

## Cooperation Project with the SADC countries

---

The role of meteorology in social and economic development is today more and more recognised and appreciated. The Governments of the South African Development Cooperation Conference (SADCC) countries have, since their independence, supported the development of meteorology in their countries.

During the early 1980s, however, it was realised that, although the SADC Governments i.e. Angola, Botswana, Lesotho, Malawi, Mozambique, Zambia, Swaziland, Tanzania and Zimbabwe, had been making efforts individually to strengthen their National Meteorological Services (NMSs) through both internal and external sources of funding, the level of support had, in general, not been sufficient to maintain adequate operational standards and to keep pace with international developments in meteorology. Recognising the increasing importance of meteorology in the development of their economies, the SADC Governments therefore sought assistance to strengthen meteorology in the region. The adoption of meteorology as a programme of the Southern Africa Transport and Communication Commission (SATCC) was seen as a viable option to attract capital investment in the development of this field through cooperation with external partners.

The region had, during the early 80s, also been affected by devastating droughts and floods, which emphasised the importance of meteorology for food security and social well-being, and, at the same time, demonstrated the urgent need for stronger regional collaboration in this area. Responding to the drought situation, the Food and Agriculture Organisation of the United Nations (FAO) assisted the SADC countries

in establishing a regional project, “Crop monitoring and early warning system for food security”, which was designed to enable them to develop strategies that would ensure food availability at all times. The United Nations Development Programme (UNDP) and WMO prepared and implemented another project, “Assistance to drought-stricken eastern and southern African countries in the fields of agrometeorology and hydrology”, the objective of which was to develop drought forecasting and monitoring capabilities. In addition the NMSs also benefited from assistance provided under the WMO’s Voluntary Cooperation Programme (VCP), the UNDP country projects as well as from bilateral arrangements. Governments were however, aware that achievements of these projects would not be sustainable without adequate support from strong NMSs.

In 1985, therefore, the SATCC Committee of Ministers recommended that a study on the status of meteorological services in the SADC region should be conducted and a detailed proposal for a programme of action should be developed. The Ministry for Foreign Affairs of Finland, decided to provide assistance to strengthen the National Meteorological Services in the region in order to improve their capabilities to meet the needs of the user community. This assistance was provided under the framework of the Finland/SATCC/WMO Meteorology Project which was launched in August 1987.

The project was implemented in two phases, with the first phase ending in June 1989 and the second one ending in December 1993. The objective of the first phase was to create the conditions for basic

weather services in the region. The second phase was designed to guarantee the continuity of these services and establish the provision of applications of meteorology to the officials responsible for food production.

The total project budget amounted to approximately FIM 66 million (about 15 million US dollars), of which 42 per cent was for fellowships/expert services and 54 per cent for equipment procurement and services. The project implementation was jointly assisted by the WMO and the FMI with similar responsibilities to those in the project in Central America.

The Co-ordination Unit, composed of the Project Co-ordinator and Assistant Project Co-ordinator was located in Maputo, Mozambique, seat of the SATCC

Technical Unit (SATCC/TU). The Co-ordination Unit was responsible for the day-to-day implementation of the project. The Government of Mozambique, through the Instituto Nacional de Meteorologia, provided the necessary facilities for and support to the Co-ordination Unit. The annual tripartite review meetings of the project were attended by representatives of the donor, the recipient countries, WMO and FMI. The meetings reviewed the progress of the implementation and made recommendations for remedial actions. SATCC organized annual meetings of the SADC directors of meteorology, during which the project status was discussed within the wider framework of the SADC meteorology program. ♦

---

## Achievements

The development objective of the project was to strengthen the National Meteorological Services in the region to ensure that weather and climate services operate at the highest possible level so that they are able to meet the needs of all sectors of the economies of the SADC countries.

Recognising that the individual member countries of SADC were at different levels in their ability to carry out meteorological activities, the immediate objectives included:

- making the National Meteorological services self-sufficient in well-trained manpower
- assisting the NMSs to upgrade and/or strengthen their data-processing and archiving facilities, maintenance capabilities,

national data collection capabilities and existing observational networks.

