Journal of Environmental Management 254 (2020) 109807

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: http://www.elsevier.com/locate/jenvman

Research article

Households' willingness to adopt greywater treatment technologies in a developing country – Exploring a modified theory of planned behaviour (TPB) model including personal norm

M. Oteng-Peprah [a,b,*], N. de Vries [a], M.A. Acheampong [c]

[a] Department of Health Promotion, Peter Debyeplein 1, University of Maastricht, Netherlands
[b] Water and Sanitation Unit, Department of Chemistry, University of Cape Coast, 0031617850426, Ghana
[c] School of Engineering, Kumasi Technical University Kumasi, Ghana

ARTICLE INFO

Keywords:
Households' willingness
Greywater
Personal norms
Theory of planned behaviour

ABSTRACT

This study explored willingness of households to adopt a greywater treatment and reuse system using the theory of planned behaviour in its original form and an extended model including personal norms. The study was conducted among 478 household heads in the central region of Ghana. The results indicate the original theory of planned behaviour (TPB) model explained about **54%** of the variance in respondents' intentions to adopt this system and the extended model which includes personal norms explained **59%** of the intentions. The extended model turned out to be the better model to predict willingness to adopt this household greywater and treatment system. The findings of this study shed more light on the role of personal norms in households' willingness to adopt a greywater treatment and reuse system and may inform interventions aimed at promoting such systems.

1. Introduction

Most developing countries are facing huge challenges with pollution in freshwater bodies caused by domestic greywater discharges. This has been attributed to lack of treatment of the greywater before discharge, lack of sewer networks and non-enforced or non-existent greywater discharge guidelines. It has been estimated that in some developing countries as much as 89% of domestic water demand is converted into greywater (Hernandez Leal et al., 2010; Oteng-Peprah et al., 2018b) which is further discharged into either open drains or haphazardly without treatment. However, lightly polluted greywater can be easily treated and reused. Many studies have been conducted on greywater reuse strategies and all these studies point to the fact that this practice is not only worthwhile, it is also a sustainable way of managing water pollution and its effects on the environment (Alderlieste and Langeveld, 2005; Chong, 2005; Dallas et al., 2004). However, issues of perceived health risks associated with greywater reuse remains a barrier to this practice. Greywater reuse can be best achieved if there is a central collection system for treatment (Hophmayer-Tokich, 2010); however, this collection system is non-existent in most developing countries which has hitherto aggravated the already complicated situation of greywater management.

Another approach to achieve greywater reuse and further reduce the burden on water resources is to tackle it from the households' point of view. Applicable systems such as membrane bioreactor, sequencing batch reactor, rotating biological contactors exist, however, these are mostly applied on large scale greywater reuse systems (Oteng-Peprah et al., 2018a). Household greywater treatment and reuse systems are largely non-existent in many developing countries largely be due to the poor dissemination of greywater reuse practices or lack of household treatment system. Encouraging household treatment and reuse schemes in individual households can improve the sanitation situation of participating households and further reduce contaminants that get discharged into the environment.

The key objective for wastewater reuse is to achieve the appropriate quality for its intended use and its subsequent protection of public health and the environment. This intended use can be directly tied to the end application which prescribes the type of treatment required and this can include aesthetics or user specific requirements. Therefore, water reuse technologies are mostly tailored to a specific purpose so that the

* Corresponding author. Department of Health Promotion, Peter Debyeplein 1, University of Maastricht, Netherlands.
E-mail addresses: m.oteng-peprah@maastrichtuniversity.nl (M. Oteng-Peprah), Nanne.devries@maastrichtuniversity.nl (N. de Vries), Mike.aacheampong@gmail.com (M.A. Acheampong).
URL: http://m.oteng-peprah@maastrichtuniversity.nl (M. Oteng-Peprah).

https://doi.org/10.1016/j.jenvman.2019.109807
Received 8 October 2018; Received in revised form 3 June 2019; Accepted 28 October 2019
Available online 13 November 2019
0301-4797/

treatment objectives can be appropriately set for application purpose, public health and environmental protection while being cost effective (Li et al., 2009; March et al., 2004).

