

**A Dissertation Project on Assessment of sustainability initiatives at  
airports: an Indian Perspective**



Submitted by,

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University of Petroleum and Energy Studies, Dehradun, India.**

**Student Declaration**

I hereby declare that this submission is my own work and that, the best of my knowledge and belief; it contains neither material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

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## **CERTIFICATE**

This is to certify that the project report entitled “Assessment of sustainability initiatives at Airports: An Indian Perspective” submitted by Savi Nair to UPES for partial fulfilment of requirements for Master of Business Administration (Aviation Management) is a bonafide record of the work carried out by her under my supervision and guidance. The content of the report, in full or parts have not been submitted to any other institute or University for the award of any other degree or diploma.

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### **2.1 Aviation in India**

Aviation industry in India is broadly classified into military and civil aviation. The pattern of war was changed by the advent of aircraft and the insistence of war gave way to the development of IAF. The true beginning of military aviation in India is through the journey of IAF. The history of civil aviation in India dates back to 1911 when a flight took off from Allahabad to Naini. General aviation flights comprises of gliders to jet flights. It includes all civil operations apart from scheduled operations.

Indian aviation shows an upward growth curve with domestic air transport being the third largest and international being the ninth largest and is supposed to be the largest market in the coming 10 to 15 years. By 2026 India is expected to be the largest aviation market in the world. The innovations through IT, cash flows through FDI and numerous routes through regional connectivity are taking Indian aviation to new heights. India possesses a status of the fastest growing aviation market in the world with innumerable opportunities to improve its level again.

Indian domestic passenger traffic reached 100 million in 2016 making India achieve another milestone. Powerful economic conditions complemented for the growth though low fares of air travel is one prime factor. International Monetary Fund forecasted that the economic conditions of India will outperform in the ongoing years. With a current market size of USD 16 billion Indian aviation industry is growing at a rate of year on year and it can replace U.K as per IATA statistics.

The factors that lead to the growth are LCCs, FDI, new airports, impact of IT in aviation, prominence of regional connectivity, access of air travel to public, less fares, lack of efficient alternative to air travel, increase in middle class income.

The government initiatives to connect tier 2 and tier 3 areas in metro cities through UDAN Regional connectivity will increase air traffic further more. As of now 56 new airports and 31 new helipads are announced by the government as part of regional connectivity.

In 2017 airlines in India took aboard 117.18 million passengers which display an 18% growth over 2016 as per DGCA data. The growth of industry is much evident from all these data.

Some major challenges were also there which may affect the projections such as fuel price, infrastructure availability, Service tax and, Lack of efficient man power, security breaches, Drone technology, reserves routes etc.

Although the Indian aviation is expected to be the largest aviation market in the world the challenges are unavoidable. Government, airport operators and airline companies should take comprehensive policies to provide safe and secure air transportation by making India the largest.

## **2.2 History of Aviation**

History of civil aviation in India was noted down in 1911 when the first flight from civil aviation sector took off with mail from a polo ground in Allahabad across River Yamuna to Naini. The first air route between Karachi and Delhi was established in 1912, India collaborating with Imperial Airways, U.K. In 1915 without any back up or funding from government the first airline Tata Sons Limited came into being. Another airline known as Royal airline commenced regular mail operations between Karachi and Bombay in 1920. Civil airports were constructed in 1924. JRD Tata started Tata Airlines to transport mail and passengers in 1932 within India. It was started in a palm hut in Juhu in Mumbai. He himself flew the first leg from Karachi to Madras. He carried more than 155 passengers and 10 tonnes of mail in his first flight. The time period between 1933 and 1934 many air taxis and airways emerged into Indian Aviation. The Indian aircraft Act was established in 1932 and revised in 1937. In 1940 by associating with Mysore government of Bangalore Hindustan Aeronautics Limited was set up. In 1941 India's first aircraft flew for its test flight. Deccan Airways was founded in 1945. In 1946, Tata Airlines became Air India. As part of Nationalisation government took 49% of the airline ownership. Almost 9 Aviation companies were operational in 1947. Orient Airways shifted its base to Pakistan which reduced the operational companies to 8. The eight companies were as follows.

1. Tata Airlines
2. Indian National Airways



3. Air Service of India
4. Deccan Airways
5. Ambica Airways
6. Bharat Airways
7. Mistry Airways
8. Kalinga Airways

Air India International Ltd was formed in 1948 to operate international flights. It commenced its international flight in the route Bombay and London via Cairo and Geneva. Helicopter services for civil use were introduced in 1953. International Airport Authority of India was established in 1972. In spite of Nationalisation Tata remained in charge of Air India until 1978. Tony Jannus Award, an outstanding award for commercial aviation airline executives was awarded to Tata in 1979. A government owned airline, Vayudoot, commenced in 1981. The legendary flight of Tata Airlines took off in 1982 flying a De Havilland Leopard Moth by JRD Tata. Pawan Hans Helicopters Limited and Indira Gandhi Rashtriya Udaan Academy started in 1985. National Airport Authority of India was constituted in 1986. In 1987 Bureau of Civil Aviation Security was established. Government of India adopted Open sky Policy in 1990. Sahara airlines commenced its first flight in 1991. May 1993 Jet Airways started its operations with a fleet of four Boeing 737 aircraft. Air corporations Act was renewed allowing private operators to enter the market, enabled them to operated scheduled service. The list of private players was:

