

SOUTH AFRICA

1. Physiography

Located on the southern tip of Africa, the Republic of South Africa stretches longitudinally from 17°E to 33°E and latitudinally from 22°S to 35°S. Namibia bounds the country on the Northwest, on the north the adjoining countries are Botswana and Zimbabwe, and on the northeast Mozambique and Swaziland. Lesotho, a landlocked country, forms an enclave within the Republic of South Africa. The South Atlantic and the Indian Oceans wash the relatively unindented coastline some 2 800 km long, west and east respectively of the longitude 20°E. The Republic has nine provinces - Northern Province, Mpumalanga, KwaZulu-Natal, Eastern Cape Province, Western Cape Province, North Cape Province, North West Province, Gauteng and Free State. The total land area of the Republic of South Africa is 122 341 km².

Topographically South Africa may be divided into four zones, the Plateau, the Escarpment, the folded Mountains and the Coastal Plain.

The Plateau, or High Veldt, has the appearance of a tremendous plain, interrupted here and there by small mountains. The Plateau, which comprises the major part of South Africa, is elevated about 1 200 m above sea level, rising to 1 800 m at the divide between the main drainage systems. South of the divide the rivers drain into the Orange River that flows westwards. The Limpopo is the main river north of the divide. It initially flows northwest, then north and eventually drains into the Indian Ocean on the eastern seaboard, as do the other long rivers of the north. Rivers rising at the edge of the escarpment are comparatively short and steep, and have formed deeply eroded canyons.

The escarpment varies in appearance according to the elevation and erosion. The most spectacular part is on the western border of KwaZulu-Natal, particularly on the Lesotho and Free State borders.

The Folded Mountains of the Western Cape Province separate two plateaux of lower elevation of 460 m and 600 - 900 m respectively, forming a step-wise approach to the central highlands.

The coastal plain varies greatly in width. In the south it is virtually non-existent but it widens on the western and eastern coasts.

2. Climate and rainfall

Approximately 86% of the area of the Republic of South Africa lies in the summer rainfall area. A narrow belt along the southern coast, some 4 million ha in extent, receives rain during all seasons. 13 million ha in the southern western corner have a Mediterranean climate with winter rainfall and a dry summer.

The rainfall decreases from east to west, from over 1 000 mm in the east to 50 - 100 mm in the Namib and Namaqualand areas in the west. Barely one third of the summer rainfall area receives more than 600 mm annual precipitation. This amount is close to the lower limit for successful rainfed crop production. An added agricultural hazard is the variable distribution of the rainfall, both within a particular season and between seasons.

The low-lying eastern coastal belt is hot and humid in summer. Because of the altitude, summer temperatures on the high inland plateau are generally lower than could be expected.

Winter temperatures in the interior often drop to below zero and frost is common.

limits of its economically usable, fresh water resources by the year 2030. Water requirements for irrigation are estimated at $10,7 \times 10^9$ m³/a or 53% of total water requirements of 20×10^9 m³/a during 1996. In addition, the maximum annual yield of groundwater is $5,4 \times 10^9$ m³ of which 2×10^9 m³ is exploited and 80% is used for irrigation. The area under irrigation in 1996 is 1,3 million ha with a potential for expansion of a further 200 000 ha, given the available water resources. Included in this total irrigated area is an area of between 50 000 - 100 000 ha which is used for foodplot and smallholder farming on a large number of irrigation schemes. Of the current area under irrigation, 86,5% is classified as very suitable and suitable (class 1 and 2 soils).

Current distribution of irrigation capacity (1998)

15 000 medium and large-scale commercial farmers irrigate around 1,3 million hectares divided into :

- 550 000 ha - Private schemes developed by owners to extract water directly from weirs, boreholes and farm dams; and for which there is no water charge at present.
- 400 000 ha - Irrigation board schemes which are privately managed but frequently were developed with Government grants and subsidised loans. In future these schemes will be managed by water user associations (WUAs).
- 350 000 ha - Government schemes which were built and operated by the Government. Operating costs are charged to farmers at a subsidised rate. The membership of these schemes will be transferred to WUAs also in due course.
- 75 000 ha - Distributed among 40 000 small-scale farmers. These schemes are operating below capacity and will be handed over to WUAs as a small hectareage of micro-scale schemes with gardens and community plots.

Water is applied for commercial production of field, industrial, horticultural, pasture and forage crops. Most of these crops are also grown in subsistence smallholder agriculture. Stabilisation of variable rainfall through irrigation is conspicuously more important for high income crops such as potatoes, vegetables, grapes, fruit and tobacco. Although grain and oilseed crops can effectively be grown under rainfed conditions, they will remain part of crop combinations under irrigation for production of seed and as rotational crops to maintain soil productivity. Pastures and forages form an important component of the fodder flow programme for dairying and sustain extensive livestock production in arid zones.

In all irrigation areas from 6 to 26% of soils have become waterlogged and salt-affected. The extent of the problem is noteworthy since, with the exception of one province, the area with high water tables and salinity levels is more than the area of risky soils (class 3 soils).

