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Participation in Household Hazardous Waste Management: A Case Study of the Dam Community, Northeast of Thailand

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Abstract:

In Thailand, Household Hazardous Waste (HHW) is usually disposed of along with general waste, since people lack accurate knowledge and understanding of how to manage HHW. Additionally, the government agencies are short of the HHW management system. The purposes of this study were, 1) to investigate HHW management, and 2) to explore public participation in HHW management. The study area was Sok Kae Village. It is located around Huai-Luang Dam, which is considered an important water resource of Udon Thani Province. The results of the study revealed that most of HHW in Sok Kae Village consisted of fertilizer containers and pesticides because most people were agriculturists. Besides fertilization and pesticide products, containers of household cleaners were also found because people utilize them in their everyday life. Regarding public participation, it was found that people participated in HHW management at a low level. The personal information affecting the HHW management significantly was the income (P-value < 0.05). People in the village suggested that there should be particular boxes and places for HHW. Moreover, people felt that it would be advantageous for them to earn an income through HHW management. This study mainly focused on the importance of the study area, which is located near the water resource. Regarding chemical contamination from HHW, this would possibly bring about issues in human health, as well as environmental pollution. For HHW management, public participation should be considered, and government agencies need a solemn policy and management system to achieve success.

Keywords: spatial pollution; wastewater; environment; eutrophication phenomenon; COVID-19 circumstances.
JEL Classification: Q53; Q51; Q56; R11.

Introduction

Household hazardous waste (HHW) is a heterogeneous waste category defined as "flammable, corrosive, reactive, caustic, and toxic" (Kummer 1999). In general, the source of HHW is household cleaning products, personal care products, unused medications, insecticides, garden pesticides, and products containing heavy metals (Diankha *et al.* 2020), such as lead, mercury, cadmium, chlorine, bromine, etc. These elements are difficult to decay, and they leave residue in the environment for a long time. Substances from HHW can cause problems with disposal. Leachate from landfills can be dangerous to the soil, surface, and groundwater. Therefore, HHW leads to human health and environmental problems (Samant *et al.* 2018; Saleh *et al.* 2020). The chemical component in HHW is harmful to human health. Moreover, most accidents with HHW occur in developing countries (Wiangnon *et al.* 2019; Bateman 2007), and this problem can be severe and difficult to control.

In Thailand, the amount of HHW is likely to increase every year. According to the Pollution Control Department (PCD) report between 2007 and 2021, HHW increased from 409,000 tons to 660,000 tons (about 61%). HHW consists of electronic products, cleaning products, batteries, fluorescent lamps, paints, and pesticides. Only 35% was disposed in the system (Ozaki *et al.* 2003; PCD, 2020). People commonly mix HHW with household waste. The local government will then collect, manage, and dispose the combined waste later. The reason people mix HHW with general waste is that they lack knowledge and proper understanding of HHW management. In addition, the local government lacks a garbage sorting, collection, and transportation system for HHW (PCD, 2018).

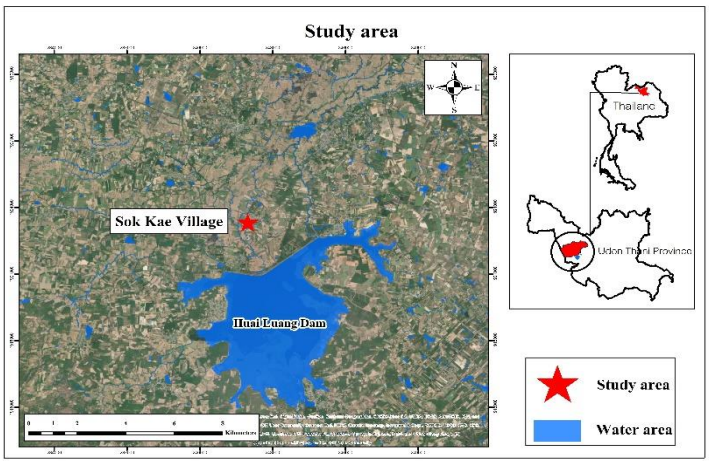
Sok Kae village is located 3 kilometres away from Huai-Luang Dam, which is considered the main water resource of Udon Thani Province. Regarding the geographical features of the village near the water resource, it can raise the risk of the chemical spill into the soil, groundwater, and eventually, the river. The critical problems of utilizing chemicals in this area are mainly pesticides and HHW without proper management. Therefore, the environment will be chemically contaminated, and it might eventually cause issues to the human health. As per the initial study, most household waste consists of general, compostable, and hazardous waste. Activities in daily life, such as cleaning the house and managing the farm, could be sources of HHW. People usually dispose HHW in general garbage, burn them, bury it into the soil, and discard it in the house. There is no HHW system management in this area, and people lack the proper understanding to manage HHW (Intasin *et al.* 2018). Consequently, the objectives of this study are to 1) collect characteristics of HHW, 2) assess the relationship of personal factors to manage HHW, and 3) examine the level of participation in HHW management. Finally, people discover the appropriate approach to managing HHW in this area.

