Strategies for Sustainable Communal Waste-water Management in the Baltic Sea Region SUWMAB

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Sources of Nutrients and pollutions

Point Sources ***Diffues Sources*** ***Linear Sources***

Roseth et al., 2012

http://www.globalwettech.com/en/

Constructed Wetland application to :

✓Domestic and municipal as well as industrial wastewater treatment and polishing

✓Sewage sludge dewatering and stabilization

✓High polluted wastewater – leachate, reject waters

✓Surface water protection – rural and storm water tretment

Single Family Constructed Wetlands below 50 PE – less than 5 m^3/day

Parameter	Inflow [$mg \cdot dm^{-3}$]	Effluent [$mg \cdot dm^{-3}$]	**Efficiency** [%]
TSS	311	10,7	**96,5**
BOD	498	2,9	**99,4**
COD	934	12,7	**98,6**
N total	94	20	**78,7**
P total	18,2	0,6	**96,7**

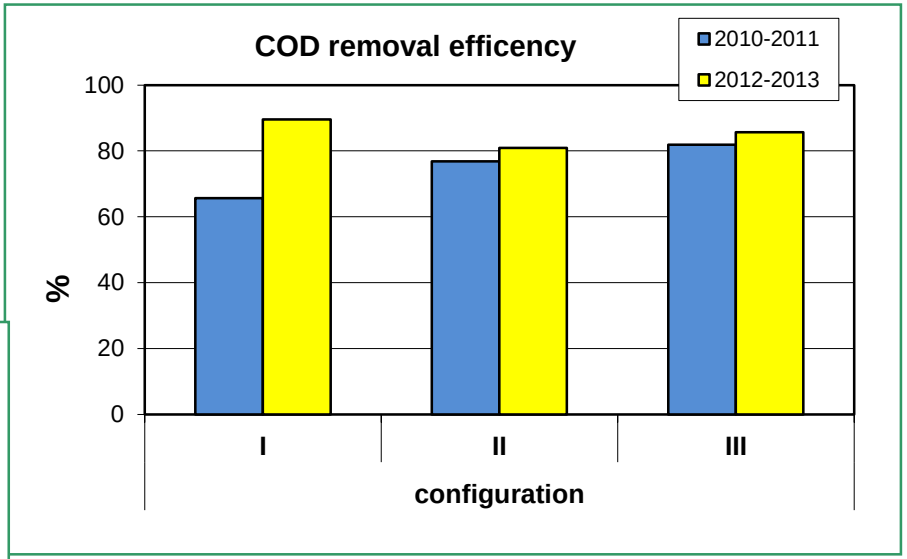
[Jówiakowski, 2012]

