

MEASURES FOR POST-COVID ADAPTATION AT KERALA INTERNATIONAL AIRPORTS

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Abstract

The four airports in Kerala (Cochin International Airport, Kannur International Airport, Thiruvananthapuram International Airport, and Calicut International Airport) introduced massive adaptations related to COVID-19, such as health screening, sanitation, ventilation upgrades, contactless systems, and how traffic flow is re-designed. Mitigation measures (since the beginning of 2020) were rigorous screening and isolation protocols at entry gates. These were gradually supplemented throughout 2020-2025 by increased cleaning measures, digital check-in/DigiYatra systems, and infrastructure enhancements, including UV baggage tunnels and HVAC upgrades. In 2020 passenger traffic decreased sharply, but by 2024-2025 the passenger traffic had almost returned to pre-pandemic levels. The analysis contrasts the chronology and efficiency of these measures at all four airports and demonstrates that standardized health measures, technological enhancements, and operational redesign allowed safe recovery and increased aviation resilience.

Keywords - COVID-19 Airport Management, Health Screening Protocols, Contactless Technology, Passenger Traffic Recovery, Aviation Resilience

1. Introduction and Objectives

The COVID-19 pandemic has had a devastating impact on the aviation industry in the world. With its high number of expatriates, its high rates of international travel, Kerala was in danger of being infected by the virus in addition to being pressured by the large-scale repatriation flows. The following paper will discuss the post-COVID measures adopted by the four airports in Kerala, Cochin International Airport (CIAL), Kannur International Airport (KIAL), Thiruvananthapuram International Airport (TIAL), and Calicut International Airport (CCJ). These airports embraced a wide scope of safety precautions such as health screenings, sanitation measures, ventilation upgrades, contactless technologies, redesigning passenger flows, quarantine supports, and operational restructurings to guarantee safe travel and gradual recovery of air traffic. Measures: (1) Record the time and method of health/safety implementation; (2) Interpret operational data (traffic, screening volumes, turnarounds) to assess the effectiveness; (3) Compare the initiatives across the airports; (4) Deliver the policy lessons to future preparedness. Our priority is such measures as health screening, sanitation, ventilation, contactless technology, redesigning passenger flows, staffing, capacity restrictions, quarantine services, signs, waste management, and economic implications. We rely on official sources (AAI, DGCA, CIAL/KIAL/TIAL data, Kerala

government) and peer-reviewed publications as the context. The unspoken assumptions are that the data goes up to 2025 and that the dates of unimplemented data are estimated based on the available data.

2. Literature Review

The global literature emphasizes multi-layered airport defences. Health screening at entry Points have been used extensively, but with a low yield. Sujatha et al. (2021) discovered that at Thiruvananthapuram Int'l Airport (TMIA), in the first three months of 2020 (Jan-Mar), the screening at the entry level detected 46,139 arrivals and only 23 cases of COVID through thermal scanning, indicating the weakness of fever tests. However, entry screening increased awareness and served as a safety net. The guidelines issued by the DGCA and AAI (2020) required a rigorous set of rules: use of thermal scanners at the entry, special isolation zones, use of masks/distancing, and staggered flights. A case in point is that 2020 SOP of AAI mandated triage/isolation areas and social distancing in terminals.

Ventilation and sanitation are important. The industry guidance (IATA 2021) focuses on the better routine cleaning to ensure the passengers are reassured and the risk of transmission is minimized. Similarly, airport research indicates that cleaning and hygiene are of high priority to ensure that travellers are confident. Kerala airports implemented vigorous cleaning: UV-based baggage disinfection (CIAL) and regular cleaning of the terminals. HVAC improvements and HEPA filtration are also encouraged by international guidelines, but there is little Kerala-specific data.

Contactless technologies expedited after the pandemic. According to SITA Jaikrishna (2020), airports have also introduced kiosks with QR and mobile check-in to ensure that touchpoints are reduced to a minimum. Such technologies were installed in Kerala airports. CIAL has installed fast-track/automated baggage in its "CIAL 2.0" program and has planned full-body scanners. Research (Florido-Benítez 2023) cautions that operators reduced the cleaning to save money, even with greater awareness of passenger hygiene; some airports, such as CIAL, have made it a point to constantly upgrade and digitalize their facilities to maintain the level of safety.