Public health concerns remain one of the key barriers to implementing greywater reuse practices. Many states in the United States, however, support the general idea of greywater reuse for non-potable purposes and this has led to implementation of numerous greywater reuse projects. These projects have demonstrated that use of properly treated reclaimed water is safe for human health and the environment as it has been reported that 'to date, epidemiological analyses of adverse health effects likely to be associated with use of reclaimed water have not identified any patterns from water reuse projects in the United States'(NAS, 2012). Another report which investigated the health impact of reclaimed water on landscape irrigation conclusively states that 'there have not been any confirmed cases of infectious disease that have been documented in the United States as having been caused by contact, ingestion or inhalation of pathogenic microorganisms at any landscape irrigation site subject to reclaimed water criteria"(USEPA, 2012). The city of Windhoek in Namibia uses recycled water to augment water supplies for potable purposes and has also not reported any public health problems (Haarhoff and VanderMerwe, 1996; Menge, 2010; Onyango et al., 2014). All these points to the fact that once the necessary technology is put in place, reusing wastewater can be considered a safe and sustainable method of managing our water resources and also reduce the burden on water treatment plants. However, if household greywater treatment is to be implemented, there is the need to assess the willingness of households to practice and adopt such a treatment system.

This study adopts a social cognitive model known as the theory of planned behaviour (TPB) in identifying beliefs of heads of households that lead to adoption of a greywater treatment and reuse system. It extends the original TPB model to include personal norms. Personal norms **have** been demonstrated to be closely related with attitudes and subjective norms by Conner and Armitage (1998). Figs. 1 and 2, shows the default and extended TPB models respectively. Studies by Klockner (2013) have further revealed that personal norms not only contribute to a better explanation of intentions and behaviour, but also improves the predictability of attitudes. Various authors have further argued that especially people's environmental attitude seems to be determined by personal norms (Arvola et al., 2008; Kaiser, 2006). The TPB model has been successfully applied to analyze different pro-environmental behaviors in both its original state and extended forms (Botetzagias et al., 2015; De Leeuw et al., 2015; Fielding et al., 2008; Ford et al., 2009; Harland et al., 1999; Peters et al., 2011; Quintal et al., 2010; Tonglet et al., 2004; Wauters et al., 2010).

The inclusion of additional variables into the TPB model has been theoretically supported by many authors due to the improved explanatory power it derives after the inclusion (Botetzagias et al., 2015; Christian et al., 2007; Thogersen and Olander, 2006). However, application of this model to pro-environmental behaviour in developing countries is very limited. Considering the hazard caused by discharging of untreated greywater into the environment in some developing countries such as Ghana, Uganda, Nepal, Mali and lack of treatment

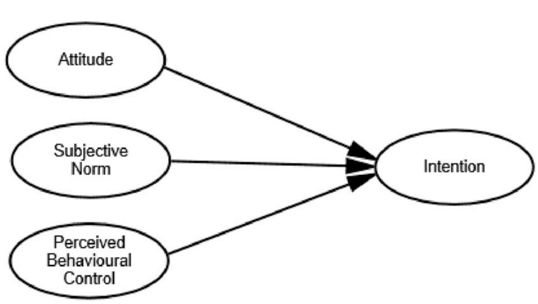

Fig. 1. Default TPB model.

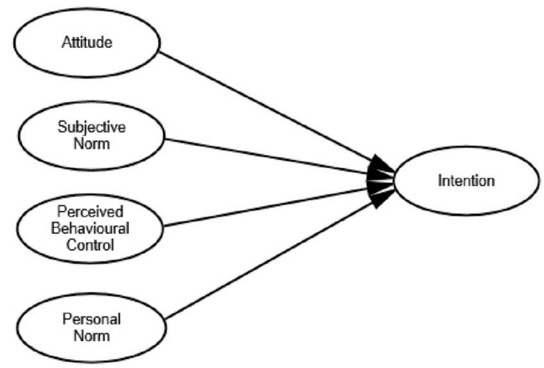

Fig. 2. Modified TPB model with personal norm.

facilities as reported by (Alderlieste and Langeveld, 2005; Katukiza et al., 2014; Oteng-Peprah et al., 2018b; Shresta, 1999) it is prudent to explore greywater treatment and reuse at the household levels. Therefore, the purpose of this study is to investigate household's willingness to adopt a greywater treatment and reuse system by first using the theory of planned behaviour in its original state and then extend this model to include personal norms. Knowledge of this will be a stepping stone on which interventions targeted at promoting greywater treatment and reuse at the household level in developing countries can be developed.

