

SOIL QUALITY MONITORING ACROSS THE WIDER DUBROVNIK AIRPORT AREA



CONTRACTING AUTHORITY: **DUBROVNIK AIRPORT Ltd.**

Zagreb, July 2015



Sveučilište u Zagrebu
Agronomski fakultet

University of Zagreb
Faculty of Agriculture



STUDY 1

SCOPE OF MEASUREMENT AND DETERMINATION OF LOCATIONS OF SOIL QUALITY MONITORING STATIONS ACROSS THE WIDER DUBROVNIK AIRPORT AREA

STUDY 2

INITIAL SOIL CONDITION ACROSS THE WIDER DUBROVNIK AIRPORT AREA

Authors:

Prof. Lepomir Čoga, PhD
Prof. Stjepan Husnjak, PhD

Contributors:

Sanja Slunjski, PhD - Ecology
Vesna Jurkić, MSc.Eng. Agron.
Ivo Pavlović, Bsc. Eng.Chem.

CLASS: 642-02/15-05/24

Reg. Number: 251-71-01-15-02

Department of Plant Nutrition
Head

/Signature Illegible/

(Prof. Milan Poljak, PhD)

Zagreb, July 2015

University of Zagreb

Faculty of Agriculture ①

DEPARTMENT OF PLANT NUTRITION
10000 ZAGREB, Svetošimunska 25

1919 · 2014
95
Years



Initial Soil Quality across the Wider Dubrovnik Airport Area

Lepomir Čoga¹, Stjepan Husnjak¹, Sanja Slunjski¹, Vesna Jurkić¹ and Ivo Pavlović¹

¹ University of Zagreb, Faculty of Agriculture, Department for Plant Nutrition, Svetošimunska cesta 25, Zagreb, Croatia (lcoga@agr.hr)

ABSTRACT

Study 2 ‘Initial Soil Condition across the Wider Dubrovnik Airport Area’ has been compiled at the request of the intervention holder, pursuant to the Decision of the Ministry of Environmental and Nature Protection (Class: UP/I 351-03/14-02/35; Ref. Number: 517-06-2-1-2-14-20) of 13th October 2014. This Study was preceded by Study 1 on the ‘Scope of Measurement and Determination of the Locations of Soil Quality Monitoring Stations across the Wider Dubrovnik Airport Area’ which contains the scope of measurement and a detailed description of the location of soil quality monitoring stations across the wider Dubrovnik Airport (Ordinance on the Methodology for Monitoring the Status of Agricultural Land (Official Gazette 43/14)).

The conducted studies aimed to determine initial soil condition across the wider Dubrovnik Airport area. This included the soil’s basic chemical properties (pH, E.C., % humus, % N, % P₂O₅ and % K₂O), the total heavy metal content (mg/kg Cd, Pb, Zn, Cu, Mn, Fe, As, Ni, Cr, Co, Mo, and Hg) and total PAHs and PCBs at selected measuring stations.

Considering the input parameters (increased air and road transport, the distance of agricultural land P1 and P2 from the D8 Motorway and the runway, the number of aircraft, fuel types...) and Airport’s projected capacity (3.98 million passengers by 2032), determination of the initial soil status serves the purposes of soil protection and monitoring the quality of valuable agricultural land in Konavosko polje as well as other agricultural land surrounding the intervention area.

To this end the initial soil quality was determined at a total of fourteen (14) monitoring stations (MS) located across six (6) locations on the valuable and extremely valuable agricultural land in Konavosko polje as well as on agricultural land on cadastral districts (CDs): CD Uskoplje, CD Močići, CD Čilipi, CD Komaji and CD Palje brdo. The monitoring stations were arranged in accordance with the Ordinance on the Methodology for Monitoring the Status of Agricultural Land (Official Gazette 43/14) so as to cover the entire area of the



intervention. The determining criteria used to choose these locations were: soil type, the area's climatic features (wind direction), the area's use (structure of production), plot size, altitude and distance of the station from Dubrovnik Airport (runway). Using this approach it is possible to distinguish the geogenic and anthropogenic impact from the potential impact of the Airport on soil pollution.

These results served to determine the initial level, type and potential source of soil pollution at the monitoring stations in accordance with the Ordinance on the Protection of Agricultural Land from Pollution (Official Gazette 09/14).

Identified quantities of total Ni and Cr at all measuring stations were significantly higher than the maximum allowable concentrations (MAC) stipulated by the Ordinance (Official Gazette 09/14), with higher amounts determined in colluvial, calcareous soils of the Quaternary age compared to the cultivated karst soils on red and brown soil on limestone, which indicates that the high Ni and Cr levels are largely the result of the parent substrate.

Unlike the Ni and Cr levels, the increased total amount of Cu in the soil was largely the result of anthropogenic influences, i.e. agricultural activities (Cu based protective agents).

Generally, the greater amounts of Cd and Zn were observed in cultivated karst soils, as opposed to the colluvial, calcareous soils of the Quaternary age where the maximum amount of plant available phosphorus was determined and was most influenced by road and air traffic.

A comparison with the MACs (Maximum Allowable Concentrations) showed that the total amounts of Pb, Co, As, Hg and Mo at all locations and measuring stations were lower than the MACs.

The determined values for total and individual concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) and individual concentrations of Poly-chlorinated Biphenyls (PCBs) are lower than the maximum allowed concentrations at all measuring stations (the MACs for total PAHs are 2.0 mg/kg and the MACs for total PCBs are <0.2 mg/kg), as defined by the Ordinance on Protection of Agricultural Land from Pollution (Official Gazette 09/14).

The question as to what extent and in what way the increase in road and air traffic will affect an increase in the amount of heavy metals and organic pollutants across the wider Dubrovnik Airport Area will be answered through annual reports on soil quality monitoring which will be carried out every year until Dubrovnik Airport reaches its ultimate capacity (3.98 million passengers by 2032).