

ENVIRONMENTAL IMPACT ASSESSMENT  
DEVELOPEMENT OF DUBROVNIK AIRPORT,  
KONAVLE MUNICIPALITY

NON-TECHNICAL SUMMARY



Zagreb, May 2014.

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Title of the study: ENVIRONMENTAL IMPACT ASSESSMENT  
DEVELOPEMENT OF DUBROVNIK AIRPORT, KONAVLE MUNICIPALITY  
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## INTRODUCTION

The subject of the Environmental Impact assessment is the development of Dubrovnik Airport, Konavle Municipality. The stakeholder of the planned project is Zračna luka Dubrovnik Ltd., Čilipi (Dubrovnik Airport).

At the request of the stakeholder, an environmental impact assesment was made, pursuant to article 28., point 1, of the Decree on Environmental Impact Assessment (OG 64/08, 67/09).

The environmental impact assesment is based on the following documents:

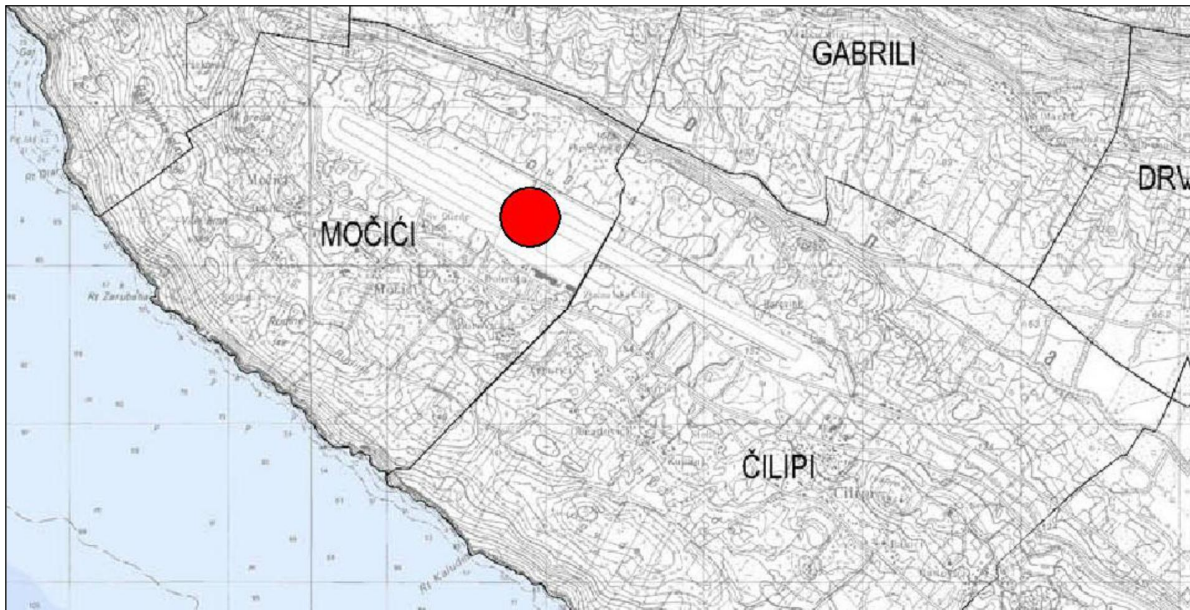
- Dubrovnik Airport Master Plan, final report, AirportConsultingViennaGmbH (ACV), Dubrovnik, November 2012
- Instruction for drafting the Environmental Impact Study of the Dubrovnik Airport expansion, Ministry of Environmental and Nature Protection, June 2013
- Urban planning scheme of the "Airport Čilipi 1", Final Plan Draft Proposal, TRAMES d.o.o., September 2013.

The goal and purpose of making this Assesment is an analysis of the current state of the environment, establishing the impact of the planned project on environmental components and proposing safety measures and an environmental monitoring programme whose application would reduce negative impact to a minimal level.

The environmental impact assesment will assess the acceptance of the planned project in relation to the environment based on the factors that determine the spread, severity and duration of the impact. At the request of the stakeholder, an environmental impact assesment was conducted by DVOKUT Ecro Ltd. Zagreb as a legal entity authorized to perform professional operations of environmental protection.

## A. PROJECT DESCRIPTION

Dubrovnik Airport (DBV) project zone is located in Konavle Municipality, and encompasses the parts of Močići and Čilipi residential areas. It is situated about 22 km away from the city of Dubrovnik, and about 7.5 km away from Cavtat, while the state road D8 is connecting it to the entire region. The DBV covers the total surface area of 1,930,000.00 m<sup>2</sup> (i.e. 193 ha).



Graphical Appendix A.-1. Dubrovnik Airport position in relation to the settlement of the Konavle municipality (source: Spatial Plan of Konavle Municipality)

The Environmental Impact Study of the project is based on the following documents:

- Dubrovnik Airport Master Plan, final report, AirportConsultingViennaGmbH (ACV), Dubrovnik, November 2012
  - Instruction for drafting the Environmental Impact Study of the Dubrovnik Airport expansion, Ministry of Environmental and Nature Protection, June 2013
- Urban planning scheme of the "Airport Čilipi 1", Final Plan Draft Proposal, TRAMES d.o.o., September 2013.

### A.1. CURRENT STATE OF DUBROVNIK AIRPORT

Dubrovnik Airport is the main point of entry in the Dubrovačko-neretvanska County. The airport can be reached from Dubrovnik in about 30 minutes time by a regular bus line, taxi or personal vehicle.

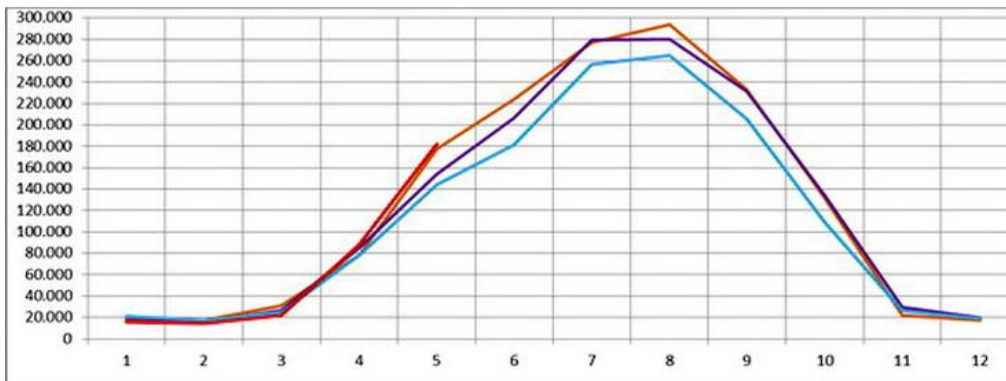
There are currently 28 airliners operating in Dubrovnik Airport that deliver services for 46 national and international destinations. The absence of a home carrier is the only fault of the airport, but the airport is a base for Croatia Airlines. In 2013. 16.126 airplanes with 1.522.629



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passengers flew in Dubrovnik Airport. The biggest traffic is recorded during the summer months from June to September (Graphical Appendix A.1.-1.).

Year	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
2011	21288	17485	25228	77946	144253	181608	256305	264651	205936	109129	26483	19189	<b>1349501</b>
2012	17843	15721	26864	84775	154387	206576	279368	279793	231418	134462	29342	19921	<b>1480470</b>
2013	18879	17154	31181	77910	177763	223809	277080	293983	233276	131853	22102	17639	<b>1522629</b>
2014	15950	14423	21963	87774	181898								<b>322008</b>



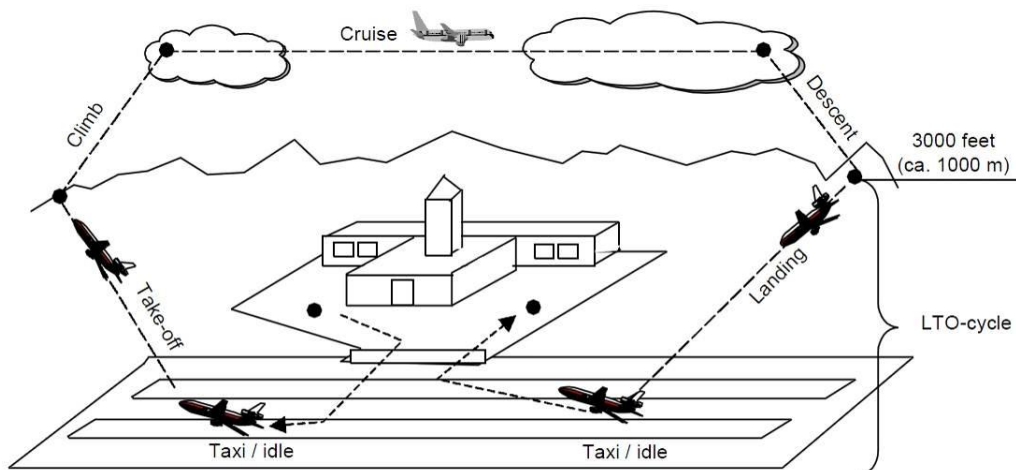
Graphical Appendix A.1-1. View of Dubrovnik Airport aviation per month (source: <http://www.airport-dubrovnik.hr>)

Aircrafts with a wing span up to 65m can land in DA, and in 2013. the most common type of ariplanes by number of operations were (Graphical Appendix A.1.-2.):

TIP ZRAKOPLOVA	BROJ OPERACIJA
A319 (Airbus 319)	3.714
B737 (100,300,400,500,600,700,800,900)	3.088
A320 (Airbus 320)	2.662
DH4 (DH8D)	1.772
A321 (Airbus 321)	978
E90 (Embraer 190)	298
CR9 (Canader Regional Jet 900)	156
ATR72 (Aerospatiale)	102
E135 (Embraer 135)	96
CL60 (Canadair Challenger)	82
ATR75 (Aerospatiale)	70
CCX (Canadair)	66

(source: <http://www.airport-dubrovnik.hr>)

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Graphical Appendix A.1-2. View of the ascending-landing cycle

Surfaces and constructions within the Airport zone are divided to *landside* (terrestrial side of the airport, section available to the public) and the *airside* (fenced airside, denied access to the public). The current appearance of the Dubrovnik Airport is shown on graphical appendixes A.1-3. and A.1-4. and photos A.1-1. to A.1-3.

In its current state, the airport area is connected to the state road D8 at the south of the project scope. Within the scope of the airport, a traffic network has been constructed with parking areas that lead to all the existing constructions of the airport and that partially satisfy the current needs. Some roads are in poor condition.



Graphical Appendix A.1-3. The current appearance of the Dubrovnik Airport (source: UPU „Zračna luka Čilipi 1“, TRAMES ltd.)