2. Analysis of the framework

2.1. The theory of planned behaviour

This theory has shown that people's behaviour in most situations can be explained and predicted by intentions, attitudes, subjective norms and behavioural control. Intention is defined by the theory as a cognitive representation of a person's readiness to perform a given behaviour, and it is considered to be the immediate antecedent of behaviour (Ajzen, 1991). Attitude according to the theory is defined as an individual's positive or negative feeling associated with performing a specific behaviour. It further states that an individual will hold a favorable attitude toward a given behaviour if he/she believes that performing the behaviour will lead to mostly positive outcomes. Therefore, attitude toward a behaviour is a positive or negative evaluation of performing that behaviour. Subjective norm is defined by the theory as the perceived social pressure to engage or not to engage in a behaviour. It is the outcome of how important referent others approve or disapprove a behaviour or intention. Finally, perceived behavioural control refers to people's perception of their ability to perform a given behaviour.

Following the definition of the three main determinants of human planned behaviour (attitude, social pressure, perceived behavioural control), the attitude of the household can be defined as the degree to which the household head expects good or bad outcomes from adopting a household greywater treatment and reuse system. The household's social pressure refers to the expectation of others to adopt or develop a greywater reuse and treatment system from important referent people. The household's perceived control focuses on beliefs about how easy or difficulty it will be to adopt or develop a greywater treatment and reuse scheme. Personal norms is defined by Schwartz and Tessler (1972) as expectations that people hold for themselves. This translates into how the household head may perceive the personal norms on the household to contribute to making a change in the environment.

2.2. Questionnaire

The questionnaire used for this study consisted of two parts; one part included items from the TPB constructs while the other part included demographics. The measurement items were developed from an elicitation study among 25 selected household heads. All the TPB constructs were measured with a 7-point Likert scale. The intention to adopt/develop greywater treatment systems was measured with 2 items, attitude measured with 3 items, subjective norms measured with 3 items, perceived behavioural control measured with 4 items and personal norms measured with 3 items. With the exception of intentions and personal norms, belief measurements had corresponding outcome evaluations.

3. Methodology

The target group was restricted to the head of the household since they are responsible for making decisions on behalf of the family. About 810 households were surveyed within the central region of Ghana using random sampling method and 521 household heads completed a self-report questionnaire representing a 64% response rate. Each respondent was introduced to the concept of greywater treatment and the treatment systems. This was done by defining greywater, and pointing to their sources, average per capita generation rates, physical and chemical characteristics and their mode of discharge into the environment. Since greywater is generated by each household, respondent easily identified with these descriptions. The researcher recruited research assistants who received training on how to assist individuals who may not be able to complete the questionnaire. The research cancelled questionnaires which had any items vacant and finally arrived at 478 responses which were used for the analysis. Statistical package for social scientists (SPSS) version 23 and Amos Version 23 were used for analysis. Structural equation modelling (SEM) was utilized to fit the data to the TPB model. SEM is a multivariate technique that combines aspects of regression and factor analysis to assess a series of dependent relationships simultaneously which is not possible using other multivariate techniques (Hair et al., 2014).

3.1. Descriptive analysis of variables

The model is assessed by using sample size independent fit indices such as root mean square error of approximation (RMSEA), normed fit index (NFI), Tucker-Lewis index (TLI) and comparative fit index (CFI). **The acceptable values of TLI and CFI have been pegged at 0.90 while a value of 0.95 and above indicates an excellent fit; RMSEA values between 0.06–0.08 are classified as acceptable while values less than 0.06 can be classified as excellent fit and finally, the NFI ranges between 0–1 with 1 being a perfect fit (**Cangur, 2015**).**

