# RENEWABLE ENERGY ADOPTION GUIDELINE IN THAILAND FOR SUSTAINABLE DEVELOPMENT OF NEW ALTERNATIVE ENERGY: GOVERNMENT AND PRIVATE SECTORS

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## ABSTRACT

*This study was conducted to survey the opinions and suggestions of concerned people in order to find guidelines for the development of alternative energy in Thailand. The population included 5 regions i.e. north, east, center, south and northeast. The 1,500 samples were chosen by Stratified Sampling including 150 concerned people from both government and private sectors. The research instruments were questionnaire and interview. Data was then analyzed quantitatively by frequency, and percentage and also qualitatively. The results revealed that solar energy was accepted as alternative energy at the highest level ranging from the stages of knowledge, persuasion, decision, implement and adoption. People agreed with solar, biogas, wind and water energy while nuclear and thermal power was not accepted. Important factors related to the acceptance belonged to the access of information about various alternative energy. Due to lacking knowledge access on alternative energy information, the public relation on related topic was necessary. In addition, government and related local administration should be responsible for providing and supporting material price, equipment, and technology for producing alternative energy. Lastly, alternative energy should be clean energy, safe, low in capital, has no impact on environment and people.*

**Keywords:** Guidelines, Renewable Energy, Adoption.

## INTRODUCTION

Nowadays, energy consumption around the world is increasing rapidly according to the modernistic and appliances (Lokeshgupta & Sivasubramani, 2019). For reason, the demands of energy and its related services to support human social and economic development, welfare and health have been increasing. Furthermore countries all around the world are keen to identify significant factors that lead to the augmentation of energy utilization and this is the fact that the shortage of the conventional energy is not so unrealistic according to the nowadays situation and this may lead to the restriction of economic growth by shortage of energy consumption infrastructure (Phrakhruopatnontakitti et al., 2020)

For developing countries, renewable energy is a significant issue that needs to be considered intensely as a policy and in order to achieve energy sustainability on a global scale (Akbar et al., 2019; Aziz et al., 2020; Razmjoo et al., 2020). Thailand as a developing country has also been suffering the circumstance, as the statistics indicated that there are 67 percent the country relies on imported energy,



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which hugely costs around 1,053 billion BAHT (Energy Policy and Planning Office, 2019) for the reason of the growing in technology and population aspects. The economic cost of dependence of foreign energy will also likely be exacerbated with rising global energy prices and increased demand from its neighboring countries which are also developing at a fast pace. It is likely that a move to renewables could reduce this dependence on costly imported energy (Macdonald, 2012). More than 80 percent of energy used in Thailand nowadays was fuel, coal, and natural gas (Ministry of Energy, 2019). The mentioned sorts of energy are exhaustible, and the cost is continuously increasing due to the expanding of economy that consequently affected energy usage amounts of the citizens inflated for the reason that the mainstream of energy in the present is inconsistent to the principle of sustainable energy in use and expensive cost (Smuthkalin et al., 2018).

However, alternative energy development plan has to be consistent to renewable energy adoption of the citizens and stakeholders in implementation of the policies. In this stage, collaboration is needed in all sectors such as directly responsible government agencies, local administrative organization, and citizens. Although Thailand at the present has conducted around 189 projects regarding renewable energy, all of them focus on just 4 types including biomass energy, biogas, electricity from renewable energy, and solar energy (Ministry of Energy, 2019), which they are insufficient to be called as success. Accordingly, this could be that the government lacks information and knowledge of the need and adoption of renewable energy for the citizens.

In finding out sustainable alternative energy, investigating renewable energy adoption is necessary in case to gather the information of which renewable energy that suitable to the demand of Thai citizen in each area. Furthermore, the study can be used in decreasing the expenses of government in importing energy from other countries, and to manage the foundation of renewable energy development into communities along with pulling down conflicts between government and citizens, in case to efficiently develop renewable energy in the line with citizens' demand in each area. This will lead Thailand to the future of renewable energy for the success of sustainably developing alternative energy. Accordingly, the study aimed to investigate the adoption level of renewable energy of citizen in Thailand, in case to find out the guidelines of renewable energy adoption for developing new sustainable alternative energy. The contents will be presented in the following sequence: conceptual and empirical background, methods and results, conclusions and discussion.