6. Brief history of irrigation development

Irrigation development in South Africa can be divided into three broad phases. It must, however, be emphasized that these phases overlap, as do involvement of private and public organisations who have undertaken the development :

Phase 1 : Individual diversion schemes

In the period up to 1875, water resource development for irrigation was done on private initiative. Small-scale utilization was undertaken without government assistance. This first phase of individual weir-diversion or pump schemes is characterized by a subsistence economy; limited and distant markets; and little incentives for capital investment in waterworks. Where natural circumstances were favourable, water was abstracted from rivers.

Phase 2 : Co-operative flood diversion schemes

An active policy with the objective to promote irrigation started in the then Cape Colony. A twofold strategy of obligatory collaboration between producers, and provisions to grant unsubsidized loans for individual or co-operative weir-diversion and flood irrigation schemes, was followed in the second phase. This was facilitated by means of legislation promulgated in 1877, and this year is accepted as the beginning of modern irrigation in South Africa. However, development of co-operative flood schemes progressed slowly. Although measures were taken to make loans more attractive, irrigation development only gained momentum after 1906, following an economic improvement brought about by the demand for ostrich feathers as a fashion article. Ostriches are adapted to a dry climate and require permanent pastures such as lucerne under irrigation. The considerable expansion of co-operative flood irrigation schemes was of short duration, mainly because of declining markets between 1914 and 1916. This coincided with a severe drought and as a result not all scheduled land was cultivated, which culminated in an inability to repay irrigation loans.

Phase 3 : Public storage schemes

At the beginning of the third phase it was explicitly recognized that unreliable rainfall and variable river flow necessitates water storage for regular irrigation of crops. Included were a range of field, industrial and horticultural crops such as wheat, tobacco, cotton and citrus. The aspiration to store flood waters and the expected ability of farmers to finance capital expenditure due to improved markets for staple crops, contributed towards a change in policy during 1920. Storage was specifically considered essential on co-operative flood schemes already established or in the process of completion for full water application. In addition, unused potential could be harnessed through water storage in summer rainfall areas for supplementary water application in critical growth periods.

Problems were experienced with a low ratio of people in relation to the area irrigated. It was inevitably realized that irrigation schemes cannot succeed without irrigators or people on the land. This led to the strategy of establishing settlers on co-operative schemes and impoverished people on a small number of government initiated irrigation settlements. With a continued inability of settlers to repay irrigation loans, the financing strategy was changed to writing off loans, partial subsidization of private and co-operative schemes and total subsidization of public schemes.

The development of storage schemes was undertaken with the broad objective of utilization of water resources for future agricultural development and improved prosperity of society.

These different phases of irrigation development and changes in policy are related to the phases of economic development: Private irrigation schemes were dominant during the agricultural phase; co-operative schemes were implemented during the agricultural-mining phase; and government settlement schemes below public storage dams coincide with the agricultural-mining-industrial phase.

As was to be expected, the emphasis in water policy gradually shifted away from irrigation towards industrial development. This is illustrated by replacement of the Irrigation and Water Conservation Act of 1912 with the Water Act of 1956 and change of functions and name of the Department of Irrigation to the Department of Water Affairs.

Following the democratic elections in 1994 a total reform of water policy and water legislation was undertaken. A completely new National Water Act was proclaimed in South Africa on October 1 1998. Key elements and principles of the new act are:

- The water resources in South Africa is a national asset.
- National Government will act as the custodian of the nation's water resources.
- All water in the water cycle, be it surface or groundwater, will be treated as part of the common resource.

- Water required to meet basic human needs and to maintain environmental sustainability will be guaranteed as a right. This will be known as the Reserve.
- The legitimate requirements of neighbouring countries will have priority over uses other than the Reserve.
- Uses other than the Reserve will be recognised only if they are beneficial in the public interest.
- The allocation of water will have as objective the achievement of equitable and sustainable economic and social development.
- Investments in infrastructure for water use, made by the user, will be taken into consideration when water allocations are made.
- The riparian system of allocation of water, in which riparian land has a right to use water, is being abolished.
- Water user allocations are no longer permanent, but will be given for a reasonable period.
- The efficient use and the conservation of water will be promoted by the Act.
- The main points on the action agenda, which can be highlighted, are as follows:
- Achieving policy goals of social equity, economic efficiency, financial and environmental sustainability.
- Recognizing existing lawful water use, or in legal terms, water use which is “beneficial in the public interest”.
- Phasing out subsidies and recovering costs directly or indirectly from beneficiaries.
- Establishing black smallholders to improve household food security and reduce poverty.
- Implementing water conservation and demand management strategies.
- Registering all existing lawful water use, to enable the Department to manage water resources, to ensure fair share allocation, to protect the environment and to charge for water use.
- Issuing licences for water use, starting with the most water stressed areas.

7. Statistics relating to irrigation

Year	Total area irrigated (ha)
1910	231 362
1924	318 767
1965	736 932
1996	1 290 132
2000	1 300 000

ICID and South Africa

South Africa joined the ICID family in 1992 and has been actively associating itself with ICID activities in Africa as well as at the international level. The 51st IEC meeting will be held in Cape Town in October 2000. The current Chairman of the South African National Committee on Irrigation and Drainage (SANCID) is Mr Felix B Reinders, while the former Chairman, Mr David S van der Merwe is a Vice-President of ICID for the term 1997-2000. The secretariat of the SANCID is located in Pretoria.