Adi Sumarmo airport train station: Transit and connectivity

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Abstract. The growth of people's needs for transportation facilities in Indonesia has urged the government to build a particular space that could accommodate, facilitate, and contain people’s fast and massive movements. Urban planning needs to be oriented to transit activities to accommodate people’s moving behavior. Surakarta’s Adi Sumarmo International Airport has been one of the government’s plans for developing infrastructural facilities to connect essential areas in Central Java. As an international airport, Adi Sumarmo International Airport is expected to facilitate people’s movement to the city of Surakarta and other cities nearby. This article discusses the design of an airport-train station, employing a transit-oriented development approach. The design implements the concept of walkability, mixed use neighborhood, and an inclusive environment.

1. Introduction

People’s mobility has grown massively during the last couple decades. The quantity of various transportation facilities was also grown in some areas to accommodate people’s needs. This has resulted in the increase of traffic and traffic congestion that hamper people’s mobility in their activities. Peter Calthorpe, an architect and urban designer, has coined transit-oriented development in 1982 as an idea to connect people’s activity nodes easily, and thus, improve effective movements. Transit-oriented development concept was developed to enhance transit ridership [1].

Transit-oriented development is defined as a system of concentrated mixed-use development that incorporates various public facilities near transportation facilities. The idea is transforming car-dependent neighborhoods into a community that relies on reliable, affordable, and comfortable public transportations. Transportation nodes are connected with each other and are equipped with facilities that allow people to walk to their destinations or transit to other transportation modes to reach their destinations. Studies show that transit-oriented development has increased economic development [1,2] and establishing a sense of place at transportation nodes [1,3,4]. Transit-oriented development has also been a way of revitalizing the city [5]. Transit-oriented development, also known as TOD, is a planning or developing method to accommodate people’s movement. The goal is to achieve an effective moving environment that is safe, comfortable, and accessible for every potential user. This concept is significantly related to a more sustainable compact city [6].

Initiated with the transportation policy in Jakarta, the capital city of Indonesia, the Indonesian government has recommended the integration of transportation modes. The policy is aimed at reducing traffic problems in big cities. Adi Sumarmo International Airport in the city of Surakarta, Central Java, has been included in government’s plan of infrastructure development to connect cities in Indonesia [7,8]. Adi Sumarmo International Airport was constructed in 1940 and has been designated an international airport to serve some cities outside Indonesia since 1989. Its development as an
international airport supports Surakarta’s program as one of major tourism destinations in Indonesia. The airport is situated on a suburban area, surrounded by open spaces and paddy fields, in the outskirt of Surakarta city. The airport is strategically located to reach the surrounding cities, such as Surakarta, Yogyakarta, Klaten, Boyolali, and Semarang.

This article discusses the design of Adi Sumarmo Airport Train Station using transit-oriented development theme. The Airport Train Station will facilitate trips from Adi Sumarmo Airport to Solo Balapan Station using trains and to other cities using shuttle buses. It is expected to raise the business activities and tourism in Solo City. The design added a train station and a transit hotel to the site, where Adi Sumarmo airport has existed.

2. Method

The design of the Adi Sumarmo Airport Train Station employed transit-oriented development. There are seven principles of transit-oriented development: (1) quality public transit; (2) active transport; (3) car use management; (4) mixed-use neighborhoods with efficient buildings; (5) neighborhood centers and vibrant ground floors; (6) public spaces; and (7) community participation and collective identity. We used behavioral approach in designing the transit station to achieve users’ comfort. Spaces are arranged in such a way to be able to facilitate social interactions among users. We follow the TOD guidelines that consist of walk, cycle, connect, transit, mix, densify, and compact.

3. Results and discussions

The design concepts comprise the zoning and circulation, the building masses, and façade. The main idea is how to facilitate users with as many as spaces to walk comfortably in the facility.

3.1. Zoning and circulation

Zoning and routing are key variables in TOD planning [9]. In TOD, zoning arranges which areas can be accessed by public and which are private. The public zone occupies a dominant part of the site to let users penetrate as many as areas in the site. The additional train station and the transit hotel are located to the east of the existing airport building. The train station can be reached directly from the arrival lobby to allow efficient movements [10]. This building has three storeys, containing waiting room, stores, restrooms, prayer rooms, and a nursing room. Those who transit to travel to the city can directly go the third level and ride the shuttle train. Users can also use the transit hotel that is located to the east of the transit station. The hotel is equipped with meeting rooms, in addition to lodging. Zoning in this design considers proximity among functions [4].

![Figure 1](image_url)  
**Figure 1.** The site plan. The pedestrian way is provided to connect all buildings with the facilities outside of the site.
The circulations are divided into pedestrian paths, roadway for cars, and busway (Fig. 1). Such an arrangement allows maximum comfort for pedestrians. Pedestrian paths are separated from driveways. Crossings with vehicles are also avoided for safety reasons.

3.2. Building form

Figure 2. The building masses combine rectangular floor plans with a triangular roof, inspired by the traditional Javanese roof.

The main form is rectangle to allow efficient movements and the use of space (Figure 2). The triangular form is inspired by the limasan roof, a Javanese traditional form. Such a roof represents the hope that the city could be more prosperous. The traditional form is combined with a more articulated curve roof that shows a fast movement. This curve roof covers the train station area.

The mass configuration serves to form a positive space on the outside. Such a building form enables users’ continuous visual and movement experiences that are both linear and integrated (Figure 3). This allows “eyes on the street” to let visual interaction among users in the public space [11], a key feature in generating a sense of place [5,9].

Figure 3. Linear movements inside the building.
3.3. Inner and outer spaces connection

The connection between the inner and outer spaces is important to define the liveliness of the environment around the building’s area. The design uses glass walls to allow visual connection between the interior and the exterior. Visual connection is a key element in making place in a community [12].

![Figure 4. The fluid connection of the interior and the exterior.](image)

4. Conclusion

Transit-oriented development is a crucial solution to traffic congestion and environment sustainability issues. Adi Sumarmo airport-train station is designed using this approach to enhance people’s mass transportation ridership. The main concept includes zoning and circulation that encourage pedestrians’ comfortable walking activities, connectivity among facilities, and the making of place that facilitates social interaction among users. The building masses are arranged in such a way to allow fluid connectivity between the interior and the exterior. This connection is also enabled through the use of glass walls.

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