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Enabling Delta Life

WFD - Explorer 2.0

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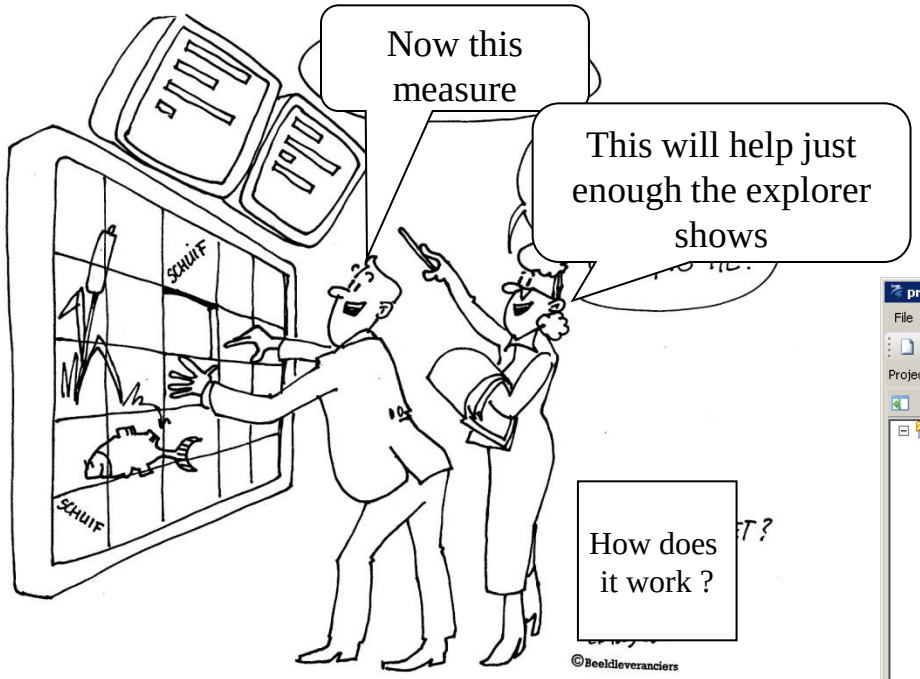
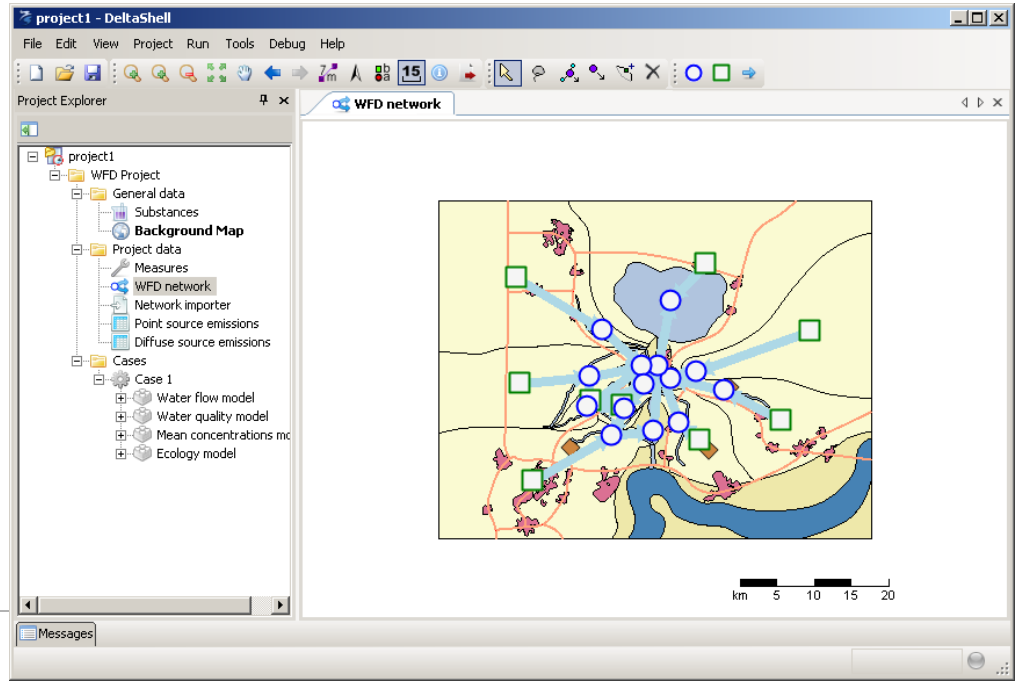
WFD-Explorer

An interactive tool for the selection of measures





It sounds simple …

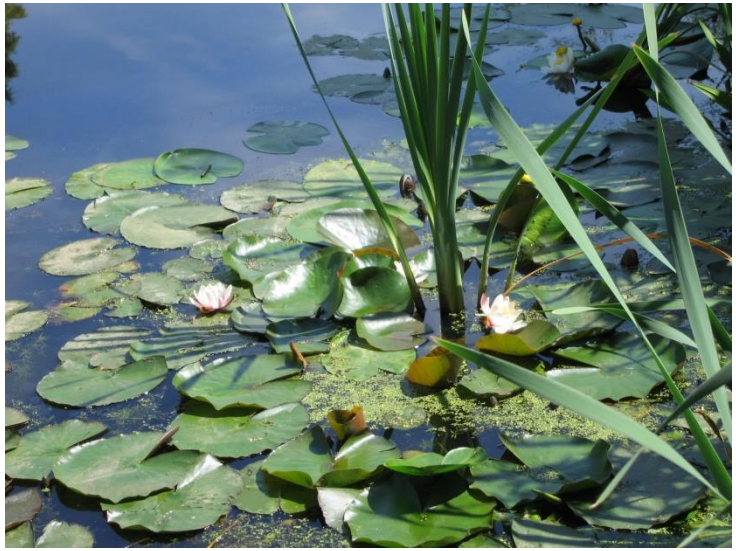
today

“Green soup”

research

measures

2015 - 2027



“Good ecological potential”

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The Water Framework Directive (Europe)

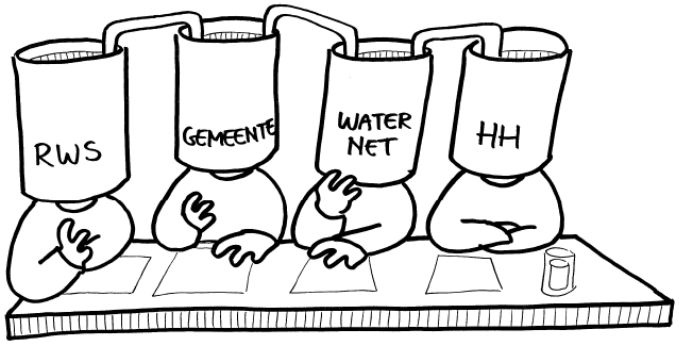
- Target is to reach Good Ecological Status (GES) in EU in 2015 - 2027
- Targets are defined for various quality elements :
  - > Phytoplankton (algae)
  - > Aquatic flora
  - > Benthic invertebrates
  - > Fish
- The target is linked to the reference situation for natural waters
- Derived targets for non-natural (artificial, heavily modified) waters: Good Ecological Potential (GEP)
- Scores per quality element: Ecological Quality Ratio (EQR)

