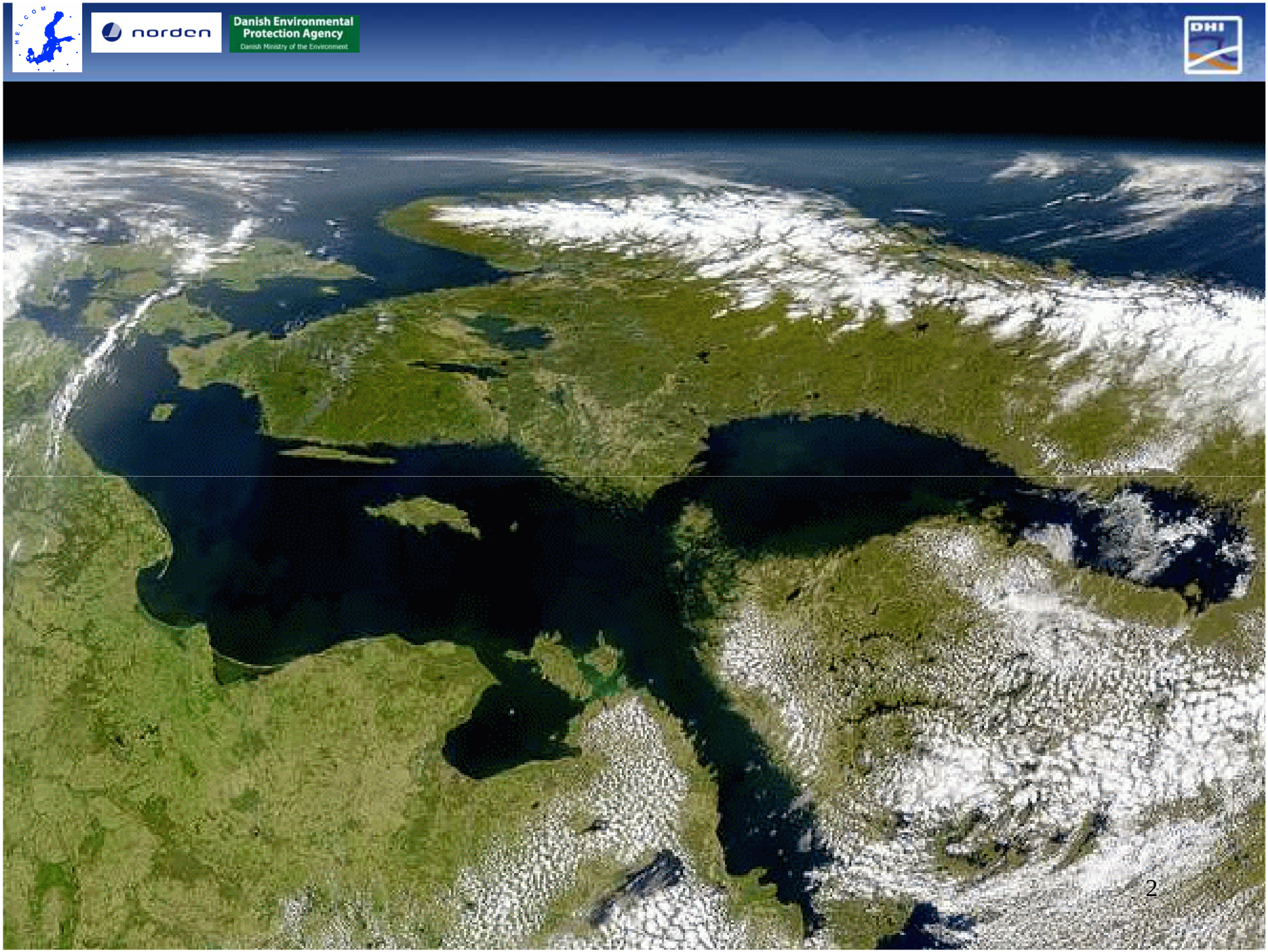
„Sustainable Wastewater Management in River Management Plans in Baltic Sea Region" Gdynia 19 – 20 November 2009

Why sustainable sanitation in Baltic Sea Region?

Gunnar Noren
CCB Secr. General

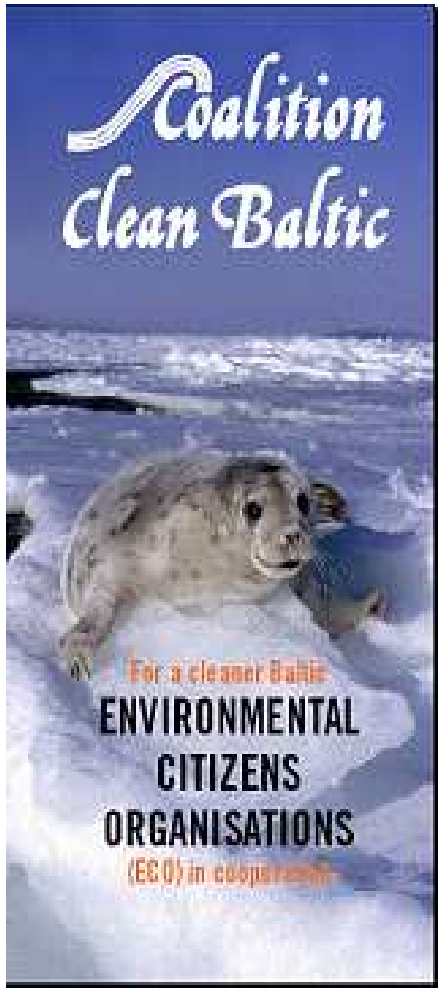

HELCOM
norden
Danish Environmental Protection Agency
Danish Ministry of the Environment
DHI

What is CCB?

Coalition Clean Baltic

CCB – Joining forces for the Baltic

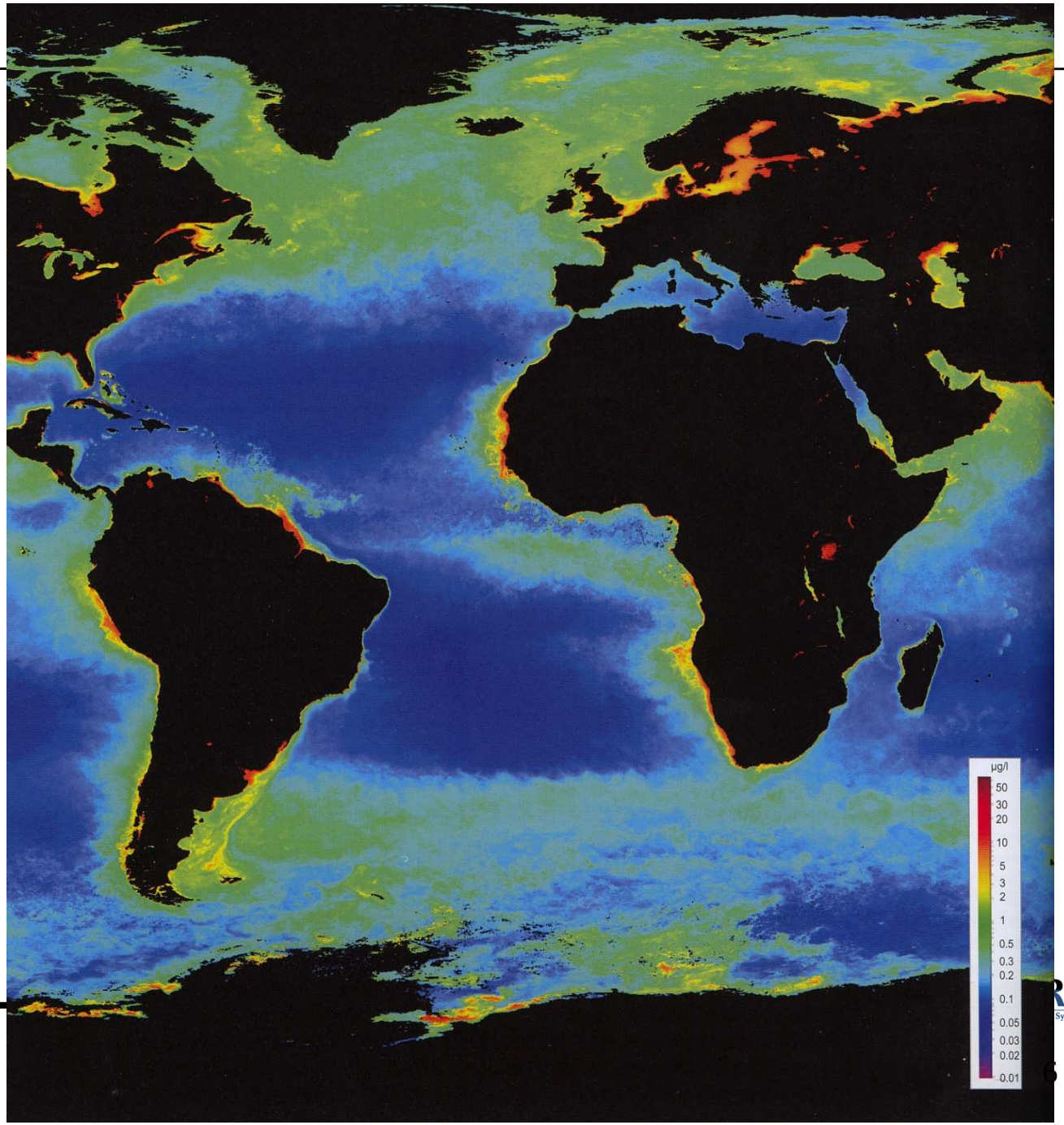
- **CCB** is a network of Environmental NGOs, working in the Baltic Sea catchment area.
- **CCB** was established in 1990
- **CCB** is environmental Citizens Organisations (ECO) in cooperation
- **CCB** has 25 member organizations
- **CCB** has members and cooperation partners in: Belarus, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden, Ukraine



