Mediterranean water monitoring working group meeting

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# Water Quality monitoring in Tunisia

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# SUMMARY

- Introduction
- Presentation of the existing water quality monitoring networks
- The main results of the networks optimization study
- The networks exploitation and Conclusion

# water management

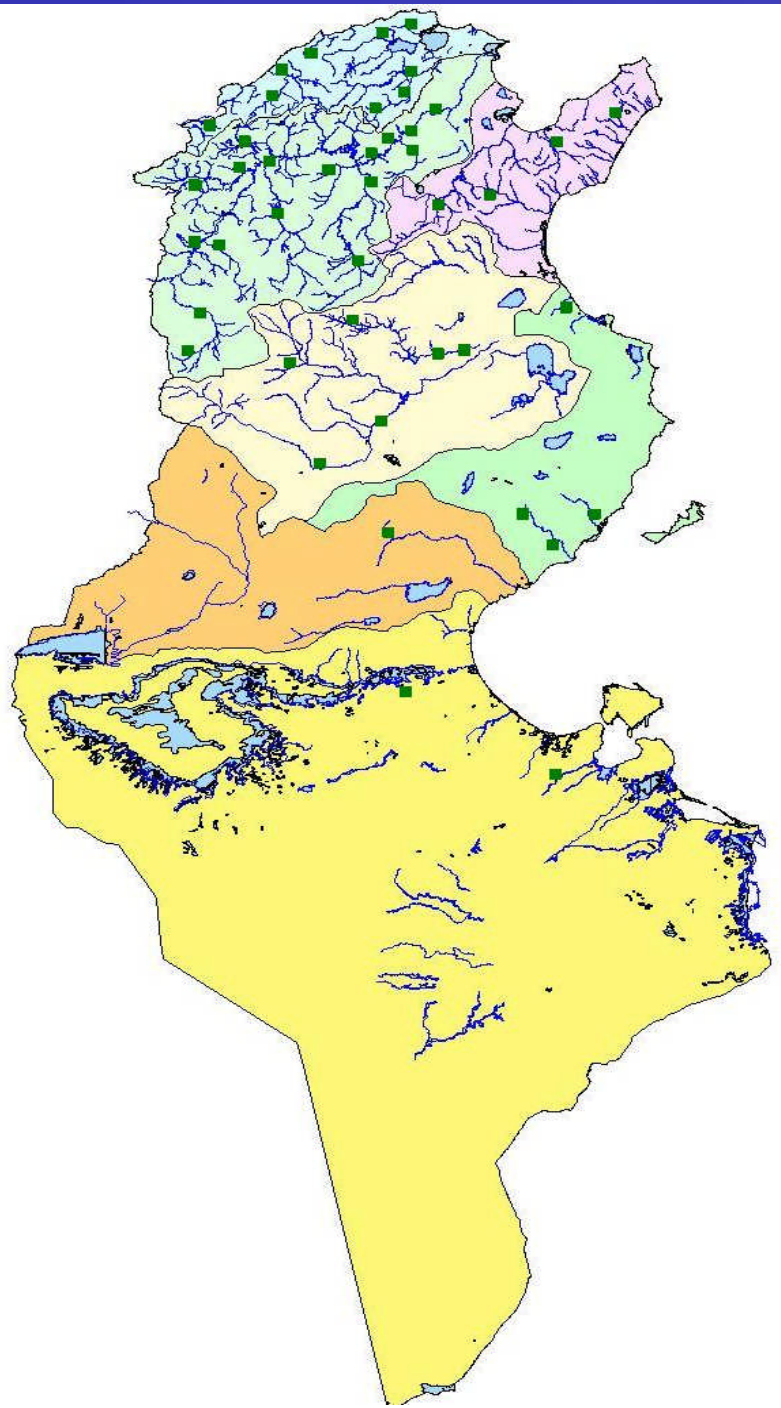
**Water management in Tunisia is based in the first place on the monitoring of the water resources evolution thanks to many networks:**

- **Surface water networks (rainfall, hydrometric/ quality)**
- **Groundwater water networks (piezometric, quality)**

# The water quality monitoring networks

**In Tunisia, there are 3 main water quality monitoring networks:**

- **The surface water quality network**
- **The groundwater quality network**
- **The Water Pollution sources network**



# Surface water quality monitoring

**The network is composed by about 60 main hydrometric stations and 170 secondary monitoring points at which usually a number of water quality measurements are performed such as:**

- ✓**Water conductivity**
- ✓**Determination of water majors ions**
- ✓**Determination of water turbidity**

