6 CLEAN WATER AND SANITATION

Tunisia experience in 6.3.2 Indicator submission

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Interagency and Experts Collaboration to Improve the Production and Dissemination of SDG Indicators from Official National Sources
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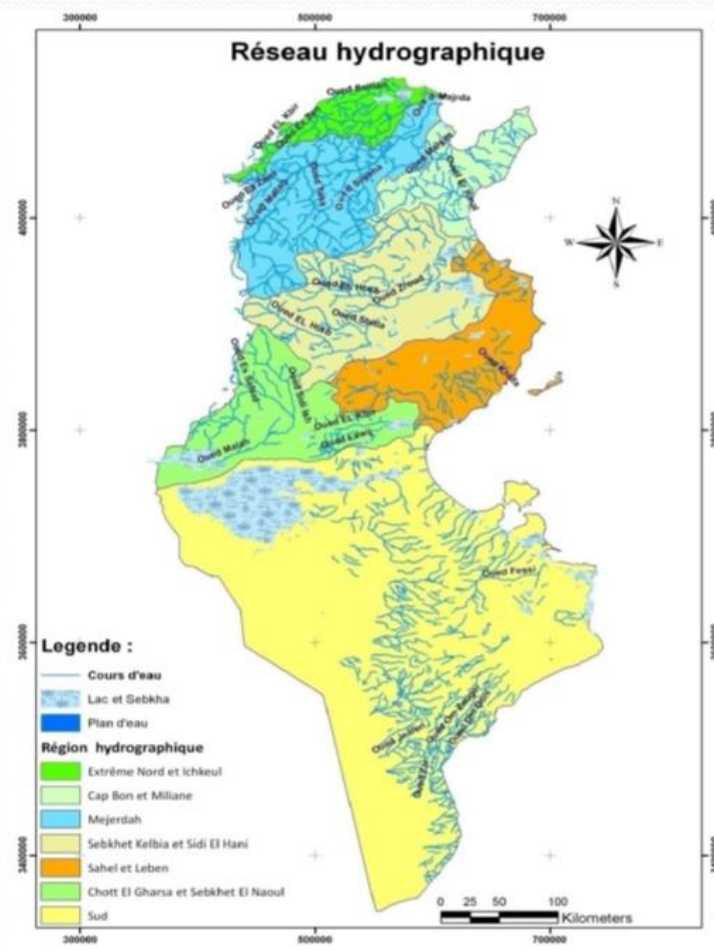
Water Resources in Tunisia : surface water resources



Secteurs	Apport moyen Mm^3/an	Pourcentage %
Extrême Nord et Ichkeul (Bassin 3)	960	36
Cap Bon, 0. Miliane et Sahel Nord (Bassin 4)	250	9
Méjerdah-Ghar el Melh (Bassin 5)	1000	37
Sebkhat Kelbia – Sidi el Hani (Bassin 6)	212	8
Sahel de Sousse et Sfax et l'oued Lebben (Bassin 7)	63	2
Chott el Gharsa et Sebkhats Naouel – Sidi Mansour (bassin 8)	95	4
Sud (bassin 9)	120	4
Total	2700	100

- Semi-arid region, growing population and economy, erratic rainfall, overexploited underground resources : Tunisia's big challenge in next years is Water scarcity.
- Maximum rate of mobilization : 90%
  - ✓ 35 dams
  - ✓ 234 hill dams
- The per capita endowment is at about **450 cm** per capita per year. This ratio will reach **315 cm** per capita per year in 2030, (<1000 cm).

Water Quality Legislation and Standards in Tunisia
first challenge in 6.3.2 reporting

- **Drinking water**

✓ N.T 09.14 (1983) – quality of potable water.

✓ N.T 09.13 (1983) – quality of surface water that can be used as potable water source.

