The Effects of Light Pollution in Hong Kong

Daniel Karol

Michael Ng

Marina Varlamova

Gregory Walls

5 March 2010

Project number: AGK-1004

The Effects of Light Pollution in Hong Kong

AN INTERACTIVE QUALIFYING PROJECT REPORT

SUBMITTED TO THE FACULTY OF

WORCESTER POLYTECHNIC INSTITUTE IN

PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

5 MARCH 2010

Sponsoring Agency:

Friends of the Earth Hong Kong

Submitted to:

Cheng Sze Ling, Officer/Project Liaison

Professor Andrew G. Klein, Advisor

Professor R. Creighton Peet, Co-Advisor

Respectfully Submitted by:

Daniel Karol

Michael Ng

Marina Varlamova

Gregory Walls

Abstract

The purpose of this project was to determine the perceived effects of light pollution on the residents of Hong Kong and to develop a set of recommendations for our sponsor, Friends of the Earth Hong Kong, to use in promoting better light pollution regulations. Through our fieldwork in Hong Kong and archival research we determined the sources of light pollution, the effects it might have on the residents, and ways to effectively reduce and manage excessive lighting in Hong Kong.

Acknowledgements

We would like to thank the following people and institutions:

Our sponsoring agency, Friends of the Earth Hong Kong, for providing us with this research opportunity and supporting us. Within this organization we would like to thank the following people:

Sze Ling Cheng, Catherine Lau and Hahn Chu our project liaisons at the Friends of the Earth Hong Kong. We would like to especially thank Sze Ling Cheng, for her generous help in translating documents for us and assisting our team with making connections amongst the business owners and government officials.

We would also like to thank all of the people who consented to having us interview them. Although they remain anonymous, special thanks to Ms. A, Ms. C, and Ms. Q.

We would like to thank all of the professors who were willing to talk to us as well. Professor Jason Pun from Hong Kong University, Professor Reggie Kwan from Caritas Institute of Higher Education and Professor Winnie Cheung from Hong Kong Polytechnic University. All contributed enormously to our project by helping us obtain permission to survey on their campuses as well as providing technical and background knowledge.

We would like to thank Mr. So-Chu Wing from the Hong Kong Space museum for his invaluable insight into light pollution in Hong Kong.

We would like to thank our advisors from Worcester Polytechnic Institute, Professor Creighton Peet and Professor Andrew Klein, for their continual guidance and support throughout the project.

We would like to thank Michael Karol for helping revise our report.

We would like to thank the communities of Hong Kong that allowed us to survey them. We would also like to thank the community centers that helped us conduct our survey.

We would like to thank Olympic Terrace Suites for providing us housing during our stay in Hong Kong.

Finally, we would like to thank Worcester Polytechnic Institute for the unique opportunity to travel and work in Hong Kong.

Authorship

This report was written with equal input by all team members to ensure that a full range of ideas and contributions was achieved. **Editing and revisions** were done on each section by the entire team. For each section, we have listed the original author(s):

Misc (Title, acknowledgements, etc.): Greg Walls

Abstract: Daniel Karol, Michael Ng, Greg Walls

Executive Summary: Michael Ng and Greg Walls

Introduction: Michael Ng and Greg Walls

Background: Michael Ng, Greg Walls, Daniel Karol, Marina Varlamova

Methodology: Michael Ng and Greg Walls

Results and Analysis: Daniel Karol, Michael Ng, Greg Walls

Conclusions and Recommendations: Daniel Karol, Greg Walls

Appendices: Daniel Karol, Michael Ng, Marina Varlamova, Greg Walls

Formatting: Michael Ng and Marina Varlamova

Additionally:

Data Analysis and Computation: Daniel Karol

Correspondence and Contact Point: Marina Varlamova

Photographic material: Daniel Karol

Table of Contents

List of Figures

List of Tables

Executive Summary

For many people in the world today, artificial lighting is a blessing that has played an important role in the progress and advancement of society. As we move towards increasing urbanization and globalization, the demand for artificial lighting will increase to enable people to live safely and comfortably. However, studies show that excessive amounts of artificial lighting, one of the causes of light pollution, can adversely affect the environment and its inhabitants. This is especially the case in the more thriving and densely populated cities such as Hong Kong. Also known as the Pearl of the Orient, Hong Kong is home to thousands of business owners competing for the attention of millions of inhabitants through the use of massive and intensely lit advertising billboards and signs. However, Hong Kong does not have regulations set in place to control this light pollution.

Friends of the Earth Hong Kong (FoE) is a nongovernmental organization that aims to promote sustainable practices in Hong Kong. One of FoE's objectives is to combat light pollution in Hong Kong by lobbying the government to pass a set of ordinances to regulate the use of illumination. In 2008, FoE initiated the "Dim It" campaign, calling on a number of businesses to dim their lights for one hour of stargazing. This campaign was FoE's initial effort to fight light pollution by promoting the awareness of this environmental concern. In our study we worked closely with FoE to provide the research and data necessary for their campaign against light pollution.

Goals and Objectives

To help FoE in their campaign against light pollution our study addressed two goals. Our first goal was to determine the extent to which light pollution was perceived as a problem by the people living in Hong Kong. Our second goal was to recommend applicable lighting ordinances for reducing light pollution in Hong Kong. To achieve our first goal we determined how people perceived excessive

lighting to be affecting them and what they perceived the current level of lighting was. To achieve our second goal we identified ordinances for reducing light pollution and determined what the sources of light pollution were in Hong Kong. Using these findings we were able to provide an applicable set of recommendations on how to reduce excessive lighting in Hong Kong.

Methodology

We reached these goals using several different methods. We conducted a survey in several areas of Hong Kong known to have excessive lighting to determine how people felt excessive lighting was affecting them. We also conducted interviews with individuals who complained about light pollution, from whom we collected more qualitative data in order to corroborate the quantitative data from our survey results. We then researched and documented lighting ordinances around the globe in order to determine the most appropriate methods for reducing light pollution in Hong Kong. In addition, we conducted field observations at locations known to experience greater amounts of excessive lighting to gather more concrete data on the sources of light pollution.

Results and Analysis

Our results show that light pollution is a serious problem in Hong Kong. Additionally, there are no regulations currently in place to control excessive lighting. The lack of lighting regulations has allowed businesses to use intensely lit and bright advertising signs to capture the attention of potential customers, thus contributing to the excessive lighting.

We found that a quarter of our respondents felt they were severely affected by excessive artificial lighting. Our data suggest the most common negative effect light pollution has had on our respondents was visual fatigue.

We identified several of the strongest sources of light pollution and determined which of these were most likely to cause problems for people living near them. From our survey data we found that people felt spotlights as well as advertisement signs were the main sources of excessive lighting.

Finally, our study of international ordinances yielded several possible solutions for controlling excessive lighting, which allowed us to recommend appropriate measures for reducing light pollution in Hong Kong.

Conclusion and Recommendations

Through our research, we have obtained data that strongly suggest that light pollution is adversely affecting some Hong Kong residents, causing them to experience visual fatigue, weariness, sleep loss, anxiety, and depression. Light pollution can be controlled and managed effectively, as many cities around the world have already done. The following are several key light pollution ordinances we recommend:

- Timing regulation for video billboards and advertising signs
- Shielded lighting fixtures for streetlights and spotlights
- Light pollution as a civil offense in a court of law
- Government permit required for installing video billboards

These ordinances, if incorporated into Hong Kong law, should help manage and control most of the light pollution in the parts of the city where it is a problem. Like all nation-wide problems, solving this problem will involve cooperation among the government, businesses, and private individuals.

1. Introduction

As the world has advanced, the amount of artificial lighting has increased dramatically, contributing to a rising global environmental problem: light pollution. Light pollution has adverse effects on people and the environment, blocks out the stars in the night sky, and constitutes a waste of energy. The International Dark-Sky Association (2009) defines light pollution as: "Any adverse effect of artificial light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste" (p.2). Some of the largest and most thriving cities such as New York, Las Vegas and Tokyo radiate large amounts of artificial light. Part of the problem stems from the premise that brighter means more prosperous. Another part of the problem may exist because of the lack of awareness regarding light pollution. Reducing light pollution across the globe is a challenging task, and as with every other environmental pollution problem, it requires the joint efforts of governments, companies, and individuals across the globe to solve it.

Like other major cities around the world, Hong Kong suffers from light pollution. Also known as the "Pearl of the Orient", Hong Kong is a very prosperous city, and the enormous amount of light pollution it produces is so great that Chinese Taikonauts have reported being able to see the Hong Kong's glow from outer space with the naked eye (FoE, 2008).

One of the major causes of light pollution across the city is business advertising. In some districts in Hong Kong, residential apartments and buildings are intermingled with business shops and restaurants. Many businesses make use of intensely lit advertising signs and billboards to capture the attention of tourists and potential customers. The lighting from these signs and billboards can sometimes spill onto surrounding residential buildings and possibly affecting the residents.

The issue of light pollution in Hong Kong has been approached several times by various organizations. One of the most prominent environmentalist organizations in Hong Kong, Friends of the Earth Hong Kong (FoE), has been shedding light on the adverse effects of light pollution. In 2008, FoE collaborated with various astronomical groups in order to encourage businesses to reduce lighting for their billboards and advertising displays. The project, named the "Dim It Campaign", called for a "lights out" event where major corporations were asked to turn off their lights for one hour in order to allow people to star gaze from Victoria Harbor (Friends of the Earth Hong Kong, 2008). In 2007, the University of Hong Kong and the Environmental and Conservation Fund joined forces in order to create a survey researching the intensity of light pollution in various areas around Hong Kong. The results of this survey were used to produce a map of Hong Kong showing the amounts of light in the night sky at various locations all around the city (Pun, So, 2007). Despite these efforts, little has been done by the government to reduce light pollution.

Friends of the Earth Hong Kong has begun a campaign across Hong Kong to further promote the awareness of the harm light pollution can cause to the city's inhabitants in order to push for outdoor lighting ordinances (Friends of the Earth Hong Kong, 2008). A detailed and complete understanding of the multi-faceted effects of light pollution is needed to push forward this environmental campaign. For this FoE has wanted to determine how the residents of Hong Kong perceived excessive lighting to be affecting them. Furthermore, FoE has been looking to formulate and propose a set of policy recommendations to regulate light pollution throughout Hong Kong. Without a new policy enforceable by law, light pollution in Hong Kong will persist.

This project identified the ways in which light pollution affected the residents of Hong Kong as well as the outdoor lighting ordinances that might be applicable to Hong Kong. To accomplish this we

sought to address two goals. Our first goal was to determine the extent to which light pollution was perceived as a problem by the people in Hong Kong. This goal was achieved by conducting local field studies using a survey and interviews to gather information from the residents of Hong Kong. Second, we identified appropriate lighting ordinance concepts for controlling light pollution in Hong Kong. We accomplished this by analyzing light pollution management ordinances from around the world and extracting the concepts behind each ordinance.

2. Background

Light pollution is a growing environmental concern in many urban areas around the world. In this chapter we provide a definition of light pollution and a description of the different types of light pollution. We also review previous studies on light pollution and discuss the problem in a global context. Finally we explain some of the possible effects light pollution may have on people based on clinical studies.

2.1. Light Pollution

In this section we define light pollution and present some of the different types of light pollution encountered around the globe. We look into the details of how Light Emitting Diodes (LEDs) and neon lights operate, since these are the main sources of light pollution that are found in Hong Kong. Also included in this section is how to measure light pollution.

2.1.1. Defining Light Pollution

The International Dark-Sky Association (2009) defines light pollution as "Any adverse effect of artificial lighting including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste" (p. 1). Light pollution is generally divided into two categories: astronomical and ecological. The astronomical definition of light pollution involves too much light blocking out the starry night sky, which can seriously impede the studies of astronomers. Ecological light pollution usually refers to the effect that too much light has on the environment, including humans (Longcore, 2004).

Light pollution is a serious problem recognized by many governments around the world. In many modern cities, such as New York City and Las Vegas, the level of illumination is almost that of a sunny day. This is a recent phenomenon stemming from the over-saturation of electronic billboards and other forms of lit advertisements. "If you happen to be 5, a giant illuminated Mickey Mouse

dancing on your bedroom walls would probably be the greatest thing that ever happened to you. But for a grown-up, the discovery that the billboard outside your bedroom window has been replaced by a digital LED sign flashing a rotating cast of Mickeys and Paris Hiltons bright enough to shame the sun might be a little less pleasing" states Katherine Mangu-Ward (2009, p. 1), senior editor of *Reason Magazine*. Situations like these are not uncommon among other cities in the world, and the problem is only getting worse as cities grow.

2.1.2. Measuring Light Pollution

There are several different methods of measuring light pollution. Qualitatively, light pollution can be measured according to the effects it has on the environment. Quantitatively speaking, it is possible to measure the intensity in a unit known as a lumen. However, when determining the amount of light a large source such as a billboard produces, it is necessary to measure the intensity of lights (in lumens) over an area, which is a different unit called lux. One device that is capable of doing so is the photometer. For example a photometer reading of a standard 60-watt incandescent light bulb would show that the bulb puts off about 870 lumens of light (MacIsaac, 1999).

One of the more important questions in light pollution research has to do with how much lighting is too much. According to the organization Environmental Protection UK (2010), "The level of light needed in lux will vary depending upon the circumstances, but as a rough guide the level of illumination required in a dark area to recognise [sic] a face at a distance of 10 metres is 2.7 lux" (p.5). Table 2-1 shows some other examples of typical outdoor lux levels which lighting engineers try to achieve:

Table 2-1: Typical outdoor lux levels

Situation (Environmental Protection UK, 2010)	Lux
Night time on a dark landscape (remote area, national park)	<1
Night time on an urban street (suburban)	5
Night time in an urban street (town or city centre)	10
Flood lighting on a stone building	60
Evening televised Football match (at pitch level)	1600

Situation (Schlyter, 2003)	Lux
Sun overhead	130,000
Full daylight (not direct sun)	10,000 – 25,000
Overcast day	1,000
Very dark overcast day	100
Twilight	10
Deep twilight	1
Full moon overhead	0.267

2.1.3. Classifying Light Pollution

Generally speaking, light pollution is a far less noticeable phenomenon in suburbs and smaller towns. In large cities however, where the population is denser and there are larger amounts of advertising signs and billboards, light pollution tends to be far more noticeable and intrusive. Light pollution can be caused by anything giving off artificial light, which includes stoplights, advertisement signs, televisions, flashlights, etc.

Some of the different forms of light pollution are glare, light trespass, and skyglow. Glare is the result of a light source being brighter than its surroundings. According to Mario Motta (2009), president of Massachusetts Medical Society, "The glare from bad lighting is a public-health hazard — especially the older you become. Glare light scattering in the eye causes loss of contrast and leads to unsafe driving conditions, much like the glare on a dirty windshield from low-angle sunlight or the high beams from an oncoming car" (p. 2).

Light trespass takes place when unwanted light enters someone's property (Campaign for Dark Skies, 2010). Sources for such light pollution can range from a street lighting illuminating one's lawn to an advertisement billboard shining through one's bedroom window (see Figure 2-1).

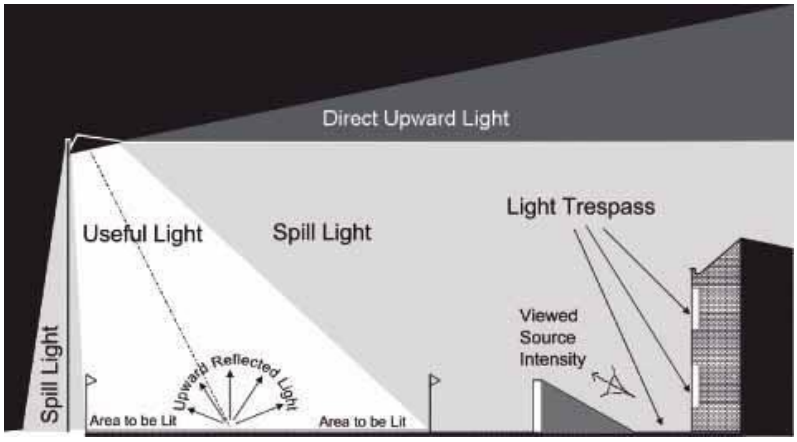


Figure 2-1: Light Spill (The Institution of Lighting Engineers, 2005)

The final type of light pollution is known as skyglow, or "uplight", a phenomenon that occurs when a source of lighting is improperly aimed or unshielded, causing the excess illumination to be emitted above the skyline. This creates a glow above highly populated areas. It affects not only astronomers but any person wishing to observe the night sky (Campaign for Dark Skies, 2010).

2.1.4. Lighting Technologies

This section explains the different artificial lighting technologies used by businesses to display their advertisements and market themselves.

a) LED lights

LEDs, or light emitting diodes, are very small solid-state devices that are placed in electrical circuits. They produce light when electrons move through semiconductor material (Harris, 2002). They are different from common incandescent bulbs because they do not generate very much heat, or burn out. LEDs have a lifetime lasting up to 60,000 hours which is much longer than an incandescent light bulb (Philips Lumileds Lighting Company, 2007, p.10). Due to the fact that LEDs require less energy and generate less heat waste, there has been a recent movement among businesses and advertisers to replace old incandescent light fixtures with LEDs (Brill, 2006, p.5). Moreover, improvements in the

lifetime and the development of electronic and optical solutions have led to the rise of an extensive chain of suppliers and solution providers that have aided in the spread of LED-based products (Wafer, 2005). LED light is also vectored; meaning that while it is less spread out, it is more intense in a specific direction (Harris, 2002).

Figure 2-2 shows the vectored nature of the LEDs. The lights that are pointing towards the camera appear brighter.

Figure 2-2: LED microscope illumination (Ryf, 2008).

b) Video billboards

Some of the most excessive lighting in cities comes from massive televisions known as video billboards. Video billboards are usually used to advertise a product or service, but on occasion, major television networks will use these screens to bring their content to passers-by. A great example of how these billboards are used is in Times Square, New York, seen in Figure 2-3. As can be seen, these advertisements compete for the attention of the pedestrians by featuring bright colors and flashing lights.

Figure 2-3: Video billboards Times Square, New York (Rafi, 2004)

Modern video billboards can be made using several technologies: LED and incandescent light bulb cluster arrays, or LCD panels. Due to their increased efficiency, any screen larger than a consumer television is most likely made up of LED cluster arrays (Brill, 2006, p.1). LED and incandescent cluster arrays work by putting a red, green and blue light next to each other and changing the brightness of the three lights to get an average color. When one stands far enough away from the screen or when the lights are small enough, the three colors blend together. A screen can be built by arranging such clusters in various rows and columns (Tyson, 2008, p.3). LED screens are more popular than other display types because they offer greater efficiency and can be easily repaired by swapping out a single LED or cluster if it burns out instead of the whole screen.

LCD panels are more appropriate for smaller advertising applications. LCD or liquid crystal displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passing through the liquid causes the polarized crystals to align in such a way so that

light can pass through them (see Figure 2-4). Therefore, each crystal is like a shutter, either allowing light to shine through or blocking the light. This polarization is determined by the alignment of the surface of the electrodes (Tyson, 2008, p.10).

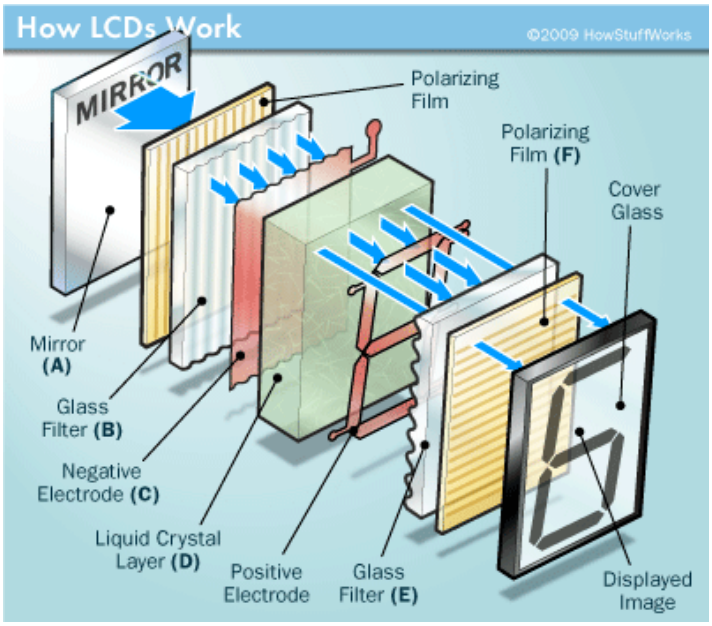


Figure 2-4: How LCDs Work (Tyson, 2008)

c) Neon lighting

Another common type of lighting used in advertising is neon lights. Neon lights are filled with an inert gas, which can be any of the noble gases but is usually neon (Schiff, 2006, p.2). Being an inert gas, neon will not react with any other material or chemical unless forced to (through quantum level effects) by electricity. When a charge runs through neon, it allows any of the free electrons to speed up, which increases the overall kinetic energy. Once the kinetic energy is increased enough, the electrons ionize, creating a superheated gas known as plasma, which gives them a positive or negative charge. Once the electrons travel through the tube and complete the electrical circuit, they lose their charge, emitting photons in the process. These emitted photons are what give off the glow associated with neon lighting. Neon lighting is commonly used due to the fact that it has been around for much

longer than LED technologies and they not have to be replaced often as they last from 8 to 15 years (Neon Sign World, 2008, p. 19).

2.2. Studies on Light Pollution

This section discusses past research and studies on light pollution around the world, outdoor lighting ordinances worldwide, and the documented effects of light pollution on humans.

2.2.1. Light Pollution in a Global Context

In an effort to measure light pollution around the globe, Cinzano, Falchi, and Elvidge (2001), researchers from the Light Pollution Science and Technology Institute in Italy, have devised a map that shows the levels of light pollution in the world. According to Cinzano et al., "About two-thirds of the World population and 99 per cent of the population in the continental United States and European Union live in areas where the night sky is above the threshold set for polluted status. Assuming average eye functionality, about one-fifth of the World population, more than two-thirds of the United States population and more than one half of the European Union population have already lost naked eye visibility of the Milky Way"(p.1).

Based on this map, Tony Flanders (2009) from the Sky & Telescope magazine of astronomy has identified in his study the top ten light-polluting cities (p. 2). Nine of these are metropolitan areas in North America, while Tokyo holds the tenth place, even though it is the world's most densely populated metropolitan area. Astrophotographer Jerry Lodriguss (2009) corroborates this study with research of his own, showing that "a nearly continuous stretch of severe light pollution runs all the way from Washington D.C. through Baltimore, Philadelphia, and New York City to Boston" (p.11).

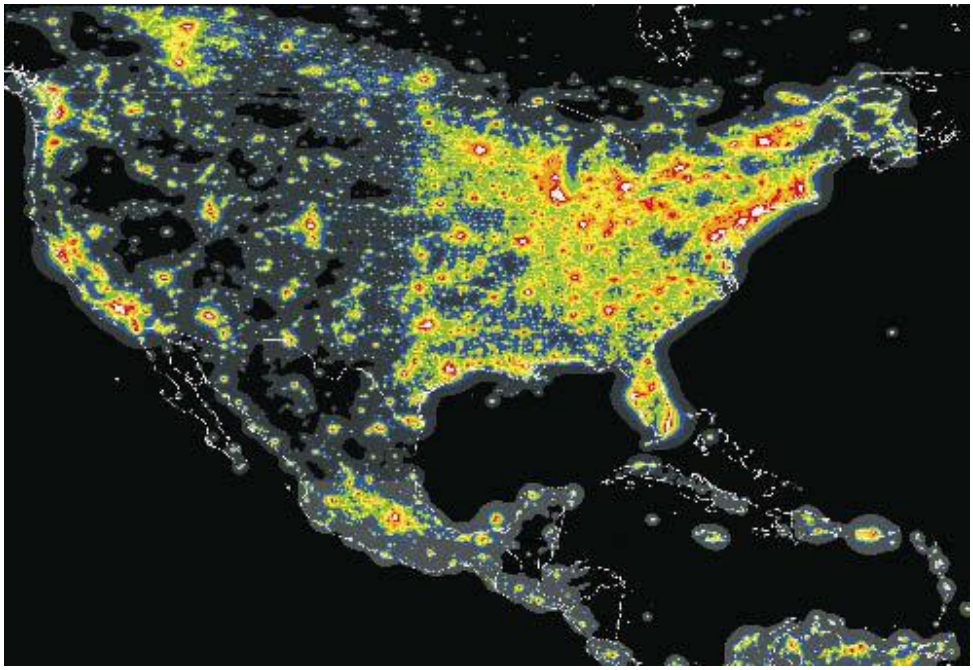


Figure 2-5: Concentration of highest light-polluted cities in the northeast of the US

Figure 2-5 suggests that the top light-polluted cities are concentrated on the northeastern region of the United States. It also shows that severe light pollution is also found in California. In fact, according to the IDA (2009), "the sky glow of Los Angeles is visible from an airplane 200 miles away" (p.1). Another specific example of light pollution is in New York City, the "City that never sleeps". Ron Chepesiuk (2009) discusses in his article that each year in NYC, close to "10000 migratory birds are injured or killed crashing into skyscrapers" (p.11) because their migratory behavior is disrupted by the brightly lit buildings.

2.2.2. Light Pollution Ordinances Overseas

According to Inderwiesen (2010), an outdoor lighting ordinance "establishes community standards for outdoor lighting that not only protects the night sky from excessive light pollution, but also promotes safety and energy conservation, reduces light trespass preserving adjacent land value, and even helps protect the environment for nocturnal animals" (p. 2).

Several governments, both national and provincial, have instated laws enforcing the regulation of illumination. In the state of California, USA, reduction of wasteful lighting was enforced as part of the government's attempt to fight the energy crisis that took place in 2001. Another state in the USA, Connecticut, established a law that required roadway lighting to provide minimum illumination necessary for its purpose. Connecticut is not the only state focusing on light pollution. In New Mexico, the ordinance approved applies not only to the amount of illumination but also its direction. With a few exceptions, most of the outdoor lighting in New Mexico has to be shielded below the level of the sky line or turned off after 11 p.m. (see Appendix O).

2.2.3. Physiological Effects of Light Pollution

Another perspective on light pollution is to look at how it affects people. LED light fixtures and video billboards can have an impact on our lives physiologically and psychologically. Many psychologists and medical professionals have conducted studies on the effects of light on people on a small scale (Jeanine Skorinko, personal communication, 18 Nov 2009).

Light pollution has been linked to many physiological effects, including disruptions of circadian rhythms, sleep disruption, and many more (Littlejohn, 2008, p.1). The increasing effects of light pollution are raising concerns among scientists. Accordingly, there has been an increase in studies on this phenomenon and its effects on the human body.

Two of the most problematic physiological effects are caused by bright and strobing light fixtures. When patients are brought into the intensive care unit (ICU) of a hospital or medical center, they are subject to high intensity LED lightings, and may develop ICU syndrome. ICU syndrome is caused by a temporary loss of normal melatonin secretion patterns and has many known physiological effects such as delirium (Axell, 2002, p.2). The second well-known and better documented

physiological effect that can be caused by excessive lightings is the induction of epileptic seizures. Seizures are defined as "a sudden surge of electrical activity in the brain that usually affects how a person feels or acts for a short time" (epilepsy.com, 2009, p.2).

2.2.4. Psychological Effects of Light Pollution

In addition to physiological effects on the human body, light pollution can have major psychological impact as well. As in many cities such as Hong Kong, there is often so much light that falling asleep can become very difficult. Sleep disruption has been linked to various problems including depression, bi-polar disease, narcolepsy, and other complications (Littlejohn, 2008). All of these lead to less energy and focus throughout the next day.

In the event that light nuisance causes an individual to lose sleep for several days in a row, there is a chance he/she could develop sleep deprivation (Van Dongen, 2003, p.6). Some of the common symptoms of sleep deprivation are:

- Decreased alertness and manual dexterity
- Impaired memory and cognitive function
- Irritability
- Weakened immune system

Many people commonly suffer from these symptoms but never recognize them as unusual because sleep deprivation is usually subtle enough to go unnoticed. The bright lights of the intensive care unit have been known to cause anxiety, hallucination and delirium (Axell, 2002).

2.3. Light Pollution in Hong Kong

Hong Kong is one of the most densely populated cities around the world (Central Intelligence Agency, 2009). In Hong Kong and many other major Asian cities, companies compete for business by setting up large flashing signs and billboards (see Figure 2-6). In an attempt to draw a potential

customer's eyes, the owners make their billboards flash rapidly and intensely. Since Hong Kong is so densely populated, many businesses have sprung up in the area, leading to a greater competitive atmosphere and creating a drive for bigger and more visible advertisements.

Figure 2-6: Advertising signs spilling light onto residential buildings

"Perhaps the most extreme example is found at Windsor House, Causeway Bay, where some 60 floodlights illuminate four billboards on the side of the building. Using a meter to determine the lux, a measure of light intensity, Chung found that this translates to street level illumination of 9,000 lux" (Carvalho, 2008, p.6). These advertisements are the main source of light pollution in Hong Kong. Despite the amount of light pollution found in Hong Kong, little has been done by the government to regulate and control it.

2.3.1. Lighting Technologies in Hong Kong

Hong Kong businesses use several different types of lighting technologies. These range from older technologies such as neon lighting to new and emerging technologies such as LED video billboards.

a) Video billboards

Due to its population density, Hong Kong is vertically oriented meaning most buildings are tall. Because there is less ground level property available for shop owners, they must utilize the upper floors for business. It is not uncommon for a restaurant to be as high up as the sixth floor (Jeanine Skorinko, personal communication, 18 November 2009). Unfortunately when a business is on the sixth floor and relies on pedestrians as its main source of income, it needs some way to make its presence known. Therefore businesses use large, brightly lit signs to attempt to attract potential customers. Figure 2-7 shows a section of a plaza in Hong Kong nicknamed Times Square due to its resemblance to its American namesake.

Figure 2-7: Video billboards in Times Square (Audreyandjack, 2006)

Advertisers compete for attention via the content of their screens just as much as they compete using the actual screens themselves. Thus a large number of video billboards feature advertisements that flash bright images to grab the eye of a passerby.

Figure 2-8: Video Billboard at Tsuen Wan

As mentioned in section 2.2.3, if someone is exposed to these intense flashing lights and colors over a prolonged period of time, he/she may develop ICU syndrome or a variety of other conditions. It is well known that these lightings can have huge impacts on people in controlled laboratory settings, but what is still unknown is how much of these effects are caused by this type of lighting in the real world.

b) LED advertisements

A recent phenomenon regarding light pollution in Hong Kong has to do with the newer LEDs that are beginning to replace traditionally lit advertisements. The combination of low prices, increased brightness, and simplicity is highly attractive to most businesses. This, however means that the signs stay on longer, contributing to light pollution. Figure 2-9 shows an example of an LED advertisement sign in Hong Kong.

Figure 2-9: Close-up of LED advertisement

c) Neon lights

One of the oldest types of lighting technologies still employed in Hong Kong is neon lighting. Figure 2-10 below shows a number of neon signs and advertisements on Nathan Road. Additionally, neon lights can be designed and engineered into a variety of shapes, sizes, and colors, more so than LED advertisements or billboards (Neon Haven, 2009).

Figure 2-10: Neon lightings in Nathan Road, Hong Kong

2.3.2. Friends of the Earth Hong Kong's Plans for Light Pollution

Currently, the only established law regarding outdoor lighting policies in Hong Kong limits the positioning of video billboards along highways. Friends of the Earth Hong Kong (2008), our project sponsor, is driving a campaign named "Dim It", which seeks to address the issue of outdoor lighting pollution and energy waste. "… Hong Kong currently does not have any laws to regulate light pollution. The wastage of energy and disturbance to citizens has been growing out of hand.

The "Dim It" campaign urges the government to execute statutory control of light pollution" (p.3). Friends of the Earth Hong Kong (FoE) is preparing to begin a new campaign, which our research will contribute to. The ultimate goal of FoE is to have the government legislature pass a bill with specific details regarding what kinds of outdoor lighting are allowed without compromising any of the benefits of lighting, such as security and increased visibility at night. For example, one of the suggestions by the IDA (2010) was "…the use of 'full-cutoff' fixtures, meaning the bulb is recessed within an opaque lampshade or shield that focuses the light downward, which prevents glare" (p.2). Along with other measures designed specifically to allow lighting while minimizing the light pollution, this campaign aims to lower any of the potential effects that residents of Hong Kong may be suffering from due to light pollution.

3. Methodology

The goals of our project were two-fold: (1) to determine the extent to which light pollution is perceived as a problem by the people living in Hong Kong and (2) to recommend applicable lighting ordinances for reducing light pollution in Hong Kong to our sponsor, Friends of the Earth Hong Kong.

3.1. Extent to Which Excessive Lighting is Perceived as a Problem

We employed three methods to help us determine the extent to which excessive lighting is perceived as a problem by the people of Hong Kong: survey, interviews, and field observations. The survey was designed to gather data on how people perceived excessive lighting was affecting them, while the interviews and field observations yielded more in-depth qualitative data which gave specific examples of the possible adverse effects of excessive lighting.

3.1.1. Survey

In our survey we asked people if they believed excessive artificial lighting was affecting them, and if so, *how* they perceived it to be affecting them (please refer to Appendix B for our survey questionnaire). The second to last question on the questionnaire also listed all of the major districts in Hong Kong, so that we could gather data on which districts had the most severe perceived problems. We categorized our respondents into 3 separate age groups: people aged 18 – 34, people 35 – 59 years old, and senior citizens 60+ years of age. Additionally, we had an under 18 stratum, which was included in the questionnaire so that people who were under the age of 18 would not be excluded from the survey. Although we did not focus on the under 18 age group, it did provide a small amount of data which was included in the overall results. We surveyed a total of 369 individuals in order to be as representative of the population as possible given our time constraints. We arranged the survey data

in a spreadsheet in order to analyze the information and draw conclusions (refer to Appendices O and P for our calculations).