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Graphical Appendix A.1-4. The current appearance of the Dubrovnik Airport - terrestrial side and part of the airport side (source: Google earth)



Photo A.1-1. The current appearance of the Dubrovnik Airport (apron, taxiways and runway)



Photo A.1-2. The current appearance of the Dubrovnik Airport (view of the demolished building "C" terminals, parking)



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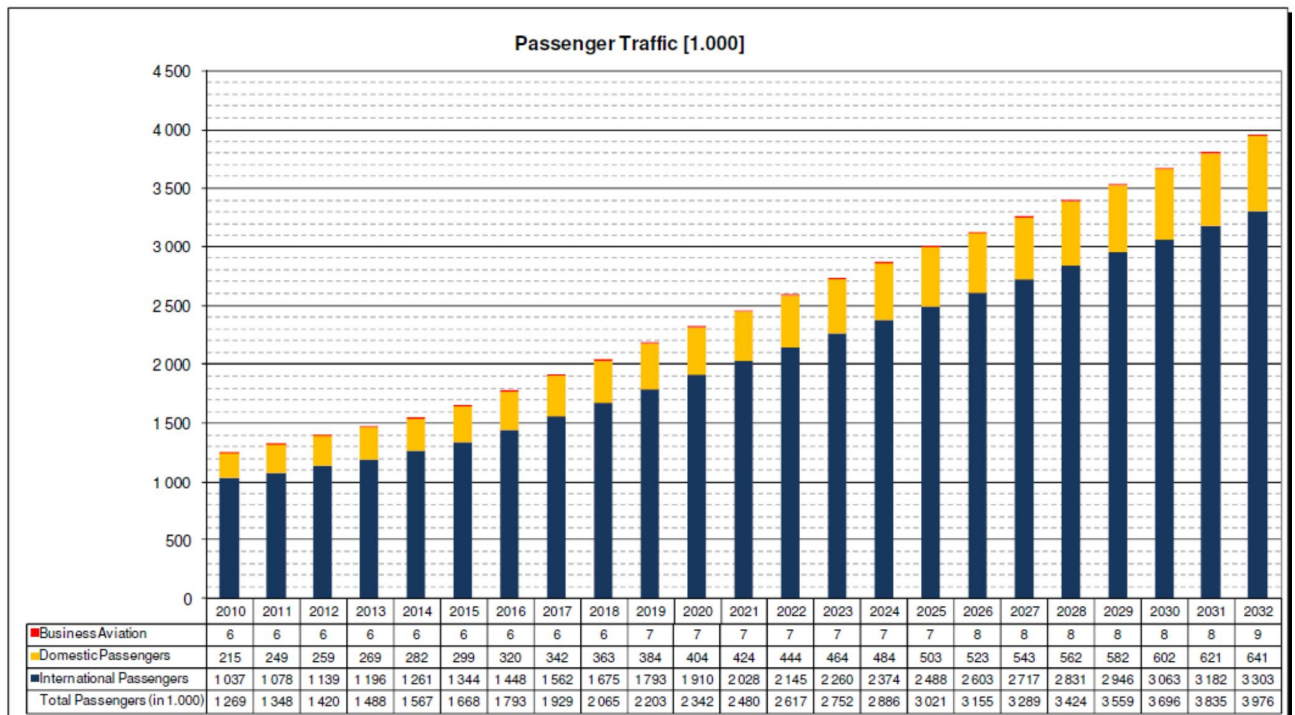


Photo A.1-3. The current appearance of the Dubrovnik Airport (View of the rescue fire department, garage technical block, cargo block, internal pumping station for fuel, parking)

## A.2. PLANNED DEVELOPMENT OF DUBROVNIK AIRPORT

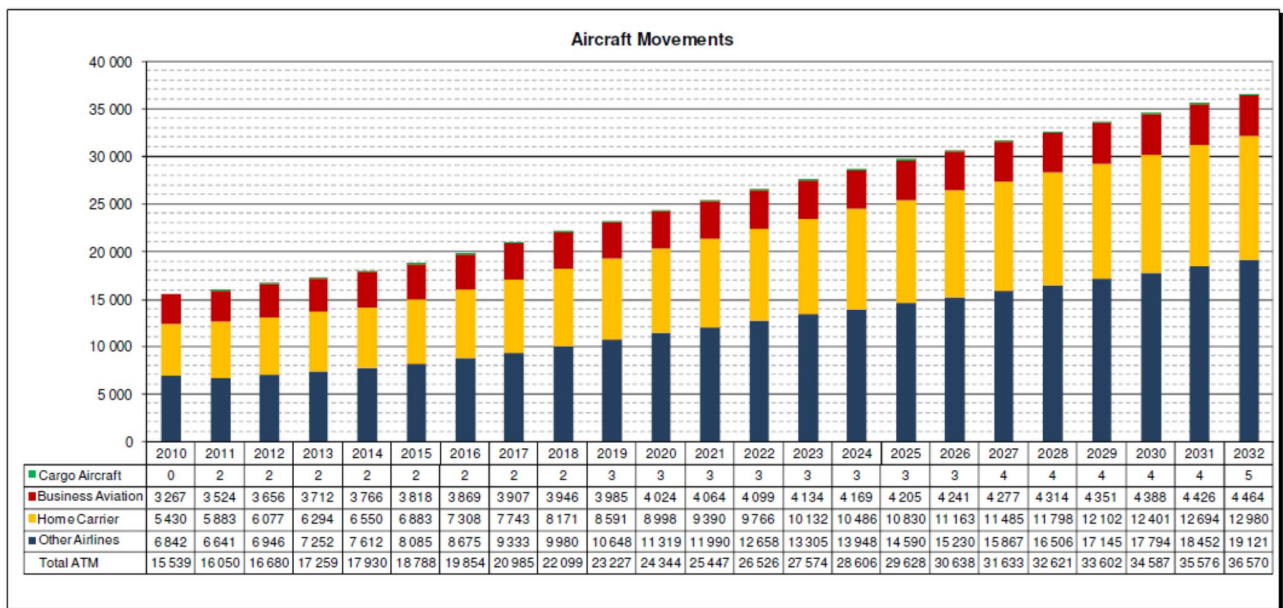
Airport reconstruction and development project shall ensure the increase of competitiveness of Dubrovnik Airport in relation to other airports, higher level of service, higher employment rates, and improvements in both, inbound and outbound tourism.

One of the Airport primary goals is to increase the number of passengers to approximately 3.98 million per year in the planning period until the year 2032. (Graphical Appendix i A.2-1. i A.2-2.).



Graphical Appendix A.2-1. Passenger traffic prognosis for DBV (basic scenario) 2010. – 2032. (source: Master plan Dubrovnik Airport, final report, Airport Consulting Vienna GmbH (ACV), Dubrovnik, November 2012.)

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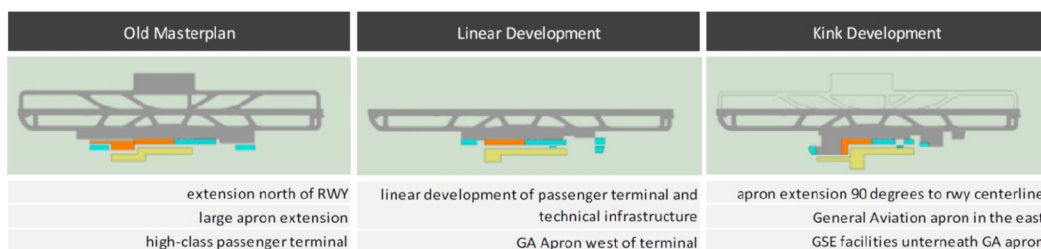


Graphical Appendix A.2-2. Passenger traffic prognosis for DBV (basic scenario) 2010. – 2032. (source: Master plan Dubrovnik Airport, final report, Airport Consulting Vienna GmbH (ACV), Dubrovnik, November 2012.)

Conducted analysis and forecasts of passenger and flight increase lead to the conclusion that the existing terminals are already reaching the threshold of their capacity for the current number of passengers.

### VARIANT SOLUTIONS

The Master Plan for the development of Dubrovnik Airport (Airport Consulting Vienna GmbH, November 2012) was based on the projections for a significant increase in air traffic in the 2012-2032 period. Based on the 2007 Master Plan, as well as the new traffic prognoses, during the design development there were discussions regarding several possible developments of the Dubrovnik Airport, presented in the table below.



Graphical Appendix A.2-3. Development possibilities taken into consideration

The concept of future development north of the runway was considered as a possible long-term strategy. The possibility of Dubrovnik Airport development which would place the passenger terminal and infrastructural facilities in a linear direction, along the apron extending to the east and west within the width of the existing one was also considered.

The "Kink" development option was chosen as the best possibility given that due to the position of the D-8 state road south of Dubrovnik Airport and terrain topography it is not possible or financially justified to expand the airport north- and/or southward, and a detailed elaboration of the design was carried out based on this option. It also provides for the development of aprons under a 90° angle in relation to the taxiway, enabling the construction of a new seasonal terminal perpendicular to the existing terminals. All new airport facilities shall be placed in a zone with the most favourable terrain topography (optimisation of the number of terrain work), within a band situated between the existing operational surfaces and the D-8 state road (the existing access road shall be preserved). This way, a good organisation on both the air side and the landside will be achieved, with optimal traffic solutions regarding aircraft operations, as well as road traffic connections. Also, the area owned by the Dubrovnik Airport is used to the best possible extent, avoiding possible property-rights issues.

Solution of road traffic linking Dubrovnik airport is of great importance for the planned development of Dubrovnik airport. Information on current and projected traffic flows suggest possible negative impact on the population, which must be taken into account when selecting transport solutions. Therefore, there were considered four different variants.

The first option was based on the existing road network without change, which has been verified in terms of traffic load in the planned year. The specified level of service is unsatisfactory, because there are already delays which are unacceptable.

Second option of the existing differ only by expanding the main entrance/exit and a central exit to the extent in a way that those expansion are at the level of increased maintenance and as such meets all the requirements.

The third option is based on an attempt to create a new entrance/exit to replace the existing one and to reorganize traffick network. In the beginning it would create large costs while ultimately would not create traffic solution that would provide better traffic and technical elements of the solutions offered by another variant.

The fourth option was analized in relation to the solution of the crossing out of level with the passage entrance and exit lanes from the airport under the state road route which would give the optimum traffic solution. The only problem is that the traffic load does not require such a solution at this rate of growth in the next 35 years, which is totally unjustified from the level of financial viability. Therefore, this option was not taken seriously into consideration.

After a detailed study of all of the above mentioned, the second option was selected as optimal because of its advantages in terms of increasing capacity as traffic demands and can be sought with minimal financial investment.

