

Management elements in the Bug river valley

Hydrotechnical activity within the river channel and the valley bottom directly influences both past and present threats to the natural assets of the valley. Based on archival researches and territorial works a record was made of the effects of engineering activities in the Bug river valley.

Even the most detailed, actual data about the condition of the natural resources does not present a real picture of the environmental transformation, as it does not convey the intensity and the character of this transformation.

An attempt to grasp this phenomenon is seen in a study of changes in the land use structure in the Bug river valley. The study was based on a comparative analysis of maps of selected areas representing the valleys physiographical regions. In each case details of land use were presented from two periods separated by at least 50 years (Fig. 1-4).

Within this comparative analysis of maps it is important to remember that, despite the fact that maps are a rich source of information, it is not always possible to treat them as a reliable source. Not so long ago topographical information on the maps was purposely falsified. Also, maps have different scales, different degrees of generalization and detalization which can encumber any detailed comparison.

Hydrotechnical and transportation development

Most management elements disturb the ecology of the river valleys. Hydrotechnical constructions (accumulating, regulating, flood control) and constructions of the transportation infrastructure (road, railways, bridges, border crossings), play a major role here. Some of them constitute parallel or longitudinal obstacles that prevent organisms from reaching the water or moving freely, as well as hindering seasonal animal migration. They also hinder the spatial continuity of the valley in its role as an ecological corridor. The boundary character of the Bug river conditions hydrotechnical and transportation management of its valley. This divides the river into three sections: the Ukrainian section, the Belarussian section and the Polish section. The presence of a carefully guarded border between Poland and USSR hindered any actions aimed at constructing and regulating an embankment along the river, and the development of border crossings (bridge crossings over the Bug river). However, the situation supported the preservation of the unique natural assets in the area. The situation in the Ukrainian (upper) and Polish (lower) course of the river was different. Management of the valley was unlimited, allowing the construction of two dams and numerous bridges as well as a regulated embankment along some sections of the Bug river. Still, hydrotechnical and transportation management, especially in Poland, was not too intensive. This was mainly due to the financial situation, which also limited actions taken in the boundary section: for example the existing embankments were not developed despite the often high water stages of the Bug river, and the bottom of the flood terrace was almost left untouched in this section. Hydrotechnical and transportation structures were constructed over several hundred years depending on economic need and technical ability. At present remains of those structures are still found in certain parts of the Bug river valley; to a certain extent they also act as an ecological barrier. Some of those remains were adopted by nature: near Łęgi (Janów Podlaski) a habitat is being designed which will adopt the remains of the bridge crossing. The term "hydrotechnical structures" comprises the following items: flood control embankments, dams, weirs, barriers, structures related to regulation of the river (strengthening of the river channel) and drainage ditches. Their presence not only disadvantages the hydrological condition of the river: acceleration of the water flow and decreased underground water level, but also decreases the diversity of habitats and organisms. There is deterioration of islands, old river beds, and natural, sandy slopes which create good conditions for bird nesting: terns, plovers, sand martins, and kingfishers for example near Wyszów and Wywłoka [Nowicki et al. 1993]. The moisture level in the valley also decreases, which results in characteristic changes in the uses of the valley (specially the deterioration of the wet meadows). Limitation of the flooded areas results in a lack of re-development of natural habitats (riparian forests, flood hay-growing meadows). In the Ukrainian section the Bug river is dammed in two places: Sosnowka and Dobrotwór. In the much longer, boundary sections there are no such structures. There is only a small damming in the debris under the railway bridge in Dorohusk and a needle weir on collapsible wheels built in 1931 near Terespol, 2.5 km, below the outlet of the Muchawiec river - which was designed to dam the channeled Muchawiec river [Monografia... 1985]. In the Polish section there are no big hydrotechnical structures. The only structures present are related to the regulation of the Bug river. These are: transversal groins and strengthened banks near Wyszów, and a new channel near Wywłoka and the outlet

section Kuligow - Popowo Koscielne. Structures of this type are also present in other sections. Some of them are remains of old activity (mainly in the second half of the 19th century). For example, in Moscice Dolne and Jableczna the river was changed in such a way that the present buildings were constructed on the left bank of the river [Rakowski 1996].

