KOUPACÍ JEZÍRKA,
BIOBAZÉNY
A VEŘEJNÁ KOUPALIŠTĚ
PŘÍRODĚ BLÍZKÁ ŘEŠENÍ

**24|1|2024**

**Dipl. Ing. Stefan Bruns, Německo**

# VEŘEJNÁ PŘÍRODNÍ KOUPALIŠTĚ VE SVĚTĚ – ZPŮSOBY ČIŠTĚNÍ VODY, DESIGN, PŘEDPISY VČETNĚ HYGIENICKÝCH

ASOCIACE
BIOBAZÉNŮ A JEZÍREK

# ASOCIATE BIOBAZENU A JEZIREK

**24.01.2024**

POLYPLAN KREIKENBAUM

For people and the environment –
Sustainable planning from a single source






# OFFICE PRESENTATION - POLYPLAN/KREIKENBAUM

## SERVICES TO IMPLEMENT SUSTAINABLE PROJECTS

**The Polyplan - Kreikenbaum Group**

**- a young at heart team with 30 years of professional experience**

**... and always innovative ideas**

**LANDSCAPE ARCHITECTURE**
City planning, campus planning
Waterfronts & Lakes
Urban lakes, water playgrounds

**ENVIRONMENTAL ENGINEERING**
Public outdoor and indoor swimming pools
Lake restoration and urban waters
Retention soil filter
Modulation of hydraulics and aquatic ecosystems
Water playgrounds
Technical and biological water treatment
Engineering biology
Retention soil filter

**TGA**
Office buildings, residential complexes
Sustainable energy management
Local heating concepts
Integrative residential construction energy planning

**PROJECT SUPERVISION**
Support in water management
Database-based project communication (DASEE, DANA)
Energy controlling via IOT based systems

# OFFICE PRESENTATION CREDENTIALS

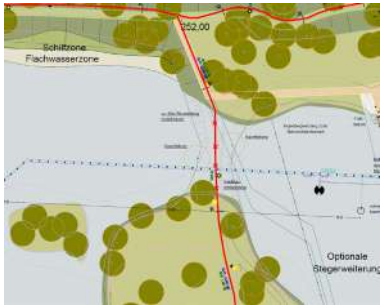
POLYPLAN KREIKENBAUM

**Aabach Talsperre (200 ha)**
Offenbach (Frankfurt)

**Maschsee (80 ha)**
Hannover, Redevelopment concept

**Friedhofsgewässer (Water network)**
Bremen

**Potsdamer Platz, water technology,**
Berlin




**Aueweiher Fulda**
Fulda

**Südseecamp**
Wietzendorf

**Arkadien Settlement project**
Winnenden, Gewässer

# OFFICE PRESENTATION
## REFERENCES
## NATURAL BATHS

**Freibad Tessin**
Tessin

**NSP Ruds Vedby Kiddy pool of the public**

Dänemark

## OFFICE PRESENTATION
## REFERENCES
## CHLORINATED POOLS




**Melbbad, Bonn, Germany**



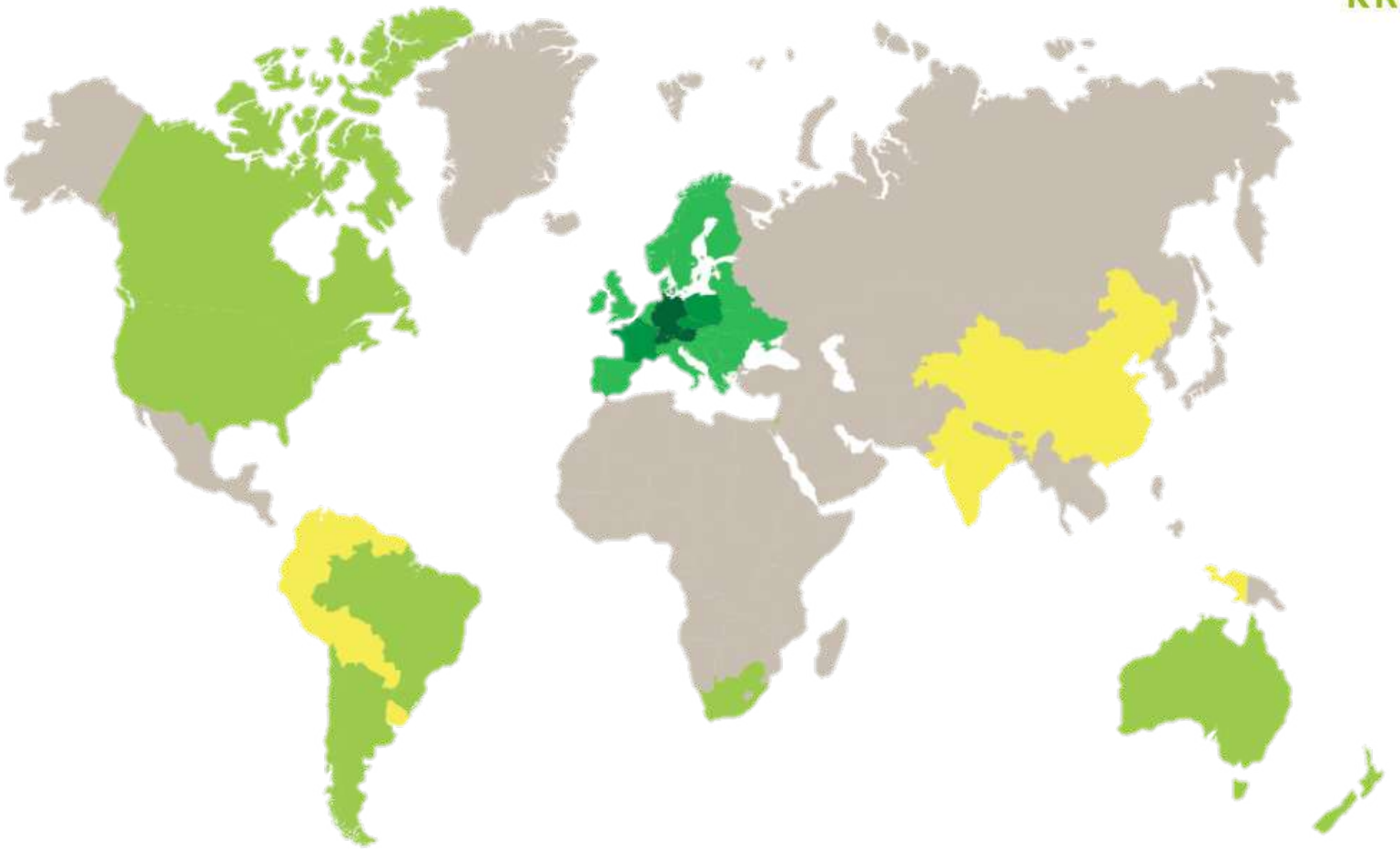
**Aqualaazium**

**Germany, Hannover**

# Faces of an NSP

POLYPLAN KREIKENBAUM

# PUBLIC NSP IN THE WORLD

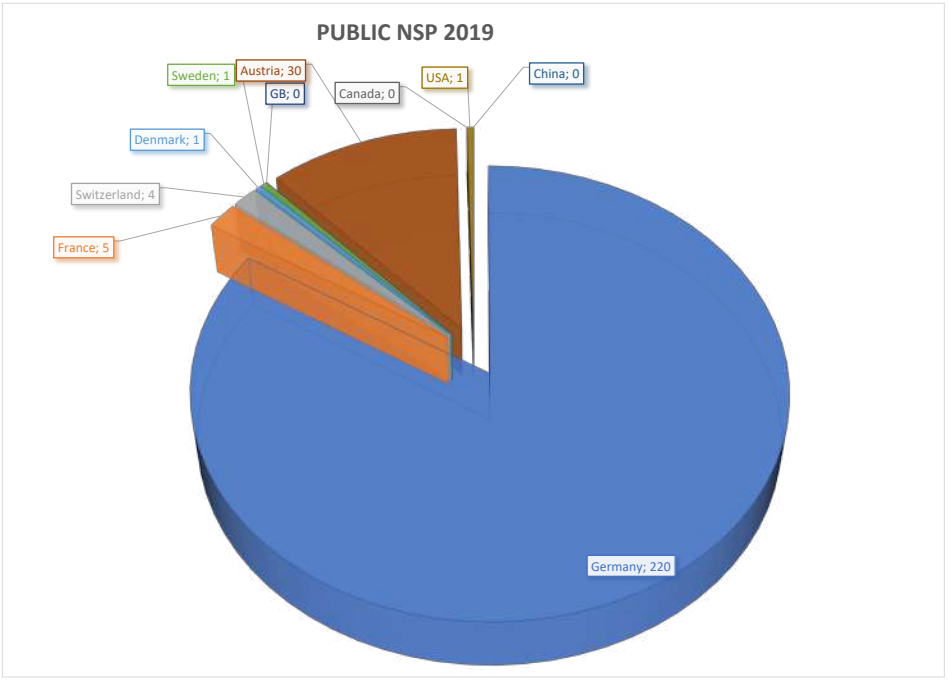


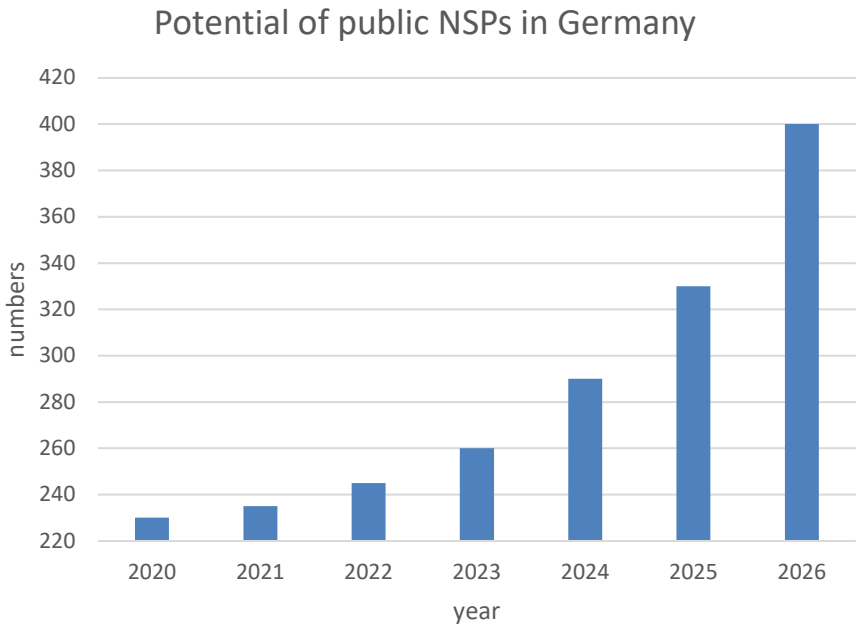
Author: Stefan Bruns; Stefan.Bruns@polyplan-gmbh.de