1. Jet Airways
2. Air Sahara
3. Modiluft Airlines
4. Damania Airways
5. NEPC airlines
6. East West Airlines

In 1995 the above mentioned 6 airlines had 10% domestic traffic. Apart from that many foreign airlines also started operating in India. 42 airlines provided their services to, from and through India. International Airport Authority of India was merged with National Airport Authority of India in 1995. For the use and development of Airport infrastructure, the policy on Airport infrastructure of India was developed in 1997. In 1999 Cochin Airport came into existence as the first airport made as Public Private Partnership. The process for the same

started in 1993. In 2000, Brand name of Sahara Airlines was changed to Air Sahara. In 2003 Low Cost Carriers started its operations, Air Deccan being the first to begin its business as a LCC model. Approval to set up private Greenfield Airport in Hyderabad and Bangalore was passed by the Government. Spice Jet started in 2004 and Go Air in 2005. In 2004 5/20 rule came into existence which allows an Indian carrier to operate international services which has an experience of 5 years and a fleet of minimum 20 aircraft. Air India, Indian Airlines, Jet Airways, Air Sahara was allowed to handle international services in 2005. Kingfisher airlines came as a luxury airline for the premium passengers in 2005. Indigo emerged in the aviation market in 2006. Private Public Partnership model in Mumbai and Delhi airports were approved by Government in 2006 for restructuring and modernisation. As per Regional Airline policy airlines, licenses were allowed to airlines to operate in a particular region in 2007. Mergers and acquisitions made consolidation of airlines possible. The three such incidents that happened in 2007 were:

1. Air India – Indian Airlines
2. Jet Airways acquired Air Sahara and it was renamed as JetLite
3. Kingfisher acquired Air Deccan and renamed as Simplify Deccan.

Government announced Greenfield Airport policy in 2008. Kingfisher Red became the new name for Simplify Deccan. An autonomous body by the Act of Parliament was created to regulate the aviation economy named AERA Airports Economic Regulatory Authority of India. The establishment of Airport Economic Regulatory Appellate Tribunal was undertaken in 2010. 2010 was a year of revamp for the Indian aviation Industry after being hit by the financial crisis. In 2011, Indian aviation witnessed a traffic growth of 60million passengers which showcased the revival of the industry. In 2012 Indian aviation saw its downturn as a number of issues were faced by the industry. Kingfisher grounded in 2012, Air India witnesses loss. High fuel prices, operational cost, bilateral agreements, DGCA suspended Kingfisher’s license etc made the industry struggle. In 2013, Jet Airways became the first airline to accept FDI in aviation as Aeronautical Information Circular in 2013 allowed 49% of FDI in aviation. In 2014 Air India posted a loss of 5.574 Crore INR with other airlines making losses. It was again a striving year which project aviation as a loss making business though India became the 10<sup>th</sup> largest aviation market in 2014. Thus it was a mixed year. 2015 witnessed three new airlines Vistara – one full service carrier and two low cost carriers emerged Air Pegasus based in Bangalore and TruJet based in Hyderabad. Indigo made its first IPO in 2015. DGCA got its first women head in the same year. New Civil Aviation

Policy was cleared by the cabinet in 2016 and it came out as NCAP2016. It allows 100% FDI in airlines. NCAP focused on reviving 150 airports, regional connectivity, viability gap funding, underserved and unserved airports to be taken care of. It permitted free stay for foreign aircraft in Indian MROs for 6 months. Policy of 2500INR for one hour flight was discussed under NCAP 2016. It also renewed the 5/20 rule to 0/20 rule. NCAP discussed global connectivity to India through open sky policy with countries beyond 5000km from Delhi. It also talked on bilateral agreement, code share agreement etc. Use of small aircraft and helicopters were discussed in NCAP 2016. Route Dispersal Guidelines was another point informed by NCAP 2016. Charter operations were liberalised. Civil aerospace manufacturing has special mention in it. Overall 2016 took Indian aviation to a sweet spot. In 2017, domestic air passenger traffic crossed 100 million passengers for the first time ever.

### **2.3 Aviation Market**

India is expected to be 3<sup>rd</sup> largest aviation market in the world. By then the passenger growth will reach 421 million from 223 million. The contribution to GDP from travel and tourism accounts to US\$ 100billion in 2017. In 2017 spending business and leisure travel accounts to 10.26 billion dollars and 181.6 billion dollars respectively.

#### **Demand**

Rising working group and acceptance of middle class to travel by air are the major demand for domestic travel. Increase in number airport will increase passenger thereby reducing congestion at major airports. Increase in trade will increase the freight growth rate.

#### **Opportunities**

MRO facility demand is extremely high. Fuel cost is the highest expense followed by MRO that accounts for 13 – 15% o revenue. Currently MRO industry has revenue of US\$5 billion.

#### **Investments**

Airport sector is looking forward for US\$12.1 billion investment as per Five year plan. Private sector participation in PPP airports brings high investments to airport sector.

#### **Policy**

Private sector participation has been encouraged by government. 100% FDI allowance as per NCAP 2016.

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India attained the position of 9<sup>th</sup> largest in the world aviation market. There is a growth rate of 21.5 % in domestic sector. The data displays the market size of aviation in FY 17

Scheduled Airline – 1700

Non scheduled airline (operational) – 112

Cargo handled – 2930000

Number of airports – 125 (AAI)

Non AAI airports – 339

Non operational – 9

Operational – 90

Civil enclaves – 26

Domestic airports – 66

Customs airport – 7

International – 17

Six major airports with passenger traffic (2017)

1. Indira Gandhi International Airport – 57.7 million
2. Chhatrapati Shivaji International Airport – 45.2 million
3. Bangalore International Airport – 22 million
4. Chennai International Airport – 16.7 million (AAI)
5. Hyderabad International Airport – 15.24 million
6. Netaji Subhas Chandra Bose International Airport – 14.35 million

Passenger traffic – 264.9 million in 2017 which encompasses a growth of 18.5 over 2016

Domestic aviation expanded with a CAGR of 13.5 percent FY16-17 as per ibef data.

DGCA projected that there is a growth of 21.5 % in FY17 over FY16

International passenger growth rate shows a CAGR of 9.2 % over 2016 and the passenger traffic has increased by 8.5 %.

Growth of aircraft movement was reported as CAGR of 5.59% and aircraft movement is increased with an YoY growth of 3.91%. India had a total aircraft movement of 1.86 million in FY 2017.

AAI dominates in Indian Aviation market but, private players move forward with new business strategies, technological intervention and more infrastructure development.

