


GUIDE TO AIRPORT PERFORMANCE MEASURES

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February 2012

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Guide to Airport Performance Measures

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Performance Indicators in Six Key Performance Areas

Core	Safety and Security	Service Quality
<ol style="list-style-type: none"> 1. Passengers 2. Origin and Destination Passengers 3. Aircraft Movements 4. Freight or Mail Loaded/Unloaded 5. Destinations—Nonstop 	<ol style="list-style-type: none"> 1. Runway Accidents 2. Runway Incursions 3. Bird Strikes 4. Public Injuries 5. Occupational Injuries 6. Lost Work Time from Employee Accidents and Injuries 	<ol style="list-style-type: none"> 1. Practical Hourly Capacity 2. Gate Departure Delay 3. Taxi Departure Delay 4. Customer Satisfaction 5. Baggage Delivery Time 6. Security Clearing Time 7. Border Control Clearing Time 8. Check-in to Gate Time

Productivity/Cost Effectiveness	Financial/Commercial	Environmental
<ol style="list-style-type: none"> 1. Passengers per Employee 2. Aircraft Movements per Employee 3. Aircraft Movements per Gate 4. Total Cost per Passenger 5. Total Cost per Movement 6. Total Cost per WLU 7. Operating Cost per Passenger 8. Operating Cost per Movement 9. Operating Cost per WLU 	<ol style="list-style-type: none"> 1. Aeronautical Revenue per Passenger 2. Aeronautical Revenue per Movement 3. Non-Aeronautical Operating Revenue as Percent of Total Operating Revenue 4. Non-Aeronautical Operating Revenue per Passenger 5. Debt Service as Percentage of Operating Revenue 6. Long-Term Debt per Passenger 7. Debt to EBITDA Ratio 8. EBITDA per Passenger 	<ol style="list-style-type: none"> 1. Carbon Footprint 2. Waste Recycling 3. Waste Reduction Percentage 4. Renewable Energy Purchased by the Airport (Percent) 5. Utilities/Energy Usage per Square Meter of Terminal 6. Water Consumption per Passenger

SECTION 1

Introduction

1.1. Purpose of the Guide

This *Guide to Airport Performance Measures* is designed to help airports around the world in their performance management efforts by providing a useful set of performance measures across a number of categories. The measures are divided into six categories, referred to as Key Performance Areas (KPAs) and discussed subsequently. The 42 individual measures are referred to as Performance Indicators (PIs).

More important than just listing individual PIs, this Guide also defines each measure, discusses the factors that drive particular results, identifies the types of airports where the measure is applicable, and discusses the strengths and weaknesses of each measure as a benchmarking tool.

This Guide does not provide guidance on the basic steps airports should take to develop, implement, and refine their performance management systems. Those subjects are covered elsewhere, including *ICAO's Airport Economics Manual*¹ (currently being revised) and other resources listed in the *Resources* section of the Guide.

1.2. Different performance indicators (PIs) for different airports

Airports operate under very different circumstances in terms of aviation activities, commercial activities, site constraints, governance and ownership structure, etc., and as a result, individual airports will find different performance indicators to be most relevant and useful. For example, privatized airports are likely to focus on different financial PIs than non-profit government-owned airports. Larger airports are likely to focus on different PIs than smaller airports. Airports with large developable land areas are likely to focus on different PIs than tightly constrained airports in large urban areas.

¹ *ICAO's Airports Economics Manual (Doc. 9562).*

Even among airports with similar characteristics, managers will have different views regarding which PIs are most important, and how many PIs the airport should track. A smaller set of closely-monitored PIs is likely to be a more effective performance management tool than a larger set of PIs that attracts less focus. And over time, the set of PIs of most importance to the individual airport will change as new issues arise. A key example of this is the currently evolving area of Environmental PIs, which until recently was not a key performance management area for many airports.

1.3. Internal versus external benchmarking

Airport benchmarking is divided into two types of comparisons: (1) Internal (or self-benchmarking)—where an airport compares its performance with itself over time; and (2) external (or peer benchmarking)—where an airport compares its performance against other airports, either at a single point in time or over a period of time. In this Guide, we use the terms *Internal Benchmarking* and *External Benchmarking*.

1.4. Benchmarking cautions

When used carefully, benchmarking is a powerful analytical tool. When used carelessly, benchmarking results are very much like tabloid headlines—making very strong claims that upon further analysis turn out to be far from the truth.

Airports are complex sets of businesses, and different airports operate in very different physical, financial, and governance environments. To make useful comparisons among airports, it is essential to compare similar sets of businesses operating in similar environments—which is easier said than done. When comparing one airport to another, some of the typical factors that drive different results and should be considered in making comparisons include: passenger volume, capacity constraints, mix of international and domestic traffic, mix of local and transfer passengers, mix of passenger carrier service (network, low cost, charter), mix of passenger versus cargo activity, degree of outsourcing, range of services provided by the airport, airport development program status, weather conditions, geographic location, urban versus rural location, physical size of the airport, public transportation access and usage, regulatory environment, local labor conditions, and ownership and governance structure.

Internal benchmarking, where an airport compares its performance with itself over time, is less complex than external benchmarking because the number of variables that change at an airport from one year to another is limited. Take for example a comparison of airport employees in the current year versus the previous year which shows that airport employment has declined. Even here, however, year-to-year comparisons may not be simple. Does the reduction in airport employees mean that airport management is operating the airport more efficiently? Perhaps, but what if airport management has outsourced additional functions over the past year, and the cost for the vendor to perform these same functions is higher than for the former employees? Or what if the number of passengers and operations has declined substantially over the past year while airport employment has declined only slightly? What conclusion should be drawn then?

To compensate for changing passenger volume in this simple example, a more useful PI may be *Passengers per Employee* (one which is included in the Guide). Even when used only for internal benchmarking, however, the PI has its own issues. Take the case of passengers declining by 10% as a result of weak economic conditions while airport employment remains unchanged, resulting in a drop in the airport's performance on this PI. Is it reasonable to expect the airport to adjust its employment to match airline passenger changes over a short period of time, a longer period, or—because of the safety, regulatory, and operational requirement to provide a minimum level of services—not on a matching basis even over the long term? Even when used only for internal benchmarking, this PI is only the first step, leading to the next questions: *What is driving the change, and is the change within the airport's control? If not, which stakeholders influence the result and in what ways?*

Taking the same indicator and using it for external benchmarking is more of a challenge. For example, if we compare a European airport with a U.S. airport in terms of *Passengers per Employee*, we may find that the European airport has far fewer passengers per employee. Does this mean the European airport has lower productivity? Not necessarily, as some European airports have large ground handling staffs, and as such those airports provide a labor-intensive function that U.S. airports do not.

Take two similarly-sized airports which have different *Passengers per Employee* and which do not provide ground handling. What else could explain the difference? As mentioned, differing degrees of outsourcing drive differences in this measure. So do differing levels of service provided using airport employees. For example, in one case, the airport

may include janitorial, maintenance, or repair services using its own staff as part of its basic office or terminal charges, while in another, the airport may require the tenant to provide these services.

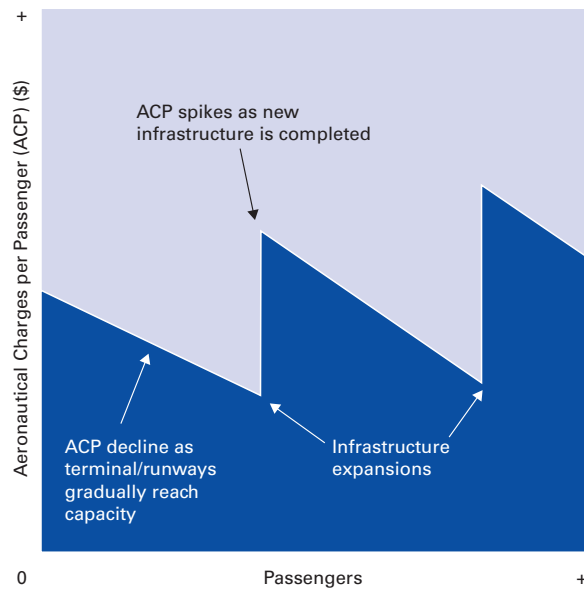
Take another case where two airports in the same region run by the same company or airport authority have very different *Passengers per Employee*. What if one airport is a domestic low cost airport with simple facilities and high gate utilization, and the other is a complex collection of facilities serving primarily network carriers, with a large single daily international bank of flights? We would expect the latter airport to require more employees to serve the same number of passengers.