## LITERATURE REVIEW

### Theory of Adoption

Adoption is a decision of "*full use of an innovation as the best course of action available*" and rejection is a decision "*not to adopt an innovation"* (Rogers, 2003). Rogers defines diffusion as "*the process in which an innovation is communicated thorough certain channels over time among the members of a social system*". The adoption theory is applied to understand the citizens' behaviors in adopting renewable energy since it seems to be new and challenges. Rogers (2003) has divided the stages of the adoption process into 5 stages: 1) knowledge, 2) persuasion, 3) decision, 4) implementation and 5) confirmation. The details are as follows.

The Knowledge Stage: Sardianou & Genoudi, (2013) indicated that people with higher level of knowledge related to renewable energy consumption can lead to have higher degree in willing to adopt renewable energy sources in their home. In addition, Irfan et al. (2020) have conducted research regarding



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renewable energy adoption in Pakistan and the results have shown that the adoption of energy is a complex and intricate procedure affected by a wide range of factors; it prompts traction among researchers to examine these influence factors.

The persuasion stage: herewith, Zyadin et al. (2012) indicated that studying related to attitude toward energy consumption was very much important as well as there should be a study on what are the factors that can be influencing to decide to utilize the renewable energy sources. As a result, Sardianou & Genoudi (2013) identified that age, education, income, and tax reduction can lead people to have higher degree in selecting to use the renewable energy. In addition, Keramitsoglou (2016) explored that adolescents' knowledge and perceptions can be correlated with attitudes towards renewable energy sources.

The Decision Stage: the decision stage was applied to sustainable renewable energy adoption; it can refer on how the people use the information and knowledge to evaluate the advantages and disadvantages of renewable energy. Zhou et al. (2019) found that found that the adoption processes can be compared to understanding in the role of coercion, emulation, competition and learning.

The Implementation Stage: according to Fashina et al. (2019) who studied about the drivers and barriers of renewable energy applications and development in Uganda. They found that in applying new renewable energy, measures and policies are required in case to facilitate the utilization of renewable energy in the country. In the meantime, Zhou et al. (2019) have investigated Understanding of renewable energy policy adoption and evolution in Europe in case to explore the diffusion of renewable energy policies across nation-states of Europe and found that the adoption processes can be compared to understanding in the role of coercion, emulation, competition, and learning.

The Adoption Stage: the innovation-decision already has been made, but at the confirmation stage the individual looks for support for his or her decision. According to Sahin (2006) who studied the theory of adoption, he claimed that the decision can be reversed if the individual is *"exposed to conflicting messages about the innovation".* The result of adoption sustainable renewable energy can lead to sustainable development. This is corresponding to the study done by Güney (2019), who investigated the research concerning renewable energy on sustainable development. The result of the research indicated that countries which focused on using renewable energy, it is tremendously important in making the development sustainably.

## Status of Energy in Thailand

Thailand has relied on imported energy in the number of 67 percent, which means the huge expenses has to be spending away as an exchange. For the reason, in 2015 there was government plan concerning renewable energy, called "*The Alternative Energy Development Plan (AEDP) 2015-2036*", aiming for alternative forms of energy. It supplied 30% of total energy consumption (Ministry of Energy, 2015). Within this figure, it included provision for an increase in several technologies; though primarily solar, wind, hydro, bio-energy and bio-fuels and this makes renewable energy one of Thailand's top energy priorities (Ministry of Energy, 2015).

According to AEPD plan of the government, the usage of renewable energy increased significantly regarding to energy intensity in 2019. Thailand has used renewable energy in the amount of 14,370 tons equal to crude oil which increased around 12.9 percent comparing to the same period of the previous year. Moreover, the energy intensity was continuously decreased after energy efficiency plan was conducted in 2015 (Ministry of Energy, 2019).



