BP TARGET NEUTRAL
ONLINE TRAVEL CALCULATORS:
METHOD FOR CALCULATING TRANSPORT EMISSIONS

1.0 EXECUTIVE SUMMARY

BP Target Neutral is committed to helping individuals to tackle their personal carbon footprint from their daily journeys.

This methodology statement was developed to support BP Target Neutral's online carbon offsetting calculators for the European markets.

The paper sets out the overarching approach for all transport-related projects undertaken by BP Target Neutral and presents the rationale behind the method adopted for calculating emissions arising from different passenger transport modes.

Using the explained methodology, the online travel tools calculate the offset cost by multiplying the tonnage (1 tonne of CO2e is equivalent to 1 carbon credit) by the latest BP Target Neutral carbon credit portfolio price. A link to a payment option is provided to allow the user to complete the transaction.

1.1 EMISSION FACTORS

Emission factors for the European markets are derived from the 2017 UK Government Greenhouse Gas (GHG) Conversion Factors for Company Reporting. The WBSCD/WRI GHG Protocol recognises this source for use as default emission factors where country specific values are not readily available.

This document, previously known as the 'Guidelines to Defra/DECC's GHG Greenhouse Gas Conversion Factors for Company Reporting', is updated on an annual basis. To have alignment across BP Target Neutral's suite of tools, all emission factors are updated simultaneously for consistency, therefore there may be a short lag between emission factor release dates and when the calculators are updated.

Emissions are determined from either (1) fuel use, taking into account the vehicle and fuel types, or (2) distance travelled using the appropriate average emission factors for different travel modes.

When calculating emissions, not only are direct 'tank-to-wheel' emissions of CO_2, CH_4 and N_2O from the combustion of fuel accounted for, but also the indirect emissions associated with the extraction and transport of primary fuels as well as the refining, distribution, storage and retail of finished fuels (otherwise known as the 'well-to-tank' emissions).

The applicable 'well-to-tank' emissions, whether relating to fuels or different travel modes, are therefore lifted from the specific 'WTT' table in DEFRA's GHG Conversion Factors for Company Reporting document and added to the relevant conversion factor. Table 1 below shows a small sample of emission factors used in the online calculator and used within the

example calculations which follow.

Table 1: Example emission factors used for the European markets

Emissions Category	Description	TTW Emissions	WTT emissions	Total WTW emissions	
Fuel	100% mineral petrol	2.30075	0.59549	2.89624	$kgCO_2e$/litre
Fuel	Liquid Petroleum Gas (LPG)	1.50807	0.18961	1.69768	$kgCO_2e$/litre
Car	Small petrol car, up to 1.4 litre engine	0.15649	0.04253	0.19902	$kgCO_2e$/km
Train	National rail	0.04678	0.00921	0.05599	kgCO2e/pkm
Underground/tram	London Underground	0.04674	0.00745	0.05419	kgCO2e/pkm
Coach/bus	Coach	0.0278	0.00659	0.03439	kgCO2e/pkm

1.2 EXAMPLE CALCULATIONS

Slight variances will be seen between the online tools and the manual calculations laid out below due to formatting results to a set number of decimal places at the point of display to the end user.

1.2.1 CAR TRAVEL

a. *Car type*

After inputting annual distance travelled, users in the European markets can select the fuel type followed by their car size.

For example, if a driver travelled 10,000 miles and opted for a small petrol car, emissions generated would be as follows:

= distance in km x emission factor
= (distance in miles x conversion to km) x emission factor
= (10,000 miles x 1.6093 km/mile) x 0.19902 kgCO2e/km
= 3,202 kgCO2e = 3.2 tCO2e

b. *Fuel type*

Alternatively, it is possible for a user to enter the car's fuel efficiency value in either 'miles per gallon' (mpg), 'litres per 100 km' (l/100km) or the vehicle emissions value in gCO2/km.

Where fuel efficiency is provided, emissions are calculated on the basis of fuel usage and the fuel-specific conversion factor, as in the examples below.

Emissions for 10,000 miles travelled in a petrol-fuelled car with 'mpg' value of 36:

= fuel usage in litres x emission factor
= [(mileage/fuel efficiency) x conversion to litres] x emission factor

= [(10,000 miles/36 mpg) x 4.5461] x 2.8962 kgCO2e/litre
= 3,657 kgCO2e = 3.7 tCO2e

Emissions for 10,000 miles in an LPG-fuelled car with 'l/100km' value of 27:

= fuel usage in litres x emission factor
= [(fuel efficiency) x (distance in miles x conversion to km)] x emission factor
= [(27/100) x (10,000 miles x 1.6093 km/mile] x 1.6977 kgCO2e/litre
= 7,377 kgCO2e = 7.4 tCO2e

In instances where the user enters the car emissions value in gCO2/km, this is uplifted by 15% to account for CH4 and N2O emissions as well as indirect 'WTT' emissions.

