Rapid Assessment of proposed Hydropower Plants on Drin River near Ashta (south of Shkodra)

The braided Drin River (during flood season), which will be impacted by the Ashta hydropower plants seen from Rosafa Castle, Shkodra, Albania (Photo credit: Schneider-Jacoby), EuroNatur

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Preface

EuroNatur is implementing with WWF MedPo the project “Protection of Priority Wetlands for Bird Migration (Adriatic Flyway) in the Dinaric Arc Ecoregion through Integrated Site and River Basin Management”. The project is supported by the MAVA Foundation. Lake Skadar and the Bojana-Buna delta is one of the priority wetlands affected by such a project.

This short report is based mostly on available data sources and published reports. For the basic habitat assessment different data sources such as historical maps, SPOT 5m and Google Earth data was included for the analysis. The assessment cannot substitute more detailed investigations related to flora and fauna as well as hydrological, hydraulic and sedimentological assessments.

Table of contents:

1. The planned hydropower stations

At the Drin River near the village Ashta (some 8 km southeast of Shkodra and Lake Skadar) a new hydro power station is planned. The Austrian Verbund has already signed a contract with the Albanian Government http://www.verbund.at/cps/rde/xchg/internet/hs.xsl/8525.htm (link in German only).
The building of the first power station Ashta 1 which is located on the existing weir Spathara should already start this autumn, Ashta 2 in 2010 which is located some 5 km downstream near of the outlet of the bypass canal which have to be constructed.

Some main technical figures:
Installed capacity: 48, 2 MW (for discharge of 530 m³/s) for 230 million kWh/a
Costs: about 160 Mio €
The hydro-dams should start working from 2011 and 2012 onwards.
The electricity produced should be provided for KESH (Albanian national energy company), at least for about 15 years.

Figure 1: The project site at the Drin river close to Lake Skadar with the bypass canal.

2. Short description Drin River

The Drin is the largest tributary of the western Adriatic Sea with about 15,000 km² catchment (including Ohrid lake system) and an annual average discharge of 270 m³/s. The river is characterized by long narrow breakthrough and even canyon stretches before leaving the mountains near Shkodar. In the early 1970ties three huge dams were built in this middle river section changing the hydrological, hydraulic and sediment regime of the river considerably. Both White and Black Drin headwaters feed the huge reservoir "Liqeni i Fierzës" with 72,5 km² surface and a 152 m high dam with a capacity of 2,700 million m³ and an installed power of 500 MW. Further downstream the "Liqeni Komanit" dam is followed by the "Liqen i Vaut të Dejës" with 24,7 km² surface and a maximum depth of 52 m).

The gravel-loaded river in the lower reach leaving the mountains build large braided river sections in the plain often change it's course in ancient times. The Drin flows until 1848 completely into the Adriatic Sea near Leza, about 25 km east of the Bojana-Buna delta today. Flood events in 1848, 1858 and 1896 let breakthrough the river to the Buna River (drainage of Lake Shkodar) by natural channel shift supported by canals to use hydropower for mills south of Shkodar and partial closure of its former river bed. The flood of 1896 was estimated with 7,000 m³/s, which is tremendous for a catchment of this size (the Albanian Alps have very high precipitation values). Due to the breakthrough the water level of Lake Skadar rises during flood season for up to 3 meters. During specific conditions Drin water can enters even the Lake (compare Worldbank 2006).

The Buna leaving the Skutari Lake has a mean annual discharge of about 300 m³/s (the discharge through the Bojana-Buna delta into the Adriatic Sea is about 584 m³/s).

Last Drin tributary is the Kir which shift about 1750 its course from west of Shkodar town into the Lake Skadar to the Buna (southeastern of the castle, today into the Drin) by destroying northern suburbs of the city (compare Boskovic 2004).

3. Impacts of existing Hydropower Dams

- The river turns from highly dynamic braided river sections with huge gravel bars and islands into very slow flowing to stagnant (during low water period) reservoirs, changing all habitats and species compositions of the original state until the 1970ties.
- Due to the volume of the 5 large dams of 2,8 Billion m³ (as comparison Kadar Lake varies between 2 Billion m³ during low water and 3,57 Billion for maximum water level) the overall hydrological regime changed for low water (possible steering of discharge during draughts, increasing discharge e.g. for irrigation) and small flood events (1-10 years). Latter are in particularly important to keep the typical highly dynamic braided river zones which its specifically adapted flora and fauna which becomes very rare over the past 150 years in central Europe (e.g. Tagliamento in Italy is still a good example). There is no evidence that the dams change extreme flood events, however the magnitude of impact can be more dangerous further downstream after releasing large flood waves (compare example of Kamp in 2002 flood, where the flood steering of dams in the upper

course failed). Due to the retention volume it is estimated that floods of about 5,000 m³/s can be reduced to about 2,000 m³/s downstream of last dam (if the dams are not filled with water).