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## Renewable Energy in Thailand

Energy security has long been a top priority for Thailand. More than half of its energy supply relies on imported energy; a proportion is likely to increase further when its proven reserves of oil and gas are depleted, as anticipated in less than a decade, unless other indigenous energy sources are exploited. This has not only challenged security of supply but has also had significant implications for overall energy expenditure in the future (Ministry of Energy, 2017). Thailand was the first developing country to adopt renewable energy that was a Small Power Producer Program in 2002 (Greacen & Bijoor, 2007), for the reason Thailand has been giving precedence to renewable energy. Nowadays, the Ministry of Energy of Thailand has issued the strategic plan in supporting, analyzing, developing, and researching renewable energy in the country for enhancing renewable energy to be continuously sustainable in using and can be stably distributed into electricity generating system and other fields which can be divided as followed:

Solar Energy: Most of the solar energy projects in Thailand are done by government (via local government‘s demands) because the government has responsibility to take care of social security and people’s livings. Privates are not much interest in the solar energy products because it is of high investment and has slow payback period (Pattarapremcharoen et al., 2007).

Hydropower Energy: At present, there are a total of 10 Downstream Hydropower Plant Projects. The 7 projects that have finished construction and can generate power are Pasak Jolasid Dam in Lop Buri Province, Khun Dan Prakarn Chon Dam in Nakhon Nayok Province, Chao Phraya Dam in Chai Nat Province, Mae Klong Dam in Kanchanaburi Province, Naresuan Dam in Phitsanulok Province, Kwai Noi Bumrung Dan Dam in Phitsanulok Province, and Kiew Kho Ma Dam in Lampang Province.

Wind Energy: The supply of Thailand's electricity from wind power is very small compared to other energy sources. Wind energy is considered a minor resource supported by the Electricity Generating Authority of Thailand (EGAT) to reduce energy imports and improve energy security before turning to other fuels.

Geothermal Energy: Electricity Generating Authority of Thailand, in cooperation with Department of Mineral Resources, University of Chiang Mai and experts from Japan, United Stage of America, and France, studied and surveyed the geothermal power sources, focusing on 2 sites of the North which were in San Kamphaeng and in Fang Districts, Chiang Mai Province.

Biogas Energy: Most biomass and biogas power plants are located in the central and north-western Thai provinces due to the existing grid connectivity. These areas are also dominated by the agricultural sector. In 2014, biomass and biogas were accounted for 58% of the renewable energy generation in Thailand.

Nuclear Energy: The Electricity Generating Authority of Thailand (EGAT), the main power producer in Thailand, was first interested in nuclear power as an electricity option in 1967 when the electricity demand increased considerably for the first time as a result of the economic and industrial growth and after a long dormant period, the nuclear power is now reviewed as one part of the solution for future energy supply in the country. Under the current PDP (as revised in 2009), two 1,000- megawatt nuclear power plants, about 5% of total installed electricity capacity in the country, are expected to start operations during 2020-2021. EGAT will be responsible as the owner and operator of these first units of nuclear power (Namwong, 2011).



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## Conceptual Framework

According to literature review, researchers have conducted the study followed the conceptual framework as Figure 1.

