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# ICAO Forecasts for Effective Planning and Implementation

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## Assembly Resolution A38-14

### Appendix C : Forecasting, planning and economic analyses

*The Assembly:*

- *Requests the Council to prepare and maintain, as necessary, forecasts of future trends and developments in civil aviation of both a general and a specific kind, including, where possible, local and regional as well as global data, and to make these available to Contracting States and support data needs of safety, security, environment and efficiency*
- *Requests the Council to develop one single set of Long Term Traffic Forecasts, from which customized or more detailed forecasts can be produced for various purposes, such as air navigation systems planning and environmental analysis*



## Needs of Long-Term Traffic Forecasts (LTF)

- The forecasts are critical to:
  - effectively implement ICAO's No Country Left Behind (NCLB) initiative
  - estimate future trends of noise, emissions and particulate matter
  - assess the operational and cost-effectiveness of air navigation systems including the Aviation System Block Upgrades (ASBU)
  - assess licensed personnel and training requirement
  - infrastructure planning and capacity building for improved safety of operations
- The forecasts are the basis for effective planning activities in States and ICAO.
- The development of the forecasts has taken into account the needs of States and the Organization and various ICAO entities.



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# Development of Long-term Traffic Forecasts





## Data sources

Main source: ICAO Air Transport Reporting Forms A, B and C submitted by States

Completed with data from national offices of statistics:

 <p><b>Transportation.gov</b> U.S. Department of Transportation</p>	<p>US Department of Transportation (Bureau of Transportation Statistics)</p>
	<p>AvStats (UK CAA)</p>
 <p>Australian Government Department of Infrastructure and Regional Development</p>	<p>Bureau of Infrastructure, Transport and Regional Economics (Australia)</p>

**90% of scheduled international passenger and 95% of Freight traffic covered by reported traffic**

	<p>Official Airline Guide (OAG)</p>
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Cleaned OAG used to complement the data to arrive at **100%** coverage



**Air Traffic Demand = Function (Economic Growth, Cost, non-economic events ....)**

- ❑ **Macro-economic factors**
  - **GDP per capita** (More disposable income per capita, higher demand for leisure travel)
  - **Employment** (Increasing economic activity and employment generating higher demand for business travel)
  - **Population growth** (Increasing population can drive travel demand)
  - **International Trade** (Cargo)
  
- ❑ **Micro-economic factors (cost of travel)**
  - **Regulations** (market access/ticket prices)
  - **Infrastructure** (transportation network, connections to airport, air traffic control, etc.)
  - **Market structure** (extent of airline competition)
  - **Input costs** (fuel, capital costs, labor costs etc.)
  
- ❑ **Random non-economic factors**
  - 2001 9/11 (North America and connected routes)
  - 2003 SARS (Asia and connected routes)
  - 2010 Iceland Volcano (Europe and connected routes)
  - 2011 Tsunami (Japan and connected routes)



## Passenger traffic demand model

### Econometrics Modeling

50 Route Groups      900 Observations

Utilized panel model approach

Overcomes time series limitations and allows for using the entire dataset



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### Basic Specification

Capture Key Economic Drivers

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Traffic demand per capita = f(Income per capita, Cost)  $RPKPC_t = f(GDPPC_t, OilPrice_t)$

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Income and Cost – Real GDP Per Capita & Oil Prices

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### Transportation maturity

As countries income grows demand for air travel increases; transport infrastructure improves to allow for increased activity (Ishutkina and Hansman 2009)

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As economies move from lower to higher income levels air demand growth will increase and then moderate (S-curve)

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Forecast model needs to account for this transition of route groups

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### Year Specific Event

Effects of 9/11 on air travel in the North America domestic, Intra north America and North Atlantic.

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SARs epidemics in Asia for 2003 , etc.

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## Cargo traffic demand model

- **Forecast at regional level**
  - Africa
  - Asia and Pacific
  - Europe
  - Latin America and the Caribbean
  - Middle East
  - North America
- **Model Specification**
  - Individual ordinary least squares (OLS) regression was used for each region as it performed better than other approaches
  - GDP and oil prices main explanatory variables

