

ASSESSMENT OF KNOWLEDGE AND PERCEPTION OF ADVERSE HEALTH  
EFFECTS ASSOCIATED WITH SELF PREVENTION FROM AIR POLLUTION  
IN TRAFFIC POLICEMEN BANGKOK THAILAND

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บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)  
เป็นแฟ้มข้อมูลของนิสิตเจ้าของวิทยานิพนธ์ ที่ส่งผ่านทางบัณฑิตวิทยาลัย

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A Thesis Submitted in Partial Fulfillment of the Requirements  
for the Degree of Master of Public Health Program in Public Health  
College of Public Health Sciences  
Chulalongkorn University  
Academic Year 2016  
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การประเมินความรู้และการรับรู้ผลกระทบเชิงลบต่อสุขภาพที่มีผลต่อการป้องกันตนเองจาก  
มลภาวะทางอากาศของตำรวจจราจรในกรุงเทพมหานคร ประเทศไทย



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาขารณสุขศาสตรมหาบัณฑิต  
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Thesis Title ASSESSMENT OF KNOWLEDGE AND PERCEPTION OF ADVERSE HEALTH EFFECTS ASSOCIATED WITH SELF PREVENTION FROM AIR POLLUTION IN TRAFFIC POLICEMEN BANGKOK THAILAND

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ศศิวิมล วรรณาลัย : การประเมินความรู้และการรับรู้ผลกระทบเชิงลบต่อสุขภาพที่มีผลต่อการป้องกันตนเองจากมลภาวะทางอากาศของตำรวจจราจรในกรุงเทพมหานคร ประเทศไทย (ASSESSMENT OF KNOWLEDGE AND PERCEPTION OF ADVERSE HEALTH EFFECTS ASSOCIATED WITH SELF PREVENTION FROM AIR POLLUTION IN TRAFFIC POLICEMEN BANGKOK THAILAND) อ.ที่ปริกษาวิทยานิพนธ์หลัก: รศ. ดร. วัฒนสิทธิ์ ศิริวงษ์, 137 หน้า.

การศึกษาวิจัยครั้งนี้ มีวัตถุประสงค์เพื่อการประเมินความรู้และการรับรู้ผลกระทบเชิงลบต่อสุขภาพที่มีผลต่อการป้องกันตนเองจากมลภาวะทางอากาศของตำรวจจราจรในกรุงเทพมหานคร ประเทศไทย โดยเป็นการศึกษาวิเคราะห์ แบบภาคตัดขวาง กลุ่มตัวอย่างคือตัวแทนของตำรวจจราจรในจังหวัดกรุงเทพ จำนวน 223 คน โดยวิธีการสุ่มตัวอย่างและเก็บข้อมูลด้วยวิธีการตอบแบบด้วยตัวเองตามแบบสอบถามที่สร้างขึ้น การวิเคราะห์ข้อมูลใช้สถิติเชิงพรรณนา และใช้การทดสอบค่าไคว์-สแควร์ (Chi-square test) และ การทดสอบของฟิชเชอร์ (Fisher Exact Test) ผลการศึกษา พบว่า ผู้ตอบแบบสอบถามเป็นเพศชาย 100% และ 45.7 % โดยมีอายุในช่วงระหว่าง 41 – 50 ปี 44.4% มีระดับการศึกษาอยู่ในระดับปริญญาตรี และ พบว่า ผู้ตอบแบบสอบถาม 72.2 % ไม่เคยได้รับข้อมูลข่าวสาร และ 74.4 % ไม่เคยได้รับการอบรม โดยความรู้อยู่ในระดับปานกลางเท่ากับร้อยละ 48.4 และการรับรู้ผลกระทบเชิงลบต่อสุขภาพส่วนน้อยอยู่ในระดับไม่ดี ร้อยละ 2.7 ส่วนการป้องกันตนเองจากมลภาวะทางอากาศส่วนน้อยอยู่ในระดับไม่ดี ร้อยละ 3.1 นอกจากนี้ การทดสอบความสัมพันธ์ พบว่า ความรู้มีความสัมพันธ์กับลักษณะทางสังคมและประชากร ได้แก่ ระดับการศึกษา ( $p\text{-value} < 0.011$ ) ความถี่ของการออกกำลังกาย ( $p\text{-value} < 0.001$ ) การมีโรคประจำตัว ( $p\text{-value} < 0.028$ ) การได้รับข้อมูลข่าวสาร ( $p\text{-value} < 0.011$ ) และการได้รับการอบรม ( $p\text{-value} < 0.005$ ) ความรู้มีความสัมพันธ์กับการรับรู้ผลกระทบเชิงลบต่อสุขภาพ ( $p\text{-value} < 0.001$ ) และความรู้มีความสัมพันธ์กับการป้องกันตนเองจากมลภาวะทางอากาศ ( $p\text{-value} < 0.001$ ) นอกจากนี้ พบว่า การรับรู้ผลกระทบเชิงลบต่อสุขภาพมีความสัมพันธ์กับการป้องกันตนเองจากมลภาวะทางอากาศ ( $p\text{-value} < 0.043$ ) ผลจากการศึกษานี้ หน่วยงานที่เกี่ยวข้องควรจัดกิจกรรมเชิงรุกให้กับตำรวจจราจร ในแง่การความรู้เกี่ยวกับพฤติกรรมป้องกันมลภาวะทางอากาศ และจัดกิจกรรมส่งเสริมการรับรู้อันตรายของสุขภาพจากมลภาวะทางอากาศ เพื่อให้ตำรวจจราจรมีพฤติกรรมปฏิบัติตัวป้องกันจากมลภาวะทางอากาศที่เหมาะสมมากยิ่งขึ้น

สาขาวิชา สาธารณสุขศาสตร์

ลายมือชื่อนิติต .....

ปีการศึกษา 2559

ลายมือชื่อ อ.ที่ปริกษาหลัก .....

# # 5578844153 : MAJOR PUBLIC HEALTH

KEYWORDS: KNOWLEDGE, PERCEPTION, SELF-PREVENTION, AIR POLLUTION, TRAFFIC POLICEMEN

SASIWIMOL WANNALAI: ASSESSMENT OF KNOWLEDGE AND PERCEPTION OF ADVERSE HEALTH EFFECTS ASSOCIATED WITH SELF PREVENTION FROM AIR POLLUTION IN TRAFFIC POLICEMEN BANGKOK THAILAND. ADVISOR: ASSOC. PROF. WATTASIT SIRIWONG, Ph.D., 137 pp.

This study aimed to examine the association between knowledge and perception of adverse health effects associated with self-prevention from air pollution in traffic policemen in Bangkok, Thailand. This study was a cross sectional study which was selected by random sampling and self-administrated questionnaires from 223 participants. The data were analyzed by using descriptive statistics and using the Chi-square test and Fisher Exact Test. The result indicates that the respondents were 100% male and 45.7% aged between 41-50 years, 44.4% in Bachelor's degree and found that 72.2% of respondents had not received information, and 74.4 % had not been trained. Most of the respondents had knowledge at moderate level 48.4 %. A minority of respondents had the perception of adverse health effects at poor level 2.7 % and had self-prevention behavior from air pollution at poor level 3.1 %. Furthermore, the knowledge was associated with socio-demographics characteristics in terms of education level, frequency of exercise, having chronic disease, information about air pollution and health effect and Training on prevention of air pollution at p-value as 0.011, 0.001, 0.028, 0.011 and 0.005, respectively. Knowledge of respondents were associated with perception of adverse health effects on health (p-value <0.001) and also associated with self-prevention behavior from air pollution (p-value <0.001). Last, the perception of adverse health effects was associated with self-prevention behavior from air pollution (p-value <0.043). This study recommended that government agencies and related organizations should provide traffic policemen with proactive programs in terms of knowledge about air pollution prevention behaviors and enhance health effect perceptions from air pollution in order to have more appropriate prevention behaviors.

Field of Study: Public Health

Academic Year: 2016

Student's Signature .....

Advisor's Signature .....

## ACKNOWLEDGEMENTS

The successful completion of this thesis resulted from collaborative and encouraging efforts from many people who I would like to express my gratitude. First of all, I am most grateful to my advisor, Assoc. Prof. Wattasit Siriwong, Ph.D., for his guidance, encouragement, supervision, invaluable advice throughout the thesis process.

Furthermore, I also would like to express my gratitude to my Assoc. Prof. Ratana Somrongthong, and Ph.D., Nutta Taneepanichskul, my co-advisor for their valuable suggestions to improve my thesis. In spite of their busy schedules, I always was received their consulting time that assisted me in a complete thesis.

I am also would like to give my special thanks to Daisy Morknoy, Ph.D. and Saowanee Nokaew, Ph.D., my co-external advisor for their precious time and giving comments in this study.

Lastly, I also sincerely express my deep gratitude to all traffic policemen who participated in this study from 11 police stations as Phahonyothin, PrachaChuen Vibhavadi, Phlapphla Chai 1, Phlapphla Chai 2, Nangloeng, Din Daeng, Sutthisan, HuaiKhwang, Rat Burana and Bukkal for their valuable time to do the questionnaires.

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## LIST OF ABBREVIATIONS

AQI	Air Quality Index
EPA	Environmental Protection Agency
KAP	Knowledge, Attitude, and Practices
NAAQS	National Ambient Air Quality Standards
NIOSH	National Institute for Occupational Safety and Health
PPE	Personal Protective Equipment
SCBA	Self-Contained Breathing Apparatus
WHO	World Health Organization



## CHAPTER 1

### INTRODUCTION

#### 1.1 Background and Rational

Bangkok is the capital city which known in Thai as Krung Thep Maha Nakhon. Bangkok has the highest population in Thailand. There is a population over six million or 12.6 percent of the Thailand's population. Nowadays, Bangkok has an expansion of industry and the tourism because there are many attractions and landmarks as the center of communication in Thailand that is the location of many county-level government agencies and many public agencies for public schools, universities, and hospitals. Moreover, there are many routes of road that through the north, south, east and west routes of Thailand. There were 9,018,594 registered vehicles with Bangkok Metropolitan Administration in 2015.

Regarding all of the above reasons, it can commonly accept that Bangkok has high the number of vehicles in the area which causing air pollution, especially in rush hour. Therefore, the roads in Bangkok have filled with several of pollutants and air pollution is caused by road vehicles that the transportation of vehicles makes the dust on the road more blown becoming suspended particles in the air (PM<sub>2.5</sub> and PM<sub>10</sub>). At the same time, Bangkok has crowded with traffic on the road causing traffic problems. The incomplete combustion of vehicle leads to the amount of toxins and toxic gas concentrations in the atmosphere such as lead, carbon monoxide (CO), ozone gas (O<sub>3</sub>), oxides of nitrogen (NO<sub>x</sub>) and sulphur dioxide (SO<sub>x</sub>). The amount and composition of the dust on the road also depends on the type and locations of the street as well as the cleaning such as a macadamized road have less the suspended particles in the air than the concrete roads (Pollution control department, 2013).

The Bangkok management policy has presently built the various new routes in order to solve the traffic jam in Bangkok and has the annual plan to improve the existed roads. From this management policy, it can cause more pollutants in the ambient. Thus,

these conditions are sources of air pollution such as dust, soot, smoke, toxic gases, hydrocarbons, etc., and presently the dust also result from building construction, the burning grass in the open area that occurs almost 3,000 times per year. (Pollution control department, 2013)

From the total dust monitoring in Bangkok, it found that in 2013 there were 50 areas that had a number of total dust average in 24 hour values between 0.04 – 0.25 mg./m<sup>3</sup>, had the dust which particle size less than 10 µg (PM<sub>10</sub>) value between 5 - 303 mg./m<sup>3</sup> and had the dust which particle size less than 2.5 µg (PM<sub>2.5</sub>) value between 9 - 112mg./m<sup>3</sup>. Consequently, there were the report from pollution control department mentioned that 18 routes had PM<sub>10</sub> concentration exceeding standard level while 9 routes had total dust concentration and 1 route had PM<sub>2.5</sub> concentration exceeding standard level. The suspended particles have enormous impact on human in several aspects as a black smoke from the incomplete combustion of a motorcycle engine can cause allergies that reduced resistance to disease, headache, blurred vision, nausea, vomiting, and fatigue.

From these effects, it demonstrates that the people who worked in the high risk area especially the traffic policeman may have health effect from air pollution. Traffic policemen have a high risk to exposure suspended particles because they responsible for overseeing the state's security and orderliness of traffic as well as have the duty on the road regularly. Darasawat (1996) said that traffic policemen worked 8 hours per day and 5 days per week that led to health hazard. Moreover, some traffic policemen worked more than 10 - 14 hours per day and 46% of traffic policemen worked 7 days per week that could face with suspended particles while working on the road in the rush hour traffic congestion.

There were several research studies on the traffic police as the association between the work of traffic police with the heavy traffic in Bangkok and the incidence of respiratory disease. Aekplakorn et al (1991) studied the relationship between traffic police who worked with heavy traffic in Bangkok and the occurrence of respiratory diseases compared to the suburban police. The results of this study showed that the



traffic police in Bangkok had 4.4 times higher risk of respiratory symptoms and bronchitis than the suburban police. In additions, from classification of working illness incidence (exposure-response relationship) found that traffic policeman who worked 3-14 years had 3.4 times higher risk of bronchitis and who worked 15-29 years had 6 times higher risk. The pulmonary function tests were found that Bangkok traffic policeman had the full force of exhalation volume of 25%-35% (FEF 25-75%) was significantly lower than the suburban police which indicated that the traffic police had lower respiratory tract pathology (small airways disease).

From the problems mentioned above, air pollution in Bangkok is mainly caused by emissions from vehicles that make people gets respiratory symptoms and diseases particularly traffic policeman. Therefore, the problem of air pollution in Bangkok is an urgent issue. Monitoring air quality in areas with heavy traffic, surveillance of diseases caused by air pollution such as air-flow ventilation and measures to tackle traffic jams are very important.

As the result, the researcher was interested in knowledge and perception toward self-prevention of traffic policemen in Bangkok which has the most traffic congestions. Nevertheless, few studies have examined the knowledge and perception toward self-prevention of traffic policemen principally in Bangkok, which are presently confront air pollution situation. Consequently, this study are employed a cross-sectional questionnaire survey dealing with knowledge and perception toward self-prevention of traffic policemen Bangkok, Thailand.

## **1.2 Research questions**

- What are the level of knowledge and perception toward self-prevention of traffic policemen in Bangkok?
- Is there any association between socio demographic factors and self-prevention of traffic policemen in Bangkok?
- Is there any association between knowledge and perception towards self-prevention of traffic policemen in Bangkok?

- Is there any association between knowledge and self-prevention of traffic policemen in Bangkok?
- Is there any association between perception and self-prevention of traffic policemen in Bangkok?

### **1.3 Research Hypothesis**

- There is association between socio demographic factors and self-prevention of traffic policemen in Bangkok.
- There is association between knowledge and perception towards self-prevention of traffic policemen in Bangkok.
- There is association between knowledge and self-prevention of traffic policemen in Bangkok.
- There is association between perception and self-prevention of traffic policemen in Bangkok.

### **1.4 Research objectives**

- To assess level of knowledge, perception and self-prevention associate with the working area in traffic policemen.
- To explore the association between socio demographic factors and self-prevention of traffic policemen in Bangkok.
- To explore the association between knowledge and perception towards self-prevention of traffic policemen in Bangkok.
- To provide recommendations to improve the behavior of self-prevention from air pollution in traffic policemen.

## 1.5 Variables in the study

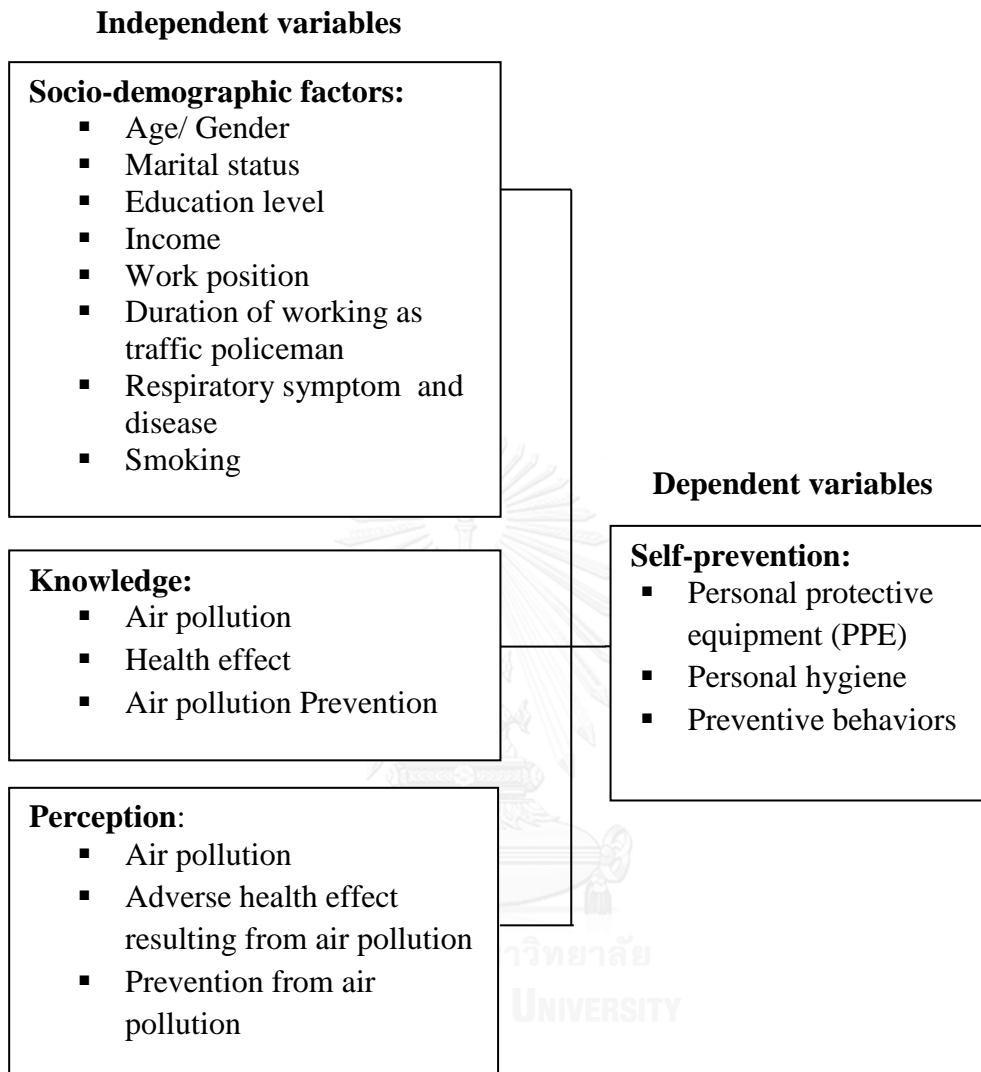
### 1.5.1 Independent variables

- **Socio-demographic factors:** Age, Gender, Education level, Income, Work position , Duration of working as traffic policeman and Respiratory symptom and disease
- **Knowledge:** Air pollution and the know how to prevent themselves from air pollution
- **Perception:** Risk of diseases caused by air pollution, the adverse health effect resulting from air pollution, benefit to prevention from air pollution and barriers to prevention from air pollution

### 1.5.2 Dependent variables

- **Self-Prevention:** Personal protective equipment (PPE), personal hygiene and preventive behavior

## 1.6 Conceptual framework



## 1.7 Operational Definitions

This research study focuses on assessment of knowledge and perception of adverse health risks associated with self-prevention from air pollution in traffic policemen in Bangkok, Thailand. Traffic policemen are capable to expose the air pollution while working on the road. In the independent variable in this research as following.

Socio-demographic factors are a population expressed statistically that defined by its sociological and demographic characteristics. This study focus on age, gender, marital status, education level, income, work position, duration of working as traffic policeman, respiratory symptom and disease and smoking which related to personal factor and environment around target group can have the enormous impact on the knowledge and perception toward self-prevention from air pollution in traffic policemen.

Knowledge means the basic elements that the policemen can learn from experience or training enable them to express their own self-prevention. Knowledge in this study mean air pollution in terms of particulate matter and the know how to prevent themselves from air pollution.

Perception in this research relate to individual opinion, attitude, thought and belief including risk of diseases caused by air pollution, the adverse health effect resulting from air pollution, benefit to prevention from air pollution and barriers to prevention from air pollution

The dependent variables in this research only concentrate on the self-prevention from air pollution. Self-prevention means individual target group express their behaviors in order to air pollution prevention which concentrates personal protective equipment, personal hygiene and preventive behaviors.

### 1.8 Study area

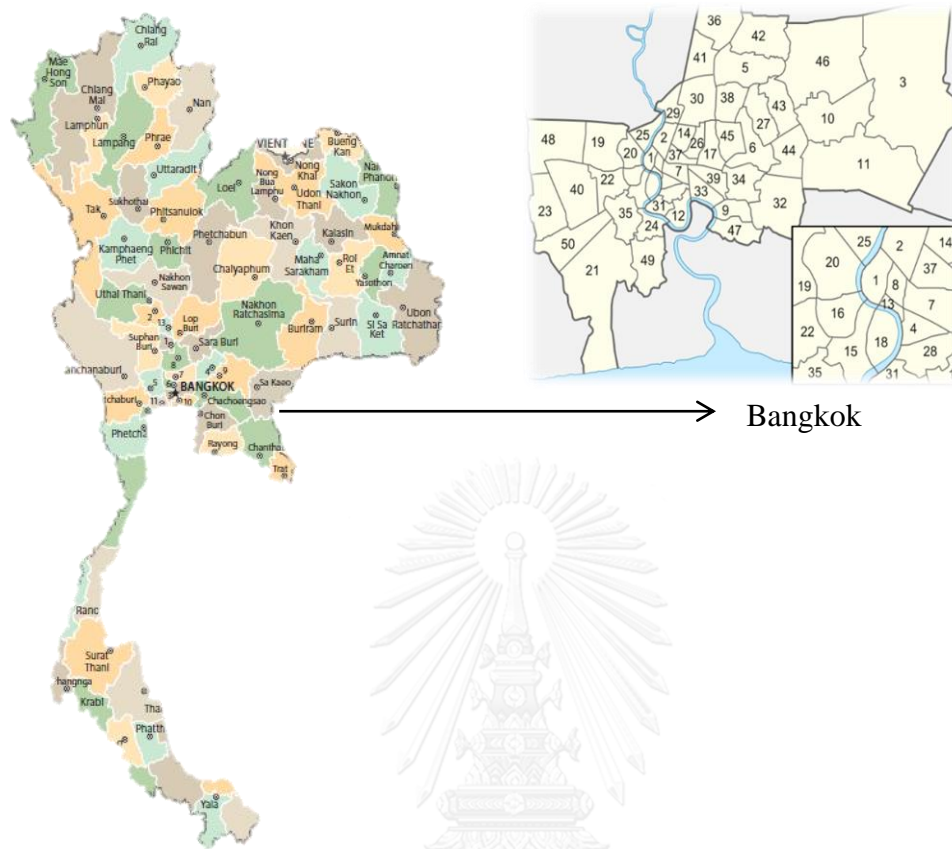


Figure 1 The study area location at Jatujak, PomPrapSattruPhai, DinDaengand Rat Burana district in Bangkok (Pollution control department, 2012-2013).

