AOT Climate Change Management

Supporting Document

Climate Related Management Incentives

CEO	Business Unit Managers	Employees
Mr. Nitinai Sirismatthakarn Our President (CEO equivalent) is entitled to monetary incentives from climate change management.	AOT Senior Executives and member of Energy Conservation Committee are entitled to monetary incentives from eco-efficiency program.	All employees are eligible to monetary incentives from proposing energy efficiency or GHG reduction ideas.
Type of incentive: Monetary **Incentivized KPI:** Emission reduction	**Type of incentive**: Monetary **Incentivized KPI:** Eco-efficiency	**Type of incentive:** Monetary **Incentivized KPI:** Efficiency
The performance of emission reduction and climate change management are KPIs as a part of corporate sustainability performance. The improvement of sustainability performances, according to S&P Global Corporate Sustainability Assessment is set as CEO's KPIs which ties to monetary incentives upon the achievement.	Monetary incentives are available for AOT Senior Executives and Energy Conservation Committee, who successfully drive eco-efficiency program and contribute to energy reduction according to the plan.	Monetary incentives and awards are available for employee(s) across the organization who win the innovation contest to improve operational efficiency including energy efficiency and GHG reduction. This is included the success of Airport Carbon Footprint Monitoring according to Airport Carbon Accreditation for 6 airports as KPIs.

Significant Financial Impact

Transition Risk (Nationally Determined Contributions: NDC)

Impact	Financial impact
AOT is aware of Thailand's Nationally Determined Contributions (NDC) aiming to reduce 20-25 % of GHG by 2030 compared to Business-As-Usual (BAU), which can result in the enforcement of carbon tax or cap and trade scheme, adding more costs to the companies that have high GHG emission.	**49,729,680 THB (Financial Impact)** - Potential amount of carbon tax payment for AOT based on its GHG emission. **47,000,000 THB (Management Cost)** - Investment of emission reduction technology - Investment on renewable energy source to meet sustainable design building

Physical Risks (Flood)

Impact	Financial impact
High precipitation not only caused aviation problem but also delay of landing and departure due to flooding at the taxiway (which could possibly occur due to higher volume of precipitation in the future with the current condition of airport's infrastructure).	**1,700,000,000 THB (Financial Impact)** - The estimated restoration cost to resume the operations at Don Mueang Airport and head office **159,200,000 THB (Management Cost)** - Investment on new phase of airport infrastructure - Investment on infrastructure maintenance

Climate Related Opportunities

Impact	Financial impact
The construction of additional runways at Suvarnabhumi Airport does not only benefit AOT in terms of larger service capacity to accommodate more passengers and generate more income but also reduces emission by shortening taxi time for landing and taking off. As AOT is the largest state-owned airport operator of Thailand, this contributes substantially to emission reduction of the airport, airlines and the aviation sector of the country.	**28,989,180,000 THB (Annual financial positive impact)** - More passengers capacity and higher revenue generation **5,448,985,250 THB (Management Cost)** - Investment on new phase of airport infrastructure **-** investment on renewable energy source and infrastructure to meet sustainable design building

Scope 3 Emission

Evidence of Scope 3 Emission Tracking

Example from Suvarnabhumi Airport

Emissions Sources	Emissions	Unit	%
Scope 1: Direct GHG emissions			
Stationary source	118.73	tCO_2e	0.01
Mobile source	1,760.49	tCO_2e	0.09
Other activity	0.56	tCO_2e	0.00
Total Scope 1 emissions	**1,879.78**	**tCO_2e**	**0.10**
Scope 2: Indirect GHG emissions			
Emissions from electricity consumption	87,231.45	tCO_2e	4.69
Purchased cooling water	52,047.95	tCO_2e	2.80
Total Scope 2 emissions	**139,279.40**	**tCO_2e**	**7.49**
Scope 3: All other indirect emissions			
LTO cycle	1,021,096.11	tCO_2e	54.92
APUs	231,314.96	tCO_2e	12.44
engine testing	284.46	tCO_2e	0.02
GSE	26,951.73	tCO_2e	1.45
Surface access	319,136.56	tCO_2e	17.16
Business travel	89.66	tCO_2e	0.00
Waste management	346.10	tCO_2e	0.02
Shuttle bus	786.09	tCO_2e	0.04
Electricity re-sold	118,161.62	tCO_2e	6.36
Total Scope 3 emissions	1,718,167.28	tCO_2e	92.41
Total all scopes of emissions	1,859,326.46	tCO_2e	100.00

The methodology is in line with Airport Carbon Accreditation Standard

Internal Carbon Price

Internal Carbon Price is applied in financial impact assessment on transitional risk: Climate regulation (Carbon Tax)

Application of Internal Carbon Price
The emerging regulations to reduce GHG as part of NDC may lead to an implementation of carbon tax in Thailand. AOT's internal carbon price is a shadow price based on Singapore carbon tax as it is the first country in Southeast Asia (same region as Thailand) to enforce this regulation. The carbon tax rate of (5 SGD/tCO2e or 115 THB/CO2e) is internally used to support decision making for executives in terms of energy efficiency and other low carbon projects.

