Quantifications of Greenhouse Gases Emissions from Healthcare Facilities: Case Studies of Health Promoting Hospitals in Thailand

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Introduction

- Databases related to greenhouse gases (GHGs) assessment of healthcare facilities in Thailand are limited.
- Studying GHGs emission from healthcare services is needed to develop guidelines for mitigating all GHGs emissions.

Objectives

- To quantify GHGs emissions from healthcare facilities in Thailand via case studies

- To identify GHGs emission sources and key emission activities from health care facilities via case studies

Methodology

- Two Health Promoting Hospitals (A and B), located in central region of Thailand, were selected as the representatives of primary level facility.

- Scope 1 (Direct emission), Scope 2 (Indirect emission) and Scope 3 (Other indirect emission) were accounted based on the Greenhouse Gases Protocol (2019) and Thailand Greenhouse Gas Management Organization (TGO, 2020). All activity information are listed in Table 1.

Table 1 Collecting activity data from year 2019 to 2021

Scopes of emission	Activities
1	Fuel Utilization
2	Electricity Consumption
3	A4 paper, Tap water, Solid waste management, Staff and patient commute

- **Estimation of GHGs emission** were calculated as:

$$\text{GHGs emission (CO}_2\text{-eq)} = \text{Activity data} \times \text{Emission factor (EF)} \quad \text{Eq.1}$$

where: CO_2-eq (CO_2 equivalent;) is amount of GHGs in terms of CO_2 emission

EF is the average emission rate of GHGs for given sources derived from TGO (2021).

- **GHGs emission intensity** was determined by Eq.2.

$$\text{Emission intensity} = \text{GHGs emission} / \text{Amount of patient} \quad \text{Eq.2}$$

where:

Emission intensity is the level of GHGs emissions per number of patients.

Amount of patient is the number of patient (head) who visited the hospital per year.

Results

- **Scope 3 (indirect emissions)** contributed the largest share of GHGs for both health promoting hospitals (see Fig.1)

- **Patient commute** was the largest contributor to total GHGs emissions, followed by electrical energy consumption and fuel consumption for both hospitals (see Fig.2).

Results (cont.)

- **Average GHGs emission and intensity** of health promoting hospitals A and B during 2019-2021 were 22.22 and 0.008 tCO$_2$-eq per head of patient and 29.21 and 0.009 tCO$_2$-eq per amount of patient.
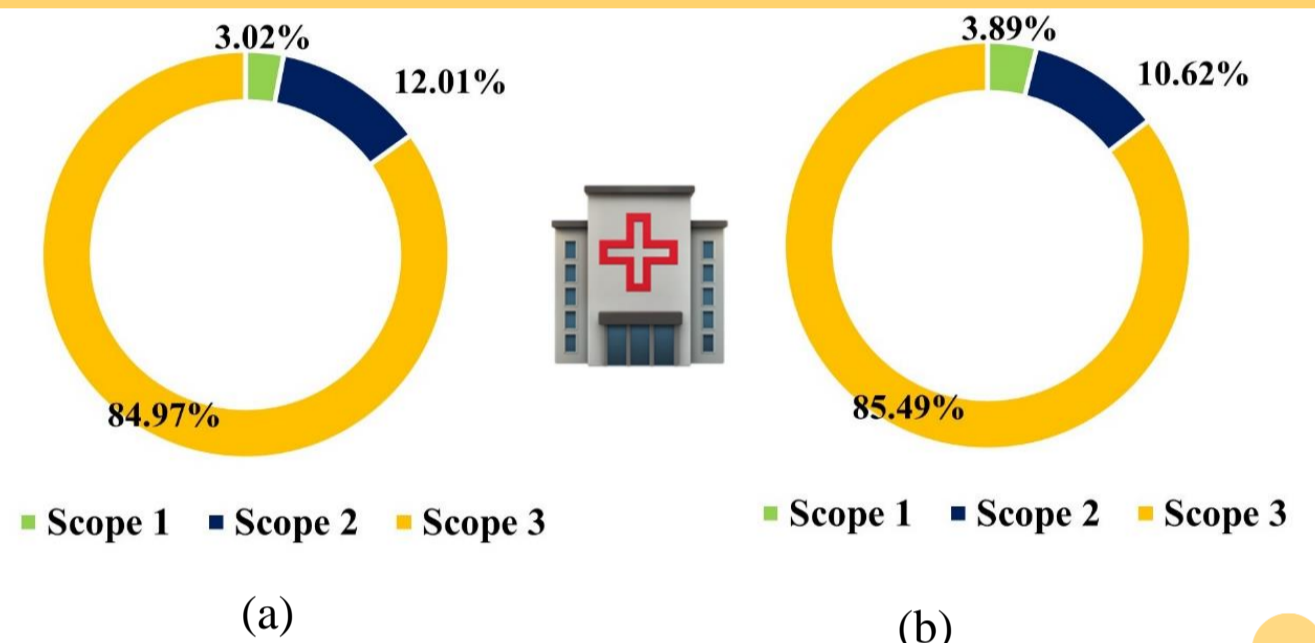