Table 1 The study area

NO.	District	Detail
8	PomPrapSattruPhai	The area that has PM <sub>10</sub> highly exceeded the standard in 2012.
24	Rat Burana	The area that has not exceeded the standard in 2012-2013
26	Din Daeng	The area that has PM <sub>2.5</sub> highly exceeded the standard in 2012-2013
30	Jatujak	The area that has PM <sub>10</sub> highly exceeded the standard in 2013

## CHAPTER 2

### LITERATURE REVIEW

In this chapter, the information of knowledge, perception and self-prevention and related factors has been reviewed to introduce the viewpoint about the status of using personal protective equipment in traffic policemen. A variety of previous studied concentrated on five main aspects as follows

1. Air pollution
2. Pollutant effect.
3. Socio-demographic factors
4. Knowledge, perception, and self-prevention
5. Respirator

#### 2.1 Air pollution

##### 2.1.1 Air

Air is the most valuable resource. It is necessary for our body to live because it provide human with oxygen. Adults usually breathe in about 10-20 cubic meters of air per day. Besides, children breathe nearly twice that amount because they are during growth. Air consists of 78.09 percent by volume of Nitrogen, 20.94 by volume of Oxygen and the remaining 0.97 percent of carbon dioxide, argon and other gases.

##### 2.1.2 Air pollution

Air pollution is the condition of the outdoor atmosphere impurities such as dust, gas, various aerosol, smell, smoke, etc. in terms of their quantity and period that is enough to cause harm to human, living organisms such as food crops, built environment or the natural. Air Pollution System contains 3 parts of the relationship between the

sources of air pollutants (Emission Sources), the atmosphere and receptor which have been affected from air pollution as Figure 2.

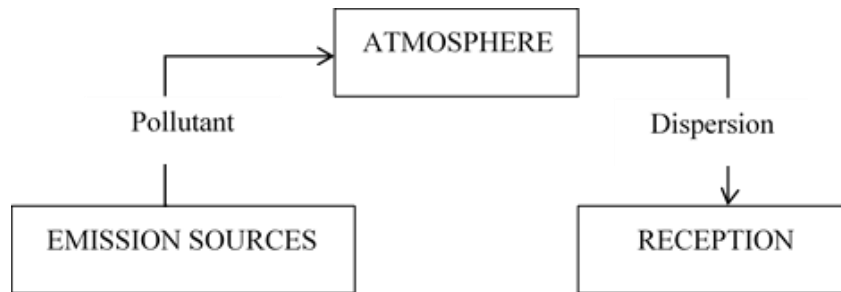


Figure 2 Air pollution System

### 2.1.3 Sources of air pollutants

Sources of air pollution are generally divided into two sources as follows.

1. Natural Sources. A source of air pollutants is caused by natural processes. There is not human involvement at all, such as volcanic eruptions, forest fires, seas and oceans as a source of salt spray.

2. Man-Made Sources. It is a source which caused by human actions in terms of mobile sources including cars, boats, motor, and stationary sources that represents the unmoving origin such as industrial air pollutants which result from the use of fuels and processes. Moreover, it also result from the area sources that cannot be exactly origin such as open burning, food grilling and wind-blown sand dust.

### 2.1.4 Types of air pollutants

Air pollutants can be divided into two categories.



## 1. Gases Pollutants

Gas pollutant is toxic in the form of gases and vapors. This pollutant is based on type of industrial production and vehicles such as Sulfur compound, CO, Nitrogen compounds, Organic compounds, Halogen compounds, H<sub>2</sub>S, steam and odors.

## 2. Particulate Matter

It is a solid or liquid particle under normal temperature and pressure. The particle size has different sizes depending on the size and source emission. The sizes have generally range from 0.01 to 1000 microns. However, the particle which is typically smaller than 10 micron can cause health problems and enter into the respiratory system especially particles smaller than 10 microns. The particles less than 10 microns is called particulate (Suspended particulate matter) PM<sub>10</sub>, generally known as dust. Particulate pollutants can be divided into the following types.

Table 2 Type of particulate Matter

No.	Type of particulate Matter	Description
1	Grit	Airborne solid particles have diameter range more than 500 microns.
2	Dust	Airborne solid particles ranging in diameter between 0.25-500 micron which may be organic or inorganic.
3	Mist	A particulate matter results from the condensation of vapor or gas or small droplets of water suspended in air. When there is high concentration of the aerosol until reduce the ability to see, it is called the fog.
4	Smoke	Solid particles of carbon combines with liquid particles from incomplete combustion, typically has a diameter less than 2.0 microns.

No.	Type of particulate Matter	Description
5	Fume	A solid is caused by condensation of steam from the chemical reaction which is less than 1 micron.
6	Aerosol	A particulate matter of solid or liquid suspended in the atmosphere that is less than 1.0 micron.
7	Smog	A particulate matter originates from the combination of smoke and fog
8	Ash	Airborne solid particles come from the combustion of fuel incomplete combustion which is smaller than 0.1 microns.

### 2.1.5 The traffic-related air pollution

Air pollution is one of the majority problems in the metropolis especially Bangkok. The traffic-related air pollution results from several issues as

1. Combustion of vehicle emission and the gasoline usage which cause gas such as sulfur dioxide, nitrogen dioxide, metal oxides, carbon monoxide and ash.
2. Dispersed dust and particles which came from the activities of construction and transport materials and goods.

As for the health effect, the air pollution has adverse enormous impact on health and sanitation whether the odor, nuisance and health effect on the respiratory system and cardiopulmonary system. Therefore, monitored pollution in the atmosphere is one of the most important missions governed by the air quality monitoring constantly. The air pollution is measured in terms of as particle size less than 10  $\mu\text{g}$  ( $\text{PM}_{10}$ ), particle size less than 2.5 $\mu\text{g}$  ( $\text{PM}_{2.5}$ ), lead, carbon dioxide, carbon monoxide, hydrocarbons, oxides of nitrogen and sulphur dioxide.

### **2.1.6 Ambient Air Quality Standards**

In Thailand, there are two ambient air quality standard as Thai ambient air quality standards and International Ambient Air Quality Standards (EPA). Thai ambient air quality standard was determined by National Environmental Board issued under the Enhancement and Conservation of National Environmental Quality to control the environmental quality. The details of these standards, it has set the standards for Carbon Monoxide, Nitrogen Oxides, Sulfur Dioxide, Ozone, Lead and dust, according to time and average value is defined as Table 2.

The Clean Air Act of The United States of America requires Environmental Protection Agency (EPA) establish National Ambient Air Quality Standards (NAAQS) for the six significant pollutants that can be harm to human and environment. National Ambient Air Quality Standards separate the standard into two categories as primary standards and secondary standards. Primary standards relate to public health protection in terms of the susceptibility populations such as elder and children group. Secondary standards associate with public welfare protection in terms of protection to animals, crops and vegetable's defect and against reduced visibility. Regarding air quality standards, it usually focuses on six pollutants to determine air quality level in the atmosphere that is appropriate to human life and other living organisms. The six criteria pollutants result from as following items.

- **Particulate Matter**

The particle pollutant is solid or liquid at normal temperature and pressure. Sometime, it may be in the form of small liquid drops or small solid from nature such as dust from dry soil, smoke from forest fires, or smoke and ash from industry.

- **Lead**

The majority of causes of lead emissions have been from fuels in vehicles and industrial process.

- Carbon monoxide

Carbon monoxide emission on the road is usually caused by the incomplete combustion of fuel in an engine that emission out from the exhaust.

- Ozone Gas ( $O_3$ )

Ozone is the gas that can be found near the ground and in the atmosphere above 20 km. above the surface. Ground-level ozone is naturally formed when oxides of nitrogen ( $NO_x$ ) and volatile organic compounds (VOCs) react with ultraviolet. The mainly source of  $NO_x$  and VOCs is mobile sources, including cars, trucks, buses, agricultural equipment and construction equipment. In fact, Inhalation of ozone can be a great feeling because ozone has the ability to kill pathogen. Therefore, it is important to protect it from ultraviolet that cannot penetrate the atmosphere down to Earth. However, it may be hazardous to health if there are more than safe levels. Presently, it found that the amount of ozone near the surface is higher than that safe level which is likely to affect the safety and health.

- Sulphur dioxide ( $SO_2$ )

Sulphur dioxide is a colorless gas with a sharp odor and mainly cause from industrial plants that use coal, gas or oil. Sulphur is a component of coal and gas in plant that may emission the sulphur dioxide such as the power plant and motor vehicles.

- Nitrogen dioxide ( $NO_2$ )

Nitrogen dioxide results from the burning of fuels such as gas, coal, oil, pollution. The importance cause of nitrogen dioxide occurrence is the vehicles and factories such as power plant, petroleum industry which release  $NO_2$ . In addition, nitrogen dioxide brings about acid rain that can also cause respiratory diseases in terms of exposure in large quantities.

Table 3 Ambient Air Quality Standards

Pollutants	Averaging period for Thai standard	Thai Standard	Primary/Secondary	Averaging period for EPA	EPA Standard
Carbon Monoxide	1-hour	30 ppm.	Primary	1-hour	35 ppm
	8-hour	9 ppm.	Primary	8-hour	9 ppm
Lead	1-Month	1.5 $\mu\text{g}/\text{m}^3$	Primary/Secondary	Rolling 3 month	0.15 $\mu\text{g}/\text{m}^3$
Nitrogen Dioxide	1-hour	0.17 ppm.	primary	1-hour	0.1 ppm
	Annual	0.03 ppm.	Primary/Secondary	Annual	0.005 ppm
Ozone	1-hour	0.10 ppm.			
	8-hour	0.07 ppm.	Primary/Secondary	8-hour	0.075 ppm
Particulate Matter					
▪ PM <sub>2.5</sub>	24-hour	0.05 $\text{mg}/\text{m}^3$	primary	Annual	0.012 $\text{mg}/\text{m}^3$
	Annual	0.025 $\text{mg}/\text{m}^3$	secondary	Annual	0.015 $\text{mg}/\text{m}^3$
▪ PM <sub>10</sub>	24-hour	0.12 $\text{mg}/\text{m}^3$	Primary/Secondary	24-hour	0.035 $\text{mg}/\text{m}^3$
	Annual	0.05 $\text{mg}/\text{m}^3$	Primary/Secondary	24-hour	0.15 $\text{mg}/\text{m}^3$
Sulfur Dioxide	1-hour	0.3 ppm.	primary	1-hour	0.007 ppm
	24-hour	0.12 ppm.	secondary	3-hour	0.5 ppm
	Annual	0.04 ppm.	primary	Annual	0.012 $\text{mg}/\text{m}^3$

However, this research only concerns about particulate matter in Bangkok because it is the most health hazards. It is able to causes breathing difficulties and bronchitis. It also causes visibility problems due to absorption and causes the distribution of light shines upon the earth that makes weather will be overcast light less than normal.

Bangkok has a large amount of particulate matter from five significant sources including road, vehicle, construction, boiler and the power plant. In 1996, Pollution Control Department said that the particulate matter from the road has about 20,378 tons which is 33.2 percent from all sources. In the same year, there are 14,043 tons/year (22.8%) from the vehicle usage resulting from the combustion of the engine. Consequently, the particulate matter problem usually came from the road and vehicle usage.

Bangkok also encounters with dust problems exceeding the air quality standard throughout the last 10 years as Figure 3. In addition, the transportations sector in Bangkok is a majority source of pollutions which result from several significant reasons. In 2015, there are more 7.92 percent vehicles registered than 2013. It can be assume that in 2015 has more traffic jams on the road and use increasingly the amount of gasoline which can cause air quality problems.

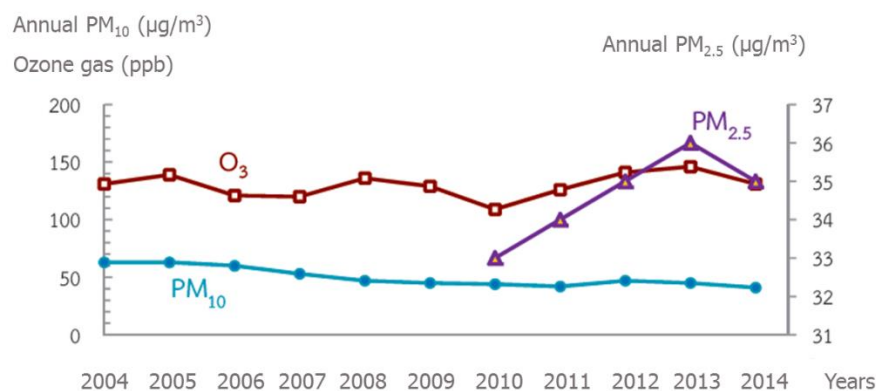


Figure 3 Annual average of PM<sub>10</sub> and PM<sub>2.5</sub> and Maximum 1-hour average of Ozone each measuring station in Bangkok and its Vicinity in 2004 – 2014.

(Pollution Control Department, 2014)

As for PM<sub>10</sub> problem, Bangkok have many areas that have high annual mean values and maximum daily average such as the Santiphap road of PomPrapSattruPhai District was the 4th ranked of the country in 2012 and the Phahonyothin Road of Jatujak District was the 2nd ranked of the country in 2013. Furthermore, Bangkok also has the PM<sub>2.5</sub> problem because Din Daeng Road is the first PM<sub>2.5</sub> problem area in Thailand in 2013 - 2015.

The rating of particulate matter problem areas are considered by following the below criterions.

1. Maximum daily average that shows the highest 24-hour average measurement in the year associated with acute health effects.
2. The mode that represents the volume of the most common dust pollutions.
3. The annual mean values that relates with the health impact from the accumulated exposure pollution all the year.
4. Number of days in terms of a 24-hour value exceeding air quality standards (Actual Exceedances) that demonstrated health impacts from exposure the pollutants for long time.

Table 4 The Ranking critical area of Particulate Matter problem that exceed the air quality standard in Bangkok  
(Pollution control department, 2012-2015)

Pollutants	Year	Area	Annual mean values (mg/ m <sup>3</sup> )	Maximum daily average (mg/ m <sup>3</sup> )	Actual Exceedances (Times)
PM <sub>10</sub>	2012	Santiphap Road, PomPrapSattruPhai	78	211	24
		The Rama 6 Road	78	149	5
		Phahonyothin Road, Jatujak	72	161	8

Pollutants	Year	Area	Annual mean values (mg/ m <sup>3</sup> )	Maximum daily average (mg/ m <sup>3</sup> )	Actual Exceedances (Times)
		Hirunruchi Thonburi Road	62	130	1
		The Rama 4 Road	57	127	1
		Din Daeng Road	57	114	-
	2013	Phahonyothin Road, Jatujak	82	303	39
		The Rama 6 Road	57	152	3
		Phahonyothin Road, Jatujak	63	141	3
	2014	Hirunruchi Thonburi Road	52	182	15
		The Rama 4 Road	74	202	16
		Din Daeng Road	55	149	5
PM <sub>2.5</sub>	2012	Din Daeng Road	34	86	46
	2013	Din Daeng Road	35	112	40
	2014	Din Daeng Road	36	87	43
	2015	Din Daeng Road	36	101	60

## 2.2 Pollutant Effects

As for the air pollution brings about many critical problem as following

1. Human health effect. Air pollution is one of the cause that can result from several respiratory disease, heart conditions, cardiovascular diseases, hypertension as well as others threats to the human body. In addition, air pollution is able to also rapid exacerbations of the condition that may result in death among patients.



2. Plants and Animals effect. Harmful gases make great damage to plants and crops. Plants and crops have effect on grow slowly, withered leaves, pale kink and animals have effect on weary body, wat less and growth slowly.
3. Atmospheric corrosion effect. Atmospheric corrosion is the degradation of materials and structures exposed to air pollution. Any pollutants which lower the pH of rainwater will expedite corrosion.
4. Visibility effect. Reduction of visibility is likely to the most apparent symptom of air pollution. The particle pollutant diffusion impairs mush more readily which also lead to global warming.

Consequently, Air pollution have to be measure in order to know its level that able to harm for living organism. Thailand, national air quality, it was evaluated from 62 the automatic monitoring station in 29 province by using the Air Quality Index (AQI) to assess air quality. The Air Quality Index (AQI) calculate 5 pollutants as average 24 hour particulate matter less than 10  $\mu\text{g}$  ( $\text{PM}_{10}$ ), Average 8 hour carbon monoxide (CO), average 1 hour Ozone ( $\text{O}_3$ ), average 24 hour Sulphur dioxide ( $\text{SO}_2$ ) and average 1 hour Nitrogen dioxide ( $\text{NO}_2$ ). AQI demonstrates how polluted or clean the air is and what is associated health effect should be of concern. AQI is measured from the level of pollutants that have the highest level of one day. It will representative the air quality index of that day. In Thailand, air quality index is divided into 5 levels as level 0 to > 300 which level have the color's level to show the difference of health concern When air quality index are above 100, the air quality is considered to be affecting on human health or unhealthy.

Table 5 Health Implications of each the Air Quality Index (AQI) level.

(Pollution control department, 2012-2015)

AQI Values	Levels of Health Concern	Colors	Health Implications
0-50	Good	Blue	No health meanings
51-100	Moderate	Green	No health meanings
101-200	Unhealthy	Yellow	Adults and children with respiratory disease ought to consider reducing physical activity, especially outdoors.
201-300	Very Unhealthy	Orange	Adults and children with respiratory disease ought to consider avoid physical activity. General People reducing physical activity, especially outdoors. General People ought to consider avoid physical activity. People has respiratory disease should always stay indoors.
> 300	Hazardous	Red	General People ought to consider avoid physical activity. People has respiratory disease should always stay indoors.

From the evaluation of the automatic monitoring station, it showed there are several critical area with concentration of air pollution exceeding standard that evaluation by the Pollution Control Department in every year. The key pollutants were particulate matter, ozone and benzene. Especially in Map Ta Phut subdistrict Rayong province, it still has the problem if Volatile Organic Compound (VOCs). In 2014, there was the number of day where the air quality index (AQI) exceeded 100 values from the automatic monitoring stations as Figure 4

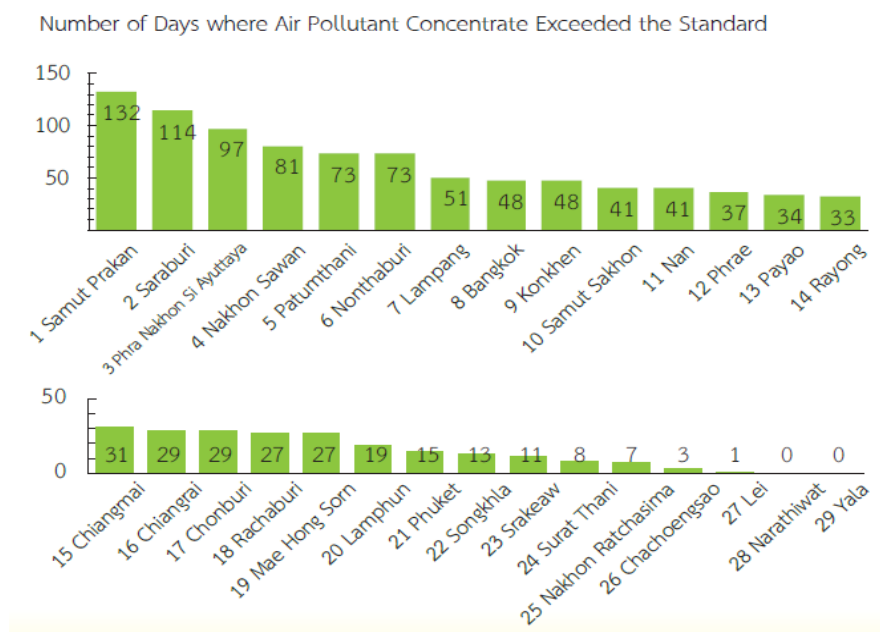


Figure 4 Ranking Provinces in terms of level of air pollution in 2014 (Pollution Control Department, 2014)

Additionally, national air pollution has average concentration of each pollutant as shown in Figure 5

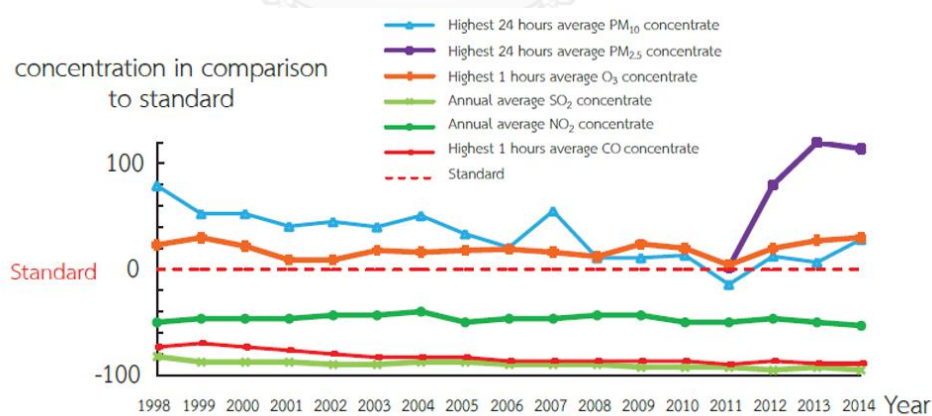


Figure 5 National Average Concentration of PM<sub>10</sub>, PM<sub>2.5</sub>, CO, O<sub>3</sub>, SO<sub>2</sub> and NO<sub>2</sub> that shown as Percentage of the standard (0% = standard) in 1998 – 2014. (Pollution Control Department, 2014)

### 2.2.1 Respiratory tract

The respiratory tract is divided into two sections as an upper and a lower part. The upper respiratory tract consists of the nose, nasal cavity, throat and trachea (windpipe). An upper part, there is hairy nose and moisture to filter the large particulate matter. The lower respiratory tract is comprised of trachea, bronchi, and lungs that contain bronchioles and alveoli. When you breathe through lower airway, the speed of the air flow in the lungs will be decrease affecting particle deposition mechanisms in airways.

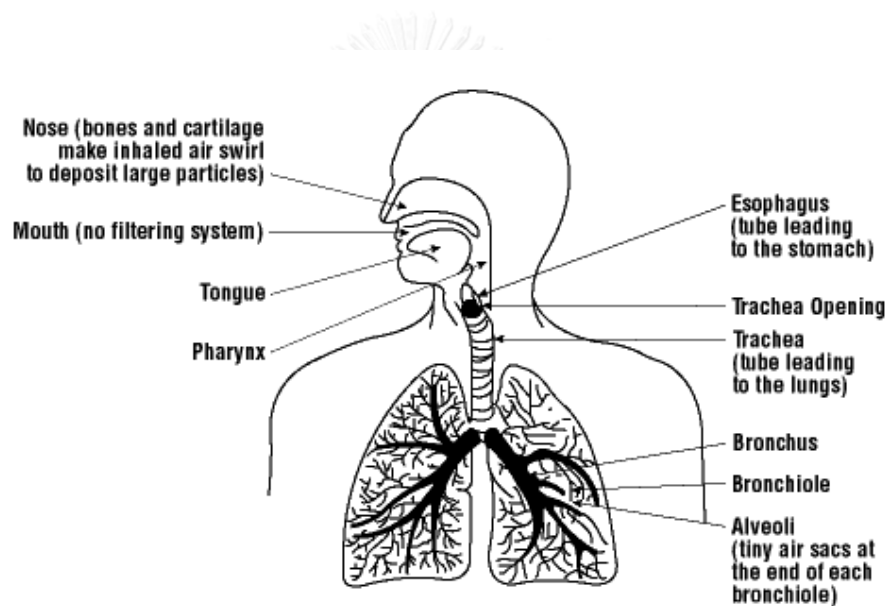


Figure 6 Anatomy of Lung

### 2.2.2 The deposition mechanism

The deposition mechanism depends on the shape, size, and density of the particulate matter (Aerodynamic size). The particulate matters are deposited by one of five different ways that is impaction interception, sedimentation, diffusion, and electrostatic precipitation as Figure 6.