Major Private Players are

1. GMR
2. GVK
3. SIEMENS
4. FAIRFAX
5. L & T
6. UNIQUE
7. MAYTAS infra

In 12<sup>th</sup> five year plan (2012 – 2017) private sector invested in airports was increased by 69.1% than 11<sup>th</sup> five year plan. GMR Delhi joined hands with Airbus to set up flight simulator at Aerocity. Development fee were utilised by airports in an increased rate.

Delhi and Mumbai airport collects airport development fees and utilise it for fund expansion whereas Hyderabad and Bangalore use their User development fee for maintenance.

Indian airports depend more on commercial revenue from car parking, advertising, and retail shopping. Nagpur airport advertise to empower girl child in a unique way with the initiative “art for a cause”.

Growth drivers

1. Demand

Increase in working population and middle class income. Domestic travellers have increased also tourism brings more foreign travellers. External trade becomes another reason for increasing demand.

## 2. Policy

Government is focusing on infrastructure development. Liberalization and open sky policy promotes air traffic. SOPs and FDI encouragement by the government also contributed to the growth of industry.

## 3. Investments

Modernisation and development of airports are driven by Airport Authority of India. Existing airports are earmarked to expand and upgrade. Strong demand projection brings glamorous returns.

Improvement of travel and tourism sector through efficient advertising abroad creates more demand. A CAGR of 15.74% is from leisure travel and tourism. Business hubs in Mumbai, Delhi, Bangalore and Chennai promote business travel in India.

Focus of GoI in Infrastructure development as per 12<sup>th</sup> Five Year Plan boosts airport development in India. They are planning to invest in airport and Air Navigation Services US\$1.83 billion in 2026. Private participation in airports allowed maintaining of airports under PPP model which attracts more revenue from airport sector. PPP model airports handle 60 % traffic and 40% by AAI. Bilateral agreements with foreign countries enable to fetch more traffic. Air India launched a flight to Tel Aviv via Saudi Arabia. India signed open skies agreement with Greece. MoU between India and Spain was signed in May 2017. Lufthansa launched a flight from Brussels to Mumbai. GoI allowed 100% FDI in domestic airlines and 49% FDI for foreign carriers. For a period 10 year 100% exemption of Tax was allowed for airport projects by GoI. MRO services are exempted from customs duty. US\$265.86 million were earmarked for the debt ridden Air India to revamp the national carrier by government. A budget of 14million is allocated for Airport Authority of India in FY 2017 Union budget. An amount of 9.71 million was allocated in Union budget FY2017 to meet the expenditure of BCAS. There was a 22% hike in the allotment of budget for aviation in FY17 than in FY16.

In last five years AAI developed 26 airports and 250 airports will be made operational by 2026. In North East India 30 airports will be made operational which is under progress. AAI will make 22 airports to get connected via RCS scheme. In next 5 years AAI will develop 20 airports under Tier II and Tier III. An interregional hub in Guwahati has been planned by AAI. Selected airports in Tier II are planned to be considered to develop under PPP model. GoI has approved 15 Greenfield PPP airports.

### Major foreign players in Indian Aviation

1. Airports company South Africa Global
2. Malaysia Airport Holdings Berhad
3. Frankfurt Airport service world wide
4. Air Asia
5. Jet Airways

### Opportunities

In 12<sup>th</sup> Five year plan Indian aviation is expected to receive 12.1 billion dollars. Private sector will bring in 9.3 billion dollars. Presence of PPP model in existing Greenfield airports are likely to increase. Investment opportunities in AAI airports from parties are likely to get. MRO industry will receive 1.5 billion dollars by 2020 which develops the aerospace industry in India. Airline companies in India spend 13 – 15 % of its revenue after fuel cost. There is an 100% owned subsidiary of Air India was opened in Hyderabad airport in 2015. Airports to focus on more commercial revenue through car parking, advertising, retail shopping etc. Satellite based ANS are under development which will showcase more opportunities for future airports.

### Airports

Airports are not just a place to facilitate air transport as earlier. It has become a place for public meetings, business hub, and a major economic activity. Airports along with its catchment area are the main focus for business which contributes to the economy of the country. It represents a country to the world. Airport is the first place which displays a India to other countries in the world. They take an impression of India as soon as they lands in our airports. It is a symbol of national pride which we showcase to others who visit our country.

Airports are the true array to the inaccessible areas, sensitive regions, border etc in the north, west and north east.

It can be integrated with other modes of transportation in the country for efficient connectivity.

We 464 airports and airstrips in the country among those 26 civil enclaves at defence airfields, 125 are managed by airport authority of India which facilitates air transportation in the country.

Airports are divided into the following

1. International airports: In India, we have 17 international airports of which the popular one's are

Airports are major industrial establishments. The airport business includes passengers as well as freight transport. The airport business deals with almost everything that occurs in an airport which extends to historical, legal, commercial activities. Airports facilitate many services and facilities which can be classified into three clusters.

1. Operational services
2. Traffic handling
3. Commercial activities

All the airport operations are carried out as per ICAO mentioned standards and recommended practices. Airport planning, designing and operations are carried out as per the guidelines of DGCA's civil aviation requirement.

Traffic handling in an airport comprises of passenger handling and cargo handling. The facilities, infrastructure, manpower etc are made to work in harmony for efficient movement of aircraft and to provide best customer experience.

The aeronautical revenue from airports are regulated and it has to be attained only through restricted means as per economic regulatory. Non aeronautical revenue (commercial revenue) has got major attention especially by private airports in India. **Economic sustainability** is one primary means airports brought up as the focus is laid on revenue. Revenue from concessionaries, outsourcing of cargo and ground handling will fetch high revenue. To maintain growth of airport and to sustain economy commercial revenue is one important means.

For AAI owned airports 20 -30 % of total revenue is from commercial revenue. AAI airport haven't utilised the prospects of commercial revenue much. Private airports focus on commercial revenue and invest in it to reap the profit.