Our survey questionnaire was written in English, and our sponsor helped us translate it into Chinese in order to overcome the language barrier. Having the questionnaire in Chinese was vital for our study because a lot of the people we surveyed had difficulty reading and understanding English. Additionally, we included a small introductory paragraph at the top of the questionnaire stating who we were, where we were from, and what the goals of our study were.

We took two approaches to surveying: first we printed out hard copies of our questionnaire and surveyed citizens directly. Second, we digitized the questionnaire and hosted it on a web server, which allowed respondents to take the survey from their computers. All of our questionnaire responses were recorded in a spreadsheet, and the spreadsheet was backed up daily by two of our team members to ensure maximum data protection. We administered the survey using several different strategies listed below.

a) Universities and colleges

In order to reach the 18-34 age group, we traveled to local universities and colleges, which gave us the easiest access to this segment of the population. We began by contacting professors at various universities and colleges to request their help in getting permission to survey both students and faculty. Many professors offered to help us distribute the questionnaire by sending it out to the students enrolled in their classes. Additionally, we contacted environmentalist student groups in these universities to help us administer the survey (please refer to Appendix O for the detailed list of institutions and student activity groups we contacted).

b) Residential areas

In order to reach the middle-aged population, we went door to door in residential areas with high levels of excessive lighting as identified by our sponsor (please refer to Appendix E for the detailed list of locations). Starting with apartments located near commercial buildings in Mong Kok, we sent teams of two to knock on each apartment door and carry out the survey. We surveyed at two different time periods: 14:00 – 16:00 and 18:30 – 21:00. We chose the afternoon time period in order to contact people after lunch but before dinner. We chose the night time period to contact people after dinner but before families started going to bed. However, trying to administer our survey in the residential areas proved to be the most time consuming surveying strategy and yielded the least number of responses because most residents were unwilling to participate in the survey.

c) Community service centers

Another approach we took was to administer our survey at community service centers. These centers were usually full of volunteers interested in community well-being and therefore were friendly and easily approachable. Our sponsor helped us find a list of all community service centers on the Hong Kong government website, and we contacted them ahead of time in order to ask for permission to pass out our questionnaire (please refer to Appendix O for the detailed list of the community service centers we visited and surveyed).

d) Senior citizen centers

Our last area of surveying helped us reach the 60+ age group. We began by contacting a few senior citizen centers by phone (please refer to Appendix O for the list of senior citizen centers we contacted) and asked for permission to visit and survey. Additionally, our sponsor contacted several senior citizen centers for us and inquired whether we could stop by and hand out our questionnaire. Most of the senior homes arranged a general meeting in a common area. We would arrive, explain to

them who we were and what we were doing, and administer the survey. Some of the senior centers we were given permission to visit only allowed us to drop off the questionnaires, and at their request had their staff administer them for us. We contacted eleven senior citizen centers. Four of these centers allowed us to drop off questionnaires, and two of these centers allowed us to survey the members directly. We received no reply from the remaining seven centers.

3.1.2. Interviews

Interviews gave us a more in-depth look at some of the perceptions of light pollution (please refer to Appendix C for our interview protocols). Using the interviews, we engaged in active discussions with the interviewees to find out if they considered light pollution a problem and how it had affected them. Our interviewees included one local business administrator, two working-class citizens, three university and college professors, and one graduate student engaged in environmental studies (please refer to Appendix O for details on the individuals we interviewed for our study). We first approached the local citizens and business owners through email, exchanged phone numbers, and eventually arranged a meeting with each person at a location of their choice. For our interviews with university and college professors, we contacted them via email and arranged a meeting in their office. Lastly, for the graduate student we interviewed we contacted him via email and interviewed him at the library of the Hong Kong Space Museum. We created a general interview protocol for most of our interviewees, as well as several specific ones for those with experience on light pollution topics (see Appendix B).

Interviews we had with citizens affected by light pollution helped us obtain a deeper understanding of how light pollution affected their lives. We asked the interviewees what problems light pollution caused them, had them fill out a survey questionnaire, and discussed any additional comments or concerns they had. For the business manager, we discussed the light pollution from both

a personal point of view and an advertising point of view in order to determine how excessive lighting impacted them and their businesses. We also inquired whether or not the business owner would support ordinances to regulate light pollution. For the college professors we also asked them how they felt affected by light pollution and requested help in administering our survey to their students. The interviews were recorded when given permission, and if not, one of our team members took notes during the interview sessions to make sure the relevant details were captured. This information was used to draw examples of how light pollution might have affected people and was linked to our survey data to corroborate our results.

3.1.3. Field Observations

We performed field observations on two areas of high light pollution: Mong Kok and Causeway Bay (see Appendix M for our field observation templates). We chose these two locations from the sources of excessive lighting our sponsor had given us, as these places had high amounts of excessive lighting. We walked around these districts with a camera and a photometer. We took pictures of items that were determined to be examples of light trespass, skyglow, or inefficient lighting installation. We also took photometer readings to record the lighting levels in the area. For the lights that were set far into buildings or unable to be measured close enough, we took a general ambient light measurement (photometer pointed to the sky) and a vectored light measurement (photometer pointed directly towards the light with a conical shield which blocked most of the other light sources). We used a white conical shield for the vectored light measurement so the light coming in would not be absorbed.

Furthermore, we recorded the color of the light, the technology used to emit the light (e.g. LED, LCD, neon lighting), the style (e.g. solid, flashing, video) and the purpose of the light in order to collect data on the most common types of light pollution. We used the photometer readings in comparison

with the “recommended lux levels for street level in a city” from the Environmental Protection UK group (see Section 2.1.2 for details) to show specific examples of excessive lighting throughout both districts.

3.2. Applicable Lighting Ordinances for Reducing Excessive Lighting in Hong Kong

Another one of our goals entailed researching light pollution regulations around the world to determine possible lighting ordinances that could be implemented in Hong Kong. The first step in accomplishing this goal was to compile a list of lighting ordinances. We assembled this list through two methods, searching scholarly databases online and a file the International Dark Sky Association had compiled using Google Earth showing all of the light pollution ordinances around the world. Although every country has different rules and regulations regarding lights and advertisements many light pollution ordinances are still founded on basic conceptual ideas that could be applied to almost anywhere in the world (see Appendix O for a table of light pollution ordinances and concepts).

After compiling the list of light pollution ordinances, we then analyzed each law to identify the problem it addressed and how this problem was solved. From this we drew out the concepts behind each law, thus keeping the more relevant details (e.g. cones around lights to direct light downward, certain times of the day lights could be turned on, maximum light brightness). Finally, we took the list of concepts and determined which ones could be applied to Hong Kong to reduce excessive lighting. We did this by using our field observations and looking at the different types of artificial lighting prevalent in Hong Kong. For each of the field observations we identified the lux levels and the most common types of light pollution. From there we determined which of the lighting ordinances could address and prevent the greatest number of lighting problems.

4. Results and Analysis

The goal of our project was first to determine the extent to which excessive artificial lighting is perceived as a problem by the people of Hong Kong and then formulate a set of recommendations for Friends of the Earth Hong Kong on how to regulate light pollution. We begin this chapter by discussing our field observations of light pollution in Hong Kong. In addition, we discuss and analyze a total of 369 survey responses we gathered from the residents of Hong Kong. From these survey responses we were able to determine the extent to which light pollution is perceived as a problem in Hong Kong. We also examine lighting ordinances from 8 countries from around the world and from 23 states in the United States. These ordinances allowed us to build a solid set of concepts on how to effectively regulate artificial lighting.

4.1. Sources of Light Pollution in Hong Kong

One of our objectives was to determine what the most problematic sources of light pollution are for the people of Hong Kong. Using the information collected from our survey, field observations, and interviews we were able to estimate which light sources contributed the most to light pollution. Figure 4-1 shows the mean perceived contribution to light pollution for each of the sources on a scale of 0 to 6, where 0 is 'None Whatsoever' and 6 is 'Highly Excessive'.

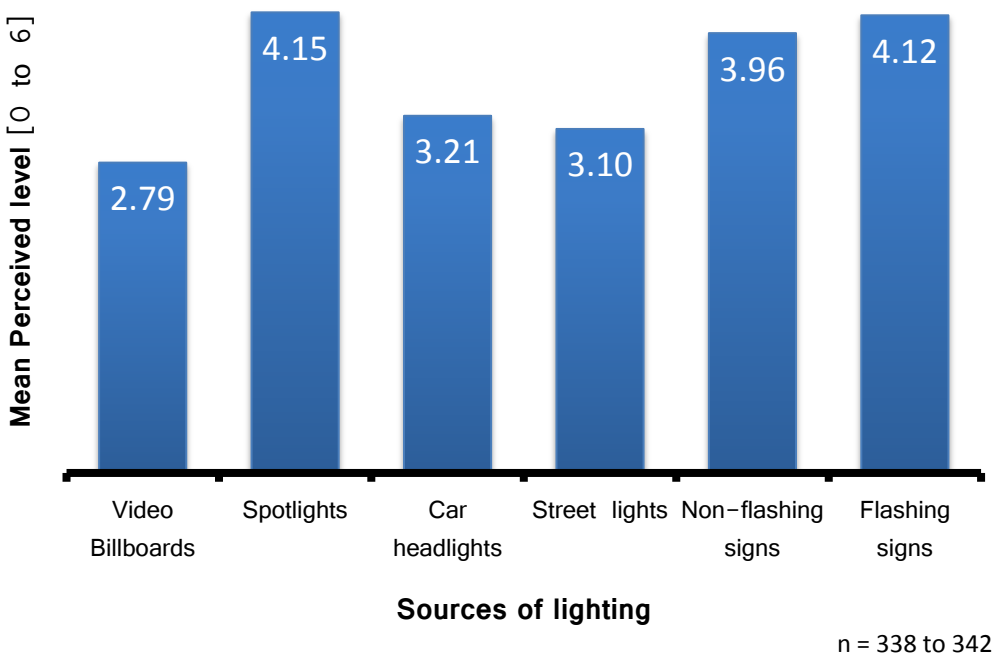


Figure 4-1: Perceived Sources of Light Pollution

4.1.1. Non-Advertisement Sources of Light Pollution

This section describes the impact that non-advertising lights such as streetlights and vehicles headlights have on light pollution. Figure 4-2 shows a photograph taken from the top of an apartment building. The highway appears to glow from the streetlights and vehicle headlights along it.

Figure 4-2: Non-advertising sources of light pollution at Sham Shui Po

a) Street lights

Streetlights help illuminate the street, make it safer to walk along at night and provide lighting for cars that are traveling on the roads. Figure 4-1 shows that on average, our respondents rated the contribution of streetlights to light pollution at 3.1. This means that the streetlights' contribution to light pollution is not perceived to be as significant when compared to the other sources of excessive lighting.

Streetlights are usually mounted lower down on buildings or on their own stands, and they almost always point down. Therefore, their contribution to light pollution should be minimal as the light is not traveling in an upwards direction towards residential apartments. Even though streetlights are not considered to be a major source of light pollution, some still add to the overall light pollution problem because of their lack of proper shielding which causes the light to spill onto unintended areas.

b) Vehicle headlights

Figure 4-1 shows that for vehicle headlights, the average rating from our respondents was a 3.2. Unlike streetlights, automotive headlights emit directed lighting and they are designed to light the entire area in front of the vehicle. This means that since the light is focused and intense, it can be seen from the windows of the lower levels of residential apartments.

4.1.2. Advertisement Sources of Light Pollution

This section describes the impact of advertisement lightings on light pollution. Figure 4-3: shows an example of a commercial area in Hong Kong lit up by advertising signs and billboards. We can see that a residential building (top right hand corner) is located in the middle of a busy intersection surrounded by advertising lightings from shops and restaurants.

Figure 4-3: Advertising lightings in Mong Kok

a) Spotlights

As seen in Figure 4-4, spotlights are usually used to illuminate a static image. These spotlights are commonly found in several of the more commercial districts in Hong Kong. Many fashion advertisements rely on photographs to show off their wares, which require high-quality images that cannot be displayed using current lighting technology. Therefore, many companies set up spotlights to illuminate these advertisements.

Our respondents ranked spotlights at 4.2 (see Figure 4-1), meaning that compared to the rest of the sources, spotlights are perceived to be the major contributor to light pollution. Since many of the spotlights are aimed up towards the sky, this not only shines light into residential apartments but adds directly to skyglow as well.

Figure 4-4: Spotlights at MongKok

The apartment building, shown in Figure 4-4, appears to be as bright as day when compared to the already over-lit night sky of Hong Kong. When measured by a photometer, the level of lighting at street level is 815 lux and the residences are exposed to varying intensities based on their location. This level of lighting is half of the 1600 lux recommended for illuminating a professional sports stadium.

b) Non-flashing advertisements

Non-flashing advertisement signs can be found in many of Hong Kong's more commercial districts. These signs are usually static images that are backlit or self-illuminated and do not flash or pulse.

Figure 4-5: LukFook Jewelry Store non-flashing sign in Causeway Bay

Our respondents rated non-flashing advertisement signs on average as 3.9 (see Figure 4-1), which is fairly high on our scale of 0 [None Whatsoever] to 6 [Highly Excessive]. This could be because they are commonly used by many small businesses and shops in Hong Kong's commercial districts. They are so ubiquitous, that their combined output makes people perceive them as a severe source of light pollution. These lights can cause light trespass when mounted near windows of residential apartments, as shown in Figure 4-5, because the glow they give off can shine into windows.

c) Flashing advertisements

Many businesses use flashing signs as a way of drawing the eyes and attention of potential customers (see background section 2.1.4). We observed that many of the flashing signs are mounted up high in the air, thus they tend to shine into people's apartments. In Figure 4-6, the restaurant's advertising sign is causing light to trespass into the residential apartments. The light from the sign is going directly into the apartments it is mounted next to and flooding the residences with flashing red neon light. Additionally, the lighting is inefficient since some of the light output of the sign is shining up against the building, instead of out towards the street where it can catch potential customers' eyes.

Figure 4-6: Tsui Wah Restaurant Sign

Our respondents ranked flashing advertisement signs as one of the worst sources of light pollution, at 4.12 (see Figure 4-1). Additionally, many of the people we interviewed or talked to during our survey mentioned flashing lights as an especially large nuisance.

d) Video billboards

From our field observations, we have noted that while rare so far, video billboards tend to shine much brighter than most other light sources. These can be found on some tall skyscrapers as well as in some of the heavily populated, more commercial districts.

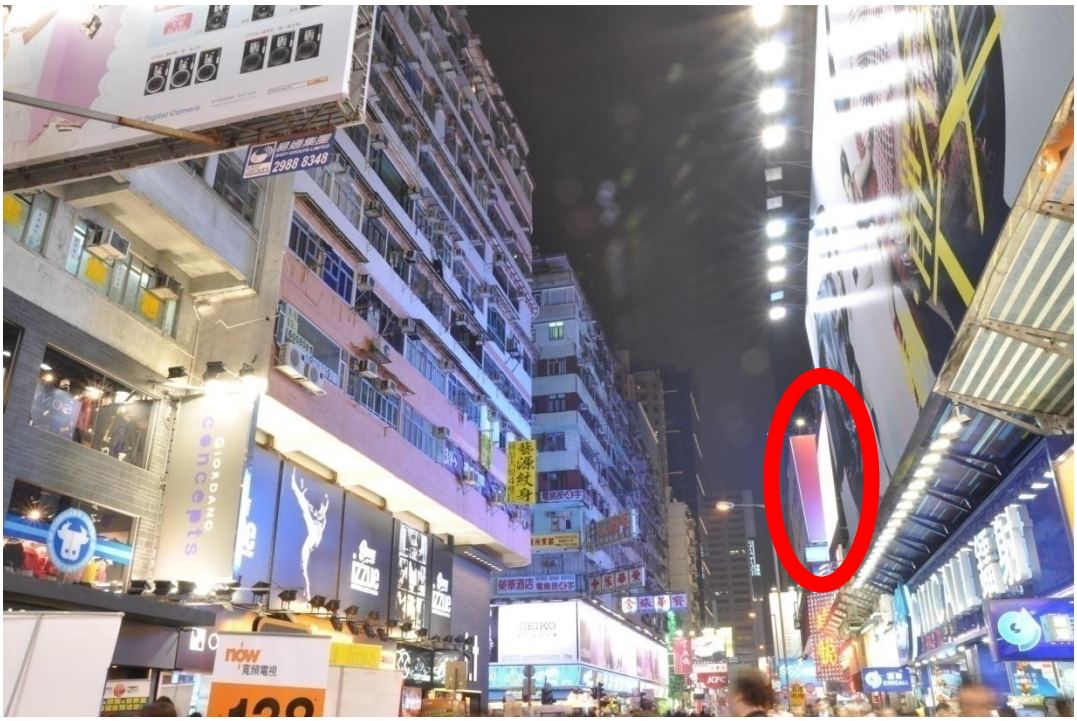


Figure 4-7: Residential Apartment (left) Affected by LED Video Billboard (In red circle)

Figure 4-7 shows a photograph of a residential apartment located across from a video billboard. This photo was taken at 10:03 p.m. Even though the sun sets around 7:00 p.m., the apartments appear to be lit up almost as if it were daytime.

Our respondents rated video billboards the lowest contributor to light pollution out of all light sources, at 2.8 (see Figure 4-1). However, two of the three people we interviewed mentioned that

video billboards caused them more problems in their residences than any of the other sources of light pollution. These problems included sleep-loss, anxiety, visual fatigue, stress, and headaches. This discrepancy can be due to the fact that video billboards are comparatively rare in Hong Kong, thus most people do not feel they are a big source of light pollution. However, in the few places where video billboards do exist, they cause severe problems, as pointed out by our interviewees.

4.2. Levels of Lighting in Hong Kong

Our survey results show that the respondents feel the levels of lighting in Hong Kong are above their ideal levels of brightness. These perceived levels of brightness differ by respondents according to the districts or areas in which they live. The next sections present our findings on the perceived levels of lighting in Hong Kong.

4.2.1. Perceived Levels of Lighting

Figure 4-8 shows the ratings of the perceived levels of brightness next to the ideal levels of brightness. A great number of our respondents felt the current level of light outside their residences at night, shown on the graph in the left half of Figure 4-8, is halfway between being bright as day and dark as night, i.e. levels 2 to 4. The graph in the right half of Figure 4-8 shows a major shift towards lower levels of lighting, i.e. levels 0 to 1. The graph on the right of Figure 4-8 shows a large portion of our respondents desire lower levels of lighting, i.e. levels 0 to 2. Additionally the average perceived level of brightness is 2.7, where the average level of desired brightness is 1.5. This difference of 1.2 shows a major shift towards lower levels of lighting. Furthermore, 8% of our respondents felt that the outside of their residences at night is close to being as bright as day, i.e. levels 5 and 6. One example of this is Ms. A, one of our interviewees, who described the level 5 lighting seeping into her living room as a "thunderstorm" and as "someone taking flash photography inside my living room".

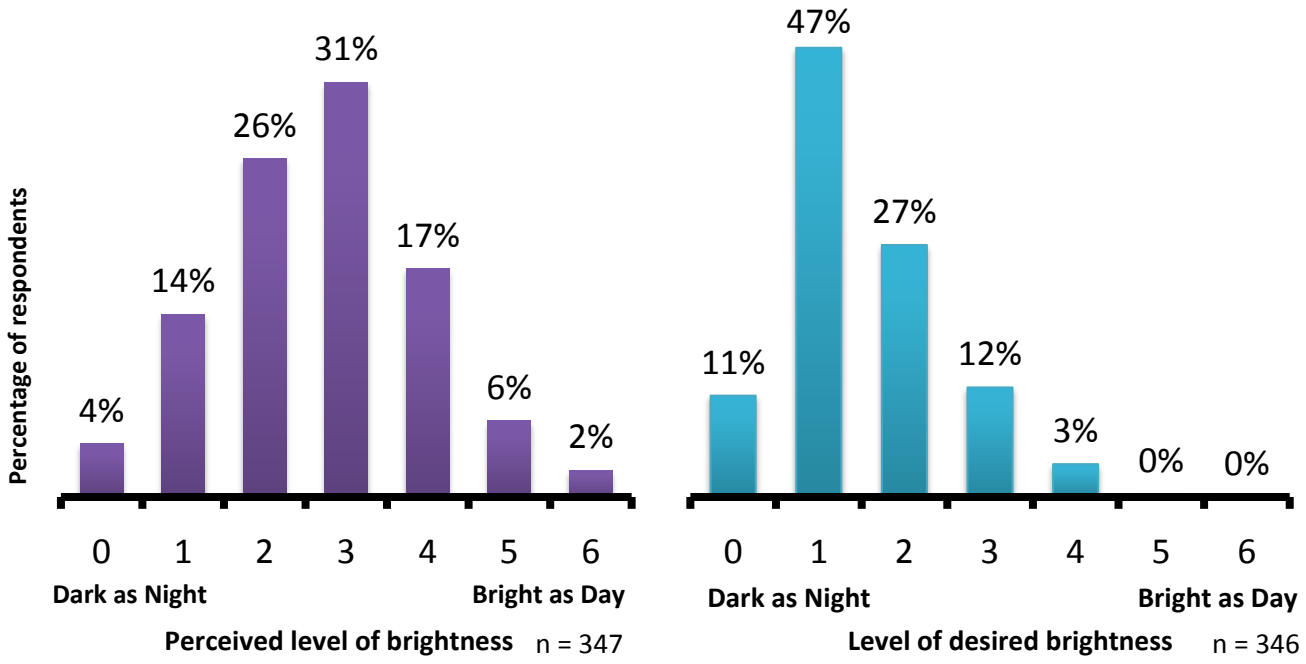


Figure 4-8: Perceived (left) and desired (right) levels of light

4.2.2. Desired Brightness Adjustment

As can be seen in Figure 4-9, 70% of our respondents felt the need to have the lighting outside of their residences dimmed. This further corroborates our findings that excessive lighting is perceived to be a problem, and the majority of our respondents feel something needs to be done about it. We arrived at this estimate through a different index which we will call the Desired Brightness Adjustment or DBA for short. DBA is the result of subtracting the desired level of brightness from the perceived level of brightness for each individual respondent. A small portion of our respondents have shown they want the level of lighting outside their residences' increased. This may be because they live in a neighborhood with poor street lighting and they would like the neighborhood to be brighter to increase the safety.

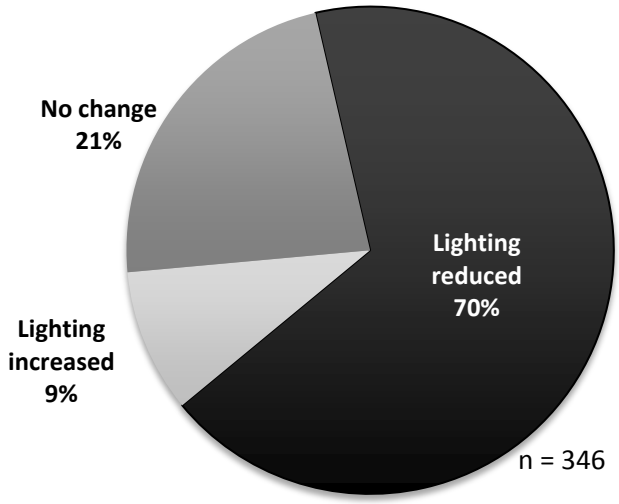


Figure 4-9: Desired Brightness Adjustment

Figure 4-10 shows a distribution plot of the DBA from our survey responses. The negative values of the DBA represent the level of adjustment the respondents would like for the lighting around their residences to be lowered by. Conversely, positive numbers mean that the respondents would like the area around their residences brighter. Close to 18% of the respondents felt the need for the lighting outside of their apartments to be adjusted downwards by 3 or more points.

Additionally, 50% of our respondents felt the lighting outside of their residences should be adjusted downwards by 1 or 2 points. This difference in levels of adjustment could be due to the fact that some people live in areas with higher levels of excessive lighting than others. Nevertheless, a considerable portion of our respondents feel the area outside of their residences is over-lit. Since 68% of our respondents wanted the light to be darker by some amount, this clearly shows that our respondents feel there is excessive lighting and that reductive measures should be taken.

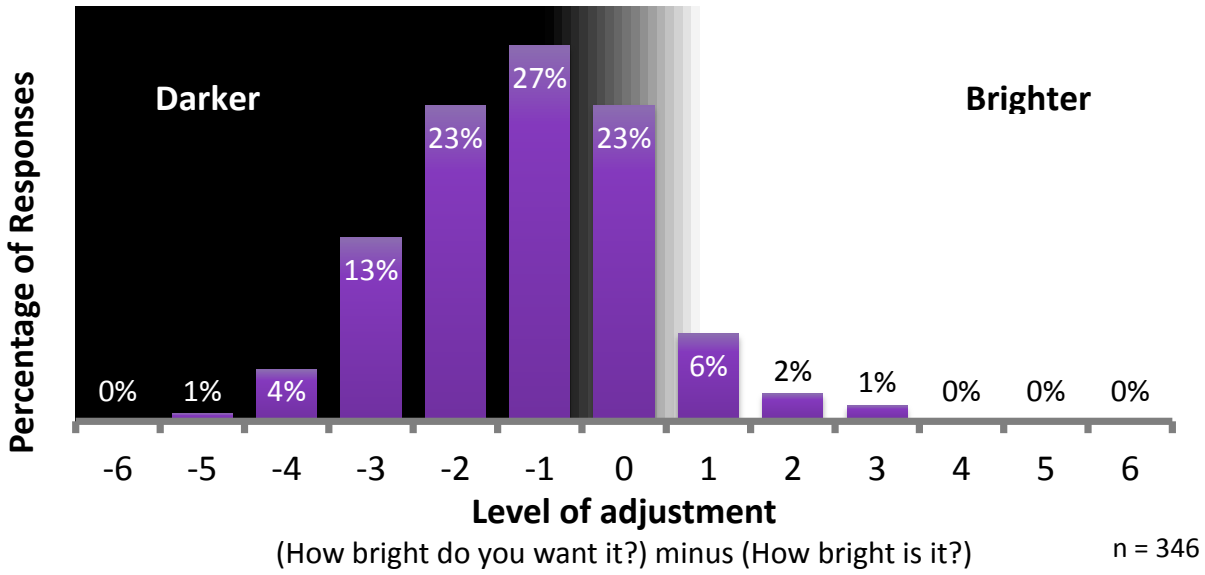


Figure 4-10: Distribution of the DBA

4.2.3. Levels of Lighting by District

We determined that the top three over-lit areas according to our survey respondents are Yau Tsim Mong, Tuen Mun, and Wan Chai. Table 4-1 lists the districts from our survey and their average DBAs sorted by DBA score. These are the districts with 10 or more responses from our survey results. Yau Tsim Mong, rated at -1.77 is a major commercial district, therefore it is perceived to suffer the most from light pollution. Sham Shui Po, on the other hand, is a less busy district and is rated at -0.89. Furthermore, the DBA values for each of these districts are less than zero, although some districts are more negative than others, meaning in these districts some people think that there is more light than they need or might want.

Table 4-1: Average DBA throughout Hong Kong

District	Average RBAD	District	Average RBAD
Yau Tsim Mong 油尖旺	-1.77	North 北區	-1.21
Tuen Mun 屯門	-1.50	Southern 南區	-1.13
Wan Chai 灣仔	-1.45	Eastern 東區	-1.13
Kowloon City 九龍城	-1.35	Kwun Tong 觀塘	-1.11
Tsuen Wan 荃灣	-1.35	Sha Tin 沙田	-1.05
Wong Tai Sin 黃大仙	-1.33	Outlying Islands 離島區	-0.92
Central & Western 中西區	-1.27	Sham Shui Po 深水步	-0.89
Tai Po 大埔	-1.23	Sai Kung 西貢	-0.64

4.3. Perceived Effects of Excessive Lighting

Results from our survey show that our respondents do feel that excessive lighting causes them adverse health effects. We examined how severely our respondents felt affected, as well as the different symptoms related to the exposure to excessive lighting and other ways in which they feel affected by it.

Figure 4-11 shows how severely our respondents felt affected by excessive lighting, if at all. Ninety-two percent of them felt that excessive lighting is affecting them to some extent, while twenty-three percent felt severely affected, which corresponds to levels 5 and 6 on our scale. To put this into context, Ms. M, one of our interviewees, who reported a 6 felt the excessive lighting outside her apartment was causing her massive headaches. However, a small percentage (8%) claimed they did not feel affected at all. This may be because they live in areas with little or no light pollution.

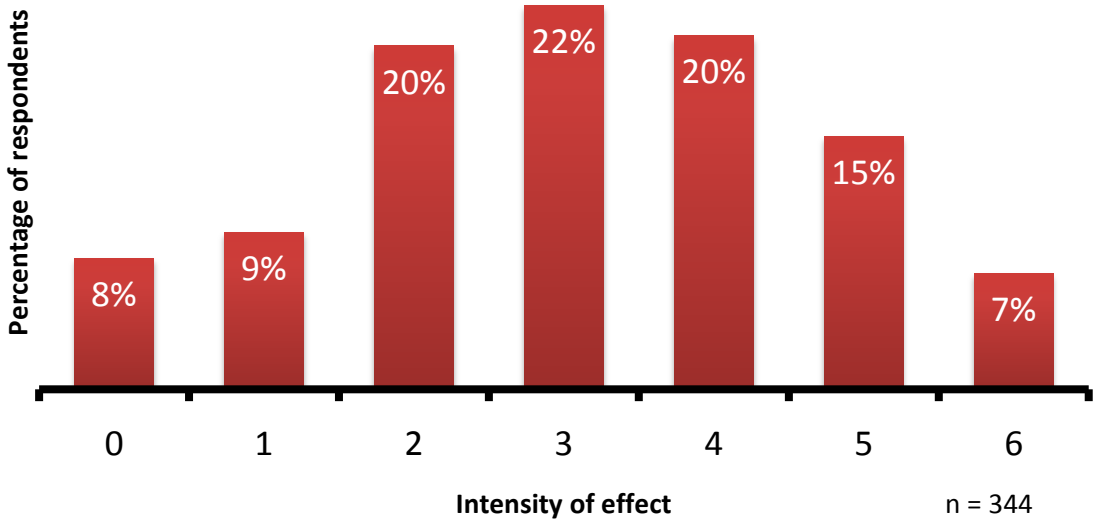


Figure 4-11: Perceived severity of lighting

As discussed in our background chapter, we identified possible symptoms related to being exposed to excessive artificial lighting. The symptoms we studied were anxiety, sleep loss, visual fatigue, depression and weariness. Later in the section we will analyze each of these individually. Figure 4-12 shows the average perceived intensity for each of the symptoms on a scale of 0 to 6.

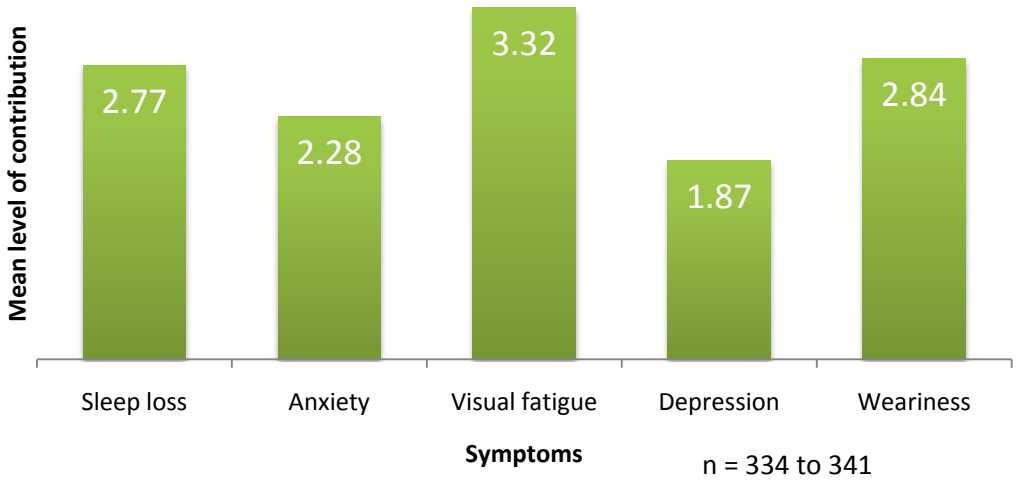


Figure 4-12: Mean intensity of tested symptoms

Visual fatigue was the most severe and prevalent symptom, followed by weariness and sleep loss, while depression and anxiety were not perceived to be as severe. This clearly shows that on average our respondents are suffering from excessive lighting in some way. We are aware that these symptoms can be caused by a variety of factors aside from excessive lighting. However, we put emphasis on capturing people's perceptions about whether they considered excessive lighting caused them to feel these symptoms.

As seen in Figure 4-13, seventy percent of our respondents, those who rated the intensity at level 3 or higher, claim they felt that excessive lighting is causing them visual fatigue.

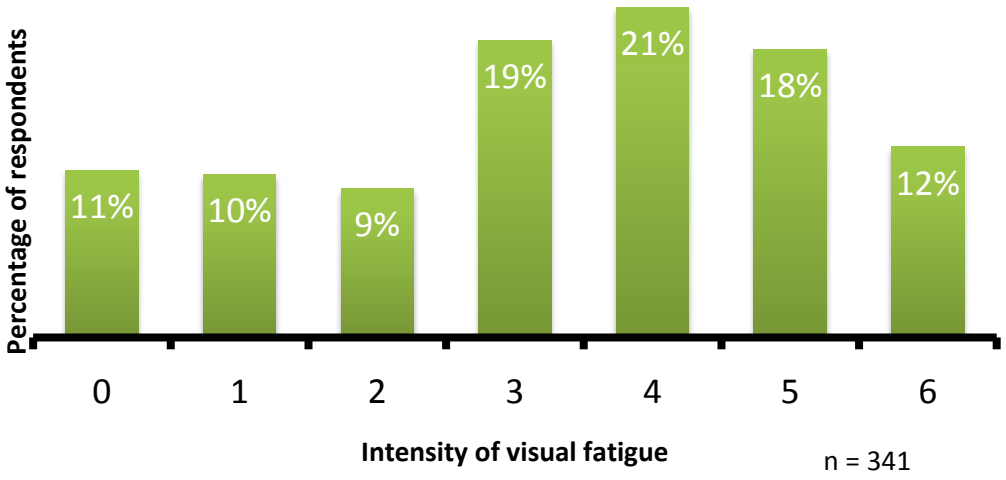


Figure 4-13: Visual fatigue symptom data

Weariness is perceived by our respondents as the second most severe of the symptoms we researched. The graph in Figure 4-14: shows that 84% of our respondents rated the intensity at level 1 or higher, meaning that excessive lighting causes them to feel tired, at least to some extent.