- Impaction

The impaction is typically occurring with the particulate matters greater than 10  $\mu\text{m}$  which is too large to change directions. It depends on the mass of particle and the air velocity. It always deposit in the nose and throat. However, this deposition can't penetrate to lower part of the respiratory tract.

- Interception

Particulate matters deposition in the respiratory tract can occur when the edge of the particulate matters particle touches the surface. This deposition is the most significant for elongated particles (e.g., fibers) as length determines where the particulate matters will be intercepted. In addition, the method is usually seen in the bronchial tree.

- Sedimentation

This method represents deposition caused by gravitational forces. The opportunity of this deposition increase depends on the particle size, particle density, and length of time (residence time) spent in the respiratory tract. Sedimentation is considerable for particulate matters with diameter greater than 0.5  $\mu\text{m}$  that most common in bronchi and bronchioles where air velocity is rather low.

- Diffusion

Diffusion is the random motion of particulate matters that is known as Brownian motion. It happens to particles are smaller than 0.5  $\mu\text{m}$  that most common in bronchioles and alveoli. The smaller the particulate matters size, the more active the movement is.

- Electrostatic Precipitation

Inhaled particulate matters are able to electrically charge. It based on their shape, size, and density.

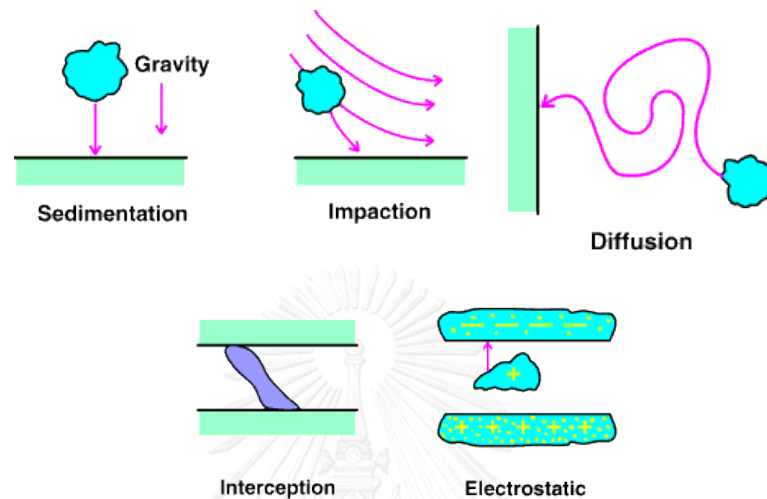


Figure 7 The deposition mechanisms in lung airway.

### 2.2.3 Health effect

Several air pollutants have known harmful effects on the environment and human health. Mostly areas of around the world, these pollutants are principally the consequence of combustion from space heating, motor vehicle traffic or power generation. In general when you are young or in a good state of health, moderate air pollution levels are not probable to have any adverse short term effects. Nevertheless, long term air pollution exposure is capable to bring about more serious symptoms and diseases affecting human health. This principally affects the inflammatory and respiratory systems, but is also capable to bring about to more serious conditions such as cancer and heart disease. People with heart or lung disease s may be more susceptible to the air pollution effects.

### 2.2.3.1 Overall Health Effects

Effect of highly air pollution levels can cause acute health problems including

- Aggravated cardiovascular and respiratory symptoms and diseases
- Added stress to lungs and heart that must work harder in order to supply the oxygen.
- Cells damage in the respiratory system

Long-term air pollution exposure can have permanent health effects including

- Expedited aging of the lungs
- Decreased lung capacity
- Loss of lung function
- Development of diseases such as asthma, emphysema, bronchitis, and possibly cancer
- Reduction of life span

### 2.2.3.2 Health Effects from critical six pollutants

Moreover, health effects from critical six pollutants that mentioned in air quality standards, as following items

- Particulate Matter

Particulate Matter is a complex compound which contains water, smoke, sulfates, nitrates, metals, dust, soot and tire rubber. It can be directly emitted form reactions of gases such as nitrogen oxides, as in smoke from a fire. The size of particles directly relate to their potential for causing health problems. The particle size less than 2.5 leads to the greatest problems because they can assess deep into lungs and even assess into your bloodstream.

Some studies mention about long-term particle pollution especially particles size less than 10 and 2.5 microgram with significant health problems as following items

- Increased respiratory symptoms, such as coughing, difficulty breathing, or irritation of the airways
- Reduction of lung function
- Worsen asthma
- Increased of chronic respiratory disease in children
- Increased of chronic obstructive lung disease or chronic bronchitis
- Unusual heartbeat

Some studies also mention about Short-term exposure to especially particles size less than 10 and 2.5 microgram leads to acute health problems as coughing, chest tightness, shortness of breath, Irritation of the throat, nose and eyes and cause arrhythmias and heart attacks.

- Lead

Human is able to be exposed to lead from air pollution directly, through inhalation. When expose it, lead will be in the blood and accumulates in the bones which depend on the level of exposure. In addition, lead also can adversely affect the nervous system, immune system, kidney function, the cardiovascular system, and reproductive system. Last, lead usually effects most faced with populations are cardiovascular effects in adults and neurological effects in children.

- Carbon monoxide

When you inhale carbon monoxide, it will take the place of oxygen in order to combine with hemoglobin that becomes a Carboxyhaemoglobin. Carboxyhaemoglobin results in oxygen in the blood decreasingly that cause the people who inhale carbon monoxide will headache, fatigue, vomiting, blurred vision and severe symptoms may be up to a coma.



- Ozone Gas ( $O_3$ )

When the human obtain ozone regularly, it is harmful to the lungs especially in childhood who still in the period of lung development cause damage to the reproductive system and heredity. Moreover, it also is harmful to the fetus and cause lung diseases such as asthma, bronchitis to the immune system in respiratory decline, to reduce the amount of grip the breath and to increase the amount of fluid in the lungs and shortness of breath.

- Sulphur dioxide ( $SO_2$ )

Sulphur dioxide is able to affect the respiratory system and lung function, and eyes irritation. The respiratory tract's inflammation can causes coughing, asthma, mucus secretion and chronic bronchitis as well as result in people more inclined to infections of the respiratory tract. People admit hospital with cardiac disease and mortality increase on days that higher  $SO_2$  levels. When  $SO_2$  mixtures with water, it lead to sulfuric acid which is the primary component of acid rain. Acid rain is capable to cause of deforestation.

- Nitrogen dioxide ( $NO_2$ )

In short-term concentrations in terms of Nitrogen dioxide ( $NO_2$ ) exceeding  $200 \mu\text{g}/\text{m}^3$ , it is formed a toxic gas causing inflammation of the airways. Some epidemiological studies have referred that asthmatic children will have symptoms of bronchitis increasing with  $NO_2$  long-term exposure. Decreased of lung function growth is also rerated to  $NO_2$  at currently measured concentrations in North America and Europe.

Regarding only focusing on particulate matter, it has adverse enormous impacts that contribute to health, the environment and an economy issue.

Particulate Matter is a complex mixture of extremely small particles and liquid droplets which is a large particle size results in the air pollution or nuisance. The particle size less than 10 microns can be exposed into respiratory tract and adhere parts of the respiratory system which can cause irritation and damage the lung tissue. If the respiratory track exposes in large doses or over a long time to accumulate, the lung will be scar tissue to form or become to fascia which lead to performance of lung function degrade. In addition, it also brings about the symptoms of asthma, bronchitis, emphysema and respiratory diseases due to chance of infection increases. As for The particle size less than 2.5 microns, it can enter into alveoli and absorbed into the blood system that leads human have artery stenosis and heart attack as well as make PAHs (Polycyclic Aromatic Hydrocarbons) are carcinogen.

There is the studies of the pollution control department (2014) found that if the dust levels rise  $30 \mu\text{g} / \text{m}^3$  would be the following .

1. Higher natural mortality rate by 3-5% .
2. Respiratory disease mortality increased 7-20 % .
3. The rate of respiratory disease's hospitalization increased 5.5 % .
4. Elderly groups have the rate of respiratory disease's hospitalization rose 17.6 % .
5. Adults who do not smoke and work where there is no air conditioning. They have respiratory disease rose 20-26 % .

### **2.3 Socio-demographic factors**

The Socio-demographic factors are a population expressed statistically that defined by its sociological and demographic characteristics. Socio-demographic factors are significant contribution to the health of a population and health outcomes such as age, income and education level.

As for ages, everyone will develop the knowledge or ability increasingly with age. Age is very important to the thought and faith of individuals because it have an

enormous impact to the behavior. Moreover, ages are the one of the variables of Becker's health beliefs that is ages have positive relationship with health prevention. Besides, people can develop the knowledge and skills depend on the level of education. The more have higher education, the more have the ability to evaluate and logical thinking.

Therefore, socio-demographic factors have impact on the knowledge, perception, and self-prevention of traffic policemen in Bangkok.

## **2.4 Knowledge, perception, and self-prevention**

### **2.4.1 Knowledge**

Bloom (1971) is divided knowledge into 4 dimensions as factual knowledge, conceptual knowledge, procedural knowledge, and Meta-Cognitive Knowledge. Factual information is the basic elements from experience or training that enable them to solve problems. Conceptual knowledge is about to association among the basic elements with larger structures that make them function together. Procedural knowledge tells how to do something and criteria for using methods, skills, techniques and algorithms. Meta-cognitive Knowledge is the knowledge of cognition and awareness. Regarding this study, knowledge is referred as factual knowledge that makes target groups express their own self-prevention

### **2.4.2 Perception**

Perception demonstrates their inclined severe disease in advance. The policemen can deeply understand the adverse health effect on their lifestyle, recognize avoid its diagnostic and avoid disease by expressing preventive behavior. Perception can be categorized to four types.

- Perceived Susceptibility

Perceived susceptibility is called perceived vulnerability that refers to one's perception of the risk or the opportunities of contracting a health condition or disease (Witte, 1992). It also is able to evaluate of illness susceptibility (Becker, 1988). The perception relates to belief of human who is directly responsible for compliance with health advice in terms of health prevention and health disease. Human's belief level is not equal in each person. So, each person will avoid illness and disease by preventing and treating different.

- Perceived Severity

It is an assessment of the disease perceived severity, the impact of a health problem or the disease, which cause disability or death. For instance, the people who have health problem as serious tend to engage in their behaviors to prevent severity from occurring.

- Perceived Benefits

Perceived benefits refer to the efficacy of a health promotion behavior to reduce risk of disease. An individual's belief has influence on the action of decrease susceptibility to a health problem based on a comparison of the advantages and disadvantages of behavior by selecting the action brings about the effective result.

- Perceived Barriers

An assessment of the behaviors associated with the health in a negative way such as the cost or consequences arising from the performance of certain activities. Thus, perceived barriers are significant factor to prevention behavior and the behavior of cooperation in the treatment of disease.

### 2.4.3 Self-prevention

Self-prevention can be separated into two categories (Prapapen, 1993) as preventive health behavior and illness behavior. Preventive behavior is about to the individual's action that helps to promote health and prevent occur the disease. Illness behavior refers to when individual know that they got illness, how behaviors they have. The behavior differently according to several factors such as the knowledge about the cause of disease, symptom, and treatment

Self-prevention in this study is about to the action of individual to prevent disease that focusing on 3 remarkable factors as

- Personal protective equipment (PPE) that the policemen have to wear when they work in order to barrier the pollutants into the respiratory system.
- Personal hygiene is the first step to maintain cleanliness, good groom of the body and good health. The majority of disease and sickness is capable to controlled and prevented through appropriate personal hygiene. The policeman need to have the good personal hygiene such as they should take a bath every day, wash hands with soap before eating and preparing food and change a cloth after work.
- Preventive behavior is the individual activities or actions bring about individual health condition.

Consequently, this research applies the method of KAP surveys to assess the knowledge, perception, and self-prevention of the community. It provides researcher with an educational diagnosis of the community. KAP Study is able to tell us to know about what people know about certain things, how they feel and also how they behave.

#### **2.4.4 KAP survey**

Knowledge, attitude, and practices (KAP) survey is a study of a definite population to collect information on related topic. Regarding KAP surveys, the data are collected by an interviewer using a structured, standardized questionnaire. These data then are able to be analyzed quantitatively or qualitatively depending on the objectives as well as design of the study. In addition, KAP survey is capable of identify knowledge gaps, culture beliefs, or behavioral characteristics that may facilitate the understanding and action. KAP survey also can be used to orient resource allocation and project design, as well as to establish a baseline for comparison with subsequent and post intervention KAP surveys. KAP survey needs an internal human resource and an external expert with competent skill. It may be essential to hire individuals or agencies to induce tasks such as defining the number of people to be surveyed the questionnaires, do the survey interviews in the local languages, enter information from the survey to computer, or analyze the collected data. When a consultant's scope of research is expected to be most useful at a later phase, such as data analysis, it is very important to involve the consultant from the initial design questionnaire and survey. This is beneficial to ensure that consultant are aware of the survey's objectives, design and implementation plan, and can contribute in valuable methods when their competences are required (WHO, 2008).

#### **2.4.5 The steps of KAP survey**

In KAP survey (WHO, 2008), there are six step as follows

- Step 1: Define the survey objectives.

In initial step, we have to contain information about how to get access the existing data, determine the objectives of the survey and main areas of enquiry and identify the survey population and sampling plan.

- Step 2: Develop the survey protocol

In this step, it drafts components to include in the survey protocol and recommendations to help identify the key research questions. Moreover, the survey requires ethic review part is criticized in this step, and creating a work-plan and budget.

- Step 3: Design the survey questionnaire

To proposes significant steps for developing, pre-testing and complete the questionnaires, and for making a data analysis plan.

- Step 4: Implement the KAP survey

In the step 4, it includes considerations for choosing survey data, recruiting and training survey interviewers, and deal with survey implementation.

- Step 5: Analyze the data

To composed of entering and checking the quality of the survey data, and implementing the data analysis plan which was created in step 3.

- Step 6: Use the data

Emphasize the ideas on how to translate the survey findings into action, elements to including the study report, and how to disseminate the survey findings.

## 2.5 Respirator

A respirator is equipment that protects people from inhaling dangerous substances such as chemicals and infectious particles. Respiratory protective equipment is among the most significant parts of protective equipment for working in hazardous environments. Choosing the right respiratory protective equipment requires an evaluation of all the workplace operations, processes or environments that can make

are respiratory hazard. The individuality of the hazard and its airborne concentrations has to be determined before choosing respiratory protective equipment. This evaluation should be done by experienced safety personnel or industrial hygienist (OHSA, 2002). There are several different types of respirators such as

- Tight-fitting or half masks which cover the mouth and nose and full face pieces that cover the face from the hairline to below the chin.
- Loose-fitting such as hoods or helmets that cover the head totally.
- Air-purifying which removes contaminant from the air pollution. They filter or clean chemical gases out of the air as you breathe. This respirator includes a face piece or mask, and a cartridge or canister. Straps secure the face piece to the head. The cartridge may also have a filter to remove particles. Gas masks are effective only if used with the correct cartridge or filter (these terms are often used interchangeably) for a particular biological or chemical substance. Selecting the proper filter can be a complicated process. There are cartridges available that protect against more than one hazard, but there is no “all-in-one” cartridge that protects against all substances. It is important to know what hazards you will face in order to be certain you are choosing the right filters/cartridges.
- Powered Air-Purifying Respirator (PAPR) uses a fan to draw air through the filter to the user. They are easier to breathe through; however, they need a fully charged battery to work properly. They use the same type of filters/cartridges as other air-purifying respirators. It is important to know what the hazard is, and how much of it is in the air, in order to select the proper filters/cartridges.
- Self-Contained Breathing Apparatus (SCBA) is the respirator commonly used by firefighters. These use their own air tank to supply clean air, so you don't need to worry about filters. They also protect against higher concentrations of dangerous chemicals. However, they are very heavy (30 pounds or more), and require very special training on how to use and to maintain them. Also, the air tanks typically last an hour



or less depending upon their rating and your breathing rate (how hard you are breathing).

### 2.5.1 Usage condition of respirators

#### 1. Single use

This single use type of mask cannot change the filter and can leave depending on operating conditions. Most of single use type is a ¼ air filters of face masks.

#### 2. Replaceable use

It is mask filter which will filter characteristics based on the nature of the contamination of pollutants in the atmosphere.

### 2.5.2 The standards of particulate filters

2.5.2.1 United States NIOSH standards that define following types the particulate filters

Table 6 Filter penetration limit of airborne particles.

Filter penetration limit (%)	airborne particles		
	Rating Not oil resistant	Rating Oil Resistant	Rating Oil Proof
95	N95	R95	P95
99	N99	R99	P99
99.97	N100	R100	P100

2.5.2.2 European standards EN 143 that define the following categories of particulate filters that is able to be attached to a face mask

Table 7 Meaning of % Filter penetration limit

Class	Filter penetration limit (%)	Meaning
P1	80	The particles formed by mechanical processes such as dust
P2	94	The particles caused by mechanical and thermal processes, including dust, spray, or fumes
P3	99.95	With all kinds of particles that are very toxic

### 2.5.3 The criteria of respirators selection

1. To know the type of pollutants that might get into the body. For example, stone mill work, spraying pesticides even medical personnel who has the risk of infection.
2. To know the concentration of the pollutants.
3. To know the toxicity of the substance.
4. Using of filtering technologies such as fiber filters dust, fume-absorbent filters gas and vapor.
5. Look for quality certification standards which use the international standards because TIS. (Thailand) certificate has only a helmet and safety shoes standards.
6. To study manual and features listed before use.

Thai Health Promotion Foundation (2015) stated the concept of using respirator to prevent the air pollution summarized as follows

1. Must not be used in the absence of oxygen.
2. To ensure that respirator is in good condition and no damage, especially the filter condition.
3. Fit to face.
4. Check the valve that has function to passage of air.

5. If you feel uncomfortable when you use the respirator, you must change the filter immediately.

The study concentrated on the particulate matter respirators which are able to protect against particles, fumes, mists and are intended only for low hazard levels. The commonly known as protective mask in terms of dust face mask are type of particulate respirator. Protective Mask, there are several kinds. The properly use of mask to protect the respiratory tract infections and also protect against certain types of pollutants can be divided into categories. Protective mask can divided by European standard according the outside features as

1. Full Face Mask
2. Half face Mask. When worn, it covers the nose and mouth and chin.
3. Quarter Face Mask. When worn, it covers only the nose and mouth.

As for in this study only focus on the dust face mask in terms of quarter face mask. Dust mask is produced from pulp, paper and may or may not have fabric filters. For employed individuals in the midst of dust in factories like cement, concrete, stone or industrial electronics to be careful about is the dust or for women to wear while cleaning the house. The pollutants which is larger than pore are filtered by the type N, R, P. Some filters have no channel for breathing exhalation valve. The advantages of this dust face mask is disposable which is no need for cleaning supplies and is also lightweight and easy to wear. The disadvantage of this type of filter is often difficulty breathing in due to small pore size block the air circulation. Thus, it cannot to wear it for a long time. This respiratory will filter pollutants differently such as N-95 can filter 95% of the substances or pollutants with a particle size of 300 nanometers or larger than 0.3 microns.

## CHAPTER 3

### METHODOLOGY

#### 3.1 Research Design

This study was a cross sectional study in terms of knowledge, perception of adverse health effect associated with self-prevention from air pollution in Bangkok traffic policeman (Jatujak, PomPrapSattruPhai, Din Daeng and Rat Burana District)

#### 3.2 Study population and Sample size calculation

The study population of this study was mainly people who traffic policemen in Jatujak, PomPrapSattruPhai, Din Daeng and Rat Buranadistrict in Bangkok and focused on using personal protective equipment (PPE). Jatujak and PomPrapSattruPhai District referred to the area that had highly exceeded the standard in term of PM<sub>10</sub>. Din Daeng District referred to the area that had highly exceed the standard in term of PM<sub>2.5</sub>. Lastly, Rat Burana District referred to the area that had not exceeded the standard.

The sample size assessment was calculated by using this formula: (Yamane, Taro, 1967:886)

$$n = \frac{N}{1 + N(e)^2}$$

Where,        n = The estimate sample sizePM  
                   N = The population size  
                   e = The level of precision require, the value of 5% was selected

From the police station in Jatujak, PomPrapSattruPhai, Din Daeng and Rat Burana district, there were 406 traffic policemen who had the responsibility to work at

outside of police station or the various traffic areas. Then, we were able to calculate sample size when  $N=406$  and  $e = 0.05$  as

$$n = \frac{406}{1 + 406 (0.05)^2}$$

$$n = 202$$

With estimate 10 % of 202 (or 21) if any participants did not participate. Consequently, approximately 223 participants were required in this study.

As the result, Jatujak, PomPrapSattruPhai, Din Daeng and Rat Burana district, there were sample size of traffic policemen in each station as follow.

Table 8 The name of police station in each research district

No.	Research district	The name of police station	Amount (Traffic policemen)	Sample size
1	Jatujak	Phahonyothin	39	21
		PrachaChuen	29	16
		Vibhavadi	41	23
2	PomPrapSattru Phai	Phlapphla Chai 1	36	20
		Phlapphla Chai 2	35	19
		Nangloeng	41	23
3	Din Daeng	Din Daeng	26	14
		Sutthisan	38	21
		HuaiKhwang	42	23
4	Rat Burana	Rat Burana	45	25
		Bukkal	34	19
Total			406	223

### 3.3 Inclusion and Exclusion Criteria

In this research, there were 223 traffic policemen in interesting areas to assess the factors that associated with the traffic policeman.

▪ Inclusion Criteria:

1. The traffic policemen who had the responsibility to work at outside of police station or the various traffic areas.
2. The traffic policemen who were 20 - 60 year olds.

▪ Exclusion Criteria:

1. The traffic policemen who were responsible for sedentary work in offices.
2. The traffic policemen who never worked on the traffic duty that could be assumed they weren't exposed to traffic-related pollution.
3. The traffic policemen who had a duration of working as policeman less than 1 year.

### 3.4 Methodology

The objective of this study was the traffic policemen who worked along the road to handle the transportation system. They were able to expose the air pollution that had adverse enormous impact if they did not use the personal protective equipment (PPE). Therefore, this research focused on knowledge and perception of adverse health effects associated with self-prevention from air pollution in traffic policemen, Bangkok Thailand.

Sampling collection process, the ethic was approved the consideration part and passed the permission to be collected the data. Moreover, the questionnaires were pilot tested from 30 Bangkean traffic policemen for validation and collected real data from policemen who worked at Jatujak, PomPrapSattruPhai, Din Daeng and Rat Burana

district in Bangkok. Lastly, the data were analyzed by using SPSS 16.0 version to interpret data for final report.