# PUBLIC NSP IN THE WORLD

POLYPLAN KREIKENBAUM

IOB




Author: Stefan Bruns; Stefan.Bruns@polyplan-gmbh.de

# GENERAL ARGUMENTATION - PRO AND CONTRA

1. Nature Awareness
2. Energy resources
3. Nature based Solutions
4. Better CO2 balance
5. No Alergica
6. No dangerous chemical products (Chlorine gas)
7. No chemical by-products
8. Attractive landscape element also beside the season

1. Less biofilm
2. Less human maintenance effort
3. always the same water quality
4. Less hygienic measurements
5. Less parasides

# ECONOMICAL ARGUMENTATION - PRO AND CONTRA



POLYPLAN KREIKENBAUM

1. Savings of investment cost 15-40%
2. Saving of energy costs 20-80%
3. Saving of water recourses 60 l/bather and day
4. Better funding options

1. Saving of cost for anelyses 6000-10.000 €/year
2. Less human recourses

POLYPLAN KREIKENBAUM

1. Water temperature <27°C
2. Water transparence > Bottom
3. Max. nominal bathers 1 Bather/$m^3$/d
4. No max. Bather limitation/day
5. Frequence of Health measurements 7-14 days

PUBLIC NSP
DEMANDS TO THE WATER TRANSPARENCE

1. Always up to the bottom
2. 0,5-2 Fnu

# 'Clear and beautiful:' Edmonton says chemical-free swimming pool first in Canada

*The Borden Natural Swimming Pool uses plants, zooplankton and granite rather than chlorine or salt to filter its water*

THE CANADIAN PRESS

**The Canadian Press**
Rob Drinkwater

Published Jul 20, 2018 • Last updated Jul 20, 2018 • 3 minute read

Join the conversation

Members of the public float in the outdoor natural pool in Edmonton, Alta., on Monday, July 16, 2018. JORG XMIT: EDM101 PHOTO BY JASON FRANSON/CANADIAN PRESS

# JUMPING

# PUBLIC NSP IN THE WORLD

# LIVE GUARD

1. Lifeguards are mandatory.
2. The pool should be planned in such a way that it can be seen from one position.
3. Normally, the baths work with one lifeguard of up to about 300 bathers.
4. With 3000 bathers, about 3 lifeguards are used.

Author: Stefan Bruns; Stefan.Bruns@polyplan-gmbh.de

## INTRANCE REGULATION

1. FREE ENTRY
2. AUTOMATIC PAID ENTRY
3. MANUAL ENTRY TO BE PAID
4. ANNUAL PASSES FOR YEAR-ROUND USE OF THE FACILITY

# OFFICE PRESENTATION
## REFERENCES
## NATURAL BATHS

**Freibad Ennigerloh**
Ennigerloh

# OFFICE PRESENTATION/TEAM/EXPERIENCES
## OFFICE PRESENTATION – QUALIFICATIONS/REFERENCES
## LOT 1 - NATURAL POOLS


**Naturfreibad Bingen**
Bingen am Rhein

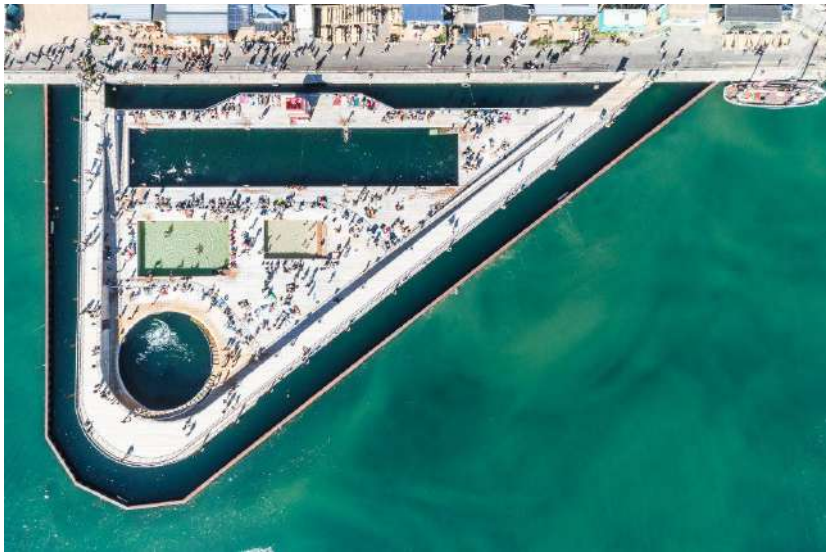
**Nordseelagune Burhave**
Burhave

## TOP 6: PLANUNG UND KONZEPT

## NSP BREMEN, GERMANY INTENSIVE 3000 BATHERS A DAY

# Impressions

## NSP Floating Pool Aarhus, Denmark, extensive 4000 Bathers a day 24.000 m³



**Floating Pool Aarhus**

Unique Concept Design "Basin in treated Cover Basin"
The attractive harbor pool in Aarhus consists of a spacious platform in which 3 pools are embedded.

The edge area facing away from the pier has a second deck level which creates a multi-dimensional character and many niches are built up.

The bath is operated according to the EU bathing water directive. The pools (kiddy pool, swimmer pool and jumper pool) are located in the swimming deck. The wall and bottom of the basins are framed by a net. That means the basins are hydraulic open against the Cover basin.

**Place:**
Teknik og Miljø Center
for Byens Anvendelse
Aarhus Kommune
Kalkværksvej 10
8000, Aarhus C

**Contractor:** AarhusKommune Team Byggemodning

**Period:**
2017 - 2018

**Phases:**
1-9

**Honrar:**
6.000.000,00 €
2.000.000,00 € (Polyplan+Polycon)

Impressions

NSP Floating Pool Aarhus, Denmark, extensive 4000 Bathers a day

24.000 m³

## Straussvej Courtyard



**Client:**
KØBENHAVNS KOMMUNE

**Location:**
Copenhagen, Denmark

**Execution time:**
2019 to 2020

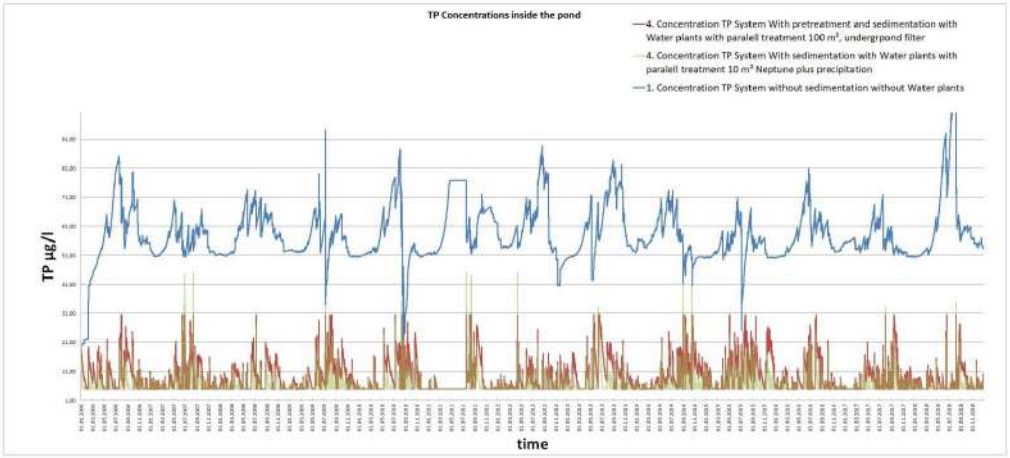
**Service phases:**
1 - 4

**Opening:**
2020

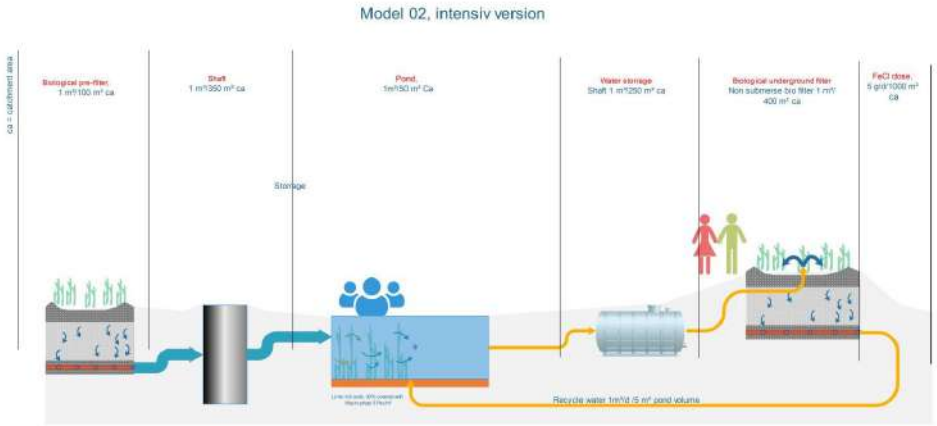
**Building costs:**
450,000 Euro

**Planning Fees:**
32,000 Euro

# Impressions




We used our numerical simulation tools to design the water treatment system and positioned it in close coordination with the open space planners and the client. According to model calculations, phosphorus concentrations of 5 to 31 µg/l Ptot-P occur. So far, the measured concentrations were 5 – 15 µg/l.