The Polish section of the Bug river is characterized by the channel's embankment. The flood control embankments were raised too close the channel. These are: embankment of 65 km length running from Krzemien - Zagacie (Jablonna Lacka) to Szyrkaszyn (Sadowne) located in the left-wing of the Bug river valley. This is a single embankment. In the section from Brok to Malkinia a double embankment was raised. In this section there is also a bilateral embankment from the outlet of the Bug river to the Zegrze Reservoir - from Popow (Kuligow) to Serock (each of them is 6 km long).

The boundary section there are two kinds of flood control embankment: old lower (2 to 3 m high) and new ones - higher (about 5 m high). They are present near Dorohusk (old one - 2 km long), in Wlodawa (old one - 2 km long), from Uhruska through Stujno to Zberez (new one - lower about 5 km long), near Terespol (new ones, outer and inner embankments, each one about 2 km long). Ukrainian and boundary section on the Ukrainian and Belarussian side the embankments were raised in several places: near Brzesc and Czerwonograd. Engineering meliorations took place mainly in the boundary section of the Bug river. They were conducted in the second half of the 19th century and then continued in 60's and 1970's. The drainage ditches from that period are not currently functional, therefore they overgrow and do not fulfil their role. They are present near Zberez, Horodno, Bereznica, Matcze, Skrychiczyn, Swierze, Uhrusk. In Poland embankments near Stary and Serpelice. [old hydrotechnical structures: dams and dykes related to the water mills are worthy of mention. They were present near Strzyzow, Mielniki, Uhrusk, Wola Ika, Niemirow and Gnojno [Mapa Kwatermistrzowska... 1839-1843, Gloger]. At present there are no remains of them that could constitute an ecological barrier. In contrast to hydrotechnical structures, the transportation infrastructure is a special ecological barrier. These are mainly bridges related to well established roads traffic network (including border crossings), with varying degrees of traffic, run transverse to the valley-axis. Apart from the bridges and slopes in the river valley there are roads and railway lines (very often on the slopes) which are parallel to the valley-axis. They give an indication of the width of the ecological corridor in their given section. As with the hydrotechnical structures, some of the current transportation infrastructure are remains of the old (defunct) routes. This is clear especially in the boundary section where, after the border of the Bug river was established in 1945, some of the routes disappeared and bridges were closed. Crossing neighbours from the other side was only possible via the border crossroad and railway) in Terespol, the railway crossing in Dorohusk and the crossing of the metallurgical-sulphur line in Grodek. After the fall of the USSR and the rising of the independent states of Ukraine and Belarus, three new road border crossings were developed: in Dorohusk, Zosin (Ukraine) and Slawatycze (with Belarus). Current traffic structures in the boundary section of the Bug river are: bridge crossings and road embankments leading from Grodek, Zosin, Dorohusk, Slawatycze, Terespol and Kukuryki. A special attention should be paid to the area near Dorohusk where there are two steel bridges (a railway and road bridge leading from a road on a bilateral road embankment). The same applies to the area near Terespol where there are eight bridges - two road and two railway bridges and four smaller ones designed for pedestrians - at present used only by border guards (it may be assumed that in the past they served as walking bridges). In Poland there are nine bridges - three railway bridges and six road bridges. They are located in Fronolow/Mierzvice (railway), Kozki (road), Tonkiele (road), Nur (road), Malkinia (railway and road), Brok (road), and Wyszow (road and railway). There are remains of two kinds of old traffic structures: bridges, for example in Terespol and transverse embankments in: Krylow, Strzyzow, Dubienka, Wlodawa, Orchowek, Koden, 1-e'gi near Pratulino, Jableczna, Wirow, Krzemien, Branszczyk, Kamienczyk and Rybienko. They were connected with, currently, non-existent routes that lead to the crossing or to the bridge over the Bug river. The roads that run mostly on the embankments along the valley create a transverse barrier. In the first place these are: "Nadbuzanska Road" Zosin - Terespol (816) and fragments of national roads from Hrubieszow to Zosin (844), Terespol - Janow Podlaski (698), Anusin - Tonkiele (637) and Nur - Brok (694). Bridges built on the crosssection of the tributaries (for example on the "Nadbuzanska Road" in Dubienka) are connected to the afore-mentioned roads. The single-track railway from Chelm to Wlodawa is also a transverse barrier, which runs along several of the embankments. It reaches the Bug river valley near Wola Uhruska and leads to Orchowek through its 28 km. The project to develop a water road East-West and the development of the bridge border crossing on the Bug river may also threaten the ecological corridor of the Bug river valley. The first project would require concentration of the current, straightening and deepening of the channel, the building of longitudinal dams (minimal solution) or a full embankment of the valley and construction of 7 or 13 water steps: Neple, Mielnik, Granne, Zuzele, Malkinia, Branszczyk, Barcice (maximum solution) which would cause flooding of the valley in the dam reservoir [Monografia... 1985]. Realization of either of the two projects would result in destruction of the natural assets of the river and its valley followed by

