

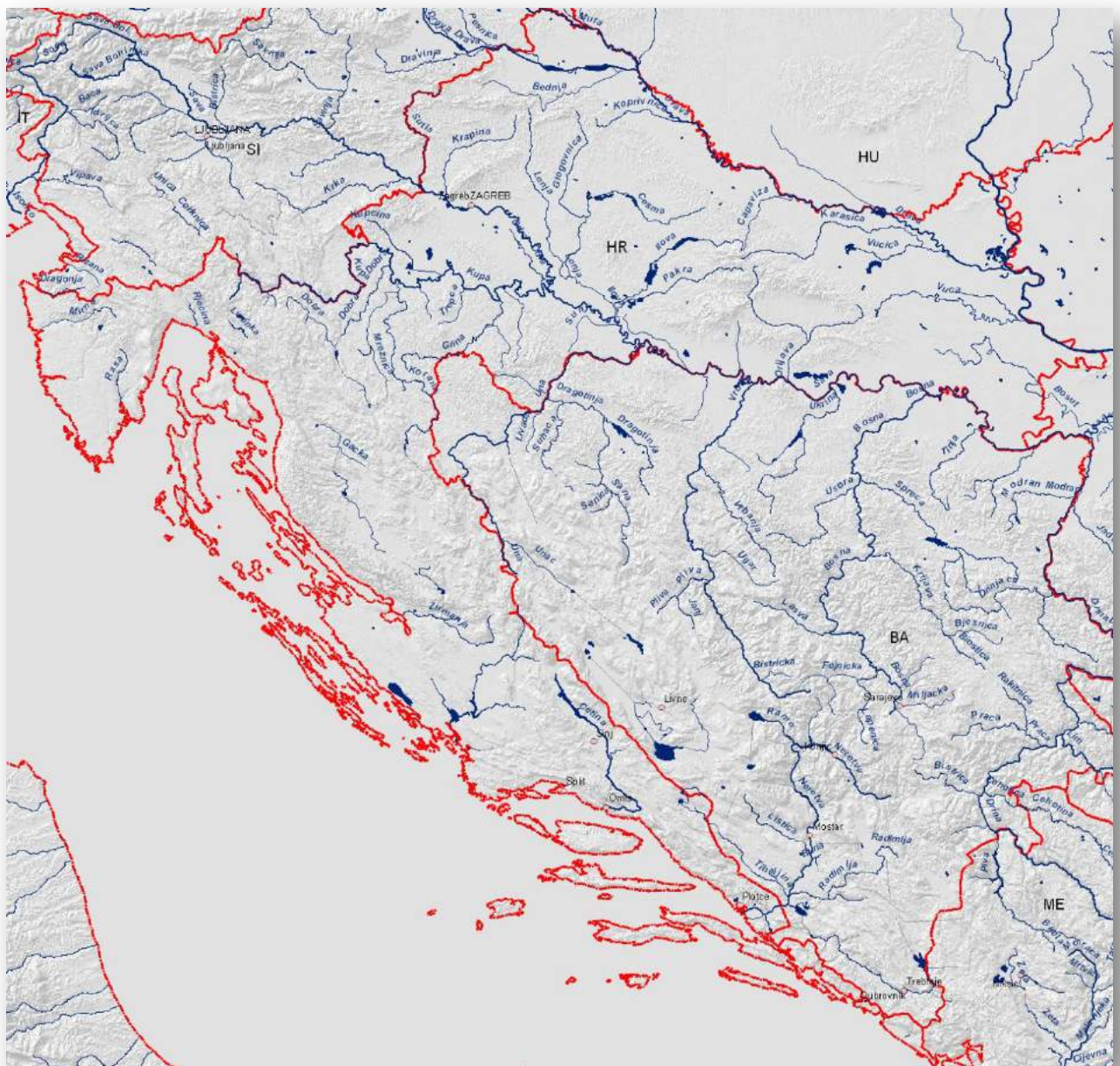


Outstanding Balkan River landscapes – a basis for wise development decisions

Croatia

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1. Hydromorphological intactness of rivers

There are four classes characterising the different levels of hydromorphological intactness: Class 1 shows in blue colour near-natural conditions). Class 2-3 is characterised by slightly to moderately modified status, indicated in light green. Class 4 for river stretches which are extensively altered are orange and class 5 (red) indicates stretches with severely modifications in particular impoundments. Lakes and rivers outside of the project areas are visualised in dark blue.

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Hydromorphological assessment







-  Class 1: Near-natural
-  Class 2-3: Slightly to moderately modified
-  Class 4: Extensively modified
-  Class 5: Severely modified/ Impoundment
-  Poljes, floodplains, estuaries/deltas (no assessment)
-  Reservoirs mostly used for hydropower
-  Other rivers and lakes (no assessment)
-  State boundaries
-  Major cities

