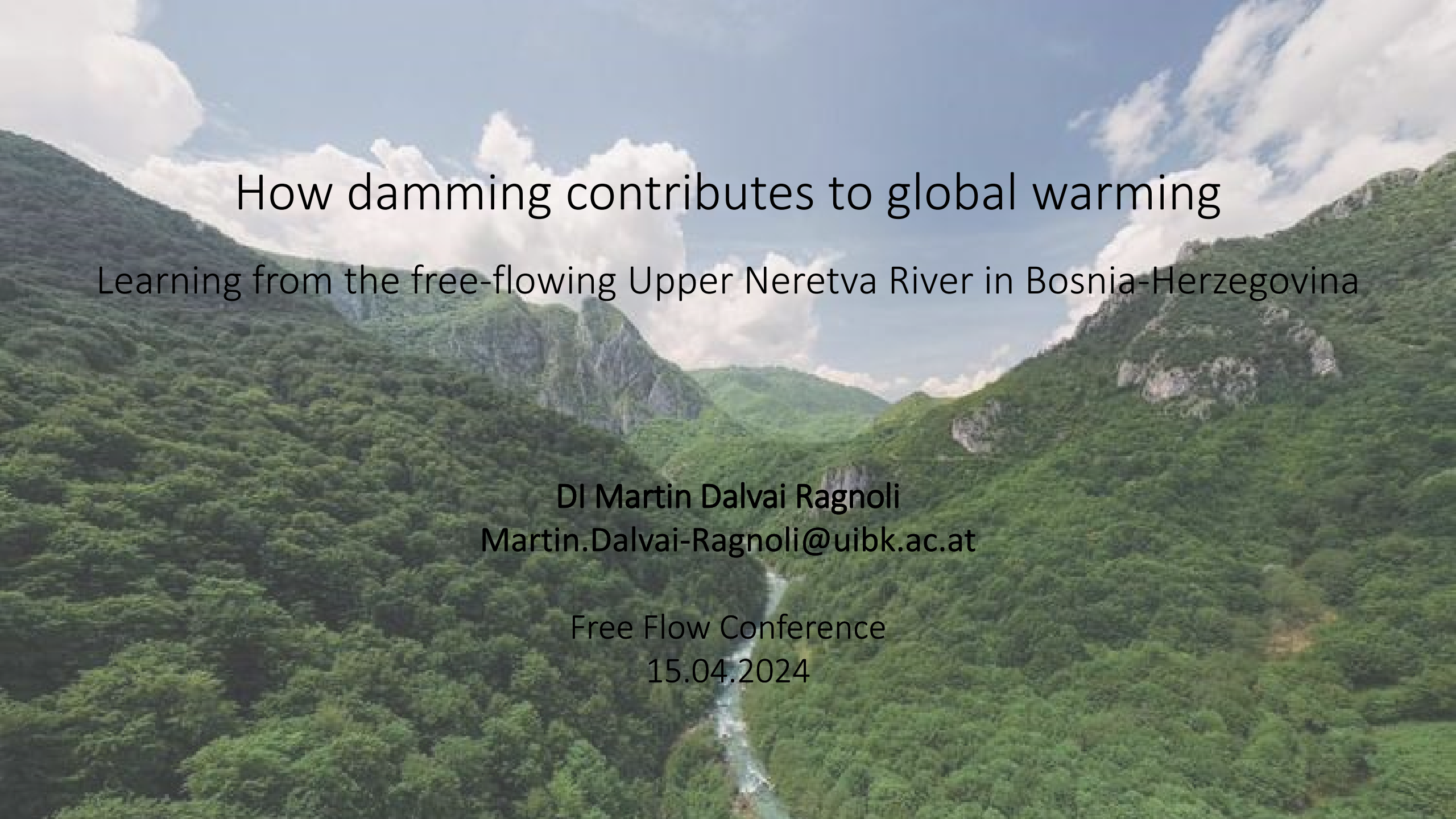

How damming contributes to global warming

Learning from the free-flowing Upper Neretva River in Bosnia-Herzegovina

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Free Flow Conference
15.04.2024