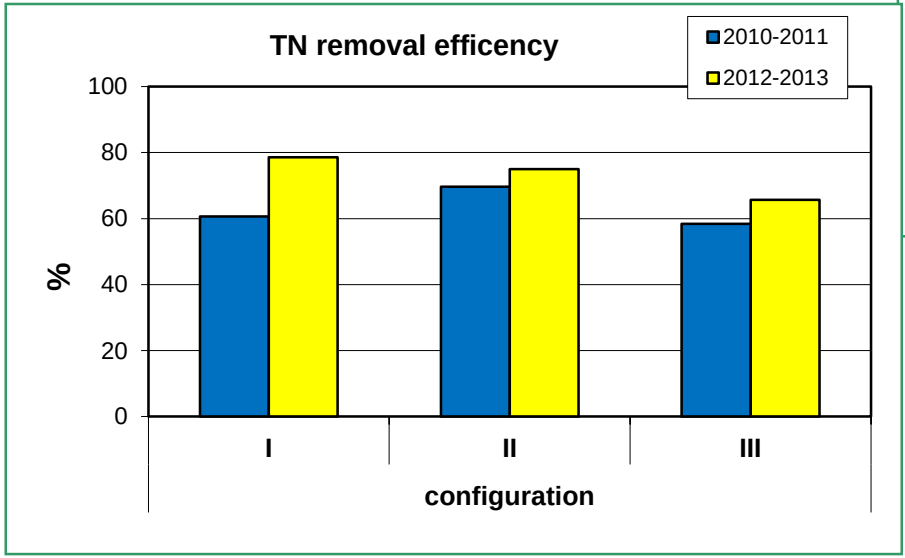
Foto M.Gajewska and K.Józwiakowski

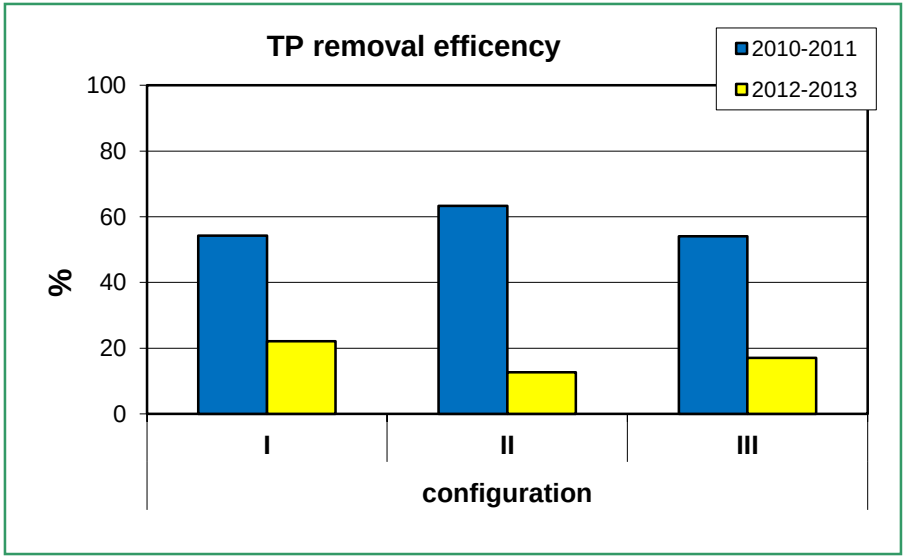
Single Family CWs in Kaszyby Lake District by GUT, [Obarska – Pempkowia et al., 2015]

Nine facilities builed in 2009 with III configurations (three facilities in each configuration)

1. **Config I – VSSF +pond ,**
2. **Config II- VSSF I + VSSF II + pond,**
3. **Config III – prefilter + HSSF + pond**