### 3.5 Research Instrument

A data collection instrument regarding the standardize questionnaires in this study was used by self- administrated questionnaire at the police station. The questionnaire was modified based on How to conduct KAP survey (WHO, 2008), OSHA Respirator Medical Evaluation Questionnaire (Mandatory) (OHSA, 2012) and a descriptive study to assess the knowledge, attitude and practice among traffic policemen to protect against health hazards in Bangalore City (Shashidhara, 2005). The questionnaire comprises four parts

- **Part 1:** Socio demographics

There were 15 questions in this part. The part was focused on general information such as age, gender, educational levels, income, duration of working on the road, type of working area and frequency working.

- **Part 2:** The knowledge relates to air pollution of traffic policemen in Bangkok

There were 15 questions in this part. The questions were asked for the air pollution and the know how to prevent themselves from air pollution.

A correct answer was score on 1 and the wrong answer was given 0 score. The total scores were 15 that could be classified into 3 groups as follow. Bloom's cut off point-60%-80% (Bloom, 1975)

Table 9 Knowledge's level

Level	Percentage	Scores
High	81 -100	12 -15
Moderate	60 – 80	9 - 12
Low	Less than 59%	0 - 8

- **Part 3:** The perception of adverse health effect relates to air pollution of traffic policemen in Bangkok.

In this part, there were 15 questions that included the risk of diseases caused by air pollution, the adverse health effect resulted from air pollution, benefit to prevention from air pollution, and barriers to prevention from air pollution. This part was also measured by using Likert's scale. The Likert's scale had 5 meanings which included both positive and negative as follow. It was developed by Thanusin (2009) who modified this part from the questionnaire in order to assess the related to attitude regarding perceived severity of *C.botulinum* and consumption behavior.

Table 10 The meaning of perception scores

Positive Meaning	Scores	Negative Meaning	Scores
Strongly agree	5	Strongly agree	1
Agree	4	Agree	2
Neutral	3	Neutral	3
Disagree	2	Disagree	4
Strongly disagree	1	Strongly disagree	5

In addition, the scores varied from 1 - 75 and were categorized into 3 levels as follow.

Good Perception	60 - 75 Scores (81%-100%)
Moderate Perception	45 - 59 Scores (60%-80%)
Poor Perception	1 - 44 Scores (Less than 60%)



- **Part 4:** The self-prevention from air pollution of traffic policemen in Bangkok.

In this part, there were 20 questions asked about how often they use personal protective equipment, personal hygiene, and preventive behaviors. It included both positive and negative point of views as four rating scales. It was developed by Chapha (2007) who modified this part from the questionnaire in order to assess the preventing behavior related to osteoporosis among premenopausal women (Monrudee, 2009).

Table 11 The meaning of practice scores

Positive Meaning	Scores	Negative Meaning	Scores
Always	5	Always	1
Usually	4	Usually	2
Sometime	3	Sometime	3
Rarely	2	Rarely	4
Never	1	Never	5

Furthermore, the scores varied from 1 - 100 and were categorized into 3 levels as follow.

Good Prevention	81 - 100 Scores (81%-100%)
Moderate Prevention	60 - 80 Scores (60%-80%)
Poor Prevention	1 - 59 Scores (Less than 60%)

### 3.6 The Result of Validity and Reliability

#### 3.6.1 Validity test

The validity was able to measure by using the content validity and criterion-related validity that were checked by three experts after constructing the draft questionnaire.

The validity was adjusted by using Item – Objective Congruence (IOC) formula. The IOC formula was used for appropriate questions identification. The question of questionnaires was adjusted or eliminated if the IOC value was found to be less than 0.05. (Rovinelli and Hambleton, 1977) The scoring criteria were as follows:

If the question was not directly aimed at	+1 rating.
Not sure if the question was not on purpose, or	0 points.
If the question was not directly aimed at	-1 rating.

From this formula,

$$IOC = \frac{\sum R}{N}$$

IOC = Index of Item – Objective Congruence

$\sum R$  = Score of the expert opinion

N = A number of experts

The selection criteria questions was

1. The question of the IOC from 0.5 to 1.00 was selected.
2. The IOC was less than 0.5 should be adjusted or eliminated.

Consequently, all question was evaluated by three experts and had IOC on each questionnaire more than 0.5

Moreover, the validity of this study also used the criterion as 1) How to conduct KAP survey (WHO, 2008) 2) OSHA Respirator Medical Evaluation Questionnaire (Mandatory) (OHSA, 2012) 3) Descriptive study to assess the knowledge, attitude and practice among traffic policemen to protect against health hazards in Bangalore City (Shashidhara, 2005).

### 3.6.2 Reliability

The Reliability was tested

1. By using the criteria of reliability (Garrett,1965)

If the tests were range from 0.00 to 0.20, it indicated that there was very low level.

If the tests were range from 0.21 to 0.40, it indicated that there was low level.

If the tests were range from 0.41 to 0.70, it indicated that there was moderate level.

If the tests were range from 0.71 to 1.00, it indicated that there was high level.

2. By using Kuder–Richardson formula in terms of KR-21

From this formula,

$$r_{tt} = \left( \frac{k}{k-1} \right) \left( 1 - \frac{\bar{X}(k-\bar{X})}{S^2} \right)$$

$r_{tt}$  = The reliability of the test

$k$  = The number of test

$\bar{X}$  = The average score of the test

$s^2$  = The variability of the test

In this research, part 2 used KR-21 which had the value was 0.87

3. By using Cronbach (Cronbach's Alpha Coefficient)

From this formula,

$$\alpha = \left( \frac{k}{k-1} \right) \left( 1 - \frac{\sum S_i^2}{S^2} \right)$$

$\alpha$  = The reliability of the test

$k$  = The number of the test

$\sum S_i^2$  = The sum of the variance of each test

$S_t^2$  = The variability of the test

In this research, part 3 used Cronbach's Alpha Coefficient which had the value was 0.83 and part 4 used Cronbach's Alpha Coefficient which had the value was 0.84

Cronbach's Alpha Coefficient was greater than 0.7 considered acceptable level. Thus, the reliability test of confidence coefficient alpha was greater than 0.7 meant the questionnaire was to a great extent. (Cronbach, 1951).

Table 12 Cronbach's alpha

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

### 3.7 Data collection

The data were collected by using four structured questionnaires as socio-demographic factors, the knowledge factors associate with self-prevention from air pollution of traffic policemen in Bangkok, the perception of adverse health effect associate with self-prevention from air pollution of traffic policemen in Bangkok, the self-prevention from air pollution of traffic policemen in Bangkok.

Process of the data collection, the researcher coordinated to target police stations and gave questionnaire and instructions to all participants. The instructions of questionnaire, it recommended the traffic policeman should do the questionnaire after

working on the road and how to do the questionnaires. Thus, the respondents had corresponded to reality as possible. After that, the researcher collected the answer's questionnaire.

### **3.8 Data analysis**

The data were analyzed by using SPSS 16.0 version statistics software.

- **Descriptive statistics**

The descriptive statistics which presented the distribution of various variables of sample in terms of percentage, frequency, mean and standard deviation.

- **Analytical statistics**

Using analytical statistics, Chi-square which assessed the relationship between socio-demographic factors, the knowledge factors, the perception, and self-prevention at the 0.05 significant level. Moreover, this study also used Fisher Exact Test to assess the relationship when some cells of the cross tabulation was zero value. (Hinkle et al,2003).

### **3.9 Ethic consideration**

This study was approved under the guideline of College of Public Health Sciences. The study was done with the permission of the Ethic Review Committee Study Title NO. 113/59, COA NO. 128/2016, Date of Approval: 12 July 2016.

Participants were received full explanation about this study, including the purpose, process and the benefits of this study.

### **3.10 Limitation**

3.10.1 The study was performed in the small target groups that made the result of the study was limited.

3.10.2 The variables should be added in the conceptual framework to find the other variable that may be related with self-prevention from air pollution.

3.10.3 The self-administrated questionnaire was not enough to indicate the true assessment of variables. It required more qualitative data collection method such as face to face interview and observation.

### **3.11 Benefit of this study**

From the result of this study, it provided us to prevent the factor that had impact on self-prevention from air pollution and gave the recommendation to improve their behavior as well as reduced opportunity of respiratory disease in traffic policemen, Bangkok.

## CHAPTER 4

### RESULTS

#### 4.1 Descriptive Analysis

This chapter described a detailed description of the results got from the analysis of the survey. The descriptive analysis was mainly used to summarize primary data acquired. The researcher derived frequency and percentage to describe socio-demographic characteristics from 223 participants who are traffic policemen in intersrtng areas as Jatujak, PomPrapSattruPhai, Din Daeng and Rat Burana district, Bangkok, Thailand. In term of assessment the level of knowledge, perception and self-prevention scores, mean and standard deviation was applied to summarize level of agreement toward adverse health effect relates to air pollution of traffic policemen in Bangkok and frequency of practicing the self-prevention from air pollution. Additionally, the interpretation of score based on table 9 -11 also illustrated the knowledge level and concern perception of policemen in this study. Lastly, the relationship between knowledge and perception and self-prevention among the respondents was described by correlation.

##### 4.1.1 Socio Demographics of Respondents

In this section, the researcher described socio-demographic information of 223 respondents. The result was demonstrated in table 13 - 17.

According to table 13, the result found majority of traffic policemen in this research were male, accounted for 100%. The respondents in this study aged between 21 and 59 years old, and averagely aged 44.7 years old. The largest percentage distribution toward age group was 41-50 years old (45.7%), followed by 51-60 (27.8%), 21-30 (16.1%), and 31-40 (10.3%). It found 44.4% of respondents hold highest

education as Bachelor's Degree (44.4%), followed by certificate (36.3%), diploma (13%), and Master's Degree (6.3%).

Table 13 Respondent's demographic characteristics (n = 223)

Demographic characteristics		Frequency	Percent
Gender	Male	223	100
	Female	0	0
Age (range = 21 – 59, average = 44.7±10)	21 - 30	36	16.1
	31 - 40	23	10.3
	41 - 50	102	45.7
	51 - 60	62	27.8
Education level	Certificate	81	36.3
	Diploma	29	13.0
	Bachelor' s Degree	99	44.4
	Master's Degree	14	6.3

From table 14, the result found traffic policeman in this research had duration of working between 1 and 40 years, with the average of 12.3 years. The majority of respondents worked as traffic policeman 6 - 10 years (32.3%), followed by 11 – 15 years (28.7%), over 15 years (26.5%), and less than 5 years (12.6%). In regard of salary, most of them earned 25, 000 – 30,000 Baht per month (35%), followed by 20,000 – 25,000 Baht (24.7%), more than 30,000 Baht (15.2%), 15,000 – 20,000 Baht (14.3%), and less than 15,000 Baht (10.8%). Furthermore, they worked d ranges from 1 – 12 hours per day with average of 6 hours. The majority of respondents worked 8 – 11 hours a day on the road (48.9%), follow by worked 3 or less 3 hours (23.8%), worked 4 - 7 hours (19.3%) and more than 11 hours (8.1%) Moreover, 46.6% of respondents worked 6 days on the road per week, followed by 23.8% of 5 days and 22% of 7 days, respectively.



Table 14 Respondent's salary and working information (n = 223)

Demographic characteristics		Frequency	Percent
Duration of working as traffic policeman	Less than 5 years	28	12.6
	6 - 10 years	72	32.3
	11 - 15 years	64	28.7
	Over 15 years	59	26.5
Income	Less than 15,000 Baht	24	10.8
	15,000 – 20,000 Baht	32	14.3
	20,000 – 25,000 Baht	55	24.7
	25, 000 – 30,000 Baht	78	35.0
	More than 30,000 Baht	34	15.2
Working hours (range = 1 – 12, average = 6.2±3.7)	3 hours or less	53	23.8
	4 - 7 hours	43	19.3
	8 - 11 hours	109	48.9
	More than 11 hours	18	8.1
Working days	1 day	5	2.2
	2 days	1	.4
	3 days	3	1.3
	4 days	8	3.6
	5 days	53	23.8
	6 days	104	46.6
	7 days	49	22.0

In regard of health (table 15), the result explained more than half of respondents did exercise for 1 – 3 days per week (54.7%), while 30% of respondent never did it and followed by exercised for 4 -6 days per week (10.8%) and exercised on every day (4.5%). 65.9% of respondents last health checked up by doctor within 6 months ago, checked 1 year ago 23.3%, checked more than 1 year ago 8.5% as well as was not examination (2.2%). 77.4% of respondents had no chronic disease and 84.8% of

respondents did not have respiratory symptoms or disease. Only 25.6% of respondent had chronic disease and 15.2% had respiratory symptoms or disease.

Table 15 Respondent's health information (n = 223)

Demographic characteristic		Frequency	Percent
Frequency of exercise	Never	67	30.0
	1-3 days/week	122	54.7
	4-6 days/week	24	10.8
	Everyday	10	4.5
Latest health checkup by doctor	6 months ago	147	65.9
	1 year ago	52	23.3
	More than 1 year ago	19	8.5
	Had not examination	5	2.2
Having chronic disease	No	166	74.4
	Yes	57	25.6
Having respiratory symptoms or disease	No	189	84.8
	Yes	34	15.2

In case of smoking habit (table 16), it found majority of respondents never smoked (57%), while 22% of respondent currently smoke and 21.1% of entire respondent had quit smoking. 19.3% of respondent smoked about 1-10 rolls per day, while 13% smoked 11-20 rolls, and 3.5% smoked over 20 rolls.

Table 16 Respondent's smoking behavior (n = 223)

Demographic characteristic		Frequency	Percent
Smoking behavior	Never smoked	127	57.0
	Had quit smoking	47	21.1
	Smoking	49	22.0
	Never	143	64.1

Demographic characteristic		Frequency	Percent
Number of rolls per day	1-10 Rolls	43	19.3
	11-20 Rolls	29	13.0
	21-30 Rolls	7	3.1
	31-40 Rolls	1	.4

From table 17, it found majority of respondents had not got information about air pollution and health effect from government organizations during one year ago (72.2%), while 27.8% of respondent received these information. Moreover, 74.4% of respondents had not got training on self-prevention from air pollution from government organizations during one year ago, while 25.6% of respondents used to train on this program.

Table 17 Respondent's awareness and experience in training on prevention of air pollution and health effect (n = 223)

Demographic characteristic		Frequency	Percent
Information about air pollution and health effect during one year ago	No	161	72.2
	Yes	62	27.8
Training on prevention of air pollution during one year ago	No	166	74.4
	Yes	57	25.6

#### 4.1.2 Respondent's Knowledge towards Air Pollution in Bangkok

In this section, the researcher carried out the descriptive results from part 2 of questionnaire to explore the level of knowledge of traffic policemen in this study and to explore perception of adverse health effect relates to air pollution of traffic policemen in Bangkok. The result was demonstrated in table 18 - 19.

From data shown in table 18, there were 15 questions were applied to measure respondent's knowledge toward air pollution, health effect, and air pollution prevention. As air pollution, it showed 89.7% of respondents answered wrong choice on what factor is not the main cause of air pollution, while most of respondents understood traffic pollution (88.8%). In aspect of health effect, it found 43.9% of respondent did not know route that the air pollution can pass through the body, while 88.3% of respondent understood health effect of long term suspended particulate material exposure. For air pollution prevention, it found 67.7% of respondent did not know the most suitable type of respiratory protective equipment to traffic policemen, while 86.1% of respondent known methods to check the respiratory protective equipment before wearing.

Table 18 The knowledge relates to air pollution of traffic policemen in Bangkok (n = 223)

The knowledge	Wrong answer		Correct answer	
	n	%	n	%
<u>Air pollution</u>				
The Commercial and residential heating is not the main cause of air pollution.	200	89.7	23	10.3
Vehicle uses is the main cause of air pollution in communities.	30	13.5	193	86.5
Suspended particulate material, Carbon dioxide and Ozone are the components of the air pollution.	81	36.3	142	63.7
The traffic pollution is polluting the air with automobile emission.	25	11.2	198	88.8
Diesel vehicle can cause traffic air pollution mostly.	47	21.1	176	78.9
Low quality fuel, lack of maintenance of vehicle and down old car are the reason that results in the air quality excess the standard from vehicle.	40	17.9	183	82.1

The knowledge	Wrong answer		Correct answer	
	n	%	%	n
	Suspended particulate material is the air pollutant that found to be the main problem and exceeding standards in Bangkok.	58	26	165
<u>Health effect</u>				
Dermal, Inhalation and Ingestion route that make the air pollution can pass through the body.	98	43.9	125	56.1
Pharynx can filter a large particulate matter.	54	24.2	169	75.8
Respiratory problems is the effect of long term suspended particulate material exposure.	26	11.7	197	88.3
<u>Air pollution Prevention</u>				
Cotton face Mask is the most suitable type of respiratory protective equipment to traffic policemen.	151	67.7	72	32.3
Respiratory protective equipment should be used during every day duty.	53	23.8	170	76.2
The respiratory protective equipment have to check and clean before wearing and after every use.	31	13.9	192	86.1
Prevent the pathogen is not the beneficial of face mask while work on the road.	68	30.5	155	69.5
Legislation vehicle, Preventing the spread of dust and providing new technology are methods to solve the problem of particulate matter.	36	16.1	187	83.9

After measure knowledge of respondents through 15 questions, the researcher interpreted the level of knowledge based on table 9. The score varied from 2 to 14 with average score of  $10.3 \pm 2.3$ , which indicated respondent had low to high level on knowledge. The result found 48.4% of respondents either had moderate and 34.5% of high knowledge level. Only 17.0% of respondent had low level of knowledge.

Table 19 The level of knowledge relates to air pollution of traffic policemen in Bangkok (n = 223)

Knowledge	Frequency	Percent
Low	38	17.0
Moderate	108	48.4
High	77	34.5
Total	223	100.0

#### 4.1.3 Respondent's Perception towards Air Pollution in Bangkok

In this section, the researcher carried out the descriptive resulted from part 3 of questionnaire to explore the level of knowledge of traffic policemen in this study and to explore perception of adverse health effect relates to air pollution of traffic policemen in Bangkok. The result was demonstrated in table 20 - 24.

As the data in table 20, most of respondents had good understanding and moderate perception on both positive and negative questionnaires. From the positive answer, the majority of respondents strongly perceived that it is necessary to wear respiratory protective equipment when you work on the road (57.4%), from your work on the road, you highly expose the pollutants (52%) and the pollutant from the roadway can contribute to respiratory disease and symptom (50.7%). Half of respondents agreed that while working on the street, you have dizziness, nausea and vomiting from inhaling air pollution from traffic (57.8%) and using face masks can avoid respiratory diseases such as bronchitis, asthma, bronchitis, lung cancer (54.3%). On the other hand the positive questions, there were 27.8% disagreed strongly and 33.2% disagreed with perceived respondents in terms of inhalation of dust, soot and the exhaust during the operation regularly don't have impact on the body because the body has immune system and 15.2% strongly disagreed and 35.9% disagreed with dust can only cause coughing, sneezing, stuffy nose as well as 13.9% disagreed strongly and 43.9% disagreed with it is not necessary to use face mask because it is able to little filter dust.

Table 20 Percentage of perception toward air pollution of each individual item by respondent (n = 223)

Perception items	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly disagree %
Traffic is the main cause of air pollution.	48	48.4	2.2	1.3	0
The pollutant from the roadway can contribute to respiratory disease and symptom.	50.7	46.6	1.8	0.9	0
Inhalation of dust, soot and the exhaust during the operation regularly don't have impact on the body because the body has immune system. *	13.9	21.5	3.6	33.2	27.8
Respiratory disease caused by the inhalation of air pollution from traffic. It will happen only to unhealthy people only. *	10.8	24.7	5.8	24.7	10.8
From your work on the road, you highly expose the pollutants?	52	42.6	3.1	2.2	0
From your work on the road for long time, you have high risk of lung cancer.	45.3	46.6	4.9	2.7	0.4
While working on the street, you have dizziness, nausea and vomiting from inhaling air pollution from traffic	21.5	57.8	14.8	5.8	0

Perception items	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly disagree %
Dust can only cause coughing, sneezing, stuffy nose. Therefore, you don't have concerns about working on the road. *	16.6	27.4	4.9	35.9	15.2
You have the high risk of respiratory disease and symptom.	42.2	48.9	8.1	0.9	0
It is necessary to wear respiratory protective equipment when you work on the road.	57.4	35.9	5.4	0.9	0.4
Working for a long time without a face mask can cause dizziness, nausea, vomiting.	35.9	48.9	10.3	4.5	0.4
Using face masks while working on the road makes uncomfortable to breath, but it makes feel safe from air pollution	23.8	48.4	10.3	16.6	0.9
Using face masks can avoid respiratory diseases such as bronchitis , asthma, bronchitis , lung cancer	29.6	54.3	10.3	4.5	1.3
It is not necessary to use face mask because it is able to little filter dust. *	9.9	22.0	10.3	43.9	13.9
Traffic police who work on the streets have higher risk of respiratory diseases than the police work as administrator in the office.	47.1	49.3	3.6	0	0

\* Negative statement



From table 21, the result shown the respondent was mostly agreed with pollutant from the roadway can contribute to respiratory disease and symptom ( $\bar{x} = 4.47$ ), followed by highly expose the pollutants ( $\bar{x} = 4.44$ ) and traffic is the main cause of air pollution ( $\bar{x} = 4.43$ ).

Table 21 The perception on air pollution (n = 223)

Perception on air pollution	Mean	S.D
Traffic is the main cause of air pollution.	4.43	0.61
The pollutant from the roadway can contribute to respiratory disease and symptom.	4.47	0.58
Inhalation of dust, soot and the exhaust during the operation regularly don't have impact on the body because the body has immune system.	2.62	1.45
Respiratory disease caused by the inhalation of air pollution from traffic. It will happen only to unhealthy people only.	2.71	1.31
From your work on the road, you highly expose the pollutants?	4.44	0.66
Average score	3.72	0.56

According to table 22, the result shown the respondent was mostly agreed with they have high risk of lung cancer ( $\bar{x} = 4.33$ ), followed high risk of respiratory disease and symptom ( $\bar{x} = 4.32$ ), and have dizziness, nausea and vomiting from inhaling air pollution from traffic ( $\bar{x} = 3.96$ ).

Table 22 The perception on health effect (n = 223)

Perception on health effect	Mean	S.D
From your work on the road for long time, you have high risk of lung cancer.	4.33	0.52

Perception on health effect	Mean	S.D
While working on the street, you have dizziness, nausea and vomiting from inhaling air pollution from traffic	3.96	0.74
Dust can only cause coughing, sneezing, stuffy nose. Therefore, you don't have concerns about working on the road.	2.94	1.30
You have the high risk of respiratory disease and symptom.	4.32	0.65
Average score	3.87	0.52

In regard of table 23, the result shows respondent was mostly agreed with necessary to wear respiratory protective equipment when work on the road ( $\bar{x} = 4.48$ ), followed by working on the streets have higher risk of respiratory diseases than work as administrator in the office ( $\bar{x} = 4.43$ ), and working for a long time without a face mask can cause dizziness, nausea, vomiting ( $\bar{x} = 4.16$ ).

Table 23 The perception on air pollution prevention (n = 223)

Perception on air pollution prevention	Mean	S.D
It is necessary to wear respiratory protective equipment when you work on the road.	4.48	0.68
Working for a long time without a face mask can cause dizziness, nausea, vomiting.	4.16	0.81
Using face masks while working on the road makes uncomfortable to breath, but it makes feel safe from air pollution	3.78	1.02
Using face masks can avoid respiratory diseases such as bronchitis , asthma, bronchitis , lung cancer	4.07	0.82
It is not necessary to use face mask because it is able to little filter dust	2.71	1.23

Perception on air pollution prevention	Mean	S.D
Traffic police who work on the streets have higher risk of respiratory diseases than the police work as administrator in the office.	4.43	0.56
Average score	3.94	0.43

After measure perception of respondents through 15 questions, the researcher interpreted the level of perception based on table 10. The score varied from 43 to 75, which had average score of  $58.97 \pm 6.75$ . The result found 52.9% of respondents either had moderate perception and 44.4% of good perception toward adverse health effect relates to air pollution. Only 2.7% of respondent had poor perception.

