

## Introduction

This document outlines the process for the collation and analysis of the carbon-efficiency data in the TUI GROUP Annual Report 201/16 [FY16], including the basis of the underlying assumptions and the methodology applied to the calculations undertaken during the preparation of the report.

The methodology for the calculation of selected flight operations metrics was taken into account by PwC in their assurance procedures – please refer to PwC's Independent Assurance Report via the following weblink:

<http://www.tuigroup.com/en-en/sustainability/reporting-downloads>

## Background

New Regulations came into force in the UK on the 1st October 2013 for all companies listed on the London Stock Exchange Main Market. The Companies Act 2006 (Strategic and Directors' Reports Regulations 2013) required affected organizations including the former TUI Travel PLC to report direct and indirect greenhouse gas [GHG] emissions (expressed as CO<sub>2</sub> equivalent or CO<sub>2</sub>e) from their global operations – accounting for all six Kyoto Protocol gases<sup>2</sup>, as appropriate.

TUI GROUP is listed on the London Stock Exchange Main Market but is domiciled in Germany and will produce its FY1516 Annual Report in accordance with German Law. However, TUI GROUP still wishes to maintain its leadership position regarding reporting and disclosure of carbon emissions (both absolute and relative) so will continue to report in line with the aforementioned UK Companies Act 2006 (outlined above).

FY1415 was also a transition year, whereby the former TUI Travel became TUI GROUP in December 2014 and so as outlined in the FY1314 Methodology Document, the business has now taken the decision to reappraise the methodology deployed for calculating and reporting carbon emissions on a relative (intensity) basis – see below.

Finally, it is worth noting that whilst neither the UK nor German Governments currently require these data to be externally verified, either the intensity metric or the absolute footprint, TUI GROUP has taken the additional voluntary step to have these headline carbon emission metric data verified in line with best practice by a third party, PwC.

## Flight operations metrics

TUI GROUP calculated the following carbon efficiency performance metrics for the TUI GROUP Annual Report FY1415 which were audited by PwC – see the actual table below with FY1415 data. These metrics are also reported in TUI GROUP's FY1415 Annual Report and TUI GROUP's FY1415 Magazine. It is these data contained in the table below that PwC have specifically verified and which PwC's Independent Assurance Report relates.

| <b>INTENSITY (RELATIVE)<br/>METRIC</b>  | <i>gCO<sub>2</sub>/Revenue Passenger<br/>Km (RPK<sup>3</sup>)</i> | <i>gCO<sub>2</sub>e/Revenue Passenger<br/>Km (RPK)</i> |
|-----------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------|
| FY1415 TUI GROUP airlines               |                                                                   |                                                        |
| ArkeFly                                 | 63.8                                                              | 64.4                                                   |
| Corsair International                   | 79.8                                                              | 80.6                                                   |
| Jetairfly                               | 69.6                                                              | 70.3                                                   |
| Thomson Airways                         | 63.7                                                              | 64.3                                                   |
| TUIfly                                  | 63.4                                                              | 64.0                                                   |
| TUIfly Nordic                           | 60.6                                                              | 61.2                                                   |
| <b>TUI GROUP airlines<br/>(average)</b> | <b>66.0</b>                                                       | <b>66.7</b>                                            |

<sup>1</sup> The TUI GROUP Financial 15/16 Year is 1<sup>st</sup> October 2015 – 30<sup>th</sup> September 2016.

<sup>2</sup> Carbon dioxide (CO<sub>2</sub>); Methane (CH<sub>4</sub>); Nitrous oxide (N<sub>2</sub>O); Hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); and Sulphur hexafluoride (SF<sub>6</sub>)

<sup>3</sup> RPK – Revenue Passenger Km

The data in the table below have not been verified by PwC and therefore PwC's Independent Assurance Report does not relate to these.

| <b>INTENSITY &amp; ABSOLUTE METRICS</b> | <i>Tonnes</i> | <i>g/100 RPK</i> |
|-----------------------------------------|---------------|------------------|
| FY1415 - TUI GROUP airlines             |               |                  |
| Oxides of Nitrogen (NO <sub>x</sub> )   | 30,754        | 41.38            |
| Carbon Monoxide (CO)                    | 1,523         | 2.05             |
| UnburntHydrocarbons                     | 130           | 0.17             |

## Metrics used

All metrics are using data for the reporting period 01 October 2015 to 30 September 2016 (TUI GROUP's 2015-16 financial year) using the following methodology:

- Individual airline total carbon emissions and relative [specific CO<sub>2</sub> and CO<sub>2</sub>e] carbon efficiency as well as the Group [TUI GROUP's] total fuel burn and airlines CO<sub>2</sub> and CO<sub>2</sub>e averages for passenger flights were calculated.
- In addition to the key metrics mentioned in the letter of variation, dated 1 November 2013, the indicators 'total fuel consumption' and 'specific fuel consumption in litres per 100 pax revenue km' will be included in the assurance scope of the auditor – PwC – for FY1516.
- The methodology related to carbon disclosure used followed the protocols outlined in the BS EN 16258 – 2012, "Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers)" document, The British Standard's Institute adopted the methodology document of the European Standard [which was approved by CEN on 8 September 2012]. This is essentially the methodology that Airlines with operations within the EU and beyond follow to comply with the EU's Emissions Trading Scheme requirements.
- The UK Government's Environment Department [DEFRA]'s GHG Conversion Factors for Company Reporting have been used – last issued in June 2016.
- As a German domiciled company and one operating under German Law when it comes to filing company accounts, TUI GROUP has now adopted this EU methodology [using the Great Circle Distance plus 95km for this reporting year [FY1516], rather than the previous UK-specific methodology issued by DEFRA which had been used when during former times as TUI Travel PLC.