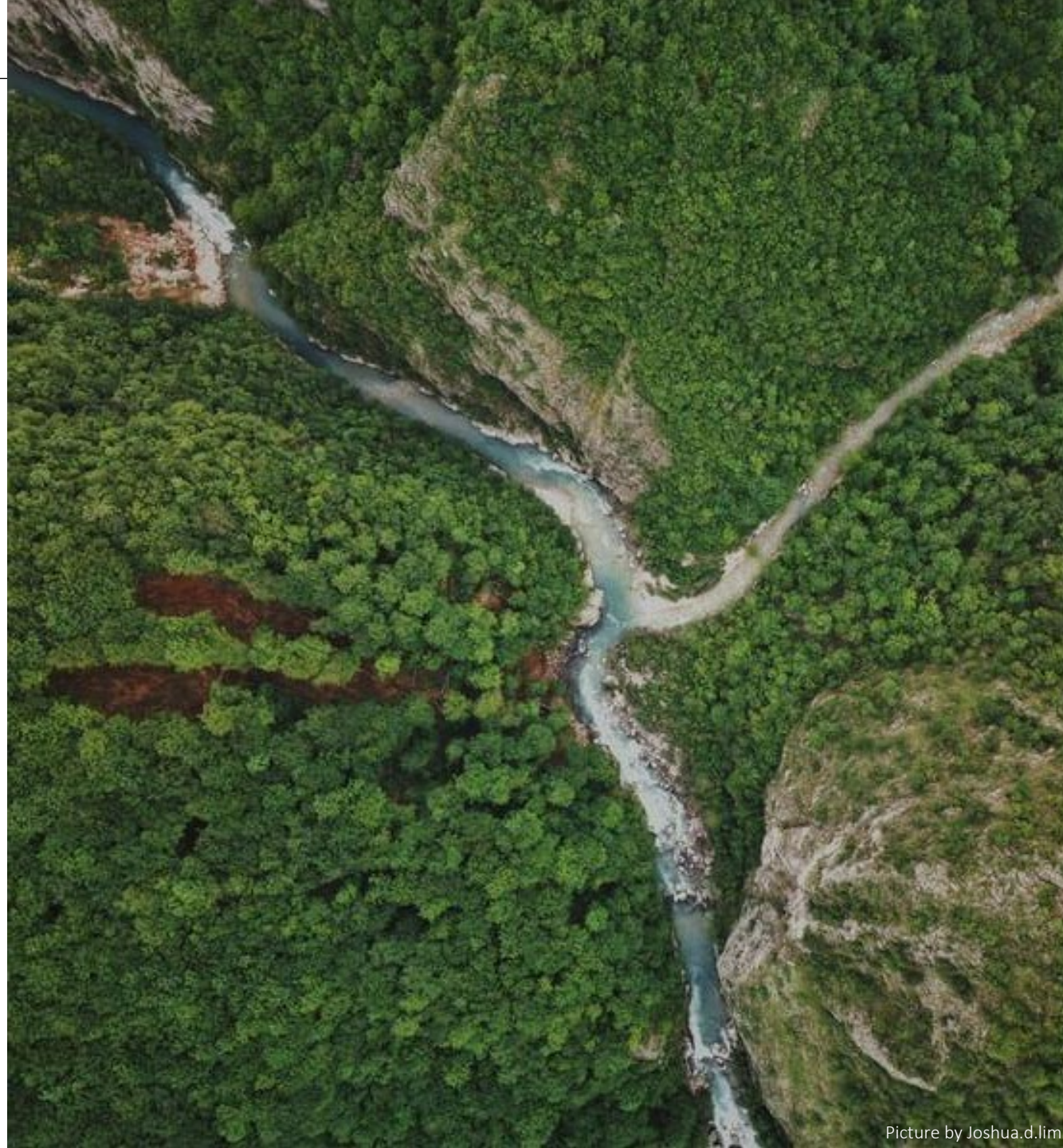
Overview

Neretva Science Week

Rivers and Greenhouse gases

Results from the Neretva

Dam lakes and Greenhouse gases



Picture by Joshua.d.lim

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Neretva Science Week

- Gathering of scientists to collect data
- Scientists for Balkan Rivers
- June & July 2022

Tomorrow (16.04.2024) 8:50,
Gabriel Singer:
The river as a habitat for river ecologists

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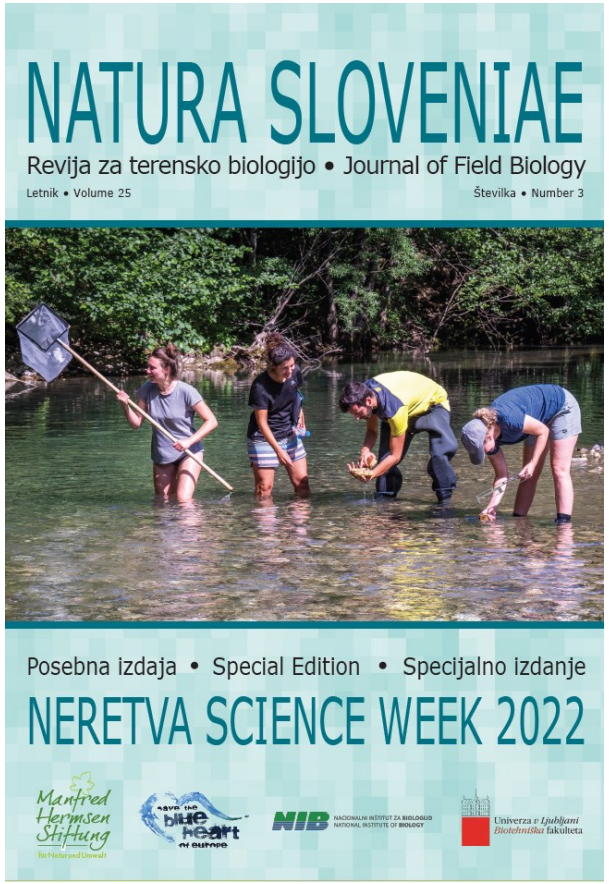
Neretva Science Week



https://journals.uni-lj.si/NaturaSloveniae/issue/view/1226

https://balkanrivers.net/en/neretva-science-week

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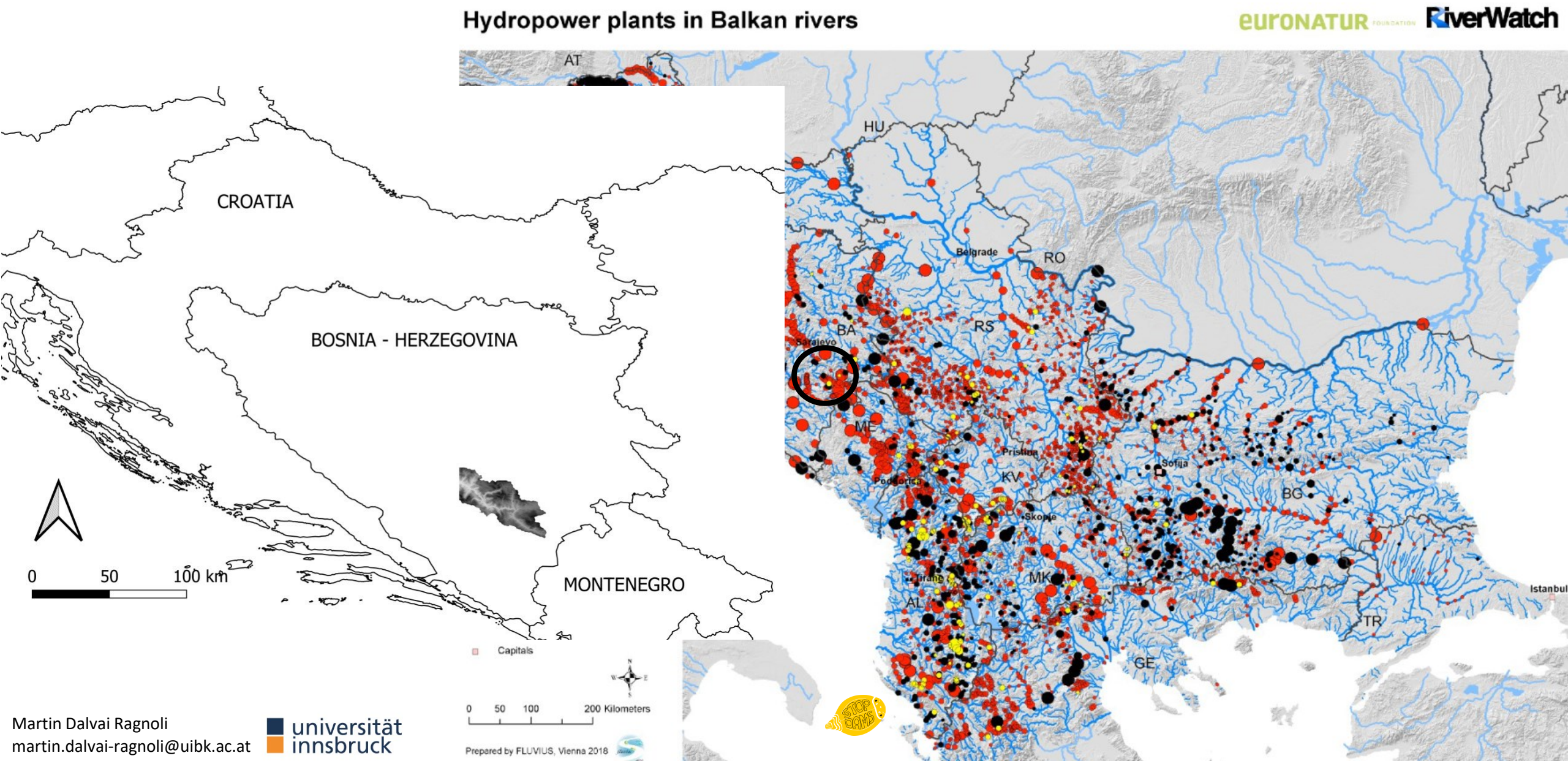

