



ANNEX 6

Imotsko polje springs (PA2.4.2)

SET-UP OF PILOT-SPECIFIC MANAGEMENT PRACTICES

D.T2.1.2 Transnational case review of best management practices in pilot actions

BEST MANAGEMENT PRACTICES REPORT IN PILOT ACTION

“IMOTSKO POLJE SPRINGS”

FINAL VERSION

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1. Introduction

In this report best management practices are presented on the level of Pilot Action “Imotsko polje springs” (Figure 1.), regarding potential conflicts of interest between land use management and water protection.

The aim of this report is to provide the review of best practices regarding different types of land use (agriculture, grassland, forestry) respectively vegetation cover (wetland), aiming at water protection and mitigating floods in the Pilot Action.

For this, first of all human activities have to be identified, which are posing risk to water quality and quantity; flooding and consecutive to water management. Finally, review of best management practices in the Pilot Action is presented.

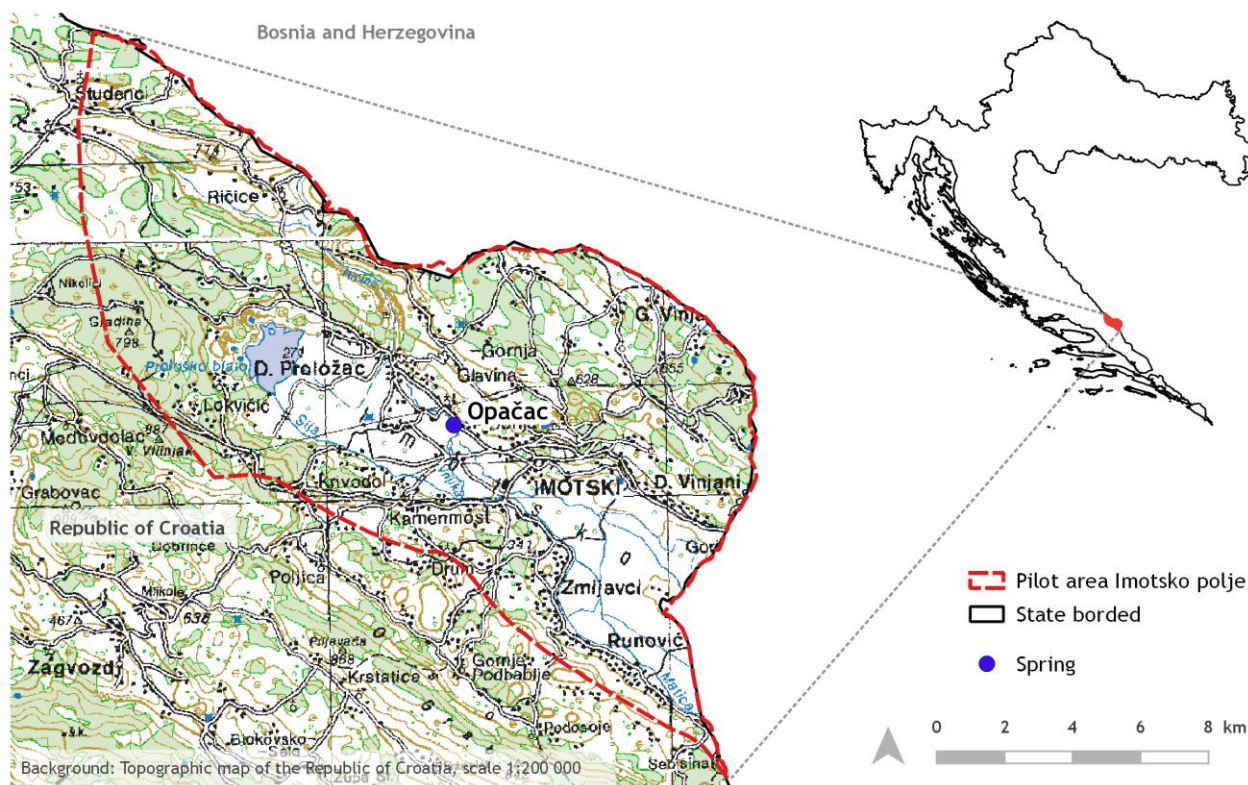


Figure 1. Pilot action Imotsko polje springs



2. Land use, drinking water and flood protection in the Pilot Action

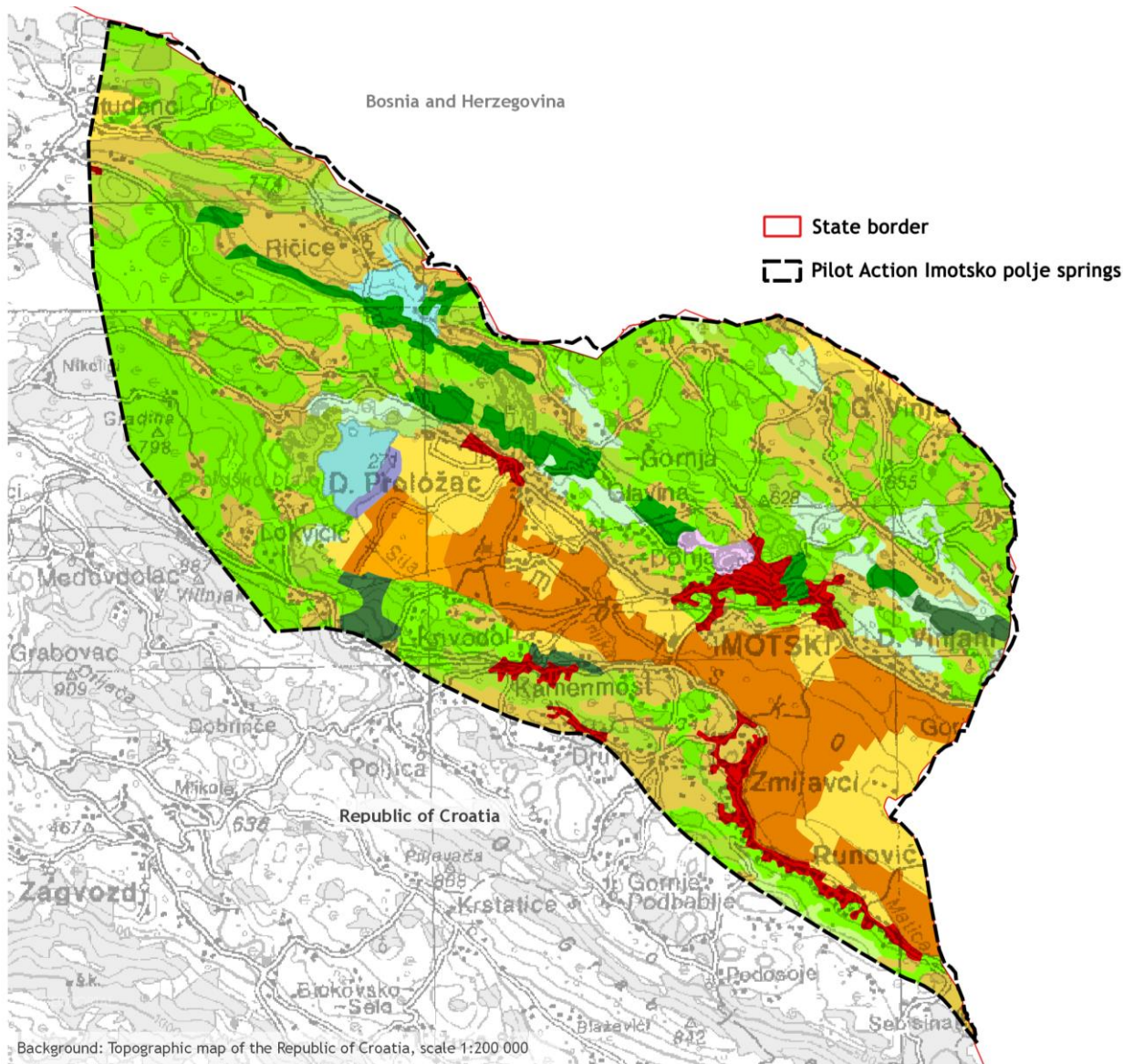
2.1. Land use

In the Republic of Croatia Ministry of Construction and Physical Planning performs administrative and other tasks related to physical planning, regulations for land use and protection of space. Every county, municipality and city must have the cartographical representation of land use, as well as prescribed conditions of land use.

Pilot Action **Imotsko polje springs** is located in southern part of Splitsko-dalmatinska County. Spatial plan of Splitsko-dalmatinska County define the goals of spatial development and organization, protection, use and purpose of space with appreciation to the protection and conservation of natural, cultural - historical and landscape values. Also, spatial plans define the land use in compliance with the protection of human health against negative impacts such as floods, pollution etc. Therefore, some land uses are prohibited in flood risk areas and areas with high groundwater levels (e.g. construction of industrial facilities, cemeteries, landfills etc.).

As indicated in The State of the Environment Report of the Republic of Croatia comprehensive policies and legislation for the implementation of the rational and sustainable management and protection of land is not yet established and also there is no systematic monitoring of changes in land use in Croatia. Land use maps of the Republic of Croatia were created within the Corine land cover project for years 1980, 1990, 2000, 2006 and 2012. Corine land cover is available to the public via web page (<http://corine.azo.hr/corine/hr#sthash.oqXIRm9d.dpbs>). Also, the Physical planning information system (ISPU) as an application of the Ministry of Construction and Physical Planning that merges Geoportal, Cadaster and spatial plans into one unit, enables the end users simple access to the information on the rules of land use.

Land use in Pilot Action Imotsko polje springs is presented in Figure 2. and Table 1. Broad-leaved forests (6652 ha) along with land principally occupied by agriculture, with significant areas of natural vegetation (3715 ha) covers the majority of Pilot Action area. Agricultural production composed of complex cultivation patterns, agricultural land with significant areas of natural vegetation, permanently irrigated land, non-irrigated arable land, pastures and vineyards is concentrated in Imotsko field and along settlements. Water bodies cover 313 ha, while around 62 ha is covered with inland marshes.