4. Results and discussion

4.1. Descriptive statistics

Most of the respondents were male (63.2%) and had an average age of 45(±8.2) years. This is representative of the household heads in Africa and most of the developing countries. In these countries, the eldest adult male culturally is the head of the household and he makes decisions for the household. In terms of level of education, majority of the respondents (43.10%) had acquired some level of tertiary education hence an indication of comprehension of the questionnaire items. Participants reported moderate intentions ($M = 3.78$, $SD = 1.31$), a moderate positive attitude ($M = 8.13$, $SD = 0.90$), moderate social pressure ($M = 9.19$, $SD = 10.44$), low controllability ($M = 5.74$, $SD = 3.39$) and a slightly high personal norms ($M = 4.99$, $SD = 0.93$). The correlation matrix of the latent variables presented in Table 1 indicates that almost all the variables in the models are significantly associated with intentions.

4.2. Testing the default model

The structural model representing willingness of households to adopt a greywater treatment and reuse system is presented in Fig. 3. The model was able to explain 54% of the variance of intentions of households to adopt a greywater treatment system. From the structural model, it can be seen that attitude ($\beta = \mathbf{0.58}$, $SE = 0.014$, $p = 000$), subjective norms, ($\beta = \mathbf{0.46}$, $SE = 0.021$, $p = 0.019$) and perceived behavioural control ($\beta = \mathbf{0.55}$, $SE = 0.016$, $p = 0.000$) all had moderate intentions by household heads to adopt a greywater treatment and reuse system which were all statistically significant. All items loaded above 0.60 on their assigned factors with the exception of water conservation ($\lambda = 0.53$) and were significantly associated with their specified constructs. The strongest effect on intentions is attitude ($\beta = \mathbf{0.58}$), behavioural control ($\beta = \mathbf{0.55}$) and subjective norms ($\beta = \mathbf{0.46}$). The fit indices indicate that the standard TPB model provides an excellent fit to the data for the default model ($\chi^2 = 110.82$, $df = 48$, $p < 0.000$, $NFI = 0.935$, $TLI = 0.942$, $CFI = 0.962$, $RMSEA = 0.044$).

4.3. Testing the modified model

The modified structural model with personal norms is presented in Fig. 4. This shows **an** improvement in prediction over the default model and explained **59**% of the variance in the model. In the modified model, the strongest effect on intentions is personal norms ($\beta = \mathbf{0.65}$) followed by attitude ($\beta = \mathbf{0.58}$), behavioural control ($\beta = \mathbf{0.55}$) and subjective norm ($\beta = \mathbf{0.46}$). The modified model also shows an improvement in the fit indices over the default model ($\chi^2 = 184.18$, $df = 80$, $p < 0.001$, $NFI = 0.949$, $TLI = 0.951$, $CFI = 0.970$, $RMSEA = 0.041$) which is an excellent fit for the data.

Table 1 presents the average scores on the determinants of willingness. The willingness is assumed to be based on the rational expectations of the household head, therefore data in Table 1 represent the household head's expectations on adoption of a greywater treatment and reuse system at the household level.

4.4. Effect of beliefs

Comparing the three-path coefficient of the default model (Fig. 3), results showed that the impact of beliefs from attitude thus, environmental hazard, pollution prevention and water conservation were the most important factors that affect the intentions of households to adopt a greywater reuse and treatment system. Again, comparing the four-path coefficient of the modified model (Fig. 4), it can be seen that the impact of beliefs from personal norm thus, moral obligation, feeling of guilt and better feeling had the greatest impact on household's willingness to adopt a greywater treatment and reuse system.

Table 1

	Cronbach Alpha	Mean	S.D.	1	2	3	4	5
1. Attitude[1]	0.77	8.13	0.90	1				
2. Subjective norm[1]	0.61	9.19	10.44	**0.44****	**1**			
3. Perceived behavioural control[1]	0.65	5.74	3.39	**0.24**	**0.23**	**1**		
4. Intentions[2]	0.84	3.78	1.31	**0.58****	**0.46****	**0.55****	**1**	
5. Personal Norm[2]	0.75	4.99	0.93	**0.59****	**0.50****	**0.39****	**0.65****	1

Theoretical range (−21 to 21)[1] (1–7)[2] **p < 0.01.