Other likely differences in *Passengers per Employee* will occur between airports with a single efficient terminal, and those having multiple terminals connected by bus or light rail. Also, airports that operate in very constrained small sites versus those with thousands of hectares to maintain.

Other PIs are far more complex than *Passengers per Employee*. For example, *Aeronautical Revenue per Employee*, a measure that attracts a great deal of attention, is subject to all of the variables discussed above plus additional complexities. As noted, some European airports have ground handling as a major source of aeronautical revenue, while many other airports do not. Without isolating this revenue source, any aeronautical revenue-based comparison will be seriously flawed as it will suggest that those European airports produce unusually high *Aeronautical Revenue per Passenger*. Also making comparisons across countries is problematic because of differences in what is included in aeronautical charges in terms of taxes, environmental charges, ATC-related charges, and passenger-based charges. It is critical to isolate non-core components of aeronautical revenue to improve the quality of any PI comparisons.

In understanding aeronautical revenue, it is also important to recognize that aeronautical charges are often set on some form of cost-recovery, or cost-plus basis. This means that airports that have recently completed major terminal projects are likely to have high debt service costs and in turn high *Aeronautical Revenue per Passenger*. More generally, an airport's capital cost per passenger, and in turn its *Aeronautical Revenue per Passenger* is likely to be influenced by where the airport stands on the capital development cycle. Typically, that cycle works as illustrated in the diagram that follows. As the number of passengers increases, an airport's cost per passenger declines until the airport's facilities approach capacity, at which point, there is a spike in capital costs per passenger as new capacity is added.

Typical Airport Development Cost Cycle



The purpose of describing some of the complexities involving in making airport comparisons is not to suggest that external benchmarking is a hopeless task. It is rather to show that: (1) Many indicators will be useful primarily for internal benchmarking; (2) Even internal benchmarking should be viewed not as an end in itself, but as an analytical tool that leads to a series of “why” questions; (3) For external benchmarking results to be meaningful, it is essential to find truly comparable “peer” airports in terms of the many factors that drive the indicator; and (4) Many performance indicators measure, or include as a denominator, passengers, movements, or other factors which are largely beyond the airport’s control. The description of each PI highlights the primary benchmarking issues to be considered when using that PI.

1.5. Description of Key Performance Areas and reasons identified

Airports and other organizations take a variety of approaches in categorizing Performance Indicators. In this Guide, we refer to categories of PIs as “Key Performance Areas,” which is also the term used by the International Civil Aviation Organization (ICAO)² in dealing

² See *Glossary* for brief description of ICAO.

with this subject. (See next section for discussion of ICAO's role in airport performance management.) Some airports categorize PIs into as few as three Key Performance Areas³; others use 15 or more.⁴ There are examples of effective programs at both ends of the scale.

This Guide uses the following six Key Performance Areas for the reasons discussed:

- **Core** – these are the core measures used to characterize and categorize airports, such as the number of passengers and operations. Although airports may have little control over these core indicators, especially in the short term, they are important indicators of overall airport activity, and important drivers and components of other indicators.
- **Safety and Security** – these are the most important airport responsibilities, and therefore they are categorized separately.
- **Service Quality** – this increasingly important area reflects the evolution of airport management from having a primary focus on facilities and operations to having a strong customer service focus in an increasingly competitive environment.
- **Productivity/Efficiency** – these measures are closely related/overlapping measures of an airport's performance. They are sometimes separated into productivity measures, which track output on a non-cost basis—e.g., passengers per airport employee or departures per gate—and efficiency measures, which track output on a cost basis—e.g., total or operating cost per passenger.
- **Financial/Commercial** – this includes measures relating to airport charges, airport financial strength and sustainability, and the performance of individual commercial functions.
- **Environmental** – this evolving area has become a strong focus for airport managements striving to minimize environmental impacts.

³ See for example Graham, Anne, *Managing Airports, an International Perspective, 3rd ed.*, 2008, Ch. 3, pp. 69-95, which uses three categories: Economic Performance; Operations; Service Quality.

⁴ See for example Blais, Jan and Hazel, Robert, et al., *Resource Guide to Airport Performance Indicators*, Airport Cooperative Research Program, Transportation Research Board, April 2011, which uses the following 23 categories: Airfield Operations; Air Service; ARFF; Cargo; Concessions; Energy; Environmental; Financial; Fuel; General Aviation; Grants; Human Resources, Information Technology; Legal; Maintenance; Parking; Planning/Construction; Police/Security; Properties/Contracts; Public Affairs; Safety/Risk Management; Service Quality; Terminal Operations.

1.6 Relationship to ICAO performance management policies

ICAO has provided guidance on airport performance management in two documents listed below. In these documents, ICAO recommends that States (i.e., national governments) ensure that airports have performance management systems in place, and that those systems include one or more performance indicators in four specified key performance areas.

ICAO's Policies on Charges for Airports and Air Navigation Services (Doc. 9082)⁵ ("ICAO's Policies"), currently being revised, states that "performance management is an important management tool for providers, users and regulators" and recommends that States ensure that providers develop and implement appropriate performance management systems that include:

- i. Defining performance objectives with the purpose, as a minimum, to continuously improve performance in four key performance areas (KPA), i.e., safety, quality of service, productivity and cost effectiveness, it being understood that States may choose additional KPAs according to their objectives and their particular circumstances;
- ii. Selecting and reporting at least one relevant performance indicator and its target for each of the KPAs selected;
- iii. Using the results to evaluate and improve performance; and
- iv. Undertaking consultations with users and other interested parties to achieve a mutual understanding and consensus, where appropriate, on performance objectives, level of performance targets and plans to achieve the targets."

ICAO's Airports Economics Manual (Doc. 9562)⁶, currently being revised, includes guidance on establishing a performance management system, descriptions of the four KPAs listed above, a list of several Performance Indicators (PIs) for each of the four areas (without a detailed description of the individual PIs), and a discussion of benchmarking.

⁵ Document 9082, paragraph 27, in process of revision as of December 2011.

⁶ Section B and Appendix 1.

The table below summarizes the primary differences between the four ICAO KPAs and the larger set of six KPAs used in this Guide.

ICAO KPAs and ACI Guide to Airport Performance Measures KPAs

Four ICAO KPAs	Corresponding KPA in ACI Guide	Comments
	Core	Airports may have little control over these core indicators, such as the number of passengers, especially in the short term, but they are important indicators of overall airport activity, and drivers and components of other indicators
Safety	Safety and Security	Safety and security are both critical airport functions, which sometimes overlap
Quality of Service	Service Quality	Equivalent KPAs
Productivity	Productivity/Efficiency	Airports often combine Productivity and Cost Effectiveness in a single KPA. As used by ICAO, productivity refers to the relationship of output to input (e.g., passengers per airport employee), while cost effectiveness refers to the financial input or cost required to produce a nonfinancial output (e.g., total cost per passenger)
Cost Effectiveness		
	Financial/Commercial	Financial/commercial may cover a broad range of measures, including those relating to charges, debt, profitability, and commercial revenue
	Environmental	Many airports have developed or are in the process of developing Environmental PIs

SECTION 2

KEY PERFORMANCE AREAS AND PERFORMANCE INDICATORS

2.1. Performance Indicators (PIs) included within each KPA

A full list of the key indicators included within each area is provided below

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2. Runway Incursions	17
3. Bird Strikes	18
4. Public Injuries	19
5. Occupational Injuries	19
6. Lost Work Time from Employee Accidents and Injuries	20
2.4 Service Quality	21
1. Practical Hourly Capacity	22
2. Gate Departure Delay	23
3. Taxi Departure Delay	23
4. Customer Satisfaction	24
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2.5 Productivity/Cost Effectiveness	28
1. Passengers per Employee	29
2. Aircraft Movements per Employee	29
3. Aircraft Movements per Gate	30
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5. Total Cost per Movement	32
6. Total Cost per WLU	33
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1. Carbon Footprint	46
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For each Key Performance Area, the Guide provides a short introduction with a list of relevant PIs within that area, and brief comments on major issues frequently encountered in that area.

