Ecohydrologie et Urbanisation

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Au Centre IRD-UCAD de Hann, bâtiment H4, 1er étage

United Nations
Educational, Scientific and
Cultural Organization

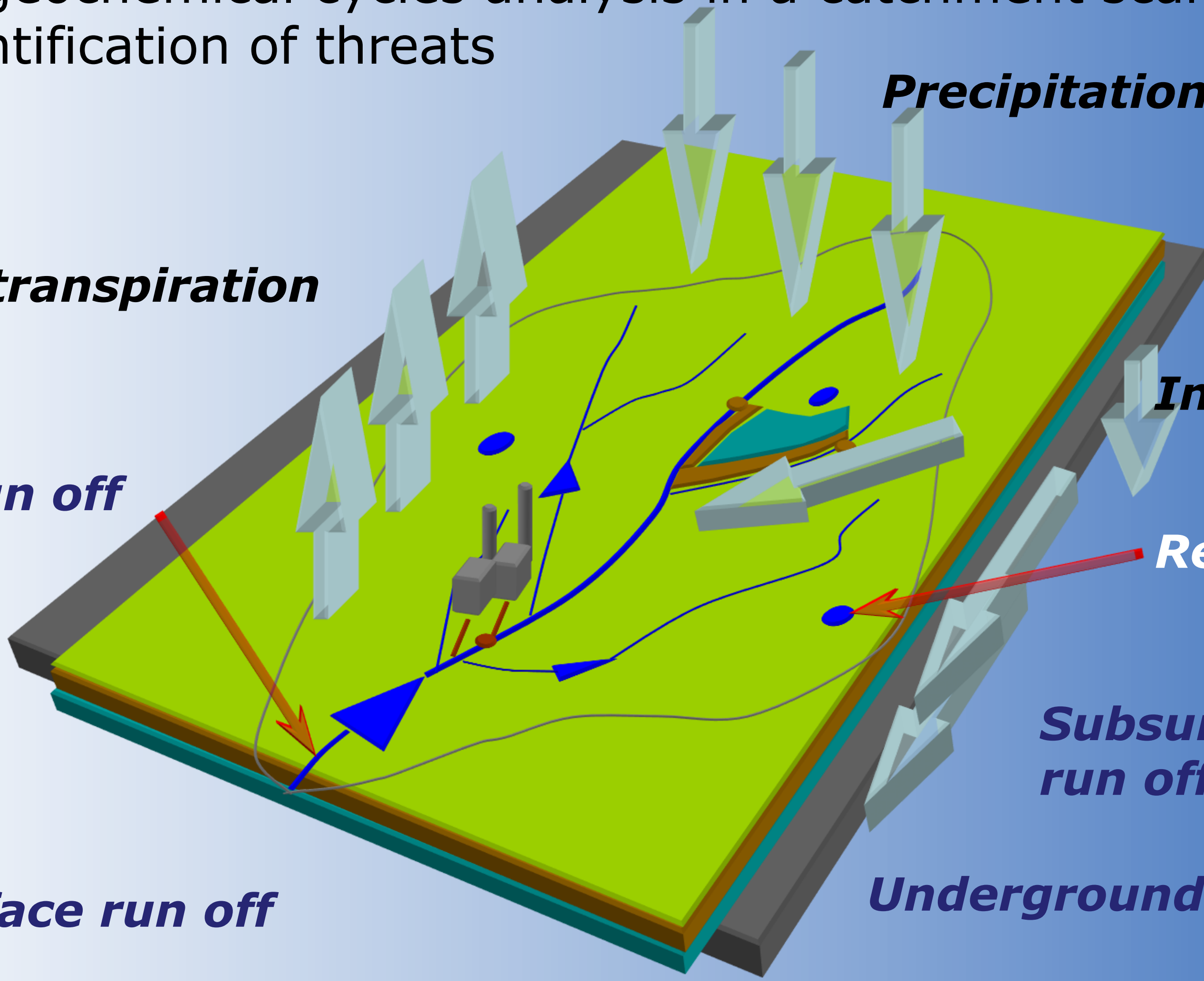
International
Hydrological
Programme

IHP-VIII 2014-2021

United Nations Educational, Scientific and Cultural Organization
International Hydrological Programme
ecohydrology programme

I – FIRST PRINCIPLE (Zalewski 2010)

Quantification of hydrological cycle as a template for biogeochemical cycles analysis in a catchment scale, and identification of threats



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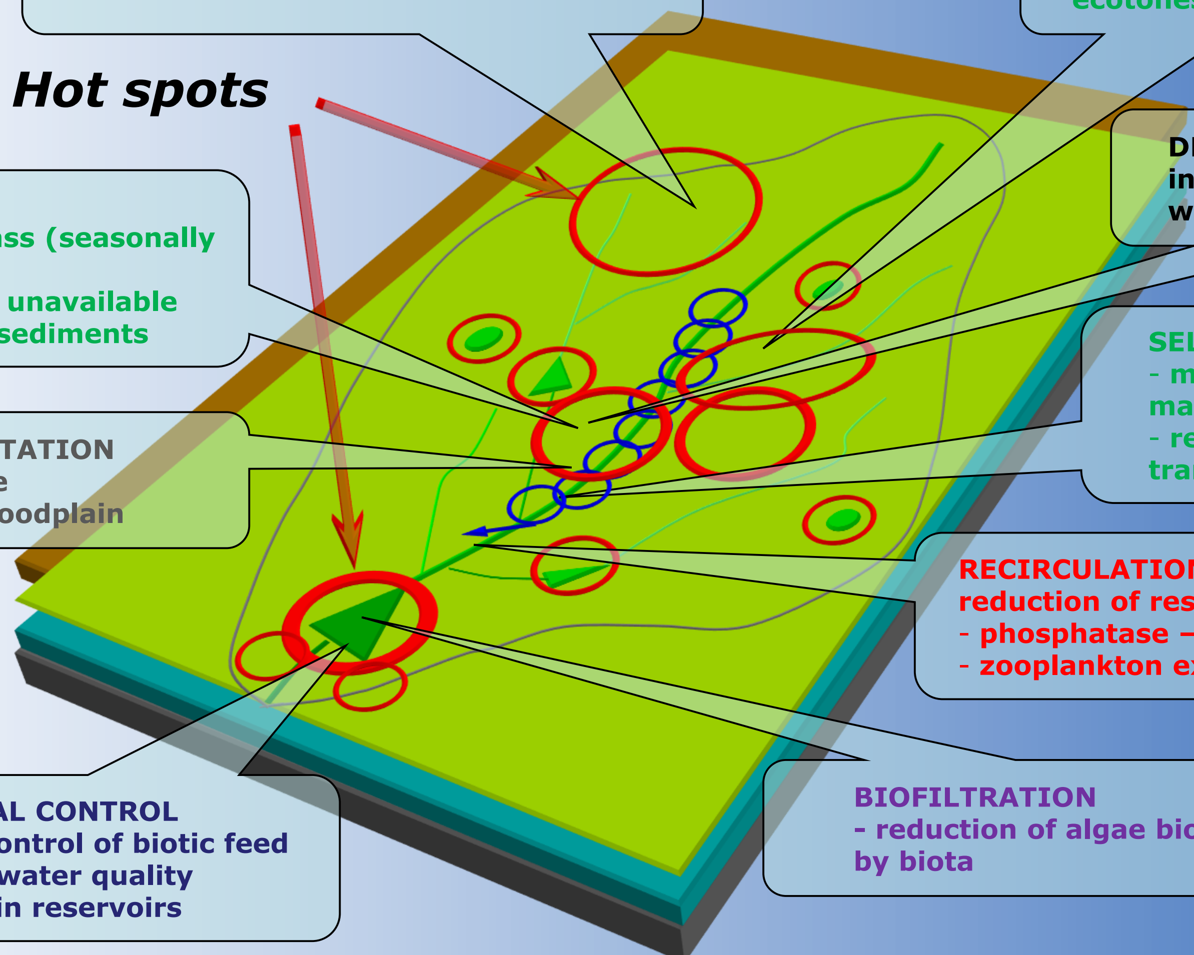
II – SECOND PRINCIPLE