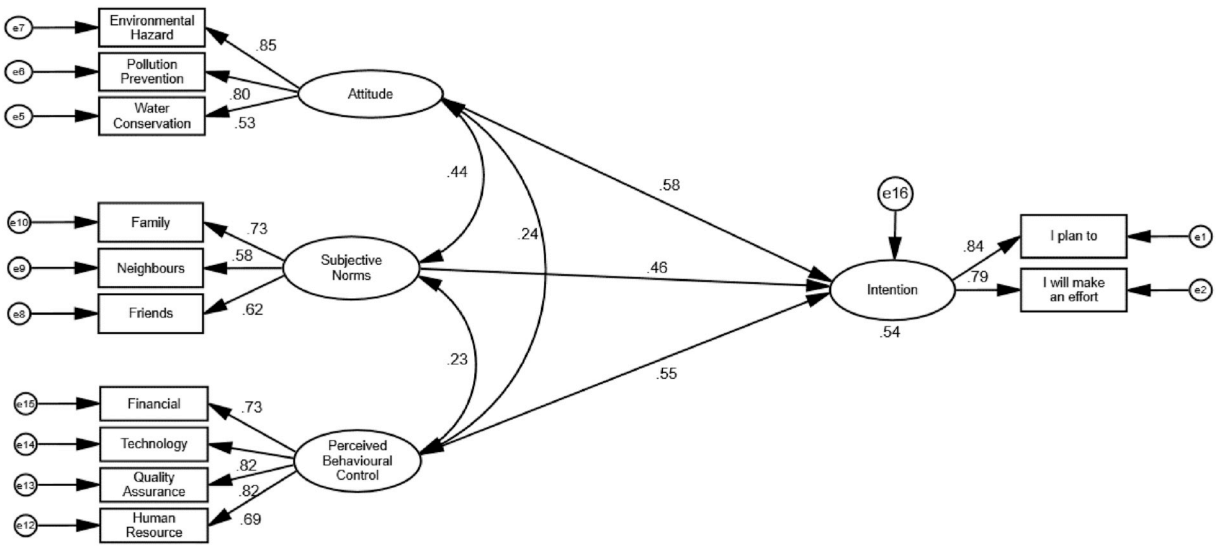

Fig. 3. Default model.