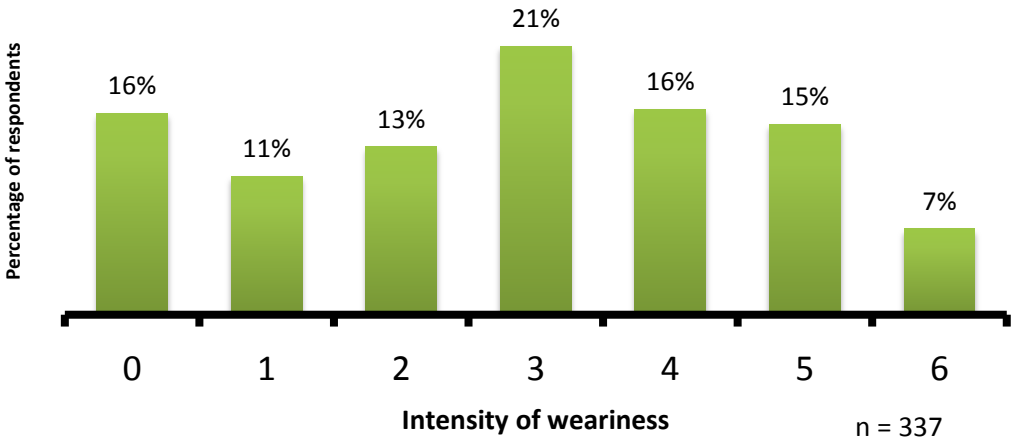


Figure 4-14: Weariness symptom data

Figure 4-15 shows a majority of our respondents feel artificial lighting outside their residences causes them to lose sleep. Furthermore, almost a quarter of them feel heavily sleep-deprived, i.e. intensity levels of 5 or 6, showing that the lights outside of their residences at night are indeed too bright and are adversely affecting them.

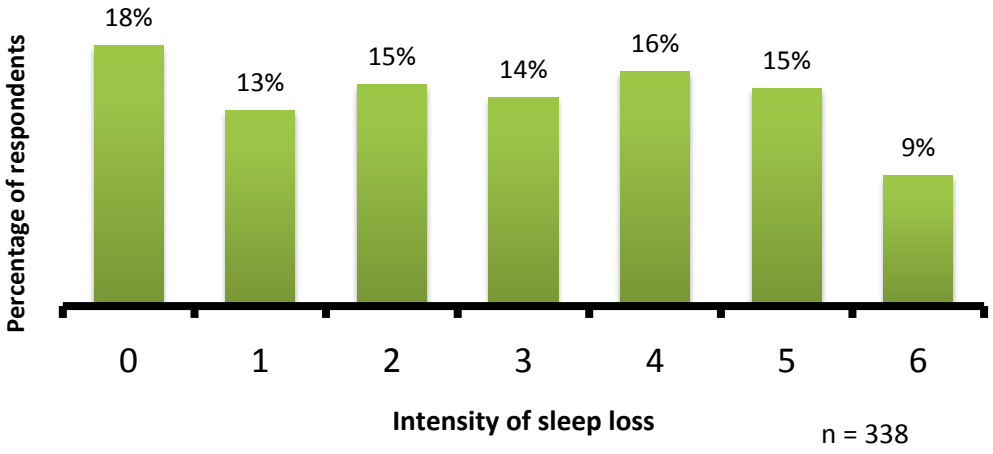


Figure 4-15: Sleep loss symptom data

Figure 4-16 shows that 78 percent of our respondents felt that excessive lighting caused them anxiety on some level. An example of artificial lighting inducing anxiety in someone can be seen in one

of our interviewees, Ms. A. According to her, "…It just makes me anxious during the day when it flashes, especially when it was really strong. I did find it made me anxious, and I didn't feel like we should be having that sort of flash photograph going on in our living room…" (refer to Appendix C.1 for the interview transcript). As evidenced by her experiences and the data in Figure 4-16, 78% of our respondents, i.e. the ones at level 1 or higher, believe that light pollution can cause anxiety.

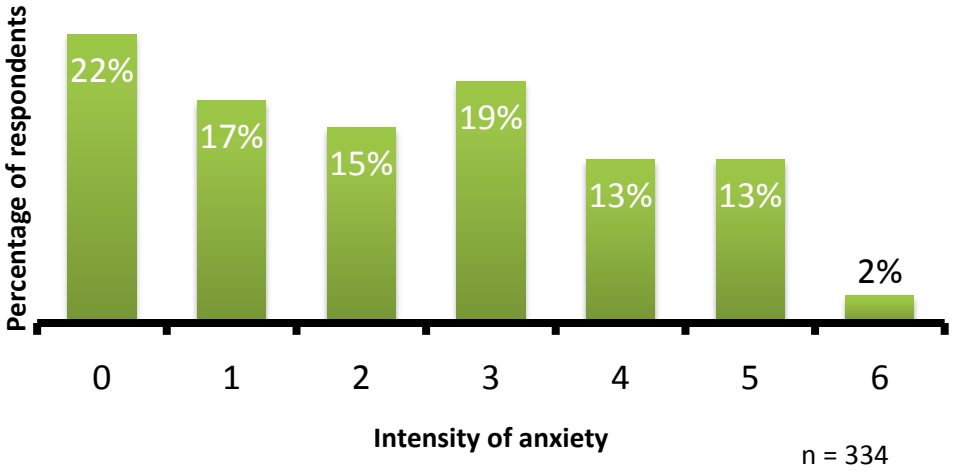


Figure 4-16: Anxiety symptom data

Our respondents did not feel excessive lighting was causing them to feel depressed compared to any of the other symptoms. Close to a third of them did not feel depressed at all, as shown in Figure 4-17: , while 52% of them rated depression between levels 1 and 3. This suggests the majority of our respondents felt either mildly affected by depression or not affected at all.

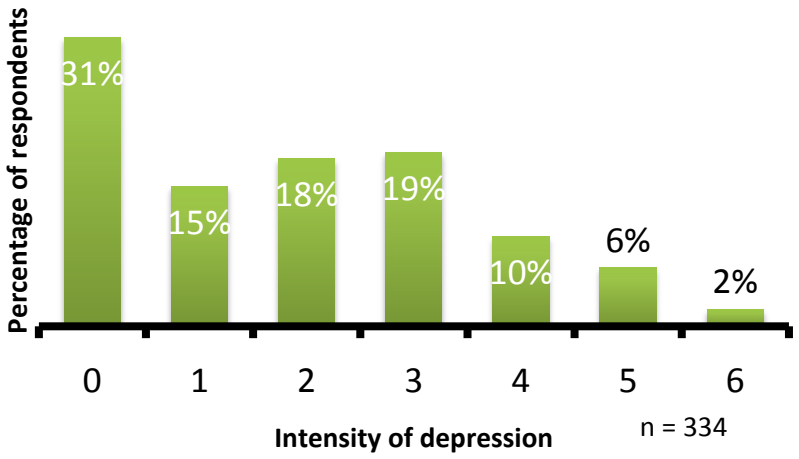


Figure 4-17: Depression symptom intensity

4.3.1. Relocation Consideration

As the severity and level of excessive lighting increases, the number of people who have considered moving to a new residence increases as well, as shown in Figure 4-18. For example, for the respondents that had a DBA of -3, 20% of them have considered moving. The more excessive lighting they have experienced, the more they want to move to a new residence.

There is a significant difference in the number of responses between a -4 and a -3 DBA, suggesting that level -4 is the critical point at which our respondents feel the level of excessive lighting is so severe that they are much more likely to consider moving. We can also see that 14% of the people have expressed their desire to move to a brighter area. Again, this may be because of safety reasons, i.e. their neighborhood is too dark at night.

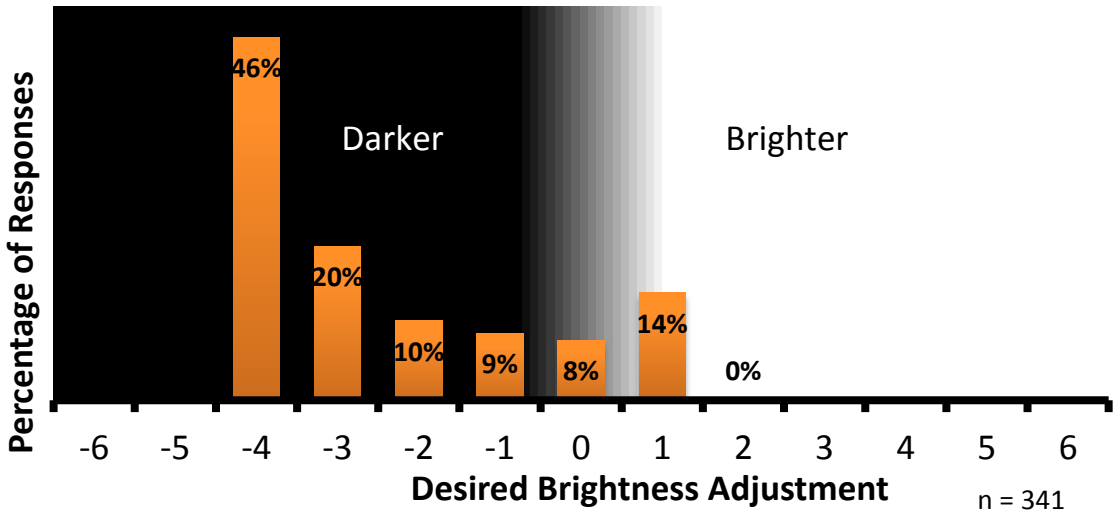


Figure 4-18: Relocation consideration as a function of DBA

4.3.2. Personal Accounts of Light Pollution

To further corroborate our survey data, we now take a look at several cases of excessive lighting disrupting people's lives. Ms A. (mentioned originally in section 4.2) lives in the Mid-levels on Hong Kong Island, an area that is subjected to the lighting from large advertisement signs in Central.

Figure 4-19: AIA Building in Central

Ms. A and her family experience intense flashes of light in their apartment living room during the day. The source of these flashes, according to her, is the building owned and operated by AIA,

which boasts a bright flashing sign, shown in Figure 4-19 that changes “We Are Asia” and “AIA”. Ms. A said that it was almost like camera flashes coming into their living room day and night, and that it caused her anxiety, stress, and sometimes headaches. The flashes did not bother them much at night because they had curtains. However, during the day, when the curtains are pulled open, Ms. A finds that the flashing in her living room is rather irritating and bothersome, rating the severity of this excessive lighting at 5.

All the way on the other side of Hong Kong in Kowloon City is Ms. M, who also feels affected by excessive lighting outside her residence. When Ms. M was young, she used to play in the park down at the first floor. However, that space was later used for the East Asia Games. She described the spotlights shown in Figure 4-20 which were installed for the East Asia Games stadium outside of her apartment as “bright as the sun” (see Appendix D.2 for details) and rated the level of lighting at 6.

Figure 4-20: Lights outside Ms. M's window

When she turns off the lights, it is still as bright inside of her room as it is outside. This light enters through her window on the fifth floor and affects her sleep. During the day, however, Ms. M feels that the intensity of the lights often causes her headaches.

About two months after she complained, the lights were dimmed slightly. Although the lights are dimmer now, they still are bright enough to affect Ms. M's sleep, which prompted her to buy heavier curtains for her window.

4.4. Light Pollution Management Concepts

The second goal of our project entailed making recommendations to Friends of the Earth about lighting ordinances the government could enact that would help reduce light pollution in Hong Kong. After compiling a list of international and state light pollution ordinances (see Appendix O for a full list), we extracted the main concepts behind them.

Hong Kong is a unique city with very different zoning laws than most other cities. While most cities have laws explicitly detailing where residential areas are supposed to be and where businesses are allowed to operate, Hong Kong is unique in that some residential apartments are intermingled with businesses. This means that many of the light pollution ordinance concepts which may be applicable in cities with clearly defined zones may not apply to Hong Kong, or they might need to be adjusted to fit Hong Kong. The following are the concepts that we compiled:

- **Infraction of light pollution ordinance results in monetary penalty and possible jail time**:

  If there are to be light pollution ordinances enacted in Hong Kong, there must be mechanisms to enforce these policies. Relatively speaking, light pollution is not a serious crime, so the punishment should be a civil infraction, such as a fine. With this ordinance, people would be motivated to actually fix the excess lighting problem rather than just pay the fine and ignore it, as they will be forced to spend the money regardless. If this ordinance were to be adopted, the government of Hong Kong could decide a suitable fine to charge for each infraction.

- **All lights in certain zones must be off between certain hours of the night**:

  This ordinance ensures that in certain areas of the city, streetlights and other public/private lighting fixtures must switch off between certain hours of the night. Since space is at a premium, it is often not an option to move an advertising sign or change the location of a light pollution causing light source. If there was an ordinance that outlawed certain intensities of light to be on past a certain time, this would reduce a lot of the light trespass that occurs when advertising signs that are on all night shine into people's apartments.

  Alternatively, some businesses in Hong Kong stay open until the early hours of the morning; a step-down policy could be initiated as well. This would mean that past a certain hour all light intensity would have to be reduced. This would allow late-night businesses to remain operational, while at the same time allowing residents in the surrounding areas to sleep. There could be several tiers as the night progresses, until sunrise when the lights can go back to full power. Additionally, this regulation could include a section that prevents a business from keeping its sign on (or at full power) after it closes. Not only would this eliminate most late night light pollution, it would also save energy.

- **Light fixtures should be fully shielded and directed at its intended target:**

  Some US states require that special cutoff hoods or translucent prisms must be used over the light, in order to cut down the intensity and direct the light at its intended target. Figure 4-21 shows an example of the lighting found in Hong Kong (on the left) and an example of a more ideal lighting (on the right). The red area in the figure shows the light that is missing the black billboard; the green on the other hand shows light that is being used efficiently and hitting its

target. The light bulb on the lighting fixture to the left in Figure 4-21 is exposed, directed downwards and poorly shielded. The lighting fixture to the right in the same figure is shielded and its light is directed at the intended target.

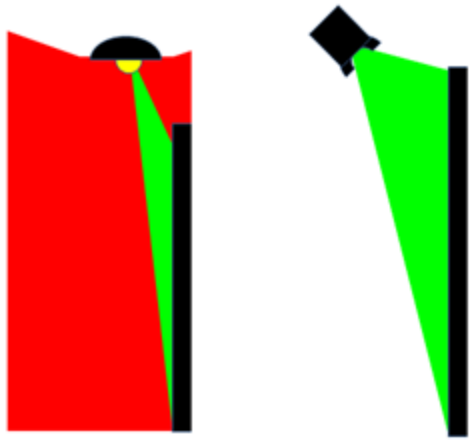


Figure 4-21 : Properly shielded lighting fixture

Since these prisms and hoods only work with point source light fixtures, they would only be applicable to streetlights and spotlights, and not to flat advertising signs. Because our survey data shows that spotlights are perceived as the major contributor to light pollution (see section 4.1 for details), this ordinance would be appropriate for reducing light pollution in Hong Kong.

The ordinance also states that only a small percent of the lights rays (usually 0% to 5%) are allowed to go past the 180 degree horizontal line or spill onto neighboring residential buildings. Limiting the light's rays to below the horizontal line will limit the amount of light that is allowed up into the upper levels of buildings where residential apartments are found.

- **A person may not direct any amount of light past his property lines without express permission from the neighbor**:

  This ordinance would not work very effectively in Hong Kong. Due to the nature of most of the residences in Hong Kong, many people do not own property and only rent an apartment. The population density of Hong Kong is very high, so trying to make sure everybody's light stayed on their own property would not work very well. Additionally, since a lot of the land is owned by the government, and there are many businesses and residences that share space, determining ownership could be very difficult.

- **Buildings and monuments must be lit from the top down**:

  In Hong Kong, due to the way the residential apartments are in some of the business districts lighting a building from the top would mean some of the light would shine directly down into the apartments before hitting the streets. Even if the lights were mounted below the level of residential apartments, much of the light would bounce up and around and back into the residential areas above the light fixtures. This ordinance combined with the shielded lighting ordinance could effectively control both light trespass and sky glow.

- **Exemptions to light pollution ordinances (seasonal low wattage lighting, temporary lighting, emergency lighting, navigational lighting, special events, areas of high pedestrian traffic, national flags/monuments):**

  This is another ordinance common to all countries and states. This ordinance is put in to ensure that in special circumstances (e.g. emergencies, navigational lighting, etc.) lighting that is

directed upwards, unshielded, or is in some way breaking another ordinance is not illegal. We recommend Hong Kong adopt a set of exemptions as well, including: emergency lighting, temporary lighting (construction, public events), navigational lighting, and low-wattage seasonal lighting.

- **A special court may be set up which deals with light pollution infractions in a civil court (similar to small claims court):**

  In the United Kingdom, there are no specific light pollution ordinances. Instead, the Clean Air Act essentially allows for light nuisance to be legally categorized the same as any other nuisance. In the United Kingdom, this allows an ordinary citizen to bring a complaint to the court system, and let a magistrate or judge determine whether or not an infraction has occurred. This ordinance would work well for Hong Kong due to the special mixture of business and residential buildings that pervades some of the commercial areas. Since the light pollution bothers some people, but not others, this is a flexible ordinance that allows those who are bothered by light pollution to do something about it, while those who are not bothered by light pollution can avoid extraneous government intervention in their lives. This is needed in addition to other ordinances, so that some issues of light pollution not explicitly covered can be addressed.

- **Limitations on light fixtures**:

  This ordinance approaches light pollution from the economic perspective and helps cut down on energy waste caused by excess lighting. The IESNA has defined standardized light intensities

that it has deemed appropriate for different situations, and many states and countries with this ordinance use these standards to characterize the amount of allowable power. While this ordinance can be effective, it is difficult to keep track of the millions of lights around Hong Kong. However, this could be used in conjunction with the civil case ordinance, allowing any light fixture that is causing a problem to be measured and compared to a standard.

- **Video billboards require government permits in order to be installed:**

  Through our research, we determined that in many cities video billboards have special laws applying to them, ranging from limitations on light intensity to limitations on the type of flashing/movement allowed on the billboard itself. Many of the city laws deal with video billboards from a driving hazard viewpoint, as brightly lit and flashing video billboards can distract drivers. While the Hong Kong Transport Department does set limitations on the number of video billboards along the highways, they currently have no policies regarding video billboards along streets within the city (Cheng Sze Ling, personal communication, 26 February 2010). From our field observations, we noticed that video billboards are rare compared to neon and normal LED signage. However, we also observed that some video billboards were installed close to residential buildings.

  Rather than try and make explicit laws that account for all of the varied video billboard types and locations, instituting a permit system for video billboards will let the government decide on a case-by-case basis whether or not the billboard is causing negative effects. Furthermore since these billboards use LED technology and these types of billboards will undoubtedly increase in number due to their lower cost compared to other types of lighting (see background chapter

for details), this ordinance would help limit the installation of these billboards in residential neighborhoods.

5. Conclusions and Recommendations

This section presents the conclusions of our research on light pollution and its implications for the residents of Hong Kong. From these conclusions we have developed a series of recommendations that Hong Kong might use to reduce light pollution. Our conclusions and recommendations will help further an understanding of excessive lighting in Hong Kong and provide some practical solutions for controlling excessive lighting.

5.1. Extent to which light pollution is perceived as a problem in Hong Kong

Our results and analysis strongly suggest that excessive lighting is a serious problem in some of the districts in Hong Kong. Based on our analysis from section 4.2.1 we can conclude that the most commercial districts are the ones that are perceived to have the most severe light pollution. This suggests that shops and restaurants are the major contributors to excessive lighting, and when formulating policies for reducing light pollution these are the main groups that have to be addressed.

Our data show that our respondents do feel affected by visual fatigue, weariness, sleep loss, anxiety and depression due to excessive lighting. As noted in our Background chapter, clinical studies have shown that sleep loss can cause a variety of negative effects and symptoms.

Data from our survey allowed us to estimate the major sources of light pollution in Hong Kong. Our data suggest business advertising is the major cause of excessive lighting, since our respondents considered the major sources of light pollution were spotlights, flashing advertisement signs and non-flashing advertisement signs (see section 4.3.1). Many of the business signs and advertisements were not only intensely lit, but were angled improperly or inefficiently.

5.2. Light Pollution Ordinance Recommendations for Hong Kong

The second goal of our project was to recommend applicable lighting ordinances to reduce light pollution in Hong Kong. After conducting field observations we came up with four concept recommendations and a method for dealing with special circumstances that could help mitigate excessive lighting and regulate light pollution in Hong Kong. It might not be feasible to retroactively apply these regulations to the current lighting in Hong Kong, therefore these might be applicable only to future lighting fixture installations.

Additionally, during our research we came across a project that was being conducted by the International Dark Sky Association and the Illumination Engineering Society of North America to design a universal lighting ordinance model that could be used by any community to control light pollution. Currently, this document is being developed and is not publicly available (IDA, 2010). We recommend that this document be reviewed as soon as it is released. This should provide valuable insights into effective and proven measures for controlling light pollution around the globe.

5.2.1. Civil Court for Light Pollution

Allowing citizens to take light nuisance complaints to civil court would be appropriate for Hong Kong. Our results show that while light pollution is a major problem for some people, it is not an issue for every resident of Hong Kong. Therefore, this ordinance would allow those citizens most concerned about light pollution to be able to appeal to the government for intervention.

5.2.2. Light Fixtures Shielded and Properly Directed

Another light pollution ordinance that we suggest the government implement (especially in areas of new construction) would be to require that all streetlights and spotlights lights be shielded. This ordinance would be extremely beneficial to Hong Kong since it would help cut down on light

trespass. All lights must be shielded, so that no light may shine upon unintended areas. It must be shielded so that the direct light falls upon the intended target. In addition to preventing light trespass caused by streetlights and spotlights, this ordinance will also help reduce skyglow and allow for more efficient lighting.

5.2.3. Timing Ordinance

This ordinance would specify times when non-essential lightings would be required to be dimmed or turned off. Businesses would be required to dim their lights starting at a certain time of night to a threshold that would allow them to remain operational, while protecting the residents in the surrounding area from the possible effects of light pollution. This system could also include a clause that prevents shops and restaurants from leaving any signage lit while they are not open for business.

5.2.4. Exemptions to Light Pollution Ordinance

We suggest Friends of the Earth use the list of exemptions below that might apply to Hong Kong when recommending light pollution ordinances to the government: navigational lighting, emergency lighting, temporary lighting, low-wattage aesthetic holiday lighting, and national flag/monument lighting. With these exemptions, safe and effective lighting can still be used in special circumstances.

5.2.5. Video Billboard Installation Permit

This ordinance would make it mandatory for any advertising agency or business that wants to install a video billboard to apply for a government permit first. This would ensure that the intensity, operation, and size of each billboard can be regulated and approved to ensure that the video billboard will not be causing negative effects due to its location or intensity. Additionally, since the government would be able to control the location of video billboards they could make certain residential neighborhoods are not exposed to this type of intense and disruptive lighting.

As for existing video billboards, audits could be performed to determine whether they are adversely affecting residents in the neighboring areas. Video billboards that comply with the standards set by this ordinance would be issued a permit. Billboards that do not comply should be required to follow stricter timing regulations, i.e. should be turned off at dusk.

5.3. Recommendations for Further Research

In order to further understand the problem of light pollution in Hong Kong, we recommend several studies be performed to obtain more concrete data about the effects of light pollution in Hong Kong. These should include medical studies, economic studies, and a study determining what the positive benefits of lighting can be. These studies are all broad, expensive, and time-consuming, so we recommend that, if possible, they be conducted with government support.

5.3.1. Determining Appropriate Levels of Lighting

We were unable to determine specific lux levels that correspond to comfortable levels of lighting. The equipment we used was designed for measuring ambient light lux levels, not specific point source samples, which meant we were unable to determine which specific kinds of light emitted the majority of the measured ambient lighting. Due to time constraints, we were unable to run enough experiments to statistically correlate ambient lighting in a room with different effects caused by excessive lighting (see background section 2.3.2). We recommend a study be commissioned to determine the quantitative measures of the levels of lighting throughout the city. This information could be used to determine the levels of lighting at which people feel adversely affected versus what level of lighting is needed for safety purposes. Furthermore, these findings would allow the government to effectively regulate lighting.

5.3.2. Business Advertising

From our findings we determined that most of the light pollution in the areas we studied in Hong Kong is caused by advertising signs. During our field observations, we noticed one very distinctive feature of the advertising signs: some of them were on at full power even when the business was not open. We recommend a study to determine whether or not having a storefront sign turned off when the business closes for the day would impact its sales. If this factor does not impact the business' sales, then business owners could reduce their expenses by turning off their signs in order to cut down on energy costs.

5.4. Conclusion

Light pollution is a serious problem around the world, and Hong Kong is no exception. Effectively managing light pollution will involve cooperation among the public, the government, and private businesses and industries. Through our research, we have demonstrated that light pollution is adversely affecting some of Hong Kong's residents. With the recommendations we have provided here there will hopefully come a day when light pollution in Hong Kong will be well managed.

References

Audreyandjack. (2006, May 18). Hong Kong [Web log image]. Retrieved November 19, 2009 from http://www.travelpod.com/travel-blog-entries/audreyandjack/worldtrip-2005/1147918800/tpod.html

Axèll, A, Malmros, C, Bergbom, I, & Lundberg, D. (2002). Intensive care unit syndrome/delirium is associated with anemia, drug therapy and duration of ventilation treatment. *Acta Anaesthesiologica Scandinavica*, *46*(6), Retrieved November 4, 2009 from http://icupsychosis.org.uk/documentation/121.pdf

Brill, L. (2006, October 10). Led billboards: outdoor advertising in the video age. *SignIndustry*, Retrieved November 20, 2009 from http://www.signindustry.com/led/articles/2002-07-30-LBledBillboards.php3

Campaign for Dark-Skies. (2010). Words and phrases it might be useful to know when discussing light pollution. *Glossary of lighting terms.* Retrieved February 6, 2010 from http://www.britastro.org/dark-skies/glossary.html?1O

Carvalho, C. (2008, March 17). Frazzle dazzle. *South China Morning Post*

Central Intelligence Agency. (2009). Hong Kong. *The World Factbook 2009, 2009*, Nov 22. Retrieved November 5, 2009 from https://www.cia.gov\/library/publications/the-world-factbook/index.html

Chepesiuk, R. (2009). Missing the Dark: Health effects of light pollution. *Environmental Health Perspectives, 117*(1), A20-A27. Retrieved November 4, 2009 from http://docs.darksky.org/Codes/LightingCodeHandbook.pdf

Chi-fai, C. (2008, April 21). Public Urged to Report Cases of Light Pollution. *South China Morning Post,* p. 3.

Cinzano, P, Falchi, F, & Elvidge, C. (Photographer). (2001). The First world atlas of the artificial night sky brightness. [Web]. Retrieved November 4, 2009 from http://www.lightpollution.it/cinzano/download/0108052.pdf

Environmental Protection, UK. (2010). How much light do we need?. *Light pollution*. Retrieved February 9, 2010 from http://www.environmental-protection.org.uk/neighbourhood-nuisance/light-pollution/

Epilepsy.com. (2009). What is a seizure? Retrieved Nov 19, 2009 from http://www.epilepsy.com/pdfs/what_is_a_seizure.pdf

Flanders, T. (2009, June 25). Light pollution per capita. *Sky & Telescope*, Retrieved November 20, 2009 from http://www.skyandtelescope.com/community/skyblog/stargazing/49099591.html

Friends of the Earth Hong Kong. (2008). Dim it campaign sum-up. Retrieved November 6, 2009 from http://www.foe.org.hk/welcome/geten.asp?id_path=1,%207,%2026,%202453,%203672,%204188

Harris, T. (2002, January 31). How Light emitting diodes work?. *How stuff works*, Retrieved December 2, 2009 from http://www.howstuffworks.com/led.htm

Inderwiesen, P. (2008). Outdoor Lighting Ordinance Support Resource for Fort Bend and Brazoria Counties, Texas, p.2. Retrieved February 10, 2010 from http://www.tovinder.net/lighting/light_ord.htm

The Institution of Lighting Engineers (2005). Guidance notes for the reduction of obtrusive light. Retrieved February 6, 2010 from http://www.britastro.org/dark-skies/pdfs/ile.pdf

International Dark-Sky Association, & Illuminating Engineering Society. (2009). Model lighting ordinance. Retrieved November 22, 2009 from http://www.darksky.org/mc/page.do?sitePageId=58880

International Dark-Sky Association. (2009). IDA mission and goals. Retrieved November 16, 2009, from http://www.darksky.org/mc/page.do?sitePageId=56411&orgId=idsa

Littlejohn, K. (2008, August 27). Sleep deprivation can spell big trouble. *Builder*, Retrieved November 4, 2009 from http://www.builderau.com.au/strategy/career/soa/Sleep-deprivation-can-spell-big-trouble/0,2000063986,339291619,00.htm

Lodriguss, J. (2009). Catching the light. Retrieved November 11, 2009 from www.astropix.com/HTML/H_OTHER/SATPOL1.HTM

Longcore, T., & Rich, C. (2004). Ecological light pollution. *Frontiers in Ecology and the Environment, 2*(4), 191-198. Retrieved November 15, 2009 from http://dx.doi.org/10.1890/1540-9295(2004)002[0191:ELP]2.0.CO;2

MacIsaac, D., Kanner, G., & Anderson, G. (1999). Basic physics of the incandescent lamp (lightbulb). *Physics Teacher, 37*, 520-523. Retrieved November 17, 2009 from http://www.cce.ufes.br/jair/web/TPTDec99Filament.pdf

Mangu-Ward, K. (January 01, 2009). Slipped a mickey? One man's light pollution is another man's historic landmark. *Reason,* Retrieved November 16, 2009 from http://www.accessmylibrary.com/article-1G1-191010867/slipped-mickey-one-man.html

McGuire, B. E., Basten, C. J., Ryan, C. J., & Gallagher, J. (2000). Intensive care unit syndrome. *Arch Intern Med., 160*(7), 906-909.

Motta, M. (2009, June 22), U.S. physicians join light-pollution fight. *Sky & Telescope,* Retrieved November 6, 2009 from http://www.skyandtelescope.com/news/48814012.html

Neon Haven. (2009, June 5). Advantages of neon signs.*Neon Light Articles*, Retrieved January 15, 2010 from http://www.myneonhaven.com/Neon/2009/07/advantages-of-neon-sign.html

Neon Sign World Ltd. (2008). Frequently Asked Questions. *Neon information center*. Retrieved February 6, 2010 from http://www.neon-sign.us/

Nightscape Authority (2009). Simple Guidelines for Lighting Regulations for Small Communities, Urban Neighborhoods, and Subdivisions. Retrieved February 6, 2010 from http://docs.darksky.org/Codes/SimpleGuidelines.pdf

Philips Lumileds Lighting Company. (2007). Understanding power LED lifetime analysis, Retrieved November 15, 2009 from http://www.philipslumileds.com/pdfs/WP12.pdf

Pun, C. S. J., & So, C. W. (2007). *Report of light pollution in hong kong* No. ECF Project ID: 2007-01), Retrieved January 20, 2010 from http://www.darkskiesawareness.org/lp-in-hk.php

Rafi, B. (Photographer). (2004). NYC. [Web]. Retrieved November 19, 2009 from http://www.flickr.com/photos/rafi/11406117/

Ryf, A. (2008). LED microscope illumination. Retrieved November 22, 2009 from http://www.ryfag.ch/en/product_expanded/49/155-led+microscope+illumination+.html

Schiff, E. (2006). *How do Neon Lights Work?*. Scientific American. Retrieved January 22, 2010 from http://www.scientificamerican.com/article.cfm?id=how-do-neon-lights-work

Schlyter, P. (2003). *Radiometry and photometry in astronomy* . Retrieved Feburary 22, 2010 from http://stjarnhimlen.se/comp/radfaq.html#10

Tyson, J. (2000, July 17). How Lcds work. *How Stuff Works*, Retrieved December 1, 2009 from http://www.howstuffworks.com/lcd.htm#

Van Dongen, H., Rogers, N., & Dinges, D. (2003). Sleep debt: Theoretical and empirical issues. *Sleep and Biological Rhythms, 1*(1), 5-13. Retrieved November 14, 2009 from http://www.med.upenn.edu/uep/user_documents/Van_Dongen_etal_SleepBiolRhy_1_2003.pdf

Wafer, J. (January 2005). LED's continue to advance. *Photonics Spectra,* Retrieved November 4, 2009 from http://www.photonics.com/Content/ReadArticle.aspx?ArticleID=20809

Wikipedia. (2009). *Light pollution.* Retrieved November 22, 2009 from http://en.wikipedia.org/wiki/Light_pollution

Glossary

Glare - difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlamps at night.

Heat map - a graphical representation of data where the values taken by a variable in a two-dimensional map are represented as colors.

ICU syndrome - a disorder in which patients in an intensive care unit (ICU) or a similar setting experience a cluster of serious psychiatric symptoms. ICU syndrome is a form of delirium.

IDA – International Dark Sky Association

IESNA – Illumination Engineering Society of North America

Ionization – the physical process of converting an atom or molecule into an ion by adding or removing charged particles such as electrons.

Light Emitting Diode (LED)-a small semiconductor device which emits light, usually colored, when an electric current passes through it. LEDs are energy saving and have a long service life.

Light Pollution (astronomical) – too much artificial lighting causing a decrease in visibility of the starry night sky

Light Pollution (ecological) – any negative effects artificial lighting might have on the nearby flora and fauna.

Light trespass - light entering areas or premises outside the boundary of the premises to be illuminated.