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How damming contributes to global warming:
Learning from the free-flowing Upper Neretva River in Bosnia-Herzegovina

25 HPP planned

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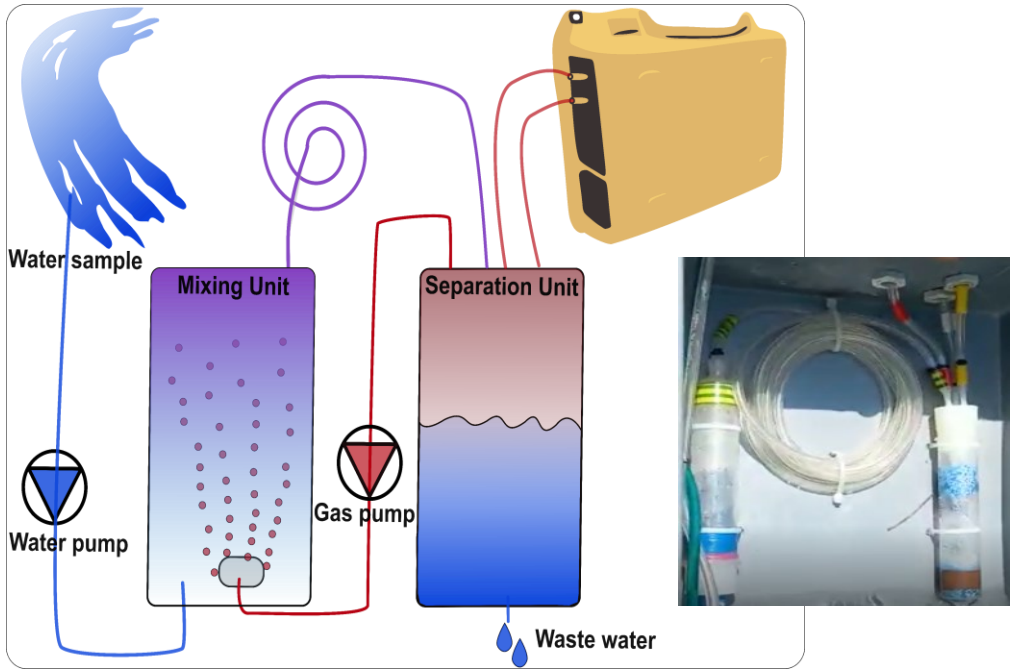
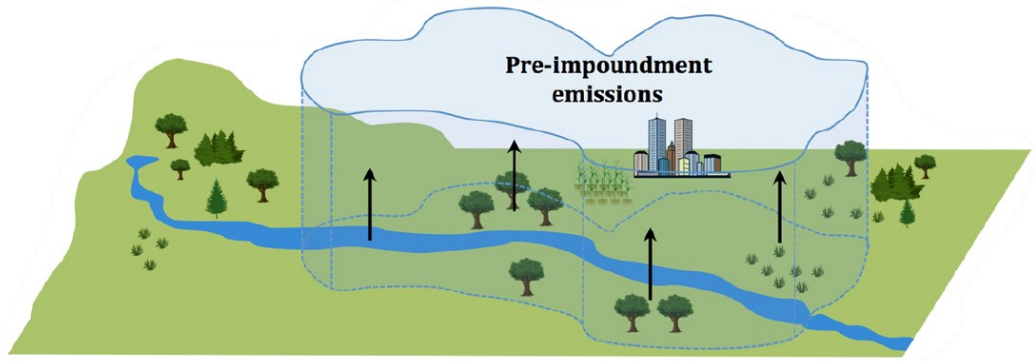
Picture by Joshua.d.lim