The evaluation of the project carried out in 1993 showed that it had been successfully implemented. Under the manpower development programme, seventy-one fellowships were awarded in various specialised areas in meteorology. In addition, three in-country training programmes were carried out for Class III personnel in Angola, for Class II personnel in Zimbabwe and for Class I personnel in Mozambique. There is no doubt that the project made a substantial contribution to the development of a core of well-trained scientific and technical experts in various specialised areas of meteorology.

One of the primary objectives of the project was to upgrade the operational ca-

pabilities of the National Meteorological Services in the region in order to ensure their capability to provide the relevant meteorological data and products necessary

for the development of the economies of the SADC Member States. For this reason, the implementation of the equipment component of the project was focused on upgrading the meteorological observing networks, data collection and processing facilities, and on ensuring adequately-trained staff through workshops on the maintenance of meteorological instruments and equipment.

At the regional level, the installation of an automatic Message Switching System (MSS), at the Lusaka regional Telecommunication Hub and the establishment of the Regional Maintenance Centre in Gaborone were some of the successful

achievements of the project. Moreover, at both national and regional levels the international experts provided the needed knowledge and guidance in various fields. Quarterly newsletters were published by the FMI in 1991 - 1993 on the project activities.

The impact of the strengthened meteorological services on the socio-economic development of individual countries is already in evidence. Computerisation of data processing has enabled meteorological services to respond in a timely manner to requests for data and products. The project as a whole made a marked contribution to the performance of the meteorological services, particularly in the monitoring of drought at national and regional levels. The achievements and impacts at national level during 1987 – 1993 are presented by country. ♦



**Angola**

The Angolan National Meteorological Service - the Instituto Nacional de Hidrometeorologia e Geofisica (INAMET) - received assistance in the form of fellowships, experts, consultants and equipment. The project provided six fellowships: two in meteorology, one in data processing, and three in equipment maintenance. Two staff members participated in the regional workshop on instrument calibration and comparison held in Maputo in August 1991. To satisfy the special manpower requirements in INAMET, an instructor in meteorology was fielded to organise and implement an in-country training programme for WMO Class III meteorologists. Twenty-eight members of staff successfully completed this course. Considering that prior to the project, INAMET had only four Class I meteorologists, three Class III meteorologists and two Class IV personnel, the project inputs were substantial.

Under the equipment component, INAMET was provided with various types of surface observational equipment to rehabilitate the station network, 17 HF transceivers for the improvement of national data collection, and a CLICOM system to es-

tablish a computerised data management system. In addition, an upper-air station was installed at Luanda Airport, to strengthen weather forecasting and aviation services. Furthermore, INAMET's maintenance capabilities were strengthened through the fielding of a consultant to design a maintenance workshop and later by the installation of maintenance equipment and vehicles for station inspection.

The National Meteorological Service (INAMET) suffered substantially because of the ongoing civil disturbance in the country which did not allow access to meteorological outstations in particular. The project, however, strengthened manpower capability and improved data management, weather forecasting and aviation services. The Institute is now able to respond better to demands for climate data for use in economic development activities.

Angola is a vast country, with important agricultural, mineral and energy resources. It needs a strong Meteorological Service to assist in the development of these resources and to help with building potentially one of the strongest economies in the region. ♦



***Botswana***

The manpower development programme in Botswana consisted of one fellowship in electronic engineering and another in data processing at M.Sc. level. Three staff members attended the regional CLICOM training workshop and three technicians participated in the regional workshop for instruments calibration which was held in Maputo.

Equipment provided to Botswana included three automatic weather stations installed at Moremi Game Reserve, Maun and Gaborone. In addition, one upper-air station was established at Lethlakane. Other types of surface observing equipment and instruments were also installed at various places to strengthen the network. As a result, the flow of data to the Gaborone National Meteorological Centre (NMC) was increased. At Maun and Francistown, two facsimile recorders were installed to improve data reception and the quality of aeronautical services at the regional airports. Four HF transceivers were installed at Lethakane, Selibe Phikwe, Pandamatenga and Gweta to facilitate data collection from those stations. At the Gaborone NMC, an automatic Message Switching System (MSS) was installed in order to automate data reception, retransmission and archiving. Furthermore, a CLICOM system was provided to Botswana to facilitate the processing of meteorological data.

Maintenance facilities at the Meteorological Service were also strengthened through the establishment of the Regional Maintenance and Calibration Centre in Gaborone which will serve not only Botswana but also the SADC region as a whole.

