



# Offsetting in the aviation sector

**Evaluating voluntary offset programs of major airlines**

Elizabeth Zelljadt

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## Contact information

Elizabeth Zelljadt  
Fellow  
Ecologic Institut

E-Mail: [elizabeth.zelljadt@ecologic.eu](mailto:elizabeth.zelljadt@ecologic.eu)

Tel: [\(+1\) 413 210 8663](tel:+14132108663)

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## Introduction

Efforts to address the rapid growth of emissions from air travel have been under discussion for years within the United Nations' aviation body - the International Civil Aviation Organization (ICAO). In 2013, ICAO agreed on a goal of limiting international aviation's net emissions growth to 2020 levels (estimated at roughly 700 million tonnes CO<sub>2</sub> per year in 2020<sup>1</sup>), via a mix of efficiency measures, biofuel use, technology and operational improvements including a CO<sub>2</sub> standard, and a global market-based measure (GMBM). In other words, the industry's growth from 2020 onward should be "neutral" in terms of net CO<sub>2</sub> emissions.

Along with airline operational changes and aircraft technology improvements, offsetting is expected to help compensate for the gap between what the other measures are supposed to accomplish and the reality of exponentially growing emissions from the sector. Nevertheless, the idea of offsetting as a measure for achieving reductions has gained support recently, with a June 2016 meeting of the trade association for the world's airlines (the International Air Transport Association or IATA, representing over 250 airlines or 83% of total air traffic) urging ICAO to adopt a global market-based measure.<sup>2</sup> At the 39th ICAO Assembly held in the fall of 2016, ICAO states adopted a resolution establishing the Carbon Offset and Reduction Scheme for International Aviation (CORSIA). The final CORSIA<sup>3</sup> was a departure from earlier draft texts, starting with two voluntary phases until 2027. Due to exemptions and the fact that opposed states with rapidly growing aviation hubs decided not to participate, the CORSIA is now expected to cover only around three quarters of emissions above 2020 levels.

Estimates of the volume of CORSIA units needed to offset aviation's emissions growth vary – one study predicts demand for nearly eight billion tonnes of offsets cumulatively through 2040.<sup>4</sup> With such large volumes of emission reductions at stake, ongoing consultations regarding the *quality* of allowable offsets are critical to ensuring that an offsetting approach for aviation has environmental integrity. Most policy makers have come to a consensus on the meaning of "quality" and "environmental integrity" in terms that such units must be real, permanent, additional, measurable, and only counted once towards a mitigation commitment. Offsets without these qualities would undermine the effectiveness of a market-based measure. Information on existing offset programs used by global air carriers is useful in this regard, as it sheds light on current trends and perceived "best practices" among the industry players who will be buying whatever CORSIA units that ICAOs deems eligible.

To that end, this report investigates the way air carriers currently engage in offsetting (to the extent they do so at all), with a focus on the offset project types, credits, and entities involved. It consolidates evidence of offsetting practices from over 30 air carriers, organized in an order loosely determined by a combination of carrier size/"importance" as measured by annual Scope 1 emissions<sup>5</sup> and availability of corporate sustainability or emissions information.<sup>6</sup>

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1 ICAO (2015) "Overview of ICAO's Environment Work", Presentation held during the Global Aviation Dialogues (GLADs) on Market-Based Measures to address Climate Change, Singapore, 23 April 2015. Available online at: [http://www.icao.int/Meetings/GLADs-2015/Documents/Presentations/Singapore/20150423\\_GLADs\\_P1\\_V36\\_SINGAPORE.pdf](http://www.icao.int/Meetings/GLADs-2015/Documents/Presentations/Singapore/20150423_GLADs_P1_V36_SINGAPORE.pdf)

2 IATA resolution of June 2, 2016 (available online at <http://www.iata.org/pressroom/pr/Documents/iata-agm-2016-resolution-mbm.pdf>) states that: "Aircraft operators should have as broad access as possible to the carbon markets and be able to use any carbon emissions units that meet the environmental integrity and other eligibility criteria to be agreed by States at ICAO."

3 The report, including the resolution language, can be found here: [http://www.icao.int/Meetings/a39/Documents/WP/wp\\_530\\_en.pdf](http://www.icao.int/Meetings/a39/Documents/WP/wp_530_en.pdf)

4 A coalition of non-governmental organizations cooperating on the issue of aviation emissions (including Carbon Market Watch) estimated the amount of aviation emissions needing to be offset between 2020 and 2040 at 7.8 billion tonnes, based on the projected emissions growth for this time period estimated in the ICAO GLADs submission cited above. See "How big is aviation's emissions gap?" at <http://www.flightpath1point5.org/>

5 Scope 1 refers to direct aviation emissions (those from the burning of jet fuel during flight) and are most frequently/consistently reported in e.g. corporate sustainability documents, as opposed to Scopes 2 or 3, which take into account emissions from ground operations, ancillary vehicles, airport maintenance, etc. For some airlines including e.g. Thai and South African, annual emissions information was not available - the authors placed those carriers toward the bottom of the list given their primarily domestic flight portfolio.

6 Availability refers to (in order of consideration for this study): accessibility of offset program information on the official airline website, information about offsetting initiatives in corporate documentation (annual reports, sustainability/responsibility reports), references to airline offsetting initiatives from third parties (media reports, listing as part of initiatives of overall airline groupings such as Star Alliance or OneWorld), and details provided to researchers via phone/email correspondence with airline representatives and/or offset aggregator/retailer organizations.

# 1 Context of findings: the need for a transparent, robust registry

Before even compiling the findings of this report, simply gathering the necessary information proved difficult (and in some cases impossible) due to the heterogeneous nature of voluntary offset initiatives. The act of surveying all airline offsetting programs to provide a systematic overview revealed large disparities in corporate approach that will have to be addressed in a future CORSIA system run by ICAO:

Since most airlines have outsourced the offset accounting and/or acquisition process to (sometimes multiple) third parties, who in turn present and consolidate information about offset projects differently, assembling pertinent information from each carrier involved investigation and interviews rather than simple information collection from e.g. the carrier's website. The information most critical to proper carbon market accounting (number of tonnes involved, price per tonne) was largely unavailable, due to the **disconnect between institutions managing the offset credit acquisition process on behalf of airlines** (e.g. Sustainable Travel International, MyClimate, CarbonNeutralCompany) and the airline departments authorized to disclose such information. This points to another critical task for creators of a CORSIA under ICAO: in addition to setting rigorous standards for integrity of the offsets themselves, stakeholders must establish rules for a transparent CORSIA structure in which offset transactions can be traced and logged in a registry. A recent paper on aviation sector offsetting<sup>7</sup> details the accounting difficulties such a registry must prevent: it distinguishes among double use, double *issuance*, and double *claiming* of emission reductions for offsetting purposes.<sup>8</sup>

The current voluntary offset market supplying airlines' customer programs can fall prey to each of these, as it constitutes a mix of registries (Voluntary Carbon Standard or VCS uses the Markit registry, the Climate Action Reserve or CAR has its own registry, the CDM has the international transaction log or ITL) from which offset "middlemen" or retailers take credits to form mixed (and thus hard to trace) portfolios, with corporate buyers often purchasing a basket of credits at different prices whose use as an offset requires cancellation/retirement from various registries.

