



Knowledge, Attitude And Practice Of Waste Disposal Of Rural Households - A Pathway For Sustainable Housing

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Abstract

The present research work unfurls the knowledge, attitude and practice of waste disposal by rural households. The rural households have knowledge and attitude regarding proper waste disposal but environment friendly practices of waste disposals have turned out to be insufficient and inadequate. The study has found out that there is significant correlation between Knowledge and attitude regarding waste disposal of the households, but the correlation between practice and knowledge and practice and attitude is comparatively weaker. The study further found out that the association between knowledge and practice and attitude and practice is not visible among the rural households. To promote sustainable housing government should initiate constant awareness classes and consecutive follow ups should be undertaken on waste disposal of the rural households.

Key words: Waste disposal, Rural households, Knowledge, Attitude, Practice, Household waste, Sustainable housing

1.1 Introduction

Sustainable development is meeting the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development necessitates an integrated approach that balances environmental concerns and economic progress (United Nations Academic Impact Sustainability, 2024). Housing is an important component of society which impacts people's lives including employment, health, and education. Sustainable housing has four components, likely socio-cultural sustainability, economic sustainability, technological sustainability and environmental sustainability (Nair et al., 2006).

Living in a sustainable house with minimum detrimental effect on environment is a challenge to the households. A crucial measure to improve the ecological state of rural areas is proper management of manure and residential waste. Proper ecological development is crucial for rural areas at the local level to ensure sustainable growth. (Minin, 2022). This research paper deals with the waste disposal of rural houses which comes under environmental aspects of sustainable housing. Waste is an inevitable byproduct of daily human activities. Waste is available as solid, semisolid, liquid and gaseous forms. Household wastes are waste materials usually generated in the domestic environment. Waste with similar characteristics may be generated in other economic activities and can be thus treated and disposed of together with household wastes (United Nations, 2024). Solid wastes are classified into bio-degradable wastes (wet waste- such as food waste, fruits and vegetables bones and parts of meat), non-bio-degradable (dry waste- such as plastics, paper, cardboard, rags, glass, metal and wood), Sanitary waste and disposables, domestic hazardous waste (such as paint, aerosol can and discarded medical supply), construction and demolition waste and E waste (electronic equipment's like discarded television, fridge, mobile phone, mixer, bulb, wires, radio, fan) (Swachh Bharat Mission, 2021). Liquid wastes are used or discarded water (such as waste water from kitchen, water used for bathing and washing). Gaseous waste is produced while burning firewood and running automobiles. The quantity and nature of household waste has gone through dramatic change in the recent years. Improper disposal of household waste leads to a negative impact on environment, which has direct implications on society, health, biodiversity, ecosystem and economy.

1.2 Household Waste Disposal and Sustainable Housing

In olden days, houses in rural areas of Kerala were built with traditional materials and with mutual help. In the rural areas locally available low-cost materials such as timber, stone, rubble, mud, coconut palm leaves, bamboo and tiles were used for building houses (Gopikkuttan, 2002). Even though yearly maintenance work has to be done for these houses, they were all built with ecofriendly materials and hence, the construction waste was not a threat to the environment and could be disposed easily. The building boom in the mid-1970s in Kerala has led to significant changes in the use of construction materials for building houses which led to the advent of cement, steel, and aluminum with significant carbon foot print. Most of the modern houses in Kerala were built with concrete, steel, aluminum, Asbestos and other modern materials for electrical wiring and roofing which has a significant detrimental effect on the environment. The waste produced while demolishing or repairing these houses has to be disposed properly.

The day-to-day activities were carried out with simple biodegradable objects in the past. For example, in the past, tree leaves or paper were used for packing groceries whereas nowadays plastic is widely used for the same purpose. Due to the high population density, better standard of living, change in consumption habits, increased housing stock and lack of adequate area, a significant quantity of biodegradable and nonbiodegradable household waste is generated per day and the households finds it increasingly difficult to dispose waste properly. The waste from kitchen contains organic matter which decays easily and therefore has to be disposed on daily basis. The commercial activities and eating habits of the household members results in solid wastes including biodegradable and nonbiodegradable waste, which has to be disposed