Singapore carbon tax Link 5 SGD / tCO2e = 116 THB/tCO2e Conversion rate: 23.07 THB / 1 SGD as of 30 Sep 2020

Low Carbon Product

Emission reduction from airport improvement:

Construction of the third and the fourth run way of Suvarnabhumi Airport

Airport improvements	Airfield improvements	Installation of LED instead of classic light (ICAO Secretariat)	CO_2 savings = 0.4 * kWh * kg of CO_2/kWh$_i$	An airport uses 600,000 kWh per year for light. CO_2 released per 1 kWh produced is 0.3 kg (0.0003 tonnes) The annual CO_2 savings can be estimated as: 0.4 * 600,000 * 0.0003 = 72 tonnes CO_2 saved
		Construction of runways (ICAO Secretariat)	Use IFSET or FS = ∑[time savings$_i$ (min) * FB$_i$ /min]	An airport with an average of 100,000 arrivals and 100,000 departures annually is building an additional runway. On average, aircraft are expected to save 3 minutes on arrival and 5 minutes on departure from the additional runway. Arriving aircraft typically burn 35 kg (0.035 tonnes) per minute and departing aircraft burn 12 kg (0.012 tonnes) per minute during taxi. The annual fuel savings can be estimated as: — arrivals: 3 * 0.035 * 100,000 = 10,500 tonnes fuel saved — departures: 5 * 0.012 * 100,000 = 6,000 tonnes fuel saved Total: 16,500 tonnes fuel saved

Reference: ICAO Doc 9988 , Guidance on the development of State's Action Plans on CO2 Emission Reduction Activities

Example of calculation for AOT's construction of the third and the fourth run way of Suvarnabhumi Airport

การคาดการณ์จากสมมุติฐานดังกล่าวสรุปได้ว่า Assumptions on fuel consumption in take-off and landing at Suvernabhumi Airport

สำหรับโครงการสร้างทางวิ่งที่ 3 ของสนามบินสุวรรณภูมิแล้วเสร็จในปี 2565 จะช่วยลดการใช้น้ำมันของ
สายการบินของไทย เข้า-ออก ของสนามบินสุวรรณภูมิ ประมาณ (96,710*3*0.035) + (96,710*5*0.012) = 15,957 ตัน
สำหรับโครงการสร้างทางวิ่งที่ 4 ของสนามบินสุวรรณภูมิแล้วเสร็จในปี 2573 จะช่วยลดการใช้น้ำมันของ
สายการบินของไทย เข้า-ออก ของสนามบินสุวรรณภูมิ ประมาณ (148,751*3*0.035) + (148,751*5*0.012) = 24,544 ตัน

วิธีการคำนวณปริมาณคาร์บอนไดอออกไซด์เทียบเท่า ที่ลดลง Emission Reduction from Fuel saving

ปริมาณน้ำมัน * Emission Factor = จำนวนปริมาณตันคาร์บอนไดอออกไซด์เทียบเท่า

หมายเหตุ ค่า Emission Factor อ้างอิงจาก Airport Carbon and Emission Reporting Tool (ACERT) version 4.0, ACI มีค่าเท่ากับ 3.1528 $kgCO_2e/kg$

ปริมาณคาร์บอนไดอออกไซด์เทียบเท่า ที่ลดลง Total GHG Reduction

สำหรับโครงการสร้างทางวิ่งที่ 3 ของสนามบินสุวรรณภูมิแล้วเสร็จในปี 2565 เท่ากับ 15,957 * 3.1528 = 50,309 ตันคาร์บอนไดอออกไซด์เทียบเท่า
สำหรับโครงการสร้างทางวิ่งที่ 4 ของสนามบินสุวรรณภูมิแล้วเสร็จในปี 2573 เท่ากับ 24,544 * 3.1528 = 77,382 ตันคาร์บอนไดอออกไซด์เทียบเท่า

หมายเหตุ [1] Airport Carbon and Emission Reporting Tool (ACERT) version 4.0, ACI

Ground Powering and Cooling System for Aircraft

Calculation is based on emission avoidance from fuel combustion by aircraft to generate electricity which has higher emission factor compared to grid electricity

5.2 Auxiliary Power Unit (APU) and engine testing

5.2.1 Auxiliary Power Unit

The actual fuel flow rate of all APU models operated at BKK and actual running time of each APU operated were not accessible. Therefore, emission of APU was calculated using numbers of flights, and distance of each flight to identify estimated APU fuel consumption of each flight. The fuel consumption was multiplied by emission factors.

Distance criteria for short-haul and long-haul flight

TGO provides emission factors for short-haul flight and long-haul flight but does not provide the definition of these two classifications. As a result, the distance criteria defined by EUROCONTROL[9], as shown in Table 13, are used for classifying distance of each flight.

Table 13: Distance criteria for short-haul and long-haul flight

Type of flight	Distance
Short haul flight	Less than or equal to 1,500 kilometres
Long haul flight	Greater than 1,500 km