2. Methodology

2.1 Study Area

This study was conducted in Sok Kae village, Muang Pia Subdistrict, Kut Chap District, Udon Thani Province, in the Northeast of Thailand (latitude 17°22'51.01"; longitude 102°34'17.52").

Figure 1 – Study area.



There are 187 households with a total population of 888 – 422 men and 466 women. Sok Kae village is located near the main water resource called Haui-Luang Dam, which is 3 kilometres far away from the village. The

villagers use the water from Haui-Luang Dam for consumption. The characteristic of this area is a basin surrounding water resources and an irrigation canal near the village.

2.2 Study Design and Sampling

This study was a cross-sectional survey. The sample size was 127, with respondents with a confidence level of 0.95 (Krejcie & Morgan, 1970). The focus group was 30 samples, including volunteers, community leaders, and representatives of local governments.

2.3 Data Collection

A questionnaire was used to elicit data from household respondents. It was developed from household waste management literature. The content of the questionnaire was examined by an expert to ensure content validity. The questionnaire consisted of (1) general information: gender, age, level of education, employment, monthly income, family size, and period of community living, (2) characteristics and amount of HHW, (3) participation level of HHW management with 7 questions, and (4) appropriate guidelines for managing HHW. The questionnaire's quality was determined by five experts to find out the index of item objective congruence (IOC), which was 0.89.

2.4 Statistical Analysis

Descriptive statistic data comprise of a frequency, percentage, mean, and standard deviation (SD). The participation level of HHW management was employed. It was divided into 4 levels: least (1.00–1.50), less (1.51–2.50), moderate (2.51–3.50), and high (3.51–4.00). Pearson's Correlation statistic was applied to analyse the relationship between each variable, while one-way ANOVA was used to examine each factor's difference.

3. Results

3.1 General Information

The characteristics of the respondents are summarized in Table 1. Based on 127 respondents, 62.2% were female, and most were aged between 51 and 60 (39.4%). As for the education level, 84.3% graduated from elementary school. Most respondents were farmers (91.3%). In terms of monthly income, 61.4% earned under 5,000 baht. The largest family size was between 3–4 members (38.6%). The period of community living was over 20 (37.8%).