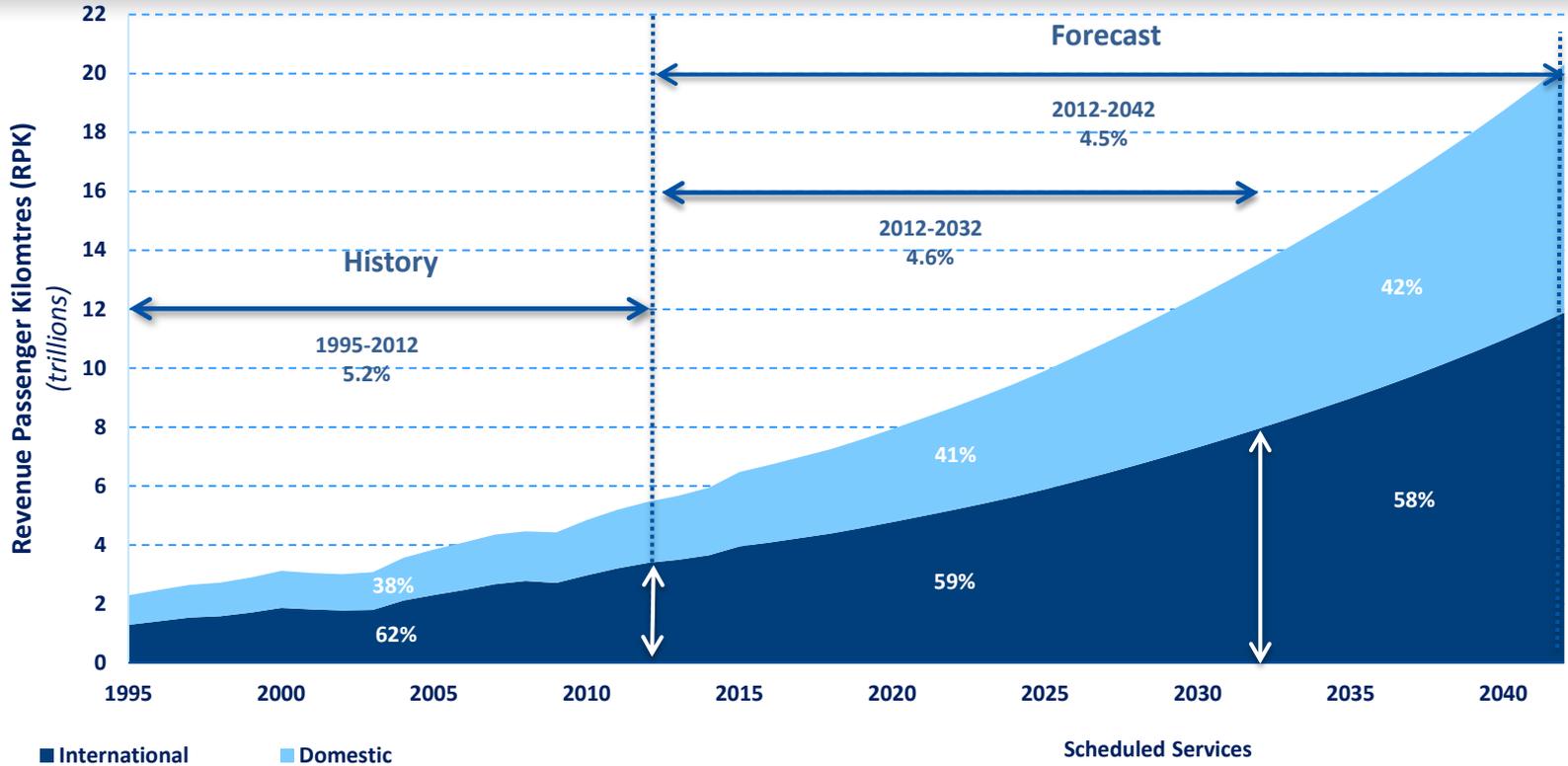


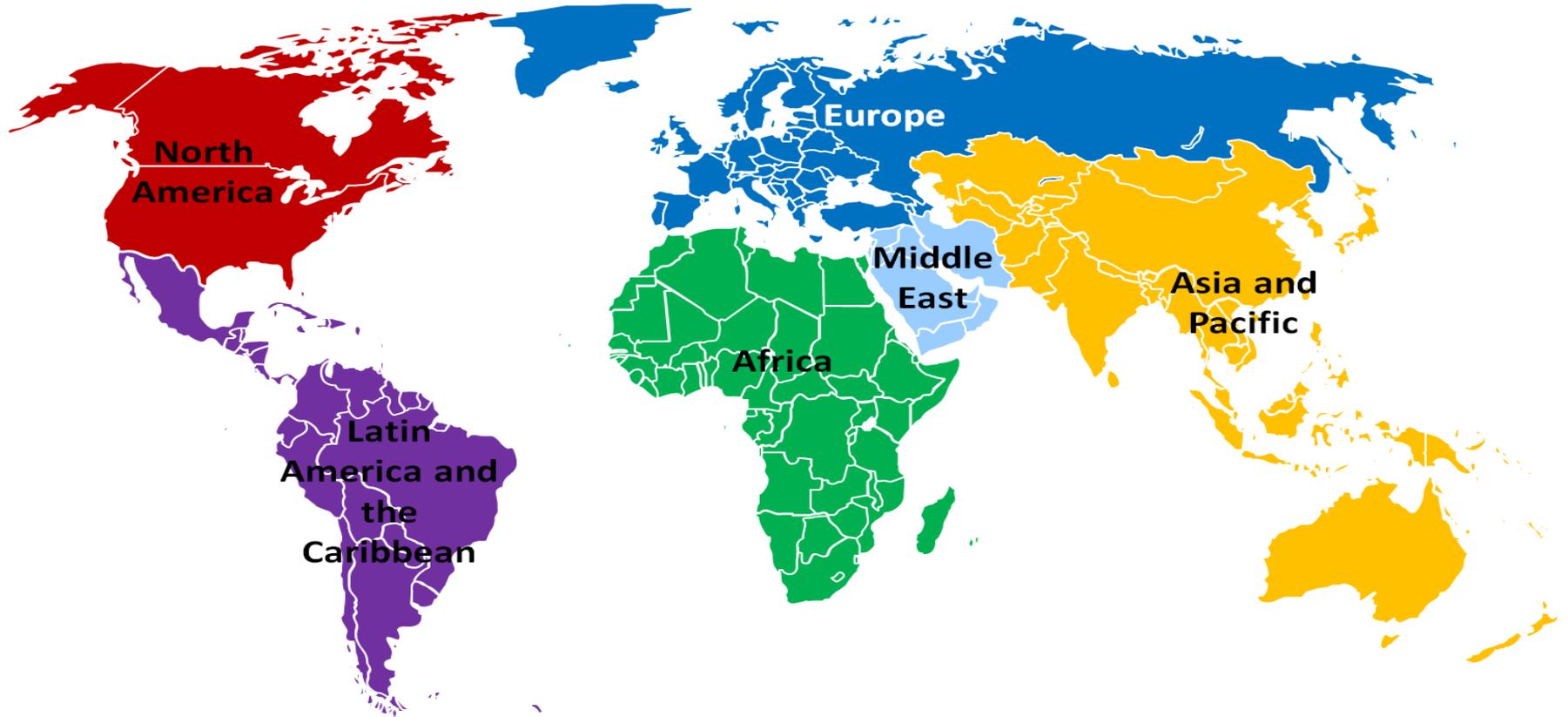
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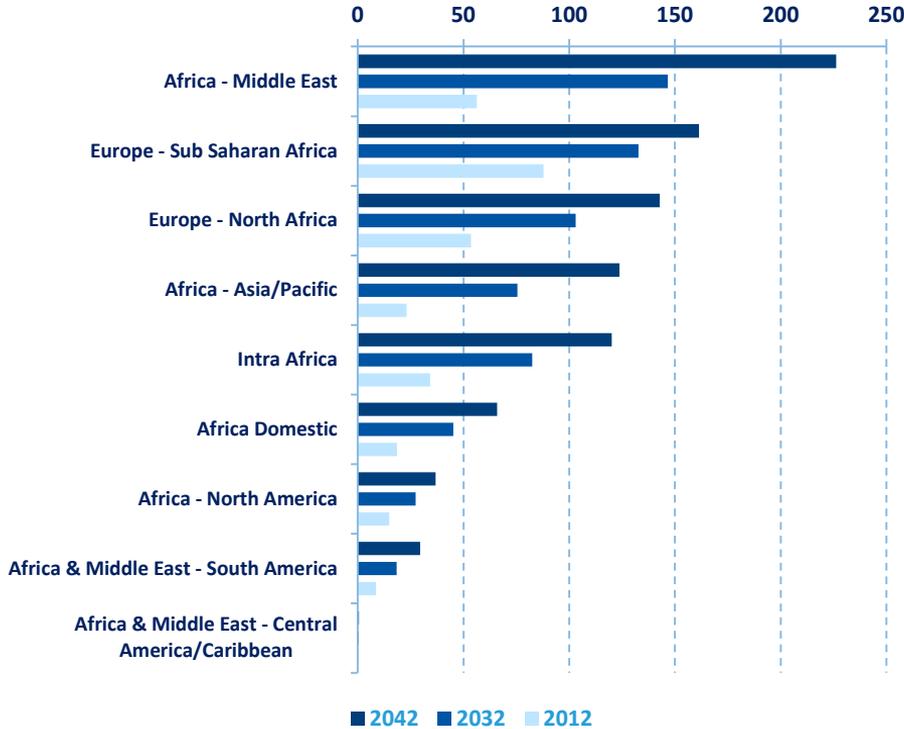
# Results of Long-term Traffic Forecasts



