

## **Environmental Law Knowledge Affecting to Environmental Policy Formulation**

**By**

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### **Abstract**

The populations were local administrators of Sub-district Administrative Organization (SAO) of Maha Sarakham Province in fiscal year of 2021. The Simple Random Sampling technique was conducted with 400 local administrators. The questionnaire used an instrument for data collection. Multiple Regression Analysis is an inferential statistic for data analysis. Descriptive statistics were mean, and standard deviation. The objective of research was to predict the environmental law knowledge influencing to environmental policy formulation. The finding showed that the prediction equation of relationship between independent variables of Environmental Damage (X1), Natural Resource Damage (X2), Ecological Damage (X3), Civil Liability (X4), Criminal Liability (X5), and Administrative Liability (X6) affecting to Environmental Policy Formulation (Y) of local administrators. It can be explained that Criminal Liability (X5) was the most effect to Environmental Policy Formulation (Y) with 41.20 percent with statistical significance at level of 0.01. However, the other factors also assist to support effective environmental policy formulation of local administrators. To formulate environmental policy, the local administrators need to have actual knowledge and clear understanding in all aspects of environmental law such as environmental damage, natural resource damage, ecological damage, civil liability, criminal liability, and administrative liability, thus they can formulate the effective environmental policy for SAO.

**Key Words:** Environmental Law Knowledge/ Affecting/ Environmental Policy Formulation

### **Introduction**

Currently, environmental degradation is dramatically occurrence unavoidably since the economic expansion and technological advance, these lead to easier huge consumption of natural resources for serving people requirements of their living. Moreover, the rapid growth of global population due to the progressive of science and technology also supports longer live than the past so it causes the accumulation of population reaching 8 billion at the middle of year 2022. As results, diverse countries including Thailand realize to the importance of environmental and ecological conservation and pay more attention to environmental problems and crisis (Senachai, 2009, Sahney, et al., 2010, Thiengkamol, 2011e, Thiengkamol, 2020, & Kaewhao, 2022).

Sustainable development) refers to a pattern of development that serves the need of present generation without compromising to the next generation requirements to response their needs. According to the Basic Principles or Key Principles that compose of economic perspective, ecological perspective, and social perspective, these are managed the balance of the three systems harmoniously without loading to any systems. These will lead human beings to accomplish real sustainable development (Thiengkamol, 2011e, Thiengkamol, 2020, & Kaewhao, 2022).

Thailand, the Act of National Environmental Quality Promotion and Maintenance B.E. 2518 is the first environmental law was declared, the second act was published in B.E. 2521 and the third was released in B.E. 2522. Presently, the Act of National Environmental Quality Promotion and Maintenance B.E. 2535 contains 115 sections and is still actively used. However, at present the new act is still under preparation to be formulated. This new act requests the Thai citizen participation together with the attention of non-governmental organization (NGOs), therefore, it still in the process of formulating. Subsequently, the environmental argument at hearing phase is beneath the obligation of civil court, criminal court, and administrative court consideration. These depend on the fact of each case. Furthermore, particularly actual case decision, it had numerous difficulties in different subjects and had not yet offered exclusive decision. However, there are no guidelines for improvement, because most of the problems were directly decided by justice consideration and most topics were not yet made a judge. To keep the proactive role of the court, it needs more information that can validate the environmental cases to be applied for a similar case. Consequently, decision making of environmental cases with the standard of international criterion, and assessments with awareness of environmental matters must be considered (Intasaro, 2007, Rueangsri, 2009, Kodmhai.com., 2014).

