

**SERBIA ACCELERATING INNOVATION AND GROWTH  
ENTREPRENEURSHIP (SAIGE) PROJECT**

**Program PRISMA**

**ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)**

**HIGH-THROUGHPUT FIELD PHENOTYPING IN TEMPERATE MAIZE HYBRID  
BREEDING: HOW CAN PHENOMICS IMPROVE SPEED AND ACCURACY OF  
SELECTION?**

**FINAL DOCUMENT**

Belgrade,  
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## ABBREVIATIONS AND ACRONIMS

CAD	Civil Aviation Directorate
DSM	Digital Surface Model
ESMF	Environmental and Social Management Framework
ESMP	Environmental Social Management Plan
ESS	Environmental and Social Standards
HTFP	High-throughput field phenotyping
MRIZP	Maize Research Institute Zemun Polje
OHS	Occupational Health and Safety
PI	Principal investigator
PIU	Project Implementation Unit
SAIGE	Serbia Accelerating Innovation and Growth Entrepreneurship
SF	Science Fund
SRO	Scientific Research Organisation
UAS	Unoccupied Aerial Systems
UAV	Unmanned Aerial Vehicle
WB	World Bank
RGB	Red-Green-Blue

## 1. Introduction

This draft Environmental and Social Management Plan (ESMP) has been prepared for the PRISMA Program, funded by the Science Fund of the Republic of Serbia. The goal of the PRISMA Program is to support research projects based on excellent ideas that in the future may have a significant impact on the development of science and research, as well as society at large, and clearly stated motivation for research within the framework of modern trends in the development of science in the relevant scientific fields.

The ESMP aims to identify negative environmental and social impacts during the implementation of the subject project, define the implementation of measures to mitigate and manage them aiming to meet requirements of the World Bank (WB) Environmental and Social Standards (ESS1 – ESS10) and Serbian national legislation.

This ESMP is a standalone management tool that details the set of mitigation, monitoring and institutional measures to be taken during the implementation of the research project HIGH-THROUGHPUT FIELD PHENOTYPING IN TEMPERATE MAIZE HYBRID BREEDING: HOW CAN PHENOMICS IMPROVE SPEED AND ACCURACY OF SELECTION? (PHENO\_MaizE in further text). Also, the purpose of the ESMP is to eliminate adverse environmental and social risks and impacts, offset them, or reduce them to acceptable levels highlighting the following:

- (1) identifies potential adverse and beneficial environmental and social impacts of the PHENO\_MaizE project as well as the extent of short- and long-term effects.
- (2) develops a set of mitigation and enhancement measures for potentially adverse and beneficial impacts and defines the roles and responsibilities of personnel in charge.
- (3) determines requirements for ensuring that those responses (i.e. mitigations and enhancements) are made effectively and in a timely manner as well as reported adequately;
- (4) describes the means for meeting those requirements in line with regulatory/legal basis.

## 2. Project Description

INSTITUTIONAL AND ADMINISTRATIVE PART	
Country	Serbia
Project	Serbia accelerating innovation and growth entrepreneurship (SAIGE) project
Sub-component	Science Fund of the Republic of Serbia
Program	Program PRISMA
Subprogram	Biotechnical Sciences
Project title	HIGH-THROUGHPUT FIELD PHENOTYPING IN TEMPERATE MAIZE HYBRID BREEDING: HOW CAN PHENOMICS IMPROVE SPEED AND ACCURACY OF SELECTION?
Acronym	PHENO_MaizE
Principal Investigator (PI)	Sofija Božinović
Participating Scientific and Research Organization (SRO)	Maize Research Institute Zemun Polje
Partner Research Organization on the project	N/A
Project duration	36 months
Number of researchers	6 /six/ (PI + 5 team members)

The overall objective of the PHENO\_MaizE project is to explore the use of high-throughput field phenotyping (HTFP), specifically, UAS (Unoccupied Aerial Systems - unoccupied aerial vehicles aka drones coupled with sensor) derived data, in temperate hybrid maize breeding program.

HTFP represents one of the most promising tools for data-based decisions in plant breeding, extensively studied by many research teams around the world, with new discoveries being published every day. During the Project, the team members will attend several training courses related to drone operating and drone data usage and management. While gaining more knowledge in the UAS specific technology and its relevance for plant breeding, team members will train more researchers from SRO in the use of UAS technology in plant breeding. PHENO\_MaizE is a one big step for the SRO to slowly build its capacities in UAS-based plant breeding research.

