

Interview of Mr Alban Michel (Responsible of the Information System of the Sélune Project)

Preamble

I represent the Sélune Scientific Programme. We are independent observers of this project to restore ecological continuity (and therefore the removal of the dam).

The removal of the two dams is supervised by the contracting authorities:

- DDTM (Departmental Direction of the Territories and the Sea, the State) for Vezins
- EDF (Electricité de France) for the Roche-Qui-Boît dam (LRQB)

We do not have much (any more) information on these worksites (except for safety reasons). EDF asks that we do not communicate on the La-Roche-Qui-Boît construction site.

What are the main reasons/issues for such a project?

The two large dams (Vezins and La Roche qui Boit) caused a break in the ecological continuity of the main course of the Sélune -> significant modifications

significant modifications :

- the hydrological regime (lotic -> lentic in the reservoirs)
- water temperature and
- biological flows (migratory fish)
- biogeochemical flows (sediment accumulation, etc.)

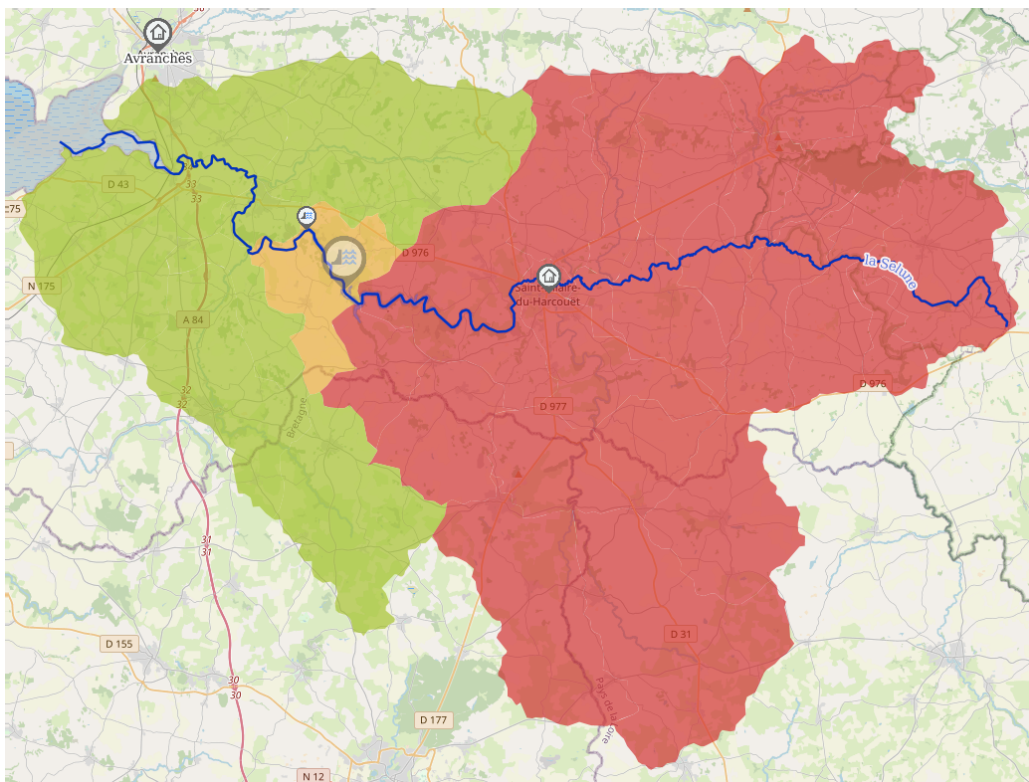


Fig1: Map of the Sélune River area (green: connected River Basin(RB); yellow: partly connected RB; red: disconnected RB)

NB: the Sélune is an emblematic case study (because of the size of the dams), but the problem of river fragmentation is much broader. Within the Sélune, there are many other (less important) obstacles that cause a rupture (more or less strong of the ecological continuities): weirs...