Coalition Clean Baltic is a network of environmental non-governmental organisations (NGOs) working in the Baltic Sea catchment area:

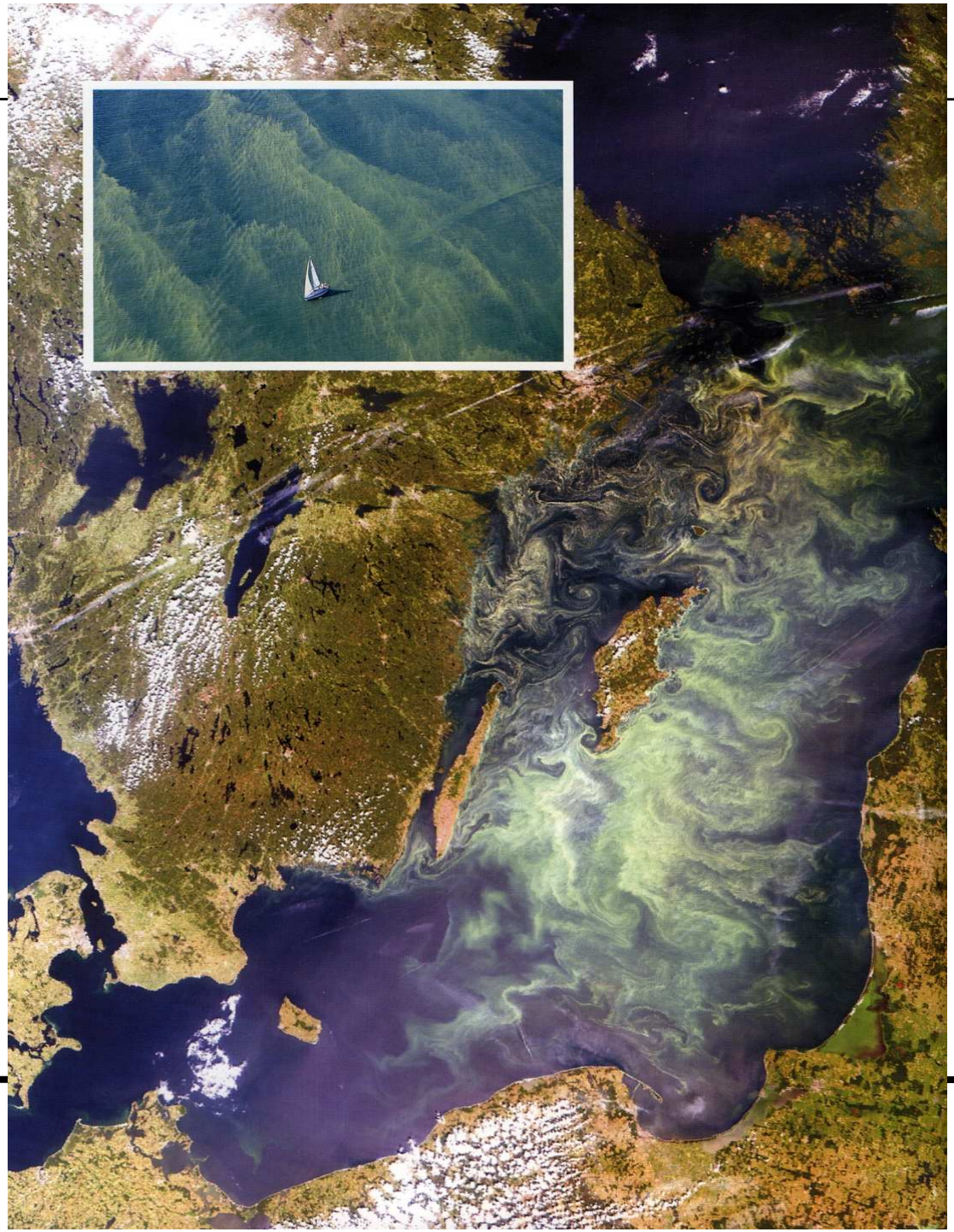
- ***For protection of the Baltic Sea Environment!***

Coalition Clean Baltic



Planning

Coalition Clean Baltic



WRS
Water Revival Systems

3 Priority Areas with sub-areas

1. Promotion of good ecological water status

- Sustainable wastewater management
- Sustainable River Basin Management
- Promotion of water protection measures in Agriculture

2. Prevention of installations and transports harmful to the Baltic Sea environment and coastal areas

- Harmful installations and transports
- Promotion of sustainable development in coastal zones
- Harmful Hydro-electric power plants

3. Development of sustainable Baltic Sea fisheries

- Protection of the naturally spawning Baltic Salmon
- Promotion of Baltic Sea sustainable fishing practices

Why do CCB promote Sustainable Sanitation?

- Contribute to solution of the Baltic eutrophication problem

- Small- and medium-sized municipalities and single family-homes give substantial contribution to Baltic eutrophication

- protection of the environment (lakes, streams and the sea)!

-**conservation of natural resources (nutrients and water)!**

- For Public Health promotion!

Also: Sustainable Sanitation can <u>save money</u> and <u>make system more robust</u>

CCB member of GWP CEE

-supported the initiative - book production "Sustainable Sanitation in CEE"

Illustration: Peter Ridderstolpe, WRS


Biological toilet
Sand filter
Treatment plant
Constructed wetland
Biofilter ditch
Irrigation
Spray filter
Compact filter
Pond
Blackwater separation
Chemical precipitation
Urine diversion
Infiltration
Reactive filter
Open sand filter

Planning for sustainable sanitation- Open Wastewater Planning

Gunnar Norén

Coalition Clean Baltic

Open Wastewater Planning

- Focus on functions
- Involve relevant stakeholders
- Consider the whole system
- Consider and compare several technological options

Focus on functions

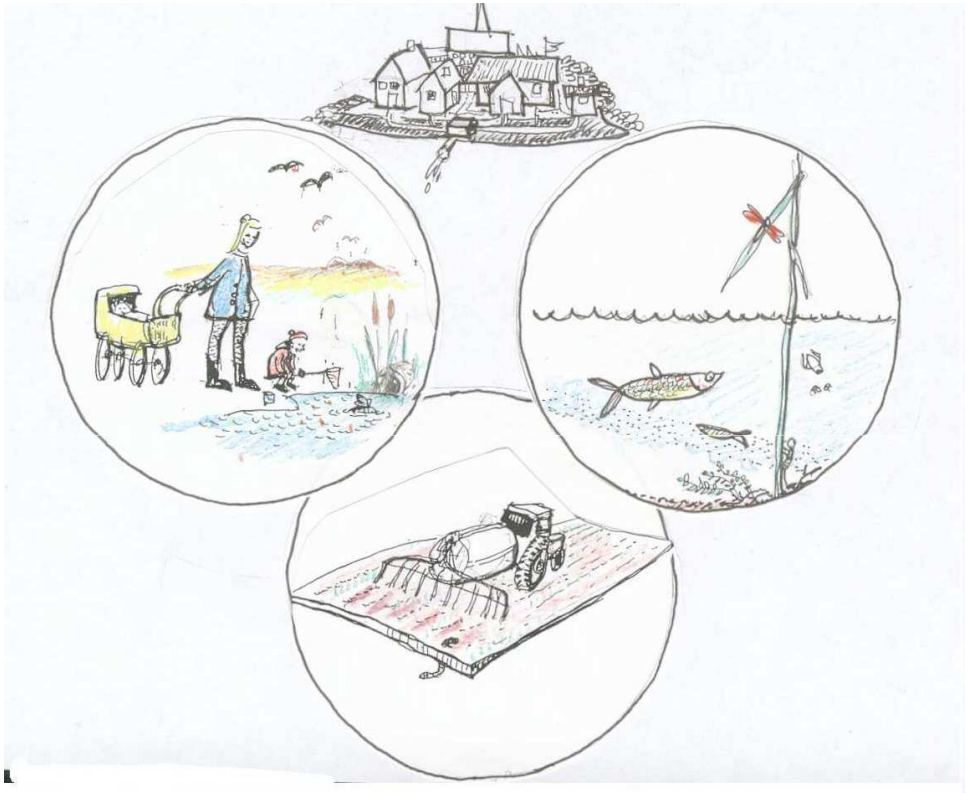


Illustration: Peter Ridderstolpe, WRS

Private goals:
Safe, comfortable, and affordable sanitation for the users.

