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Raising environmental awareness to improve toilet and drainage facilities around Lake Tempe in South Sulawesi, Indonesia

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**ABSTRACT:** The aim of this study was to determine the effect of environmental knowledge, conservation and motivation to maintain the environment, as well as to moderate the behaviour of the public in providing family latrines and drainage. Research areas were selected by purposive sampling: 150 respondents were selected by systematic random sampling. The data were analysed using multiple regression. The results showed that knowledge of the environment and conservation, and the motivation to preserve the environment provide a positive influence on the behaviour in the provision of toilet facilities and maintaining appropriate drainage around Lake Tempe in South Sulawesi, Indonesia.

## INTRODUCTION

In Indonesia, Act No. 32 of 2009 about the protection and management of the environment states that systematic and integrated efforts need to be made to preserve the environment and prevent pollution or other environmental damage. Such efforts include planning, utilisation, control, maintenance, supervision, and enforcement of the law [1]. The development is a continuous process and has a continuous impact on the population and the environment. Therefore, it is necessary for there to be harmony between the development of the population and environmental concerns in order to create the conditions conducive to maintaining sustainable development [2]. Sustainable development is development that provides for the human needs of the present without prejudice to those who will have their own needs in the future [3]. Based on the sustainable development concept, to ensure that an environment provides for the needs of the future for mankind requires good knowledge of the environment and knowledge of environmental conservation and high motivation and appropriate behaviour to maintain that

environment.

Preliminary studies conducted in August 2013 in the settlements around Lake Tempe, South Sulawesi, Indonesia, found as follows: 1) family latrines owned by the community are still far from what is expected; and 2) the drainage of the settlements is not well-maintained by the community. Further observations of the physical environment in some families in the settlements around Lake Tempe in September 2013 found that: 1) the toilet facilities used to dispose of faeces have not been constructed in an environmentally-friendly way, causing bad odours; 2) residential drainage is less maintained by the community; and 3) the physical environment of the settlements is squalid and causes unpleasant odours due to stagnant water in some sections of the drainage channels. The conditions of the family latrines and drainage in the settlements described above has most likely been caused by a lack of knowledge about the environment and conservation in the community, and poor motivation of the people towards nurturing environment. This shows that the environmental behaviour of the people who live around Lake Tempe is poor.

Based on the above description, it seemed appropriate to undertake research, which could reveal the influence of environmental knowledge and motivation in maintaining the environment, and the impact of these on the people's behaviour in providing toilet facilities and maintaining drainage of the settlements around Lake Tempe. This information is the basis for directing people's behaviour towards future provision of toilet facilities and drainage of the settlements around Lake Tempe.

## RESEARCH METHOD

This research reports on a correlational study aimed at determining the effect of environmental knowledge, environmental conservation knowledge and motivation to maintain an environment either individually or jointly on the behaviour of society providing family toilets and maintaining drainage settlements around Lake Tempe.

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The sample areas for this study were three villages,

Soppeng, Wajo and Sidrap, which were selected intentionally (purposive sampling). These are villages near Lake Tempe in the south of Sulawesi Island in Indonesia. The population for this study was the householders living in the three villages. The sample (respondents), respectively 50 householders in each village, were selected by the method of systematic random sampling. Thus, the study sample size was 150 households.

The dependent variable (Y) of this research is behaviour of the public in the provision of family latrines and maintenance of drainage. The independent variables were: 1) knowledge of the environment (X1); 2) knowledge of environmental conservation (X2); and 3) the motivation to preserve the environment (X3).

The research instrument consisted of:

1. Observation guidelines of the people's behaviour to provide family toilet facilities and to maintain drainage;
2. A test of environmental knowledge;
3. A test of knowledge of environmental conservation;
4. A questionnaire on motivation for nurturing the environment.

Data collection was done as follows: 1) information about the behaviour of the public to provide toilet facilities and maintain drainage was obtained by observation; 2) data on environmental knowledge and environmental conservation knowledge were gained by providing a test; and 3) data on the motivation to preserve the environment were obtained by questionnaire.

The analysis of data was undertaken by descriptive and inferential statistical analysis. The analysis model includes: a) simple regression, which aims to test the influence of environmental knowledge, environmental conservation knowledge and motivation to maintain an environment toward behaviour of society providing family toilet facilities and maintaining drainage; and b) multiple regression analysis intended to test the effect of environmental knowledge, environmental conservation knowledge and motivation to preserve the environment, and to influence public behaviour to provide family latrines and maintain drainage.

**RESULTS AND DISCUSSION**

### Description of the Environmental Knowledge of Respondents

The environmental knowledge of the respondents was analysed using descriptive statistics, which consists of 18 questions. The result of the research showed that 8% of respondents have a low level of environmental knowledge; 79% of respondents had a moderate level of knowledge and 13% of respondents were in a high category. The average value of 8.87 fell within the medium category.

