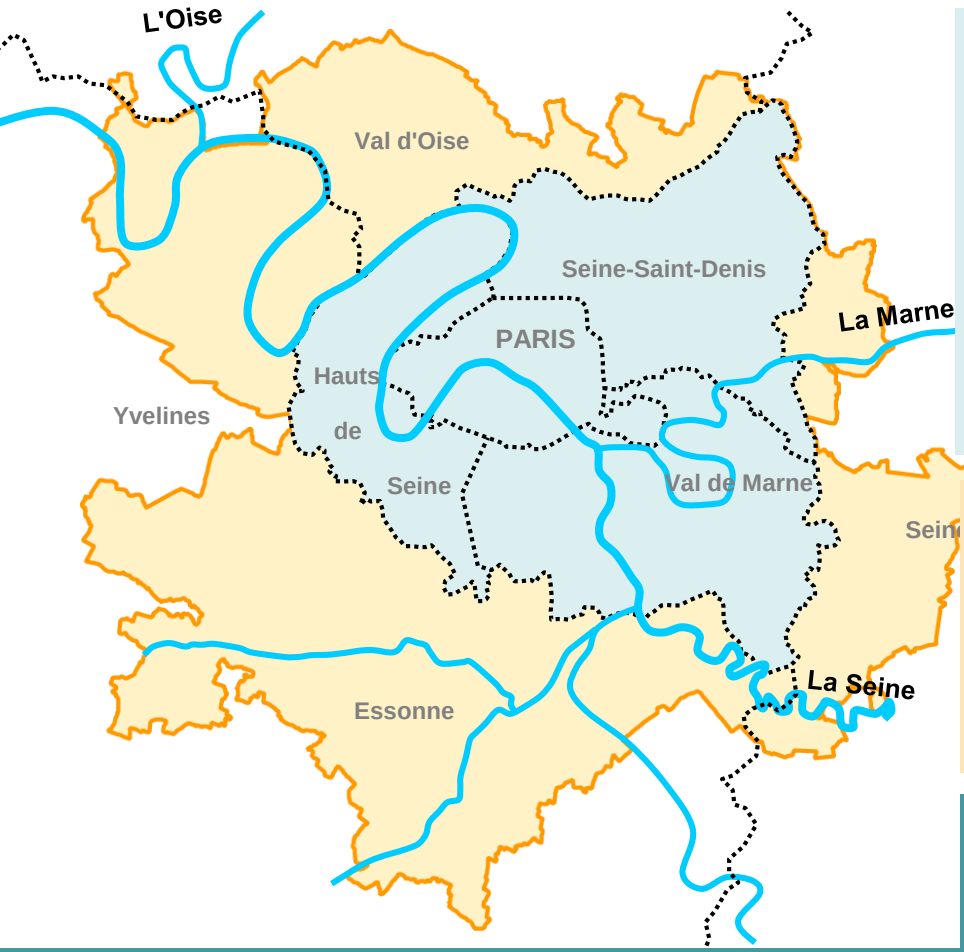
# SIAAP's Experience in Planning & Deployment for Real Time Control Systems for Waste Water Management

SIAAP

Service public de l'assainissement francilien

www.siaap.fr

# 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

- 162 municipalities
- 2.3 M inhabitants

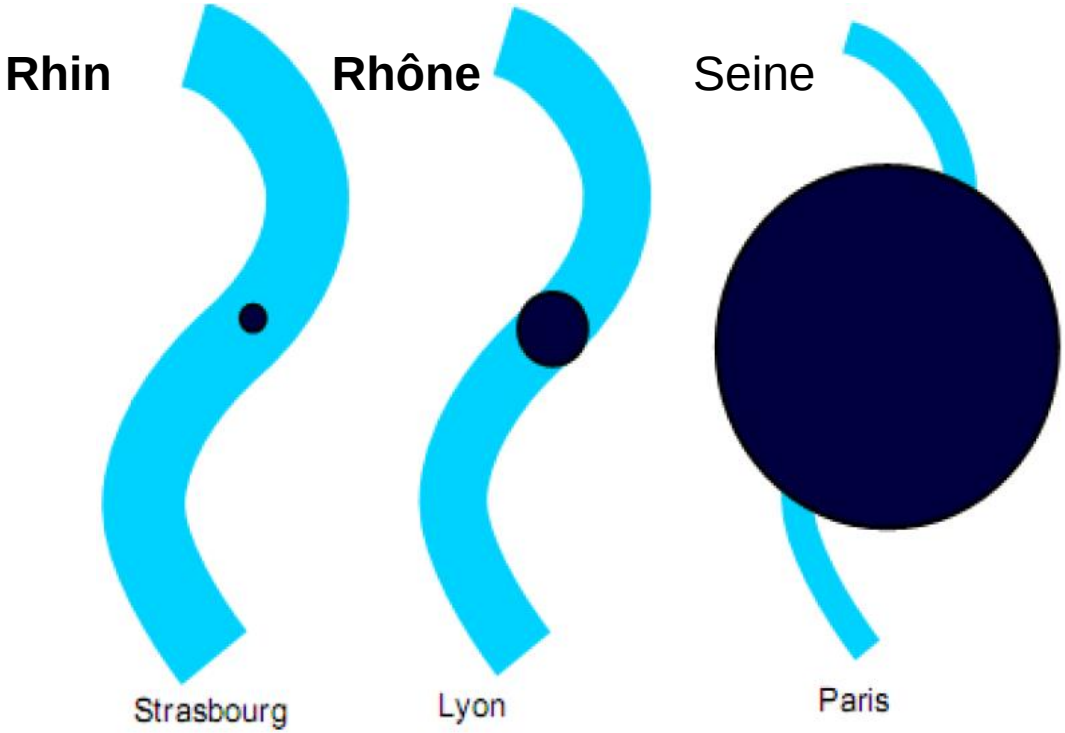
- 1820 km²
- 2 400 000 m³/d
- Mainly a combined sewer system
- Outer suburb : separate system

## SIAAP :

- 286 municipalities
- 8,9 M connected inhabitants
- 400 industrial companies
- 15 000 km of municipal sewers