For each Performance Indicator, the following information is provided:

- Title
- Definition
- Applicability to which types of airports
- Drivers
- Useful for internal/external benchmarking
- Comments regarding usefulness or limitations

2.2 Core

Core indicators are used to track the fundamental measures of airport activity, such as passengers and operations.

Indicators

1. Passengers
2. Origination and Destination Passengers
3. Aircraft Movements
4. Freight or Mail Loaded/Unloaded
5. Destinations—Nonstop

Comments

These indicators are important determinants of the financial health of the airport, the airport's regional economic impact, and the quality of air transportation offered at the airport.

Changes in Core indicators are primarily the result of airline decisions which are largely beyond the control of airports. In most cases, airports have only a limited ability to influence core indicators by establishing favorable airport charges, offering efficient and passenger-friendly infrastructure and services, effectively marketing themselves to airlines and passengers, and sometimes offering financial incentives or marketing support for new service.

Core indicators are critical drivers of many other performance indicators. For example, higher passenger volume drives increased airport revenue through passenger charges, landing fees, car parking, food & beverage spending, etc. Core indicator values—whether expressed in passengers, movements, or freight tonnes—influence asset utilization and airport costs per passenger or movement. Core indicators also are critical drivers of some aspects of service quality, particularly delays, as airports approach saturation.

**Passengers (total annual)—
Core 1****Definition**

Passengers, including enplaning and deplaning, measured over the course of a year. (See Glossary for definition of Passenger.)

Applicability

All commercial service airports

Drivers

Primary drivers are local demand and airline route planning and pricing decisions (which will influence, among other things, number of transfer passengers).

Benchmarking

As a Core PI, most useful for internal benchmarking to track growth or decline from year-to-year, and to identify other airports of similar size for further study.

Comments

Many important PIs are driven by this Core PI, or use this Core PI as the denominator.

**Origination and Destination Passengers (total annual)—
Core 2****Definition**

Passengers whose air travel begins or ends at the airport, measured over the course of a year. Excludes passengers who are changing planes at the airport to embark on a flight to another destination. A passenger who makes a round-trip is counted as two Origination and Destination (O&D) Passengers.

Applicability

Applicable primarily to airports with a significant number of connecting passengers. For other airports, the number of O&D passengers will be approximately the same as the number of total passengers.

Drivers

Primary drivers are local demand, competing airports in the same catchment area, and airline route planning and pricing decisions.

Benchmarking

As a Core PI, most useful for internal benchmarking to track growth or decline from year-to-year, and to identify other airports of similar size for further study.

Comments

A number of important PIs are driven by this Core PI or use this Core PI, as opposed to the broader measure of total passengers, as the denominator. Some indicators may use the components of this PI—*Origination Passengers* or *Destination Passengers*. For example, typically only *Origination Passengers* use the airport's car park facilities, and only *Destination Passengers* rent cars at the airport. Similarly, typically only *Origination Passengers* use the primary security screening services at an airport, while only *Destination Passengers* use an airport's baggage claim facilities. Although airports sometimes estimate either *Origination* or *Destination Passengers* by dividing *O&D Passengers* by two, that may not reflect true inbound and outbound patterns.

Aircraft Movements (total annual)— Core 3

Definition

Aircraft take-offs or landings at an airport, measured over the course of a year. One arrival and one departure are counted as two movements.

Applicability

All airports

Drivers

Primary drivers are local demand and airline route planning and pricing decisions.

Benchmarking

As a Core PI, most useful for internal benchmarking to track growth or decline from year-to-year, and to identify other airports of similar size for further study.

Comments

Many important PIs are driven by this Core PI, or use this Core PI as the denominator. For example, airfield capacity and delay issues are driven primarily by aircraft movements.

**Freight or Mail Loaded/Unloaded (total annual tonnes)—
Core 4****Definition**

Freight or mail loaded or unloaded at the airport, measured in metric tonnes over the course of a year.

Applicability

All airports with freight

Drivers

Primary drivers are local demand and airline route planning and pricing decisions.

Benchmarking

As a Core PI, most useful for internal benchmarking to track growth or decline from year-to-year, and to identify other airports of similar size for further study.

Comments

Note that the U.S. uses the short ton (2000 lbs), as opposed to the tonne (1000 kg or 2204.6 lbs). Some important PIs are driven by this Core PI, or use this Core PI as the denominator. For airports where a large portion of the freight is carried as “belly” freight, it may not be possible to separate airport costs and revenues attributable to freight versus passengers.

**Destinations—Nonstop—
Core 5****Definition**

Number of airports with nonstop service, including destinations with only seasonal service, measured over the course of a year.

Applicability

All commercial service airports

Drivers

Primary drivers are local demand and airline route planning and pricing decisions.

Benchmarking

As a Core PI, most useful for internal benchmarking to track growth or decline from year-to-year, and to identify other airports of similar size for further study.

Comments

Airports closely monitor the number of nonstop destinations and typically track the number of domestic and international destinations separately. Having a greater number of nonstop destinations, especially those involving long-haul international flights, generates regional economic benefits.

2.3 Safety and Security

Safety indicators are used to track airfield safety issues as well as safety issues involving other portions of the airport, including roadways, and general employee safety. Security indicators may be used to track security violations, thefts and crimes, and responsiveness.

Indicators

1. Runway Accidents
2. Runway Incursions
3. Bird Strikes
4. Public Injuries
5. Occupational Injuries
6. Lost Work Time from Employee Accidents and Injuries

Comments

Safety PIs, such as the number of aircraft accidents and runway incursions, are widely used. The substantial multi-agency governmental role in security makes it less susceptible to performance management from the airport perspective, although airports can and do track violations and take corrective action within the areas they control.

Runway Accidents (per thousand movements)— Safety and Security 1

Definition

Aircraft accidents involving a runway per thousand aircraft movements (takeoffs and landings are counted separately), measured over the course of a year.

Applicability

All airports

Drivers

Runway accidents occur for multiple reasons, most of which are beyond the airport's control. Among the drivers that airports influence are runway and taxiway design and maintenance, snow and ice removal, FOD removal, signage, lighting, wildlife management, and runway interference by airport vehicles. Drivers of this PI beyond the airport's control include meteorological conditions, air traffic system errors, individual operator errors, and aircraft maintenance and mechanical issues.

Benchmarking

Extremely small numbers of runway accidents may limit ability to benchmark. If sufficient data to draw conclusions, may be useful for internal and external benchmarking.

Comments

Safety is the most critical aviation goal. Because the number of runway accidents is so small, probably zero in most cases, this PI is only a high level measure of airport runway safety. For most airports, additional metrics (e.g., *Runway Incursions* below) will be necessary to highlight runway safety in greater detail.

Runway Incursions (per thousand movements)— Safety and Security 2

Definition

Number of occurrences per thousand movements involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft, measured over the course of a year.

