

## **CHAPTER VI**

### **CONCLUSIONS AND SUGGESTIONS**

This chapter contains conclusions from the research on measuring environmental impacts using Life Cycle Assessment of the cement production process at PT Semen Padang that has been carried out and suggestions for further researchers.

#### **6.1 Conclusions**

Based on the research that has been carried out to measure the impact of emissions arising from the cement production process at PT Semen Padang with the Life Cycle Assessment approach using Simapro software, it can be concluded:

1. Based on the calculations that have been obtained, the impact categories that are very influential in the cement production process are Respiratory Inorganics, Global Warming, and Non-renewable energy. These three impacts are taken because from each stage in the IMPACT 2002+ method these three impacts are the biggest contributors to the impact on the cement production process. Inorganics respiratory value at the characterization stage is 0.113 Kg PM2.5 which is divided into four processes in the cement manufacturing process at PT Semen Padang where the kiln system which produces raw mix is the biggest contributor of 0.112. The global warming impact value is 648 with the clinical system that gives a global warming impact of 457. The total non-renewable energy impact value is 3280 with the largest contributor being the process that occurs in the kiln system of 3810. Overall, the process that contributes to the impact of emissions generated during the cement production process is the clinker production process found in the klin system followed by the process in the raw mill and cement mill. One of the biggest factors is the use of energy used by PT Semen Padang in the production process. The energy used is electricity and

coal. As it is known that the use of coal in the cement production process has a bad impact on the environment because it releases emissions that affect humans and the surrounding environment.

2. Improvement recommendations to reduce the potential environmental impact of the cement production process by substituting coal fuel with alternative fuel in the form of red calliandra wood. Kaliandra is one of the renewable energy source plants with a heating value of 4700 kcal with a TSR value of 25%. The amount of calliandras required is 53.67 kg and 132.75 kg of coal. Kaliandra has an emission factor of 0.73 kg CO<sub>2</sub>/kg which is smaller than coal. Based on the calculation results after using the improvement recommendations, there was a decrease in the impact category of global warming and non-renewable energy. The decrease in the global warming impact category is 7.4%. The impact of non-renewable energy is also reduced by the addition of calliandras as fuel by 25%. potential energy source to replace coal in combustion. The use of calliandras as an alternative fuel can reduce carbon dioxide (CO<sub>2</sub>) emissions produced by burning coal. Based on the results obtained, there was no reduction in the impact category respiratory inorganics. This shows that there is no adverse effect if there is a change in fuel. Thus, the use of calliandra wood as an alternative fuel can help reduce the environmental impact of the cement industry and improve energy sustainability. But to achieve the 25% target has not been met. with the availability of 265 ha of land is still not enough to achieve the target, so more encouragement is needed for the desired target to be achieved. To achieved the target the number of calliandras required is 11490320.74 calliandras, with 1 m x 1 m planting, the land required is about 1,150 ha of land required. The target of 25% use of TSR is very possible by utilizing unused agricultural land in West Sumatra

## 6.2 Suggestion

Suggestions for further research on the topic of measuring environmental impacts using the Life Cycle Assessment approach are to expand the scope of the cement production process at PT Semen Padang so that the evaluation of the cement production process at PT Semen Padang can be carried out more thoroughly and also can mapping the land available to plan the calliandra to achive the target 25% TSR.

