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# Do Families Attitudes and Behaviors Support Sustainable Water Consumption

By Ayfer Aydiner Boylu[1], Gulay Gunay[2]

**Abstract**
For increasing the quality of life and sustainable improvement, the importance of reaching for drinkable, usable and clean water sources in the 21st century has increased and started to become a significant potential problem to be solved in the World. With today's busy lifestyles, people are often unaware of the amount of water they consume. With the acceleration of modern life, individuals often choose the solution that best suits their time and convenience, rather than optimizing for efficiency and environmental outcomes, since they do not find water-related activities important. Water, which is naturally regarded as an inexhaustible source, is gradually decreasing over time and disappearing day by day. Therefore this research has been planned to determine individuals' water consumption behavior at homes regarding the effective and efficient use of water sources. The sample comprised 654 individuals who resided in Safranbolu, Turkey. Data were collected through a demographic information form, Attitudes Toward Water Use (AtWC), Water Saving Behavior at the Home (WSBQ) and Sustainable Consumption Behavior Scale (SCBs). To determine the factors affecting water saving behavior at the home, correlation and hierarchical regression analyses were employed. Pearson correlation analyses revealed significant positive relationship between sustainable consumption behavior (SCBs) and saving behavior at the home (WSBQ) ($r=.43$; $p<0.01$), attitudes toward water use (AtWC) and saving behavior at the home (WSBQ) ($r=.24$; $p<0.01$). Hierarchical multiple regression analysis displayed that water saving behavior at home is influences by sustainable consumption behavior and attitudes toward water conservation. The theoretical implication of this study helps to understand the basic concepts of water saving behavior.

*Keywords: Households, attitudes toward water use, water saving behavior, sustainable consumption behavior*

## 1. Introduction

Today's people lifestyles are unsustainable in many ways and are based on overproduction and overconsumption; putting too much pressure on our natural resources and imposing negative environmental, economic, (individual and collective) social and health impacts (Backhaus et al., 2012:10).
One of the most essential natural resource to sustaining life is fresh water. Water is inevitable sources on which all living creatures' very survivals depends and also affect their lives directly. It is not just a biological need for human beings but also the very economic, social and cultural life itself (Kılıç, 2008). The overall quality of life for humans, animals and plants is therefore linked to the quality and quantity of water resources (Wisconsin Extension, 2002). However, the increase in the world population and the economic developments accelerate the demand for water and threaten the water reserve levels which are already close to the limit values. Today, current water resources are under the pressure of the different factors such as increase in population, global warming, agriculture, industrialization and urbanization (Kılıç, 2008; Vörösmarty, 2000).

[1]Hacettepe University, Ankara, Turkey
[2]Karabuk University, Karabuk, Turkey

Today the number of people who do not have access water and sufficient hygiene conditions is defined by billions. While more than 1.2 billion people in the world do not have safe and clean drinking water, more than 2.4 billion are unable to access to water appropriate for health conditions and many people die due to water-related diseases every year (Klawitter and Qazzaz, 2005; UN Press Release, 2003). If sustainable use of water source cannot be ensured, it is estimated that two third of the world population will face a severe water-deficiency or water-absence by 2025 (Scanlon, Cassar and Nemes, 2004).

Contrary to common believe, Turkey is not a water-rich country. Unplanned flow of industrialization and urbanization, fast population growth, illegal housing, opening underground water reserves to urbanization in the recent year have caused adverse changes in the usable water amount. (TÜSİAD, 2008). Usable water amount per capita in Turkey is 1430 $m^3$ (İMO, 2009: 30). Even if it is believed that our population will be 100 million by 2030 and our water sources will be used with 100% efficiency, the water amount per capita will be reduce to 1000 $m^3$ and Turkey will become one of the water-poor countries.

Within this point, water which is an indispensable element for all living and unliving life should be perceived with a sustainable point of view. Sustainability of water sources is to meet the water needs of today`s individuals without sacrificing the future generations` water needs. Most of the time in today's rushing life, people are not fully aware of the amounts of water consumed (Randolph and Patrick, 2008), nor in which activities they consume the most. The result of the study by Randolph and Patrick (2008) support the low level of awareness of actual water users (only one in five 19% of all respondents said they knew how much water they used in a quarter). Water consumption is usually not obvious to the eye or mind. People tend to use water unconsciously, not referring to the use of water as an activity by itself, but as a tool to accomplish other activities (Gram-Hanssen, 2008; Medd and Shove, 2005), whether related to hygiene (brushing teeth or washing clothes) or home care (gardening or mopping the floor), for pampering and relaxation (a nice bath after a long day of work) or even as a daily practice (the morning shower to feel fresh and awake).