Applicability

All airports

Drivers

Runway incursions occur for multiple reasons, including pilot and vehicle driver errors. Among the drivers that airports influence are runway and taxiway design and maintenance, signage, lighting, and runway interference by airport vehicles.

Benchmarking

Useful for both internal and external benchmarking.

Comments

Runway incursions occur for multiple reasons, and the airport must focus on those within its control and apply best international practices.

**Bird Strikes (per thousand movements)—
Safety and Security 3****Definition**

Number of incidents per thousand movements involving bird strikes, which are collisions of airborne animals (usually birds, but also including bats) with aircraft, measured over the course of a year.

Applicability

All airports

Drivers

Location of airport near water, fields, forests, or other areas of natural habitat may provide shelter, nesting areas, and feeding areas for wildlife. Airports must take actions to create hostile habitat for birds while complying with environmental and wildlife regulations.

Benchmarking

Useful for internal benchmarking and for external benchmarking with other airports having similar habitat and wildlife populations.

Comments

Bird strikes occur for multiple reasons, and the airport must focus on those within its control and apply best international practices.

**Public Injuries (per thousand passengers)—
Safety and Security 4****Definition**

Number of public injuries per thousand passengers, measured over the course of a year.

Applicability

All commercial service airports

Drivers

Accidents are often driven by slippery conditions, inadequate signage or construction barriers, or involve vehicles.

Benchmarking

Useful for internal and external benchmarking.

Comments

Public injuries may occur for a variety of reasons. Preventive actions include winter treatment of roads, effective signage, isolation of construction areas, and installation of slip-resistant surfaces. Reporting may occur through the dispatch function or as a result of claims filed.

**Occupational Injuries (per thousand hours worked)—
Safety and Security 5****Definition**

Occupational injuries to airport authority employees per thousand hours worked.

Applicability

All airports

Drivers

Lack of safety precautions, unsafe working conditions, engaging in more risky types of work, such as certain types of construction, inadequate safety training, or the lack of a safety culture.

Benchmarking

Useful for internal and external benchmarking.

Comments

Injuries may occur for a variety of reasons. It is important that airports have a work environment that emphasizes safety.

**Lost Work Time from Employee Accidents and Injuries
(per thousand hours worked)—
Safety and Security 6**

Definition

Lost time due to employee accidents and injuries, measured per thousand hours worked.

Applicability

All airports

Drivers

Lack of safety precautions, unsafe working conditions, engaging in more risky types of work, such as certain types of construction, inadequate safety training, or the lack of a safety culture.

Benchmarking

Useful for internal and external benchmarking.

Comments

Accidents may occur for a variety of reasons. It is important that airports have a work environment that emphasizes safety.

2.4 Service Quality

Service quality indicators focus both on how passengers perceive the level of service provided by the airport, and on objective measures of service delivery.

Indicators

1. Practical Hourly Capacity
2. Gate Departure Delay
3. Taxi Departure Delay
4. Customer Satisfaction
5. Baggage Delivery Time
6. Security Clearing Time
7. Border Control Clearing Time
8. Check-in to Gate Time

Comments

This important area of airport performance reflects the strides made by airports to deliver an increasingly high standard of service in multiple areas, ranging from airport cleanliness to minimization of wait times, to the provision of a wide range of attractive retail opportunities. Some measures of service quality must be based on passenger surveys, as they reflect overall passenger perceptions. Some delay measures may be driven by airport capacity limitations.

Practical Hourly Capacity— Service Quality 1

Definition

Maximum aircraft movements per hour assuming average delay of no more than four minutes, or such other number of delay minutes as the airport may set.

Applicability

All airports

Drivers

Practical hourly capacity is largely a function of runway capacity which is determined by the number of runways, their configuration and separation, taxiway access and capacity, air traffic system restrictions, weather and terrain, type and mix of aircraft, arrival/departure mix. Many of these factors are fixed until new infrastructure is added.

Benchmarking

Useful for internal benchmarking as part of the process of determining whether additional airfield capacity is required.

Comments

There is no consensus on the best measure of runway capacity, which is a fundamental airport metric along with terminal capacity. *Practical Hourly Capacity (PHC)* is a useful measure because it incorporates a level of service requirement. The standard definition of PHC uses a maximum delay of 4 minutes, although individual airports may calculate PHC based on other maxima, such as 8 minutes, depending on individual circumstances and air carrier planning criteria. Runway capacity, expressed in movements per hour, is generally higher during optimum conditions than during IFR conditions when radar separation between aircraft is required. The magnitude of the difference varies from airport-to-airport depending on the airfield configuration and other drivers listed above. Other measures of runway capacity include declared runway capacity and maximum hourly capacity.

**Gate Departure Delay —
Service Quality 2****Definition**

Average gate departure delay per flight in minutes—measured from scheduled departure time at average and peak times.

Applicability

All commercial service airports

Drivers

Gate departure delays may be a function of airport capacity constraints, limited air traffic system capacity, airline scheduling practices, airline operational issues, late aircraft arrivals from the prior station, adverse weather, and other factors.

Benchmarking

Useful for internal benchmarking and external benchmarking as the first step in analyzing the causes of delay.

Comments

Multiple delay measures are used by airports, airlines, and others. To compare airports across countries, delay measures first should be standardized. It is important to determine the causes of gate departure delays, which may be largely beyond the airport's control and may vary by season. Related operational measures include flight cancellations and airport closures.

**Taxi Departure Delay—
Service Quality 3****Definition**

Average taxi delay for departing aircraft per flight in minutes—measured by comparing actual taxi time versus unimpeded taxi time at average and peak times.

Applicability

All commercial service airports

Drivers

Taxi departure delays may be a function of airport capacity constraints, limited air traffic system capacity, airline scheduling practices, airline operational issues, adverse weather, and other factors.

Benchmarking

Useful for internal benchmarking and external benchmarking as the first step in analyzing the causes of delay.

Comments

Multiple delay measures are used by airports, airlines, and others. To compare airports across countries, delay measures first should be standardized. It is important to determine the causes of gate departure delays, which may be largely beyond the airport's control and may vary by season. Related operational measures include flight cancellations and airport closures.

Customer Satisfaction — Service Quality 4

Definition

Overall level of passenger satisfaction as measured by survey responses.

Applicability

All airports

Drivers

Customer satisfaction is driven by multiple factors: some are within the airport's control, such as cleanliness, ease of wayfinding, variety of shops, comfort of departure areas, reliability of escalators and moving walkways; others may or may not be within the airport's control such as *Security Clearing Time* and *Baggage Delivery Time*; and still others are not within the airport's control, such as speed of airline check-in, level of airfares, and range of flights offered.

Benchmarking

Individual airport surveys may be useful for internal benchmarking so long as applied consistently. Multi-airport surveys, such as the ACI-ASQ, are required for external benchmarking.

Comments

Customer satisfaction with the airport—the only subjective PI included—has become a very important indicator, driven by multiple factors and entities as described above. Airports must understand what drives their customer satisfaction rating in order to take appropriate action, including working with airlines and government agencies as required to improve their performance.

**Baggage Delivery Time—
Service Quality 5****Definition**

Average time for delivery of first bag and last bag—measured over the course of a year.

Applicability

All commercial service airports

Drivers

Airline or ground handling company operational performance, airline scheduling practices (which determine volume of connections and connecting times), security screening issues (often driven by government agency management of screening), and airport layout, facilities, and equipment.

Benchmarking

Useful for internal and external benchmarking.

Comments

Baggage delivery time is an important service quality metric, although one that is largely beyond the control of airports and within the control of airlines or their designated ground handling companies. In its Baggage Improvement Programme, the International Air Transport Association (IATA) lists over 70 performance issues to be tracked over the course of baggage check-in, security screening, transfer, and re-delivery to the passenger. The airport role in these issues is largely limited to providing necessary facilities and equipment.