Moreover, airlines are not the main participants in this market - the demand side consists mainly of other large corporate entities meeting their carbon neutrality claims via offsetting. For example, the main benefactor of the Alto Mayo forest conservation project in Peru, to which United Airlines' customer offset payments go, is the Walt Disney Corporation. Airline customer offsetting represents only a small portion of the voluntary offset flow, which is largely determined by the large corporate buyers' main projects. It is unclear what kinds of offsetting programs or units will be eligible for the CORSIA, however any eligible units will enjoy a price premium that makes their relationship to the rest of the offset market relevant. Therefore, accounting for the generation, transfer, use and cancellation of such units must ensure transparency among all participating institutions (states, airlines, project developers, verifiers, brokers and ICAO) to prevent double *issuance* of CORSIA units and/or double *claiming* notably at the level of the UNFCCC and the Paris Agreement. Double claiming occurs when the country in which the offset project occurs claims the reduction under its national actions toward the climate agreement even though they should be subtracted from the country's inventory if purchased as offsets by an outside entity. A precedent for keeping country and project emissions from

7 Cames and Schneider, 2016: ICAO's offsetting mechanism: avoiding double counting of emission reductions. Carbon Mechanisms Review, Issue 3, September-October 2016. Wuppertal: Wuppertal Institut. Pages 11-14. Available online at <http://www.carbon-mechanisms.de/en/2016/cmr-3-2016-from-kyoto-to-paris/>.

8 Ibid: Double use occurs if one offset unit is used more than once under the market based mechanism, e.g. if the same unit is used in two different years or by two different airlines for compliance. Double issuance occurs if more than one unit is issued for the same emission reduction. For example, with multiple programs operating in parallel under different governance arrangements, two programs could issue units for the same emission reductions. Double claiming occurs if an emission reduction is used by both the buyer and the seller. For example, if an emission reduction is counted by an airline towards offsetting requirements under ICAO and by the seller (a country) towards its national emission reduction goal under UNFCCC.

being double counted or claimed may be the connection between the EU's registry for allowances in its emission trading system and the UNFCCC's international transaction log (ITL).

## 2 Spectrum of initiatives

In line with the purpose of this study to inform eventual offset standards required of all airlines under an international market based measure through ICAO, Table 1 shows initiatives on the wide spectrum of carbon offsetting. Shading denotes the degree to which activities can be likened to what mandatory offsetting under an ICAO program could potentially look like.

Also denoted in color are the "top 10" carriers according to scheduled passenger kilometers flown (in order of size by that metric), followed by carriers that constitute major affiliates of these or part of the same corporate entity (Swiss and Austrian are part of Lufthansa Group, Air France and KLM are one company, Iberia and British Airways are both part of the merged entity IAG, etc.).

Note that a future market based measure required by ICAO would only pertain to *international* Scope 1 emissions – for some airlines, particularly domestic carriers, these make up only a small percentage of total emissions. Calculating the size/impact by airline if emissions from domestic air travel are removed is beyond the scope of this study.

### Typology of offset programs

**"Corporate offsetting"** means the airline purchases emission reduction units as a company, either to count against a voluntary emission target or to voluntarily offset its employees' emissions. Since the respective carrier spends its own money to do so, this type of offsetting comes closest to purchases carriers will make under a market-based measure required by ICAO. Only 4 carriers<sup>9</sup> engage in such a practice: Delta has set a voluntary internal emissions baseline and offsets any emissions above that baseline, Qantas and Cathay Pacific claim to offset employee travel, and Costa Rican national carrier NatureAir offsets its entire operations via a government-run carbon neutrality program that supports forest conservation.<sup>10</sup>

**"Customer offsetting"** refers to the main subject this report investigates: programs through which the carrier offers customers the choice to purchase emission reduction credits from projects to offset the climate change impact of their flight(s). This is usually done with a "carbon calculator" tool, made available either on the airline's website or via an affiliated organization, through which a customer can calculate the CO<sub>2</sub> emissions associated with a particular journey in tonnes in order to purchase the requisite amount of offsets. The structure of such programs – and the price customers are asked to pay per tonne, as well as the degree to which intermediaries are involved - varies greatly across airlines, but the types of projects offered show some indicative trends that can inform future offset requirements under an eventual ICAO offsetting regime. Depending on how corporate ownership/affiliation is defined, up to 12-15 airlines offer customer offsetting programs.<sup>11</sup> These are compared in Section 2 with respect to the types of entities, credits, and projects involved.

9 Air New Zealand engages in corporate offsetting to the extent it is covered under the New Zealand Emissions Trading System (NZ ETS) – the carrier must account for half the emissions from fuel use by surrendering compliance units to the government on an annual basis. This act of offsetting at the company level is mandatory in the same way that airlines must surrender allowances to cover emissions from flights within EU/EEA air space under the EU ETS – those acts of compliance offsetting are outside the scope of this study, which focuses on voluntary initiatives only.

10 The cost of the offsets is incorporated into ticket prices rather than offered as a separate choice for customers – NatureAir flights are thus "automatically" more expensive than they would be without the offsetting program, but also automatically carbon neutral under the terms of Costa Rica's government carbon neutrality program.

11 The passenger airline group within the corporate entity Lufthansa Group comprises Lufthansa Passenger Airlines (including Germanwings and Eurowings), SWISS, and Austrian Airlines. Of these, SWISS and Lufthansa established offsetting programs in 2007 in cooperation with MyClimate, whereas Austrian cooperates with Climate Austria and integrates offsetting into the booking process. Tonnage figures, however, are available only for Lufthansa Group as a whole. Air France and KLM report total annual emissions together - but they each run distinct offset programs, neither of which provides information on volumes offset to date or annually. Moreover, the offsetting program managed by ClimateCare on behalf of IATA – from which South African Airlines and Mango make offsetting available to customers, also claims to provide offsetting services for local airlines

Given that voluntary offsetting by definition has no specific requirements, some programs do not follow the “typical” offsetting model of accounting for emissions on a per-tonne basis. Rather, customers can choose to **fund activities** associated with emission reduction (such as renewable energy projects at the local level, or a specific nature conservation initiative) that do not necessarily correspond to a measurable emission reduction result per dollar contributed. To the extent that efforts funded by such initiatives can be considered to reduce emissions, they are reflected in this report. Also, some carriers that offer the traditional customer offsetting on a per-tonne basis via a carbon calculator additionally offer the option to donate a lump sum to their program, allowing customers to support projects financially irrespective of the climate impact of a particular flight.