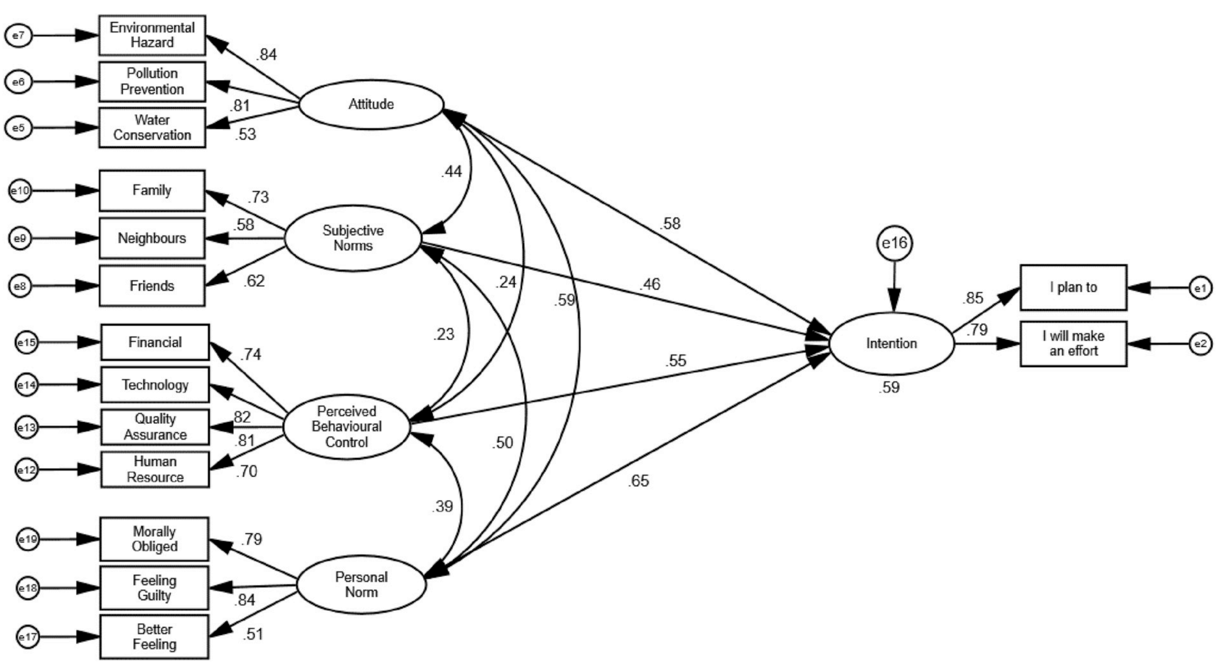

Fig. 4. Modified model.

5. Discussion

To better understand households' intentions to adopt a greywater treatment and reuse system at the household level, two models were tested. The first was the original TPB model and the second an extended TPB model with personal norms. These personal norms are not part of the original TPB model. Greywater treatment and reuse systems are not common in the study area as it is the situation in many developing countries so in this hypothetical case, household heads cannot refer to their past habits and behaviour. Danner et al. (2008) suggested that when there is no past behaviour or habits, the future behaviour is guided by intentions. The inclusion of personal norms has been reported to improve the predictive ability of the model especially for pro-environmental behaviours (Arvola et al., 2008; Kaiser, 2006; Klockner, 2013). The results of the study support the main premise of the original TPB model which says that people who have positive attitude towards the behaviour, receive the support of people who are important to them and think they are able to participate in the behaviour in question will be more likely to carry out that behaviour (Ajzen, 1991). From Fig. 3 it can be seen that attitude, subjective norm and perceived behavioural control are all positively associated with behavioural intentions. The original TPB model explained **54**% of the variance in household's willingness to adopt the greywater treatment and reuse system. When the original model was extended to include personal norm, this increased to **59**% of the variance being explained. The obtained results confirm similar research on pro-environmental behaviour where there was also an increase in the percentage variance explained when the TPB model was extended with personal norms (Harland et al., 1999). The improvement in the model can be associated with better linkage of environmental attitudes with personal norms as suggested by Arvola et al. (2008). The household head's attitude is considered to be a determining factor in adopting this system. The findings of this research further support that the households head perceived attitude has positive impact on the adoption of a treatment system as can be seen in Fig. 3. Generally, for a household to adopt this system it is perceived that it can reduce environmental hazard, prevent environmental pollution and provide economic relief in terms of bills paid for use of water. Social pressure has positive and significant impact on households' intentions to adopt this treatment and reuse system. For example, increase in pressure from family members, friends and neighbours that the adoption of this system will reduce environmental hazard, reduce pollution and provide some financial relief will lead to a positive intention towards adopting this system. All four control beliefs: financial incentives, technology, quality assurance and human resource had significant effect on intentions to adopt the treatment and reuse system. For households to adopt this system, they must be able to overcome these factors such as financial commitment into obtaining this system, understand the appropriate technology, have the relevant human resource or expertise available and be assured of the quality assurance of the treated water.

5.1. Limitations

This study used the responses of the household heads and as such it might be possible the responses from the household head may not be the general consensus from members within the household. Again, actual behaviour could not be measured because household greywater treatment and reuse systems are not commonly available in most developing countries, therefore the association between consumers' intention and actual behaviour could not be assessed. Also, most likely, most household heads do not exactly know what a greywater treatment and reuse system might look like – even with the explanation offered in this study and this might also affect the responses to the questionnaire items. The research has only been conducted in the central region of Ghana which makes generalization of the results risky though the social dynamics in the central region can be compared to what prevails in most developing countries. Finally, this is a self-reported questionnaire and hence it might not reflect the true state of the issues as expounded in this questionnaire items.