Greenhouse gas footprint in natural conditions

Equilibration system to measure dissolved CO_2 and CH_4

Estimate emissions





Dalvai Ragnoli et al. 2023

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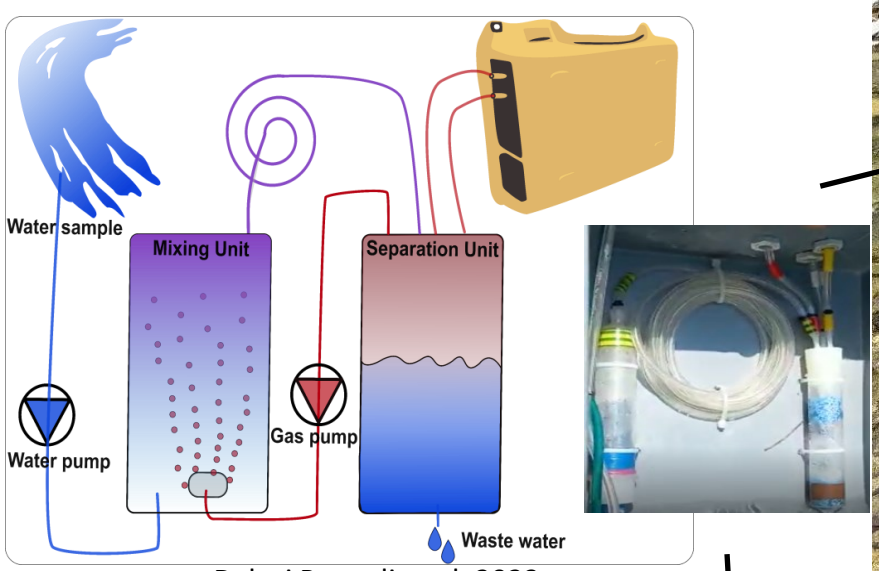
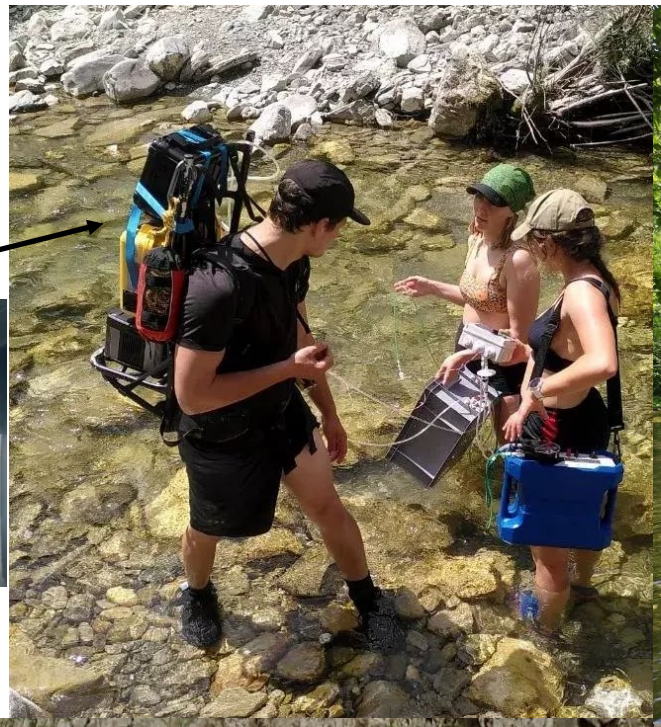
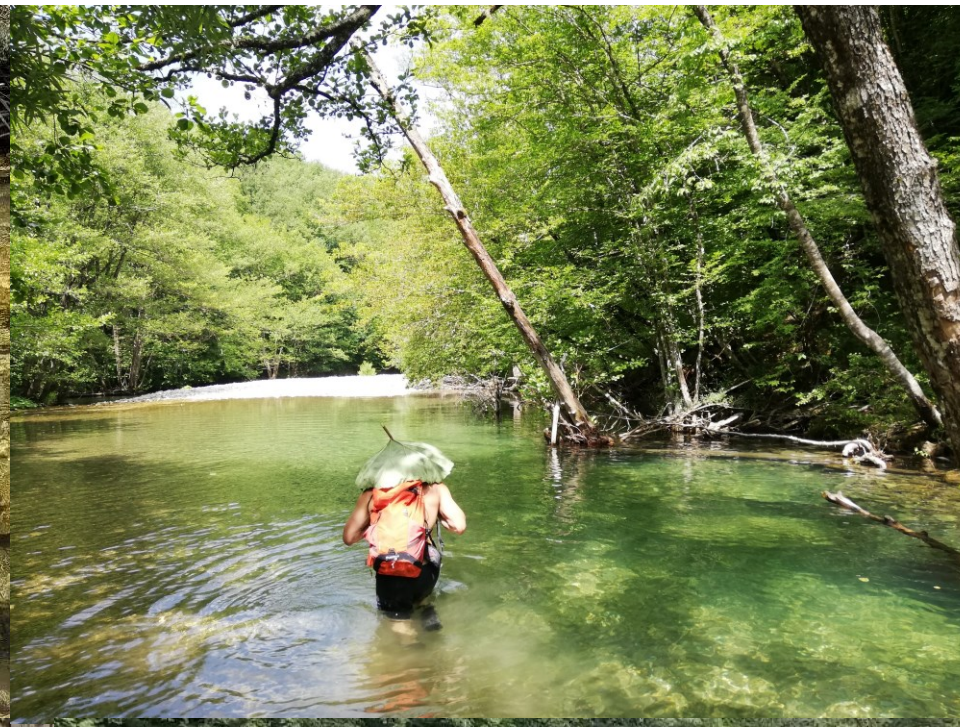


Dalvai Ragnoli et al. 2023



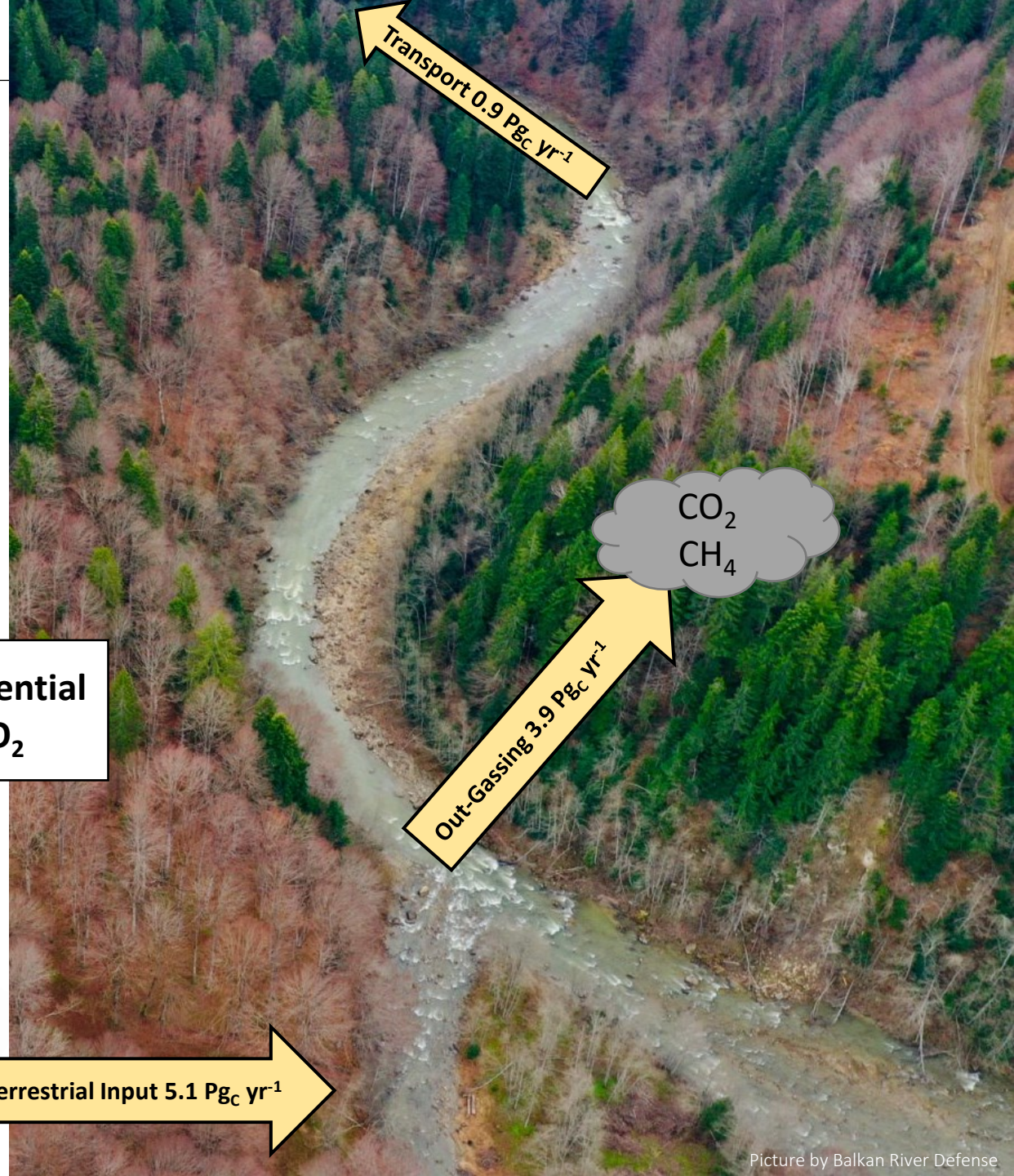


Rivers and Greenhouse gases

- Receive terrestrial input
- Transport
- OM is metabolized
- C- outgassing (CO_2 & CH_4)
- Emissions depend on