**The collected data are published by the Water Resources General Direction in an annual report called « Annuaire hydrologique de la Tunisie »**

# the groundwater quality network

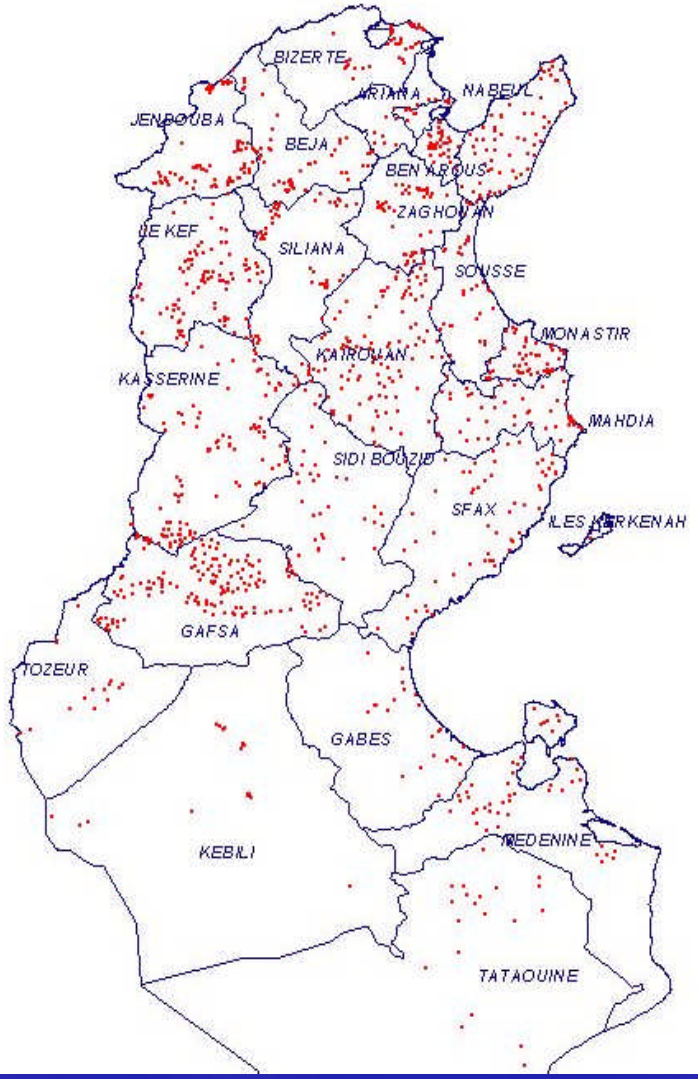
- The groundwater network was set up in 1998:
  - 1200 monitoring boreholes (shallow and deep wells)
    - Monitoring of TDS
    - Monitoring of nitrates
- Some analysis exist since many years
- Since 1993, data bank relative to the resultats of the chemical analysis carried out at the laboratory of the Water Resources General Direction was set up (monitoring of the major chemical elements and measuring out of the Nitrate element).

# Groundwater quality network

| Region | Shallow aquifers | Deep aquifers | Total |
|---|---|---|---|
| North | 325 | 159 | 484 |
| Centre | 196 | 212 | 408 |
| South | 208 | 100 | 308 |
| Total | 521 | 359 | 1200 |

**1200 monitoring boreholes for groundwater quality :**
**(TDS and nitrate)**

## Répartition régionale du réseau de suivi de la qualité des eaux souterraines



# Groundwater quality analysis procedure

- One to two analysis per year regarding TDS and the nitrate
- The water samples are abstracted from the boreholes in the field and the analysis are carried out at the Water Resources General Direction laboratory.
- **The collected data are published by the Water Resources General Direction in an annual report called « Annuaire de la qualité des eaux souterraines en Tunisie »**

# Groundwater quality monitoring objectif

- **Evaluation of the aquifers salinization under the impact of the intensive abstraction**
- **Evaluation of the aquifers contamination with the nitrates under the impact of the massive utilization of fertilizers**
- **Evaluation of the groundwater resources in terms of « quantity with a certain quality » in order to define the water resources use (drinking water, irrigation…)**

## Water Pollution sources monitoring network

**The setting up of a water pollution sources monitoring network is in progress (Ministry of Environment)**

**It is the result of a study carried out by the Ministry of environment. The tasks, already acheived, have allowed to:**

- ✓**Identify and caracterize all potential water pollution sources in Tunisia**
- ✓**Set up a data base about these potential water pollution sources: the data base is called « spore » and it will contribute to feed the National Information System about WATER in Tunisia called (SINEAU) which is « une première » in the Mediterranean region.**