In November 2017, Ministry of Civil Aviation gave approval for 18 new airports in the country. They are:



1. MOPA in Goa
2. Navi Mumbai, Shirdi & Sindudurg in Maharashtra
3. Bijapur, Gulbarga, Hasan, Shimoga in Karnataka
4. Pakyong in Sikkim
5. Karaikal in Pondicherry
6. Dholera in Gujarat
7. Bhogapuram in Andhra Pradesh

## **2.4 Airport Ownership**

Privatizations in Indian airports are through PPP model that is Public Private Partnership model. PPP is a method of giving open foundation and administrations by Government in organization with private area. It is a long haul course of action amongst Government and private part element for arrangement of open utilities and administrations.

PPP instrument is a noteworthy component of India's foundation creation endeavors as there is colossal level of speculation necessity in the segment. The twelfth arrangement focuses to burn through \$1000 bn to extend framework. Traditional type of fund – the budgetary distribution by the legislature isn't sufficient to meet this enormous speculation measure. So the administration at introduce is attempting a few endeavors to alter and stimulate the PPP (Public Private Partnership) method of framework age. A board led by Kelkar additionally made profitable suggestions to engage the PPP instrument.

India's involvement with PPP in a genuine way began from 2006 onwards. PPP requires private segment support in broad daylight resource creation through cash, innovation and administration. For this, few models welcoming thier support were propelled for various activities. A portion of the generally received types of PPPs incorporate form work exchange (BOT) and its variations, construct rent exchange (BLT), outline fabricate work exchange (DBFOT), work look after exchange (OMT), and so forth.

These models work on various conditions on the private area in regards to level of venture, proprietorship control, chance sharing, specialized joint effort, span of the undertaking, financing mode, charge treatment, administration of money streams and so on. Following are the primary models of PPPs.

(a) Build Operate and Transfer (BOT): This is the straightforward and regular PPP demonstrate where the private accomplice is mindful to configuration, manufacture, work (amid the contracted period) and exchange back the office to people in general segment. Part of the private division accomplice is to bring the fund for the undertaking and assume the liability to build and look after it. Consequently, the general population area will enable it to gather income from the clients. The national interstate tasks contracted out by NHAI under PPP mode is a noteworthy case for the BOT show.

(b) Build-Own-Operate (BOO): This is a variation of the BOT and the distinction is that the responsibility for recently fabricated office will rest with the private party here.

The general population segment accomplice consents to 'buy' the products and ventures created by the task on commonly concurred terms and conditions.

(c) Build-Own-Operate-Transfer (BOOT): This is additionally on the lines of BOT. After the arranged timeframe, the framework resource is exchanged to the legislature or to the private administrator. This approach has been utilized for the advancement of interstates and ports.

(d) Build-Operate-Lease-Transfer (BOLT): In this approach, the administration gives an admission to a private element to construct an office (and potentially outline it also), claim the office, rent the office to people in general division and after that toward the finish of the rent time frame exchange the responsibility for office to the legislature.

(e) Lease-Develop-Operate (LDO): Here, the legislature or general society segment element holds responsibility for recently made framework office and gets installments as far as a rent concurrence with the private promoter. This approach is generally followed in the advancement of air terminal offices.

(f) Rehabilitate-Operate-Transfer (ROT): Under this approach, the administrations/neighborhood bodies enable private promoters to restore and work an office amid a concession period. After the concession time frame, the undertaking is exchanged back to governments/nearby bodies.

(g) DBFO (Design, Build, Finance and Operate): In this model, the private party accepts the whole accountability for the plan, development, back, and work the undertaking for the time of concession.

(h) The private party accepts the whole accountability for the outline, build, fund, and work or work and keep up the undertaking for the time of concession.

(I) Management contract: Here, the private promoter has the obligation regarding a full scope of speculation, task and support capacities. He has the expert to settle on day by day administration choices under a benefit sharing or settled expense game plan.

(j) Service get: This approach is less engaged than the administration contract. In this approach, the private promoter plays out a specific operational or upkeep work for an expense over a predetermined timeframe.

#### National PPP approach (2011) and Draft PPP Rules (2012)

In the light of developing PPP patterns and strategy/institutional intercession, the GoI had wanted to have an expansive arrangement system set up. The Ministry of Finance drafted a National PPP strategy for requesting recommendations in 2011.

In this manner, it turned out with a complete arrangement of draft PPP manages in 2012. The draft strategy proposes to centre on helping Central and State Government organizations and private financial specialists by:

- Undertaking PPP extends through streamlined procedures and standards
- Ensuring the reception of significant worth for-cash approach through improvement of hazard return designation in venture organizing.
- Attaining satisfactory open oversight and observing of PPP ventures
- Developing administration structures to encourage intensity, decency and straightforwardness.

#### Unmistakable highlights of the bill for PPP

- A grievance determination component for private bidder confronting issues identified with acquirement
- Audit of the concessionaire's books of records by the Comptroller and Auditor General of India, upon the demand of the obtaining substance.

Airports use Client charge based BOT demonstrate: ordinarily utilized as a part of medium to vast scale PPPs for the vitality and transport subsectors.

## **2.5 Airport sustainability**

Sustainability is ordinarily defined as an initiative to maintain sustainable practices in three dimensions Social, Environmental and Economic sustainability.

Maintainable practices can decrease the natural effect of created framework while in the meantime making monetary and operational advantages for an undertaking and social advantages for the group on the loose. Together, these parts of maintainability are generally alluded to as the 'triple primary concern'.

For the individuals who know about this definition, we still now and then ponder – what does it extremely mean to be practical? How would you arrive and how would you know you've arrived?

Sadly, there is no enchantment reply. The appropriate response is diverse for each air terminal and its extraordinary blend of possession, working attributes, occupants, concessionaires, administrations, and the district of the world where it's found.

Air terminals all through the world today are tested increasingly to accomplish new objectives and focuses for enhanced natural execution, for example, forcefully decreasing ozone harming substance (GHG) outflows and making progress toward carbon lack of bias, while regularly managing rare subsidizing and restricted staff assets.

