

# A multidisciplinary approach to sewage and storm water drainage – Case studies of the towns of Pula and Rovinj



Authors: Tatjana Uzelac, Katja Sošić

# **Multidisciplinary approach to sewage and storm water drainage**

What is multidisciplinary approach to sewage and storm water drainage in the cities?

*“Solutions should combine function, aesthetics and usability.”*

*“Solutions should be planned in multi-disciplinary co-operation of urban planning, urban design, landscape architecture and water management.”*

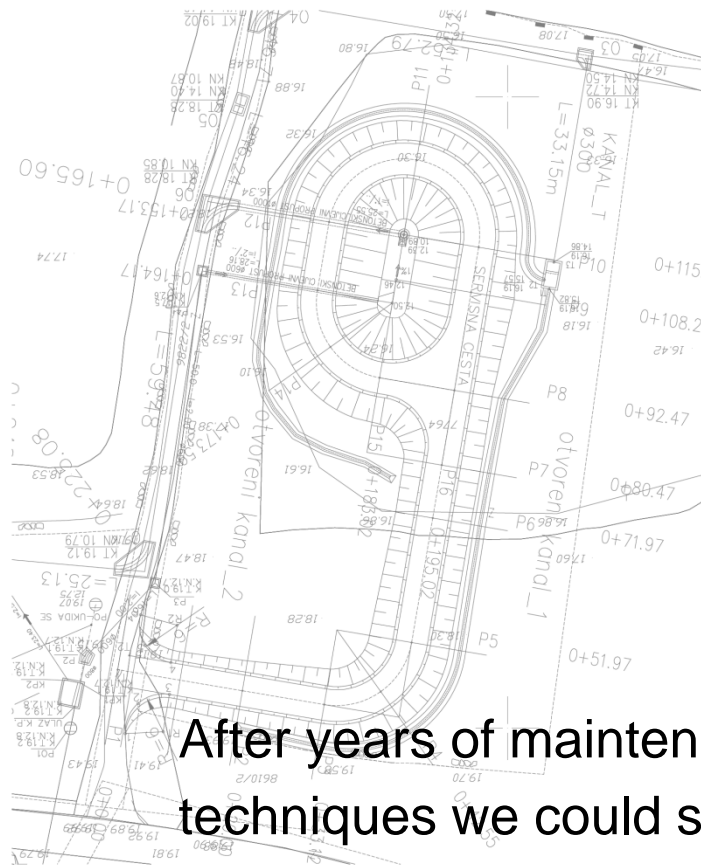
*SWITCH CASE STUDY*

# Case studies

- “Istrian Y” highway
- Beltway – Town of Pula
- Nazorova street – Town of Pula
- Losinjska street – Town of Pula
- Stanga Industrial zone – Town of Rovinj
- Monsena Valdaliso Tourist village – Town of Rovinj

# “Istrian Y” Highway

- Dry lagoons with open channel drainage system
- Wet lagoons with closed drainage system



After years of maintenance and only civil hydraulic engineering techniques we could say that is not possible to keep sustainable development especially on the karst without other techniques like landscape design, urban planning and water management.

