SPACE-O Workshop on using Water Quality Forecasting in Decision Making
Brussels, Belgium – April 19th, 2018

Water Treatment Plant Optimization (WTPO)

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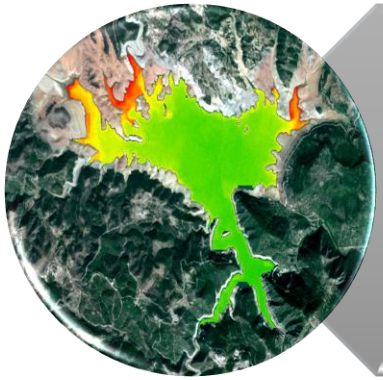
The WTPO tool ***aims*** to

- indicate **cost-efficient water treatment options** based on the forecasted water quality
- support the WTP operators to **deal with critical** water quality parameters on-time
- **provide insight** into the WTP **performance** in the upcoming days under typical and proposed water treatment practices – **system behaviour**

With the WTPO tool ***assessments*** and ***proposals*** are made for

1. the **most appropriate depth** for water abstraction (in case of multiple water intake ports)
2. **optimum water treatment** options that minimize the operational cost in terms of chemical and power consumption



WATER QUALITY PARAMETERS CURRENTLY INCORPORATED

- Chlorophyll
- Total Suspended Solids

Which may become critical for the operation of the water treatment plant

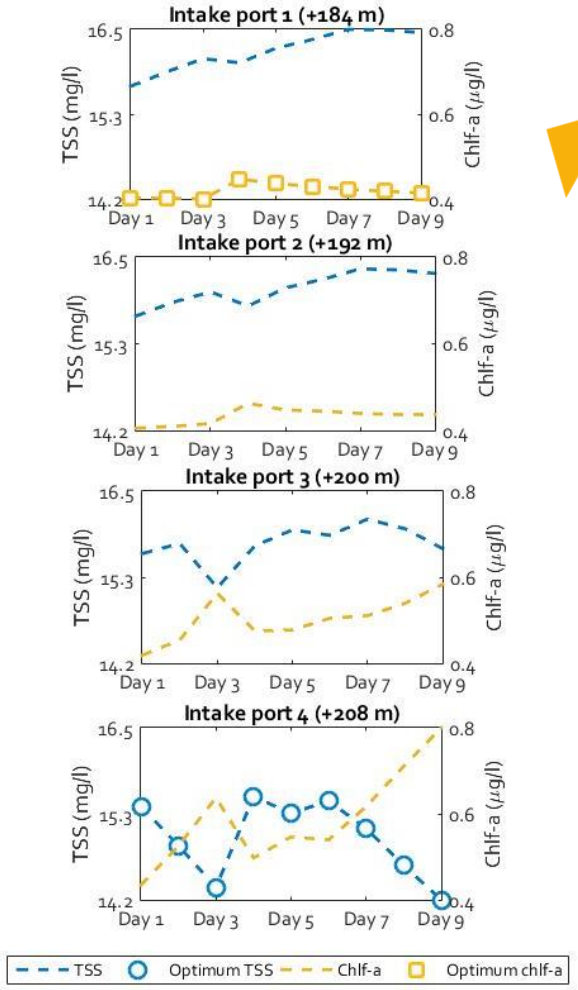
WATER TREATMENT SCHEME TESTED

- Coagulation - sedimentation
- Filtration

Which are the main treatment steps (along with oxidation) to deal with high concentrations with the parameters discussed

