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REGIONAL AIRPORTS, TERRITORIAL CONNECTIVITY, AND GEOPOLITICAL ASYMMETRIES: A CONCEPTUAL FRAMEWORK

AEROPORTOS REGIONAIS, CONECTIVIDADE TERRITORIAL E ASSIMETRIAS GEOPOLÍTICAS: UM QUADRO CONCEITUAL

AEROPUERTOS REGIONALES, CONECTIVIDAD TERRITORIAL Y ASIMETRÍAS GEOPOLÍTICAS: UN MARCO CONCEPTUAL

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Alexandre Pinchemel[1], Mauro Caetano[2]

ABSTRACT

Regional airports play a fundamental role in territorial connectivity by linking peripheral and less accessible regions to national and international air transport networks. However, the literature lacks a consistent definition of regional airports, limiting comparative analyses and a broader understanding of their geographical and socioeconomic roles. This study conducts a semi-systematic review of 379 studies on regional, small, or secondary airports to trace the literature's evolution and identify key conceptual and thematic approaches. Only 14 studies provide explicit definitions, revealing substantial conceptual fragmentation across geographical, operational, functional, and traffic-related criteria. In response, the study proposes an integrative conceptual framework that considers these dimensions and supports a more consistent classification of regional airports across different territorial contexts. By clarifying the concept, the framework provides a foundation for future comparative research on the spatial distribution of airport infrastructure, regional accessibility, territorial connectivity, and air transport's contribution to regional development.

Keywords: Air Transportation. Airport Definition. Regional Aviation. Semi-systematic Literature Review.

RESUMO

Os aeroportos regionais desempenham um papel fundamental na conectividade territorial, ligando regiões periféricas e de difícil acesso às redes de transporte aéreo nacionais e internacionais. No entanto, a literatura carece de uma definição consistente de aeroportos regionais, o que limita análises comparativas e uma compreensão mais ampla de seus papéis geográficos e socioeconômicos. Este estudo realiza uma revisão semi-sistemática de 379 estudos sobre aeroportos regionais, de pequeno porte ou secundários, com o objetivo de traçar a evolução da literatura e identificar as principais abordagens conceituais e temáticas. Apenas 14 estudos fornecem definições explícitas, revelando uma fragmentação conceitual substancial entre critérios geográficos, operacionais, funcionais e relacionados ao

[1] PhD Candidate in Aeronautics Infrastructure Engineering at the Aeronautics Institute of Technology (ITA). E-mail: alexandreintl@hotmail.com. Orcid: https://orcid.org/0000-0003-1707-2871

[2] Postdoc in Sustainable Aviation from KTH Royal Institute of Technology - Sweden. Postdoc in Air Transport from Aeronautics Institute of Technology (ITA). PhD in Production Engineering from the University of São Paulo (USP). Professor at ITA, Brazilian Air Force (FAB). E-mail: caetano@ita.br. Orcid: https://orcid.org/0000-0002-5978-1054

tráfego. Em resposta, o estudo propõe uma estrutura conceitual integrativa que considera essas dimensões e apoia uma classificação mais consistente de aeroportos regionais em diferentes contextos territoriais. Ao esclarecer o conceito, a estrutura fornece uma base para futuras pesquisas comparativas sobre a distribuição espacial da infraestrutura aeroportuária, a acessibilidade regional, a conectividade territorial e a contribuição do transporte aéreo para o desenvolvimento regional.

Palavras-chave: Transporte Aéreo. Definição de Aeroporto. Aviação Regional. Revisão Semi-sistemática da Literatura.