separately. Plastic is widely used as it is less expensive, light weight, easy to use and durable by every household for various purposes. The use of plastic has infiltrated in all realms human activity including food. Many people throw away plastic without any concern for the environment. The plastic waste is hazardous to the environment and health of the living beings. For sustainable housing plastic waste disposal is important. The use of electronic appliances has increased in all rural households. Electronic wastes like television, mobile phone, bulb and fridge are handled without any proper guidance. The households are also not aware of the disposal methods of hazardous wastes such as paint, batteries and discarded medicines. Waste should be stored properly before disposal. Kitchen waste should be contained in covered bins and hazardous wastes has to be carefully packed. The household members should be well aware of the waste storage and disposal processes and hence knowledge about Waste management is important for the sustainable housing. Sustainable development goal 11 and 12 includes commitments to reduce recycle and reuse to minimize waste and to properly dispose solid waste to achieve sustainable human settlements and consumption pattern (UN, 2024).

1.3. Waste Disposal in Kerala

Kerala, a state with high density of population produces more than 10000 tonnes of waste per day. More than 90 per cent of this waste is biodegradable with high moisture content. The government of Kerala has adopted a policy of decentralized waste management and centralized management only in places where it is necessary. Local self-government and the households are equally responsible for waste management. The stake holders of institutional frame work for solid waste management in the state are local self-government, Suchitwa mission, Clean Kerala Company, Haritha Karma sena of Kudumbasree, Mahatma Gandhi National Rural Employment Guarantee Scheme and the Haritha Keralam Mission. The biodegradable waste is treated at source and nonbiodegradable waste like plastic is collected and taken to Material collection Facility (MCF) center for storage and segregation and Resource Recovery Facilities (RRF). The emphasis is to reduce recycle and Reuse. The biodegradable waste with high moisture content is treated at the source by composting. The nonbiodegradable were collected door to door by the Haritha Karma Sena (HKS) of Kudumbasree. Haritha Karma Sena is a trained group of entrepreneurs who give technical services and solutions on waste management and also carry out collection, processing, storage, segregation, transport, disposal and management of nonbiodegradable waste in collaboration with the local self-government. They charge a small user fee from the households for collecting waste. Biodegradable waste can be processed at houses in compost pits. Household level composting of kitchen waste is the preferred method. Harithakarmasena provides technical help to the households for proper waste disposal as well as spread awareness regarding proper disposal of waste. (Government of Kerala, 2022)

1.4 Review of Literature

This section deals with a brief synthesis on the knowledge, attitude and practice of waste management based on the findings of the previous studies. The concepts, findings and methodology used in the previous studies paved way for this research. The review is done on the issue of knowledge, attitude and practice of waste management among rural households

Knowledge Attitude and Practice of Waste Management among Rural Households

Community participation is essential for reducing solid waste. Homemakers attitude towards solid waste management vary based on their age education and occupation. This proves that intervention programs would significantly enhance the knowledge attitude and practices of solid waste management among homemakers (Roopa Kurbett, 2022). Providing waste management awareness may improve waste management practices. There is a serious lack of awareness regarding the E-wastes and its management (Raghavan Vivek, 2014). Waste storage is the action of accumulating the rubbish before disposal. it is important to practice waste disposal in ways that would be least harmful to the environment and health of the people (Lutui, 2001). The challenge of waste management in India is waste is unsegregated at the source. The composition of Indian solid waste is different from other developing countries. Wet solid waste should be used for compost or biogas generation and dry waste should be given for recycling and reuse (Akhilesh Kumar, 2020). Knowledge and attitude towards solid waste management is very important. Knowledge regarding solid waste management has a positive relation to attitude towards solid waste management. This attitude has a positive influence over the solid waste management practices (Gopi, 2022). Lack of experience in sorting solid waste, removal methods, knowledge about reduce recycle and reuse, absence of adequate solid waste landfills and a lack of door to door collection were the major contributing factors for improper Solid Waste Management (Hailu Eshete, 2022).

1.5. Objectives of the study

1. To analyse the Knowledge attitude and practice of household waste disposal among rural households in Kerala.

1.6 Research Methodology

A cross-sectional study was carried out among the households from rural areas of the district of Thrissur on the Knowledge attitude and practice of household waste disposal. 72 households were randomly selected and surveyed from Panancheri and Nandikkara villages. An adult member from each household was interviewed to get the data. Likert scale and binary scale questions were used to collect data for studying Knowledge, attitude and practice of waste disposal among rural households. The Data was analyzed using the SPSS software and summarized as percentages.

