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Ecovillages, Environmental and Sustainability Practices among Ecovillage Operators

Rohana Sham[1], Imran Mohammad[1], Dolores Csabai[2], Nik Mastura Nik Mohammad[3]

[1] Graduate Business School, Faculty of Business and Management, UCSI University Kuala Lumpur, Malaysia
[2] Department of Education, Little Village Organization, Hungary, Europe
[3] Department of Landscape and Architecture, Universiti Teknologi Mara, Shah Alam, Malaysia

rohana@ucsiuniversity.edu.my,1001955718@ucsiuniversity.edu.my,pandora@litvill.com, nik.izgroup@gmail.com
Tel of 1st Author: +60125570602

Abstract
This paper focuses on the operation of ecovillages, their environmental issues and sustainability practices worldwide. The main objective is to examine the critical factors affecting the sustainability of ecovillages and their operating environment. This study proceeds with a quantitative research method to further investigate the sustainability practice among ecovillages operation globally. The data have been collected through a self-administered questionnaire using online platforms. This study focuses on energy efficiency, organic food, telework, and social media, towards the sustainability of worldwide Ecovillages' operation. The primary outcome shows the sustainability of ecovillages is significantly affected by energy efficiency, telework, and social media.

Keywords: Ecovillages; Environment; Sustainable; Practice

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1.0 Introduction

The first definition is to incorporate human activities in the natural world that can successfully be continued into the indefinite future without harming nature (Gillman, 1991). The purpose of ecovillage has been modified by Dawson (2015). He defines an ecovillage as an intentional community, traditional or urban, which incorporates ecological, economic, social, and cultural components of sustainability to regenerate the natural environment. The term 'sustainability can be defined as meeting our present needs without relying on the ability of future generations to meet their needs (Mischen, Homsy, Lipo, & Holahan, 2019). Thus, the ecovillages are seen as sustainable communities designed and managed by the cooperation of the community members. The society intends to make it sustainable in three ways: ecological, economic, and social factors (Gilman,1991). Ecovillages heavily rely on the following approaches worldwide: organic farming, permaculture, renewable energy, co-housing, and infrastructural capital. This practice ensures self-sufficient and fulfils the community's actual needs within the available resources to maintain sustainability (Gilman, 1991). The usage of renewable energy is

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prevalent in ecovillages by solar panels, wind turbines, and other renewable energy sources (Bocco, Gerace, & Pollini, 2019). However, far too little attention has been paid to energy efficiency and its effect on the sustainability of the ecovillages.

Organic farming is also a concern for the ecovillages, as they strive to produce their food. Organic farming is an environmentally friendly practice, but only doing organic agriculture will not guarantee fulfilling the demand of ecovillages of locally grown organic food (Didarali & Gambiza, 2019). Significant problems of organic farming are less yield, high labour input, and high cost (Didarali & Gambiza, 2019), leading to the failure of the sustainability concept in the ecovillages.

Finding a job or 'telework' in the ecovillages is also a serious concern, especially in maintaining environmental sustainability from carbon emissions. Although extensive research has been carried out about other environmental factors of the ecovillages, not a single study adequately covers the employment factor, particularly telework and its relationship with sustainability. If telework is less implemented and lack of opportunity created in ecovillages, it is believed that this will increase the villagers' carbon footprint and reduce the sustainability practice (Bocco, Gerace & Pollini, 2019).

Despite several issues discussed toward the ecovillages' sustainability operation, emerging technology, such as the internet, is surprisingly believed to damage ecovillage societies (Glaser, Liu, Hakim, & Vilar, 2018). Many ecovillages failed due to less communication and socialising among members. It includes lack of human interaction and cooperation, jealousy, competition, social media, which has been the leading cause of these community failures (Dregger, Schimmel, Joubert, Ottmar, & Klodt, 2014). Due to the lack of study reported on the usage of social media and the sustainability aspect of ecovillages, this has created a massive gap for the survey to fill. A study on sustainability in Malaysia focused on the traditional village character inhabited by a society that preserves their cultural and traditional practices, which Jaffar and Harun (2019) reported. Their study has not highlighted the term ecovillages and sustainability, creating a gap for the survey.

Thus, this study aims to determine the factors affecting the sustainability of ecovillages and propose a sustainable operating model for ecovillages to be implemented. The research also focuses on answering four research questions: 1) Does energy efficiency affect the sustainability of the ecovillages? 2) Does organic food affect the sustainability of the ecovillages? 3) Does telework affect the sustainability of the ecovillages? 4) Does social media affect the sustainability of the ecovillages? These four central hypotheses are to be tested in this study.