RESUMEN
Los aeropuertos regionales desempeñan un papel fundamental en la conectividad territorial al conectar regiones periféricas y menos accesibles con las redes de transporte aéreo nacionales e internacionales. Sin embargo, la literatura carece de una definición consistente de aeropuertos regionales, lo que limita los análisis comparativos y una comprensión más amplia de sus funciones geográficas y socioeconómicas. Este estudio realiza una revisión semisistemática de 379 estudios sobre aeropuertos regionales, pequeños o secundarios para rastrear la evolución de la literatura e identificar enfoques conceptuales y temáticos clave. Solo 14 estudios proporcionan definiciones explícitas, lo que revela una fragmentación conceptual sustancial en función de criterios geográficos, operativos, funcionales y relacionados con el tráfico. En respuesta, el estudio propone un marco conceptual integrador que considera estas dimensiones y respalda una clasificación más consistente de los aeropuertos regionales en diferentes contextos territoriales. Al clarificar el concepto, el marco proporciona una base para futuras investigaciones comparativas sobre la distribución espacial de la infraestructura aeroportuaria, la accesibilidad regional, la conectividad territorial y la contribución del transporte aéreo al desarrollo regional.

Palabras clave: Transporte Aéreo. Definición de Aeropuerto. Aviación Regional. Revisión Semisistemática de la Literatura.

1 INTRODUCTION

Airports primarily connect territories at regional, national, and global levels and generate economic benefits for the regions they serve. They serve as essential centers of economic and tourism activity, fostering local economic development linked to regional business growth across scales (Resende et al., 2026; Novák et al., 2024). Among airport configurations in the literature, regional airports stand out for serving communities further from major metropolitan centers, offering a variety of destinations and travel options that are often shorter and, in some cases, more comfortable than those provided by larger facilities (Dobruszkes et al., 2017). While major hub airports receive the largest share of passenger traffic, demand for air travel at regional airports can be constrained by bottlenecks stemming from underutilization, which create accessibility issues (Bergantino et al., 2020; Iyer and Thomas, 2021) and often render these routes financially unviable for airlines due to factors such as population density, connectivity, and other variables that influence profitability and revenue (Thomas and Jha, 2024; Pauwels et al., 2024; Pot and Koster, 2022).

Regional airports face many challenges, and although scholars value them, they are not universally recognized across airport samples. This can hinder research on data comparability, as varying criteria and terminology can compromise the ability to compare results (Resende and Caetano, 2026). As a result, it becomes difficult to test, refute, or refine rigorous theoretical propositions and to consolidate this expanding field of research. This also creates a practical drawback for public policy and regulation: the government may not meet the criteria for a subsidy program aimed at regional airports if it relies on the various definitions found in the literature.

Few efforts have developed a single definition of regional airports. Most existing studies are limited to isolated case studies or analyses in which authors use the term "regional airport" without an explicit definition, or they develop their own definition without engaging with the literature. Because classification criteria differ across countries and sources, this practice reinforces the conceptual inconsistency this study addresses. Accordingly, this study has two objectives. First, to conduct a semi-systematic review of the literature to understand the extent of interest in regional airports and their main areas of focus, and second, given the fragmentation of the literature regarding the definition of a regional airport, to establish a consistent conceptual definition that integrates insights from multiple empirical studies on regional airports.

2 METHODOLOGY

This analysis adopts a semi-systematic (or narrative) review approach focused on regional airports. While this method does not require the rigorous protocol of a systematic review, the study used a systematic and transparent process to search, select, analyze, and group patterns around a common theme, then synthesize insights into meta-narratives. Rather than aiming to cover everything written, it maps how research on regional airports has developed over time in a selected field and proposes a broad conceptual definition of the term.

The semi-systematic review assumes that the field is heterogeneous because the literature uses different terms for the same object of study (Snyder, 2019). Accordingly, the search string was expanded beyond "regional airport" to include "secondary airport" and "small airport." In defining regional airports based on the literature, the review prioritizes each publication's utility—specifically, whether it defines regional airports and distinguishes them from other types, such as large airports. Following Snyder's (2019) guidance, the review transparently documents all procedures.