# Beltway Town of Pula

Too expensive

Last section public calls – Golden kilometer



To retention peak flows

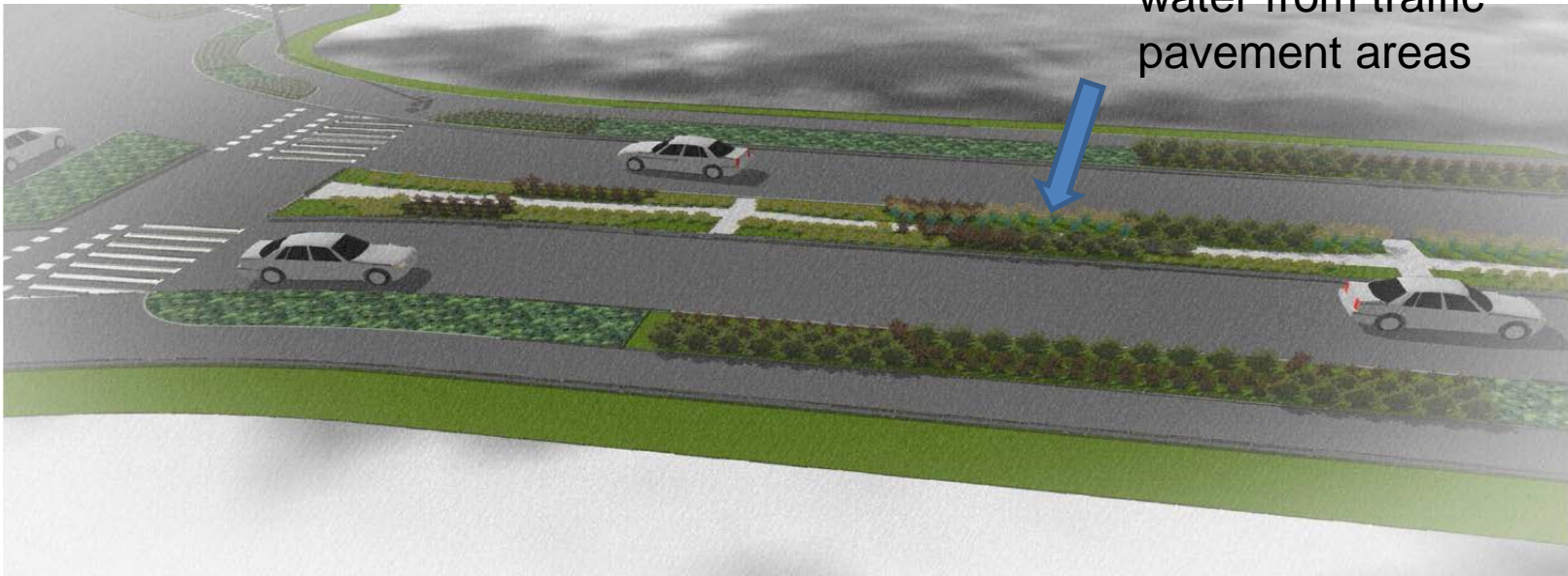
Unused green belts

Existing beltway – Town of Pula

# New Beltway – Town of Pula

## Vegetated swales

Collecting rain  
water from traffic  
pavement areas



Purification

Retention

Reconstruction

# New Beltway – Town of Pula

## Rain gardens

Collecting rain water from connecting streets storm water drainage sewers



Purification

Retention

# New Beltway – Town of Pula – Roundabout

## Rain gardens and Vegetated street swales

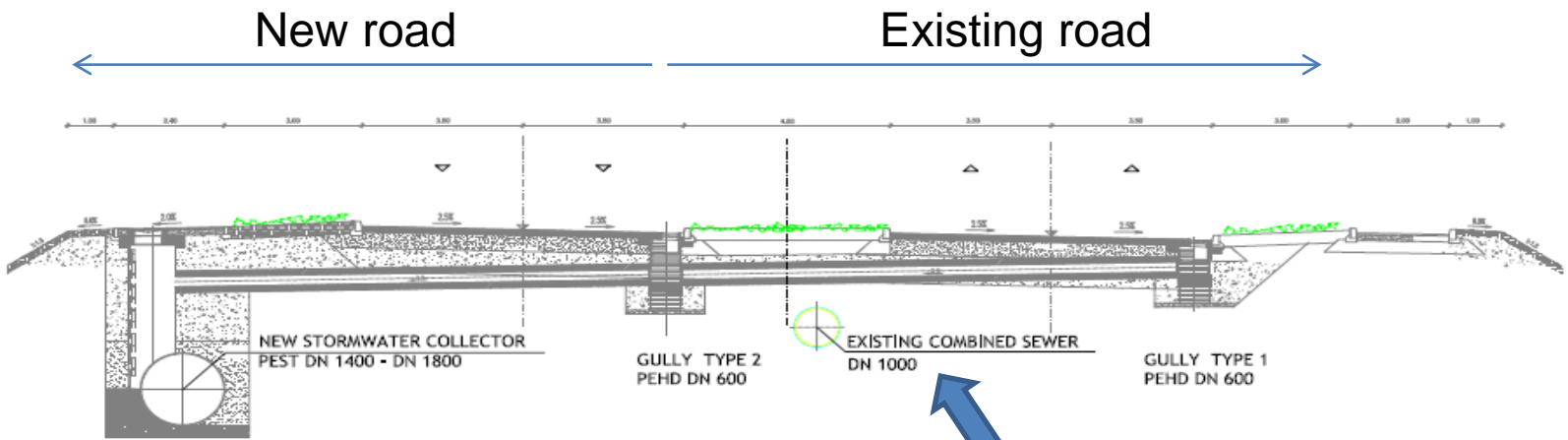


