NAJNOVEJŠA ZNANSTVENA DOGNANJA ZA BLAŽENJE UČINKOV PODNEBNIH SPREMEMB V VODNIH EKOSISTEMIH

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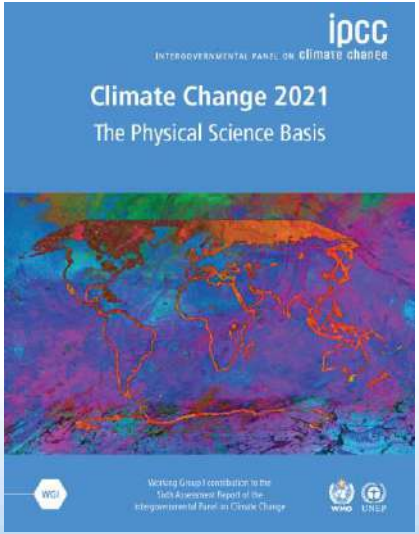
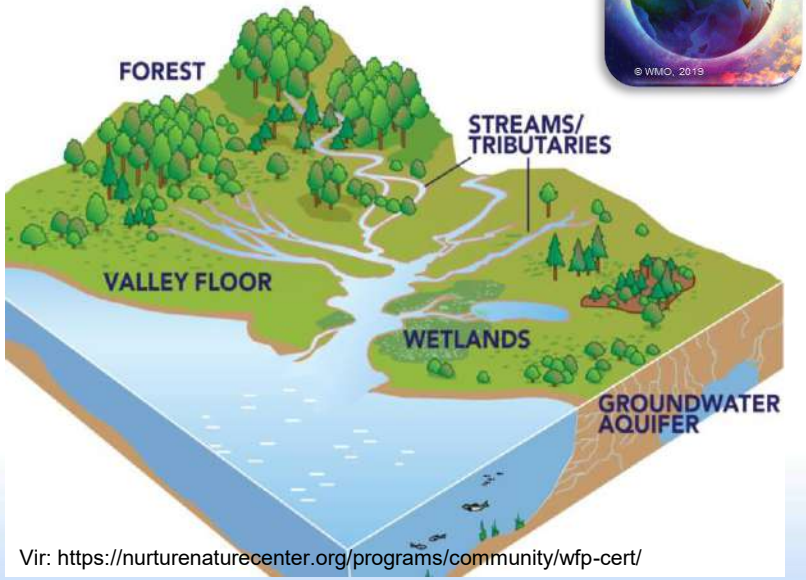
Nacionalni inštitut za biologijo

