

SESSION 02I/H NATURE BASED SOLUTIONS, ECOSYSTEM SERVICES AND GROUNDWATER

May 18, 2022

11:30 AM - 12:45 PM

Room 109



INTERNATIONAL CONFERENCE

GROUNDWATER, KEY TO THE SUSTAINABLE DEVELOPMENT GOALS

PARIS - May 18 -20, 2022



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ORGANIZED BY IAH-CFH, UNESCO-IHP, THE FRENCH WATER PARTNERSHIP, UNDER THE PATRONAGE OF THE FRENCH NATIONAL COMMISSION FOR UNESCO AND WITH THE SUPPORT OF THE MINISTRY FOR ENVIRONMENT, SEINE-NORMANDY WATER AGENCY, AND SORBONNE UNIVERSITY

SESSION 02I/H

NATURE BASED SOLUTIONS, ECOSYSTEM SERVICES AND GROUNDWATER

104 - Ecosystem services and nature-based solutions: Which role for groundwater and hydrogeologists?

11:30-11:45

Speaker: Cécile HÉRIVAUX

088 - The holistic value of managed aquifer recharge: assessing its influence on the environment and the synergies and trade-offs triggered by ecosystem service interaction

11:45 - 12:00

Speaker: Catalin STEFAN

018 - Improving Groundwater Recharge Using Nature-Based Solutions

12:00-12:15

Speaker: Mark WHITEMAN

164 - Nature-based water storage in seasonal rivers in support of resilient livelihoods in semi-arid Africa: Assessing the Toroka sand river in Kenya

12:15-12:30

Speaker: Michel FREM

230 - International knowledge exchange Nature Based Solutions

12:30 - 12:45

Speaker: Laura NOUGUES

ECOSYSTEM SERVICES AND NATURE-BASED SOLUTIONS: WHICH ROLE FOR GROUNDWATER AND HYDROGEOLOGISTS?

C.Hérivaux, J.C. Maréchal, P. Le Coënt, N. Frissant (BRGM)

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*International Conference « Groundwater, key to the Sustainable Development Goals »
May 18-20th 2022, Paris*



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CONTEXT

- Ecosystem Services (ES) assessments and Nature-based Solutions (NBS) design have increased considerably over the last 15 years
- Many publications on water-related ES and NBS
- These concepts are increasingly percolating into the operational sphere



