The challenge of climate change for Paris Region's sanitation

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- **SIAAP’s presentation**
- **Climate change Seine river catchment**
- **The challenge**

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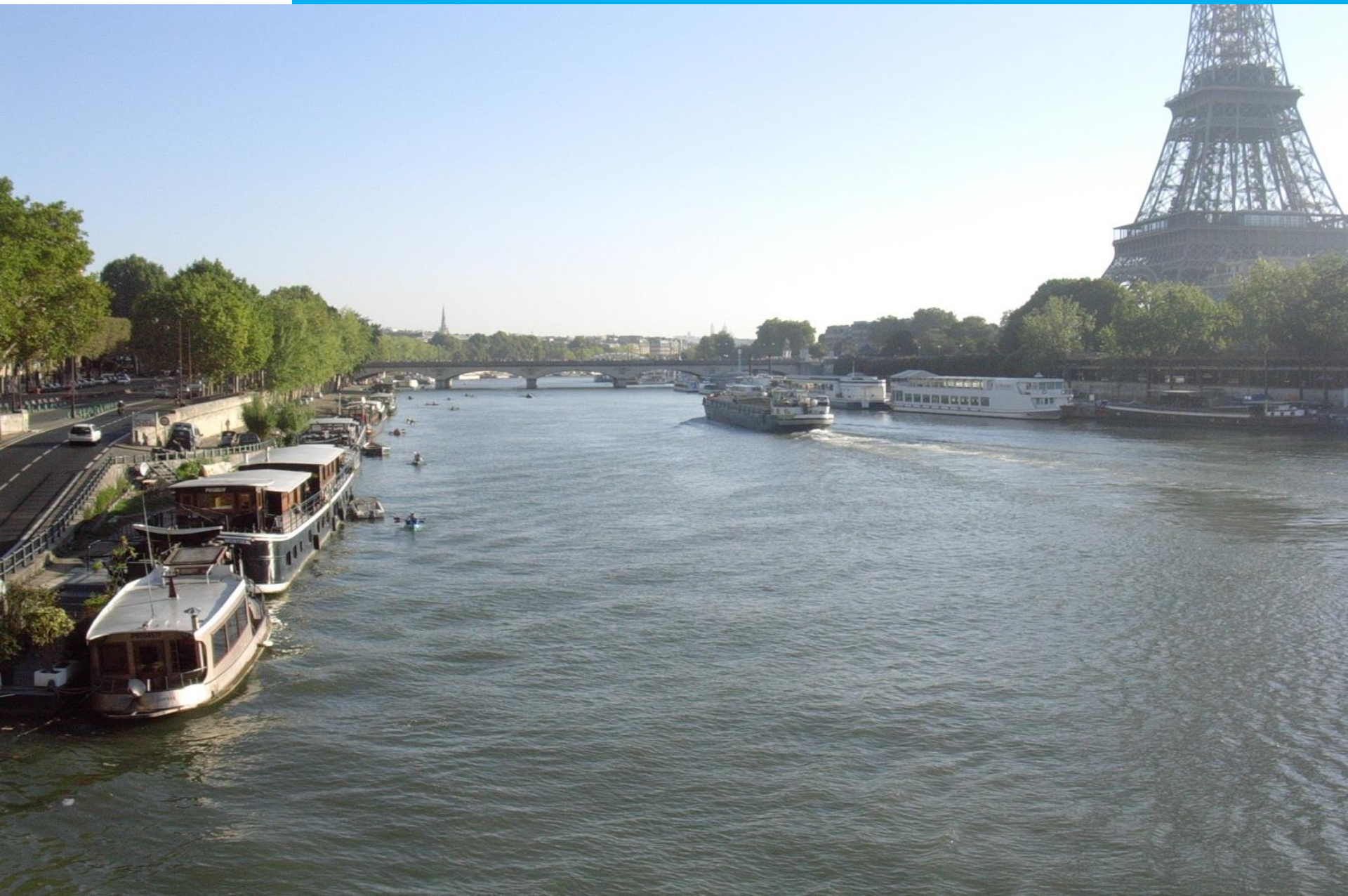
The Seine river in Paris…



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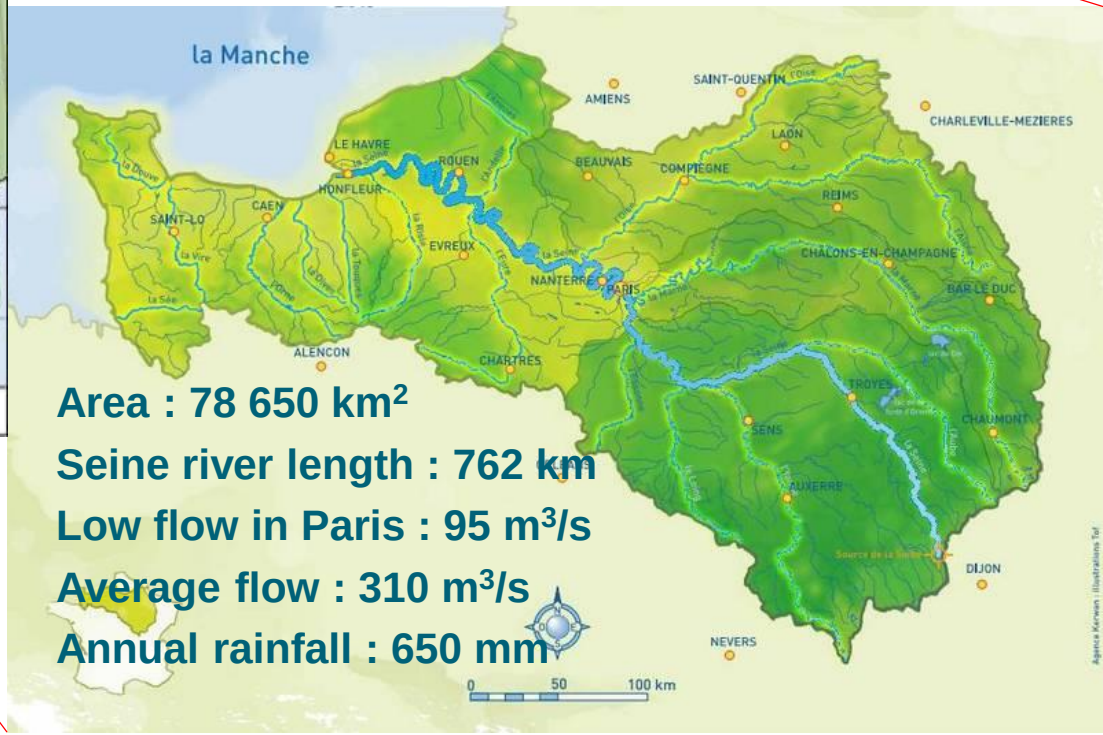
Seine river Catchment