Mutlistage (5 stage) Constructed Wetland in Dąbrowica, Poland

[Józwiakowski, 2012], foto Józwiakowski

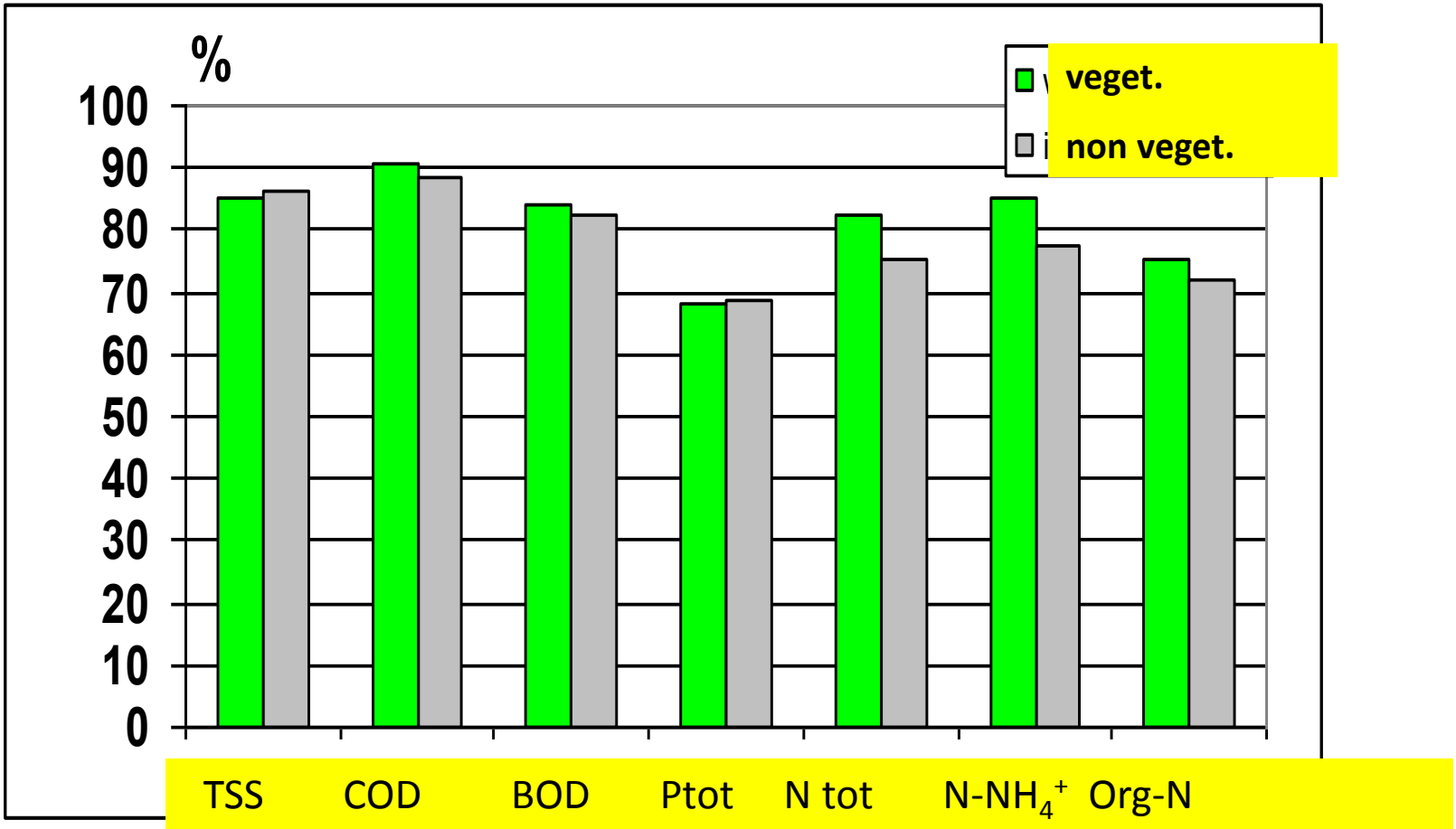
A - w kwietniu, **B** - w sierpniu, **C** - w grudniu, **D** - ścieki z II układu oczyszczania (VF-HF): 1 - surowe, 2 - po osadniku,5- po złożu z trzciną, 6- po złożu z wierzbą

Parameter	Obiekt nr 3 - Oczyszczalnia w Dąbrowicy Site A			Site B		
	C_{in}	C_{out}	**E [%]**	C_{in}	C_{out}	**E [%]**
Total *coli* forms [MPN·100 cm^{-3}]	$1.3 \cdot 10^5$	< 5	99.9	$7 \cdot 10^8$	< 5	99.9
Coli forms faecal [MPN·100 cm^{-3}]	$1.3 \cdot 10^5$	< 5	99.9	$7 \cdot 10^6$	< 5	99.9

Multistage Treatment Wetland working as local WWTP (15- 750 pe) and application up to 20 000 PE

Comparison of average removal efficiency of pollutants in five HCW in Poland

in vegetated (IV-X) and non vegetation seasons (XI-III), [Gajewska &Obarska-Pemokowiak, 2011]