- **Effluents**

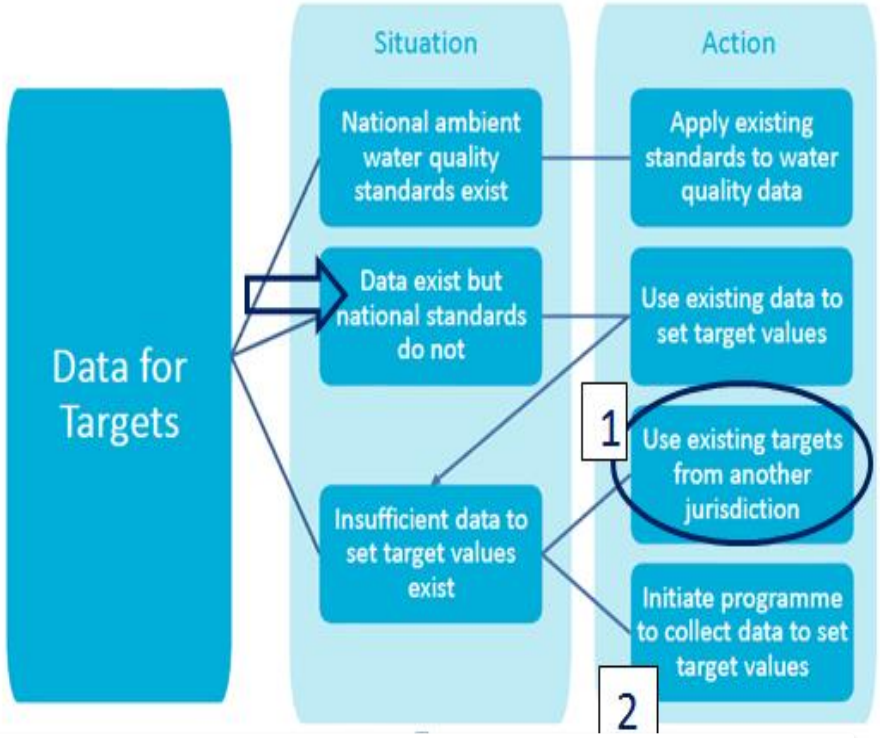
✓ Decree 2018-315 du 26 mars 2018 – regulating the discharge of treated wastewater in Public water domain, Public maritime domain and public sewer system

✓ Decree No. 94-1885 (1994) regulating the discharge of wastewater (other than domestic water) into the environment.

✓ NT 106.03 identifying conditions for the reutilization of treated wastewater for irrigation.

- **Ambient waters or ecosystem quality**

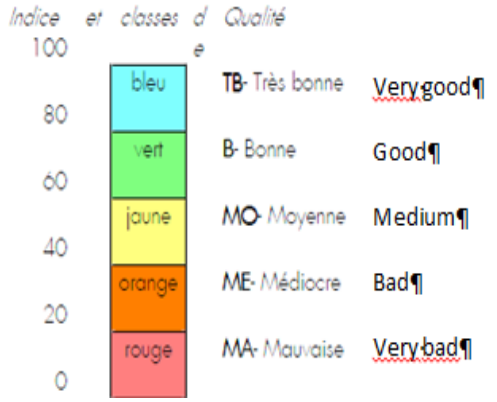
There is no legislation regarding ambient water quality.



To evaluate surface water bodies, we referred to DCE standards (Good quality)
To evaluate ground water bodies, we referred to NT 09.14 for drinking water standards

Cooperation betwen stakeholders is very important regarding this point, a bigger database would help determining reference conditions and setting targets.

Surface water bodies targets : European evaluation system for rivers water quality



