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# Users' Awareness, Attitudes, and Perceptions of Health Risks Associated with Excessive Lighting in Night Markets: Policy Implications for Sustainable Development

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**Abstract:** The introduction of artificial lighting has dramatically transformed nighttime activities, becoming a very positive but also disruptive factor that must be optimized and adapted according to the guidelines of sustainable policies. In this framework, night markets in Thailand are definitely popular destinations among locals and tourists that are found in every town and city in the whole country, being the source of livelihoods for many people. It is well-known that shops in night markets frequently use colorful light sources, emitting high levels of illumination to attract customers. Since previous research has shown environmental risks of inappropriate lighting on human health and well-being, as well as on ecosystems, excessive lighting in night markets could have adverse effects on vendors' health if they are exposed to high illumination levels during long hours every night. This is a risk for people, but also for their attachment to their lands, traditions, culture, and way of life. This study was designed to explore whether excessive illumination of night markets has impacts on vendors' health and well-being. The research was conducted through an empirical study in a night market in the center of Surin province (Thailand), using observations and a questionnaire survey of 205 vendors and clients (non-vendors). The results show that night markets' vendors were more likely to suffer from eye- and sleep-related problems than non-vendors. Women were affected more than men. The results also revealed that the majority of both vendors and non-vendors tended to have awareness about excessive lighting impacts on human health, with more vendors tending to agree with the fact than non-vendors. Although night markets' are their main source of income, the majority of vendors were more unlikely to agree about the contribution of night markets to local livelihoods and development than non-vendors. These findings have implications for the Thai Authority in setting up appropriate lighting policies and regulations for night markets. The target is not only energy savings, but also to protect the public's health, culture, and traditional livelihoods, in a way that supports sustainable development.

**Keywords:** sustainable development; lighting policy; public health; energy savings; Thailand

## 1. Introduction

Nowadays, there is wide agreement that many of the most dramatic problems of humankind directly deal with sustainable development. Although the sustainable use of energy and natural resources, as well as the decrease in the emissions of contaminant and greenhouse gases, are major concerns, fostering the well-being of people and sustainable progress, without substantial disruptions

to traditional ways of life, are key factors to grant a fair distribution of resources and ensure their availability to future generations. Appropriate lighting has proven to be a transversal factor of sustainable development, with a high importance in human activities, granting safety, well-being, efficacy, profitability, and a healthy environment. Although the primary target of lighting should be to grant the safety of people and their goods [1], its impact on other activities, like commerce, leisure, or both, is also essential for personal well-being, as well as economic and social development. In spite of this positive influence on human life, the impact of night lighting, from other perspectives, also has negative aspects. Thus, light pollution [2], or the very high consumption in terms of energy, raw materials for the manufacture of luminaries, CO<sub>2</sub> emissions due to the production of electrical energy, and the manufacture of the luminaries, auxiliary devices, wiring, etc. are major concerns for public administrations [3–5]. Although the massive introduction of LED lighting has resulted in a lower consumption per luminary, the continuous growth of cities and population makes lighting a main challenge for sustainable development.

Furthermore, the effects of no-appropriate lighting during nighttime on human health are proven [6–10], as well as its effects on animal life [11–13], plants [14–18], and astronomical observations [19,20]. More specifically, the effects of light on human physiology and psychology have been well-known for ages. For the purposes of this research, the most important effects of lighting are those produced on the circadian rhythms (oscillations in some rhythms of our body lasting about a day, such as the sleep–wake cycle, the cycle of body temperature) [21].

In summary, all the advantages and shortcomings of lighting must be carefully considered when planning all kinds of facilities and installations [22], with special attention to sustainable development, when considered from its wider perspective. Night markets are a good example of necessary facilities in many countries of the world where inappropriate lighting can be a source of problems in spite of other benefits.

#### *Night Markets and Excessive Illumination in Thailand*

Night markets are typical open-air facilities for both local inhabitants and tourists to shop and spend time working during the night. They are very popular and indispensable to people in many Asian countries.

Thailand is home to some of the biggest and best ones across South East Asia. This country has a long history of night markets, which are teeming all over the country, in every corner of cities and villages, and usually on every night of the week. Thus, night markets of all shapes, sizes, and types of businesses are present in every village and town in Thailand, and they are open on a daily basis. These facilities are sources of livelihoods for many Thai people, especially for the poor, women, and unskilled people, as the vending activities in the night markets require low capital and investment.