Therefore saving water in homes has become extremely important in terms of sustainability. A large amount of the water consumed in the home. Because water is a resource used in many different ways around the home: for drinking, in food preparation, for sanitation (cleaning people, clothes and the home itself) and to maintain lawns and gardens (Wisconsin Extension, 2002). Past research has determined that water consumption within households is dependent on numerous factors, which include: the number of people in the house, the age of residents, education levels of residents, lot size of properties, residents' income, efficiency of water consuming devices (i.e. clothes washers, shower heads, tap fittings, dishwashers and toilets) and the attitudes, beliefs and behaviours of consumers (Renwick and Archibald, 1998; Corral-Verdugo et. al., 2003; Loh and Coghlan, 2003; Inman and Jeffrey, 2006; Jorgensen et. al., 2014). Renwick and Archibald's (1998) Econometrics Model suggests that household characteristics, such as density, household size, location and number of faucets (proxy for house size), play a large role in determining water use, as well as the impact of price and water restrictions. The Social and Economic Household Water Consumption Model proposing by

Jorgensen, Graymore and Toole (2009) also suggests that demographics, dwelling characteristics (including house size, water using appliances and type) and household composition (number of people and ages) impact directly on consumption, conservation intention, trust and perceived behavioral control and on the range of attitudes, perceptions and habits. Attitudes, beliefs and actual behaviours are particularly relevant as water management initiatives often include pressure on residents to reduce household water consumption through undertaking more sustainable water consumption practices (Willis et. al., 2011). Therefore households attitudes, beliefs and behaviours plays an important role in water consumption patterns in the home.

To understand the embodiment of people's attitudes and behaviour, and their association with water consumption, Ajzen and Fishbein's (1980) theory of reasoned action was adopted as a point of departure. Ajzen and Fishbein's theory conceptualises the linkages between beliefs, attitudes, perceived social norms and behaviours by building on the expectancy value theory through the incorporation of normative social influence on behavioural intention (Hassell and Cary, 2007). Several earlier research studies, for example, Syme and Nancarrow (1992) and Po et al. (2005) adopted the same approach to investigate attitudes and their impact on water consumption behaviour. Another model developed by Gregory and Di Leo (2003) emphasized environmental behavior where awareness (i.e., issues, knowledge and opportunities) affects unreasoned (habits and reflexes), and reasoned (i.e., involvement, attitudes, intentions, perceived self-efficacy) influences. They argue that issues, knowledge and opportunities all directly impact on behavior, which in turn impacts on reasoned and unreasoned influences. Hence, conducted studies show that behaviors in daily life can be effective on saving (Carlsson-Kanyama, Linden and Eriksson, 2005).

Given the decreasing amount of fresh water available, making the most out of the water resources available to us should be taken as a personal goal for everyone. Consuming water sustainably should be amongst everyone's priorities: consuming responsibly, even if it means shifting one's consumption habits, and consuming less (Elizondo and Lofthouse, 2010). The following behaviors can help conserve water by reducing the amount of water a person uses and save money too: turning the water off during brushing teeth; turning off the tap while washing vegetables; turning the shower off while soaping in; starting the machine only when it is full to save water, and repairing leaks or reporting them to landlords (Marandu, Moeti and Joseph, 2010). There is also a plethora of initiatives to reduce consumption by using water efficient fittings within the home, for example, dual flush toilets, low flow shower heads (NSW Department of Planning, 2007).

This study aims to gain sustainable behaviors relating effective and productive use of water sources and raise awareness on this matter by drawing attention to behaviors of families and individuals towards water use at home. Thus, while meeting the needs of today and taking the needs of future generations, sustainability regarding the effective management and use of existing water sources will be ensured within the family which is the smallest unit of the society.