# The importance of the water monitoring networks in Tunisia

**A special care is given to our water monitoring networks, in fact, a pioneer study to optimize the water monitoring networks was carried out recently in order to make these networks :**

- Easily manageable
- More representative
- Better responding to the water resources dynamic:
  - New conditions of abstraction (getting higher and higher)
  - developpement of new artificial recharge projects
  - Increase in the number of the hydraulic structures (new conditions of recharge)

# The results of the networks optimization study

# THE STUDY MAIN RESULTS REGARDING WATER QUALITY

- **The set up of a data bank for water quality monitoring**
- **Readjustement of the existing networks:**
  - **1- Elimination of unreliable monotoring boreholes**
  - **2- Adding of new monitoring boreholes**
- **The recommandation of monitoring in some cases other water quality parameters besides the TDS and the nitrate such as the chlorine and the bromine**

# Data bank

| | Piezometric network | Groundwater quality network |
|---|---|---|
| Number of boreholes | 3900 | 1200 |
| Number of records | 140 000 | 14 000 |

# Groundwater quality monitoring record

- Identification
- Geographical position
- Monitered aquifer
- Techinical data about the borehole
- Reference Chemical analysis
- Borehole environment
- Groundwater quality monitoring
- Groundwater quality trend

| | | | |
|---|---|---|---|
| Région: NORD EST<br>Gouvernorat: NABEUL<br>Délégation: EL HAOUARIA | Evaluation du réseau de suivi Qualité de l'eau<br>FICHE DE POINT D'OBSERVATION | Numéro I: NA_100820039<br>Num IRH:<br>Type: Puits | |

**Identification**

*Designation/Nom* Bir Rouissi *Lieu-Dit:*

**Localisation géographique**

| *Coordonnées - Grades décimaux* | | | *Coordonnées - UTM* | |
|---|---|---|---|---|
| *Longitude :* | 9,5363 | gr | *X =* | 670804,6 |
| *Latitude :* | 41,134 | gr | *Y =* | 4098523 |

**Aquifère suivi** *Objectif suivi :*

Nappe phréatique *Nom :* Plaine d'El Haouaria

*Code:* 43110

**Données techniques sur le point d'observation**

*Profondeur:* m

*Débit exploitation:* l/s *Usage des eaux:*

*Année réalisation forage :*

*Profondeur forée:* m *Prof.crép.supérieure:* m

*Profondeur tubée:* m *Prof.crép.inférieure:* m


**Analyse chimique de référence** Date prélèvement:

| *Analyse standard* | | | | *Autres éléments mesurés* | |
|---|---|---|---|---|---|
| *Ca++:* | mg/l | HCO3--: | mg/l | | mg/l |
| *Mg++:* | mg/l | Cl-: | mg/l | | mg/l |
| *Na+:* | mg/l | SO4--: | mg/l | | mg/l |
| *K+:* | mg/l | NO3-: | mg/l | | mg/l |

Conductivité: µS/cm

pH:

***Observations:***

**Environnement du point d'observation**

*Environnement hydraulique:* Oued *Distance:* 0,5 Km *Zone exutoire:* Oui

*Environnement agricole:* *Nature Exutoire:* *Distance:* 1,0 Km

*Sites potentiels pollution:* *Distance :* Km *Captage AEP:* ☐ *Distance :* Km

*Habitat proche :* Non

**Suivi des paramètres de qualité de l'eau**

*Fréquence mesures . :*

*Lacunes:* Non

*Début suivi :* 1998 *RS =* **4254** mg/l *NO3 =* **55,8** mg/l

*Derniere mesure enr.:* 2004 *RS =* **5106** mg/l *NO3 =* **83** mg/l

**Caractéristiques historiques Qualité de l'eau**

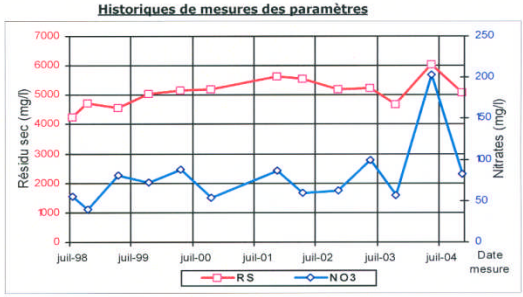
*Variation RS depuis début suivi =* **852** mg/l

