



Data Article

Case study on city-airports: Datasets and calculation models



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ARTICLE INFO

Article history:

Received 18 November 2020

Revised 18 January 2021

Accepted 20 January 2021

Available online 30 January 2021

Keywords:

Airport planning

City-airport planning

Transport system analysis

Network Analysis

S.W.O.T. Analysis

ABSTRACT

Data have been collected over time, belonging the 2018th and 2019th, from airports owners, from stakeholders, from universities, from the net, and performing under GIS evaluation processes. Most of the collected data are geographic, economic, and financial statements of the different ownerships, maps about the airport and urban planning, and data about carriers and routes. Specifically, the GIS has been useful to the Network Analysis evaluations. The analysis results can be collected and used in the most comprehensive analysis of similar systems. The results summarize data about four different couples of small remote airports in the EU and their specific network systems [1–4]. Therefore, the ongoing analysis wait to be extended to other similar systems.

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DOI of original article: [10.1016/j.jairtraman.2020.101977](https://doi.org/10.1016/j.jairtraman.2020.101977)

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Social media:  (A. Massaro)<https://doi.org/10.1016/j.dib.2021.106789>

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Specifications Table

Subject	Management, Monitoring, Policy, and Law
Specific subject area	Notably, it analyzes airport management, planning systems, monitoring of resources' capability, policy on the various stakeholders, and related laws.
Type of data	Table Image Graph Figure
Acquiring Data Methodology	The data comes from searching on the net, using a notebook, or through a pen drive transferring, either using Windows Software or Google Applications.
Data format	Raw
Parameters for data collection	The data collection follows the scheme described in the <i>Experimental Design, Materials, and Methods</i> paragraph, using GIS software to evaluate the data. The set follows a complete acquisition of data on the matters of the ongoing search.
Description of data collection	The data collection follows the scheme described in the <i>Experimental Design, Materials, and Methods</i> paragraph, using GIS software to evaluate the data. The data acquisition follows effective utilization. Moreover, they come from relationships with some of the different stakeholders and universities.
Data source location	Institution: University of Parma City/Town/Region: Parma/PR/Emilia Romagna, Italy 44°45'55.8"N 10°18'30.4"E
Data accessibility	With the article: <i>Comparing proximity for couples of close airports. Case studies on city-airports in the pre COVID-19 era</i> , <i>Journal of Air Transport Management</i> , Volume 91, March 2021, 101,977, https://doi.org/10.1016/j.jairtraman.2020.101977

Value of the Data

- These data help discover information and suggestions in different remote parts of the EU, evaluating intersections between airports and city planning systems.
- The data could be useful to Researchers, Students, Professors, Managers, and Shareholders.
- The data lead to an overall evaluation of connections between investments and planning, airports, and cities, improving connectivity, accessibility, and proximity in the transport systems.

1. Data Description

Data collected regards four couples of different airports, their cities, and the relative network system [5–8]. The dataset comes from many internet portals for each analyzed region. Moreover, for two of the four couples, data are obtained directly from the respective owners, belong to various meetings in the ongoing search with Parma University. The GIS has drawn all the maps, all the vectorial files with CAD software, all the tables with Microsoft Excel, and all the Figures with Open Source Applications. For first, managing the multiple datasets by Excel, codified, and linked to the next use with the GIS software. The construction of the different maps (some in the article) regarding the four couples results by scaling various network systems with proper relationships. Directly from the earned analysis of the networks (the following data, kept out by the article, show the work of Norway's couple), it has been possible to summarize the diverse airport-cities results in a final SWOT Analysis.

2. Experimental Design, Materials and Methods

The following procedure describes the utilized methodology to build the different maps, substantially addicted to using the GIS software [9–11].

The data have been collected, transformed, and linked using various codes strictly related to each other following the analysis scheme from multiple sources.

Hålogaland (NO)
Northern Norway – Bodo

3. Multilevel Arc-node Integrated System

3.1. DATABASE calculation model

- **CORE:** AIRPORT (8)
- **NETWORK SYSTEM 1:** ROADWAY + COASTAL SHIPWAY;
- **NETWORK SYSTEM 2:** AIR ROUTE SYSTEM (by Departure Base);
- **FIELDS:**
 - Network 1:
 - Airports;
 - Municipalities;
 - Ports.
 - Network 2:
 - Airports;
 - Airliners.