(1) Abstraction depth optimization

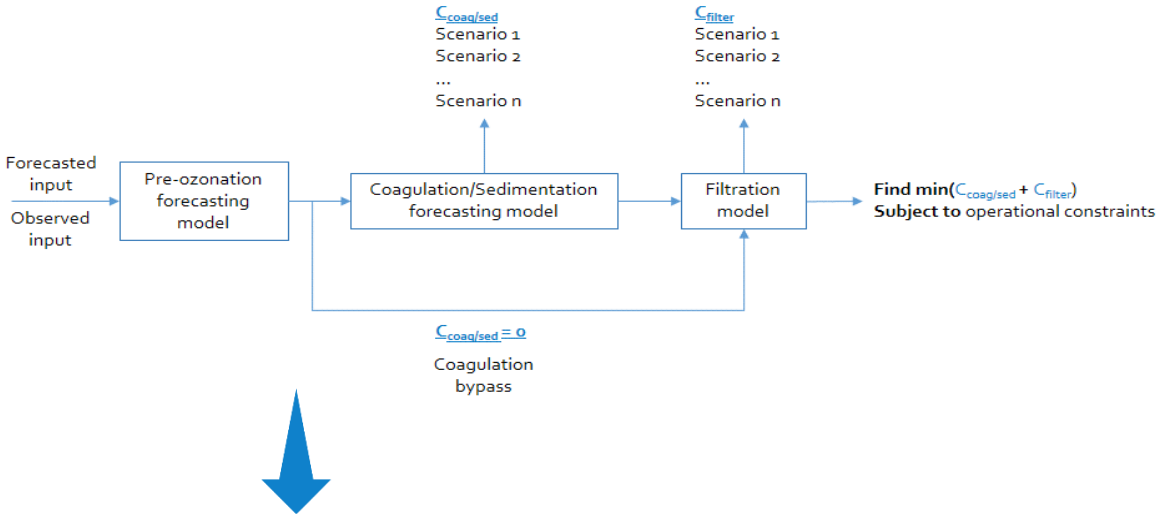
Overview of total suspended solids and chlorophyll-a at various depths and for the next 9 days.



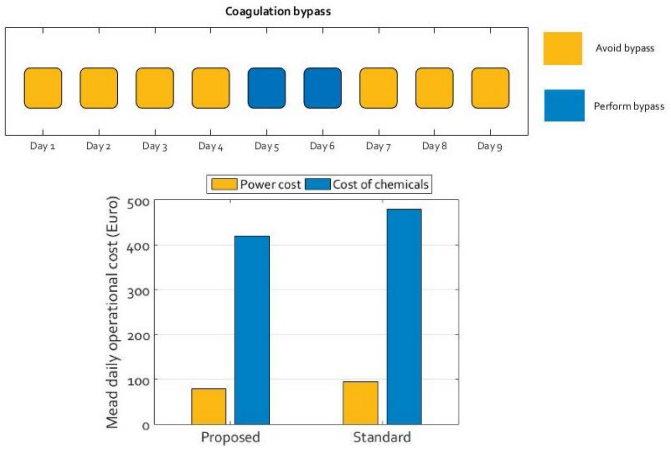
- Parameters may present a different profile at various depths and therefore the operator must decide which depth is the optimum for water abstraction

(2) Water treatment plant optimization

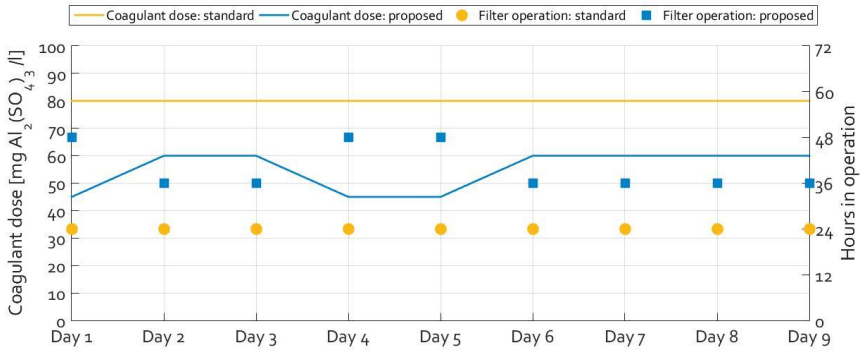
The optimization of the WTP operation is a **cost minimization** problem subject to case-specific **operational constraints** and **standards of effluent water quality**



- Should coagulation be bypassed?
- How frequent should the filter backwash cycles be?