The enactment of laws, rules and regulations must include punishments appropriate to the offense that how far and wide impact will affect people's quality of life. It also needs to be seriously enforced by the actions of officials who may directly establish environmental police. To have the knowledge to strictly maintain the law, it is useful in enforcing laws and regulations by adopting the principle that "Polluter Pays Principle: PPP ." The Polluter Pays Principle, it was presented by the Organization for Economic Co-operation and Development (OECD) since the 1970s and has been accepted until today. The main principle is removing the cost of polluting the environment (environmental costs) or external effects (externality) into the cost of producing goods and services that affect the environment. This will increase the cost and price of such goods and services. It causes producers and consumers to change their behavior and take responsibility for their actions, which will be beneficial to the preservation of environmental quality. The polluter pays principle solves the problem of market failure caused by environmental failure. This will cause the cost of goods and services to not truly reflect social costs. This results in the production and consumption of goods and services that are more destructive to the environment than they should be. The aforementioned principles can also be applied in natural resource management by assigning resource users to be responsible for the degradation from the use of natural resources or may be called the User Pays Principle (UPP). UPP is a variation of the polluter-pays principle that calls upon the user of a natural resource to bear the cost of running down natural capital. (Thiengkamol, 2020, European Environment Agency, 2022, & Kaewhao, 2022).

Thailand, 2017 Constitution, Section 43, Section, Rights and Liberties of the Thai People stipulates that a person and community has the right in issue 3, people can sign a petition to suggest to government agencies to implement what action would be useful to people or communities or refrain from taking action that will affect is the peaceful living of the people or the community. They will get notified of the results of consideration quickly. However, government agencies must consider the proposal. That recommendation by allowing the relevant people to have participate in the consideration in accordance with the procedures provided by law. According to Section 58, any action taken by the State, or which the State will allow any person to undertake if such action may affect natural resources. Environmental quality, health, sanitation, quality of life or any other significant interests of the people or communities or the environment severely. The state must conduct a study and assess the impact

on the quality of the environment and the health of the people or communities and arrange for the opinions of stakeholders, relevant people, and communities to be heard first to be assembled consideration of operations or permits as provided by law. Individuals and communities shall have the right to receive information, clarifications, and reasons from government agencies prior to the operation or permission under paragraph one. In carrying out or granting permission under paragraph one, the state must be careful to minimize impacts on people, communities, the environment and biodiversity. They must proceed to remedy the suffering or damage to the affected people or communities fairly and without delay (Langarbindhu, 2018, & Kaewhao, 2022).

Environmental law knowledge is composed of Environmental Damage, Natural Resource Damage, Ecological Damage, Civil Liability, Criminal Liability and Administrative Liability. Environmental damage or degradation is the declination of the environment with reduction of resources such as soil, water and air, the devastation of ecosystems and the elimination of wildlife. Ecological damage is described as the effects of all possible environmental deprivation. Ecological destruction has been an essential factor in the diminution of various ecosystems. This also impacts the way of subsistence of a certain organism in its environment. In civil cases, civil liability is not required the responsible for release the problem by paying money or other object to alleviate trouble occurrence because most civil actions involve claims that the defendant harmed the claimant by means of neglect rather than unlawful actions. Criminal liability is any liability, fine, criticism or other official permission or approval for an action that resulted from the defilement of any criminal law. Administrative liability is one of the sorts of lawful liability in the manner of a negative reaction of the authorized bodies of a specific state to administrative illegal action committed by an individual. In public or commercial purchasing, this person may be the customer's representative (Preston, 2005, Intasaro, 2007, Scott, 2008, Senachai, 2009, Kamin, et al., 2014, Borvornsakulcharoen et al., 2015, Thiengkamol, 2020, & Kaewhao, 2022).

Environmental Law Knowledge Influencing to Environmental Policy Formulation is an important issue for local administrators of Sub-district Administrative Organization (SAO) of Maha Sarakham Province to conserve the environment quality and ecological system protection to meet the real sustainable development because if they can formulate an effective policy of environment law. This will persuade and enforce the local people to participate in environmental quality control and ecosystem conservation with knowledge and understanding in environmental law by regarding all aspects of environmental damage, natural resource damage, ecological damage, civil liability, criminal liability, and administrative liability. Thus, the local community will achieve the sustainable environment and ecosystem undoubtedly (Kamin, et al., 2014; Borvornsakulcharoen et al., 2015; Thiengkamol, 2020; & Kaewhao, 2022).