Table 24 Overall perception score toward adverse health effect relates to air pollution of traffic policemen in Bangkok (n = 223)

Perception	Frequency	Percent
Poor Perception	6	2.7
Moderate Perception	118	52.9
Good Perception	99	44.4
Total	223	100.0

#### 4.1.4 Respondent's Self-prevention from Air pollution

In this section, the researcher carried out the descriptive resulted from part 4 of questionnaire to explore personal protective equipment, personal hygiene, and preventive behaviors of 223 policemen who were participants in this study. The result was demonstrated in table 25 - 29.

As the data in table 25, there were 20 questions were applied to measure respondent's self-prevention from air pollution. In term of Respiratory Protective Equipment (Face Mask), it showed the positive question 41.7% of respondents wore

Face Mask equipment while working and 38.6% of respondents checked respiratory protective equipment before using, while 40.8% of agency did not purchase the mask and 24.6% of never been got the information about how to properly wear a mask from government and the private sector. In the contrast of positive questions, 21.5% of respondents did not wear a mask because it is difficult to perform traffic work during working and 10.3% of respondents did not worn face mask interferes with routine talking in walky-talky. In aspect of personal hygiene, it found 39% of respondent changed a dirty cloth after work and 31.4% of respondent washed hands and face with soap before eating and preparing food. The positive questions of protective behaviors, 33.6% of respondents had not been trained to know about air pollution and health effects, 31.4% of after working on the road, the respondents sometimes notice that they had dizziness, nausea, vomiting, difficulty breathing, chest pain every time as well as 30.9% of respondents had not been trained to know how to protect yourself from respiratory disease. However, the negative questions, it showed that 51.1% of respondents did never smoke while working.

Table 25 Percentage of Self-prevention from air pollution of each individual item by respondents (n = 223)

Self-prevention n items	Always %	Often %	Sometime %	Rarely %	Never %
<u>Respiratory Protective Equipment (Face Mask)</u>	41.7	25.6	22.9	8.1	1.8
Wear Face Mask equipment while working					
Check respiratory protective equipment before using.	38.6	26.5	20.2	5.8	9.0
You Regularly clean your mask before / after use.	22.9	40.4	23.3	10.3	3.1

Self-prevention n items	Always %	Often %	Sometime %	Rarely %	Never %
How often do you change your respiratory protective equipment?	22.9	40.4	23.3	10.3	3.1
Wearing face mask interferes with routine talking in walky-talky. *	14.8	32.7	39	3.1	10.3
While working, you do not wear a mask because it is difficult to perform traffic work.*	9.4	22.0	29.6	17.5	21.5
You always get the information about how to properly wear a mask from government and the private sector.	6.3	15.2	43.1	18.8	24.6
Your agency will be out the cost of purchasing the mask.	5.4	9.0	24.2	20.6	40.8
<u>Personal hygiene</u>	31.4	36.8	25.6	5.4	0.9
Wash hands and face with soap before eating and preparing food					
Change a dirty cloth after work	39.0	37.2	20.2	2.2	1.3
Got plenty of rest (8 to 10 hours per night)	14.3	16.1	48.9	16.1	4.5
You daily eat a variety from each of the five food groups.	11.7	24.7	47.5	12.1	4.0
<u>Protective behaviors</u>	8.1	19.3	14.8	6.7	51.1
How often do you smoke while working?*					

Self-prevention n items	Always %	Often %	Sometime %	Rarely %	Never %
How often do you do you check up your health?	17.0	24.7	34.1	23.8	0.4
How often do you have the annual pulmonary checkup?	18.4	18.8	28.3	31.8	2.7
When you have difficulty breathing or chest pain, You will immediately see a doctor	17.5	15.2	30.9	13.9	22.4
After working on the road, you notice that you will have dizziness, nausea, vomiting, difficulty breathing, chest pain every time.	3.6	12.1	31.4	30.5	22.4
You've been trained to know about air pollution and health effects.	5.4	12.1	26.0	22.9	33.6
You've been trained to know how to protect yourself from respiratory disease	3.1	13.9	27.8	22.4	30.9
You ever find a book to read articles on the subject of air pollution more.	4.5	15.2	24.2	23.8	30.5

\* Negative statement

In regard of table 26, the result showed respondent was mostly agreed with practicing on wear face mask equipment while working ( $\bar{x} = 3.97$ ), followed by check respiratory protective equipment before using ( $\bar{x} = 3.82$ ), and frequency on change respiratory protective equipment ( $\bar{x} = 3.72$ ).

Table 26 The score of practicing on respiratory protective equipment (n = 223)

Respiratory Protective Equipment (Face Mask)	Mean	S.D
Wear Face Mask equipment while working	3.97	1.04
Check respiratory protective equipment before using.	3.82	1.25
You Regularly clean your mask before / after use.	3.61	1.20
How often do you change your respiratory protective equipment?	3.72	1.02
Wearing face mask interferes with routine talking in walky-talky.	3.40	1.09
While working, you do not wear a mask because it is difficult to perform traffic work.	2.80	1.26
You always get the information about how to properly wear a mask from government and the private sector.	2.61	1.19
Your agency will be out the cost of purchasing the mask.	2.19	1.20
Average score	3.26	0.68

From table 27, the result shows respondent was mostly agreed with practicing on change a dirty cloth after work ( $\bar{x} = 4.11$ ), followed by wash hands and face with soap before eating and preparing food ( $\bar{x} = 3.92$ ), and daily eat a variety from each of the five food groups ( $\bar{x} = 3.30$ ).

Table 27 The score of practicing on personal hygiene (n = 223)

Personal hygiene	Mean	S.D
Wash hands and face with soap before eating and preparing food	3.92	0.92
Change a dirty cloth after work	4.11	0.89
Got plenty of rest (8 to 10 hours per night)	3.21	1.02
You daily eat a variety from each of the five food groups.	3.30	0.95
Average score	3.63	0.67

In case of protective behavior, the result shows respondent was mostly agreed with practicing on check up their health ( $\bar{x} = 3.38$ ), followed by having the annual pulmonary checkup ( $\bar{x} = 3.22$ ), and immediately see a doctor when having difficulty breathing or chest pain ( $\bar{x} = 2.92$ ).

Table 28 The score of practicing on protective behaviors (n = 223)

Protective behaviors	Mean	S.D
How often do you smoke while working?	2.30	1.45
How often do you do you check up your health?	3.38	1.03
How often do you have the annual pulmonary checkup?	3.22	1.15
When you have difficulty breathing or chest pain, You will immediately see a doctor	2.92	1.38
After working on the road, you notice that you will have dizziness, nausea, vomiting, difficulty breathing, and chest pain every time.	2.45	1.08
You've been trained to know about air pollution and health effects.	2.36	1.20
You've been trained to know how to protect yourself from respiratory disease	2.39	1.14
You ever find a book to read articles on the subject of air pollution more.	2.40	1.20
Average score	2.67	0.77

After measure self-prevention of respondents through 15 questions, the author interpreted the level of self-prevention based on table 11. The score varies from 35 to 96, which had average score of  $63.11 \pm 11.7$ . The result found 53.8% of respondents either had moderate prevention and 43% of good prevention toward adverse health effect relates to air pollution. Only 3.1% of respondent had poor prevention.



Table 29 Overall practice score toward self-prevention from air pollution of traffic policemen in Bangkok (n = 223)

Self-prevention	Frequency	Percent
Poor Prevention	7	3.1
Moderate Prevention	120	53.8
Good Prevention	96	43
Total	223	100.0

#### 4.2 Inferential Analysis

In this section, the researcher applied analytical statistics to resolve four research hypotheses of the study. Chi-square was employed to test all of hypotheses and measure relationship between socio-demographic factors, the knowledge factors, the perception, and self-prevention. The result was demonstrated in table 30 - 34.

**Hypothesis 1:** There was association between socio demographic factors and self-prevention of traffic policemen in Bangkok.

From the result of Chi-square in table 30, the cross tabulation of gender, age, education levels, work experiences, income, working hours, working days, frequency of exercise, latest health check up by doctor, having chronic disease, having respiratory symptoms and disease, smoking behavior, number of cigarette, information about air pollution and health effect and training on prevention between air pollution were performed respectively. There were no signification association of gender, age, work experiences, income, working hours, working days, latest health check up by doctor, having respiratory symptoms and disease, smoking behavior, number of cigarette and self-prevention with p-value (no value, 0.892, 0.556, 0.505, 0.567, 0.304, 0.330, 0.898, 0.294 and 0.457 respectively ) at 0.05 significant level.

The chi-square statistics test indicated that there was signification between education levels, frequency of exercise, having chronic disease, information about air

pollution and health effect and training on prevention between air pollution and self-prevention with p-value 0.011, 0.001, 0.028, 0.011 and 0.005 respectively at 0.05 significant level. The percentage of neutral self-prevention among diploma was 62.1%, bachelor's degree was 57.6%, and certificate was 43.2%. The percentage of neutral self-prevention among 4-6 days/week of exercise was 75% and everyday was 60%. The percentage of neutral self-prevention among the respondent who got information about air pollution and health effect was 54.8% and the respondent who had not been got information about air pollution and health effect was 49.1%. The percentage of neutral self-prevention among the respondent who has trained on prevention of air pollution was 54.4% and the respondent who had not trained on prevention of air pollution was 49.4%. Thus, the researcher partially accepted hypothesis 1 which referred there was association between socio demographic factors and self-prevention of traffic policemen in Bangkok in terms of education levels, frequency of exercise, having chronic disease, information about air pollution and health effect and training on prevention between air pollution and self-prevention.

Table 30 The relationship between socio demographic factors and self-prevention of traffic policemen in Bangkok. (n = 223)

Demographic Variables	Self-Prevention			$\chi^2$	p-value
	Not Concern	Neutral	Concern		
	No. (%)	No. (%)	No. (%)		
<b>Gender</b>					
Male	91 (40.8)	113 (50.7)	19 (8.5)	-	-
Female	0 (0)	0 (0)	0 (0)		
<b>Age</b>					
21 - 30	15 (41.7)	17 (47.2)	4 (11.1)		
31 - 40	8 (34.8)	13 (56.5)	2 (8.7)	2.27	0.892
41 - 50	40 (39.2)	52 (51)	10 (9.8)		
51 - 60	28 (45.2)	31 (50)	3 (4.8)		

Demographic Variables	Self-Prevention			$\chi^2$	p-value
	Not Concern No. (%)	Neutral No. (%)	Concern No. (%)		
<b>Education level</b>					
Certificate	41 (50.6)	35 (43.2)	5 (6.2)	16.51	0.011*
Diploma	11 (37.9)	18 (62.1)	0 (0)		
Bachelor' s Degree	31 (31.3)	57 (57.6)	11 (11.1)		
Master's Degree	3 (21.4)	8 (57.1)	3 (21.4)		
<b>Work Experiences</b>					
Less than 5 years	31 (43.1)	35 (48.6)	6 (8.3)	4.90	0.556
6 - 10 years	13 (46.4)	14 (50)	1 (3.6)		
11 - 15 years	24 (37.5)	31 (48.4)	9 (14.1)		
Over 15 years	23 (39)	33 (55.9)	3 (5.1)		
<b>Income</b>					
Less than 15,000 Baht	11 (45.8)	11 (45.8)	2 (8.3)	7.29	0.505
15,000 – 20,000 Baht	12 (37.5)	15 (46.9)	5 (15.6)		
20,000 – 25,000 Baht	18 (32.7)	30 (54.5)	7 (12.7)		
25, 000 – 30,000 Baht	34 (43.6)	40 (51.3)	4 (5.1)		
More than 30,000 Baht	16 (47.1)	17 (50)	1 (2.9)		
<b>Working hours</b>					
3 hours or less	28 (52.8)	22 (41.5)	3 (5.7)	4.821	0.567
4 - 7 hours	15 (34.9)	24 (55.8)	4 (9.3)		
8 - 11 hours	41 (37.6)	57 (52.3)	11 (10.1)		
More than 11 hours	7 (38.9)	10 (55.6)	1 (5.6)		
<b>Working days</b>					
1 day	1 (20)	3 (60)	1 (20)	13.94	0.304
2 days	0 (0)	1 (100)	1 (0)		
3 days	0 (0)	3 (100)	0 (0)		
4 days	3 (37.5)	3 (37.5)	2 (25)		
5 days	24 (45.3)	22 (41.5)	7 (13.2)		

Demographic Variables	Self-Prevention			$\chi^2$	p-value
	Not Concern No. (%)	Neutral No. (%)	Concern No. (%)		
6 days	44 (42.3)	52 (50)	8 (7.7)		
7 days	19 (38.8)	29 (59.2)	1 (2)		
<b>Frequency of exercise</b>					
Never	37 (55.2)	30 (44.8)	0 (0)	27.73	0.001*
1-3 days/week	51 (41.8)	59 (48.4)	12 (9.8)		
4-6 days/week	1 (4.2)	18 (75)	5 (20.8)		
Everyday	2 (20)	6 (60)	2 (20)		
<b>Latest health checkup by doctor</b>					
6 months ago	58 (39.5)	74 (50.3)	15 (10.2)	6.88	0.330
1 year ago	26 (50)	25 (48.1)	1 (1.9)		
More than 1 year ago	5 (26.3)	12 (63.2)	2 (10.5)		
Have not examination	2 (40)	2 (40)	1 (20)		
<b>Having chronic disease</b>					
No	65 (39.2)	82 (49.4)	19 (11.4)	7.66	0.028*
Yes	26 (45.6)	31 (54.4)	0 (0)		
<b>Having respiratory symptoms or disease</b>					
No	76 (40.2)	97 (51.3)	16 (8.5)	0.215	0.898
Yes	15 (44.1)	16 (47.1)	3 (8.8)		
<b>Smoking behavior</b>					
Never smoked	53 (41.7)	66 (52)	8 (6.3)	4.931	0.294
Had quit smoking	20 (42.6)	24 (51.1)	3 (6.4)		
Smoking					

Demographic Variables	Self-Prevention			$\chi^2$	p-value
	Not Concern No. (%)	Neutral No. (%)	Concern No. (%)		
<b>Number of rolls</b>					
Never	60 (42)	75 (52.4)	8 (5.6)	7.76	0.457
1-10 Rolls	20 (46.5)	17 (39.5)	6 (14)		
11-20 Rolls	2 (28.6)	4 (57.1)	1 (14.3)		
21-30 Rolls	2 (28.6)	4 (57.1)	1 (14.3)		
31-40 Rolls	0 (0)	1 (100)	0 (0)		
<b>Information about air pollution and health effect</b>					
				9.04	0.011*
No	73 (45.3)	79 (49.1)	9 (5.6)		
Yes	18 (29)	34 (54.8)	10 (16.1)		
<b>Training on prevention of air pollution</b>					
				10.57	0.005*
No	75 (45.2)	82 (49.4)	9 (5.4)		
Yes	16 (28.1)	31 (54.4)	10 (17.5)		

\* Significant at the 0.05 level (2-tailed).

**Hypothesis 2:** There was association between knowledge and perception towards self-prevention of traffic policemen in Bangkok.

From the result of Chi-square in table 31, the cross tabulation of knowledge and perception were performed. The chi-square statistics test indicated that there was signification between knowledge and perception due to p-value was lower 0.05 at 0.05 significant level. (p -value = 0.001). The percentage of moderate perception among moderate knowledge was 57.4. The percentage of good perception among high knowledge was 50.6. The percentage of moderate perception among low knowledge was 50. As the result, the researcher accepted hypothesis 2 which referred there was

association between knowledge and perception towards self-prevention of traffic policemen in Bangkok.

Table 31 The relationship between knowledge and perception towards self-prevention of traffic policemen in Bangkok (n = 223)

Demographic Variables	Perception			$\chi^2$	p-value
	Poor No. (%)	Moderate No. (%)	Good No. (%)		
<b>Knowledge</b>					
Low	5 (13.2)	19 (50)	14 (36.8)	20.997	0.001*
Moderate	0 (0)	62 (57.4)	46 (42.6)		
High	1 (1.3)	37 (48.1)	39 (50.6)		

\* Significant at the 0.05 level (2-tailed).

**Hypothesis 3:** There was association between knowledge and self-prevention of traffic policemen in Bangkok.

From the result of Chi-square in table 32, the cross tabulation of knowledge and self-prevention were performed. The chi-square statistics test indicated that there was signification between knowledge and self-prevention due to p-value was lower 0.05 at 0.05 significant level. (p -value = 0.001)

The percentage of moderate self-prevention among high knowledge was 64.9. The percentage of good self-prevention among high knowledge was 50.6. The percentage of poor self-prevention among moderate knowledge was 50.9. As the result, the researcher accepted hypothesis 3 which referred there was association between knowledge and self-prevention of traffic policemen in Bangkok.

Table 32 The relationship between knowledge and self-prevention of traffic policemen in Bangkok. (n = 223)

Demographic Variables	Self-Prevention			$\chi^2$	p-value
	Poor No. (%)	Moderate No. (%)	Good No. (%)		
<b>Knowledge</b>					
Low	19 (50)	16 (42.1)	3 (7.9)	17.78	0.001*
Moderate	55 (50.9)	47 (43.5)	6 (5.6)		
High	17 (22.1)	50 (64.9)	10 (13)		

\* Significant at the 0.05 level (2-tailed).

**Hypothesis 4:** There was association between perception and self-prevention of traffic policemen in Bangkok.

From the result of Chi-square in table 33, the chi-square statistics test indicated that there was zero cell value in poor perception with good self-prevention of the cross tabulation. After that, the researcher had to transform table into 4 x 4 by merging cell of moderate and good cell of self-prevention and merging cell of moderate and good perception. Moreover, the researcher decided to merge good self-prevention to moderate self-prevention and merge good perception to moderated perception because the good self-prevention and good perception cell had the lowest percentage value.

Table 33 The relationship between perception and self-prevention of traffic policemen in Bangkok. (n = 223) from Chi-square test

Demographic Variables	Self-Prevention			$\chi^2$	p-value
	Poor No. (%)	Moderate No. (%)	Good No. (%)		
<b>Perception</b>					
Poor	5 (83.3)	1 (16.7)	0 (0)	7.40	0.116
Moderate	52 (44.1)	58 (49.2)	8 (6.8)		
Good	34 (34.3)	54 (54.4)	11 (11.1)		

Thus, the hypothesis used Fisher Exact Test to assess the relationship. From the result of Fisher Exact Test in table 34, the cross tabulation of perception and self-prevention were performed. Fisher Exact test indicated that there was significance between perception and self-prevention of traffic policemen because p-value is lower 0.05 at 0.05 significant level. (p -value = 0.043)

The percentage of poor self-prevention among poor perception was 83.3. The percentage moderate and good self-prevention among moderate and good perception was 60.4. As the result, the researcher accepted hypothesis 4 which referred there was association between perception and self-prevention of traffic policemen in Bangkok.

Table 34 The relationship between perception and self-prevention of traffic policemen in Bangkok. (n = 223) from Fisher Exact Test

Demographic Variables	Self-Prevention		p-value
	Poor No. (%)	Moderate and Good No. (%)	
<b>Perception</b>			
Poor	5 (83.3)	1 (16.7)	0.043
Moderate and Good	86 (39.6)	131 (60.4)	



## CHAPTER 5

### DISCUSSION

This chapter provided the purpose of this study that was to evaluation the knowledge, perception and self-prevention from air pollution of traffic policemen in Bangkok. The areas that the researcher had selected to study were Jatujak, PomPrapSattruPhai, Din Daeng and Rat Burana district. Jatujak was a representative of the area had PM<sub>10</sub> highly exceeded the standard in 2013. PomPrapSattruPhai was a representative of the area had PM<sub>10</sub> highly exceeded the standard in 2012. Din Daeng was a representative of the area had PM<sub>2.5</sub> highly exceeded the standard in 2012-2013. Rat Burana was a representative of the area had not exceeded the standard in 2012-2013. There were 223 respondents who are traffic policemen from 11 police stations from those areas.

The results were discussed as follows.

- 5.1 Socio demographics characteristics.
- 5.2 Knowledge's level of adverse health effect towards Air Pollution
- 5.3 Perception's level of adverse health effect towards Air Pollution
- 5.4 Self-prevention s level from Air pollution
- 5.5 The association between demographic factors and self-prevention
- 5.6 The association between knowledge and perception of adverse health effect
- 5.7 The association between knowledge and self-prevention of traffic policemen
- 5.8 The association between perception of adverse health effect and self-prevention of traffic policemen.

## 5.1 Socio Demographics

In this study, the socio demographic were assessed in terms of gender, age, education level, income, etc. The entire of respondents were male. The result was as follows

### 5.1.1 Personal information

The finding shown that most of respondents have age ranged from 41 – 50 years (45.7%), bachelor's degree (44.4%), working as traffic policeman 6 - 10 years (32.3%) that average  $12.3 \pm 9.1$  years, 25, income 000 – 30,000 Baht (35.0%), worked hour per day 8 - 11 hours (48.9%) that average  $6.2 \pm 3.7$  hours, Worked 6 day per week (46.6%), exercised 1-3 days/week (54.7%), did not have chronic disease (74.4%), did not have respiratory symptoms or disease (84.8%), did not have smoking behavior (57.0%), and the respondents that had smoking behavior about 1-10 rolls per day. From these results, it showed mostly policemen had highly an opportunity to expose the pollutants when they worked on the road due to the number of their working hour. Moreover, some policemen also had smoking behavior. Thus, local authority should have protective measurement as job and working area rotation which prevent the policeman from the same highly risk area.

### 5.1.2 Training Information

The survey found that the respondents mostly policemen did not get information about air pollution and health effect from government organizations during one year ago and had not got training on self-prevention from air pollution from government organizations during one year ago as 72.2 % and 74.4%, respectively. According to Viyada (2009), who mentioned that there were 63.3% of the Suratthani traffic policemen who never had trained on traffic air pollution. It could be assumed that the majority of policeman in Thailand have ever got information about air pollution and health effect and got training on self-prevention from air pollution. Thus, the Royal

Thai Police should have zero illness from work-related policy in order to reduce the prevalence of respiratory disease from work.

## **5.2 Knowledge's level of adverse health effect towards Air Pollution**

### 5.2.1 Knowledge about air pollution

From the answer of questionnaires found that over 80% of respondents understand about the air pollution in communities and traffic pollution. However, most of respondents did not know cause of air pollution (89.7%) and some respondents did not know the air pollution in terms of what is air pollution (36.3%) and traffic pollution (11.2%) as well as which type of vehicle can cause traffic air pollution mostly (21.1%).

### 5.2.2 Health effect

The finding shown that the respondents mostly understood long term health effect of air pollution (88.3%) and the route (56.1%) and part of the respiratory track (75.8%) that have effect on having the respiratory symptom and diseases.

### 5.2.3 Air pollution Prevention

Most of the respondents clearly known about how to use respiratory protective equipment in term of 76.2% what time that should be use respiratory protective equipment, 86.1% how to check the respiratory protective equipment before wearing, 69.5% what is the beneficial of face mask, 83.9% know about methods to solve the problem of particulate matter. Therefore, 67.7% don't know about what is the suitable respiratory protective equipment to use while working as traffic policeman on the road.

