Vjosa- Science Conference

The Vjosa –A unique opportunity for European River Science

Faculty of Natural Sciences, University of Tirana, Albania

June 8th, 2016

UNIVERSITETI I TIRANËS
Fakulteti i Shkencave të Natyrës
Departamenti i Biologjisë

Tiranë, më 20.06.2016

Lënda: The Vjosa Science Conference / Konferenca Shkencore për Vjosën

Të Nderuar Miq,

Në Konferencën shkencore për Vjosën, e cila u zhvillua në dt. 08 Qershor 2016 në FShN, UT, morën pjesë rreth 90 pjesëmarrës, 6 nga Austria dhe Gjermania, dhe të tjerët nga UT, UPT, UBT, UE, UGj, AKM etj. Në dy seancat e paradites u paraqitën 7 kumtesa me të **dhëna ekzistuese për Vjosën**: për Gjeografinë, Hidrologjinë, Kiminë, Biologjinë dhe Energjinë; kurse në dy seancat e tjera të pasdites, nga kolegët e ftuar nga Europa u paraqitën kumtesa lidhur me përvojën europiane për **Menaxhimin lumor**: për Kërkimet ndërdisiplinore, Proceset hidromorfologjike, Shërbimet e një ekosistemi lumor, dhe Menaxhimi lumor sot në Europë.

Konferenca miratoi Memorandumin '*Nevoja kërkimore për një zhvillimim të qëndrueshëm të korridorit lumor të Vjosës*', në të cilin kështillohet fort që Qeveria shqiptare të miratojë një **Moratorium 3-vjeçar për planet ndërtimore për Vjosën dhe degët e saj**. Kjo do të mund të lejojë zbatimin e një programi vlerësimi ndërdisiplinor në Vjosë, i cili mendohet të hartohet dhe vihet në zbatim nga ekspertët shqiptarë dhe ndërkombëtarë. Ky Moratorium mund të lejojë, gjithashtu, që të eksplorohen mundësitë për fonde nga BE për të mbështetur zhvillimin e qëndrueshëm në rajon.

Memorandumi u nënshkrua po atë ditë nga mbi 60 pjesëmarrës. Të tjerë kolegë jo pjesëmarrës shprehën mbështetje në ditët në vijm, duke e rritur këtë mbështetje deri në rreth 80 persona. Kjo ngjarje pati mbështetje në shtypin e shkruar dhe në mjetet e tjera të informimit. Memorandumi u dorëzua po atë ditë në Ministrinë e Mjedisit, ku gjetëm një frymë të ngrohtë dhe miqësore. Mund të pohojmë, gjithashtu, se kolegët nga Austria dhe Gjermania mbetën të kënaqur për organizimin dhe mirëkuptimin që gjetën mes nesh për të vazhduar më tej në bashkëpunimin në grup në të ardhmen. Konceptet për këtë bashkëpunim u diskutuan më tej gjatë vizitës që vijoi në Vjosë, Poçem, Tepelenë dhe Bënçë.

Paketa e gjithë Konferencës është dërguar në formë elektronike në shumë institucione dhe tek shumë ekspertë të interesuar. Kjo këtu është forma e plotë e shtypur e saj, cilën mendojmë se mund të ndihmojë më mirë dhe më lehtë njohjen me të. Ne kemi besim se me një frymë të tillë do të mund të ballafaqohen shqetësime mjedisore që kanë nevojë urgjente të ndreqen, si është shtrirja në shkallë të gjerë e HEC-eve në lumenj, dhe rasti i veçantë i Vjosës, shumë i diskutuar brenda dhe jashtë vendit, madje deri dhe në instancat më të larta të BE-së.

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Ja shkurt përmbajtja e kësaj pakete:

VJOSA-KONFERENCE

00-VJOSA-Conference-Leter
01-Vjosa-International Conference (En&Al)
02-Memorandum Vjosa (En&Al)
03-Scientists of the Vjosa Science Conference (core group)
04-Vjosa Conference_List of Participants & Supporters (Details)
I1-1-Sala & Qirjazi-Vjosa-Geography
I1-2-Selenica&Bekteshi-Vjosa-Hidrology
I1-3-Lazo et al-Vjosa-Chemistry
I1-4-Miho et al-Vjosa-Bioquality
I2-1-Kashta&Shuka-Vjosa Riparian Landscape&Vegetation
I2-2-Shumka et al-Vjosa-Biodiversity
I2-3-Bidaj et al-Vjosa-Energy
II1-1-Schiemer-RM-Interdisciplinary approaches
II1-2-Habersack-RM-Hydromorphological processes
II2-1-Pusch-RS-Ecological services
II2-2-Konecny-RM-European Framework

Janë informacione që kanë brenda një frymë ndryshe për menaxhimin lumor në ditët e sotme. Por **pa mbështetjen Tuaj si vendimmarrës kjo nuk mundet kurrësesi të arrihet!** Le të shpresojmë për mirëkuptim dhe zgjidhje!

Për grupin Organizator

Prof. Aleko Miho
Hidrobiolog
Pedagog i Botanikes së Përgjithshme
Departamenti i Biologjisë
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The Vjosa Science Conference

The Vjosa – A unique opportunity for European River Science

Faculty of Natural Sciences, University of Tirana, Albania

Aula 101B, June 8, 2016 and Field trip in June 9, 2016

www.fshn.edu.al

University of Natural Resources and Life Sciences, Vienna

Leibniz-Institute of Freshwater Ecology and Inland Fisheries

Organizers of the Conference:

- University of Tirana, Faculty of Natural Sciences;

In cooperation with:

- The University of Vienna;
- The University of Natural Resources and Life Sciences (BOKU), Vienna;
- Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Germany.

Scientific and organizing committee:

- *Prof. Aleko Miho, Department of Biology, Faculty of Natural Sciences University of Tirana, aleko.miho@fshn.edu.al&mihoaleko@yahoo.com;*
- *Prof. Lulëzim Shuka, Department of Biology, Faculty of Natural Sciences University of Tirana, lulezim.shuka@fshn.edu.al & lshuka@yahoo.com*
- *Prof. Lefter Kashta, National Herbarium, Research Center of Flora and Fauna, Faculty of Natural Sciences University of Tirana, www.fshn.edu.al, lefter.kashta@fshn.edu.al & leka.kashta@yahoo.com;*
- *Prof. Ferdinand Bego, Department of Biology, Faculty of Natural Sciences University of Tirana, ferdinand.bego@fshn.edu.al & ferdibego@gmail.com;*
- *Prof. Sajmir Beqiraj, Department of Biology, Faculty of Natural Sciences University of Tirana, sajmir.beqiraj@fshn.edu.al*
- *Dr. Jani Marka, Department of Biology, Faculty of Natural Sciences University of Tirana,* jani.marka@fshn.edu.al & *markajani@yahoo.com;*
- *Prof. Fritz Schiemer, Department of Limnology, University Vienna; First chairman:* RiverWatch, Vienna/Austria; *friedrich.schiemer@univie.ac.*
- *Prof. Wolfram Graf, Department of Hydrobiology and Aquatic Ecosystem Management, Univ. Natural Resources and Life Sciences, Vienna, wolfram.graf@boku.ac.*
- *Prof. Martin Pusch/Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, pusch@igb-berlin.de*

Background: the Vjosa River

The Vjosa River in Albania is one of Europe's last natural rivers, draining a total area of 6,700 km² in Albania and Greece and discharges an average of 204 m³/s into the Adriatic Sea. Along its entire course of over 270 kilometers (except the headwaters in Greece) it is untamed and free flowing and characterized by a high variety of hydro-morphological features. Together with its tributaries, the Vjosa provides a dynamic, near-natural ecosystem that is without par in Europe (outside Russia). Nevertheless plans are on the way to build a chain of hydropower plants. At the same time, the Vjosa represents a unique chance for European river science to assess the ecology of wild rivers.

Aim of the conference

For the first time, experts from Albanian, Austrian and German Universities come together to present and discuss the know-how about the Vjosa and to define the knowledge gaps.

While Albanian experts will identify the existing information about this river as basis for developing conservation and management concept, their collegues from Austria and Germany will present the international standards in river science and the legal requirements of the European Union.

The conference will try to answer the following questions: What do we know about the Vjosa? What needs to be surveyed following EU standards? What needs to be assessed in preparation to plan hydro dams? What role can the Vjosa play in European river science?

The conference structure and format is designed to maximize interaction between participants. The final goal is the development of a memorandum of existing knowledge and the outline of an interdisciplinary research program.

Time schedule:

Wednesday, June 8

9:00 - 9:30 am Welcome by hosts and event organizers

09:30 - 11:00 First session 1: State of knowledge about the Vjosa riverscape.

Chairman: Prof. Fritz Schiemer & Prof. Aleko Miho

- **Geographical framework conditions of the Vjosa catchment,** *Skender Sala/ Department of Geography/University of Tirana;* ***Perikli Qirjazi****/University of Elbasani 'A. Xhuvani'*
- **Quantitative management of water resources and pressures in Vjosa catchment,** *Agim Selenica/Metropolitan-University,Tirana;* ***Vera Bekteshi****/EcoAlbania*
- **Quality of waters in the Vjosa catchment – physical-chemistry, nutrients, heavy metals and organic pollutants,** *Pranvera Lazo,* ***Elda Marku****/Department of Chemistry/University of Tirana; Xhume Kumanova, Albanian Geological Survey.*
- **Biological quality of waters in the Vjosa catchment,** ***Aleko Miho,*** *Anila Paparisto, Sajmir Beqiraj, Etleva Hamzaraj, Margarita Hysko/Department of Biology; Klementina Puto/Department of Biotechnology/University of Tirana*

11:00 - 11:30 ***Coffee break***

11:30 - 13:00 First session 2: State of knowledge about the Vjosa riverscape.

Chairman: Prof. Martin Pusch & Prof. Spase Shumka

- **Riparian landscape structure and vegetation ecology of the Vjosa river,** *Lefter Kashta, National Herbarium/Research Center of Flora and Fauna;* ***Lulezim Shuka,*** *Department of Biology/University of Tirana*
- **Riverscape biodiversity of the Vjosa river,** ***Spase Shumka****/Department of Natural Sciences/Agricultural University of Tirana; Ferdinand Bego, Anila Paparisto, Sajmir Beqiraj, Department of Biology, Lefter Kashta/National Herbarium, Research Center of Flora and Fauna/University of Tirana*
- **Finding balance between HPP of Vjosa river and sustainable development,** ***Flamur Bidaj,*** *Artan Hoxha/Energy Department/Polytechnic University of Tirana; Alma Bako/EIAs and Permits Unit, Ministry of Environment.*

13:00 - 14:30 LUNCH BREAK (Snack Lunch)

14:30 - 15:30 **Second session 1: International experience**

Drejtues: Prof. Lefter Kashta & Prof. Sajmir Beqiraj

- **Interdisciplinary scientific approaches to river management**, ***Fritz Schiemer/*** *University of Vienna.*
- **Understanding hydromorphological processes as key feature for management**, ***Helmut Habersack****/University of Natural Resources and Life Sciences, Vienna.*

15:30-16:00 **COFFEE BREAK**

16:00-17:00 **Second session 2: International experience**

Chairman: Prof. Elda Marku & Univ Prof. Sajmir Beqiraj

- ***Ecological goods and services of river systems, Martin Pusch****/Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin.*
- **River management: challenges within the European framework**, ***Robert Konecny****/Department für Limnologie/University of Vienna.*

17:00-18:00 **Open discussion and lessons learned,**

Moderated by Dr. Vera Bekteshi, EcoAlbania

- Framework for memorandum
- Major gaps in knowledge
- Research requirements

19:00 **CONFERENCE DINNER**

Thursday, June 9 **Full Day Excursion with selected participants**

Konferencë shkencore për Vjosën

Vjosa – Një mundësi e veçantë për Shkencën Lumore Europiane

Fakulteti i Shkencave të Natyrës, Universiteti i Tiranës

Salla 101B, 08 Qershor & Eskursion, 09 Qershor 2016

www.fshn.edu.al

University of Natural Resources and Life Sciences, Vienna

Leibniz-Institute of Freshwater Ecology and Inland Fisheries

Organizatorët e Konferencës:

- Fakulteti i Shkencave të Natyrës, Universiteti i Tiranës; Shqipëri;

  në Bashkëpunim me:

- Universitetin e Vjenës, Austri;
- Universitetin e Burimeve Natyrore dhe të Shkencave të Jetës (BOKU), Vjenë, Austri;
- Institutin Leibniz të Ekologjisë së Ujërave të Ëmbla dhe Peshkimit të Brendshëm (IGB), Berlin, Gjermani.

Komiteti organizator shkencor:

- *Prof. Aleko Miho, Departamenti i Biologjisë,* Fakulteti i Shkencave të Natyrës Universiteti i Tiranës; *aleko.miho@fshn.edu.al & mihoaleko@yahoo.com*; President i EcoAlbania*;*
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- *Prof. Martin Pusch/Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, pusch@igb-berlin.de*

Hyrje mbi lumin Vjosë

Lumi Vjosë në Shqipëri është një nga lumenjtë e fundit natyrorë në Europë që mbledh ujërat në një hapësirë prej 6,700 km² në Shqipëri dhe Greqi, dhe shkarkon mesatarisht 204 m³/s në detin Adriatik. Përgjatë gjithë rrjedhës së tij prej mbi 270 kilometera lumi është i paprekur dhe me rrjedhje të lirë, me larmi tiparesh hidromorfologjike. Së bashku me degët, Vjosa përbën një ekosistem dinamik thuajse natyror, të rrallë për Evropën (përjashtuar Rusinë). Megjithatë, ka plane për të ndërtuar një seri hidrocentralesh. Njëherazi Vjosa është mundësi e vetme për shkencën lumore në Evropë të vlerësuar ekologjinë e lumenjve natyrorë me rrjedhje të lirë.

Qëllimi i Konferencës

Për herë të parë, ekspertët nga universitetet e Shqipërisë, Austrisë dhe Gjermanisë do të mblidhen së bashku për të paraqitur dhe diskutuar se çfarë dihet për Vjosën dhe për të përcaktuar boshllëqet në njohuri.

Ndërsa ekpertët nga Shqipëria do të sjellin informacionin egzistues për këtë lumë si mbështetje për të përpunuar konceptet e zhvillimit dhe të menaxhimit, kolegët e tyre nga Austria dhe Gjermania do të paraqesin standardet ndërkombëtare për shkencën lumore dhe kërkesat ligjore të Bashkimit Europian.

Konferenca do të përpiqet t’u përgjigjet pyetjeve qe vijojnë: Çfarë dimë ne për Vjosën? Çfarë nevojitet të hulumtohet në përputhje me standardet e BE-së? Çfarë nevojitet të vlerësohet gjatë përgatitjes së planeve për hidrocentrale? Çfarë roli mundet të luaj Vjosa në shkencën lumore të Europës?

Struktura dhe formati i konferencës është hartuar që të mundësojë bashkëveprimin sa më të mirë mes pjesëmarrësve. Qëllimi final është hartimi i një memorandumi lidhur me njohuritë egzistuese dhe skicimi i një programi kërkimor ndërdisiplinor.

Rendi i ditës:

Mërkurë, 8 Qershor

9:00 - 9:30 paradite - Mirëseardhja e Miqve nga organizatorët .

09:30 - 11:00 Seksioni i parë 1: Njohuritë mbi peizazhin lumor të Vjosës

Drejtues: Prof. Fritz Schiemer & Prof. Aleko Miho

- **Njohuri mbi rrjetin gjeografik të pellgut të Vjosës,** *Skender Sala/Departamenti i Gjeografisë/Universiteti i Tiranës;* ***Perikli Qirjazi****/Universiteti i Elbasanit 'A. Xhuvani'.*
- **Menaxhimi sasior i burimeve ujore dhe ndikimet në pellgun e Vjosës,** *Agim Selenica/Universiteti Metropolitan-Tirana;* ***Vera Bekteshi****/EcoAlbania.*
- **Cilësia e ujërave në pellgun e Vjosës – gjendja fiziko-kimike, ushqyesit, metalet e rëndë dhe ndotësit organikë,** *Pranvera Lazo,* ***Elda Marku****/Departamenti i Kimisë/ Universiteti i Tiranës; Xhume Kumanova, Shërbimi Gjeologjik Shqiptar.*
- **Cilësia biologjike e ujërave në pellgun e Vjosës – perifiton, zoobentos etj.,** ***Aleko Miho,*** *Anila Paparisto, Sajmir Beqiraj, Etleva Hamzaraj, Margarita Hysko/Departamenti i Biologjisë; Klementina Puto/Departamenti i Bioteknologjisë/Universiteti i Tiranës.*

11:00 - 11:30 PUSHIM KAFEJE

11:30 - 13:00 Seksioni i parë 2: Njohuritë mbi peizazhin lumor të Vjosës

Drejtues: Prof. Martin Pusch & Prof. Spase Shumka

- **Struktura ripariane e peizazhit dhe ekologjia bimore e lumit të Vjosës,** *Lefter Kashta, Herbari Kombëtar, Qëndra Kërkimore e Studimit të Florës dhe Faunës;* ***Lulezim Shuka****, Departamenti i Biologjisë/Universiteti i Tiranës;*
- **Biodiversiteti i peizazhit lumor të lumit të Vjosës,** ***Spase Shumka****/Departamenti i Shkencave Natyrore, Universiteti Bujqësor i Tiranës; Ferdinand Bego, Anila Paparisto, Sajmir Beqiraj/Departamenti i Biologjisë; Lefter Kashta/Herbari Kombëtar, Qëndra Kërkimore e Studimit të Florës dhe Faunës/Universiteti i Tiranës;*
- **Barazpesha ndërmjet HEC-eve dhe lumit të Vjosës dhe zhvilimi i qëndrueshëm,** ***Flamur Bidaj****, Artan Hoxhaj/ Departamenti i Energjisë/Universiteti Politeknik i Tiranës; Alma Bako/Njësia e VNM-ve dhe Lejeve mjedisoret, Ministria e Mjedisit.*

13:00 - 14:30 PUSHIM DREKE (Drekë e shpejtë)

14:30 - 15:30 **Seksioni i dytë 1: Përvoja ndërkombëtare**

Drejtues: Prof. Lefter Kashta & Prof. Sajmir Beqiraj

- **Vlerësime shkencore ndërdisiplinore për menaxhimin e lumenjve**, ***Fritz Schiemer****/Universiteti i Vjenës;*
- **Kuptimi i proceseve hidromorfologjike si tipar kyç për menaxhim***, **Helmut Habersack****/Universiteti i Burimeve Natyrore dhe i Shkencave të Jetës (Boku), Vjenë;*

15:30-16:00 **PUSHIM KAFEJE**

16:00-17:00 **Seksioni i dytë 2: Përvoja ndërkombëtare**

Drejtues: Prof. Elda Marku & Univ.prof. Di Dr. Helmut Habersack

- **Të mirat ekologjike dhe shërbimet e një sistemi lumor, *Martin Pusch****/Instituti Leibniz i Ekologjisë së Ujërave të Ëmbël dhe i Peshkimit të Brendshëm, Berlin.*
- **Sfidat e menaxhimit lumor brenda rrjetit europian**, ***Robert Konecny****/Universiteti i Vjenës, Departamenti i Limnologjisë,Vjenë.*

17:00-18:00 **Diskutime të lira dhe mësimet që merren,**
i drejtuar nga Vera Bekteshi, EcoAlbania

- Rrjeti për memorandum;
- Boshllëqet kryesore të njohjes;
- Nevojat për kërkim.

19:00 **DARKË E KONFERENCËS**

Enjte, 9 Qershor **Eskursion - gjithë dita me pjesëmarrës të caktuar**

Memorandum

Research requirements for a sustainable development of the Vjosa River corridor

Tirana, June 2016

Extensive river bed of the Vjosa near Qesarati. © Gregor Subic

1. Over the past two decades, the value of river systems and their floodplains for human well-being has clearly been identified: natural rivers provide a wide array of ecosystem services, such as natural purification of water, vast groundwater aquifers for drinking water supply and agriculture, flood mitigation, maintenance of natural biodiversity, and unique opportunities for recreation and tourism development.

2. The significance of these ecosystem services has been recognized by EU policy (e.g. EU strategy to halt biodiversity loss by 2020, EU COM Green Infrastructure Initiative) and thus have also entered into regulations for environmental impact assessments. Ecosystem services have been widely recognized as a useful tool for a holistic approach to solve multiple ecological and socio-economic challenges.

3. Due to a lack of proper environmental assessments, river engineering in industrialized countries has in the past resulted in profound and long-term negative environmental consequences and trends, e.g. increased frequency of catastrophic floods, reduced water quality, uncontrollable incision of river beds, dwindling of groundwater resources in alluvial floodplains, and loss of biodiversity. Today, this historic over-regulation of rivers necessitates costly restoration measures for compensation.

4. Meanwhile, our knowledge of the role and functioning of river systems has evolved hugelydue to management oriented research. This led to a new „echohydrology" paradigm: in order to avoid undesired effects on society, each management project requires a detailed assessment, which must include prognostic evaluation of the expected impact combining hydrology, sediment transport processes and ecology.

5. A modern conception of integrated management of river corridors must follow the European Water Framework Directive, EU Natura 2000 Directive, EU Birds and Habitats Directive and EU Flood Risk Directive. This requires an interdisciplinary assessment of the hydrologic, geomorphologic and ecologic status quo and the impacts of any major construction projects.

6. The formulation of management goals in regulated rivers of the industrialized Europe is generally based on the pre-impact reference states derived from historical analysis, while the ecological structures and processes of pristine European river corridors are poorly known.

7. In this respect the Vjosa catchment – in its state of little anthropogenic impact –may serve as a large scale natural refuge and laboratory of pan-European significance. Due to its undisturbed river continuity, sediment transport, river morphodynamics, as well as its expected high and specific biodiversity, the Vjosa represents an unique international model system for intercalibration of river assessment approaches, and could serve as an international reference site for climate change research.

8. Therefore, current plans for the construction of hydropower dams require detailed assessments of hydrologic, sedimentologic and ecologic structure and dynamics, which could also enable the development of alternative low-impact concepts. We urge that all environmental impact assessments for any hydropower development strictly follow EU standards.

9. Hence, we strongly recommend a 3-year-moratorium on construction plans on the Vjosa and her tributaries. This would enable for the implementation of an integrated assessment programme on the Vjosa, carried out by Albanian and international experts. This moratorium would also allow exploring the possibilities for EU funding to support sustainable development in the region.

10. At the same time, an open discussion process with a clear structure, mandate and decision rules and involving all major stakeholders must be initiated. Discussions should explore scenarios for the sustainable development of the Vjosa river corridor, acknowledging the links between the integrity of the Vjosa ecosystem and economic, social and cultural aspects of human well-being.

We, the undersigned scientists from Albania, Austria and Germany, request that an interdisciplinary research and assessment program be started on the Vjosa River system, to be carried out in a cooperation of Albanian and international colleagues. Together with further colleagues, the undersigned will seek for international funding of a 3-years program.

Memorandum

Nevoja kërkimore për një zhvillimim të qëndrueshëm të korridorit lumor të Vjosës

Tiranë, Qershor 2016

Shtrirje e shtratit lumor të Vjosës pranë Qesaratit. © Gregor Subic

1. Për më shumë se 20 vite, është bërë gjithmonë dhe më e qartë vlera e sistemeve lumorë dhe e zonave breglumore nën ndikimin e tyre në dobi të mirëqenies së njeriut, pasi **lumenjtë natyrorë me rrjedhje të lirë si ekosisteme sigurojnë një gamë të gjerë shërbimesh**, duke bërë të mundur pastrimin natyror të ujërave, shtrirje të gjerë ujërash nëntokësorë si për ujë të pijshëm dhe për bujqësi, zbutjen e përmbytjeve, ruajtjen e biodiversitetit natyror, dhe si mundësi e veçantë për shlodhje dhe për zhvillimin e turizmit.

2. Rëndësia e këtyre **shërbimeve të ekosistemit** është pranuar edhe nga politika e BE-së (p.sh. strategjia e BE-së për të ndaluar humbjen e biodiversitetit deri në 2020, Nisma EU COM për Infrastukturën e Gjelbër), dhe për këtë është ndërhyrë në kërkesat për vlerësimin e ndikimit në mjedis. Shërbimet e ekosistemit pranohen sot gjerësisht si mjete të dobishme për shqyrtimin tërësor në zgjidhjen e sfidave të shumta ekologjike dhe socio-ekonomike.

3. Në të kaluarën, për shkak të një vlerësimi mjedisor jo si duhet, inxhinieria lumore në vendet e industrializuara ka shkaktuar **prirje dhe pasoja mjedisore negative të rënda dhe afatgjata**, p.sh. shpeshtimi në rritje i përmbytjeve katastrofike, ulja e cilësisë së ujërave, ndërprerje e pakontrolluar e shtreteve të lumenjve, varfërime të burimeve nëntokësore në fushat lumore, dhe humbje të biodiversitetit. Për të ndrequr këto pasoja historike të përgjithshme tek lumenjtë nevojiten sot **masa ripërtëritëse të kushtueshme**.

4. Ndërkohë, njohuritë tona mbi rolin dhe funksionin e ekosistemeve lumorë ka evoluar jashtëzakonisht drejt kërkimit të orientuar nga menaxhimi. Kjo ka çuar drejt **paradigmës për një 'Ekohidrologji'** të re: me qëllim që të shamngen ndikimet e pa dëshiruara në shoqëri, çdo projekt menaxhues kërkon një vlerësim të hollësishëm dhe një prognozë të ndikimeve të mundshme, duke **kombinuar hidrologjinë, proceset e transportit të sedimenteve dhe ekologjinë**.

5. Koncepti modern i **menaxhimit gjithëpërfshirës të korridorëve lumorë** duhet të udhëhiqet nga Direktiva e Rrjetit Europian të Ujërave, Direktiva EU Natyra 2000, Direktiva EU e Shpendëve dhe Habitatev dhe Direktiva EU mbi Rreziqet nga Përmbytjet. Kjo kërkon një **vlerësim ndërdisiplinor të gjendjes hidrologjike, gjeomorfologjike dhe ekologjike** dhe gjithë ndikimet e çdo projekti ndërtimor madhor.

6. Për këtë, përpilimi i qëllimeve menaxhuese për lumenjtë e transformuar të Europës së Industralizuar mbështeten përgjithësisht në gjendjen krahasuese historike, para ndërhyrjeve, e cila bëhet nga analiza historike, kurse **strukturat dhe proceset ekologjike të sotme për korridorët e paprekur lumorë Europianë janë pak të njohura.**

7. Në lidhje me këtë, pellgu ujor i Vjosës – në gjendjen e tij të ndikimit të pakët antropogjen - mund të shërbejë si një **strehë natyrore** në shkallë të gjerë dhe si një **laborator më rëndësi** për mbarë Europën. Për shkak të vazhdimësisë së pashqetësuar lumore, të transportit të sedimenteve dhe morfodinamikës lumore, si dhe të biodiversitetit të tij të veçantë, **Vjosa përbën një system ndërkombëtar model**, të veçantë për dinamikën e ndërlikuar morfologjike dhe biologjike të korridorëve lumorë, për studime që ndihmojnë në bashkë kalibrimin e vlerësimit të ndërhyrjeve në lumenj, dhe mund të shërbejë si një vend krahasues ndërkombëtar për kërkime mbi ndryshimin e klimës.

8. Për këtë, planet e sotme për ndërtimin e digave për hidrocentrale kërkojnë **vlerësime të hollësishme mbi strukturën dhe dinamikën hidrologjike, sedimentologjike dhe ekologjike**, të cilat do të bënin gjithashtu të mundur **përpunimin e koncepteve alternative me ndikim të ulët**. Ne këshillojmë që gjithë vlerësimet e ndikimit në mjedis për çdo ndërtim hidrocentrali të ndjekin në mënyrë të rreptë standardet e BE-së.

9. Mbështetur në këtë, ne **rekomandojmë fuqishëm një moratorium 3-vjeçar për planet ndërtimore për Vjosën dhe degët e saj.** Kjo do të mund të lejojë zbatimin e një programi vlerësimi gjithëpërfshirës në Vjosë, që mund të bëhet nga ekspertët shqiptarë dhe ndërkombëtarë. Ky moratorium do të lejojë gjithashtu të **eksplorohen mundësitë për fonde nga BE për të mbështetur zhvillimin e qëndrueshëm në rajon**.

10. Në të njëjtën kohë, duhet të nisë një proces **diskutimi i hapur ku të marrin pjesë gjithë përfaqësuesit vendorë kryesorë**. Diskutimet duhet të eksplorojnë skenarët për **zhvillimin e qëndrueshëm në gjithë korridorin lumor të Vjosës,** duke njohur mirë lidhjet midis integritetit të ekosistemit të Vjosës dhe aspekteve ekonomike, sociale dhe kulturore për mirëqënien e njeriut.

Ne, shkencëtarët nënshkrues nga Shqipëria, Austria dhe Gjermania kërkojmë të nisë një **program kërkimor dhe vlerësues ndërdisiplinor në sistemin lumor të Vjosës,** për t'u bërë si bashkëpunim me kolegë Shqiptarë dhe ndërkombëtarë. Së bashku me kolegë të tjerë, nënshkruesit këtu **do të përpiqen për të kërkuar një financim ndërkombëtar për këtë program 3-vjeçar**.

University of Natural Resources and Life Sciences, Vienna

Scientists of the Vjosa Science Conference (*core group*)

Tirana, June 8 - 9, 2016

Emer. Univ.Prof. Dr. Fritz Schiemer,

University of Vienna

Former head of the Department of Ecology and Nature Conservation and the Department of Limnology

First chairman of RiverWatch, Chairman of the Science Board National Park Danube

Expertise: Ecology of Large rivers, restoration ecology, Ecohydrology

Univ.prof. Di Dr. Helmut Habersack

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Head of the 'Hydro-Ecological Field Experimental Channel (HEFE)'

Lecturer at the University of Potsdam and the Humboldt University of Berlin

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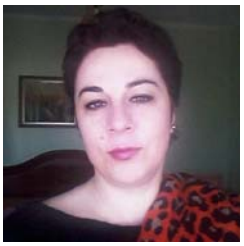
Prof. Ariola Bacu



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87	Trifon	Murataj	Local Bisnesman from Vjosa	+	Kute, Ballsh	trifon.murataj@zico-sha.com; trifon1170@gmail.com
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109	Sazan	Guri	Environemneta l Expert	+	Executive Director of G & G Studio	sazanguri@gmail.com
110	Ermira	Koçu (Deçka)	Jurist, Environmental expert	+	GIZ AL	ermira.kocu@giz.de

GEOGRAPHICAL FRAMEWORK CONDITIONS OF THE VJOSA CATCHMENT

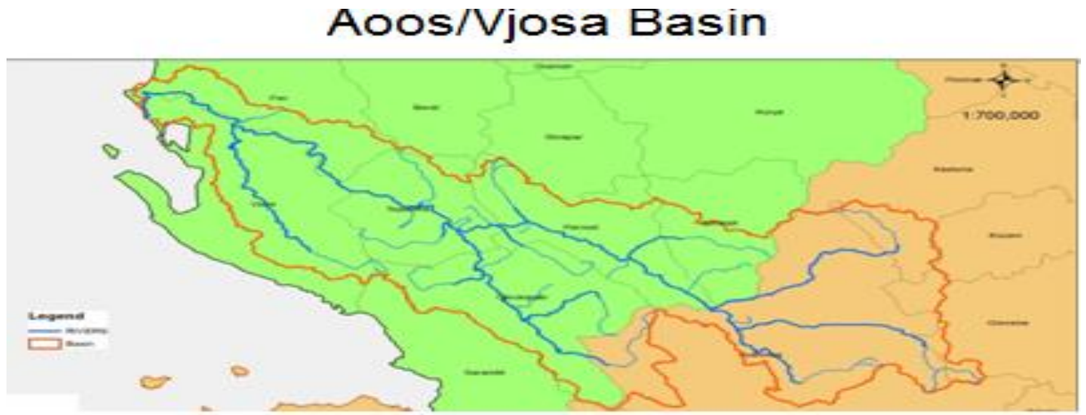
CONTENTS

- Geographic and administrative location
- Geophysics context
- Human background
- Population and evolution of the population after 1990
- Natural heritage of Vjosa river basin

Skënder Sala
Perikli Qiriazi
Department of Geography, TU & EU

GEOGRAPHIC AND ADMINISTRATIVE LOCATION

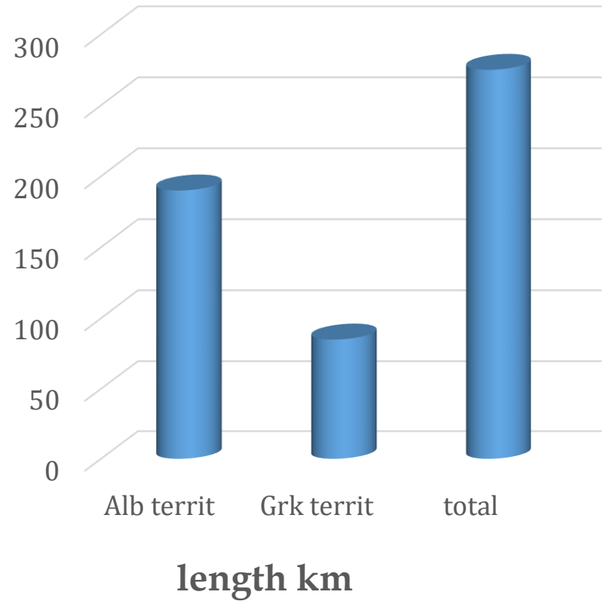
Location of Vjosa Basin and its watershed

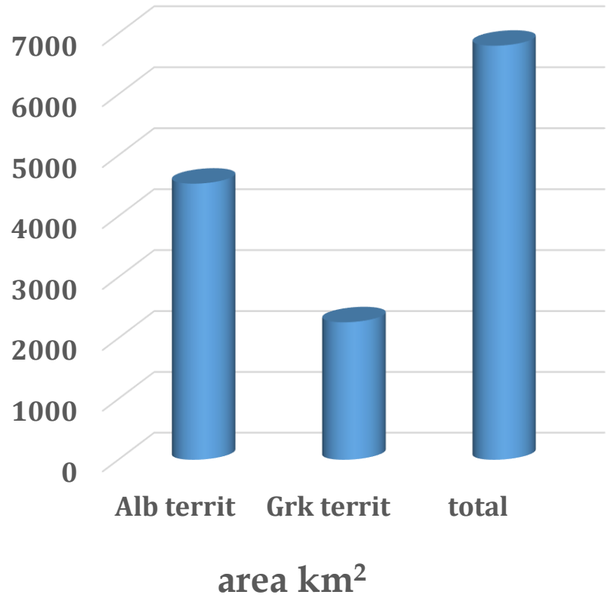


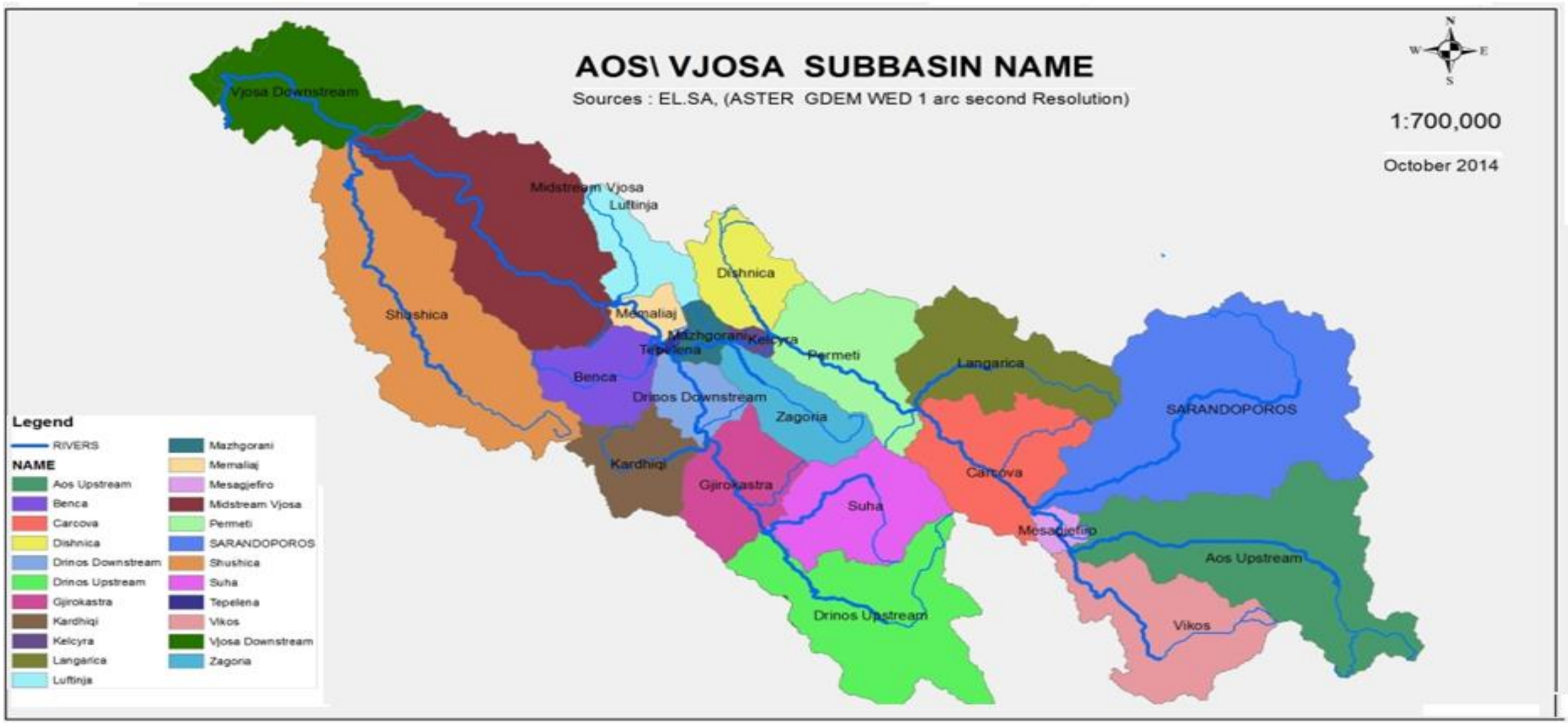
The general length of Vjosa river is **275 km**: **190 km** in the territory of Albania and **85 km** in the Greek territory.

The general area of the watershed is **6799.35 km²**: **4536.44 km²** (Albanian territory) and **2262.91 km²** (Greek territory).

The perimeter of the Vjosa Basin in the Albanian part is **480.5 km**.



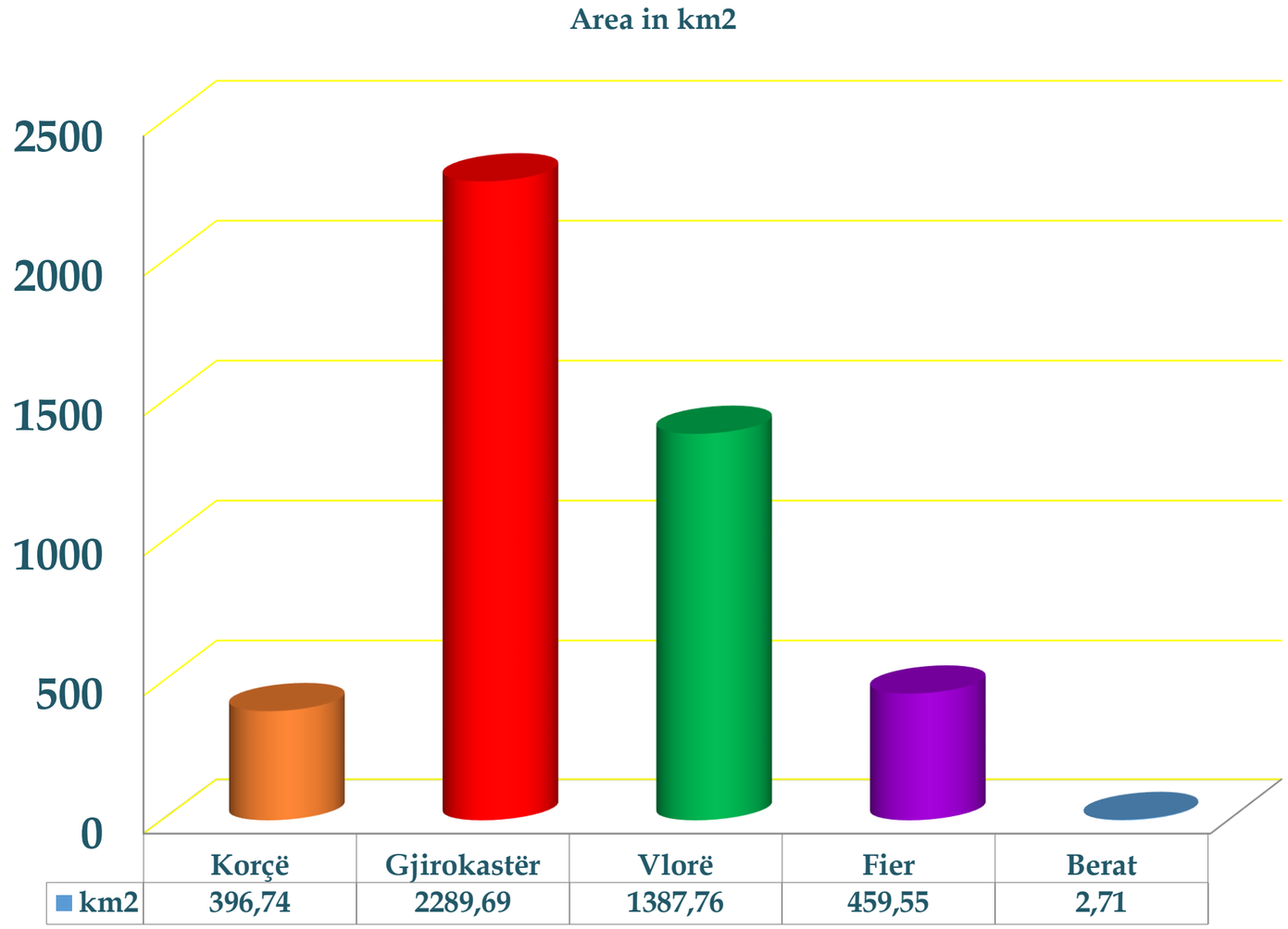



AOS\ VJOSA SUBBASIN NAME
Sources : EL.SA, (ASTER GDEM WED 1 arc second Resolution)
1:700,000
October 2014
N
W
E
S
Vjosa Downstream
Midstream Vjosa
Luftinja
Dishnica
Shushica
Memaliaj
Mazhgorani
Kelcyra
Tepelena
Permeti
Langarica
Benca
Drinos Downstream
Zagoria
SARANDOPOROS
Kardhiqi
Gjirokastra
Suha
Carcova
Mesaqjefiro
Aos Upstream
Drinos Upstream
Vikos
Legend
RIVERS
NAME
Aos Upstream
Benca
Carcova
Dishnica
Drinos Downstream
Drinos Upstream
Gjirokastra
Kardhiqi
Kelcyra
Langarica
Luftinja
Mazhgorani
Memaliaj
Mesaqjefiro
Midstream Vjosa
Permeti
SARANDOPOROS
Shushica
Suha
Tepelena
Vikos
Vjosa Downstream
Zagoria

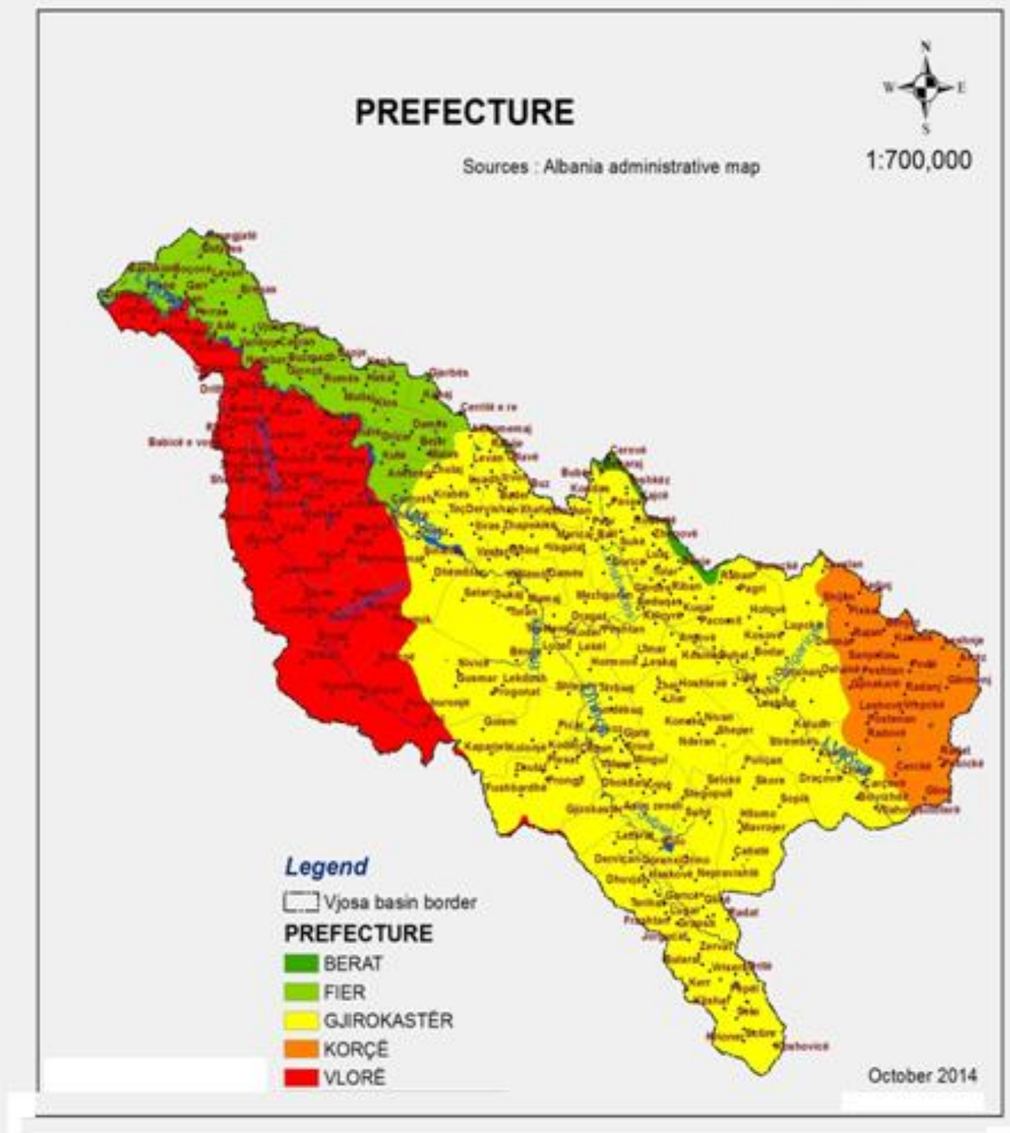
ADMINISTRATIVE SITUATION

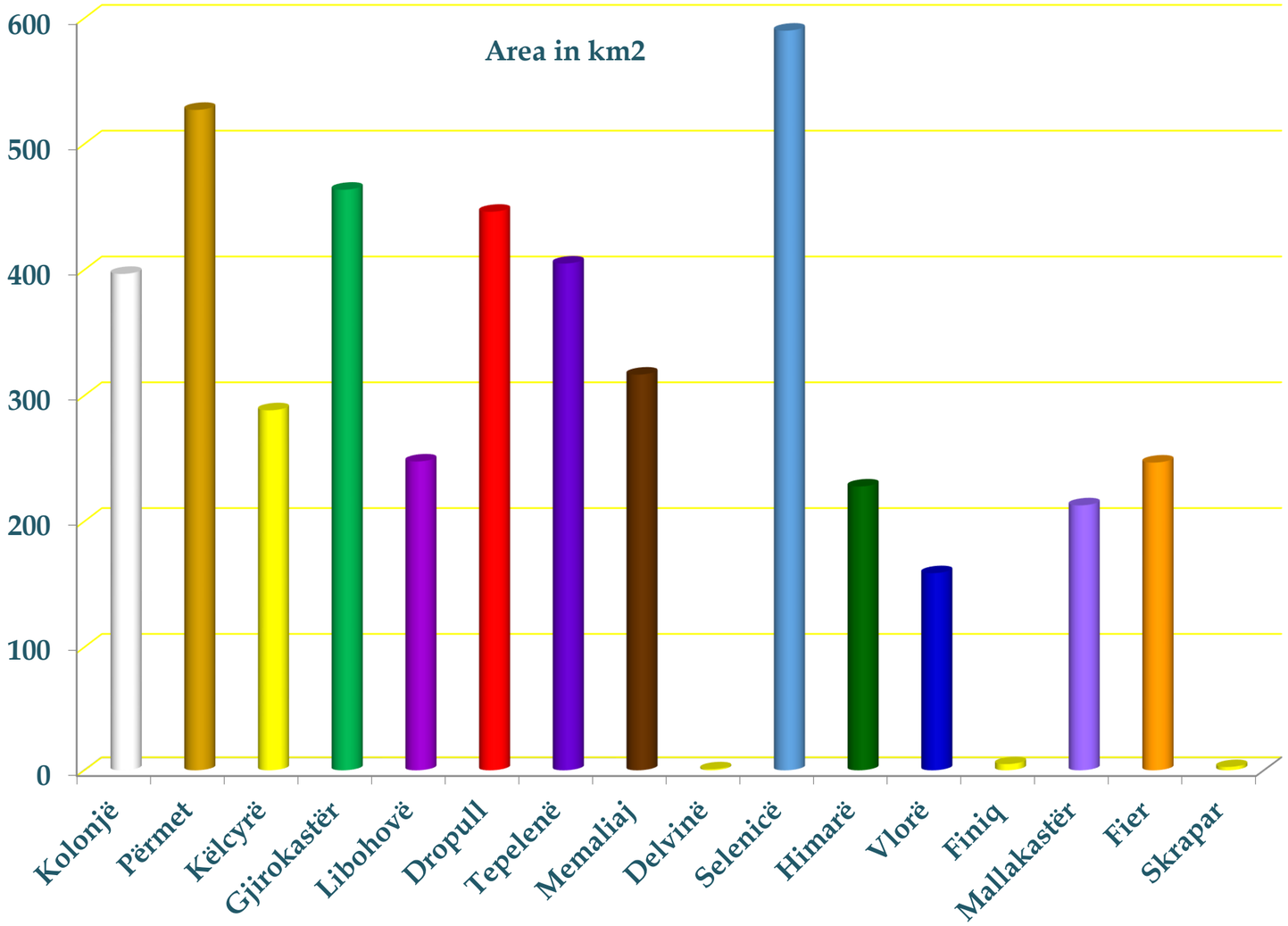
- The Vjosa Basin is part of some administrative units in the **district** of: Gjirokastra, Vlora , Fier, Korça, and Berat,
- And of the **municipalities** of: Kolonjë, Përmet, Këlcyrë, Gjirokastër, Libohovë, Dropull, Tepelenë, Memaliaj, Delvinë, Sarandë, Selenicë, Vlorë, Himarë, Fier, Mallakastër, Skrapar and Poliçan.

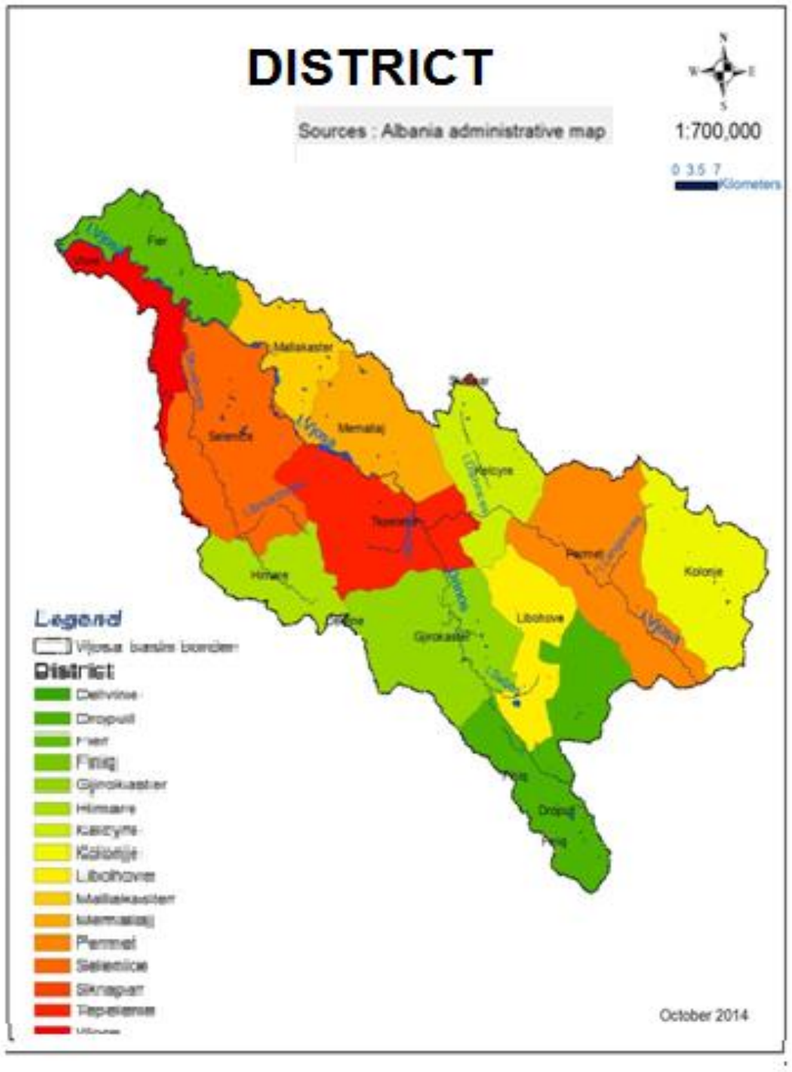
No	District	Area km²	Area %
I	**Gjirokastra**	2289.69	50.47
II	**Vlora**	1387.76	30.59
III	**Fieri**	459.55	10.13
IV	**Korça**	396.74	8.75
V	**Berat** **Total**	2.71 ***4536.44***	0.06 ***100.00***



	Korçë	Gjirokastër	Vlorë	Fier	Berat
km2	396,74	2289,69	1387,76	459,55	2,71




Area in km2
600
500
400
300
200
100
0
Kolonjë
Përmet
Këlcyrë
Gjirokastër
Libohovë
Dropull
Tepelenë
Memaliaj
Delvinë
Selenicë
Himarë
Vlorë
Finiq
Mallakastër
Fier
Skrapar


DISTRICT
Sources : Albania administrative map
1:700,000
0 3.5 7
Kilometers
Legend
Vjosa basin border
District
October 2014

The municipal units are divided in two categories:

Municipalities which lie totally in the Vjosa Basin

- Përmeti
- Këlcyra
- Gjirokastra
- Libohova
- Dropulli,
- Tepelena
- Memaliaj
- Selenica

Municipalities which lie partly in the Vjosa Basin

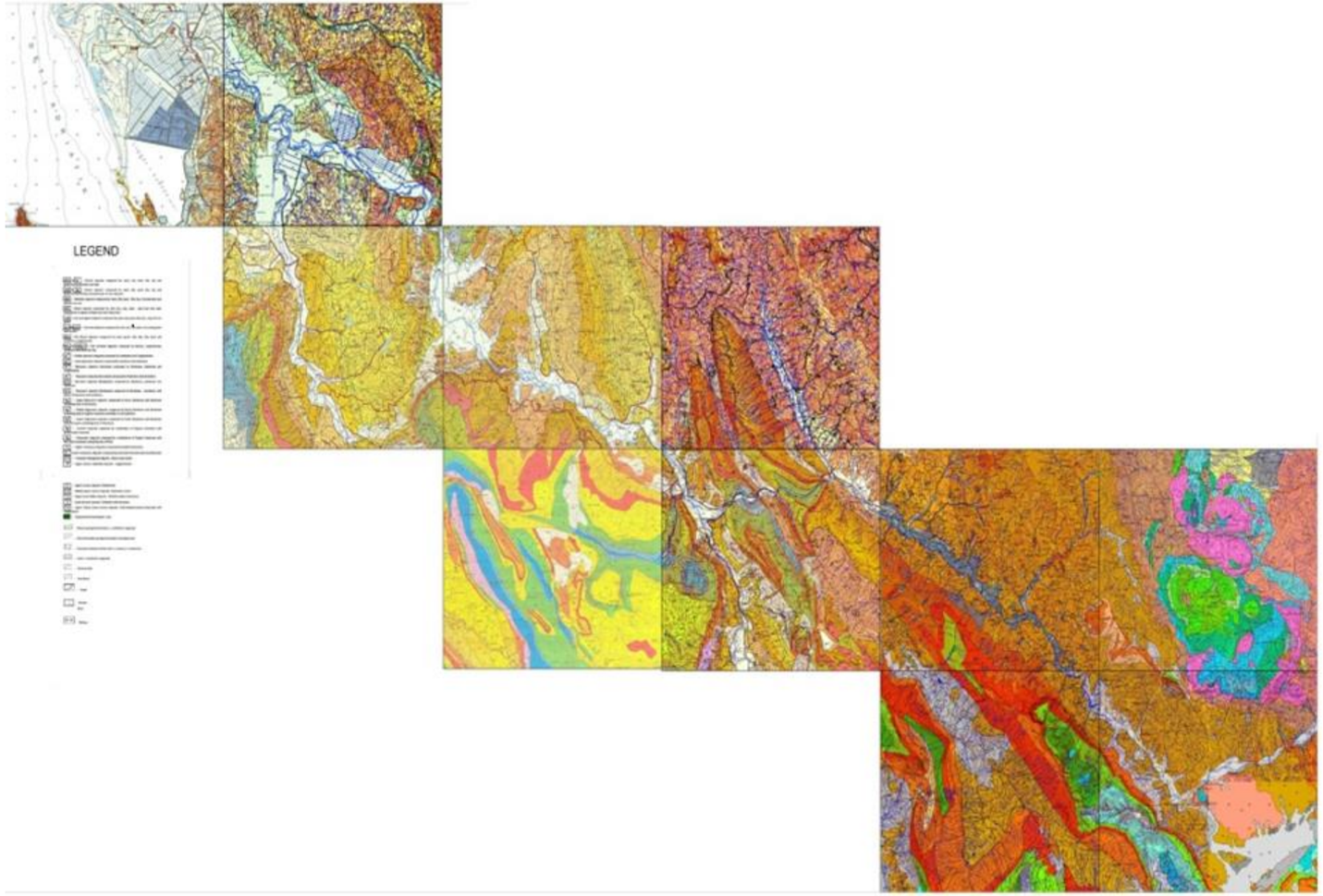
- Kolonja
- Skrapari
- Poliçani
- Mallakastra
- Fieri
- Vlora
- Saranda
- Finiqi
- Delvina

GEOPHYSIC CONTEXT

Geological and physicals phenomena identified in the Vjosa River Valley & Basin of Vjosa

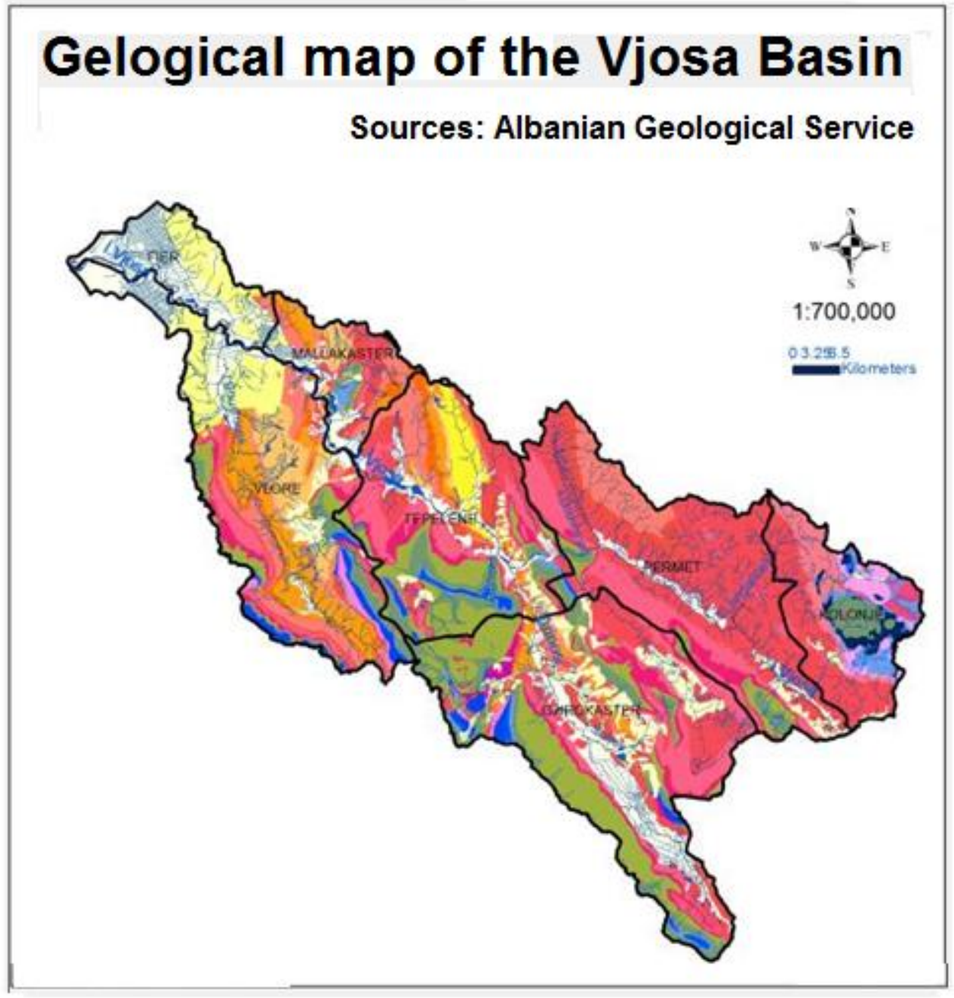
- Weathering
- Consolidation of alluvial deposits
- Karst phenomena in the limestone rocks
- Movement and sliding of the colluviums
- Tectonic activity

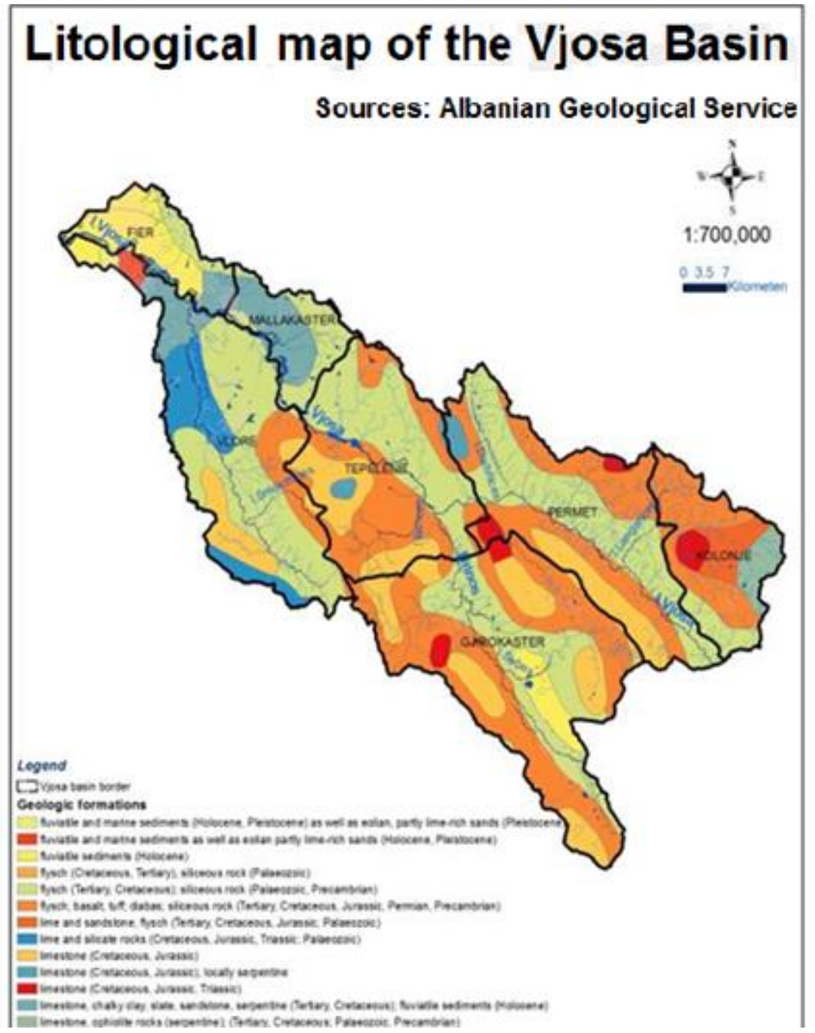
GEOLOGICAL MAP OF VJOSA RIVER VALLEY



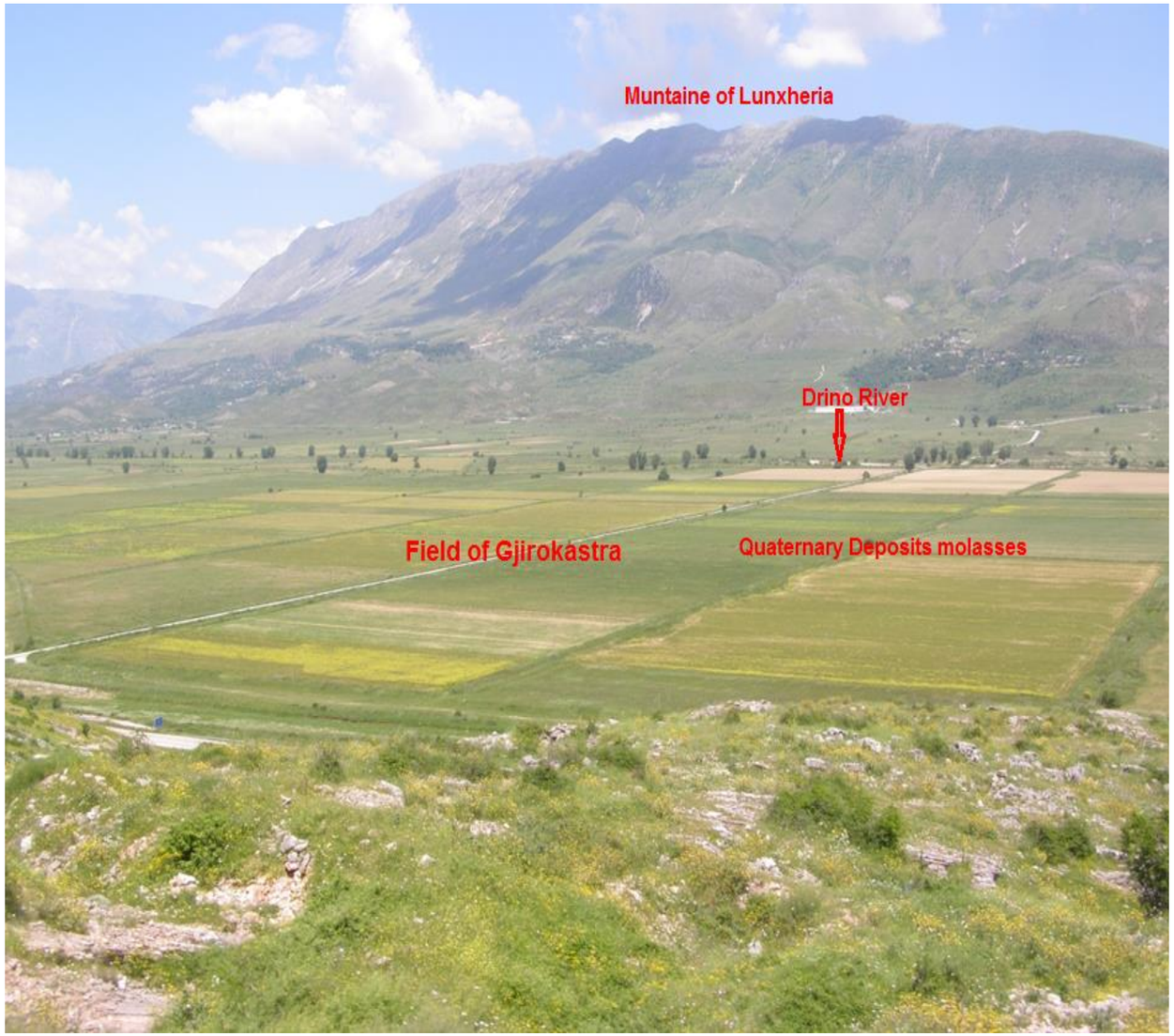
Source: Geological Service

Geological and physical phenomena identified in the Vjosa River Basin






Limestone rocks
Muntain of Dhëmbel
Flysch rocks


Muntaine of Lunxheria
Drino River
Field of Gjirokastra
Quaternary Deposits molasses

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GEOLOGICAL AND PHYSICALS PHENOMENA IN THE VJOSA BASIN

- The weather mudstone and sandstone. These rocks have a weak clayey matrix. Under the action of the atmospheric agents, they are transformed in soft rocks and in soils.

- Consolidation of the alluvial deposits - The alluvial deposits are composed of sandy, gravelly and clayey layers containing little organic matter. Under the action of the weight, these layers are strengthened in a short time. In the lower part of the river : presence of clay layers with organic matter content. These layers are less consolidated.

- Karst phenomena in the limestone rocks- This phenomenon is met where the carbonate rocks are present as in Leskovik, Kelcyra, near Tepelena and at the area near Pocem village. At these points, there exits the water resources originating Karst. In some occasions there were discovered caves with big sizes).

- The movement and sliding of the colluviums - This negative geodynamical phenomenon is present in the both slopes of the Vjosa river valley.

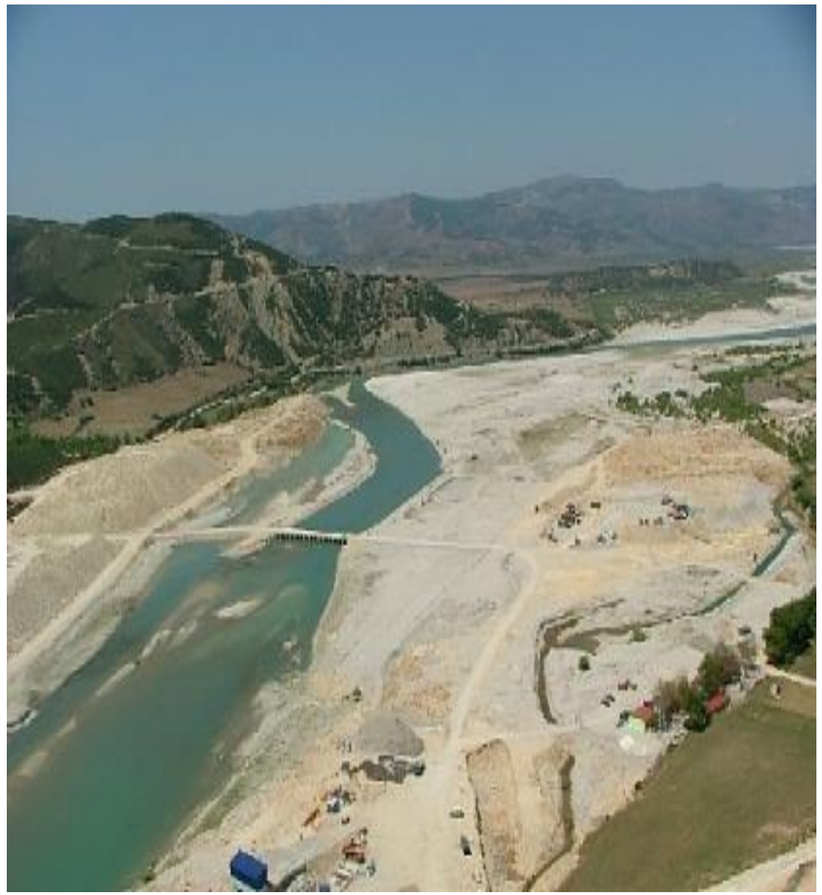
- Tectonic Movements (Tectonic faults) - All the eastern areas in Albania have moved with a low angle towards west. Consequence : destruction of the rock masses. Tectonic zones are found in the contacts between different rocks or inside the same rock. As a result of this phenomenon many rock masses in the mountain sides have moved toward the relief fall and have created a rocky bent relief

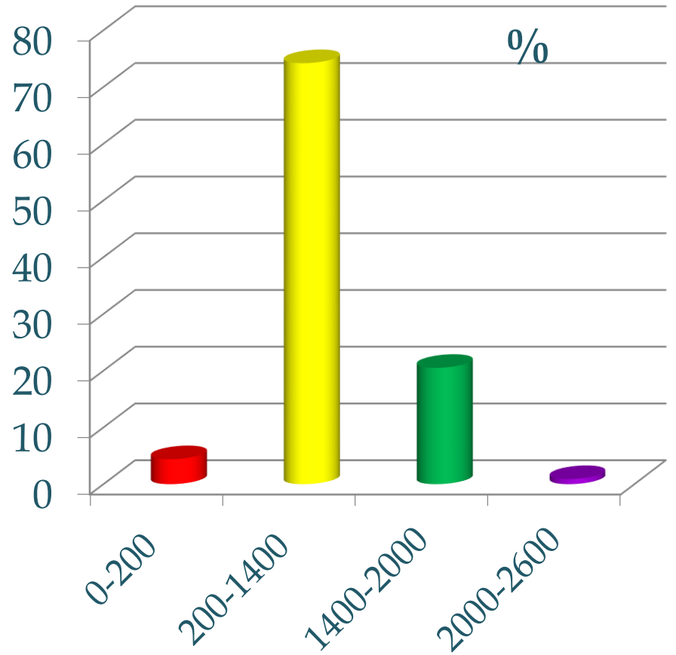
GEOPHYSIC CONTEXT

RELIEFS AND LANDSCAPES

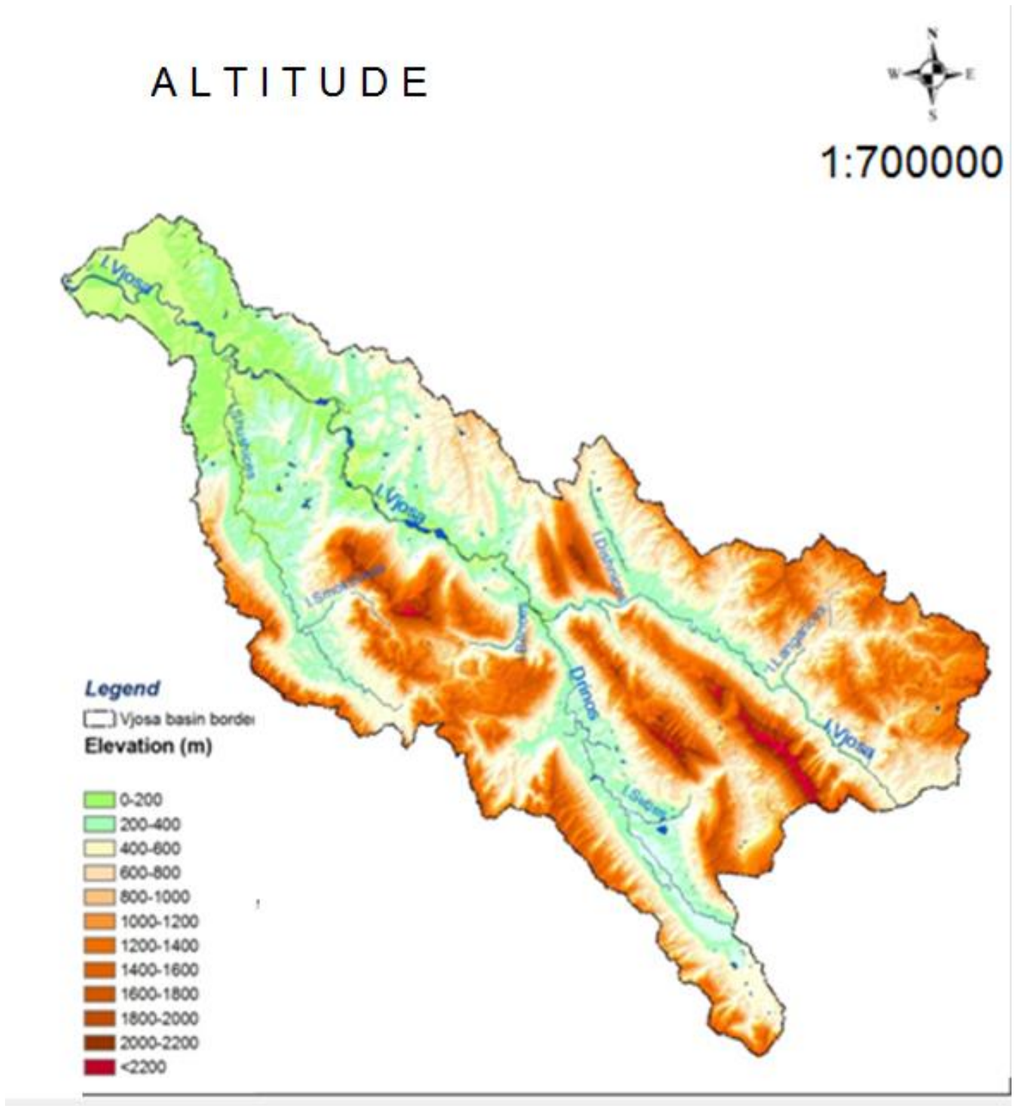
The average height of the basin riches 855 m.

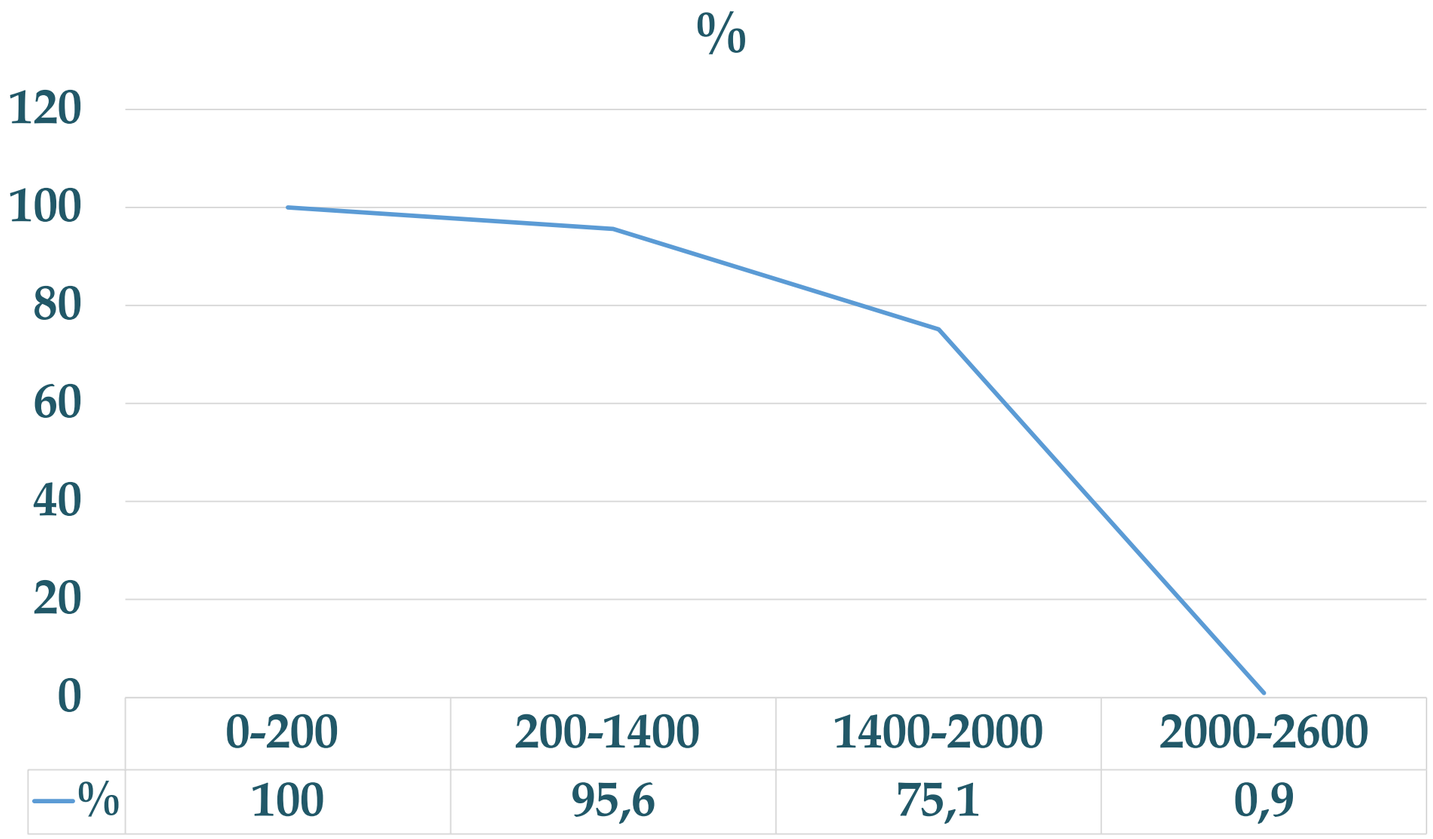
- 0-200 m, occupies 4.4 % of Vjosa basin
- 200-1400 m, occupies 74.2 % of Vjosa basin
- 1400–2000 m, occupies 20.5 % of Vjosa basin
- 2000- 2600 m, occupies 0.9 % of Vjosa basin





Classification of Vjosa Basin in function of altitude



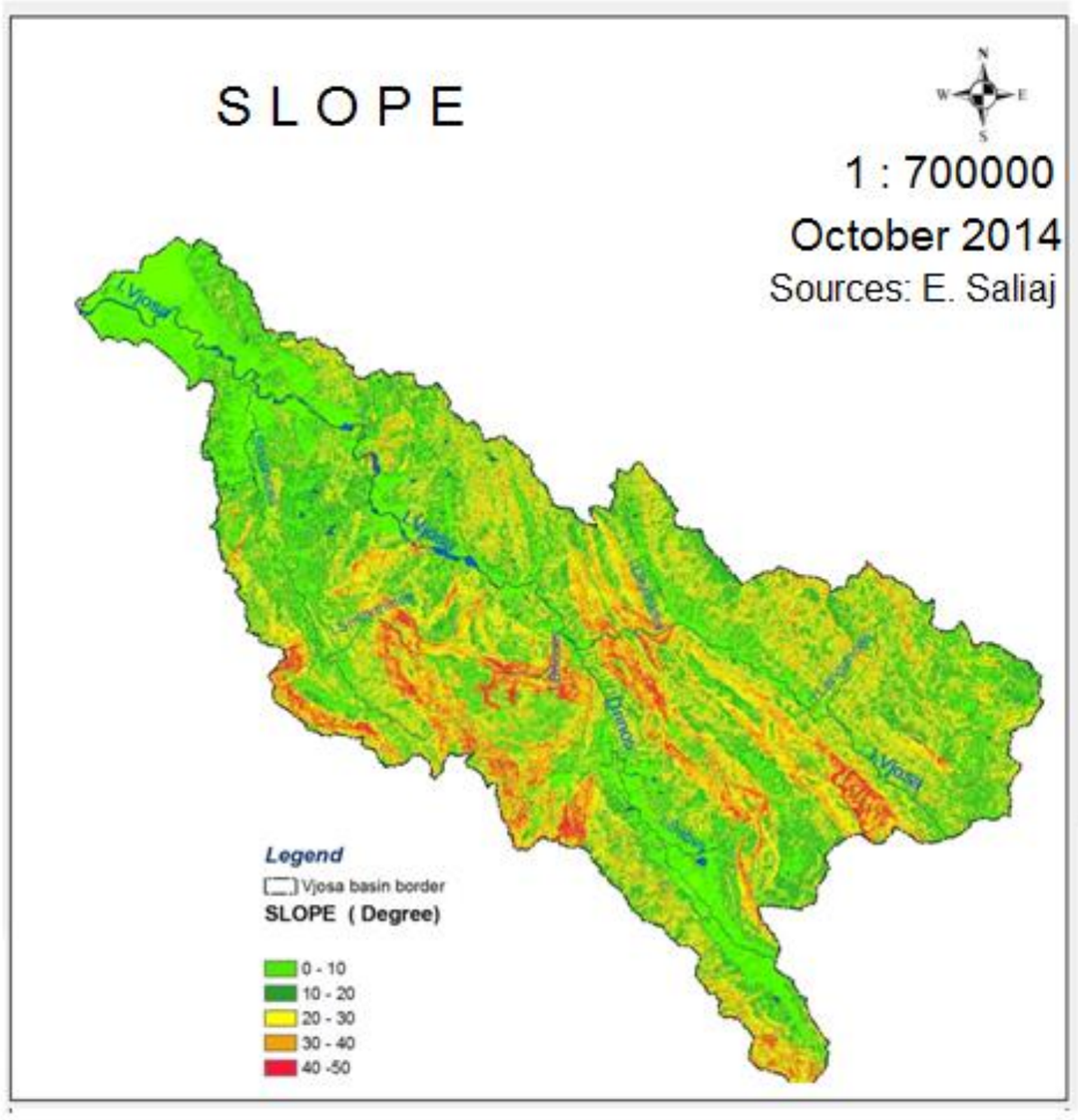


Classification of Vjosa Basin in function of altitude

SLOPES

These slopes change from about 10 to more than 500

The basin is known:
- for high values of Steep slope in the upper sector,
- for average values in the medium sector
- for very low values of Steep slope in the lower sector of the basin.



THE LANDSCAPE OF THE WATERSHED IS VERY DIVERSE:

THE LOWER SECTOR

is characterised by totally flat fields at the same altitude with the sea level or just above the seal level; wetlands with a considerable extent, abandoned Vjosa river beds.

