

## Training Module on Water Quality Monitoring



### Source to Tap and Back Training module on water quality monitoring – day 1

Result 2.5

Michiel Oudendijk & Andrea Swenne  
Monday January 16, 2017

### Introduction program of the training

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Day 2

Day 1

Goal for the 2 days: design your own monitoring grid and how to cooperate, collaborate with each other

### Introduction Source to Tap and Back (S2TAB)

### Source to Tap and Back (S2TAB)

R.2 – WQ monitoring, review and data management

R.2 – Emission reduction plans

### In this project – our main results will be in the parts of the project

From Source

and Back

- Focus on catchment management, land use and re-use of water  
This is our experience in the Netherlands

### The Netherlands: delta of 4 international basins

6

Ems

Rhine

Meuse

Scheldt

## Dutch Water Authorities (DWA)

- 1 Rijnland
- 2 Fryslân
- 3 Rivierland
- 4 Drechtstreek
- 5 Veluwe
- 6 Delfland
- 7 Rijn en IJssel
- 8 De Biesbosch
- 9 Alkmaar, Groot en Klein
- 10 Alkmaar, Westerpolder
- 11 Rijnland
- 12 Drenthe
- 13 Groningen & Noordoostpolder
- 14 Noordoostpolder
- 15 IJsselmer
- 16 De Oostvaardersplassen
- 17 De Oostvaardersplassen
- 18 De Oostvaardersplassen
- 19 De Oostvaardersplassen
- 20 De Oostvaardersplassen
- 21 De Oostvaardersplassen
- 22 De Oostvaardersplassen
- 23 De Oostvaardersplassen

## Dutch Water authority - DWA

-Decentralised authority with limited task: **integrated water management**

3 main tasks:

- Safety & flood protection
- Sufficient water
- Clean water (waste water treatment & surface water quality)

•Not drinking water!!!

## Introduction program of the training

Day 2

Day 1

Goal for the 2 days: design your own monitoring grid and how to cooperate, collaborate with each other. Learning by doing.

## Expectations

Exercise

1. Write down what you expect from this training (5 min)
2. Formulate your personal training goals (5 min)

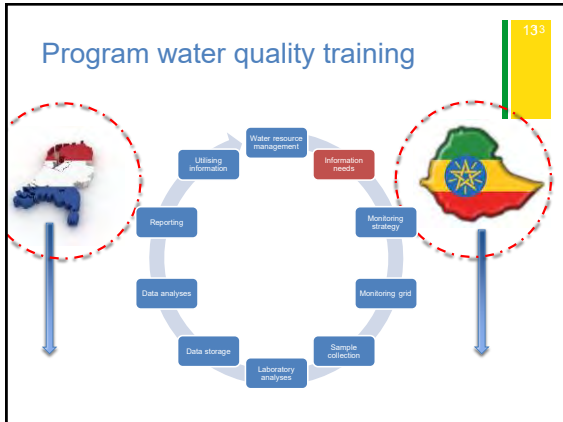
## Monitoring cycle

The cycle consists of the following steps:

- Water resource management
- Information needs
- Monitoring strategy
- Monitoring grid
- Sample collection
- Laboratory analyses
- Data storage
- Data analyses
- Reporting
- Utilising information

## Program water quality training

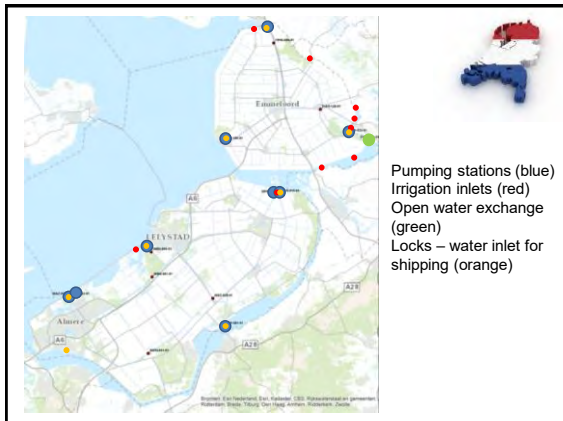
The diagram shows the monitoring cycle with the Netherlands flag on the left and the Romanian flag on the right, indicating international collaboration.



## Information needs

### Dutch example: 'blue-nodes'

- When exchanging water between water authorities, the water has to comply with certain water quality standards and limits to the amount of water that may be discharged or used. This information has to be gathered at the 'blue nodes' where water is exchanged with the neighbouring water authority.
- Information needs at the 'blue nodes':
  - Water quality (concentrations of nutrients, chloride, heavy metals, PAH)
  - Discharge volume (cubic meter per day)
  - Irrigation inlet volume (cubic meter per day)
- These information needs are written down in a formal contract between the water authorities.



## Information needs

### Some other Dutch examples:

- General water quality (test against water quality standards)
- Trend analyses (is the quality getting better or getting worse)
- Specific uses:
  - is the water suited for the production of drinking water?
  - is it safe for cattle to drink?
  - is it safe for the irrigation of certain crops?
  - is it safe to bath or swim in?
- Effect of measures taken:
  - What is the effect of measures taken to improve water quality?

## Let's work it out!

- What are your information needs?
  - What / why do you need to measure?
  - Which questions do you need to answer?
  - *What does your organisation need?*
  - *What do you think Ethiopia needs to know?*

- In three groups :
  - What are your information needs?

