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for a living planet®

Saving a picture of beauty

The Danube-Drava-Mura river corridor

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The river corridor is proposed as a trans-boundary Biosphere Reserve within the framework of UNESCO's Programme on Man and the Biosphere (MAB)

Ramsar CONVENTION ON WETLANDS

Worth a **million words**

There's an old saying that a "picture is worth a thousand words". That's very true. A photograph or a painting of a place or person or thing, full of colour, creativity and light, can often express much more than can pages of words and text.

But there's one thing that's worth even more. That can do it even better. And that's the real place, person or thing itself.

A photograph or a painting is only two-dimensional. It cannot move, or grow, or change colours or direction. Only the real thing can.

Like a real, living river – constantly shaping its own landscape in response to natural forces. The speed and level of the water, erosion, sedimentation and other processes all impact where the river's next gravel bank or side arm will form, where the next curve will wind or when a floodplain forest will be submerged.

Many typical river species such as eagles, terns, sturgeons and willow trees actually need and thrive on such a dynamic landscape. And local people's lives and economies have always been shaped by these environments. The result is an awe-inspiring natural phenomenon and experience for us.

Every living river scene has the potential to become the source of inspiration for our creative instinct. Photograph, painting, sculpture, story or poem. Freezing a moment, or an experience, in time forever.

And these can communicate the place and its values to people living far away, even at the edge of the continent – people who might become inspired to visit the river itself one day.

If the living river is still there when they arrive.

Because unlike a photograph or a painting, the real river is in the real world, not protected like in a frame or gallery. And in the real world, things are not always left alone. Threats loom on the horizon. Senseless human actions can end the nature of a place. And once gone, only scenes frozen as moments in time in a photograph or a painting will be preserved.

A river may still be there, and it may still be on a map, but it may no longer be alive.

Today, there is still a living picture of beauty in Europe called the 'Danube-Drava-Mura river corridor'... WORTH A MILLION WORDS… but it is in danger and needs your help.

This is an **awe-inspiring picture of beauty…**

A naturally rich, living river ecosystem for numerous endangered habitats and species ... Providing local people with essential services and resources.

Now is the time to **preserve** this **treasure** for the future...

To restore places that have been damaged...
And to protect it from further harm...
For nature and people.

A picture **of beauty**

The ‘Danube-Drava-Mura river corridor’ is one of the continent’s largest and best preserved river ecosystems. It provides a home to rare habitats and species such as White-tailed eagles, Little terns and otter, and economic benefits such as natural flood protection and drinking water for local people.

The trans-boundary ‘Danube-Drava-Mura river corridor’ consists of the free-flowing lower reaches of the Drava and Mura rivers and some stretches of the Danube River.

In total, the corridor extends about 600 km through the five countries of Austria, Slovenia, Croatia, Hungary and Serbia and Montenegro. Politically, many stretches of the Drava, Mura and Danube rivers represent borders between these five countries. Covering a total area of more than 250,000 hectares, the ecologically valuable area includes well preserved river stretches surrounded by extensive floodplains, wetlands, forests and meadows.

It begins at the lower reach of the Mura River at a protected ‘Natura 2000’ site in the province of Styria, Austria. The corridor then extends to where the Mura meets the Drava River and then onto where the Drava meets the Danube River near the city of Osijek in Croatia. At its end, it is marked by a large wetland area and the internationally important ‘Nature Park Kopački Rit’ in Croatia, the ‘Special Reserve Gornje Podunavlje’ in Serbia and Montenegro and the ‘Danube-Drava National Park’ in Hungary.

The Mura and Drava are the main rivers within the ‘Drava River Basin’ – itself one key part of the massive network of rivers in the heart of Europe that together form the ‘Danube River Basin’ – the most international river basin in the world.

Looking back

A strong connection between local people and nature has always existed here. For example, in honour of local environments, many villages and landscapes have names that can be traced back to nearby rivers – from Mureck in Austria, to Muramente in Hungary, to Dravsko Polje in Slovenia, to Podravina in Croatia and to Podunavlje in Serbia and Montenegro.

Historically, for nearly a thousand years, stretches of the rivers have served as border areas dividing peoples and empires. Towns like Varaždin on the Croatian Drava preserved their centuries-old fortifications that at one time warded off threats from the now fallen Ottoman Empire against the Habsburg Empire.

From the mid-20th century to the end of the 1980s, much of the corridor served as the ‘Iron Curtain’ between Western Europe and the former Eastern Bloc. A no-man zone for humans cursed with strong military protection, it became, without intention, a protected area for nature and a place where it could rebuild itself and flourish.

Since the Iron Curtain was lifted in the beginning of the 1990s, the values of this place have re-surfaced, as has a new opportunity to maximize the area’s benefits for nature and people.

With his camera, Croatian-born Mario Romulić captures a group of White-tailed eagles competing for fish on the bank of an oxbow. All around him, the air and waters teem with life, sound and movement. Transforming the scene before him into photographs bursting with creativity and light, Mario hopes to inspire others to experience the beauty of this place.

He is near the city of Donji Miholjac on the Drava River in Croatia, near the Hungarian border – home to rare habitat and endangered species of global and European importance. It is a special place, compared to other river areas that have already been dammed and damaged.

Living rivers

While most of Europe's large river systems were drastically dammed and regulated in the past, the 'Danube-Drava-Mura river corridor' was largely preserved, making it one of the continent's largest and most important. The rivers flow freely, unblocked by dams. Virtually untouched natural stretches, some 100,000 hectares of connected floodplains, and intact river processes are the norm for this gem. In simple words, this river ecosystem largely functions as it should.

Intact river stretches within the corridor exist in a state of self-regulated dynamic balance. Riverbanks, islands and branches constantly change, disappear or re-emerge in new places. Flooding, drought, erosion and sedimentation within wide spaces are vital natural processes proving that the river is alive. The river needs these natural processes to survive, just as the living human body requires processes such as respiration, digestion and blood flow. Without them, it would sicken and die.

One interesting phenomenon has been the regular changing course of rivers, at times causing unexpected impacts for areas where the river was defined as a border between countries centuries before. At some locations along the Croatian-Hungarian border, for example, where the river bed shifted, the political border remained the old river course. The result was that some lands formerly on one side of the river were now to be found on the other side. When those lands were important locally for hunting or agriculture, local residents had to create new ferry boat systems to reach those 'shifted' lands.

Biodiversity richness

The 'Danube-Drava-Mura river corridor' is one among very few places in Europe with an amazingly high level of biodiversity for such a relatively small area. In fact, it is a mosaic of some of Europe's best examples of riverine habitats. These in-

Key Protected Areas along the 'Danube-Drava-Mura river corridor'

Protecting the valuable ecosystem of the Danube-Drava-Mura rivers, including its endangered habitat and species, is needed as part of any future development of the region. The good news is that more than 90% of the area is already protected or has plans for future protection. All five countries sharing the river corridor have placed specific areas of importance under special protection such as EU Natura 2000 sites, national parks, nature reserves, nature parks and Ramsar Sites. At the same time, effective protection and management of the entire corridor is possible only if it is treated as one area by all of the five countries working together.

