

Taking gender ideologies seriously in climate change mitigation: a case study of Taiwan

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Abstract

Purpose – The purpose of this study was to examine the relationships between gender ideologies and the motivation to mitigate climate change among a sample ($N = 663$) representative of the Taiwanese population, taking into account the different aspects of gender ideology measures and the multidimensionality of gender ideologies.

Design/methodology/approach – A landline-based telephone survey in Taiwan was used to collect research data. Pearson correlations were used to determine the associations between gender ideologies and motivation to mitigate climate change, and multiple regression analysis was performed to determine whether gender ideology measures were predictors for motivation to mitigate climate change.

Findings – The results suggested that the relationships between gender ideologies and mitigation motivation are complex, and that both traditional and egalitarian views of gender ideologies, measured using different scales, are positively associated with motivation. The dynamics of relationships among subgroups divided by gender and marital status need to be considered, as the relationships between gender ideologies and motivation are salient for unmarried individuals as well as married females.

Research limitations/implications – The findings support the premise that gender ideologies play an essential and complex role in individual climate change mitigation behaviors.

Originality/value – This is the first study that systematically examined the relationships between gender ideologies and motivation to mitigate climate change.

Keywords Climate change mitigation, Gender ideologies, Taiwan, Motivation

Paper type Research paper

1. Introduction

Because individual behavior accounts for a large percentage of greenhouse gas emissions, motivating people to mitigate climate change is vital (Obradovich and Guenther, 2016). Among studies on contributory factors to such individual motivation or related proenvironmental behaviors (Gifford, 2011; Lavallee *et al.*, 2019; Petrovic *et al.*, 2014), some have focused on gender effects (Scannell and Gifford, 2013; Semenza *et al.*, 2008), such as the differences in engagement in proenvironmental behaviors between men and women (Sakellari and Skanavis, 2013; Vicente-Molina *et al.*, 2018) and gendered proenvironmental behaviors (Swim *et al.*, 2020).

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However, the relationship between gender ideologies, which critically shapes individual behaviors (Chatillon *et al.*, 2018; Knight and Brinton, 2017), and individual motivation to mitigate climate change is poorly understood (Hung and Bayrak, 2019).

Gender ideologies denote “sets of widely taken-for-granted cultural beliefs about the essential natures and relative worth of men and women” (Chatillon *et al.*, 2018: 217). Specifically, social scientists, including sociologists, psychologists and family researchers, assess gender ideologies through questions related to gendered household division of labor, workplace arrangements and separate public–private spheres, as well as working mothers’ family roles and women’s self-identification as wives, mothers and workers (Davis and Greenstein, 2009; Fuwa, 2004). Understanding gender ideologies are important because gender ideologies influence topics like household division of labor (Bartley *et al.*, 2005; Hu and Kamo, 2007), child care (Evertsson, 2014) and marital stability (Davis and Greenstein, 2004). Worldwide, large, cross-national surveys have reported that the conventional male breadwinner–female homemaker model and ideas about male primacy gradually fell out of favor after Second World War because of social changes such as increases in female labor participation and female educational attainment (Cunningham, 2008; Knight and Brinton, 2017; Lee, 2017). In the past, gender ideologies have been widely regarded as a linear continuum from traditionalism to liberal egalitarianism, and the loosening of traditionalism related to gender ideologies suggest that attitudes are moving toward liberal egalitarianism (Davis and Greenstein, 2009; Fan and Qian, 2021; Pepin and Cotter, 2018). By contrast, Chatillon *et al.* (2018) argued that gender ideologies should be conceptualized as multidimensional. Knight and Brinton (2017) found that gender ideologies in 17 European countries can be classified into four categories, namely, traditionalism, liberal egalitarianism, egalitarian familism and flexible egalitarianism. In a similar study (Grunow *et al.*, 2018), gender ideologies in eight European countries were categorized into five categories: egalitarianism, egalitarian essentialism, intensive parenting, moderate traditionalism and traditionalism.

The multidimensionality of gender ideologies, which is also makes individual gender ideologies complex to understand, is further complicated by social and demographic dynamics (Vespa, 2009). Individual gender ideologies are influenced by age, cohort, gender, parents, race or ethnicity, educational attainment, labor force participation, geographical context, religion and marital status (Davis and Greenstein, 2009). Overall, women support gender egalitarianism more than men (Cunningham *et al.*, 2005). Major life events such as marriage can change individual gender ideologies (Fan and Marini, 2000). A German study reported that marriages increases the likelihood of traditional gender ideologies (Moors, 2003), and a US study reported that marriage makes young women’s gender ideologies less egalitarian but also makes those of men in their early 20 s more egalitarian (Fan and Marini, 2000). Vespa (2009) indicated that entering marriage is associated with less and more egalitarian beliefs for affluent black men and affluent black women, respectively. In summary, the intersection of various sociodemographic profiles, including gender and marital status, shape changes in individual gender ideologies throughout the course of life.

One of the research topics that gender ideology researchers have not paid much attention to is the relationships between gender ideologies and climate change-related motivation or behavior. Individuals’ gender ideologies are related to their motivation to mitigate climate change for two reasons. First, scholars argue that the development of environmentalism is in line with traditional female gender ideologies of care and nurture, meaning that proenvironmental behaviors are regarded as feminine (Liu *et al.*, 2019; Zelezny *et al.*, 2000), particularly in private spheres such as the home (Briscoe *et al.*, 2019; Kennedy and Dzialo, 2015). Individuals with more traditional gender ideologies are thus more likely to have higher motivation to engage in climate change mitigation or other proenvironmental

behaviors. However, some proenvironmental behaviors, such as structural changes for maximizing energy efficiency within households, could be considered to be masculine (Swim *et al.*, 2020), and two studies have observed no gender differences in engagement in proenvironmental behaviors in public spheres, which are traditionally considered as male territories (Briscoe *et al.*, 2019; Hunter *et al.*, 2004). Second, climate change mitigation behaviors and associated proenvironmental behaviors within households, such as environmentally sustainable diets (Macdiarmid, 2013), low-carbon travel modes (Salonen *et al.*, 2014) and controlled energy consumption (Brandon and Lewis, 1999), are related to household decision-making (Grønhoj and Thøgersen, 2012; Johnstone and Hooper, 2016), which is closely associated with interactions of gender ideologies among household members (Bartley *et al.*, 2005; Hochschild and Machung, 2012; Davis, 1976; Qualls, 1987; Permana *et al.*, 2015; Hung, 2017). For example, men with egalitarian gender ideologies perform more housework than those with traditional gender ideologies (Cunningham *et al.*, 2005; Greenstein, 1996). In other words, individuals' gender ideologies are likely to influence household climate change mitigation behaviors via the negotiation of household members on household tasks.