### Description of the Knowledge of Environmental Conservation

For the knowledge of environmental conservation, respondents were analysed using descriptive statistics, which comprised 18 questions. The result of the research showed that 6% of respondents have a low level of environmental conservation knowledge, 82% of respondents had moderate knowledge and 12% of respondents are the high category. The average value of 9.46 falls within the medium category.

### Description of Motivation to Maintain the Environment

The motivation of respondents to maintain the environment was analysed using descriptive statistics, which consisted of responses to 16 questions. The result of the research showed that 78.7% of respondents have medium motivation for maintaining the environment and 13.3% of respondents have high motivation to preserve the environment. The average value of 44.46, placing it in the medium category.

### Description of Respondents' Behaviour in Providing Family Toilet Facilities and Maintaining Drainage

The behaviour of respondents to provide family latrines and maintain drainage was analysed using descriptive statistics based on responses to 16 questions. The results of the research showed that a total of 79% of respondents demonstrated moderate behaviour in supplying toilet facilities and maintaining drainage, and 11% of respondents were in the high category. The average value of 45.32 falls within the medium category.

### Effect of Independent Variables to the Dependent Variable

The result of regression analysis can be seen in Table 1.

Table 1. Summary of regression analysis.

No	Effect of	R2	Regression coefficient	F	Sig
1	XI toY	0.993	0.997	8597.580	0.000
2	X2toY	0.987	0.994	5784.641	0.000
3	X3toY	0.888	0.890	54770025.480	0.000
4	X1.X2.X3toY	0.994	0.996	7214643.925	0.000

Effect of Environmental Knowledge on the Behaviour to Provide Family Toilet and Maintain Drainage of Settlements

The influence of environmental knowledge (XI) on behaviour in providing family latrines and maintaining drainage of settlements (Y) is presented as the results of a simple regression analysis (ANOVA table) in Table I. The table shows that the sig = 0.000 < 0.05, this means XI affects Y. Table 1 shows that R2 = 0.993, demonstrating that the influence of environmental knowledge on the behaviour of providing toilet facilities and maintaining settlement drainage amounted to 99.3%.

Regression analysis (coefficients) are also shown in Table 1. The results of simple regression analysis of the effect of XI to Y (coefficient) show that the regression coefficient of environmental knowledge is 0.997. This means that an increase in environmental knowledge by one unit will lead to improved behaviour in providing family latrines and maintaining drainage of settlements of 0.997.

The results show that when people know that the toilet facilities and drainage of settlements can be used to protect public health, they will build family latrines and maintain drainage accordingly. Their knowledge of the negative impact of the disposal of excreta in places that will affect people's health and their knowledge of the requirements of good latrines will encourage people to build latrines in accordance with established standards. Blockage of drainage channels or because of waste can cause flooding. Their knowledge of the negative impact (such as stench) due to unavailable latrines and drainage, and environmental conditions stimulate people to behave better in providing latrines and drainage. The finding is same as that made by Walgito, who found that behaviour is formed as a result of

the stimulus or stimuli experienced by an individual [4].

Community action to build latrines and disposing of waste in places that have been prepared for that purpose demonstrate that the public exhibits responsible environmental behaviour. Responsible environmental behaviour is influenced by many factors including knowledge [5].

Behaviour relating to environmental care is behaviour that consciously seeks to minimise the negative impacts caused by a person's activity on the environment [6].

The behaviour relating to the environment includes six domains, namely: perform energy saving, mobility and transport environmentally friendly, friendly purchasing behaviour environment, recycling, caring social behaviour towards the environment and waste minimisation behaviour. This study chose to focus on behaviour related to waste minimisation as a major impact on overall environmental behaviour [7].

Environmental knowledge among members of the public was that by providing latrines and drainage they could reduce the risk of the spread of certain diseases through organic waste. People who are knowledgeable about having greater opportunities, but are not aware about the environment and prefer to defecate anywhere are vulnerable to various diseases such as diarrhoea, typhoid, dysentery, worms and itching, compared with those with adequate environmental knowledge. Thus, the need for knowledge on the use of latrines [8].

The results also showed that 87% of people have a medium-level knowledge of the environment, while based on the above opinion, one of the factors that influence responsible environmental behaviour is environmental knowledge. Based on these findings, it is necessary to make an effort to improve environmental knowledge. The efforts include counselling about the importance of toilet facilities and family latrines in controlling disease transmission, as well as education and training in the manufacture of the standardised a latrine and drainage systems. These efforts are expected to enhance responsible environmental behaviour of people in the area around Tempe Lake.