Hydraulic facilities could also become attractive landmarks



# New Beltway – Town of Pula

## Existing cross section



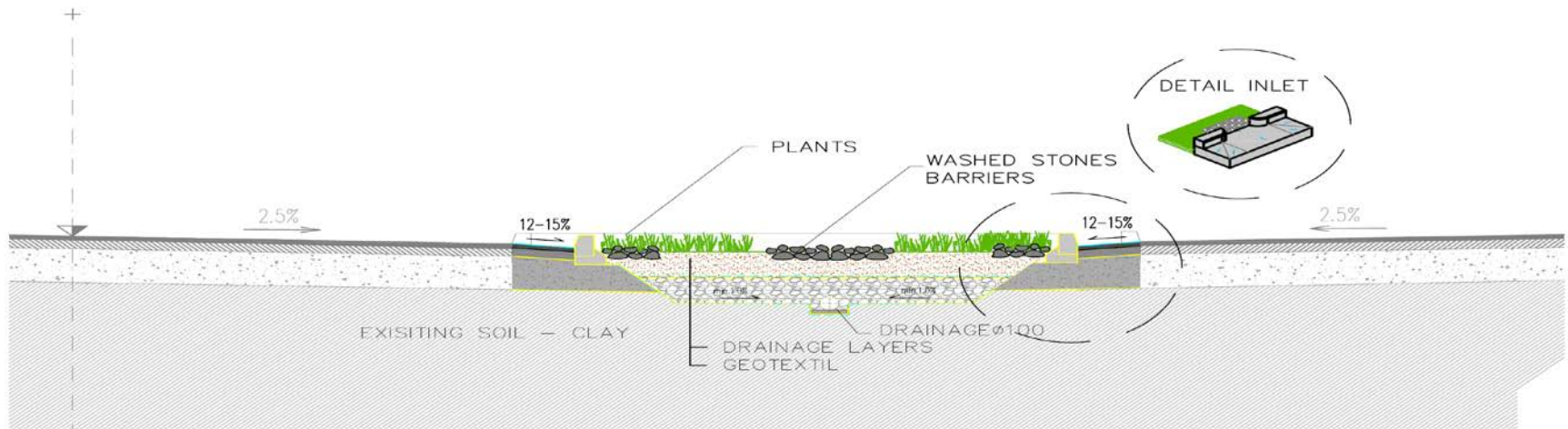
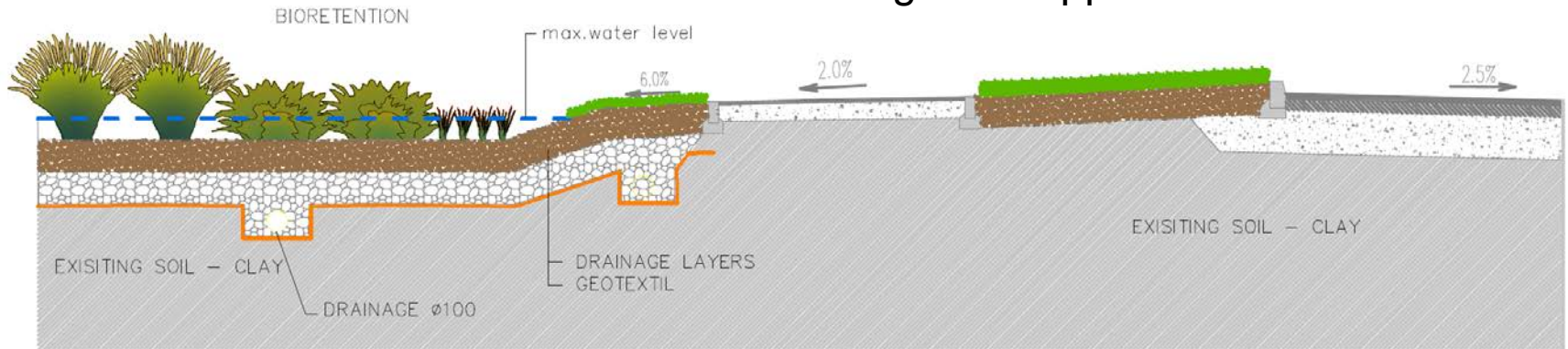
Deep excavations  
Wide pipes

To become storm water sewer

Conventional approach: "As soon as possible"?

# New Beltway – Town of Pula RECONSTRUCTION – Cross Section Bioretention and Vegetated Street Swale

Integrative approach: “Slow the flow”



Integrative approach: “Solve the problem where it occurs”