Fig. 1: Legend for the hydromorphological assessment map on next page

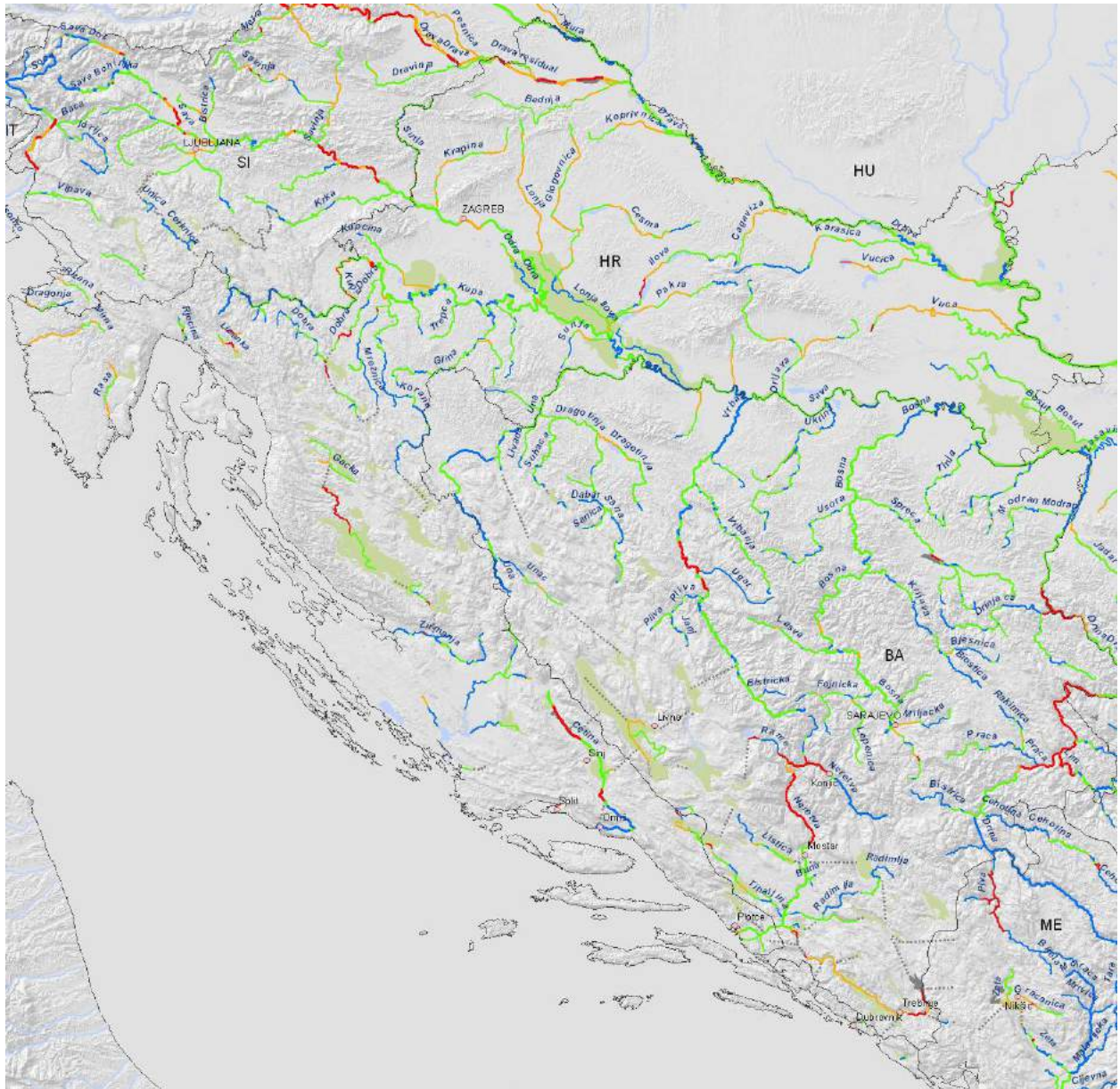


Fig. 2: Hydromorphological assessment for Croatia.

Croatia can be mainly subdivided in the northern Illyric and even Pannonian influenced part with Drava and Sava and the Karst and Mediterranean part in the south where the drainage network considerably decrease. The Drava river is modified just downstream of SI complementing the chain of hydropower plants in AT and SI. Further downstream the river still host valuable river stretches in particular in its middle course and upstream of Osijek, however peak power with daily changing water levels and regular sediment extraction (and retention of gravel in the chain of dams further upstream) leading to channel incision impacting the river as typical for most of the major Balkan rivers. The Sava hosts some of the largest floodplains in the Danube basin and some stretches with the typical meander morphology still exist.

The karst influenced rivers are much larger and significant than in SI, aside of the famous world heritage site of Plitvice or the Krka waterfalls, several canyons (as such of lower Cetina) fall in the near-natural class of the hydromorphological assessment but are partially interrupted by hydropower facilities (dams, tunnels for hydropower, diversions).

Only rivers of the Sava plain and close to the capital Zagreb are altered significantly by river regulation and technical flood defences.

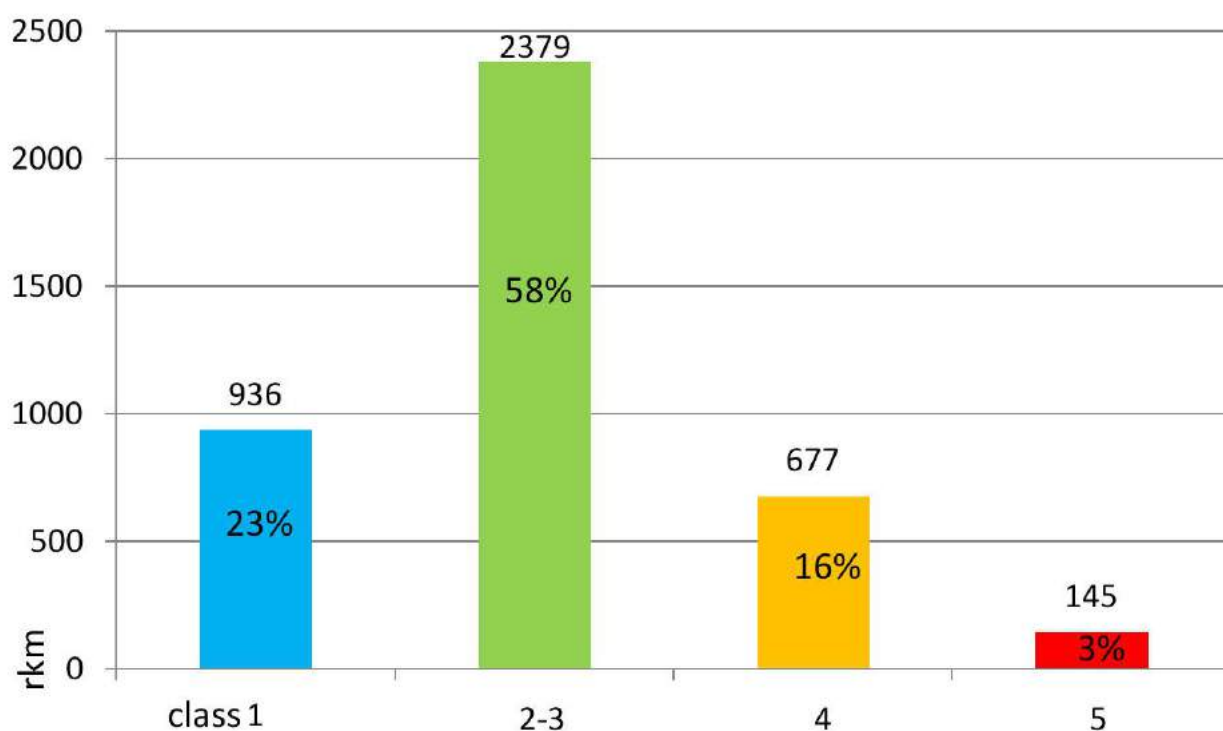


Fig. 3: Hydromorphological assessment in rkm and percentage for Croatia.

2. Protected areas, karst poljes, estuaries/deltas and important floodplains

The inventory of protected areas contains in particular Natura2000 for EU Member States (EC 2010) and Croatia (State Institute for Nature protection Croatia 2010), national parks, biosphere reserves, nature reserves, EMERALD network areas (as far as available) and Important Bird Areas as well as Ramsar sites for other countries.