Not the official subject of this analysis, but worth mentioning, is that several **airlines donate** to environmental causes as part of charitable giving or corporate responsibility activities. Emirates does not offer customer offset options but contributed €80.5 million to an Australian conservation resort and Dubai’s desert protected area. The carrier also created an award for projects that reduce emissions worth \$150,000 – the 2013 winners include initiatives similar to offset projects: distribution of energy efficient cookstoves in African villages and electrification of diesel vehicles into battery powered public transport KLM contributes unspecified amounts to ecosystem conservation projects as an official corporate sponsor of WWF, and Finnair sponsors a biodiversity conservation program in Madagascar. Air New Zealand offers customers the option to pay into a trust (instead of or in addition to purchasing offsets) that directs funds toward sustainability initiatives including research. Whether such programs are part of an overall environmental “budget,” and would thus be abandoned when air carriers are required to purchase credits to offset their emissions from international aviation, remains to be seen.

With Table 1 as a reference point for the overall nature of offsetting (or lack thereof) among all air carriers surveyed in this study, the following section focuses on those programs that involve the purchase of emission reduction credits (on a per-tonne basis) from offset projects – i.e. involvement in the (voluntary) carbon market. This type of offsetting is closest to what air carriers would engage in under an ICAO *market-based* offsetting measure.

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such as TAP Portugal and Air Kenya – those carriers in turn do not provide information regarding this cooperation. Thus, the number of carriers actually offering customer offsetting remains somewhat uncertain.

**Table 1: Offsetting initiatives by air carrier**

Airline	Corporate offsetting	Offers customer offsetting	Offers customer donation (not based on tonnes CO <sub>2</sub> )	Company donates to environmental initiative(s)
Delta				
United				
Emirates				
American				
China Southern				
Southwest				
Lufthansa Group (Includes Swiss, Austrian)				
British				
Air France				
Air China				
KLM				
Iberia				
Cathay Pacific				
Air India (+5 Indian regional carriers*)				
Qantas				
Etihad			?	
Japan Airways				
Virgin Atlantic				
South African/Mango				
Thai Air				
Air New Zealand				
NatureAir (Costa Rica)				
Korean Air				
Turkish Air				
Finnair				
Tui				

\* Air Costa, IndiGo, SpiceJet, Vistara, GoAir, JetAirways

### 3 Offsetting data – analysis of trends

Table 2 provides a more detailed compilation of only those air carriers from Table 1 whose programs fall into the “customer offsetting” category and where tonnage, pricing, and at least some project information is available.<sup>12</sup> Details about each offsetting program and the intermediary organizations involved, as well as descriptions of the projects offset money goes to, are listed by airline in the individual carrier “profiles” in Section 3.

**Table 2: Customer offsetting programs by carrier**

Airline	Annual scope 1 emissions <sup>13</sup> in MtCO <sub>2</sub>	Volume offset in that year (tonnes)	Price/tonne (customers)	Intermediary	Offset credit type(s)	Offset standard/registry	Additional certifications
Delta	34	1.2 million (corporate) + 4,000 (customer)	\$15	The Nature Conservancy (customer portion)	CERs, VERs	CDM, VCS (Markit), CAR	Verification bodies include FSC for Virginia project
United	31	unknown	Varies by project sponsored: \$20, \$10 and \$12	Sustainable Travel International	VERs	VCS (Markit)	Gold Standard
Lufthansa/Swiss	28	31,000	~\$11 (€10)	MyClimate	VERs	VCS (Markit)	Gold Standard
Austrian			~28 (€25)	Climate Austria	Mostly Austrian projects	International ones overlap with Lufthansa: VCS	Some Gold Standard
KLM	27.7	unknown	~\$9.85	“CO2Zero” (internal to KLM)	VERs	VCS (Markit)	Gold Standard
Air France		unknown	~\$23	Goodplanet Foundation	VERs	VCS (Markit and APX)	Gold Standard
Cathay Pacific	16.4	13,300	\$3.20	Unknown, if any	VERs	VCS (Markit)	One possible Gold Standard

<sup>12</sup> For Delta, which purchases a significant amount of offsets as a company separate from the customer offsetting option, information includes both purchase types – more details about both corporate and customer purchases in Delta’s carrier profile, see Section 3.

<sup>13</sup> Those given in the table are for the most recent year available – usually 2014. Annex 1 contains the previous year’s emissions and percent change in emissions between the two most recent years for those carriers for which this information is available, to illustrate emissions growth trends among airlines.

<b>Qantas</b>	11.7	Likely >230,000 <sup>14</sup>	~\$8.80 (AUS\$12)	Unknown, possibly Australia-based “ <a href="#">Climate Friendly</a> ”	VERs	VCS (Markit)	Some projects possibly additional certification (CCBS)
<b>Japan Airways</b>	8.4	unknown	\$16 or \$128	MyClimate Japan	J-credits, VERs	Japan Verified Emission Reduction Scheme, VCS (Markit)	Gold Standard
<b>Virgin Atlantic</b>	4.8	unknown	~\$15	CarbonNeutralCompany	VERs	VCS (Markit)	
<b>Thai Air</b>	n.a.	726	\$3.65	Likely direct CER purchase	CERs	CDM	Thai CDM project (biogas from pig waste)
<b>South African/Mango</b>	n.a.	n.a. (definitely <100,000)	~\$20	ClimateCare on behalf of IATA	VERs	VCS (exact project listed could not be found in VCS database)	Some projects offered by intermediary are Gold Standard
<b>Air New Zealand</b>	3	unknown	~\$16	n.a.	Credits from NZ gov’t “Projects to Reduce Emissions” program (expired)	NZ gov’t criteria (expired)	New program in the works

### 3.1 Trends among project types

Determining which offset types are most popular in empirical terms (attributing offset tonnage or dollar amounts contributed to specific projects or project types) was not possible for this study, due to the above-described lack of traceability concerning offset funding and dispersal. However, gathering all references to specific projects reveals some general “preferences” in emission reduction activities sponsored. The respective air carrier either specifically mentions the 2-3 projects its customers’ money goes toward, or the intermediary manages a portfolio of projects to which customers’ money is dispersed - sometimes both are the case.