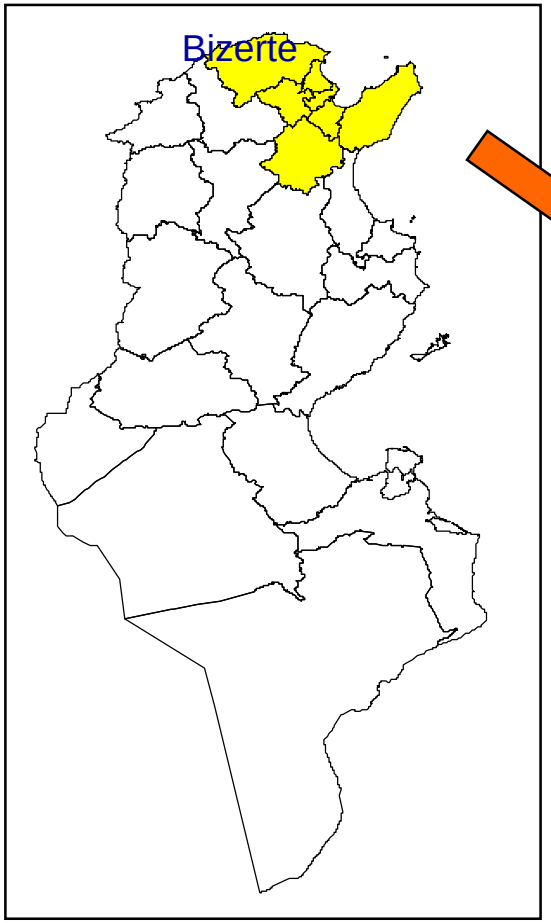
*Tendance interannuelle RS:* **Croissante**

*Variation NO3 depuis début suivi =* **26,7** mg/l

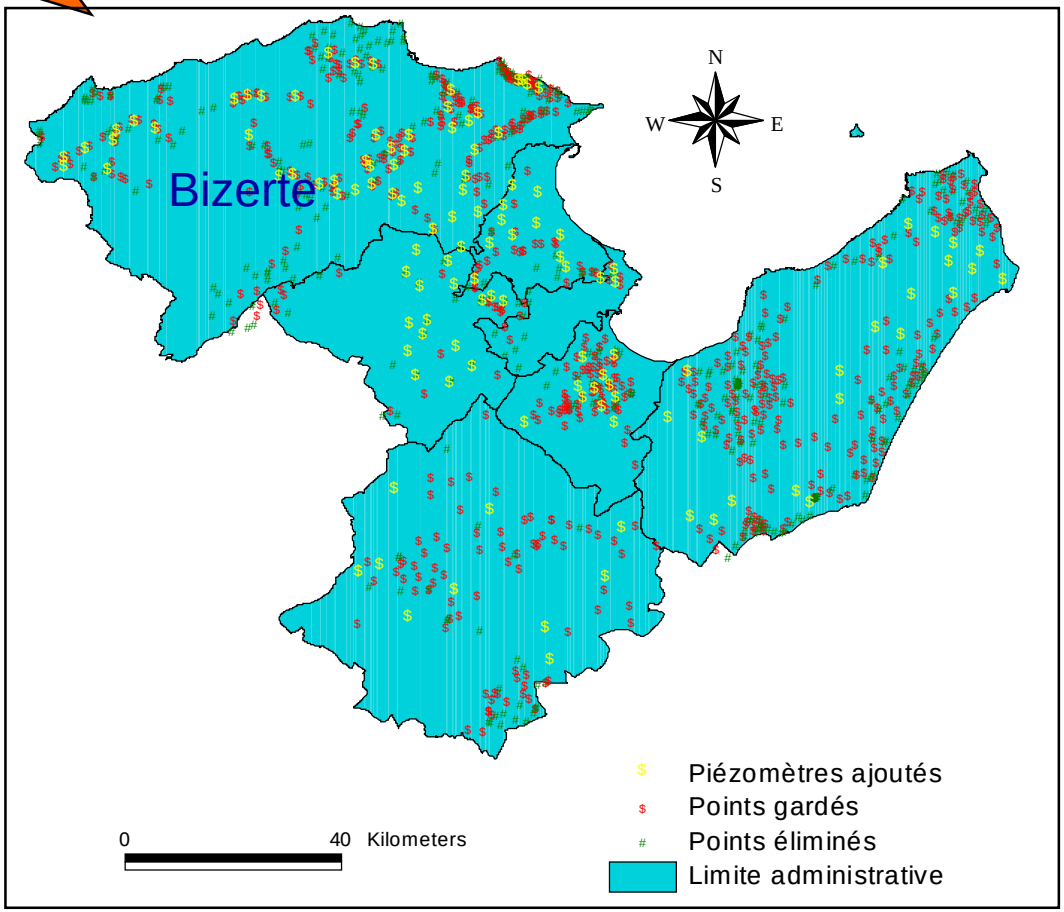
*Tendance interannuelle NO3:* **Croissante**