Liquid Crystal Display (LCD) – video screens made up of utilize two sheets of polarizing material with a liquid crystal solution between them.

Lumen - the standard unit of luminous flux, a measure of the power of light perceived by the human eye.

Lux – a measure of the intensity, as perceived by the human eye, of light that hits or passes through a surface.

Noble gas – a group of chemical elements with very similar properties: under standard conditions, they are all odorless, colorless gases, with a very low chemical reactivity.

Over-lighting – excessive usage of lighting. This can take place when light sources are too powerful and are providing too much illumination.

Photon – a particle of light

Skyglow - Unwanted light emitted into the night sky from poorly aimed lamps. Skyglow causes there to be an orange glow to be formed above cities at night.

Video Billboards – billboards made up of LED clusters that are able to display bright and colorful pictures and short videos. In most cases, video billboards are used for advertizing purposes.

Appendix A. Friends of the Earth Hong Kong

Friends of the Earth (HK) is a charitable organization established in 1983 and is one of the "most prominent green groups" of Hong Kong (FoE, 2009, About FoE). Their mission, as stated on their website is:

- **F**ocus on and protect our environment locally and regionally
- **O**ffer solutions to help create environmentally sustainable public policies, business practices and community lifestyles
- **E**ngage governments, business and society

It is important to clarify that FoE (HK) is NOT an extension or branch of Friends of the Earth International, but rather an independent non-profit organization that does not receive regular funding from the government and therefore depends on the support of volunteers and its members.

Friends of the Earth Hong Kong is engaged in a number of green initiatives throughout Hong Kong and has even expanded to China since 1992 (FoE, 2009, About FoE). Some of the campaigns found on their website include:

- Monitoring the environmental performance of the Government and the private sector
- Lobbying for sustainable policies and vision
- Promoting renewable energy technologies
- Pollution prevention, waste minimization, resource recovering and recycling, and sustainable consumption

A.1. Organizational Structure

FoE (HK) has a rather horizontal organizational structure, with their director, Edwin Lau, at the top of the hierarchy. Then there are a number of divisions that account for the different institutions within FoE (HK). Figure A-1 below gives us a more detailed view of the overall organizational structure of FoE (HK):

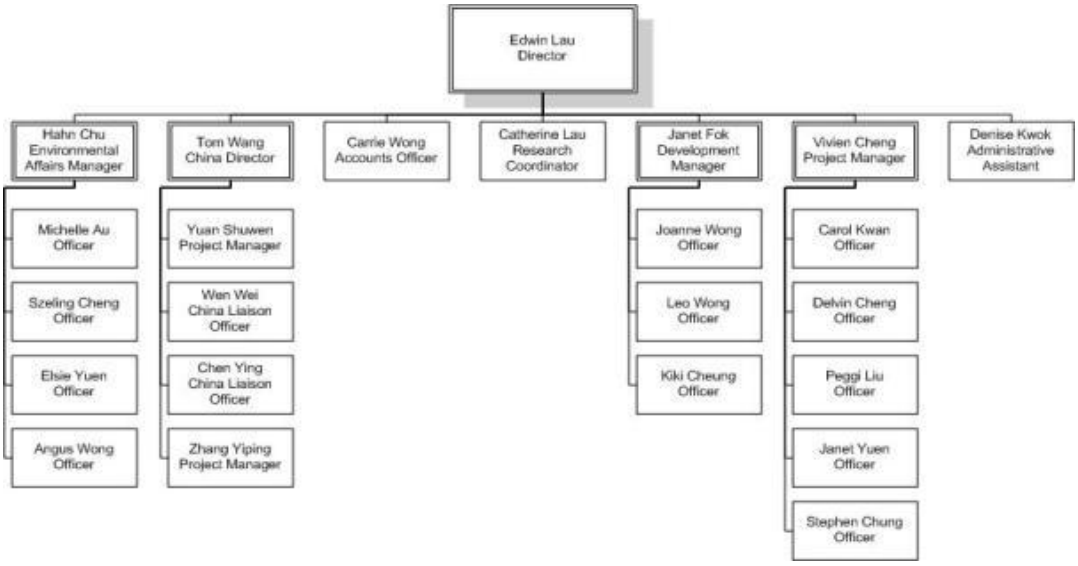


Figure A-1: FoE Organizational Structure(FoE, 2008, Annual Report)

List of Board of Governors of Friends of the Earth (HK) for the year 2008/2009

Chairperson..... Mr. Robert Young
Vice-chairperson.... Dr Vivian Wong
Hon. Treasurer.... Mr. Stanley Wong
Hon. Secretary.... Mrs. Karen Barretto
Member..... Mrs. Mei Ng
Member..... Mr. Fred Ho
Member..... Prof. Carlos W. H. Lo
Member..... Mr. Daniel Cheng
Member..... Mr. George Coombs
Member..... Prof. Fred Lee

Figure A-2: (FoE, 2008, Annual Report)

A.2. Funding and Resources

We can observe that FoE (HK) receives a big part of its income from Project Income – financial support from external entities that fund particular projects sponsored by FoE (HK). Because it is a charitable organization, it receives funding from donations via their website and from its thousands of members.

Despite all of the donations and other sources of income, FoE (HK) counts with a large volunteer base – the Hong Kong population, people who are willing to protect their environment. FoE (HK) also relies on the media to communicate all of its efforts and initiatives to the people of Hong Kong.

A.3. Dim It Campaign

In 2008, FoE (HK) started a campaign called "Dim It" to fight against light pollution, which is in line with our project, seeing how our project's goal and objectives stem from this campaign. The aim of the campaign is to go against light nuisance and energy wastage, as well as urge the government to establish policies to control light pollution (FoE, Dim It Campaign Sum-up, 2009).

6.21 Lights-out event

On June 21st 2008, FoE (HK) organized an event, sponsored by Aviva, to promote the awareness of light pollution by dimming the lights of buildings and signs throughout Hong Kong for an hour. In 2009 FoE repeated the effort with 3500 companies, a much larger group of companies, participating in the lights-out event (3500 companies). These events served to persuade the business sector to pursue greener practices and become more eco-friendly.

The Dim It campaign was supported by EPD (Environmental Protection Department), EMSD (Electrical and Mechanical Services Department), and AVIVA and funded by the Sustainable Development Fund (FoE, 2009, Dim It Campaign Sum-up).

The Dim It campaign will serve as both a reference and a starting point for our study, as it provides background information and research into light pollution.

A.4. Related Work

In 2007 Dr. Chun Shing Jason Pun and Mr. Chu Wing So from the University of Hong Kong, conducted a light pollution survey, which was funded by the Environment and Conservation Fund. The survey aimed to “contribute to the overall environment of Hong Kong by promoting light pollution reduction and energy saving” (Chun Shing & Chu, 2007).

Shaanxi Volunteer Mothers Association for Environmental Protection and Friends of the Earth Hong Kong Collaborated on the Sunflower Action Rural Village Biogas Ecological Demonstration Household Construction Project (Wang, 2008). The goal of this project is the conservation of energy in rural village homes.

According to the Environmental News Network, in its article "Green Group Urges Hong Kong Ban on Energy-Wasting Light Bulbs", an organization called Greenpeace conducted a study on "Energy-Wasting Light Bulbs" in 2007 (Associate Press, 2007).

Appendix B. Interview Protocols and Survey Questionnaire

B.1. Interview Protocol

This was our standard protocol we began with for all of our interview subjects. Depending on their profession and specialty, some parts of the protocol were removed for each interview. Specific interview protocols for individual people listed below.

Introduction:
Hi, I am [each member introduces themselves individually].

We are planning to record this interview, is that okay with you?

Firstly, thank you very much for taking the time out of your busy schedule to meet with us; this interview is a key part in our preparation for our research project in Hong Kong. If at any time during this interview you feel like you have extra information that would be useful to us outside of the specific areas of our questions, please feel free to let us know. Similarly, if you feel as if you don't have enough experience in a certain subject to adequately answer the question or if you do not wish to answer any of the questions, feel free to let us know.

What is the best way for us to reach you?

Light Pollution Primary:

Our research project primarily deals with the problem of light pollution in Hong Kong. We are doing research to the effect that this has on the people of Hong Kong, both physiologically and psychologically.

- Could you tell us about any direct experience you've had with light pollution?
- Have you ever done any work in major cities regarding light pollution?
- In your opinion, is light pollution having a significant impact on the environment?
- Could we get a copy of any reports/case studies you've had involving light pollution?
- In your opinion, what's one of the biggest sources of light pollution?
- In your opinion, is light pollution a significant problem affecting people right now?
- What are the effects of light pollution on people, from a physiological point of view?
- What are the effects of light pollution on people, from a psychological point of view?
- What would you recommend as far as policy changes in outdoor lighting standards?
- Do you have any additional information regarding light pollution you think might be useful to us?

Application of Methods:

As part of our research, we will be conducting a survey "in the field" in Hong Kong, specifically in areas of high light pollution as defined by Friends of the Earth Hong Kong, our sponsoring agency. In order to do this, we will be creating a survey to be given to the people of Hong Kong so that we might further understand some of the direct experiences the citizens of Hong Kong have had with light pollution.

- As we are limited to roughly 4 weeks "in the field", what recommendations (if any) would you have for us to use our time most efficiently, in order to maximize our understanding of the light pollution problem?
- As "outsiders", gaining the trust of the population of Hong Kong may be difficult. What, if any, recommendations do you have for us to overcome this obstacle?

- Coming from a very technical oriented school, our experience in the field of anthropology survey and recommendation is extremely limited. How should we approach the non-technical aspects of this project so that we avoid anything such as cross-culture misunderstanding or issues?
- Do you have any additional information regarding surveys or anthropological research you think might be useful?

Closing:
Thank you very much, we have just a few quick questions in closing before we are finished.

- Can we quote you in our report?
- Is there anybody else you would recommend we speak to?
- Based on your experience and expertise, are there any other areas of light pollution we should be exploring in order to further maximize our understanding of the problem?
- What questions should we have asked you?
- Do you have our contact information?

We thank you very much for your input and time with us. If you would like us to, we will gladly forward you a copy of our report as soon as it is fully completed upon our return from Hong Kong.

B.2. Interview Protocol – Professor Jason Pun

Introduction:
Hi, I am [each member introduces themselves individually]s.

We are planning to record this interview, is that okay with you?

Firstly, thank you very much for taking the time out of your busy schedule to meet with us; this interview is a key part in our preparation for our research project in Hong Kong. If at any time during this interview you feel like you have extra information that would be useful to us outside of the specific areas of our questions, please feel free to let us know. Similarly, if you feel as if you don't have enough

experience in a certain subject to adequately answer the question or if you do not wish to answer any of the questions, feel free to let us know.

Light Pollution Primary:

Our research project primarily deals with the problem of light pollution in Hong Kong, specifically, the problem of light pollution caused by excessive commercial lighting. We are doing research on the perceptions of Hong Kong citizens concerning the effects of light pollution.

- In your opinion, is light pollution having a significant impact on the environment?
- As another group of researchers studying light pollution, could you give us a short description (in your own words) of what your project was all about?
- Could we get a copy of any reports/case studies you've had involving light pollution?
- In your opinion, what's one of the biggest sources of light pollution?
- In your opinion, is light pollution a significant problem affecting people right now?
- What would you recommend as far as policy changes in outdoor lighting standards?
- Do you have any additional information regarding light pollution you think might be useful to us?

Application of Methods:

As part of our research, we will be conducting a survey "in the field" in Hong Kong, specifically in areas of high light pollution as defined by Friends of the Earth Hong Kong, our sponsoring agency. In order to do this, we will be creating a survey to be given to the people of Hong Kong so that we might further understand some of the direct experiences the citizens of Hong Kong have had with light pollution.

- As "outsiders", gaining the trust of the population of Hong Kong may be difficult. What, if any, recommendations do you have for us to overcome this obstacle?

Closing:

Thank you very much, we have just a few quick questions in closing before we are finished.

- Can we quote you in our report?
- Is there anybody else you would recommend we speak to?
- Based on your experience and expertise, are there any other areas of light pollution we should be exploring in order to further maximize our understanding of the problem?
- What questions should we have asked you?
- Do you have our contact information?

We thank you very much for your input and time with us. If you would like us to, we will gladly forward you a copy of our report as soon as it is fully completed upon our return from Hong Kong.

B.3. Interview Protocol – Ms. Q

Introduction:
Hi, I am [each member introduces themselves individually].

We are planning to record this interview, is that okay with you?

Firstly, thank you very much for taking the time out of your busy schedule to meet with us; this interview is a key part in our preparation for our research project in Hong Kong. If at any time during this interview you feel like you have extra information that would be useful to us outside of the specific areas of our questions, please feel free to let us know. Similarly, if you feel as if you don't have enough experience in a certain subject to adequately answer the question or if you do not wish to answer any of the questions, feel free to let us know.

- What is the best way for us to reach you?

Light Pollution Primary:

Our research project primarily deals with the problem of light pollution in Hong Kong, specifically, the problem of light pollution caused by excessive commercial lighting. We are doing research to the effect that this has on the people of Hong Kong, both physiologically and psychologically.

- Could you tell us about any direct experience you've had with light pollution?
- In your opinion, is light pollution having a significant impact on the environment?
- In your opinion, what's one of the biggest sources of light pollution?
- In your opinion, is light pollution a significant problem affecting people right now?
- What would you recommend as far as policy changes in outdoor lighting standards?
- Do you have any additional information regarding light pollution you think might be useful to us?

Business:

- Does being the owner of a business change the way you look at light pollution at all?
- What kind of advertising do you do for your business?
- Would you support light pollution management ordinances?
- Do you believe the government would be able to enforce light pollution regulations on businesses and buildings around Hong Kong?
- Does the government enforce any regulations for businesses currently, such as health codes or anything?
- In your opinion, would dimming advertising signs and turning them off at more reasonable times affect the income of a business in Hong Kong?

Closing:

Thank you very much; we have just a few quick questions in closing before we are finished.

- Can we quote you in our report?
- Is there anybody else you would recommend we speak to?
- Based on your experience and expertise, are there any other areas of light pollution we should be exploring in order to further maximize our understanding of the problem?
- What questions should we have asked you?
- Do you have our contact information?

We thank you very much for your input and time with us. If you would like us to, we will gladly forward you a copy of our report as soon as it is fully completed upon our return from Hong Kong.

B.4. Survey Questionnaire (English)

We are a team of students from Worcester Polytechnic Institute in the United States, working together with Friends of the Earth Hong Kong to fight light pollution in Hong Kong. The objective of this survey is to gather qualitative data on the perceived effects that light pollution might have on the people of Hong Kong. We greatly appreciate your help and if you have any concerns or are interested in helping out please feel free to contact us at greenlight@wpi.edu

1. **Do you believe excessive lighting can adversely affect a person's health?** [ ] Yes [ ] No
2. **How strongly do you feel affected by excessive artificial lighting outside of your residence?**

   No effect [0] [1] [2] [3] [4] [5] [6] Severe problems

3. **If you do feel affected, please rate the following statements on a scale of 0 to 6, where 0 is "No effect whatsoever" and 6 is "Highly affected":**

   Exterior Artificial lighting causes me to feel…

	No Effect						**Highly Affected**
Sleep loss/deprivation	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Anxiety	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Visual Fatigue	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Depression	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Weariness	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Other (specify) _____	____	[0]	[1]	[2]	[3]	[4]	[5]	[6]

4. **Please rate how bright you feel the area outside of your residence is at night**

   Pitch black [0] [1] [2] [3] [4] [5] [6] Bright as day

5. **What would be your ideal level of brightness outside of your residence at night?**

   Pitch black [0] [1] [2] [3] [4] [5] [6] Bright as day

6. **Have you ever considered moving elsewhere because of the level of light outside your residence?**

   [ ] Yes [ ] No

7. **Please rate how much you feel the following contribute to exterior excessive lighting on a scale of 0 to 6 where 0 is "None whatsoever" and 6 is "Highly excessive":**

Video Billboards	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Spotlights	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Car headlights	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Street lights	[0]	[1]	[2]	[3]	[4]	[5]	[6]

Flashing advertising signs	[0]	[1]	[2]	[3]	[4]	[5]	[6]
Non-flashing ad signs	[0]	[1]	[2]	[3]	[4]	[5]	[6]

8. Do you know what light pollution is? [ ] Yes [ ] No

[Continued on reverse]

9. Where do you live? (Official districts listed below)

- Central & Western
- Eastern
- Southern
- Wan Chai
- Kowloon City
- Kwun Tong
- Sham Shui Po
- Wong Tai Sin
- Yau Tsim Mong
- Outlying Islands
- North
- Sai Kung
- Sha Tin
- Tai Po
- Tsuen Wan
- Tuen Mun
- Yuen Long

10. What age group do you belong to?

[ ] Under 18

[ ] 18 to 34

[ ] 35 to 59

[ ] 60+

B.5. Survey Questionnaire (Chinese)

問卷調查

我們是來自美國Worcester Polytechnic Institute的學生，正與香港地球之友合作對抗光污染。是次調查的目的是收集光污染如何影響香港人的數據，我們感謝您的協助，如有任何問題，歡迎透過電郵聯絡我們(greenlight@wpi.edu)。

1. 你相信過量的燈光會影響人體健康嗎？ [ ] 相信 [ ] 不相信

2. 你覺得你受到住所外的過量人造光影響有多嚴重？

沒有影響 [0][1] [2] [3] [4] [5] [6] 嚴重影響

3. 如你受到影響，請評估受影響的狀況：([0]代表沒有影響，[6] 代表嚴重影響)

戶外人造燈光令我覺得…

	沒有影響					嚴重影響
失眠 / 減少睡眠	[0]	[1]	[2]	[3]	[4]	[5]	[6]
焦慮	[0]	[1]	[2]	[3]	[4]	[5]	[6]
眼睛疲勞	[0]	[1]	[2]	[3]	[4]	[5]	[6]
抑鬱	[0]	[1]	[2]	[3]	[4]	[5]	[6]
疲倦	[0]	[1]	[2]	[3]	[4]	[5]	[6]
其他(請註明)_____	[0]	[1]	[2]	[3]	[4]	[5]	[6]

4. 你覺得入夜後你住所外的燈光有多強？

全黑 [0][1] [2] [3] [4] [5] [6] 光如白晝

5. 你覺得入夜後你住所外的理想光度應該有多少？

全黑 [0][1] [2] [3] [4] [5] [6] 光如白晝

6. 你曾否想過因為住所外的燈光問題而搬家？

[ ] 有 [ ] 沒有

7. 請評估你覺得以下項目造成戶外過量燈光的程度：([0]代表沒有，[6] 代表嚴重過量)

電視屏幕	[0]	[1]	[2]	[3]	[4]	[5]	[6]
射燈	[0]	[1]	[2]	[3]	[4]	[5]	[6]

車頭燈 [0][1][2][3] [4] [5] [6]

街燈 [0][1][2][3] [4] [5] [6]

非閃動式廣告招牌 [0][1][2][3] [4] [5] [6]

閃動式廣告招牌 [0][1][2][3] [4] [5] [6] (請於背面繼續回答問題)

8. 你知道光污染是什麼嗎？ 知道 不知道

9. 你住在哪區？

O 中西區 O 九龍城 O 離島區 O 荃灣

O 東區 O 觀塘 O 北區 O 屯門

O 南區 O 深水步 O 西貢 O 元朗

O 灣仔 O 黃大仙 O 沙田 O 其他_____

O 油尖旺 O 大埔

10. 你的年齡屬於哪個組別？

[ ] 18以下 [ ] 18 to 34 [ ] 35 to 59 [ ] 60以上

Appendix C. Interview Transcripts and Notes

C.1. Transcript of Interview with MS. A:

…this begins with her showing us the photograph of light pollution…

DAN: Well, I think the problem is most places design their video billboards so that, they are, they are going to glow during the day, then they lower at night, because they don't need as much light. But that company I know, they did not,

MS. A: And as far as I know it goes 24 hours, yeah.

DAN: So…

MS. A: It's the Bank of China building that lights up, and they do all sorts of light shows and things, but it never flashes into the buildings, they have the intensity just right so that it doesn't indistinguishable

DAN: Ok, so, another question we have on our survey, is, do you believe excess lighting can adversely affect a person's health? And so I'm going to ask you, if you do believe, er, well because you mention on the survey you do believe it can, how do you feel it is affecting you if it is?

MS. A: Um, well I think this light in particular I have curtains up so, it doesn't actually affect me at night, but it just makes me anxious during the day when it flashes, especially when it was really strong. I did find it made me anxious, and um, I didn't feel like we should be having that sort of flash photograph going on in our living room, um, but it doesn't really affect me at night so much, and I, but I do think that excessive lighting coming in when you're trying to sleep, that can definitely affect your health.

DAN: Ok, sorry I'm just trying to think of how I'm going to formulate this question, um, have you notice that it's a problem that any of the lower level lights when you're out in the day, or is it really high profile high intensity lights that are causing problems, and with the neon signs you see down below, on the street level, are those causing you problems as well or is it really just this style?

MS. A: No, I mean I think when you live in Hong Kong you get used to a certain amount of light all the time, you're just, that artificial lighting comes in all the time, I don' feel that I'm particularly sensitive to it, but I think this was just, the intensity of that was just a little bit too far for me, but…

DAN: Yes?

MIKE: On the same note, you say people get used to it, so when you first came here, what was your reaction to all the bright lighting, and did you find it irritating at first or did you get used to it?

MS. A: Well, I suppose there's a certain level that you can get used to, and I mean I've always, I'm used to that sort of thing, I've always lived in a city. But um, I guess, uh, especially if it's something that's flashing, that's particularly irritating I think, and it's not something that you can really get used to, if it's flashing at your house like that, I mean I'm sure a lot of people do…

DAN: Ok, so I know you mentioned this before, but because we were only like taking notes at the time, compared to other cities how do you feel Hong Kong is as far as the light pollution issue goes?

MS. A: I would think it's got to be one of the worst, I just think that it's because they never turn it down, it just never seems to go to sleep. Yeah, I mean

MIKE: Compared to like New York City…

MS. A: Well Japan, no it's light pollution is not a big problem, most of the residential areas are away from that, nobody lives down in Japan near the skyscrapers and things are, but Seattle laughs it's not really like that. I mean, we're privileged because we lived far enough away from the lights, you know, we just sort of look at it differently, but I mean, uh, in Mong Kok or somewhere like that people have these lights right in front of them. I mean its ridiculous me complaining about it, they should be the ones complaining about it.

DAN: So, when this light was really bad, and it just started, did it ever cause you to kind of consider moving away?

MS. A: I guess it, sometimes I do consider moving to the other side, but my kids absolutely love being right in the city, and I think that they wouldn't like it, they said we want to have the city here, and they're quite keen to do that, so I don't think it would really suit us to do that. But yeah, sometimes I think it'd be better if, to not be in the city, it's not a deal-breaker so to speak. *laughs*

MARINA: If I may ask, how long did it take for you to complain to Friends of the Earth? Did you try and deal with it for a long time, or?

MS. A: Yeah, I did try and see if I would get used to it, I thought "well you know, I do live right in front of, you know, a very bright city, I should get used to it, but I guess it was when my son thought it was a thunderstorm or that somebody was taking pictures through a window" is when we thought to do something, and it just irritated me that they were doing it towards the residential side, and they didn't turn it down at night, I guess I wanted to complain just because I thought it was more the principle of the thing, I wanted that company to start thinking about what they were doing.

DAN: Does this lighting affect everyone in your family, or do you feel more affected than everyone else, and like I pose that same question again with your neighbors…or have you not spoken to them?

MS. A: I have spoken to my neighbor about it, she lives on a higher floor in my building, I guess maybe it just bounces off the building, she lives on the 21st floor and I live on the 5th, so I think I'm sort of, I'm on the same certain level as the building, but she was happy that I had complained, but maybe she just wanted to complain and hadn't…

MS. A: Maybe in the Army or something? Somebody had told me, I don't know anyone in there, but I think it might be some sort of residential block for the army.

DAN: So to understand truly how bright it is, when it flashes, do you feel that it's like, can you give us an analogy or something, something that might be just as bright?

MS. A: It's basically like someone's taking a flash photograph in your living room.

DAN: Thank you, that's really helpful because we try to understand how bright people are feeling the lighting around the city is, but it's very difficult because there's no way to say, well that is this brightness because we don't really have a scale we can compare anything to, we try to understand with the questionnaire by asking how bright it is, how bright do you want it, but it still doesn't like capture the intensity, so I thank you for that.

MS. A: Maybe lightning, or flashing, or…

MIKE: Yeah we're trying to capture peoples' perceptions on the problem, so our sponsor cares about public image and stuff like that, so we're trying to determine what people perceive are the problems, and…

MS. A: Right, yeah. Yeah I don't know if people think it is a big deal, I think most people grew up here, and it's yeah, unless they've made a change, you can actually see a difference…

DAN: Uh, is it possible we could have the name of the individual or the group that is in charge of maintaining your building, or ownership of your building, so we could talk to them and maybe talk to some of your neighbors as well?

MS. A: Do you mean like my landlady, or do you mean?

MIKE: I guess you're landlady.

DAN: Yeah that would work, or if there's an organization that owns and operates the building, um, we know that most buildings in Hong Kong have security at the gate, and they prefer people don't go in and survey there, um, but surveying at a building location like that would be one of the most effective ways that we can think of to truly understand what people are going through at home, as such, we need, we need to contact and get permission from the proper authorities, and I guess that authority is what we're looking for.

MS. A: Right, well, like I said, people probably wouldn't find it so bad now, because they have actually reduced the intensity of it, I could ask, I have a telephone number for the management of my building, not my landlady, but the management. You could call them. I could email that to you.

MIKE: We have a survey posted online, on a website, our website, and we would like you to help us if you can "distribute" it, to like people you know here or maybe some of your friends who think that light pollution might be affecting them.

DAN: Do you have the URL on you?

MIKE: Yeah, our website actually explains who we are, what our goals are, what our study is about, right at the home page it has our survey there, so you can fill it out.

MS. A: OK, sure.

DAN: Do you have anything you'd like to add?

MS. A: So what have you found, have you found more complaints on the Kowloon side, or this side, or?

DAN: We haven't looked at complaints based on location yet, I haven't wrote that Excel program to do that yet, but what we have noticed is that, for the most part lights are a problem, we noticed that on average, most people say that their lighting that they experience is about a three, and they would prefer a one. Though, the worst symptoms are sleep loss, visual fatigue, anxiety is kind of mid level, almost nobody feels that the light is strong enough to make them feel severely depressed or upset, or anything like that. There is a little bit of weariness, and most people when they're talking about signs they feel are contributing to these issues the most, feel that flashing advertising signs are the worst. Followed by spotlights and video billboards, although most video billboards in the city aren't nearly as bad as this one, something still does need to be done to make sure that more lights like this one don't pop up. About 15% of people say that they have considered moving because the brightness was so bad, so that kind of puts it into a perspective, how much of an issue it is for people of Hong Kong. Moving I think is something that's very severe of a last resort,

MS. A: Yeah, yeah.

DAN: So that's what we've found so far, although we still have a little bit more to look at, before we really decide what's truly going on. Like most of this we would like to take a look at as a function of

location, and most of our survey responses are from much younger generations right now, mostly college students, so right now we're working on expanding to the rest of the population.

MIKE: We have very few responses from elderly people, so right now we're trying to target these entire population samples,

MARINA: Best success was at colleges that we went to, and as…when it comes to, the, adult population, they are usually at work or too busy to answer a survey, so…

DAN: So actually, maybe that's something we should ask you, if we were interested in contacting the adult working population, do you know if there's an organization or something that has activities for working businessmen and women, like…?

MS. A: There's a YWCA on the mid-levels, and a lot of women take courses there, men too, they take courses as well,

MIKE: Adult learning centers?

MS. A: Yeah, it would be almost all ex-pats, but you know

MIKE: Ex-pats are OK, they live here too.

MS. A: But yeah, all across the mid-levels areas,

MIKE: …the place to visit, YWCA.

MS. A: Um, I think that could be a really well place to find out some information, you could definitely contact people there

DAN: OK, thank you. So we're all set?

MS. A: The YWCA is on building rd (sic), it's McDonal Rd.

ALL: Thank you very much

MS. A: No problem, it was great to be here

C.2. Transcript of Interview with Jeanine Skorinko

Ms. Skorinko is a professor of psychology at WPI. We interviewed with her in an attempt to learn more about some of the challenges involved with social science research, as well as talking with her about her firsthand experience in Hong Kong. This interview was conducted on 18 November 2009.

DAN: I'm Dan. And we are the Friends of the Earth Hong Kong light pollution group

JEANINE: The light pollution one?

JEANINE: I briefly saw you guys [at the IQP meeting with former faculty and students]

GREG: You went to Hong Kong Last year?

JEANINE: yeah, you will have a great time. Don't do bad things but you will have a great time, especially if you don't do bad things

DAN: You sound like you have had your hands full maybe?

JEANINE: No, actually we were very lucky, we had a good group. There were no major disasters but there could have been major disasters. There have been in the past.

MARINA: Really? In Hong Kong?

JEANINE: Just in general, you know, students start using drugs, that's a major issue. If they leave for a weekend and don't tell their advisor, that's also a big issue. If they get into a fight at a club, that's a big issue. If they don't do their work, that's a big issue. So don't do things that will get you kicked back to the United States.

GREG: That would be very unfortunate

MIKE: So, for our formal Intro: Hi I am Michael Ng, we are team greenlight and firstly, thank you very much for taking time out of your busy schedule to meet with us. This interview is a crucial part of our preparation for our research project in Hong Kong. If at any time during this interview if you feel you have extra information that would be usefully for us outside of our questions please let us know. Similarly, if you feel you as If you don't have enough experience on a certain subject to adequately answer the question or if you do not wish to answer any of the questions please feel free to let us know.

JEANINE: A little bit, I know it's about Light pollution.

MIKE: so, what we're doing is studying light pollution. So light pollution is, well, there are two definitions. One is astrological …

GREG: Astronomical.

MIKE: Astronomical which is the blocking of the starry night

MIKE: Which is the blocking of the starry night. And the second one is ecological damage to the environment.

GREG: Measuring the effects of humans, psychologically, physiologically, socially

DAN: So we're focusing on that second definition, um how it affects people. So we have a few questions about that.

GREG: And we understand it isn't your main specialty, we just have a few questions about surveying things.

MIKE: We're dealing with humans subjects we'll be conducting local field studies over there in hong kong, basically asking them what the effects of light pollution are on their day to day lives.

GREG: We can probably skip most of the light pollution questions; just go to the surveying ones.

JEANINE: well I was in Hong Kong, so I 'm trying to think about what I experienced in HK. I mean you don't see the stars there, but that's no different than how it is in Worcester. Um…I mean the lights will go off at certain times, but other than that, and I mean, I don't sleep with shades closed, I sleep with them open, otherwise I don't wake up very well. I've never noticed a problem with that. There was a red building nearby with lights that would go off at certain hours. Um, you feel very safe with all the lights in Hong Kong, there are many street lights and not many dark alleys, so there's a benefit to the lights being

MIKE: The other side of it…so, have you ever done any work with light pollution?

GREG: We can probably skip down a few lines mike, the light pollution questions aren't necessary.

MIKE: In your point of view, what would the psychological effects of light pollution on people? Have you had any cases?

GREG: I mean circadian rhythm disruption was one of the main things we read about, we saw it causes depression, their psychological issues, just curious if you had any experience with circadian rhythm disruption.

JEANINE: Um, I mean there are certain places in the world which are dark all the time or light all the time depending on where we are in the rotation of the earth, so they'll do different things to keep people happy. There if is light all the time than people are sleeping a little less, I think is the general

finding, but if it's dark all the time it's not their sleeping more, but it generally leads to depression more. Seasonal affect disorder, which is, not necessarily related to light but in a way it is, because once we turn into winter the days get shorter and colder, and a lot of people begin to show signs of depression and sadness because the days are darker, which is kind of the opposite of lip. The flip side of that, is when it gets lighter out, people feel like they have more time and energy throughout the day. The solutions to

[Interruptions from outside]

JANINE: to actually introduce them to more light, so having uva light bulbs (special ones) to shine on them for a certain amount of time a day. At one point of time, I don't know if this is still the case, it was actually suggested that people who suffered from seasonal affect disorder might benefit from 10 minutes of tanning a day, just for the light surrounding them. It was also theorized something to do with vitamin E deficiency. I'm not an expert in season affect disorder, but these are just some things off the top of my head I know in general.

DAN: Do you see a direct connection between the type of lighting, or the lighting you experience based on seasonal changes, do you see a correlation between that and the specific lightings we might be working with, such as LED lighting and LCD lighting?

JEANINE: Possibly, you have to look more into the type of lighting they recommend, I can't remember off the top of my head.

JEANINE: In terms of sleep and circadian rhythm, um, sleep is very important to our functioning. We will have a set amount of hours, not everyone functions the same way, so you can't say 8 hours is the best for everyone, people vary. But if they are sleep deprived, the research consistently shows lack in

cognition, lack in health, wellbeing, and all sorts of different areas, so the memories aren't as good, cognate skills aren't as well, we don't perform as well on different tests, things like that, so, the typical things you would probably think of, um…for a lack of sleep. So if light was somehow influencing their ability to sleep than it could definitely have negative ramifications on life, um…

MIKE: Ok, you mentioned you didn't have any of these problems in Hong Kong?

JEANINE: I didn't, but I'm a heavy sleeper (laughs)

DAN: Where were you in Hong Kong when you were over there, were you an awful way from central, or?

JEANINE: Right in the middle, Tsim Sha Tsui, right in the heart of it. We were in off of Nathan Road, which is a very major. I think more there it was more noise pollution [laughs], late at night I would get woken up by noise, not so much light. Not that I'm not trying to say there's no light pollution over there, light was on ALL THE TIME, and I don't know if it was necessary. But in terms of what kept me up, personal experience, it was more noise than anything else.

DAN: Ok

MIKE: Ok, when you were out in the streets, did you find it bothering or tiresome having all that light directed at you?