Bad	Insufficient	Fair	Good	Very good
EQR < 0,2	EQR 0,2-0,4	EQR 0,4-0,6	EQR 0,6-0,8	EQR > 0,8

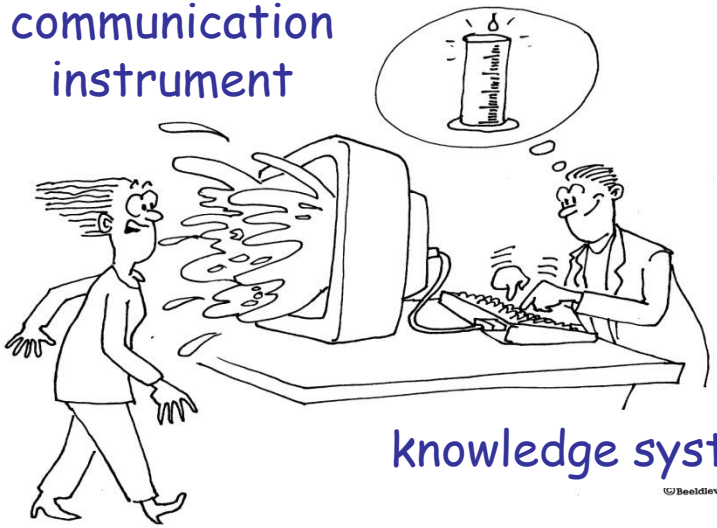
Objectives of the WFD-Explorer

- Support the drafting of a River Basin Management Plan (RBMP)
- Select the (most cost effective) measures for the RBMP
- Determination of the good chemical and ecological status / potential of the water bodies
- Stimulate the communication with stakeholders
- Encourage uniformity in the knowledge that is being used

communicating vessels



communication instrument



knowledge system

Role at implementation WFD

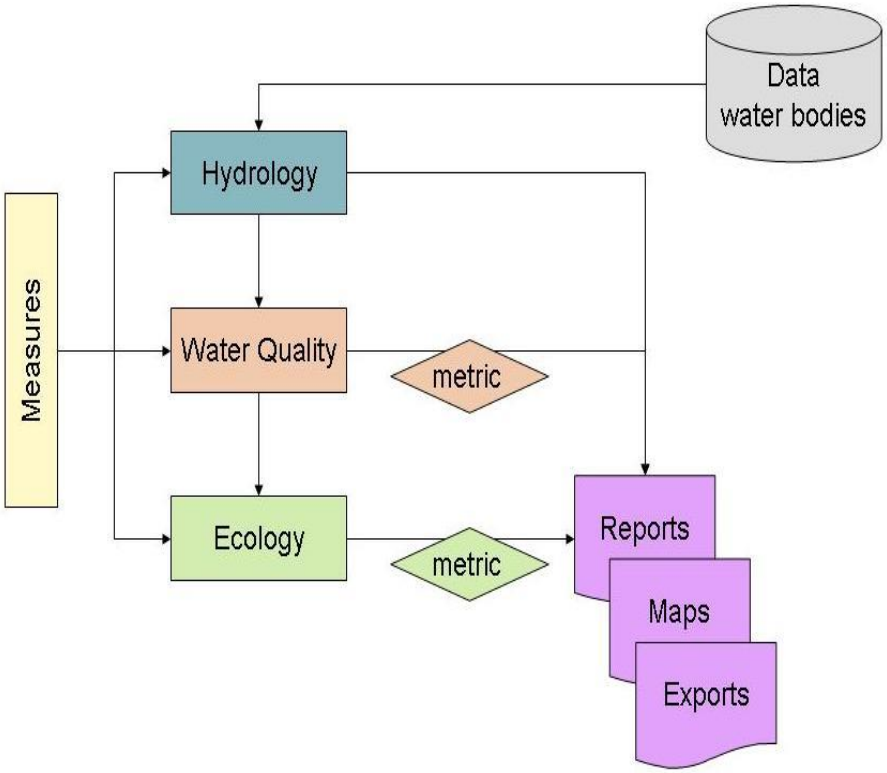
- Analyse effects of generic and regional package of measures
  - effect on ecology
  - effect on water quality
  - costs

  } do you reach the WFD-target?
- Information system for “measure – effect relation” (setup of documentation for EU)
- Next phase: develop basin management plans

Schematic overview WFD Explorer

- Hydrology and Water Quality
  - steady state
    - $\Sigma Q_{in} = \Sigma Q_{out}$
    - $\Sigma M_{in} = \Sigma M_{out} + M_{retention}$
  - seasonal forcing (4 periods/y)
  - simplified first order decay processes
  - dynamic calculations planned

- Ecology
  - several methods available
  - based on statistical relations
  - easy to expand with new data

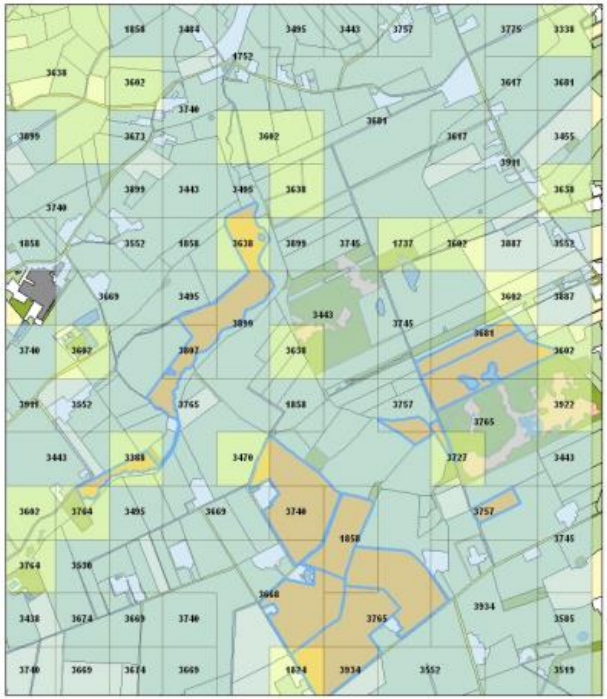


Emissions in the WFD-Explorer

1. Point Sources
   - Name
   - Id
   - Emission Type
   - Location

2. Diffuse Sources
   - Emission Type
   - Location (lumped)

3. Emissions on Area's
   - Emission Type
   - Location (lumped)
   - (Measure)



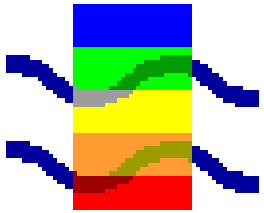
2009 Van der Salm et. al.