## PLANNED DEVELOPMENT

Dubrovnik airport development includes (Graphical Appendix 1.2):

- Construction of the new seasonal terminal (mark IS5),
- New office building (mark IS18),
- Catering building (mark IS8) and open or covered catering facilities (mark IS8<sub>1</sub>),
- Closed facilities and workshops for maintenance and operation (mark IS9),

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- Closed facilities and workshops for maintenance, operations and ground equipment (mark IS9<sub>1</sub>),
- New garage-technical block buildings including the fire protection service (marks IS10 and IS10<sub>1</sub>),
- New garage-technical block "east" (mark IS10<sub>2</sub>) planned underneath the east apron,
- New garage-technical block "west" (mark IS10<sub>3</sub>) planned underneath the artificial green hill,
- New airport landfill and solid waste management plant (marks IS14 and IS14<sub>1</sub>),
- Integration of the existing passenger terminals into the new environment ("A", "B" + new building "C"),
- Construction of the new commercial aviation terminal – VIP/CIP terminal (mark IS15) in the east apron zone
- General aviation hangar (mark IS16)
- Housing area (hangar) for domestic operator seated at the Airport (mark IS17), with their own maintenance and operations premises (mark IS17<sub>1</sub>)
- Construction of public garage (mark IS19) on the location of the present open parking for visitors with capacity of approximately 500 parking spaces.
- Construction of the new aviation fuel tank (mark IS20) including construction of underground pit system for fuel filling for 29 aircraft positions;
- Two new internal gas stations for the Airport purposes – landside (mark IS29<sub>1</sub>) and airside (mark IS29<sub>2</sub>)
- Substation reconstruction,
- Facades reconstruction in terms of energy efficiency
- Solar systems installation
- Connection to Cavtat sewage system.

#### Road traffic

The main projects planned within the Airport development relating to road traffic refer to the reconstruction of the existing road system, construction of the new roads in accordance with the calculated future load, and in relation to that, to the increase of the stationary traffic capacity.

#### Air traffic

With regard to air traffic operation areas within the airside zone, projects are planned as follows:

- Runway reconstruction;
- Reconstruction and expansion of taxiway system;
- Construction of two new rapid exit ways;
- Extension of the existing taxiway and reconstruction of the new taxiway
- West apron expansion and construction of the new apron on the west, for commercial aviation purposes, and of the new apron on the east, for general aviation purposes, including the necessary aircraft maintenance and operation facilities and hangars.

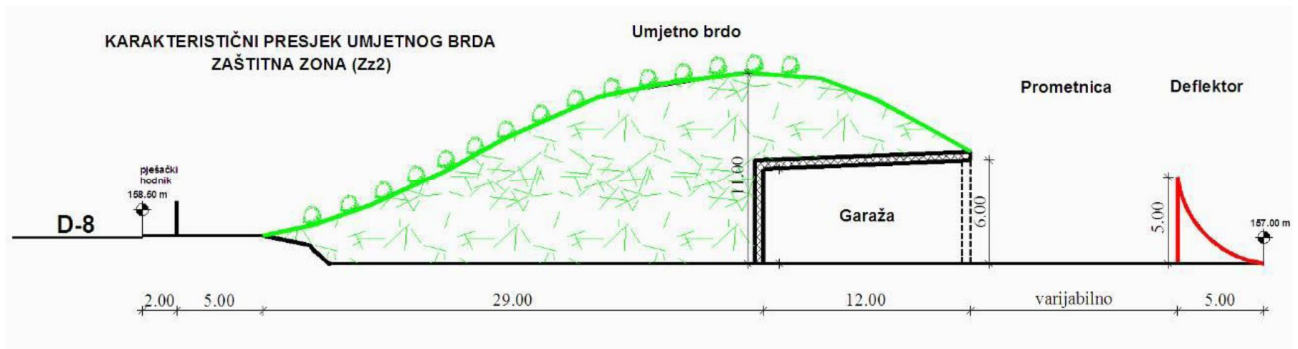


## Protective zones

Protective zones are formed to protect the settlements south of the state road from airplane noise and their exhaust gasses.

The protective zones are divided into:

- Protective zone south of the east apron (mark Zz<sub>1</sub>),
- Protective zone south of the west apron (mark Zz<sub>2</sub>).



Graphical Appendix A.2-4. Characteristic section of artificial, grassed hill in Zz<sub>2</sub> protection zone area (source: UPU „Zračna luka Čilipi 1“, Trames Ltd.)

Both zones are green protection against engine emissions and noise from aircrafts parked on aprons. Within the artificial green hill zone Zz<sub>2</sub> a garage facility is planned to accommodate the Airport vehicles and that will be facing the West apron.

## Water supply

Considering the fact that the number of passengers will be almost triplicate, it will cause a significant increase of drinking water consumption. For that purpose, the plan includes the construction of the DA internal water reservoir of the required capacity with the corresponding pump station and the distributive pipeline systems with connections for the existing and future buildings, and which in the end compose a ring-shape system of the DA sanitary water supply.

## Sanitary wastewater and rainwater drainage

The DA expansion, due to increased number of passengers, is expected to increase the amount of the sanitary wastewater. According to the physical planning documents, the internal sanitary drainage system should be connected to the “Cavtat” sewage system, which includes drainage and treatment of the sanitary wastewater from Cavtat and Zvekovica settlements and its submarine discharge into the open sea from the south side of Sustjepan peninsula.

As a reserve option, collection pits (sewage disposal tanks) will be partially operating until the sanitary drainage system is fully constructed.

Rainwater drainage system within the Airport is planned by taking into account the location of generating wastewater, the foreseen collection system and the location of rainwater discharge.

#### Electric power supply

In order to secure the increased consumption and improve the reliability of supply, the development of the electric power network within the Airport zone, shall include the removal of one existing substation, reconstruction of the other existing substation and the construction of three (3) new substations.

The UPS anticipates the construction of solar power plant for generating the electric power to be sold at incentive prices to the public electric network. They would be situated on the roof of the terminal building, the parking garage and parking space.

#### Navigational aids and aviation ground lighting power supply

The installation of the new ILS CAT I system for the gate 30 and the airfield ground lighting for the gate 30 is foreseen.

#### Public lighting

Public lighting has been constructed as independent, on separate poles along the roads and parking spaces, while the apron lighting has also been constructed on separate poles.

#### Waste management within the airport zone

Considering the increase in the number of passengers per year, it is expected that additional 45 tons of waste per year will be generated. A new facility is planned for collection, storage and processing of solid waste, which should be sufficient in size and adequately designed for accepting the anticipated increased amounts of waste.

#### Temporary facilities for the purpose of construction site organisation

Temporary production plants are facilities that are planned to be constructed for the purpose of reconstructing the existing objects and constructing new objects and operation surfaces within Dubrovnik Airport. The foreseen plants shall be located within the boundary of the DA zone and property. The most of the rough construction and asphalt works will be carried out during the DA winter working hours (from November to April).

## B. DESCRIPTION OF PROJECT LOCATION ENVIRONMENT

### RELATION BETWEEN THE PLANNED PROJECT AND PHYSICAL PLANNING DOCUMENTS

Dubrovnik Airport development Project complies with the valid physical-planning documents in the area of the Dubrovnik Airport Project:

- Dubrovačko-neretvanska County Physical Plan (*Dubrovačko-neretvanska County Official Gazette 06/03, 03/05, 03/06, 07/10, 04/12-isp., 09/13*)

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- Konavle Municipality Physical Plan (*Konavle Municipality Official Gazette 09/07, 01/08, 06/08 01/09-isp*)

Dubrovačko-neretvanska County Physical Plan and Konavle Municipality Architectural Plan are the plans of higher order, providing guidelines for the preparation of the Urban Planning Scheme for “Čilipi Airport 1”.

#### Population and settlements

The runway air corridor runs above Cavtat, a tourist centre located northwest from the Airport. Other settlements in close vicinity of the DA are Močići (southwest side of DA), Čilipi (southeast side of DA) and Zvekovica (northwest from DA).

Table B.1. provides a review of settlements within the area under consideration, with the accompanying distances from the project location.

Table B.1. Settlements within the area under consideration with the accompanying distances from the project location

Settlements	DA position and distance from the settlement boundary	DA position and distance from the first houses
Močići	Within the settlement area	35 m NE
Čilipi	Within the settlement area	85 NE
Zvekovica	400 m S	780 m SE
Uskoplje	720 m S	1400 m S
Gabrili	800 m S	1800 m S
Cavtat	835 m E	1500 m E
Drvenik	1500 m SW	2200 m W
Komaji	1900 m NW	1900 m NW
Jasenice	1900 m S	2900 m S
Mihanići	2400 m W	3300 m W
Popovići	4200 m NW	4900 m NW

Source: 2011 census, State Bureau of Statistics

#### Air quality

Splitsko-dalmatinska County, Dubrovačko-neretvanska County Zadarska and Šibensko-kninska County have been included in the zone HR 5.

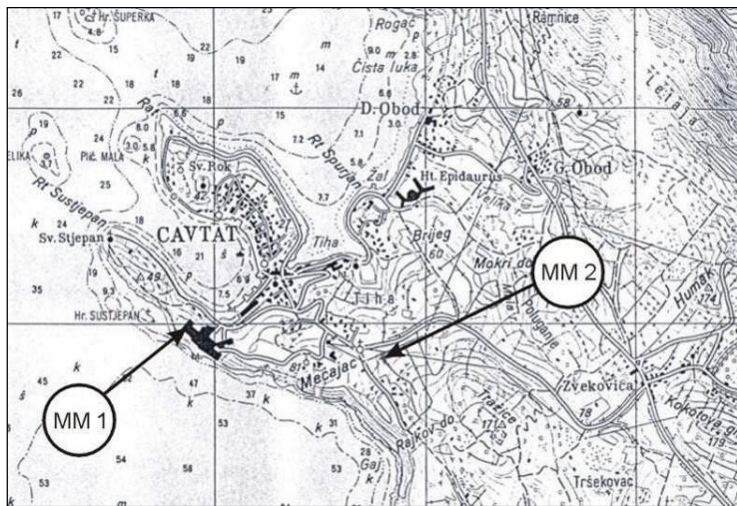
In Dubrovačko-neretvanska County air quality measurements are conducted at two stations, station Opuzen (Neretva) and station Žarkovica (Dubrovnik). Analysis of the zone HR 5 air pollutant data has shown that the air pollution is sufficiently low considering sulfur dioxide, nitrogen oxides, particulate matter, carbon monoxide and benzene, and that the quality of air according to the level of pollutants in the HR 5 area has been rated as category I quality (Article 6 of the Decree on determining the zones and agglomerations according to levels of air pollution on Croatian territory (Official Gazette 001/2014), and with regard to the ozone level in the air as quality II.

