IonCleanTech Environmental and Social Management Plan Draft Version 1.0

INTRODUCTION

This document presents the Environmental and Social Management Plan (ESMP) for the IonCleanTech project (Project no. 5661; titled "Elimination of respirable airborne particles, microplastics, microorganisms, and VOCs by ionization of indoor air and filtration systems: comprehensive investigation for reliable technological answers). The overall main objective of the planned IonCleanTech project is to utilize the potential of ozone-free ionization to deposit and neutralize air pollutants, nonbiological as well as biological, in the breathing zone in indoor spaces. In addition to contributions due to outdoor pollution sources, the presence of particulate matter (PM) as well as volatile organic compounds (VOCs) in indoor air is a sustained problem of public health in modern societies. Project tasks related to physical tests such as deposition of aerosols (mostly NaCl and cigarette smoke), microplastics, volatile organic compounds (VOC) on surfaces, and examination of filter properties during ionization, will be carried out at the Institute of Physics Belgrade (IPB). Also, IPB will prepare the physical part of biological experiments that will be carried out in MFUB and FVM, such as the environment of ionized air and aerosolized bioaerosols in a rotating chamber. The project tasks related to the Faculty of Medicine University of Belgrade (MFUB) involve the preparation of bacterial and fungal cultures and ionization treatment of these microorganisms, while the tasks performed at the Faculty of Veterinary Medicine University of Belgrade (FVM) include cell culture experiments with viruses followed by their treatment by ionization. All experiments concerning microorganisms will be performed in laboratory facilities with the appropriate biosafety level. This ESMP details mitigation, monitoring, and institutional measures to be taken during implementation of the IonCleanTech project to eliminate adverse environmental and social risks and impacts, offset them, or reduce them to acceptable levels.

PROJECT DESCRIPTION

In urban environments people spend most time indoors, making the indoor air quality of paramount importance to human health. Yet, there is a continual increase in its pollution from external sources, by diffusion, and internal, due to lower quality build, furnishing and human activities. Chronic exposures can lead to postponed severe health conditions. Air cleaning by HEPA filters depends on air changes per hour and considerably consumes electric energy due to low filter airflow. Air cleaning, when directed to act in the air breathing zone, and surface sterilization by ionization are highly effective. We will produce ozone-free air ionization by using carbon-fibre electrodes as sources of corona discharge. Corona discharge on carbon fibre electrodes does not belong to the category of ionizing radiation and also high voltage sources used for discharge (below 4 kV) are not subject to the obligation to Register and record sources of ionizing radiation. During the air ionization, pollutants will be influenced by: a) electrostatic deposition on surfaces, b) direct inactivation of bio-aerosols, c) oxidation, decomposition, deposition of volatile organic compounds (VOCs). Filtering efficiency of HVAC filters will be increased by ionization. We will optimize ion stream parameters and design innovative products for efficient directing and homogenous distribution of ions in the breathing zone and/or on HVAC filters. Novelty is primarily in comprehensive implementation-focused analysis of ionization effects on airborne: a) biological pathogens (bacteria, viruses, fungi), b) particulate matter, e.g. microplastics, c) VOCs. The envisaged project will provide scientific insights and innovative products to efficiently remove or significantly decrease transmission of harmful airborne particles, consequently improving human health and positively influencing the economy and society. Optimized parameters for most efficient ion induced particle deposition and ion distribution in the breathing zone. Innovative products: product enabling ion stream delivery into the air breathing zone, portable table ionizers with radial air flow, incoming air HVAC filter ionizer to enhance filtering efficacy.

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The Project will be carried out in the Republic of Serbia, and is governed by Serbian law. The Constitution of the Republic of Serbia ("Official Gazette of RS", 98/2006, 115/2021) guarantees the right to work, free choice of occupation, availability of work positions under equal conditions, respect of person's dignity at work, safe and healthy working conditions, necessary protection at work, limited working hours, daily and weekly interval for rest, paid annual holiday, fair remuneration for work done and legal protection in case of termination of working relations. The Labour Law ("Official Gazette of RS" 24/05, 61/05, 54/09, 32/13, 75/14, 13/17) is the main legislation that guides labour practices in Serbia. Other relevant measures are covered in the Law on Environmental Protection ("Official Gazette of RS", 135/04, 36/09), Law on Waste Management ("Official Gazette of RS", 36/09, 88/10, 14/16, 95/18), Guidelines on Good Laboratory Practice ("Official Gazette of RS", 28/08), Rulebook on the procedure for inspecting and checking equipment for work and testing working environment conditions ("Official Gazette of RS" 94/06, 108/06,

114/14, 102/15), Law on Workplace Safety and Health ("Official Gazette of RS" 101/05, 91/15), Law on Fire Protection ("Official Gazette of RS" 111/09, and 20/15), Rulebook on Personal Protective Equipment (Official Gazette of RS" 23/20).