For instance, the Talad Neon market in Bangkok (Figure 1) is open during the whole night. Food, clothes, and other goods are sold, and there are also stands to have a drink and chill out. Jumbo Klongsam market in Pathum Thani province (Figure 2) is open from 5:00 p.m. to 12:00 a.m. and mainly sells food. Night markets provide jobs and income for a large Thai population and are also considered to be a platform for creating new entrepreneurs [23].

Shops in night markets in Thailand are easily recognizable for their neon signs and intense illumination, which are used to attract customers. The reason is that shop owners perceived that more illumination is better, and, in addition, the lighting of night markets is not regulated in that country. However, continuous exposure to high levels and/or types of lighting during nighttime could have adverse effects on vendors' health, as mentioned above.

The dimensions of a standard shop are around 1.0–1.5 m × 2.0–2.5 m, and the number of lamps range from 4 to 12, depending on the shop's size and power of light sources. The majority of them use LED lamps, in order to save energy.

This study aims to understand people's perceptions of night markets' lighting and the impact of its excessive use on vendors' health and well-being. Its results and conclusions are expected to

contribute to important aspects of sustainable development, such as local policy, rural development, and attachment to the traditional economy.



**Figure 1.** Talad neon market (Bangkok).



**Figure 2.** Jumbo Klongsam market (Pathumthani).

## 2. Research Design

### 2.1. Study Location

A survey was conducted in a night market in Surin province, in Thailand (Figure 3). Surin is one of the northeastern provinces in Thailand, and it is considered one of the poorest areas. It covers a total area of 8124 km<sup>2</sup> and borders Oddar Meanchey of Cambodia. For centuries, northeastern provinces were considered to be isolated from the rest of the country. However, like other rural provinces in Thailand, Surin is also undergoing urbanization and becoming a tourist attraction, and many night markets have emerged and become popular destinations that can be easily found in almost every district along the province. Night markets there mainly sell food, clothes, and accessories. The vendors usually use an arbitrary number of any kind of lamp and different levels of illumination, without following a strict regulation. The market opened from 5:00 p.m. to 12:00 a.m.



**Figure 3.** Study case: Surin province night market.

## 2.2. Questionnaire Design

The survey instrument was created in Thai language. The survey (Appendix A) was composed of four parts:

1. Respondents' background and demographic information.
2. Respondents' circadian-rhythm and eye-related problems. Yes/no questions were used to inquire if respondents suffered circadian-rhythm and eye-related problems, and then open-ended questions were asked, in order to explore which specific problems the respondents had and how long they suffered with them.
3. Respondents' attitude toward night markets. It was composed of 5 items (i.e., contribution of night markets to income generation, poverty reduction, urbanized landscape, efficient use of public spaces, and community connection), on a five-point Likert scale (strongly disagree; disagree; uncertain; agree; and strongly agree).
4. Respondents' awareness of the effects of excessive light on human health. A five-point Likert scale (strongly disagree; disagree; uncertain; agree; strongly agree) was also used to see the level of respondents' awareness on effects of excessive light on human health (i.e., changes in biological clock, reduction in vision capacity, disturbances of sleep, and increases in other health problems).

## 2.3. Sampling Method

The survey was conducted with a total of 205 respondents, in which 103 night-market vendors and 102 non-night-market vendors (night-market clients), in order to test the differences between the 2 groups—vendors and non-vendors. The vendor and non-vendor groups were determined by using a random sampling method. The vendor population of the Surin province night market is approximately 142 people (information was given by the market authority). Therefore, the number of surveyed vendors was 103, which was calculated by using the modified Cochran Formula for sample size in smaller populations, desiring a 95% confidence level and  $\pm 5\%$  precision. However, other criteria were also set to select the vendor group, including equal representatives of both men and women, as well as age ranges. To make the sample design balanced, the same number of respondents and the same characteristics (i.e., gender and age ranges) were also determined for the non-vendor group.

## 2.4. Survey Procedure

The survey took place within two days in March 2019 and was administered in paper format via a face-to-face interview method. The interviews of the vendor group were conducted in the first day, and the second day was for the non-vendor group, by selecting randomly among night-market clients, ensuring the non-vendor sample had equal representatives of men and women and all age groups, like the vendor respondents. In total, 103 night-market vendors and 102 non-night-market vendors were surveyed, providing a total size of 205 respondents. A group of 10 assistants coming from Surin University administered the surveys, supervised by the author. The survey was administered in the Thai language, and each interview took around 10–15 min.