**Security Clearing Time—
Service Quality 6****Definition**

Average security clearing time from entering queue to completion of processing—measured at average and peak times.

Applicability

All commercial service airports

Drivers

Level of security staffing, type of screening technology used and

number of units in operation, screening procedures and protocols, number of security lanes that are staffed, passenger demand profile.

Benchmarking

Most useful for internal benchmarking and external benchmarking with other airports within the same country.

Comments

Security is administered differently across countries; it is operated by the airport or privatized in some cases, while conducted by a government entity in others. Also, different airports have different profiles in terms of peak period versus average screening demands, the amount of passenger carry-on luggage to be screened, and the level of the security threat. Passengers focus on security clearing times as an important aspect of their overall airport experience.

Border Control Clearing Time— Service Quality 7

Definition

Average border control clearing time from entering queue to completion of processing—measured at average and peak times.

Applicability

All commercial service airports

Drivers

Level of border control staffing, technology employed, procedures and protocols, number of screening lanes that are staffed, passenger profile in terms of border control screening.

Benchmarking

Most useful for internal benchmarking and external benchmarking with other airports within the same country.

Comments

Passengers focus on border control clearing times as an important aspect of their overall airport experience. Procedures and processing times vary from country to country. Although an important PI for passengers, border control processing is almost always under the control of national authorities, and airport influence is largely limited to attempting to persuade those authorities to make changes in staffing and procedures.

**Check-in to Gate Time—
Service Quality 8****Definition**

Average time from entering the check-in queue to arrival at the boarding gate—measured at average and peak times.

Applicability

All commercial service airports

Drivers

Numerous drivers at multiple processing points, including queuing and processing times at initial check-in, security screening, and in some cases, border control and then transit time by rail or bus from terminal to gate area. In addition, walking distances are a factor in the overall result and are likely to be longer at larger airports.

Benchmarking

Useful for internal benchmarking.

Comments

Passengers focus on the time spent from check-in to gate, and on the variability of this measure. The primary drivers of airline check-in and security screening times are usually beyond the airport's control. Airports should focus on the elements of this PI within their control and should influence airlines and government agencies to provide short processing times.

2.5 Productivity/Cost Effectiveness

These indicators of airport efficiency measure the resources used to produce a certain volume of activity, e.g., departures per gate or total passengers per airport employee.

Indicators

1. Passengers per Employee
2. Aircraft Movements per Employee
3. Aircraft Movements per Gate
4. Total Cost per Passenger
5. Total Cost per Movement
6. Total Cost per WLU
7. Operating Cost per Passenger
8. Operating Cost per Movement
9. Operating Cost per WLU

Comments

Productivity/cost effectiveness indicators are closely watched and important, but must be used carefully, especially for external benchmarking. Many are particularly sensitive to critical input factors that may be largely beyond the airport's control and are likely to vary from airport to airport. *Aircraft Movements per Gate*, for example, may depend largely on the airlines' scheduling practices—a network carrier may operate relatively few banks of flights at one of its international hubs, while a point-to-point low cost carrier may operate flights nearly continuously from early morning until late at night. These scheduling practices will impact gate utilization even in highly efficient multi-user terminals with common use gates under airport control.

**Passengers per Employee—
Productivity/Cost Effectiveness 1****Definition**

Total passengers per employee, expressed as full time equivalents (FTEs), measured over the course of a year.

Applicability

All commercial service airports

Drivers

Drivers include: range of services provided by the airport; extent of outsourcing of airport functions; airport passenger volume and flight peaking profile; mix of air service provided (e.g., international, domestic, cargo); mix of carrier types providing service (e.g., network versus low cost carrier).

Benchmarking

Useful primarily for internal benchmarking.

Comments

The varying degrees to which airports outsource and the differences between airports in the services they provide make this measure of labor productivity particularly difficult to use for external benchmarking. The use of other divisors besides passengers, such as WLUs or movements, may result in better measures of employee productivity. Despite these limitations, this PI may be useful for internal benchmarking to highlight changes.

**Aircraft Movements per Employee—
Productivity/Cost Effectiveness 2****Definition**

Aircraft movements per employee, expressed as full time equivalents (FTEs), measured over the course of a year.

Applicability

All commercial service airports

Drivers

Drivers include: range of services provided by the airport; extent of outsourcing of airport functions; average aircraft size; airport flight

volume and flight peaking profile; mix of air service provided (e.g., international, domestic, cargo); mix of carrier types providing service (e.g., network versus low cost carrier).

Benchmarking

Useful primarily for internal benchmarking.

Comments

The varying degrees to which airports outsource and the differences between airports in the services they provide or leave to airlines or vendors to provide make this measure of labor productivity particularly difficult to use for external benchmarking. The use of other divisors besides movements, such as passengers or WLUs, may result in better measures of employee productivity. Despite these limitations, this PI may be useful for internal benchmarking to highlight changes.

Aircraft Movements per Gate— Productivity/Cost Effectiveness 3

Definition

Aircraft movements per gate, measured over the course of a year.

Applicability

All commercial service airports

Drivers

Drivers include airline scheduling practices, mix of carrier types (network versus low cost), mix of traffic (long haul versus short haul), airport gate capacity.

Benchmarking

Useful for internal and external benchmarking, but note comments below.

Comments

This measure of the intensity of asset utilization will vary depending on multiple factors which are largely beyond the airport's control, such as the carriers' decision to operate more or fewer hub "banks" at the airport. Low cost carriers generally will have more aircraft movements per gate than traditional network carriers. Larger aircraft generally have longer turn times than smaller aircraft, resulting in fewer movements per gate. Some airports may have significant seasonal variations in the number of aircraft movements per gate. Airport control over gates (common use versus other arrangements) may also be a factor in the

intensity of gate utilization. Airports count gates differently, especially with regard to ground load gates not served with a jet bridge.

Total Cost per Passenger— Productivity/Cost Effectiveness 4

Definition

Airport total costs per passenger, i.e., operating costs plus non-operating costs, divided by passengers, measured over the course of a year.

Applicability

All commercial service airports, although the measure must be modified or a different measure used at airports with substantial freighter or other non-passenger activity.

Drivers

Drivers include: (a) airport operating costs such as labor, contracted services, maintenance, utilities and energy that may vary depending on the range and mix of airport activities (including non-aviation, handling, and security), mix of transfer and local boarding passengers, site constraints, facility design and age, location in an urban/rural area, adverse weather conditions, management decisions, local wage and employment practices, level of service provided by the airport versus being left to individual airlines or vendors, possible operating scale functions; and (b) airport non-operating costs such as capital and financing costs, including interest and depreciation, that may vary depending on facility age, site constraints, local construction costs, cost of capital, and many other factors. Other drivers include airline route planning and scheduling decisions. For example, higher total airport costs per passenger are usually required for long-haul international flights than for short-haul domestic flights, especially those provided by a low cost carrier with high gate utilization.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the many factors listed above.

Comments

This measure of airport costs is influenced by multiple factors listed above and therefore is primarily a starting point for further analysis. The divisor, number of passengers, is largely beyond the airport's control, and the measure includes in the numerator the costs attributable to cargo operations.

Total Cost per Movement— Productivity/Cost Effectiveness 5

Definition

Airport total costs per movement, i.e., operating cost plus non-operating cost divided by movements, measured over the course of a year.

Applicability

All commercial service airports, except those with substantial cargo freighter or other non-passenger activity, which should be tracked separately.

Drivers

Drivers include: (a) airport operating costs such as labor, contracted services, maintenance, utilities and energy that may vary depending on the range and mix of airport activities (including non-aviation, handling, and security), mix of transfer and local boarding passengers, site constraints, facility design and age, location in an urban/rural area, adverse weather conditions, management decisions, local wage and employment practices, level of service provided by the airport versus being left to individual airlines or vendors, possible operating scale functions; and (b) airport non-operating costs such as capital and financing costs, including interest and depreciation, that may vary depending on facility age, site constraints, local construction costs, cost of capital, and many other factors. Other drivers include airline route planning and scheduling decisions. For example, higher total airport costs per movement are usually required for long-haul international flights than for short-haul domestic flights, especially those provided by a low cost carrier with high gate utilization.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the many factors listed above.