Based on the discussion in the previous paragraph, individual gender ideologies and motivation to mitigate climate change are theoretically connected; however, few studies have examined this linkage. To the best of our knowledge, the study by Hung and Bayrak (2019) is the only one to explore this relationship. In their study of Taiwanese married couples, neither the husbands' nor the wives' gender ideologies affected their motivations, and the husbands' gender ideologies did not influence the wives' motivations. However, the wives' gender ideologies positively and significantly affected their husbands' motivations. Although informative, the study used only one question to represent gender ideologies and thus failed to explore the diversity of gender ideology measures (Chatillon *et al.*, 2018). In addition, the dyadic research design differed from those of most other related studies, which were individualistic.

The goal of the present study was to investigate the relationships between individual gender ideologies and motivation to mitigate climate change. Specifically, independent associations of questions from six categories of gender ideology measures (Davis and Greenstein, 2009) and motivation were assessed. A summative index of gender ideologies, representing the traditional–egalitarian continuum, was not used to highlight the multidimensionality of gender ideologies (Chatillon *et al.*, 2018; Tu *et al.*, 2006). In addition, four sets of samples were used to explore how the relationships between gender ideologies and motivation vary by gender and marriage status, because gender ideologies intersect with gender and marital status dynamics (Cunningham *et al.*, 2005; Davis and Greenstein, 2009; Fan and Marini, 2000). These sets comprised the full sample, two subsamples categorized according to gender, two subsamples categorized according to marital status and four subsamples categorized according to gender and marital status. Furthermore, because stronger traditional and egalitarian gender ideologies could both be associated with higher motivation to mitigate climate change (through private and public sphere mitigation behaviors, respectively), an inductive, exploratory approach was used to investigate the relationships between the two concepts, thus providing a fundamental reference for future theoretical development on this topic.

2. Methods

2.1 Research design and research context

This study was examined in Taiwan. In the past several decades, Taiwan has seen increases in both female labor force participation and female educational attainment, and the society is

moving away from traditional gender ideologies (Ho *et al.*, 2010). Compared with other East Asian countries, Taiwanese people have more egalitarian gender ideologies (Lee, 2017), but Taiwanese women still experience imbalances between family duties and work (Takeuchi and Tsutsui, 2016). Hofstede (1984) defined Taiwan as a low-to-medium masculine society, and an updated data published in 2015 still found that Taiwan is a low-to-medium masculine society (Hofstede, 2015). Taiwan falls somewhat in the middle in terms of being a masculine or feminine society, indicating shifts in attitudes toward gender ideologies despite the fact that Confucian values, which have defined Taiwanese culture, support traditional gender divisions (Wu, 2006; Yu and Miller, 2003). In addition, the Taiwanese public is increasingly aware of climate change (Hung and Bayrak, 2020), and climate change-related information has been effectively transmitted through the education system (Yu *et al.*, 2020). Therefore, in the present study, most respondents were assumed to have some level of awareness and knowledge of climate change.

This study was part of a telephone survey research project on Taiwanese people's perception of and motivation to support climate change policies. Using the computer-assisted telephone interviewing system, potential participants were reached by randomly selected telephone numbers based on the system. This nationwide landline-based survey was conducted between 4 June and 8 June, 2020. Taiwanese citizens aged at least 20 years were qualified to participate. Sampling was stratified by region (i.e. northern, central, southern and eastern/outlying islands). Figure 1 shows the map of Taiwan and the four sub-regions for the survey project. This study was approved by the Institutional Review Board of the Research Ethics Committee of National Taiwan Normal University (No.: 201810HS018). Participants provided verbal consent before the start of the survey, which was performed by a trained interviewer at the Global Views Survey Research Center.

2.2 Measures

Table 1 summarizes the measures and survey questions. Motivation to mitigate climate change, the dependent variable, was assessed through a question, revised from Brody *et al.* (2012), on whether participants planned to take steps to reduce their contribution to climate change. Although the study of Brody *et al.* (2012) was conducted in the USA, this variable has been examined previously in Taiwan (Hung and Bayrak, 2019). The independent variables used in this study included six measures of gender ideologies. Gender ideologies were evaluated through levels of agreement with six statements, one from each of the six categories (Davis and Greenstein, 2009). These statements have yielded valid and reliable results in large, crossnational population-based surveys, including the International Social Survey Program, General Social Survey, Intergenerational Panel Study of Parents and Children and the National Longitudinal Survey of Youth 1979 Cohort (Davis and Greenstein, 2009). Four of the six measures, abbreviated in Table 1 as male breadwinner, working mother-child relationship, independent women and wives help husbands' careers, have been used in large-scale survey project in Taiwan, namely, Taiwan Social Change Survey (TSCS) and Panel Study of Family Dynamics (PSFD). For questions in the remaining two categories – belief in gendered separate spheres and household utility – no measures in these two categories have been used in TSCS, PSFD or other large-scale survey projects in Taiwan. As a result, we randomly chose one of the questions listed in Davis and Greenstein (2009) to represent its categories.

Climate change perception, an important predictor of motivation for mitigating climate change (Brody *et al.*, 2012; Hung and Bayrak, 2019; Semenza *et al.*, 2008); gendered perception of climate change mitigation behaviors, which could demonstrate gender differences in the motivation to engage in climate change mitigation behaviors



Figure 1.
Map of Taiwan and
the four regions for
survey project (own
source)

(Swim *et al.*, 2020); and sociodemographic variables were used as control variables. Climate change perception was a summative index ($\alpha = 0.79$) of four five-point statements revised from the Global Warming's Six Americas Short Survey (Chryst *et al.*, 2018). Gendered perception of climate change mitigation behaviors was measured using two self-developed five-point statements. Because the two variables had a low reliability ($\alpha = 0.26$), they were analyzed separately. The sociodemographic variables comprised age, gender (0 = male, 1 = female), educational attainment, marital status (0 = currently unmarried; 1 = currently married) and having children aged under 18 years (0 = no; 1 = yes).