Fig. 1 Average proportion of GHGs emission from 2019-2021, by activity; Health promoting hospitals (a) A and (b) B
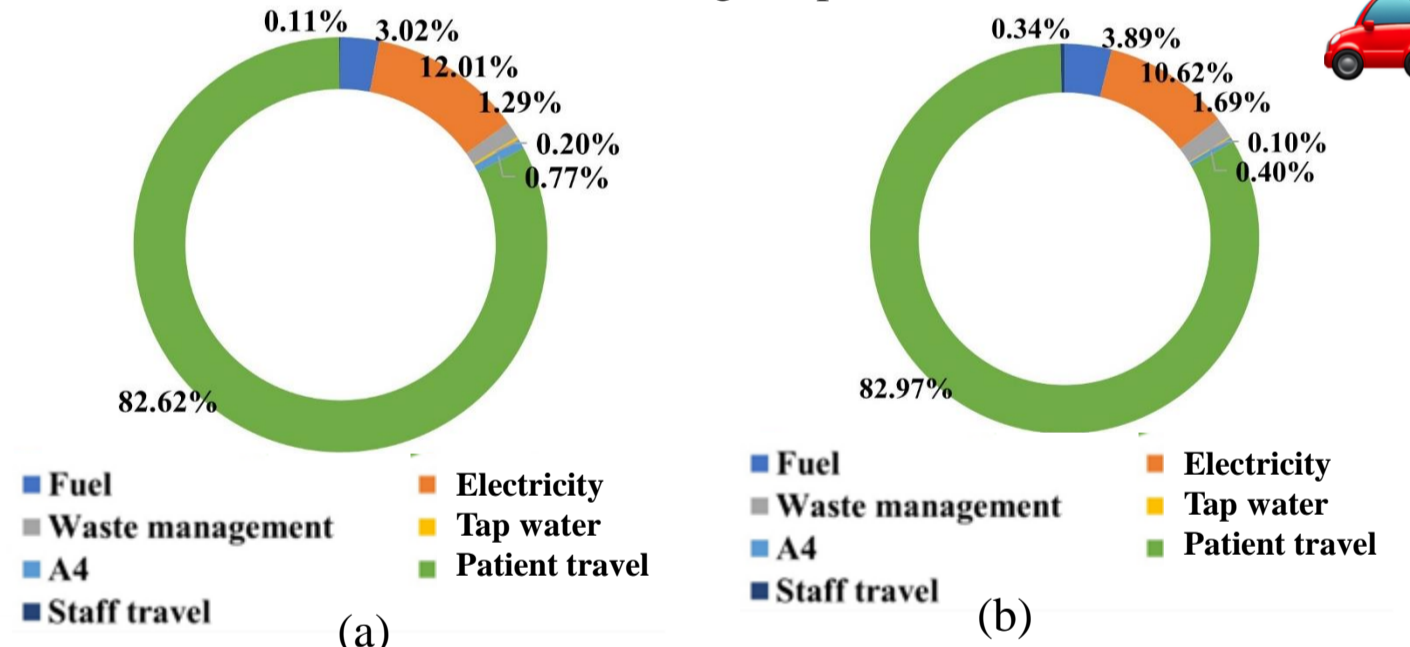

Fig. 2 Average contribution of GHGs emission from 2019-2021, by activity; Health promoting hospitals (a) A and (b) B

Conclusion and Recommendations

- Both health promoting hospitals had the same GHGs emission patterns.
- Patient travelling was found to have the largest proportion (82%), followed by electricity consumption (12%).
- Mitigation of GHGs from patient commute has high potential, including options such as tele-medicine and at-home care.
- Energy efficient technology and renewable energy sources can potentially mitigate GHGs emissions from health care operations.

Acknowledgement