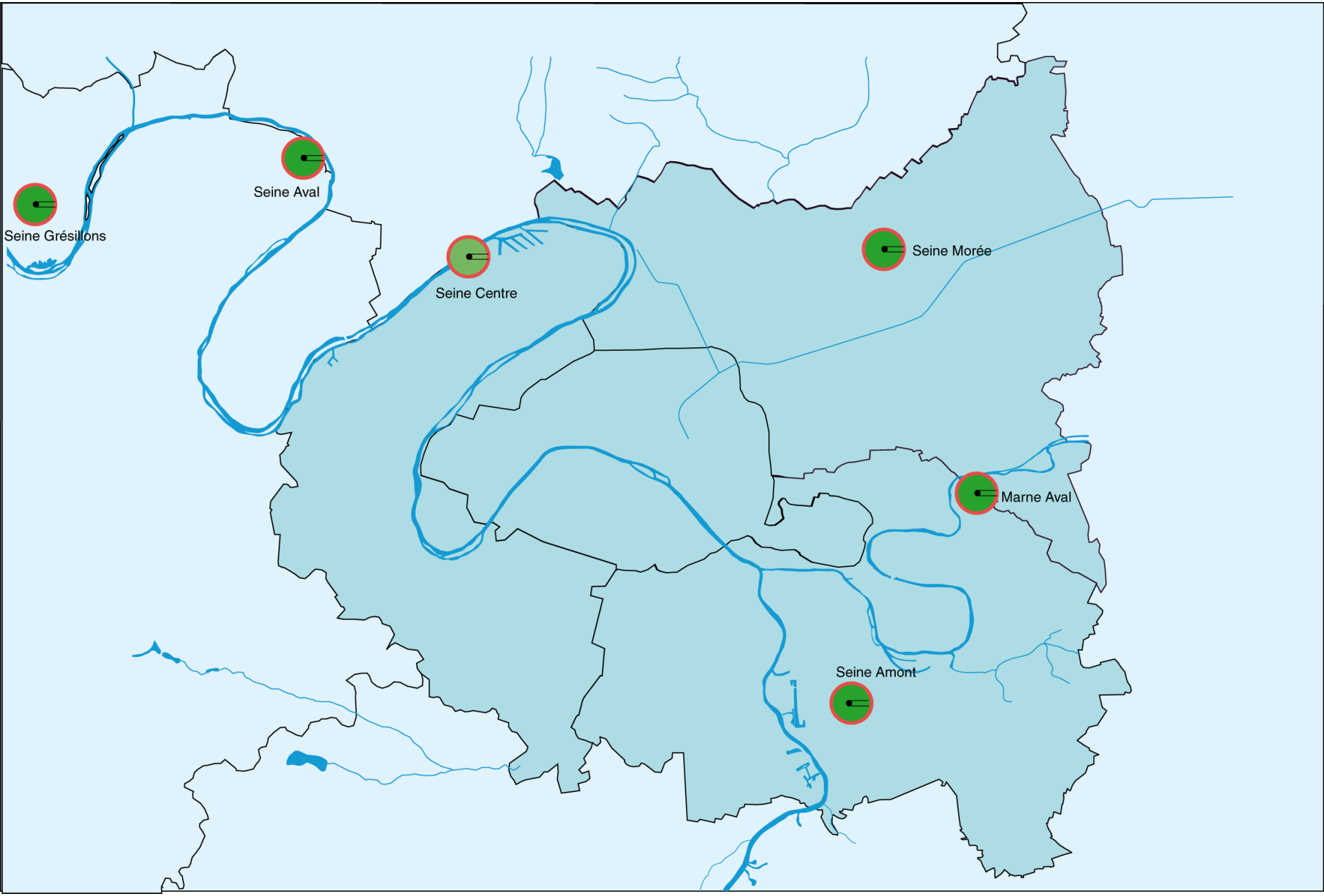
# A small river under a high anthropogenic pressure

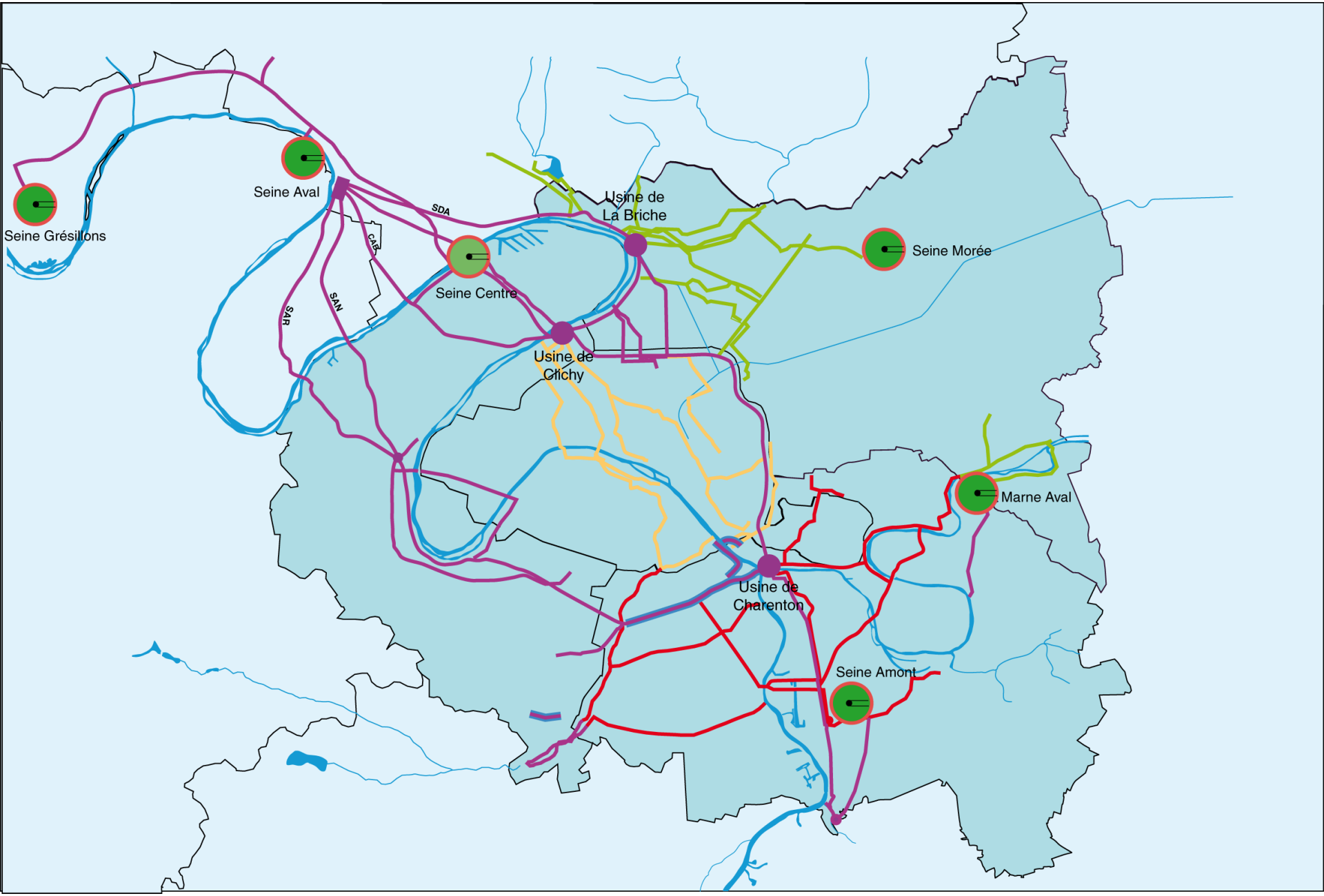
- **Seine river low flow in Paris : 91 $m^3/s$**