2014



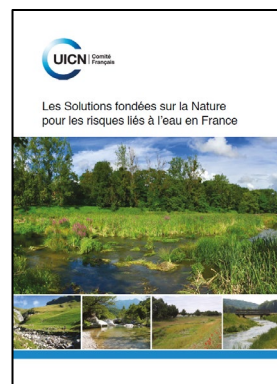
2017



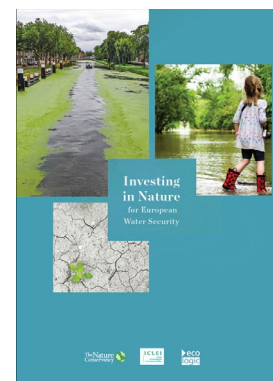
2018



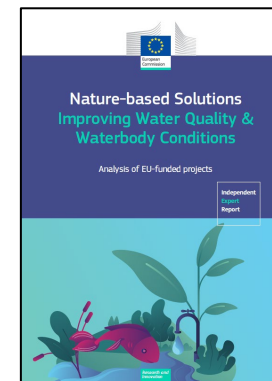
2018



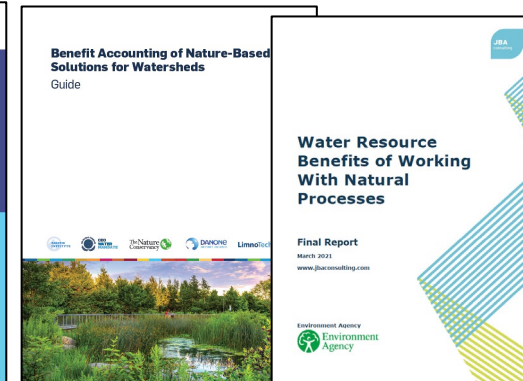
2019



2019



2020

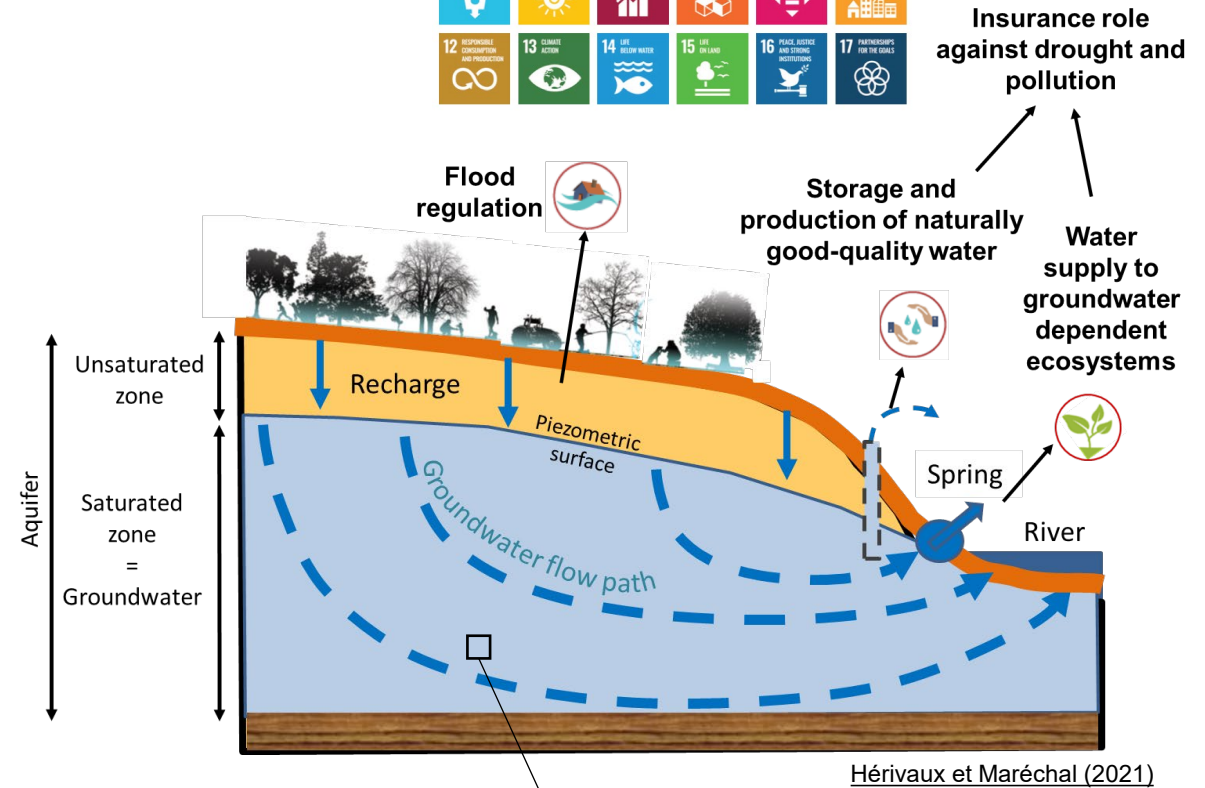


2021

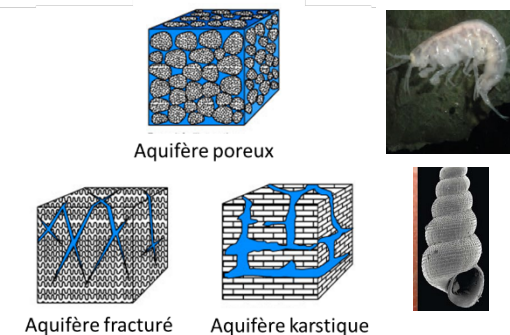
- **BUT, aquifers are still poorly considered in ES assessment and NbS design**

AQUIFERS: ECOSYSTEMS LIKE ANY OTHERS?