(Zalewski 2008)

Identification of potential areas for enhancement of ecosystem carrying capacity



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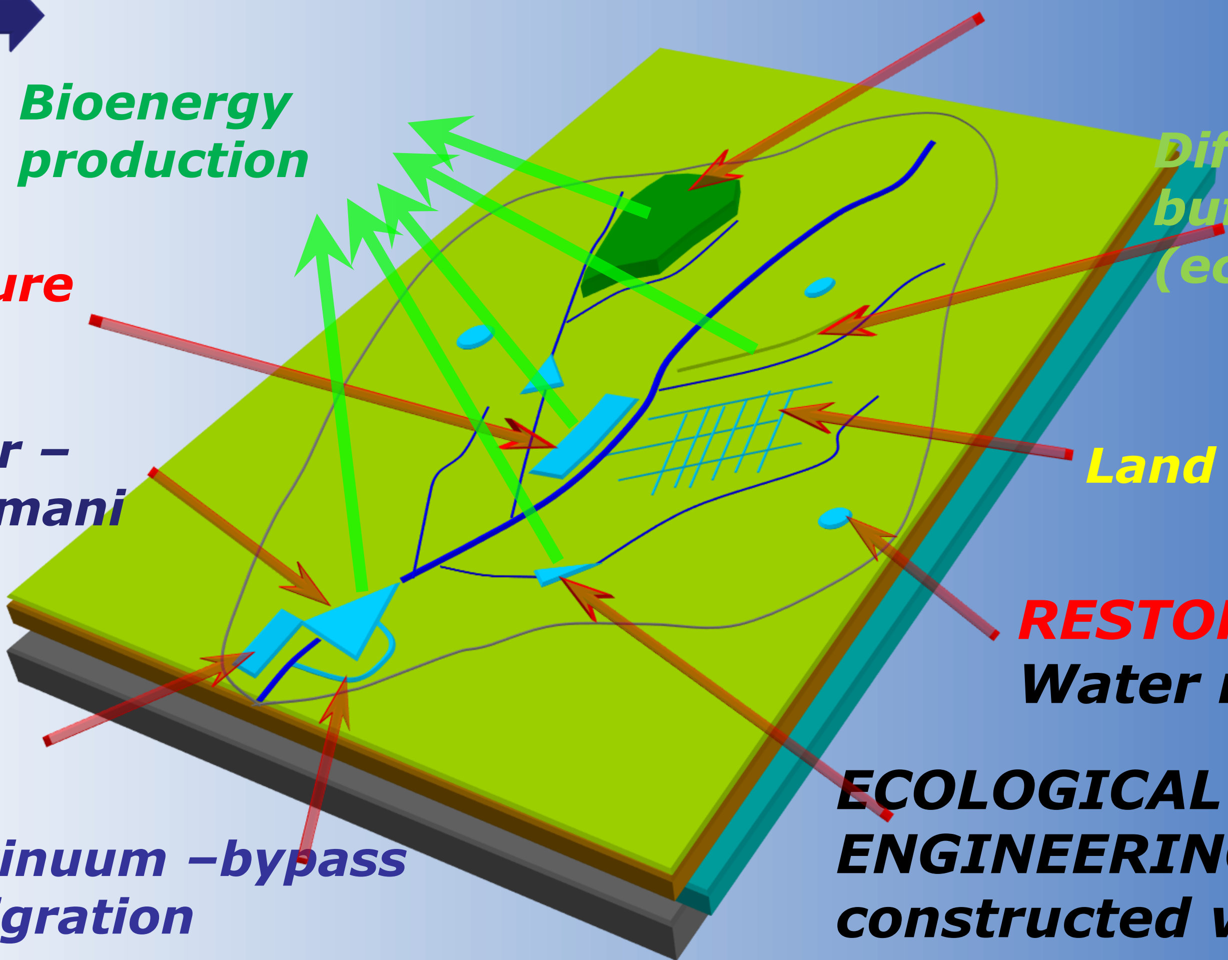
III – THIRD PRINCIPLE

Using biota to control hydrological processes and vice versa, using hydrology to regulate biota dynamics