Table 3 lists every airline’s customer offset project by type, with \* indicating a project portfolio situation in which more than one project fits into the respective category. This does not necessarily correlate with larger offset *volume* (demand) for that offset type, however. The portfolio of Austrian Air-

<sup>14</sup> Qantas’ annual report refers to 2 million offsets purchased since 2007 – that makes annual offsetting roughly 222,222 for the 9 years through 2015, with more happening in recent years due to [company-cited increased customer participation](#) in offsetting option.

lines, for instance, consists to 77% of over 100 small-scale domestic projects like rooftop solar on public buildings in Austrian villages<sup>15</sup> – the airline’s “x” in the category “Renewable energy/efficiency industrialized countries” is thus marked with “\*.”

**Table 3: Offset project types by carrier**

Airline	Forest conservation industrialized countries	Forest conservation developing countries	Renewables/efficiency industrialized countries	Renewables/efficiency developing countries	Cookstoves	Methane recovery/landfill/waste/biogas	ODS
Delta	X*	x	x	x	x	X*	
United	x	x	x				
Lufthansa/ Swiss				x	x		
Austrian		x	X*	X*	x		
KLM					x		
Air France				x		X*	
Cathay Pacific			x		x		
Qantas	X*	X*			x		
Japan Airways	x			x			
Virgin Atlantic	x			X*			x
Thai Air						x	
South African/ Mango				x			
Air New Zealand			x				
<b>Total</b>	<b>4</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>3</b>	<b>1</b>

Out of the pool of projects either profiled by airlines directly on their websites or listed in the intermediaries’ project portfolios, **none involve large hydroelectric dams, fossil fuels, nuclear genera-**

<sup>15</sup> These are considered “additional” by Austrian Air’s offset provider Climate Austria because they comply with Austria’s domestic environmental standards for projects that receive public funding as defined by the country’s environment ministry and the group Kommunalkredit Public Consulting, which is also the third party verifier for Climate Austria projects. Details available (in German only) here: <https://www.climateaustria.at/projekte.html>

**tion, HFCs, N<sub>2</sub>O, carbon capture and storage** – all project types that the International Coalition for Sustainable Aviation, a civil society observer group to ICAO, has included on its “negative list”.<sup>16</sup>

However, the most popular offset project type among airlines is ecosystem conservation, particularly forestland in both developed and developing countries. Environmental groups continue to raise concerns regarding the *quantification* of emission reduction from such projects, as “proving” tonnage reduced compared to the baseline of a counterfactual scenario is extremely complex in cases of living ecosystems and fluctuating development trajectories. Further, the issue of double claiming is particularly pertinent for land use projects, as national inventories of the countries in which the relevant ecosystems are located encompass or “count” emissions (and lack thereof) from land use. Quantification difficulties and high potential for double-claiming render ecosystem conservation offsets as having limited potential for generating credits that fit into a standardized offset supply context needed for a CORSIA program.

### 3.2 Project overlap – implications for future volumes

Aside from project type trends, the analysis also reveals some overlap among specific projects: Virgin Atlantic’s extensive project portfolio, managed by CarbonNeutralCompany, overlaps with at least one project in the portfolios of Cathay Pacific and United Airlines, respectively.<sup>17</sup> While money from two different airlines’ customers going toward the same offset project does not necessarily constitute double use or double issuance of offsets (the credits in question are traceable in the CAR and Markit registry, presumably cancelled when purchased), but there is a great deal of overlap among a small number of actors (14 airlines).

The Stockholm Environment Institute’s recent report on potential aviation offset volumes,<sup>18</sup> however, concludes that acceptable project types could yield enough emission reductions to cover most of the airline industry’s offset needs in 2020-2035. According to SEI, “carbon offsets from project types for which there is high confidence in environmental integrity, and which also advance sustainable development goals” are those involving **methane avoidance or destruction** – primarily at landfills or industrial operations. The Öko Institut comes to a similar conclusion, even if the restriction limits the program to CDM credits of high environmental integrity.<sup>19</sup>

This study’s analysis of offsets associated with airlines, however, reveals a mismatch between retail customer preferences for credits in the voluntary market and methodologies developed mainly for compliance markets and SEI’s and Öko Institut’s considerations of what kinds of projects have high environmental integrity : project types most commonly offered as customer offset options do not fall into the methane category – they are harder to market to customers, as pictures of landfills or industrial operations are not easily associated with environmental causes. For Delta, only the *corporate* offset purchases involved landfill methane – CERs from CDM projects. Thai Airways’ biogas project from a Thai pig farm is also a registered CDM project involving methane reduction and use for generating electricity. The landfill/composting project Air France’s offset middleman GoodPlanet Foundation supports in Madagascar is certified under the Voluntary Carbon Standard.

16 Available here: [https://uploads.strikinglycdn.com/files/90609612-db04-4a0e-8c43-561a9cbc75b9/FlightPath1point5\\_ICSA\\_MBM\\_Checklist.pdf?id=26292](https://uploads.strikinglycdn.com/files/90609612-db04-4a0e-8c43-561a9cbc75b9/FlightPath1point5_ICSA_MBM_Checklist.pdf?id=26292).

17 A project profiled in Virgin Atlantic’s 2014 sustainability report (though not listed in its current project portfolio), the Shanxi cookstove project, is also one of Cathay Pacific’s two projects currently sponsored by offsetting customers. Also among Virgin’s portfolio as per CarbonNeutralCompany information is the Garcia River Forest Project in California, which is one of the three to which United Airlines customer offset contributions can go.

18 Bailis, Broekhoff, and Lee (2016). “Supply and sustainability of carbon offsets and alternative fuels for international aviation.” Stockholm Environment Institute, US center. Working paper No. 2016-03. June 2016. Online available at <https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-WP-2016-03-ICAO-aviation-offsets-biofuels.pdf>.

19 Cames, M. (2015). “Availability of offsets for a global market-based mechanism for international aviation”. Öko Institut Berlin. <https://www.oeko.de/oekodoc/2394/2015-552-en.pdf>.

### 3.3 Project integrity – implications for future accounting and standardization

To avoid the aforementioned double use, double issuance, and especially double claiming, a rigorous internationally standardized accounting and registry system is needed. Currently the voluntary offset market's main step in that direction is the widespread use of internationally recognized offset standards such as the VCS and CDM, which log offset issuance and cancellation in associated registries. These are meant to ensure that - at a minimum - a project is not claiming credit under multiple revenue streams. Each standard or protocol ensures at least some (usually multiple) types of offset additionality,<sup>20</sup> though the benchmarks for what constitutes "additional" vary greatly.