- Aquifer = rock with characteristics that support groundwater storage and flow
- Aquifers play an important role in the provision of many services to human societies → SDGs
- Underground location, which makes them **invisible** and difficult to map with other ecosystems
- **A relative lack of knowledge of their biotic component** (Baumgartner, 2015; Danielopol et al., 2003; Griebler and Avramov, 2014)
- **Diversity and complexity of physical and biogeochemical processes**

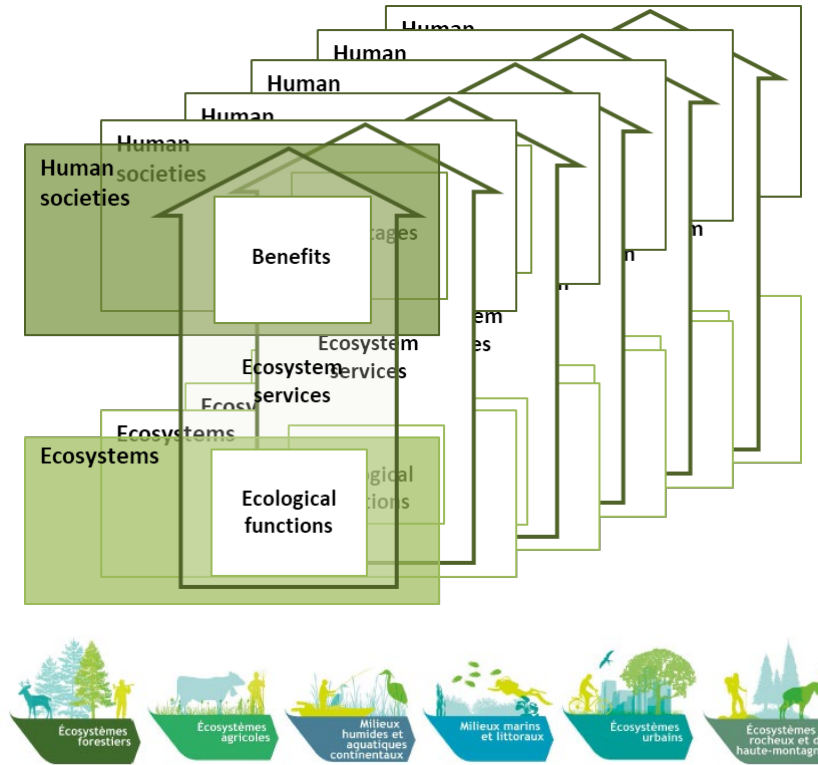


Récupération de données piézométriques sur un ordinateur portable de terrain, en 2009. © BRGM



