

TAXATION AND POPULATION CONTROL AS ENVIRONMENTAL MANAGEMENT TOOLS IN SOUTH AFRICA

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INTRODUCTION

Waste is an inevitable consequence of human existence, whether it be from a primitive subsistence lifestyle or from a high technology society. Natural processes can absorb and recycle effluent to a certain extent and consequently conserve the ecosystem. However the environment has a limited capacity to absorb pollution, and when that limit is exceeded the cumulative effect of the pollutants affect standards of living.

Concern about the environment, especially at the local level, is not only of recent occurrence. Mankind has been taking steps to counteract pollution for at least the last two millenia.

Problems associated with pollution in early Rome are documented¹. For example, "*Aristo ... did not think smoke could legitimately be allowed to penetrate from a cheese-factory into buildings higher up the road ... no more can you throw water or anything else from a building higher up on those lower down ... and smoke is just the same as water.*" Here it is recognised that a polluting industry should not affect its neighbours and steps are being taken to mollify the situation. Moreover, the comparison between smoke and water (or anything else) indicated that the unacceptable disposal of waste pertains to all forms of pollution and a holistic approach to environmental affairs.

Early documents from Israel² showed that people reacted strongly against sources of air pollution. This is evident in the Mishnah, a collection of 4 centuries of Jewish religious and cultural activities in Israel beginning during the latter half of the 2nd century BC. Probably one of the first zoning restrictions as an approach to air quality and cause management is described in the Mishnah. Three examples are described here:

- a) "*One must not establish a bakery or dyeing shop under another's store-house, nor may one open a stable underneath a storehouse.*" The reason being that the noxious odours produced by these enterprises may penetrate the store-house and cause deterioration of the commodities therein.
- b) "*Partners may prevent one co-partner from establishing a store in the court claiming 'We cannot sleep on account of noise produced by peoples coming and going'*", an early reference to noise pollution.
- c) "*Carcasses, cemeteries and tanneries must be removed from the town to a distance of fifty cubits (approximately 25m). A Tannery must not be established except on the east side of the town.*" Thus illustrating how zoning and

meteorology played an important role nearly 2000 years ago by placing enterprises at a distance and/or downwind of a town.

The above examples illustrate the ancients' recognition and control of pollution. Over recent centuries the severity and scale of pollution have increased with the introduction of fossil fuels and the rapid increase in world population. Technological advances and increased standards of living have seen a huge pressure placed on the environment. The increase in human population (even in those areas which are not technologically advanced) has stressed the environment.

This paper will discuss two cardinal points with regard to safeguarding the environment and human existence and prosperity; namely limiting the population and making pollution control cost effective. These two can be used as environmental management tools.

ENVIRONMENT

The environmental problem can be succinctly stated as: a numerous population disposing of an ever increasing quantity of waste into a finite environment, where the limitations of the environment to absorb the waste without detrimental effects have been exceeded.

The managements of anthropogenic activities on the environment will be considered here from two aspects:

- a) **Population Burden:** The increasing numbers of population and standards of living exacerbate environmental stress.
- c) **Cost Allocation:** The full cost of waste disposal is usually not borne by the source of the effluent.

Population Burden

The environmental problems of the world are reflected in South Africa. The population can be broadly divided into two groups; the poor or third world component and the affluent or first world component. The first world component of the population are few and enjoy a high standard of living. The third world component of the population are numerous and have aspirations to increase their standards of living to a first world level. The path to higher standards of living in the third world are impeded by large families and a high population growth rate.

Thus the population factor has two aspects:

- a) **Population growth:** More people will consume more resources with consequent increase in effluent.

- b) **Aspirations of the existing populace for increased standards of living:** Increasing the standard of living for the world's poor will require more industry, more chemical plants, more power plants, more vehicles, etc with an accompanying increase in total effluent.

With regard to the latter, consider the scenario where everybody in South Africa lives at a first world standard. This would mean that *industry* etc. would increase *n* fold, and assuming that existing pollution control methods are retained and a linear *knock-on* effect, then effluent would also increase *n* fold. (The existing effluent of the third world component will be extracted anon.) This scenario will be investigated from the aspect of the three pollutants of SO₂, NO_x and particulates - and will calculate the effective increase or decrease of these emissions according to the afore-mentioned changing life-styles. The present annual emission levels of these pollutants in South Africa^[9] are given in Table 1. To obtain a measure of the emissions in a hypothetical South Africa where all the population has first world standards, first extract the third world component from the data in Table 1 so that only the first world component remains, then multiply by a population factor (*x*5). For the purpose of this exercise, it will be assumed that the first world component comprises 20% of the population and that the third world component comprises 80% of the population.