Airlines are currently not required to comply with or obtain certification from a standard or protocol for the offsets they offer to customers – **almost all the projects in the customer offsetting programs of all the carriers investigated for this report could be linked to an established international standard, usually the VCS, Gold Standard, or CDM.** Many have additional certifications relating to ecosystem preservation such as the Climate, Community & Biodiversity Alliance's CCBS standard. With respect to the degree of standardization needed to create a future CORSIA market, the fact that the credits airlines currently deal with correspond to protocols that involve certification, verification, and logging of offset credits in a registry and/or database is encouraging - airlines have already embraced the concept that tradable units must adhere to at least some kind of standard.

### 3.4 Next steps

The many standards, however, involve differing criteria for additionality as well as approaches to transparency in terms of monitoring and verification. They also feature independent registries that are not always cross-referenced, which can lead to double use of offsets. In this context, it matters where airlines set the bar for environmental integrity – but evidence indicates that when *required* to offset significant tonnage, air carriers will resort to the cheapest options: Carbon-Pulse article from June 2015<sup>21</sup> quoted Qantas executive Megan Flynn as saying that airlines' activity in voluntary markets is "quite distinct from any current or future compliance obligation," and that while voluntary programs are about carefully selecting carbon-cutting projects that get a response from passengers, for compliance, carriers take "a strategy that delivers on a minimum of environmental integrity, but at the lowest cost."

Making a clear case for standard-setting at a level *above* the individual airline, the incentive structure illustrated above reveals the importance of upcoming ICAO deliberations on market based measures: based on the variety of voluntary and compliance market standards, efforts to set the bar for mandatory aviation offset standards are certainly warranted.

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20 For example, standards commonly require that a renewable energy project does not receive renewable energy credits or government subsidies in addition to the emission reduction credits for fossil fuel displacement, as this would render the project financially viable without the offset funding and thus financially non-additional. Regulatory additionality (that the project was not required by another regulation or environmental policy of the host region) is another additionality type to which standards and protocols apply.

21 Garside, 2015: "Airline offset buying on hold as slow ICAO progress risks supply squeeze." Carbon-Pulse. June 16, 2015. Available online (with subscription) at <http://carbon-pulse.com/4865/>.

## 4 Offset program and project profiles by carrier

### Air France/KLM

2014 emissions: 27.7 Mt

Approximate cost per tonne to customer: ~\$23 for Air France, ~\$10 for KLM

Projects flagged for additionality concerns: n/a

Air France and KLM feature completely separate carbon calculators and offset programs.

Air France customers are charged ~\$23/tonne, and proceeds go to the [GoodPlanet Foundation](#), which purchases offsets from the following projects in developing countries:

- [Solar cookers in Bolivia](#) – Gold Standard, in [Markit registry](#)
- [Solar cookers in Peru](#) – Gold Standard, in [Markit registry](#)
- [Biogas plants in India](#) – Gold Standard, in [Markit registry](#) (3 separate projects, this one is the biggest)
- [Waste composting in Madagascar](#) – Voluntary Carbon Standard, in [VCS database](#) and its APX registry

KLM's CO2zero program purchases Gold Standard offsets, citing only one project on its website:

- [Cookstoves in Ghana](#), registered with [Markit](#)

Like Air France, the amount (in tonnes) offset by KLM customers to date or in any given year is not provided. Customers cannot calculate the additional charge for offsetting separately, but do it via the KLM website "My Trip" once they have received a booking code. Researchers could thus not test the consumer price for offsetting, but KLM provides [this list](#) to calculate compensation amounts for typical flights – from it, the price appears to be around €8.75/tonne (\$9.85/tonne).

### Air New Zealand

2014 emissions: 3 Mt

Approximate cost per tonne to customer: ~\$16

Projects flagged for additionality concerns: Tararua wind farm<sup>22</sup>

A charity similar to that of British Airways is the primary recipient of Air New Zealand's customer contributions, with \$127,000 received from passengers in 2015 alone. The [Air New Zealand Environment Trust](#), projects for which are approved by a board of trustees, distributes donations to environmental projects but does not calculate resulting emission reductions as the primary goal is domestic ecosystem conservation. Previous projects include tree planting in a New Zealand conservation reserve, coastal revegetation efforts, and wetland restoration.

The airline also offers a "traditional" offset program, which was operational but being revamped at time of writing. Customers can use a carbon calculator to determine a tonnage volume for which they are charged roughly US\$ 16/tonne. Air New Zealand purchased Emission Reduction Units via a domestic government emission reduction initiative of the New Zealand government (the [Projects to Reduce Emissions Programme](#)) that ended at the close of the Kyoto Commitment period after 2012 – it involved funding domestic emission reduction projects enough to become commercially viable. The windfarm from which Air New Zealand purchased offsets now being paid for by its passengers choosing the offset option ([Tararua](#)) was issued a total of 228,000 tonnes over the 5 years. It is unclear how many of these units Air NZ purchased. The windfarm is run by utility provider TrustPower.

<sup>22</sup> Customer offset purchases essentially pay Air New Zealand back for credits it purchased from this project under a now-defunct domestic government emission reduction initiative. The reductions took place before 2012.

### British Airways

2014 emissions: 18.5 Mt

Approximate cost per tonne to customer: ~\$14 (£11.25 on Leapfrog website, not linked to BA flights)

Projects flagged for additionality concerns: not applicable, as tradable units are not generated

While BA used a customer offsetting option involving contributions at a fixed price per tonne from 2007, it [switched to a different model](#) after receiving customer feedback with preferences for impacting UK communities rather than supporting international projects in 2011. Since then, BA's customer contributions go toward a [Carbon Fund](#) run by a charity called [Pure Leapfrog](#).

The charity's executives intentionally withheld information about estimated tonnage offset by projects sponsored via the BA program, as its goal is social awareness raising and education rather than emission reduction on a per-tonne basis. It is unclear which specific projects BA customers' financing supports, as projects profiled in the company's [2014 corporate responsibility report](#)<sup>23</sup> are not same as shown on the Pure Leapfrog website.

### Cathay Pacific & DragonAir

2014 emissions: 16.4 Mt

Approximate cost per tonne to customer: ~\$3.20

Projects flagged for additionality concerns: InfraVest wind farms in Taiwan<sup>24</sup>

Cathay Pacific and its sister airline, Dragonair were the first airlines in Asia to launch a voluntary carbon offset scheme for their passengers in December 2007. Passengers access the "FLY greener" part of the carrier's website and use an [offset calculator](#)<sup>25</sup> to determine their contribution. The carrier's extensive documentation of offset volumes and prices by year is broken down into customer purchases vs. the company's own offsetting of staff business travel: In 2014, passengers offset 3,300 tonnes and the staff travel offsetting amounted to 10,000 tonnes. The latter cost the company HK\$250,000 (US\$32,212) meaning each tonne cost \$3.20 – very low for Gold Standard offsets. The carbon calculator shows similar per-tonne cost results.