- Finally the sediment household is considerably impacted by the retention of coarse substrate, mostly gravel and bedload in the reservoirs. Unfortunately no data are available for storage and original sediment transport within this sections but examples from upper Tagliamento, its most important tributary flowing through a similar very narrow alpine valley, indicates the impotence of gravel availability and transport. Dams on the gravel reach of upper Danube in Austria show the significant decrease of bedload transport after construction of dams of nearly 90%. Only suspended load is transported during flood through the dams. Missing or drastically reduced coarse sediment transport limit the erosion forces of the channels and succession took place on higher sediment bars and islands stabilizing the river course. This tendency will considerably enforced by missing small flood events 1-10 years annuality.
- Further the Bojana-Buna delta lack in the long term perspective on sediments increasing coastal erosion and salt water intrusion. Here the important beaches for tourism are endangered in the long-term. This is important for the renovation of the hotel facilities on Ada Island for example as they are situated immediately at the coast line (Schneider-Jacoby, 2006).

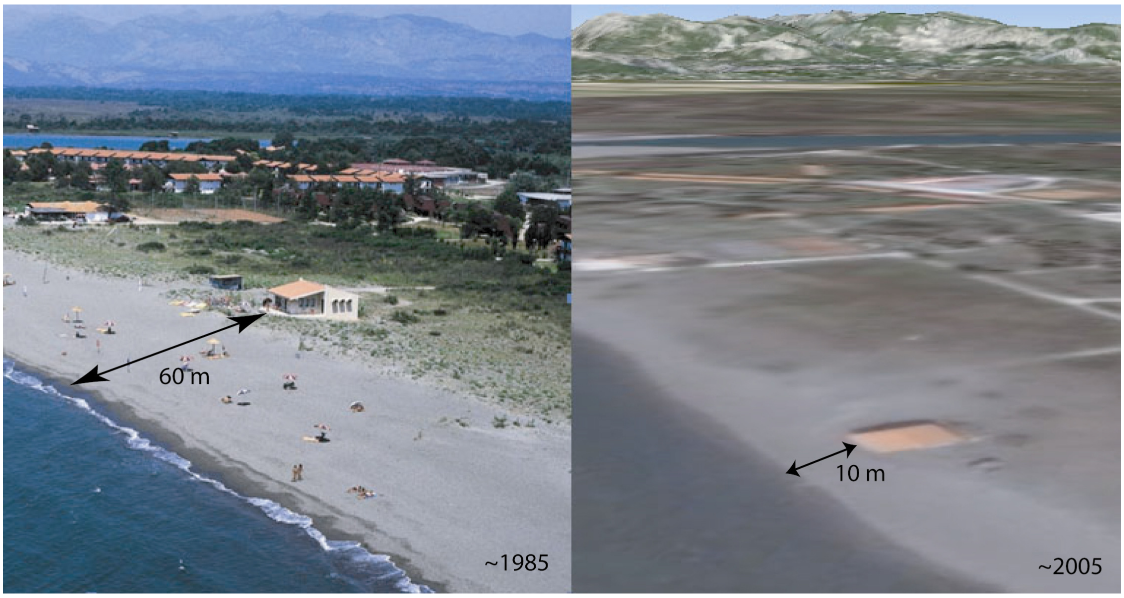


Figure 2: The Ada beach at the main delta island of Bojana-Buna during 1980ties and recent time (credit GoogleEarth). A considerable loss and erosion of beach can be observer in the delta since about 25 years. In the meantime the loss of sediment supply due to the retention in the large Drin dams is an important factor of delta degradation.

4. Basic habitat survey 1966 and today

Originally the respective river stretch was a typical braided river having numerous unvegetated gravel bars and islands regularly rebuild, eroded and accumulated during floods and only settled by spare pioneer vegetation (annual flora) followed by higher islands with typical pioneers (*tamarix* and *salix* species) and finally willow softwoods accomplished sparsely with poplar in the higher and sandy stands (for similar alpine river the following FFH types occur: 3220, 3230, 3240, 7240, 91E0*, compare Tockner 2005, and EAWAG 2001-2003). The figures one and two show this near natural stage (until the end of the 1960ties) with a large shallow water surface (during low water conditions only the deepest and largest channels will have discharge, at the surface as the huge gravel body keep a lot of water). The total size of the Lower Drin corridor is 2,500 ha.