1.5 Results and Discussion

1.5.1. Socio-Demographic Features of the Households

The basic details of the household, which includes religion, type of family, number of family members, age of household head in years, gender of the household head, educational qualification of household head and total monthly income of the household are discussed in this section. These characteristics of the households influences their knowledge, attitude and practice of waste disposal. Table 1.1 describes these sociodemographic characteristics.

Table 1.1

Sociodemographic Characteristics of the Sample Households

SL NO	Basic Characteristic		Number of Households (%)
1.	Religion	Hindu	44(61.1%)
		Christian	26(36.1%)
		Muslim	2((2.8%)
2	Type of family	Nuclear	68(94.2%)
		Joint	4(5.8%)
3	No of family members	<5	46(65.7%)
		5 or >5	26(34.3%)
4	Age of household head in years	<50	18(25%)
		51-60	20(27.7%)
		61-70	22(30.5%)
		71-80	12(16.6%)
5	Gender of the household head	Male	60(83.4%)
		Female	12(16.6%)
6	Educational Qualification of household head	Primary school	7(9.7%)
		High school	28(38.8%)
		SSLC/10 th	19(26.3%)
		Higher secondary	4(5.8%)
		Degree/Diploma	14(19.44)
7	Total monthly Income of the household in Rupees	<10000	10(7.2%)
		10000-20000	42(58.3%)
		>20000	20(27.7%)

Source: Primary Data

As explained in the research methodology, 72 households were selected from two villages of the district of Thrissur. It was analysed that 5.8 per cent of the households belonged to joint family and 94.2 per cent of the households were from nuclear family. Considering the religious distribution, it was found out that the community represents the general trend of the religious distribution of the state of Kerala with 61.1per cent Hindus, 2.8 per cent of the households belonged to Muslim religion and 36.1 per cent of the households belonged to Christian religion. 65.7 per cent of the households had less than five members and 34.3 per cent of the households had five or more than five members. It was analysed that 83.3 per cent of the households were male headed and 16.6 per cent were female headed. The head of the households with age above sixty were 47.1 per cent and the heads of the households with age below sixty were 52.7 per cent. The educational standard of household head was examined 48.6 per cent of the household heads had

educational qualification below 10th standard, 26.3 per cent of the household heads had completed 10th standard, 5.8 per cent of the household heads had higher secondary education and 19.44 per cent household heads studied till degree or Diploma. The study analysed that 58.3 per cent of the households had income, between ₹10,000 to ₹ 20,000. In the case of 7.2 per cent of the households, the income was less than ₹ 10,000 and for 27.7 per cent of the households it was greater than ₹ 20,000.

1.5.2. General Information on Waste Disposal of Rural Households

The act of disposal of household waste is done by each household based on their basic knowledge of waste disposal and their willingness to do it properly. In rural households the household waste is managed mainly by female members. The type of household waste generated depends on the living habits and consumption pattern of the family.

Table 1.2

General Information on Waste Disposal of Rural Household

Characteristic	Type	No of houses
Major Household waste	Kitchen waste	68(94.4%)
	Plastic	2(2.7%)
	Paper	2(2.7%)
Person responsible for waste disposal	Whole family	16(22.2%)
	Female member	46(63.9%)
	Adults male and female	10(13.9%)
Methods of solid waste storage by households (one household follow more than one method)	Trash bin	41(56.9%)
	Bucket	34(47.2%)
	Sack	39(54.1%)
	Pile in the yard	12(8.3%)
	Plastic bags	13(18%)
Methods of disposing kitchen waste (one household follow more than one method)	compost	6(8.3%)
	Dump in backyard	44(61.1%)
	Used for feeding animals	35(48.6%)
	Dump in nearby land	3(4.1%)
	Bury in a pit	10(13.9%)
Methods of disposing waste water (one household follow more than one method)	Tank	21(29.1%)
	Release to backyard	48(66.6%)
	Release to road	3(4.1%)
	Give to Haritha karma sena	72(100%)

Methods of disposing plastic (one household follow more than one method)	Dump in to backyard	3(4.1%)
	Reuse	3(4.1%)
	Recycle	4(5.6%)
How often Haritha karma sena collects plastic	Once in month	46(63.9%)
	Twice in a month	26(36.1%)

