

**ENVIRONMENTALLY PREFERABLE  
PRODUCTS: A PRELIMINARY  
ASSESSMENT OF THE STATUS FOR THIS  
SECTOR IN SOUTH AFRICA**

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**CONTRACT REPORT**

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PRELIMINARY ASSESSMENT OF THE STATUS FOR THIS  
SECTOR IN SOUTH AFRICA**

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## EXECUTIVE SUMMARY

The Department of Trade and Industry (DTI) commissioned the CSIR to compile an article based on a preliminary assessment of environmentally preferable products (EPP) in South Africa. The article mainly seeks to assess and review trends in EPPs in specific market sectors; identify a preliminary list of EPPs; and conduct a case study on one EPP.

According to UNCTAD [1], “environmentally preferable products (EPPs) are defined as products which cause significantly less environmental harm at some stage of their life cycle (production/processing, consumption, waste disposal) than alternative products that serve the same purpose, or products the production and sales of which contribute significantly to the preservation of the environment”. No formal South African definition for EPPs exists, and the UNCTAD definition is expected to be suitable for South Africa.

The lower environmental impacts of EPPs and their contribution to environmental preservation are generally related to the use of natural resources and energy; the amount of waste generated along the life cycle; impacts on human and/or animal health; and the preservation of the environment. In most cases the life cycle assessment (LCA) approach is generally used for determining, or verifying, the environmental friendliness of a product or service.

Internationally growing environmental awareness is conducive for the growth of EPP markets mainly in developed countries, but this is also increasing in developing countries. Specific market sectors in South Africa such as the chemical processing and agricultural sectors are experiencing pressures from local and international customers to improve their environmental performances.

The preliminary list of South African EPPs is:

- Organic agricultural products
- The wind-up radio and other appliances
- Environmentally friendly wine production
- Domestic wastewater treatment – the Bardenpho process
- Bioleaching technology
- Microwave technology for recycling acrylic sheets

- Environmentally preferable automotive manifold

A case study is conducted on the wind-up radio. The radio is produced with a clockwork mechanism that stores energy and can deliver electricity on demand. A spring generator, activated by a wind-up device, generates the power, removing the need for solar power, batteries or mains electricity. It was initially seen that the main purpose of the product was to enhance communication in developing countries, but the product has become a success in developed countries due to its environmental attributes.

It is recommended that a more comprehensive list of South African EPPs be compiled to assist the DTI in monitoring the trends in EPPs. This will enable the DTI to assist producers and promote the production of EPPs.

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## 1 INTRODUCTION

The Department of Trade and Industry (DTI) approached the CSIR for assistance in compiling an article based on a preliminary assessment of environmentally preferable products (EPP) in South Africa. Funding for the project was obtained from the United Nations Conference on Trade and Development (UNCTAD).

The article should seek to:

- provide a definition for EPPs based on international literature, and with a South African context,
- identify the criteria for a product qualifying as an EPP,
- assess and review trends in EPPs in specific market sectors, and
- identify a preliminary list of EPPs, and conduct a case study on one EPP. The case study will seek to identify the driving-force for the production of the EPP, the market reaction to the EPP, and other product specific characteristics.

The approach that was adopted was a preliminary assessment of environmentally preferable products in a South African context. This was through a review of relevant literature, however since this sector is relatively new in South Africa, international literature was primarily reviewed. Literature was sourced from the DTI, the Internet and the CSIR Information Centre.

## 2 DEFINITION OF ENVIRONMENTALLY PREFERABLE PRODUCTS

According to UNCTAD [1], “environmentally preferable products (EPPs) are defined as products which cause significantly less environmental harm at some stage of their life cycle (production/processing, consumption, waste disposal) than alternative products that serve the same purpose, or products the production and sales of which contribute significantly to the preservation of the environment”. Environmental harm can be interpreted to mean both environmental degradation as well as impacts on human health as implied by the US-EPA [2]. Therefore the environmental and human health impacts are assessed throughout the life cycle of the product, or for specific stages of the product life cycle and compared with alternative products. These products include manufactured products, agricultural commodities and forest products as well as services such as tourism [3].

Technologies and processes that have lower environmental and human health impacts than competing technologies and processes can also be classified as environmentally preferable.