#### 5.2.4 The level of knowledge

The respondents generally had got moderate knowledge which the score varied from 2 to 14 with average score of  $10.3 \pm 2.3$ . Moreover, the respondents had high level (34.5%) and low level (17.0%).

As the result, from Socio-demographic data and knowledge's level gained from the survey showed that most of the policemen had enough basic knowledge of air pollution, health effect and self-prevention. The respondent's knowledge which might obtained from their educations and the social media such as television, print media, etc. Most of the respondents had not been trained about air pollution, health effect and self-prevention especially in order to have a better understand. Thus, some respondents still had low knowledge level. This finding was also corresponded to Nareerat (2000), who mentioned that the Thai Red Cross Society College of nursing students had a medium level of knowledge concerning prevention of air pollution in Bangkok Metropolitan. Moreover, this result also agreed with Shashidhara.G (2005) who referred there was a relationship between knowledge and practice among traffic policeman to protect against health hazards generated by traffic air pollution in Bangalore City.

### 5.3 Perception's level of adverse health effect towards Air Pollution

#### 5.3.1 The perception on air pollution

Form survey, the respondents mostly agreed with air pollution by having average score 3.72. The perception of respondents in terms of the pollutant from the roadway can contribute to respiratory disease and symptom has highest score (4.47) and followed by the perception of respondents in terms of from your work on the road, you highly expose the pollutants (4.44). This finding was correspond to Catalán-Vázquez (2009) mentioned that air pollution was perceived as serious/very serious from the students in Mexico City.

### 5.3.2 The perception on health effect

The respondents mostly agreed with air pollution by having average score 3.87. The perception of respondents in terms of from they had high risk of lung cancer (4.33) and followed by they had the high risk of respiratory disease and symptom. (4.32).

### 5.3.3 The perception on air pollution prevention

The respondents mostly agreed with air pollution by having average score 3.94. The perception of respondents in terms of it is necessary to wear respiratory protective equipment when you work on the road. (4.48) and followed by traffic police who work on the streets have higher risk of respiratory diseases than the police work as administrator in the office. (4.43).

### 5.2.4 The level of the perception

The respondents generally had got moderate perception which the score varied from 43 to 75 with average score of  $58.97 \pm 6.75$ . Moreover, the respondents had high level (44.4%) and low level (2.7%)

Consequently, from the perception on air pollution, health effect and self-prevent results, it showed that the respondents had moderate and good perception with adverse health effect relates to air pollution of traffic policemen in Bangkok. As, There were a very few person that had a good perception. The perception was assumed that the respondents mostly good perception about the air pollution that had enormous adverse effect on their respiratory system and how to prevent themselves from air pollution. This finding was consist with the finding of Pannipa (2013), who stated that most of motorcycle taxi driver in Bangkok area had neutral perceived barriers to prevent environmental lung diseases. Moreover, this result also agreed with Shashidhara.G (2005) who referred there was a relationship between knowledge and practice among

traffic policeman to protect against health hazards generated by traffic air pollution in Bangalore City.

## **5.4 Self-prevention s level from Air pollution**

### 5.4.1 The level of practicing on respiratory protective equipment

The finding shown that the respondents wore face mask equipment while worked sometime to often because the average score was  $3.97 \pm 1.04$ , by followed checked and cleaned face mask before/after used (3.82, 3.61) as well as changed their face mask sometime (3.72). However, the respondents had rarely got the information about how to properly wear a mask from government and the private sector (2.80). Moreover, their agency had purchased the mask. (2.19)

### 5.4.2 The level of practicing on personal hygiene

The respondents sometime had mostly practiced on personal hygiene as washed hand, changed cloth after work, got plenty of rest and ate a variety from each of the five food groups because the average score of practicing on personal hygiene is  $3.63 \pm 0.67$ .

### 5.4.3 The level of practicing on protective behaviors

Most of the respondents had behavior to protect themselves by using face mask and practicing on personal hygiene because average score of practicing on protective behaviors was  $2.67 \pm 0.77$ . There were lowest score as air pollution, health effect and self-prevention training programs (2.36, 2.39).

#### 5.4.4 The level of self-prevention from air pollution

The respondents generally have got moderate self-prevention which the score varied from 35 to 96 with average score of  $63.11 \pm 11.7$ . Moreover, the respondents had high level (44.4%) and low level (2.7%)

Thus, self-prevention had score varies from 35 to 96, which had average score of  $63.11 \pm 11.7$ . The finding found that 53.8% of respondents either moderate prevention and 43% of good prevention toward adverse health effect relates to air pollution. Only 3.1% of respondent have poor prevention. The self-prevention was assumed that mostly respondent had good behavior on self-prevention, Although, It had some respondents had poor prevention that should been improved. This finding was agree with the finding of Pannipa (2013), who stated that the majority of motorcycle taxi driver in Bangkok area had neutral preventive environmental lung disease. This finding was also correspond to Nareerat (2000), who mentioned that the Thai Red Cross Society College of nursing students had a medium level of practice concerning prevention of air pollution in Bangkok Metropolitan.

#### 5.5 The association between socio demographic factors and self-prevention

In this study, the researcher used chi-square to assess the association between socio demographic factors and self-prevention. The result of this study interpreted that there partially were at 0.05 significant level in terms of education level, frequency of exercise, having chronic disease, information about air pollution and health effect and Training on prevention of air pollution as 0.011, 0.001, 0.028, 0.011 and 0.005, respectively. Moreover, this study had been discussed by each individual issue as follows.

##### 1. The Education Level

From the survey, the certificate education level had the percentage and the number of not concern self-prevention respondent more than other education level

(50.6%). The diploma education level had the most percentage on neutral self-prevention respondent (62.1%) The master's degree had the most percentage on concern self-prevention respondent (21.4%)

Consequently, the education level was assumed that the higher education will have more self-prevent behavior than the lower education. The higher group education got more or less the information about air pollution, health effect and self-prevention from their education that provided them with good behavior. Therefore, additional measures should be taken to reduce the gap between respondent's educations in order to the respondent who is in lower group education will have better behavior on self-prevention. This finding was agree with the finding of Hannah (2009), who stated that in the higher educated of respondents from Queensland, Australia were more likely to accept air pollution harmed their health during their work-related commute when compared to respective referent categories ( $p < 0.05$ ). This finding also agreed with Rui (2015), who mentioned that there were the relationship between the educational level of parent's respondent and the knowledge toward air pollution in children's respiratory health. Moreover, it also related with Hannah M. (2009) mentioned that those higher educated were more recognize to the air pollution which harmed respiratory during their work-related commute ( $p < 0.05$ ).

## 2. Frequency of exercise

From the survey, the respondent who never been exercised had the percentage and the number of not concern self-prevention respondent more than other group (55.2%). The respondent who exercised 4-6 days/week had the most percentage on neutral self-prevention respondent (75%) The respondent who exercised 4-6 days/week had the most percentage on concern self-prevention respondent (20.8%)

Consequently, the frequency of exercise were assumed that the person with more frequency of exercise was rather than a behavior to protect themselves from air pollution than people with less frequency of exercise. Thereby, if we want to improve the self-prevention behavior of the respondents, it should has health promotion program



that affect self-prevention the most. Moreover, additional measures should be provided health promotion program for respondents who has less exercise in order to have better behavior to protect themselves from air pollution.

### 3. Having chronic disease

From the survey, the respondent who has chronic disease had the percentage of not concern self-prevention respondent more than the respondent who has not chronic disease (45.6%). The respondent who has chronic disease had the percentage of neutral self-prevention respondent more than the respondent who has not chronic disease (54.4%). The respondent who has not chronic disease had the percentage of concern self-prevention respondent more than the respondent who has chronic disease (11.4%)

Thus, having chronic disease was assumed that the respondent who did not has chronic disease had better behavior to protect themselves from air pollution than the respondent who has chronic disease. The first priority group that we had to focus on was the respondent who has chronic disease in order to make them had better self-prevention behavior. This finding agreed with the finding of Torstem (1991), who stated that the lung disease of resident's participants in the Copenhagen area less willing to avoid car driving in terms of pollution alerts than healthy participants.

### 4. To get the information about air pollution and health effect from government organizations during one year ago

From the survey, the respondent who did not get information about air pollution and health had the percentage of not concern self-prevention respondent more than the respondent who got information about air pollution and health (45.3%). The respondent who got information about air pollution and health has the percentage of neutral self-prevention respondent more than the respondent who did not get information about air pollution and health (54.8%). The respondent who got information about air pollution and health has the percentage of concern self-prevention respondent more than the respondent who did not get information about air pollution and health (16.1%).

According to Viyada (2009), which mentioned that there were 63.3% of the Suratthani traffic policemen who never have trained on traffic air pollution. From the survey, it found that the respondent who got about air pollution and health effect from government organizations during one year ago, they had better self-prevention.

5. Training on self-prevention from air pollution from Government organizations during one year ago.

From the survey, the respondent who had not trained on prevention of air pollution had the percentage of not concern self-prevention respondent more than the respondent who had trained on prevention of air pollution (45.2%). The respondent who had trained on prevention of air pollution had the percentage of neutral self-prevention respondent more than the respondent who had not trained on prevention of air pollution (54.4%). The respondent who had trained on prevention of air pollution had the percentage of concern self-prevention respondent more than the respondent who had not trained on prevention of air pollution (17.5%). As the result, it found that the respondent who had trained on prevention of air pollution, they had better self-prevention.

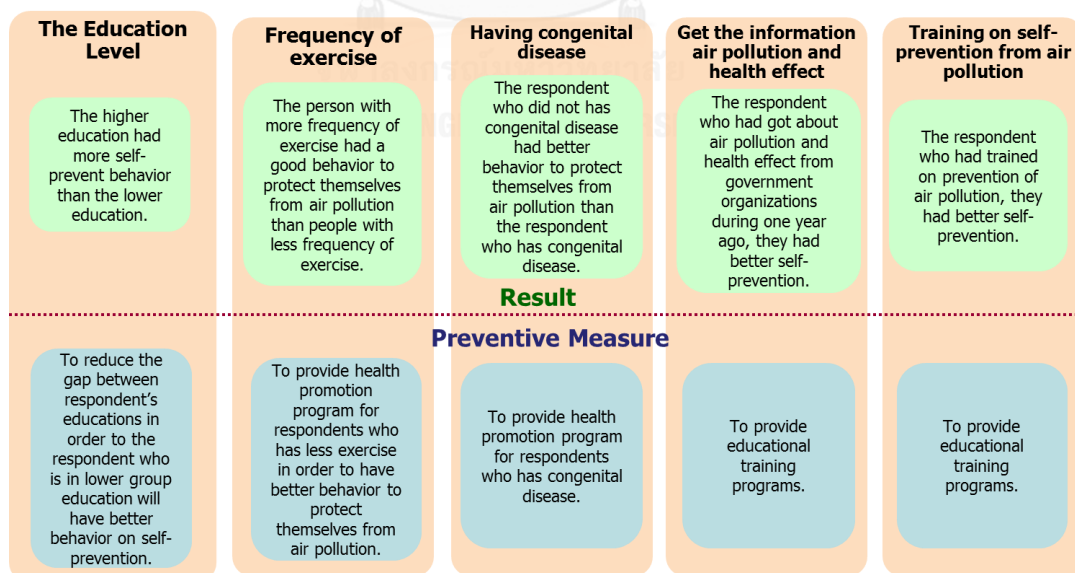


Figure 8 Conclusion of the association between socio-demographic factors and self-prevention.

### **5.6 The association between knowledge and perception of adverse health effect**

In this study, the researcher used chi-square to evaluate the association between knowledge and perception of adverse health effect. The result of this study interpreted that there were association between knowledge and perception of adverse health effect because p-value was 0.001 at 0.05 significant level. This association agreed with Rui (2015) mentioned that there were positive correlation between knowledge and attitude of children's respiratory health in Shanghai, China (spearman rank correlation were 0.40 at  $p - \text{valve} < 0.01$ ) and also agreed with to Nareerat (2000) said that there were positive correlation between attitude and practices air pollution at the 0.05 significant level.

The respondent who had low knowledge had the percentage of poor perception respondent more than other groups (13.2%). The respondent who had moderate knowledge had the percentage of moderate perception respondent more than other groups (57.4%). The respondent who had high knowledge had the percentage of good perception respondent more than other group (57.4%). Moreover, it showed some respondent had poor perception with misunderstood about the health impacts from air pollution that could be occurred only unhealthy people and the air pollution could not impact on the respiratory system due to immune system. Moreover, some respondents also misunderstood that dust cannot cause adverse health effect such as cells damage in the respiratory system. Thus, the traffic policemen should acquire the information and get training about air pollution and health effect that provide them with more good perception. In conclusion, the more the respondent gets knowledge, the better the respondent has good perception.

### **5.7 The association between knowledge and self-prevention of traffic policemen**

In this study, the researcher used chi-square to assess the association between knowledge and self-prevention of traffic policemen. The result of this study interpreted that there were association between knowledge and perception of adverse health effect

because p-value was 0.001 at 0.05 significant level. This association agreed with Rui (2015), which mentioned that there were positive correlation between knowledge and practice of children's respiratory health in Shanghai, China (spearman rank correlation were 0.37 at  $p - \text{value} < 0.01$ ). Moreover, this result also agreed with Shashidhara.G (2005) who referred there was a relationship between knowledge and practice among traffic policeman to protect against health hazards generated by traffic air pollution in Bangalore City.

The respondent who had moderate knowledge had the percentage of poor self-prevention respondent more than other groups (50.9%). The respondent who had high knowledge had the percentage of moderate self-prevention respondent more than other groups (64.9%). The respondent who had high knowledge had the percentage of good self-prevention respondent more than other group (13%). In addition, it showed some respondent did not know about the benefit and how to select of respiratory protective equipment as well as some respondent did not get the information about how to properly wear a mask from government and the private sector. So, these problems that can bring about the poor self-prevention. As the result, the more the respondent gets knowledge, the better the respondent has good behavior.

### **5.8 The association between perception of adverse health effect and self-prevention of traffic policemen**

In this study, the researcher used Fisher Exact Test to assess the association between perception and self-prevention of traffic policemen. The result of this study interpreted that there were association between perception and self-prevention because p-value was above 0.05 at significant level ( $p\text{-value} = 0.043$ ). This association agreed with Pannipa (2013) who mentioned that perceived self-efficacy and perceived benefits were positively significantly correlated with behaviors of health promoting to preventive environmental lung diseases and also agreed with to Nareerat (2000) said there were positive correlation between attitude and practices of air pollution at the 0.05 significant level.

The respondent who had poor perception had the percentage of poor self-prevention respondent more than moderate and good self-prevention (83.3%). The respondent who had moderate and good perception had the percentage of moderate and good self-prevention respondent more than poor self-prevention (60.4%). Furthermore, it showed some respondents had low perception which resulted in poor self-prevention because they perceived that it was not necessary to use face mask because it was able to little filter dust. Thus, related organizations should provide awareness program and training as well as provide adequate respiratory protective equipment (Face Mask) to make traffic policemen have more appropriate prevention behaviors. Consequently, when the policemen have good perception, it will provide good self-prevention behavior.



## CHAPTER 6

### CONCLUSION AND RECOMMENDATION

#### 6.1 Conclusions

This study was about assessment of knowledge and perception of adverse health effects associated with self-prevention from air pollutions in traffic policemen in Bangkok, Thailand. It was summarized that the standardized questionnaire was completed by random sampling and self-administrated questionnaire from 223 traffic policemen. The outcomes showed that approximately 100% of traffic policemen were male and 45.7% of their ages were in the range of 41-50 years old. 44.4% of traffic policemen had educated in bachelor's degree. 54.7% of traffic policemen had exercised 1-3 days/week. 74.4% of traffic policemen did not have chronic disease. 57% of traffic policemen did not have smoking behavior. 72.2% of traffic policemen had not got information about air pollution and health effect from government organizations during one year ago. 74.4% of traffic policemen had got training on self-prevention from air pollution from government organizations during one year ago.

From the result of chi-square statistic test, the socio-demographic was associated with self-prevention from air pollution ( $p$ -value  $< 0.05$ ) such as education level, frequency of exercise, having chronic disease, have ever got Information about air pollution and health effect and had got training on prevention of air pollution.

The knowledge and perception of adverse health effects associated with self-prevention from air pollutions in traffic policemen were tested the relationship with chi-square statistic test. The association between the knowledge and perception of adverse health effect had  $p$ -value = 0.001 and  $\chi^2 = 20.997$ . It showed that there were relationship between knowledge and perception as well as most of the respondents had moderate with neutral perception (57.4%). Additionally, the association between knowledge and self-prevention of traffic policemen in Bangkok had  $p$ -value = 0.001 and  $\chi^2 = 17.78$ . It

showed that there were relationship between knowledge and self-prevention as well as most of the respondents had high knowledge with neutral self-prevention (64.9%). Finally, the association between perception and self-prevention of traffic policemen in Bangkok had  $p\text{-value} = 0.043$ . It demonstrated that there were relationship between perception and self-prevention.

## 6.2 Recommendations and suggestions

The self-prevention and the personal hygiene as well as protective behaviors, it would be assist the traffic policemen to improve a better occupational health as well as quality of life. Therefore, there are an essential for improving self-prevention behaviors to ensure the traffic policemen to have these behaviors effectively. An appropriated policy on the fundamental of findings research experience in this study, it should be regarded for improving the knowledge and perception of adverse health effects associated with self-prevention from air pollutions in traffic policemen as follows,

1. Local authority should operate to enhance knowledge and awareness of traffic policeman as
  - To have job and working area rotation to prevent policemen who work in high risk area can rotate to other areas.
  - To provide learning project and health promotion particularly in chronic disease and the disease can occur from their work. In addition, everyone should be involved in every activities to make safety culture in their organization.
  - Preparation of media awareness that should be interesting and have many patterns due to the variety of age and work experience gaps.
  - To build safety culture in organization in terms of self-prevention practice from air pollution during work on the road.

- Establishing a mentor system to provide new traffic policemen with work instruction of working on the road and advice to protect themselves from air pollution.
2. Health education is essential to address the knowledge gap revealed in the study. The educational training programs should be organized and providing curriculum training program about air pollution, health effect and self-prevention. The curriculum training program have to appropriate for each age, work experience and rank order as well as the training programs should emphasis mainly on increasing the awareness of traffic policeman.
  3. Prevention and control disease department should support traffic policemen know the prevalence of occupational disease's traffic policemen and provide the air pollution information in order to encourage traffic policemen.
  4. Government should regulate and promote various activities to resolve the environmental problems. Environmental issues are regularly tracked continuously and inform the progress to the public from time to time as following items.
    - To develop the effective public transportation system in order to make drive less and carpooling or using more public transit.
    - Established bike lane and pedestrian lane as well as promote the walk bike run Campaign in order to reduce a private vehicle usage.
    - To develop environmentally-friendly transportation system usage, especially use alternative fuel and advances technology car.
    - Increased monitoring construction control on the roadside.



### **6.3 Limitations**

This study was random conducted for specific traffic policemen only from 11 police stations in four district in Bangkok. Therefore, it may not be represented as traffic policemen in Thailand.

The biases of self- administrated report should also be recognized because the traffic policemen may not tell the truth to the researcher.

### **6.4 Further study**

This study was reported on knowledge and perception of adverse health effects associated with self-prevention from air pollution in traffic policemen, Bangkok. Future recommended should study about health risk assessment of policemen to estimate the exposure of traffic air pollution and should be focused on health disease, health risk checkup especially lung capacity and behavior change to improve the reliable and effective implementation program to avoid adverse health effects. Moreover, further study may concern about the type of face mask that the policeman should to wear and may focus on every traffic pollutants that harm the respiratory system.

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## APPENDIX



จุฬาลงกรณ์มหาวิทยาลัย  
CHULALONGKORN UNIVERSITY

**Appendix A:**  
**Questionnaires in English Version**

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**Description**

1. The Questionnaires consisted with 4 parts.

Part 1: Socio-demographic factors (15 questions)

Part 2: The knowledge relates to air pollution of traffic policemen in Bangkok.  
(15 questions)

Part 3: The perception of adverse health effect relates to air pollution of traffic policemen in Bangkok. (15 questions)

Part 4: The self-prevention from air pollution of traffic policemen in Bangkok.  
(20 questions)

2. Your answers are strictly confidential. The results from this research are mentioned as overall performance; any personal information is not disclosed.

3. Place ( / ) in the box that you choose

4. Using 30 minutes to take this questionnaires

Thank you.

No. ....

**Part 1: Individual Factors and socio-demographic information**

Please / in the box of the selected answer.

No.	Topic
1	Gender <input type="checkbox"/> Male <input type="checkbox"/> Female
2	Age ..... Years old.
3	Education Level <input type="checkbox"/> Certificate <input type="checkbox"/> Diploma <input type="checkbox"/> Bachelor's Degree <input type="checkbox"/> Master's Degree
4	I have you been work as traffic policeman.....years.....months.
5	Salary per month <input type="checkbox"/> < 15,000 Bath <input type="checkbox"/> 15,000 – 20,000 Bath <input type="checkbox"/> 20,000 – 25,000 Bath <input type="checkbox"/> 25, 000 – 30,000 Bath <input type="checkbox"/> > 30,000 Bath
6	I work..... hours per day on the road.
7	The number of days that you work on the road per week. <input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3 Days <input type="checkbox"/> 4 Days <input type="checkbox"/> 5 Days <input type="checkbox"/> 6 Days
8	How often do you do exercise?