In the meantime, numerous must serve quickly developing traveller request, with increments in benefit and advancing traveller desires. Accordingly, air terminals require procedures for managed development that likewise control costs and lessen natural effects after some time.

By beginning with a strong arrangement, an airplane terminal can set both here and now and long haul objectives for supportability, set focuses to track execution toward those objectives, include key partners that are critical to accomplishing targets, and eventually, augment proficiency and lessen squander in all procedures – thus accomplishing that subtle triple primary concern.

Making arrangements for manageability – or the incorporation of maintainability into the airplane terminal arranging process – can be connected to new improvement, as well as to the task and upkeep of existing and maturing framework.

What's more, it doesn't just apply to involved spaces, for example, terminal structures. Abandoned structures, asphalts, and flatworks likewise advantage from supportability arranging, and can enable an air terminal to accomplish its definitive objectives.

Airports today have numerous choices by the way they approach their sustainability plan, and they have numerous sparks and objectives, yet regardless of how or why it's done, the key

shared trait is that all airports undertaking sustainability plan are looking for one overall thing – expanded productivity. By expanding proficiency, an airport can diminish inefficiency in its procedures.

### **2.5.1 Environmental Sustainability**

While airports and aviation affects social and monetary prosperity of the general population related with it, it has a gigantic negative effect on the earth. Issues like air contamination, environmental change, water contamination, noise contamination, scene disintegration and biodiversity harm are among the couple of basic issues related. The consuming of exhausted tires amid landing and take-off add to the measure of particulate issue noticeable all around, fuel exchange and storerooms add to expanded VOC focus. Biodiversity is additionally incredibly harmed because of natural surroundings misfortune and annihilation. As indicated by the Civil Aviation Authority, 2001 around 85% of bird strike include aircraft underneath 800ft.

Such episodes of bird strike, street execute, noise contamination, light contamination and air contamination contributes in debasement of naturally delicate biological system prompting biodiversity misfortune. Air contamination caused because of reasons including the consuming of aeronautics fuel discharging NO<sub>x</sub>, SO<sub>x</sub>, CO<sub>2</sub>, and so on and edacious utilization of power causing carbon dioxide (CO<sub>2</sub>) outflows is a noteworthy worry, as higher convergence of ozone depleting substances (GHG) like CO<sub>2</sub>, NO<sub>x</sub>, significantly adds to environmental change. As per DGCA's (Directorate General of Civil Aviation, Government of India) Carbon Footprint of Indian Aviation Report, around 35 million tons of CO<sub>2</sub> outflows discharged by the Airport exercises all inclusive (for year 2013) which is 5% of the general CO<sub>2</sub> emanations discharged by the whole avionics area. Indian air terminals discharged around 0.78 million tons of CO<sub>2</sub> emanation in year 2013.

Along these lines, it was understood that it was vital to keep up, control and decrease the natural harm by the aeronautics business. For this reason, the Government of India invested DGCA with the duty to keep a track and work together with ecological experts on natural issues, for example, identified with aircraft noise, discharges from the airplane motor according to ICAO Annex 16, and other type of contamination from air terminal exercises. DGCA is in charge of all parts of implementation and direction of flight in India. An Aviation Environmental Unit was additionally set up by DGCA on issues identified with condition, giving direction and answer for issues like decrease in CO<sub>2</sub> level, reduction of noise contamination, change of fuel productivity among others. Besides, to guarantee ecological wellbeing, the setting up of natural units by different partners, for example, the carriers, route specialist organizations and air terminal experts has additionally been proposed, however the data identified with these unit is yet not accessible on open area. According to April 2011 roundabout, it has been made compulsory by DGCA for submitting month to month fuel utilization information to set up a carbon dioxide emanation stock.

## 2.5.2 Economic sustainability

Economic activities involve creating overabundance land for extra income. Pull in business by advancing airport's provincial resources, Partner with privately owned businesses or other open organizations to draw in new income creating exercises. Advance the airport by promoting it to provincial, national and universal meetings. Economic advantages comprises opening of foreign market to Indian exports, Connectivity of Indian items to significant markets in the world, FDI in India and so forth.

Air transport needs huge investment to provide services to the public where airport capacity is one limitation faced by civil aviation as it costs more to build new airports and to expand facilities in airports.

Economic sustainability designs the way of doing business in airports by generating revenue. New technologies will be utilized to reduce cost and time. Asset utilization will be higher to increase revenue generation. It intends to reduce developmental, operational and maintenance cost. Airports generate trade, wealth and Employment. A sound business model will enable to focus on economic sustainability. Safe and secure methods to generate revenue are advised in economic sustainable practices. Life cycle analysis of infrastructure is necessary to reduce the cost thereby contributing to increase in revenue. Growing investor confidence is a part of economic sustainability.

The three main components of economic sustainability are:

1. Wages and added business value
2. Transaction between airport and broader economy
3. Provision of infrastructure facilities which contributes to economy.

Bigger malls and branded shops inside airports create business in airport which draws money from passengers to airport as an additional contribution to commercial revenue.

Economic viability has to be maintained and continue for a long term. Airport creates job in nearby community which indirectly contribute to Indian economy. Development of small and large business aiming the primary and secondary catchment area for the passengers, the business can be included in Regulatory Asset Base will contribute to economic sustainability.



### **2.5.3 Social Sustainability**

Being a socially capable undertaking, Airports Authority of India (AAI) is resolved to serve the general public and is attempting endeavors to upgrade the personal satisfaction of the general population from underprivileged segments of the general public, particularly those living close to its air terminals. The AAI is persistently investigating the open doors where it can serve the general public and is continuously expanding its use on Corporate Social Responsibility and welfare exercises.

For their different CSR and welfare exercises, the AAI has spent Rs. 601.9 million amid FY 2016-17. Here we take a gander at the points of interest of the different exercises embraced by the AAI.

#### **1. Emergency vehicle Service for North-East**

AAI has furnished an emergency vehicle with Advanced Life Support System (ALS) to the Primary Health Center at Longding District of Arunachal Pradesh with a target of reinforcing the wellbeing administrations in the remote north-east locale.

