An Empirical Study on Carbon Tracking for Thai Hotel Operation

Amphai Wejwithan[1*], Pittha Phongpradist[2] and Tanawan Sintunawa[1]

[1]Green Leaf Foundation, Bangkok 10400, Thailand
[2] Faculty of Humanities and Social Sciences Suan Dusit University, Bangkok 10300, Thailand

ABSTRACT

Thailand relies on the tourism industry as a major industry that can contribute to Thai business, jobs, and other tourism supply chains. Tourists' demand focuses on significant areas in the megacity of tourist destinations around Thailand. The study focuses on carbon emissions by tracking hotel operations in Thailand. Data analysis shows how much carbon emissions are in three major tourism destinations in Thailand namely, Bangkok, Chonburi, and Phuket. The areas are coastal or seaside vacations in the tourism industry and are classified as megacities. Additionally, behavior changes in the hotel business can be observed by using the number of hotel establishments. The increasing number of rooms registered throughout Thailand. The observation found that the number of hotels in study areas has continuously increased for years. The increasing figures showed from 2,958 hotels in 2016 to 3,857 hotels in 2024 (TAT intelligence center, 2024). Converting to the number of rooms will be calculated along with tracking carbon emission by using average data from the Hotel Sustainability Benchmarking Index from Cornell Hotel Sustainability Benchmarking study (CHSB), in 2023 (Ricaurte & Jagarajan, 2023). The study measures the relative content of the number of rooms and carbon emission per room night (occupied room). According to the CHSB report, the tracking of carbon emissions shows a significant result in increasing trends in the operation of the hotels. The means figures of a kilogram of carbon dioxide emission equivalent ($kgCO_2$) in 2023 showed that Bangkok is 123.7 kilograms per room night, Chonburi is 54.2 kilograms per room night and Phuket is 126.5 kilograms per room night. Furthermore, carbon dioxide emission tracking will be observed by rooms sold and occupancies in each area. The results in the study areas can be applied to all hotels in the whole country.

Keywords: Carbon tracking/ Tourism/ Sustainability hotel / Low carbon tourism

1. INTRODUCTION

An Empirical Study on Carbon Tracking for Thai Hotel Operations study is the primarily study for Thai Hotel and Carbon emission equivalence to total Green House Gases Emission. Three main tourist destinations in this study are; Bangkok; Thailand metropolitan, which can be identified as a megacity in the region. Pattaya is one of the most popular tourist destinations not far from Bangkok. The last destination which is taking place as a famous tourist destination located along the Andaman coastal line is Phuket.

1.1 Why three main destinations are selected?

The reason for selecting the 3 main tourist areas, Bangkok, Phuket, and Chonburi, is because these are the main areas that tourists will travel to. Bangkok is considered the initial area where tourists will enter the country. Phuket is the area where tourists intend to go to relax. Chonburi is the area closest to Bangkok. Therefore, there is a connection between the number of tourists, both Thai and foreigners. The reason why this study selected 3 areas for comparison and initially studied the amount of carbon dioxide equivalent produced by providing accommodation services in the 3 areas.

1.1.1 Bangkok

Bangkok is one of the world's top tourist destinations of 162 cities worldwide, Master Card ranked Bangkok as the top destination city by international visitor arrivals in its *Global Destination Cities Index 2018*, ahead of London, with just over 20 million overnight visitors in 2017.

This was a repeat of its 2017 ranking (for 2016). Euromonitor International ranked Bangkok fourth in its Top City Destinations Ranking for 2016. Bangkok was also named "World's Best City" by *Travel + Leisure* magazine's survey of its readers for four consecutive years, from 2010 to 2013.As the main gateway through which visitors arrive in Thailand, Bangkok is visited by the majority of international

tourists to the country. Domestic tourism is also prominent. The Department of Tourism recorded 26,861,095 Thai and 11,361,808 foreign visitors to Bangkok in 2010. Lodgings were made by 15,031,244 guests, who occupied 49.9 percent of the city's 86,687 hotel rooms. Bangkok also topped the list as the world's most popular tourist destinations in 2017 rankings (wikipedia, 2024a).

1.1.2 Chonburi

Following the end of World War II, coastal towns particularly Ang Sila witnessed an influx of Teochew Chinese migrants.