CONCEPTUAL SCHEME

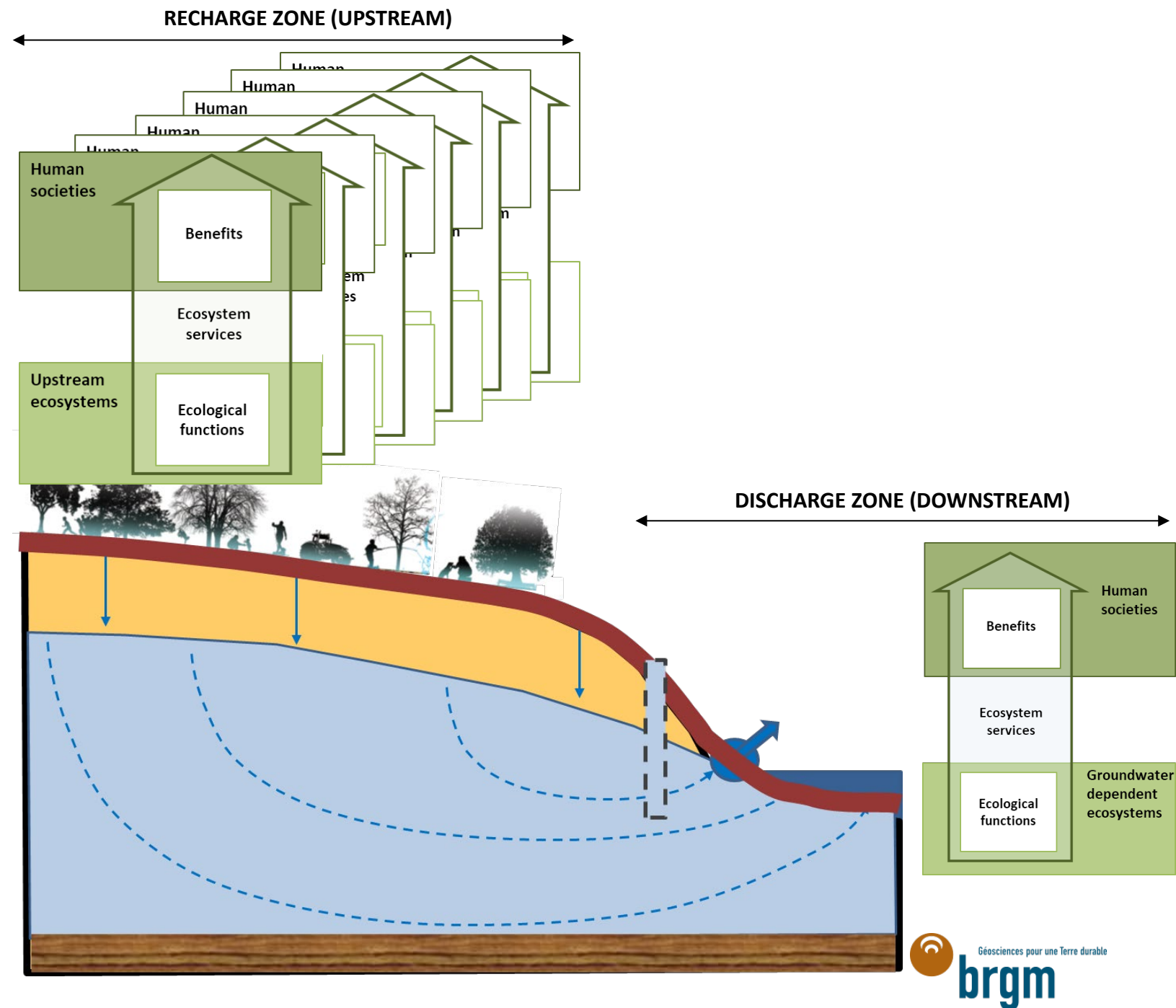
- From a mono-ecosystem approach...