The attainment of sustainable development is generally seen to be the final goal of the production and use of EPPs as seen by UNCTAD [1] and the International Institute for Environment and Development (IIED) [3]. Therefore the impacts of a product or service should be assessed on environmental as well as on social grounds; the former in terms of its contribution to the preservation of the environment, and the latter in terms of its contribution to the satisfaction of the basic needs of its producers. This article will focus on the environmental issues of EPPs.

Due to the increased awareness of the environment and environmental attributes of products in developed countries, a significant market has been created for the use of environmentally preferable products in these countries. It is largely seen that certain products, particularly agricultural products, from developing countries are preferable due to their lower environmental impacts [1]. These products satisfy the needs of the markets created in developed countries thereby making export options possible for developing countries. Associated with the export from developing countries are the potential benefits of foreign exchange generation/savings, employment and income generation, and environmental protection and improvements.

No formal South African definition for EPPs was found in the literature, however the UNCTAD definition is expected to be suitable for South Africa. In most South African cases, products are referred to as 'environmentally friendly products' in comparison to other products when they exhibit reduced or limited environmental impacts. The life cycle assessment approach is relatively new in South Africa, so the environmental impacts of the complete life cycle of the product or service are not yet considered. However specific stages of the life cycle are considered such as the use of the product (eg. reduced electricity usage) or manufacturing stage (eg. limited use of resources).

### 3 CRITERIA FOR QUALIFYING AS AN ENVIRONMENTALLY PREFERABLE PRODUCT

The lower environmental impacts of EPPs and their contribution to environmental preservation are generally related to one of the following areas [1]:

- the use of natural resources and energy,
- the amount of waste generated along the life cycle,
- impacts on human and/or animal health, and
- the preservation of the environment.

As indicated previously, a life cycle assessment (LCA) approach is generally used for determining, or verifying, the environmental friendliness of a product or service. Using the LCA approach, the environmental impacts are determined for the different phases of the product (raw materials acquisition, production/processing, packaging, use, re-use, recycling and product disposal). The LCA of a product can be used to identify environmental advantages of a product; provide evidence which helps to protect a product against negative claims; and identify environmentally harmful phases in a product's life cycle. Therefore a complete, or partial, life cycle assessment of a product is needed to determine or verify if a product is environmentally preferable.

The LCA approach or the compliance with specific standards is manifested through product labelling. Various types of environmental labels and certification programmes have been developed which respond to different criteria for EPPs [4]. An example of a certification programme is the International Federation of Organic Agriculture Movements (IFOAM) in the organic sector, which lays down guidelines for environmental performance and the social rights of workers [5].

The above discussion presented the criteria for EPPs, but it must be noted that mainstream consumers value price and performance ahead of environmental qualities [1]. Even though consumers in developed worlds are generally willing to pay premium prices for EPPs, the EPPs must demonstrate that they have superior environmental qualities above alternative products, and that the performance is the same or better.

## 4 TRENDS IN MARKET SECTORS

As the trend towards environmental awareness continues to increase in developed countries, the markets for environmentally preferable products, services, technologies and process will continue to grow, however the market for EPPs is still considered small in global terms. Growth for this market could soon become evident in developing countries as environmental awareness increases there as well, and the market for EPPs could become significant on a global scale.

Specifically in South Africa, which is classified as a developing country, the awareness in environmental issues and environmental impacts of products is increasing. However, this increase in environmental awareness is practically limited to middle and upper social classes. For the bulk of the South African population which is classified as lower social class, other product attributes like cost and performance still outweigh the environmental considerations.

### *Environmental legislation and policies*

Recently introduced legislation in South Africa includes the National Water Act, the National Environmental Management Act, the White Paper on Integrated Pollution and Waste Management, and the National Waste Management strategy. This legislation has focussed on integrated waste management including waste minimisation, re-use, recycling, etc. These Acts and policies are not directly related to EPPs, but they have forced manufacturers to focus on products that use lesser resources and produce less waste thereby being more environmentally friendly and acceptable.

### *Public awareness*

As indicated previously, increasing public awareness is mainly in the middle and upper social classes, and this is mainly due to the improved availability of information on environmental issues. Although, this is not directly related to EPPs, it is expected that markets for EPPs will benefit nevertheless.

Specific market sectors in South Africa such as the chemical processing sector are already experiencing pressures from legislation, customers (local and international) and local communities to reduce their environmental impacts. The result of this pressure is that companies are forced to produce products and technologies that are more environmentally friendly and are seen to be environmentally preferable. International and some local customers are stipulating

that companies adopt an environmental management system such as ISO 14 001, to ensure continuous improvement of environmental performance.