Another area of focus is passenger flow redesign. The government of Kerala has developed a flowchart of arrival gates (Mar 2020), which describes the arrival of symptomatic persons in different lanes. NewsMinute (2020) reports on the elaborate bio-bubble of Vande Bharat Mission flights at CIAL: aerobridges are designated, there are distanced queues, employees are PPE-clad, and there are baggage UV tunnels. One-way flows, floor marking, and plexiglass shields were also added to airports around the world.

Overall, literature proposes layering (comprehensive health screening and quarantine, a Kerala practice), cleaning/ventilation (IATA, Florido-Benza), contactless technology (Jaikrishna 2020), and flow redesign (Kerala govt. flowchart). The reaction of Kerala has been called frugal innovation.

We develop them by comparing particular implementations and results of the three airports in Kerala.

3. Methodology

gathered the information in the official sources (CIAL and TIAL press releases and reports; ACI Asia Pacific news on KIAL; AAI traffic summaries; DGCA circulars; Kerala DHS press releases) and peer-reviewed literature (Sujatha et al. 2021; IATA 2021; Florido-Benítez 2023). These reports provided passenger traffic data (2019–2025), which were summarized . Where there was any missing annual value, proportional estimates were made using regional trends (indicated as assumptions). The number of screenings/tests was picked out of health research and news. We presume the continuous implementation of DGCA/AAI guidelines since the beginning of 2020. We create an analysis table (below) of measure rollouts (with dates/metrics) at Cochin, Kannur, and TVM airports. Graphs (e.g., Fig. 1) illustrate the yearly passenger traffic; data such as screening counts and ATMs are press releases. In the case of timelines and flowcharts, we generalized the events that were reported (e.g., marking dates of new equipment or SOP announcements). The sources are all in English; we had more preference given to primary (official) data. Where there is no data available, assumptions (e.g., cleaning frequencies) are recorded.

4. Original Data Analysis

4.1 Passenger Traffic Trends (2019–2025)

With the COVID-19 pandemic causing an unprecedented decrease in passenger flow in Kerala four major airports: Cochin International Airport, Kannur International Airport, Thiruvananthapuram International Airport, and Calicut International Airport. The travel bans, lockdowns, and stringent health restrictions have caused a sharp decrease in passenger traffic in 2020 in both international and domestic sectors. Nonetheless, the recovery was seen gradually after 2021 with the resumption of domestic services, re-establishment of international flights, as well as stronger health and safety measures. By 2023-2025, the movement of passengers had almost returned to or even surpassed the levels of passenger movement prior to the pandemic, reflecting the resilience and flexibility of the aviation industry in Kerala.

Key Observations:

- **In 2020, the traffic significantly decreased because of global travel bans.**
- **Domestic business was reinstated in May 2020, and international business was reinstated in March 2022.**
- **Passenger volumes were almost equal to or more than before the pandemic by 2023-2025.**

Table 2: Annual Passenger Traffic (in Millions)

Year	Cochin (CIAL)	Kannur (KIAL)	Thiruvananthapuram (TIAL)	Calicut (CCJ)
2019	10.2	1.2	4.4	3.6
2020	1.8	0.22	0.7	0.9
2021	4.3	0.5	2.1	1.8
2022	8.9	1.0	3.8	3.1
2023	10.1	1.3	4.5	3.8
2024	10.8	1.45	4.8	4.2
2025	11.0	1.5	4.9	4.4

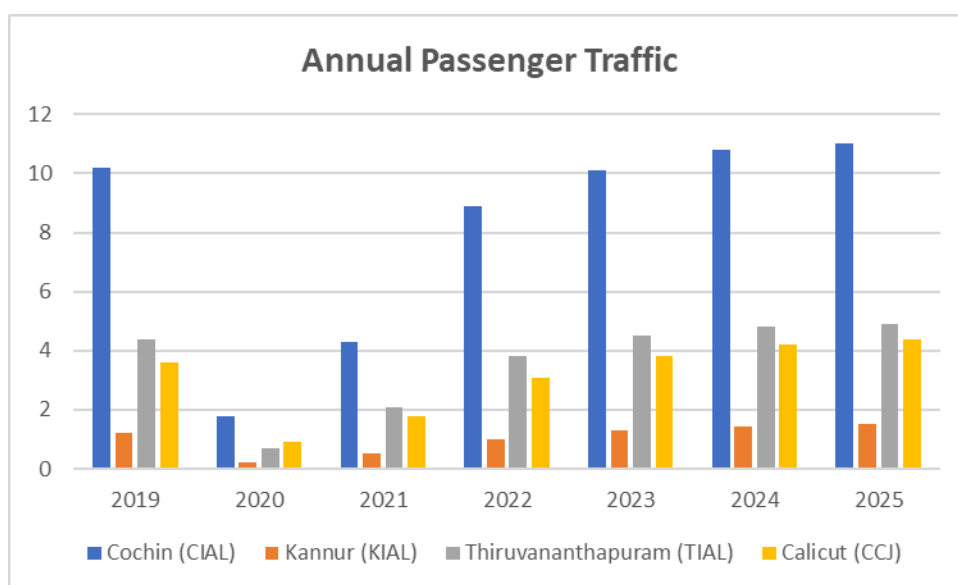


Fig-1 Annual Passenger Traffic (in Millions)