The activities envisaged include the following:

- (1) Training in UAS-based field imaging and establishment of an adequate field-mapping protocol
- (2) Field trial preparation, planting and management
- (3) Collection of UAS-derived RGB (Red-Green-Blue) images of selected maize breeding populations at multiple time points throughout the season
- (4) Extraction of image variables for each flight (time point) in each location and environment
- (5) Use of image variables to support decision-making in maize breeding
- (6) Acquire, share and exchange of new knowledge and skills to raise the team excellence and visibility of the institution

The PHENO\_MaizE project will perform phenotyping of 400 maize genotypes using RGB camera integrated with Unoccupied Aerial System(UAS-RGB) at multiple time points in two locations in Serbia - Zemun Polje and Školsko Dobro in 2024, and one location, Školsko Dobro, in 2025. Zemun Polje experimental field is 0.15 km from the settlement and 1.7 km from Danube (Figure 1), while Školsko Dobro experimental field is 1.7 km from the settlement and 5.4 km from Danube (Figure 2). Field imaging will be performed by three team members, and an appropriate drone, including the necessary equipment, will be purchased (budgeted). After buying, the drone will be insured and registered according to the Serbian laws, while three team members will obtain the licenses and get trained by licensed drone operators. The imaging will be performed in the agricultural land, property of the SRO, once a week on average from April to September (maize growing season in Serbia). After each flight images will be downloaded, processed, and accurately merged to obtain orthomosaic maps and DSMs. In each trial year, 25 to 30 digital orthomosaics will be obtained. Using open-source software, image-derived features will be extracted and used in predictions of important maize agronomic traits. Team members will also collect other important traits manually in all environments. Trials will be harvested and information on grain yield and grain moisture at harvest will be obtained. In the frame of the Project, imaging data, geospatial vector data, and numerical and descriptive data relevant to maize morphological and agronomic traits will be collected/generated, and a Data management plan will be provided to correctly store, and safely keep all the obtained data. No personal data will be collected. The results will be used only for research purposes.

## Environmental and Social Baseline Data

Both Zemun Polje and Školsko Dobro experimental sites are located in Zemun Polje settlement (Figures 1 and 2). Zemun Polje is an urban neighborhood of Belgrade, the capital of Serbia. It is located in the municipality of Zemun with a total land area of 29.91 square kilometers (0.03% of Serbia). Zemun Polje is located on both railway and highway Belgrade-Novı Sad, halfway between the western section of urban Zemun (Nova Galenika) and Batajnica. The nearest airports are Zemun Polje airport, „Nikola Tesla“ Belgrade airport and Batajnica airport, as shown in Figures 3 and 4. A significant structure in Zemun Polje is the Maize Research Institute „Zemun Polje“, a public scientific and research organization that encompasses three office buildings, agricultural land, a seed processing center and other crop production facilities.



**Figure 1.** The distance of Zemun Polje experimental field from the settlement and Danube River



**Figure 2.** The distance of Školsko Dobro experimental field from the settlement and Danube River



**Figure 3.** The distance of Zemun Polje experimental field from airports



**Figure 4.** The distance of Školsko Dobro experimental field from airports

### Population

The majority of agricultural production occurs in unpopulated areas. The portion of airspace above this land usually belongs to unmanned aircraft flight regions I and II. The first region is located above an “undeveloped and uninhabited area where there are no persons other than the person operating the unmanned aircraft”, while the second region is located above a “constructed or uninhabited area where there are buildings not intended for human habitation, with a possibility of retaining people for a short period of time”.

Close to 40,000 people live in Zemun Polje and surrounding local communities. As shown in Figures 1 and 2, the Zemun Polje experimental field is 0,15 km distant from the first house, while the Školsko Dobro experimental field is 1,7 km distant from the first house in Zemun Polje settlement. In Zemun

Polje experimental site, other people except the SRO employees can access the approach road to the Zemun Polje maize field trials since the road is not closed. The approach road to the field trials in Školsko Dobro location is monitored and secured by SRO and the gate is kept closed outside of working hours. Only employees can officially enter the Školsko Dobro location.