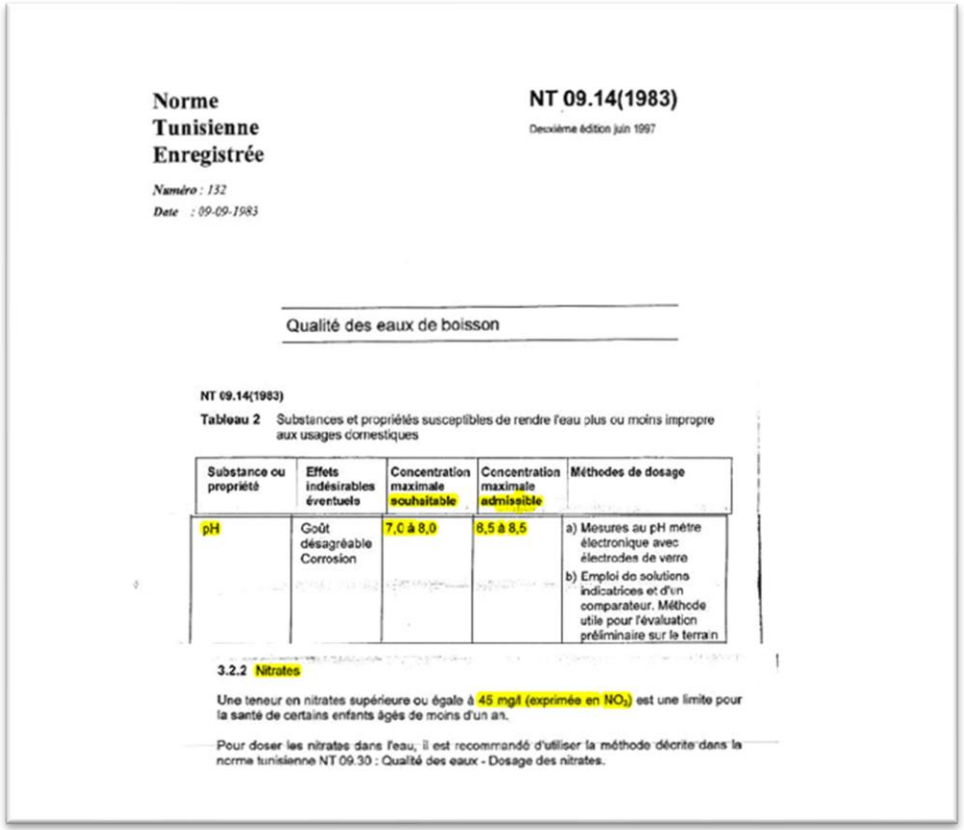
Grilles d'évaluation SEQ-Eau

- Parameters are clustered in 16 alterations
- The system allows to define:
  - Water ability to ensure biology
  - Water ability to ensure uses
  - **Water Quality Index**

Classe de qualité →	*Bleu*	*Vert*	*Jaune*	*Orange*	*Rouge*
Indice de qualité →	*80*	*60*	*40*	*20*	
3 - NITR – NITRATES					
NO_3^- (mg/l NO_3)	2	10	25	50	
4 - PHOS - MATIERES PHOSPHOREES					
PO_4^{3-} (mg/l PO_4)	0,1	0,5	1	2	
8 – ACID - ACIDIFICATION					
pH min	6,5	6,0	5,5	4,5	
MAX	8.2	9	9,5	10	
9 – MINE - MINERALISATION					
Conductivité (µS/cm) min	180	120	60	0	
MAX	2500	3000	3500	4000	

Ground water aquifers targets: NT 09.14 for drinking water standards

Ground water is supposed to be used either as tap water, or for irrigation. We referred to Tap water standards in setting targets for aquifers.



Norme Tunisienne Enregistrée

Numéro : 132
Date : 09-09-1983

NT 09.14(1983)
Deuxième édition juin 1997

Qualité des eaux de boisson

NT 09.14(1983)

Tableau 2 Substances et propriétés susceptibles de rendre l'eau plus ou moins impropre aux usages domestiques

Substance ou propriété	Effets indésirables éventuels	Concentration maximale souhaitable	Concentration maximale admissible	Méthodes de dosage
pH	Goût désagréable Corrosion	7,0 à 8,0	8,5 à 8,5	a) Mesures au pH mètre électronique avec électrodes de verre b) Emploi de solutions indicatrices et d'un comparateur. Méthode utile pour l'évaluation préliminaire sur le terrain

3.2.2 Nitrates

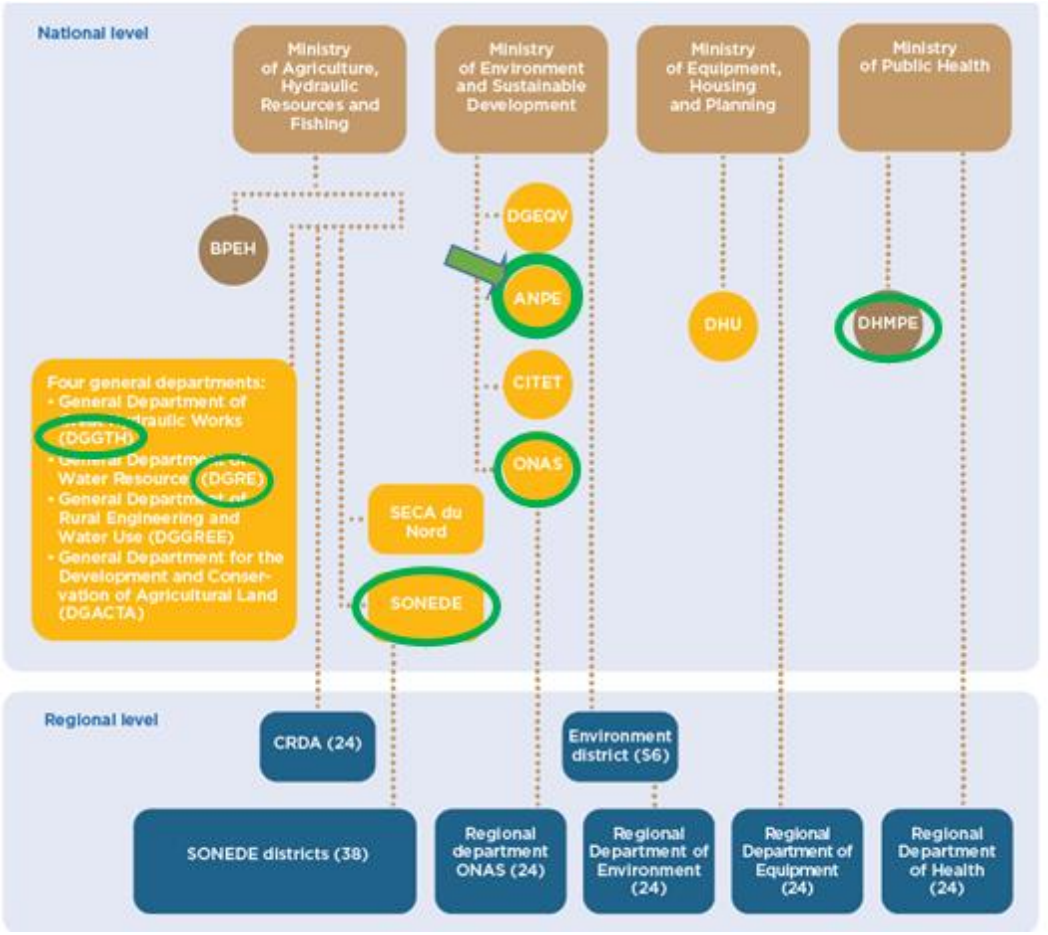
Une teneur en nitrates supérieure ou égale à 45 mg/l (exprimée en NO_3) est une limite pour la santé de certains enfants âgés de moins d'un an.