Table 1. General information

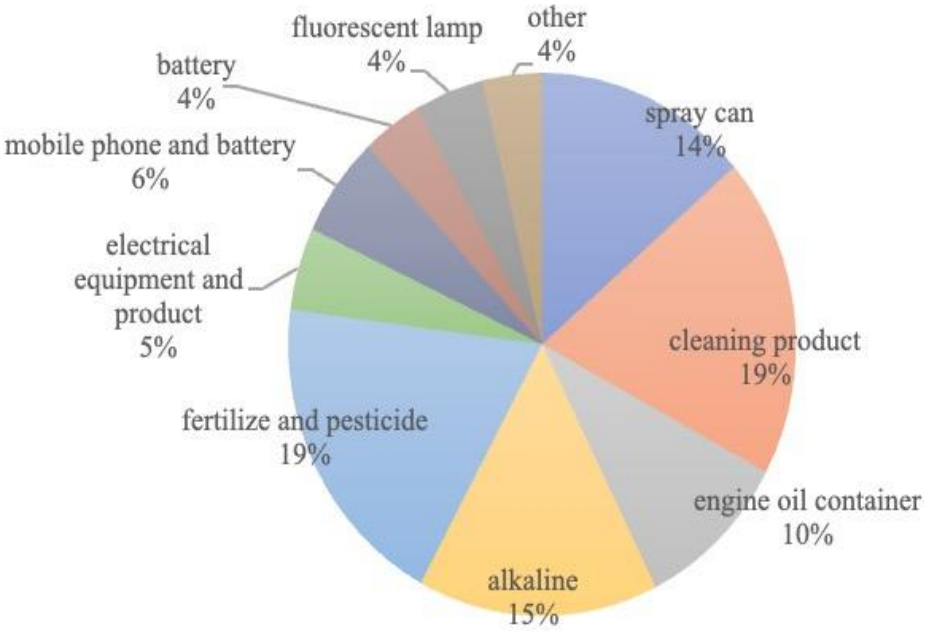
Personal Factor	Amount (%)	Average ± SD
Gender		
1. Male	48 (37.8)	1.622 ± 0.487
2. Female	79 (62.2)	
Age (Year)		
1. Under 30	0	3.913 ± 0.967
2. 31–40	14 (11.0)	
3. 41–50	23 (18.1)	
4. 51–60	50 (39.4)	
5. Over 61	40 (31.5)	
Education level		
1. Elementary School	107 (84.3)	1.213 ± 0.529
2. Middle School	13 (10.2)	
3. High School / Pt. / M.D.	7 (5.5)	
4. Bachelor's degree or higher	0	
Occupation		
1. Farmer	116 (91.3)	1.0867 ± 0.282
2. Employee	11 (8.7)	
3. Others	0	
Monthly income (Baht)		
1. Under 5,000	78 (61.4)	1.478 ± 1.069
2. 5,001–10,000	17 (13.4)	
3. 10,001–15,000	24 (18.9)	
4. 15,000–20,000	4 (3.1)	
5. Over 20,001	4 (3.1)	

Personal Factor	Amount (%)	Average ± SD
Family size (Members)		
1. 1–2	38 (29.9)	2.110 ± 0.945
2. 3–4	49 (38.6)	
3. 5–6	28 (22.0)	
4. Over 6	12 (9.4)	
Period of community living (Years)		
1. Under 5	11 (8.7)	3.772 ± 1.286
2. 5–10	12 (9.4)	
3. 11–15	20 (15.7)	
4. 16–20	36 (28.3)	
5. Over 20	48 (37.8)	

3.2 Characteristics and Amount of HHW

This study found that most HHW in Sok Kae village was commonly mixed with household waste. It was collected, managed, and disposed of in landfills by the local government once a week. Moreover, HHW was collected in the owner's place (house and farm). As most respondents were farmers, they used chemical products on the farm. Thus, fertilization and pesticide products were found the most (19%). Besides, many HHW categories from household products are shown in Fig. 2. Those products consist of cleaning products (19%), alkaline (15%), and spray can (14%). Heterogeneities of the electronic products include mobile phones and batteries (6%), fluorescent lamps (4%), and electrical equipment (5%). The others 4% were medicine, nail polish, paint house, etc. Some people were aware of the dangers of chemical substances, but there was no suitable place to trash them. Consequently, they kept some HHW, such as chemicals containing engine oil and electronic products in the house area.

Figure 2. Characteristics of HHW in Sok Kae village (Data collected from Jan to March 2020).



3.3 Level of Participation in HHW Management

The results showed that 127 respondents participated in the HHW management program at a less level overall (1.72 ± 046). The issue that the respondents most participated in HHW management was about receiving HHW information from local government and leaders (2.05 ± 0.74), but the interpretation was still at a less level. The lowest average of the participation level represented sorting out household hazardous waste before deposing (1.36 ± 0.56), which was considered the less level.