# Impressions

POLYPLAN KREIKENBAUM





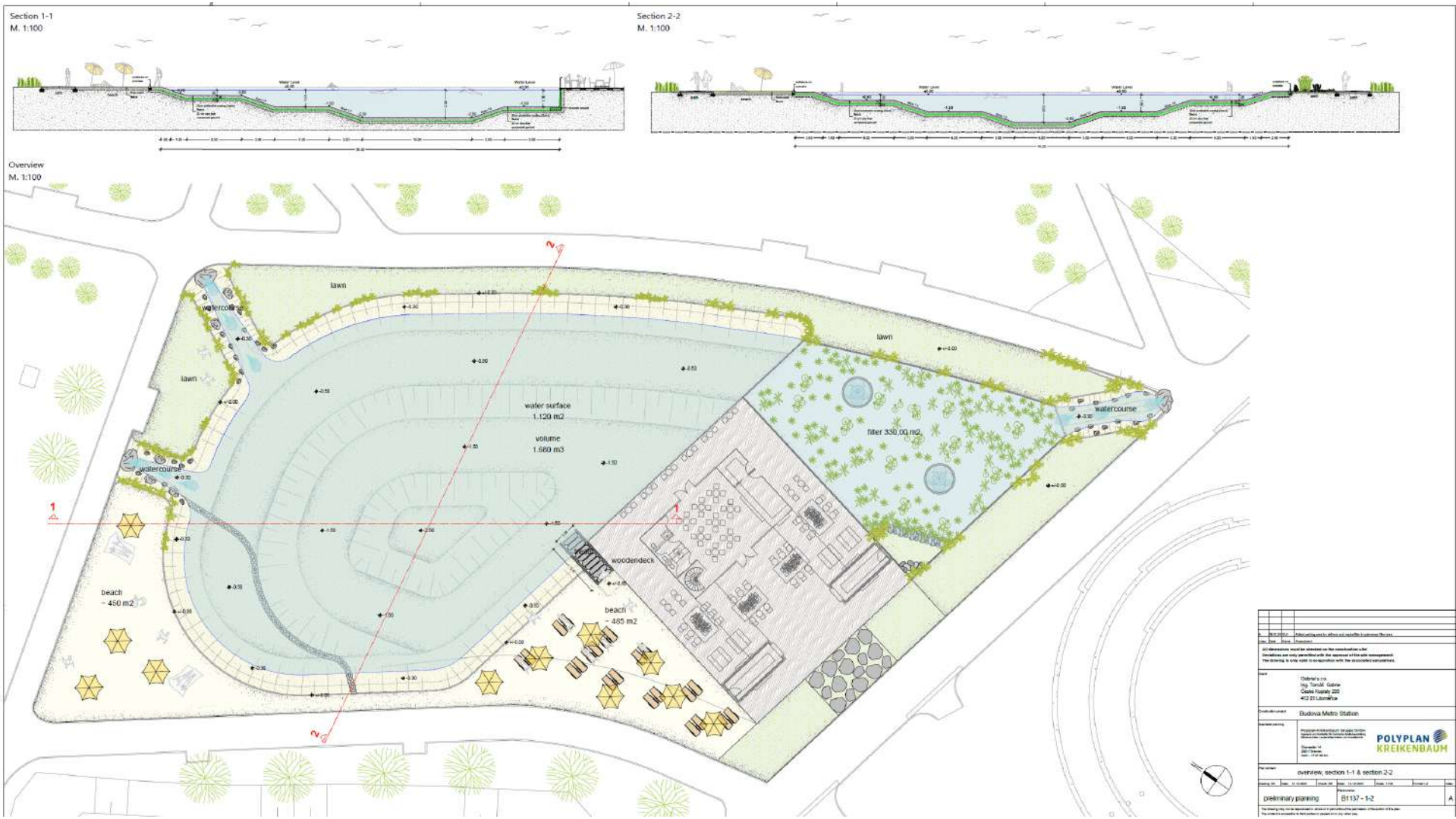




# Sponge City project Metro station Budova

## Urban pool with natural water treatment

## Surface 1120 m²




Version 1: Natural pool organic design cost effective

# Impressions

## NSP Floating Tessin, Germany, extensive use

## 4000 bathers a day

## 3400 m³


**Tessiner Südsee**

The Pool is located in an area just south of the existing sports and leisure complex in the area of Sankt-Jürgen-Straße. It covers an area of approximately 1.7 hectares. The lake was used as a bath with biological water treatment, gem. FLL 2011 running and the filter surfaces are located in the eastern part of the site.

The lake has an area of approx. 2.500m² and a water depth of up to 4m.

In the eastern area, a 25m pool with 4 lanes is integrated. In the western shore area, a bridge and a water slide, as well as two smaller ones

Basins are each arranged with approximately 50m ² of water surface.

In the south and north beach areas with a total area of approx. 1.400m² border the bathing lake.

**Places:**
Tessin

**Contractor:**
City of Tessin
Alter Markt 1
18195 Tessin

**Period:**
2010 - 2012

**Phases:**
1-9

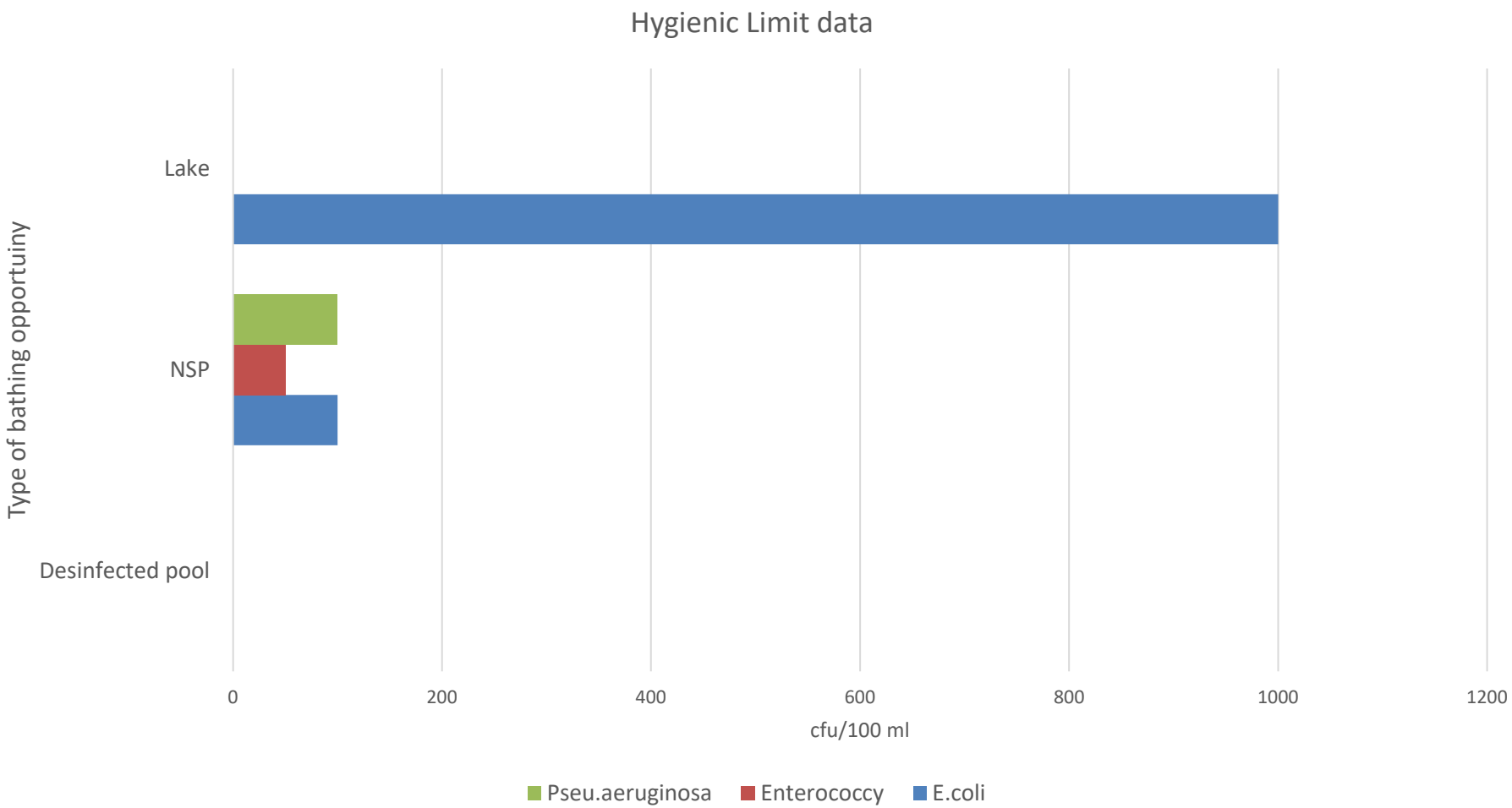
**Construction costs:**
2,0 Mio. Euro

**Planning fee:**
150.000 Euro

**honorary regulatio hoai:**
Part II and Part IV, General Planning

# Water treatment

## Hygienic limits, FLL Regulation

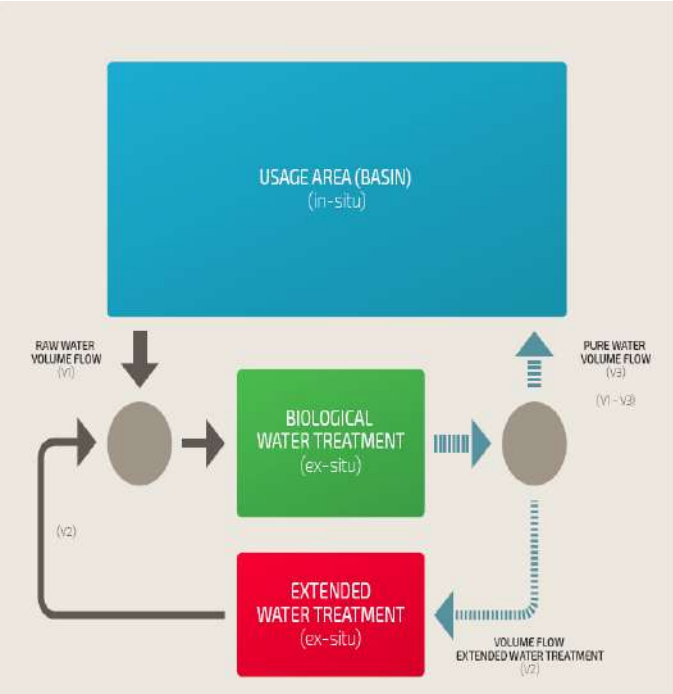


# Wy water treatment

# Wy water treatment

POLYPLAN KREIKENBAUM

# Water treatment
## Analogy disinfected pool versus NSP




**Impact of Zoo plankton against Giardia and Protozoea … a positive factor against chlorine disinfection?**

### Internal disinfection

A study of 13 public swimming pools was carried out in Germany, with the aim of recording semi-qualitative data on the zooplankton population. The tests detected the presence of the genera Flagellata, Ciliata, Rotatoria, Cladocera and Copepoda. A low filtration rate was identified if values were between 0 and 2.5 times per day, while a comparatively high filtration rate was characterized by values between 2.6 and 10 times per day. The maximum filtration rate occur with approx. 20 $m^3/m^3/d$, the 90% occur with 0.04 $m^3/m^3/d$

### External disinfection

Disinfection via external water treatment is crucial in ensuring the safety of the system for both users and the environment.
1 to 3 Log steps

Impact of Zooplankton Grazing on the Existstation, Viability, and Infectivity of the Protozoan Pathogens *Cryptosporidium parvum* and *Giardia lamblia* ;S. J. Connelly,1* E. A. Wolyniak,2 K. L. Dieter,1† C. E. Williamson,1 and K. L. Jellison2; *Department of Zoology, Miami University, Oxford, Ohio,1 and Department of Civil and Environmental Engineering, Lehigh University, Bethlehem, Pennsylvania2*; Received 30 May 2007/Accepted 6 September 2007

## In-situ disinfection in baths with biological water treatment

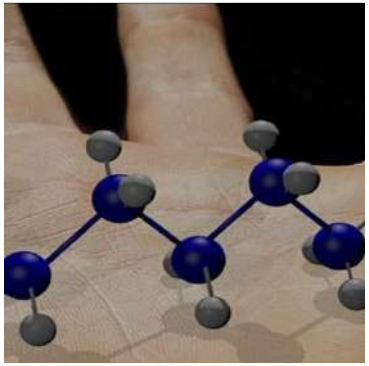
Interior disinfection in bathrooms with biological water treatment

Filtration by zooplankton 0.04 – 24 $m^3/m^3$tank volume/day

The filtration line is higher at higher bath loads, because the nutrient supply is then better

The zooplankton filters where it finds food (algae, bacteria, foursomes, etc.) Compared to chlorine, it is therefore a "smart disinfectant“

The presence of zooplankton is not easy to measure



## In-situ disinfection in baths with chemical/physical water treatment

Disinfection with chlorine is effective against many viruses and bacteria within minutes.