Background: Topographic map of the Republic of Croatia, scale 1:200 000

CORINE LAND COVER 2012 - PILOT ACTION IMOTSKO POLJE SPRINGS



















- | | |
|--|---|
|  Urban fabric (<80% built) |  Broad-leaved forest |
|  Sport and leisure facilities |  Coniferous forest |
|  Non-irrigated arable land |  Mixed forest |
|  Irrigated arable land |  Natural grasslands |
|  Vineyards |  Sclerophyllous vegetation |
|  Olive groves |  Transitional woodland-shrub |
|  Pastures |  Sparsely vegetated areas |
|  Complex cultivation patterns |  Inland marshes |
|  Land principally occupied by agriculture, with significant areas of natural vegetation |  Water bodies |

Figure 2. Corine Land Cover 2012, Pilot Action Imotsko polje springs



Table 1. Corine Land Cover in the Pilot Action Imotsko polje springs

Corine Land Cover in the Pilot Action Imotsko polje springs		
CLC code	CLC category	Area (ha)
311	Broad-leaved forest	6652.32
243	Land principally occupied by agriculture, with significant areas of natural vegetation	3715.83
221	Vineyards	2305.93
324	Transitional woodland-shrub	1743.81
242	Complex cultivation patterns	1638.70
321	Natural grasslands	753.59
312	Coniferous forest	678.73
112	Urban area (<80% constructed)	597.61
512	Water bodies	313.10
313	Mixed forest	252.64
223	Olive groves	214.05
323	Sclerophyllous vegetation	175.27
231	Pastures	111.52
142	Sport and leisure facilities	74.21
411	Inland marshes	62.73
333	Sparsely vegetated areas	13.57
212	Permanently irrigated land	6.59
211	Non-irrigated arable land	1.35

Agriculture

Irrigation plan that is relevant for the Pilot Action area is the Irrigation plan of the Split-Dalmatia County which was created by the Institute for Adriatic culture and melioration of karst in Split in 2006.

Estimation of the pressures on agricultural land due to applied nitrogen and phosphorus was carried out by determining the spatial distribution of nitrogen and phosphorus deposited on agricultural land via mineral and organic fertilizers. According to the River Basin Management Plan (2016.-2020.), the organic nutrients pressure is also related to cattle keeping and grazing and application of manure on agricultural land. Since the Pilot Action is located in the Split-Dalmatia County, the data for this county is applicable to this area. The amount of applied nitrogen and phosphorous on agricultural land in the Split-Dalmatia County is 29 kg/ha for N and 5 kg/ha for P.



Irrigation and melioration

Currently, the Study of Environmental impact for the planned irrigation system of Imotski field is under preparation. Imotski field has the most extensive agricultural activity in the area. Today's agricultural production covers 1,580 hectares, while 3,330 hectares are intended to be used after construction of irrigation system. This means that about 88% of the area of the Imotski field will be covered by agricultural production. 450 hectares are in plans for routes, network of canals, infrastructure facilities, forests, waterways, etc. Irrigation system construction will significantly change agricultural production, which implies intensification of production, particularly fruit, vegetable and arable crops, which, unlike wine cultivars, require irrigation.