  Concentration

  Turbulence



warming potential
CH_4 >> CO_2

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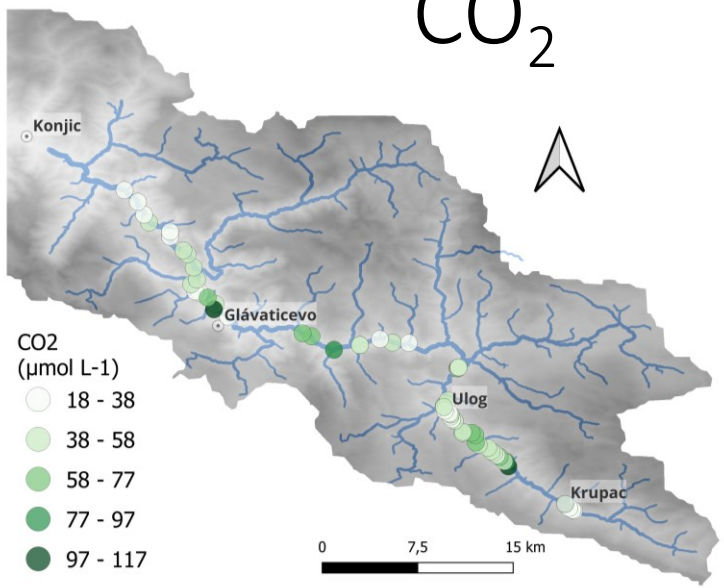
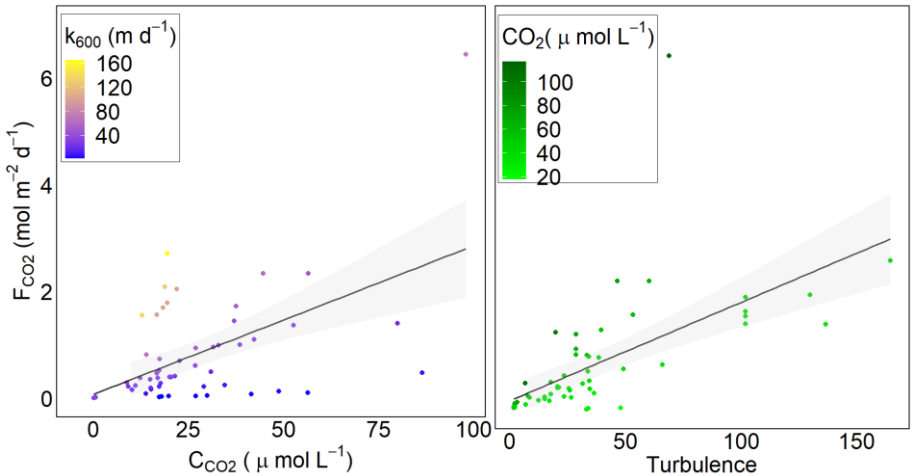
Picture by Balkan River Defense

Results from the Neretva

CO_2



CO_2 variable in space
Emits CO_2 at low rates
concentration & turbulence



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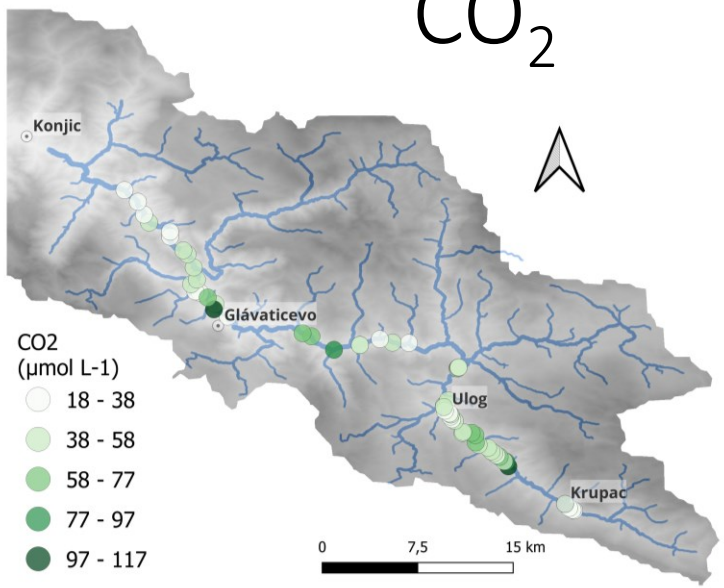
Results from the Neretva

