Chapter I

Introduction

1.1 Background

Sluice gate is a man-made hydrology structure which controls the discharge or flow depth of an open channel flow such as river flow. In Indonesia, there are many sluice gate installed on many rivers such as Bendung Pasar Baru on Cisadane river, Jagir on Jagir river, and Demangan on Bengawan Solo river, which is presented in Figure 1.1. Sluice gates only controls the flow depth if it is placed at the middle of the channel. Sluice gates also control the discharge if it is placed at the channel's entrance or a reservoir. This could be troublesome in Indonesia, a tropical country with dry and rainy season, which causes the rivers having its discharges fluctuate over the year. This makes operating sluice gates to be harder while avoiding floods. Therefore, by this final project, the writer wants to analyse the river flow behaviour and the effects of sluice gates with a model based on Saint-Venant equations and obtain the solution with numerical approach.

1.2 Problem Identifications

In this final project, the behaviour of the surface of river flow and the effect of sluice gate to the surface will be analysed and discussed using Saint-Venant Equations. Therefore, the the detailed problems are:

1. How Saint-Venant equations models river flows?
2. How the surface of river flows behave in steady state condition?
3. How sluice gates affect the surface of river flows in steady state condition?

1.3 Scope Limitations

Since the topic of river hydrology is broad and complex, the scope of this final project is limited to several terms to answer the problem. The terms are:

1. The model is applied to single channel only.
2. Curves and turns in the rivers path are not considered to the model.

a)  b) 

c) 

Figure 1.1: Beberapa contoh pintu air di Indonesia: a)pintu air Bendung Pasar Baru [1], b) pintu air Jagir [11], c) pintu air Demangan [5].

3. On a channel, only one sluice gate is simulated.

1.4 Goals

The goals of this final project are:

1. to understand how Saint-Venant equations models the surface of river flows,
2. to understand the behaviour of the surface of river flows in steady state condition, and
3. to understand the effect of sluice gates to the surface in steady state condition.