Calibration chambers and test instruments were donated to the Centre and technicians were trained in March 1993 to use the equipment.

The Department of Meteorological Services (DMS) of Botswana has grown very rapidly in recent years. The Government has been investing considerable resources in the Department, and there has also been some assistance from other UN projects and bilateral arrangements. The Project has contributed significantly to making the DMS one of the strongest Meteorological Services in the region. The improved data coverage through a dense observational network and the effective use of the CLICOM system has enabled DMS to prepare and issue high-quality advisories for water resource management and for drought monitoring. The Department now issues regular and timely bulletins.

The economy of Botswana is the fastest growing in the region, but it relies heavily on mining and animal husbandry. The larger part of the country is arid or semi-arid and rainfall is a limiting factor in the development of agriculture and other economic activities. The Department of Meteorological Services is now better prepared to provide the necessary technical support for the efforts by the Government to overcome problems brought about by weather and climate, and ultimately to expand and diversify the country's economy. DMS is already providing assistance to the efforts to identify suitable areas for the introduction of new species of crops. It is also providing data for the assessment and exploitation of solar and wind energies. ♦



## *Lesotho*

The number and quality of specialised personnel in Lesotho was enhanced under the project through the successful implementation of nine fellowships. One short-term fellowship was aimed at improving management capability through the organisation of a study tour to Ethiopia, Niger and Hong Kong. Three fellowships were awarded for M.Sc. studies in agrometeorology, climatology and data processing, one at Class III level and another at Class II diploma level in agrometeorology. This training not only enhanced the technical capability of the Lesotho Meteorological Service, but also allowed it to increase the number of its WMO Class I meteorologists from two to six, representing a significant growth. In addition, two staff members participated in the regional workshop on instrument calibration, while three others participated in the regional workshop on data processing.

With regard to the equipment component, the project provided and installed a variety of basic observational equipment, such as raingauges and thermometers, for the purpose of rehabilitating and establishing new stations. An automatic weather station was established at Letseng-la-Terai in the remote mountain area of the country. To strengthen communications, the Meteorological Service received six HF transceivers equipped with solar panels and a Radio Teletype (RTT) to strengthen the reception of external data. In addition, a satellite receiving station, comprising a Primary Data User Station (PDUS), a METEOSAT Data Distribution (MDD) and a Data Receiving Station (DRS), was installed. This enabled the Service to receive satellite cloud pictures, aeronautical meteorology products and other meteorological information.

Furthermore, in an effort to increase the quality of meteorological data in the country, a consultant was recruited to design a calibration and maintenance workshop. Later in the project, calibration and test equipment as well as other types of maintenance equipment were installed. Two project vehicles were also provided to facilitate station inspection in the country. With regard to the data processing infrastructure, the project provided a CLICOM system to improve the Service's data handling capabilities and also to establish a meteorological data bank. In addition, a specialist in data processing was trained by the project.

The project has had a very positive impact on the Lesotho Meteorological Services (LMS). The installation of the satellite reception capability at the Moshoeshoe International Airport has improved the quality of aeronautical services and weather forecasts. The establishment of an automatic weather station at Letseng-la-Terai will save lives and contribute towards national disaster preparedness and prevention by giving timely warnings of sudden changes in the weather, particularly for the vulnerable mountain people. The development of a computer-based data bank has enabled the LMS to meet its obligations to the massive Lesotho Highlands Water Project. Water is the country's most valuable resource. The Meteorological Service has developed a close operational co-operation with the Department of Energy, which has seen the use of meteorological data in the design and construction of four hydrological plants. Meteorological data has again been used in studies to assess wind and solar potential. The Meteorological Service has also developed close operational links with agencies responsible for the conservation of the environment, espe-

cially in soil and rangeland protection. These organisations value the importance of the meteorological data banks in their activities. Improved data management facilities and qualified staff have allowed the Service to publish two bulletins: the Monthly Weather Bulletin and the ten-day Agrometeorological Bulletin.