**Historiques de mesures des paramètres**






# Tthe study was carried out by gouvernorat (24 gouvernorat in Tunisia)



# The methodology of work

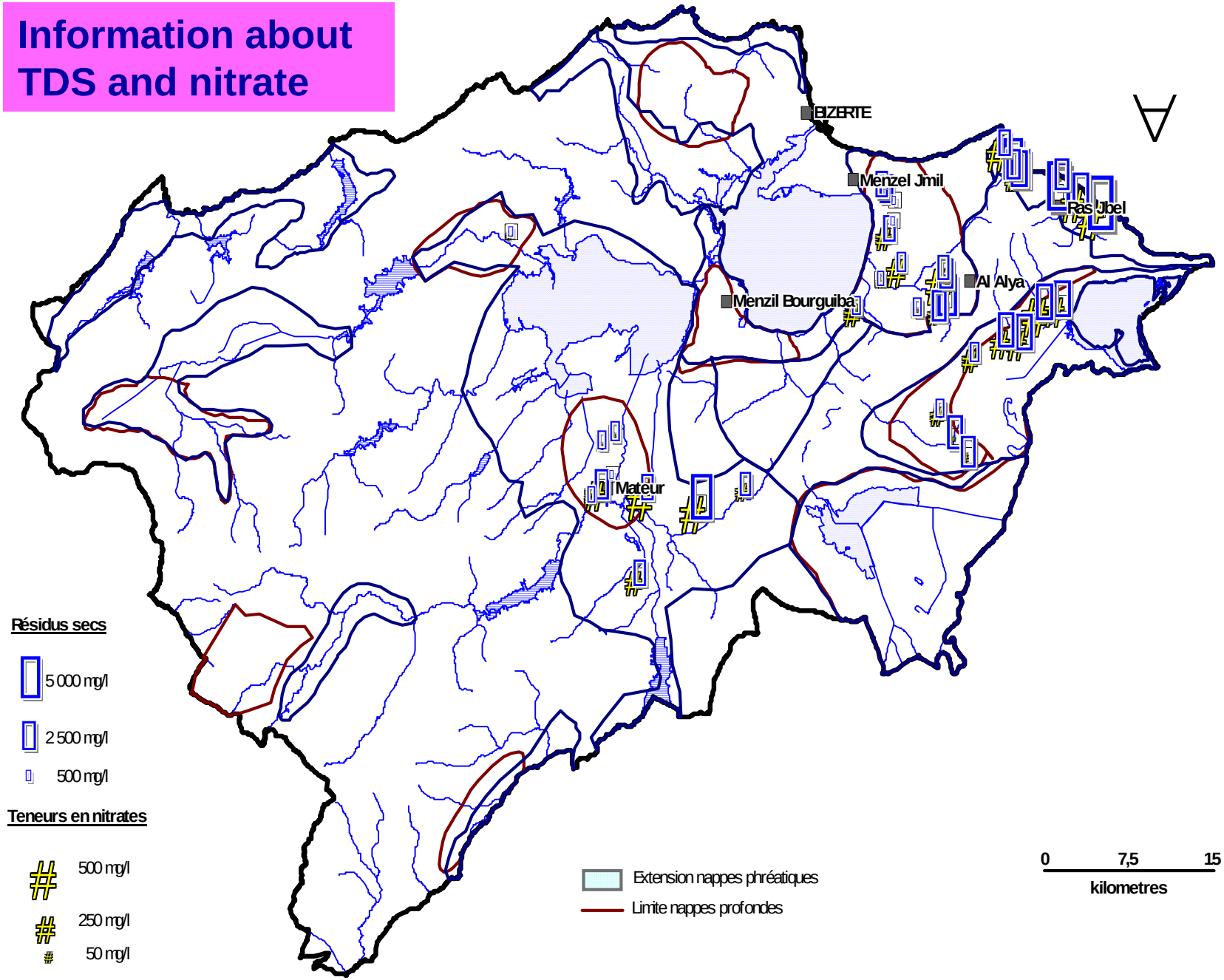
It is based on :