## Climate and meteorological characteristics

Dubrovnik littoral area has the characteristics of a pleasant Mediterranean climate with especially long, calm, dry and sunny summer, and short, mild and humid winter, and with the autumn season that is warmer and more humid than the spring season. Slightly modified Mediterranean climate with autumn temperatures higher than the spring ones, is a reflection of the specific contact position between the Adriatic open sea and the Orjen massif in the close hinterland. The unfavourable characteristic of climate in this area is very low humidity in the warm part of the year. Maritime impacts dictate slight temperature fluctuations. Continental impacts are weak, and represented by occasional intrusions of cold winds from the hinterland – most often the bora wind. The characteristic position of Dubrovnik Airport, which is located in the close vicinity of the Adriatic coast on the south and of the mountains in the north, causes frequent occurrences of the bora wind.

## Noise

Over the past forty years, several noise level measurements have been conducted in the DA area. The first noise level measurement was conducted during 1970., and it was conducted in the area of in the area of the then future housing construction (at Rajkov Dol) and the hotel construction on the Sustjepan peninsula. The second noise level measurement on the DA area was conducted during 2001. (during which the measurements of noise levels were conducted at approximately the same places where the measurement was carried out in 1970. (Graphical Appendix C.5-1.).



Graphical Appendix B.-1. Position of measurement points when measuring noise levels in 2001.

Considering that over 30 years have passed between the two measurement cycles, it was not possible to carry out a direct comparison of the measured and rating levels of air traffic noise, especially due to the fact that the measurements have been conducted in accordance with different standard procedures, showing different results for air traffic noise rating. The last air traffic noise measurement in the DA area, was carried out during winter and summer months of 2009 at 4 locations.



### Habitat classification, flora and fauna

A tour of the site of the project location concluded that the area on which the new surfaces and buildings are planned, is largely covered in mixed stands of holm oak–Virgillian oak forests with some Aleppo pine and Mediterranean cypress and its degradation forms.

Expansion of the existing, and construction of the new taxiways is planned in the green belt enclosed by the current runway and taxiways, so there could be no mention of natural habitat.

Airside of Dubrovnik Airport is enclosed by the protection fence in order to prevent the unauthorised entrance of persons, but also wild animals, in order to prevent the accident situations as much as possible. The earlier described vegetation is a suitable habitat for smaller species that have developed a tolerance to noise emissions and presence of people and machinery. Relatively dense vegetation provides them shelter and "protective" zone to the traffic areas of the airport.



Photographs B.-1. i B.-2.

The vegetation in areas where new operations are planned

Cave Đurovića situated underneath the existing aprons of the DA is located on the DA area. It extends in the direction of the southeast - northwest, at a distance of approximately 199 m.

### Protected natural heritage

Within the inner area of Dubrovnik Airport there are no parts of nature protected under the Nature Protection Act (OG 80/13).

In the area of Konavle Municipality, pursuant to the Nature Protection Act, three protected areas have been proclaimed until now:

- Islands of Mrkan, Bobara and Supetar – special zoological-ornithological reservation - Cavtat
- Konavoski dvori – significant landscape – Ljuta (surface area of 793.15 ha, and located approximately 6.9 km southeast from DA)
- Šipun cave – geomorphologic-hydrologic natural monument – Cavtat (located approximately 2.8 km northwest from DA)

Konavle Municipality Physical Plan suggests initiating the proposal to protect the “Konavle” Regional Park on the surface of 20,957.68 ha that would encompass the entire terrestrial part of the Municipality.

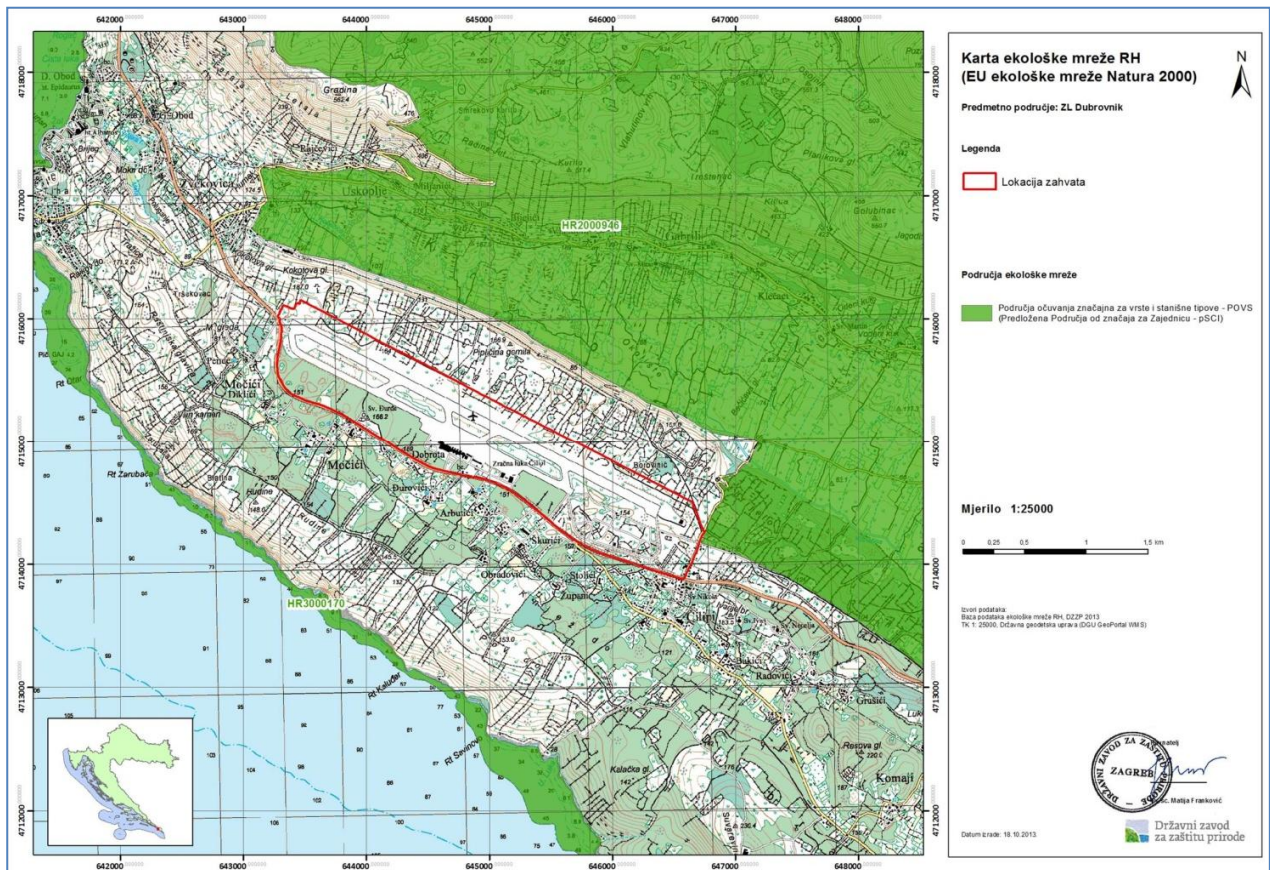
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### RoC Ecological Network

According to the excerpt from the RoC Ecological Network (October 2013), Dubrovnik Airport is not located within the area of the RoC Ecological Network (EU ecological networks Natura 2000).

In the wider DA area, there are two preservation areas important for species and habitat types (POVS), HR2000946 - Snježnica and Konavosko polje, and HR3000170 - Aquatorium alongside the Konavle Rocks.



### Cultural- historical heritage

A preliminary assessment has been conducted on the basis of the existing information from the records of the cultural heritage protection service, available literature, and primarily on the basis of site visits. The Study includes the information on cultural-historical values (movable and immovable cultural goods) in construction impact zones, from which the following have been established in the area of the Study:

#### Sacral buildings

- St. Đurđa Church

Archaeological sites

- Cemetery around St. George's Church, Đurovića cave and the probable Roman road

Ethnological sites

- Remains of field houses, stone vessels for water and draw-wells

Archaeological movable findings

- Roman ceramics fragments on the ground surface



Crkva sv. **Đurđa**



**Đurovića špilja**

Photos B.-3. i B.-4. Some of the cultural and historic values in the impact zone of construction

Landscape

The main role in the landscape picture is held by the southwest open slopes of Snježnica Mountain and by the asphalt surface of Dubrovnik Airport.

Natural covering is composed of the rocky pastures, low and high growing shrubs.

Settlements near the location of the project are villages Močići, Zvekovića, Uskoplje i Čilipi. The origin and development of these settlements is related to agriculture.



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Photo B.-5. Reef Kokotova glava, Pipličina gomila and vučje ždrilo and mountain Sniježica with the village Uskoplje in the background

### Tourism

Dubrovačko-neretvanska County data show that in 2011 the total of 950,415 foreign guests have visited the region, which is 5.7% more in comparison with the previous year. The main incoming markets for Dubrovnik region are France, Great Britain and Germany, therefore, the visitors arriving by plane. In 2011, after several years of decline, the share of domestic tourists has increased by 15.2%, reaching a figure of almost 96,500 tourists. The unique position of Dubrovnik and the difficulties related to reaching the city by road, speak in favour of the fact that the air traffic development holds the key significance for the region as an incoming tourist destination.

### Pedological characteristics and agriculture

According to the land development plan (Konavle Municipality Physical Plan), the planned project of Dubrovnik Airport development does not fall into the category of agricultural lands. Within this area (23.8 ha in total) there are neither agricultural plots nor any type of agricultural activity.

The wider area of the project scope is located within the Konavle field, and Dubrovnik Airport is situated on its southwest end. Konavle field is alluvial - colluvial valley with a height of 48-200 meters above sea level. In agricultural terms, it represents the most valuable part of Konavle Municipality, which, considering the climate and pedological characteristics (soil structure), allows cultivation of all types of agricultural crops.

### Forestry

The area of Dubrovnik Airport is entirely located in the area of Forest Administration Branch Office Split, Forrest Office Dubrovnik, on the area of the management unit 985 Dubrovnik - Elafiti. There are no managed forest areas within the area of the project scope.

### Hunting

The project scope area is entirely situated on the territory of the County hunting ground XIX/35 - Konavle, in vicinity of its southwest boundary. Within the project scope there are no used forest areas.



### Geological characteristics

The Airport site is located on deposits of cretaceous age - limestone and dolomites of various age.

The project location is situated in Dubrovnik epicentral area, i.e. in one of the seismically most active areas in Croatia.

### Hydrogeological characteristics

Dubrovnik Airport is situated on porous and partially non-porous carbonate deposits without the surface flow.

It is situated outside of the sanitary protection zones of the water spring. The closest zone II of the sanitary protection of Konavoska Ljuta spring is located at the distance of approximately 4,300 m NE from the project location. The water spring which is the closest to the project location is Duboka Ljuta spring, located at the distance of approximately 3,300 m NW from the project location.