H REGULATION **B**

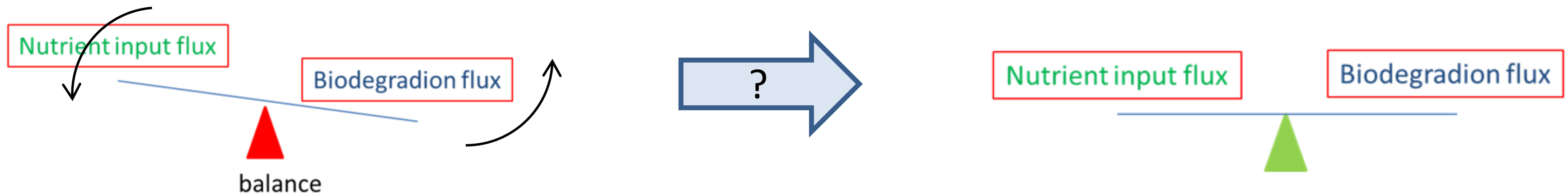
Dual regulation



Dual regulation principle

Polluted water courses

Natural water courses

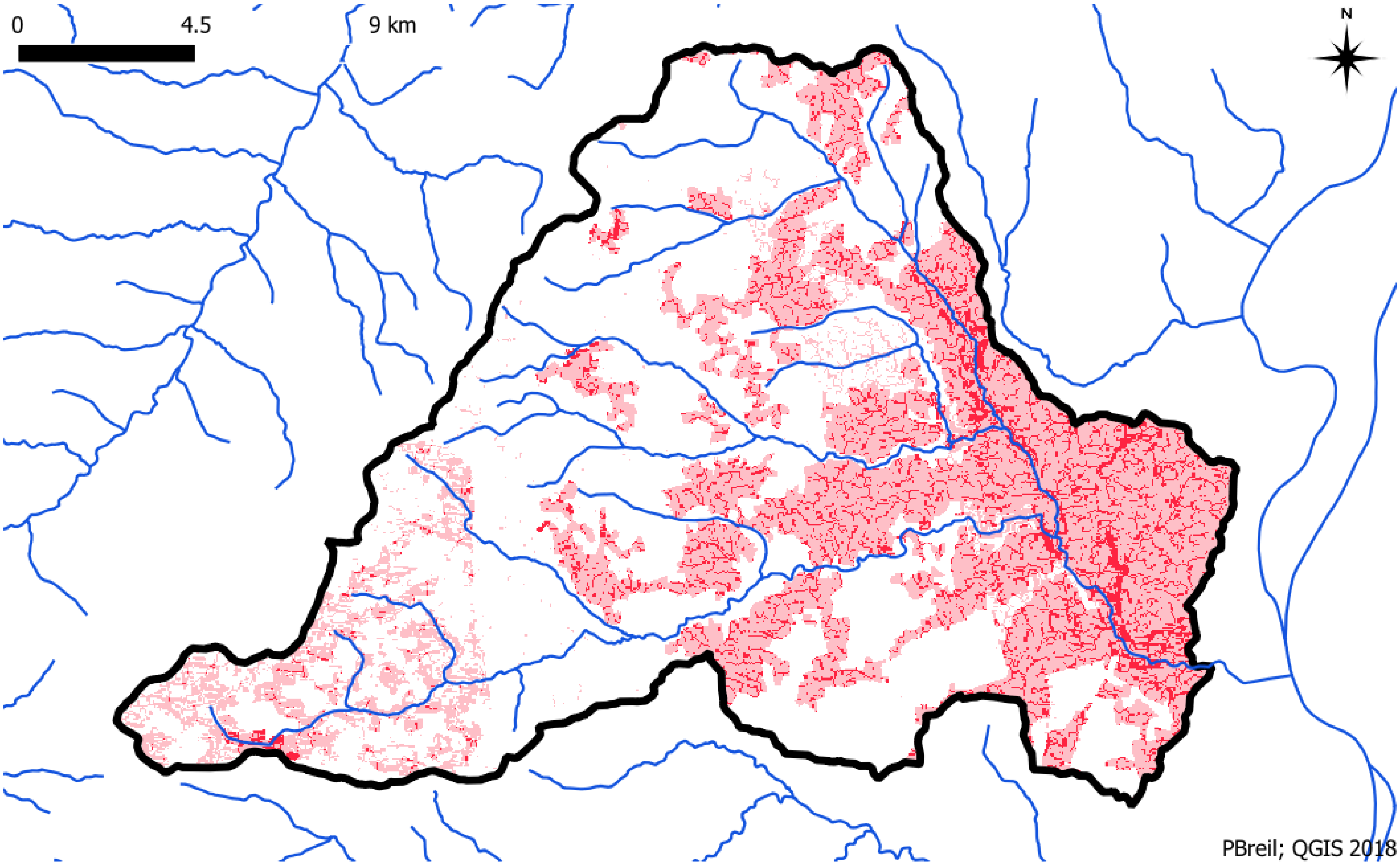


Biodegration flux = Biodegration kinetic * Reactive surface

Nutrients flux = Concentration * water discharge

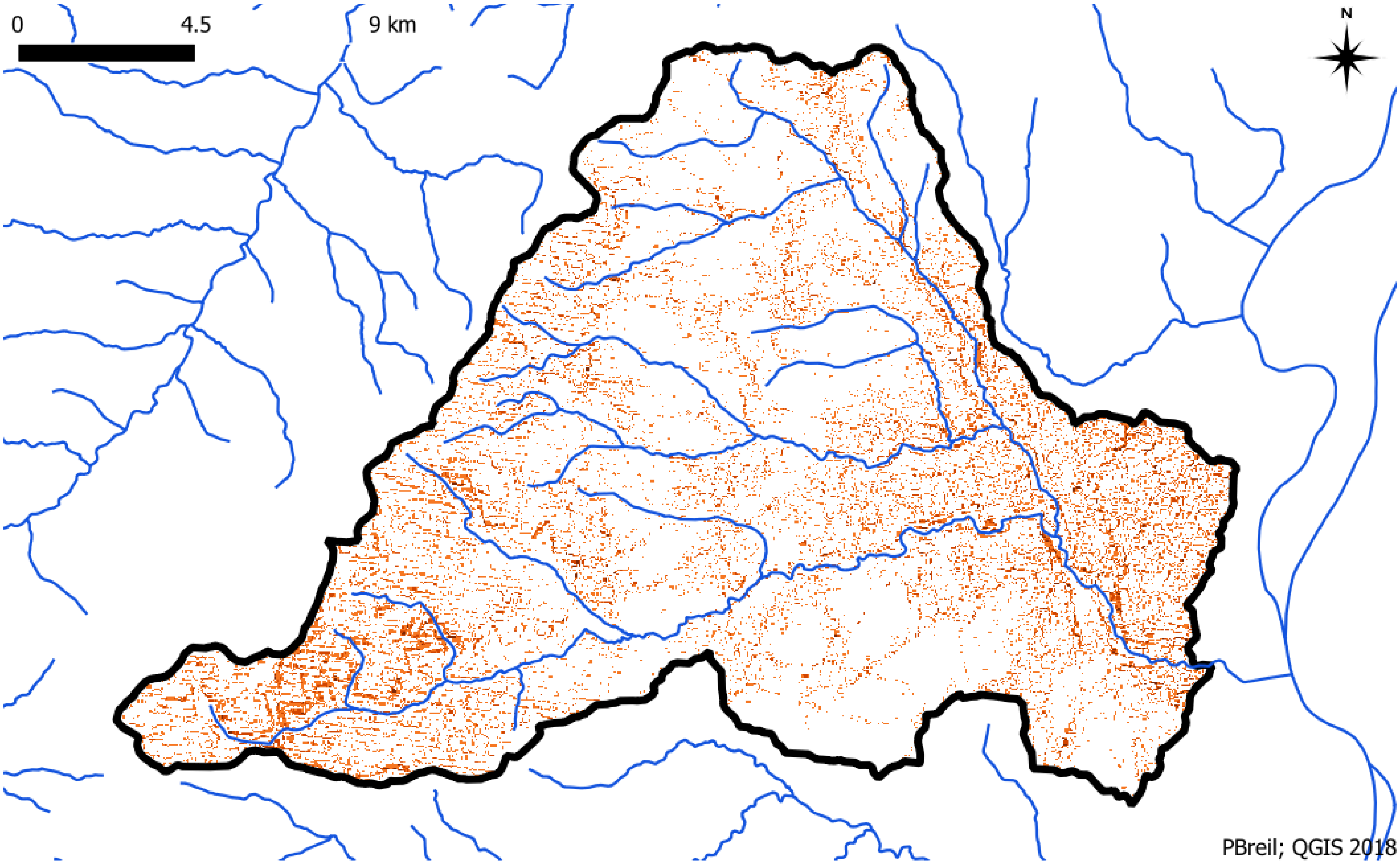
I – hydrological cycle

Where surface runoff does initiate?