### Geology and soil

The geodiversity index of Zemun Polje obtained based on geological, geomorphological, pedological, and hydrological elements, is very low (<5). Although this area is less populated and with less variety of geodiversity, it is the most important agricultural area. According to the pedological study, soil in Zemun Polje experimental sites is carbon chernozem, with low alkaline reaction, characterized by medium total nitrogen content and humus, as well as high content of phosphorus and potassium.

### Climatic characteristics

Zemun Polje has a moderate continental climate, with four seasons. Autumn is longer than spring, with longer sunny and warm periods. Winter is not so severe, with an average of 21 days with temperatures below zero. January is the coldest month, with an average temperature of 0.1°C. Spring is short and rainy. Summer arrives abruptly. The average daily temperature is 18.2°C. The characteristic is Košava - the southeast-east wind, which brings clear and dry weather. The average annual rainfall is 669,5 mm, while during the growing season (April–September) precipitation is in total 391 mm. Based on the analysis of the extreme index, it was concluded that there was an increase in episodes with heavy precipitation on the territory of Serbia, although the changes in the total amount of precipitation were small. However, the most pronounced changes were observed in the warming trends, followed by the increase in extremely high temperatures and the prolongation of warm periods.

### Air quality

Based on the Air quality index (AQI) and concentration of pollutants (PM2.5, PM10, O3, NO2, SO2, and CO) Zemun Polje and its surroundings belong to the overall negative trend of low ambient air quality in Belgrade urban area. Increased concentrations of the above-listed pollutants, mainly PM2.5, PM10, as well as CO and NO2, could be expected. MRIZP is a stationary source of pollution at the Zemun Polje location, but the concentration of pollutants is being regularly monitored and has never exceeded maximum statutory value.

### Waste

The general state of waste management in Serbia is still mostly inadequate. Waste management at MRIZP is in line with current national laws and the best available techniques for reuse and recycling. The Institute has established adequate procedures for the disposal of all categories of hazardous and non-hazardous waste according to the Law on waste management. According to the requirements of this document, the generator sorts and classifies the waste created by the activity of the legal entity packs it in the prescribed manner and stores it until it is handed over to the person who carries out the collection, and/or to the person who transports the said waste, i.e. to the person who carries out its storage and/or treatment. The Law on Waste Management requires waste to be described in a way that allows safe handling and management of the subject with waste, as well as that any change of waste ownership must be accompanied by appropriate documentation that needs to include the waste index number.



### Water resources

The nearest surface water is the Danube river. The distance of the Zemun Polje experimental site from the Danube is 1.7 km, while the distance of Školsko Dobro experimental site is 5.4 km (Figures 1 and 2). MRIZP uses groundwater for crop watering when necessary, and accordingly, at the Zemun Polje experimental site, there are three watering wells, of which two have a total water flow of 40 l/s and one of 3 l/s.

### Flora and Fauna

The location has no special natural values since both experimental sites are located in agricultural land. The presence of rare plant and animal species, as well as particularly valuable plant communities, was not registered.

### Noise

The negative impact of noise is of a local nature, while MRIZP does not represent a significant noise generator, and therefore is not obligated to examine the noise level in the environment. There are no recorded complaints about the increased level of noise. The impact of ionizing radiation and radioactive contamination does not exist at the site.

### 3. Policy, legal and regulatory framework

Environmental legislation in Serbia has over 100 laws and regulations ([List of regulations](#)). Currently, the majority of these are harmonized with EU directives and other legislation. Key policies governing environmental protection in Serbia are contained in strategic documents such as the National Programme of Environmental Protection, the Waste Management Programme for 2022-31, the Water Management Strategy of the Territory of the Republic of Serbia Until 2034, and the National Strategy of Sustainable Development, as well as provincial and municipal plans and programs ([Environmental law 2022](#)).

The key regulatory authorities responsible for environmental policy and enforcement in Serbia are the Ministry of Environmental Protection (including its environmental inspection department) and the Agency for Environmental Protection. Provincial and municipal secretariats and inspections also play an important role in law enforcement within an autonomous province (ie, municipality).

Since the PHENO\_MaizE project will use UAS/drone for field imaging of 400 maize genotypes in two locations (Figures 3 and 4), it will be necessary to comply with the provisions of the Data Secrecy Law (Official Gazette of the RS, no. 104/2009) and the Law on Protection of Personal Data (Official Gazette of RS, No. 87/2018).