Morning Glory:
Dawn in Croatia's
Kopački Rit Nature Park

clude floodplain forests, wet meadows, marshes, reed beds, oxbows, side arms and very dynamic habitats such as steep banks, gravel and sand banks and natural islands. Many are ideal breeding and feeding grounds for birds, fish and mammals.

One of the richest biodiversity hotspots is found in the area between Croatia, Hungary and Serbia and Montenegro where the Drava meets the Danube. With more than 63,700 ha of protected wetlands, including Hungary's 'Danube-Drava National Park', Croatia's 'Nature Park Kopački Rit' and Serbia and Montenegro's 'Special Reserve Gornje Podunavlje', it is home to many species of global and European importance including the White-tailed eagle, Pygmy cormorant and Spoonbill.

Secretive Species:
Enough quiet places for Black stork breeding.

The corridor's interconnected system of floodplains includes some of Europe's best and most endangered floodplain forests. Consisting mainly of oak, ash, willow and poplar forests, these are fascinating habitats where large trees are partially submerged, for up to three months at a time, beneath floodwaters that regularly come and go. These forests have evolved to depend on floods for their survival given their constant supply of nutrients and water. In fact, the seeds of floodplain trees such as willows and poplars can only grow in the newly formed sand and gravel banks of a living river.

Bird haven

Floodplain forests, with their old trees and minimal human disturbance, are ideal breeding grounds for endangered White-

NATURA 2000 SITES

The lower Mura in Austria was nominated in 2001 as a Natura 2000 site, named 'Steirische Grenzmur mit Gamlitzbach und Gnasbach', under the EU Habitats and Birds Directives and covers 34 km along the Mura River border shared with Slovenia. It marks the origin of the free-flowing lower stretches of the Mura and Drava and hosts the second largest riverine forest in Austria. A management plan has been elaborated for the 2,200 ha area and river restoration work has already begun in cooperation with Slovenia.

Through entry into the EU in May 2004, Slovenia and Hungary proposed that the Mura and Drava riverine landscape should be included into the list of Natura 2000 sites. Croatia is also taking important steps to protect its rivers under EU nature conservation laws on its way into the European Union.

From the distance: Only gravel and sand on the Drava?

tailed eagles, Saker falcons and Black storks. Forty percent of the Danube River Basin's entire White-tailed eagle population, or about 100 breeding pairs, live along the corridor. Rivers and oxbows adjacent to floodplain forests in turn provide excellent feeding habitat, as do semi-natural fish ponds which also serve as breeding grounds for water birds such as the globally endangered Ferruginous duck. In total, the corridor provides breeding habitat for about 150 bird species, the most endangered of which live in dynamic habitats.

The area's steep sand and loam banks, with loam cliffs up to 40 m high, have attracted many birds that dig protective caves for breeding their newborn including Sand martins, Bee-eaters and Kingfishers. After Hungary's Tisza River, the Drava is the most important breeding place for Sand martins in the Danube River Basin, with a total of more than 14,000 pairs and one significant colony of 3,000 pairs on the lower Drava near Donji Miholjac in Croatia, close to the Hungarian border.

Common sandpipers, Little ringed plovers, Common terns and Little terns breed on open gravel and sand banks, free of vegetation. The Little tern is a particularly special friend to the area – its rarest and most sensitive bird species with only 10 to 15 pairs in all.

Over a quarter-million water birds rest along the river system during the winter season, taking refuge and feeding in the rivers' free-flowing, ice-free stretches. In the Danube-Drava confluence alone, over 20,000 individuals can be found including grebes, cormorants, herons, egrets, ducks, geese and gulls.

DRAVA-DANUBE TRIANGLE

One of the best preserved floodplain areas in the Danube Basin is located at the confluence of the Drava and Danube rivers. With an area of some 63,700 ha, politically it includes three protected areas with each one belonging to a different country. Ecologically, however, the area under protection can be seen as one large protected site.

Kopački Rit Nature Park – Croatia

Covering some 24,000 ha, this area is protected under Croatian national law. Valued as a former hunting reserve in the last century, at first by the Habsburgs and then by former Yugoslav President Tito, the most ecologically valuable part of the area (7,100 ha) was protected in 1976 as a Special Zoological Reserve. Later, the entire area became a Ramsar Site. The area has also been proposed as a National Park and Natural World Heritage Site. The reserve is covered with extensive reed beds, willow, poplar and oak floodplain forests and is interspersed by ridges, ponds, shallow lakes and marshes. Floods usually last 100 days a year and large areas are regularly inundated by shallow water. The abundance of food and underwater vegetation is ideal for fish spawning which makes Kopački Rit, after the Danube Delta, the most important spawning ground in the Danube Basin. The Basin's highest density of White-tailed eagles are found here (about 30 pairs), as are several large colonies of Herons and Cormorants.

In focus: One of the last breeding grounds on rivers for the Little tern in Europe.

From Wild carp to Siberian iris

With 61 species of fish such as Sterlet, Wild carp, Mud minnow, Nase, Barbel and Catfish, the area is one of the most important fish spawning grounds in the entire Danube Basin. Fish are attracted to the area's near natural conditions unblocked by dams.

Also noteworthy are the large number of mammals including endangered wildcats and bats. Otters have used the corridor in the last 30 years to re-populate creeks and rivers in south-eastern Austria that were not long ago devoid of otters, highlighting the ecological importance of this east-west axis for migration.

Danube-Drava National Park – Hungary

In April 1996, this park was created to protect the entire length of the Drava within Hungarian territory and the Danube floodplains. In 1997, parts of the Danube were designated as two Ramsar Sites. The protected floodplain system of about 28,200 ha includes the largest floodplain forest – Gemenc Béda-Karapancsa - in Central Europe. The park's wetlands, large river arms and oxbows are a major breeding ground for Black storks, White-tailed eagles and some 110 other bird species including Heron colonies and a high density of Kingfishers. Over 5,000 animal and 600 plant species can be found here. Recently, WWF successfully reintroduced the Beaver into the park from populations in Bavaria.

Gornje Podunavlje Special Reserve – Serbia and Montenegro

An integral part of the Danube-Drava floodplain system, this sprawling wetland area covering nearly 11,500 ha at the left side of the Danube in the Vojvodina region, Serbia and Montenegro, is sharing the ecological values of the region.

Ramsar
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Some 50 species of dragonfly also grace the area including the small Darter, a species from the global red list, and the Green-eyed hook-tailed dragonfly.

Wet meadows include unusual plants such as the Siberian iris, orchids and the White narcissus. And oxbows and side branches abound with vast expanses of reed and sedge as well as rare plants such as the Mosquito fern, Floating fern, Water lily and Water chestnut. Many of the water plants depend on the river's dynamic processes.