Before formulating environmental policy for the conservation and utilization of resources. Natural balance and sustainability at the local level to support the achievement of national sustainability, therefore, it is necessary for local administrators to have knowledge and understanding of environmental laws both nationally and locally. However, environmental law includes both domestic law and international law. The internal environmental laws are governed by both civil and criminal law enforcement, criminal, and administrative facets. The main principles of environmental law include the precautionary principle. The polluter pays principle, strict liability principles, principles of Public Participation, the principle of decentralization, securities rights or sovereign rights (Kramer, 2018; Borvornsakulcharoen et al., 2015).in the

Currently, to formulate environmental policy any country or community, it depends on the environmental facing problem because each community or country has different context. Therefore, it requires a clear intent to comply with the vast range of environmental legislation which may affect any community or country. An environmental policy is a clear expression of community or country to achieve its commitment to green issues and a reduction in the wider environmental impact of its management and operations. It sets out several environmental improvements that can be determined to follow environmental policy formulation. Creating a company environmental policy can provide some serious benefits such as waste reduction, energy conservation, monitoring and reducing environmental and ecological impacts, transferring environmental knowledge, persuade people participation, preventing events, and aid behavior change at individual and community level. Final result of the effective environmental policy will issue the excellent action plan and program implementation (Howlett, and Mukherjee, 2017; British Assessment Bureau, 2022; Thiengkamol, 2020; & Kaewhao, 2022). However, the basic contents and concepts of environmental policy should cover natural resources, environment quality, ecosystem balance, decrease all soil, water, and air pollution, waste reduction, and energy conservation (Thiengkamol, 2020; & Kaewhao, 2022).

Thailand, national environmental policy issued regarding to 1) manage the natural resource base firmly for balance and fairness and sustainability, 2) generate green growth for prosperity and sustainability, 3) raise the level of measures for managing natural resources and environment, and 4) build partnerships in natural resource management and environment (Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment, 2018). To accomplish the national policy as mentioned above, SAO needs to formulate the policy to support these national policies to effectively succeed. Thus, the policy at the local level should pay attention to natural resource and environment conservation, energy management, waste reduction, people participation, knowledge transferring, and behavior change. These need to integrate into the local policy formulation with positive legal cognition of local people (Pimdee et al., 2012a; Kotchachote et al., 2013a; Kamin et al., 2014; Srikaewtoom et al., 2014; Thiengkamol, 2020; Chena et al., 2020; & Kaewhao, 2022).

Consequently, this research will provide the guideline for local administrators of SAO in Maha Sarakham Province to formulate the applicable environmental policy as effective model for other provinces of the country as well.

## **Methodology**

The research design was conducted step by step as follows:

The population were local administrators of 143 Sub-district Administrative Organization (SAO) in Maha Sarakham Province and each SAO has 12 administrators, thus there are 1,716 local administrators in fiscal year of 2021 (Department of Local Organization, 2022). The simple random sampling technique was used to collect the samples of 400 local administrators from 143 Sub-district Administrative Organization (SAO) in Maha Sarakham Province, Northeastern in Thailand. The size of sample was calculated by Taro Yamane Formula  $n = N / (1 + Ne^2)$ . The sample size was 324 at least with a confident interval with 95% or 5% error (Yamane, 1973).

The research instrument was the questionnaire with 89 items and it was used for data collection. The content and structural validity were determined by Item Objective Congruent  
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(IOC) by 5 experts in the aspects of environmental law, policy maker, social science, local administrative scholar, and environmental study. The accepted value of content validity was more than 0.5. The 5-rating scale of Likert's scale were used for each item evaluation by starting from 1 as strongly disagree to 5 as strongly agree. There are 7 items for each issue of environmental law knowledge covering environmental damage, natural resource damage, ecological damage, civil liability, criminal liability and administrative liability. The environmental policy formulation covering natural resource and environment conservation, energy management, waste reduction, people participation, knowledge transferring, and behavior change. The reliability was determined by Cronbach's correlation and the accepted level was higher than 0.8 (Hair, et al., 2010; & Thiengkamol, 2016).