Despite their many potential uses, drones have raised concerns about privacy (spying on individuals) and safety (causing accidents). To address these concerns, Serbia's Civil Aviation Directorate (CAD) adopted the Regulation on Unmanned Aircraft ([Drone laws in Serbia](#)). CAD is responsible for drafting, amending, and supplementing those regulations in the Republic of Serbia.

The latest publication titled *Drone-Related Agrotechnologies for Precise Plant Protection in Western Balkans: Applications, Possibilities, and Legal Framework Limitations* ([Ivezić et al. 2023](#)) concisely summarizes legislation for drone usage in Serbia and other Western Balkan countries.

The laws and regulations that are binding on the Project PHENO\_MaizE are listed below.

- Air transport law ("Official Gazette of the RS", Nos. 73/2010, 57/2011, 93/2012, 45/2015 I 66/2015, 83/2018, 9/2020 and 62/2023)
- Regulation on unmanned aircraft ("Official Gazette of the RS", no. 1/2020)
- Law on environmental protection ("Official Gazette of the RS", No. 135/2004, 36/2009, 36/2009, 72/2009, 43/2011, 14/2016, 76/2018, 95 /2018 and 95/2018),
- Law on Waste Management ("Official Gazette of RS, No 36/09, 88/10, 14/16, 95/18)
- Law on Plant Protection Products ("Official Gazette of RS, No 41/09, 17/19)
- Law on Science and Research of the Republic of Serbia ("Official Gazette of RS", No. 49/2019),
- Law on Science ("Official Gazette of the RS ", br. 116/2007, 88/2009, 88/2009, 104/2009, 10/2015 and 36/2018),
- Law on Health and Safety at Work ("Official Gazette of RS, No 101/5, 91/15),
- Law on gender equality ("Official Gazette of RS", No. 52/2021)
- Law on Protection of Personal Data ("Official Gazette of RS ", No. 87/2018),
- The law on data confidentiality ("Official Gazette of RS", No. 104/2009),
- Law on free access to information of public significance ("Official Gazette of RS", no. 120/2004, 54/2007, 104/2009, 36/2010 and 105/2021),

- Regulation on the procedure for issuing permission for aerial photography of the territory of the FRY and for issuing cartographic and other publications: SRJ 54/1994-758, RS 72/2009-139 (other law).

#### 4. Overview and relevance of ESS for PHENO\_MaizE project

According to the Program PRISMA by the Science Fund of the Republic of Serbia and SAIGE Framework for Environmental and Social Management and the screening assessment, the project is classified as **Moderate**. Based on the project activities, the following applicable ESSs establish the standards that the PHENO\_MaizE project will meet through the project life cycle, as follows:

No. of ESS	Description	Relevance
1 	Assessment and Management of Environmental and Social Risks and Impacts	Relevant
2 	Labor and Working Conditions	Relevant
3 	Resource Efficiency and Pollution Prevention and Management	Not relevant
4 	Community Health and Safety	Relevant
5 	Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Not Relevant
6 	Biodiversity Conservation and Sustainable Management of Living Natural Resources	Not relevant
7 	Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Relevant
8 	Cultural Heritage	Not Relevant
9 	Financial Intermediaries	Not Relevant
10 	Stakeholder Engagement and Information Disclosure	Relevant

## 5. The potential risks and impacts assessment

### Potential impacts on the air quality

Agricultural land preparation in autumn and during spring and movement of agricultural vehicles and cars to and from the field trials may result in increased airborne particulates, thus affecting the air quality. No permanent air emission sources will be created by the project implementation. The impact is temporary, intermittent, and moderate, lasting during the field trial season.

### Potential impacts on water (water protection and drainage) and soil

Standard crop management will be applied in field trials (experimental area will be close to 0,8 ha in each location) including deep tillage in autumn and pre-sowing soil preparation during spring, as well as pre-emergence (Adengo, active matter isoxaflutole + thiencazuron-methyl + cyprosulfamide) and post-emergence herbicide application, if necessary (Laudis, active matter tembotrione + isoxadifen-ethyl; Callisto, active matter mesotrione; Motivel, active matter nikosulfuron). The impact is temporary, intermittent, and moderate, lasting during the field trial season. All the activities follow relevant Serbian laws, listed in SRO official online bulletin board, accessible by all employees, and supplemented with SRO internal plans and acts.

Deep tillage in autumn and pre-sowing soil preparation during spring, as well as pre-emergence are not financed from the project budget.