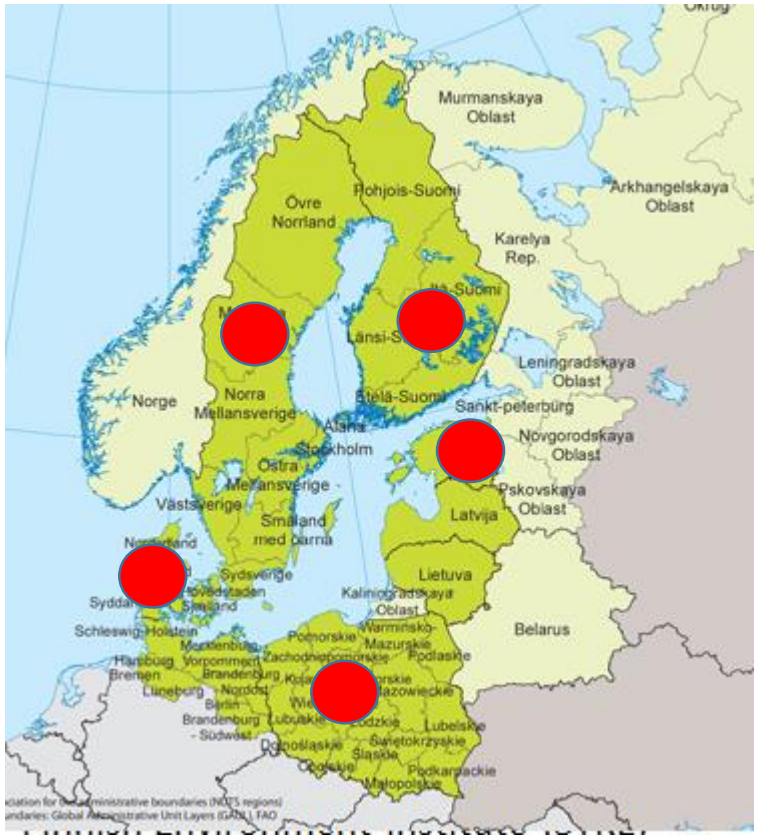
SUWMAB project is dedicated to popularization of constructed wetlands (CWs) for water pollution control in the Baltic Sea Region. *„Think globally act locally*” *and* *„Stay green”*

CWs have been chosen for promotion because of their following advantages:

- **excellent nutrient and other pollutants’ removal rates (the newer systems),**
- **easy to construct and maintain (given the know-how),**
- **economic**
- **CO_2 sequestration through the plants,**
- **low energy footprint an low energy operational demand,**
- **positive and ancillary benefits regarding biodiversity and landscape,**
- **Involvement of local community,**
- **recreational and educational functions.**
- **Ecosystem service**

http://www.globalwettech.com/en/

SUWMAB Partners so-far:



- Gdańsk University of Technology (GUT), Poland
- Pomorskie Fund for Environment and

Water Protection (WFOŚ), Poland

- Halmstad University (HH), Sweden
- Oulu University of Applied Sciences (OU), Finland
- Finnish Environment Institute (SYKE)
- University of Tartu (UT), Estonia
- Estonian Fund for Nature (ELF)
- Aarhus University (AU), Denmark
- Cooperating municipalities from Poland, Denmark, Finland and Sweden

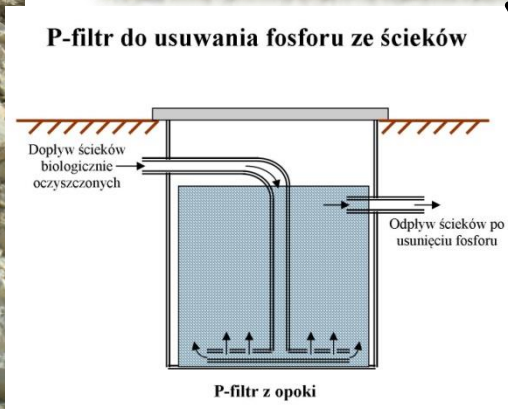
… we are open to cooperation with interested NGOs and local/regional administrations from Baltic Sea Region countries!

Our goal is to apply to the 2nd Call of the Baltic Sea Region Programme in summer 2016

www.interreg-baltic.eu/

APPLICATION OF ROCKS carbonate-siliceous for Phosphorus removal from wastewater

Linke with PHOSRRE



After using in WWTP the rock can be used as fertilizer on fields

Foto and schemes by Józwiakowski

Investigation of this material is needed, foto Józwiakowski, 2014

SUWMAB project is going to fill the knowledge gaps and counteract prejudice among local decision-makers, constructors and end-users.