Ecology (Dutch data sets)

National

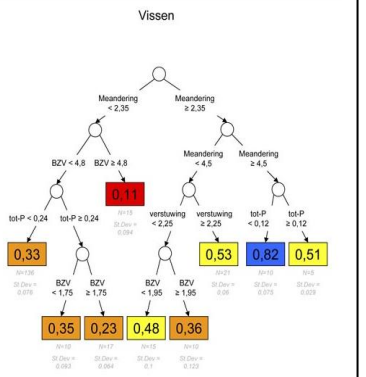
Regional data

Ecotopes
Species
Abundancy

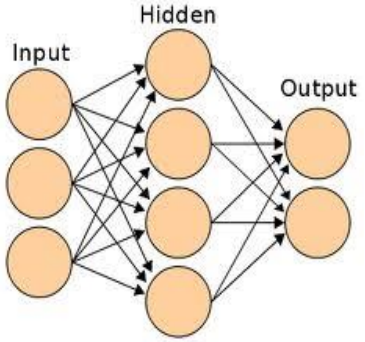


Qbwat 4.42

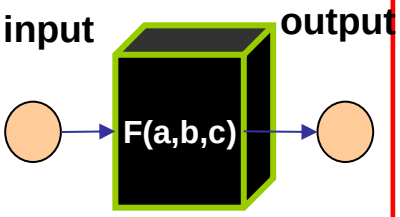
Key factors
Layout
Substances
Maintenance



Reg. Trees 2012



Neural Network



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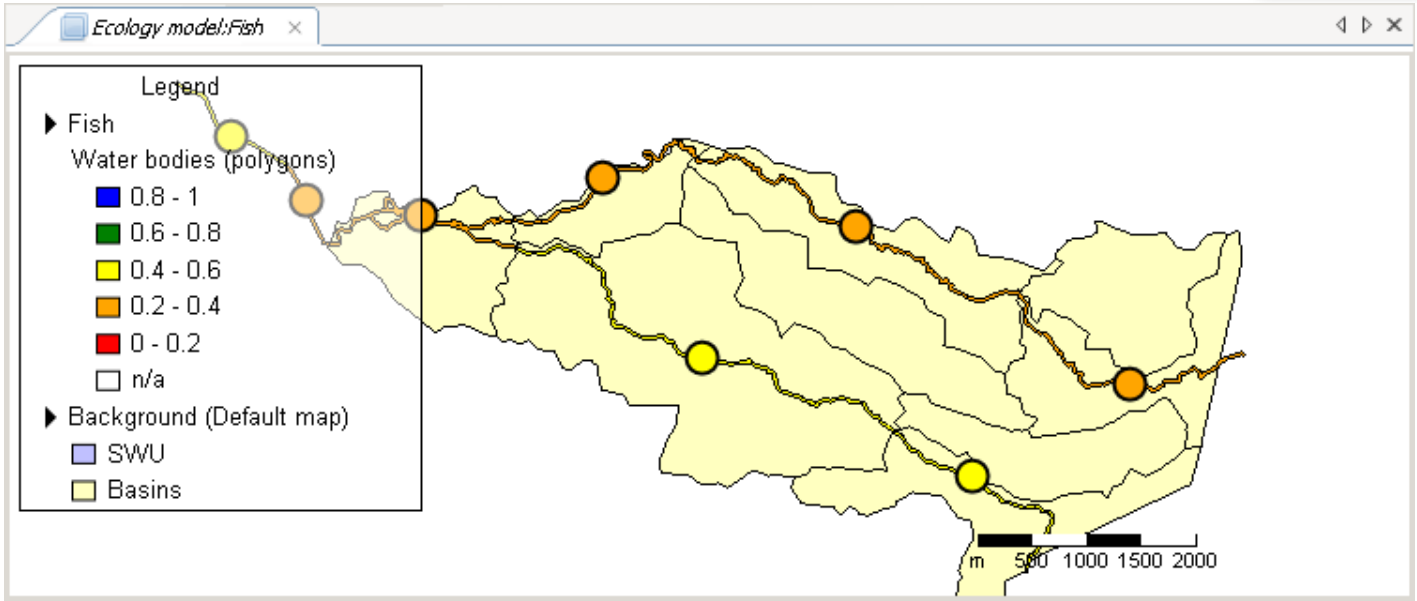
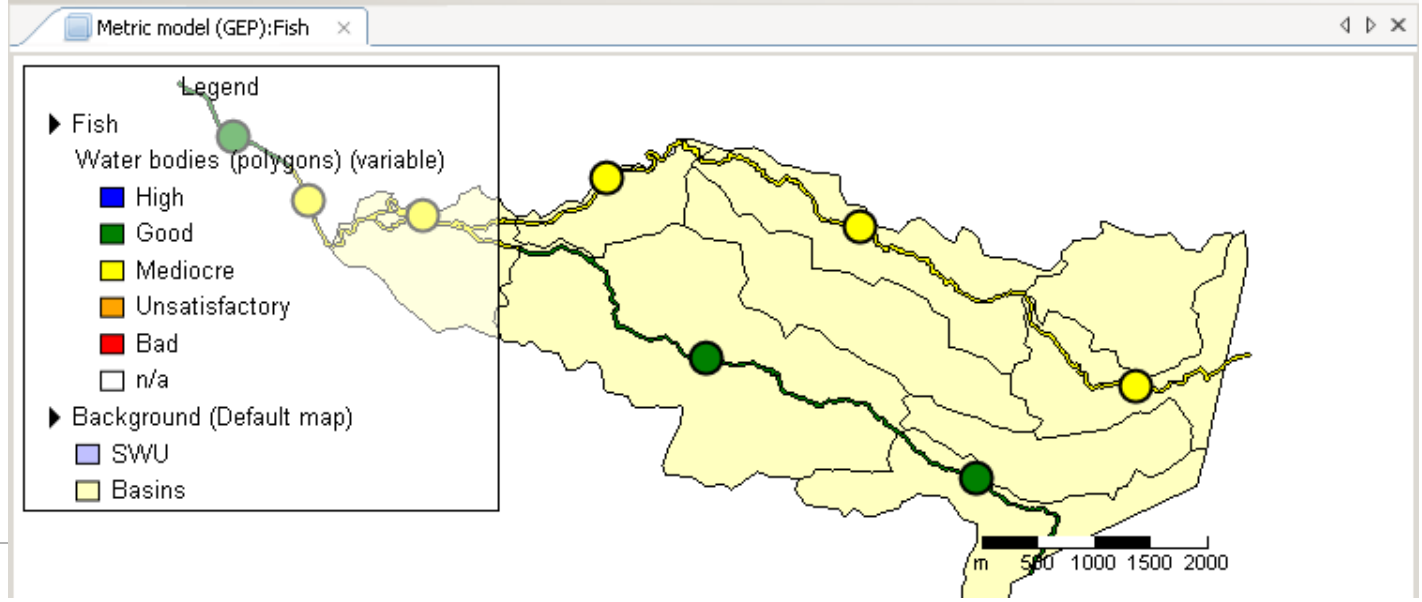
Metrics

