of age and gender (or a possible interaction between age and gender) on the mean factor scores of both wood and carbon fibre as E-Cargo bike frame materials.

4.1 RQ1: Correlational Findings for Different Bike Frame Materials: Wood vs. Carbon

The first two negative correlations draw a consistent picture of positive associations (cf. section 3.1) within the ratings of wooden E-Cargo bikes and those with carbon frames. However, there were no associations between wood and carbon, which underlines the consistency of these results.

The further correlational findings indicate that people who report more positive ratings on a wooden E-Cargo bike also express more positive environmental attitudes. Interestingly, this positive association with environmental attitudes was not found for E-Cargo bikes with carbon frames. Hence, pro-environmental attitudes may positively influence the perception of wooden E-Cargo bikes. This finding is consistent with research indicating that solid wood is considered more natural and environmentally friendly than synthetic materials (Zhang et al., 2023). However, the same study also demonstrated that synthesised material products were perceived as less eco-friendly than less processed materials (Zhang et al., 2023). This suggests that the favourable perception of wood may not extend to applications where its natural appearance is not maintained (Zhang et al., 2023).

Additionally, we observed that participants willing to buy an E-Cargo bike are generally interested in buying it independently of the frame material, such as wood or carbon. Our findings align with broader e-bike adoption research that emphasises factors beyond specific frame materials. For instance, a study reported that high costs and infrastructure barriers often suppress actual purchase intentions for electric two-wheelers (Pyakurel et al., 2025). Therefore, consumers, while interested in novel transportation options, may nonetheless prioritise practical considerations when making purchasing decisions.

Finally, the positive association between the factor score of the ratings of the semantic differential of wooden E-Cargo bikes and age is somewhat surprising, as it was not observed for the ratings of the semantic differential of the carbon E-Cargo bikes. This discrepancy could be attributed to a higher perceived value of natural materials, such as wood, among older participants (Hencová and Kotradyová, 2023).

4.2 RQ2: Comparison of Different Bike Frame Materials: Wood vs. Carbon

Taken together, the findings of the comparison of wood and carbon ratings given by the participants indicate no preference for either wood or carbon as the frame material of an E-Cargo bike. Interestingly, the mean buying intention was rather low for both frame materials on the scale ranging from 1 (= yes) to 7 (= no; $M_{(Wood)} = 6.18, SD = 1.17; M_{(Carbon)} = 6.13, SD = 1.34$). This could also be affected by the ratings of the pictures presented in the online questionnaire of the E-Cargo bikes, which are made of wood or carbon. However, none of the participants was exposed to either of them. Hence, none of them could test those E-Cargo bikes in real-world settings, which could have substantially affected the assigned ratings. These findings are consistent with previous research indicating that consumers' evaluations can differ depending on whether products are assessed online or in person (Dzyabura et al., 2019).

4.3 RQ3: Investigation of Age Groups and Gender Effects

The investigation of RQ3 was separated into two analyses stages: First, for the semantic differential applied to rate wooden and carbon fibre bike frames, it revealed not only a relatively small interaction effect of age and gender when focusing on the effect size, but also more substantial effect for age group, revealing that older respondents (40+ years) were rating E-Cargo bikes better than younger ones (18 to 39 years). However, these findings contrast with research on the acceptance of truly novel technologies, where younger demographics often exhibit higher positive evaluations and earlier adoption (Weigl et al., 2022)

Second, regarding environmental attitudes, we identified a relatively large main effect of gender, considering the effect size, and also a fairly large one (although not very large) for the interaction effect of age and gender. Notably, it is interesting that younger

men (18 to 39 years old) assign substantially smaller values than younger women (stating the largest values). However, for respondents older than 40 years, both females and males report almost the same values for environmental attitudes. Nevertheless, it is essential to note that women are assigning slightly larger values than men. This finding aligns with general observations that women demonstrate a stronger inclination towards sustainability considerations than men. Still, it contradicts the findings that the age group plays no role in these attitudes (Weigl et al., 2022).

4.4 Limitations and Future Research

This study provides valuable insights into the influence of material choice on purchase decisions for E-Cargo bikes, but it is subject to several limitations. Its scope focused mainly on material perception, excluding traditional materials such as steel and aluminium, as well as pragmatic factors such as cost and weight. The simulated product presentation further limited ecological validity, as participants could neither interact with nor test ride the bikes. The carbon fibre model, presented only as a graphical illustration rather than a photograph, may also have biased perceptions. In addition, prior familiarity with the materials was not assessed, and relevant sociodemographic factors, such as commuting distance and family situation, or psychological aspects, such as green product scepticism, were not considered. Finally, while purchase intentions were measured, the underlying motivations were not systematically explored.

Future research should integrate real-world exposure, for example, through test rides and rely on high-fidelity visualisations to ensure accurate representation of materials. It should also include cost, weight, and traditional materials, while considering sociodemographic and psychological aspects.

5 CONCLUSIONS

This exploratory online questionnaire study investigated how different frame materials, i.e., wood versus carbon fibre, may influence perceptions, buying intention, and environmental attitudes regarding E-Cargo bikes. Although participants with stronger pro-environmental attitudes tended to rate wooden bikes more favourably, overall preferences between wood and carbon did not significantly differ. Moreover, gender and age effects emerged selectively, with women expressing greater environmental concern and a somewhat stronger interest in wooden frames. These findings suggest that while material choice alone may not drive purchasing decisions, it interacts with demographic and psychological factors.

6 HIGHLIGHTS

- No preference was found for innovative bike frame materials such as wood or carbon fibre for E-Cargo bikes.
- Participants with stronger pro-environmental attitudes rated wooden E-Cargo bikes more favourably.
- Women reported more pro-environmental attitudes than men in this context.
- Buying intention was rather low for E-Cargo bikes in general, regardless of the bike frame material.
- Testing E-Cargo bikes in real-life settings could positively affect buying intention.

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