Comprehensive **awareness-raising campaign** will accompany all SUWMAB activities, in order to raise the capacities of technicians and administrators dealing with wastewater treatment - study visits, information events and training sessions - for municipality officials, inhabitants and multiplicators who wish to gain expertise in ecological engineering.

A number of **demonstration plants** will be designed, constructed, operated and evaluated. Moreover SUWMAB will elaborate **methodology for evaluating** the condition and efficiency of the treatment plants and test them on the constructed demo sites.

Main outputs:

- best-suited solutions for each type of location and user needs (**best practice**) along with detailed technical instructions for the construction and operation.
- input to local, regional and national regulators **land strategies** dealing with wastewater management and environmental protection.

All the mentioned outputs will be not of local nature, but have a **strong transnational character**. Likewise, transnational cooperation and exchange of knowledge will be necessary to produce them.

There are many types of CWs and possible combinations.

The claimed disadvantages ("insufficient nutrient removal, clogging"), and thus sometimes prejudice result from:

- Wrong design, applying a type or size of CW unsuitable for the given location
- Lack /missing maintenance.

All these problems are going to be addressed by SUWMAB, by promoting **highly efficient** technologies, which will be **adapted** to the local conditions and user needs. They will be designed to protect ground water resources while meeting the most stringent environmental discharge standards.

OUTPUT form SEED MONEY - **Pre-feasibility study for treatment wetland application for wastewater treatment in dispersed development**