Public goals:
A. Protection of Public Health
B. Recycling of nutrients (and water and nutrients)
C. Protection of water recipients

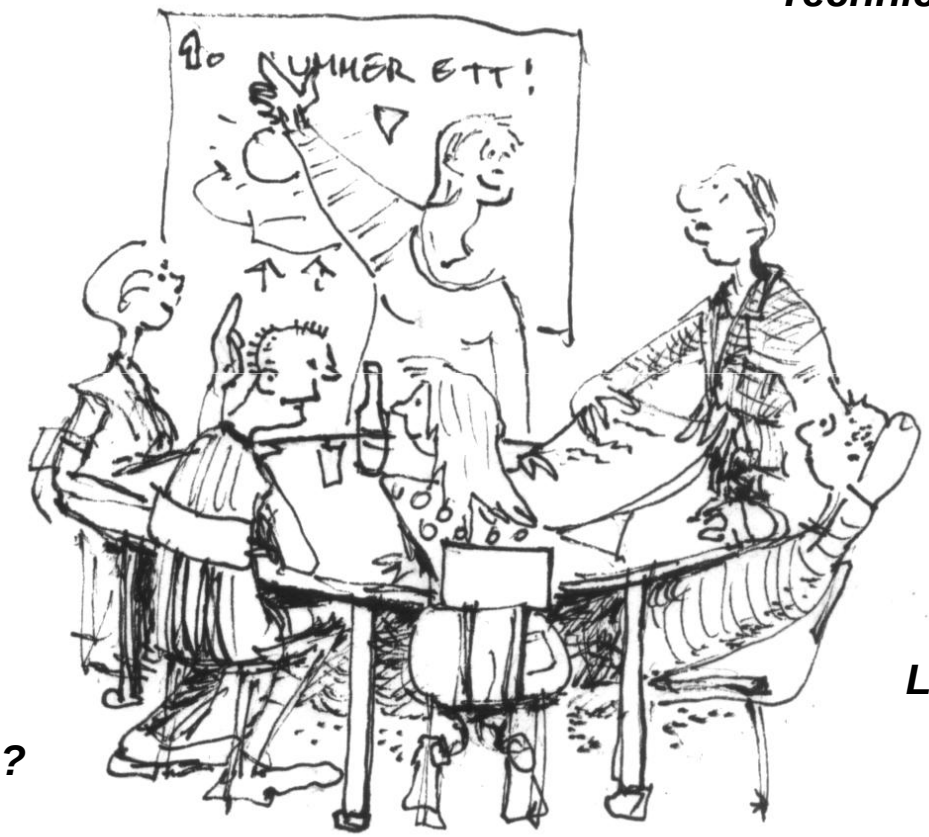
Open dialogue with stakeholders on requirements and means

Responsibilities?

Technical options?

Need for environmental precautions?

Costs, affordability?



Monitoring?

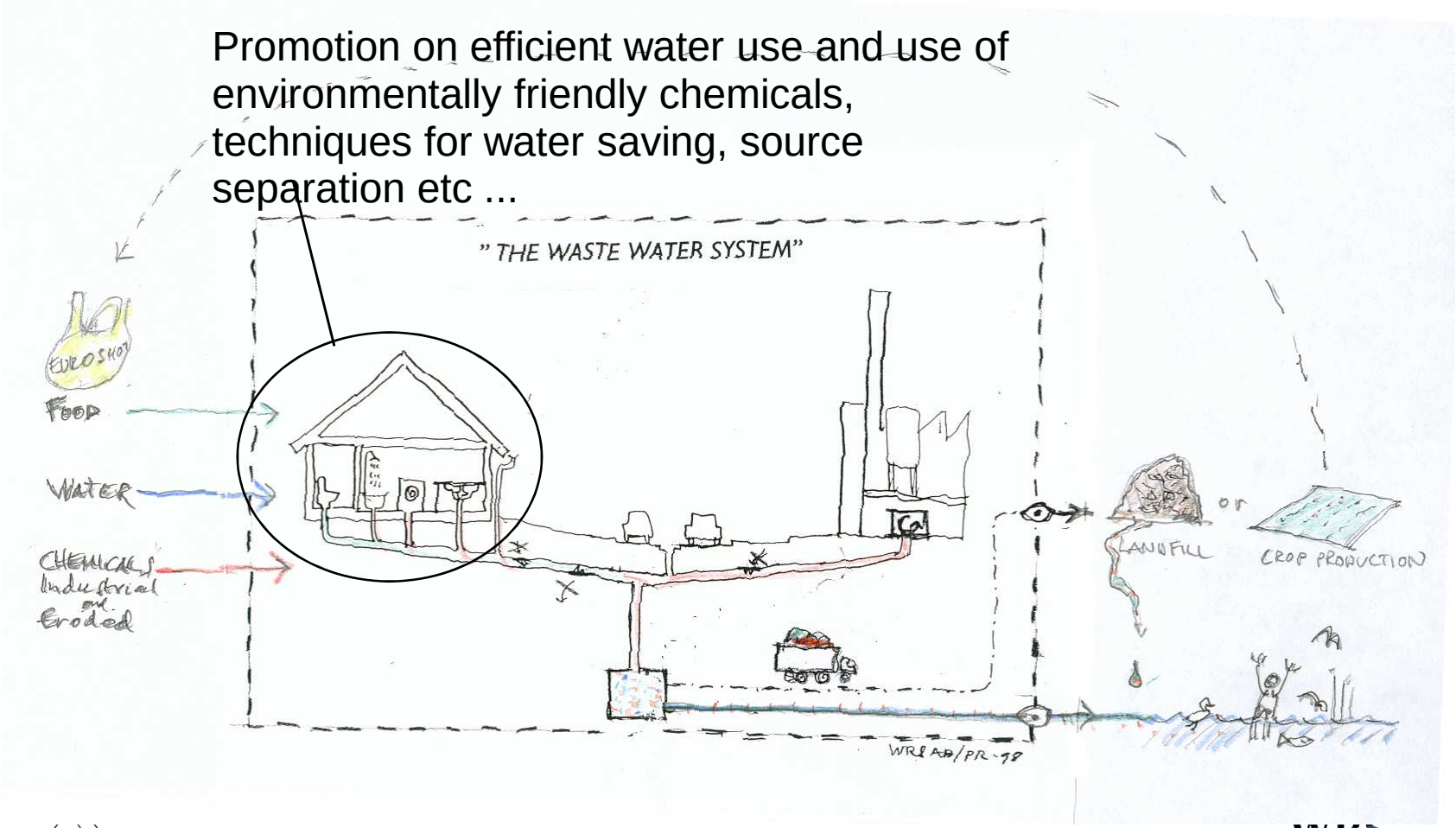
Flows and loads?

Legislation?