## Effect of Environmental Conservation Knowledge on the Behaviour to Provide Family Toilet and Maintain Drainage of Settlements

Regression analysis to determine the influence of environmental conservation knowledge (X2) on behaviour related to the provision of family latrines and to maintain drainage of settlements (Y) is presented in Table 1. Based on the table, it appears that a significance of  $0.000 < 0.05$ , it means X2 has an effect on Y. Based on the model summary,  $R^2 = 0.987$ . This indicates that the influence of X2 to Y = 98.7%. The contribution of the environmental conservation knowledge to the behaviour of providing toilet facilities and maintaining drainage of settlement is also presented in Table 1. The results of the regression analysis (coefficient) shows that the regression coefficients X2 to Y = 0.994. This means

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that the increase in environmental conservation knowledge by one unit leads to improved behaviour in providing family latrines and maintaining drainage of settlements by 0.994.

Knowledge of conservation is a collection of information related to safeguarding and preserving the environment and natural resources. In connection with this study, the conservation of knowledge relating to the protection and maintenance of soil and water resources from the sources of pollution that come from faeces, urine and domestic waste is an issue. The presence of these wastes in the environment causes pollution of land and water resources. Faeces and urine contain pathogenic bacteria, and when added to the environment will be mixed with the soil and water, and subsequently transferred to humans causing various diseases. In addition, domestic waste containing detergent can cultivate soil microbiota and water. In addition, if domestic waste is rich in organic matter, decomposition by microorganism decay causes odour around neighbourhoods.

Public knowledge is needed about environmental conservation and the negative impact of faeces, urine and domestic waste, to encourage society to provide latrines



and drainage settlement. Analysis of the data showed that the provision of latrines and improved drainage are influenced by the knowledge of conservation. Conservation knowledge variables influence the behaviour of people with respect to the provision of latrines and drainage amounted to 98.7%. Results of the analysis of the data also showed that one unit of improved conservation knowledge leads to an increase in the behaviour, with respect to the provision of latrines and drainage of 0.994 units. These findings illustrate that conservation knowledge is very important in encouraging the behaviour concerning the provision of latrines and drainage settlements

The results also illustrate that human interaction with the environment can lead to both positive and negative impacts. When people know the negative impact of their activities on the environment they try to control it by providing the facilities to reduce the negative impact. This finding is the same as that reported by Thoha, who stated that human behaviour is a function of human interaction with the environment [9]. A person's behaviour is the result of all kinds of experiences, as well as the interaction of people with their environment, embodied in the form of knowledge [10].

The results showed that the 82% of people around Lake Tcmpe have knowledge of environmental conservation are in the medium category. Therefore, it is necessary for efforts to be made to increase public knowledge about environmental conservation. Such efforts can be done through counselling, education and training, meetings with residents and other similar activities.

Effect of Environment Maintaining Motivation on the Behaviour to Provide Family Toilet and Maintain Drainage of Settlements

Table 1 also presents simple regression analysis (ANOVA table) to investigate the motivation to preserve the environment (X3) on the behaviour related to the provision of family toilet facilities and maintenance of drainage (Y). The table shows that at a significance level of  $0.000 < 0.05$ , X3 affects Y. Based on the model summary that  $R = 0.888$ , the influence of X3 to Y = 88.8%.

The results of the regression analysis (coefficient) show

that the regression coefficient of X3 to Y = 0.890. This means that an increase in motivation to preserve the environment by one unit leads to improved behaviour in providing the family latrines and maintaining drainage of settlements of 0.890.

Motivation is the encouragement of a nurturing environment inside and outside the settlement in order to ensure that the environment is not damaged. Communities around the Lake Tcmpe settlement realise that any decline in the quality of the urban environment will ultimately have a negative impact on their health. Their desire to maintain healthy living and environmental conditions in the slums will motivate them to provide latrines and drainage settlements. Latrines and drainage settlements are a facility that reduces the risk of transmission of germs. Their awareness of the benefits of latrines and drainage for the health increases the encouragement of the public to provide proper latrines and drainage.

The results showed that the influence of motivation to maintain an environment on behaviour to provide latrines and drainage amounted to 88.8%. Results of the analysis of the data also showed that if the motivation to maintain the environment improved by one unit, then, the behaviour of the community in providing latrines and drainage will increase by 0.890 units. These findings illustrate that the motivation to preserve the environment is an important factor in influencing the behaviour to provide latrines and drainage. In principle, the public in residential areas have similar needs to those in other areas of society; namely, the need for a healthy life. The need for a healthy life will be achieved if neighbourhoods are well-maintained. It motivates people to provide latrines and drainage. The motivation is assumed to be an individual activity to determine the basic framework and define the behaviour for the purpose of achieving that objective [11]. The motive is the urge of human beings to behave in order to achieve the goal [12].