Table 2. Level of Participation in HHW Management (n=127)

Engagement Questions	Participation level (%)				Average ± SD	Results
	least	*less*	*moderate*	*high*		
1. You have offered opinion on household hazardous waste management.	33.9	52.8	11.8	1.6	1.81 ± 0.70	Less
2. You have proposed the idea of eliminating household hazardous waste.	41.7	51.2	5.5	1.6	1.67 ± 0.66	Less
3. You have been a co-planner for solving household hazardous waste.	31.5	63.8	3.9	0.8	1.74 ± 0.57	Less
4. You have provided useful information to manage household hazardous waste.	27.6	67.7	3.9	0.8	1.78 ± 0.55	Less
5. You have persuaded people in the community to participate in household hazardous waste management activities.	44.9	48.0	5.5	1.6	1.64 ± 0.66	Less
6. You sorted out household hazardous waste before deposing it.	67.7	28.3	3.9	0	1.36 ± 0.56	Lease
7. You received HHW information from local government and leaders.	25.2	44.9	29.9	0	2.05 ± 0.74	Less
Average					1.72 ± 0.46	Less

3.4 Relationship between General Information and the Participation Level in HHW Management

A study of the relationship between general information and the participation level in HHW management with Pearson's correlation consisted of 7 variables: gender, age, education level, occupation, monthly income, family size, and period of community living (Table 3). The findings showed that gender and persuasion were statistically significant ($p < 0.05$). Monthly income and proposing the idea of eliminating HHW were statistically significant ($p < 0.05$). Moreover, monthly income and persuasion, and sorting out HHW before disposing were statistically significant ($p < 0.05$). One-way ANOVA found that the difference in monthly income impacted the participation level ($p < 0.05$).

Table 3 - Relationship between general information and HHW management

Variables	Pearson's Correlation								F-test
	1	2	3	4	5	6	7	Average	
1.Gender	-0.095	-0.121	-0.014	-0.047	**-0.182***	-0.018	0.028	-0.088	1.613
2.Age	0.058	-0.058	0.017	0.009	-0.049	-0.030	-0.038	-0.019	0.808
3.Education level	0.024	0.044	-0.053	-0.056	0.040	0.006	-0.066	-0.011	1.083
4.Occupation	0.043	-0.016	0.092	0.124	-0.043	-0.050	-0.020	0.220	0.412
5.Monthly income	0.106	**0.277****	0.140	0.148	**0.184***	**0.207***	0.105	**0.223***	**2.102***
6.Family size	0.070	0.077	-0.040	0.008	0.131	0.118	0.024	0.077	1.613
7.Period of community living	-0.048	0.173	0.136	0.108	0.144	0.017	0.144	0.132	0.632

3.5 Appropriate Approach to Managing HHW

According to the previous study, people in Sok Kae village did not participate in managing HHW. Thus, the researchers organized a session for exchanging and proposing appropriate approaches to managing HHW. Stakeholders, such as the local government, schools, leaders, and health promotion hospitals were invited to the meeting. With this session, the villagers gained accurate knowledge about HHW. As shown in Table 4, the most outstanding suggestions were as follows: creating hazardous waste boxes and designating dangerous waste disposal points separated from solid waste bins (94.5%), needing to earn money from managing HHW (90.6%),

developing an action plan to handle hazardous waste, informing the public and taking serious action (80.3%), promoting a conscious approach to hazardous waste management in the public address system (78.0%), and courtesy of external agencies such as educational training, studying, and viewing work (77.2%), and persuading people to participate in household hazardous waste management (70.9%).