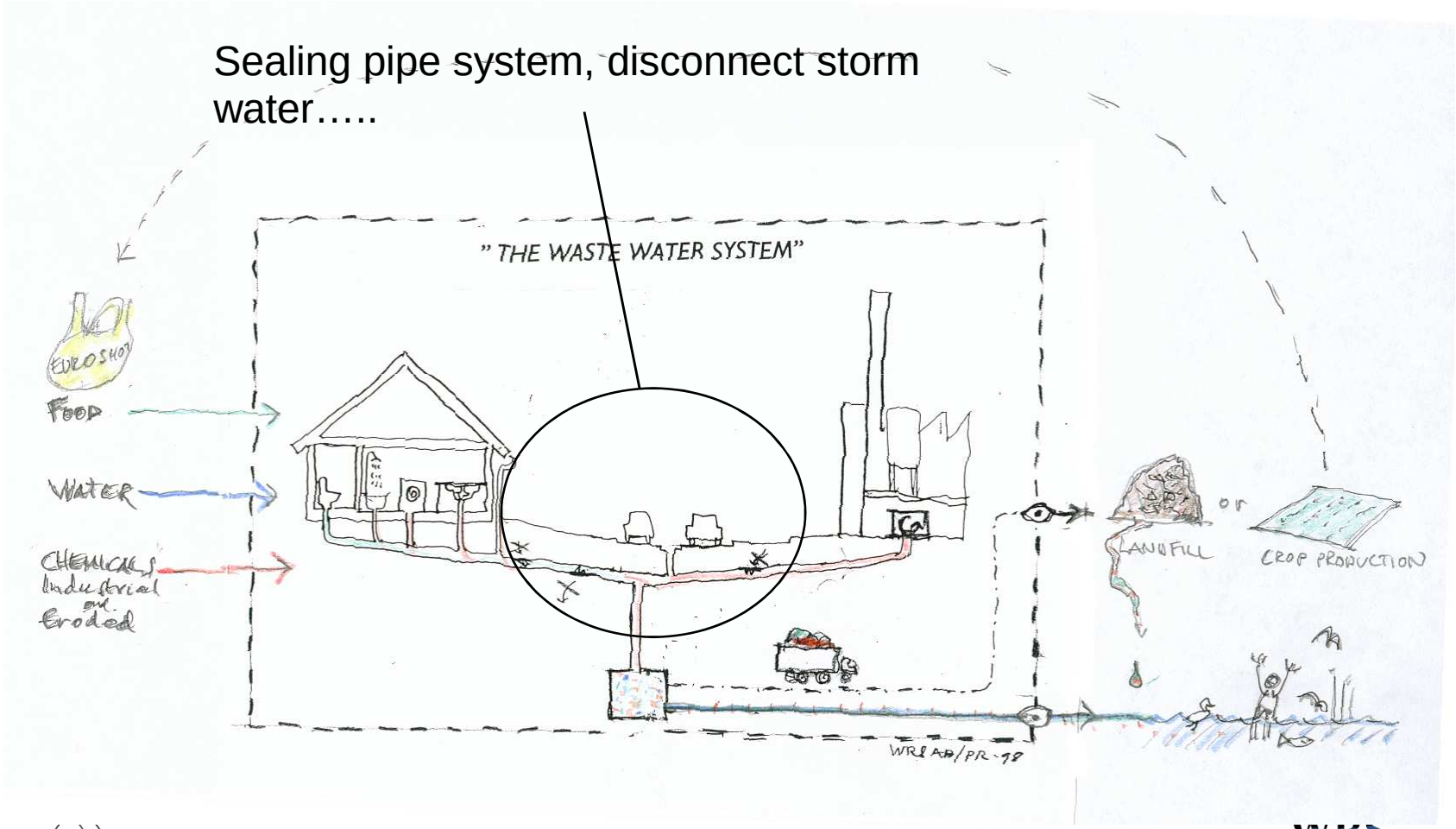
Natural conditions?

Illustration: Peter Ridderstolpe, WRS

Consider the whole system!



Consider the whole system!



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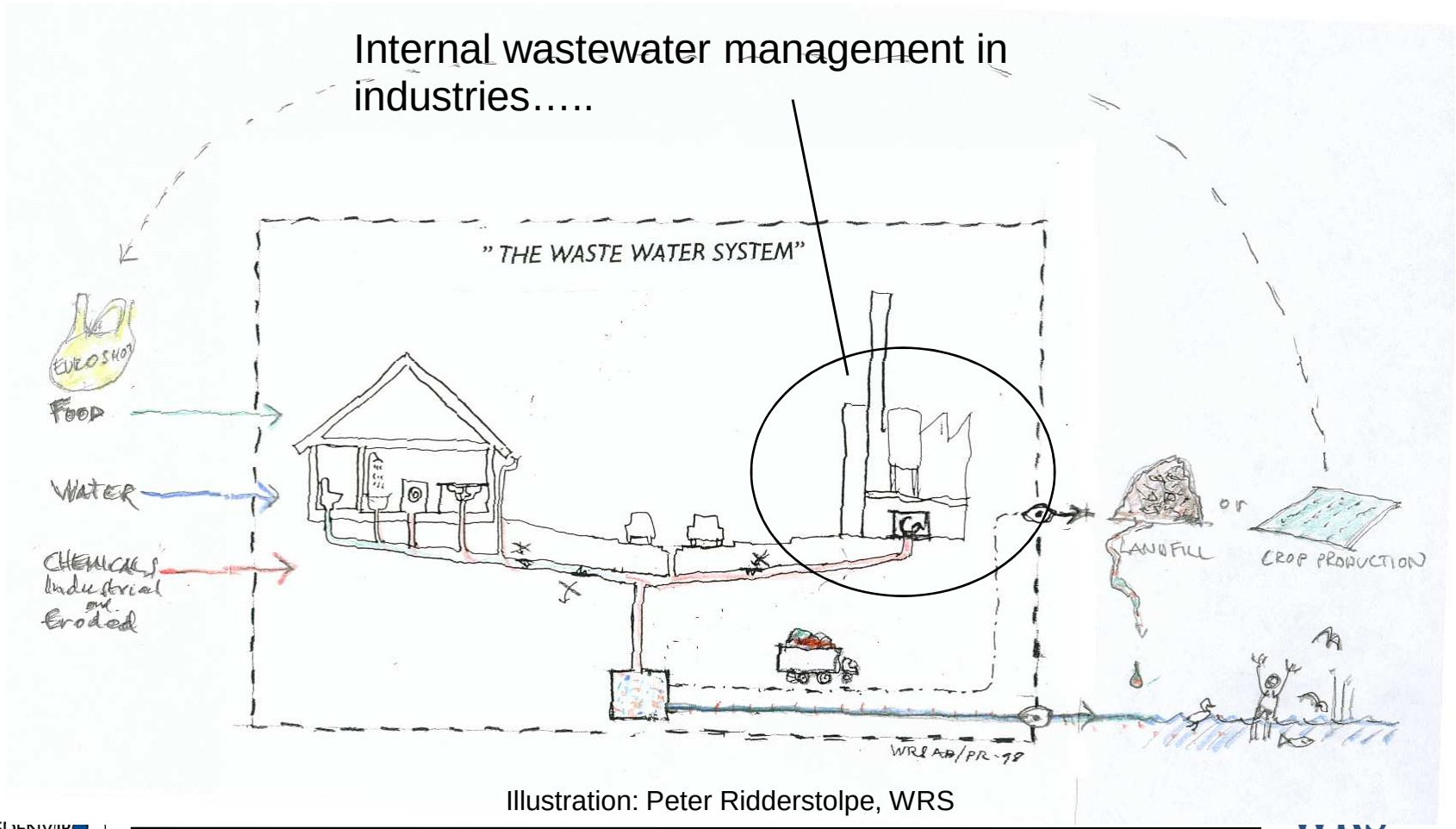


Illustration: Peter Ridderstolpe, WRS

The planning process - step by step

1 → **Identify the problem and stakeholders**

2 → **Identify local conditions and system boundary**

3 → **Set up a Terms of Requirements (T&R)**

4 → **Investigate possible solutions**

5 **Evaluate and compare options**

↓

6

Decide!

Further investigation or implementation

Step 1: The case “Vadsbro” southern Sweden...

- Old and obsolete plant (and collecting system)
- High consumption of electricity and chemicals
- Weak and uncertain treatment result

> Develop existing system or constructing new?

> Targets (ambitions) vs. reasonable costs?

Stakeholders

- Residents/users
- Planners & decision makers
- Schools & commercial operators
- Land owners
- Contractors
- Farmers
- Community-based organisations
- Others: neighbours, etc.