The descriptive statistics was employed for mean and standard deviation explanation and inferential statistics as multiple regression analysis was used for data analysis for predicting the correlation of environmental law knowledge toward environmental policy formulation.

## Results

### ***Results of Demographic Characteristics of Sample Group***

The finding revealed that the demographic characteristics of local administrators, most of them are 256 males (64.00%), work experience more than 5 years 223 people (55.75%), married status with 278 people (69.50%), most of them got bachelor degree 328 people (82.00%), and live in the SAO area 350 people (87.50%)

### ***Results of Environmental Law Knowledge***

Environmental law knowledge regards to environmental damage, natural resource damage, ecological damage, civil liability, criminal liability and administrative liability. The results are presented in Table 1. Local administrator had environmental law knowledge in the aspect of criminal liability at the highest level with a mean of 4.32. Subsequences were ecological damage with the mean of 4.27, and 1. Environmental damage with the mean of 4.25 respectively.

**Table 1. Mean and Standard Deviation of Environmental Law Knowledge**

Environmental Law Knowledge	Mean	Standard Deviation
1. Environmental Damage	4.25	1.23
2. Natural Resource Damage	4.18	1.56
3. Ecological Damage	4.27	2.01
4. Civil Liability	4.02	1.78
5. Criminal Liability	4.32	2.03
6. Administrative Liability	4.16	1.68
Total Environmental Law Knowledge	4.20	1.92

### ***Results of Environmental Policy Formulation***

Environmental policy formulation covers natural resource and environment conservation, energy management, waste reduction, people participation, knowledge transferring, and behavior change. The results are presented in Table 2. The local administrator had Environmental Policy Formulation in the aspect of people participation at the highest level with mean of 4.52. Subsequences were waste reduction with the mean of 4.45, and energy management with the mean of 4.38 respectively.

**Table 2.** Mean and Standard Deviation of Environmental Policy Formulation

Environmental Policy Formulation	Mean	Standard Deviation
1. Natural Resource and Environment Conservation	4.34	2.23
2. Energy Management	4.38	2.16
3. Waste Reduction	4.45	2.19
4. People Participation	4.52	1.99
5. Knowledge Transferring	4.13	2.34
6. Behavior Change	4.36	2.01
Total Environmental Policy Formulation	4.35	2.25

**Results of Multiple Analysis of the Correlation of Environmental Law Knowledge toward Environmental Policy Formulation**

The relationship between independent variables of Environmental Law Knowledge affecting dependent variable of Environmental Policy Formulation of local administrators presented in table 3 and 4.

**Table 3.** Result Analysis Prediction Power of Environmental Law Knowledge Affecting Environmental Policy Formulation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.805	0.703	0.678	0.175
a:	Predictors: Constant, Environmental Damage, Natural Resource Damage, Ecological Damage, Civil Liability, Criminal Liability, and Administrative Liability			
b:	Dependent Variable: Environmental Policy Formulation			

From table 3, after Multiple Linear Regression was analyzed between independent variable of Environmental Damage (X1), Natural Resource Damage (X2), Ecological Damage (X3), Civil Liability (X4), Criminal Liability (X5), and Administrative Liability (X6) affecting dependent variable Environmental Policy Formulation. It revealed that regression coefficient equaled to 0.805 (80.50%) and coefficient of a R Square was 0.703 (70.30 %) with statistical significance at level of 0.01. After it was adjusted, the coefficient of R Square with power of prediction was 0.678 (67.80%).

**Table4.** Multiple Linear Regression Analysis between Environmental Law Knowledge Affecting Environmental Policy Formulation

Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	51.138	6	8.523		
	Residual	16.759	393	0.043	297.048	0.000**
	Total	67.897	399			

a: Predictors: Constant, Environmental Damage, Natural Resource Damage, Ecological Damage, Civil Liability, Criminal Liability, and Administrative Liability  
 b: Dependent Variable: Environmental Policy Formulation

From table 4, after Multiple Linear Regression was analyzed between independent variable of Environmental Damage (X1), Natural Resource Damage (X2), Ecological Damage (X3), Civil Liability (X4), Criminal Liability (X5), and Administrative Liability (X6) affecting dependent variable Environmental Policy Formulation. It revealed that the variance value of F-test: Variance Ratio Test was conducted, and the value is 297.048 with statistically significant at 0.01.

