

DRYvER is a research & innovation project funded by Horizon 2020 focusing on drying rivers and the impact of climate change. The 4-years project started in September 2020 and brings together 25 partners from 16 countries in Europe and South America as well as from China and the USA. Its main goals are to collect, analyse and model data from 9 drying river networks (DRN) in Europe and South America to create a novel global meta-system approach that incorporates hydrology, socioeconomics, ecology and biogeochemistry in order to craft strategies, tools and recommendations for adaptive management of river networks.

ARTICLE N°1 Pécs: 3rd DRYvER Consortium Meeting

In September, DRYvER consortium meeting took place during a one and a half day in Pécs (Hungary). The purpose of this meeting was to gather the participants to review the progress of DRYvER since the last consortium meeting in June 2022. This provided an opportunity to evaluate the results achieved to date, and to reflect on the missing elements for finalizing the activities. The meeting was also the time for several discussions on the upscaling, on the prospective scenario and on the prioritization of conservation criteria for current and future DRNs. Moreover, the meeting was the time to discuss the NFF IPBES framework as well as the potential outcomes of DRYvER for policy change. The meeting really helped to understand what was going on in each work package and to strengthen the links between the partners. Next one will be the final meeting, in September 2024!



Group photo of the DRYvER team taken at the 3rd General Assembly (photo: M. Drenovác)

ARTICLE N°2 Feedback on the DRYvER Training School



Pictures were taken by A. Móra, B. Pernecker, and Q. Zhan during the DRYvER Training School

In the autumn of 2023 (between 28 September and 09 October) the Department of Hydrobiology, University of Pécs organized the Training School (TS) program of DRYvER. The five-day-long TS gave DRYvER's young researchers (from MSc to Postdoc level) the opportunity to get an insight into the scientific know-how and acquire the skills of each Work Package. In addition to field measurement techniques, for example, guidelines and legislation were discussed, as well as the use of possible nature-based solutions, and the trainees were introduced to a number of modelling procedures (e.g. modelling of flow intermittency, modelling of greenhouse gas emissions, modelling of spatiotemporal connectivity with a meta-community ecological approach, etc.). In total, 30 people participated in the TS, 11 as trainers and 19 as trainees. Of course, in addition to the professional program, there was also the opportunity for a little "networking" over a beer and dinner, or during the fieldtrip to the Old-Drava Visitor Centre.





Trainees said about the TS:

"I really like the training school organized by DRYVER in Pécs. It gave me a chance to learn about many other interesting topics through lectures and hands-on exercises given by experts from different WPs within the DRYVER project. Although there are always reports and publications made accessible by other WPs, such a training school present their work in a more tangible way. Aside from the learning component, I also enjoyed the interactions with other junior/senior researchers throughout the training school. For instance, I met many friendly students/PhD candidates (e.g. Anita, Zsolt, Martin, Bea) from the host group - Department of Hydrobiology at University of Pécs. And we were given the chance to visit the Drava River, which is part of the 'Amazon of Europe.' It was such a wonderful excursion to the Old-Drava Visitor Centre. In the end, I want to express my thanks to the local host team again led by Bálint and Zoltán from the Department of Hydrobiology at University of Perc. We were taken care very well by the local host team. Thanks to them we could have such a nice experience on local foods, culture, and nature, in addition to of course the well-organized training sessions. If there is a pity, that would be too short, as good times always past so fast."

Qing Zhan (NIOO)