Area : 78 650 km²

Seine river length : 762 km

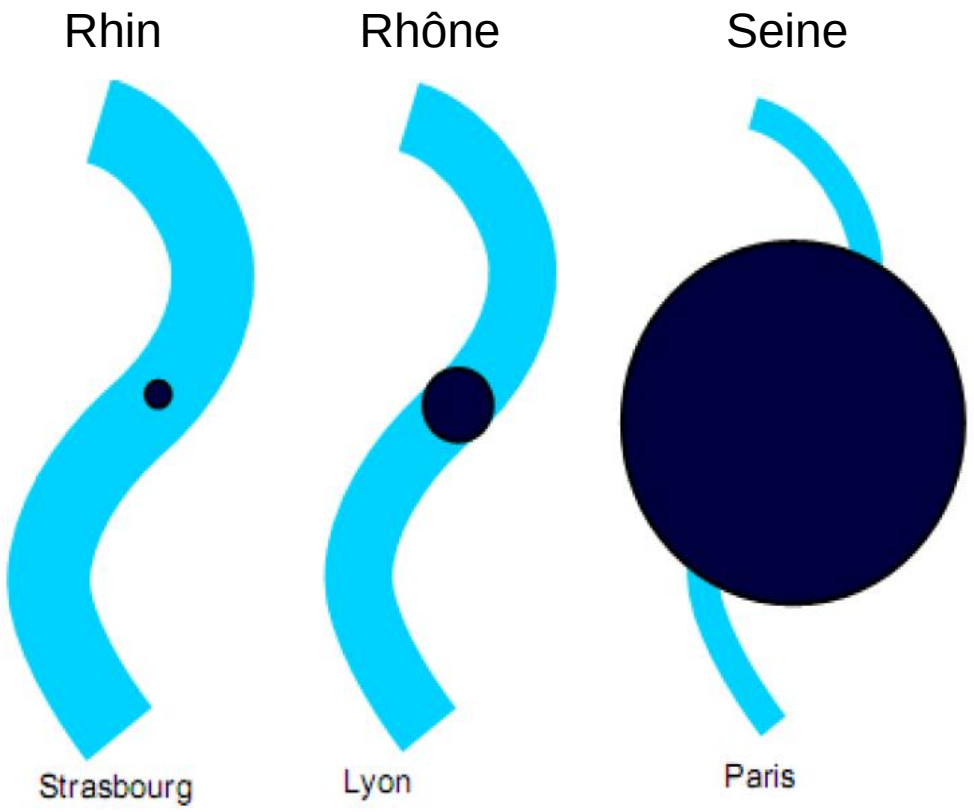
Low flow in Paris : 95 m³/s

Average flow : 310 m³/s

Annual rainfall : 650 mm

A small river under a high anthropogenic pressure

- **Seine river low flow in Paris : 91 m³/s**



m³ /d/inhabitant	**65**	**18**	**1,2**

Source : DRIEE

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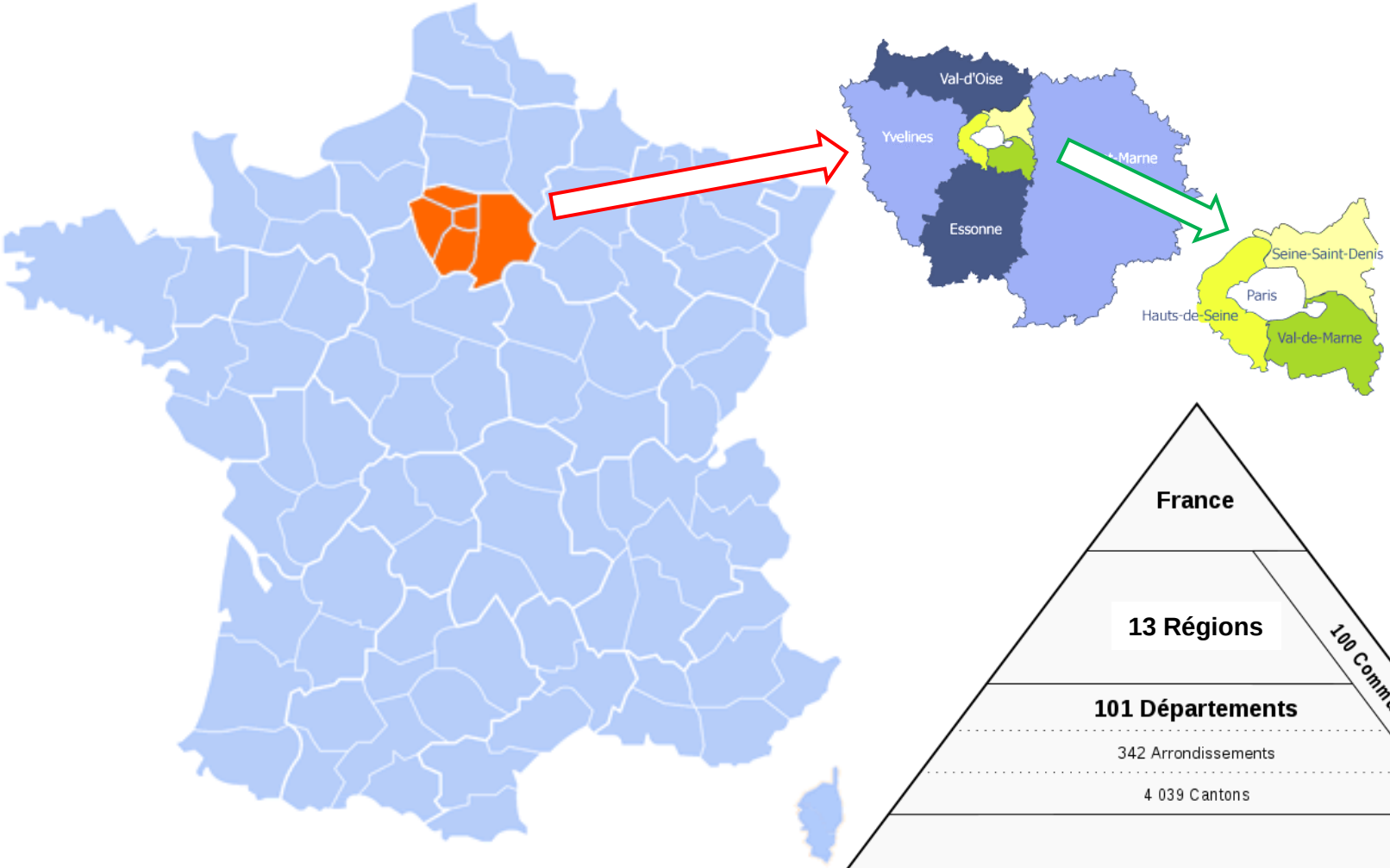

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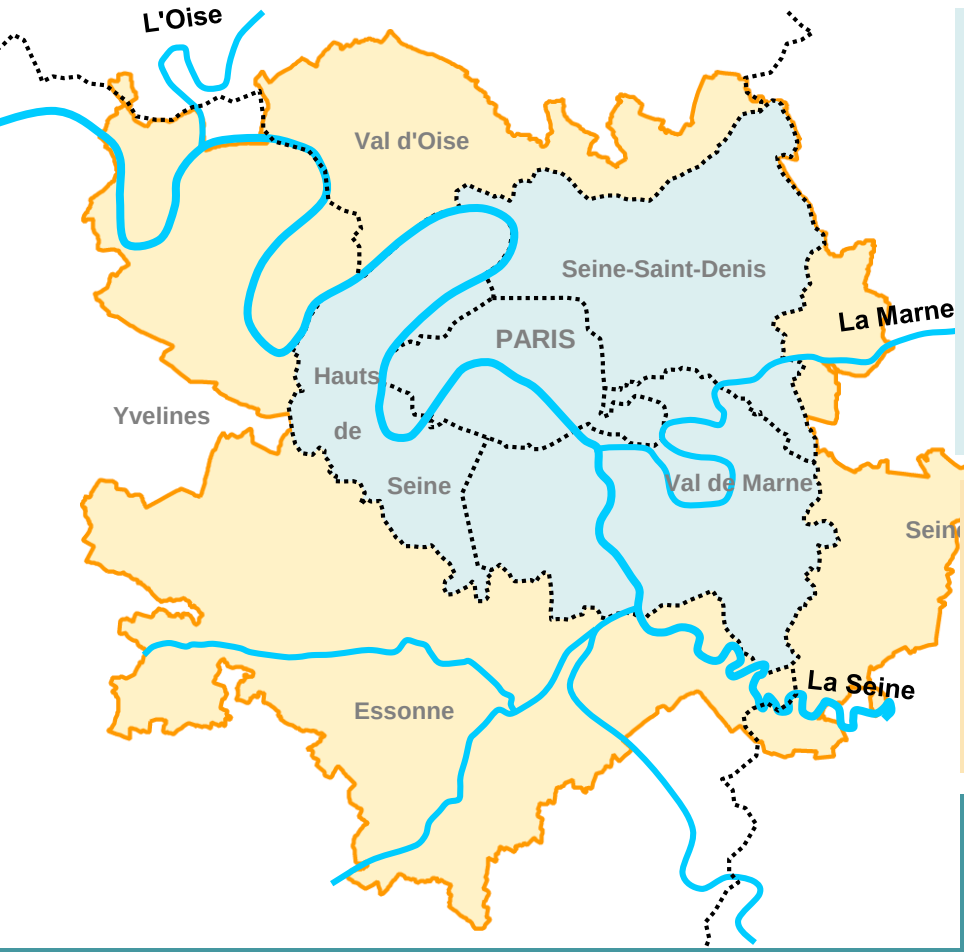
SIAAP presentation



The formally SIAAP

- 4 departments (administrative divisions of France)

The SIAAP Board (33 elected members)

- 124 municipalities
- 6.6 M inhabitants

Extended SIAAP limits

- 164 municipalities
- 2.3 M inhabitants

- 1800 km²
- 2 400 000 m³/d
- Mainly a combined sewer system
- Outer suburb : separate system

SIAAP :

- 288 municipalities
- 9 M connected inhabitants
- 400 industrial companies
- 15 000 km of municipal sewers

