

## CHAPTER 1

### INTRODUCTION AND BACKGROUND

#### 1.1 INTRODUCTION

There is a global trend towards sustainable environmental management and it is hard to imagine that the South African society will not be affected by this. In fact, statements by Government Departments, such as the Department of Minerals and Energy and the Department of Environmental Affairs and Tourism, indicate that the South African government is actively investigating the possibilities and consequences of South Africa's environmental responsibilities.

It would not be far-fetched to state that South African macro economic policy makers have established international recognition for the prudent manner in which they have approached South Africa's macroeconomic challenges since the landmark elections held in 1994. However, despite the successes that have been achieved, a number of concerns remain, of which sustainable development, the high level of unemployment and social imbalances are major aspects.

In the first instance, South African policy makers have to consider the objective of increasing future economic growth within a framework that ensures that current economic achievements are sustainable. Sound management of natural resources is therefore becoming an integral part of South African policy makers' responsibilities. Due to the fact that South Africa is relatively energy intensive, authorities have started to examine different approaches for managing its extensive resource base. One of the main concerns with regard to sustainable development is South Africa's current level of carbon dioxide (CO<sub>2</sub>) pollution.

The use of coal is the major contributor towards the high level of CO<sub>2</sub> pollution in South Africa. The country is endowed with a significant portion of the world's coal reserves and as a result, coal is used relatively cheaply to fulfil more than 75 percent of energy needs. The largest consumer of coal in South Africa is the electricity supply industry, which uses coal as its primary input. Coal accounts for about 93 percent of electricity generating capacity in South Africa (<http://www.fe.doe.gov/international/safrover.html>, p15). This results in severe pollution and electricity generation from coal is the single largest source of CO<sub>2</sub> emissions, with a contribution of more than 53 percent towards aggregate national CO<sub>2</sub> emissions. Apart from this, the use of coal-derived petroleum products contributes a further 14 percent to national CO<sub>2</sub> emission levels. It is

therefore not surprising that South Africa is the biggest contributor towards CO<sub>2</sub> pollution on the African continent (<http://wwwfe.doe.gov/international/safrover.html>, p19).

South African policy makers have a number of possible policy instruments at their disposal for addressing the environmental problem. A system of national environmental taxes would be a definite consideration in this regard. Taxes, however, distort economic behaviour and environmental taxation has several drawbacks. Besides popular criticism that refers to the loss of competitiveness that arises in countries that unilaterally adopt this type of taxation, more recent criticism has emerged. This criticism is directed towards subjects such as loss of efficiency and the complex nature of environmental taxation when more than one externality is present. These externalities include positive spillovers such as research and development. Also more importantly, it is generally accepted in economic literature that the benefit provided by environmental taxation is too costly in terms of the resultant lower economic growth because regulations imposed on firms can reduce the overall level of employment and investment in the economy (Carraro and Soubeyran, 1996, p73).

Concerns regarding the negative effects of environmental taxation are further highlighted by the fact that South Africa cannot afford to implement policies that could have negative consequences for economic growth and employment. It is well known that South Africa struggles with one of the highest levels of unemployment in the world and that current levels of economic growth are not sufficient to address this issue. It is also well known that a reduction in the unemployment rate is foremost on the agenda of policy makers in South Africa. It is almost certain that any policy that could decrease economic growth or employment will not find support from policy makers or in broader South African society, regardless of the consequences of pollution for sustainable development.

## **1.2 OBJECTIVE OF THE STUDY**

It is within the above-mentioned context that this study tests whether it is possible for policy makers to design an environmental policy that could achieve a simultaneous reduction in CO<sub>2</sub> pollution and increase economic growth and employment. Although the design of such a policy could seem ambitious, economic and environmental literature proposes two hypotheses that suggest that it is possible. These are the “double dividend hypothesis” and the “Porter hypothesis” (Goulder, 1994 and Jaffe, 1997).

The “double dividend hypothesis” suggests that switching the burden of taxation from labour to pollution could reform the South African fiscal system in a way that would reduce unemployment and increase economic growth. The “Porter hypothesis” suggests that environmental taxation could induce technological innovation in industries that are affected by environmental policies. This technological innovation could reduce pollution and unemployment while also contributing to economic growth.

These hypotheses are, however, controversial in many respects and have gained a significant amount of international interest from economists, environmentalists and policy makers. Much theoretical and practical research has been performed on the question of whether it is possible to obtain benefits simultaneously in both the non-economic and economic domains by internalising pollution externalities. If the answer is positive, one could infer that such a “no-regrets” environmental policy would correct market imperfections and contribute to economic growth and the reduction of unemployment in South Africa.

For illustrative purposes a policy that introduces a tax that increases the cost of coal by 50 percent (in the production processes of South African industries) is implemented. The use of coal as the object of taxation is chosen because of the importance of this resource in satisfying South Africa’s energy needs, and because of the positive relationship between the use of coal and CO<sub>2</sub> emissions.

The methodology of the study is comprised of:

- i. An investigation and description of the two economic problems that are addressed in this study. The first problem that will be investigated is the contribution of consumption of coal towards South African CO<sub>2</sub> pollution. The second is the problem of unemployment in the South African economy.
- ii. Descriptions of these economic problems are followed by an investigation and review of the double dividend and the Porter hypotheses. This review consists of an overview of the economic literature that concerns itself with both the theoretical and practical sides of the two theories.
- iii. Investigation of the economic theories is followed by a description of a Computable General Equilibrium model (CGE model) that is used to test different environmental policy proposals.

- iv. Finally, results from the different policy proposals are reported and recommendations are made towards the design of an environmental policy that could address environmental concerns without harmful consequences for the economy.

### **1.3 OUTLINE OF THE STUDY**

This thesis can be divided into four sections. The first section can be described as “The Problems” (consisting of Chapter 2 and Chapter 3). Chapter 2 describes the South African coal sector, the use of coal in South Africa and the pollution problem that is associated with this resource. Chapter 3 describes South Africa’s problem of unemployment and how it seems to be limited to the unskilled and informal sector labour force.

The second section can be described as “The Literature Review” and consists of Chapters 4, 5 and 6. Chapter 4 describes the literature and theory behind the double dividend hypothesis, while Chapter 5 describes some empirical findings from studies that have been performed to test this hypothesis. Chapter 6 describes the literature and theory behind the Porter hypothesis and highlights the potential role that technological change plays in obtaining the dual objective of economic growth and an improved environment over the long term.

The third section consists of “The Model” (Chapters 7, 8 and 9). Chapter 7 briefly describes the concept of a general equilibrium- and computable general equilibrium (CGE) model. This chapter is included for the benefit of “non-economic/non-modeller” readers. Chapter 8 describes the structure of the CGE model that is used in this study, while Chapter 9 describes the database and the derivation of the various elasticities that are used within the model.

“The Results” make up the fourth and last section (Chapters 10, 11 and 12). The model closures are described in Chapter 10, while the results of the short-run simulations are reported in Chapter 11. These short-run simulations are proposed to test whether some form of double dividend is possible in the South African economy over a short time period. It is shown that certain applications of tax revenue would achieve positive welfare and economic benefits in the short run. In spite of this, the short run simulation results indicate that without technological innovation, the environmental benefit from environmental taxation would be insignificant. Chapter 12 builds on the results of the short-run simulations in Chapter 11 – the scenario of whether technological innovation could result in positive benefits for the environment and the South African economy is tested.

University of Pretoria etd – De Wet, T J (2003)

A summary follows in which the results of the study are summarised. Recommendations towards further study and policy objectives are made.