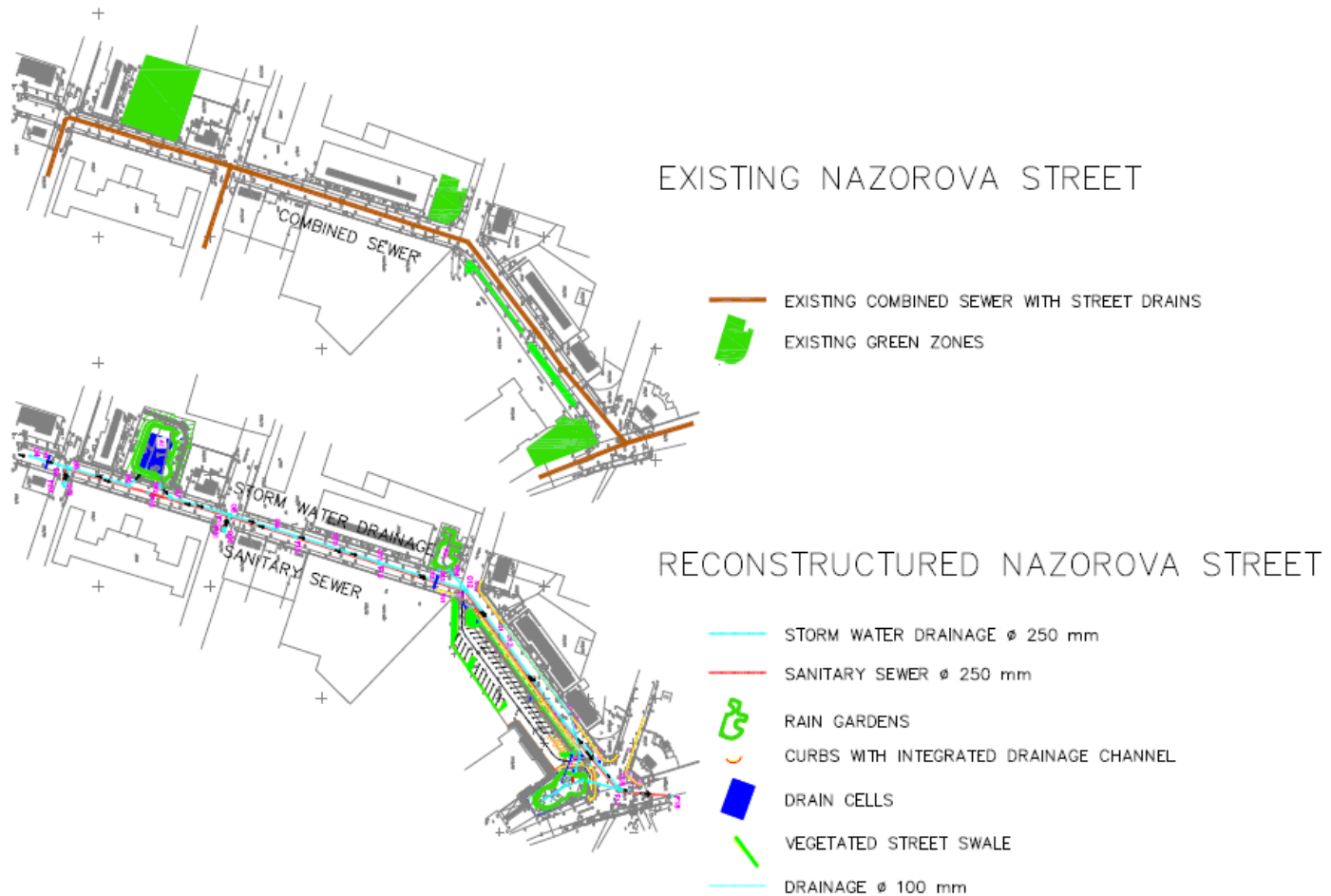
# Nazorova street – Town of Pula

Combined sewer reconstruction to storm water drainage and sanitary sewer and street reconstruction, rain gardens