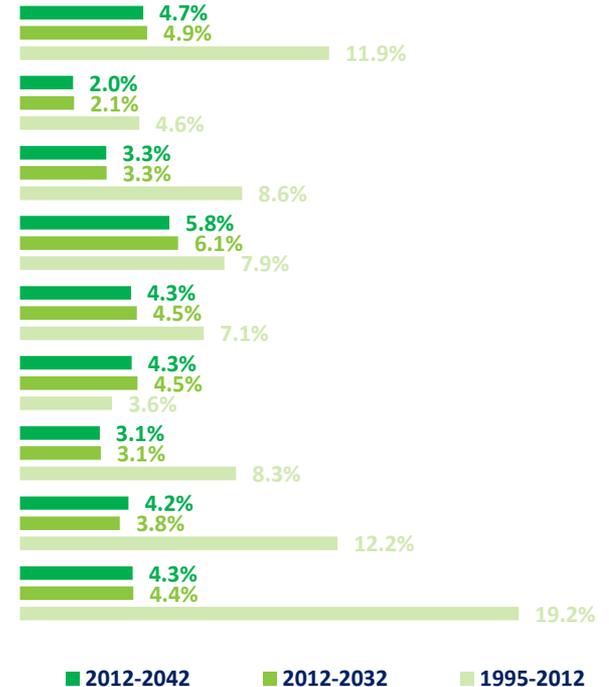




Revenue Passenger-Kilometres (RPK) (billion)

