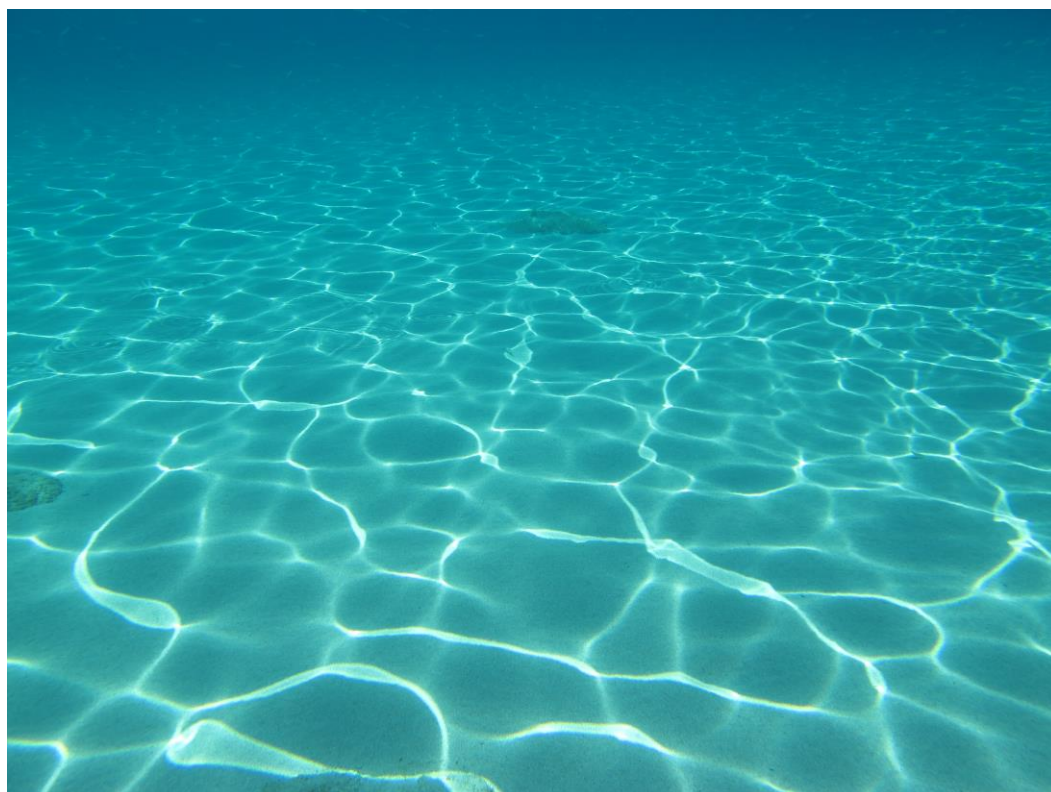




Strategic environmental assessment

SUMMARY

River Basin Management Plan (2016 - 2021)



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1 STATE OF ENVIROMENT AND IMPACT ASSESSMENT

1.1 Physical planning

Construction of wastewater treatment plants is a delicate and important task of any urban agglomeration and settlement. In Croatia, there are considerable differences in the level of coverage of drainage systems between the counties, particularly among the cities and municipalities. A larger share of the population covered by the services of public sewage and wastewater treatment plants is characterized by settlement with larger population. Urban planning documentation at county level, to a great extent determines that the wastewater treatment should be dealt with comprehensively. It also determines the upgrade and modernization of existing as well as construction of new drainage system and waste water treatment plants.

1.2 Biological diversity and protected areas of nature

In terms of biodiversity, Croatia is one of the richest countries in Europe. This is due to its specific geographic location, which includes both the Mediterranean region and the Central European continental area. Also, due to its specific position, i.e. relief features and specificities, Croatia can be distinguished by great diversity of the habitat types, many of which are rare and endangered. Among the rare and endangered habitats there is a large number of coastal, aquatic and wetland habitats, important for endangered and protected species. Croatia is also specific for the numerous endemic species which make up almost 2.7% of the total number of known wild species in the country. Areas with high biodiversity are recognized and protected by the law as protected areas of nature and/or included in the ecological network. Many of these areas are dependent on the water status and the water management (i.e. protected areas and the ecological network sites where water status and water management represents the essential element of their protection).

Since the ecosystems, habitats and species that depend on the water status and water management are known as especially sensitive and vulnerable, River Basin Management Plan (RBMP) has potentially large impact on biodiversity and protected areas in Croatia. Most well-known environmental problems for biodiversity, and consequently for the protected areas features, are recognized as directly or indirectly important for RBMP. The latest Environmental Status Report (2014) and the State of Nature Report (2014) emphasize loss and degradation of habitats and natural ecosystems as the most important cause of threats to biodiversity. The regulation of watercourses and changes in the water regime or water usage and associated infrastructure, are the major threats to all habitat types dependent on water, such as river shoals, sand and muddy river banks, marshes, wetlands, underground habitats, karst watercourses with travertine communities and travertine barriers, wet grasslands and riparian forests. Floods are an integral and therefore inevitable part of nature, which plays a key role in the ecosystem functioning and provides a crucial support for sustainable development. These processes are of particular importance for the karst ecosystems. The impacts of increased marine and river traffic are reflected in increased noise, subsequent disturbance of animal species, and also pollution, which could make the surrounding habitats unfavourable for wildlife. Also, the traffic can obstruct migration of animals and availability of natural resources and promote the spread of invasive species. Uncontrolled use of biological resources (e.g. fisheries) and pollution are also among the most negative impacts. Due to pollution, wetland habitats, such as bogs, and subterranean habitats and species are especially vulnerable. One of the major sources of pollution is agricultural areas, where nitrates, pesticides and other pollutants come into the water bodies as the result of runoff. Other identified problems and pressures that may adversely affect biodiversity, which are important for RBMP, include: construction of the municipal infrastructure, aquaculture, disturbance of wildlife, invasive species, climate change and energetics.

Measures that are proposed by RBMP are mostly administrative and are dealing with: better regulation and enforcement of water services, transparent management, definition of better management and methodology criteria (assessment of the water status), regulation of the monitoring programs, regulation of water abstraction, control of the

pollution sources, etc. The implementation of such measures may have a long-term, moderate to significant positive impact on biodiversity and protected areas, in terms of conservation of species and habitats associated primarily with the aquatic ecosystems. This shall be accomplished through the rational use of water resources and improvement of water bodies' status. Regulatory and administrative measures usually act indirectly or secondary, and synergistically. On the other hand, implementation measures often have a direct impact on biodiversity and protected areas, that are often significantly positive (e.g. implementation measures to control sources of pollution, implementation measures to reduce and mitigate the impact of the hydromorphological load etc.). Flood risk management, administrative and implementation measures are significantly positive, as they will reduce flood risk areas by encouraging the protection and conservation of natural retention and wetland areas.

Implementation of the measures that include construction of various projects (e.g. construction or improvement of various public water supply and public sewerage systems, revitalization projects, etc.) may result in adverse, locally limited, impact on biodiversity and protected areas during the construction phase (e.g., temporary disturbance of animal species, permanent and / or temporary habitat loss, spread of invasive alien species). This could have effect on species and habitats that are associated with aquatic ecosystems, but also the surrounding terrestrial ecosystems in the wider project area. These negative impacts, if any, can be avoided or mitigated in the pre-construction phase of each project by specifying the measures in the environmental impact assessment (EIA) and / or nature impact assessment (NIA), therefore making them acceptable at the level of impact analysis for RBMP. A more detailed analysis of the direct impacts, with regard to spatial distribution of specific projects, will be possible through the procedures of strategic environmental assessment (SEA) of spatial plans and / or water management plans. Also, in order to avoid potential negative impacts and / or in order to further contribute to improving the ecological conditions for the species and habitats (biodiversity) depending on the water status and management, it is necessary to take into account the measures related to the better-defined administrative implementation. For example, plans at lower level of water management hierarchy, where necessary, should provide measures to protect the biological diversity (endangered and rare species and habitats) and protected areas of nature. Also, during the preparation of plans / projects the investor should consult appropriate experts in the field of nature and / or the Croatian Agency for the Environment and Nature.

In order to RBMP to be compliant with the Draft of Strategy and Action Plan for the Protection of Biological and Landscape Diversity of the Republic of Croatia (2015), and to contribute more to better conservation of biodiversity, protected areas of nature and the target species and habitats (i.e. the integrity of the ecological network) through good water status, it is recommended to amend the RBMP. The implementation of the closer intersectoral collaboration mechanisms, faster information exchange and research of nature conservation interest, as well as implementation of the "ecosystem services" concept in defining the revitalization and / or renaturation and flood risk management

(e.g. retention areas) programs, should lead to the altogether better water status, which is withal the goal of this RBMP.

Given all of above, RBMP is, with the implementation of the proposed measures, considered as acceptable at the SEA level, with mostly positive impacts on biodiversity and protected areas of nature.

1.3 Areas of special water protection

In order to increase the level of protection for surface and ground waters, as well as unique and valuable water-dependent ecosystems, areas of special water protection proclaimed: water intended for human consumption or reserved this use in the future, waters capable of supporting freshwater fish and water suitable for shellfish, areas for bathing and recreation, sensitive areas, basins of sensitive areas, areas susceptible to nitrate pollution of agricultural origin, vulnerable areas, areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection. These areas are particularly vulnerable to induced pollution that come as a result of human activity, from point source and scattered pollution.

Implementation of the RBMP will have direct influence for water quality improvement and following measures will enable more efficient protection of these areas. Due to increase of eutrophication in Danube River Basin, whole area is declared as sensitive. There is also a higher number of vulnerable areas. Adriatic River Basin is less exposed to floods and has smaller proportion of potential pollutants. Proposed measures within RBMP which will lead to better control of scattered pollution sources from agricultural area, as well as measures for reduced pollution from wastewaters, will lead to improvement of water, especially in sensitive and vulnerable areas.

According to Flood risk management plan large number of protection and regulation structures should be built. That can have both positive and negative impact on areas of special water protection. Possible negative impact is related to areas designated for protection of habitats or species, which is explained in previous chapters (protected areas of nature and ecological network). On the other side, there will be positive impact due to decreased flood risk within areas that are defined as areas of higher pollutant emission (agricultural areas, unauthorised dumps...).

In conclusion, RBMP for period from 2016. to 2021. will generally have positive effect on areas of special water protection and therefore contribute to their further protection.

1.4 Landscape

Implementation of the Plan could generally cause two types of impacts on the landscape: (I) impact on the physical structure of the landscape that occurs due to changes in land cover and natural morphology of the terrain, and (II) impact on the appearance and perception of the landscape that occurs due to the aforementioned changes.

These impacts can be of a dual character: (A) positive impacts may occur due to implementation of measures for control and reduction of hydromorphological load (existing and new). This especially refers to the measure for revitalization / renaturation of water bodies. It implies mitigation of hydromorphological degradation, with the objective of restoring the original naturalness of water and marsh / wetland habitats. These habitats are characterised by great landscape diversity - they are rich with mutually contrasting elements (water surface, natural banks and sandbanks, waterfalls, hydrophilic and hydrophilic vegetation ...) that carry substantial visual and environmental values, as well as define character of a particular area. Considering before mentioned, these measures could finally lead to restoration / enhancement of landscape diversity. Furthermore, positive impacts on landscape may occur due to implementation of measures for protection of drinking water, such as (1) implementation of the rehabilitation measures in the zones of sanitary protection (i.e. illegal waste disposal sites), (2) defining of sanitary protection zones, as well as (3) implementation of programs to protect strategic reserves of drinking water. Sanitary protection zones and strategic reserves of drinking water are areas with proscribed limitations for development of specific activities. This leads to reduced opportunities for construction of the newly planned interventions (eg. transport / energy infrastructure, etc.), in both number and scope, which could ultimately prevent new occupancy; (B) Adverse impacts may occur due to implementation of measures for construction of new spatial structures (water supply and drainage systems, water facilities for flood risk management...). Significance of these impacts depends largely on the landscape characteristics of the area in which they are planned, as well as the type of planned activity (since they can significantly differ in appearance and dimensions depending on their purpose).