Pour doser les nitrates dans l'eau, il est recommandé d'utiliser la méthode décrite dans la norme tunisienne NT 09.30 : Qualité des eaux - Dosage des nitrates.

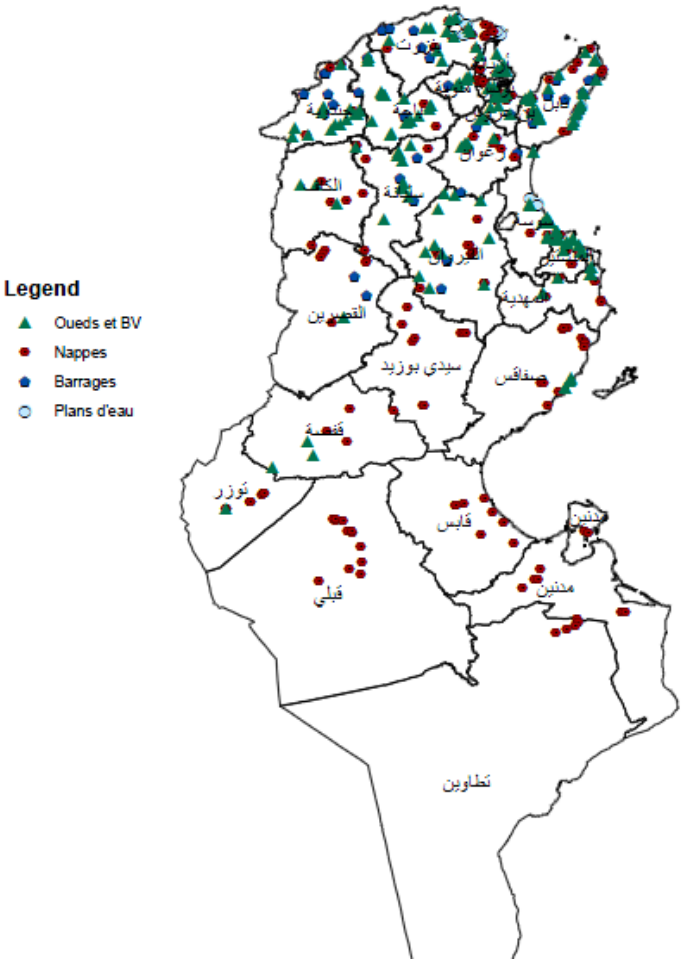
Water Quality Monitoring networks : Diversity that makes indicator calculation more difficult

- **Agriculture Ministry** :
  - Surface and ground water monitoring at national level, two parameters are measured (salinity and nitrates),
  - Dams water quality monitoring.
  - Drinking water monitoring,
- **Public Health Ministry** :
  - Also monitoring drinking water
- **Environment Ministry** :
  - Treated waste water monitoring (released by water treatment plants)
  - Copeau : National Network for water quality monitoring at national level, different types of water