Lesotho's weather and climate are perhaps the most problematic and harshest in the region. Weather elements, especially temperature, are highly variable even from day to day. An early frost can damage the

whole maize crop. Droughts, floods, severe local storms, hail, strong winds, and snowfall occur frequently. Losses of human and animal lives as a direct result of the weather are recorded almost every year. The country is very mountainous, containing over-exploited steep terrain so that ecosystem is very fragile, displaying a high level of degradation, especially through soil erosion. The conditions in Lesotho therefore demand a strong and active National Meteorological Service. ♦



**Malawi**

Under the training component of the project for Malawi, five fellowships were implemented in meteorology, data processing/computer science and equipment maintenance. Personnel from the Meteorological Department also attended the two workshops on data processing and equipment maintenance.

Under the equipment component of the project, observational equipment was provided to the Department including two barometers for use at Chileka and Lilongwe Airports, one MDD satellite receiving station at Lilongwe, one hydrogen generator to rehabilitate the upper-air station at Mzuzu and various types of surface observing instruments. Seven HF transceivers were also installed at various stations to improve internal data collection. The project also contributed to the strengthening of external links by providing additional funds for the GTS link between Lilongwe and Lusaka.

With regard to data processing activities, a CLICOM system was provided to strengthen the computerisation of meteorological data management. Additionally, the Meteorological Department was provided with appropriate equipment to improve the

operations of the maintenance workshops at Chileka and Lilongwe.

As in other SADC countries, the project in Malawi complemented assistance provided under other funding arrangements. However, computerisation of data processing facilities has contributed to a more timely and better response to customer requirements for data. A special customer is the Water Department, with whom collaboration has improved markedly. The Meteorological Department is the focal point for solar energy activities, and the radiation data from the improved network enables it to meet its responsibilities in this regard.

The satellite reception capability and the automatic weather stations have improved the quality of weather forecasts and the special services for Lake Malawi. These include forecasting and monitoring of conditions on and near the lake for boating and fishing. Accurate forecasts are also required for early warning of flash floods, a serious problem in Malawi. Malawi's population is mostly engaged in peasant subsistence farming and the strengthened Meteorological Service is now better prepared to provide services for food security, transport, public health and construction. ♦





### *Mozambique*

The project contributed to the manpower development of the National Service of Mozambique, INAM, by providing a total of seven long-term fellowships. Under the training programme, three fellows completed WMO Class I training in 1993, while another completed his Ph.D. studies in 1992. Two technicians were also trained under the project.

In a bid to solve the manpower problems in INAM in the long-term, and also those of other Portuguese-speaking countries in Africa, a Class I training course in meteorology was introduced at the local Eduardo Mondlane University in Maputo. Two WMO experts provided assistance with the training. The Department also benefited by sending participants to the regional courses on data processing (March 1993 in Gaborone, February 1995 in Lusaka) and workshops on equipment maintenance (August 1991 in Maputo, March 1993 in Gaborone).

In order to strengthen the observational network in the country, the project established an upper-air station at Nampula and provided various types of conventional and non-conventional meteorological equipment and instruments. Furthermore, a total of 16 HF transceivers were provided and installed at various places in the country to strengthen internal communications. An MDD satellite receiving station was also installed in Maputo to increase the avail-

ability of meteorological data and products. In addition, a CLICOM system was provided to improve the management of meteorological data. Maintenance and calibration equipment were also installed to strengthen the maintenance capabilities of the Service. The Service was also provided with four vehicles.

Even though it has a long established history, the Meteorological Service in Mozambique has suffered substantial deterioration in its infrastructure because of the civil unrest that existed from the 1970s until the early 1990s. The project, however, contributed to the on-going recovery plan of the Meteorological Service which is receiving special support from the Government. This has been demonstrated by the Government's decision to upgrade the status of the Meteorological Service from that of an ordinary department to that of an Institute. The project in Mozambique was able to redress the special problems faced by the Service, in order to enable it to contribute to the economic development activities in the country. The strengthened observation network improved communications data and products for applications to help the economic recovery efforts. The project's inputs have also helped to improve the quality of public weather forecasts as well as specialised forecasts for Maputo Bay for activities related to fishing. ♦



### *Swaziland*

The objective of the project in Swaziland was mainly focused on providing support to the establishment of a unified National Meteorological Service in the country. In this connection, consultation was provided to advise the Government on the creation of the Meteorological Department. Later, the project provided an expert to act as an advisor to the management of the new Service and also an agrometeorologist to establish agrometeorological activities in the country. Consultation was also provided to design maintenance workshops, and establish weather forecasting services. Under the manpower development programme, the project trained five WMO Class I meteorologists, including one at M.Sc. level, in data processing. It also trained four WMO Class II meteorologists and three others at WMO Class III level. It is worth noting that the project was the sole source of funding for the WMO Class I personnel now manning the Meteorological Service.