Major important floodplains were used continuously, meaning for the large rivers such as Danube, Drava and Sava they are subdivided in upper, middle and lower parts. In addition the map includes all assessed karst poljes, estuaries/deltas as well as other wetlands.

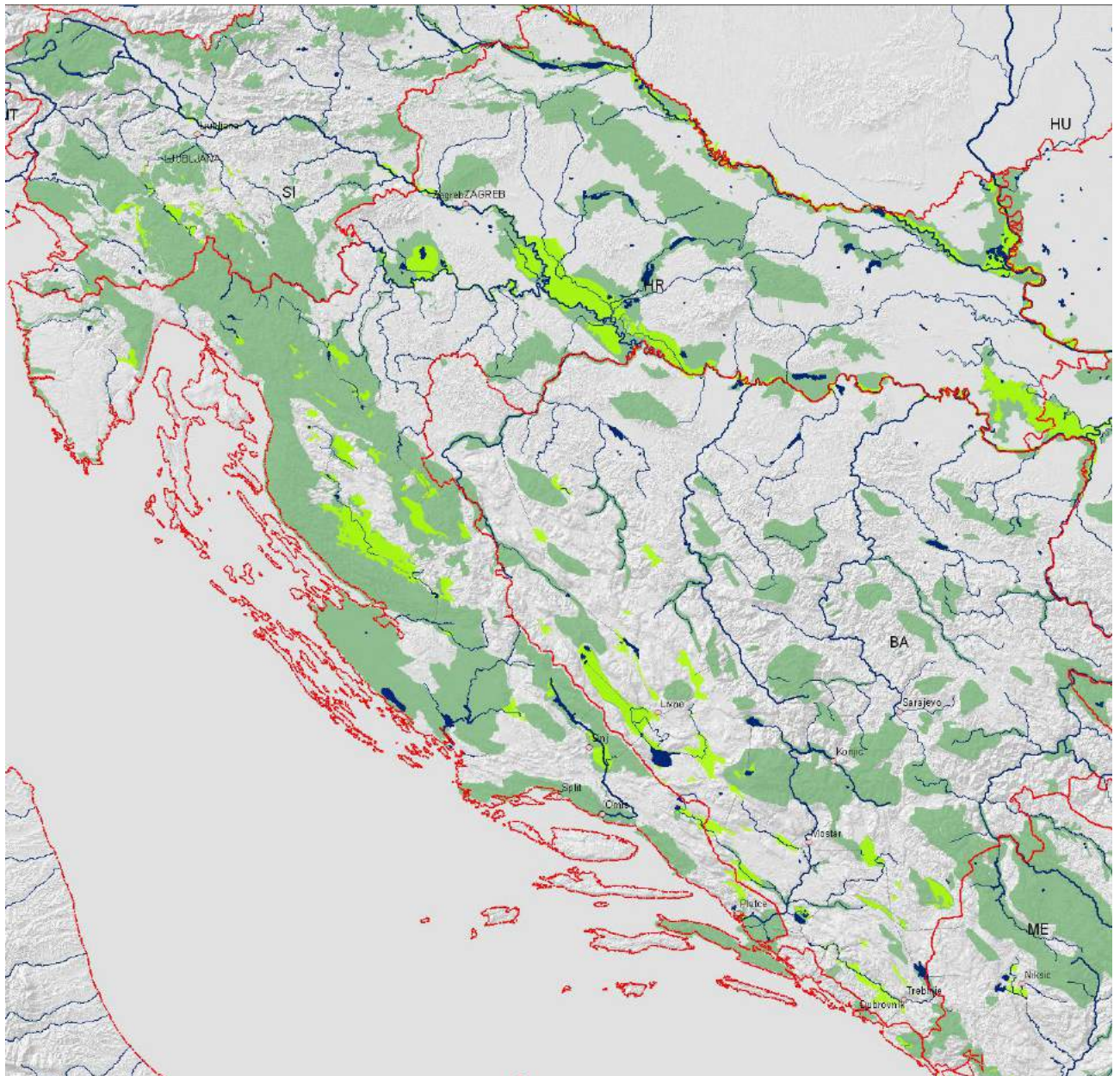


Fig. 4: Protected areas (incl. planned and proposed areas) in dark green (light green are poljes and large floodplain areas)

3. Conservation value of rivers

The conservation value is assessed in three levels: Very high conservation value (in blue), high conservation value (in dark green) and low conservation value (in light green). Karst poljes, major floodplains as well as deltas and estuaries with very high conservation value are visualized in dark blue-green and high conservation value in light green and low in light turquoise. Karst poljes and deltas are from particular interest for nature protection, therefore nearly all fall in the first two conservation classes.

	Hydro-morphological assessment class	Conservation value (assessment as result of overlay of hydromorphological assessment + protected areas + floodplains)
Class 1	Near-natural	Very high
Class 2-3	Slightly to moderately modified	High (river stretches crossing important floodplains/poljes/estuaries/deltas or overlapping with protected areas or both belonging to the “Very high” conservation value stretches)
Class 4	Extensively modified	Low, but important for longitudinal continuum (river stretches crossing important floodplains/poljes/estuaries/deltas or overlapping with protected areas or both belonging to the “High” conservation value stretches)
Class 5 Impoundments	Severely modified	Not assessed

Fig. 5: Definition of conservation value

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Conservation value for rivers (left) and poljes, estuaries/deltas and floodplains (right)











-  Very high conservation value 
-  High conservation value 
-  Low conservation value 
-  Impounded stretches and hydropower reservoirs
-  Other rivers and lakes (no assessment)
-  State boundaries
-  Major cities