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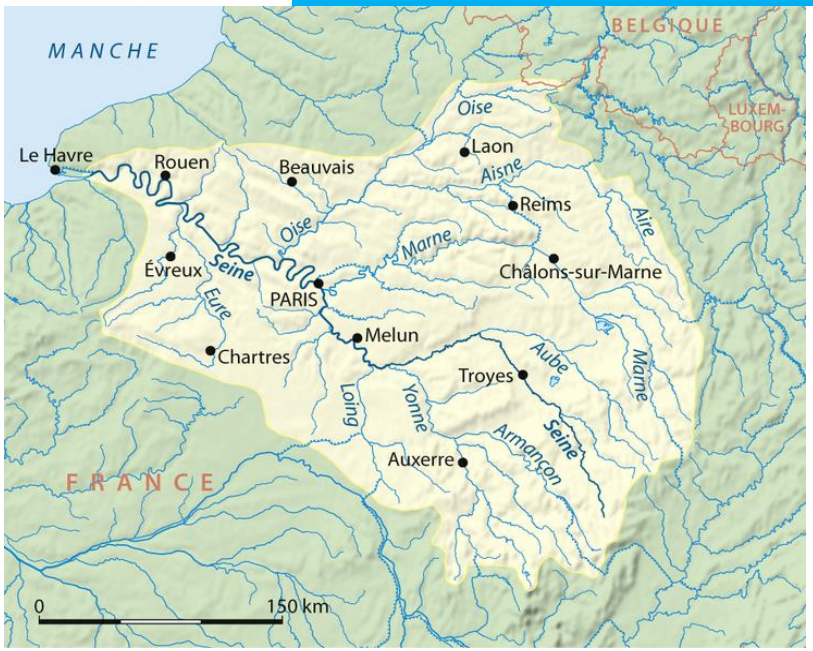
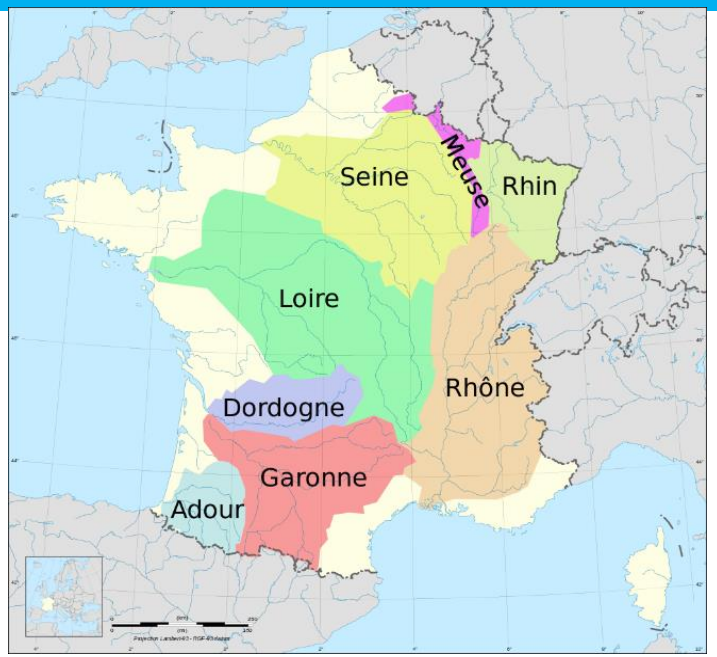
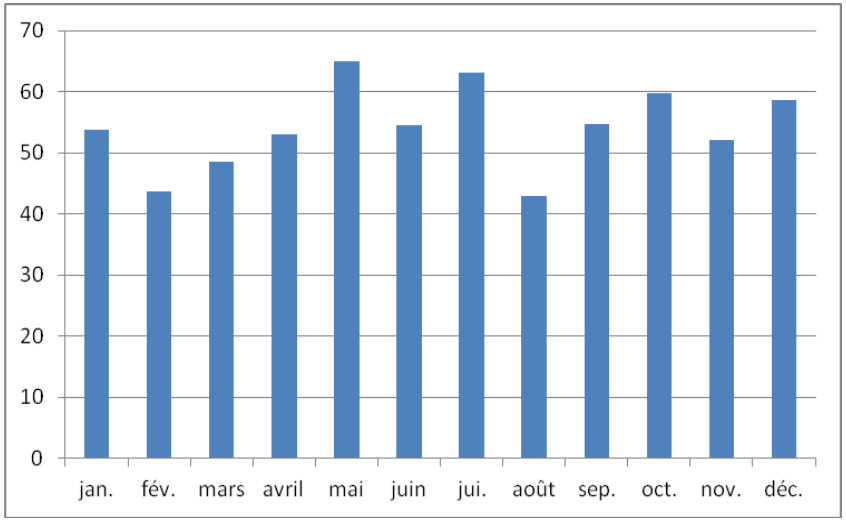
Surface Water





Annual average rain
640 mm/year



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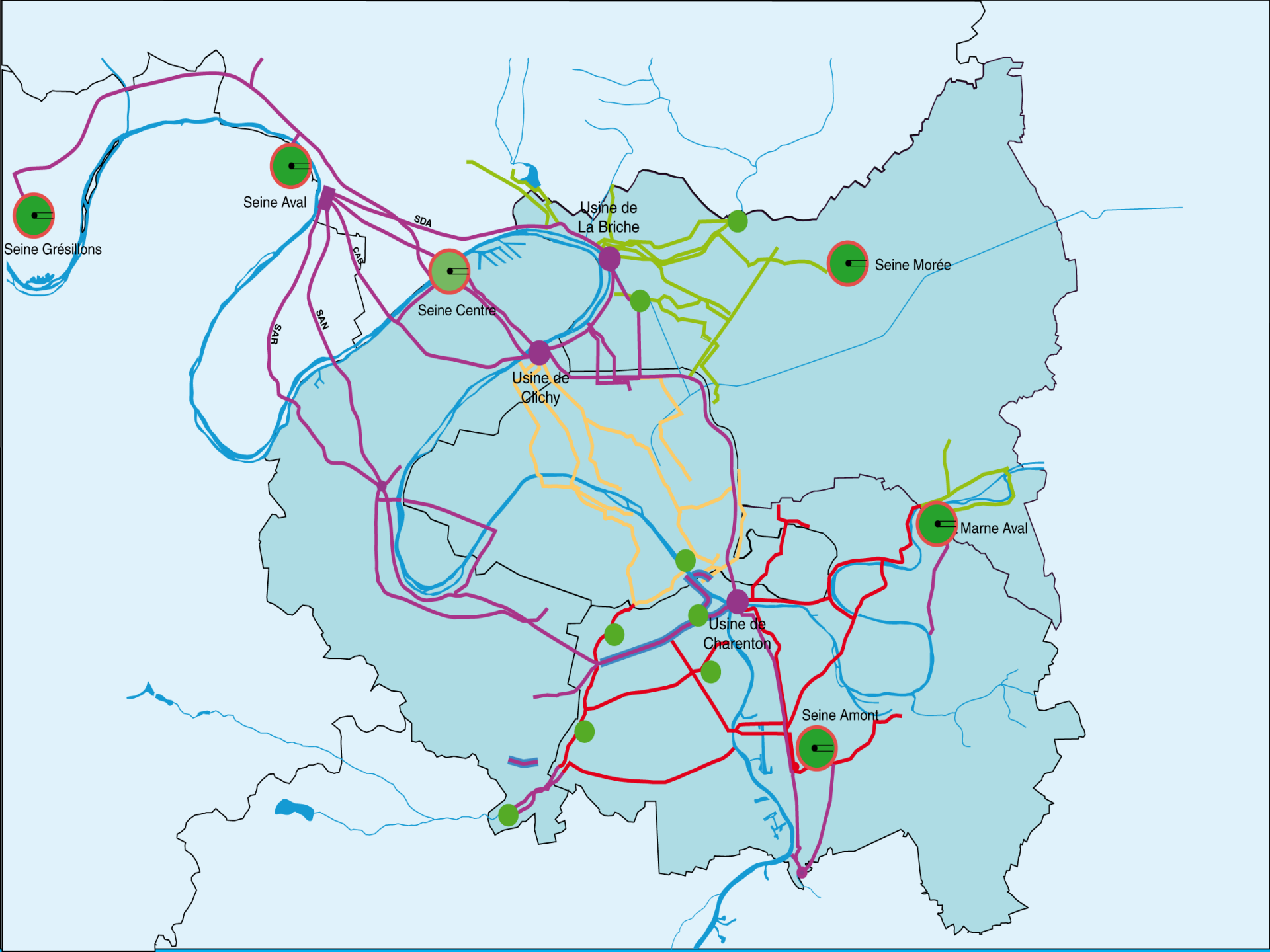
Seine Grands Lacs

