

# PROLINE-CE

## WORKPACKAGE T2, ACTIVITY T2.3

### IMPLEMENTATION OF BEST PRACTICES FOR WATER PROTECTION IN PILOT ACTIONS

#### D.T2.3.1 EVALUATION REPORTS FOR EACH PILOT ACTION

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**PILOT ACTION: PA2.1 Well field Dravlje valley in  
Ljubljana**

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Lead Institution	PP4 - University of Ljubljana
Contributor/s	See next page
Lead Author/s	Barbara Čenčur Curk
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Contributors, name and surname	Institution
Barbara Čenčur Curk	PP4 - University of Ljubljana, NTF
Jerca Praprotnik Kastelic	PP4 - University of Ljubljana, NTF
Anja Torkar	PP4 - University of Ljubljana, NTF
Primož Banovec	PP4 - University of Ljubljana, FGG
Ajda Cilenšek	PP4 - University of Ljubljana, FGG
Matej Cerk	PP4 - University of Ljubljana, FGG
Branka Bračič Železnik	PP5 - Public Water Utility JP VO-KA



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## 1. Introduction

Best management practices (hereinafter BMPs) for drinking water protection and management derived from T1 were reviewed and relevant BMPs were selected for particular pilot action. Implementation status of BMPs was verified in Pilot Actions (T2); in case of lacks identified, possibilities of improvement and implementation were also assessed. Drinking water protection and management and best practices are strategically implemented in the pilot actions, in order to achieve a function-oriented land-use based spatial management for water protection at the operational level. Measures and actions were analysed and proposed concerning mitigation of extremes and achieving a sustainable drinking water level. PROLINE-CE pilot actions reflect the broad range of possible conflicts regarding drinking water protection, such as: forest ecosystem service function; land-use planning conflicts; flooding issues; impact of climate change and land-use changes; demonstration of effectiveness of measures including ecosystem services and economic efficiency.

Review of main land use conflicts and BMPs on Pilot Action level has already been done in Pilot Action BMPs reports, which were a basis for *D.T2.1.2 Transnational case review of best management practices in pilot actions*. Description of natural characteristics of Pilot Site is presented in *D.T.1.4 Descriptive documentation of pilot actions and related issues*.

Activities within Pilot Action are described in *D.T2.2.2 Partner-specific Pilot Action documentation report*.

The Deliverable *D.T2.3.1 Evaluation reports for each pilot action* presents an evaluation of actual implementation and thematic interpretation of tested management practices as well as their acceptance among stakeholders and experts is carried out for pilot action PA2.1 Well field Dravlje valley in Ljubljana.

## 2. Evaluation of BMPs in Pilot Action

### 2.1. Implementation of BMPs

Implementation of BMP's in PA2.1 Well field Dravlje valley in Ljubljana is still evolving. Through discussion with stakeholders and experts about our pilot action's local problematics many GAP's and BMP's important in practice were identified. After previous study of the Legislations, implementation of BMP's in PA2.1 Well field Dravlje valley in Ljubljana will be strategically planned through further discussion with stakeholders, experts and political consultants in order to direct us and help us to truly implement new or upgraded legislations. Many BMP's are connected to modelling which is further described in the *D.T2.2.2* report.



Many stakeholders were already approached for discussion:

- a. *Institute of the Republic of Slovenia for Nature Conservation*
- b. *The Slovenian Forestry Institute*
- c. *City of Ljubljana - Department for Environmental Protection*
- d. *Ministry of the Environment and Spatial planning - Slovenian Environment agency*
- e. *Ministry of the Environment and Spatial planning - Slovenian water agency*
- f. *Hidrotehnik, water company d.d.*
- g. *The Ljubljana ZOO*
- h. *Slovenian motorway Network company (DARS)*
- i. *Snaga d.o.o. - Waste management service of Ljubljana manager of Tivoli, Rožnik and Siška hill Landscape Park*

Some stakeholders were not yet approached but will be in the near future (Chamber of Agriculture and Forestry of Slovenia).