For irrigation, 2,580 ha are planned, which makes 77% of agricultural areas, or 68% of the Imotsko polje. Wine cultivars, which need not be irrigated, will be grown on a surface of 1,050 ha. Water for irrigation would be taken from the existing reservoir of Ričica.

It was estimated irrigation system will have significant negative impact on both water quantity and water quality in the area, so the final impact will be assessed after completion of the impact study.

Urban Area

Waste management

Table 2. Waste management plans in the Pilot Action area (according to the Croatian Agency for environment and nature, 2017)

Runovići	Waste management plan for the period 2014.-2018.
Imotski	Waste management plan for the period 2012.-2019.
Lokvičići	Not adopted
Lovreć	Not adopted
Podbablje	Not adopted
Proložac	Not adopted
Zmijavci	Not adopted, existing Draft for the period 2014.-2018.

For the systematic waste management in the Split-Dalmatia County, construction of waste treatment and disposal facilities are planned.



According to the Environment contamination register by the Croatian Environment Agency, following waste producers in the pilot action Imotski field springs are:

Table 3. Waste producers in the Pilot Action South Dalmatia: Prud, Klokun and Mandina spring (data for the Split-Dalmatia County for the year 2016)

Waste production source	City/settlement	Type of waste	Amount of produced waste
Electrical power distributor	Imotski	Hazardous	5.8 t /year
Electrical power transmission	Imotski	Hazardous	36.8 t/year

Sewage system of Imotski

According to the Spatial plan of City of Imotski, existing sewage system is a mixed sewage system, fecal sewage system and separate sewage system that are all connected to the public channel network. Sewage system exists only in the city area, while other smaller settlements have septic pits or so-called black pits.

According to the Spatial plan of Split-Dalmatia County, it is necessary to build a sewerage network in the area of Imotski and in other settlements whose drainage gravitates to the treatment facility in Imotski. This is primarily related to settlements in Opačac spring catchment, for which an idea of sewage drainage was developed. Reconstruction of the purification unit is required, and connection of the Proložac sewerage network to the device because it is in water sensitive area. The construction of the Proložac municipal sewage system and the disposal of wastewater to the existing wastewater treatment plant of Imotski enable protection of the sources from pollution. 11,950 m of collector and 5 supporting pump stations were built, and a technical inspection of the system and connection to the Imotski city plant were provided. In the area of Zagvozd municipality it is necessary to reconstruct and upgrade the sewage network with the construction of a purifier.

Industry

In the past, Imotski was a significant industrial center, where industrial plants represented the beginnings of the development of industrial activity, such as "Imota", "Agrokoka" and so on. In the structure of the Imotski economy today, the share of industrial production is not on an enviable level. The market is reflected in the production of textiles.



Mineral raw materials

The most widespread material of the area is limestone which is found in the locality of Vinjani Gornji, and serves as a technical stone in construction.

Forests

In the Pilot Action area coastal thermophilic forests and shrubbery prevail (according to the information system of nature protection provided by State Institute of nature protection). In the thermophilous forests there are *Quercuss pubescens*, *Pinus sylvestris* and *Pinus nigra*, and on smaller surfaces are also shrubbery and maquis as endangered habitat types. Forest vegetation is protected within significant landscape Imotski lakes - Gaj which is proclaimed by Nature protection act (OG 80/13).

Grassland

In the most part of Pilot Action area submediterranean and epimediterranean dry grassland prevail (according to the information system of nature protection provided by State Institute of nature protection).

According to the “Agriculture that protects nature, Protection of nature through measures of Rural Development Programme of the Republic of Croatia 2014.-2020.”, decreasing number of grazing animals in the last decade is leading to the disappearance of grasslands rich in plant and animal species. Also, cattle is kept indoors in longer period through the year. The problem is particularly serious in the karst and mountainous areas where shrubs have suppressed the valuable grassland species adapted to survive in the poor soil or in holes between rocks with very little water.

Floods

Out of the total available area, about 70% is exposed to periodic flooding of lower or greater intensity and duration, and excessive moisture during winter and spring. The south-eastern part of the Imotski field is exposed to flooding primarily due to the operation of HPP Pec-Mlina in the neighboring state.

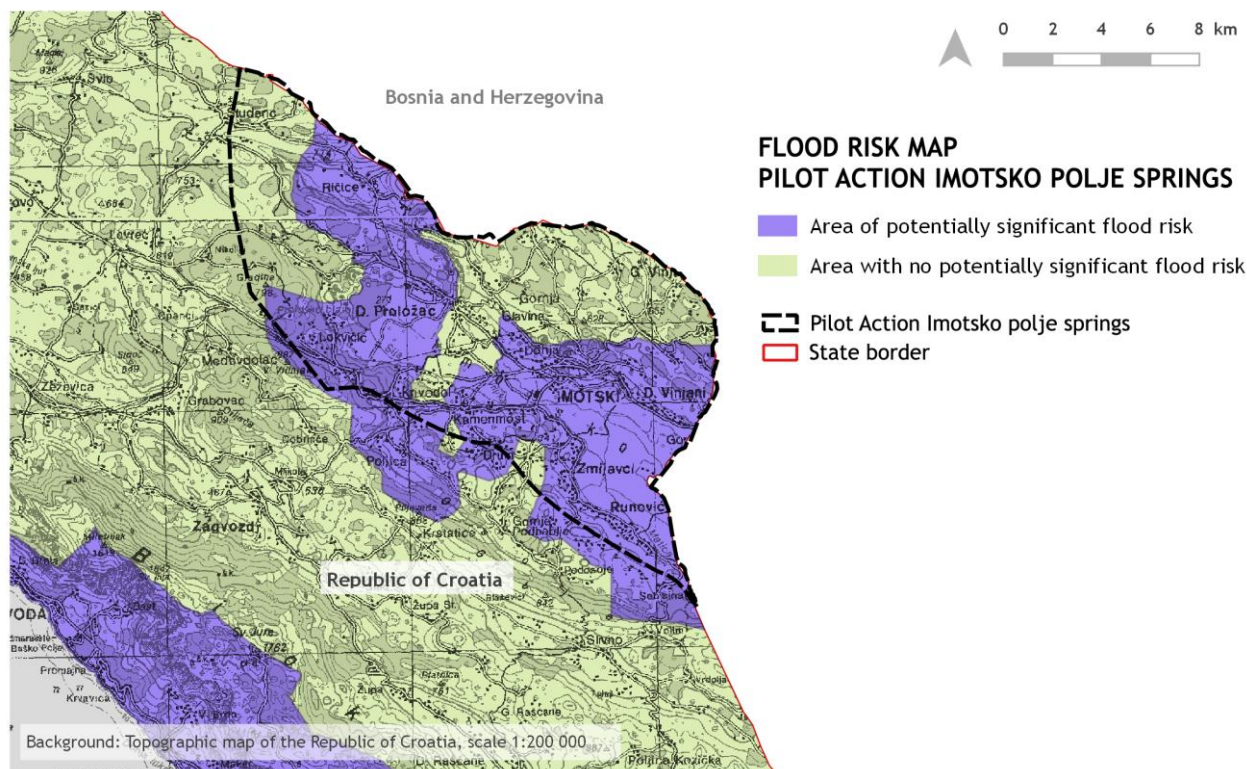


Figure 4. Flood Risk Map, Pilot Action Imotsko polje springs

Within the Trebižat-Vrljika-Ričica system, a few facilities were built for flood mitigation:

- The Prološko blato retention area was built to accept the flood wave of Ričica-Suvaja and its transformation. The Suvaja riverbed is regulated on the same entrance through which it becomes a channel

Accumulation of Ričica is a multifunctional object. It protects the downstream villages and the Imotsko polje from the flooding of the water of Ričina or Suvaja. Retention space that accepts high water and controlled water flow into the Suvaja basin enables irrigation of the Imotsko-Bekijsko polje during the vegetation period.

Vrljika River is the largest watercourse of the Imotsko-Bekijsko field, which is 18.3 km long and passes from the Opačac spring to the tunnel of Pećnik in Herzegovina. It is the main recipient of the polje and receives water input from a network of drainage channels of the polje.

Vrljika's regulation was carried out at the beginning of the 1960s and no system reconstruction nor cleaning of the basin haven't been done since. Such a situation requires urgent intervention, but any major action on the Vrljika River can be done only after repairing the condition in the downstream section of the watercourse in the Herzegovinian part of the field. The same applies for the increase of the Pećnik tunnel capacity and the river Trebižat as the main recipient.



With the construction of the Ričica reservoir, the Imotsko-Bekijsko field is protected from the outside flood waters. The biggest problem remains the internal water of Imotsko polje, i.e. the recipients who should receive them. Regulation of the Vrljika segment, reconstruction of the Pećnik tunnel and regulation of the Trebižat River, the problem of flood water reception would be solved. The problematic part of the system is situated on the territory of the Federation of Bosnia and Herzegovina, which outlines the need and obligation to negotiate and harmonize the actions with the relevant institutions of the other country. Areas designated as floodplain should be employed for non-sensitive flood uses, so they will not suffer any great damage due to high water.

2.2. Drinking water protection

For the purpose of protection of surface and groundwater resource and unique and valuable ecosystems dependent on water, protected areas are established by Water Act and other legislatives. Water that is intended for human consumption or is reserved for public water supply is or will be identified by Hrvatske vode (Croatian Waters) in every water basin area. Determination of drinking water protection zones (DWPZ), obligatory measures and limitations that are conducted in them as well as the deadlines for decisions on protection and the process of making these decisions are governed by The Ordinance on the conditions for the establishment of sanitary protection zones (Official Gazette No. 66/11 and 47/13). Established sanitary protection zones are implemented into spatial planning documents (spatial plans of counties, cities or municipalities).

Sanitary protection zones in aquifers with fracture and fracture-cavernous porosity are divided into:

- zone of limitation (IV. zone),
- zone of limitation and surveillance (III. zone),
- zone of strict limitation and surveillance (II. zone),

According to the data provided by Hrvatske vode, proclaimed sanitary protection zones are presented in Figure 3.