Total storage capacity: 850 000 000 m³


Seine Grésillons
Seine Aval
SDA
CAS
SAN
SAR
Seine Centre
Usine de
La Briche
Seine Morée
Usine de
Clichy
Marne Aval
Usine de
Charenton
Seine Amont

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Exceptionnal catches

Salmon 07/09/2008 at Maisons-Laffitte (78)

Sea trout 26/07/2008 at Suresnes (92)

Salmon October 2008 at Suresnes (92)

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CLIMATE CHANGE

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Climate Studies

- **GICC-Seine** (2004, coord. Univ. Paris 6)
  - Impacts hydrologiques et biogéochimiques des changements climatiques sur la Seine

- **RExHySS** (2009, coord. Univ. Paris 6)
  - Impacts des changements climatiques sur la Seine et la Somme

- **Explore2070** (2012, coord. MEDDE)
  - Adaptation aux changements climatiques en France

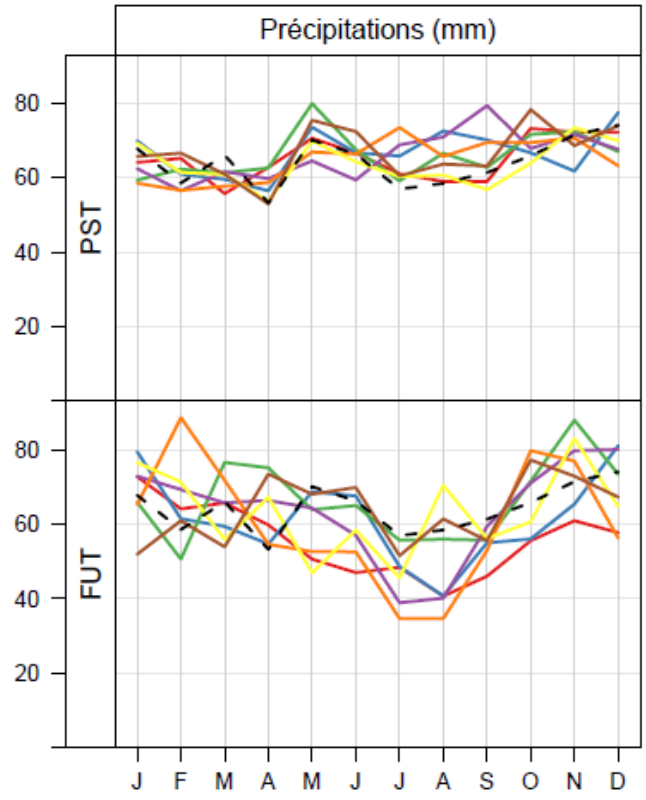
- **Climaware** (2013, coord. Irstea / Seine Grands Lacs)
  - Impacts des changements climatiques sur la gestion des lacs-réservoirs

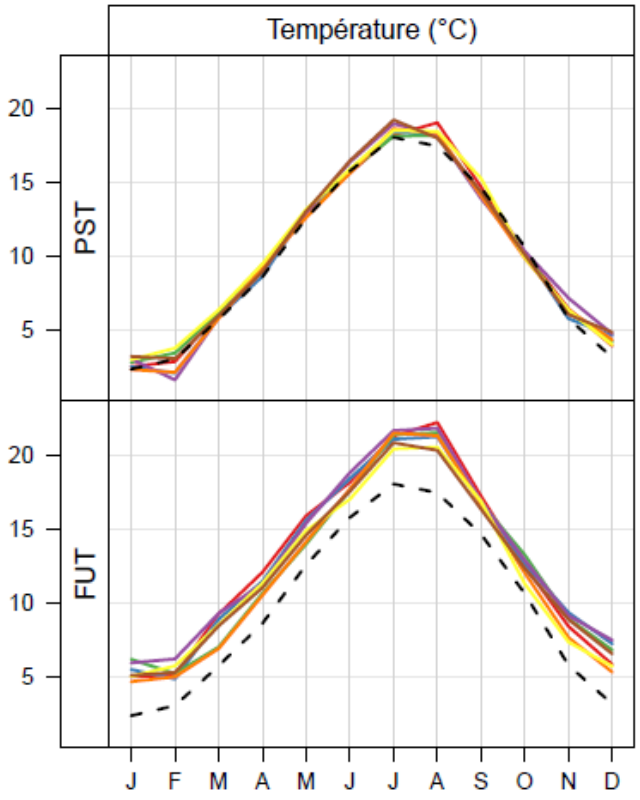
Climate impact on Seine basin

A1B IPCC scenario

Présent 1961-1990

Futur 2046-2065

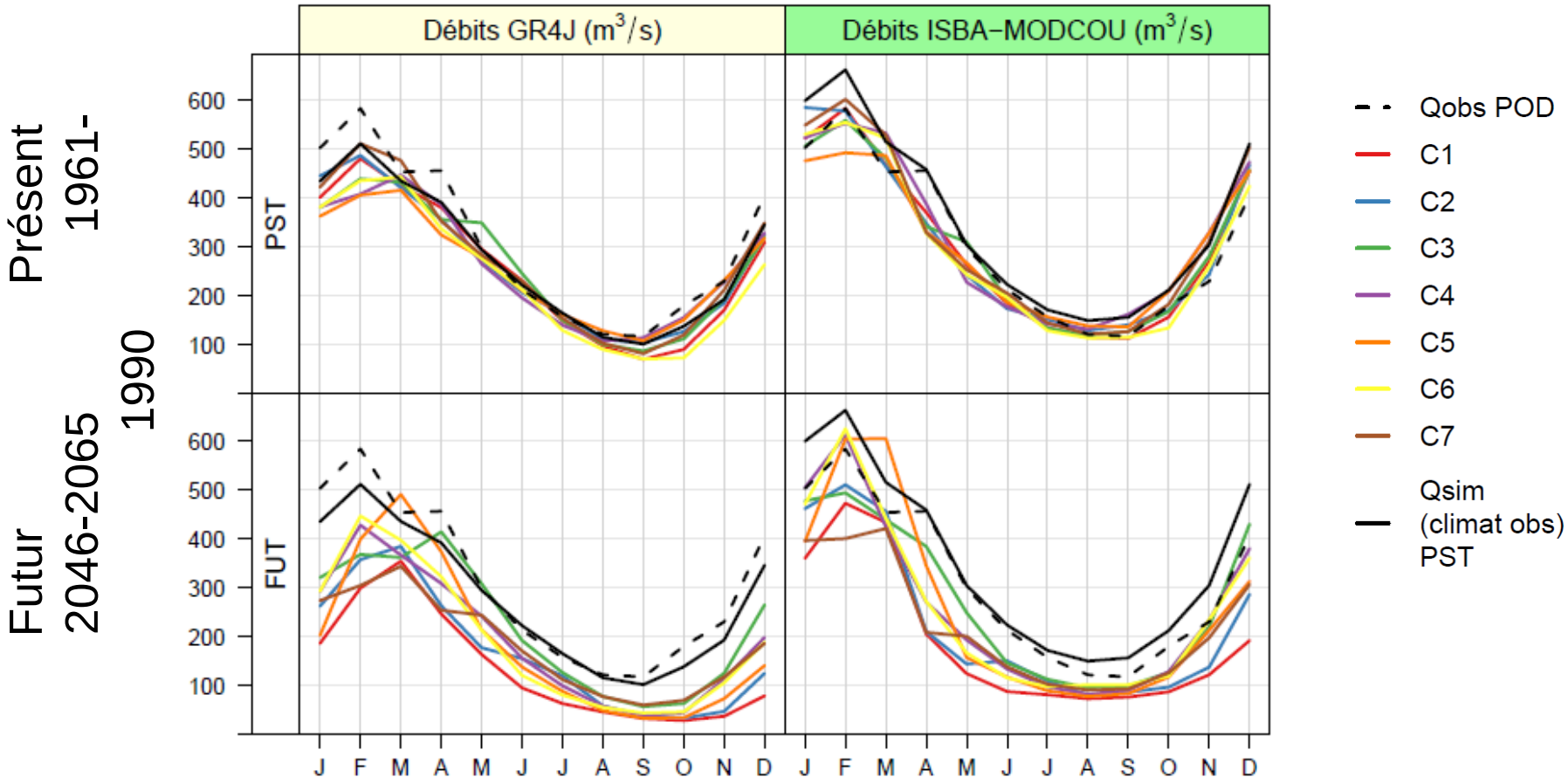




(Source : Projet Explore2070)