3.2. CONNECTIONS: relations 1 - M (one to many)

- Fields Descriptors:
 - Airport:
 1. Matching Indicator: AI_01
 2. Name;
 3. ICAO_CODE;
 4. IATA_CODE;
 5. Type of Airport;
 6. Type of Traffic;
 7. PAX 2008 - 2018;
 - 1.1 MAIN AIRPORTS

Matching Indicator: PAIR_01

- a. Tonne;
- b. Passenger by Type: Scheduled/Not Scheduled;
- Municipality:

Matching Indicator: MUN_01

1. Name;
2. Area;
3. Population 2018;
4. County;
5. Density;
6. Net operating surplus as a percentage of gross operating revenues (percent)/ 2015–2018;
7. Annual accumulated surplus/deficit as a percentage of gross operating revenues (percent) / 2015–2018;
8. Working capital excl. pension premium deviation as a percentage of gross operating revenues (percent) / 2015–2018;
9. Net interest rate exposure as a percentage of gross operating revenues (percent) / 2015–2018;
10. Net loan debt as a percentage of gross operating revenues (percent) / 2015–2018;
11. Unrestricted revenues per capita (NOK) / 2015–2018;

12. Free equity operational account (percent) / 2015–2018;
13. Gross investment expenditures as a percentage of gross operating revenues (percent) / 2015–2018;
14. Self-investment financing as a percentage of total gross investment expenditures (percent) / 2015–2018;

1.2 MAIN MUNICIPALITIES

Matching Indicator: PMUN_01

- a. Gross operating expenditure- Amount per Capita (NOK) - Transport companies/transport measures / 2015 - 2018;
- b. Net operating expenditure - Amount per Capita (NOK) - Transport companies/transport measures / 2015 - 2018;
- c. Adjusted gross operating expenditure - Amount per Capita (NOK) - Transport companies/transport measures / 2015 - 2018;
- d. Gross investment expenditures - Amount per Capita (NOK) - Transport companies/transport measures / 2015 - 2018;
- e. Gross operating expenditure- Amount per Capita (NOK) - Municipal industrial activities / 2015 - 2018;
- f. Net operating expenditure - Amount per Capita (NOK) - Municipal industrial activities / 2015 - 2018;
- g. Adjusted gross operating expenditure - Amount per Capita (NOK) - Municipal industrial activities / 2015 - 2018;
- h. Gross investment expenditures - Amount per Capita (NOK) - Municipal industrial activities / 2015 - 2018;
- i. Gross operating expenditure- Amount per Capita (NOK) - Diagnosis, treatment and rehabilitation / 2015 - 2018;
- j. Net operating expenditure - Amount per Capita (NOK) - Diagnosis, treatment and rehabilitation / 2015 - 2018;
- k. Adjusted gross operating expenditure - Amount per Capita (NOK) - Diagnosis, treatment and rehabilitation / 2015 - 2018;
- l. Gross investment expenditures - Amount per Capita (NOK) - Diagnosis, treatment and rehabilitation / 2015 - 2018;
- m. Building Work Started 2017/18;
- n. Number of temporary residents in municipal dwellings, in total (number) 2015/18;
- o. Number of dwellings bought of the latest year (number) 2015/18;
- p. Holiday Houses Started 2017/18;
 - Port:

Matching Indicator: POR_01

1. call ship 2017 - 2018;
2. pax 2017 - 2018;
 - Airliner (Norwegian, SAS, Widerøe):

Matching Indicator: AIR_01

1. Type;
2. Name;
3. Operating Revenues;
4. Net Financial Costs;
5. Ordinary Result.

- Adding Field:
 - Counties:

Matching Indicator: CO_01

1. Public Transport by bus - Utilization of Capacity (percent) 2008/2017;
2. Public Transport by bus - Ticket revenues per passenger-km (NOK per km) 2008/2017;
3. Public Transport by bus - Utilization of Capacity Passenger kilometers per inhabitant (km) 2008/2017;
4. Public Transport by bus - Expenditure per vehicle-hours (NOK per hour) 2008/2017;
5. Real Estate:
 - a. Sales of Operational Assets and Real Estate 2018;
 - b. Total Revenues 2018;
 - c. Total Financing (E) 2018;
 - d. Disposal of Real-Estate 2018;
- Hospitals:

Matching Indicator: H_01

1. Total Number of Beds;
2. Beds Per Year 2017 - 2018
 - Oil Bases:

Matching Indicator: OB_01

1. Active/Inactive;

○ Networking Fields Descriptors:

- Roadway + C_Shipway:

Matching Indicator: RS_01

1. Name;
2. Length;
3. Type;
4. Investments_NTP (COST);
5. Maximum Travel Speed Before NTP (SPEED_0);
6. Maximum Travel Speed After NTP (SPEED_1);
7. Time Path Before NTP (TIME_0);
8. Time Path After NTP (TIME_1);
 - Air Route System:

Matching Indicator: AR_01

1. Base Departure - Base Arrival;
2. Length;
3. Investments_NTP;
4. Medium Travel Speed;
5. Speed_Path;
6. Airliner;

○ Linking Sheet

Airport	AL_01	MUN_01			AIR_01	CO_01		OB_01	RS_001	ARS_001
Municipality	MUN_01		AL_01	POR_01		CO_01	H_01		RS_001	ARS_001
Port	POR_01		AL_01					OB_01	RS_001	
Airliner	AIR_01		AL_01							ARS_001
County	CO_01	MUN_01	AL_01	POR_01					RS_001	
Hospital	H_01	MUN_01							RS_001	
Oil Base	OB_01		AL_01							ARS_001
RoadW+C_ShipW	RS_001	MUN_01	AL_01	POR_01		CO_01	H_01			
Air Route System	ARS_001		AL_01		AIR_01	CO_01		OB_01		

4. Using Roadway + C_Shipway Network

1. The connectivity measurement has been done by Network Analysis tools, building the following matrix:

- Origin – Destination Matrix between Municipalities and Airports;
- Origin – Destination Matrix between major Hospitals of Hålogaland and Municipalities;
- Origin – Destination Matrix between Airports and major Hospitals of Hålogaland;

The algorithm uses a priority queue on which performing three operations: the construction of the string, the extraction of the minimum element, and the reduction of an element's value. The computational complexity of Dijkstra's algorithm managing time can be a function of $|V| e |E|$ (number of vertices and arcs). The data structure used for implementing the priority queue determines the complexity of the three operations and, consequently, that of the algorithm. In general, complexity, $T_D(G)$ of the Dijkstra's algorithm can be the sum of the following three different operations, necessary for the operations of constructing a queue with elements: $\Theta(|V|)$ / [building the tale], $O(|V|)$ / [taking out the minimum value], $\Theta(1)$ / [reduce a value], so the simple formula (Arrays-based solution) of the Dijkstra's algorithm follows:

$$O(|V|^2 + |E|)$$

Where the worst case is: $O(|E| + |V| \log |V|)$

The evaluation of airport connectivity has been managed to cross the data before and after NTP investments, changing the path's maximum speed.

1. The catchment area measurement has been done by Network Analysis tools, building two different types of maps:

- Airports catchment areas by time of journey before and after investments;
- Hospital catchment areas by time of journey before and after investments;

The evaluation of airport catchment areas has been managed to cross the data before and after NTP investments, changing the path's maximum speed.