It has almost no effect on protozones and on viruses with a stable envelope. Regarding the latter, there is little research

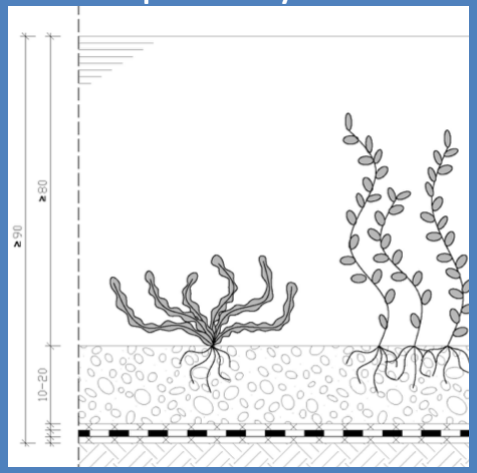
The presence of chlorine is easy to measure

POLYPLAN KREIKENBAUM

# Water treatment

## different Ex-situ Water treatment groups

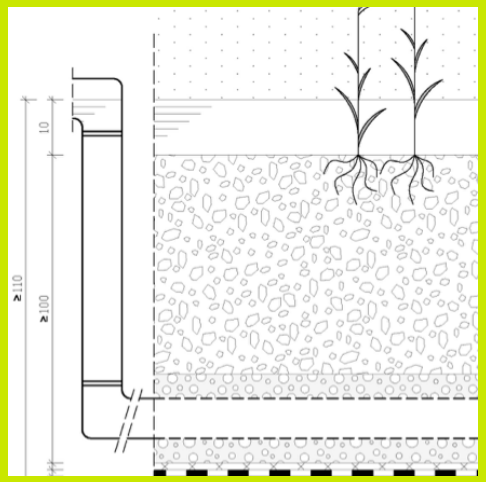
### Aquatic systems



- **Hydrobotanik**

1. PT elimination by macrophytes 30-40%
2. E. coli elimination via zooplankton filtration
3. Habitat for zooplankton

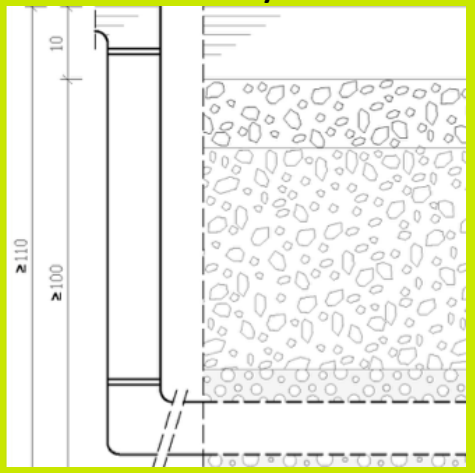
### Biofilter systems



- **Constructed Wetlands**

1. PT Elimination by Biofilm 10-20%
2. E. coli Elimination 1…3 Log steps

### Biofilter systems



- **Substrate filter**

1. PT Elimination by biofilm 10-20%,
2. E. coli Elimination 1...3 Log steps

Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V.

https://shop.fll.de/en/fll-english-publications.html

Water treatment

different Ex-situ Water treatment

| Anforderung \ Art der Filtration | | Hydrobotanische Anlagen | |
|---|---|---|---|
| | | submers | emers |
| **Aufbau** | | | |
| **Höhe Wassersäule** | | ≥ 0,80 m | 0,10 – 0,50 m |
| **Dicke der Substratschicht** | | 10 – 20 cm | 10 – 30 cm |
| **Gefälle auf Filtersohle** | | — | — |
| **Verhältnis von Mächtigkeit der filterwirksamen Schicht zum horizontalen Abstand der Dränagen** | | — | — |
| **Material** | | | |
| **Korngrößenbereich** [1)] | **Pflanzenstandort** | ≤ 8 mm | |
| | **Filter** | — | — |
| **Überkorn (Filter)** | | — | — |
| **Anteil an abschlämmbaren Teilen** | | ≤ 10 % | |
| **Frostbeständigkeit** | | muss gegeben sein | |
| **Pflanzenverträgliche Eigenschaften des Substrates** | | • frei von pflanzenschädlichen keine Stoffen<br>• keine negativen Wechselwirkungen zwischen Substrat und Pflanze<br>• gut durchwurzelbar | |
| **Toleranzen** | | | |
| **Schichtdickentoleranz** | | — | — |
| **Ebenheit** | | — | — |
| **maximale Setzungen nach 1-jährigem Betrieb** | | — | — |
| **Kennwerte** | | | |
| **$K_f$-Wert in m/s** | | — | — |
| **Nährstoffgehalt im Wasser C/N/P-Verhältnis** | | 106/16/7 | — |
| **Beschickungshöhe $Q_{max}$** | | 6 m³/(m² x Tag) | 6 m³/(m² x Tag) |
| **Eliminationsrate Phosphor** | | 0,4 | 0,3 |
| **Eliminationsrate *E. coli*** | | 0,1 | 0,1 |

Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V.

https://shop.fll.de/en/fll-english-publications.html

# Water treatment

## Constructed wetlands (essentials)



**WATER TREATMENT IN NATURAL POOLS IN GENERAL**

**Water Treatment – kindly supported by Mother Nature**

**Basically the water treatment in a natural bath is very simple.**

**Leave the chemicals out and take natural materials in.**

**We work with a development of our own, the**

**Neptun® Percolating Filter**

**Water is oxygenated by being sprayed via sprinkler nozzles (this is also an impressive and at the same time relaxing picture for the guest)**

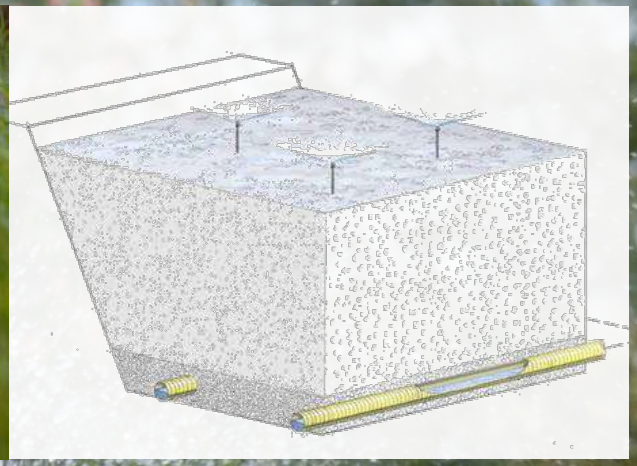
**While the water trickles down through the filter substrate pathogenic germs are being eliminated by physical and biochemical processes**

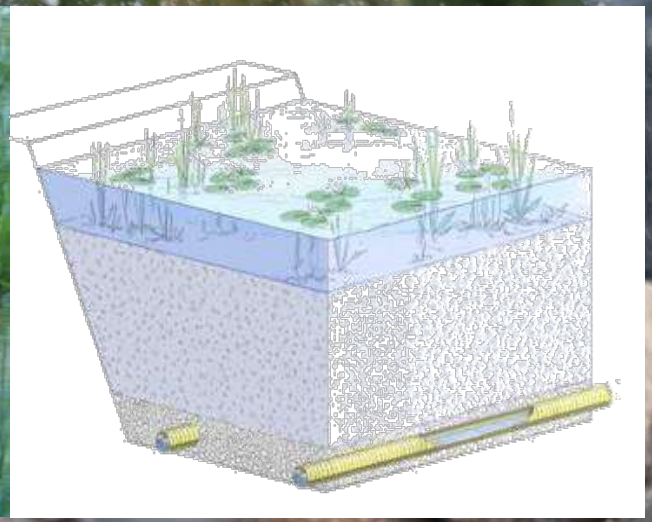
**The filter thus guarantees high operational reliability**

**Overflow water is captured in the wet filter pool which is cropped with water plants.**

# Water treatment

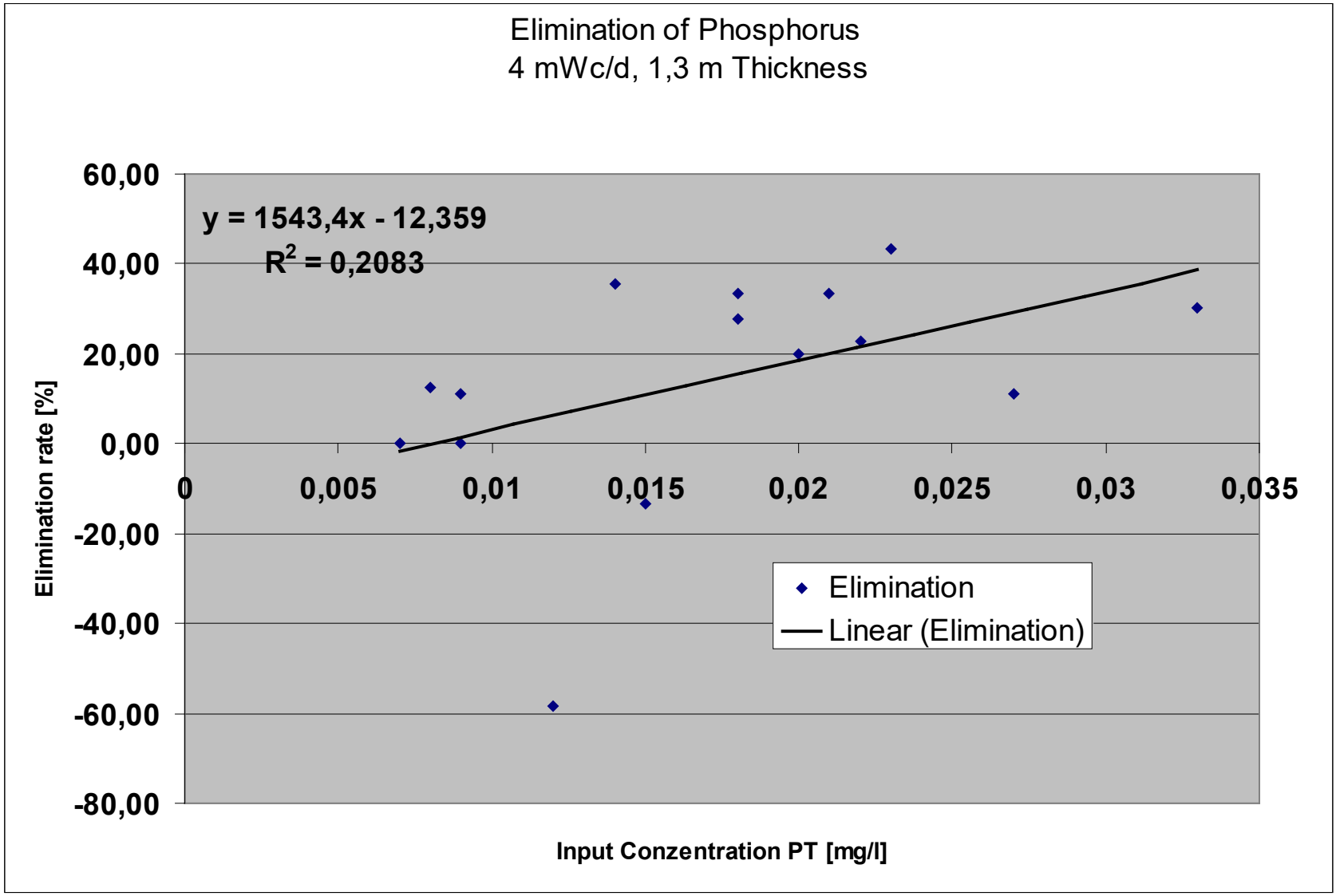
## Constructed wetlands (essentials)