Cathay Pacific does not appear to work through a retailer or aggregator, but the two current projects listed on its website as recipients of customer offset funding are Gold Standard projects:

- A [cookstoves project in Shanxi, China](#) – Gold Standard, in [Markit Registry](#)
- A bundled [wind farm project in Taiwan](#) – Gold Standard, in [Markit registry](#)

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<sup>23</sup> Available here: [http://responsibleflying.ba.com/wp-content/uploads/RFFE\\_2014\\_Summary\\_online.pdf](http://responsibleflying.ba.com/wp-content/uploads/RFFE_2014_Summary_online.pdf)

<sup>24</sup> Emission reduction units from this project face the potential for double claiming at the national level, as Taiwan's government in June 2015 passed legislation setting a binding national emission reduction target and foreseeing implementation of a cap-and-trade system. Accounting is further complicated by the fact that Taiwan is not party to the United Nations Framework Convention on Climate Change, where countries log their national reduction targets against which double issuance and double claiming can be checked.

<sup>25</sup> Available here: [http://www.cathaypacific.com/cx/en\\_US/about-us/environment/fly-carbon-neutral-fly-greener/calculate-and-offset-your-carbon-emissions.html](http://www.cathaypacific.com/cx/en_US/about-us/environment/fly-carbon-neutral-fly-greener/calculate-and-offset-your-carbon-emissions.html).

## Delta

2014 emissions: 34 Mt

Approximate cost per tonne to customer: \$15

Projects flagged for additionality concerns: Hyundai steel waste to energy project<sup>26</sup>

In anticipation of future ICAO regulation, Delta set a voluntary internal carbon neutral growth target of keeping total annual emissions at 2012 levels. It purchased offsets to cover the difference between 2012 and 2013 levels (570,301 tonnes) and between 2012 and 2014 levels (1.2 million tonnes) for a total *corporate* purchase of nearly 1.8 million offsets. CERs purchased by Delta in 2012 (in anticipation of a significant compliance obligation under EU ETS, which did not materialize due to the “stop the clock” legislation) accounted for 787,000 tonnes – Delta officials confirmed the projects from which these CERs came were located in China and India.

The other roughly 1 million tonnes necessary to meet the internal offsetting target came from a portfolio of projects listed in the 2014 corporate sustainability report, all of which can be traced to projects registered in either the VCS or CDM database. Tonnage was not broken down by project:

- Aurá Landfill Gas Project, Brazil (CDM)
- Hyundai Steel Waste Energy Cogeneration Project, South Korea (VCS)
- Improved Cooking Stoves Diffusion Programme, Peru (Gold Standard)
- Oaxaca 1-3 Bundled Wind Projects, Mexico (VCS)
- Madre de Dios REDD project, Peru (VCS)
- BrasCarbon Methane Recovery Projects, Brazil (CDM)
- Florestal Santa Maria REDD Project, Brazil (VCS)

Separate from the corporate target, Delta offers customer offsetting at \$15/tonne via [online offset calculator](#). The offsets come from projects run by [The Nature Conservancy](#). The current projects to which customer offset contributions go are:

- [Rio Bravo Climate Action Project](#) since 2012 (rainforest conservation in Belize) – certified, [in VCS database](#).
- [Clinch Valley Conservation Forestry Program](#) since 2013 (forest conservation and management in Virginia, USA) – certified, in CAR database, offsets are eligible for compliance to emitters under California’s ETS
- [Valdivian Coastal Reserve](#) since 2014 (forest conservation in Chile) – certified, [in VCS database](#), additional certification by CCBS Third Edition Gold Level

The total volume offset by Delta customers via TNC projects was 2,243 tonnes in 2014, Delta purchased an additional 1,667 tonnes as an Earth Month matching program in that year

<sup>26</sup> Though the project design document states that no emissions trading programs are applicable, Korea has a national ETS that covers Hyundai and other industrial emitters. Two other steel plants in Korea use waste gas cogeneration and claim environmental credit for doing so in the form of KCERs (Korean domestic offset units). Given the crediting period from 2010-2020, it is likely that reductions from this project can be considered double claimed since at least the start of the Korean ETS in January 2015.

### **Etihad**

According to the [2013 CSR report](#) of the airline, “Etihad Guest offers a carbon offsetting program that allows members to donate miles to carbon reduction projects around the world. In 2013, Etihad Guest members donated 937,437 miles to offset approximately 699 tonnes of carbon dioxide. Numerous environmental projects have benefitted from this initiative, including a biomass scheme in India, wind farms in China and others in Cambodia and Uganda.”

The Etihad website section “Etihad guest” has donation options only for aid and relief efforts (Red Cross, global health partnerships, educational initiatives) and no environmental projects. No carbon calculator or offsetting link could be found on the website.

### **Japan Airways**

2014 emissions: 8.4 Mt

Approximate cost per tonne to customer: ~\$16 or \$128

Projects flagged for additionality concerns: Japanese domestic forest management<sup>27</sup>

Japan Airways offers customer offsetting via MyClimate Japan, a subsidiary of the Swiss-based organization providing offsets for Lufthansa and Swiss Air. Customers calculate their flight mileage and corresponding payment via an [online carbon calculator](#), and are offered the option to contribute to one of two projects:

- Power generation from wood waste in a Brazilian sawmill – Gold Standard, in [Markit registry](#)
- Forest management in Oguni, Japan – “J-credit” under Japan’s domestic voluntary offset J-VER program

The Brazilian project is significantly cheaper at roughly \$16/tonne, while the Japanese forest restoration contribution costs \$128/tonne.

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<sup>27</sup> As with the Austrian domestic projects, purchases of offsets generated by Japanese local forest management efforts certified by a domestic body risk double claiming at the national level because they would have to be subtracted from Japan’s international emission reduction target. At the project level, the offsets involve thinning forest to achieve better growth patterns, a procedure that could face additionality concerns given existing forest management practices.