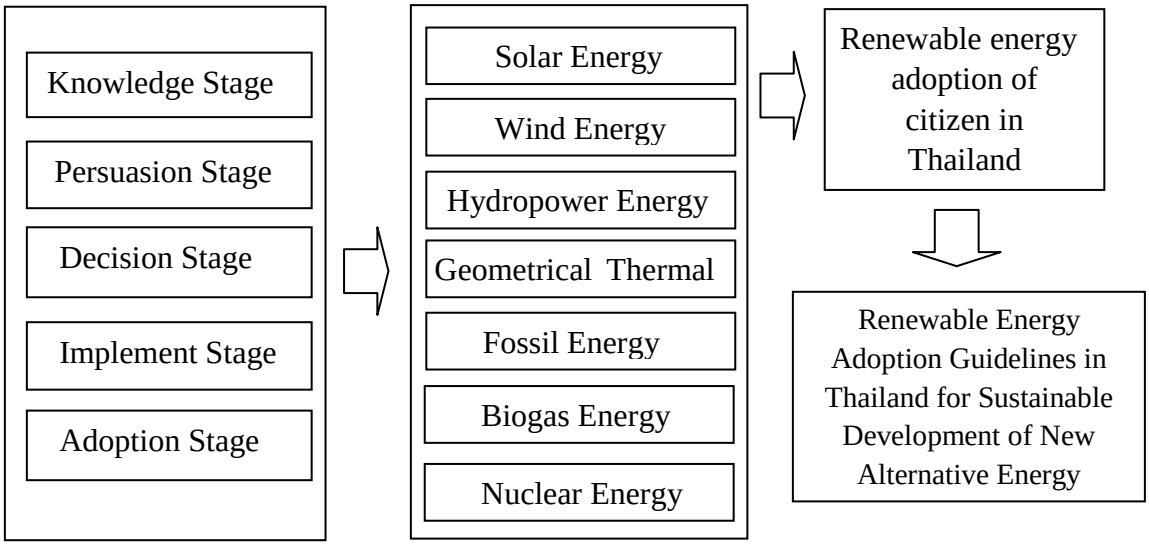


**FIGURE 1**
**CONCEPTUAL FRAMEWORK**

## RESEARCH METHODOLOGY

For the population and sample calculation, the stratified sampling was conducted in this study by divided population from 5 regions including Northern, Southern, Eastern, Northeastern in the total number of 1,500 persons. The instrument using in this study was surveyed questionnaire. Researchers have designed the questionnaires for interrogating and interviewing by using related theory and consulted with the specialists to define the structure of the questionnaires which can be divided into 2 parts including 1) background of respondent, and 2) renewable energy adoption levels of Thai citizens with 5 processes of adoption theory consisted 1) knowledge stage, 2) persuasion stage, 3) decision stage, 4) implement stage and 5) adoption stage.

In testing the questionnaire validity, the designed questionnaires were examined by 3 specialists to check the correctness and content validity if the questions were focused on the objectives of the study or not, and then corrected them all into the appropriate choices for gathering information in the next step. After the examining, questionnaire was piloted using the similar group of population in the number of 15 persons and analyzed the reliability using Cronbach's alpha, which after being tested the score was higher than 0.70 as recommended**.**

Statistics used in analyzing the gathered information was from SPSS for windows which including descriptive statistics for clarifying the frequency and percentage of background information and adoption levels and qualitative synthesizing, in case to find out the guidelines of new alternative energy development from renewable energy adoption of Thai citizens.



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## RESEARCH RESULTS

### Results of the Analyzed Information from the Questionnaires

Most of the respondents were female by 56.2% and followed by male 43.8%, the average age was at 34 with the oldest 87 years old while the youngest was 15 years old and after managed group of age, almost of the respondents were between 21-30 years old with the highest averages 29.03. Status of the respondents were single by 55.21% followed by married 38.45% and divorced/widowed with 38.40%, for the education, most of them graduated with a bachelor's degree at the percentage of 53.53%, followed by high school to high vocational certificate 22.40% and primary school to high school the lowest 18.53%. The respondents mostly earning a living as an employee with 30.67% and a merchant 15.47%. Generally, the respondents earned their salary lower than 10,000 baht as 34.47%, around 10,001–15,000, 19.33%, and 15,001–20,000 at the average of 13.07%. The respondents were not likely to be the member of society group such as a house wife group, club member, associations, or cooperative group as the average of 71.07%, in the other hand, the respondents who were the member of the mentioned group were just 28.13%.

### Results of the Analyzed Adoption Levels of Renewable Energy of Thai Citizen

Wind Energy: For the adoption stages of wind energy, it is found that in knowledge stage, the citizen demands the information regarding wind energy in high level as the average of 29.9%, in persuasion stage, the citizen was attentive in wind energy in high level, as the total of 25.9%, in decision stage, the citizen thought that wind energy is a useful renewable energy in communities in high level with 43.2%, in implement stage, the citizen suggested that it should be conducted the implement in the area before actually used in the high level by 37.8%, and adoption stage, Thai citizen willing to support the project of wind energy in high level with the average of 40.6%.