## 2. Method

### 2.1 Participation and Procedures

This study conducted in Safranbolu-Karabuk/Turkey. The sample group of this study consisted of households which have been dwelling in Safranbolu province. The sample were selected from district of Safranbolu, according to the address-based population registration system.This research was carried out in downtown with 750 households. There are a total of 21 neighbourhoods in the central district of Safranbolu. Simple random sampling method was the basic selection process in this study. Each unit in the population is identified, and each unit has an equal chance of being in the sample. Due to the difficult accessibility to all individuals in the 21 neighborhood, 3 neighborhoods having different socio – economic levels were included in the research. 3 avenues from each neighborhood and 5 streets from each avenue have been selected randomly. To reach the individual during the implementation of the questionnaire, it was included only 3 household from each even-numbered apartment located in the street. The sample of the study consist of people who agreed to participate on a voluntary basis. In this context 750 household were interviewed. Each participant was contacted individually and completed the questionnaire (56 household do not accepted the interview). Following the authors' introduction, the purpose of the study was explained. The participants were also informed that participation was voluntary. After obtaining their consent, the questionnaire form was given to them and they completed the form on their own. Uncompleted and uncorrected questionnaire forms were not taken into consideration (40 questionnaires). Finally, a total of 654 interviews were conducted with an 87.2 percentage participation rate. The data were collected between May and June 2012.

### 2.2 Instruments

The data was obtained with questionnaire form. This form comprises demographic characteristics of households, attitudes toward water use, behavior of water use at the home, attitudes toward sustainable development.

*Demographic Characteristics*: Demographic question are gender, age (age was coded the age in years at the time of the interview), education, monthly income (it was coded in years at the time of the interview), working status.

*Sustainable Consumption Behavior Scale (SCBs):* This scale developed by Kiracı and Karalar (2010). Sustainable consumption was measured using the Sustainable Consumption Behavior Scale (SCBs), which includes 36 items such as "I avoid products in aerosol containers." Responses were given on a 5-point Likert Scale, ranging from 1 ("never") to 5 ("every time"). 8,13,14,15,16 items was coded reverse. In this study the Cronbach's alpha coefficient was used to determine the internal consistency reliability of scale used. It was determined that alpha value for SCB scale was 0.63. SCB scale do not have high alpha values and so the scale could be improved in future research. But in this study Cronbach's alpha coefficient was found .71.

*Attitudes toward Water Use (AtWU):* This form has been created by Dolnicar and Hurliman (2010) to determine individual's attitudes toward water use. Attitudes toward water use form consist from 13 items. Responses were given on a 5-point Likert Scale, which

ranges from "1=strongly disagree to 5=strongly agree". Items "*I am not concerned at all with water conservation*" and "*Water conservation is not my responsibility*" has been reverse coded. The highest scores mean that more positive attitudes toward water use. The coefficient of internal consistency of the form was .74. The lowest score is 18, while the highest score is 65 (M=49.49; s=7.18).

*Water Saving Behaviour Questionnaire (WSBQ):* This questionnaire developed by Hablemitoğlu and Özmete (2010) to determine respondents how applied or unapplied water saving behavior in their house. Water Saving Behavior Questionnaire consists from four main groups: dishwashing (5 items), drinking and cooking (8 items), washing clothes (9 items), personal care (9 items). Questionnaire has a total of 31 items. Respondents who participated in the survey were asked to evaluate these items with one of the options, between "Never (1) – Sometimes (2) – Always (3)". High scores mean good water saving behavior. According to Hablemitoğlu and Özmete (2010) Cronbach Alpha, for the 31 item behaviors was found .72. Internal consistent was found each main group vary from .62 to . 72 (.72 for dishwashing, .70 for personal care, .63 for washing clothes and .62 for drinking and cooking respectively). In this study Cronbach Alpha was calculated .78 for general questionnaire, .78 dishwashing, .53 drinking and cooking, .68 washing clothes, .60 personal care.

### 2.3 Data Analysis

The statistical analysis consist of descriptive statistics, correlation and hierarchical multiple regression analysis. Descriptive statistics such as frequencies, means, standard deviation, alpha reliability coefficient was calculated.