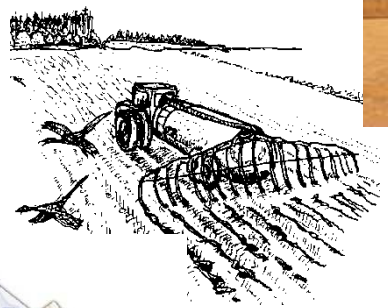
Step 2: Local conditions












System boundaries

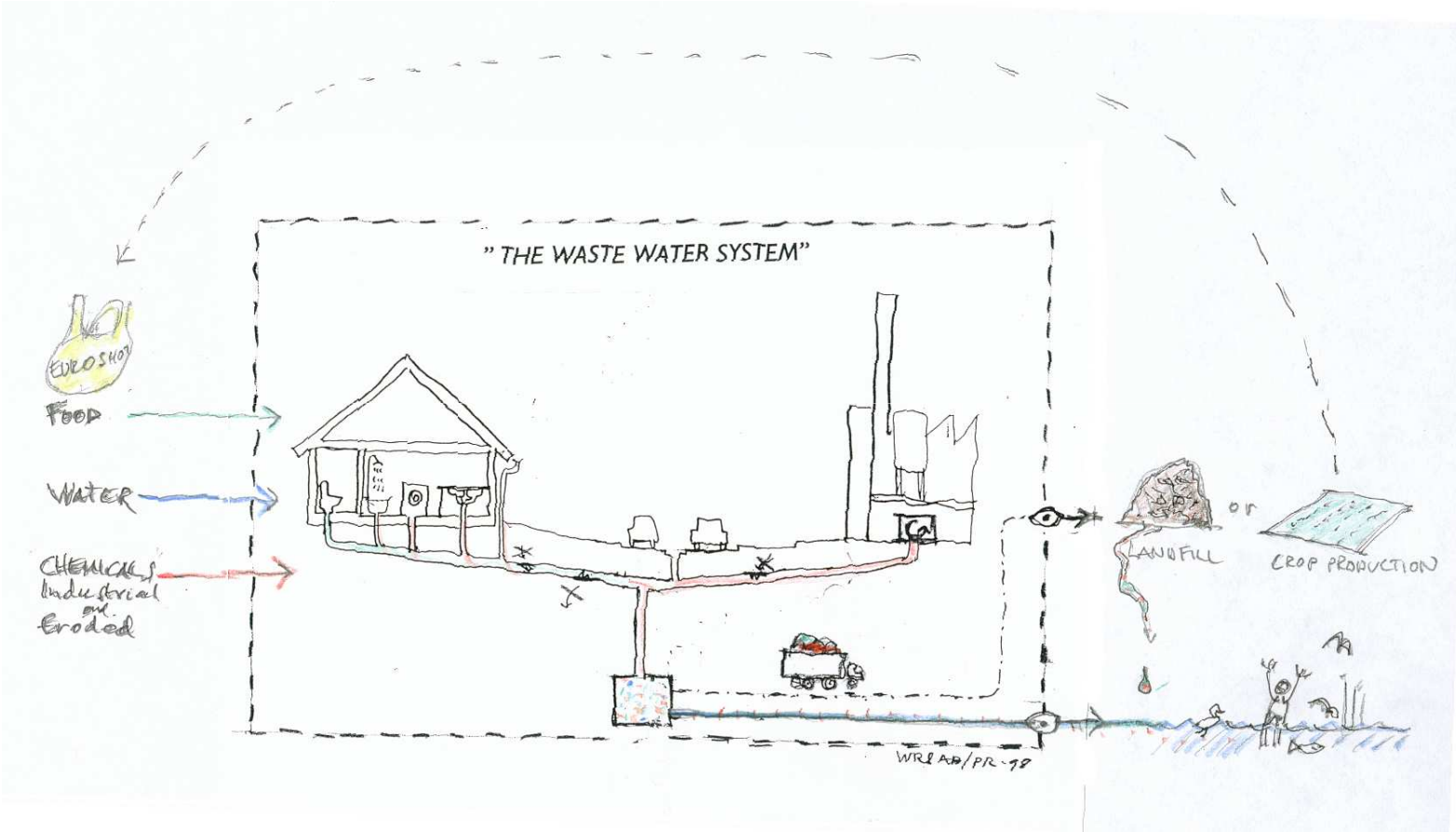


Illustration: Peter Ridderstolpe, WRS

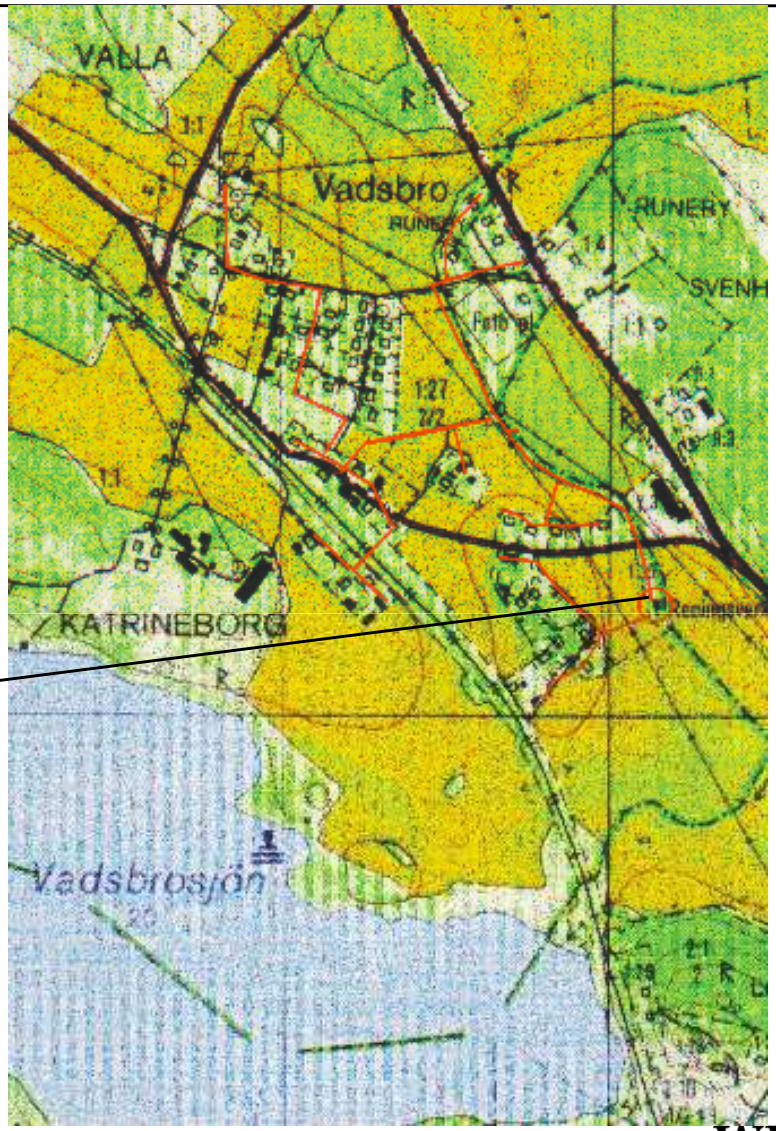
Vadsbro case, continued...

Local conditions in Vadsbro:

Rural area, farmland, forest, nice lake

Local water well middle of village

Existing pipe system, two pump stations



Vadsbro case, continued...

NUMBER OF PERSONS

-Designed for: 145
-Today: 125

WASTEWATER FLOW

-45 m^3/day average (320 l/person/day)

NUTRIENT AND ORGANIC MATTER FLOWS

Calculations from Swedish standard figures:

-Phosphorus: 110 kg/year
-Nitrogen: 700 kg/year
-BOD_7: 2 450 kg/year

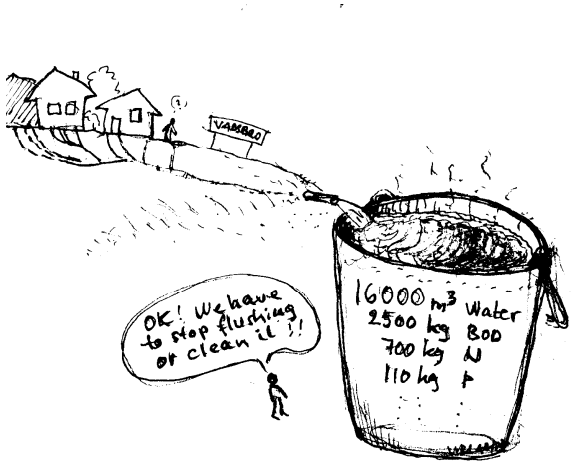


Illustration: Peter Ridderstolpe, WRS

Step 3: Terms of Requirement (ToR) for Vadsbro

Primary functions	Practical considerations
Protection of public health ▪ Avoidance of sanitary nuisances, e.g. bad odour. ▪ The effluent should either be of bathing water quality or excluded from direct exposure to humans until it has achieved bathing water quality. *Recycling* ▪ Phosphorous: >75% recycled ▪ Other resources valuable for agriculture *Protection of water recipients* ▪ Phosphorous: >90% reduction. At most 0.1 kg/pe as annual discharge and <0.1 mg/l. ▪ Nitrogen: >50% reduction. At most 2.5 kg/pe as annual discharge. Discharged in the form of nitrate. ▪ BOD: >95% reduction.	*Economy* ▪ Investment should not exceed USD 4000 per household. ▪ Operation and maintenance should not exceed USD 250 per year per household. *Socio-culture* ▪ New systems may require new responsibility arrangements between the municipality and farmers. ▪ Nutrient recycling should be adapted to the possibilities in the area. ▪ The system should be adapted to present and future land use in the area. *Technical function* ▪ A proven, robust system that gives few surprises. ▪ Use of existing infrastructure when feasible. ▪ Discharge monitoring may be more challenging for new systems and could require new methods.