Podnebne spremembe

Globalno segrevanje



Podnebne spremembe in celinske vode

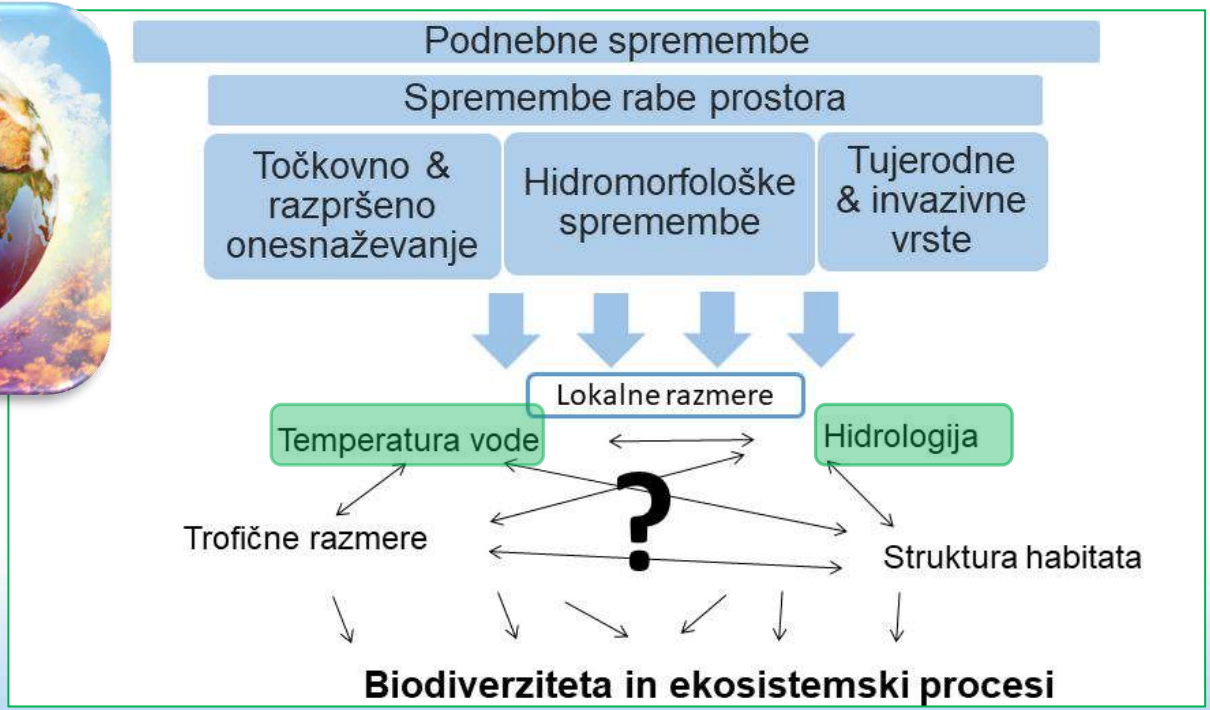


Vir: https://nurturenaturecenter.org/programs/community/wfp-cert/

+

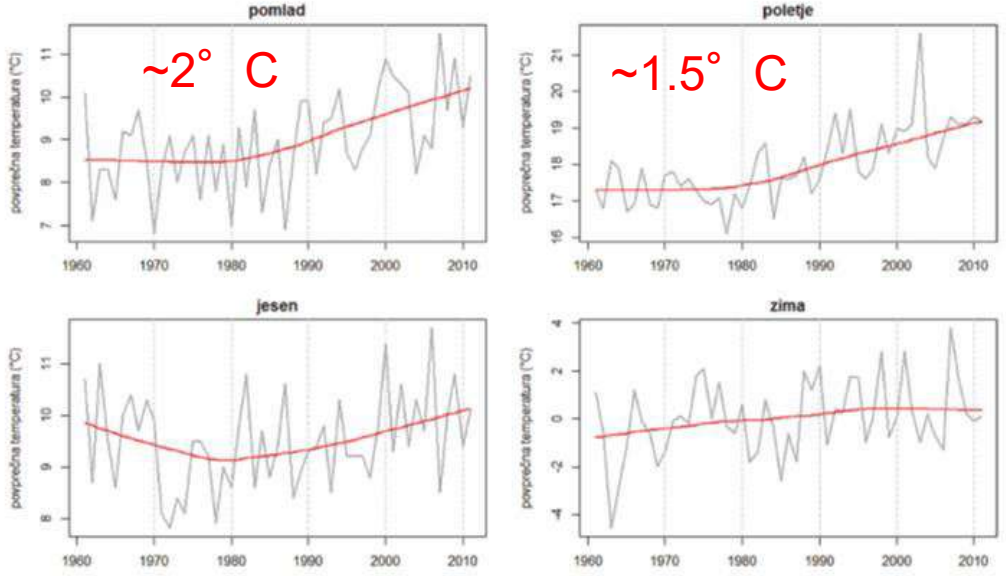
Vir: https://bewaterfriendly.com/our-water/watersheds/

Podnebne spremembe in celinske vode



Temperatura in celinske vode

Povprečna temperatura zraka se je v obdobju 1961–2011 dvignila za 1,7 °C

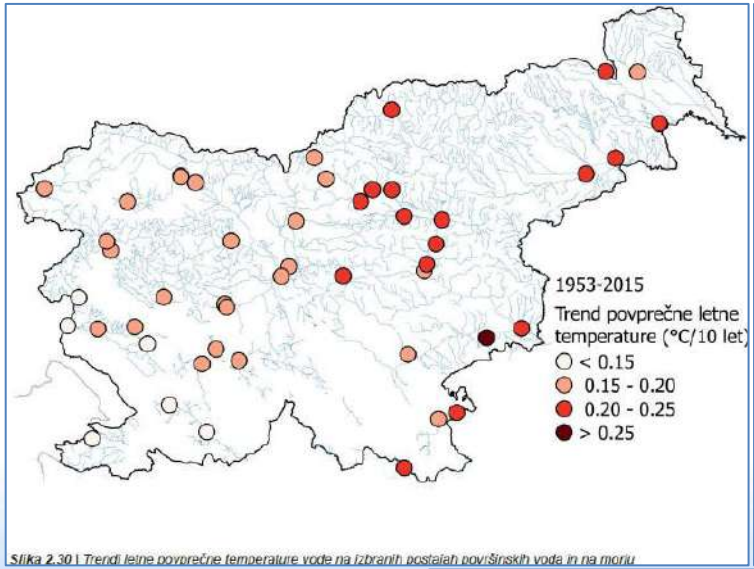


Slika 1. Časovni potek povprečne temperature zraka po meteoroloških letnih časih v obdobju 1961–2011 za celotno Slovenijo (siva krivulja) in glajeno drseče povprečje (rdeča krivulja). (Vir: Vertačnik in sodelavci: Podnebna spremenljivost Slovenije, Glavne značilnosti gibanja temperature zraka v obdobju 1961–2011)

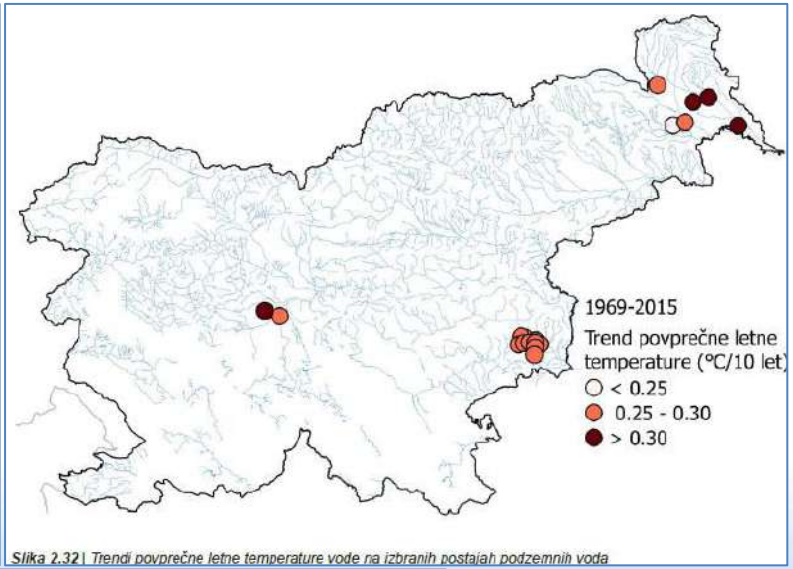
Vir: Vetrnica, SMD, 2013

Temperatura in celinske vode

Temperatura površinskih voda se je v obdobju 1953–2015 zviševala s trendom 0,2 °C na desetletje, temperatura podzemnih voda v obdobju 1969-2015 pa s trendom 0,3 °C na desetletje.