GES

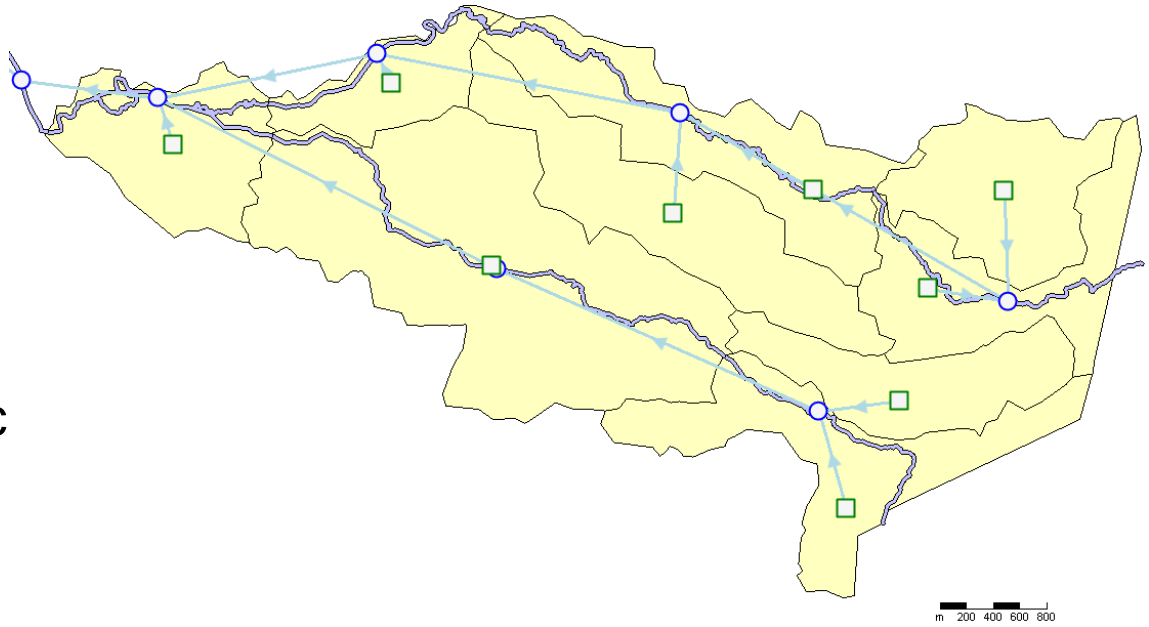
GEP





River Basin data

- Water network
  - Surface Water (Waterlichamen);
  - Catchments; and
  - routing
- Emissions
  - water; and
  - Substances
- Ecological parameters
  - Layout; and
  - Maintenance
- GIS material, maps, etc



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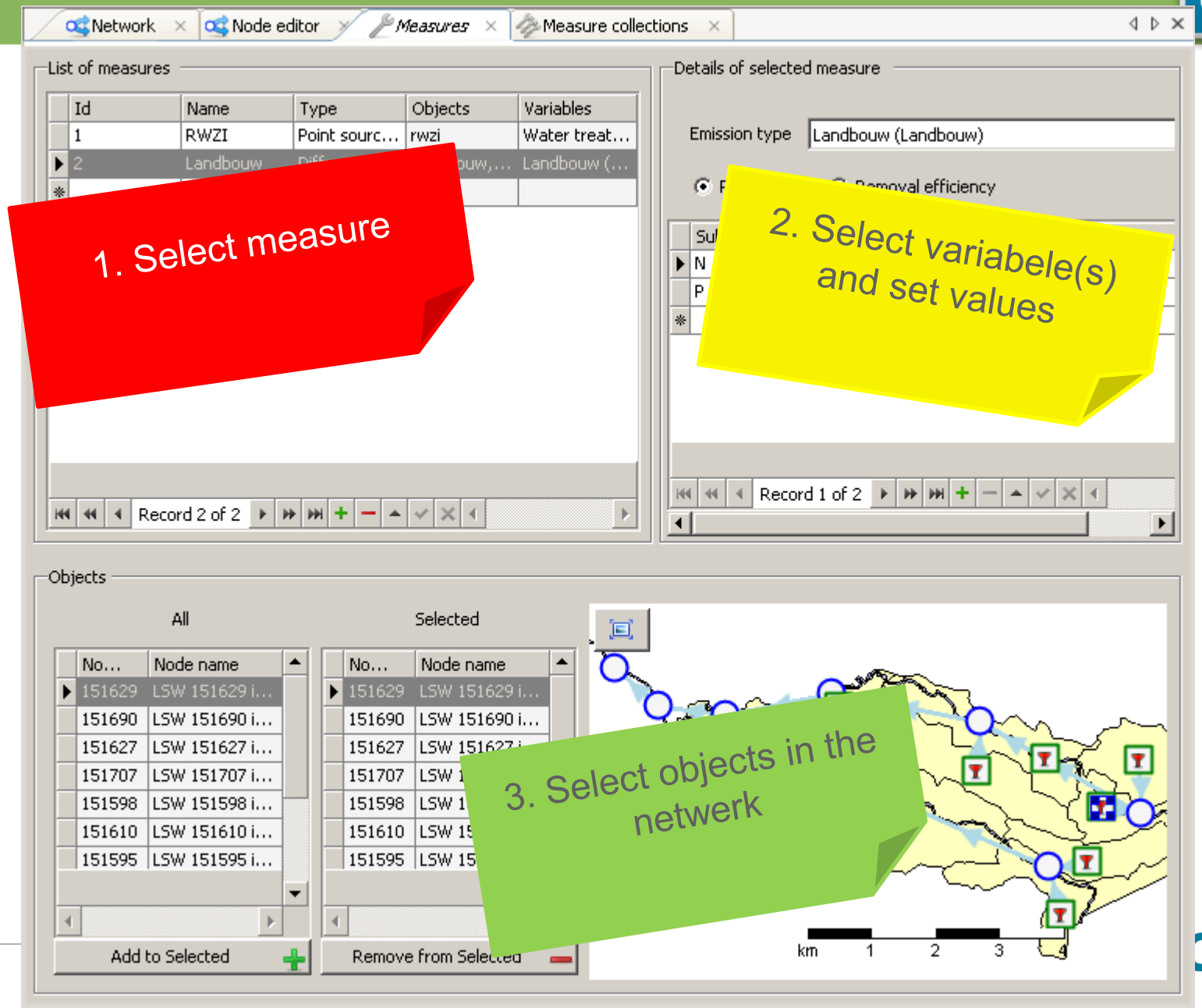
Measures