For further exposure and evaluation of GAP's and BMP's, the issues discussed with listed stakeholders should be presented:

***Institute of the Republic of Slovenia for Nature Conservation*** exposed concern about none of suggested upgrades is taking action on Municipal spatial plan and security policies of natural values despite many suggestions and necessary yearly improvements. ***Snaga d.o.o.*** is therefore taking over management of the Ljubljana's city park Tivoli, Rožnik and Siška hill (TRŠ) and with guidelines set by City of Ljubljana - Department for Environmental Protection many actions and upgrades will therefore take place, including arrangement of thematic paths and view-points. At the meeting, we agreed that Snaga d.o.o. as the manager of TRŠ Landscape Park can inform, through its channels, the relevant stakeholders and local population about the placement of a new reserve water source for drinking water in the Dravlje valley area. In addition, we come to the conclusion that the forest in this area is mostly defined as a forest with a special purpose with emphasized social and ecological functions and that cooperation with the Slovenia Forest Service is necessary.

A great challenge and the main issue exposed by the Institute of the Republic of Slovenia for Nature Conservation present spreading of the invasive plants which cannot be limited. This issue was discussed also among other stakeholders, like foresters, motorway supervisors and environmental departments; for example, ***City of Ljubljana - Department for Environmental Protection*** cut invasive plants and implemented the pilot project of the production of paper and making promotional calendars from that paper (*Fallopia japonica*). Another exposed issue are spatial plans which are constantly changing and attached performed pressures of license re-issuing. They are aware of wrongly regulated water courses and streams which present flood risk, but this is priority of another



department - of **Slovenian Water Agency** which is a new body within the Ministry of the Environment and Spatial Planning, also water permit and water consents. The Agency highlights the problem of coordination of the annual plan with other stakeholders, for example with nature conservationists who require the definition of activity - it is difficult to foresee all annual activities, usually they adjust them constantly. Legislative acts are positively set, but the coordination of water-related sectors is problematic, as there is a lack of communication and cooperation among them. Sectors dealing with water are very scattered across different institutions (Slovenian Water Agency, The Slovenian Environment Agency ...). The problem is also in the approach, since everyone focuses on their own problems and does not generally look at improvements of the public interest (e.g. ecologists and nature conservationists are concerned with the protection of animal species and nature, which prevents regulation of watercourses - the habitats of protected species). The disagreement with foresters was pointed out, since they do not completely clean wood and residues after the logging, which is a problem in the fluidity of the streams and higher possibility of flooding.

The public utility service in the area of water management comprises the most important part of the **Hidrotehnik's** activities, since it is specialized in carrying out hydrotechnical works. The company obtained a concession from the Ministry of the Environment and Spatial Planning for the provision of public utility services in the basin of the middle Sava and Soča river basin. Our Pilot area lies in the middle Sava basin, therefore they manage river Glinščica as well. They tried to clean the Pržanec tributary, but unfortunately, because of the opposition of farmers on one side and the protected path - Trail of Remembrance and Comradeship, which would not survive heavy machinery, and was therefore impossible. Manual mowing of the banks is carried out downstream of the highway, but not upstream, so it would require regular sanitary work.

*In our Pilot Area most of the forest* locates in Ljubljana's city park Tivoli, Rožnik and Šišenski hill and within Polhograjski Dolomiti area. The main problem present constant conflicts among land owners, due to relatively small parcels with numerous private owners. According to this issue, limitation of Spatial plans by the municipalities borders and disharmonisation on State's level were mentioned by **Stakeholder the Slovenian Forestry Institute**. They also exposed the problem of aging of Slovenian forest, due to unregularly maintenance. Logging should take place in time of frozen ground, due to smaller erosion. Older forest is more vulnerable to extreme weather conditions and catastrophes - therefore climate changes. The research on climate change in Slovenia and monitoring the type of change and the consequences it may have on our climate is the under restriction of **Slovenian Environment Agency** is a body of the Ministry of the Environment and Spatial Planning. They explained different regional climate models and scenarios and gave the climate change projections data on our pilot action area with suggestions how to use given data in the groundwater and surface water modelling regarding the climate change. *Climate change also indicates the need for irrigation of agricultural land. In the Area there are few bigger farms, with intensive farming and pastures.*



*The Ljubljana ZOO* is operating for 70 years now and still has no connection to the public sewage system but is planned to be built later this year (2018). Their own treatment plant is very busy with operating restaurant for people and animals and 280.000 visitors per year. Torrental water running from hill Rožnik's banks through the ZOO is causing clogging of the runoff chanel and consequently flooding. Despite momental huge amount of water income, there is a lack of water for animal requirements and for irrigating plants for animals food. The ZOO is searching for solutions how to catch the torrential water and collect it in wider channels or ponds. With our knowledge they could arrange the water runaway with a charging reservoir for collecting water for the animals.