With regard to the equipment component, the project provided a variety of conventional and non-conventional meteorological equipment in order to establish new stations and to rehabilitate old ones. Special agrometeorological stations were established at the Malkerns Agricultural Research Station and at Big Bend. Three synoptic stations were established at Matsapha, Mbabane and Siteki. In order to improve the internal and external collection of meteorological data in the country, six HF stations and a facsimile receiver were provided and installed at various stations. Furthermore, an MDD satellite station provided by the EEC was upgraded with the addition of a PDUS. Data management capabilities

were strengthened in the new Service with the provision of a CLICOM system. It is significant to note that the expanded and upgraded observational network and communications resulted in an increased flow of meteorological data to the headquarters.

In the early stages of the project, a consultant was recruited to design a maintenance workshop in Mbabane. Later in the project, a maintenance workshop was established through the installation of various types of calibration and maintenance tools.

The project came at a very opportune moment for the creation of a unified National Meteorological Service in the country. Following the successful implementation of the project, Swaziland now has sufficient manpower and infrastructure to run the National Meteorological Service, which was formally established under the legal notice No. 162 of 1991. The act was promulgated on October 2, 1992; the Service is therefore one of the youngest in the region. Through the efforts of the project, the Meteorological Service is now able to contribute to the social and economic development efforts of the country.

Swaziland possesses one of the strongest and most diversified economies in the region. The economy is, however, extremely sensitive to weather and climate, as it is based, in addition to mining, on agriculture, mainly horticultural and animal husbandry. The establishment of the data bank is expected to enable the Meteorological Service to contribute to the strengthening of the economy by providing meteorological data and advice to improve agricultural production. ♦



**Tanzania**

The manpower capability of the Directorate of Meteorology of Tanzania was strengthened with the implementation of a number of fellowships. One staff member completed a two-year training in data processing systems analysis in the United Kingdom and two others completed short-term courses in weather forecasting, specialising in numerical weather prediction. Another staff member completed a computer hardware maintenance course. The project further provided training aids including overhead projectors, a television and cassette recorder for use in local training of mid-level meteorologists at the training institute at Kigoma. Group training was also provided for some members of staff in meteorological data processing and equipment maintenance.

Under the equipment component of the project, the Directorate of Meteorology received various types of conventional and non-conventional meteorological equipment to rehabilitate well over twenty stations. Two upper-air stations were also established at Kigoma and Mtwara. In order to enhance the collection of meteorological data, communications facilities were

strengthened through the installation of ten HF transceivers. Four facsimile receivers were provided and installed in Zanzibar and at Kigoma, Mtwara and Tabora. Furthermore, a CLICOM system was installed at the Dar es Salaam Headquarters to facilitate the processing of meteorological data. The Directorate also benefited from the services of the regional data processing expert who was stationed at the Directorate's premises in Dar es Salaam. With regard to the maintenance of meteorological equipment and instruments, the project provided workshop tools and other types of maintenance equipment; field inspection was also strengthened through the provision of five vehicles.

Tanzania is a vast country, with a wide meteorological network to serve the largest population in the region. The project has had a positive impact on the operational capabilities of the Directorate of Meteorology. It now produces better quality services to agriculture, water supplies and aviation at both the headquarters in Dar es Salaam and at the regional offices in Zanzibar, Mtwara, Kigoma and Tabora. ♦