Considering the fact that strategic level of impact assessment does not deal with individual interventions, or specific locations, only general statement that these risks exist can be given. Defining specific adverse impacts and proposing appropriate protection / mitigation measures is possible only in the following stages, i.e. (1) development of planning documents (multi-annual programs for the construction of water facilities) and following SEA procedures; (2) development of specific investments at more detailed, project level and following EIA procedures.

It is important to note that the SEA procedures for multi-annual programs for the construction of water facilities are carried out. Furthermore, EIA procedures for the individual investments at project level are yet to be carried out. Considering before mentioned, it is possible to conclude that the risk of significant degradation of the landscape (its structural elements and esthetic values) will be prevented or reduced to an

acceptable level by applying protection measures issued in SEA and EIA procedures, and hence previously mentioned risks can be considered as negligible.

1.5 Cultural and historical heritage

Croatian territory is extremely rich in cultural and historical heritage. Due to its favourable geographic position, topographic and climatic characteristics, the settlement of this area begins in the earliest periods of prehistory and almost continuously can be observed throughout all prehistoric and historic periods up to present. The main characteristic of this area provides diverse and rich cultural heritage, which is the basic division of the classified material (immovable and movable) and the intangible heritage.

Beside cultural objects that are preventative or permanently protected and registered in the Cultural Objects Register of the Republic of Croatia, the largest number of cultural and historical values are recorded in spatial planning documents (county physical plans and regional plans for the town / municipality).

Implementation of the plan is likely to have a medium negative impact on the cultural and historical heritage. Planned preventive measures of protection within the components A and B which include the implementation of building measures, will result in interventions that can significantly impact the scope or protected cultural property and registered cultural and historical value. Possible negative impacts on the cultural and historical heritage are: destruction of potential archaeological sites and recorded elements of cultural heritage and the distortion of the visual features of the cultural landscape. As the inside components B. do not determine the location of planned constructions, a more detailed evaluation of the impact assessment on cultural heritage will be conducted in the framework of Environmental impact assessment for the individual planned constructions.

1.6 Forestry

Basic principle of the Croatian forestry is sustainable management with preservation of the natural forest structure and diversity as with permanent increase in quality and stability of the economic and other non-wood based forest functions. This is seen from the fact that about 75 % of Croatian forests are under FSC certification that insures healthy and stable forest ecosystem whilst securing raw material for wood industry and energy sector.

Sustainable management is also expressed through conservation and in increase of forest areas and trough continuous transfer of the degraded stands into higher silvicultural forms as the management effect.

On the other hand, large number of downgrading factors (extreme drought, forest fires, plant illness and forest pests) with influence of the human activity (air pollution, soil acidification, changes in above- and underground water regimes) are deteriorating forest ecosystem quality and functions.

Observing impacts of water on the forests and forestry, it is the most expressed in lowland forests with small differences between terrain heights (meters above sea level). In these areas every intervention brings changes in the above- and underground water level over large areas since even 0.5 m difference in height a.s.l. can set apart areas that would be flooded or not. This also have significant influence on tree species or forest type distribution.

Performed analysis of the lowland and riparian forests' flooding endangerment regarding high and middle endangerment and tree species provenance areas, has shown that more than one third of these forests are endangered. Although flooding is essential factor for the development and support of these forests, it can have significantly negative impact on forests and forestry in case of long term retention of the water, primarily by preventing essential and season-defined forest activities.

Observing spatial distribution of the high probability for flooding regarding lowlands and riparian forest, it can be inferred that the forests around rivers Sava, Drava and Danube, city of Karlovac or in Spačva pool can sustain the most pronounced damages in case of longer periods of water retention that can prevent normal forest activities.

These forests are also greatly influenced by ground water levels. It is proved that the ground water levels of the open aquifers have influence on the volume ratio of the most significant tree species in these areas (*Quercus robur*- Pedunculate oak, *Fraxinus angustifolia*- Narrow-leaf ash and *Carpinus betulus*-Common hornbeam). It is also proven that significant changes in ground water level have negative impact on trees in these forests.

Changes in open aquifers' ground water level are result of watercourse canalising, bank creation, river bed deepening or similar hydro-technical interventions. The most affected are middle-aged and old stands whose root system is developed in different water level

conditions and due to age and lost root growth ability, these trees cannot adapt to new conditions.

Some hydro-technical interventions (new canals or dams) can have positive effect on underground water levels if ground water levels are already low in designated area.

Therefore, it is essential prior any hydro technical intervention (especially large scale intervention) to explore and record a present state of the surrounding forest area regarding health, quality and ground water levels, as to establish effective monitoring of the open aquifers' water levels and surrounding forests after intervention. By investigating present state, we can determine what water levels were/are optimal or present water deficiency/sufficiency and by those findings canal depth or dam height can be regulated to achieve optimal water levels.

Without this Plan, significant activities, like development of a lower rank Plans or water usage, emission and pollution guidelines and conditions, would not be executed and various negative influences on forests and forestry will be continued.

With this SEA, all possible impacts on forestry are considered on strategic level and in the most designated measures additional monitoring of the open aquifers' ground water level are prescribed, as well as monitoring of the forests state surrounding water bodies or hydro-technical interventions in order to mitigate acknowledged impact.

With those types of monitoring, optimal conditions for forest development in that areas would be determined and actions could be performed in case of changed conditions. Also, that knowledge can be beneficial in the process of development of various related strategic and management plans, as well in development of various related guidelines.

1.7 Game and hunting

According to Hunting Act, game are all animal species that live free in nature or at the areas designated to breed, intensive breed or reproduction in pursues of the hunting or usage.

For this strategic assessment impact on big game (*Ursus arctus* -Brown bear, *Cervus elafus* -Red deer, *Capreolus capreolus*- Roe deer and *Sus scrofa*-Wild boar) was assessed. Big game needs large areas for normal development and has wide daily and seasonal migrations. Daily migrations, pursuing food or mate, can be even few dozen kilometres. Seasonal migrations are more expressed in hilly and mountainous areas where animals migrates to lower parts during autumn and winter and in the spring or summer are going back to the mountains. Sometimes animal concentration in winter habitats is highly above habitat capacity so there can be increased damages to agriculture and forest cultures if adequate breeding and protection measures are absent.

Flood endangerment analysis regarding big game was performed only for hunting areas where these animals are listed as main species, although there are present in many surrounding hunting areas as passing animal species due to migration amplitudes. This analysis only included parts of the hunting areas that are used for hunting productivity areas calculation (forests, pastures, meadows).

According the analyses, brown bear's habitats are not endangered from flooding regarding hunting areas where it is listed as main species. Observing red deer and roe, 10 % or 14 % of habitat areas are endangered regarding high or medium probability of flooding, respectively. For wild boar, below 10 percent of the habitats are endangered by high or medium probability of flooding.

Nevertheless that only one tenth of the areas are endangered for red deer, roe deer or wild boar, more significant is spatial distribution of the endangerment.

From created and accompanied maps it is seen that the most endangered areas are around rivers Sava, Drava and Danube, city of Karlovac or in Spačva pool where high probability of flooding is stretched as far as 10 hunting areas. This can present a great problem if flood is quickly rising; even more since floodings are mainly spring or autumn events when most game animals have off-springs which can cause great damages to game and hunting in general in case of the fast or long term floods.

Without this Plan, significant activities, like development of a lower rank Plans or water usage, emission and pollution guidelines and conditions, would not be executed and various negative impacts on game and hunting will be continued and not mitigated. Without this Plan, animal drinking water quality would not be improved; polluted water would be embedded into vegetation that animals use for food and suitable habitats created by watercourse revitalization and renaturalization would not be enlarged.

With this SEA, all possible impacts on game and hunting are considered on strategic level and within some related designated measures, development of management plans and



guidelines regarding game is added. This management plans and guidelines should contain adequate measures to ensure undisturbed game life cycle and population development based on findings during additional research of big game migration patterns.

1.8 Soil and agriculture

The main characteristic of the soils in Croatia is their diversity. It is recorded 6 main soil types and the most common are luvisol (12.1 %), than pseudogley (9.9 %), glays (9.6 %), brown soil on limestone and dolomite (8.4 %), rendzinas (7.5 %) and acid brown soil (5.5 %). Other types of soil occupy less than 5 % each.

Roles of soils are multiple and multi-purpose, interdependent and hardly separable. These roles are manifested in:

- the production of biomass as the primary and most important role of the soil on which depends the life on Earth. The soil is the basic substrate for plant production.
- ability to receive, accumulate and transform of pollutants and ability to maintain genetic resources and biodiversity. Soil is the habitat and genetic reserve of flora and fauna, micro and macro organisms.
- ensuring a basis for conducting human activities and landscape architecture.

Land, however, includes the physical space: soil, climate, hydrological and geological characteristics and vegetation to the extent that affects the ability to use, then the results of past and present human activities, with or without the socio-economic conditions (FAO, 1976). The land is in the broad sense of the term land use. Also, the land can be seen as a limited resource that makes a link between human activity and the environment. Land use and land use change are the main drivers of environmental change and significantly affect quality of life, ecosystems and economic activity.

For the assessment of land use in Croatia, the most important source is Corine land cover database. According to these data forest land in 2012 in the Republic of Croatia occupies 41.8 % of land area and agricultural land occupies 50.8 % of the land area of the Republic of Croatia. Forest and farmland together occupy 92.6 % of the land area of Croatia.

In the forest area the dominant representation has luvisol with 15.7 % of the total area under the forest. The next is brown soil on limestone and dolomite (12.5 %), pseudogley (11.5 %), distric brown soil (10.8 %), rendzinas (10.8 %), gleys (8.4 %) and black soil (6.8 %).

On agricultural area it is found occurrence of almost all types of soils. Of the total area of agricultural land, most of it occupies gleys with 13.8 %. The next is luvisol with 13.3 %, pseudogley with 11.9 % pseudogley, brown soil on limestone and dolomite with 7.8 %, rendzinas with 7.4 %, red soil with 5.5 % and hydroameliorated hydromorphic soil with a 5, 2 %. Other types of soil alone occupy less than 5% of agricultural area.

Threats and loads of soil that leads to its degradation can be: natural and anthropogenic. Natural threats are natural phenomena such as storms, floods, earthquakes. volcanoes, fires, etc., which cause: water and wind erosion, landslides, being turned into marshland, drainage, salination and sodification, acidification, loss of biodiversity and others. Many of these degradation changes beside the natural causes can be the result of anthropogenic threats that may include changes in land use (soil sealing, construction of reservoirs, etc.),

water regime changes (melioration, irrigation, retention, etc.), the use of mineral resources, industrial production, waste disposal (industrial, dangerous, construction and municipal), agriculture, accidents military activity etc. The most common result of all these threats is the loss of soil, physical and chemical degradation of the natural characteristics of soil, contamination by chemical substances that does not originally belong to the soil and dangerous substances. All these changes ultimately affect changes (usually negative) of conditions of surface and ground water.