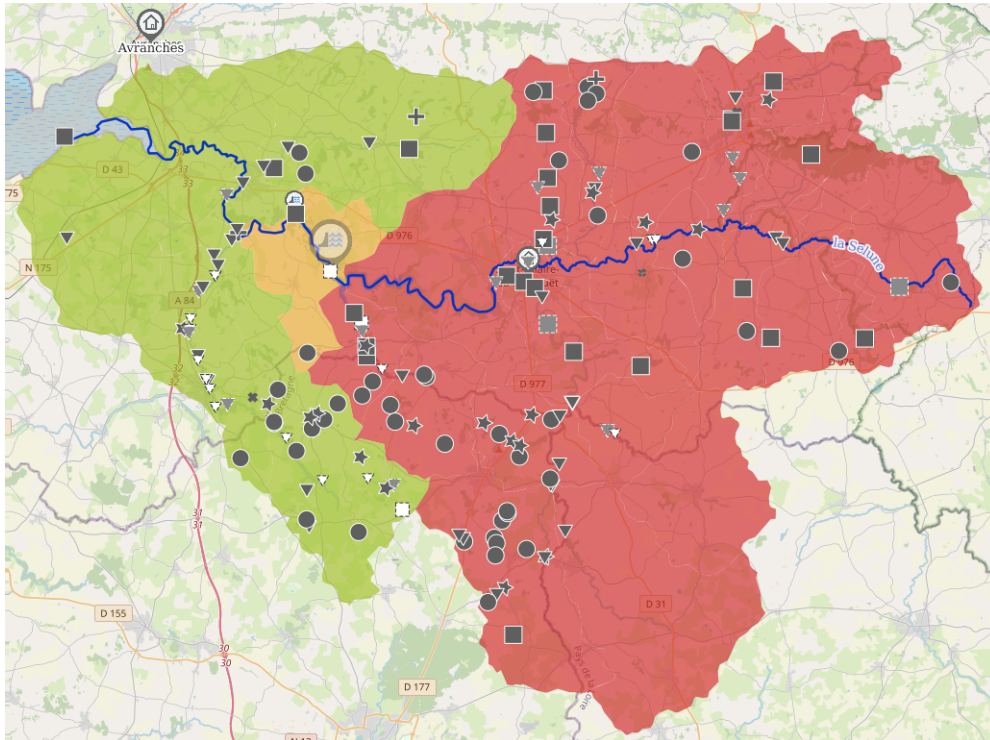


Fig2: On the Sélune : 2 dams to be removed, among others (white: removed; grey: to be removed; dark grey: still existing).

Figure 1. Rythme de construction des grands barrages dans le monde au cours du XX^e siècle (source ERN).

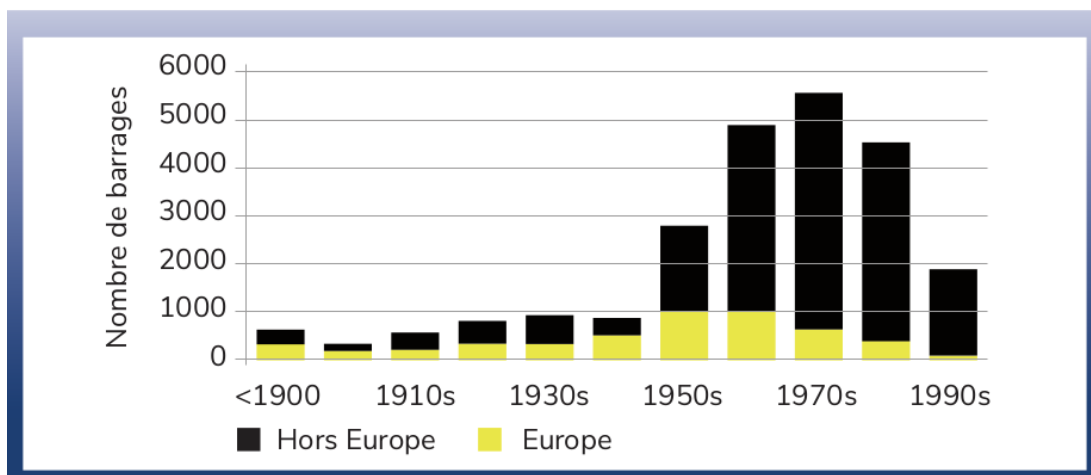


Fig 3: Rhythm of construction of large dams worldwide during the 20th century (source ERN)

Behind the decision to remove the dams on the Sélune:

- impact on local ecology (not only migratory fish),
- Numerous regulatory obligations to comply with standards,
- water quality problems caused,
- low energy productivity,
- technical impossibility of constructing passages to restore the continuity of the watercourse.