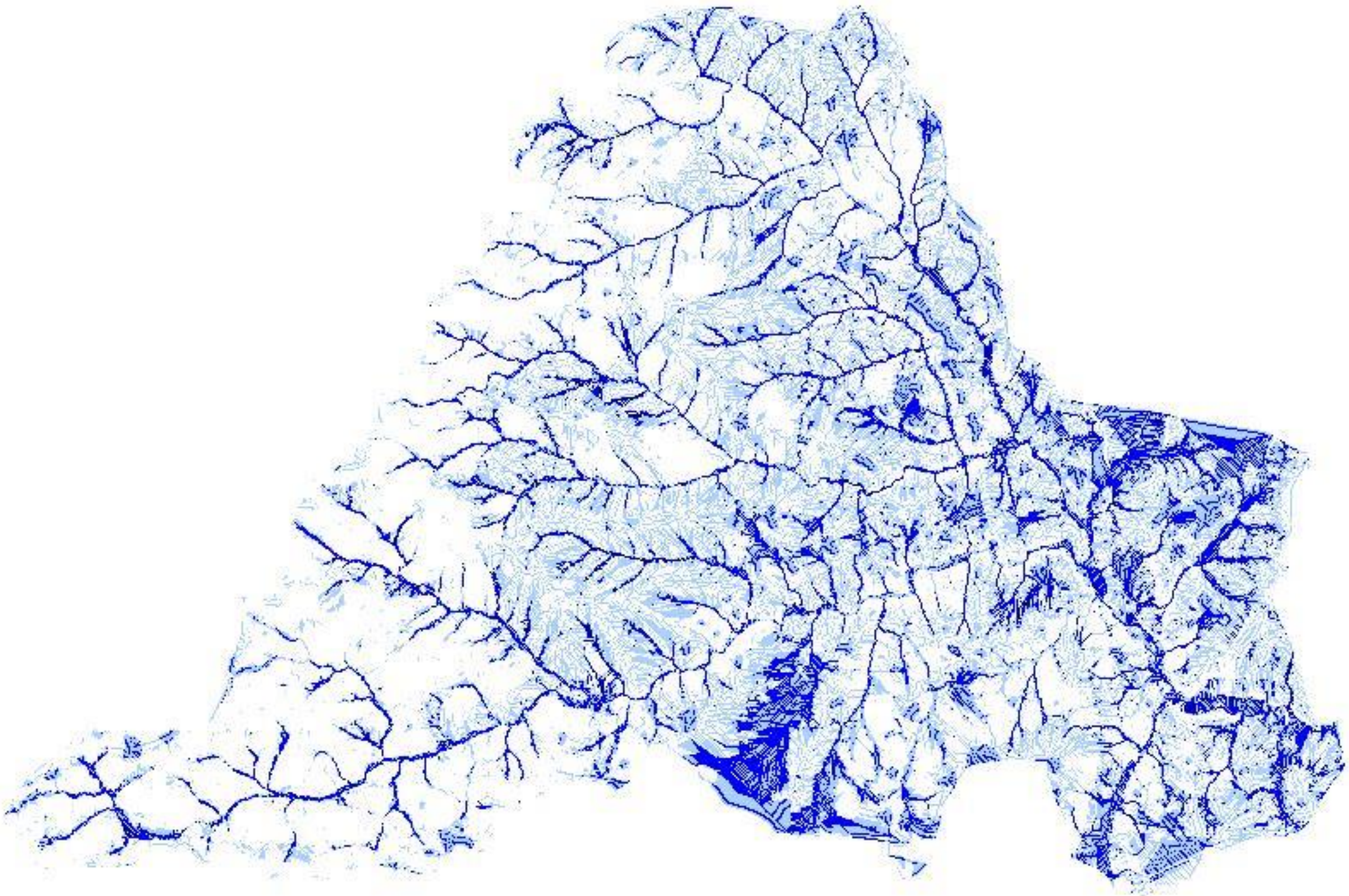
I – hydrological cycle

Where surface runoff does circulate?



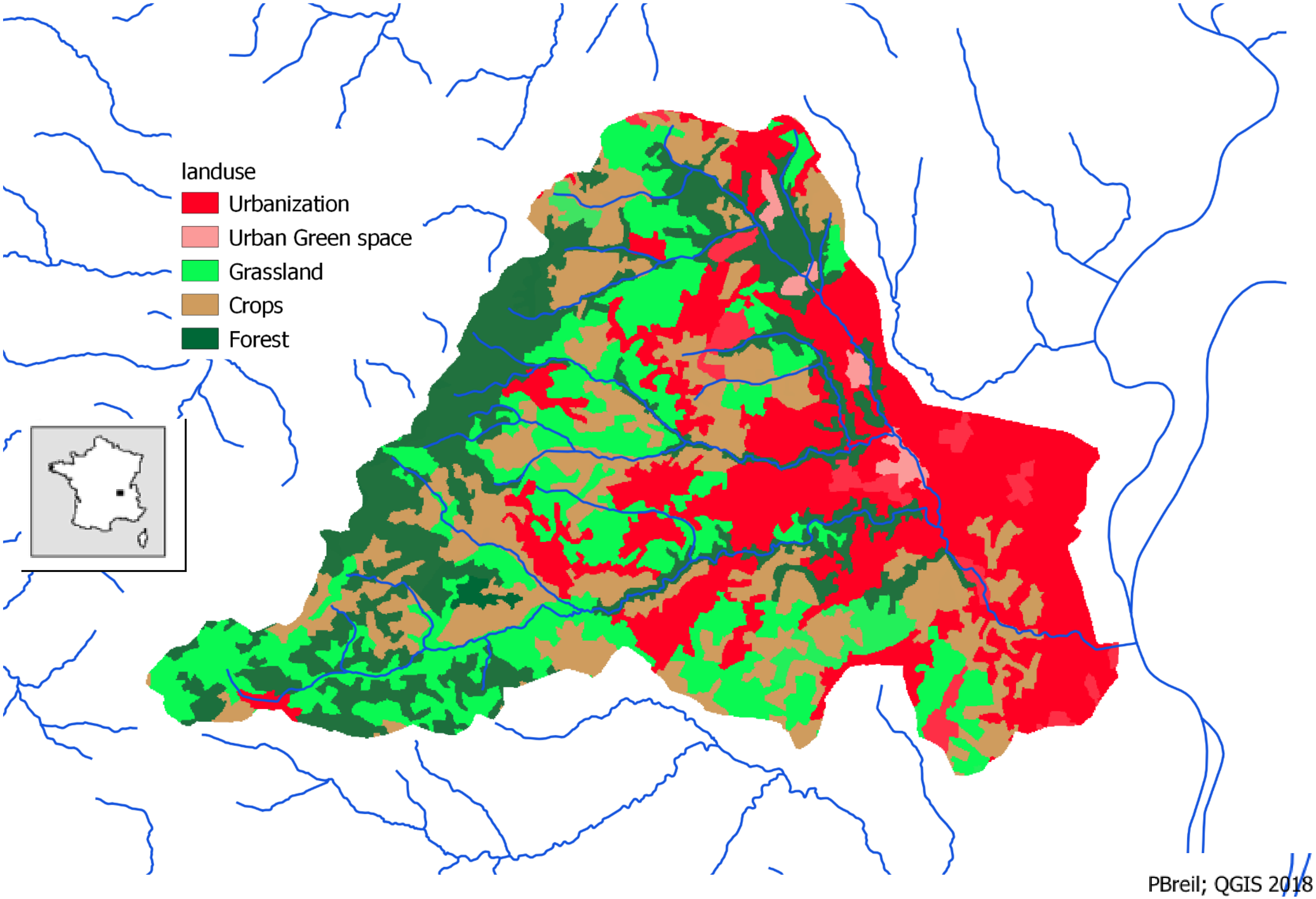
I – hydrological cycle

Where surface runoff does accumulate?