| $m^3/d/inhabitant$ | 65 | 18 | 1,2 |
|---|---|---|---|

Source : DRIEE


Seine Grésillons
Seine Aval
Seine Centre
Seine Morée
Marne Aval
Seine Amont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SDA
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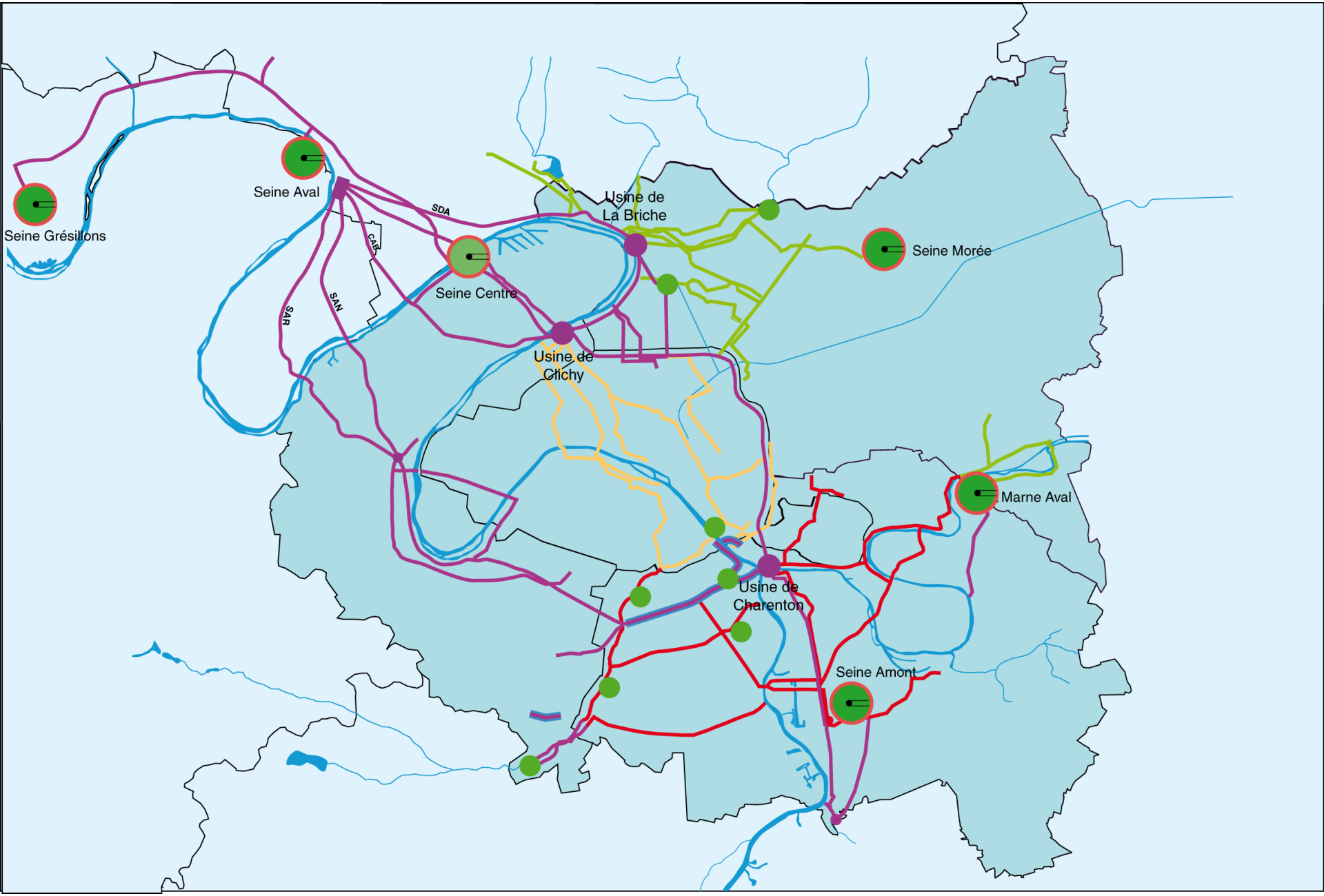
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# Real Time Control : a long history

- **1974: Seine-Saint-Denis *département* started with a first local automated control system for the management of stormwater detention tanks**
- **1986: Seine-Saint-Denis operate the first large-scale stormwater system flow control with radar rainfall data**
- **1990 : Each *département* has its own remote monitoring system**
- **1990: SIAAP implemented SCORE system with a first goal: mitigating the lack of treatment capacity by storing daily peak flow in its tunnels**
- **1997 : The new sanitation master plan proposed an extensive RTC allowing to reduce the needs of storage facilities by 650 000 $m^3$**
- **2000 : beginning of the working in strong relationship with SIAAP's partnairs**
- **2008: SIAAP implemented MAGES, a RTC at a regional scale fully integrated and connected**
- **Innovation needs time to become fully operational**