Table 4. Suggestions for HHW management in Sok Kae village (n = 127, more than one answer can be selected)

Suggestions for HHW management	Number of people (%)	Sequence
- Create household hazardous waste boxes and designate household hazardous waste disposal points separated from solid waste bins.	120(94.50)	1
- Create opportunities or find ways for people to earn money from managing household hazardous waste.	115(90.60)	2
- Develop an action plan for handling household hazardous waste, inform the public, and take serious action.	102(80.30)	3
- Promote conscious approach to household hazardous waste management in the public address system.	99(78.00)	4
- Courtesy of external agencies such as educational training, studying and viewing work.	98(77.20)	5
- Persuade people to participate in household hazardous waste management.	90.90(70.90)	6

4. Discussion

The study of general information showed in Table 1 found that the average age of respondents was 51 and older. Moreover, the education level of people was under middle school. These findings represented people's limitations in access to information and knowledge of HHW management, which is consistent with Amouei *et al.* (2016). They found a significant relationship between the level of education and HHW management practices. On the other hand, Ziaee *et al.* (2012) state that only 10% people with a bachelor's degree separate and dispose HHW. As almost respondents were farmers, the monthly income of respondents was under 5,000 baht. These results indicated that people mainly focused on their job and daily income rather than HHW management, which relies on the study by Chaiyarit and Intarasaksit (2021) that the separation of HHW and buyback of recyclable material could attract people.

As shown in Fig. 1, not surprisingly, most HHWs were fertilizer and pesticide containers, because there are plenty of cultivated areas there, and the respondents were farmers. Besides this, a number of cleaning products was utilized because people use them in their daily life. Pollution Control Department (2020) report that the needs and appreciation of electric appliances and electronic devices have been increasing. Technological disruption results in changing electronic devices more often for modernity. Low-quality products are imported, and these do not have a long life. These reasons lead to the increase of HHW. Although the amount of this kind of HHW in Sok Kae Village is less than other types of waste now, the aforementioned factors might cause an increase in HHW in the village in the future.

People's levels of participation in HHW management (Table 2) were less. Although people participated in receiving HHW information from the local government and leaders, they did the least: sorting out household hazardous waste before disposing it. Moreover, participation in other activities of HHW management was considered less as well, which conformed to Ozaki *et al.* (2003) and U-Tapan *et al.* (2013). They found that the HHW management system, which includes established separation, storage, collection, transportation system, and separate regulation, was poor. The relationship of general information and HHW management showed strong statistical significance between monthly income and the proposed idea of eliminating HHW ($p<0.01$), which affected people to participate in activities of HHW management (Hansasiriphot *et al.* 1988). Nonetheless, Otoniel *et al.* (2008) state that difference in income level could influence to the amount and characteristic of product. On the other hand, Chaiyarit and Pitaksanurat (2021) found that the status of respondents influenced HHW management.

The suggestion that people proposed the most was creating opportunities or finding ways to earn money from managing HHW. It related to the monthly income factor and how the separation of HHW and the buyback of recyclable material could attract people. The creation of HHW boxes, designation of HHW disposal points separate from solid waste points, and the development of an action plan for handling HHW to inform the public and take action seriously were concerned. It seems that people need the activity of HHW management. These

suggestions were related with Intarasaksit and Pitaksanurat (2019), who stated that HHW management should start at the source first and then used to create specific policy and campaigns for HHW management.

Conclusion

The results of the study showed that most respondents were females aged between 51 and 60 years. As there were plenty of cultivation areas, a lot of people were farmers, whose monthly income was under 5,000 baht. Family size was between 3–4 people, and most people lived in the area for over 20 years. Due to the lack of a proper HHW management system in the area, most of HHW were cleaning products, fertilizers, and pesticide containers. The level of participation in HHW management was less. However, the relationship between monthly income and participation in HHW management was seen to be very significant. As a consequence, people suggested to create HHW boxes, and designate HHW disposal points separate from solid waste bins. The results of this study could possibly be anticipated for the neighbouring areas. The study area was located around Huai-Luang Dam. Its geographical feature is a basin with a watercourse. If chemical substances from the residue of hazardous waste contaminate this, it might consequently lead to environmental pollution and human health issues. Therefore, the results of this present study should be proposed to government agencies and other related sectors in order to monitor and prevent the contingent problems. The suggestions obtained from the sample group should be taken into consideration, particularly the issues on the management contribution of occurring HHW and the public participation process, which might conduce to the establishment of an efficient operation system.