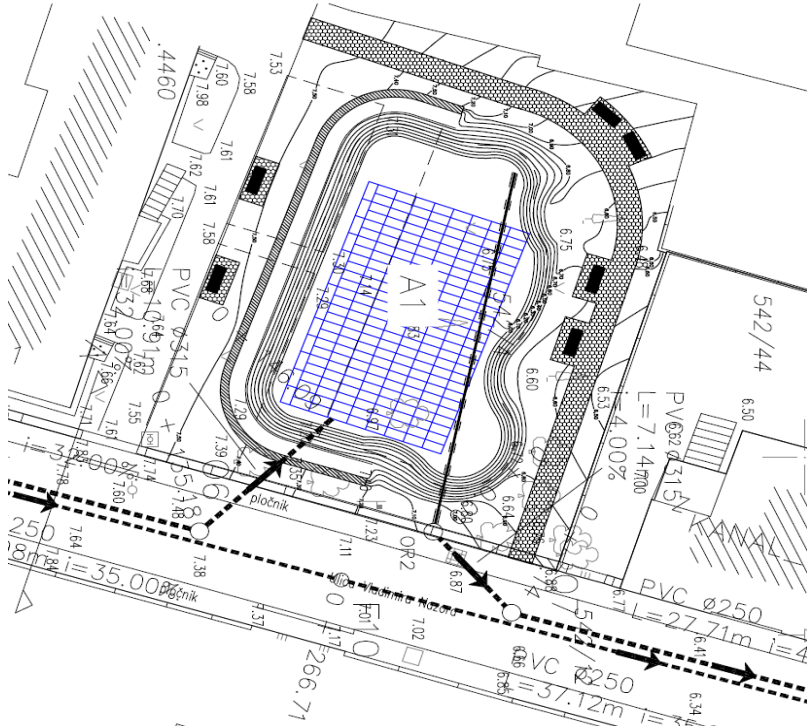
Existing street view

# Nazorova street – Town of Pula



# Nazorova street – reconstruction

## Rain garden A1



Civil works



Landscape design

# Nazorova street – reconstruction Rain garden A1



# Nazorova street – construction

## Rain gardens, A1, A2 and A3



A1 - Drain cells

- Highest peak flows



A2 - Drainage layers

- Smallest retention
- Two linear street drains



A3 - Geomembrane

- Ground water influence

## Nazorova street - construction



Whole parking slopes oriented to vegetated swale without storm water drainage



Lower street area with perforated curbs and integrated drainage channel



# Nazorova street – after 6 months



# Nazorova street – after 6 months

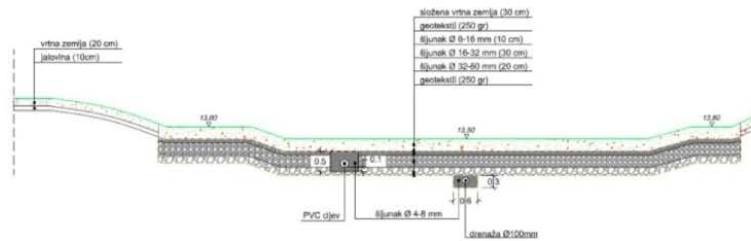
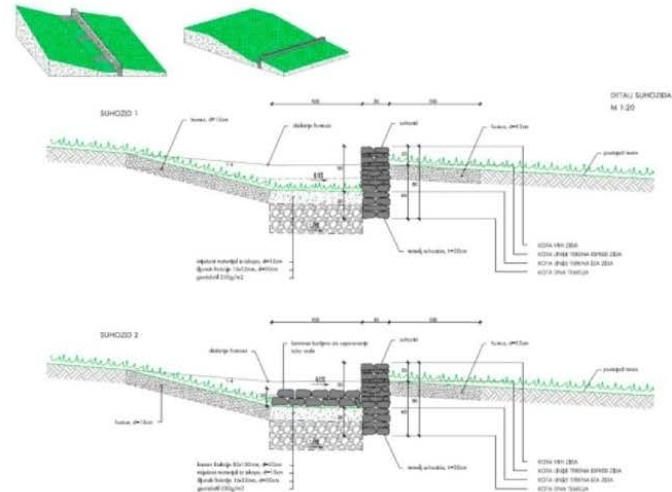
## Vegetated swale after completion



# Nazorova street Conventional vs. Integrative

<b>Traditional approach</b>	<b>Integral approach</b>
Sewage system – pipes with drains – 69 drains necessary as well as a pipeline with a 700 mm diameter on the downflow section	Pipeline with a 250 mm diameter, last section with a 400 mm diameter 2 grates, 3 rain gardens, 1 absorption draw-well, 1 infiltration trench, curbs with integrated drainage channel – as a part of the road
In the downflow section it is necessary to take care of 606 l/at peak flow	In the downflow section 206 l at peak flow remained to take care of
Price for the storm water drainage 215 000,00 EUR	Price for the storm water drainage 100 000,00 EUR
Upflow – abandoned grassed over surfaces, flooding in the downflow sections and lower city zones	Upflow – set grassed over surfaces, prevented flooding in the lower city zones
No influence on social and aesthetic component	Economic, aesthetic and ecological influence at the level of the entire eco-system