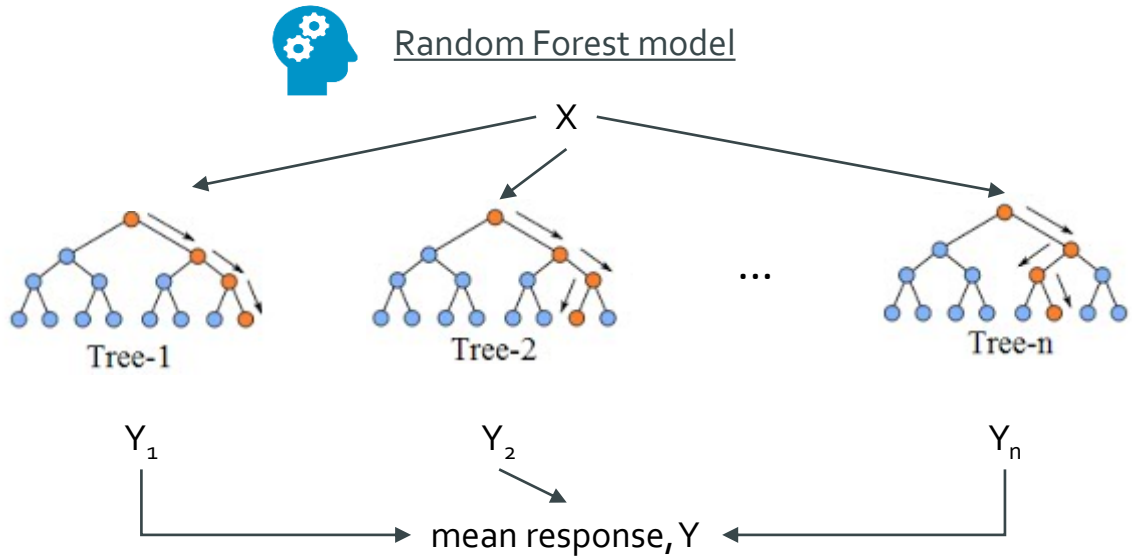
- What is the optimum coagulant dose?
- Is there a cost estimate for the proposed operational options?



The science behind the WTP process simulation

Machine-learning algorithms are implemented to simulate each process separately

Highly adaptable to WTPs that may deviate from conventional water treatment schemes



- ✓ Data collected from the automated control system of the WTP
- ✓ Prior to analysis, data sets are filtered to remove specific artefacts
- ✓ High predictive capacity for each treatment stage (R^2 >0.75)