The lack of a legal framework for the sustainable management and protection of soils and land has resulted in a lack of data about the state of soil and land use, making it impossible to determine the changes in the condition of the soil and monitor damage and pollution caused by natural or anthropogenic sources. For the same reason the adoption of specific preventive measures to protect soil and for sustainable land management also failed. At the EU level, as well as in Croatia, there is no legal obligation for the identification of contaminated and potentially contaminated sites. Risk of new soil pollution is regulated preventive by EU's legislation, which was introduced into the Croatian legislation, such as the IPPC Directive, the Directive on Waste disposal and the Water Framework Directive. Ordinance on Protection of Agricultural Land from Pollution (Official Gazette 9/14) defines pollutants, sources of pollution and maximum limits for pollutants in the soil, but only for agricultural land. The limit values of pollutants in the soil are not prescribed for the land used for other purposes (eg. Forest land, settlements, parks and playgrounds, industrial zones), which prevents the definition and systematic monitoring of contaminated and potentially contaminated sites, and any changes in the soil state.

Potential problems associated with contamination of soils exist in locations where there is no adequate communal infrastructure. In some municipalities and cities, which usually consist of single closed drainage systems, sewer systems are combined drainage systems of sanitary and storm water. In areas where drainage is resolved in a way that the waste water goes into the collection and septic tanks leaching into the ground water and its contamination are possible.

Agricultural land in Croatia is the most vulnerable to erosion. High risk of erosion has 23.2 % of agricultural land and 23.1 % has moderate risk of soil erosion. Forest land is vulnerable to water erosion mainly in the karst area, and a moderate real risk encompasses 44.8% of the forest soil. In the Croatian territory there were thousands of landslides. Landslides and mudslides are common after heavy rainfall, seismic but also inappropriate human activities. Salinization of soil associated with the penetration of sea water in the hinterland and its use for irrigation, have been recorded in the Neretva valley, in the area of Vrana basin and the lower course of the river Mirna and Rasa in Istria. Soil acidification was observed in the area of Slavonia and Baranja, and it is estimated that at least 410 hectares of soil in Eastern Slavonia is alkalized. For the assessment of other degradation processes (reduction of biodiversity of soil, soil compaction and permanent soil cover) there are not available quality data.

According to the Ministry of Agriculture, as agricultural land is considered agricultural areas: arable land, meadows, pastures, orchards, olive groves, vineyards, ponds, swamps and marshes, as well as other land that can be used for agricultural production economically justified costs. According to CBS data the area of agricultural land in the period from 2009 to 2013 oscillate around 2.6 million hectares.

According to the Paying Agency 186,333 family farms and 6,813 other entities (trades, cooperatives, companies) was dealt with agriculture in 2014. In addition to crop production in the Republic of Croatia is significant and animal production which in 2012 took place on 120,895 farms. Number LU / ha in 2012 in the Republic of Croatia amounted to 0.24 LU / ha which is significantly less than the limits prescribed by Nitrate Directive (2.4 LU / ha) and there is a room for more intensive development of animal husbandry in Croatia.

The impact of agriculture on ecosystems can be reflected in the reduction of biodiversity due mostly monoculture production, pollution by excessive use of pesticides, pollution due to excessive use of mineral and organic fertilizers, greenhouse gas emissions and favouring erosion (water and wind) due to inadequate tillage.

Consumption of mineral fertilizers in Croatia amounted to 371,769 t. The impact of excessive use of fertilizers is the most evident and most easily detected by controlling the amount of nitrate in surface and ground waters. Therefore, at the end of 2012, the Croatian Government adopted the Decision on determining the vulnerable areas in the Republic of Croatia (Official Gazette 60/10, Official Gazette 32/10 and Official Gazette 130/12). Vulnerable areas are areas where it is necessary to implement enhanced measures to protect water from pollution by nitrates from agricultural sources, and each EU member state determines the vulnerable zones on the basis of the Nitrates Directive. Each member state has the option to declare the entire territory as a vulnerable area or only a part of its territory. Croatia has decided to declare as vulnerable area only part of its territory, which make up to 9 % of territory. In the first period of application (four years), the annual amount of nitrogen that manufacturer enters the by manure may not exceed 210 kg N / ha, and after this period shall not exceed 170 kg N / ha. The Nitrates Directive limits the use of nitrogenous fertilizers. They are allowed to use to achieve a particular yield only in an amount which makes the difference between the needs of crops for nitrogen and nitrogen that will be available to her through manure and mineralization of soil organic matter. For the monitoring of consumption of fertilizers it is more important to analyse the quantity of active nitrogen applied to agricultural production. Thus, in 2012 in the Republic of Croatia used a total of 178,976 t of nitrogen, 132 132 t by fertilizers and 48 845 t of nitrogen from organic fertilizers. If that amount is distributed on the utilized agricultural land it is obtained that in 2012 in the Republic of Croatia was spent an average of 91 kg / ha of nitrogen which is much less than the Nitrate Directive permitted (recommended).

Significant contamination of soil and water and can cause excessive use of plant protection products (pesticides), which are divided into three main groups: herbicides, fungicides and zoocides. When analysing the data should also take into account that it is better to analyse the active substances than the preparations because very often the same active ingredient

can be found in a number of preparations in different concentrations depending on the manufacturer and its use. In that case the analysis of pesticide use would be almost impossible. In Croatia in 2012 were registered 210 active substances in 734 registered preparations. In the year 2012, in Croatia were spent 2,205,186 kg active substances of pesticides. According to the share of individual groups of pesticides, herbicides in total consumption (46.8%) and fungicides (50.2%) participate with almost equal share. Share of zoocides is only 3 %. In 2012, in Croatia were used 157 active substances which represent about 74.8% of the total number (210) of registered active substances of pesticides. If the total consumed amount of active substance is distributed on the total surface used in agriculture it is obtained that in 2012 the average spent amount was about 2 kg active substances per ha.

Most of described impacts of agriculture can be reduced by introducing ecological and integrated agricultural production. They can be also reduced by changes in agricultural practices in conventional agriculture, which is conducted in accordance with the principles of good agricultural practice, with emphasis on the protection of environmental components. Organic production is a complex production of crops in which is not allowed to implement of mineral fertilizers and chemical plant protection products and where exist a need to maintain and increase the fertility and biological activity of soil. This production is only permitted in soils where there is no industrial and other emissions of pollutants. Integrated agriculture implies a balanced application of agro-technical measures for the production of environmentally and economically friendly products, with minimal use of agrochemicals. Croatia applied integrated agriculture since 2010, from when the Ministry of Agriculture (MP) establishes Register of the integrated production of agricultural products in the electronic system of the Paying Agency in Agriculture, Fisheries and Rural Development (Paying Agency). According to the Register, in Croatia in 2010 in an integrated system of agriculture was 170.78 ha of agricultural land, and at the end of 2012 72,258.6 ha, which indicates a significant growth.

Organic agriculture in Croatia appeared in 2002. From 2003 to 2014 the number of holdings that practice organic farming has increased from 130 to 2,194. In 2010, the Republic of Croatia in the system of ecological agriculture was included 23,282 ha, and in 2014, 50,054 ha of which is a significant increase. The number of cattle in the system of ecological animal husbandry in the same period showed significant fluctuations. The number of cattle and equine animals is reduced (25.4% and 35.6%), sheep and poultry increases significantly (132.0% and 123.3%), the number of goats has stagnated and the number of pigs after strong growth in 2012 decreases.

In general, agricultural land in Croatia is increasingly being used in accordance with the principles of sustainable agricultural production.

Non-implementation of this plan would not have continued with the extremely important regulating activities on the adoption of various plans of lower rank, determining the conditions and guidelines for water use and water discharge, and pollutants, which would continue the various negative impacts on the soil, and consequently on agriculture. Equally, it should not create the conditions for an increase in meliorated and irrigated agricultural



land. Absent to encourage monitoring and improving soil and water state. Would not be implemented measures to control and prevent uncontrolled disposal of sewage waters, excessive use of pesticides, fertilizers and animal manure and monitoring of soil and water in an appropriate manner and at the appropriate locations. There are no positive impacts caused by non-implementation of this plan.

1.9 Population and public health

The plan implements a series of measures aimed at ensuring acceptable drinking water quality, water for bathing and recreation, water for farming aquatic organisms for human consumption as well as protection of people and goods from adverse effects of floods. As the purpose of the Plan is enhancing water quality and flood protection it has significant positive impact on population and public health.

1.10 Water bodies

Pursuant to the Water Protection Act water protection objectives are:

- a. prevent further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems;
- b. promote sustainable water use based on a long-term protection of available water resources;
- c. aim at enhanced protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances;
- d. ensure the progressive reduction of pollution of groundwater and prevent its further pollution, and
- e. contribute to mitigating the effects of floods and droughts.

The purpose of this Plan is to establish a set of measures to achieve the above objectives. The objectives (a) to (d) are to be achieved through the component A of the Plan and the objective (e) through the component B. Thus, the impact of the component A of the Plan on water bodies is significant and positive.

Potentially adverse impact on water bodies can be caused by flood protection projects in cases where such projects include engineering works. In this case the impact is mainly on hydromorphological characteristics of that water body. The Plan however encourages green infrastructure and plans the regulation works only when necessary. This is expressed in the following measures of the component B:

- introduction of special level of protection and preservation of natural retentions and wetlands [...],
- encouraging technical solutions which ensure: retention of water in the river basin as long as possible, and allow the spreading of watercourses to decelerate runoff,
- preservation, restoration and expansion of areas which have a potential to retain flood water, such as natural retentions, wetlands and floodplains,
- limit the use of land intended for retention of flood water and implement administrative measures to prevent water and soil pollution with hazardous substances during flooding,
- in former floodplains continue to develop lowland retentions in order to lower the flood load and thus protect the areas downstream,
- use the existing floodplains as meadows and pastures or for the restoration of alluvial forests.

Possible construction works on water bodies will be subject to environmental impact assessment - in that procedure necessary protection measures will be developed which will ensure protection of water bodies. In case of possible transboundary impacts additional to EIA procedures, transboundary consultations will be carried out according to Espoo Convention and bilateral and multilateral agreements. All of above ensures overall positive impacts of the Plan on water bodies.

1.11 Marine environment

According to the Initial evaluation (Institute of Oceanography and Fisheries, 2012) were allocated pressures on the status of the marine environment. Significant environmental problem related to development is intensive construction (actual or planned) in coastal areas with inadequate utilities that are mainly related to tourism. The construction has a direct and indirect impact on the marine ecosystem in the form of a degradation of marine habitats and changes in physical and chemical parameters. Recognized pressures by fishing on ecosystems are physical damage of marine habitats caused by fishing gear, the impact on biodiversity of commercial, non-commercial and bycatch species. Recognized pressures arising from marine aquaculture activities in the Adriatic are the impact of anchoring system on sea-grass meadows, changes in water column and seabed status (according to physical-chemical parameters). Pressures related to the marine transport have been recognized in the form of negligent disposal of solid waste (mainly packaging and food) and liquid waste (oily water), the transfer of invasive organisms from other areas (primarily ballast water) and mixing of water masses in ports which results in disturbance in seabed structure. Pressures on the marine environment pollution by hazardous substances are viewed through the input of substances for protection of agricultural crops, heavy metals and radionuclides.