*Slovenian motorway Network company (DARS)* supervises the most busy part of Ljubljana's ring-road motorway crossing Kozarje (60.000 vehicles per day). The future plan for the highway is making a 6-pass road from existing 4-pass with construction starting on 2020. Plan includes new pumping stations on both sides of the motorway and a resting place for trucks on one side. All construction is located in the predicted DWPZ 3. On this part of the motorway there are several retention pools, oil trappers, dischargers and a treatment plant that purifies wastewater. Emptying and cleaning is carried out regularly and records are kept in DARS's archive. In times of flood, the construction retained the first water increase and later flooded them. Most of the results of waste water are in accordance with the regulation, except for spring samples, when salinity was slightly increased. In the legislations there is no limitation of salinity - chlorides.

From this discussions many new GAPs and BMPs were identified and are overviewed in Table 1: Added GAPs after stakeholder involvement are written in red and previously recognized GAPs are written in black. All are connected to a certain stakeholder or stakeholders.

**Table 1: Added GAPs after stakeholder involvement are written in red and previously recognized GAPs are written in black. All are connected to a certain stakeholder or stakeholders.**

Topic	Identified GAP	Measure	Stakeholder
Land use management	Agriculture: inflexible time ban of fertilizers and manure application	Redefinition of time ban of fertilizers and manure application	Chamber of Agriculture and Forestry of Slovenia
	Abandoning private forests, aging of forests and with it exposing vulnerable forests to natural disasters	Forestry subsidies and encouraging foresters to younger their forests	The Slovenian Forestry Institute



Non-structural flood mitigation	Legalization of illegal construction on flood areas	To prevent legalization of construction on flood areas	→	Ministry of the Environment and Spatial planning - Slovenian water agency
	Surface water intrusion in the well	Sealed wells heads	→	Ministry of the Environment and Spatial planning - Slovenian water agency,
	Pollution sources in flood prone areas are not known / identified	Register of existing and potential point pollution sources		City of Ljubljana - Department for Environmental Protection
	River banks vegetation is not maintained	Reducing river banks vegetation	→	The Slovenian Forestry Institute, Ministry of the Environment and Spatial planning - Slovenian water agency, Hidrotehnik, water company d.d.
	Torrential water flooding - excessive surface runoff, lack of water for animals and watering plants	Development of retention capacities as part of sustainable drainage systems (green infrastructure)		Ljubljana ZOO
Drinking Water sources protection	Unarranged road rainwater discharge	Collection and treatment of road rainwater discharge, particularly within drinking water protection areas	→	Slovenian motorway Network company (DARS)
	Individualistic (Non-Sectoral) approach to common problematics regarding protection of drinking water resources	Joined and integrated management of drinking water resources (horizontal and vertical co-operation)	→	All
	Lack and not effective control over Implementation of DWPZ restrictions	Strict implementation and inspection of DWPZ restrictions	→	Ministry of the Environment and Spatial planning - Slovenian water agency
	DWPZ areas are not determined - problem of spatial planning	With modeling DWPZ areas will be determined	→	City of Ljubljana - Department for Environmental Protection
	In the legislations there is no limitation of road runoff water salinity	Define limitation of salinity of road water run-off and further incorporation into Decree	→	Slovenian motorway Network company (DARS)





## 2.2. Acceptance of BMPs among stakeholders

Since GAP's and BMP's important in practice were identified through stakeholder workshops and individual discussion with each stakeholder and experts, their support and contribution are expected.

Further implementation of BMP's in PA2.1 Well field Dravlje valley in Ljubljana will be strategically planned through further discussion with stakeholders and with cooperation of a social scientist and a spatial planner in order to direct us and help us to truly implement new or upgraded legislations.

## 2.3. Overview table about implementation of BMPs in Pilot Action and their acceptance among stakeholders

**Table 2: GAPS and proposed BMPs with recommendations for implementation in Pilot Action.**

<b>Actual management practice (GAP)</b>		Agriculture: inflexible time ban of fertilizers and manure application	Abandoning private forests, aging of forests and with it exposing vulnerable forests to natural disasters
<b>Proposed BMP</b>		<b>Redefinition of time ban of fertilizers and manure application</b>	<b>Forestry subsidies and encouraging foresters to younger their forests</b>
<b>Proposed solutions and recommendations</b>	<b>adaptation of existing land use management practices</b>	Since vegetation activity depends on current weather conditions, the period of restrictions should be redefined according to the weather condition instead of calendar date. If vegetation is not active, the N-compounds pass through soil directly into the groundwater.	Aging of Slovenian forest, due to unregularly maintenance is problematical, since older forest is more vulnerable to extreme weather conditions and catastrophes. Logging should take place in time of frozen ground, due to smaller erosion.
	<b>Adaptation of existing flood/drought management practices</b>	Inappropriate fertilization management affecting groundwater and surface waters could cause pollution by transportation of pollutants during floods.	The foresters do not completely clean wood and residues after the logging, which is a problem in the fluidity of the streams in case of floods.
	<b>Adaptation of policy guidelines</b>	The Slovenian Environment Agency yearly produces the agronomic prediction according to the weather forecast but is more as a recommendation and	Most of the forest in the PA locates in two nature parks: Nature park Tivoli, Rožnik and Šišenski hill and also the natural park Polhograjski Dolomiti. In