JEANINE: No, I saw it more as a safety thing, I'd rather have the light so I can see where I'm going and can see people around me, especially being a single female walking along on my own that was a lot more comforting than dark lights. I mean I walk from here to my car, Higgins House lot, and there's no lighting in part of it, and that's, you know, [laughs] worrisome, regardless of what time it is, now it gets

dark or sooner, I'm walking out there at 5 o clock and still people around. Though it can be a lot to process, lights and flashing lights, neon signs and stuff.

MARINA: It's just that the public is exposed so much to the advertisement and advertisements are known to be colorful to attract attention, but if that advertisement is affecting people and is always flashing at them, than perhaps it somehow affects them?

JEANINE: People work in funny ways, so color is a little bit more attractive and appealing than black and white, but it depends on the amount of color, the amount of distraction, there are a lot of variables to it. There's actually a banner blindness right now, so website with little banner ads or ads that pop up that use color and animation and such and people are actually, um, unconsciously they process them so they'll still be able to report some details of them, but for the most part it's a banner blindness, so they don't look. Eye-tracking studies will show usability studies of websites, if there's anything that has a picture on it that may be an ad you will look everywhere on the page but that ad

MARINA: So, it's not the same as advertisements on the streets, right?

JEANINE: On the streets is a different story. So I'm trying to, I don't know. [laughs]. I'm taking the best example that I know is actual advertising, whether or not that would actually parlay onto what's on the streets, that's a good question. You know, I mean Hong Kong everything is vertical, the signs will come off, and come vertically, so you're going to have to look up. Just looking straight ahead, it's more actually a sea of people, so you have to pay more attention to where you're walking so you don't run into someone, than necessarily what's going on.

MIKE: So we'd like to ask you some questions about applications of research methods and things like that, so, our first question, as part of our research we will be conducting surveys in the field, in HK,

specifically in areas of high light pollution as defined as the FoE HK sponsoring agency. In order to do this, we will be creating surveys and giving, to be given to people of Hong Kong, so that we will further understand some of the direct experiences of the citizens of Hong Kong, and what they have to do with light pollution. So, as we are limited to roughly 4 weeks in the field, what recommendations, if any, would you have for us, to use our most, time most efficiently? In order to maximize our understanding of the lp problem?

JEANINE: So is that in general, for IQP, or for surveying, or..?

DAN: Well answer both sides to it.

GREG: We understand your specialty might be helpful in terms of psychologically talking to people, cultural variance, maybe some of your experience with that.

JEANINE: Well, in terms of finishing your IQP, just follow the schedule. You have a certain amount of time, you have to work on intro, method, etc. Having advised there, in terms of the survey you start thinking of questions now, and then the question, so are you thinking of doing a paper and pencil survey? Talking to people?

DAN: We are looking at many different methods, possibly even a digital format, similar to a paper and pencil survey, but we also would like to do some interviews as well. But we are interested in strategies and general tips and information you might have.

JEANINE: So, what areas are high light pollution areas? What areas are you going to?

DAN: Central, um, I'm not entirely sure about the locations of Hong Kong

MIKE: Our sponsors will be providing us with specific locations they want us to investigate

JEANINE: Out in the New Territories, and I'm just basing on what my students experienced, you know they surveyed people in Central, in Tsim Sha Tsui, [pause] all over, and they had a harder time in the New Territories area, than necessarily in Central or Tsim Sha Tsui, or like the Mong Kok area, I think they had some issues in Mong Kok as well, and they used both paper and pencil and interview, so, paper and pencil, if you can get someone to translate it into Chinese, they found that was beneficial, so they had it…their format wasn't necessarily the best they did English than the Chinese right under it, you could just have two surveys, that was something else they thought of. The problem there was not everyone was literate in Chinese, so they might be able to speak it, but not read it. Inevitably you're going to lose some people, and depending on what format you use, interviews are more time…[pause], timely,

GREG: In terms of surveys in general, from a psychology background, is there any sort of official resource of information? Professor Peet has given us information about sampling bias, etc., but we obviously have no experience whatsoever, but is there some sort of online resource that's well known in the psychology world or sociology world that could give us some ideas about, I mean there are obviously things about surveying, I don't know…

DAN: The official way to do things to make sure you can eliminate biases,

GREG: Right, so we can write in our report about surveys, maybe there was something we did wrong, etc.

JEANINE: Yeah the issue of bias, or skewed data, and all that sort of stuff is always going to be an issue when your assessing people's attitudes, there's always lots of error. Someone says one thing, someone else something else, two people say the same thing interpreted differently, on my computer I have a

chapter from a research methods textbook that I could send to you, if you give me an email address. It talks about how to, what types of questions to ask, how to ask different types of questions, it talks about the difference between asking 7 point Likert scales, or scaled questions vs. open-ended responses, so you have to deal with those differently in data analysis. The benefits and negatives to those yes/no questions, things like that, in terms of scaling. One thing you never want to do is, the first question, 7 point scale "strongly disagree" 1, strongly agree 7, and then you think, "oh well I want to make sure their paying attention so I'll switch the anchors on number 2", so you switch agree/disagree, you can't do that, because you won't know whether they actually did pay attention to that, you don't know what that number means, based on the original anchor or the new anchor, it's a common thing like "I'm going to catch them, make sure they pay attention", but people aren't going to pay attention, especially if it starts with an S, so make sure you keep that consistent. Certain questions the way you word them can lead them into wanting to give you a particular answer, you just have to kind of read your questions, words that you use, make sure you define things, when you say light pollution make sure people understand what you mean by light pollutiom, so you might have to break that down. You can ask the same question in several different ways, so how much did you like your experiment, or how much did you want to get along with your experiment, if you saw the experimenter around the real world, would you be friends with them? It's all in the same construct as liking, and their responses may be similar or differ a little bit, but you can group those questions together to kind of get an index of liking, so you can use similar questions and

JEANINE: The benefit of that is you get a little more variation in stuff, so you can kind of build a stronger case, if you miss still just one question, based on that one question and how they interpret that one question, if you use similar questions it can strengthen the argument they group together,

and there are stats you can do to see if they actually statistically group together. But then you know if you ask multiple questions for the same thing it increases the length of your survey, it's a double-edged sword, you know.

GREG: Generally speaking, 4 to 5 questions, people don't want to waste time, the group that was talking to us said their survey was 3 pages long, and I feel like that would be way too long, and people will just say "oh I don't want to do this anymore".

JEANINE: My students had somewhat of an issue with that, they had the English and Chinese on the same surveys, so their survey was 4 pages long, in reality it was double sided, not super long, but people would be like "oh sorry I got to go" so they would only do the first page of it. That is a concern, but you also want to, it's a delicate balance. You need to make sure you're asking questions you need to ask, but you're not asking too many questions. Um, boring your participants is a possible bias, if their bored you don't know if their paying attention, they might just answer randomly, you can also look through the responses, if people give the same response, 5 all the way down, whatever, that's a generally good indication they weren't paying attention. Um, so you can always take that data out, and put it back in and see what happens.

DAN: As far as question types go, obviously the most useful is a short answer, or open-ended response, where you can understand what their thinking, respond to such, but those are usually the hardest to get, so how do you make sure, I mean it's hard to analyze, so how do you make sure your getting the proper balance of information to speedy response? To an analyzable answer, all of that sort of stuff, um, what sort of questions do you go with, do you have to go with a mix? Would it be better to go with some pure straight multiple choice, um…

JEANINE: That's a judgment call, there's no wrong answer, I mean you're right, short answers can give you a lot more info, but you also have to rely on people's handwriting, their language skills, so they give you great answer but it could make no sense, and then you have to deal with that data, how do you use that data, and you can actually quantify short answer responses, so if you're looking for a particular thing, you could go through and rate each response based on how much it, you know, how, if I was looking at, if I had someone write about a day in the life of someone, and their writing a story about someone they see, and I want to know how much they're stereotyping, I can have people go through without knowing anything about the condition they're in, they could rate it on how stereotypical it sounded, you define what that means. So you can go through and rate that and turn that into a quantifiable variable. You can take excerpts and use it throughout your writing, from short answers to kind of strengthen the numbers you get, so you could say people on average say that light pollution wasn't a problem, in fact here's a quote from someone, so they could help you fill in and supplement that way, to kind of sell your research. In terms of other scalable items, I mean using scales are quick and easy. Questions…what their wording is could be an issue, so you just have to think about what your questions actually asking, you can get means, you could see, you could actually compare the response from one question to another question, you could run a correlation, you have lots of data to play with. But…I don't know, you know, that's based on whether or not you have stats know-how

JEANINE: You definitely want to be, even when your interviewing and doing survey stuff, make sure you jot down any information you can about your demographic. Gender is easy, race to some extent you can identify, you might not want to necessarily say someone is a particular [laughs] you could see someone and think their male but really they're female, or vice versa, and it gets tricky, and you might not be able to tell from names. Maybe you [points at mike]. One way you can do it here is you know,

Cindy vs. Bob, you know, kind of is a good indication, but we never know, I know Ryan's who are female, you know, and there's lots of Chris's, male or female, you don't know, so you just have to be careful about the conclusions you make. So if your sample is only college students that's a limitation, but you see it in one group, future research is a limitation, but you can turn those things into future research, "looking at an older demographic"

JEANINE: well, I would try and randomly select a sample that way, you could kind of look at demographics, I mean today you could say today I got a lot of younger people, tomorrow target older people to make sure you make the sample, but I mean, you can't, when you have 5 females, and 50 guys, you can't make that comparison, you can't tell me what the females thought. The sample is too small. Same thing is with, two old people, all the rest of your sample is young, so just be careful. I mean…difference of 5 people, not a big deal, you know, but when it gets larger than that you might not be able to make certain conclusions, and you have to be careful about the conclusions you make. So for instance I was told once you become over 30 you like to eat fish, but I'm not sure if that's based on my students project, thinking that was one conclusion they probably couldn't make.

DAN: So do you have any other questions you'd like to ask before we move onto closing?

GREG: Real quick, in your experience, are there any sort of cultural things we should watch out for, not watch out for, but in terms of us being outsiders and having no sort of knowledge, does that require a little bit of HK culture, talking to them, anything like that you'd recommend, in terms of approaching wise,

JEANINE: No…I mean, seem friendly and approachable, it doesn't always work. It takes time. You'll learn the art as you do it. The first few times you might stumble, you'll get the hang of it, one of my

students at first hated surveying, because he just was sort of an awkward thing for him, and he'd be like "um, can you do this for me for class?" and that approach didn't work, and he got more comfortable with approaching people, and by the end he was doing really well. I have one student who just, I don't know if there was something about her, I think only like 5 people said no to her ever, she just was, she just flourished, picking up everyone on the street and getting them to answer questions for her, and sometimes people would work for me, and sometimes people wouldn't for me, so it just depends. You just pick people. And you kind of learn, you can learn to read people's non-verbal's, if they are looking straight ahead, and they have headphones in, they're not going to stop. Right? I mean, they're busy. If, they look more like they're looking around, or they're kind of walking more leisurely, they might be more likely to help you. Um, you know, tourists are going to be an issue, how do you decide if someone's a tourist or not a tourist. You aren't going to know if they're from mainland, Australia, US, etc. You probably want to have a question on your survey to distinguish whether or not there a resident of HK as well. You could also then, if you're surveying tourists, see if there's a difference between tourist population, resident population, um…so…

GREG: Yeah that's, I'm good

MIKE: Going back to the methods, what would be our best way to like, reach more elderly people? Like…

JEANINE: That's a good question. They love the park in the morning, Tai Chi, that might not be the best time, I mean there may be a limitation to that in that their doing their exercise at that point of time, I mean I would slap you upside the head if you bothered me during exercise time, but maybe a lot of them actually depending on where and when, I mean Kowloon Park in particular are doing Tai Chi or dance, some are just socializing. The YMCA there are lots of old people there, but again they're

working out, so I don't know, how well you'd get people there. I'm trying to think, if there's any senior centers or anything, that would just require some Googling and looking, you might be able to get access into there, I'm not sure. You know in the US how would I get an elderly sample? I would contact the senior centers around, see if I could go hang out with them for awhile, you know, I'm trying to think, I worked with someone who did elderly research, I'm trying to think how they contacted people. Newspaper, they put ads in the newspaper, probably not going to work for you guys.

DAN: Here's another question along the same lines, because there are organization for elderly people that get them together like a senior center and the Tai Chi in the morning and things like that, they might be easier to get in contact with, or than the, business class, the people that work the 9-5 all day, and, I was wondering if you had any idea the best way to get in contact with that demographic?

JEANINE: There might be social groups for them as well, you know the 5 o Clock happy hour, I don't know. I saw signs for happy hours, didn't go to them, um, they probably won't help you when they're at a bar either, that's a good question. Asking people in the streets during lunch time, not necessarily the best time, but there's going to be ebbs and flows depending on when you survey, on the way home to work, if you're on the streets that's one way to get them. If you look up different, if there's some sort of thing going on in the park, if there's a show or something, um…

JEANINE: If you look up different, if there's some sort of thing going in the park maybe, if there's a show or something, um…um, I'm trying to think…you could get them…those are the best ideas off the top of my head.

JEANINE: That's the key, you can't get wrapped up in the limitations, you'll never get a representative sample, you can never create the perfect survey. There's always going to be something you never

thought of. I do experiment after experiment…and…OH, people didn't understand the word egalitarian, because they did last time, defining things, that process…that's what follow up is for, that's what future research is for, you can never do one study to solve all problems, you can do one study to help answer a part of the problem, but…that's just one thing to keep in mind. It's easy to think "Oh I gotta make sure this is perfect" and you do want o make sure it's good, but it can never be perfect…

JEANINE: So…I don't know what information is actually in this textbook because I don't use it, which is why I feel fine giving it to you, but there's a chapter on sleep and dreaming…

MIKE: Thank you

C.3. Transcript of Interview with Professor Jason Pun

PROFESSOR PUN: Light trespass, not the same as light pollution, light trespass is a very unique situation in Hong Kong, in NYC this is not the same. Here there are many high-rises, where you can actually have light directed into your apartment. I think sort of in the US light trespass is a little less of a problem, lower population density, due to poor lighting density. It is a much bigger problem in Hong Kong, a very interesting concept. On the other hand, imagine a very very strong bream of light shot into the sky will not affect your living room, but will still affect your life.

MIKE: Yeah, we narrowed it down to billboards and advertising and signs,

PROFESSOR PUN: 7-11, McDonalds, etc.

MIKE: Yeah

PROFESSOR PUN: I know the friends of Earth people quite well,

DAN: You can see how our questions are tailored, how they're directed. We have both English and Canto.

PROFESSOR PUN: I'm no expert in social surveys, so…

MIKE: Yeah we've had trouble doing surveys, a lot of people don't want to do this.

PROFESSOR PUN: They tell me you have to be careful, you can really misguide people with the questions. For example, the first question, yes or no can be misleading. When you understand that people can get mislead...you should usually include half and half, a choice, otherwise they might criticize your survey as misleading. Before you even get into it, the first question might be misleading. But I'm not social science, other people have told me about these.

MARINA: If you could direct us to…

PROFESSOR PUN: Actually the FoE people have done lots of work, we have a center for social science here in HKU, they are experts, maybe consult them see if they can give you some tips or comments.

DAN: If we were interesting surveying on campus, is there anything we need to do?

PROFESSOR PUN: That's a good point, to be honest I don't know. Laughs. You might want to contact our university international office

MIKE: Yeah we ran into that problem on HKU, permissions and stuff.

PROFESSOR PUN: I have a similar feeling we might do the same thing too. Laughs. How long are you going to be in Hong Kong?

MARINA: We have terms, instead of semesters, so we do 3 classes a term, 7 weeks a term.

PROFESSOR PUN: So that should be enough time to do the survey, that's good. So I think that the university international affairs, our SAO would be great. Hopefully some of your predecessors have already contacted us so you have a good reputation.

MIKE: So you guys did a study, what did you think were the biggest sources?

PROFESSOR PUN: Well, anytime you have human beings, you have light pollution. This comes with the fact we're humans and we work at night, we have activities at night, by definition any light unnecessarily spilled out is light pollution, in a city like Hong Kong where the population density if so great we have serious light pollution problems, artificial lighting. It's not entirely clear whether sort of domestic light use vs. commercial vs. public lighting is more significant, that would be a great project my student Wing was thinking about. I just want to show you something…(shows picture)

So this is a spectroscopy of the night sky. So you want to think about what is pollution the night sky. This is a very very nice sight (I think in Arizona) but a huge contribution is the high pressure sodium ;lamps. These are very popular lamps used for public lighting. There are some Mercury lines, for commercial uses. Now, for this particular sight, this is the continuum component (continual light bulb), because I'm also doing a paper on different kinds of lights. So this would be the other types, incandescent lights, etc. So you can see there really is a mixed bunch, and it's not clear which has the highest component. Domestic vs. commercial vs. public. I think these are the 3 main sources, and this is something I want to find out. I hope to find out. It will be interesting. If you just go mash up the total amounts of brightness, you cannot tell where it comes from. You have to separate the components and do spectroscopy or narrow band photometry to study the variation of emissions coming from one bad vs. the other, like sodium lamps.

DAN: Is his thesis available on public domain, or?

PROFESSOR PUN: Not yet, his thesis defense will be in two weeks. *Laughs*

MARINA: We can email him about it.

MIKE: What do you recommend as far as policy changes as far as outdoor lighting standards?

PROFESSOR PUN: Good question. Our government is actually putting in regulation to regulate the usage of outdoor lighting in Hong Kong, I think it's a fantastic idea. The indistinguishable they have, their having consultations right now and the proposed regulation is not out yet. I had a student a few years ago in environmental management, we looked at the problem, we thought about it a lot, and we thought of a few ways that should be considerations for the areas of consideration, that's what I think. In a dense city like Hong Kong, which is unique, we have to have huge population stuck in a huge area,

and big pockets of area, very concentrated area. Right next could be country parks where's there no people living, Hong Kong is quite unique. I'm thinking of something. The second is time. There should be some time element in there, we hope. We have to at least respect the rights of the business people to use commercial lightings up to a certain time, that's the second element. On the other hand, its' entirely up to the owner of the light to decide what time. Of course, people are rational people, so they'll turn it off at 2 a.m. not because of preserving pristine sky but because they know that not that many people are walking around at 2.m. On the other hand, that will give good excuse for 7-11 people to have hugely bright lights. The third factor is to hopefully be put in, as an astronomer, not currently pollution can be preserved so that the developments of, well you understand we need developments in the city, but there are pockets of HK still pretty nice in terms of LP, so I hope that the local astronomers enjoy it, and I certainly hope that there could be regulations to really preserve those light areas. So that's why we have this concept of a star night preservation zone, to preserve the night sky in those areas, and to have stricter development code for those areas in HK. If the coming regulation actually addresses some or all of this, it would be OK. When the government first came out with this idea it was mostly on the energy saving part, which is perfectly good and a good aspect, and we have talked with them a lot, including FoE, to try and expand the idea to not just think of the energy saving idea.

MIKE: Yeah if we think about conserving energy, new tech is really efficient, but can be really bright as well. Conserving energy might just mean replacing them with newer brighter lights with less energy, which would be a problem. We need to expand

PROFESSOR PUN: Exactly, after the fact you saved some energy that's not how we look at it, it's not a good way. You now replace your light bulbs Tungsten with Led lights did you do a good job? It's not the case.

MARINA: We've been gathering data surveying for the past two weeks, and it hasn't gone that well for us. So do you have any recommendations or anything?

PROFESSOR PUN: How have you guys gone about this?

MARINA: Our methods are to, several approaches. Approach universities, talk to students, find out where students are living in heavily populated areas. We're also talking to residential areas, which is the hardest, they have security, and if we do manage to get in many people are reluctant to answer. We've gathered that should be the main focus of our survey, but…

PROFESSOR PUN: As I said, I'm no expert, when I supervised my students from a few years ago he proposed to do a survey, I said sure but I don't know how. laughs. In the end we had a big scheme to interview people on the street, but it is really difficult and time consuming and that's why org pay lots of money to do it for them. In the end we settled on a web based survey. Also, these can be very biased. You can never quite control what kind of traffic you get, so it will always be biased. We ended up with pretty good results, but it works out ok, but of course from scientific accuracy and representation it's certainly not as good as finding a right mix of representative population. For those, it's going to be a lot better if you can go into a building, you know these are people in a residential areas, etc. It's not easy. That's all I can tell you. Approaching universities is a good idea; young people are usually more outspoken, less afraid of English speakers. Not a big problem of Hong Kong people. *Laughs*. So yeah it's not easy.

MIKE: We have an online version

PROFESSOR PUN: Yeah, then you have to find the right place, etc.

PROFESSOR PUN: But people seldom have home pages these days, people go to facebook, social websites, so it's always by referral

DAN: We've been giving our link to colleges, so

PROFESSOR PUN: Have you contacted the various environmental societies of each university? That's a great way. Environmental science majors, different variations in all the universities. I'm sure they have student organizations. You need to, I think it shouldn't be that hard to find those societies, and they are more active. The point is to find it. Energetic people who want to do something, not me. *Laughs*.

MIKE: We were hoping you could direct us to those people, maybe pass on the link to any classes you teach. If their interested you could have them fill it out. We're also trying to get more response from the adult population, so we're thinking maybe college faculty…

PROFESSOR PUN: I don't want to, discourage you too much, but we are old and lazy. We don't respond very well to sort of some student sending surveys to us, we just delete them

everybody laughs

MARINA: We do it too,

PROFESSOR PUN: I mean, sometimes I send emails they just delete it, this is the reality these days. So maybe a combination, the university and environmental groups, whole bunches in HKU. They are quite active.

PROFESSOR PUN: and the good thing of them is they keep good maintenance between universities, and they all talk

HKU is a good group. The student I supervise in my projects she works for “greenpace” (sic) or some stuff, I can talk to her; I supervise her so I have to meet her every week and ask her if she’s interested. A couple of her friends, etc, offer some help. So this is some ideas, as for adults, I don’t see any good way other than just going to the street, unfortunately. But this is so time consuming, just to get ten of them. Go to bus stops, ferry stops, try and get them to help you

DAN: Because our survey is so short, we can get about 15 in a half hour, but it’s tough.

PROFESSOR PUN: Exactly its very time consuming, all 4 people just talking, even just to collect a hundred would take a day or two, but

MIKE: If we could do that, it’d be great

PROFESSOR PUN: You could try, I don’t know, but go to something residential area, go to subway stations, etc. Outside MTR. On the other hand, there will still be bias, for having a population understand and do the interview in English, usually if I see foreigners I expect indistinguishable, a person who doesn’t speak English might be a little scared. You mentioned how to get the trust of locals, it’s not easy, lan kwei fung is alright, but you want to get a good mixture of public stuff, a huge population lives in public asphalt, these are gov sponsored housing estates. If you really want to be scientific you need a mixture. But that’s what makes it fun! Laughs. If it’ easy, it’s already been done.

MARINA: Any questions for us?

PROFESSOR PUN: No, I wish you guys good luck, have fun, glad to see some enthusiastic students from Worcester, people who just elected a republican senator for some reason, to come to HK and help out. I'm willing to help out as much as I can.

MARINA: So we will send you an email to the link with our online version

PROFESSOR PUN: I can forward it to the online students, I can hook you up with someone. On the other hand, let me just, ok I can help you out. Yeah yeah, I'll help you out with my contact of the student organization here, that would be great, they have a whole bunch of environmentally conscious students.

Appendix D. Personal Accounts of Light Pollution

D.1. Ms. A's Case

Name: Ms A.

Area: Mid-levels

Description:

Ms A. is a woman in her mid-40's who lives in the Mid-levels on Hong Kong Island, home to the famous "Mid-Levels Escalators" and a great number of businesses vying for the attention of the public through the use of immense advertising signs and video billboards. Despite being essential to businesses, these advertisements are often too bright and shine into people's residences. This is known as light trespass and is a serious case of light pollution that can cause health-related problems (see section 2.2.4 for more details).

Ms. A and her family experience intense flashes of light in their apartment living room during the day. The source of these flashes, according to her, is the building owned and operated by the Bank of China, situated across from her building, which boasts a bright flashing sign that reads "We Are Asia". Ms. A said that it was almost like camera flashes coming into their living room day and night, and that it caused her some anxiety and stress. The flashes didn't bother them much at night because they had curtains. However, during the day, when the curtains are pulled open, Ms. A finds that the flashing in her living room is rather irritating and bothersome.

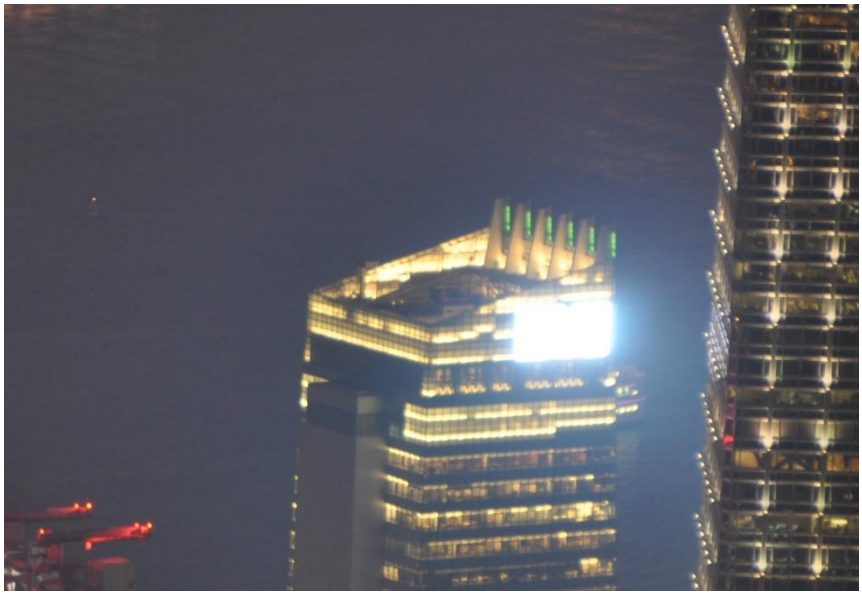


Figure D-1: We Are Asia sign at Victoria Peak

Because of this Ms. A contacted Friends of the Earth Hong Kong for help dealing with the light pollution. Friends of the Earth then worked with her to submit her complaints and eventually, after a couple of months, the intensity of the "We Are Asia" sign was reduced a little, although it is still bright enough to be a nuisance.

Ms. A. was born and raised in a large city in the West Coast of the US, and she has lived in the UK, Japan and Hong Kong. This gives her a unique perspective on the light pollution problem, and when asked about the light pollution in Hong Kong compared to other countries, she replied "I would think it's got to be one of the worst".

Quotes (see Appendix C.1 for full transcript):

"…It just makes me anxious during the day when it flashes, especially when it was really strong. I did find it made me anxious, and I didn't feel like we should be having that sort of flash photograph going

on in our living room…but it doesn't really affect me at night so much, but I do think that excessive lighting coming in when you're trying to sleep, that can definitely affect your health."

"I'm used to that sort of thing, I've always lived in a city. But um, I guess…especially if it's something that's flashing, that's particularly irritating I think, and it's not something that you can really get used to, if it's flashing at your house like that, I mean I'm sure a lot of people do…"

"We're privileged because we lived far enough away from the lights, you know, we just sort of look at it differently, but I mean, in Mong Kok or somewhere like that people have these lights *right in front of them*. I mean its ridiculous me complaining about it, they should be the ones complaining about it."

"...but I guess it was when my son thought it was a thunderstorm or that somebody was taking pictures through a window, is when we thought to do something, and it just irritated me that they were doing it towards the residential side, and they didn't turn it down at night…"

D.2. Ms. M's Case

Name: Ms. M

Area: Kowloon City

Description:

Ms. M is a high school student living in Kowloon City. We met her through Friends of the Earth, to whom she complained about light pollution to. The apartment complex where she lives in recently installed a couple of street lights that are "bright as the sun" the light sips through her window on the fifth floor. The light mainly affects her sleep. When she turns off the lights, it is still as bright inside of her room. During the day, however, Ms. M feels that the intensity of the lights cause her headaches all the time.

When Ms. M was young, she used to play in the park down at the first floor. However, that space was later used for the East Asian Games. They built many bright lights around it and they contribute a lot to the light pollution affecting her.

Figure D-2: Excessive lighting outside Ms M's window

Ms. M had read about light pollution and Friends of the Earth in the newspaper before and decided to write them a letter about how light pollution was affecting her life. Friends of the Earth contacted their real estate management, and after about two months the lights were dimmed. Although the lights are dimmer now, they still are bright enough to affect Ms. M's sleep, which prompted her to buy curtains for her window.

Additionally, Ms M provided us with a detailed explanation of the light pollution outside of her residence, shown in Figure D-2.

Quotes:
"…The lights go on very early, around 5pm and they don't go off until after 5 or 6 am…"

"The light is light the sun, like broad daylight coming in through the window and illuminating my room… my sister's room is worse"

"so many many lights were built for the East Asian Games…"

D.3. Ms. Q's Case

Name: Ms. Q

Area: Mid-levels

Description:

Ms. Q is a woman in her 30's living in a mid-levels apartment. She claims that excessive lighting shining through her windows at night gives her headaches, and doesn't allow her to fall asleep until around 1 a.m. She has undertaken a one-woman light pollution crusade against many of the bright lights she sees shining into her apartment, "hunting them down" and attempting to shut them off. She has been successful with many of the video billboards and bright lights she sees shining into her room, and she is currently in contact with several more building owners to attempt to shut down the rest of the lights causing her problems.

Verbal Complaints:

-Bright flashing "We Are Asia" sign

-Affected both her and her boyfriend

-Cause stress, anxiety, headaches, and sleep loss

-It took Ms. Q several months to get each of the lights shut down; many times, the people in charge of the lights were reluctant to dim or shut off the lights and continually made up excuses as to why they could not do it.

Appendix E. Residential Areas Surveyed

Location	Date	Address
Mong Kok	1/19/2010	618 Shanghai St
Causeway Bay	1/23/2010	290 Lockhart Rd

Appendix F. Senior Citizen Centers

Name	Contact name	Contact email	Contact telephone	Location
St. James Settlement Center	Catherine H.Y. Ho	catherine.ho@sjs.org.hk	852 2882 8726	Fortress Hill
Methodist Southorn Centre for the Elderly	Mark Y.K. Tsui	marktsui@methodis-centre.com	852 2838 6368	Wan Chai
St. James Settlement Center		cwdecc@sjs.org.hk	2805 1251/ 2815 4866	Central/Western
Hong Kong Sheng Kung Hui Welfare Council		wdme@skhwc.org.hk	2818 3717/ 2818 5056	Central/Western
Neighbourhood Advice-Action Council		tcis@naac.org.hk	3140 6365/ 3140 6366	Island
Hong Kong Society for the Aged		cwdecc.hke@sage.org.hk	2558 0187/ 2558 6266	Eastern
St. James' Settlement		wcdecc@sjs.org.hk	2835 4324/ 2834 7300	Wan Chai
Aberdeen Kai-fong Welfare Association Social Service Centre		jcwck@akwassc.org.hk	3550 5520/ 2552 6719	Southern
Christian Family Services Centre		tlvmede@cfsc.org.hk	2357 9963/ 2345 6018	Kwun Tong
Hong Kong Christian Service		whdecc@hkcs.org	2717 0822/ 2174 5564	Kwun Tong
Wong Tai Sin		cyme@skhwc.org.hk	2323 0632/ 2329 0911	Wong Tai Sin

Appendix G. List of Interviewees

Email	Telephone	Interview Date	Comment
socw@hkusua.hku.hk	(852) 9447 2120	1/25/2010	Interview Wing on study on light pollution by HKU
jcspun@hkucc.hku.hk	(852) 2859 1962	1/26/2010	Interview Professor Pun on study on light pollution by HKU
		2/2/2010	Ms. A
		2/4/2010	Ms. M
		2/12/2010	Ms. Q

Appendix H. University Contacts

Hong Kong Polytechnic University	Department	Position	Email	Telephone	Comments
Winnie Cheng	English	Director	egwcheng@polyu.edu.hk	(852) 2766-7558	Contacted Winnie Cheng to administer survey to her students in the English department
Ben Hui	SAO		Ben.Hui@inet.polyu.edu.hk		Contacted SAO to get permission to survey at HKPU

Hong Kong University					
Jason Pun	Physics	Assistant Professor	jcspun@hkucc.hku.hk	852-2859-1962	Interviewed Jason Pun about his study on Light Pollution. Also asked him to help us administer survey to his students
Lee Yuen Ki, Judy	Astronomy Club	External Vice-chairlady	suastro@hkusua.hku.hk		Contacted club to speak to members, administer survey, and ask for permission to go to their homes
	Environmental Life Science Society		elsshku@www.hku.hk		Contacted club to speak to members, administer survey, and ask for permission to go to their homes
	Greenwoods Organization				Contacted club to speak to members, administer survey, and ask for permission to go to their homes

Caritas					
Reggie Kwan	Caritas Francis Hsu College	President of Caritas	reggie.kwan@cfhc.edu.hk	852-3427-9797	

Appendix I. Community Service Centers

Name	Contact email	Contact telephone	Location
Caritas Community Centre - Caine Road	ycscrcc@caritassws.org.hk	2843 4652	2/F, Caine House 2 Caine Road Hong Kong
Caritas Community Centre - Aberdeen	ycsabncc@caritassws.org.hk	2552 4211	20-22 Tin Wan Street, Aberdeen Hong Kong
Caritas Community Centre - Kowloon	ycsklncc@caritassws.org.hk	2339 3713	1/F, 256A Prince Edward Road, West Kowloon
Caritas Mok Cheung Sui Kun Community Centre	ycsmcskcc@caritassws.org.hk	2816 8044	27 Pokfield Road Kennedy Town, Hong Kong
Caritas Community Centre - Tsuen Wan	ycstwcc@caritassws.org.hk	2493 9156	9 Shing Mun Road New Territories, Tsuen Wan
Caritas Community Centre - Ngau Tau Kok	ycsntkcc@caritassws.org.hk	2750 2727	2/F, 1 On Tak Road Ngau Tau Kok, Kowloon
Martha Boss Lutheran Community Centre	mblcc@lutheran.org.hk	2199 9401	89 Chung Hau Street, Homantin Kowloon
HKSHK Lady MacLehose Centre	director@skhmaclehose.org.hk	2423 5265	22, Wo Yi Hop Road, Kwai Chung, New Territories
MongKok Kaifong Assn. Ltd.	pdchssc@mkkfa.org.hk	2395 3107	45 Fuk Tsun Street, Tai Kok Tsui, Kowloon
St. James' Settlement	laurence.lam@sjs.org.hk	2835 4371	7/F, 85, Stone Nullah Lane, Wanchai Hong Kong
Yan Oi Tong	cliff.au@yot.org.hk	2655 7500	5/F, Yan Oi Tong Centre, 18 Kai Man Path, Tuen Mun, N.T.
Yuen Long Town Hall	johnnyklchan@yahoo.com	2476 7771	4 Tai Yuk Road, Yuen Long N.T.