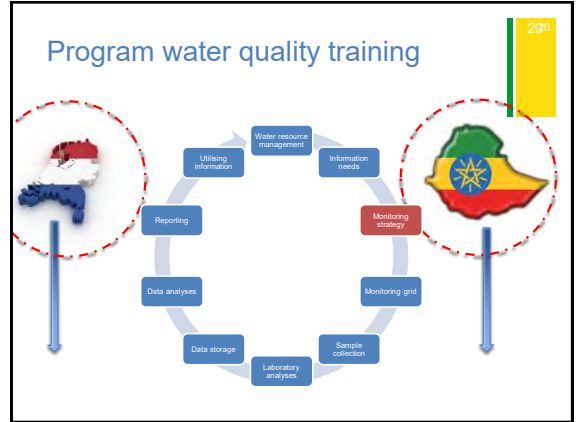
## Let's work it out!

- What are your information needs?
  - What / why do you need to measure?
  - Which questions do you need to answer?
  - *What does your organisation need?*
  - *What do you think Ethiopia needs to know?*

- Work this out in 30 minutes
- Everybody writes topics on yellow notes
- Be as specific as possible
- Collect and discuss the information
- Presentation maximum 5 minutes per team
- Choose a spokesperson
- Present on half flip-over per team

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- Coffee break



### Monitoring strategy

Dutch example: 'blue nodes'

Questions to be answered:

- What do you already know?
- What do you not know yet?
- What do others know?

### Monitoring strategy

Dutch example: 'blue nodes'

This example is very specific in describing the monitoring needs:

- Ongoing, continuous monitoring
- Fixed number of specific locations
- Data collection by the water authority (water quality, discharge volumes, irrigation inlet volumes) and by the province (water inlet through the locks for shipping)
- Prescribed frequency for sample collection (to calculate a mass balance for certain parameters (nutrients, chloride))
- Online measurement not an option for all parameters, so samples need to be collected.

### Let's work it out!

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#### ■ What is your monitoring strategy?

- What information do we already know? (in answers to the questions/information needs)
- Is data already being collected? (in relation to the information needs) by yourself, by others?
- Is almost similar data collected that can be used? What data?
- Are there alternatives? Which alternatives?

### Let's work it out!

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#### ■ What is your monitoring strategy?

- What information do we already know? (in answers to the questions/information needs)
- Is data already being collected? (in relation to the information needs) by yourself, by others?
- Is almost similar data collected that can be used? What data?
- Are there alternatives? Which alternatives?

- Work this out in 20 minutes
- Everybody writes topics on yellow notes
- Be as specific as possible
- Collect and discuss the information
- Presentation maximum 5 minutes per team
- Choose a spokesperson
- Present on half flip-over per team

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- Lunch break

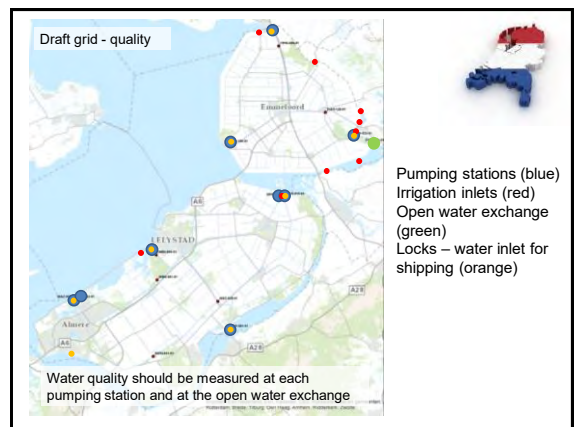
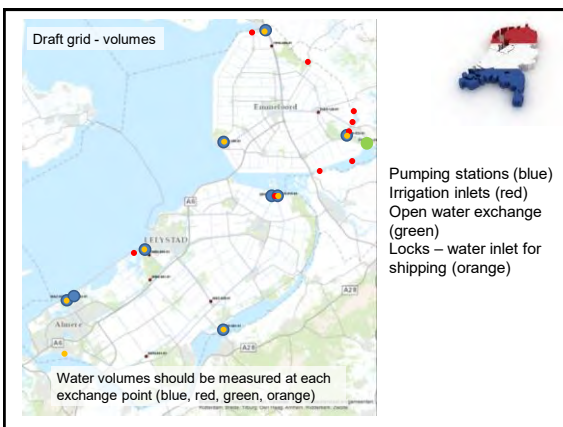
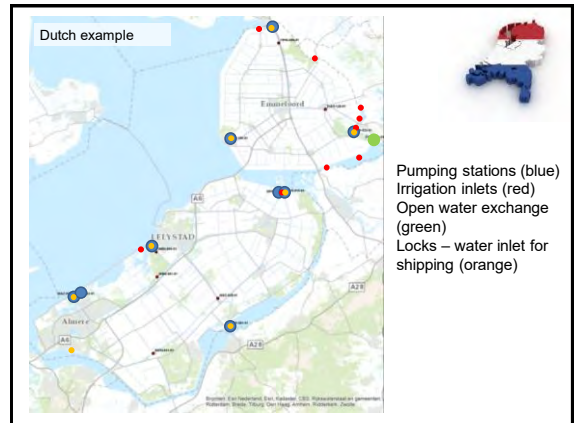


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### Design monitoring grid

Steps to design a monitoring grid:

- Select sampling locations – draft grid
- Visit sampling locations
- List of parameters and consumables/necessaries
- Make a budget plan
- Make choices if needed (budget)



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## Visit sampling locations

- Is the location suited for measurements?
  - Is it possible to do the measurements here?
  - Is it safe to sample here?
  - Can the location be reached easily?
  - Do you need permission to get here?
  