**Table 5. Coefficients of Independent Variables Affecting Environmental Policy Formulation**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std .Error	Beta		
3	Constant	0.059	0.151	-	0.393 0.695
	Environmental Damage (X1)	0.103	0.035	0.091	5.898 0.004**
	Natural Resource Damage (X2)	0.162	0.037	0.124	9.356 0.005**
	Ecological Damage (X3)	0.352	0.039	0.423	11.845 0.000**
	Civil Liability (X4)	0.308	0.036	0.362	11.413 0.000**
	Criminal Liability (X5)	0.412	0.038	0.210	12.049 0.000**
A	Administrative Liability (X6)	0.292	0.036	0.356	10.049 0.000**

A Dependent Variable: Environmental Policy Formulation

From Table 5, linear regression equation, it revealed that independent variables of Environmental Damage (X1), Natural Resource Damage (X2), Ecological Damage (X3), Civil Liability (X4), Criminal Liability (X5), and 6) Administrative Liability (X6) affecting to dependent variable of Environmental Policy Formulation (Y) of local administrators, with statistical significance at level of 0.01 for all aspects of independent variables of Environmental Damage (X1), Natural Resource Damage (X2), Ecological Damage (X3), Civil Liability (X4), Criminal Liability (X5), and Administrative Liability (X6) are able to predict Environmental Policy Formulation (Y) of local administrators, then, the equation 1, was written as the following.

$$y = a+b_1x_1+b_2x_2+ b_3x_3+b_4x_4+b_5x_5+b_6x_6 \quad (1)$$

When

y = Environmental Policy Formulation as Dependent Variable

a = constant value

b1 = Coefficient relation of Environmental Damage as Independent Variable

x1 = Environmental Damage as Independent Variable

b2 = Coefficient relation of Natural Resource Damage as Independent Variable

x2 = Natural Resource Damage as Independent Variable

b3 = Coefficient relation of Ecological Damage as Independent Variable

x3 = Ecological Damage as Independent Variable

b4 = Coefficient relation of Civil Liability as Independent Variable

x4 = Civil Liability as Independent Variable

b5 = Coefficient relation of Criminal Liability as Independent Variable

x5 = Criminal Liability as Independent Variable

b6 = Coefficient relation of Administrative Liability as Independent Variable

x6 = Administrative Liability as Independent Variable

Thus, the prediction equation of relationship between independent variables of Environmental Damage (X1), Natural Resource Damage (X2), Ecological Damage (X3), Civil Liability (X4), Criminal Liability (X5), and Administrative Liability (X6) affecting Environmental Policy Formulation (Y) of local administrators. It can be explained that Criminal Liability (X5) was the most effect to Environmental Policy Formulation (Y) with 41.20 percent with statistical significance at level of 0.01. Subsequences were Ecological Damage (X3) with 35.20 percent, Civil Liability (X4) with 30.80 percent, Administrative Liability (X6) with 29.20 percent, Natural Resource Damage (X2) with 16.20 percent, and Environmental Damage (X1)with 10.30 percent at statistical significance at level of 0.01 as the following equation 2.