Step 4: Analysis of possible solutions

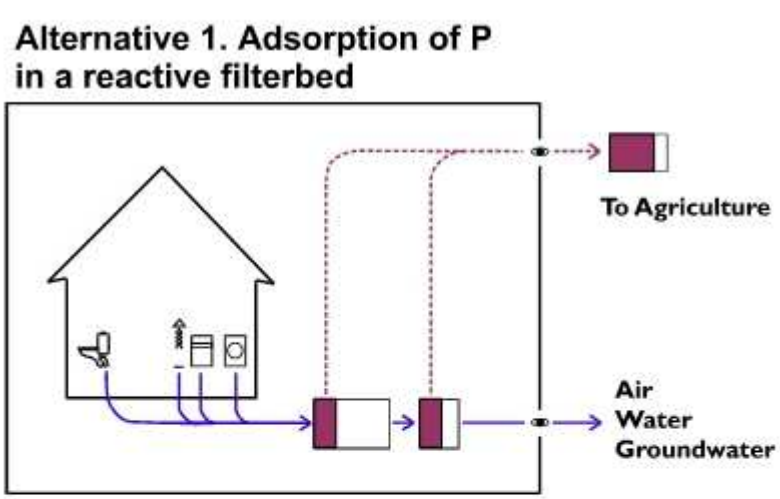
Illustration: Peter Ridderstolpe, WRS

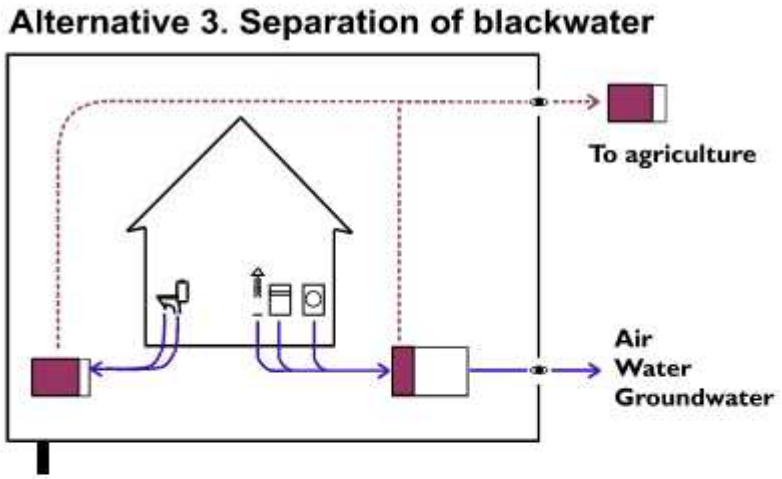
Assessing measures at the point of origin...

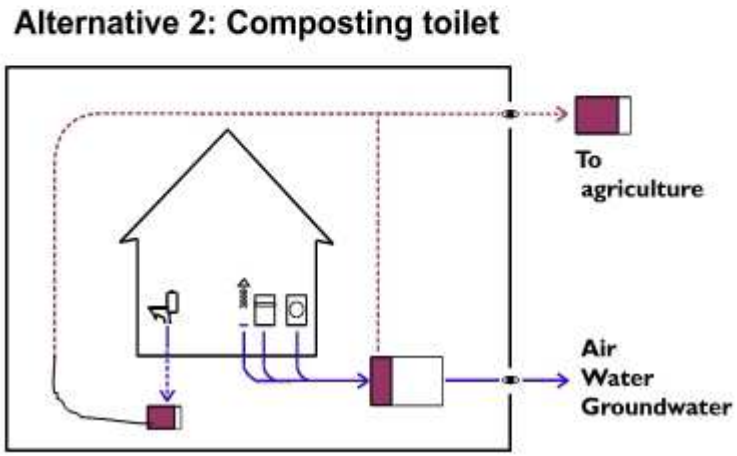
- source separation and

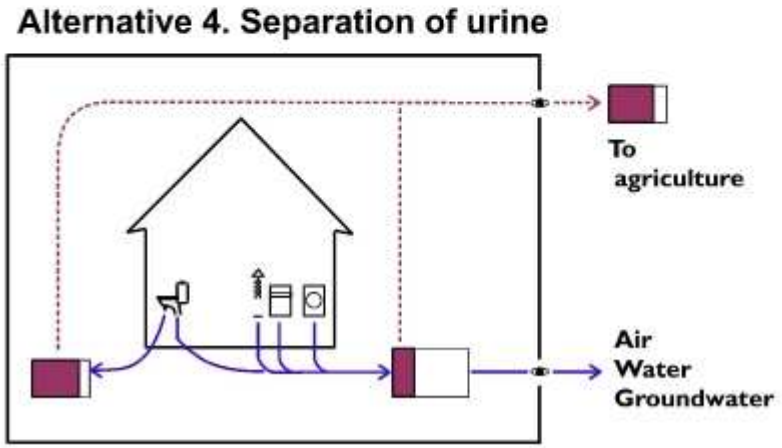
onsite treatment?

Vadsbro case, continued...







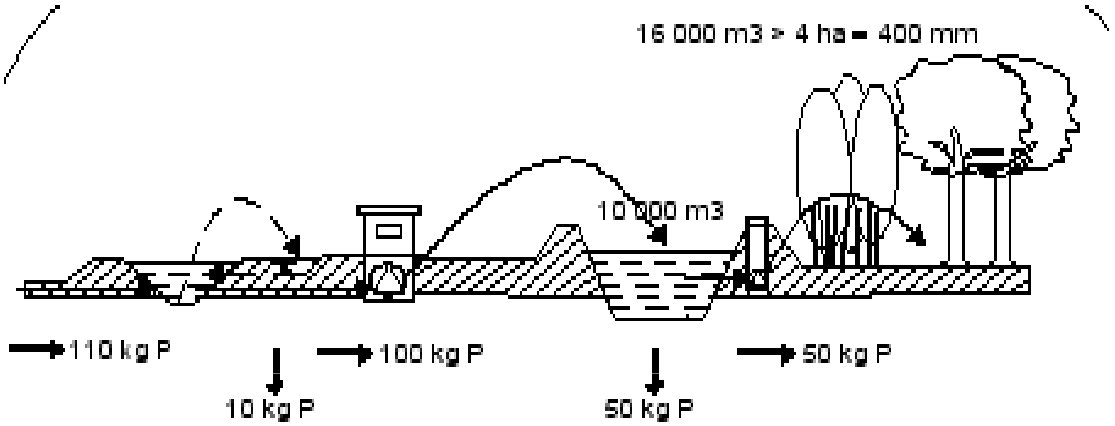


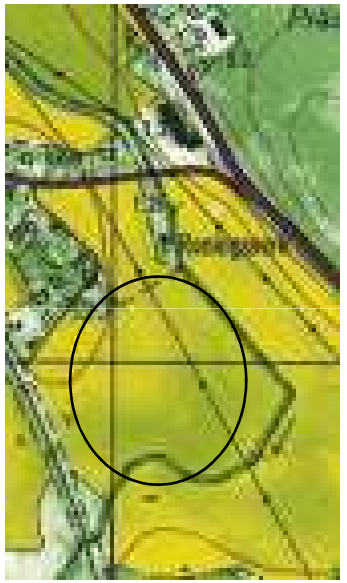
Assessing measures at the “end of pipe” ...

“Six different options fulfil the “terms of requirement”!

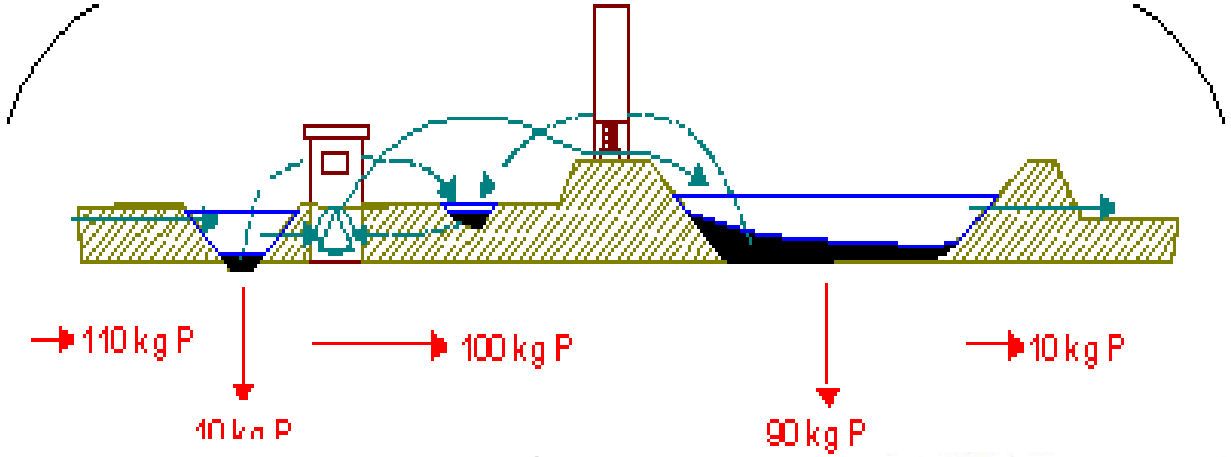
1. Forest irrigation
2. Precipitation pond
3. Trickling filter and biofilter ditch
4. Wetland/Agriculture rotation system
5. Open sandfilter
6. Compact treatment plant