- Document where samples are to be taken:
  - Description
  - Coordinates
  - Pictures, map
  - Contact information for permission (if needed)

Meetpunt  
2019-204-01

Omschrijving  
ONBEKEND, stager t/o Topstad  
UK

Coördinaten  
1707N, 118657


Toelichting






## eu07rak

### Akaki river after Lake Aba Samuel





**Sampling:**

- Sample between the dam and the road (crossing the river)
- Sample using a sampler on a pole

**Site details:**

- River width ~20-30m
- Local land use: reservoir, agriculture
- Flow: high flow

Sampling site 6 in report Daniel  
Sampling site La16 in report Zerfe

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## Parameters to be measured

- What parameters are needed?
  - Nutrients
  - Chloride
  - Heavy metals
  - PAH
  
- What sampling frequency?
  - Prescribed in the contract for the 'blue nodes' is sampling 24x/year to be able to estimate a mass balance.
  - Heavy metals and PAH that are expensive to analyse have to be sampled 12x/year (mainly for testing against the water quality standard)

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## Budget plan

- Cost of sampling
- Cost of transportation
- Cost of analyses (laboratory days, consumables, equipment etc.)
- Cost of reporting
- ...

+ .....

- Does it fit the budget (?)
- If it does: OK
- If not: where can adjustments be made?
  - Reduce number of locations
  - Reduce number of samples (sampling frequency)
  - Reduce parameters to be analysed
  - Increase the budget?

## Budget plan



■ Sampling: 24x EUR 480,- =	EUR 11.520,-
■ Transportation: 24x EUR 50,- =	EUR 600,-
■ Cost of analyses:	
■ nutrients: 24*10*EUR 60,- =	EUR 14.400,-
■ chloride: 24*10*EUR 20,- =	EUR 4.800,-
■ Heavy metals: 12*10*EUR 80,- =	EUR 9.600,-
■ PAH: 12*10*EUR 135,- =	EUR 16.200,-
■ Cost of reporting: 5 days @ EUR 480,- =	EUR 2.400,-
+ .....	
<b>Total:</b>	<b>EUR 59.520,-</b>

## Design monitoring grid


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Steps to design a monitoring grid:

- Select sampling locations – draft grid
- Visit sampling locations
- List of parameters and consumables/necessaries
- Make a budget plan
- Make choices if needed (budget)

## Let's work it out!


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- Take 1 of the information needs  
Design a monitoring grid
- Where to sample/measure? (and why on that location – is there already sampling going on)
- What parameters to measure?
- How often? - frequency
- (what accuracy)
- Consequences (finances, capacity), prioritising, combining? – make choices

## Let's work it out!

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- Take 1 of the information needs  
Design a monitoring grid
- Where to sample/measure? (and why on that location – is there already sampling going on)
- What parameters to measure?
- How often? - frequency
- (what accuracy)
- Consequences (finances, capacity), prioritising, combining? – make choices

- Work this out in 45 minutes
- Make choices on the map
- Work out locations, reasons per location
- Collect and discuss the information
- Presentation maximum 5 minutes per team
- Choose a spokesperson
- Present on 1 map & 1 flip-over per team

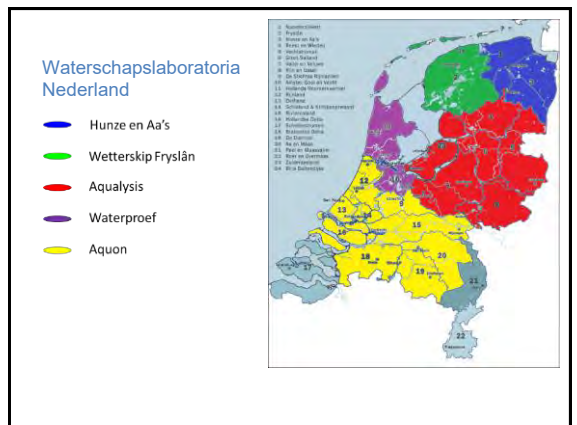
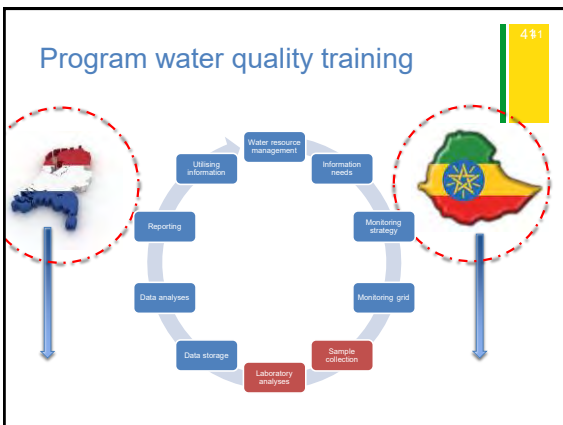
## Let's work it out!

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- Take 2 of the information needs  
Design a monitoring grid
- Where to sample/measure? (and why on that location – is there already sampling going on)
- What parameters to measure?
- How often? - frequency
- (what accuracy)
- Consequences (finances, capacity), prioritising, combining? – make choices


- Work this out in 45 minutes
- Make choices on the map
- Work out locations, reasons per location
- Collect and discuss the information
- Presentation maximum 5 minutes per team
- Choose a spokesperson
- Present on 1 map & 1 flip-over per team






## Sampling & analysis



### Dutch example – sampling & laboratory



- In our region:
  - One shared lab for 5 organisations
  - Co-owned by the 5 organisations
  - Highly specified
  - Well equipped
  - Very efficient
- Aqualysis
  - 50 employees
  - 40,000 samples
  - 800,000 analyses
  - EUR 6,000,000.-



## Let's work it out!

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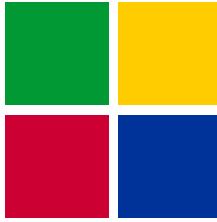
- Sampling and collection
  - How is the situation now?
  - Do you see any improvements
  - Suggestions for collaboration?
- In 30 minutes:
  - Discuss in three groups
  - Present on 1 flip over

## Source to Tap and Back –

### Training module on water quality monitoring – day 2

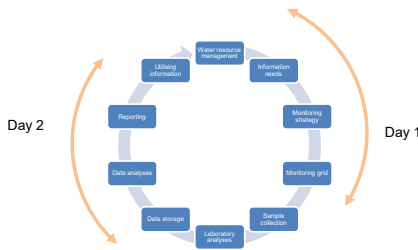
Michiel Oudendijk & Andrea Swenne  
Tuesday January 18, 2017

Result 2.5


## Introduction program of the training

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Day 2

Day 1

Goal for the 2 days: design your own monitoring grid and how to cooperate, collaborate with each other

## Monitoring S2TAB

### Surface water




Recap of Day 1, using Monitoring grid S2TAB as example.