PBreil; QGIS 2018

II – Type of of threats



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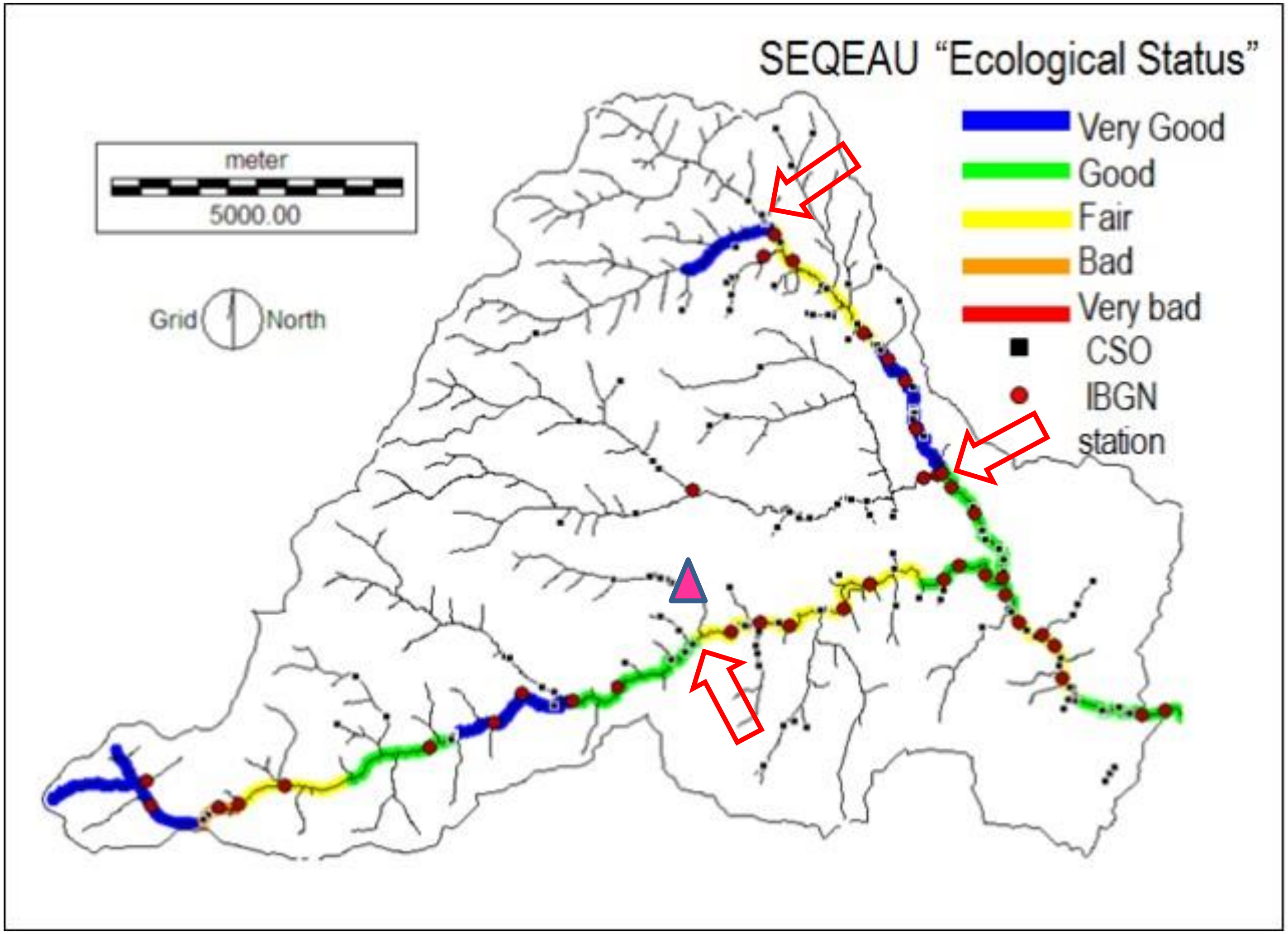
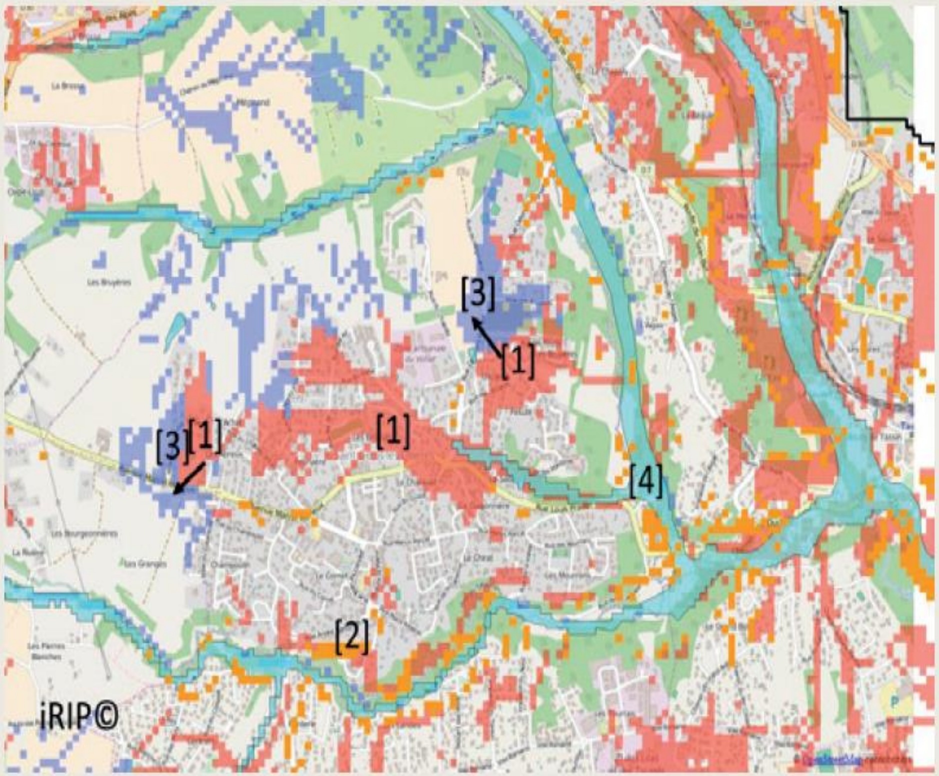
II – Type of threats



II – Type of threats
Rural land use

II – Type of threats
PeriUrban land use

❷ Il faut savoir cartographier les étapes du ruissellement intense pluvial afin d'imaginer des moyens de prévention adaptés.



L'inondation par ruissellement intense.

[1] zone de production – la lame d'eau peut atteindre quelques centimètres tout en s'écoulant.

[2] zone et axe de transfert – le ruissellement peut se concentrer, prendre de la vitesse et éroder les parties meubles, devenir boueux.

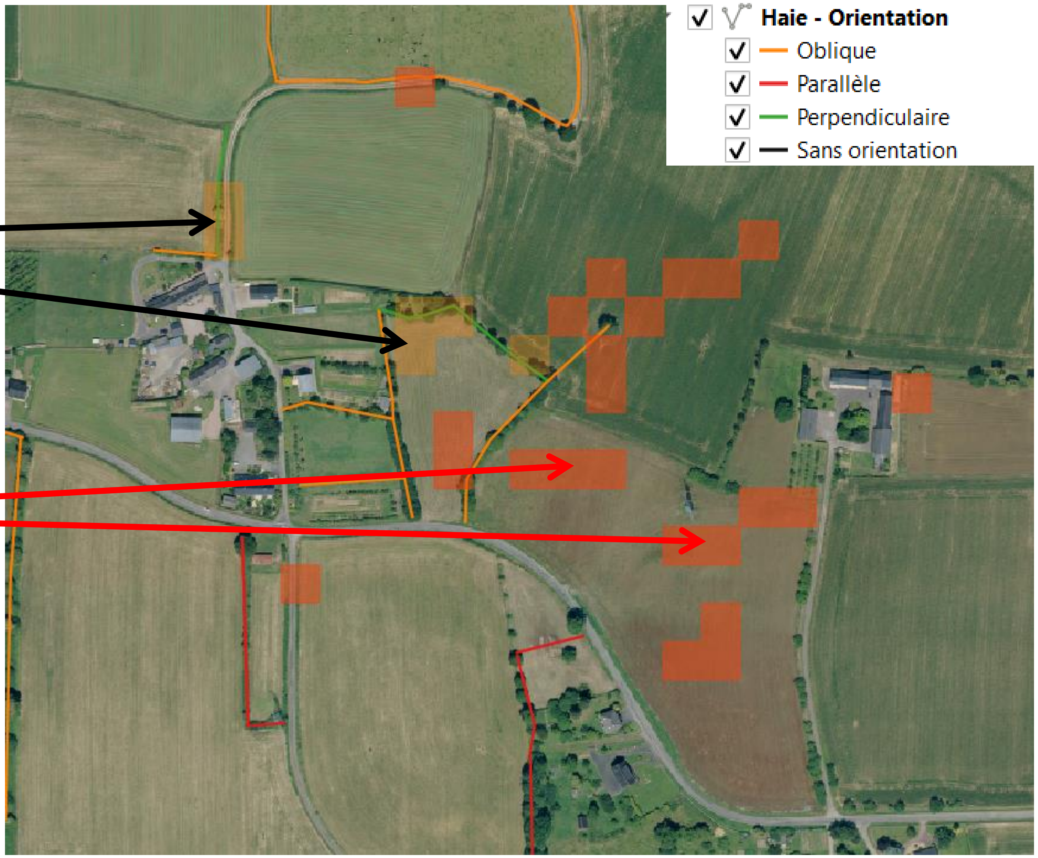
[3] l'écoulement est ralenti ou bloqué, la hauteur d'eau peut augmenter, inonder et les matières transportées se déposer, ensevelir.

[4] la limite de la zone inondable (EAIP) par débordement des cours d'eau.