### Potential impacts of generated waste streams

Field trial activities come with waste, including empty bags and packs, seed bags, and other debris to be generated. Waste will be disposed of properly to avoid adverse impacts on the environment, during the project implementation. The impact is of local extent and temporal during the field trial season. Waste management and disposal procedure is regulated by relevant Serbian laws, listed in SRO official online bulletin board and accessible by all employees, and supplemented with SRO internal plans and procedures.

### Potential impacts on workers' health and safety

The project includes laboratory and field work. The laboratory work includes kernel husking, seed counting and packing, with no other potentially dangerous activity. Seeds will not be treated with any chemicals at this stage. In the field, workers will potentially be exposed to herbicides, dust, and different weather conditions. Additionally, there is an increased risk of accidents for the laborers due to lack of personal protective gear (use of Personal Protective Equipment such as hats, masks, and safety shoes). The risk of these hazards may affect workers' health and work productivity.

### Mitigation measures

Personnel working in the field are trained according to the nature of the specific activities that will be performed. Training courses are provided by the specifically appointed SRO person and are carried out according to the relevant Serbian laws and SRO internal procedures and rules. Records are kept of all training in accordance with Law.

### Potential accidents risk and public safety

There is the risk of accidents caused by drones. The drone accidents may include (1) collisions with objects such as trees, buildings, or other manned or unmanned aircraft, leading to crashes (both experimental sites are in the near vicinity of the airport); (2) loss of control - the operator can lose

control of the drone due to a malfunction, operator error, or signal interference, resulting in a crash; (3) human error - accidents can happen when the operator does not follow rules and regulations, such as flying too close to people or property or flying above the legal altitude limit. The drone is budgeted and will be bought at the beginning of the Project implementation.

#### Mitigation measures

Third-party liability insurance will be obtained. Three team members will obtain licenses for drone flying and imaging and will be trained by the licensed drone operator before the start of field imaging. Field trials in the PHENO\_MaizE project will be located 0.15 km (Zemun Polje) and 1.7 km (Školsko Dobro) from populated areas. The road network along the field trials does not serve as access and link for communities in the Project area since this land is exploited only by SRO. Entrance to the corn field trials and nurseries is restricted for all except the employees. Zemun Polje field trials are often being monitored by security during the season. Nevertheless, in both locations, concerns regarding privacy and safety are justified, and detailed mitigation measures have been provided in the Mitigation plan.

#### Potential socio-economic impacts

The PHENO\_MaizE project will have a major positive impact on the socioeconomic conditions through the creation of direct as well as indirect jobs. The expected increment in crop productivity and production using drone-based technology will increase income and thus improve beneficiaries' livelihoods.

## 6. Mitigation Plan

Phase	Issue	Mitigating Measure	Cost of Mitigation (If Substantial)	Responsibility	Supervision observation and comments (to be filled out during supervision)
Preparatory	<i>Ensuring that drones to be used for research are registered</i>	-public procurement -Project specific demand <a href="https://cad.gov.rs/upload/plovidbenost/2021/DCV-AIR-OB-U003%20-%20Zahtev%20za%20upis%20bespilotnih%20vazduhoplova%20u%20Evidenciju%20vazduhoplova.pdf">https://cad.gov.rs/upload/plovidbenost/2021/DCV-AIR-OB-U003%20-%20Zahtev%20za%20upis%20bespilotnih%20vazduhoplova%20u%20Evidenciju%20vazduhoplova.pdf</a>	budget item of the project	procurement department and project PI	SF/MRIZP
Preparatory	Ensuring safe operation of Drone	-public procurement -mandatory third-party insurance <a href="https://www.bpl.rs/2019/03/19/obavezno-osiguranje-bespilotnih-vazduhoplova-na-4-rate/">https://www.bpl.rs/2019/03/19/obavezno-osiguranje-bespilotnih-vazduhoplova-na-4-rate/</a>	budget item of the project	Project PI	SF/MRIZP
Preparatory	Drone: Licensing for the safe use of drones. Who can operate a drone?	-Drone operators will obtain license at CAD <a href="https://cad.gov.rs/upload/bespilotni/DCV-PEL-OB-001%20Izdanje%2003.pdf">https://cad.gov.rs/upload/bespilotni/DCV-PEL-OB-001%20Izdanje%2003.pdf</a>	budget item of the project	Project PI	SF/MRIZP
Preparatory	Drone: Training for drone flying. <i>Who needs to be trained for drone drive?</i>	Drone operators will be trained by licensed trainers before any field work and provide licenses on demand.	budget item of the project	Project PI	SF/MRIZP
Preparatory	Impact on the local populations (Field activities)	Before the start of the field work, documented information is prepared, which contains all the necessary measures that should be taken by the researcher/participant in the Project, so that the	/	Project PI	PIU/SF/MRIZP

