

### SOUTH AFRICAN RESOURCES

South Africa has a number of resources which need to be properly managed to ensure that it is not exploited. Exploitation of our resources will affect our food production, medication, energy supply, our economy and it may lead to some species becoming extinct. The following resources will be discussed:

Plants, e.g. African potato

Animals, e.g. fish, black rhino

#### A. AFRICAN POTATO: an example of a South African resource for medicinal purposes

The World Health Organisation (WHO) estimates that around 80% of the population in Africa uses traditional medicines. In Sub-Saharan Africa there is one traditional healer for every 500 people, whereas there is only one medical doctor for every 40 000 people. It has been estimated that 70% of the South African population consult traditional healers and that the whole industry is worth R250 million.

Raw materials for herbal medicines are often collected from wild plant populations. Over-harvesting to meet the demands for the local use and export demands is a growing problem. Widespread publicity about the use of the African potato in treatment of HIV/AIDS has boosted the demand for the plant

#### AFRICAN POTATO (*Hypoxis hemerocallidea*).

Common names: yellow stars, star lily, african potato (Eng.); sterretjie, Afrika-patat (Afr.); inkomfe, ilabatheka (isiZulu)



African potato showing leaves and flowers



Tuber of the African potato found below the soil

#### GEOGRAPHICAL DISTRIBUTION

Common in grasslands of the provinces of the Eastern Cape Province, KwaZulu -Natal, Mpumalanga, Northern Province and Gauteng as well as in our neighbouring countries Swaziland and Lesotho.

#### MEDICINAL USES OF THE AFRICAN POTATO

The African potato plant is high in sterols and sterolins. These are natural immune-boosting substances that have yielded an important breakthrough in the fight against arthritis and cancer. Since they also increase the body's natural resistance to disease, the African Potato has given fresh hope to treatment of other illnesses from the common cold to cancer. Further research on the plant extract has shown that the new remedy appears to alert the immune system to produce more lymphocytes which are then made available to destroy invading viruses and bacteria which cause bodily harm. Some studies indicated that the African potato is beneficial in the treatment of diseases in the following ways:

- Cancer:** Apart from immune-boosting sterols, the African Potato was also found to contain a new compound with definite anti-cancer properties
- Rheumatoid Arthritis (RA):** is an inflammatory disease characterized by dysregulation of the immune system. B-lymphocytes become overactive and secrete antibodies that destroy synovial tissues of the joint. Sterols/sterolins have been shown to increase the regulation of antibody production by B-lymphocytes. It also decreased secretion of pro-inflammatory macrophages, thereby decreasing inflammation.
- Immunosuppression in Endurance Athletes:** Marathon runners and endurance athletes often exhibit an increased inflammatory response to injury, as well as an immune suppression characterized by frequent bacterial and viral respiratory infections, all a result of high-intensity training. A study of marathon runners given a 100:1 sterol/ sterolin mixture found a decreased inflammatory response.
- Diabetes:** Animal research found that in an oral glucose tolerance test sterols/ sterolins protected test animals from an excessive rise in glucose levels due to glucose loading. This may be attributable to the fact that these sterols are capable of stimulating insulin secretion and thereby raising circulating insulin levels for better blood sugar control.
- Pulmonary Tuberculosis:** The results of a study suggest that the drug might be of therapeutic value in cases of multi-drug-resistant tuberculosis.
- HIV/AIDS:** Research conducted in South Africa indicated a slowing viral replication rate thereby slowing disease progression.

**Dosage forms:** In traditional medical practice, a mixture is taken orally. Fresh juice from the tuber is applied externally. Tuber extracts are also available in capsule and tablet form.

#### Traditional medicines currently under investigation

Not all scientists believe in the healing value of *Hypoxis hemerocallidea* (Inkomfe, "African Potato"). Some initial research has also been done on this bulb, which suggests that it may have immune-boosting properties in the short-term. However, laboratory research at Tygerberg Hospital by Prof P Bouic indicated that it might harm the immune system when taken over a long term. This illustrates the need to properly investigate all these plants before they are given as treatments.

#### Corrective management

The many uses of the African potato make it a very popular plant which may lead to the exploitation of the plant if it is not protected. If the African potato is exploited it may become extinct which may influence food chains and food pyramids. Humans may not have any plants to use for medicinal purposes.

To protect the plant many medicinal plant nurseries have been established. The medicinal plant nursery at the Silverglen Nature Reserve in Durban is one such example. The horticulturist consults the local inyangas to determine which plants are generally required. The horticulturist then cultivates these species so that they

are made more easily available to the inyangas instead of them being harvested from the wild. The inyangas are also taught techniques of cultivating the required plants for themselves.

As a result of new legislation a Traditional Healers Council will be established. This Council will oversee the registration and regulation of all types of traditional healers (including inyangas, sangomas, traditional birth attendants and traditional surgeons), and will set practice standards.

It is estimated that 200 000 traditional healers will be eligible for registration. Once the new law comes into effect only registered healers will be allowed to practice traditional medicine. The new law does not allow for traditional healers to diagnose or treat terminal diseases, including HIV, AIDS, and cancer. Traditional healers who are registered will be able to claim from the medical aid schemes of their patients.

Traditional healers who are not registered and attempt to practice traditional medicine, or claim to be able to treat or cure a terminal disease, will be fined or imprisoned.

#### Scientific research into traditional medicines

#### The South African Traditional Medicines Research Unit of the Medical Research Council (MRC).

The MRC has established a South African Traditional Medicines Research Unit so that these medicines can be properly researched. They have also produced a guide for traditional healers entitled 'The South African Primary Health Care Handbook Combining Western and Traditional Practices'. This was written in consultation with different traditional healer groups and is in line with the South African National Drug Policy, which emphasises 'the rational and safe use of medicines, including traditional medicines'.