## 2.5. Data Analysis

Descriptive and inferential statistical analyses were subsequently performed. Chi-square ( $\chi^2$ ) was applied to compare the distribution of responses to the discrete outcome variable among two or more independent comparison groups. The  $\chi^2$  test provides information not only on the significance of any observed differences, but also provides detailed information on exactly which categories account for any differences found. The  $\chi^2$  test was performed to compare demographic characteristics between vendor and non-vendor groups, as well as the difference in percentages of vendors/non-vendors' and male/females' responses, in terms of health problems associated with excessive lighting. Fisher's exact test was instead used in cases where there were cells with a frequency less than 5 and/or with small group sizes, as the Fisher's exact test has no sample-size restriction.

Two sample T-tests were performed with continuous data and Likert data to compare the difference in means between the two independent groups' responses, i.e., between vendors and non-vendors, and between male and female, regarding respondents' demographic characteristics, awareness of excessive light impacts on human health, and attitude toward the contribution of night markets to local development. Similarly, the one-way analysis of variance (ANOVA) was used to explore the differences in means among more than two groups (i.e., age groups).

Some statistical notations used in the paper are reported in Table 1.

**Table 1.** Statistical notations.

N	Number of Members of Sample
$\chi^2$	Chi-Square statistic
$t$	$t$ score
df	Degree of freedom
SD	Standard deviation
$\bar{x}$	Mean of sample
F	F ratio
$p$	$p$ -value

### 3. Results and Discussion

#### 3.1. Sample Socioeconomic Demographics

There was no difference in number of male and female respondents in both groups of vendors and clients, and the populations of vendors and clients differed in number of socioeconomic and demographic parameters (Table 2). Overall, 103 night-market vendors and 102 non-night-market vendors were surveyed, providing a total size of 205. However, 11 respondents (eight vendors and three non-vendors) did not fully answer all questions; therefore, the number of respondents used for data analysis was 194 (95 vendors and 99 non-vendors).

Concerning the ages of both groups, there was a slight difference between two respondent groups' ages: more surveyed non-vendors fell into the age range from 30 to 40 than surveyed vendors. Respondents of the vendor group were more likely to have higher education (70.5% vs. 42.4% having university,  $p < 0.001$ ), because working in night markets is usually a source of income in additional to a main occupation, so vendors had a higher overall income ( $1423.57 \pm 899.38$  vs.  $661.609 \pm 588.0$  Baht/day,  $p < 0.001$ ), but more exposure to artificial light ( $7.78 \pm 2.63$  vs.  $5.17 \pm 1.21$  h/night,  $p < 0.001$ ), and they stayed closer to lamps (around  $103.89 \pm 61.48$  cm vs.  $195.53 \pm 96.09$ ,  $p < 0.001$ ).

Both groups (67.4% for vendors and 73.7% for clients) applied energy-saving measures, but around half of both two groups didn't know about lamp and lighting regulations (43.2% for vendors and 57.6% for non-vendors). The majority in both groups perceived light color of the environment around them as "white".

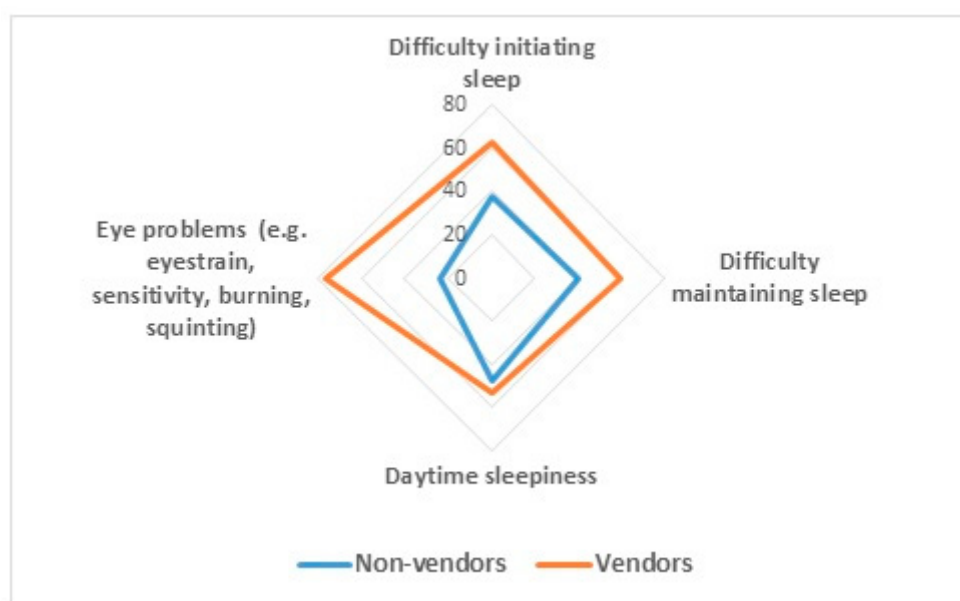
**Table 2.** Sample demographics and comparisons among respondents of two groups of night-market vendors and non-vendor participants.