2.3 Analytical methods

First, Pearson correlations were used to determine the associations between gender ideologies and motivation to mitigate climate change. Second, after relevant variables were

Variables/ survey questions	Measurement scale
<ul style="list-style-type: none"> • <i>Motivation to mitigate climate change (dependent variable)</i> I plan to take steps to reduce my contribution to climate change 	1–5 1 = strongly disagree to 5 = strongly agree
<ul style="list-style-type: none"> • <i>Gender ideologies (independent variables)</i> A man's job is to earn money; a woman's job is to look after the home and the family. (male breadwinner) There is some work that is men's and some that is women's, and they should not be doing each other's. (gendered jobs) A working mother can establish just as warm and secure a relationship with her children as a mother who does not work. (working mothers/children relationship) Having a job is the best way for a woman to be an independent person. (independent women) Men should share the work around the house with women, such as doing dishes, cleaning, and so forth. (men share household works) It is more important for a wife to help her husband's career than to have one herself. (wives help husbands' careers) 	1–7 1 = strongly disagree to 7 = strongly agree
<ul style="list-style-type: none"> • <i>Climate change perception (control variables)</i> How worried are you about the impact of climate change? 	1–5 1 = not at all worry to 5 = extremely worry
How much do you think that climate change will harm future generations of people?	1 = not at all to 5 = extremely serious harm
How much do you think climate change will harm you personally?	1 = not at all to 5 = extremely serious harm
How important is the issue of climate change to you personally?	1 = not at all to 5 = very important
<ul style="list-style-type: none"> • <i>Gendered perception of mitigation behaviors (control variables)</i> More females than males engage in energy-saving behaviors When a male is engaged in energy-saving behaviors, he could be easily mocked that he is not like a man 	1–5 1 = strongly disagree to 5 = strongly agree
<p>Notes: Phrases within parentheses in gender ideologies are abbreviations of the statements; in addition to climate change perception and gendered perception of mitigation behaviors, control variables also included sociodemographic variables (gender, age, educational attainment, marital status and having children)</p>	

Table 1. Measures and survey questions

controlled for, multiple regression analysis was performed to determine whether gender ideology measures were predictors for motivation to mitigate climate change. Gender was not included in the analysis of the subsamples of men and women. Marital status was not included in the analysis of the subsamples of unmarried and married participants. Gender, marital status and having children aged under 18 years were not included in the analysis of the four subsamples of unmarried and married men and women. None of the unmarried men had children aged under 18 years.

To ensure gender and marital status were taken into account, all analyses were conducted on four sets of samples: the full sample ($N = 663$), two subsamples of men and women ($n = 325$ and 338 , respectively), two subsamples of unmarried and married individuals ($n = 236$ and 427 , respectively) and four subsamples of unmarried men, married

men, unmarried women and married women ($n = 130, 194, 105$ and 223 , respectively). All analyses were performed using SPSS for Windows, version 23.

2.4 Sample statistics

A total of 703 interviews were completed. For data cleaning, the steps of previous literatures were referenced (Maibach *et al.*, 2011; Scannell and Gifford, 2013). Participants who had missing data for three or more responses to the 13 main concept questions (i.e. those concerning motivation to mitigate climate change, gender ideologies, climate change perception and gendered perception of mitigation behaviors) were excluded from analysis, as were those with missing data for any of the sociodemographic variables. Data for 663 participants were retained. Missing data for the 13 main concept questions were replaced by the means. By using the Rake Weights option in SPSS, the data set was weighted to represent the Taiwanese population (aged 20 years or older) in terms of age, gender and regional distribution.

The weighted data set had slightly more women than men ($n = 338$ and 325 ; 51% and 49%, respectively). The mean age category of the participants was 45–49 years old, with the 40–44 ($n = 68$; 10.3%) and 85–89 years old groups having the most and the least participants ($n = 8$; 1.3%), respectively. Almost half ($n = 303$; 45.7%) and only 5% of the participants lived in northern Taiwan and eastern Taiwan/outlying islands ($n = 36$, 5.4%), respectively. Moreover, 41.6% of participants ($n = 276$) had at least a bachelor's degree, and approximately 7% ($n = 45$; 6.7%) had only graduated from elementary school. Married participants comprised 64.5% ($n = 427$) of the participants, and 24.4% ($n = 162$) had children aged under 18 years.

3. Results

3.1 Descriptive statistics

Table 2 presents the descriptive statistics. Overall, very high motivation to mitigate climate change was observed. Mean scores for the six gender ideology measures indicated that on average, participants supported gender egalitarianism. Participants strongly supported men's participation in housework, as well as the ideas that women having a job is the ultimate symbol of independence and that working mothers can maintain quality relationships with their children. However, slightly more participants agreed with gendered jobs, the male breadwinner–female homemaker model and the priority of husbands' careers over their wives'. A high level of climate change perception was noted; participants expressed diverse views on whether energy-saving behaviors are feminine, but they tended to disagree that men could be mocked if they engaged in such behaviors.

Gender differences were identified for most of the statements. Compared with men, women had higher mitigation motivation and held more egalitarian views on four out of the gender ideology statements: the male breadwinner–female homemaker model; working mothers' relationships with their children; independent women; and men's participation in housework. More women than men were concerned about climate change and believed that more women engage in energy-saving behaviors. No gender differences were observed for gendered jobs, the prioritization of husbands' careers over their wives' and the mocking of men for performing energy-saving behaviors.

Marital status mattered for some of the statements. Compared with their unmarried counterparts, married participants supported more traditional gender ideologies such as the male breadwinner–female homemaker model and the belief that wives should support their husbands' careers instead of developing their own. Married participants also expressed

Construct/questions	Full sample	Gender		Marital status			Gender × Marital Status		
		Males	Females	Unmarried	Married	Unmarried females	Married females		
Motivation to mitigate climate change	4.22(0.89)	4.12(0.97)	4.32(0.78)**	4.21(0.84)	4.23(0.91)	4.11(0.93)#	4.13(1)#	4.32(0.69)#	4.32(0.82)#
Male breadwinner [@]	2.44(1.72)	2.63(1.79)	2.25(1.63)**	2.14(1.54)	2.61(1.79)**	2.22(1.61)\$	2.91(1.85)#	2.03(1.44)\$	2.35(1.7)\$
Working mothers/children relationships	5.64(1.39)	5.47(1.46)	5.79(1.3)**	5.7(1.35)	5.6(1.41)	5.59(1.4)#	5.39(1.5)\$	5.83(1.28)#	5.78(1.31)#
Independent women	5.71(1.46)	5.51(1.51)	5.90(1.38)**	5.74(1.4)	5.69(1.49)	5.56(1.44)#	5.47(1.56)\$	5.97(1.34)#	5.87(1.41)#
Gendered jobs [@]	2.19(1.39)	2.29(1.49)	2.08(1.28)	2.04(1.33)	2.26(1.42)	2.06(1.37)\$	2.45(1.55)#	2.02(1.3)\$	2.11(1.28)\$
Men participate in household works [@]	6.29(1.06)	6.18(1.1)	6.39(1.02)*	6.39(0.87)	6.24(1.15)	6.31(0.85)#	6.1(1.23)\$	6.48(0.89)#	6.35(1.07)#
Wives help husbands' careers [@]	3.28(1.87)	3.31(1.84)	3.26(1.89)	2.67(1.64)	3.62(1.9)**	2.80(1.59)\$	3.65(1.92)#	2.51(1.69)\$	3.59(1.89)#
Climate change perception	15.3(3.3)	14.7(3.46)	15.86(3.06)**	15.27(3.29)	15.31(3.33)	14.67(3.41)\$	14.73(3.5)\$	16.01(2.97)#	15.8(3.1)#
Feminine mitigation behaviors [@]	2.7(1.35)	2.31(1.16)	3.07(1.41)**	2.49(1.25)	2.82(1.39)**	2.18(1)\$	2.4(1.25)\$	2.87(1.41)#	3.17(1.4)#
Males being mocked	1.41(0.73)	1.4(0.68)	1.43(0.78)	1.37(0.71)	1.44(0.75)	1.32(0.6)	1.45(0.73)	1.44(0.82)	1.42(0.76)