Process input

Total organic carbon

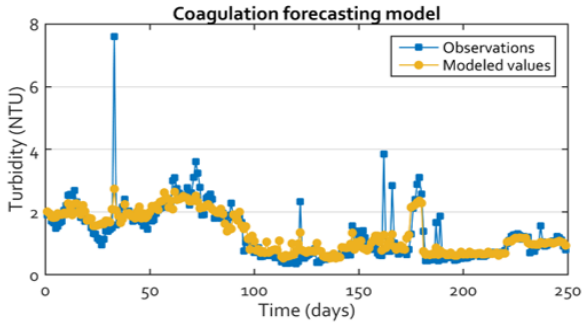
Turbidity

pH, temperature

Control parameters

Coagulant
- type
- concentration

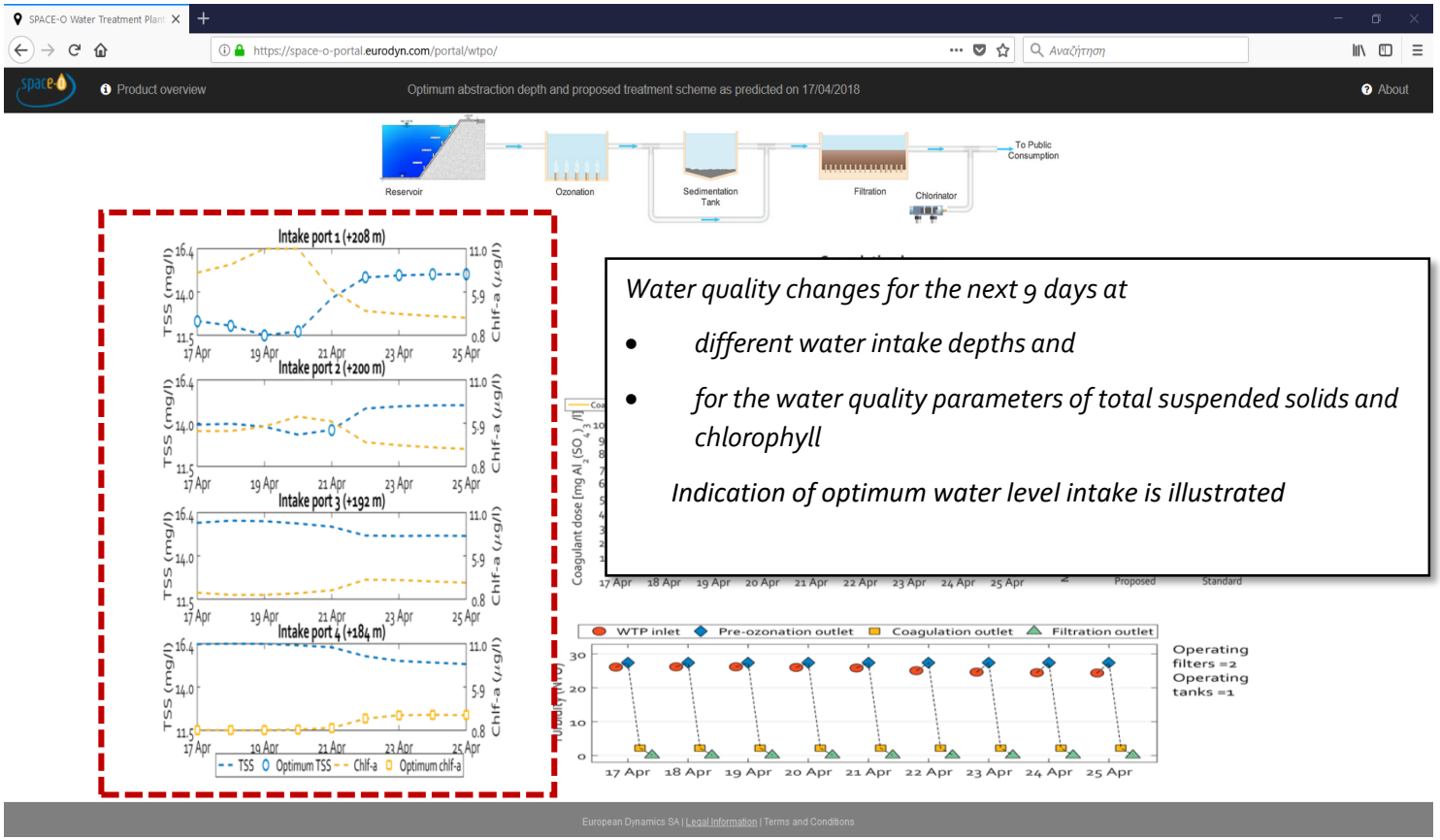
Poly-electrolyte
- type
- concentration



Process output

Turbidity


SPACE-O Water Treatment Plant
https://space-o-portal.eurodyn.com/portal/wtpo/
Product overview
Optimum abstraction depth and proposed treatment scheme as predicted on 17/04/2018
About
Reservoir
Ozonation
Sedimentation
Filtration
Chlorinator
To Public Consumption
Reservoir water intakes
Water Treatment Plant Process
Coagulation bypass
Perform bypass
Intake port 2 (+200 m)