Even if having several water quality is a major asset in water management system, this split makes computing 6.3.2 indicator much more challenging



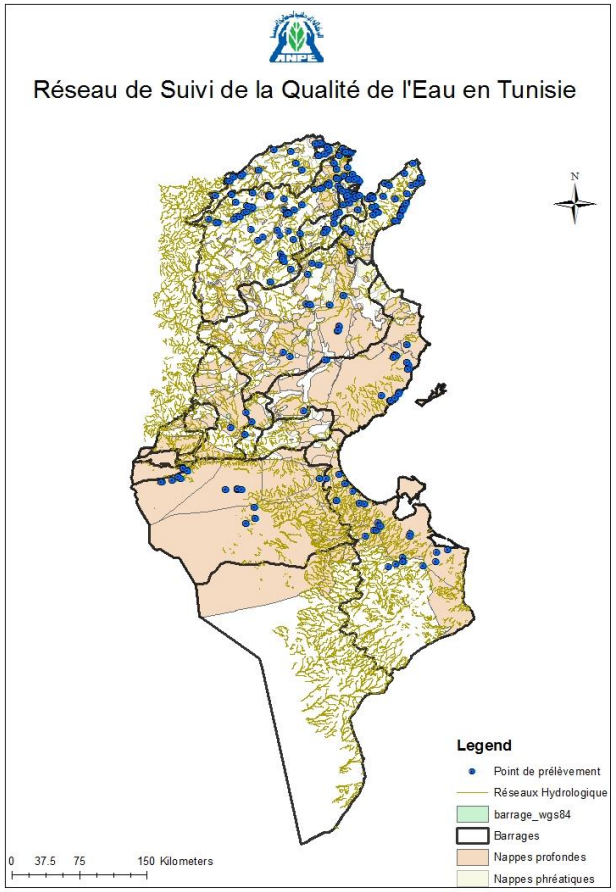
Ambient Water Quality Monitoring network
Copeau Network



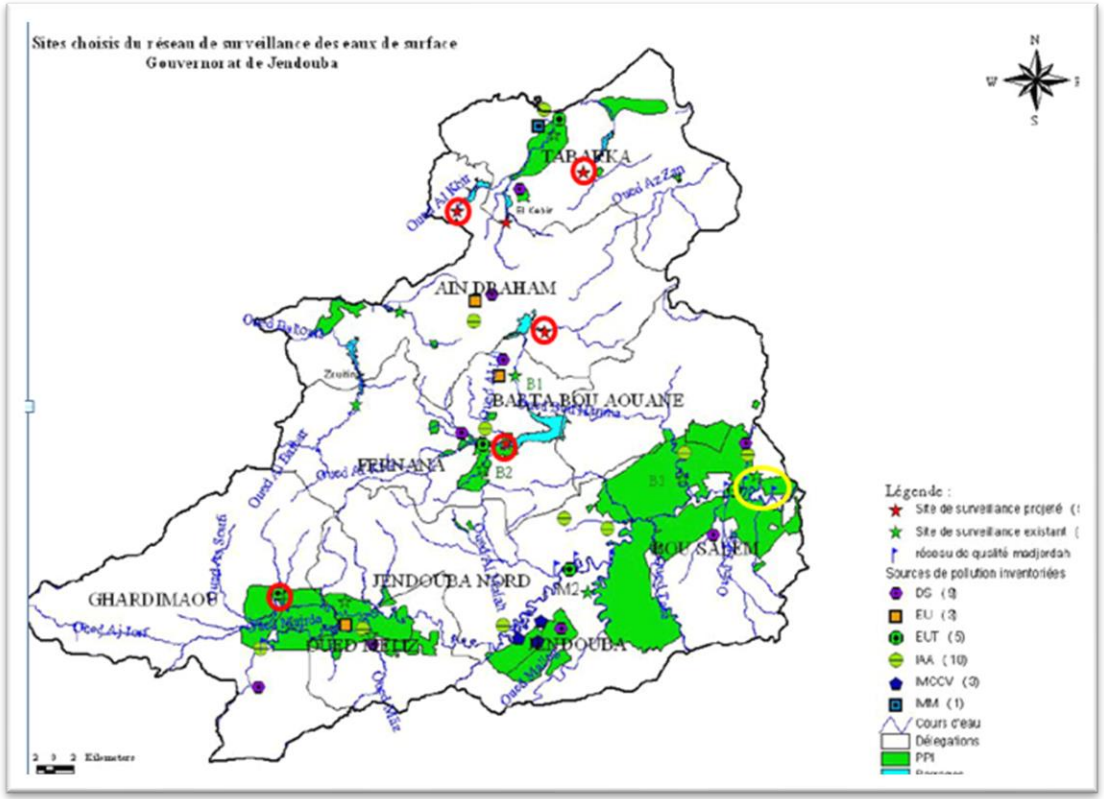
More than 400 monitoring points distributed as follows:

- 110 MP located in rivers
- 35 MP located in dams and 27 MP located in wetlands.
- 170 MP to monitor groundwater
- 88 MP for releases (treated and untreated).