The Vietnam War would also cause an influx of American G.I.S to arrive, particularly in Pattaya. This would go on to lead Chonburi province to become popular among foreign tourists (wikipedia, 2024b).

1.1.3 Phuket

The development of Phuket's tourism sector began in earnest in the 1980s, with the west coast beaches, notably Patong, Karon, and Kata, emerging as key tourist destinations. Following the 2004 tsunami, efforts were made to restore all affected buildings and attractions. The island has since undergone extensive development, evidenced by the construction of new hotels, apartments, and houses.

In a 2005 report by Fortune Magazine, Phuket was listed among the top five global retirement destinations. The island's appeal as a retirement location is attributed to various factors, including its climate, lifestyle, and amenities.

The year 2017 marked a significant influx of tourists to Phuket, with the island welcoming approximately 10 million visitors, predominantly from overseas. China was noted as the primary source of these foreign tourists. The tourism sector in Phuket played a crucial role in Thailand's economy, generating about 385 billion baht in revenue, which constituted nearly 14% of the nation's total earnings of 2.77 trillion baht in that year.

In the first half of 2019, Phuket experienced a decrease in tourist arrivals, which impacted the local hospitality industry. This trend was marked by reduced hotel occupancy rates and intensified price competition among accommodations. Consequently, there was a noted decrease in revenue per available room (RevPAR). Analysts attribute this downturn to the fewer tourists and an oversupply of hotel rooms. However, despite the decline in tourist numbers, the Tourism Authority of Thailand (TAT) reported a 3.1% increase in tourism revenues for the same period.

Estimates of the total number of hotel rooms in Phuket vary. According to Oxfam, Phuket has approximately 60,000 hotel rooms to cater to its 9.1 million annual visitors. Contrasting figures were presented in reports by the Bangkok Post in September 2019. One report indicated that Phuket has around 600 hotels comprising 40,000 rooms. A separate report from three weeks earlier estimated 93,941 available hotel rooms, excluding villas and hostels, with an expectation of an additional 15,000 rooms by 2024. These varying figures highlight the difficulty in accurately quantifying the total number of hotel accommodations in the region.(wikipedia, 2024c)

1.2 Hotel business

Hospitality includes a range of businesses, such as hotels, restaurants, bars, resorts, cruise ships, theme parks, and other service-oriented businesses that provide accommodations, food, and beverages. Hospitality is all about creating a welcoming and comfortable environment for guests and meeting their needs. (insider, 2024)

1.3 Climate change and tourism

The world has agreed to keep global warming at 1.5 to 2°C compared to pre-industrial levels, for which it will be necessary to reduce emissions of greenhouse gases to net zero by mid-century (Singh et al., 2018). As a result, there is a pressing need to identify strategies that can significantly reduce emissions throughout the world economy. Tourism has considerable relevance for achieving this goal, as it includes

various vital emission subsectors such as aviation and is estimated to have been responsible for 8% of global CO_2-equivalent emissions in 2013 (Lenzen et al., 2018).Tourism is also a growth sector, further emphasizing the importance of mitigation, specifically since a COVID-19 rebound is evident and future high growth rates are expected (Citaristi, 2022). Carbon management, including CO_2 as well as other greenhouse gases, is thus a key management challenge for the sector (Stefan Gössling, 2023).

The impossibility of accommodating further growth and emission reductions aligned with scientific targets was already outlined in the(UNWTO & Change, 2008) report "Climate Change and Tourism – Responding to Global Challenges". Even in the most ambitious mitigation scenario, the sector's emissions were projected to fall by just 16% (2005-2035) if growth continued. National studies confirm this. For example, research for Norway has shown that under a continued tourism growth scenario, country-wide decarbonization rates would have to be 30 times higher than observed rates to approach net zero by 2050 (Sun et al., 2022) . Decarbonization challenges for tourism have now been repeatedly outlined (Scott & Gössling, 2021), with the central conclusion that tourism will not achieve carbon neutrality under continued growth scenarios.