## SCORE - 1990

SYSTÈME DE COORDINATION, D'ORGANISATION ET DE RÉGULATION POUR L'EXPLOITATION DES ÉMISSAIRES

## MAGES
## PC SAPHYR - 2008

# Multiple challenges

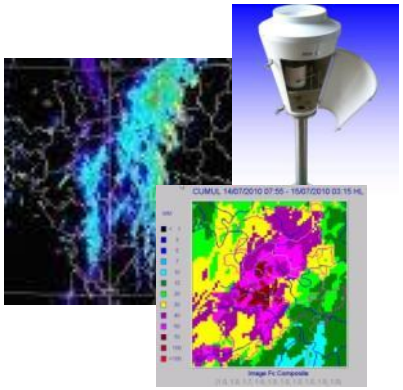
- **Environmental issues**
  - **Fragile River  Seine: low water levels (< 90 $m^3/s$),**
  - **Floods during summer rain storms**
  - **Compliance with European Directives**
    **(Urban Wastewater Treatment , Water Framework, Flood)**
- **Multiple stakeholders/operators**
  - **Permanent communication between operators (sharing information)**
  - **Coordinating and making their decisions consistent**
- **Multiple works for transport, storage and treatment**
  - **A complex sanitation system**
  - **High performance routing to treatment plants taking into account**
    - available capacity of wastewater works
    - non uniform weather conditions on the SIAAP territory

# MAGES an innovative and operational management tool

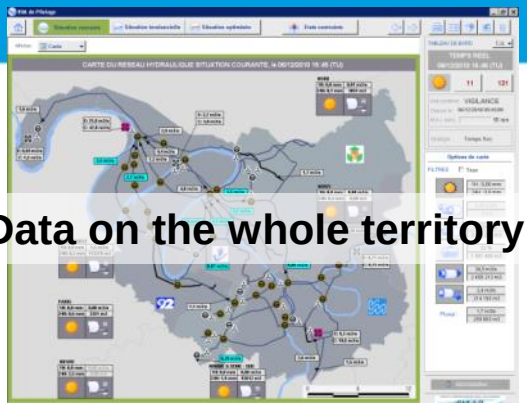
- **Objectives**
  - Shared and global real-time overview of the hydraulic conditions of the network
  - Forecasting levels and flows during dry (24 h) and wet weather (6 h)
  - Guiding operators according to 4 criteria:
    1. Reduce risks of overflowing
    2. 0ptimize the use of treatment capacities
    3. Maximize the use of storage capacities
    4. Limit untreated discharges into the receiving water body