## Total passengers

Passenger numbers are derived from on-board reports signed by the flight's commander, i.e. Flight Crew on-board. This information is fed into the TUI GROUP's airlines operations database, for flights that actually occurred. All persons aboard the aircraft are included in the total passenger count (i.e. all male, female and child passengers and non-revenue passengers, such as crew on non-active duty); with the exception of active crew on duty and infants.

## Flights considered

TUI GROUP considered all flights conducted under TUI airline's flight number. In addition, it includes ferry flights (a flight is referred to as a ferry flight if it is done without passengers for revenue, rather than logistical, purposes). However, there are a number of types of flight excluded. As follows:

- excluding sub-charters flying for a TUI airline;
- excluding sub-charters a TUI airline flies for other airlines;
- excluding positioning flights (a flight is referred to as a positioning flight if it is done without passengers for logistical, rather than revenue purposes); and
- excluding training, technical and all-cargo flights.

## Absolute fuel burn and carbon data calculations

The scope of TUI GROUP airlines' carbon data is as follows:

- All flights conducted under each airline's flight number including sub-charters flown for TUI GROUP airlines
- Excluding sub-charters TUI GROUP airlines fly for other airlines.

<sup>4</sup> These KPIs were not audited by PwC in FY1314 on account of being the restated figures

<sup>5</sup> ICAO – International Civil Aviation Authority, a UN agency.

### Fuel Consumption

For each TUI Airline, fuel data is derived from on-board reports signed by the flight's commander. This information is fed into the TUI GROUP's airlines operations database, for flights that actually occurred. The fuel to be considered to calculate the CO<sub>2</sub> and CO<sub>2</sub>e efficiency is the fuel used from the moment the aircraft moves under its own or external power for the purpose of taking-off until the moment it comes to rest at the end of the flight (often referred to from "Off-block" to "On-block").

### Great Circle Distance (GCD)

The GCD is the shortest distance between two points on the surface of a sphere, measured along the surface of the sphere – i.e. the Earth. The methodology used by TUI GROUP's airlines to calculate this distance is based on officially published airport reference points (in the AIP – Aeronautical Information Publication); using the Vincenty Inverse formula with the Latitude/Longitude points based on the World Geodetic System WGS 84. As outlined and discussed in this document, for this reporting year (FY15), TUI GROUP has applied GCD plus 95km as prescribed by the EU Methodology [EN 16258 – 2012].

### Revenue Passenger Kilometre [RPK]

A Revenue Passenger Kilometre [km] for a flight is defined as:

- *gCO<sub>2</sub>/Revenue Passenger km value*  
This is calculated by taking the GCD flown by an aircraft (in kilometres) for a given flight multiplied by the total number of passengers (using the logic of previous reporting years in order to show our improvements).
- *gCO<sub>2</sub>e/Revenue Passenger km value*  
This is calculated by taking the GCD flown by an aircraft (in kilometres) for a given flight multiplied by the total number of passengers (using the logic of previous reporting years in order to show our improvements).

### Carbon dioxide efficiency factor for TUI GROUP's airline passengers

The carbon dioxide efficiency factor or co-efficient for TUI GROUP's airline passenger calculations is as follows:

- *gCO<sub>2</sub>/Revenue Passenger km value*  
A factor of 3,149.66667 tonnes of CO<sub>2</sub> per tonne of aviation turbine fuel burnt has been used. Source, DEFRA [UK] – June 2016, Version 1.
- *gCO<sub>2</sub>e/Revenue Passenger km value*  
A factor of 3,181.18586 tonnes of CO<sub>2</sub>e per tonne of aviation turbine fuel burnt has been used. This factor also includes indirect/"Well to Tank" emissions of Nitrogen Dioxide (N<sub>2</sub>O) and Methane (CH<sub>4</sub>), two of the six Kyoto gases that form the "CO<sub>2</sub> equivalent" for aviation turbine fuel in addition to CO<sub>2</sub>. Source, DEFRA [UK] – June 2011, Version 1.
- *Specific Fuel Consumption*  
Litres per 100 revenue passenger km is a common metric used in Europe to express fuel-efficiency and as such is calculated using first principles. For conversion from mass information to litre the standard factor 0,8 kg/liter is used.
- *Carbon monoxide [CO], Unburnt Hydrocarbons [UHCs] & Oxides of Nitrogen (NO<sub>x</sub>)*  
These pollutants are all by-products of airline fuel combustion. However, these pollutants all have a non-uniform relationship to combustion of fuel, whereas this is not the case for CO<sub>2</sub> emissions. The standard way to calculate these [CO, UHCs & NO<sub>x</sub>] emissions is using the ICAO5 Landing & Take-Off [LTO] Cycle info tables with specific reference to the different phases of flight, e.g. take-off, climb, cruise, arrival etc. These data are then combined with engine/airframe combinations to pinpoint the emission values for each variation. Source, ICAO.

<sup>4</sup> These KPIs were not audited by PwC in FY1314 on account of being the restated figures

<sup>5</sup> ICAO – International Civil Aviation Authority, a UN agency.