### Road Traffic

Road traffic network in the wider area surrounding Dubrovnik Airport consists of the state roads, county roads and local roads.

The main road is a state road D8, which connects the airport to Dubrovnik and the rest of the county. According to the Physical Planning Strategy of the Republic of Croatia and Dubrovačko-neretvanska County Physical Plan, the highway (alternatively expressway) corridor which would begin at the border with the municipality Župa dubrovačka, and end at the border with Montenegro on the Debeli Brijeg territory was planned through the area of Konavle Municipality.

### Water supply

The existing water supply system of Konavle-west is based on tapping of Duboka Ljuta spring in Župa dubrovačka.

### Waste water drainage

Partly constructed drainage network has been established only in Cavtat. Sewage is used to drain waste water and partially rainwater directly into the sea, without treatment. Today, sanitary waste water drainage from the aforementioned urban area does not meet the requirements and high standards of the coastal area protection.

For the aforementioned reason, the project of the Sewage system has been prepared and it is encompassing the wider urban area of Cavtat and Zveković and the Dubrovnik Airport.

### Maintenance of rivers and watercourses, amelioration drainage

For the purposes of high water evacuation from Konavle field (Konavosko polje) in the autumn-winter period, a tunnel MHE "Konavle" was built, which is used to evacuate water to the sea from the lowest point of the field and by using the shortest way. Apart from that, collected waters are drained into the sea via natural precipice.

Basic and detailed canal network, drainage network and other accompanying facilities are planned to be constructed in Konavle field.

### Energy supply

The basic energy supply of the Konavle area, but also of the wider area of the city of Dubrovnik, is carried out via the existing substation Komolac.

Planned construction of the substation Plat will radically change the concept of the electric power supply of the wider Dubrovnik area under consideration and open completely new development perspectives.

Presently, there is no gas supply in the area of Konavle Municipality, and there are no information relating to production and pipeline transport of oil and gas.

## C. REVIEW OF POTENTIAL ENVIRONMENTAL IMPACTS OF THE PROJECT

### Population impact

In the course of the Airport construction, population impact will be limited exclusively to the closest settlements, Močići (DA southwest side) and Čilipi (DA southeast side).

Negative population impact during the Airport construction will manifest in the following:

- Emission of dust and exhaust gases during construction works,
- Increased noise level,
- Obstructions in regular movement of people.

In the course of the project use, the population impact will manifest as follows:

- Increased noise level due to air traffic
- Increased noise level due to road traffic generated within the airport
- Air quality impact of air traffic
- Air quality impact of road traffic generated within the Airport
- Positive impact on economy

The direct impact of the project development Dubrovnik airport to the economy is reflected in a number of elements:

- New international connections with countries with expanding markets will open;
- A marketing programme to attract new airliners will be conducted;
- it is expected that the total number of passengers using airport services at the end of the proposed period will be around 3,98 million;
- the economic meaning of the airport far surpasses the procedures and services needed to travel;
- the airport functions as a primal economic booster of the region (/ social and local infrastructure) and the country;
- Airport takes off as a "business card" of the region because this is where the newly arrived passengers create first impressions;
- From an economic point of view, the development of the Dubrovnik Airport will contribute to the regional economy by creating jobs and will be an important source in terms of corporate tax;

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- Value added tax which is collected from tourists who spend money in the region, is a factor that must not be ignored;
- Increased availability and trend of taking shorter but more frequent vacations, will lead to a larger share of tourists arriving by air;
- the creation of additional sources of income by implementing a development program for non-air affairs (new concessions in the terminal, parking, etc.);
- Number of employees over the next year will be increased in accordance with the rate of traffic growth, to improve efficiency.

### Air quality impact

The negative impact on air quality during construction is the result of necessary activities needed during construction. The biggest contribution to reduction of air quality during construction are the result of necessary is made by emissions of dust from the open areas and by products of burning fossil fuel in engines of the machinery. Those impacts cannot be entirely prevented but they can be localised and reduced. Having in mind the limited time of the construction, the aforementioned negative impact on air quality has been estimated as minimal.

The main sources of emissions during use of Dubrovnik Airport are:

- Gases generated by burning fuel in aircraft engines
- Gases emitted into atmosphere during fuel reloading
- Gases generated by burning fuel required for the work of the necessary ground equipment for maintenance, repair and servicing of aircrafts on the ground
- Emissions from motor vehicles for transport of passengers, airport employees and visitors
- Emissions from the central boiler room funnel
- Gases generated by burning fuel used by vehicles on the state road D8, a certain percentage of which is related to the work of the Airport

The increased capacity of Dubrovnik Airport will increase emissions of air pollutants, causing the air quality reduction. The modeling of air pollution was conducted due to increased air and road traffic.

The largest contribution to total emissions into the air occurs as a result of combustion of fossil fuels in aircraft. The scope of the impact assessment of road traffic on air quality of the surrounding area of Dubrovnik Airport is limited to part of the D8 state road that runs directly next to the airport.

According to the results of the model of concentration of pollutants in the air, caused by increased emissions from all segments of the activities of the airport shall not exceed the limits set by the Regulation on the levels of pollutants in the air (OG 117/2012).

### Air traffic impact on climate change

According to estimates, transport generates approximately 13% of the total greenhouse gas emissions. Within these 13% air transport generates another 13% of emissions. Therefore, the air transport generates a little over 1.7% of total greenhouse gas emissions. Most of the greenhouse gases generated by aircraft operations is CO<sub>2</sub> so it is generally considered that

aircrafts produce 2% of global CO<sub>2</sub> emissions. From the point of view of the impact of CO<sub>2</sub> emissions from aircraft on climate, the most significant are the emissions at cruise altitude flight regime that takes place at altitudes between 8 and 12 km. Emissions of gases at those altitudes has a much greater impact on the natural balance.

Water vapor (H<sub>2</sub>O) released from aircraft engines can facilitate the formation of high, icy clouds at cruise altitudes flight regime (8-12 km). These clouds also contribute to the greenhouse effect. As with CO<sub>2</sub> emissions of water vapor from the plane is proportional to the amount of fuel used and it cannot be eliminated.

Since the combustion of fossil fuels necessarily forms carbon dioxide and water vapor, reducing emissions of these gases from transport equipment exclusively is achieved by development in terms of reducing the consumption of fossil fuels and increasing the use of alternative fuels. According to some estimates, today's aircraft emissions are about 70% lower than 40 years ago.

Dubrovnik Airport cannot influence the aircraft greenhouse gas emissions, since this limitation does not fall into the domain of the Airport alone, but into the scope of airline companies and ICAO/CAEP standards. Efficiency improvements and emission reduction that can be influenced by the Airport, relate to the Airport objects. Reduction of gas emissions generated by energy generating facilities, primarily the boiler room, may be accomplished by installation of gas boilers, instead of the previous that worked on the extra light fuel oil. With respect to protecting air quality fuel gas is acceptable because gas has lower emissions of air pollutants from diesel fuel (particularly sulfur oxides). The intelligent design of the interior of the terminal and other facilities, as well as their isolation, should reduce the need for heating and cooling (eg, passive heating air-conditioning). The use of renewable energy sources, especially solar energy, should also contribute to the reduction of pollutant emissions.

The planned increase in activities of the airport will increase the amount of necessary terrestrial operations, and thus the emissions due to the use of vehicles required for the implementation of these operations (airport operational vehicles).

Adjustment of design documentation to possible climate change impacts and disaster risk management

When developing design documentation it is also necessary to carry out the analysis of adverse impacts of climate change in order to mitigate, as much as possible, the adverse impact on the functionality and sustainability of the development of Dubrovnik Airport. Listed below are the assumptions, entry data, procedures and actions that will include, in the design stage, the impact of climate change, all in accordance with the applicable legislation, technical regulations, standards and rules.

The possible risks that will be taken into account in designing are as follows:

A. Increase of temperature extremes that may result in:

- greater requirements for cooling and heating systems in buildings;

The changes of the usual external temperatures that may occur due to climate change will directly cause difficulties in the operation of the cooling and heating systems and the internal room temperatures as set out in the design will not be achieved. Taking into consideration possible summer temperature increase and the winter temperature decrease in the 2°C and 5 °C interval, the summer external temperature as set out in the design will increase from the current 33°C to between



35 and 38°C, and the winter temperature of -2°C will decrease to between -4 and -7°C.

- degradation of the runway and the runway foundations:  
The effects of temperature changes on the structure are manifested as the expansion and contraction of materials. If the temperature increases, the materials expand, and if the temperature decreases, they contract. If the structure element dimensions change, stress occurs in the structure, depending on its statics. Taking that into consideration, the temperature change of 15-20% does not represent a risk neither for the runway nor for the already constructed and future buildings.
- reduced possibilities for take-off and landing, that will possibly result in the requirement for a greater runway length:  
Since there are certain reserves with regard to the total length of the runway necessary for take-off and landing of almost all aircrafts that will carry out operations in the upcoming period, the temperature increase of up to 3°C will not have an adverse effect on the airport functionality.

B. Greater frequency of heavy precipitation events,

The increase of extreme rain events is one of the key factors that are taken into account due to the current climate change. Since extreme rain events are relevant to the sizing of the storm water drainage systems, climate change should be included as one of the criteria in designing and planning these systems, all in order to ensure the design criteria throughout the lifespan of the building. That that may result in:

- damage to the runway and other infrastructure:  
The possible damage to pavement structures in use caused by heavy precipitation/leaching has been avoided since the load-bearing layers and embankments will be constructed by using a mechanically compacted grained stone material with a low content of tiny particles and high drainage properties. The leaching of storm water through this material does not result in washing off or settling and therefore there is no possibility of damage to the pavement surfaces. Considering that Dubrovnik Airport is located on a plateau above the Konavle Field, at a sufficient distance from all the existing waterways, there is no risk of torrents and spilling from the nearby existing waterways that would cause damage to the airport infrastructure.
- storm water drainage that will exceed the capacity of the storm water drainage system:  
Taking into consideration all of the aforementioned guidelines and recommendations based on experience, as well as various field measurements and observations, the change of rain events will not significantly affect the functionality of the storm water drainage system in the Dubrovnik Airport area.

C. Greater frequency of extreme storms that may result in:

- damage to the terminal, navigation equipment and signalling system due to wind:  
In the Dubrovnik Airport area, the maximum measured gush of wind is 200 km/h (the probability of this occurring is very low), and this value will be used to calculate the load capacity of all the exposed sections of high facilities. In addition, facilities in the vicinity of manoeuvring areas have also been calculated and sized to the jet thrust (260km/h at a distance of 15m) that is significantly larger than wind load whereby safety is given additional priority in the calculation.
- influence on the usability factor of the aerodrome

If there will be some significant changes to the distribution and increase in speed of winds in the future it will be taken into account during the design process by extending the runway width (greater width has a positive effect to the cross-wind component tolerance), displacing the threshold, installing of additional aeronavigation devices and equipment or applying some other possible measure.