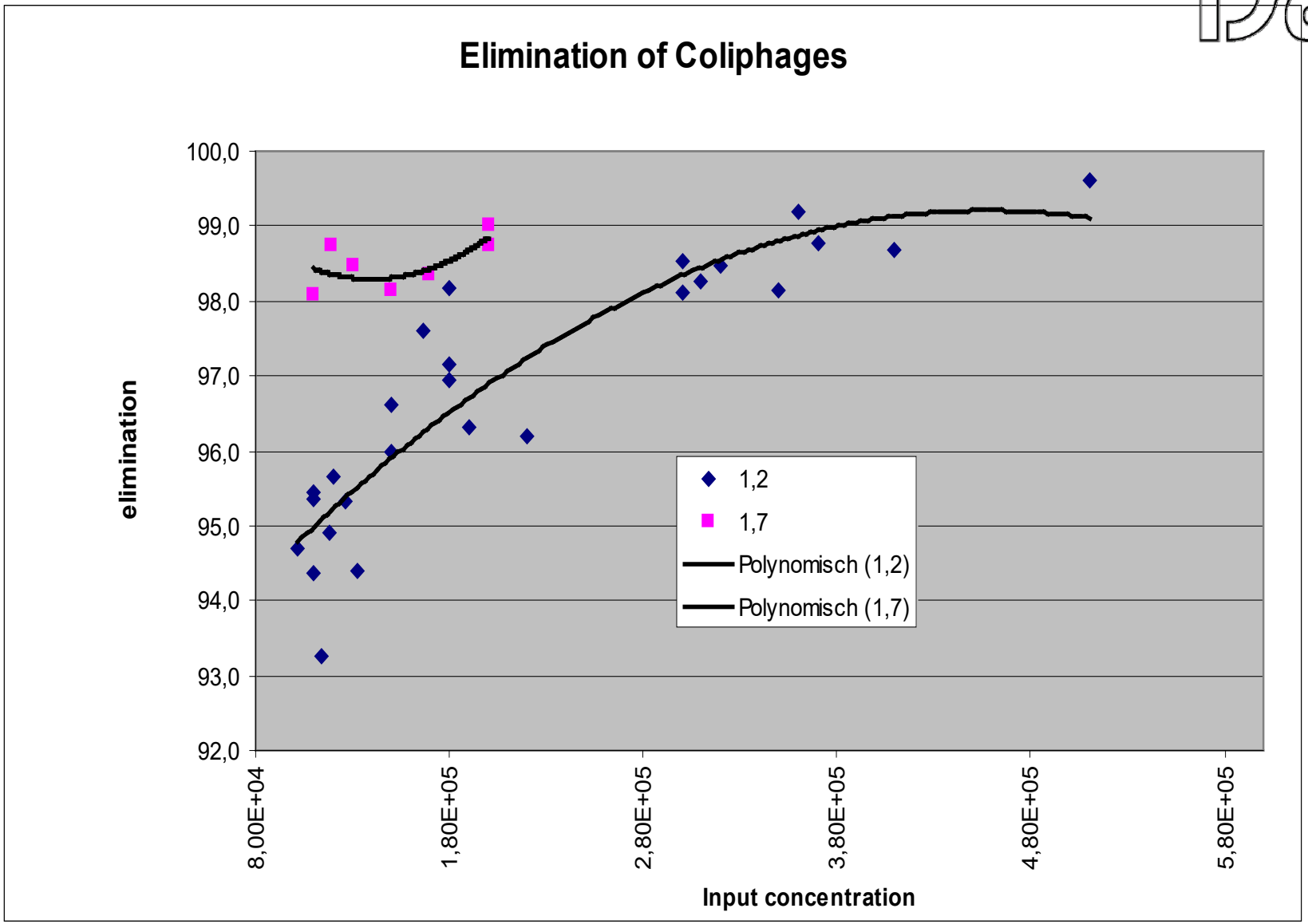



POLYPLAN KREIKENBAUM

# Ex-situ Phosphor reduction, Constructed wetlands (R&D)



## Ex-situ Virus reduction, Constructed wetlands (R&D)

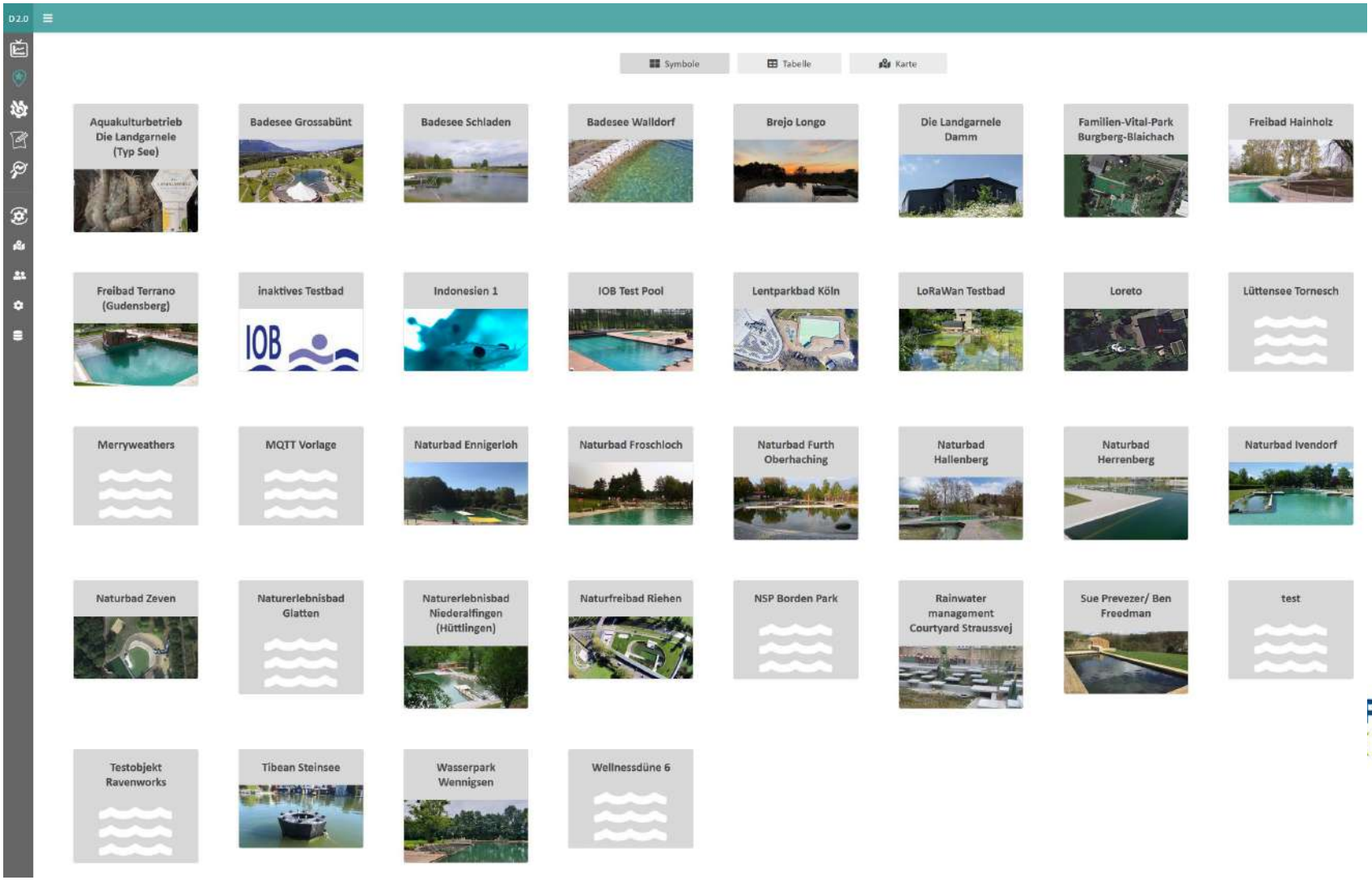


# Data Base Dana


- Database for approx. 80 Public NSP world wide 2005 - today
- All Parameters are described with regulations like DIN, EN…
- All sampling points are described in a scientific way
- Operation data
- Hygienic data
- Limnologic data