question- able economic returns [Chylarecki et al. 1993, Kajak 1993]. The second project - the development of the border crossings is less damaging. There are plans in the near future to build a third bridge over the Bug river in Dorohusk. It would be built 20 m to the north of the existing road bridge in order to improve the operations of the border crossing. A further project of this kind would be the development of the border crossing (bridge crossing) between Poland and Belarus in Wlodawa.

However, current representatives of technological sciences follow the "new wave" of thinking and will more often incorporate ecological criteria in their hydrotechnical and traffic structures. Based on the idea of adapting the afore-mentioned structures to the needs of living organisms and eco-systems. Taking these criteria into consideration would allow for the preservation of the natural assets of the river valleys (space protection, continuity of the valley ecological corridors, environmental mosaic and biological diversity); and create a modern flood control system. Ecological development of the rivers would support their new role - that of attractive tourist routes [Kolodziejcki 1999]. This is one of the aims of ecological policy in the Bug River Euroregion. Improvement of water purity is the first among the strategic programs. Attention is also given to the development of the Bug river as a center for water tourism and the development of tourist border crossings equipped with pontoon bridges, foot-bridges or ferry crossings [Polski 1997], which do not create an ecological barrier. The actions described give an optimistic vision for the future of the ecological corridor of the Bug river valley. If there are not enough funds to realize those plans there should still be enough to stop prevent further damage and to preserve the natural richness of the area. This is what we can learn from history. Land use and management elements of the selected sections of the Bug river valley Volynian-Podolian Section Study area. The subject of the paper is the fragment of the Bug river valley which is bounded by the valley edges as determined in the geomorphologic mapping and borders of the Army Topographical Map 1:50000 Dubienka (M-34-36 D).

Analysis of land use and management within this section was based on the afore-mentioned topographical map (state from 1975-1984) which was compared with a topographical Map from the Polish Army General Staff 1:100 000 chart - Chehn (state from 1994) and terrain observations in 1999. The comparative material includes: tactical map WIG 1:100 000 scale chart - Chelm (belt 44, column 37, state from 1931) and Lubomla (belt 44, column 38, state from 1933). To unify the scales the chart for Dubienka was re-produced in 1:100 000 scale and presented on two maps showing the state from 1993 and 1999. The selected section of the Bug river valley comprises the natural areas of Poland and Ukraine located to the south of the border crossing in Dorohusk. In physiographical terms this area belongs to Polesie Wolynskie [Kondracki 1998]. It is a very interesting area. It includes parts which are legally protected: Strzelecki Landscape Park (in the south), ecological premise - retention reservoir in Husynne, and areas proposed for legal protection: Debowiec habitat - currently in the design phase. This area is a refuge for birds. In this section the Bug river takes in many left-bank tributaries - the largest being the Udal and the Welnianka river. There are many old oxbows - most of them overgrown. In the spring this area is often flooded, this results in a natural fertilization of the valley and ensures its proper use. All these elements indicate great promise of the selected section of the Bug river valley to act as an ecological corridor. Good natural assets make the area ideal for recreational purposes. This is the case in Poland. In Starosiel there is a resort with clearly marked paths for walking ("Starorzecze", "Dolina Bugu"). Agrotouristic Association of Dubienka has its headquarters in Dubienka. Land Use. This section of the Bug river valley is characterized by large amounts of meadow and pastureland. They are mainly found on the flood terraces of the Bug river and its tributaries. There are also many areas of scrubby brushwood (mostly in Ukraine). In addition, on the flood terrace, and also on the overflow terrace there is arable land especially near to settlements - near Dorohusk, Husynne, Uchanka and Dubienka. Forest communities mainly cover the overflow terrace. The largest are near Dubienka (Starosiel) in Poland and almost the whole section in Ukraine. There is a clear contrast between the left and the right wing of the Bug river valley - in Ukraine there are 10 times more forests than in Poland (10.12 km² and 0.91 km² respectively). During the last 60 years in Poland, there was an increase of arable land at the cost of meadow and pasture land, for example: northward from Husynne and eastward from Dubienka. There was also an increase in forest areas (from 0.36 km² to 0.91 km²), for example: eastward from Turki, south west from Husynne and north-west from Dubienka. According to "Local Plans of Dubienka district management" the forest areas are to grow systematically. In Ukraine (former USSR) the area of meadow and pasture decreased while the forest area grew (from 0.51 km² to 10.12 km² as did the scrub lands. At present there is a remarkable difference in the forest areas on the opposite sides of the Bug river valley, this was much smaller 60 years ago (0.15 km²). The total forest area occupied 0.87 km² (now 11.03 km²). The changes in the land use structure were caused by an increased drainage of the land. Settlement. Most settlements are found on the overflow terraces. These are small villages, the largest being Dubienka and Dorohusk (in Poland) and Berezce (in Ukraine). It is important to note changes in the distribution of settlements that have occurred over the last 60 years. While in Poland settlements were not too large (for example: a resort was built on the location