Comments

This measure of airport costs is influenced by multiple factors listed above and therefore is primarily a starting point for further analysis. The divisor, number of movements, is largely beyond the airport's control.

Total Cost per WLU— Productivity/Cost Effectiveness 6

Definition

Airport total costs per Work Load Unit, i.e., operating costs plus non-operating costs divided by Work Load Units.

Applicability

All commercial service airports

Drivers

Drivers include: (a) airport operating costs such as labor, contracted services, maintenance, utilities and energy that may vary depending on the range and mix of airport activities (including non-aviation, handling, and security), mix of transfer and local boarding passengers, site constraints, facility design and age, location in an urban/rural area, adverse weather conditions, management decisions, local wage and employment practices, level of service provided by the airport versus being left to individual airlines or vendors, possible operating scale functions; and (b) airport non-operating costs such as capital and financing costs, including interest and depreciation, that may vary depending on facility age, site constraints, local construction costs, cost of capital, and many other factors. Other drivers include airline route planning and scheduling decisions. For example, higher total airport costs per WLU are usually required for long-haul international flights than for short-haul domestic flights, especially those provided by a low cost carrier with high gate utilization.

Benchmarking

Useful for internal benchmarking. External benchmarking should be very approached carefully because of the many factors listed above.

Comments

This measure of airport costs is influenced by multiple factors listed above and therefore is primarily a starting point for further analysis. The divisor, Work Load Units, attempts to incorporate the cost impact of cargo activities, but is largely beyond the airport's control as with passengers and movements.

Operating Cost per Passenger— Productivity/Cost Effectiveness 7

Definition

Airport operating costs per passenger, divided by passengers, measured over the course of a year.

Applicability

All commercial service airports, except those with substantial cargo freighter or other non-passenger activity.

Drivers

Drivers include the full range of airport operating cost drivers such as labor, contracted services, maintenance, utilities and energy that vary depending on site constraints, facility design and age, location in an urban/rural area, adverse weather conditions, management decisions, local wage and employment practices, level of service provided by the airport versus being left to individual airlines or vendors, possible operating scale functions, and others. Other drivers include airline route planning and scheduling decisions and changes in local air travel demand which impact the passenger denominator. The type of air service offered is also a factor. For example, long-haul international flights are likely to have higher airport operating costs per passenger than short-haul domestic flights, especially those provided by a low cost carrier with high gate utilization.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the difficulty in finding a comparable peer group in terms of the many factors listed above.

Comments

This measure of airport costs takes out the capital cost component and therefore helps an airport make cost comparisons. However, there remain many important differences from one airport to another in the factors affecting airport operating costs and therefore use of this PI is primarily a starting point for further analysis.

Operating Cost per Movement— Productivity/Cost Effectiveness 8

Definition

Airport operating cost per movement, measured over the course of a year.

Applicability

All commercial service airports

Drivers

Drivers include the full range of airport operating cost drivers such as labor, contracted services, maintenance, utilities and energy that vary depending on site constraints, facility design and age, location in an urban/rural area, adverse weather conditions, management decisions, local wage and employment practices, level of service provided by the airport versus being left to individual airlines or vendors, possible operating scale functions, and others. Facilities that are over- or under-sized in relation to the number of movements will drive higher or lower total costs per movement. Airline scheduling decisions also drive this measure as they impact the movement denominator.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the difficulty in finding a comparable peer group in terms of the many factors listed above.

Comments

This measure of operating cost efficiency is useful for providing another perspective on airport operating costs in addition to examining operating costs per passenger. Also, unlike “per passenger” measures, this indicator may be used for cargo airports. Note, however, that an airport’s operating cost per cargo movement is typically lower than per passenger movement as fewer services and facilities are required, and therefore blending the two types of operations is problematic. There remain many important differences from one airport to another in the factors affecting airport operating costs and therefore use of this PI is primarily a starting point for further analysis.

Operating Cost per WLU— Productivity/Cost Effectiveness 9

Definition

Airport operating costs per Work Load Unit, measured over the course of a year.

Applicability

All commercial service airports

Drivers

Drivers include the full range of airport operating cost drivers such as labor, contracted services, maintenance, utilities and energy that vary depending on site constraints, facility design and age, location in an urban/rural area, adverse weather conditions, management decisions, local wage and employment practices, level of service provided by the airport versus being left to individual airlines or vendors, possible operating scale functions, and others. Other drivers include airline route planning and scheduling decisions and changes in local air travel demand which impact the WLU denominator. The type of air service offered is also a factor. For example, long-haul international flights are likely to have higher airport operating costs per WLU than short-haul domestic flights, especially those provided by a low cost carrier with high gate utilization. The mix of passengers and cargo volume also drives this PI as the assumed equivalence of one passenger to 100 kg of cargo is unlikely to reflect the actual operating cost ratio between the two.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the difficulty in finding a comparable peer group in terms of the many factors listed above.

Comments

This measure of operating cost efficiency is useful for providing another perspective on airport operating costs in addition to examining operating costs per passenger and operation. Also, unlike “per passenger” measures, this indicator may be used for airports with a mix of passenger and cargo activity. Note, however, that the WLU’s treatment of 100 kg of freight as the equivalent of a single passenger has been criticized as not analytically based and as attributing a greater amount of cost to freight than is actually incurred. There remain many important differences from one airport to another in the factors affecting airport operating costs and therefore use of this PI is primarily a starting point for further analysis.

2.6 Financial/Commercial

Financial/commercial performance indicators are used to track the airport's financial performance, including airport charges, airport financial strength and sustainability, and the performance of individual commercial functions.

Indicators

1. Aeronautical Revenue per Passenger
2. Aeronautical Revenue per Movement
3. Non-Aeronautical Operating Revenue as Percent of Total Operating Revenue
4. Non-Aeronautical Operating Revenue per Passenger
5. Debt Service as Percentage of Operating Revenue
6. Long-Term Debt per Passenger
7. Debt to EBITDA Ratio
8. EBITDA per Passenger

Comments

Financial indicators are among the PIs most widely used and are closely tracked by airports, airlines, and regulators.

Aeronautical Revenue per Passenger— Financial/Commercial 1

Definition

Aeronautical charges per passenger, measured over the course of a year, net of discounts or fee waivers. Average of aeronautical revenues collected per passenger for use of airfield (landing fees, ramp/apron fees), gate charges, terminal space, passenger-related charges, and ground-handling user fees. Includes Passenger Facility Charges at U.S. airports. Excludes air traffic control fees and facility rentals for ancillary buildings, such as maintenance hangars and cargo buildings.

Applicability

All commercial service airports, except those with substantial cargo freighter or other non-passenger activity.

Drivers

Drivers include applicable rate-making methodology, which is often based at least in part on the airport's cost of providing aeronautical facilities and services. As such, many of the same drivers for total airport costs per passenger also drive aeronautical revenue per passenger. In relatively few cases, aeronautical charges may be set based on market rates. The number of passengers is driven by local demand and airline route planning and pricing decisions.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the difficulty in finding a comparable peer group in terms of the many factors listed above.

Comments

Aeronautical revenue per passenger is often a function of the airport's capital development phase, as expansion programs are most likely to increase an airport's cost per passenger when initially completed, which is reflected in the airport's aeronautical revenue per passenger. This measure is sensitive to changes in the level of passengers. Use of this PI is primarily a starting point for further analysis.