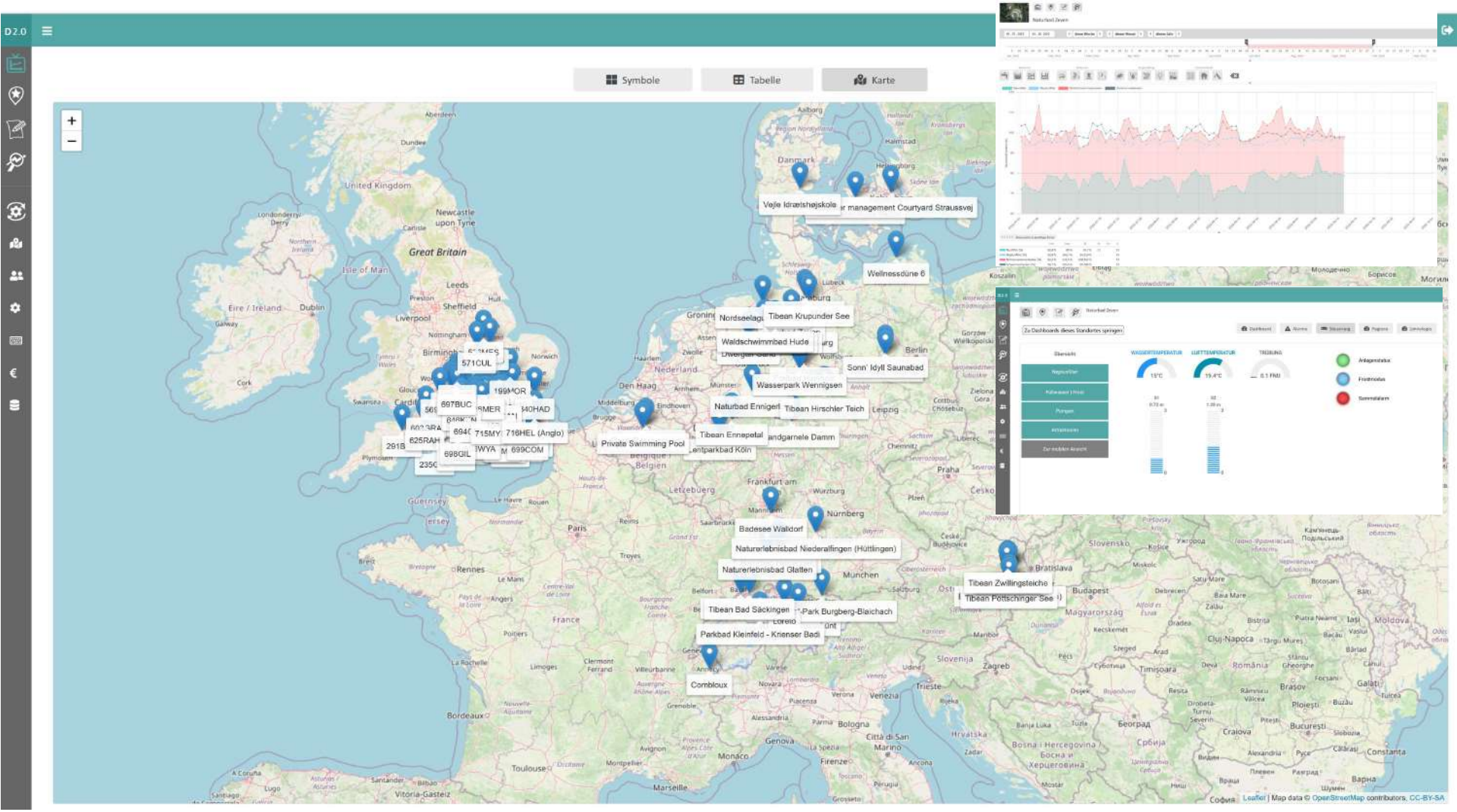
# Water treatment

## DANA 2.0 Projects, evaluation of 80 public and 60 privat NSP



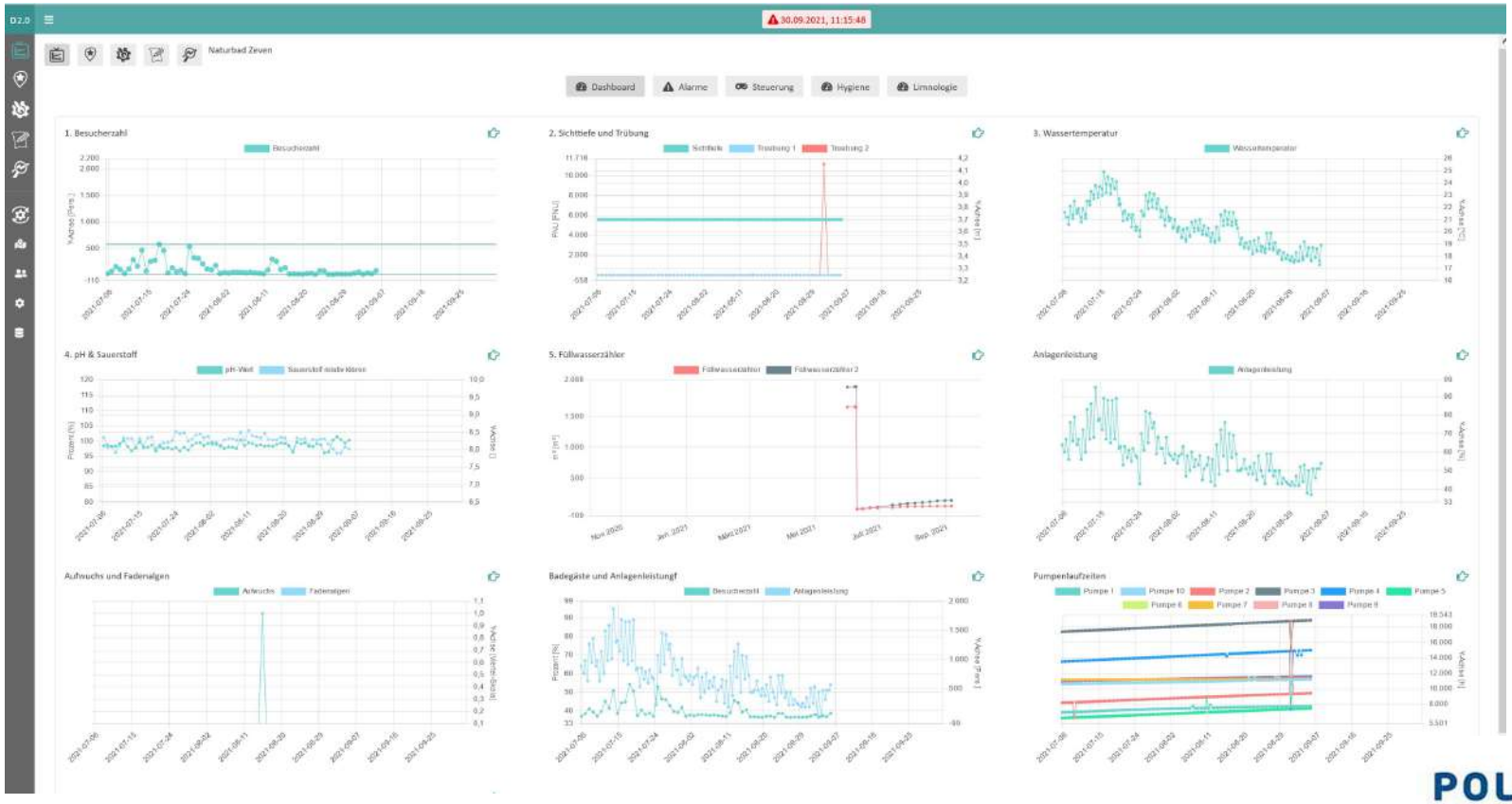
# Water treatment

## Location of the NSPs in DANA



# Water treatment

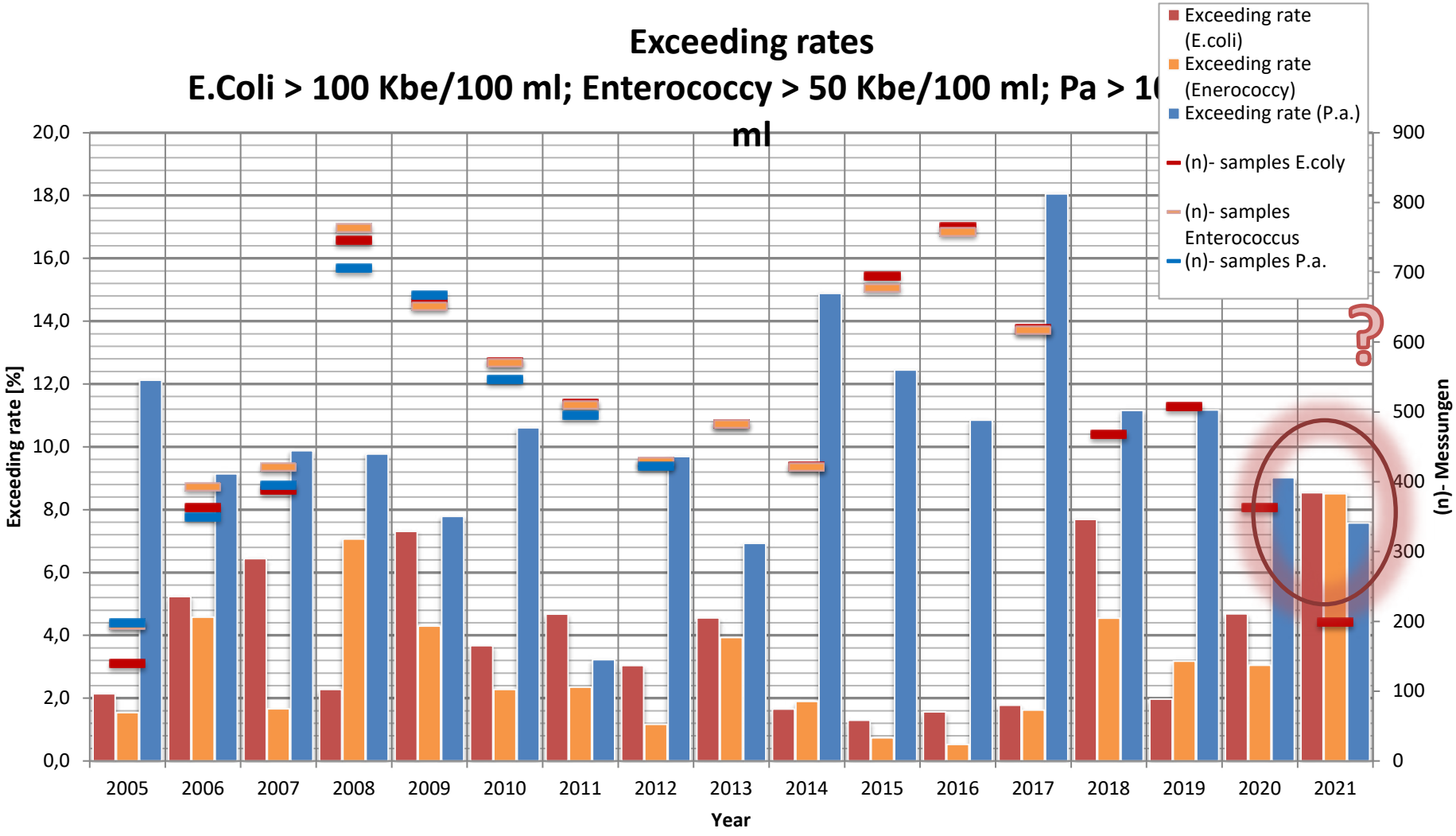
## DANA 2.0 Projects, evaluation of 62 public NSP




