PROTECTION and DEVELOPMENT of the ALBIAN-NEOCOMIAN GROUNDWATER as STRATEGIC RESOURCE for DRINKING WATER
SUMMARY

- *STRENGTHS of ALBIAN-NEOCOMIAN AS STRATEGIC RESOURCE FOR DRINKING WATER*

- *THE WEAKNESSES*

- *CONTRIBUTIONS OF MODELLING*

- *TRANSCRIPTION INTO THE WATER MANAGEMENT MASTER PLAN*

- *ENHANCEMENT OF CONTROLS*
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- **ENHANCEMENT OF CONTROLS**
The large area may authorize many people potentially to have an access at the resource.
Remark: as we could see later, Albian and Neocomien aquifers are connected by leakage, thus, for more convenience, we often will orally use the Albian term for the 2 aquifers.
HISTORICAL ADMINISTRATIVE PROTECTION OF THE ALBIAN GROUNDWATER

Law in 1935

Piezometric levels

Administrative limit of withdrawals in 1979

1996 Water Management MP Albian-Neocomian is dedicated as a rescue resource

BUT LATER, IT HAS BEEN NECESSARY TO VERIFY IF THIS REGULATION WERE REALLY APPLICABLE ACCORDING TO THE HYDROGEOLOGICAL CONTEXT AND THE CURRENT CONDITIONS OF THE PUMPINGS. THAT IS THE OBJECT OF OUR CURRENT PRESENTATION.
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DESPITE OF A IMPORTANT STOCK OF GROUNDWATER, THERE IS A RELATIVELY WEAK FLUX IN COMPARISION OF POTENTIAL PUMPINGS

Groundwater flow in 1841
DESPITE OF A IMPORTANT STOCK OF GROUNDWATER, THERE IS A RELATIVELY WEAK FLUX IN COMPARISION OF POTENTIAL PUMPINGS.

CURRENTLY, FLOWS CONVERGE TOWARDS PUMPING ZONES (SALTED WATER COULD INVADE THE AQUIFER LIMITS NEAR THE SEA)
LACK OF AN OPTIMAL DISTRIBUTION OF RESCUE WELLS

EXISTING DISTRIBUTION

TARGET NETWORK OF RESCUE WHICH WILL BE SIMULATED
INSUFFICIENT DEPTH OF THE EXISTING WELLS

Piezometry after a scenario of crisis: all the existing wells have pumped at their maximum.

CURRENTLY, IF A CRISIS WAS HAPPENING, THE MOST OF WELLS WOULD BE DRY AFTER FEW DAYS. THUS, THE DEPTH OF THE PUMPS WILL HAVE TO BE ADAPTED FOR THE CRISIS SITUATION (WHICH WILL BE DEFINED THANKS TO THE MODELLING)
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TEST THE OPERATION OF A RESOURCE MOBILIZATION IN TWO STAGES

CURRENT STATIC LEVEL

Minimum volume consent to a valorisation of the groundwater for the purpose of ultimate rescue
Test 7 à 15 Mm3/an

STATIC LEVEL STEP N°1 (New wells authorized with little unitary volume in normal situation)

Available volume for to face the crisis

STATIC LEVEL STEP N°2 (After intensive pumping during a crisis)
The higher would be the density of boreholes, the easier could be the rescue distribution during a crisis.

Given that a pumping may approximately deliver a maximum of 150 m³/h, we have tested some different densities:

- 120000 habitants (easier)
- 180000 habitants (chosen)
- 240000 habitants (limit)

There is no difference on piezometric surface resulting from these 3 variants.
VARIANTS TO BE STUDIED
Which aquifer to be tap?

Is it useful to optimize a repartition of boreholes between Albian and Neocomian?

Modeling shows that it is better to tap Albian because of the ascendant leakage from Neocomien when pumping into Albian (Units=Mm3)
VARIANTS TO BE STUDIED
Must we regulate in the only central basin where problems occur (Ile de France) or throughout the entire basin?

For to be well accepted by users, a regulation throughout the basin is better than a local one. Pumping authorizations will be allowed proportionately to the number of inhabitants living in the different areas of the basin.
EVALUATION OF THE POSSIBILITY TO DEVELOP PUMPINGS IN NEW NORMAL SITUATION

CURRENT STATIC LEVEL

Minimum volume consent to a valorisation of the groundwater for the purpose of ultimate rescue
Test 7 à 15 Mm3/an

NEW NORMAL SITUATION WHAT PIEZOMETRIC LEVEL?