Equation prediction in terms of raw score was demonstrated as the following equation 2.

$$Y = 0.059 + 0.103X_1 + 0.162X_2 + 0.352X_3 + 0.308X_4 + 0.412X_5 + 0.292X_6.2$$

Equation prediction in term of standard score was demonstrated as the following equation 3.

$$Zr=0.091Z_1+0.124Z_2+0.423Z_3+0.362Z_4+0.210Z_5+0.356Z_6.3$$

## Discussion

The results illustrated that Criminal Liability (X5) affecting dependent variable of Environmental Policy Formulation (Y) of local administrators with the highest effect of 41.20 percent with statistical significance at level of 0.01. This indicated that Criminal Liability (X5) is an essential factor for Environmental Policy Formulation. Therefore, local administrator should employ this factor to emphasize the attention of local people to aware to comply with environmental law practice by perform the better participation through the environmental conservation behavior with regarding on the issues of natural resource and environment conservation, energy management, waste reduction, people participation, knowledge transferring and behavior change. The results are congruent to the studies of Kamin et al., 2014; Bootrach et al., 2015a; Borvornsakulcharoen et al., 2015; Tippalert et al., 2015; Wongsueb et al., 2015; Sutthiphapa et al., 2016. Consequently, Ecological Damage (X3) is another essential factor that affected Environmental Policy Formulation (Y) of local administrators with 35.20 percent. The result is pertinent to the study of Wongsompong et al., 2016. Furthermore, Civil Liability (X4) can forecast the Environmental Policy Formulation (Y) of local administrators with effect of 30.80 percent and it is also in line with the study of Borvornsakulcharoen et al., 2015. However, Administrative Liability (X6) also plays another important factor for Environmental Policy Formulation (Y) of local administrators with effect of 29.20 percent. To formulate environmental policy for each community, it requires the current environmental problem and environmental quality including understanding the situation social norm and way of local people life. Thus the local administrators who were elected by should understand all aspects of economic, environment and social context, thus they should be able to formulate the proper environment policy that is appropriate to their local community. However, this research it demonstrated that the finding shows the 3 important issues of Ecological Damage, Civil Liability, and Criminal Liability are required put in the environmental policy as priority considerations.

## Conclusion

The findings showed that the criminal liability plays a very important role in regulating the environmental policy formulation of local administrators. Moreover, environmental law knowledge of environmental damage, natural resource damage, ecological damage, civil liability, and administrative liability are also other critical variables to assist and support for environmental policy formulation of SAO. Therefore, if the local administrator can formulate the proper environment policy for their community, this will lead to change the local people to participate in environment and natural resource by acquiring knowledge and altering their behavior with complying environmental law seriously. Finally, sustainable development will happen in the community and will support better life quality of local people as well.

## References

- British Assessment Bureau. (2022). Environmental policy: confirming your green credentials. Retrieved from 28 Nov 2022: <https://www.british-assessment.co.uk/insights/writing-an-environmental-policy/>
- Bootrach, P., Thiengkamol, N., Thiengkamol Khoowaranyoo, T. (2015a). Environmental