Monitoring locations reflect pressures observed in the water body. MP are much more frequent in waterbodies where potential pollution sources exist, than waterbodies located in unaffected areas.



Monitoring Program Design



Monitoring Points identification based on:

- Water vulnerability, rivers which flow in dam or wetland are considered more vulnerable
- Existant monitoring points (cooperation and complementarity between stakeholders is considered)
- Inventory and classification of pollution sources,

Targets

- Water quality status determination (or estimation) at a certain time and location,
- Spatial and temporal trends Analysis regarding water quality
- Helping in establishing cause/effect relations : at least giving basic elements in estimating :
  - impacts of pollution on water quality degradation in short and long terms,
  - impacts and effectiveness of mesurements taken by authority to fight water quality pollution

Administrative units were taken into consideration, and not water masses, same thing for underground waters, we didn't consider aquifers.
- No MP found for many surface water bodies and aquifers (absence of significant contamination source)
- Difficulties in identifying MP located in sufficiently mixed waters

Monitoring Programme Operation

- Commonly monitored parameters
  - Physicochemical analysis
    - In situ measurements : **pH**, Temperature, **Conductivity**, Turbidity, **Dissolved Oxygen (intermittent measuring)**, Total Dissolved Solids, salinity,
    - Lab measurements
      - **Nitrates** and **Ortho Phosphates** (frequent measurements)
      - Sulfates
      - COD (frequent but not for all MP) and BOD (intermittent)
      - Hardness (intermittent)
      - Heavy metals : Cr IV, Zn, Fe, Pb, Ni, …
- Additional parameters
    - Bacteriological : E.Coli, TC, FC
    - Hydrocarbons

  Only In some special cases
- **Frequence of sampling : twice a year**
- **We considered only nitrates in stead of Total Oxidised Nitrogen (Nitrate + Nitrite) because we don't measure Nitrite**

- Copeau Network operates in Tunisia since 2004, it was extended in 2010 : Project with Aquapole/Liège.
- Copeau Network operates sampling and analysis in one Central laboratory and one regional laboratory.