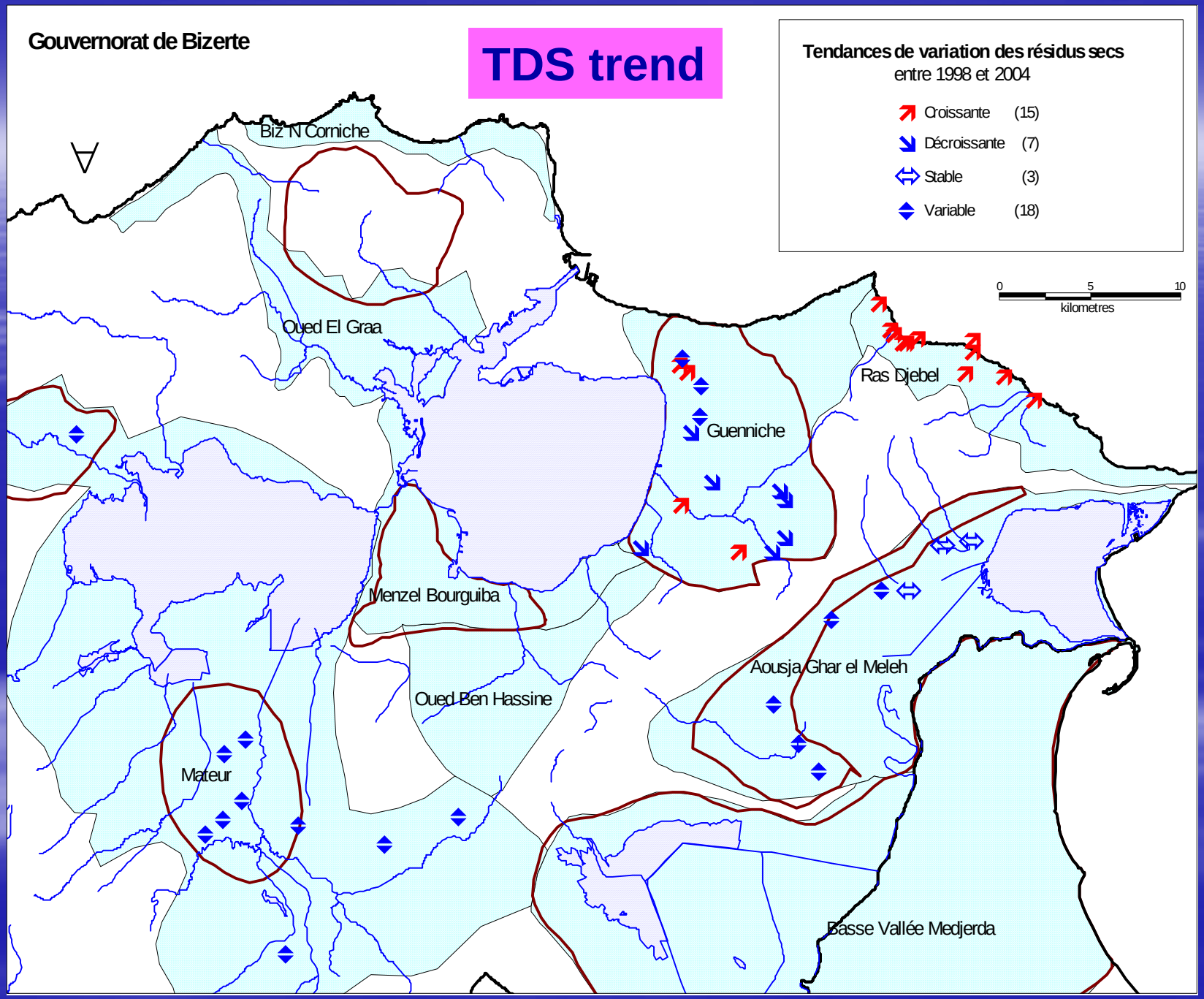
- The analysis of the existing network
- The analysis of the data evolution