References

[1] Amouei A, *et al.* 2016. Knowledge, Attitude and Practice of Iranian Urban Residents Regarding the Management of Household Hazardous Solid Wastes in 2014. *Arch Hyg Sci.*, 5(1): 8-1

[2] Bateman, D. N. 2007. Household products. *Medicine* (Baltimore) November, 35(11): 620–21. DOI:10.1016/j.mpmed.2007.08.002

[3] Chaiyarit, J. and Intarasaksit, P. 2021 Household hazardous waste characterization and quantification at source in Thailand. *Journal of the Air & Waste Management Association*, 71(8): 989-994. DOI:10.1080/10962247.2021.1906355

[4] Chaiyarit, J. and Intarasaksit, P. 2021. Factors influencing appropriate management of household waste in developing country. *Asia-Pacific Journal of Science and Technology*, 26(01): 1-7

[5] Diankha, A., El hadjiMamadou Sonko, D. D., Gning, J. B., and Diop, C. 2020. Household Hazardous Waste Management: A Review. *International Journal of Recent Advances in Multidisciplinary Research*, 07(11): 6381-6388.

[6] Hansasiriphot, B., Wanphichit, L. and Ninsamrit, S. 1998. Comments on participation in garbage disposal and cleanliness of people in Bangkok. [In Thai]. Final research report. National Institute of Development Administration Research Center, Bangkok.

[7] Intarasaksit, P., and Pitaksanurat, S. 2019. Factors influencing appropriate management of household hazardous waste in Nakhon Nayok, Thailand: A multilevel analysis. *J Air Waste Manag Assoc*. 2019 Mar; 69(3): 313-319. DOI: 10.1080/10962247.2018.1536616

[8] Intasin, A., *et al.* 2018. Potential, Problems and Needs of Villagers: A Case Study of Ban Sok Kae, Moo5, Muang Phia Sub-district, Kut Chab District, Udon Thani Province. General Education Department, Udon Thani Rajabaht University.

[9] Krejcie, R. V., and Morgan, D. W. 1970. Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3): 607–610.

[10] Kummer, K. 1999. *International Management of Hazardous Wastes: The Basel Convention and Related Legal Rules*. Oxford University Press.

[11] Otoniel, B. D., Liliana, M.-B., and Francelia, P. G. 2008. Consumption patterns and household hazardous solid waste generation in an urban settlement in México. *Waste Management*, 28(1): S2-S6.

[12] Ozaki, H., *et al.* 2003. Management of hazardous waste in Thailand: present situation and future prospects. *J Mater Cycles Waste Manag*, 5: 0031–0038. DOI: https://doi.org/10.1007/s101630300006

[13] Saleh, H. M., Salman, A. A., Faheim, A. A. and El-Sayed, A. M. 2020. Sustainable composite of improved lightweight concrete from cement kiln dust with grated poly(styrene). *J. Clean. Prod.*, December 277: 123491. DOI: 10.1016/j.jclepro.2020.123491

[14] Samant, M., Pandey, S., and Pandey, A. 2018. Chapter 11 Impact of Hazardous Waste Material on Environment and Their Management Strategies. in Bhatt, P. & Sharma, A. (2018). Microbial Biotechnology in Environmental Monitoring and Cleanup. P 175 -192.

[15] U-Tapan, S., *et al.* 2013. A study of environmental contamination from hazardous waste and the community management. *Disease Control Journal*, 39(3): 258-265.

[16] Wiangnon, J., Srisatit, T., and Popradit, A. 2019. Affected Factors for Solid Waste Management in the Upstream of Watershed and Touristic Area using Analytic Hierarchy Process. A Case Study of Pai District, Thailand. *Journal of Environmental Management & Tourism*, 4 (36): 563-574. DOI:https://doi.org/10.14505//jemt.10.3(35).11

[17] Ziaee, S. *et al.* 2012. Qualitative and quantitative examination of household hazardous waste in Tehran. *Advances in Environmental Biology*, 6: 676-683.