STATIC LEVEL STEP N°1 (New wells authorized with little unitary volume in normal situation)

Available volume for to face the crisis

STATIC LEVEL STEP N°2 (After intensive pumping during a crisis)
This map indicates that THE DIFFERENCE OF PIEZOMETRY BETWEEN THE CURRENT SITUATION AND THE NEW SITUATION WITH NEW BOREHOLES AND MODERATE PUMPINGS (+7,5 Mm3) MAY BE ACCEPTABLE FOR THE EXISTING USERS
EVALUATION OF THE POSSIBILITY TO FACE THE CRISIS

CURRENT STATIC LEVEL

Minimum volume consent to a valorization of the groundwater for the purpose of ultimate rescue Test 7 à 15 Mm3/an

STATIC LEVEL STEP N°1 (New wells authorized with little unitary volume in normal situation)

Available volume for to face the crisis

STATIC LEVEL AFTER INTENSIVE PUMPING DURING A CRISIS STEP N°2

END OF THE CRISIS SITUATION WHAT Piezometric LEVEL?
EVALUATION OF THE POSSIBILITY TO FACE THE CRISIS

This PIEZOMETRIC MAP INDICATES THE PIEZOMETRY AT THE END OF A SIMULATED CRISIS (DELIVERY 20L/INHABITANT/DAY FOR ABOUT 15 MILLIONS PERSONS DURING 3 MONTHS)

THIS SITUATION HAS BEEN JUDGED ACCEPTABLE.

THE DEPTH OF THE PUMPS WILL HAVE TO BE ADAPTED FOR THE CRISIS SITUATION
THE RETURNING TO THE EQUILIBRIUM AFTER A CRISIS DEPENDS ON:

- THE PLACE CONSIDERED
- THE POLICY HELD: CONTINUING THE PUMPINGS OR NOT

EVALUATION OF THE POSSIBILITY FOR THE GROUNDWATER LEVEL TO RETURN AT THE INITIAL STATE AFTER THE CRISIS
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THE RESULTS OF REFLEXIONS AND MODELLINGS HAVE BEEN TRADUCT IN THE WATER MANAGEMENT PLAN

THE WMMP:

- Confirms the Albian-Neocomian aquifers as a strategic resource for rescue water supply in the basin
- Limits the maximum withdrawal volume for the two aquifers and for all the basin at 29 millions m3/year
- Organizes the spatial and temporal management of withdrawals during normal and crisis times
Δ Existing boreholes

Into the white areas, no additional boreholes can be set up.

One rescue borehole can be set up in each blue area (which corresponds to approximately at a district of 180000 inhabitants.)
WATER MANAGEMENT PLAN

REPARTITION OF THE ALLOWABLE VOLUMES IN THE DEPARTMENTS

<table>
<thead>
<tr>
<th>DEPARTMENT</th>
<th>CURRENT VOLUME</th>
<th>ADDITIONNAL ALLOWABLE VOLUMES</th>
<th>TOTAL VOLUME (m³/year)</th>
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<tr>
<td>PARIS (75)</td>
<td>225 000</td>
<td>515 000</td>
<td>740 000</td>
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<td>SEINE-ET-MARNE (77)</td>
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<td>YVELINES (78)</td>
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<td>ESSONNE (91)</td>
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<td>SEINE-SAINT-DENIS (93)</td>
<td>3 453 000</td>
<td>386 000</td>
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<td>VAL DE MARNE (94)</td>
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<td>YONNE (89)</td>
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<td>EURE (27)</td>
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<td>755 000</td>
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<tr>
<td>SEINE MARITIME (76)</td>
<td>76 000</td>
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<td>385 000</td>
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<tr>
<td><strong>Totaux arrondis</strong></td>
<td><strong>22 000 000</strong></td>
<td><strong>7 000 000</strong></td>
<td><strong>29 000 000</strong></td>
</tr>
</tbody>
</table>

PUMPING AUTHORIZATIONS ARE ALLOWED PROPORTIONATELY TO THE NUMBER OF INHABITANTS LIVING IN THE DIFFERENT AREAS OF THE BASIN.
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ENHANCEMENT OF CONTROLS

In addition of the WMP, the Albian-NeoComian is added to the French areas inside which authorizations are obligatory as soon as the thresholds of 8 m³/h is reached.

The Prefects have to define, to each town, the depth from which this regulation is applicable.

Classes of depth
PROTECTION and DEVELOPMENT of the ALBIAN-NEOCOMIAN GROUNDWATER as STRATEGIC RESOURCE for DRINKING WATER RESCUE

THANK YOU FOR YOUR ATTENTION