THE MEDIUM SECTOR

are situated low, average and high hills composed of highly fragmented Terrigenous from the erosion of Vjosa tributaries, which has degraded and even completely transformed many landscapes;

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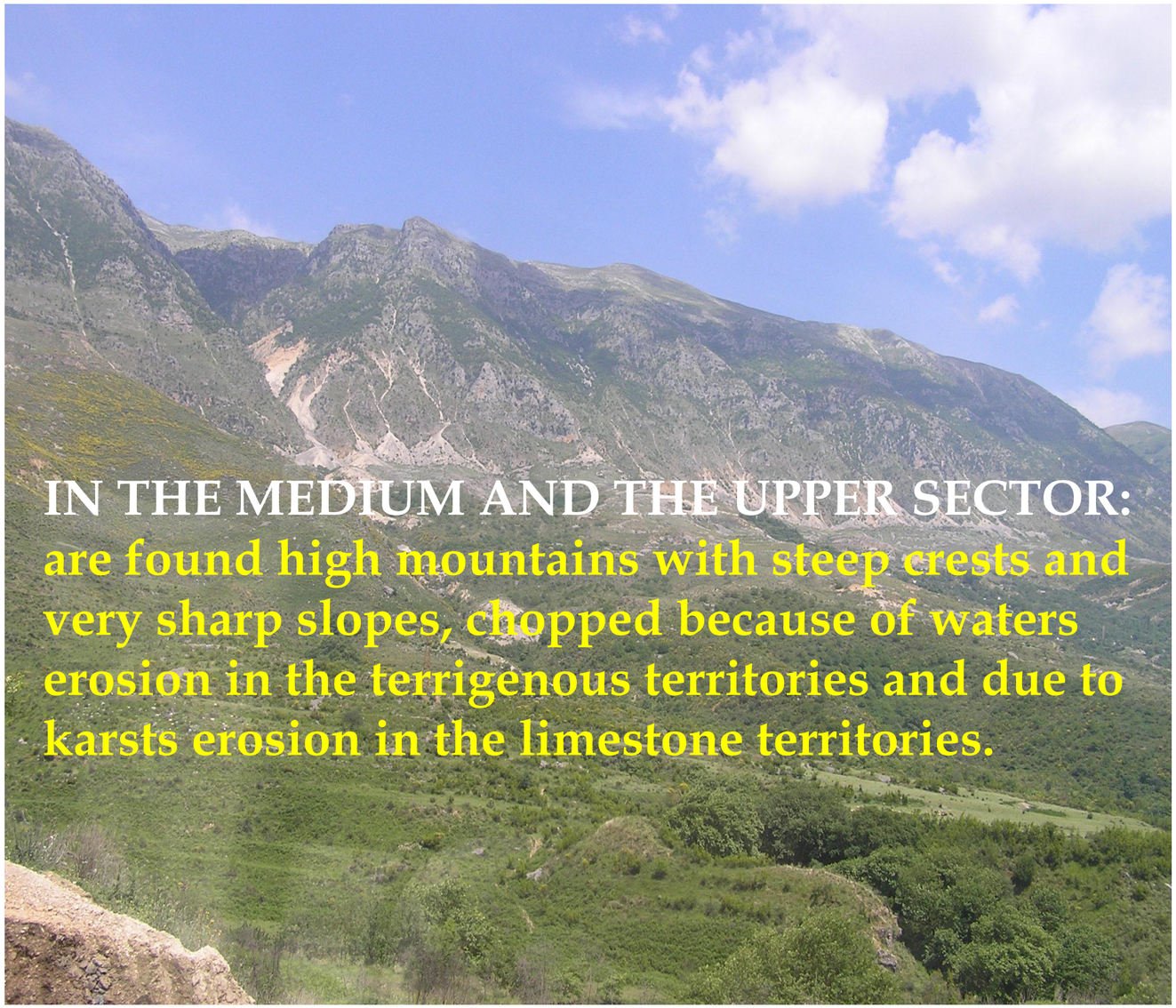
Degraded land of Frashëri area


IN THE MEDIUM AND THE UPPER SECTOR:
are found high mountains with steep crests and very sharp slopes, chopped because of waters erosion in the terrigenous territories and due to karsts erosion in the limestone territories.

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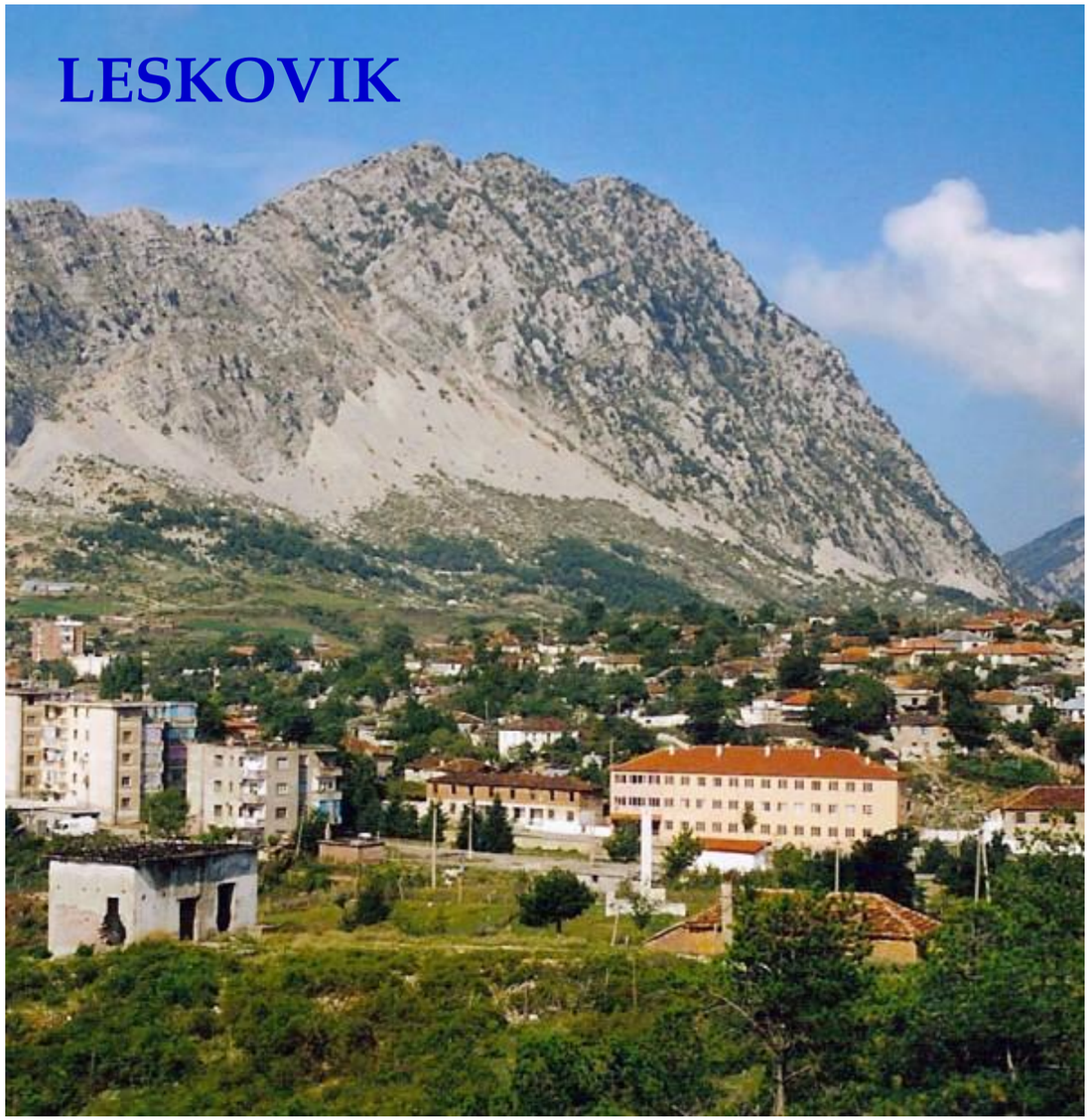

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Faculty of Natural Sciences, University of Tirana, June 8th, 2016

HUMAN AND SOCIAL BACKGROUND

Population

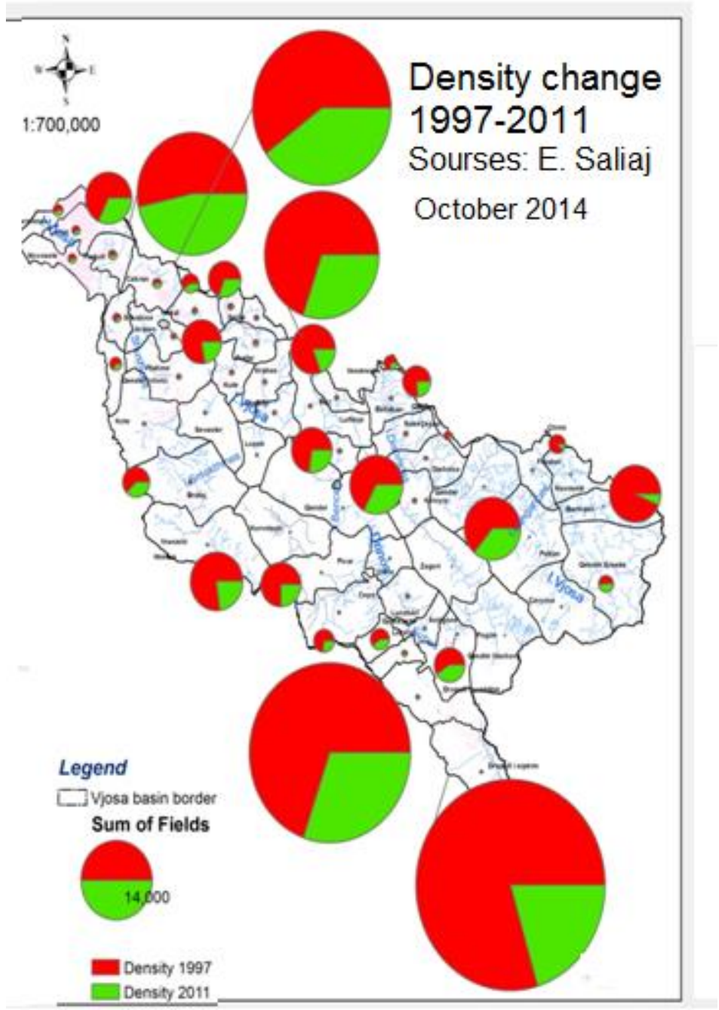
- Based on the data of INSTAT (2011 Census) the population of the Vjosa Basin in 2011 was 184,781 inhabitants, while the average density of the population of this basin was 40,7 habitants/km^2. This density is much smaller than the country average population density of 97 habitants/km^2.

The population density of the basin varies from one area to the other:

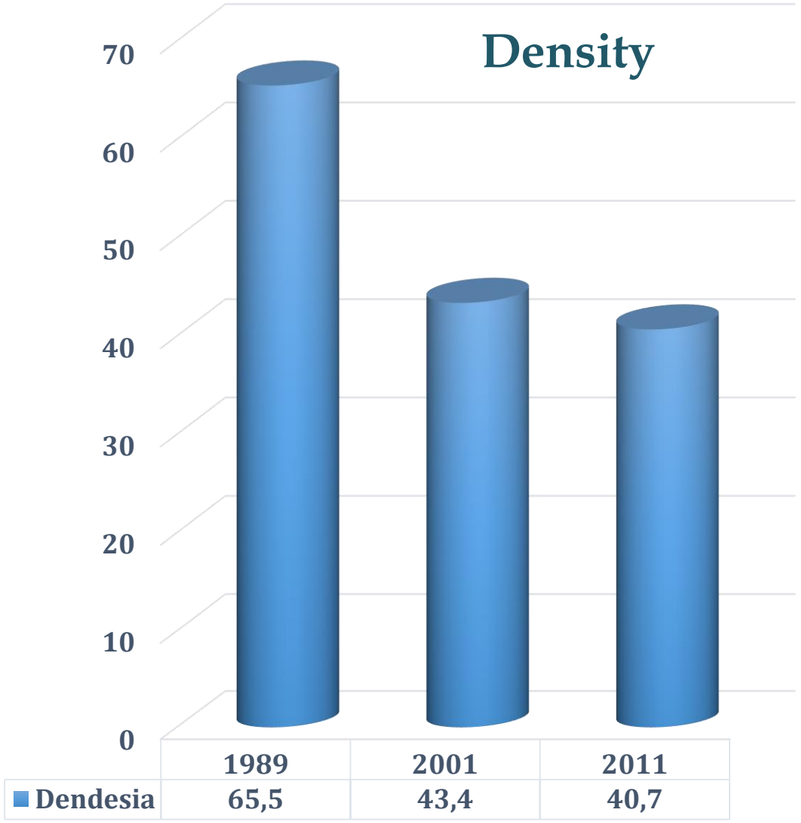
- In the upper sector, not very urbanized, lives about 30 % of the population with density 10-20 inhabitants/km^2.
- In the lower sector, urbanized, lives 70 % of the population with density 100-250 inhabitants/km^2.

The density of the population of the basin varies considerably:

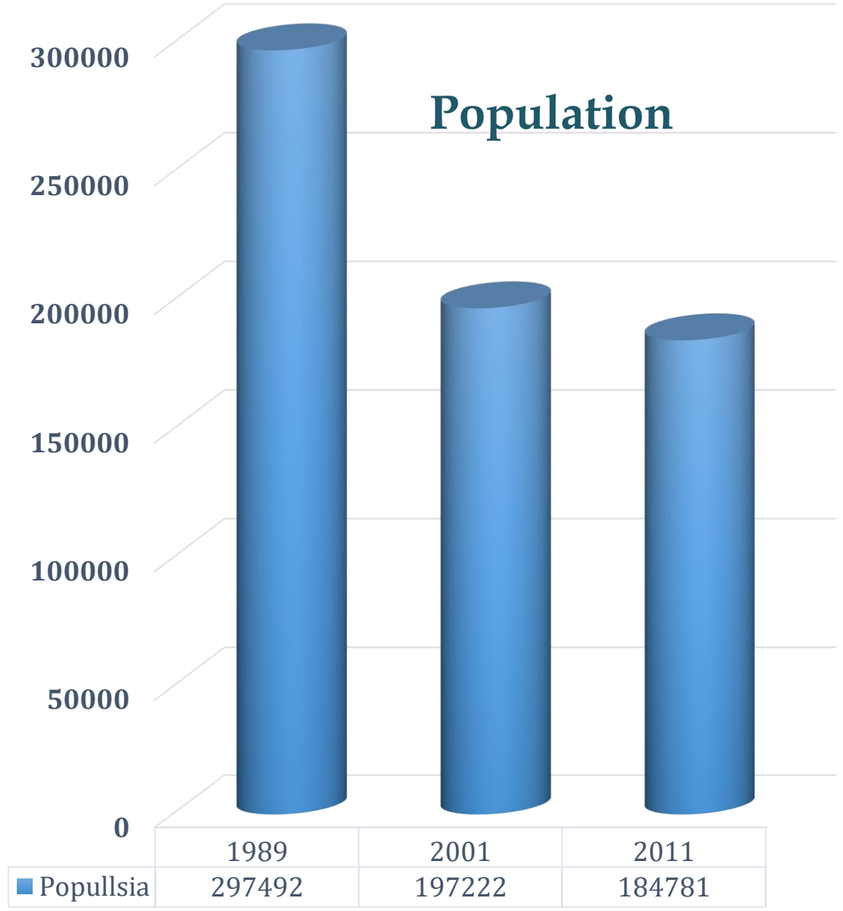
- The watersheds of the upper sector tributaries: Lemnica, Lengarica etc. have low populat. density of about 10 inh/km^2.
- The watershed of Drino is known for its average values of populat. density (30-40 inh/km^2)
- The lower sector of the Shushica watershed and the continuing of Vjosa, are known for high values of more than 250 inh/km^2.

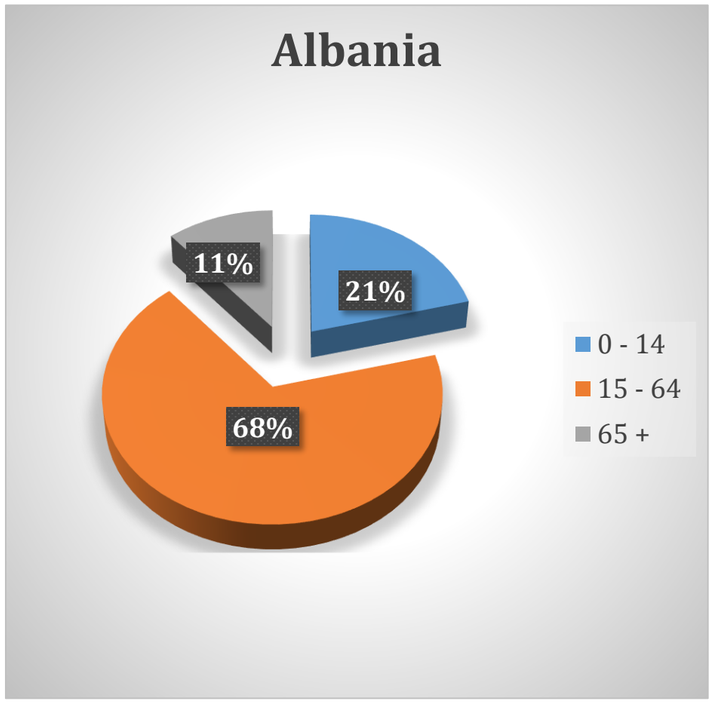


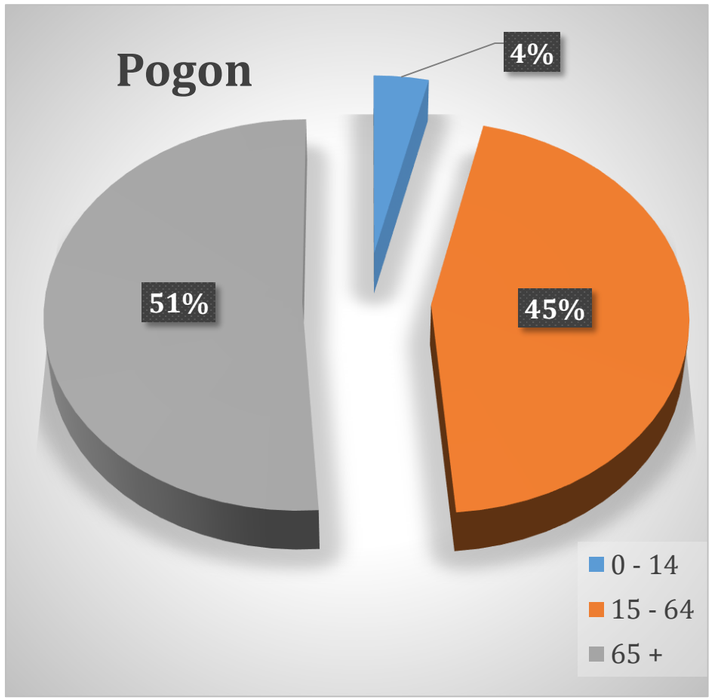
EVOLUTION OF THE POPULATION AFTER 1990

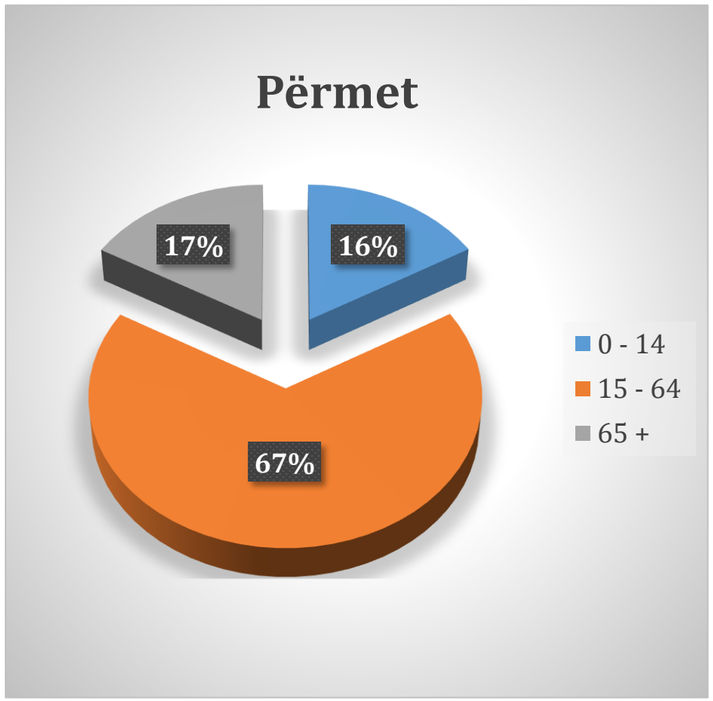


After 1990, the population has continuously diminished, mostly because of migration inside and outside the country and less because of the decrease in the number of births.









THE AGE STRUCTURE OF THE POPULATION OF ALBANIA, POGON COMMUN AND PERMETI CITY 2011

ECONOMIC ACTIVITY

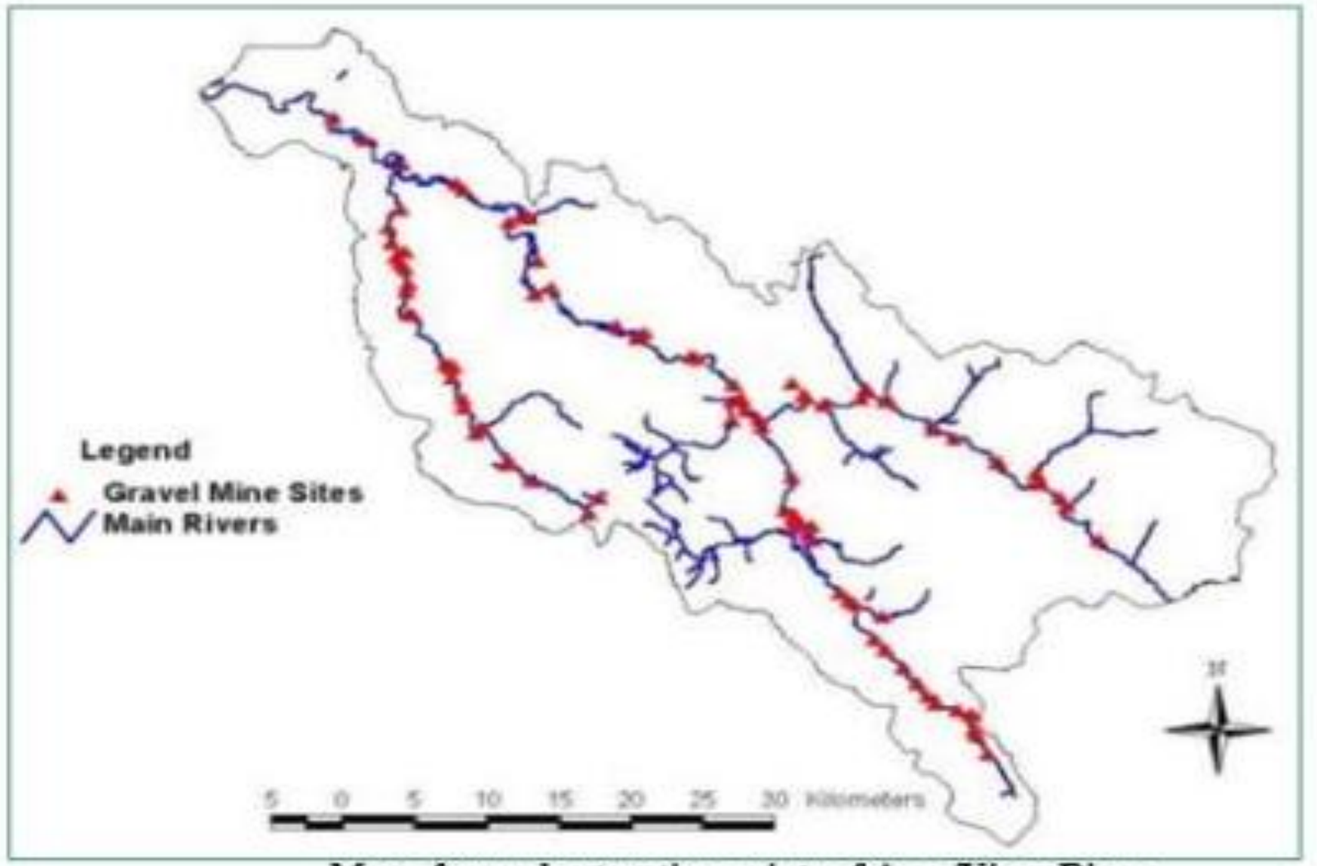
There are altogether seven districts in the Vjosa river basin: Përmet, Gjirokastër, Tepelenë, Kolonja, Fieri, Mallakastra and Vlora;

More than 80 % of people live in the rural area and this means that the main economic activity in the Vjosa river basin is agriculture;

The main activities with big pressure in the Vjosa river basin:

- **gravel extraction,**
- **water bottling,**
- **hydropower plants**

SITUATION OF THE GRAVEL EXTRACTION POINTS IN THE VJOSA WATERSHED IN 2006



Map of gravel extraction points of Aoos/Vjosa River

GRAVEL EXTRACTION

- The main activities of Vjosa river basin were the gravel extraction from river beds. This activity is carried out with very high intensity, having a negative impact on the change of the river bed of Vjosa and its tributaries;

- In 2000 there were about **56** gravel extraction points: **26** in Vjosa river bed, **16** in Shushica river bed and about **14** in Drino river bed

IMPACT OF GRAVEL EXTRACTION

- Despite the prohibition of gravel extraction activity, the impact is still present and maybe irreversible;

- Construction waste, gravel, concrete and waste remained from the gravel extraction activities are present in different areas along the river bed;

- Gravel processing plants: four gravel processing plants, three of them at Shushica River and one at Vjosa River which are ordered to finalize the decommissioning process.

- The permitted gravel extraction companies have not been operating in compliance with the requirements and conditions of the permits (without considering the potential ones operating without permit);

- The degradation present in this area is caused by unsustainable use of the resources and lack of rehabilitation measures;
- The result of negative impacts is:
- Damage and destruction of embankments;
- Flooding;
- Loss of agricultural land;
- Negative visual and landscape impacts etc

FLOODING OF VJOSA IN THE PERIOD 31 JANUARY TO 5 FEBRUARY 2015

IMPACT OF GRAVEL EXTRACTION

➢ In depth assessments may lead to conclusions such as potential negative impacts on biodiversity, fishery, sensitive areas etc;

➢ The negative impacts of previous and present activities (legal or illegal) along the Vjosa river basin may have negatively impacted the Vjosa estuary and coastal area where there is another threat for the Vjosa-Narta landscape protected area.

IMPACT OF OTHER ACTIVITIES

There are 105 water-using companies that possess permits to use the water resources;

From these 105 companies:

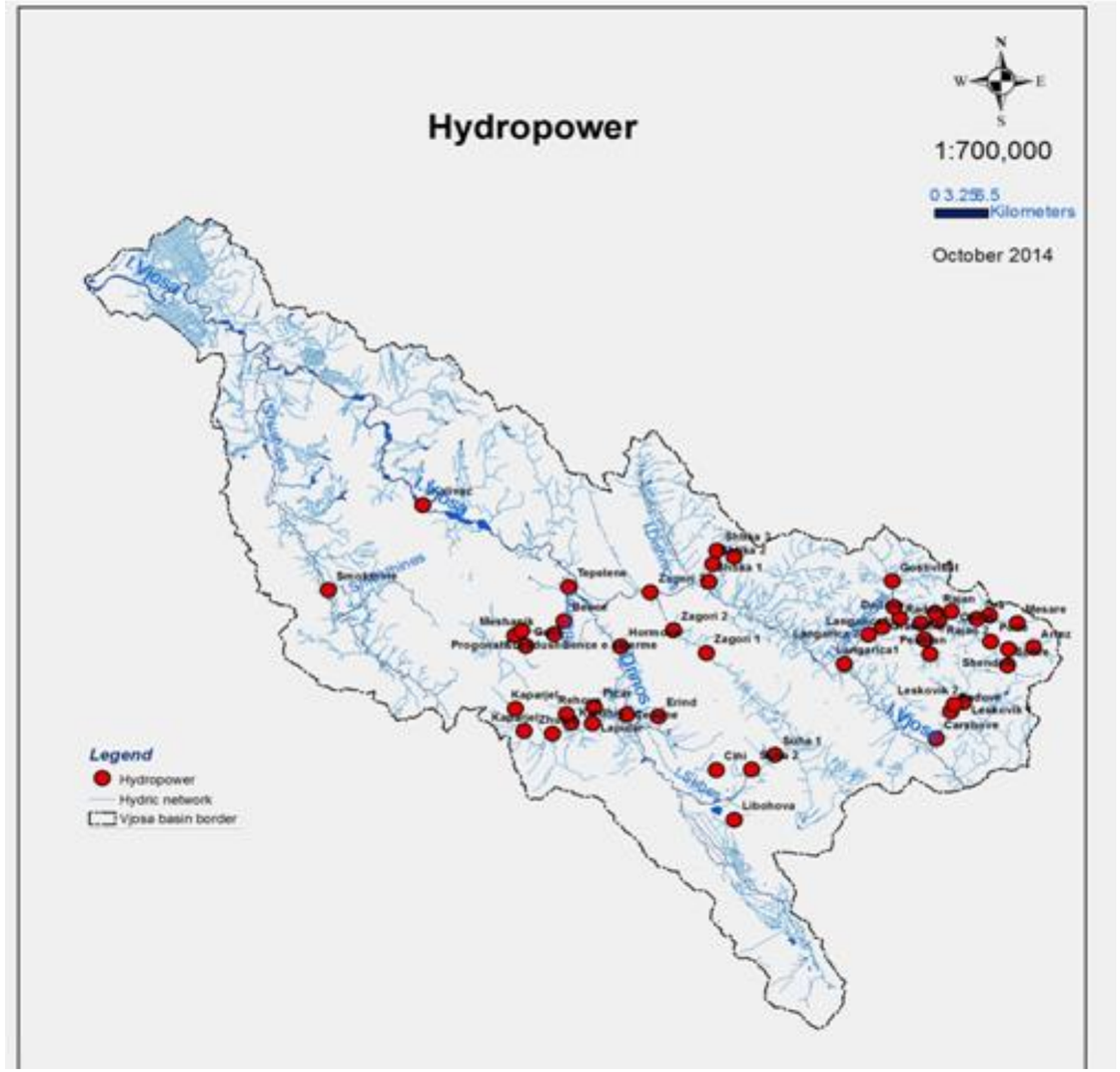
- 28 water bottling companies;
- 29 Hydropower Plants;
- 9 well-drilling companies;
- 39 entities using water from which 20 for Water Supply and Sewerage purposes.

IMPACT OF HYDROPOWER PLANTS

➢ Kalivaci HPP is situated approximately 28 km from the town of Tepelena. The Kalivaci scheme comprises a fill-type dam using excavation materials and gravel, a diversion tunnel and a power station. To date, only earthworks are under construction;

➢ 29 Hydropower Plants ;

➢ Important to evaluate the cumulative effects of the envisaged projects in the Vjosa river basin


Hydropower
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October 2014
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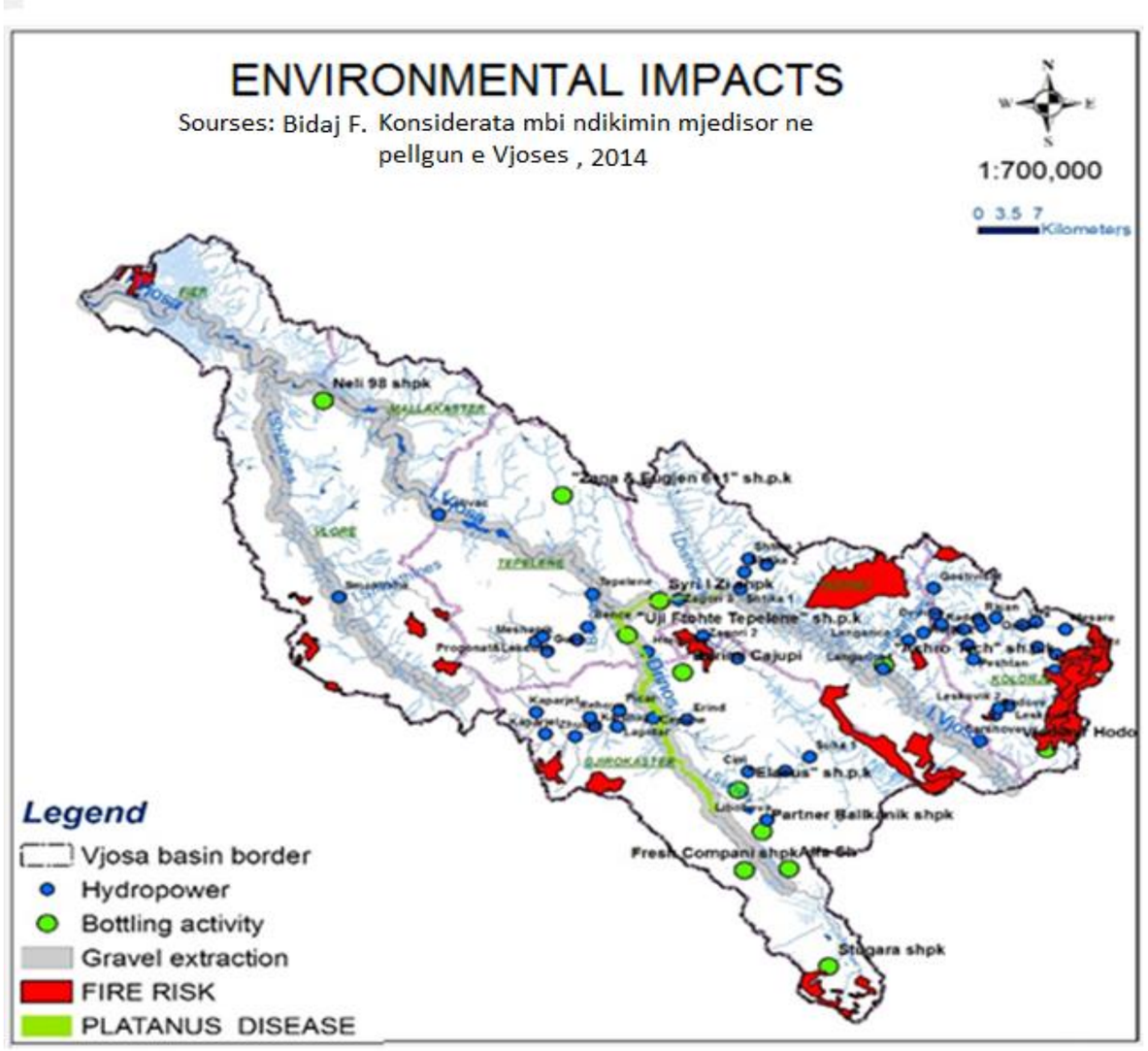
Hydropower
Hydric network
Vjosa basin border

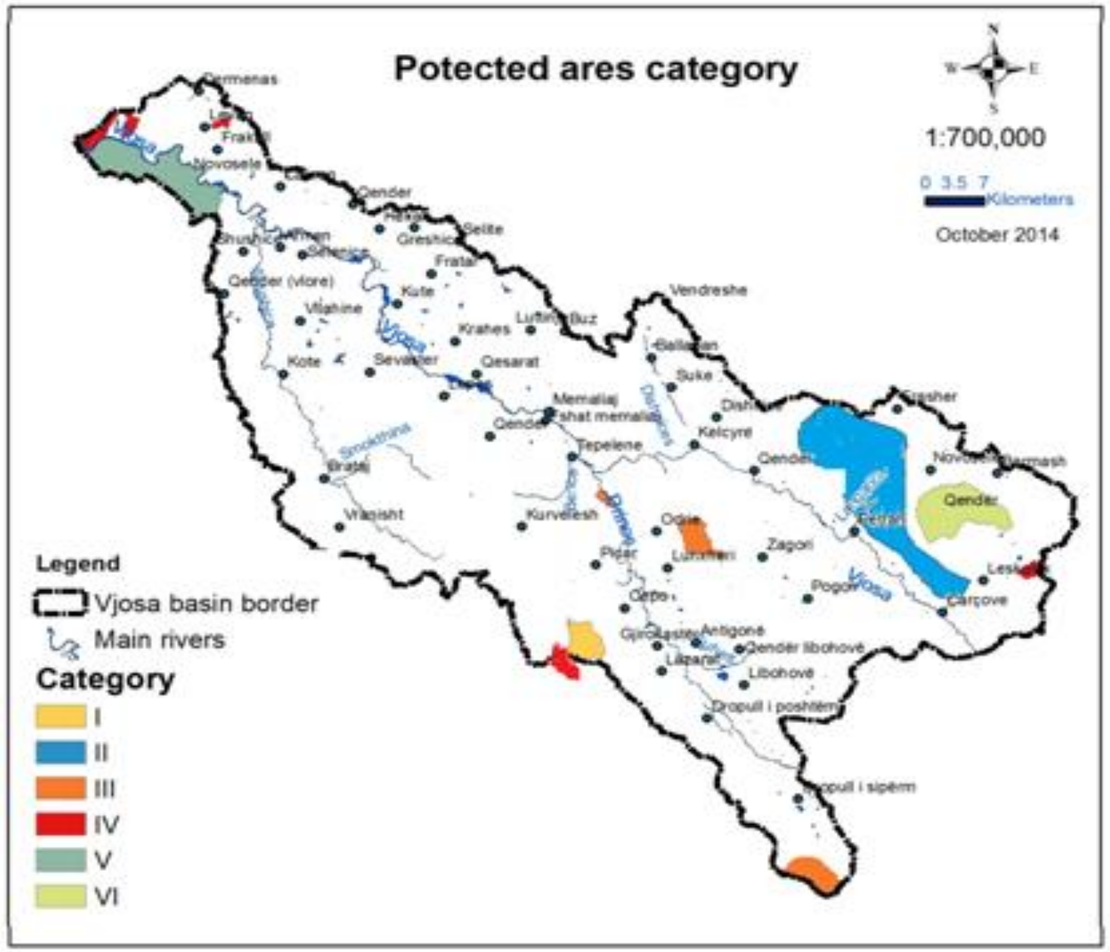

ENVIRONMENTAL IMPACTS
Sourses: Bidaj F. Konsiderata mbi ndikimin mjedisor ne pellgun e Vjoses , 2014
1:700,000
0 3.5 7
Kilometers
Legend
Vjosa basin border
Hydropower
Bottling activity
Gravel extraction
FIRE RISK
PLATANUS DISEASE

TOURISM AND LEISURE ACTIVITIES

- The area is very rich with natural and cultural monuments attracting visitors and tourists
- Përmet and its communes with river Vjosa passing is very attractive for tourists;
- Këlcyra valley
- Këlcyrë Gorge is one of the most beautiful gorges of Albania, especially the Black Water Source, a worth place visited, especially the waterfall;
- The Thermal waters of Bënja: one of sources of sulfur-spring sub-thermal;
- National Park of "Hotovë-Dangëlli" forms a giant green crown with apparent contrasts, very attractive for the visitors;
- Carshova : the tumbled horizons olistoliths of Çarshova.
- Vjosa-Narta Landscape Protected Area

NATURAL HERITAGE OF VJOSA RIVER BASIN
PROTECTED AREAS

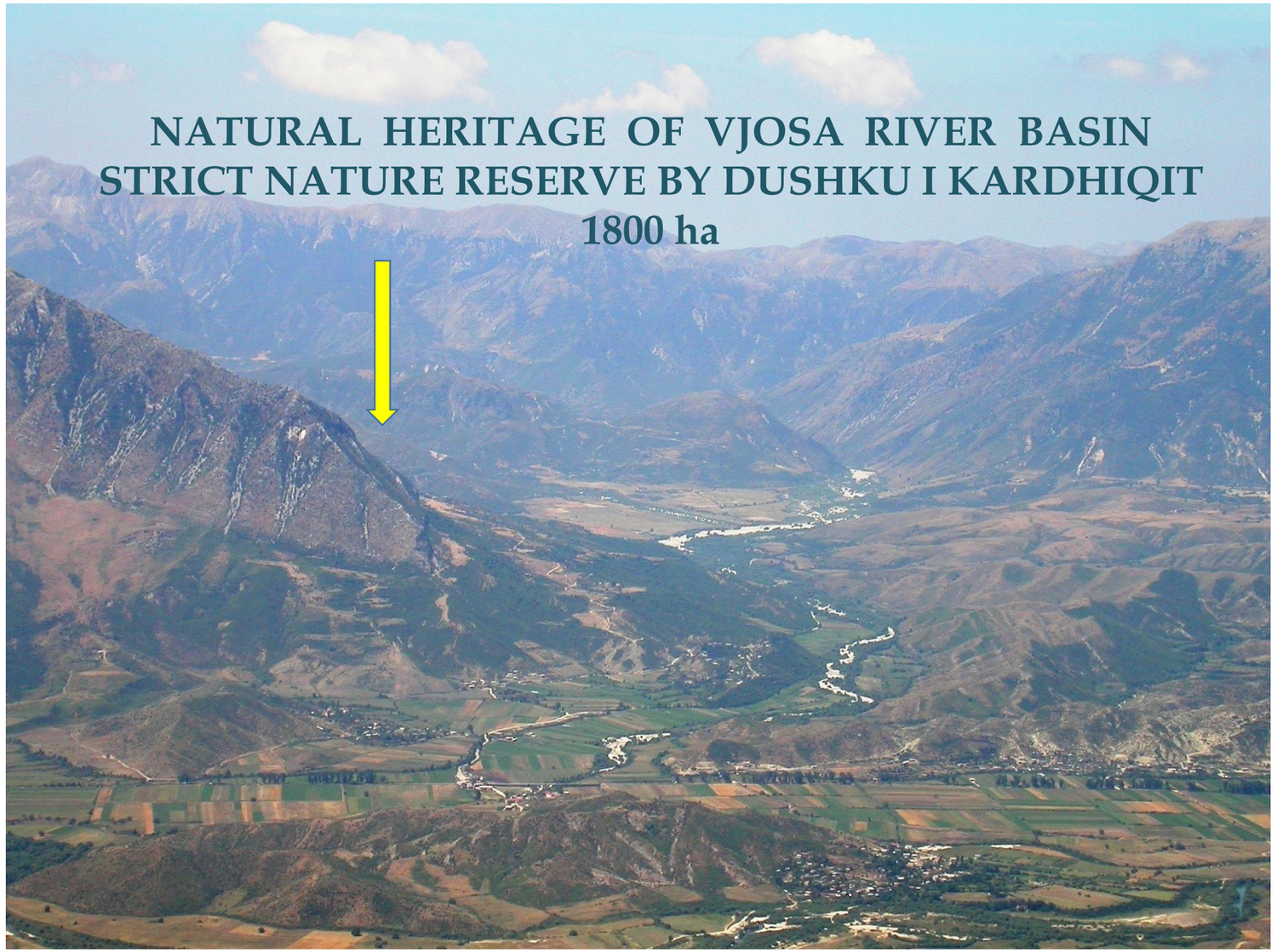
Name	Category	Function
Dushkut i Kardhiqit	1	Strict Natural Reservat
Bredhi i Hotoves-Dangelli	2	National Park
Uji i Ftohte	3	Natural Monument
Zhej	3	Natural Monument
Bredhi i Sotires	3	Natural Monument
Shelegur -Germenj	4	Natural Park
Pishe Poro	4	Natural Park
Levan	4	Natural Park
Vjose Narte	5	Protected Landscapes
Piskal-Shqeri	6	Protected area of Naural Managed Resources



It has a distinctive relief, with big contrasts, which extends from 600 m to 1600 m above sea level.

It is known for big biodiversity:

- Mediterranean shrubs and oak, Macedonia fir (Abies borissi-Regis Matf), black pine (Pinus nigra) etc.;
- very rich wildlife: Chamois, deer, brown bear, wolf, badger, etc.; is one of the bird migration routes.



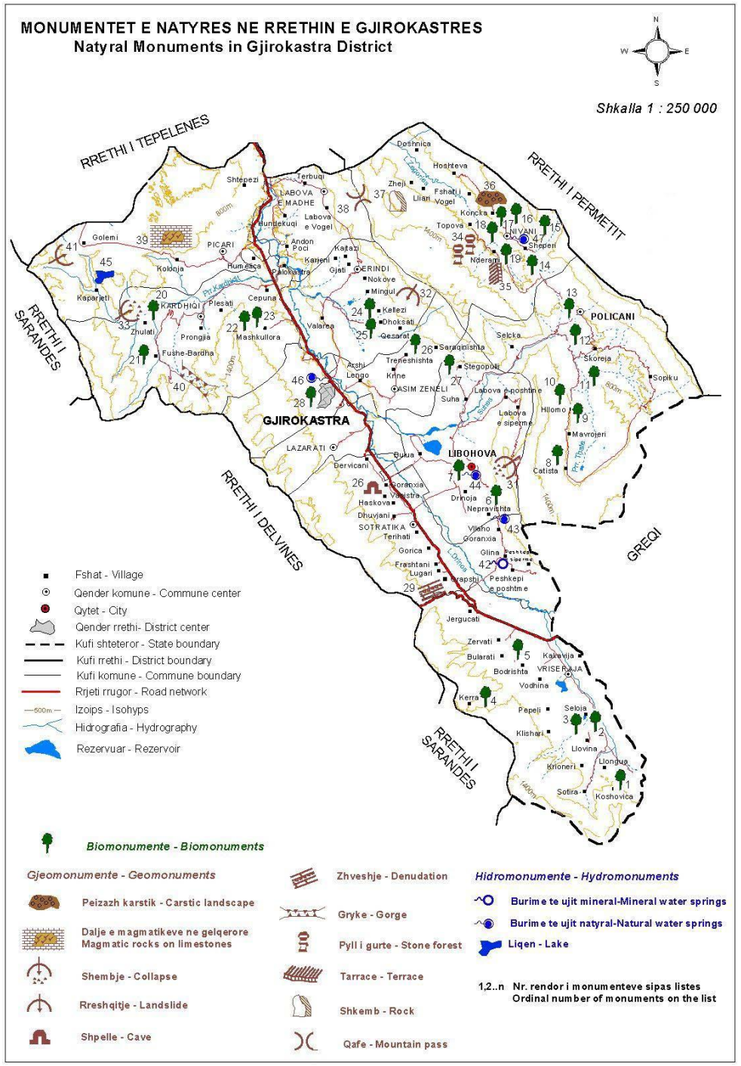
NATIONAL PARK BY BREDHI I HOTOVES (34361ha).

It is situated in the highlands of Dangëllia in the watershed of the right tributaries of Vjosa: Lemnica, Langarica, Çarshova;

It is distinguished for high values of biodiversity; it consists of grand fir forests, mainly of Macedonian fir (Abies Matf borissi-regis) it has large mammals (wolf, bear, roe, wild boar, etc.).

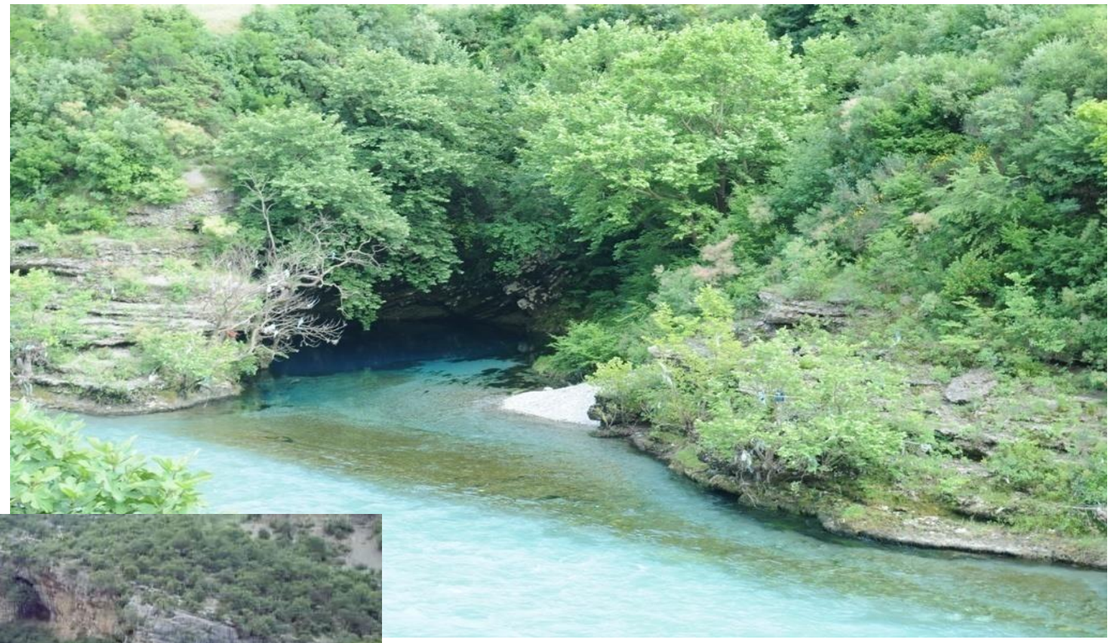
The park was zoned based on the values and the presence of human activity: Central area with a surface of 2888.69 ha , Sustainable use area (18922.50 ha); Recreational area (80.28 ha), Traditional use area (2469.58 ha).

ABOUT 130 NATURAL MONUMENTS



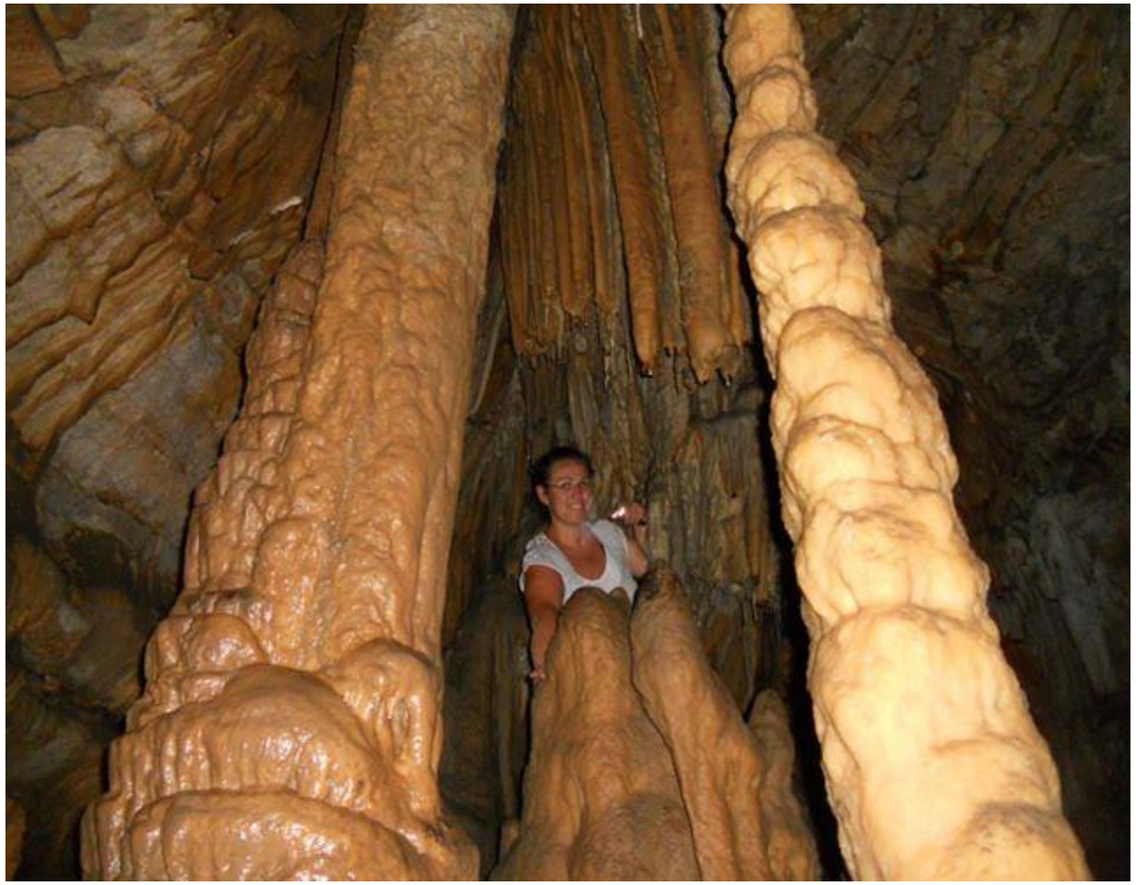
- Natural Managed Reserves/Natural Parks: Germenj – Shelegur (430 ha), Levan(200 ha) and Pishe Poro (1500 ha).
- Protected Landscapes, Narte-Vjose (19738 ha);
- Protected area of Managed Reserve, Piskal – Shqeri (5400ha);
- Wetlands of International Importance (Ramsar) of Narta Lagoon;
- The Ecomuseums, which are managed by a joint Albanian –Greek council and from the local government in Albania and Greece.

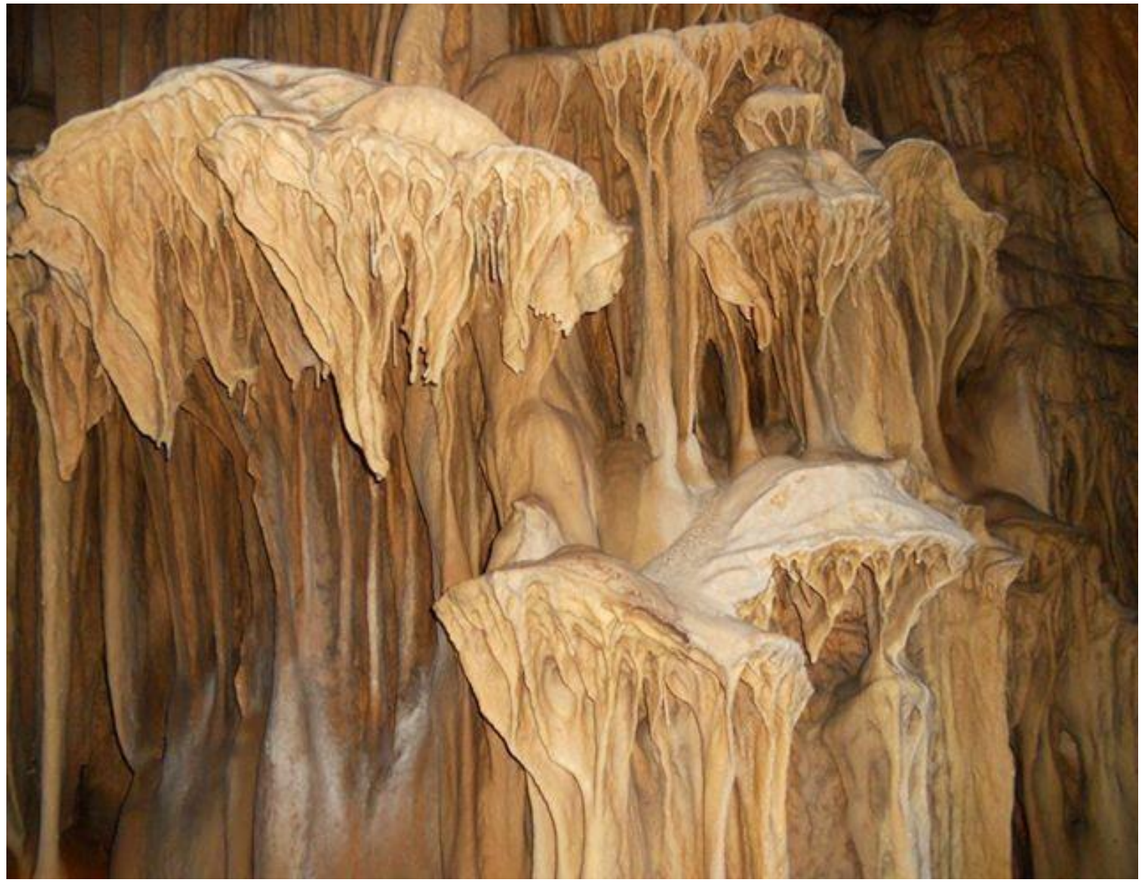
Petrani Rock: Geo-monument



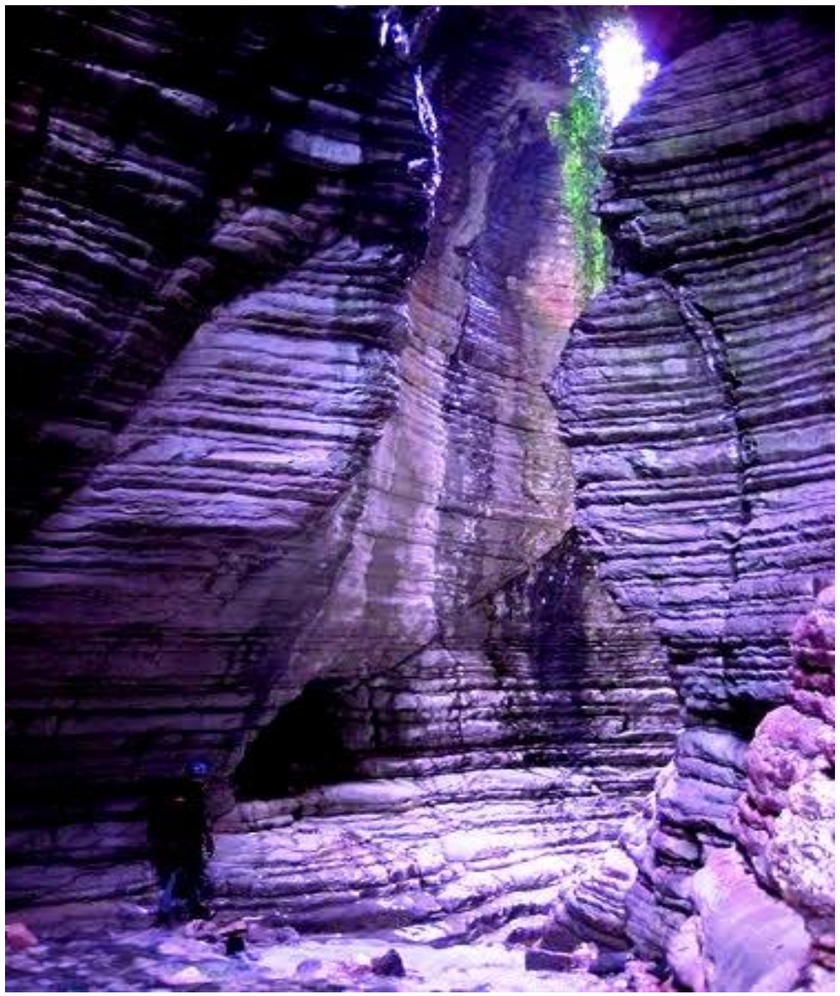
Black water of Këlcyra: Hydro-monument

Lengarica canyon: Geo-monument

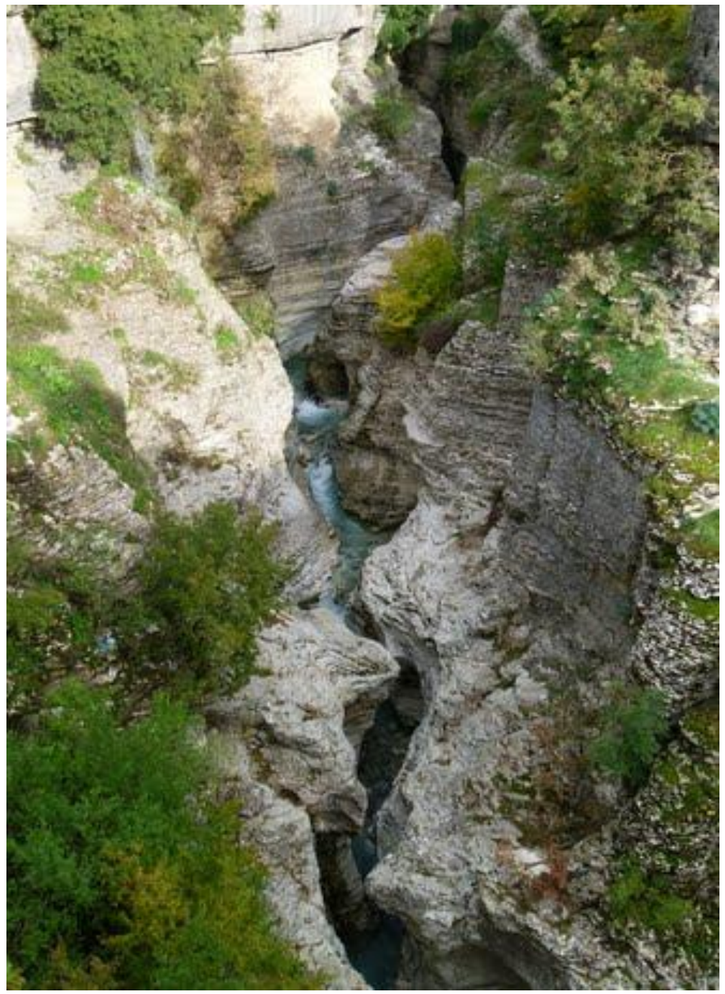




Pigeon's cave in Lengarica canyon: Geo-monument



Nivica canyon in Bënça River: Geo-monument



Lekdushi canyon in Bënça River: Geo-monument

City's Rock in Përmeti town: Geo-monument

Thermal springs in Bënja-Lengarica River: Hydro-monument

Blue springs in Virua-Drinos River: Hydro-monument

Leskoviku plane tree: Bio-monument

The Vjosa Science Conference

The Vjosa – A unique opportunity for European River Science

Aqueduct in Bënça: Historical monument of ottoman period

Katiu bridge in Bënja: Historical monument of ottoman period

Traditional ethnographic wearing during the polyphonic festival in Gjirokastra castle: Polyphony is a UNESCO protected heritage

Traditional polyphonic festival in Gjirokastra castle: Polyphony is a UNESCO protected heritage

QUANTITATIVE MANAGEMENT OF WATER RESOURCES AND PRESSURES IN VJOSA RIVER BASIN

Agim Selenica: Metropolitan University Tirana,
Vera Bekteshi: EcoAlbania

CONTENT

- Hydrography of Vjosa Basin
- Climate Zones
- Temperature and Rainfall Regimes
- Ground water
- Floods and Flooding
- Pressures on environment

HYDROGRAPHY OF VJOSA BASIN

The hydrographic basin of Albania has a total area of 43,305 km2 from which only 28,748 km2 are situated within the state territory of Albania. The rest, which belongs to the catchments of the rivers Drini and Vjosa, is situated in Greece, Montenegro, Kosova and Macedonia.

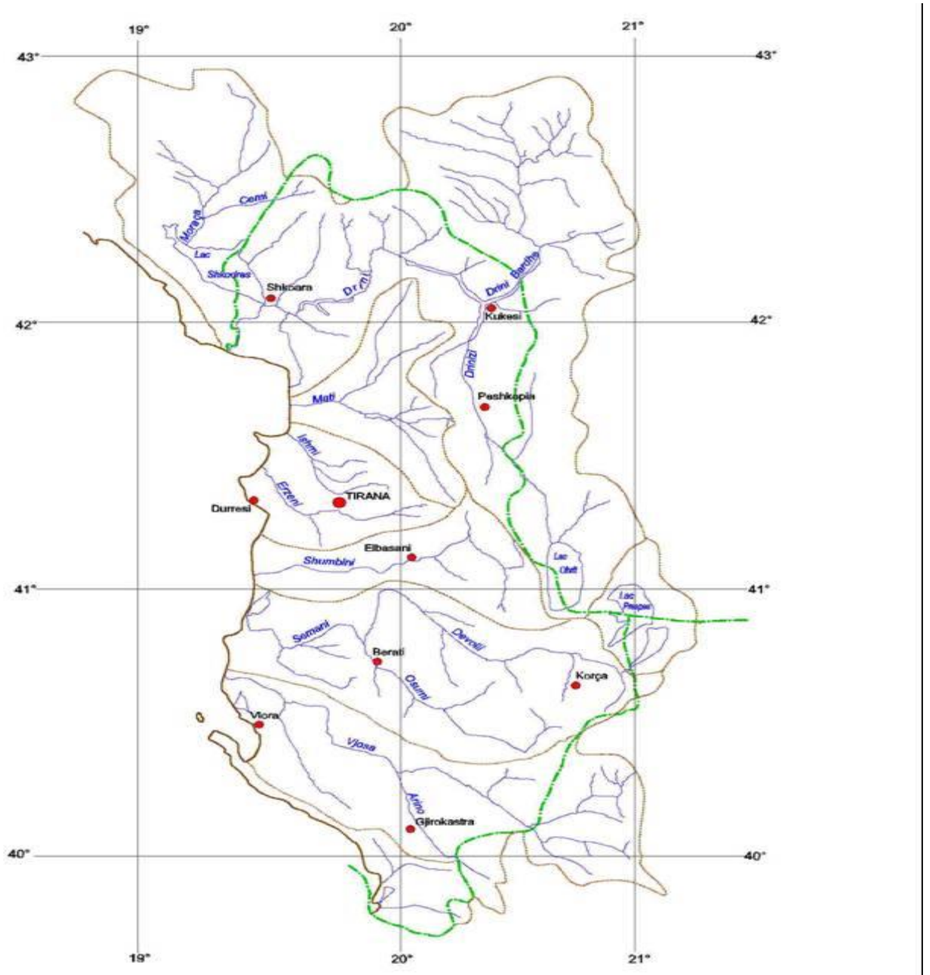
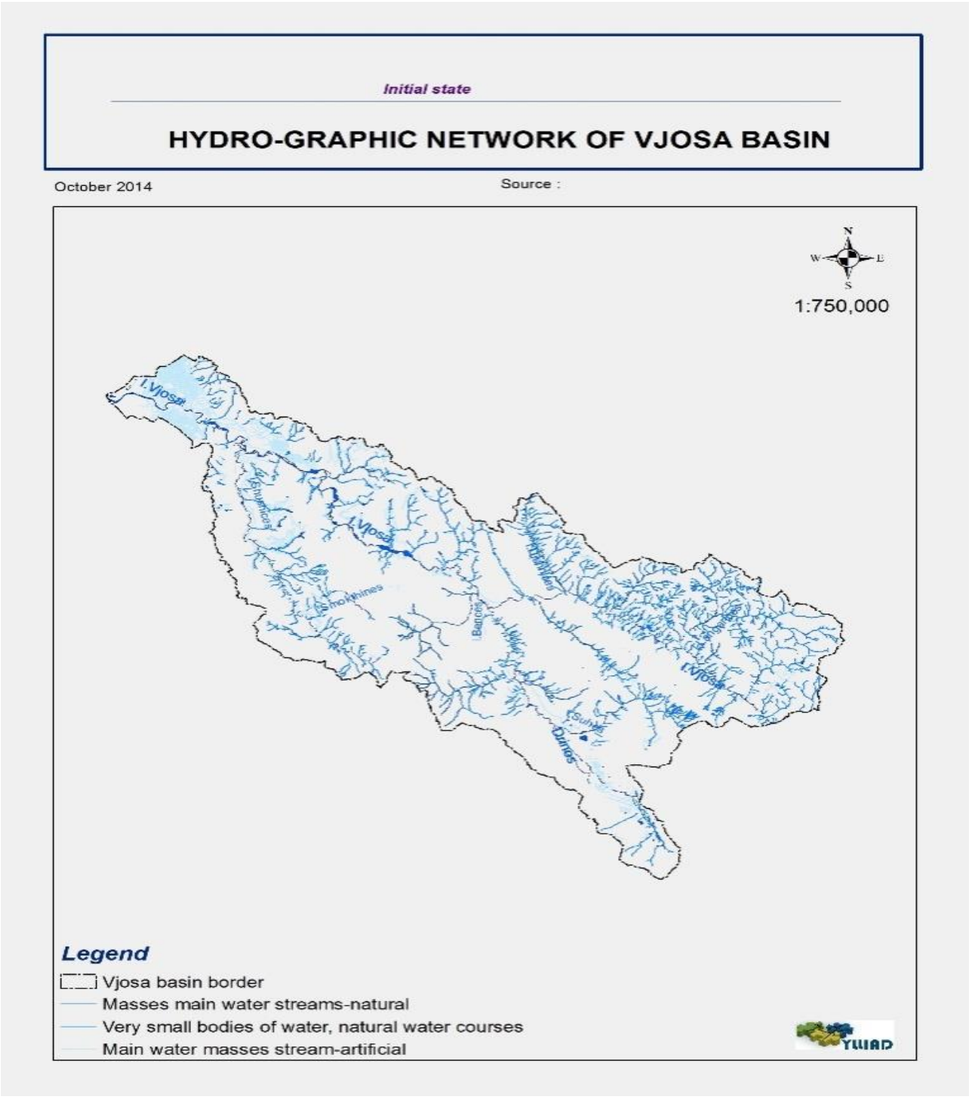


Fig- 1 - Harta hidrografike e Shqiperise.
Carte hydrographique de l'Albanie

Cartographie, Jean Pierre DERRUCHE, Octobre 2000

HYDROGRAPHY OF VJOSA BASIN

- The general area of the Vjosa watershed is 6799.35 km2, from which 4536.44 km2 lie in the Albanian territory
- The Vjosa catchment includes the tributaries: Sarandoporos, Drino River, Shushica River and many other smaller tributaries.
- The largest tributary of the Vjosa is the Drino; it has a catchment area of 1.320 km^2 of which 256 km^2 are situated in Greece.
- Characteristic feature of the catchment of the Vjosa : presence of deep karst aquifers, which assure an abundant groundwater supply during the dry season.

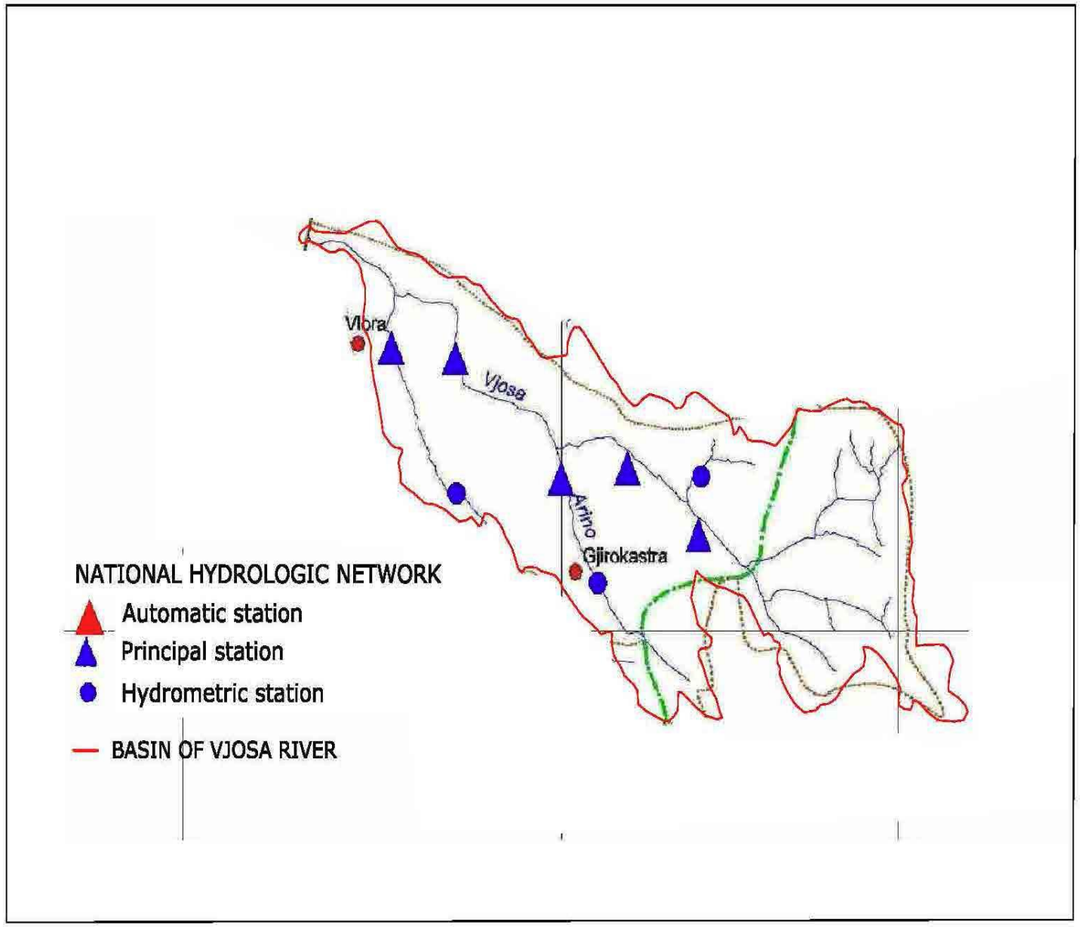


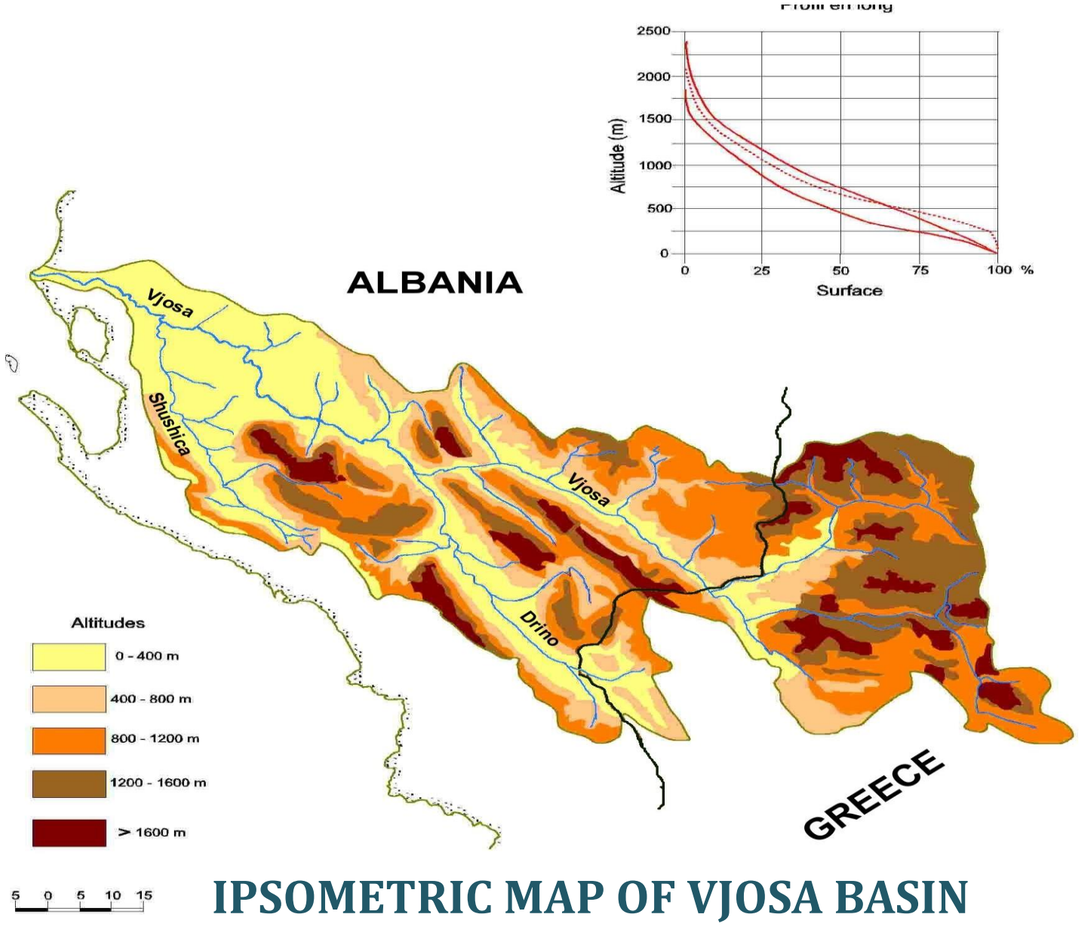
MAIN HYDROGRAPHICAL CHARACTERISTICS

Site	Watershed surface A(km^2)	Mean altitude H (m)	River length L (km)	Embankment slope I (%)	Density of hydrographic system D (km/km2)	Width of basin B (km)
Biovizhde	2170	1220	90	27	2	24
Petran	2420	1190	110.2	28	2	21.9
Permet	2810	1160	120	28	2.1	23.5
Kelcyre	3060	1130	136.2	28	2.2	22.5
Dragot	3470	1090	149.7	29	2.2	23.2
Ura Leklit (Drinos)	1300	748	80.3	28	2.5	16.2
Dorze	5420	963	182.8	29	2.3	29.7
Pocem	5570	947	203.2	29	2.3	27
Drashovice (Shushica)	587	618	62.5	31	2.1	9.4
Mifol	6680	858	253.8	28	2.3	26.3

HYDROGRAPHICAL NETWORK

RIVER	Branch	STATION	Begin	Periode I	Periode II	Periode III
Vjosa		Biovizhde	1950	1950-1954	1968-1977	Closed
Vjosa		Çarshove	1976			Continue
Vjosa		Badlonje	1981			Continue
Vjosa		Permet	1968			Continue
Vjosa		Dragot	1947	1947-1954	1977-1993	Closed
Vjosa		Tepelene	1947			Continue
Vjosa		Dorez	1957	1957-1994		Closed
Vjosa		Pocem	1967	1967-1993		Closed
Vjosa		Mifol	1947			Continue
Vjosa		Petran	1947	1947-1978		Closed
Vjosa	Drinos	Gjirokaster	1949	1949-1981	1981-1993	Closed
Vjosa	Drinos	Hormove	1973			Continue
Vjosa	Drinos	Ura Leklit	1947	1947-1988		Closed
Vjosa	P.Çarshoves	Çarshove	1974	1974-1993		Closed

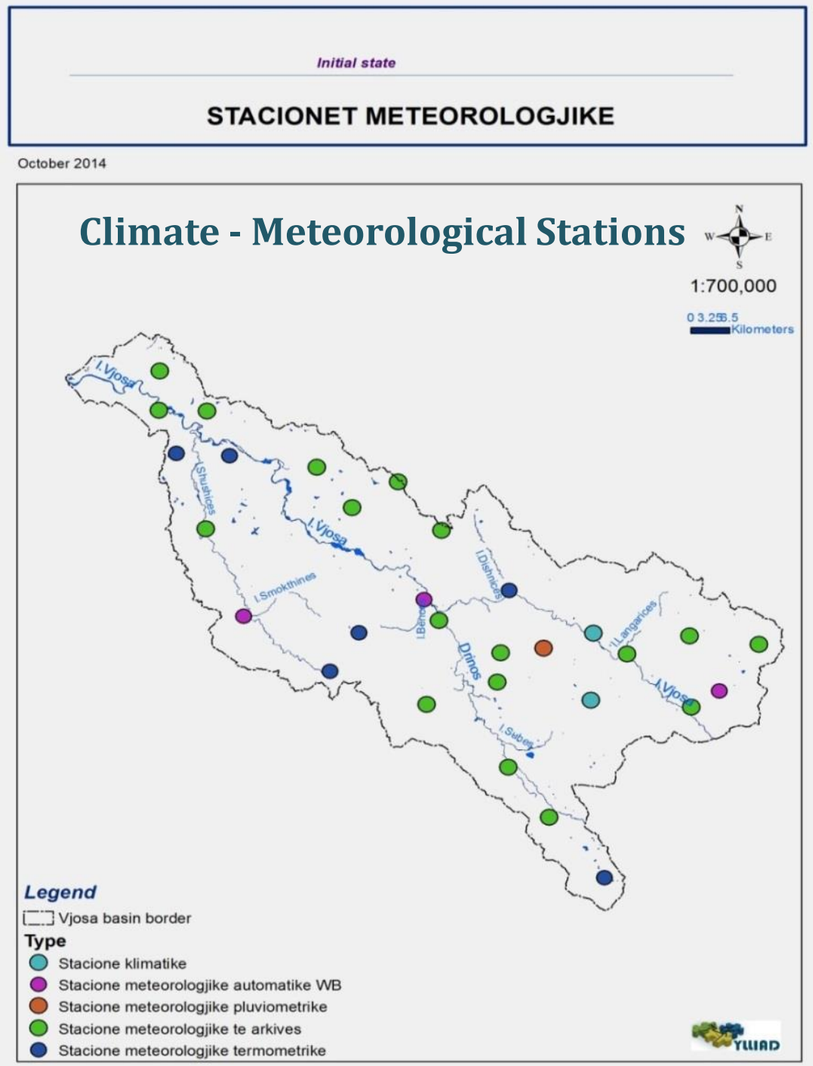


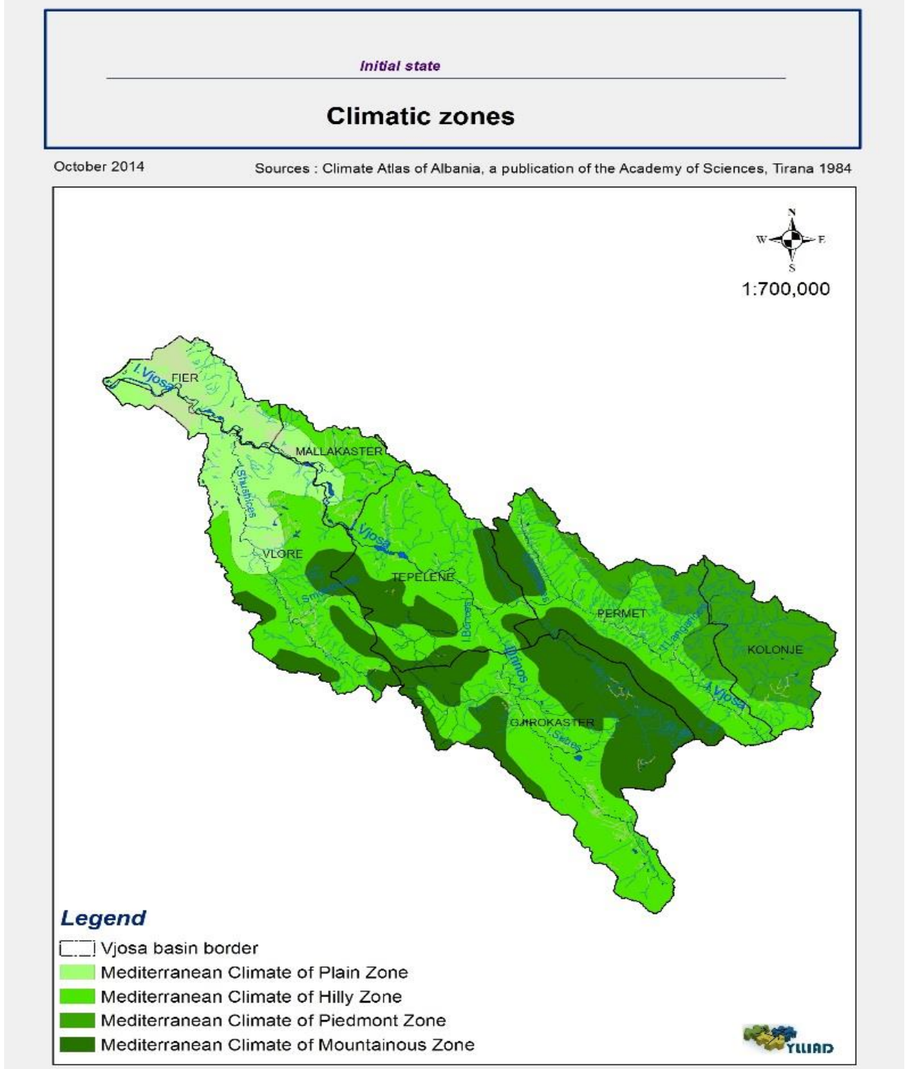


IPSOMETRIC MAP OF VJOSA BASIN

MAIN HYDROGRAPHICAL CHARACTERISTICS

- Basic hydrological characteristics of Vjosa River :
- annual discharge volume: 5,550 million m3
- specific watershed flow: 26 l/s.km^2
- ratio wettest month (February) to driest month (August-September): 7.3, a low value for a river without regulating structure
- 10-year flood : about 21 times the river module
- The water regime of Vjosa River is typical Mediterranean: high discharges during the wet season and low discharges in the dry period (Au-Sept.)
- The annual mean flow varies from Q = 60.2 m3/s in the upper part of the river (Biovizhde) until Q = 176 m3/s in the lower part of the river (Mifol).
- Vjosa basin is rich in groundwater resources, mainly in the form of springs : “Syri i Kalter” 15m3/s; spring of Viroi 25-30m3/s





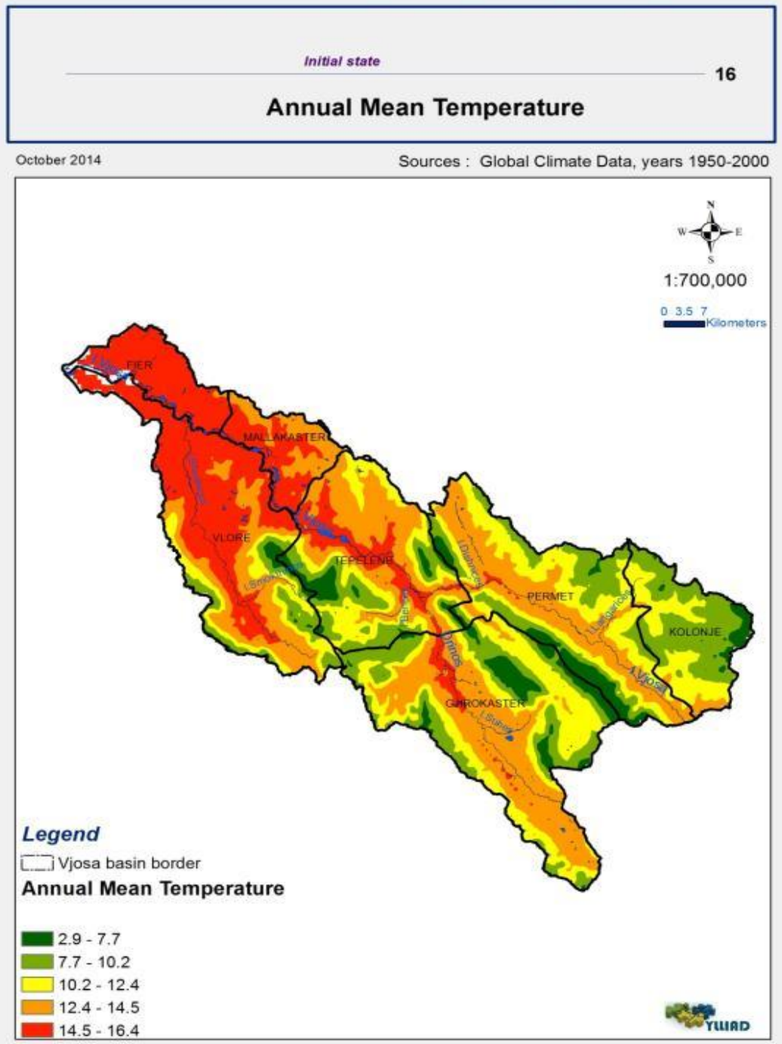
CLIMATIC ZONES

In the basin of Vjosa are observed four main climatic zones:

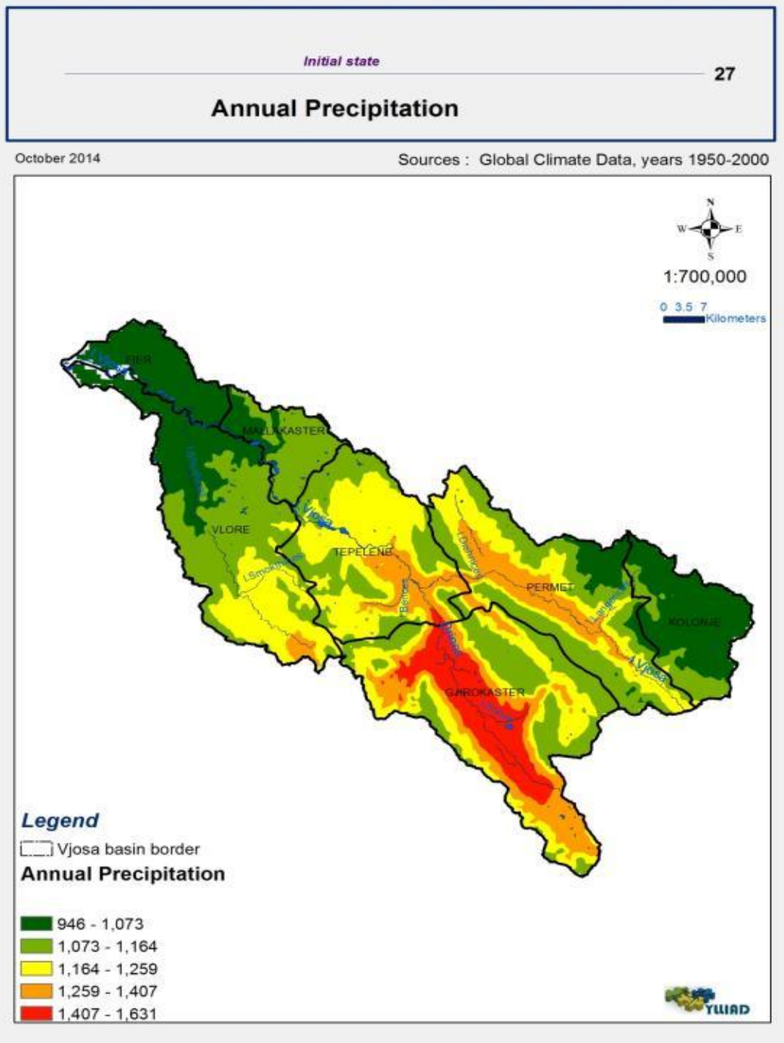
- -Mediterranean Climate of Plaine
- -Mediterranean Climate of Hilly zone
- -Mediterranean Climate of Piedmont zone
- -Mediterranean Climate of Mountains zone

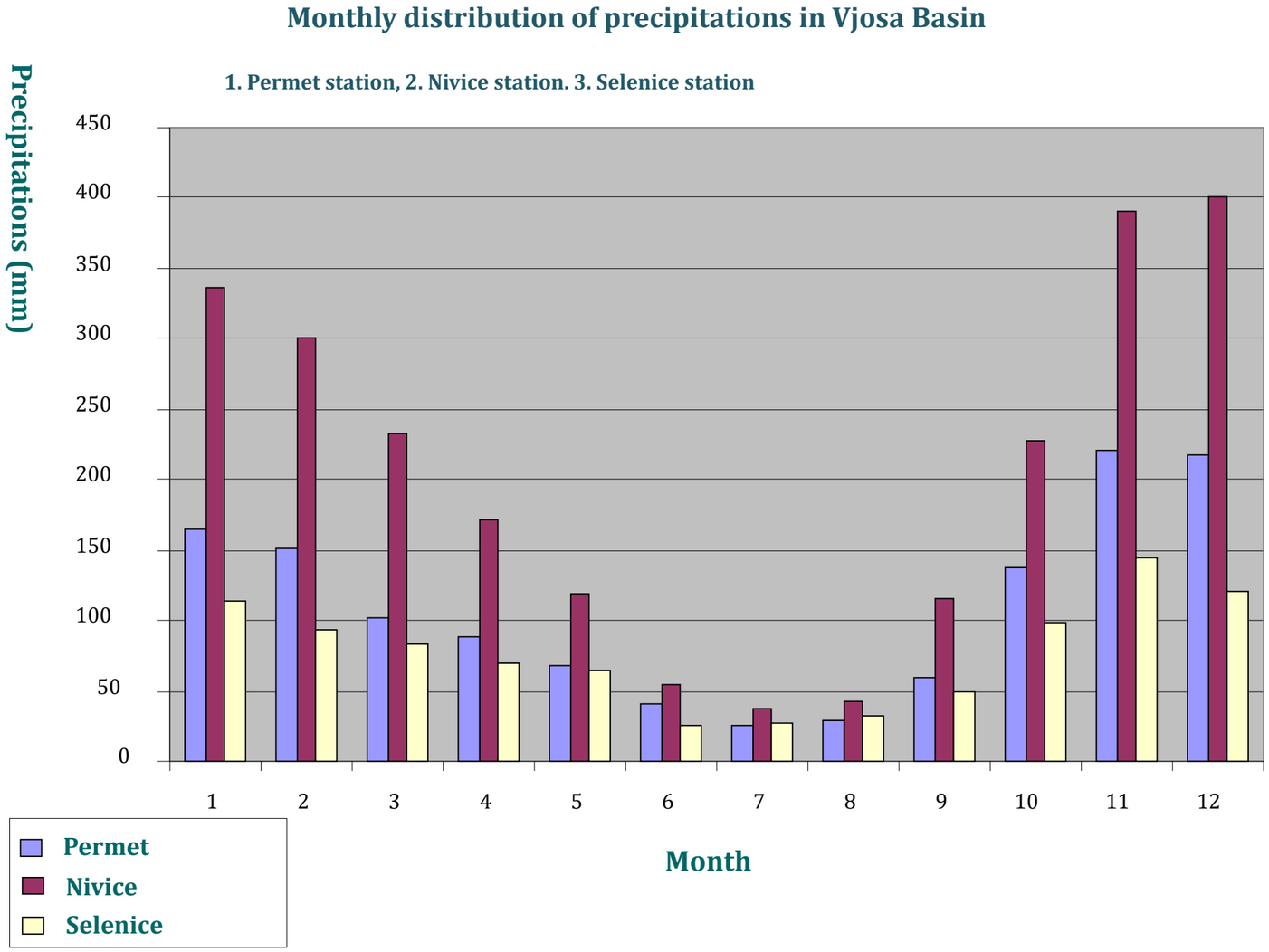
In the upper sector of the basin: mountainous Mediterranean climate (cold winter and fresh summer).