# MAGES : integrated information and decision support system

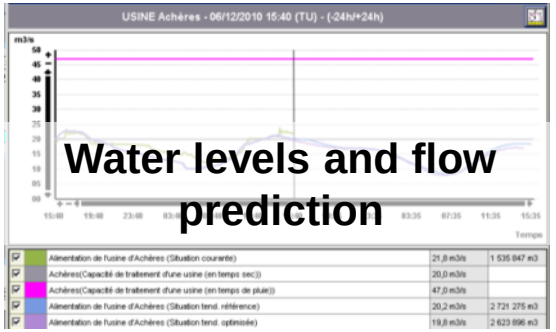
## Weather forecast data



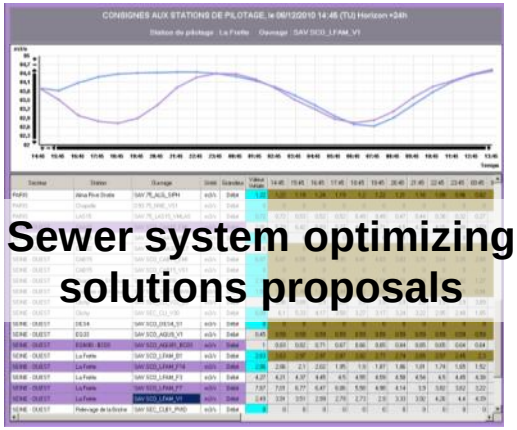
**Hydrological and Hydraulic models**



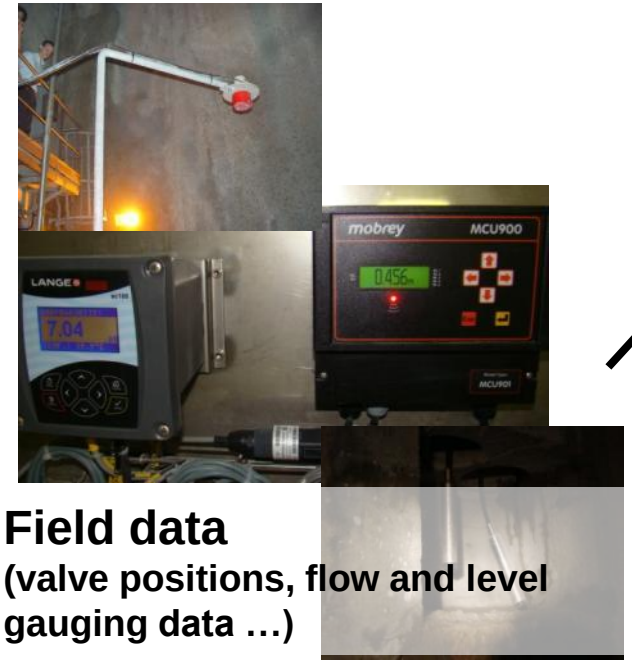
**Data on the whole territory**



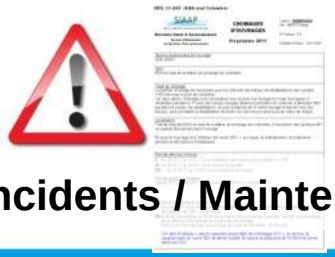

**Water levels and flow prediction**



**Sewer system optimizing solutions proposals**

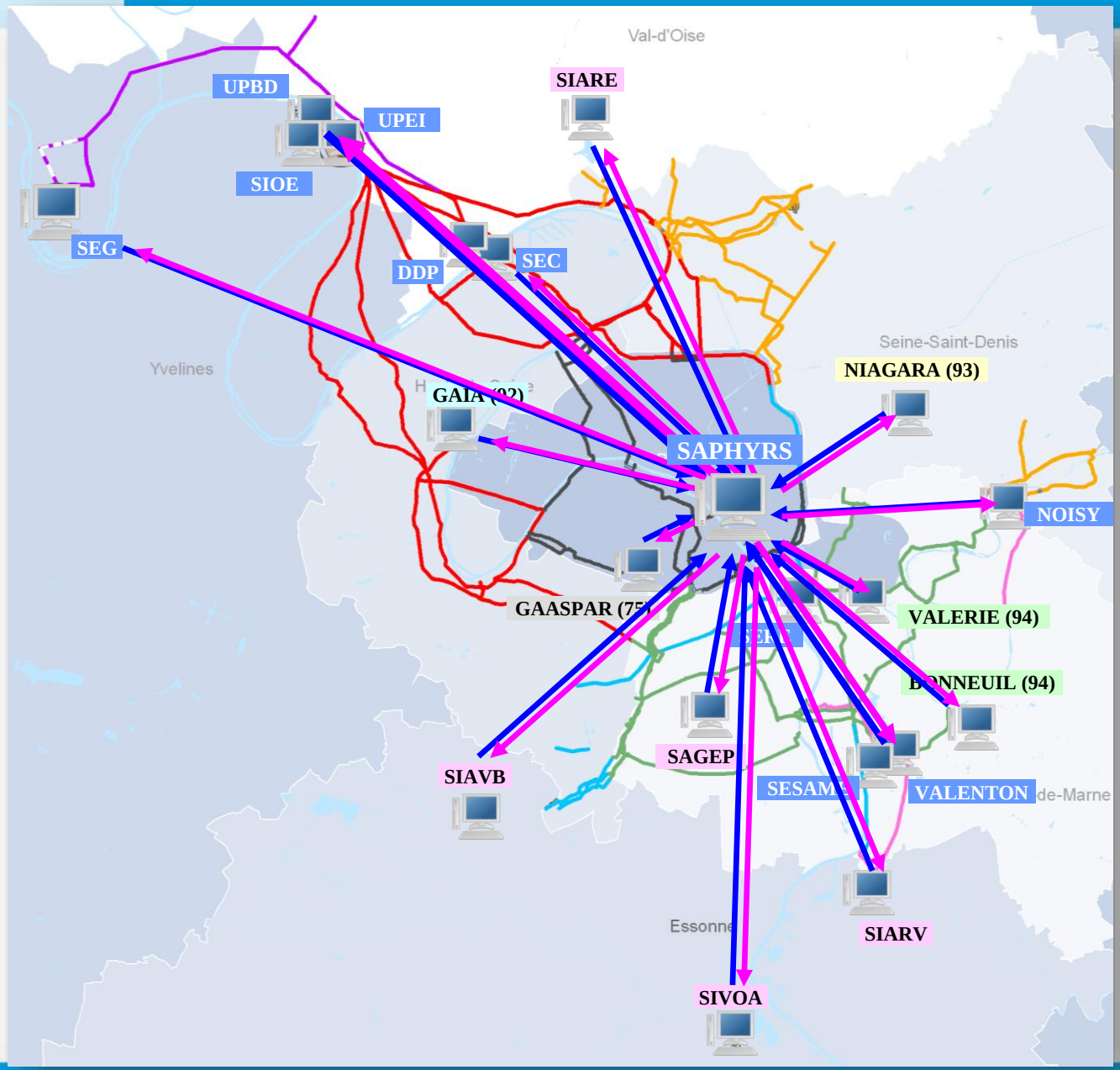


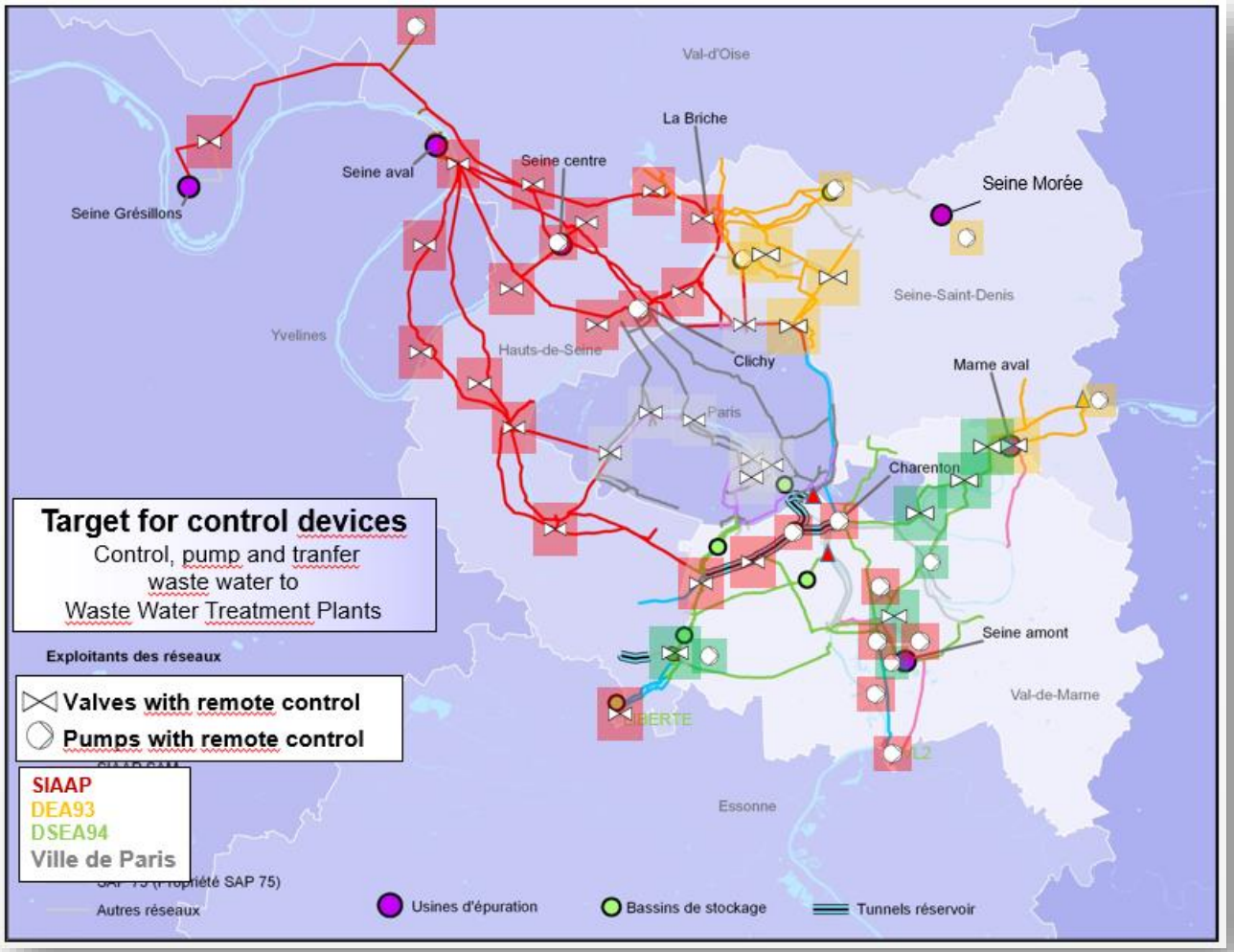

**Field data**
**(valve positions, flow and level gauging data …)**



**Incidents / Maintenance**

# Multisite deployments




Val-d'Oise
La Briche
Seine centre
Seine aval
Seine Grésillons
Seine Morée
Seine-Saint-Denis
Yvelines
Hauts-de-Seine
Clichy
Marne aval
Paris
Charenton
Seine amont
Val-de-Marne
Essonne
Target for control devices
Control, pump and tranfer waste water to Waste Water Treatment Plants
Exploitants des réseaux
Valves with remote control
Pumps with remote control
SIAAP
DEA93
DSEA94
Ville de Paris
Autres réseaux
Usines d'épuration
Bassins de stockage
Tunnels réservoir

# MAGES's Benefits

- The tool has won the trust of the operators
- RTC implementation is going with structural changes in SIAAP's sanitation system
- A comprehensive understanding of how the system works
- A comprehensive approach of the operation of the sanitation system
- Shared information between all the operators
- New procedures has been implemented: works planning, weekly forecast bulletin
- Efficiency assessment : how to objectively assess the benefits of smartphones?