What were the main stages in dismantling the dams?

Upstream of the decision:

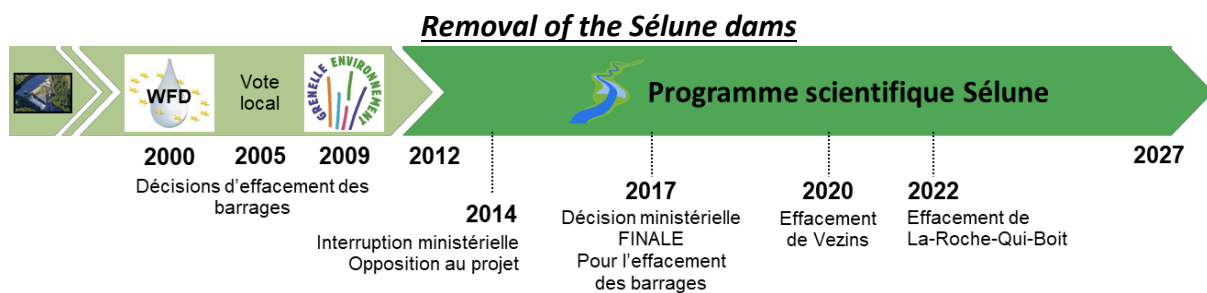
- 1993 [local level]: catastrophic emptying of the Vezins' dam which caused a massive transfer of sediments downstream

-> left its mark on people's minds

- 2000 [European law]: adoption of the **WFD (2000/60/EC)**

→ objective for 2015 (now 2027) = "good status" or "good potential" of water bodies (to guarantee sustainable management of this resource)

NB: "good status" of water bodies (WFD) = good ecological and chemical status



-> Subject of numerous political, ecological and societal debates initiated by the State's decision not to renew the concessions of the dams to EDF by 2009.

- 2007 [local decision]: the SAGE (water development and management plan) -> aims to reconcile the satisfaction and development of the various uses (drinking water, industry, agriculture, etc.), and the protection of aquatic environments, taking into account the specific characteristics of a territory) of the Sélune validates the project to remove the dam
 - 2005: elected members of the CLE (Commission Locale de l'Eau - Local Water Commission) want the dam to be removed
 - 2006: consultation of the public and the basin committee
- 2009 [national intervention]: The Grenelle of Environment identifies the levelling of the dams on the Sélune to emphasise the restoration of ecological continuity
- 2012: Beginning of the Sélune Scientific Programme
- 2014 [national intervention]: interruption of the dam removal project by the Minister of Ecology (S. Royal)
- 2017 [national intervention]: final adoption of the Clearance Operation
- 2019: start of deletion (Vezins -> End of 2020) -> and end in 2021-2022 (2023?)
- mid-2022: start of clearing of La-Roche-Qui-Boît?

NB: end of 2027 = end of the scientific programme. It will take time to monitor this restoration of ecological continuity (not all processes have the same time frame)

What were the biggest obstacles to the dismantling?

- A particular risk: polluted sediments in a tributary (the Yvrande) -> specific management to secure the sediments (OK?)
- **Social and political dimension:** conflictual situation (social aspect of the removal project)

NB: the Sélune scientific programme is multidisciplinary and integrates a Human and Social Sciences (HSS) approach, with a range of methods: surveys, semi-directive interviews, participant observation, landscape observatory, etc.

Objective of this project (<2019): to understand the evolution of the uses and representations of the Sélune valley, as well as to isolate the factors responsible for local tensions.