Example of the French
assessment of ecosystems and
ecosystem services

CONCEPTUAL SCHEME

- From a mono-ecosystem approach...
- ... to an approach integrating aquifers

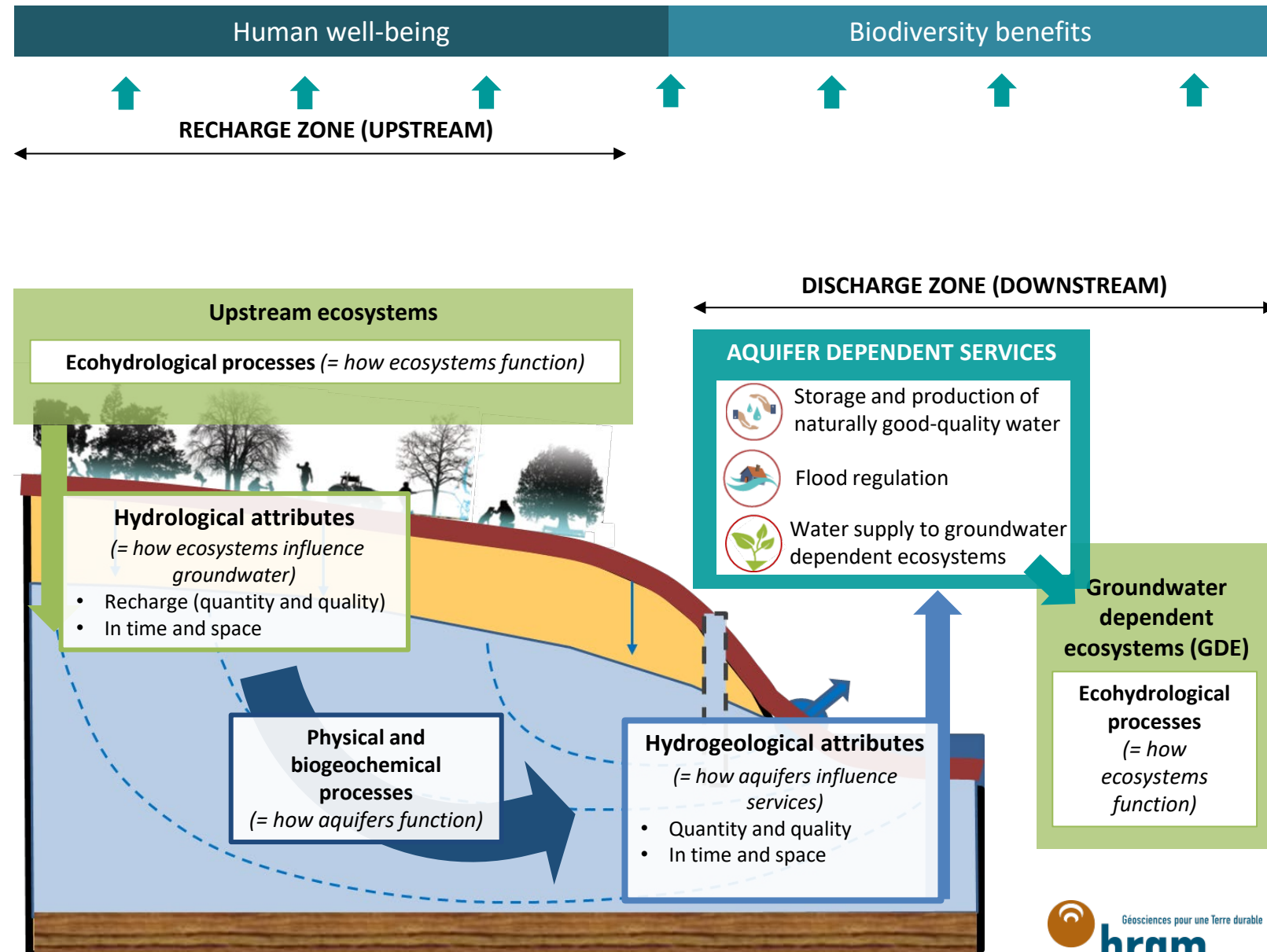


CONCEPTUAL SCHEME

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- ... to an approach integrating aquifers

Concept 1: Aquifer dependent services

- The **integrative dimension of aquifers** in the recharge zone
- The **importance to understand physical and biogeochemical processes**
- The **sustainability** of aquifer-dependent services is **threatened by the degradation of the chemical and quantitative groundwater status**.
- **Potential consequences of overlooking aquifers:**
 - wrong ES estimates
 - low level of groundwater protection