		Vendors	Non-Vendors	Statistic	df	p-Value
Number of surveys (n)	194	95	99			
Gender (%)	Female	52.6%	50.5%	$\chi^2 = 0.023$	1	0.87
	Male	47.4%	49.5%			
Age (%)	<30	16.8%	8.1%	$\chi^2 = 7.89$	3	0.048
	30–40	38.9%	56.6%			
	40–50	28.4%	19.2%			
	>50	15.8%	16.2%			
Education (%)	Primary	6.3%	7.1%			< 0.001 *
	Secondary	4.2%	18.2%			
	High school	17.9%	31.3%			
	Graduate	70.5%	42.4%			
Income per day (Thai Baht) ( $\bar{x} \pm SD$ )	Post-graduate	1.1%	1.0%	$t = -6.81$	163.34	< 0.001
	White	1423.57 $\pm$ 899.38	661.609 $\pm$ 588.0			
Perception of night light colors (%)	Yellow	72.6%	69.7%			
	Amber	3.2%	6.1%			
	Red	13.7%	4.0%			
	Multi-colors	0.0%	2.0%			
Exposure to artificial light per day (h) ( $\bar{x} \pm SD$ )		10.5%	18.2%	$t = 7.75$	92.66	<0.001
Distance to artificial light (cm) ( $\bar{x} \pm SD$ )		7.78 $\pm$ 2.63	5.17 $\pm$ 1.21	$t = 5.96$	65.22	<0.001
Apply energy-saving regulations (%)	Yes	103.89 $\pm$ 61.48	195.53 $\pm$ 96.09	$\chi^2 = 0.67$	1	0.415
	No	67.4	73.7			
Knowing about lamp and light-system regulations (%)	Yes	32.6	26.3	$\chi^2 = 4.54$	2	0.103
	No	56.8	42.4			
		43.2	57.6			

\* Note: Fisher's exact test.

### 3.2. Public Perception of Excessive-Light-Related Health Problems

Our result showed that night-market vendors reported suffering from more health problems than non-vendors. The main problems of the vendors were eye-related, including eyestrain, sensitivity, burning, squinting, impaired vision, etc. They also suffered from difficulty initiating sleep, difficulty maintaining sleep, and daytime sleepiness, which is in agreement with the disruptions of circadian rhythms caused by lighting reported in the literature. In general, more night-market vendors have these problems than non-vendors (Figure 4).



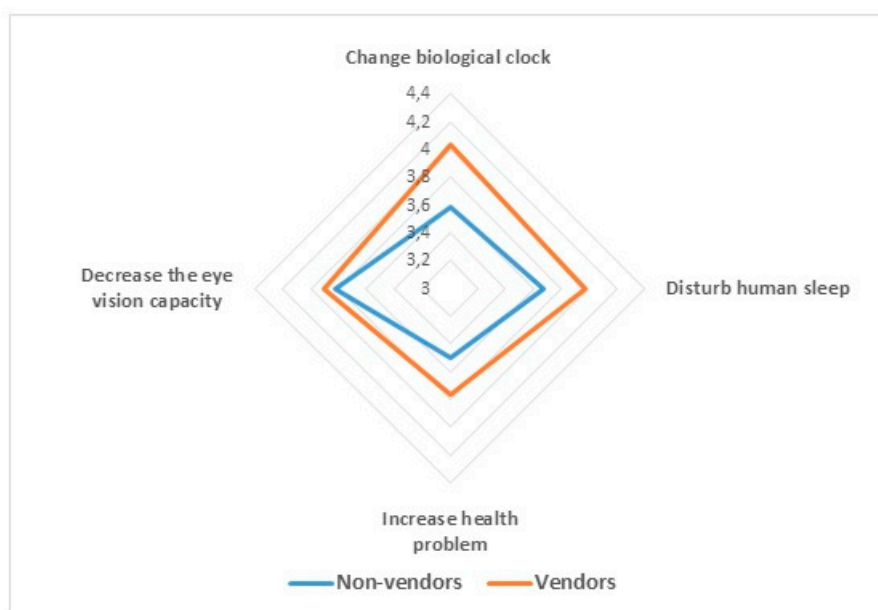
**Figure 4.** Percentages of vendors and non-vendors reporting health problems they perceived as being associated with excessive lighting.