Fig. 6: Legend for the map on conservation value on next page

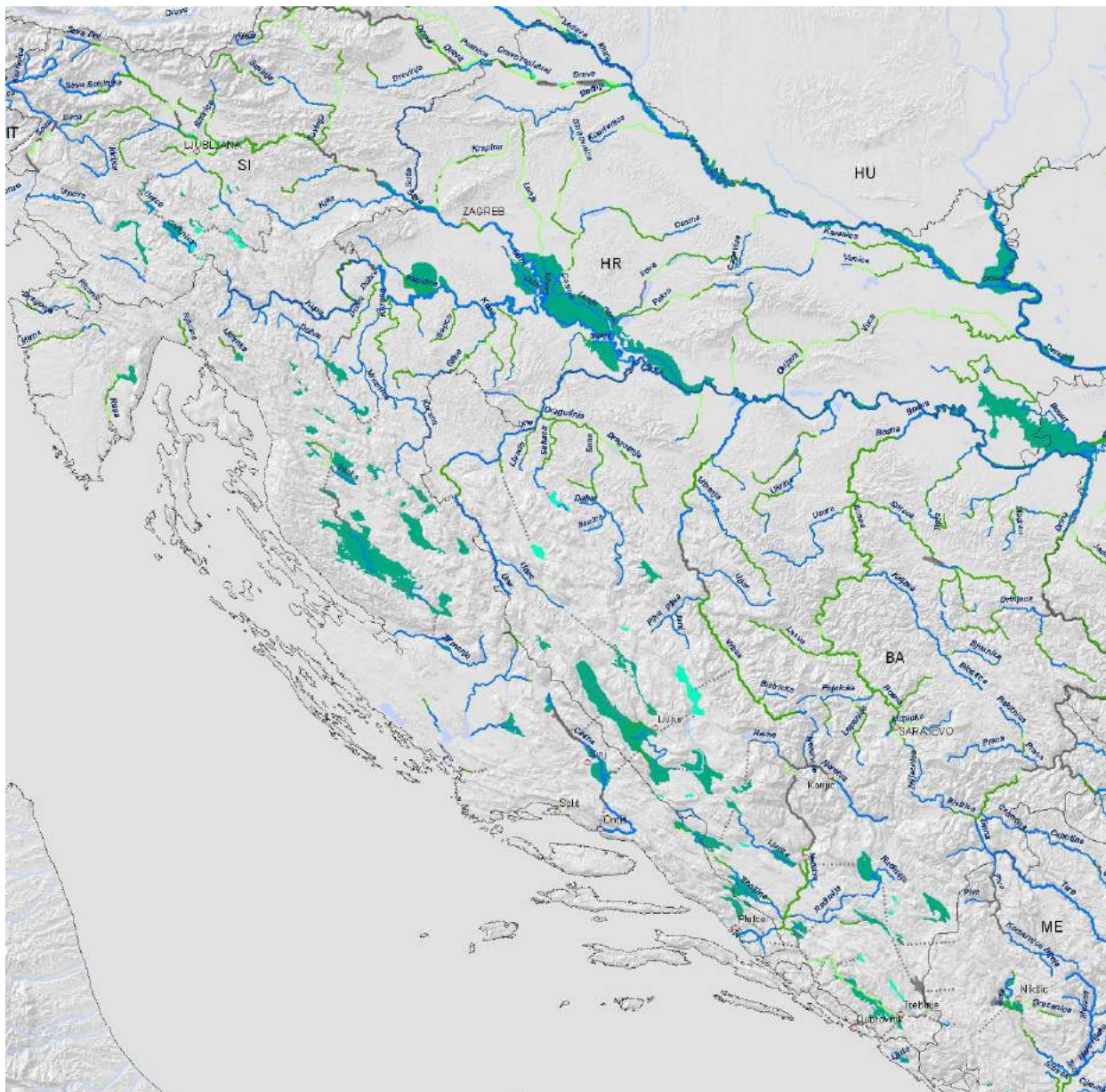


Fig. 7: Conservation value for HR.

The figure 40 indicates the outstanding position of Croatia regarding high conservation values: Over 60% of the river stretches fall in the first category.

Croatia has already a preliminary Natura2000 coverage protecting many river corridors and raising several river reaches into the very high conservation value class due to their protection status (in particular on major rivers such as Sava, Drava, Danube and Kupa). But Sava, lower Drava and lower Kupa as well as Danube have additionally major floodplains. Great examples for still intact floodplains are the Kopački Rit nature park on Danube and Lonjsko Polje nature park on Sava. But also many Mediterranean rivers with impressive canyons fall without doubt into the very high conservation class such as river stretches hosting the Plitvice and Krka waterfalls. Low conservation value tributary stretches can be find on smaller streams between Drava and Sava.

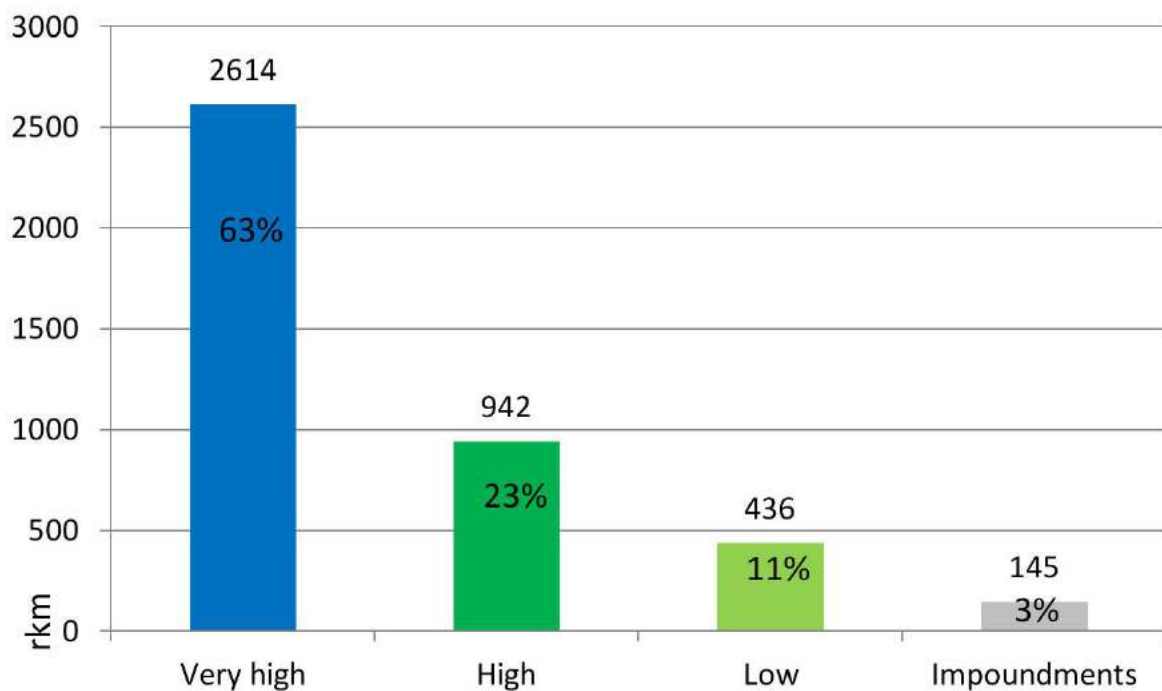


Fig. 8: Conservation value in rkm for HR

4. Hydropower plants

Hydropower plants were recorded firstly along the “status type” into “existing/operating”, “under implementation” and “planned”. Further dams are classified in three size classes: 1-10 MW, 10-50 MW, and > 50 MW.

