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FLOOD DAMAGE AND LOSSES IN RURAL POLAND (1960-1990)

Floods are the most spectacular natural hazard in Poland. Between 1960-1990 total flood losses averaged 0.3% of the net national income. Floods are particularly severe as they often entail evacuation of several or several dozen thousand people from the endangered areas (in the years 1960, 1970, 1977, 1979, 1980 and 1982 over 20 thousand), as well as damage to the buildings which permanently decreases the quality of living standards of the flood victims.

Most flood damage occurs in rural areas, though flood danger in the analyzed period also appeared in urban areas (floods in 1977, 1979, 1982, and 1987). Floods in Poland cause the greatest losses in agriculture (70% of direct losses). Between 1975 and 1990 the share of direct losses in agriculture ranged from 88% in 1980 to 49.4% in 1990. The number of casualties caused by floods in Poland is relatively small. In 1960-1990 21 persons died, some of them being life-guards. However, the data of the insurance company (State Insurance Company — PZU) show that the value of material losses caused by flood in the years 1975-1986 was 50% higher than fire losses, which are usually most severe in rural areas. Floods are the most widespread natural hazard in rural Poland (73% of losses). Crops constitute 96% of the value of the direct flood losses.

Insurance of buildings, movable property (crops, means of production, house and household furnishings) and crops against damage caused by natural hazards in rural households was statutory in Poland in the years 1958-1990 (since 1990 only buildings). In 1960-1974 the value of indemnities for flood losses in rural areas constituted 22.6% of the total value of direct flood losses, and in the years 1975-1986 38.5% of total flood losses (constant prices of 1987 according to Grochulski and Żelazo's conversion rate (1988)). The value of indemnities paid prior to 1975 was lower because the extent of crop insurance was gradually rising. At first, insurance covered cereals only, but from 1965 onwards it also included root crops, and from 1972 — grasses of meadows and pastures. In the years 1972-1990, 55.8% of crop damage claimed and acknowledged by the PZU concerned grasses, 28.5% root crops, and 15.7% cereals. That is why before 1975 the

share of indemnities in the case of movable possessions (12.1%) and buildings (2.5%) was higher. In the years 1975-1986 their share fell to 2.1% and 1.9% respectively. Lower losses in root plants, cereals, buildings and movable property indicate a greater threat in areas of extensive cultivation, which is advantageous.

The analysis of the trend of changes of intensity indices of flood damage and losses in rural areas has revealed that damage to cereals shows a declining trend, which is advantageous (Table 1). Great fluctuations of changes, having no clear-cut direction, reveal the most widespread damage comprising grasses of meadows and pastures. Damage to movable possessions shows a decreasing tendency to the largest extent. However, a conspicuous increase in damage to root crops and rural buildings is disadvantageous. It is hard to find out univocal causes of a considerable fall of damage to movable possessions after 1971: was it the effect of a more rigid insurance policy in accepting indemnity claims, or of a better protection of peasant property, which is more difficult in case of less movable objects, i.e. buildings and crops.

Table 1

Analysis of trend of flood damage and losses in rural areas
(consecutive five years' average)

	Index	Period	Equation	r	F _{obl}	Significance level
1.	Cereals (% of farms)	1962-88	2.106 — 0.335T	-0.50	8.14	0.01
2.	Root crops (% of farms)	1967-88	0.290 + 0.151T	0.87	61.66	0.00
3.	Grasses (% of farms)	1974-88	4.107 + 0.061T	0.22	0.67	0.43
4.	Buildings (% of farms)	1962-84	0.056 + 0.002T	0.60	11.92	0.00
5.	Buildings (z/farm)	1962-84	11.595 + 1.801T	0.80	38.66	0.00
6.	Property (% of farms)	1962-84	1.009 — 0.040T	-0.67	17.52	0.00
7.	Property (z/farm)	1962-84	145.292 — 4.481T	-0.58	10.42	0.00

Index of damage intensity — ratio of the number of flood damage cases accepted by the insurance company to the number of insured farms in percent; loss intensity — value of indemnities (in zlotys — constant prices of 1987) paid per one insured farm; period — successive years for which calculations were made of consecutive average values of indices from five-year periods; equation — equation of linear regression (trend), T — increase of time in years; r — correlation coefficient between consecutive 5 years' averages of flood damage and loss indices and the time of their occurrence in the given period; F_{obl} — value of calculated test F for degrees of freedom $v_1 = 1$, $v_2 = N - 2$ (N — number of years); significance level — significance level for calculated value F.

Source: Archives of the Department of Property Insurance of the State Insurance Company.