1.4 Sustainability benchmarking for hotel business

Tourism places pressures on the environment through the services provided (accommodation, food, leisure activities, and transport), meanwhile it is particularly vulnerable to global warming as climate is a crucial component of destinations' attractiveness. As a result, research focusing on the impacts of tourism has increased significantly. Practitioners consult a plethora of frameworks and publications to environmentally assess tourism but none of the existing guidelines provides specific recommendations making it difficult to obtain reliable results that can be properly replicated and compared. This paper discusses the use of Footprint family indicators in tourism through a review of studies that measure the Water, Carbon, and Ecological Footprint of tourists (Miralles et al., 2023).

1.5 Carbon footprint for hotel business

The Carbon Footprint as a concept was born from the Ecological Footprint. Considering the definition by (Ewing et al., 2012) "the CF measures the total amount of GHG emissions that are directly and indirectly caused by an activity or are accumulated over the life stages of a product" and is expressed in mass units of CO_2 or mass units of CO_2 Equivalent if other GHG besides CO_2 have been accounted for. Several standards and methodologies tackle the CF issue of products and services.

- Energy in kilowatt-hours (kWh),
- Water in liters (L) and
- Waste generation (kg)

Greenhouse gas emissions (also termed carbon footprint) in kilograms of carbon dioxide equivalent ($kgCO_2e$), converting each energy source of GHG emissions into $kgCO_2e$ (using only carbon dioxide, methane, and nitrous oxide).

The data provided on the following pages in Exhibits 6, 7, and 8 show the average change in the following six measures from 2019 to 2022 and from 2021 to 2022: (1) GHG emissions per occupied room, (2) GHG emissions per square meter, (3) energy per occupied room, (4) energy per square meter, (5) water per occupied room, and (6) water per square meter.

2. METHODOLOGY

2.1 Tracking for hotel consumption profile

Hotels and resorts are required to conduct assessments or city measurements to assess their energy and resource consumption, which we call tracking for the Hotel consumption Profile.

The hotel's resource usage tracking will be used in this study are energy, water, and waste.

The factor that may have an impact on resource consumption or what will be used to calculate the hotel's carbon footprint is climate change at different times of the year.

However, Bangkok and Pattaya are connected by being tourist cities for tourism throughout the year.

In Phuket province, there may be fluctuations depending on the tourist seasonal change, which includes both the high season and the location due to the southwest monsoon.

However, since these three areas are the main tourist areas of Thailand, there is a campaign to promote tourism throughout the year, which may have different customer groups using the services.

2.2 Carbon footprint and calculation

This study, specifically on carbon emission, will refer to the carbon calculation CHSB in 2023.

Carbon calculation of the number of rooms sold throughout the year in the study area is compared with the standard value obtained from the calculation per room sold of the reference value.

The preliminary calculations will be shown in the study results and study analysis.

3. RESULTS AND DISCUSSION

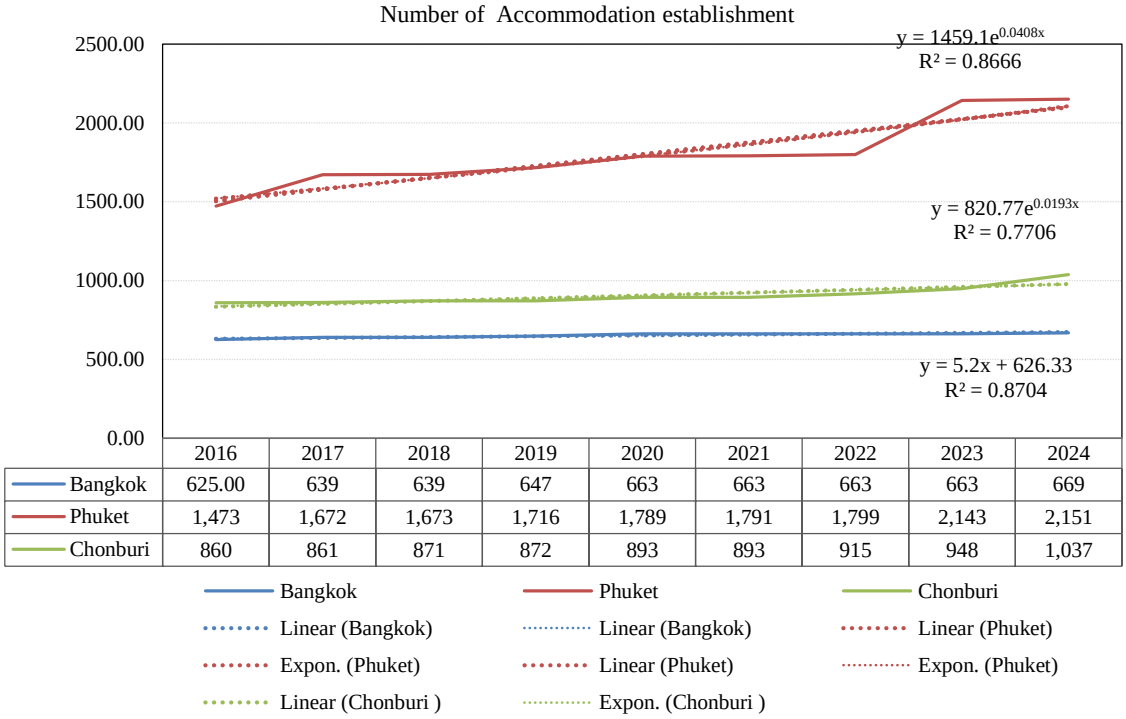
3.1 Comparison of CO_2 profile in the study area