	<input type="checkbox"/> Never <input type="checkbox"/> 1 - 3 days/week <input type="checkbox"/> 4 -6 days/week <input type="checkbox"/> Everyday
9	When do you have last health checkup by doctor? <input type="checkbox"/> 6 months ago <input type="checkbox"/> > 6 months - 1 year ago <input type="checkbox"/> > 1 year ago <input type="checkbox"/> Have not Examination
10	Do you have a chronic disease? <input type="checkbox"/> No <input type="checkbox"/> Yes, please specify .....
11	Do you have / had respiratory symptoms or disease? If you have / had, please select. <input type="checkbox"/> No <input type="checkbox"/> Yes, - Allergy - Bronchitis - Others, please specify..... - Asthma - Pneumonia
12	Do you smoke? Please choose how often? <input type="checkbox"/> Never smoked (Go to question 15) <input type="checkbox"/> Had quit smoking for at .....Year ..... months (Go to question 15) <input type="checkbox"/> Smoking - Every day - Not every day
13	How many you smoke a cigarette per day? <input type="checkbox"/> 1 - 10 Rolls <input type="checkbox"/> 11 - 20 Rolls <input type="checkbox"/> 21 - 30 Rolls <input type="checkbox"/> 31 - 40 Rolls

14	<p>Have you ever got information about air pollution and health effect from Government organizations during one year ago?</p> <p><input type="checkbox"/> NO</p> <p><input type="checkbox"/> Yes</p>
15	<p>Have you ever got training on self-prevention from air pollution from Government organizations during one year ago?</p> <p><input type="checkbox"/> NO</p> <p><input type="checkbox"/> Yes</p>

**Part 2:** The knowledge relates to air pollution of traffic policemen in Bangkok.

No.	Topic
1	<p><u>What is not</u> the main cause of air pollution?</p> <p><input type="checkbox"/> Industries</p> <p><input type="checkbox"/> Agriculture</p> <p><input type="checkbox"/> Traffic</p> <p><input type="checkbox"/> Commercial and residential heating</p>
2	<p>What is the main cause of air pollution in communities?</p> <p><input type="checkbox"/> Sewage</p> <p><input type="checkbox"/> Vehicle uses</p> <p><input type="checkbox"/> Smoke from industrial facilities</p> <p><input type="checkbox"/> Natural phenomena</p>
3	<p>What are the components of the air pollution?</p> <p><input type="checkbox"/> Suspended particulate material</p> <p><input type="checkbox"/> Carbon dioxide</p> <p><input type="checkbox"/> Ozone</p> <p><input type="checkbox"/> All the above</p>
4	<p>What is traffic pollution?</p> <p><input type="checkbox"/> Polluting the air with automobile emission.</p> <p><input type="checkbox"/> Polluting the air from industrial.</p> <p><input type="checkbox"/> Polluting the air from household.</p>

	<input type="checkbox"/> Polluting the air from burning garbage.
5	<p>Which type of vehicle can cause traffic air pollution mostly?</p> <input type="checkbox"/> Electric vehicle <input type="checkbox"/> Solar vehicle <input type="checkbox"/> Diesel vehicle <input type="checkbox"/> Hydropower vehicle
6	<p>What is the reason that results in the air quality excess the standard from vehicle?</p> <input type="checkbox"/> Low quality fuel <input type="checkbox"/> Lack of maintenance of vehicle <input type="checkbox"/> Down old car <input type="checkbox"/> All the above
7	<p>What is the air pollutant that found to be the main problem and exceeding standards in Bangkok?</p> <input type="checkbox"/> Suspended particulate material <input type="checkbox"/> Oxygen <input type="checkbox"/> Mercury <input type="checkbox"/> Arsenic
8	<p>What is route that the air pollution can pass through the body?</p> <input type="checkbox"/> Ingestion <input type="checkbox"/> Inhalation and Ingestion <input type="checkbox"/> Dermal, Inhalation and Ingestion <input type="checkbox"/> Is not able into the body
9	<p>What part of the respiratory that filter a large particulate matter?</p> <input type="checkbox"/> Nose <input type="checkbox"/> Pharynx <input type="checkbox"/> Lung <input type="checkbox"/> Alveolus
10	<p>What is the effect of long term suspended particulate material exposure?</p> <input type="checkbox"/> Diarrhea

	<input type="checkbox"/> Have a fever, chills <input type="checkbox"/> Respiratory problems <input type="checkbox"/> Rash on the body
11	<p>What is the most suitable type of respiratory protective equipment to traffic policemen?</p> <input type="checkbox"/> Handkerchief <input type="checkbox"/> Use a hands-off <input type="checkbox"/> Cotton face Mask <input type="checkbox"/> Particulate Filter Respirator
12	<p>When respiratory protective equipment should be used?</p> <input type="checkbox"/> During every day duty <input type="checkbox"/> Sometimes if desired <input type="checkbox"/> When heavy smoke <input type="checkbox"/> When traffic jam
13	<p>How to check the respiratory protective equipment before wearing?</p> <input type="checkbox"/> Check whether the elastic band is proper <input type="checkbox"/> Check whether respiratory protective equipment is torn. <input type="checkbox"/> Cleaned after every use. <input type="checkbox"/> All the above.
14	<p>What is not the beneficial of face mask while work on the road?</p> <input type="checkbox"/> Prevent dust <input type="checkbox"/> Prevent car exhaust fumes <input type="checkbox"/> Prevent vapors of various chemicals <input type="checkbox"/> Prevent the pathogen
15	<p>What are methods to solve the problem of particulate matter?</p> <input type="checkbox"/> Legislation Vehicle emissions that exceed the standard. <input type="checkbox"/> Preventing the spread of dust from the activities. <input type="checkbox"/> Providing new technology to control the source. <input type="checkbox"/> All the above.

**Part 3:** The perception of adverse health effect relates to air pollution of traffic policemen in Bangkok.

NO	Topic	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Traffic is the main cause of air pollution.					
2	The pollutant from the roadway can contribute to respiratory disease and symptom.					
3	Inhalation of dust, soot and the exhaust during the operation regularly don't have impact on the body because the body has immune system.					
4	Respiratory disease caused by the inhalation of air pollution from traffic. It will happen only to unhealthy people only.					
5	From your work on the road, you highly expose the pollutants?					
6	From your work on the road for long time, you have high risk of lung cancer.					
7	While working on the street, you have dizziness, nausea and vomiting from inhaling air pollution from traffic					
8	Dust can only cause coughing, sneezing, stuffy nose. Therefore, you don't have concerns about working on the road.					

9	You have the high risk of respiratory disease and symptom.					
10	It is necessary to wear respiratory protective equipment when you work on the road.					
11	Working for a long time without a face mask can cause dizziness, nausea, vomiting.					
12	Using face masks while working on the road makes uncomfortable to breath, but it makes feel safe from air pollution					
13	Using face masks can avoid respiratory diseases such as bronchitis , asthma, bronchitis , lung cancer					
14	It is not necessary to use face mask because it is able to little filter dust					
15	Traffic police who work on the streets have higher risk of respiratory diseases than the police work as administrator in the office.					

**Part 4:** The self-prevention from air pollution of traffic policemen in Bangkok.

NO	Topic	Always	Often	Sometime	Rarely	Never
1	<u>Respiratory Protective Equipment (Face Mask)</u>					

	Wear Face Mask equipment while working					
2	Check respiratory protective equipment before using.					
3	You Regularly clean your mask before / after use.					
4	How often do you change your respiratory protective equipment?					
5	Wearing face mask interferes with routine talking in walky-talky.					
6	While working, you do not wear a mask because it is difficult to perform traffic work.					
7	You always get the information about how to properly wear a mask from government and the private sector.					
8	Your agency will be out the cost of purchasing the mask.					
9	<u>Personal hygiene</u> Wash hands and face with soap before eating and preparing food					
10	Change a dirty cloth after work					
11	Got plenty of rest (8 to 10 hours per night)					

12	you daily eat a variety from each of the five food groups.					
13	<u>Protective behaviors</u> How often do you smoke while working?					
14	How often do you do you check up your health?					
15	How often do you have the annual pulmonary checkup?					
16	When you have difficulty breathing or chest pain, You will immediately see a doctor					
17	After working on the road, you notice that you will have dizziness, nausea, vomiting, difficulty breathing, chest pain every time.					
18	You've been trained to know about air pollution and health effects.					
19	You've been trained to know how to protect yourself from respiratory disease					
20	You ever find a book to read articles on the subject of air pollution more.					



## Appendix B:

### Questionnaires in Thai Version

แบบสอบถามความรู้การรับรู้ผลกระทบเชิงลบต่อสุขภาพและการป้องกันตนเองจากมลภาวะทาง  
อากาศของตำรวจจราจรในกรุงเทพมหานคร

#### คำชี้แจง

1. แบบสอบถามนี้ แบ่งออกเป็นทั้งหมด 4 ส่วน ดังนี้

ส่วนที่ 1 ข้อมูลทั่วไป จำนวน 15 ข้อ

ส่วนที่ 2 แบบสอบถามประเมินด้านความรู้ด้านมลภาวะทางอากาศจากการจราจร  
ของตำรวจจราจรในกรุงเทพมหานครจำนวน 15 ข้อ

ส่วนที่ 3 แบบสอบถามประเมินการรับรู้ผลกระทบเชิงลบต่อสุขภาพที่ด้านมลภาวะ  
ทางอากาศของตำรวจจราจรในกรุงเทพมหานคร จำนวน 15 ข้อ

ส่วนที่ 4 แบบสอบถามประเมินเกี่ยวกับการป้องกันตนเองจากมลภาวะทางอากาศ  
ของตำรวจจราจรในกรุงเทพมหานคร จำนวน 20 ข้อ

2. ข้อมูลการตอบแบบสอบถามของท่านจะเก็บเป็นความลับ ซึ่งการเสนอผลการวิจัยจะมีการ  
นำเสนอเป็นภาพรวม ข้อมูลที่สามารถระบุถึงตัวผู้กรอกแบบสอบถามจะไม่ปรากฏในรายงาน

3. ให้ใส่เครื่องหมาย (/) ลงใน  ที่เลือก

4. กรุณาใช้เวลาทำแบบสอบถาม 30 นาที

ขอขอบคุณเป็นอย่างสูง

ลำดับที่.....

## ส่วนที่1: ข้อมูลทั่วไป

โปรดใส่เครื่องหมาย (/) ลงใน  ที่ตรงกับความเป็นจริง

ลำดับ	หัวข้อ
1	เพศ <input type="checkbox"/> ชาย <input type="checkbox"/> หญิง
2	อายุ ..... ปี
3	ระดับการศึกษา <input type="checkbox"/> ประกาศนียบัตร <input type="checkbox"/> อนุปริญญา <input type="checkbox"/> ปริญญาตรี <input type="checkbox"/> ปริญญาโท
4	คุณปฏิบัติงานด้านการจรรยาเป็นระยะเวลาจนถึงปัจจุบัน.....ปี .....เดือน
5	เงินเดือนต่อเดือน <input type="checkbox"/> < 15,000 บาท <input type="checkbox"/> 15,000 – 20,000 บาท <input type="checkbox"/> 20,000 – 25,000 บาท

	<input type="checkbox"/> 25,000 – 30,000 บาท <input type="checkbox"/> > 30,000 บาท
6	จำนวนชั่วโมงการปฏิบัติหน้าที่บนท้องถนนต่อวัน โดยเฉลี่ย เป็นเวลา..... ชั่วโมง.....นาที
7	จำนวนวันที่ทำงานอยู่บนท้องถนนต่อสัปดาห์ <input type="checkbox"/> 1 วัน <input type="checkbox"/> 2 วัน <input type="checkbox"/> 3 วัน <input type="checkbox"/> 4 วัน <input type="checkbox"/> 5 วัน <input type="checkbox"/> 6 วัน <input type="checkbox"/> มากกว่าหรือเท่ากับ 7 วัน
8	ออกกำลังกายอย่างต่อเนื่องมากกว่า 30 นาทีโดยบ่อยแค่ไหน? <input type="checkbox"/> ไม่ออกกำลังกาย <input type="checkbox"/> 1 - 3 วันต่อสัปดาห์ <input type="checkbox"/> 4 - 6 วันต่อสัปดาห์ <input type="checkbox"/> ทุกวัน
9	คุณได้เข้ารับการตรวจสุขภาพโดยแพทย์ครั้งสุดท้าย เมื่อไร ? <input type="checkbox"/> 6 เดือนที่ผ่านมา



	<input type="checkbox"/> 1 - 10 มวน <input type="checkbox"/> 11 - 20 มวน <input type="checkbox"/> 21 - 30 มวน <input type="checkbox"/> 31 - 40 มวน <input type="checkbox"/> มากกว่า 40 มวน
14	<p>คุณเคยได้รับข้อมูลข่าวสารเรื่องมลภาวะทางอากาศและผลกระทบต่อสุขภาพจากองค์กรภาครัฐในช่วงเวลา 1 ปีที่ผ่านมาหรือไม่</p> <input type="checkbox"/> ไม่เคย <input type="checkbox"/> เคย
15	<p>คุณเคยได้รับการอบรมเรื่อง วิธีป้องกันตนเองจากมลภาวะทางอากาศ ในช่วงเวลา 1 ปีที่ผ่านมาหรือไม่</p> <input type="checkbox"/> ไม่เคย <input type="checkbox"/> เคย

ส่วนที่ 2 : แบบสอบถามประเมินด้านความรู้ด้านมลภาวะทางอากาศจากการจราจรของตำรวจจราจร

ในกรุงเทพมหานคร

คำชี้แจง โปรดทำเครื่องหมาย / ลงในช่องว่างตรงตามความเป็นจริง

ลำดับ	หัวข้อ
1	ข้อใดไม่ได้เป็นสาเหตุหลักของมลพิษทางอากาศในชุมชนเมือง

	<input type="checkbox"/> อุตสาหกรรม <input type="checkbox"/> เกษตรกรรม <input type="checkbox"/> การจราจร <input type="checkbox"/> การเผาไหม้จากที่อยู่อาศัยและเชิงพาณิชย์
2	<p>ข้อใดเป็นแหล่งที่ก่อให้เกิดมลพิษทางอากาศในแถบชุมชนเมืองมากที่สุด</p> <input type="checkbox"/> จากการสะสมของสิ่งปฏิกูล <input type="checkbox"/> ยานพาหนะที่ใช้เครื่องยนต์ <input type="checkbox"/> จากการทำเกษตรกรรม <input type="checkbox"/> จากปรากฏการณ์ธรรมชาติ
3	<p>ข้อใดคือส่วนประกอบของมลพิษทางอากาศ</p> <input type="checkbox"/> ฝุ่นละอองขนาดเล็ก <input type="checkbox"/> ก๊าซคาร์บอนมอนอกไซด์ <input type="checkbox"/> เบนซิน <input type="checkbox"/> ถูกทุกข้อ
4	<p>มลพิษการจราจรคืออะไร</p> <input type="checkbox"/> มลพิษทางอากาศที่มีเกิดจากเผาไหม้ของรถยนต์ <input type="checkbox"/> มลพิษในโรงงานอุตสาหกรรม <input type="checkbox"/> มลพิษจากครัวเรือน <input type="checkbox"/> มลพิษทางอากาศจากการเผาไหม้ขยะ

5	<p>ประเภทของยานพาหนะใดที่สามารถก่อให้เกิดมลพิษทางอากาศการจราจรมากที่สุด</p> <p><input type="checkbox"/> รถยนต์ที่ใช้พลังงานไฟฟ้า</p> <p><input type="checkbox"/> รถยนต์ที่ใช้พลังงานแสงอาทิตย์</p> <p><input type="checkbox"/> รถยนต์ที่ใช้น้ำมัน</p> <p><input type="checkbox"/> รถยนต์ที่พลังน้ำ</p>
6	<p>ข้อใดคือเหตุผลที่ทำให้รถยนต์ก่อให้เกิดคุณภาพอากาศเกินมาตรฐาน</p> <p><input type="checkbox"/> น้ำมันเชื้อเพลิงที่มีคุณภาพต่ำ</p> <p><input type="checkbox"/> ขาดการบำรุงรักษาของรถ</p> <p><input type="checkbox"/> รถสภาพเก่า</p> <p><input type="checkbox"/> ถูกทุกข้อ</p>
7	<p>สารมลพิษทางอากาศการจราจรใดที่พบว่าเป็นปัญหาหลักและเกินมาตรฐานในกรุงเทพมหานคร</p> <p><input type="checkbox"/> ฝุ่นละอองขนาดเล็ก</p> <p><input type="checkbox"/> ออกซิเจน</p> <p><input type="checkbox"/> พรอท</p> <p><input type="checkbox"/> สารหนู</p>
8	<p>มลพิษทางอากาศสามารถเข้าสู่ร่างกายได้เส้นทางใดบ้าง</p> <p><input type="checkbox"/> การกลืนกิน</p> <p><input type="checkbox"/> การสูดดมและการกลืนกิน</p>

	<input type="checkbox"/> ผิวหนัง, การสูดดมและการกลืนกิน <input type="checkbox"/> ไม่สามารถสร้างรายได้
9	<p>ส่วนใดของร่างกายทำหน้าที่กรองฝุ่นละอองที่มีขนาดใหญ่</p> <input type="checkbox"/> ขนจมูก <input type="checkbox"/> คอหอย <input type="checkbox"/> ปอด <input type="checkbox"/> ถุงลม
10	<p>ข้อใดคือผลกระทบของการรับสัมผัสฝุ่นละอองเป็นระยะเวลานาน</p> <input type="checkbox"/> ท้องเสีย <input type="checkbox"/> เป็นไข้ หนาวสั่น <input type="checkbox"/> มีปัญหาทางเดินหายใจ <input type="checkbox"/> ผื่นขึ้นตามตัว
11	<p>ข้อใดชนิดของอุปกรณ์ปกป้องมลพิษจากการฝุ่นละอองการจราจรเหมาะสมที่สุด</p> <input type="checkbox"/> ผ้าเช็ดหน้า <input type="checkbox"/> ไข่มือปิด <input type="checkbox"/> หน้ากากอนามัยที่ทำจากผ้า <input type="checkbox"/> หน้ากากชนิดเปลี่ยนไส้กรอง
12	<p>ตำรวจจราจรควรใช้อุปกรณ์ป้องกันทางหายใจในการปฏิบัติงานเมื่อไร</p> <input type="checkbox"/> ในระหว่างการปฏิบัติหน้าที่ทุกวัน



	<input type="checkbox"/> บางครั้งหากต้องการใช้ <input type="checkbox"/> เมื่อมีปริมาณคว้นมาก <input type="checkbox"/> เมื่อมีการจราจรคับคั่ง
13	<p>ข้อใดคือการใช้อุปกรณ์ป้องกันทางหายใจได้อย่างถูกต้อง</p> <input type="checkbox"/> ตรวจสอบยางรัดก่อนใช้งานทุกครั้ง <input type="checkbox"/> ตรวจสอบอุปกรณ์ป้องกันทางว่าหายใจสนิทขาดหรือไม่ก่อนใช้งานทุกครั้ง <input type="checkbox"/> ทำความสะอาดหลังการใช้งานทุกครั้ง <input type="checkbox"/> ถูกทุกข้อ
14	<p>ข้อใดเป็นไม่ใช่ประโยชน์ของอุปกรณ์ป้องกันระบบทางเดินหายใจ ขณะทำงานบนท้องถนน?</p> <input type="checkbox"/> ป้องกันฝุ่นละออง <input type="checkbox"/> ป้องกันควันไอเสียรถ <input type="checkbox"/> ป้องกันไอระเหยของสารเคมีต่างๆ <input type="checkbox"/> ป้องกันการติดเชื้อ
15	<p>ข้อใดคือแนวทางในการแก้ไขปัญหาฝุ่นละออง</p> <input type="checkbox"/> ออกกฎหมายเข้มงวดกับยานพาหนะที่ปล่อยมลพิษเกินค่ามาตรฐาน <input type="checkbox"/> ป้องกันการฟุ้งกระจายของฝุ่นจากกิจกรรมต่างๆ <input type="checkbox"/> จัดหาเทคโนโลยีใหม่ๆ ในการควบคุมแหล่งกำเนิด <input type="checkbox"/> ถูกทุกข้อ

ส่วนที่ 3 : แบบสอบถามประเมินการรับรู้ผลกระทบเชิงลบต่อสุขภาพที่ด้านมลภาวะทางอากาศของ

ตำรวจจราจรในกรุงเทพมหานคร

ลำดับ	หัวข้อ	เห็นด้วย อย่างยิ่ง	เห็น ด้วย	เฉยๆ	ไม่เห็น ด้วย	ไม่เห็น ด้วยอย่าง ยิ่ง
1	การจราจรเป็นสาเหตุหลักของ มลพิษทางอากาศ					
2	มลพิษทางอากาศจากการจราจร ก่อให้เกิดโรคหรือมีอาการทาง ระบบทางเดินหายใจ					
3	การหายใจเอา ฝุ่น เขม่า คาร์บอนจาก ไอเสียรถยนต์ระหว่างการ ปฏิบัติงาน อย่างเป็นประจำ ไม่ มีผลกระทบต่อร่างกาย เพราะ ร่างกายมีระบบภูมิคุ้มกัน ร่างกาย					
4	โรกระบบทางเดินหายใจที่เกิด จากการสูดดมมลพิษทางอากาศ จากการจราจร จะเกิดขึ้นเฉพาะ					

	กับคนที่มึร่างกายไม่แข็งแรง เท่านั้น					
5	จากงานของคุณคุณมีโอกาสรับ สัมผัสมลพิษทางอากาศสูง					
6	จากการปฏิบัติงานบนท้องถนน เวลานานของคุณมีโอกาเป็น โรคโรคมะเร็งปอด					
7	ขณะปฏิบัติงานบนท้องถนนคุณ เคยมีอาการเวียนศีรษะคลื่นไส้ อาเจียนจากการสูดดมมลพิษ ทางอากาศจากการจราจร					
8	ฝุ่นละอองมีผลทำให้เกิดอาการ คัดจมูก ไอ จาม เพียงเท่านั้น จึง ไม่ต้องกังวลต่อการปฏิบัติงาน บนท้องถนน					
9	คุณมีความเสี่ยงสูงที่จะเป็นโรค หรือมีอาการทางระบบทางเดิน หายใจ					

10	การใช้หน้ากากเป็นสิ่งจำเป็น ขณะปฏิบัติงานด้านการจราจร บนท้องถนน					
11	การปฏิบัติจราจรเป็นเวลานาน โดยไม่ใช้หน้ากาก อาจทำให้ อาการเวียนศีรษะคลื่นไส้ อาเจียน แน่นหน้าอก					
12	การใช้หน้ากากขณะปฏิบัติงาน บนท้องถนนทำให้อึดอัด หายใจ ไม่สะดวกแต่ทำให้รู้สึกป้องกัน ฝุ่นละออง					
13	การใช้หน้ากากสามารถ หลีกเลี่ยงโรกระบบทางเดิน หายใจเช่นโรคหอบหืดอักเสบ, หอบหืดหลอดลม, มะเร็งปอด ได้					
14	การใช้หน้ากากเป็นสิ่งที่ไม่ จำเป็นเนื่องจากสามารถที่จะ กรองฝุ่นละอองได้เพียงเล็กน้อย					
15	ตำรวจจราจรที่ปฏิบัติงานบน ท้องถนนมีความเสี่ยงเป็นโรค					

	ทางเดินหายใจมากกว่าตำรวจที่ ทำหน้าที่ธุรการ					
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ส่วนที่ 4 : แบบสอบถามประเมินเกี่ยวกับการป้องกันตนเองจากมลภาวะทางอากาศของตำรวจจราจร

ในกรุงเทพมหานคร

ลำดับ	หัวข้อ	ทุกครั้ง	บ่อยๆ	บางครั้ง	นาน ๆครั้ง	ไม่เคย
1	<u>อุปกรณ์ป้องกันระบบทางเดิน หายใจ (หน้ากาก)</u> คุณสวมใส่หน้ากากในขณะที่ ปฏิบัติงานจราจรบนท้องถนน					
2	ตรวจสอบหน้ากากก่อนที่จะใช้ เสมอ					
3	คุณทำความสะอาดหน้ากากเป็น ประจำก่อน/หลังใช้เสมอ					
4	คุณเปลี่ยนอุปกรณ์ป้องกันระบบ ทางเดินหายใจของคุณบ่อยแค่ไหน ไหนต่อสัปดาห์					
5	การสวมใส่หน้ากากขณะ ปฏิบัติงานนั้นเป็นอุปสรรคกับ					

	การพูดคุยตามปกติในWalky-Talky					
6	ขณะปฏิบัติงานคุณ ไม่สวมใส่หน้ากากเพราะเป็นอุปสรรคในการปฏิบัติงานจราจร					
7	คุณเคยได้รับข้อมูลเกี่ยวกับวิธีการสวมใส่หน้ากากอย่างถูกวิธีจากภาครัฐและภาคเอกชน					
8	หน่วยงานของคุณ เป็นผู้ออกค่าใช้จ่ายในการจัดซื้อหน้ากาก					
9	<u>สุขอนามัยส่วนบุคคล</u> คุณล้างมือและล้างหน้าด้วยสบู่ก่อนการเตรียมและการรับประทานอาหาร					
10	คุณเปลี่ยนเสื้อผ้าที่สกปรกหลังการทำงานทุกครั้ง					
11	คุณได้รับการพักผ่อนที่เหมาะสม (8 - 10 ชั่วโมงต่อวัน)					
12	คุณรับประทานอาหารเช้าครบ 5 หมู่					
13	<u>พฤติกรรมป้องกัน</u>					