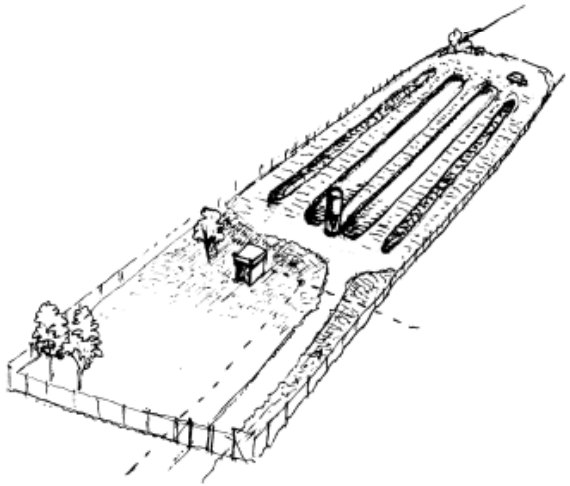
1. Forest irrigation...



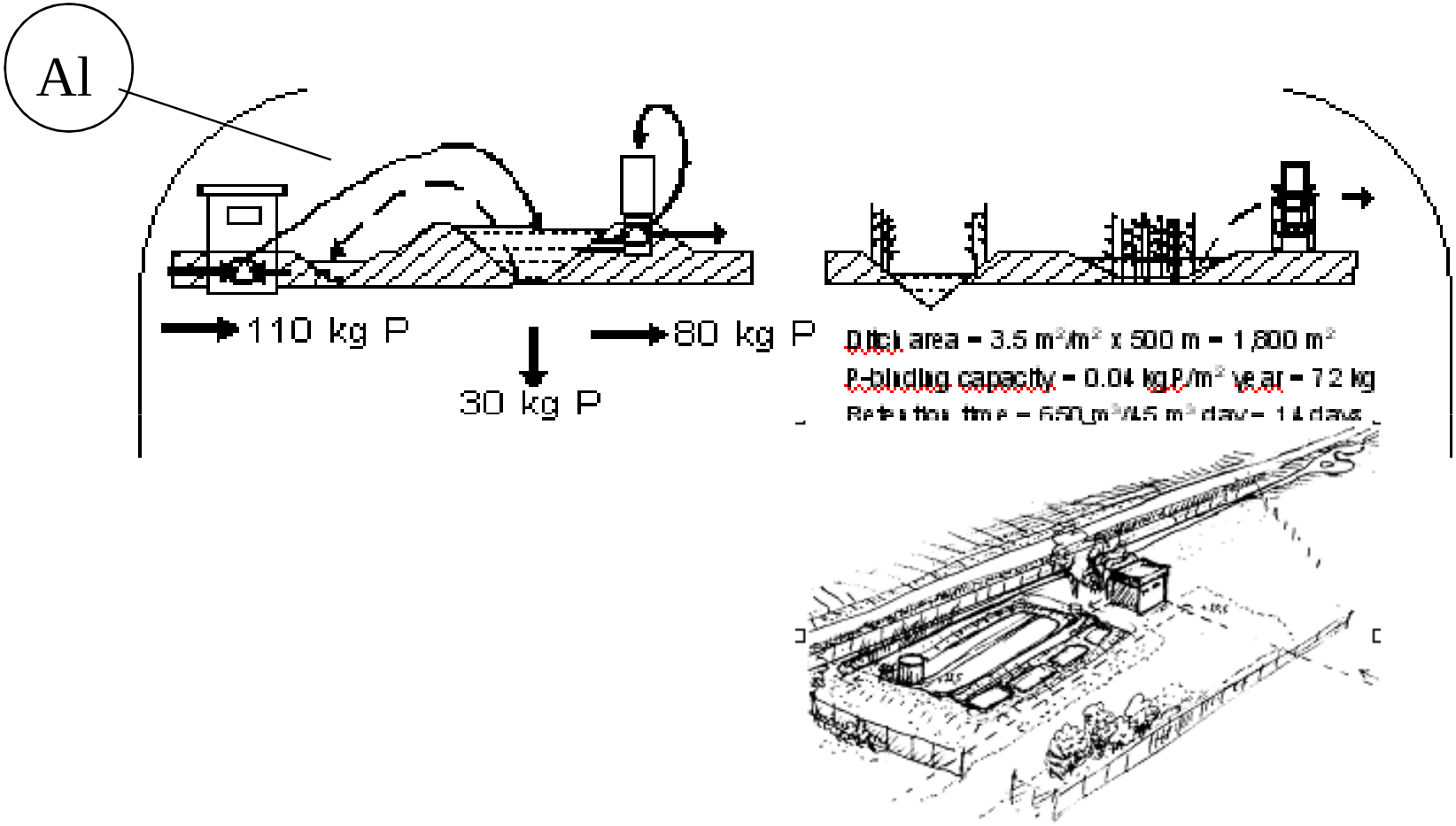


2. Precipitation with slaked lime, sedimentation in ponds

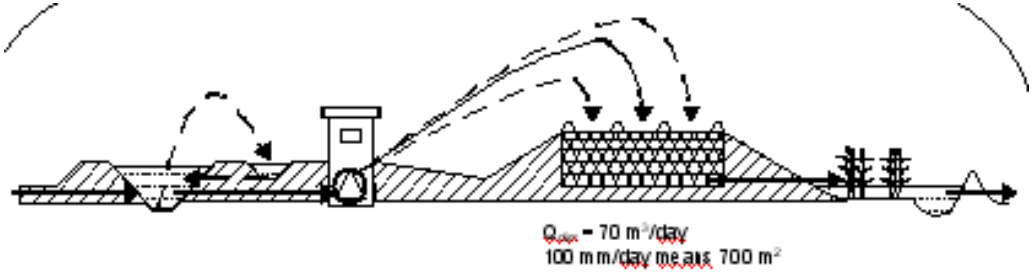


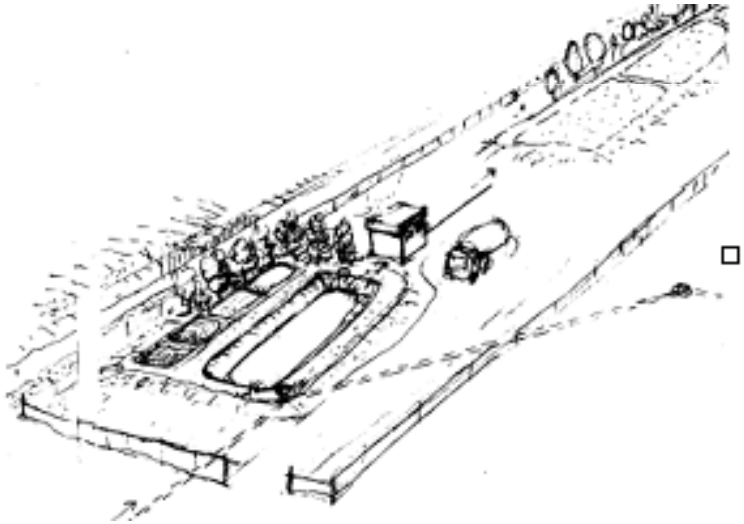


3. (Pre precipitation)- Trickling filter and biofilter ditch

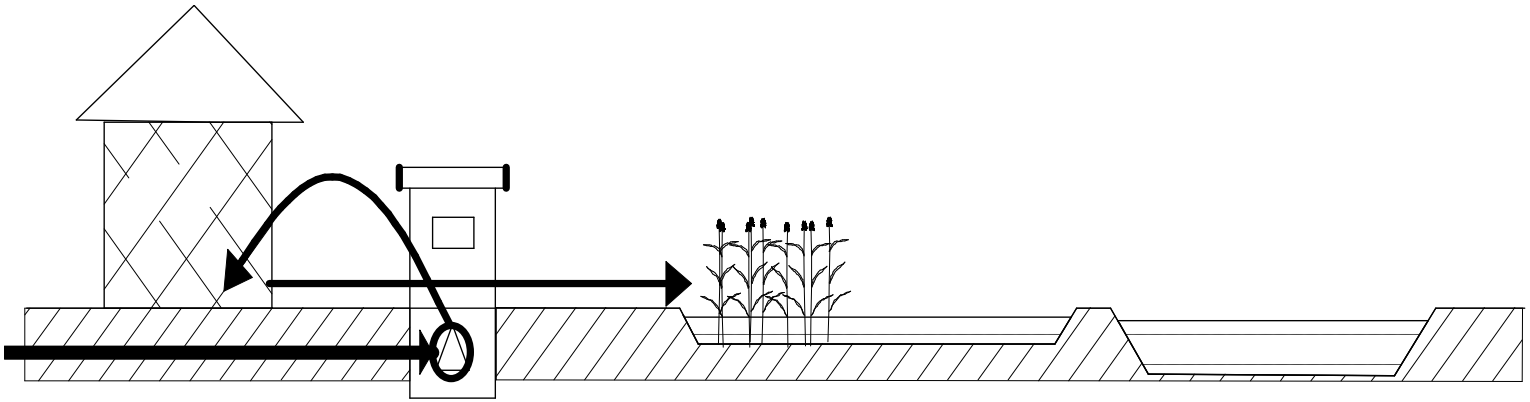


5. Open sand filter





6. Compact treatment plant and biofilter ditch

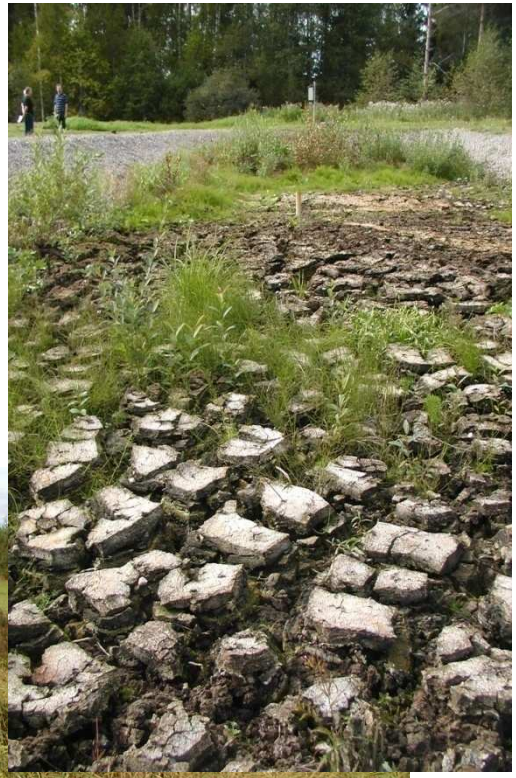


Step 5: Final evaluation of the alternatives

	Alt. 1 Irrigation	Alt. 2 Ca-precip.	Alt. 3 Bioditch	Alt 4. Rotation syst	Alt. 5 Sandfilter	Alt 6 Treat. plant
Economy	+++	+++	++	++	-	--
Reduction	+++	++	++	++	++	+
Potentials for recycling	++?	++	++	+++	++	++
Hygienic safe	-	++	++	-	++	-
Local adaptation	--	+	++	++?	+	++
Responsibility /Control	-	++	++	-	+++	+++
Conclusion	Very efficient and cheap but hygienic hazards Landscape impact	Efficient Robust service demanding	Efficient Cheap Flexible Robust	Not proved but very interesting	Efficient but quite expensive	Not cost efficient Simple planning

Step 6. Implementation

Sludge Treatment - Drainage beds is a good option



Case 2: Improved sanitation in rural Bulgaria

- Low income , high unemployment
- Household farming
- Carts bedrock, shallow soils, sensitive groundwater
- Private wells
- Simple pit latrines

Terms of Requirement (ToR) for Case 2: Bulgaria

Primary functions	Practical considerations
Protection of public health All parts of the system and the subsequent handling of products must achieve a high levelof hygiene and disease protection, including: ▪ High hygienic standard within the toilet, the washing area, and with regards to greywater/wastewater effluent, etc. ▪ Excreta must be stored/disposed of ▪ without risk of seepage of pathogens to the groundwater ▪ It must be possible to manage collection and disposal of waste products in a hygienically safe manner *Recycling* ▪ Virtually all nutrients from the sanitary system (urine as well as faeces) should be recycled to productive land, so