Appendix J. Lighting Ordinances

Table J-1 – United States Lighting Regulations (Adapted from the IDA, 2009 Directory of Lighting Ordinances)

STATE	Individual Concepts (interpreted in our own words)
Arizona	
AZ House Bill Title 49 (See Chapter 7)	49-1102: All outdoor lights need to be fully or partially shielded except for incandescent sources 150 watts or less. Streetlights are exempt if shielding is not available from manufacturer. These restrictions do not apply to emergency lighting so long as the emergency exists. All outdoor lighting used for city or town improvement, construction, or maintenance are exempt. All outdoor lighting used for construction or major renovation of municipal buildings and town facilities. 49-1103: All outdoor lighting fixtures not meeting the provisions of this article will still be allowed IF they are turned off between the hours of Midnight and sunrise by an automatic shutoff device. 49-1104: No new mercury vapor outdoor lights can be installed after January 1, 1991. Additionally, no replacement equipment other than bulbs for mercury vapor light fixtures is allowed to be sold past January 1, 1991. The use of mercury vapor light fixtures is prohibited in general after January 1, 2011. However, outdoor lighting systems erected prior to 1950 are exempt from this provision. 49-1105: Nothing in this article shall apply to airport navigational lighting. 49-1106: These restrictions shall apply to all towns, cities, or counties unless said areas have equal or more stringent provisions on their own.
Arkansas	
The Shielded Outdoor Lighting Act Title 8, Chapter 14, Shielded Outdoor Lighting Act	8-14-102: The purpose of these laws is to save energy and preserve the environment. 8-14-104: 1. After January 1, 2006 no public funds shall be used to install outdoor lighting unless it is shielded. This shall not apply to any county or municipality which determines it to be prohibitive in comparison to the cost of unshielded lighting fixtures. 3. Each electric public utility shall offer a shielded lighting option. Each company MUST inform its customers of the

	availability of shielded lighting services. 4. This chapter does not apply to incandescent outdoor lighting 150 watts or above, or other light sources 70 watts or less, as well as outdoor lighting fixtures on interstate or federal highways. Additionally, if the lighting fixture was installed before August 12, 2005, this provision shall not exist. Finally, this provision shall not apply to navigational lighting or outdoor lighting fixtures that are necessary for worker safety. 8-14-105: Violations of this chapter are punishable by a warning for the first offense and a $25 fine minus the replacement costs for each light fixture for a second or subsequent offense. 8-14-107: The provisions of this chapter shall not apply to any town, city, or county which has adopted equal or more stringent laws than the provisions within this chapter.
California	
CEC 2005 Building Energy Efficiency Standards, Section 132-Outdoor Lighting Controls and Equipment (pg 75)	132-A: All permanent outdoor lighting with lamps rated over 100 watts shall either have a lamp efficacy of at least 60 lumens per watt or be controlled by a motion sensor. Exemptions include: Emergency lighting, lighting used in and around swimming pools, searchlights, theme park lighting, lighting for film or live performance, temporary outdoor lighting, LED lighting, sign lighting. 132-B: All outdoor luminaires that use lamps rated greater than 175 watts shall be designated “cutoff” for light distribution. To comply with this requirement, the light must be rated “cutoff” in a photometric test report that includes any tilt or other non-level mounting condition of the installed luminaire. “cutoff” is a luminaire light distribution clssificaton where the candela per 1000 lamp lumens does not numerically exceed 25 at or above a vertical angle of 90 degrees above the Nadir, and 100 at or above a vertical angle of 80 degrees above the nadir. Nadir is defined as the direction straight down by a plumb line. Exemptions include: signs, lighting for vertical facades emergency lighting, temporary outdoor lighthing, lighting used in swimming pools, replacement of existing pole mounted luminaires. 132-C: All permanent outdoor lighting shall be controlled by a photocontrol or astronomical time switch that turns off when outdoor day lighting is available, with the exception of lighting in tunnels and other covered areas that require lighting during the day. For lighting of building facades, parking lots, student pick up areas, and other large outdoor

	canopies where two or more luminaires are used, an automatic time switch must be installed that is capable of turning off the light when not needed or reducing power by at least 50% (in Watts). Exemptions include the same as listed above. 133: Controls for signs. All signs permanently connected with lighting must be controlled with an automatic time switch or photocontrol/astronomical time switch. All outdoor signs shall be controlled with a dimmer that provides the ability to automatically reduce power by a minimum of 65% during nighttime hours. Exceptions same as listed above.
West Hollywood, California	Ordinance stating that government permit is required for all installations of video billboards, as well as a list of restrictions as to what the video billboard may use.
Colorado	
Title 24, Article 82, Part 9 **(24-82-902)**	1. On or after July 1, 2002, any new outdoor lighting fixture installed using state funds must meet at least the following requirements: A. For outdoor lighting with an output rated greater than 3,200 lumens, the fixture must be a full cutoff luminaire B. The minimum illuminance adequate for the intended purpose is used with respect to recognized standards, such as those adopted by the North American IESNA. C. Full consideration has been given to costs, energy conservation, glare reduction, the minimization of light pollution and the preservation of the night environment D. It has been determined that outdoor lighting must be needed and the same purpose cannot be accomplished with reflective road signs, warnings, or other informational signs. 2. Exemptions include a federal law preempting state law, temporary outdoor lighting, emergency lighting, special events or situations, the lighting is used solely to enhance the aesthetic beauty of an object, or a compelling safety interest exists that cannot be addressed otherwise.
Substitute House Bill No. **5686 - Public Act No. 03-**	03-210B: No floodlight intended for private use illumination shall be located within the state right-of-way, with the exceptions of (1) the luminaire is designed to minimize light trespass/glare and maximize energy use, (2) maintained luminance levels produced by the luminaire equal to the

210 (Reduction of Hazardous Road Glare and Light Pollution from Private Area Floodlighting)	minimum maintained levels recommended by the IES, (3) the light is sufficiently shielded and aimed so no directly light is visible from the highway, and (4) the light is properly shielded and directed so no direct light is visible at a viewing height of 5 feet or greater along the adjacent property line.
Delaware	
Title 7: Conservation & Natural Resources, Chapter 71A. Regulation of Outdoor Lighting	7102A: Outdoor lighting may be installed using state funds only if (1) the new replacement is a cutoff luminaire if the rated output is over 1,800 lumens, (2) the minimum illuminance adequate for the purpose Is used with respect to nationally recognized standards, (3) for lighting of a designated highway or highway system the DOT determines the purpose of lighting cannot be accomplished via reflective road signs, warning signs, or other effective passive methods. For purposes of the above provision, "energy conservation" means reducing energy costs and resources used and includes using a light with lower wattage or a timer. Exemptions for the above include: federal law preempting state law, temporary outdoor lighting, emergency lighting, special events or situations, outdoor lighting used solely to enhance aesthetic beauty, compelling safety interest exists that cannot be addressed by another method.
Georgia	
HB-942	HB-942: All state parks, historic sites, and recreation areas under the control of the Department of Natural Resources shall be designated as "dark sky preserves". Lighting fixtures installed at such places must follow several rules: They must not interfere with nighttime activities, all new lighting installed within 3 years following the effective date of this article must be shielded by ten degree fixtures, if the light is on during all hours of the day it must only be placed in parts with high human traffic. Additionally, any outdoor advertising signs installed must be lit by lights only illuminated from the top down.
Hawaii	
STATE OF HAWAII H.B. NO 1743	

Indiana	
HB 1839	2. The director in charge of outdoor light pollution control must either be a professional engineer or an experience electrical system installer. 7. All new outdoor lighting may not project more than 3% of it's rays above the horizon line. Where practicable, lighting must include timers, dimmers, and sensors to reduce overall energy consumption. Outdoor lighting used to iilluminate a street sign or advertising sign may not allow light to spill beyond the borders of the sign. A person may not direct any light onto an adjacent property either directly or indirectly without express permission of the adjacent property owner. In order to install a new light fixture outdoors, a permit must be applied for and evidence must be submitted that the light follows all rules and regulations. A person may not use a laser light source or similar high intensity light projected not greater than 20 degrees below the horizontal for outdoor advertising or entertainment. A person may not use searchlights for advertising purposes. Outdoor advertising signs may not be illuminated between 11 p.m. and 7 a.m. Exceptions include: emergency lighting, hazard lighting, seasonal and decorative lighting displays that use low wattage bulbs, and temporary lighting (defined as only on continually for a period of under 30 days, with at least 180 days in between usages)
Iowa	
HF 2014, HF 265, SSB 3035	HF2014: 2. A person is prohibited from doing the following: installing an outdoor light that is not fully shielded if the light is greater than 1,800 lumens, illuminating advertising signs/aesthetic lighting/outdoor recreational center/laser sources/outdoor display lights between 11 p.m. and sunrise, unless a special event is going on. A person guilty of above infractions will be tried for a simple misdemeanor, and each subsequent offense will also constitute a misdemeanor. A fine ranging from $50 to $100 may be levied and up to no more than 30 days in jail. HF265: This bill mainly has to do with reducing glare, and it is more of an explanation for the above lighting bill. It also puts in a new clause stating that all electric utility companies must provide fully shielded lighting fixtures or cutoff switches for the hours between 11 p.m. and sunrise.

	SSB3035: This adds a third update to the first outdoor lighting bill, this time talking specifically about state funded outdoor lighting fixtures. By January 1, 2002, all new state light fixtures installed at a state facility may not emit light above the horizontal axis (see exemptions in original bill). By January 1, 2002, any new state lighting fixture must not emit any more than 5% of its total light output in the zone from 15 degrees below the horizontal axis to the horizontal axis.
Maine	
	1769: A person may not use state funds to install or replace outdoor lighting unless a. The luminaire is a full cutoff luminaire when the rated output is above 1,800 lumens b. The luminaire's maximum illuminance does not exceed the maximum illuminance recommended by the IES c. The director of the Bureau of Public Improvements ensures that consideration is given to minimizing light pollution and light trespass. d. Exceptions include: federal laws preempting state laws, and the Director of the Bureau of Public Improvements determines that there is a compelling safety interesting that cannot be addressed by other methods.
Maryland	
House Joint Resolution 14	This resolution, passed in 2001, merely calls for the creation of a light pollution task force in order to study the problem of light pollution management and regulation. There were 22 members required to be on the task force, ranging from professional engineers to electric fixture installers.
Massachusetts	
H.3418	No state funded outdoor lighting fixture or replacement lighting fixture may be installed without meeting the following conditions: a. The new luminaire is a full-cutoff lighting fixture when the rated output of the luminaire is greater than 1,800 lumens. b. If a lighting recommendation applies, the minimum illuminance specified by the recommendation is used. c. If there is no minimum, then the recommended lighting standard for a certain purpose will be by the guidelines of the IESNA. d. For roadway lighting, it must first be proven that passive lighting (reflectors, roadway markers, lines, or informational means) cannot replace a normal luminaire. e. Adequate consideration must be given to issues of glare, light

	trespass, light pollution, and energy minimization. Exemptions: Federal law preempting state law, temporary outdoor lighting, emergency lighting, navigational system lighting, special events, aesthetic purposes, state prison, safety lighting, or any urban areas where there is high night-time pedestrian traffic.
Michigan	
Natural Resources and Environmental Protection Act (Excerpt) 324.75101	324.75103: No outdoor lighting shall be installed within a dark sky preserve unless necessary for security or safety. The commission shall also ensure that outdoor lighting within a dark sky preserve does not reasonably interfere with nighttime activities. 324.75104: The commission shall also ensure that all outdoor lighting in a dark sky preserve is direct downward, fully shielded (when possible), and wherever practical and appropriate contain motion sensor fixtures
Minnesota	
16B.328 Outdoor Lighting Fixtures Model Ordinance (2008) (Statute)	Development of MLO: The Model Lighting Ordinance must address the following issues: standards for lighthing on private property, outdoor advertising, lighthing on commercial, industrial, or institutional property, how illumination levels should be measured, possible exemptions, recommended elements for an exterior lighting plan development, treatment of nonconforming lighting, lighting standards that may apply in special districts, light pole maximum heights, and light trespass. State-Funded Outdoor Lighting: Outdoor lighting may be installed or replaced using state funds if the new fixture is a cutoff luminaire if the rated output is over than 1,800 lumens, if the minimum illuminance for use Is still preserved against a nationally recognized standard, if the DOT determines that passive lighting cannot work, and finally if full consideration has been given to energy consumption requirements and costs. You are exempt if construction of the lighting would be 15% more on the cost of lighting which does not apply, increase in the cost of maintenance and repair is more than 10% over the course of its life, or it results in some negative safety impact.
Rogers, Minnesota	Ordinance stating that installation of all video billboards must require permit from the town government before installation may occur.
Montana	

Montana Code, Title 23: Parks, Recreation, Sports, and Gambling; Chapter 1: Parks; State Parks; <u>Good neighbor policy -- public recreational lands</u>	Good Neighbor Policy: All people in Montana are required to minimize or reduce light trespass and light pollution on their neighbors adjoining property(not specified how)
New Hampshire	
<u>Relative to Outdoor Lighting Efficiency</u> (HB 585)	9-D2I: No state funds will be used to buy outdoor luminaires unless the following criteria are satisfied: a. The luminaire is fully shielded when the rated output is more than 1,800 lumens b. The max illuminance level does not exceed the minimum recommended for that purpose by the IES c. The director of the agency responsible for the new light gives consideration to light trespass and glare 9-D2II: Exceptions include: If federal law preempts state law, compelling safety interest, lighting for public and historic structure or monuments 9-D3I: The New Hampshire Dark Sky Policy encourages local municipalities to enact such local ordinances and regulations to conserve energy, minimize light pollution and preserve dark skies wherever practical. 9-D5I: The DOT shall prepare an annual report given every November 1 to review and update lighting laws as well as report on the energy costs and maintenance costs in relation to shielded lighting.
New Mexico	
<u>Night Sky Protection Act</u> (1999)	4. All outdoor light fixtures installed after January 1, 2000 shall be shielded with exception of incandescent bulbs 150 Watts or less and other sources of light 70 Watts or less. 5. Outdoor lighting is allowed unshielded so long as the fixture is extinguished by an automatic cutoff device between 11 p.m and sunrise. No outdoor recreational facility, public or private, should be illuminated after 11:00 p.m. except for national or international tournaments or sports games beginning

	before 11:00 p.m. 6. No new mercury vapor outdoor lighting fixtures can be installed after January 1, 2000 7. Exemptions: outdoor lighthing on state signs, previous outdoor lighting fixtures before Jan 1, 2000 (although when broken, they must be replaced with new shielded ones), navigational lighting systems for airports and other lighthing necessary for aircraft safety, safety lighting for works outdoors.
Mandatory Night Sky Act Enforcement (HB 362)	In order to promote and ensure the Night Sky Protection Act, the construction industries division of the regulation and licensing department shall enforce the NSPA as it pertains to public buildings subject to permit and inspection under the Construction Industries Licensing Act.
Rhode Island	
CHAPTER 420 2002-S 2399A Enacted 28 JUL 2002. An Act Relating to State Affairs and Government - Outdoor Lighting Control	42-136-4: Any new permanent outdoor lighting installed by the state must meet the following requirements: a. The new luminaire permits no more than 2% of the total lumen in the zone of 90 to 180 degrees vertical angle if the rated output of the lumen is greater than 3,200 lumen. b. The minimum allowance specified by an applicable recommendation or regulation shall be used, giving full consideration to energy conservation and glare. c. Passive lighting systems (reflectorized roadway markers, lines, warning signs, etc.) must be used unless it is determined the purpose of lighting cannot be achieved by these means. d. Adequate consideration shall be given to energy conservation and minimization of light trespass. Exceptions include emergency lighting, federal law preempting state law, special requirements (sporting matches, flag lighting, etc.), where there is substantial nighttime pedestrian traffic, where it has been addressed by another method that safety is required. The DOT shall ensure that all laws and regulations are enforced and followed.
Bill H7990 - NIGHT OUTDOOR PUBLIC LIGHTING - Introduced: 07 MAR 2000 -	Although this falls under a separate bill in the Rhode Island state legislature, it is almost identical word for word to the above bill, with the exception that the first part is for bulbs rated 1,800 lumens, not 3,200.

IDA Read Copy	
Texas	
Texas Statutes Health & Safety Code, Chapter 425: Regulation of Certain Outdoor Lighting	All new or replacement state-funded outdoor lighting must be from cutoff luminaires If the rated output of the fixture is greater than 1,800 Lumens
Vermont	
Vermont Statutes, Title 10, Chapter 24: Outdoor Lighting	Vermont has no actual outdoor lighting regulation, although it does in a bill call for a 20 person advisory board to be created and formulate an outdoor lighting ordinance following base recommendations by the IDA, IESNA, and the CPTED based on several criteria: a. An evaluation of the need for lighting at all. b. Turning off noncritical lighting after business hours and at other non-required times. c. Limitations on the use of noncutoff and semicutoff light fixtures. d. Use of outdoor lighthing fixtures that emit no more than two percent of light above the horizontal plane. e. Use of shielding that minimized the extent to which light passes above the horizontal. f. Providing uniform and appropriate lighting for parking lots. g. The careful selection of lamp wattage and outdoor lighting fixture type or placement. h. The shielding and aiming of outdoor light fixtures to keep the projection of light within property. With respect to minimizing glare, the board would consider provisions that would encourage: a. Use of full cutoff light fixtures and exterior visors b. Use of quality prismatic or translucent to spread the bright image over a larger area and reduce the brightness of source c. Appropriate mounting height of necessary floodlights d. Acknowledgement that different types of land (suburban, city, rural) require different lighting regulations. e. The setting of a maximum amount of footcandle levels or standards for a range of outdoor lighting applications. Additionally, they would also acknowledge special

	circumstances such as safety/security concerns, historic areas or structures, emergency lighting, aesthetic lighting, special public events.
Virginia	
Virginia Public Procurement Act 2.2 Administration of Government, Section 1111 Department of General Services: purchase of light fixtures.	2.2-1111: Requires the Division of Purchase and Supply to adopt regulations: a. requiring state public bodies to procure only shielded outdoor light fixtures b. provide exemptions for temporary, safety, or specific aesthetic need or that such fixtures are not more expensive over the life of the fixture
Washington	
2534	2534: 3. All new public and private lighting installed after July 1, 2008 must conform to listed standards. 4. Exemptions include: temporary lighting, emergency lighting, hazard warning lighting, seasonal and decorate lighting, navigational lighting 5. All new or replacement lighting must be a fully-shielded luminaire if the output is greater than 1,800 lumens. Where practicable, lighting fixtures must include times or cutoff switches to maximize and save energy. 6. Street and advertising signs must be fully shielded and mounted on the top of the sign. 9. Mercury vapor lights are now illegal to buy or sell. All must be removed by July 1, 2009.
Wyoming	
SF0041, SF0048, SF0049	SF0041: The first bill passed basically states that the state of Wyoming must adopt ordinances regulating the types of outdoor lighting, the construction, and the installation as well. SF0048: This bill has to do with electric utility companies and requirements that they offer tariffs for all customers who

	want to minimize light trespass and maintain dark skies. It also states that rates for these lighting apparatus shall not be subsidized by revenue from other services provided by the utility companies. SF0049: This bill was enacted by the state legislature essentially handing off the baton of light pollution management to the individual counties in Wyoming, giving them the right to make and choose their own specific set of lighting policies which fit their county best.

Table J-2 - European Lighting Regulations (Adapted from the IDA, 2009 Directory of Lighting Ordinances)

Country	Individual Concepts (interpreted in our own words)
Czech Republic	
Protection of the Atmosphere Act, June 2002	The law defines "light pollution" as "every form of illumination by artificial light which is dispersed outside the areas it is dedicated to, particularly if directed above the level of the horizon." In this law, there is use of light fixtures that do not allow light above the horizon. The enforcement for this law is a fine ranging from 500 to 150,000 Czech Crowns ($26.14 - $7,842)US.
Italy	
Visual Lombardy Law no. 17/2000	Applies to all light fixtures, old and new. Limitation of over lighting through use of flux reducers. Allows 0 cd/klm above 90 degrees (in practice, that means 0.49 cd/klm) Gives 3 years to enforce the law.
	Upward beams of light are prohibited. Lighting design must be provided by a professional engineer. Buildings and monuments should be lit from the top down.
United Kingdom	
Clean Neighborhoods and Environment	Great Britain doesn't have a whole new law for light pollution. Instead, there was a change in a previously existing law called the Clean Neighborhoods and Environment Act which was instated in 1990. The amendment states that now

Act 2005 under the Office of Public Sector Information, Part 9: Miscellaneous; Section 102: Statutory nuisance	light pollution is on the same level as noise pollution (aka a "nuisance") as opposed to before when it was nothing at all. The main idea is that this amendment allows for local authorities to have the power to do something about the light pollution. There is now a system where people can make a formal complaint, take advertisers to court and etc.
Slovenia	
	Absolutely no lighting above the horizon. Lower electricity consumption. Limits placed on electricity use for illuminations both public (5.5 kWh), private (44,5 kWh), total (50 kWh per capita). Power maximums set for business illumination (0.075 W/ m2 during business hours and 0.015 W/ m2 outside of business hours) . Law applies to all buildings, public and private. Cultural monuments should not be lit any more than 1 cd/ m2.
Chile	
Supreme Decree 686 "Norma Luminica"	This was a law passed in 1999, after 6 years of being debated in the Chilean legislature. It states that all lighting in 3 region of Northern Chila (Il Paranal, Armazones III Las Campanas IV La Silla, Tololo, Pachon) be directed down towards the ground. Street Lighting was scheduled to become fully compliant by October

	1, 2005. As of now, 70% of street lighting meets these standards and work is continuing.
Catalonia, Spain	
Pilot Programme	As of right now, there are no light pollution laws in Spain. However, there is what is being called a "pilot programme" to study the effects of light pollution throughout Spain. In the first stage, the researchers created a light map detailing the extent of light pollution in Spain. In the second, ongoing part of the program, the researchers are studying, designing, and testing different proposals of implementations to adjust the problem of uplift, wasted energy and shielded lighting. They are also working on an estimate cost for the price of converting over certain regions of Spain into "
Canary Islands	
8705 al Decree 243	I.The territorial limit to the application of the law is restricted to the entirety of the island of La Palma. II. Outdoor lighting is defined as the following: Street lights, ornamental lighting, ighting in parks, lighting for recreational reasons, illuminated advertisements, outdoor lighting for private houses. For all outdoor lighting, the emission of light in the upward direction must be avoided For all outdoor lighting, the spectral distribution of light emitted by bulbs shall be such that the sum of the spectral radiance for all wave lengths of less than 440

	nm is less than 15% of the total radiance. A filter shall be applied to all lights not meeting this specification. Street lamps must be installed that all light is projected below the horizontal tangent at the lower point on the lamp. In the case of street lighting, only low-pressure sodium bulbs may be used. Mercury vapor bulbs are outlawed. Aesthetic lighting can be used with any type of lighting so long as it is extinguished past midnight. They shall always be directed downward.

Appendix K. Lighting Ordinance Concepts

Concept	Category
Lighting 150 Watts or more must be fully shielded	Light Amount Restriction
The yearly consumption of electricity for public illumination per municipality inhabitant shall not exceed 44,5 kWh.	Power Amount Restriction
Lights must be off between Midnight and sunrise	Light Timing Restriction
Lights must be off between 11 p.m. and sunrise	Light Timing Restriction
Lights must be off between 11 p.m. and 7 a.m.	Light Timing Restriction
Buildings and monuments should be lit from top to bottom	Light Direction Restriction
Bodies of light will shine 0% above the horizon	Light Direction Restriction
Upward directed light beams and beacons should be prohibited	Light Direction Restriction
Vapor-Mercury light bulbs	Type of light Restriction
Utility companies are legally forced to offer fully shielded or cutoff lighting fixtures for no extra cost	Light Pollution Management
Temporary Lighting (lasting less than 30 consecutive days)	Exemption to Light Pollution Ordinance
Emergency Lighting	Exemption to Light Pollution Ordinance
Navigational Lighting	Exemption to Light Pollution Ordinance
“Special Events” such as sporting events, concerts, or other non-recurring events will be allowed to have lights on past turning-off time	Exemption to Light Pollution Ordinance
Illuminated street signs and advertising signs must have lighting fixtures mounted at the top of the sign	Light Pollution Management
Seasonal decorative lighting of low wattage	Exemption to Light Pollution Ordinance
Minimum illumination standards from the IESNA	Light Pollution management
Use of prisms or translucent materials to spread out light	Light Pollution Management
Aesthetic lighting for monuments, flags, statues, and other landmarks	Exemption to Light Pollution Ordinance
Restrictions on % amount of light (2 – 5) rays allowed past the horizontal	Light Amount Restriction
A person may not direct any amount of light past his property line without the express consent of his neighbor	Light Pollution Management
No more than 10% of the light stream may go past the façade of the cultural monument.	Light Pollution Management
An infraction of any of the light pollution ordinances results in a misdemeanor	Enforcement of Policy
An abatement notice can be filed against the light nuisance. Failure to comply renders a consumer party liable to a fine of £5,000, or a business party £20,000.	Enforcement of Policy
An infraction will result in a $25 - $100 fine minus the cost of fixing said light fixture	Enforcement of Policy

An infraction will result in up to 30 days in jail	Enforcement of Policy
Penalties for non compliant installations should be proportional to the number of fixtures.	Enforcement of Policy
Areas of high pedestrian traffic	Exemption to Light Pollution Ordinance

Condensed Light Pollution Ordinance Table

Concept	Category Light Pollution Ordinance
Infraction of LP ordinance results in monetary penalty and possible jail time	Enforcement of Policy
All lights in certain zones must be off between certain hours of the night	Light Timing Ordinance
No light may be allowed to have rays going anywhere above the 180 degree horizontal axis	Light Pollution Management
A person may not direct any amount of light past his property lines without express permission from the neighbor	Light Pollution Management
Buildings and monuments must be lit from the top down	Light Pollution Management
A permit system controlled by the government for installing video billboards	
A special court may be set up which deals with light pollution infractions in a civil court (similar to small claims court)	Light Pollution Management
Special cutoff "hoods" or translucent materials must be used over the light in order to cut down intensity and angle of light reflection	Light Pollution Management
Exemptions to Light Pollution Ordinances: seasonal low wattage lighting, temporary lighting, emergency lighting, navigational lighting, special events, areas of high pedestrian traffic, national flags/monuments	Light Pollution Ordinance Exemption

Appendix L. Field Observations Data Form

Case Number: **Technology**: LED Neon Sign Florescent Halogen LCD Other_____

District: **Style of Lighting:** Flashing [Frequency]_____ Video[description]_____ Solid

Photo Number: **Type of Light Pollution:** Light Trespass Glare Skyglow Other_____

Individual Light Pollution Identification

Location	Tech	Style	Purpose	Photometer Readings	Type of LP	Problem caused	Color

Comments:

Appendix M. Field Observations Raw Data

Case Number: 01 **Technology:** LED Neon Sign Florescent Halogen LCD Other_____

District: Mong Kok **Style of Lighting:** Flashing [Frequency]_____ Video[description]_____ Solid

Photo Number: **Type of Light Pollution:** Light Trespass Glare Skyglow Other_____

Individual Light Pollution Identification

Done on: 02/08/2010

Location	Photo Number	Tech	Style	Purpose	Photometer Readings	Type of LP	Problem caused	Color
Langham Place Main Exit	747-748	Halogen	Solid	Spotlight	163 Lux 135 Lux	Skyglow	Light mounted upwards causes skyglow	Orange
Bonjour across from Langham Place Main Exit	749 – 756	Halogen	Solid	Spotlight	820 Lux	Light Trespass	Lights pointing up towards sign also shining into apartment windows	White
3D Nathan Road, Lukfook Jewlery	757 - 764	Neon	Flashing Light (198 flash/min)	Advertising	500 Lux	Light Trespass	The neon advertising sign was flashing into the apartment across the street	Blue and Red
655 Nathan Road	765 – 768	Halogen	Solid	Backlights	260 Lux	Skyglow, Light Trespass	We observed backlights behind a billboard shining up into apartments above and into the sky, although we did witness it turn off at	White
Sai Yeung Chai St. South (iPhone Ad)	769 – 774	Halogen	Solid, flashing video	Advertising, illumination	620 Lux 455 Lux	Light Tresspass, Skyglow	The light from the iPhone ad was shining into people's apartments across the street and up	White
Sai Yeung Choie St. South (Jeansmith)	775 – 791	LCD	Video Billboard	Advertisment	Bright Flash (260 Lux)	Light Trespass, Skyglow	The video was strobing INTENSE light flashes into the apartment across the street, as well as upwards directed	multi
Tung Chai St. Golden Dispensary	792 – 796	Low-pressure Sodium	Solid	Street Light	24 Lux	Light Trespass, Light Management	The streetlight was mounted ABOVE the person's apartment, literally shining into it	orange
Fa Yuen/Shantang St. Intersection	797-798	Halogen	Solid	Advertising	58 Lux	Glare, Light Trespass	The light was shining directly down into the street (glare) as well as in people's windows	White
Adidas Billboard Fa Yuen Rd.	799 – 806	Halogen	Solid	Advertising	195 Lux	Glare, Light Trespass	Same as above, shines directly onto road and into people's apartments	White
Fa Yuen Road (entirety)	807 – 815	Varied	Varied	Advertising	N/A	Glare, Light Trespass,		Multiple

Top of Langham Place	816-831	Neon	Solid	Unknown (navigation?)	N/A	Skyglow	The top of Langham Place building has a gigantic neon dome shining into the sky	Pink
Nelson Rd. Fa Yuen Rd. Intersection	832 -834	Halogen	Solid	Advertising	202 Lux	Light Trespass	The light was mounted above an apartment, shining into both the sign and the apartment	White
15B Nelson Street	835 – 840	Halogen	Solid	Illumination	206 Lux	Light Pollution Management	Lighting was put in a completely wasteful space, most of it is directed onto a blank wall. Waste of energy.	White
55 Sai Yuen Choi St	841 – 843	Halogen	Solid	Advertising	843 Lux	Light Trespass	Light mounted directly above sign and shining into window	White
55 Argyle Road, Tamron Wing Shang Photo Supplies	844 – 857	Neon	Flashing (2 flashes/s)	Advertising	94 Lux	Light Pollution Management	The shop was closed, and from the hours posted had been closed for 2 hours already. The sign was on full brightness blinking fast and furious, wasting energy	Blue/Red

Case Number: 02 **Technology:** LED Neon Sign Florescent Halogen LCD Other_____

District: Causeway Bay **Style of Lighting:** Flashing [Frequency]_____ Video(description)_____ Solid

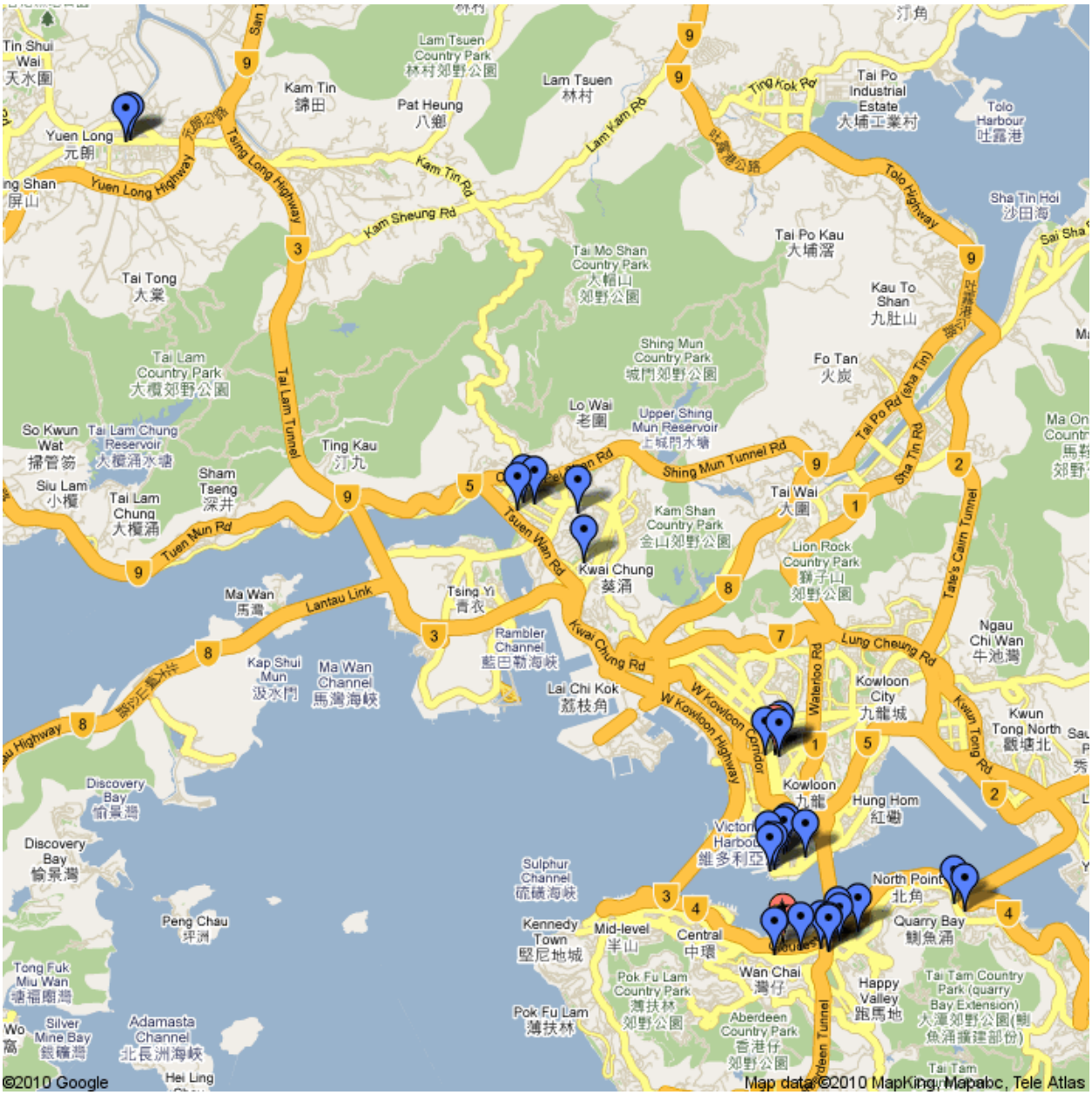
Photo Number: **Type of Light Pollution:** Light Trespass Glare Skyglow Other_____