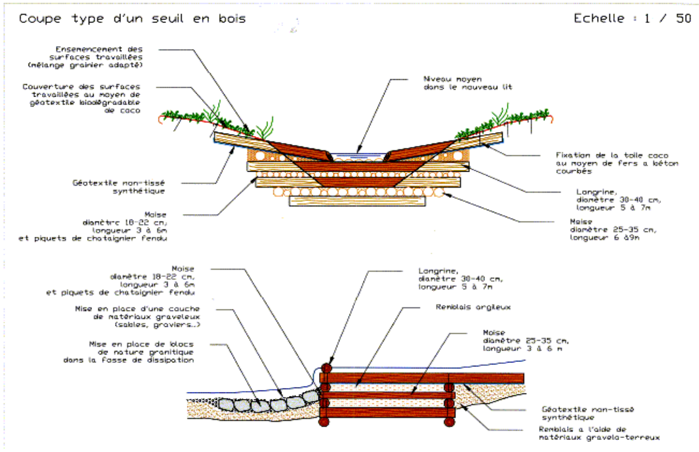
III – Natural based solution opportunities Rural land use

Haie
« efficace »
interceptant un
transfert de
ruissellement

Transfert de
ruissellement
non intercepté
par une haie

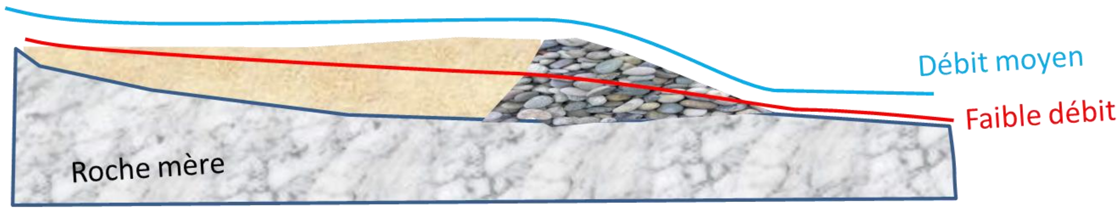


III – Natural based solution opportunities
Periurban land use

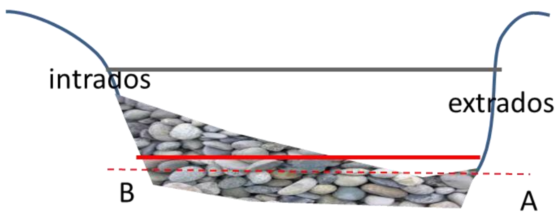


" Porous weir"

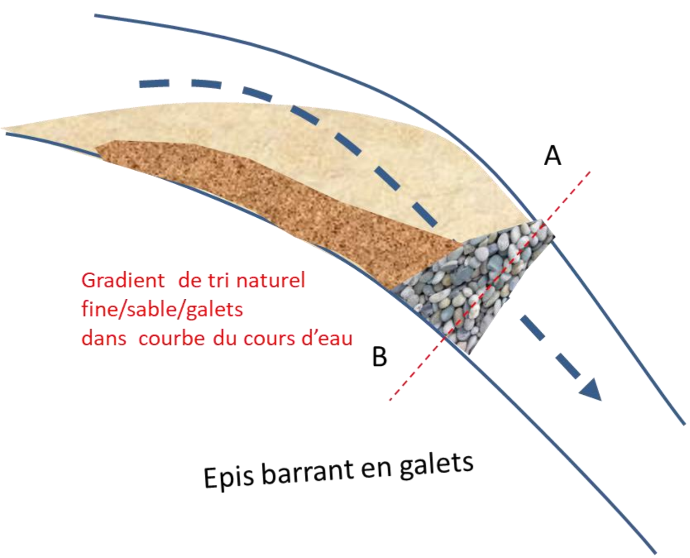
III – Dual regulation into seasonal- rivers



Ep moyenne du lit de sable de 40 cm à calculer selon pente locale. Détermine hauteur de l'épis

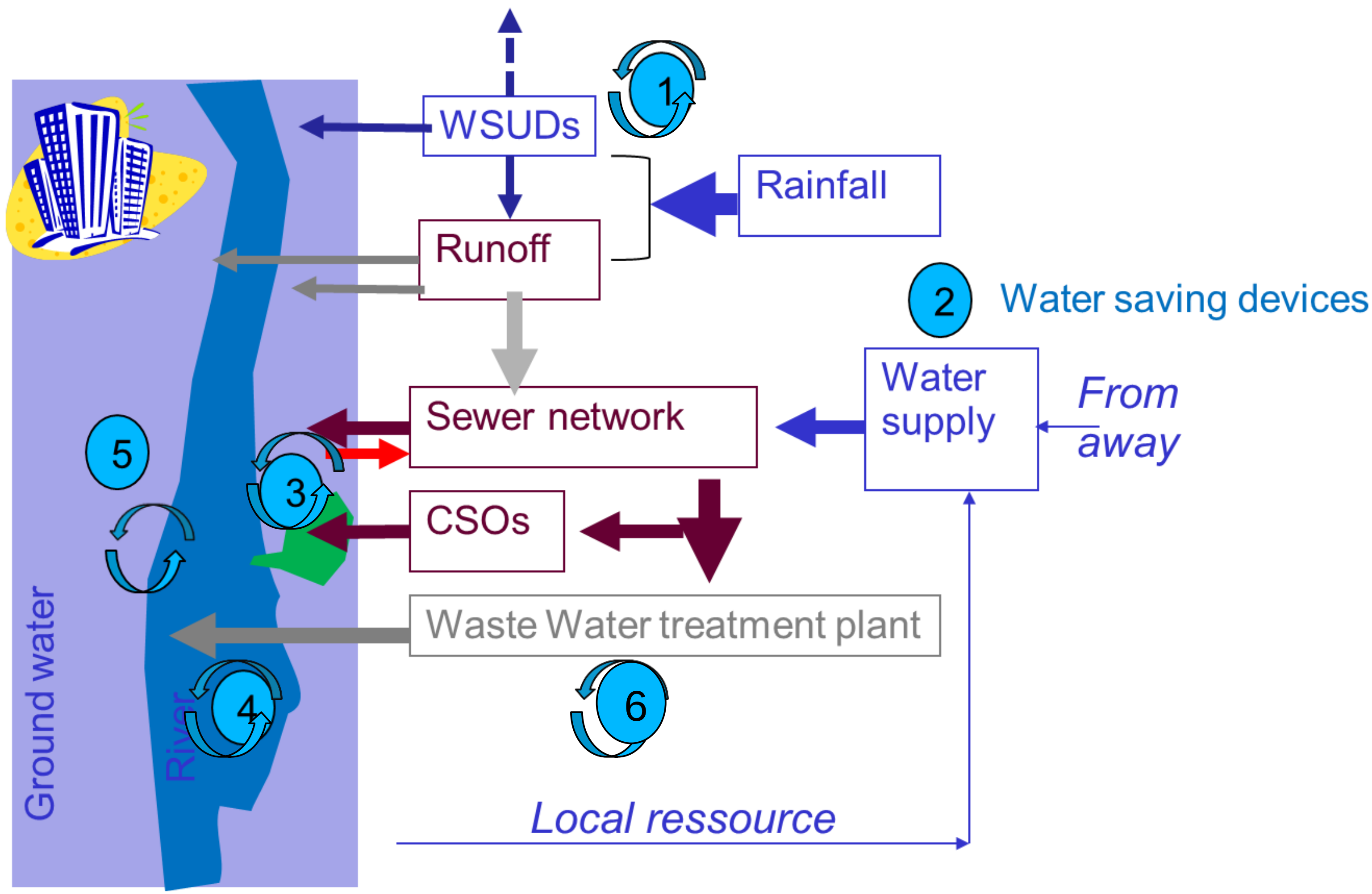


Fonctionnement:
Interception pollution complète à faibles débits
Régénération biochimique à débit moyen
Régénération physique à fort débit