In the lower sector of the basin: typical plain climate (wet soft winter and hot summer)



- The eastern part is colder than the western part.
- **Thermal regime** : quite uniform along Vjosa river. Annual mean temperature : 13 – 16°C
- The winter is mild. The frost period is short and the number of days with frost usually is from 15 to 20 days a year.
- **Precipitation** regime is Mediterranean, with less precipitation in the summer months (July, August) and greater precipitations in the months of November, December.
- Rainy days : 85 to 100 days per year. Rains are less heavy, while snow is a rare event.
- Greater precipitations in the Drinos valley:1930mm in Gjirokastra





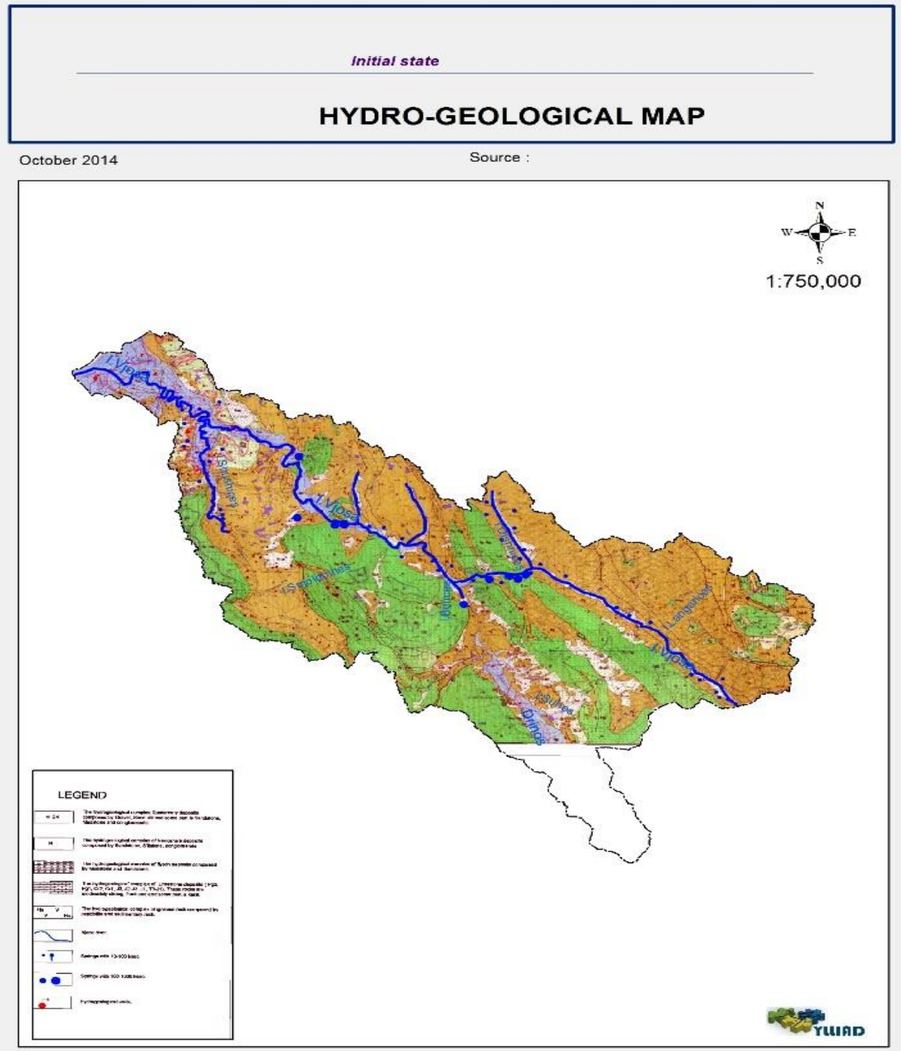
RAINFALL REGIME

In the middle part of the basin, where are found the highest mountains, the rainfall is almost 2 times higher than in the upper part (Permet) and the lower part of the basin (Selenice 925mm).

GROUNDWATER RESOURCES

The Vjosa basin includes three main aquifers:

- Aquifer along the lower valley of the Vjosa. It supplies the city of Fier with more than 1 m3/s of good quality water
- Aquifer around Sarande and Butrint. It supplies part of the drinking water to Sarande. Very good quality water, and extraction is around 100 l/s for Sarande only
- Aquifer in the Drino valley around Gjirokaster. It supplies part of the drinking water to Gjirokaster. Very good quality water, and extraction is around 40-90 l/s for Gjirokaster only.



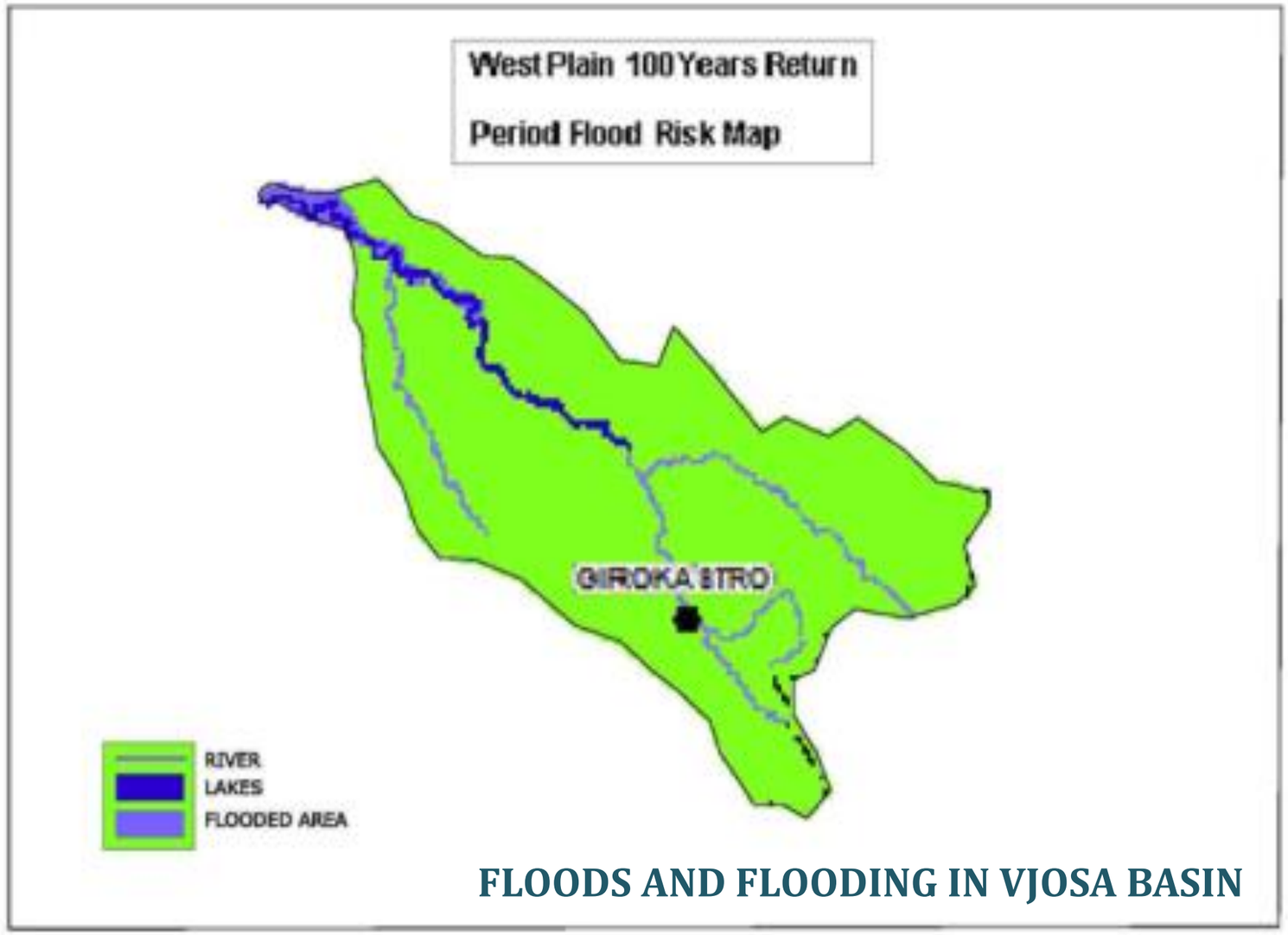
OTHER GROUNDWATER RESOURCES : SPRINGS AND KARSTS PRODUCTION

Springs and Karsts phenomena: located at Eastern part of the Vjosa valley from Leskoviku up to Pocemi. Springs: Leskovik, Dragot, Peshtan, Kelcyra, Dorezi, Kalivaci, Pocem.

Langarica

Kelcyre

Viroi



FLOODS AND FLOODING IN VJOSA BASIN

The map of the flooding with a return period 100 years for Vjosa river basin
All the lower part of Vjosa Basin (mainly downward Mifoli) is completely inundated

Flooding is a natural phenomenon in Vjosa River.
The floods are flashy and flood – waters occupy the floodplain; close to the river mouth area, these waters inundate the floodplain for several weeks.
Vjosa River is characterized by high floods:

- 2000-3000 m3/s in the upper part
- 5000-6000 m3/s in the lower part.

Important flooding in the low part of the basin.
During the high floods some thousands of ha of the agricultural land are inundated causing important economic damages.

FLOODS AND IN VJOSA BASIN

FLOODS HISTORY

Big flooding are observed in the past:
11 big flooding during 19th century. The higher floods are observed in 1937 and in 1962 – 1963
16 November 1962: higher river stages in Vjosa and its tributaries
13 January 1963: Same magnitude as the flooding of November 1962 but inundating a wider region of the country. Vjosa river over spilled the river banks from Selishta downward inundating a part of coastal swamps. Novosela and Mifol were inundated.
Inundated surface : 3538 ha during 20 days

ACTUAL SITUATION

Attempts have been made to alleviate flood situation by building protective dykes and creating upstream storage.
Although many of these measures have been beneficial, they also served to encourage further encroachment upon river floodplains, thereby raising the potential for flood damage.
Actually, a high % of the population lives very close to the river mouth areas, where the risk of flooding is higher.

ECONOMIC BACKGROUND
PRESSURES

- Industry and Commercial Activities
- Gravel Extraction
- Impact of Hydropower plants
- Other activities
- Agriculture impact
- Forest fire

IMPACT OF HYDROPOWER

Kalivaci HPP is situated approximately 28 km from the town of Tepelena. The Kalivaci scheme comprises a fill-type dam using excavation materials and gravel, a diversion tunnel and a power station. To date, only earthworks are under construction;

29 Hydropower Plants ;

Important to evaluate the cumulative effects of the envisaged projects in the Vjosa river basin.

INDUSTRY AND COMMERCIAL ACTIVITIES

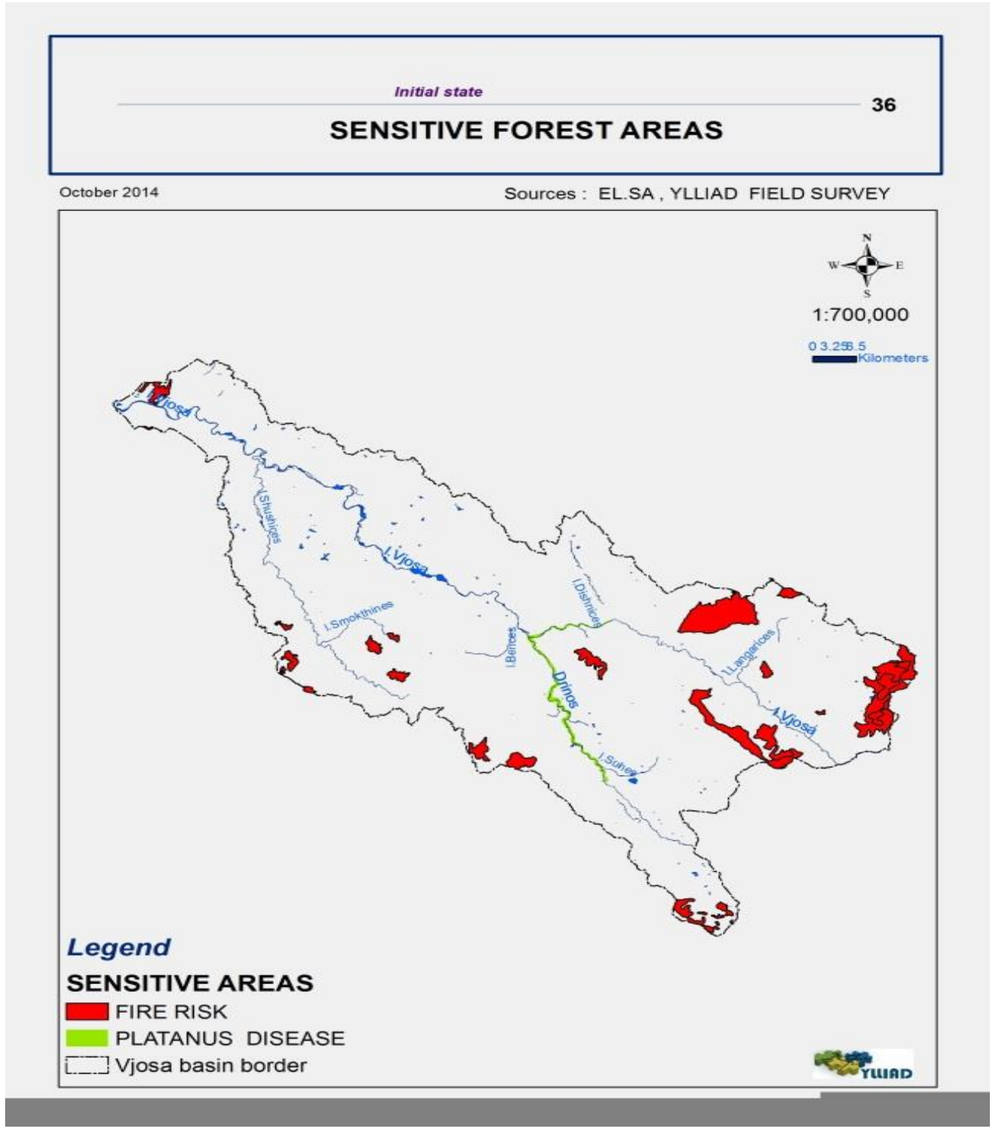
- There are altogether seven districts in the Vjosa river basin: Permet, Gjirokaster, Tepelene, Kolonja, Fieri, Mallakastra and Vlora;
- More than 80% of people live in the rural area and this means that the main economic activity in the Vjosa river basin is agriculture;
- The main activities with big pressure in the Vjosa river basin: gravel extraction, water bottling, hydropower plants.

IMPACT OF OTHER ACTIVITIES

There are 105 water-using companies that possess permits to use the water resources;

From these 105 companies:

- 28 water bottling companies;
- 29 Hydropower Plants;
- 9 well-drilling companies;
- 39 entities using water from which 20 for Water Supply and Sewerage purposes



FIRE IMPACT IN THE VJOSA BASIN

On agricultural Land:

Loss of agricultural land transformed into construction land;
Division of the land in small parcels,
Different pollution – need to rehabilitate the forest.

On the water sources:

Increase of the erosion due to the burning of the vegetation;
Increase of the turbidity of water with the increase of the erosion;
Negative impact in the quality of the water with the increase of the presence of the nitrate and nitrite deposits in the water.

QUALITY OF WATERS IN THE VJOSA CATCHMENT – PHYSICAL-CHEMISTRY, NUTRIENTS, HEAVY METALS AND ORGANIC POLLUTANTS

Pranvera Lazo[1], Elda Marku[1], Xhume Kumanova[2]

1 Department of Chemistry, University of Tirana
2 Albanian Geological Survey.

ELEMENTS OF „GOOD STATUS“ OF SURFACE WATERS

Water quality is determined by physical, chemical and microbiological parameters .

Biological quality components

Hydromorphological quality components

and

general chemical quality components
+ specific pollutants

↓

good ecological status

Priority substances

↓

Good chemical status

↓

good status

Chemical characteristics of river waters are a reflection of:

- the soils and rocks with which the water has been in contact
- agricultural and urban runoff
- municipal and industrial untreated wastewaters impact
- microbial and chemical transformations

Chemical and physical parameters

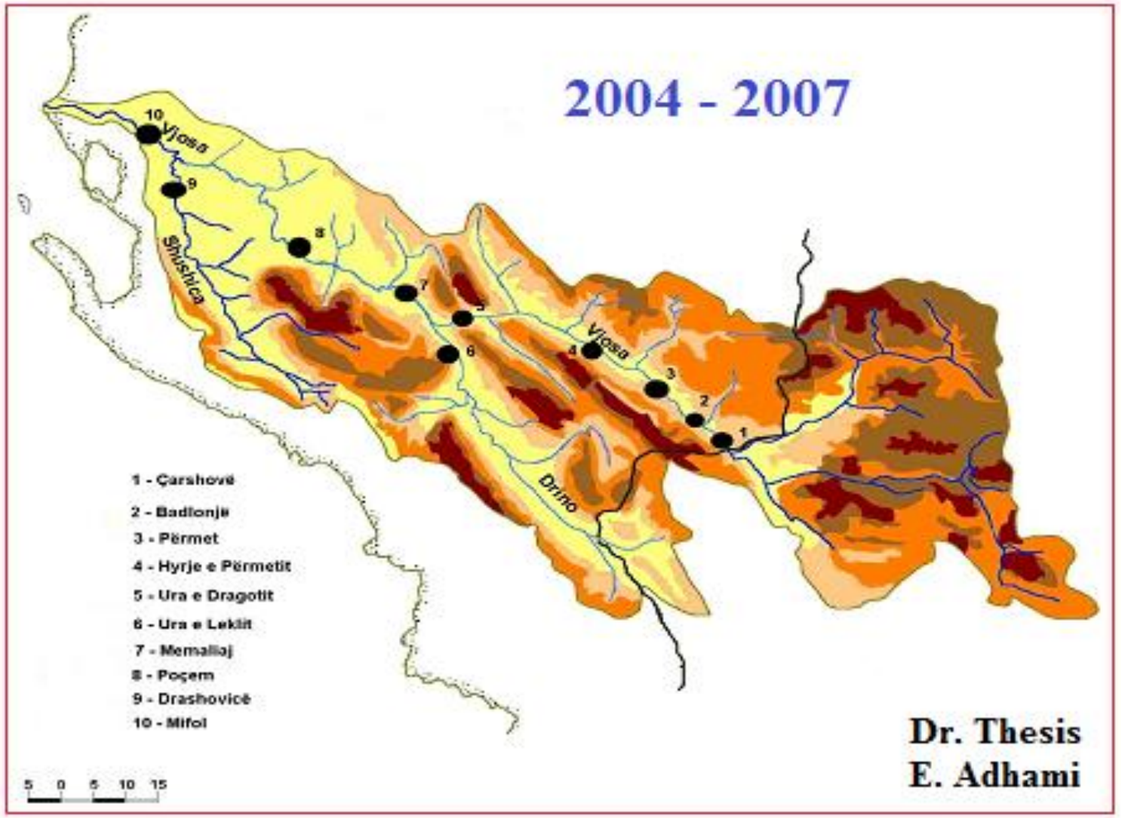
pH and Alkalinity
Inorganic Indicators: hardness, TDS, TSS, conductivity, and adsorption ratio, DO, BOD, COD
Inorganic Minerals

- Major cations : calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^{+}) and potassium (K^{+}).
- Major anions : chloride, sulfate, carbonate, bicarbonate and fluoride

Nutrients: nitrate, nitrite, ammonium, phosphate
Inorganic pollutants: Heavy metal ions
Organic materials:

- Natural Organic Matter
- Man-made Organics (pollutants)
- Measurement of Organics in Water - Organic Carbon

VJOSA BASIN

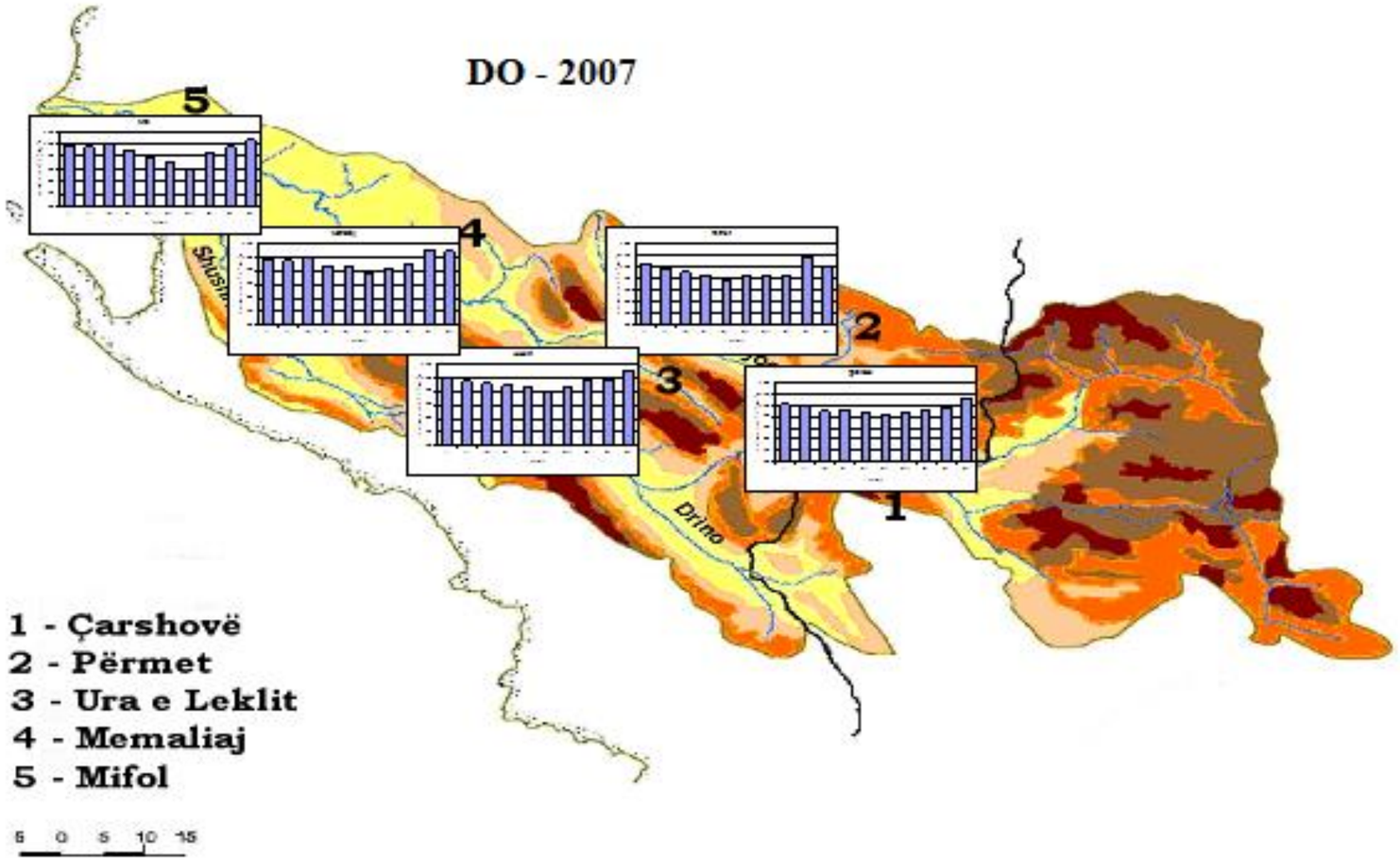


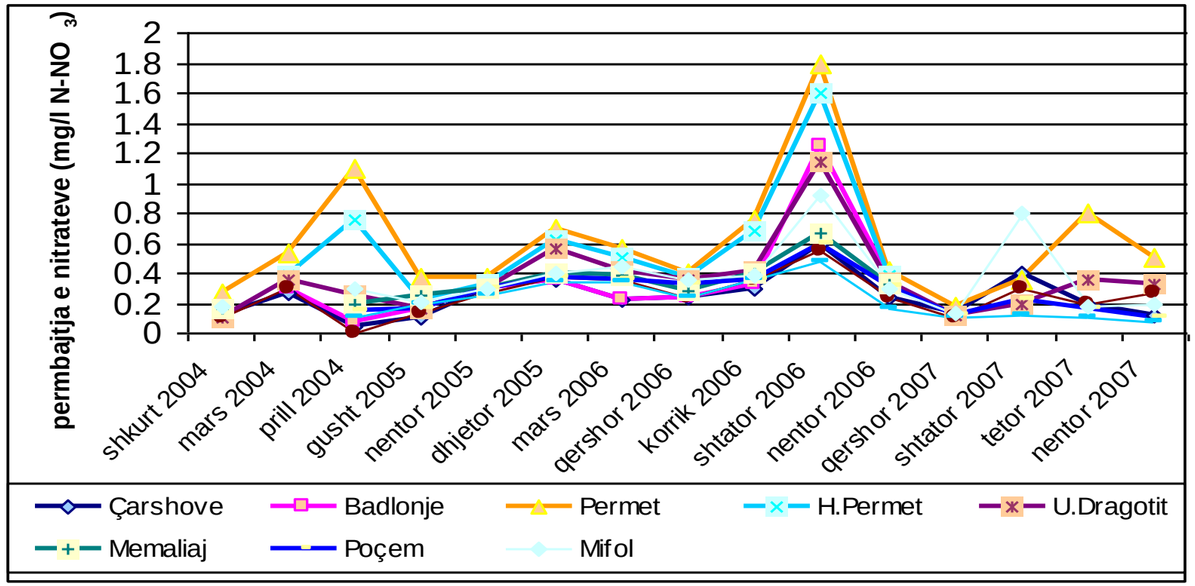
Parameters

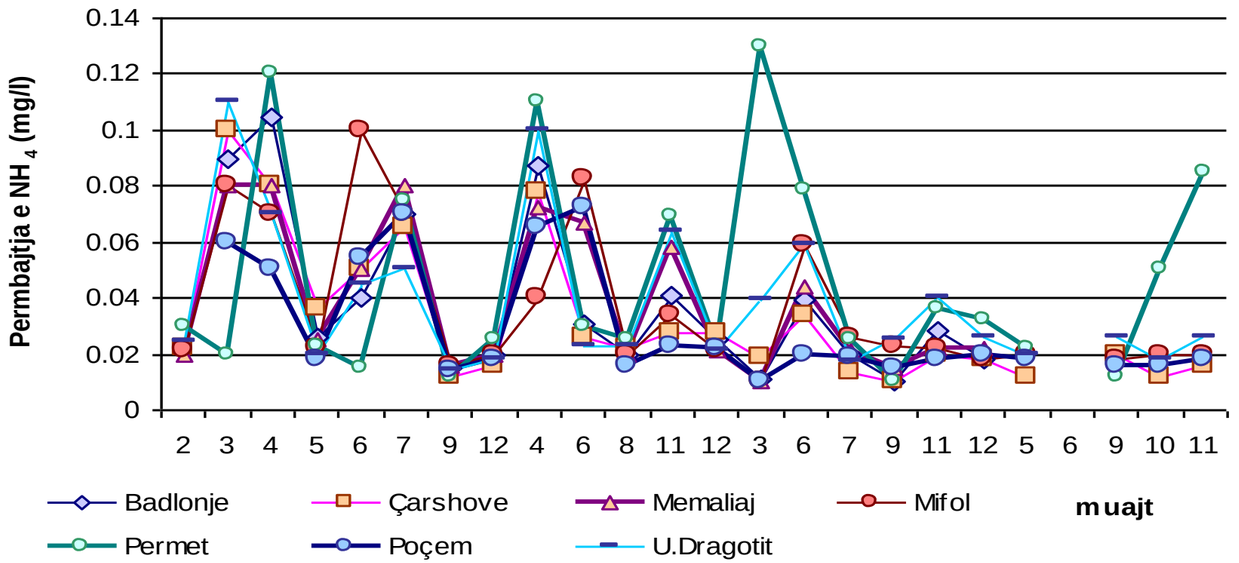
pH	Cond.*	K+	Na+	Ca++	Mg++	NH4+	ΣCations
HCO3-	CO3-	Cl-	SO4-	NO3-	NO2-	F-	Σanions
H2SiO2	Hard.	DO	COD		TSS	TC	TN

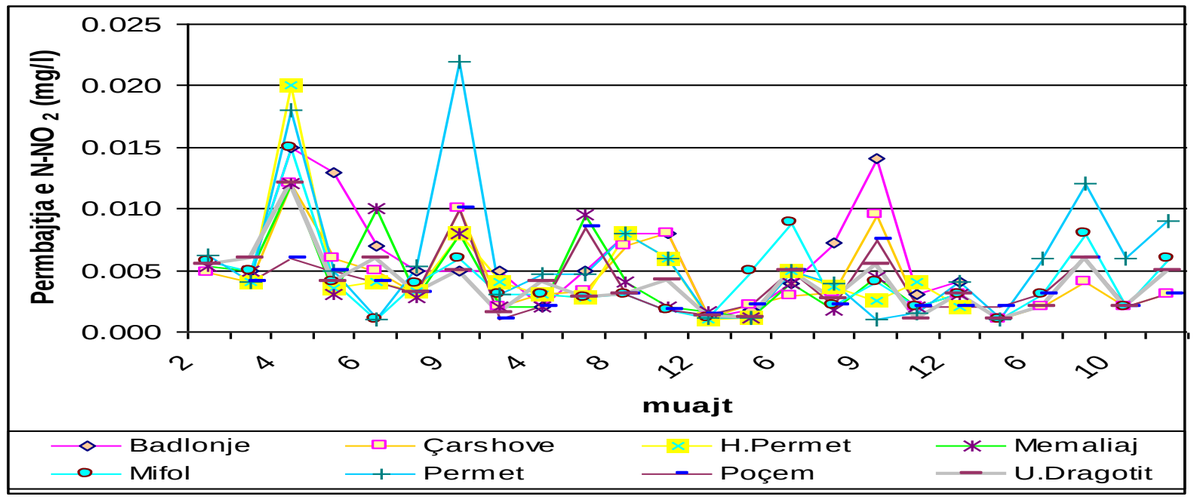
mg/L, * µS/cm

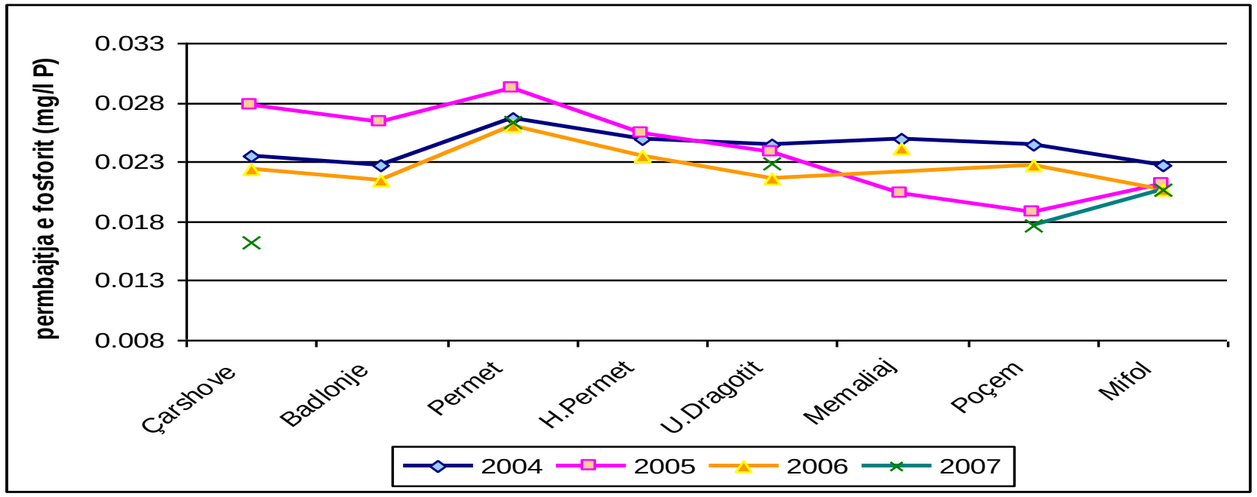
DISSOLVED OXYGEN (DO) 2007




permbajtja e nitrateve (mg/l N-NO 3)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
shkurt 2004
mars 2004
prill 2004
gusht 2005
nentor 2005
dhjetor 2005
mars 2006
qershor 2006
korrik 2006
shtator 2006
nentor 2006
qershor 2007
shtator 2007
tetor 2007
nentor 2007
Çarshove
Badlonje
Permet
H.Permet
U.Dragotit
Memaliaj
Poçem
Mifol


Permbajtja e NH 4 (mg/l)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2 3 4 5 6 7 9 12 4 6 8 11 12 3 6 7 9 11 12 5 6 9 10 11
muajt
Badlonje
Çarshove
Memaliaj
Mifol
Permet
Poçem
U.Dragotit


Permbajtja e N-NO 2 (mg/l)
0.025
0.020
0.015
0.010
0.005
0.000
2 4 6 9 4 8 12 6 9 12 6 10
muajt
Badlonje
Çarshove
H.Permet
Memaliaj
Mifol
Permet
Poçem
U.Dragotit


permbajtja e fosforit (mg/l P)
0.033
0.028
0.023
0.018
0.013
0.008
Çarshove
Badlonje
Permet
H.Permet
U.Dragotit
Memaliaj
Poçem
Mifol
2004
2005
2006
2007

QUALITY CLASSIFICATION (NIVAS; RATLI-2000)

Sampling Sites	Class	Estimation (Class)
Çarshovë	1.5	Very Good (I)
Badlonj	1.6	Very Good (I)
Përmet1	1.7	Very Good (I)
Përmet2	1.6	Very Good (I)
Dragoti Bridge	1.6	Very Good (I)
Lekli Bridge	1.5	Very Good (I)
Memaliaj	1.6	Very Good (I)
Poçem	1.5	Very Good (I)
Drashovic	1.6	Very Good (I)
Mifol	1.6	Very Good (I)

Chemico-physical parameters (2012-2015)

Sampling Sites	Period	pH	Cond.µS/cm	K	Na	Ca	Mg	NH4	Cations
P 1-1 Drinos	2012	7.39	535	0.39	1.38	74.15	26.75	0	102.75
P 1-1 Drinos	2014	7.86	527	0.96	10.22	90.66	7.68	0.01	109.57
P 1-1 Drinos	2015	7.93	524	0.7	10.32	87.82	7.52	0.04	106.41
P 3-3 Ura Subashit	2012	7.5	490	0.39	1.38	63.13	27.36	0	92.35
P 3-3 Ura Subashit	2014	7.72	497	1.06	9.48	84.04	7.76	0.01	102.39
P 3-3 Ura Subashit	2015	7.91	510	0.72	9.34	85.32	7.6	0.03	103.03
P 7-7 Tepelene	2012	7.69	523	1.56	8.97	55.11	29.79	0	95.52
P 7-7 Tepelene	2014	7.87	497	1.3	18.2	65.34	12.26	0.01	97.14
P 5-5 Tepelene	2015	8.05	477	1.16	17.25	65.13	12.26	0.04	95.87
P 3-3 Ura Mifolit	2013	8.15	526	3.51	28.06	63.13	12.16	0.02	106.93
P 9-9 Ura Mifolit	2014	7.83	490	1.36	17.92	63.42	12.92	0.01	95.64
P 9-9 Ura Mifolit	2015	7.95	488	1.14	17.92	63.11	8.66	0.03	90.87
P 8-8 Gryka Poçemit	2014	8	471	1.38	16.34	61.8	11.72	0.02	91.28
P 8-8 Gryka Poçemit	2015	7.86	464	0.99	15.37	59.12	11.82	0.04	87.37

Chemico-physical parameters (2012-2015)

Sampling Sites	HCO3	CO3	Cl	SO4	NO3	NO2	F	∫anions	H2SiO2	Hard.° g	Tot. Mn	COD	TSS	TC	TN
P 1-1 Drinos	207	0	19.5	93.4	0.92	0		321.3	1.04	16.5	424				
P 1-1 Drinos	162	21	15.5	90.3	1.38	0.04	0.08	289.9	2.32	14.4	399	0.67	1.3	3.14	0.46
P 1-1 Drinos	177	9	13.5	99.2	2.22	0.02	0.22	301.0	1.8	14.0	407		2.5	2.46	0.56
P 3-3 Ura Subashit	195	0	16.0	84.0	0.55	0		295.7	1.3	15.1	388				
P 3-3 Ura Subashit	165	12	14.0	83.5	1.22	2	0.04	275.5	1.88	13.2	378	0.67	4.2	3	0.38
P 3-3 Ura Subashit	177	9	12.6	89.1	2.22	0.01	0.2	290.0	1.73	13.7	393		2.7	2.66	0.54
P 7-7 Tepelene	177	0	37.3	83.5	0.25	0		298.0	1.3	14.6	393				
P 7-7 Tepelene	137	15	28.0	75.0	1.38	0.02	0.1	256.8	3.02	12.0	354	1.13	307	3.38	0.4
P 5-5 Tepelene	149	9	26.5	83.4	1.77	0.01	0.16	270.3	2.59	11.9	366		132	2.65	0.45
P 3-3 Ura Mifolit	177	3	40.8	64.2	1.71	0		286.6	1.3	11.6	393	0.2	26		
P 9-9 Ura Mifolit	146	12	35.6	64.6	1.62	0.01	0.08	260.2	2.37	11.8	356	1.1	10.9	2.82	0.44
P 9-9 Ura Mifolit	153	9	25.9	71.7	2.04	0.01	0.15	261.3	1.95	10.8	352		46.4	1.79	0.5
P 8-8 Gryka Poçem	156	12	23.9	65.4	1.64	0.01	0.14	258.6	2.37	11.3	350	0.59	362	5.1	0.48
P 8-8 Gryka Poçem	146	9	22.6	75.9	1.46	0.01	0.23	255.5	1.56	11.0	343		86.8	2.01	0.38

DIRECTIVE 2013/39/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 12 August 2013

amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

The Commission has conducted a review of the list of priority substances in accordance with Article 16(4) of Directive 2000/60/EC and with Article 8 of Directive 2008/105/EC and amended the list of priority substances by:

- identifying new substances for priority action at Union level,
- setting EQS for those newly identified substances,
- revising the EQS for some existing substances in line with scientific progress
- setting biota EQS for some existing and newly identified priority substances.

Environmental quality standards (EQS):

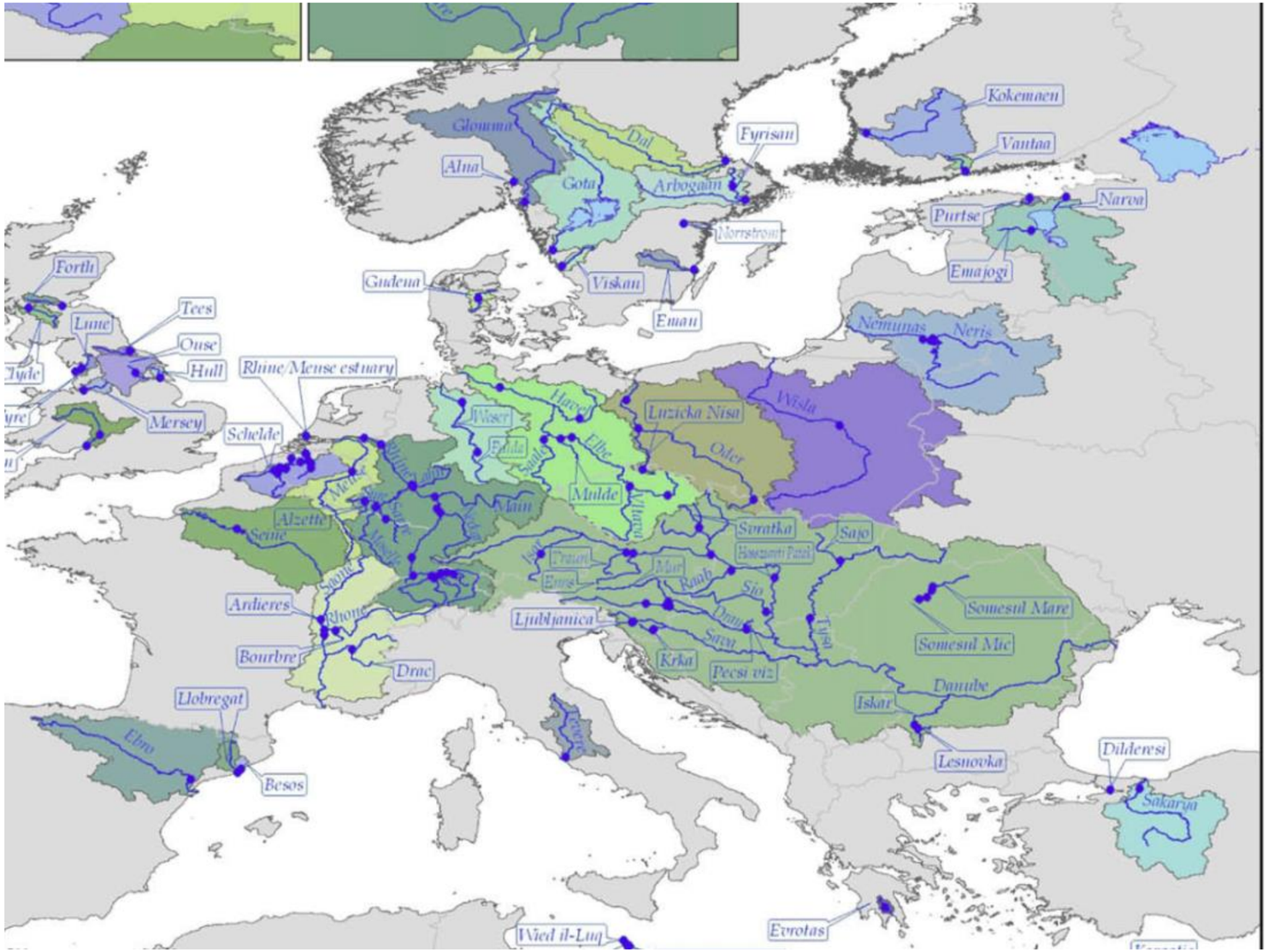
- annual average value AA-EQS
- maximum allowable concentration MAC

Nr.	Name of priority substance	priority hazardous substance	Nr.	Name of priority substance	priority hazardous substance	Nr.	Name of priority substance	priority hazardous substance
(1)	Alachlor		(16)	Hexachlorobenzene	X	(31)	Trichlorobenzenes	
(2)	Anthracene	X	(17)	Hexachlorobutadiene	X	(32)	Trichloromethane (chloroform)	
(3)	Atrazine		(18)	Hexachlorocyclohexane	X	(33)	Trifluralin	X
(4)	Benzene		(19)	Isoproturon		(34)	Dicofol	X
(5)	Brominated diphenylethers	X	(20)	Lead and its compounds		(35)	Perfluorooctane sulfonic acid and its derivatives (PFOS)	X
(6)	Cadmium and its compounds	X	(21)	Mercury and its compounds	X	(36)	Quinoxyfen	X
(7)	Chloroalcanes C10-C13	X	(22)	Naphthalene		(37)	Dioxin and dioxin-like compounds	X
(8)	Chlorfenvinphos		(23)	Nickel and its compounds		(38)	Aclonifen	
(9)	Chlorpyrifos (Chlorpyrifos-ethyl)		(24)	Nonylphenols	X	(39)	Bifenox	
(10)	1,2-dichloroethane		(25)	Octylphenols		(40)	Cybutryne	
(11)	Dichloromethane		(26)	Pentachlorobenzene	X	(41)	Cypermethrin	
(12)	Di(2-ethylhexyl)phthalate (DEHP)	X	(27)	Pentachlorophenol		(42)	Dichlorvos	
(13)	Diuron		(28)	Polyaromatic hydrocarbons (PAH)	X	(43)	Hexabromocyclododecanes (HBCDD)	X
(14)	Endosulfan	X	(29)	Simazine		(44)	Heptachlor and heptachlor epoxide	X
(15)	Fluoranthene		(30)	Tributyltin compounds	X	(45)	Terbutryn	

The European Commission has proposed adding 15 additional priority substances to the 33 pollutants regulated under the EU's Directive on Priority

- Aclonifen, Bifenox, Cypermethrin, Dicofol, Heptachlor and Quinoxyfen - used for crop and plant protection.
- Cybutryne, Dichlorvos and Terbutryn - biocides used for coastings and surface protection.
- Perfluorooctane sulfonic acid (PFOS) and
- Hexabromocyclododecane (HBCDD) - industrial chemicals.
- Dioxin and Dioxin-Like PCBs – used in the past in electronic equipment and now produced from combustion.
- 17 alpha-ethinylestradiol (EE2), 17 beta-estradiol (E2) and Diclofenac – used in drug manufacturing. EE2 is an ingredient in contraceptive drugs, while E2 is used in hormone replacement medications.

With the aim of achieving good surface water chemical status, the revised EQS for existing priority substances should be met by the end of 2021 and the EQS for newly identified priority substances by the end of 2027.



ENVIRONMENTAL POLLUTION

More than **100 individual water** samples from over **100 European rivers** from 27 European Countries were analyzed for 35 selected compounds, comprising pharmaceuticals, pesticides, PFOS, PFOA, benzotriazoles, hormones, and endocrine disrupters.

Around 40 laboratories participated in this sampling exercise. **Only about 10% of the river** water samples analyzed could be classified as "very clean" in terms of chemical pollution.

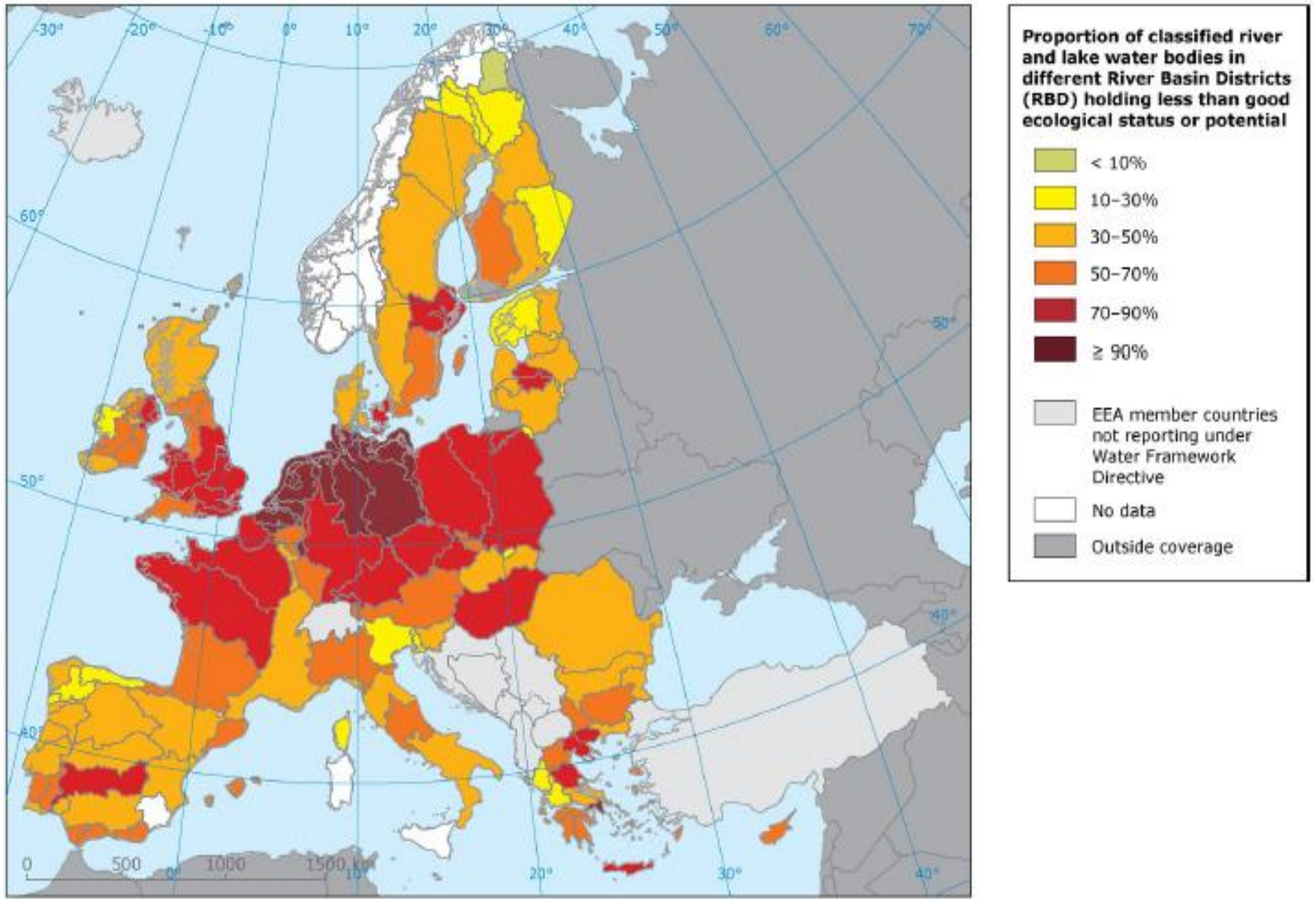
ASSESSMENT OF CHEMICAL STATUS OF SURFACE WATERS in 14 River Basin Districts (RBD), Vjosa River included in GR05 (8 rivers)

Only a few priority substances were investigated:

- Heavy metals (Cadmium, Lead, Mercury, Nickel)
- Pesticides (Diuron, Isopruton)
- Industrial pollutants (Brominated Diphenylether, 8 Di(2-ethylhexyl)phthalate (DEHP);
- Other pollutants

Exceedances were found only for Brominated Diphenylether , Diuron and Tributyltin compounds

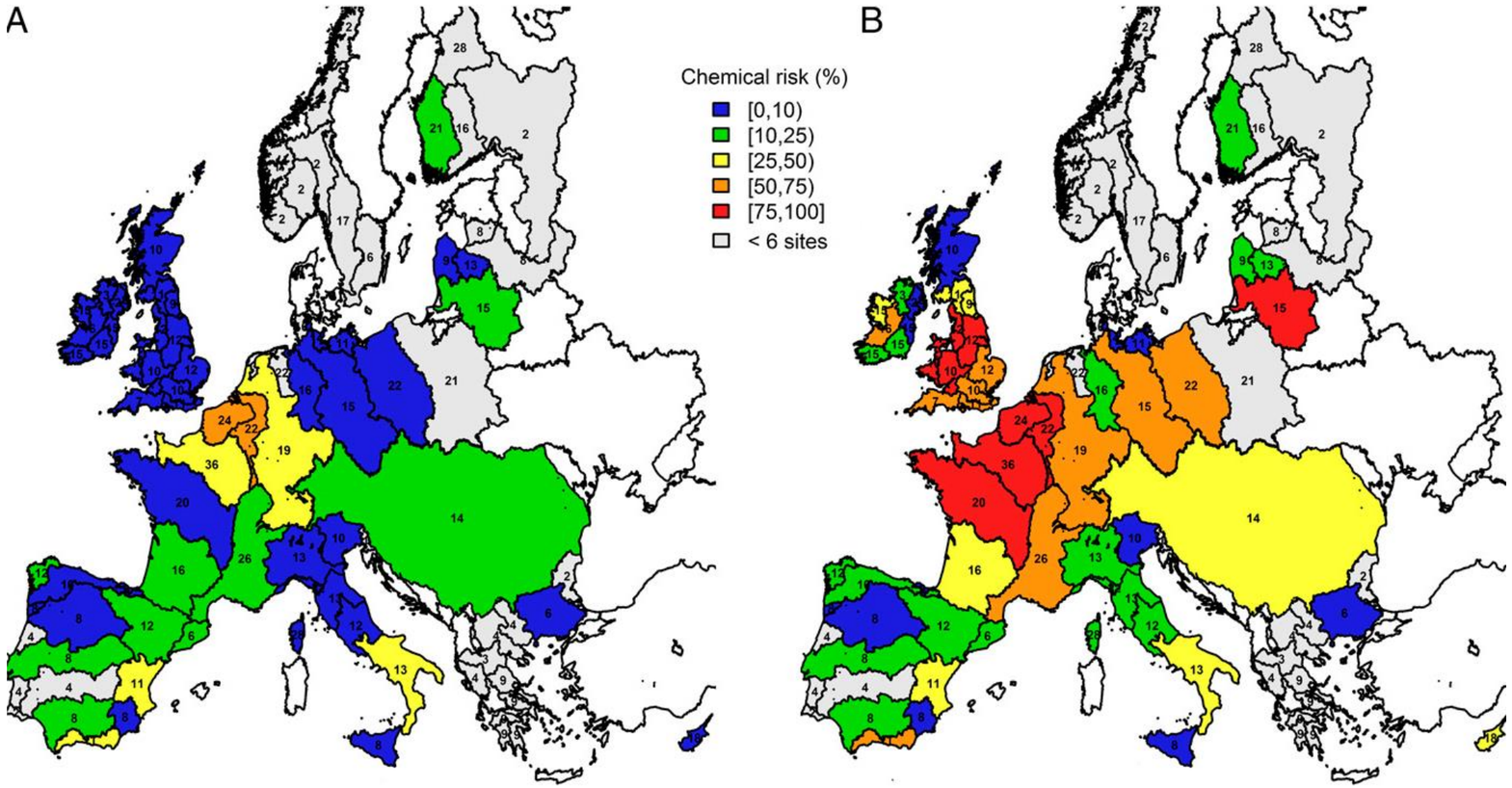
Map 1: Proportion of classified river and lake water bodies in different River Basin Districts (RBD) holding less than good ecological status or potential



Organic chemicals jeopardize the health of freshwater ecosystems on the continental scale

Egina Malaj[a,b,1], Peter C. von der Ohe[a,c], Matthias Grote[d], Ralph Kühne[e], Cédric P. Mondy[f], Philippe Usseglio-Polatera[g], Werner Brack[a], and Ralf B. Schäfer[b,1]

[a]Department of Effect-Directed Analysis, Helmholtz Centre for Environmental Research-UFZ, 04318 Leipzig, Germany; [b]Institute for Environmental Sciences, University of Koblenz-Landau, 76829 Landau, Germany; [c]Amalex Environmental Solutions, 04103 Leipzig, Germany; [d]National Hydraulics and Environment Laboratory, Research and Development Division, Electricité de France, 78401 Chatou, France; [e]Department of Ecological Chemistry, Helmholtz Centre for Environmental Research-UFZ, 04318 Leipzig, Germany; [f]Department of Systems Analysis, Integrated Assessment and Modelling, Eawag: Swiss Federal Institute of Aquatic Science and Technology, 8600 Dübendorf, Switzerland; and [g]Interdisciplinary Laboratory for Continental Environments, Centre National de la Recherche Scientifique, Unité Mixte de Recherche 7360, University of Lorraine, 57070 Metz, France



Chemical risk (by percentage range) in European river basins.

The map displays the fraction of sites where the maximum chemical concentration
exceeds the acute risk threshold (A)
and the mean chemical concentration exceeds the chronic risk threshold (B) for any organism group.
This dataset comprises > 8,200 monitoring sites, covering 34 European countries, >200 organic pollutants

ENVIRONMENTAL POLLUTION OF RIVERS, LAKES AND WETLANDS IN GREECE

Environmental Research and Reports on the State of Greek Freshwater Resources

Athanasios Valavanidis, Thomais Vlachogianni
Department of Chemistry, University of Athens, University Campus Zografou, 15784 Athens, Greece

EUROPEAN CLASS
ARISTOTLE UNIVERSITY OF THESSALONIKI
SCHOOL OF BIOLOGY

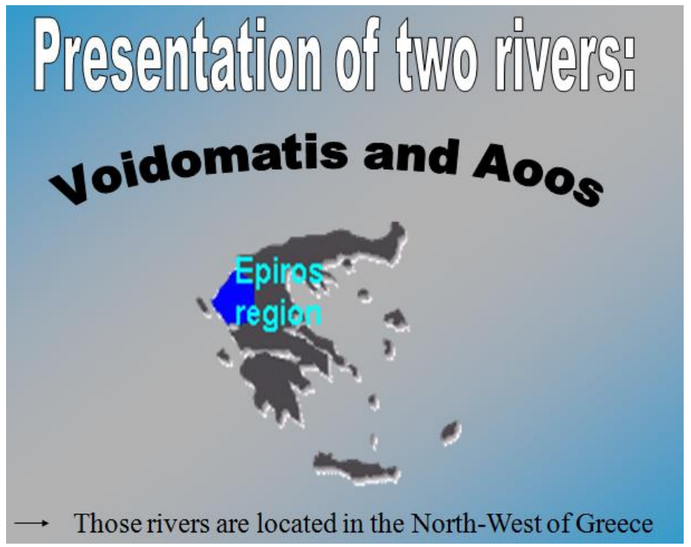
EUROPEAN CLASS 2000

PROJECTS OF FRESHWATER ECOLOGY

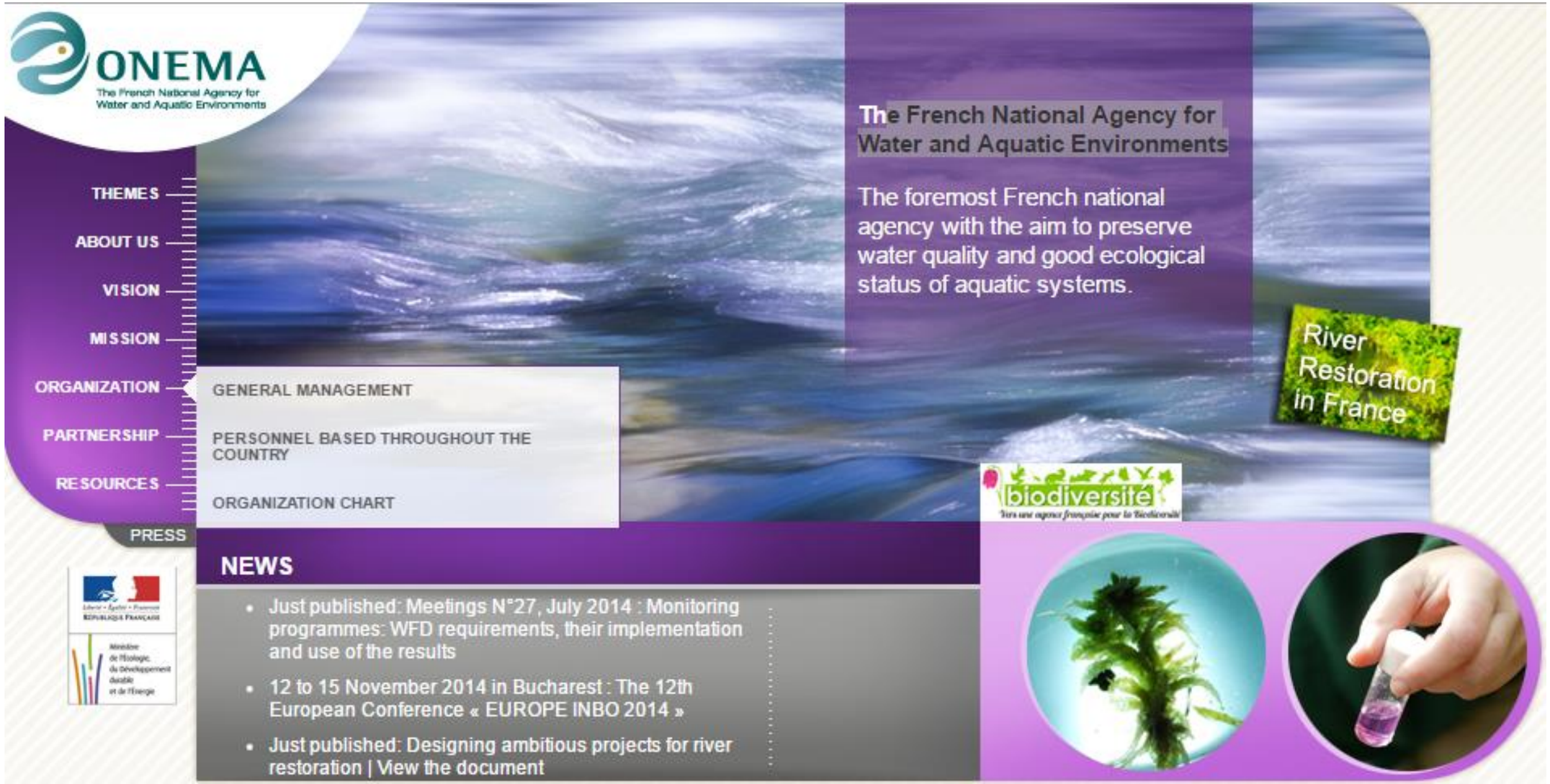
Rivers

Lake Pamvotis

Heavy metal concentrations and natural radioactivity were measured on the surface waters of rivers Aoos, Kalamas, Louros (Epirus), Aliakmonas (Macedonia) and Pinios (Thessaly) in the period 2004–2006. Concentrations for metals were lower than the ones usually found in polluted rivers.

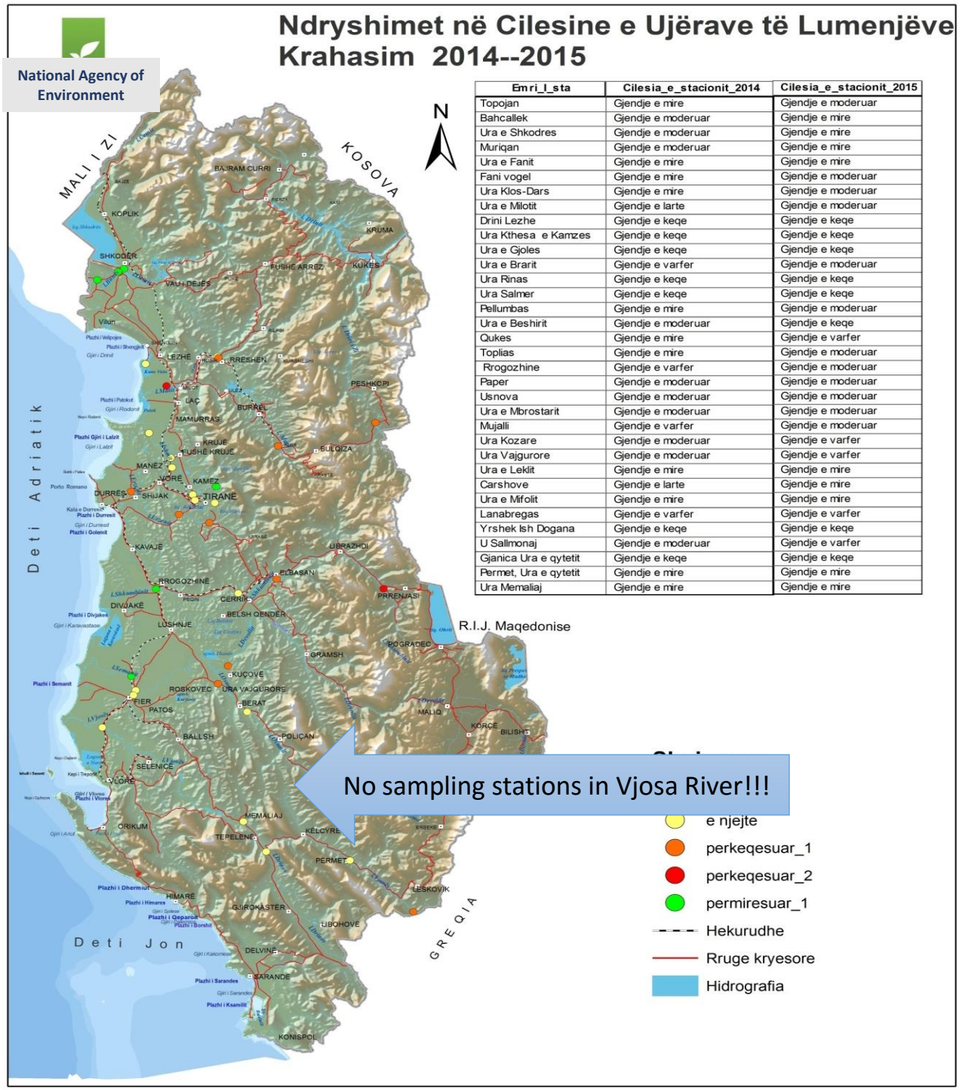


	Aoos
Conductivity (μ Siemens)	207
TDS (mg/l)	106
pH	8,43
DO_2 (mg/l)	10,54
DO (%)	100
Temp (°C)	14,1


ONEMA
The French National Agency for Water and Aquatic Environments
THEMES
ABOUT US
VISION
MISSION
ORGANIZATION
PARTNERSHIP
RESOURCES
PRESS
GENERAL MANAGEMENT
PERSONNEL BASED THROUGHOUT THE COUNTRY
ORGANIZATION CHART
The French National Agency for Water and Aquatic Environments
The foremost French national agency with the aim to preserve water quality and good ecological status of aquatic systems.
River Restoration in France
biodiversité
NEWS
Just published: Meetings N°27, July 2014 : Monitoring programmes: WFD requirements, their implementation and use of the results
12 to 15 November 2014 in Bucharest : The 12th European Conference « EUROPE INBO 2014 »
Just published: Designing ambitious projects for river restoration | View the document

COMPARISON OF RIVER WATER QUALITY 2014-2015

Two systems were used for assessing the quality of the water of Vjosa River: biological parameters and nutrient content. Samples are collected every month from March – August, 2011 at six stations along the upstream of the Vjosa River, Albania. According to the data concerning benthic micro-invertebrates, the water of Vjosa River is, in total, of good quality. The values of parameters like EPT, biotic index, tolerance value and nutrients are in correlation with bacterial loads in the water. The human impact on the quality of water of Vjosa River is more than evident. The uncontrolled disposals of untreated industrial and domestic wastes in Albania are considered the main pollution sources so that it is necessary to strength the environmental periodic control of the contamination factors and parameters.



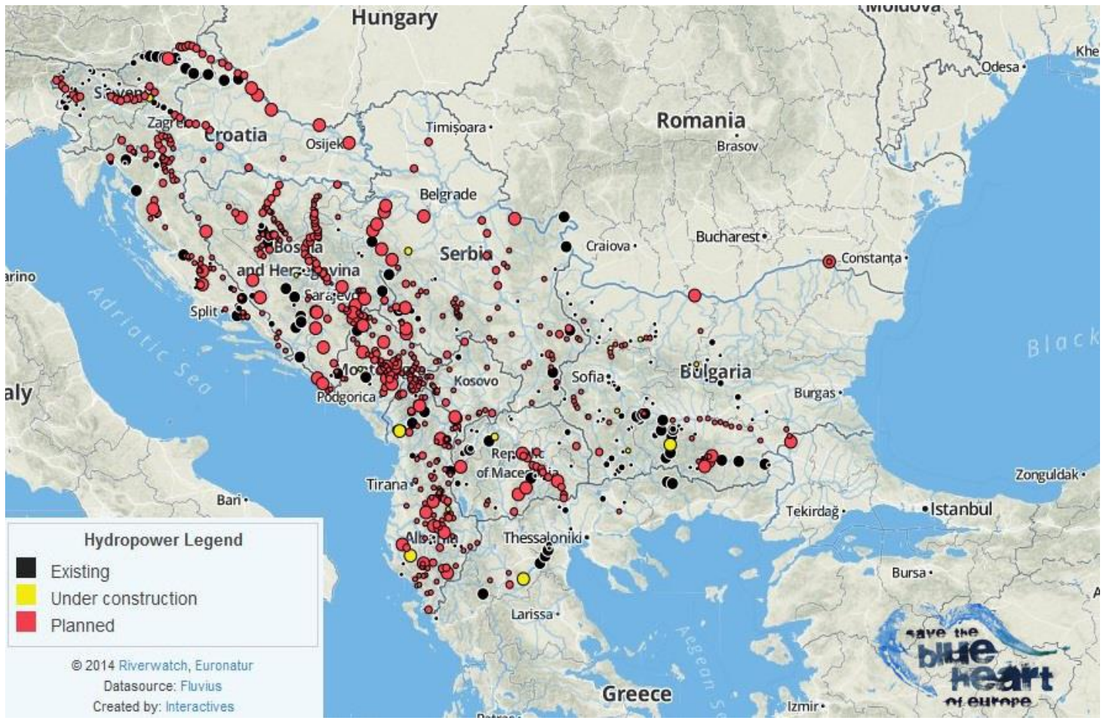
Emri_I_sta	Cilesia_e_stacionit_2014	Cilesia_e_stacionit_2015
Topojan	Gjendje e mire	Gjendje e moderuar
Bahcallek	Gjendje e moderuar	Gjendje e mire
Ura e Shkodres	Gjendje e moderuar	Gjendje e mire
Muriqan	Gjendje e moderuar	Gjendje e mire
Ura e Fanit	Gjendje e mire	Gjendje e mire
Fani vogel	Gjendje e mire	Gjendje e moderuar
Ura Klos-Dars	Gjendje e mire	Gjendje e moderuar
Ura e Milotit	Gjendje e larte	Gjendje e moderuar
Drini Lezhe	Gjendje e keqe	Gjendje e keqe
Ura Kthesa e Kamzes	Gjendje e keqe	Gjendje e keqe
Ura e Gjoles	Gjendje e keqe	Gjendje e keqe
Ura e Brarit	Gjendje e varfer	Gjendje e moderuar
Ura Rinas	Gjendje e keqe	Gjendje e keqe
Ura Salmer	Gjendje e keqe	Gjendje e keqe
Pellumbas	Gjendje e mire	Gjendje e moderuar
Ura e Beshirit	Gjendje e moderuar	Gjendje e keqe
Qukes	Gjendje e mire	Gjendje e varfer
Toplias	Gjendje e mire	Gjendje e moderuar
Rrogozhine	Gjendje e varfer	Gjendje e moderuar
Paper	Gjendje e moderuar	Gjendje e moderuar
Usnova	Gjendje e moderuar	Gjendje e moderuar
Ura e Mbrostarit	Gjendje e moderuar	Gjendje e moderuar
Mujalli	Gjendje e varfer	Gjendje e moderuar
Ura Kozare	Gjendje e moderuar	Gjendje e varfer
Ura Vajgurore	Gjendje e moderuar	Gjendje e varfer
Ura e Leklit	Gjendje e mire	Gjendje e mire
Carshove	Gjendje e larte	Gjendje e mire
Ura e Mifolit	Gjendje e mire	Gjendje e mire
Lanabregas	Gjendje e varfer	Gjendje e varfer
Yrshek Ish Dogana	Gjendje e keqe	Gjendje e keqe
U Sallmonaj	Gjendje e moderuar	Gjendje e varfer
Gjanica Ura e qytetit	Gjendje e keqe	Gjendje e keqe
Permet, Ura e qytetit	Gjendje e mire	Gjendje e mire
Ura Memaliaj	Gjendje e mire	Gjendje e mire

CONCLUSIONS AND RECOMMENDATIONS

- There are no systematic studies for physico-chemical parameters for Vjosa River waters. Not all the parameters have been investigated
- There are no data for priority substances according to Directive 2013/39/EU , so there is no assesment of chemical status of river waters
- In order to estimate the “chemical status” of Vjosa river waters, regular monitoring studies of physical, chemical parameters and priority substances are necessary
- More sampling stations close to urban areas
- There is a need of collaboration between chemists and biologists in this field

BIOLOGICAL QUALITY OF WATERS IN THE VJOSA CATCHMENT

A. Miho, A. Paparisto, S. Beqiraj, E. Hamzaraj, M. Hysko, K. Puto
Faculty of Natural Sciences, University of Tirana

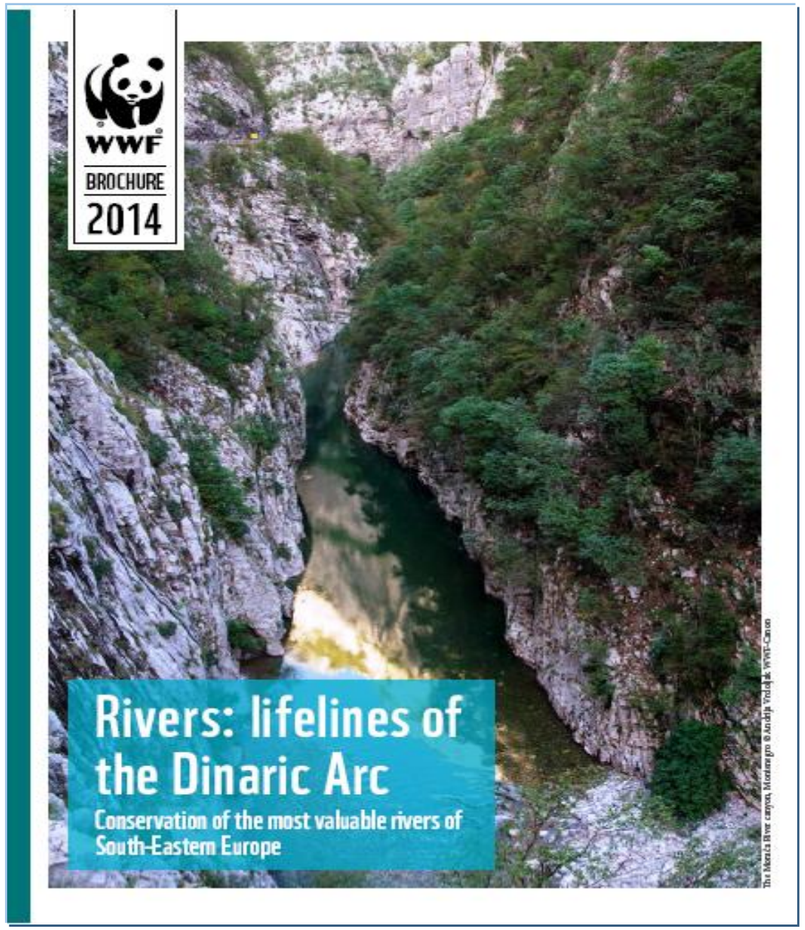


THE CAMPAIGN: SAVE THE BLUE HEART OF EUROPE

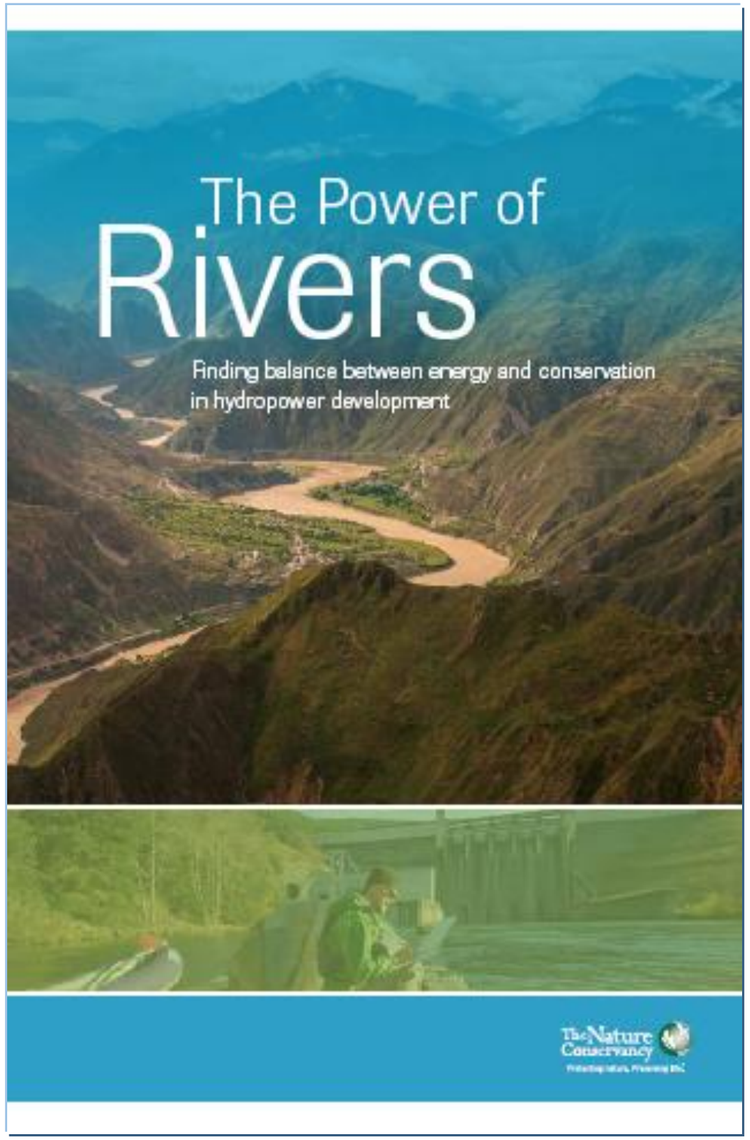
http://www.balkanrivers.net/en/news

Ed. (2014): **Rivers: lifelines of the Dinaric Arc**

Conservation of the most valuable rivers of South-Eastern Europe. WWF – World Wide Fund for Nature (Formerly World Wildlife Fund), Rome, Italy. 17 pp.



http://d2ouvy59p0dg6k.cloudfront.net/downloads/rivers_lifelines_of_the_dinaric_arc_1.pdf



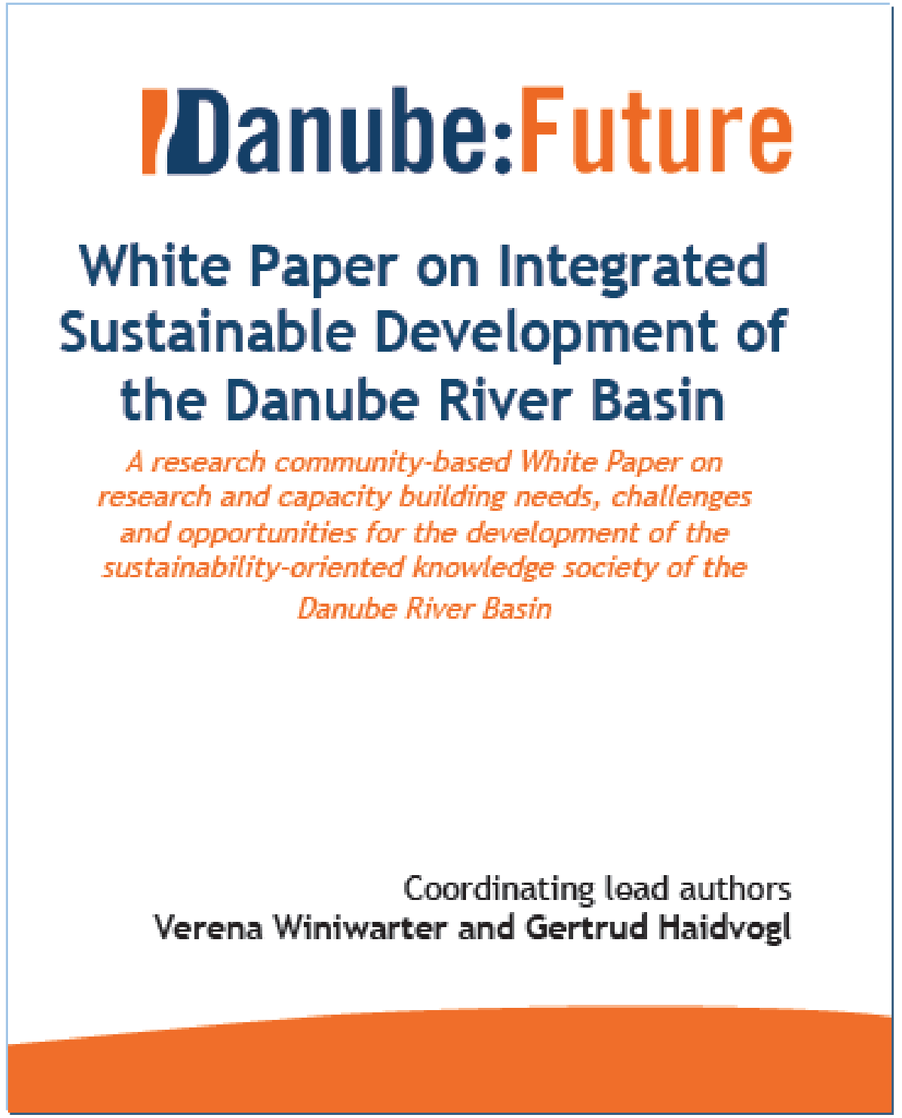
The Power of Rivers: Finding balance between energy and conservation in hydropower development

Opperman J., Grill G., Hartmann J. (2015): The Power of Rivers: Finding balance between energy and conservation in hydropower development. The Nature Conservancy: Washington, D.C.

http://www.hydrosustainability.org/getattachment/ad1b6774-ca2b-40c8-9285-d13a61395370/Nature-Conservancy--The-Power-of-Rivers.aspx

Danube: Future White Paper on Integrated Sustainable Development of the Danube River Basin

http://www.danubefuture.eu/sites/default/files/DanubeFuture_WhitePaper.pdf



BIOQUALITY - INDICATORS

- Periphyton data (diatoms)
- Macroinvertebrates
- Microbiology

Vjosa River with the most important mentioned sampling sites

PERIPHYTON DATA (DIATOMS)

Periphyton sampling (EN13946:2003):

Brushing the upper surface of the hard substratum (stones) vigorously to remove the diatom film with a stiff toothbrush (or other similar instrument, small knife);

Collection of submerged macrophytes and macroalgae;

Transport/Preservation in plastic bottles 50 ml in formaldehyde 4% or denaturized ethanol 90%;

PERIPHYTON - LAB WORK

Cleaning of diatom frustules boiling the material, first with HCl cc and then with H2SO4cc, or with H2O2cc as described by Krammer & Lange-Bertalot (1986-2001) & EN13946:2003.