CONCEPTUAL SCHEME

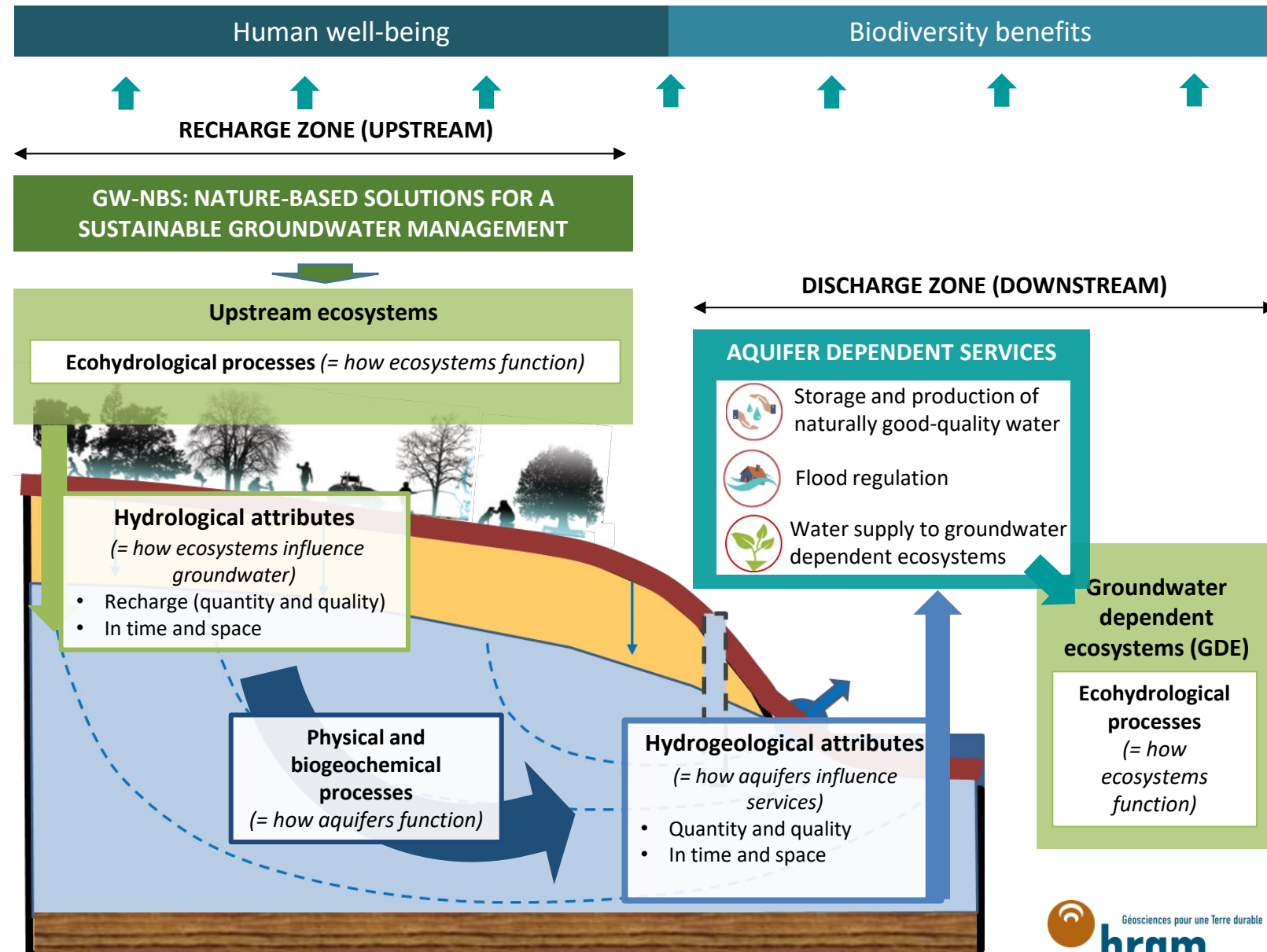
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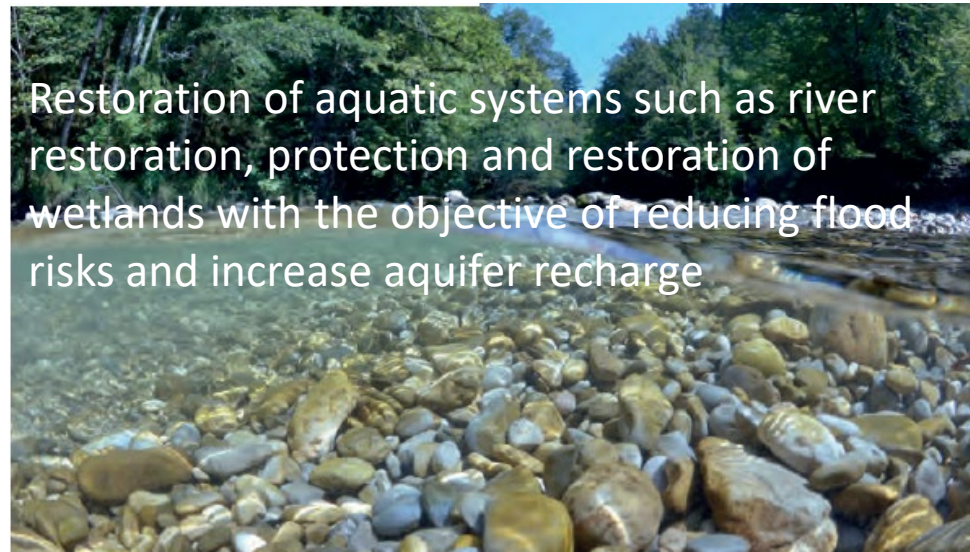