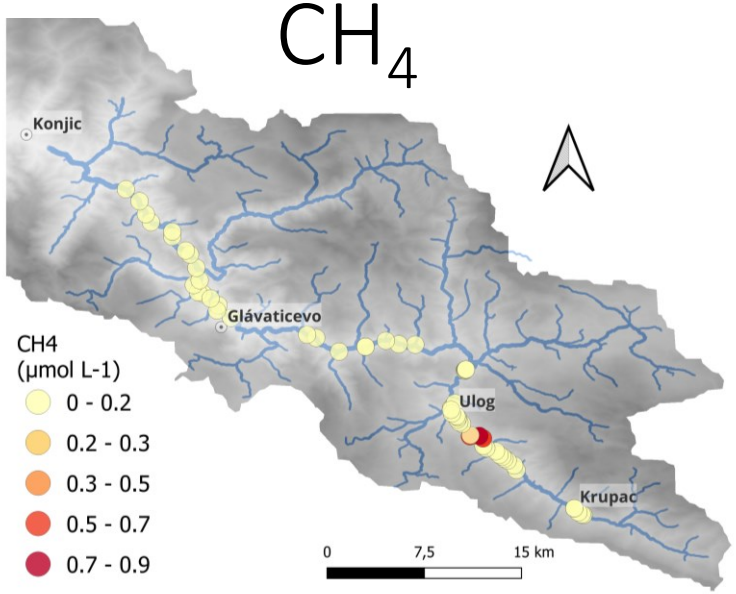
CO_2

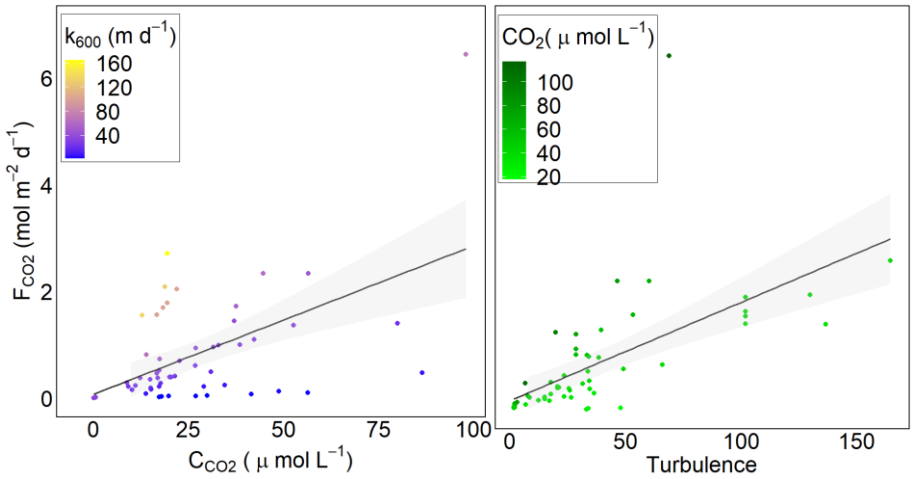


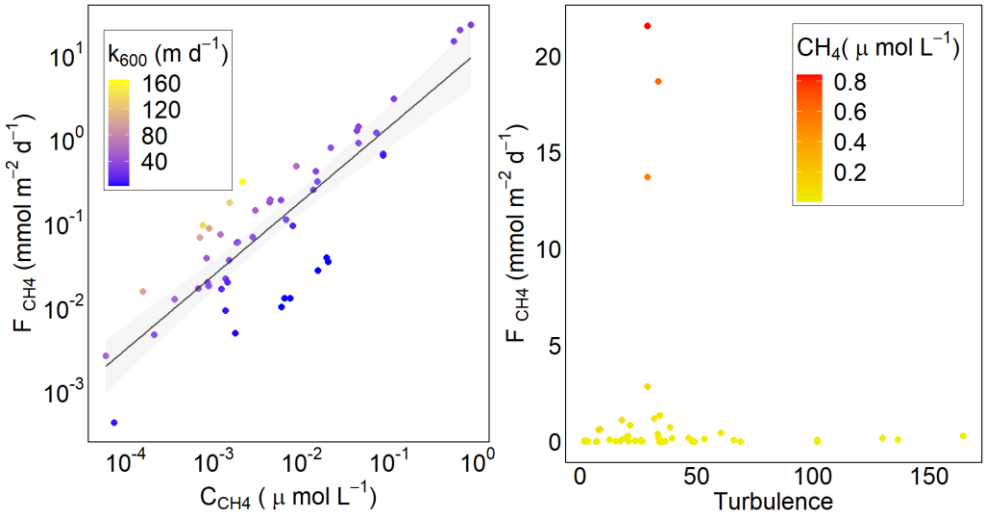
CO_2 variable in space
Emits CO_2 at low rates
concentration & turbulence

Single CH_4 hotspot
Exceptionally large pool
Emission → concentration

CH_4







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Results from the Neretva

CO_2

Free Flowing
Oxygenated

CH_4

Standing Water
Accumulation of OM
No Oxygen

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Dam lakes and Greenhouse gases