The history of this valley sheds light on the current context:

- first of all, a "golden age" when nautical and fishing activities developed (<1990), shows and the creation of the Mazure (nautical and leisure center).
- Slow decline and a turning point = 1993: poorly controlled emptying → degradation of the water quality of the lakes (end of nautical activities) + "monopolisation" by certain fishermen and users (140 fishing huts) and users (140 fishing huts and 124 private pontoons).
1993: foundation of the "Friends of the Dam" association → to promote activities around the lakes
- ~ 2007 (vote of the CLE → removal of the dams). The "Friends of the Dam" association becomes an opposition group

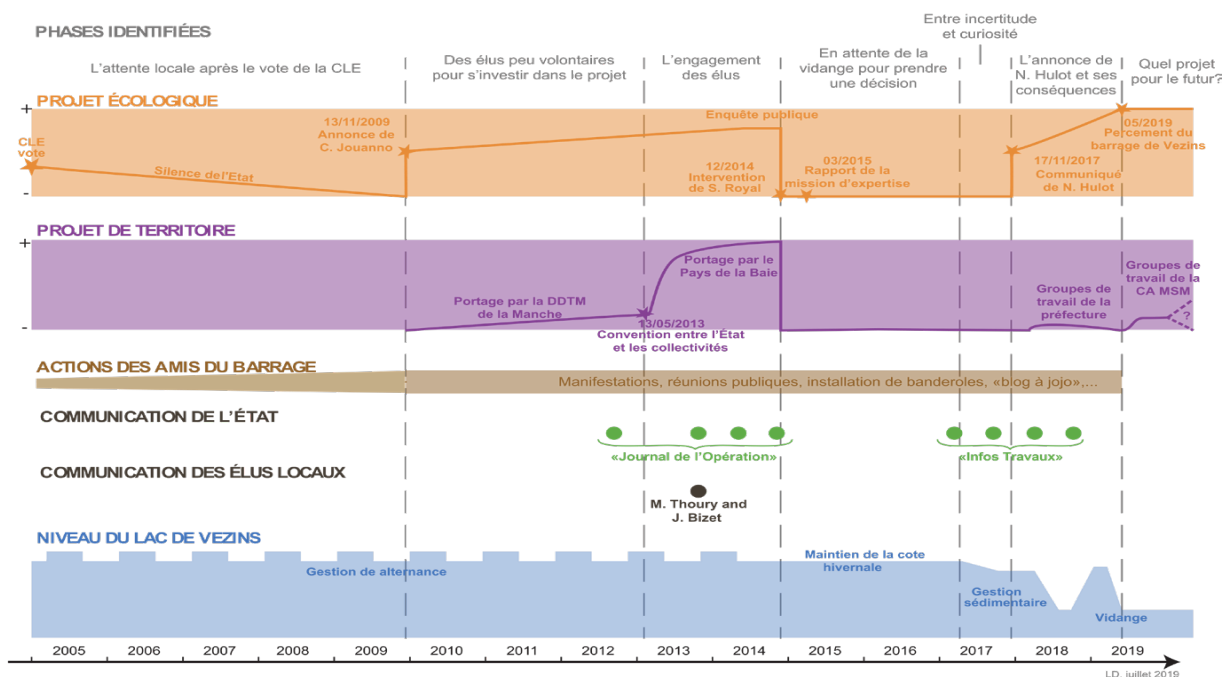


Fig4: Chronology of the interplay of actors around the lake of Vezins between 2005 and 2019

(< 2019) Opponents of the project

- see this project as the loss of places to live, relax and enjoy nature
- do not understand that a green energy is being sacrificed for questionable ecological arguments (hypothetical return of the salmon, for them)
- perceive salmon fishing as a leisure activity for the wealthy (unlike carp, pike-perch and catfish fishing)
- see lakes as ecosystems to be preserved + services related to recreation and energy
- suspect "blackmail between governments and NGOs", a decision imposed "from above" to "make an example".