Permanent microscopic slides using Naphrax (index 1.69). Samples and permanent slides deposited in Lab of Botany, University of Tirana.

BIOQUALITY SURVEY - LAB WORK

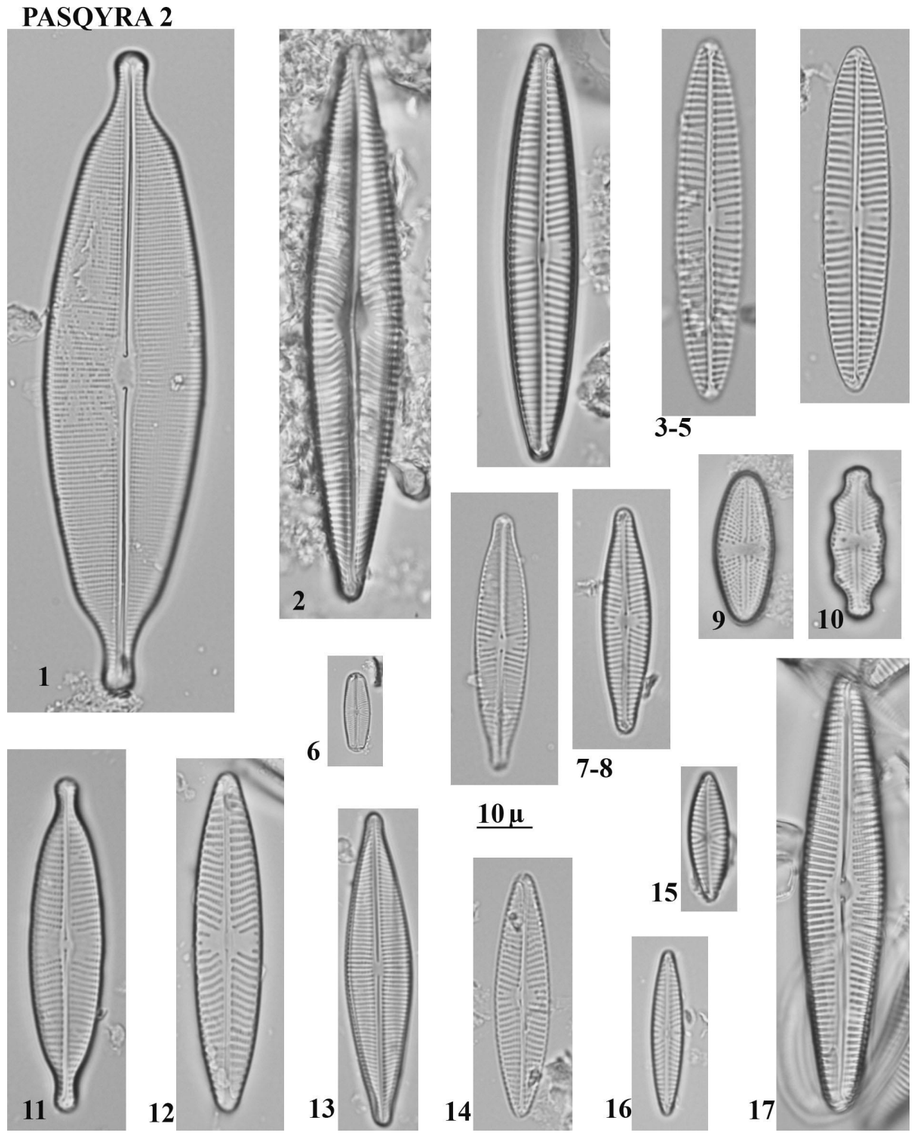
Examination using microscopes Leica DLMB, Motic BA310, with objectiv HI100x, and digital camera, in the lab of Botany, FNS, UT

Taxonomic determination using Krammer & Lange-Bertalot (1986-2001), Witkowski (2000) keys, AlgaeBase (Guiry & Guiry, 2016), World Register of Marine Species (WoRMS) and other available literature.

More than 400 valves counted in each microscopic slide/s, obtaining **statistically reliable** results (limit of confidence up to 95%).

PERIPHYTON DATA (DIATOMS)

1. *Navicula (Craticula) ambigua* Ehrenberg;
2. *Navicula radiosa* Kützing;
3-5. *N. tripunctata* (Müller) Bory;
6. *N. pupula* Kützing var.pupla;
7-8. *N. veneta* Kützing;
9. *N. mutica* Kützing var. *mutica*;
10. *N. nivalis* Ehrenberg;
11. *N. capitatoradiata* Germain;
12. *N. dealpina* Lange-Bertalot;
13. *N. halophila* (Grunov) Cleve;
14. *N. erifuga* Lange-Bertaloti;
15-16. *N. cryptotenelloides* Lange-Bertalot



BIOQUALITY USING DIATOMS - TROPHIC INDEXES

Calculated using the formula of Zelinka & Marvan (1961):

Saprobic Index (SI) indicate the presence of degradable organic compounds (Rott et al., 1997)

$$SI = \frac{\sum_{i=1}^{n} S_i G_i p_i}{\sum_{i=1}^{n} G_i p_i}$$

Trophic Index of Diatoms (TIDIA) based on the presence of the non-organic nutrients (nitrogen and phosphorous) (Rott et al., 1999)

$$TI_{DIA} = \frac{\sum_{i=1}^{n} TW_i G_i p_i}{\sum_{i=1}^{n} G_i p_i}$$

Specific Pollution Sensitivity Index (IPS), (Coste in Cemagref, 1982)

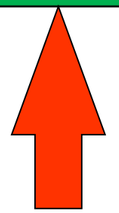
$$IPS_o = \frac{\sum_{i=1}^{n} n_i S_i V_i}{\sum_{i=1}^{n} n_i V_i}$$

Diversity index (H') (Shannon & Weaver, 1949). Maraglef index (d; 1957) d = (S 1)/logeN

$$H' = -\sum_{i=1}^{n} p_i \log_2 p_i$$

INDEX OF POLLUTION SENSITIVITY (IPS) (COSTE IN CEMAGREF, 1982)

Bad / Keqe	Poor / Varfër	Moderate / Mesatare	Good / Mirë	High / Shumë mirë
IPS < 5	5 ≤ IPS < 9	9 ≤ IPS < 13	13 ≤ IPS < 17	17 ≤ IPS ≤ 20



The EU Water Framework Directive 2000/60/EC aims for **'good status'** for all ground and surface waters (rivers, lakes, transitional waters, and coastal waters) in the EU.

DIATOM INDEXES FROM VJOSA CATCHMENTS WATERS (1996-2015)

Code	River	Station	N	H'	d	TIDIA	TIDIA Class	SI	SI Class	IPS	IPS Class
						06.09.1996					
187	Lengarica	Radova spring	13	2.4	1.89	2.8	Eupolytroph	1.6	I-II	14.59	Good
188	Drino	Tepelena spring	17	2.7	2.49	2.6	Eutroph	1.6	I-II	14.09	Good
						11.05.2002 & 12.05.2002 (Kupe, 2006)					
294	Shalsi river	Shalsi river, Germenj	31	7.1	4.77	1.8	Mesotroph	1.7	I-II	15..94	Good
295	Shalsi	Spring, Germenj	25	3	3.80	2.9	Eupolytroph	1.7	I-II	15.47	Good
296	Lengarica	Radova spring	13	2.6	1.97	2.6	Eutroph	2.1	II	11.59	Moderate
297	Vjosa	Kelcyra spring	26	2.5	3.68	2.0	Mesoeutroph	2.1	II	15.47	Good
298	Vjosa	Kelcyra spring	26	3.4	4.00	2.3	Eutroph	1.8	II	15.30	Good
299	Drino	Tepelena spring	22	3.0	3.31	2.3	Eutroph	1.5	I-II	16.80	Good
300	Drino	Sotira	19	3.2	2.86	2.5	Eutroph	1.8	II	17.06	Good
						10.05.2004 (Kupe, 2006)					
14	Shalsi	Spring, Germenj	35	2.51	5.46	1.9	Mesoeutroph	-	-	17.38	Good
15	Vjosa	Dragoti	44	3.29	6.76	2.1	Mesoeutroph	-	-	14.31	Good
16	Vjosa	Mifoli	28	2.92	4.32	1.5	Oligomesotroph	-	-	16.61	Good

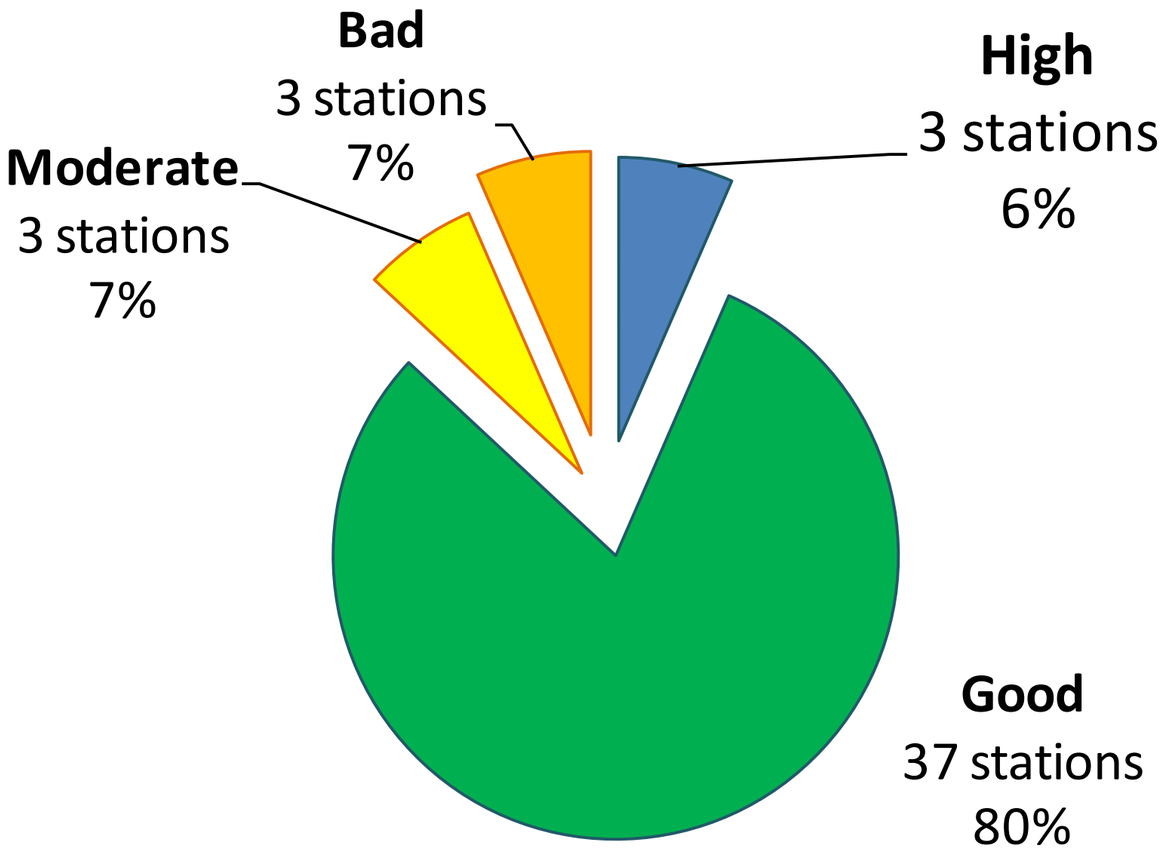
DIATOM INDEXES FROM VJOSA CATCHMENTS WATERS (1996-2015)

Code	River	Station	N	H'	d	TI_{DIA}	TI_{DIA} Class	SI	SI Class	IPS	IPS Class
22.10.2005											
1-9 samples	Lengarica	Benja thermal springs	9-23	2.1-3.3	1.74-4.78	1.4-3.3	Oligo- to Eupolytroph	1.6-2.4	I-II to II	5.68-16.88	Poor - High
06.10.2006 & 07.10.2006 (Kupe, 2006)											
Al_RV_20	Vjosa	Çarshova	28	4.18	4.35	2.81	Eu-polytroph	1.95	II	14.9	Good
Al_RV_21	Vjosa	Permeti	23	2.15	4.19	2.61	Eutroph	1.91	II	13.1	Good
Al_RV_36	Vjosa	Dragoti	24	2.85	3.67	2.39	Eutroph	1.85	II	15.5	Good
Al_RV_35	Drino	Lekli	32	3.28	4.91	2.31	Eutroph	1.72	I-II	15.4	Good
Al_RV_37/0	Vjosa	Memaliaj	54	2.74	-	1.13	Oligotroph	1.91	II	14.8	Good
Al_RV_37/1	Vjosa	Qesarati	21	1.95	3.57	2.36	Eutroph	1.74	I-II	15.7	Good
Al_RV_38	Vjosa	Kute	62	4.34	9.65	2.38	Eutroph	1.73	I-II	14.89	Good
Al_RV_19	Vjosa	Mifoli	17	0.85	2.44	1.47	Oligo-mesotroph	1.60	I - II	16.73	Good
01.02.2010 & 16.04.2010 (Reservoirs)											
3	Vjosa	Ballsh	38	2.88	4.98	1.8	Mesotroph	1.7	I-II	17.52	High
1 & 4	Vjosa	Fratari	35, 56	3.90, 4.33	8.37, 8.94	2.7, 1.8	Eupolytroph-Mesotroph	2.1, 1.3	II, I	11.08, 16.17	Moderate - Good
5, 6, 8	Drino	Viroi	22-59	1.95-3.27	3.2-4.5	2.0-2.4	Mesoeutroph-Eutroph	1.7-1.8	I-II	17.35-17.57	High
November 2011 (Black Spring); 17 & 21.04.2012											
8	Vjosa	Black spring	41	1.92	6.31	2.3	Eutroph	2.1	II	15.28	Good
7	Drino	Viroi spring	34	2.82	5.30	2.2	Eutroph	1.7	I-II	18.06	High
6	Drino	Viroi reservoir	29	2.9	4.39	1.6	Oligo-mesotroph	1.4	I-II	15.28	Good
Al_RV_19	Vjosa	Mifoli	23	1.42	3.48	2.2	Eutroph	1.8	II	16.01	Good

DIATOM INDEXES FROM VJOSA CATCHMENTS WATERS (1996-2015)

Code	River	Station	N	H'	d	TI_{DIA}	TI_{DIA} Class	SI	SI Class	IPS	IPS Class
March-April, 2015; and Cajupi spring, 22.03.2014; Gusmari reservoir, Tepelena, 19.07.2004											
1	Vjosa	Mifoli	50	-	7.53	-	-	-	-	15.58	Good
10-Qe	Vjosa	Qesarati	24	-	3.64	-	-	-	-	15.43	Good
6-Dr	Vjosa	Dragoti	26	-	4.03	-	-	-	-	15.76	Good
7-Le	Drino	Lekli	47	-	7.39	-	-	-	-	14.36	Good
8-UF/Te	Drino	Uji i Ftohte, Tepelene	28	-	4.40	-	-	-	-	16.46	Good
4-Gj2	Drino	Virua (River)	60	-	9.47	-	-	-	-	11.88	Moderate
4'-Vi	Drino	Virua spring	23	-	3.54	-	-	-	-	15.70	Good
5-Ka	Kardhiqi	Kardhiqi	25	-	3.90	-	-	-	-	13.70	Good
3-Gj1	Drino	Kordhoce	22	-	3.30	-	-	-	-	15.70	Good
Çajup 1	Çajupi	Çajupi, spring	42	-	6.70	-	-	-	-	15.60	Good
10	Gusmari	Gusmari reservoir	27	-	4.21	-	-	-	-	14.97	Good

TSI QUALITY CLASSES FOR VJOSA CATCHMENTS WATERS (UP TO 2015)



MACROINVERTEBRATES, SAMPLING

- **Vjosa, Drino and Shushica** - eight stations (Çarshova, Permeti, Dragoti, Lekli (Drino river), Memaliaj, Qesarati, Vodica (Shushica river), Mifoli in October 2006 (Beqiraj et al., 2006).
- **Only Upper part of Vjosa –** 3 stations (Petrani, Mezhgorani and Memaliaj) during 2006 – 07 (Paparisto et al., 2008)
- **Only Upper part of Vjosa** - six stations (Çarshova; Petrani (upstream Permeti); Permeti; Piskove (downstream Permeti); Dragoti ose Kelcyra (???); Vasjari (downstream Memaliaj) in March – August, 2011 (Hamzaraj et al., 2012; 2014)
- **Kick net**, mesh size 0.5 mm

MACROINVERTEBRATES, LAB WORK

- **EPT indexes** were calculated, based on presence of Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies).
- **EPT Family index** and EPT index classification; MGBI Index and MGBI Index classification (HBRW Tier 2, 2002)

MACROINVERTEBRATES

EPT-families				
No.	**<2**	**2-5**	**6-10**	**>10**
Water quality	Poor	Good	Very good	Exellent
Level of impact	Impacted	Moderated impact	Fair impact	No impact

Biotic Index –EPT Family Richness			
Biotic Index	0-3.75	3.75-6.50	>6.50
Level of impact	No impact	Moderated impact	Impacted

EPT Family index and EPT index classification; MGBI Index and MGBI Index classification (HBRW Tier 2, 2002)

	Çarshova	Permeti	Dragoti	Lekli	Memaliaj	Qesarati	Vodica	Mifoli
T T	11	15	9	27	7	15	19	9
A av.	490	375	175	268	18	328	163	14
H'	1.5	1.8	1.8	3.3	-	1.7	2.8	-
EPT	7	7	3	7	2	7	4	3
EPT Class	Slightly impacted				Moderately impacted	Slightly impacted		
MGBI	4.43	4.44	3.70	3.97	4.33	4.25	2.78	4.90
MGBI Class	Not impacted							Slightly impacted

Quantitative data and values of some indexes for benthic macroinvertebrates of Vjosa River (Hamzaraj et al., 2014)

Quantitative data and values of some indexes for benthic macroinvertebrates of Vjosa River (Beqiraj et al., 2006)

Stations	**TNI**	**EPT**	**Quality**	**EPT BI**	**Impact**
Çarshova	612	7.0	Very good	2.71	No Impact
Petrani	274	5.5	Good	3.30	No Impact
Permeti	633	5.6	Good	3.06	No Impact
Piskove	2100	6.4	Very good	3.23	No Impact
Dragoti	1729	6.4	Very good	3.54	No Impact
Vasjari	722	5.6	Good	3.80	Mod. Impact

Quantitative data and values of some indexes for benthic macroinvertebrates of Vjosa River (Paparisto et al., 2008)

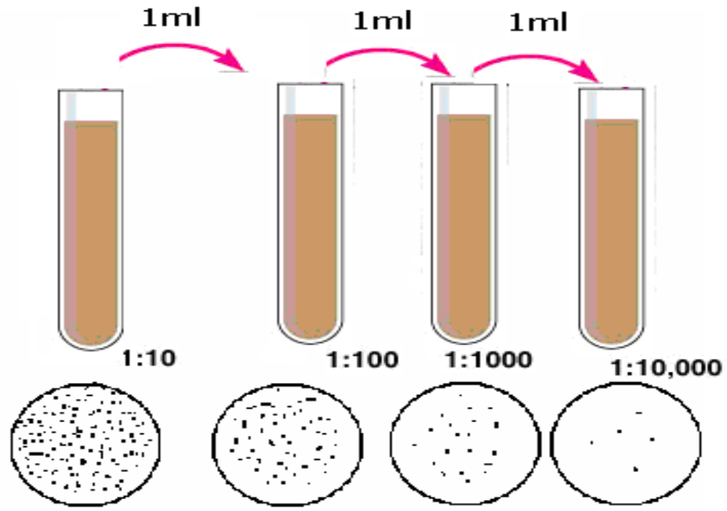
Selected groups	Families	TV	Density	TVxD
Mayflies	*Heptagenidae*	4	32	128
	Ephemeridae	4	10	40
	Caenidae	7	9	63
	Baetidae	4	4	16
Stoneflies	*Perlodidae*	2	22	22
	Leptoflebidae	2	10	20
	Chloroperlidae	1	1	1
	Capnidae	-	10	-
	Leuctidae	-	10	-
Caddisflies	*Hidropsichidae*	4	22	68
	Odontoceridae	0	8	0
	Lepidostomatidae	1	8	8
	Rhyacophilidae	0	6	0
	Beraeidae	-	4	-
	Density Total		132	
	TVxD Total			383
	EPT Biotic Index [(TVxD)/ D]	2.9		

MICROBIOLOGY, SAMPLING

- **Vjosa, Drino and Shushica** - eight stations (Çarshova, Permeti, Dragoti, Lekli (Drino river), Memaliaj, Qesarati, Vodica (Shushica river), Mifoli in October 2006 (**Hysko et al.**, 2010).
- **Upper part of Vjosa** - six stations (Çarshova; Petrani (upstream Permeti); Permeti; Piskove (downstream Permeti); Dragoti ose Kelcyra (???); Vasjar (downstream Memaliaj) in March – August, 2011 (**Hamzaraj et al.**, 2012; 2014)
- **Upper part of Vjosa and Drino** – 3 stations (Drino: Pasarela; Bridge, downstream Gjirokastra town; Virua spring; Vjosa: downstream Kelcyra; Tepelena, after joining with Drino) during Summer 2012 to Autumn 2013 (**Piro et al., 2013**)

MICROBIOLOGY, LAB WORK

MICROBIOLOGICAL STANDARD FOR RIVERS: ISO 7899-1 (CFU/100ML)				
Total coliforms	1,250	2,500	5,000	10,000
Fecal coliforms	250-500	500-1,000	1,000-2,000	over 2,000
Quality Class	**Very good**	**Good**	**Bad**	**Very Bad**

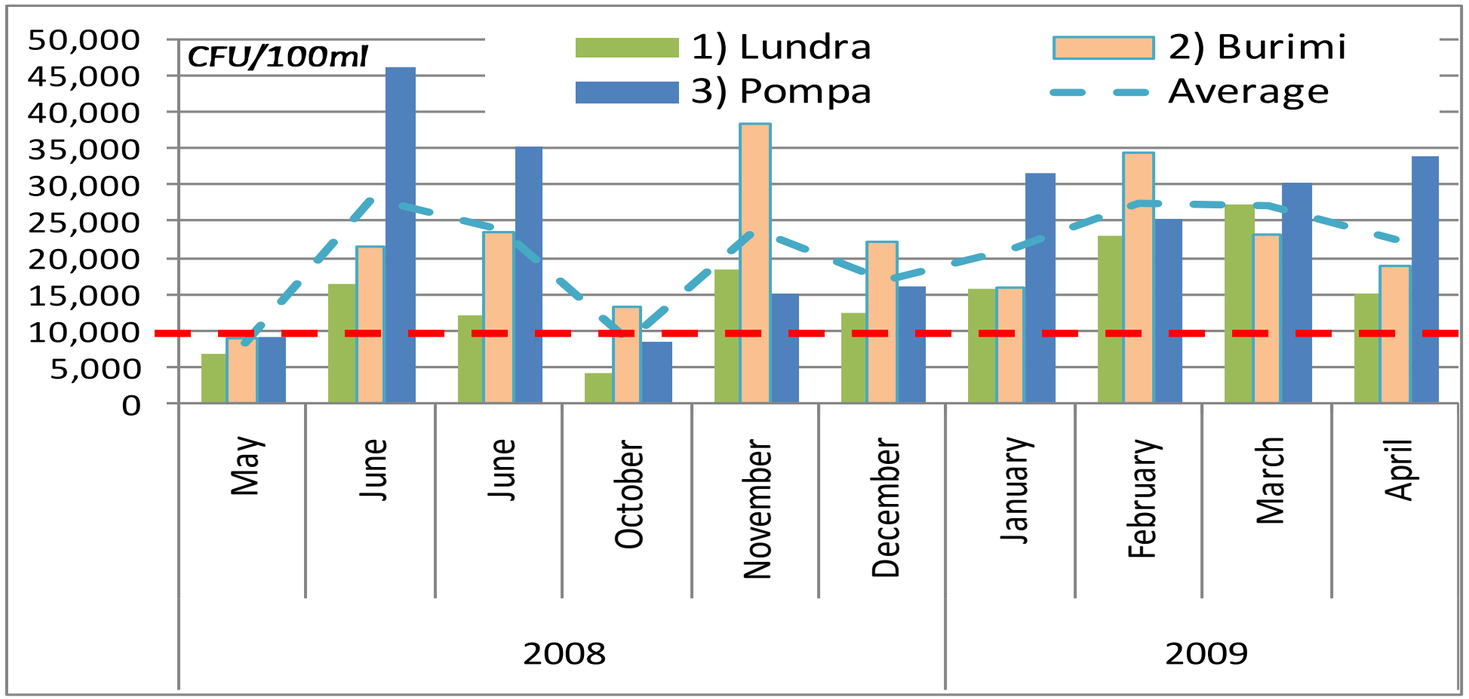


MPN index was used for the evaluation of total coliform bacteria in water, expressed as the number of organisms per 100 mL (CFU/100ml)

MICROBIOLOGY, VJOSA IN PERMETI

Years	Months	1) Lundra	2) Burimi	3) Pompa	Average
2008	May	7,067	9,050	9,283	8,467
	June	16,517	21,433	46,500	28,150
	June	12,400	23,617	35,500	23,839
	October	4,383	13,400	8,717	8,833
	November	18,567	38,417	15,117	24,034
	December	12,600	22,150	16,317	17,022
2009	January	15,933	15,883	31,700	21,172
	February	23,033	34,283	25,400	27,572
	March	27,450	23,283	30,617	27,117
	April	15,233	18,733	34,067	22,678

Total coliforms (CFU/100 ml) in three stations in Vjosa River in Permeti area, during 2008-2009 (**Hysko et al., 2010**). Colors are related with water quality classes based on the microbiological standard for rivers: ISO 7899-1



Total coliforms (CFU/100 ml) in three stations in Vjosa River in Permeti area, during 2008-2009 (**Hysko et al., 2010**). Colors are related with water quality classes based on the microbiological standard for rivers: ISO 7899-1

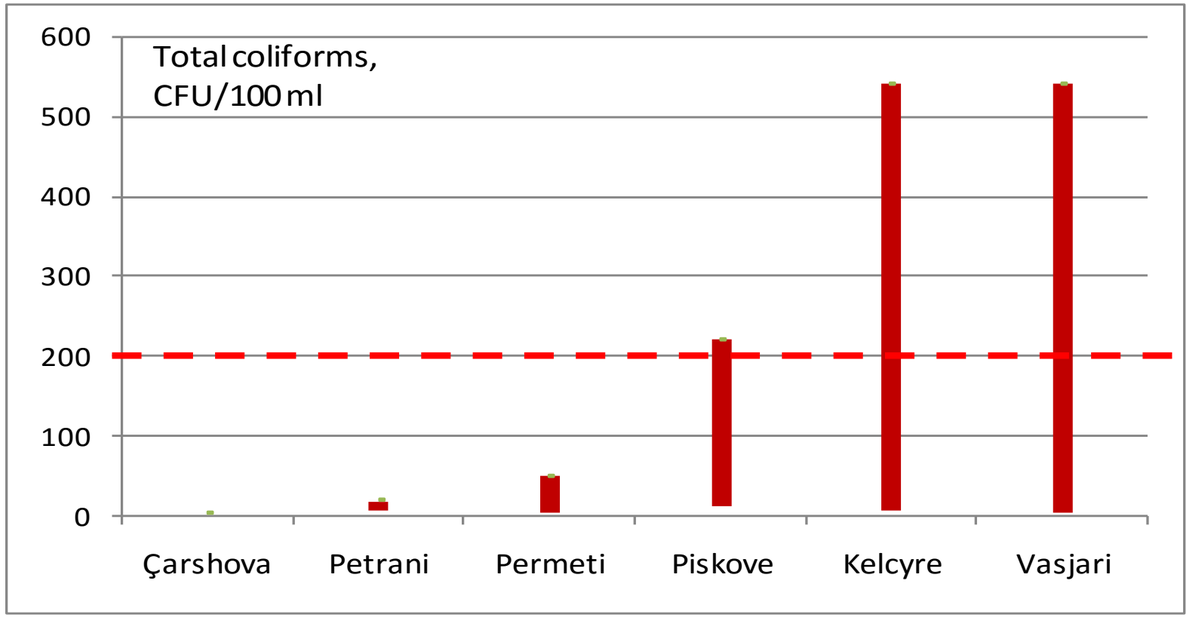
Stations	1) Lundra	2) Burimi	3) Pompa	Average	Control
Tomato	453,000	320,000	268,000	347,000	3,500
Cucumber	424,700	220,000	685,000	443,233	3,150
Peppers	380,800	250,000	297,000	309,267	3,050
Courgette	**4,045,300**	**3,900,000**	**1,960,000**	**3,301,767**	9,800
Egplants	293,000	360,000	395,000	349,333	2,850

Total coliforms (CFU/g fresh weight!) in vegetables (tomatoes, cucumber, eggplants, courgettes and peppers) irrigated with Vjosa waters from three stations in Permeti area, during 2008-2009 (**Hysko et al., 2010**).

MICROBIOLOGY IN PERMETI & TEPELENA

Stations	Total Coliforms (CFU/ 100 ml)	Heterotrophs (CFU/ml)
Çarshova	2	130
Petrani	5	213
Permeti	20	238
Piskove	84	2058
Dragoti	210	734
Vasjari	222	1051

Data on total coliforms and heterotrophs of Vjosa River (**Hamzaraj et al., 2014**)

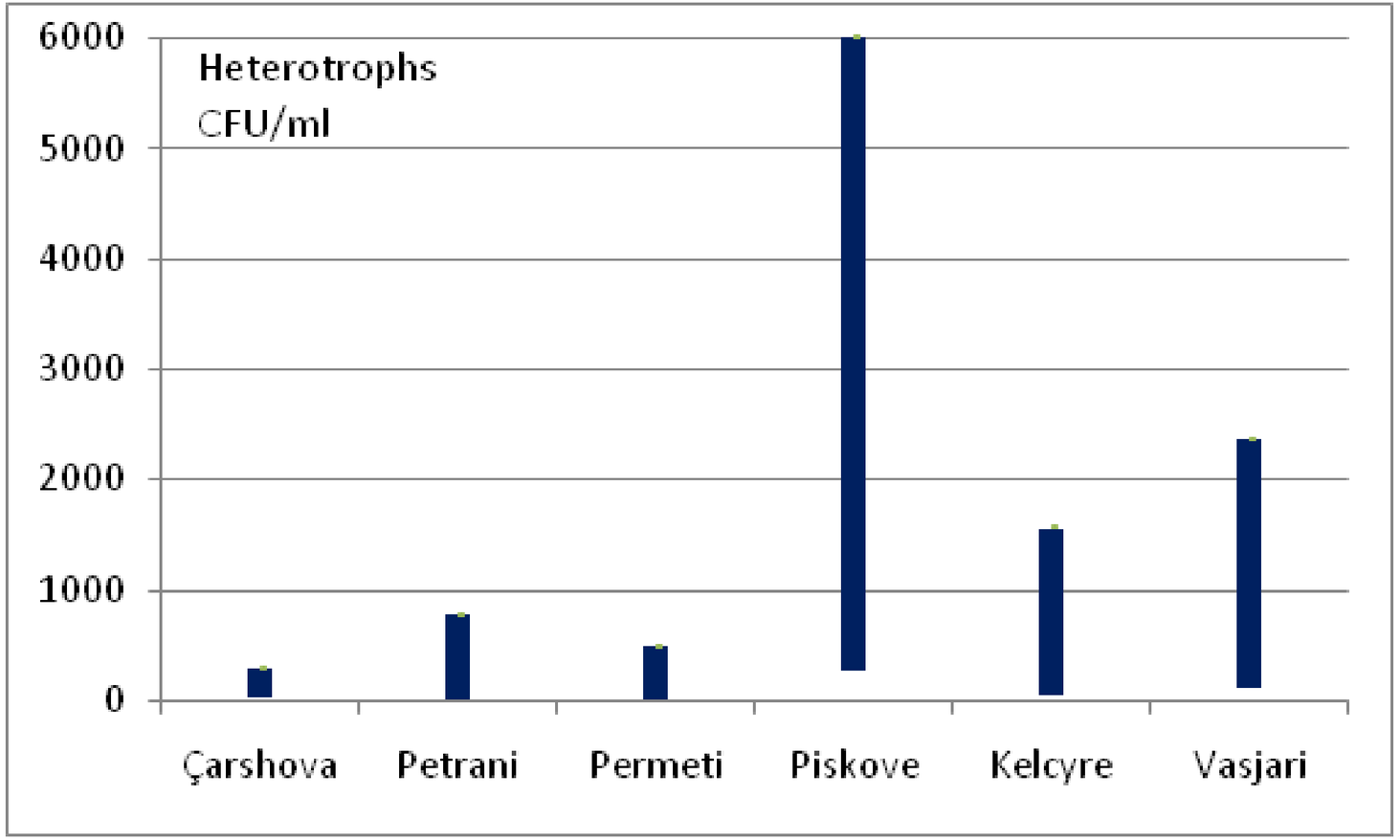


Dynamics of total coliforms (CFU/100ml) (minimum, average, maximum) in Upper part of Vjosa during March-August 2011, after (**Hamzaraj et al., 2014**). **Red dashed line** 200 CFU/100 ml is the water quality standard of US EPA (1986), where the swimming may be unsafe.

Year	Season	FC, CFU/100ml			FS, CFU/100ml		
		Kakavi	Pacarela	Bridge	Kakavi	Pacarela	Bridge
2013	Winter	140	46,000	1,500,000	-	-	-
	Spring	200	460,000	9,300,000	110	9,300	6,400
	Summer	240	460,000	12,000,000	230	12,000	23,000
	Autumn	240	93,000	750,000	230	4,300	7,500
2014	Vinter	230	28,000	240,000	210	2,400	11,000
	Spring	230	39,000	75,000	40	430	23,000
	Sumer	240	390,000	7,500,000	210	9,300	28,000

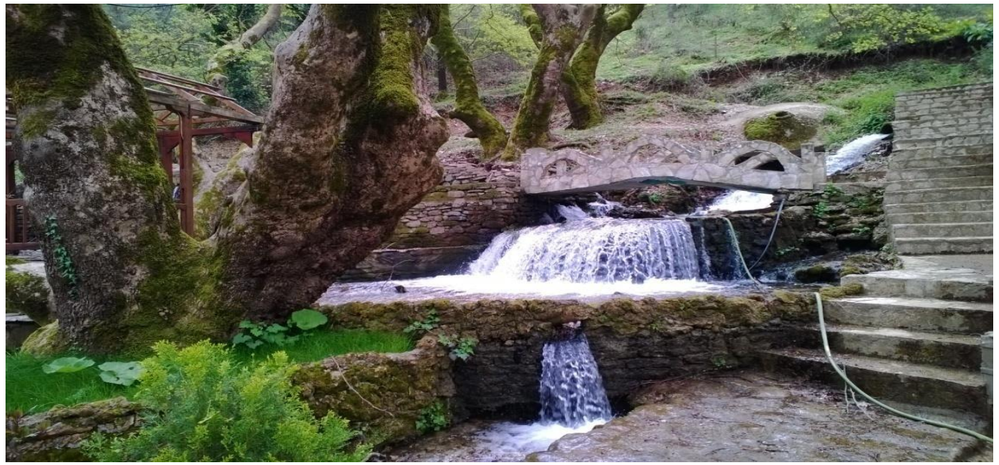
Recent data about fecal coliforms (FC) and fecal streptococci (FS) in waters of Drino river, its Upper part (Gjirokastra town up to the Greek border - Kakavi (**Puto, personal communication**).

MICROBIOLOGY IN PERMETI & TEPELENA



Dynamics of heteroptrophs (CFU/ml) (minimum, average, maximum) in the Upper part of Vjosa during March-August 2011, after (**Hamzaraj et al., 2014**).

RIVERSCAPE HABITATS FROM VJOSA CATCHEMNT



BIOQUALITY – SOME PUBLICATIONS

- Miho A. (2014): Overview on bioquality of Albanian surface waters based on microscopic algae. International Conference on Applied Biotechnology (ICAB-2014), organized and supported by FNS, UT, Tirana, 22 September 2014. Book of Proceedings: 11-16
- Meço M., Ndoj E., Nika O., Miho A. (2014): Vështrim mbi cilësinë biologjike të ujërave sipërfaqësore shqiptare. Buletini i Shkencave Natyrore (BSHN), Faculty of Natural Sciences, University of Tirana: Vol. 18: 49-60. http://buletini.fshn.edu.al/
- Miho A., Kupe L., Jaupaj O., Karjalainen S. M., Hellsten S., Pritzl G. (2008): Overview of Water Quality of Albanian Rivers. The Third International Scientific Conference BALWOIS 2008, Ohrid, Mk, 27-31 May 2008. http://balwois.com/balwois/administration/full_paper/ffp-969.pdf
- Beqiraj S., Licaj P., Luotonen H., Adhami E., Hellsten S., Pritzl G. (2006): Situation of benthic macroinvertebrates in Vjosa river-Albania and their relationships with water quality and environmental state. http://balwois.com/balwois/administration/full_paper/ffp-1190.pdf.
- Paparisto A., Keçi E., Pepa B., Muranyi D. (2008): Preliminary data on using insects and other invertebrate groups as biological indicators of water quality in some Albanian rivers. The Third International Scientific Conference BALWOIS 2008, Ohrid, Mk, 27-31 May 2008. http://balwois.com/balwois/administration/full_paper/ffp-969.pdf

BIOQUALITY – SOME PUBLICATIONS

- Hamzaraj E., Lazo P., Paparisto A., Laknori O., Duka S., Dahriu O. (2012): Water Quality from Microbiological Point of View of Vjosa River, Albania. BALWOIS 2012 - Ohrid, Republic of Macedonia - 28 May, 2 June 2012
- Hysko M., Gace B., Puto K. (2010): Microbial Water Pollution of Vjosa River and the Vegetable Contamination by Irrigation. BALWOIS 2010 - Ohrid, Republic of Macedonia - 25, 29 May 2010. http://balwois.com/balwois/administration/full_paper/ffp-1732.pdf
- Hamzaraj E., Lazo P., Paparisto A., Duka S., Mavromati J., Halimi E., Topoviti D. (2014): An overview of water quality of Vjosa river in Albania based on biological and chemical parameters. International Journal of Advances in Engineering & Technology, Vol. 7, Issue 5: 1359-1374. ©IJAET ISSN: 22311963:
- Piro Ç., Puto K., Azemaj E. (2013): Microbiological pollution of Vjosa and Drino rivers and the fresh vegetable contamination by irrigation. International Journal of Agriculture and Crop Sciences. Available online at www.ijagcs.com. IJACS/2013/6-19/1347-1352. ISSN 2227-670X ©2013 IJACS Journal

CONCLUSIONS

- The reported data were **sporadic**, sparse and **not regular in time** and focused **mostly in the Upper part**.
- The biological quality of waters in Vjosa catchment seems of **good quality**, besides the sporadic and not recent data.
- However, the waters may have **pollution from inorganic mater, nutrients** (nitrogen and phosphorous), but with low or moderated impact, probably due to the self-purification of rivers.
- **High microbiological content** were also found in the river parts close to urban centers.

RECOMMENDATIONS

- An **integrated study of Vjosa catchment** is strongly recommended, aimed to know the hydrology, physical-chemistry and biology of the waters, the knowledge of natural and biological values in the riverscape, of Vjosa, Drino and tributaries, and especially the human impact (urban, agriculture, livestock, forestry, etc.).
- It will help authorities for **developing conservation and management concepts** in the future, especially from large expansion of dams and not sustainable hydropower development in the future.

Riparian Landscape Structure and Vegetation Ecology of the Vjosa River

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Lulezim Shuka
Department of Biology/University of Tirana

WHAT VJOSA VALLEY REPRESENT IN THE FLORA AND VEGETATION POINT OF VIEW

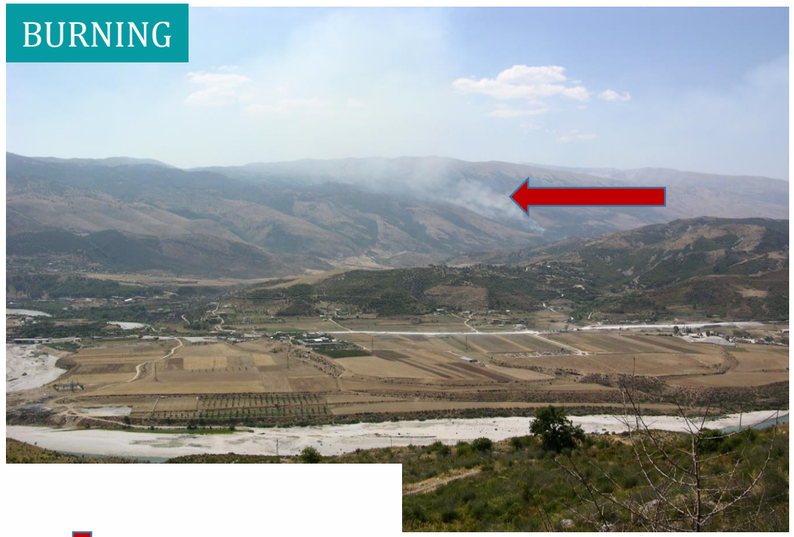
- Intact areas of native riparian vegetation of Vjosa Valley are an important component of both terrestrial and aquatic ecosystems which supports
- Highly diverse flora and fauna, being on the edge of an aquatic and terrestrial system
- Acts as a drought refuge, as in droughts it may be the only place where plants may have new growth, flowers or are producing seed – hence it can be an important source of food
- Provides breeding habitat for water birds and other species
- Is often the only reasonably healthy native vegetation remnant in catchments which have been largely cleared, giving it special importance to biodiversity; and,
- Acts as a wildlife corridor, linking habitats, though its value depends on it s size and structure.

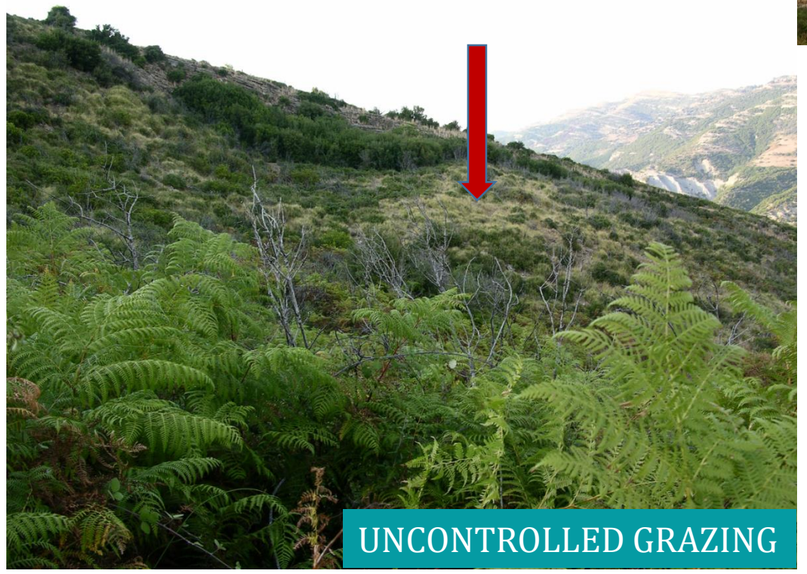
RIPARIAN VEGETATION IS IMPORTANT TO THE HEALTH OF RIVERS AND STREAMS BECAUSE IT PROVIDE

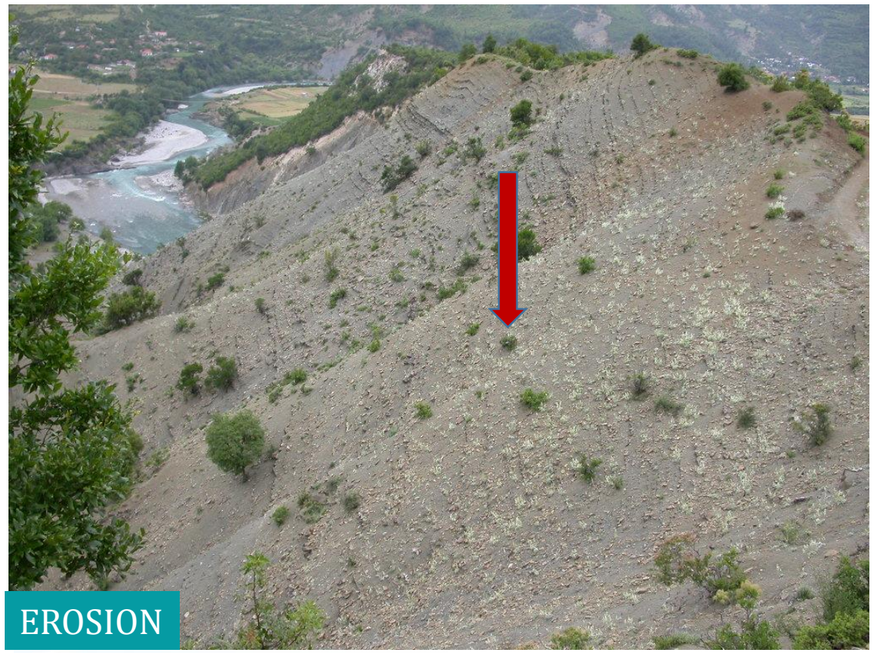
- Organic matter to a river – a major food source for in stream biota
- A supply of woody debris within the river that forms essential habitat areas for many fish and invertebrates and influences the river shape and substrate
- A source of shade that can influence water temperature and light penetration, therefore regulating instream primary production
- Stability to banks, minimizing erosion in many areas; and as
- A buffer between adjoining land and the river, filtering nutrients, sediment and pesticides from catchment runoff

MAIN THREATS FACING NATIVE RIPARIAN VEGETATION UP TODAY IN VJOSA VALLEY

- It is well known that a change of water flow in the Albanian rivers during last decades is companied with great impact on biodiversity and habitat fragmentation.
- Along with political and economic reason there have been identified serious impacts, generally in biodiversity loss, habitat destruction and ecological integrity of ecosystem functions
- Clearing and logging
- Erosion
- Chemical pollution in the recent past
- Uncontrolled grazing
- Weed invasion
- Changes to flow regimes
- Burning

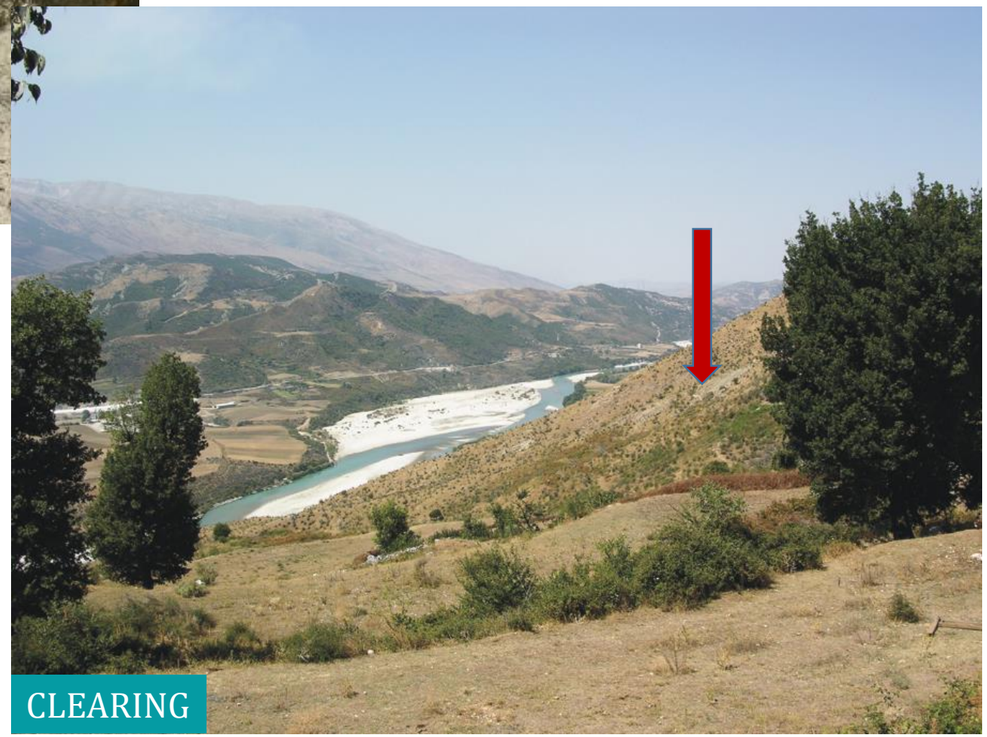

BURNING


UNCONTROLLED GRAZING



EROSION

EROSION



CLEARING

LOGGING

HOWEVER, THE VJOSA RIVER REMAIN THE ONLY UNTOUCHED RIVER IN EUROPE

The Vjosa Science Conference

The Vjosa – A unique opportunity for European River Science

FOREST SPECIES IN THE VJOSA VALLEY

Forest species	Area in ha
Pine tree	11,661
Fir	6,036
Oaks	38,518
Shrubs	61,214
Beech	1,320
Poplar	1,175
Chestnut + walnut + acacia	966
Broad leaf tree, etc	14,477

40% of the total surface of the upper part of Vjosa Valley is covered by forests. Oaks, beeches, firs and pine trees are the most extensive forest ecosystems

View from Biovishda Bridge

DIFFERENT HABITAT TYPES MAKE VJOSA RIVER AN IMPORTANT ECOSYSTEM FOR BIODIVERSITY CONSERVATION

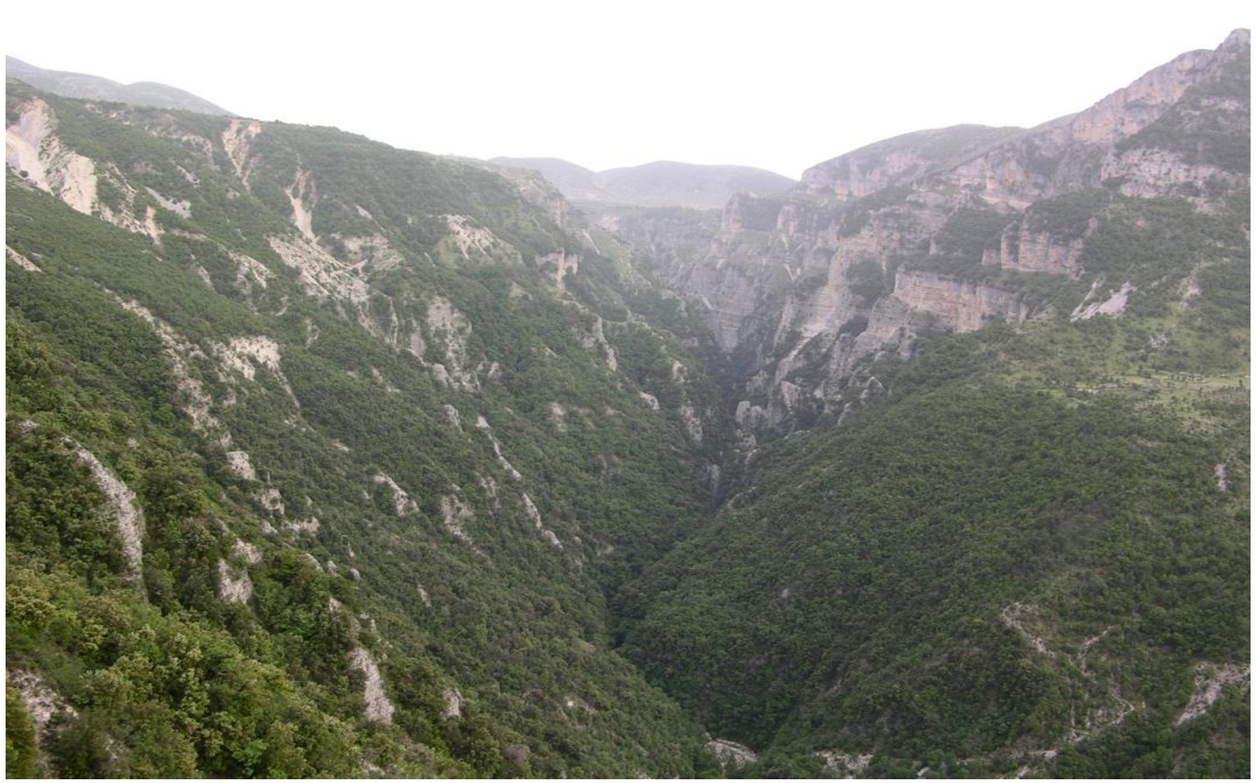
1140 Mudflats and sandflats not covered by seawater at low tide
1150 * Coastal lagoons
2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes)
3170 * Mediterranean temporary ponds
3280 Constantly flowing Mediterranean rivers with Paspalo-Agrostidion species and hanging curtains of Salix and Populus alba
8210 Calcareous rocky slopes with chasmophytic vegetation
9180 * Tilio-Acerion forests of slopes, screes and ravines
91E0 * Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
92C0 Platanus orientalis and Liquidambar orientalis woods (Platanion orientalis)
92D0 Southern riparian galleries and thickets (Nerio-Tamaricetea and Securinegion tinctoriae)
9320 Olea and Ceratonia forests
9340 Quercus ilex and Quercus rotundifolia forests

2120 Shifting dunes along the shoreline with *A. arenaria* (white dunes)

1150 * Coastal lagoons

1140 Mudflats and sandflats not covered by seawater at low tide

3280 Constantly flowing Mediterranean rivers with Paspalo-Agrostidion species and hanging curtains of Salix and *Populus alba*



8210 Calcareous rocky slopes with chasmophytic vegetation

8210 CALCAREOUS ROCKY SLOPES WITH CHASMOPHYTIC VEGETATION

- Chasmophytic vegetation consists of plant communities that colonise the cracks and fissures of rock faces:
- Distinguished the following plant communities:

- *Asplenium ruta-muraria* community

- The habitat include thermo- and meso-Mediterranean (Onosmetalia communities) with Campanula versicolor, *Silene* spp., *Saxifraga* spp., *Ramonda serbica*, *Pinguicula hirtiflora* etc.).

- This habitat type presents a great diversity, with many endemic and sub-endemic plant species where the following are also indicator of habitat quality
- Hypericum haplophylloides, *Cymbalaria microcalyx* subsp. minor, *Alkanna corcyrensis*, *Lilium candidum*, *Heliosperma* sp.

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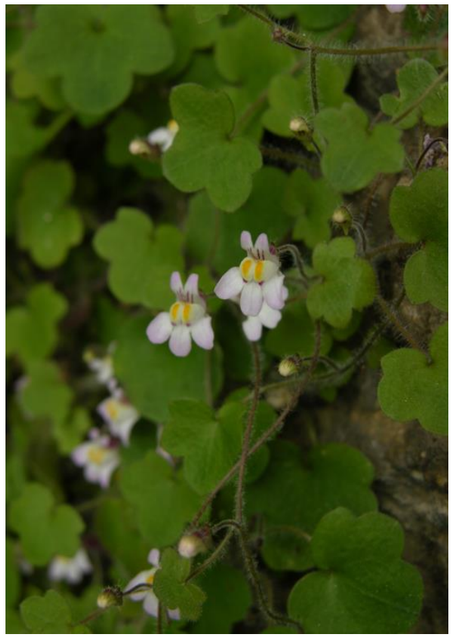
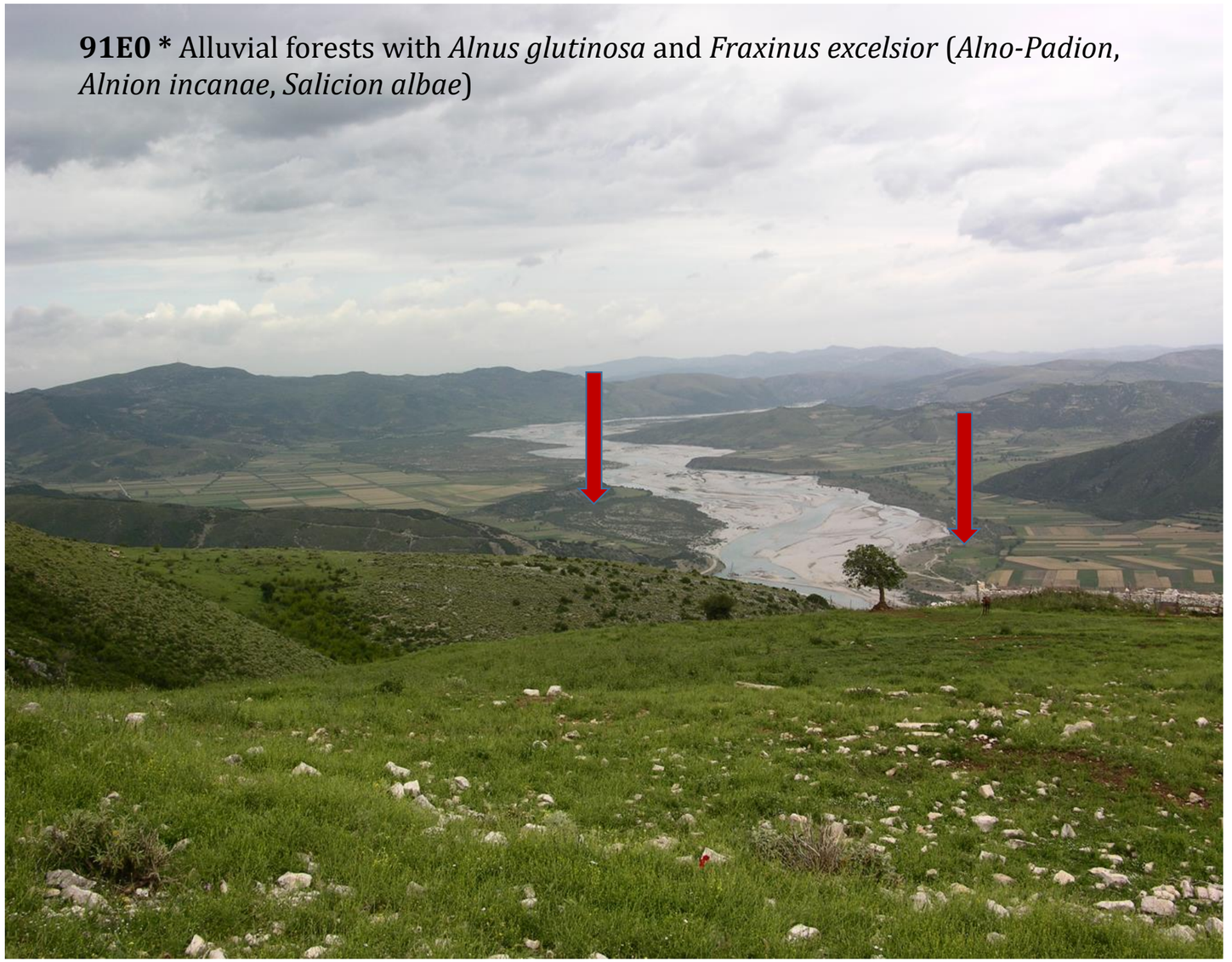



9180 * *Tilio-Acerion* forests of slopes, screes and ravines

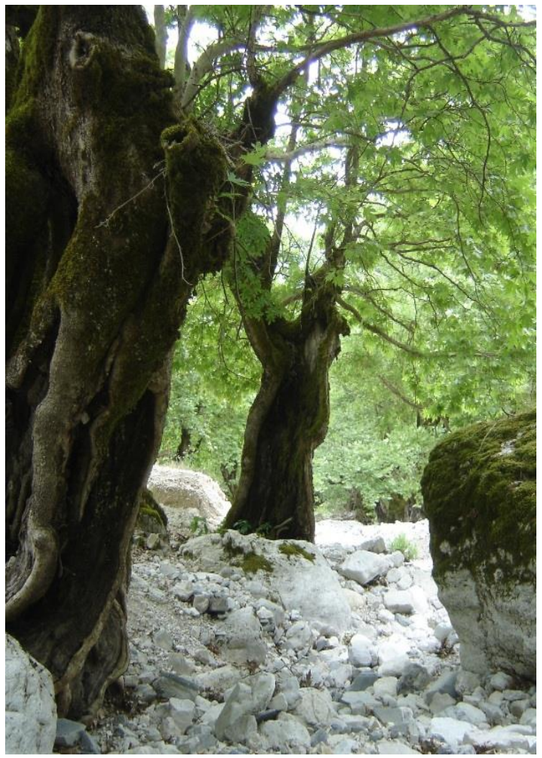
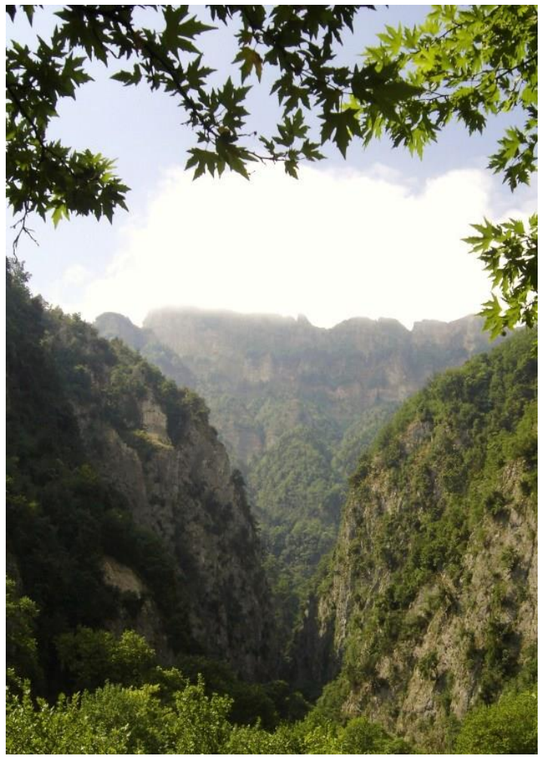
9180 * *Tilio-Acerion* forests of slopes, screes and ravines



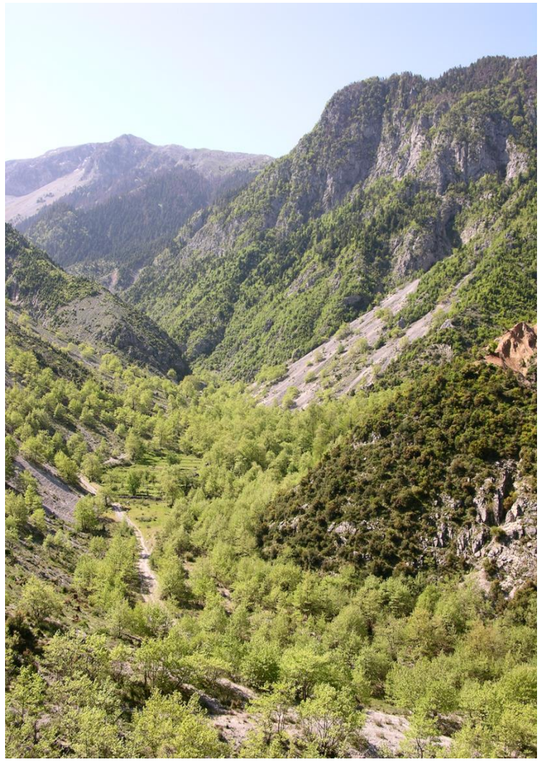
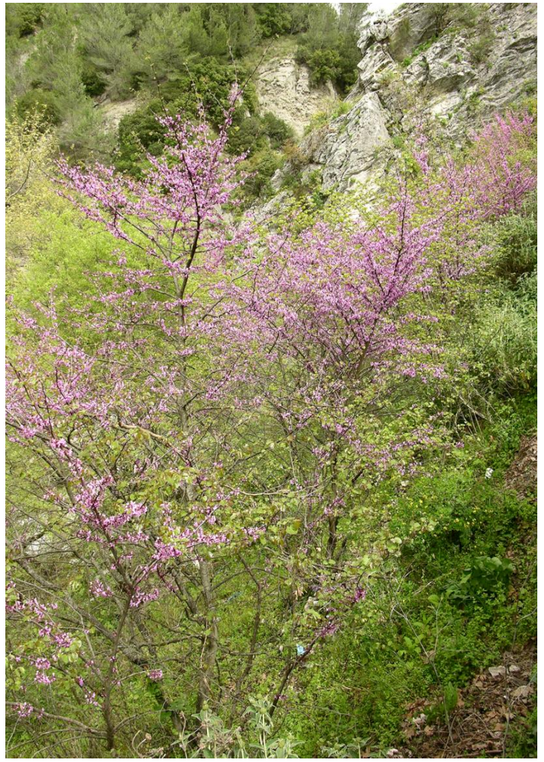
91E0 * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)




They forms arborescent galleries of tall Salix alba and are important sites for ***Orchid*** species

92C0 *Platanus orientalis and Liquidambar orientalis woods*
(Platanion orientalis)

92C0 *Platanus orientalis and Liquidambar orientalis woods*
(Platanion orientalis)

***92D0** Southern riparian galleries and thickets (**Nerio-Tamaricetea** and **Securinegion tinctoriae**)*

***9340 Quercus ilex** and **Quercus rotundifolia** forests*

Arbutus andrachne (*Ericaceae*) - Greek Strawberry Tree, with fruits ripen in Autumn

- Vjosa Valley represents the North and West extreme of its natural area of occurrence
- Unique in Albania: the shrub association dominated by *Arbutus andrache* (*Andrachno-Quercetum ilicis*) from Permeti to Leskovik

Arbutus andrachne (*Ericaceae*) - Greek Strawberry Tree, with fruits ripen in Autumn

PRESSURES OBSERVED

- Changes in water bodies conditions
- Soil pollution and solid waste (incl. discharges)
- Invasive alien species
- Urbanization near the river bank and…
- Agriculture development and deforestation

CONSERVATION MEASURES

Performing of the ecological functions of the riparian vegetation depend on its width, connectivity, and the quality, quantity and structure of the vegetation presented on it, so to conserve the Vjosa River is needed…

- Establishing protected areas/sites along the river and Vjosa watershed
- Legal protection of habitats and species
- Manage landscape features

CURRENT KNOWLEDGE OF BIODIVERSITY IN VJOSA RIVER SYSTEM COUNTING THREATS THAT JEOPARDIZE SPECIES AND ECOSYSTEMS SURVIVAL

Shumka, S – FBF, Agricultural University of Tirana
Bego, F – FNS, Tirana University
Beqiraj, S – FNS, Tirana University
Paparisto, A – FNS, Tirana University
Kashta, L – FNS, Tirana University
Miho, A - FNS, Tirana University

This narrative review summarizes different primary sources, unpublished data from which are drawn conclusions into a holistic interpretation contributed by the authors!

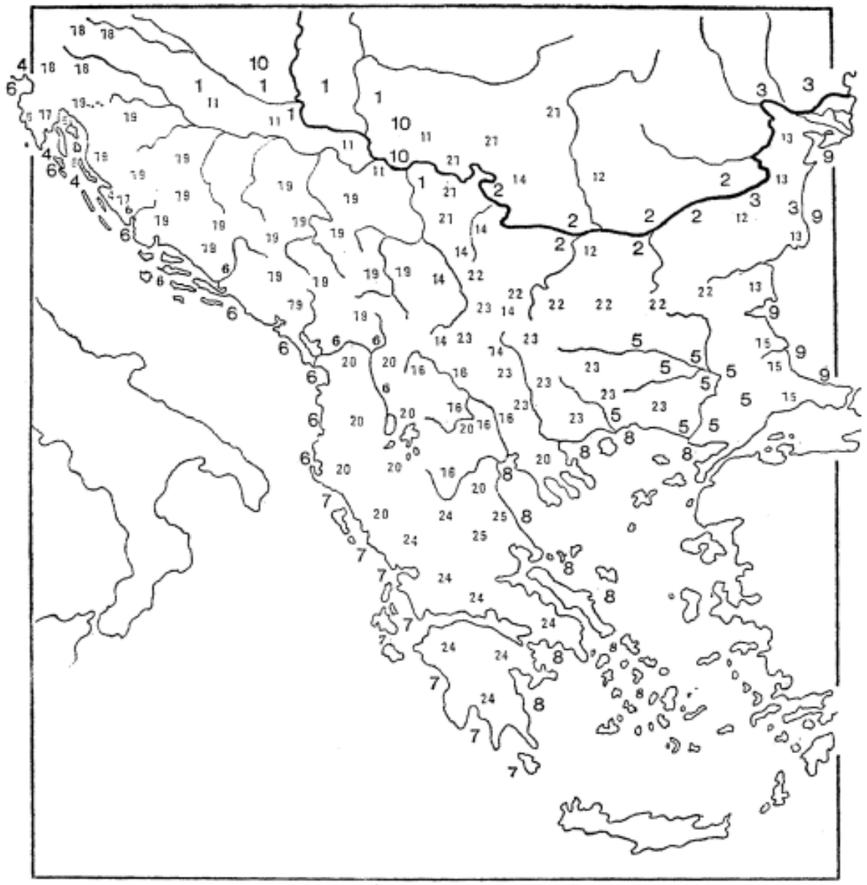
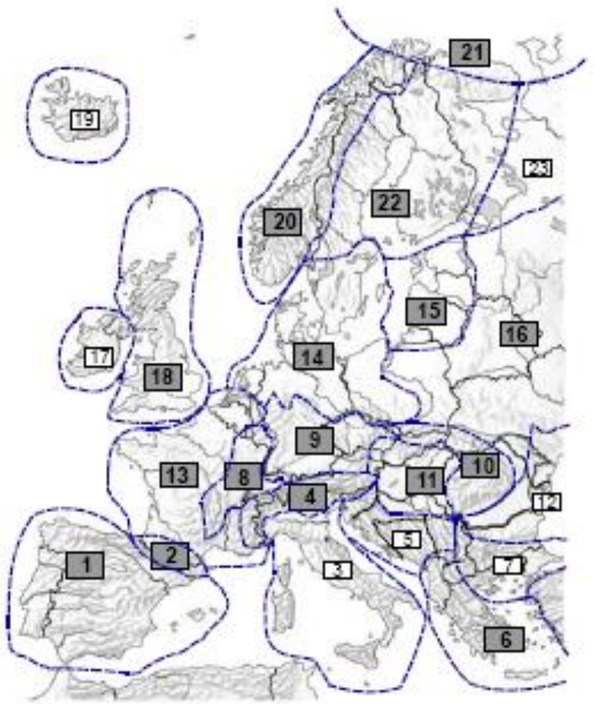


Fig. 4. Scheme of biogeographical and faunistic territories of the Balkan Peninsula and adjacent countries. Distribution of faunistic elements. A. Plains: 1. Pannonian; 2. Dacian (Vallachian); 3. Pontian; 4. Lombardian; 5. Thracian; 25. Thessalian. B. Coasts of the following Mediterranean seas: 6. Adriatic; 7. Ionian; 8. Aegean; 9. Pontian; 10. Ancient Pannonian. C. Characteristic hill and sub-montane elements: 11. sub-Pannonian; 12. sub-Dacian; 13. sub-Pontian; 14. Moesian; 15. Strandjanian; l6. Macedonian; 17. Liburnian. D. Elements characteristic of mountain systems: 18. Eastern Alps; 19 Northern Dinarids; 20. Southern Dinarids; 21. Carpathian; 22. Balkan Range (Stara Planina); 23. Rilo-Rhodopes; 24. Mountains of Southern Greece and Peloponese; 25. Thessalian plain (Matvejev, 1980).

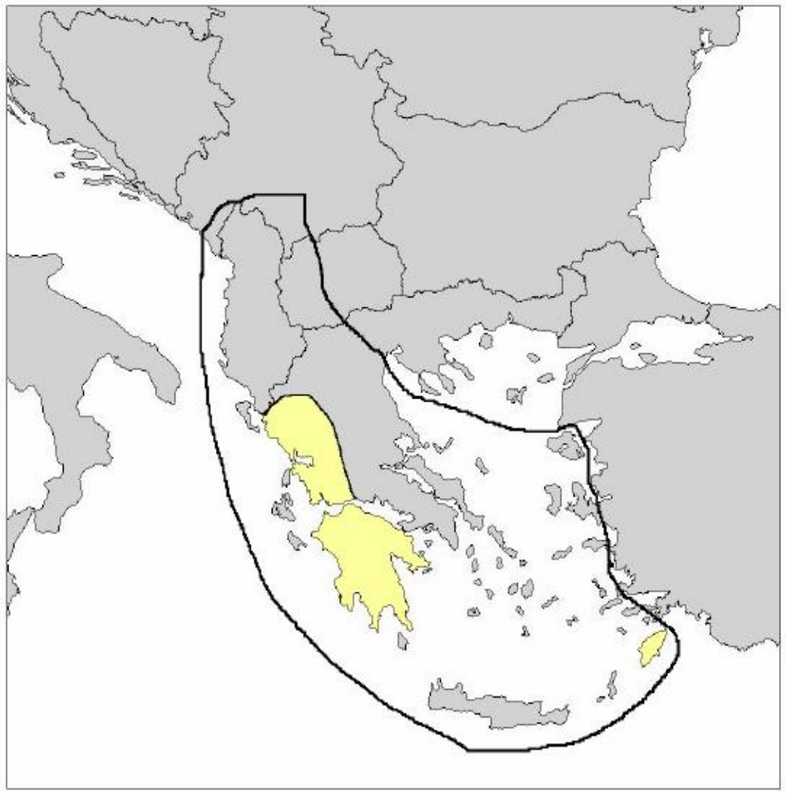
HOW MUCH WE KNOW ABOUT VJOSA BIODIVERSITY?

A search of ‚any time' type via Google scholar 40:

- (x35 time less than Ohrid
- (x33 time less than Shkodra
- (x25 time less than Prespa
- (x 4 time less than Drini)



Ecoregions (WFD documents)



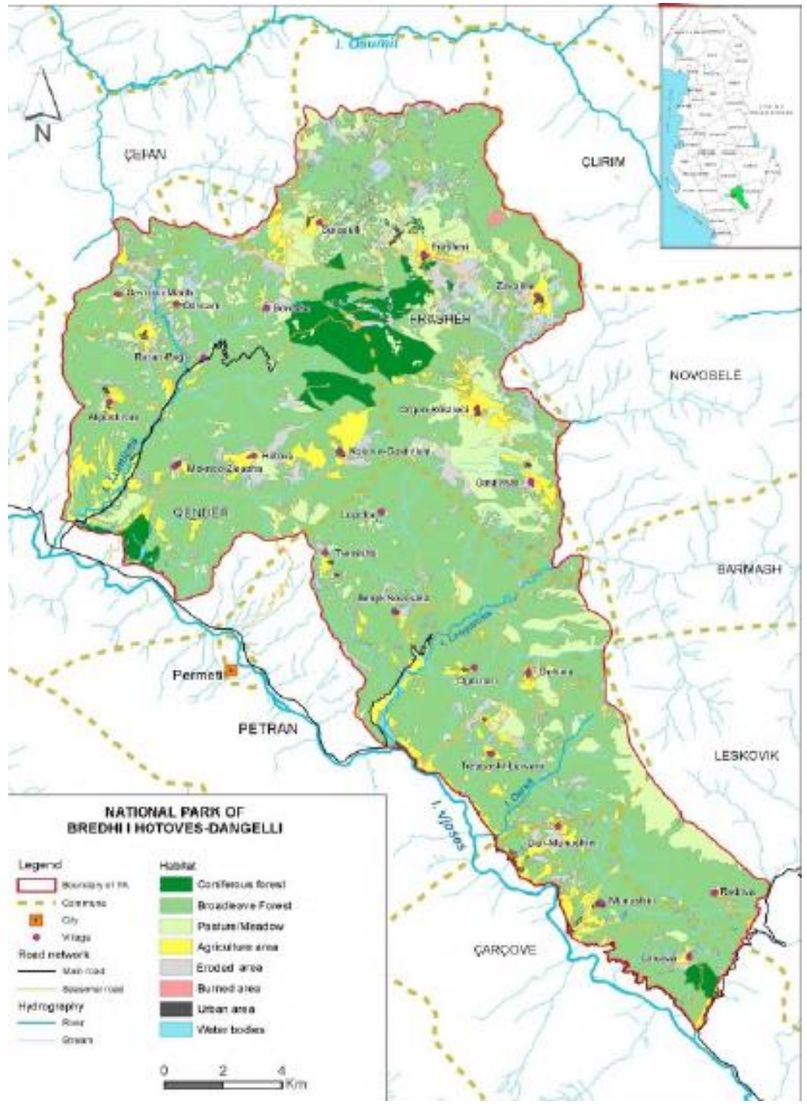
(6) Hellenic Western Ballkan

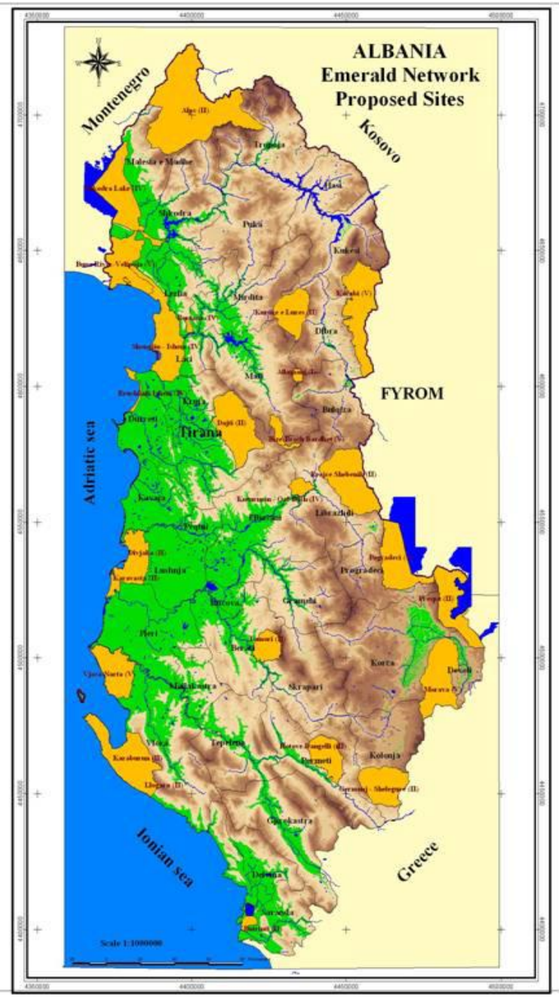
European Green belts and Albania
12, 500 km. North to South Importance of Albanian PAs

BREDHI I HOTOVE – DANGELLI NATIONAL PARK:

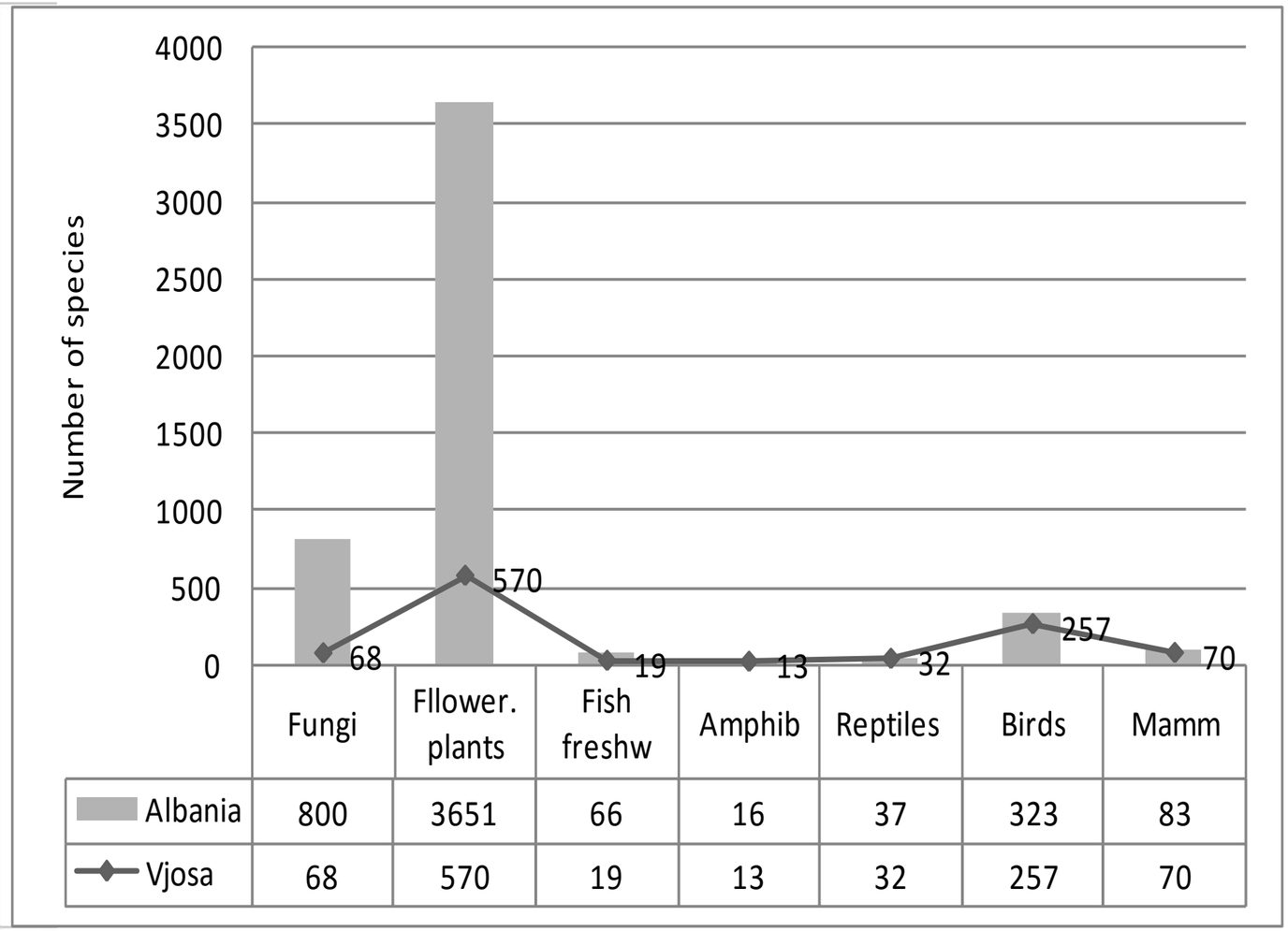
- The area represents a vast variety of ecosystems, including a significant collection of Macedonian fir (*Abies borisii-regis*). Mixed forests of, Hungarian oak (*Quercus frainetto*), Turkey oak (*Quercus cerris*), Maple (Acer), Black hornbeam, (*Carpinus betulus*) and Juniper (*Juniperus*); shrub vegetation of Strawberry tree (*Arbutus unedo*), raspberries tree (*Rubus ulmifolius*) and others are some of the most important values in the National Park.

- The park area is known for its many interesting species. The most common species include: the brown bear (*Ursus arctos*), wolf (*Canis Lupus*), red fox (*Vulpes vulpes*), marten (*Martes foina*), wild boar (Sus scrofa), hare (*Lepus europaeus*), the squirrels (*Sciurus vulgaris*) and many others. The most important inhabitant of the forests, however, is the deer (*Capreolus capreolus*) that lives in the fields and in the depths of the forests.





Emeralds and IPA (MoEFWA, 2013)



	Fungi	Fllower. plants	Fish freshw	Amphib	Reptiles	Birds	Mamm
Albania	800	3651	66	16	37	323	83
Vjosa	68	570	19	13	32	257	70

Biodiversity values of the Vjosa Valley in comparison with the Countrywide

MICROALGAE

- **More than 95 taxa** were present in the phytoplankton of the lagoon; besides a high proportion of diatoms, dinoflagellates, *cryptophyceae* and some filamentous cyanobacteria have been detected.

- The scarce exchange with the sea and a potential high input of nutrients from Vlora town and the surrounding watershed may be the cause for the dominance of the filamentous cyanobacteria *Oscillatoria* spp., as well as for the increase of dinoflagellates of the genera *Prorocentrum* and *Dinophysis*; some of the latter, *Prorocentrum minimum* and P. lima, are highly toxic.

AQUATIC VEGETATION COMPONENTS

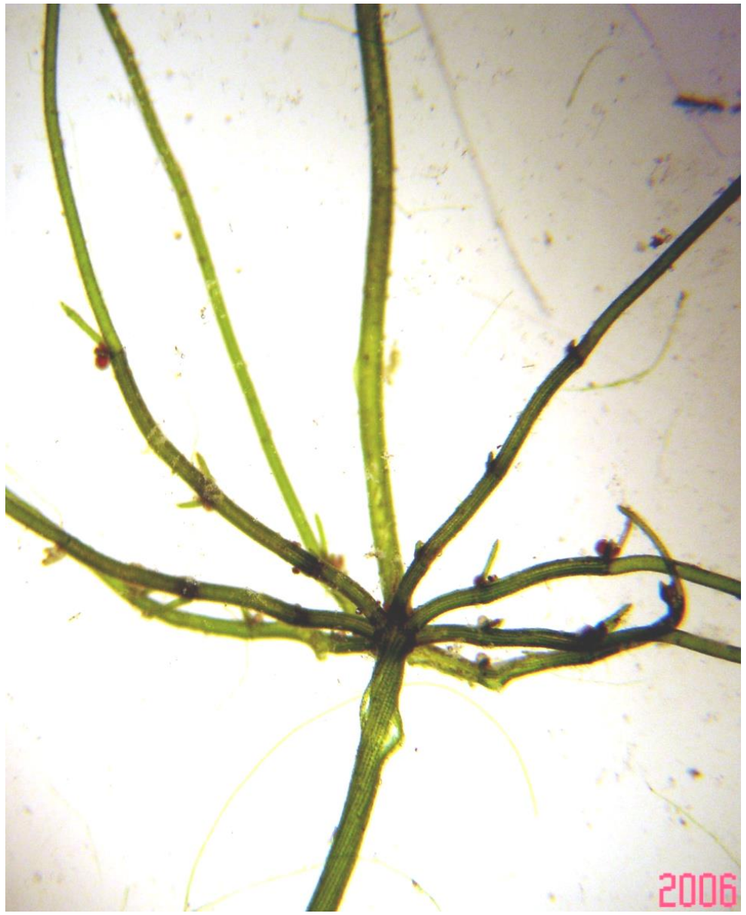
- For the marine zone with a sandy substratum submersed meadows of *Posidonia oceanica* are characteristic at depths from 2 to 20 m.
- In shallow and protected zones *Posidonia* is substituted by
- *Cymodocea nodosa* or rarely by *Zostera noltii* as seen near the Treporti cape.
- These habitats are often complemented by the green algae *Caulerpa prolifera* and *Flabella petiolata*.
- On rocky substrates near the Treporti cape the brown algae *Cystoseira* is more frequent, mainly *C. barbata*. Members of the genera *Acetabularia*, *Flabella, Anadiomene, Dasycladus, Hypnea* and *Sargassum* indicate the tropical affinity of the site.
- Some Atlantic influence is represented by the species *Taonia atomaria* and *Sphaerococcus coronopifolius*, while *Fucus virsoides* is an Adriatic endemic species.