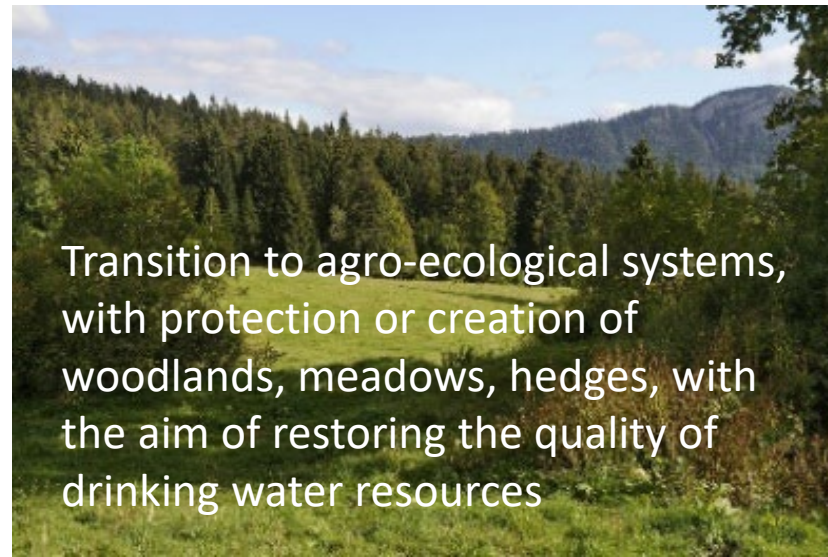
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Concept 2: NBS for sustainable groundwater management (GW-NBS)