- Information needs:
  - What is the current environmental state
  - What are the biggest water quality problems

## Monitoring S2TAB

### Surface water



- Monitoring strategy:
  - Monitoring for S2TAB builds on the EU-WFF monitoring grid


#### Monitoring strategy (1 / 2)

- Project focus & monitoring strategy is Surface water for drinking water & irrigation.
- Very limited experience with surface water sampling & analysis (phase 1 – baseline inv.)
- Capacity building means using own laboratory
- Collecting data on essential parameters for surface water & emission control
- Not many sampling points & parameters
- Year round – 1 sample per season

#### Monitoring strategy (2 / 2)

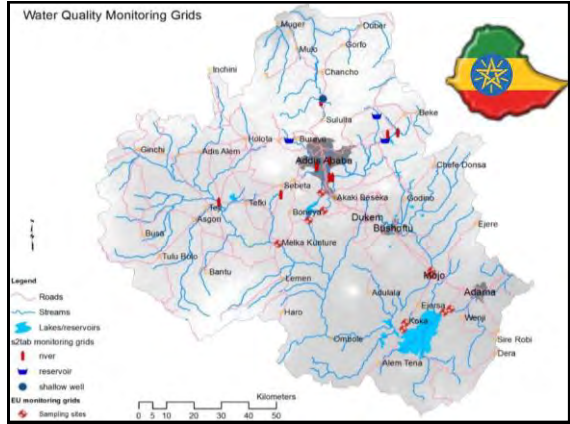
- Long term monitoring of WQ (where possible use sampling sites that already have data available)
- General surface WQ (not yet focused on measuring pollution sources)
- Seasonal variations in WQ
- Using available laboratory equipment
- Budget constraints
- 2 years of sampling within EU WFF funding

## Monitoring S2TAB Surface water




Steps to design a monitoring grid:

- Select sampling locations – draft grid
- Visit sampling locations




Water Quality Monitoring Grids					
Code	Name	Location		Type	
		X	Y		
<b>S2TAB sampling grids</b>					
s2tab01	Sibilu 01 right stream	472380	1016949	River	
s2tab02	Sibilu 02 left stream	472246	1016953	River	
s2tab03	Handug well (nr. Dereje)	472950	1017940	Shallow well	
s2tab04	Dire reservoir	492600	1011328	Reservoir	
s2tab05	Inlet to legadadi from Sendafa catchment	500285	1004950	River	
s2tab06	Laga Bari	496510	1004274	River	
s2tab07	Laga Diadi reservoir	495818	1002334	Reservoir	
s2tab08	Bulbula on Bole Road	475334	993983	River	
s2tab09	Bulbula before G. Akaki	475483	987730	River	
s2tab10	G. Akaki before Bulbula	476161	987768	River	
s2tab11	Gefersa reservoir	460690	1001985	Reservoir	
s2tab12	L. Akaki before Kera	470531	991822	River	
s2tab13	Kera before Little Akaki	470929	991998	River	
s2tab14	Awash malka bal'o on Jimma road	435038	977956	River	
s2tab15	Sebeta south of Sebeta town	457635	981044	River	
<b>EU ongoing sampling grids</b>					
EU01aw	Awash river after Lake Koka	519565	937179	River	
EU02aw	Lake Koka at Koka Dam	517164	935985	Reservoir	
EU03ko	Awash river before Lake Koka	503310	929380	River	
EU04mo	Mojo river before Lake Koka	503037	931867	River	
EU05mo	Mojo river before Mojo (railroad tracks)	512621	951938	River	
EU06mo	Mojo river at the end of Mojo	511973	949590	River	
EU07ak	Akaki river after Lake Aba Samuel	467851	971311	River	
EU08ga	Great Akaki river before Lake Aba Samuel	473256	975027	River	
EU09la	Little Akaki river before Lake Aba Samuel	472424	981849	River	
EU10aw	Awash river at Awash Melka Kunture	456741	962199	River	




## S2tab09: Bulbula River before Great Akai

Coordinates (UTM 37P) : E 475483      N 987730



How to get there:

- Drive north on the parallel road to the ring road from the Akaki Kality traffic circle
- Follow the roads heading left
- 4WD is mandatory



## S2tab09: Bulbula River before Great Akaki






Sampling:

- Walk down towards river
- Sample downstream of bridge

Site details:

- River width ~20m
- Local land use: domestic
- Flow: clearly visible

## Monitoring S2TAB Surface water




Steps to design a monitoring grid:

- Select sampling locations – draft grid
- Visit sampling locations
- List of parameters and consumables/necessaries
  - Based on parameters in EU WFF monitoring
  - Excluding some drinking water parameters
  - Excluding parameters that were too expensive to analyse (requiring additional hardware (a.o. As, Hg))

### Monitoring S2TAB


Surface water – parameters to be analysed



- DO, pH, Temperature, EC, Turbidity (field measurements)
- Cl, F, SO4 (anion)
- NO3, NO2, NH4, (NH3), total-N, PO4, total-P (nutrients)
- As, Cd, Cr, Cu, Hg, Ni, Pb, Zn (heavy metals)
- BOD (biochemical oxygen demand)
- COD (chemical oxygen demand)