Damage to farm houses is the most acute in everyday life. The greatest intensity of damage of this type was recorded in the following years: 1960,

1970, 1972, 1977, 1980, and 1985, with over 14 inundated buildings per 10,000 insured farms on the average (the sum of arithmetic mean and standard deviation for the years 1960-1986). In absolute figures, some 50% of total indemnities in the years 1960-1986 were paid in three years: 1980 (26.6%), 1985 (15.3%), and 1977 (7.9%). Flood in 1980 caused the largest losses in Poland over the past fifty years (1.6% of the net national income). It appeared to be a catastrophe not only for farmers but also for the insurance company which had granted certain preferences to crop insurance. In the years 1970-1986, average values of indemnities for crops almost doubled the value of premiums paid by the farmers, while in 1980 they were 12 times as large. Indemnities for flood losses in crops constituted 46.8% of total value of indemnities paid by the insurance company in 1980. As a result, the PZU recorded the only case in its history (1960-1990) when payments exceeded revenues in the overall balance (-0.9%), whereas the value of indemnities averaged 70-80% of the value of premiums paid.

About one-fourth of flood damage claims is not accepted by the PZU. In the years 1964-1986, 23.3% of claims were rejected in buildings and 17.3% in movable possessions. Up to 1972, not many claims in crops were rejected, but the share of rejected claims increased upon extension of insurance over grasses (27.7% in 1975-1987). No correlation was found between the share of rejected claims and the intensity of damage in case of buildings and possessions. However, there is a correlation between the lower percentage of unaccepted damage in crops and a greater intensity of acknowledged damage ($r = -0.71$, $a = 0.01$), which might corroborate priorities granted by the insurance company for damage of more economic character. However, crop insurance was not remunerative to the insurance company and it should be regarded as one of the forms of subsidizing agricultural output by the State (until 1990).

Hydrologic data show that floods occur most often in southern Poland, in the catchments of the Upper Vistula and Odra. The rivers in this area are characterized by the greatest variability of daily discharges (Dynowska 1989). This is the area where the largest annual precipitation totals occur and where summer precipitation is most often very heavy. Great differences in the terrain levels and small soil permeability cause a more intensive surface water runoff.

In the years 1960-1974 nearly 50% of total value of indemnities for the flood losses were paid in south-eastern Poland (the former Cracow, Rzeszów, Kielce and Lublin voivodships). In Cracow voivodship, the intensity of damage to buildings was four times higher, while in crops and movable possessions it doubled the country average.

On the other hand, in 1975-1986 over 45% of the value of indemnities for the flood losses in rural areas was paid in central and western areas of Poland. However, that was damage to crops. This is the region of prevalent intensive agriculture of high commodity value, and the summer floods in

1980 and 1985 occurred before or during harvesting¹. In central Poland, losses in buildings and movable possessions increased, though the Carpathian region maintained the leading position in the share of damage to buildings (over 50%). Diversified relief causes that densely settled areas (buildings) in the valleys are more frequently endangered by the violent floods in south-eastern Poland, where total non-agricultural losses are generally greater (44%) than the country's average (30%). The highest share of losses in movable possessions was recorded after 1975 in central and eastern Poland (30%). Those higher losses were most probably the result of a violent occurrence of ice-jam flood in 1982 and of excessive faith in durability of flood embankments (1979, 1982), which did not allow the farmers to secure part of their possessions.

The lowest flood losses in rural areas occurred in northern Poland as well as on the south-eastern Highlands, which are climatically and geomorphologically less endangered by floods (Fig.1).

In the period under investigation a clearly marked fall of flood losses in rural areas was recorded in the western Carpathian region, where a higher flood danger led to more intensified protection measures (storage reservoirs, channel enlargements, abatement schemes). In the eastern Carpathian region, where no such intensive anti-flood measures were undertaken, flood losses increased (1980, 1987). The insurance data show that flood losses maintained on the same level in the catchment of the Upper and Middle Odra, but flood-control devices were considerably dcapitalized there, which was shown by the most catastrophic flood in 1977.

Lowlands in Central Poland rank second in respect of flood danger in Poland. The increase in flood losses in this area is due to occurrence of extremum meteorological and hydrologic phenomena all over the century (heavy rains in June and July 1980, as well as in August 1985; violent thawing following one of the most snowy winters of the century, the soil being frozen throughout March, April 1979; exceptionally favourable conditions for the emergence of brash-ice in the Lower Vistula in January 1982), as well as due to cases of failure on the part of man. The flood-control on small and some sections of large rivers is not satisfactory. Embankments are not sufficiently developed and require modernization (38%). Bad condition of drainage systems caused more severe effects of floods in 1980 and 1985.