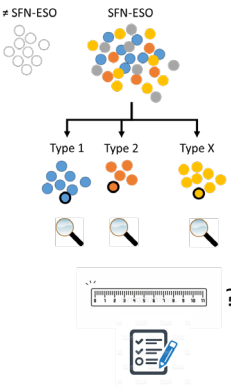
GW-NBS: NBS FOR SUSTAINABLE GROUNDWATER MANAGEMENT

Some examples...



GW-NBS: NBS FOR SUSTAINABLE GROUNDWATER MANAGEMENT

A dedicated research project with the French Rhône-Méditerranée Corse Water Agency (2021-2024):



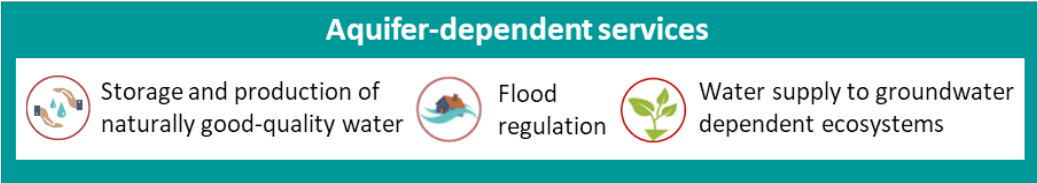
- To clarify and delimit GW-NBS concept
- To identify and analyse past and on-going experiences of gw catchments with GW-NBS
- To assess costs, effectiveness (on hydrogeological attributes), benefits, negative effects
- To support future potential GW-Nbs programs



Proposed definition:

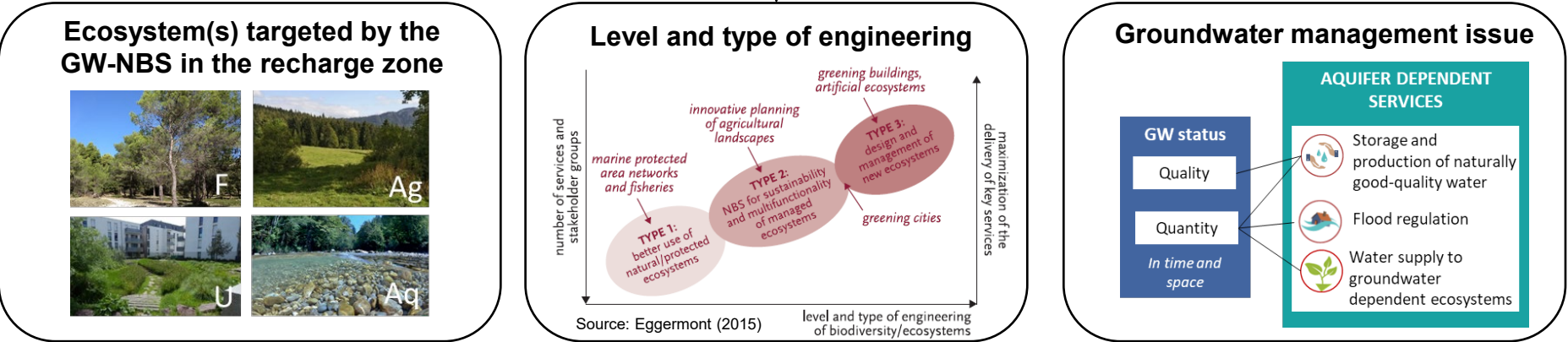
Adaptation of the IUCN NbS definition (2016)

- Actions to protect, sustainably manage and restore natural and modified ecosystems
- Enabling the maintenance/improvement of at least one aquifer-dependent service, by influencing the quantitative/qualitative status of groundwater



- To provide both human well-being and biodiversity benefits

A diversity of GW-NBS, depending on...



AND still many remaining questions :

Conditions to be met for a solution to be considered as a GW-NBS, how to assess their effectiveness, the most relevant scale for their implementation, the diversity of associated benefits and the modalities of their financing

KEY MESSAGES

- **Aquifer-dependent services and Nature-based solutions for sustainable groundwater management** : 2 key concepts for a better integration of aquifers in ES and NBS based policies
- **Hydrogeology is essential for understanding physical and geochemical processes/ delimit the relevant scale**
- Sustainable groundwater management with NBS generate a **diversity of benefits** for biodiversity and human well-being
- **Combining ecology, hydrogeology and human and social sciences** is required to assess aquifer-dependent services and design appropriate Nature-based solutions for sustainable groundwater management

Thank you for your attention!