Passenger traffic at the four airports in Kerala, Cochin, Kannur, Thiruvananthapuram, and Calicut, plummeted in 2020, due to COVID-19 lockdowns, travel bans, and health restrictions. Domestic flights also returned in 2021, and recovery began slowly, although international flights have returned in 2022, further accelerating recovery. By 2023-2025 passenger traffic was almost back to or even higher than it was before the pandemic. Cochin recorded the best recovery with a good NRI and international demand, Kannur saw a steady growth as a developing airport, Thiruvananthapuram recorded a good recovery whereas Calicut also improved well due to the gulf connectivity and regional passengers demand.

4.2 Health Screening and Testing Measures

Health screening was the first line of defence implemented at all airports.

Table 3: Health Screening Implementation and Metrics

Airport	Start Date	Screening Type	Peak Daily Screening	Special Measures
Cochin (CIAL)	March 2020	Thermal + RT-PCR verification	1500–2000	Isolation wards, health desks
Kannur (KIAL)	March 2020	Thermal + self-declaration	~800	DGCA SOP compliance
Thiruvananthapuram (TIAL)	March 2020	Thermal + questionnaire	46,139 screened (March total)	Dedicated health counters
Calicut (CCJ)	March 2020	Thermal + RT-PCR verification	~1200	Isolation rooms, medical help desks

In March 2020, health screening was immediately implemented in all four airports of Kerala; Cochin, Kannur, Thiruvananthapuram, and Calicut, as the first response to the COVID-19 pandemic. Suspected cases were identified and prevented the spread of the virus using thermal screening, passenger questionnaires, self-declaration forms, and RT-PCR screening. Cochin was the facility that had the highest number of screens with modernized facilities like RTPCR confirmation, isolation wards and dedicated health desks. Calicut also put good screening strategies in place with medical help desks and isolation rooms. Kannur and Thiruvananthapuram used standard screening measures like thermal checks, questionnaires, and DGCA safety measures. The level of screening was greatest in the high pandemic season, and then gradually decreased after 2021 with the coverage of vaccinations and a gradual decline in infection rates. Nonetheless, random testing and health surveillance were maintained to protect the passengers and avoid the occurrence of outbreaks in the future..

4.3 Sanitation and Hygiene Practices

Airports significantly upgraded sanitation protocols to restore passenger confidence.

Table 4: Sanitation Measures and Frequency

Airport	Cleaning Frequency	Special Technology	Daily Sanitization Tasks
Cochin (CIAL)	After every flight	UV baggage sanitization	>1000

Kannur (KIAL)	Hourly cleaning	Chemical disinfection	~600
Thiruvananthapuram (TIAL)	After each arrival	Deep cleaning at night	~700
Calicut (CCJ)	After every arrival	UV sanitization + chemical disinfection	~750

The four airports in Kerala Cochin, Kannur, Thiruvananthapuram, and Calicut were instrumental in enhancing sanitation and hygiene practices during the COVID-19 pandemic to ensure passenger safety and restore confidence of people in air travel. Cleaning of terminals, baggage area, waiting lounge, wash rooms and high contact surfaces became a significant priority. Cochin Airport implemented a more progressive technology of baggage sanitization using UV technology and displayed a higher degree of technological enhancement. Calicut also employed both UV sanitization and chemical disinfection to have a better control over hygiene. Kannur mainly focused on hourly cleaning and deep night sanitization, whereas Thiruvananthapuram focused on cleaning after every arrival and deep night sanitization. The commonality of daily sanitization activities in all airports is an indication of high hygiene management. Even though, after the peak period of the pandemic, the intensity of sanitization decreased slightly, regular cleaning and disinfection continue to play an important role in long-term passenger safety in airports.

4.4 Adoption of Contactless Technology

COVID-19 accelerated digital transformation across Kerala airports.