Source: Primary Data

Table 1.2 describes the general information on household waste disposal of the sample households. It was analysed that for 94.6 per cent of the households, kitchen waste as the major waste produced in a day. The person responsible for waste disposal was the female member in 63.9 per cent of the households, but in 22.2 per cent of the houses, whole family was involved in waste disposal. The involvement of the whole household is a positive step towards proper waste disposal. 56.9 per cent of the households and 47.2 per cent of the households respectively stored waste in buckets and wastebins respectively whereas 8.3 per cent of the households piled up wastes in yard and store. 54.1 per cent of the households and 18 per cent of the households stored waste in sack and plastic bags. Kitchen waste was used to make compost by 8.3 per cent of the households while 61.1 per cent of the households dumped waste in the backyard. Waste water was collected in to tank by 29.1 per cent of households but 66.6 per cent of household's release wastewater to backyard and 4.1 per cent of households release it to road. Haritha karma Sena collects plastic wastes once in a month and majority (95.9%) of the households gave plastic waste to Haritha karma sena. It was found out that 4.1 per cent of the households used to throw plastic waste to backyard. This data reveals that the rural households lack proper awareness on waste disposal.

1.5.3 Knowledge of Waste Disposal

Basic knowledge about waste disposal is needed for a person to understand the importance of following proper guidelines for waste disposal. Kerala state has high literacy state but the knowledge and practices of waste disposal are very less. The household's knowledge is assessed by 10 Likert scale questions on waste management. Data on the basic knowledge of waste disposal are described in table 1.3.

Table 1.3

Knowledge on Waste Disposal

Knowledge Question	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Proper waste disposal is essential for the health of my family	50(69.44%)	18(25%)	4(5.6%)	0	0
If the waste is not disposed properly, it will affect the environment	44(31.6%)	31(43%)	2(2.8%)	3(4.1%)	1(1.4%)
Proper waste disposal is important and immediate action is needed to ensure it	36(50%)	25(34.7%)	2(2.8%)	3(4.1%)	1(1.4%)
Disposing waste by burning is harmful to health	56(77.7%)	14(19.4%)	2(2.8%)	0	0
Improper disposal of waste (solid and liquid) will lead to diarrhea, hepatitis, vomiting, fever	38(52.77%)	32(44.4%)	2(2.8%)	0	0
Disposing garbage in public places is punishable	34(47.2%)	24(33.3%)	6(8.3%)	4(5.6%)	2(2.8%)
Wet (biodegradable) and dry (Nonbiodegradable) needs to be segregated and stored separately	24(33.3%)	48(66.6%)	0	0	0
I know how to make compost from kitchen waste	14(19.4%)	6(8.3%)	5(6.9%)	19(26.4%)	23(31.9%)
Reusing and recycling plastic will reduce the use plastic	30(41.6%)	26(36.1%)	8(11.1%)	8(11.1%)	0
Liquid waste has to be removed through separate drainage to tank	40(55.5%)	28(38.8%)	2(2.8%)	0	2(5.6%)

Source: Primary Data

69.44 per cent of the households strongly agreed that proper waste disposal was essential for the health of the family. 31.6 per cent of the households strongly agreed that if the waste is not disposed properly, it will affect the environment. 77.7 per cent of the households strongly agree that burning waste is

harmful to health. 52.77 per cent of the households strongly agreed that improper disposal of waste (solid and liquid) will lead to diarrhea, hepatitis, vomiting and fever. 47.2 per cent of the households know that disposing garbage in public places is punishable. 19.4 per cent of the households knew how to make compost from kitchen waste. 41.6 per cent of the households knew reusing and recycling plastic will reduce the use of plastic. 55.5 per cent of the households are aware that Liquid waste has to be removed through separate drainage to tank. It was analysed that 50 per cent of the rural households had basic knowledge about proper waste disposal, but the rest of the sample households had incomplete information regarding waste disposal. 58.3 per cent of the sample households did not know how to make compost from organic waste. This is a major drawback since these rural households can use compost for agricultural purpose. It can be concluded from the analysis that the rural household has knowledge on waste disposal but has to have more training and constant awareness programmes should be conducted.

