

**ENERGY CONSUMPTION AND THE
ECOLOGICAL FOOTPRINT OF TOURISM
IN AN ISLAND DESTINATION: THE CASE OF KOH
SAMUI, THAILAND**

Submitted by

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ABSTRACT

This thesis aims to apply the concept of the Ecological Footprint (EF) to examine the impact that the tourism industry has on the environment through energy consumption and also investigates patterns of energy-consuming behaviour among tourists and tourism businesses. EF is becoming an increasingly popular analytical tool in tourism studies. However, at present most attention has fallen on its value for studying tourism in international level. Moreover, very few studies have taken account of the influence of social factors when making EF calculations linked to tourism. As a consequence of these biases, there is currently a need for studies of tourism which take account of EFs at the destination level and how the behaviour of tourists and tourism businesses affects energy consumption at holiday destinations. This study addresses this gap by investigating the EF of energy-consuming behaviour linked to tourists and tourism businesses at a particular holiday destination, namely Koh Samui in Thailand, and also by exploring the factors which influence this kind of behaviour.

The findings of this study show that most tourists rely on modes of transport which release high levels of CO₂ (especially long haul flights). In the case of Thailand, a majority of tourists fly from Bangkok to Koh Samui and then use private cars to get around the island. Energy intensive electrical appliances such as air conditioning and tankless hot water heaters were widely used in accommodation, while beach activities, which generally have a low carbon footprint, attracted the largest numbers of tourists. It was also found that demographic factors, including travel behaviour and concern for the environment, influenced these kinds of behaviour in various ways.

As regards different types of tourism business, in the accommodation sector hotels used the largest quantities of electricity while tour operators used more diesel and petrol than any other type of tourism business. Furthermore, it was also found that even though respondents who stayed in five-star hotels expressed the greatest level of concern for climate change, they still considered their own convenience and satisfaction to be their highest priorities. Tourism on Koh Samui consumed about 54.55 PJ of energy in 2007 and thus needed 3.41 gha of forest land to absorb the resulting CO₂ emissions. Given that this figure exceeds the current world-average biocapacity of 1.8 gha, it can be stated that tourism on Koh Samui is currently unsustainable.

This study highlights the relationship between the EF of tourism at a particular holiday destination and the energy-consuming behaviour of both tourists and tourism businesses. In this way, it is shown here that excessive energy consumption combined with a lack of effective energy management in the business sector can lead to the development of an unsustainable EF. In response to this finding, practitioners and policy-makers should consider ways of mitigating EFs linked to tourism.

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LIST OF ABBREVIATIONS

ANOVA	=	Analysis of Variance
CO ₂	=	Carbon Dioxide
DEDE	=	Department of Alternative Energy Development and Efficiency
EF	=	Ecological Footprint
EGAT	=	Electricity Generating Authority of Thailand
EIA	=	Environmental Impact Assessments
EIO	=	Environmental Input-Output Model
EPPO	=	Energy Policy and Planning Office, Ministry of Energy, Thailand
GHG	=	Green House Gas
IPCC	=	Intergovernmental Panel on Climate Change
Koh Samui	=	Koh Samui Island, Surattani, Thailand
KSMC	=	Koh Samui City Municipality
LAC	=	Limit of Acceptable Change System
LCA	=	Life Cycle Assessment Model
LPG	=	Liquid Petroleum Gas
PEA	=	Provincial Electricity Authority
PWA	=	Provincial Waterworks Authority
SMEs	=	Small and medium sized enterprises
SMTEs	=	Small and medium-sized tourism enterprises
SPI	=	Sustainable Process Index
TAT	=	Tourism Authority of Thailand
UNFCCC	=	United Nations Framework Convention on Climate Change
WWF	=	World Widelife Fund

UNITS OF MEASUREMENT AND CONVERSION FACTORS

Prefix	Symbol	Value	Example
Kilo	K	10^3	Kilowatt/ kW
Mega	M	10^6	Megajoule/ MJ
Giga	G	10^9	Gigajoule/ GJ
Tera	T	10^{12}	Terajoule/ TJ
Peta	P	10^{15}	Petajoule /PJ

Type	Unit Name	Symbol
Energy	joule	J
Power	watt	W
Time	hour	h
Energy (electricity use)	kilowatt-hour	kWh
Temperature degree	Celsius	°C
Fuel	litres	l
Distance	passenger-kilometre	pkm
Area	global hectare	gha

Type	Unit Name	Symbol	Value
Energy (Electricity use)	kilowatt-hour	kWh	$3.6 \times 10^6 \text{ J} = 3.6 \text{ MJ}$
Energy	terawatt-hour	TWh	$3.6 \times 10^{15} \text{ J} = 3.6 \text{ PJ}$
Energy	litre of petrol	L	$3.2 \times 10^7 \text{ J}$
Energy	m^3 of natural gas at STP		$3.4 \times 10^7 \text{ J}$
Power	kWh per year	kWh/y	0.114 W
CO ₂	Tonnes	CO ₂	1 tonnes = 1,000 Kg
Area	hectare	hectare	1 hectare = 10,000 m ²