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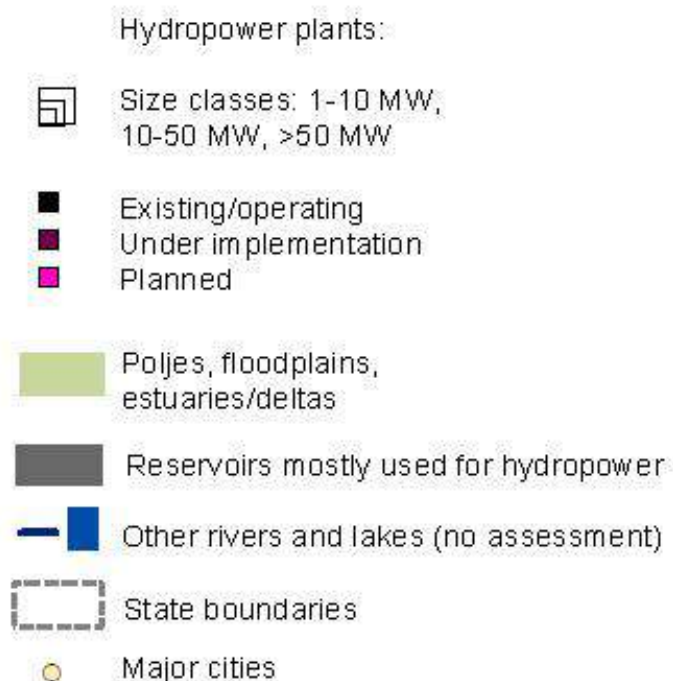


Fig. 9: Legend for the dam map on next page

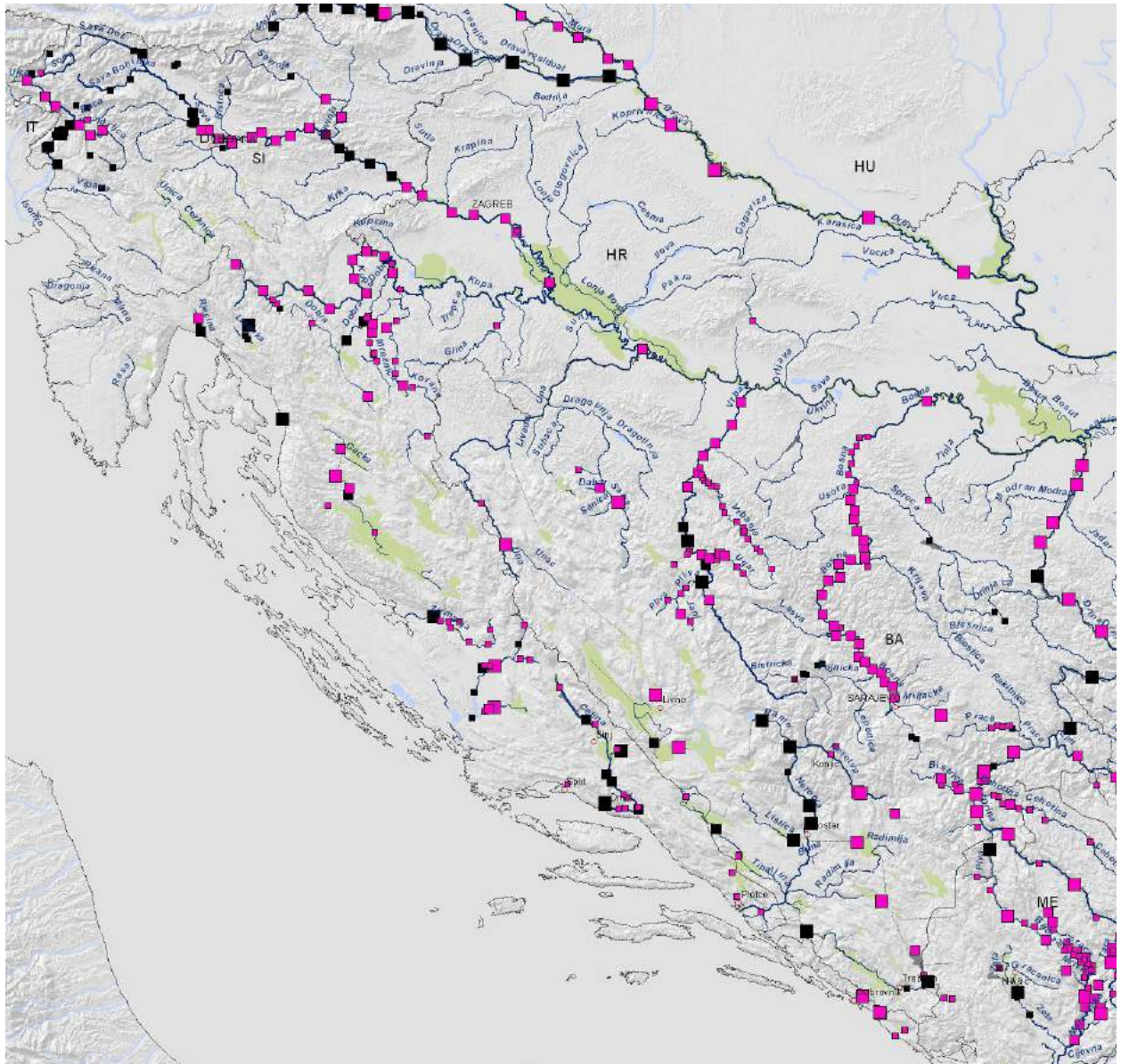


Fig. 10: Hydropower plants for HR.

Croatia plans a significant number of hydropower plants along all rivers and all sizes: Sensible karst rivers will be affected as well as the large lowland rivers such as Drava, Sava and Kupa.