Solar Energy: The adoption of Thai citizen regarding solar energy has shown that in knowledge stage, the citizen demands the information regarding solar energy in high level as the average, 42.8%, for persuasion stage, the citizen was attentive in solar energy in high level, as 41.3%, then decision stage, the citizen thought that solar energy is a useful renewable energy in their communities in high level with 53.6%, hence in implement stage, the citizen would accept solar energy without the implement before the actually use by 48.7% and adoption stage, Thai citizen willing to support the project of solar energy in high level with the average of 48.2%.

Hydropower Energy: Hydropower energy adoption of Thai citizen was indicated that at knowledge stage, the citizen demands the information regarding hydropower energy in high level as the average, 27.2%, still persuasion stage, the citizen was attentive in hydropower energy in high level, as 26.5%, for decision stage, the citizen thought that hydropower energy is a useful renewable energy in communities in high level with 37.5%, similarly as decision stage, in implement stage, the citizen suggested that it should be conducted the implement in the area before actually used in the high level by 36.1% and adoption stage, Thai citizen willing to support the project of hydropower energy in high level with the average of 32.9%.

Geometric Thermal Energy: Unlike the others, geometric thermal energy was demanded the information in low level as the average, 51.8% for the knowledge stage, similarly in persuasion stage, the citizen was attentive in geometric thermal energy in low level, as 47.2%, in decision stage, the citizen thought that it should has an information noticing regarding geometric thermal energy before



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making decision in low level with 28.2%, in implement stage, the citizen suggested that it should be conducted the implement in the area before actually used in the high level by 27.7% and in adoption stage, Thai citizen willing to support the project geometric thermal energy in high level with the average of 20.5%.

Fossil Energy: Fossil energy adoption of Thai citizen has shown that in knowledge stage, the citizen demands the information regarding fossil energy in high level as the average, 21.4%, in persuasion stage, the citizen was attentive in fossil energy in high level, as 21.9%, for decision stage, the citizen thought that it should has an information noticed regarding fossil energy before making decision in the highest level with 32.8%, hence in implement stage, the citizen suggested that it should be conducted the implement in the area before actually used in the high level by 26.9% and adoption stage, Thai citizen willing to participate the project of fossil energy in high level with the average of 28.4%.

Biogas Energy: For the adoption of biogas energy, in knowledge stage, the citizen demands the information regarding fossil energy in high level as the average, 26.9%, as well as in persuasion stage, the citizen was attentive in fossil energy in high level also, at 24.9%, in decision stage, the citizen thought that it should has an information noticing regarding fossil energy before making decision in high level with 39.4%, also in implement stage, the citizen suggested that it should be conducted the implement in the area before actually used in the high level by 36.8% and adoption stage, Thai citizen willing to participate the project of fossil energy in high level with the average of 34.7%.

Nuclear Energy: It can be said that in this study nuclear energy was the one that the citizen most unlikely to adopt the energy as an alternative energy according to the results of 5 stages that revealed that in knowledge stage, the citizen has noticed the information regarding nuclear energy in low level as the average, 51.1%, for persuasion stage, the citizen agreed with the using of nuclear energy in low level, as 47.2%, also in decision stage, the citizen thought that it should has an information noticing regarding nuclear energy before making decision in high level with 28.2%, more over in implement stage, the citizen suggested that it should be conducted the implement in the area before actually used in the high level by 27.7%, and adoption stage, Thai citizen has shown the adoption in overview of nuclear energy in low level with the average of 38.7%.

## The Analyzed Results Regarding Renewable Energy Adoption of Thai Citizen

According to Table 1, most of respondents adopted renewable energy in fair level by 45.4%, while the average of the adoption in high level was 25.2%. Biogas energy was the most adopted in fair level with 50.5% followed by hydropower with 49.6% of fair level and then wind/fossil energy which have equal average at 49.5% of fair level and the last but not the least one solar energy, with 46.0% of fair level.