Slika 2.30 | Trendi letne povprečne temperature vode na izbranih postajah površinskih voda in na morju

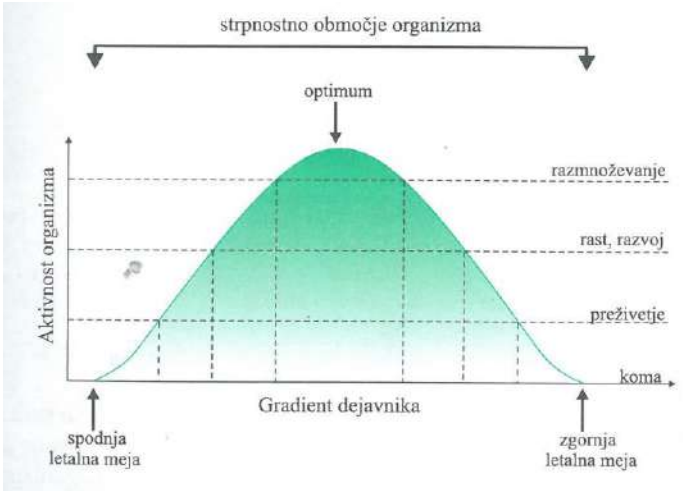


Slika 2.32 | Trendi povprečne letne temperature vode na izbranih postajah podzemnih voda

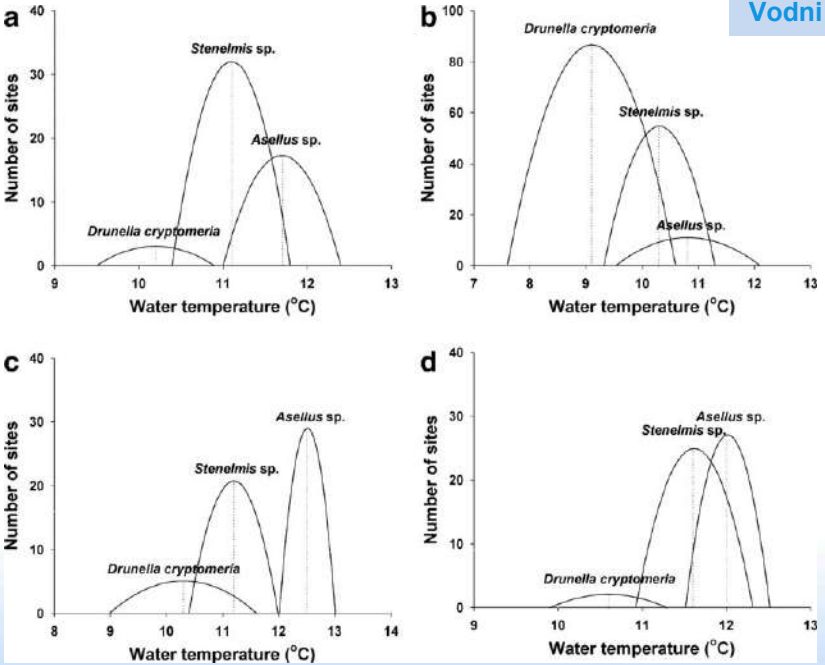
Vir: OCENA podnebnih sprememb v Sloveniji do konca 21. stoletja : sintezno poročilo / [avtorji besedila Renato Bertalanič ... [et al.] ; urednica Mojca Dolinar]. - Ljubljana : Ministrstvo za okolje in prostor, Agencija Republike Slovenije za okolje, 2018-. - (ARSO vreme)

- Kemijske reakcije, raztapljanje mineralov, C cikel
- Vodni biofilmi
- Alge in makrofiti
- Vodni nevretenčarji
- Ribe
- Prehranjevalne mreže

Ekološka strpnostna krivulja I



Vir: Tome. D. 2006. Ekologija. Organizmi v prostoru in času.

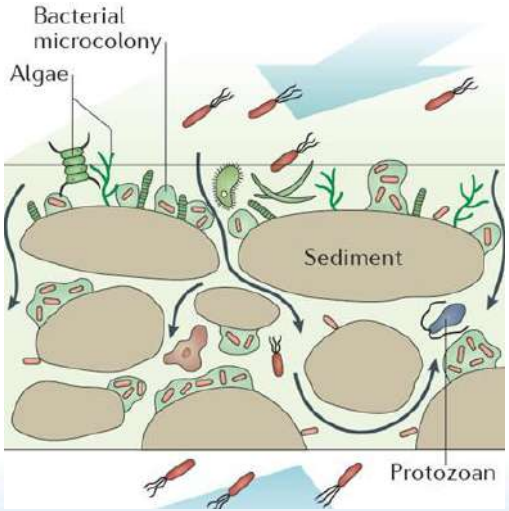


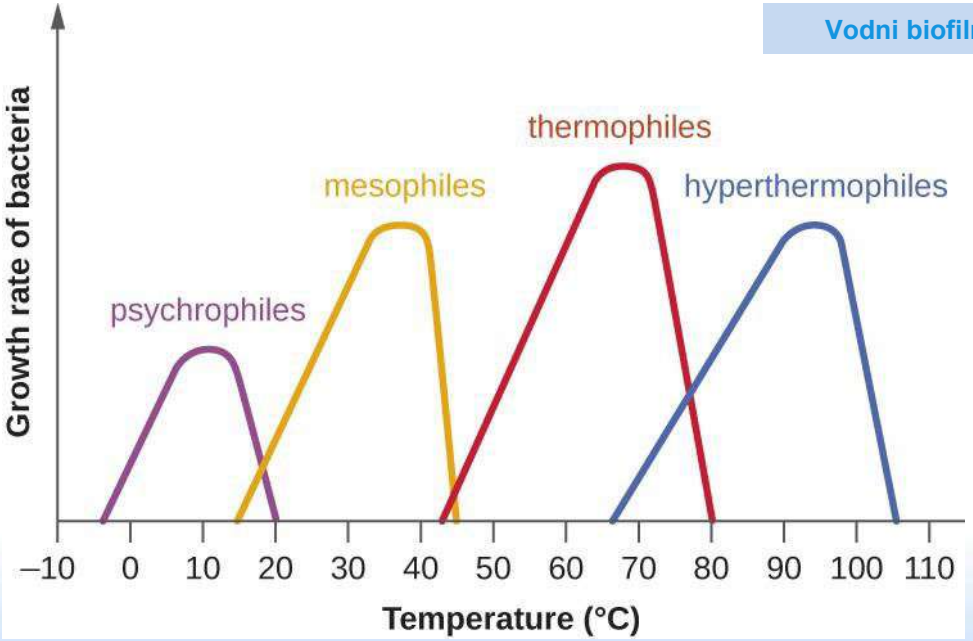
Vir: Fengqing et al (2013). Temperature change and macroinvertebrate biodiversity: Assessments of organism vulnerability and potential distributions. Climatic Change 119