6. Conclusions

The results of this study can be applied by stakeholders and agencies that intend to promote greywater treatment and reuse at the household level in developing countries. In order to convince household heads to adopt household greywater treatment and reuse systems, specific drivers of intentions must be addressed in the campaign. Attitude, personal norms, subjective norm, and perceived behavioural control seemed to all contribute to intentions; however, attitude and personal norms seem to be the strongest determinants. From the viewpoint of attitudes, campaign messages on attitudes could focus on some environmental benefits of greywater treatment and reuse. For example, greywater treatment and reuse systems could prevent environmental hazards and pollution associated with untreated greywater releases and further contribute to conservation of water by adopting a treatment and reuse system. Including these messages in a campaign or intervention message could contribute to attitude change which could then result in actual behaviour. With respect to personal norms, household greywater treatment and reuse systems could be promoted by making it known to households that they could contribute to making a change and that adopting this system could be seen as a moral obligation. This can be done by appealing to households about the hazard associated with release of untreated greywater into the environment without treatment and how this could lead to pollution of freshwater resources and subsequently affect aquatic life and the fact that their adoption of this system can reduce or bring about a change in this environmental hazard. With respect to perceived behavioural control, the treatment system should have a certification of quality and it also should not also affect the finances of the households. In fact, a free system will be easily adopted since it provides no financial burden on households while reducing the volume of treated water that will be paid for. For social norm, household treatment and reuse schemes can be promoted when important others such as family, friends and neighbours have all embraced the concept and fully support this concept.

Declaration of competing interest

The authors declare no conflict of interest in this research.

Acknowledgement

The authors acknowledge funding from the Netherlands Government under the NUFFIC project NICHE 194-01 and support from the University of Maastricht Netherlands.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvman.2019.109807.

References

Ajzen, I., 1991. The theory of planned behaviour. Organ. Behav. Hum. Decis. Process. 50, 179–211.
Alderlieste, M.C., Langeveld, J.G., 2005. Wastewater planning in Djenne, Mali. A pilot project for the local infiltration of domestic wastewater. Water Sci. Technol. 51, 57–64.
Arvola, A., Vassallo, M., Dean, M., Lampila, P., Saba, A., Lahteenmaki, L., Shepherd, R., 2008. Predicting intentions to purchase organic food: the role of affective and moral attitudes in the Theory of Planned Behaviour. Appetite 50, 443–454.
Botetzagias, I., Dima, A.F., Malesios, C., 2015. Extending the Theory of Planned Behavior in the context of recycling: the role of moral norms and of demographic predictors. Resour. Conserv. Recycl. 95, 58–67.
Cangur, S., 2015. Comparison of model fit indices used in structural equation modelling under multivariate normality. J. Mod. Appl. Stat. Methods 14, 151–167.
Chong, B., 2005. Implementation of an Urban Pilot Scale Ecological Sanitation Wastewater Treatment System in Kuching Sarawak, Malaysia. Natural Resources and Environment Board Sarawak, Malaysia.
Christian, J., Armitage, C.J., Abrams, D., 2007. Evidence that theory of planned behaviour variables mediate the effects of socio-demographic variables on homeless people's participation in service programmes. J. Health Psychol. 12, 805–817.
Conner, M., Armitage, C.J., 1998. Extending the theory of planned behavior: a review and avenues for further research. J. Appl. Soc. Psychol. 28, 1429–1464.
Dallas, S., Sceffe, B., Ho, G., 2004. Reedbeds for greywater treatment—case study in Santa Elena-Monteverde, Costa Rica, Central America. Ecol. Eng. 23, 55–61. Elsevier.
Danner, U.N., Aarts, H., de Vries, N.K., 2008. Habit vs. intention in the prediction of future behaviour: the role of frequency, context stability and mental accessibility of past behaviour. Br. J. Soc. Psychol. 47, 245–265.
De Leeuw, A., Valois, P., Ajzen, I., Schmidt, P., 2015. Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high-school students: implications for educational interventions. J. Environ. Psychol. 42, 128–138.
Fielding, K.S., McDonald, R., Louis, W.R., 2008. Theory of planned behaviour, identity and intentions to engage in environmental activism. J. Environ. Psychol. 28, 318–326.
Ford, R.M., Williams, K.J.H., Bishop, I.D., Webb, T., 2009. A value basis for the social acceptability of clearfelling in Tasmania, Australia. Landsc. Urban Plan. 90, 196–206.
Haarhoff, J., VanderMerwe, B., 1996. Twenty-five years of wastewater reclamation in Windhoek, Namibia. Water Sci. Technol. 33, 25–35.
Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C., 2014. Multivariate Data Analysis, Eight Edition. Prentice-Hall, New Yersey.
Harland, P., Staats, H., Wilke, H.A.M., 1999. Explaining proenvironmental intention and behavior by personal norms and the theory of planned behavior. J. Appl. Soc. Psychol. 29, 2505–2528.
Hernandez Leal, L., Temmink, H., Zeeman, G., Buisman, C., 2010. Comparison of three systems for biological greywater treatment. Water 2, 155–169.
Hophmayer-Tokich, S., 2010. In: UoTatC, Institute (Ed.), Wastewater Management Strategy: Centralized V. Decentralized Technologies for Small Communities. Leewarden, The Netherlands.
Kaiser, F.G., 2006. A moral extension of the theory of planned behavior: norms and anticipated feelings of regret in conservationism. Personal. Individ. Differ. 41, 71–81.
Katukiza, A.Y., Ronteltap, M., Niwagaba, C.B., Kansiime, F., Lens, P.N.L., 2014. Grey water characterisation and pollutant loads in an urban slum. Int. J. Environ. Sci. Technol. 12, 423–436.