Network
Node editor
Measures
Measure collections
List of measures
Id
Name
Type
Objects
Variables
1
RWZI
Point sourc...
rwzi
Water treat...
2
Landbouw
Landbouw (...
Record 2 of 2
1. Select measure
Details of selected measure
Emission type
Landbouw (Landbouw)
Removal efficiency
Record 1 of 2
2. Select variabele(s) and set values
Objects
All
Selected
No...
Node name
151629
LSW 151629 i...
151690
LSW 151690 i...
151627
LSW 151627 i...
151707
LSW 151707 i...
151598
LSW 151598 i...
151610
LSW 151610 i...
151595
LSW 151595 i...
Add to Selected
Remove from Selected
3. Select objects in the netwerk
km
1
2
3
4

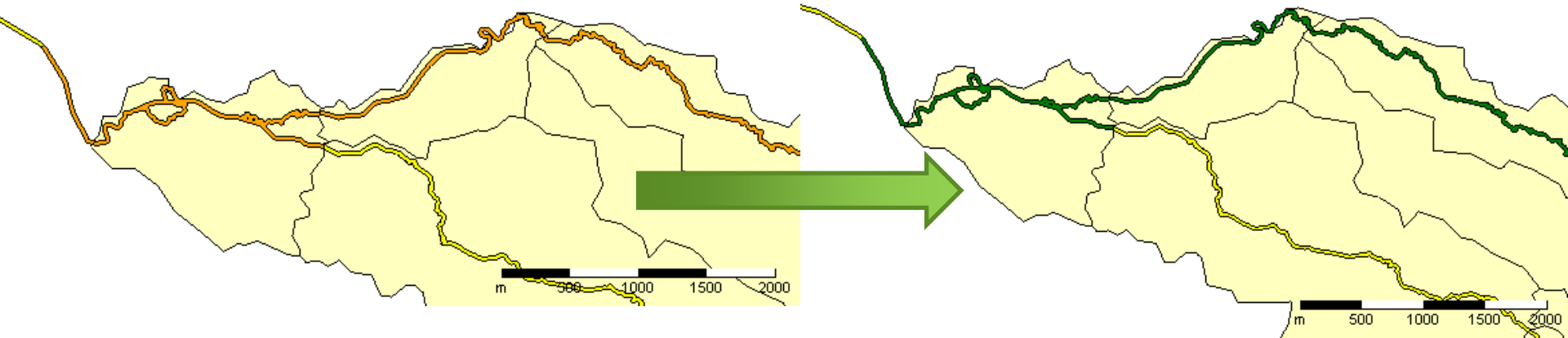
Types of measures

Emission reduction:

- Increased treatment of waste water (Household and Industries)
- (international) policy on fertilizer use

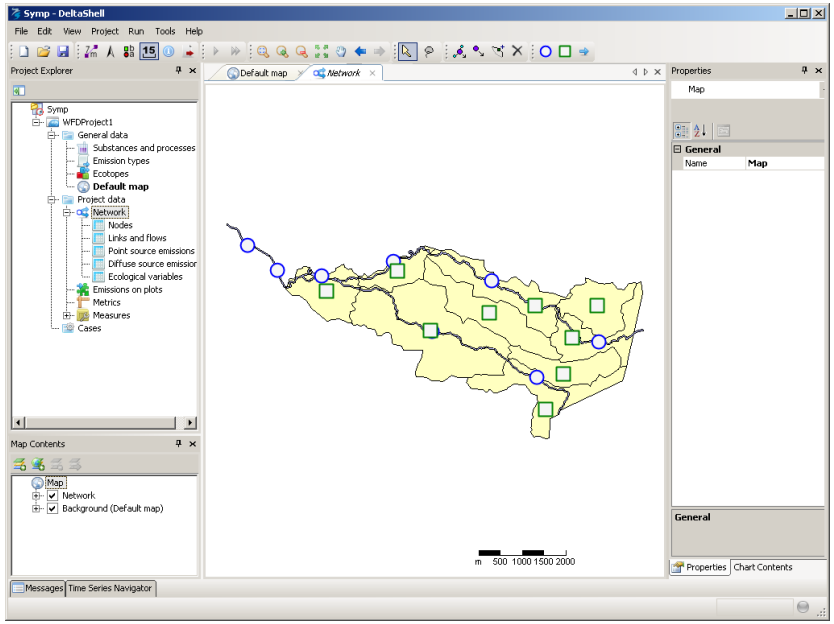
Ecological measures:

- Introduction of helophytes and wetlands (filters)
- nature friendly river banks
- restore meandering in small streams



How to set up a schematisation

- By scratch, manual by GUI
- Generate by GIS information and data
- Retrieve information from hydrodynamic models (i.e. SOBEK)



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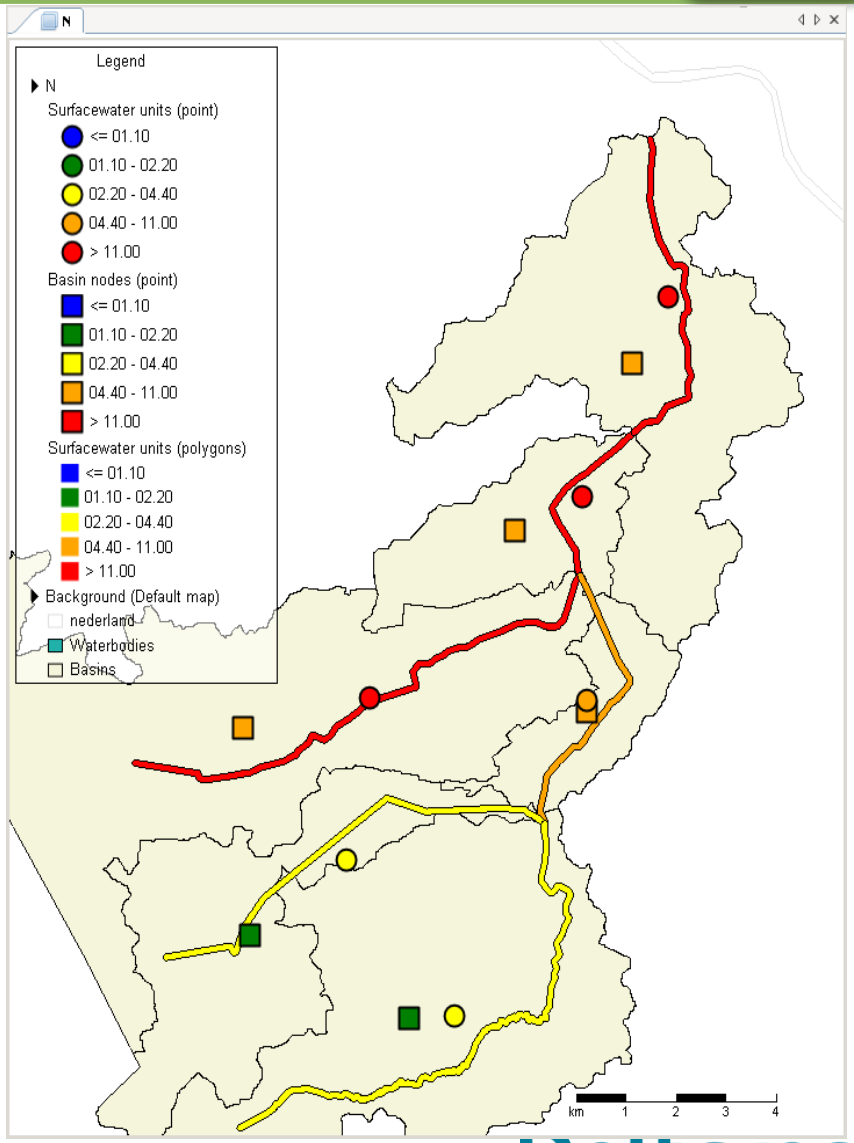
Results of computations