BASELINE DATA

The IonCleanTech project activities will be carried out at IPB, MFUB, and FVM that are public accredited research and education institutions (Accreditation Act numbers: 660-01-000015/69, 612-00-00139/2022-06, and 660-01-00002/36 respectively) with documented procedures for the protection of worker rights, worker safety, and environmental protection. Safety rules and regulations are publicly available at https://vet.bg.ac.rs/sr/dokumenta/zashtita-bezbednost-i-zdravlje-na-radu-i-u-radnoj-okolini, or as internal documents.

The research activities predicted by the project do not deviate from the regular working activities of the SROs, and as such are not expected to bear any substantial or high additional risks to worker health and safety or the environment. However, certain low risk actions have been identified, and the Mitigation and Monitoring tables given below outline how those risks will be managed during the course of the Project.

SENSITIVE RECEPTORS

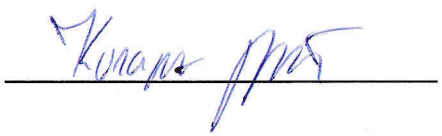
Sensitive receptors are not affected by the Project activities since there is no potential impact on public health and the environment.

POTENTIAL IMPACT AND IMPACT ASSESSMENT

Given the nature of the project activities, there will be no emissions of waste gases, noise, vibration, heat or radiation. The project will not generate any additional types of waste beyond what is generated by the daily activities of the SROs. Therefore, any solid waste generated by the project that needs to be disposed of by licensed disposal companies will be disposed of in accordance with SRO's existing procedures. Only very small quantities of solid waste will be generated and the safe disposal of this waste will also be adequately covered by the existing waste management procedures. There are no potential impacts on water and soil as all laboratory activities within the SROs are carried out in accordance with Good Laboratory Practice with appropriate waste management procedures. Potential health and safety impacts include possible laboratory accidents, equipment failures and fire hazards. However, the risk of these events is low as all SRO procedures including the Risk Assessment Act are in place and comply with relevant legislation. Corona discharge on carbon fibre electrodes is a low power electric discharge at atmospheric pressure which does not belong to the category of ionizing radiation and also high voltage sources used for discharge (below 4 kV) are not subject to the obligation to Register and record sources of ionizing radiation ("Official Gazette of RS", 25/2011 i 50/2018). Project activities do not include human subjects in the research.

PROJECT IDENTIFICATION: IonCleanTech, Project no. 5661

Draft Version 1.0 of ESP prepared by dr Predrag Kolarž, Principal Investigator of the IonCleanTech project, in Belgrade, 18.04.2023.



I MITIGATION PLAN

Phase	Issue	Mitigating Measure	Cost of Mitigation (If Substantial)	Responsibility*	Supervision observation and comments (to be filled out during supervision)
Project Preparation	The Project Preparation does not include any additional environmental or social risks	N/A	N/A	N/A	
Project Execution / operate	General conditions - Health and Safety	- According to "Official Gazette of RS" 101/05, 91/15, the **Risk Assessment Act** is adopted in written form for all workplaces. As reported in the **Risk Assessment Act,** the Department for Microbiology where cell culture and virus experiments as well as bacteria and fungi experiments will be performed is stated as a low risk workplace. (IPB, MFUB, FVM) - The activities related to work with cells and viruses will be organized to prevent accidental situations, and reduce the possible negative impact on employees and the environment, all in accordance with written instructions (**SOPs**) (FVM); The activities related to work with reference strains of bacteria and fungi will be organized to prevent accidental situations, and reduce possible negative impact on employees and the environment, all in accordance with written instructions (**SOPs**) (MFUB); - Work with cells and viruses will be coordinated and performed by participants trained for safe laboratory work. **Training certificates are available.** (FVM, MFUB) - All researchers are provided with equipment for personal protection at work (masks, gloves, protective glasses, etc.) as stated in the **Risk Assessment Act**, and according to	N/A	IPB, MFUB, FVM	