# Smart technologies
# Safety & Human resources stakes

- **MAGES & SAPHYR is a master piece for the management of Paris Region sanitation system**

  **Securing the system is a priority**

  **System redundancy is an answer**

- **Support for maintenance teams whose skills must evolve along with the technology**
- **Support of operation teams for operating under degraded modes**

# Maintenance and Training

- **Maintenance of equipments and information tools & technologies**
- **A good maintenance level is required to ensure maximum availability of equipment. This is major requirement for reliable system**
- **Developments in metrology, computer and telecommunication technologies are moving fast and require continuous upgrading**
- **Having trained and competent agents to adapt the system to these changes is a concern of the department.**

# Operation under degraded conditions

- **Being able to operate the sanitation system under degraded conditions for these smart tools : energy losses, extrem flood, etc.**
- **Two solutions :**
  - **Preparing procedures for such conditions**
  - **Developing a training simulator**

# Outlook to the futur

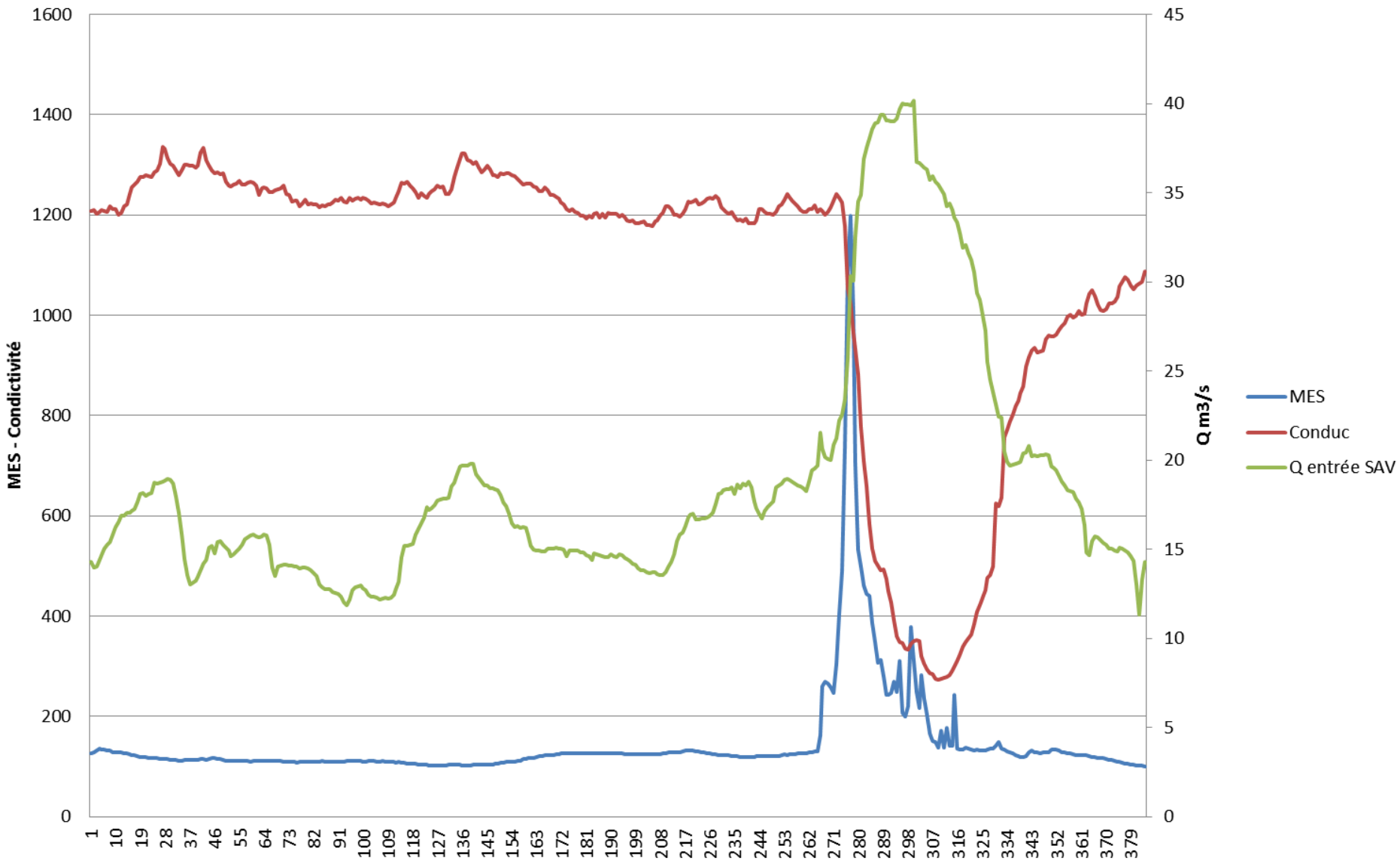
# New stakes for SIAAP

- Reaching the objectives of the WFD
- Optimising the operation and environmental costs : being more efficient
- Preparing the implementaiton of the Stormwater management facilities from the Sanitation masterplan
- Rising pollutants loads at the inlet of the WWTP and lower river Seine low-flow
- More responsive and more complex systems
- Stricter regulation