Aeronautical Revenue per Movement— Financial/Commercial 2

Definition

Aeronautical charges per movement, measured over the course of a year. Average of aeronautical revenues collected per movement for

use of airfield (landing fees, ramp/apron fees), gate charges, terminal space, passenger-related charges, and ground-handling revenue. Includes Passenger Facility Charges at U.S. airports. Excludes air traffic control fees and facility rentals for ancillary buildings, such as maintenance hangars and cargo buildings.

Applicability

All commercial service airports

Drivers

Drivers include applicable rate-making methodology, which is often based at least in part on the airport's cost of providing aeronautical facilities and services. As such, many of the same drivers for total airport costs per movement also drive aeronautical revenue per movement. In relatively few cases, aeronautical charges may be set based on market rates. The number of movements is driven by local demand and airline route planning and pricing decisions.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the difficulty in finding a comparable peer group in terms of the many factors listed above.

Comments

Aeronautical revenue per movement is often a function of the airport's capital development phase, as expansion/modernization programs are most likely to increase an airport's cost when initially completed, which is reflected in the airport's aeronautical revenue. This measure is sensitive to changes in the level of movements. Use of this PI is primarily a starting point for further analysis.

Non-Aeronautical Operating Revenue as Percent of Total Operating Revenue— Financial/Commercial 3

Definition

Total non-aeronautical operating revenue as a percentage of total operating revenue, measured over the course of a year.

Applicability

All airports

Drivers

Drivers include amount of non-aeronautical operating revenue, as well as amount of aeronautical revenue. Non-aeronautical revenue drivers include management decisions, passenger scale, contractual terms, facilities constraints, natural resources on site, location in areas that offer commercial opportunities, degree of competition with off-airport parking and other commercial vendors, availability of mass transit, and many other factors. In cost-recovery based regulatory systems, aeronautical revenue may be driven primarily by capital and operating costs, which are often a function of the airport's capital development phase as expansion/modernization programs are most likely to increase an airport's cost when initially completed.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the difficulty in finding a comparable peer group in terms of the many factors listed above.

Comments

Measures success in diversifying revenue source away from aeronautical charges. However, measures revenue only, not margin or ROI. Primary sources of non-aeronautical operating revenue are typically retail concessions, car parking, property income and rent, food & beverage, rental car concessions, advertising—with significant variations in mix between airports and in different regions. Use of this PI is primarily a starting point for further analysis.

Non-Aeronautical Operating Revenue per Passenger— Financial/Commercial 4

Definition

Total non-aeronautical operating revenue per passenger, measured over the course of a year.

Applicability

All commercial service airports

Drivers

Drivers include management decisions, passenger scale, contractual terms, facilities constraints, natural resources on site, location in areas that offer commercial opportunities, degree of competition with off-airport parking and other commercial vendors, availability of mass transit, and many other factors. The passenger divisor is driven by local demand and airline route planning and pricing decisions.

Benchmarking

Useful for internal benchmarking. External benchmarking should be approached very carefully because of the difficulty in finding a comparable peer group in terms of the many factors listed above.

Comments

Primary sources of non-aeronautical operating revenue are typically retail concessions, car parking, property income and rent, food & beverage, rental car concessions, advertising—with significant variations in mix between airports and in different regions. Airports typically track a number of these components separately in their own PIs. One measure of success in diversifying revenue sources away from aeronautical charges. Use of this PI is primarily a starting point for further analysis.

Debt Service as Percentage of Operating Revenue— Financial/Commercial 5

Definition

Debt service (principal plus interest) as a percent of operating revenue, measured on an annual basis.

Applicability

All airports with debt

Drivers

Drivers include annual debt service and operating revenue. Debt service is driven by the amount of debt outstanding, which may be a function of the airport's capital development phase as expansion/modernization programs are likely to increase an airport's debt. Other debt service drivers are interest rates, debt structure, and issuance costs, which will vary based on market conditions and airport credit rating. Operating revenue is driven by aeronautical and non-aeronautical revenue.

Benchmarking

Useful for internal benchmarking and external benchmarking as a measure of financial leverage.

Comments

Typically used as a measure of financial leverage. Airports with recently completed major capital development programs are likely to have higher debt service as a percent of operating revenue. As debt

service becomes a greater percentage of operating revenue, the airport is likely to have less spending flexibility. Use of this PI is primarily a starting point for further analysis. An alternative measure of leverage is interest as percent of operating revenue.

Long-Term Debt per Passenger— Financial/Commercial 6

Definition

Long-term debt plus accrued interest payable less the balance in both the debt service reserve fund and debt service or sinking fund, per passenger measured at the end of the reporting period.

Applicability

All commercial service airports with long-term debt

Drivers

Drivers include amount of long-term debt and number of passengers. Amount of long-term debt is likely to be a function of the airport's development spending for major projects such as terminal, airfield, and roadway improvements, as well the availability of non-debt sources of funding for development, such as aeronautical and other fees.

Benchmarking

Useful for internal and external benchmarking.

Comments

Typically used to provide a measure of financial leverage. Airports with recently completed major capital development programs are likely to have higher long-term debt per passenger. At higher debt levels, the airport is likely to have less spending flexibility and may incur higher borrowing costs. For some airports, high long-term debt per passenger is the result of having experienced significant passenger declines since the completion of major development programs.

**Debt to EBITDA Ratio—
Financial/Commercial 7****Definition**

Debt-to-EBITDA (earnings before interest, taxes, depreciation, and amortization) measured at the end of the reporting period.

Applicability

Airports that measure earnings (as opposed to most U.S. airports)

Drivers

Drivers include both debt and EBITDA. Amount of debt is likely to be a function of: (a) the airport's spending for major capital projects such as terminal, airfield, and roadway improvements, and (b) the availability of non-debt sources of funding, such as operating revenue or dedicated user charges such as the US Passenger Facility Charge. EBITDA is driven by multiple factors including aeronautical charge levels, which are frequently limited by regulation, the success of the airport's commercial program, operating expenses, and the passenger level and growth rate.

Benchmarking

Useful for internal and external benchmarking.

Comments

A commonly used measure of financial leverage. Airports with recently completed major capital development programs are likely to have higher debt to EBITDA. At higher debt levels, the airport may have less spending flexibility and incur higher borrowing costs. The high relative debt burden of some airports may be the result of significant traffic declines since the completion of major development programs.

**EBITDA per Passenger—
Financial/Commercial 8****Definition**

EBITDA (or earnings before interest taxes depreciation and amortization) per Passenger, measured over the course of a year.

Applicability

Generally applies to commercial service airports operated on a for-profit basis.

Drivers

EBITDA is driven by multiple factors including aeronautical charge levels, which are frequently limited by regulation, the success of the airport's commercial program, and the passenger level and growth rate. Higher revenue and lower operating costs result in greater EBITDA. The number of passengers is driven by local demand and airline route planning and pricing decisions.

Benchmarking

Useful for internal and external benchmarking.

Comments

This indicator is often used to make profitability comparisons between airports and, by applying a multiplier to EBITDA, as a means of valuing airports for investors. As with most measures, it should not be used in isolation because it provides an incomplete picture. EBITDA is not a pure measure of either profitability or cash flow. It measures an airport's operating profitability before non-operating expenses (interest) and non-cash charges (depreciation and amortization). Another commonly used measure of airport profitability is the EBITDA margin, defined as $\text{EBITDA}/\text{revenues}$.

2.7 Environmental

Environmental indicators are used to track an airport's progress in minimizing the environmental impacts of its operations.

Indicators

1. Carbon Footprint
2. Waste Recycling
3. Waste Reduction Percentage
4. Renewable Energy Purchased by the Airport (%)
5. Utilities/Energy Usage per Square Meter of Terminal
6. Water Consumption per Passenger

Comments

This evolving area has become a strong focus in recent years, with some important indicators still being developed. Environmental indicators may cover a wide range of subjects, including emissions, noise, minimization of energy and water usage, environmentally sound building practices, environmental violations, use of renewable sources, and other areas.