Climate impact on Seine basin

Monthly average flow



(Source : Projet Explore2070)

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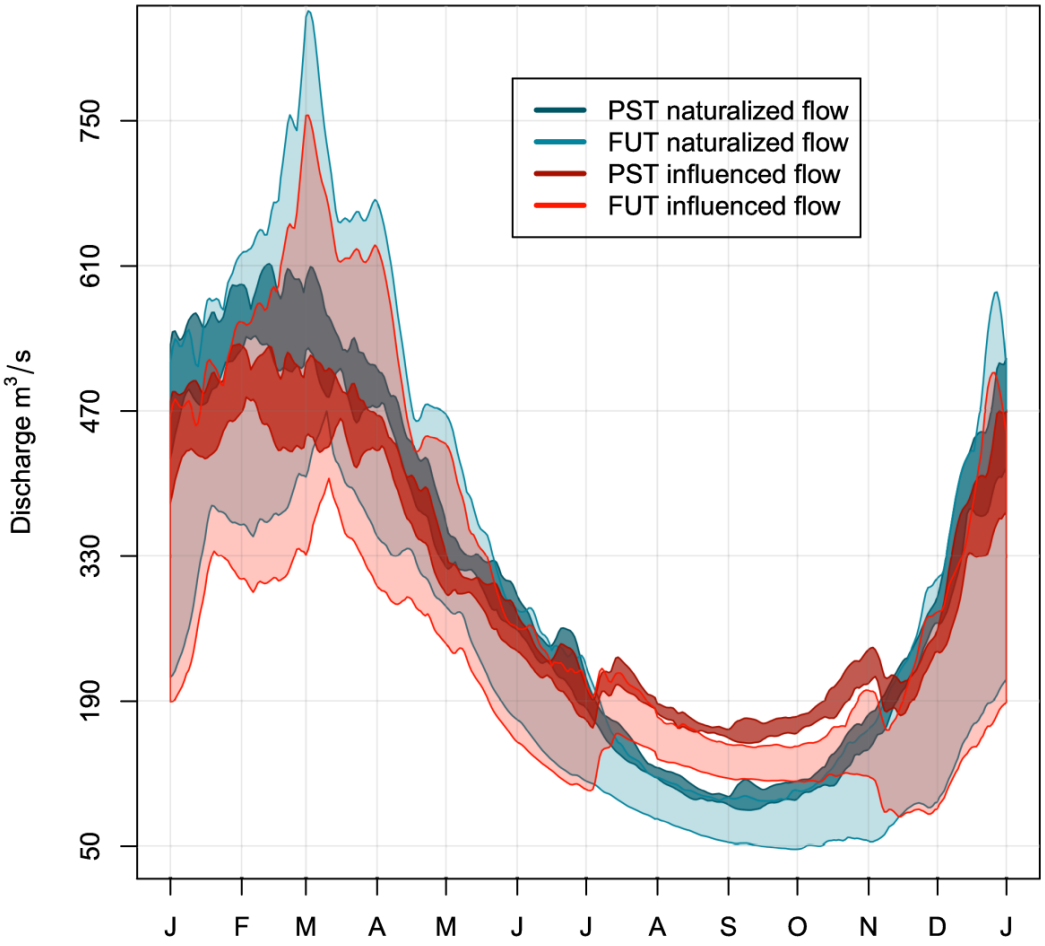
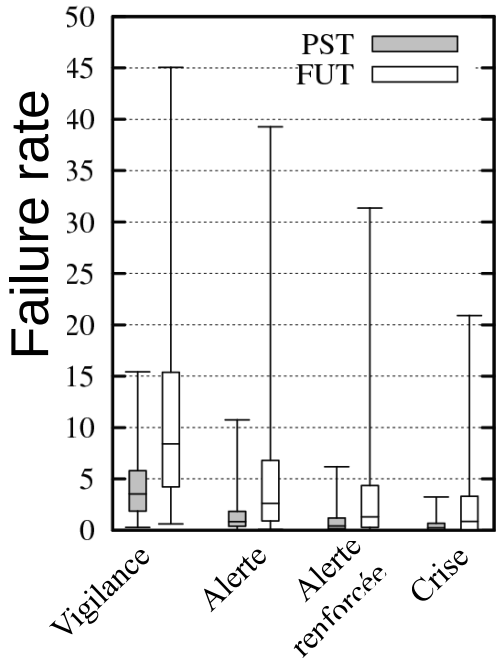
Impact betwen naturel and influence flow



iwrm-net | ClimAware
CLIMATE CHANGE IMPACTS ON THE MANAGEMENT OF WATER RESOURCES

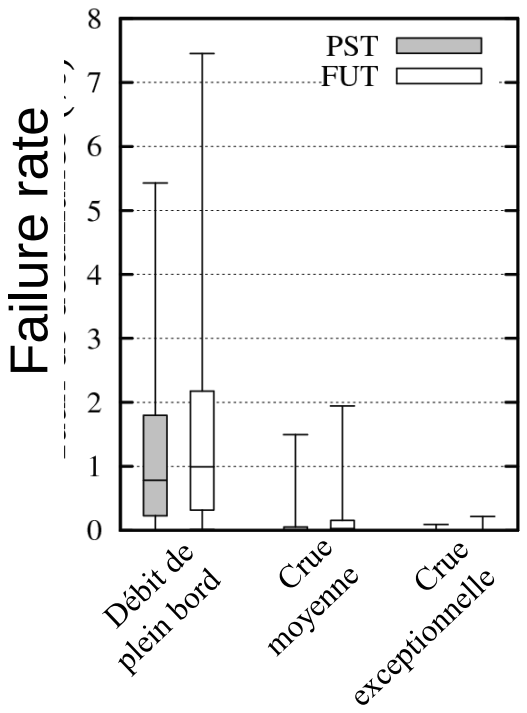
- Current management rules (2046-2065)

Low-Flow



➢ **Rising in failure rate**

Floods



➢ **No significant trends**

(Source : Projet Climaware)

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CLIMATE CHANGE IMPACT ASSESSMENT AND CHALLENGES

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Sanitation master plan

- An upgrade of the SIAAP sanitation masterplan is currently undergoing
- A large use of numerical modelling
- A river Seine quality is used for the impact assessment : ProSe developped by PIREN Seine
- The most performing scenario has been tested
- Robustness testing on 2 reference years 2010 and 2011 under new climate conditions