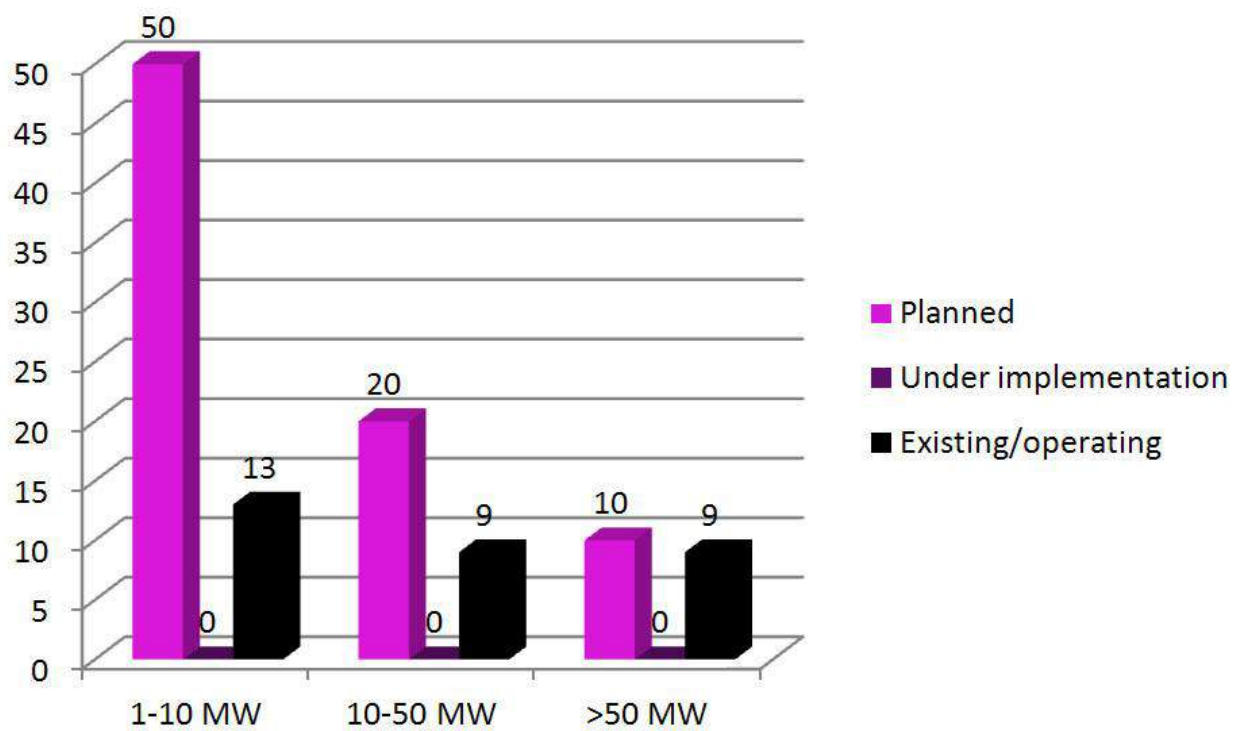


Fig. 11: Distribution of hydropower plants for HR.

5. Affected river stretches with conservation value by hydropower

This chapter combines the information of the “Conservation Value” with the planned hydropower plants.

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Hydropower plants:

Size classes: 1-10 MW,
10-50 MW, >50 MW

Planned

Conservation value for rivers (left) and poljes,
estuaries/deltas and floodplains (right):

Very high conservation value

High conservation value

Low conservation value

Fig. 12: Legend for the “conflict map” on next page

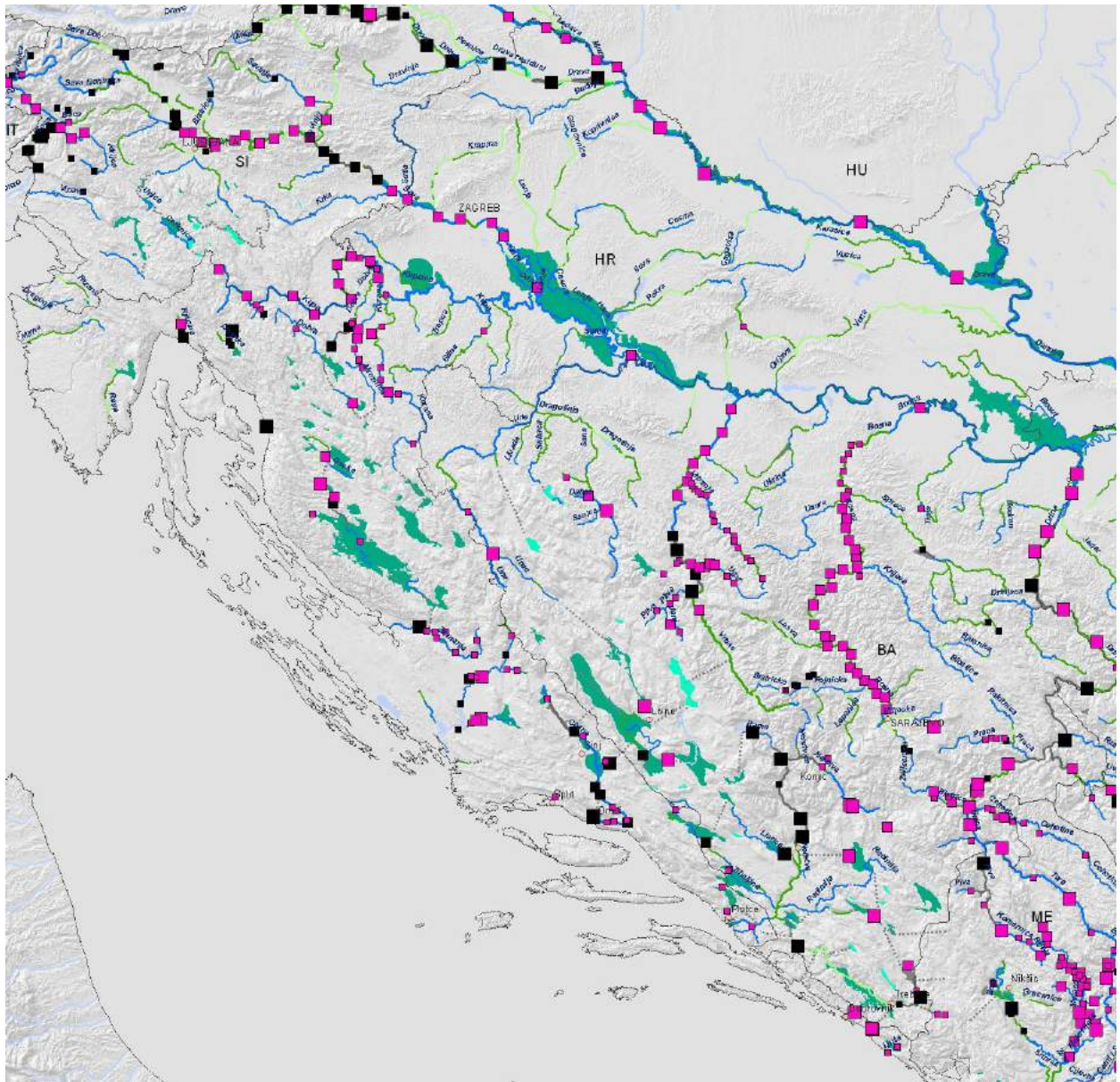


Fig. 13: Affected very high and high conservation stretches by planned hydropower plants for HR.