From the graph on the number of hotels in the 3 study areas, namely Bangkok, Phuket, and Chonburi, the number of hotels registered in Phuket has increased each year with a relatively high trend followed by an increase in the number of hotels in Chonburi. In Bangkok, the number is quite stable.

That is, from 2016 onwards until the present at the time of the study, which is mid-2024, it was found that the number of hotels registered in Bangkok was 625 hotels in 2016, increasing to 669 hotels in 2024.

In the number of hotels in Phuket Province in 2016, there were 1,473, increasing to 2151 in 2024, which is a very high percentage increase of 86.41%.

Meanwhile, Chonburi Province has 860 registered hotels in 2016 and will increase to 1,037 in the middle of this year in 2024. (See Figure 1.)



	2016	2017	2018	2019	2020	2021	2022	2023	2024
Bangkok	625.00	639	639	647	663	663	663	663	669
Phuket	1,473	1,672	1,673	1,716	1,789	1,791	1,799	2,143	2,151
Chonburi	860	861	871	872	893	893	915	948	1,037

Figure 1. Number of accommodation establishment (Source: TAT Intelligence 2024, complied by Authors)

If we consider the number of rooms registered in three areas, Phuket Province will certainly have the largest number of rooms, followed by Bangkok and Chonburi respectively (See Figure 2).

The conclusion of the study, if we consider the number of rooms sold since 2018, except during the COVID-19 crisis, it was found that the trend of room sales has increased and the amount of carbon dioxide emissions per room sold has also increased.

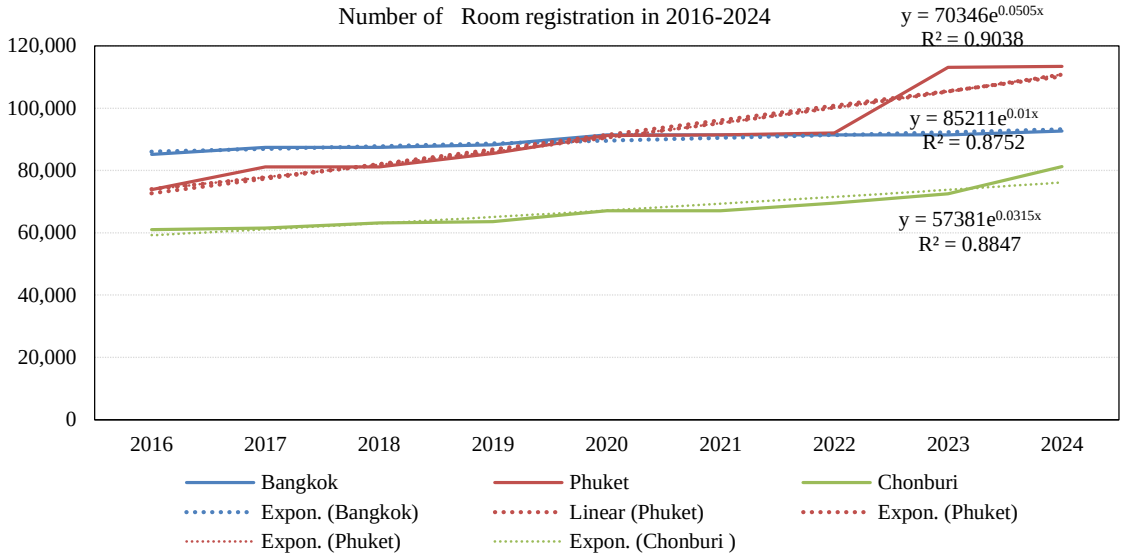


Figure 2. Number of room registration in 2016-2024 (Source: TAT Intelligence 2024, complied by Authors)

However, the highest number of occupancy or rooms sold each month of each year will be in the area with relatively consistent travel in Bangkok.