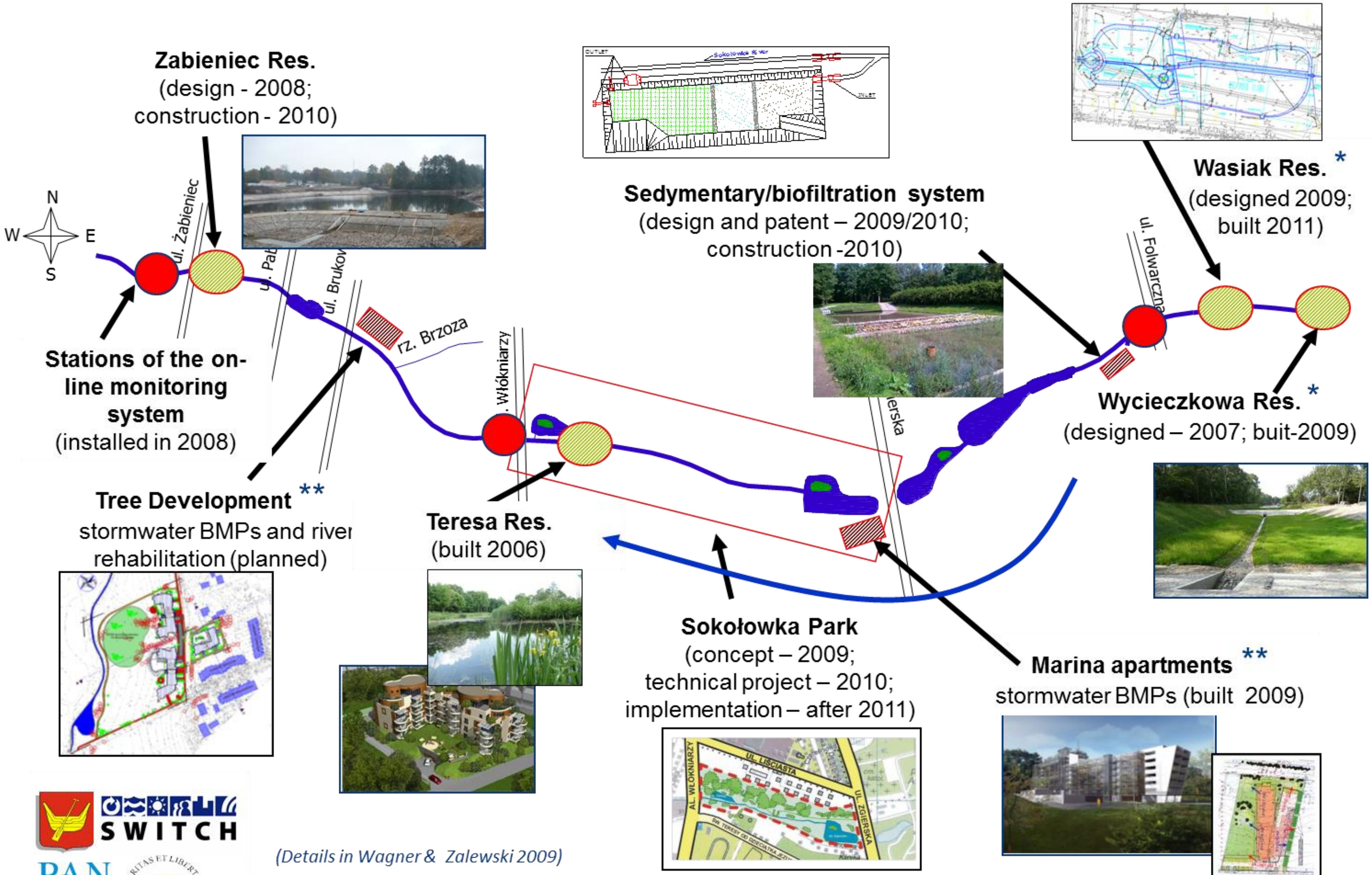


Principe d'un épi poreux (Breil & Namour, 2017)

III – Natural based solution opportunities Into dense urban land use

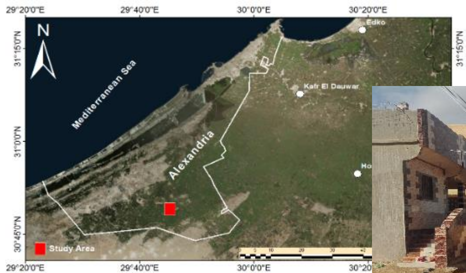


VI– range of solutions in dense urban areas



(Details in Wagner & Zalewski 2009)

Egyptian case



Rural area
(Diab Village)

High salt concentration of the ground water and canal irrigation

Deterioration of soil quality and limited cultivation

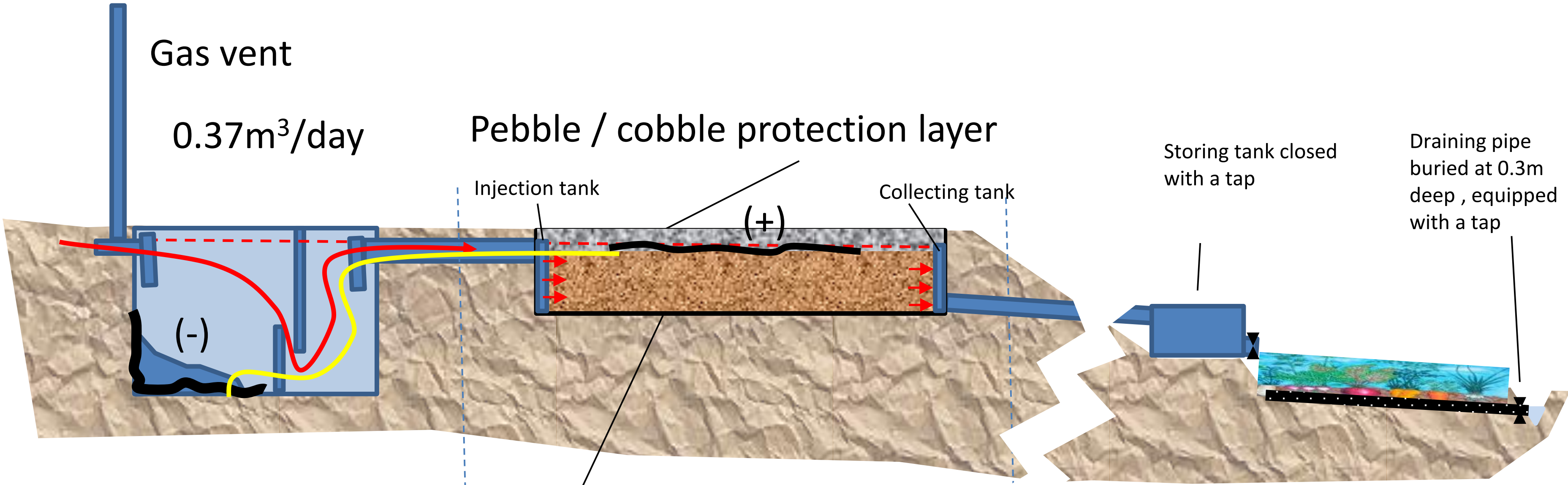
No wastewater treatment system

Samples were collected from available water sources

Public participation

- **Community entering through “Future Protectors” NGO**
- Deciding after Listening
- Sharing decisions
- The output can be start-ups

Anaerobic biodegradation



Sceptic tank principle

<u>Anoxic biodegradation phase</u>

Design
3-4 m^3 for 5 persons

Must be cleaned every 3 years

Medium to coarse sand (0.25<∅<1mm)

<u>Oxic mineralization phase</u>

Design assuming
Hydraulic conductivity of 10^{-4} m/s
Sand Volume of 0.5 m X 2.0 m X 12.0 m
Hydraulic gradient of 0.5 m

Which gives:
A flux of 0.36 m^3/day
Residence time of 10 days
Storage capacity of 3.7 m^3

Phase 1 : washing soil by flooding irrigation (as it is practice by local people). Duration is 40 days for a plot of 5m2 flooded each night under 0.07 m of treated WW.