### Monitoring S2TAB

Surface water




Steps to design a monitoring grid:

- Select sampling locations – draft grid
- Visit sampling locations
- List of parameters and consumables/necessaries
- Make a budget plan
  - Available hardware budget R2.5 + R2.8 = EUR 40,000.-
  - Available days EPHI R2.5 and R2.8 = 900 days
  - Roughly halve for R2.5 and halve for R2.8
- Make choices if needed (budget)

### Monitoring S2TAB

Surface water – Budget Plan




- Sampling (4 rounds)
  - 96 days
  - EUR 4,300.- (cost for car)
- Analysis (4 rounds)
  - 280 days

No	List of Instruments	Price
1	Hydride-system-for-As-&Hg	16,000€
2	Lamps for As-&Hg-with-standards	1,200€
3	Graphite tube	4,500€
4	Graphite insert	750€
5	Argon & Acetylene gas	417€
6	Reagents	2500€
7	Sampling & BOD Bottle	1,000€
8	Boots	30€
9	DO meter	3,000€
10	TDS/Turbidity/EC multiple measuring kit	600 €
	<b>Total</b>	<b>27,297€ – 10,097€</b>

### Monitoring S2TAB

Surface water

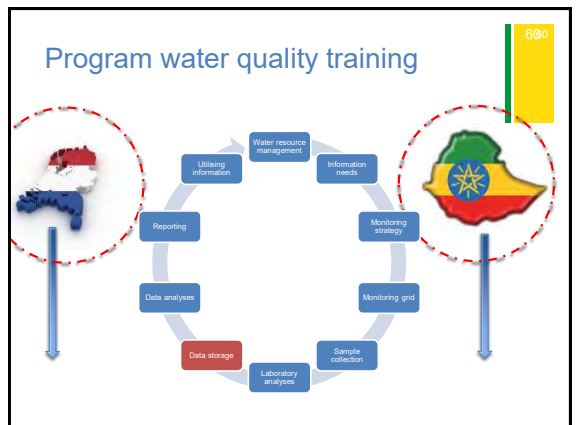


- Information needs:
  - What is the current environmental state
  - What are the biggest water quality problems
- Monitoring strategy:
  - Extension of EU monitoring grid
- Monitoring grid, budget plan
- Sampling
- Laboratory analyses
- Data storage
- Etc...

### Waterschapslaboratoria Nederland



- Hunze en Aa's
- Wetterskip Fryslân
- Aqualysis
- Waterproef
- Aquon



## Data in spreadsheets (1/2)



- Matrix format
  - Very compact
  - Works great for project data (like lab reports)
  - Little information in the file on how a value was measured
  - Difficult to use when combining data from different sources / matrix formats

Nr	UTME	UTM	Local Name	WP Index	EC	ISO	E	PH	NW	Nr	K1	Com	Mpr	Fr	Stat	Mpr	Q	MSD
1	465778	599808	Aasia BH	AA010	341	206	8.64	76	2.8	3.32	1.08							7.94
3	465719	599747	Lulu redwater	AA000	300	200	7.28	22	8.3	37	11.2	0.87						5.86
5	471500	599500	Lulu redwater	AA000	436	240	7.9	13	5.2	63.6	13.3							9.93
6	466810	1001200	MILLIANG-3	AA010	471	361	8.97	0.24	12.7	4.1	13.2	2.7	0.50					1.9
7	477715	597474	VanA-Milieu District	AA000	284	341	7.31	29.5	6.2	26.4	4.32							9.51
8	466070	1000785	Sunarti	AA000	280	300	8.29	50	3.7	14.1	3.24	0.29	2.88					
9	465990	599440	Sunarti	AA000	464	206	7.38	62	5	33.6	6.16	0.09						21.9
10	466740	599180	Mikawa BH-16	AA010	344	226	7.05	17	6.8	46.8	5.16	0.06	5.96	0.1				0.1
11	466200	599200	Mikawa BH	AA010	260	344	7.71	14.5	4.5	42.2	6.18	0.04						1.59
12	467280	599400	Ayay-1	AA010	504	344	7.42	0.39	7.7	22	16.6	3.24	0.77					35.8
13	470210	1001880	Duta Zebra-2	AA010	200	136	7.61	36	4.5	29.4	2.04	0.16	0.0	5.96				
14	461460	599800	Arwentes-2	AA010	414	272	7.24	30.5	3.2	53.8	15.7	0.28	0.0	7.94				
15	465640	599420	Lulu Stream	AA010	233	142	6.67	9.6	4.5	27.7	4.50	0.12	0.1	8.94	0.14			
16	464670	599470	Sumur BM-13	AA000	1904	1304	6.5	49	24.3	29.2	6.81	0.19		47.7				
17	470280	1002090	Kulawa-Mikawa	AA010	194	136	6.86	6	4.5	29.2	6.1	0.08	0.0	8.94	0.02			
18	474230	1002370	Shromawa-Kulawarini	AA020	234	134	7.14	19	7.4	22.7	4.08	0.05		7.94	0.02			
19	470260	1002130	Total-Beta Zebra-1	AA010	181	138	7.34	24	5.5	12.6	2.24	0.47	0.0	1.60	0.21			
21	460740	599180	Repa-23	AA020	285	174	7	10.4	4.5	36.1	5.18	0.1		2.91				
23	461310	599640	Sulan Techniques	AA020	402	260	7.30	50	4.5	30.3	6.18	0.26	0.0	10.9	0.02			