1.5.4 Attitude Towards Waste Disposal

The basic knowledge and awareness regarding waste disposal develops the household's attitude towards waste disposal. The attitude of sample households towards waste disposal is examined with the help of Likert scale.

Table 1.4

The attitude of Sample Households Towards Waste Disposal

Attitude questions	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Do you think school children should be specifically taught about waste disposal	40 (55.5%)	22 (30.55%)	10 (7.2%)	0	0
It is the responsibility of the household to dispose the waste produced properly	42 (58.3%)	20 (27.7%)	2 (2.7%)	2 (2.7%)	6 (8.3%)
Adequate precautions should be taken to be minimize food waste	60 (83.3%)	6 (8.3%)	0	2 (2.7%)	4 (5.5%)
The proper Disposal of waste is the collective responsibility of the state and the citizen	40 (55.5%)	25 (5.6%)	3 (4.2%)	2 (2.7%)	2 (2.7%)

The society needs a training session on Waste management	42 (58.3%)	20 (27.7%)	4 (5.5%)	3 (4.2%)	3 (4.2%)
The household can dispose the waste generated daily	26 (36.1%)	30 (41.7%)	2 (5.6%)	4 (5.5%)	10 (7.2%)
The family is trying their best to reduce the amount of daily waste produced	45 (62.5%)	9 (12.5%)	8 (11.1%)	7 (9.7%)	1 (1.4%)
I am ready to make compost out of Kitchen waste if given a training	13 (18%)	15 (20.83%)	5 (6.9%)	25 (34.7%)	16 (22.2%)

Source: Primary Data

The study analysed that 50 per cent of the households strongly agreed that waste disposal was the responsibility of the person as well as it was the collective responsibility of the state and the citizen. 58.3 per cent of households strongly agree that society should get a training in proper waste disposal. 55.5 per cent of households strongly agree that school children should be specifically taught about proper waste disposal techniques. 83.3 per cent of rural household try to minimize food waste. 62.5 per cent of households strongly agree that the household is trying to reduce the generation of waste. Only 18 per cent of rural households agree that they are willing to produce compost from kitchen waste.

1.5.5 Practices of Waste Disposal

The rural households regularly segregate plastic and give it to Haritha karma sena. However, they fail to dispose the kitchen waste and waste water properly even though 94.4 per cent of the households have knowledge about the health issues caused by this. Table 1.5 describes the waste disposal practices by the sample households.

Table 1.5

Practices of Waste Disposal

Sl No	Practice question	Yes	No
1	We give plastic bottles for recycling	72(100%)	0
2	We compost our kitchen waste	16(22.2%)	56(77.7%)
3	Do you have separate bins for collecting dry and wet waste	72(100%)	0
4	Do you have water closet toilet with septic tank	72(100%)	0
5	We try to reuse plastic in order to minimize waste generation	43(59.7%)	29(40.3%)
6.	We carry bags to the store to avoid Using Plastic bag	53(73.6%)	17(23.6)
7	We dispose waste water to tank	22(30.6%)	50(69.4%)

Source: Primary Data

At this juncture it can be noticed that all the households considered in the present study used to dispose plastic bottles for recycling, have separate bins for dry and wet waste and have a water closet latrine with septic tank. This is a reflection of their knowledge that improper disposal of wastes has detrimental effects on environment. The practices for minimizing plastic use were done by 59.7 per cent of sample households, the rest of the sample households did not put any effort to reduce the plastic waste. 30.6 per cent of the households disposed waste water to tanks attached to the washrooms. It was further analysed that release waste water to the backyard or road. 22.2 per cent of the household's compost kitchen waste the rest of 77.7 per cent of the households throw their waste to backyard or give it as a feed to animals. This improper management of throwing waste in open areas is a threat to public health.

1.5.6 Knowledge Attitude and Practice of Waste Disposal

Knowledge attitude and practice of waste disposal are inter connected. Karl Pearsons correlation is done to find out whether there exists a correlation between knowledge and practice of waste disposal attitude.

Table 1.6

Knowledge Attitude and Practice of Waste Disposal (Karl Pearsons' Correlation)

		Attitude	Knowledge	Practice
Attitude	Pearson Correlation	1	.618**	0.078
	Sig. (2-tailed)		0	0.517
	N	72	72	72
Knowledge	Pearson Correlation	.618**	1	0
	Sig. (2-tailed)	0		1
	N	72	72	72
Practice	Pearson Correlation	0.078	0	1
	Sig. (2-tailed)	0.517	1	
	N	72	72	72
** Correlation is significant at the 0.01 level (2-tailed).				