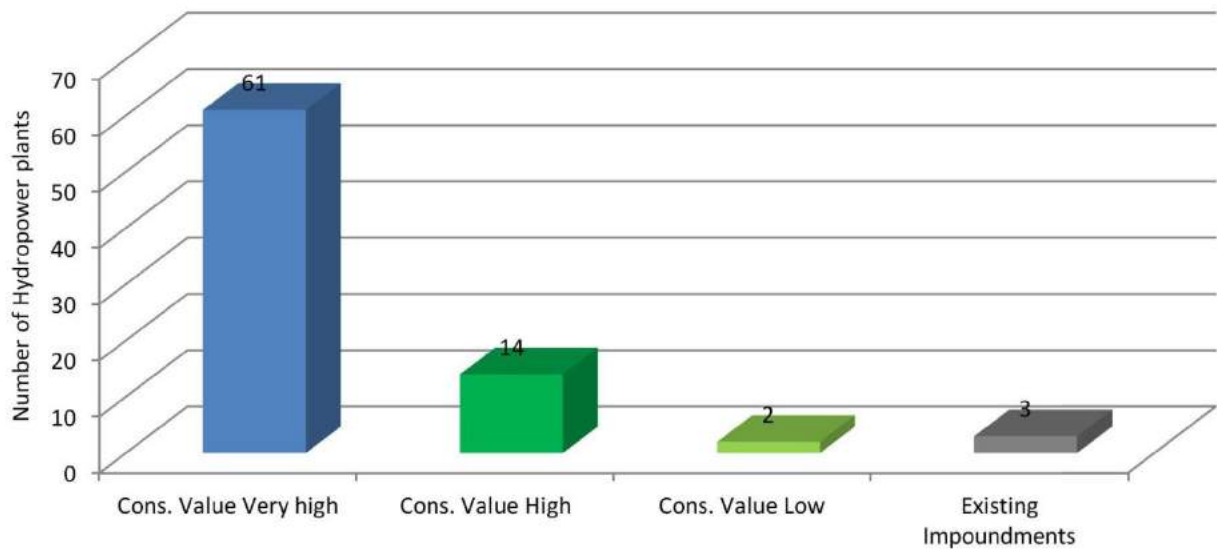


Fig. 14: Number of planned hydropower plants that would affect very high, high and low conservation stretches for HR.

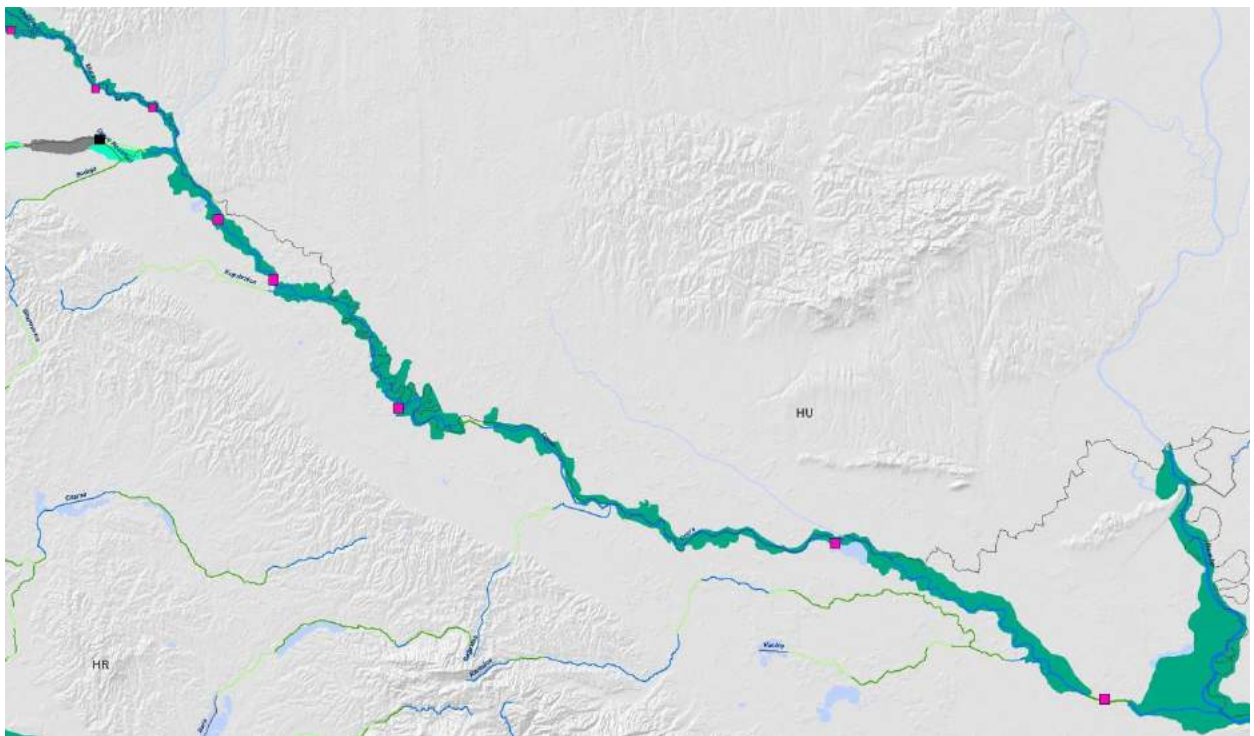


Fig. 15: Map zoom on lower Drava: New hydropower plants would be in contradiction to the declared transboundary biosphere park in the entirely designated protected area (Molve 1 and 2 just downstream of the Mura confluence replacing the earlier “Novo Virje” project and “Mota” on Mura are the most advanced proposals.

The recently completed hydropower plant “Lešće” is located at upper Dobra River. The project was implemented by HEP (Hrvatska Elektroprivreda) and is the first large hydropower plant built in Croatia since independency in 1991. The plant is a storage type with an installed power of 42 MW. The dam crest has 52.5 m and the length of the impounded reservoir is 13 rkm. The narrow valley used to be among the few with near-natural conditions in this part of Croatia. It has turned into a stagnant hydropower reservoir.



Construction works in 2008 (Google Panoramio, by user haze 2005).



Dobra before construction left (Google Panoramio, user lordstocks) and after clear-cut as preparation for flooding on right side (by Ivan Perković).