## Data in spreadsheets (2/2)

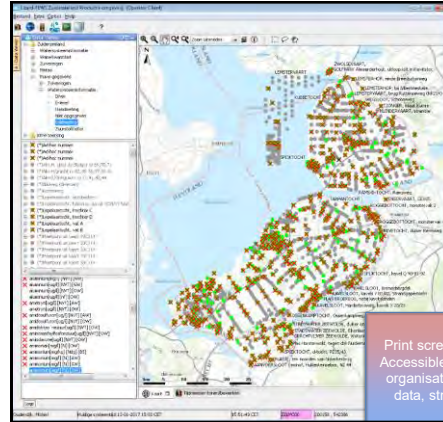


- Listing format
  - Uses a lot of redundant information (more work)
  - More info on how a value was measured
  - Better suited for combining data from different sources

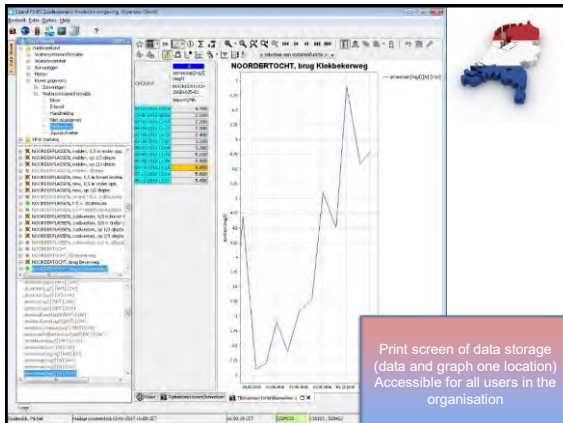
Sample	Sample description	Time	Time	Sample date	Sample date	Sample	Parameter	Unit	Method	Reference	Lab	Lab identification	Lab name	Method used	Source	Year of
010002	Sample description	010002	010002	2014-2014	2014-2014	010002	Temp	°C	See	See	See	See	See	See	See	2014
010007	Sample description	010007	010007	2014-2014	2014-2014	010007	Temp	°C	See	See	See	See	See	See	See	2014
010012	Sample description	010012	010012	2014-2014	2014-2014	010012	Temp	°C	See	See	See	See	See	See	See	2014
010017	Sample description	010017	010017	2014-2014	2014-2014	010017	Temp	°C	See	See	See	See	See	See	See	2014
010022	Sample description	010022	010022	2014-2014	2014-2014	010022	Temp	°C	See	See	See	See	See	See	See	2014
010027	Sample description	010027	010027	2014-2014	2014-2014	010027	Temp	°C	See	See	See	See	See	See	See	2014
010032	Sample description	010032	010032	2014-2014	2014-2014	010032	Temp	°C	See	See	See	See	See	See	See	2014
010037	Sample description	010037	010037	2014-2014	2014-2014	010037	Temp	°C	See	See	See	See	See	See	See	2014
010042	Sample description	010042	010042	2014-2014	2014-2014	010042	Temp	°C	See	See	See	See	See	See	See	2014
010047	Sample description	010047	010047	2014-2014	2014-2014	010047	Temp	°C	See	See	See	See	See	See	See	2014
010052	Sample description	010052	010052	2014-2014	2014-2014	010052	Temp	°C	See	See	See	See	See	See	See	2014
010057	Sample description	010057	010057	2014-2014	2014-2014	010057	Temp	°C	See	See	See	See	See	See	See	2014
010062	Sample description	010062	010062	2014-2014	2014-2014	010062	Temp	°C	See	See	See	See	See	See	See	2014
010067	Sample description	010067	010067	2014-2014	2014-2014	010067	Temp	°C	See	See	See	See	See	See	See	2014
010072	Sample description	010072	010072	2014-2014	2014-2014	010072	Temp	°C	See	See	See	See	See	See	See	2014
010077	Sample description	010077	010077	2014-2014	2014-2014	010077	Temp	°C	See	See	See	See	See	See	See	2014
010082	Sample description	010082	010082	2014-2014	2014-2014	010082	Temp	°C	See	See	See	See	See	See	See	2014
010087	Sample description	010087	010087	2014-2014	2014-2014	010087	Temp	°C	See	See	See	See	See	See	See	2014
010092	Sample description	010092	010092	2014-2014	2014-2014	010092	Temp	°C	See	See	See	See	See	See	See	2014
010097	Sample description	010097	010097	2014-2014	2014-2014	010097	Temp	°C	See	See	See	See	See	See	See	2014
010102	Sample description	010102	010102	2014-2014	2014-2014	010102	Temp	°C	See	See	See	See	See	See	See	2014
010107	Sample description	010107	010107	2014-2014	2014-2014	010107	Temp	°C	See	See	See	See	See	See	See	2014
010112	Sample description	010112	010112	2014-2014	2014-2014	010112	Temp	°C	See	See	See	See	See	See	See	2014
010117	Sample description	010117	010117	2014-2014	2014-2014	010117	Temp	°C	See	See	See	See	See	See	See	2014
010122	Sample description	010122	010122	2014-2014	2014-2014	010122	Temp	°C	See	See	See	See	See	See	See	2014
010127	Sample description	010127	010127	2014-2014	2014-2014	010127	Temp	°C	See	See	See	See	See	See	See	2014
010132	Sample description	010132	010132	2014-2014	2014-2014	010132	Temp	°C	See	See	See	See	See	See	See	2014
010137	Sample description	010137	010137	2014-2014	2014-2014	010137	Temp	°C	See	See	See	See	See	See	See	2014
010142	Sample description	010142	010142	2014-2014	2014-2014	010142	Temp	°C	See	See	See	See	See	See	See	2014
010147	Sample description	010147	010147	2014-2014	2014-2014	010147	Temp	°C	See	See	See	See	See	See	See	2014
010152	Sample description	010152	010152	2014-2014	2014-2014	010152	Temp	°C	See	See	See	See	See	See	See	2014
010157	Sample description	010157	010157	2014-2014	2014-2014	010157	Temp	°C	See	See	See	See	See	See	See	2014
010162	Sample description	010162	010162	2014-2014	2014-2014	010162	Temp	°C	See	See	See	See	See	See	See	2014
010167	Sample description	010167	010167	2014-2014	2014-2014	010167	Temp	°C	See	See	See	See	See	See	See	2014
010172	Sample description	010172	010172	2014-2014	2014-2014	010172	Temp	°C	See	See	See	See	See	See	See	2014
010177	Sample description	010177	010177	2014-2014	2014-2014	010177	Temp	°C	See	See	See	See	See	See	See	2014
010182	Sample description	010182	010182	2014-2014	2014-2014	010182	Temp	°C	See	See	See	See	See	See	See	2014
010187	Sample description	010187	010187	2014-2014	2014-2014	010187	Temp	°C	See	See	See	See	See	See	See	2014
010192	Sample description	010192	010192	2014-2014	2014-2014	010192	Temp	°C	See	See	See	See	See	See	See	2014
010197	Sample description	010197	010197	2014-2014	2014-2014	010197	Temp	°C	See	See	See	See	See	See	See	2014
010202	Sample description	010202	010202	2014-2014	2014-2014	010202	Temp	°C	See	See	See	See	See	See	See	2014
010207	Sample description	010207	010207	2014-2014	2014-2014	010207	Temp	°C	See	See	See	See	See	See	See	2014
010212	Sample description	010212	010212	2014-2014	2014-2014	010212	Temp	°C	See	See	See	See	See	See	See	2014
010217	Sample description	010217	010217	2014-2014	2014-2014	010217	Temp	°C	See	See	See	See	See	See	See	2014
010222	Sample description	010222	010222	2014-2014	2014-2014	010222	Temp	°C	See	See	See	See	See	See	See	2014
010227	Sample description	010227	010227	2014-2014	2014-2014	010227	Temp	°C	See	See	See	See	See	See	See	2014
010232	Sample description	010232	010232	2014-2014	2014-2014	010232	Temp	°C	See	See	See	See	See	See	See	2014
010237	Sample description	010237	010237	2014-2014	2014-2014	010237	Temp	°C	See	See	See	See	See	See	See	2014
010242	Sample description	010242	010242	2014-2014	2014-2014	010242	Temp	°C	See	See	See	See	See	See	See	2014
010247	Sample description	010247	010247	2014-2014	2014-2014	010247	Temp	°C	See	See						