→ feeling of a lack of dialogue and consultation in decision-making

→ pessimism about the future of the valley. Low flows in the Sélune are worrying (no more water reserves)

→ deplore the lack of political vision and financial means to build the future of the territory

(< 2019) Territory project

- delay in building a vision for the territory (1 State/Collectivities dynamic had started in 2013 then abruptly stopped at the end of 2014)
- 2017: relaunch of the deletion project → resumption of the scientific programme, but not the territory project

→ Scientists continue to observe the network of stakeholders that is being set up to design the valley of tomorrow

Sediment management before the dam was levelled? Were there any adaptations for the dismantling of the 2nd dam (La Roche-Qui-Boît) following the dismantling of the 1st (Vezins)?

1/10/2021: postponement of the emptying of the Roche-Qui-Boît dam (initially planned for spring 2021) -> Spring 2022.

- To limit the risks downstream, particularly in the event of flooding,
- OFB recommendation (French Biodiversity Agency)

Currently, sediment management has been resumed (at the former Vezins reservoir) but mainly concerns the banks

We do not know whether such adaptations are being studied by EDF.

Was there a short-term ecological cost after the dam was dismantled?

The construction site necessarily had an impact, but on environments that were already degraded:

- the bottom of the reservoir areas was cleaned or dredged
- the banks were recreated by construction equipment

Downstream, we did not observe any major accident (as was the case with the 1993 emptying)

What level of ecological restoration of the river and the adjacent riparian zone? impact on migratory fish species and on flora, evolution of bio-indicator species

-> Biological, hydrological, geomorphological, societal and economic compartments

The removal of the Vezins dam was completed at the end of 2020, so it is still a little early to give an exhaustive answer:

- the response of some compartments is longer than others (for the biological -> speed of colonisation...)
- data acquired in 2021 are being processed (e.g. benthic macroinvertebrates)

-> The following are first signs, in the conditional. We will have to wait for the end of the scientific programme (and the hindsight we will have then) to be able to be affirmative

Biological

- Migratory species are waiting (there is still the downstream dam to cross): the last few years of monitoring have confirmed the blocking effect of the LRQB dam on fish populations
 - Eels Abundance Index (EAI)
 - Sea Lampreys spawning ground counts
 - Salmon Abundance Index (SAI)
- Riparian vegetation: rapid recolonisation, but plant successions are still in their infancy -> More time is needed to see the evolutionary trends in the valley (+ renaturation project...)
- Benthic macroinvertebrates: the answer would be quick with observations of recolonisation of neo-lotic areas
- photosynthetic biofilms (Diatomic Biological Index (DBI) + chlorophyll) would differentiate the only station still in a reservoir from all the other stations (including one station in the former reservoir area)

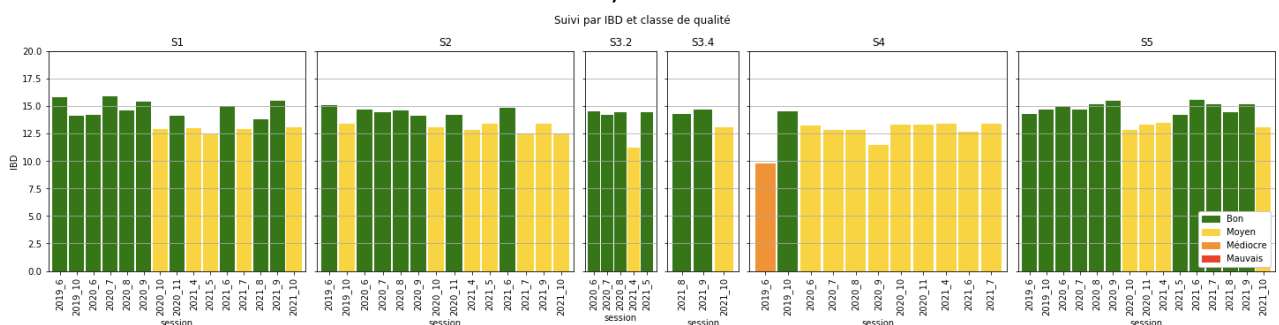


Fig5: Monitoring by DBI and quality classes

- Macrophyte Biological Index in Rivers (MBIR): (waiting for results) recolonization might be slower

Hydrological

NB: with the emptying of LRQB scheduled for 09/2021 and then postponed to spring 2022, the hydrological year 2022 will certainly mark the last year of the work period and will precede the return of free flow in the Sélune.