Result split into layers:

- “Real world” layer:
  - Polygons, i.e. Waterbodies
- Schematic network
  - Basin Nodes
  - Surface Water Units



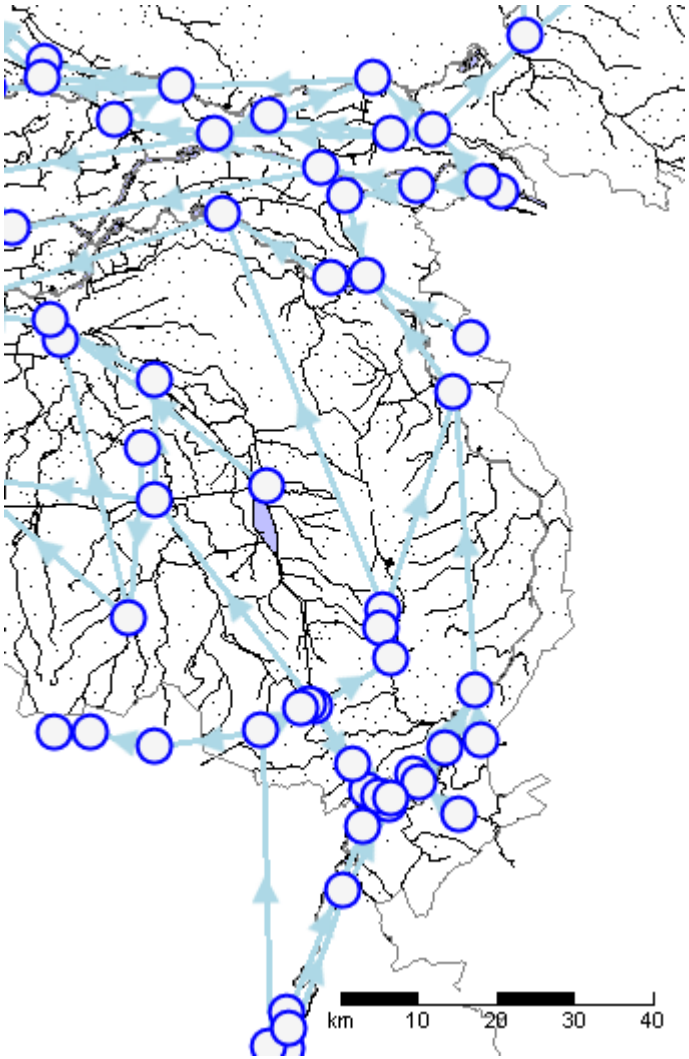
Application: an example

National schematisation of the Netherlands:

- Based on National Hydrological Instrument (NHI)
  - Ground water (250 m*250 m)
  - Surface water (± 8800 units)

- WFD- explorer schematisation
  - WFD water bodies
  - 18000 nodes
  - Emissions from (PRTR, STONE)

- Cases:
  - Nutrients (Ntot, Ptot)
  - Priority substances (30+)



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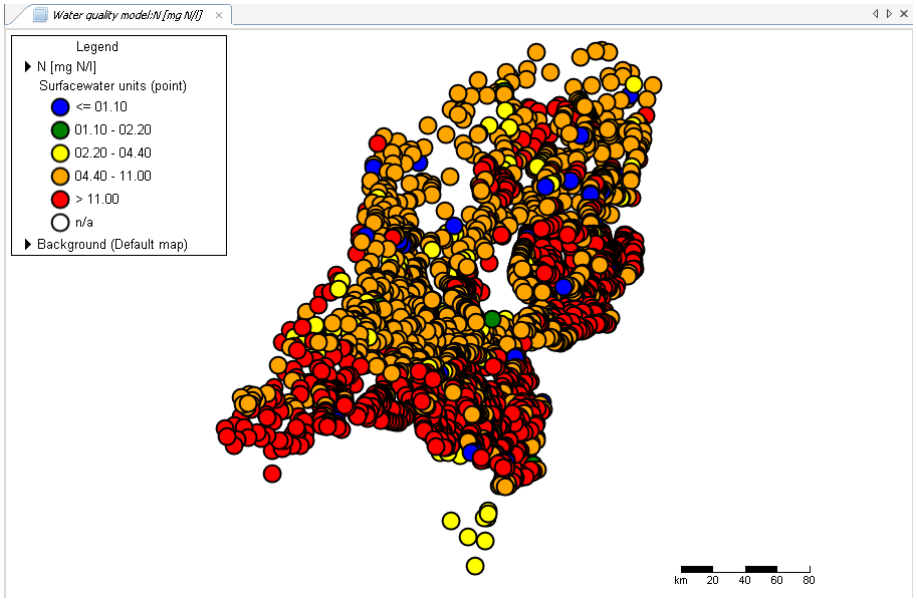
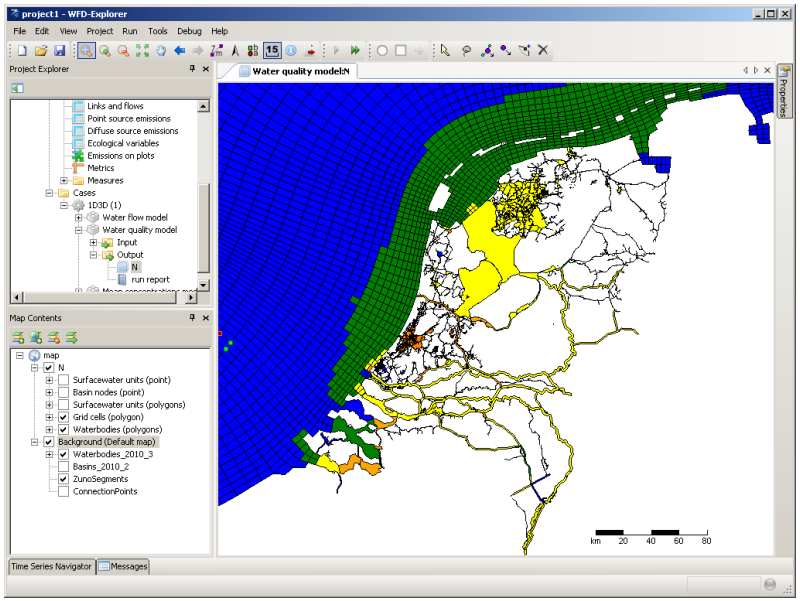
Nutrient case (pilot)