Bivariate Pearson Correlation analysis was performed to determine the level and direction of the relationship between the dependent and independent variables. Last stage hierarchical regression analysis was employed to predict water saving behavior. Independent variables are put into the regression analysis in a certain sequence to determine the model that best describes the dependent variable (Cohen et al. 2003:141). In this study, multiple-variable hierarchical regression analysis were performed to find out whether some variables related to water saving behavior such as; demographic variables (age, monthly income, education, member of household), sustainable consumption behavior, attitudes toward water conservation. All analysis was performed using SPSS 18 (Statistical Package for the Social Sciences).

## 3. Results

Table 1 indicates that 49.1 % were female and 50.9% were male. The ages of respondents ranged from 19 to 81 years old; 33.9 percent of participants were aged between 36 – 45 and the average age was 39 (SD=9.80). The income mean for the total sample was 1839, 10 (SD=1217.6). 43.1% of them reported monthly income between 1001 TL and 2000 TL and only 27.4% reported earning more than 2001 TL. Respondents who had high school degree presented the majority of the sample (196) showing a total rate of 30.0%. More than half of the participants (53.7%) were worker, 32.7% percent was non-worker and only 13.6% was retired.

**Table 1.** Demographic characteristics

| Demographic characteristics | N | % |
|---|---|---|
| **Gender** | | |
| Female | 321 | 49,1 |
| Male | 333 | 50,9 |
| **Age (M=38.9; S=9.7)** | | |
| Less than 25 | 49 | 7,5 |
| 26 – 35 | 207 | 31,7 |
| 36 – 45 | 222 | 33,9 |
| More than 46 | 176 | 26,9 |
| **Education** | | |
| Primary school | 182 | 27,8 |
| Secondary school | 86 | 13,1 |
| High school | 196 | 30,0 |
| Vocational school | 84 | 12,8 |
| Bachelor's and more | 88 | 13,5 |
| **Monthly income (M=1839.1; S=1217,6)** | | |
| Less than 1000 TL | 193 | 29,5 |
| 1001 TL – 2000 TL | 282 | 43,1 |
| More than 2001 TL | 179 | 27,4 |
| **Working status** | | |
| Worker | 351 | 53,7 |
| Non-worker | 214 | 32,7 |
| Retired | 89 | 13,6 |

The mean, standard deviation, minimum and maximum scores and Cronbach alpha of internal consistency was calculated in order to demonstrate the reliability of the study scales sustainable consumption behavior (SCBs), attitudes toward water use (AtWU) and water saving behavior questionnaire (WSBQ). The results indicated that SCBs score range 39.00 to 176.00 and mean of scale was 106.74 (SD=14.95), AtWU scores varies between 20.00 and 65.00, average was found 51.12 (SD=6.85). Water saving questionnaire mean was 110.23 (SD=15.37), the lowest score was 66.00 and the highest score was 160.00. All of three scales internal consistency was among acceptable values, respectively .71, .74 and .78 (Table 2).

**Table 2.** Mean, Standard Deviation, and Cronbach's Alpha

| Variables | N | Min. | Max. | M | SD | Cronbach's Alpha |
|---|---|---|---|---|---|---|
| Sustainable Consumption Behavior Scale (SCBs) | 654 | 39.00 | 176.00 | 106.74 | 14.95 | .71 |
| Attitudes toward Water Use (AtWU) | 654 | 20.00 | 65.00 | 51.12 | 6.85 | .74 |
| Water Saving Behavior Questionnaire (WSBQ) | 654 | 66.00 | 160.00 | 110.23 | 15.37 | .78 |

Table 3 display the Spearman correlation among the demographic variables, sustainable consumption behaviors, attitudes toward water conservation and water saving behaviors. As shown in Table 3, there was statistically significant positive relationship between monthly income ($r=.08$; $p<0.05$), sustainable consumption behavior ($r=.40$; $p<0.01$), attitudes toward water conservation ($r=.27$; $p<0.01$) and water saving behaviors. The correlation strength of the dependent and independent relationship considered

moderate. But according to the statistical analyses there is no relationship between demographic variable (except monthly income) and water saving behavior and this is quite striking findings.

