
WWTP Nova Gorica
50 500 PE
Drainage and treatment
of waste water
in the Soča river basin

Index of content

I. General description and technical data

1. Basic facts about the project

Operational Program of the Republic of Slovenia ***for urban waste water collection and treatment (11.11.2010)*** → **agglomeration of Nova Gorica as one of the national priorities(more than 15.000 inhabitants).**

95% of the urban waste water from the agglomeration of Nova Gorica (ID 1515) should be connected and treated on WWTP by December 31, 2010 (2008), (disinfection by December 31, 2015

Šempeter – Vrtojba (ID 1490) and Miren (ID 1033) should be connected and treated on WWTP by December 31, 2015.

Streams Koren and Vrtojbica are currently ("de facto") in function as a waste water collectors for the cities of Nova Gorica and Šempeter-Vrtojba. WFD → Bad ecological status!

The project of WWTP solves the problem of a serious pollution of the river Vipava and streams Koren and Vrtojbica → gulf of Trieste

The scope of the project

1. Nova Gorica, Šempeter and Vrtojba → upgrade of the existing combined sewer network and at least 95% of connected load (PE)

2. Miren → construction of a new separate sewer network and sewer pressurised collector to the WWTP

3. WWTP site→ construction of the infrastructure to the WWTP (road, power supply, water, gas ...)

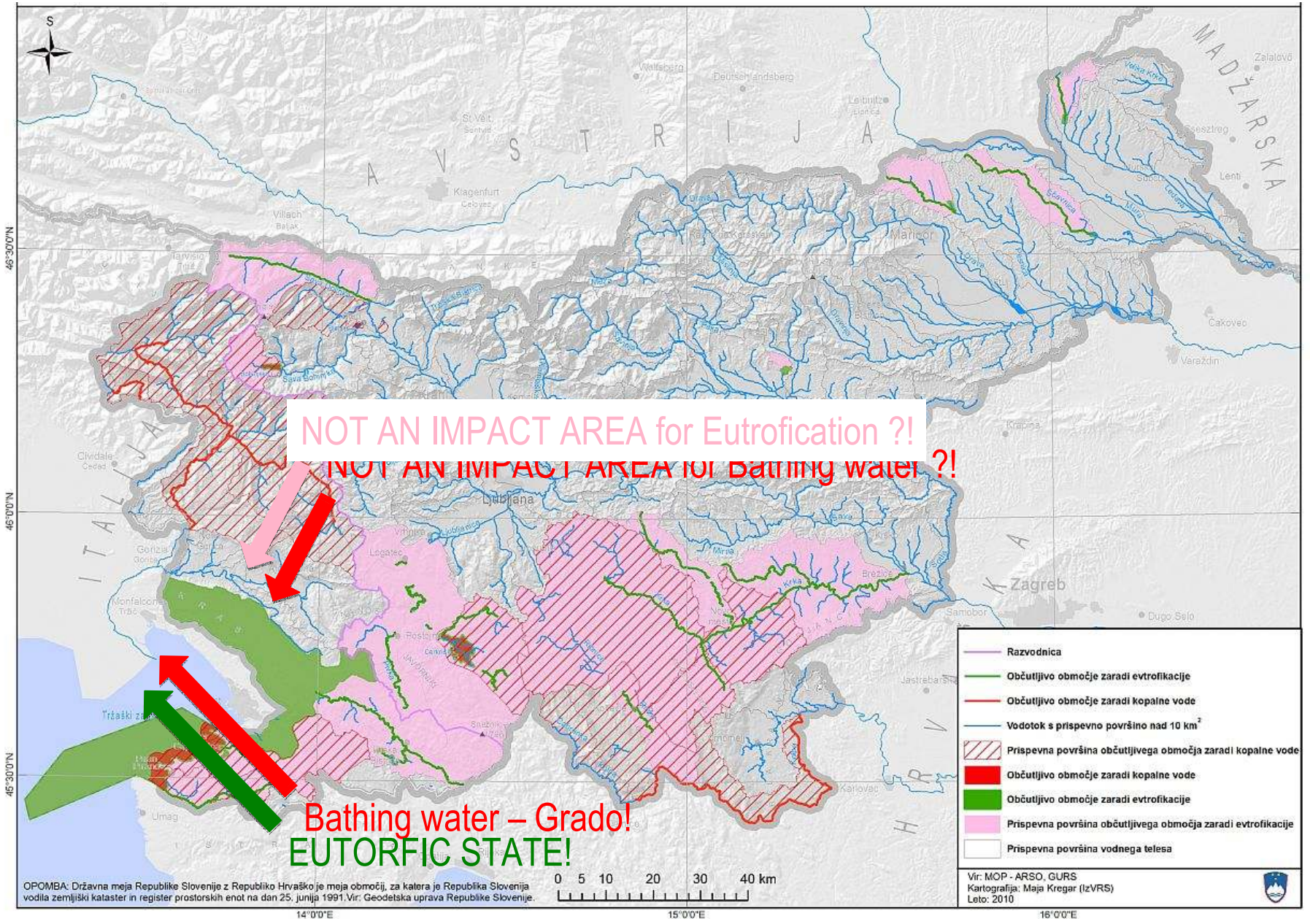
4. Construction of the WWTP and service buildings

1. Nova Gorica, Šempeter, Vrtojba and Miren → border with Italy.
2. Nova Gorica → catchment area of the river Soča and stream Koren
3. Šempeter-Vrtojba → catchment area of the stream Vrtojbica → river Vipava.
4. Miren → catchment are of the river Vipava → river Soča
5. The river Soča → outflow (in Italy) in the Adriatic Sea (Gulf of Trieste)
6. **Nova Gorica, Šempeter-Vrtojba and Miren → discharging the untreated wastewater (indirectly) to the Gulf of Trieste – EUTROFIC STATE.**

