Processes of Erosion and Deposition at the European Russia and Byelorussia.

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On the pattern of erosion and sedimentation at the European Russia and Byelorussia the influence of geographical zoning can clearly be seen. It is evident in climatic and terrain conditions at the territory, the latitudinal extent of vegetation and soil zones, in socio-economic conditions, and in the development of farming first in the southern part of forest zone, then in the forest steppe, and then in the steppe zone.

At the beginning of intensive agriculture in 16-17th centuries area of arable lands had increase in southern part of forest zone and in the northern part of forest-steppe zone till the 18th century, when the maximum of erosion and sedimentation rate was found there, mostly in the area of humic podzolic soils. These previously timbered areas were cultivated to the extent of 30-60%, and the fairly steep slopes of the Srednerusskaya and Privolzhskaya uplands provided favorable conditions for erosion. In the area of humic podzolic soils 60% of the total soil-loss at the territory were washed away.

In the 19th century the intensity of erosion in the southern part of forest zone and the northern part of forest-steppe zone did not diminish. Although the most heavily eroded and gulled areas of arable land were abandoned and returned to natural woodland, new land, often with longer and steeper slopes, was brought under cultivation after land reform of 1861. Steep valley banks were cultivated, which caused intensive rill and gully erosion. Consequently, soil-loss in the area of humic podzolic soils comprised 45% of soil-loss from the entire territory. Intensive sedimentation in some river valleys of this area began in 18th century and continued till the end of 19th century.

Arable lands in southern part of forest-steppe belt start to increase from 18th century and reached their maximum in the end of 19th century: the tilled area here increased by 30-40%. The most intensive sheet, rill and gully erosion in forest-steppe zone was observed during 19th century and erosion here represented 45% of total soil-loss at the territory. At the same time heavy sedimentation of small river valleys occur.

In the 20th century, a substantial reduction (up to 50%) of cultivated land took place in the southern part of forest zone. Since the steepest and most eroded lands were abandoned, the potential for erosion of arable land decreased. The widespread use of perennial grasses in crop rotation also led to a lower rate of erosion. As a result only 23% of soil-loss at the territory remained in the forest zone. Much of the gully network became overgrown with bushes and trees, and sedimentation in small river valleys mostly stopped. In the forest-steppe zone, the arable area decreased on 10%. However the rate of erosion didn't decreased significantly (39% of the total soil-loss), because the area of row crops (potato, maize, sugar bean) increased. However, the rate of sedimentation in small river valleys slowly increased.

In the 19th-20th centuries, cultivation spread further to the south of the steppe zone of the European Russia. Here erosion over the last century has washed away 37% of total soil-loss, and linear erosion was increased rapidly. The sedimentation has changed stream morphology and reduced both the total length and order of stream networks.

The contemporary average severity of erosion follows the same trend. In the Baltic Seaboard, the average soil-loss from arable land on major uplands is 5-7 t/(ha a) (in the south 8-9 t/(ha a)), and on lowlands 1.0-1.5 t/(ha a). In areas of glacial landforms on uplands it is 10-12 t/(ha a) and on glacial-lake and fluvioglacial plains approximately 2 t/(ha a). Roughly the same relationship is found between soil-loss from uplands and plains in the central part of the European Russia: Central Russian Uplands, 7-8 t/(ha a); Oka-Don lowlands 0.5-2.0 t/(ha a). By contrast, the lowest erosion rate, in the middle of the Byelorussia Pripyat' wooded lowland, is less than 0.5 t/(ha a). The southern uplands stand out as having the highest soil-loss rates (Stabropol' upland, 15-20 t/(ha a)), and the lowlands a trivial rate: the Caspian Plain loses less than 0.5 t/(ha a).

The mean rate of sheet erosion on the arable lands on the European Russia and Byelorussia is 4.4 t/ha per annum. On 19.5% of the arable land the rate of erosion is less than 0.5 t/(ha a), on 35.9% it is in the range 0.5-2.0 t/(ha a), on 24.5% it is in the range 2.0-5.0 t/(ha a), on 10.6% it is in the range 5.0-10.0 t/(ha a), on 5.2% it is in the range 10.0-20.0 t/(ha a), and on 4.2 % of the arable land erosion rate is more than 20.0 t/(ha a).

Sedimentation of small rivers, and to some extent of medium-sized rivers, is heaviest in the northern part of steppe and forest steppe zones: the general condition of small rivers in the south of the European Russia is little short of disastrous. Dry valleys, which have served as buffers to sedimentation and have protected small and medium-sized rivers from heavy aggradation, suffer heaviest sedimentation in the central part of the territory.