Table 1: Annual emission levels of pollutants in South Africa^[9] (millions of tonnes per annum)

	Total Emissions	Power Generating Plants	Other Industries	Domestic	Vehicles
SO ₂	2,8	1.18	1.51	0.08	0.03
NO _x	0.9	0.33	0.33	0.01	0.23
Particulates	1.0	0.20	0.53	0.24	0.03

Extract the 80% third world component from the values in Table 1. Assume that all the domestic effluent originates from the third world component, and that a conservative 60% of the effluent from the power generating plants, other industry and vehicles is attributable to the first world component. Then the emissions attributable to the first world component alone can be easily calculated and are given in Table 2.

Table 2: Annual emission levels of pollutants in South Africa calculated as attributable to the first world component (millions of tonnes per annum).

	Total Emissions	Power Generating Plants	Other Industries	Domestic	Vehicles
SO ₂	1.64	0.71	0.91	0	0.02
NO _x	0.54	0.20	0.20	0	0.14
Particulates	0.46	0.12	0.32	0	0.02

The total population of South Africa has been assumed to be five times the first world value. Therefore it is a simple matter to calculate the total emissions should the whole of the population be of the first world standard - see Table 3.

Table 3: Hypothetical emissions if the present population of South Africa were at first world levels.

	Total Hypothetical Emissions M tonnes/ annum	Increase Over Present Day Levels
SO ₂	8.2	2.9
NO _x	2.7	3.0
Particulates	2.3	2.3

In this scenario, it can be seen that should the entire present population of South Africa be instantaneously transformed to a first world level then the SO₂ and NO_x emissions would increase three fold. The particulate emissions would increase only 2.3 times, lower than the other SO₂ and NO_x as would be expected from the decrease in the domestic coal consumption by the third world component.

If present trends continue, the population of South Africa is expected to double over the next few decades. In this case, extrapolating the figures in Table 3 indicated a six fold increase in SO₂ and NO_x emissions and a nearly five fold increase in particulate emissions.

Cost Allocation

Although some industries are implementing responsible controls of air pollution, these are essentially non-contributory to the bottom-line profit.

Presently, reasons for undertaking pollution controls include:

- a)- Legal Requirements.

b) Concern for the environment and company image.

Neither of these two considerations concerns increasing industrial efficiency. Therefore on economic grounds, there is little reason to implement pollution control measures.

Presently, effluent injected into the atmosphere has no further cost implication at source. Such pollution impacts *down-wind* with its accompanying costs, now borne by sectors of society which have had no share in the profit generated at the pollution source.

DISCUSSION

It has been shown above that the increasing population and standards of living may have the effect of considerably increasing the pollution load on the environment. If the viability of mankind is to be maintained then the increasing pollution stress on the environment must be relieved. This Section will discuss this topic from two aspects: limiting the population and cost effective pollution control.

Population Control

The environment in South Africa, let alone the world, cannot endure an ever increasing population and still remain viable. Water resources alone place an upper limit of approximately 80 million people in South Africa (a limit which perhaps needs further investigation in light of recent droughts and severe climate variations). Moreover, just the increase in living standards of the third world component of the present population will place undue stress on the environment. The implication is that the growth in the population must be curtailed, else impoverishment will increase.

Although Africa has been the only part of the world where fertility has not shown signs of decreasing, recently in certain parts the birth rate has shown signs of abating. For example in south western Nigeria women want contraception at three main points of their lives^[4]:

- * *Before marriage. Teenage pregnancies become increasingly undesirable once education is the key to some forms of employment.*
- * *After birth. Many sub-Saharan societies traditionally expect women to abstain from sex for two to three years after the birth of a child. That habit is breaking down, but there is pressure to keep up appearances, which, coupled with an awareness that spacing helps the children's health, means there is demand for contraception.*
- * *Once a grandchild is born. Older women using contraception in south-western Nigeria often do so because they do not want an embarrassing pregnancy to reveal that they are sexually active grandmothers.*

Part of the reason for the fall in birth rate appears to be a change in government policy whereby the wider distribution of contraceptives is encouraged^[4]. The above shows that a change in customs is possible. Large families must be

curtailed, and the common excuse of tradition must go the way of other traditions (such as living in caves) and evolve into a practice commensurate with the modern world.