Individual Light Pollution Identification

Location	Photo Number	Tech	Style	Purpose	Photometer Readings	Type of LP	Problem caused	Color
Exit F MTR (Jardine's Bazaar)	860	Halogen	Solid	Advertising	100 Lux 150 Lux	Skyglow Light Pollution Management	The light was aimed directly upwards towards the sky	White
SOGO Club, Hennesy Road	863-865, 873 – 881	Halogen	Solid	Advertising	117 Lux 150 Lux	Skyglow	Light was pointed directly upwards towards sky	White
Intersection of Hennesy Road and Percival Street	866-867	LCD	Video	Advertising	49-55 Lux(flashing)	Light Trespass	The video billboard on the screen was flashing directly into the apartment across the street.	Multi.
Hennesy Road, Lukfook Jewlery	869 - 872	Neon	Flashing	Advertising	37 – 49 Lux 70 Lux	Light Trespass	The Lukfook Jewlery store neon sign is mounted on the wall and flashing directly into apartments	Red, White, and Blue
Hennesy Road, Toshiba sign (on top of building)	873 – 885	Neon	Solid	Advertisement	44 Lux	Skyglow	The gigantic "Toshiba" sign is lit up way on top of a building causing massive skyglow	Red
MX Building, 411 Lockhart Road	886 – 890	Halogen	Solid	Illumination	50 Lux 176 Lux	Skyglow, Light Trespass	The sign near the MX building is extremely bright and both pointing the wrong way and onto someone's apartment	White
Sino Plaza	891 – 900	Neon	Flashing	Advertisement	69 Lux	Skyglow	The flashing light across the street reflects off this building and into the sky	Blue, Red
Sino Plaza	901 - 911	Halogen	Solid	Illumination	44 Lux	Skyglow	The lights illuminating the top of the building are pointed towards the sky	White
Jaffe Road (Below Shao Building)	912	Neon	Flashing	Advertisement	51 Lux 19 Lux	Light Trespass	The neon sign for the shop is flashing directly into the apartment window next to it	Pink, Yellow, White
Blue Video Building	915, 918	LCD	Video	Advertisement	11.7 Lux	Skyglow	LCD Billboard that's at the top of the building is flashing brightly into the sky, contributing to skyglow	Multi
Panasonic Building	919, 922	Neon	Solid	Advertisement	12.4 Lux	Skyglow	The Panasonic sign at the top of the building is glowing off into the night	Blue and White

Comments:

Appendix N.Locations of Excessive Lighting Provided by Friends of the Earth Hong Kong



Appendix O.Personal Data

Timestamp	Question #1	Question #2	Question #3					Question #4	Question #5	RBAD	Question #6	Question #7						Question #8	Question #9
			Sleep loss	Anxiety	Visual Fatigue	Depression	Weariness					Video Billboards	Spotlights	Car headlights	Street lights	Non-flashing signs	Flashing signs		
1/20/10 6:34 AM	Yes	6	5	5	6		6	6	3	3	No	3	3	3	5	3	4	Yes	
1/20/10 1:35 PM	Yes	3	1	1	3	1	2	3	1	2	No	6	5	6	2	6	6	Yes	
1/21/10 2:14 AM	Yes	2	1	0	2	0	1	3	2	1	No	2	4	2	5	0	0	Yes	
1/21/10 10:56 PM	Yes	6	6	4	4	4	4	5	3	2	No	4	5	4	5	2	6	Yes	
1/26/10 8:19 AM	Yes 相信	0						1	1	0	No 沒有	5	6	4	3	5	5	Yes 知道	Sai Kung 西貢
1/26/10 10:38 AM	Yes 相信	3	4	4	5	3	5	5	1	4	No 沒有	5	5	6	4	6	4	No 不知道	Kowloon City 九龍城
1/26/10 10:42 AM	Yes 相信	4	5	5	6	3	5	3	0	3	Yes 有	4	5	2	3	3	5	Yes 知道	Tung Chung
1/26/10 7:34 PM	Yes 相信	6	6	5	6	5	5	4	2	2	Yes 有	2	6	3	2	5		Yes 知道	Yau Tsim Mong 油尖旺
1/26/10 7:47 PM	Yes 相信	4	3	1	3	1	2	3	3	0	No 沒有	2	4	3	1	2	2	No 不知道	Sai Kung 西貢
1/26/10 8:06 PM	Yes 相信	2	4	2	5	0	4	3	1	2	No 沒有	3	4	5	3	4	5	No 不知道	Central & Western 中西區

1/26/10 8:12 PM	Yes 相信	4	4	3	4	4	5	4	3	1	No 沒有	3	3	3	3	3	3	No 不知道	Yau Tsim Mong 油尖旺
1/26/10 8:12 PM	Yes 相信	2	1	1	1	1	1	2	2	0	No 沒有	0	6	1	1	6	6	Yes 知道	Wong Tai Sin 黃大仙
1/26/10 8:15 PM	Yes 相信	3	3	3	5	2	3	3	1	2	No 沒有	3	5	4	5	6	6	No 不知道	Wong Tai Sin 黃大仙
1/26/10 8:20 PM	Yes 相信	2	2	2	4	2	3	3	1	2	No 沒有	0	3	2	2	0	0	Yes 知道	Kwun Tong 觀塘
1/26/10 8:21 PM	Yes 相信	1	0	0	0	0	0	1	0	1	No 沒有	6	6	4	5	5	6	Yes 知道	Ma Wan
1/26/10 8:30 PM	Yes 相信	2	1	0	0	0	1	2	1	1	No 沒有	1	0	0	2	5	3	No 不知道	Kowloon City 九龍城
1/26/10 8:39 PM	Yes 相信	5	6	4	5	4	5	2	1	1	No 沒有	4	6	5	5	6	6	No 不知道	Sha Tin 沙田
1/26/10 8:42 PM	Yes 相信	1	5	3	4	3	3	2	1	1	No 沒有	5	5	3	2	3	5	Yes 知道	Southern 南區
1/26/10 8:43 PM	Yes 相信	4	4	4	5	3	5	4	1	3	No 沒有	4	6	2	4	6	5	No 不知道	Eastern 東區
1/26/10 8:47 PM	Yes 相信	4	4	3	5	2	2	3	1	2	No 沒有	4	5	4	3	4	5	Yes 知道	
1/26/10 9:01 PM	Yes 相信	5	4	5	4	4	5	3	1	2	No 沒有	3	5	5	3	5	4	Yes 知道	Laichikok
1/26/10 9:11 PM	Yes 相信	2	3	2	3	2	2	3	4	-1	No 沒有	2	3	3	3	3	3	Yes 知道	Sham Shui Po 深水步
1/26/10 9:12 PM	Yes 相信	2	2	3	4	3	3	2	2	0	No 沒有	2	2	2	2	2	2	No 不知道	Kowloon City 九龍城
1/26/10 9:13 PM	Yes 相信	3	3	3	4	2	4	3	1	2	No 沒有	4	4	4	3	6	4	Yes 知道	Central & Western 中西區
1/26/10 9:20 PM	Yes 相信	2	2	2	6	0	3	2	0	2	No 沒有	1	6	4	3	6	6	Yes 知道	Central & Western 中西區

1/26/10 11:03 PM	Yes 相信	1	1	1	1	0	1	1	1	0	No 沒有	4	5	3	2	6	5	Yes 知道	Sai Kung 西貢
1/26/10 11:25 PM	Yes 相信	3	3	3	5	4	0	3	2	1	No 沒有	2	6	4	3	6	6	No 不知道	Eastern 東區
1/26/10 11:34 PM	Yes 相信	4	3	3	3	3	3	3	3	0	No 沒有	1		3	3	5	5	Yes 知道	元朗
1/26/10 11:39 PM	Yes 相信	0	0	0	0	0	0	2	0	2	No 沒有	3	6	2	1	5	3	Yes 知道	Wan Chai 灣仔
1/26/10 11:48 PM	Yes 相信	0	0	0	0	0	0	2	0	2	No 沒有	3	6	2	1	5	3	Yes 知道	Wan Chai 灣仔
1/26/10 11:51 PM	Yes 相信	0	0	0	3	0	0	3	2	1	Yes 有	3	3	3	0	4	4	No 不知道	Southern 南區
1/26/10 11:54 PM	Yes 相信	0	0	0	1	0	1	2	1	1	No 沒有	0	0	0	0	0	0		Wan Chai 灣仔
1/26/10 11:58 PM	No 不相信	0	0	0	3	1	3	4	1	3	No 沒有	4	4	4	3	4	3	No 不知道	Eastern 東區
1/26/10 11:59 PM	Yes 相信	6	6	5	6	3	6	3	1	2	No 沒有	2	6	5	3	6	6	Yes 知道	Eastern 東區
1/27/10 12:01 AM	No 不相信	0	0	0	3	0	2	2	3	-1	No 沒有	0	2	2	0	6	2		
1/27/10 12:02 AM	Yes 相信	5	6	5	6	3	6	2	2	0	No 沒有	5	5	5	2	6	5		
1/27/10 12:02 AM	Yes 相信	3	1	0	4	0	2	3	2	1	No 沒有	3	6	1	2	6	6	Yes 知道	Tsuen Wan 荃灣
1/27/10 12:03 AM	Yes 相信	3	2	0	3	0	3	3	3	0	No 沒有	3	2	2	3	6	2	Yes 知道	Central & Western 中西區
1/27/10 12:03 AM	Yes 相信	0	0	0	0	0	0	3	2	1	No 沒有								
1/27/10 12:05 AM	Yes 相信	6	6	2	6	2	6	3	3	0	No 沒有	5	5	5	1	6	6	Yes 知道	Eastern 東區

1/27/10 12:05 AM	Yes 相信	6	5	2	6	2	6	3	3	0		5	5	5				Yes 知道	Eastern 東區
1/27/10 12:08 AM	Yes 相信	5	4	4	5	3	4	3	2	1	No 沒有	4	6	5	5	5	4	Yes 知道	Sham Shui Po 深水步
1/27/10 12:11 AM	Yes 相信	1			1			1	1	0	No 沒有					1	0	No 不知道	
1/27/10 12:13 AM		6	6	5	6	6	5	3	2	1	Yes 有	5	3	1	4		0	Yes 知道	Eastern 東區
1/27/10 12:52 AM	Yes 相信	4	3	2	4	2	3	2	2	0	No 沒有	5	6	3	3	6	5	Yes 知道	Sai Kung 西貢
1/27/10 1:47 AM	Yes 相信	4	4	2	5	3	5	1	1	0	No 沒有	4	6	5	3	5	4	No 不知道	Tsuen Wan 荃灣
1/27/10 2:03 AM	No 不相信	2	2	1	1	0	1	5	0	5	No 沒有	5	6	5	5	6	5	Yes 知道	Eastern 東區
1/27/10 2:09 AM	Yes 相信	2	0	1	3	0	1	3	2	1	No 沒有	4	6	3	1	6	3	Yes 知道	Eastern 東區
1/27/10 2:30 AM	Yes 相信	1	3	1	2	0	0	2	1	1	No 沒有	1	1	0	1	2	1	Yes 知道	North 北區
1/27/10 2:40 AM	Yes 相信	0	0	0	0	0	0	1	1	0	No 沒有	1	4	2	3	5	5	Yes 知道	Sai Kung 西貢
1/27/10 2:45 AM	Yes 相信	4	4	4	4	4	4	4	4	0	No 沒有	3	4	4	4	5	4	Yes 知道	Sha Tin 沙田
1/27/10 2:55 AM	Yes 相信	5	4	4	4	4	4	5	2	3	No 沒有	3	6	5	4	6	6	Yes 知道	Wong Tai Sin 黃大仙
1/27/10 3:52 AM	Yes 相信	2	3	2	3	0	2	2	1	1	No 沒有	2	2	3	1	1	2	Yes 知道	Tai Po 大埔
1/27/10 4:10 AM	Yes 相信	2	0		1	0	1	2	1	1	No 沒有	1	2	2	4	0	0	Yes 知道	
1/27/10 4:26 AM	Yes 相信	3	1	0	4	0	1	3	3	0	No 沒有	3	5	5	5	5	5	No 不知道	元朗

1/27/10 4:27 AM	Yes 相信	2	1	1	0	0	0	2	1	1	No 沒有	1	6	3	4	4	4	Yes 知道	North 北區
1/27/10 4:37 AM	Yes 相信	4	5	0	5	0	4	3	0	3	No 沒有	4	5	4	3	6	5	Yes 知道	東涌
1/27/10 4:37 AM	Yes 相信	3	4	4	6	1	6	3	1	2	No 沒有	0	6	5	2	6	5	Yes 知道	Yau Tsim Mong 油尖旺
1/27/10 5:01 AM	Yes 相信	2	5	5	5	2	3	2	1	1	No 沒有	2	4	3	6	5	4	Yes 知道	North 北區
1/27/10 5:02 AM	Yes 相信	3	0	0	0	0	0	3	1	2	No 沒有	3	5	5	4	4	5	Yes 知道	Yau Tsim Mong 油尖旺
1/27/10 5:31 AM	Yes 相信	4	2	2	3	2	2	4	1	3	No 沒有	1	3	3	3	5	5	Yes 知道	Wong Tai Sin 黃大仙
1/27/10 6:03 AM	Yes 相信	2	1	1	3	1	3	1	1	0	No 沒有	1	1	3	5	6	5	Yes 知道	Tuen Mun 屯門
1/27/10 6:14 AM	Yes 相信	1	1	1	1	1	2	1	0	1	No 沒有	2	6	5	4	6	5	Yes 知道	Sha Tin 沙田
1/27/10 6:56 AM	Yes 相信	4	4	2	5	1	2	3	2	1	No 沒有	2	4	5	1	4	5	Yes 知道	Tsuen Wan 荃灣
1/27/10 8:07 AM	Yes 相信	1	0	0	0	0	0	2	1	1	No 沒有	3	5	5	5	4	4	Yes 知道	元朗
1/27/10 8:23 AM	Yes 相信	2	2	2	2	2	2	2	2	0	No 沒有	1	3	2	2	4	3	Yes 知道	元朗
1/27/10 8:26 AM	Yes 相信	1	0	0	2	0	1	2	1	1	No 沒有	1	3	2	2	4	4	Yes 知道	Tuen Mun 屯門
1/27/10 8:43 AM	Yes 相信	4	3	0	6	0	4	4	1	3	No 沒有	3	6	5	3	6	2	Yes 知道	Tsuen Wan 荃灣
1/27/10 8:46 AM	Yes 相信	3	0	0	0	0	0	2	1	1	No 沒有	4	5	4	3	3	3	Yes 知道	Wan Chai 灣仔
1/27/10 8:53 AM	Yes 相信	3	1	1	1	0	2	3	2	1	No 沒有	2	4	2	2	4	3	Yes 知道	Kwai Chung

1/27/10 9:26 AM	Yes 相信	1	0	0	3	1	2	2	2	0	No 沒有	1	6	4	2	6	3	Yes 知道	Tuen Mun 屯門
1/27/10 9:45 AM	Yes 相信	4	3	1	4	0	3	4	1	3	No 沒有	2	6	5	3	6	5	Yes 知道	元朗
1/27/10 9:57 AM	Yes 相信	4	4	4	4	3	3	2	1	1	No 沒有	3	5	3	3	5	5	Yes 知道	Sha Tin 沙田
1/27/10 10:28 AM	Yes 相信	2	4	5	4		5	1	1	0	No 沒有	4		5			5	Yes 知道	元朗
1/27/10 11:06 AM	Yes 相信	3	1	1	3	1	2	4	1	3	No 沒有	4	5	3	5	6	5	Yes 知道	Tuen Mun 屯門
1/27/10 12:18 PM	Yes 相信	2	2	2	3	2	3	1	2	-1	No 沒有	2	4	3	3	5	5	Yes 知道	元朗
1/27/10 12:50 PM	Yes 相信	2	2	3	3	2	2	4	1	3	No 沒有	0	4	3	5	3	4	Yes 知道	Tsuen Wan 荃灣
1/27/10 1:03 PM	Yes 相信	3	2	2	2	1	2	4	2	2	No 沒有	4	6	2	3	4	4	Yes 知道	Sai Kung 西貢
1/27/10 6:31 PM	Yes 相信	6	0	0	0	0	0	2	1	1	No 沒有	1	5	4	5	6	6	Yes 知道	Eastern 東區
1/27/10 8:46 PM	Yes 相信	5	5	5	6	5	5	5	1	4	Yes 有	4	6	4	3	6	6	Yes 知道	Yau Tsim Mong 油尖旺
1/27/10 8:58 PM	Yes 相信	0	0	0	0	0	0	1	1	0	No 沒有	0	0	0	0	0	0	Yes 知道	Sha Tin 沙田
1/27/10 9:25 PM	Yes 相信	0	1	1	1	0	1	0	0	0	No 沒有	2	2	2	1	4	3	Yes 知道	Kwun Tong 觀塘
1/27/10 9:43 PM	Yes 相信	5	6	5	6	5	5	4	1	3	No 沒有	6	6	2	2	6	6	No 不知道	Yau Tsim Mong 油尖旺
1/27/10 10:02 PM	Yes 相信	2	1	1	1	1	1	1	1	0	No 沒有	1	5	4	5	6	6	Yes 知道	Eastern 東區
1/27/10 10:05 PM	Yes 相信	2	5	0	5	0	3	3	1	2	No 沒有	0	5	2	2	1	2	No 不知道	Hang Hao Station

1/27/10 10:07 PM	Yes 相信	3	0	0	1	0	0	2	1	1	No 沒有	2		3	2	2	4	No 不知道	Hang Hao Station
1/27/10 10:08 PM	Yes 相信	2	1	4	3	5					Yes 有	4	2		1	5	3	No 不知道	
1/27/10 10:10 PM	Yes 相信	3	3	1	4	2	3	3	2	1	Yes 有	4	6	4	5	2	4		Wan Chai 灣仔
1/27/10 10:17 PM	Yes 相信	4	5	3	4	3	4	4	1	3	No 沒有	2	5	3	4	6	5	Yes 知道	Tsuen Wan 荃灣
1/27/10 10:19 PM	Yes 相信	0						2	1	1	No 沒有	4	6	2	2	5	2	Yes 知道	Sai Kung 西貢
1/27/10 10:26 PM	Yes 相信	5	0	0	0	0	0	4	1	3	No 沒有	4	4	4	2	3	4	Yes 知道	Kowloon City 九龍城
1/27/10 10:28 PM	Yes 相信	1	3	2	4	3	2	2	2	0	No 沒有	5	2	4	2	4	5		Kowloon City 九龍城
1/27/10 10:29 PM	Yes 相信	4	3	3	3	3	3	4	2	2	No 沒有	3	5	4	4	4	5	Yes 知道	Outlying Islands 離島區
1/27/10 10:29 PM	Yes 相信	3	5	4	4	4	6	4	0	4	No 沒有	0	5	5	3	5	5	Yes 知道	Sha Tin 沙田
1/27/10 10:37 PM	Yes 相信	5	4	2	5	1	5	2	0	2	Yes 有	0	5	1	2	2	2	Yes 知道	Kwun Tong 觀塘
1/27/10 10:39 PM	No 不相信	3	5	2	5	1	4	1	3	-2	No 沒有	3	5	4	2	2	5	Yes 知道	Kwun Tong 觀塘
1/27/10 10:46 PM	Yes 相信	2	4	2	5	1	4	2	3	-1	No 沒有	2	5	1	3	2	6	No 不知道	Kwun Tong 觀塘
1/27/10 10:48 PM	Yes 相信	4	1	4	6	1	5	3	0	3	No 沒有	2	5	5	2	3	5	Yes 知道	Sha Tin 沙田
1/27/10 10:50 PM	No 不相信	2	2	2	2	0	0	3	4	-1	No 沒有	1	1	3	5	5	6	Yes 知道	Eastern 東區
1/27/10 10:52 PM	Yes 相信	2	3	1	4	1	5	2	1	1	No 沒有	4	5	3	3	5	5	No 不知道	元朗

1/27/10 10:54 PM	Yes 相信	0	0	0	0	0	0	0	0	0	No 沒有	6	6	4	3	5	6	Yes 知道	Southern 南區
1/27/10 10:55 PM	Yes 相信	4	5	4	4	3	4	4	1	3	No 沒有	6	4	4	3	4	6	Yes 知道	Yau Tsim Mong 油尖旺
1/27/10 10:57 PM	Yes 相信	5	0	0	0	4	0	3	0	3	No 沒有	2	4	3	5	0	6		
1/27/10 10:59 PM	Yes 相信	3	0	0	1	0	0	2	1	1	No 沒有	0	2	0	2	2	3	Yes 知道	Wan Chai 灣仔
1/27/10 11:00 PM	Yes 相信	6	5	5	4	3	5	4	1	3	No 沒有	5	6	4	5	3	5	No 不知道	Wan Chai 灣仔
1/27/10 11:01 PM	Yes 相信	4	3	3	4	3	4	2	1	1	No 沒有	0	0	0	1	2	3	Yes 知道	Wong Tai Sin 黃大仙
1/27/10 11:03 PM	Yes 相信	4	1	1	4	2	5	4	1	3	No 沒有	1	5	2	6	5	5	No 不知道	Tsuen Wan 荃灣
1/27/10 11:04 PM	Yes 相信	4	5	3	6	4	4	4	2	2	No 沒有	3	5	6	4	4	4	Yes 知道	[none specified]
1/27/10 11:05 PM	No 不相信	3	3	4	5	4	3	3	1	2	No 沒有	3	5	5	4	5	5	Yes 知道	Central & Western 中西區
1/27/10 11:07 PM	Yes 相信	6	6	6	6	6	6	6	4	2	No 沒有	5	5	5	5	0	5	Yes 知道	Tsuen Wan 荃灣
1/27/10 11:09 PM	Yes 相信	5	1	2	0	2	0	2	2	0	No 沒有	3	5	3	5	4	6	Yes 知道	
1/27/10 11:10 PM			1	0	2	0	0	0	0	0	Yes 有	2	3	3	6	1	2	No 不知道	Eastern 東區
1/27/10 11:12 PM	Yes 相信	4	2	0	0	0	3	0	2	-2	Yes 有	0							Wan Chai 灣仔
1/27/10 11:13 PM	Yes 相信	6	0	0	3	0	3	4	4	0	Yes 有		4	4	4	4	4	Yes 知道	Outlying Islands 離島區
1/27/10 11:15 PM	Yes 相信	2	0	0	3	0	0	1	3	-2	No 沒有	1	3	3	2	3	3	Yes 知道	Outlying Islands 離島區

1/27/10 11:16 PM	Yes 相信	3	2	1	2	1	3	3	1	2	No 沒有	1	3	2	3	6	6	Yes 知道	Wan Chai 灣仔
1/27/10 11:18 PM	No 不相信	3	2		5	6	4	4	2	2	Yes 有	3	5	4	2	2	5	Yes 知道	Central & Western 中西區
1/27/10 11:19 PM	Yes 相信	3	2	3	4	2	4	2	3	-1	No 沒有	2	3	2	3	3	3	Yes 知道	元朗
1/27/10 11:21 PM	Yes 相信	3	4	3	3	1	3	4	3	1	No 沒有	3	5	6	4	3	3	Yes 知道	Southern 南區
1/27/10 11:22 PM	No 不相信	0	3	3	5	3	3	1	1	0	No 沒有	4	1	1	4	1	1	No 不知道	Sham Shui Po 深水步
1/27/10 11:23 PM	Yes 相信	0	5	3	4	2	4	0	0	0	No 沒有	5	5	5	4	6	6	Yes 知道	North 北區
1/27/10 11:24 PM	Yes 相信	5	6	6	6	4	4	5	1	4	Yes 有	2	4	3	5	3	6	Yes 知道	Wong Tai Sin 黃大仙
1/27/10 11:26 PM	Yes 相信	4	3	4	4	3	4	4	4	0	Yes 有	3	3	4	3	4	3	Yes 知道	Sha Tin 沙田
1/27/10 11:27 PM	Yes 相信	4	4	3	4	3	6	3	2	1	No 沒有	3	4	2	4	5	5	Yes 知道	North 北區
1/27/10 11:29 PM	No 不相信	3	3	4	2	4	3	5	3	2	No 沒有	3	2	4	2	4	3	No 不知道	Wong Tai Sin 黃大仙
1/27/10 11:31 PM	Yes 相信	1	2	1	2	0	2	1	2	-1	No 沒有	2	4	4	3	6	6	Yes 知道	Sham Shui Po 深水步
1/27/10 11:33 PM	Yes 相信	2	4	3	4	4	3	3	2	1	No 沒有	2	5	3	4	4	4		North 北區
1/27/10 11:34 PM	Yes 相信	4	3	3	3	3	3	4	2	2	No 沒有	3	4	3	3	3	3	Yes 知道	Kwai Fong
1/27/10 11:36 PM	Yes 相信		0	1	1	1	1	3	4	-1	Yes 有	2	2	2	2	2	2	Yes 知道	Wan Chai 灣仔
1/27/10 11:37 PM	Yes 相信	6	5	4	4	3	6	4	2	2	No 沒有	2	2	2	4	4	5	Yes 知道	Sham Shui Po 深水步

1/27/10 11:38 PM	Yes 相信	4	5	5	5	5	4	2	0	2	Yes 有	4	4	2	2	3	4	Yes 知道	Tsuen Wan 荃灣
1/27/10 11:40 PM	Yes 相信	5	2	3	4	3	3	4	2	2	No 沒有	1	5	4	4	3	5	Yes 知道	Southern 南區
1/27/10 11:41 PM	Yes 相信	2	5	5	5	5	5	3	1	2	No 沒有	4	6	5	5	5	5	Yes 知道	Tuen Mun 屯門
1/27/10 11:43 PM	Yes 相信	3	4	4	2	3	5	3	1	2	No 沒有	2	6	5	4	3	6	Yes 知道	Kowloon City 九龍城
1/27/10 11:44 PM	Yes 相信	3	3	2	1	0	2	2	2	0	No 沒有	2	1	3	2	4	5	Yes 知道	Eastern 東區
1/27/10 11:45 PM	Yes 相信	2	6	3	6	3	6	3	3	0	No 沒有	5	6	3	2	3	4	No 不知道	Eastern 東區
1/27/10 11:46 PM	Yes 相信	4	4	4	3	3	4	2	2	0	No 沒有		4	4	3	5	5	Yes 知道	Tsuen Wan 荃灣
1/27/10 11:48 PM	Yes 相信	4	3	2	4	3	4	3	1	2	No 沒有	2	4	3	3	4	4	No 不知道	Wan Chai 灣仔
1/27/10 11:49 PM	Yes 相信	2	2	1	4	2	3	2	3	-1	No 沒有	3	5	3	3	3	5	Yes 知道	North 北區
1/27/10 11:50 PM	Yes 相信	2	1	1	2	1	2	0	1	-1	No 沒有	1	2	2	1	3	4	Yes 知道	Sha Tin 沙田
1/27/10 11:52 PM	Yes 相信	4	5	1	4	1	4	3	2	1	No 沒有	4	4	4	4	1	5	Yes 知道	Eastern 東區
1/27/10 11:53 PM	Yes 相信	2	2	2	1	2	2	4	3	1	No 沒有	1	2	1	1	2	2	No 不知道	Wong Tai Sin 黃大仙
1/27/10 11:54 PM	Yes 相信	4	4	4	4	4	4	2	0	2	No 沒有	4	4	4	4	4	4	Yes 知道	Sha Tin 沙田
1/27/10 11:56 PM	Yes 相信	3	1	1	4	1	4	3	2	1	No 沒有	2	4	4	3	3	4	Yes 知道	Yau Tsim Mong 油尖旺
1/27/10 11:57 PM	Yes 相信	4	3	4	5	3	3	3	3	0	No 沒有	5	5	3	3	2	3	No 不知道	Southern 南區

1/27/10 11:59 PM	Yes 相信	3	4	3	5	3	5	2	1	1	No 沒有	4	6	5	4	6	6	No 不知道	Kwun Tong 觀塘
1/28/10 12:00 AM	Yes 相信	5	5	3	5	3	5	2	1	1	No 沒有	2	6	5	4	5	6	Yes 知道	Eastern 東區
1/28/10 12:01 AM	Yes 相信	5	6	3	5	1	4	2	0	2	No 沒有	3	5	5	2	3	5	Yes 知道	Central & Western 中西區
1/28/10 12:32 AM	Yes 相信	0	0	0	0	0	0	1	1	0	Yes 有	2	0	1	0	0	0	Yes 知道	元朗
1/28/10 1:14 AM	No 不相信	6	1	0	0	0	0	0	1	-1	No 沒有	0	0	0	2	0	0	Yes 知道	Outlying Islands 離島區
1/28/10 1:16 AM	Yes 相信	3	3	2	5	2	4	2	2	0	No 沒有	3	5	6	4	4	5	Yes 知道	
1/28/10 1:18 AM	Yes 相信	6	1	1	3	0	1	2	1	1	No 沒有	0	2	1	2	4	3	Yes 知道	Mainland China
1/28/10 1:20 AM	Yes 相信	0	2	3	5	2	5	2	1	1	No 沒有	3	5	4	3	3	6	No 不知道	Tsuen Wan 荃灣
1/28/10 2:44 AM	Yes 相信	2	0	0	0	0	0	3	0	3	Yes 有	6	6	4	6	6	6	Yes 知道	Sai Kung 西貢
1/28/10 4:34 AM	Yes 相信	1	5	4	6	2	5	2	1	1	Yes 有	3	5	5	3	4	5	Yes 知道	Outlying Islands 離島區
1/28/10 5:00 AM	Yes 相信	5	0	3	5	0	5	3	2	1	No 沒有	1	4	3	3	5	6	Yes 知道	Outlying Islands 離島區
1/28/10 5:16 AM	No 不相信	1	0	0	0	0	0	3	3	0	No 沒有	0	1	0	1	0	0	Yes 知道	Wan Chai 灣仔
1/28/10 6:09 AM	Yes 相信	4	3	3	3	2	3	4	2	2	No 沒有	1	5	3	2	5	5	Yes 知道	Kowloon City 九龍城
1/28/10 6:57 AM	Yes 相信	6	5	3	3	2	2	4	1	3	No 沒有	0	6	4	6	4	5	Yes 知道	青衣
1/28/10 10:55 AM	Yes 相信	4	5	1	3	2	4	4	2	2	No 沒有	1	6	3	4	5	5	Yes 知道	Southern 南區

1/28/10 11:30 AM	Yes 相信	3	5	0	1	0	0	4	2	2	No 沒有	0	0	0	2	5	0	Yes 知道	Sha Tin 沙田
1/28/10 10:37 PM	Yes 相信	2	5	3	4	2	4	3	2	1	No 沒有	3	4	3	2	4	4	Yes 知道	Eastern 東區
1/28/10 11:23 PM	Yes 相信	4	2	0	3	0	2	3	2	1	No 沒有	4	6	6	3	4	4	Yes 知道	Sha Tin 沙田
1/28/10 11:26 PM	No 不相信	2	0	0	0	0	0	3	1	2	No 沒有	3	4	2	4	1	2	Yes 知道	Sha Tin 沙田
1/28/10 11:32 PM	Yes 相信	6	1	1	5	1	5	5	1	4	Yes 有	2	6	5	5	6	6	Yes 知道	葵青
1/29/10 12:27 AM	Yes 相信	1	4	4	4	4	5	1	1	0	No 沒有	5	6	4	4	5	6	Yes 知道	Sha Tin 沙田
1/29/10 6:12 AM	Yes 相信	5	3	3	4	3	3	4	2	2	No 沒有	2	5	4		5	5	Yes 知道	Sha Tin 沙田
1/29/10 6:55 AM	Yes 相信	4	4	4	4	4	4	3	0	3	No 沒有	1	6	3	4	4	6	Yes 知道	元朗
1/29/10 11:06 AM	Yes 相信	1	1	0	1	0	1	3	1	2	No 沒有	5	6	3	3	5	5	Yes 知道	Central & Western 中西區
1/30/10 12:01 AM	Yes 相信	1	1	1	3	0	2	2	1	1	No 沒有	1	3	2	2	4	5	Yes 知道	Outlying Islands 離島區
1/30/10 9:03 AM	Yes 相信	5	4	3	5	2	4	6	2	4	Yes 有	2	6	4	6	6	6	Yes 知道	Kwun Tong 觀塘
1/30/10 11:15 AM	Yes 相信	1	0	0	0	0	0	1	0	1	No 沒有	1	5	2	2	2	5	Yes 知道	元朗
1/30/10 11:48 AM	Yes 相信	2	3	3	4	2	2	2	0	2	No 沒有	3	5	5	4	4	5	Yes 知道	Central & Western 中西區
1/31/10 1:24 AM	Yes 相信	4	6	5	6	5	5	3	1	2	No 沒有	4	5	2	3	6	6	Yes 知道	Outlying Islands 離島區
1/31/10 1:36 AM	Yes 相信	3	4	1	5	0	4	3	2	1	No 沒有	5	6	4	3	4	5	Yes 知道	Wong Tai Sin 黃大仙