Vodni nevretenčarji

Ekološka strpnostna krivulja II

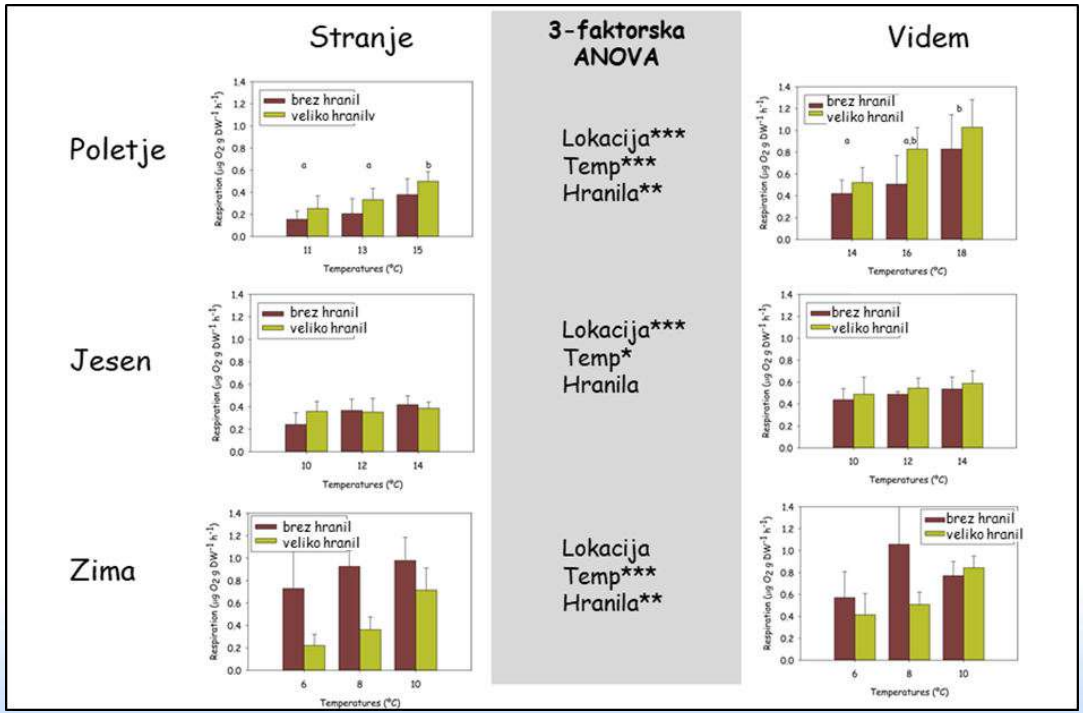
Vodni biofilmi





https://courses.lumenlearning.com/microbiology/chapter/temperature-and-microbial-growth/

Odziv aktivnosti biofilma na temperaturo



Sp. Stranje

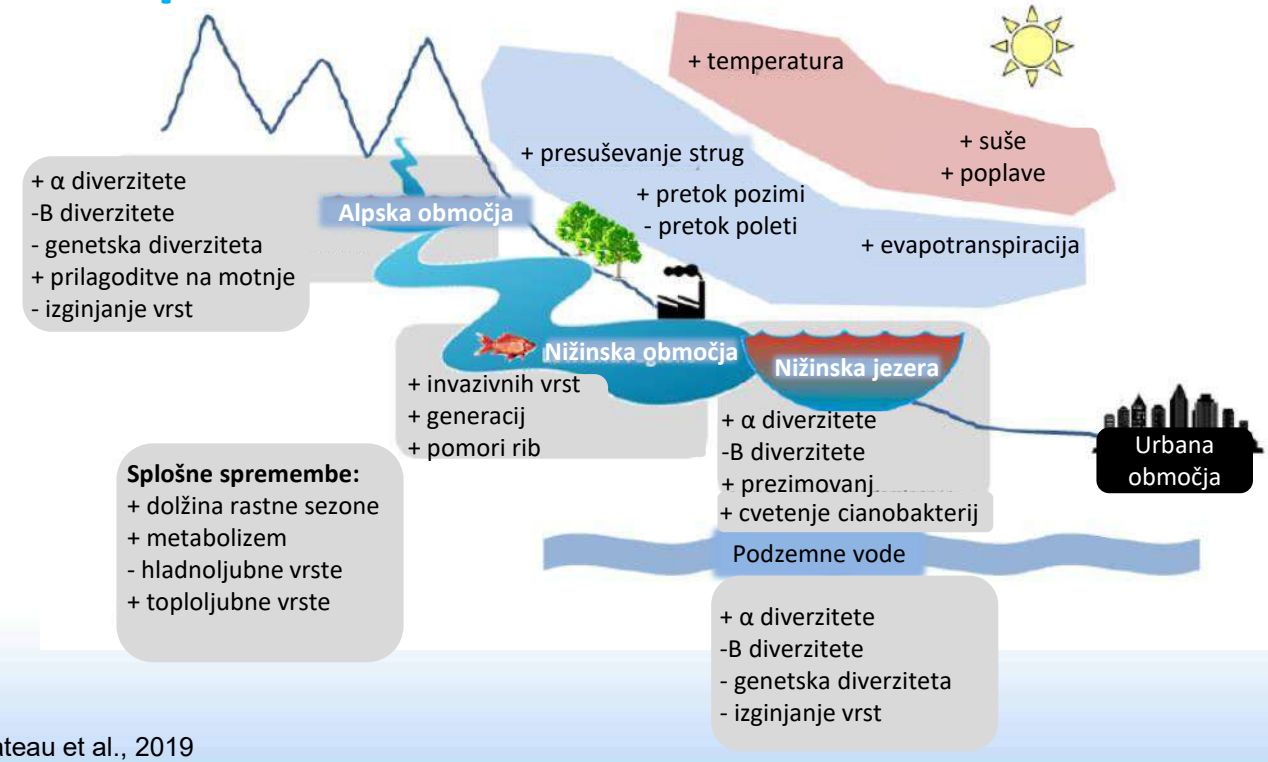
Videm

Odziv dihanja biofilmov v rečnih sedimentih na povišanje temperatur. Vir: Mori et al., 2016