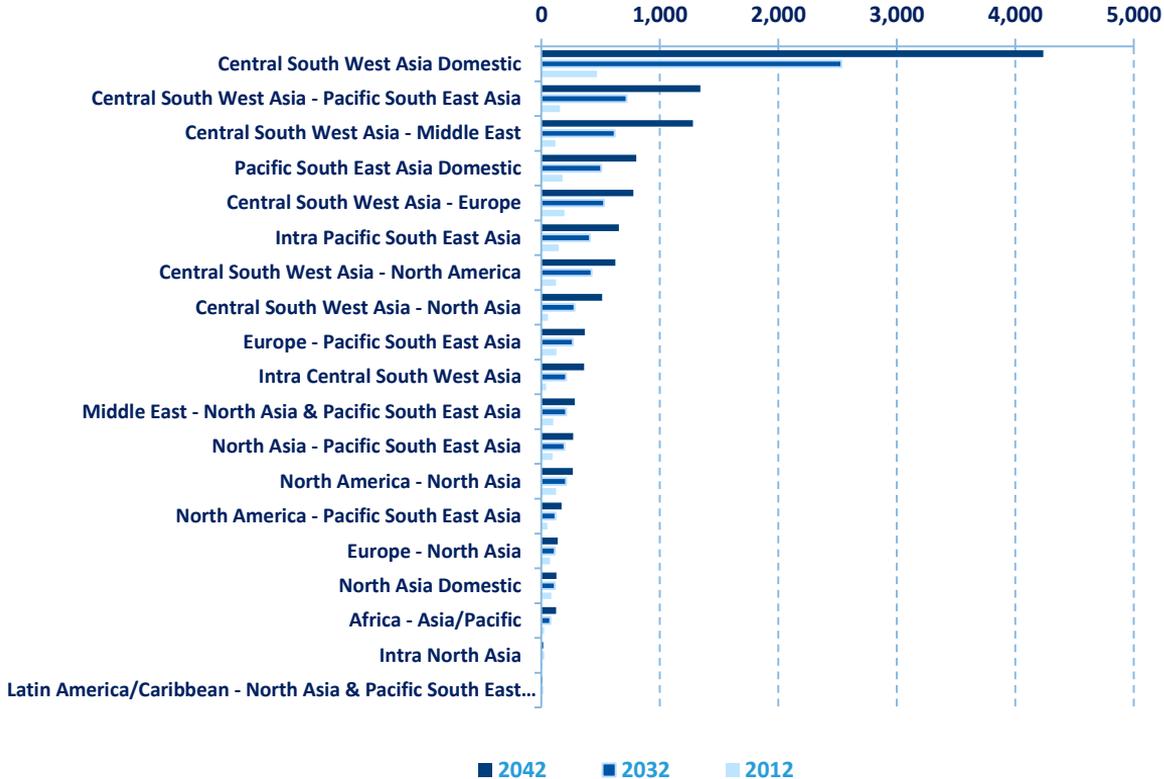


CAGR\*

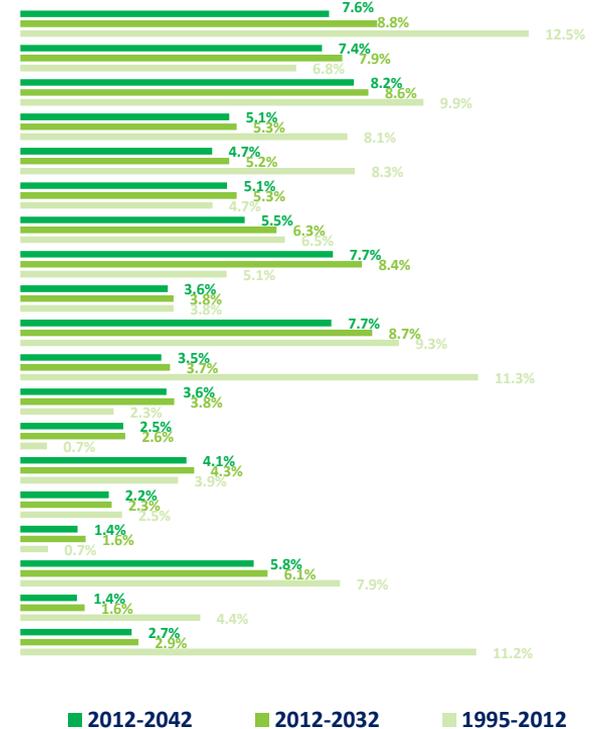


\*CAGR: Compound Annual Growth Rate

Revenue Passenger-Kilometres (RPK) (billion)



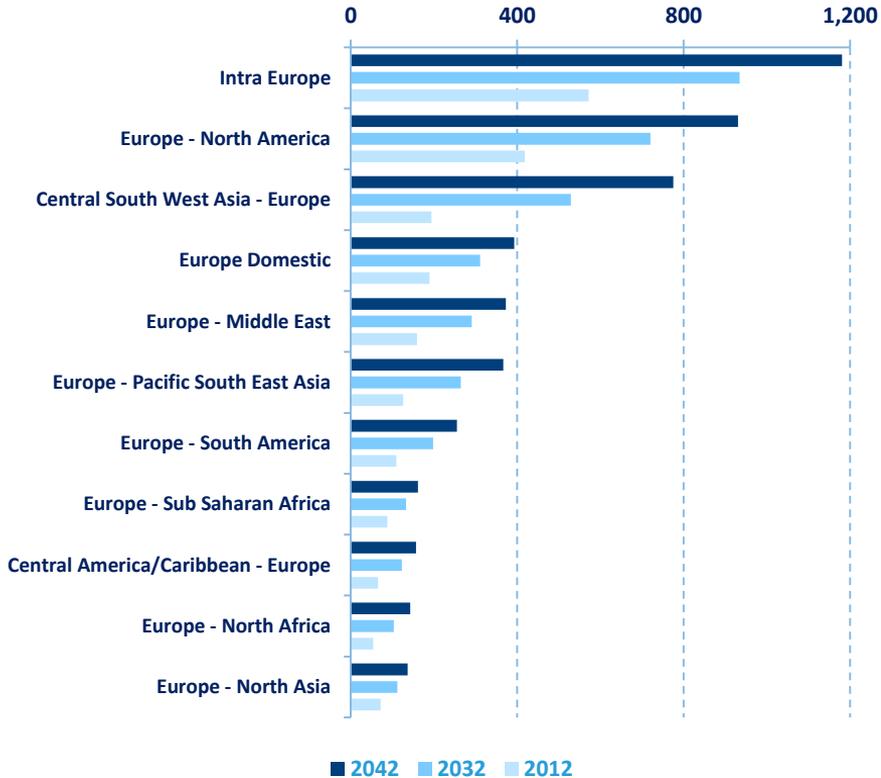
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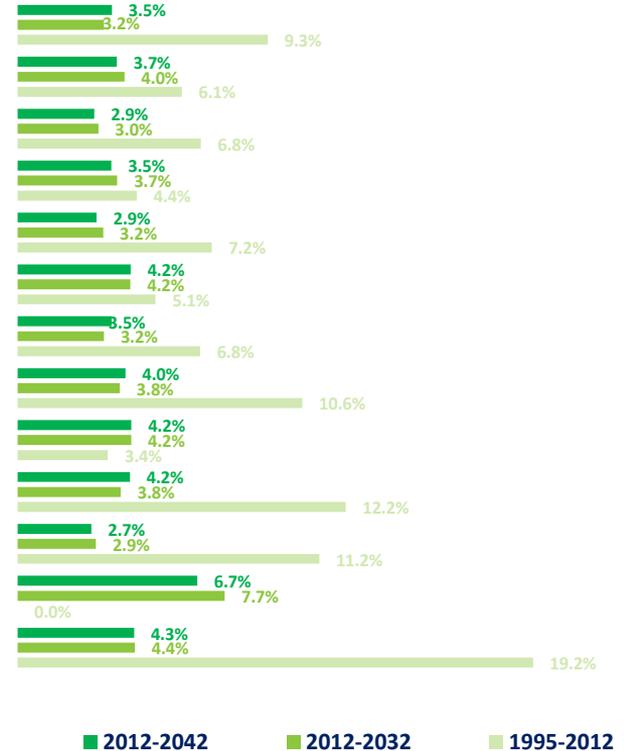
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Revenue Passenger-Kilometres (RPK) (billion)