2. WWTP Location

River basin management plan 2009 – 2015 - Danube and Adriatic see river basin

Sensitive areas



River basin management plan 2009 – 2015 - Danube and Adriatic see river basin

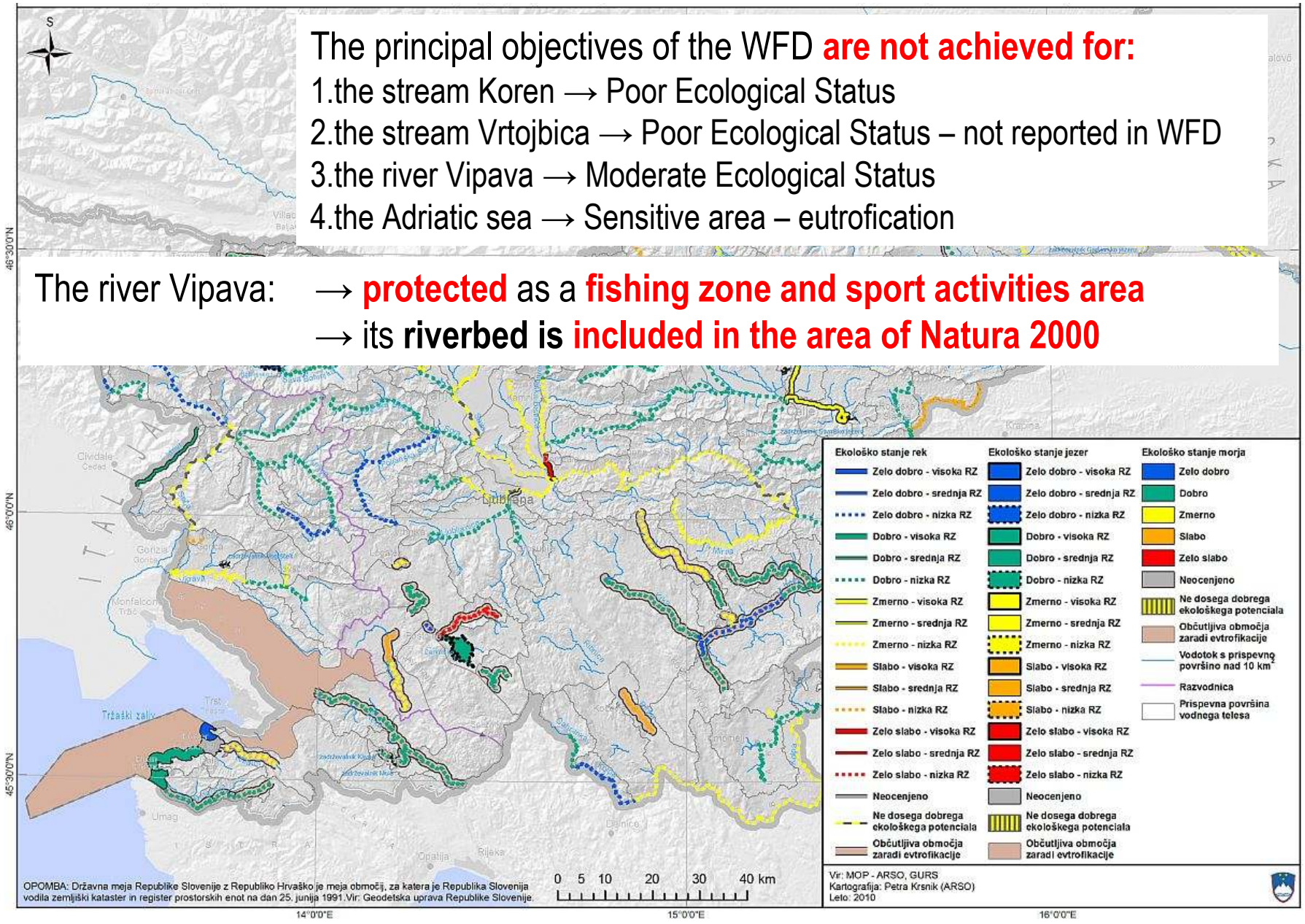
Ecological status

The principal objectives of the WFD **are not achieved for:**

1. the stream Koren → Poor Ecological Status
2. the stream Vrtojbica → Poor Ecological Status – not reported in WFD
3. the river Vipava → Moderate Ecological Status
4. the Adriatic sea → Sensitive area – eutrofication

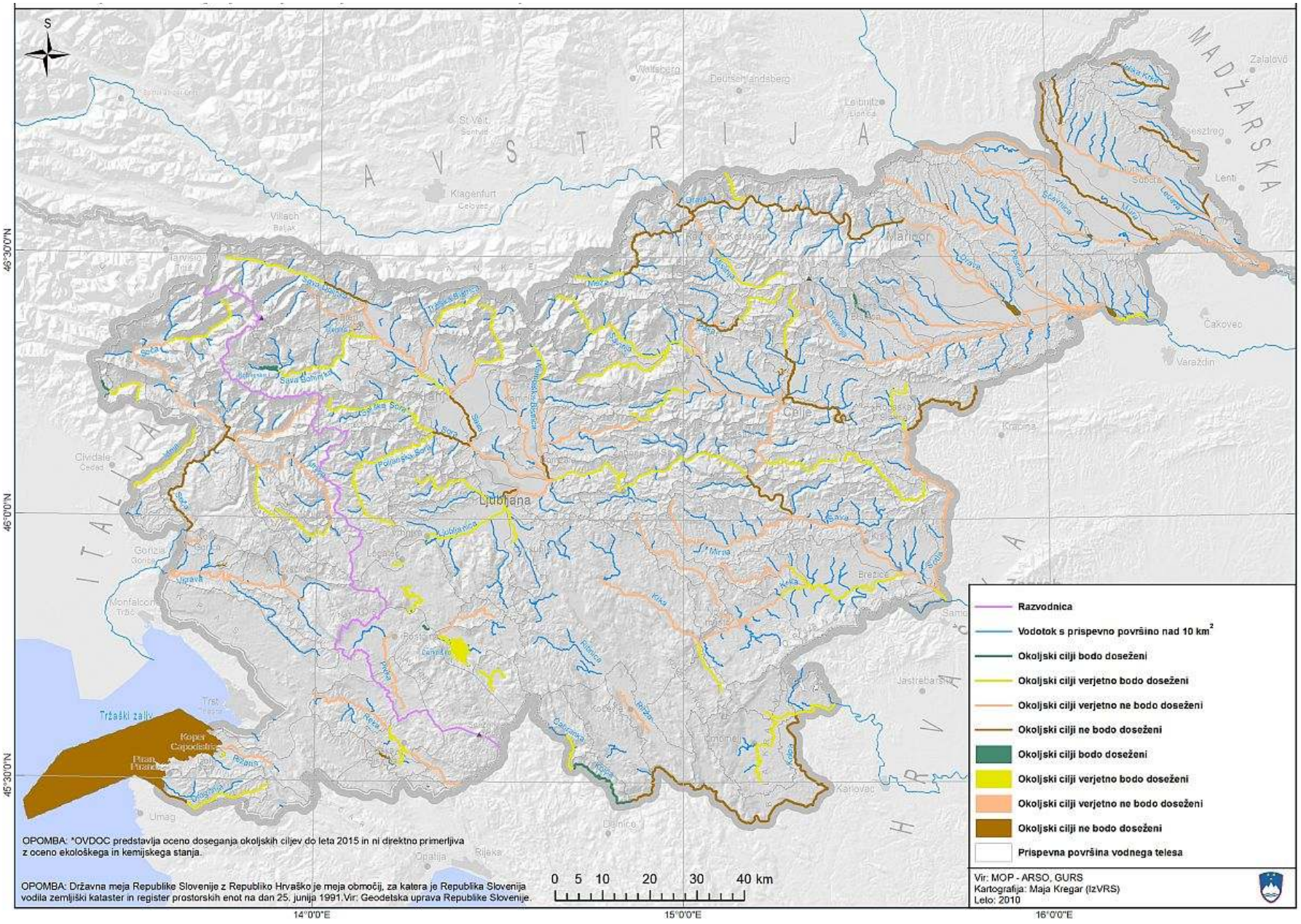
The river Vipava: → **protected** as a **fishing zone and sport activities area**