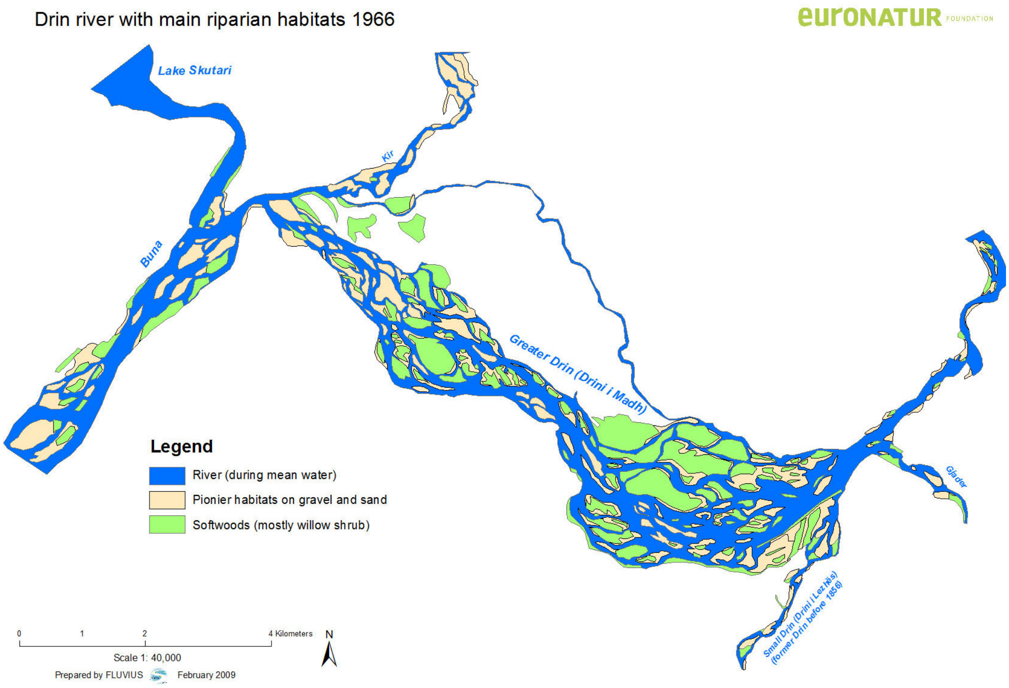


Figure 3: Drin river and riparian habitats in 1966 (after the breakthrough to Buna river in the second half of 19th century with the later constructed regulation of the inlet in the former Drin river bed and before the construction of the large reservoirs upstream beginning of 1970ties)

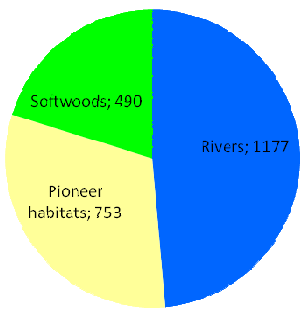


Figure 4: Main habitat distribution of the Lower Drin corridor (the distribution of river channels and pioneer habitats (unvegetated gravel bars) is rather variable. In fact softwoods and mostly willow shrubs covered only less of 25% of the former active floodplain.

The dams in the lower Drin mountainous stretch changed first of all the hydraulic flow conditions and hydromorphological characteristics:

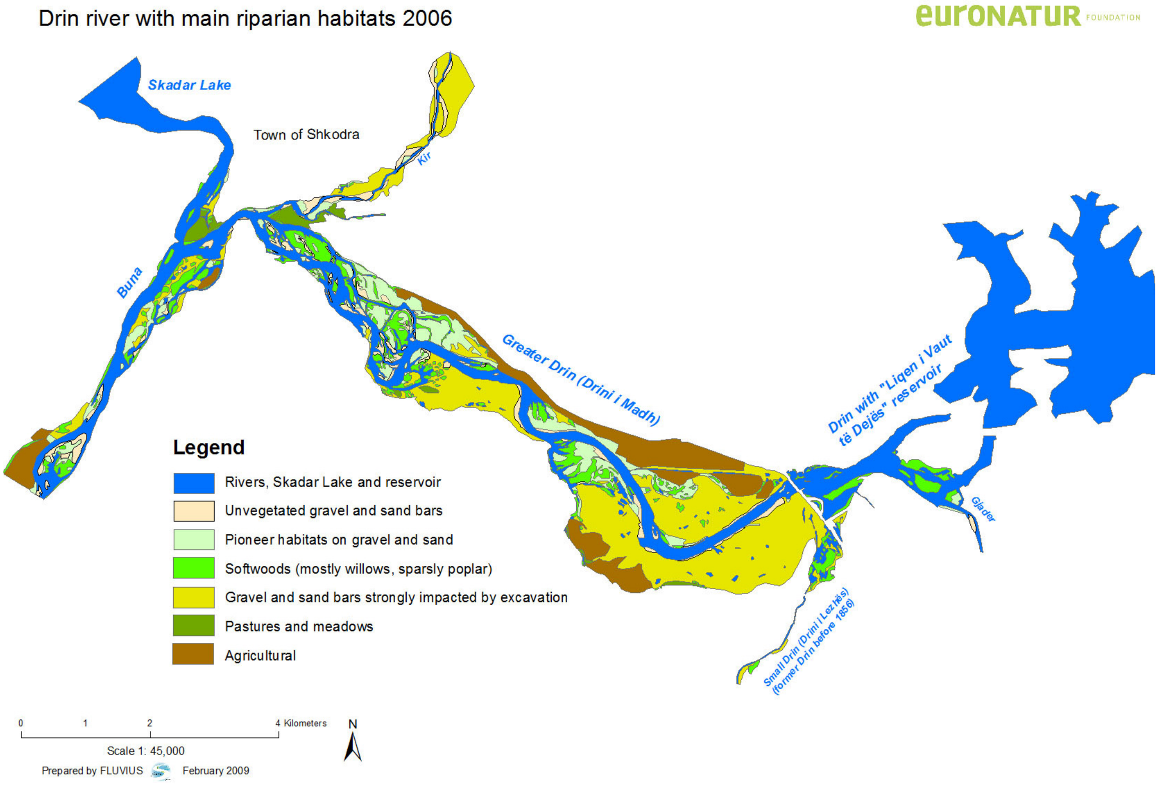


Figure 5: The figure 3 and 4 indicate the strong changes after the building of huge dams in the upper course beginning of 1970ties and the excessive gravel exploitation from the area just downstream of the weir (downstream of main dam). The typical habitats decrease substantially (rivers, gravel and sand bars, pioneer habitats and softwoods).

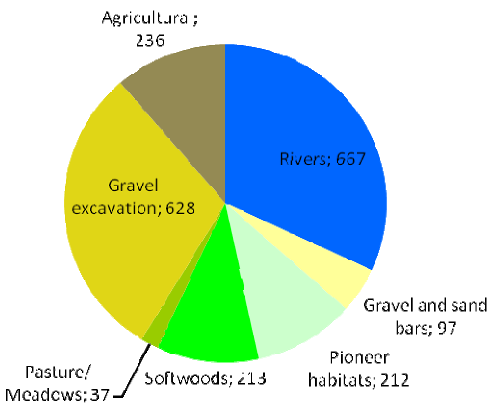


Figure 6: Drin river and riparian habitats in 2006 (after the construction of large reservoirs upstream and the still ongoing excessive gravel exploitation and before the construction of the proposed hydropower plant near Ashta

The mapping of 2006 is more precise and has more classes due to the better data situation. Basically the still large systematically exploited gravel area (628 ha) remains in the active floodplain and could be partially restored.

The complex discharge situation after the breakthrough to Buna led to different erosion and accumulation pattern in both rivers, however the strongly reduced flood dynamics in the lower Drin corridor cause the reduction of typical habitats. Due to the sediment trapping behind the dams the river start to erode its main channel and the channel form changes from typical braided towards anbranching river types having mostly one main channel. The Buna which had to take the whole discharge of Drin after the breakthrough start first to enlarge its river bed and to accumulate sediments due to the decreasing slope toward the delta. Due to channel narrowing and regulation however downstream from Shkodar the incision start also even if the Drin is still able to recharge its own sediments from the corridor (but no new sediments are coming from the Drin reservoirs. Therefore the system can be understand and assess only as a whole, long time monitoring and sediment transport model should be installed to find the best solution for the ecological functionality and for flood protection (see also last chapter).