**Table 3.** Correlation between Water Saving Behavior and Independent Variable

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|
| **1. Gender** | 1,000 | -,075 | ,046 | -,211** | -,148** | -,023 | -,011 |
| **2. Age** | | 1,000 | -,164** | -,367** | ,032 | ,069 | -,007 |
| **3. Monthly income** | | | 1,000 | ,495** | ,103** | -,106** | ,083* |
| **4. Education** | | | | 1,000 | ,137** | -,102** | ,037 |
| **5. SCBs[1]** | | | | | 1,000 | ,235** | ,401** |
| **6. AtWU[2]** | | | | | | 1,000 | ,271** |
| **7. WSBQ[3]** | | | | | | | 1,000 |

*p<0.05; **p<0.01 [1] = Sustainable Consumption Behaviors; [2] =Attitudes toward Water Use; [3] =Water Saving Behaviors.

A three-stage procedure was used in the regression analyses to predict water saving behavior in houses. First stage of the Hierarchical Regression Analyses demographic (i.e. gender, age, monthly income, education) were entering to the analyses, in the second stage sustainable consumption behavior was included. In the last stage attitudes toward water use were added to the regression along with the demographic factors and sustainable consumption behavior. These equation models were repeated, using water saving behavior as the dependent variable.

The determination coefficients ($R^2$) obtained in the end of three stages were compared and the variables evaluated for participant discretely if these variables give information about water saving behavior in house.

**Table 4.** Hierarchical Regression Analysis Predicting Water Saving Behavior in House

| Variables | Model 1 | | | | Model 2 | | | | Model 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **B** | **Beta** | **t** | **p** | **B** | **Beta** | **t** | **p** | **B** | **Beta** | **t** | **p** |
| **Gender** | -0,439 | -0,024 | -0,573 | 0,567 | 0,803 | 0,044 | 1,151 | 0,250 | 0,745 | 0,040 | 1,090 | 0,276 |
| **Age** | 0,016 | 0,017 | 0,397 | 0,692 | -0,012 | -0,013 | -0,339 | 0,735 | -0,016 | -0,016 | -0,434 | 0,665 |
| **Monthly income** | 0,001 | 0,067 | 1,473 | 0,141 | 0,000 | 0,055 | 1,348 | 0,178 | 0,000 | 0,064 | 1,599 | 0,110 |
| **Education (Primary school)** | -0,032 | -0,002 | -0,031 | 0,975 | -0,058 | -0,003 | -0,062 | 0,951 | -0,162 | -0,008 | -0,177 | 0,859 |
| **Education (Secondary school)** | 1,204 | 0,044 | 0,987 | 0,324 | 0,940 | 0,034 | 0,856 | 0,392 | 1,053 | 0,039 | 0,978 | 0,329 |
| **Education (Vocational school)** | 1,004 | 0,036 | 0,821 | 0,412 | 0,387 | 0,014 | 0,351 | 0,725 | 0,697 | 0,025 | 0,644 | 0,520 |
| **Education (Bachelor's and more)** | -0,332 | -0,013 | -0,273 | 0,785 | -1,579 | -0,063 | -1,434 | 0,152 | -1,165 | -0,047 | -1,077 | 0,282 |
| **SCB[1]** | | | | | 0,274 | 0,444 | 12,290 | 0,000*** | 0,247 | 0,401 | 11,019 | 0,000*** |
| **AtWU[2]** | | | | | | | | | 0,241 | 0,187 | 5,235 | 0,000*** |
| R | .088 | | | | .443 | | | | .478 | | | |
| $R^2$ | .008 | | | | .196 | | | | .229 | | | |
| Adj. $R^2$ | .003 | | | | .186 | | | | .218 | | | |
| F | 1.347 | | | | 19.649 | | | | 21.225 | | | |
| df | 7 – 646 | | | | 8 – 645 | | | | 9 – 644 | | | |

***p<0.001 [1] = Sustainable Consumption Behaviors; [2] =Attitudes toward Water Use; [3] =Water Saving Behaviors.

Having looked at Table 4 results indicated that demographic variables were not significantly predictor on the first step for water saving behavior in houses with R=.088 $R^2$=.008 and adj. $R^2$=.003 ($F_{(7, 646)}$=1.347, p>0.05). The second step of the analyses displayed statistically significant multiple $R^2$ for total sample and explains 44% of the

total variance ($R=0.443$, $R^2=0.196$, Adj. $R^2=0.186$, $F_{(8,645)}=19.649$, $p<0.001$). Considering also participant standardized regression coefficient (β) and the t-test results show that the relationships was significant between sustainable consumption behavior and water saving behavior ($\beta=.44$, $p<.05$).