- Some parameters monitored on the Sélune already show a response to the emptying and opening of the Vezins dam.
 - e.g. specific **phosphorus** flows (downstream > upstream)
- Nevertheless, two years after the levelling, the influence of the Roche-Qui-Boît dam is still observable on temperatures and suspended matters (SM) concentrations

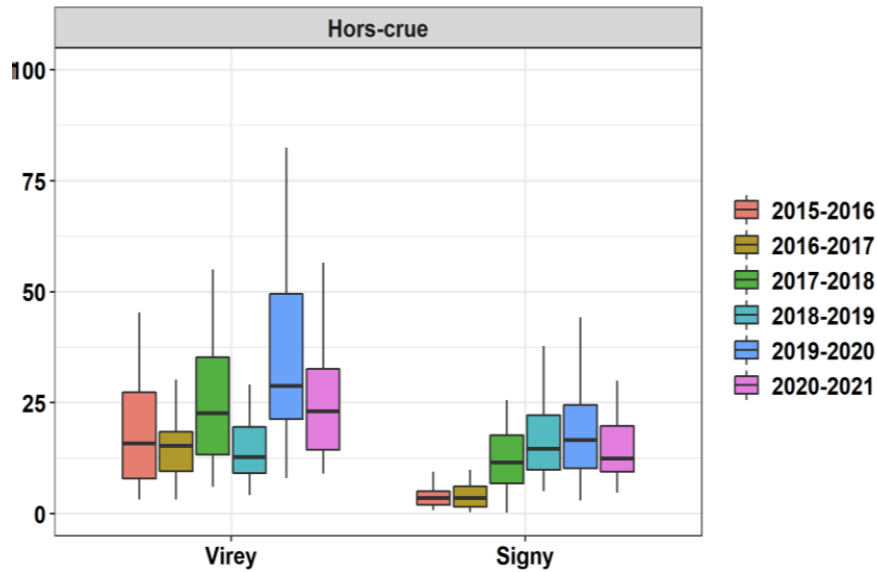


Fig6: Boxplot distribution of SM concentrations (mg/L) by year. (Hors-crue = Off-flood)

- Increase in SM concentrations downstream since the start of the works, but a still significant upstream/downstream granulometric difference (see 2019 report);
- Increase in phosphorus concentrations downstream since the beginning of the works (less marked "buffer effect" of the reservoirs);

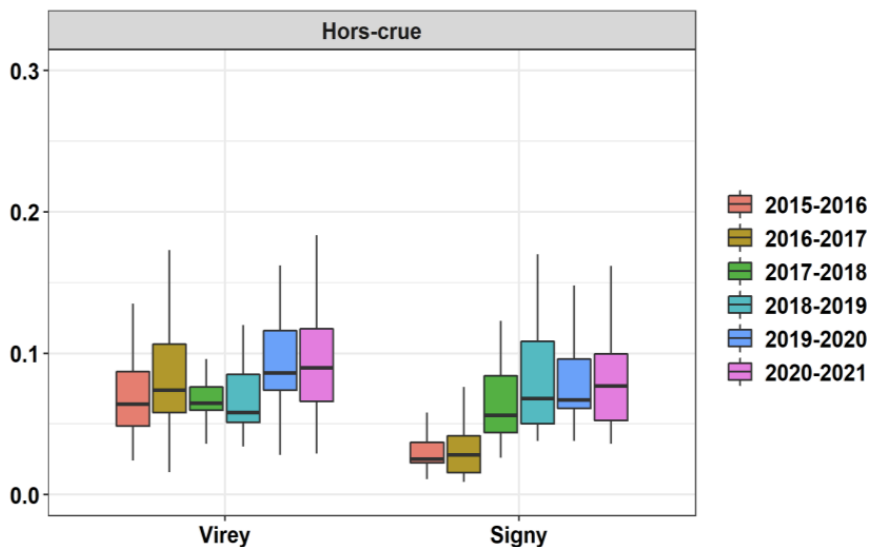


Fig7: Boxplot distribution of total phosphorus concentrations for the different hydrological years. (Hors-crue = Off-flood)

- Decrease in organic matter, a priori of rather aquatic origin, in the watercourses downstream of the dams. This origin of the organic phase of the SM will be studied in greater detail in the coming years using molecular markers.