The Scopus database was selected because it is a multi-publisher index covering more than 7,000 publishers and including numerous well-established air transport journals. It also supports simultaneous searches of article titles, abstracts, and keyword lists for previously selected terms, unlike other online databases, which search only the article title. The identification criteria involved searching for the keywords "regional airport," "small airport," or "secondary airport" in the article title, abstract, or keywords, restricted to the subject areas of Social Sciences; Business, Management and Accounting; Engineering; and Economics, Econometrics and Finance. Eligible records were further limited to English-language journal articles published from 2007 to 2025.

3 FINDINGS

Table 1 presents the evolution of the use of the term “regional airport” in scientific research from 2007 to 2025. A total of 379 articles were identified across various journals. The years 2022 and 2025 saw the highest publication volumes, with 36 articles each. Between 2007 and 2018, the average was 13.8 articles per year, rising to 30.4 per year in the subsequent period. An interesting aspect of these findings is the growth breakdown by journal. This reveals that leading journals in the air transport and airport sectors (such as the Journal of Air Transport Management, Transportation Research Record, Journal of Transport

Geography, and Transportation Research Part A) maintained stable output levels over the years. However, the share of the all-other category rose from 67% in 2007–2018 to 79% in 2019–2025.

Table 1

Range of articles from the search

Journal	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Journal of Air Transport Management		1	1	5	2	2	2	2	2	3	3	4	5	3	5	3	3	2	3	51
Transportation Research Record	1		1	1	2	1				1	1	1	2		1	3	1	3		19
Journal of Transport Geography	1			1	4		4		1	1				3		1		1		17
Journal of Airport Management												1	1	3				4	4	13
Transportation Research Part A: Policy and Practice							1	1			2	2	2	1					2	11
Research in Transportation Business and Management					1	3				3				1		1	1		1	11
Transport Policy						1		1		1			3			1	1			8
Case Studies on Transport Policy										1				1	1	2			1	6
Transportation Research Part E: Logistics and Transportation Review		1	1				1	1		1		1								6
Research in Transportation Economics		1		1							1			2	1					6
Aerospace											1			1		1	2		1	6
International Journal of Transport Economics		1				2							1		1					5
Tourism Management		1	1	1	1															4
International Journal of Sustainable Development and Planning				4																4
Others	3	4	4	6	5	6	5	9	10	10	6	11	18	11	23	24	11	22	24	212
Total per year	5	9	8	19	15	15	13	14	13	21	14	20	32	26	32	36	19	32	36	379

Source: research data

The term “regional airport” does not stem from a concentration of research on the topic in specialized journals but from its growing presence across journals in other fields. A significant share of these dispersed studies falls under the “Technology/Operations” or “Out of Scope” classifications shown in Table 2, covering topics such as sensing, drones, energy, pavement engineering, and AI applied to traffic control. In these studies, the term “regional airport” appears either as a unit of analysis or in a relational context, without discussing or characterizing the concept itself.

Table 2

Frequency of the field of study

Broad field of study	Frequency
Technology/Operations	14%
Business model	13,2%
Traffic demand	12,4%
Performance/efficiency	11,3%
Location	9%
Economic effects	8,7%
Airline	8,2%
Infrastructure	7,1%
Environment	6,6%
Out of Scope	5,5%
Regulatory	4%
Total	100%

Source: research data

These sub-areas involve:

- **Traffic demand:** includes factors influencing demand growth and networks
- **Performance/efficiency**: assesses the efficiency and profitability of regional airports
- **Airline**: the influence of airlines and cases of Low-Cost Carriers (LCCs)
- **Infrastructure**: both physical infrastructure and slot allocation and preparation for urban air mobility
- **Business model**: business model and commercial strategies; regional cooperation
- **Location issues**: considered neighboring relationships, accessibility, connectivity, and catchment area analysis
- **Economic effects**: economic changes and regional development, including discussions on subsidies.
- **Regulatory**: deregulation issues, public policy principles, government-sponsored reviews
- **Technology/Operations**: context of a technology application
- **Environment**: noise and emissions reductions
- **Out of scope** – no analysis of the airport itself.