Intake port 3 (+192 m)
Intake port 4 (+184 m)
TSS (mg/l)
Chlf-a (μg/l)
TSS
Optimum TSS
Chlf-a
Optimum chlf-a
Coagulant dose: standard
Coagulant dose: proposed
Filter operation: standard
Filter operation: propose
Coagulant dose [mg Al2(SO4)3/l]
Hours in operation
Power cost
Cost of chemicals
Mead daily operational cost (Euro)
Proposed
Standard
WTP inlet
Pre-ozonation outlet
Coagulation outlet
Filtration outlet
TURBIDITY (NTU)
Operating filters =2
Operating tanks =1
17 Apr
18 Apr
19 Apr
20 Apr
21 Apr
22 Apr
23 Apr
24 Apr
25 Apr
European Dynamics SA | Legal Information | Terms and Conditions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Chlf-a (μg/l)
17 Apr
19 Apr
21 Apr
23 Apr
25 Apr
TSS
Optimum TSS
Chlf-a
Optimum chlf-a
Water quality changes for the next 9 days at
different water intake depths and
for the water quality parameters of total suspended solids and chlorophyll
Indication of optimum water level intake is illustrated
Coagulant dose [mg Al2(SO4)3/l]
17 Apr
18 Apr
19 Apr
20 Apr
21 Apr
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23 Apr
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Pre-ozonation outlet
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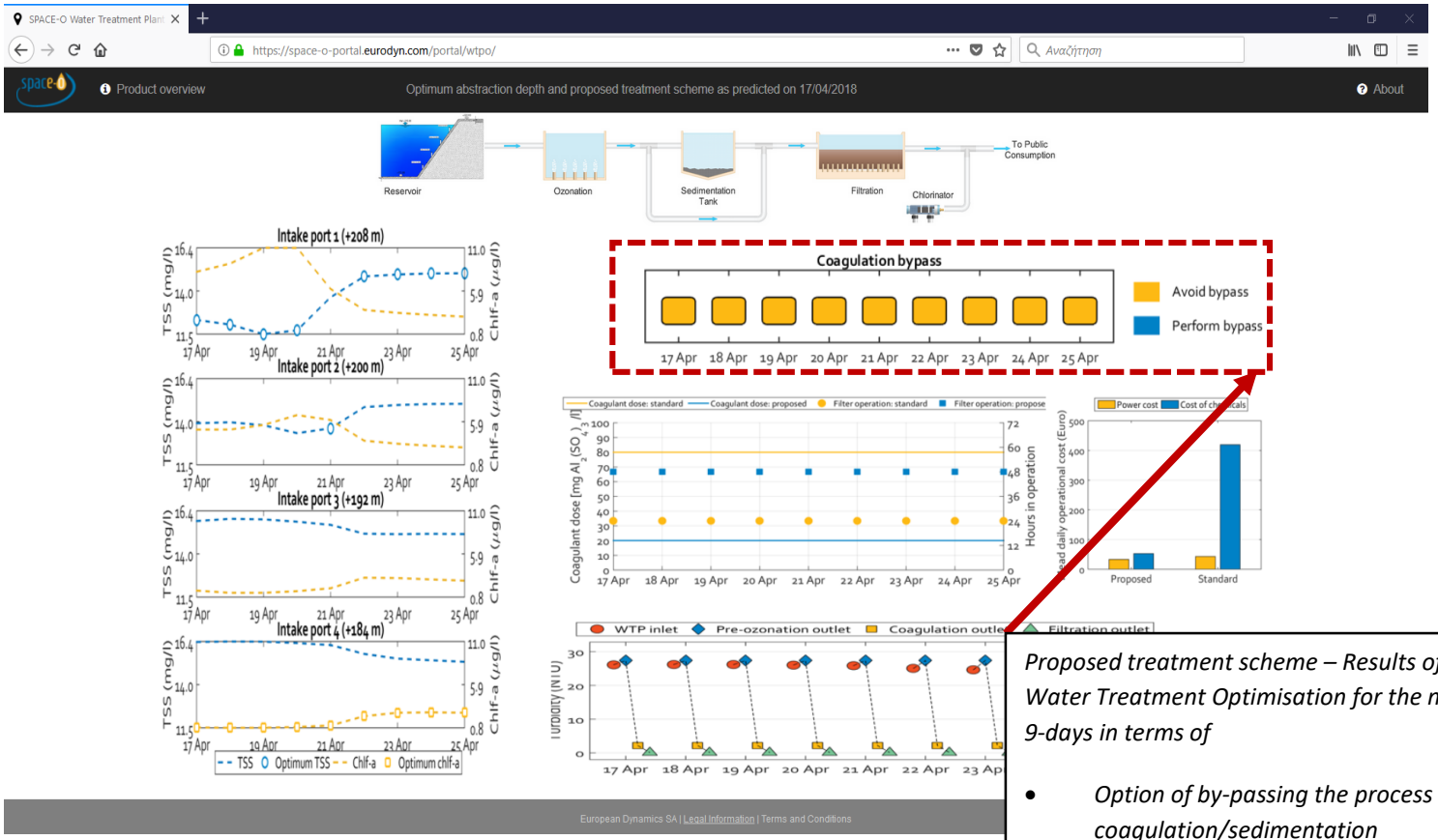
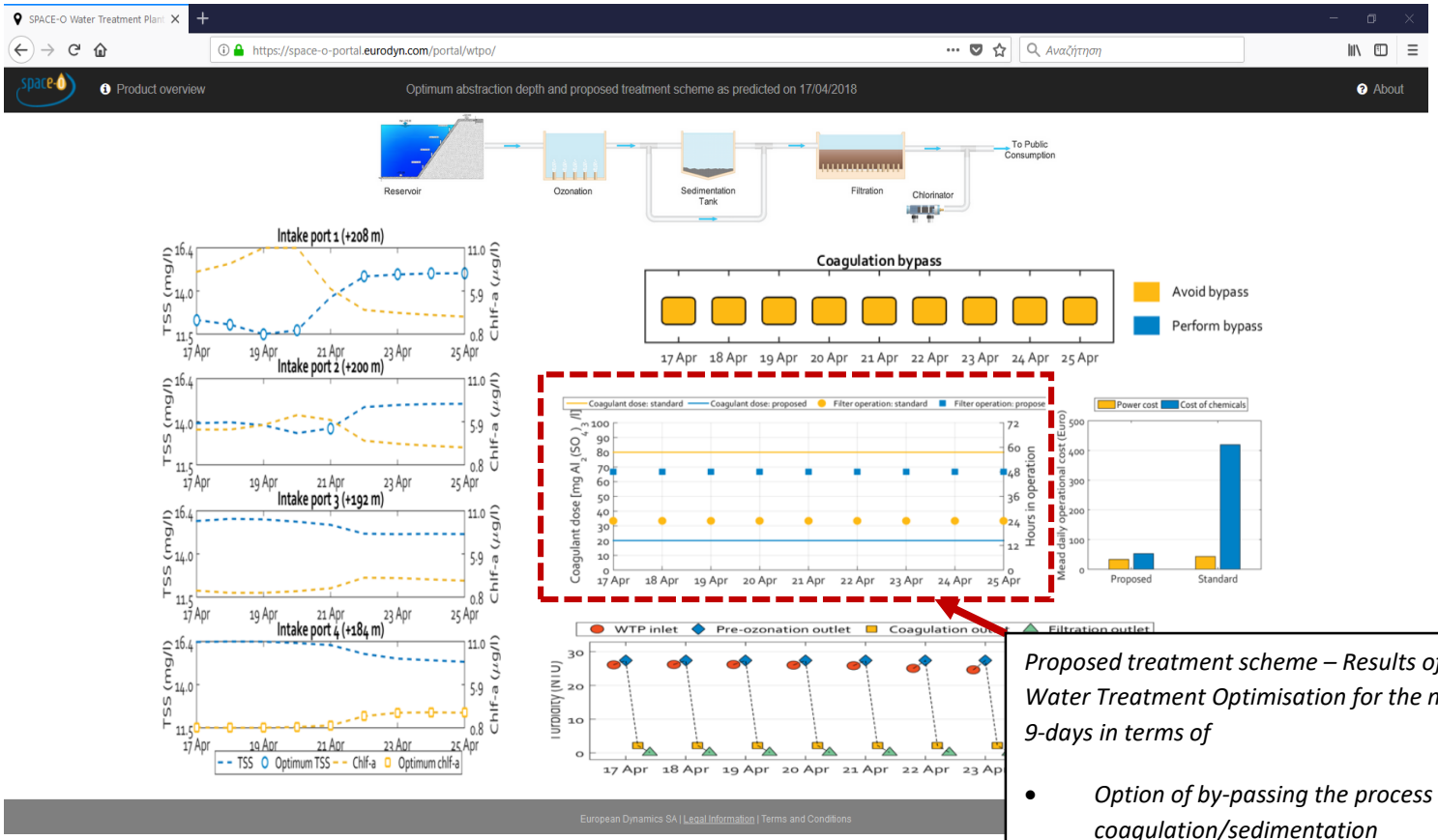