Notes: Numbers are reported with means (standard deviations). Mean differences in gender and marital status were evaluated using *t* tests, and * indicate statistically significant differences at $p < 0.05$ and $p < 0.01$, respectively. One-way analysis of variance or Kruskal–Wallis tests were performed to evaluate mean differences in the groups categorized by gender and marital status, # and \$ indicate numbers belonging to the same subgroups in *post-hoc* comparisons using the Gabriel method. @ represents mean score differences tested using Kruskal–Wallis tests

Table 2.
Descriptive statistics

stronger beliefs than unmarried participants that women engage in more energy-saving behaviors than men.

Considering the effects of gender and marital status simultaneously, married men and women had the most traditional and most egalitarian gender ideologies, respectively. Climate change perception and the perception that energy-saving behaviors are feminine demonstrated gendered differences and were not associated with marital status. No significant differences were observed for men being mocked for energy-saving behaviors. Finally, although significant differences were noted for motivation to mitigate climate change, *post-hoc* analysis using the Gabriel method indicated no differences in mean scores between the four subsamples.

3.2 Correlations between gender ideologies and motivation to mitigate climate change

Table 3 presents the Pearson correlation analysis results. In the full sample, four out of the six gender ideology measures were significantly but weakly correlated with motivation. Among them, the male breadwinner–female homemaker model was negatively correlated with motivation, whereas the working mothers’ relationships with children, independent women and men’s participation in housework measures were positively correlated with motivation. No significant correlations were detected for gendered jobs or wives’ support of their husbands’ careers with motivation.

Among men, only men’s participation in housework was significantly (weakly positively) correlated with motivation. Among women, three measures were significantly correlated with motivation. Both working mothers’ relationships with children and independent women were weakly positively correlated with motivation, and gendered jobs was weakly negatively correlated with motivation.

For unmarried participants, the male breadwinner–female homemaker model and working mothers’ relationships with children were significantly correlated with motivation (weakly negatively and weakly positively, respectively). Among the married participants, independent women was significantly weakly and negatively correlated with motivation.

Among unmarried men, working mothers’ relationships with children was significantly weakly and positively correlated with motivation. Among married men, men’s participation in housework was significantly weakly and negatively correlated with motivation. Significant weak and negative correlations between the male breadwinner–female homemaker model and motivation were observed among unmarried women. Finally, among married women, independent women was significantly weakly and positively correlated with motivation.

In the full sample and the married individuals, the perception of energy-saving behaviors as feminine was weakly positively correlated with motivation, and the belief that men could be mocked for performing energy-saving behaviors was weakly negatively correlated with motivation. Moreover, climate change perception was weakly positively correlated with motivation across all four sets of samples.

3.3 Multiple regression analysis for predicting motivation to mitigate climate change

Table 4 presents the results of nine multiple regression analyses performed to determine the effects of gender ideologies on motivation, net of relevant control variables. The average tolerance values for these nine models were between 0.72 and 0.85, and the average variance inflation factors were between 1.18 and 1.46, indicating limited multicollinearity problems.

Predictors	Full sample	Gender		Marital status		Gender × marital status			
		Male	Female	Unmarried	Married	Unmarried male	Married males	Unmarried females	Married females
Male breadwinner	-0.085*	-0.102	-0.037	-0.136*	-0.068	-0.094	-0.111	-0.197*	0.014
Working mothers/children relationships	0.113**	0.088	0.120*	0.223**	0.061	0.240**	0.001	0.172	0.100
Independent women	0.109**	0.039	0.170**	0.115	0.107*	0.102	0.003	0.095	0.197**
Gendered jobs	-0.030	0.050	-0.123*	-0.057	-0.020	-0.016	0.085	-0.126	-0.122
Men participate in household works	0.081*	0.123*	0.005	0.072	0.087	0.061	0.152*	0.063	-0.013
Wives help husbands' careers	0.007	0.039	-0.025	0.065	-0.023	0.134	-0.011	-0.011	-0.033
Feminized mitigation behaviors	0.118**	0.095	0.090	0.095	0.127**	0.096	0.095	0.034	0.111
Men being mocked	-0.082*	-0.089	-0.084	-0.034	-0.106*	-0.027	-0.122	-0.072	-0.090
Climate change perception	0.328**	0.307**	0.327**	0.366**	0.309**	0.353**	0.279**	0.349**	0.319**

Notes: * $p < 0.05$; ** $p < 0.01$. Numbers for motivation to mitigate climate change are reported as r values

Table 3. Pearson correlation analysis results (dependent variable: Motivation to mitigate climate change)

The regression model was significant for the full sample ($R^2 = 0.14$, $F[14,648] = 7.55$, $p < 0.01$). None of the gender ideology measures were significant predictors of motivation. The significant predictors were climate change perception, the perception that energy-saving behaviors are feminine and age ($\beta = 0.31$, 0.09 and 0.14). The regression model was significant for the subsample of men ($R^2 = 0.154$, $F[13,311] = 4.363$, $p < 0.01$). The male breadwinner–female homemaker measure was the only significant predictor of motivation among the gender ideology measures ($\beta = -0.14$). The other significant predictors were climate change perception and age ($\beta = 0.3$ and 0.18 , respectively). The regression model was significant for the subsample of women ($R^2 = 0.163$, $F[13,324] = 4.869$, $p < .01$). Independent women was the only significant predictor of motivation among the gender ideology measures ($\beta = -0.14$). The other significant predictor was climate change perception ($\beta = 0.3$). The regression model for the subsample of unmarried individuals was significant ($R^2 = 0.246$, $F[13, 222] = 5.565$, $p < 0.01$). Three of the gender ideology measures were significant predictors, namely, the male breadwinner–female homemaker model, working mothers’ relationships with their children and wives helping their husbands’ careers ($\beta = -0.24$, 0.24 and 0.2 , respectively). The other significant predictors were climate change perception ($\beta = 0.36$) and age ($\beta = 0.16$). The regression model was significant for the subsample of married participants ($R^2 = 0.126$, $F[13, 413] = 4.582$, $p < 0.01$). The significant predictors in this model were climate change perception, the perception of energy-saving behaviors as feminine and age ($\beta = 0.29$, 0.1 and 0.14 , respectively).