		not as an obligation with determined exact date of fertilizing period.	these parks activities are limited according to Ordinance for each Nature park in order to protect nature but there are no directives for maintaining the safety of the forest and their visitors, even sanitary cutting needs authority's agreement.
<b>IMPLEMENTATION</b>		<b>No</b>	<b>No</b>
In case of NO:	• <b>possibility of implementation</b>	With sufficient political will and farmers support implementation would be possible.	Concessionaires (Snaga d.o.o.) are taking over management of the TRŠ park and therefore policies of the Park will be upgraded, and many actions will take place since the Parks budget will increase according to the Municipalities promises.
	• <b>proposal of procedure for implementation</b>	Increasing of environmental awareness of local farmers and to upgrade legislations with political consultants advice.	Snaga d.o.o. already started to inform and aware relevant stakeholders; local farmers and residents through meetings.
	• <b>other (please, specify)</b>	/	/
<b>ACCEPTANCE AMONG STAKEHOLDERS AND EXPERTS</b>			
	• <b>possibility of implementation</b>	The Slovenian Environment Agency agronomic prediction according to the weather forecast but is more as a recommendation Expected limitations are lack of political will and resistance of local farmers.	Implementation depends on the budget of the Park. The main problem presents many private owners of relatively small parcels, hence constant conflicts among them.
	• <b>proposal of procedure for implementation</b>	Workshops and seminars for local farmers would improve awareness and perhaps reduce polluting their local groundwater source.	The upgrade of the Park's policies in the direction of rejuvenating and regularly maintaining the forest.
	• <b>other (please, specify)</b>	/	/



Actual management practice (GAP)		Water balance status and effective mitigation measures are not known (identified)
Proposed BMP		Identification of problematic locations and possible solutions is done by modelling.
Proposed solutions and recommendations	adaptation of existing land use management practices	Not relevant
	Adaptation of existing flood/drought management practices	A Hydrologic model is a simplification of a real-world system (e.g., surface water, groundwater) that aids in understanding, predicting, and managing water resources. Hydrological/hydraulic models are developed to analyse, understand, and explore solutions for sustainable water management, in order to support decision makers and operational water managers. Hydrological models also allow us to do scenario analysis.
	Adaptation of policy guidelines	Flood risk map as an adaptation of evaluation of parcels included in Municipal spatial planning.
<b>IMPLEMENTATION</b>		
In case of NO:	<ul style="list-style-type: none"> <li>possibility of implementation</li> </ul>	The stakeholders generally fully accept the implementation of water balance model. The modelling to certain extent required by national legislation, but precise method is not defined.
	<ul style="list-style-type: none"> <li>proposal of procedure for implementation</li> </ul>	Existing modelling approach - models developed by local communities and investors should be changed as they do not provide river basin scale models (they are usually limited by the municipal borders).
	<ul style="list-style-type: none"> <li>other (please, specify)</li> </ul>	The scale and standardized approach to modelling is not defined different models are used (1D, 1D-2D, 2D for hydraulics), and different for hydrological modelling 1D, 2D, distributed, method for the integration of urban drainage is not defined.
<b>ACCEPTANCE AMONG STAKEHOLDERS AND EXPERTS</b>		
	<ul style="list-style-type: none"> <li>possibility of implementation</li> </ul>	Stakeholders agree on the importance of the harmonized river basin scale hydrological and hydraulic modelling providing good information on water balance. Nevertheless, existing legislation, but also specific bottlenecks (human resources, financial resources) do not provide easy solutions.
	<ul style="list-style-type: none"> <li>proposal of procedure for implementation</li> </ul>	Change in legislation should define better the institution in charge of river basin scale models instead of municipality base models.
	<ul style="list-style-type: none"> <li>other (please, specify)</li> </ul>	/