Objectives:

- Evaluate River Basin Management Plans, emission reductions
- Gain insight in nutrient flows in the Netherlands
- Present results to WFD Water bodies
- Present the effect of the measures on the North sea coast





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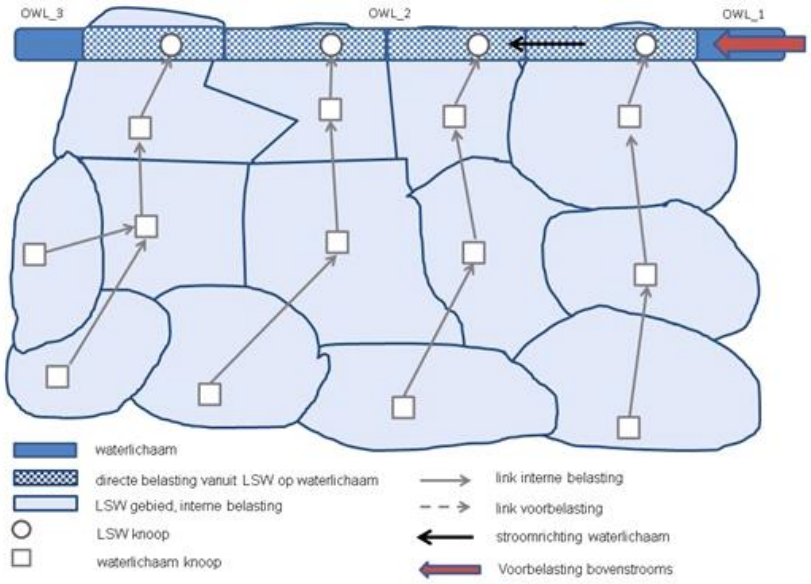
Priority substances

Objective:

- What is the contribution of different sources on the loading of priority substances on a water body level
  - 1. Direct loading on water body
  - 2. Loading on catchment of a water body
  - 3. Inflowing loads

Method:

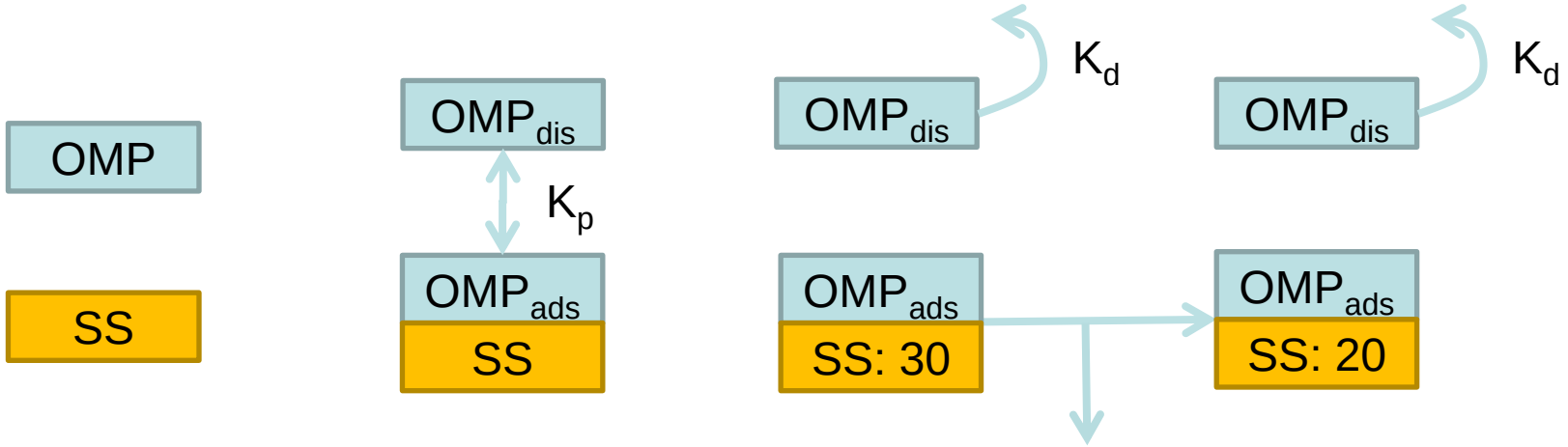
- National schematisation
- 30 substances
- Emissions from PRTR
- Extra processes added