1/31/10 9:07 AM	Yes 相信	3	0	0	3	0	2	3	2	1	No 沒有	1	5	3	3	5	6	Yes 知道	Kowloon City 九龍城
1/31/10 9:38 AM	Yes 相信	2	1	0	1	0	1	2	1	1	No 沒有	5	6	5	5	5	6	Yes 知道	Sha Tin 沙田
1/31/10 9:41 AM	Yes 相信	4	5	1	5	1	5	2	1	1	No 沒有	0	3	1	3	1	0	Yes 知道	Eastern 東區
1/31/10 9:49 AM	Yes 相信	6	6	6	6	6	6	4	1	3	Yes 有	3	6	5	4	6	5	Yes 知道	
1/31/10 10:16 AM	Yes 相信	2	2	1	3	1	3	2	1	1	No 沒有	2	3	2	2	4	6	Yes 知道	Tai Po 大埔
1/31/10 11:02 AM		3	2		2	2	1	2	1	1	No 沒有	2	2		2	3	3	No 不知道	元朗
1/31/10 12:25 PM	No 不相信	5	0	0	0	0	0	3	1	2	No 沒有	0	0	0	0	2	0	Yes 知道	Central & Western 中西區
1/31/10 1:44 PM	Yes 相信	5	6	5	6	4	6	5	1	4	Yes 有	4	4	4	4	6	6	Yes 知道	Tuen Mun 屯門
1/31/10 4:10 PM	Yes 相信	1	0	0	0	0	0	1	1	0	No 沒有	1	5	3	2	2	3	Yes 知道	Sha Tin 沙田
1/31/10 8:51 PM	Yes 相信	1	0	0	0		0	1	1	0	No 沒有	0	2	1	1	1	2	Yes 知道	
1/31/10 9:05 PM	Yes 相信	5	1	1	2	2	1	4	1	3	Yes 有	0	1	2	4	2	1	Yes 知道	元朗
1/31/10 9:21 PM	Yes 相信	3	3	3	4	3	3	2	1	1	No 沒有	4	6	6	4	5	6	Yes 知道	Kwun Tong 觀塘
1/31/10 10:40 PM	Yes 相信	3	1	2	1	2	3	1	4	-3		3	4	3	1	1	5	No 不知道	
1/31/10 10:53 PM	Yes 相信	2	2	2	4	0	2	2	0	2	No 沒有	2	4	5	5	5	6	Yes 知道	Kowloon City 九龍城
1/31/10 11:11 PM	Yes 相信	2	2	2	2	2	2	2	2	0	No 沒有	3	5	3		3	4	Yes 知道	Sham Shui Po 深水步

1/31/10 11:16 PM	Yes 相信	4	4	2	4	2	3	3	1	2	No 沒有	2	5	2	4	5	6	Yes 知道	Wan Chai 灣仔
1/31/10 11:16 PM	Yes 相信	1	1	1	2	0	0	4			No 沒有	6	6	2	2	6	6	Yes 知道	Sai Kung 西貢
1/31/10 11:23 PM	Yes 相信	2	0	0	0	0	0	2	1	1	No 沒有	4	6	6		5	6	Yes 知道	Central & Western 中西區
1/31/10 11:42 PM	Yes 相信	2	2	2	3	2	3	2	1	1	Yes 有	5	5	4	3	4	5	Yes 知道	Tai Po 大埔
2/1/10 12:53 AM	Yes 相信	4	3	5	6	3	5	5	2	3	No 沒有	3	5	4	4	1	1	Yes 知道	Tuen Mun 屯門
2/1/10 12:58 AM	Yes 相信	4	0	1	4	2	4	2	0	2	No 沒有	3	0	3	4	0		Yes 知道	Tai Po 大埔
2/1/10 1:05 AM	Yes 相信	5	5	4	5	3	4	6	2	4	No 沒有	4	6	5	5	6	5	Yes 知道	Tsuen Wan 荃灣
2/1/10 1:07 AM	Yes 相信	3	4	3	5	2	5	3	1	2	No 沒有	4	6	3	5	5	6	Yes 知道	Sai Kung 西貢
2/1/10 1:14 AM	Yes 相信	2	0	0	0	0	0	2	2	0	No 沒有	3	4	1	2	2	3	Yes 知道	Central & Western 中西區
2/1/10 1:54 AM	Yes 相信	4	0	2	3	0	2	3	0	3	No 沒有	5	6	5	5	5	6	Yes 知道	
2/1/10 1:58 AM	Yes 相信	2	0	0	2	0	1	3	2	1	No 沒有	6	4	4	4	5	6	Yes 知道	Southern 南區
2/1/10 3:31 AM	Yes 相信	4						1	1	0	No 沒有	1	5	2	2	4	6	Yes 知道	Eastern 東區
2/1/10 4:49 AM	Yes 相信	4	4	4	3	3	3	3	1	2	No 沒有	6	6	4	3	6	6	Yes 知道	Sham Shui Po 深水步
2/1/10 5:19 AM	Yes 相信	5	4	5	6	4	6	4	2	2	Yes 有	3	6	5	4	5	6	Yes 知道	Sai Kung 西貢
2/1/10 5:47 AM	Yes 相信	3	2	2	4	2	3	3	2	1	No 沒有	6	5	4	4	5	5	Yes 知道	Yau Tsim Mong 油尖旺

2/1/10 6:32 AM	Yes 相信	4	0	0	3	0	3	3	1	2	No 沒有	0	0	2	2	0	0	Yes 知道	North 北區
2/1/10 6:55 AM	Yes 相信	3	1	1	1	1	1	3	1	2	No 沒有	1	1	1	1	1	1	Yes 知道	North 北區
2/1/10 7:55 AM	Yes 相信	2	4	2	2	0	0	1	1	0	No 沒有	5	5	3	4	6	6	Yes 知道	Tai Po 大埔
2/1/10 8:44 AM	Yes 相信	4	5	5	6	3	5	1	1	0	No 沒有	2	4	2	2	4	6	Yes 知道	Tai Po 大埔
2/1/10 9:00 AM	Yes 相信	3	6	3	6	3	6	3	1	2	No 沒有	6	6	3	0	6	6	Yes 知道	Outlying Islands 離島區
2/1/10 9:28 AM	Yes 相信	3	3	3	2	3	4	3	1	2	No 沒有	5	6	5	4	6	6	Yes 知道	元朗
2/1/10 9:58 AM	Yes 相信	2	2	2	4	2	3	1	2	-1	No 沒有	0	1	2	1	0	0	Yes 知道	Kwun Tong 觀塘
2/1/10 10:00 AM	Yes 相信	3	5	4	5	3	5	3	1	2	No 沒有	5	6	4	4	4	4	Yes 知道	Southern 南區
2/1/10 10:07 AM	Yes 相信	0	0	0	0	0	0	1	1	0	No 沒有	3	4	4	2	5	5	No 不知道	Kwun Tong 觀塘
2/1/10 10:23 AM	Yes 相信	2	4	1	1	1	1	1	1	0	No 沒有	0	0	0	3	0	0	Yes 知道	Kwun Tong 觀塘
2/1/10 10:31 AM	Yes 相信	4	3	4	4	3	3	4	1	3	Yes 有	0	1	2	6	0	0	Yes 知道	Tai Po 大埔
2/1/10 10:43 AM	Yes 相信	2	1	0	1	0	0	3	1	2	No 沒有	2	5	3	2	2	3	Yes 知道	Eastern 東區
2/1/10 11:07 AM	Yes 相信	4	3	2	4	2	3	2	2	0	No 沒有	3	3	2	2	3	4	No 不知道	Sai Kung 西貢
2/1/10 12:02 PM	Yes 相信	2	0	0	1	0	0	4	1	3	No 沒有	3	4	5	6	6	5	Yes 知道	Tai Po 大埔
2/1/10 7:26 PM	Yes 相信	3	0	0	1	0	1	4	1	3	No 沒有	2	4	4	3	2	3	Yes 知道	Kwun Tong 觀塘

2/2/10 2:26 AM	Yes 相信	3	2	1	2	0	0	2	2	0	No 沒有	2	2	2	2	2	2	No 不知道	Tai Po 大埔
2/2/10 2:54 AM	Yes 相信	5	5	3	5	0	3	5	2	3	Yes 有	6	0	0	0	6	0	Yes 知道	Central & Western 中西區
2/2/10 2:57 AM	Yes 相信	4	3	4	6	0	1	4	1	3	No 沒有	4	6	1	1	3	3	Yes 知道	Sham Shui Po 深水步
2/2/10 3:00 AM	Yes 相信	1	1	1	1	1	1	3	2	1	No 沒有	5	6	2	1	5	5	Yes 知道	Tuen Mun 屯門
2/2/10 5:26 AM	Yes 相信	2	2	1	2	0	1	2	1	1	No 沒有	1	2	2	4	0	0	Yes 知道	Outlying Islands 離島區
2/2/10 11:30 AM	No 不相信	3	2	0	2	0	0	2	0	2	No 沒有	0	6	2	3	4	6	Yes 知道	Eastern 東區
2/2/10 1:45 PM	Yes 相信	3	4	5	5	3	4	3	0	3	No 沒有	2	4	3	5	4	5	Yes 知道	Kwun Tong 觀塘
2/2/10 10:16 PM	Yes 相信	2	2	2	3	1	2	3	2	1	Yes 有	4	4	1	2	4	3	Yes 知道	
2/2/10 10:18 PM	Yes 相信	5	2	2	3	1	1	4	2	2	No 沒有	4	4	3	3	4	3	Yes 知道	
2/2/10 10:19 PM	Yes 相信	5	4	3	3	3	3	0	1	-1	No 沒有	4	2	2	2	6	5	Yes 知道	
2/2/10 10:22 PM	Yes 相信	2	2	1	2	0	0	1	1	0	No 沒有	4	5	1	0	2	2	Yes 知道	
2/2/10 10:23 PM	Yes 相信	3	1	1	1	1	1	0	3	-3	No 沒有	3	4	3	4	5	4	Yes 知道	
2/2/10 10:24 PM	Yes 相信	4	4	5	6	3	4	0	3	-3	No 沒有	4	4	2	2	4	3	No 不知道	
2/2/10 10:25 PM	Yes 相信	1	3	3	5	2	3	1	1	0	No 沒有	5	4	3	2	5	4	Yes 知道	
2/2/10 10:35 PM	Yes 相信	1	1	1	4	1	4	1	1	0	No 沒有	2	4	4	3	5	6	Yes 知道	Tai Po 大埔

2/3/10 1:04 AM	Yes 相信	1	0	0	1	1	2	2	2	0	No 沒有	2	3	3	4	3	4	Yes 知道	Southern 南區
2/3/10 1:31 AM	Yes 相信	2	1	1	1	1	1	2	1	1	No 沒有	4	5	6	4	5	6	Yes 知道	Kwun Tong 觀塘
2/3/10 3:34 AM	Yes 相信	1	1	1	1	1	1	1	1	0	No 沒有	1	5	5	2	5	6	No 不知道	Sai Kung 西貢
2/3/10 3:36 AM	Yes 相信	4	3	3	4	2	3	4	1	3	No 沒有	3	4	2	3	4	5	Yes 知道	Yuen Long 元朗
2/3/10 3:37 AM	Yes 相信	6	6	5	6	6	6	4	3	1	No 沒有	4	6	6	3	4	6	Yes 知道	Southern 南區
2/3/10 3:38 AM	Yes 相信	5	5	4	4	4	5	4	3	1	No 沒有	5	6	5	4	5	6	Yes 知道	Tsuen Wan 荃灣
2/3/10 3:39 AM	Yes 相信	6	6	6	6	6	6	6	2	4	No 沒有	6	5	6	5	6	6	Yes 知道	Southern 南區
2/3/10 3:41 AM	Yes 相信	4	5	5	5	5	5	3	2	1	No 沒有	3	3	3	3	3	3	Yes 知道	Tsuen Wan 荃灣
2/3/10 3:42 AM	Yes 相信	5	5	5	6	5	6	5	4	1	No 沒有	5	6	6	6	5	6	Yes 知道	Southern 南區
2/3/10 3:44 AM	Yes 相信	4	2	2	3	1	3	3	3	0	No 沒有	2	4	2	2	3	3	Yes 知道	Wong Tai Sin 黃大仙
2/3/10 3:45 AM	Yes 相信	6	6	5	6	4	5	4	1	3	Yes 有	4	5	5	6	6	6	Yes 知道	Sha Tin 沙田
2/3/10 3:47 AM	Yes 相信	6	5	4	6	4	6	5	3	2	No 沒有	5	6	5	5	6	6	Yes 知道	Southern 南區
2/3/10 3:51 AM	Yes 相信	5	5	4	5	4	4	4	1	3	No 沒有	3	6	3	3	6	6	No 不知道	Wan Chai 灣仔
2/3/10 7:13 AM	Yes 相信	2	2	1	2	1	2	3	1	2	No 沒有	1	5	3	4	3	4	Yes 知道	Tai Po 大埔
2/3/10 11:04 AM	Yes 相信	5	3	3	3	3	3	2	3	-1		3	6	4	3	6	6	Yes 知道	Wong Tai Sin 黃大仙

2/3/10 11:06 AM	Yes 相信	3	3	2	2	2	2	3	1	2	No 沒有	5	4	4	4	5	4	Yes 知道	
2/3/10 11:07 AM	Yes 相信	4	4	4	4	4	4	1	0	1	No 沒有	2	3	4	5	5	5	Yes 知道	Wong Tai Sin 黃大仙
2/3/10 11:08 AM	Yes 相信	2	0	0	4	0	4	3	1	2	No 沒有	4	2	1	4	3	6	Yes 知道	Wong Tai Sin 黃大仙
2/3/10 11:10 AM	Yes 相信	4	2	0	2	0	1	4	2	2	No 沒有	1	4	4	5	5	4	Yes 知道	Yau Tsim Mong 油尖旺
2/3/10 11:12 AM	Yes 相信	3	5	4	3	3	4	3	4	-1	Yes 有	3	4	3	4	4	5	Yes 知道	Yau Tsim Mong 油尖旺
2/3/10 11:14 AM	Yes 相信	3	2	5	4	5	5	3	2	1	No 沒有	3	5	4	5	4	5	Yes 知道	Wong Tai Sin 黃大仙
2/3/10 11:15 AM	Yes 相信	4	4	5	6	4	5	4	1	3	No 沒有	1	4	4	3	3	3	Yes 知道	Yau Tsim Mong 油尖旺
2/3/10 11:18 AM	Yes 相信	4	5	4	5	3	3	3	2	1	No 沒有	3	4	2	4	6	6	Yes 知道	Central & Western 中西區
2/3/10 11:20 AM	Yes 相信	1	0	0	3	0	3	4	3	1	No 沒有	1	1	5	2	1	2	Yes 知道	Kowloon City 九龍城
2/3/10 11:27 AM	Yes 相信	5	5	3	5	0	3	5	2	3	Yes 有	6	0	0	0	6	0	Yes 知道	Central & Western 中西區
2/3/10 7:32 PM	Yes 相信	5	6	5	6	5	6	5	0	5	No 沒有	5	6	4	3	6	6	Yes 知道	Central & Western 中西區
2/4/10 9:26 AM	Yes 相信	4	5	2	4	2	5	3	1	2	No 沒有	2	6	4	5	4	4	Yes 知道	Outlying Islands 離島區
2/4/10 9:57 AM	Yes 相信	2	4	3	5	3	4	2	1	1	No 沒有	2	4	3	3	5	5	Yes 知道	Sha Tin 沙田
2/4/10 10:03 PM	Yes 相信	0	3	2	4	2	1	2	1	1	No 沒有	2	4	1	1	4	1	No 不知道	Southern 南區
2/4/10 10:06 PM	Yes 相信	4	2	1	3	1	3	4	4	0	No 沒有	2	5	4	4	5	5	Yes 知道	Hong Hum

2/4/10 10:58 PM	Yes 相信	3	6	6	5	5	5	4	2	2	Yes 有	4	5	4	5	3	2	Yes 知道	
2/4/10 10:59 PM	Yes 相信	2	2	1	3	1	3	2	1	1	No 沒有	2	1	3	2	3	1	Yes 知道	Kwun Tong 觀塘
2/4/10 11:00 PM	Yes 相信	1	6	5	5	2	3	3	0	3	No 沒有	0	3	0	1	4	4		
2/4/10 11:02 PM	Yes 相信	3	4	3	4	2	5	3	5	-2	Yes 有	2	3	2	5	6	2	No 不知道	Tsuen Wan 荃灣
2/4/10 11:04 PM	Yes 相信	5	5	3	3	2	3	2	1	1	No 沒有	1	3	1	1	3	1		Kowloon City 九龍城
2/4/10 11:05 PM		5	5	3	3	2	3	1	1	0	No 沒有	2	3	2	1	3	1		Kowloon City 九龍城
2/4/10 11:07 PM	Yes 相信	3	2	3	3	2	4	3	1	2	No 沒有	3	3	3	2	4	3	Yes 知道	Kowloon City 九龍城
2/4/10 11:12 PM	Yes 相信	0	0	0	0	0	0	2	3	-1	No 沒有	2	2	2	2	3	2	Yes 知道	Kowloon City 九龍城
2/4/10 11:14 PM	Yes 相信	4	2	2	2	2	2	5	2	3	No 沒有	2	4	4	3	5	1	Yes 知道	Kowloon City 九龍城
2/4/10 11:16 PM	Yes 相信	4	4	2	4	0	3	5	2	3	No 沒有	1	2	2	4	5	1	Yes 知道	Eastern 東區
2/4/10 11:18 PM	Yes 相信	3	2	0	2	0	0	2	2	0	No 沒有	2	3	3	2	3	2	No 不知道	Southern 南區
2/4/10 11:21 PM	Yes 相信	4	4	1	3	0	0	3	0	3	No 沒有	4	4	1	0	4	1	No 不知道	Wan Chai 灣仔
2/4/10 11:22 PM	Yes 相信	4	4	3	5	4	3	5	2	3	No 沒有	2	4	4	2	2	2	Yes 知道	Eastern 東區
2/4/10 11:26 PM	Yes 相信	4	4	4	5	3	2	4	2	2	Yes 有	3	3	3	3	4	4	Yes 知道	North 北區
2/4/10 11:29 PM	Yes 相信	3	2	2	2	2	2	3	2	1	No 沒有	2	4	3	3	4	5	Yes 知道	[none specified]

2/4/10 11:31 PM	Yes 相信	0	0	0	0	0	0	0	1	-1	No 沒有	0	4	2	2	6	6	Yes 知道	Tsuen Wan 荃灣
2/4/10 11:33 PM	Yes 相信	2	4	1	3	3	2	2	3	-1	Yes 有	1	5	5	5	5	6	Yes 知道	Central & Western 中西區
2/5/10 2:23 AM	Yes 相信	4	4	3	3	3	3	2	2	0	No 沒有	2	4	4	3	4	5	No 不知道	Kowloon City 九龍城
2/5/10 8:38 AM	Yes 相信	3	4	4	4	2	4	3	1	2	No 沒有	3	5	4	4	5	6	Yes 知道	Tuen Mun 屯門
2/7/10 8:05 AM	Yes 相信	3	2	2	2	2	2	2	1	1	No 沒有	4	5	3	4	4	6	Yes 知道	Tsuen Wan 荃灣
2/7/10 11:20 PM	Yes 相信	3	3	3	4	2	3	4	2	2	No 沒有	4	6	4	5	5	6	Yes 知道	Kowloon City 九龍城
2/8/10 5:25 AM	Yes 相信	3	4	3	3	2	4	3	2	1	No 沒有	2	4	3	5	2	2	Yes 知道	Yuen Long 元朗
2/8/10 8:31 PM	Yes 相信	2	2	2	5	0	2	2	1	1	No 沒有	6	6	2	2	5	6	Yes 知道	Kwun Tong 觀塘
2/9/10 6:10 AM	Yes 相信	4	6	5	5	2	3	5	1	4	No 沒有	5	5	3	2	5	4	Yes 知道	Kwun Tong 觀塘
2/9/10 8:39 PM	Yes 相信	3	3	3	4	0	4	3	1	2	No 沒有	5	6	6	4	6	6	Yes 知道	Central & Western 中西區
2/9/10 10:16 PM	Yes 相信	5	5	5	5	4	5	3	1	2	No 沒有	2	4	4	2	3	5	No 不知道	Outlying Islands 離島區
2/9/10 10:19 PM	Yes 相信	6	6	5	6	5	6	6	2	4	Yes 有	6	6	5	3	4	6	Yes 知道	Eastern 東區
2/9/10 10:23 PM	Yes 相信	3	3	4	4	4	3	2	2	0	No 沒有	0	1	1	1	2	4	Yes 知道	Eastern 東區
2/9/10 10:25 PM	Yes 相信	0	3	2	3	1	3	1	3	-2	No 沒有	2	4	2	2	3	4	Yes 知道	Sai Kung 西貢
2/9/10 10:27 PM	Yes 相信	5	5	5	5	5	5	1	1	0	No 沒有	1	5	4	4	3	5	Yes 知道	Central & Western 中西區

2/9/10 10:28 PM	Yes 相信	1	0	0	3	0	0	4	2	2	No 沒有	0	2	0	0	0	0	Yes 知道	North 北區
2/9/10 10:31 PM	Yes 相信	2	0	0	3	0	0	1	1	0	No 沒有	3	3	4	1	3	3	No 不知道	Wan Chai 灣仔
2/9/10 10:34 PM	Yes 相信	5	5	5	5	5	5	1	1	0	No 沒有	0	0	0	1	0	0	No 不知道	Wan Chai 灣仔
2/9/10 10:35 PM	Yes 相信	5	6	5	5	5	6	5	1	4		5						Yes 知道	Eastern 東區
2/9/10 10:37 PM	No 不相信	3	0	1	2	1	2	1	1	0		0	3	3	3	5	6	No 不知道	Eastern 東區
2/9/10 10:40 PM	Yes 相信	4	3	5	4	5	4	4	1	3	No 沒有	4	4	4	4	5	5	No 不知道	Eastern 東區
2/9/10 10:41 PM	Yes 相信	2	2	2	1	1	1	1	1	0	No 沒有	0	0	0	1	0	0	No 不知道	Eastern 東區
2/9/10 10:42 PM	Yes 相信	3	3	2	3	3	3	3	2	1	No 沒有	3	4	4	4	3	3	Yes 知道	Eastern 東區
2/9/10 10:44 PM	Yes 相信	2	1	1	2	1	2	2	1	1	No 沒有	3	6	5	4	2	5	Yes 知道	Eastern 東區
2/9/10 10:45 PM	Yes 相信	4	4	3	5	5	4	3	1	2	No 沒有	2	4	4	3	4	5	Yes 知道	North 北區
2/9/10 10:46 PM	Yes 相信	1	1	0	0	0	0	1	1	0	No 沒有	1	4	2	3	3	5	Yes 知道	Tuen Mun 屯門
2/9/10 10:48 PM	Yes 相信	5			5		5	3	2	1		2	3	1	3	5	6	No 不知道	Eastern 東區
2/9/10 10:49 PM	Yes 相信	2	1	0	0	0	0	1	1	0	No 沒有	2	3	2	3	3	3	No 不知道	Tuen Mun 屯門
2/9/10 10:50 PM	Yes 相信	5	6	5	5	5	5	2	1	1	No 沒有	3	3	3	3	3	3	Yes 知道	Sai Kung 西貢
2/9/10 10:53 PM	Yes 相信	0	2	0	0	0	0	2	0	2	No 沒有	2	2	3	3	3	5	No 不知道	Eastern 東區

2/9/10 10:54 PM	Yes 相信	3	3	4	4	3	3	4	0	4	No 沒有	6	6	5	3	5	6	Yes 知道	Wan Chai 灣仔
2/9/10 10:56 PM	Yes 相信	3	2	2	1	1	1	2	1	1	Yes 有	1	3	4	5	6	6	No 不知道	Eastern 東區
2/9/10 10:58 PM	Yes 相信	5	4	3	4	4	3	3	2	1	No 沒有	3	4	3	3	2	2	No 不知道	Kwun Tong 觀塘
2/9/10 11:02 PM	Yes 相信	0	0	0	0	0	0	1	1	0	No 沒有	0	0	0	1	0	0	No 不知道	North 北區
2/9/10 11:06 PM			0	0	0	0	0	0	0	0		0	0	0	0	0	0	Yes 知道	Yau Tsim Mong 油尖旺
2/9/10 11:09 PM	Yes 相信	6			6			1	1	0	No 沒有		6					Yes 知道	Eastern 東區
2/9/10 11:11 PM	Yes 相信	2	5	5	5	4	5	2	2	0	No 沒有	6	6	5	4	5	6	Yes 知道	Eastern 東區
2/9/10 11:12 PM	Yes 相信	5	4	3	4	3	4	2	1	1	Yes 有	2	5	3	4	2	4	No 不知道	Southern 南區
2/9/10 11:17 PM	Yes 相信	2	2	2	5	0	2	2	1	1	No 沒有	6	6	2	2	5	6	Yes 知道	Kwun Tong 觀塘
2/10/10 12:24 PM	Yes 相信	5	6	5	5	3	4	4	1	3	No 沒有	4	4	3	6	5	5	Yes 知道	Central & Western 中西區
2/10/10 12:28 PM	Yes 相信	5	5	6	6	5	6	4	1	3	Yes 有	2	5	5	3	4	5	Yes 知道	North 北區
2/11/10 8:54 PM	Yes 相信	3	5	3	5	3	5	2	4	-2	No 沒有	4	6	6	6	6	6	Yes 知道	Eastern 東區
2/11/10 8:56 PM	Yes 相信	3	4	4	4	3	4	4	3	1	No 沒有	3	4	4	3	4	4	No 不知道	Southern 南區
2/11/10 8:57 PM	Yes 相信	3	1	1	1	1	1	3	1	2	No 沒有	2	3	2	2	4	5	Yes 知道	Tuen Mun 屯門
2/11/10 8:58 PM	Yes 相信	3	0	1	3	0	2	0	2	-2	No 沒有	4	4	5	4	4	6	Yes 知道	Sha Tin 沙田

2/11/10 9:00 PM	Yes 相信	5	5	1	3	0	5	2	3	-1	No 沒有	4	6	2	5	4	6	Yes 知道	Eastern 東區
2/11/10 9:01 PM	Yes 相信	5	5	5	6	2	5	3	2	1	No 沒有	2	3	3	2	3	5	Yes 知道	Southern 南區
2/11/10 9:04 PM	Yes 相信	3	1	1	1	1	1	2	2	0	Yes 有	1	1	1	1	1	1	No 不知道	Wong Tai Sin 黃大仙
2/11/10 9:06 PM	Yes 相信	3	0	5	6	4	5	3	2	1	No 沒有	3	6	3	4	5	4	Yes 知道	Southern 南區
2/11/10 9:06 PM	Yes 相信	1	1	0	1	0	1	1	1	0	No 沒有	1	1	1	2	1	1	Yes 知道	Southern 南區
2/11/10 9:12 PM	Yes 相信	0						1	1	0	No 沒有	5	4	4	3	6	4	No 不知道	Southern 南區
2/11/10 9:14 PM	Yes 相信	5	0		5			3	3	0	No 沒有	6	6		6	6	6	Yes 知道	Central & Western 中西區
2/11/10 9:15 PM	No 不相信	2	0	0	3	1	1	1	0	1	No 沒有	1	3	1	3	1	1	No 不知道	Central & Western 中西區
2/11/10 9:15 PM	Yes 相信	3	3	3	3	3	3	0	1	-1	No 沒有	2	2	3	3	3	1	Yes 知道	Central & Western 中西區
2/11/10 9:17 PM	Yes 相信	3	3	3	3	3	3	3	3	0	Yes 有	3	3	3	3	3	3	No 不知道	Central & Western 中西區
2/11/10 9:19 PM	Yes 相信							3	2	1	No 沒有	3	3	2	3	3	3	No 不知道	Central & Western 中西區
2/11/10 9:26 PM	Yes 相信	2	1	1	5	1	4	3	3	0	No 沒有	1	2	4	4	3	2	Yes 知道	Central & Western 中西區
2/11/10 9:27 PM	Yes 相信	3	4	4	4	4	4	3	0	3	No 沒有	4	5	4	5	6	5	No 不知道	Southern 南區
2/11/10 9:29 PM		1						3	1	2	No 沒有	6	3	3	4	5	5	Yes 知道	Central & Western 中西區
2/11/10 9:30 PM	Yes 相信	3	1	3	3	3	3	1	2	-1	No 沒有	4	4	3	3	5	4	Yes 知道	Central & Western 中西區

2/11/10 9:32 PM	No 不相信	0						3	1	2	No 沒有	6	3	1	2	6	6	No 不知道	Wan Chai 灣仔
2/11/10 9:35 PM	Yes 相信	3	2	0	3	2	2	2	3	-1	No 沒有	3	4	4	4	3	5	Yes 知道	Central & Western 中西區
2/11/10 9:36 PM	Yes 相信	5	6	6	6	5	5	3	1	2	No 沒有	6	6	6	3	6	6	Yes 知道	Central & Western 中西區
2/11/10 9:42 PM	Yes 相信	5	5	4	3	3	4	3	3	0	No 沒有		6	6	4	4	3	Yes 知道	Mei Foo
2/11/10 9:44 PM	Yes 相信	5	6	3	4	2	3	2	1	1	No 沒有	6	5	4	6	6	3	Yes 知道	Tai Po 大埔
2/11/10 9:54 PM	Yes 相信	4	4	3	3	3	3	3	1	2	No 沒有	4	4	4	2	4	2	Yes 知道	Sham Shui Po 深水步
2/11/10 9:55 PM	Yes 相信	4	6	5	4	3	3	3	1	2	Yes 有	4	5	6	4	5	6	Yes 知道	Tai Po 大埔
2/11/10 9:56 PM	Yes 相信	2	0	0	1	0	2	6	3	3	No 沒有	4	3	5	6	6	6	Yes 知道	Wan Chai 灣仔

Appendix P. Data Distribution

Location	Responses	
Central & Western 中西區	30	10%
Eastern 東區	39	13%
Southern 南區	23	8%
Wan Chai 灣仔	20	7%
Kowloon City 九龍城	17	6%
Kwun Tong 觀塘	19	7%
Sham Shui Po 深水步	9	3%
Wong Tai Sin 黃大仙	15	5%
Yau Tsim Mong 油尖旺	13	4%
Outlying Islands 離島區	12	4%
North 北區	14	5%
Sai Kung 西貢	15	5%
Sha Tin 沙田	20	7%
Tai Po 大埔	13	4%
Tsuen Wan 荃灣	17	6%
Tuen Mun 屯門	12	4%
Yuen Long 元朗	2	1%
TOTAL	290	

Age	Responses	
Under 18	25	7%
18 - 34	194	57%
35 - 59	80	23%
Over 60	42	12%
TOTAL	341	

Question 8 Responses Awareness of light pollution		
No	66	20%
Yes	270	80%
TOTAL	336	

Single Scales

Question 2 Effect of excessive lighting		
Scale	Responses	
0	26	8%
1	31	9%
2	68	20%
3	76	22%
4	70	20%
5	50	15%
6	23	7%
AVERAGE	3.1	
TOTAL	344	

Question 1 Responses Dangers of lighting		
No	17	5%
Yes	325	95%
TOTAL	342	

Question 6 Responses		
No	298	87%
Yes	43	13%
TOTAL	341	

Question 4 Perceived level of brightness		
Scale	Responses	
0	14	4%
1	48	14%
2	89	26%
3	109	31%
4	60	17%
5	20	6%
6	7	2%
AVERAGE	2.69	
TOTAL	347	

Question 5 Desired level of brightness		
Scale	Responses	
0	37	11%
1	164	47%
2	92	27%
3	40	12%
4	12	3%
5	1	0%
6	0	0%
AVERAGE	1.5	
TOTAL	346	

RBAD [Question 5] – [Question 4]		
Scale	Responses	
-6	0	0%
-5	2	1%
-4	13	4%
-3	46	13%
-2	79	23%
-1	94	27%
0	79	23%
1	22	6%
2	7	2%
3	4	1%
4	0	0%
5	0	0%
6	0	0%
AVERAGE	-1.1676	
TOTAL	346	

Compound Scales

Question 3												
Scale	Symptoms of excessive lighting											
	Sleep loss / Deprivation		Anxiety		Visual Fatigue		Depression		Weariness		TOTAL	
0	60	18%	74	22%	36	11%	103	31%	54	16%	327	19%
1	45	13%	57	17%	35	10%	50	15%	37	11%	224	13%
2	51	15%	50	15%	32	9%	60	18%	45	13%	238	14%
3	48	14%	62	19%	64	19%	62	19%	72	21%	308	18%
4	54	16%	42	13%	71	21%	32	10%	55	16%	254	15%
5	50	15%	42	13%	62	18%	21	6%	51	15%	226	13%
6	30	9%	7	2%	41	12%	6	2%	23	7%	107	6%
AVERAGE	2.8		2.3		3.3		1.9		2.8		2.6	
TOTAL	338		334		341		334		337		1684	

Question 7												
Scale	Sources of light pollution											
	Video Billboards		Spot Lights		Car Headlights		Street Lights		Non-Flashing Advertising signs		Flashing Advertising signs	
0	36	11%	17	5%	19	6%	13	4%	21	6%	25	7%
1	47	14%	15	4%	26	8%	31	9%	16	5%	16	5%
2	74	22%	27	8%	63	19%	74	22%	30	9%	26	8%
3	67	20%	42	12%	81	24%	88	26%	55	16%	44	13%
4	59	17%	75	22%	80	24%	73	22%	68	20%	48	14%
5	35	10%	80	23%	54	16%	44	13%	79	23%	89	26%
6	24	7%	85	25%	17	5%	15	4%	72	21%	93	27%
AVERAGE	2.8		4.1		3.2		3.1		3.9		4.1	
TOTAL	342		341		340		338		341		341	