THE RIVER DANUBE FLOOD OF 27 MARCH 1988*

ROBERT GEIPEL
Department of Geography
University of Technology, Munich
Germany

INTRODUCTION

European rivers tend to have long and well documented history of floods. The Danube, Europe’s second largest river after the Volga, flows through or marks the border of eight states: Austria, Bulgaria, Czechoslovakia, Hungary, Romania, the Soviet Union, West Germany and Yugoslavia. As an international river, 2,857 km long, and with a catchment area of 817,000 km², it poses many ecological and political problems.

The German share of the Danube river basin amounts to 77,057 km², which is less than a tenth of the whole. This account is further restricted to a short reach of 176 km between Regensburg and Passau, the latter being the town where the Danube crosses the border between Germany and Austria, 2,202 km from its mouth and 280 m above sea level.

There is an abundance of research on flooding of the Danube. In the vicinity of Regensburg, the Schwabelweis gauge has measured river stage since 1845. The 20 largest floods to have occurred within the last 150 years have registered discharges between 1,910 m³/sec. and 3,880 m³/sec., while in unexceptional years the maximum flow is about 950 m³/sec (fig. 1). The flood of 27 March 1988 ranked fifth among the twenty largest events, with a discharge of 2,700 m³/sec.

The left tributaries of the Danube originate from hill country and have their maximum flows in winter, while the right tributaries rise in the Alps and their maximum discharges occur in summer, at a time of melting snows. This means that the discharge of the main river is relatively balanced. The mean discharge of the Alpine River Inn exceeds that of the Danube itself, the tributary carries more water than the trunk stream it joins. Extreme floods result when maximum discharges from both halves of the river basin coincide.

* The author is grateful to David Alexander’s linguistic improvements of the first draft of this paper

\textit{J. Namec et al. (eds.), Prediction and Perception of Natural Hazards, 111–118.}
Man-made changes in the extent of floods

The severity of flooding on the Danube has been strongly influenced by many changes occurring to its floodplain since the beginning of the 19th century. Moors and bogs have been drained, cultivated and settled, including the Danube moor, which measures 200 km². Since steamship navigation began in 1836, the meandering stream has been straightened. Artificial cut-offs through meander bends reduced the length of the Danube and caused it to incise its bed, thus increasing its fall and decreasing its width. The construction of levees began in 1884, with the aim of confining floodwaters to a narrower path.

In 1921 a contract for the construction of a ship canal was signed and the Danube was changed into a sequence of reservoirs with hydro-electric power stations. To stop the erosion of the bed, an agreement was signed in 1976 to change the whole of the Danube into a canal. These modifications led to a loss of floodwater retention space, as stagnant waters have been cut off and drained and the land filled. Riverine forests have been eliminated, wetlands drained and the infiltration capacity of soils diminished by field clearance.
The use of heavy agricultural machinery compresses soils and increases surface runoff. Crops like corn, sugar beet and turnips, which are planted in rows, increase the potential for soil erosion, especially during the spring floods where only scarce vegetation covers the fields. In recent decades the area planted with these crops has increased.

The construction of settlements and roads has sealed off large areas and increased the surface runoff. In the Alpine catchment areas of the Danube's tributaries leisure activities claimed vast areas for skiers, involving the clearance of forests and the construction of chair-lifts and downhill skirruns. Man-made increases of runoff added to the reduced storage capacity of forests which are dying under the impact of acid precipitation. The combination of all of these factors has increased the water yield of the catchment and speeded up the process of surface drainage, thus increasing the risk of flooding.

The Rhine-Main-Danube Canal

The section of the Danube most affected by the flood of March 27, 1988, is being rebuilt as part of the Rhine-Main-Danube Canal. The construction of this artificial water course has been harshly criticized because the estimates of commercial traffic that the canal is likely to carry are considered highly unreliable. Therefore, during the last years of the Social-Democratic government of West Germany, building was stopped, although it was resumed after the Conservative victory in the Spring of 1983.

The sectors where the levees were breached in 1988 contained hand-built dikes constructed between 1933 and 1942 to reclaim land for pasture and cultivation. These polders were drained by ditches and sluices. The dams and earthworks are now fifty years old. Local funds have not been spent on maintenance or repairs because the canal project is viewed as a major Federal expenditure on renovation of drainage and flood defenses.

But in the period of time that elapsed between the construction of weak gravel dams and work on the impending Rhine-Main-Danube Canal, the population of the floodplain has lived with increased flood risks. In the same degree that the upstream sector is well-proofed against flooding, the hazard in the downstream sector has grown. Present construction stopped before reaching Straubing (2,320 km from the mouth of the river), and it was here that the poorly-constructed levees burst. It can, therefore, be concluded that the history of the construction of the Canal will be closely linked with flood hazards on the Danube between Regensburg and Passau.

The controversy

Opinions on the Canal are divided between two highly confrontational parties. The first group considers this project as one of the most important works of the twentieth century, finally creating a connection between the North Sea and the Black Sea. This was a dream of Charlemagne, who in 793 A.D. failed in his attempt to build a small canal connecting...
Rezat and Altmühl via tributaries of the Main and the Danube. The second attempt involved the Ludwig-Danube-Main Canal, which opened in 1845 when the newly initiated railway age was bound to consign it to failure. The present project for a "Europe Canal," with a bank-to-bank width of 55 m, a bottom width of 31 m, a depth of 4 m and locks 190 m long, is being built to carry ships of up to 1,350 tons and is intended as a highly visible landmark of public power and political prestige (WIRTH 1986, p. 88). This view is shared by the renowned IFO Institute (Information and Forschung = research) (1982) and is also backed by many political statements.