2.0 Review of Ecovillages' Operation Around the World

Ecovillages are gaining global attention recently, as people are trying to live more sustainably (Dawson, 2013). The Association for Information on Local Development (AEIDL) research reveals that the modern concept of ecovillages has been around since 1991. More than 2000 intentional community initiatives have promoted sustainability in European countries (EU) (Hara, 2013). However, most initiatives failed within two years because the communities could not successfully maintain and establish their overall goals of sustainable lifestyle (Forster & Wilhelmus, 2005).

The first ecovillage was founded in Iceland, called Solheimar, in 1930 (Jackson, 2004). It was not termed an ecovillage—activist Gilman invented this term in 1991 (Dawson, 2015). Currently, there are around 300-400 villages that call themselves ecovillage (Dawson, 2015). However, most of them do not meet the criteria given by Gillman (1991) because some of them are eco-resorts or learning centres and not good human living areas (Wagner, 2012; Dawson, 2015).

(a) (b)

Fig. 1. (a) Heating System; (b) Ecological house
(Source:) East, 2018

Figures 1(a) and (b) show that the houses are off-grid and use solar panels to generate renewable energy. These houses are pretty much environmentally friendly. They have also developed a technology-based heating system, eliminating the use of fossil fuels (East, 2018).

In the USA, ecovillages are formed primarily to live a sustainable lifestyle both socially and environmentally. There are 102 genuine ecovillages, almost twice the number of European ecovillages (Roseland, 2000). All these ecovillages meet the sustainability requirement given by Gilman (1991) and Dawson (2015). Farming is the main profile of these ecovillages. Typically, American ecovillages focus on the community's mission and create a healthy society. Below are some sample ecovillages in America.

(a) (b)

Fig. 2. (a) Houses in an American Ecovillage; (b) Houses in an American Ecovillage
(Source: Global Network of ecovillages)

Figures 2 (a) and (b) clearly show that the ecovillages' design in America is different from the ecovillages in Europe. Their energy source is both solar panels and the primary grid.

Ecovillages in Asia focus on a more spiritual element. This can be seen with implementing ecovillages like Auroville, Govardhan ecovillage in India, and Sarvodaya in Sri Lanka (Sarvodaya, 2005). In South Asia, half of the population lives in villages, and the development and sustainability of urban areas are linked to the sustainability of villages (Olesen & Jensen, 2017). Below are some pictures of ecovillages in Asia.

(a) (b)

Fig. 3. (a) Houses and energy (b) Water harvesting system
(Source: Olesen and Jensen,2017; Sarvodaya 2005)

Figures 3 (a) and (b) show that the ecovillages in Sri Lanka cannot produce their energy and a proper water harvesting system. The source of energy is from the primary grid. The material of the houses is not eco-friendly; therefore, these villages are not genuine ecovillages according to the definition and theory of Dawson (2015).

Thus, it can be said that ecovillages in different continents have different profiles and different missions. However, the main goal of all is to live a sustainable lifestyle.

2.1 Review of Factors Affecting the Ecovillages' Sustainability

2.1.1 Energy and Ecovillage Sustainability

Renewable energy and energy efficiency both are important for energy sustainability (Tomicic & Schatten, 2016). The usage of renewable energy is prevalent in ecovillages in solar panels, wind turbines, and other renewable sources (Bocco, Gerace, & Pollini, 2019). However, far too little attention has been paid to the relationship between energy efficiency and ecovillages' sustainability. Using energy-efficient equipment and monitoring renewable energy consumption is essential to keep the energy consumption at a minimum (Nižetić, Djilali, Papadopoulos, & Rodrigues, 2019). Thus, the following hypothesis is proposed: there is a relationship between energy efficiency and sustainability of ecovillages.

2.1.2 Organic Food and Ecovillage Sustainability

Organic food is one of the critical components of agricultural sustainability, where every ecovillage should provide its food supply by producing chemical-free food. It is mainly done by the experience and skills of the farmers, using fewer chemicals. The use of technology is coming on the new way to help the farmers from sowing the seeds to harvesting the final crops, like soil preparation, the status of the produce, required irrigation and detection of insects to create a more sustainable environment (Ayaz, Uddin, Sharif, Mansour, Hadi,& Aggoune, 2019).

Therefore, it has been agreed that producing organic food can influence the sustainability of ecovillages (Naresh, & Munaswamy, 2019). Thus, the following hypothesis is proposed: There is a relationship between organic food and the sustainability of the ecovillages.

2.1.3 Telework and Ecovillage Sustainability

Teleworking has also affected the sustainability of the operation of ecovillages. Telework might positively improve the environment, such as improving air quality, reducing greenhouse gas emissions, and reducing waste (Davies,2020). Therefore, telework has been beneficial to the overall ecosystem, especially in maintaining ecovillage sustainability (Suzuki, Imaizumi and Tachi, 2012). However, until today, a lack of discussion was made on this aspect. Thus, the following hypothesis is proposed: There is a relationship between telework and the sustainability of ecovillages.