The regression model was significant for the subsample of unmarried men ($R^2 = 0.274$, $F[11, 118] = 4.069$, $p < 0.01$). Three out of the six gender ideology measures were significant predictors: the male breadwinner–female homemaker model, working mothers’ relationships with their children and wives helping their husbands’ careers ($\beta = -0.21$, 0.32 and 0.21 , respectively). The other significant predictor was climate change perception ($\beta = 0.39$). The regression model was significant for the subsample of married men ($R^2 = 0.136$, $F[11, 182] = 2.601$, $p < 0.01$). The only significant predictor of motivation was climate change perception ($\beta = 0.25$). The regression model was significant for the subsample of unmarried women ($R^2 = 0.221$, $F[11, 93] = 2.404$, $p = 0.011$). The male breadwinner–female homemaker model was the only significant predictor among the gender ideology measures ($\beta = -0.3$). The other significant predictor was climate change perception ($\beta = 0.36$). The regression model was significant for the subsample of married women ($R^2 = 0.18$, $F[11, 221] = 4.401$, $p < 0.01$). Among the gender ideology measures, the male breadwinner–female homemaker model and independent women were significant predictors ($\beta = 0.16$ for both). The other significant predictor was climate change perception ($\beta = 0.3$).

4. Discussion

The results suggest that the linkages between individual gender ideologies and motivation to mitigate climate change are complex. Net of relevant control variables, the relationships between gender ideologies and motivation in the general population may not be as important as expected, but gender ideologies do have effects on motivation when gender and marital status are considered. In addition, these effects cannot be simplified into those of traditional or egalitarian gender ideologies.

The regression analysis of the full sample demonstrated that, net of relevant control variables, none of the gender ideology measures were significant predictors of motivation. However, the other results suggest that these relationships are mediated by other variables. For example, in the correlation analysis (Table 3), four out of the six gender ideology measures were significantly correlated with motivation, and, when only those six measures were considered as predictors of motivation (data not shown), the regression model was

Predictors	Gender		Marital status		Gender × marital status				
	Full sample	Male	Female	Unmarried	Married	Unmarried male	Married males	Unmarried females	Married females
Male breadwinner	-0.058	-0.138*	0.057	-0.235**	-0.002	-0.210*	-0.113	-0.300*	0.157*
Working mother-child relationship	0.067	0.073	0.055	0.232**	-0.002	0.318**	-0.037	0.102	0.043
Independent women	0.046	-0.032	0.138**	0.049	0.057	0.000	-0.021	0.063	0.163*
Gendered jobs	0.009	0.084	-0.094	-0.007	0.023	0.015	0.124	-0.061	-0.104
Men participate in household works	-0.010	0.071	-0.079	-0.080	0.015	-0.080	0.117	-0.105	-0.077
Wives help husbands' careers	0.044	0.094	-0.004	0.200**	0.012	0.205*	0.043	0.196	-0.037
Climate change perception	0.305**	0.294**	0.300**	0.361**	0.288**	0.385**	0.247**	0.362**	0.295**
Feminized mitigation behaviors	0.089*	0.096	0.083	0.039	0.097*	0.100	0.104	0.012	0.077
Men being mocked	-0.042	-0.055	-0.037	-0.019	-0.064	-0.025	-0.071	-0.020	-0.048
Gender	0.020			0.006	0.043				
Age	0.139*	0.175*	0.124	0.156*	0.144*	0.120	0.125	0.168	0.105
Educational attainment	0.046	-0.024	0.132	0.091	0.042	0.050	-0.020	0.107	0.135
Marital status	-0.059	-0.135	0.006						
Having children	0.025	0.085	-0.011	-0.033	0.053				
R ²	0.14	0.154	0.163	0.246	0.126	0.274	0.136	0.221	0.18
Average VIF	1.37	1.46	1.38	1.32	1.33	1.41	1.18	1.45	1.28

Notes: * $p < 0.05$; ** $p < 0.01$. Numbers are reported as standardized β values. Blanks indicate that the particular variables were not included in the regression model

Table 4. Multiple regression analysis results (dependent variable: Motivation to mitigate climate change)

significant ($R^2 = 0.029$, $F[5, 656] = 3.216$, $p < 0.01$), with working mothers' relationships with their children and independent women predicting motivation ($\beta = 0.086$ and 0.83 , respectively). However, as seen in Table 4, this significance disappeared when relevant control variables were introduced (e.g. age, climate change perception and perception of energy-saving behaviors as feminine), suggesting that these variables mediate the relationships between gender ideology measures and motivation. According to Davis and Greenstein (2009), age intersects with other sociodemographic factors such as cohort and marriage, and it affects individual gender ideologies. In addition, mitigation behaviors and associated proenvironmental behaviors intersect with gender (Vicente-Molina *et al.*, 2018), and this intersection has social consequences (Swim *et al.*, 2020). In essence, gender ideologies are likely indirectly associated with motivation to mitigate climate change in the general population.

Gender ideologies play defined roles in affecting motivation when gender and marital status are considered. Overall, higher motivation was observed in men (mainly unmarried) against the separate sphere ideology (i.e. those opposing the male breadwinner–female homemaker model and supporting the idea of men's participation in housework). Higher motivation was noted in women, particularly married women, who agreed with the independent women statement. This result somewhat contradicts the idea that women are more likely to engage in private proenvironmental behaviors because of traditional gender ideologies (Swim *et al.*, 2020; Zelezny *et al.*, 2000). Researchers have suggested that this statement concerns' women's self-identity (Davis and Greenstein, 2009), and that its relationship with motivation to mitigate climate change could be explained by socialization and social role theory (Diekman and Eagly, 2000). These theories affirm that individual beliefs and behaviors are shaped by cultural gender norms (Zelezny *et al.*, 2000). In many cultures, as girls and women are socialized to be caring, caring for the environment and being environmental friendly is then an act of "doing gender" (Dzialo, 2017; Kennedy and Kmec, 2018; West and Zimmerman, 1987), showing who we are as women. It is through the linkage of women's self-identity that bridge the traditional female gender ideology of caregiving roles and egalitarian gender ideology of independent women together, resulting in the support of equalitarian gender ideologies to actually associate with females' higher motivation. This association was specifically salient to married women, who tend to have more care-related responsibilities, such as childcare, than unmarried women. Thus, the fulfillment of traditional female gender ideologies is associated with higher motivation. Regarding marital status, significant associations between gender ideologies and motivation were mainly observed among unmarried individuals. Some associations were noted among married women, but few, if any, were detected among married men. In the multiple regression analysis of four subsamples of unmarried and married men and women, the lowest variances explained by the model were those in the married men subsample. This suggests that other factors not considered in this study, such as environmental worldviews (Brody *et al.*, 2012) and self-efficacy (Hung and Bayrak, 2019) as well as social factors such as social norms and interpersonal relationships (Chen, 2016; Goldberg *et al.*, 2019; Hung, 2018), could be important in predicting motivation for this particular subgroup.