→ its **riverbed is** **included in the area of Natura 2000**



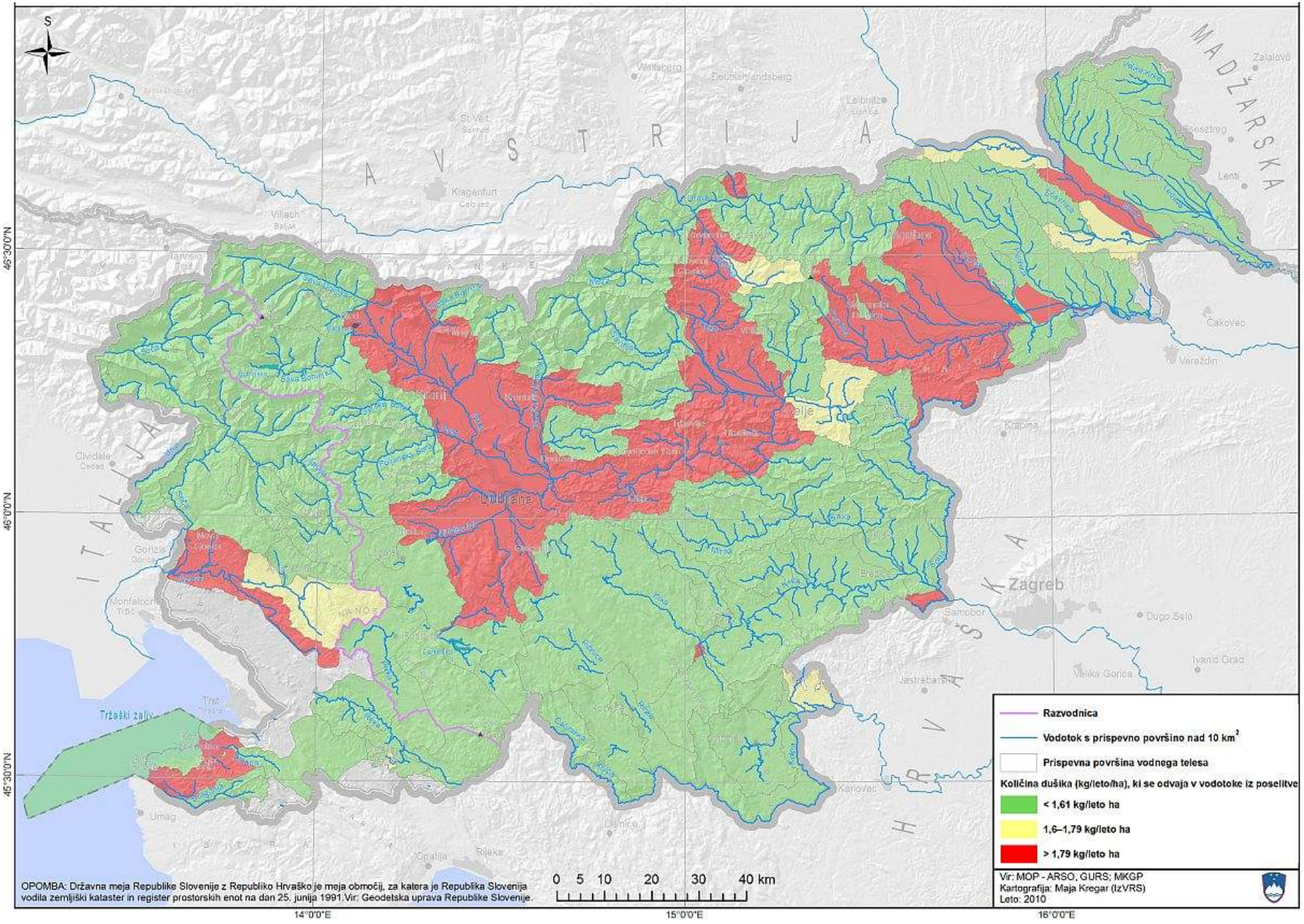
River basin management plan 2009 – 2015 - Danube and Adriatic see river basin

