

## A Simplified Carbon Footprint Calculator

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### Abstract

The objectives of this study have their origins in moves to reduce the carbon footprint of human activities and thus moderate global warming and the impacts of climate change. The objectives are: 1) to study the main daily activities affecting the release of greenhouse gases; and 2) to develop and provide a website containing information on ways to reduce greenhouse gas emissions. The study used the following research methodologies: 1) data collection from brainstorming with industry specialists; 2) data gathering from a simplified online Carbon Footprint Calculator; and 3) testing and adjusting the calculator programme.

The results showed that transportation, electricity use, food consumption, waste production, water use, chemical use, and utilities were the six activities that contributed most to the release of greenhouse gases. The results also showed that of the two programmes developed – the Carbon Footprint Calculator and the questionnaire: “*Are you a green consumer?*” – The latter was accessed more. Furthermore, it was found that people were unclear about the term “carbon footprint” and the average per person per day carbon dioxide equivalent (CO<sub>2</sub>e) was in agreement with that found in similar studies.

*Key word:* global warming/ greenhouse gas emission/ carbon footprint

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### 1. Introduction

Building awareness of the need to mitigate global warming has been a strong trend worldwide. This brings about international and national agreement and implementation plans on this issue. For Thailand, various activities and campaigns have been introduced by both government agencies and private companies such as promoting renewable energy, and using fewer plastic bags in daily life. The linked issue which Thailand has to perform as a Non-Annex I party of COP convention (UNFCCC, 1992) is to record and report greenhouse gas emission annually. This mission aims to encourage Non-Annex I countries to report the reduction of greenhouse gas emission. Thus this message is delivered to citizens including Thai people through a key word “Carbon Footprint”. In

Thailand, carbon footprint is well-known among producers exporting their products in the international market. That is because the product with less carbon footprint would be more desirable as an import to other countries (UNEP, 2002). For the Thai consumer, carbon footprint is still a new concept and its definition and benefits seem difficult to understand.

As the duty of the Department of Environmental Quality Promotion (DEQP) is to educate and build people’s awareness regarding environmental issues, it is a great challenge for DEQP to inform people about carbon footprint. Basic daily activities are the main parameters which DEQP used to encourage greater understanding and concern about carbon footprint. Also, recently, information on websites is widely accessed by Thai people. The simplified carbon footprint calculator has

been launched through the official website of DEQP named [www.environnet.in.th](http://www.environnet.in.th).

Before launching this carbon footprint calculator, the study was completed. Two objectives of the research were:

(1) To study the main daily activities affecting greenhouse gas emission.

(2) To provide website information on ways of reducing greenhouse gas.

## 2. Methodology

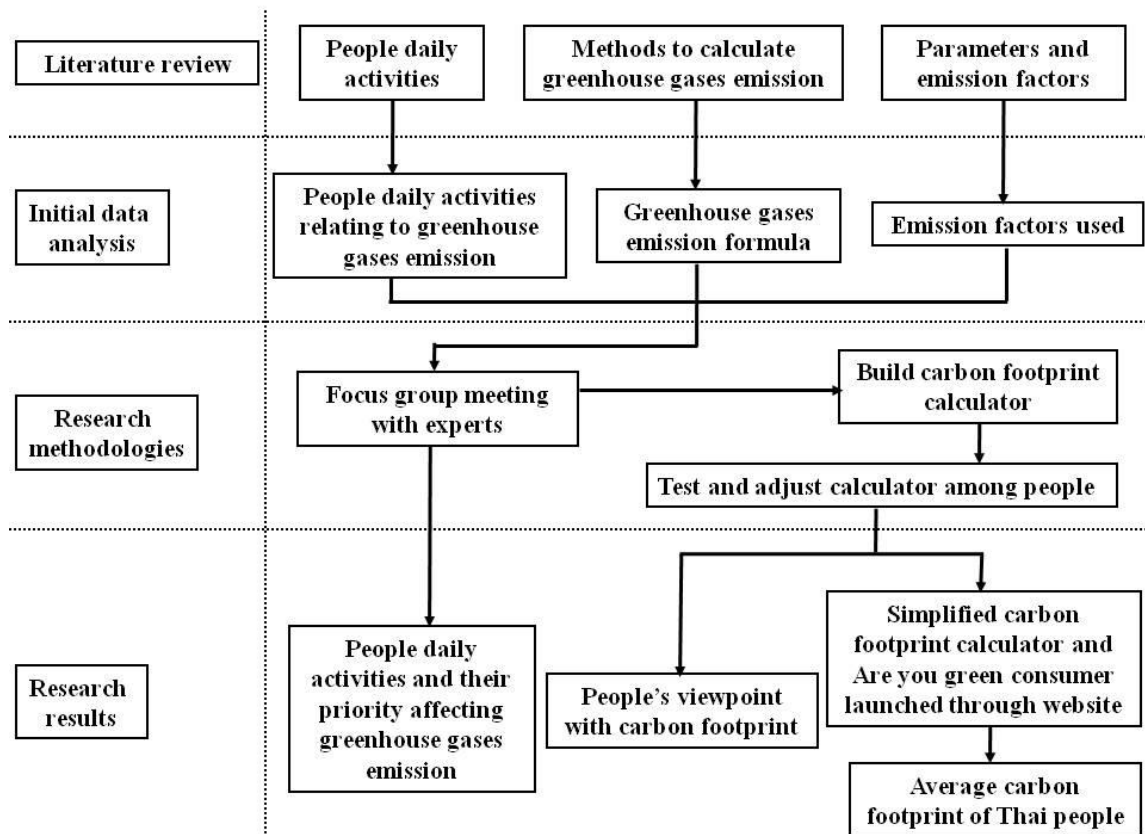
In order to achieve the two objectives, methodologies of this study were determined which were:

(1) Data revision and brainstorming with specialists to find out the main daily activities of people which affect greenhouse gas emission and the methods of calculating greenhouse gas emission from those activities (IPCC, 1996; Lenzen, 2003; Malanie, 1994; Robins, 1997; Sirgy, 2003; Ministry of Energy, 2003; Ministry of Energy, 2008).

(2) Building an easy carbon footprint calculator to launch through the website (American Forests, 2007; EPA, 2007; Padgett, 2008).

(3) Testing and adjusting the program in trials to arrive at the simplified carbon footprint calculator.

The methodologies were set out in the research framework in Figure 1.



**Figure 1** Research frame work for the study of simplified carbon footprint calculator

### 3. Results

The study results were delivered from two linked parts, (A) Focus group meeting with the experts leading to building of Carbon Footprint Calculator and Are you a green consumer? testing program (B) Outcome from users through calculator and testing program.

The results from a focus group meeting by using Delphi Technique with seventeen environmental experts from universities and related government organizations on 9 October 2008 were:

(1) The six main daily activities of people affecting greenhouse gas emission which should be examined when building a Carbon Footprint Calculator were as follows:

- Transportation
- Use of electricity
- Food consumption
- Waste production
- Use of water
- Use of chemicals and utilities

These were also prioritized by being the principal activity emitting greenhouse gas.

(2) Two programs related to this study were created and launched through the official website of DEQP named [www.environnet.in.th](http://www.environnet.in.th) in Thai version in May 2009. The first program was called: Carbon Footprint Calculator and the second program called: Are you a green consumer? This was because the experts recommended using the second one for checking the user understands.

After launching both programs through the website, they were tested with around 400 users. All of the participants could understand the Are you a green consumer? program, but the Carbon Footprint Calculator program had to be adjusted twice. The first time was about

the data required. Users were asked to fill in baht units to identify their electric and water use rather than fill in the unit of kilowatt/hour and cubic meter, because it is an easier process. The second time concerned the result from the calculator. The users had no clear concept of the size of their carbon footprint. Therefore, the number of trees needed to absorb their greenhouse gas emission was added. The final web pages of the Carbon Footprint Calculator and Are you a green consumer? programs which were launched around a year ago are shown in Figure 2 and 3 respectively.

(3) It was noticeable that the Are you a green consumer? program was accessed more by people than the Carbon Footprint Calculator. The main reasons reported by users are that they do not have a clear concept of carbon footprint and cannot imagine how it relates to their life.

The number of samples representing population at 99% of confidence level from the database of Carbon Footprint Calculator program was selected randomly and compared to Thai population structure, proportion of gender and age range. The result shows that population and sample are similar; therefore, results from the database can be claimed to represent the population.