The dichotomous traditional–egalitarian conception of gender ideologies oversimplifies the complex relationships between individual gender ideologies and motivation to mitigate climate change. For example, support of the male breadwinner–female homemaker model was negatively correlated with motivation among unmarried men and women (i.e. more egalitarian views on this statement were associated with higher motivation; Table 4). However, for married women, agreement with the statement and motivation were positively correlated (i.e. more traditional views on this statement were associated with higher

motivation). That is, traditional and egalitarian gender ideologies, measured using different scales, were both related to higher motivation. The findings are summarized as follows. Unmarried men against the male breadwinner–female homemaker model and for the working mothers’ relationships with their children measure (i.e. those with more egalitarian views) exhibited higher motivation than those who did not, as did those who agreed with wives supporting their husbands’ careers (i.e. those with more traditional views). Both married women who supported the male breadwinner–female homemaker model (i.e. those with more traditional views) and the independent women statement (i.e. those with more egalitarian views) exhibited higher motivation than those who did not. These findings demonstrate how gender ideologies are likely to change throughout the life course (Davis and Greenstein, 2009) and should be regarded as multidimensional (Chatillon *et al.*, 2018; Tu *et al.*, 2006). They also indicate the complex relationships between gender ideologies and motivation.

As mentioned, the control variables likely mediate the relationships of gender ideologies with motivation, and their importance in predicting motivation cannot be ignored. Climate change perception is a positive predictor of motivation, which is in agreement with the findings of previous studies (Brody *et al.*, 2012) and the theoretical expectations. The standardized beta values suggested that climate change perception had the strongest effect on motivation among all the variables considered in the multiple regressions. Some effects were detected for the perception of energy-saving behaviors as feminine, suggesting that people are affected by gendered behavioral norms (Swim *et al.*, 2020). Age was positively associated with motivation, indicating that younger people exhibited lower motivation. This finding is consistent with those of another Taiwanese study (Hsu and Yang, 2011) but different from those of studies conducted in other countries where younger people have relatively higher environmental risk perception and engagement in associated proenvironmental behaviors (Mohai and Twight, 1987; Ortega-Egea *et al.*, 2014). Because age intersects with other sociodemographic variables such as cohort, educational attainment and marital status, future studies could investigate how these complex relationships affect the unique effect of age on motivation to mitigate climate change in Taiwan.

Different gender ideologies are likely related to differences in levels of engagement in mitigation behaviors between public and private spheres (Briscoe *et al.*, 2019; Hunter *et al.*, 2004; Swim *et al.*, 2020), and the present results suggest that both traditional and egalitarian views are likely related to higher motivation. Thus, future studies could further differentiate public mitigation behaviors from private ones to gain a deeper understanding of how gender ideologies affect mitigation motivation. In addition, although motivation is an important antecedent to proenvironmental behavior, the gaps between them (Kollmuss and Agyeman, 2002) and how gender ideologies relate to actual mitigation behaviors warrant further research. Furthermore, new measures of gender ideologies that avoid gender binaries and encompass gender fluidity have been developed (Baber and Tucker, 2006); their associations with mitigation motivation and behavior are worthy of investigation. Future studies should also use several questions, instead of one measure used in this study, to represent different dimensions of gender ideologies to provide more reliable results. Finally, as some of the predictors that are likely to influence the motivation to mitigate climate change are not included in this study (Brody *et al.*, 2012), our statistical models could have endogeneity issues.

5. Conclusion and future outlook

This study systematically examined how gender ideologies affect individual motivation to mitigate climate change. The results suggest an indirect relationship between gender

ideologies and motivation in the full sample. However, relationships between gender ideologies and motivation varied across subgroups when gender and marital status were considered; notably, gender ideology was associated with motivation in both unmarried individuals and married women. The results also indicated that the relationships of gender ideologies with motivation are complex; both traditional and egalitarian gender ideologies were associated with motivation, and this nuance varied across subsamples. Therefore, climate change-related studies must consider gender more comprehensively. Furthermore, gender ideologies and motivation to mitigate climate change are complexly linked. Examining this relationship could facilitate transition to a sustainable, carbon-neutral and gender-equal world. In terms of climate change strategies and management, this study shows that communicating climate change mitigation strategies to citizens requires a more targeted and individualized approach, depending on one's life trajectories, gender, marital status and other socio-demographic factors. A one-size-fits-all communication strategy will thus not effectively reach all individuals. This study further showed that the linkages between individual gender ideologies and motivation to mitigate climate change are complex. It is thus argued that climate change awareness and communication strategies need to coevolve with society's ever shifting perceptions and ideologies.

The limitations of this research are as follows. This study did not include all predictors influencing the motivation to mitigate climate change; a gender binary approach was adopted, failing to take into account the many genders people have; no differentiation was made between public and private mitigation motivations; and this study did not adopt qualitative methods. However, the strengths of this study mainly lie in the innovative inductive approach to contribute to further theorization on the relationship between gender ideologies and climate change mitigation motivation, and the transparent methodology and operationalization of this study may allow future studies to replicate the findings of this study.

References

- Baber, K.M. and Tucker, C.J. (2006), "The social roles questionnaire: a new approach to measuring attitudes toward gender", *Sex Roles*, Vol. 54 Nos 7/8, pp. 459-467.
- Bartley, S.J., Blanton, P.W. and Gilliard, J.L. (2005), "Husbands and wives in dual-earner marriages: decision-making, gender role attitudes, division of household labor, and equity", *Marriage and Family Review*, Vol. 37 No. 4, pp. 69-94.
- Brandon, G. and Lewis, A. (1999), "Reducing household energy consumption: a qualitative and quantitative field study", *Journal of Environmental Psychology*, Vol. 19 No. 1, pp. 75-85.
- Briscoe, M.D., Givens, J.E., Hazboun, S.O. and Krannich, R.S. (2019), "At home, in public, and in between: gender differences in public, private and transportation pro-environmental behaviors in the US intermountain west", *Environmental Sociology*, Vol. 5 No. 4, pp. 374-392.
- Brody, S., Grover, H. and Vedlitz, A. (2012), "Examining the willingness of Americans to alter behaviour to mitigate climate change", *Climate Policy*, Vol. 12 No. 1, pp. 1-22.
- Chatillon, A., Charles, M. and Bradley, K. (2018), "Gender ideologies", in Risman, B.J., Froyum, C.M. and Scarborough, W.J. (Eds), *Handbook of the Sociology of Gender*, Springer International Publishing, Cham, pp. 217-226.
- Chen, M.-F. (2016), "Extending the theory of planned behavior model to explain people's energy savings and carbon reduction behavioral intentions to mitigate climate change in Taiwan—moral obligation matters", *Journal of Cleaner Production*, Vol. 112, pp. 1746-1753.