Charophyta algae from Lengarica

Chara gymnophylla

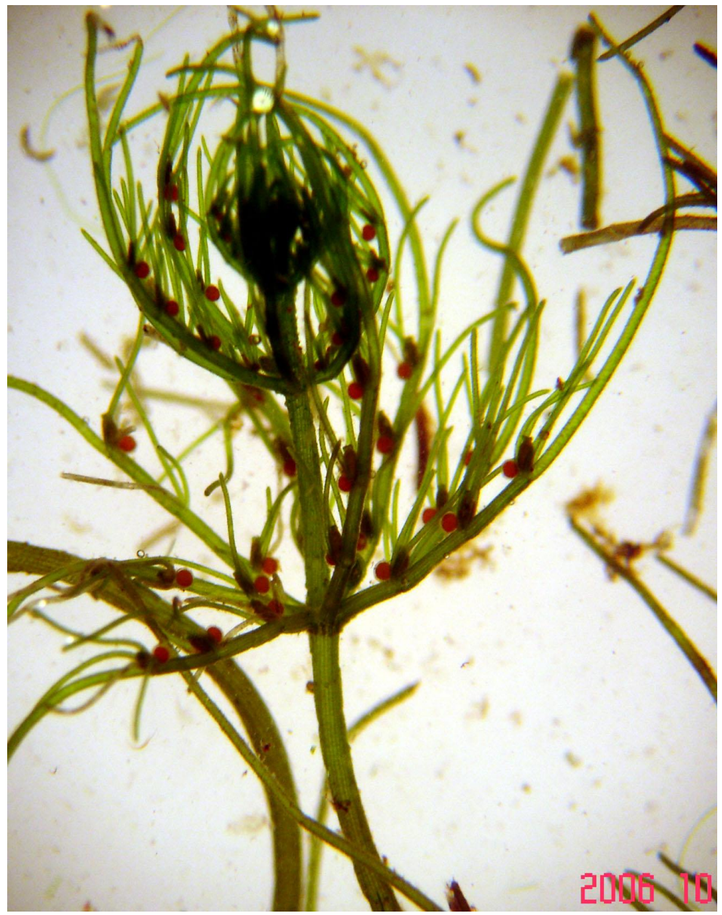
Chara vulgaris f. longibracteata

CHAROPHYTA FROM DRINO RIVER



Chara vulgaris

Chara vulgaris f. longibracteata



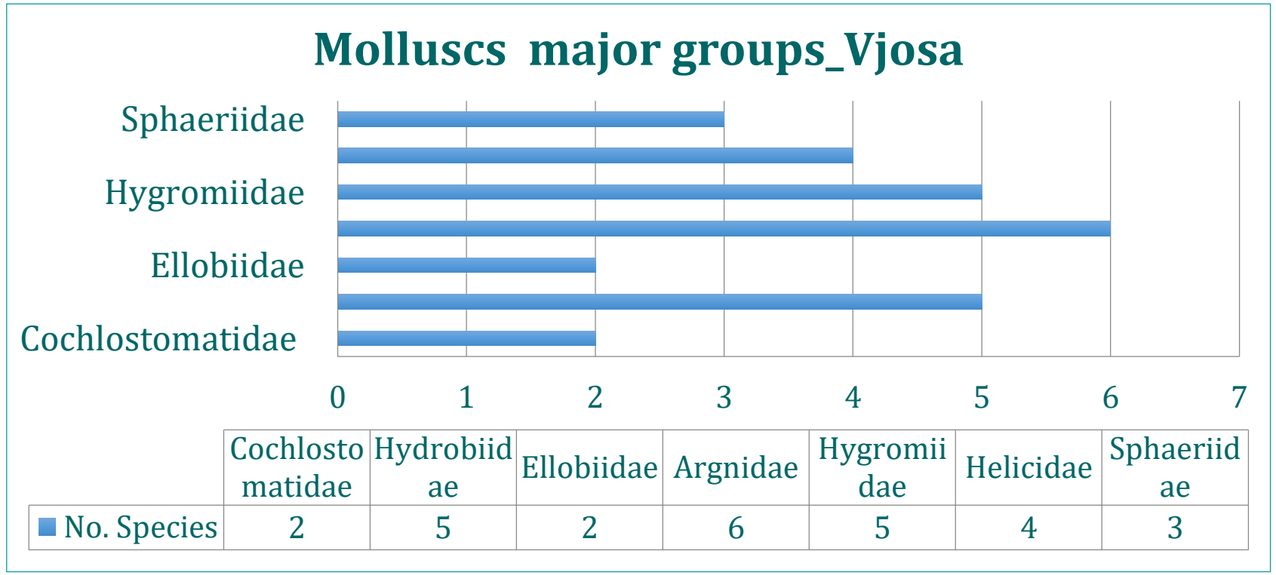
Chara vulgaris f. longibracteata

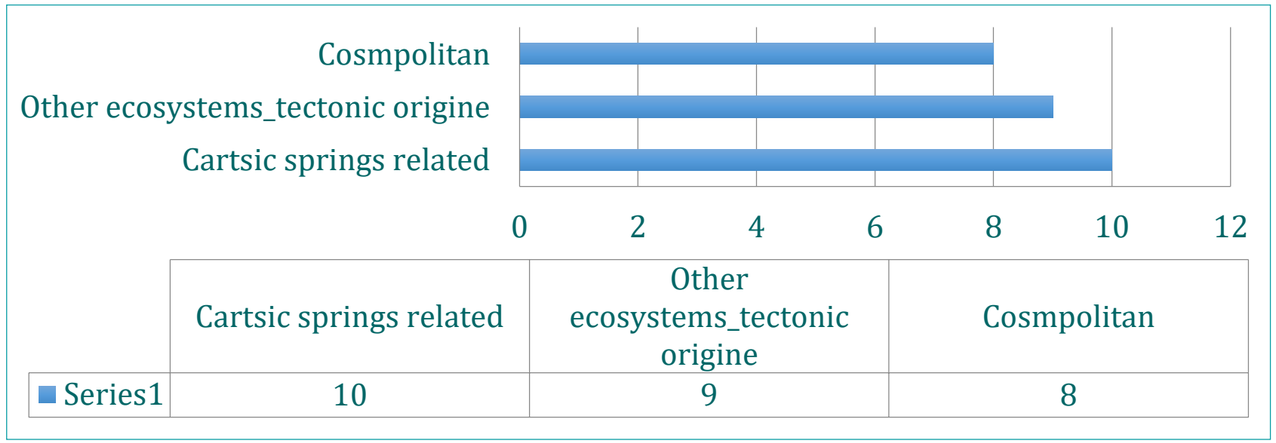
INVERTEBRATES - MACROINVERTEBRATES

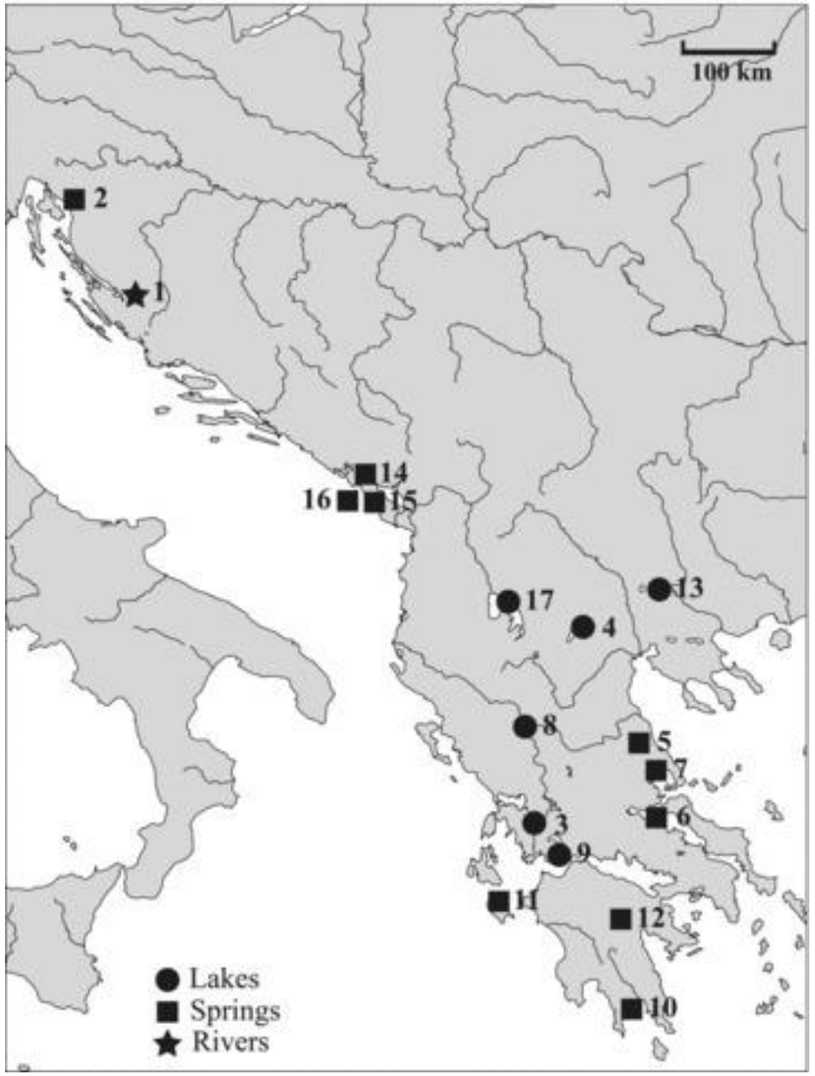
- A total of 49 taxa of benthic macro-invertebrates. The highest quantitative variation has been recorded for the net spinners *Hydropsyche (Tricoptera),* while the variation of species number had the highest value for coleopters.

- 75 different taxa. *Ephemeroptera* appeared to be the most abundant order in almost all sites during the high flow season. *Trichoptera* constituted the second most abundant order, and during the low flow period their family, *Hydropsychidae*, became dominant.

Hatzinikolaou, Y., Dakos, V., Lazaridou, M. (2008): Assessing the Ecological Integrity of a Major Transboundary Mediterranean River Based on Environmental Habitat Variables and Benthic Macroinvertebrates (Aoos-Vjose River, Greece-Albania). Internat. Rev. Hydrobiol.93 (1) :73– 87







Locations of the extinct mollusks of the Balkan region: 1,

Belgrandiella zermanica, Dalmatinella fluviatilis, Islamia zermanica, Tanousia zrmanjae; 2, ***Graziana lacheineri adriolitoralis***, ***Vinodolia fiumana***; 3, ***Dianella schlickumi***; 4, ***Graecoanatolica vegorriticola***; 5, Graecorientalia vrissiana; 6, ***Grossuana serbica vurliana***; 7, ***Heleobia achaja sorella***, ***Turcorientalia hohenackeri hohenackeri***; 8, ***H. steindachneri, I. epirana, Orientalina curta albanica, Paladilhiopsis janinensis;*** 9, ***I. graeca, Pseudoislamia balcanica, Trichonia trichonica, Valvata klemmi***; 10, ***I. hadei***; 11, ***Pseudamnicola macrostoma***; 12, ***T. kephalovrissonia***; 13, ***G. macedonica***; 14, ***Antibaria notata, V. gluhodolica***; 15, ***Bracenica spiridoni***; 16, ***V. matjasici***; 17, ***Ohridohauffenia drimica***

Régnier, C., Fontaine, B., Bouchet, Ph. (2009): Not Knowing, Not Recording, Not Listing: Numerous Unnoticed Mollusk Extinctions. Conservation Biology 23(5): 1214-1222

INVERTEBRATES – OTHER ARTHROPODS

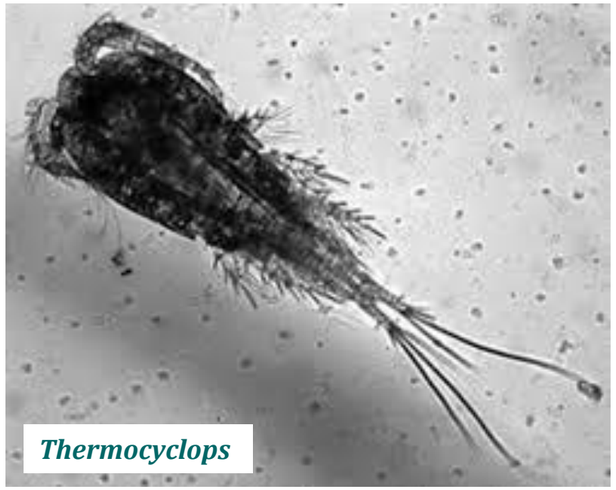
L. cervus

Malcosoma neustria

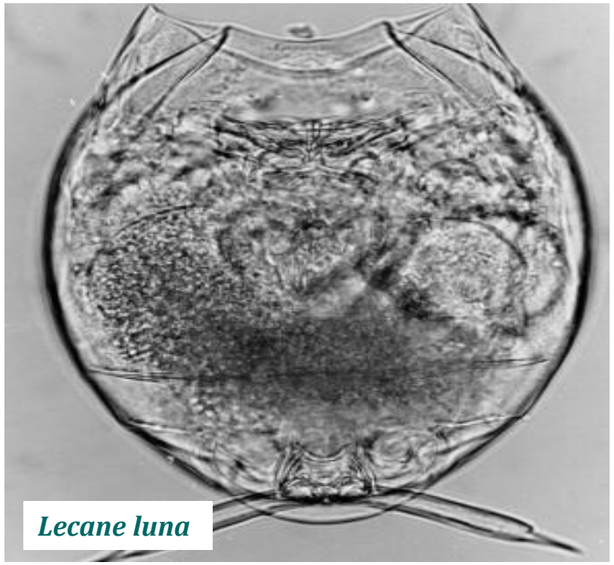
Un-expectable reach zooplankton composition *(Kelcyra Gorge Glide-May, June 2015)*

Ascomorpha ecaudis (Perty), *Brachionus angularis* Gosse, *B. calyciflorus Pallas, Epiphanes sp., Lepadella ovalis (o.f.m.), Kellicottia longispina* (Kell.), *Keratella cochlearis K. quandrata* (Muller), *Lecane luna (o.f.m.), L. lunaris* (Ehrb. (Gosse),), *Mytilina mucronata* (Muller), *Polyarthra major* (Burck.), *P. vulgaris Carl., Ploesoma sp., Trichocerca elongata* (Gosse), *Bosmina longirostris (o.f.m.), Simocephalus exspinosus* (Koch), *Chydorus sphaericus (o.f.m.), Cyclops sp., Eudiaptomus gracilis Sars, Thermocyclops crassus* (Fischer).

More than 150 species of winged insects (Pterygota) ***Lepidoptera*** (63 species), ***Coleoptera*** (43), ***Odonata*** (8) and ***Orthoptera*** (7).
The biological equilibrium becomes occasionally displaced by the development of massive blooms, even of endangered species with multi annual dynamics, like night butterflies with *Thaumetopoea* pityocampa, Hyphantria cunea and Malcosoma neustria



Thermocyclops



Lecane luna

VERTEBRATES - FISHES


Cobitis ohridana (VU)


Misgurnus fossilis


Oxynoemacheilus pindus (VU)

- **17 fish species** in the up Kalivaçi section
- **7 marine + 21 estuary...**
- Catodromic and anadromic

Site.name	River.name	Site.code	Longitude	Latitude	Obs.dens.HINTOL.inf.150	Obs.dens.O2INTOL	Obs.ric.RH.PAR	Obs.dens.LITH	Exp.dens.HINTOL.inf150	Exp.dens.O2INTOL	Exp.ric.RH.PAR	Exp.dens.LITH	Ids.dens.HINTOL.inf.150	Ids.dens.O2INTOL	Ids.ric.RH.PAR	Ids.dens.LITH	Method	Richness	Captures	Ecoregion	ST-Species	River.zone	Aggregated.score.Salmonid.zone	Aggregated.score.Cyprinid.zone	FishIndex	FishIndex.class
BorderAl_Gr	Vjosa	AL0001	20.5901	40.07153	28.18182	29.09091	4	140.9091	55.78398	73.04808	3.994336	134.7261	NA	NA	0.871641	0.92286	Wading	6	312	Est	0.205128	Cyprinid	NA	0.89725	0.89725	2
Border 5	Vjosa	AL0002	20.57585	40.08183	17.36842	17.36842	3	136.3158	55.09984	72.28037	3.331304	134.0716	NA	NA	0.828938	0.912813	Wading	5	268	Est	0.123134	Cyprinid	NA	0.870876	0.870876	2
Biovizhde	Vjosa	AL0003	20.46015	40.16552	16.4	15.2	4	90	35.82389	47.08572	4.668003	87.87965	NA	NA	0.804693	0.915379	Wading	7	231	Est	0.164502	Cyprinid	NA	0.860036	0.860036	2
Br. Stermbec	Vjosa	AL0004	20.46015	40.16552	16.08696	11.73913	5	98.26087	43.44823	57.29198	6.010625	108.0342	NA	NA	0.788677	0.873264	Wading	9	261	Est	0.103448	Cyprinid	NA	0.830971	0.830971	2
Petran	Vjosa	AL0005	20.44882	40.17744	12.72727	10.45455	5	83.63636	35.86784	47.52544	6.023925	91.01003	NA	NA	0.787675	0.87696	Wading	9	210	Est	0.109524	Cyprinid	NA	0.832317	0.832317	2
Permet	Vjosa	AL0006	20.41522	40.2074	NA	16.5	5	88.5	35.91897	47.7108	5.360705	92.07719	NA	NA	0.840152	0.892873	Wading	8	193	Est	0.170984	Cyprinid	NA	0.866513	0.866513	2
Grabove	Vjosa	AL0007	20.24167	40.2851	20.43478	12.6087	5	75.65217	28.38086	37.84405	4.698976	73.93257	NA	NA	0.898276	0.915067	Wading	7	178	Est	0.162921	Cyprinid	NA	0.906671	0.906671	2
Exit Kelcyra	Vjosa	AL0008	20.17459	40.30252	4.117647	1.176471	4	41.17647	16.49236	22.03175	4.702898	43.29408	NA	NA	0.801445	0.88929	Wading	7	77	Est	0.025974	Cyprinid	NA	0.845368	0.845368	2
G1 Kelcyra	Vjosa	AL0009	20.13127	40.29883	1.263158	0.421053	5	12.84211	5.233483	6.997217	5.376805	13.78782	NA	NA	0.838815	0.881791	Mixed	8	137	Est	0.029197	Cyprinid	NA	0.860303	0.860303	2
G2 Kelcyra	Vjosa	AL0010	20.12805	40.29842	NA	0.7	6	9.5	3.978911	5.324391	6.051297	10.51978	NA	NA	0.867178	0.870936	Mixed	9	110	Est	0.054545	Cyprinid	NA	0.869057	0.869057	2
Dragoti Bridge	Vjosa	AL0011	20.07876	40.2922	29.62963	22.22222	4	65.18519	27.77366	37.24294	6.057057	74.07534	NA	NA	0.688718	0.861591	Wading	9	209	Est	0.287081	Cyprinid	NA	0.775155	0.775155	2
En. Memaliaj	Vjosa	AL0012	20.06052	40.27997	23.2	20.4	5	94	34.98134	47.07078	5.392665	94.64855	NA	NA	0.837501	0.904479	Wading	8	247	Est	0.206478	Cyprinid	NA	0.87099	0.87099	2
Af. Memaliaj	Vjosa	AL0013	20.01314	40.2815	27.5	25	4	104.5	37.00477	49.91382	4.048962	101.1419	NA	NA	0.865885	0.918505	Wading	6	211	Est	0.236967	Cyprinid	NA	0.892195	0.892195	2
Iliras	Vjosa	AL0014	19.88251	40.37543	15.45455	15.45455	3	74.09091	29.05974	39.34677	4.731984	80.71098	NA	NA	0.680688	0.876593	Wading	7	185	Est	0.183784	Cyprinid	NA	0.778641	0.778641	2
Pocem	Vjosa	AL0015	19.74063	40.49691	22.33333	21.66667	4	76.33333	29.88654	40.60734	6.770698	84.23253	NA	NA	0.637749	0.871966	Wading	10	263	Est	0.247148	Cyprinid	NA	0.754858	0.754858	2
Pocem West	Vjosa	AL0016	19.72372	40.49136	11.66667	12.33333	5	54	23.00492	31.27936	7.450186	65.03016	NA	NA	0.689862	0.841042	Wading	11	203	Est	0.167488	Cyprinid	NA	0.765452	0.765452	2

VERTEBRATES – AMPHIBIANS & REPTILES

The amphibians (13 species out of 16 at national level) are a taxonomic group usually connected with different habitats during their lifecycle, both water and terrestrial. The most popular amphibians encountered are the Yellow-Bellied Toad (*Bombina variegata*) and the Common Toad (*Bufo bufo*). Present as well *Rana graeca*, *Rana balcanica*, *Triturus cristatus*, etc.

Reptiles (32 of 37 species) are represented by Balkan Whip Snake (*Coluber gemonensis*), Leopard Snake (*Elaphe situla*), four-lined snake (*Elaphe quatuorlineata*), Hermann's tortoise (*Testudo hermanni*), European pond turtle (*Emys orbicularis*) and the European green lizard (*Lacerta viridis*), etc..


Rana graeca


Emys orbicularis

VERTEBRATES - BIRDS

There is a wide variety of bird **(257 out 323 species) species present within the valley** in connection to the different ecosystems and habitats. Species, such as Eagle Owl (*Bubo bubo*), Long-legged Buzzard (*Buteo rufinus*), Levant Sparrow hawk (*Accipiter brevipes*), Lanner Falcon (*Falco biarmicus*), Sparrow hawk (*Accipiter nisus*), Golden Eagle (*Aquila chrysaetos*), European Honey Buzzard (*Pernis apivorus*), Gosshawk (*Accipiter gentilis*), Short-toed Eagle (*Circaetus gallicus*), Egyptian Vulture (*Neophron percnopterus*), Grey-headed Woodpecker (*Picus canus*), Barn Owl (*Tyto alba*) and Kestrel (*Falco tinnunculus*) are present and good indicators of the areas ecosystems condition.

Egyptian Vulture (*Neophron percnopterus*)

VERTEBRATES - MAMAMLS

70 out of 83 at national level

Large carnivores are also common such as the brown bear (*Ursus arctos*) and the wolf (*Canis lupus*). Large mammals in the wider area also comprise the roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*). Furthermore the mammals are also presented by bats (*Rhinolophus euryale*), *Rhinolophus blasii* and *Myotis cappaccinii*, *Myositis bechsteinii* red squirel (*Sciurus vulgaris*), fat dormouse (*Glis glis*), hazel dormouse (*Muscardinus vellanarius*), beech marten (*Martes foina*), badger (*Meles meles*), red fox (*Vulpes vulpes*) and wild cat (*Felis sylvestris*).

Ursus arctos

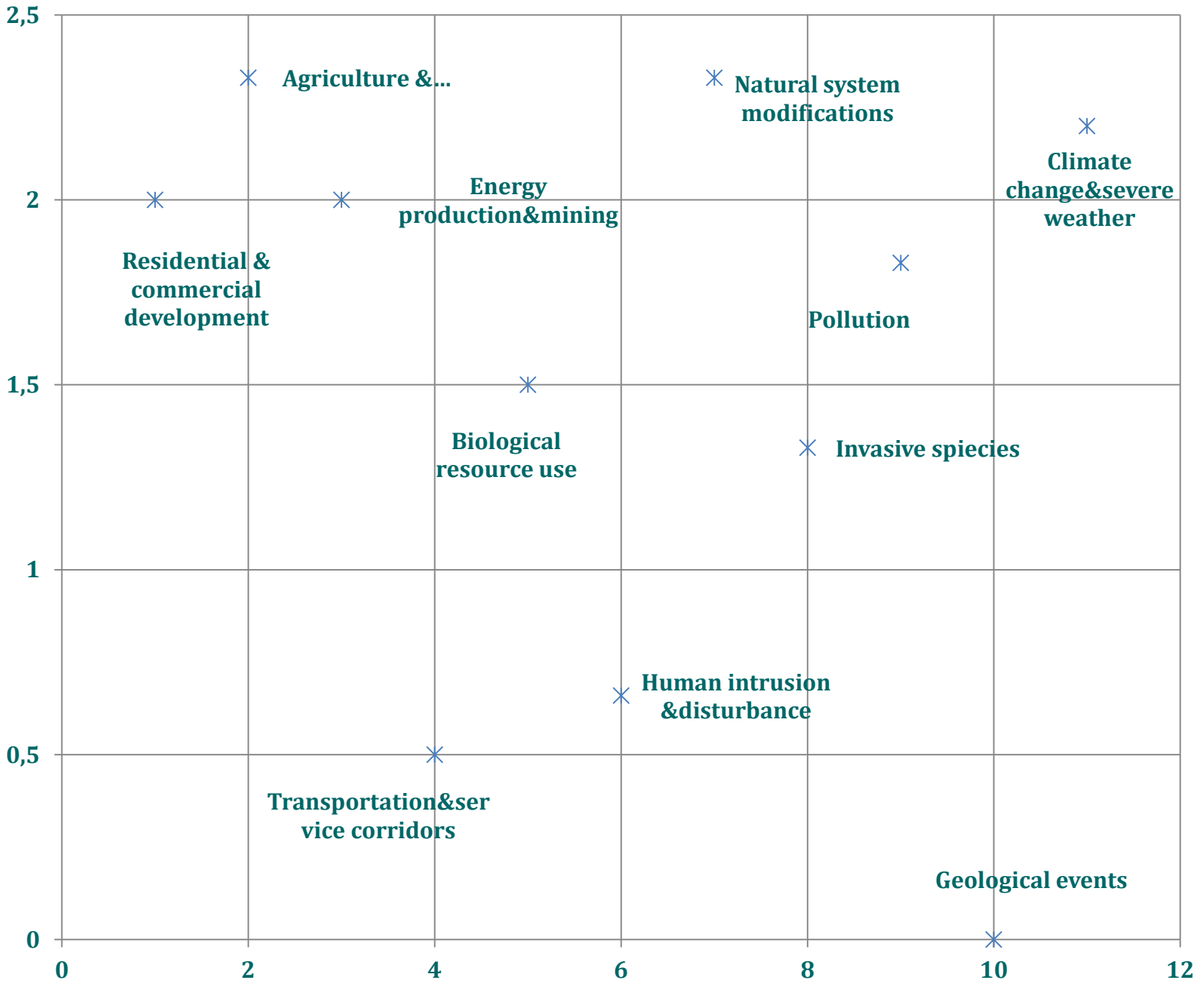

Myositis bechsteinii

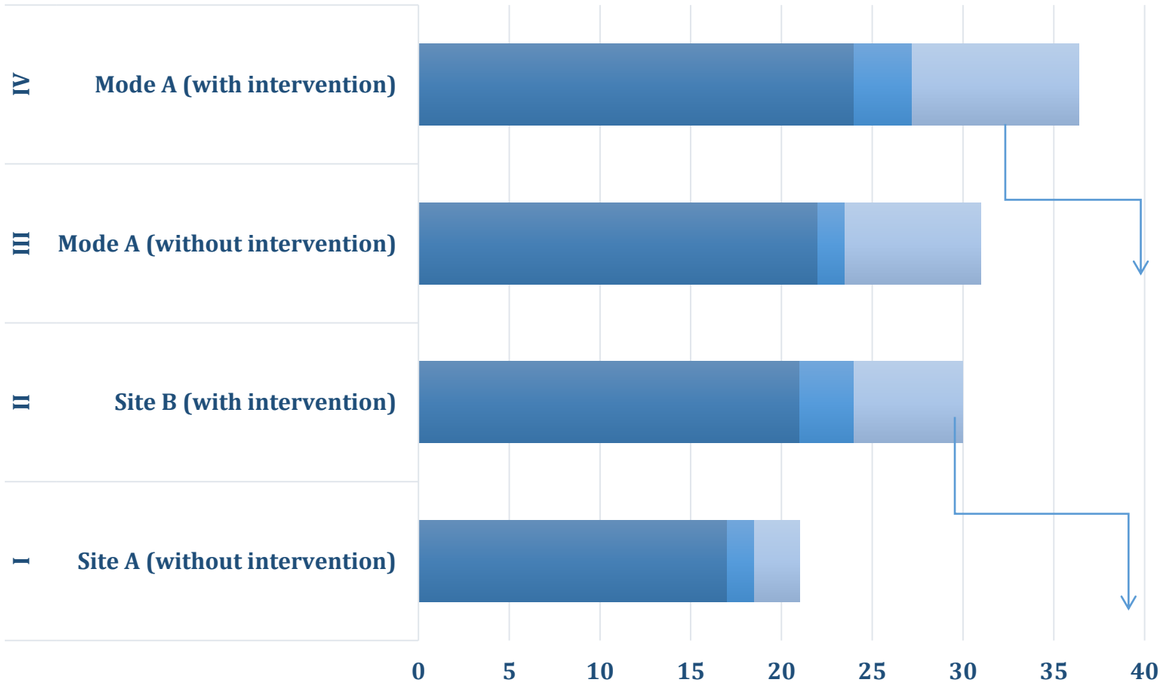
Threat class	Major threat	Level of knowledge	Impact	Average impact	Maximum impact
1. Residential & commercial development	1.1. Housing&urban areas	well - known	3	2	3
	1.2. Commercial&industrial areas	moderately known	1		
	1.3. Tourism&recretaion areas	well - known	2		
2. Agriculture & aquaculture	2.1 Annual & perennial non-timber crops	less-known	2	2(2.33)	3
	2.2 Wood & pulp plantations	less-known	1		
	2.3 Livestock farming & ranching	well - known	2		
	2.4 Marine & freshwater aquaculture	less-known	2		
3. Energy production&mining	3.1. Oil&gas drilling	well - known	1	2	3
	3.2. Mining&Qurrying	well - known	2		
	3.3. River mining	well - known	3		
	3.4. Renewable energy	well - known	2		
4. Transportation&service corridors	4.1. Road&railroads	well - known	2	1(0.5)	2
	4.2. Utility&servic elines	–	0		
	4.3. Shippinl lanes	–	0		
	4.4. Flight paths	–	0		
5. Biological resource use	5.1. Hunting&Trupping animals	moderately known	2	2(1.5)	3
	5.2. Gathering terrestrial plants	moderately known	1		
	5.3. Logging&wood harvesting	well - known	3		
	5.4. Fishing&harvesting aquatic resources	moderately known	1		
6. Human intrusion&disturbance	6.1. Recreational activities	less-known	1	1(0.66)	1
	6.2. War, civil unrest& military excersises	–	0		
	6.3. Work&other activities	less-known	1		
7. Natural system modifications	7.1. Fire&fire supression	less-known	2	2(2.33)	3
	7.2. Dams & water management/use	moderately known	2		
	7.3. Other ecosystem modifications	less-known	3		
8. Invasive spiecies	8.1. Invasive non-native/alien species	moderately known	2	1(1.33)	2
	8.2. Problematic native species	less-known	0		
	8.3. Introduced genetic material	less-known	2		
9. Pollution	9.1. Domestic & urban waste water	well - known	3	2 (1.83)	3
	9.2. Industrial & military effluents	moderately known	2		
	9.3. Agricultural & forestry effluents	moderately known	2		
	9.4. Garbage & solid waste	well - known	3		
	9.5. Air-borne pollutants	less-known	1		
	9.6. Excess energy	–	0		
10. Geological events	10.1. Volcanoes	–	0	0	0
	10.2. Earthquakes/tsunamis	–	0		
	10.3. Avalanches/landslides	–	0		
11. Climate change&severe weather	11.1. Habitat shifting & alteration	well - known	3	2(2.2)	3
	11.2. Droughts	less-known	3		
	11.3. Temperature extremes	less-known	2		
	11.4. Storms&floodings	less-known	3		
	11.5. Other impacts	–	0		

THE THREATS OF VJOSA BIODIVERSITY

The general threats to freshwater biodiversity in Albania can be grouped under five interacting categories: flow modification; overexploitation; water pollution; destruction or degradation of habitat; and invasion by exotic species.

Method approach: GIWA (2015)…

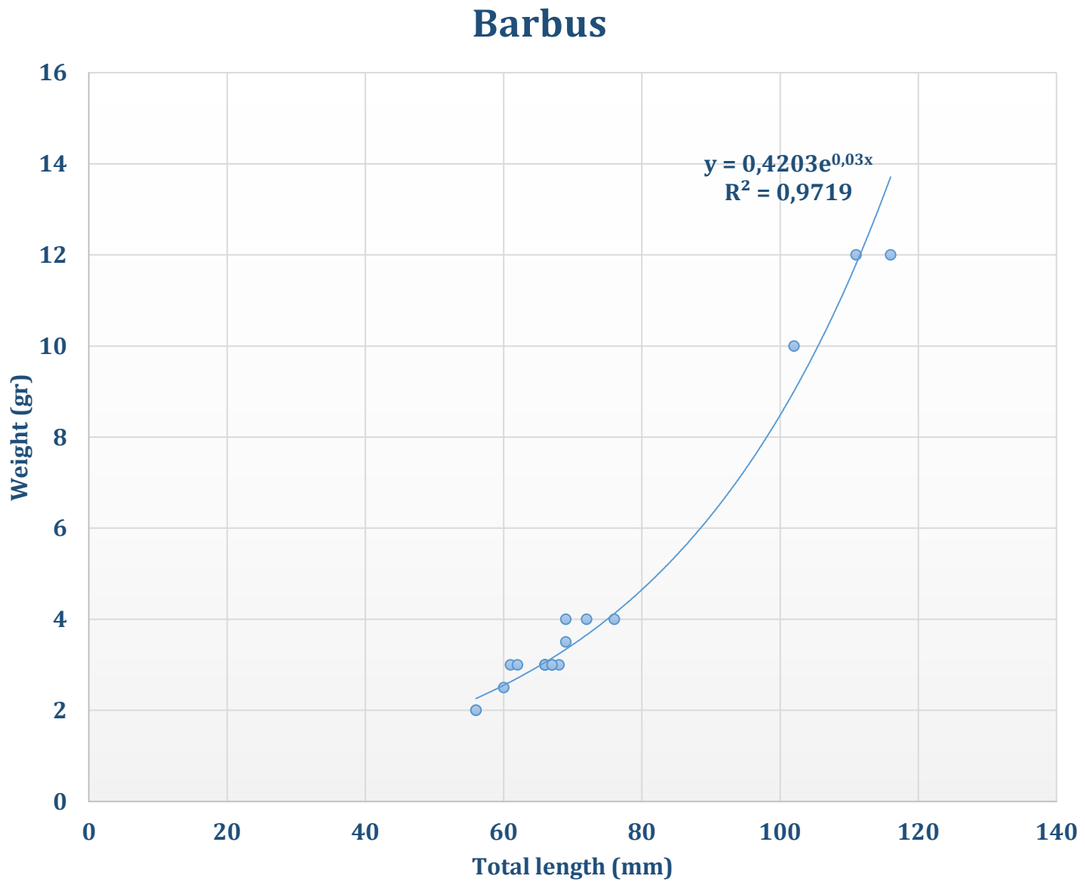


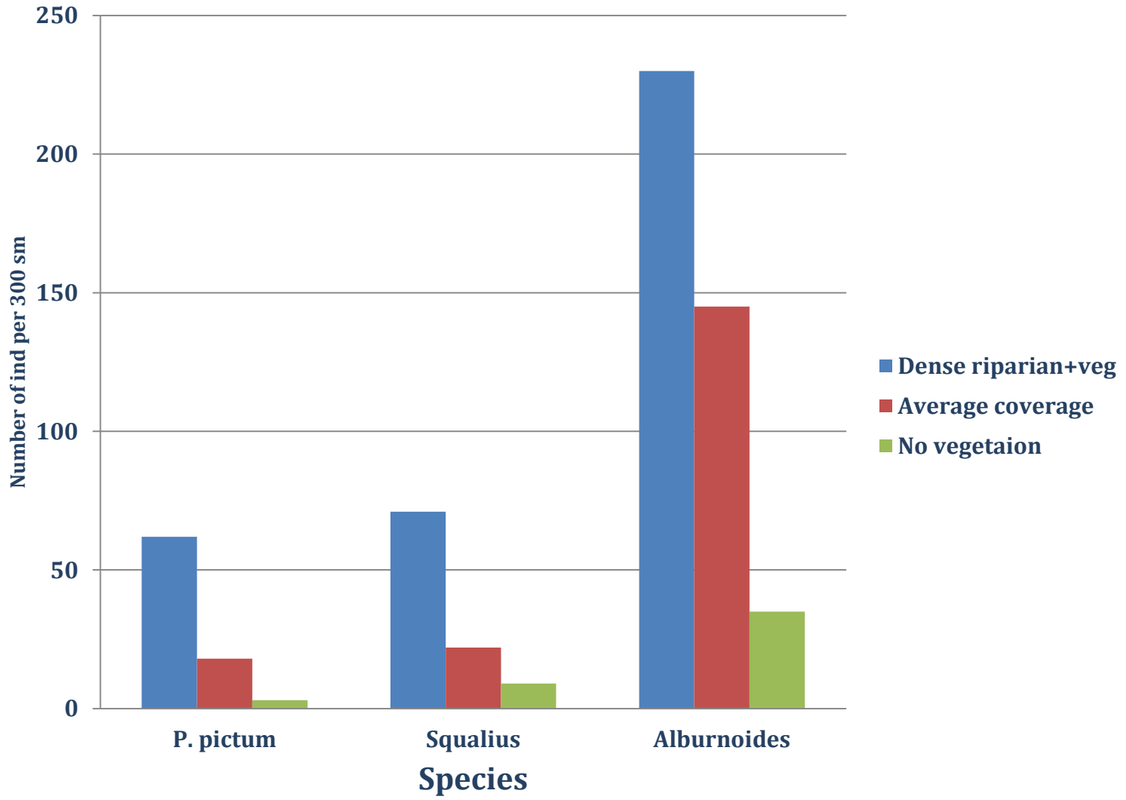


	I Site A (without intervention)	II Site B (with intervention)	III Mode A (without intervention)	IV Mode A (with intervention)
Av. Tem	17	21	22	24
Fluctaion	1,5	3	1,5	3,2
Recovery over threashold	2,5	6	7,5	9,2

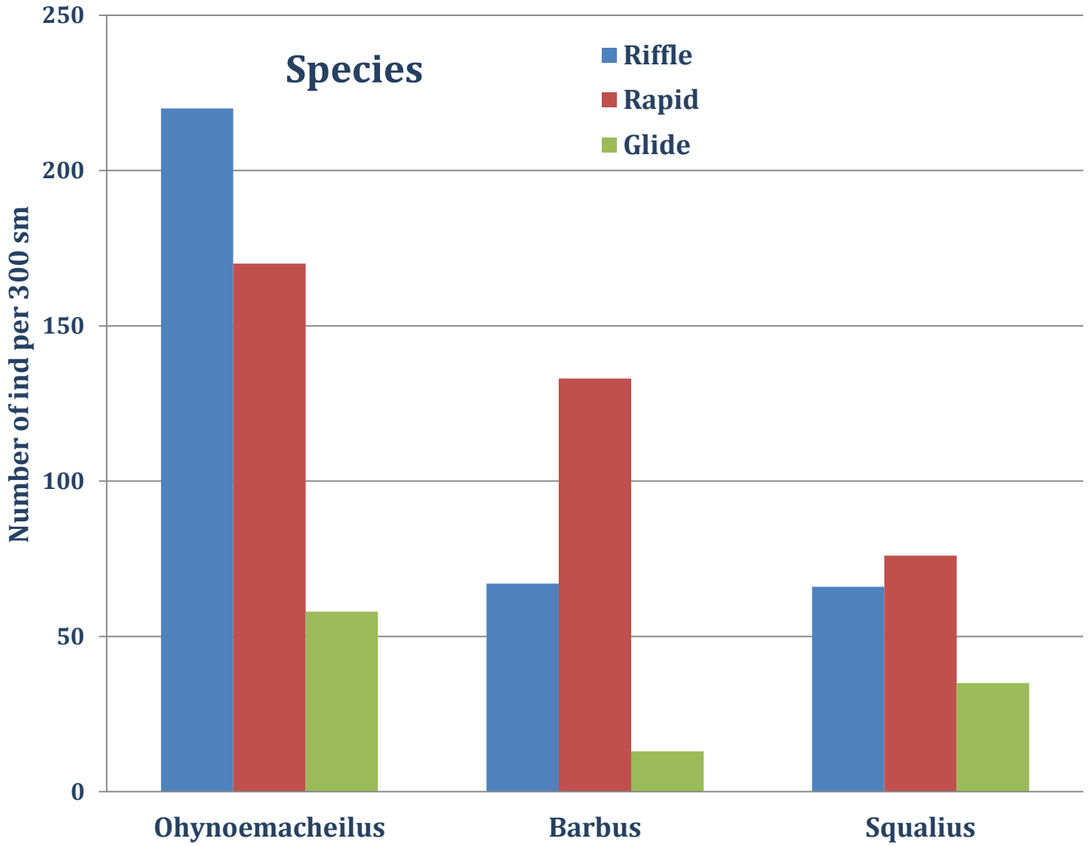
The effects of fluctuating temperature regimes on temperature tolerance, thermal stress accumulation and recovery, and growth is still largely a mystery.

INTERACTION BETWEEN RIPARIAN & OTHER AQUATIC VEGETATION AND ADJACENT LIVINGS-FISH SP-VJOSA

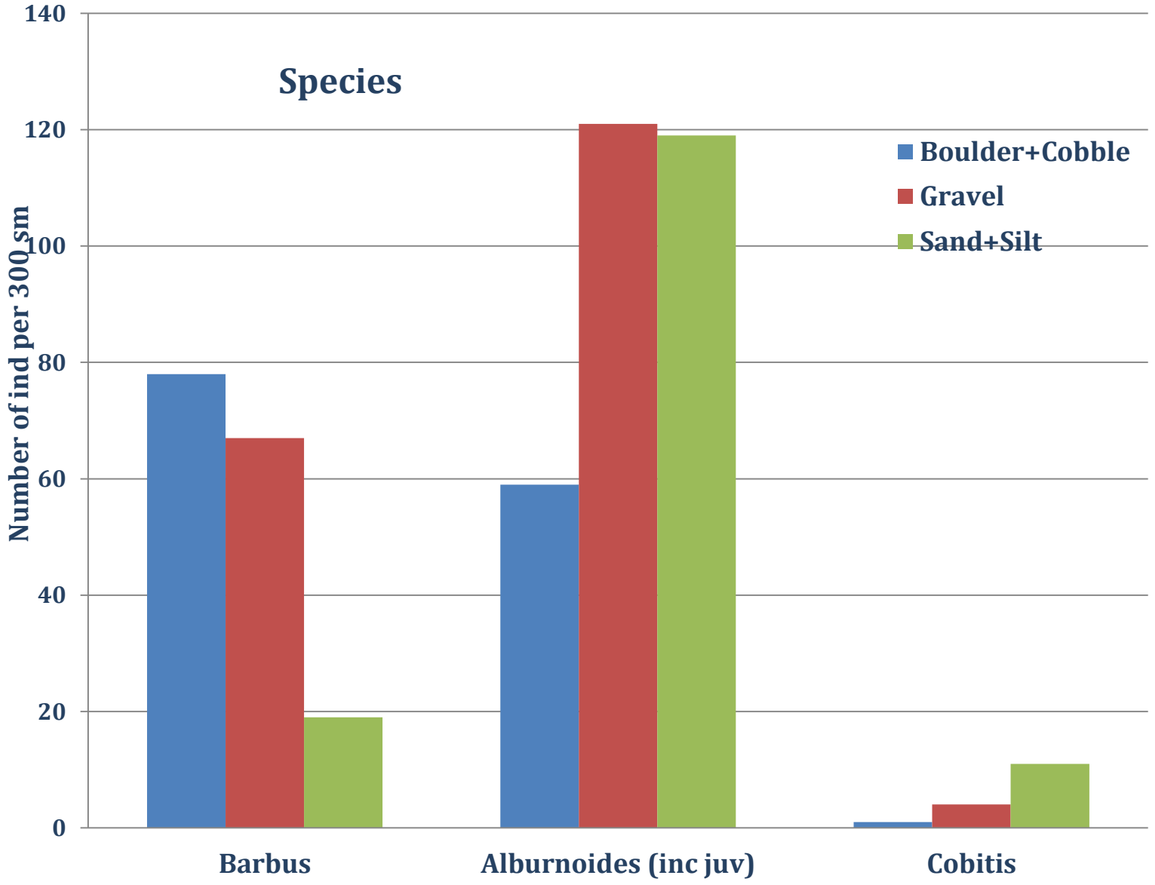




Interaction between riparian & other aquatic vegetation and adjacent livings-fish sp-Vjosa



Flow of patterns influence – Devoll – Tomorica



Substrate -fish-Langarica

Lengarica Canyon

Ottoman bridge in Bënja beside Lengarica River

Vjosa River near Këlcyra gorge

FINDING BALANCE BETWEEN HPP OF VJOSA RIVER AND SUSTAINABLE DEVELOPMENT OF ALBANIA

CONTENTS

- Introduction
- Vjosa power potential
- Electricity cost of Vjosa river HPP.
- The national energy strategy and natural gas supply
- Alternative of Thermal power plant (TPP)
- A comparative analyse of specific cost of electricity generation
- Conclusions

Prof.As. F.Bidaj[1], A. Bako[2], Dr. A. Hoxha[1],

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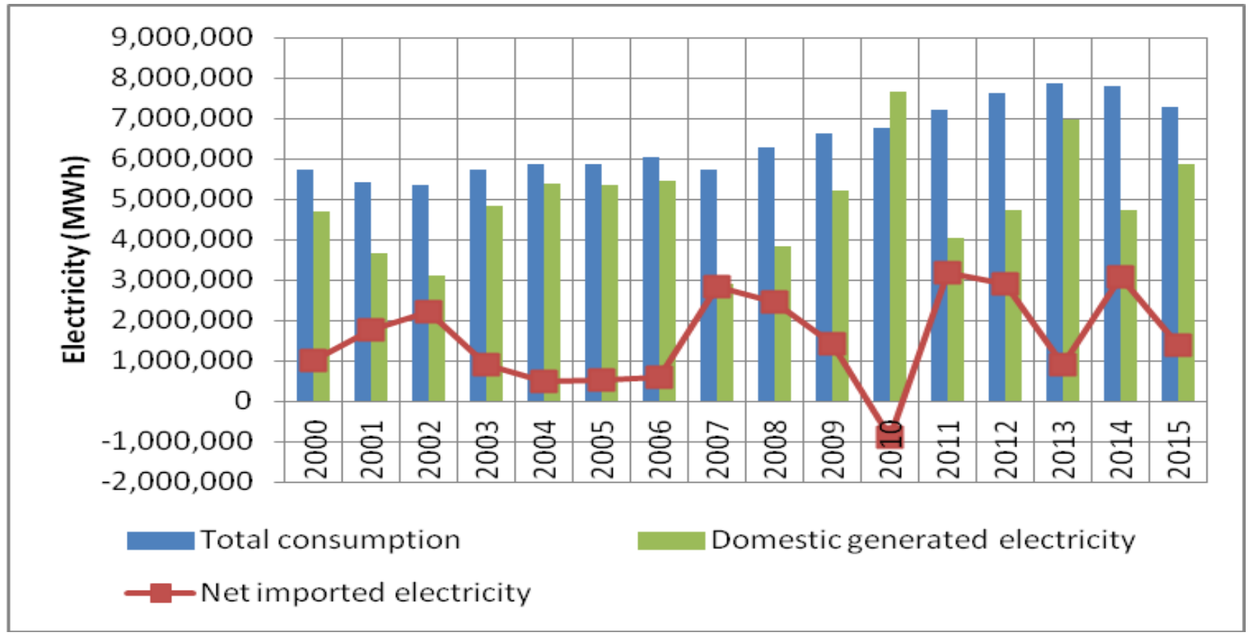
2- Former EIAs and Permits Unit, MoE
e-mail: fbidaj@yahoo.com; ahoxha@fim.edu.al

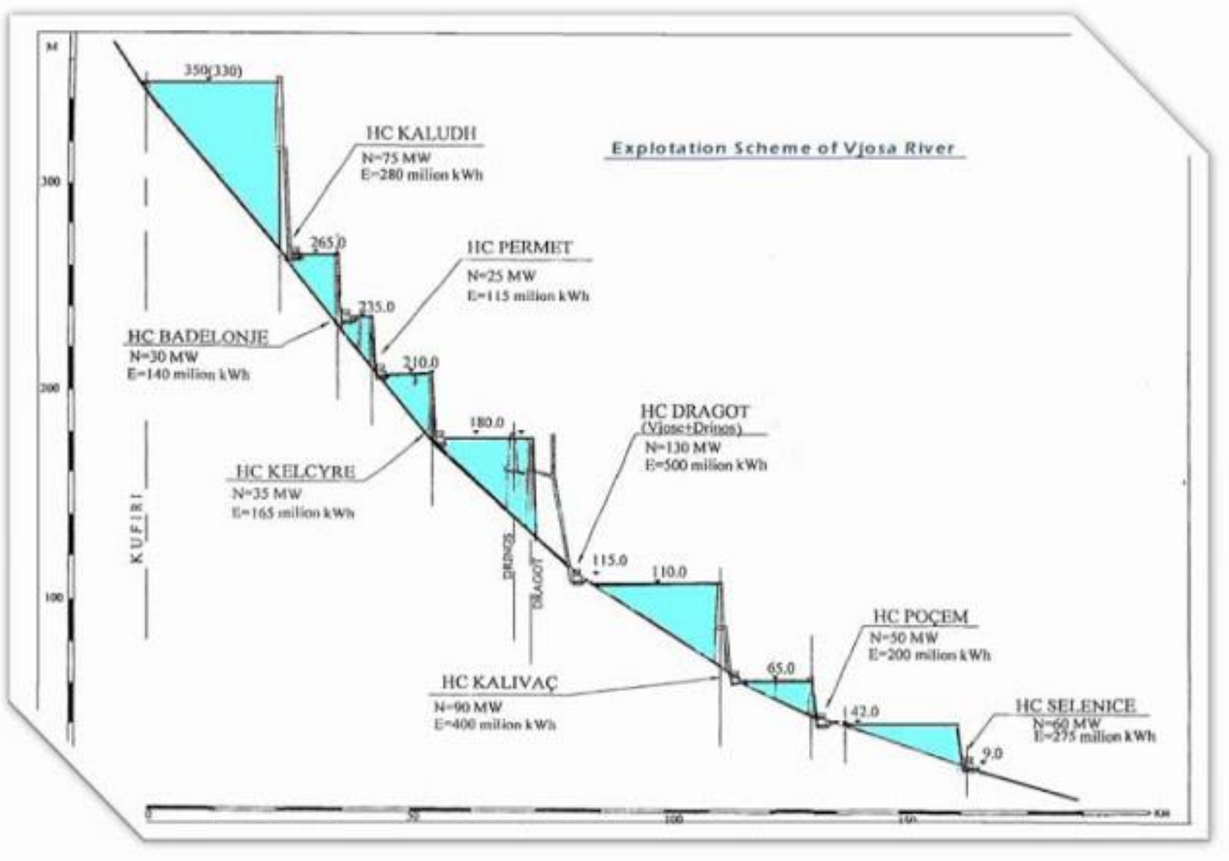
ELECTRICITY BALANCE IN ALBANIA

Nr	HPP type	Installed capacity (MW)
1	Public	1350
2	Private	375
3	Total	
	- Connected to transmission	1725 1572
	- Connected to distribution	153

In total there are **17 small HPP** , some of them have been constructed and are generating the electricity, but this number can be increased up to 30.



VJOSA RIVER POWER POTENTIAL



Name	Capacity MW	Annual generation GWh	Catchment km²	Mean flow m³/sek
Kaludh	75	280	2370	63
Badelonje	30	140	2780	74
Permet	25	115	2820	75
Kelcyre	35	165	3240	88
Dragot	130	580	5030	144
Kalivac	90	400		
Pocem	50	200	5570	159
Selenice	60	275	5710	163
Total:	495	2155		

In total there are **17 small HPP** , some of them have been constructed and are generating the electricity, but this number **can be increased up to 30.**

VJOSA RIVER POWER POTENTIAL

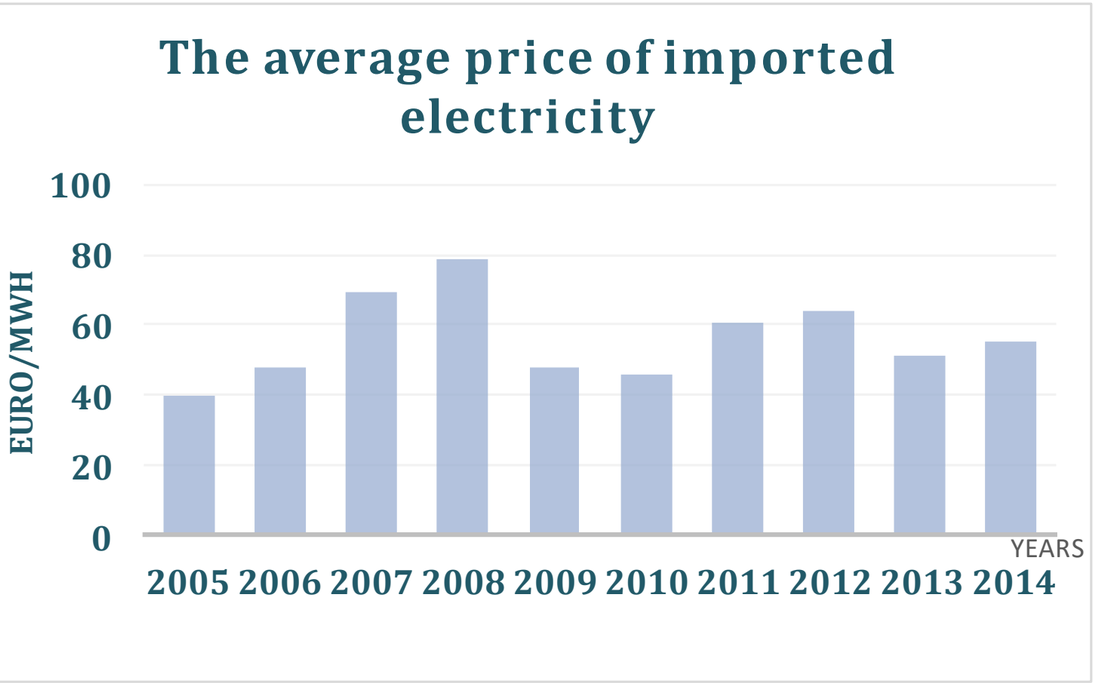
PARAMETERS THAT DEFINE COST HPP ENERGY

- Delivery Q
- Head H
- Technology
- Construction
- Instrument&automation
- Electrical equipment
- Installation
- Contigency etc

THE ENVIRONMENT COST FOR CONSTRUCTING HPP

- Land 175 ha/MW
- Flora and fauna
- Trees 0.5 – 4 Euro/m2, 0.5 – 4 Euro/m^2,
- Roads
- Interconnection
- Displacement of habitants, etc.

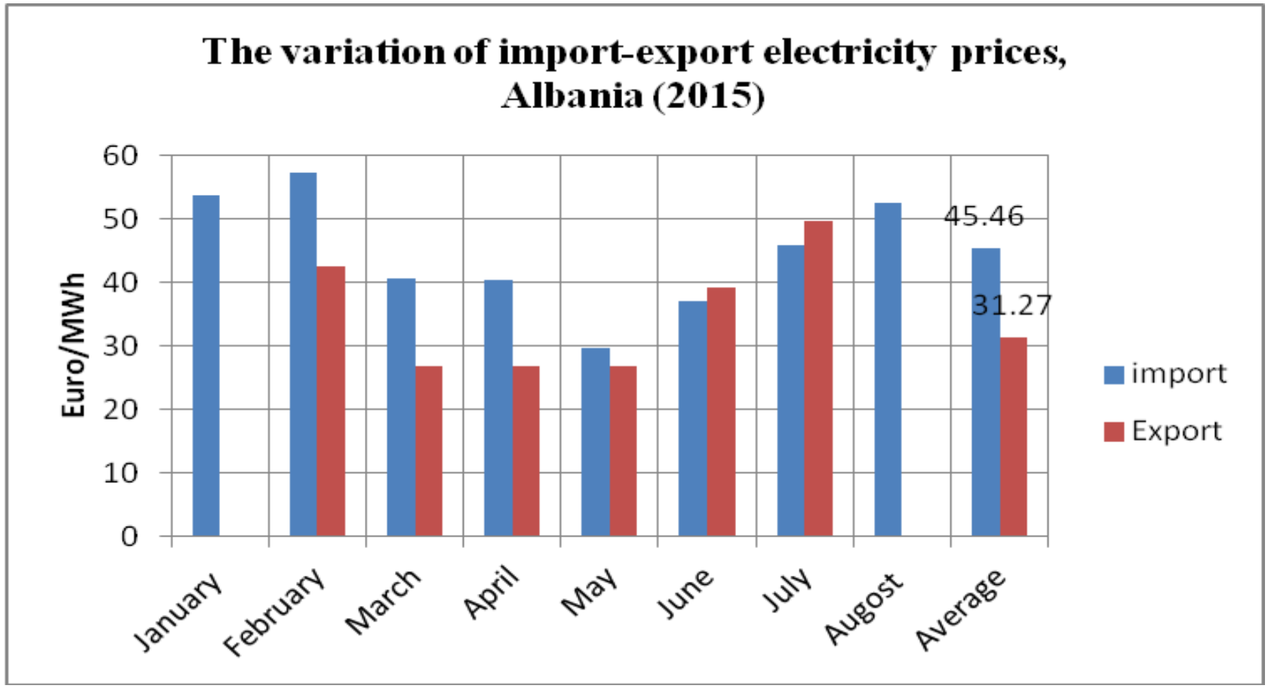
THE IMPORT ELECTRICITY



The imported electricity price has been variable, being always above **40 Euro/MWh and till 80 Euro/MWh**. This fact is very powerful driver to push towards constructing new power plant.

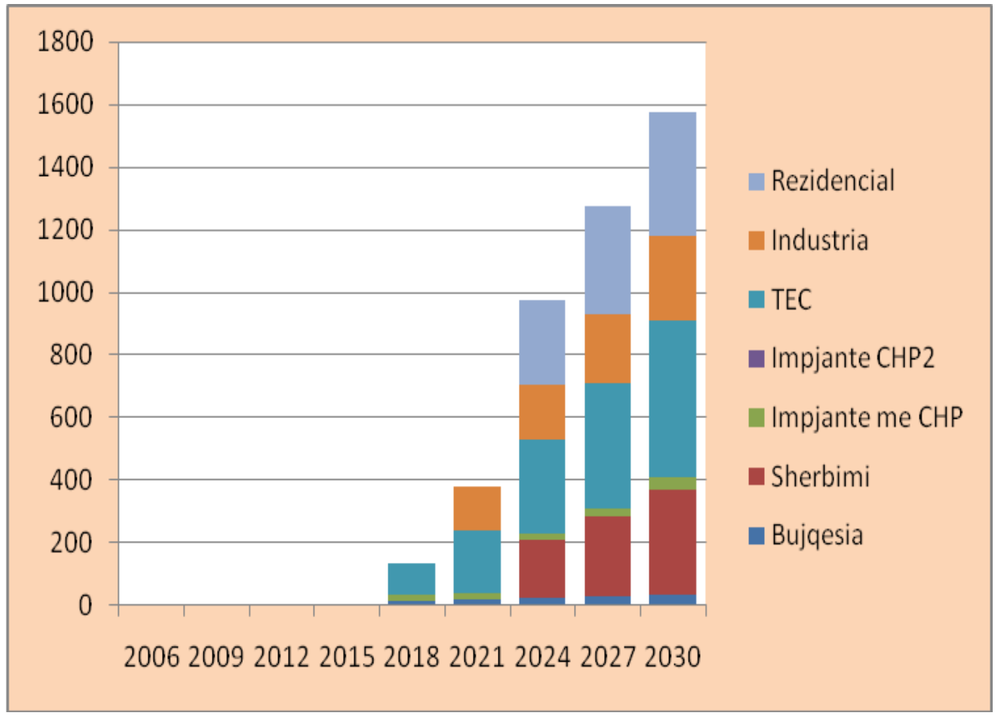
The import electricity depend on the weather conditions:
- **generation only by HPP**
- **households consumption**

THE VARIATION OF THE PRICES



The diference between average electricity prices **is 14.19 Euro/Mwh**
Who will pay for it?

ALTERNATIVE OF NATURAL GAS



Energy consumption according to different consumer sectors in Albania

- Domestic natural gas production is 17 milion m3N,while the reserve is estimated 3.63 milliarde m3N
- It is expected that natural gas will be used firstly in TPP to generate electricity, and later in th industrial sector and residential as well. The demand is estimated to achieve by 1.6 miliarde m3N, 13 years latter after the natural gas of TAP has started to use.
- The new TPP capacity is estimated to be 300 MW. Of course it will not discriminate the other PP technologies.

VLORA TPP

- The construction of Vlora TPP will fulfil and the other requirements, if this TPP will work with natural gas. The total capacity would be 300 MW
- The modern energy technology with natural are more convenient for:
- Natural gas has lower emissions
- Higher efficiency
- Modern systems for environment protection
- Lower specific cost of electricity generation
- Higher capacity factor

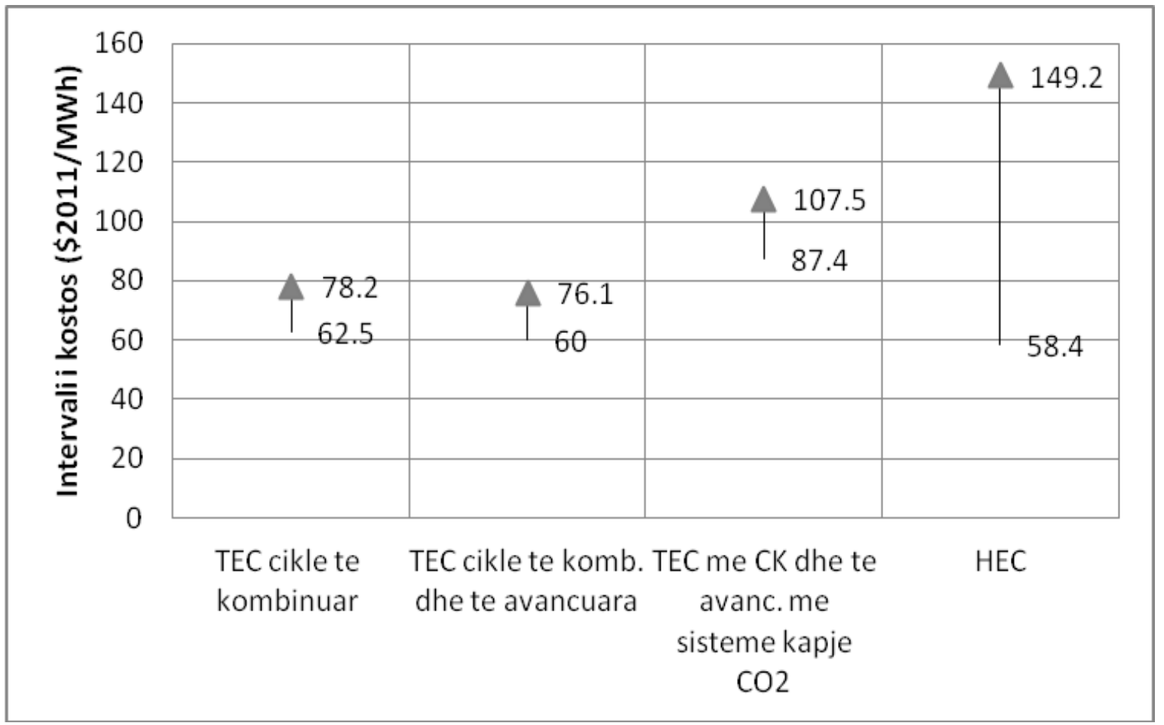
THE COMPARATIVE ANALYSE OF HPP AND TPP

The specific cost of electricity depend on:

- Typology of PPT
- Costs of prime energy sources and their variation
- Local costs, cost of workforce and the
- Environmental cost
- Costs of electricity network connection etc.

- The energy technology
- Three typology of TPP with natural gas:
- Combined cycle
- Advanced combined cycle
- Advanced combined cycle with carbon capture system
- HPP with dam

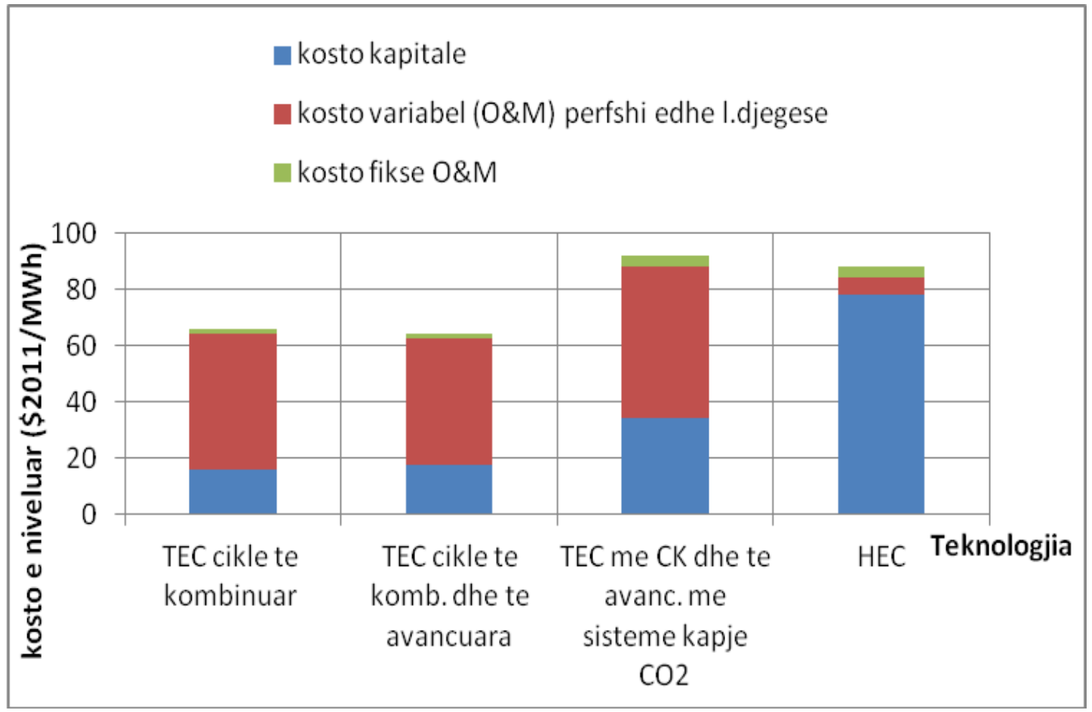
The variation of specific cost for 4 technologies



The ratio is:

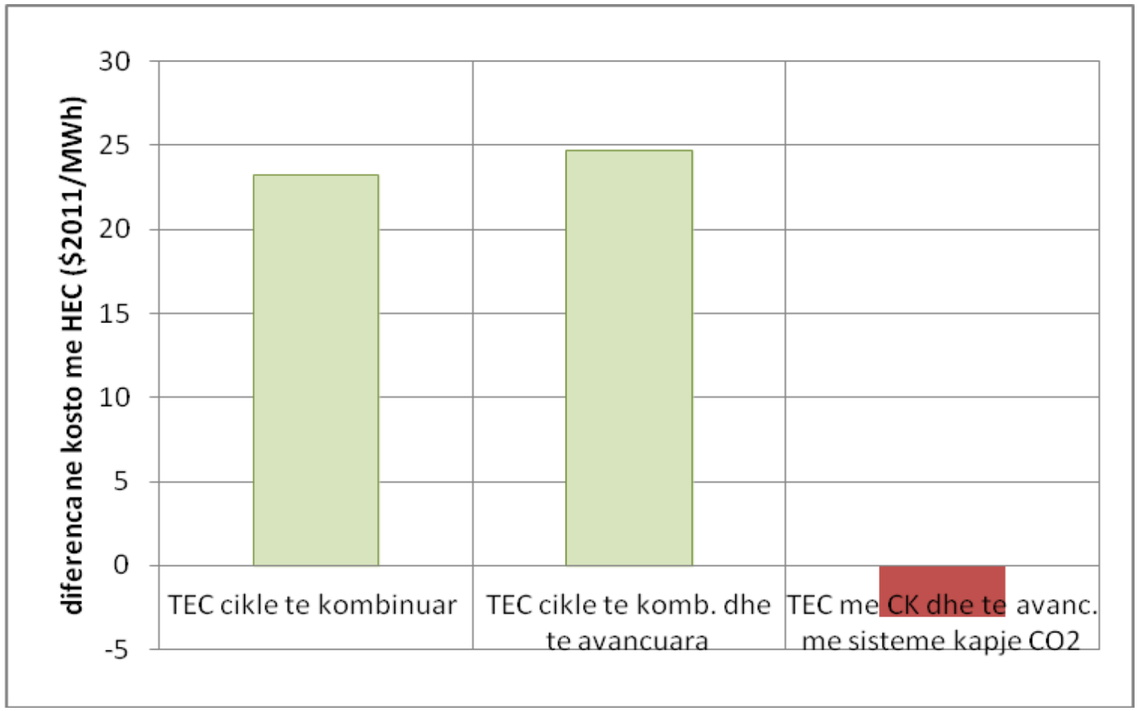
Technology I: 1.251
Technology II : 1.268
Technology III: 1.232
Technology IV: 2.555

The specific electricity costs for 4 technologies



The lowest cost is for TPP ACC
The highest cost is for TPP with ACC and CCS

The comparison



The difference -I and IV is **21 Euro/MWh,**
The difference II and IV is **22.5 Euro/MWh,**
The difference III and IV is **– 2.8 Euro/MWh**

CONCLUSIONS

- The policymakers for energy, environment and economy ought to undertake the decision for carry out the study for **sustainable development of electricity system** in Albania.
- This study, using the **complex analysis**, will seek to **guarantee the life of new generation** as well as the **environment protection**. Additional study for the water reserve is recommended also.
- From energy point of view the constructing **of Vjosa river HPP doesn't present the emergence** case. It is recommended do **not construct** this HPP and to look at the other alternatives.
- The **natural gas is great opportunity** for Albania and for the electricity generation. The results of study for the potential of natural gas use in Albania, are very useful.
- The additional **TPP capacity 200 MW will be alternative of Vjosa river HPP**
- The generation with natural gas TPP **will reduce the specific cost of electricity**, estimated not less than **20 Euro/MWh**.
- The central institutions are encouraged to **support the Albanian scientific institutions** to carry out the **complex study aiming to get sustainable solutions**

ECOLOGICAL ASSESSMENT AS BASIS FOR RIVER MANAGEMENT

CONTENTS

- Learnings from long-term effects of engineering
- The significance of science in river management
- International regulations
- Standard operational procedures
- The value of the Vjosa
- Recommendations for science and policy

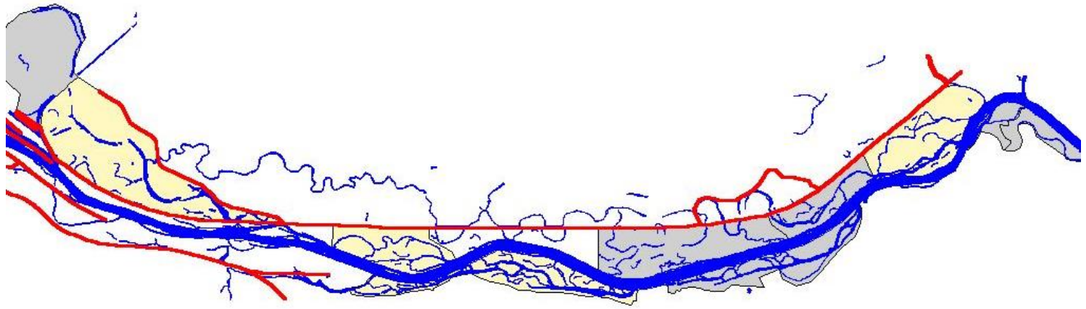
Fritz Schiemer
Department of Limnology and Oceanography
University Vienna

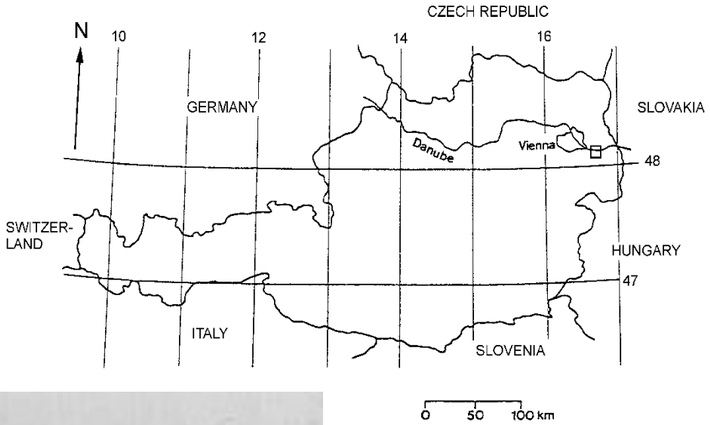
THE HAINBURG CONTROVERSY, 1984

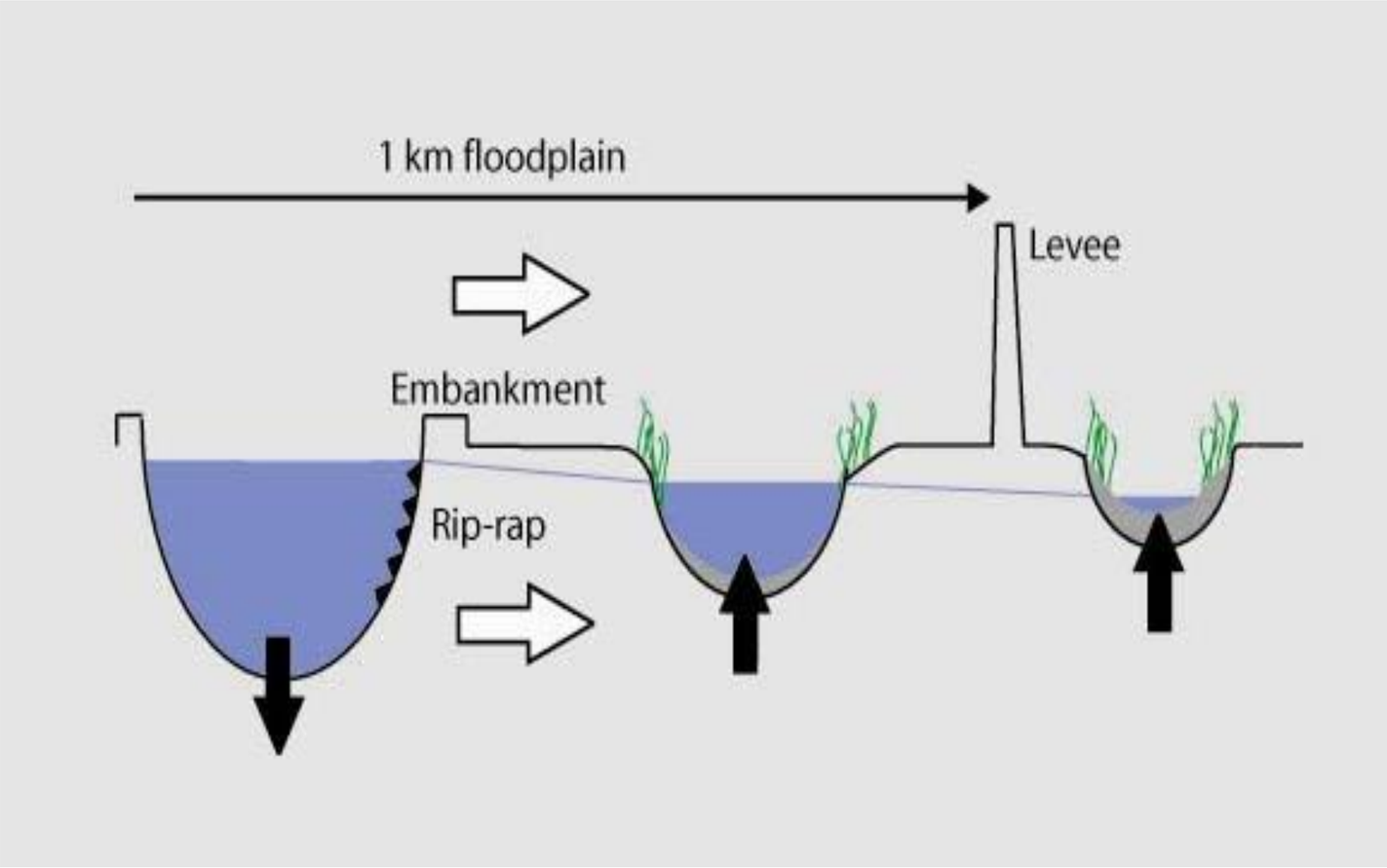
- 1983/84 discussion on a hydropower dam
- „Ecology Commission“of the Austrian government
- science-policy dialogue
- management oriented research

- Landscape elements with significant functions for the water cycle, natural transport and purification processes
- Many uses: clean water, flood control, conservation, tourism, fisheries etc.