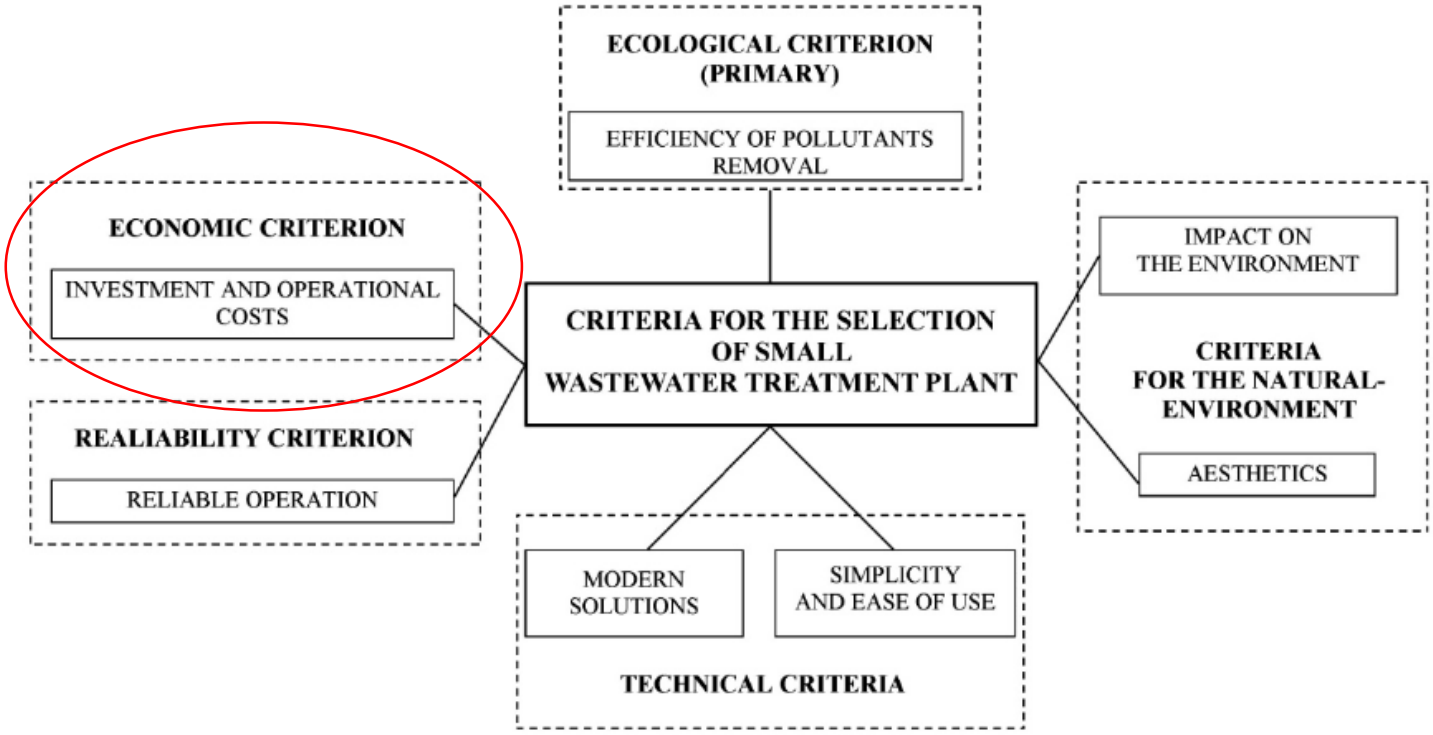


Fig 1 Selection criteria for small WWTPs according to sustainability principles [Józwiakowski et all, 2015]

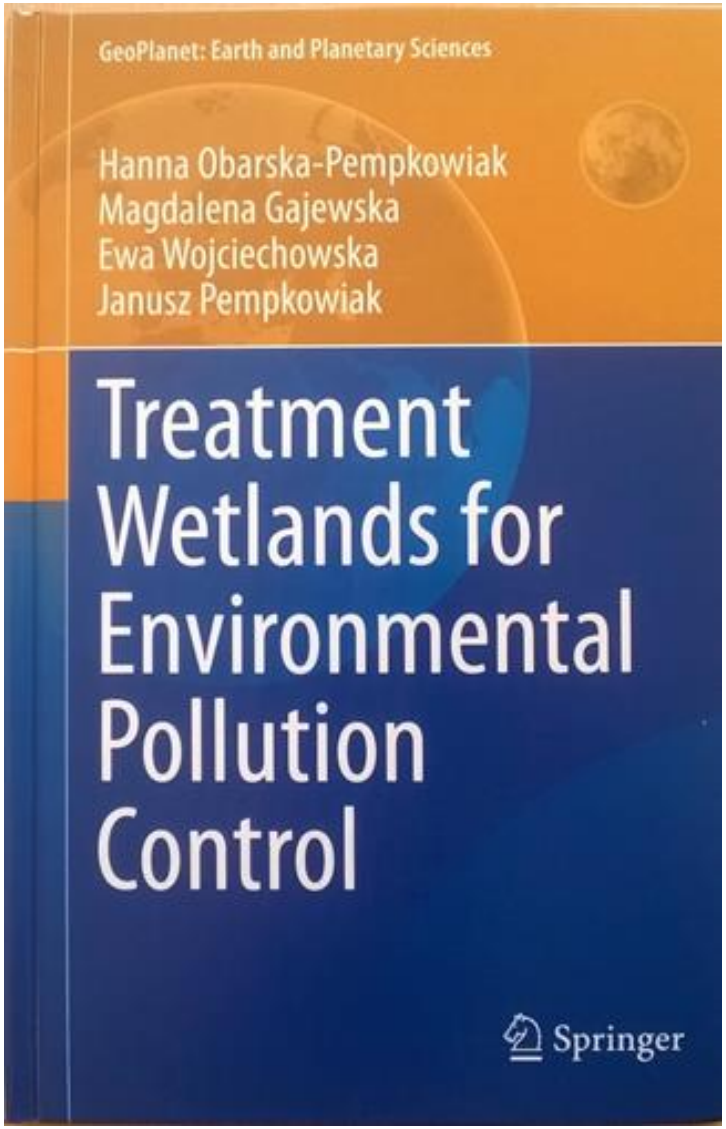
OUTPUT form SEED MONEY - **Pre-feasibility study for treatment wetland application for wastewater treatment in dispersed development**