Generally, trophic status of the Adriatic sea can be described as oligotrophic, characterized by low primary production, good water transparency, low concentrations of nutrients and chlorophyll a and the absence of hypoxia.

Implementation of RBMP will have a positive impact on the regulation and reduction of nutrient enrichment, organic matter, contamination by dangerous substances and the reduction of biological disturbance in the form of reduction on input of pathogens (quality of bathing water).

SEA also analysed implementation RBMP on 11 descriptors (defined by MSFD) and a reviewed GES and the target features for each individual descriptor in the Adriatic. SEA prescribed measures related to monitoring harmonization within RBMP and records related to marine waste.

1.12 Fisheries

Despite the small share of GDP, fisheries contributes to a positive trade balance, which is important because of the employment opportunities in coastal areas and on islands, where the fisheries sector is one of the few activities that provide a source of income throughout the year. The main strategic goal in the fisheries is to achieve a competitive, modern and dynamic fisheries and aquaculture through the sustainable use of resources. In the last five years in the marine aquaculture production showed an upward trend until 2011, and is around 16,000 tons, thanks to the constant growth of tuna farming in the period, followed by a decline to 13,916 tons in 2012, mainly due to the fall in production due to tuna fishing restrictions. At the same time catching fish increases as of 2011 when exceeding 70,000 tons, then in 2012 a decline to 63,000 tons. The share of aquaculture in the primary fishery products by 2010 exceeds 21%, which is higher than 20.4% of the EU average. In the past two years the share falls to 19% or 18% due to decline in production of tuna and trout.

The average age of the Croatian fishing fleet is over 30 years, but unevenly distributed in all segments of the fleet. It should be noted that most of the vessels are poorly equipped in terms of energy efficiency (old engines with high fuel consumption), product quality (lack of ice machines and related storage facilities and cold storage on board), as well as equipment related to the improvement of working conditions and safety board.

Freshwater fishing includes commercial and sport fishing, as well as measures to protect fish stocks and regulated by the provisions of the Freshwater Fisheries Act and regulations. Commercial fishing in the Republic of Croatia, as well as preferential trade, are present on the Danube River (within the borders of the Republic of Croatia) and the Sava River (downstream from Jasenovac in Croatia borders), so only in the system of large lowland rivers, where the favourable status of fish communities is good in qualitative and quantitative terms. Freshwater fishing is allowed and defined by prescribed fishing zones, fishing gears and equipment, catch quotas, fishermen exam, records of catches, the fee for fishing, as well as protective measures for the conservation of fish stocks.

Strategic Environmental Assessment considered all the impacts on the strategic level which could affect fisheries and estimated positive impact of the implementation of Plan in terms of regulation and the reduction of pollution by hazardous substances and reduce biological disturbance in the form of reduction of pathogens inputs.

1.13 Climate change

1.13.1 Climate change adaptation

Impacts of the climate change on the Plan implementation are results of: increase of the mean temperature, reduction of the precipitation in the Adriatic water basin district, sea level rise and potential impact on floods. Mean air temperature increase will cause the increase of the surface waters temperature, which could lead to increased vulnerability to eutrophication. Precipitation decrease together with the temperature increase will cause decrease of the available drinking water in the Adriatic water basin district. This will be most expressed in summer when the needs for water are the highest because of tourism. The amount of the Adriatic Sea level rise cannot be projected with high confidence, but it is probable that there will be a sea level rise. That would endanger lower levels of the Adriatic coast. There is very level of confidence in establishing a relation between the climate change and frequency or intensity of floods. In the 5th IPCC report it is stated that it is more probable that large damages caused by floods in the recent years are caused by the change of the land use (mostly urbanization) which causes increased runoff, then climate change.

Some of the measures implemented by the Plan can be considered as adaptation measures to the climate change impacts. Implementing and enhancing monitoring of the waters and adjusting the legal conditions for water use, it is possible in timely manner to prevent the adverse impacts of temperature change. Further on there is a series of measures which aims at conserving enough amount of drinking water. Plan also has a measure for improving the system of sea flooding. In the part related to flood protection the Plan stresses the need to solve the illegal use of floodplains. Finally the Plan implements a measure to further analyse the impacts of the climate change on flood protection concepts.

1.13.2 Emissions of greenhouse gases

Waste management activities, such as disposal and processing of municipal solid waste, management of waste water and waste incineration, are source of emissions of greenhouse gases, including methane (CH₄), carbon dioxide (CO₂) and nitrous oxide (N₂O). The agricultural activities contribute directly to greenhouse gas emissions: key source of methane emission is manure management and the result of agricultural soils management are high emissions of nitrous oxide N₂O. According to the latest *Croatian Greenhouse Gas Inventory for the Period 1990-2012, January 2015*, the share of the total greenhouse gases emissions in 2012 from the agricultural sector amounted to 12.8% and from waste management 4.3%. Without the implementation of the Plan it can be assumed that there will be no expected reduction of greenhouse gas emissions associated with the measures provided by this Plan.

1.14 Waste

Sustainable Waste Management Act (Official Gazette 94/13) prescribes the adoption of a new Waste Management Plan of the Republic of Croatia until 31 of December 2014.

The current waste management is in the process of harmonisation with standards in the field of waste management according to the Waste Management Plan and transitional periods in the Treaty of Accession of the Republic of Croatia to the European Union is underway, according to which all existing landfills must implement the requirements of the Directive 1999/31/EZ till December 31, 2018.

Waste Management Strategy of the Republic of Croatia (Official Gazette 130/05) recognizes the problem of sewage sludge. According to the Strategy, the treatment and disposal of the municipal sewage sludge will be managed according to the European practice and objectives in different ways depending on local conditions - from thermal treatment to use in agriculture. According to the Ordinance on management of sewage sludge when used in agriculture (Official Gazette 38/08) it is allowed to use only treated and stabilized sludge containing heavy metals and organic substances in quantities lower than limit values lay down by the Ordinance and if pathogenic organisms, potential disease agents are destroyed.

According to the Sustainable Waste Management Act (Official Gazette 94/13) the maximum permissible weight of biodegradable municipal waste that can be disposed annually at all landfills and inconsistent landfills in Croatia, based on the weight of biodegradable municipal waste produced in 1997 is 50% or 378,088 tons till 31 December 2016 and 35 % or 264,661 tons till December 31, 2020.

According to the data of Environmental Protection Agency (EPA), in 2013, Croatia has produced a total of 1,720,758 tonnes of municipal waste (organized collection covers 98% of the population). A slight upward trend in the amount of municipal waste present at 2011, continued in 2013. Comparing to previous year, the amount of municipal waste in 2013 increased by 3%, while comparing to 2011, it increased by 4.6%.

In order to address the problems of management of sewage sludge from wastewater treatment plants, the technical-economic study "*Treatment and disposal of waste and sewage sludge from wastewater treatment plants in cities and municipalities of Croatia*" (WYG International, 2013) was developed. This study thoroughly addresses the problem of sewage sludge management and analysed all the possibilities and technical solutions at the national level.

It is estimated that the existing wastewater treatment plants generate approximately 35,000 to 40,000 tonnes of dry matter.

About 50% of the sludge is produced at the central wastewater treatment plant in Zagreb and temporarily stored at the site.

According to the reported data of Environmental Protection Agency, in 2013, of 1 580 tonnes of sludge dry matter intended for agriculture use (according to the reports of the sludge producers), actually 1 317 tonnes was applied on agricultural land (according to the reports of sludge users). The prescribed application forms do not require the data on the temporarily stored quantities of sludge by users and consequently it is not possible to determine whether this difference occur due to a temporary stored quantity or something else. The sludge is used on agricultural land of total area of 600 ha.

Almost half of the amount of sludge used in agriculture was not directly applied to agricultural land, but used in the form of compost after mixing with bio-waste from public areas (leaves, grass, branches...).

1.15 Air

Based on the results of the monitoring of air quality in Croatia in 2013, it was concluded that the major cities in continental Croatia as Zagreb, Sisak, Osijek and Kutina have elevated concentration of PM_{10} related to traffic and industry. High ozone values, as a result of pollution from transport and industry, have been recorded in Zagreb and Slavonski Brod, and in the coastal region due to the high intensity of solar radiation. Also, exceeding of ground-level ozone targets occurred on almost all stations for background air quality monitoring throughout the territory of the Republic of Croatia, indicating a significant regional contribution and the impact of cross-border pollution transport.

Elevated levels of NO_2 were observed in the vicinity of roads in cities (Zagreb, Split, Rijeka and Šibenik) and it can be concluded that the dominant contributor to the pollution of NO_2 was fossil fuel combustion in road transport.

Exceeding values of H_2S resulted from large industrial centres in Rijeka and Sisak and Slavonski Brod which is, as well, situated close to the industry. Exceeding values of the NH_3 were recorded only in Kutina.

Emissions of air pollutants

According to the report *Air Pollutant Emissions in the Republic of Croatia in 2015 (1990-2013)*, *AZO 2015*, emissions of all relevant pollutants SO_2 , NO_x , NMVOC, CO, NH_3 , PM_{10} and $PM_{2.5}$ and metals showed a general decreasing trend in the period from 1990 to 2013. The reasons are manifold: stricter regulations on allowable concentrations of air pollutants and emission limit values, ban on the sale of lead containing gasoline, the use of better quality fuel with lower sulphur content, gasification and connecting to the district heating network, the use of low-sulphur coal and to a lesser extent, the development of public transport, but as well the decline in industrial production and the reduction of energy production due to the economic crisis.

1.16 Transport

Croatia's inland waterway ports are Vukovar, Osijek, Slavonski Brod and Sisak. All of the mentioned ports are mainly characterized by freight transport and with minor passenger infrastructure, while the port of Slavonski brod has no passenger infrastructure.

Passenger transport has the highest rate in the city of Vukovar and is still growing (Danube passenger cruisers), meanwhile an increase of local passenger transport has been noted in the city of Sisak.

The freight transport is mainly influenced and connected to the industry and agriculture located in wider region of the mentioned inland waterway ports. These forms of transport may influence general pollution levels and water quality, but rainwater and floods can also affect the development of waterways transport and local road infrastructure.

According to the Medium term development plan of inland waterways and inland ports of the Republic of Croatia, waterway transport has to be integrated into the intermodal transport network in order to strengthen its role on the market. For the integration of inland waterway transport in the intermodal transport network, it is important to raise the level of reliability and efficiency of inland navigation through the provision of high quality transport infrastructure.

Integrate inland waterway transport in the intermodal transport network of Croatia is partly possible through the implementation of measures from the River Basin Management Plan 2016-2021.

Although the objectives and measures of the River Basin Management Plan do not have a direct impact on traffic (road, rail, waterways, maritime transport), there may be indirect effects on the further development of transport infrastructure in the immediate vicinity of waterways in terms of introducing special measures for roads near areas of special water protection. Such measures, however, will not be a limiting factor for the development of road infrastructure because of the simplicity of their implementation, by introducing new civil engineering and technical solutions for the sanitation of traffic pollutants leached from roads ("road runoff").

At the strategic level the plan has a positive impact on traffic, through the measures for flood protection. Measures regarding the regulation of water flows in areas of high flood risk produce positive outcomes in the form of reduced costs of maintenance and road reconstruction affected by floods.

1.17 Monitoring programme

Multi-annual program for constructions of communal water management, regulation and protection water facilities and amelioration facilities are finished and strategic environment assessments were conducted with proposed environmental monitoring programs.