SANITARY PROTECTION ZONES - PILOT ACTION IMOTSKO POLJE SPRINGS

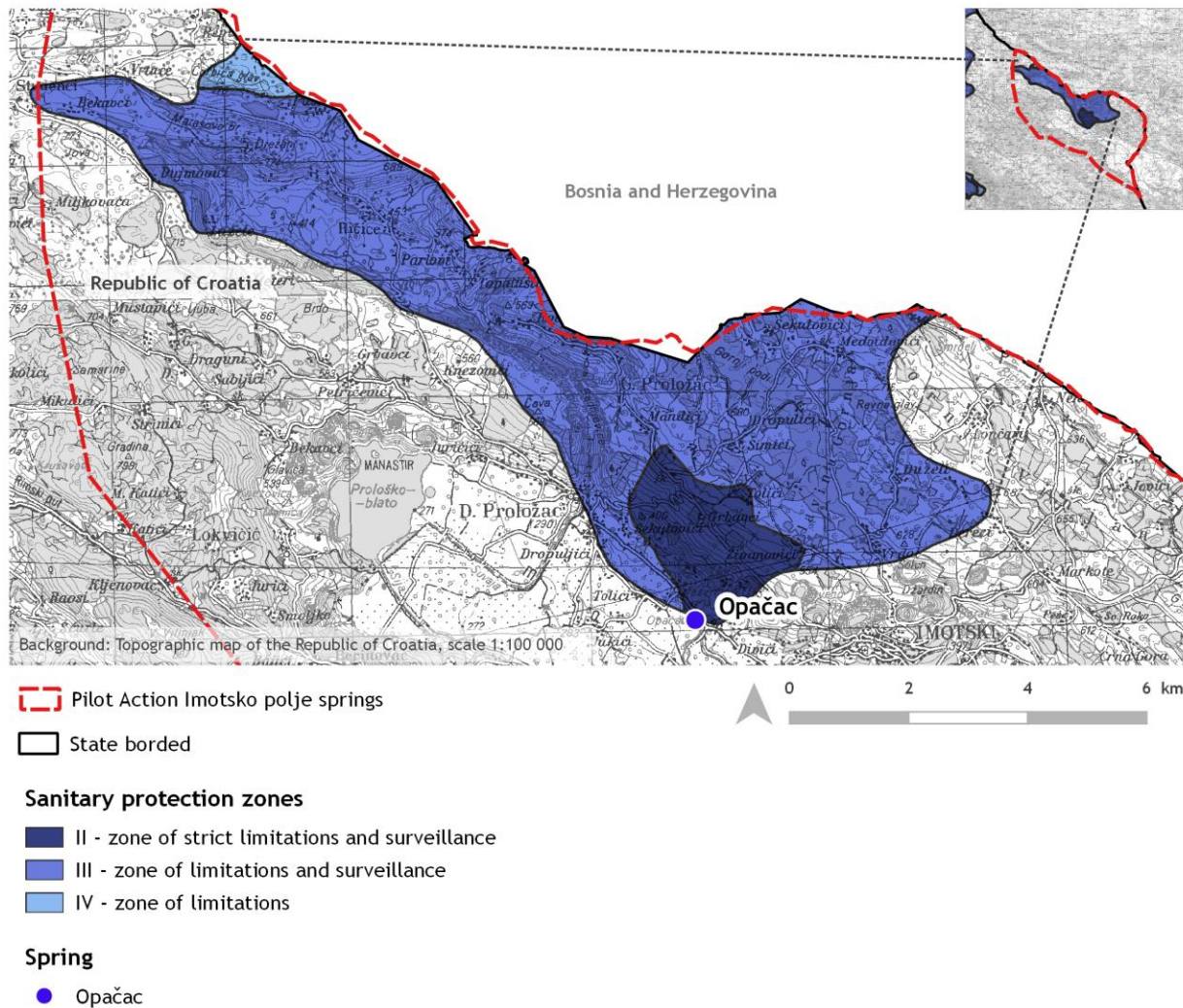


Figure 3. Sanitary protection zones within Pilot Action Imotsko polje springs

The water supply system of the town of Imotski uses drinking water from the source of Opačac (Vrljika River) whose capacity is 500-1300 l/s. Although so far around 85% of the system has been built, all settlements and even some in the town of Imotski have not yet been connected to the water supply system, and a continuation of the construction of the system is planned to ensure that all settlements have solved their supply with potable water.

Table 5. Water supply systems of the Dubrovnik-Neretva County in the pilot area

Water supply system zones	Water supply system	Number of citizens (2011. list)	Number of citizens connected to water supply system
Imotski-Vrgorac	Water supply system Imotska krajina	29739	26616



3. Best Management Practices

Water management

Decision on making an Investment Program for the preparation, design, reconstruction, rehabilitation and construction of drainage facilities in the area of Split-Dalmatia County and allocation of funds of the County Budget to cities and municipalities for these purposes in 2017.

- Construction of the sewerage of Gradac-Zaostrog, and the design, reconstruction and construction of sewerage network and drainage facilities in the Gradac municipality
- Design, reconstruction and construction of sewerage network and drainage facilities in the area of Lokvičići,
- The continuation of the construction of the sewerage network through the Zagvozd narrow center and the design, reconstruction and construction of the sewerage network and drainage facilities in the area of Zagvozd municipality,
- Construction of drainage along ŽC 6182 from school to Čapina, and the design, reconstruction and construction of sewerage network and drainage facilities in the area of Zmijavci municipality
- Design, reconstruction and construction of water supply in the area of Lokvičići, Zagvozd, Imotski city,
- Construction of the waterworks Garci and the supply pipeline Garci-Jerkovići and the design, reconstruction and construction of water supply in the area of the Zmijavci municipality
- Reconstruction of waterworks, pumping stations of Banja and Butina in the area of the town of Vrgorac

Advantages

- further construction and maintenance of water supply system, water drainage system and sewage system will have cumulative positive impacts on the protection of water resources (surface water as well as groundwater)

Challenges

- great drinking water losses due to outdated urban infrastructure
- poor waste water management and purification



3.1. Forest

In the Pilot Action area forest can be divided into privately owned forests and forest land and forests and forest land owned by State. Also, forests are divided into protective, economic and special purpose forests. Protective forests mitigate or prevent negative, anthropogenic impacts or natural hazard effects on land, soil, water, settlements, people and their assets. The most significant protective functions of forests are reduction of floods effects (maintaining the “natural” flow regime by reducing and delaying the stormflow peaks) and reduction of soil erosion caused by water (reduction of sedimentation of deposits incurred due to soil erosion in water stream channels and stagnant water bodies).

Spatial plan of City of Imotski prescribes measures for the protection of forests that include following:

- analyze the existing state of forest from the aspect of their ecological values and their impact on other nature components (soil, water, air etc.),
- preserve existing forests and implement the afforestation near tourism zones and agricultural production areas,
- while planning the construction of tourism objects on unbuilt locations forest protection needs to be considered.

Of particular interest is the protection of the forest areas and the restoration of forests destroyed by fire, as well as the creation of preconditions for afforestation of new forest areas, especially since the area is prone to fire hazard. When restoring the forest areas destroyed by fire, it is important to note that instead of Aleppo pine, it is afforested with seedlings of indigenous herbs that are less susceptible to fire (evergreen oak, European hornbeam, strawberry tree, etc.).

Advantages

- continuous afforestation that offers a chance to expand the existing biodiversity; great forest cover (47.5%) with dominantly productive forest land provides a clear frame for forestry that helps secure the water protection functionality of forest ecosystems

Challenges

- erosion due to forest loss that influences the water quality of the area; confusing ownership issues; dominance of tourism over forest protection



3.2. Grassland

According to the Corine Land Cover 2012 data, the pilot area consists of 753 ha of natural grassland and 111 ha of pastures (Table 1).

Croatian Ministry of agriculture issued conversion prohibition (in agricultural purpose) of permanent grassland and pastures in specific NATURA 2000 areas.

According to the Ordinance on the amendment of the Ordinance on agricultural land use records (35/15, 118/16, 26/17) “The edge buffers along water streams” are grassy belts that are at least 3 m wide and are at the interface of arable land that is at least 10 meters away from the edge of the water stream.

Advantages

- positive impact on the ecosystem water provision and regulation; protection from soil stress and erosion

Challenges

- grassland areas (meadows and pastures) are neglected due to centralization and village abandonment; low grassland utilization even though they occupy a large part of the total agricultural area

3.3. Agriculture

According to the Rural Development Programme of the Republic of Croatia, Good Agricultural and Environmental Conditions (GAEC) referred in Chapter I of Title VI of Regulation (EU) No 1306/2013 are defined in national laws and specified in the programs. GAEC are defined by the Ordinance on cross-compliances (OG No. 27/14 and 32/15) and Ordinance on the amendments of Ordinance on cross-compliances (OG No. 45/16) which was adopted, based on the Act on State Support in Agriculture and Rural Development (OG No. 80/13). The requirements concerning the use of fertilizers and plant protection products are laid down by the Ordinance on cross-compliance (OG No. 27/14 and 32/15). Agency for payments in agriculture, fishery and rural development controls meeting the rules of cross compliance by the obligors. Measures related to the cross-compliance that are prescribes by Rural Development Programme are Advice on cross-compliance; Vocational training for cross-compliance, agriculture, environment and climate



measures and organic farming etc. The overall objectives of these measures are providing advice to farmers on cross-compliance and agricultural practices related to climate and the environment, advice on the adoption of practical measures to increase resistance of agricultural systems against erosion, floods and droughts, the maintenance of agricultural land in order to preserve it in good condition and the reduction of the negative impacts of agriculture on the environment and climate. Education of farmers on cross-compliance is regulated with Ordinance on system of farmers consulting on cross-compliance (OG No. 22/10) and Ordinance on implementation of measure 01 „Transfer of knowledge and informing activities“, submeasure 1.1. „Support for vocational training and activities for acquiring skills“, type of operation 1.1.1. „Vocational training on cross-compliance, package M“ (OG No. 96/15).