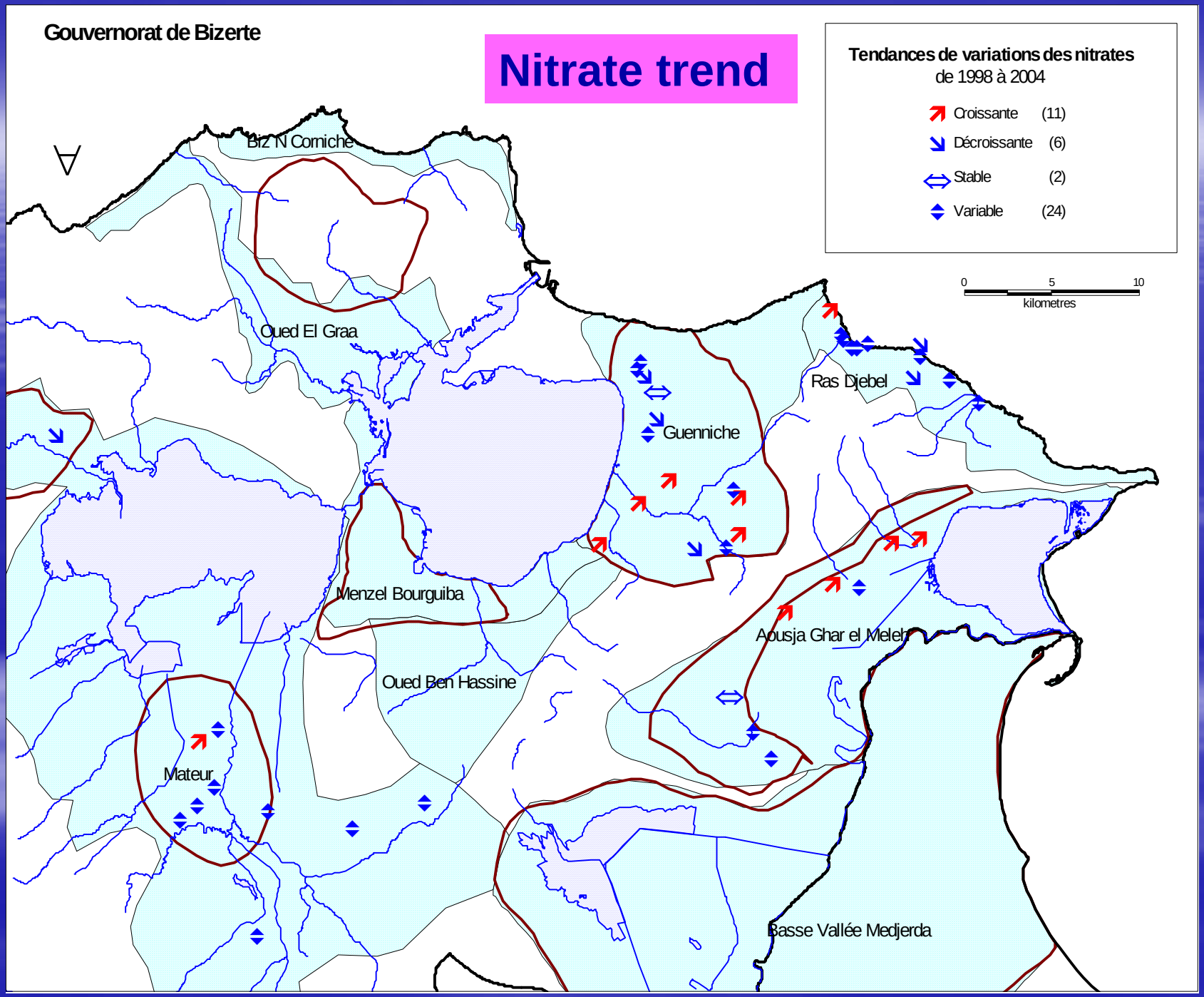
**The elimination or the adding of new monitoring boreholes depends on the following points:**