### Data analysis & reporting Dutch example

- Data validation
  - Complete
  - Plausible



Print screen of data storage  
Accessible for all users in the  
organisation (all monitoring  
data, structured storage)



Print screen of data storage  
(data and graph one location)  
Accessible for all users in the  
organisation

### Data analysis & reporting Dutch example

- Data validation
  - Complete
  - Plausible
- Data aggregation
  - Testing against water quality standards
  - Trend analyses




[www.zuiderzeeland.nl](http://www.zuiderzeeland.nl)  
Print screen of internet  
Accessible for everyone



[www.zuiderzeeland.nl](http://www.zuiderzeeland.nl)  
Print screen of internet  
Accessible for everyone  
Sampling locations water  
quality (monitoring grids)

[www.zuiderzeeland.nl](http://www.zuiderzeeland.nl)  
Print screen of internet  
Accessible for everyone  
Compliance per sampling  
location (with standards)

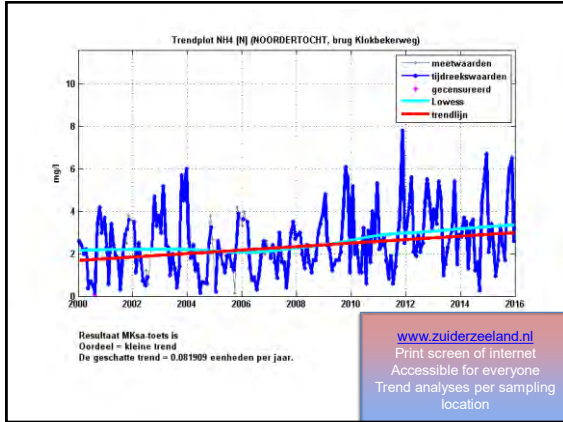
[www.zuiderzeeland.nl](http://www.zuiderzeeland.nl)  
Print screen of internet  
Accessible for everyone  
Compliance per sampling  
location (left)

[www.zuiderzeeland.nl](http://www.zuiderzeeland.nl)  
Print screen of internet  
Accessible for everyone  
Waterbodies for EU water  
framework directive

[www.zuiderzeeland.nl](http://www.zuiderzeeland.nl)  
Print screen of internet  
Accessible for everyone  
Compliance per sampling  
location

[www.zuiderzeeland.nl](http://www.zuiderzeeland.nl)  
Print screen of internet  
Accessible for everyone  
Trend analyses per sampling  
location

[www.zuiderzeeland.nl](http://www.zuiderzeeland.nl)  
Print screen of internet  
Accessible for everyone  
Trend analyses per sampling  
location



## Data analysis & reporting Dutch example



- Data validation
  - Complete
  - Plausible
- Data aggregation
  - Testing against water quality standards
  - Trend analyses
- Reporting
  - Plain dataset
  - Report (analogue/digital)
  - Articles (scientific, popular)
- Answering the original questions (information needs)

### Let's work it out!



- Take one of your monitoring grids of yesterday
- Data validation & analysing
  - how do you do it right now?
  - do you see any improvements?
- Reporting
  - how do you want to report your information?
  - what's necessary to do so?
  - how do you share your report?