Socio-economic benefits

Complimenting the corridor's high level of biodiversity is its multiple social and economic benefits. For the people who live there, the corridor's natural processes and ecosystem functions have always played a vital role in shaping their lives and economies. This is especially true of the area's floodplains, the growing economic importance of which is only now beginning to be recognized locally and worldwide. Most importantly, floodplain systems result in lower costs for providing flood prevention, water purification and supply and irrigation systems.

The corridor's extensive and intact floodplains work as a natural buffer that protects communities from floods – better than can human engineered dams and regulation works. Floodplains provide natural reservoir space for floodwaters, but only if the floodplains have not been diked and artificially disconnected from the river channel, as has become increasingly the case throughout Europe. By absorbing water quickly and releasing excess water slowly, flood peaks are reduced.

The Danube, Drava and Mura play a vital role in preserving good groundwater conditions, achieved through the strong interaction between the river and groundwater. As rivers are connected to groundwater areas ('aquifers'), regularly fluctuating river water levels in turn cause groundwater levels to fluctuate. During high water level periods, rivers release water to aquifers, filling or feeding them with filtrated river water. Similarly, during drier summer periods, groundwater aquifers release much needed waters back into the rivers. Also known as the 'pulse' or 'breath' of floodplains, these processes provide oxygen to ground waters, keeping them 'fresh'. As a result, the groundwater aquifers along the corridor are an essential provider of high quality and quantity drinking water to local communities.

Good groundwater conditions are an important freshwater supplier for forests and agriculture in the region. The famous

Catch of the day: Local fisheries still have key economic importance.

Nature provides: From flood protection to water purification services for local people.

4,000 ha 'Repaš' oak forest, for example, on the Croatian left bank of the Drava near the Hungarian border, depends on good groundwater conditions which feed the forest with a constant supply of water year-round. Economically, the monetary value of the benefits provided by the Repaš forest have been estimated at over 20 million Euros per year through activities such as sustainable forestry, tourism and hunting.

Water and wine

The corridor is prized for its excellent self-purification capacity. It naturally purifies water by acting like a highly efficient sewage treatment plant – absorbing chemicals, filtering pollutants and sediments, breaking down suspended solids and neutralizing harmful bacteria. This includes a highly important role in reducing nutrient pollution from agriculture and human waste.

Floodplains also help to determine local climate. Their abilities in 'absorbing' seasonal temperature changes, moderating climate extremes including summer heat waves, and affecting local humidity in summer have significant positive consequences for many sectors, especially agriculture.

The corridor has always provided benefits for local fishermen and numerous recreational values for residents. Now, the potential for eco-tourism is growing – from swimming and guided boating on the river, to sport fishing, cycling and walking the new trails. The proximity of the area to surrounding rich fruit orchards and famous hilltop vineyards, producing excellent organic liqueurs (palinka) and wines, also helps, as do the many local natural thermal springs.

Today, the strong ecological, economic, cultural and historical values along the corridor are still in place, waiting to be realized, maximized and fully enjoyed.

The area is still worth a million words, worthy of capturing our fascination. But for how long?

Case Study
Austria's Upper Drava I

Over a century ago, the Drava River, in the Austrian province of Carinthia, was a typical, Alpine wild and dynamic river with extensive gravel banks, islands, side arms and oxbows. It was home to large populations of species such as Danube salmon, Kingfisher and Eurasian otter. Regularly inundated by water, its floodplain areas hosted some of Europe's finest floodplain alder and ash forests, and provided socio-economic benefits such as natural flood protection, clean drinking water and fisheries.
Today, after one century of river channeling and hydropower dam development, only remnants of the former system have been preserved, found on Austria's upper Drava. Free-flowing for over 60 km, it is the only stretch of the Drava left in Austria without dams and still hosts floodplain forests and endangered species.

The Danube-Dra

Proposal for a Trans-Boundary UNESCO Bi

AUSTRIA

MURSKA SOBOTA

Mura

Drava

SLOVENIA

NAGYKANIZSA

MARIBOR

PTUJ

ORMOŽ

VARAŽDIN

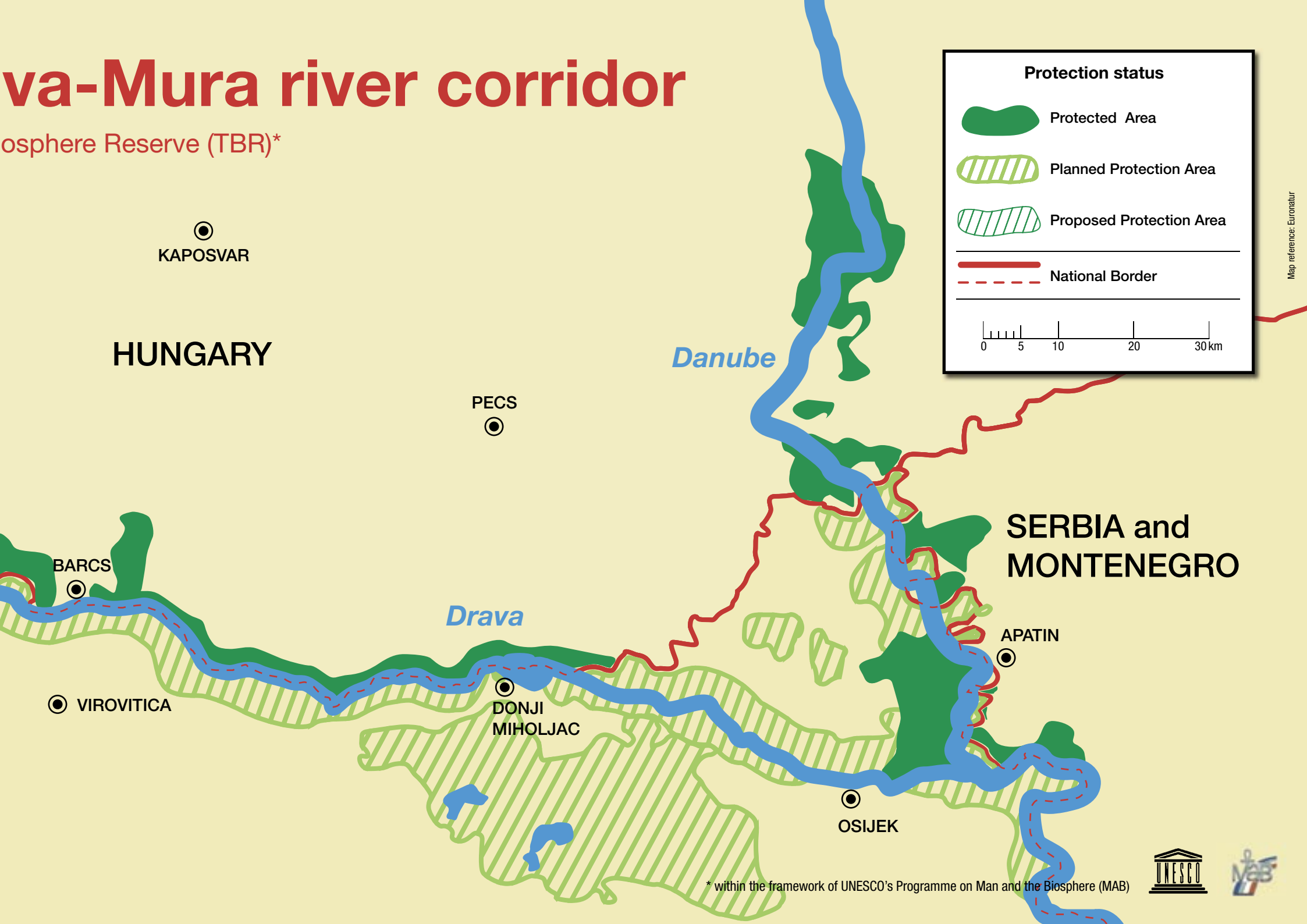
KOPRIVNICA

CROATIA

ZAGREB

va-Mura river corridor

osphere Reserve (TBR)*



* within the framework of UNESCO's Programme on Man and the Biosphere (MAB)