Another sector that is seeing the benefits and importance of EPPs is the farming/agricultural sector. It has been indicated that the global growth in organic grown agricultural products is approximately 20% per year [5]. This presents significant opportunities to the local agricultural sector in producing organically grown agricultural products. Organic products are grown, processed and packaged without using synthetic chemicals, and in a manner that does not harm the environment therefore they are categorised as EPPs. These products are also preferable because they are not genetically modified, and consumer trends in Europe are moving away from genetically modified crops.

It has been claimed that organically grown products fetch prices between 20 and 30% more than non-organically grown products [5]. However some farmers have indicated that the figure is closer to 10% more, suggesting that even though there are significant demands in European markets, the importers and retailers make the larger profits. The developing world farmers have to compete through lowering prices and reducing profits, the economics thereof may be questionable in many cases.

## 5 PRELIMINARY LIST OF SOUTH AFRICAN ENVIRONMENTALLY PREFERABLE PRODUCTS

The following is a preliminary list of EPPs that are produced in South Africa.

### *Organic agricultural products*

As indicated above, developed-world markets have created significant demands for organically grown agricultural products. South African farmers have acknowledged these demands and are converting to organic farming.

### *Wind-up radio and other appliances*

A British inventor, Trevor Baylis, developed the clockwork-driven radio. The rights to produce and market the radio were acquired by two South African based executives, and they formed the BayGen Power Group in 1994 [6].

The initial radio that was produced had a clockwork mechanism which stores energy and can deliver electricity on demand. A spring generator, activated by a wind-up device, generates the power, removing the need for solar power, batteries or mains electricity [7]. Subsequent models of the radio do include supplementary energy sources such as solar power and batteries.

Since the initial radio does not require batteries or mains electricity, it can be used in remote areas where batteries and mains electricity are not available [8]. The radio is referred to as an EPP as it does not require mains electricity or use batteries, thereby conserving natural resources.

### *Environmentally friendly wine production*

The South African wine industry have taken steps to ensure that South African wine ranks among the world's best with the launch of the Integrated Production of Wine (IPW) programme in 1998 [9]. The IPW programme is an environmentally friendly system, differing from systems in other countries because it is totally inclusive and includes all process from soil preparation to the production processes and even up to the recycling of the packaging material of the final product.

The system was implemented to ensure that South African wines are accepted in export markets due to environmentally preferable characteristics [10].

*Domestic wastewater treatment – The Bardenpho process*

Countries throughout the world (USA, Canada, Brazil, Poland, Japan, New Zealand, Denmark and Germany) are enjoying benefits derived from a wastewater treatment process developed by South-African born engineer Dr James Barnard and the CSIR [11]. The process, referred to as the Bardenpho process, was developed to remove nitrates and phosphates from wastewater.

The process converts the nitrates formed in activated sludge into nitrogen gas, which is released into the air. While this occurs, 90%-97% of the phosphates in the water are captured by the biological sludge. A portion of the sludge is removed and disposed off on the lands, thereby removing the phosphates from the sewage.

The Bardenpho process is environmentally preferable when compared to other processes as it removes both nitrates and phosphates whereas other processes remove nitrates and little or no phosphates. Nitrates and phosphates are the main causes of the eutrication of water bodies, and have to be removed from sewage.

*Bioleaching technology*

Traditionally the recovery of copper from sulphide ores involved the use of furnaces or smelters. This resulted in environmental problems such as the release of sulphur dioxide [12].

Billiton have developed bio-leaching technology at their South African research facilities for the treatment of copper, nickel and zinc (BioCOP®, BicNIC® and BioZINC® respectively) containing ores. Bio-leaching refers to the use of microorganisms to dissolve metal of value (eg. copper, nickel, zinc) from a sulphide mineral. The end product of bio-leaching is an acid solution containing the soluble metal. Economic studies have established that this technology is competitive with the traditional processes. It has also been established that this technology is environmentally preferable to smelting and roasting processes as gaseous sulphur dioxide emissions are eliminated and arsenic is released in the form of an environmentally acceptable and disposable effluent [12].

Recently, Billiton announced a 50-50 joint venture with Chilean copper group Codelco for the use of the Billiton BioCOP® technology for the extraction of copper in Chile [13]. This represents an example of South African environmentally preferable technology that is used abroad, in this case a developing country.