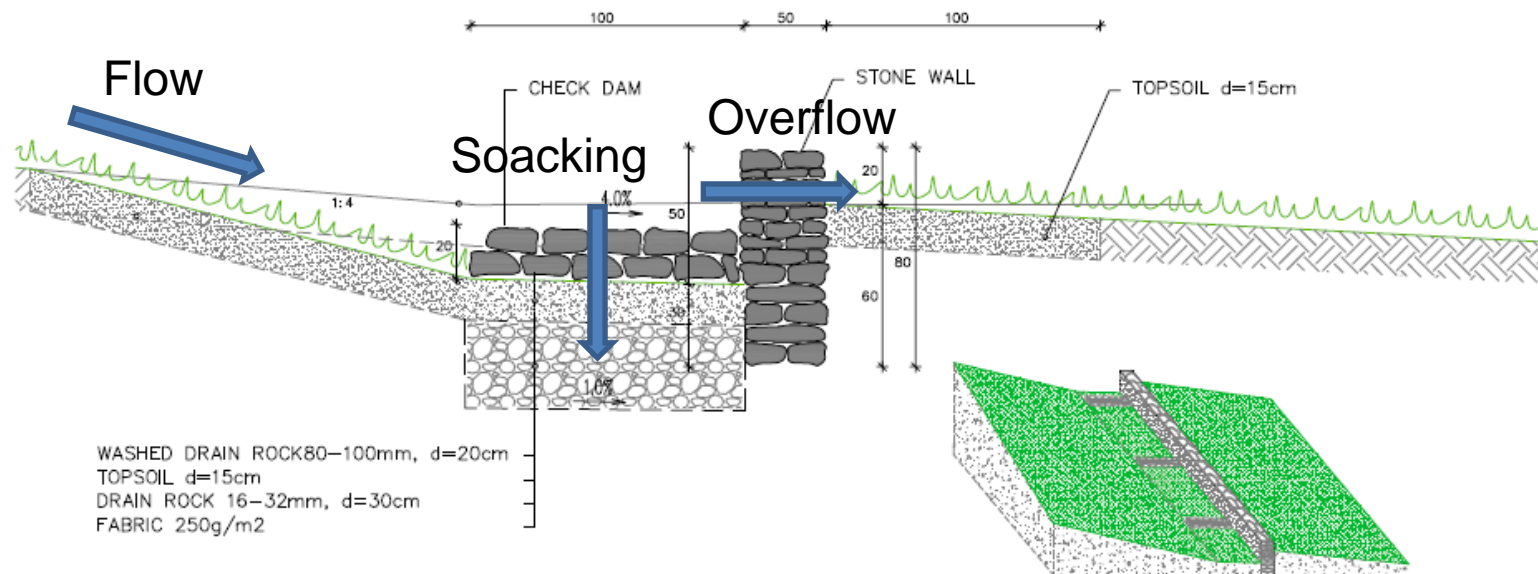
# Lošinjska street – Town of Pula



# Lošinjska street – Town of Pula

Stone walls - protect lower town area from surface water

STONE WALL

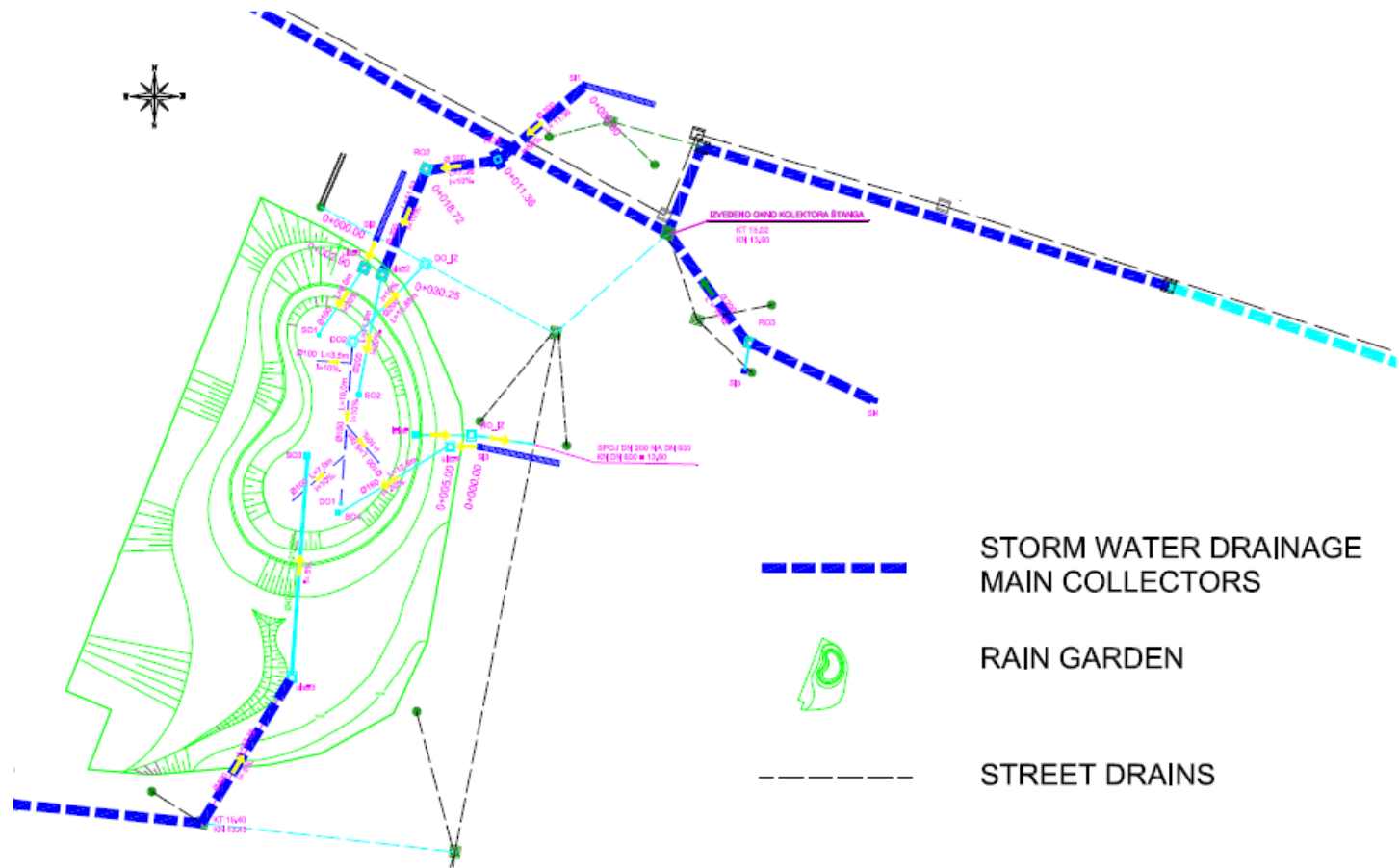


## Lošinjska street – Town of Pula



# Stanga – industrial zone – Town of Rovinj

## Peak flows detention from main storm water collectors



# Stanga – industrial zone – Town