Cianobakterije in podnebne spremembe

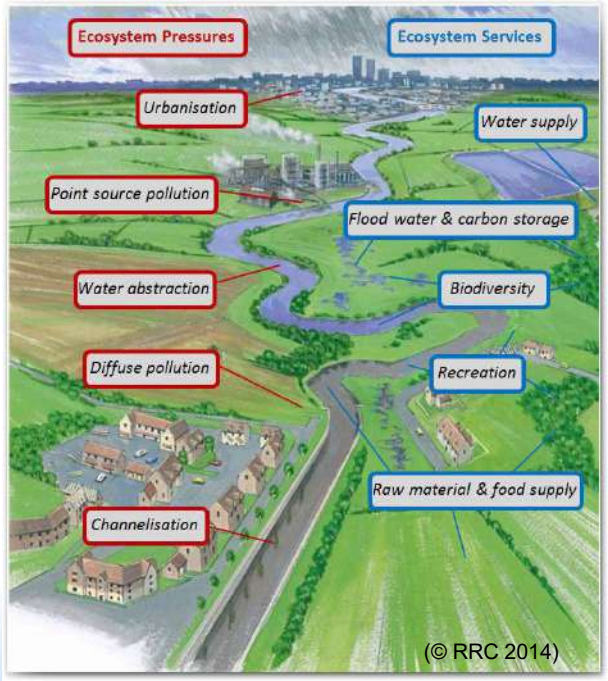
- Podvojitev št. dni z razrastmi do leta 2050
- Toksičnost, genotoksičnost in potencialna karcinogenost
- Velika gospodarska škoda!

Podnebne spremembe in celinske vode



Povzeto po Benateau et al., 2019

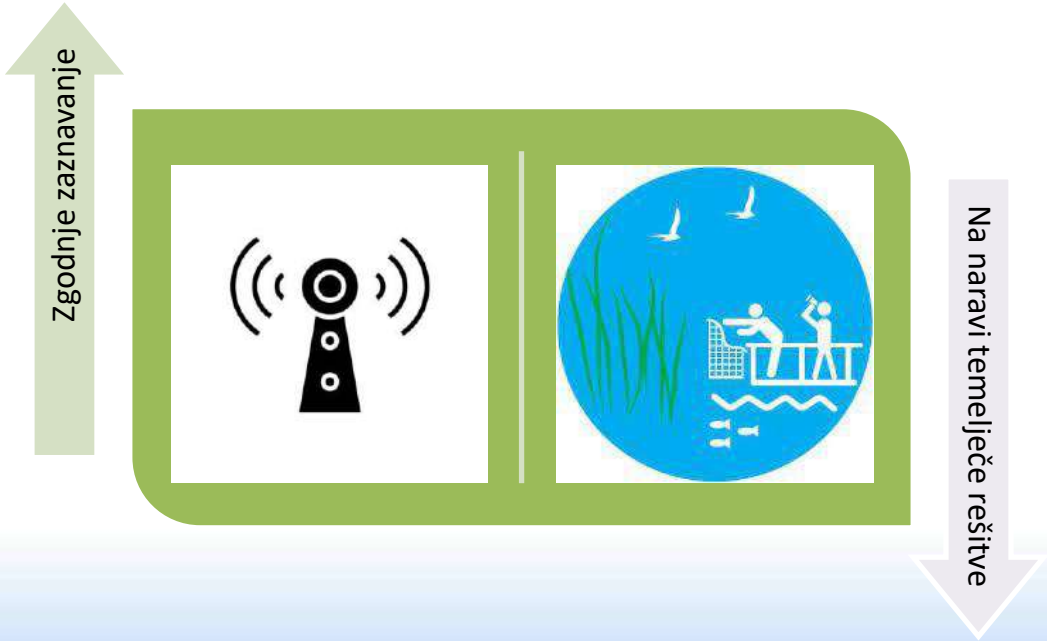
Zakaj je to naš problem?



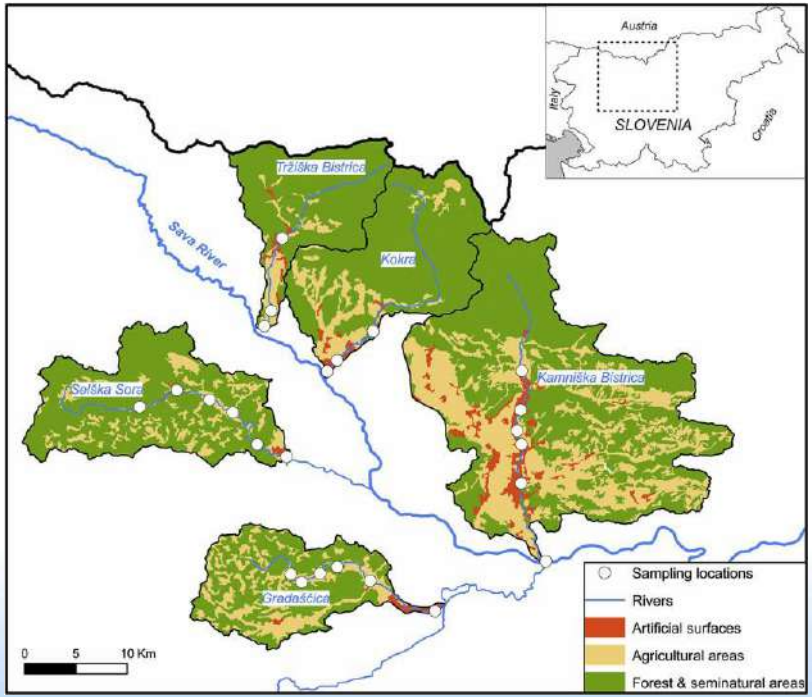
Pritiski in ekosistemske storitve na nivoju porečja (© RRC 2014)
vir: https://broadlandcatchmentpartnership.org.uk/about/catchment-based-approach/