Therefore, since the environmental monitoring in RBMP entirely covered by monitoring programs that have already been stipulated in above mentioned strategic assessments, SEA does not provide additional monitoring program and reference is made to the existing monitoring programs.

2 MEASURES

BASIC MEASURES

5.2.1 Measures of cost recovery from water services and prompting efficient water use

2) Measures of introduction of the cost recovery principle from water services and improvement of business operations

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Through a RBMP's programme of measures ensure complete transparency in the expenditure of water fees thus encouraging the public (users of water services) to use water efficiently and to accept the economic costs of water services.

3) Measures to increase water user contributions to the recovery of external costs of environmental and resource and encourage efficient water use.

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Ensure the use of the water protection fees collected for production and importing of mineral fertilizers and plant protection products and their placement on the market in the Republic of Croatia (or at least a part of the fees) for projects whose primary purpose is improving the water status and status of aquatic ecosystems (e.g. public education, projects related to the reduction of toxic substances pollution of aquatic ecosystems).
- Through RBMP, or equivalent plans at lower level of water management hierarchy, these facts should be defined: 1) in what way and to what extent is the usage of the generated water fee funds planned, in order to achieve the objectives of the water environment protection, 2) indicators that would serve as basis for monitoring the effectiveness of spending the generated water fee funds, 3) responsible institutions / persons for the implementation and monitoring of the use of the generated water fee funds. This data should be made publicly available to encourage the public to use water efficiently and accept the economic costs of water services.

5.2.2. Measures for protection of drinking water

1) Measures to improve management of drinking water protection

FORESTRY

- During development of the Drinking water strategic reserves protection programme adequate measures based on the sustainable use of the forests.
- During development of the Drinking water strategic reserves protection programme adequate measures that will insure permanent forest coverage with minimal usage of mechanic for forest exploitation according to specific sanitary protection zones, must be incorporated.

SOIL AND AGRICULTURE

- When creating a Program for protection of strategic reserves of drinking water with implementation plan to incorporate measures that will in the neighboring environment of sources limit the use of mineral and organic fertilizers and plant protection products in agriculture as well as limit the capacity for livestock.

TRANSPORT

- When creating the Program for protection of strategic reserves of drinking water it is important to incorporate measures that will include special designs of road drainage in order to avoid water contamination from runoff pollution.

2) Implementation measures for drinking water protection

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Encourage the implementation of the nature conservation measures in the early phases of project planning through plans at lower level of water management hierarchy and/or individual projects (e.g. construction works as part of the rehabilitation measures, upgrade/improvement of public water supply systems).

FORESTRY

- Harmonize law and bylaws associated with development of the forest management plans to ensure incorporation of felling restrictions (all except sanitary felling) in 2nd zone of the sanitary protection in FMPs during their creation (Felling restrictions according article 23 of the Ordinance on condition for determination springs sanitary protection zones OG 66/11, 47/13).

SOIL AND AGRICULTURE

- Educate farmers, who use farmland or raise cattle in the second sanitary protection zone about limitations that are prescribed for that zone.
- Strengthen control of the implementation of regulations related to agricultural production in the second zone of sanitary protection of springs.

5.2.3 Measures of water abstraction control

1) Measures of water abstraction control

TRANSPORT

- The criteria for determining the need for verification and possible restrictions should take into account the maintenance of navigability while limiting the use and water abstraction on waterways.

2) Implementation measures of water abstraction control

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Programme designed to encourage implementation of measures to reduce the load caused by water abstraction and programme of rationalisation of water use should clearly define responsible institutions / entities and time frame for the implementation of this programmes, as well as indicators for monitoring the effectiveness of their implementation.
- All new projects that require water or technological water as a resource should in early preconstruction phase predict adequate technology and technical solutions that use smaller amounts of water, as well as predict and ensure biological minimum release, that is ecologically acceptable flow .
- Where construction or upgrade of public irrigation systems is predicted, if necessary, encourage the implementation of the nature protection measures (biodiversity, protected areas, ecological network) in the early design phases of the plans at lower level of water management hierarchy and individual projects preparation .
- Baseline assessment studies have to be prepared in order to assess the cumulative impact of all planned irrigation systems on a single basin / watercourse, that is to assess the significance of the impact on the regime of ground and surface waters. Priority areas for baseline assessment study preparation are the basins where the poor quantitative status of the groundwater bodies is estimated and/or where significant load of water abstraction and diversion exists.
- When planning the water abstraction projects, baseline assessment study has to be prepared in order to assess the cumulative impacts of water abstraction plans on

surface and groundwater bodies. Priority areas for baseline assessment study preparation are the basins where the poor quantitative status of the groundwater bodies is estimated and/or where significant load of water abstraction and diversion exists.

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during the preparation of irrigation plans / projects.

5.2.4. Measures of groundwater recharge control

FORESTRY

- To establish effective piezometer network in all Croatian lowland and riparian forests for better monitoring of the present state of underground waters in root domain (underground waters in open aquifers) or possible changes caused by hydro-technical intervention and structures
- Dendrochronological research must be performed in order to determine optimal level of those underground waters for tree growth and yield prior to construction of water-technical structure that can have effect on the open aquifers' underground waters.
- Effective monitoring of the surrounding forests health growth and yield must be established after construction of any larger water-technical structure.

5.2.5 Measures of control of point sources

1) Measures to improve control of point sources of pollution

FORESTRY

- Incorporate the measure of defining horizontal movement of the underground water available to roots while developing Guidelines for emission the pollution from point sources and regarding those scopes of movement create buffer zones. Especially, if it directed towards forests in protected areas (according to relevant nature and forest protection legislation) to which open aquifers' underground water is essential surviving factor.

SOIL AND AGRICULTURE

- Increase the supervision of quality of sludge used in agriculture and the ways of its implementation.

WATER BODIES

- In the guidelines for implementation of the „combined approach“ to the water body protection, include the guidelines for the determination of the mixing zone.
- Establish and maintain catalog of storm water overflows on public sewerages. Establish water quality monitoring on significant overflows which have discharge into water bodies that will not achieve the good status even after implementation of the basic measures (after 2021).

2) Implementation measures for control of point sources of pollution

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Through plans at lower level of water management hierarchy, as well as on the individual project level, encourage implementation of the nature protection measures (biodiversity, protected areas, ecological network) in the early design phases of construction / upgrading of public sewerage systems.

FORESTRY

- Expand the activities of the research monitoring on surrounding arable and forest areas to determine the extent, scope and impacts of the pollution.

SOIL AND AGRICULTURE

- During the planning and construction of drainage systems and wastewater treatment plants respect all measures prescribed by the Multi-annual Programme for the construction of municipal water works 2014 - 2023 (2014) and the strategic assessment of the same document relating to the protection of soil from pollution.

AIR

- During project development and procedure of environmental impact assessment for the wastewater treatment plant define measures to prevent and reduce emissions of air pollutants, primarily odour, in order to achieve values in accordance with the legally defined limit values of pollutants in the air.
- During project development and the procedure of environmental impact assessment for the incineration of waste sludge from waste water treatment plants define measures to prevent and reduce emissions of air pollutants in accordance with the legally defined limit values of emission of pollutants.

5.2.6. Measures of control of diffuse sources of pollution

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Ensure the use of the water protection fees collected for production and importing of mineral fertilizers and plant protection products and their placement on the market in the Republic of Croatia (or at least a part of the fees) for projects whose primary purpose is improving the water status and status of aquatic ecosystems (e.g. public education, projects related to the reduction of toxic substances pollution of aquatic ecosystems).

FORESTRY

- Incorporate monitoring of the state and changes in surrounding forests as well as open aquifers' underground water levels into monitoring of the vulnerable areas water state.

SOIL AND AGRICULTURE

- Develop a register of septic tanks and collecting tanks and their users.
- Finding the most efficient model of supervision of septic and collecting tanks to reveal their "bandwidth", by measures which would oblige owners / users to emptying pits and disposal of urban waste water by authorized suppliers of public drainage services (with an estimate of the time required for filling pits and control their discharge), or adequate technical methods of determining bandwidth septic tanks and collecting tanks.
- Encourage the rational use of fertilizers in agriculture, e.g. use of fertilizers with the mandatory analysis of the soil.
- In areas with intensive agriculture plan and encourage the establishment of windbreak belts to help reduce the impact of wind erosion on soil and water.

5.2.7 Measures of control and reduction of hydromorphological load

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted i.e. adequate research has to be conducted during the early preparation of revitalisation projects in order to define ecological objectives of the revitalisation and conduct the revitalisation primarily to improve the species and habitats conditions.

- In accordance with the European Commission manuals (e.g. Guidance document on Inland waterway transport and Natura 2000, 2012), the best available techniques have to be applied when building new or reconstructing the existing inland waterway structures in order to reduce the ecological pressure on habitats and species.
- When planning new inland waterways, or increasing their existing categories, Feasibility study has to be conducted, taking into account the value of ecosystem services.
- Revitalisation measures and measures for hydromorphological load reduction, based on the conducted monitoring of hydromorphological loads and discussed with appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature, have to be included in the Programme of regular economic and technical maintenance of watercourses, water estate and water facilities.
- In the early planning phase of projects designed to reduce hydromorphological load (e.g. revitalisation and renaturalisation projects) ecosystem services evaluation should be included as a valid measure during the cost-effectiveness analysis.

FORESTRY

- Incorporate assessment and monitoring of the ecological state of the surrounding forests that are adjacent or near to watercourse during any monitoring and assessment of the hydro-morphological and biological state of the watercourses.

5.2.8. Measures of control of other significant impacts on the water status, particularly hydromorphological status

Measures are not defined.

5.2.9. Measures prohibiting discharges into groundwater

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be included during the early preparation of criteria for indirect discharges into groundwater
- Define the risk (level) of bioaccumulation for pollutants listed in the criteria for indirect discharges into groundwater.

FORESTRY

- Additional monitoring is needed for forests in the areas where increased pollutant emission is identified that must include determination of chemical water quality, open aquifers' underground water levels as well as state and yield of the those forests.

SOIL AND AGRICULTURE

- In the case of waste water discharges in very small streams and the streams that for a certain period regularly or occasionally dry up or sink, along with other prescribed measures to add a measure which stipulates that those emissions are temporarily until they find another, technologically feasible and economically acceptable solution.

5.2.10. Measures of elimination and reduction of pollution with priority substances

SOIL AND AGRICULTURE

- Measure "operationalize regulations in the field of chemicals that regulate the monitoring of data on production, trade and use of dangerous chemicals whose trade is prohibited or restricted, including hazardous substances after use in water, in particular from plant protection products and biocidal products "amend to read:
- Operationalize the regulations in the field of chemicals which regulate monitoring data on the production, transport, use and disposal of packaging of dangerous chemicals, which circulation is prohibited or restricted, including hazardous substances after use in water, in particular from plant protection products and biocidal products.

Add measure:

- Encourage education of users of plant protection products and biocidal products that their use will be professional and rational and would not be harmful to water, soil and agricultural production.

WASTE

- In the future procedures of issuing / extending the water rights acts approving wastewater discharge, consistent application of the latest standards, prohibitions and restrictions for all priority and other relevant pollutants according to evaluate the chemical status of water is necessary.

5.2.11. Measures of prevention from accidental pollution

Measures are not defined.

ADDITIONAL MEASURES

5.3.1. Water intended for human consumption or reserved this use in the future

Measures are not defined.