Unwanted **landscapes**

Despite its current beauty, the Danube-Drava-Mura's natural values are threatened by further river engineering. The goal now is not to continue ecologically destructive practices but to preserve what has been left and restore what has already been damaged.

Until the beginning of the 19th century, both the Drava and Mura rivers were entirely free-flowing and pristine. Since then, they have faced human threats, most the result of a management approach that heavily impacted the natural river landscape. The main causes were from actions to control river flow through building hydropower dams, river channelling and extracting gravel and sand.

Due to the past impacts on both rivers, which were done in excess, much of the area's unique natural values have been preserved only within the undammed, free-flowing stretches of the 'Danube-Drava-Mura river corridor' and are therefore of key importance both nationally and to all of Europe. But more destructive practices are planned or are still being applied, and more of the same problems continue to be felt. New engineered landscapes are replacing old healthy natural landscapes again.

More dams, less nature

The Drava and Mura rivers have been used for hydropower generation for over a century. Only the river stretches within the corridor, and the upper reaches of both rivers in Austria, have had the fortune of almost completely avoiding dam development. In other parts of the Drava River Basin, especially the middle stretches of the Drava and Mura, 48 dams shadow long stretches of both rivers. Mainly because of these dams, over 50 percent of the Drava and Mura rivers have been modified with vast ecological impacts.

The Donja Dubrava dam, visited by our friend Mario (see right box), was the last and largest dam. Built in 1989 some 10 km above the Drava-Mura confluence, it changed the final braided stretch of the Drava into a massive 16 sq km reservoir of concrete. A diversion canal further diverts over 98 percent of the water from a major section of the original natural river bed to the dam structure. The result?

Habitats and species have been heavily impacted. Sites with floodplain forests were permanently flooded and replaced by new static environments. Typical species dependent on dynamic habitats have become rare or extinct. Colonies of Little and Common terns and Sand martins are gone.

With the river disconnected from the groundwater, groundwater levels have changed all around the reservoir. With an end to naturally fluctuating water levels, the result has been poorer drinking water quantity and quality, a reduced self-purification capacity and drying out of forests.

Downstream from Donja Dubrava, long stretches of the river corridor are now threatened by the dam in the long-term. For example, twice a day, the dam releases a massive amount

Mario Romulić stands next to a river bank upstream from where the Drava and Mura meet at Donja Dubrava in Croatia. Few birds fly above him. This time, he will not use his camera. Why? Because here, there is nothing really left to photograph. The river is no longer alive.

Just as wild bird eggs are fragile and vulnerable to disturbance, so is the river. Here, nature has been replaced by an engineered landscape. Where the living river was intertwining and dynamic, it is now straight and still. Where the river's edges were made of gravel and floodplain forests, it is now solid and concrete. Where children played, signs warn against swimming.

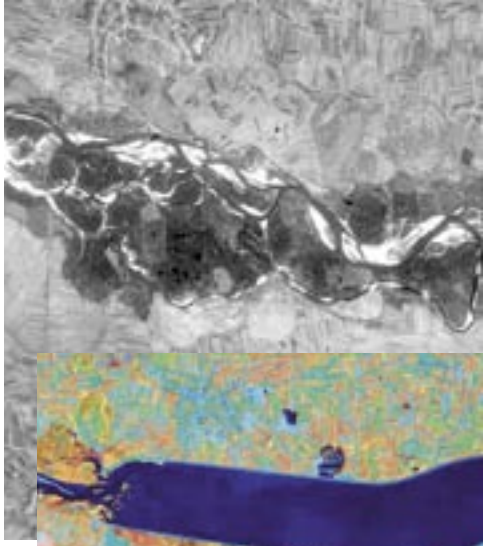
The devastation on the Drava River at Donja Dubrava was caused by a hydropower dam, the last in the long chain of dams reaching along the river from Austria to Slovenia and up to the Mura confluence in Croatia. It is only one of many negative past legacies in the Drava River Basin.

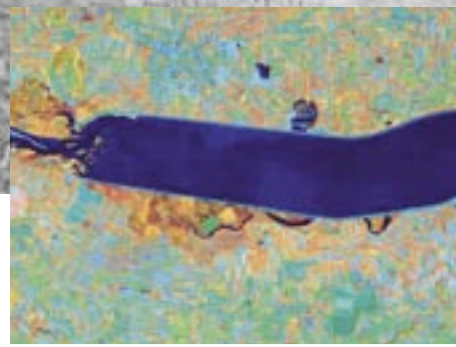
of water from its reservoir to create a maximum surge of electrical energy. This creates an artificial flood wave downstream with rapid water level changes of up to 1.8 meters, which has led to a decline in fish populations.

It has also ended the natural flow of the river's surface waters and its transportation of solid matter downstream. The reservoir behind the dam has become a trap for large volumes of sediment, especially gravel and sand moving downstream, like a clot blocking the flow of blood in a human artery.

The result has been a continuous deepening of the river bed along the free-flowing stretches below the dam. This has led to lower surface and ground water levels, now endangering floodplain forests and local drinking water supplies.

Finally, the belief that dams effectively protect against large floods is fading in the area and throughout Europe. As dams and dykes have grown in size, so too have the impacts of large floods – no joke in Europe, where from 1991 to 1995 alone, the total cost of floods was estimated at around 100 billion Euros. Again in 2002 and 2005, floods had disastrous effects throughout the continent, including the Danube Basin. Europeans are discovering that nature's own wetlands and floodplains are much better in protecting them against floods than human engineered dykes and dams.