- Chryst, B., Marlon, J., van der Linden, S., Leiserowitz, A., Maibach, E. and Roser-Renouf, C. (2018), "Global warming's 'six Americas short survey': Audience segmentation of climate change views using a four question instrument", *Environmental Communication*, Vol. 12 No. 8, pp. 1-14.
- Cunningham, M. (2008), "Changing attitudes toward the male breadwinner, female homemaker family model: influences of women's employment and education over the lifecourse", *Social Forces*, Vol. 87 No. 1, pp. 299-323.
- Cunningham, M., Beutel, A.M., Barber, J.S. and Thornton, A. (2005), "Reciprocal relationships between attitudes about gender and social contexts during young adulthood", *Social Science Research*, Vol. 34 No. 4, pp. 862-892.
- Davis, H.L. (1976), "Decision making within the household", *Journal of Consumer Research*, Vol. 2 No. 4, pp. 241-260.
- Davis, S.N. and Greenstein, T.N. (2004), "Interactive effects of gender ideology and age at first marriage on women's marital disruption", *Journal of Family Issues*, Vol. 25 No. 5, pp. 658-682.
- Davis, S.N. and Greenstein, T.N. (2009), "Gender ideology: Components, predictors, and consequences", *Annual Review of Sociology*, Vol. 35 No. 1, pp. 87-105.
- Diekmann, A.B. and Eagly, A.H. (2000), "Stereotypes as dynamic constructs: women and men of the past, present, and future", *Personality and Social Psychology Bulletin*, Vol. 26 No. 10, pp. 1171-1188.
- Dzialo, L. (2017), "The feminization of environmental responsibility: a quantitative, cross-national analysis", *Environmental Sociology*, Vol. 3 No. 4, pp. 427-437.
- Evertsson, M. (2014), "Gender ideology and the sharing of housework and child care in Sweden", *Journal of Family Issues*, Vol. 35 No. 7, pp. 927-949.
- Fan, P.-L. and Marini, M.M. (2000), "Influences on Gender-Role attitudes during the transition to adulthood", *Social Science Research*, Vol. 29 No. 2, pp. 258-283.
- Fan, W. and Qian, Y. (2021), "Constellations of gender ideology, earnings arrangements, and marital satisfaction: a comparison across four east Asian societies", *Asian Population Studies*, Vol. 0 No. 0, pp. 1-17.
- Fuwa, M. (2004), "Macro-level gender inequality and the division of household labor in 22 countries", *American Sociological Review*, Vol. 69 No. 6, pp. 751-767.
- Gifford, R. (2011), "The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation", *American Psychologist*, Vol. 66 No. 4, p. 290.
- Goldberg, M.H., van der Linden, S., Maibach, E. and Leiserowitz, A. (2019), "Discussing global warming leads to greater acceptance of climate science", *Proceedings of the National Academy of Sciences*, Vol. 116 No. 30, pp. 14804-14805.
- Greenstein, T.N. (1996), "Husbands' participation in domestic labor: Interactive effects of wives' and husbands' gender ideologies", *Journal of Marriage and the Family*, Vol. 58 No. 3, p. 585.
- Grønhoj, A. and Thøgersen, J. (2012), "Action speaks louder than words: the effect of personal attitudes and family norms on adolescents' pro-environmental behaviour", *Journal of Economic Psychology*, Vol. 33 No. 1, pp. 292-302.
- Grunow, D., Begall, K. and Buchler, S. (2018), "Gender ideologies in Europe: a multidimensional framework: gender ideologies in Europe: multidimensional scheme", *Journal of Marriage and Family*, Vol. 80 No. 1, pp. 42-60.
- Ho, H.-Z., Chen, W.-W., Tran, C.N. and Ko, C.-T. (2010), "Parental involvement in Taiwanese families: Father-mother differences", *Childhood Education*, Vol. 86 No. 6, pp. 376-381.
- Hochschild, A. and Machung, A. (2012), *The Second Shift: Working Families and the Revolution at Home*, Penguin.
- Hofstede, G.H. (1984), *Culture's Consequences: International Differences in Work-Related Values*, Sage, Newbury Park, London.

- Hofstede, G. (2015), "Dimensions data matrix", Geert Hofstede, available at: <https://geerthofstede.com/research-and-vsm/dimension-data-matrix/> (accessed 30 August 2021).
- Hsu, M.-L. and Yang, Y.-J. (2011), "Risk communication of global warming: lay perceptions and actions in Taiwan", *Communication and Society*, Vol. 15, pp. 71-104.
- Hu, C.-Y. and Kamo, Y. (2007), "The division of household labor in Taiwan", *Journal of Comparative Family Studies*, Vol. 38 No. 1, pp. 105-124.
- Hung, L.-S. (2017), "Married couples' decision-making about household natural hazard preparedness: a case study of hurricane hazards in Sarasota county, Florida", *Natural Hazards*, Vol. 87 No. 2, pp. 1057-1081.
- Hung, L.-S. (2018), "Gender, intra-household dynamics, and household hurricane preparedness: an exploratory study employing a dyadic interview approach", *International Journal of Disaster Risk Science*, Vol. 9 No. 1, pp. 16-27.
- Hung, L.-S. and Bayrak, M.M. (2019), "Wives influence climate change mitigation behaviours in married-couple households: insights from Taiwan", *Environmental Research Letters*, Vol. 14 No. 12, p. 124034.
- Hung, L.-S. and Bayrak, M.M. (2020), "Comparing the effects of climate change labelling on reactions of the Taiwanese public", *Nature Communications*, Vol. 11 No. 1, p. 6052.
- Hunter, L.M., Hatch, A. and Johnson, A. (2004), "Cross-National gender variation in environmental behaviors*", *Social Science Quarterly*, Vol. 85 No. 3, pp. 677-694.
- Johnstone, M.-L. and Hooper, S. (2016), "Social influence and green consumption behaviour: a need for greater government involvement", *Journal of Marketing Management*, Vol. 32 Nos 9/10, pp. 827-855.
- Kennedy, E.H. and Dzialo, L. (2015), "Locating gender in environmental sociology: locating gender in environmental sociology", *Sociology Compass*, Vol. 9 No. 10, pp. 920-929.
- Kennedy, E.H. and Kmec, J. (2018), "Reinterpreting the gender gap in household pro-environmental behaviour", *Environmental Sociology*, Vol. 4 No. 3, pp. 299-310.
- Knight, C.R. and Brinton, M.C. (2017), "One egalitarianism or several? Two decades of Gender-Role attitude change in Europe", *American Journal of Sociology*, Vol. 122 No. 5, pp. 1485-1532.
- Kollmuss, A. and Agyeman, J. (2002), "Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?", *Environmental Education Research*, Vol. 8 No. 3, pp. 239-260.
- Lavallee, J.P., Di Giusto, B. and Yu, T.-Y. (2019), "Collective responsibility framing also leads to mitigation behavior in east Asia: a replication study in Taiwan", *Climatic Change*, Vol. 153 No. 3, pp. 423-438.
- Lee, Y.-J. (2017), "Multiple dimensions of Gender-Role attitudes: diverse patterns among four East-Asian societies", in Tsai, M.-C. and Chen, W. (Eds), *Family, Work and Wellbeing in Asia*, Springer, pp. 67-87.
- Liu, T., Geng, L., Ye, L. and Zhou, K. (2019), "Mother nature' enhances connectedness to nature and pro-environmental behavior", *Journal of Environmental Psychology*, Vol. 61, pp. 37-45.
- Macdiarmid, J.I. (2013), "Is a healthy diet an environmentally sustainable diet?", *Proceedings of the Nutrition Society*, Vol. 72 No. 1, pp. 13-20.
- Maibach, E.W., Leiserowitz, A., Roser-Renouf, C., Mertz, C.K. and Akerlof, K. (2011), *Global Warming's Six Americas Screening Tools: Survey Instruments; Instructions for Coding and Data Treatment; and Statistical Program Scripts*, Yale University and George Mason University. Yale Project on Climate Change Communication, New Haven, CT.
- Mohai, P., Twight, B.W. (1987), "Age and environmentalism: an elaboration of the Buttel model using national survey evidence", *Social Science Quarterly, University of Texas Press, in Cooperation with the Southwestern Social . . .*, Vol. 68 No. 4, pp. 798-815.