Enviromental objectives achievement



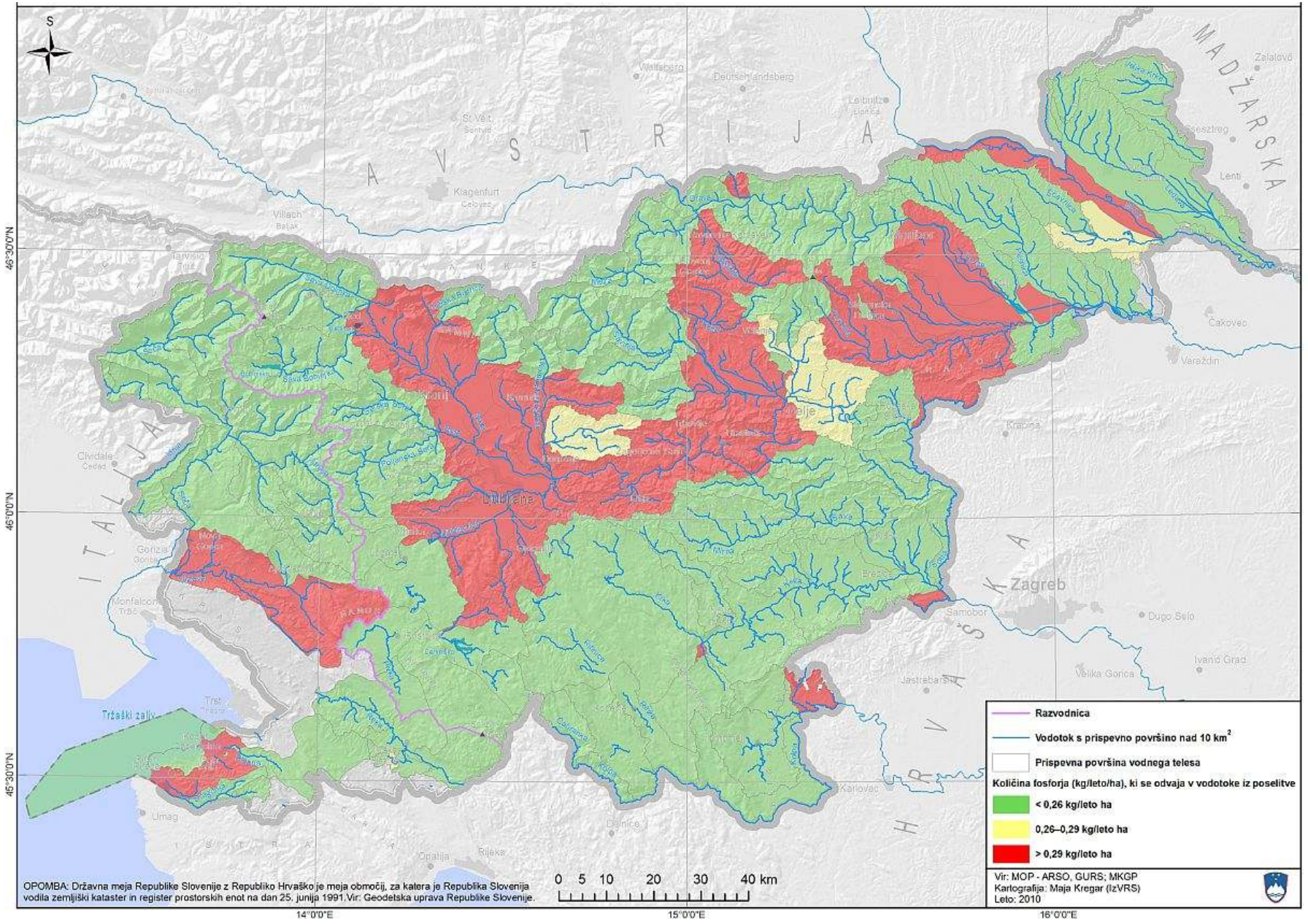
River basin management plan 2009 – 2015 - Danube and Adriatic see river basin

Diffuse sources – Nitrogen (population)



River basin management plan 2009 – 2015 - Danube and Adriatic see river basin

Diffuse sources – Phosphorus (population)



WWTP Site Selection

Historical Overview - Chronology

1. **70s of the last century** → (current) **WWTP site selection in the Urban Spatial Plan**.
2. **First negotiations** for a common WWTP for the Italian and Slovenian → **started 1986, end 1995**.
3. **Cross-border WWTP**: 4 different technically feasible connecting options were discussed with → **most cost-effective option (in case of a common WWTP)** → connection with a pressurized and gravitational wastewater collector from Vrtojba (at the site where the WWTP Nova Gorica is planned). Those four options were analysed in:
   1. Ureditev odvodnje mesta Nova Gorica: Povezava kanalizacije mesta Nova Gorica in Gorica v Italiji, št. proj. 0087, september 1986, VGI Soča
   2. Ureditev odvodnje mesta Nova Gorica: Povzetek za potrebe jugoslovansko-italijanske mešane komisije za vodnogospodarsvo, št. proj. 0189, september 1986, VGI Soča
   3. Odvodnje mesta Nova Gorica: Povzezava kanalizacije dveh mest, št. proj. 17/91, marec 1992, VGI Soča
   4. Čistilna naprava mesta Nova Gorica, št. proj. 19/95-A ,maj 1995, VGI Soča
4. **Based on the above documents** → **ECONOMICALLY AND POLITICALLY BETTER SOLUTION TO IMPLEMENT AN OWN WWTP.**
5. **Current state of the sewer system** → **implemented between 1986 and 1995** → **based on the decision for an own WWTP** → **the current sewer system outflow (Vrtojbica) is just app. 505 m away from the chose WWTP site**
6. **In 1995 all the negotiations ended** → **FINAL DECISION FOR AN OWN WWTP AT THE (CURRENTLY) CHOSEN SITE!**

Historical Decisions Review and Final Site Selection

1. **Political and monetary changes in Slovenia from 1986 to today → review and update of the historical decisions**
2. **The the following documentation has been made:**

1 Idejna zasnova "Kanalizacija Miren", št. proj.: S-75/96, Hydrotech d.o.o., december 1996

2 Idejna zasnova "Kanalizacija Orehovlje", št. proj.: S-76/96, Hydrotech d.o.o., december 1996

3 Analiza razvojnih možnosti – Strokovna podlaga za izdelavo sprememb in dopolnitev prostorskega plana Mestne občine Nova Gorica, Koda d.o.o., september 2006,