6. List of planned Hydropower dams

ID_HP	Rivers Poljes	Name Location HPP	Installed MW	Affected River Jewels
HR/SI_HP_511	Mura	Mursko Središće	10-50	T_SI-HR_RJ_476; T_SI-HR_RJ_628
HR_HP_513	Mura	Gorican	10-50	T_SI-HR_RJ_476; HR_RJ_628
HR_HP_514	Mura	Kotoriba	10-50	T_SI-HR_RJ_476; HR_RJ_628
HR/SI_HP_512	Mura	Podturen	10-50	T_SI-HR_RJ_476; T_SI-HR_RJ_628
HR/SI_HP_520	Kupa	Kupari	10-50	
HR/SI_HP_521	Kupa	Kočičin	10-50	T_HR-SI_RJ_077
HR/SI_HP_522	Kupa	Dol	10-50	T_HR-SI_RJ_077
HR/SI_HP_523	Kupa	Severin	10-50	T_HR-SI_RJ_077
HR/SI_HP_524	Kupa	Prilišće	10-50	T_HR-SI_RJ_077
HR/SI_HP_525	Kupa	Stankovci	10-50	
HR/SI_HP_526	Kupa	Otok	10-50	
HR_HP_528	Kupa	Brodarci	10-50	
HR_HP_529	Kupa	Pokuplje	10-50	HR_RJ_423; HR_RJ_631
HR_HP_528	Kupa	Brodarci	10-50	
HR_HP_529	Kupa	Pokuplje	10-50	HR_RJ_423; HR_RJ_631
HR/SI_HP_527	Kupa	Božakovo	10-50	
HR/BA_HP_542	Sava	Šamac	10-50	T_HR-BA_RJ_627; T_SI-HR-RS_RJ_422
HR_HP_386	Sava	Podsused	10-50	T_SI-HR-RS_RJ_422; HR_RJ_625
HR_HP_538	Sava	Prečko	10-50	T_SI-HR-RS_RJ_422; HR_RJ_626
HR_HP_539	Sava	Zagreb	10-50	T_SI-HR-RS_RJ_422
HR_HP_540	Sava	Strelečko	10-50	T_SI-HR-RS_RJ_422; HR_RJ_626
HR_HP_541	Sava	Jasenovac	10-50	T_SI-HR-RS_RJ_422; HR_RJ_626
HR_HP_387	Sava	Drenje	10-50	T_SI-HR-RS_RJ_422; HR_RJ_626
HR_HP_389	Ombla	Ombla	> 50	
HR_HP_390	Lika	Kosinj	10-50	
HR_HP_507	Drava	Molve 2	> 50	HR_RJ_420; HR_RJ_629
HR_HP_507	Drava	Molve 1	> 50	HR_RJ_420; HR_RJ_629
HR_HP_508	Drava	Barcs	> 50	HR_RJ_420; HR_RJ_629
HR_HP_509	Drava	Donji Miholjac	> 50	HR_RJ_420; HR_RJ_629
HR_HP_510	Drava	Osijek	> 50	HR_RJ_420
HR_HP_515	Dretulja	Mrežnica	10-50	HR_RJ_427
HR_HP_516	Mrežnica	Juzbašić	10-50	HR_RJ_640
HR_HP_517	Mrežnica	Erdelj	10-50	HR_RJ_640
HR_HP_518	Korana	Primisje	10-50	HR_RJ_642
HR_HP_519	Korana	Lučica	10-50	
HR_HP_530	Krka	Miljačka 2	> 50	HR_RJ_637
HR_HP_531	Čikola	Čikola 1&2	> 50	HR_RJ_636
HR_HP_532	Zrmanja	Ervenik	10-50	HR_RJ_632
HR_HP_533	Zrmanja	Zrmanja	10-50	HR_RJ_632
HR_HP_1581	Zrmanja	Zegar	1-10	HR_RJ_632
HR_HP_534	Rječina	Valici	10-50	
HR_HP_535	Lika	Senj 2	> 50	HR_RJ_431

ID_HP	Rivers Poljes	Name Location HPP	Installed MW	Affected River Jewels
HR_HP_536	Lika	Otocac	10-50	
HR_HP_537	Trebišnjica	Dubrovnik 3	> 50	
HR_HP_1580	Cikola	Cikola 3&4	10-50	
HR_HP_1582	Pozega	Orljava	1-10	
HR_HP_1583	Glina	Glina	1-10	
HR_HP_1584	Curak	Zeleni Vir 1	1-10	Zeleni Vir
HR_HP_1585	Kupica	Zeleni Vir 2	1-10	Zeleni Vir
HR_HP_1586	Ilovac	Kupa tributary	1-10	
HR_HP_1587	Brodaci	Kupa Tributary	1-10	
HR_HP_1588	Vrbovsko	Dobra	1-10	
HR_HP_1589	Korana	Korana 2	1-10	
HR_HP_1590	Korana	Barilovic	1-10	
HR_HP_1591	Lipa	Lipa	1-10	
HR_HP_1592	Pustika	Pustika	1-10	
HR_HP_1593	Dobra	Dobrenici	1-10	
HR_HP_1594	Tounjicia	Dizdari	1-10	
HR_HP_1595	Mreznica	Sastavci	1-10	
HR_HP_1596	Mreznica	Bakici	1-10	
HR_HP_1597	Korona	Hrvatski Blagaj	1-10	
HR_HP_1598	Korona	Bukovje	1-10	
HR_HP_1599	Korona	Puskaric	1-10	
HR_HP_1600	Korona	Smoljanak	1-10	
HR_HP_1601	Tisovac	Tisovac 1	1-10	HR_RWJ_461
HR_HP_1602	Lika	Miskulin 2	1-10	HR_RWJ_461
HR_HP_1603	Una	Strbacki bug	1-10	
HR_HP_1604	Zrmanja	Berberov	1-10	
HR_HP_1605	Krupa	Krupa B	1-10	
HR_HP_1606	Krupa	Krupa A	1-10	
HR_HP_1607	Zrmanja	Mocro Polje	1-10	
HR_HP_1608	Bustinica	Bustinica -H	1-10	
HR_HP_1609	Krcic	Krcic 1-6	1-10	
HR_HP_1610	Krka	Bilusica Buk	1-10	
HR_HP_1611	Krka	Manojlavica slap	1-10	
HR_HP_1612	Cikola	Cikola 5	1-10	
HR_HP_1615	Jadro	Vrilo	1-10	
HR_HP_1616	Cetina	Tisne Stine	1-10	
HR_HP_1617	Cetina	Kostanje	1-10	
HR_HP_1618	Cetina	Voloder	1-10	
HR_HP_1619	Cetina	Bartulovic	1-10	
HR_HP_1613	Cetina	Mahe Vinalic	1-10	
HR_HP_1620	Cetina	Pleici	1-10	
HR_HP_1614	Cetina tributary	Nahe Rumin	1-10	
HR_HP_1621	Ricica	Ricica	1-10	
HR_HP_1622	Rastok	Rastok	1-10	
HR_HP_1623	Krotusa	Krotusa	1-10	
HR_HP_1624	Koavle	Koavle	1-10	
HR_HP_1625	Ljuta	Ljuta 1	1-10	
HR_HP_1626	Neretva	Neretva	1-10	
HR_HP_663	Livanjsko Polje	Čaprazlije	1-10	

Picture cover: User alenas on Google Panoramio (Korana River)

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