The third stage was run by including attitudes toward water conservation regression equations. The results illustrated that the stage was significant for sample ($R=0.478$, $R^2=0.229$, Adj. $R^2=0.218$ $F_{(9,644)}=21.225$, $p<0.001$). Additionally finding indicated that among participants the relationships between attitudes toward water conservation and water saving behavior ($\beta=.187$, $p>0.001$) was insignificant (Table 4).

## 4. Discussion

Within the concept of sustainability, efforts to meet the needs of today without destroying the sources of future generations constitute the fundamental component of water consumption. In this study we are investigated factors that may have an affect family's sustainable water consumption behavior.

Previous studies displayed that there is a relationship between socio-demographic characteristics such as gender, education, age, income, family characteristics etc. and water conservation behavior (Gregory and Leo, 2003; Clarke and Brown, 2006; Grafton et al. 2009; Shan et al., 2015). However there is limited information about the relationship between sustainable consumption behavior and water conservation behavior. In this study, exception of monthly income, none of the socio-demographic variables (gender, age, education level) have significant correlation with water conservation behavior. According the research conducted by Grafton et al. (2009), in 10 different countries (Australia, Canada, Czech Republic, France, Italy, Korea, Mexico, Netherlands, Norway and Sweden) with the participation of about 10 000 households, results suggest that household size, residence size, education, employment status and household income had positive and significant effects on household water consumption. Khalid et al. (2016), investigated water conserving behaviors in Pakistan. They found that females, housewives, participants with low education, adults (age range 41-50) and families of 7 to 9 members had more water conserving behaviors. In the study done by Clark and Brown (2006), demographic characteristics had an impact on the ability and capability of individuals to acquire and apply household water saving and water recycling measures. In contrast to these studies De-Oliver (1999), found an inverse relationship between socio-demographic factors and water conservation behavior. Zietlow (2016), the socio-demographic and psychological determinants of water conservation behavior, based on three distinct datasets from Germany and Jordan. The results indicate that water conservation does not differ with respect to age, education, and income, but rather with different levels of environmental attitude. Similarly Adams (2014) investigated the links between socio-economic characteristics and water conservation attitudes. He reported that socio-demographic variables such as income, age, and occupation were not significant correlations of water conservation behavior; only gender was a significant correlation of water conservation behavior. The differences in the results of studies on the relationship between socio-demographic factors and water-saving behavior can be stem from factors such as social structure, lifestyles and habits.

Water consumption behavior is associated with many socio-demographic and socio-cultural behavior patterns of people (Renwick and Archibald, 1998; Corral-Verdugo et al., 2002; Newton and Meyer, 2012; Willis et al., 2013; Jorgensen et al., 2014). However limited studies have investigated sustainable consumption behavior, attitudes toward water use behavior and water conservation behavior of household (Willis et al. 2011; Adams, 2014). In contrast to the literature, our research displayed that socio-demographic characteristics, included in the regression analysis, do not have significant variance of family's water conservation behavior. The additions of the sustainable consumption behavior score have significantly increased the amount of variance explained water conservation behavior. Also the addition of attitudes toward water use significantly increased the amount of variance explained in family's water conservation behavior and consistent with expectations, water conservation behaviors were increased in the families whose attitudes towards water use scores are higher. This finding provides further support to previously reported research studies by revealing the link between positive attitudes towards sustainable consumption and water conservation. For example Corral-Verdugo et al. (2002), found that conservation motives significantly reduced annual water consumption. Also in Gilg and Barrs' study (2006) committed environmentalists and main streamenvironmentalists were most likely to engage in energy and water saving activities regularly. Willis et al. (2011) results indicated that residents with very positive environmental and water conservation attitudes consumed significantly less water in total and across the behaviourally influenced end uses of shower, clothes washer, irrigation and tap, than those with moderately positive attitudinal concern.

Results from this study show that the consciousness of sustainable consumption lead to lower levels of total water consumption in households. This can be explain by the fact that low educational level and lack of consciousness cause people not to conserve water. Therefore to contribute in improving the consciousness, educational institutions should insert some topics on sustainable consumption in curriculum at all educational levels and mass media should seek to spread among people.

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