

INTRODUCTION

1. Background of the Study

1.1. International Airport

The system of civil aviation, particularly airports as its crucial facility, has come to be the most substantial element of transportation and one of the main requirements to 1900s trade and market. The commercial division of civil aviation, containing more than 900 airlines and 22.000 aircraft, had become the choice of transportation to more than 2 billion passengers and carried 85 million tons of cargo on more than 74 million flights to more than 1700 airports in more than 180 countries worldwide, in 2008 alone (Horonjeff, 2010). Furthermore, charter, corporate and private general aviation in the million were carried out all around the world on thousands of airports, both general and commercial type.

General aviation and commercial service perform as the major means of transportation and moreover the only way reach the outside world in many remote regions around the world. The influence of commercial aviation industry around the world is considered remarkable, providing more than \$2.6 trillion in economic activity, comparable to 8% of the world gross domestic product, and accommodate over 29 million jobs globally. Civil aviation is accountable for USD 900 billion in economic activity and providing 11 million jobs in the United States alone (Horonjeff, 2010).

Airport as the anchor of such an essential factor in global communities had a significant impact on the industry. Airport is a particular area of land or water (including any buildings, installations and equipment) intended in whole or in part for the arrival, departure and movement of aircraft (Annex 14 from ICAO, 1999). As the intermediary between land and air commotion, the quality of airport directly affect the continuity and level of aviation service as a whole. High level facility in terms of complexity such as airports requires a maximum quality and congeniality from all of it's elements.

Main elements which serve as the important roles in airports and aviation activities are security protocol, passengers service and air traffic control.

Lack of concern and management in various main and supporting elements of airports has proven to be fatal and sometimes disastrous. Incapable security system applied in airports leads to criminal activities by individuals and high profile criminal organisations. Organised modus operandi used by criminals exploits security drawbacks as a loophole for smuggling activities and even terrorism. While security protocol provides safety from illegal activities, technical issue and maintenance protect flight activity from the danger of aircraft accident which is fatal most of the time. Unqualified human resources for technical purposes of an aircraft as well as deficiency in technical procedures, management and equipments required are the main source of catastrophy in aviation. Whereas airport serve a critical role in many aspect of global growth, the existence of airport and the activity it accommodate have negative impacts, especially on the ecosystem.

1.2. Environmental Effect of Aviation Activities

Ecosystem is an ecological unit in which there are structures and functions in which the structures referred to in the definition of these ecosystems associated with species diversity (Tansley, 1935). In ecosystem, organisms evolved together with the physical environment as a system. Organisms will adapt to the physical environment and on the other hand, physical environment is also affected by organisms that accommodated by it for living. Essentiality of the ecosystem balance is inversely proportional to the state of the global environment as a whole today. Regrettably, airport and aircraft activities are one of the main source of damage to the ecosystem that has been happening around the world.

Means of transportation and buildings ranked as the second and third worst destructive factors of nature due to human activities, where the first position is occupied by coal and diesel power plant (Natural Resources Defense Council (NRDC), 2005). Utilization of fossil fuel for transportation

and diesel powered generator to fulfill the energy requirements of buildings throughout the world contribute to enormous amount of air pollution. Diesel powered generator is favored for its undemanding nature in terms of installation and maintenance. However, low level of the generator's efficiency, leads to worse pollution than a normal city power plant. Various aspects of life in the structure of ecosystems suffer the devastating impacts of pollution. Disaster after disaster began to appear everywhere with greater impact each time, the destruction of natural habitats, extinction of various species, as well as the depletion of natural resources due to over-exploitation.

According to statistics from the Federation Aviation Administration (FAA) and the National Transportation Safety Board (NTSB) in 2015, there were 102.465 flights by aircraft alone on a daily basis. Aviation is the highest polluting transportation mode on earth (Whitelegg, 2003). To adequately accommodate the facility and aviation activities, airport buildings are built large enough to accommodate air vehicle, passengers and employees. Therefore, airport has high energy consumption for the operational needs of airline mechanics, as well as for passenger comfort inside the airport terminal. Excessive noise produced by aircraft and airport activity is another form of pollution. Noise pollution can cause blood pressure changes, as well as changes in sleep and digestive patterns and triggers signs of stress on the human body as a whole. The variety and sheer amount of pollution caused as well as energy used to meet the demand of overall air transportation activity will certainly cause a terrible consequences to the ecosystem on a global scale.

Due to the high level of harm caused by airport buildings and aviation activities, every airport has to be carefully and thoroughly designed and constructed with green & sustainable concept in mind to minimize and even dispel the effects of pollution that could bring harm and destruction to the nature. In order to understand and apply green and sustainable design to buildings with high level of complexity such as airports, extensive and comprehensive learning, research and training are required to achieve high level of expertise and knowledge on the matter at hand. There has to be a deep

consideration and collaboration of hard work from both the government and private sector on the whole to overcome these.

1.3. Papua and International Airport

Indonesia which is touted as the lungs of the world is required to be sensitive and responsive to environmental problems. Although various measures have been done to create environmentally friendly means of transportation and buildings, the results attained in Indonesia is considerably low from expectation. This matter is caused by the indifference of Indonesian government and its people as a whole, in addition to the low level of effectiveness of the measures taken by the government as well as the lack of proficient human resources. Therefore Indonesia needs a follow-up solution from various parties on this issue not only in the central/major areas or cities, but also equally to all regions around the archipelago.

Papua as one among the largest provinces in Indonesia has shortcomings in terms of infrastructure to facilitate the activities of aviation. These drawbacks is not only in the form of availability of airport in an area in need of aviation, but also capabilities of the existing facility to appropriately accommodate aviation activities in accordance with airport standards. Moreover Papua does not have its own proficient international airport.