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		impact on the local population is minimized (various notices, etc.);			
Preparatory	Accident's prevention	Prepared emergency response plans and communication protocols for informing the public in case of emergency situations.		Project PI	PIU/SF/MRIZP
Preparatory	OHS (Occupational Health and Safety) regulations for workers and researchers	Establishment and implementation of appropriate procedures related to OHS related to fieldwork		Project PI	PIU/SF/MRIZP
Execution	Laboratory work including Life and Fire Safety	Adherence to – <ul style="list-style-type: none"> <li>- Risk assessment act</li> <li>-Rulebook on use of laboratory equipment at the MRIZP</li> <li>-Rulebook on fire protection</li> <li>-Program for basic training and knowledge test of employees in fire protection area</li> <li>- All researchers in the Project are familiar with the Manual, that governs the work in the laboratory,</li> <li>- Control of environmental conditions (microclimate, chemical hazards, physical hazards, lighting, biological hazards) in the Laboratory,</li> <li>- Instructions for using the equipment available to researchers (the instructions are in printed form and available/highlighted on the wall next to the equipment).</li> <li>- Instructions for safe work, management of waste, chemicals, hazardous waste, etc. are available in laboratories.</li> <li>- All researchers in the Project are familiar with the "Instructions for action in case of fire".</li> </ul>	not substantial	SRO, Project PI	PIU/SF/MRIZP
Execution	Field work	-Appointed person for safety and protection at work at MRIZP -Act on risk assessment	not substantial	SRO, Project PI	PIU/SF/MRIZP

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		<ul style="list-style-type: none"> <li>-Rulebook on job organization and systematization at MRIZP</li> <li>-Rulebook on rights, obligations and responsibilities in area of safety and health at work</li> <li>-Training program on safety and protection at work</li> <li>- Training program for fire protection at work,</li> <li>–Everyone is familiar with the procedure/instructions that contain all recognized potential risks (accidental situations) for the work of researchers and workers in the field</li> </ul>			
Execution	Herbicide treatment during maize season	<ul style="list-style-type: none"> <li>-Study on ecological status of MRIZP</li> <li>-List of approved plant protection agents at the MRIZP</li> <li>-Safety data sheets for all plant protection agents in Serbian language accessible online and printed</li> <li>-Herbicides operation manuals</li> <li>-Waste management plan 2021-2024 at MRIZP</li> <li>-Form for Procedure on Waste management at MRIZP (P-4.11) (accessible online at MRIZP bulletin board)</li> <li>- Report – packaging in accordance with LAW</li> <li>-Report on waste examination/ categorization – pesticides in accordance with LAW (2023)</li> </ul>	not substantial	SRO, Project PI	PIU/SF/MRIZP
Execution	Capturing other employees/random people by accident via drone	<ul style="list-style-type: none"> <li>-Prepare flight schedule and share with other SRO employees that work in the field, but not directly involved in the Project</li> <li>-Hang printed flight schedules around the experimental field to warn people</li> <li>-Check the experimental site for any people nearby</li> <li>-Stop imaging if notice any other people except for the team members approaching</li> </ul>	not substantial	Project PI and team members	PIU/SF/MRIZP



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Execution	Communication with local community	<ul style="list-style-type: none"> <li>- Creation of flyers for information</li> <li>- Regular notification about the drone flight plan via flyers, two days before</li> <li>- Placing notices at the nearest local pub and shop</li> <li>- Possibility of a grievance - Contact details for complaints will be available on the flyer</li> </ul>	not substantial	Project PI and team members	PIU/SF/MRIZP
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## 7. 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)
Preparatory phase	Permits and training necessary for the drone operating in the designated locations	In the SRO	Through receiving and keeping all the permits, licences and specifications	Before the start of the drone imaging	not substantial	SRO and Project PI PIU/SF/MRIZP	
Preparatory phase	Instructions/training of technical staff regarding the field work safety and protection	In the SRO	Through documented information on provided	Before the start of the field work Periodically	not substantial	SRO and Project PI	PIU/SF/MRIZP