The opponents of the scheme are environmentalists, critical economists (FULLING, 1978) and the German Council of Landscape Protection (1983) which--apart from the destruction of unique river valleys--lists the following as causes for rejecting the scheme:

(a) the expected decline in freight traffic (for example, the conversion of the Austrian steelworks Voest near Linz to new raw material);

(b) the excessive transportation time (from Rotterdam to Odessa by sea takes 6 - 10 days, while on the canal it will be 23 - 30 days),

(c) the threat of competition from East European countries, which may use the international canal to ship products at excessively low-priced freight rates;

(d) the ensuing decrease in freight traffic on the German Federal Railway, which already runs a high deficit;

(e) the plan to drain water from the River Danube into the dry Middle Franconian basin in a way that is less hygienic and economic than pipelines;

(f) the long-term damages involved in changing riverine meadows into arable land, thus endangering a unique riparian flora and fauna along the Danube downstream of Regensburg.

The people of the region, who were affected by the 1988 flood, are well aware of these inter-relationships

The survey

We defined a study zone consisting of six communities on the north bank of the Danube and three on the south bank. In this area levees broke during the 1988 flood and 20 km² of land were inundated, necessitating the evacuation of people and livestock. We carried out questionnaire interviews with a sample of 180 households in the area. The rate of return, at an overall 57 percent (103 questionnaires), was higher on the north bank than on the south bank.
The questionnaire, asked residents to assess the flood risk, define the likely recurrence interval for a flood of this size, give an explanation of the causes of the event, describe how they were affected by the disaster, explain their position or role in the local community and describe what responsibilities they had at the time. The 103 respondents who described what they perceived to be the cause of the March 1988 flood gave the following explanations (Fig. 2):

The natural cause was perceived as the coincidence of high precipitation (70 percent) and snowmelt (60 percent) in the mountains. Outdated levees, a man-made hazard, also attracted credence (60 percent) as a cause of the disaster, followed by floods on the northern tributaries and straightening of the course of the Danube. A minority of respondents regarded the construction of the canal (25 percent of interviewees) and the delay in building it (20 percent) as relevant causes of the flood. Environmental damage in the Alps and the death of forests rank last among the perceived causes.

The disaster has an indisputable political dimension, whether or not the culprit is regarded as construction of the Rhine-Main-Danube Canal or the temporary interruption of work during the Social Democratic-Liberal coalition in Bonn. Minister of Transport Hauff (Social Democratic Party) described the canal as "the most unnecessary building work
since the erection of the Tower of Babylon." But the Conservatives argued in the Bavarian Diet that the interruption of the building works led to the abandonment of measures to restore the old levees, and thus mitigate the ensuing flood.

Among the interviewees, whose electoral behavior was predominantly conservative, 20 percent charred this point of view, but more of them (25 percent) believed that the canal or the straightening of the Danube were the main anthropogenic causes of the flood.

An analysis of newspaper comments shows that the same polarization existed in the media: left-leaning or liberal newspapers (such as Frankfurter Rundschau and Suddeutsche Zeitung) stress the "man-made" argument, while conservative papers (Frankfurter Allgemeine Zeitung, Die Welt) insisted that the causes of the flood were natural.

The predictions of recurrence interval made by the 103 interviewees show a marked pessimism. The flood was a once-in-30-years event, but 25 percent expected a similar event to occur in less than 3 years and 30 percent expected it to happen again within the following three to ten years. This puts the pessimists in a majority of 55 percent of the respondents. Only 28 percent were realistic in their assessment (10 - 30 years) and a mere 17 percent were optimistic enough to expect a return period of 30 - 100 years.

Hardly any differences can be detected between the perceptions of north and south bank residents, even though the impact on the latter area was smaller. Evidently the population of the study area was sufficiently homogeneous for differences of perception to be slight. Respondents to a question about how to mitigate future floods put the responsibility firmly on the government.

Respondents tended to reject measures which would affect them personally, such as strengthening building codes, refusing people permission to live in the hazard zone or, even more drastically, relocating the local population. Technocratic activities were preferred to organizational ones. We are evidently dealing with a population that expects everything from the state which, since 1933, has improved living standards by making investments designed to increase the available arable land. At the same time it also endangered the population by not mitigating the flood risk, although promising permanent security in the near future with the completion of a magnificent construction project. Evidently the occupants of the flood-prone area along the River Danube in Lower Bavaria will have to repeat in the 1990s the experiences of the 1940s in the USA when Gilbert White started out to explore the then new field of natural hazards.

In line with the focus of our workshop, this paper is intended to show that the perception of flood hazards, and of scientific information regarding them, is filtered through the political opinion of those who are the target group of all predictions, forecasts and warnings— the population of the flood hazard area. Whether government policies appease this group or not depends strongly on the degree of partisanship between the local population and either the government or its political opposition.
REFERENCES