of Farim in Starosiel), drastic transformations took place in Ukraine. Some of the villages located near the Bug river channel in the line of Dubienka disappeared: Binduga, Bystraki and Kladniow. It is also of note that at present in Poland this process whereby villages disappear continues for example: Kolemczyce (located on the overflow terrace near the Bug river channel) is depopulating. Transportation. A major role (in transportation) is played by the "Nadbuzanska Road", much of which runs in a meridional direction along the edge of the overflow terrace in Poland. It connects two villages: Dorohusk and Dubienka and also, through numerous side branches, villages located to the north of these. There is no equivalent of the "Nadbuzanska Road" in Ukraine. There are roads with a shorter range, the most important of which is that connecting the two villages: Wysock and Berezce. The last 60 years has brought changes the transportation structure. The most important is the disappearance of routes connecting the villages on the left (presently Polish) side with villages located on the right (presently Ukraine) side of the Bug river valley. They disappeared or were reduced to the size of paths, among others: the roads connecting Dubienka with Binduga and with Bystraki, and connecting Dorohusk with Berezce. Other management elements. Embankments, dams and dikes are rarely found in this section. They are mostly found near the flood terrace in Poland. The first few are related to the "Nadbuzanska Road", mainly in places where it crosses the side valleys, for example: near Uchanka. Eastward from Dubienka there is a great transverse embankment that almost reaches the Bug river channel. A very big dike (embankment) surrounds a retention reservoir in Husynne, built on the Udal river. A small embankment that acts as a road can be found near Husynne village. Special attention should be drawn to a mound in Uchanka that commemorates a battle between Polish Army under Tadeusz Kosciuszko and the Russian army, with trenches between Uchanka and Dubienka located on the edge of the flood terrace. In this section there are many excavations that adversely influence the landscape. The biggest are in the south from Dorohusk near the "Nadbuzanska Road". Two of them act as dumping grounds. Southward from Dubienka, in the Welnianka river valley, there are also concave forms divided by dikes which are most probably the remains of old ponds. There are also drainage ditches dewatering the forest area in Starosiel. Most of the afore-mentioned forms did not exist 60 years ago. Bridges are also elements of management, yet they are present only on the Bug river tributaries: Udal and Welnianka. The biggest are related mainly to the "Nadbuzanska Road". This situation is similar to the one 60 years ago, yet the bridges are different. It is important to note, that at that time there were several crossings (people were transported by boats) on the Bug river (for example: to Kladniow, Bystraki and Berezce) which have since disappeared. Conclusions. Characteristic changes in land use and the management of this sec a map issued by WIG [Military Geographical Institute] in 1:100 000 scale (Opalin chart, row 43, column 37 showing the state from 1933) and a current topographical map in 1:50 000 scale, showing the state from 1975 to 1984. The total area of the researched section of the valley was 135 km². The section selected for analysis is the Polesie section of the Bug river valley - southern border of Western Polesie [Kondracki 1998]. The Bug river valley runs from the south to the north here. In contrast to the valley, the river is meandering, changing direction every couple of hundred meters. The Bug river had this character during the whole researched period and before; traces of the meandering course are seen in numerous old river beds from different development phases - ranging from those connected to the river current, to those completely cut off from the river, which are often located far from the river channel. In this section the river takes in small nameless tributaries along both banks. The width of the valley ranges from about 4 to 8 km and is typical of the Polesie section. The height of the valley bottom changes from about 170 to 154 m ASL. Due to considerable natural assets in this area, many protected sections were established within the analysed fragment of the valley, or near to it. These are nature reserves: Maloziemce (fauna - created to protect the nesting place of common heron), Magazyn, the Brudziniec Lake, Three Lakes (water-peat) and the Sobiborski Landscape Park, together with the buffer zone. Land Use. Currently, this area is characterised by remarkable natural and recreational value. Forests and meadows cover almost half of the researched area. These areas are seen as slightly transformed, but almost natural elements of the land scape. Green regions are located in the lowest parts of the area and forests are located either near to the channel, or in the drier habitats on the overflow terrace. Comparison of the two maps shows a doubling of the forest area from 15.4% to 34.7%. A vast forest area appeared in Poland in the central part of the chart between Stuiino and Wolczynny. At present this forest is protected as a landscape park. This increase took place at the cost of meadows, their area decreasing greatly from 29.4% to 13.7%. Meadows were partially drained thanks to drainage works near Adamczuki and Stuiino (drainage ditches), and thanks to development of flood control embankments, mainly in Poland on the southern part of the chart. Most probably, natural processes also influenced the decrease of the meadow area. The drained meadows were covered partially by forests and partially by arable land. Comparison of the maps allows one to draw conclusions not only about the quantity but also about the quality changes of the meadows. It appears that today meadows are drier than in the pre-war years. Analysis of the maps also implies a major increase of the stream length. This is due to the development