The calculated  $\chi^2$  revealed a significant difference between non-vendors and vendors in terms of eye problems ( $\chi^2 = 12.52, p < 0.001, df = 1$ ). There is a much higher number of vendors reporting eyestrain and sleeping problems associated with excessive lighting in the market than non-vendors.

The  $\chi^2$  was also performed to compare the difference in percentages between male and female respondents reporting health problems they perceived as being associated with excessive lighting. The results revealed that women seem to report these problems more than men. Female respondents had difficulty initiating sleep ( $\chi^2 = 3.73, p\text{-value} = 0.05, df = 1$ ), experienced daytime sleepiness ( $\chi^2 = 15.13, p\text{-value} < 0.001, df = 1$ ), and suffered from eye-related problems ( $\chi^2 = 6.31, p\text{-value} = 0.01, df = 1$ ) more than male respondents. These results may be due to the remarkable hormonal differences between men and women.

### 3.3. Public Awareness of the Impact of Excessive Light on Human Health

The results indicated that the majority of survey respondents were aware of the excessive-lighting impacts on human health (Figure 5). Both vendors and non-vendors tended to be neutral about or agree with the proposal that excessive lighting levels are linked to circadian-rhythm-related problems. T-test data showed that vendors tended to agree more and agree strongly than non-vendors on how excessive light can change a human's biological clock ( $t = 3.75, df = 185.8, p < 0.001$ ), disturb human sleep ( $t = 2.55, df = 191.26, p = 0.012$ ) and increase health problem ( $t = 2.10, df = 189.96, p = 0.04$ ), while there was no difference of awareness about the impact of excessive lighting on vision between two groups.



**Figure 5.** Excessive lighting impacts on human health. Mean values calculated from individual scores (1 = strongly disagree; 2 = disagree; 3 = uncertain; 4 = agree; 5 = strongly agree) (N = 194).

#### 3.4. Public Attitude Toward the Contribution of Night Market to Local Development

Table 3 shows that vendors tended to be neutral about the contribution of night markets to local development, while non-vendors were more likely to agree with that. T-test data revealed the difference of attitudes between the two groups for all aspects of night markets' contributions to local livelihoods, local development, and community cohesion.

**Table 3.** Difference between vendors' and non-vendors' attitudes toward the contribution of night markets to local development. Mean values calculated from individual scores (1 = strongly disagree; 2 = disagree; 3 = uncertain; 4 = agree; 5 = strongly agree) (N = 194).

	Vendors ( $\bar{x} \pm SD$ )	Non-Vendors ( $\bar{x} \pm SD$ )	t-Statistic	df	p-Value
Income generation	3.30 ± 0.67	3.95 ± 0.83	5.98	186.89	<0.001
Poverty reduction	3.07 ± 0.88	4.04 ± 0.76	8.21	185.23	<0.001
Landscape urbanized and modernized	3.20 ± 0.85	3.84 ± 0.86	5.29	191.9	<0.001
Efficient use of public space	3.37 ± 1.00	3.85 ± 0.87	3.55	186.21	<0.001
Community interaction and connection	3.41 ± 0.96	3.91 ± 0.81	3.90	183.74	<0.001

T-test was also performed to see the difference of attitudes between females and males within the vendor group. The results in Table 4 revealed that men were more likely to disagree or be neutral about the role of night markets in poverty reduction, urbanization, efficient use of public space, and community connection.

ANOVA was performed to see the differences of attitude toward the contribution of night markets to local development among four age groups. The results revealed no significant difference among these groups.

The study results show that night markets are a source of livelihoods and incomes for local populations. The income per day gained from selling in the night market is higher than the daily salary of an ordinary worker. That is the reason why many university graduates choose to be vendors in the night markets as their main or second job. One of the reasons behind this success can be in their very striking lighting. This is in agreement with other studies, like the one of Johnstone et al., in 2019 [24], which showed that LED lighting impacts night-market businesses' prosperity in Kenya because of its attractiveness to customers.