		the Rulebook on Personal Protective Equipment ("Official Gazette of RS", 23/20). The equipment is regularly and adequately used in accordance with written instructions (**SOPs**); (MFUB, FVM) - All measures related to fire protection, in accordance with the law, are implemented in all facilities. According to "Official Gazette of RS" 111/09, and 20/15 and the **Rulebook on Fire Safety**, firefighting equipment is available at location (also stated in the **Risk Assessment Act**) and firefighting training is performed for all employees. All participants in the Project are familiar with the "Instructions for action in case of fire", which is documented; (MFUB, FVM, IPB) - According to "Official Gazette of RS" 101/05, 91/15, 111/09, and 20/15, notification signs are placed in places that must be specially marked for safety reasons: "first aid", "evacuation direction", "exit" this is also stated in the **Risk Assessment Act** (MFUB, FVM, IPB) - According to "Official Gazette of RS" 101/05, 91/15, and 24/05 and the **Rulebook on Workplace Safety and Health Protection** and as stated in the **Risk Assessment Act** first aid kits are present in facilities where Project activities related to work with viruses and cells are performed. (MFUB, FVM) - According to "Official Gazette of RS" 101/05, 91/2015 and as stated in the **Rulebook on Workplace Safety and Health Protection** and **Risk Assessment Act** there is an employee responsible for the supervision of workplace health and safety and fire protection (MFUB, FVM, IPB) - According to the **Risk Assessment Act,** signs for safety and/or health, for the purpose of notifying and informing employees about potential risks are in place, and directions of movement and permitted places of detention, as well as measures to prevent or eliminate risks are visibly marked.(FVM, MFUB) - According to the "Official Gazette of RS" No. 94/06, 108/06, 114/14 and 102/15, the **Rulebook on Workplace Safety and Health Protection**, and the **Risk Assessment Act,** work equipment is inspected and tested			

		in the manner provided by technical regulations and manufacturer's instructions. Regular and extraordinary inspections are performed by a legal entity with a license to inspect and test work equipment. Records of work equipment inspection are kept. (MFUB, FVM) - Before the onset of Project activities, adequate warning signs will be placed, and unemployed persons will be prohibited from entering the laboratories.			
Project Execution / operate	Laboratory work	- The principles of Good Laboratory Practice ("Official Gazette of RS" No. 28/08) are respected in the laboratories where tests related to work with viruses, bacteria, and fungi are carried out. Standard operating procedures (**SOPs**) are in place for the planned activities. All Project participants are familiar with these documents that regulate laboratory work (**SOPs**); - As stated in the Project documentation, and **training documents** a satisfactory number of qualified participants working in appropriate premises of accredited SROs with devices, and material for correct performance of laboratory tests are provided; - The laboratories where Project tasks will be performed have adequate capacity, and the area where laboratory tests are performed is clearly defined and labeled with separate areas for different activities - The laboratories where Project tasks will be performed have adequate equipment for planned activities. Instructions for equipment use are available to Project participants in printed form and on the wall next to the equipment; A documented procedure is in place concerning the event of equipment failure, or mishandling; - In accordance with the Rulebook on the procedure for inspecting and checking work equipment ("Official Gazette of RS", No. 94/06, 108/06, 114/14 and 102/15) and as stated in the **Rulebook on Workplace Safety and Health Protection**, and the **Risk Assessment Act,** work equipment is inspected and tested by licensed companies which is recorded. - According to the Rulebook on personal protective equipment ("Official Gazette of RS", 23/20) personal	N/A	MFUB, FVM	

		protective equipment is available for all Project participants during laboratory work as stated in the **Risk Assessment Act**, The equipment is used in accordance with written instructions (**SOPs**) - Reagents and solutions are marked with data on identity, expiration date and special storage conditions. Purchased products are verified before use, labeled upon opening and appropriate records are made. The storage of reagents and consumables is performed according to the manufacturer's instructions, also defined within **SOPs**. - Chemical sanitizing agents for disinfection are used according to safety data sheets and in accordance with written instructions (**SOPs**) - Risks associated with laboratory activities are recognized and documented in the **Risk Assessment Act** and risk management measures are defined accordingly. - Waste handling and removal is done in a way that does not damage the integrity of the examination. Appropriate conditions for collection, storage and disposal of waste, as well as appropriate procedures for decontamination and transport, have been established at the institutional level as stated in the **Waste Management Plan** and **Risk Assessment Act**; - Waste generated in the laboratory during Project activities is disposed in special labeled autoclavable bags and autoclaved as stated in the **Waste Management Plan and SOP documents**. - The person responsible for waste management was appointed in accordance with the law ("Official Gazette of RS", 36/09, 88/10, 14/16, 95/18).			
Project Execution / operate	Work with gasses under pressure	- If pressurized gases are used in the laboratory, employees are familiar with important parameters (safe handling, pressure, maximum consumption capacity, flammability, toxicity, etc.) as stated in available safety data sheets. Only gases and quantities of gases that are needed are in the working space. - Institutions where Project activities will be performed have contracts with licensed suppliers of pressurized	N/A	MFUB, FVM, IPB	