Table 2 presented the sub-areas in which the term “regional airport” appeared. Ten broad areas were selected, along with a sub-area labeled “Out of Scope,” comprising articles that did not analyze airports themselves but appeared in the search results through citations or examples. Of the 379 selected articles, only those that explained or defined regional airports were retained, resulting in a final set of 53 articles. These articles focused on regional

airports and discussed them in some capacity, presenting characteristics of their operations and geographical locations.

This observation in Table 2 motivates the present study. The term is increasingly used beyond its field of origin—air transport and airport management—as different disciplines adopt their own interpretations without engaging with one another. The semi-systematic review shows that studies using the term “regional airport” do not necessarily refer to the same airport category or assume similar roles and characteristics. Table 2 also presents the sub-areas in which the term “regional airport” appeared. Ten broad areas were selected, along with an “Out of Scope” sub-area for articles that did not analyze airports themselves but appeared in the search results through citations or examples. Of the 379 selected articles, only those that explained or defined regional airports were retained, resulting in a final set of 53 articles. These articles focused on regional airports and discussed them in some capacity, describing their operational and geographical characteristics.

The search for a definition of regional airports stems from the literature consulted, precisely because the term lacks consensus. Most articles in the collection treat “regional” relationally, without providing their own cutoff criterion. Jimenez and Suau-Sanchez (2020) propose three airport types. Primary airports are major hubs located within a multi-airport system (MAS) or in large urban centers. Secondary airports carry significant commercial traffic within a MAS but are not the largest; they lie in the shadow of a nearby larger airport and have a strong presence of low-cost carriers (LCCs) (Dennis, 2007; Dobruszkes et al., 2017). Regional airports, in turn, are situated around metropolitan areas and on the peripheries of large cities and are characterized by low passenger throughput. Often, they are the only link that can break through economic and social isolation, enabling national integration (Donehue and Baker, 2012; Adler et al., 2013).

Regional airports do not always meet economic criteria, as many are former military facilities repurposed for civilian use, including in Germany (Breidenbach, 2020), Australia (Khanjanasthiti et al., 2025), and England (Budd et al., 2024). Despite the financial challenges of sustaining operations, these airports are maintained for strategic reasons: to create economic opportunities and improve access for communities (Postorino and Praticò, 2012). Baker et al. (2015) also describe a bidirectional causal relationship between regional air transport and economic growth, in which each supports the other through increased infrastructure investment, local business development, and market expansion.

In contrast, Pot and Koster (2022) argue that economic growth benefits regional airports, rather than the reverse. Most regional airports are publicly financed, owned, and supported by local governments (Große et al., 2021; Wu et al., 2023; Pot and Koster, 2022), and depend on national subsidies and incentives to sustain operations. To address demand issues, they seek to attract low-cost carriers (LCCs) by offering lower airport charges (Iyer and Thomas, 2021; Thomas and Jha, 2024). Low passenger demand can increase the prices needed to cover facility costs (Adler et al., 2013), so these airports rely on subsidies (Dziedzic and Warnock-Smith, 2016) and commercial agreements with airlines to maintain services.

LCCs increasingly operate at regional airports, though they do not operate exclusively there. While LCCs focus on major European cities, they also use regional and secondary airports as alternatives within large cities or within Multi-Airport Systems (MAS) (Dobruszkes, 2013; Dobruszkes et al., 2017), that is, airports sharing the same catchment area. Most regional airports in Germany serve LCCs, and all are non-hub airports with low annual passenger throughput (Borbely, 2019). Despite limited infrastructure, LCCs adapt to meet their needs; in doing so, they address slot availability and traffic congestion, reducing costs associated with flight delays (Tapiador et al., 2008). By contrast, secondary airports have an advantage over regional airports in passenger air traffic because of their proximity to metro stations, which benefits low-cost services at these locations (Minato and Morimoto, 2011). The more LCCs operate, the more efficient a regional or secondary airport becomes (Button et al., 2018).