## Lufthansa Group

2014 emissions: 28 Mt

Approximate cost per tonne to customer: ~\$11 for Lufthansa, ~\$28 for Austrian

Projects flagged for additionality concerns: Renewable energy projects in Austria<sup>28</sup>

Lufthansa and SWISS have offered their customers the option to offset their flight emissions via the organization MyClimate since 2007 – currently the funds go toward two projects, the portfolio of options changes as tonnage is retired and new projects become available. Lufthansa’s sustainability team is consulted regarding which projects to offer. The current two projects are:

- [Efficient cookstoves in Siaya, Kenya](#) – certified by the Gold Standard, in [Markit registry](#)
- [Solar lighting for rural Ethiopia](#) – certified by the Gold Standard, in [Markit registry](#)

Austrian Airways began a partnership in 2008 with the organization [Climate Austria](#), which funds small-scale domestic emission reduction projects but also some projects in developing countries. The group’s 2014 [project portfolio](#) contains over 40 domestic projects involving small-scale rooftop photovoltaics, energy-efficient lighting upgrades, and biomass heating – the four non-Austrian projects involve small scale hydroelectricity in Mexico and Bulgaria, respectively, as well as a Kenyan cookstove project and a rainforest protection project in the Democratic Republic of Congo. They make up only 23% of the total portfolio, and customers cannot choose to sponsor only the international projects due to the portfolio management approach. Unlike Lufthansa, Austrian provides the option to offset at booking – Lufthansa executives confirmed that due to this, the majority of Lufthansa Group’s significant customer offsetting volume (31,000 tonnes in 2015) is from Austrian Airways customers going to Climate Austria’s portfolio rather than the Gold Standard projects via MyClimate.

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28 Austrian Airways customers who choose to pay into the Climate Austria portfolio are mainly contributing to energy efficient lighting, photovoltaic panels, or biomass heating at domestic venues such as sport centres or nature museums. Besides double claiming associated with Austria’s overall emission reduction requirement in the power sector, these investments are not financially additional by international project standards.

**Qantas:**

2014 emissions: 11.7 Mt

Approximate cost per tonne to customer: ~\$8.80

Projects flagged for additionality concerns: Australian fire prevention initiative<sup>29</sup>

In terms of volume, Qantas' Fly Carbon Neutral offset program is the largest of all airlines, with 2 million voluntary offsets purchased since 2007 according to the carrier's [annual report](#) and an internal study of offsetting covered by [the press](#). Qantas most recent [sustainability report](#) claims the firm offsets all employee business travel and ground fuel emissions - specific tonnage is not named, nor does the report specify whether the company offsets are included in the cumulative 2 million tonne figure.

According to the extensive offset program information on its website, Qantas customer offset payments go to four projects, all of which are certified by VCS and generating VCUs as shown in VCS project database:

- [Forest preservation in Papua New Guinea](#)
- [Land conservation in Tasmania](#)
- [Brazil nut forest conservation project in Peru](#)
- [Cookstoves project in Cambodia](#)

However, Qantas' [separate offsetting tool](#) through which customers can actually pay for offsets (accessed via the online carbon calculator) profiles only three projects: the Tasmanian and PNG conservation projects, and a fire prevention initiative in North Kimberly, Western Australia. The latter program is cited in Qantas [sustainability brochure](#) (see page 7) but is not a VCS or CDM project. Rather, it generates units formerly recognized by the Australian government as offsets domestic emitters subject to the country's (now abandoned) carbon pricing program could purchase. After the carbon pricing was scrapped by a new government in 2014, Qantas began offering customers the opportunity to purchase offsets from [the project](#), which involves indigenous groups and fire prevention for land conservation.

Qantas customers pay ~AUS\$12/tonne (US\$8.80) for offsets.

**South African Airlines (and Mango)**

Passengers flying on South African Airlines are offered an offsetting option at the end of the booking process, which can also calculate individual legs of multi-part flight using a methodology developed by IATA. The extra charge amounts to roughly US\$20/tonne, and the funds go toward "a solar water heater project" in South Africa – neither the airline website, nor the website of the intermediary ClimateCare, provides information on offset volumes involved or links to any project documentation. There is no solar water heater project registered in the VCS database. The first CDM project to be certified by the (then new) Gold Standard – the [Kuyasa project in South Africa](#) – involved distribution of solar water heaters. This project was being [redeveloped as a Programme of Activities under the CDM](#) in 2011 and is likely the recipient of the airline offsetting funds.

UK-based [ClimateCare](#) runs the overall offsetting initiative on behalf of [IATA](#) – according to [an online brochure](#), several other airlines participate in the IATA offsetting program including Air Kenya and TAP Portugal. Statements that the regional South African carrier Mango also offers offsetting via the IATA program can be found via Climate Care, [not on Mango's website](#).<sup>30</sup> ClimateCare claims to have offset a total of 100,000 tonnes through the IATA offsetting programs. Most projects profiled on ClimateCare's website appear to generate Gold Standard VERs.

<sup>29</sup> The overlap with domestic emission reduction efforts and lack of internationally-recognized certification or registry for the offset credits purchased renders this project susceptible to double claiming at the Australian national level.

<sup>30</sup> When booking a flight on Mango, customers are given the option to donate to the Robin Good Foundation, UNICEF, and Operation Hydrate but no offset projects are presented through the booking process before payment.

### Thai Air

2014 emissions: n/a

Approximate cost per tonne to customer: ~\$3.65

Projects flagged for additionality concerns: n/a

Customer offset contributions (via a carbon calculator methodology provided by IATA) go to a Thai CDM project involving fossil fuel displacement by burning biogas from pig farm effluent. The project type can be categorized as [methane recovery from animal waste](#). The project's crediting period is ten years and it was registered in 2008.

According to Thai's 2015 CSR report, passengers paid \$2,649 to the offsetting program in 2014 which equalled a bit over 726 tonnes. That makes the cost \$3.65/CER, which is similar to recent average voluntary offset prices according to [Ecosystem Marketplace's annual report](#) (page 6).

### United

2014 emissions: 31 Mt

Approximate cost per tonne to customer: \$10, \$12, and \$20 depending on project

Projects flagged for additionality concerns: Capricorn Ridge Wind Farm<sup>31</sup>

Sustainable Travel International (STI), whose portfolio of offset projects managed on behalf of companies includes nine current projects, directs contributions from United Airlines' CarbonChoice program to the following three projects detailed below.

United's is the only program to differentiate per tonne cost by project, with the domestic forest offsets being most expensive.<sup>32</sup>

- [Garcia River Forest Conservation Project](#) (forest conservation and sustainable management in California) - CAR certified, [in CAR database](#) – additional certification by Forest Stewardship Council and Sustainable Forestry Initiative. Customers pay \$20/tonne
- [Capricorn Ridge Wind Farm](#) (wind power generation in Texas – certified, [in VCS database](#)). Customers pay \$10/tonne.
- [Alto Mayo Rainforest Preserve](#) (forest conservation in Peru – certified, [in VCS database](#)) – additional certification by Climate, Community and Biodiversity Standard. Customers pay \$12/tonne.