Societal and economic

- Societal
 - With the Vezins dam now cleared, will a new phase begin?
 - A questionnaire survey of locals regarding the future of the Sélune valley was carried out during spring 2021 (awaiting results)
- Economic: unfortunately we do not directly follow the economic evolution of the territory

What are the monitoring tools? Are they powerful enough?

- Sélune Observatory, with 2 components:
 - River dynamics (hydraulic, chemical and sedimentary flows)
 - Monitoring of biocenoses (biological flows)
- Complemented by research projects to answer specific questions, but also to analyze the data monitored by the Observatory

Is there groundwater monitoring before and after demolition? If so, with what methods and indicators?

The research project "Hyporheic flows, exchanges groundwater-river" (LEARN) studies the exchanges between the groundwater and the water of the Sélune valley in order to prevent the physical, chemical and biological changes that the restoration of continuity will have on the quality of the water in the Sélune.

<https://programme-selune.com/fr/projets-en-cours/flux-hyporheiques-echanges-nappes-rivieres/>

Objectives:

1. Characterise the hydraulic conditions of the flows.
2. Measure hyporheic flows and groundwater-river exchanges.
3. Identify the geochemical and biological factors controlling these flows.

The project is due to be completed and results delivered this year...

NB: Piezometers are also installed (rather regulatory monitoring).

What ecosystem services are promoted by the removal of the dam in this specific area?

- Supply and regulating services (water, salmon...)

Other services will not appear but could be renewed (depending on the territorial project):

- Cultural services (leisure activities: fishing, canoeing, hiking...)

What are the main arguments that can be used to promote the dismantling of dams, on a regional and European/international scale?

- Assessment of the cost/benefit ratio
- A dam has a major impact on ecological continuity and this has a cost

Is the ecological cost always higher than the socio-economic benefit when dams are retained?

I am not competent enough to answer this.

Hydraulic dams are, to my knowledge, the only source of decarbonised and controllable renewable energy (in the case of dams such as those on the Sélune). In a context of climate change, will we be able to do without them?

The WFD only requires us to ask the question: how can we restore ecological continuity and the good quality of water bodies? This implies considering demolition, but does not (always) impose it.

NB: many dams were created in the 1950s. Others, such as those on the Sélune, were created much earlier. The question of obsolescence also arises (and the risks that go with it).

Why do you think dam removal is an effective tool for climate change mitigation?

I am not an expert in this field and could not answer this question.

Questions related to hydropower

What is your overall opinion on the definition of hydropower as green energy? Do you think that an energy mix including hydropower is a solution and a sustainable alternative to fossil fuels?

“green energy” (cf. wikipedia): energy sources with a low impact on the environment

- Even green energy production is not without impact (direct or indirect) on the environment and this includes hydropower
- The fact that (some) hydropower is controllable makes it strategic
- It is difficult to generalise from one case (the Sélune): in this case, there was no possibility of development and a rather low electrical output

The Sélune dams provided an annual production of 27 GWh, i.e. :

- the equivalent of the consumption of a town of 15,000 inhabitants
- 1/1000th of what the Flamanville nuclear power plant (in the same department) provides

In the case of the Sélune, the question is whether the disruption of ecological continuity with green algae blooms and the emptying of the 1993 river has a low impact on the environment...

Did you encounter any conflicts of interest or corruption during the demolition project?

No (I have only been working on this project for 2 years)

As scientists, we are 'safe', working for the civil service, our salary does not depend on the results we publish, whether they are for or against this project.

We aim to produce objective and independent results, which can serve as an example for other future projects.

*Many thanks to Mr. Alban Michel,
Athénaïs Georges (Grüne Liga Berlin e.V.)*