By operating efficiently, regional airports can become strategic hubs that capture market potential and improve financial performance (Giovanelli et al., 2024). They typically face low commercial demand, while sparse and irregular air traffic creates instability. This poses a challenge for Japanese regional airports, which must develop both aeronautical and non-aeronautical revenue streams to achieve commercial viability (Minato and Morimoto, 2011). Although these airports handle less traffic and are often located in peripheral areas, they are not necessarily far from major hubs. They also serve commercial and general aviation, including flight schools (Nõmmik and Antov, 2020). In Norway, regional airports have relatively small catchment areas and face competition from lower airfares at major airports, which can lead to passenger traffic leakage as travelers choose major hubs instead (Lian and Rønnevik, 2011). Even so, in some places regional airports are often the sole or primary means of tourist access to islands (Button et al., 2018; Karagkouni and Dimitriou, 2022), such as Crete in Greece and Fernando de Noronha in Brazil.

In the international systems reviewed, airports are classified primarily by passenger volume. In India, non-hub regional airports are typically located in areas with distinctive terrain and geography, handle up to 3 million passengers annually, and are often near cities (Iyer and Thomas, 2021; Thomas and Jha, 2022). Pauwels et al. (2024) define a “regional airport” as one that handles fewer than 10 million WLUs (Work Load Units) and operates point-to-point, short- to medium-haul flights. In Europe and China, classification is based almost entirely on quantitative criteria. Xiang et al. (2023) define Chinese regional airports as those with annual passenger throughput below 2 million that serve short-haul aircraft. European studies (Pot and Koster, 2022; Giovanelli et al., 2024) often use the European Commission's (2005) classification, which defines large airports as handling over 5 million passengers annually, medium airports as serving between 1 and 5 million, and small airports as accommodating fewer than 1 million. Medium and small airports are considered regional airports.

This contrasts with the United Kingdom, where passenger-volume rankings play little role. Regional airports are informally defined as those outside South East England, home to the country’s major hubs: Heathrow, Gatwick, Stansted, Luton, and London City. With far less direct connectivity than these hubs, regional airports tend to depend on them for access to global networks (Suau-Sanchez et al., 2016; Budd et al., 2024). However, this definition seems simplistic because it groups large facilities such as Birmingham and Manchester Airports with smaller airports. By contrast, the Federal Aviation Administration (FAA) classifies regional airports by the demographics of the areas they serve rather than passenger volume, typically locating them in metropolitan areas with urban populations exceeding 50,000 or micropolitan areas with urban populations between 10,000 and 50,000.

In Annex 14, ICAO (2018) classifies airports according to the number of movements per runway during peak hours. Under this classification, aerodrome traffic density is light (fewer than 15 movements per runway), medium (16 to 25 movements per runway or 20 to 35 movements across the aerodrome), or heavy (more than 26 movements per runway or more than 35 movements across the aerodrome). However, this classification can be misleading, especially in popular tourist destinations where air traffic fluctuates seasonally. In Brazil, the national regulatory agency, ANAC (2026), defines regional airports as those intended to serve regions of state interest and connect them to major centers, without setting a quantitative threshold. To prevent passenger numbers from overshadowing operational context, Khanjanasthiti et al. (2025) avoided quantitative metrics when defining regional

airports. Instead, they classified Australian airports using a combination of governance and passenger profiles, location, and network function.

Similarly, regional airports are characterized by simpler infrastructure and restrictions on the types of aircraft they can accommodate. In Australia, regional airports fall under the Regional, Rural and Remote (RRR) airport classification, serving smaller populations, growing slowly, and spread over large distances, with routes operated by turboprop aircraft (Baker et al., 2015; Donehue and Baker, 2012). In Norway, almost all regional airports offer turboprop service, whereas jet service is offered at the main airports. Regional airports typically operate few regularly scheduled air services, lack a control tower, and cannot accommodate large aircraft landings (Boiral et al., 2019).