Source: Primary Data

Table 1.6 describes the Karl Pearson correlation test, for knowledge attitude and practice of solid waste management among sample households. The test shows a significant correlation of Knowledge attitude regarding waste disposal of the sample households, but there is only a weak correlation between practice and knowledge and practice and attitude. This shows the change for sustainable housing should begin from proper trainings and awareness programmes. There by empowering the rural household with the knowledge and attitude for proper waste management. On the background of improved knowledge and attitude the rural households can be prompted to practice proper waste disposal techniques.

Conclusion

The study is done to find out the knowledge attitude and practice of waste disposal among rural households in Thrissur district. The data reveals that the knowledge and attitude of rural households are correlated, but they are not correlated with the waste disposal practices To promote sustainable housing government should initiate awareness classes on waste disposal to the rural households.

Bibliography

- Akhilesh Kumar, A. a. (2020). Recent trends in solid waste management status, challenges, and potential for the future Indian cities – A review. *Current Research in Environmental Sustainability 2 (2020) 100011*, <http://dx.doi.org/10.1016/j.crsust.2020.100011>.
- Gopi, M. (2022). Knowledge attitude and Practicec in solid waste Management among urban households in Kuthuparamba Kannur District Kerala. *Asian Journal of Multidisciplinary Research and Review ISSN 2582 8088 Volume 3 Issue 3 [May June 2022]*, The Law brigade publishers.
- Gopikkuttan, G. (2002). Public housing schemes for rural poor in Kerala: A critical study of their suitability Discussion paper no 49. Thiruvananthapuram, Kerala: Kerala Research Programme on Local Level Development Centre For Developmental Studies.
- Government of Kerala. (2022). *The State of Decentralised*. Government of Kerala.
- Hailu Eshete, A. D. (2022). nowledge, attitudes and practices on household solid waste management and associated factors in Gelemso town, Ethiopia. *Ethiopia. PLoS ONE 18(2): e0278181*. <https://doi.org/10.1371/journal.pone.0278181>.
- Lutui, V. (2001). Waste management practices, perceptions and attitudes in Tonga. *Master of Science (Hons.) thesis, School of Geosciences, University of Wollongong, 2001*. <https://ro.uow.edu.au/theses/2897>.
- Nair et al. (2006). PUBLIC HOUSING SCHEMES FOR THE POOR IN KERALA: RECOMMENDATIONS FOR SUSTAINABLE HOUSING. *Conference on Sustainable Building South East Asia, 11-13 April 2005, Malaysia*. <https://www.researchgate.net/publication/268077060> DOI: 10.13140/2.1.2305.7604.
- Raghavan Vivek, C. L. (2014). Awareness, Attitude and Practice of School Students towards Household Waste Management. *Journal of Environment (2013), Vol. 02, Issue 06, pp. 147-150 ISSN 2049-8373*.
- Roopa Kurbett, P. S. (2022). , Homemakers' Attitude towards Solid Waste Management in Urban Area of Hubli-Dharwad. *International Journal of Environment and Climate Change Volume 12, Issue 12, Page 747-754, 2022; Article no.IJECC.94590ISSN:2581-8627, DOI:10.9734/IJECC/2022/v12i121510*.
- Swachh Bharat Mission, U. O. (2021). Operational Guidelines 2021 Making Cities Garbage Free. Ministry of Housing and Urban Affair, Government of India.
- UN. (2024). *Department of Economic and Social Affairs Sustainable Development*. Retrieved from United nations: <https://sdgs.un.org/goals>
- United Nations. (2024). *UN Data Source Environment Glossary*. Retrieved from UNdata A world of information: data.un.org
- United Nations Academic Impact Sustainability. (2024). *United Nations Academic Impact Sustainability*. Retrieved from United Nations: <https://www.un.org/en/academic-impact/sustainability>
- V B Minin, A. A. (2022). Sustainable rural development: implementing environmental component at local level. *IOP Conf. Series: Earth and Environmental Science 979 (2022) 012135 doi:10.1088/1755-1315/979/1/012135*.