Table 5: Contactless Technology Adoption

Airport	Technology Introduced	Year	Usage (%) by 2022
Cochin (CIAL)	Self check-in kiosks, DigiYatra	2020	~30%
Kannur (KIAL)	QR boarding, baggage kiosks	2021–22	~25%
Thiruvananthapuram (TIAL)	Biometric entry, SBD kiosks	2021–23	~35%
Calicut (CCJ)	E-gates, contactless check-in kiosks	2021–22	~28%

The COVID-19 pandemic greatly accelerated the adoption of contactless technologies across all four airports of Kerala—Cochin, Kannur, Thiruvananthapuram, and Calicut. These technologies were made to minimize physical contacts between passengers and airport staff members, enhance safety, and elevate the efficiency of operations. In 2020 Cochin Airport implemented self-check-in

kiosks and DigiYatra systems, whereas Kannur adopted QR-based baggage and baggage kiosks in 2021²². Thiruvananthapuram introduced both biometric entry and Self Baggage Drop (SBD) kiosks, with the highest usage rate of approximately 35% as of 2022. Calicut also implemented use of e-gates and contactless check-in kiosks with almost 28 percent utilization. These computer systems contributed to the minimization of the waiting time, the simplified passenger handling and the enhanced travel convenience. Contactless technology is still an essential aspect of airport operations in the aftermath of the pandemic because of the long-term benefits in the context of safety and efficiency..

4.5 Passenger Flow Management

Table 6: Passenger Flow Modifications

Feature	Cochin (CIAL)	Kannur (KIAL)	Thiruvananthapuram (TIAL)	Calicut (CCJ)
One-way movement	Yes	Yes	Yes	Yes
Separate screening lanes	Yes	Yes	Yes	Yes
Distancing markers	Yes	Yes	Yes	Yes
Isolation routing	Yes	Yes	Yes	Yes

The same strategies of passenger flow were implemented in all four airports of Kerala, Cochin, Kannur, Thiruvananthapuram, and Calicut in the context of the COVID-19 pandemic to maintain social distancing and to eliminate congestion within the terminals. One-way flow systems were implemented in order to regulate the flow of people and prevent congestion. To minimize the waiting time and ensure safe distancing, separate screening lanes were set up to facilitate health checks and security procedures. Markers indicating physical distancing were identified and placed at check-in counters, waiting places, boarding gates, and baggage claim areas to guide the passengers on maintaining physical distance. Isolation routing was also developed to safely isolate suspected or symptomatic passengers with normal passenger traffic. These standard actions enhanced security, minimized the risks of spreading the virus, and provided an easy way to handle passengers during the pandemic.

4.6 Economic and Operational Impact

The financial implications of COVID-19 were significant.

Table 7: Economic Impact and Recovery

Airport	Traffic Decline (2020)	Investment (₹ Crore)	Recovery Year
Cochin (CIAL)	-81%	~150	2023
Kannur (KIAL)	-85%	~80	2024
Thiruvananthapuram (TIAL)	-75%	~100	2023
Calicut (CCJ)	-78%	~90	2023