D. Extreme seismic loading that may result in:

- damage or reduced usability of the buildings due to earthquake.

Seismic load represents the dominant load to the reinforced concrete facilities. Since it is extremely hard, even impossible, to predict (either duration time, frequency or magnitude), it is included in the calculation through the action spectrum and maximum acceleration of soil for the defined return period. , all Dubrovnik Airport facilities that have been or will be designed and constructed in accordance with the currently applicable regulations meet the load capacity and usability requirements.

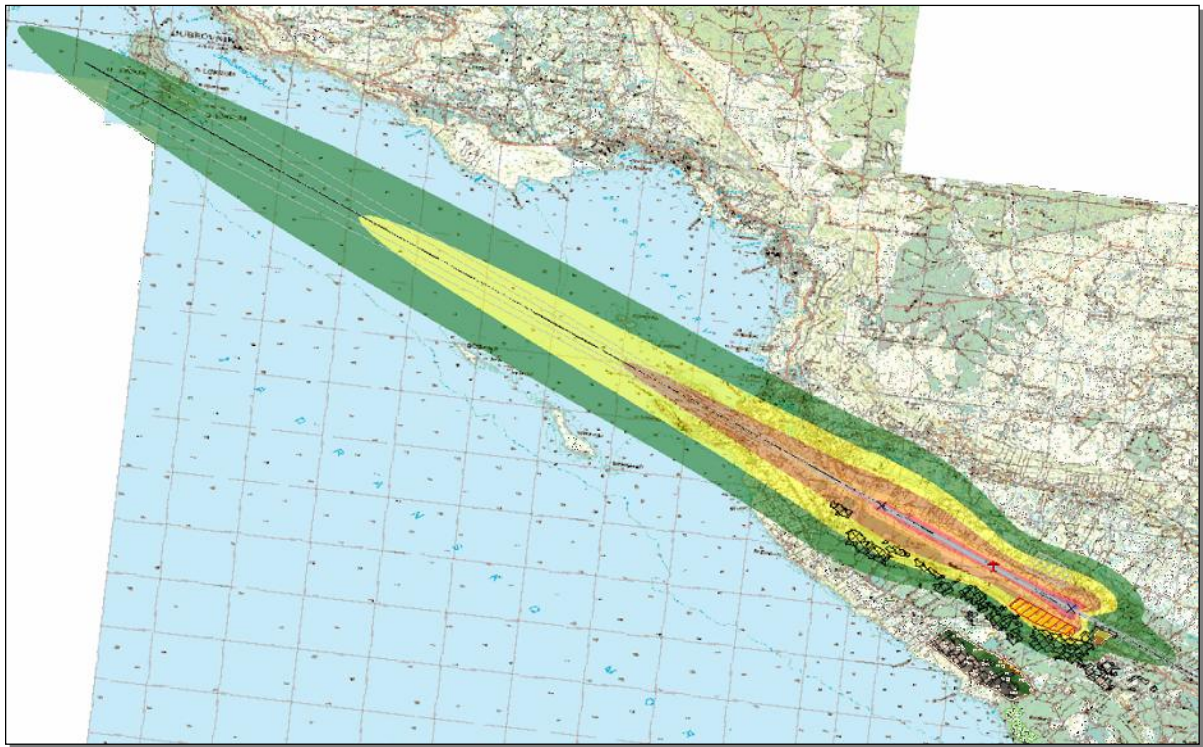
#### Impact on noise level

During the construction period, the environment will be affected by noise, generated primarily by heavy construction machinery and devices, and by goods vehicles operating on the construction site. When drafting the project documents and making construction plans the actual noise produced will be determined, and the equipment and/or systems for reduction of noise coming to the closest residential objects will be introduced.

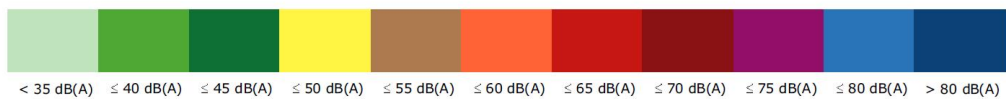
Increased noise levels from air and road traffic will occur during construction. The intensification of air traffic will increase noise surface grades 40 - 50 dB (A) to 96.8%. When comparing the results with the air traffic noise model for 2012, it is clear that by the end of the programme period, the average increased noise level during the day and during the night will be maximum 5 dB(A).

On the basis of results received by conducting the modelling, one can draw a conclusion that the planned air traffic increase will lead to the significant increase of noise level, especially in the areas of Cavtat and Močići settlements.

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Graphical Appendix C.-1. Levels of aircraft noise during the night for 2032.

Noise levels will increase in 2020. by 3 to 6 dB in relation to the year 2012. due to increased road traffic (During the night, noise increases will go up to 15 dB).

### Impact on habitat, flora and fauna

During construction, expansion will cause 23.8 ha of the habitat to be redeveloped within the zone of Dubrovnik Airport. In the largest part of the area (14.8 ha) it refers to mixed stand of the holm oak-virgillian oak forests including some Aleppo pine and Mediterranean cypress.

Additional negative impact on the habitat in the area under consideration when conducting the works may be caused by an irregular organization of habitats and in the event of extraordinary situations (accidents...).

The planned expansion will cause no additional impact on the natural values of Đurović cave site. During the demolition of the existing building "C" (August 2012.) recording and monitoring of Djurovic Caves was carried out to determine whether construction work have an impact on the cave, and whether the construction of a new terminal building will be compromised due to the potential impact of the cave to its static. It was concluded that the works, which are only 50 meters from the cave, have no effect on the stability of the cave and the cave itself will not affect the structural integrity of the new terminal building. Other planned facilities are at much

greater distances than Djurovic caves so it can be concluded that the extension of of Dubrovnik Airport will have no impact on the present site.

The regular use of Dubrovnik Airport will not cause negative impact on the habitat in the wider DA area, with the exception of accident situations that might have negative impact (fire, fuel or oil spillage into the surrounding habitat).

#### Impact on natural heritage

Special zoological-ornithological reservation – the islands of Mrkan, Bobara and Supetar are located from 3.9 to 5.35 km west, that is, southwest from the DA. The arrival and departure routes do not go above the islands, but between the islands of Supetar and Bobara, that is, Mrkan. At the same time, the aircraft fly on appropriate altitudes (370 i.e. 760 m.a.s.l.) so there will be no impact on the area under consideration.



Graphical Appendix C.-2. The position of the ornithological reserve - islands Mrkan, Bobara and Supetar in relation to DA (source: Google maps)

#### Impact on the RoC Ecological Network

Through the procedure of the Prior assessment of the project's acceptability for ecological network, the Nature Protection Administration within the Ministry of Nature and Environmental Protection has issued the Certificate stating that the project will have no negative impact on objectives of preservation and integrity of the ecological network areas and the proposed Natura 2000 areas.

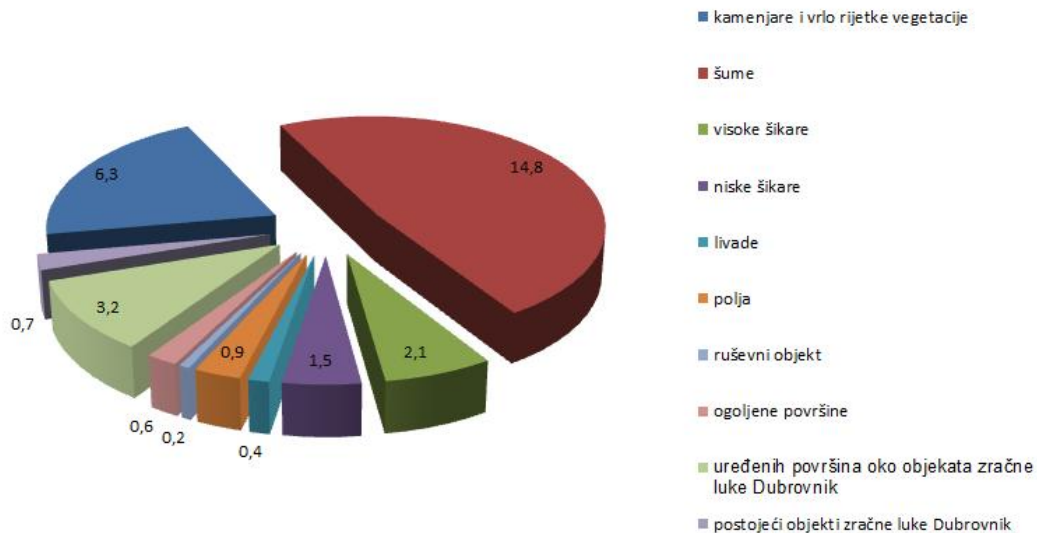
#### Impact on cultural - historical heritage

Separate ethnological localities have been identified together with objects at risk of being physically destroyed by the considered project, which need to be timely archaeologically documented (prior to the project implementation). Due to the possibility of finding a Roman road on the route of the present field path heading east from St. Đurđa church, it is necessary to ensure an uninterrupted archaeological supervision during the construction works. Archaeological supervision will determine the existence of the possible locality and define further protection measures in terms of archaeological research.



### Impact on landscape

The project location is formed by natural systems of rocky pasture, scrub and forest in karst terrain. The planned expansion and renovation will be located on a total area of 30.5 hectares that will repurpose the following areas:



Graphical Appendix C.-3. Areas that will be reassigned by construction

The view of the area from the nearest settlement Močići will not change due to the fact that the existing and the planned position is on the area marked as Dubrovnik Airport. The total landscape impact of the planned project has been estimated as low impact.

### Impact on soil and agriculture

Short-term impact during the Airport construction that will not remain after the project completion, refers to covering the ground in case of dumping of excess excavated material (negligible), dust deposition on the ground (negligible), increased amounts of waste and potential inadequate management and spillage of oil and grease (accident situations) when filling the transport vehicles, inadequate machinery maintenance, inadequate storage of waste and supporting technical devices and fuel. Impact on the soil can be alleviated by proper construction site organization and adequate management.

When using the procedure negative impacts on the soil will occur within the zone of the airport and in the smaller extent to the agricultural production in the wider area of the airport due to air pollution due to the gradual increase of the intensity of air and road transport. In a lesser degree pollutants can lead to a slowdown in the growth and development of crops and restricting organic farming to the wider project area.

The impact of increased air traffic on the soil is difficult to quantify. The negative impact of the products of combustion of aircraft fuel is mainly reflected in altitude, where they influence the ozone, so it is difficult to determine the final balance. In the reaction of these compounds with water vapor the appearance of acid rain occurs, but the area of their distribution is very broad and in terms of the procedure the mentioned effect is not significant.