1. Varstvo narave – vrst
2. Odvisnost od vodnih virov in povezanih ekosistemov (pitna voda, namakanje, hrana, industrija, gospodinjstva, rekreacija, sproščanje)

Rešitve?

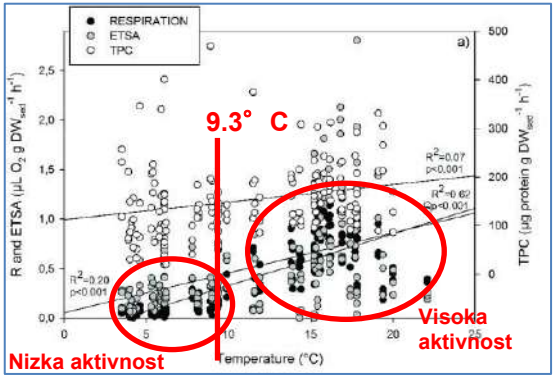


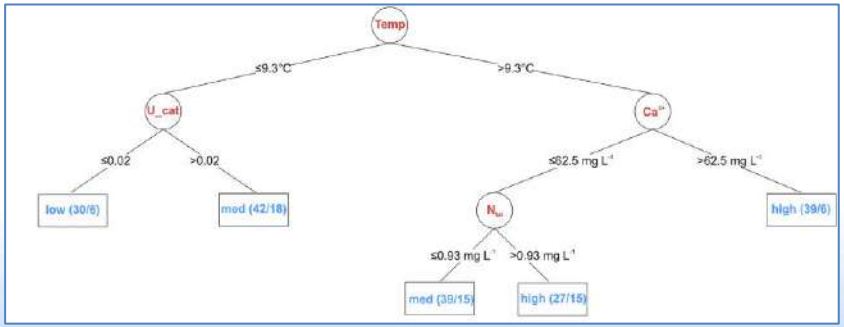
Zaznavanje aktivnosti in biomase biofilmov



Vir: N. Mori et al. / Water Research 149 (2019) 9e20

- Linearno povečevanje mikrobne aktivnosti in biomase s T!
- Prag 9.3° C in sinergistični vplivi z rabo prostora in hranili!





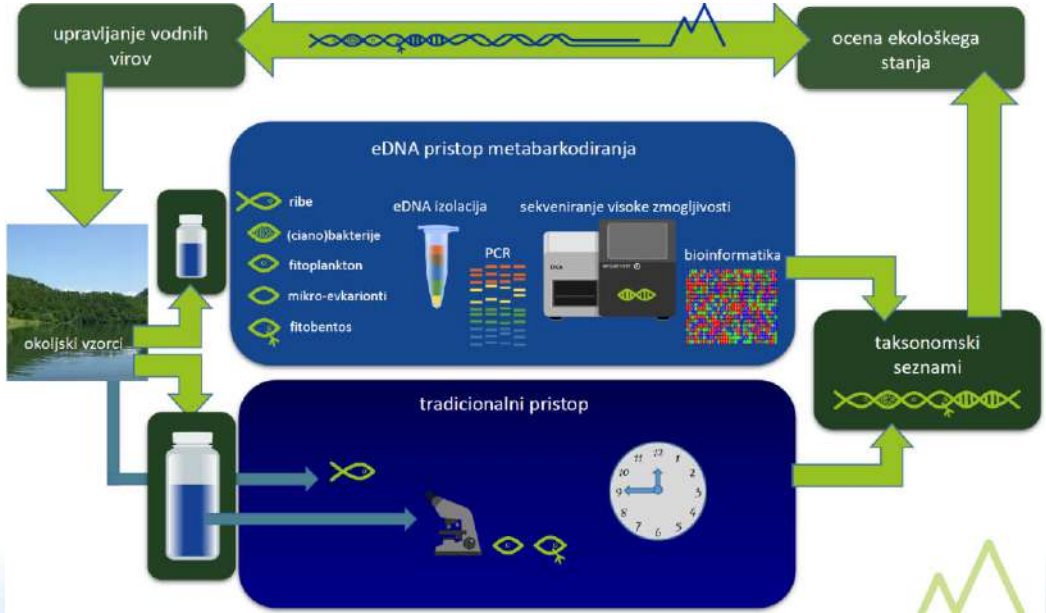
Zgodnje zaznavanje cianobakterij

Interreg Alpine Space Eco-AlpsWater

Inovativna ocena ekološkega stanja in strategija upravljanja z vodami za varovanje ekosistemskih storitev v alpskih jezerih in rekah (2018-2021)