In accordance to The Ordinance on the establishment of a framework for action to achieve the sustainable use of pesticides (Official Gazette No. 142/12) all farmers who apply the pesticides on their agricultural land, all distributors and counselors must have appropriate training and knowledge about the pesticides application.

In order to increase the cultivable areas and their possibilities of better management, the Municipal and City Planning Projects should define measures for the Vrličko, Mućko, Šoltansko and Hrvatačko fields, as well as measures for further improvement of partially landscaped fields: Sinj, Imotsko and Vrgorac. In the use of agricultural land, it is necessary to foresee the development of ecological agriculture, which implies lower utilization of agrochemicals and promote the production of "healthy food".

Split-Dalmatia County plans to carry out the financial support for the further development of agricultural production by following projects:

- Construction of accumulations in agriculture (according to the Decision on publication of The Public Call for Measure 5. Support for the construction of simple accumulations in agriculture of the Agricultural and Rural Development Program in the Splitsko-dalmatinska County for year 2017)
- Infrastructure refurbishment (according to the Decision on the publication of The Public Call for the applications of support from Measure 11. Organization of the existing neglected field roads in Dalmatinska Zagora, coastal area and islands of the Agricultural and Rural Development Support Program in the Splitsko-dalmatinska County for year 2017)
- Support to the agricultural associations (according to the Decision on the publication of The Public Call for the applications for support from Measure 7. Support to the agricultural



associations of the Agricultural and Rural Development Support Program in the Splitsko-dalmatinska County for year 2017)

- Encouraging the development of competitive agricultural production (according to the Decision on the publication of The Public Call for the application for the support from Measure 9. Support for the development of competitive agricultural production of the Agricultural and Rural Development Support Program in the Splitsko-dalmatinska County for year 2017)
- Subsidies for the agricultural production (according to the Decision on the publication of The Public Call for the application for the support from Measure 12. Support for the co-financing planting material in the Splitsko-dalmatinska County, Agricultural and Rural Development Support Program in the Splitsko-dalmatinska County for year 2017).

Spatial plan of Split-Dalmatia County prescribes measures for the protection of valuable agricultural land:

- reduce the use of valuable agricultural land for other purposes,
- encourage the production of organic food,
- traditional agricultural production should have the priority (vineyards, olive groves etc.),
- the fundament of agricultural production should be homestead farms.

Irrigation issues

All issues related to irrigation in the City of Imotski should be aligned with the adopted ones of the irrigation plan for the Split-Dalmatia County, both present and future solutions of the irrigation system for the entire area of the Imotsko - Bekijsko field.

Advantages

- increase in organic food production; a more sustainable use of pesticides; dry stone wall building to stop soil erosion

Challenges

- the permanent loss of land (and the associated soil) appears in several forms, and in the SDC (Split-Dalmatia County) area firstly as a result of: urbanization, construction of infrastructure, exploitation of mineral raw materials (unsanitary quarries), intensive agriculture (greenhouses) and visible waste landfills.



- There is no systematic monitoring in the SDC - monitoring the status and changes in soil quality, soil conditions, hazard and the consequences.

3.4. Urban areas (settlements)

Decision on the adoption of the Investment Program for the preparation, design, reconstruction, rehabilitation and construction of the transport infrastructure in the area of Split-Dalmatia County and allocation of funds for the County Budget to cities and municipalities for these purposes in 2017 (including the municipalities/cities of Runovići, Gradac, Imotski, Lokvičići, Lovreč, Donji Prologac, Zagvozd, Zmijavci).

Ethno zones on the national and county levels of significance are regulated by the creation of a network of settlements where revision of local traditions is carried out by a planning approach. As the preservation of ethnological values is directly related to the preservation of the vitality of the settlement, it is necessary to promote the elements of spirituality in the cultural creativity of the inhabitants of the ethno zone and the development of economic activities related to working practices of the inhabitants (agricultural production, handicrafts, rural tourism) through the action of institutions and foundations.

Advantages

- reconstruction of waterworks, pumping stations of Banja and Butina in the area of the town of Vrgorac as the most important drinking water springs of the area
- reconstruction and construction of sewerage network and drainage facilities in the county

Challenges

- great drinking water losses due to outdated urban infrastructure; poor waste water management and purification

3.5. Industrial areas

According to the Spatial plan of Split-Dalmatia County, procedures in industrial objects can be approved only if they do not cause negative impacts on the environment. If the negative impacts occur, it is necessary to limit the possibility of retention in the area of industrial production.



Waste management

Waste management plan of Split-Dalmatia County envisions the implementation of recycling measures and measure of separate waste collecting:

- recycling islands for separate waste collecting of paper, glass, PET packaging, metal packaging;
- collecting cardboard packaging from shops in cities and smaller settlements
- separate bulk waste collecting (Vrgorac in pilot action area),
- separate green waste collecting from public areas, compost of green waste from households and tourism objects (Vrgorac in pilot action area),
- measures that ensure the installation of construction waste recycling equipment (Vrgorac in the pilot action area)
- measures that ensure the collecting of waste in the recycling yards (Vrgorac in the pilot action area).

Also there is a program of investments in the repair of illegal waste landfills and the allocation of funds of the County Budget to cities and municipalities for these purposes in 2017.

Ministry of Environment and Energy plans rehabilitation and closing of landfill Kozjačić which is located in the area of Imotski is a natural karst sinkhole that will be, according to the Environmental impact Study, filled with waste until the Regional centre for waste management in Lećevica starts operating.

Disposal of waste is carried out in accordance with the planned remediation method, and when the landfill is used, the landfill will cover a watertight dump site. The waste disposal site will be completed by the Topana d.o.o. from Imotski.

The Waste Management Plan in the Split-Dalmatia County envisages implementation of the following primary recycling measures or separate collection of waste at the site of production:

1. Setting up recycling islands for separate collection of paper, glass, PET packaging, metal packaging containers with the volume of 2-3 m³;
2. Collection of wrappings, cardboard packaging from shops in settlements and cities or "shopping centres" for Europress special vehicles;
3. Organize separately collected bulk waste at 16 locations in the County: Vis, Hvar, Brač, Split (+ Omiš), Sinj, Makarska, Imotski, Vrgorac, Kastela, Omiš, Solin, Supetar, Trilj, Trogir where waste will be collected according to an accurately defined organization and



time schedule, and deferring it to the workstation where it would go and bring it to the user;

4. Collect green waste from public areas and compost it as well as to separately collect bio-waste from households and tourism industry in special containers and composting it on 7 locations in the County of Vis, Hvar, Brač, Split (+ Omis), Sinj, Imotski and Vrgorac).
5. Provide facilities for the recycling of construction waste at 8 locations in the County (Vis, Hvar, Brač, Split (+ Omiš), Sinj, Makarska, Imotski and Vrgorac).
6. Provide separate collection of waste in recycling yards at 16 locations in the County (Vis, Hvar, Brač, Split (+ Omiš), Sinj, Makarska, Imotski, Vrgorac, Kaštela, Omis, Solin, Supetar, Trilj, Trogir) for the disposal of certain types of waste.