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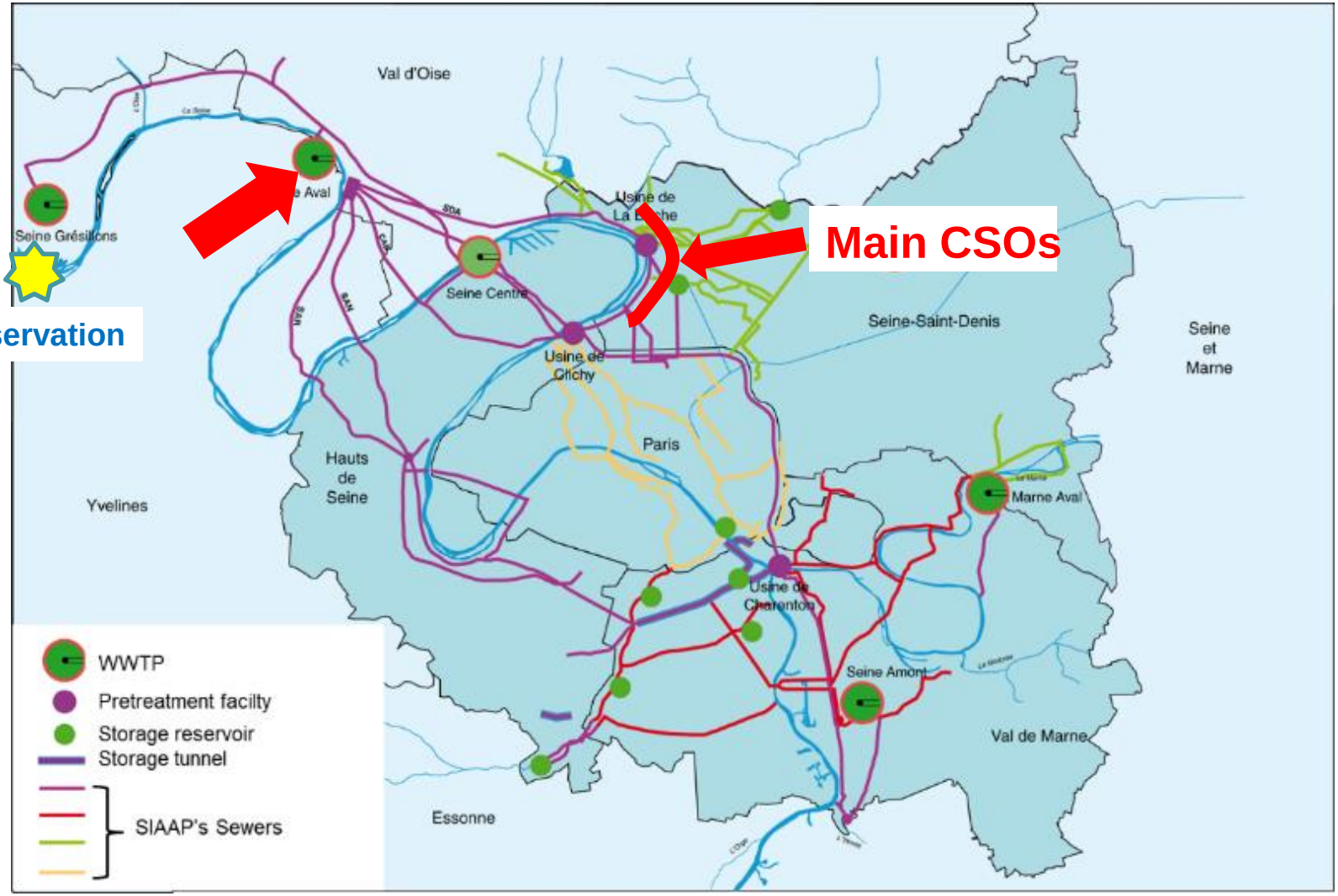

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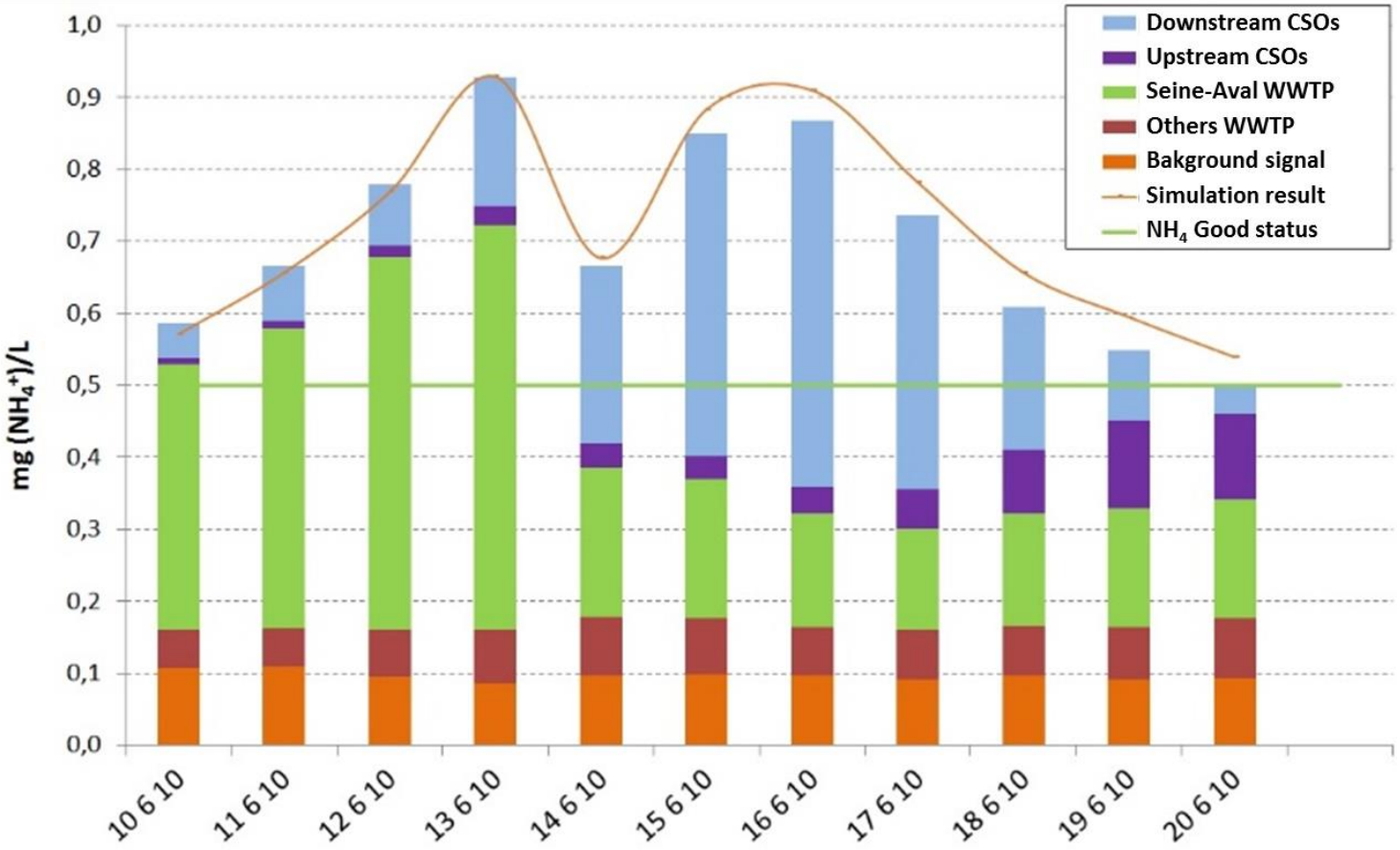
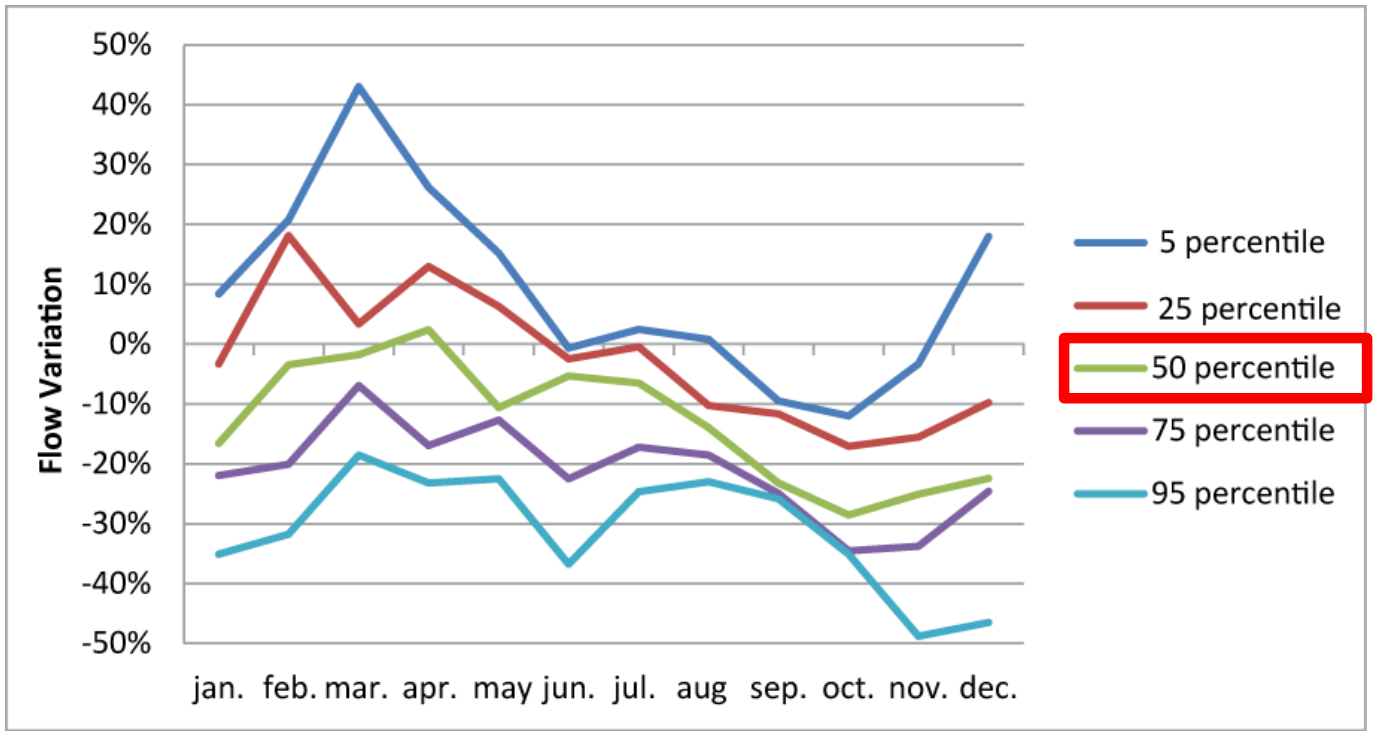
A complex impact on receiving water