Adsorbed substances

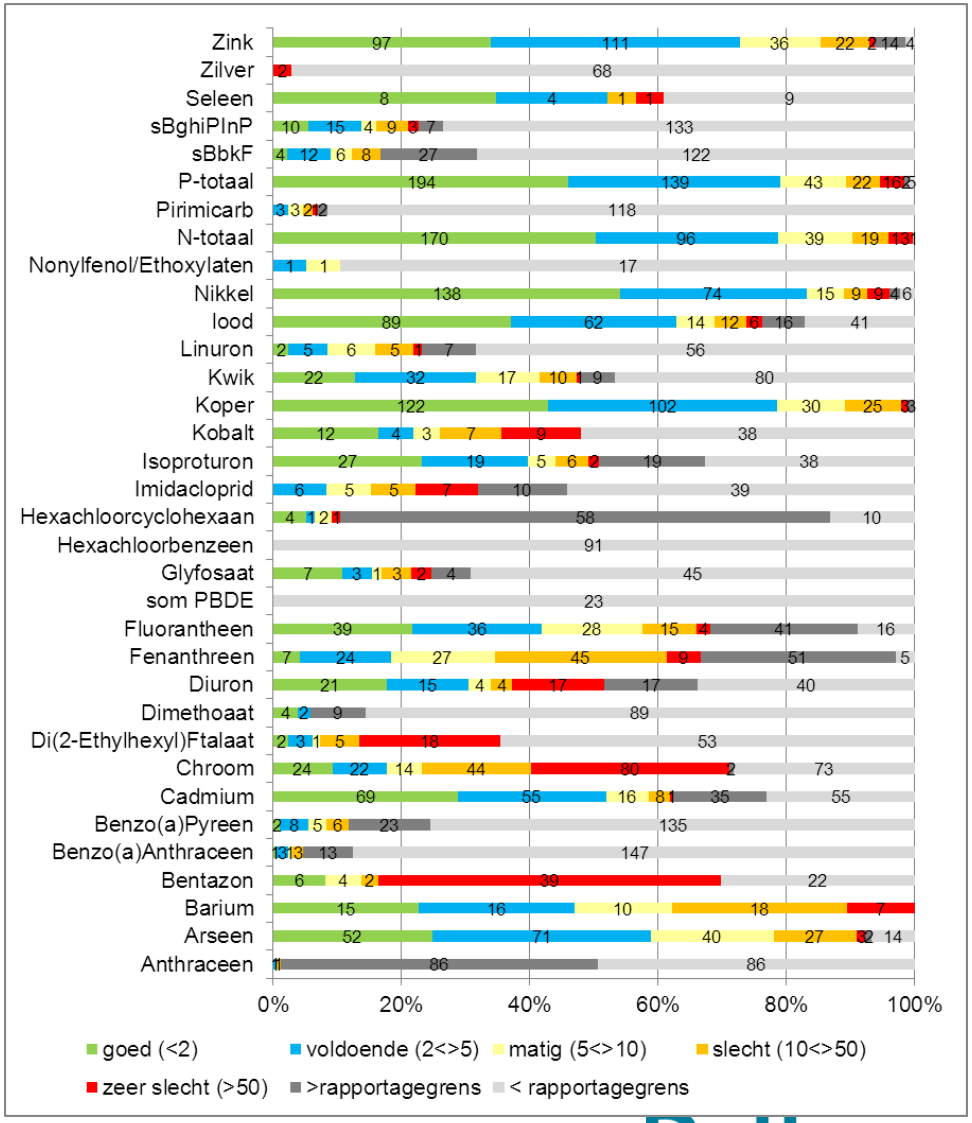
Process formulations (added to standard WFD-Explorer):

1. adsorption to SS by partition coefficient K_p
2. sedimentation of adsorbed fraction by difference in Suspended Solids concentrations (when concentration drops)
3. Decay of the dissolved fraction (biodegradation, photolysis, volatilization)



Substances taken into account (30+)

- Priority substances
  - N, P
  - Cd, Zn, Pb, Cr
  - Imidacloprid
  - ..
- Rhine Substances List
  - Bentazone
  - Phenanthrene
  - ..



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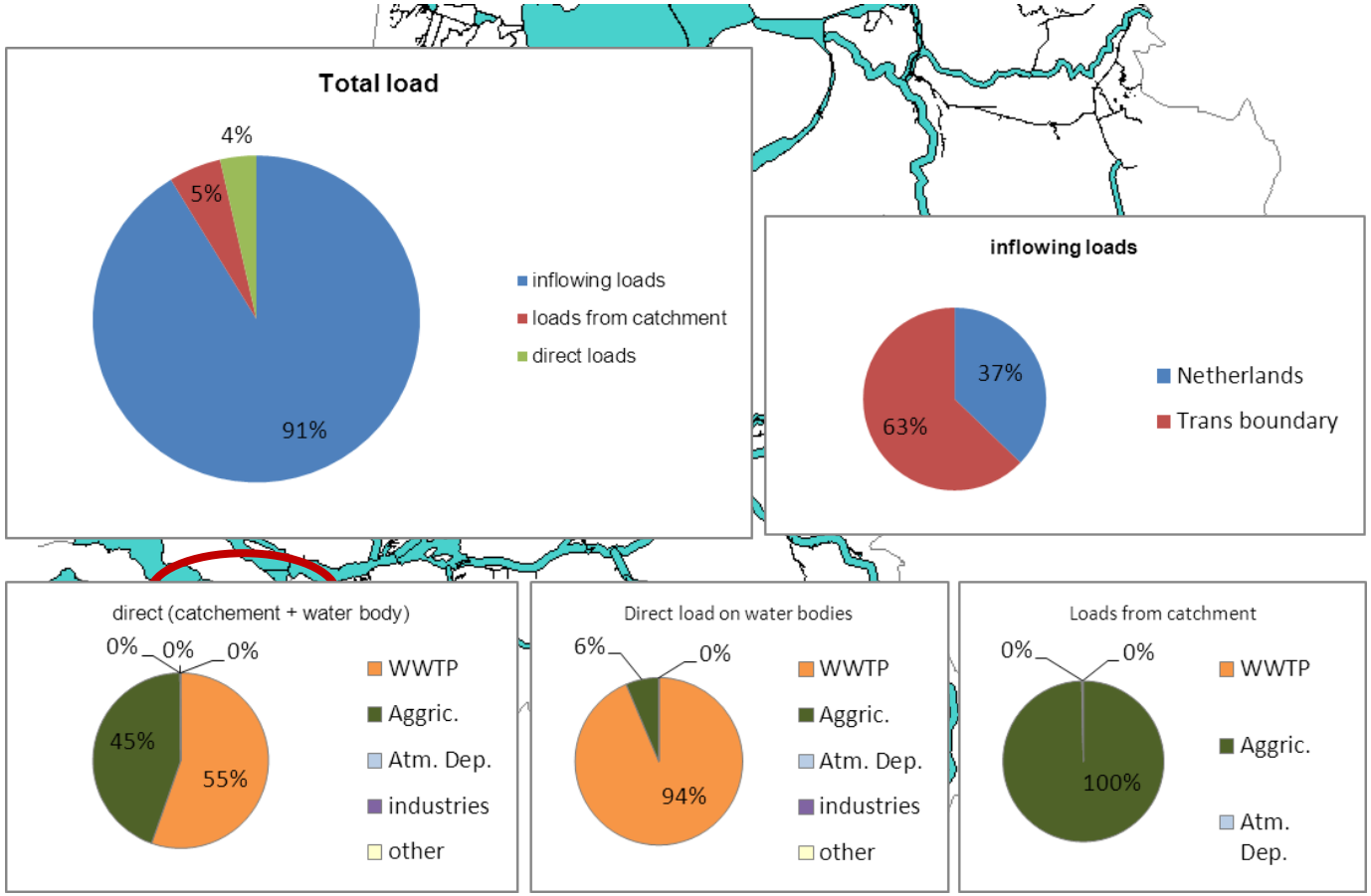
Results: Pie charts of contributions

Ntot on water body **"Volkerak"**



Future developments

- Dynamic computations (hydrology, water quality)
- Access to detailed water quality processes library (DELWAQ)
  - Nutrients
    - fractions: NH4, NO3, orgN, etc.
    - processes: (de)nitrification, uptake by algae, etc.
  - HM, OMP: Sedimentation and resuspention, detailed decay
- International knowledge rules for Ecology

WFD – Explorer: Information

Development:

Website (Dutch):

- http://public.deltares.nl/display/KRWV/KRW-Verkenner

Contact:

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Thanks for your attention!