A population limitation programme is a national matter and therefore is the responsibility of central government. The present family planning programme should be expanded as is deemed appropriate. One of the more persuasive methods is to make it financially rewarding to have small families. Legislation limiting size of families has been promulgated in a number of countries - eg Singapore, China where families are limited to one child, and more recently Iran which has just passed legislation limiting couples to three children^[6]. Unless mankind voluntarily limits population, then the decision will be taken from him and natural effects will take over with the accompanying human misery.

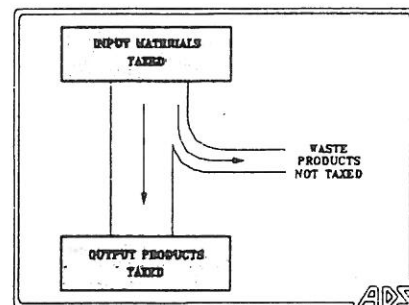
Taxation

It is inevitable that pollution must be more effectively controlled if we are to preserve our environment. Even if the population numbers could remain static, the uplifting of the third world component will increase effluent.

The defense that South Africa is a developing country and therefore cannot afford investment in pollution control is invalid. It is based on the perception, the industry's view point, that present pollution control is non-productive. The alternative, as stated in the President's Report^[5], is to put a value on pollution. This could be done in the form of a well constructed tax structure.

FIGURE 1:

Industrial process configuration showing the three elements of input, output and waste. Generally input materials and output products are taxed - waste is no taxed.



Legislation in South Africa provided for taxes at various levels in our society. For industrial processes, these include a tax on input services and materials, and on the output products - Figure 1. Presently the third element of an industrial enterprise, namely the waste products, is untaxed. The financial implications of pollution are not born by the source. Placing a well constructed tax on this element can have a number of advantages to the industry, government, and the population as a whole.

- a) It would provide the government with an extra source of revenue.
- b) It would provide industry with an avenue to decrease its tax burden by trading off the costs of pollution control and tax obligations.
- c) Provide an environment acceptable to the general public.

The system should be implemented so that the tax is seen not merely as a fine, but as a less desirable alternative to waste control. The intention of the system is not to punish the emitters of effluent, but to apply a charge for using the environment as a dump (as other services are costs) at such a level that control alternatives become cost effective. The waste dump charge should be placed on the amount and types of effluent produced.

The implementation of such a tax requires a multi-disciplinary investigation before application. Technical aspects which bear consideration include:

- a) Only those effluents which can be reliably measured can be utilised. This may seem to place an unfair advantage on industries whose waste products cannot be measured. In these cases it may be possible to base the waste dump charge on input materials and make adjustments for the efficiency of installed cleaning equipment.

The rate of the tax should be commensurate with known detrimental impacts of the effluent.

- c) Infra structure to implement a monitoring network will need to be established.
- d) Care must be taken to ensure that industries are not placed at an international competitive disadvantage.

The revenue generated from such a tax could be allocated to a special fund (rather than the general government coffers although past experience advocates caution) and used to ameliorate the effects of the pollution. These could include inter alia:

- a) Administration of a national environmental management programme.
- b) Environmental research, and the development of new control technologies.
- c) Medical treatment of those suffering from the effects of pollution.
- d) Cleaning-up operations associated with accidental spills.

An appropriate tax will encourage the development and use of innovative pollution control technology.

CONCLUSION

Mankind has had mastery of his environment, using and moulding it to his desires, but his custodianship has been less than impeccable. The world is presently reaching its limits to absorb anthropogenic waste. The expanding population and the aspirations of the present populace place an ever increasing burden on the environment. For example, if in South Africa the entire population existed at a first world level, then some of the present air pollution emissions would increase approximately three fold. On the other hand industry, which is blamed for most of the pollution, produced wealth and increased standards of living which tends to limit population growth.

The following two points are proffered as management tools to limit pollution:

- a) The population should be limited to curtail demand of resources. In the long term (time scale of centuries) the population should be limited to levels which can be sustained by renewable resources.
- b) Pollution should be made cost effective by the application of an appropriate charge for the use of the environment as a dumping ground.

Although a pristine environment may not be attained, the ideal goal is to maintain an environment in which both flora and fauna can cope with limited levels of pollution without discomfort. If actions are not taken to improve management of the environment, then natural processes will take over and render mankind inconsequential.

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