4 TOWARDS A DEFINITION OF REGIONAL AIRPORTS

After a more in-depth analysis of the remaining articles from the previous filtering stage, only 14 articles conceptualized "regional airport" in the body of the text, often distinguishing it from other airport types. This stage helped identify how the literature defines regional airports. Table 3 presents the main characteristics found in the authors' definitions.

Table 3

Conceptual definition of regional airports

Acronym	Concept	Sources
LTRF	Low passenger traffic	(Dennis, 2007); (Boiral et al., 2019); (Borbely, 2019); (Adler et al., 2013); (Donehue and Baker, 2012); (Jimenez and Suau-Sanchez, 2020); (Iyer and Thomas, 2021); (Thomas and Jha, 2022); (Thomas and Jha, 2024)
PCOM	Poor connectivity	(Suau-Sanchez et al., 2016); (Breidenbach, 2020); (Thomas and Jha, 2024)
RGLT	Regular transportation	(Donuhuer and Baker, 2012)
LCCS	Used by LCC's	(Dobruszkes et al., 2017); (Borbely, 2019); (Nõmmik and Antov, 2020); (Jimenez and Suau-Sanchez, 2020)
LPOP	Low population density	(Donuhuer and Baker, 2012)
INTL	Offer international routes	(Suau-Sanchez et al., 2016); (Khanjanasthiti et al., 2025)
RMTE	Remote/ not far from major hubs/cities	(Denis, 2007); (Donuhuer and Baker, 2012); (Adler et al., 2013); (Boiral et al., 2019); (Nõmmik and Antov, 2020); (Breidenbach, 2020); (Iyer and Thomas, 2021); (Thomas and Jha, 2022); (Thomas and Jha, 2024); (Pauwels et al., 2024).

Source: the authors

When conceptualizing regional airports, authors consider both demand-side and geographic factors, as shown in Table 3. Overall, regional airports serve as spokes or feeders in the air transport network and typically function as end-point destinations. As they are not

primary airports, they have less market power to attract airlines and provide less connectivity than major hubs. Where connectivity is available, LCCs usually provide it, leaving these airports with few options for regularly scheduled service, especially on international routes. Regional airports also tend to be farther from metropolitan areas or located in less densely populated secondary cities, which is associated with lower passenger throughput.

Building on these insights, this study brings together key ideas from the literature to develop a globally comprehensive concept of regional airports. Rather than focusing on a single dimension or relying on a fixed passenger-volume threshold or absolute distance cutoff, it defines regional airports as those that provide commercial flights connecting communities to national and international markets, have passenger volumes and connectivity levels well below those of major hub airports, and serve an independent catchment area. Accordingly, a regional airport is not interchangeable within a larger city's multi-airport system and does not compete directly with other airports in that system.

5 CONCLUSION

Despite differences in geographic contexts, regulatory environments, and economic conditions, this definition aims to encompass most studies of regional airports. However, it has several limitations. First, because the search was restricted to the terms "regional airport," "small airport," and "secondary airport," it may have missed other terminology used across the extensive literature on regional airports. Second, the proposed concept depends on the presence of a major hub airport, which varies across national contexts and regulatory frameworks. Third, the definition only partly accounts for airports with overlapping functions—those that serve as reliever airports while maintaining independent catchment areas—and this warrants further empirical investigation.

Considering these limitations, the proposed concept, developed by cataloging 379 articles in a semi-systematic review, appears applicable to most studies and their subareas. The study's theoretical contribution—defining regional airports—can help group airports within the same category for benchmarking and support comparisons across the literature. Regional airports are politically and socially significant to their communities. Their future remains uncertain, but they may become strategic hubs for Urban Air Mobility (UAM) operations, including eVTOL aircraft, whose market introduction is imminent.

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