		gasses who handle the transport, installation, and collection of pressurized gas cylinders. - The safety data sheets are available and working instructions for safe work with gases under pressure are in printed form and on the wall next to the equipment prepared for researchers/participants in the Project. - Pressurized gas cylinders are placed in laboratories in secure areas protected from falling and being exposed to sources of heat according to instructions obtained from the supplier. - Gas consumption is enabled only with a suitable pressure regulator, before connection the seal is checked by certified personnel of the supplier. - The bottle valve and pressure regulator are regularly maintained in good condition, so that they are not contaminated with fats and oils. The installation for gas consumption is manually controlled; and the bottle valve is closed when not in use; - Existing labels on cylinders are not removed and there is no label or it is not legible, such bottles are not used; - Damaged pressurized gas bottles are not used, as well as bottles with damaged labels, but are marked with the appropriate label and the supplier is notified for further collection; - The transport of cylinders with pressurized gases is carried out only with a closed valve and a protective cap, and so that the cylinder is secured against sliding and rolling and is performed by the supplier; - Procedures in case of fire were defined and all researchers/participants in the Project were informed about it. According to "Official Gazette of RS" 111/09, and 20/15 and the **Rulebook on Fire Safety**, firefighting equipment is available at location (also stated in the **Risk Assessment Act**) and firefighting training is performed for all employees. All participants in the Project are familiar with the "Instructions for action in case of fire", which is documented;			

Project Execution / operate	Waste management	- At SRO level, **Waste Management Plan** is drawn up in accordance with the Rulebook on Waste Management ("Official Gazette of RS", 36/09, 88/10, 14/16, 95/18) and all Project participants are familiar with the operational procedures for medical waste management. - The medical waste flow generated in the laboratories within the Project are defined and all employees are familiar with them. All instructions are written and accessible. - Researchers in the Project are familiar with protective measures (personal protective equipment) and the reaction plan in the event of an accident during medical waste management as stated in the **Waste Management Plan**; - There is a special medical waste treatment plant at FVM for the disposal and destruction of medical waste, as well as places for short-term waste disposal, according to the regulations of the Law on Environmental Protection ("Official Gazette of RS" 135/04, 36/09) and with the **Risk Assessment Act**. - All generated waste is separately collected, sorted, and classified in the prescribed manner, and temporarily stored in designated containers and marked in accordance with the Law on Waste Management of the RS ("Official Gazette of RS", 36/09, 88/10, 14/16, 95/18) and as stated in the **Waste Management Plan**; - As stated in the **Waste Management Plan** and **Risk Assessment Act**, conditions are ensured that waste is stored in a way that does not affect human health and the environment, and there is no mixing of different types of waste, as well as no mixing of waste with water; - The waste is handed over to the licensed organization that has permission to collect and transport waste and is contracted by the SRO for a specific type of waste in accordance with the Law ("Official Gazette of RS", 36/09, 88/10, 14/16, 95/18);	N/A	IPB, MFUB, FVM	

		- The person responsible for waste management was appointed in accordance with the law ("Official Gazette of RS", 36/09, 88/10, 14/16, 95/18).			

* Items indicated to be the responsibility of the contractor shall be specified in the bid documents

II MONITORING PLAN

Phase	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?	When is the parameter to be monitored-frequency of measurement or continuous?	Monitoring Cost What is the cost of equipment or contractor charges to perform monitoring?	Responsibility	Supervision observation and comments (to be filled out during supervision with reference to adequate measuring reports)
Project preparation	N/A	N/A	N/A	N/A	N/A	N/A	
Project Execution / Operate	Waste disposal	At each SRO	Inspection of documents	Periodically, when sufficient waste is collected	Covered by SRO overhead	Responsible persons for each WP	
Project Execution / Operate	Fire safety	At each SRO	Inspection of documents and facilities	Once, during Project activities	No additional cost	Responsible persons for each WP	
Project Execution / Operate	Protective equipment	At each SRO	Inspection at Project location - laboratories	Once, during Project activities	No additional cost	Responsible persons for each WP	
Project Execution / Operate	Prevention of accidents	At each SRO	Inspection of facilities and documents	Once, during Project activities	No additional cost	Responsible persons for each WP	

III. PUBLIC CONSULTATION DETAILS AND MINUTES OF MEETING FOR THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Public consultations well be held on the 26th April 2023. Details will be provided in separate document (IonCleanTech_ESMP_PublicConsultations.docx)

ESMP reviewed and approved by Environmental and Social Expert:

Date

Name

Title

Signature