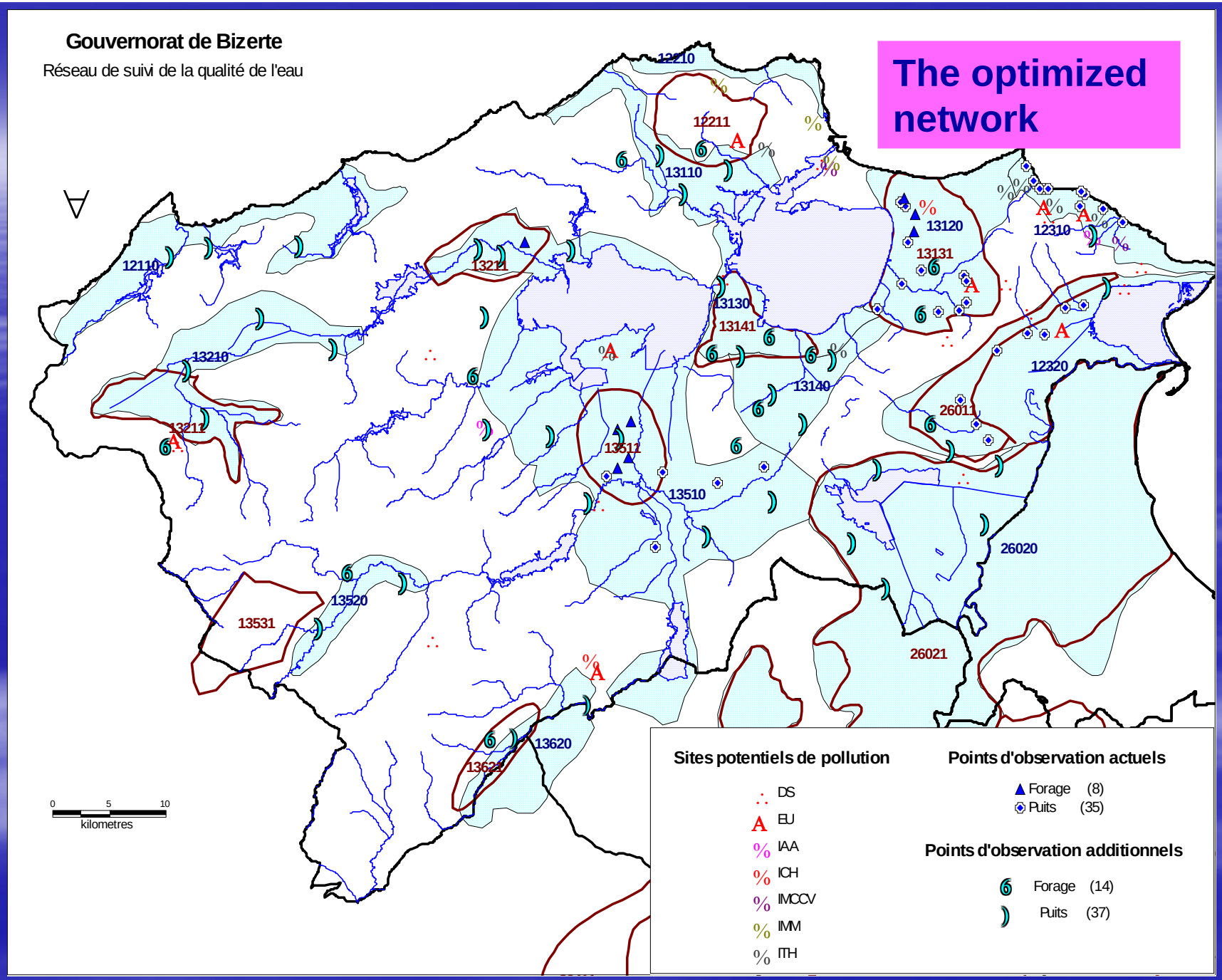
- Spatial distribution of the existing network,
- The location of Water pollution sources
- Hydrodynamic caracteristic of the aquifer
- The existing of abstraction shallow or deep wells

# Information about TDS and nitrate




Gouvernorat de Bizerte
TDS trend
Tendances de variation des résidus secs
entre 1998 et 2004
Croissante (15)
Décroissante (7)
Stable (3)
Variable (18)
0 5 10
kilometres
Biz N Corniche
Oued El Graa
Ras Djebel
Guenniche
Menzel Bourguiba
Oued Ben Hassine
Aousja Ghar el Meleh
Mateur
Basse Vallée Medjerda


Gouvernorat de Bizerte
Nitrate trend
Tendances de variations des nitrates
de 1998 à 2004
Croissante (11)
Décroissante (6)
Stable (2)
Variable (24)
0 5 10
kilometres
Biz N Corniche
Oued El Graa
Ras Djebel
Guenniche
Menzel Bourguiba
Aousja Ghar el Melel
Oued Ben Hassine
Mateur
Basse Vallée Medjerda


Gouvernorat de Bizerte
Réseau de suivi de la qualité de l'eau
The optimized network
12210
12211
13110
12110
13211
13120
13131
12310
13130
13141
13210
13140
12320
13212
26011
13511
13510
26020
13520
13531
26021
13620
13621
0 5 10
kilometres
Sites potentiels de pollution
DS
EU
IAA
ICH
IMCCV
IMM
ITH
Points d'observation actuels
Forage (8)
Puits (35)
Points d'observation additionnels
Forage (14)
Puits (37)

# The networks exploitation

# The networks exploitation
# CONCLUSION

**Water quality monitoring networks**

- **Data base with long history evolutions**
  - **Assess the l conditions of our water resources (surface water and groundwater resources)**
  - **Identify the risks of water pollution**
  - **Elaborate predictive studies**
  - **Delimitate the protection and banning zones (for water use or abstraction)**
  - **Update our water resources legal policies**

DECISION SUPPORT SYSTEM
fOR
A WATER RESOURCES SUSTAINABLE MANAGEMENT


THANK YOU