Change flow condition

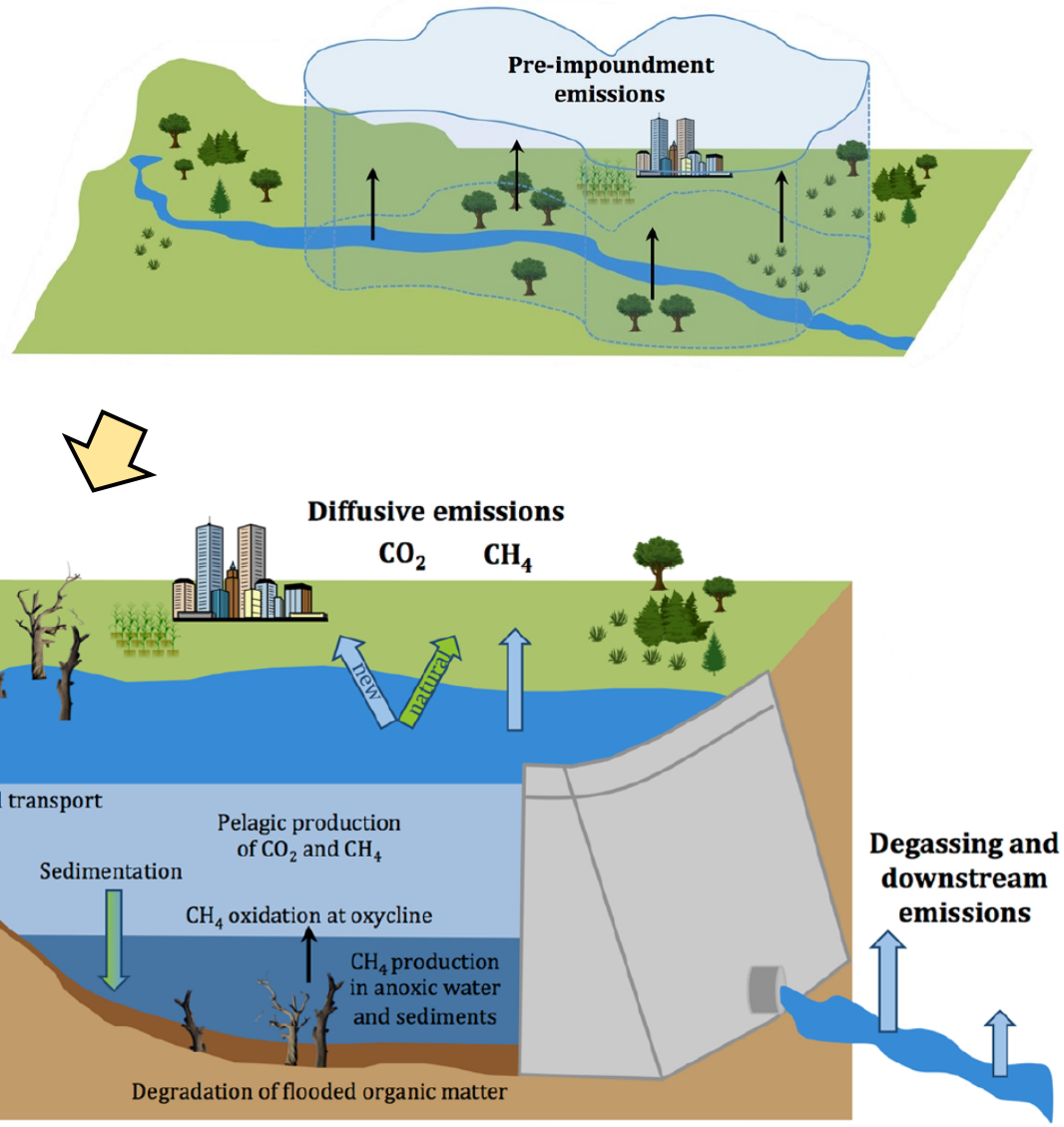
CH_4 production

CH_4 emissions

Standing Water
Accumulation of OM
No Oxygen
Stratification

Anoxic water and sediment layers

Bubble emissions
Degassing at turbines



Prairie et al. 2018

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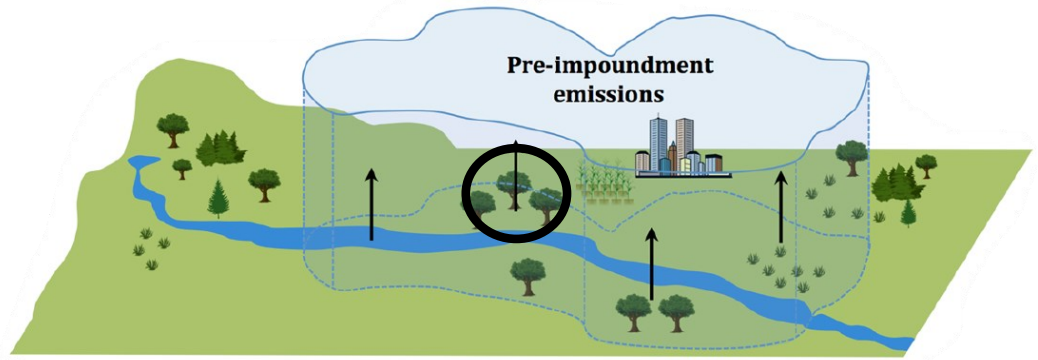
Change flow condition

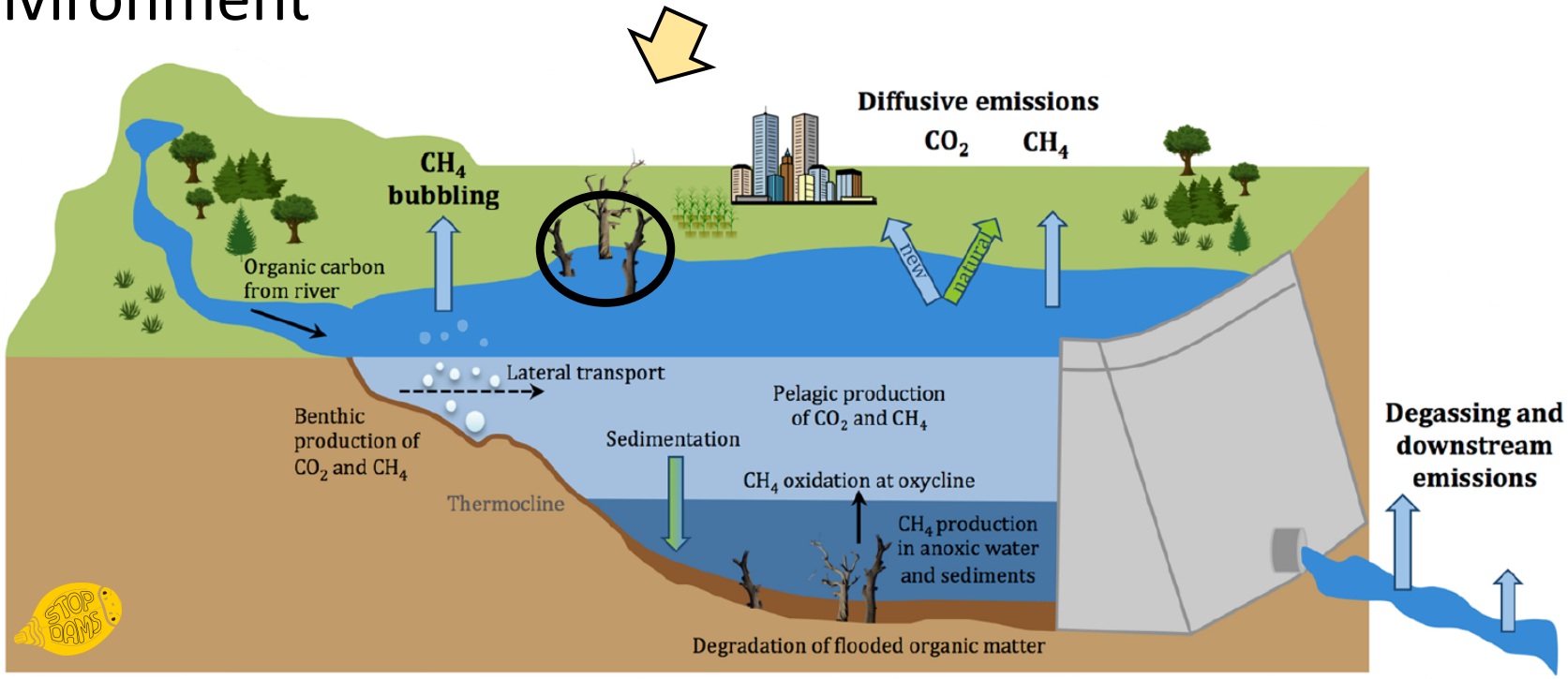


Change the surrounding environment

Uptake and storage of CO_2

Flooded OM degradation

Emission of CO_2 & CH_4



Prairie et al. 2018

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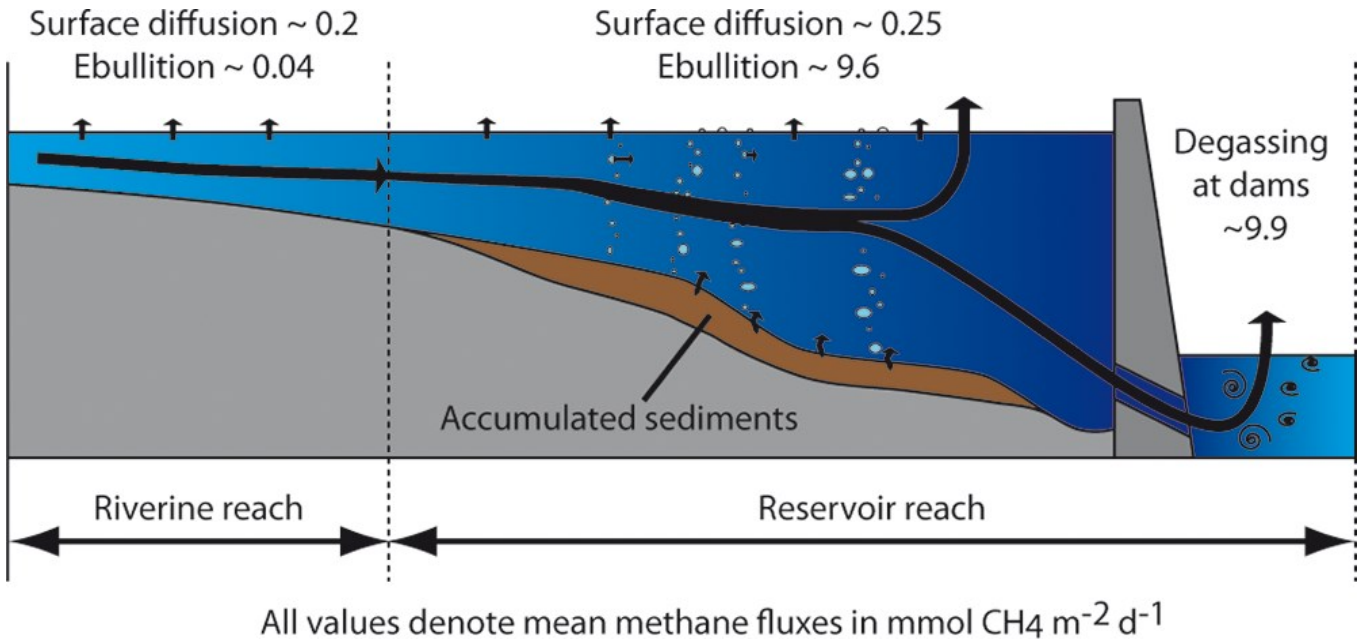
Dam lakes and Greenhouse gases