However, the findings also depicted that more night-market vendors suffered from circadian-rhythm-related problems than non-vendors, including vision problems, difficulty initiating sleep, and difficulty maintaining sleep. The experience with health problems made vendors unlikely to have positive attitudes toward the contribution of night markets to local development, in spite of their dependence on night markets and the higher incomes they received from them, when compared to other jobs.

**Table 4.** Difference between female and male attitudes toward the contribution of night market to local development within vendors' group. Mean values calculated from individual scores (1 = strongly disagree; 2 = disagree; 3 = uncertain; 4 = agree; 5 = strongly agree) (N = 194).

	Female ( $\bar{x} \pm SD$ )	Male ( $\bar{x} \pm SD$ )	<i>t</i> -Statistic	df	<i>p</i> -Value
Income generation	3.44 ± 0.79	3.18 ± 0.52	1.91	75.34	0.059
Poverty reduction	3.27 ± 0.94	2.90 ± 0.79	2.05	86.36	0.043
Landscape urbanized and modernized	3.51 ± 0.84	2.92 ± 0.75	3.59	88.72	<0.001
Efficient use of public space	3.37 ± 0.86	3.04 ± 1.01	3.61	92.77	<0.001
Community interaction and connection	3.78 ± 0.77	3.08 ± 1.01	3.82	90.55	<0.001

Because individuals' own experiences and environments often influence their awareness and attitude [25,26], both vendors and clients were aware of lighting impacts on vision, as lighting's impacts on the eyes are more perceptible than other problems. Vendors were more likely to accept that excessive light can alter the human biological clock, disturb human sleep, and increase health problem, because many of them had experienced the health problems related to high levels of illumination.

This is the first field study up to date demonstrating these effects and perceptions in real conditions applicable to the topic under consideration: people developing their activities under too intensive or spectrally inaccurate lighting in night markets.

#### 4. Conclusions

This study analyzed both the real and perceived impact of lighting among vendors and non-vendors in night markets. The methodology was based on a field survey in one typical night market in Surin province (Thailand).

Given the importance of night markets as a source of complementary income and even as unique livelihood, and their critical role in maintaining the traditional economy in many urban and rural environments around Asia, the health and well-being of both vendors and visitors is a key factor to achieving sustainable development in such a quickly growing zone like Southeast Asia and, in general, in the whole continent. Hence, the higher the sense of well-being among people making their living from night markets, the higher their attachment to their land and way of life. This is especially critical to avoid depopulation in rural zones and uncontrolled shifts to unsustainable economies and massive migrations toward big cities.

On the other hand, the extremely important role of lighting as a transversal factor in every human activity, and the necessity to keep it in mind when talking about sustainable development, is without doubt. Thus, the need for accurate policies for lighting, in order to grant health and well-being to the users of lighting installations, as well as the need to design and maintain these installations with the minimum consumption of energy, raw materials, and financial resources, makes it necessary to apply the current knowledge on this matter to night markets.

From the well-known perspective of installations, excessive levels of lighting, spectral distribution producing scattering toward the sky, or emission of light beams toward inaccurate directions, disturbing people, is considered light pollution. Night markets are outdoor places, and, hence, they can produce light pollution, but they are also places where people work. Most countries in Europe and North America regulate light pollution and also lighting levels in work places.

The results of this work, proving more health problems among vendors, confirm the necessity of regulating the lighting of night markets in Thailand and most countries in Southeast Asia.

This higher impact among vendors can be explained by their more continuous exposure to higher levels of illumination during inappropriate hours, at night. This impact is real (higher incidence of eye- and sleep-related problems) and also perceived.

Besides the considerations above, a careful analysis of the results leads to some very interesting conclusions:

- (1) The incidence of health-related problems and circadian-rhythm issues among the vendors is proven. Given the direct relationship between high levels of illumination during nighttime and these kinds of problems, policies requesting lower levels, especially in the late night, could result in a clear improvement in their health and well-being, as well as a decrease in sanitary expenses and increase in productivity. This increase in productivity could be especially important for the vendors who have other occupations and use night markets as a supplementary source of income.
- (2) Vendors are aware of the impact of intensive lighting on their health, but do not seem to look for alternatives. They just go on with their activities. They are probably afraid of losing customers if they individually decrease the levels of lighting in their shops. This makes it even more necessary to reach agreements with the support of the local authorities.
- (3) The relatively low mood of vendors toward the impact of night markets seems to be motivated by their health problems and their awareness about the causes, directly related to intensive lighting at inappropriate times of the night. This attitude can influence new generations to abandon night markets as a main source of income or, at least, as a complementary source of incomes. This lack of attachment can become a source of migration and the search for less-sustainable ways of life outside their homelands.
- (4) Lower levels of lighting result in a decrease in energy consumption and number of light sources, as well as the maintenance and operations related to daily life, like recycling. It has a positive impact on both the economy and environment.