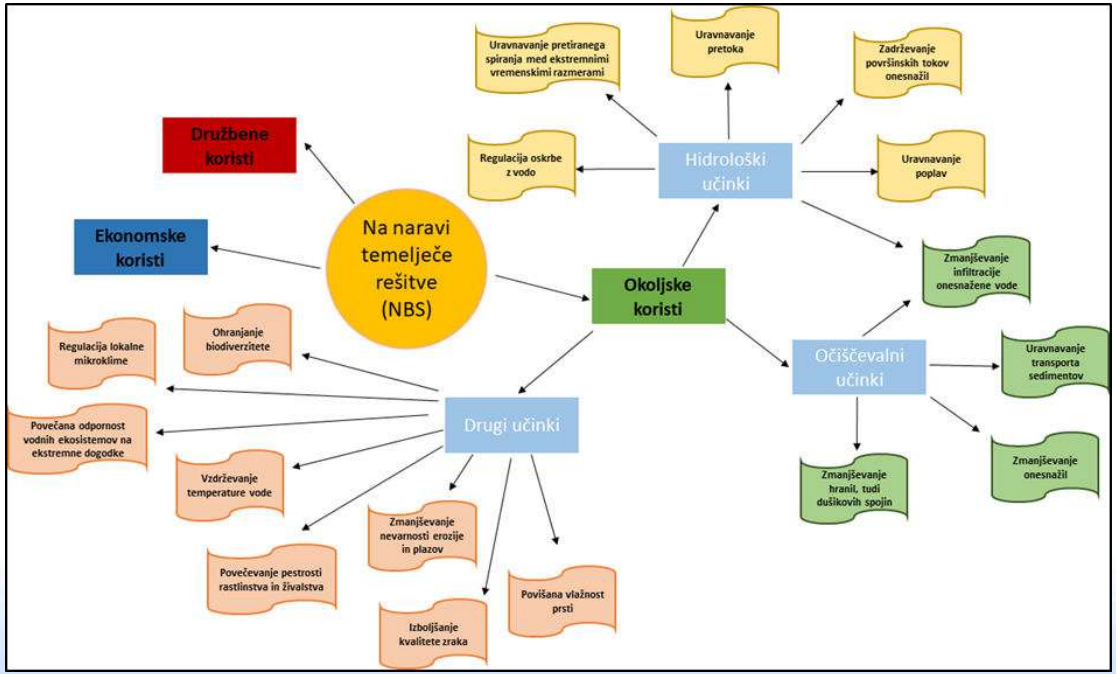
Cilji projekta:

- Inovativni pristopi meritev stanja v okolju
- Uskladitev pristopov za oceno kakovosti vode
- Lokalno izvajanje pilotnih raziskav
- Biomonitoring naslednje generacije in politika
- Izboljšati upravljanje vodnih virov in ekosistemskih storitev z uporabo novih, inovativnih pristopov



Na naravi temelječe rešitve

Vsi ukrepi za zaščito, sonaravno upravljanje in obnavljanje naravnih ali spremenjenih ekosistemov, ki učinkovito naslavljajo družbene izzive in sočasno podpirajo človekovo dobrobit in koristijo biodiverziteti (IUCN, 2020).



povzeto po Mancuso et al., 2021

Na naravi temelječe rešitve in podnebne spremembe

Podnebne spremembe

- Blaženje učinkov segrevanja
- Blaženje poplav
- Blaženje suše

- Obrežna vegetacija, pogozdovanje v porečju,..
- Obnavljanje mokrišč, poplavnih ravnic,..
- Polnjenje in obnavljanje vodonosnikov, zadrževanje vode v porečjih z renaturacijo rek

5 The integration of NbS in national policy frameworks to date

National governments play a key role in fostering the use of NbS. Governments need to design an institutional, policy, regulatory and financial enabling environment that facilitates the take up of NbS by both public agencies across levels of government as well as private actors. It is important for national governments to ensure that governance arrangements, regulations and technical capacity do not inadvertently discourage their use. In the following section, a scan of current policy provisions for NbS across OECD countries is provided. The scan focuses on national adaptation plans and strategies as well as a complementary OECD survey. To get a more complete picture of the integration of NbS in national policy frameworks, and their implementation progress in water-related risk management, other policy documents, regulations and financing mechanisms need to be additionally examined. In-depth country case studies will be carried as part of the OECD work on NbS to provide a more comprehensive assessment for a selected set of countries.

National adaptation plans provide a good entry point to understanding the policy priority given to NbS as an adaptation measure in OECD countries. National adaptation plans bring together countries' policy priorities and suggested actions as part of the national policy agenda for climate change adaptation, of which water-related risks are a key part. Table 5.1 shows that out of the 35 OECD* countries that have national adaptation plans or strategies, 24 directly mention NbS**.

References to NbS range from countries simply stating that they recognise the importance of these approaches as part of climate change adaptation, to the explicit reference of using NbS for addressing specific hazards. For example, when looking at the national adaptation plans for Japan and Poland, NbS are stated as being valuable approaches that will become increasingly important due to intensifying climate impacts. In the cases of Australia, Canada, Denmark and Norway, specific NbS are referenced as being important approaches that can complement grey infrastructure in certain sectors, with wetlands and urban greening being two examples. Australia stands out in that the plan mentions the suitability of NbS in the areas of coastal, river as well as urban flooding. In the absence of coasts, Hungary is another example where NbS feature prominently in their national adaptation policy framework. Their use is suggested in the areas of riverine and urban flooding as well as to address drought risk.

Despite the fact that the majority of OECD countries have incorporated the concept of NbS into their national adaptation plans, very few suggest more concretely how NbS should be features in implementation. Only six countries make such references to concrete implementation measures, such as the creation of policies mandating the use of green drainage systems, the monitoring of ecosystem services, and proposing policies requiring the use of natural flood prevention mechanisms. No national adaptation policies contain quantitative and measurable targets relating to NbS deployment and performance.

Apart from national adaptation policies, a 2019 OECD survey on the implementation of the OECD Recommendation on Water suggests that NbS feature quite prominently in water management strategies, and many countries seem to be using NbS to address water quality, quantity (i.e. water scarcity) as well as flood risk management issues. The survey found that 23 out of 27 country respondents include NbS in their water management strategies (OECD, 2020$_{[1]}$). Seventeen countries put forward that NbS are being used for water quantity management, while 18 countries use NbS for flood risk management. Examples of other uses included managing storm water and rainwater harvesting (Figure 5.1 – page 18).