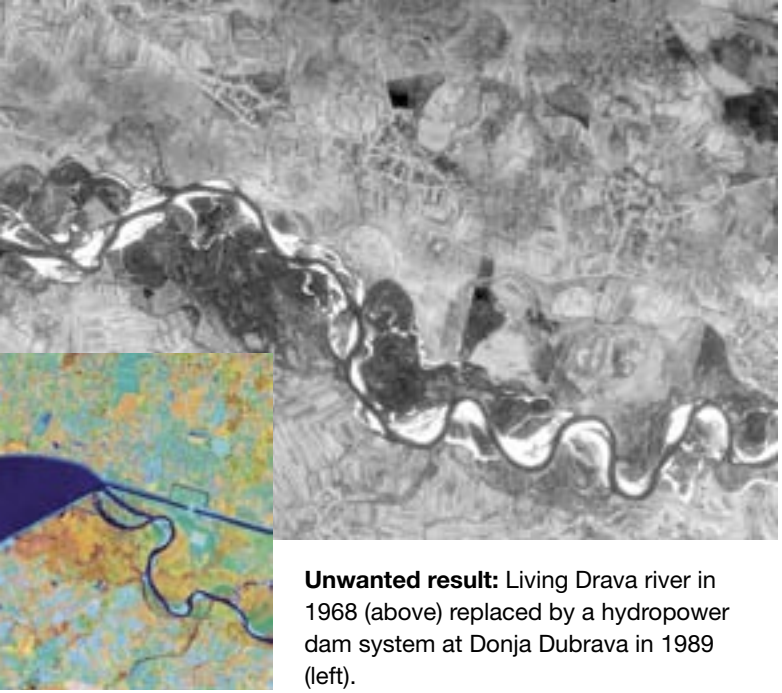
Enough damage: No need to repeat this picture throughout the river corridor.

Novo Virje lost?

Our friend Mario took the trip to Donja Dubrava to see with his own eyes what could happen to other beautiful landscapes along the Drava and Mura in the future. One particularly threatened place is near the town of Novo Virje. Why? Because in Novo Virje, the Croatian electricity company Elektroprivreda hopes to build a new hydroelectric dam costing more than half a billion Euros!

The idea was actually part of an older plan from the 1970s jointly agreed by Hungary and the former Yugoslavia, calling for four new large dams along their common border. However, as communism ended in the late 1980s, scientific and public protests against the dams forced both governments to back out of the plan. Soon after in 1991, Hungary progressively gave strict protection to its part of the Drava floodplains through the gradual creation of the 'Danube-Drava National Park'.

The Yugoslavian succession state Croatia responded very differently. In 1992, Croatia created a new dam proposal named after the small village of Novo Virje, to be situated



Unwanted result: Living Drava river in 1968 (above) replaced by a hydropower dam system at Donja Dubrava in 1989 (left).

solely on Croatian territory but with impacts for Hungary. Soon after, the Croatian forestry association protested against the dam given the impacts it would have on the precious Repaš lowland forest.

If built, the dam would have an installed capacity of about 138 MW, the largest dam on the Drava. It would create a 25 km long reservoir, flood over 2,700 ha of the lower Drava ecosystem and disrupt the river corridor in the middle of its length. At 25 m in height, the lower walls of the reservoir would dominate the beautiful landscape. And as the barrage would only be 150 m from Hungarian territory, Hungary's 'Danube-Drava National Park' and Natura 2000 site would seriously suffer.

Biodiversity would be profoundly impacted. Under the EU's 'Habitat Directive' (see page 27), at least 10 habitat types including softwood forests and meadows (priority habitats of European importance), and 30 animal species including otter, fishes and bats, would be substantially reduced or destroyed. The same would happen to 26 bird species under the EU's 'Bird Directive' including the Little tern, White-tailed eagle and Black stork.

In other words, nature around Novo Virje would meet the same disastrous fate as did nature around Donja Dubrava.

It was therefore a big surprise when an Environmental Impact Study (EIA) by Croatian firm Elektroproject (the same firm that planned the dam) in 1998 found the project to be environmentally feasible. Local and international criticism quickly followed and Hungary opposed the project given that the EIA failed to assess impacts on Hungary's National Park. Today, the Novo Virje project has been stalled until a transboundary EIA, still in progress, is completed. Meanwhile, Croatian electricity company Elektroprivreda remains anxious to gain project approval and start construction.

Decay through river channelling

Civil river managers have traditionally justified the engineered 'channelling' of river stretches along the river corridor as a means to control floods, improve navigation and provide new lands for agriculture. This has primarily been through the building of dikes parallel to the river and stone embankments that fix riverbeds in a narrow corset. We now know that the channelling was done in excess, many problems resulted, and old justifications have often become outdated forms of water management.

The first major river channelling works on the lower Drava were in the early 19th century under the Habsburg Monarchy. Engineers intent on creating a shorter and straighter main channel merged smaller channels or made new main channels by cutting off river curves or 'meanders'. Most of this work occurred between 1805 and 1848 as 62 large cuts were made to meanders, reducing river length by 75 km or 60 percent, mainly downstream from Barcs, Hungary to the Danube confluence. By 1915, most meanders on the lower Drava were cut off.

As noted earlier, after World War II, large stretches of the Drava and Mura rivers became border areas between Hungary and the former Yugoslavia, and part of the infamous 'Iron Curtain'. A positive result was that many areas in this militarized belt, left alone, partly self-restored themselves to near natural conditions over time.

Straightening the river: Two centuries of channelling the Drava continues to this day.

Channels after the changes

Since the lifting of the Iron Curtain, countries have continued old negative practices. Most visibly, the Croatian Water Management Authorities have resumed channelling river stretches along Croatia's borders with Hungary and Slovenia and along inner stretches of the Drava. In most cases, Hungarian and Slovenian authorities have agreed.

One example, the biggest river engineering project in the entire Drava Basin since 1990, was carried out on a 15 km stretch of the old Drava ('Stara Drava') riverbed in Croatia downstream from Varaždin without any consideration of environmental aspects. Once a valuable large wetland area and dynamic river, it is now an artificial channel with a series of pools separated by stone barriers. In 2002, similar regulations affected a 20 km stretch of the Stara Drava upstream from Varaždin along the Croatian-Slovenian border – fortunately, this second project was recently put on hold due to a lack of environmental considerations.

Another example is the new stone embankments built near Legrad at the Mura confluence opposite the 'Special Zoological Reserve Veliki Pažut' and the Hungarian 'Danube-Drava National Park'. Here, similar to other parts further downstream, massive regulation works have destroyed natural steep banks with colonies of Sand martins and Bee-eaters and cut off river branches and valuable fish-spawning grounds. In response, several 100,000 Euros were spent to save a few hectares of arable land.

Dangerous digging: Gravel and sand extraction destroys the living river system.

Forest decline: River bed straightening and artificial stone banks separate trees from essential water sources.

Throughout the corridor, many former natural islands, bays and gravel and sand banks (and thus breeding grounds for endangered Little terns and Common sandpipers) have disappeared because of channelling. Cutting off floodplains and side channels has left fish such as pike and carp without valuable spawning grounds or migration routes.

River channelling has also led to increased water velocities, a deepening of the river bed, and thus a fall of groundwater levels and a continuous drying out of water bodies and forests such as those at Repaš. For example, in the last 80 years, the Drava riverbed has deepened by some two metres at Botovo in Croatia and continues to deepen at 2,6 cm per year.

Future plans for river channelling, as planned along the Drava in Croatia or even within the Nature Park Kopački Rit, hold more of the same problems.