"This autumn I participated in DRYVER Training School for early career researchers held in Pécs, Hungary. Training school was organised by the University of Pécs and lasted for five full days. We had four days of workshops and one day of fieldtrip. Workshops took place in the boardroom of the Faculty of Sciences of the University of Pécs. The room was nice and suitable: it had enough space, a big screen for presentations, and comfortable chairs. The only bad thing was that the hotel, where all trainees were accommodated, was quite far away from the university, and we had to take a long walk every day to there and back. Workshops covered all DRYVER work packages, meaning all topics included in the project: modelling stream discharge, measuring greenhouse gas emissions and river ecosystem metabolism, metacommunities, ecosystem services, management, and citizen science. All workshops were very hand-on: we worked with the actual data collected for the project and tried implementing different calculations with R programme. I liked that for greenhouse gas emissions and river ecosystem metabolism measurements we went on a river site and followed the measurement procedure, this gave us a small taste of the fieldwork done during the project. I did not participate in the DRYVER sampling campaigns; thus, it was a great opportunity for me to see how the data I am using for modelling was collected. I also enjoyed the field trip to the Old Drava Visitor Centre. We heard a presentation about the activities of the centre, visited exhibitions of the local wildlife and saw cute farm animals. After eating goulash soup, we took a small hike to see oxbows and the River Drava. Training school ended with a joint dinner of organisers and trainees in a restaurant with tasty traditional Hungarian food. Altogether, the training school was professionally organised and hopefully all trainees found it useful for them. In addition to new skills acquired, it gave an opportunity to interact with other participants of the project to share experience and discuss about ideas and thoughts."

Margot Sepp (ICRA)



Pictures were taken by A. Móra, B. Pernecker, and Q. Zhan during the DRYVER Training School



ARTICLE N°3 Why integrating drying into river networks is crucial? A new paper involving DRYvER colleagues

Link to the original paper published in Nature Reviews Earth & Environment:
<https://doi.org/10.1038/s43017-023-00495-w>

Non-perennial river segments – those that recurrently cease to flow or frequently dry – occur in all river networks and are globally more abundant than perennial (always flowing) segments. However, research and management have historically focused on perennial river segments. In this Review, we outline how non-perennial segments are integral parts of river networks. Repeated cycles of flowing, non-flowing and dry phases in non-perennial segments influence biodiversity and ecosystem dynamics at different spatial scales, from individual segments to entire river networks. Varying configurations of perennial and non-perennial segments govern each river network's physical, chemical and ecological responses to changes

in flow regimes, especially in response to human activities. The extent of non-perennial segments in river networks has increased due to warming, changing hydrological patterns and human activities, and this increase is expected to continue. Moreover, the dry phases of flow regimes are expected to be longer, drier, and more frequent, albeit with high regional variability. These changes will likely impact biodiversity, potentially tipping some ecosystems to compromised stable states. Effective river network management must recognize ecosystem services (such as flood risk management and groundwater recharge) provided by non-perennial segments and ensure their legislative and regulatory protection, which is often lacking. The knowledge DRYvER is producing demonstrates this need to integrate non-perennial sections into river science and management. But DRYvER will also produce tools and recommendations to do so: stay tuned!



Example of degradation on non-perennial segments of the Albarine: sediment mining from a dry riverbed (credit: Thibault Datry)

ARTICLE N°4 Focus on the French DRN

DRYvER studies 9 case studies (drying river networks or DRNs) in the EU and South America which cover different climatic and biogeographical zones. This month, we present the French case study.

Presentation of the DRN

The French case study network is the Albarine, which is a sub catchment of the Ain river network. The drainage area of the Albarine is approximately 354 km² and it

is located in eastern France, in the Jura Mountains. The area is in continental ecoregion and pre-alpine climate. More than 80 km of the Albarine river network (~25% of the catchment) is intermittent. The river contains some protected invertebrate and fish (salmonids) species. Anthropogenic alterations include rectification of some section, a few weirs and point-source sewage discharge. Irrigation, water for human consumption, fishing, and recreation are the most relevant ecosystem services in the area.





Presentation of the Team working in the DRN

People from two institutions compose the French Team: the National Research Institute for Agriculture, Food and Environment (INRAE) and The Laboratory of Alpine Ecology (LECA). The team at INRAE, led by Thibault Datry, has been working in this DRN for more than 15 years, and performed the biodiversity (WP2) sampling; it was composed of the taxonomy experts Maxence Forcellini and Bertrand Launay and the research assistants Guillaume le Goff and Abdelkader Azougui.