Through this Administrative Department, the County of Split-Dalmatia invites primary schools from the whole County to participate in the collection of waste paper and cardboard every year. In action in 2008, 38 schools attended, whose students collected 124 tons of paper and cardboard. The action in 2009 was carried out from the 15th of April to the 15th of November 2009 and 147 tonnes of paper and cardboard were collected.

«Kozjačić» Vinjani Gornji, Imotski

In 2009, 11465 tonnes of waste were deposited at the Kozjačić landfill. Most of it is municipal waste, but it also contains a part of the waste sludge from the unit for the purification of water, and part of another special waste. The landfill is located in a natural karstic pit at the depth of 43 m. The nearest settlement is Aračići - Vinjani Gornji, located southwest, at a distance of about 900 m. The landfill environment is karst, which is mostly covered with underbrush. The landfill is managed by "Topana" d.o.o. - Imotski, and the owner of the land on which the landfill is located is Croatian forests. Waste is compressed and covered with an inert material two times per year, and the average height of the decomposed waste is 15 m. The landfill is partially fenced and guarded from 06 to 22 o'clock. There is a facility for employees but there is no garage for vehicles. A trencher is operating at the landfill (a JCB excavator).

Disinfection and deratization are performed annually and a waste log is kept. Waste from the area of Imotski and all the municipalities of Imotski area are disposed of at the landfill.

Intensive work on education and informing of their fellow citizens on waste management is being undertaken by utility companies "Michieli-Tomic" d.o.o. from Pučišća on the island of Brač, and "Čistoća" - d.o.o. from Split.



Advantages

- increased environmental awareness through various workshops and local community actions; set up of numerous recycling islands and facilities over the coming period

Challenges

Croatia is at EU bottom concerning waste management. According to data from 2013, only around 13% of waste is being recycled, and another 2% goes to compost. Rates of recycling are still too low to comply with 50% of waste recycling set in the EU Waste Framework Directive (WFD) which has to be met by 2020. According to European Commission, the reasons are following:

- Lack of clear allocation of tasks and lack of co-ordination between the different administrative levels;
- • Insufficient (door-to-door) separate collection of waste;
- • Sub-optimal planning of waste management;
- • Insufficient incentives to manage waste according to the waste hierarchy;
- • Unclear management of outputs of mechanical-biological treatment plants (MBTs);
- • Enforcement capacity.

Split-Dalmatia County is the worst in Croatia concerning waste recovery, with a rate of only 1.1%. At national scale, over 3000 illegal waste dump sites are present, many in Split-Dalmatia county and Dubrovnik-Neretva county (however, the exact number is unclear).

3.6. Wetland

The Republic of Croatia has numerous diverse and preserved natural and semi-natural habitat types with the abundance of species. Pursuant to the Birds Directive, Special Protection Areas (SPA) for bird species are proclaimed, while in accordance to the Habitats Directive Special Areas of Conservation (SAC) are proclaimed (Table 7.). In the Pilot Action Imotsko field spring, protected wetland areas are significant landscape Modro oko and Desne lake (according to the Corine Land Cover 2012, wetland occupy 62.7 ha).



Table 7. Protected areas in the Pilot Action Imotsko field springs

Natura 2000 SAC in Pilot Action Imotsko polje spring	
sitecode	sitename
HR2000932	Prološko blato
HR2000933	Vrljika
HR2000934	Crveno jezero
HR2000935	Modro jezero
HR2001229	Bočni kanal uz Vrljiku
HR2001236	Kanjon Badnjevice
HR2001507	Izvor Krčevac

Advantages

- wetlands have important role from biodiversity and landscape aspect,
- wetlands are important factors in water storage, groundwater recharge and reduction of down-stream runoff,
- high protection degree in selected location and designed sites; with the declaration of protected areas under various EU and national projects (e.g. Natura 2000 etc.), biodiversity is secured.

Challenges

- The Strategy and Action Plan for the Protection of Biological and Landscape Diversity of the Republic of Croatia (OG No. 143/08) states that these habitats, especially water courses, grasslands and wetlands are endangered due to degradation and reduction of biological and landscape diversity, excessive exploitation of natural resources, introduction of invasive species, construction of infrastructure (construction of roads, power plants, water management structures leads to habitat loss and fragmentation), agricultural activity (melioration, land consolidation, abandoning of agricultural lands) pollution, urbanization and global climate change,
- relatively low share in the surface (6% of land) of protected natural resources, however, the Ecological Network, which covers 47.2% of the County's surface, should be taken into account,
- negative occurrences within protected areas such as: tree felling, sand filling and cementing, humus excavation, unlawful construction, improper use and waste pollution, wastewater remediation and others,
- reduction of landscape and biodiversity (endangered species and habitats) due to inadequate protection management system,



- lack of and/or non-alignment of spatial plans of protected areas with spatial plans of local self-government units,
- input of allochthon (e.g. mouflon) and invasive (e.g. Caulerpa) species,
- the disappearance of domestic taxa and breeds; Insufficient expertise of the researchers.

4. Floods

Spatial plan of City of Imotski prescribes measures against the floods:

- in areas with the potential flood risk, land use that is not vulnerable to floods should be planned,
- in areas with the potential flood risk where construction of buildings is allowed, resistant and hard materials should be used in construction,
- existing local springs, wells and water tanks should be protected,
- protection against the flood must be in compliance with Water Act, National plan for flood control (Official Gazette No. 84/10) and Plans for the protection against the floods of Split-Dalmatia County,
- water bodies and water resources should be regulated in such a way as to ensure the prescribed water regime, quality and protection of water.

5. Conclusion

The karstic fields, due to their natural characteristics, represent rare areas in the karst where there is a surface water flow yet at the same time they are very suitable for agricultural activity. Given the fact that agricultural activity has a negative impact on both quality and quantity karst fields represent a major challenge for water management and protection.