Extracting of gravel and sand

Since decades, people have benefited from the area's high quality gravel and sand, mainly used as building materials

for houses and roads. In fact, the Drava and Mura valleys possess huge deposits of these resources with layers descending 150 meters deep into the earth, especially in Croatia's Podravina region.

Unfortunately, many extraction activities, in particular those from the natural river bed, have massively damaged the ecosystem. Similar to the impacts from river channelling, extractions have resulted in a loss of valuable habitats and a deepening of river beds as sediment is removed.

Large-scale commercial gravel digging started in the mid-1970s in Hungary and the former Yugoslavia. From 1975 to 1996, Hungary and Croatia officially extracted a total of five million cubic meters of gravel and sand from the Drava, mainly from the main channel.

Regarding the two major engineering projects near Varaždin noted above, besides channelling the river, the projects also included massive gravel extractions. Here, the Croatian Water Management Authorities commissioned the projects, materials from which were used in motorway construction including a major stretch between Varaždin and Zagreb.

Other devastating excavation projects are being carried out throughout the corridor, as well as by Hungarian Water Management Authorities – for example, about 120,000 cubic meters of gravel yearly are excavaded from within the 'Danube-Drava National Park'. Recently, Croatian Water Management Authorities also planned to extract some two million cubic meters of gravel and sand, equivalent to 200,000 truckloads, over the next five years from the lower Drava. The plan was put on hold as no environmental concerns were taken into account.

However, alternative solutions do exist. The extractions could be carried out outside of floodplains in land-based gravel and sand pits. This could be based on careful spatial and landscape planning, taking into account the environment.

No need to repeat old mistakes

Damages caused by each of the three main threats – dams, channelling and excavations – are by themselves significant. The damage caused by the three activities working together, however, is far greater than just the sum of the parts.

Take as one example the problem of sediment in the Drava. Upstream dams have already blocked most of the natural sediment flow downstream. This has increased downstream erosion, deepened the riverbed and lowered groundwater levels. At the same time, river channelling adds to the problem by straightening and deepening the river. And excavations remove even more solids and sediment from the river.

In conclusion, most of the corridor's natural values still remain. But if new plans based on outdated methods go ahead, and if no river restoration of damaged stretches is carried out, the natural values will be lost.

But it doesn't need to be that way. The good news is that a change of thinking is happening and the European Union appears to be helping changing course, for the better. More people are becoming aware of the importance of the Danube, Drava and Mura. This should help to save them.

Case Study: **Austria's Upper Drava II**

From the early twentieth century, the Drava in Austria, upstream of Spittal an der Drau, met the same fate as did many other natural Alpine rivers. Its riverbed was canalized, bends and meanders were straightened, and river branches were cut off from the main stream. This was based largely on an approach to flood protection favouring large engineering projects and meeting local residents' demands for intensified farming and housing in the floodplain area.

As a result, the river's character changed considerably with an enormous loss and degradation of its natural habitats such as its floodplain forests, and declines in species populations such as the Danube salmon. Channeling and gravel extraction deepened the riverbed leading to faster river flows and a lowering of the groundwater level. The deterioration of natural flood-retention capacity also increased the risk of flooding.

In the early 1990s, proposed hydropower dams threatening the area were cancelled due to public protests, opening the door to river restoration and the protection of the remnants of the natural values.

A return to **origins**

Many good solutions to protect the natural values within the 'Danube-Drava-Mura river corridor' are already in place, and EU environmental legislation will be a further help. Despite this good news, more needs to be done, and true trans-boundary cooperation will only work if an idea, born in 1993, becomes a reality soon.

Many parts of the river corridor have been able to naturally regenerate themselves or were preserved for over 40 years as part of the former Iron Curtain. Here, most of the area was inaccessible to people and left to become one of the most diverse areas in Europe.

This example brings hope that other previously damaged parts of the river corridor will also naturally recover and be better protected. And there is hope elsewhere.

Governments and authorities along the river corridor have made significant progress in protecting many areas (see page 10). In fact, more than 90 percent of the area is already protected or has been planned for protection at the national level.

At the same time, where threats have continued, a network of local, national and international conservation organisations such as WWF, Euronatur, Drava League, Green Action, Drava Federation and DOPPS-Birdlife Slovenia are active in defending areas and seeking better protection – from the proposed dam at Novo Virje to new plans for river channelling and extracting sediments from the rivers.

This included a colourful demonstration in front of Croatia's parliament in Zagreb in mid-2003. Dressed up as fish, the NGOs demanded an immediate end to gravel extraction and river channelling on the 'Stara Drava' at Varaždin, commissioned by the Croatian Water Management Authorities. NGOs argued that the plan, similar to other plans along the river, was destroying a unique European ecosystem and was against Croatian and EU law. As a result of the protests in Croatia and at the EU level, the plan was set aside.

Many people have realized that a change in the management of the rivers is needed. And NGOs have been pushing for trans-boundary solutions and improved river management throughout the river corridor to this day.

EU impacts

The European Union and in particular its environmental legislation is backing both the ongoing efforts of NGOs along the corridor and those governmental bodies striving to better protect and manage its natural values and resources.

Ingrained in a new commitment to conserve Europe's natural heritage, new legislation protecting water, rivers and riverine habitats and species are now being implemented throughout the EU. Most notable is the Water Framework Directive (WFD), perhaps the world's strongest water protection legislation, and the Habitats and Birds Directives (see page 27).

The directives are providing the legal basis for a paradigm shift in river management and better protection for Europe's biodiversity. More than anything, this has meant a change

Upstream from the Croatian town of Osijek on the Drava, Mario Romulić is admiring re-creation at work. In the early 1900s, engineers had reduced the river's length here from 80 to 45 km by regulating and straightening its natural meanders. Over the next century, the river stretch was left alone and was able to naturally reconnect many cut-off areas, create new meanders and extend its length back to 68 km. Today, it flows through an amazingly large floodplain forest.

That's good news – and perfect for one of Mario's great photos.

Enough is enough: NGOs protest against gravel extraction in Zagreb, Croatia.

from working against rivers to working with them, from channelling and damming to restoring and protecting them. It has also lead to a new sense of cooperation and trust between governments and NGOs. This includes joint efforts on major river restoration projects across the continent, including ones in the Upper Drava River in Austria (see boxes) or on the Loire River in France.

More work to be done

Positive changes happening across the EU are spilling into the Drava Basin to EU Members States such as Austria, Hungary and Slovenia, and EU Candidate Countries such as Croatia. But more efforts are needed.

Many parts of the corridor remain at risk of failing to meet EU environmental objectives, especially if plans to build new dams are implemented, or if channelling the river or extracting gravel and sand continues. Croatia's situation appears to be most precarious – if it builds the dam at Novo Virje, for example, the country would clearly be breaking EU law and risk chances of entering the EU.

A change, therefore, from river engineering to river restoration and sustainable management is urgently needed. But to date, there have only been minor efforts to restore damaged parts of the river ecosystem. More natural areas in the river corridor require stronger protection. And the management of many existing protected areas needs improvement.