For example, emissions for 10,000 miles travelled in a car emitting 275 gCO2/km:

= [(emissions value x 1.15) x (distance in miles x conversion to km)]/ 1,000
= [(275 gCO2/km x 1.15) x (10,000 miles x 1.6093 km/mile)]/ 1,000
= 5,090 kgCO2e = 5.1 tCO2e

c. *Vehicle registration number*

For the UK market the user has the option to enter the vehicle registration number. The car type is automatically looked up in the relevant database and the emissions are calculated depending on the annual distance travelled entered by the user.

1.2.2 TRAIN TRAVEL

UK users can enter the departure and arrival stations, select return trip and input the number of trips. The National Rail conversion factor is used across all European markets for consistency. The shortest distance between stations, taking into account the curvature of the Earth, is calculated using their longitude and latitude coordinates. An uplift of 20% is subsequently applied to reflect the train route distance more accurately.

Emissions for a person travelling from London King's Cross to Cambridge once:

= distance between stations x uplift factor x emission factor x number of trips
= 75.6 km x 1.2 x 0.05599 kgCO2e/pkm x 1
= 5.1 kgCO2e

Emissions for someone travelling from London Paddington to Oxford and back five times:

= 2 x (distance between stations x uplift factor x emission factor x number of trips)
= 2 x (79.9 km x 1.2 x 0.05599 kgCO2e/pkm x 5)
= 53.7 kgCO2e

All other users inside Europe are able to input the trip distance in miles and in kilometres respectively, trip type, and number of trips. It is assumed that the user would obtain the distance travelled from a web mapping service, such as Google Maps or Bing Maps, which

would return a road distance value. No uplift factor is applied to the distance entered by the user as driving distances are found to broadly correlate with train distances.

Emissions for European users doing a single 40 km trip four times:

```
= distance in km x emission factor x number of trips
= 40 km x 0.05599 kgCO2e/pkm x 4
= 9.0 kgCO2e
```

1.2.3 TRAVEL BY UNDERGROUND/TRAM

As for train travel, it is possible for UK users to enter the departure and arrival stations, and likewise an uplift factor of 20% is applied to UK travel on the Underground. The London Underground conversion factor is applied to emissions calculations for all European users. No uplift factor is used in emissions calculations for European countries outside of UK for the same reason as above.

Emissions for a UK user undertaking 13 single trips on the London Underground between Holborn and Bank:

```
= distance between stations x uplift factor x emission factor x number of trips
= 2.2 km x 1.2 x 0.05419 kgCO2e/pkm x 13
= 1.9 kgCO2e
```

Emissions for European users undertaking five 8 km return trips on the tram:

```
= 2 x (distance x emission factor x number of trips)
= 2 x (8 km x 0.05419 kgCO2e/pkm x 5)
= 4.3 kgCO2e
```

1.2.4 TRAVEL BY COACH/BUS

For all European users, calculating the emissions from travel by coach or bus requires the user to input trip distance, type and number.

Emissions for a person making one return 14-mile trip in Europe:

```
= 2 x [(distance in miles x conversion to km) x emission factor x number of trips]
= 2 x [(14 miles x 1.6093 km/mile) x 0.03439 kgCO2e/pkm x 1]
= 1.6 kgCO2e
```

1.2.5 AIR TRAVEL

Two key elements form the basis of air travel emissions calculations:

(1) An uplift factor of 8% applied to the flight distance to factor in sub-optimal routing and stacking at airports during periods of heavy congestion; and

(2) The Radiative Forcing Index (RFI) of 1.9 applied to the CO2 emissions factor of any

given flight type to account for non-CO2 climate change effects of aviation, for example, those associated with vapour trails or NOx emissions.

These two factors have already been incorporated into DEFRA's GHG conversion factors. As mentioned in Section 1.2, 'WTT' emissions have been included in the relevant emission factors.

Flight distances are calculated using the Great Circle Flight methodology to account for the curvature of the Earth.

Emission factors are applied according to the route length, e.g. domestic, short-haul international or long-haul international. Band distances are used to determine the flight type. Table 2 below outlines the band start point for each flight type as well as the associated emission factor.

Table 2: Flight type band start points and emission factors

Flight type	Band start (km)	TTW Emissions	WTT emissions	Total WTW emissions	
Domestic	0	0.26744	0.0293	0.29674	(kg CO2e/pkm)
Short-haul international	401	0.16103	0.0176	0.17867	(kg CO2e/pkm)
Long-haul international	3700	0.19745	0.0216	0.21908	(kg CO2e/pkm)

Class information is not taken into consideration i.e. the average conversion factor, instead of factors specific to economy, business or first class travel, is used for each flight type.

Emissions for a person making four return trips from London Heathrow to Cape Town:

= 2 x (distance x long-haul international average emission factor x number of trips)
= 2 x (19,350 km x 0.21908 kgCO2e/pkm x 4)
= 16,957 kgCO2e = 17.0 tCO2e