Coefficients of variation of the flow applied to the Seine and the Marne



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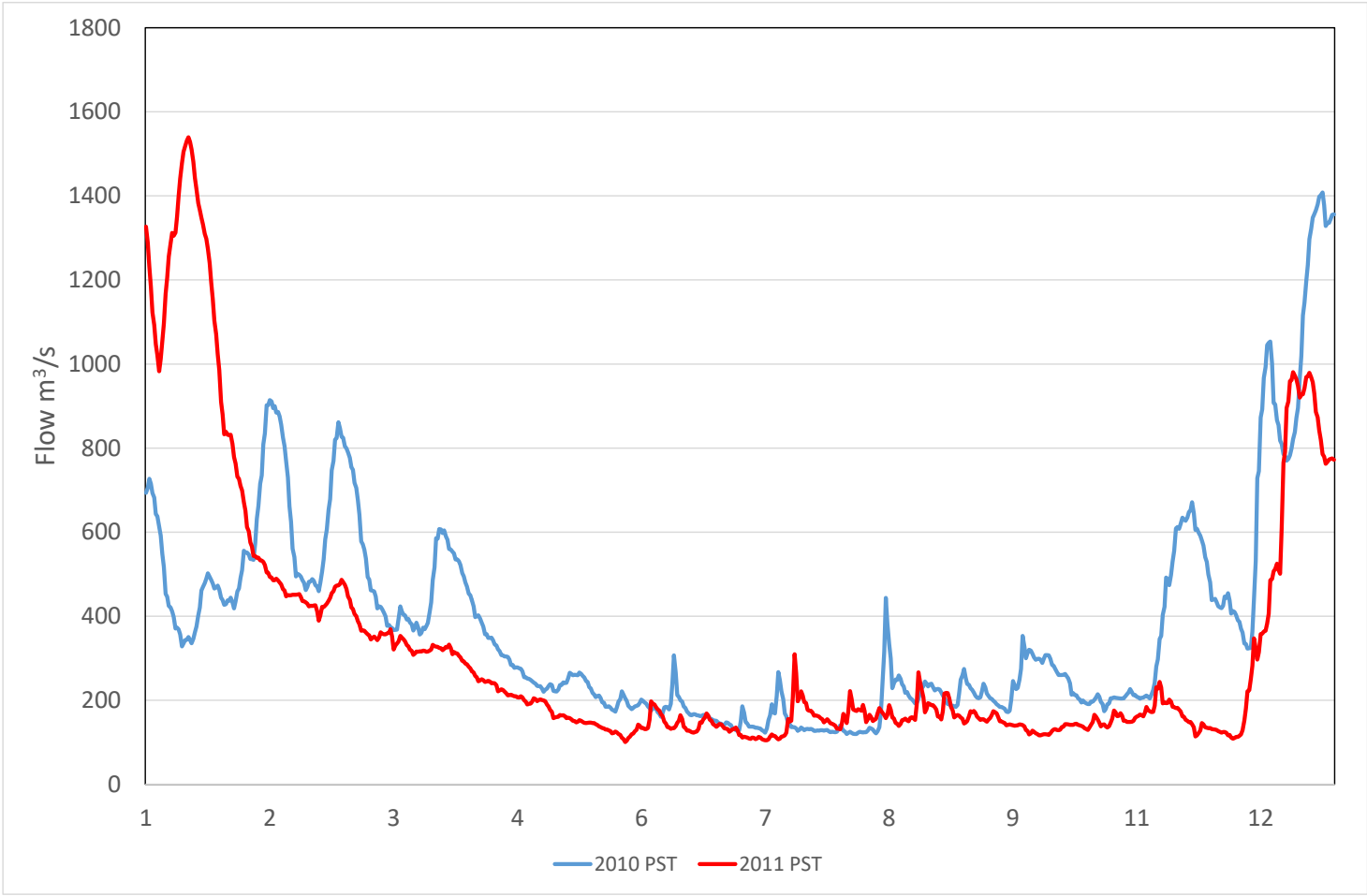

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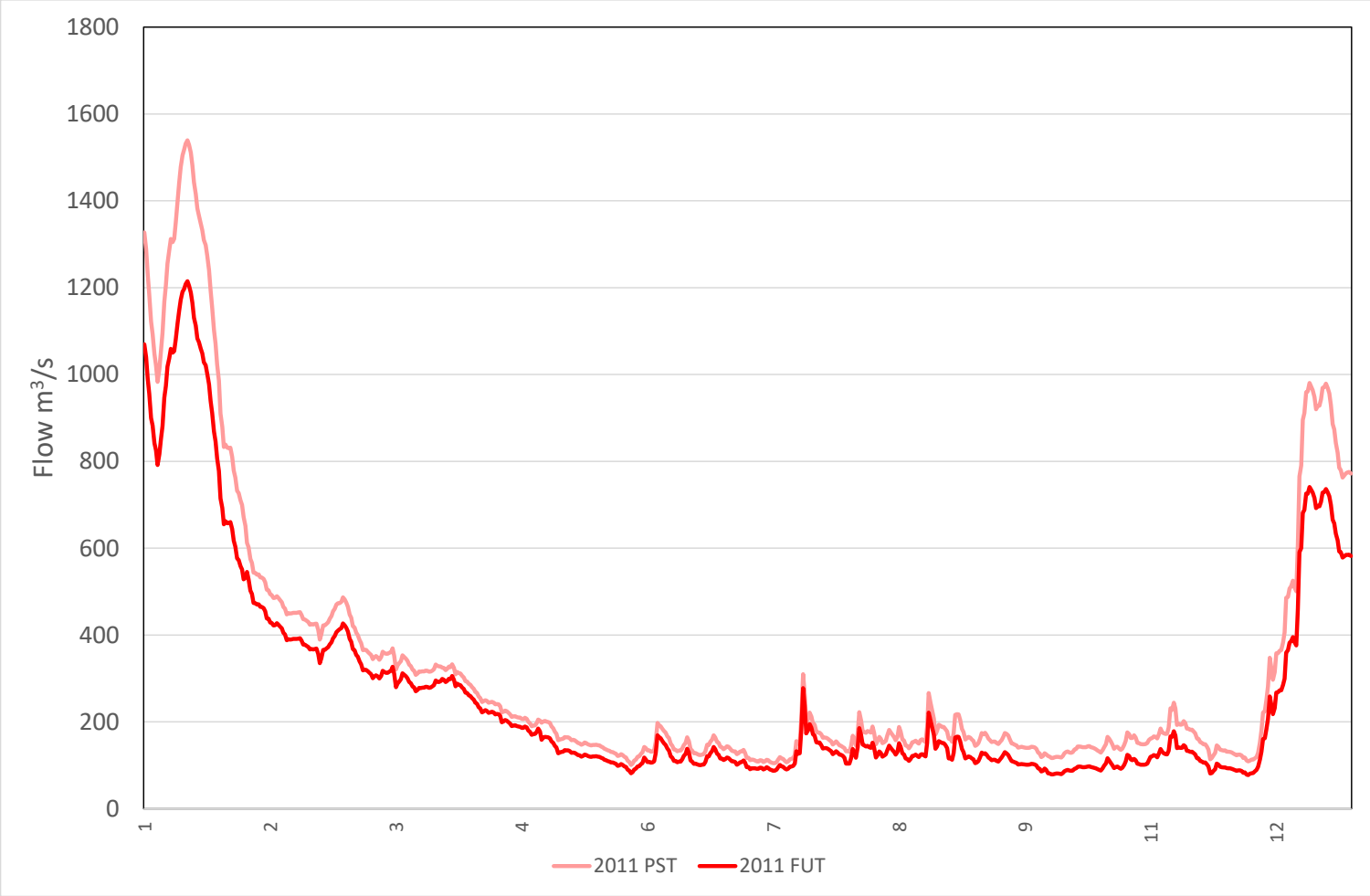