However, if considering by compounded the average of high and fair level together, the results will show that the renewable energy with the most of respondents adopted was solar energy with 85.4% of the average, followed by biogas energy, 78.6%, and the wind power at 77.4% of the average, hydropower energy, 76.5%, and the following, geometric thermal energy with 58.4 and the last one, nuclear energy by 46.2 of the average of high and fair level. For nuclear energy, most of respondents has the adoption in the compounded of high and fair level by 46.2% which can be divided into fair level by 38.7% and high level just 14.4%, furthermore nuclear energy was the most renewable energy that respondents refused the adoption as 15.1% of the average while solar energy gained the most average of high and fair level as 85.7% with 1.3% of refusing.



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**Table 1**
**THE AVERAGES OF RENEWABLE ENERGY ADOPTION IN THAILAND**

| Renewable Energies | Levels of Renewable Energy Adoption | | | | | | | | Overall Population (person) |
|---|---|---|---|---|---|---|---|---|---|
| | High | | Fair | | Low | | Refused | | |
| | Population | Average | Population | Average | Population | Average | Population | Average | |
| 1. Wind Energy | 414 | 27.9% | 734 | 49.5% | 314 | 21.2% | 21 | 1.4% | 1483 |
| 2. Solar Energy | 593 | 39.7% | 687 | 46.0% | 195 | 13.1% | 19 | 1.3% | 1494 |
| 3. Hydropower Energy | 400 | 26.9% | 737 | 49.6% | 319 | 21.4% | 32 | 2.1% | 1487 |
| 4. Geothermal Energy | 257 | 17.3% | 610 | 41.1% | 523 | 35.3% | 93 | 6.2% | 1484 |
| 5. Fossil Energy | 323 | 21.9% | 729 | 49.5% | 378 | 25.6% | 44 | 3.0% | 1473 |
| 6. Biogas Energy | 419 | 28.1% | 752 | 50.5% | 280 | 18.8% | 37 | 2.5% | 1487 |
| 7. Nuclear Energy | 212 | 14.4% | 467 | 31.8% | 569 | 38.7% | 223 | 15.1% | 1470 |
| **All Renewable Energies** | 374 | 25.2% | 674 | 45.4% | 368 | 24.8% | 67 | 4.5% | 1483 |

## Renewable Energy Adoption Guidelines in Thailand for Sustainable Development of New Alternative Energy

The guidelines of renewable energy adoption for developing new sustainable alternative energy is the government have to create the comprehension with the citizen to be conscious in necessary of renewable energy by emphasized the personnel to notice the descriptions. There should be the learning center for acknowledging and demonstrating the process of renewable energy utilization. Government should educate private sector in producing or investing renewable energy technology, and should be using public relations media in each province such as newspaper, radio networks, television networks for educating citizen and pointing out the importance of renewable energy. The technology of renewable energy to be more materialistic and contribute in the field of research for discovering further species of fuel plant which can be seed in the unused area and no effects to the other countries, not just to increase the income but also increase alternative energy which lead to the sustainable development and suitable of using. Government has to support the citizen in utilizing renewable energy by decreasing the expenses in set-up process and material costs to be purchasable price for citizen and also has to encourage using renewable energy in household. Lastly, People should be able to participate in the development of alternative energy use in each process for the sustainable of the development.

## DISCUSSION

According to the analyzed results, Thai citizen mostly adopted renewable energy in fair to high level, due to Thailand is a tropic country, utilizing solar energy is the most effective comparing to the stages of adoption theory. The citizen adoption solar energy in knowledge stage, persuasion stage, decision stage, implement stage and adoption stage, in other words, the citizen has obtained the information regarding solar energy, interested in solar energy and agreed to support the project of solar energy in their community, for reason that solar energy was not harmful or dangerous to the community which corresponded to Moss et al. (2014) who conducted the research of "*Solar Energy in Australia"* that solar energy has less damage