DANUBE RIVER REGULATION, 1875







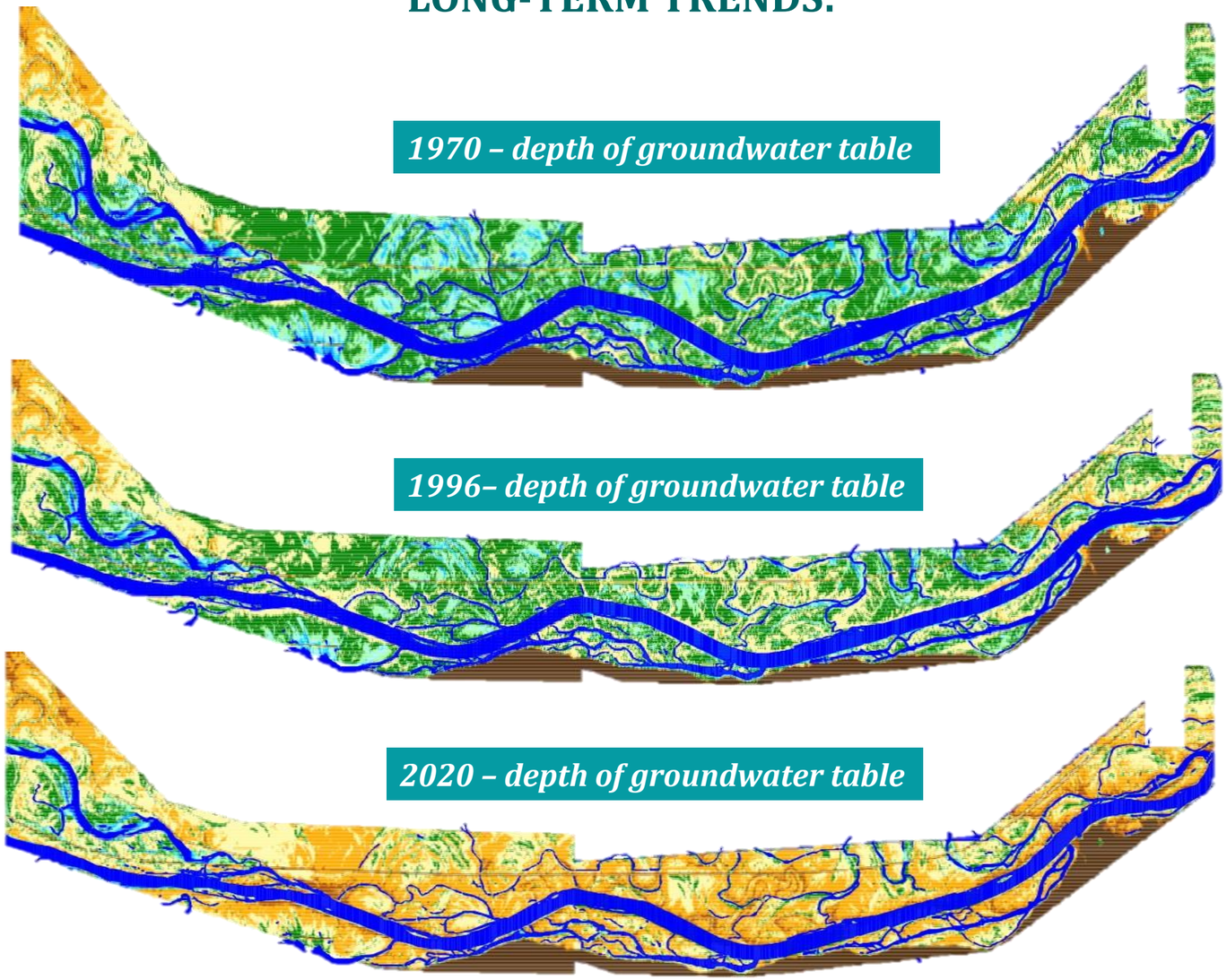
ENGINEERING MEASURES:

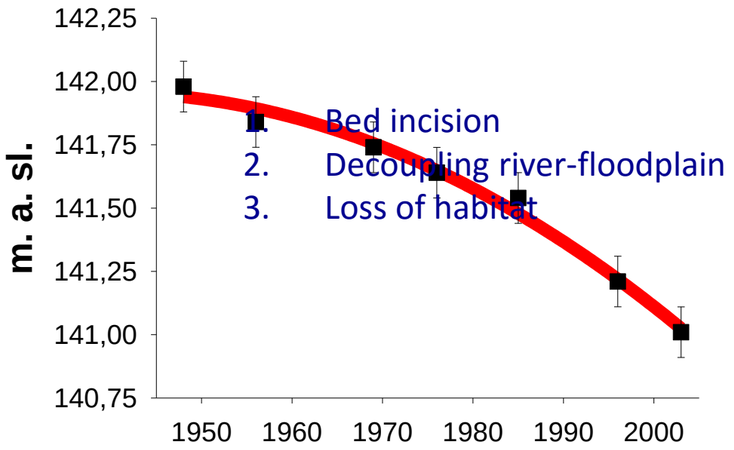
- Straightened channel
- Armored embankments
- Floodplains restricted by levees

IMMEDIATE EFFECTS LOSS OF

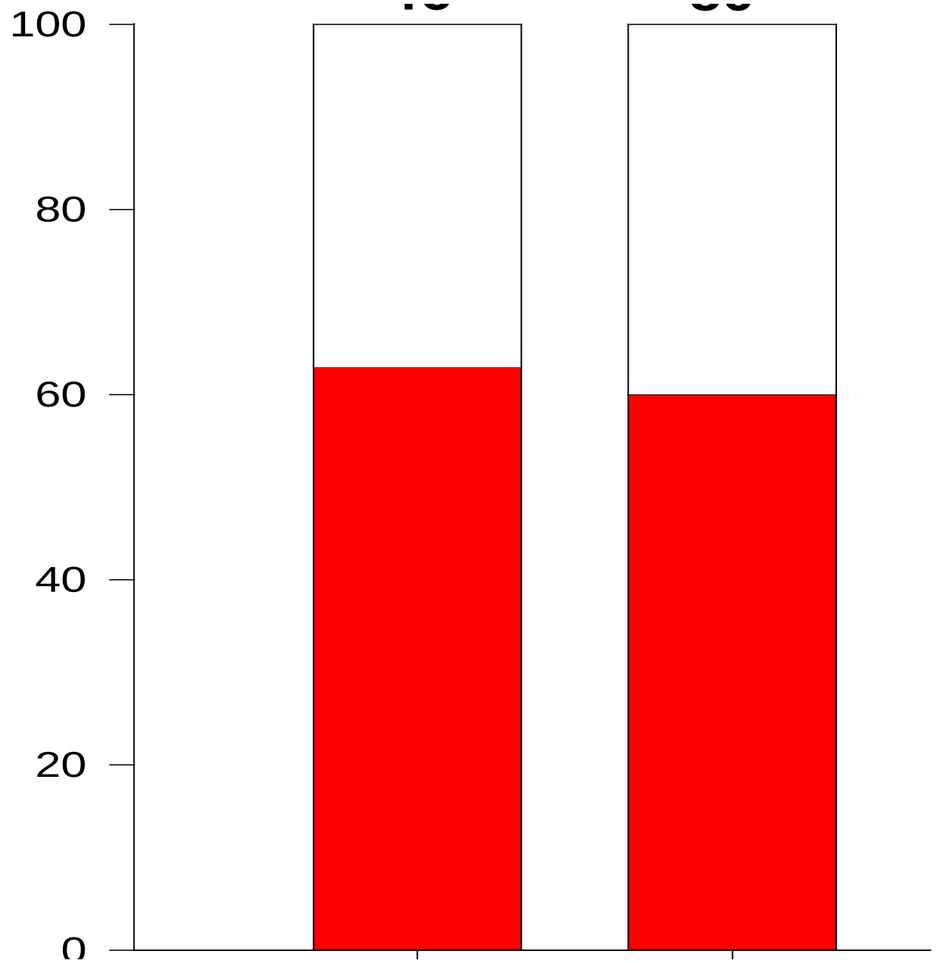
- inshore zones
- connectivity
- geomorphic dynamics

LONG-TERM TRENDS:



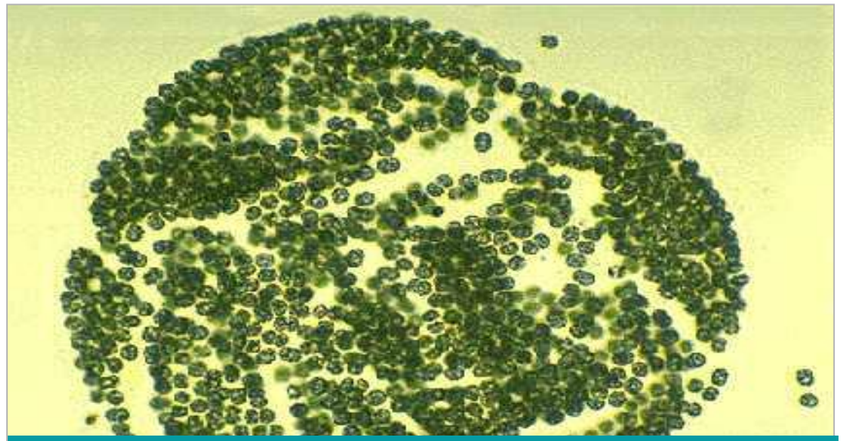


LONG-TERM CONSEQUENCES OF RIVER REGULATION: LOSS OF BIODIVERSITY



DOWNSTREAM EFFECTS

eutrophication and hepatotoxic cyanobacteria blooms



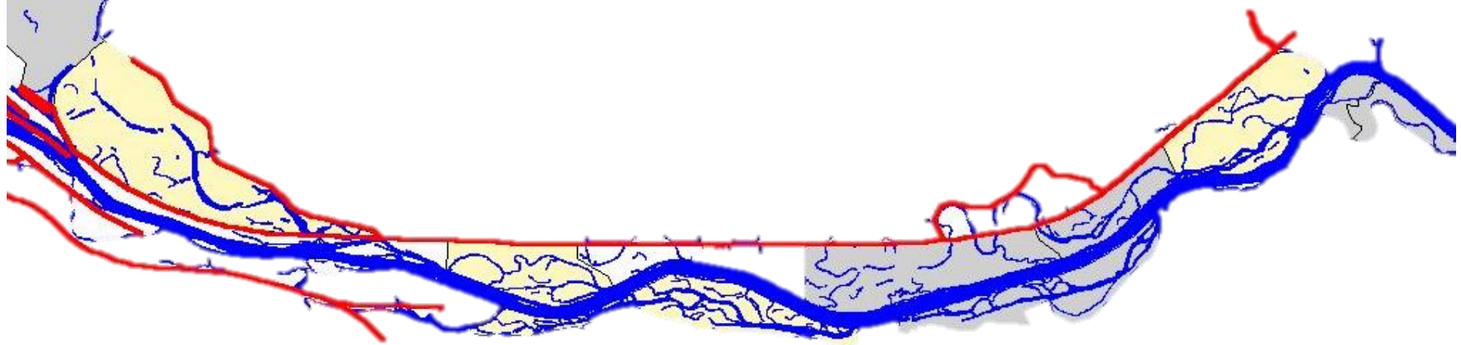
eutrophication and hepatotoxic cyanobacteria blooms

Reservoir-flushing

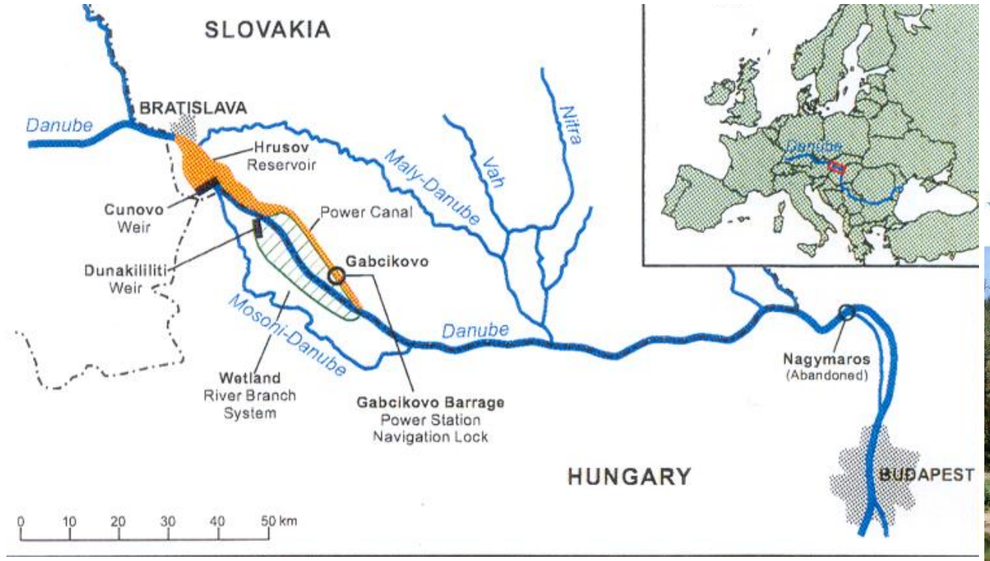
Residual flow

The freeflowing section of the Danube between Vienna and Bratislava

- National Park
  1996
- „Danube Restoration Programme“
  1992-1996
- Integrated River Engineering Programme”
  Since 2000



PROJECTS ON RIVER MANAGEMENT



EUROPEAN UNION
European Regional Development Fund

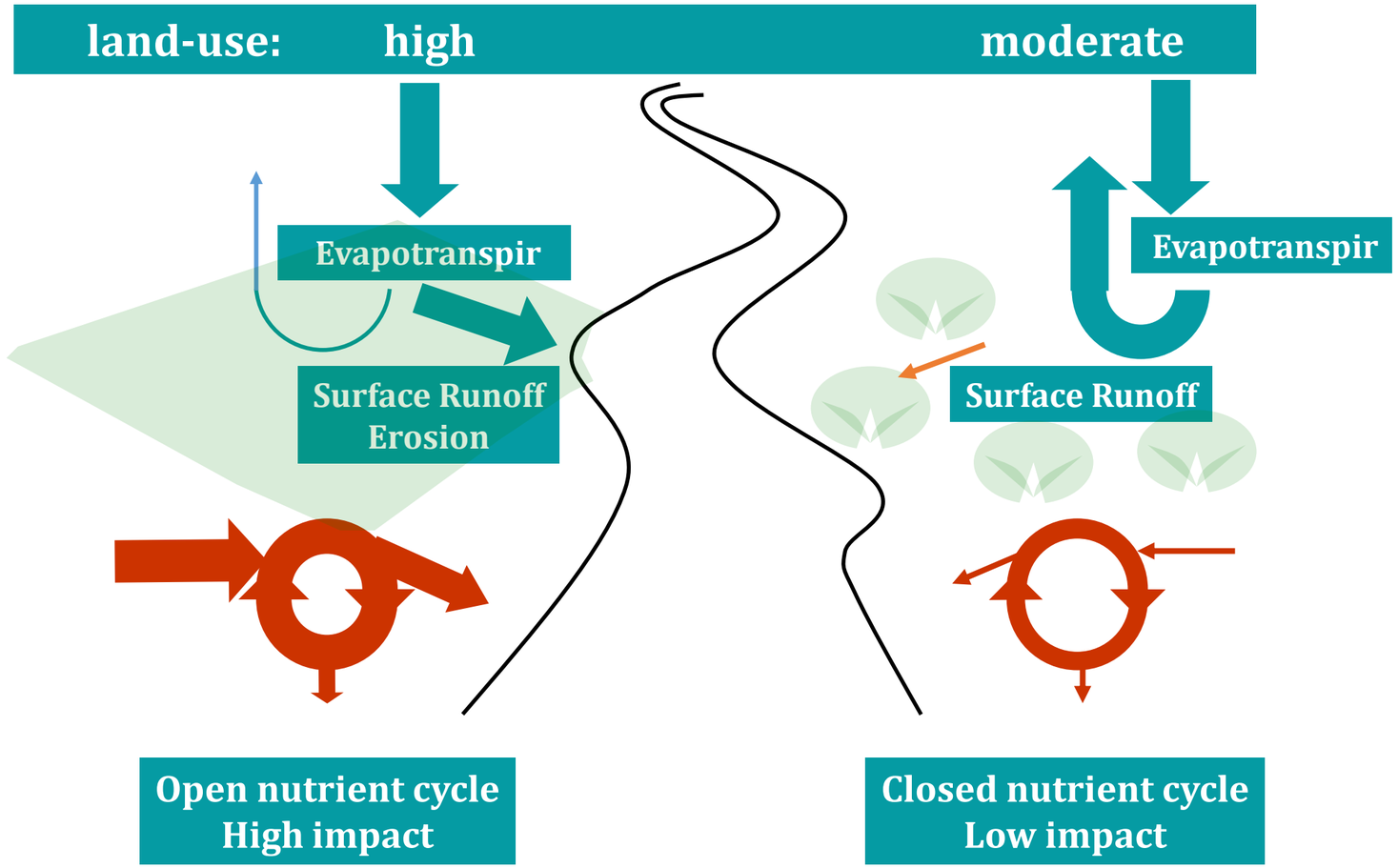
creating the future
Programm zur grenzüberschreitenden Zusammenarbeit SLOWAKEI - ÖSTERREICH 2007-2013
Program cezhraničnej spolupráce SLOVENSKÁ REPUBLIKA - RAKÚSKO 2007-2013

Revitalisierung der March

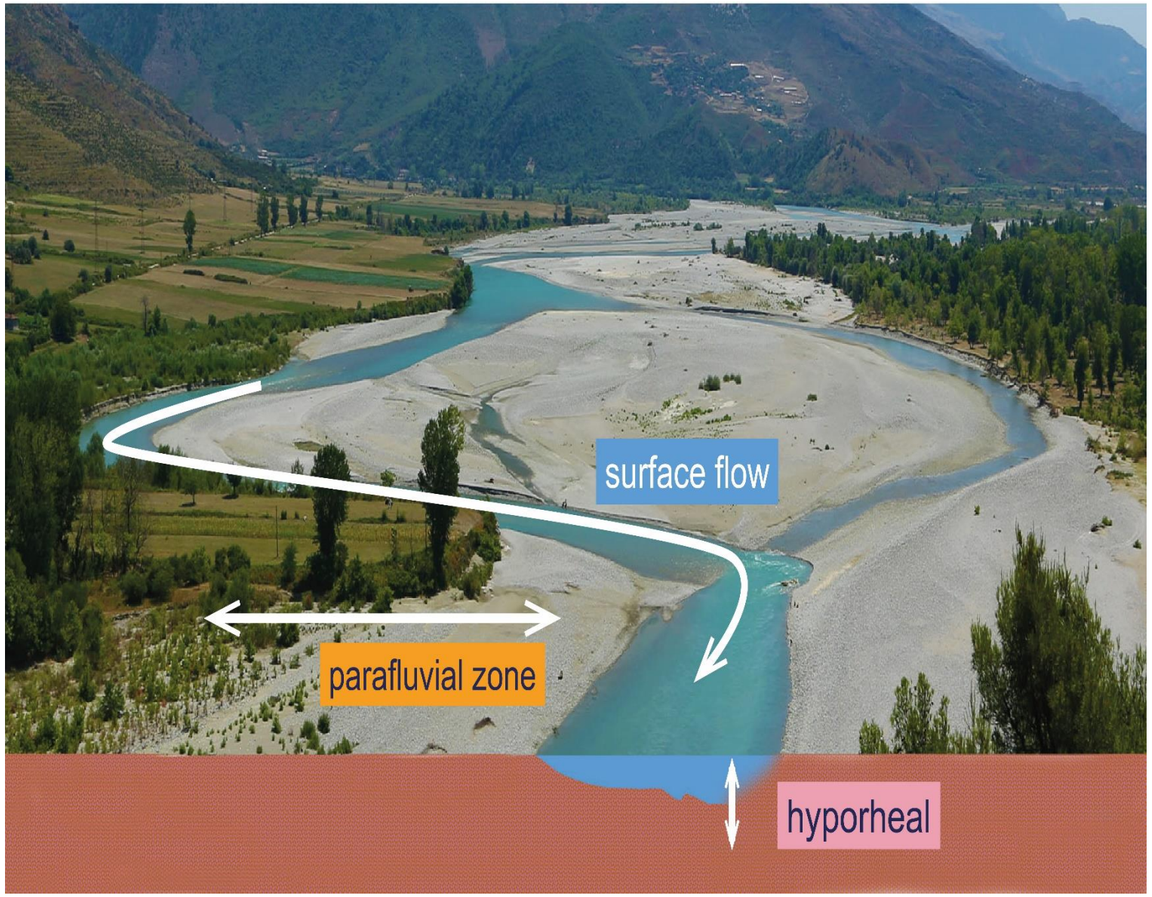
significance of science in river management

KLIWAS
Klima · Wasser · Schifffahrt

INTEGRATED WATERSHED MANAGEMENT



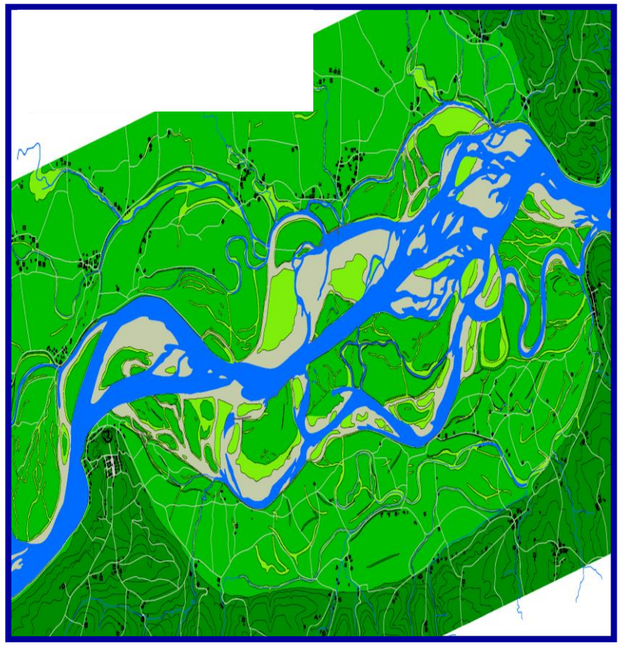
THE MAIN CHALLENGE: CAUSE-EFFECT CHAIN



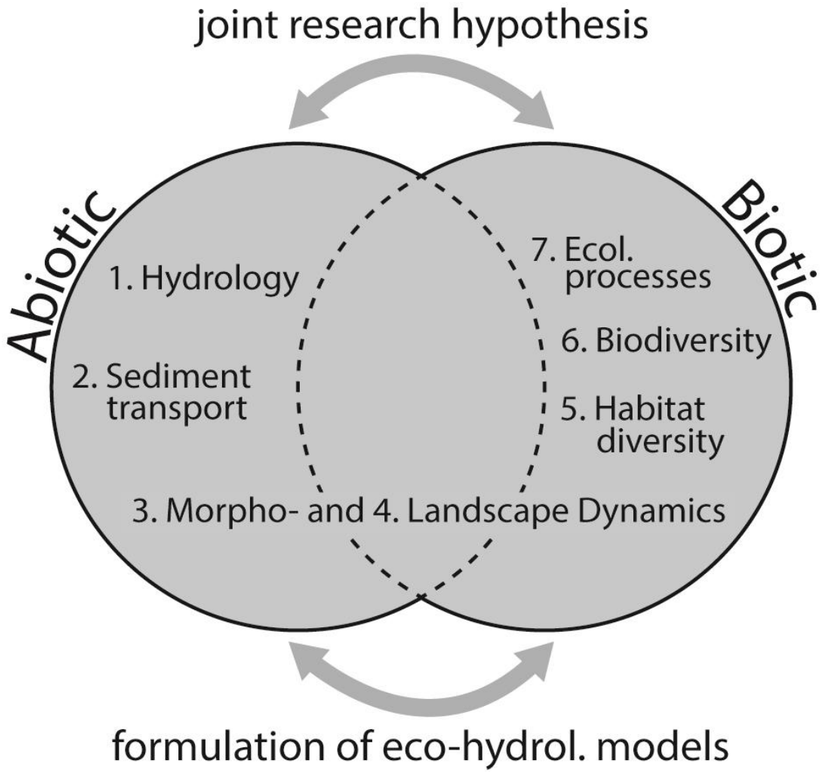
key processes
(hydrology & sediment transport:
geomorphic dynamic)

landscape composition
dynamic equilibrium in habitat composition & connectivity

Characteristic process dynamics and biotic diversity

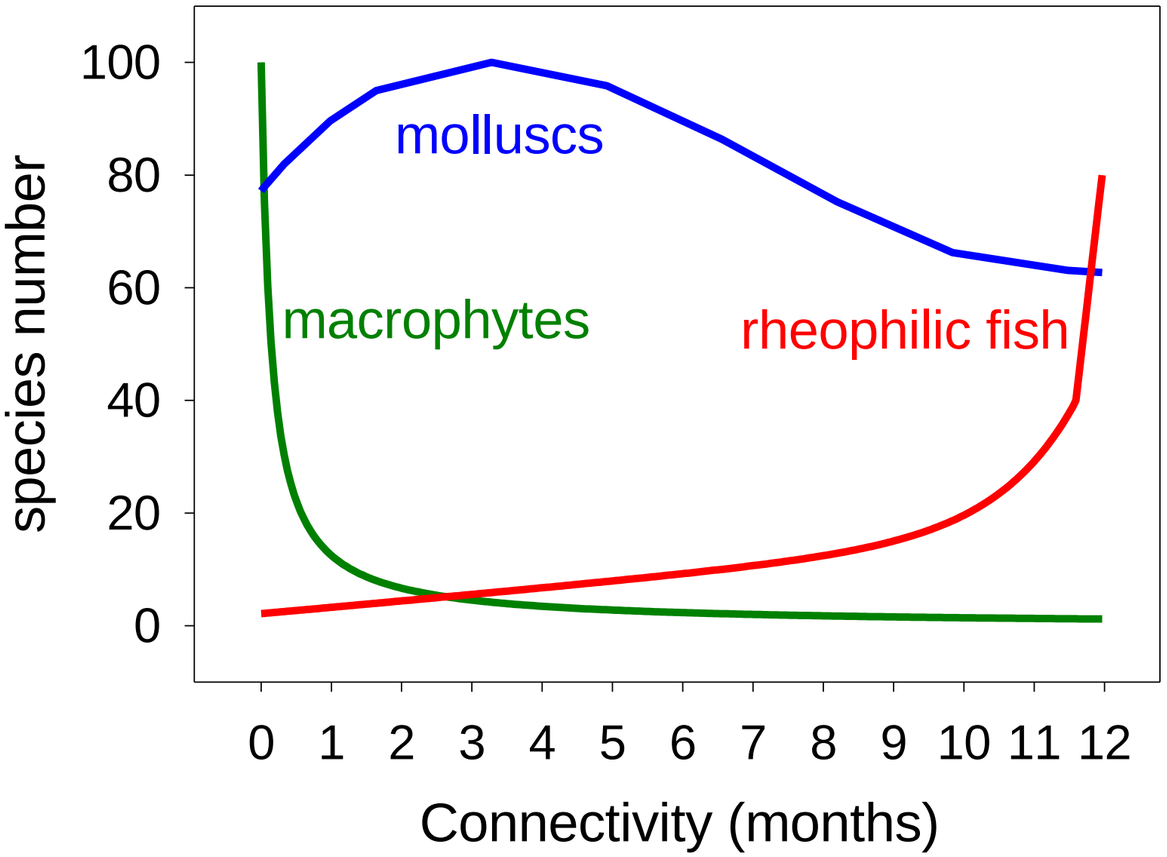


INTERDISCIPLINARITY: CONNECT SCIENTIFIC DISCIPLINES



- **joint problem identification**
- **joint hypothesis formulation**
- **interaction throughout the research programme**

THE FUNCTIONAL RESPONSE BETWEEN HYDROLOGICAL CONNECTIVITY AND BIODIVERSITY



science arena

interdisciplinary science

policy arena

stakeholders **authorities**

public awareness & politics

policy arena

CONNECT SCIENCE TO POLICIES:

- Expert panels with long-term mandates for defining and evaluating management objectives
- Continued science- practitioners dialogue
- Experts should be part of the planning and decision process

EU DIRECTIVES AND INTERNATIONAL RECOMMENDATIONS

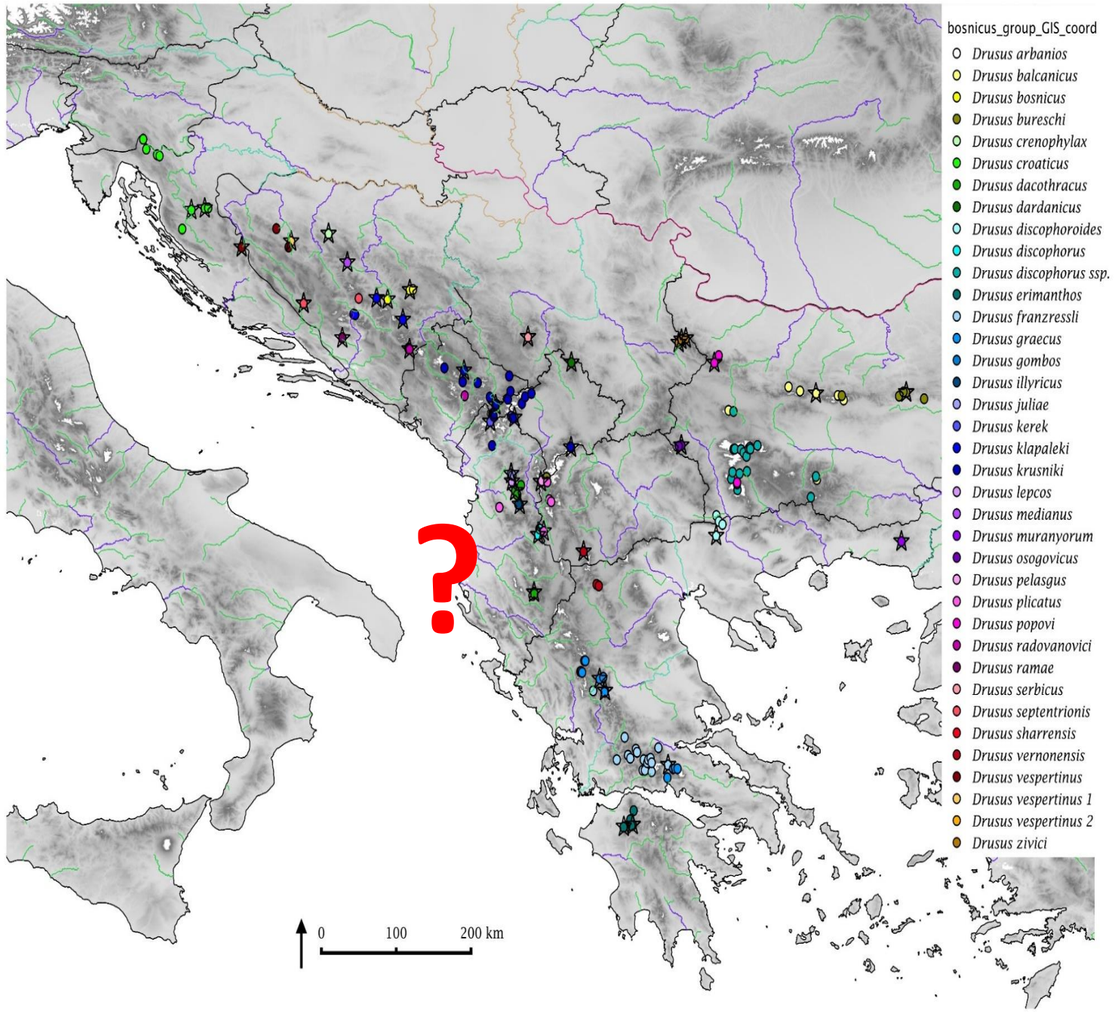
- Environmental Impact Assessment Directive (85/337/EC)
- Water Framework Directive (2000/60/EC)
- Birds Directive (79/409/EC)
- Habitats Directive (92/43/EC)
- Natura 2000 network for protected areas
- “Recommendations by the ICPDR“

"STANDARD OPERATIONAL PROCEDURE" (SOP) FOR RIVER MANAGEMENT

- International regulations and recommendations
- Science based approach: detailed assessment of the structure and function of the riverine landscape
- Independent, interdisciplinary expert panels with long-term mandate
- Comprehensive management plans taking into account competitive stakeholder interests
- River forum (stakeholders, scientists, authorities)

THE VALUE OF THE VJOSA

- The value of the Vjosa: undisturbed fluvial morphology & sediment transport
- The value of the Vjosa: specific biodiversity
- Small-scale endemism patterns



KEY FEATURE: ECO-HYDROLOGY, GEOMORPHOLOGICAL DYNAMICS

CONCLUSIONS

science arena

- management-oriented, interdisciplinary research program
- well-structured interdisciplinary assessment program has good chances to find international support
- Use international experience on river science
- Vjosa is a challenging natural laboratory

CONCLUSIONS

policy arena

- Follow international regulations and experience
- Management has to be based on scientific knowledge
- River engineering without knowledge lead to deficiencies and call for costly remediations on the long run.
- Accepting the unique value of Vjosa
- River forum including scientists, stakeholders and decision makers

UNDERSTANDING HYDROMORPHOLOGICAL PROCESSES AS KEY FEATURE FOR MANAGEMENT

CONTENTS

- Introduction and problem description
- Hydromorphological processes in a scaling framework
- Sediment challenges in Europe and examples
- Summary and outlook

Helmut Habersack
BOKU - University of Natural Resources and Life Sciences Vienna

SEDIMENT TRANSPORT

Surplus of fine sediments

Surplus of fine sediments

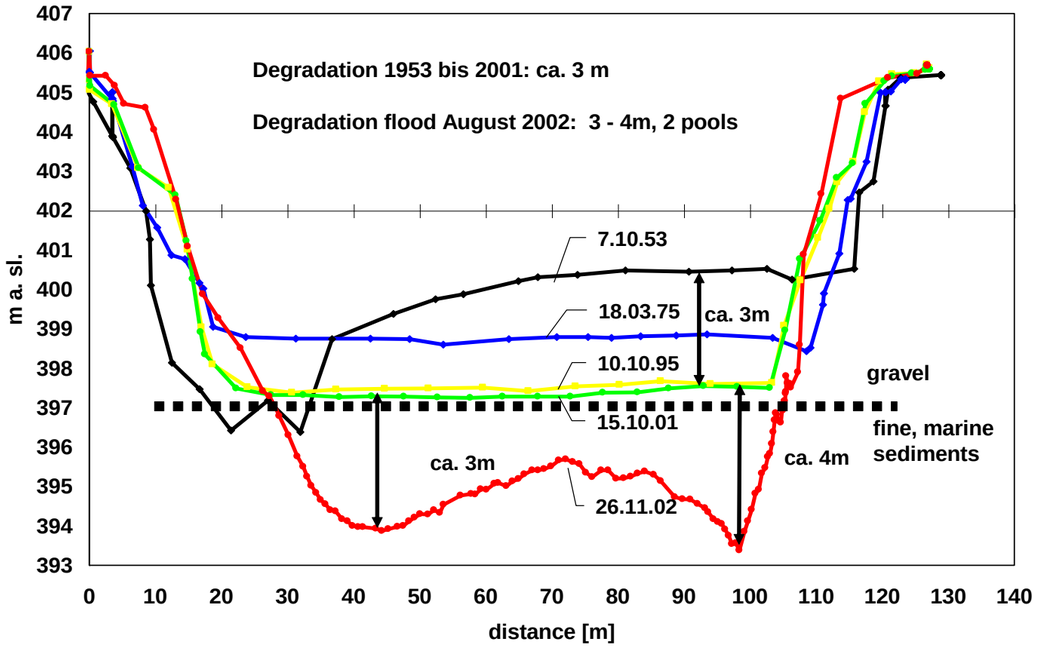
Deficit of sediments downstream the dam

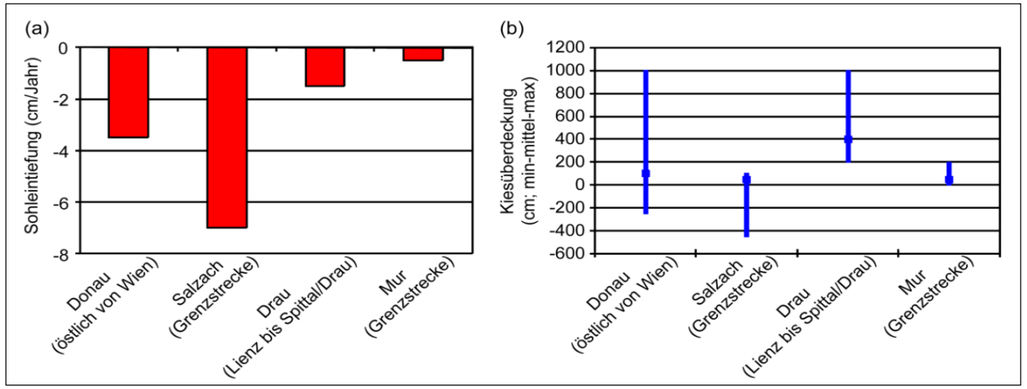
The Vjosa Science Conference

The Vjosa – A unique opportunity for European River Science

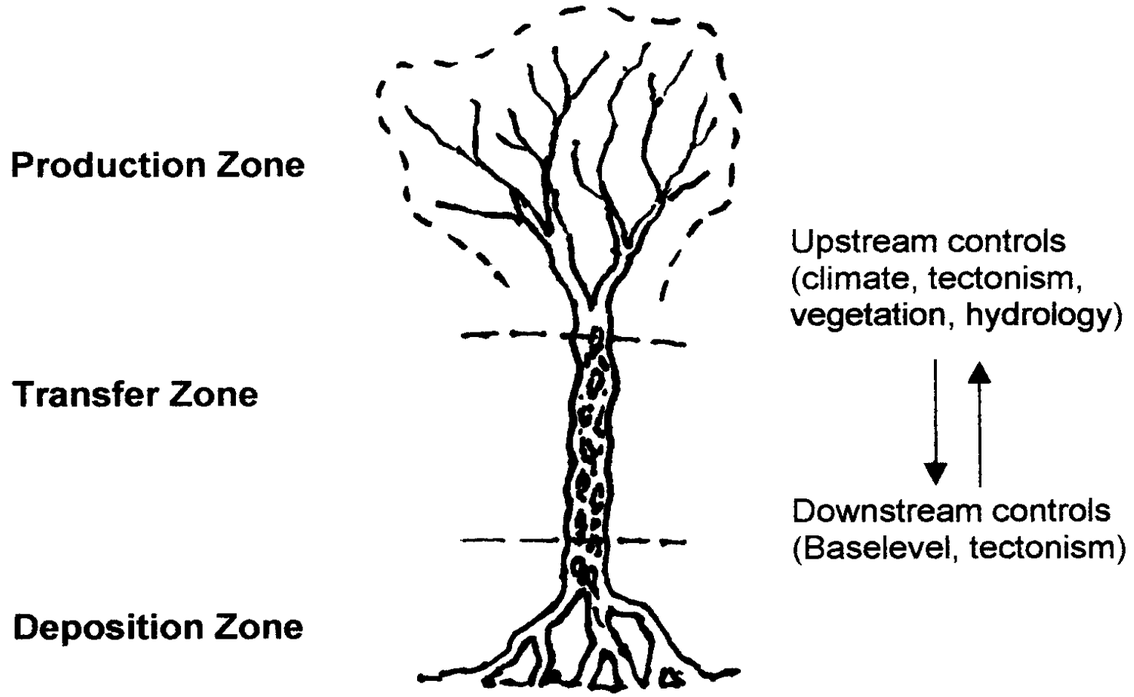
Problem example 1
Sediment continuum – surplus

Problem example 2
Sediment continuum – deficit

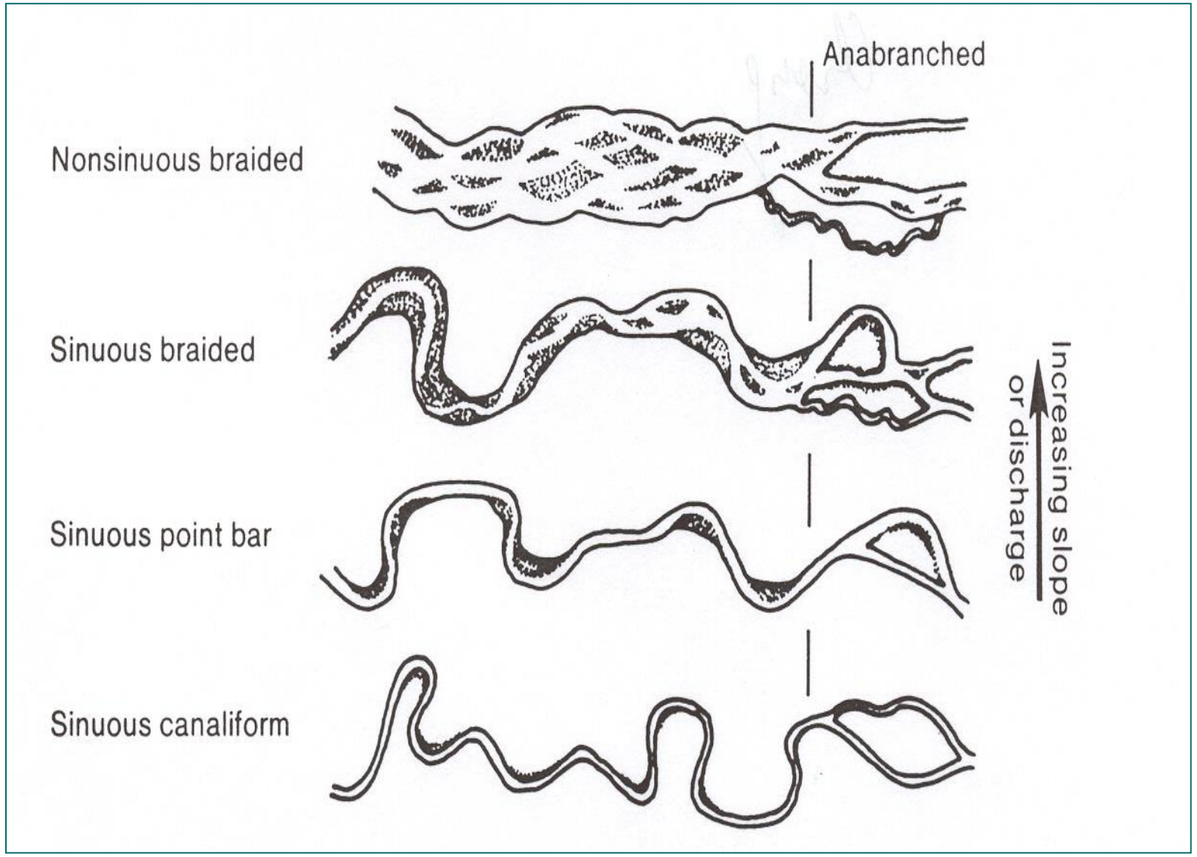


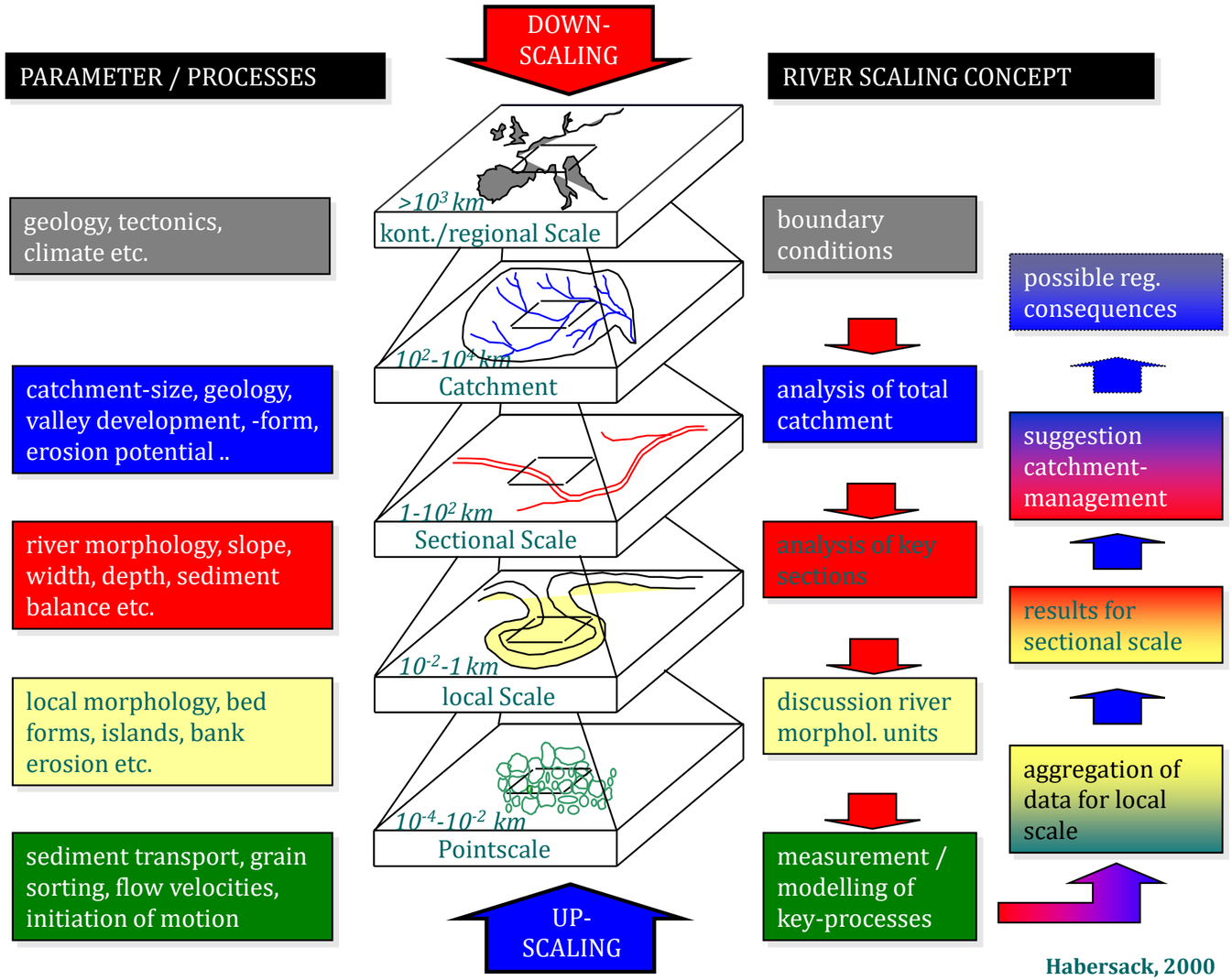


RIVER MORPHOLOGY



after Schumm

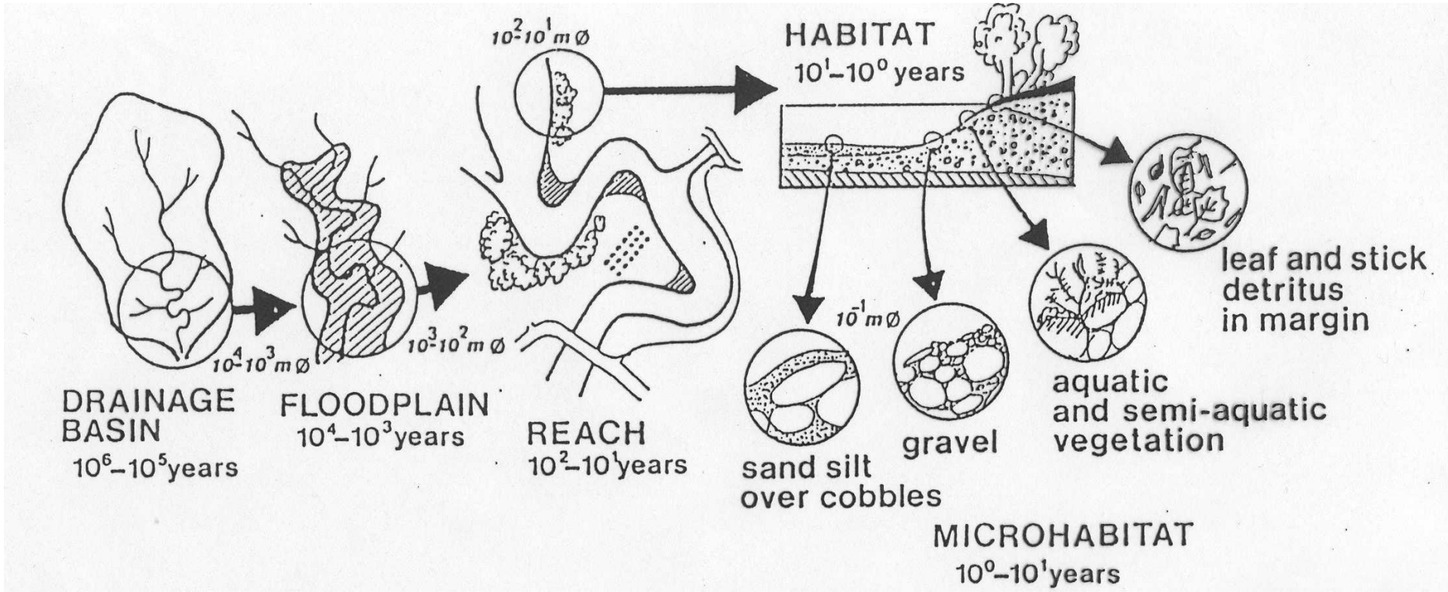




Habersack, 2000

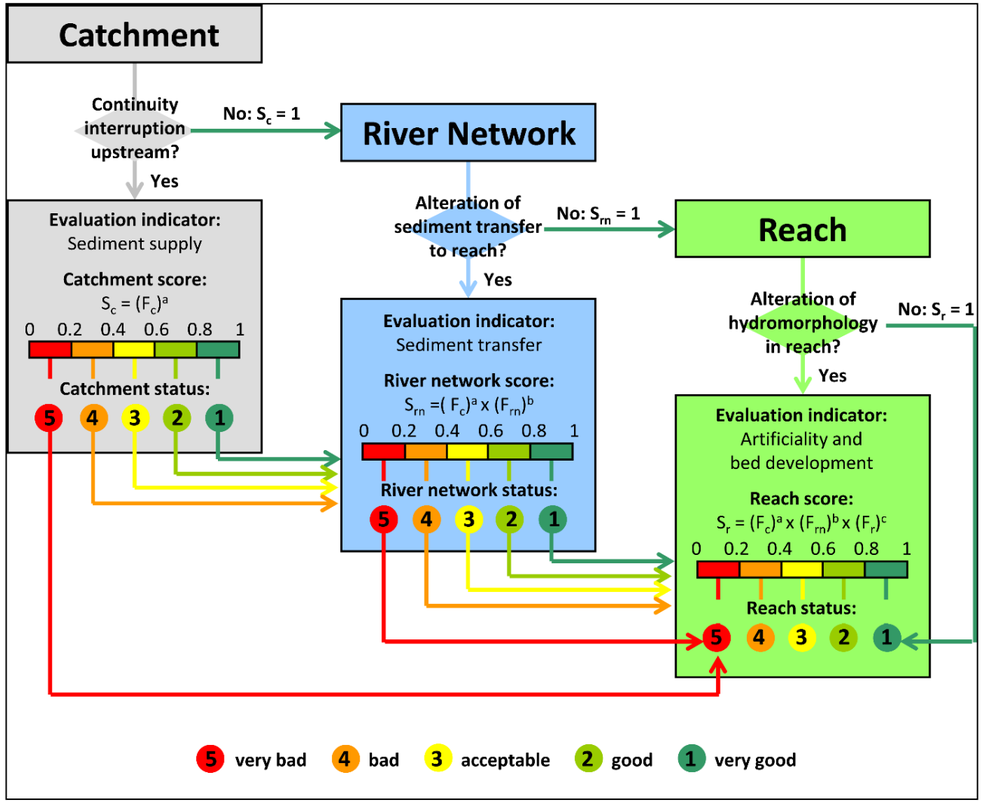
FUNCTIONS OF HYDROMORPHOLOGY IN RIVERS

- Development of the river bed and morphodynamics
- Prerequisite for the minimization of negative trends (e.g. river bed degradation)
- Habitats
- Groundwater flow
- Nutrient transport…
- Hydropower, river engineering, flood protection, torrent control, restoration…

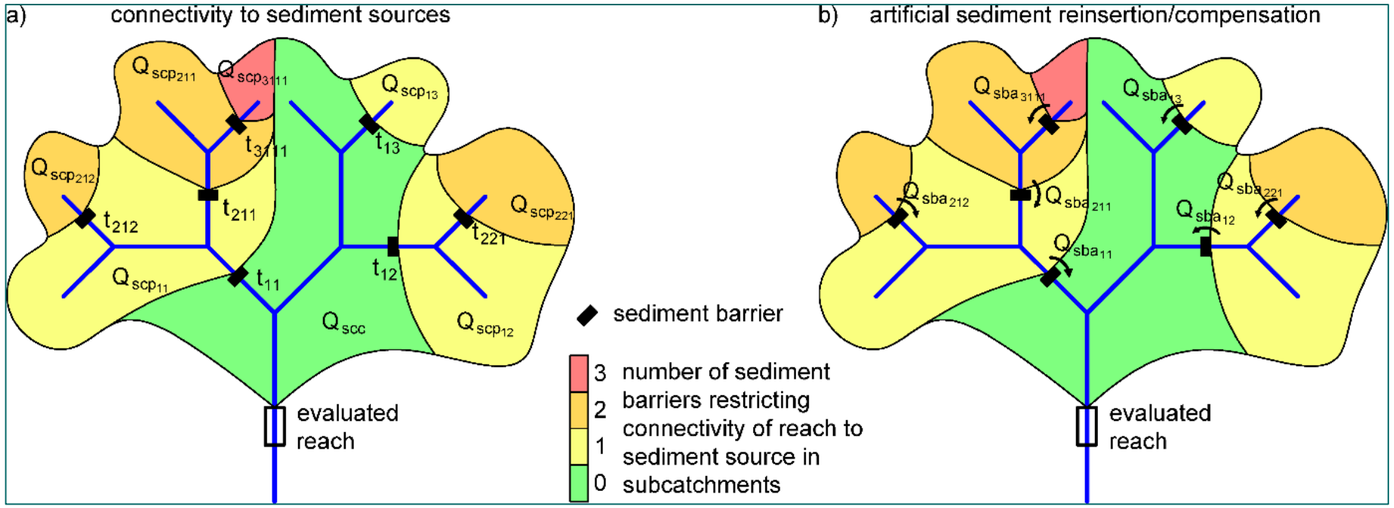


Scales of the river morphology

SPAWNING & JUVENILE STATUS NASE

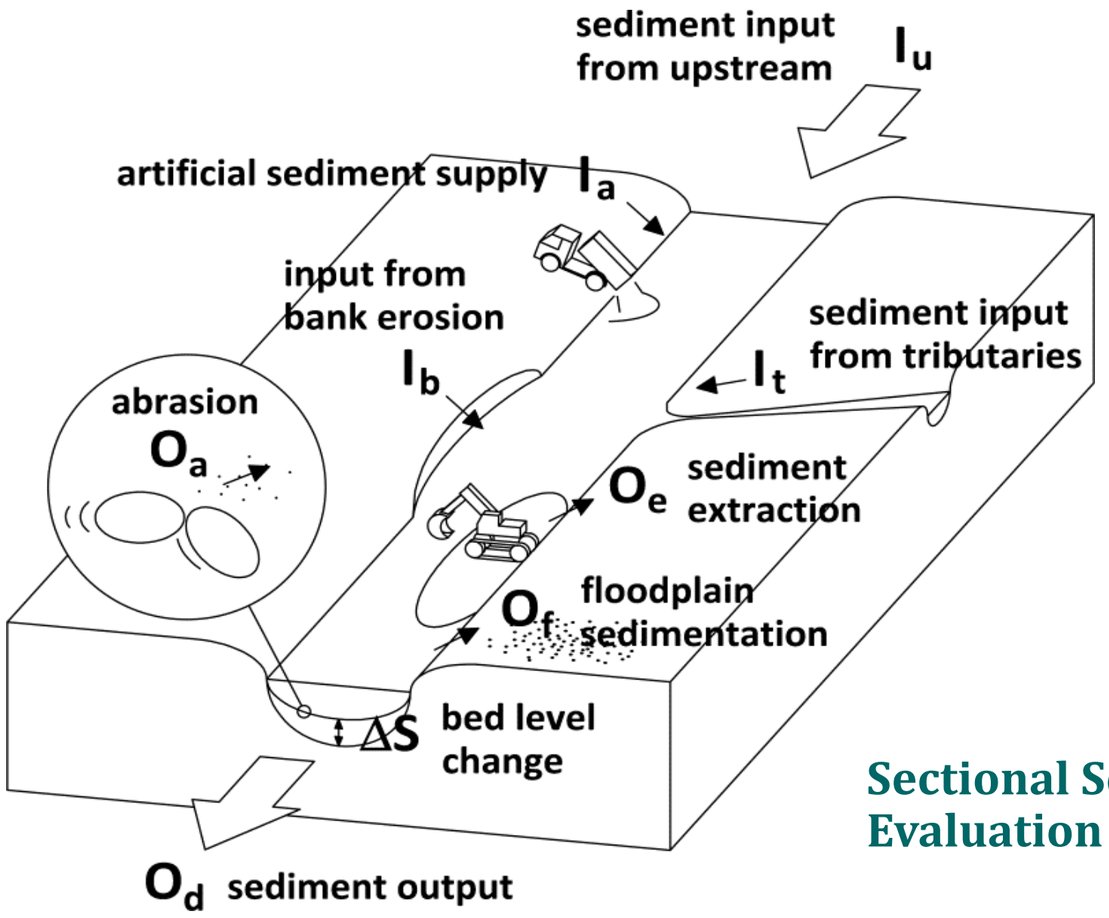


$$Q_{sbt} = t_{1i}\left[\sum_{i=1}^{n} Q_{scp\,1i} + t_{2ij}\left[\sum_{j=1}^{n} Q_{scp\,2ij} + t_{3ijk}\left[\sum_{k=1}^{n} Q_{scp\,3ijk}\ldots\right]\right]\right]$$

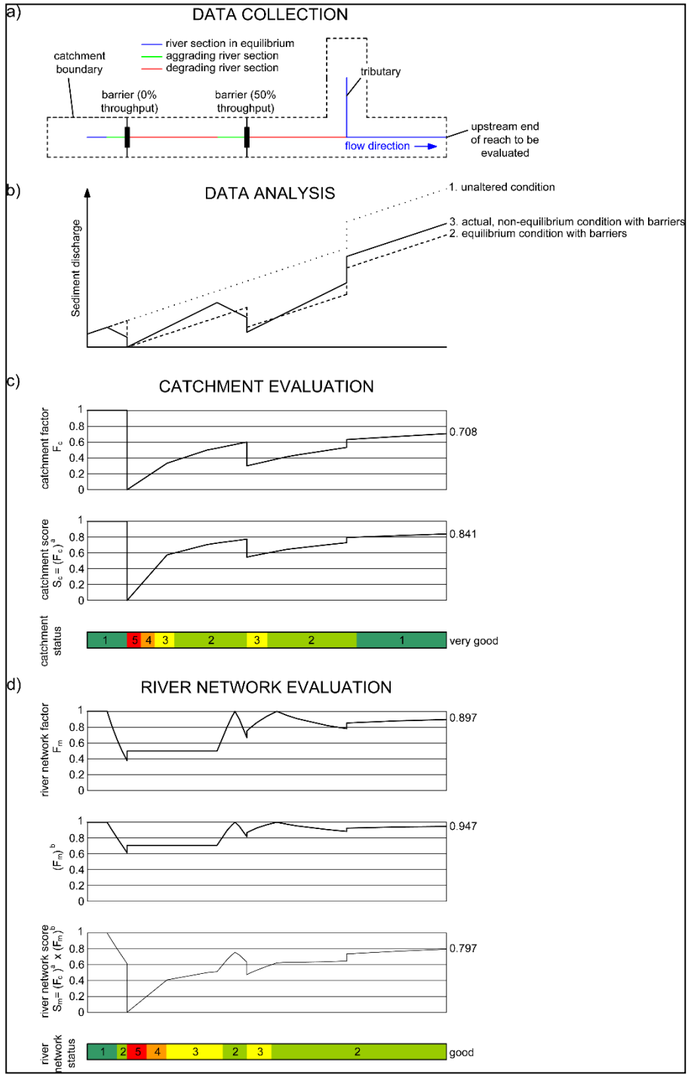


Catchment Scale – Hydromorphological Evaluation Tool HYMET

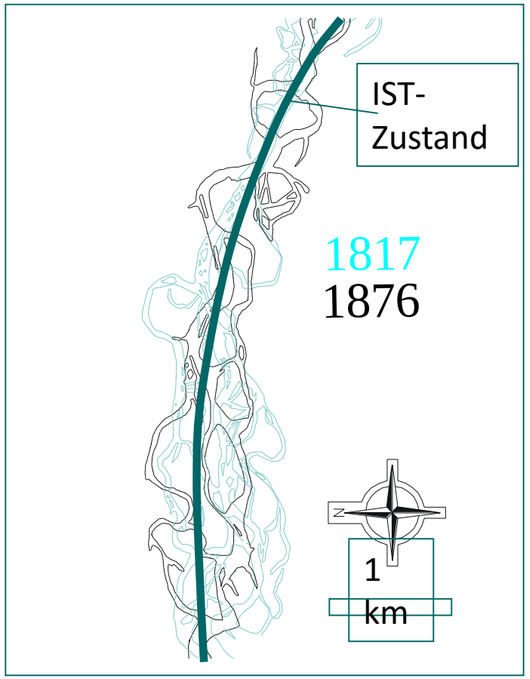
$$(I_u + I_t + I_a + I_b) - (O_d + O_e + O_f + O_a) = \Delta S$$

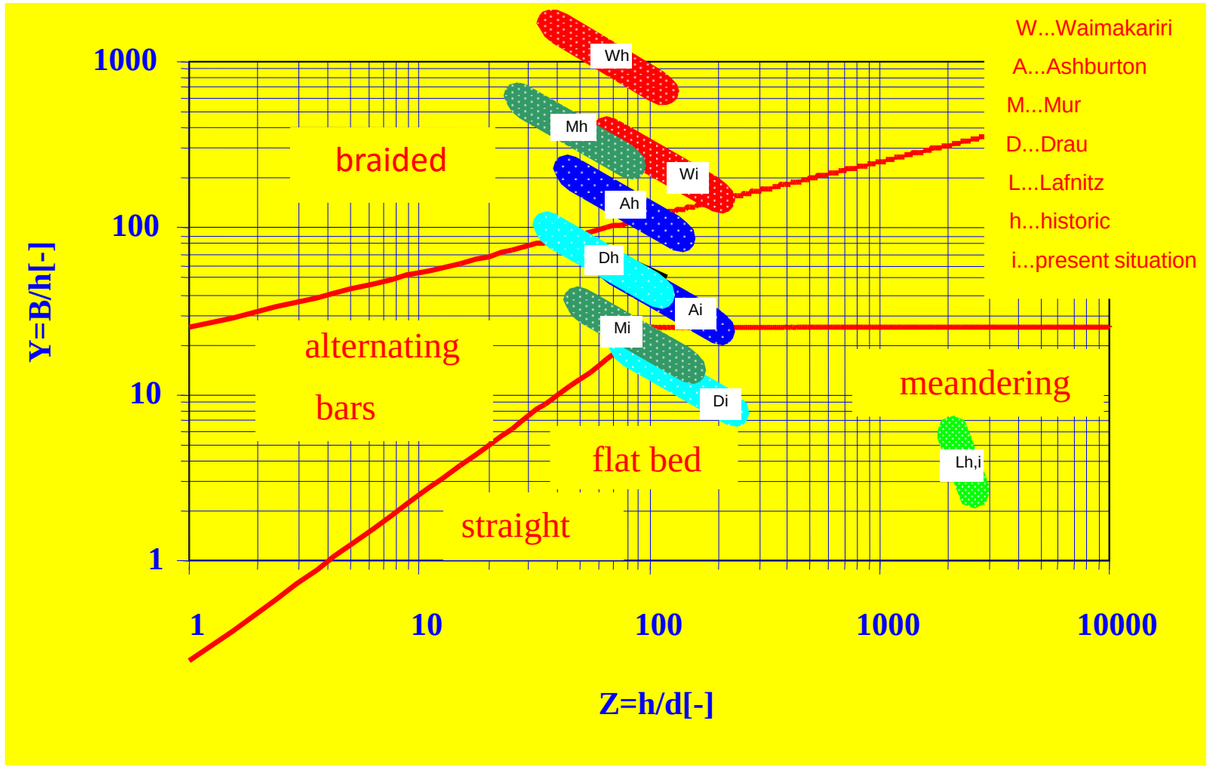


Sectional Scale – Hydromorphological Evaluation Tool HYMET

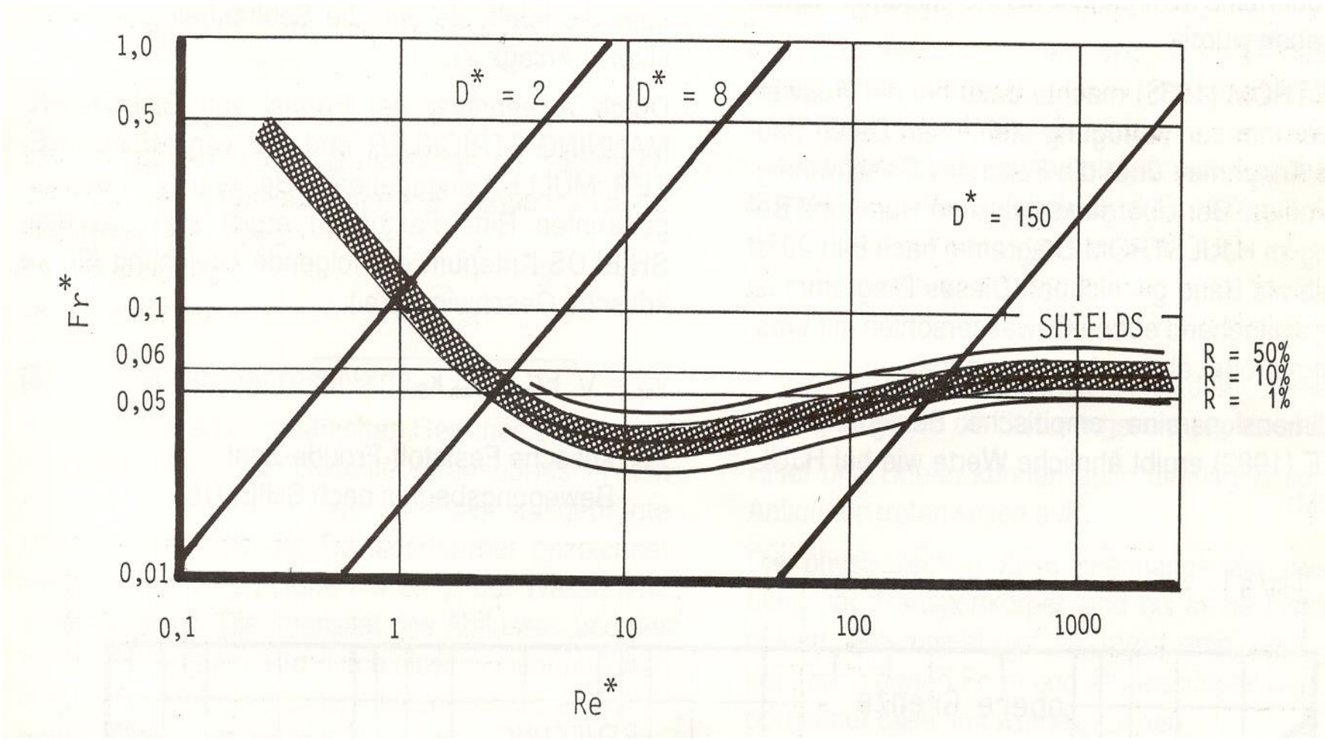


ANALYSIS OF RIVER MORPHOLOGY

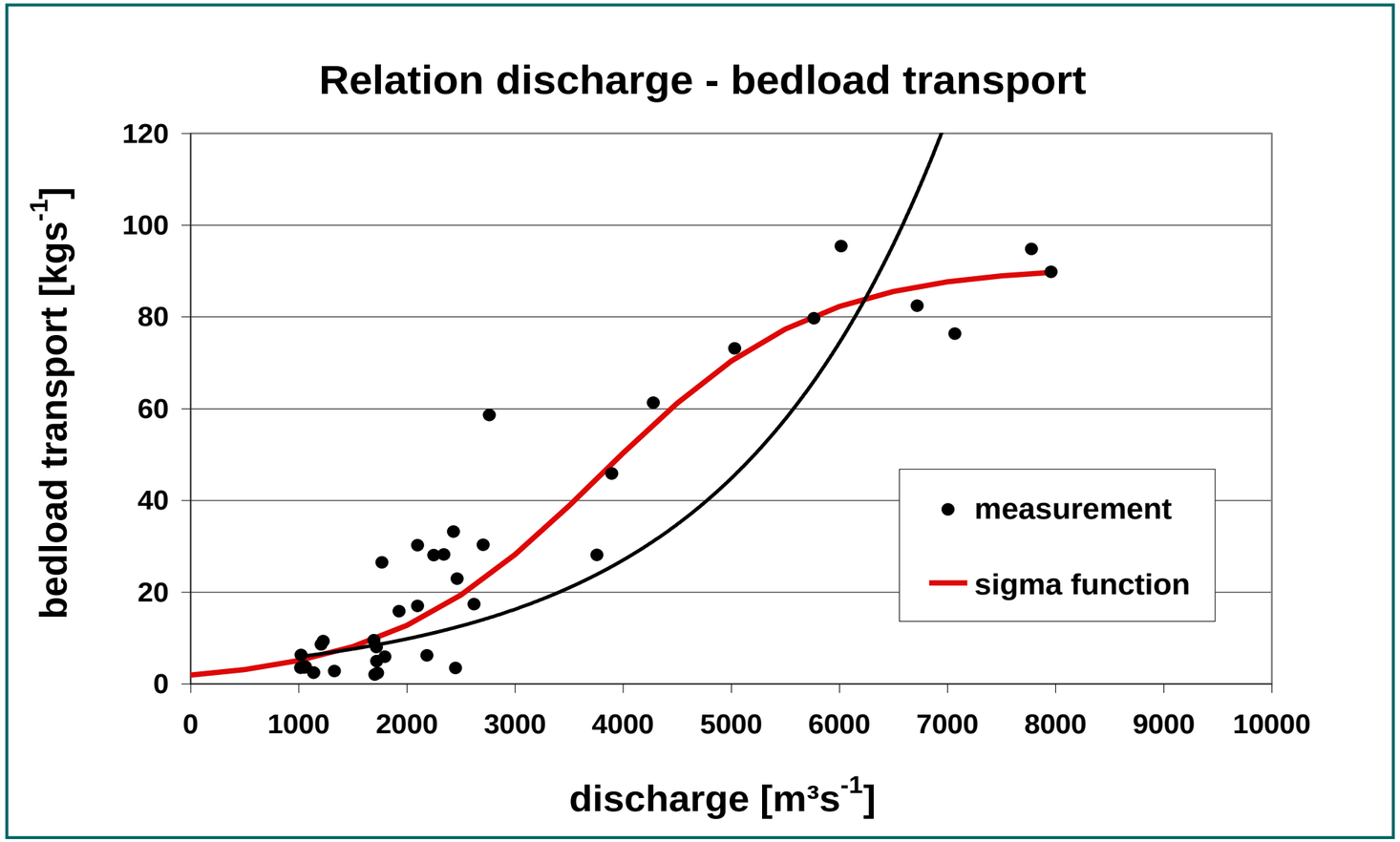




INITIATION OF MOTION



DANUBE BASKET SAMPLER MEASUREMENTS
Bedload Flux

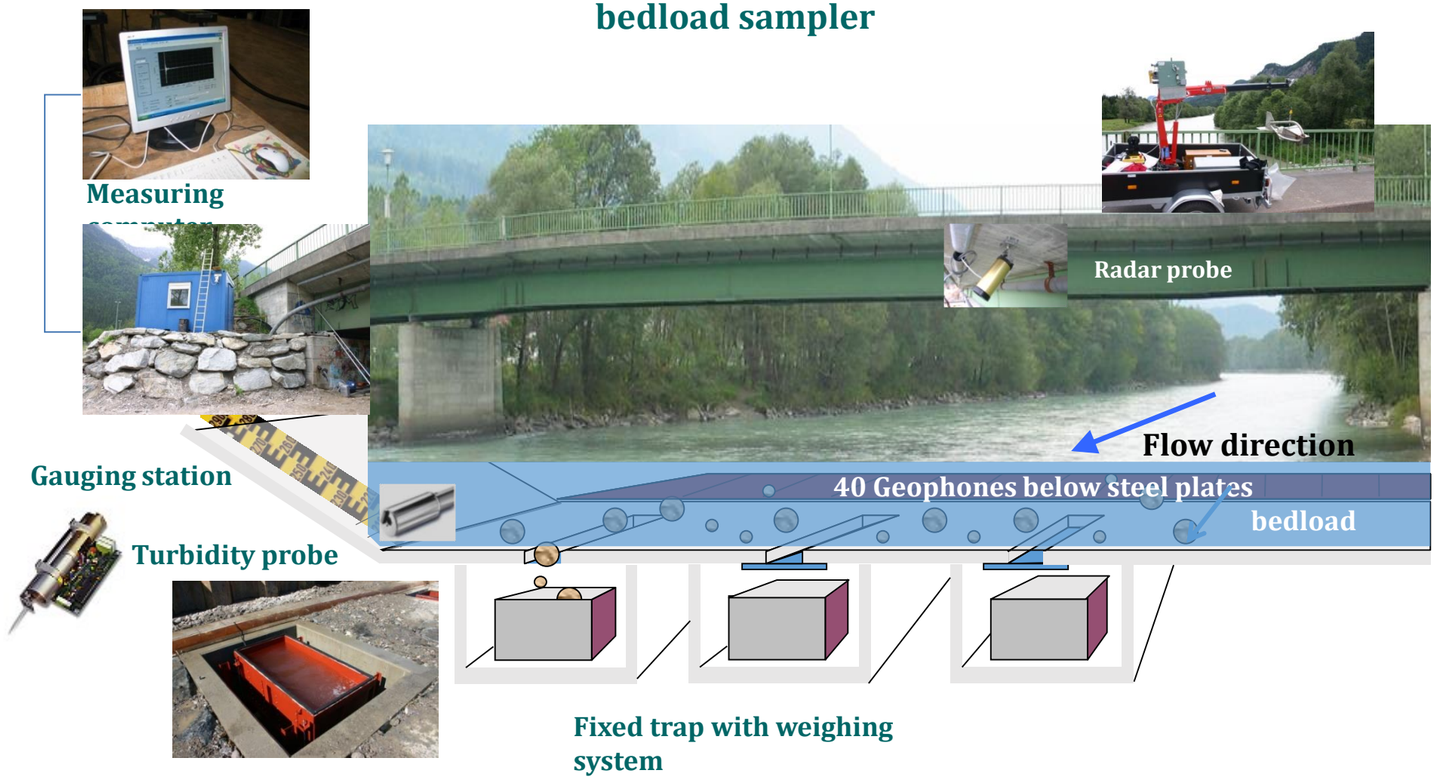


1. Initiation of motion
2. High flow sediment transport

New bedload transport formulation ? – Implementation in numerical model !

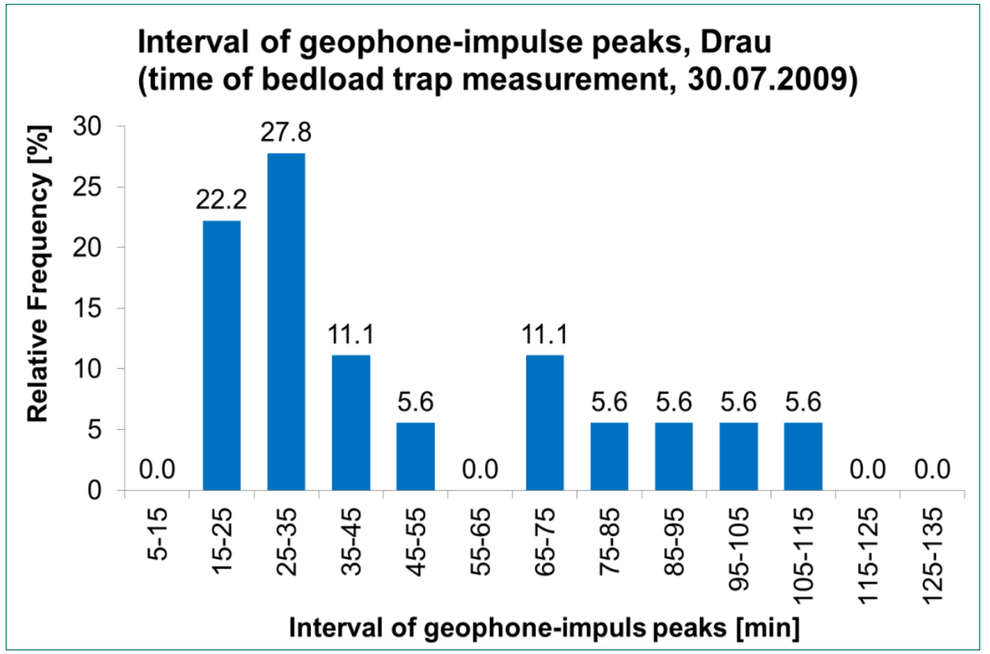
INTEGRATED SEDIMENT MONITORING STATION DRAU

Concept of monitoring system Drau-Isel

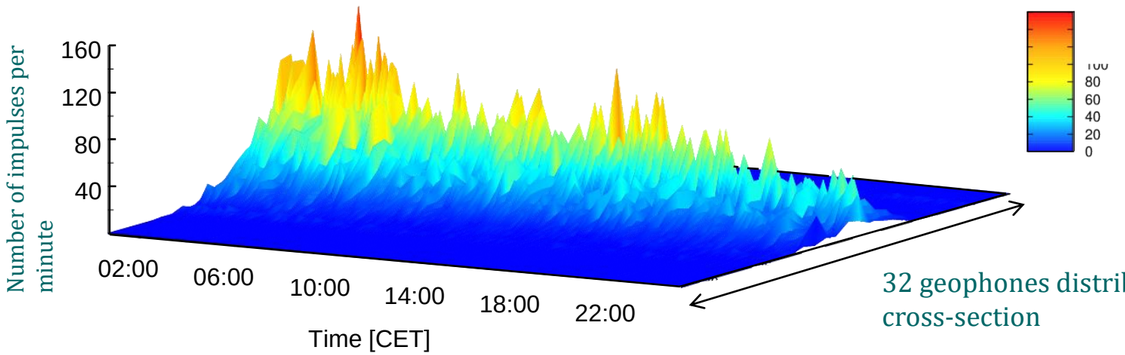


GEOPHONES - RESULTS

- Continuous recording
- Spatio-temporal variability
- Initiation of motion



Distribution of Geophonimpulses per minute 24hours daily graph, 25.06.2011
Lienz, Isel

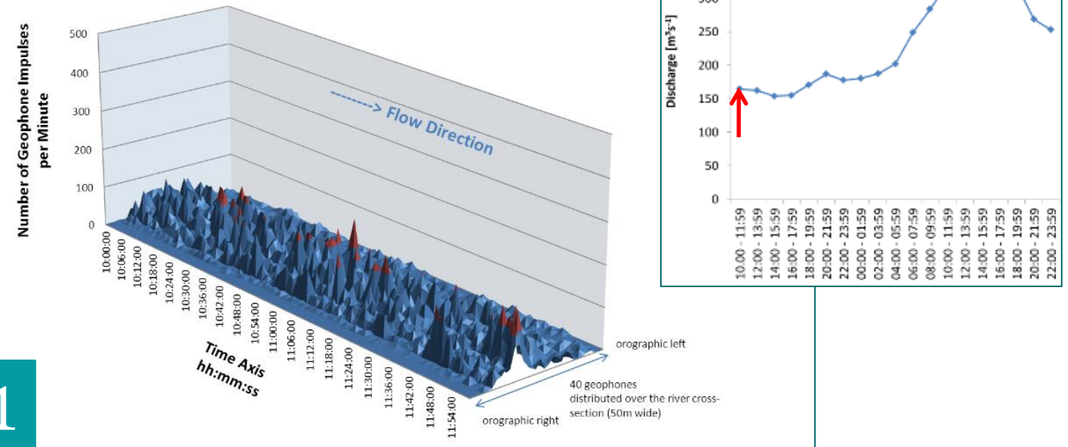


32 geophones distributed over the river cross-section

The Vjosa Science Conference

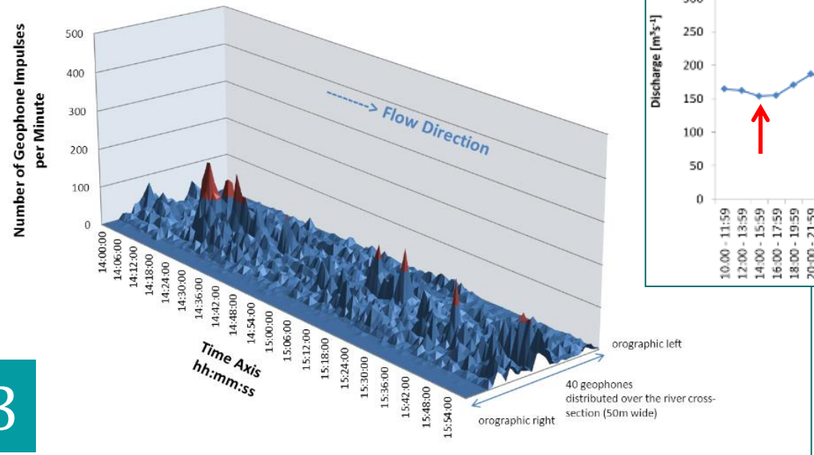
The Vjosa – A unique opportunity for European River Science

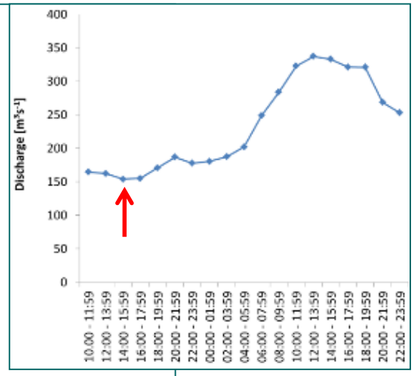
Geophone Impulses, distributed over river cross-section
Date: 17.07.2009, Time Periode: 10:00 - 11:59, Discharge: Q = 164.45 m³/s,
Dellach im Drautal - Austria



1

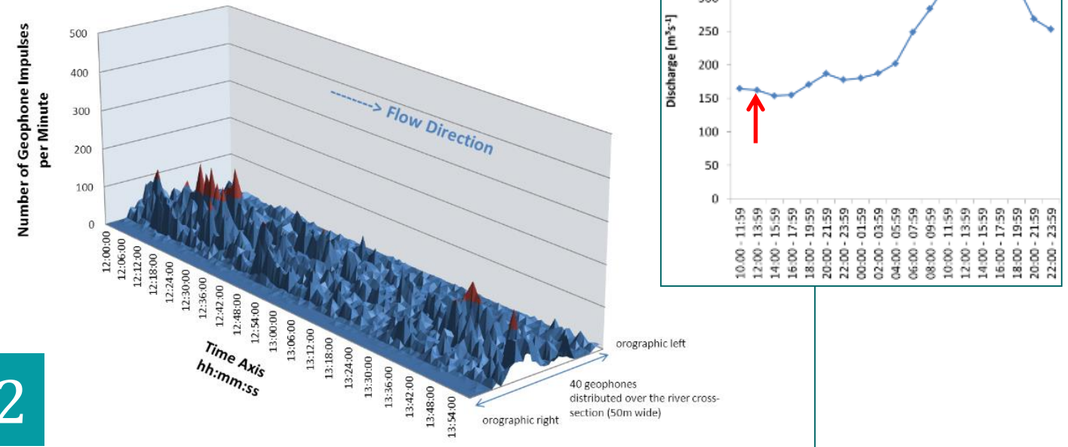
Geophone Impulses, distributed over river cross-section
Date: 17.07.2009, Time Periode: 14:00 - 15:59, Discharge: Q = 154.08 m³/s
Dellach im Drautal - Austria





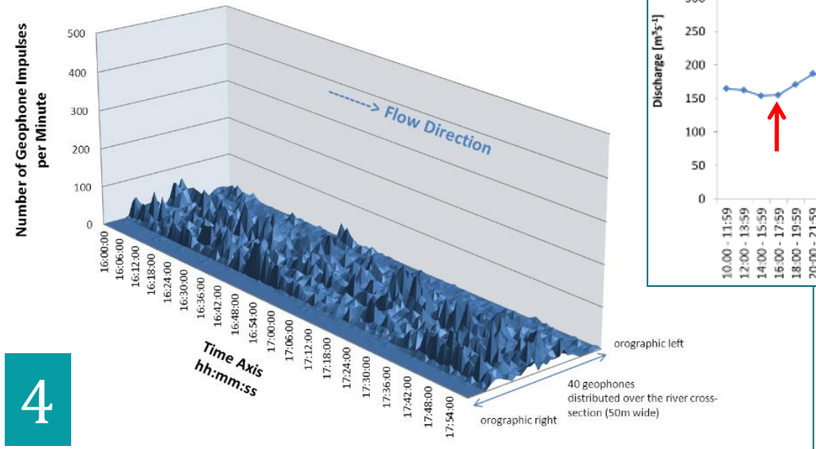
3

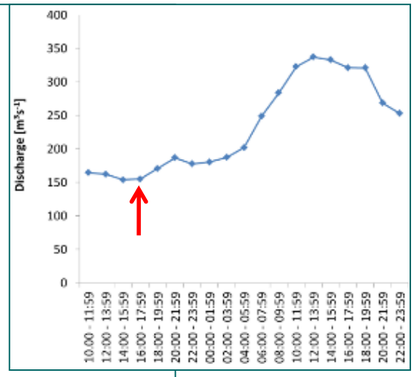
Geophone Impulses, distributed over river cross-section
Date: 17.07.2009, Time Periode: 12:00 - 13:59, Discharge: Q = 162.45 m³/s,
Dellach im Drautal - Austria



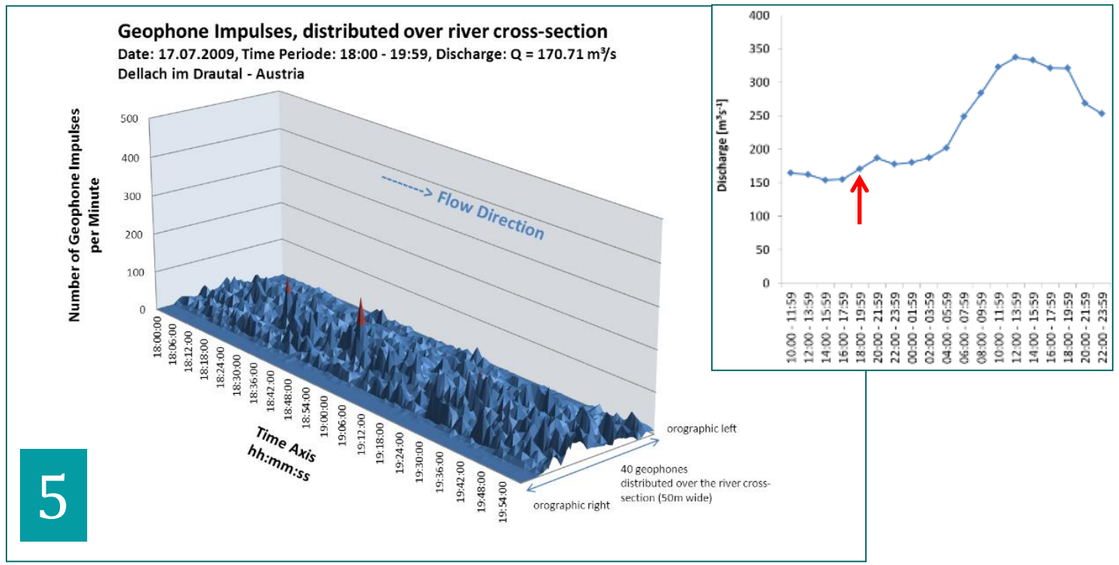
2

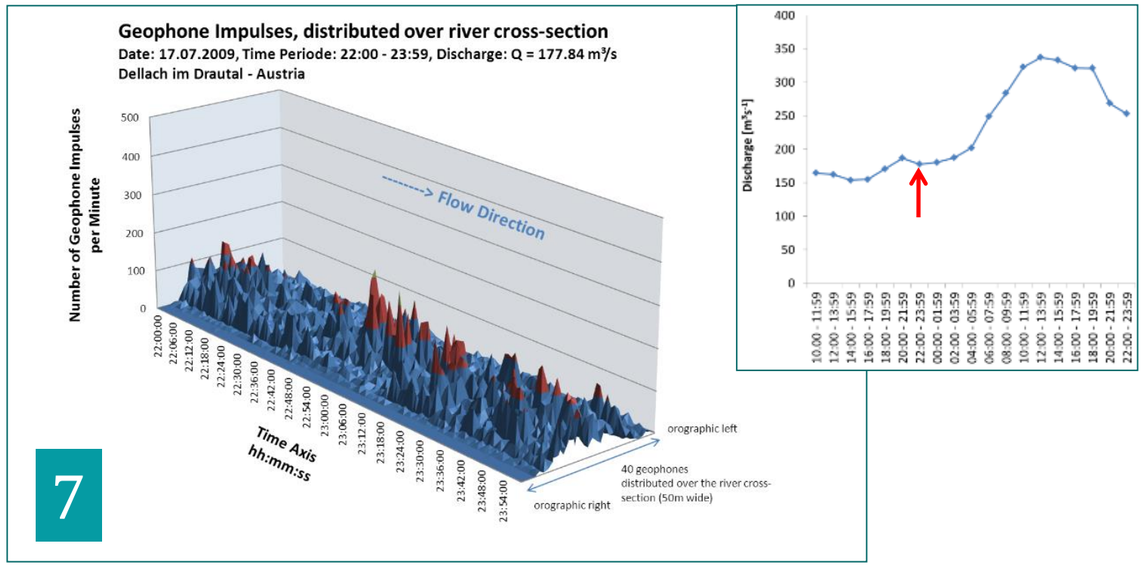
Geophone Impulses, distributed over river cross-section
Date: 17.07.2009, Time Periode: 16:00 - 17:59, Discharge: Q = 155.19 m³/s
Dellach im Drautal - Austria

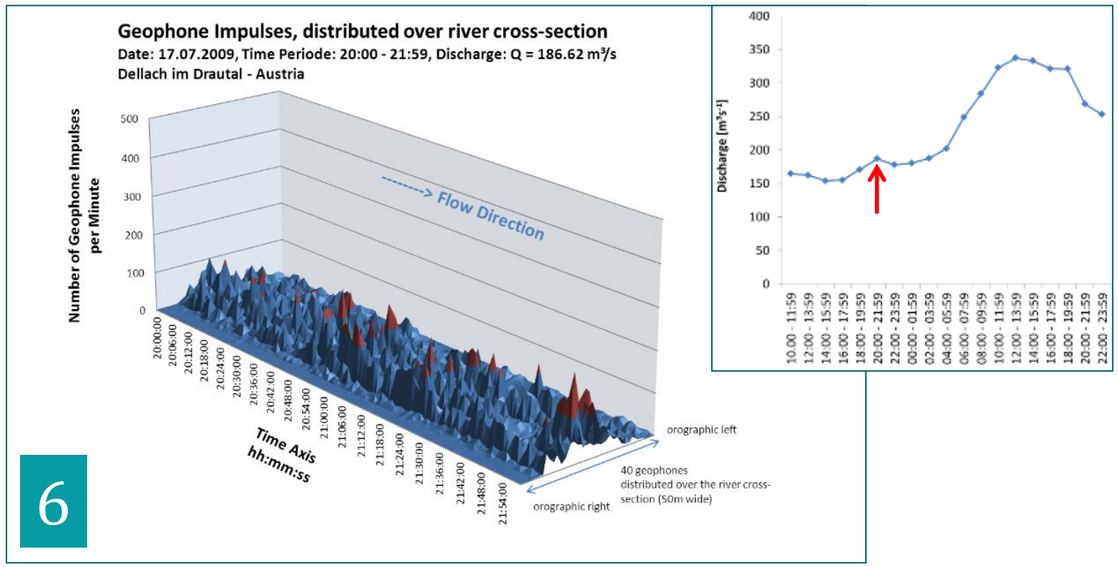


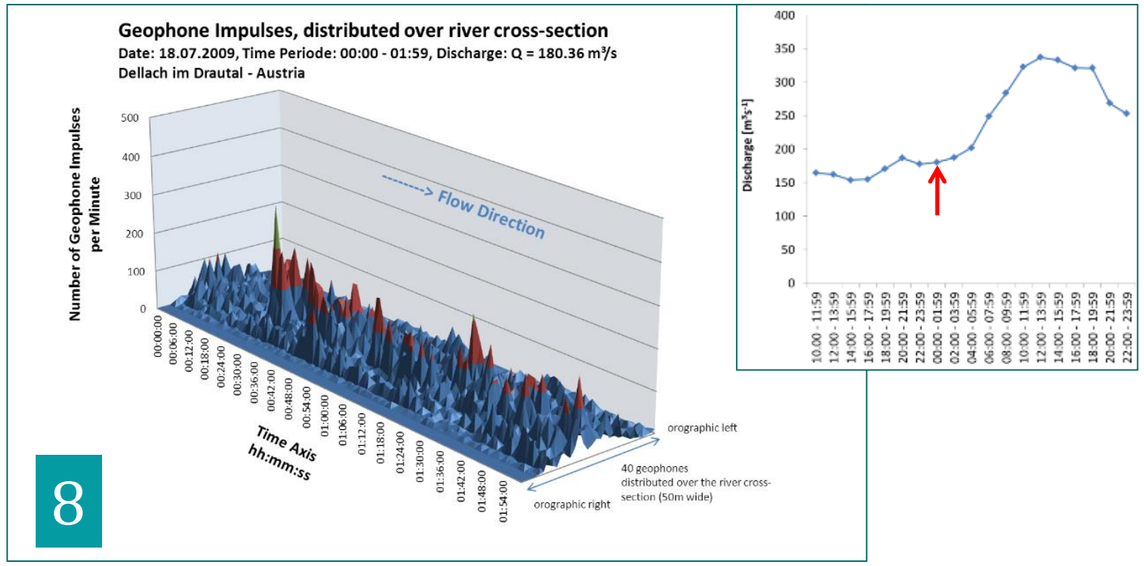


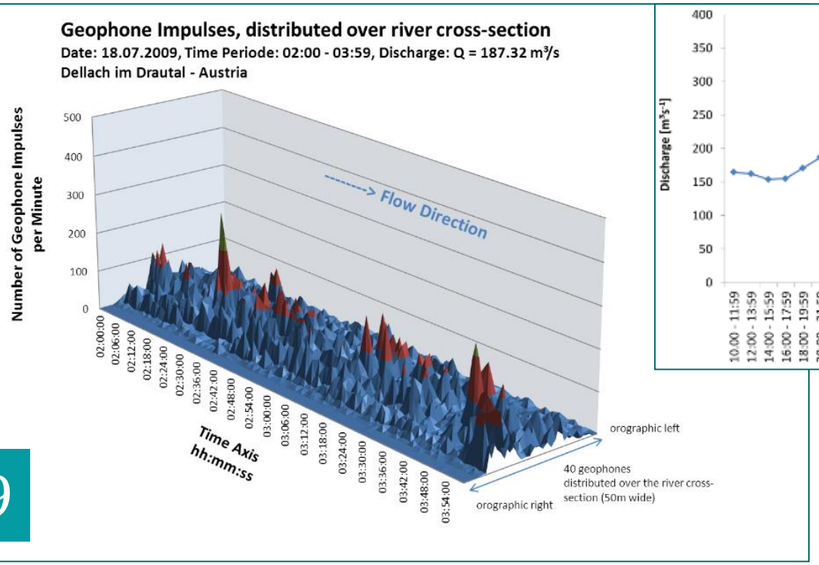
4


Geophone Impulses, distributed over river cross-section
Date: 17.07.2009, Time Periode: 18:00 - 19:59, Discharge: Q = 170.71 m³/s
Dellach im Drautal - Austria
Number of Geophone Impulses per Minute
Time Axis hh:mm:ss
Flow Direction
orographic left
orographic right
40 geophones distributed over the river cross-section (50m wide)
Discharge [m³s⁻¹]
5