The CSIR is researching traditional medicines and the production of safe plant extracts that can be used in clinical trials. The Council works with other research institutes and universities as well as traditional healers. It has established a database providing information on over 500 commonly used plant medicines.

The National Reference Centre for African Traditional Medicines is a government initiative launched with the support of both the CSIR and the MRC. Its aims are to become a comprehensive resource and research centre for all aspects of traditional medicines, including the protection of intellectual property rights to the use and development of the different plant medicines.

#### B. FISH AS A RESOURCE FOR FOOD

Study the information provided and answer the questions set.

1. Some of the most important food chains occur in the sea. In the upper surface where light can penetrate, there are millions of microscopic organisms called plankton. Some of these organisms can photosynthesise and are therefore like plants. They are called phytoplankton. Others are like animals and feed on the phytoplankton. They are called zooplankton. The fish that we catch to eat, feeds on the zooplankton. This may be represented in the form of a food chain as follows:

phytoplankton → zooplankton → fish → humans

- If the fish population in an ecosystem had to be exploited by over-fishing:
  - 1.1.1 explain the effect this would have on humans. (2)
  - 1.1.2 explain the effect this would have on the zooplankton. (2)
- What effect would this change in zooplankton population, mentioned in 1.1.2 have on the phytoplankton population in this food chain? (4)
- Explain the importance of food chains in maintaining the balance in any ecosystem (4)
- Describe TWO abiotic and TWO biotic factors that could have a detrimental effect on the population of fish in an ecosystem. (8)

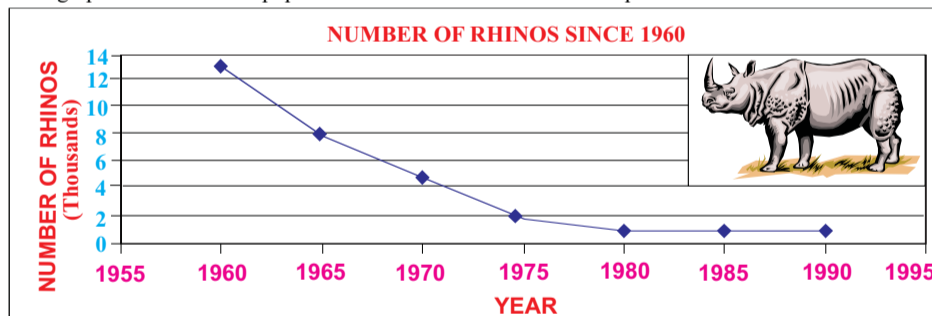
- Study the table below showing fishing quotas for two types of fish (1 and 2) in two countries (A and B).

	Country A	Country B
Fish 1	56 700	205 720
Fish 2	106 360	833 200

- 2.1 What information is needed to set the quota for each of the two countries? (2)
  - 2.2 Explain how the required information is obtained. (4)
  - 2.3 Why is the quota for fish 2 higher than that for fish 1? (2)
- The quotas for both types of fish could be different in a few years time. Suggest ONE possible reason for this. (2)
  - How does each country possibly try to keep within its quota? (4)

#### C. THE RHINOCEROS (GAME) AS A SOUTH AFRICAN RESOURCE AND AN ENDANGERED SPECIES.

- The graph below shows the population of the black rhinoceros over a period of time:



- The black rhino is on the red list of endangered species. What is an endangered species? (2)
- Provide an explanation for the shape of the graph. (4)
- What was the size of the rhino population since 1980? (2)
- Since 1975 there was a reduction in the rate at which the rhinoceros population slowed down. Suggest ONE way in which this may have been brought about. (2)

#### EFFECTS OF POLLUTANTS ON HUMAN PHYSIOLOGY AND HEALTH

##### Nature of pollutants

Pollutants can be classified into **degradable, non-degradable** and **biodegradable**.

Pollutants are also transferable i.e. They could move from their original source to other sources of pollution e.g. nitrogen oxides released by industries are dispersed into the air. These pollutants dissolve in moisture and fall to the ground as acid rain.

Types of Pollution	Examples of Pollutants
Air	Carbon dioxide, carbon monoxide, sulphur dioxide, lead, chlorine, asbestos fibres, dioxins, furans, nitrogen oxides
Water	urine, faeces, bacteria, fungi, detergents
Land	Radioactive waste, plastic, tin, organic waste, sewer, glass

#### WASTE MANAGEMENT

##### Effects on environment of waste:

Toxic wastes dumped into water destroy aquatic life. Illegal dumping can degrade soil. Burning wastes contribute to air pollution. Decomposition of waste produces greenhouse gases.

##### Effects on human health:

Waste scavengers are exposed to health hazards e.g. medical wastes. Burning of waste create ash and other air pollutants causing respiratory disorders, physical and mental retardation in children and cancer. Decay and faecal matter promote bacterial growth causing cholera, rashes etc. Dumping sites provide ideal habitat for rodents, flies etc. These creatures spread bacteria and fungi.

**Incinerators:** Incinerators are used to burn household, industrial and organic wastes in urban areas. Some hospitals dispose of medical waste in their own or send wastes to privately owned incineration companies. Human remains may be cremated depending on cultural beliefs.

**Corrective Management:** Recycle plastic, glass, tin, steel, paper and re-use glass. Reduce waste, create compost heaps by disposing of household vegetable matter. Educate schools, communities, industries about reducing waste and safe disposal of waste. Increase skilled personnel for effective monitoring.

Enforce stricter measures with respect to existing laws and enacting further relevant legislation