Since the project refers to expanding the capacity of the existing Aircraft, those impacts will be low.

### Forestry

The development of Dubrovnik Airport will make no impact on forests nor on forest-related activities, since the nearest managed forest areas are located 0.96 km west, that is 1.27 km north, and 1.84 km southeast from the area of the project scope.

### Hunting

The project is carried out within the existing enclosed airport area, so there will be no impact on hunting activities. Small negative impact may be caused in case of the furry game breaking through the protection fence and entering the Airport area, but this possibility is very small due to strength of the protection fence. Greater potential threat comes from game birds, since they might collide with airplanes, but removing the vegetation during the construction stage and noise caused by the increased traffic intensity will reduce this possibility.

### Water impact

During construction, the possible negative water impact has been assessed as low and temporary in character. Negative water impact during construction is possible if failing to introduce a gradual approach to construction.

Considering the change of collection and drainage of polluted rainwater in the area of DA, the groundwater impact will be improved since the polluted rainwater will no longer be drained into the terrain without the prior processing on oil and grease separators. Due to using environmentally friendly de-icing agents, the water impact will be more favorable in comparison to the earlier situation. Due to processing wastewater from the restaurant, laundry, etc., on oil and grease separators, that is, on the foam separator, the water impact will be improved. Earlier geotechnical research works in the area of Dubrovnik Airport have found no groundwater, but there is a possibility of groundwater in deeper horizons. The potential negative impact on groundwater is considered to be low.

### Influence on traffic routes

During construction, due to increased frequency of vehicles that are leaving the location and joining the flow of traffic on the state road D8, certain disturbances are possible. The most of the rough construction and asphalt works will be carried out during the winter working hours of the DA (from November to April), when overloading on the surrounding roads is much less present than during the summer period.

During the construction there will be no impact on air traffic, due to adequate functioning of the construction site, which will ensure uninterrupted air traffic in accordance with the flight schedule.

Planned development of the Airport and the increased number of passengers will also result in increased traffic on the access road, the main road D8 from the Airport to Dubrovnik which is currently overloaded. Planning of improvements of the road connection is already under way. In the oncoming period, the state expressway Dubrovnik (Osojnik) – Debeli brijeg is planned to be constructed, and it will pass north from the Airport and from the existing corridor of D8. In that way, the most of the traffic on the existing state road D8 would be redirected from this road, which is passing through the densely populated area.

The manner, procedures and other conditions for safe takeoff and landing of aircraft have been determined for Dubrovnik Airport and they are published in the manner typical for the air traffic. In this way, by implementing all of the measures required by the strict air traffic safety regulations, there will be no negative impact on air traffic caused by development of Dubrovnik Airport.

### Impact on infrastructure

During construction there is a possibility of negative impact on the elements of water supply, drainage, electro-energetic or telecommunication network and there may be mechanical damages of the water supply elements and indirectly, drinking water pollution, that is, the damages of the telecommunication lines and channels. All possible negative impacts will be avoided by adequate organization of construction, by respecting and taking into account of the special construction requirements obtained from the certain institutions when acquiring the certain permits, and by respecting the valid legal regulations and rules of construction, traffic, electro-energetic and mechanical profession.

During the use, that is, during regular air traffic on Dubrovnik Airport, no negative impacts on infrastructure elements are expected. Negative impacts are possible only in case of accident situations.

### Impact due to waste generation and management

During construction, impact might be made due to increased waste level, caused by inadequate waste management. As side effects of construction, different types of hazardous and non-hazardous waste will be generated.

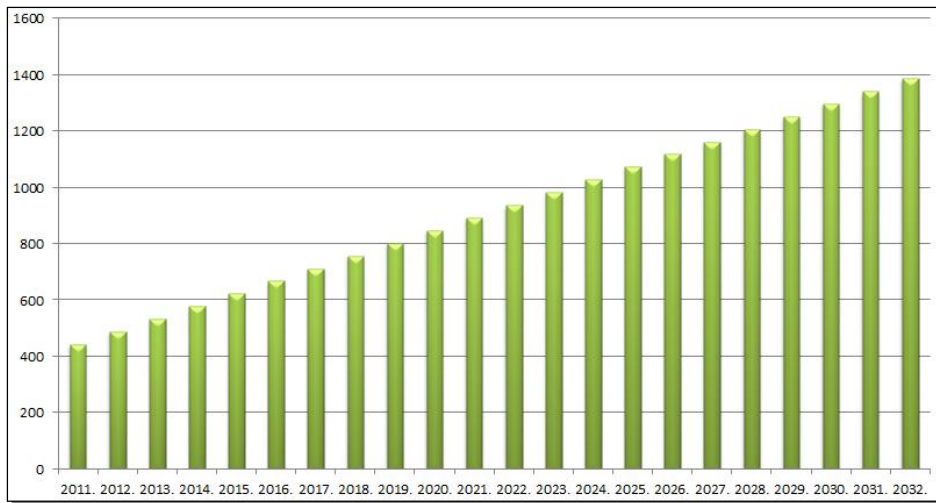
In Dubrovnik Airport, the technological work process generates non-hazardous technological waste and hazardous waste.

The increased number of passengers is expected to cause the increased amounts of waste (Graphic appendix C.4). Considering the increase of the annual number of passengers it is expected that the amount of waste in 2032. will grow to 122 tons.

Dubrovnik Airport Waste Management Plan for 2012 – 2016 contains measures for implementation of waste management and reduction of the certain types of waste within the DA.

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Graphical Appendix C.-4. Increase of the amount of waste in the planned period

### Accidents

During construction emergencies such as fires, collisions of construction vehicles, accidents when working with machinery or accidents caused by force majeure (lightning, extreme adverse weather conditions, etc.) may occur.

During intervention negative impact may occur due to the emergencies such as earthquakes, storms, etc.

During the course of the operation of air transport emergencies in the form of crash of birds and airplanes, extraordinary pollution, fires and explosions may occur.

### Environmental overload caused by lights

Increase of lighted areas, especially in the landside part of the Airport, will cause the additional overload by lights. In relation to the current state, this will be the impact of low intensity, especially if taking into account the Airport working hours from 5 a.m. to 11 p.m. in summer, that is, to 10 p.m. in winter.

In order to prevent the environmental overload caused by lights as much as possible, it is necessary to use ecologically acceptable or shadow lighting<sup>1</sup> by night.

### Description of potential transboundary impacts

On the north and northeast side, Konavle Municipality is bordering Bosnia and Herzegovina, while on the east and southeast side, it is bordering Montenegro. On the south, the Municipality reaches the state maritime border, that is, the territorial sea border.

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<sup>1</sup>Ecologically acceptable lighting is any lighting-technical device that fulfils the need for artificial lighting on the certain location, while not causing permanent interference through electromagnetic emissions into the environment. Through its emission, such devices may not interfere with activities and health of people, nor change the behaviour of indigenous animals and plants in the close vicinity and in more distant environment.



Dubrovnik Airport is located from 3.7 km (area of Jasenice settlement) to 9.38 km (area of Duba Konavoska settlement) away from Bosnia and Herzegovina. It is located about 12.9 km away from Montenegro (area of Dubravka settlement).

With regard to the aforementioned distances, the possible impact on these areas during the project use, that is, due to increased air traffic, has been taken under consideration.

According to flight altitudes of aircraft arriving to and departing from Dubrovnik Airport when entering the aerospace of Montenegro and Bosnia and Herzegovina, it may be concluded that there will be no impact on the population and protected areas of nature made through increased noise level or air emissions.

Development and use of the DA in the planned period will be harmonized with the international obligations of the Republic of Croatia relating to transboundary pollution and environmental impact.

## D PROPOSAL FOR THE PROJECT ENVIRONMENTAL ACCEPTABILITY ASSESSMENT

The analysis of the current state of the environment and the planned projects potential impacts on individual environmental components were estimated. Given that this is a reconstruction and development of existing operational Dubrovnik Airport it was established that additional interventions will cause significant changes in the wider area of operations.

Some aspects of the project will reduce existing DA impacts on the environment (impact on water), while some will affect their partial increase (effect of increased levels of noise and air pollution caused by increased air and road transport). Thus the procedure will mostly affect the local population, but will also contribute to increasing the wider economy, improving tourism and transport links of the already traffic isolated Dubrovnik Riviera.

The table below briefly lists possible impacts on environmental components, the proposed protection measures as well as the residual impacts that can not be further mitigated. Subsequently it can be concluded that the project of reconstruction and development of operational Dubrovnik Airport is environmentally acceptable.

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PART OF ENVIRONMENT	IMPACTS	ENVIRONMENTAL PROTECTION MEASURES	REMAINING IMPACTS
Population and economic characteristics	<p>Negative impact on population during the Airport construction will be manifested in the emission of dust and exhaust gases during construction work, increased noise level and the obstructions in regular movement of people</p> <p>During the project use, the impact on population will be manifested by increased noise levels and impact on air quality due to air and road traffic and a positive impact on the economy and tourism</p>	<p>Measures of protection from increased noise levels and air protection measures</p>	<p>The planned project will have direct impact on population in the nearest settlements of Močiči and Čilipi through air and noise pollution (including Cavtat) due to air and road traffic. The impact has been assessed as moderate. Positive impact on the settlements, municipality and the wider Dubrovnik littoral, through significant direct fiscal benefits in the coming years of use. Incoming and outgoing tourism will improve.</p>
Air quality	<p>The biggest contribution to reduction of air quality during construction is made by emissions of dust and by products of burning fossil fuel.</p> <p>The biggest contribution to air quality is made by gases generated by airplane engines, delivery and road vehicles.</p>	<p>Bulk construction material to be transported in appropriate and technically functioning vehicles, and to be kept wet or covered, especially on windy days.</p> <p>Non-asphalt roads used for transport to be watered on dry days..</p> <p>Optimizing the design of the airport, layout and infrastructure, modifying the process of practice in the form of better efficiency, substitute ground equipment with low-emission technologies and the promotion of other environmentally friendly modes of transportation on earth to assist in approaching sustainable development commercial air transport task is solely the Dubrovnik airport. Measuring air quality, implementation of corrective plans and programs, the construction of alternative road routes and inform the public about issues affecting local air quality task and obligation regional, local and national authorities, with of course the indispensable cooperation of the Dubrovnik airport.</p>	<p>Air impact by air and road traffic.</p>