<b>Actual management practice (GAP)</b>		Legalization of illegal construction on flood areas	Surface water intrusion in the well
<b>Proposed BMP</b>		<b>To prevent legalization of construction on flood areas</b>	<b>Sealed wells heads</b>
<b>Proposed solutions and recommendations</b>	<b>adaptation of existing land use management practices</b>	Parcels evaluation of flood risk should not be taken only as a recommendation but for a regulation, never the less it is a mandatory requirement for buildings permit. Therefore, construction on such areas is illegal and should be penalized.	Wells heads should be constructed as sealed in a way to prevent the surface water intrusion in the well during the flood event.
	<b>Adaptation of existing flood/drought management practices</b>	Illegal construction on areas evaluated with flood risk should not be legalized and should bear the consequences of floods or financial consequences of flood protection constructions.	Many water supply wells are on flood-prone plains, so the wells heads should be constructed as sealed.
	<b>Adaptation of policy guidelines</b>	Improvement of ineffective control or higher penalties from state authority on illegal construction (legislation implementation problem).	Amendment to the data specification relative to standards of construction on flood prone zones (proposed amendment to existing Decree on conditions and limitations for constructions and activities on flood risk areas 89/08).
<b>IMPLEMENTATION</b>		No	Currently these measures are recognized as necessary in Slovenia, because they are not implemented
<b>In case of NO:</b>	<ul style="list-style-type: none"> <li>• <b>possibility of implementation</b></li> </ul>	Strict implementation of construction inhibition on floodplains considering flood hazard map is possible with Municipalities support.	The information on the type of the well (sealed) should be emended to the data specification according to INSPIRE directive and reported in the national database of public service providers.
	<ul style="list-style-type: none"> <li>• <b>proposal of procedure for implementation</b></li> </ul>	After agreement with stakeholders (Ministry of the Environment and Spatial planning - Slovenian Environment & Slovenian water agency) this legislation proposal about flood risk evaluation of	Recommendations on the level of strategic guidelines resulting from the PROLINE-CE project, implementation on the level of national legislation requesting obligatory sealed well heads for the water



		parcels included in municipal spatial planning will be discussed among departments how to implement this legislation and propose an approach of solving this problem.	supply wells on flood prone areas.
	• <b>other (please, specify)</b>	Strict implementation of construction inhibition on floodplains considering flood hazard map.	/
<b>ACCEPTANCE AMONG STAKEHOLDERS AND EXPERTS</b>			
	• <b>possibility of implementation</b>	Despite strict legislations usually corruption at municipalities or at planning companies make such acts possible, therefore implementation and realisation present a challenge.	/
	• <b>proposal of procedure for implementation</b>	Stakeholders (Ministry of the Environment and Spatial planning - Slovenian Environment & Slovenian water agency) support us and will suggest how to approach solving this problem.	Communication with the Geodetic Administration of the Republic of Slovenia regarding the amendment to INSPIRE directive standards in the field of groundwater data.
	• <b>other (please, specify)</b>	Flooding of constructions in floodplains due to noncompliance of the legislation and large material damage are now Municipalites problem.	Awareness rising and education process on this risk and potential measure as the number of stakeholders (only Water Utilities) is relatively limited.

<b>Actual management practice (GAP)</b>		Pollution sources in flood prone areas are not known / identified	River banks vegetation is not maintained
<b>Proposed BMP</b>		<b>Register of existing and potential point pollution sources</b>	<b>Reducing river banks vegetation</b>
<b>Proposed solutions and recommendations</b>	<b>adaptation of existing land use management practices</b>	Some of the potential pollution sources are known (especially industrial establishments under Seveso Directive), but there is among others no registry of	Spreading of invasive plants cannot be limited. The most problematic plants are <i>Ambrosia</i> and <i>Japanese Knotweed (Fallopia japonica)</i> .