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31 Besides the issue of double claiming given that the US power sector is subject to emission reduction requirements, the 2015 [verification report](#) for this project reveals that it also sold renewable energy credits (RECs), which monetize MWh of renewably generated electricity. This would constitute a case of double issuance, although according to the report "RECs are excluded from the quantity of electricity generated by the Project when calculating emission reductions and no emission reductions are claimed from electricity production associated with these RECs."

32 Repeated requests to United for information about volumes purchased by United customers (cumulatively or by project, in any year or ever) went unanswered, and STI could not share volume information without permission from United.

### Virgin Atlantic

2014 emissions: 4.8 Mt

Approximate cost per tonne to customer: ~\$15

Projects flagged for additionality concerns: Destruction of ozone depleting substances at US facility<sup>33</sup>

VA customers intending to offset their flight are taken to a separate online calculator managed by CarbonNeutralCompany – the rate (converted from British pounds) is about \$14/tonne.

Customers pay into a [portfolio of projects](#)<sup>34</sup> managed by CarbonNeutral – the pool currently contains six projects:

- two wind power projects in India (Andipatti<sup>35</sup> and Coimbatore<sup>36</sup>)
- two wind power projects in China ([Zhangjiakou](#) and [Zhangbei](#), both Gold Standard projects logged in the Markit registry)
- the [Garcia Forest Conservation Project](#) in California from which United Airlines customers can also choose to buy offsets (albeit at a higher price per tonne)
- a project destroying ozone depleting substances (ODS) at a commercial facility in Arkansas, USA, registered with the [US EPA](#) and CAR, and generating offsets eligible for California ETS compliance.

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33 The California Air Resources Board rescinded eligibility of some offsets from this facility for compliance to the state's ETS, citing the facility's failure to comply with (unrelated) other chemical regulations: <https://www.epa.gov/ods-phaseout/ods-destruction-technologies>

34 More available here: <http://www.carbonneutral.com/page/carbon-portfolios/>

35 This project could not be found in the VCS database, but is also a CDM project registered in 2013:

<https://cdm.unfccc.int/Projects/DB/BVQI1363686050.18/view>

36 The VCS database contains three bundled wind projects in Coimbatore district of Tamilnadu India – the only one entirely in that district involves 23 turbines:

[http://www.vcsprojectdatabase.org/#/project\\_details/644](http://www.vcsprojectdatabase.org/#/project_details/644)

## 5 Annex: Selected airlines' emissions in recent years

Total CO<sub>2</sub> emissions Scope 1 (airplane fuel combustion) in metric tonnes

<b>Delta, including wholly owned subsidiaries</b>		
2014	33,927,971	~6% decrease
2013	31,953,942	

Source: [http://www.delta.com/content/dam/delta-www/about-delta/corporate-responsibility/2014\\_DeltaCRR\\_FINAL\\_WEB.pdf](http://www.delta.com/content/dam/delta-www/about-delta/corporate-responsibility/2014_DeltaCRR_FINAL_WEB.pdf) see page 28.

<b>United</b>		
2014	31,132,366	~1% decrease
2013	31,360,099	

Source: <http://crreport.united.com/fact-sheets/metrics>.

<b>Emirates</b>		
2014-2015	28,389,374	10% increase
2013-2014	25,762,374	

Source: [http://content.emirates.com/downloads/ek/pdfs/environment/ENV\\_REPORT-2014\\_15\\_updated.pdf](http://content.emirates.com/downloads/ek/pdfs/environment/ENV_REPORT-2014_15_updated.pdf).

<b>American</b>		
2014	35,142,000 (+6,621,000*)	1.3% decrease
2013-2014	42,300,000	

\* for regional flights of wholly owned affiliates and contract flying

Source: <https://www.aa.com/i18n/aboutUs/corporateResponsibility/main.jsp>.

<b>China Southern</b>		
2014	18,940,000	~13% increase
2013	16,757,379	

Sources:

<http://www.csair.com/en/about/shehuizerenbaogao/resource/7eecd9b39d6e2f7d08f125519dd5b4b3.pdf> and <http://www.csair.com/en/about/shehuizerenbaogao/resource/0d0b8c349d997e1c26ae90743038a2bc.pdf>.

<b>Southwest</b>		
2014	17,784,227	1% increase
2013	17,956,473	

Source: <http://www.southwestonereport.com/2015/#/report-page>.

<b>Lufthansa</b>		
2014	27,801,092	1% increase

See <https://www.lufthansagroup.com/fileadmin/downloads/en/LH-sustainability-report-2015.pdf>.

<b>British Airways</b>		
2014	18,500,274	2.3% increase
2013	18,087,655	

Source: <http://responsibleflying.ba.com/wp-content/uploads/BA-Environmental-Performance-2015.pdf>.

<b>Air New Zealand</b>		
FY 2015	3,073,455	4% increase
FY 2011*	2,959,402	

\*data not available for 2014

Source: [http://static.airnewzealand.com/assets/PDFs/J004845-Sustainability-Report-2015\\_FINAL-ART-NEW\\_MEDRES.pdf](http://static.airnewzealand.com/assets/PDFs/J004845-Sustainability-Report-2015_FINAL-ART-NEW_MEDRES.pdf).

<b>Cathay Pacific &amp; DragonAir</b>		
2014	16,400,000	5% increase
2013	15,500,000	

Source: <http://downloads.cathaypacific.com/cx/aboutus/sd/2014/>.

<b>Etihad</b>		
2013	7.2 million(?)*	

Source:

<http://www.etihad.com/Documents/PDFs/Corporate%20Social%20Responsibility%20Report/csr-2013-english.pdf>.

\* CSR report 2013 (cited above, see page 32) refers to 7.2 billion tonnes CO<sub>2</sub> – looks like orders of magnitude were mixed up in conversion

<b>Japan Airways</b>		
2014	8,400,000	<1% increase
2013	8,200,000	

Source: [https://www.jal.com/en/csr/report/pdf/index\\_2015\\_10.pdf](https://www.jal.com/en/csr/report/pdf/index_2015_10.pdf).

<b>Qantas</b>		
2014/2015	11,707,259	2% decrease
2013/2014	11,938,500	

Source: <https://www.qantas.com/infodetail/about/environment/our-commitment-to-environmental-sustainability.pdf>.

<b>Virgin Atlantic</b>		
2013	4,772,101	3% decrease
2012	4,926,742	

Source: <http://www.virgin-atlantic.com/content/dam/VAA/Documents/sustainabilitypdf/virgin-atlantic-change-is-in-the-air-sustainability-report-2014.pdf>.