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			instructions/training				
Execution	Technical correctness of drone and camera	In the field	Preflight and post-flight drone checklist <a href="https://mydroneservices.com/wp-content/uploads/2023/04/combined-drone-preflight-checklist-and-drone-post-flight-checklist.pdf">https://mydroneservices.com/wp-content/uploads/2023/04/combined-drone-preflight-checklist-and-drone-post-flight-checklist.pdf</a>	Before the start of flight mission	not substantial	Project PI and team members	PIU/SF/MRIZP
Execution phase	Flying conditions (weather)	Experimental fields	Visually	Before each flight	not substantial	Project PI and team members	PIU/SF/MRIZP
Execution phase	Location inspection for random unknown people	Experimental fields	Visually	Before each flight	not substantial	Project PI and team members	PIU/SF/MRIZP
Execution phase	Provided healthy and safe equipment for field workers	SRO building/On site	visually	Before the start of field work	not substantial	Project PI and team members	PIU/SF/MRIZP
Execution phase	Proper waste collection and hazardous management (including herbicide packaging)	Experimental fields	Visually	During field trial management	not substantial	Project PI and team members	PIU/SF/MRIZP
Execution phase	Life and fire safety (LFS) procedures in laboratory	Laboratory of the institution implementing the project.	Visual inspections and checks of the documentation	Periodically during the implementation of the project	not substantial	Responsible person for LFS in SRO	PIU/SF/MRIZP

#### ESMP FOR PHENO\_MaizE PROJECT

The Mitigation and Monitoring Plans will be regularly reviewed and updated to adapt to changing project circumstances and feedback from stakeholders and regulatory authorities. The effectiveness of the mitigation measures should be assessed, and adjustments will be made as needed to ensure the project remains in compliance with environmental and social requirements and the Science Fund will be notified of all changes

## 8. Training and capacity building

A drone with an integrated camera will be bought at the beginning of the Project implementation. Also, in order to successfully exploit HTFP in plant breeding some background in spectral sensing, geopositioning, image processing, data management, and analytics is needed. Therefore, team members will learn how to fly a drone, and successfully perform crop imaging, including image data processing and exploitation. All this will help SRO to start implementing a new technology and approach in plant breeding research.

Specific trainings include:

1. **Training in drone operating and crop imaging.** This will provide team members with the necessary skills to correctly monitor crops, in accordance with all the regulations and safety and health measurements. The course will include safe and responsible drone operation, including flight planning, and equipment maintenance.
2. **Training in image processing.** Single field images that drone captures during a flying mission need to be merged into a georeferenced image of the flying area commonly known as orthomosaic or 3D representation of the area surface like 3D point-cloud or digital surface model (DSM). For this, team members will learn to work in special photogrammetry software.
3. **Training in image-derived data processing and analysis.** The project will gather a great number of different data types and researchers will learn how to analyze large data sets and use them in their plant breeding programs. External collaborator will provide courses on predictive model construction and machine learning techniques/methods.
4. **Training of technical staff.** Permanent and seasonal workers (if needed) will get specific training/instructions on field work safety measurements in accordance with the Project activities.

The use of HTFP in plant breeding is a relatively new field, but the benefits of its adoption in SRO research are recognized. SRO researchers and collaborators will improve the parameters of scientific excellence and their overall position in the scientific community. The Project will increase team competitiveness and make us a desirable partner for future collaborations on national and international levels. We will strengthen our long-standing partnership with external collaborator from the EU and enhance regional i.e. international cooperation. Also, by engaging two young researchers in the study, we have an opportunity to generate next-generation maize breeders with skills and knowledge to apply modern tools in their own future programs, thus further developing their careers and SRO positions.

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

#### PROJECT

#### HIGH-THROUGHPUT FIELD PHENOTYPING IN TEMPERATE MAIZE HYBRID BREEDING: HOW CAN PHENOMICS IMPROVE SPEED AND ACCURACY OF SELECTION? (PHENO\_Maize)

#### INTRODUCTION

This document serves as an annex to the Environmental and Social Management Plan, offering detailed insights into the Public Consultation aspect. The purpose of the Public Consultation was to present the primary environmental management issues associated with the project to relevant experts in the public domain. The objective was to gather additional perspectives from participants, aiming to incorporate specific suggestions and aspects into the plan that may arise during the discussions.