4 Analiza stanja in teženj prostorskega razvoja Mestne občine Nova Gorica, Locus d.o.o., november 2006,

5 Analiza demografskih in ekonomskih razmer za strategijo prostorskega razvoja občine Šempeter-Vrtojba, Koda d.o.o., januar 2006,

6 Strategija gospodarskega razvoja in izračun površin za urbanizacijo do leta 2021 občine Šempeter-Vrtojba, Koda d.o.o., marec 2006,

7 Primerjalna študija z vidka umestitve v prostor, vplivov na okolje in ekonomskega vidika, Projekt d.d., februar 2008,

8 Hidrološko hidravlična analiza območja Regionalnega prostorskega načrta Čistilne naprave ob Vrtojbici., Inštitut za vodarstvo d.o.o., avgust 2009,

9 Rekonstrukcija razbremenilnih in zadrževalnih objektov na kanalizacijskem omrežju občine Nova Gorica, IDZ št. P06-04/09-MT, Hidrolab d.o.o., november 2009

10 Rekonstrukcija razbremenilnih in zadrževalnih objektov na kanalizacijskem omrežju občine Šempeter-Vrtojba, IDZ št. 025-39/09, SPIT d.o.o., november 2009

11 Ocena vpliva izpusta prečiščene odpadne vode in čistilne naprave »Ob Vrtojbici« na vodotok - Hidravlično hidrološki vidik - Naravovarstveni vidik, Aquarius d.o.o., november 2009,

12 Okoljsko poročilo za regionalni prostorski načrt za čistilno napravo »Ob Vrtojbici« , Aquarius d.o.o., januar 2010

13 Utemeljitev investicije v kanalizacijsko omrežje občine Nova Gorica in Šemepter-Vrtojba, Hidrolab d.o.o., oktober 2010

14 Utemeljitev obremenitve CČN Nova Gorica, št. 1-02/11, Hidrolab d.o.o., junij 2010 in junij 2011

15 WWTP Nova Gorica, Potential Locations Comparison – Including Required Sewer System Upgrade -, Hidrolab d.o.o., July 2011

16 Option analysis for the project »Collection and treatment of waste water in the basin of Soča (WWTP Nova Gorica), July 2011

Result of the review

Option No.	WWTP	Invest. [€]	Invest. [€/PE]	Final sludge disposal [€/PE/year]	Final sludge disposal [€/year]
Option 1	WWTP "Ob Vrtojbici" 50 500 PE (65 000)	34 930 707	537.39	0.34	22 083
	WWTP "Nova Gorica"				

FINAL DECISION:

THE MOST COST-EFFECTIVE

↓

A COMMON (SLOVENIAN) WWTP FOR NOVA GORICA, ŠEMPETER-VRTOJBA AND MIREN

↓

AT THE CURRENTLY DEFINED SITE

↓

Option 1:

1.The most cost-effective

2.Outflow to Vrtojbica from WWTP → recommended by (docs. 11 and 12) "Enviromental reports"

3.The area of the planned WWTP → currently degraded are of a former gravel pit → contemporaneous rehabilitation of the area.

expansion is a real problem.

3. WWTP Size

Current load (as on June 2009)

1. Continuous measurement of discharge (flows) from 22.4.2009 to 23.6.2009 (recorded every 3 minutes) → highest drinking water demand in each year
2. Same period → waste water composition sampling (COD, BOD_5, P, N, TSS).
3. From the sold drinking water analysis (as in 2009) it was determined:
   - ① domestic water discharge + small commercial activity - app. 165 l/PE/day
   - ② domestic water discharge - app. 150 l/PE/day
   - ③ total water discharge (all activities) - app. 204 l/PE/day
   - ④ total sold drinking water – 2 033 901 m^3/year
4. From waste water discharge & quantity of sold drinking water → Annual average of the sewer infiltration water from combined and separate sewer systems (Q_{iw24}) & Daily peak of the wastewater flow (Q_{px}) → Q_{iw24}:Q_{w24}=54%:46%

Hydraulic load: Q_{cw} = 439.28 l/s **Biological load: 43 000 PE + 2000 PE = 45 000 PE**

Expected (design) load of the WWTP – 30 years live time

1. Lower drinking water consumption in the past 9 years (2000 - 2009) → app. 17%.
   - ① domestic water consumption: 130 l/os/dan
   - ② total water discharge (all activities) : 192 l/os/dan
   - ③ total sold drinking water – 2 155 935 m^3/year (6% more than in 2009)

2. Increase of load (due to population and commercial growth) in the WWTP lifetime (30 years) → according to existing and future (in the approval phase) spatial plans (strategical and executional) and the most likely scenario of development for these areas
   - ① population growth → 0.16 %/year
   - ② commercial activity → 1.69%/year
   - ③ public facilities → 0.26%/year (assumed as the current highest "theoretical" load → according to rated values)

3. Annual average of the sewer infiltration water from combined and separate sewer systems (Q_{iw24}) → lowered to 51% of dry weather flow in daily average (Q_{w24}) → 0.15l/s/ha
   - ① upgrade of the sewer system
   - ② maintenance and rehabilitation (sewer system, water supply system)

Hydraulic load: Q_{cw} = 535.98 l/s

439.28 l/s→22% → 535.98 l/s

Biological load: 48 500 PE + 2000 PE = 50 500 PE

45 000 PE →12% → 50 500 PE

min. act. sludge. conc. (e.g. 12 g/l MLSS)

4. WWTP Technology

Legal framework

1. Water Framework Directive 2000/60/ES

2. Urban Waste Water Treatment Directive 91/271/EGS

Article 5: ***In cases where the catchment areas are situated wholly or partly in another Member State Article 9 shall apply****.* ***Member States shall ensure that the identification of sensitive areas is reviewed at intervals of no more than four years****.*