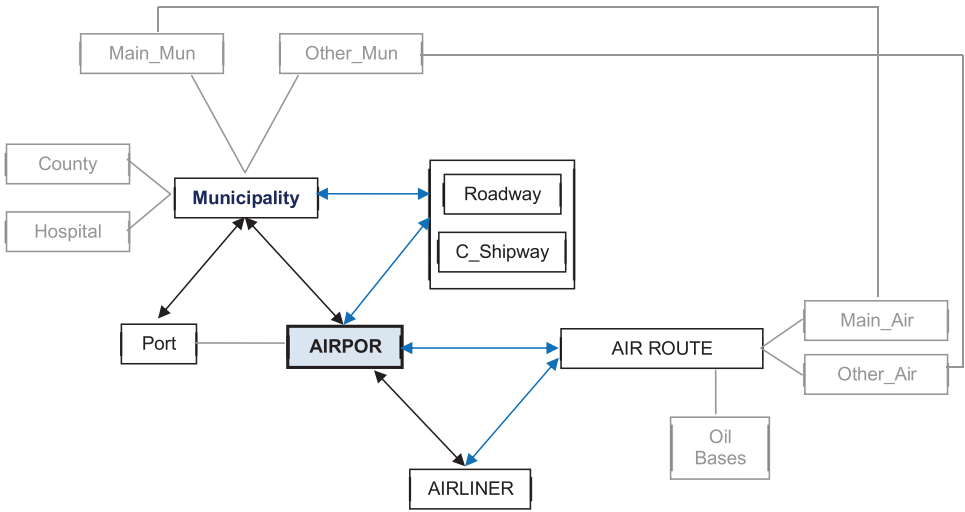
- It has been possible to evaluate served, overserved, and unserved zones, by variation in time ($\Delta\%$ in the years) of the economic features into the county, municipality, airport, and port sheets:
 - Financial critical figures for municipalities;
 - Investment, revenues, and expenditures in transports for counties;
 - Investment, revenues, and expenditures in tourism facilities;
 - Investment, revenues, and expenditures in health;
 - Investment, revenues, and expenditures in touristic real estate;

The location-allocation analysis has been helpful to evaluate the different weights of the airports in the municipality demand.

4.1. Using airway network

For the initialization, the methodology uses a simplified and remodeled form of the mathematical model for planning of aviation routes illustrated by Johan Oppen and Møreforsking Molde (A mathematical model for planning of aviation routes, Johan Oppen, Møreforsking Molde, Britvegen 4, 6402 Molde, Norway, <http://www.moreforsk.no>):

$$\min \sum_{i \in N} * \sum_{n=1}^N * \sum_{j \in N} * \sum_{m=1}^N * \sum_{a \in A} * \sum_{d \in D} c^a [c(i, j)] * x^{ad} [x(injm)] + \sum_{a \in A} F^a y^a$$

CONNECTIONS: RELATIONS 1 - M (One to Many)**Fig. 1.** Connection relations.

Sets:

N Airports

A Aircraft

D Days of the week

Parameters:

$B^a[A \in N]$ Base airport for aircraft a

N Maximum number of visits to any airport per day

F^a Fixed cost for using aircraft a during the time horizon

$C^a[C(i, j)]$ Cost of flying aircraft a from node i to node j

$T^a[T(i, j)]$ Flying time for aircraft a from node i to node j

$S^d[S(i)]$ Minimum number of seats offered to and from node

$D^d[D(i, j)]$ Minimum number of flights offered from node i to node j on day d

P^a Number of passenger seats in aircraft a

Variables conditions:

$x^{ad}[x(injm)]$ 1 if aircraft a travels directly from node i to node j on day d , visiting node i for the

n th time and node j for the m th time, 0 otherwise (Fig. 1)

y^a 1 if aircraft a is used during the time horizon, 0 otherwise

$z^{ad}[z(injm)]$ 1 if aircraft a travels from node i to node j on day d , visiting node i for the n th time and node j for the m th time, 0 otherwise (z variables represent a connection on a specific trip without looking at the actual routing, so it could be a direct link, or it could be a connection with multiple legs.)

- Route system evaluation has been useful also to find the sheet of the best path to Gardermoen.
- The weight of the existing route system has been managed by the cost of journeys, type of company, number of passengers (adding $\Delta\%$ variation of the passenger in the years) and tonne:
 - Some different kernel density maps are useful to evaluate the impact of actual routes:
 - Routes of Northern Region;
 - Routes of Halogaland;
 - Routes on petroleum basis.

CRediT Author Statement

Silvia Rossetti: Assistant Professor

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.dib.2021.106789](https://doi.org/10.1016/j.dib.2021.106789).

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