of drainage ditches. Settlement. At present settlement in the analysed area consists of 10 villages evenly distributed on the overflow terrace, on both sides of the valley. Buildings are of a rural character. The level of settlement has decreased over the last half-century. Some villages such as Maloziemce disappeared almost completely, only single farms remained. Other villages, for political reasons, were trans-located - Koszary, Olszanka - outside the valley. Most of the settlements disappeared and the village buildings weakened. The settlements of the Bug river valley included in the Dubienka chart are connected to the change of the area's status to that of a border, requiring that it remain uncultivated or utilized to some small degree. It resulted in the transformation of small areas and even the disappearance of some villages, and an increase in the forestation of Ukraine. In Poland, the cause of the changes is more complicated. For example the increase in arable land area near Dubienka could be caused by the loss of importance of this village in favour of Dorohusk (privileged by important railways and roads), distance from main transportation routes, lack of industry and the fall of navigation on the Bug river. Such a situation made people turn to farming which increased the areas of arable land in the valley. In times of economic transformation and the opening of borders it is important to direct land use and management of the valley in such a way that the pressure of border crossing (road and railway) in Dorohusk would not become a threat to the natural assets of the ecological corridor of the Bug river valley.

Polesie Section
Study area. The research dealt with a section of the Bug river valley presented on a chart of the Military Topographic Map in 1:50000 scale (M-34-24-C Zabuzje). This area is located in the section that is a border between Poland and Ukraine, between Dorohusk and Wlodawa. The edge villages within the limits of the Zabuzje chart are: Zabuzje and Maloziemce in the south and Koszary in the north. The researches were based on comparison of the content regarding land use from Transportation. These degeneration processes also apply to the road network. Before the war there were two parallel roads with a paved surface on both sides of the Bug river. At present there is only one such a road in Poland, the course of the roads did not significantly change here. The road fragments near Zabuzja and Grabow, currently in Ukraine, are the remains of the second road. One can only hope that present roads are of a better quality than those from the pre-war times. A railway line from Chelm to Wlodawa runs through the western periphery of the researched area - it already existed in the inter-war period. Other management elements. There is no investment in these areas. The only things worthy of attention are flood control embankments in the southern parts of the chart, mainly in Poland. The drainage works were done mainly in Ukraine, south of Adamczuki village. Facilities and drainage ditches make up a secondary management element, apart from the flood control embankments, crucial for the valley's function. The afore-mentioned ditches were built in areas called (before the war) - Zabuzanskie Holendry. The name comes from the Dutch who came in the 19th century from Zulawy Wislane and are known for their drainage skills.