Proposed treatment scheme – Results of Water Treatment Optimisation for the next 9-days in terms of

- *Option of by-passing the process of coagulation/sedimentation*
- *Coagulant dose*
- *Filtration washing cycles*



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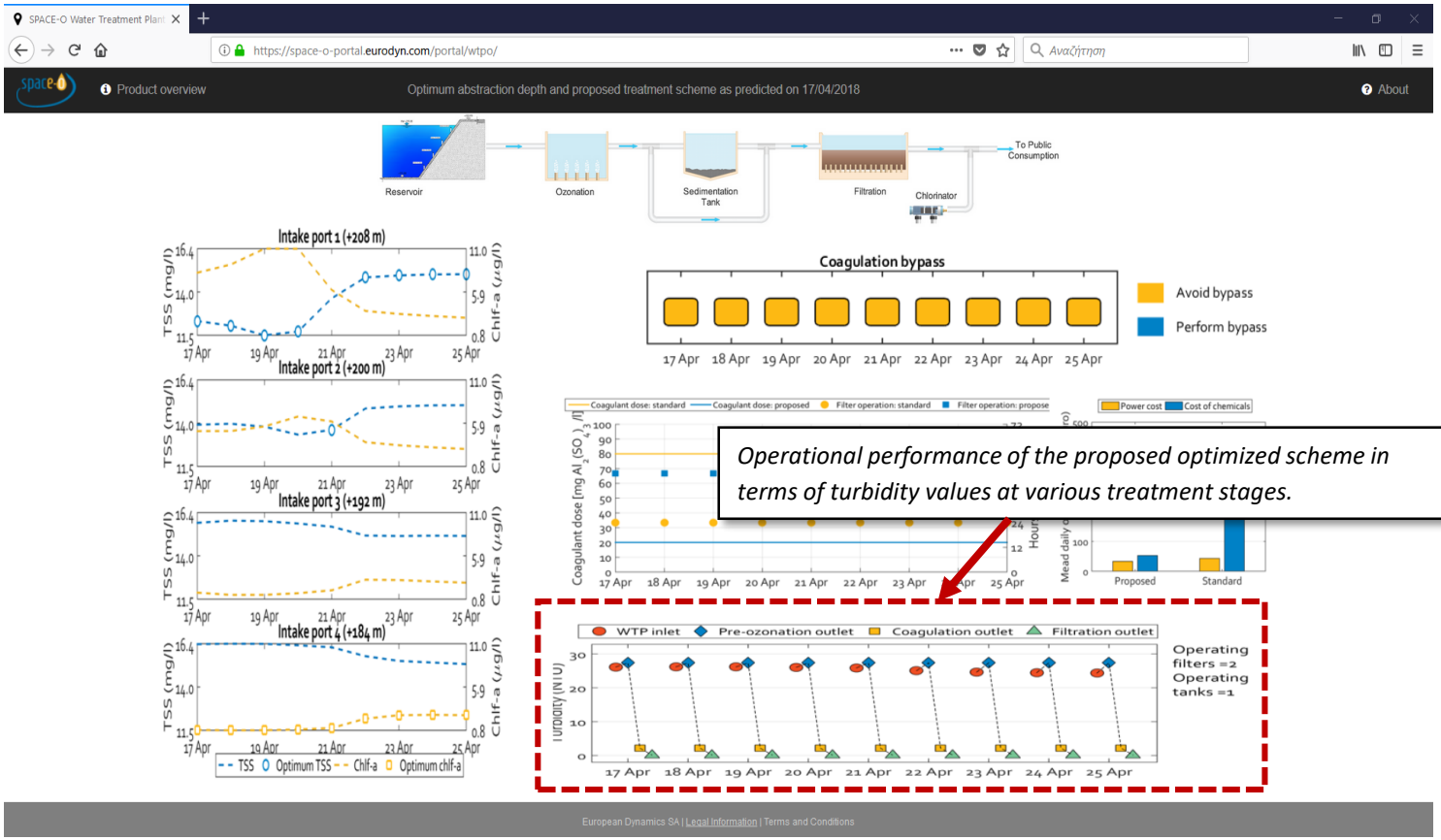
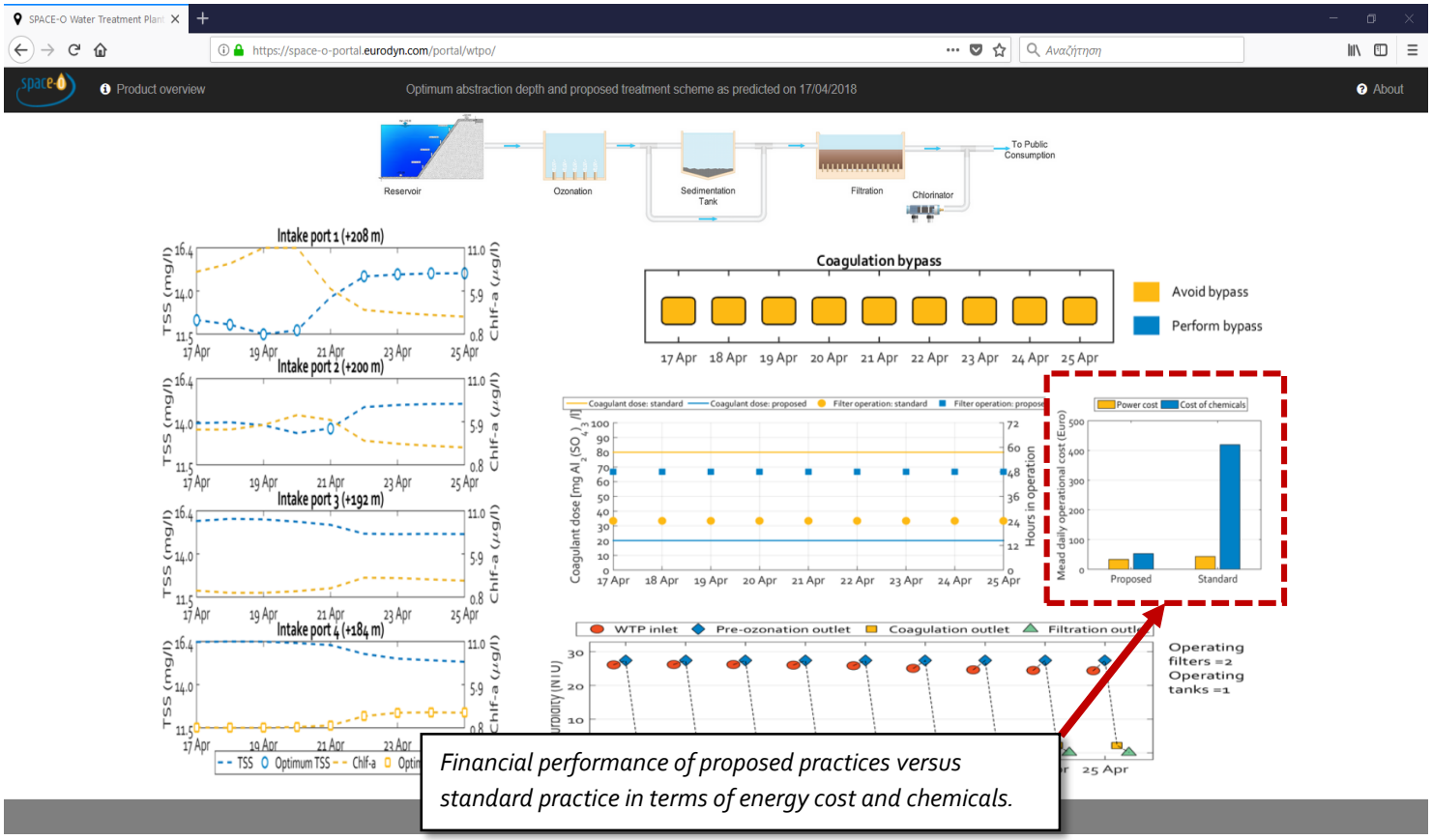


Operational performance of the proposed optimized scheme in terms of turbidity values at various treatment stages.



Financial performance of proposed practices versus standard practice in terms of energy cost and chemicals.

Interactive Exercise – Open discussion

https://portal.space-o.eu/portal/

Partners:

EMVIS WATER RESOURCES & ENVIRONMENT MANAGEMENT

EOMAP

SMHI

EUROPEAN DYNAMICS

IWA the international water association

ORGANIZATION FOR THE DEVELOPMENT OF CRETE S.A.

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