POLYPLAN KREIKENBAUM

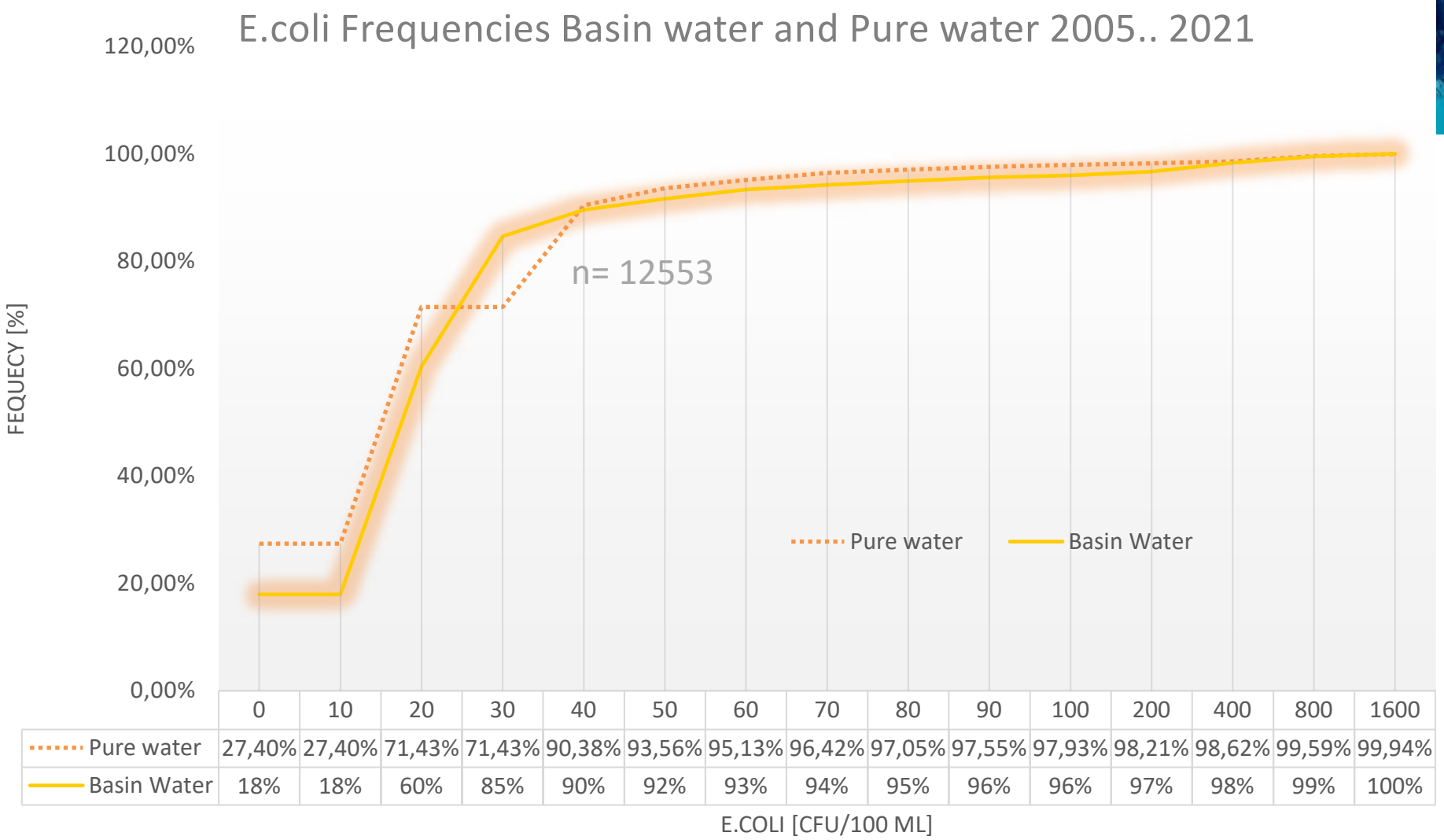
# Hygienic Results

## Frequency of exceedings



# Hygienic Results

## E.Coli Frequency of concentrations




| | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 200 | 400 | 800 | 1600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pure water | 27,40% | 27,40% | 71,43% | 71,43% | 90,38% | 93,56% | 95,13% | 96,42% | 97,05% | 97,55% | 97,93% | 98,21% | 98,62% | 99,59% | 99,94% |
| Basin Water | 18% | 18% | 60% | 85% | 90% | 92% | 93% | 94% | 95% | 96% | 96% | 97% | 98% | 99% | 100% |

Frihamn, Gothemborg

## Floating Pool


POLYPLAN KREIKENBAUM

Frihamn, Gothemborg

## Floating Pool

**(Gotenborg 2023)**



POLYPLAN KREIKENBAUM

Frihamn, Gothemborg

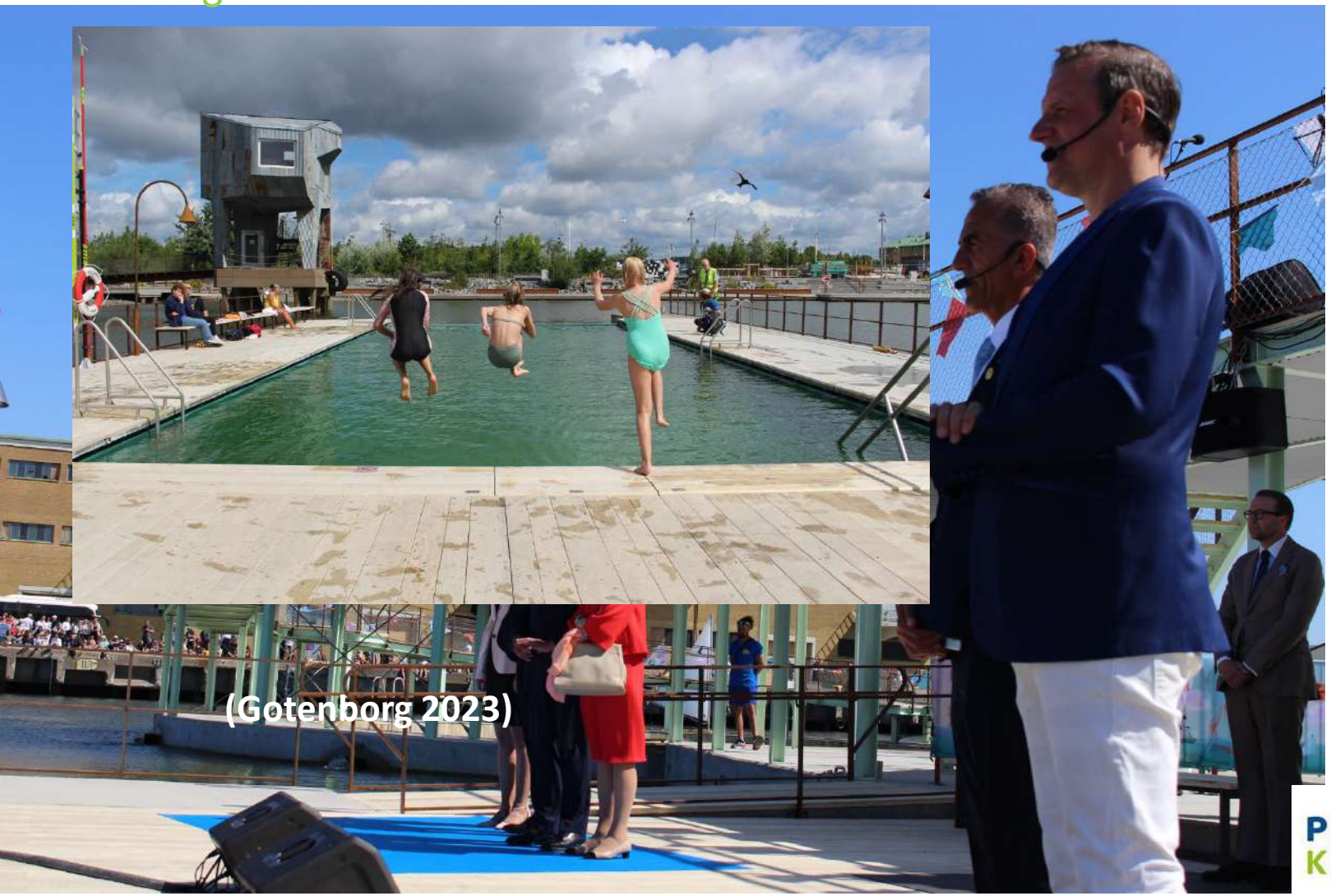
## Floating Pool




POLYPLAN KREIKENBAUM

# Frihamn, Gothemborg

## Floating Pool




POLYPLAN KREIKENBAUM

Frihamn, Gothemborg

# Floating Pool


POLYPLAN KREIKENBAUM

Frihamn, Gothemborg

## Floating Pool


POLYPLAN KREIKENBAUM

Frihamn, Gothemborg

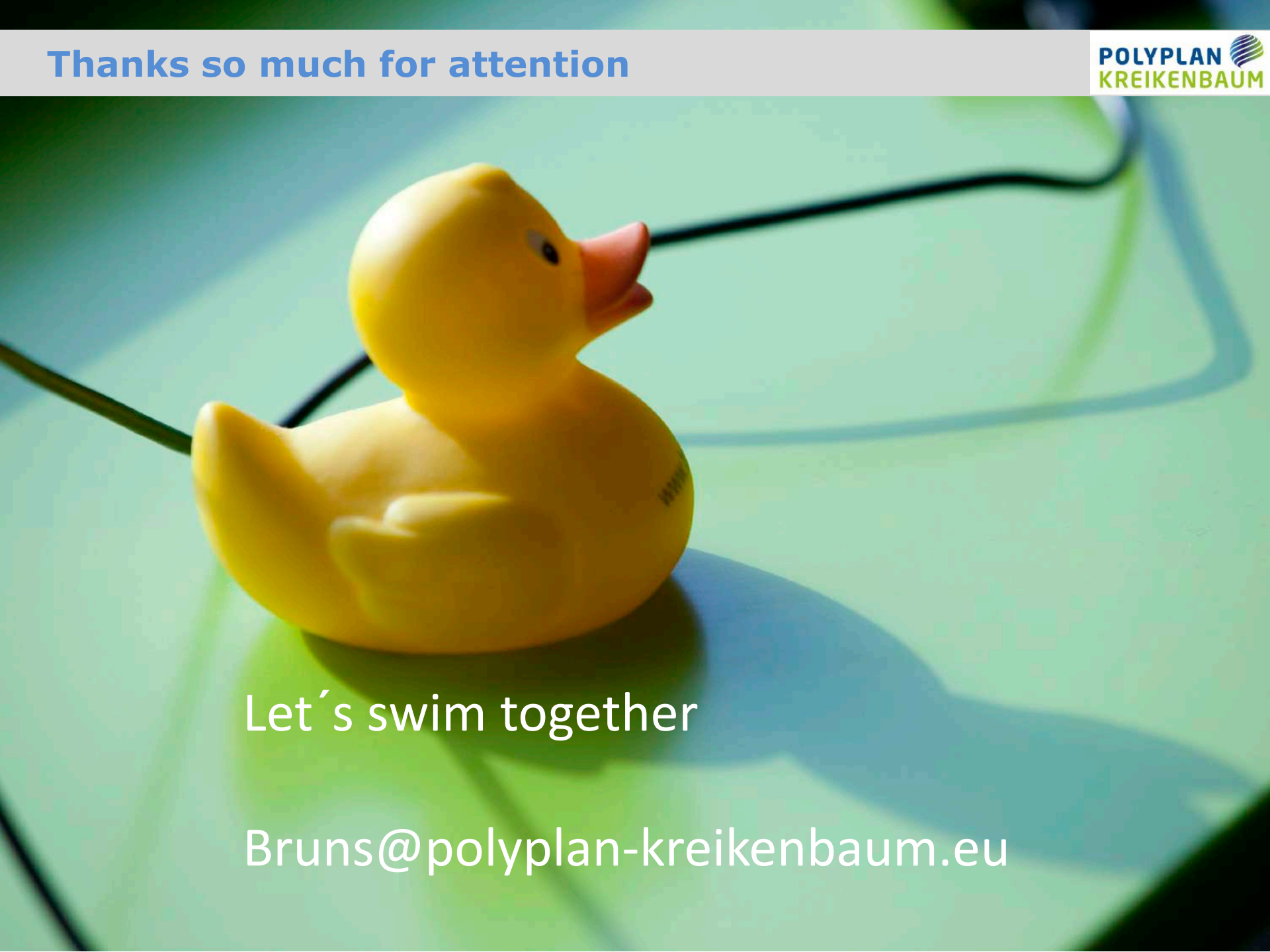
## Floating Pool


POLYPLAN KREIKENBAUM

Frihamn, Gothemborg

# Floating Pool

# Thanks so much for attention



Let´s swim together

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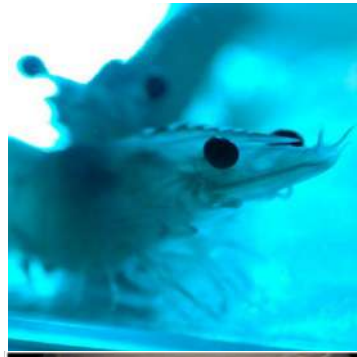
Water treatment

## EU Project Gigital intelligence HUB DIH4 CPS

Im Rahmen von DIH4CPS wurde eine Shrimp-Detektion mittels neuronaler Netze implementiert.