Phase 2 : drip irrigation with 0.007 m / day (0.7 cm) required for vegetable growing in arid zone (FAO data).

WHAT ARE THE DEMONSTRATION SITES?

http://ecohydrology-ihp.org/demosites/

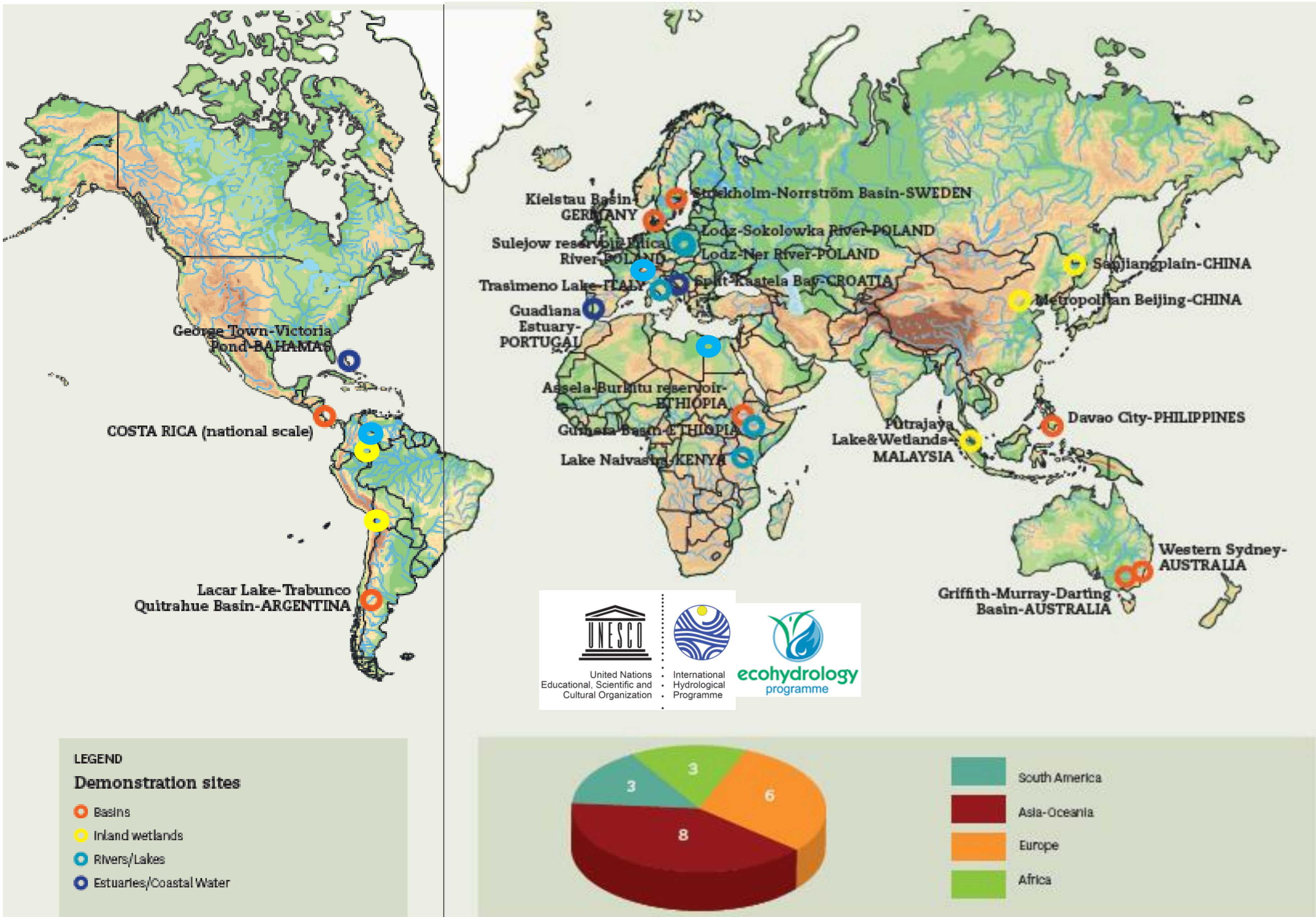
The Ecohydrology Programme is also based on a network of demonstration site which integrate the concept of "**enhanced ecosystem potential**" with EH strategies closely related with water to improve IWRM on specific areas.

They:

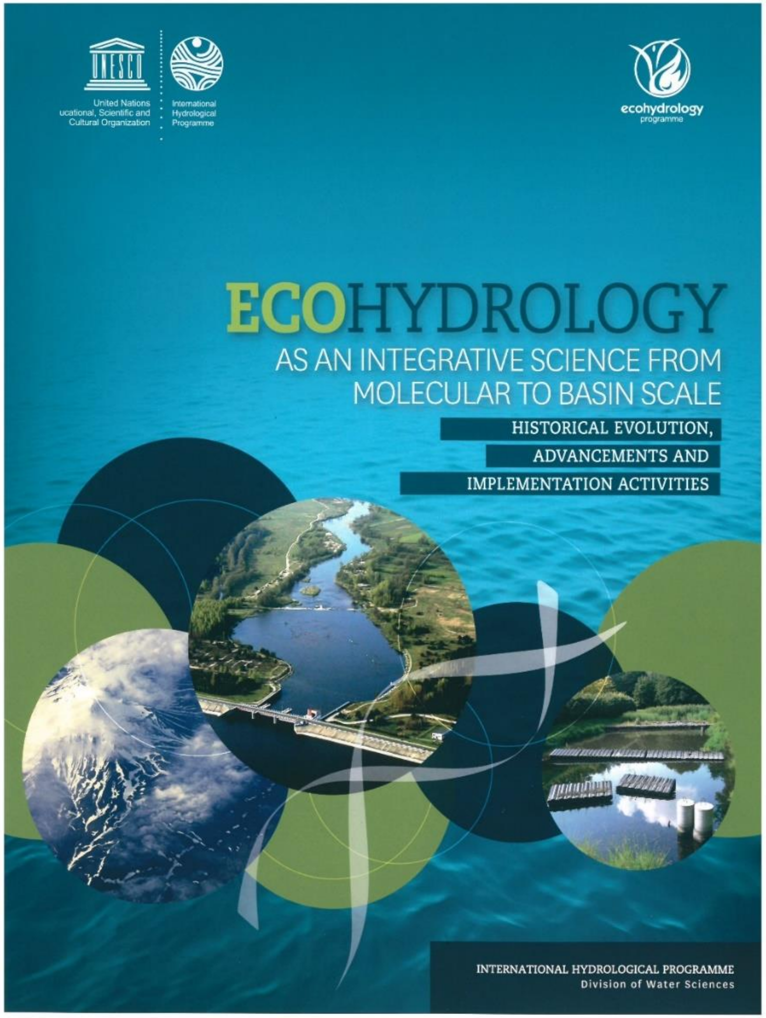
- Are **long-term monitoring** projects involving different local stakeholders in order to solve environmental, economic and social issues.
- Use the **most appropriate** and **cost-effective** ecohydrological engineering solutions for each ecosystem as management tools for Integrated Water Resources Management (IWRM).
- Provide contribution for both **human** sustainable development goals (e.g. Goal 2) and **environmental** ones (Goal **6**, in particular targets 6.5 & 6.6, and Goals 13, 14 and 15).

These projects follow a solution-oriented approach for the enhancement of **W**ater resources, **B**iodiversity and ecosystem **S**ervices for society and of the **R**esilience to various forms of anthropogenic impacts (**WBSR+C**).

Network of the demonstration sites



Dissemination Material



EcoHydrology is not just greening!