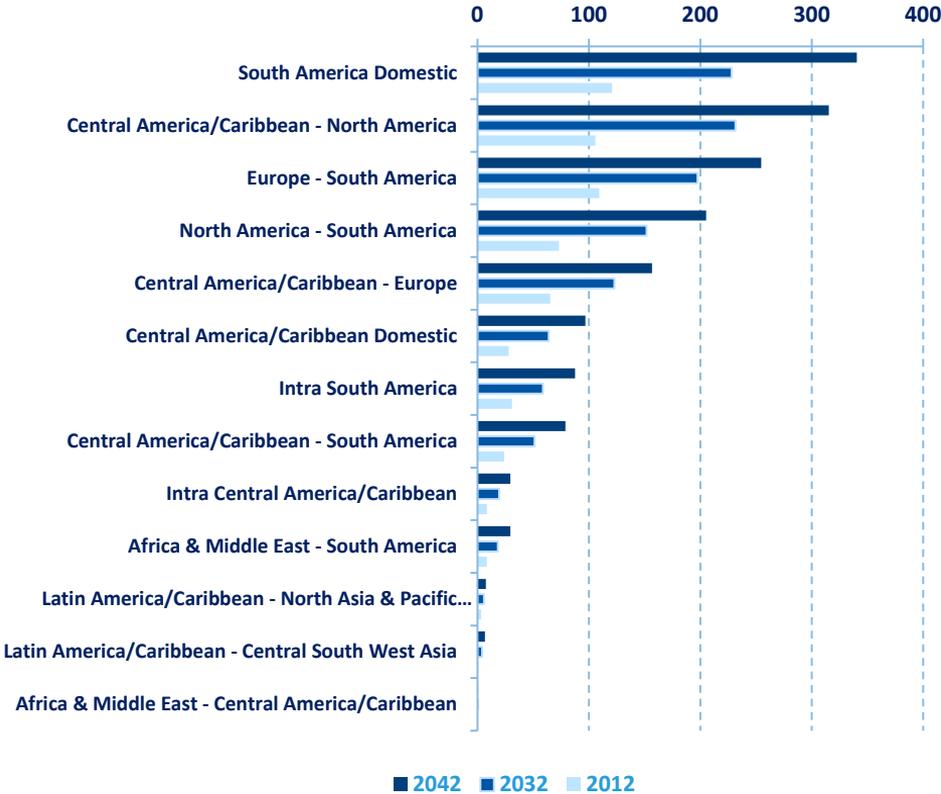
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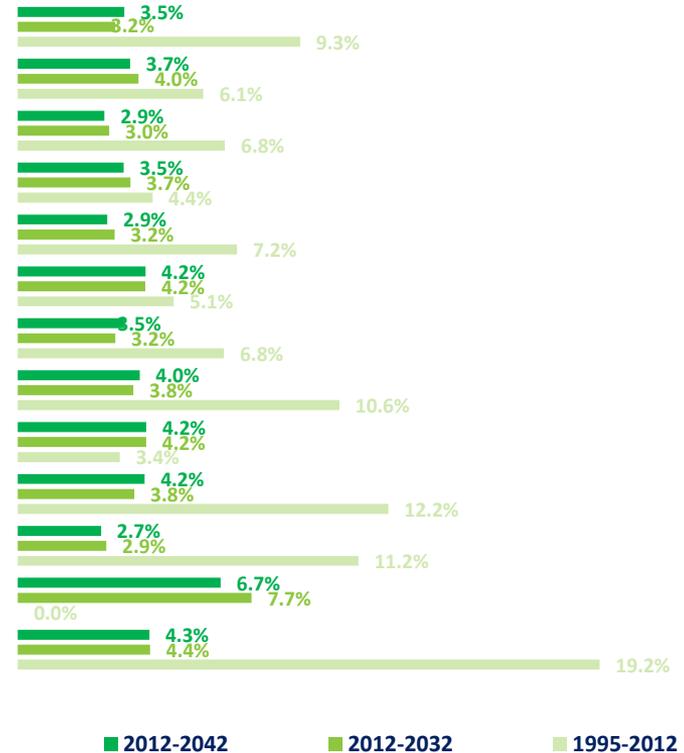
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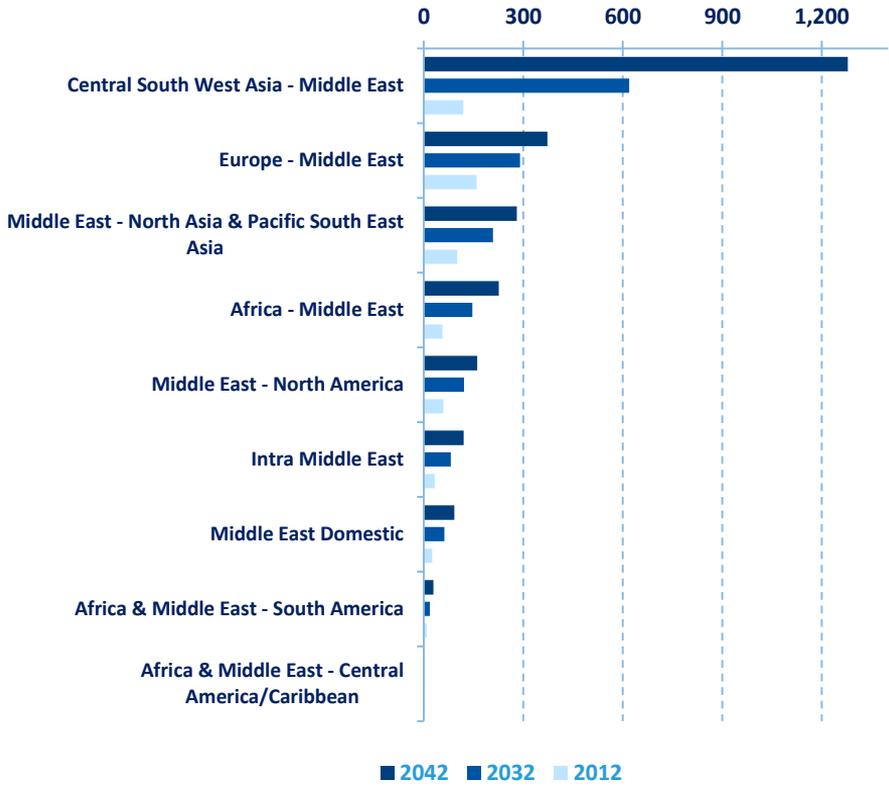