of Rovinj

## Peak flows detention from main storm water collectors





# Stanga – industrial zone – Town of Rovinj Peak flows detention from main storm water collectors



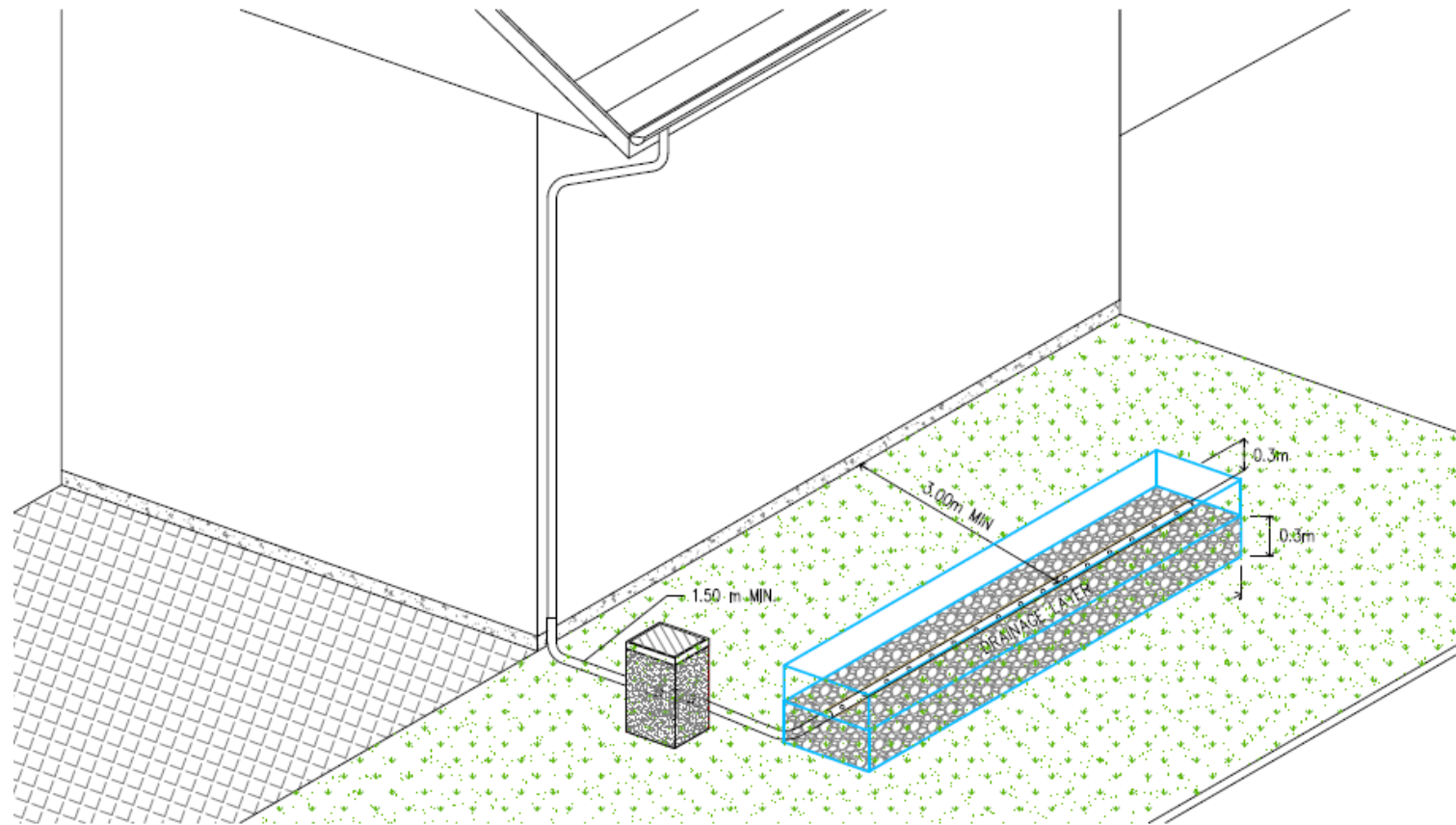
Stanga Rain Garden – 1 hour after heavy rain

# Monsena Valdaliso – Turist Village, Town of Rovinj

Principles of WSUD and Water Harvesting, Rain gardens instead of classical pipe system