5.3.2. Waters capable of supporting freshwater fish and water suitable for shellfish

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during the early preparation of additional measures related to the hydromorphological loads reduction and their harmonization with the additional measures defined in the RBMP for areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection.
- When introducing alien (allochthonous) species for freshwater fish /shellfish farming, risk assessment of species (re-)introduction into the nature has to be carried out, in accordance with legal provisions in force.
- Measure “For water bodies which were assessed as having unsatisfactory hydromorphological status, determine the significance of the hydromorphological load for the status of fish population and propose measures to reduce the hydromorphological load.” should be amended as follows “For water bodies which were assessed as having unsatisfactory hydromorphological status, determine the significance of the hydromorphological load for the status of fish population and propose measures to reduce the hydromorphological load, as well as measures to ensure watercourse connectivity and ecologically acceptable flow, where they are not presently ensured.”

5.3.3 Areas for bathing and recreation

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be included in the early preparation of additional measures for protection of bathing waters (if proposed).

5.3.4 Sensitive areas, basins of sensitive areas

Measures are not defined.

5.3.5. Areas susceptible to nitrate pollution of agricultural origin, vulnerable areas

Measures are not defined.

5.3.6 Areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection

Measures to improve management

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- During the early preparation of management plans of protected areas and Natura 2000 sites (where maintenance or improvement of the water status is an important element of their protection), Hrvatske vode have to be included through consultations with management plans developers and continuous intersectoral data exchange.

FORESTRY

- During development of the management plans, impact assessment of the prescribed measures on forests and game is needed, as well as their harmonization in order to insure sustainable development mimicking natural processes and optimal state of the populations.

Measures to reduce the impact of hydromorphological loads for new interventions/loads

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- In order to reduce the risk of introduction and spreading of invasive alien species it is necessary to implement additional measures to control and reduce the impact of biological load (as defined in the RBMP) during the construction and maintenance of new projects.
- In order to preserve biodiversity and protected areas, as well as favourable conservation status of target species and habitats i.e. the integrity of the ecological network, it is necessary to ensure watercourse connectivity during the construction of new projects (especially the construction of hydropower facilities).

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during revision and/or amendment of the Cadastre of Small Hydroelectric Plants, as well as during the early planning phase of new projects regarding the construction of small hydropower plants.
- Ecosystem services evaluation should be included as a valid measure during the cost-effectiveness analysis in the early project planning phase.

FORESTRY

- Measure „Secure beneficial water regimes in riparian forests” amend as follows „Secure beneficial aboveground and underground water (in open aquifers) regimes in riparian forests.”
- Measure „Maintain favourable structure and configuration of the watercourses banks and allow natural processes including erosion.” amend as follows „Maintain favourable structure and configuration of the watercourses banks and allow natural processes including erosion or vegetation coverage and growing.“
- Establish effective monitoring underground water levels in riparian forests in order to determine favourable water regimes.

Measures to reduce hydromorphological impacts of the existing hydromorphological loads

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted i.e. adequate research has to be conducted (if needed) during the early preparation of revitalisation projects in order to define ecological objectives of the revitalisation and conduct the revitalisation primarily to improve the species and habitats conditions.
- Ecosystem services evaluation should be included as a valid measure during the cost-effectiveness analysis in the early project planning phase (e.g. in the early planning phase of revitalisation and renaturalisation projects).

FORESTRY

- Measure „Improve the hydro-morphological conditions of the water bodies and where is necessary and suitable execute restoration of the degraded water and swamp habitats” amend as follows „Improve the hydro-morphological conditions of the water bodies and where is necessary and suitable execute restoration of the degraded water, swamp and riparian habitats”.

Measures to reduce the impacts of hydromorphological loads of regular watercourse maintenance

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- In order to reduce the risk of introduction and spreading of invasive alien species it is necessary to implement additional measures to control and reduce the impact of biological load (as defined in the RBMP) during the regular maintenance of the watercourses.

SOIL AND AGRICULTURE

- For each intervention of regular maintenance of watercourses, retention, reservoirs and other water structures which produce excess material plan to deposit that matter to locations for disposal, not in the immediate vicinity of the watercourse to avoid damage and distortion of the good condition of the soil in these areas.

Measures to reduce the impact of point and diffuse water pollution

Measures are not defined.

Measures to control and reduce the impact of biological load

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Measures should be amended with the measures related to the adequate disposal of the plant material mown and cut on the locations where invasive plant species were recorded and prohibition of the herbicides use in the vicinity of watercourses:
 - (i) Adequately dispose the plant material mown and cut on the locations where invasive plant species were recorded - burning is the most appropriate method, especially in the case of the Japanese knotweed. It is important to prevent spreading of the mown plant material into the watercourse in order to prevent accidental spreading of the species in the downstream areas.
 - (ii) Chemicals used to stop the spread of invasive plant species should not be applied in the vicinity of the watercourse in order to prevent watercourse pollution and degradation of aquatic habitats.
- Measures related to the control of the invasive alien species spreading should be included in the General technical conditions for water management projects and other related documents.

Other protected nature areas where the maintenance or improvement of the water status presents an important element of its protection.

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be included in the early preparation of additional measures.

FORESTRY

- In additional measures implement open aquifers' underground water levels monitoring as well as monitoring of the surrounding forests' ecological state.

5.4. SUPPLEMENTARY MEASURES

5.4.1. Supplementary measure of harmonisation of the water status monitoring

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Number of stations monitoring the transport of bottom river sediments has to be increased and continuous monitoring ensured, especially on the rivers used /planned as inland waterways.
- The most important riverine breeding and wintering grounds of freshwater fish have to be defined in cooperation with appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature, especially in those rivers where sediment is currently being removed/there are plans for its removal for maintenance of inland waterways.

FORESTRY

- In prescribed monitoring implement open aquifers' underground water levels monitoring in riparian forests' area as well as monitoring of the surrounding forests' ecological state.

MARINE ENVIROMENT

- Due to rationalization of costs, consolidate all national monitoring programmes in the Adriatic under jurisdiction of Republic of Croatia.

5.4.2. Supplementary control measures for point and diffuse sources of pollution

Measures are not defined.

5.5. PROGRAMME OF IMPLEMENTING MEASURES TO REDUCE FLOOD RISKS

1) Measures to improve flood risk management

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- During the preparation of operational flood protection plans in accordance with the National Protection and Rescue Directorate, the emphasis should be put (as much as possible) on the ecosystem-based disaster risk reduction.

2) Implementing measures to reduce areas at flood risk

BIOLOGICAL DIVERSITY, PROTECTED AREAS OF NATURE, ECOLOGICAL NETWORK

- Implementation of nature protection measures should be encouraged already in the early design phases of plans at lower level of water management hierarchy (e.g. Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities 2013 - 2017) but also at the individual project level.
- When assessing the impact of rehabilitation, reconstruction and development of the flood control systems, as well as the construction of lowland retentions on the biodiversity, protected areas and/or ecological network, mitigation measures should be identified during the environmental impact assessment (EIA) and / or nature impact assessment (NIA) in order to avoid harmful impacts of these projects.
- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during the plans / projects preparation. In areas where there is a risk of greater impact on the biodiversity, protected areas and/or ecological network, appropriate measures should be already implemented in the project design phase and harmonised with the additional measures defined in the RBMP for areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection in order to speed up the procedures of nature impact assessment.
- Programme of regular economic and technical maintenance of watercourses, water estate and water facilities has to be harmonised with technical solutions based on ecologically acceptable approach and similar measures proposed by other plans and programmes regarding the flood risk management.

- Measures defined in RBMP as additional measures for areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection should be included in the General technical conditions for water management projects and other relevant documents. Education of all stakeholders (developers of the Programme of regular economic and technical maintenance of watercourses, designers and contractors) in regard to measures implementation should be conducted.
- Programme of regular economic and technical maintenance of watercourses, water estate and water facilities should be prepared not only annually, but also in multiannual cycles.
- During the preparation of seawater flood protection concept and analysis of climate change impacts on the concepts of protection from adverse effects of water and flood risk management, the emphasis should be put (as much as possible) on the ecosystem-based disaster risk reduction and ecosystem-based climate change adaptation.
- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during the preparation of the protection programmes and management plans for registered floodplains and retention areas, preparation of seawater flood protection concept and the analysis of climate change impacts on the concepts of protection from adverse effects of water and flood risk management.

CULTURAL AND HISTORICAL HERITAGE

- Before construction, natural heritage conservation study needs to be conducted with impacts assessment analysis on all types of cultural objects and prepare mitigation measures.

FORESTRY

- In case of existing or new retentions, swamps or inundations in riparian forest areas, enable natural or artificial withdrawal of the water from designated areas after flood water level is decreased.
- During development of the Protection programs and Management plans, incorporate measures that enables undisturbed game's life cycle or undisturbed forest management.
- Determine big game's migratory patterns and pathways in order to perform better flood risk assessment and flood impact on game and hunting.
- During establishment of the retentions, swamps or inundations, take care on big game's migratory patterns and pathways in order not to interrupt them.



SOIL AND AGRICULTURE

- By investigative monitoring identify areas that are subject to water erosion (floods) and monitor the intensity and erosion, especially during and after rainfall of great intensity.

3) Measures to reduce flood risk through public participation

Measures are not defined.



3 TRANSBOUNDARY IMPACTS

3.1 Biodiversity and protected areas

In order to assess potential transboundary impact of the RBMP on the biodiversity and protected areas of nature, transboundary areas that depend on the water status and water management were analysed - i.e. areas in the vicinity and downstream of the transboundary watercourses (Slovenia, Hungary, Serbia , Bosnia and Herzegovina), as well as areas influenced by the Adriatic Sea (Slovenia, Italy, Montenegro). During the analysis of the potential impacts, possibility of transboundary impacts on the biodiversity and protected areas of Montenegro and Italy was excluded.

Measures proposed by RBMP mostly contribute to the improvement of the water status. Since the implementation of such measures may have a long-term, moderate to significant positive impacts on biodiversity and protected areas in Croatia (in terms of species and habitat conservation related primarily to the aquatic ecosystems), they are expected to have a positive impact on the transboundary areas that depend on the water status and water management in Croatia - i.e. areas located in the close vicinity of the national border (in Slovenia, Hungary, Serbia or Bosnia and Herzegovina), areas located downstream of Croatia or those influenced by the Adriatic Sea (in Slovenia). Flood risk management, administrative and implementation measures that aim to reduce the flood risk areas by encouraging the protection and conservation of natural retention and wetland areas could also result in positive downstream transboundary impacts.

On the other hand, implementation of the measures that include construction of various projects (e.g. construction of public water supply and public sewerage systems, revitalisation projects etc.) designed for achieving the RBMP objectives (good water status and reduced hydromorphological loads), may result in adverse, spatially and/or time-limited impacts on biodiversity and protected areas (mainly those associated with aquatic ecosystems). If present, those negative impacts could, locally, result in adverse impacts on biodiversity and protected areas of neighbouring countries, primarily those areas located in the close vicinity of the national border (in Slovenia, Hungary, Serbia or Bosnia and Herzegovina). Since the possible negative impacts can be assessed in more detail (precise project location and character of the possible impacts) during the SEA of water management and/or spatial plans, through the EIA mechanism, as well as in cooperation with the relevant institutions of neighbouring countries (if deemed necessary), they are considered as acceptable on the SEA level.