Since 1987 there has been no catastrophic flood in Poland, but its occur-

¹ A large share of indemnities paid to the farmers in west-central part of the country (Wielkopolska and Kujawy regions) is partly affected by the extent of crop insurance since 1972 (grasses constituted over 55% of total number of crop damage cases) and by greater agricultural losses in the lowland areas than in southern Poland. According to the data of the Chief Committee for Flood Control, nearly 70% of the direct flood losses (all sectors of national economy by 1975-1987) were equally shared by three regions: Lower Silesia (24.0%), Wielkopolska and Kujawy (22.9%), and Carpathian region (22.5%).

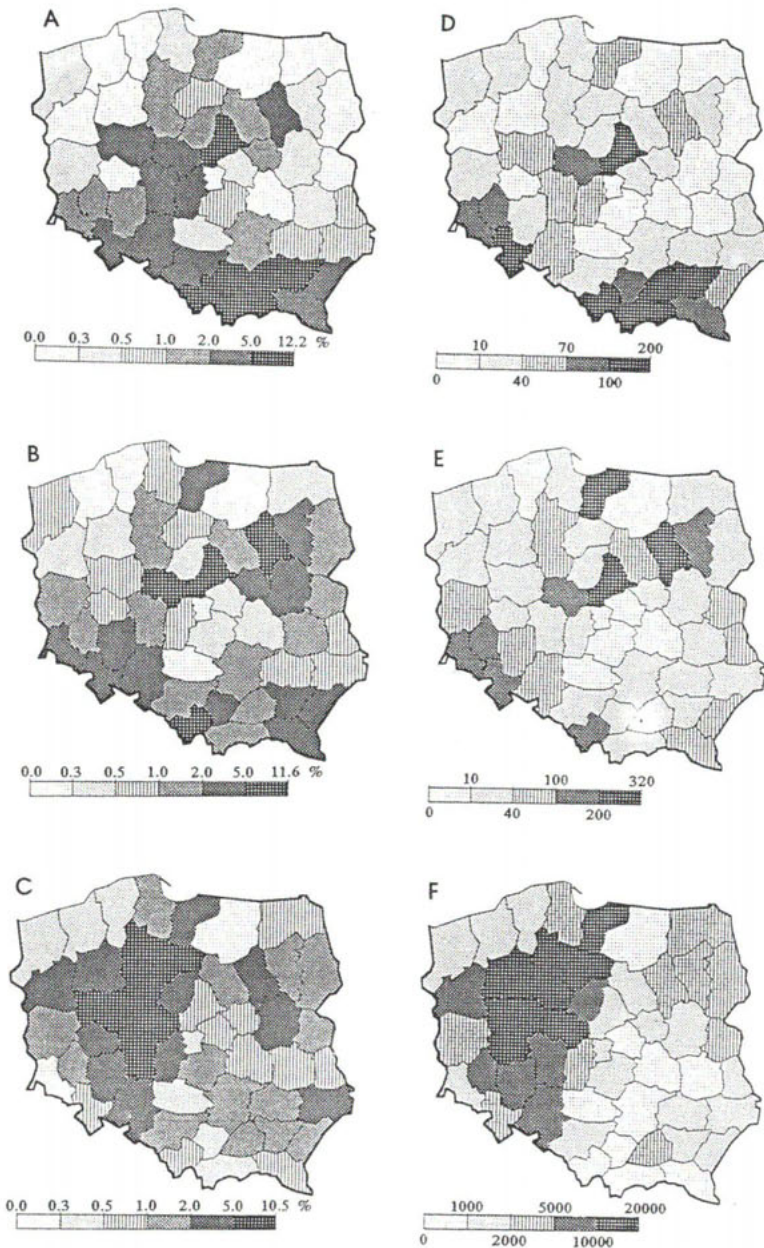


Fig.1. Value of indemnities from the State Insurance Company claimed by the farms for the flood losses in Poland, 1975-1986

Percentage of total country value of indemnities: buildings (A), movable possessions (B), crops (C); an average value of indemnities (in zlotys — constant prices of 1987) per one insured farm: buildings (D), movable possessions (E), crops (F)

rence in the future is likely to have severe effects for the farmers. Liquidation of compulsory crop insurance and the increasing of premiums, as well as difficulties in selling agricultural products made the majority of farms abandon insurance (it is continued by only several thousand farms in the PZU). In view of high interest on bank credits, reconstruction of the farm after a successive flood might become a severe problem.

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