[18] Pollution Control Department. 2018. Booklet on Thailand State of Pollution 2018. Pollution Control Department, Ministry of Natural Resources and Environment. Bangkok: S.Mongkon Press Limited Partnership

[19] Pollution Control Department. 2020. Thailand State of Household Hazardous Waste report. Pollution Control Department, Ministry of Natural Resources and Environment. Bangkok: Pollution Control Department. (in Thai).

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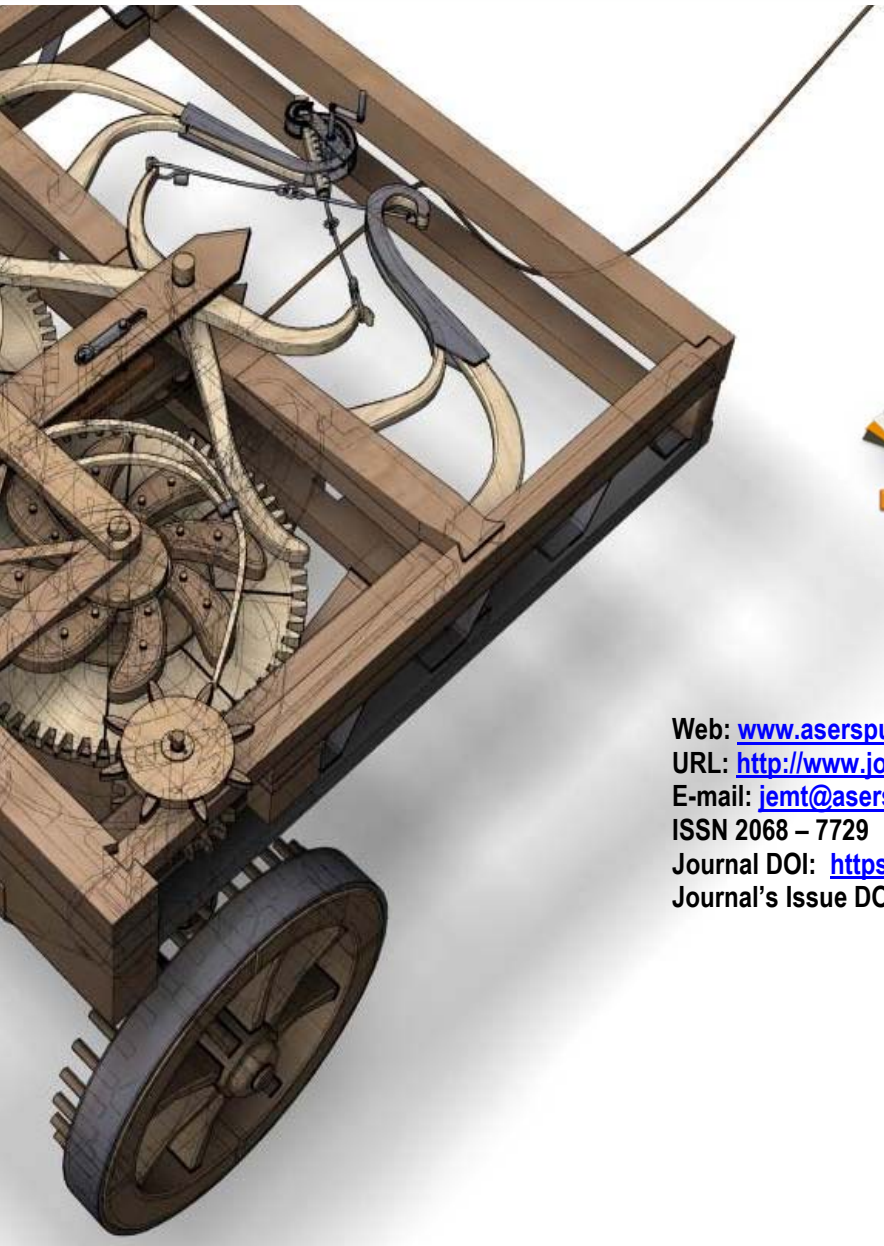

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