as tominimise nitrogen losses within the system,pollution, etc. *Protection of water recipients* ▪ Excreta must not be stored or disposed of so that there is a risk of leachate of nutrients into the groundwater ▪ Surface waters (ditches, ponds, rivers,lakes) should be protected from nutrients and organic matter originating from toilets and greywater/wastewater	*Economy* ▪ Investment costs should be reasonable ▪ Households should be able to carry out operatior and maintenance in kind *Socio-culture* ▪ Responsibilities of households and ▪ authorities must be clear ▪ The toilet should be inside the house ▪ The system must be easy to use, including for children, women, and the elderly *Technical function* ▪ Operation and maintenance should be easily performed by the users themselves ▪ It must be possible to evaluate the system performance

Alternatives

- Existing pit latrines improved by ventilation and continued grey water handling by throwing buckets in the yard
- Dry urine diversion and on-site greywater management in a constructed soil filter
- On-site water borne system with treatment in soil filters

Dry urine diversion

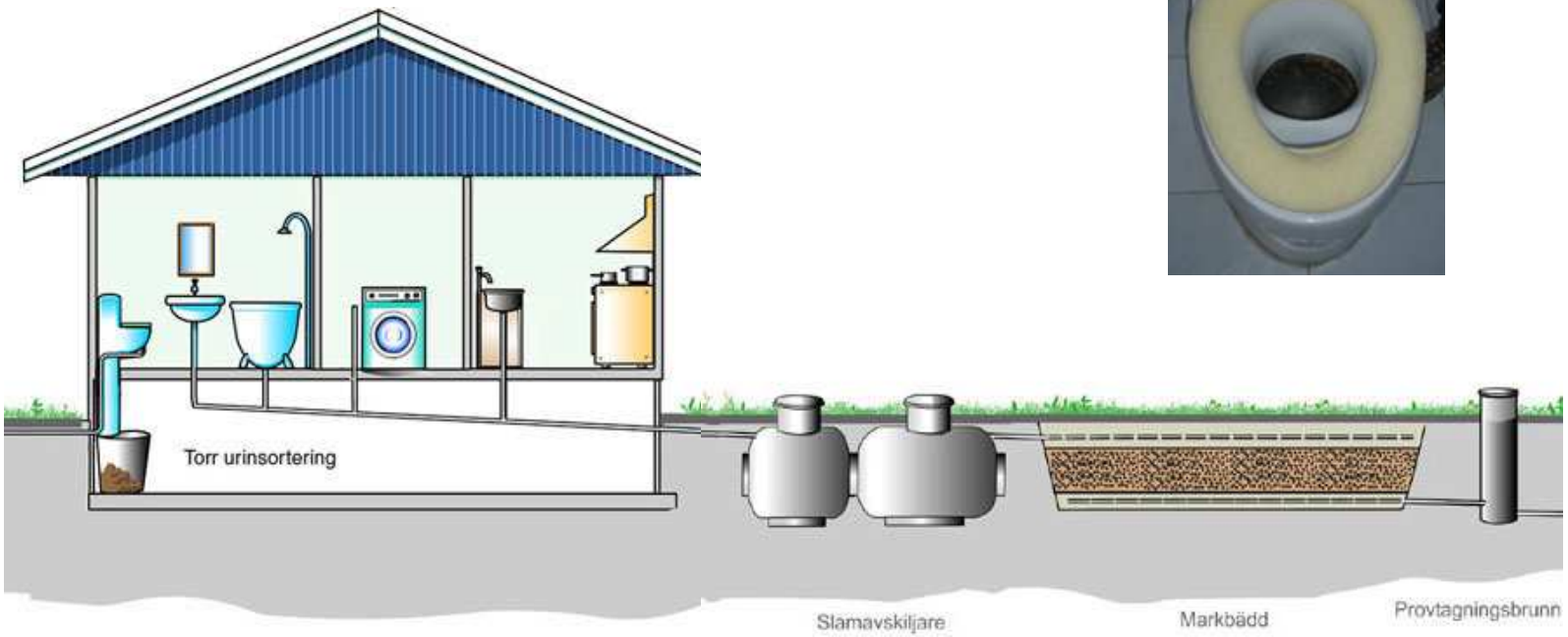


Illustration: Johan Palmcrantz

Open wastewater planning - conclusions

- Change preconceived thinking and create real understanding for the reasons for treatment
- Force “decision makers” to consider the whole system
- Create understanding for the software part of the system (user aspects, institutional aspects, economical aspect etc.)
- Promote public participation (democratic planning)
- Promote locally adapted systems
- Promote development of new techniques

Draw back: More effort in planning must be allocated than normal

Remember:

⇒ Think about the user! Involve stakeholders!

⇒ Keep all goals/targets in mind!

⇒ Consider the whole system!

⇒ Practical aspects often determine long-term function

Thank You!


Recycle nutrients
(P, N, K) from toilet
waste , back to
agricultural land
and crop production
Use a recycling
system as for
manure from
cattle.