2.1.4 Social Media and Eco Village Sustainability

Apart from the discussed variable, social media has also become an increasingly important component of people's lives. The statement has been further elaborated by Glaser, Liu, Hakim, and Vilar (2018) that social media damages offline social relationships by filling uptime with a large number of shallow and strangers' online connections. They further argue that social media separates the community in ecovillages due to a lack of physical communication. Thus, the following hypothesis is proposed: There is a relationship between social media and the sustainability of ecovillages.

Based on the literature discussion, energy efficiency, organic food, telework, and social media are the critical factors affecting ecovillages' sustainability. The following is the research framework for the study.

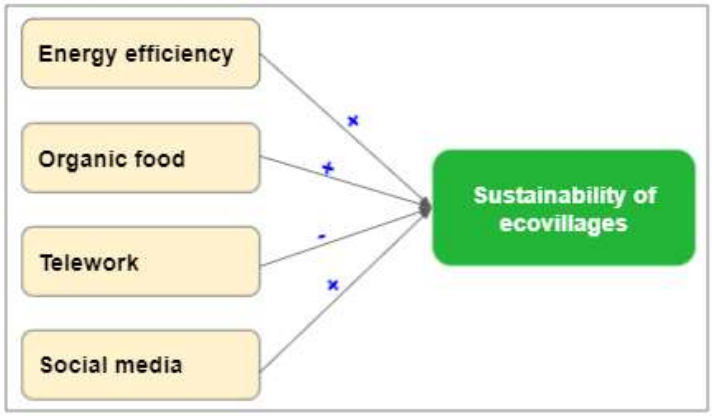

Fig. 4. Theoretical Framework

3.0 Methodology

In this research, a quantitative method was used. According to Leedy (1993), the quantitative approach is ideal when dealing with numbers or measurable variables. The research questions were developed from the past research about sustainability in ecovillages as well as in general. The questionnaires with a five-point Likert scale (Likert,1932) were sent to all the genuine ecovillages worldwide. A target sample size of 207 ecovillages with around 20 thousand residents was the approach for the study. The selection of the sample is in line with Krejcie and Morgan (1970). The questionnaires were sent in November 2020 on the ecovillages, Global Network Ecovillage, and Foundation for International Communities. Data were then analysed using SPSS software, where multiple regression analyses were run to answer the study's primary objective. The Cronbach alpha value (all questions above 8.0) (Cronbach 1951) was observed to maintain the validity and reliability of the query used.

4.0 Finding and Analysis

4.1 Mean Score Analysis

This section discusses the mean score of energy efficiency, organic food, telework in the worldwide ecovillages.

Community members are aware of the importance of energy efficiency has a very high mean of 4.56, which means the community members know the importance of energy efficiency. On the contrary, energy needs are met through sustainable energy resources with a low mean of 3.22, which means renewable energy sources fulfil energy needs only in some ecovillages. Eco-friendly transportation has a reasonable standard, which indicates that some vehicles are eco-friendly. Finally, the mean is high for electronic appliances and zero energy building concepts, which shows that electronic devices and houses in the ecovillages are eco-friendly.

Table 1. Mean score of energy efficiency

	Variable questions	Mean	St. Deviation
1.	Community members are aware of the importance of energy efficiency	4.56	.613
2.	Energy needs are met through sustainable energy resources	3.22	1.181
3.	Means of transportation is eco-friendly	3.41	1.120
4.	Electronic appliances are eco-friendly	3.88	.920
5.	Houses are built with zero energy building concept	3.88	.865

Table 2. Mean score of organic food

	Variable questions	Mean	St. Deviation
1.	Community members do not purchase food items from outside	4.40	6.10
2.	Food items in the eco-village are not produced by using chemical fertilizers	4.28	.559
3.	Community members are aware of the usage of technology in organic farming	4.37	.775
4.	Community members are willing to use technology to produce organic food.	4.32	.795
5.	Technological resources are available to community members to use in daily agriculture activities	4.23	.765

Table 2 shows that 'Community members do not purchase food items from outside' has the highest mean of 4.40, meaning most ecovillages meet their food demand within the ecovillage. Hardly any food items are purchased from outside. Furthermore, 'food items in the ecovillages are not produced by using chemical fertilisers' has a very high mean of 4.28, which shows that none of the ecovillages uses chemical fertilisers to make their food. The awareness of technology usage in agriculture has a high value of 4.37, which indicates that most community members are aware of technology usage. In addition to that, the mean of the willingness to use the technology is also high. Finally, the availability of the technological resources to produce organic food also has a reasonable standard of 4.23, which says that community members have sufficient resources to use the technology.