In addition to national adaptation plans, there are of course many other policy instruments that aim at facilitating their use in different policy areas such as water management and land-use planning. For example, the EU Floods Directive (2007) promotes nature and risk-based adaptation planning opposed to technological hazard mitigation. A 2019 study found that this directive has

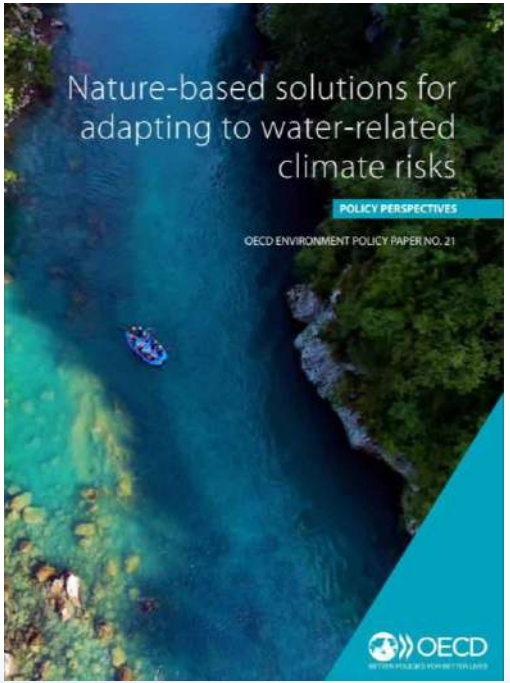
TABLE 5.1. **NbS in National Adaptation Plans or Strategies**

OECD Country*	Reference to NbS in national adaptation plans/ strategies					Clear link to an implementation strategy?
	Coastal hazards	River flooding	Urban flooding	Drought	Other	
Australia	•	•	•			
Austria		•	•			•
Belgium			•			
Canada*		•	•			
Chile	•		•		•	•
Colombia	•			•	•	
Czech Republic				•	•	
Denmark	•		•		•	
Estonia						
Finland						
France			•		•	
Germany					•	
Greece						
Hungary		•	•	•		
Ireland			•	•		
Israel						
Italy						
Japan					•	
Latvia		•			•	
Lithuania						
Luxembourg						
Mexico	•	•				
Netherlands		•	•			•
Norway		•	•			•
Poland	•	•	•			•
Portugal						
Slovak Republic		•		•		
Slovenia						
South Korea						
Spain	•					
Sweden			•			•
Switzerland				•		
Turkey			•		•	
United Kingdom			•			•
United States**	•		•			•

* Iceland and New Zealand excluded, as they do not have a national adaptation plan. New Zealand, however, has a central government adaptation programme, as well as an adaptation technical working group.

** The United States Environmental Protection Agency created a policy document in 2014 for the purpose of providing policy makers with adaptation implementation strategies.

Source: Sources listed in Annex II



OECD, 2020, vir: https://www.oecd.org/environment/nature-based-solutions-for-adapting-to-water-related-climate-risks-2257873d-en.htm

Primer dobre prakse Cerkniško jezero

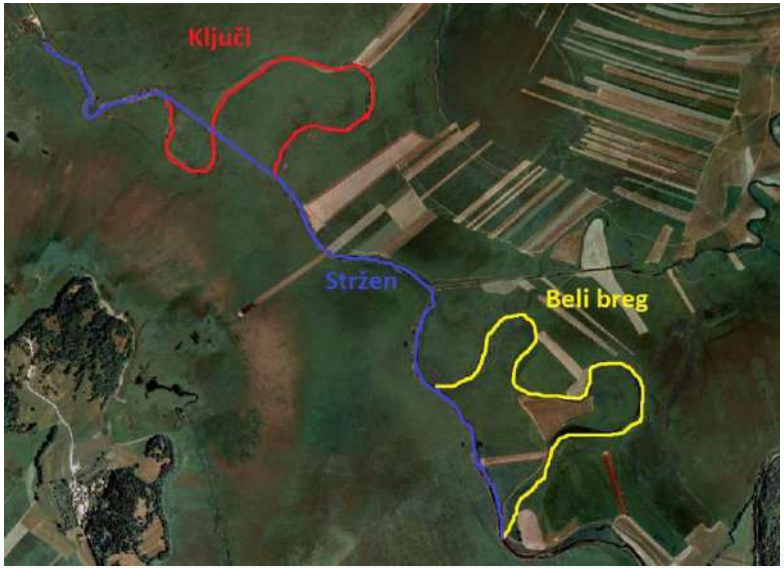
NOTRANJSKI REGIJSKI PARK

Life Stržen

KRAS.RE.VITA

2009 - obnova zgornjih delov Goriški Brežiček in Tresenec
2017 - Stržen na Belem bregu
2019 - Stržen v Ključih

Eden izmed rezultatatov: počasnejše odtekanje vode!



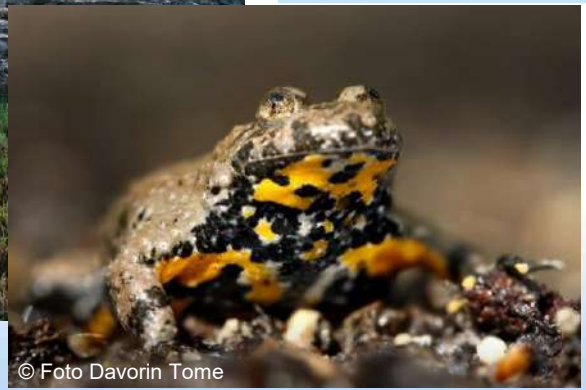
Vir:https://zrsvn-varstvonarave.si/wp-content/uploads/2019/10/Kozina_LIFE-Str%C5%BEen_GI-2019.pdf

Primer dobre prakse Ljubljansko barje

EVROPSKA UNIJA
EVROPSKI SKLAD ZA REGIONALNI RAZVOJ

poljuba

Vzpostavitev 41 vodnih teles: mlak in luž oziroma uleknin v letu 2020.



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