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COPEAU
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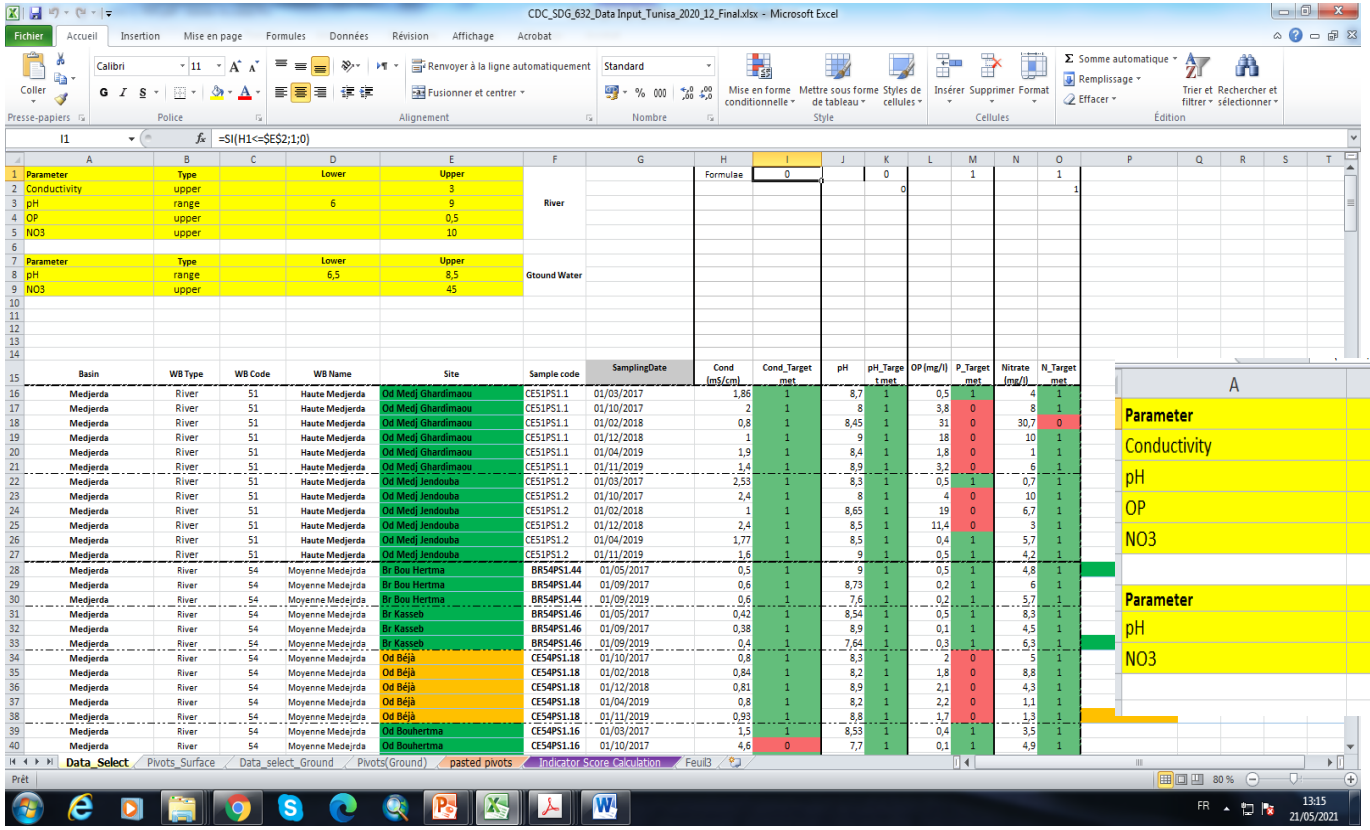
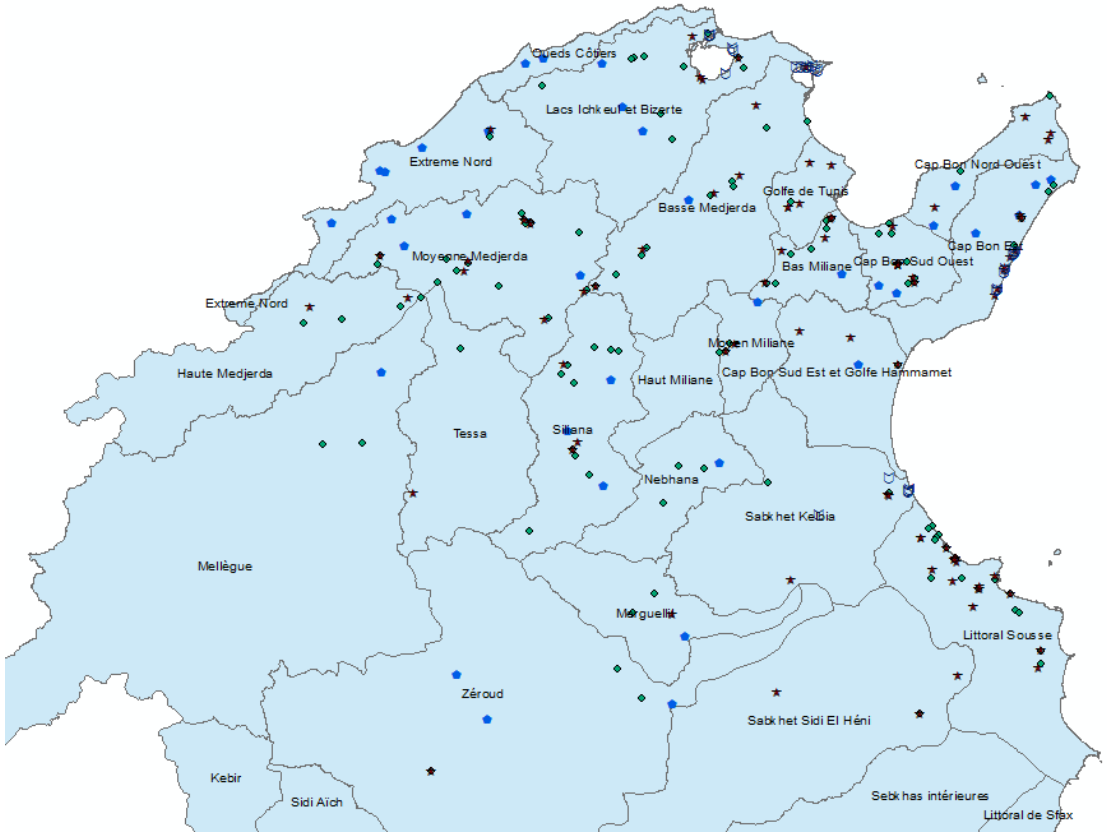
Finally : how we computed 6.3.2 indicator 2017-2019