(4) The average of greenhouse gas emission of Thai people or carbon footprint is 12.46 kg CO<sub>2</sub>e per person per day or 4.55 tons CO<sub>2</sub>e per person per year which requires around 500 trees in order to be absorbed. This could be expressed as an average ecological footprint which is equal to 2.8 rai or equal to 4,480 square meters or equal to 4.48 hectare. Therefore, Thailand needs to be 55% forested if it is to absorb greenhouse gas emission from Thai people.

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Let's calculate your Carbon Footprint ....  
by using This Easy Carbon Footprint Calculator

You are ☐ Male ☐ Female ☐ Not sure

Your age ☐ Below 25 ☐ 25-59 ☐ 60 and over

☒ Reset    Next ➤

**Page 2/5**

Let's calculate your Carbon Footprint ....  
by using This Easy Carbon Footprint Calculator

You travel by ☒ Car ☐ Motorcycle ☐ Bus  
☐ Sky Train ☐ Public boat

for  km. or stop in a day

If you travel by car and motorcycle,  persons go together.

◀ Back    Next ➤

**Page 3/5**

Let's calculate your Carbon Footprint ....  
by using This Easy Carbon Footprint Calculator

You spend  baht /month for electric use at home.

You spend  baht /month for tap water use at home.

There are  people in your house.

◀ Back    Next ➤

**Page 4/5**

Let's calculate your Carbon Footprint ....  
by using This Easy Carbon Footprint Calculator

You consume meat-pork-chicken-fish  gram/day

You consume rice-vegetable-fruit  gram/day

◀ Back    Next ➤

**Page 5/5**

Let's calculate your Carbon Footprint ....  
by using This Easy Carbon Footprint Calculator

You produce GHGs  kg/day (Carbon Footprint)

Therefore, you should grow  trees to absorb GHGs

Your ecological footprint are  Rai (Thai unit)

◀ Back    Reset ⌂

**Figure 2** Easy Carbon Footprint Calculator launched through the website

**Let's check ... which level of green consumer are you**

You are ☐ Man ☐ Woman ☐ Not sure

Your age ☐ Below 25 ☐ 25-59 ☐ 60 and over

☐ Reset

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**How often you do these activities? 5 = very often**

	5	4	3	2
1. Travel by public transportation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Walk or bike occasionally.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
3. Turn on electric appliances which essential to use.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Use electric appliances which use less electricity.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Use tap water in sufficient way.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
6. Apply rain water for some activities at home.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
7. Mainly consume vegetable or fruit.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
8. Buy organic products, with no chemical used in production process.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Reuse, reduce and recycle.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
10. Separate garbage.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

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**Let's check ... which level of green consumer are you**

You are a green consumer at middle level.

Please go further to be in the higher level.....

☐ Reset

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**Figure 3** Are you a green consumer? Testing program launched through the website

#### 4. Discussion

Compared with the studies of core organizations working on carbon footprint issue, i.e. the Office of Natural Resources and Environmental Policy and Planning and Thailand Greenhouse Gas Management Organization, the results of this study are similar. However, in the last few years a number of researches addressed the greenhouse gas emission factors of Thailand, and in addition the IPCC launched the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Therefore, some numbers used in this program need to be updated.

#### 5. Conclusion

The study results could be concluded as follows.

- (1) Transportation, Use of electricity, Food consumption, Waste production, Use of water, Use of chemicals and utilities were prioritized as the six main daily activities affecting greenhouse gas emission.
- (2) Two programs called: Easy Carbon Footprint Calculator and Are you a green consumer? have been launched through the website named [www.environnet.in.th](http://www.environnet.in.th) as simplified programs to develop of ways to save the earth from global warming by getting to know more about carbon footprint, the current worldwide issue.
- (3) It is essential for Thai people to gain a better understanding of carbon footprint issues which are increasingly impacting on their daily

life. This would be an important responsibility of DEQP to promote this issue using technology which is simplified and accessible to the public.

- (4) The average carbon footprint from this research is 12.46 kg CO<sub>2</sub>e per person per day and the average ecological footprint per person is 4.48 hectare. Therefore, Thailand needs to have about 55% of its area forested in order to purify greenhouse gas emission from Thai people.

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