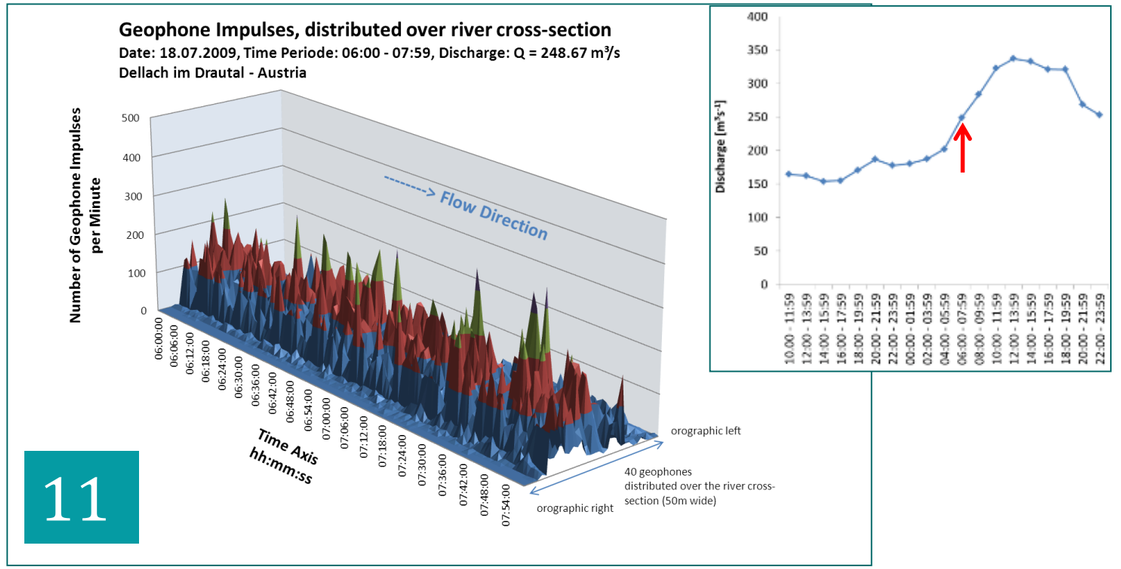

Geophone Impulses, distributed over river cross-section
Date: 17.07.2009, Time Periode: 22:00 - 23:59, Discharge: Q = 177.84 m³/s
Dellach im Drautal - Austria
Number of Geophone Impulses per Minute
Time Axis hh:mm:ss
Flow Direction
orographic left
orographic right
40 geophones distributed over the river cross-section (50m wide)
Discharge [m³s⁻¹]
7


Geophone Impulses, distributed over river cross-section
Date: 17.07.2009, Time Periode: 20:00 - 21:59, Discharge: Q = 186.62 m³/s
Dellach im Drautal - Austria
Number of Geophone Impulses per Minute
Time Axis hh:mm:ss
Flow Direction
orographic left
orographic right
40 geophones distributed over the river cross-section (50m wide)
Discharge [m³s⁻¹]
6

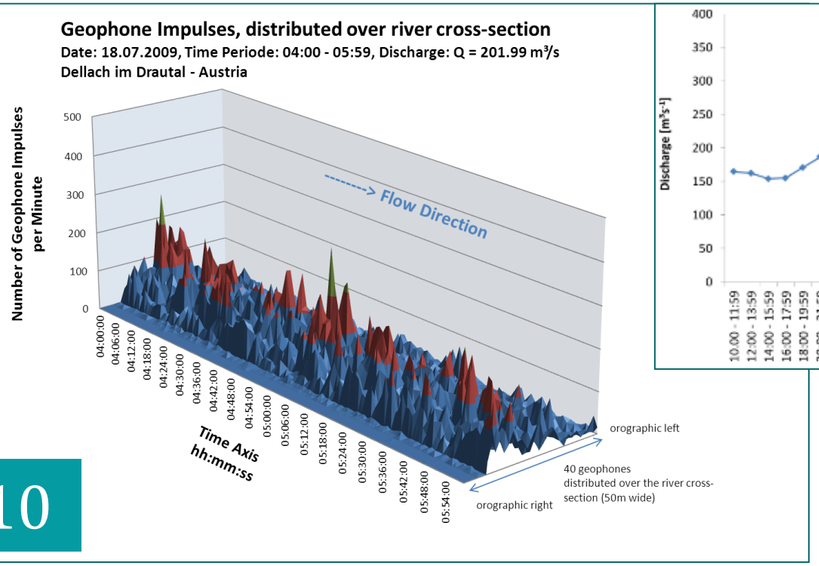

Geophone Impulses, distributed over river cross-section
Date: 18.07.2009, Time Periode: 00:00 - 01:59, Discharge: Q = 180.36 m³/s
Dellach im Drautal - Austria
Number of Geophone Impulses per Minute
Time Axis hh:mm:ss
Flow Direction
orographic left
orographic right
40 geophones distributed over the river cross-section (50m wide)
Discharge [m³s⁻¹]
8


Geophone Impulses, distributed over river cross-section
Date: 18.07.2009, Time Periode: 02:00 - 03:59, Discharge: Q = 187.32 m³/s
Dellach im Drautal - Austria
Number of Geophone Impulses per Minute
Flow Direction
Time Axis hh:mm:ss
orographic left
orographic right
40 geophones distributed over the river cross-section (50m wide)
Discharge [m³s⁻¹]

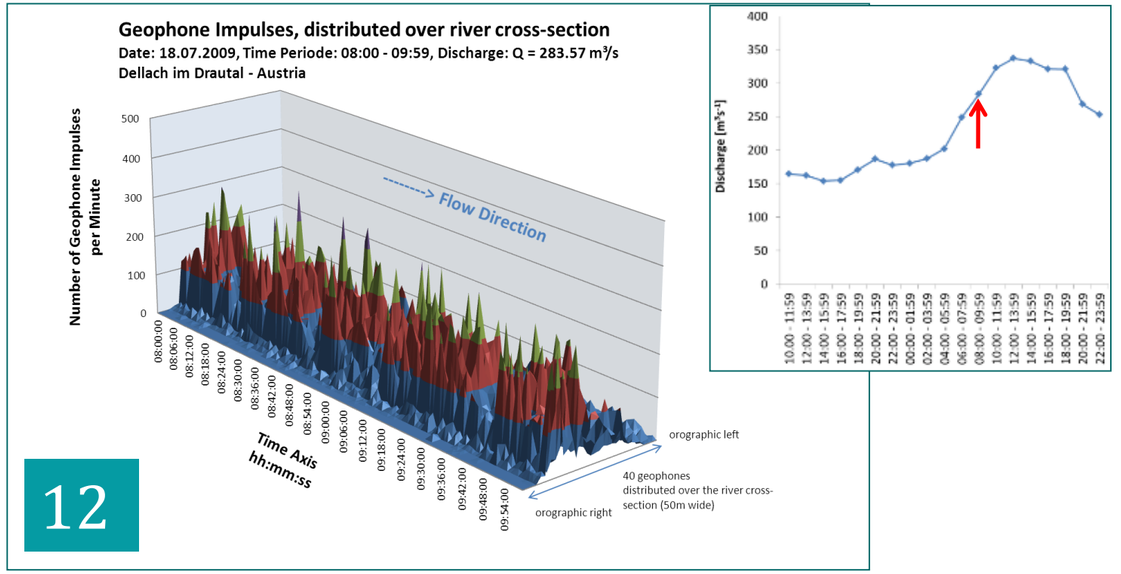
9


Geophone Impulses, distributed over river cross-section
Date: 18.07.2009, Time Periode: 06:00 - 07:59, Discharge: Q = 248.67 m³/s
Dellach im Drautal - Austria
Number of Geophone Impulses per Minute
Flow Direction
Time Axis hh:mm:ss
orographic left
orographic right
40 geophones distributed over the river cross-section (50m wide)
Discharge [m³s⁻¹]

11


Geophone Impulses, distributed over river cross-section
Date: 18.07.2009, Time Periode: 04:00 - 05:59, Discharge: Q = 201.99 m³/s
Dellach im Drautal - Austria
Number of Geophone Impulses per Minute
Flow Direction
Time Axis hh:mm:ss
orographic left
orographic right
40 geophones distributed over the river cross-section (50m wide)
Discharge [m³s⁻¹]

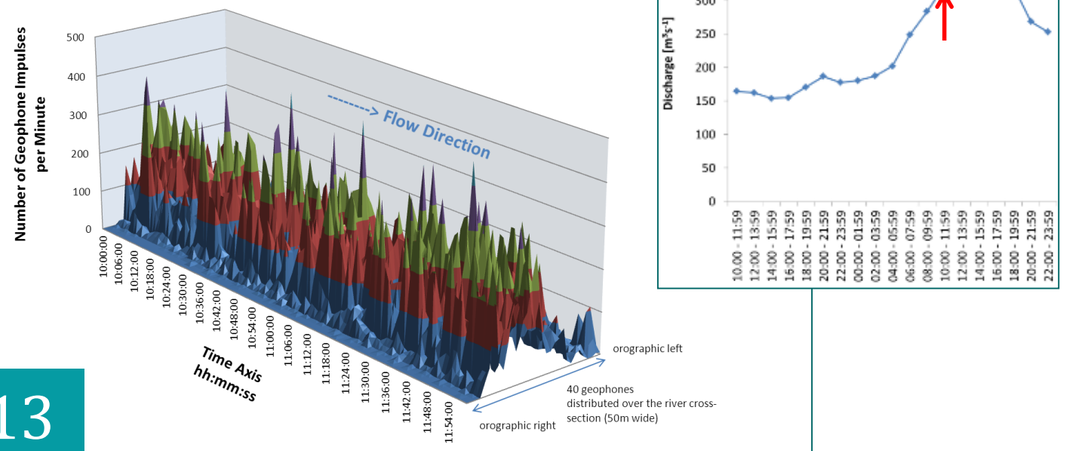
10


Geophone Impulses, distributed over river cross-section
Date: 18.07.2009, Time Periode: 08:00 - 09:59, Discharge: Q = 283.57 m³/s
Dellach im Drautal - Austria
Number of Geophone Impulses per Minute
Flow Direction
Time Axis hh:mm:ss
orographic left
orographic right
40 geophones distributed over the river cross-section (50m wide)
Discharge [m³s⁻¹]

12

Geophone Impulses, distributed over river cross-section

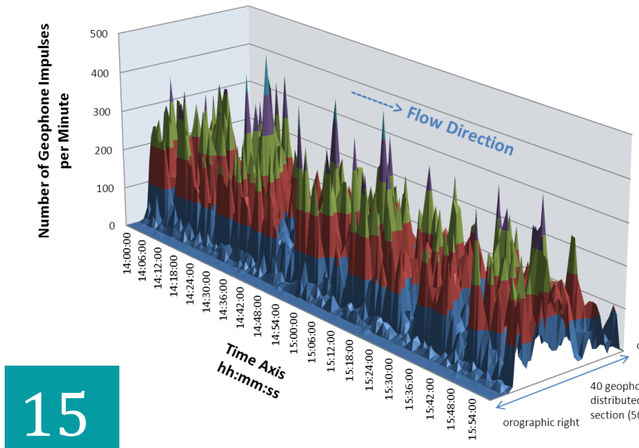
Date: 18.07.2009, Time Periode: 10:00 - 11:59, Discharge: Q = 322.65 m³/s
Dellach im Drautal - Austria

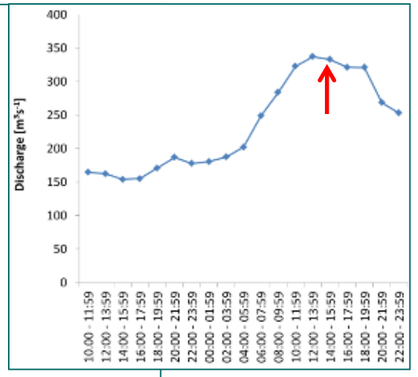


13

Geophone Impulses, distributed over river cross-section

Date: 18.07.2009, Time Periode: 14:00 - 15:59, Discharge: Q = 333.11 m³/s
Dellach im Drautal - Austria

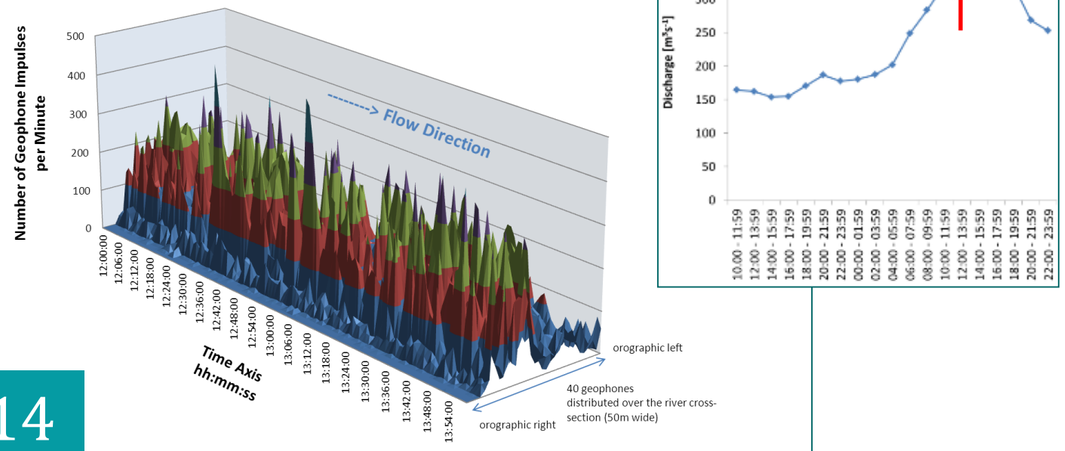




15

Geophone Impulses, distributed over river cross-section

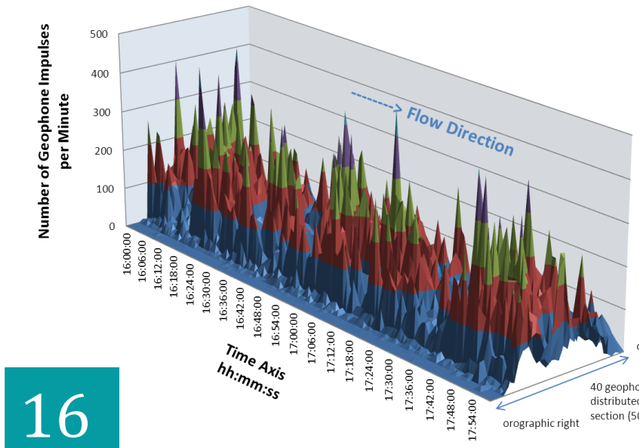
Date: 18.07.2009, Time Periode: 12:00 - 13:59, Discharge: Q = 337.07 m³/s
Dellach im Drautal - Austria

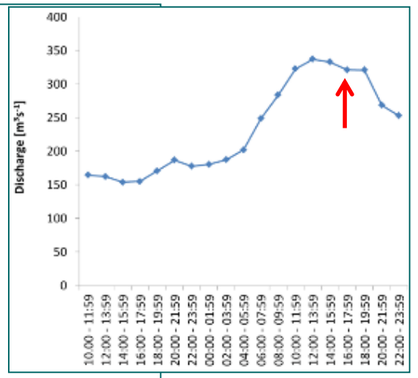


14

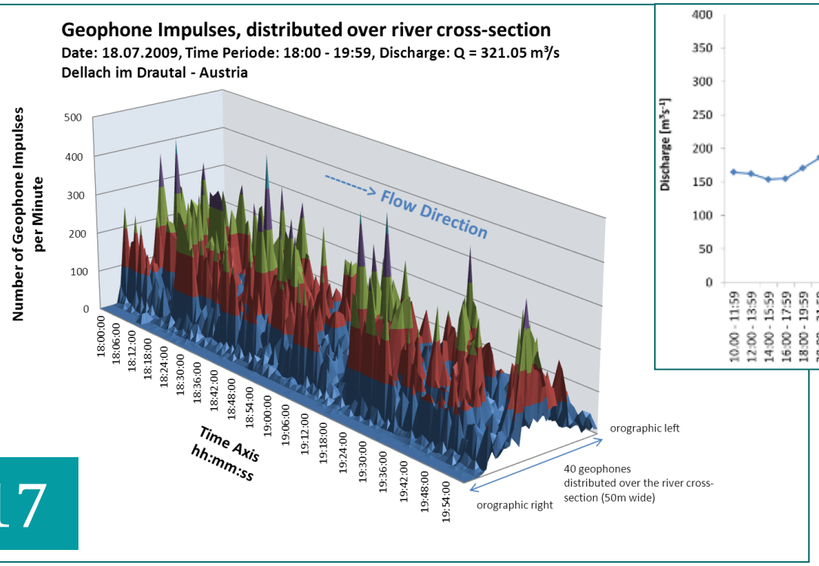
Geophone Impulses, distributed over river cross-section

Date: 17.07.2009, Time Periode: 16:00 - 17:59, Discharge: Q = 321.26 m³/s
Dellach im Drautal - Austria

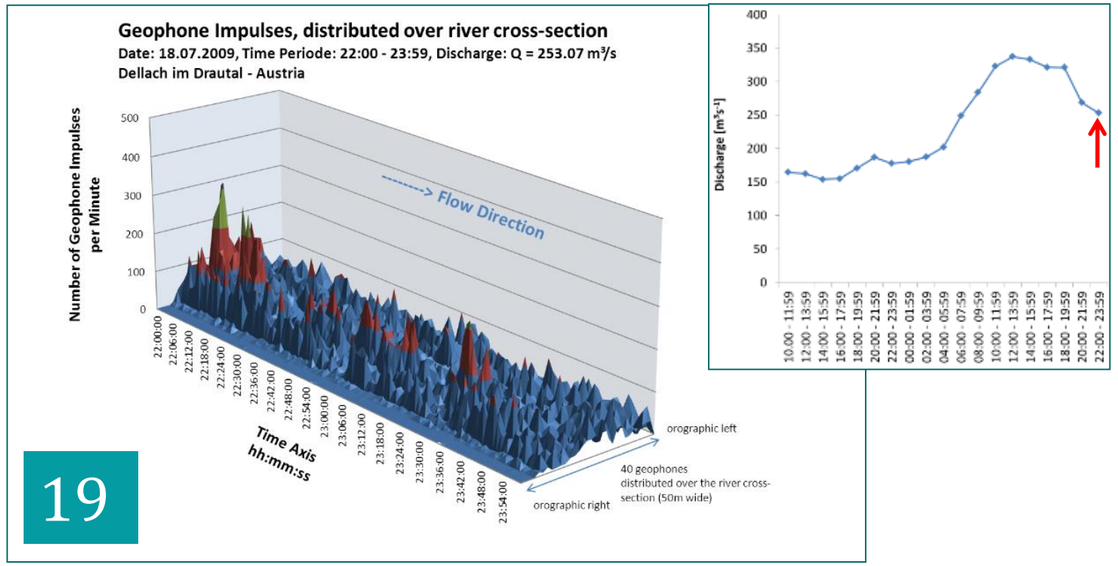




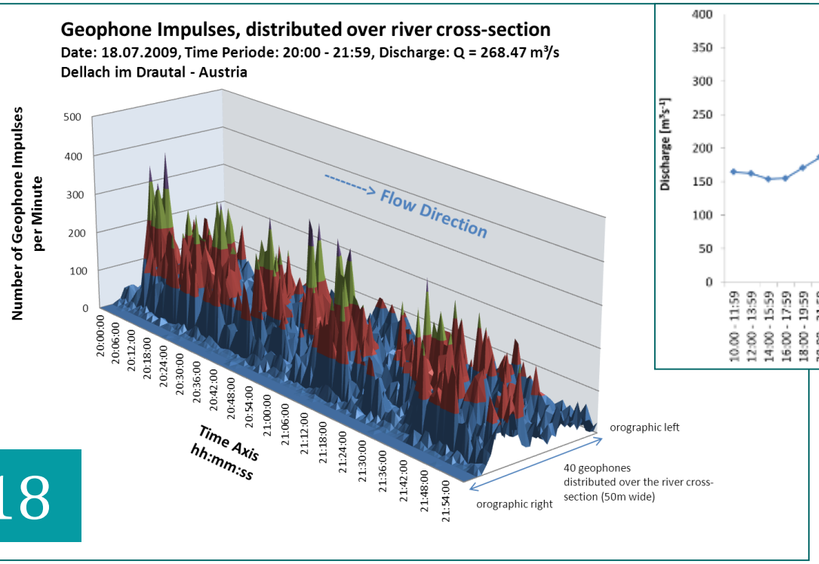
16



17

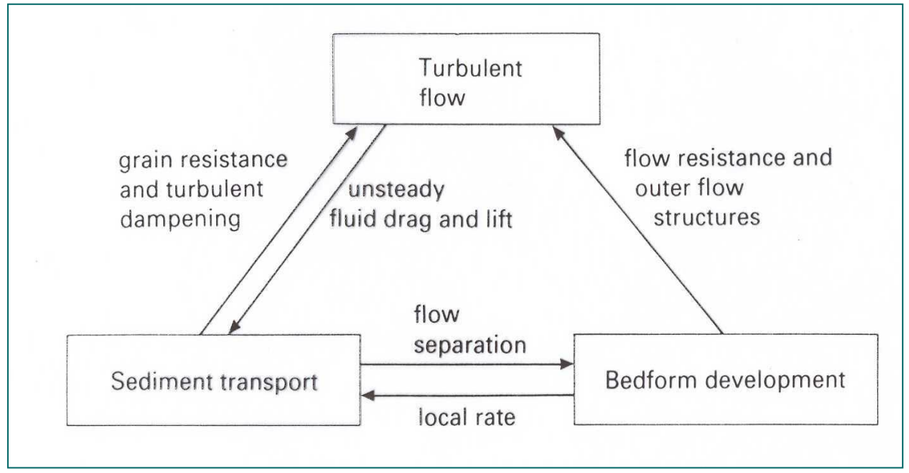


19

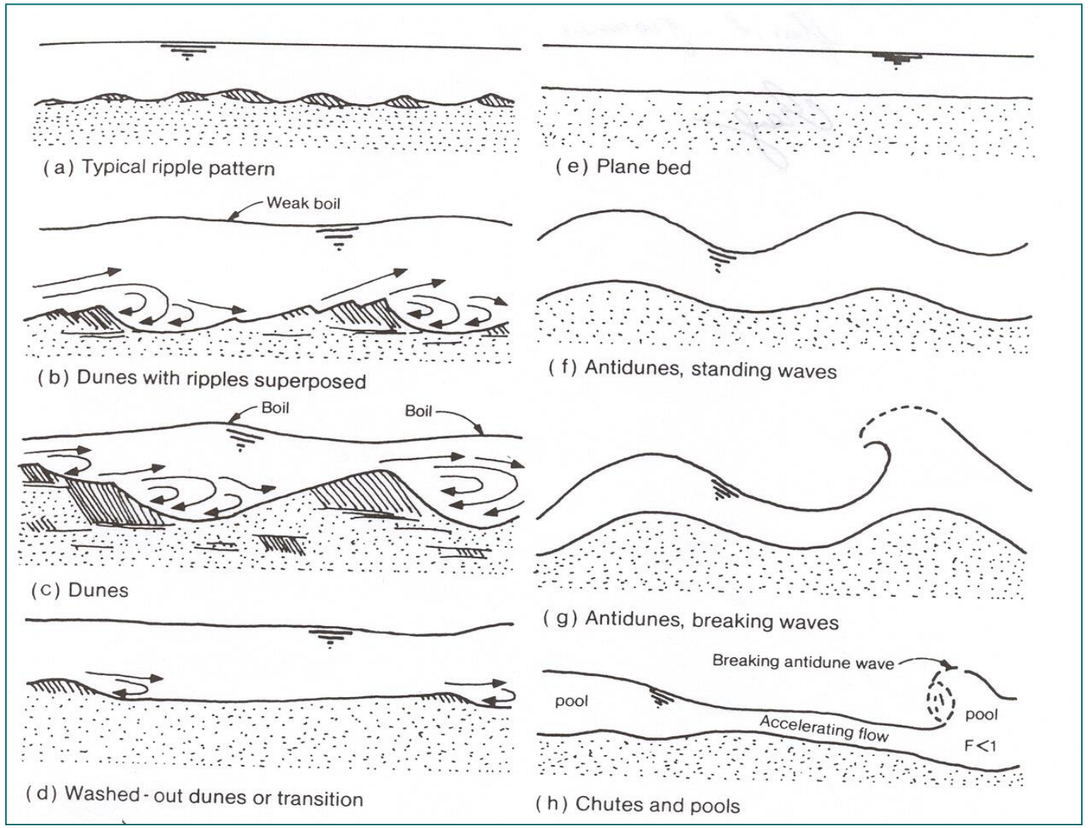


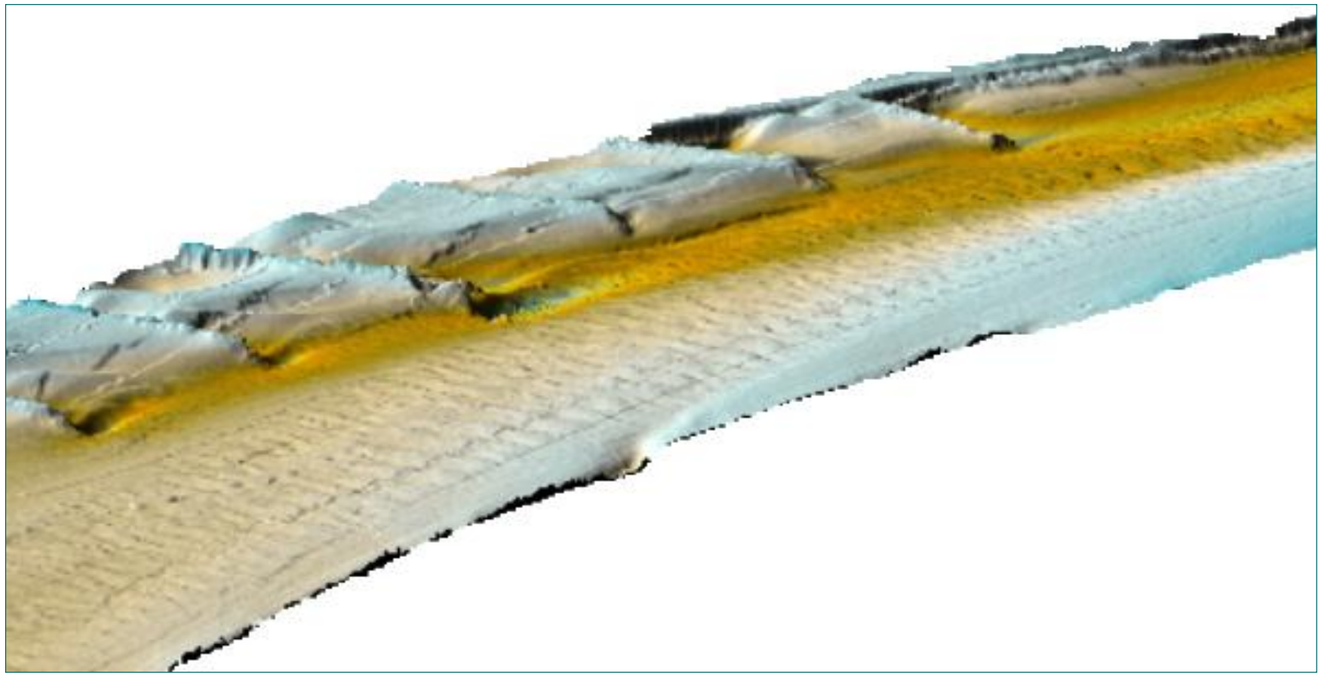
18

SEDIMENT TRANSPORT



BEDFORMS





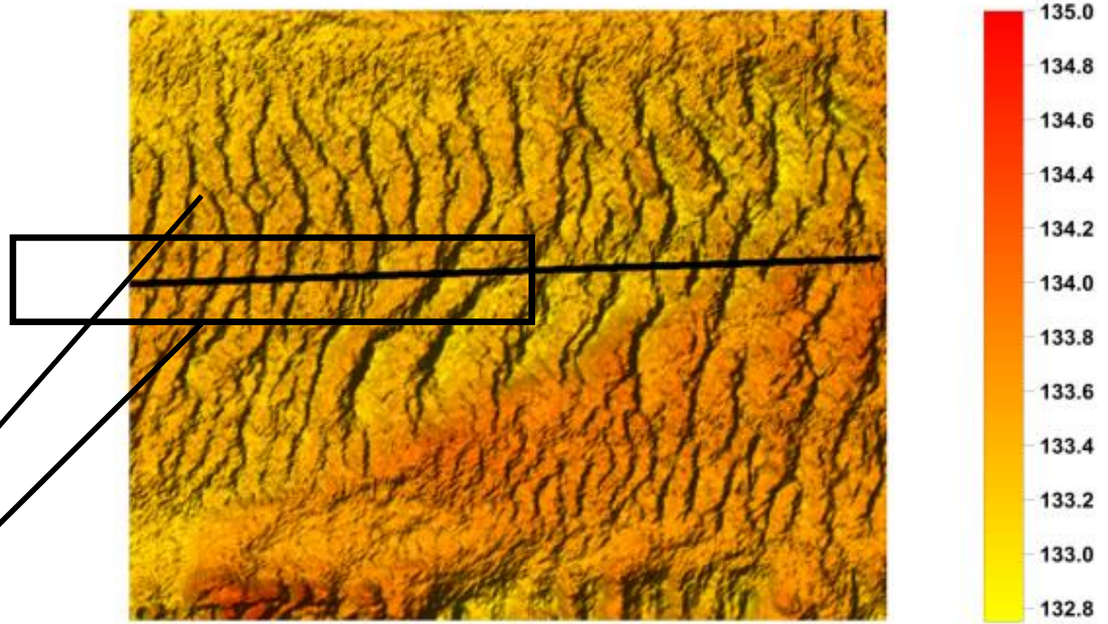
- **Multi Beam bathymetries revealed bed forms**
- **In gravel bed rivers seldomly documented**

BED FORM TRACKING

Multibeam bathymetry
Q2830 m^3s^{-1}

- *viadonau:* 6 measurements
from 09:06 – 16:03 (375 min)

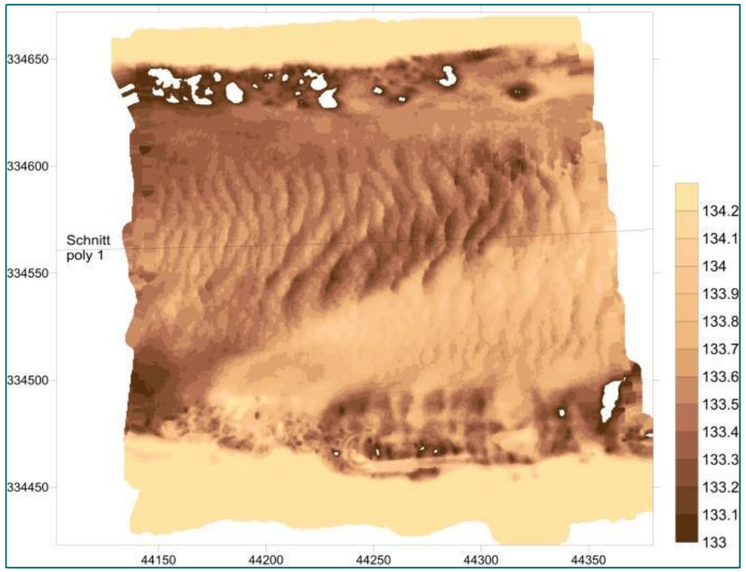
- *Strabag:* 10 measurements
from 09:10 – 10:33 (83 min)



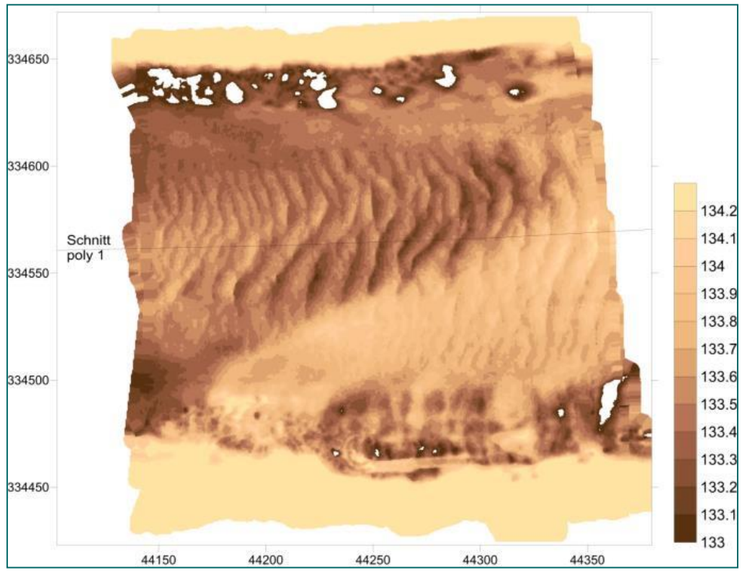
Viadonau: **10:10** Uhr

Strabag: **10:12** Uhr

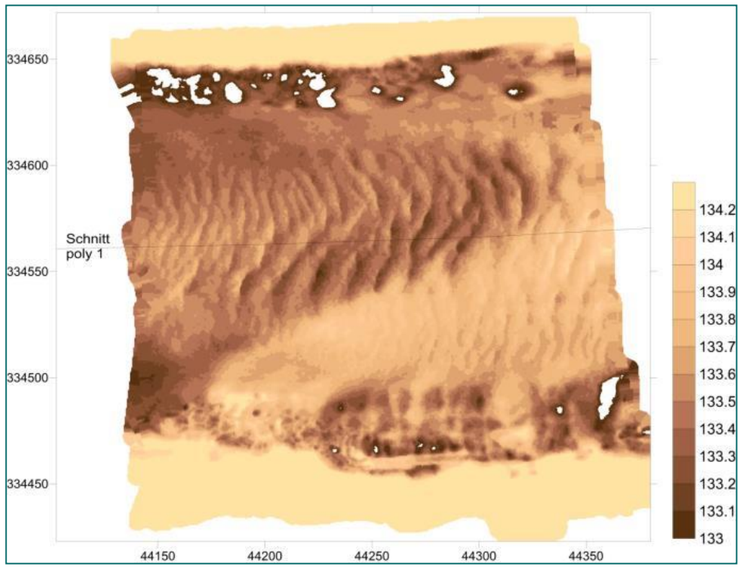
BED FORM TRACKING



SURVEY: 1
Time:09:06

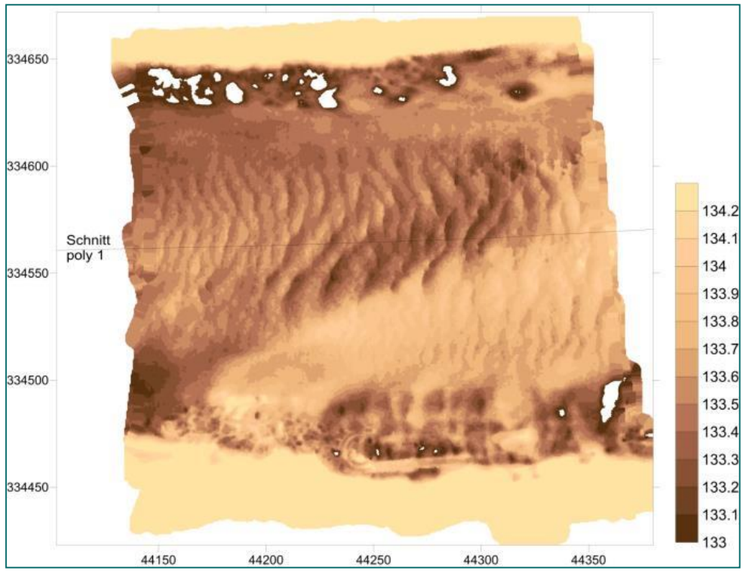


SURVEY: 2
Time:10:10

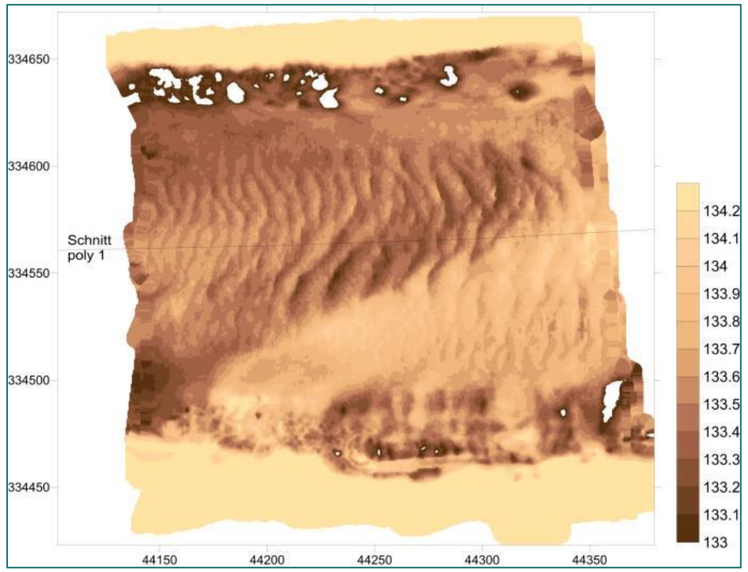


SURVEY: 3
Time:11:12

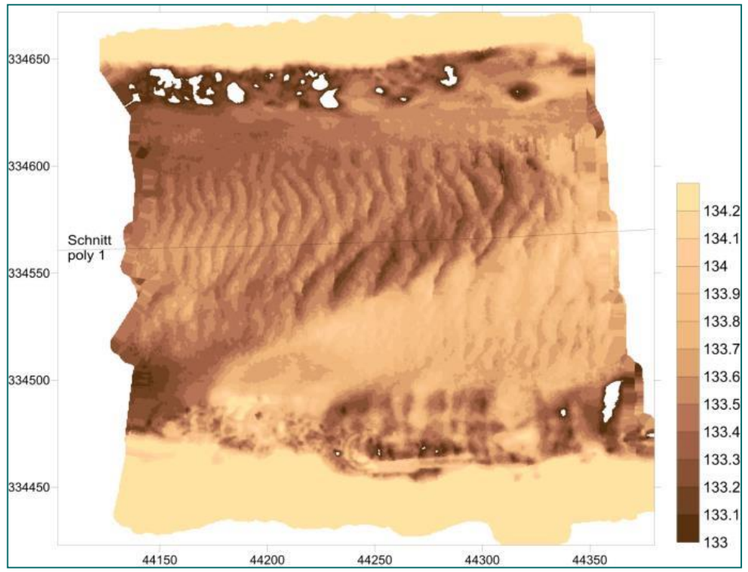
BED FORM TRACKING



SURVEY: 4
Time:13:28

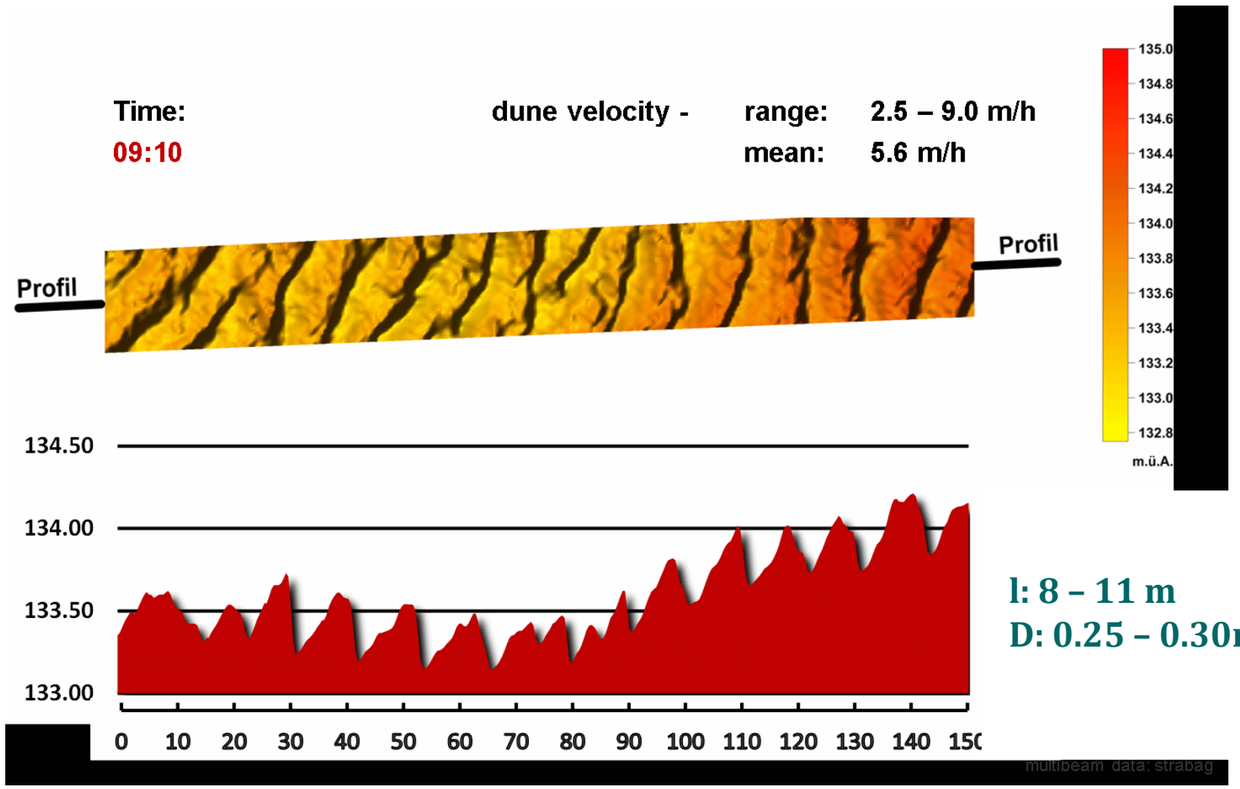


SURVEY: 5
Time:14:04



SURVEY: 6
Time:15:03

BED FORM TRACKING – DUNE VELOCITIES



l: 8 – 11 m
D: 0.25 – 0.30m

In comparison: mean transport distance of a single tracer stone 6.2 – 10.6 m/d

MODEL PRINCIPLES

Energy equation of water

$$\frac{\partial Q}{\partial t}+\frac{\partial}{\partial x}\left(\frac{Q^2}{A}\right)+gA\frac{\partial z}{\partial x}+gAI_R=0$$

Continuity equation of water flow formula

$$\frac{\partial Q}{\partial x}+\frac{\partial A}{\partial t}=0$$

Continuity equation of sediments

$$(1-p)\frac{\partial A_b}{\partial t}+\frac{\partial Q_s}{\partial x}-q_s=0$$

Sediment transport formula

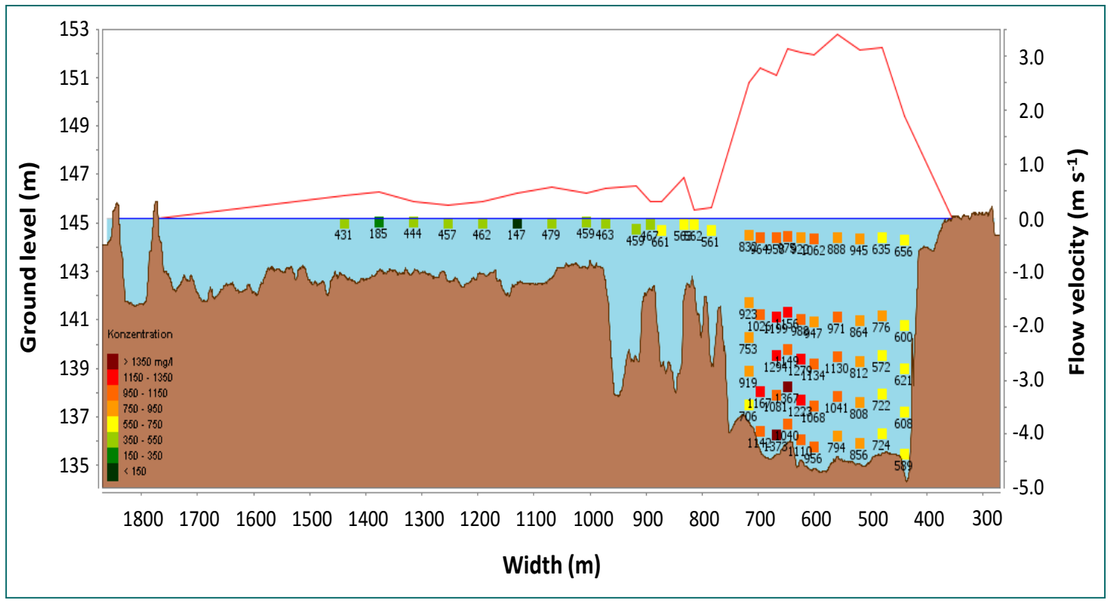
$$\frac{\gamma R_h(k/k')^{3/2}I}{d}-0{,}047(\gamma_s-\gamma)=0{,}25\sqrt[3]{\rho}\frac{(g_s')^{2/3}}{d}$$

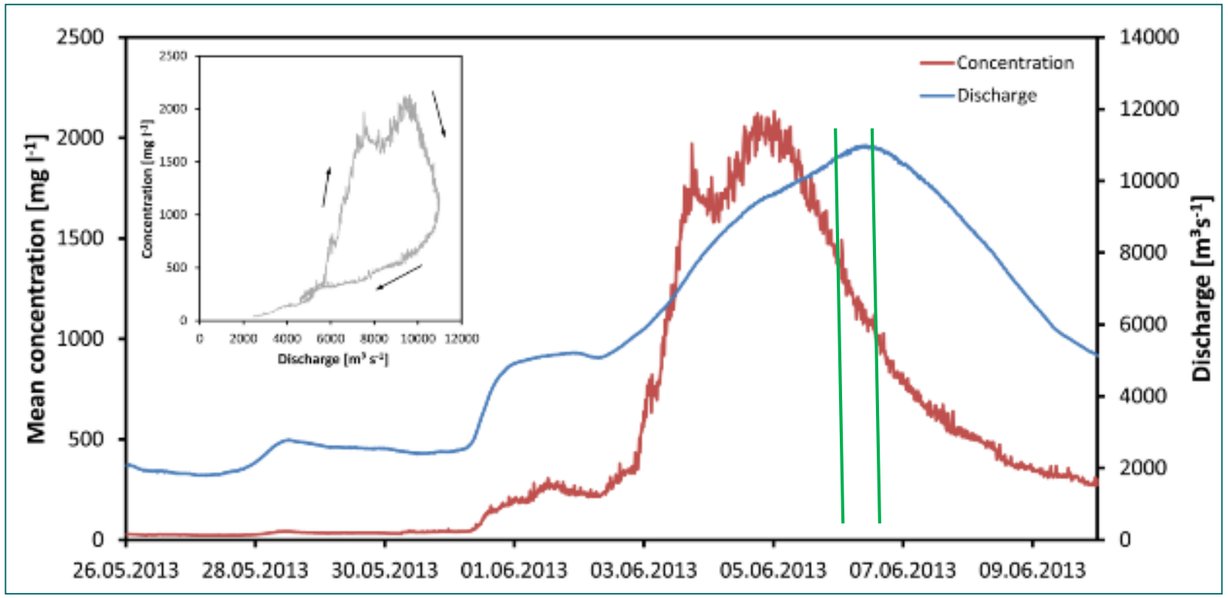
SEDIMENT CHALLENGES IN EUROPE

Element	High Status
Hydrological regime	The quantity and dynamics of flow, and the resultant connection to groundwater's, reflect totally, or nearly totally, undisturbed conditions.
River continuity	The continuity of the river is not disturbed by anthropogenic activities and allows undisturbed migration of aquatic organisms and **sediment transport.**
Morphological conditions	Channel patterns, width and depth variations, flow velocities, substrate conditions and both the structure and condition of the riparian zones correspond totally or nearly totally to undisturbed conditions.

- EU Water Framework Directive 2000
- Hydromorphological Quality Components

FLOOD EVENT JUNE 2013

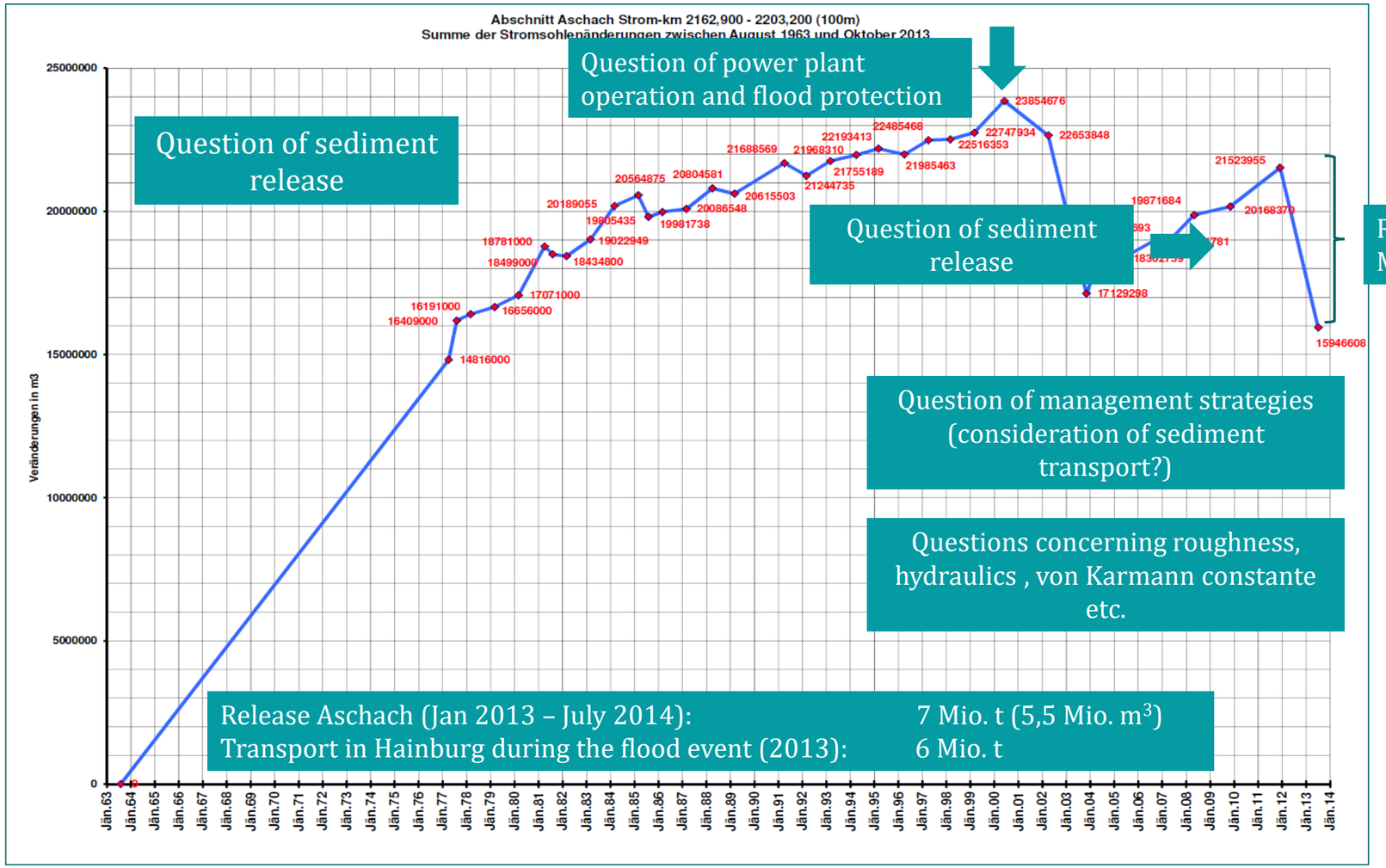




$Q = 10{,}738\ m^3\ s^{-1}$
$s_m = 855.2\ mg\ l^{-1}$
$Q_s = 9{,}180\ kg\ s^{-1}$

Multi-point measurement

REMOBILISATION IN A HYDROPOWER PLANT



Question of power plant operation and flood protection

Question of sediment release

Question of sediment release

Release: 5,5 Mio. m^3

Question of management strategies (consideration of sediment transport?)

Questions concerning roughness, hydraulics , von Karmann constante etc.

Release Aschach (Jan 2013 – July 2014): 7 Mio. t (5,5 Mio. m^3)
Transport in Hainburg during the flood event (2013): 6 Mio. t

SEDIMENTATION DURING FLOOD 2013

Machland

Eferdinger Becken

SUMMARY AND OUTLOOK

- **EU Water Framework Directive** requires the **improvement** of the **sediment continuity** when necessary to **keep** and **reach** the **good ecological status.**
- **Process understanding** in **Hydromorphology** is **limited** due to a **lack** of **Reference Natural River Systems**.
- **R&D Needs related to Hydromorphology are given at the catchment scale** (e.g. sediment production and erosion), **reach scale** (e.g. sediment transfer in river network), **local scale** (e.g. sediment continuum, initiation of motion, bedforms).
- **The Vjosa River System** would provide an **excellent** and **unique chance** to **improve** our **understanding** of **hydromorphological processes**.
- **Before further planning** and **implementation** of **hydropower plants** a **detailled analysis** of the **existing situation** including all scales from catchment to point scale should be done as **baseline information** and as a prerequisite.

ECOLOGICAL GOODS AND SERVICES OF RIVER SYSTEMS

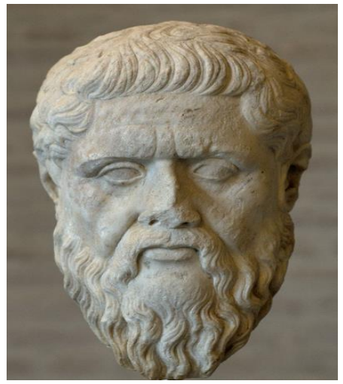
CONTENTS

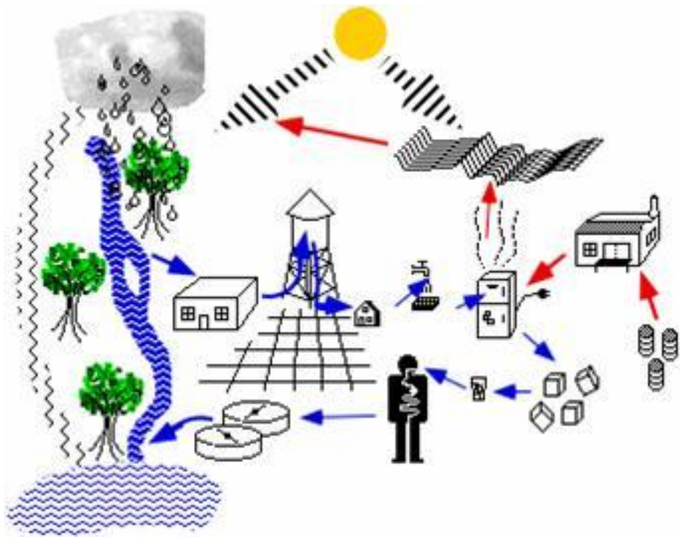
- Concept of „ecosystem services“ (ES)
- Ecological structures and functions generating ES
- Inter-sectoral integration of river and floodplain management
- Assessment of ecosystem services provided by rivers and floodplains in Germany

Martin Pusch
Leibniz Institute of Freshwater Ecology and Inland Fisheries, Berlin (Germany)

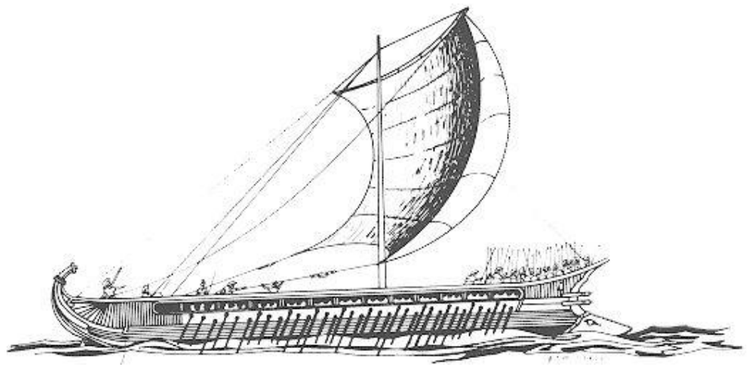
CONCEPT OF ECOSYSTEM SERVICES

- Ecosystem services: Final ecosystem services are components of nature, directly enjoyed, consumed, or used to yield human well-being (Boyd & Banzhaf 2007)
- The term ecosystem services was developed implicitely by several authors during the second half of the 20th century, when it became clear that resources for human civilization earth are limited and might be threatened
- However, the knowledge about ecosystem services is old: Greek philosopher **Plato (428 – 348 BC)** complained: Deforestation for ship building purposes results in soil erosion in the region around Athens, and ‚fat and soft soil' is transformed into ‚infertile stony hills'

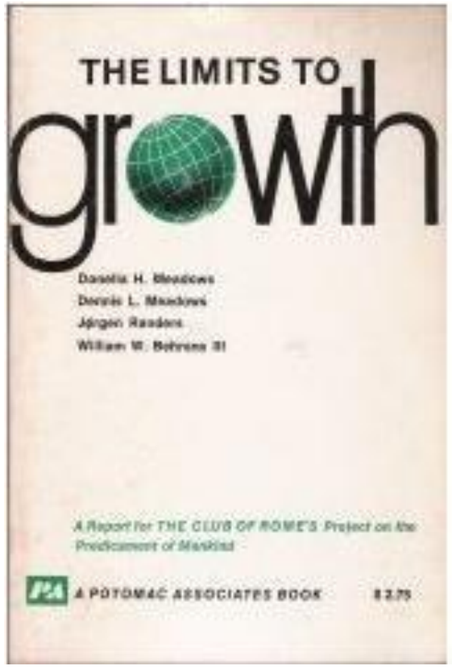




- Similar old knowledge in eastern philosophy: **Chinese philosopher 老子 Laozi (c. 6th century BC)** said: 他认为如果人类像自然过度索取开发，违反自然之道，就意味着人类末日的到来 Excessive exploitation of the nature would against the philosophy of 'Dao', which means the end of human. In the book 道德經 Daode Jing it is written:



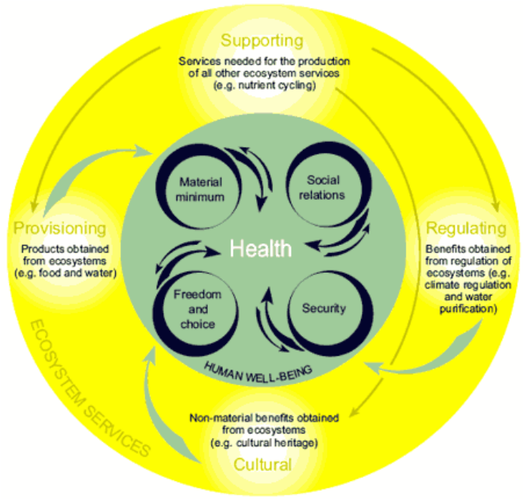
ECOSYSTEM SERVICES



- First use of the term of ‚sustainability‘:
  Donella, Meadows, Meadows (1972):
  The Limits of Growth: a report for the Club of Rome's project on the predicament of mankind.

- First scientific article about ‘nature’s services’, incl. first monetization (= expression of a nature’s value as money value): Westman, W.E. (1977): How Much Are Nature's Services Worth? Science

- First use of the term „ecosystem services: Ehrlich & Ehrlich (1981): Extinction: The Causes and Consequences of the Disappearance of Species



ECOSYSTEM SERVICES

✓ **Linkage between ecology and economy:**

De Groot, R.S. (1987): Environmental functions as a unifying concept for ecology and economics. The Environmentalist 7: 105–109.

✓ **Development of ES concept:**

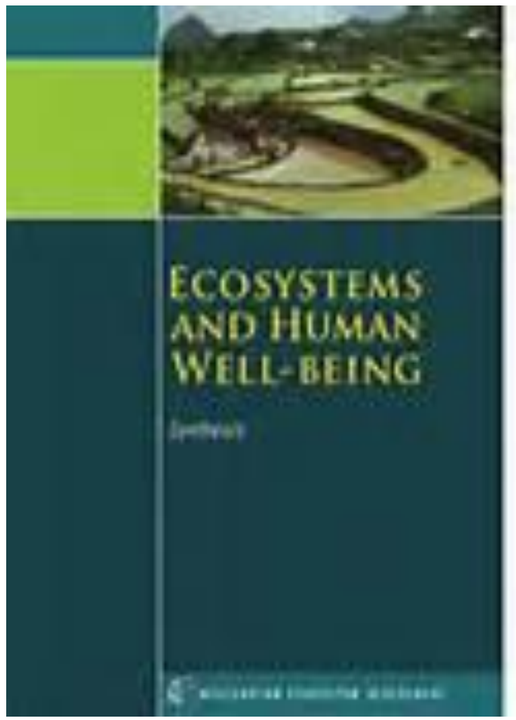
Costanza, R. (ed.) (1991): Ecological Economics: The Science and Management of Sustainability. New York: Columbia Univ. Press.

✓ **Popular introductory book:**

Daily, G.C. (1997): Nature's Services: Societal Dependence on Natural Ecosystems. Island Press, Washington, DC.

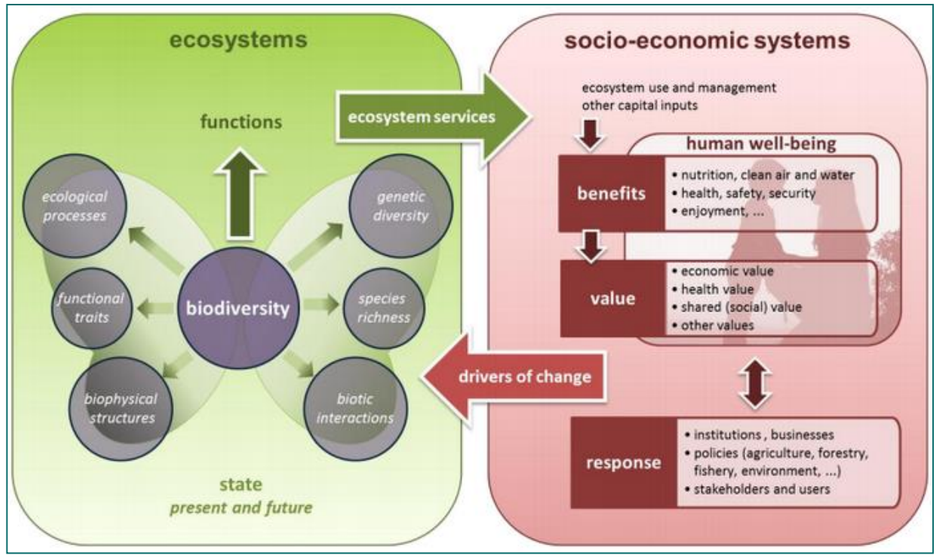
✓ **Political Impact:**

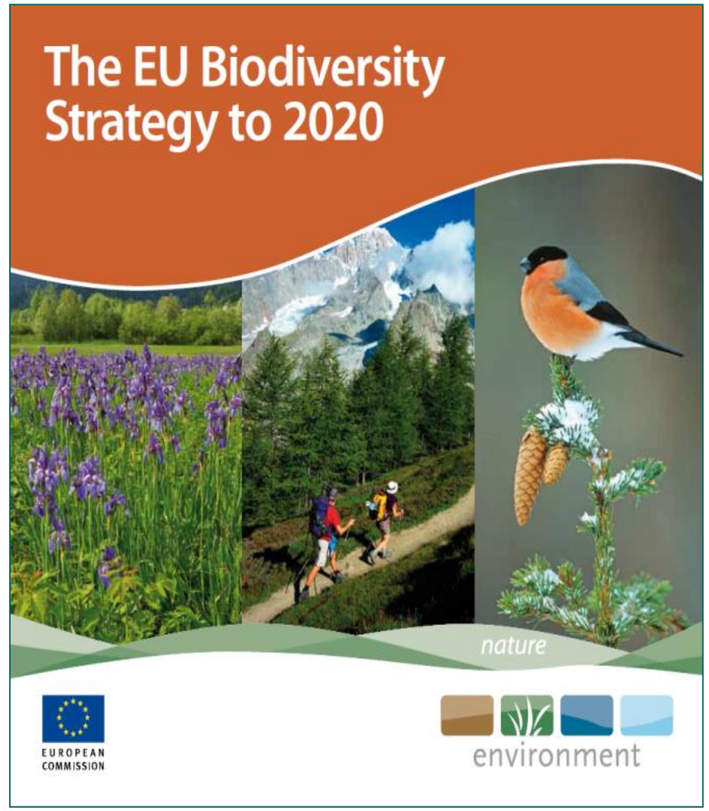
Millennium Ecosystem Assessment (2005):
Ecosystems and Human Well-Being: Synthesis



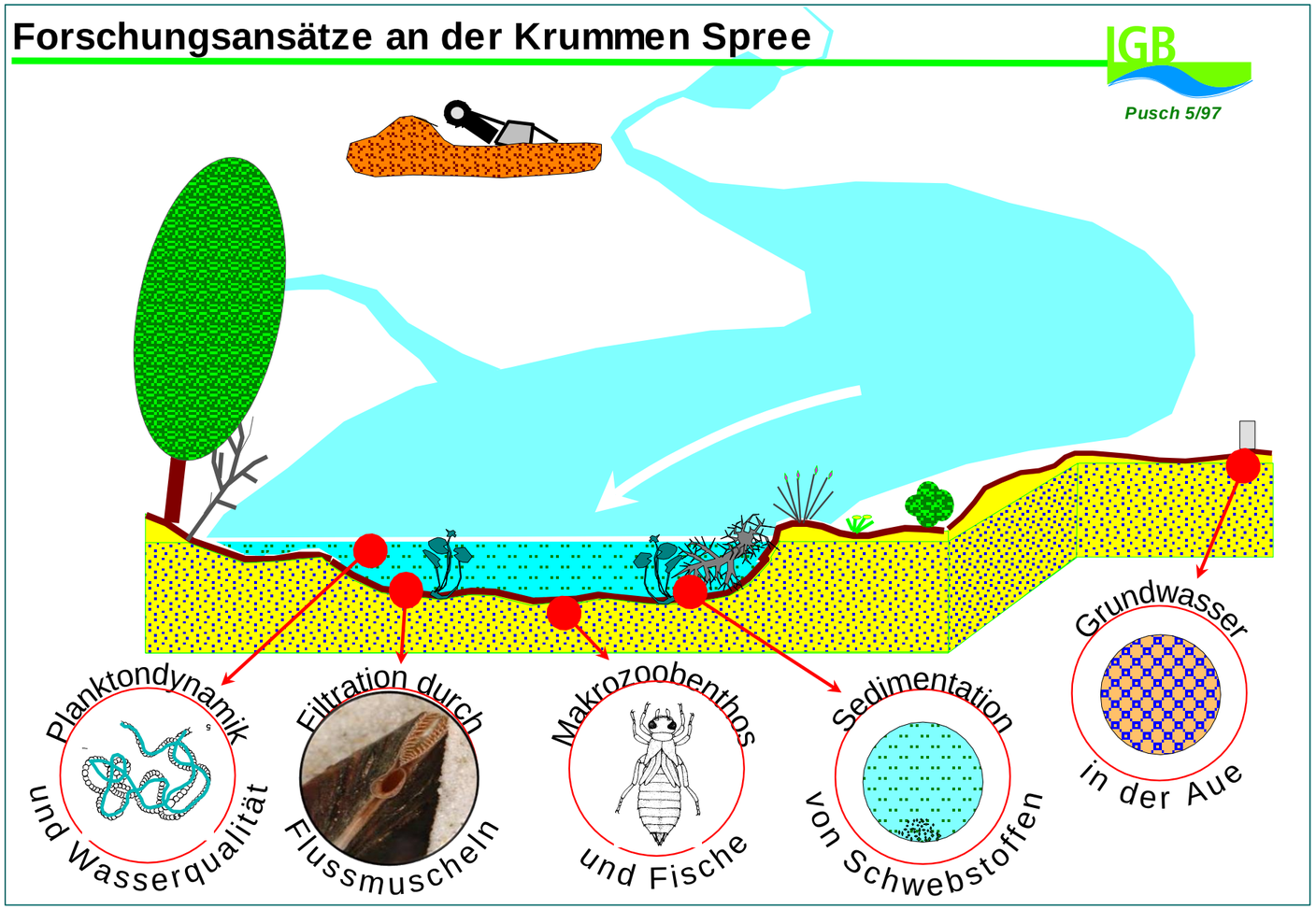
ECOSYSTEM SERVICES POLICY

- **Goal setting in EU:** EU Biodiversity Strategy to 2020
- **Implementation:** International Initiative: The Economics of Ecosystems and Biodiversity (TEEB)
- **EU Initiative:** Mapping and Assessment of Ecosystems and their Services (MAES)





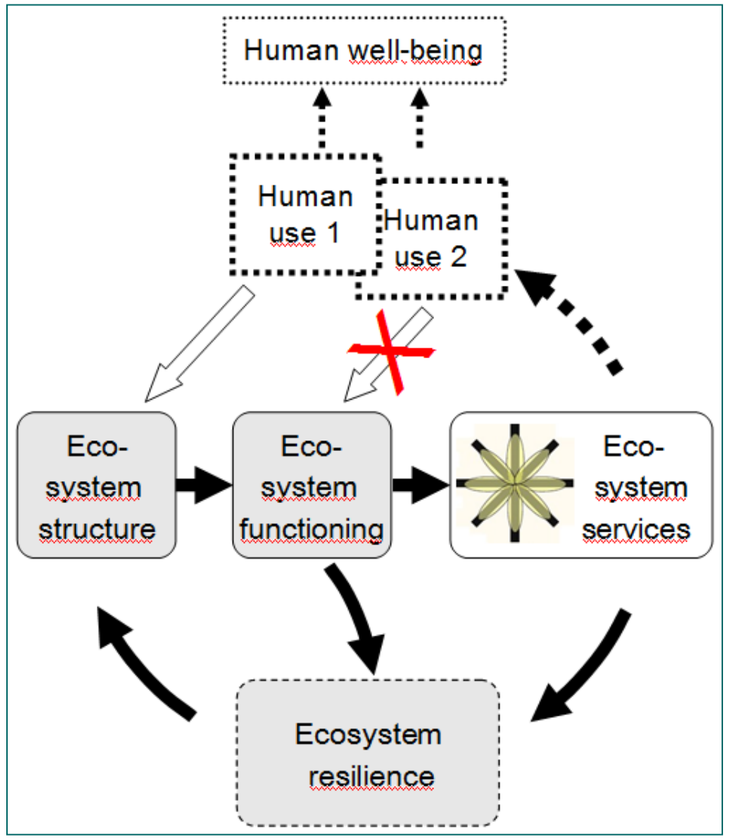
ECOLOGICAL STRUCTURES AND FUNCTIONS GENERATING ES



Hydromorphological structure and biotic communities form the basis for ecological functions of rivers and floodplains

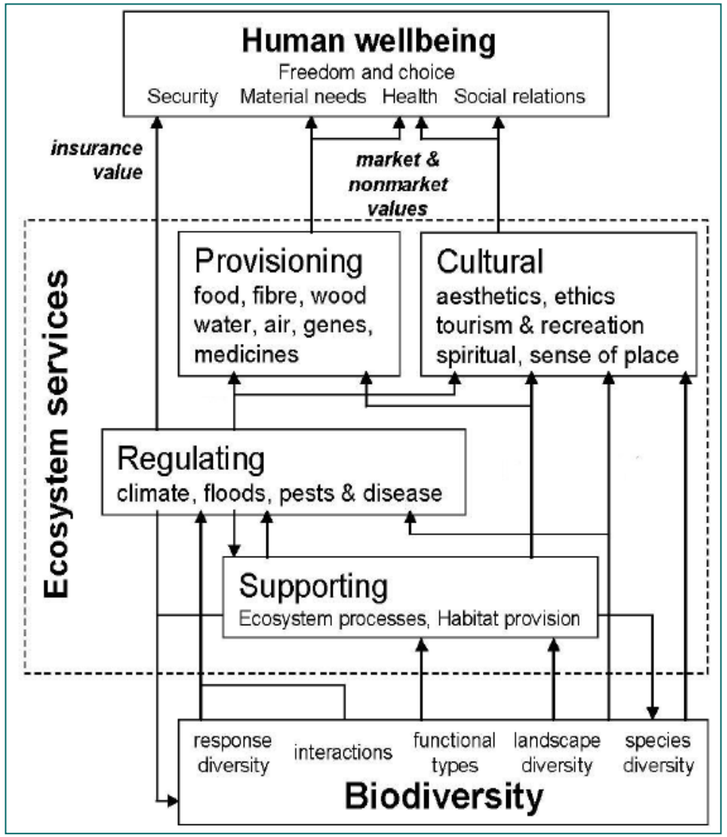
ECOSYSTEM SERVICES

- Cultural services, as recreation, tourism, esthetics and religious significance of landscape elements
- Supporting services, as soil generation, photo synthesis or nutrient recycling
- Provisioning services, as food, water, fibers, wood, oil
- Regulating services, as regulation of climate, floods, diseases or water quality

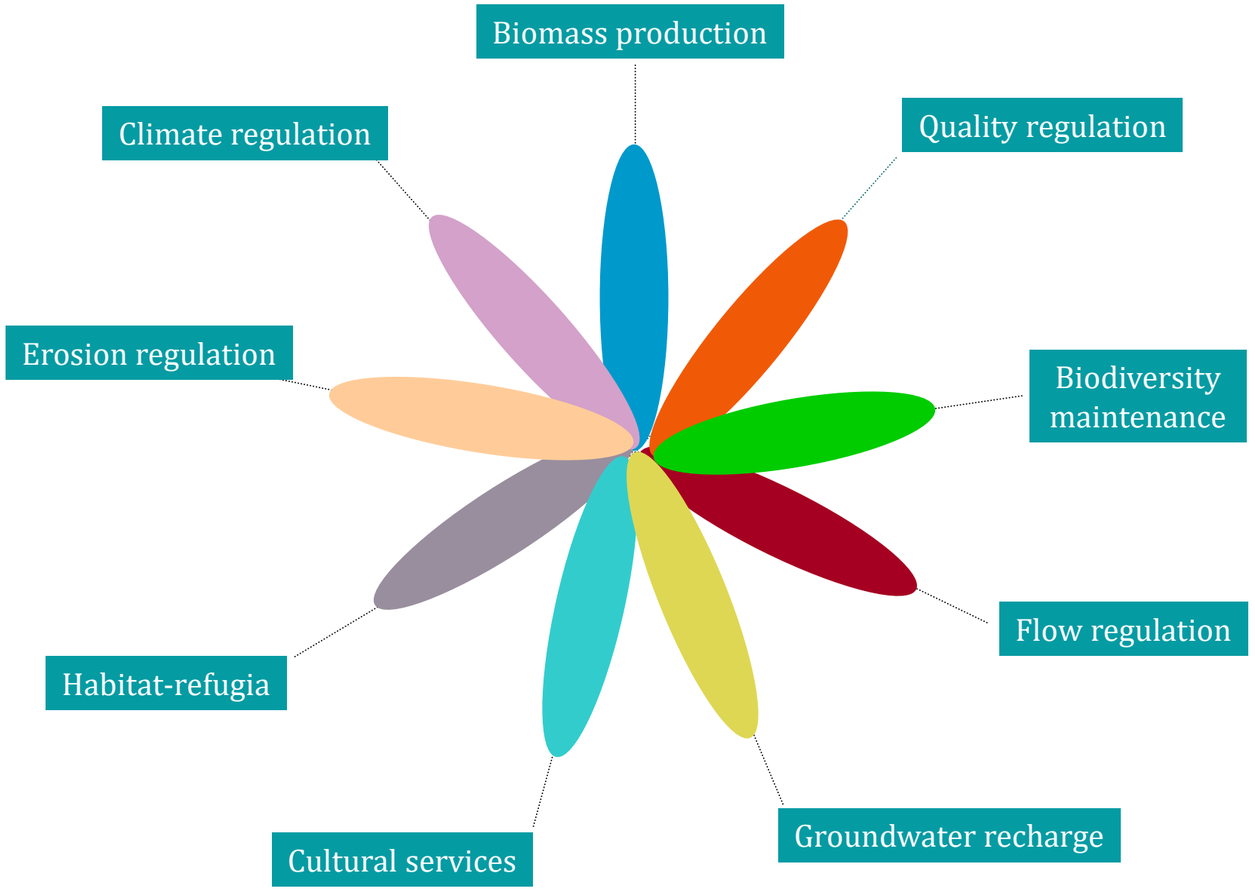


ECOSYSTEM SERVICES

- Linkages between biodiversity, ES categories,
  and human wellbeing
- The interactions shown by arrows here have largely still not been quantified for rivers and floodplains!
- Ecosystem services much depend on the resilience of ecosystems!