5. Impacts of the planned hydropower stations

The maps one and two indicate the strong change of the formerly braided into a so-called anabranching river system and the loss of dynamic pioneer habitats (the upper part is heavily impacted by excessive gravel exploitation and can be seen not as typical (in this section the river was additionally regulated).

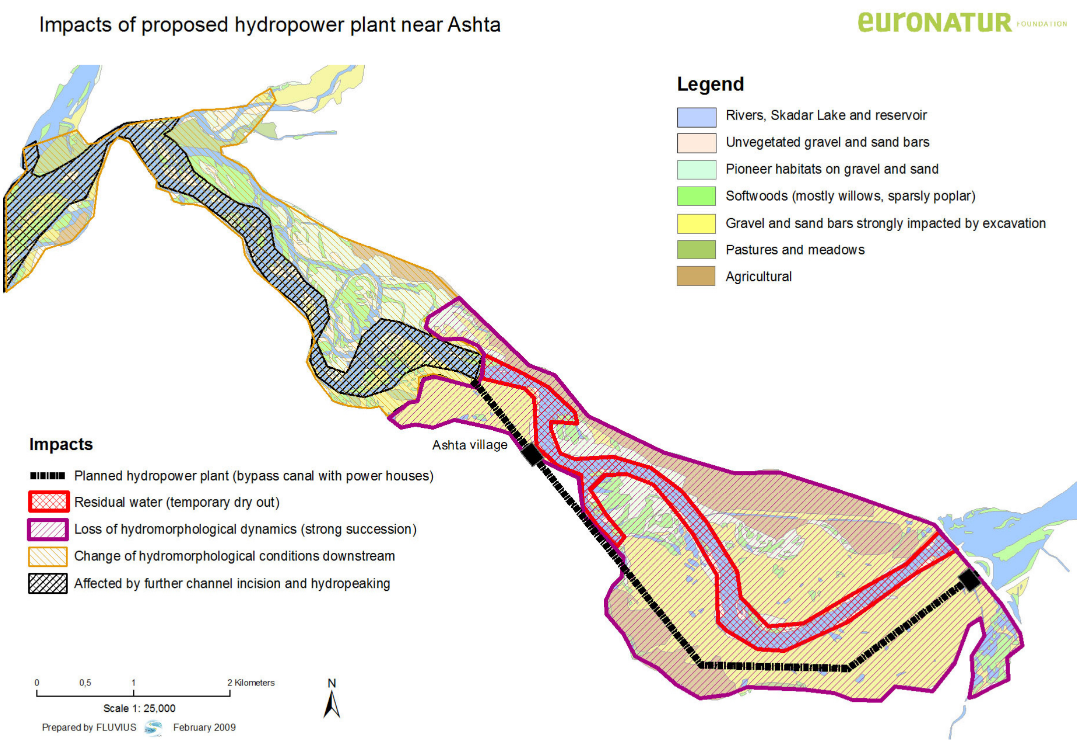


Figure 7: Proposed hydropower plant near Ashta and expected impacts on the main riparian habitats

The dam will:

- The upper part of the stretch with residual water will remain only as high flood river bed falling dry over longer periods
- Further drastically reduce the formerly braided, high dynamic river reaches down to Shkodra, even if some 3 rkm will remain downstream from the bypass hydropower canal inlet.
- The remaining free flowing stretch downstream to the Buna confluence will be not sufficient for the typical free flowing reach for nature protection reasons
- Erosion will increase below the hydropower canal inlet in the main channel