The team at LECA is led by Arnaud Foulquier, working with the postdoctoral researcher Naiara López-Rojo. They performed the ecosystem functioning sampling (WP3) at the local DRN, and at the Finnish DRN with the help of postdocs Romain Sarremejane and Amélie Truchy, PhD candidate Teresa Silverthorn and research engineer Frédéric Boyer. The eDNA platform at LECA was also in charge of the eDNA extraction and sequencing of the samples from the 6 European case studies, which meant a total of 714 sediment and 619 biofilm samples.

Why is this river network particularly interesting?

The Albarine river network presents a variety of intermittent reaches in the headwaters due to the karstic geology, but also in its downstream part due to transmission loss into a very porous alluvial aquifer. After flowing for 45 km over a karstic plateau and through gorges, the downstream section of the river flows through an alluvial plain, where the water continuously infiltrates into the underlying aquifer and gradually leads to complete river drying. Drying typically starts in spring at the confluence with the Ain River, and the drying front then progressively moves upstream throughout the summer. Flow resumes most years in late autumn/early winter. Flow permanence was identified as the main driver of biodiversity, but also as a key determinant of most ecological functions and ecosystem services.

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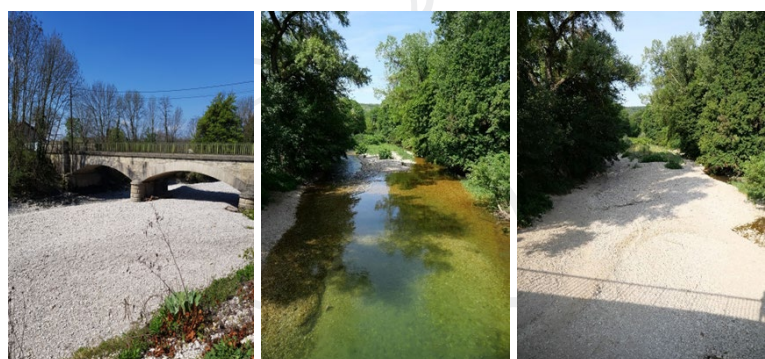
Location of the French DRN



N. López-Rojo and T. Silverthorn measuring CHC emissions



T. Datry, A. Foulquier, and B. Launay sorting the invertebrate samples

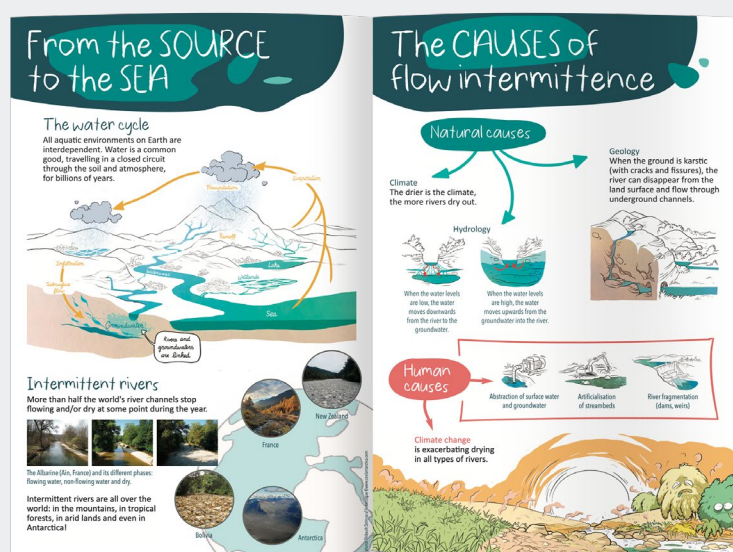


From left to right: 1) Downstream section of the Albarine river during the summer dry period; 2) wet and 3) dry phase of an intermediate section of the Albarine river



ARTICLE N°5 Exhibition on the website

INRAE, in collaboration with other French key players (EVS, SR3A, RM&C water Agency), prepared an exhibition to raise the general public awareness on the importance of intermittent rivers. The partners identified that the main obstacle to the implementation of public policies related to water management was the negative perception people have of the intermittent rivers. For this, the exhibition should be broadly shared to the general public and especially to the policy makers. The exhibition was translated to English and uploaded on the DRYVER website: <https://www.dryver.eu/media/intermittent-rivers-a-grapical-overview>. The objective is that partners translate it to their own language and use the exhibition to sensitize more people across Europe.