### Let's work it out!



- Take one of your monitoring grids of yesterday
- Data validation & analysing
  - how do you do it right now?
  - do you see any improvements?
- Reporting
  - how do you want to report your information?
  - what's necessary to do so?
  - how do you share your report?
- Work this out in 20 minutes
- Presenting 1 flip over
- Presentation maximum 5 minutes per team
- Choose a spokesperson

85

- LUNCH

86

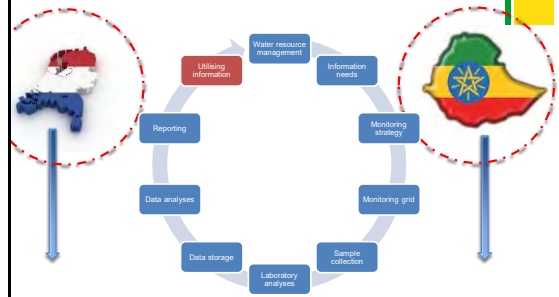
- Results water quality monitoring S2TAB – Tsigereda

87

- Results inventory data management - Tewodros

88

### Program water quality training



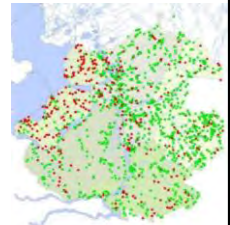
### Utilising information Dutch example – Blue nodes

- In the example the report is just a completed and validated dataset. No testing, trend analyses, interpretation. Utilising is left for the recipient of the dataset who will do more reporting steps:
  - Combine the dataset with other data
  - Test if water quality standards are met
  - Calculate a mass balance
  - Discuss the results together, if needed define action plan together

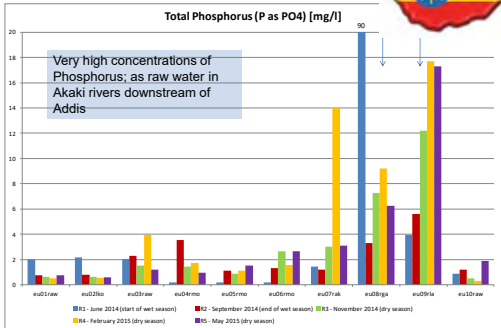


### Utilising information Dutch example – exceeding standard

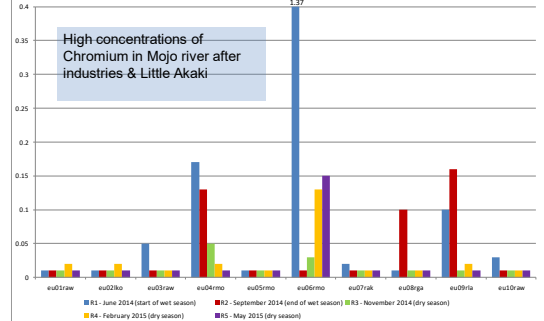
- When you conclude that standards are not met:
  - Together with stakeholders define measures
  - Make an action plan
  - Execute the measures – for example improve waste water treatment plant



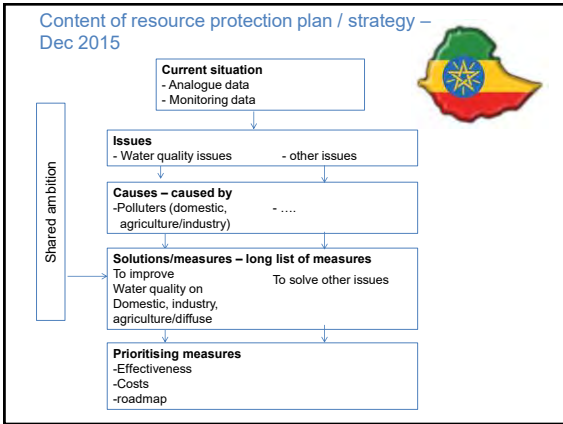
### Utilising information



### Chromium (Cr) [mg/l]



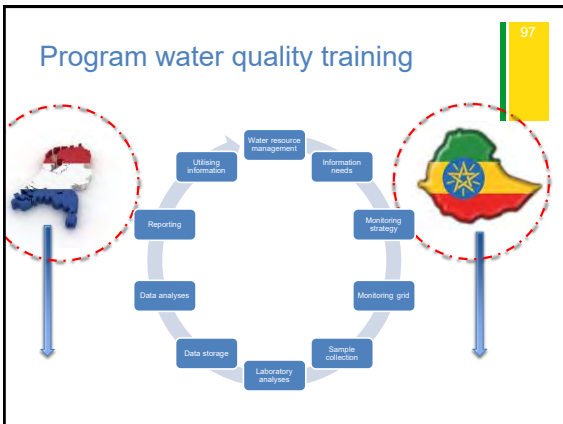




- ### Shared ambition water resource protection team (Dec 2015)
- The water quality of the Awash River must meet river water quality standards, that make it suited for domestic use (irrigation, watering cattle and the production of drinking water).
  - To reach this goal, the pollution levels need to decrease by 80% (compared to now) by 2025 / 2030.
  - Focus areas are industry, municipalities and agriculture/irrigation in the Upper Awash (Addis-Adama).
  - An Integrated Water Resource Management Plan is established with the water resource protection team. Each stake holder take specific responsibilities.

- ### Let's work it out!
- 
- How do we share results/information between organisations?
    - How do we do it right now?
    - How would you like it to be – what's your goal?
    - What's your first step to reach it?
  - In three groups

- ### Let's work it out!
- 
- How do we share results/information between organisations?
    - How do we do it right now?
    - How would you like it to be – what's your goal?
    - What's your first step to reach it?
  - In three groups
    - Work this out in 20 minutes
    - Everybody writes topics on yellow notes
    - Be as specific as possible
    - Collect and discuss the information
    - Presentation maximum 5 minutes per team
    - Choose a spokesperson
    - Present on half flip-over per team



### Questions?

Comments?