Podlaski Section

Study area. The subject of the paper is a section of the Bug river valley from Janow Podlaski (part of a village called Wygoda) to Mielnik, bounded by the edges of the valley established during geomorphologic researches and borders of the chart taken from the Military Topographical Map 1:50 000 Janow Podlaski (N-34-143-A) showing the state from 1975-1982. The comparative material includes maps from WIG [Military Geographical Institute] in 1:100 000 scale - charts: Siemiatycze (row 39, column 36 - state from 1937) and Biata Podlaska (row 40, column 36 - state from 1931). This area is 117.85 km². To unify the scale the chart - Janow Podlaski was reduced to 1:100 000 scale. The researched area represents the Podlaski Gap of the Bug river [Kondracki 1998]. In this fragment the Bug river valley has a southeast to northwest course (in the Janow Podlaski - Niemirow section south-north), despite the fact that the meandering river flows in certain sections in a northerly direction and even north to west. The old river beds "buzyska" are the remains of the old course of the Bug river channel; they are of various sizes and development phases - from those connected to the current to those completely cut off and dry, which form curved hollows. The biggest ones (meander lakes) even have proper names: Zatoka (located to the northwest of Borsuki village) and Buzysko (northward from Bubel Stary village). In the upper part of the researched section of the Bug river valley there is an outlet of the left bank tributary - the Czyzowka river. In this section the Bug river narrows significantly, the relative height of the edges - increases reaching 55 m in Mielnik (Gora Zamkowa). This fragment of the valley is said to have the most picturesque landscape due to the dramatic height differences, there are many viewing points - places with a very wide view of the meandering river. This was one of many reasons why the researched area was included in the borders of a landscape park - the "Podlaski Gap of the Bug river". On the high bank of the Bug river, on Gora Zamkowa in Mielnik, there is an early medieval (11th to 12th century) castle - a key archeological point. In Wygoda village (part of Janow Podlaski) there is the oldest, working stud in Poland (established in 1817) where Arabian horses are bred. The annual horse auctions take place here. The analysed area is situated on what has been the border for more than 400 years. From 1569 to 1795 it was a border between Lithuania and the Crown

(separating Brzeskie and Podlaskie voivodships), near Niemirow in 1795 three partitioned sectors of Poland were brought together: Prussian and Russian (on the right bank of the Bug river) and Austrian (on the left bank), during World War II the Bug river separated German - occupied Poland (GG) from the territories occupied by the USSR. Currently in the section above Niemirow the Bug river is a frontier river between Poland and Belarus. Below Niemirow the border leaves the river's course and runs further to the northeast along the so called "Napoleonian" road. Land Use. This section of the Bug river valley is characterized by a relatively high (over 50%) concentration of "seminatural" areas (forests and shrubs, meadows and pastures). Green grounds are located in a vast (up to 2 km wide) - area in the neighbourhood of the river channel - mainly on the flood terrace. The banks of the Bug river and of the old river beds together with the islands on the Bug river are covered by osier brushwood. Forest communities cover mainly the overflow terrace but they can also be found in lower locations. Arable land is found almost only beyond the flooded area. The most obvious difference in land use during the last 50 years is the major (almost double from about 10.9% to about 21.4%) increase of the forest area at the cost (mainly) of arable land. The newest forest complex grew in the bend between Mielnik, Sutno and Wajkowo. There are also more forests in the north from Borsuki, in the south from Niemirow and in other places. The area of meadow did not undergo any significant changes (it increased slightly from 23.9% to 26.6%). There is, however, a dense network of surface water on the meadows within the valley. These are draining ditches created by people, which de-water