#### **2. Giving Funds to Cochlear Implant Surgery to ALIMCO for Under-Privileged Children**

According to gauges, in excess of 10,000 youngsters in India are conceived with intrinsic hearing misfortune and require cochlear embed. In perspective of the way that it is exceptionally troublesome for the underprivileged individuals to meet the costs for cochlear embed surgery for their youngsters, AAI marked a Memorandum of Understanding (MoU) with Artificial Limbs Manufacturing Corporation Of India (ALIMCO) on March 17, 2017 under which it consented to help 15 under-special kids for leading cochlear embed surgeries, which have been effectively finished. Moreover, the AAI has chosen to support 100 underprivileged kids in the current money related year 2017-18 for cochlear embed surgeries to under-special youngsters by giving monetary help of Rs. 66.9 million to ALIMCO and has entered a MoU with them on September 4, 2017 in such manner.

#### **3. Money related Support to Hospitals for Procuring Medical Equipments**

The AAI has given money related help to various healing facilities. The first being Sri Venkateswara Institute of Research and Rehabilitation for the Disabled (VIRRD), a beneficent healing facility in Dwaraka, Tirumala, Andhra Pradesh, for acquiring extra supplies to give amazing orthopedic support of the poorer segments of society. The second and third being two more doctor's facilities in Andhra Pradesh – Maharaja District Hospital, Vizianagaram and Maharani Hospital (Gosha Hospital), Vizianagaram – for securing medicinal supplies for viable working of these healing centers and to render better administrations to the patients.

#### 4. Development of Shelter Home at BRD Government Hospital, Gorakhpur

Considering that BRD Government Hospital in Gorakhpur, Uttar Pradesh is gone by vast number of patients and numerous camp outside the healing center neglecting to secure a bed, AAI, in a joint effort with the clinic, is building 108 slept with protect homes in the doctor's facility to give safe houses to the patients and their relatives.

#### 5. Development of Toilets in Government Schools

The AAI has since 2014-15, in co-appointment with the Ministry of Human Resource Development (MHRD), under the Swachh Vidyalaya activity, built in excess of 1,500 toilets in roughly 800 government schools, subsequently profiting more than 100,000 under-favored understudies considering there. Till March 31, 2017, more than Rs. 263.6 million has been spent on the development of toilets including Rs. 35.5 million in FY 2016-17.

#### 6. Development of Community Bio-Toilets

In an exertion towards satisfying its duty towards tidiness and adding to the administration's lead battle Swachh Bharat Abhiyan, people group bio-toilets were built by AAI at Phoolpur, Allahabad. These bio-toilets diminish strong human waste by 90 percent and change over it into supplement rich fertilizer.

#### 7. Commitment to Clean Ganga Fund

The Government of India is appreciating cleaning the water of Ganga River. A clean Ganga subsidize has additionally been set up to gather finances that would be utilized as a part of different exercises identifying with the revival of Ganga River. To support the aggregate endeavors, AAI contributed Rs. 200 million (Rs.20 Crores) to the Clean Ganga Fund.

#### 8. Strong Waste Management Project at Varanasi

The Solid Waste Management (SWM) program at Varanasi under the Swachh Bharat Abhiyan means to set up a trustworthy motorized and computerized framework for strong waste accumulation and transportation on pilot premise in 14 wards of Varanasi along the banks of Ganga. The AAI broadened bolster towards this SWM venture at Varanasi to the tune of Rs 50 million (Rs 50 Crore).

#### 9. AAI Paper Recycling Unit

Motivated by the idea of advancing better practices for condition preservation, AAI turned into the principal Public Sector Undertakings (PSU) in India to build up the Paper Recycling Unit to help the reason Government Recycled Office Waste (GROW).

#### 10. Aptitudes Development Program

Following the achievement of expertise improvement activities before, AAI and Construction Industry Development Council (CIDC) marked a MoU for Financial Assistance for Employment Oriented Training and Skill Development Program.



## **2.6 Literature Review**

Aviation industry is at its peak with high growth rate in India. When new heights are attained responsibilities will also arise. Earlier itself airport started focusing on economic sustainability. The growth airports contribute to the Indian economic growth. Impact of globalization and liberalisation were also evident in Indian aviation industry. The importance of economic sustainability was taken out as a major topic and revenue generation as its complementary subject through economic sustainability became a sensational area.

The focus on global warming, ozone depletion, climate change led to environmental sustainability. Airports while increasing business through economic sustainability should maintain environment and environmental sustainability of airports got major attention in discussions, research papers and all. Airport is responsible to take care of its surroundings by adopting sustainable environmental practices.

Society is the major stakeholder of airports which helps them to increase their business. The passenger who travels from an airport generates business for that airport. Therefore it is necessary to take measures for their well being. The airports recognized that it is their responsibility to serve their customers by protecting the Man in its surroundings and the their Man power who work for them to improve the airport business.

Sustainability practices should maintain a proper balance of current demand with future needs. The parameters of sustainability have to be gathered in order to move forward to create a balance that meets current demand along with future needs.

A literature review has been carried out to identify the sustainability factors for economic, environmental and social practices. Previous research items are taken as aid in formulating the parameters for economic, environmental and social sustainability of airports.

### **2.6.1 The concept Evolution**

“The ability to be maintained at certain rate or level” is the English meaning of sustainability as mentioned in Oxford dictionary, “ability to continue certain behaviour indefinitely”, and “the endurance of systems and processes”. Scholars relate religion and sustainability in their age old books. Jeremy L. Caradonna finds the depth sustainability through history in her book where she elaborates environmental sustainability and future challenges of sustainability.