		some other pollution sources (i.e. heating oil tanks in households), which are still quite common in Slovenia. Also, storage of large quantities of hazardous materials on flood prone zones is not regulated.	Ambrosia is declared to remove with a Decree while Japanese Knotweed is only advised to remove, both in the periods until blooming (August/September) to reduce the spreading. Ambrosia is prescribed to spray with applications to slower the spreading but with only cutting, it is still not sufficiently removed. Some of the stakeholders will try to remove Ambrosia with steam devices which is a new technic and more sufficient. Japanese knotweed is removed by cutting but the only sufficient way to permanently remove the plant is to dig it out with its roots.
	<b>Adaptation of existing flood/drought management practices</b>	Some non-SEVESO and non - IED facilities are handling nevertheless significant amounts of polluting substances on flood prone areas. This includes also households storing small amount of chemicals, and especially heating oil tanks, that might leak during the flood event.	River banks vegetation prevents accessibility of rivers / streams and with it cleaning the stream bed. Fluidity of the streams is reduced with the residues after the logging, which presents a great issue in time of high water and floods.
	<b>Adaptation of policy guidelines</b>	Potential pollution sources are exceeding current requirements of national legislation (Slovenia: Environmental protection act O.G. 39/2006) and EU requirements SEVESO Directive, IED Directive 2010, E-PRTR Register.  Proposed amendment to existing Decree on conditions and limitations for constructions and activities on flood risk areas 89/08 - activities of storage activity on flood prone zones.	Similar Decree as on Ambrosia ( Ambrosia should be Decree on measures to suppress harmful plants of genus Ambrosia (Uradni list RS, št. 63/10) should be accepted also on Japanese Knotweed. The fees for not cutting river bank vegetations should increase.
<b>IMPLEMENTATION</b>		Currently these measures are recognized as necessary in	No



		Slovenia, because they are not implemented	
In case of NO:	<ul style="list-style-type: none"> <li>• <b>possibility of implementation</b></li> </ul>	<p>Possibility for implementation are medium. Information on some pollution /sources could originate from:</p> <p>a) Formalized procedures relative to chimney sweepers identifying the location and status of devices (and tanks)</p> <p>b) Identification of stores and storage facilities with hazardous substances.</p>	<p>Interest into implementation was shown among many stakeholders and therefore has potential for implementation but it may take some time to process the procedure.</p>
	<ul style="list-style-type: none"> <li>• <b>proposal of procedure for implementation</b></li> </ul>	<p>To adopt and enforce legislation enabling access to data and reporting on the amount of stored hazardous substances on flood prone areas. Maintenance of the dataset. After the identification it is important to raise awareness and provide measures leading to improvements.</p>	/
	<ul style="list-style-type: none"> <li>• <b>other (please, specify)</b></li> </ul>	/	/
ACCEPTANCE AMONG STAKEHOLDERS AND EXPERTS			
In case of YES	<ul style="list-style-type: none"> <li>• <b>possibility of implementation</b></li> </ul>	<p>Data collection, data validation and maintenance, legal framework for the data collection present a challenge.</p>	<p>The stakeholders are aware of this problematic and are trying to solve it each in their own way, therefore they will support implementation of legislations.</p>
	<ul style="list-style-type: none"> <li>• <b>proposal of procedure for implementation</b></li> </ul>	<p>Communication with the Slovenian Water Agency regarding the added information on potential storage of hazardous substances (as activity) in Water Management Information System.</p>	/
	<ul style="list-style-type: none"> <li>• <b>other (please, specify)</b></li> </ul>	<p>Aggregated list of all potential point pollution sources (industry, heating oil tanks in households, etc.) is needed for efficient incident management</p>	<p>Slovenian motorway Network company (DARS) is trying to remove ambrosia with steam devices. City of Ljubljana - Department for Environmental</p>



		in case of flood event	Protection implemented the pilot project of production the paper from Japanese Knotweed and did the promotional calendars from that paper.
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<b>Actual management practice (GAP)</b>		Torrential water flooding while there is lack of water for the animals and watering the plants
<b>Proposed BMP</b>		<b>Development of retention capacities as part of sustainable drainage systems (green infrastructure)</b>
<b>Proposed solutions and recommendations</b>	<b>adaptation of existing land use management practices</b>	Development of small retention measures, with water retention for different users.  Potential users: watering of green infrastructure, climate impact on the city level, water for biodiversity, water for animals in the city. Improved fire protection for more resilient city.
	<b>Adaptation of existing flood/drought management practices</b>	Aim of the improved retention measure: torrential waters running from the Rožnik hill are causing flooding and erosion problems.
	<b>Adaptation of policy guidelines</b>	Existing policy and regulation measures do not address necessity for gradual multi-use improvements of existing drainage systems.  Strategic development of new policy framework addressing complex climate change adaptation process is necessary.
<b>IMPLEMENTATION</b>		<b>Currently these measures are recognized as necessary in Slovenia, because they are not implemented</b>
<b>In case of NO:</b>	• <b>possibility of implementation</b>	Currently low possibilities for implementation. There is no national discussion on sustainable drainage systems.  Development of regulation and indicator system for the identification of objectives of water retention and reuse municipalities should achieve.
	• <b>proposal of procedure for implementation</b>	Development of regulation on water wise cities on national level as a part of climate change adaptation procedures.  Integration of water wise concept on the level of city planning with overall water balance management as one of the component of spatial planning process.
	• <b>other (please, specify)</b>	/
<b>ACCEPTANCE AMONG STAKEHOLDERS AND EXPERTS</b>		