There is increasing recognition that successful protection and management of the trans-boundary area can only be found in cooperation between countries. Currently, many activities geared to protecting the corridor's environment are disjointed and separate. The river is not being treated as a shared resource among countries, but rather as separate areas managed at the national level.

Unless trans-boundary cooperation is ensured, the river corridor cannot be truly protected and managed, and EU environmental objectives for water management and nature conservation will not be met. The good news is that an appropriate solution exists.

International Instruments for conserving the 'Danube-Drava-Mura river corridor'

A number of excellent Europe-wide and worldwide laws exist to help conserve and ecologically manage the internationally significant values of the 'Danube-Drava-Mura river corridor'.

EUROPEAN UNION (EU)

The EU's environment legislation and programmes are among the strongest tools in the world for protecting and restoring biodiversity and the ecological management of natural resources. If an EU Member State fails to comply with an EU law, then the EU Court of Justice could impose penalties. Candidate Countries wishing to join the EU such as Croatia also need to comply with the EU's full law framework (*aquis communitaire)* before accession to the EU. To find out more: http://europa.eu.int/comm/environment/

Water Framework Directive (WFD)

This is an ambitious and innovative approach to water management. It aims to protect all EU rivers, lakes, coastal waters and groundwaters. National governments need to ensure all waters achieve a "good ecological status" by 2015. Waters crossing borders require the cross-border cooperation of governments through shared river basin management. A shared management plan should include all ecological and human activities taking place in a river basin -the five countries sharing the Danube, Drava and Mura have yet to develop such a plan.

On the move: One of thousands of Bee-eaters along the Danube-Drava-Mura.

A vision for nature and people

In 1993, Austrian, Slovenian, Hungarian and international conservation NGOs met in Kaposvar, Hungary. There, the vision of protecting the entire 'Danube-Drava-Mura river corridor' as a trans-boundary protected area was born. The idea was based on the premise that the ecological richness and socio-economic importance of the whole river system, from Austria to Serbia and Montenegro, could only be guaranteed through trans-boundary protection and management.

For the vision to be possible, authorities and governments across the river corridor need to overcome their national approaches and differences and unite under an international framework. They need to work for the entire river corridor and share strengths and experiences.

It was agreed that the best route toward trans-boundary protection and management was through designating the 'Danube-Drava-Mura river corridor' as a Trans-Boundary Biosphere Reserve (TBR) within the framework of UNESCO's Programme on Man and the Biosphere (MAB). By definition, a TBR provides official recognition, at an international level and by a UN institution, of a political will by many countries to cooperate in conservation and sustainable use through the common management of a shared ecosystem. TBRs demonstrate a balanced relationship between humans and nature and are designated by the International Co-ordinating Council of the MAB Programme of UNESCO at the request of the states concerned.

According to UNESCO, from an ecological point of view, TBRs are essential for the conservation of habitats and species. They support trans-border collaboration at the scientific level allowing scientists to exchange their views and research observations. And they foster peace between nations through mutual understanding and collaboration.

At home: Steep loam banks provide breeding places for Bee-eaters.

Habitats and Bird Directives

These ensure the conservation of natural and semi-natural habitats, wild animal, birds and plant species that are considered to be of Europe-wide importance. Vital to the Danube, Drava and Mura, they require EU Member States to achieve a "favorable conservation status" for habitats and species populations, and prohibit them from deteriorating the quality of wetlands. Countries should designate special areas for protection as part of an EU-wide ecological network known as Natura 2000.

LIFE

The LIFE programme compliments EU environmental legislation through co-financing projects. It has a leading role in promoting and financing ecologically based river restoration projects across Europe. From 1992 to 2004, the LIFE programme spent nearly 1.5 billion Euros. The future LIFE + programme will hopefully ensure the continuity of these amounts.

A place to discover: Linking natural wonders with children's curiosity.

Making the case

On June 25, 1997, the international conservation organisation Euronatur contacted UNESCO and asked for support for making the river corridor a TBR. UNESCO had given positive feedback during an international conference held in Slovenia in May 1996. As a result, on July 18, 1997, UNESCO officially welcomed the idea.

From 1997 to 1999, a working group of some 40 experts of governmental organisations and NGOs from the five countries began developing a proposal to see how a TBR might work. Financed by the Dutch government, with technical help from international conservation organizations Euronatur and IUCN, and supported by the Croatian, Hungarian and Slovenian governments, the project focused on satisfying a number of UNESCO criteria.

By 1999, a clear 'Vision Concept' for international cooperation and the TBR was sent to UNESCO. The report showed that many UNESCO criteria had already been satisfied, including one that the area should have an appropriate size to serve the three functions of a biosphere reserve including conservation, development and logistic support.

Criteria are already satisfied

The 'conservation function' requires the area to contribute to the conservation of landscapes, ecosystems, species and genetic variation. The 'development function' requires the area to foster economic and human development which is socio-culturally and ecologically sustainable. This includes conservation, the sensitive use of river resources, sustainable tourism, sustainable forestry and agricultural practices, and support for local production. The 'logistic support function' calls for support for demonstration projects, environmental education and training, and research and monitoring. It further encourages

Environmental Assessment Directives

The Environmental Impact Assessment (EIA) Directive assesses the probable effects of a project on people, the environment and cultural heritage. It makes sure that EU environmental legislation is met and demands that project planners provide alternative plans to protect the environment. For example, if a country wants to improve flood protection, it needs to show different plans that strive to minimize the negative impacts on a river's ecological system. The Strategic Environmental Assessment (SEA) Directive ensures that environmental consequences of plans and programmes are identified and assessed during their preparation and before their adoption.

INTERNATIONAL CONVENTIONS

The following conventions were signed by numerous governments to ensure the conservation, restoration and sustainable management of biodiversity and natural resources.

Danube River Protection

Signed by Danubian countries (among them Austria, Croatia, Hungary, Slovenia and Serbia and Montenegro) and the EU, this is now the legal framework for all activities related to the Danube River Basin's waters, ecosystems and environmental conditions. Wetland conservation has a high priority, including the protection of the Danube-Drava-Mura floodplains.

increasing public awareness at the local, regional, national and international level.

The 'Danube-Drava-Mura river corridor' clearly satisfies criteria for being "significant for biological diversity conservation" given its large variety of species and habitats of European importance and its "mosaic of ecological systems representative of major bio-geographic regions". It is also one of the last places in Europe where rivers and natural areas are still connected by uninterrupted corridors of wetlands, meadows, pastures and lowland forests, without intersection by dams.

Many sustainable development initiatives already exist along the river corridor, preserved by local communities, including organic farming, extensive animal grazing in meadows, fish farming, lowland forest management, biking and angling tourism, wine-making and thermal spas. The area's cultural heritage also remains intact including its rustic villages and farms and active larger towns.

Regarding logistic support in the TBR, monitoring in the area could be enhanced, adding to current efforts already carried out in the 'Nature Park Kopački Rit ', the 'Danube-Drava National Park' and by universities and NGOs throughout the river corridor.