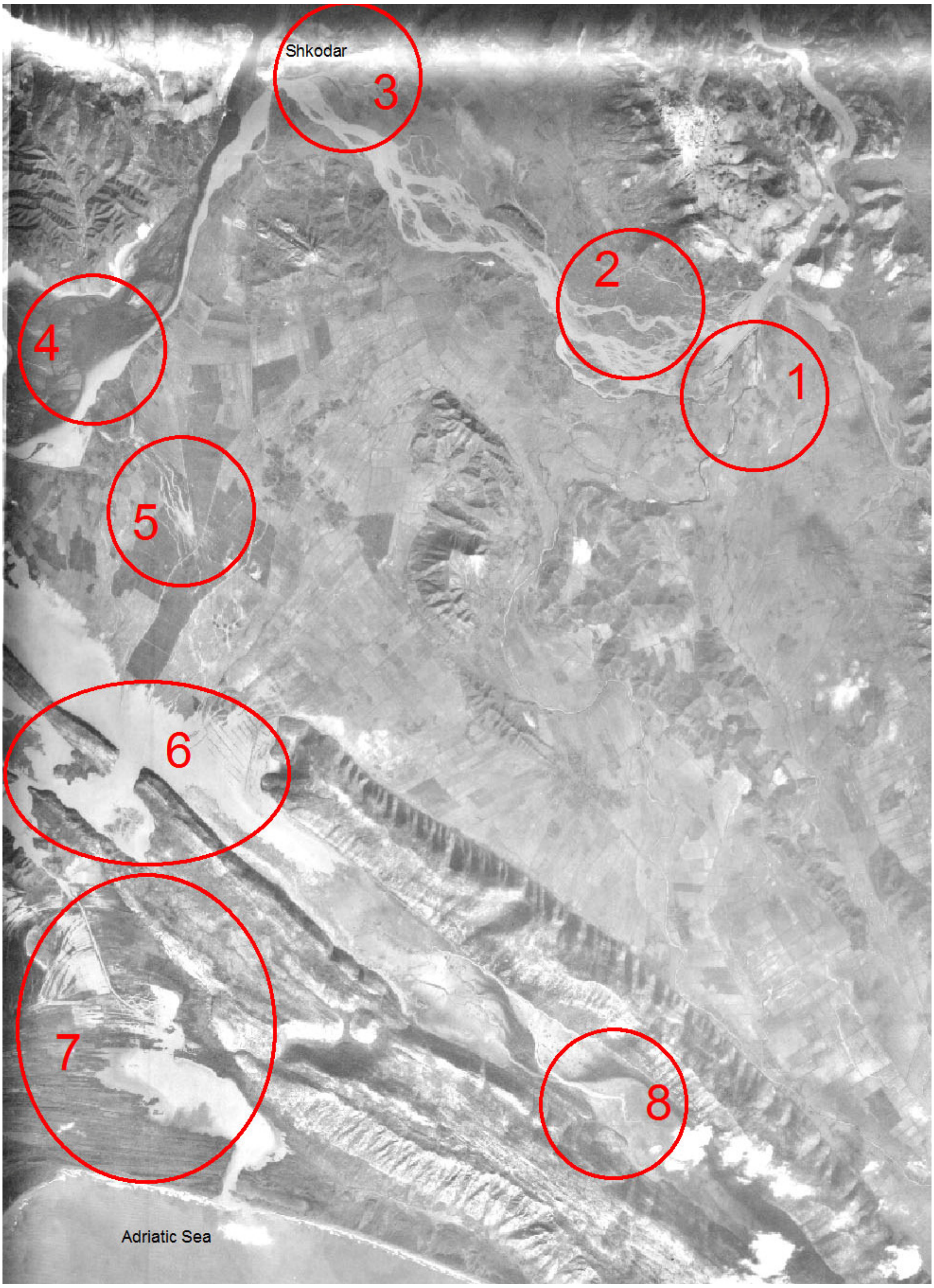
6. Riverine landscapes of Drin, Bojana-Buna and Laguna complexes

The system of mountainous river sections, unique lake outflow and tectonic active landscape and relief leading to very complex discharge situations in particularly during flood makes it necessary to assess the whole riverine landscape and to discuss impacts on that system. Flood protection of Shkodra must be guaranteed by the bypass via the former Drin channel, which could be natural channels towards Leshe.

Further a complex solution for flood control is needed for the whole Bojana-Buna Delta. An example for such a programme is the Central Sava Basin (Brundic et al. 2001). Here the protection of the flooded areas as retention area combined with release channels and conservation programmes provides optimal conditions for the safety and economic development. For the whole area all flooded areas and potential retentions areas have to be defined (see figure 3) and combined. Before further hydropower dams as Ashta are planned, the solutions for the flood control has to be designed.

Figure 3 (next page): Corona picture of 1966 showing the region during a flood event and indicating the most endangered parts of the floodplain which should be kept as retention areas.

1: Former Drin channel could serve as a bypass
2: Drin channel must be remain in full width and length as retention area
3. Kir torrent must be keep free from any settlements
4. Buna retention on Montenegrinean side must be dimensioned sufficient large
5. Land overflow along former channels, should be managed appropriately
6. Former Buna breakthrough will be also in future necessary to keep maximum flood conveyance to the sea as the recent Buna breakthrough is narrow and a serious obstacle for floods
7. Laguna environment have to be protected to overtake flood waves
8. Former flood way towards the former Drin channel should be reconsidered



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