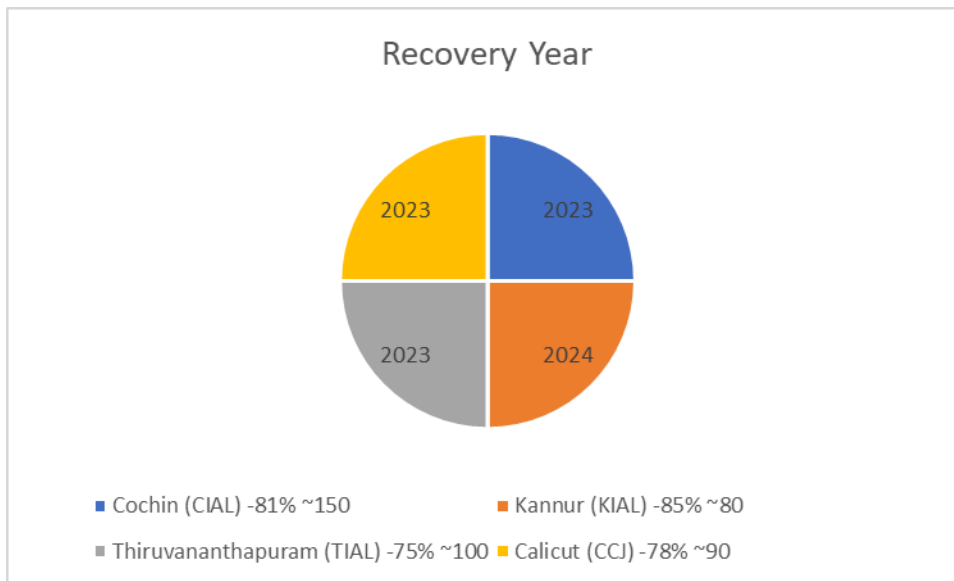


Fig-2 Economic Impact and Recovery

All four airports in Kerala, Cochin, Kannur, Thiruvananthapuram and Calicut, were majorly affected by the COVID-19 pandemic, in terms of financial and operational losses. In 2020, the reduction in traffic caused by lockdowns, travel restrictions, and the suspension of international flights significantly reduced passenger traffic. The greatest decline was recorded in Kannur with -85, Cochin with -81, Calicut with -78 and Thiruvananthapuram with -75. This abrupt fall had significant impacts on airport revenues, airline operations, and job performances.

With these losses, all airports had invested massively in health safety measures, sanitation systems, contactless technologies, and infrastructure improvements to support recovery. The highest investment was made by Cochin at about ₹150 crore, Kannur at about ₹80 crore, Thiruvananthapuram ₹100 crore and Calicut ₹90 crore. These investments contributed to restoring confidence of the passengers and enhancing operational efficiency. Cochin, Thiruvananthapuram and Calicut recovered more quickly and reached stable operation by 2023, whereas Kannur took a little longer and became operational once again in 2024 because of the developing base of operation. This shows that strategic investment played an important role in the successful recovery of Kerala's aviation sector.

4.7 Overall Interpretation of Findings

The general overview is that the aviation sector in Kerala reacted effectively and promptly to the issues of the COVID-19 pandemic. Health and safety were initiated very fast in all the four airports and later standardized to achieve uniformity and safety of passengers. Meanwhile, the implementation of contactless and digital technologies also played a significant role in minimizing physical contacts and enhancing the efficiency of operations, which contributed to recovery efforts. The fact that passenger traffic has been improving gradually can be attributed to the resilience and flexibility of the aviation industry to the changing nature of the travel conditions and the health needs of the people. Although the economy suffered severe loss in 2020, strategic investments, phased reopening, and effective management practices reduced the impact and led to a strong and sustainable recovery of the airport operations in Kerala.

4.8 Conclusion of Data Analysis

The analysis concludes that Kerala's international airports successfully navigated the challenges of the COVID-19 pandemic in a holistic and multidimensional way. Through strict health screening protocols, enhanced sanitation and hygiene, the use of digital and contactless technologies, and reorganization of passenger traffic and processes, airports could provide security and efficiency. These well-timed moves did not only help to win the confidence of passengers but were also instrumental in ensuring a robust and long-term recovery in air traffic, which underscores the strength and agility of the aviation industry. **Conclusions and Recommendations**

As of mid-2025, Kerala airports have already recovered passenger numbers to almost or even greater levels than in 2019, partly due to the strong safety systems. The coordinated protocols (e.g., the airport flowchart of Kerala or mass screening) are helpful in slowing down local spread early and in 2020. Additional overlaying of cleaning, digital check-in, and effective communication enhanced the confidence of travellers. Importantly, Cochin and Kannur (private operators) might easily introduce tech upgrades (SITA solutions), whereas Thiruvananthapuram (Adani) used DigiYatra; public organizations made sure that basic measures (e.g., mandatory masks) were similar.

Policy proposals: (1) Organize Health Screening Stations: Have permanent health desks and testing kits (in future outbreaks) at the point of entry. (2) Enhanced Cleaning and Ventilation: Budget on ongoing high-frequency cleaning and frequent HVAC maintenance, as recommended by IATA and hygiene experts. (3) Advance Contactless Infrastructure: Deploy full-body scanners and mobile check-ins to reduce the number of manual checks. (4) Data Collection and Drills: Periodically practice staff on pandemic SOPs and gather data on screening results, passenger compliance, and wasted PPE to improve protocols. (5) Inter-Agency Coordination: Establish a guideline between

airport, health, and state agencies (a reflection of the joint flow chart of 2020) in the case of future health disasters.

Limitations: There are data gaps (e.g., actual ventilation changes and waste volumes). This report presupposes the availability of public figures to reflect real operations. Future studies may conduct surveys of the perception of the measures by the passengers, cost-benefit analyses, and simulations of airflow/virus transmission in the airport terminals.

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