Article 9: ***Where waters within the area of jurisdiction of a Member State are adversely affected by discharges of urban waste water from another Member State, the Member State whose waters are affected may notify the other Member State and the Commission of the relevant facts****.* ***The Member States concerned shall organize, where appropriate with the Commission, the concentration necessary to identify the discharges in question and the measures to be taken at source to protect the waters that are affected in order to ensure conformity with the provisions of this Directive.***

ANNEX II: A water body must be identified as a sensitive area if it falls into one of the following groups:

…

(c)areas ***where further treatment*** *than that prescribed in Article 4 of this Directive* ***is necessary to fulfil other Council Directives****.*

3. Bathing Water Quality Directive 2006/7/ES

Article 1: This Directive shall apply to any element of surface water where the competent authority expects ***a large number of people to bathe and has not imposed a permanent bathing prohibition, or issued permanent advice against bathing (hereinafter bathing water)****.*

4. The Habitat Directive 92/43/EEC

4. Environmental Protection Act (Ur. l. št. 39/2006, 70/2008. 108/2009)

:

Facts

1. **Independently of the chosen location** → outflow to the river Soča and to the Gulf of Trieste → **sensitive area due to its EUTROFIC STATE → removal of nutrients (P and N)!**
2. The catchment area of the river Soča and Vipava → **not (yet) defined as a area of impact for the North Adriatic Sea?**
3. To reach the **principal objective of the WFD (Good Ecological Status)** for the river Vipava → **removal of nutrients (P and N)!**
4. **The "Environmental report"** (docs. 11 and 12), **restrictions due to the fishing zone area** on the river Vipava (Directive 92/43/EEC) and the **area of Natura 2000 → create favourable conditions for the life of fishes and other aquatic organisms → pathogens are a threat → disinfection!**
5. The river Vipava → **protected as a fishing zone and sport activities area (e.g. swimming, fishing,…) → pathogens are a threat → disinfection!**
6. The mayors of Nova Gorica, Miren-Kostanjevica and Renče-Vogrsko have signed **an agreement to encourage a development of tourism and sport activities** on the catchment area of the river Vipava → **bathing water quality for the river Vipava → disinfection!**
7. According to Urban Waste Water Treatment Directive 91/271/EGS (and the Slovenian legislation) → **outflow from a WWTP discharging directly (or in its tributaries) in a surface water body which is identified as bathing water zone → disinfection!**
8. All potential locations for the WWTP(s) → **on the impact area of the river Soča and the Adriatic Sea (Gulf of Trieste) → major holiday resorts (Gradež (IT), Tržič (IT), Koper (SI), Ankaran (SI), Debeli Rtič (SI),…) with areas of bathing water zones → disinfection!**
9. Regional spatial plan "Čistilna naprava ob Vrtojbici" → **the WWTP should be build on 29 500 m^2 → small footprint of the WWTP!**
10. Local Authorities Ordinance → **forbid the sludge storage at the site of the WWTP → technology with the lowest sludge production!**
11. According to the Slovenian legislation (7th Article of the Environmental Protect Act) **each intervention in the environment must be designed and implemented so that it causes a minimal environmental pollution → removal of nutrients (P and N), disinfection!**

Outflow parameters for the WWTP Nova Gorica

Parameter	As	Unit	WWTP size [PE]		
			2 000 – 10 000	**10 000 – 100 000**	100 000
TSS	-		60	**35**	35
NH_4	N	mg/l	10	**10**	10
COD	O_2	mg/l	125	**110**	100
BOD_5	O_2	mg/l	25	**20**	20
Total Nitrogen	N	mg/l			

Parameter	As	Unit	WWTP size [PE]		
			2 000 – 10 000	**10 000 – 100 000**	100 000
Total Nitrogen	N	mg/l	15	**15**	10
Percent of reduction for Total Nitrogen		%	70	**70**	80
Total Phosphorus	P	mg/l	2	**2**	1
Percent of reduction for Total Phosphorus		%	80	**80**	80

Parameter	Unit	Concentration	
		Inland	Costal
Intestinal enterococci	cfu/100 ml	**400**	200
Escherichia coli	cfu/100 ml	**1000**	500

Option analysis – water line technology

1. **Disinfection with chlorine → discarded due to cancerogenic, mutagenic and toxic by-products (TOX, AOX, THM,…)!**
2. **Disinfection with PAA → discarded due higher costs**

Classic active sludge tech.

SBR

Inflow → Mechanical tr. → Scrap

Mechanical tr. → SBR react. → Sludge tr. → Deh. Sludge

SBR react. → Tr. Water Tank → Filtration → UV Dis. → Outflow

Disinfectant	Costs [€/m³]
Chlorine (Cl_2, NaOCl, $Ca(OCl)_2$, ClO_2)	0.0160
Peracetic Acid (PAA)	0.0401
UV radiation	0.0171