Zoning for conservation and sustainable use

The Trans-Boundary Biosphere Reserve would be harmonized with the zoning scheme typical for TBRs. These are built around 'core zones' – the most ecologically valuable and vulnerable areas that are given legal long-term protection – such as islands, gravel and sand banks, natural wetlands and forests. Core zones have already been established or planned in the 'Nature Park Kopački Rit ' and the 'Danube-Drava National Park'.

Touristic charms: Restored wooden mill on the Mura River.

Around these would be the 'buffer zones' where only activities compatible with conservation objectives can take place. Buffer zones include grassland pastures, meadows, forests, fishponds and traditional small farms. Finally, 'transition zones' would include areas where sustainable resource management practices are developed and promoted. Here, communities would cooperate in developing a conservation strategy and fostering regional development with improvements to tourism, local spas, wine production, and large fields of geothermal waters around the lower Drava for energy production.

Ramsar

This convention protects wetlands of international importance and supports the wise use of natural resources. Ramsar sites in the river corridor include Croatia's 'Nature Park Kopački Rit' and parts of Hungary's 'Danube-Drava National Park'. Proposed sites include the Drava and Mura in Slovenia.

ESPOO

Obliges countries to consult each other on, and assess major projects likely to have, significant adverse trans-boundary environmental impacts. The impacts of the planned Novo Virje dam in Croatia are currently being assessed together with Hungary in the frame of this convention.

Rio

Protects biological diversity across the entire planet.

Bern

Protects European wild plants, animals and habitats, especially those requiring multinational cooperation. The EU implemented this convention through its creation of the Habitats Directive.

Bonn

Protects migratory species of wild animals and their habitats by promoting strict protection and international agreements.

There is hope: Upper Drava river stretch before and after restoration efforts in Austria.

Next steps

If created, the Danube-Drava-Mura TBR would be the largest coherent riverine reserve in all of Europe. It would form a crucial part of the 'European Green Belt' proposed by the World Conservation Union (IUCN), which aims to create an ecological network along the former Iron Curtain from the Barents to the Black Sea.

The network of local, national and international NGOs wants the TBR to become a reality. They are lobbying their governments, which are partly sympathetic to the idea, to make it happen and raise awareness of its benefits. They're also talking about precedents in Central Europe where national governments already agreed to cooperate on common environmental objectives.

A good step would be a joint agreement between the governments of the five 'Danube-Drava-Mura river corridor' countries. An example for this was in 2000 when the environment ministers from Bulgaria and Romania, in conjunction with Moldova and Ukraine, signed a declaration for creating a "Green Corridor" for the lower Danube. Initiated and facilitated by WWF, this is the largest international, cross-border wetland restoration and protection initiative in Europe, comprising nearly 1 million ha of existing and planned protected areas as well as potential restoration sites. Implementation includes partners at the local, national and international level (e.g. EU, UNDP, UNEP, World Bank). This agreement was followed by a declaration made during the "Head of States Summit on Environment and Sustainable Development in the Carpathian and Danube Region" on 30 April 2001.

There are also signs of possible first steps toward a TBR. One is the trilateral cooperation between Hungary, Croatia and Serbia and Montenegro for the protected areas in the Danube-Drava triangle. The second is the plan by the Croatian Ministry of Culture to protect and unify the Drava and Mura rivers in the five Croatian counties as a Regional Park – a unique Croatian contribution towards making the TBR a reality.

Case Study: **Austria's Upper Drava III**

Around the mid-1990s, the regrettable environmental situation along the 60 km free-flowing stretch of the Drava upstream of Spittal an der Drau led to a new ecologically-based river management concept. Its implementation began by preserving and restoring what was left of the once rich natural environment. The area was nominated as a Natura 2000 site under the EU's Habitat Directive and restoration activities qualified for EU funds through the EU's LIFE Nature programme. With support from the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, and the Water Management and Nature Conservation Authority of the Province of Carinthia and WWF Austria, the 6.3 million Euro project was carried out from 1999-2003.

In the end, it became one of the largest river restoration projects in Europe. Key positive results included better flood prevention – for example, over a 200 ha space, natural flood retention capacity improved by 10 million cubic meters. The speed of the flood wave slowed down by more than one hour. Riverbed deepening either stopped and in some places river depth decreased. Some 50 to 70 ha of additional natural river habitats such as river islands, gravel banks and steep banks for endangered species such as Danube salmon, Common sandpiper and Kingfisher were recreated. And grayling fish populations doubled. The project proved that river restoration works and is sustainable and cheaper in the long run.

Call for Action

The Vision for the trans-boundary 'Danube-Drava-Mura river corridor' is to have a fully functioning, dynamic river ecosystem with a wider variety of natural habitats and species and natural goods and services for people.

The network of local, national and international conservation organisations including WWF, Euronatur, Drava League, Green Action, Drava Federation and DOPPS-Birdlife Slovenia calls on policy-makers and authorities in all five countries (Austria, Slovenia, Croatia, Hungary and Serbia and Montenegro) to stop further deterioration and to increase effective protection and management of this trans-boundary river ecosystem, in accordance with national legislation, international obligations and EU environmental legislation.

Stop major threats and start restoration

- Halt further development of new hydropower dams along the river corridor, in particular the planned Novo Virje dam on the Drava in Croatia, and explore alternative energy sources.
- Adapt the operation of the last hydropower dam on the Croatian Drava at Donja Dubrava to the ecological needs of the dynamic river, in particular by halting peak-mode operation and restoring the natural river flow of the downstream section.
- Halt further removal of gravel and sand from the riverbed and banks and therefore from the river system.
- Change the management of the rivers from river channelling and the implementation of further river regulation structures to sustainable management and river restoration.

Increase effective protection and management

- Establish legal protection status for those areas within the corridor which are not protected yet, such as the Drava stretch in the planned "Regional Park Drava- Mura" in Croatia.
- Ensure legal enforcement and effective management of existing protected areas such as the Mura in Slovenia or Hungary and the Danube in Serbia and Montenegro.
- Establish and effectively manage a trans-boundary UNESCO Biosphere Reserve across the five countries concerned as the most appropriate international framework for trans-boundary cooperation in conservation and management.

An official agreement between the governmental bodies of the five countries regarding the establishment of a trans-boundary UNESCO Biosphere Reserve would express a common political will to cooperate in the conservation and sustainable use of biological diversity as well as peaceful development of this cross-border region.

As demonstrated on the lower Danube between Romania, Bulgaria, Moldova and Ukraine, the 'Danube-Drava-Mura river corridor' would gain international recognition and support, for the benefit of nature and people.

Top-level support: 2001 Heads of State Summit for Danube protection proved that inter-governmental cooperation is possible, and needed.

for a living planet®

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Protecting the trans-boundary river corridor of the Danube, Drava and Mura

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The river corridor is proposed as a trans-boundary Biosphere Reserve within the framework of UNESCO's Programme on Man and the Biosphere (MAB)

Ramsar CONVENTION ON WETLANDS

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