Es wurden zwei Basismodelle zur Objekterkennung in Bildern verwendet: YOLOv5 von Ultralytics und Tensorflow Object Detection API (EfficientDet).

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Water treatment

## In-Situ Desinfektion, AI-Model

Artificial intelligence = structures that are not programmed, but derived from algorithms = machine learning

The algorithm is trained to derive the relevant structures that are necessary to solve given problems. (Deru and Ndiaye 2019, 17) A distinction is made between the following three forms of machine learning:


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# Ex-situ Virus and Bacteria reduction, Constructed wetlands (R&D)

| | Mittlere Keimzahlreduktionen in Log Stufen (95th confidence interval) | | | |
|---|---|---|---|---|
| **Barrier** | **Bakteriofage MS2 (qPCR)** | **Bakteriofage MS2 (PMA pre-treated qPCR)** | ***Enterococcus faecalis* (culture assay)** | ***Saccharomyces cerevisiae* (culture assay)** |
| NF Neptune filter | 1.35 (1.05, 1.82) | 0.83 (0.44, 1.64) | 1.48 (1.36, 1.60) | 1.69 (1.54, 1.85) |
| Hydrobotanik + Überstauter Substratfilter | 2.35 (2.21, 2.52) | 1.76 (1.55, 2.02) | 1.79 (1.75, 1.84) | 1.84 (1.63, 2.01) |
| UV1 (nach Neptunfilter) | 0.73[b] (0.13, 1.40) | 0.62[b] (-0.24, 1.18) | > 4.02 ( 3.66, 4.62) | >2.83 (2.49, 3.33) |
| UV2 (Nach Hydrobotanik+ Überstautem Bodenfilter) | >1.56[b] (1.39, 1.69) | 1.76[b] (1.48, 1.96) | > 4.04 (4.01, 4.07) | >2.77 (2.51, 3.17) |

## Ex-situ e.coly reduction, Constructed wetlands (R&D)

| Versuchs-phase | Filterhöhe | Wasser-temperatur | Hydraul. Belastung | Auslastung Anlage | *E coli* - Ausgangs-konzentration | Reinigungs-leistung |
|---|---|---|---|---|---|---|
| Nr. | [m] | [°C] | [$m^3/m^2*d$] | [%] | [MPN/100ml] | [%] |
| 1 | 1,7 | 23 | 6 | 50 | 100 | 100 |
| 2 | 1,7 | 23 | 12 | 50 | 500 | 99,8 |
| 3 | 1,7 | 23 | 12 | 50 | 2000 | 99,9 |
| 4 | 1,2 | 23 | 12 | 50 | 500 | 99,3 |
| 5 | 1,2 | 23 | 12 | 50 | 2000 | 99,4 |
| 6 | 1,2 | 23 | 12 | 100 | 500 | 99,9 |
| 7 | 1,2 | 23 | 12 | 100 | 2000 | 99,8 |
| 8 | 1,2 | 23 | 24 | 100 | 500 | 99,4 |
| 9 | 1,2 | 23 | 24 | 100 | 2000 | 99,2 |
| 10 | 0,8 | 23 | 12 | 50 | 500 | 98 |
| 11 | 0,8 | 23 | 12 | 50 | 2000 | 97,7 |
| 12 | 0,8 | 23 | 12 | 100 | 500 | 99,7 |
| 13 | 0,8 | 23 | 12 | 100 | 2000 | 99,6 |

Reference I

NSP Bingen- semi artificial in Hillside, (Germany) intensive use

2000 bathers a day

Water volume 3200 m³

POLYPLAN KREIKENBAUM

Reference I

- One Basin, Depths from 0.1 to 3.5 m
- 4* 25 m lines plus long range swimming 80 m
- Major focus: Family, morning swimmer, Childs, Youngsters, Schools


Reference II

NSP Tessin (Germany), very organic design

2000 bathers a day

Water volume 3200 m³

# Reference II

- Sandbeaches surrouning
- One Basin, Depths from 0.1 to 3.5 m
- 4* 25 m lines
- Major focus: a Familiy one day Vacation Happening, schools, Tourists from the baltic sea


**Tessiner Südsee**

The Pool is located in an area just south of the existing sports and leisure complex in the area of Sankt-Jürgen-Straße. It covers an area of approximately 1.7 hectares. The lake was used as a bath with biological water treatment, gem. FLL 2011 running and the filter surfaces are located in the eastern part of the site.

The lake has an area of approx. 2.500m² and a water depth of up to 4m.

In the eastern area, a 25m pool with 4 lanes is integrated. In the western shore area, a bridge and a water slide, as well as two smaller ones

Basins are each arranged with approximately 50m ² of water surface.

In the south and north beach areas with a total area of approx. 1.400m² border the bathing lake.

**Places:**
Tessin

**Contractor:**
City of Tessin
Alter Markt 1
18195 Tessin

**Period:**
2010 - 2012

**Phases:**
1-9

**Construction costs:**
2,0 Mio. Euro

**Planning fee:**
150.000 Euro

**honorary regulatio hoai:**
Part II and Part IV, General Planning

Reference III

Bylderup (Denmark), very artificial

2000 bathers a day

Water volume 3200 m³

# Reference III

- Stringent deckings are framing the pools
- Sandbeaches, small seperate kiddy pool wih sand beach
- 6* 25 m lines
- Major focus: Village pool. Swimmer, Familiy, schools, Tourists from sommer camps

**Natural Bad Ruds Vedby**

Polyplan planned and advertised the entire open space planning and bathing technology. The bathroom is supervised by the Polyplan bath monitoring team and has a high operational safety.

Here it was about to discuss the first bath with biological water treatment in Denmark with the state health department and to obtain a special permit. After several hygiene workshops, all players agreed on the FLL guideline 2011. In addition, there is a requirement on the part of the operator to use as much electrical energy as possible. The maximum energy consumption should not exceed 12 kwh / d.

**Places:**
Ruds Vedby
4291, Dänemark

**Contractor:**
Jesper Fussing Hjortgaard

**Period:**
2013 -2015

**Phases:**
1-8

**Construction costs:**
1,5 Mio. Euro

Impressions

NSP Bingen- semi artificial in Hillside, (Germany) intensive use

2000 bathers a day

Water volume 3200 m³

Impressions

## NSP Kirchdorf- Low energy – extensive organic design – big water bodies – extensive use

## 1200 bathers a day

## Water volume 4500 m³




**Combination of Neptune and wet filters and hydro botany**

Attractions such as a slide and water cannons complement large lawns and retreats for relaxing and playing. Active play areas, especially the offer for children, have been expanded. The integration of the club restaurant with a terrace directly on the water improves the quality of stay. The bank filtration is located in a part of the basin separated by bars. The cleaning performance is achieved here with special plants and drained water drainage. The neptune
Floor filter has a high disinfection capacity and thus ensures a high level of hygienic operational safety and
very clear water. The combination of these filter systems, with their specific cleaning performance and the connection with intelligent measurement and control technology, guarantees permanently optimal water quality.

**Project location:**
Diepholz district in Lower Saxony
**Client:**
Consolidated community of Kirchdorf
**Execution time:**
2002-2003
**Work phases:**
1-9
**Building-costs:**
360,000 euros, plus 120,000 euros personal contribution
**Fee:**
80,000 euros
**Size:**
3,500 sqm

# Impressions

## NSP Edmonton- extreme artificial design – big water bodies – semi Intensive use

## 1200 bathers a day

## Water volume 1600 m³

**NSP, Natrual Swimming Pool Edmonton**

The Borden parc Project has been realized by the partners GH3 and Polyplan. GH3 was responsible for the landscape and Building design. Polyplan was responsible for the Pool function, the water treatment, pump and pipe design and for micro controller system.

Today Polyplan monitor the system over the DANA platform and provide the back ground service for the pool operators on side.

**Place:**
Edmonton

**Contractor:**
Stadt von Edmonton
10111-104 Avenue NW
Edmonton, Mr. Robb Heit

**Period:**
2013 - 2018

**Phases:**
1-9

**Construction costs:**
6,0 Mio. CAD

# Impressions

## NSP Ennigerloh- semi artificial design – semi Intensive use
## 1500 bathers a day
## Water volume 2700 m³




**New planning of the swimming pool Ennigerloh**

The swimming pool Ennigerloh is to be re-designed into a bath with biological water purification.

In addition to the renovation of the existing pools and buildings, the attractiveness of the outdoor pool is the focus.
The basic pool types and uses will continue to be offered and complemented by an extended non-swimmers area and beach area as well as a new jump facility and a slide. To increase the bathing pleasure and full deoletion of the bathing season, the pool water should be heated. The prerequisites and services which the outdoor pool must fulfill after the refurbishment are summarized in a specification, which is attached as an annex.

**Place:**
Ennigerloh

**Contractor:**
Business and spa operation
Marktplatz 1
59320 Ennigerloh

**Period:**
2019 - 2020

**Phases:**
1-9

**Construction costs:**
2,0 Mio. Euro

**Planing fee:**
380.000 Euro

**honorary regulatio hoai:**
Part II and Part IV
General Planning

Impressions

## NSP Froschloch - artificial design – Intensive use

## 3500 bathers a day

## Water volume 890 m³




**Natural Outdoor Swimming Pool Froschloch**

The outdoor swimming pool was in its former state in need of renovation. The need of renovation concerned the basin substance (leaks), the technical water treatment (Filter, disinfection, basin hydraulics), as well as the free surfaces.

The water treatment system of the natural outdoor swimmingpool Froschloch is a ground filter called Neptune. It is covered in swamp and ripe plants for aesthetics. The Water treatment area is 1200 m² big and is designed for 1700 visitors.

In 2015 Polyplan was awarded with the international pondy award 2015 by the

**Places:**
Schwimmweg 2
44139 Dortmund

**BContractor:**
Sportwelt Dortmund gGmbH
Frau Heckmann

**Period:**
2007 - 2008

**Phases:**
1-8

**Construction costs:**
1,7 Mio. Euro

**Planing fee:**
280.000 Euro

**honorary regulatio hoai:**
Part 2, Part 4