3.2 Areas of special water protection

Proposed measures within RBMP will have positive impact on areas of special water protection and will contribute to their further protection. Therefore by implementation of the RBMP transboundary impacts are not expected.

Transboundary impact of Plan on areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection are described within previous chapters.

3.3 Landscape

Individual water management structures are not subject of the Plan, so cross-border impacts of individual interventions cannot be determined. But if one takes into account the fact that the construction of water management facilities is planned on the territory of the Republic of Croatia, and that the impacts on the landscape, which may occur as a result of their construction, are limited to the close area of a particular intervention (in the range of views from a human perspective), it can be concluded that the implementation of the Plan will not lead to significant cross-border impact on the landscape.

3.4 Culture and historical heritage

The RBMP does not define individual interventions/projects, so that it is not possible to evaluate their potential adverse transboundary effects on cultural heritage at present level. If there will be certain projects which could have transboundary impacts on cultural heritage, they will be subject to environmental impact assessment including transboundary consultations according to Espoo Convention and bilateral and multilateral agreements. In that procedure necessary protection measures will be developed which will ensure avoidance/mitigation of adverse transboundary impacts. It is to be noted that significant transboundary impacts on cultural heritage were identified neither in SEA for Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities nor in SEA for Multi-annual construction programme for water utility facilities which are programmes that implement the strategic goals of the RBMP.

3.5 Forestry

Transboundary impacts of this Plan on forest and forestry, considering its strategic level, will be positive since all designated measures and their amendments by this SEA are directed towards improvement or at least keeping “status quo” of the water status.

Interventions that will cause changes in watercourses’ water levels, flow rate or creating new canals near border will affect open aquifers’ underground water levels on both sides of the watercourse, therefore establishment of monitoring is essential to determine whether those impacts are positive or negative. Significantly positive impact will be caused by creating new retentions or swamps on Croatian side of the state border since it would decrease the probability or duration of the flooding in downstream countries.

Specific interventions are not the subject of the RBMP, but they will be subject to environmental impact assessment including transboundary consultations according to Espoo Convention and bilateral and multilateral agreements. In that procedure necessary protection measures will be developed which will ensure avoidance/mitigation of possible adverse transboundary impacts.

3.6 Game and hunting

Transboundary impacts of this Plan on game and hunting of the surrounding countries on strategic level will be positive since all designated measures and their amendments by this SEA aim at improvement or at least keeping “status quo” of the water status.

Interventions such as creation of new canals, retentions, swamps or inundation can cause the disruption of the migratory pathways, especially for the big game whose population distribution and migration includes several adjacent states. Therefore, determination of migratory patterns and pathways is essential prior such interventions.

Specific interventions are not the subject of the RBMP, but they will be subject to environmental impact assessment including transboundary consultations according to Espoo Convention and bilateral and multilateral agreements. In that procedure necessary protection measures will be developed which will ensure avoidance/mitigation of adverse transboundary impacts.

3.7 Soil and agriculture

Implementing the proposed Plan will improve the state of the soil and agricultural production as well. That will also improve the state of surface and underground water. If this situation appears in the Croatia, it will be the same situation in surrounding countries.

Implementing the proposed Plan there will be no negative impacts on soil and agriculture in Croatia and surrounding countries.

3.8 Population and public health

The plan implements a series of measures aimed at ensuring acceptable quality of drinking water, water for bathing and recreation, water for farming aquatic organisms for human consumption as well as protection of people and goods from adverse effects of floods. As the purpose of the Plan is enhancing water quality it has significant positive impact on population and public health, both in Croatia and in neighbouring countries.

Regarding the flood protection, the RBMP encourages green infrastructure and plans the regulation works only when necessary. This is expressed in the following measures of the component B:

- introduction of special level of protection and preservation of natural retentions and wetlands [...],
- encouraging technical solutions which ensure: retention of water in the river basin as long as possible, and allow the spreading of watercourses to decelerate runoff,
- preservation, restoration and expansion of areas which have a potential to retain flood water, such as natural retentions, wetlands and floodplains,
- limit the use of land intended for retention of flood water and implement administrative measures to prevent water and soil pollution with hazardous substances during flooding,
- in former floodplains continue to develop lowland retentions in order to lower the flood load and thus protect the areas downstream,
- use the existing floodplains as meadows and pastures or for the restoration of alluvial forests.

Measures which aim at retention of flood water in river basin have significant positive transboundary impact on flood protection in downstream countries.

3.9 Water bodies

Pursuant to the Water Protection Act water protection objectives are:

- (a) prevent further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems;
- (b) promote sustainable water use based on a long-term protection of available water resources;
- (c) aim at enhanced protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances;
- (d) ensure the progressive reduction of pollution of groundwater and prevent its further pollution, and
- (e) contribute to mitigating the effects of floods and droughts.

The purpose of this Plan is to establish a set of measures to achieve the above objectives. The objectives (a) to (d) are to be achieved through the component A of the Plan and the objective (e) through the component B. Thus, the transboundary impact of the component A of the Plan on water bodies in Slovenia, Hungary, Serbia, Bosnia and Herzegovina is significant and positive. There is no impact on water bodies in Italy, and there is a weak positive impact on coastal waters in Montenegro.

Potentially adverse impact on water bodies can be caused by flood protection projects in cases where such projects include engineering works. In this case the impact is mainly on hydromorphological characteristics of that water body. The Plan however encourages green infrastructure and plans the regulation works only when necessary. This is expressed in the following measures of the component B:

- introduction of special level of protection and preservation of natural retentions and wetlands [...],
- encouraging technical solutions which ensure: retention of water in the river basin as long as possible, and allow the spreading of watercourses to decelerate runoff,
- preservation, restoration and expansion of areas which have a potential to retain flood water, such as natural retentions, wetlands and floodplains,
- limit the use of land intended for retention of flood water and implement administrative measures to prevent water and soil pollution with hazardous substances during flooding,
- in former floodplains continue to develop lowland retentions in order to lower the flood load and thus protect the areas downstream,



-
- use the existing floodplains as meadows and pastures or for the restoration of alluvial forests.

Thus it is expected that there will be no negative impacts on water bodies in neighbouring countries caused by the component B.

3.10 Fisheries

Measures defined by Plan will not have transboundary impact on fisheries.



3.11 Waste

Measures in the field of waste management defined by Plan will not have any transboundary impact.



3.12 Air

Transboundary impact on air quality is not expected.

3.13 Transport

Even though the scope of the River Basin Management Plan is the improvement of water quality, river habitat protection and flood risk management the proposed measures do not have significant effect in terms of transportation restrictions for the mayor transportation waterways that are a part of the TEN-T transportation corridors namely the Rhine-Danube Corridor and Sava Corridor.

4 ECOLOGICAL NETWORK - APPROPRIATE ASSESSMENT

Scope of the River Basin Management Plan (2016 - 2021) (RBMP) is located within the ecological network. Based on the Opinion of the Ministry of Environmental and Nature Protection (CLASS: 325-03/15-01/04; REG. NO.: 525-12/0938-15-2, from 14th January 2015), Appropriate Assessment of the RBMP is conducted as part of the Strategic Environmental Assessment in order to assess the significance of the Plan's impacts on target species and habitats and the integrity of ecological network.

Since the scope of the RBMP includes the whole area of ecological network in the Republic of Croatia, in coordination with the State Institute for Nature Protection ecological network sites were identified where the maintenance or improvement of the water status is an essential element of their protection and which could be affected by the implementation of the Plan's measures designed for water status and flood risk management. In the Danube River Basin distinguished areas cover 28% of the total area, while in the Adriatic River Basin they cover 45% of the land area and 30% of the marine area. During the analysis of the RBMP's impacts on both River Basins, emphasis was placed on the target aquatic habitats (some of them rare or endangered - e.g. travertine barriers, underground aquatic habitats, turloughs); riparian habitats with amphibious and marsh vegetation; and hygrophilous and humid grasslands, shrubs and forests. Moreover, since the Adriatic River Basin encompasses transitional and coastal waters, distinguished habitats also included target coastal (and saline) habitats - e.g.; muddy, sandy and rocky shores with halophytes; estuaries, coastal lagoons and large shallow inlets and bays; as well as *Posidonia* beds, mud and sand beds.

The RBMP will have direct or indirect positive impact on conservation of target species and habitats. Planned measures mostly have moderate to significant positive impact on the improvement of the water status reducing the recognized pressures on target species and habitats (e.g. pollution, urbanisation, natural resource use, water abstractions, land use, natural system modifications of water bodies due to diverse construction works on watercourses, regulations and morphological changes of watercourses and banks etc.). Measures regarding the flood risk management which aim to conserve present and potential floodplains and retentions are in accordance with the internationally acknowledged approach "Room for the River". These measures may have a significant positive impact on ecological network sites which protect floodplains, upon condition that identification of those areas, their protection programs and management plans are made in close cooperation with the nature protection sector.

Possible negative impacts on the ecological network are connected with the construction works planned to achieve the RBMP objectives (e.g. construction of public water supply and public sewerage systems, revitalisation projects and construction of regulation and protection water facilities planned as part flood risk management. These projects may result in negative, often cumulative impacts on target species and habitats due to the potential disturbance and habitat loss and/or quality degradation. Most of these projects

have purpose of maintenance and improvement of water status and reducing the impact of hydromorphological loads. Moreover, character of their impact will be assessed in more detail (precise project location and intensity of the possible impacts) during the SEA of water management and/or spatial plans, as well as through the NIA mechanism. Therefore, these projects are considered as acceptable on the level of RBMP impact analysis with implementation of proposed mitigation measures.

On strategic level, the RBMP encourages better intersectoral collaboration in order to lessen potential negative impacts on the minimal possible level. Furthermore, it suggests implementation of measures aimed to maintain and improve the status of target species and habitats during the projects' early planning phase (while designing the water management plans and/or individual projects). Apart from contributing to the effective implementation of the RBMP, better intersectoral collaboration and implementation of certain measures in the early planning phase could also facilitate the future appropriate assessment procedures.

Considering all of the above, it is concluded that RBMP (2016 - 2021) is acceptable for the ecological network, with mostly positive effects on target species and habitats and the integrity of ecological network, while recognized negative impacts could be mitigated if measures proposed by this Appropriate Assessment are applied.

4.1 Mitigation measures

BASIC MEASURES

5.2.1 Measures of cost recovery from water services and prompting efficient water use

2) Measures of introduction of the cost recovery principle from water services and improvement of business operations

- Through a RBMP's programme of measures ensure complete transparency in the expenditure of water fees thus encouraging the public (users of water services) to use water efficiently and to accept the economic costs of water services.

3) Measures to increase water user contributions to the recovery of external costs of environmental and resource and encourage efficient water use.

- Ensure the use of the water protection fees collected for production and importing of mineral fertilizers and plant protection products and their placement on the market in the Republic of Croatia (or at least a part of the fees) for projects whose primary purpose is improving the water status and status of aquatic ecosystems (e.g. public education, projects related to the reduction of toxic substances pollution of aquatic ecosystems).

5.2.2. Measures for protection of drinking water

2) Implementation measures for drinking water protection

- Encourage the implementation of the nature conservation measures in the early phases of project planning through plans at lower level of water management hierarchy and/or individual projects (e.g. construction works as part of the rehabilitation measures, upgrade/improvement of public water supply systems).

