C FLOOD-CONTROL FUNCTION OF RESERVOIRS

The flood control function of reservoirs is along with their storage function the basic component of the comprehensive water-management effect of the reservoirs. The regime of a reservoir includes both these basic functions, which means that it increases low discharges and decreases high discharges. There is no sharp boundary between these two tasks; a reservoir which theoretically establishes a completely uniform discharge ($\alpha = 1.0$) has one single capacity which is perfectly able to ensure both the storage and flood control functions.

Only a reservoir can ensure the storage function, flood control can, however, also be ensured by, e.g., river training or by technical and organizational measures during a flood. Flood-control reservoirs are therefore less frequently needed than storage reservoirs. Other reasons arise from the time development of streams and their environment. River training has been built so that the non-damaging flow (the flow without damaging inundations) reaches relatively high values, e.g., the flow with one year return period and even more. Economic losses are only caused by floods with a longer return period, i.e., with a smaller probability of exceedance. It need not always be economical to build reservoirs to reduce these damages.

The basic characteristic of a reservoir with flood-control release is an *empty* volume which can hold part of the flood volume. The flood then causes less harm downstream of the reservoir. This empty volume can be a special volume, the so-called *flood-control (retention) capacity* (controlled or uncontrolled), or it can be gained by partly emptying the storage capacity before a flood. Frequently both of these methods are combined.

Every reservoir with a storage function also has a certain flood-control effect. If a storage reservoir is at least slightly emptied, e.g., at the end of a low-flow period, at least part of a flood wave can be intercepted by the storage capacity. When the relative yield is high (continuous decreasing of the water volume even for several years) the control effect of the storage capacity can be very extensive. This effect is automatic, regardless of the flood-control function of the reservoir. The flood control effect of the storage capacity can be greatly increased without causing any harm to water supply, e.g., if water is released according to a rule curve (Chap. 13) which ensures that the storage capacity is partly emptied in a certain period of the year or by short-term discharge forecasts; this makes it possible to lower the level of the storage capacity just before a flood occurs.

Flood-control release has its effect on the stream downstream of a reservoir and

on the environment of the stream. With the increasing area of the interbasin downstream the river the effect diminishes.

The most usual task of a flood-control reservoir is to lower flood discharges to a value, which does not cause any damage to the stream downstream of the reservoir. It is usually not very economical to ensure flood control with a very small probability of exceedance; the control function is therefore usually designed with a certain, economically justified, *rate of reliability*. Flood control can also help to delay the damaging effects of a flood downstream of a reservoir, as time is gained to introduce indispensable technical measures to alleviate flood damage.