CAGR\*

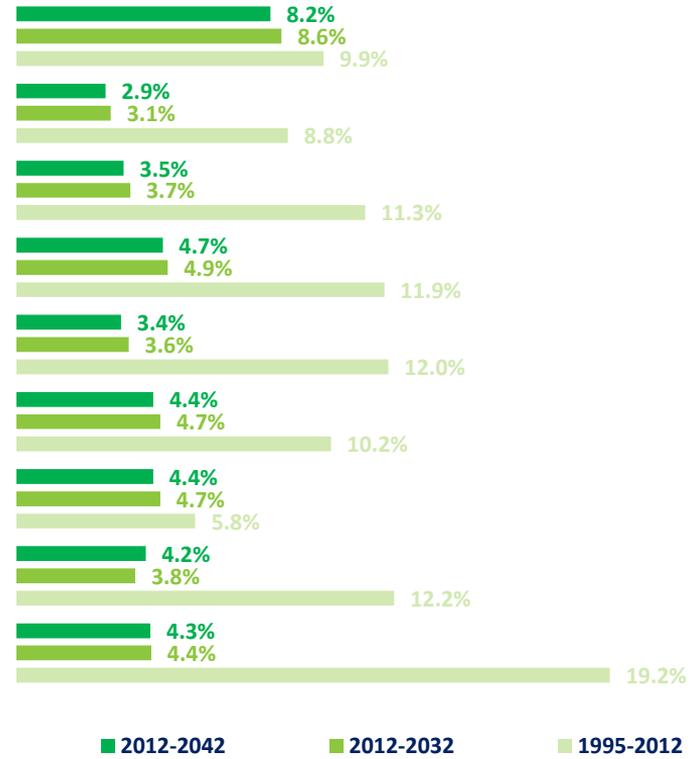


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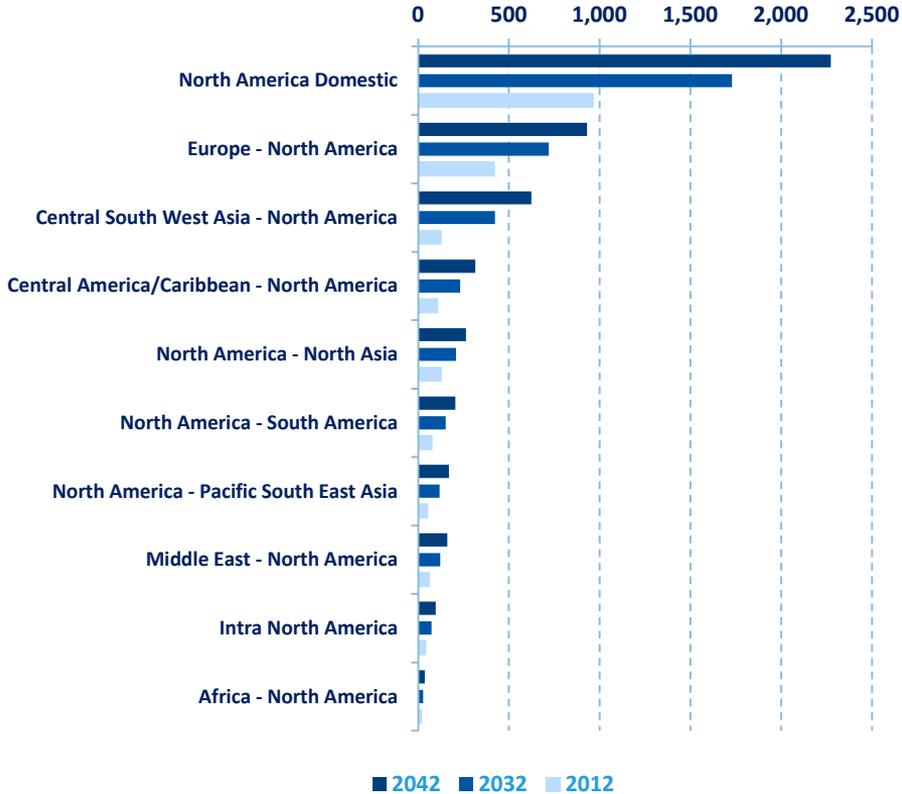
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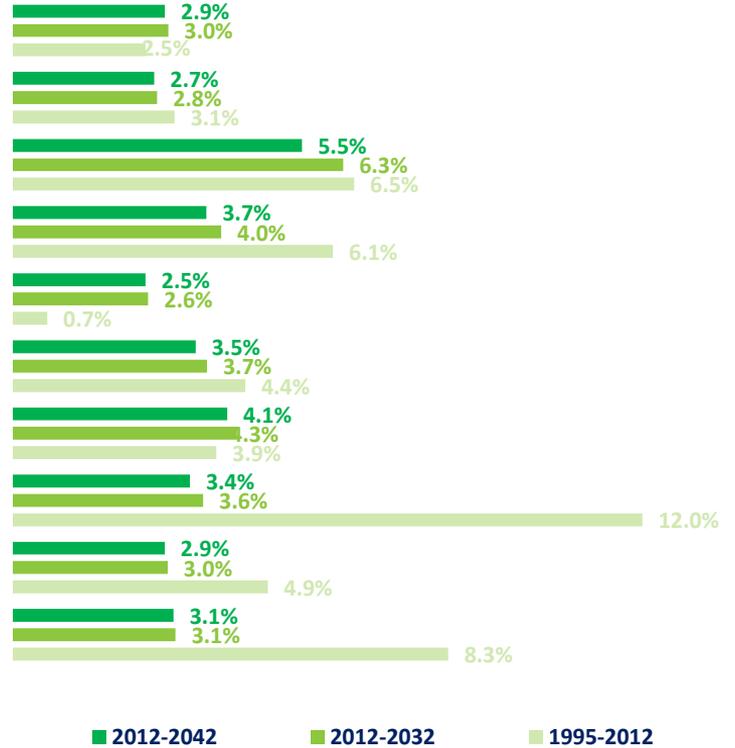
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Revenue Passenger-Kilometres (RPK) (billion)