5.2.3 Measures of water abstraction control

2) Implementation measures of water abstraction control

- Programme designed to encourage implementation of measures to reduce the load caused by water abstraction and programme of rationalisation of water use should clearly define responsible institutions / entities and time frame for the

implementation of this programmes, as well as indicators for monitoring the effectiveness of their implementation.

- All new projects that require water or technological water as a resource should in early preconstruction phase predict adequate technology and technical solutions that use smaller amounts of water, as well as predict and ensure biological minimum release, that is ecologically acceptable flow .
- Where construction or upgrade of public irrigation systems is predicted, if necessary, encourage the implementation of the nature protection measures (biodiversity, protected areas, ecological network) in the early design phases of the plans at lower level of water management hierarchy and individual projects preparation .
- Baseline assessment studies have to be prepared in order to assess the cumulative impact of all planned irrigation systems on a single basin / watercourse, that is to assess the significance of the impact on the regime of ground and surface waters. Priority areas for baseline assessment study preparation are the basins where the poor quantitative status of the groundwater bodies is estimated and/or where significant load of water abstraction and diversion exists.
- When planning the water abstraction projects, baseline assessment study has to be prepared in order to assess the cumulative impacts of water abstraction plans on surface and groundwater bodies. Priority areas for baseline assessment study preparation are the basins where the poor quantitative status of the groundwater bodies is estimated and/or where significant load of water abstraction and diversion exists.
- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during the preparation of irrigation plans / projects.

5.2.5 Measures of control of point sources

2) Implementation measures for control of point sources of pollution

- Through plans at lower level of water management hierarchy, as well as on the individual project level, encourage implementation of the nature protection measures (biodiversity, protected areas, ecological network) in the early design phases of construction / upgrading of public sewerage systems.

5.2.6. Measures of control of diffuse sources of pollution

- Ensure the use of the water protection fees collected for production and importing of mineral fertilizers and plant protection products and their placement on the market in the Republic of Croatia (or at least a part of the fees) for projects whose primary purpose is improving the water status and status of aquatic ecosystems (e.g. public education, projects related to the reduction of toxic substances pollution of aquatic ecosystems).

5.2.7 Measures of control and reduction of hydromorphological load

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted i.e. adequate research has to be conducted during the early preparation of revitalisation projects in order to define ecological objectives of the revitalisation and conduct the revitalisation primarily to improve the species and habitats conditions.
- In accordance with the European Commission manuals (e.g. Guidance document on Inland waterway transport and Natura 2000, 2012), the best available techniques have to be applied when building new or reconstructing the existing inland waterway structures in order to reduce the ecological pressure on habitats and species.
- When planning new inland waterways, or increasing their existing categories, Feasibility study has to be conducted, taking into account the value of ecosystem services.
- Revitalisation measures and measures for hydromorphological load reduction, based on the conducted monitoring of hydromorphological loads and discussed with appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature, have to be included in the Programme of regular economic and technical maintenance of watercourses, water estate and water facilities.
- In the early planning phase of projects designed to reduce hydromorphological load (e.g. revitalisation and renaturalisation projects) ecosystem services evaluation should be included as a valid measure during the cost-effectiveness analysis.

5.2.9. Measures prohibiting discharges into groundwater

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be included during the early preparation of criteria for indirect discharges into groundwater
- Define the risk (level) of bioaccumulation for pollutants listed in the criteria for indirect discharges into groundwater.

ADDITIONAL MEASURES

5.3.2. Waters capable of supporting freshwater fish and water suitable for shellfish

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during the early preparation of additional measures related to the hydromorphological loads reduction and their harmonization with the additional measures defined in the RBMP for areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection.
- When introducing alien (allochthonous) species for freshwater fish /shellfish farming, risk assessment of species (re-)introduction into the nature has to be carried out, in accordance with legal provisions in force.
- Measure “For water bodies which were assessed as having unsatisfactory hydromorphological status, determine the significance of the hydromorphological load for the status of fish population and propose measures to reduce the hydromorphological load.” should be amended as follows “For water bodies which were assessed as having unsatisfactory hydromorphological status, determine the significance of the hydromorphological load for the status of fish population and propose measures to reduce the hydromorphological load, as well as measures to ensure watercourse connectivity and ecologically acceptable flow, where they are not presently ensured.”

5.3.3 Areas for bathing and recreation

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be included in the early preparation of additional measures for protection of bathing waters (if proposed).

5.3.6 Areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection

Measures to improve management

- During the early preparation of management plans of ecological network sites (where maintenance or improvement of the water status is an important element of their protection), Hrvatske vode have to be included through consultations with management plans developers and continuous intersectoral data exchange.

Measures to reduce the impact of hydromorphological loads for new interventions/loads

- In order to reduce the risk of introduction and spreading of invasive alien species it is necessary to implement additional measures to control and reduce the impact of biological load (as defined in the RBMP) during the construction and maintenance of new projects.
- In order to preserve favourable conservation status of target species and habitats i.e. the integrity of the ecological network, it is necessary to ensure watercourse connectivity during the construction of new projects (especially the construction of hydropower facilities).
- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during revision and/or amendment of the Cadastre of Small Hydroelectric Plants, as well as during the early planning phase of new projects regarding the construction of small hydropower plants.
- Ecosystem services evaluation should be included as a valid measure during the cost-effectiveness analysis in the early project planning phase.

Measures to reduce hydromorphological impacts of the existing hydromorphological loads

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted i.e. adequate research has to be conducted (if needed) during the early preparation of revitalisation projects in order to define ecological objectives of the revitalisation and conduct the revitalisation primarily to improve the target species and target habitats conditions.

- Ecosystem services evaluation should be included as a valid measure during the cost-effectiveness analysis in the early project planning phase (e.g. in the early planning phase of revitalisation and renaturalisation projects).

Measures to reduce the impacts of hydromorphological loads of regular watercourse maintenance

- In order to reduce the risk of introduction and spreading of invasive alien species it is necessary to implement additional measures to control and reduce the impact of biological load (as defined in the RBMP) during the regular maintenance of the watercourses.

Measures to control and reduce the impact of biological load

- Measures should be amended with the measures related to the adequate disposal of the plant material mown and cut on the locations where invasive plant species were recorded and prohibition of the herbicides use in the vicinity of watercourses:
 - (iii) Adequately dispose the plant material mown and cut on the locations where invasive plant species were recorded - burning is the most appropriate method, especially in the case of the Japanese knotweed. It is important to prevent spreading of the mown plant material into the watercourse in order to prevent accidental spreading of the species in the downstream areas.
 - (iv) Chemicals used to stop the spread of invasive plant species should not be applied in the vicinity of the watercourse in order to prevent watercourse pollution and degradation of aquatic habitats.
- Measures related to the control of the invasive alien species spreading should be included in the *General technical conditions for water management projects* and other related documents.

Other protected nature areas where the maintenance or improvement of the water status presents an important element of its protection.

- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be included in the early preparation of additional measures.

5.4. SUPPLEMENTARY MEASURES

5.4.1. Supplementary measure of harmonisation of the water status monitoring

- Number of stations monitoring the transport of bottom river sediments has to be increased and continuous monitoring ensured, especially on the rivers used /planned as inland waterways.
- The most important riverine breeding and wintering grounds of freshwater fish have to be defined in cooperation with appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature, especially in those rivers where sediment is currently being removed/there are plans for its removal for maintenance of inland waterways.

PROGRAMME OF IMPLEMENTING MEASURES TO REDUCE FLOOD RISKS

1) Measures to improve flood risk management

- During the preparation of operational flood protection plans in accordance with the National Protection and Rescue Directorate, the emphasis should be put (as much as possible) on the ecosystem-based disaster risk reduction.

2) Implementing measures to reduce areas at flood risk

- Implementation of nature protection measures should be encouraged already in the early design phases of plans at lower level of water management hierarchy (e.g. Multi-annual programme for the construction of regulation and protection water facilities and amelioration facilities 2013 - 2017) but also at the individual project level.
- When assessing the impact of rehabilitation, reconstruction and development of the flood control system, as well as the construction of lowland retention on the ecological network, mitigation measures should be identified during the nature impact assessment (NIA) in order to avoid harmful impacts of these projects.
- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during the plans / projects preparation. In areas where there is a risk of greater impact on the ecological network, appropriate measures should be already implemented in the project design phase and harmonised with the additional measures defined in the RBMP for areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential

element of their protection in order to speed up the procedures of nature impact assessment.

- Programme of regular economic and technical maintenance of watercourses, water estate and water facilities has to be harmonised with technical solutions based on ecologically acceptable approach and similar measures proposed by other plans and programmes regarding the flood risk management.
- Measures defined in RBMP as additional measures for areas designated for protection of habitats or species where the maintenance or improvement of water status is an essential element of their protection should be included in the General technical conditions for water management projects and other relevant documents. Education of all stakeholders (developers of the Programme of regular economic and technical maintenance of watercourses, designers and contractors) in regard to measures implementation should be conducted.
- Programme of regular economic and technical maintenance of watercourses, water estate and water facilities should be prepared not only annually, but also in multiannual cycles.
- During the preparation of seawater flood protection concept and analysis of climate change impacts on the concepts of protection from adverse effects of water and flood risk management, the emphasis should be put (as much as possible) on the ecosystem-based disaster risk reduction and ecosystem-based climate change adaptation.
- Appropriate experts in the nature protection field (biology, nature protection) and/or Croatian Agency for the Environment and Nature have to be consulted during the preparation of the protection programmes and management plans for registered floodplains and retention areas, preparation of seawater flood protection concept and the analysis of climate change impacts on the concepts of protection from adverse effects of water and flood risk management.

4.2 Transboundary impacts

In order to assess potential transboundary impact of the RBMP on the ecological network, transboundary ecological network sites that depend on the water status and water management were analysed - i.e. areas in the vicinity and downstream of the border watercourses (Slovenia, Hungary, Serbia, Bosnia and Herzegovina), as well as areas influenced by the Adriatic Sea (Slovenia, Italy, Montenegro). During the analysis of the potential impacts, possibility of transboundary impacts on the ecological network of Montenegro and Italy was excluded.

Measures planned by the RBMP mostly have moderate to significant positive impact on the improvement of the water status by reducing the pressures on target species and habitats which will have positive effects on the transboundary areas of ecological network. Measures regarding the flood risk management that aim to conserve present and potential retentions and floodplains could have a significant positive impact on areas of ecological network which protect floodplains, upon condition that identification of those areas, their protection programs and management plans are made in close cooperation with the nature protection sector. Their impact on the transboundary areas of ecological network is mostly positive, while any potential negative impact on the transboundary areas can be lessened or eliminated during the early planning phase (e.g. identification) and/or in cooperation with the relevant institutions of neighbouring countries.

Possible negative impacts on the transboundary areas of ecological network could be connected with the construction works (e.g. construction of public water supply and public sewerage systems, revitalisation projects etc.) designed for achieving the RBMP objectives - i.e. to achieve good water status and reduce hydromorphological loads to a lesser extent. Considering the general features of such projects, possible negative impacts are expected to be spatially and / or time-limited, potentially affecting the transboundary sites in the close vicinity of the border watercourses, while the potential adverse impact on the water bodies of the neighbouring countries located downstream of Croatia is assessed as low and indirect. Since the possible negative impacts can be assessed in more detail (precise project location and character of the possible impacts) during the SEA of water management and/or spatial plans, through the NIA mechanism, as well as in cooperation with the relevant institutions of neighbouring countries (if deemed necessary), they are considered as acceptable on the SEA level.