In summary, night markets are key sources of incomes and traditional economy at local levels, in many Asian countries, like Thailand. The impact of their peculiar lighting on vendors' health, well-being, and perceived problems is a real threat for their long-term survival, with a consequent influence on sustainable development.

Although this study was conducted with a small vendor population from a seven-hour night-market in a remote province, it provided the first empirical insight into the health impacts caused by excessive lighting in night markets in Thailand. It is suggested that further research should be conducted in other types of night markets (i.e., 24-h night markets, e.g., in Bangkok) and/or integrated with medical statistics reporting vendors with circadian-rhythm disturbances and other health problems associated with excessive illumination, in order to provide more accurate evidence. These research findings speak to the need for policies regulating sustainable lighting in night markets to not only ensure livelihoods for local vendors and save energy, but also to reduce the lighting impacts on vendors and health-care costs.

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**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A Questionnaire Survey (Thai Language was the Original Language of the Survey)

Survey on awareness, attitude, and perception of excessive lighting effects on human health.

Dear participants, This is a survey regarding users' awareness, attitude, and perception of excessive lighting effects on human health. It is implemented by Dr. Thi Phuoc Lai Nguyen, Assistant Professor at the Department of Development and Sustainability, School of Environment, Development, and Resources, Asian Institute of Technology (Thailand). Your participation is voluntary and may be discontinued at any time. Your responses are anonymous, and the individual study results will be confidential and only used for the research purpose. Data will not be traceable to you and will not be shared with anyone.

Thank you for your time. If you have any questions, or if you want the study's final report, please contact me at phuoclai@ait.asia.

### I. Respondent's general information

1. What is your gender? <input type="checkbox"/> Female <input type="checkbox"/> Male	2. How old are you? _____
3. What is your highest education? <input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> High school <input type="checkbox"/> University <input type="checkbox"/> Post-university	4. How much is your average income a day? _____ Baht
5. What is the color of lamps around you? <input type="checkbox"/> White <input type="checkbox"/> Yellow <input type="checkbox"/> Amber <input type="checkbox"/> Red <input type="checkbox"/> Multicolor	6. How many hours a night are you exposed to artificial light? _____ hours
	7. How far is approximately the distance between your post and the lamps? _____ cm
8. Do you apply any energy saving regulation? <input type="checkbox"/> Yes <input type="checkbox"/> No	9. Do you know any lamp and light system regulations? <input type="checkbox"/> Yes <input type="checkbox"/> No
10. At what time do you go to bed in the night? _____	11. How many hours do you sleep a day? _____ hours

### II. Information on Respondent's circadian rhythm and eye health

1. Do you suffer any problems with sleeping associated with excessive lighting?

Yes

No

If yes, what are the problems and how long have you suffered with this problem?

<b>Problems</b>	<b>When</b>
_____	_____
_____	_____
_____	_____
_____	_____

2. Do you have any eye related problem associated with excessive lighting?

Yes

No

If yes, what are the problems and how long have you suffered with this problem?

<b>Problems</b>	<b>When</b>
_____	_____
_____	_____
_____	_____
_____	_____

III. Respondent’s attitude toward night markets

<i>To what extent to you agree with the following statement?</i>	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Night markets are a source of income generation and employment of many people in your area					
2. Night markets contribute to poverty reduction in your area					
3. Night markets have made your town more urbanized and modernized					
4. Night markets have contributed to the efficient use of public space					
5. Night markets have contributed to community interaction and connection					

## IV. Respondent's awareness of excessive light effects on human health

To what extent do you agree with the following statement?	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Exposure to excessive illumination during the night can change your biological clock					
Exposure to excessive illumination during the night can trouble your sleep					
Exposure to excessive illumination can cause health problems					
Exposure to excessive illumination can decrease vision capacity					

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