MBR

Inflow → Mechanical tr. → Scrap

Mechanical tr. → Biolog. react. → Sludge tr. → Deh. Sludge

Biolog. react. → Filtration → Outflow

Mechanical tr. → Biolog. react. → Sett. Tank → Filtration → UV Dis. → Outflow

Biolog. react. → Sett. Tank

Sludge tr. → Deh. Sludge

Water line technology – costs & other benefits

Investment cots

MBR	SBR	Classic WWTP
15 330 000 €	15 940 000 €	15 892 000 €

Chosen water line technology

MBR

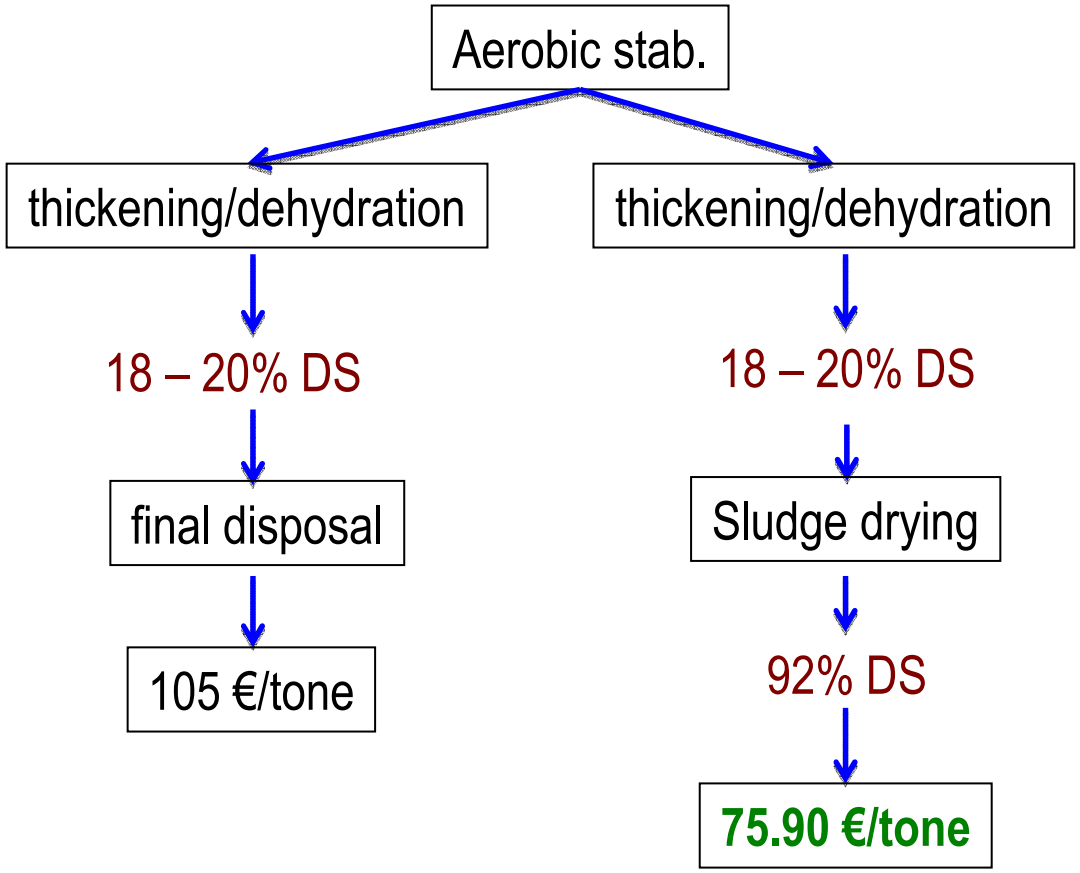
		- - - - - -
941 525 €/year	**864 838 €/year**	883 918 €/year

Other benefits

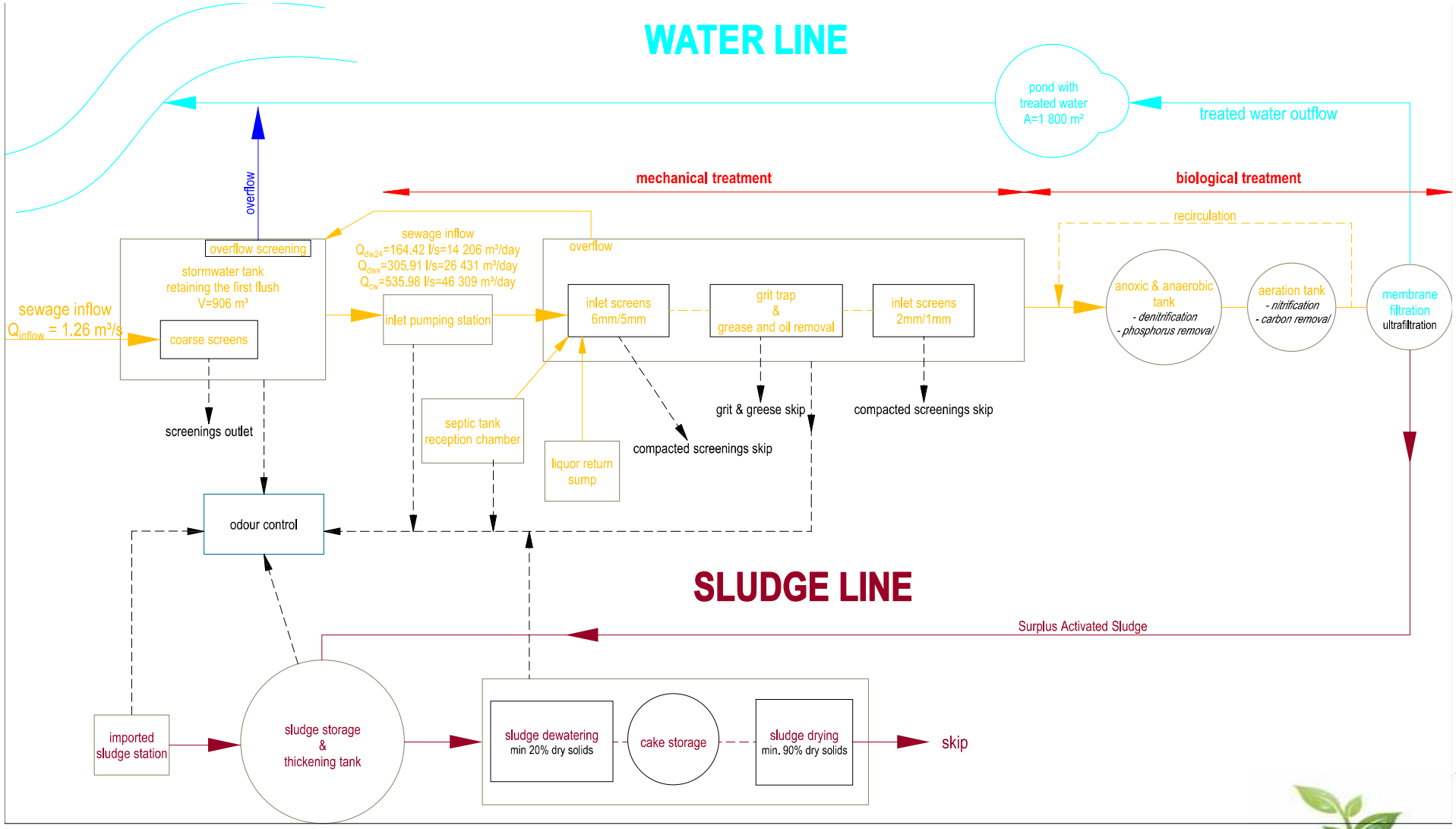
Higher operating safety and stability → **MBR**
Higher outflow quality → **MBR**
Smaller footprint → **MBR**
Lower sludge production → **MBR**
Increase of biological load with no structural interventions → **MBR**
Forthcoming (more strict) legislation ready → **MBR**

Option analysis – sludge treatment

1. Local Authorities Ordinance → **forbid the sludge storage at the site of the WWTP → technology with the lowest sludge production**!
2. Anaerobic stabilisation → **not cost effective for a so small WWTP**.