	คุณสูบบุหรี่ในขณะที่ทำงานแต่ละวันบ่อยแค่ไหน					
14	คุณตรวจสอบสภาพประจำปีบ่อยแค่ไหน					
15	คุณตรวจการตรวจสมรรถภาพปอด (เป่าปอด) ประจำปีบ่อยแค่ไหน					
16	เมื่อคุณมีอาการหายใจไม่สะดวก เจ็บหน้าอก คุณจะรีบไปพบแพทย์					
17	หลังปฏิบัติงานทุกครั้ง คุณจะสังเกตว่าตนเองมี อาการวิงเวียนศีรษะ คลื่นไส้ อาเจียน หายใจไม่สะดวก เจ็บหน้าอก					
18	คุณเคยรับการอบรมให้ความรู้เรื่องมลพิษทางอากาศและผลกระทบต่อสุขภาพ					
19	คุณเคยรับการอบรมให้ความรู้วิธีการป้องกันตนเองจากโรค					

	ระบบทางเดินหายใจในการ ทำงานจราจร					
20	คุณเคหาหนังสือบทความใน เรื่องมลพิษทางอากาศมาอ่าน เพิ่มเติม					





## Appendix C: Certificate of Ethic Approval



คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย  
254 อาคารจามจุรี 1 ชั้น 2 ถนนพญาไท เขตปทุมวัน กรุงเทพฯ 10330  
โทรศัพท์/โทรสาร: 0-2218-3202 E-mail: eccu@chula.ac.th

AF 01-12

COA No. 128/2559

### ใบรับรองโครงการวิจัย

โครงการวิจัยที่ 113/59 : การประเมินความรู้และการรับรู้ผลกระทบเชิงลบต่อสุขภาพที่มีผลต่อการ  
ป้องกันตนเองจากมลภาวะทางอากาศของตำรวจจราจรใน  
กรุงเทพมหานคร ประเทศไทย

ผู้วิจัยหลัก : นางสาวศวิมล วรรณาลัย


หน่วยงาน : วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย  
ได้พิจารณา โดยใช้หลัก ของ The International Conference on Harmonization – Good Clinical Practice  
(ICH-GCP) อนุมัติให้ดำเนินการศึกษาวิจัยเรื่องดังกล่าวได้

ลงนาม  ลงนาม   
(รองศาสตราจารย์ นายแพทย์ปรีชา ทิศนประดิษฐ์) (ผู้ช่วยศาสตราจารย์ ดร.นันทรี ชัยชนะงศาโรจน์)  
ประธาน กรรมการและเลขานุการ

วันที่รับรอง : 12 กรกฎาคม 2559 วันหมดอายุ : 11 กรกฎาคม 2560

#### เอกสารที่คณะกรรมการรับรอง

- 1) โครงการวิจัย
- 2) ข้อมูลสำหรับกลุ่มผู้เชี่ยวชาญหรือผู้มีส่วนร่วมในการวิจัยและ ใบยินยอมของกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัย
- 3) ผู้วิจัย  ชื่อที่โครงการวิจัย: 113/59
- 4) แบบสอบถาม วันที่รับรอง: 12 ก.ค. 2559
- เดือนปี: 11 ก.ค. 2560

1. ข้าพเจ้ารับทราบว่าเป็นการสมัครรับพิจารณาโครงการวิจัยก่อนได้รับการอนุมัติจากคณะกรรมการพิจารณาจริยธรรมการวิจัยฯ
2. หากใบรับรองโครงการวิจัยหมดอายุ การดำเนินการวิจัยต้องยุติ เมื่อต้องการต่ออายุต้องขออนุมัติใหม่ล่วงหน้าไม่ต่ำกว่า 1 เดือน หรือยื่นส่งรายงานความก้าวหน้าการวิจัย
3. ต้องดำเนินการติดตามที่ระบุไว้ในโครงการวิจัยอย่างเคร่งครัด
4. ใช้เอกสารข้อมูลสำหรับกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัย ใบยินยอมของกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัย และเอกสารเชิญเข้าร่วมวิจัย (ถ้ามี) เฉพาะที่ประทับตราคณะกรรมการเท่านั้น
5. หากเกิดเหตุการณ์ไม่พึงประสงค์หรือแรงในสถานที่เก็บข้อมูลที่อนุมัติจากคณะกรรมการ ต้องรายงานคณะกรรมการภายใน 5 วันทำการ
6. หากมีการเปลี่ยนแปลงการดำเนินการวิจัย ให้ส่งคณะกรรมการพิจารณาจริยธรรมรับรองก่อนดำเนินการ
7. โครงการวิจัยไม่เกิน 1 ปี สิ้นงบประมาณสิ้นสุดโครงการวิจัย (AF 03-12) และบทกัณฑ์เอกสารวิจัยภายใน 30 วัน เมื่อโครงการวิจัยเสร็จสิ้น สำหรับโครงการวิจัยที่เป็นวิทยานิพนธ์ให้ส่งบทกัณฑ์เอกสารวิจัย ภายใน 30 วัน เมื่อโครงการวิจัยเสร็จสิ้น

AF 02-12



The Research Ethics Review Committee for Research Involving Human Research  
Participants, Health Sciences Group, Chulalongkorn University  
Jamjuree 1 Building, 2nd Floor, Phayathai Rd., Patumwan district, Bangkok 10330, Thailand,  
Tel/Fax: 0-2218-3202 E-mail: [eccu@chula.ac.th](mailto:eccu@chula.ac.th)

COA No. 128/2016

### Certificate of Approval

**Study Title** No. 113/59 : ASSESSMENT OF KNOWLEDGE AND PERCEPTION OF  
ADVERSE HEALTH EFFECTS ASSOCIATED WITH SELF  
PREVENTATION FROM AIR POLLUTION IN TRAFFIC  
POLICEMEN BANGKOK THAILAND

**Principal Investigator** : MISS SASIWIMOL WANNALAI

**Place of Proposed Study/Institution** : College of Public Health Sciences,  
Chulalongkorn University

The Research Ethics Review Committee for Research Involving Human Research  
Participants, Health Sciences Group, Chulalongkorn University, Thailand, has approved  
constituted in accordance with the International Conference on Harmonization – Good Clinical  
Practice (ICH-GCP).

Signature: *P. Sa. Tasanapradit* Signature: *Nuntaree Chaichanawongsaroj*  
(Associate Professor Prida Tasanapradit, M.D.) (Assistant Professor Nuntaree Chaichanawongsaroj, Ph.D.)  
Chairman Secretary

Date of Approval : 12 July 2016

Approval Expire date : 11 July 2017

#### The approval documents including

- 1) Research proposal
- 2) Patient/Participant Information Sheet and Informed Consent Form
- 3) Researcher
- 4) Questionnaire



The approved investigator must comply with the following conditions:

1. The research/project activities must end on the approval expired date of the Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, Chulalongkorn University (RECCU). In case the research/project is unable to complete within that date, the project extension can be applied one month prior to the RECCU approval expired date.
2. Strictly conduct the research/project activities as written in the proposal.
3. Using only the documents that bearing the RECCU's seal of approval with the subjects/volunteers (including subject information sheet, consent form, invitation letter for project/research participation (if available)).
4. Report to the RECCU for any serious adverse events within 3 working days
5. Report to the RECCU for any change of the research/project activities prior to conduct the activities.
6. Final report (AF 03-12) and abstract is required for a one year (or less) research/project and report within 30 days after the completion of the research/project. For thesis, abstract is required and report within 30 days after the completion of the research/project.
7. Annual progress report is needed for a two-year (or more) research/project and submit the progress report before the expire date of certificate. After the completion of the research/project processes as No. 6.

## Appendix D:

ลำดับที่.....

ส่วนที่ 1 : ข้อมูลทั่วไป

โปรดใส่เครื่องหมาย (/) ลงใน  ที่ตรงกับความเป็นจริง

ลำดับ	หัวข้อ
1	เพศ <input type="checkbox"/> ชาย <input type="checkbox"/> หญิง
2	อายุ ..... ปี
3	ระดับการศึกษา <input type="checkbox"/> ประกาศนียบัตร <input type="checkbox"/> อนุปริญญา <input type="checkbox"/> ปริญญาตรี <input type="checkbox"/> ปริญญาโท
4	คุณปฏิบัติงานด้านการจราจรมาเป็นระยะเวลาจนถึงปัจจุบัน.....ปี.....เดือน
5	เงินเดือนต่อเดือน <input type="checkbox"/> < 15,000 บาท <input type="checkbox"/> 15,000 – 20,000 บาท <input type="checkbox"/> 20,000 – 25,000 บาท <input type="checkbox"/> 25, 000 – 30,000 บาท <input type="checkbox"/> > 30,000 บาท
6	จำนวนชั่วโมงการปฏิบัติหน้าที่บนท้องถนนต่อวันโดยเฉลี่ย เป็นเวลา.....ชั่วโมง.....นาที
7	จำนวนวันที่ทำงานอยู่บนท้องถนนต่อสัปดาห์ <input type="checkbox"/> 1 วัน <input type="checkbox"/> 2 วัน <input type="checkbox"/> 3 วัน <input type="checkbox"/> 4 วัน <input type="checkbox"/> 5 วัน <input type="checkbox"/> 6 วัน <input type="checkbox"/> มากกว่าหรือเท่ากับ 7 วัน



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	<input type="checkbox"/> ไม่เคย <input type="checkbox"/> เคย
15	คุณเคยได้รับการอบรมเรื่อง ผลกระทบต่อสุขภาพและวิธีป้องกันตนเองจากมลภาวะทางอากาศ ในช่วงเวลา 1 ปีที่ผ่านมาหรือไม่ <input type="checkbox"/> ไม่เคย <input type="checkbox"/> เคย

ส่วนที่ 2 : แบบสอบถามประเมินด้านความรู้ด้านมลภาวะทางอากาศจากการจราจรของตำรวจจราจรในกรุงเทพมหานคร  
 คำชี้แจง โปรดทำเครื่องหมาย / ลงในช่องว่างตรงตามความเป็นจริง

ลำดับ	หัวข้อ
1	ข้อใดไม่ถือเป็นสาเหตุหลักของมลพิษทางอากาศในชุมชนเมือง <input type="checkbox"/> อุตสาหกรรม <input type="checkbox"/> เกษตรกรรม <input type="checkbox"/> การจราจร <input type="checkbox"/> การเผาไหม้จากที่อยู่อาศัยและเชิงพาณิชย์
2	ข้อใดเป็นแหล่งที่ก่อให้เกิดมลพิษทางอากาศในแถบชุมชนเมืองมากที่สุด <input type="checkbox"/> จากกระแสมอเตอร์ไซด์ปฏิกูล <input type="checkbox"/> ยานพาหนะที่ใช้เครื่องยนต์ <input type="checkbox"/> จากการทำเกษตรกรรม <input type="checkbox"/> จากปรากฏการณ์ธรรมชาติ
3	ข้อใดคือส่วนประกอบของมลพิษทางอากาศ <input type="checkbox"/> ฝุ่นละอองขนาดเล็ก <input type="checkbox"/> ก๊าซคาร์บอนมอนอกไซด์ <input type="checkbox"/> เบนซิน <input type="checkbox"/> ถูกทุกข้อ
4	มลพิษการจราจรคืออะไร <input type="checkbox"/> มลพิษทางอากาศที่เกิดจากเผาไหม้ของรถยนต์ <input type="checkbox"/> มลพิษในโรงงานอุตสาหกรรม <input type="checkbox"/> มลพิษจากครัวเรือน <input type="checkbox"/> มลพิษทางอากาศจากการเผาไหม้ขยะ



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5	<p>ประเภทของยานพาหนะใดที่สามารถก่อให้เกิดมลพิษทางอากาศการจราจรมากที่สุด</p> <p><input type="checkbox"/> รถยนต์ที่ใช้พลังงานไฟฟ้า</p> <p><input type="checkbox"/> รถยนต์ที่ใช้พลังงานแสงอาทิตย์</p> <p><input type="checkbox"/> รถยนต์ที่ใช้น้ำมัน</p> <p><input type="checkbox"/> รถยนต์ที่พลังน้ำ</p>
6	<p>ข้อใดคือเหตุผลที่ทำให้รถยนต์ก่อให้เกิดคุณภาพอากาศเกินมาตรฐาน</p> <p><input type="checkbox"/> น้ำมันเชื้อเพลิงที่มีคุณภาพต่ำ</p> <p><input type="checkbox"/> ขาดการบำรุงรักษาของรถ</p> <p><input type="checkbox"/> รดสภาพเก่า</p> <p><input type="checkbox"/> ถูกทุกข้อ</p>
7	<p>สารมลพิษทางอากาศการจราจรใดที่พบว่าเป็นปัญหาหลักและเกินมาตรฐานในกรุงเทพมหานคร</p> <p><input type="checkbox"/> ฝุ่นละอองขนาดเล็ก</p> <p><input type="checkbox"/> ออกซิเจน</p> <p><input type="checkbox"/> ปะรุธ</p> <p><input type="checkbox"/> สารหนู</p>
8	<p>มลพิษทางอากาศสามารถเข้าสู่ร่างกายได้เส้นทางใดบ้าง</p> <p><input type="checkbox"/> การกลืนกิน</p> <p><input type="checkbox"/> การสูดดมและการกลืนกิน</p> <p><input type="checkbox"/> ผิวหนัง, การสูดดมและการกลืนกิน</p> <p><input type="checkbox"/> ไม่สามารถสู่ร่างกายได้</p>
9	<p>ส่วนใดของร่างกายทำหน้าที่กรองฝุ่นละอองที่มีขนาดใหญ่</p> <p><input type="checkbox"/> ขนจมูก</p> <p><input type="checkbox"/> คอหอย</p> <p><input type="checkbox"/> ปอด</p> <p><input type="checkbox"/> ฤงลม</p>
10	<p>ข้อใดคือผลกระทบของการรับสัมผัสฝุ่นละอองเป็นระยะเวลานาน</p> <p><input type="checkbox"/> ท้องเสีย</p> <p><input type="checkbox"/> เป็นไข้ หนาวสั่น</p> <p><input type="checkbox"/> มีปัญหาทางเดินหายใจ</p> <p><input type="checkbox"/> ผื่นขึ้นตามตัว</p>
11	<p>ข้อใดชนิดของอุปกรณ์ปกป้องมลพิษจากการสูดดมการจราจรเหมาะสมที่สุด</p>



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	<input type="checkbox"/> หันชี้ตหน้า <input type="checkbox"/> ไข่มือปิด <input type="checkbox"/> หน้ากากอนามัยที่ทำจากผ้า <input type="checkbox"/> หน้ากากชนิดเปลี่ยนไส้กรอง
12	คำวิจารณ์การใช้อุปกรณ์ป้องกันทางหายใจในการปฏิบัติงานเมื่อไร <input type="checkbox"/> ในระหว่างการปฏิบัติหน้าที่ทุกวัน <input type="checkbox"/> บางครั้งหากต้องการใช้ <input type="checkbox"/> เมื่อมีปริมาณควันมาก <input type="checkbox"/> เมื่อมีการจราจรคับคั่ง
13	ข้อใดคือการใช้อุปกรณ์ป้องกันทางหายใจได้อย่างถูกต้อง <input type="checkbox"/> ตรวจสอบยางรัดก่อนใช้งานทุกครั้ง <input type="checkbox"/> ตรวจสอบอุปกรณ์ป้องกันทางหายใจลักษณะหรือไม่ก่อนใช้งานทุกครั้ง <input type="checkbox"/> ทำความสะอาดหลังการใช้งานทุกครั้ง <input type="checkbox"/> ถูกทุกข้อ
14	ข้อใดเป็นไม่ใช่ประโยชน์ของอุปกรณ์ป้องกันระบบทางเดินหายใจ? <input type="checkbox"/> ป้องกันฝุ่นละออง <input type="checkbox"/> ป้องกันควัน ไอเสียด <input type="checkbox"/> ป้องกันไอระเหยของสารเคมีต่างๆ <input type="checkbox"/> ป้องกันการติดเชื้อ
15	ข้อใดคือแนวทางในการแก้ไขปัญหาฝุ่นละออง <input type="checkbox"/> ออกกฎหมายเข้มงวดกับยานพาหนะที่ปล่อยมลพิษเกินค่ามาตรฐาน <input type="checkbox"/> ป้องกันการฟุ้งกระจายของฝุ่นจากกิจกรรมต่างๆ <input type="checkbox"/> จัดหาเทคโนโลยีใหม่ๆ ในการควบคุมแหล่งกำเนิด <input type="checkbox"/> ถูกทุกข้อ

ส่วนที่ 3 : แบบสอบถามประเมินการรับรู้ผลกระทบเชิงลบต่อสุขภาพที่สัมพันธ์ภาวะทางอากาศของตำรวจในกรุงเทพมหานคร

ลำดับ	หัวข้อ	เห็นด้วยอย่างยิ่ง	เห็นด้วย	เฉยๆ	ไม่เห็นด้วย	ไม่เห็นด้วยอย่างยิ่ง
1	การจราจรเป็นสาเหตุหลักของมลพิษทางอากาศ					



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2	มลพิษทางอากาศจากการจราจรก่อให้เกิดโรคหรือมีอาการทางระบบทางเดินหายใจ					
3	การหายใจเอาฝุ่น เขม่า คาร์บอนไอเสียรถยนต์ระหว่างการทำงาน อย่างเป็นประจำ ไม่มีผลกระทบบต่อร่างกาย เพราะร่างกายมีระบบภูมิคุ้มกันต้านร่างกาย					
4	โรกระบบทางเดินหายใจที่เกิดจากการสูดดมมลพิษทางอากาศจากการจราจร จะเกิดขึ้นเฉพาะกับคนที่มี่ร่างกายไม่แข็งแรงเท่านั้น					
5	จากงานของคุณ คุณมีโอกาสรับสัมผัสมลพิษทางอากาศสูง					
6	จากการปฏิบัติงานบนท้องถนนเวลานานของคุณ มีโอกาสเป็นโรคโรคมะเร็งปอด					
7	ขณะปฏิบัติงานบนท้องถนน คุณเคยมีอาการวิงเวียนศีรษะ คลื่นไส้ อาเจียน จากการสูดดมมลพิษทางอากาศจากการจราจร					
8	ฝุ่นละอองมีผลทำให้เกิดอาการ คัดจมูก ไอ เจ็บเข้านั้น จึงไม่ต้องการงดการปฏิบัติงานบนท้องถนน					
9	คุณมีความเสี่ยงสูงที่จะเป็นโรคหรือมีอาการทางระบบทางเดินหายใจ					
10	การใช้หน้ากากเป็นสิ่งจำเป็นขณะปฏิบัติงานด้านการจราจรบนท้องถนน					
11	การปฏิบัติงานจราจรเป็นเวลานาน โดยไม่ใช้หน้ากาก อาจทำให้มีอาการวิงเวียนศีรษะ คลื่นไส้ อาเจียน แน่นหน้าอก					
12	การใช้หน้ากากขณะปฏิบัติงานบนท้องถนน ทำให้ลดอัตราหายใจไม่สะดวกแต่ทำให้รู้สึกป้องกันฝุ่นละออง					
13	การใช้หน้ากากสามารถหลีกเลี่ยงโรกระบบทางเดินหายใจเช่น โรคหลอดลมอักเสบ, หอบหืดหลอดลม มะเร็งปอด ได้					



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14	การใช้หน้ากากเป็นสิ่งที่ไม่จำเป็นเนื่องจากสามารถที่จะกรองฝุ่นละอองได้เพียงเล็กน้อย					
15	ตำรวจจราจรที่ปฏิบัติงานบนท้องถนนมีความเสี่ยงเป็นโรคทางเดินหายใจมากกว่าตำรวจที่ทำหน้าที่ธุรการ					

ส่วนที่ 4 : แบบสอบถามประเมินเกี่ยวกับการป้องกันตนเองจากมลภาวะทางอากาศของตำรวจจราจรในกรุงเทพมหานคร

ลำดับ	หัวข้อ	ทุกครั้ง	บ่อยๆ	บางครั้ง	นานๆ ครั้ง	ไม่เคย
1	อุปกรณ์ป้องกันระบบทางเดินหายใจ (หน้ากาก) คุณสวมใส่หน้ากากในขณะที่ปฏิบัติงานจราจรบนท้องถนน					
2	ตรวจสอบหน้ากากก่อนที่จะใช้เสมอ					
3	คุณทำความสะอาดหน้ากากเป็นประจำก่อน/หลังใช้เสมอ					
4	คุณเปลี่ยนอุปกรณ์ป้องกันระบบทางเดินหายใจของคุณบ่อยแค่ไหนต่อสัปดาห์					
5	การสวมใส่หน้ากากขณะปฏิบัติงานนั้นเป็นอุปสรรคกับการพูดคุยตามปกติใน Walky-Talky					
6	ขณะปฏิบัติงาน คุณไม่สวมใส่หน้ากาก เพราะเป็นอุปสรรคในการปฏิบัติงานจราจร					
7	คุณเคยได้รับข้อมูลเกี่ยวกับวิธีการสวมใส่หน้ากากอย่างถูกวิธี จากภาครัฐและภาคเอกชน					
8	หน่วยงานของคุณ เป็นผู้ออกค่าใช้จ่ายในการจัดซื้อหน้ากาก					
9	สุขอนามัยส่วนบุคคล คุณล้างมือและล้างหน้าด้วยสบู่ก่อนการเตรียมและการรับประชาชน					



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10	คุณเปลี่ยนเสื้อผ้าที่สกปรกหลังการทำงานทุกครั้ง				
11	คุณได้รับการพักผ่อนที่เหมาะสม (8 - 10 ชั่วโมงต่อวัน)				
12	คุณรับประทานอาหารครบ 5 หมู่				
	<b>พฤติกรรมกรป้องกัน</b>				
13	คุณสูบบุหรี่ในขณะที่ทำงานแต่ละวันบ้อยแค่ไหน				
14	คุณตรวจสอบสภาพประจำปีบ้อยแค่ไหน				
15	คุณตรวจการตรวจสอบรถสภาพปอด (เบ้าปอด) ประจำปีบ้อยแค่ไหน				
16	เมื่อคุณมีอาการหายใจไม่สะดวก เจ็บหน้าอก คุณจะไปพบแพทย์				
17	หลังปฏิบัติงานทุกครั้ง คุณจะสังเกตว่าตนเองมี อาการเวียนศีรษะ คลื่นไส้ อาเจียน หายใจไม่สะดวก เจ็บหน้าอก				
18	คุณเคยรับการอบรมให้ความรู้เรื่องมลพิษทางอากาศและผลกระทบต่อสุขภาพ				
19	คุณเคยรับการอบรมให้ความรู้วิธีการป้องกันตนเองจากระบบทางเดินหายใจในการทำงานจริง				
20	คุณเคยหาหนังสือ บทความ ในเรื่องมลพิษทางอากาศมาอ่านเพิ่มเติม				



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วันที่มอบ..... 11 ก.ค. 2563

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