

Systematic meteorological observations

All countries are responsible under international regulations for maintaining systematic and reliable measurements of weather and the atmosphere. For this purpose, each country has a National Meteorological Service. The measurements are supposed to be carried out simultaneously and regularly and transmitted immediately to the international telecommunication network. Wind direction and speed, visibility, air and soil temperature, humidity, solar radiation, cloudiness, cloud base, atmospheric pressure and precipitation are the essential variables to be measured. Every country is obliged to produce real-time data for international use and is also permitted to use the information produced in other countries. The system that collects, analyses and distributes weather and other environmental information throughout the world, is called World Weather Watch (WWW) which comprises the Global Observing, Telecommunication and Data Processing Systems. About 2000 upper-air stations constitute the backbone of the Global Observing System (GOS); 1300 of these stations provide real-time data in a coded form for global exchange once or twice a day. In addition to upper-air stations, about 50.000 synoptic stations provide real-time data, normally every three hours, for regional or global exchange, to facilitate weather forecasts on all scales. The national meteorological services are continuously working to support the weather and climate monitoring for their own country and the WWW. The production of the required data is inadequate in many developing countries due to the lack of stations, personnel and international telecommunications. The coverage and den-

sity of the national station network in each country are determined by international regulations. Each network constitutes a part of the basic observational system of WWW, the operation of which requires real-time transmission and filing of data. The National Meteorological Services are also obliged to produce reliable statistical data for national and international use. Determining the normal climatological conditions and their variability requires daily measurements at each station for periods of 30 years (1931-1960, 1961-1990, 1991-2020 etc.). Climate data archives serve as a necessary base for inventory of natural resources, land use etc. They are also important for environmental monitoring. Many developing countries lack climatological statistics on the most recent normal period (1961-1990) or have statistics only on a few meteorological variables.

The National Meteorological Service in each country is responsible for the maintenance of the equipment at the stations, the availability of personnel, the regularity of the observations and, if possible, for the acquisition of essential technical facilities. Finland has given assistance to developing countries by supporting activities aimed at strengthening the National Meteorological Services, i.e. the provision and installation of measuring and controlling equipment for reliable observation of and information on weather. Finnish-made meteorological instruments, in particular radiosondes and their control equipment play an important part in the worldwide network of upper-air stations. An ordinary upper-air station consists of two separate buildings. One has a control unit and is used for the reception, transmission and filing of data, the other

provides space for filling up balloons with gas produced by a hydrogen generator. The generator requires water and electric power supply. Most stations in the developing world are therefore situated near airports and observatories. If necessary, a diesel generator is used as a standby power supply. The control unit is solar powered at some stations. The personnel at upper-air stations work for the National Meteorological Service. They have the basic knowledge of meteorological activities. The technicians are capable of operating a station after receiving further training of four to six weeks. Operators are responsible for the maintenance of the hydrogen generator, filling up and releasing the balloons with radiosondes, reception of the sounding data,

filing the data and transmitting it to the National Meteorological Service and the international WWW network. The coded data is normally transmitted by HF-radio, telex, telephone or through a satellite channel. The sounding lasts approximately two hours. If the transmission is carried out successfully, the data is available for WWW within three hours. A delivery of data from a developing country to WWW requires success at every stage of the operation. The operation of an upper-air station is a challenging task for a National Meteorological Service in a developing country. Shortage of money sometimes makes the acquisition of radiosondes and balloons difficult, which endangers uninterrupted operation of the stations.