	<ul style="list-style-type: none"> <li>• <b>possibility of implementation</b></li> </ul>	<p>An initiative was launched and Ljubljana as Green Capital of Europe 2016 is considering it as one of the development potentials.</p> <p>No communication on higher (regulatory) level yet, due to the election procedure and re-organization of the ministries.</p>
	<ul style="list-style-type: none"> <li>• <b>proposal of procedure for implementation</b></li> </ul>	<p>Communication with the stakeholders: state level - Ministry of Environment and Spatial Planning (general regulatory framework) and the City Municipality of Ljubljana (implementation framework).</p>
	<ul style="list-style-type: none"> <li>• <b>other (please, specify)</b></li> </ul>	<p>Overall awareness rising as retention measures have significant spill-over effect, in order to motivate the communities towards its implementation. Retention measures should address the issue of IAS and mosquito control as well.</p>

<b>Actual management practice (GAP)</b>		Unarranged road rainwater discharge	Individualistic (Non-Sectoral) approach to common problematics regarding protection of drinking water resources
<b>Proposed BMP</b>		<b>Collection and treatment of road rainwater discharge, particularly within drinking water protection areas</b>	<b>Joined and integrated management of drinking water resources (horizontal and vertical co-operation)</b>
<b>Proposed solutions and recommendations</b>	<b>adaptation of existing land use management practices</b>	<p>Road rainwater discharge (and main roads rainwater drainage and retention ponds with treatment) must be controlled and regularly maintained for all roads and motorways.</p> <p>Furthermore, road rainwater should not run through public sewage system.</p>	<p>Ministries, experts and public independently approach to common problematics, such as drinking water resources protection, instead of combining their knowledge and experiences to find unified and optimal solutions. Therefore, more communication and cooperation is needed horizontally (inside ministries, among ministries, among experts, etc.) and vertically (panel discussions/round tables with experts and governmental bodies). More interactions (discussions, negotiations, finding solutions for sectors on which drinking water protection measures affect (trying to find win-win</p>



			situations)) are needed for achieving the main goal - drinking water protection.
	<b>Adaptation of existing flood/drought management practices</b>	Undesirable liquids such as mineral oils or other chemicals can be rinsed from the road into the groundwater and can consequently result in pollution of the drinking water source. Therefore, controlled and regularly maintained road rainwater discharge is necessary for all roads and motorways.	/
	<b>Adaptation of policy guidelines</b>	Adaptation of road management policy for road rainwater to run through separate system and not through public sewage system.	/
<b>IMPLEMENTATION</b>		No	No
<b>In case of NO:</b>	<ul style="list-style-type: none"> <li>• <b>possibility of implementation</b></li> </ul>	Hopefully our political consultants will have good advice on its implementation to change construction legislations.	Realistically there are low possibilities of this drastic change in work organisation.
	<ul style="list-style-type: none"> <li>• <b>proposal of procedure for implementation</b></li> </ul>	Separate drainage system should already be included into road planning.	Water sectors should be reunited into one organisation and clearly separate their duties about drinking water resources protection issues.
	<ul style="list-style-type: none"> <li>• <b>other (please, specify)</b></li> </ul>	/	/
<b>ACCEPTANCE AMONG STAKEHOLDERS AND EXPERTS</b>			
	<ul style="list-style-type: none"> <li>• <b>possibility of implementation</b></li> </ul>	/	/
	<ul style="list-style-type: none"> <li>• <b>proposal of procedure for implementation</b></li> </ul>	/	/
	<ul style="list-style-type: none"> <li>• <b>other (please, specify)</b></li> </ul>	On motorways and main roads rainwater drainage and retention ponds with treatment are arranged but the infrastructure is not maintained.	/