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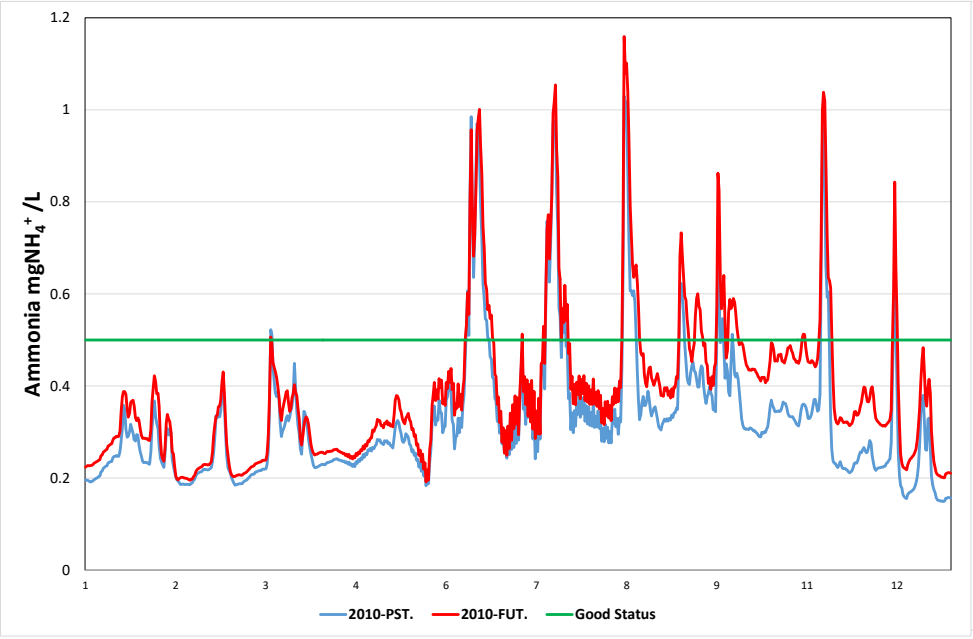

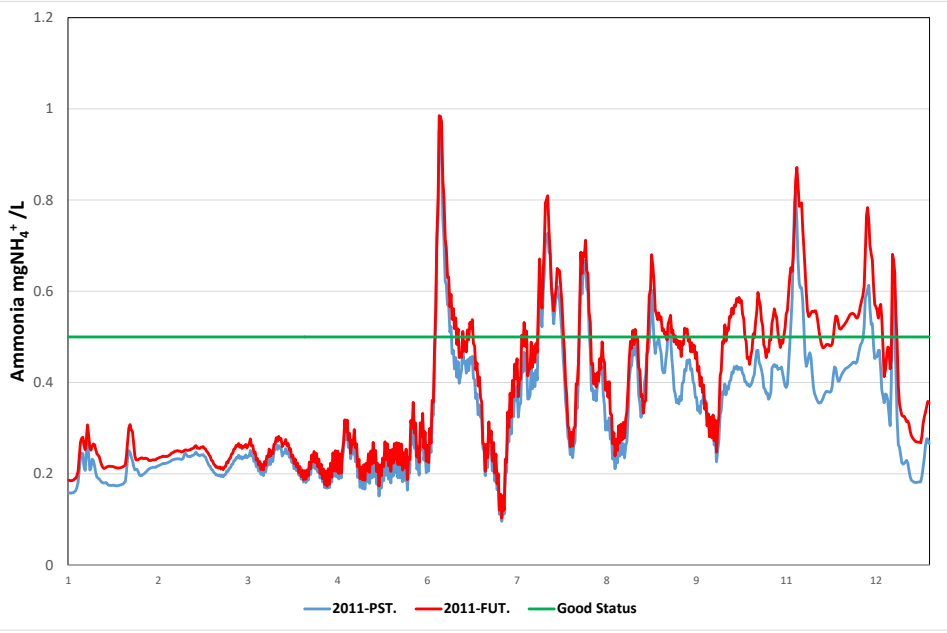

	Number of unsatisfactory days	
	Present	Future
2010	35	55
2011	36.5	93
2010-2011	71.5	151

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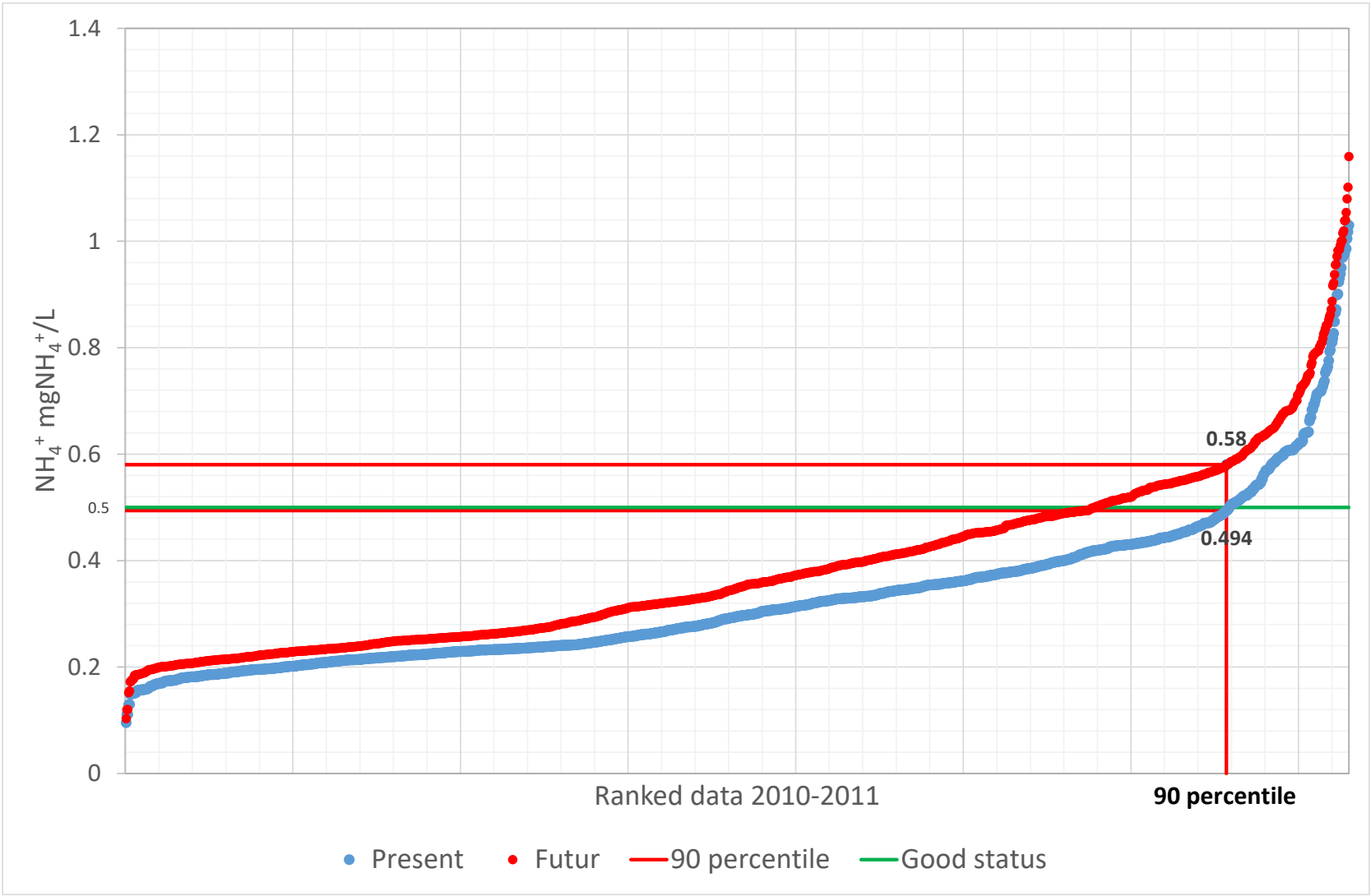
Climate change impact



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Climate change adaptation

- **The context will become really more constrained**
- **Reaching a high level of performance :**
  - **Building new storage facilities**
  - **Developping green infrastructure for stormwater management**
  - **Improving of SIAAP's real time control system**
  - **Implementing of smart tools based on river quality forecast to adjust the waste water treatment plant performances and CSOs management**
- **New sanitation approach to reduce Nitrogen inputs ?**

Thank for your attention

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