CAGR\*



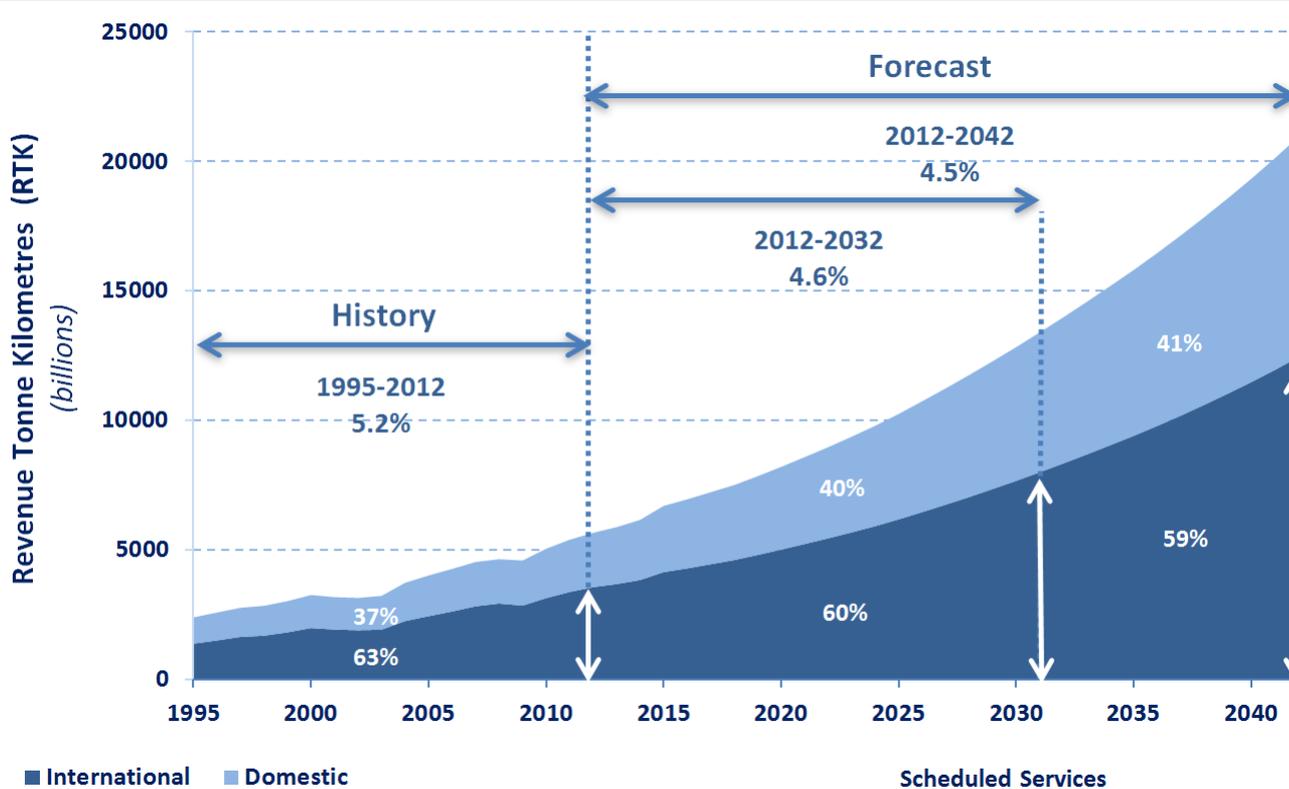
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### Summary of Total Cargo Traffic Forecasts by Region of Airline Registration