There are currently 4 airports in Papua which accommodate international flights. These airports are Frans Kaisepo Airport in Biak, Sentani Airport in Jayapura, Mozes Kilangin Airport in Mimika and Mopah Airport in Merauke. Among these airports, only Frans Kaisepo Airport in Biak had functioned as International airport a few years back, but only provided if a demand took place. The other 3 airports have not been used and functioned properly as international airport.

Jayapura as the capital city of Papua unfortunately does not have its own capable international airport. Sentani Airport which serve as the only airport in Jayapura and several other regions around it, only provide international flight from and to Port Moresby, Papua New Guinea and only on

a certain circumstances. This matter causes quite a loss from an economic standpoint of Papua as a whole because of the high frequency of international flights to and from Papua. To be able to make international flights to, passengers from/to Papua must fly by international airports located on another island with a large cost. Moreover, airports in Papua have inadequate facilities in terms of supporting the convenience of passengers, aircraft flight operations, and unfortunately airport security system.

Lack of attention and concern for these fundamental things is one of the main causes of the high levels of environmental pollution by regional airports which resulted in damage to the environment and well-being of the population. It is quite alarming for an area which considered being one of the largest in Indonesia. The design of international airport based on green & sustainable architectural principle is carried out in hope that the result of this work became a pioneer of green building in Papua which are still exceptionally low and addressing problems of quality infrastructure and airport facilities, as well as providing the first international airport in Papua.

1.4. Identification of the Problem

Based on elucidation of the background of the study, to overcome the problems of low quality airports in Indonesia and particularly in Papua, as well as the negative impact of the existence of airports and aviation activities to the nature, an environmentally friendly international airport design based on standardized green and sustainable principle is required. The result is hoped to be a role model of high quality airport and pioneer of green airport and green building as a whole in Papua and Indonesia for its purpose in preservation of the environment as well as educational needs. Furthermore, in relation to architectural subject, the objective is how to determine the concept of planning and design of "Green & Sustainable International Airport of Jayapura, Papua".

2. Aims of the study

“To design an international airport in Jayapura, Papua with green and sustainable architecture approach”

3. Objectives

Objectives in the design of ‘International Airport of Jayapura, Papua with Green and Sustainable Architecture Approach’ are:

- a. Deliver a building area that can accommodate international airport activity and its auxiliary facilities at an appropriate location in Jayapura.
- b. Achieve a green and sustainable international airport design which include the following aspects:
 - 1) Undemanding energy requirements.
 - 2) Availability of alternative energy source on site.
 - 3) Appropriate waste management.
 - 4) Application of environmentally friendly building material.
 - 5) Located on a specific distance from residence or city area to minimize the direct negative impact of pollution to human.
 - 6) Buildings layout design to increase the efficiency of aviation activity and all of its supporting elements.
 - 7) Airport design that follow specific standards of green and sustainable design issued by legal government or private entities.

4. Significance of the Study

Significance of the study of ‘International Airport of Jayapura, Papua with Green and Sustainable Architecture Approach’ are:

- a. The demand of a high quality, adequate and modern facility that able to provide the need of air transportation on national and international coverage in Papua.
- b. Provide an environmentally friendly international airport design to minimize negative impacts of pollution caused by the existence of an airport and aviation activity in Papua.

- c. Improvement of regional and national economy with the provision of air transport activity center that is able to accommodate any activities, purpose, and regional plan for the government as well as the private sector on national and international scale.
- d. The preparation & making of concept/synthesis (SKPA) and building design (in the studio).

5. Scope & Limitation

Scope & limitation of the study of ‘International Airport of Jayapura, Papua with Green and Sustainable Architecture Approach’ are:

- a. The main discussion is the design International Airport in Jayapura.
- b. The design is focused on minimizing the negative impacts of airports and aviation with green and sustainable concept design.
- c. Standards issued by legal government or private entities is used as a basis for concept development or applied directly to the green and sustainable airport design.
- d. For other problems that are beyond the scope of the architectural coverage and determine if it is deemed to be fundamental will be studied and solved using assumptions as well as the practical logic in accordance with existing capabilities.

6. Study Methods

6.1. Theoretical Study

The study of literature, which is the taking information and knowledge from several sources concerning international airport and sustainable design that can be used to address each problem found in the design process with a solution.

6.2. Data Accumulation

Data required in the design of ‘International Airport of Jayapura, Papua with Green and Sustainable Architecture Approach’ are as follows:

- a. Data of existing airport
- b. Regional data and statistics related to airport
- c. Data and information regarding international airport
- d. Data and information regarding green and sustainable building design particularly airport.

6.3. Analysis

Analyzing physical and non-physical data required, which then used as consideration in the design of 'International Airport of Jayapura, Papua with Green and Sustainable Architecture Approach'.

7. Planning & Design Concept

Creating a basic concept or planning to use descriptive method to clarify and reinforce one another that are embodied in a concept of planning and design.

8. Study Systematics

8.1. Chapter I Introduction

Contains the title and background understanding of the issues raised as a basis for the preparation and planning of SKPA to realize the goals to be achieved with the use of certain methods.

8.2. Chapter II Review of Literature

Contains theories related to the problem and the basics of data sources concerning the issues raised for SKPA report.

8.3. Chapter III General Description of Plan Location

Contains a description of the location of the object that will serve as a place for planning and design of the building, as well as other data that support the existence of the object obtained from direct observation and study of literature.

8.4. Chapter IV Planning & Design Concept

Contain problem analysis and the approach of the concept which is then applied to the planning and design of the building.