The first three pages of the online exhibition

ARTICLE N°6 Review meeting: public deliverables available on the website

On November 30, 2023, the second review meeting took place. The Steering Committee, the Project Officer and two experts from the European Commission had an online review meeting. The Work Package leaders presented the essential activities they realized during second period of the project (from month 18 to month 36); they valorized the main results and explained the delays and difficulties. Once validated by the experts, first trimester 2024, the public deliverables will be uploaded on DRYVER website and will be accessible by anyone (the list is constantly updated): <https://www.dryver.eu/results/reports-and-documents>.



ARTICLE N°7 DRYvER webinars: A success to disseminate around a larger public

In October 2023, DRYvER partners started a series of five webinars to disseminate the activities implemented in each work package.

Three of them already took place:

- Hydrological Trajectories of Drying River Networks under climate change
- Predicting biodiversity changes in Drying River Network
- Predicting changes in ecosystem functions in Drying River Network

Each time, two partners from a different organization presented the work implemented and especially the results they had obtained. Until now, it has been a success since we had around 40 participants attending to each webinar. If you missed them, they are now on the website:

<https://www.dryver.eu/media/vidweos>.

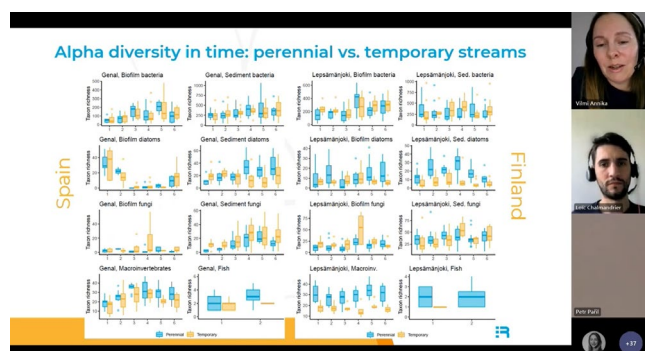
There are now two webinars left:

- “Ecosystem services of DRNs and their values” will take place on January 17 from 11 to 12 and will be presented by SYKE, ICRA and UC-IHC:
[Link to the event.](#)
- “Adaptive management of DRNs” will take place on February 23 from 11 to 12 and will be presented by Guido Schmidt from FT and Eirika Albrecht from SYKE:
[Link to the event.](#)

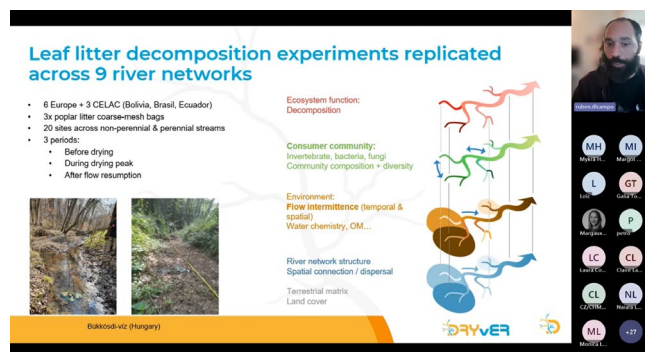
You are welcome to join the webinars and to share these events broadly.



Screen captures from the 1st DRYvER webinar



Screen captures from the 2nd DRYvER webinar



Screen captures from the 3rd DRYvER webinar

Impressum

The DRYvER Consortium (<http://www.dryver.eu>)

Project Coordinator and Management: Thibault Datry,
Institut National De Recherche Pour L'agriculture,
L'alimentation Et L'environnement (INRAE)
(<https://riverly.inrae.fr/en/home>) and
Emilie Baffie, Erdyn (<https://www.erdyn.com/en>)

Contact e-mail: info@dryver.eu

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