- Moors, G. (2003), "Estimating the reciprocal effect of gender role attitudes and family formation: a log-linear path model with latent variables", *European Journal of Population/Revue Européenne de Démographie*, Vol. 19 No. 2, pp. 199-221.
- Obradovich, N. and Guenther, S.M. (2016), "Collective responsibility amplifies mitigation behaviors", *Climatic Change*, Vol. 137 Nos 1/2, pp. 307-319.
- Ortega-Egea, J.M., García-de-Frutos, N. and Antolin-López, R. (2014), "Why do some people do 'more' to mitigate climate change than others? Exploring heterogeneity in Psycho-Social associations", *Plos One*, Vol. 9 No. 9, p. e106645.
- Pepin, J.R. and Cotter, D.A. (2018), "Separating spheres? Diverging trends in youth's gender attitudes about work and family", *Journal of Marriage and Family*, Vol. 80 No. 1, pp. 7-24.
- Permana, A.S., Aziz, N.A. and Siong, H.C. (2015), "Is mom energy efficient? A study of gender, household energy consumption and family decision making in Indonesia", *Energy Research and Social Science*, Vol. 6, pp. 78-86.
- Petrovic, N., Madrigano, J. and Zaval, L. (2014), "Motivating mitigation: when health matters more than climate change", *Climatic Change*, Vol. 126 Nos 1/2, pp. 245-254.
- Qualls, W.J. (1987), "Household decision behavior: the impact of husbands' and wives' sex role orientation", *Journal of Consumer Research*, Vol. 14 No. 2, pp. 264-279.
- Sakellari, M. and Skanavis, C. (2013), "Environmental behavior and gender: an emerging area of concern for environmental education research", *Applied Environmental Education and Communication*, Vol. 12 No. 2, pp. 77-87.
- Salonen, M., Broberg, A., Kytä, M. and Toivonen, T. (2014), "Do suburban residents prefer the fastest or low-carbon travel modes? Combining public participation GIS and multimodal travel time analysis for daily mobility research", *Applied Geography*, Vol. 53, pp. 438-448.
- Scannell, L. and Gifford, R. (2013), "Personally relevant climate change: the role of place attachment and local versus global message framing in engagement", *Environment and Behavior*, Vol. 45 No. 1, pp. 60-85.
- Semenza, J.C., Hall, D.E., Wilson, D.J., Bontempo, B.D., Sailor, D.J. and George, L.A. (2008), "Public perception of climate change: voluntary mitigation and barriers to behavior change", *American Journal of Preventive Medicine*, Vol. 35 No. 5, pp. 479-487.
- Swim, J.K., Gillis, A.J. and Hamaty, K.J. (2020), "Gender bending and gender conformity: the social consequences of engaging in feminine and masculine Pro-Environmental behaviors", *Sex Roles*, Vol. 82 Nos 5/6, pp. 363-385.
- Takeuchi, M. and Tsutsui, J. (2016), "Combining egalitarian working lives with traditional attitudes: Gender role attitudes in Taiwan, Japan, and Korea: gender role attitudes in Taiwan, Japan, and Korea", *International Journal of Japanese Sociology*, Vol. 25 No. 1, pp. 100-116.
- Tu, S., Liao, P. and Chang, Y. (2006), "Gender-Role attitudes in Taiwan and coastal China", *Kazoku Syakaigaku Kenkyu*, Vol. 17 No. 2, pp. 95-109.
- Vespa, J. (2009), "Gender ideology construction: a life course and intersectional approach", *Gender and Society*, Vol. 23 No. 3, pp. 363-387.
- Vicente-Molina, M.A., Fernández-Sainz, A. and Izagirre-Olaizola, J. (2018), "Does gender make a difference in pro-environmental behavior? The case of the Basque Country university students", *Journal of Cleaner Production*, Vol. 176, pp. 89-98.
- West, C. and Zimmerman, D.H. (1987), "Doing gender", *Gender and Society*, Vol. 1 No. 2, pp. 125-151.
- Wu, M.-Y. (2006), "Hofstede's cultural dimensions 30 years later: a study of Taiwan and the United States", *Intercultural Communication Studies*, Vol. 15 No. 1, pp. 33-42.
- Yu, H. and Miller, P. (2003), "The generation gap and cultural influence – a Taiwan empirical investigation", *Cross Cultural Management: An International Journal*, Vol. 10 No. 3, pp. 23-41.

Yu, T.-K., Lavalley, J.P., Di Giusto, B., Chang, I.-C. and Yu, T.-Y. (2020), "Risk perception and response toward climate change for higher education students in Taiwan", *Environmental Science and Pollution Research*, Vol. 27 No. 20, pp. 24749-24759.

Zelezny, L.C., Chua, P.-P. and Aldrich, C. (2000), "New ways of thinking about environmentalism: elaborating on gender differences in environmentalism", *Journal of Social Issues*, Vol. 56 No. 3, pp. 443-457.

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