This study classifies the evolution of sustainability into three areas

## 1. Sustainability and theories

In airports many sustainable practises are relevant than in other industries. There are many debates and theories on sustainability. In airports economic and environmental sustainability has been dig deep by researchers, but social sustainability is another area which is untapped. To develop a valid concept of sustainability previous theories will give insight. Writers from 18<sup>th</sup> 19<sup>th</sup> and 20<sup>th</sup> century described about sustainability in their works voluminously. It has been defined in various subjects such as economics, philosophy and science. The time of evolution of man it contributed to the discussion of the topic sustainability. Humans moved from one place to another for food, water, shelter. They reared cattle and acquired land for cultivation and multiplied themselves (Meadows et al 1992). This change human underwent created monetary benefits. Humans began to consider things around them such as land, animal, food, water, shelter as resources with which they can make money out of it (Mebratu, 1998). The use of all metals, machines and lack of hygiene generated pollution such as air, water and noise. Thus, sustainability in society became a major concern. The impact of industrialization alleviated the pollution issue and in order to preserve environment policy makers began to set rules. The relationship between human and nature is mentioned in many religions as well which exhorts harmony of man and nature.

The evolution of sustainability concept was a result of many such theories that came much earlier. “Economics and theory of limits” was quoted by Mebratu 1998. The awareness of environment was linked with social science by Redclift which gave way to sustainability. Some of the authors believe that it was technology which led to the development of sustainable practices by observing and giving attention to skills, natural resources and human needs. This concept of sustainability was seen in many field of study such as ecology, conservation, biology etc. Forestry sector was the beginning of sustainability is discussed by Filho (2000). In order to maintain the optimum use of forest resources the term sustainability came into being as per the study. Thus, it can be concluded that various study contributed to the evolution of the concept of sustainability.

### **2.6.2 Global efforts in terms of sustainability**

The time period between 1972 and 1992 saw many developments in the concept of sustainability. In 1972 there was UN conference on human environment which discussed human environment and considered it as a management tool. World Wildlife Fund and IUCN launched world conservation strategy which was another milestone in the concept of sustainability. It presented environment and development hand in hand and contributed to the development of the term sustainability. The year book of IUCN 1972 brought the idea of sustainability and environment together. “Our Common Future” was published by World Commission on Environment and Development (WCED) that emphasised on sustainable development. It says be it any activity, economic, social or political the environment should be at the centre. The WECD gives the definition of sustainability as “development meets the needs of present without compromising the ability of future generations to meet their own needs.” Miltin 1992 criticised the definition. But, it remains as one of the lucid definition of sustainability.

After the WCED report, the UN began an earth summit in 1989 (Holmberg).

The UN meeting on Environment and Development otherwise called the earth summit at Rio de Janerio, helped spread the idea of maintainability over the world. Amid this time, the vast majority of the investigations concentrated just on the earth, albeit a few analysts thought of social parts of the sustainability. In the 1990s, sustainability turned into the idea of devouring just to take care of current demand and securing natural assets for the future society.

### **2.6.3 Finding the definition of sustainability**

Since 1990s researchers started discussing sustainability as an academic topic. A few starting works have a place with Kidd who related maintainability with different hypotheses like moderate development, the hypothesis of environmental conveying, the asset condition root, the biosphere root, the scrutinize of innovation root what's more, eco-advancement. Sustainability has been utilized as a part of research with a wide range of points of view. After 1992, numerous scientists portrayed manageability as making an adjustment between society, condition and economy. It can be summed up as "Be socially and ecologically

amicable at a lower cost." Previously, sustainability had zero effect on nature and society. Since human exercises have imbalanced society and nature, an examination has been drawn. One more basic protest that came in amid this time is that improvement can't be economical. Individuals need to choose sustainability (no improvement) and advancement (unsustainability). On the opposite side, anthropocentrism pushed for approaches and advancement coordinated toward human esteems and welfare.

As indicated by the "Environmental modernization" (techno driven) hypothesis, maintainability issues can be taken care of by directors and specialized methodologies and there is no compelling reason to stop the current level or pace of advancement (Baker, 2007). Henceforth, sustainability is worried about exercises synchronized with nature, yet the approach toward sustainability remains uncertain and confounding.

In the mid 1990s, sustainability concentrated on advancement and specialists considered it's an administration obligation (Fliho, 2000). Afterward, numerous scientists took a shot at modern supportability methodologies. A further move has been seen from an organization viewpoint to a store network point of view. Numerous supportability systems like the life cycle examination, support to grave, lean and green production network, prompt the idea that sustainability can't be accomplished in a modern domain until the point that it is received over the production network. A large portion of the investigations have been expert to enhance sustainability execution in a specific day and age. There is constantly some negative result from each human and business movement, and this day and age concentrated on bringing down these effects ( Jabbour et al., 2014). This day and age likewise saw a move from organization particular sustainability exercises to store network particular exercises (Carters and Rogers, 2008). Ideas like the life cycle investigation, support to grave and lean supply were acquainted with check item sustainability at each progression. Different units have been distinguished to gauge the sustainability execution and a standout amongst the most well known is the carbon impression.

## **2.7 Dimensions of sustainability**

As the significance of sustainability and economical improvement is as yet uncertain, the measurement of maintainability since its definition stays debated. The most well known and widely utilized measurements of sustainability were reported by Elkington in 1994.

Sustainability has been separated into three sections, which are environmental sustainability, social sustainability and economic sustainability.

### **3 Background of the Study and Objectives**

The Airport Cooperative Research program (ACRP) Synthesis report S02-02

The report alludes to rehearses that guarantees

- Protection of the earth, including preservation of characteristic assets
- Social advance that perceives the requirements of all partners
- Maintenance of high and stable levels of monetary development and work

Airports right now take after principles and controls forced by DGCA. DGCA circular mentions noise management activity designs and decrease of carbon outflow from aircraft. Indeed, even with these controls air terminals are as yet creating contamination and waste caused by hurtful chemicals. The best approach to make a green culture by cutting expense is the point of environmental sustainability designs. Our investigation will discover new measures which can likewise be used for Environmental sustainability.