Parameter	Type	Lower	Upper	
Conductivity	upper		3	River
pH	range	6	9	
OP	upper		0,5	
NO3	upper		10	
Parameter	**Type**	**Lower**	**Upper**	
pH	range	6,5	8,5	Gtound Water
NO3	upper		45	

85 : National Indicator score



Monitoring Station Indicator Score

Basin	WB	WB Type	Score/MP	Score/WB	"good water quality"	Monitoring Value
	Oueds côtiers	R	81,3	81,3	1	32
	Br Gamgoum		81,3			16
	Br Ziatine		81,3			16
	Bas Miliane	R	72,9	73	0	48
	Br Bir Mcherga		68,8			16
	Br El Hma		81,3			16
	Od Meliane		68,8			16
	Basse Medjerda	R	81,9	82	1	72
	Br Laâroussia		75,0			24
	Od Medj Slouguia		87,5			24
	Od Medj Testour		83,3			24
	Cap Bon Est	R	86,7	87	1	60
	Br Chiba		95,0			20
	Br Elmlaâba		80,0			20
	Br Lebna		85,0			20
	Cap Bon Nord Ouest	R	75,0	75	0	40
	Br Bezirkh		80,0			20
	Br Laabid		70,0			20
	Cap Bon Sud Est et Golfe Hammamet	R	91,7	92	1	24
	Br Rmel		91,7			24
	Cap Bon Sud Ouest	R	87,5	88	1	48
	Br Masri		85,0			20
	Br Tahouna		91,7			12
	Od Jdida		87,5			16
	Extreme Nord	R	90,4	91	1	52
	Br Kebir		91,7			12
	Br Moula		87,5			16
	Br Sidi Barrak		91,7			12
	Br zarga		91,7			12
	Haute Medjerda	R	81,3	81	1	48
	Od Medj Ghardimaou		75,0			24
	Od Medj Jendouba		87,5			24
	Lac Ichkeul et Bizerte	R	82,7	82	1	52
	Br Ghezela		75,0			16

Data_Select | Pivots_Surface | Data_select_Ground | Pivots(Ground)

E41: =(D42+D43+D44+D45)/4

P2/NABV/A		62,5			8	
Berkoukech Ouechteta	G	100,0	100	1	6	
P1/NBO/O		100,0			6	
Cote Orientale	G	87,5	87	1	40	
P1/NCO/BK		75,0			12	
P2/NCO/DC		83,3			6	
P3/NCO/BK		100,0			12	
P4/NCO/K		90,0			10	
Djebenyana	G	100,0	100	1	14	
P1/NJ/1		100,0			8	
P2/NJ/2		100,0			6	
Fahs	G	91,7	92	1	12	
P1/NF/F		91,66667			12	
Gabès Nord	G	100,0	100	1	10	
P1/NGN/		100			10	
Gabès Sud	G	95,5	95	1	44	
P1/NGS/K		100			10	
P2/NGS/M		100			10	
P3/NGS/M1		83,33333			6	
P4/NGS/M2		90			10	
P5/NGS/T		100			8	
Gromballia	G	87,5	88	1	24	
P1/NG/G		100			12	
P2/NG/S		75			12	
Hencha	G	94,4	95	1	18	
P1/NH/1		90			10	
P2/NH/4		100			8	
Manouba	G	100,0	100	1	14	
P1/NM/EV		100			8	
P2/NM/L		100			6	
MV Medjerda	G	100,0	100	1	6	
P1/NMVM/B		100			6	
Nappe Basse Vallée	G	96,7	97	1	30	
P1/NBV/EV		100			12	
P2/NBV/BT		90			10	
P3/NBV/Ut		100			8	
Nefzaoua Septontrionale	G	84,2	88	1	38	
P1/NFS/OS		100			8	
P2/NFS/TAK		87,5			8	
P3/NFS/SLZ		77,27273			22	
Oasis du Djrid	G	92,3	92	1	42	
P1/NOJ/N1		100			6	
P2/NOJ/N2		100			6	
P3/NOJ/T3		100			10	

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- **12** surface water masses among 27 were considered to compute surface indicator score : 83
- **22** ground water masses among 37 (that are monitored by Copeau Network) were considered to compute ground indicator score : 86
- **1030** monitoring values were used to generate a national water quality index : (600 in rivers and 430 in aquifers)

Thank you for your attention