Carbon Footprint— Environmental 1

Definition

The carbon footprint is the total set of greenhouse gas (GHG) emissions caused by activities at the airport within the airport's control, expressed in terms of the amount of carbon dioxide or its equivalent in other GHG emitted. Excludes emissions caused by airline/tenant operations and the public.

Applicability

All airports, but particularly important for larger airports

Drivers

Emissions from sources within the airport's control, such as airport vehicles, heating and cooling equipment, lighting and other electrical uses. Emissions vary with total energy consumption, use of cleaner and more efficient energy sources, use of lower emission vehicles, emission control technology, and climate factors.

Benchmarking

Useful for internal benchmarking.

Comments

Tracking this PI requires airports to conduct an inventory of greenhouse gas emissions which requires the use of industry models for which there is not yet an industry standard. In addition, airports control a relatively small portion of total GHG emissions associated with the use of their facilities. (GHG emissions from airlines and public vehicles may be tracked separately from airport-controlled emissions.) Because the *Carbon Footprint* of an airport depends on the activities it controls, airports that provide ground handling using internal resources will have larger *Carbon Footprints* than airports that outsource this function—without any resulting difference in total greenhouse emissions from the airport premises. Many European airports use the methodology prescribed by the Airport Carbon Accreditation (ACA) program established by ACI Europe, which defines the set of emissions sources included and requires that airports have their carbon footprints independently verified in accordance with ISO 14064.

Waste Recycling— Environmental 2

Definition

Percentage of solid waste that is recycled/reused/composted, including pre-consumer organics and post-consumer compostables, as well as airfield trash, measured over the course of a year. Does not include construction waste.

Applicability

All airports

Drivers

Drivers include management actions to recycle, economics of recycling in different locations, and the availability of recycling centers.

Benchmarking

Useful for internal and external benchmarking.

Comments

There remain some definitional issues as to what is included within solid waste, and there are data collection issues especially regarding waste collection outside the terminal area.

Waste Reduction Percentage – Environmental 3

Definition

Percentage reduction over the previous year in tons of solid waste, including pre-consumer organics, and post-consumer compostables, as well as airfield trash. Does not include construction waste.

Applicability

All airports

Drivers

Drivers include management actions, availability of products and packaging with less waste, customer acceptance of lower waste alternatives, economics of lower waste processes and products.

Benchmarking

Useful for internal benchmarking.

Comments

Airports may track hazardous waste volume and reduction separately. There remain some definitional issues as to what is included within solid waste, and there are data collection issues especially regarding waste collection outside the terminal area.

Renewable Energy Purchased by the Airport (%)— Environmental 4

Definition

Amount of renewable energy purchased by the airport, as a percentage of total energy consumed by the airport. Excludes energy purchases by tenants.

Applicability

All airports

Drivers

Drivers include management actions and availability of renewable energy sources at reasonable cost.

Benchmarking

Useful for internal and external benchmarking.

Comments

There is not a consensus regarding the definition of renewable energy. For example, some jurisdictions exclude hydropower from this category. For purposes of this definition, all of the traditional renewable energy sources are included, such as traditional biomass, hydropower, solar, geothermal, and wind. See *Renewables 2011 Global Status Report* for information on renewable energy usage around the world.

Utilities/Energy Usage per Square Meter of Terminal— Environmental 5

Definition

Utilities and energy used per square meter of terminal building (conditioned space), measured in kilowatt hours and therms over the course of a year.

Applicability

All airports with passenger terminals

Drivers

Drivers include: energy efficiency of terminal building and its systems, which is a function of building design, technology employed, and age of building; and heating and cooling degree days.

Benchmarking

Useful for internal and external benchmarking, provided that adjustments are made for heating and cooling days.

Comments

In general, terminals consume the largest portion of utilities/energy at an airport. Typically electricity measured in kilowatts and natural gas usage measured in therms are tracked separately. Therms are a measure of natural gas volume; BTUs a measure of heat energy. 100 cubic feet of natural gas equals 1 therm equals approximately 100,000 BTUs. Separate metering of utilities for some tenants may create measurement difficulties.

**Water Consumption per Passenger—
Environmental 6****Definition**

Water consumption in the terminal complex divided by number of passengers, measured over the course of a year.

Applicability

All commercial service airports

Drivers

Drivers include installation of lower water consumption fixtures, such as toilets, sinks, and showers, and other water minimization techniques such as the use of drip irrigation and the installation of landscaping that requires no supplemental water.

Benchmarking

Useful for internal and external benchmarking.

Comments

Useful as an initial screening indicator, which will lead to further analysis of the sources of water consumption. Other measures of water consumption are necessary for water usage outside of the terminal complex.

SECTION 3

Additional Resources

3.1 Glossary

Aeronautical revenues – Revenue to the airport from aeronautical uses by airlines, aircraft owners and FBOs, measured on a net basis after discounts and incentives. Includes charges such as aircraft landing and takeoff fees, aircraft parking charges, passenger service fees, security charges, and in the U.S., terminal rental charges imposed in lieu of passenger charges. Includes ground handling user fees which are a significant source of aeronautical revenue at some airports.

Aircraft Accident – An occurrence associated with the operation of an aircraft where, as a result of the operation of an aircraft, any person (either inside or outside the aircraft) receives fatal or serious injury or any aircraft receives substantial damage.

Aircraft Movement – An aircraft take-off or landing at an airport. For airport traffic purposes one arrival and one departure are counted as two movements, measured over the course of a year.

Airport operating costs – Ordinary airport operating costs, including the following: personnel compensation and benefits, communications and utilities, repairs and maintenance, marketing, advertising and promotion, supplies and materials, contractual services, insurance, claims, and settlements. Includes administrative costs and allocated overhead costs. Excludes non-operating costs such as debt service and depreciation.

Debt Service – Principal plus interest paid or to be paid over the life of a particular debt instrument, or within a particular reporting period.

Freight (or mail) – Freight or mail loaded or unloaded at the airport, measured in the same way that enplaning and deplaning passengers are measured.

Gate – Aircraft parking position on the terminal ramp (apron) usually connected to the terminal by a loading bridge. Gates are typically defined to include positions large enough for narrowbody or larger aircraft; smaller positions used for regional jets or turboprops are typically counted separately.

ICAO – International Civil Aviation Organization, an agency of the United Nations which adopts standards and recommended practices concerning air navigation, airports, and other aviation-related subjects for international civil aviation. Approximately 190 countries (referred to as States) are members of ICAO.

Landing fees – Fees charged to aircraft owners and operators for the use of runways, taxiways, landing strips, runway protection zones, and clearways. Does not include fees for parking aircraft.

Non-aeronautical operating revenue – Operating revenue to the airport not derived from the aeronautical use of the airport. Includes revenues from land rental and non-terminal facilities, concessions for food & beverage, retail, and advertising, rental cars, public and employee parking, hotel and ground transportation.

Non-operating costs – Expenses for activities not relating to the core operations of the airport, such as interest charges, pension contributions, capital distributions, extraordinary losses, and taxes.

Passengers – Enplaning (embarking) and deplaning (disembarking) passengers at an airport, including passengers who are continuing their air journey. Excludes passengers who remain onboard and are continuing their journey.

Runway Incursion – Any incident at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft.

Taxi to Runway – Commences when the aircraft begins to move under its own power leaving the gate, ramp, apron, or parking area, and terminates upon reaching the runway.

Total Operating Revenue – The sum of Aeronautical and Non-aeronautical operating revenue.

WLU or Work Load Unit – One passenger (departing or arriving) or 100kg of freight (inbound or outbound). Widely used aggregate measure, although criticized for arbitrary weighting of freight that may overstate its resource requirements in relation to passengers.

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Airports Council International
Guide to Airport Performance Measures

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With oversight and substantial contributions by the members
of the ACI World Economics Standing Committee