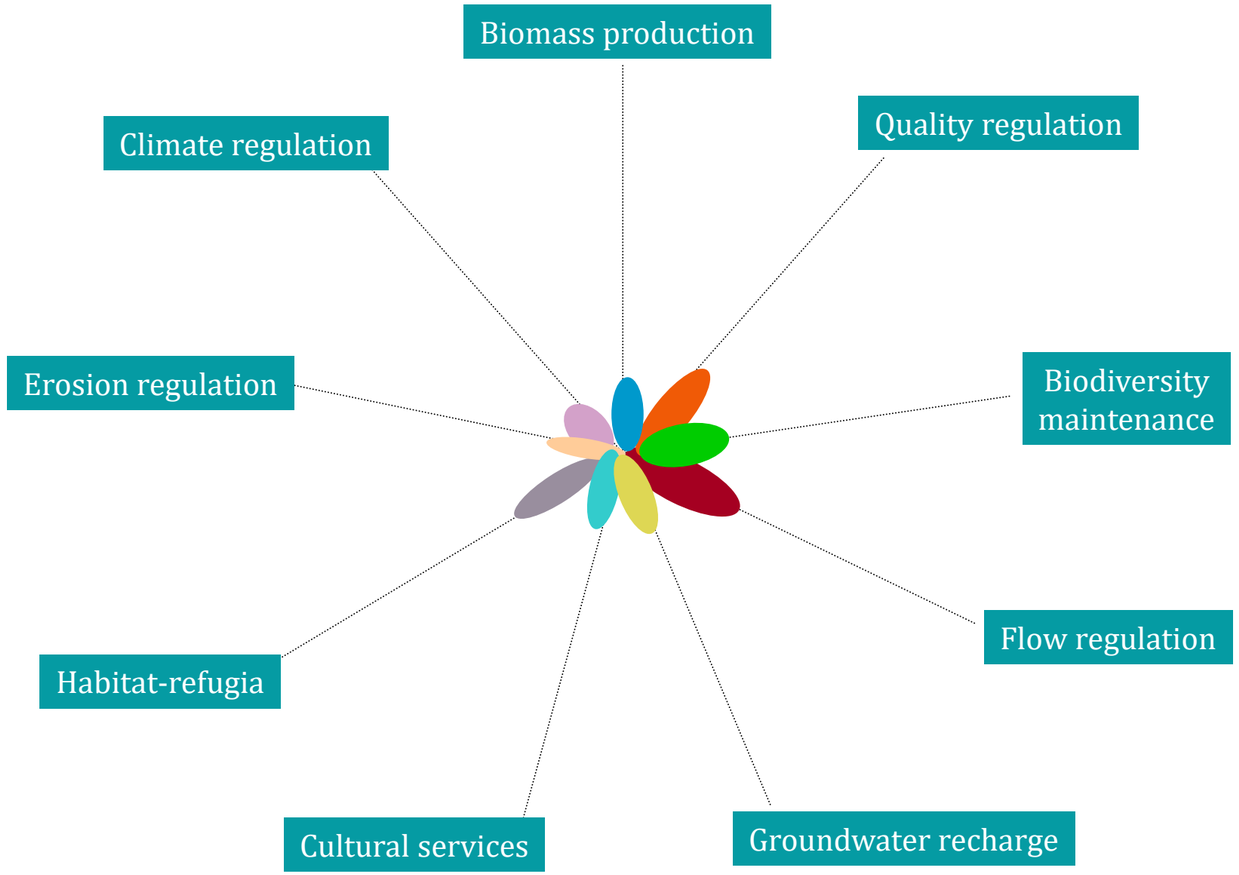
INTER-SECTORAL INTEGRATION OF RIVER AND FLOODPLAIN MANAGEMENT



ECOSYSTEM SERVICES
of multifunctional river corridors

Tagliamento River (N Italy)

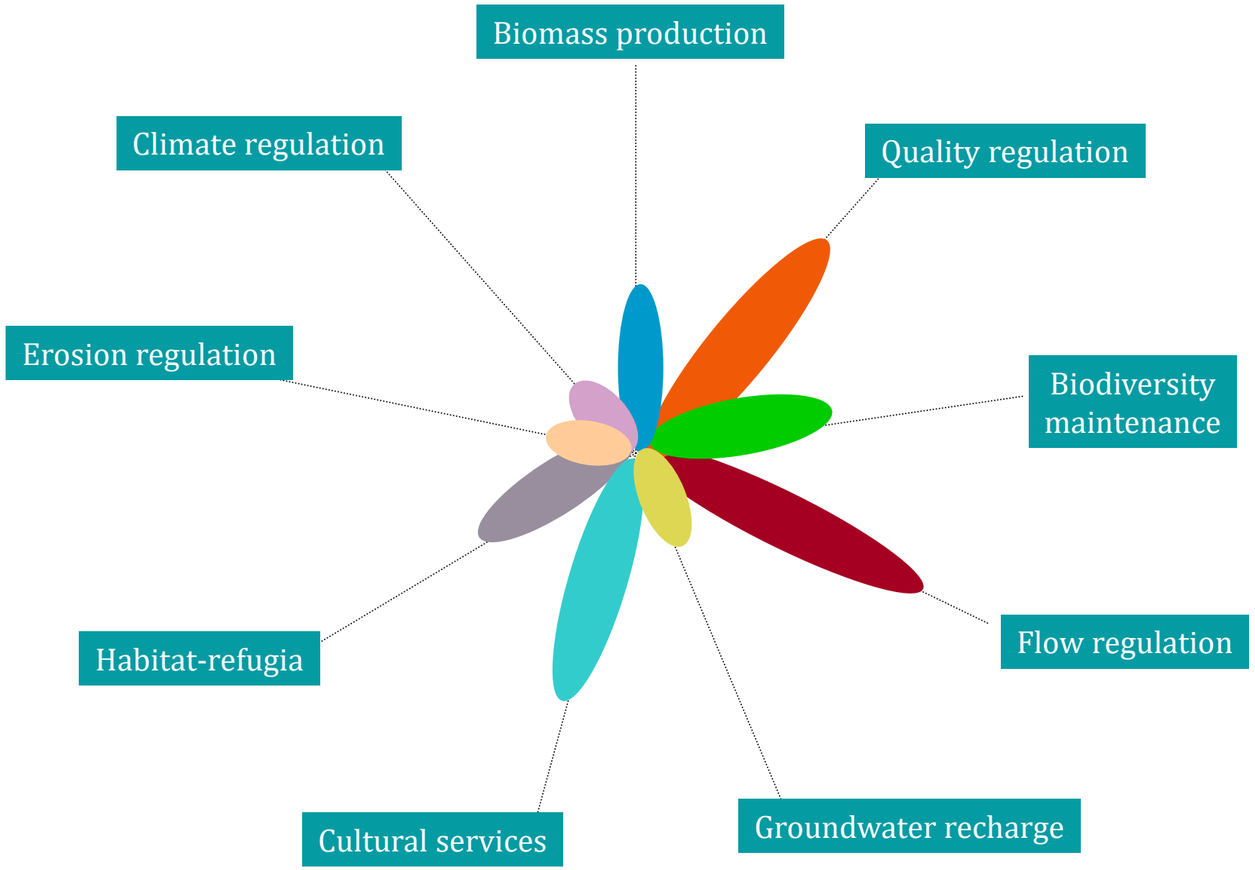
INTER-SECTORAL INTEGRATION OF RIVER AND FLOODPLAIN MANAGEMENT



ECOSYSTEM SERVICES
of degraded river corridors

Asi River (Turkey, Anatolia)
(Photo: Ali Demirsoy)

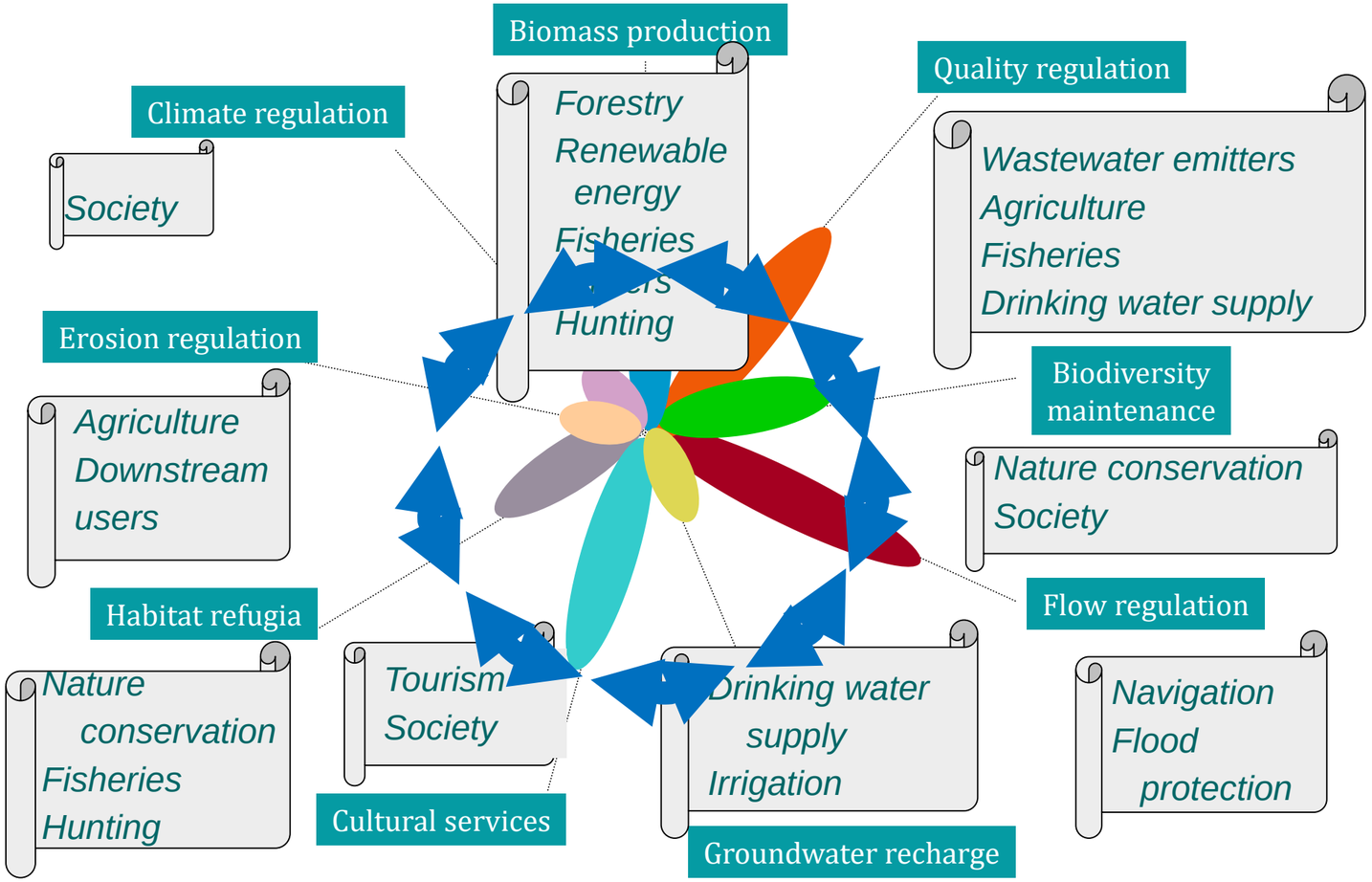
INTER-SECTORAL INTEGRATION OF RIVER AND FLOODPLAIN MANAGEMENT



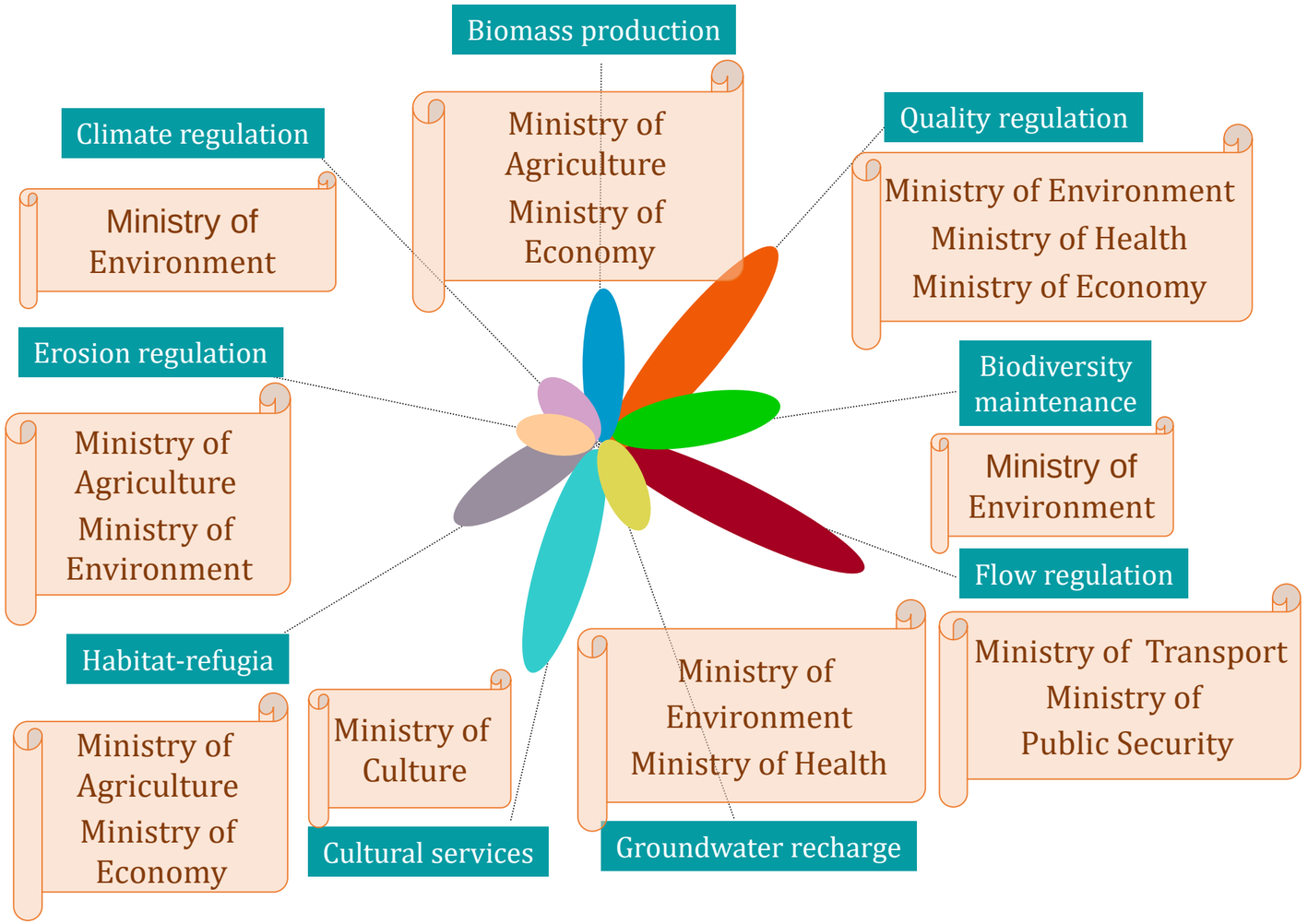
ECOSYSTEM SERVICES
of restored river corridors

Elbe River (Germany)

ECOSYSTEM SERVICES



Various users (incomplete list) and the **Interactions** of uses



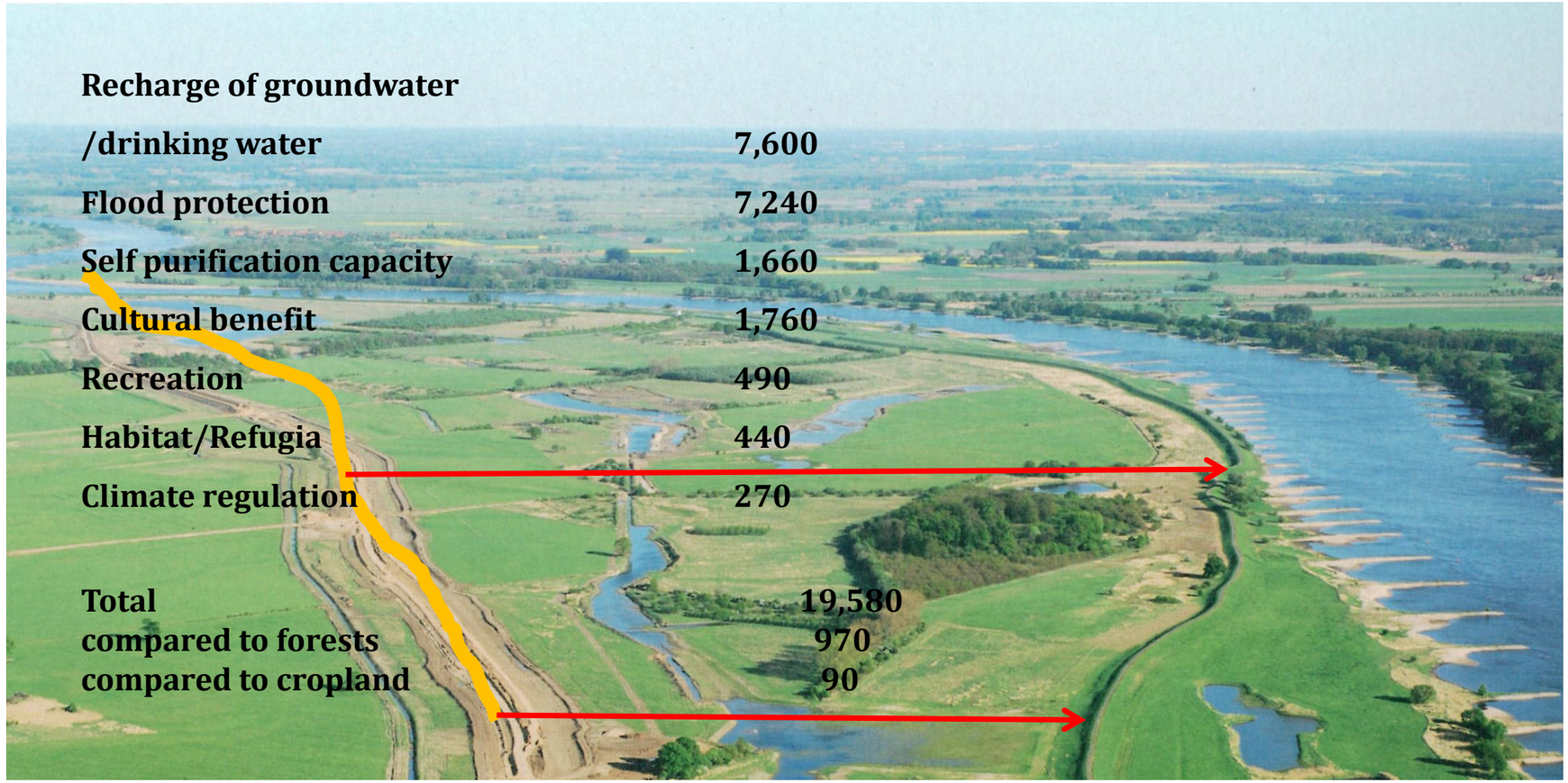
Sectoral state administrations and stakeholders (tentative list)

ECOSYSTEM SERVICES

As a river system is affected by multiple administrations and stakeholders,
all have to be involved into the development of an inter-sectoral river management plan !

MONETIZATION OF ECOSYSTEM SERVICES

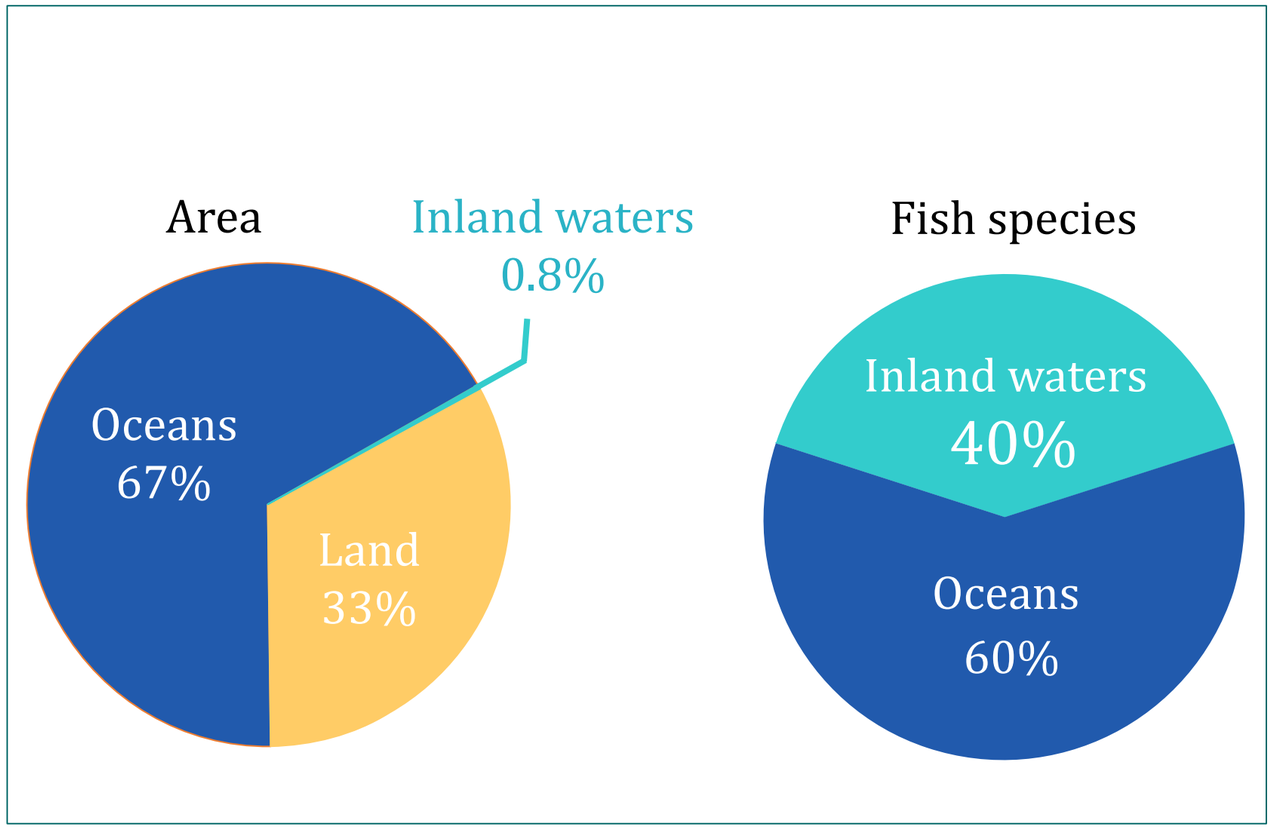
Ecosystem services of river floodplains [in USD/(ha * yr)]



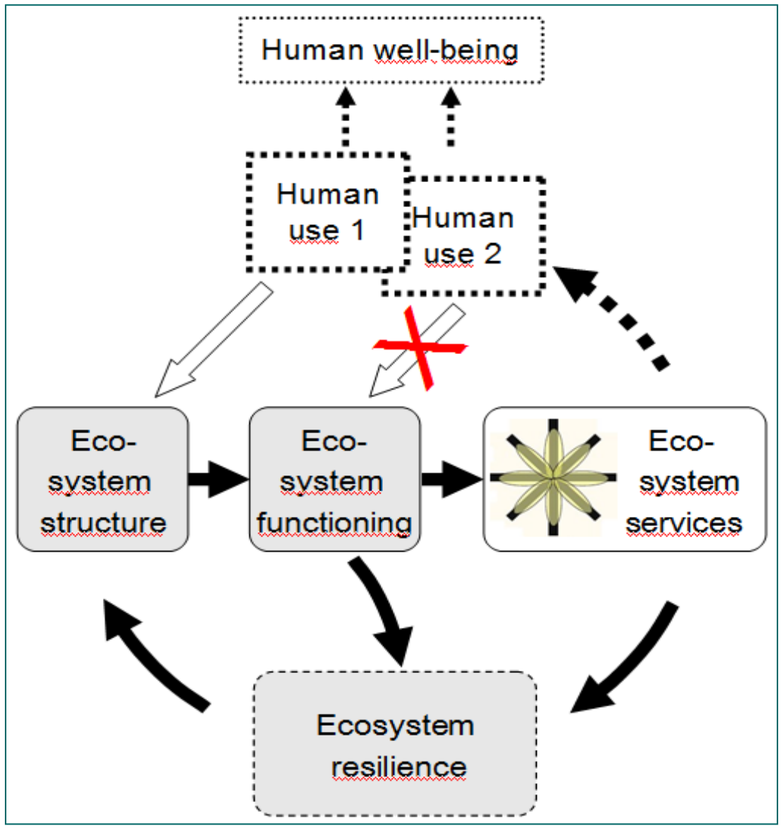
Net benefit of dyke relocation (= levee setback) on **80 000 Euro/ha**

Institut für ökologische Wirtschaftsforschung Jessel, Tschimpke, Walse **Elbe River:** r (2009): Produktivkraft Natur.

INLAND WATERS: CENTRES OF BIODIVERSITY



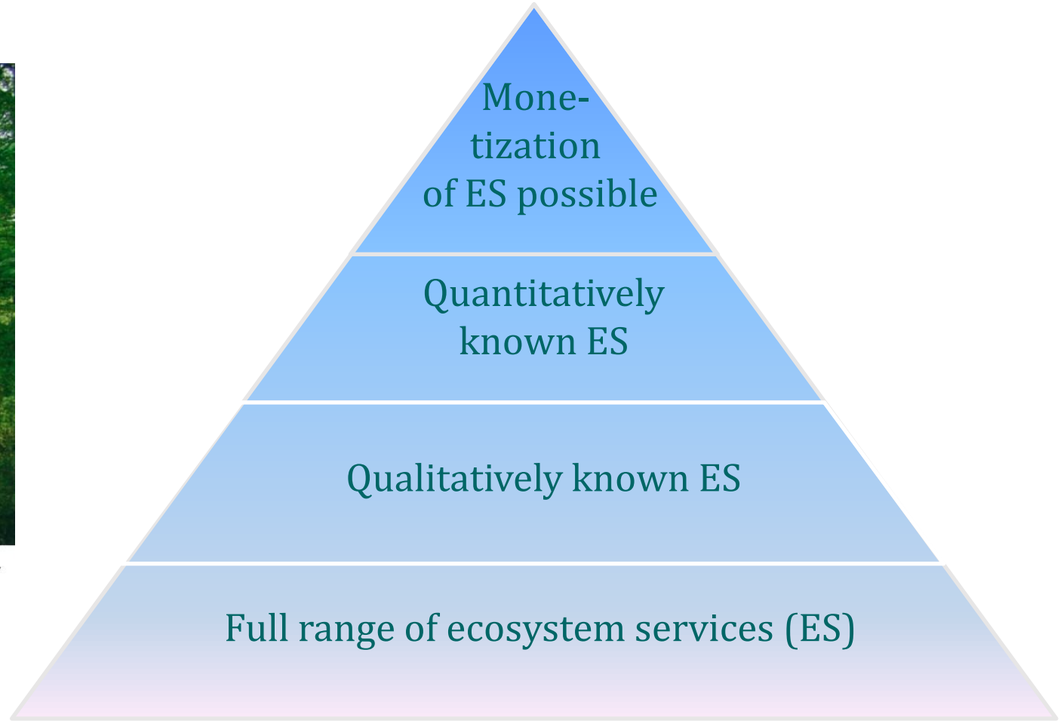
ECOSYSTEM RESILIENCE



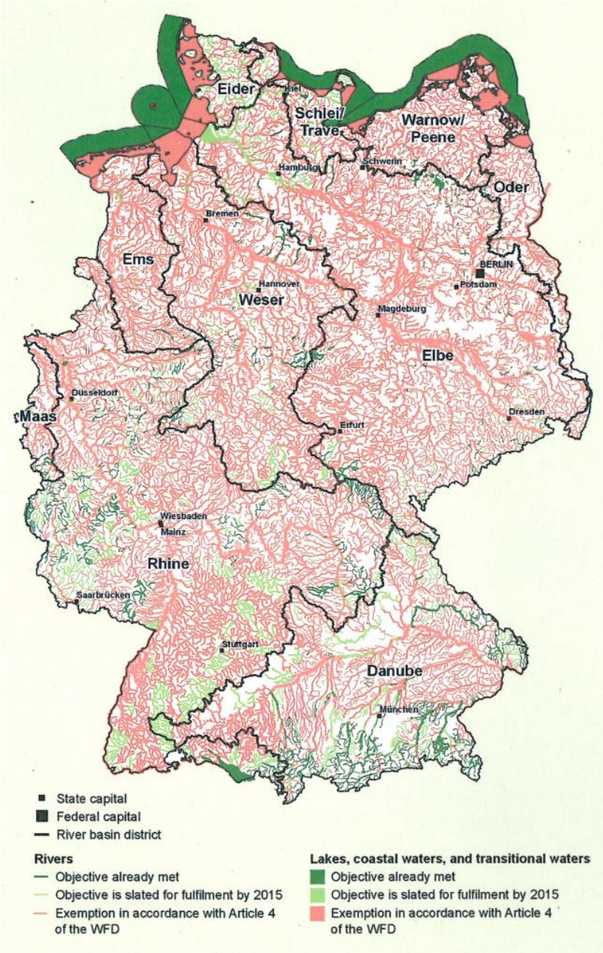
Ecosystem services much depend on the resilience of ecosystems!

SEARCHING FOR AVAILABLE INDICATOR DATA FOR ES

Abb. 5-6: Hartholz-Auenwald an der Mittelelbe mit wassergefüllter Flutrinne nach Frühjahrshochwasser (Foto: M. Scholz).



TEEB (2008): The economics of ecosystems and biodiversity

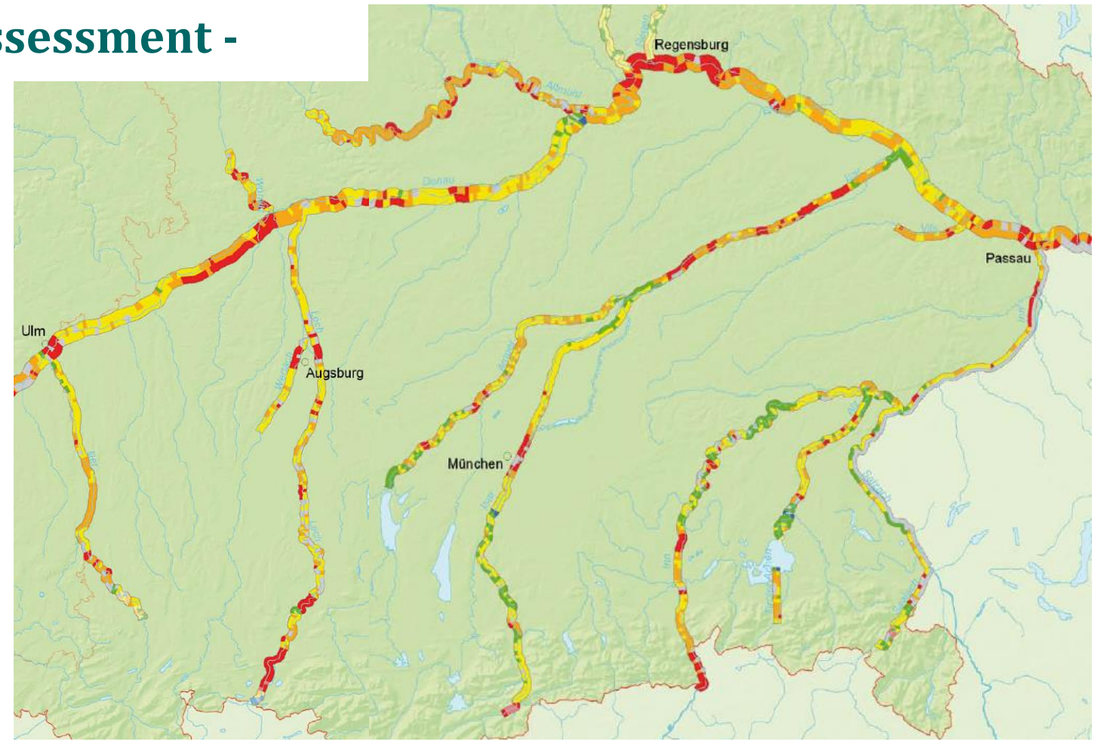


INDICATOR DATA FOR ES OF RIVERS AND FLOODPLAINS IN GERMANY

- Physical habitat assessment -

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Bundesamt für Naturschutz



Auenzustandsklassen

1 sehr gering verändert
2 gering verändert
3 deutlich verändert
4 stark verändert
5 sehr stark verändert
nicht bewertet

Abschnitte mit eingeschränkter Datenlage sind in blassen Farben dargestellt.

INDICATOR DATA FOR ES OF RIVERS AND FLOODPLAINS IN GERMANY

- Nutrient retention -

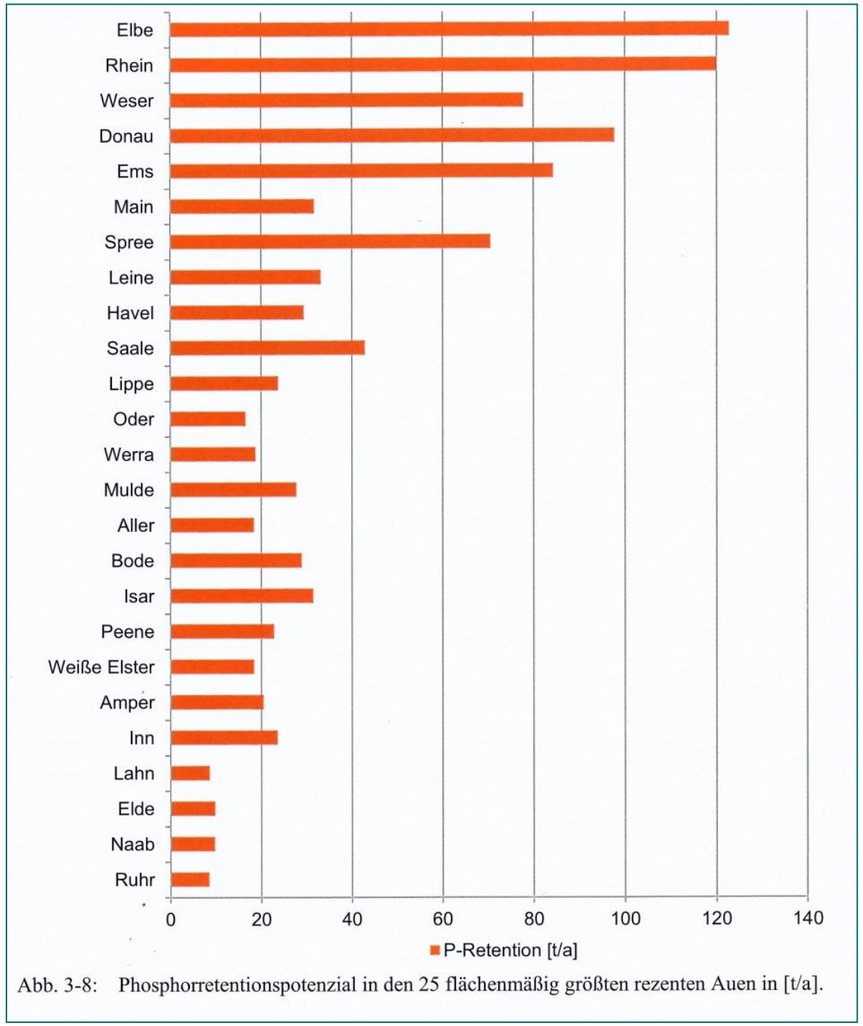


Abb. 3-8: Phosphorretentionspotenzial in den 25 flächenmäßig größten rezenten Auen in [t/a].

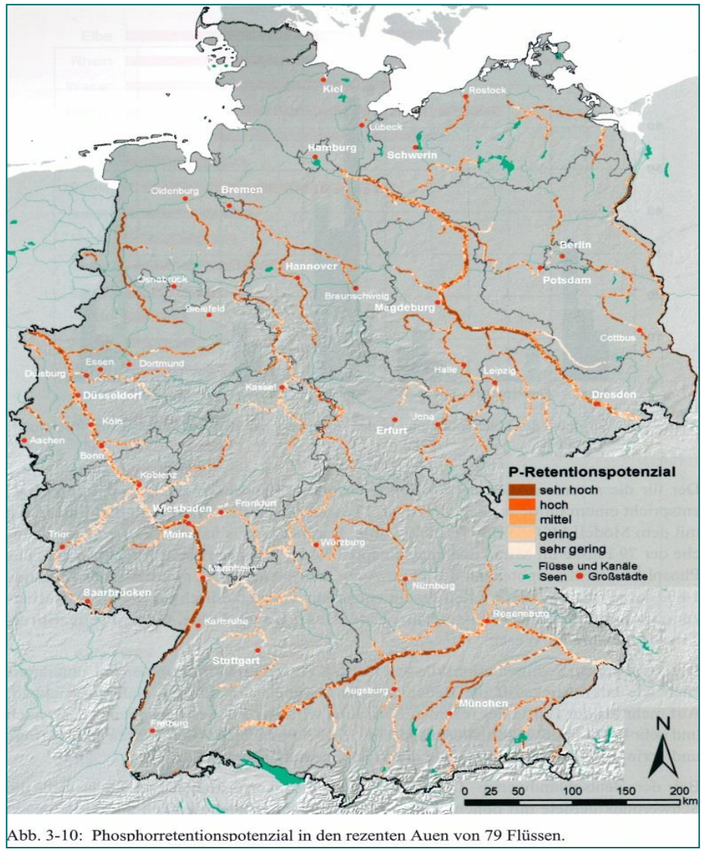


Abb. 3-10: Phosphorretentionspotenzial in den rezenten Auen von 79 Flüssen.

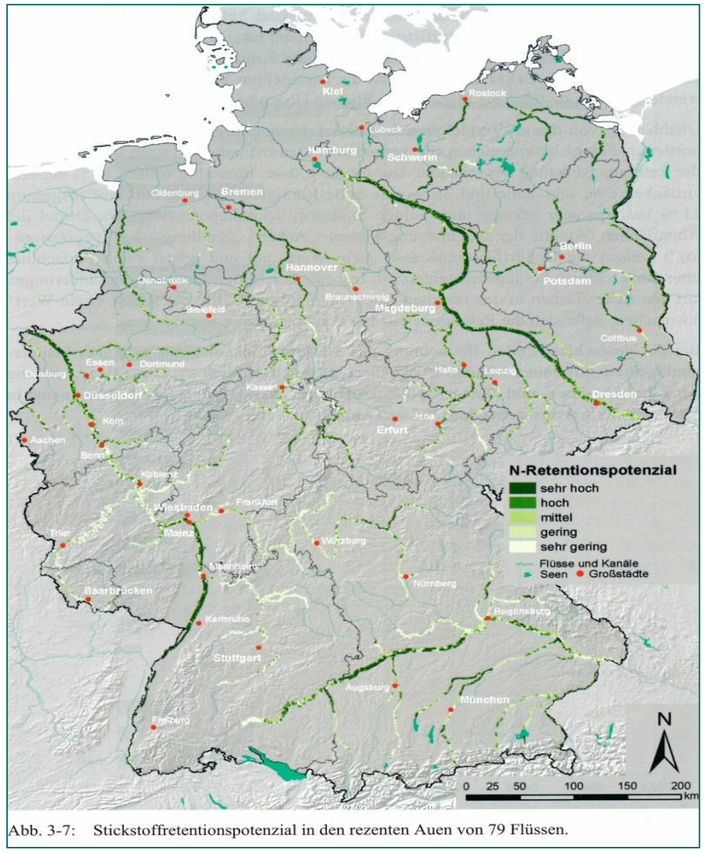


Abb. 3-7: Stickstoffretentionspotenzial in den rezenten Auen von 79 Flüssen.

Scholz et al. (2012): Ökosystemfunktionen von Flussauen

INDICATOR DATA FOR ES OF RIVERS AND FLOODPLAINS IN GERMANY

- Carbon sequestration -

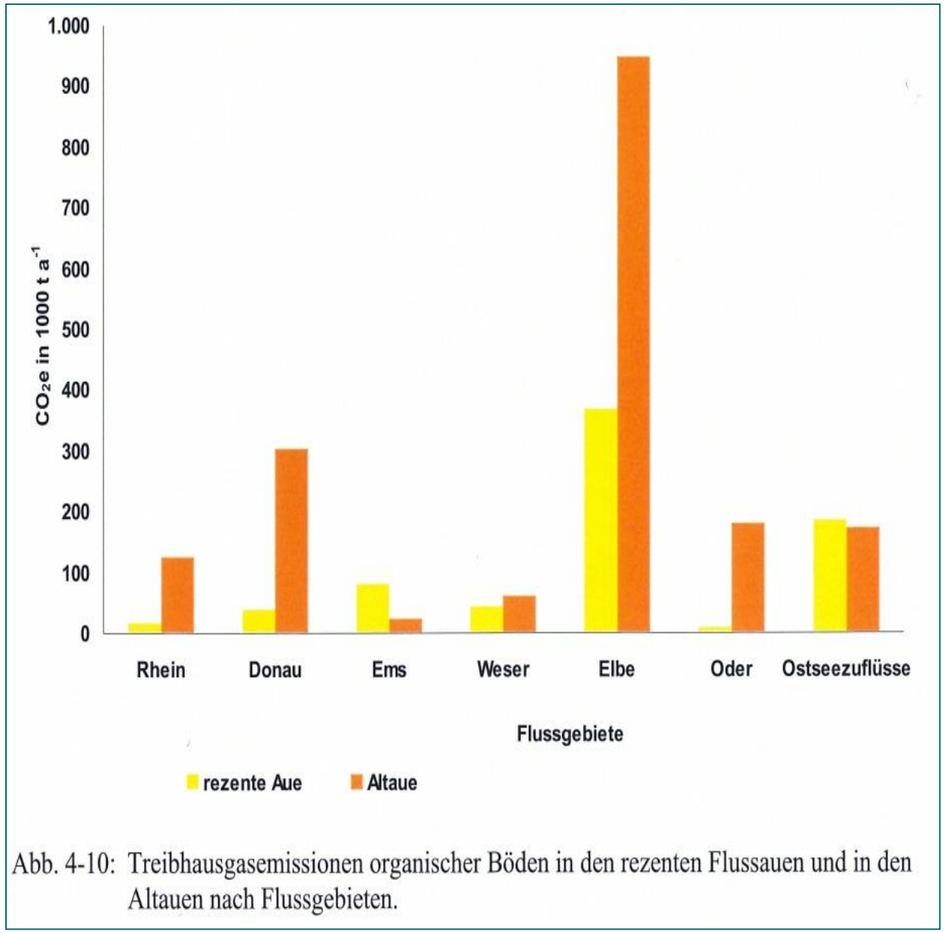


Abb. 4-10: Treibhausgasemissionen organischer Böden in den rezenten Flussauen und in den Altauen nach Flussgebieten.

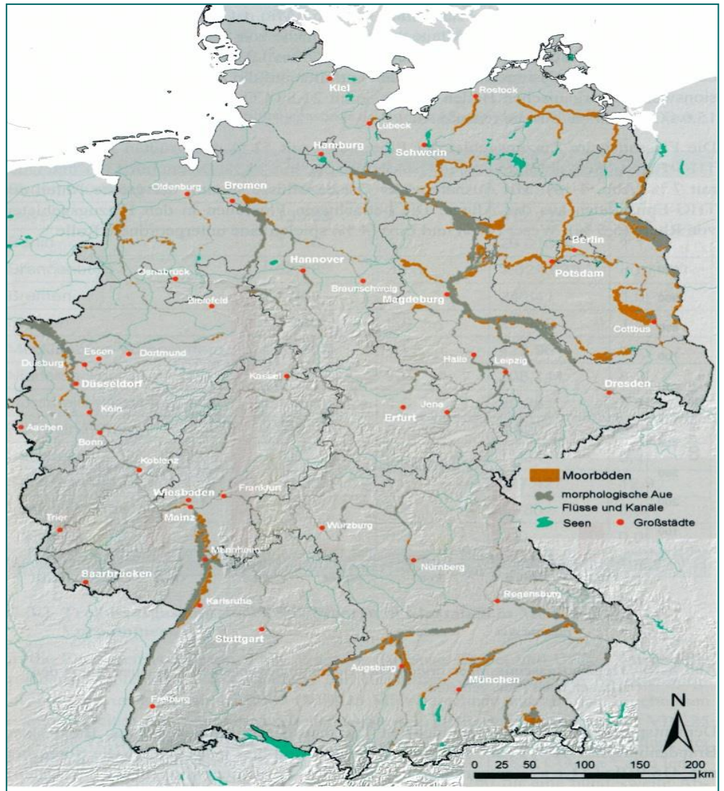


Abb. 4-9: Verbreitung organischer Böden in den morphologischen Flussauen.

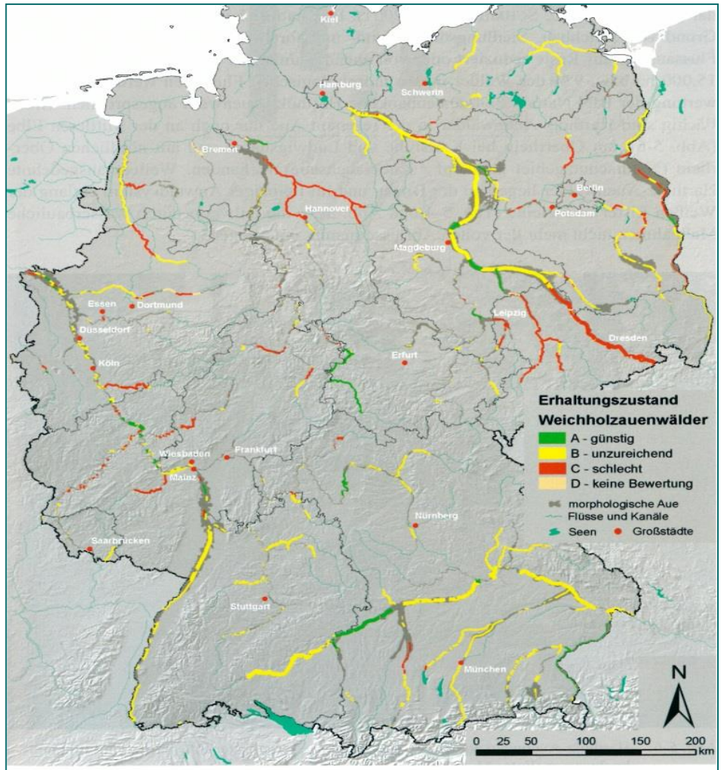


Abb. 5-5: Verbreitung und Erhaltungszustand von Erlen-Eschen-Auenwäldern und Weiden-Auenwäldern (LRT 91E0) in FFH-Gebieten der Flussauen.
Datenquelle: BfN-Natura 2000-Datenbank; Stand 2009.

Scholz et al. (2012): Ökosystemfunktionen von Flussauen

INDICATOR DATA FOR ES OF RIVERS AND FLOODPLAINS IN GERMANY

- Habitat provision for biodiversity -

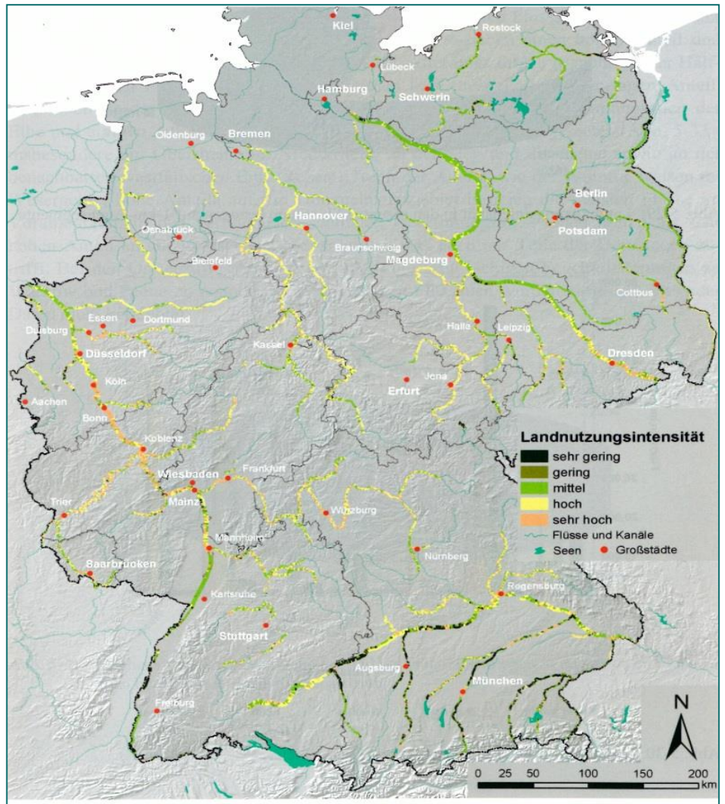


Abb. 5-28: Übersichtskarte zum Landnutzungsintensität in den rezenten Flussauen.

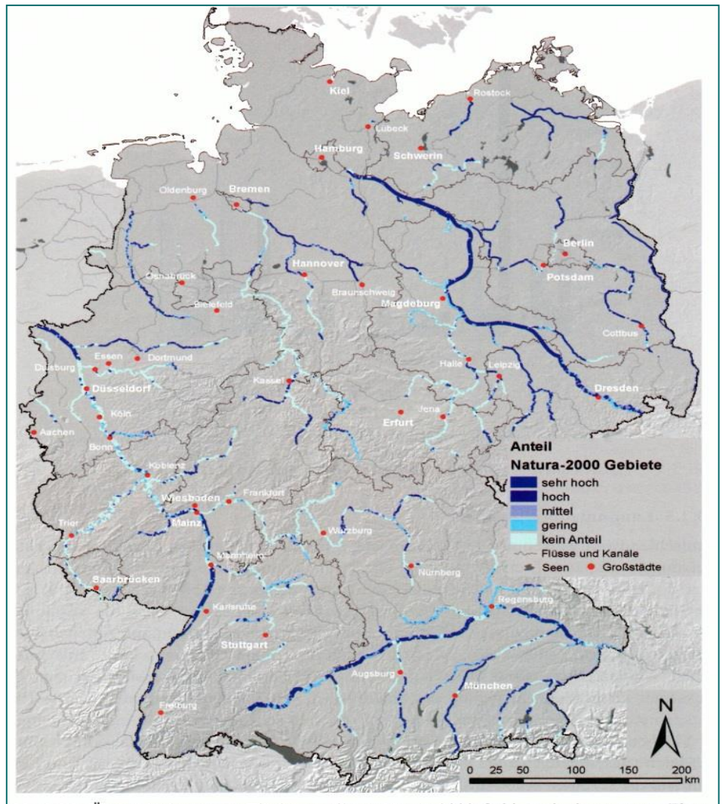


Abb. 5-26: Übersichtskarte zum Flächenanteil von Natura 2000-Gebieten in den rezenten Flussauen.

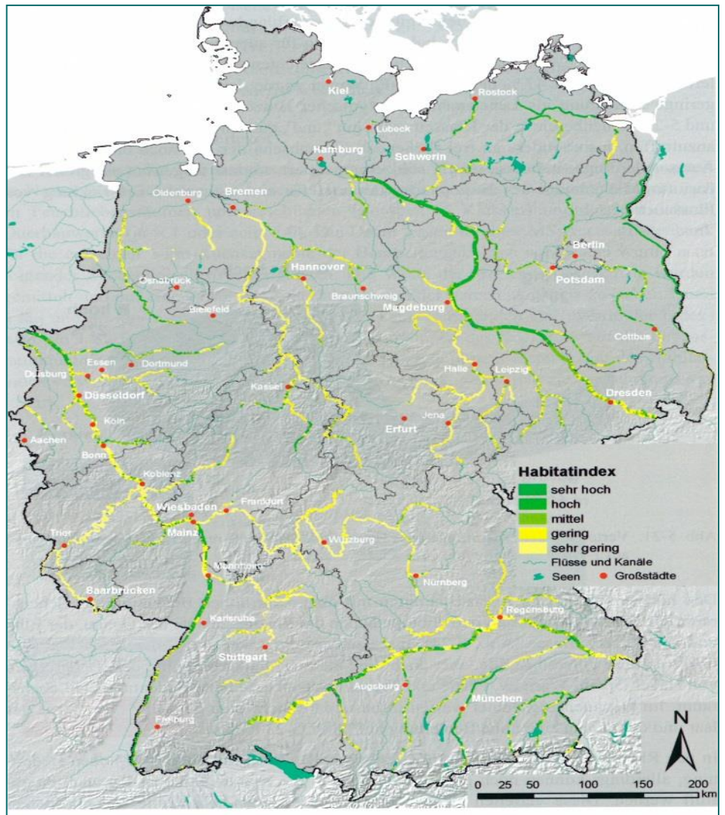


Abb. 5-22: Übersichtskarte zum Habitatindex der rezenten Flussauen.

Scholz et al. (2012): Ökosystemfunktionen von Flussauen

RIVER RESTORATION

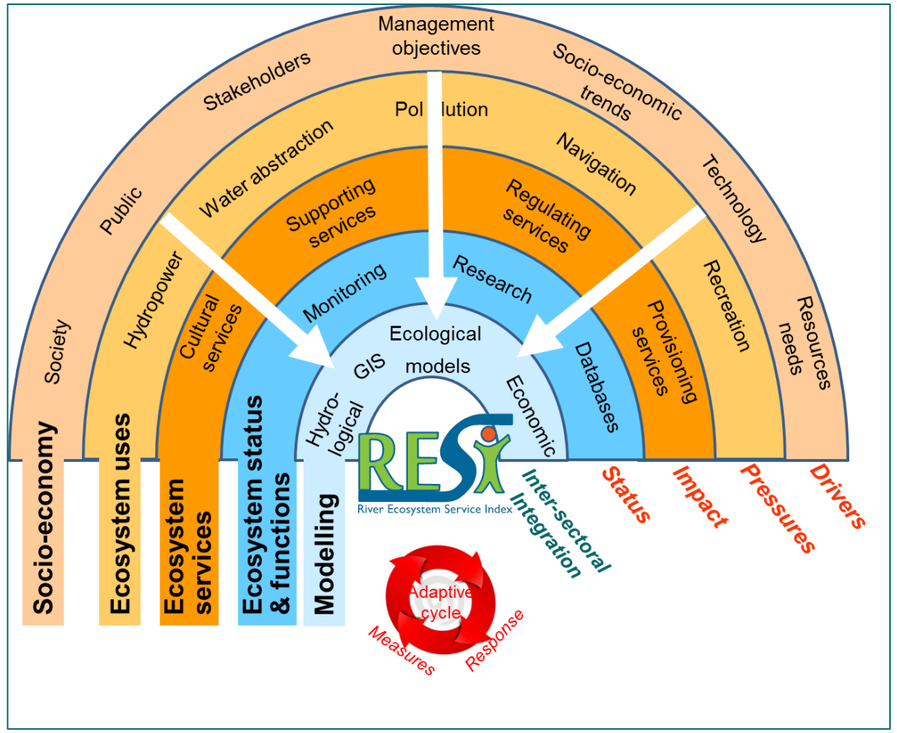
River Lahn: degraded river section (Photo: D. Hering)

River Lahn: section after restoration (Photo: D. Hering)

CURRENT TOPICAL RESEARCH PROJECT IN GERMANY:

R&D topics on ES of rivers and floodplains in Germany

- Functional assessment of ecosystems based on fulfillment of official management objectives
- Inter-sectoral approach including various official EU Directives (on water quality, flood risk, biodiversity protection) as well as various human uses
- Available data on ES are collated within a Geographical Information System (GIS)
- Synergies and trade-offs of different ES aredetected and quantified
- Areas of ES generation and ES are depicted and functionally linked
- Comparison of scenarios for river and floodplain management based on their ES balances
- Inter-sectoral ES index supporting management decisions
- Joint implementation with regional EPA‘s



The Vjosa Science Conference

The Vjosa – A unique opportunity for European River Science

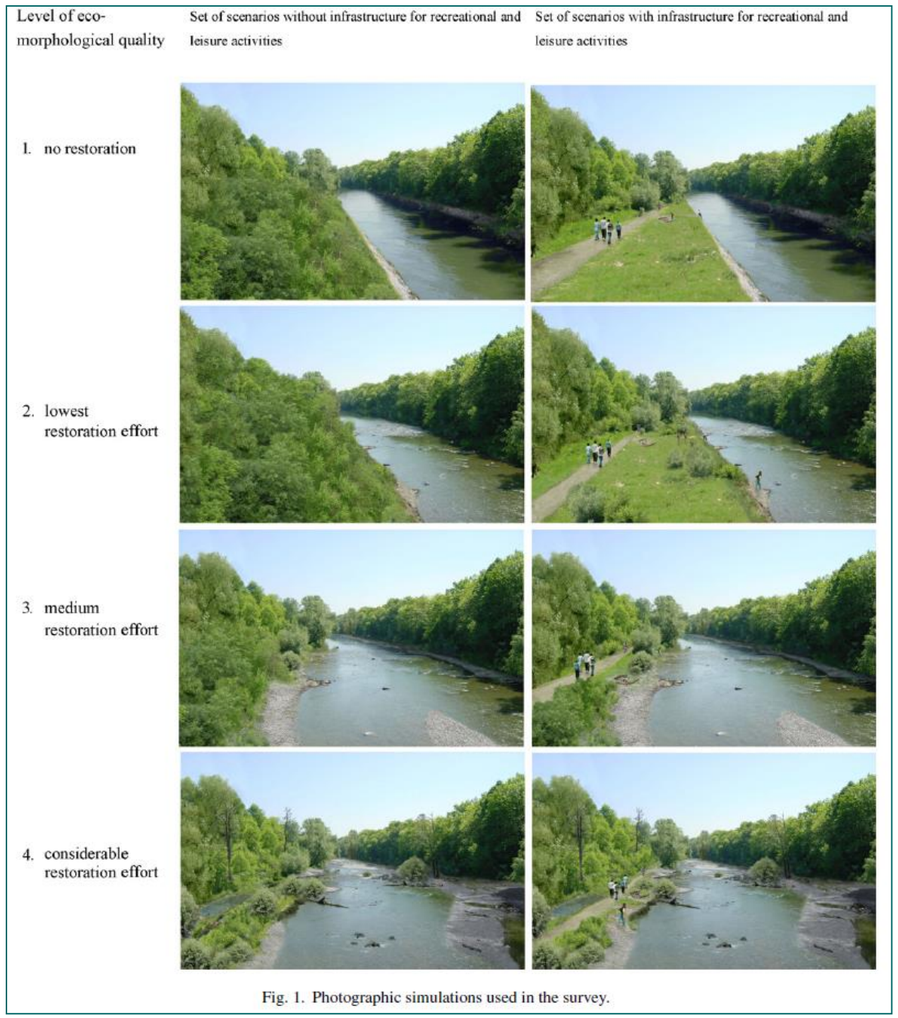
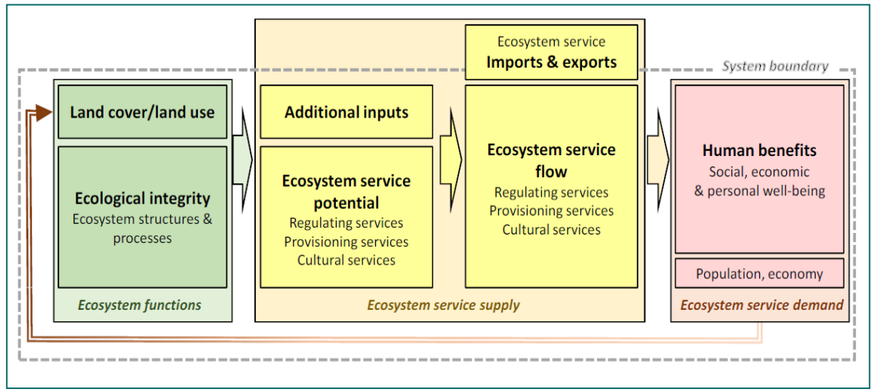


Fig. 1. Photographic simulations used in the survey.

WAY FORWARD

RESI River Ecosystem Service Index



"Nature provides a free lunch,

but only if we control our appetites."

William Ruckelshaus, Business Week 1990

RIVER MANAGEMENT: CHALLENGES WITHIN THE EUROPEAN FRAMEWORK

Robert Konecny
Austrian Federal Agency for Environment

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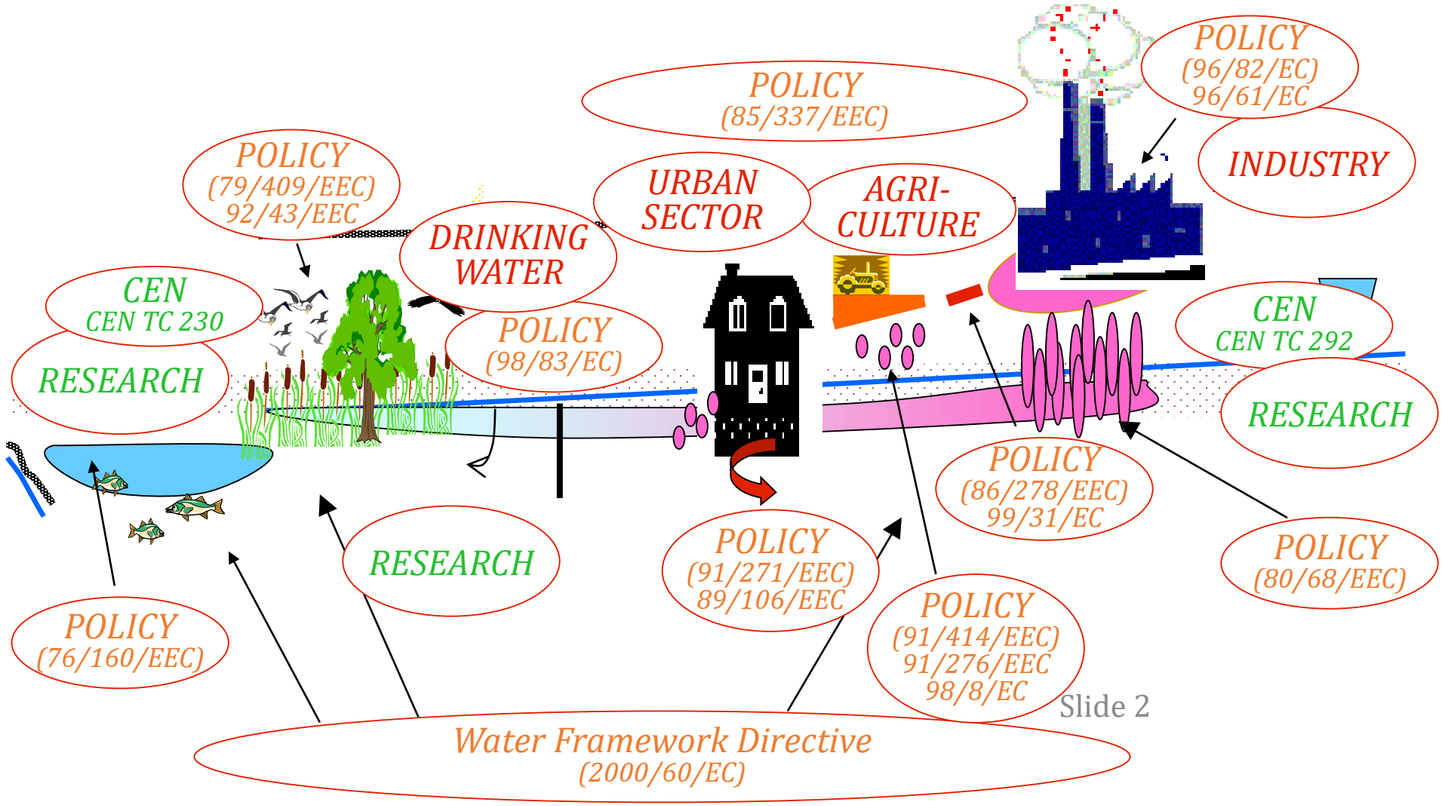
env-wfd-circa@cec.eu.int

robert.konecny@umweltbundesamt.at

EXISTING POLICY FRAMEWORK



Slide 2

Unique situation of Vjosa

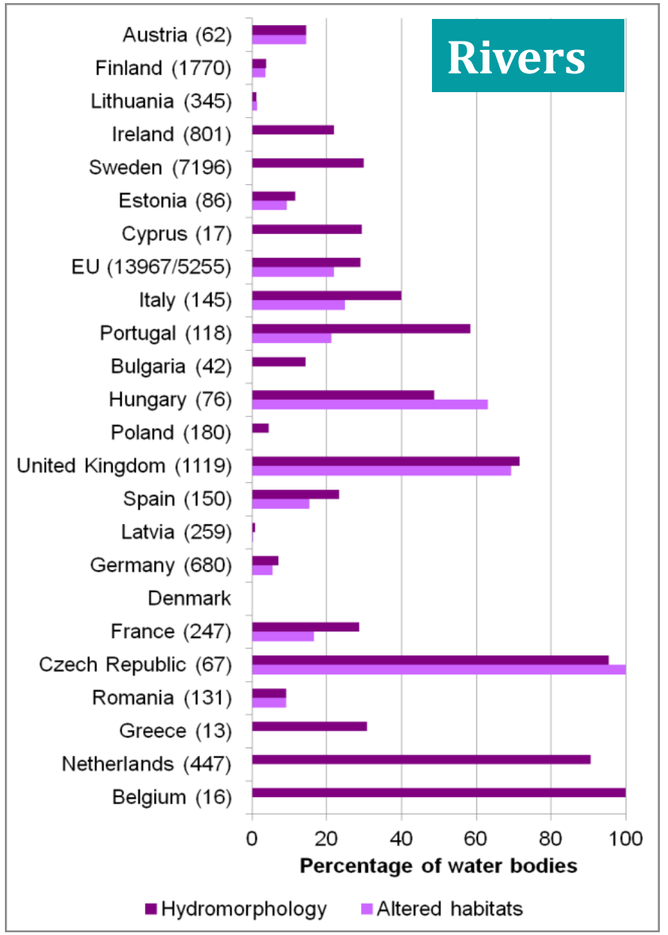
Near natural conditions

EU DIRECTIVES

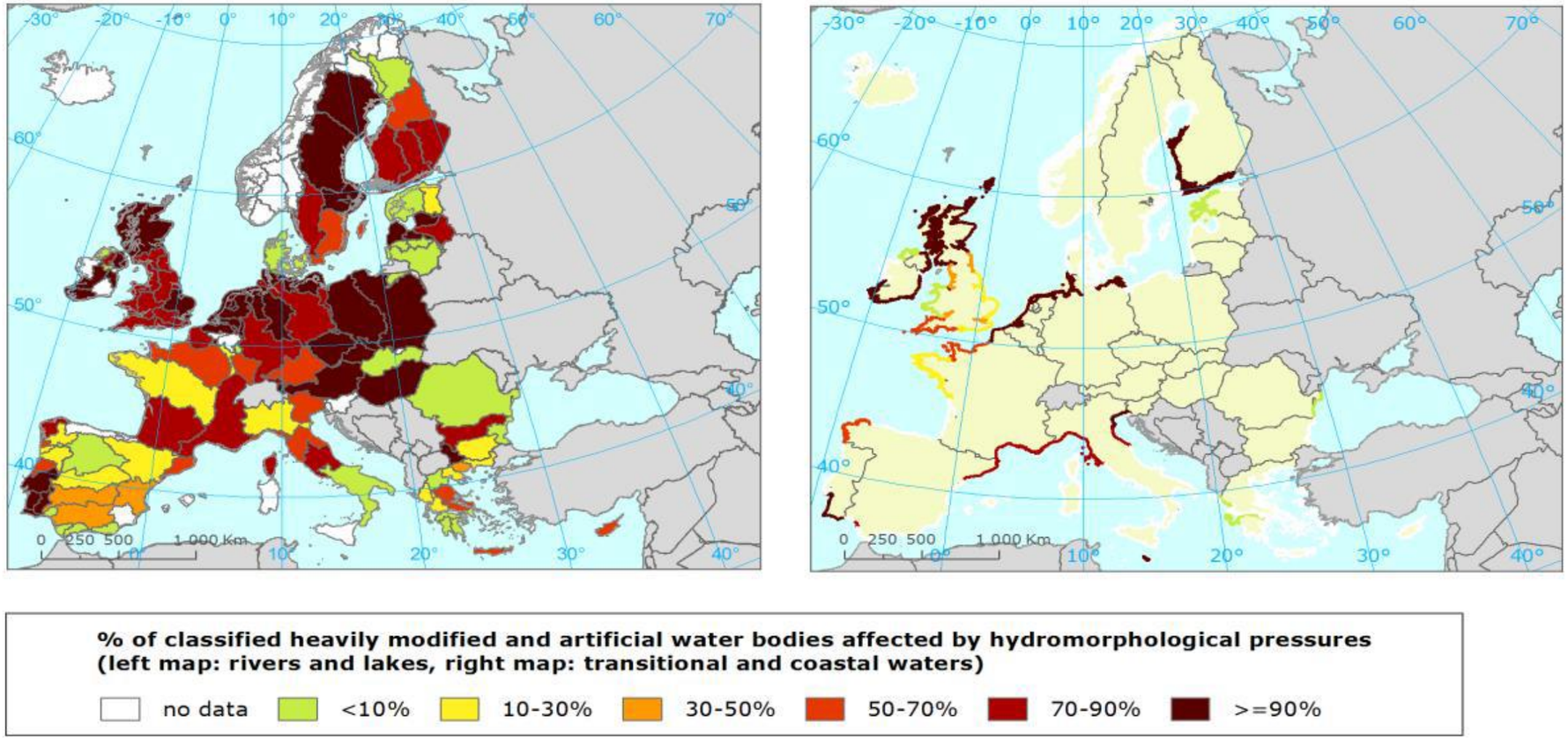
- Water Framework Directive (2000/60/EC)
- Birds Directive (79/409/EC)
- Habitats Directive (92/43/EC)
- Natura 2000 network for protected areas
- Environmental Impact Assessment Directive (85/337/EC)

LESSONS LEARNED

Percentage of classified surface water bodies affected by hydro-morphological pressures and having altered habitats in different Member States (rivers and lakes) and by sea regions and Member States bordering the sea regions (transitional and coastal waters)

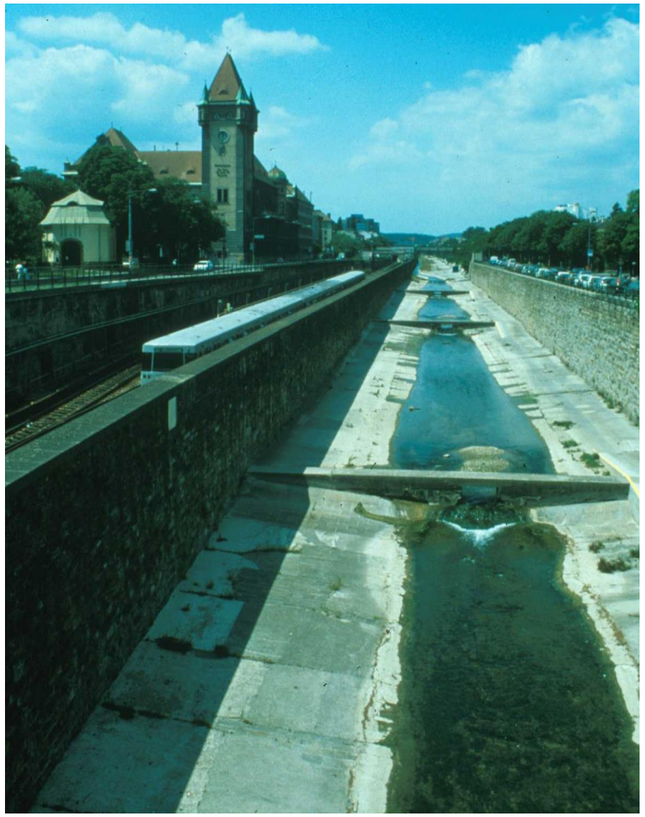


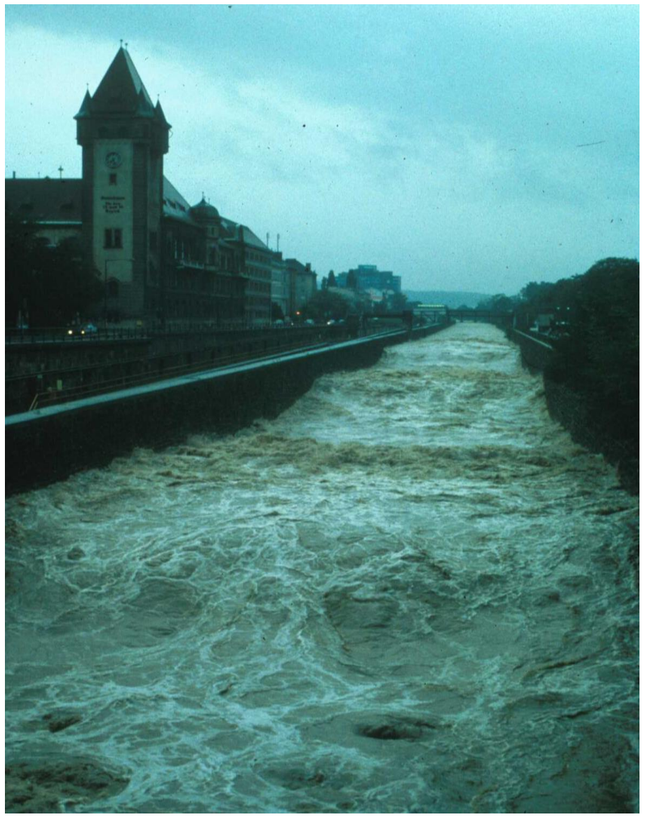
HYDRO-MORPHOLOGICAL PRESSURES



Percentage of classified HMWB/AWBs affected by hydro-morphological pressures

HYDRO-MORPHOLOGICAL PRESSURES





Flood protection city of Vienna

Heavily Modified Water Bodies

Water Framework Directive – WFD Key aims

- Expanding the scope of water protection to all waters, surface waters and groundwater
- Achieving "good status" (chemical and ecological status) for all waters by a set deadline (2027)
- Water management based on river basins
- “Combined approach" of emission limit values and quality standards
- Getting the citizen involved more closely
- Streamlining legislation
- Ecosystem approach – biological assessment

General approach

- **Typology of rivers** based on biology
- Definition of **reference** conditions
- Development of **assessment** systems for biological quality elements – pressure related

BIOLOGICAL ASSESSMENT METHODS

BIOLOGICAL QUALITY ELEMENTS

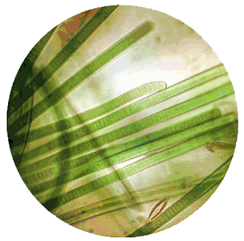
- Macrophytes and phytobenthos
- Macroinvertebrates
- Fish

- Supporting elements
- Hydromorphology
- Physico-chemical

PRINCIPLES AND PRIORITIES

- Nationwide applicable
- Robust
- Administrable
- Possible to finance

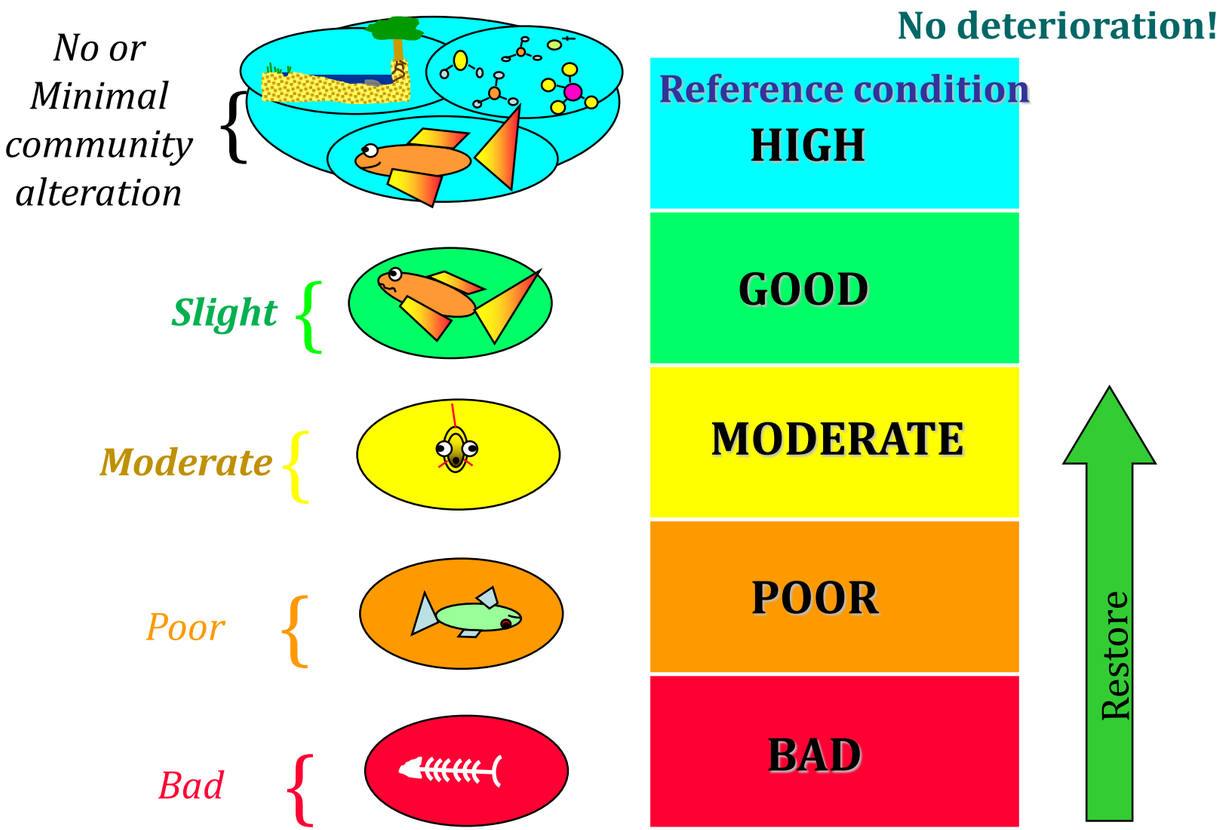
- Adaptation of existing national methods to the requirements of the WFD
- Adaptation of European methods to the national situation
- Development of new methods



Type specific reference conditions

- Nearly natural / only minimally impacted
- Reference sites: very minor anthropogenic impact; totally uneffected sites do not exist anymore - at least due to the world wide atmospheric deposition!
- Impacts on rivers or within the catchment areae only have local effects, and do not affect the original characte-ristics, so that the aquatic community is only altered minimally.

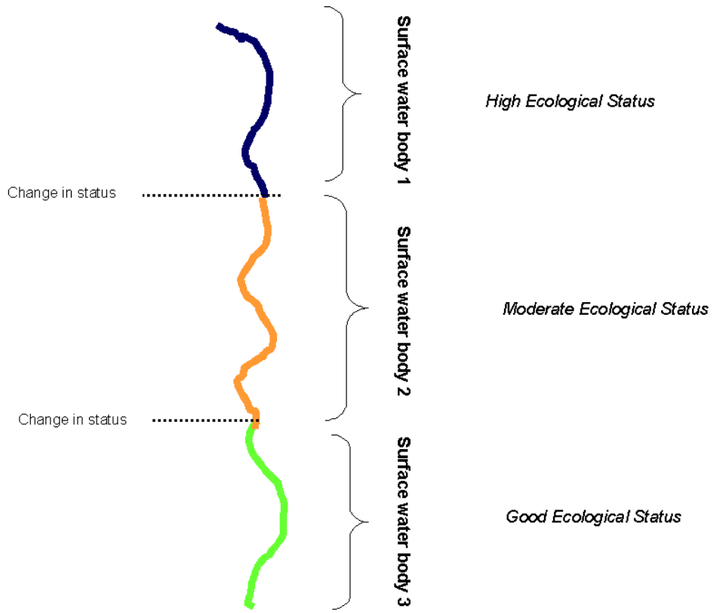
Ecological status

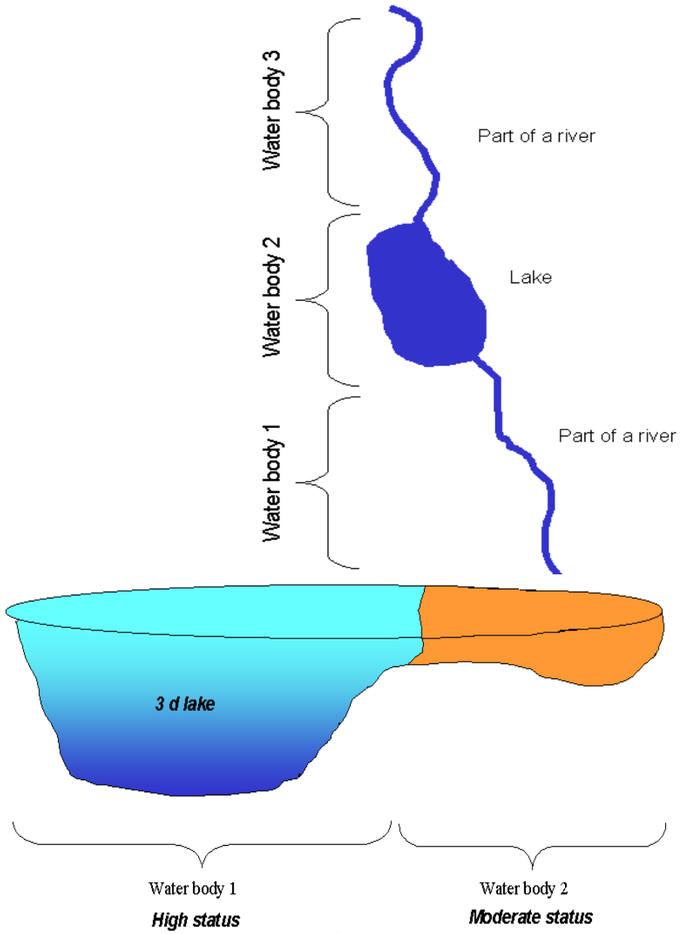


Typology - identifying water bodies

Reference Conditions for each type

Ecological status for each water body

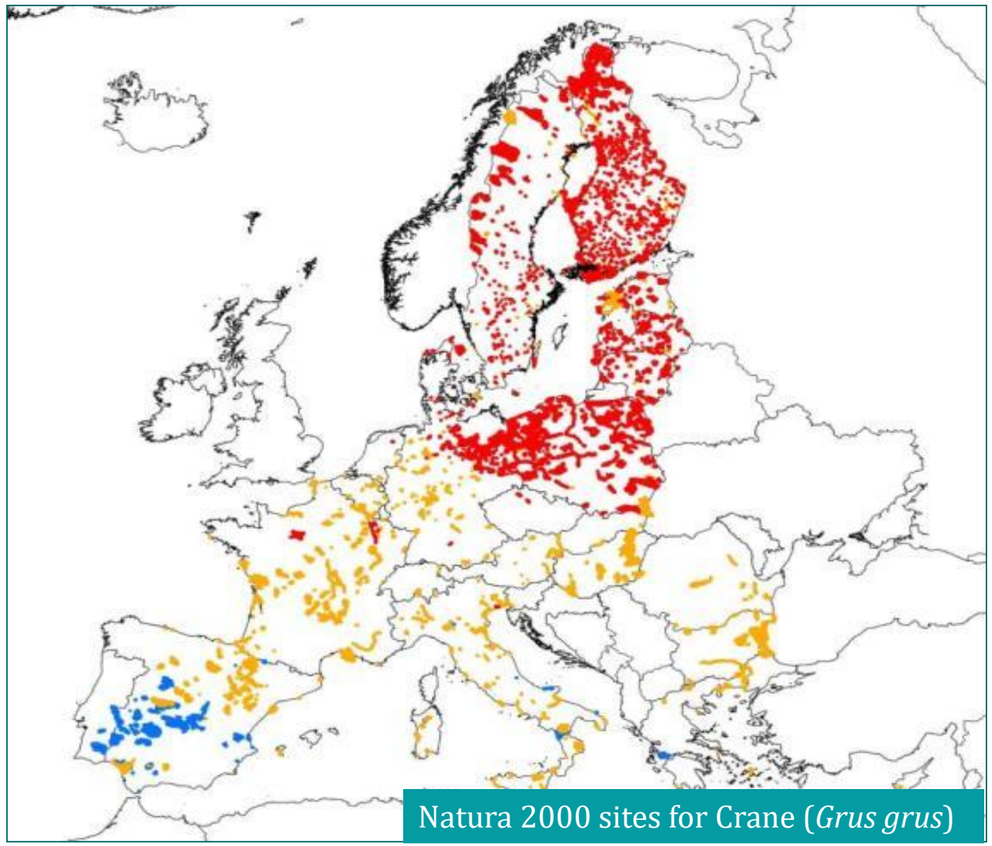




If Ecological Status = not "good" → Programme of measures to restore water body status

BIRDS DIRECTIVE

- Protects all species of naturally occuring birds in the wild state in the EU.
- Overall objective is to maintain the populations of all wild bird species in the EU via species protection and site protection



Natura 2000 sites for Crane (*Grus grus*)

- breeding
- staging
- wintering

Clear need for coordination between countries for migratory birds

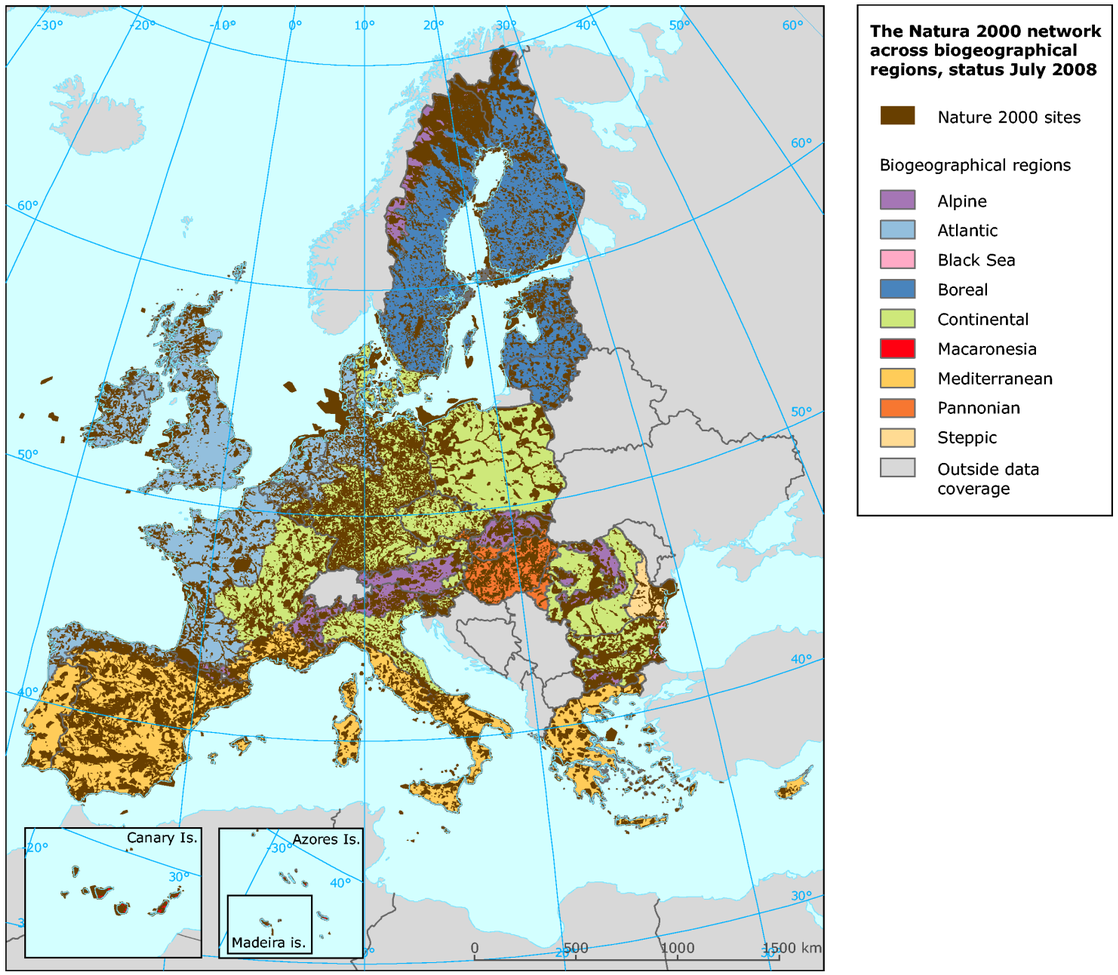
HABITATS DIRECTIVE

- Overall objective is to ensure that (other) species and habitat types are maintained at, or restored to, a 'favourable conservation status'
- Defines a network of protected areas (NATURA 2000): coherent ecological network of protected areas

Natura 2000

Probably the world's largest network of protected areas

25.828 Sites
92.227 km2
18% of EU territory



NATURA 2000 PROCESS

HABITATS DIRECTIVE

↓

National List of proposed sites (pSCI)

Accession to EU

Within 3 years

↓

Sites of Community Importance (SCI)

Within 6 years

↓

Special Areas of Conservation (SAC)

Different process = same network

BIRDS DIRECTIVE

↓

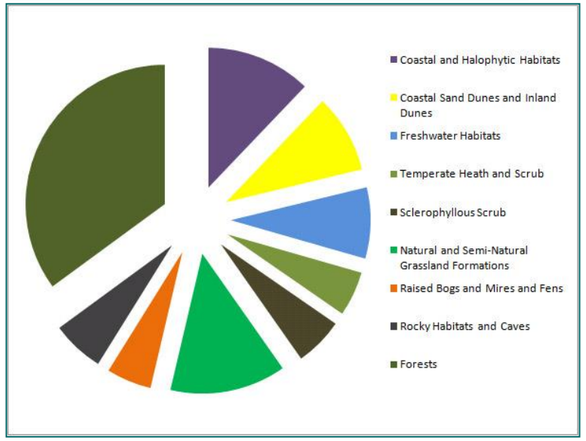
Special Protection Areas (SPA)

↓

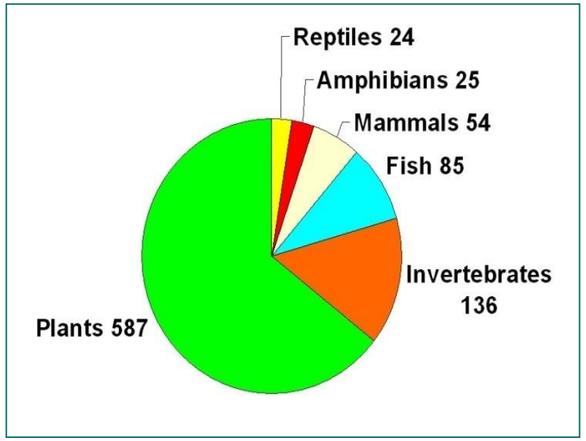
- 231 habitat types (Annex I)
- 911 species and subspecies (Annex II)

- 194 species and subspecies (Annex I)
- Migratory species

Annexes of Habitats Directive



Annexes of Birds Directive



NATURA 2000 PROCESS

Habitat types of Community interest Annex I

- in danger of disappearance in their natural range
- have a small natural range
- present outstanding examples of typical characteristics of one or more of biogeographical regions

Species of Community interest Annex II

- endangered
- vulnerable
- rare
- endemic

EVIRONMENTAL IMPACT ASSESSMENT – EUROPEAN LEGAL BASIS

- EIA-Directive (85/337/EWG)
  „This Directive shall apply to the assessment of the environmental effects of those public and private projects which are likely to have significant effects on the environment." (Art. 1 Z 1)
- Implementation in Austria:
  First implementation of the EIA Directive in 1993 with the Federal Act on Environmental Impact Assessment (Umweltverträglichkeitsprüfungsgesetz 1993)
- substantial adaptation of the Austrian legal situation – amendment of the EIA act in august 2000 (UVP-G 2000)

EIA – purpose and objectives

- Environmental Impact Assessment (EIA) is
- a systematic assessment of environmental effects
- an environmental management tool
- an aid to decision making

and should

- maximize benefits for the environment and the project developer

EIA procedures –the involved players in Austria

- ONE competent authority (CA) who leads the procedure
- experts on behalf of the project developer (PD), who elaborates the reports
- experts of the CA and other relevant authorities who check the reports
- the Ministry of Environment/the Environment Agency Austria
- the municipalities
- the public
- the environment ombudsman (one for each province)

ENVIRONMENT AGENCY AUSTRIA IN EIA

THE ROLE

- Services of the Umweltbundesamt provided for the Federal Ministry of Agriculture, Forestry, Environment and Water Management are regulated in the EIA Act 2000:

Ministry	Umweltbundesamt (=EAA)
Legal affairs	**Technical and scientific assistance; acting as <u>unit „environmental control“</u> by legal order on behalf of the Lebensministerium**

THE TASKS

- **Capacity Building**
  - ✓ Twinning (e.g. Malta, Cyprus, Rumania)
  - ✓ TAIEX (e.g. Turkey, Macedonia, Albania)
- **Development of guidelines** (e.g. within twinning-projects in English language)
- Austrian EIA Centre - national contact point

EIA EXPERIENCES IN AUSTRIA

- Sound co-operation among proponents, planning offices elaborating EIA statements and competent authorities
- Guidance documents and expert statements support the competent authority during the approval process
- Steadily increasing quality of the submission documents and the overall EIA process through learning experience
- Public and stakeholder involvement enhances transparency in project development and EIA approval

- Weak instrument in the beginning
- European standards – improvement
- Over 300 projects since 2000 – only 3 rejected!

CONCLUSIONS AND RECOMMENDATIONS

- Scientifically sound assessment of ecological status – by biological quality elements
- Public participation
- Adopting EU Directives
- Improving quality of standardized EIA, correct implementation
- Designation of protected areas
- International cooperation and capacity building
- Integrated water management based on river basins and
- Conservation management
- **To maintan the unique status of the Vjosa**

FURTHER INFORMATION

On water policy:
http://www.europa.eu.int/comm/environment/water

WFD CIRCA Information Exchange Platform (incl. guidance documents):
http://forum.europa.eu.int/Public/irc/env/wfd/library