### *Microwave technology for recycling acrylic sheets*

Using the know-how of microwave technology, a team of South African scientists have developed a method to recycle acrylic sheets (polymethyl methacrylate) effectively [14]. Though microwave technology has been in use for a number of years, this new method of polymer recycling was said to be a world first. This method could mean the end of the environmentally unpopular method of acrylic recovery using the molten metal bath. These molten metal baths are still being used in countries such as the UK and the Far East. The molten metal bath process is not energy efficient and generates effluent that requires treatment incurring additional costs.

The microwave technology is claimed to be more energy efficient, and since it lacks a caustic wash stage, it does not require effluent treatment. This technology is still in its development stage, but it could become another exportable South African technology that is the environmentally preferable option for the global acrylic recovery industry.

### *Environmentally preferable automotive manifold*

The Centre of Automotive Engineering at the University of Stellenbosch in South Africa has developed an environmentally preferable automotive inlet manifold [15]. The manifold was designed to be fitted onto vehicles in China so that they comply with stringent emissions requirements.

The inlet manifold is a series of pipes through which the engine breathes air. If designed correctly, it can enhance the performance of the engine. In this case, an older technology car's engine was adopted to use electronic fuel injection with a catalytic converter that reduces emissions by about 90%. For this reason, the manifold is classified as an EPP.

## **6 SOUTH AFRICAN CASE STUDY**

As indicated earlier, a case study would be conducted one on EPP. It was decided to conduct the case study on the Wind-up radio.

### ***The Wind-up Radio***

The clockwork-driven radio was invented by Trevor Baylis after he saw a television programme on the devastation caused by AIDS in Africa. He was inspired to build a simple spring powered generator that he hoped would improve communications, and help aid workers in Africa. The rights to produce and market the radio were acquired by two South African based executives, and they formed the BayGen Power Group in 1994. From small beginnings and employing only disabled workers at its plant, the BayGen Power Group produced 40 000 radios a month in 1998 for developing and developed country markets [16].

The initial radio that was produced had a clockwork mechanism that stores energy and can deliver electricity on demand. A spring generator, activated by a wind-up device, generates the power, removing the need for solar power, batteries or mains electricity. The generator provides a constant 3V output at around 50 mA. Subsequent models of the radio do include supplementary energy sources such as solar power and batteries.

As indicated, the radio was originally designed for use in areas where there was no mains electricity or where batteries were unavailable or extremely expensive. This means that the radio enhances communications in developing countries in a variety of areas such as health care, education and community liaison. The radios have been bought by more than 20 international humanitarian organisations, including UNICEF, the Red Cross and the Royal Institute for the Blind [7].

However, even though the radio was developed for the developing world, its biggest markets are the USA and Europe where it is considered environmentally preferable because it does not use batteries or mains electricity. Therefore it is seen to be preserving the environment by using limited resources (electricity), and producing less waste (batteries) through its life cycle.

In 1999, the sales of the radio surged to \$50m, this was mainly attributed to first world survivalists, who latched onto the wind-up concept while preparing for the chaos they expected with the arrival of the new millennium. The radio also seems to have struck a cord in the outdoor and adventure fraternity.

It was announced in 1997 that the trust fund of USA industrial giant General Electric has taken a 30% stake in BayGen's holding company for R22m [7] (approx \$3.5m). This means that BayGen has access to GE's corporate R&D

facilities. This means that together with the R&D facilities and the capital backing, other opportunities in harnessing person power can be realised such as toys, computer notebooks and even mobile telephones.

Therefore it can be seen that even though the wind-up radio was developed to serve the communication needs to developing countries, its biggest market has become the developed world due to its environmental preference relative to conventional radios. This is mainly due to the cost of the radio. At approximately \$35 per unit, this is relatively expensive to consumers in the developing world, however it is very affordable in developed world countries.

## 7 CONCLUSIONS

It has been seen that there are no deviations between the international and South African definitions of EPPs. Though the LCA approach is still relatively new in SA, products, services and technologies are still classified as friendly or preferable on the basis of one or two stages of the life cycle of the product, service or technology.

The preliminary list of South African EPPs has presented agricultural products, manufactured products as well as a number of locally developed technologies. This may present a distorted picture of EPPs in South Africa, and it is further recommended that a process be undertaken to compile a more complete list of South African EPPs.

The case study that was conducted dealt with the wind-up radios. These radios were developed to satisfy a specific market need in developing countries. Ironically, developed country consumers are buying the radios due to its environmental attributes, and outdoor convenience.

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