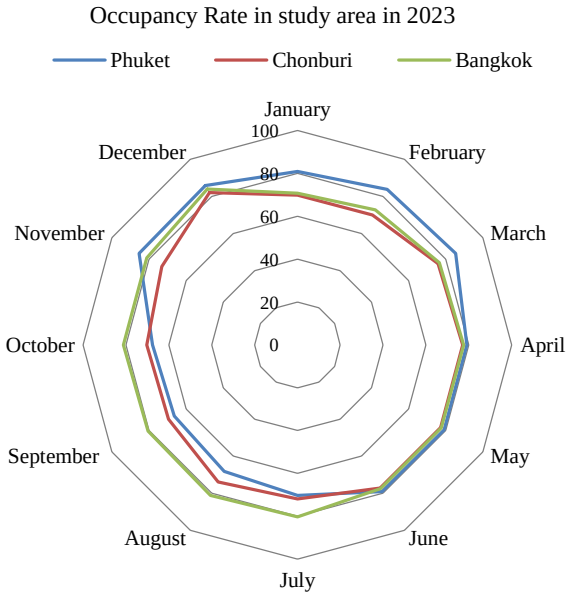


Figure 3. Room occupancy in 2016-2024 in three destinations (Source: TAT Intelligence 2024, complied by Authors)

From Table 1, when the Total Number of rooms in 2023 is multiplied by the average of the per room in each area, what will be the number of groups in each area. Phuket had approximately 32 million room-sold per year follow by Bangkok was around 26 million room-sold and 19.5 million room-sold in Chonburi.

Table 1. Shows the total room-night in 2023

Area	Number of Room	Average occupancy rate	Room-Night	Total Room-night in 2023
Bangkok	91,421	78.44	71,711	26,174,381
Phuket	113,065	77.59	87,727	32,020,404
Chonburi	72,557	73.98	53,678	19,592,349

Source: TAT Intelligence 2024, complied by Authors

From the CHSB study, it was found that Chonburi has carbon dioxide emissions of 54.2 kilograms per room-night, which is the lowest in the three study areas, followed by Bangkok with carbon dioxide equivalent emissions of 123.7 kilograms per room-night, while Phuket has the highest with an average of 126.5 kilograms of carbon equivalent per room-night.

Table 2. Shows the total CO_2e in 2023

Area	Room-Night	Emission Per Room-night (kg·CO_2e)	Ton CO_2e/day	Total of CO_2e/year (ton)
Bangkok	71,711	123.7	8,870.61	3,237,770.91
Phuket	87,727	126.5	11,097.48	4,050,581.07
Chonburi	53,678	54.2	2,909.33	1,061,905.32

Source: TAT Intelligence 2024, complied by Authors

Table 2, the equivalent amount of carbon emission per day, found that Bangkok accounted carbon from selling rooms at about 324 tons, Phuket at about 405 tons, and Chonburi at about 106 tons. However, when taking the average number of days that rooms can be sold in each area, it will be found that Bangkok has a total of carbon emissions of 2023, Phuket has a total of 2023, and Chonburi has a total of 2023.

However, such quantity, even though the technology is introduced, or some issues are debated and used as indicators for management and sustainability management in the tourism and hotel industries, is still an issue that hotels must manage the release of carbon dioxide or greenhouse gases, especially the management of resources that are the cause of greenhouse gases that were studied this time.

3.2 Discussion

In summary, if there is a need to study further in the area and in-depth the consumption profile in each category that will be used to calculate carbon dioxide, at least 3 categories: energy, which is the main calculation of water, which is a necessary resource for hotels, and finally, waste production or resource use that will create waste for hotels, all 3 elements can be studied in depth in future research.

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