Change flow condition → CH_4 production & emission

Change the surrounding environment → loss of CO_2 storage & flooding of OM



Maeck et al. 2013

Reservoir emissions >> riverine emission

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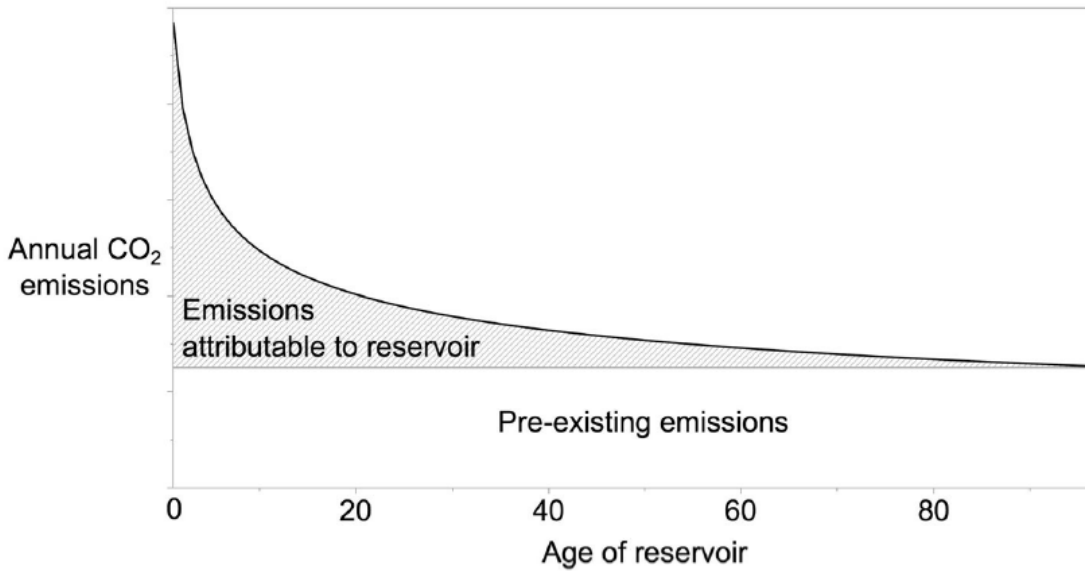

Prairie et al. 2018

Reservoir emissions >> riverine emission

emissions ↑ after impoundment

CO_2 emission decrease

CH4 emission don`t

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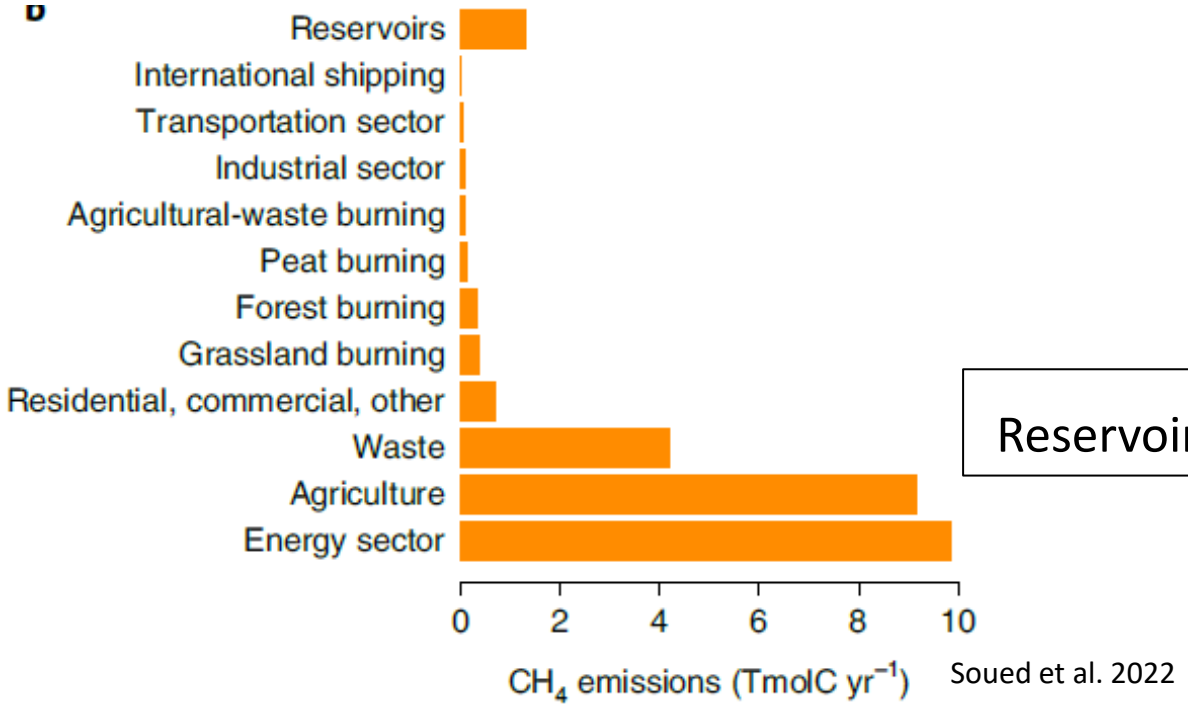

Soued et al. 2022

5.2% of human-derived CH_4 emissions in 2020

Reservoir in Switzerland: 500 mg_{CH4} m^{-2} d^{-1} (Delsontro et al. 2010)

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Currently:
Emits CO_2 at low rates
potential for CH_4 production
Dammed:
Loss of active CO_2 storage
Dam increase CH_4 emissions
High initial emissions

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https://www.fluessevollerleben.at/kaunertal/