Motivation is a psychological tendency and internal drive that stimulates and regulates the actions of an organism [13]. In a broader sense, motivation refers to the causes of the emergence of a behaviour, such as factors that

<sup>1</sup> Unoriginal text: 63 words  
[www.wiete.com.au/journals/WTE&TE/...](http://www.wiete.com.au/journals/WTE&TE/...)

encourage someone to do or not do something [14]. While Herath explains that the motive is a set of reasons that determine

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a person to engage in a certain behaviour. Motive is an internal drive or desire from within that encourages people to organise themselves to achieve a goal through activity [15].

Based on the above opinion, it can be argued that the motivation to preserve the environment is one factor that encourages the community to provide latrines and drainage. The main purpose of the provision of latrines and drainage is the need for a healthy life. The results also show that the motivation to preserve the environment of the communities around the Lake Tempe are in the medium category. As many as 82% of people have the motivation to preserve the environment in the medium category.

Therefore, it is necessary for activities to increase the motivation to preserve the environment, such as education and environmental hygiene race and other similar activities.

Effect of Environmental Knowledge, Environmental Conservation Knowledge and Motivation to Preserve the Environment jointly on the Behaviour to Provide Family Toilet and Maintain Drainage of Settlements

The result of the multiple regression analysis on the joint influence of environmental knowledge, environmental conservation knowledge and motivation to preserve the environment on the behaviour relating to providing family latrines and maintaining drainage of settlement is also presented in Table 1.

At the significance level  $0.000 < 0.05$ , X1, X2 and X3 jointly affect Y. The model summary showed that  $R^2 = 0.994$ , indicating that the influence of X1, X2, X3 on Y = 99.4%. The results show that the three exogenous variables jointly affect the behaviour of endogenous variables relating to providing latrines and drains. Variables X1, X2 and X3 represented 99.4% of the exogenous variables on endogenous variables. The remaining 0.6% is the influence of other variables.

The contribution of each exogenous variable on endogenous variables is as follows:

1. The contribution of environmental knowledge on the behaviour of providing toilet facilities and maintaining drainage settlement: based on Table 1, the regression coefficient of environmental knowledge = 0.027. This means that every time the environmental knowledge is increased by this amount, with regard to environmental conservation knowledge and motivation to maintain (lie environment, the behaviour of providing family latrines and maintaining drainage of settlements will increase by 0.027.
2. The contributions of knowledge of environmental conservation to preserve the environment on the behaviour to provide toilet facilities and maintain drainage settlement: based on Table 1, the regression coefficient of environmental conservation knowledge = 0.014. This means that every time the knowledge of environmental conservation is improved by this amount, with regard to environmental knowledge and motivation to maintain the environment, the behaviour of providing family latrines and maintaining drainage of settlements will increase by 0,014.
3. The contribution of motivation on the behaviour to provide family toilet facilities and to maintain drainage settlement: based on Table 1, the regression coefficient of environmental motivation = 1.010. This means that every time the motivation to preserve the environment is increased by this amount, with regard to environmental knowledge and knowledge of environmental conservation, the behaviour of providing family latrines and maintaining drainage of settlements will increase by 1,010.

Results of this study illustrate that when people know that the habit of dumping faeces, urine and domestic waste anywhere, it will have a negative impact on other environmental components, including the communities around Lake Tempe. In addition, public knowledge about the environmental benefits of maintaining soil and water sources around the locality motivates people to maintain environments. Knowledge of the environment, knowledge of environmental conservation and motivation to maintain

an environment have an impact on the behaviour of people to provide latrines and drainage.

This finding is supported by Hunggerfort and Volk, who state that responsible environmental behaviour is influenced by the knowledge, strategies to apply the knowledge, skills, attitudes, locus of control, and personality factors, and the factors of the situation [5]. This finding is also supported by Swan and Stapp, who suggests that the behaviour is formed by basic needs, knowledge, feelings and tendencies [16].

## CONCLUSIONS

Base on the results and discussion, it can be concluded that:

1. Environmental knowledge, environmental conservation knowledge and motivation to preserve the environment have an impact of the behaviour of people to provide family latrines and to maintain drainage of the settlement.
2. Environment knowledge, environmental conservation knowledge and motivation to nurture the environment either individually or jointly have a significant effect on the behaviour about providing family latrines and maintaining settlements' drainage.
3. Environmental knowledge, environmental conservation knowledge and motivation to nurture the environment either individually or jointly make a significant contribution to the behaviour relating to providing family latrines and maintaining settlements' drainage.

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