Table 3. Mean score Analysis for telework

	Variable questions	Mean	St. Deviation
1.	Currently community members have jobs to work from home	3.415	.774
2.	Community members have sufficient technological resources to work from the ecovillage.	3.51	.934
3.	Community members are able to easily find jobs to do telework	2.78	.871
4.	Community members are able to create jobs for its members within ecovillage.	2.86	.954
5.	Community members left ecovillage due to no job opportunity	1.93	.980

Table 3 indicates the mean score of current community members who have jobs to work from home is a moderate 3.15, which describes that only some people in the ecovillages have telework jobs. However, having technological resources for telework has a high mean, 3.51, which indicates that the community members are equipped with technical resources to work from home. On the other hand, finding a telework job has a low mean of 2.78. Similarly, the standard of creating jobs within the community is roughly the same, which means that most communities cannot work from home and do the positions within the community. To conclude further, due to a lack of job opportunities, the community members may have to commute to work, which is not feasible for those living in rural areas. Also, daily commuting increases the carbon footprint. Due to such challenges, community members may not support themselves financially and eventually leave the ecovillages. Based on the mean score (1.93) of community members who left the community, it is clear that very few community members have left the ecovillage regardless of so many challenges.

Table 4 shows the mean score for community members who are active social media users is 3.83, which indicates that some of the community members in the ecovillages use social media. However, community members who do not prefer social media over in-person interaction have a high mean of 4.23. Moreover, 'social media users in the ecovillages are not distracted from their original purpose of creating a sustainable community has a very high standard of 4.09. Thus, the community members are social media users but prefer in-person communication, and as a result, they are not distracted from their community. The mean scores of 'community members attending all the social gatherings and community members complaining about anxiety and depression because social media have a high value of 4.24 and 4.37 respectively, which means that hardly any community members skip social gatherings or have such health issues due to social media usage.

Table 4. Mean score Analysis for Social Media

Variable questions	Mean	St. Deviation
1. Currently community members are active social media users	3.83	.902
2. Community members do not prefer to spend time on social media over in person interaction.	4.23	.814
3. Social media users are not distracted from their purpose of creating sustainable community.	4.26	.869
4. Social media users in the eco-village attend all the social gatherings.	4.24	.885
5. Community members do not complain about anxiety and depression due to social media	4.37	8.24

4.2 Regression Analysis

The R square value is .247, which means that this model explains 24.7% of the variance in the sustainability of ecovillages by energy efficiency, organic food, telework, and social media. That is a low level of significance to predict the sustainability of ecovillages. Furthermore, the R-value represents the simple correlation 0.497 (the "R" Column), which shows a moderate degree of correlation between independent and dependent variables.

Table 5. Model Summary of Regression Analysis

Model	R	R square	Adjusted R square	Std. Error of the estimate
1	.497a	.247	.232	3.00272
predictors	(Constant)	Social media	Organic food	Energy efficiency, telework
Dependent variable	Sustainability of eco-villages			

Table 6. Model Summary of Regression Analysis

		Unstandardized Coefficients		Standardized coefficients	t	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	5.803	3.260		1.780	.077
	Energy efficiency	.330	.061	.348	5.408	.001
	Organic food	.100	.116	.054	.860	.391
	Telework	-.208	.088	-.148	-2.360	.019
	Social Media	.494	.123	.257	4.020	.000

Coefficients in Regression Analysis results show that energy efficiency, telework, and social media are statistically significant. The significant value of energy efficiency is (p=.001, <.05), which means that the energy efficiency significantly predicts the sustainability of ecovillages. Moreover, the considerable weight of telework is (p=.019, <.05), which means that telework especially indicates the sustainability of ecovillages. Furthermore, the significant value of social media is (p=.000, <0.05), which means that social media significantly predicts the sustainability of ecovillages. However, the importance of values of organic food (p=.391, >.05) is greater than the significant value, which means that organic food does not significantly predict the sustainability of ecovillages. This might be due to possible reasons to buy organic products easily from outside of the ecovillages, and the supply of organic food might be easy to access.

5.0 Conclusion

Sustainable ecovillages worldwide have been measured by four variables: energy efficiency, organic food, telework, and social media. Consequently, the findings demonstrated that the sustainability of ecovillages is significantly affected by energy efficiency, telework, and social media. This research proposed four hypotheses, and three out of four are supported. However, future research should look at the economic side of the ecovillages to find out how ecovillages survive financially and whether and how the financial aspects affect the sustainability of ecovillages.

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Paper Contribution to Related Field of Study

This paper contributes to the body of knowledge on Ecovillages and their sustainability aspect of the operation, which can be used as role models for another country interested in implementing the eco villages concept.

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