*(Scheduled Services)*

*Cargo traffic results in terms of FTKs*

Region	Flight Stage	CAGR*		
		2012-2022	2012-2032	2012-2042
<b>Europe</b>	<b>Total</b>	<b>2.9%</b>	<b>2.6%</b>	<b>2.4%</b>
	International	2.9%	2.6%	2.4%
	Domestic	0.2%	0.8%	1.0%
<b>Africa</b>	<b>Total</b>	<b>1.6%</b>	<b>2.1%</b>	<b>2.2%</b>
	International	1.6%	2.1%	2.2%
	Domestic	0.3%	0.1%	0.1%
<b>Middle East</b>	<b>Total</b>	<b>6.6%</b>	<b>7.1%</b>	<b>6.9%</b>
	International	6.6%	7.1%	6.9%
	Domestic	1.4%	0.7%	0.5%
<b>Asia and Pacific</b>	<b>Total</b>	<b>5.7%</b>	<b>5.1%</b>	<b>4.7%</b>
	International	5.2%	4.7%	4.3%
	Domestic	8.7%	7.8%	7.0%
<b>North America</b>	<b>Total</b>	<b>2.7%</b>	<b>2.5%</b>	<b>2.6%</b>
	International	3.7%	3.5%	3.4%
	Domestic	0.8%	0.7%	0.6%
<b>Latin America and the Caribbean</b>	<b>Total</b>	<b>3.1%</b>	<b>2.9%</b>	<b>2.8%</b>
	International	3.4%	3.1%	3.0%
	Domestic	2.0%	1.7%	1.6%
<b>WORLD</b>	<b>Total scheduled</b>	<b>4.4%</b>	<b>4.3%</b>	<b>4.2%</b>
	<b>International</b>	<b>4.5%</b>	<b>4.4%</b>	<b>4.2%</b>
	<b>Domestic</b>	<b>3.9%</b>	<b>4.0%</b>	<b>4.0%</b>





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# Forecasts for Aviation Planning



## Use of traffic forecasts

### Air navigation systems planning

Aircraft movements

### Airport planning

Aircraft movements

Airport passengers

Licensed personnel

### Airline planning

Planning of routes and services

Fleet planning

Estimation of airline's market share

- Forecasts can be used as the base to produce customized or more detailed forecasts for various purposes, such as air navigation systems planning and environmental analysis.
- Forecasts can also serve as an input to environment for critical tasks such as trend analysis, assessment and development of fleet forecasts.

## □ Estimates of Aircraft Movements

- Passenger forecasts are converted into aircraft movements taking into account fleet mix and average load factors
- forecasts of aircraft movements in a particular route group can be derived from forecasts of passengers, and assumptions about future trends in load factors and average aircraft size. The link between these variables is given by:

$$\text{Aircraft Movement} = \frac{\text{Passenger numbers forecasts}}{\text{Load factor} * \text{Aircraft size}}$$

where:

$$\text{Load factor} = \frac{\text{Number of passengers carried}}{\text{Total seats offered}}$$

$$\text{Aircraft size} = \frac{\text{Total seats offered}}{\text{total number of aircraft}}$$



## ❑ Estimates of Aircraft Movements

## ❑ Airport Passengers

- break down passenger forecasts into passengers using the arrival and departure facilities (e.g. check-in, baggage collection, customs and immigration) and passengers using transfer or transit facilities (e.g. cafeterias and transit lounges)
- The factors that influence the number of originating/terminating passengers at an airport will differ from those affecting the number of direct transit and transfer passengers
- Analyze passenger forecasts by traffic category



## □ Planning of routes and services

- Total market outlook for domestic and international markets estimated in LTF forecasts
- Internationally, the traffic rights granted by governments in bilateral agreements provide the basis for the operation of an airline's scheduled route system, the expansion of operations and the serving of new routes
- Traffic coming from, or destined for, other points should be taken into account as part of demand for traffic between two airports
- Competition between carriers or airline alliances is one of the most important elements in route and service planning

- ❑ **Fleet planning can be described as the act of determining future fleet requirements and the timing of aircraft acquisitions**
- ❑ Three approaches are commonly used in airline fleet planning efforts. They can be categorized as the **macro-evaluation method**, the **schedule-evaluation method** and the **aircraft-assignment method**

- ❑ **Macro-evaluation method :**

The macro-evaluation method is a multi-year system analysis wherein the number of various types of aircraft required is determined based on a macro-traffic forecast. There are several steps in the macro-evaluation method:

- a) Forecast aggregate passenger/freight traffic.
- b) Convert traffic forecast to a capacity forecast based on load factor assumptions.
- c) Project the capacity available from the current fleet.
- d) Calculate the additional requirements for growth and replacement, considering the fleet mix, aircraft productivity and system characteristics.



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# Future Work in Aviation Forecasts





## Future work in aviation forecasts

- Develop an electronic interface allowing States and other users to generate customized forecasts at different levels of granularity (for example, by route, by country-pair, by State of departure, by airport);
- Customize forecast results/data required for the Environment to develop its fleet forecasts, trends and assessment activities;
- Customize forecast results/data required for air navigation service planning and assessment activities at a global and regional level; and
- Updated global and regional twenty year forecasts for pilots, maintenance personnel and air traffic controllers (DOC 9956) in April 2018 to meet the needs of the ICAO Next Generation Aviation Professional (NGAP) programme.



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## The Future of Air Transport

Forecasting Tool Coming Soon.

### Historical Data Sets

Comprehensive granular data set consisting of 20 years of air traffic's demand, capacity, frequencies and load factors.

### Passenger Data

- 50 pre-defined route groups
- Customized route groups and queries

### Cargo Data

- 6 pre-defined traffic regions
- Customized route groups and queries
- Broken down by belly and dedicated cargo

### Forecasts

Up to 30 years forecasts of air traffic demand, capacity, frequencies, load factors and more!

### Passenger Forecasts

- 50 pre-defined route groups
- Customized route groups and queries

### Cargo Traffic Data

- 6 pre-defined traffic regions
- Customized route groups and queries

For more information on ECD please visit:  
<http://www.icao.int/sustainability>

Or contact us via:  
[ecd@icao.int](mailto:ecd@icao.int)



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# SmartSky business evolution

## Products

### Data:

- Country, airline, airport traffic
- City-pair traffic
- Forecasts
- ...

### Tools:

- Forecasting tool
- Air Connectivity Analysis
- WASA
- Aero Tariffs
- ...

Publications/Reports, etc...

## Platform

### Single online platform

- Data solutions
- Data tools
- Data intelligence
- Report
- ...

### Integrate user management

- One key login
- Update/upload data online

### Organization profile

- Post news/business opportunities
- Comments
- Sponsorships



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