## **Zambia**

In Zambia, the project supported manpower development by providing eleven fellowships which were successfully completed. The fellowships included one at M.Sc. level in data processing, one at B.Sc. level in meteorology, two at WMO Class II level and one at WMO Class III level; the other fellows completed specialisation courses on subjects such as telecommunications, tropical meteorology and instrument workshop maintenance practices. Some staff members also attended group training workshops in data processing and equipment maintenance. In addition, the project provided training aids, including publications, to be used in the local training of WMO Class IV personnel. During the project, consultation was provided to prepare specifications of the telecommunications equipment to be installed at the Regional Telecommunication Hub (RTH) at Lusaka and an implementation plan. Consequently, an automatic Message Switching System was installed at Lusaka RTH to strengthen its operational capabilities. Furthermore, observational equipment was provided to replace aged and malfunctioning instruments at various stations, including Ndola, Lusaka, Livingstone, Sesheke, Choma, Serenje, Kasempa, Mufulira, Mt. Makulu, Kafue and Magoye. In order to strengthen the internal communication facilities of the Zambia Meteorological Department, nine HF transceivers were installed at various stations, including those at Mansa, Isoka, Mwiniwnga, Kasempa, Sesheke and Kasama, three teletype receivers were also installed to improve data exchange with the RTH at Nairobi.

Under the auspices of the project, a CLICOM system was provided to the Department. Moreover, the Department was fortunate to have the services of an experi-

enced meteorologist who was also well-qualified in data processing and CLICOM operations. As a result, the Department became a focal point for the region's CLICOM activities, and in the spirit of "self help", the Zambian expert was available to help any country in need of assistance on CLICOM activities. In order to improve maintenance services within the Meteorological Department, the project provided workshop and laboratory equipment. Two vehicles were also provided to enhance station inspection and field maintenance. The Department's maintenance operations were further boosted by the training of two technicians.

Zambia is another country that also had other meteorological projects going on in parallel with the Finland/SATCC/WMO Meteorology project, which therefore complemented the other inputs to the Meteorological Department.

The Meteorological Department hosting the RTH is of crucial importance to the day-to-day operations of the other NMSs in the region. The strengthening of the RTH through the provision of an automatic Message Switching System has improved the amount of observational data available to the region. This has contributed to the improved quality of weather forecasts and aeronautical services in both Zambia and the region as a whole.

Zambia's achievement with the CLICOM system has been the most outstanding in the region. The Department has shown an ability to use the system most efficiently and effectively. A complete data bank has been developed and high quality publications and advisories are produced. The most frequent users of meteorological data and advisories include those involved in agriculture, soil research, forestry, seismology, energy research, construction,

water resource development and medical research.

Agriculture is at the top of the Government's priorities in the economic recovery programme. The high quality of publications and products of the Department indicates that it is well prepared to meet the challenge presented by this decision. Because of its demonstrated capability with

CLICOM, the Zambia Meteorological Department is the home of the SADC CLICOM focal point for the new "self help" mechanism. The project has made a very worthwhile contribution to the building of a solid foundation for the Zambian Meteorological Service to go on to develop its potential to better serve the national economy. ♦



**Zimbabwe**

In Zimbabwe, the project provided fellowships to assist in the development of the Department's meteorological personnel. Under the training programme, one fellow completed an M.Sc. degree in agrometeorology, two fellows were trained at Class I post-graduate diploma level, one fellow completed short-term training in forecasting and two electronic technicians and a computer hardware technician were trained. Some members of staff also participated in the workshops on equipment maintenance and data processing. In order to further enhance the number of meteorological personnel in the Department, an instructor in meteorology was recruited to implement locally a WMO Class II training programme.

Under the equipment component, two automatic weather stations were installed at Gokwe and Gutsaka, with the project providing for the site preparation and installations, as well as the required on-the-job training. One upper-air station was installed at Victoria Falls and various types of observational equipment were provided to rehabilitate a number of old stations. In addition, a total of nine optical theodolites were overhauled and are now in use at

Kariba, Gikwe, Beitbridge, Kadoma, Mutoko, Masvingo, Harare and Hwange National Park. Furthermore, the project provided ten HF transceivers and three facsimile receivers. The facsimile receivers were installed at Victoria Falls, Chiredzi and Gweru. Three vehicles and one mobile workshop were also provided to improve station inspection and field maintenance of meteorological equipment.

The Zimbabwe Department of Meteorology is one of the strongest in the region, with good support from the Government and from other projects. The Finland/SATCC/WMO project's contribution will enable the Department to provide services to one of the most sophisticated economies in the region, based on agriculture, manufacturing and industry. Drought and water shortage in general limit the performance of agriculture, so, for the country to remain one of the world's biggest producers of maize, closer co-operation between agricultural and meteorological services is essential in order to harmonise weather and agricultural practices. The project thus went a long way towards enabling the Department to meet this challenge. ♦