Klockner, C.A., 2013. A comprehensive model of the psychology of environmental behaviour-A meta-analysis. Glob. Environ. Chang. 23, 1028–1038.
Li, F., Wichmann, K., Otterpohl, R., 2009. Review of the technological approaches for grey water treatment and reuses. Sci. Total Environ. 407, 3439–3449.
March, J.G., Gual, M., Simonet, B.M., 2004. A sensitive extracto-photometric method for determination of residual chlorine in greywater. J. AOAC Int. 87, 852–855.
Menge, J., 2010. Treatment of Wastewater for Re-use in the Drinking Water System of Windhoek (City of Windhoek).
NAS, 2012. Water Reuse Potential for Expanding the Nations Water Supply through Reuse of Municipal Wastewater. The National Academies Press, Washington DC.
Onyango, L., Leslie, G., Wood, J.G., 2014. Global Potable Reuse Case Study 4: Windhoek, Namibia. Australian water recycling center of excellence, Brisbane, Australia.
Oteng-Peprah, M., Acheampong, M.A., deVries, N.K., 2018. Greywater characteristics, treatment systems, reuse strategies and user perception—a review. Water, Air, Soil Pollut. 229, 255.
Oteng-Peprah, M., de Vries, N.K., Acheampong, M.A., 2018. Greywater characterization and generation rates in a peri urban municipality of a developing country. J. Environ. Manag. 206, 498–506.
Peters, A., Gutscher, H., Scholz, R.W., 2011. Psychological determinants of fuel consumption of purchased new cars. Trans. Res. Traf. 14, 229–239.
Quintal, V.A., Lee, J.A., Soutar, G.N., 2010. Risk, uncertainty and the theory of planned behavior: a tourism example. Tour. Manag. 31, 797–805.
Schwartz, S.H., Tessler, R.C., 1972. A test of a model for reducing measured attitude-behaviour discrepancies. J. Personal. Soc. Psychol. 24, 225–235.
Shresta, R.R., 1999. Application of Constructed Wetlands for Wastewater Treatment in Nepal. University of Agricultural Sciences, Vienna, Vienna, p. 300.
Thogersen, J., Olander, F., 2006. The dynamic interaction of personal norms and environment-friendly buying behavior: a panel study. J. Appl. Soc. Psychol. 36, 1758–1780.
Tonglet, M., Phillips, P.S., Bates, M.P., 2004. Determining the drivers for householder pro-environmental behaviour: waste minimisation compared to recycling. Resour. Conserv. Recycl. 42, 27–48.
USEPA, 2012. Guidelines for Water Reuse, Washington DC.
Wauters, E., Bielders, C., Poesen, J., Govers, G., Mathijs, E., 2010. Adoption of soil conservation practices in Belgium: an examination of the theory of planned behaviour in the agri-environmental domain. Land Use Policy 27, 86–94.