the area during the more humid periods. One can assume then, that the meadows are currently drier (the compared maps are of different scale; and the different levels of generalization hinder a detailed comparison of the content – the right bank of the old river bed northwards from Nowosieiki, is clearly visible in the newer map, while it is not marked on the inter-war map, though its shape clearly indicates its natural origin). Settlement. Modern settlement in this area consists of small, up to 1000 inhabitant, villages (three with the status of a town: Janow Podlaski, Niemirow, Mielnik). They are located mainly on the overflow terrace but as close to the river as possible. Therefore, the topographic location of villages: Buczyce Stare, Bubel Lukowska, Bubel Stary, Gnojno, Borsuki (on the left bank) and Nowosieiki, Niemirow, Sutno, Wajkow, Mielnik (on the right bank) indicate the range of the flood terrace. Postwar settlement underwent both evolutionary and revolutionary changes during the past 50 years. The first major change was the trans-location of Krynki and Wieliczkowicze villages (after the establishing of the border between Poland and USSR, presently Belarus). Both villages located at the river's edge were moved and totally rebuilt, now they are located about 1.5-2 km from the river (border). Changes in names (Ponikwy - Panikwy, Nowosioiki - Nowosietki, Wieliczko- Evolutionary changes, resulting from the depopulation of the villages, are based on degeneration of farms and the scarceness of buildings. An extreme example is the almost complete disappearance of Zabuze in the lower part of the researched area. During the inter-war period this village stood by the defunct crossing on the right bank of the Bug river to Mielnik. Transportation. The transportation network in this section of the Bug river valley plays only a local role. It consists of hardened roads, which lead along the borders of the flood terrace (and on the overflow terrace) on both sides of the valley and connect the villages located along the river. There is no railway. During the last 50 years the network of paved roads changed, it was not only the expected growth (a road connecting Mielnik with Wajkow was built) but also the decrease in the number of roads. Due to the change of national status and establishing the border between Poland and Belarus the network was broken. There is no road connecting Niemirow and Krynki and Krynki with Nowosiolki. The direct connection of the boundary villages disappeared. During the inter-war period transport across the valley played an important part. This is illustrated by ferry or boat crossings marked on the WIG map in Wieliczkowicze, Niemirow, Zabuze. Currently, none of them is functioning. The reason for this was the establishment of the border on the Bug river (Wieliczkowicze and maybe Niemirow) and the increased popularity of vehicular transport (Zabuze from where its not far to the road bridge in Kozki). Other management elements. Among other management and land use elements, the only one worthy of attention is the compact network of drainage ditches on the meadows within range of the valley bottom, on the flood terrace (near Wygoda, Nowosieiki, Bubel Stary, Gnojno, Sutno, Borsuki). Divided meadows are drier therefore easier to cultivate. Comparison of the maps from 1930s and 1980s suggests that all drainage ditches were built within the last few years, yet varying degrees of detail leaves room for uncertainty. Other management elements (embankments, dikes, dams, excavation for clay, sand, gravel, peat exploitation) are so rare as to have no influence on the landscape. Conclusions. There are several causes for the afore-mentioned transformations in the management and land use of the Bug river valley in the section between Janow Podlaski and Mielnik. The most important (influencing all aspects of the valley management) are political issues: World War II (destruction) and the later establishment of national borders on the Bug river and within the valley bottom. This led not only to changes in the settlement and transportation patterns but also to translocation of some of the area into the peripheral zone of the country, which is used less. Therefore, there is only minor development of the transportation network and