An investigation directed by IATA and the information gave by ACI the economic activity at Indian airports are assessed. They have examined on GDP commitment of Aviation to the nation. Making of open employments, money paid for assess that builds government's cash. Network and its connection to FDI have been considered. Increment of availability and its commitment to GDP has been broke down. Aviation sector and financial impression are investigated. We will cover more viewpoints in our exploration that adds to economic sustainability.

Terrorist assault and aircraft administration are the main components talked about by other insightful articles. Our exploration will emphasize on all of the measures said in the report for Social sustainability.

Web based reviews alongside feasible practices received from RGIA and CSIA alongside new measures that Indian airports can use as a way to achieve sustainable later on too.

Airport drove social, environmental and economic development accompanies a cost. Our study goes for sustainability with less cost as it focuses on sustainability ought not be at the cost of productivity.

### **3.1 Objective**

- To identify the sustainable initiatives specific to Indian airports.
- To finalize the sustainable initiatives specific to Indian Airports.
- To assess and analyse the identified sustainable initiatives.

Different approaches to conduct the research:-

#### **1. Qualitative Approach**

Delphi Method: The Delphi Technique was originally conceived as a way to obtain the opinion of experts without necessarily bringing them together face to face. The Delphi research method is a flexible research technique that has been successfully used to explore new concepts within and outside of the systems of knowledge. (Skulmoski et al., 2007 cited by Joshi et al., 2011). Joshi et al., (2011), Grisham (2009) & Hsieh et al. (2006) used the Delphi method to send and receive questionnaires and interviews with experts.

### **3.2 Scope**

The Scope of the study is to find out factors adopted by airports in attaining sustainability along with proposing new measure that contribute to sustainability of airports which followed in other sectors such as supply chain management and so on. The findings from the study fill the gap in the existing body of knowledge area.

## 4 Research Methodology

The rationale behind choosing the methodology is to collect different parameters, identify, evaluate and to obtain expert opinion to validate the parameters identified. The decision makers consist of experts from airport of our country. In this research 59 indicators of sustainability are identified that are recognized through literature. This study utilizes qualitative analysis of parameters and validating the indicators through expert opinion.

### 4.1 Research Design

#### 4.1.1 Research Type

Research Type adopted is of exploratory in nature.

#### 4.1.2 Questionnaire design

Questionnaire is designed to validate the indicators identified through expert opinion.

##### 4.1.2.1 Validation from Expert

➤ Economic Sustainability	Valid
Construction Efficiency	<input type="checkbox"/>
Operational cost efficiency	<input type="checkbox"/>
Sustainable purchase policy	<input type="checkbox"/>
Concessionaries & tenants	<input type="checkbox"/>
Reduce utility cost	<input type="checkbox"/>
Reduce energy cost	<input type="checkbox"/>
Efficient passenger flow	<input type="checkbox"/>
Parking space	<input type="checkbox"/>

“Assessment of sustainability initiatives at Airports: An Indian Perspective”

Tourism	<input type="text"/>
Technology utilization	<input type="text"/>
Acquire lower contracts	<input type="text"/>
Stakeholder's sound economic condition	<input type="text"/>
Government Regulations	<input type="text"/>
Efficient supply chain management	<input type="text"/>
Anti corruption	<input type="text"/>
Risk Adaptability	<input type="text"/>
Commercialization	<input type="text"/>
Inter modal operations	<input type="text"/>
Business from catchment area	<input type="text"/>
Resource efficiency	<input type="text"/>
Affordability	<input type="text"/>
If any other (Please add or specify)	<input type="text"/>
<b>➤ Social Sustainability</b>	
Employee Welfare	<input type="text"/>
Public Awareness	<input type="text"/>
Passenger Well being	<input type="text"/>
Preserve heritage	<input type="text"/>



“Assessment of sustainability initiatives at Airports: An Indian Perspective”

Manage public sentiments	
Employee Awareness	
Responsibility to community	
Stakeholder relation	
Corporate responsibility	
Women specific issues (Passenger & Employee)	
Maintain goodwill of airport	
Equality in work environment	
Skill development	
Protection of human rights	
Labour welfare	
Save local culture	
Public donations	

Political relations	
Health & Safety	

➤ **Environmental Sustainability**

Land use compatibility	
Employee commutation by their own increase air pollution	
Emission	
Waste management	
Renewable energy	
Noise Pollution	
Water consumption	
Energy consumption	
Go Green, use technology	
Green initiatives	

Oil spill from aircraft	
Passenger Congestion	
Develop ecology complex	
Open Space Preservation	

#### 4.1.3 Elements

Elements who have presented their expert opinion for the study are from the upper management level.

#### 4.1.4 Time

December 2017 to April 2018

#### 4.1.5 Extent

Expert opinion from Hyderabad, Mumbai and Trivandrum airports

## 5 Discussion

The indicators identified for economic sustainability such as operational efficiency, construction efficiency, tourism, concessionaries and tenants will attract more revenue to the airport business. Sustainability can be attained only if the practices are followed for a long term and the benefits received from the indicators are continued and make it as a routine task. With that the revenue can be increased and an economic stability can be achieved.

The indicators identified and validated for environmental sustainability such as Waste management, use of renewable energy, water consumption, energy consumption etc will make our planet a better place to live. The resources will not deplete and it can be reserved for the future generations also. Airport industry develops and earns revenue from resources and man power. Thus it has a responsibility to preserve those resources and not to pollute the environment as global warming is a hot topic for discussion which threatens the livelihood of our planet.

The indicators identified and validated for social sustainability such as employee welfare, passenger well being, preserving heritage of an area, Managing public sentiments, managing stakeholder relations, Equality in work environment etc will enhance human relations and public relations. Customers are the one who bring business and airport has commitment to people of the community where the airports exist. Customer relations will enhance business thereby increase the revenue.

## **6 Conclusion**

The dimensions of the sustainable practices are identified and validated which showcases how sustainability can be achieved and what are the indicators we have to focus on. It is necessary to embrace all the three dimensions of sustainability for the future progress of the industry. The study has prospects which can be extended and carried out in the future.

## **7 Bibliography**

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