**«The right to make a mistake » will be lower in the futur**

**A need for new smart tools**

# Transitory phenomenon



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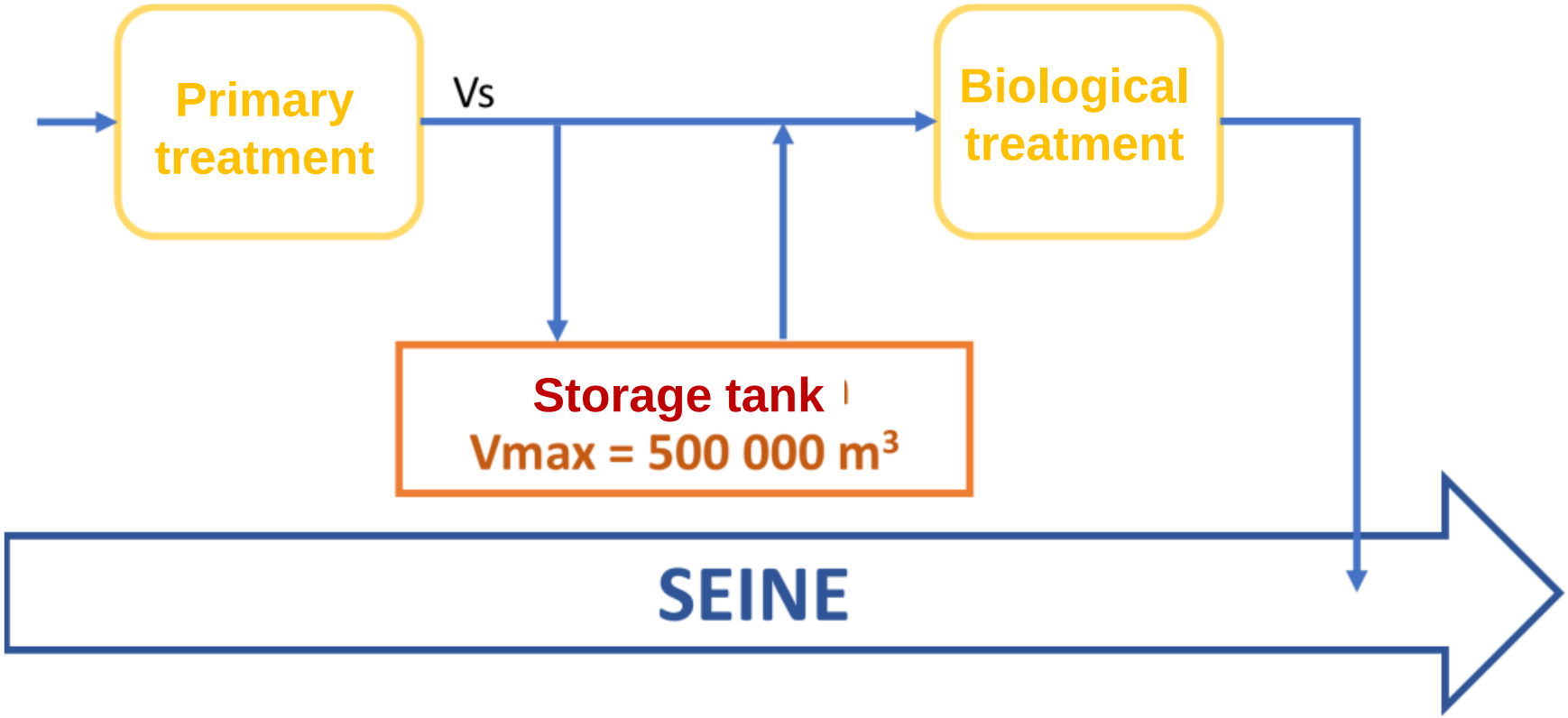
# Impacts on receiving waters

# Stormwater quality management



# Starting from our experience

- **MAGES is in operation since 2008**
- **ProSe, the river Seine modelling tool**
- **Current developments**
  - **Implementation of real time pollution monitoring at Clichy,**
  - **Devlopment in numerical modelling**

**An integrated and optimised approach of the operation of the sanitation system:**

**Transport, Treatment, Impact on the river Seine**

# The project

## ❑ 2 technical levers :

- **Continuous moniting development and implementation**
  - Sewers: OPUR
  - WWTP: MOCOPEE
  - Receiving water: PIREN Seine – Carbo Seine
- **Numérical modelling of the processes**
  - Sewers: OPUR
  - WWTP: MOCOPEE
  - Receiving wate: ProSe

# Conclusion

- **Preparing the tomorrow RTC tools**
- **Climate change makes such tools even more necessary**
- **A global innovative project for integrated management of SIAAP's sanitation system**