in some places it has even degenerated. Disadvantageous demographic processes (depopulation and aging of the villages) lead to a decrease in population, which might influence the development of this area. Pre-war towns (Janow Podlaski, Niemirow, Mielnik) lost their municipal status (Mielnik in 1934, the others after the II World War), which surely decreased their appeal for eventual habitation. This process was later intensified by the migration of the younger, or more dynamic people, to the cities. The afore-mentioned reasons explain the discontinuation of development (or the stagnation) of this region. On the opposite end of the scale there should be the melioration process and as a result the increased intensity of cultivation of the green grounds in the Bug river valley (however, it is possible that the melioration of meadows and the increased intensity of their cultivation was a short-term process). On the whole, the results of these processes, while difficult to judge from the economic point of view, are favourable to the environment. The green grounds and forests, which are in a majority in the valley, seem to relate best to the natural predisposition of the environment. Therefore the increase of their surface should be positively regarded. The natural course of the Bug river channel is an additional asset (the river was not regulated). A peripheral location to this area and the lack of a predisposition for anything other than farming guarantees (only after improvement of the Bug river's water purity) permanently good environmental conditions.

The Lower Bug river valley Study area.

The researched section of the Bug river valley is located within the range of the Lower Bug river valley [Kondracki 1998] on an area included in the map chart 1:50 000 Sterdyn (N-34-129-B). The state of the area as documented for a 1993 map 1:100 000, chart N-34-129/130 Sokolow Podlaski PPWK was accepted as the actual state. Comparative material included in a WIG map in 1:100 000 scale, charts: Ciechanowiec (row 38, column 35, state from 1937) and Malkinia (row 38, column 34, state from 1936). The outcome of the analysis of the map 1:50 000, chart Sterdyn, state for 1980 was included as additional data. This section roughly covers the river between Grodek (Jabtonna Lacka district) and Nur. In the analysed section, the Bug river valley bottom, including the river channel and two terrace levels is from about 4 km to about 7 km wide. The Bug river takes a south-east to north-west course here. The Bug river channel, with small bends, runs along the whole section of the valley, just under its right slope (significantly marked by the clear edge of the plateau). In this section the Bug river takes in three tributaries - Nurzec from the right side and from the left two small streams: the Turna and the Cetynia. Beside that, in the north-west section of the valley at the left edge there is a tributary of the Bug river - the Budzynka, joining the river outside the researched area. Land Use. Comparison of the maps from the 1930s and 1990s leads to a conclusion that this area of the Bug river valley underwent relatively rapid transformations as far as the proportions of the selected types of land use are concerned. Until the 1980s the increase of the forest surface in the eastern part of the section was the most important element. This increase caused an enlargement of the existing forest patches connecting the isolated, small forest clumps into larger complexes. This increase of the forest area took place at the cost of arable land, green grounds and mostly deforested or brushy areas of dune sands. It is unique that that biggest increase in forest area took place near to the only new settlement. Remarkable decrease of the green grounds took place as late as the 1980s and 1990s, after the development of the flood control embankment, so that the state from 1993 is very different from the one reported in 1980. In the area protected by the embankment, mainly on the higher terrace, arable land took over former areas of meadows. Settlement. The settlement network did not undergo any remarkable changes during the researched period. Only one new settlement was developed - Kamiencyk colony. Other villages did not change in size at all. Transportation. In this area there was a remarkable increase of the length of the hardened road network, presently connecting all villages within the researched area. No major new structures were developed: bridges, viaducts etc. Other management elements. The most important for the natural assets of the valley is the new flood control embankment which runs along the Bug river channel, on the left side of the valley, along the whole length of the researched valley section. The development of this embankment radically decreased the water area including the old river beds, causing the almost complete disappearance of a long meandering lake near Kielpiniec. Regulation of the water, in the wet areas of the researched section of the valley, was conducted a long time ago as is indicated by the name "Holendernia" near Chadzyn. In the last half-century drainage works were also conducted on the vast swampy areas between the Cetynka river and previously drained meadows near Chadzyn.

Bibliography

CHYLARECKI W, NOWICKI W. 1993. Wartości przyrodnicze dużych rzek Polski: zagrożenia i możliwości ochrony. *Chronmy Przynr.* Ojcz. 49: 4.

KUCHARCZYK M. (red.) 1999. Problemy ochrony i renaturalizacji dolin dużych rzek Europy. Materiały Międzynarodowej Konferencji z okazji 20-lecia Kazimierskiego Parku Krajobrazowego. Kazimierz Dolny 1-4 wrzesnia 1999 r. Wyd. UMCS Lublin.

- GLOGER Z. 1903. Dolinami rzek. Opisy podróży wzdłuż Niemna, Wisły, Bugu i Biebrzy. Nakł. Ferdynanda Hosicka. Warszawa.
- KAJAK Z. 1993. Problemy ekologiczne, ochrony środowiska i przyrody na trasie projektowanej Drogi Wodnej Wschód-Zachód. W: Tomiałojc L. (red.) Ochrona środowiska i przyrody w dolinach dużych nizinnych rzek Polski. IOP PAN Kraków.
- KOŁODZIEJSKI J. 1999. Rzeki w perspektywie integracji przestrzeni europejskiej XXI wieku. [W:] Koltuniak J. (red.). Rzeki: kultura, cywilizacja, historia. T. 8. Wyd. "Śląsk". Katowice.
- Mapa Kwatermistrzostwa Królestwa Polskiego 1839-1843. 1:126 000.
- Monografia dróg srodładowych w Polsce. 1985. Wyd. Komunikacji i Łączności. Warszawa.
- NOWICKI W., KOT H. 1993. Awifauna Wisły Górnokrajowej i jej głównych dopływów - unikatowe wartości oraz kierunki ich zachowania. [W:] Tomiałojc L. (red.). Ochrona środowiska i przyrody w dolinach dużych nizinnych rzek Polski. IOP PAN Kraków.
- POLSKI J. (red.). 1997. Strategia rozwoju Euroregionu Bug. Euroregion Bug. T. 16. Norbertum Lublin.
- RAKOWSKI G. 1996. Polska egzotyczna cz. II. Przewodnik. Oficyna Wydawnicza "Rewasz" Pruszków.

Dombrowski A., Głowacki Z., Kovalchuk I., Nikiforov M., Michalczyk Z., Szwajgier W., Wojciechowski k., H., (eds.) Bug River Valley as the ecological corridor, State – Threats – Protection. IUCN Warsaw p. 41-60.