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comparing to the other, and more suitable for the installation, Nnamdi Eronini (2014) also said that solar energy has an enormous benefit compared to other forms of renewable energy forms, furthermore, Lizunkov et al. (2018), have said in the their research that solar energy can enable the further success in reducing energy poverty as well. Even though solar energy was the most adopted renewable energy, biogas also has got the thing in it as the citizen has obtained the information regarding biogas energy, interested in and agreed to support the project of biogas energy in their community for the case that biogas energy business has been slightly growing in the country especially in rural which corresponded to what Abbas et al. (2017) have said that "*Biogas is the best suited to the conditions of the rural and biogas is not only financially feasible but environment-friendly as well",* Kelebe & Olorunnisola (2016) who conducted research in rural of Ethiopia also said that "*Biogas energy is an alternative energy source which has the potential to fill the gap in energy needs of the rural community*", Shafie et al. (2020) who conducted the potential of using biogas in Malaysia further stated that *" Biogas can provide a huge potential in the electricity generation sector*" as the results of their study. For the renewable energy which the citizen refused or less adopted were nuclear and geometric thermal energy which the citizen mostly did not obtain information adequately and this lead to the ignorance and unenthusiastic of the citizen in noticing the information, for the case, the citizen though that it should has an information noticing regarding nuclear energy before making decision and unwilling to agree the implement in the community which corresponded to the statement of Birol (2019) that "*Nuclear power in light of concerns about safety and other issues, although still see a role for nuclear in their energy transitions but are not doing enough to meet their goals"*, according to Zaigham and Nayyar (2010) who conducted the study of geothermal energy in Pakistan, geothermal energy is a new technology and people need to await further clarification before such acceptance is possible (Abbasi & Abbasi, 2010).

## CONCLUSION

The adoption of renewable energy in this study indicated that, citizen adopted solar energy, biogas energy, wind energy and hydropower energy while geometric thermal energy and nuclear energy were not adopted. The factors for adoption was acquiring the information of renewable energies which the further clarification can lead citizen to the adoption stage cumulatively. However, it was also indicated that guidelines for renewable energy adoption in Thailand to develop new alternative energy sustainably demanded the government to notice and create a better understanding in necessity of renewable energy by using the public media in the province such as newspaper, public radio, television media and social media.

## RECOMMENDATION

For practitioners, this study can assist contribute useful information regarding Thai citizen's behavior in renewable energy adoption through five stages of adoption theory for the government so that it can consider strategizing and implementing the renewable energy adoption that can be corresponding to Thai citizens' behaviors of renewable energy consumption. Specifically, the practitioners should deliver more informative notices about the renewable energy advantages and importance, provide motivational supports and facilities, allocate the assistance for renewable energy adoption, and finally ensure the designed programs successfully enabling renewable energy adoption. In addition, this study provides renewable energy adoption guidelines in Thailand for sustainable development of new alternative energy, which it can lead to create sustainable energy consumption.



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For academicians, this study can assure that applying the adoption theory can help understand more about the citizen's behavior in deciding about renewable energy consumption. The knowledge stage can provide more understanding about the sources of information needed to be used for perception. The persuasion stage provides understanding how citizens can be encouraged and motivated to use the renewable energy consumption. The decision stage stimulates process how citizen's behavior in deciding about renewable energy consumption. Meanwhile, the implementation stage illustrates the challenges and factors affecting implementation. Lastly, the adoption stage assists to understand how the implementation can be ensured successfully.

## Recommendation for Future Study

There are various points that the future research can be taken. Firstly, this study applied adoption theory to study citizens' behaviors including knowledge searching, persuasion, decision-making, implementation, and adoption. However, there are other dimensions such as motivation to renewable energy adoption, governmental supports and facilities to renewable energy adoption, financial supports for renewable energy adoption as well as other successful factors contributing renewable energy adoption. Secondly, this study is based on survey and employs descriptive statistics including frequency and percentage to analyze the data. Therefore, the future research can expand using other statistics for higher and multiple analyses, which it can lead to oversee more relationship among the studied factors. Lastly, this study seems to be based on understanding various types of renewable energy, which is very difficult to deepen the data since each type is different according to the different geography and society's perception and attitudes. Therefore, the next study can focus on single renewable energy so that the study result can obtain deeper information and related factors, which it can contribute specifically to involved participants and stakeholders.

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