WWTP Nova Gorica – scheme



II. Financial aspect

Investment costs of the project

	Value in EUR	Eligible costs	Other costs
Wastewater Treatment Plant Nova Gorica			
Technological facility	13,830,000	13,830,000	0
External of WWTP	1,500,000	1,500,000	0
Municipal infrastructure for WWTP	2,864,000	2,864,000	0
Trial operation of WWTP	941,525	941,525	
Servicing part of storage	2,423,769	2,423,769	0
External regulation of storage service	600,000	600,000	0
TOTAL WWTP	22,159,294	22,159,294	0
Collector through Vrtojba			
Total collector	2,684,500	2,684,500	0
Sewerage network			
Municipality of Nova Gorica			
Total sewage network Municipality of Nova Gorica	2,780,000	2,780,000	0
Sewage network Šempeter - Vrtojba			
Total sewage networks municipality Šempeter - Vrtojba	2,930,000	2,930,000	0
Sewage network Miren - Kostanjevica			
Total sewage network municipality of Miren - Kostanjevica	6,440,000	6,440,000	0
TOTAL sewage network	12,150,000	12,150,000	0
TOTAL investments in WWTP and sewer system	36,993,794	36,993,794	0
Other costs			
Cost of the project, investment and contract documents	1,115,140	0	1,115,140
Unforeseen work	884,925	884,925	0
Control	665,888	665,888	0
Publicity	163,705	163,705	0
TOTAL other expenses	2,829,658	1,714,518	1,115,140
TOTAL total investment, excluding VAT	39,823,452	38,708,312	1,115,140
VAT	7,964,690	0	7,964,690

Investment costs of the project true the years

EUR

Element	The investment value	To 31.12.2009	2010	2011	2012	2013	2014	2015
Wastewater Treatment Plant Nova Gorica	21,217,769				10,608,885	10,608,884		
communal infrastructure for the WWTP	2,864,000				1,432,000	1,432,000		
Trial operation of WWTP	941,525						941,525	
Collector through Vrtojba	2,684,500				1,073,800	1,610,700		
Sewerage network	12,150,000				5,036,000	3,894,000	1,610,000	1,610,000
Nova Gorica	2,780,000				1668000	1,112,000		
Miren - Kostanjevica	6,440,000				1,610,000	1,610,000	1,610,000	1,610,000
Šempeter - Vrtojba	2,930,000				1,758,000	1,172,000		
TOTAL	***36,993,794***	0	0	0	16,718,685	16,113,584	2,551,525	1,610,000
Other costs								
Cost of the project,investment and contract documents	1,115,140	1,035,140	20,000	60,000				
Unforeseen work - 5%	884,925			0	377,090	346,835	80,500	80,500
Control - 1.8%	665,888			0	300,936	290,045	45,927	28,980
Publicity	163,705			0	50,000	30,000	30,000	53,705
TOTAL	***2,829,658***	1,035,140	20,000	60,000	728,026	666,880	156,427	163,185
TOTAL INVESTMENT COSTS	***39,823,452***	***1,035,140***	***20,000***	***60,000***	***17,446,711***	***16,780,464***	***2,707,952***	***1,773,185***

Existing and proposed new prices

The current price	*All municipalities (EUR)*
The current price Sewerage collection - waste water discharge	0.4063
The current price for wastewater treatment	0.0000
The current price for the extraction and purification	**0.4063**
VAT - 8.5%	**0.0345**
The current price for collection and treatment with VAT	**0.4408**

New price	*All municipalities (EUR)*
The current price Sewerage collection	0.4063
The current price for cleaning	0.0000
Cost of new investment (drainage)	0.3947
Costs of new investments (cleaning)	0.9371
New price of discharging without VAT	**0.8010**
The new price of cleaning without VAT	**0.9371**
New price of discharging with VAT	**0.8691**
New price of cleaning with VAT	**1.0168**

Affordability

The annual cost of water services per household after the investment (year 2015)	*Municipality of Nova Gorica*	*Municipality Šempeter - Vrtojba*	*Municipality Miren - Kostanjevica*
Dringing water	107.82	111.67	107.82
Sewerage collection	53.81	55.73	0.00
Wastewater treatment	0.00	0.00	0.00
Environmental tax on pollution caused by waste water discharges	0.00	0.00	0.00
Environmental tax for the use of abstracted water	14.24	14.75	14.24
Network access - the supply of drinking water (per connection)	23.94	23.94	23.94
The network charge - discharge of waste water (per connection)	24.68	24.68	24.68
Network access - the cleaning of waste water (per connection)	48.81	48.81	48.81
Additional costs - Sewerage collection	52.28	54.15	106.09
Additional costs - waste water treatment	124.12	128.55	124.12
TOTAL	449.69	462.27	449.69
8.5% VAT	38.22	39.29	38.22
Including VAT	487.92	501.57	487.92
% Of the cost of drinking water supply and waste water for households with average income	2.46%	2.53%	2.46%

Results of the financial analysis

With the help of community	
Financial net present value investment	-3,842,659 EUR
The financial internal rate of return	3.82%
Without the help of community	
Financial net present value investment	-29,307,798 EUR
The financial internal rate of return	-2.56%

Results of the economic analysis

Economic net present value of the investment	46,533,593 EUR
Economic internal rate of return	13.48%
The present value of benefits	107,285,156 EUR
The present value of costs	60,751,563 EUR
Profitability ratio	1.77

Sources of financing

Sources of Financing	*41,094,610*
Cohesion Fund	28,572,528
The state budget	5,042,210
The municipal budget	7,479,872