- Education Strategy. *Journal Applied Environmental Education and Communication.* 14, 200-212.
- Borvornsakulcharoen, D., Thiengkamol, N., Thiengkamol Khoowaranyoo, T. (2015). Model of Environmental Law Knowledge for Undergraduate. *Journal of Industrial Education,* 14(3), 734-740.
- Department of Local Organization. (2022). Name List of Local Organization of Maha Sarakham Province. Retrieved from 28 Nov 2022, <http://www.dla.go.th/index.jsp>
- European Environment Agency. (2022). user-pays principle. Retrieved from 28 Nov 2022, <https://www.eea.europa.eu/help/glossary/eea-glossary/user-pays-principle>.
- Hair, J., Black, Jr, W., Babin, B. & Anderson, R. (2010). *Multivariate Data Analysis.* 10th ed. New Jersey: Prentice Hall.
- Howlett, M. and Mukherjee, I. (Eds). (2017). *Handbook of policy Formulation.* Cheltenham: Edward Elgar Publishing.
- Intasaro, W. 2007. Proactive Role of the Court in Management of the Environmental Cases: A Case Study of the Office of the Court Region 5 and the Court of Appeal Region 5. Independent study for Master of Art (Political Economy) Chiang Mai: Chiang Mai University.
- Kaewhao, S. (2022). *Environmental Management for Sustainability.* Bangkok: Chulalongkorn University Press.
- Kamin, P., Thiengkamol, N., Thiengkamol Khoowaranyoo, T. (2014). Environmental Education and Public Mind Affecting Forest Conservation Behavior. *Journal of Industrial Education,* 13 (3): 181-187.
- Kodmhai.com. (2014). Act of National Environmental Quality Promotion and Maintenance B.E. 2535. Retrieved from 27 Feb 2014 <http://www.kodmhai.com/m4/m4-9/H12/M1-11.html>
- Kotchachote, Y., Thiengkamol, N., Thiengkamol Khoowaranyoo, T. (2013a). Causal Relationship Model of Forest Fire Prevention. *European Journal of Scientific Research,* 104 (3), 519-532.
- Kramer, L. (2018). *Principles of Environmental Law.* Cheltenham: Edward Elgar Publishing.
- Langkarbindhu, K. (2018). The Right to Healthy Environment in Constitution of Thailand:
- Comparing Law with Foreign Countries .law journal Naresuan University 10(1):47- 61
- Lhaophet, N. Thiengkamol, N., Thiengkamol, C. (2016). Environmental Education Factor Affecting Waste Management Behavior of Villager. *EAU Heritage Journal: Science and Technology.* 10 (1), 145-156.
- Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (2018). Policies and plans to promote and maintain National Environmental Quality Act 2017 – 2036. Bangkok: Office of Natural Resources and Environmental Policy and Planning.
- Pesotskaya1, E., Selyutina, L., and Chernykh1, A. (2020). Modern aspects of the formation and implementation of environmental policy in an urban conditions. IOP Conf. Ser.:Mater. Sci. Eng. 880 012069
- Pimdee, P., Thiengkamol, N., & Thiengkamol, T. 2012a. Causal Relationship Model of Electrical Energy Conservation. *European Journal of Social Sciences,* 32(3), 306-315
- Preston, B.J. (2005). "The Role of the judiciary in Promoting Sustainable Development: The Experience of Asia and Pacific" *Asia Pacific Journal of Environmental Law,* 9, 109-212.
- Rueangsri, V. (2009). *Valuation of Environment: Experience from the Courts in United State of America. New Approaches on Development of Environmental Judicial Process.* Bangkok: Office of the Judiciary

- Sahney, S., Benton, M.J. & Ferry, P.A. (2010). Links between global taxonomic diversity, ecological diversity and the expansion of vertebrates on land. *Biology Letters*, 6(4), 544-547.
- Scott, M. (2008). Glossary. NASA Earth observatory. Retrieved from 11 Feb 2012 [http://earth observatory.nasa.gov/Glossary/index.php?mode=alpha&seg=e](http://earthobservatory.nasa.gov/Glossary/index.php?mode=alpha&seg=e).
- Senachai, F. (2009). Citizen Suit in Environmental Case. Thesis for Master of Law. Bangkok: Thammasat University.
- Srikaewtoom, N., Thiengkamol, N., Thiengkamol, C. (2014). Development Model of Biodiversity Conservation. Environmental Conservation. *Journal of Industrial Education*, 13 (3), 142-148.
- Sutthiphapa, N., Thiengkamol, N., Thiengkamol C. (2016). Model of Environmental Education Influencing Green Consumption Behavior *EAU Heritage Journal: Science and Technology*. 9 (3), 107-120.
- Thiengkamol, N. (2011e). Environment and Development Book. (4th ed.). Bangkok: Chulalongkorn University Press.
- Thiengkamol, K. N. (2016). Theory Development with LISREL Research. Bangkok: CU Printing House.
- Thiengkamol, K. N. (2020). Administration of Sustainable Environment and Naturak Resource Book. Bangkok: Se-Ed E-Book Online.
- Tippalert, T., Thiengkamol, N., Thiengkamol C. (2015). Model of Ecological Ethics for Environmental Conservation for Undergraduate. *Journal of Industrial Education*, 14(3).703-710.
- Yamane, T. (1973). Statistics: An Introductory Analysis. 3rd ed. New York: Harper and Row