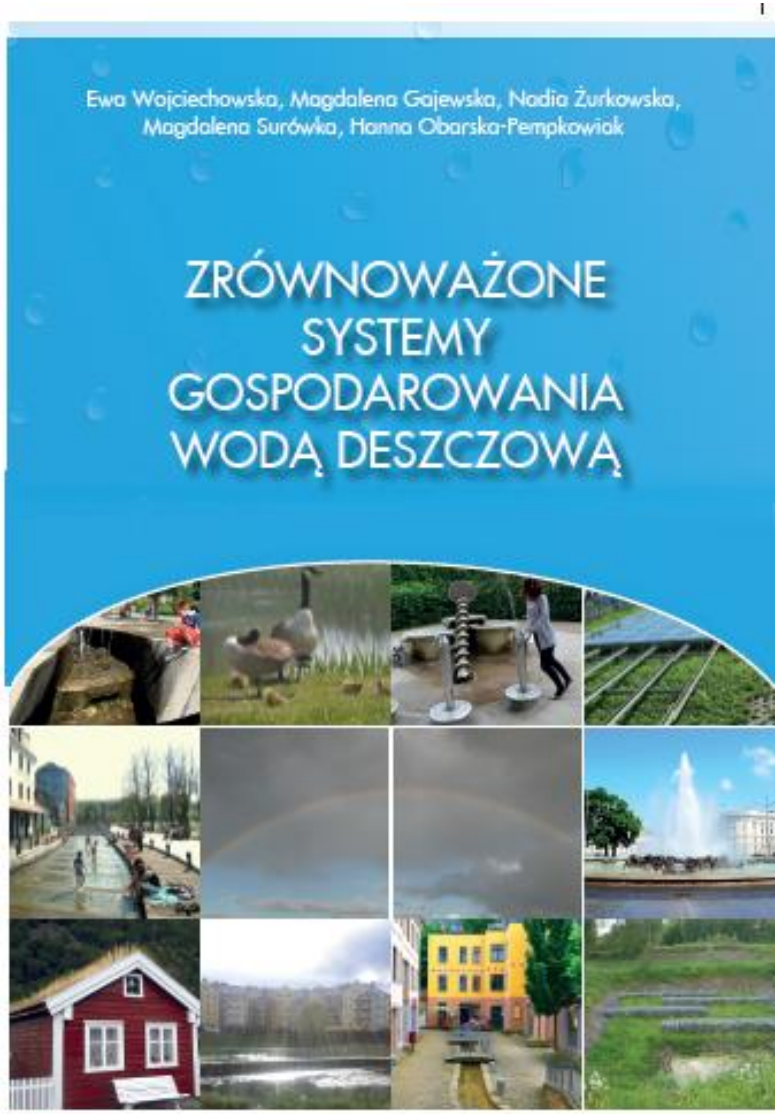
The summary of investment and exploitation costs of three different solutions for wastewater treatment , case study for 180pe settlements, [Gajewska et al. in press]

Option	Investment cost per one inhabitant [PLN]	Investment cost per one household [PLN]	Exploitation cost per one inhabitant [PLN]	Exploitation cost per 1m^3 of wastewater [PLN]
Option I	6441.67	28 280.49	619.77	21.23
Option II	**2 050-3 189**	**9 000-14 000**	**63.21**	**2.17**
Option III	2 277.78	10 000.00	832.50	28.51

- Option I – construction of local wastewater treatment plant with gravitational and pressurized networks
- Option II – construction of single family treatment wetlands plants
- Option III – construction of sealed septic tanks

BOOKS in 2015





Sustainable systems for stormwater management, SUWD/WSUD

IWA 15th International Conference

Wetland Systems for Water Pollution Control

4-9 SEPTEMBER 2016,
GDANSK, POLAND

www.icws2016.org

Thank you for your attention

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