In the area of Imotsko polje, the following activities and phenomena that are negatively reflected in the quality and quantity of drinking water can be distinguished:

- Intensive agricultural activity, which will expand even further after the planned water supply and melioration system is constructed,
- Occasional field flooding
- Insufficiently effective drainage system that needs to be reconstructed and expanded



- Illegal Waste Dumps
- Large water supply system losses (apparently as much as 80% of water is lost due to poor supply network infrastructure, making this the worse supply area in the country).

Along the north and northwestern borders of the field, there are a number of springs among which Opačac is the most important one and is a part of the water supply system. The Opačac spring forms the river Vrljika, which is the largest surface flow in the Imotsko polje. After the melioration system is constructed, Vrljika will be the main recipient of the excess water from the field (which contains various dissolved hazardous chemical substances used for the plants and soil), and the unpurified water in Vrljika continue onwards and finally end in the Neretva river. Due to all of this, a considerate and professional water resource management is crucial in order to achieve a balance between protection and the use of natural systems.

6. References

Strategies and plans

- Development strategy of Split-Dalmatia County for the period of 2011-2013 (<https://www.dalmacija.hr/Portals/0/docs/Tajnistvo/%C5%BErs%20sd%C5%BE.pdf>)
- Environmental Protection Program of the Split-Dalmatia County (<https://www.dalmacija.hr/dokumenti?EntryId=1281>)
- Local Flood Defense Plan Waters of the Split-Dalmatia County
- National Flood Defense Plans
- National Environmental Action Plan (2001)
- National plan for flood control (Official Gazette No. 84/10)
- Plans for the protection against the floods of Split-Dalmatia County
- Spatial plan of Splitsko-Dalmatinska County (Official Gazette No. 1/03, 8/04, 5/05, 5/06, 13/07 and 9/13)
- The main development plan for tourism in the Split-Dalmatia County (<http://www.dalmacija.hr/portals/0/docs/UOturizam/GLAVNI%20PLAN%20TURIZMA.pdf>)
- Water Management Strategy (2009)

Acts, ordinances and regulations

- Act on Protection against Natural Disasters (Official Gazette 73/97, 174/04)
- Act on State Support in Agriculture and Rural Development (Official Gazette No. 80/13)



- Amendments to the Spatial Management Plan of the City of Imotski from 2015 (<http://imotski.hr/wp-content/uploads/2015/01/lzmjene-i-dopune-PPUG-Imotski-2015..pdf>)
- Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
- Decision on allocation of parts of the funds allocated to the Split-Dalmatia County Budget for the year 2017.
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- Decision on the Determination of the Sanitary Protection Zone by the “Ordinance on the Conditions for Determination of Sanitary Protection Zone”
- Decision on the publication of a Public Call for Measure 5. Support for the construction of simple accumulation in agriculture of the Agricultural and Rural Development Program in the Split-Dalmatia County area for the year 2017 (8.2.2017).
- Decision on the publication of a Public Call for Applications for Support from Measure 7. Work support of the agricultural associations of the Program of Support to Agriculture and Rural Development in the area of Split-Dalmatia County for the year 2017.
- Decision on the publication of a Public Call for Applications for Support Measure 9. Support to the development of competitive agricultural production of the Agricultural Support Program for Rural Development in the Split-Dalmatia County for the year 2017.
- Decision on the publication of a Public Call for Applications for Support from Measure 11. An arrangement of the existing derelict rural pathways in Zagora, coastal area and islands of the Support Program for Agriculture and Rural Development in the Split-Dalmatia County for the year 2017.
- Decision on publication of a Public Call for Applications for Measure Support 12. Support for the co-financing of the purchase of planting material in the County of Split-Dalmatia by the Program of Support to Agriculture and Rural Development in the area of Split-Dalmatia County for 2017.
- Decision on the Publication of a Public Call for Applications for non-refundable assets under the Program for co-financing of Development Projects in Tourism in the Split-Dalmatia County for 2017 (6.2.2017).



- Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks
- Environment Protection Act (Official Gazette No. 80/13, 153/13 and 78/15)
- Forest Act (Official Gazette No. 140/05, 82/06, 129/08, 80/10, 124/10, 25/12, 68/12, 148/13 and 94/14)
- List of Wetlands of International Importance (2017),
(<http://www.ramsar.org/sites/default/files/documents/library/sitelist.pdf>)
- Environment contamination register by the Croatian Environment Agency
(<http://hnproo.azo.hr/Home.aspx>)
- Nature Protection Act (Official Gazette No. 80/13)
- Ordinance on agricultural land use records (35/15, 118/16, 26/17)
- Ordinance on cross-compliances (Official Gazette No. 27/14 and 32/15)
- Ordinance on the amendments of Ordinance on cross-compliances (Official Gazette No. 45/16)
- Ordinance on ecological agricultural production (Official Gazette No. 19/16)
- Ordinance on list of habitat types, habitat map and threatened and rare habitat types in Croatia (Official Gazette 88/14)
- Ordinance on implementation of measure 01 „Transfer of knowledge and informing activities“, submeasure 1.1. „Support for vocational training and activities for acquiring skills“, type of operation 1.1.1. „Vocational training on cross-compliance, package M“ (Official Gazette No. 96/15)
- Ordinance on system of farmers consulting on cross-compliance (Official Gazette No. 22/10)
- Ordinance on the Conditions for Determination of Sanitary Protection Area (Official Gazette 66/11 and 47/13)
- Ordinance on the establishment of a framework for action to achieve the sustainable use of pesticides (Official Gazette No. 142/12)
- The Strategy and Action Plan for the Protection of Biological and Landscape Diversity of the Republic of Croatia (Official Gazette No. 143/08)
- Water Act (Official Gazette No. 153/09, 130/11, 56/13, 14/14)
(<https://www.zakon.hr/z/124/Zakon-o-vodama>)

Information systems and database

- Corine Land Cover (<http://corine.azo.hr/corine/hr#sthash.oqXIRm9d.dpbs>)



- Environment Contamination Register by Croatian Environment Agency (<http://roo-preglednik.azo.hr/Default.aspx>)
- Natura 2000 - Standard Data Form HR1000031 Delta Neretve (<http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=HR1000031>)
- Physical planning information system (ISPU) (<https://ispu.mgipu.hr/>) provided by Ministry of Construction and Physical Planning

Other

- Agriculture that protects nature, Protection of nature through measures of Rural Development Programme of the Republic of Croatia 2014.-2020.
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- State of the Environment Report of the Republic of Croatia (2014)
- State of the Environment Report of Splitsko-dalmatinska County (2008.-2011.)
- Waste management implementation report of the Split-Dalmatia County for the period 2007.-2015.

Web pages

- Waste management
<https://www.dalmacija.hr/Portals/0/docs/Tajnistvo/%C5%BErs%20sd%C5%BE.pdf>
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