Thanks for your attention

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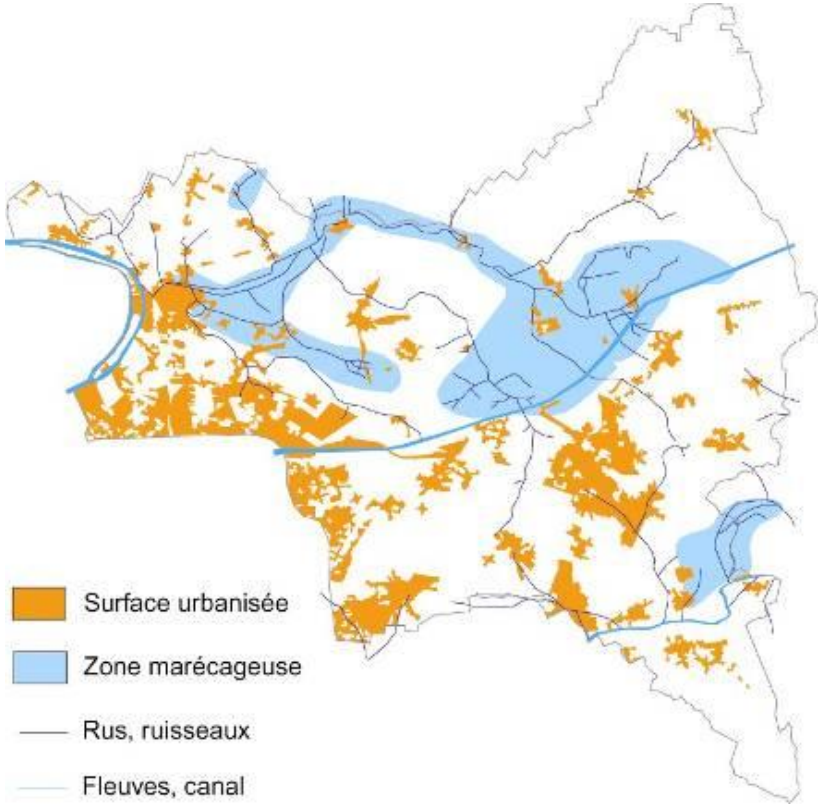
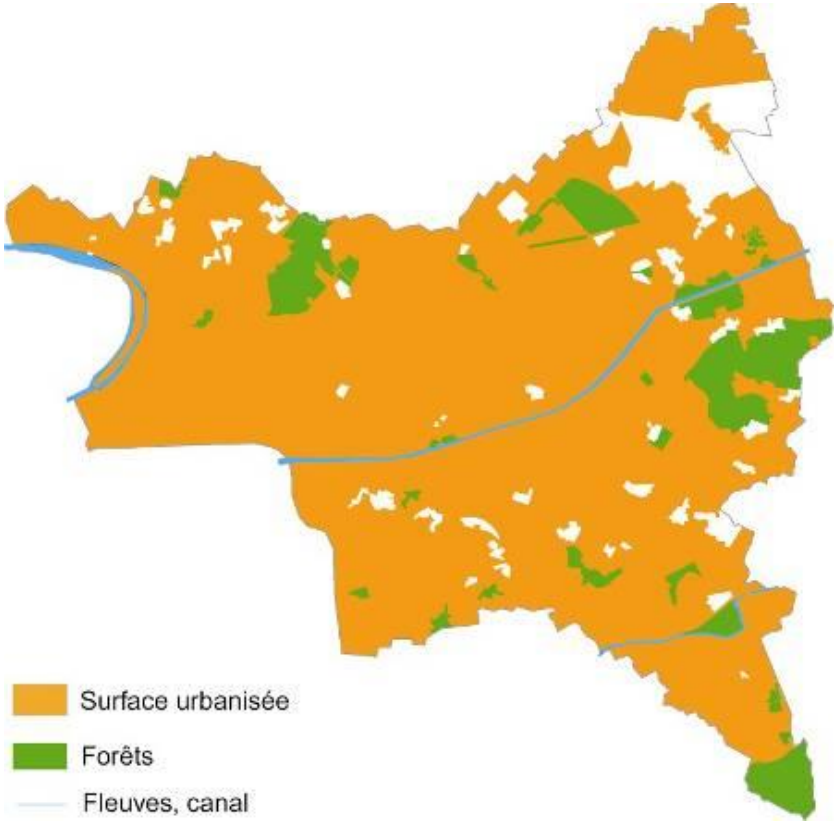
# Seine-Saint-Denis

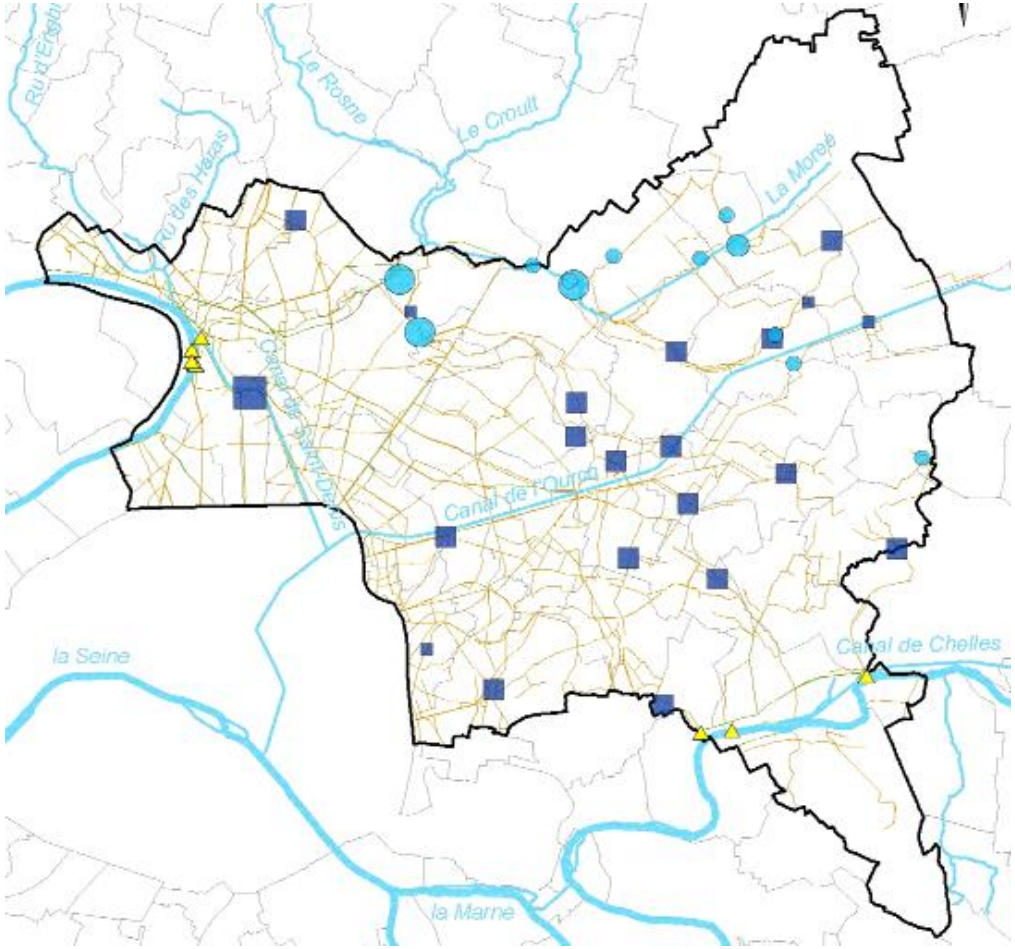



1900




2000

# Retention tanks




**1,650,000 m³**

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# Real Time Control