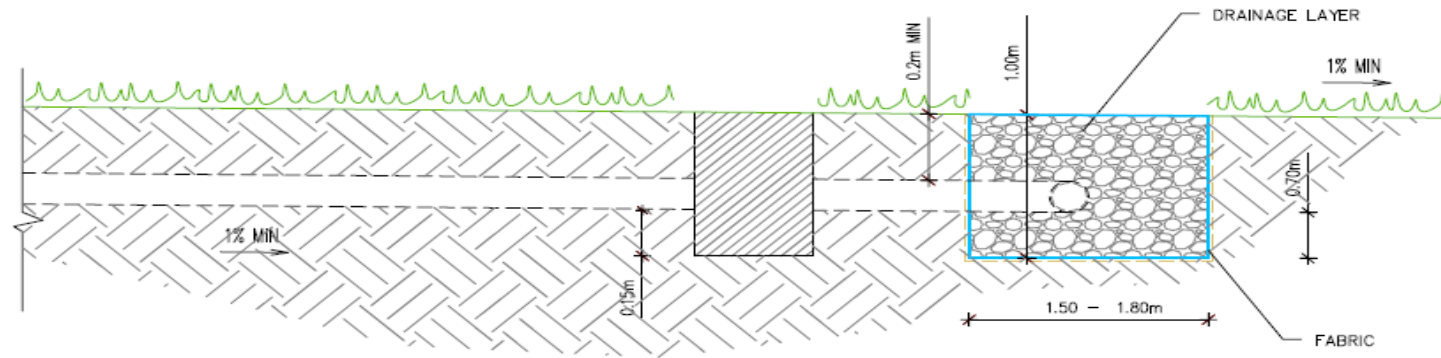


# Monsena Valdaliso – Turist Village Details



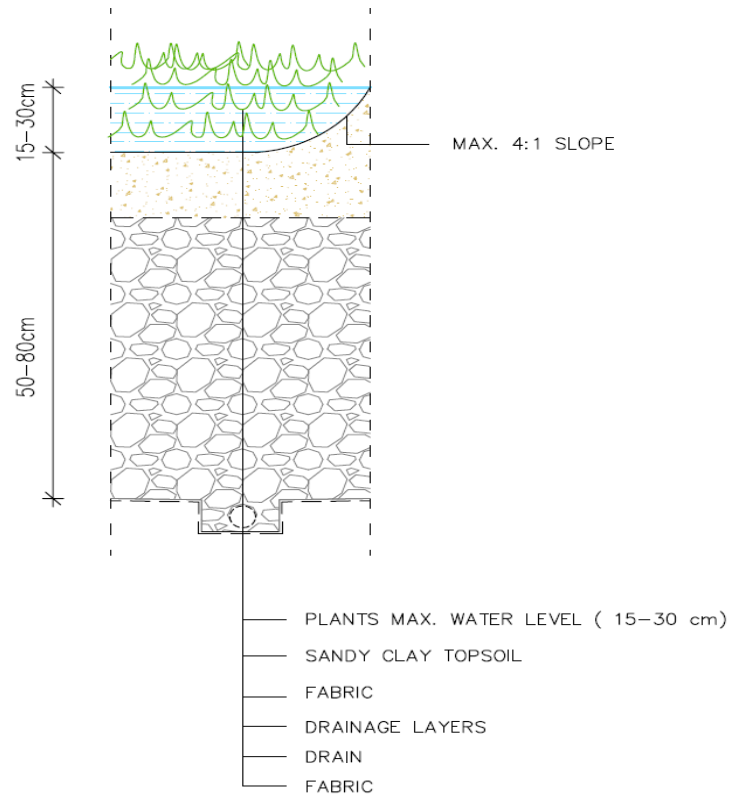
# Monsena Valdaliso – Turist Village Details

INFILTRATION TRENCH



# Monsena Valdaliso – Turist Village Details

## RAIN GARDEN – TYPICAL CROSS SECTION



# SAVINGS

<b>Facilities – road with storm water sewer and landscape design</b>	<b>Savings compared to the classical project</b>
Riva Street in Pula – road, drainage, landscaping	550 000,00 EUR
City beltway I phase – drainage, landscaping	1 300 000,00 EUR
Stanga industrial zone in Town of Rovinj – drainage, landscaping	660 000,00 EUR
Monsena tourist village – drainage and landscaping	700 000,00 EUR
Nazor Street in Pula – road, drainage, landscaping	100 000,00 EUR
Municipality of Stupnik – footpath by the main road with drainage and landscaping	100 000,00 EUR

**3,5 Mio Euro**

# CONCLUSIONS

“Urban population is on the rise.

Citizens are crying out for healthier cities: more parks, more bike lanes, better public transportation, and cleaner air. The limitations of city life are compounded by aging infrastructure, combined sewer overflows, and concerns for climate change.

We are at a critical crossroads and each development project, large or small, presents opportunities for WSUD.

Therefore, the main challenges for sustainable stormwater management are not technological, but for awareness and administration. To move forward, support must be garnered, communication must improve, and economic arguments proven.”

SWITCH CASE STUDY



Elaborated in the context of the research project  
SWITCH – Managing Water for the City of the Future  
[www.switchurbanwater.eu](http://www.switchurbanwater.eu)

On basis of work from Heike Langenbach,  
Jochen Eckart, Gerko Schröder (SWITCH Team at HCU 2/2006-7/2009)



Project coordination:  
UNESCO-IHE  
Westvest 7  
2611 AX Delft, Netherlands

SWITCH Project is funded by the Sixth Framework Programme of the European Union.



Hafencity Universität Hamburg (HCU)  
Hebebrandstraße 1  
D-22297 Hamburg  
[www.hcu-hamburg.de](http://www.hcu-hamburg.de)

Hamburg, January 2011.

© Hafencity Universität Hamburg 2011

Jacqueline Hoyer, Wolfgang Dickhaut, Lukas Kronawitter, Björn Weber

Available as publication by: jovis Verlag GmbH, Kurfürstenstraße 15/16, D-10785 Berlin  
ISBN 978-3-86859-106-4