<b>Actual management practice (GAP)</b>		Lack and not effective control over Implementation of DWPZ restrictions	DWPZ areas are not determined - problem of spatial planning
<b>Proposed BMP</b>		<b>Strict implementation and inspection of DWPZ restrictions</b>	<b>With modelling DWPZ areas were determined</b>
<b>Proposed solutions and recommendations</b>	<b>adaptation of existing land use management practices</b>	It is prohibited to carry out activities in the catchment area that could endanger the ground water quality, such as: the disposal of waste, the storage of dangerous substances, the use of pesticides and fertilizers, salting undrained surfaces like yards and gravel roads, vehicle maintenance and parking of construction machinery, except in the case of activities for the public supply of drinking water. Hence well directed restrictions for DWPZ area there is no inspection and no control over its implementation.	DWPZ areas were determined with modelling and will be proposed to include in the Spatial plan of the Municipality of Ljubljana. In current Spatial plan there is only reserved area for planned Water field without surrounding protected areas with restrictions. The restrictions should already be applied, such as: construction of buildings is prohibited, no waste disposal, no storages of dangerous substances, prohibition of use of pesticides and fertilizers, salting undrained surfaces like yards and gravel roads, etc.
	<b>Adaptation of existing flood/drought management practices</b>	In case of floods in the area of DWPZ surface waters and groundwater could cause pollution by transportation of pollutants.	Glinščica stream is already regulated practically in its entire length. The riverbed is made from concrete and there are concrete panels on some parts of the bank. The planned water field is not endangered with flooding but the surrounding area is.
	<b>Adaptation of policy guidelines</b>	Implementation should be supervised by inspectors of the Ministry of Agriculture, Forestry and Food.	/
<b>IMPLEMENTATION</b>		No	No
<b>In case of NO:</b>	• <b>possibility of implementation</b>	With Ministries (of the environment and planning) support and guaranteed budget the proposal would be feasible.	/
	• <b>proposal of procedure for implementation</b>	Ministry of the environment and spatial planning should assign supervisors to control locals and	/



		local farmers and their acts in DWPZs.	
	• other (please, specify)	Workshops and informational system about DWPZ areas restrictions should be upgraded among locals.	/
<b>ACCEPTANCE AMONG STAKEHOLDERS AND EXPERTS</b>			
	• possibility of implementation		Implementation is feasible.
	• proposal of procedure for implementation	Good effects on activities in the DWPZs are Agricultural Advisory Services encourage farmers to organic farming without pesticides and fertilizers. Because of smaller harvest, farmers get money compensations.	Water sector will be approached to form documents for the Spatial plan of the Municipality of Ljubljana.
	• other (please, specify)	/	/

<b>Actual management practice (GAP)</b>		No limitation of road runoff water salinity
<b>Proposed BMP</b>		<b>Define limitation of salinity of road water run-off</b>
<b>Proposed solutions and recommendations</b>	<b>adaptation of existing land use management practices</b>	In the narrowest area of water protection zones regulations are prescribed. It is prohibited to carry out activities in the catchment area that could endanger the ground water quality, among others also salting of undrained surfaces like yards and gravel roads is prohibited. Salting of roads and motorway cannot be prohibited, but the salinity of roadwater discharge should be limited.
	<b>Adaptation of existing flood/drought management practices</b>	/
	<b>Adaptation of policy guidelines</b>	Upgrade on the Decree on the emission of substances in the discharge of meteoric water from public roads.
<b>IMPLEMENTATION</b>		No
<b>In case of NO:</b>	• possibility of implementation	Procedure of the implementation will be suggested from our political consultants.
	• proposal of procedure for implementation	/



	• other (please, specify)	/
<b>ACCEPTANCE AMONG STAKEHOLDERS AND EXPERTS</b>		
	• possibility of implementation	/
	• proposal of procedure for implementation	/
	• other (please, specify)	/



### 3. Conclusions

The implementation of legislations is a delicate procedure which takes time and needs a correct approach. Further implementation of BMP's in PA2.1 Well field Dravlje valley in Ljubljana will be strategically planned through further discussion with stakeholders and with cooperation of a social scientist and a spatial planner in order to enable final implementation of measures. Many BMP's are connected to modelling which is further described in the D.T2.2.2 report. The results and proposals for implementation will be further explained in the next Project packages: “WPT3 - *Ecosystem Services*” and “WPT4 - *DriFLU - Drinking Water/Floods/Land-Use-Charta*”.

### 4. References

- ARSO, 2018. Slovenian Environmental Agency. Available at: <http://www.arso.gov.si/en/about%20the%20agency/>
- Hidrotehnik, 2018. Hidrotehnik, d.d. Available at: <http://www.hidrotehnik.si/podjetje/o-nas>
- DRSV, 2018. Slovenian Water Agency. Available at: <http://www.dv.gov.si/en/>