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PART OF ENVIRONMENT	IMPACTS	ENVIRONMENTAL PROTECTION MEASURES	REMAINING IMPACTS
Noise	During the construction period, the environmental noise will occur primarily as a consequence of heavy construction machinery. The planned air traffic increase will lead to the significant increase of noise level, especially in the areas of Cavtat and Močiči settlements.	With protection measures during planning (making noise management plan site, create a project for noise protection for aircraft apron, updated strategic noise maps and to establish an action plan to reduce noise) and construction are prescribed measures for use relating to prescribing operational measures to manage aircraft and if their application will not show satisfactory results, it is necessary to implement passive protection measures. One of the operational measures is that aircrafts must not ignite the main engines on the future apron west but will be pushed to the position of a taxiway, and only then they can start the main engines.	After the implementation of the measures, a certain environmental noise will remain that will be most felt in the settlement Močiči.
Habitats, flora and fauna	The construction of additional facilities the airport there will be an additional capture natural habitat in a total area of 23.8 hectares. All habitats are within the scope of DA . Regular use of DA could have a negative impact on the habitat of the wider area.	Restrict movement of heavy machinery in order to minimize degradation of surrounding habitats..	-
Natural Heritage And Ecological Network	Aircraft arrival and departure routes do not go above the islands of Supetar and Bobara, that is, Mrkan (special zoological-ornithological reservation). Therefore, the aircrafts fly on appropriate altitudes so there will be no impact on the area under consideration. Through the procedure of the Prior assessment of the project's acceptability for ecological network, the Nature Protection Administration within the Ministry of Nature and Environmental Protection has issued the Certificate stating that the project will have no negative impact on objectives of preservation and integrity of the ecological network areas		
Cultural - historical heritage	Individual sites and ethnological objects were	Sites and buildings threatened by	Permanent destruction of individual

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PART OF ENVIRONMENT	IMPACTS	ENVIRONMENTAL PROTECTION MEASURES	REMAINING IMPACTS
	identified which present intervention threatens physical destruction.	physical destruction is necessary to document the architectural time (prior to the performance of the procedure). Due to the possibility of finding a Roman road at the site of recent dirt road that leads to the church of St. Đurđa east it is necessary for the performance of construction work to ensure continuous archaeological supervision. Archaeological supervision will determine the existence of the possible locality and define further protection measures in terms of archaeological research.	sites.
Landscape	The overall impact of the planned activity on the landscape has been assessed as low impact. The planned project will result in a moderate loss and changing landscape patterns due to the removal of forest area to 14 hectares.	Develop a landscaping project for the entire landside area.	Impact is permanent.
Soil and agriculture	Short-term low intensity impacts during construction. Negative impact on soil and agriculture in the inner and outer area of the project scope will be caused by gradual increase of air and road traffic intensity. Since the project refers to expanding the capacity of the existing Aircraft, those impacts will be low.	During excavations, remove the fertile soil and store it temporarily within the project zone. The soil should be later on used for landscaping of degraded surfaces. Other measures are already covered by measures of water and landscape protection.	Land take on a total area of 22.8 hectares.
Forestry and hunting	The development of Dubrovnik Airport will make no impact on forests nor on forest-related activities since the nearest forest areas are at a distance of 0,96 km west, i.e. 1,27 km north and 1,84 km south east of the project area. The project is carried out within the existing enclosed airport area, so there will be no impact on hunting activities		
Water	During construction, the possible negative impact is assessed as low and temporary. Negative water impact during construction is	Water protection measures during construction operations relating to ensuring sanitary facilities for workers,	-



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	<p>possible if failing to introduce a gradual approach to construction.</p> <p>Considering the change of collection and drainage of polluted rainwater in the area of DA, the groundwater impact will be improved since the polluted rainwater will no longer be drained into the terrain without the prior processing on oil and grease separators.</p>	<p>proper storage of hazardous substances, materials and raw materials. Upon constructing the public drainage system "Cavtat", the DA sanitary wastewater has to be connected to the newly constructed public drainage system. Bio-degradable and phosphate-free agents to be used for de-icing of the runway.</p> <p>Regularly examine the condition of the sewerage system of DA.</p>	
Traffic	<p>During construction, due to increased frequency of vehicles that are leaving the location and joining the flow of traffic on the state road D8, certain disturbances are possible.</p> <p>During the construction there will be no impact on air traffic, due to adequate functioning of the construction site, which will ensure uninterrupted air traffic in accordance with the flight schedule.</p> <p>Planned development of the Airport and the increased number of passengers will also result increased traffic on the access road, the main road D8 from the Airport to Dubrovnik which is currently overloaded.</p>	<p>The project will create a temporary traffic regulation during the construction of the planned project. It will lead to the original condition all existing roads and paths that have been damaged due to the use of machinery and vehicles during the construction of the airport</p>	<p>In the oncoming period, the state expressway Dubrovnik (Osojnik) – Debeli brijeg is planned to be constructed, and it will pass north from the Airport and from the existing corridor of D8. In that way, the most of the traffic on the existing state road D8 would be redirected from this road, which is passing through the densely populated area.</p>
Infrastructure	<p>During construction there is a possibility of negative impact on the elements of water supply, drainage, electro-energetic or telecommunication network.</p> <p>During the use, that is, during regular air traffic on Dubrovnik Airport, no negative impacts on infrastructure elements are expected. Negative impacts are possible only in case of accident situations.</p>		
Waste	<p>During construction different types of hazardous and non-hazardous waste will be generated.</p>	<p>The waste will be disposed of by licensed entities. If necessary, revise the existing Waste Management Plan and Regulations regarding the disposal of waste from an industrial process and wastewater</p>	-

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PART OF ENVIRONMENT	IMPACTS	ENVIRONMENTAL PROTECTION MEASURES	REMAINING IMPACTS
		treatment processes	
Accidents	<p>Ecological accident situations that may be expected are:</p> <ul style="list-style-type: none"> <li>- Technical fires in temporary facilities</li> <li>- Accident situations caused by collision, overthrowing of trucks and mechanization, etc. accident situations during material loading, unloading and transport of material</li> <li>- Accident situations during work with machinery</li> <li>- Accident situations due to inadvertent leakage of fuel when filling the transport vehicles and machinery, that is, due to inadvertent leakage of lubricating agents</li> <li>- Accident situations caused by force majeure (thunder strike, extremely adverse weather conditions, etc.), technical malfunction and/or human error.</li> </ul> <p>During use environmental impact is possible in the case of an earthquake or a negative impact on the environment due to other natural hazards (hail, storm or gale-force storm). During operation, the following accident situations are also possible: Crash of birds and airplanes, extraordinary pollution - accidents due to inadvertent leakage of fuel and lubricants from machinery and fire.</p>	<p>Products for neutralization of spilled hazardous substances to be ensured on the Airport location during the construction.</p> <p>Airline fuel tanks and diesel fuel must be placed in the bund of appropriate dimensions and their condition regularly monitored. All installations and equipment, and all parts of the system for monitoring, managing, measuring, prevent the development and spread of fires or explosions or other accidents and fire alarm and fire extinguishers must be installed and maintained in good working order, in accordance with regulations, standards and manufacturer's instructions. Diesel electric generators for electricity production (for work pumping station in case of power failure) with associated fuel tanks must be installed in a covered area, on an impermeable surface. Electrical appliances and fuel storage installations must be made in explosion-proof. Provide fire protection based on the revised Plan of fire protection for the project.</p>	
Light pollution	<p>In relation to the current state, this will be the impact of low intensity, especially if taking into account the Airport working hours from 5 a.m. to 11 p.m. in summer, that is, to 10 p.m. in winter. Ecologically acceptable or shadow lighting to be used as night lighting of landside objects and surfaces</p>	<p>Ecologically acceptable or shadow lighting to be used as night lighting of landside objects and surfaces</p>	-

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PART OF ENVIRONMENT	IMPACTS	ENVIRONMENTAL PROTECTION MEASURES	REMAINING IMPACTS
Potential trans boundary impacts	On the north and northeast side, Konavle Municipality is bordering Bosnia and Herzegovina, while on the east and southeast side, it is bordering Montenegro. According to flight altitudes of aircraft arriving to and departing from Dubrovnik Airport when entering the aerospace of Montenegro and Bosnia and Herzegovina, it may be concluded that there will be no impact on the population and protected areas of nature made through increased noise level or air emissions.		

**D.2. PROPOSAL FOR ENVIRONMENTAL PERFORMANCE MONITORING PROGRAMME WITH IMPLEMENTATION PLAN**

All the results of the environmental performance monitoring should be stored and made available to the public. The environmental performance monitoring results should be submitted to the authorised institutions and the local community.

Monitoring parameter	Monitoring location	Monitoring time
Air quality monitoring program	On the exposed parts of the Močići and Čilipi settlements.	<p>Before the reconstruction and expansion of the DBV and during use ensure that the relevant meteorological parameters (mandatory air temperature, wind direction and speed) will be continuously measured and hourly concentration values of:</p> <p>Prije rekonstrukcije i proširenja zračne luke te tijekom korištenja osigurati mjerenje relevantnih meteoroloških parametara (obavezno temperature zraka, smjera i brzine vjetra) kontinuirano mjeriti i satne vrijednosti koncentracija:</p> <ul style="list-style-type: none"> <li>- Nitrogen oxides - NO<sub>x</sub> (NO<sub>2</sub>, NO)</li> <li>- Sulfur dioxide - SO<sub>x</sub></li> <li>- benzene</li> <li>- Suspended particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>)</li> <li>- Ozone (O<sub>3</sub>)</li> </ul> <p>Original and verified data on air monitoring and report on pollution levels and assessment of air quality for the individual measuring points deliver the relevant departments in accordance with a special regulation.</p>

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Monitoring parameter	Monitoring location	Monitoring time
Noise monitoring program	<p>Emission control points:</p> <ul style="list-style-type: none"> <li>- Measuring location 1 – in direction of threshold 12</li> <li>- Measuring location 2 - in direction of threshold 30</li> <li>- Measuring location 3 – on location of Močići settlement</li> <li>- Measuring location 4 – on location of Cavtat (Mećajac or Zvekovica) settlement</li> </ul>	<p>Conduct continuous noise monitoring on the emission control points. Noise measurement results to be used to analyze the prepared noise maps and action plans. In case of exceeding the prescribed noise limit values, it is necessary to determine the reasons thereof. If the cause of the recorded exceeding of noise limit values is related to the work of Dubrovnik Airport, that is, to the air traffic, adequate measures should be taken to prevent the additional exceeding.</p>
Soil quality monitoring program	<p>In the area of valuable and particularly valuable arable land (P1 and P2) in Konavosko polje as well as other agricultural soil in the vicinity of the project, which is used for the production of plants for nutritional purposes (vineyards, olive groves, etc.). The exact position of the measuring points will be determined by the authorized company / institution</p>	<p>It is necessary to establish a permanent monitoring program for soil contamination due to the input parameters (increase in air and road transport, distance of P1 and P2 areas of the state road D8 and runway, the number of aircraft, fuel type, etc.) until reaching the end of planned period (2032). If the monitoring program shows exceeding the limit values, should take protective measures.</p>