The Public Consultation was held **in person** at the premises of the Maize Research Institute Zemun Polje, Slobodana Bajića 1a, Zemun Polje, Belgrade and **online** via Microsoft Teams conferencing platform, and the key technical and content related aspects of the Public Consultation are presented below.

#### 1. Manner in which notification of the consultation was announced:

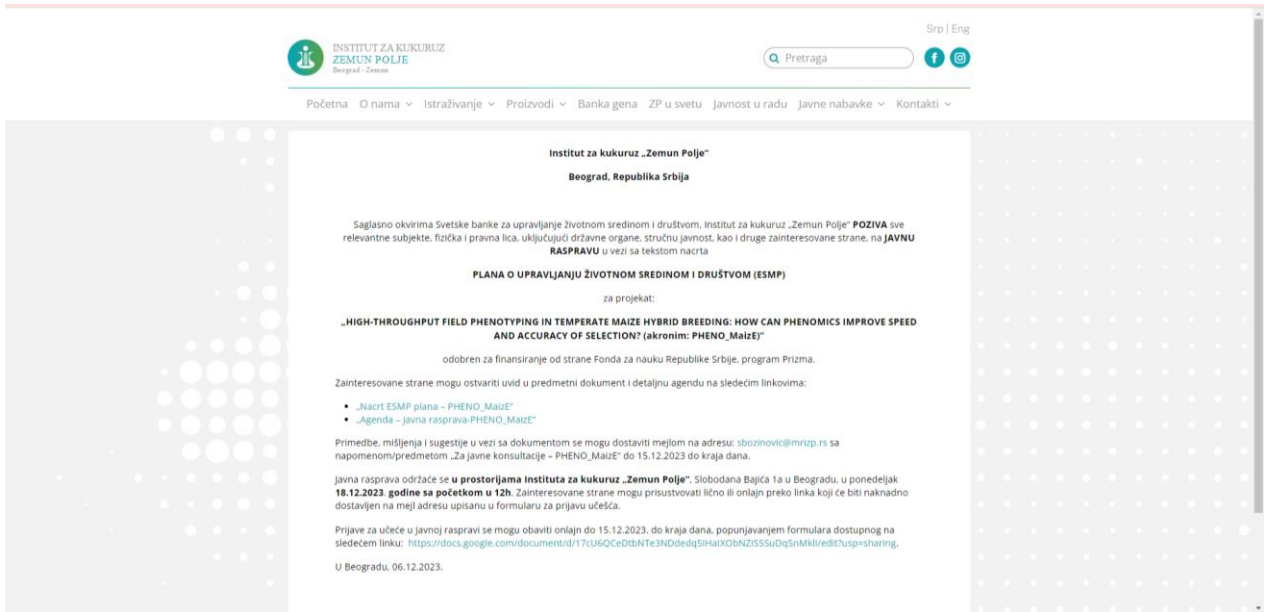
The consultation was announced to the selected audience via Maize Research Institute Zemun Polje official website (<https://mrizp.rs/o-nama/vesti/poziv-na-javnu-raspravu/>) and via e-mail invitations. The announcement was published 12 days before the public consultation.

#### 2. Date consultation was held

The consultation was held on December 18, 2023, starting at 12:00 PM local time.

#### 3. Location consultation was held

The consultation was held at the premises of the Maize Research Institute Zemun Polje, Slobodana Bajića 1a, Zemun Polje, Belgrade and via Microsoft Teams conferencing platform (<https://teams.live.com/meet/945246667781?p=3uWUUh6KJQ5USANmq>). Audio recording of the meeting is available upon request.



Picture 1: Announcement of public consultation on ESMP draft document, MRIZP web site



Picture 2. Public disclosure of ESMP draft document, MRIZP web site

#### 4. Who was specifically invited?

The invitation was made with the primary aim of aligning with the central objective of the consultation. This objective was to acquire supplementary insights for the Environmental and Social Management Plan (ESMP) from specialists and experts in the domains of agricultural and biotechnological sector, environmental protection, use of unmanned aircrafts in agriculture, as well as civil governing bodies. Therefore, it included the experts from the Ministry of Agriculture, Forestry and Water Management, Ministry of environmental protection, Zemun municipality office, Institute for medicinal plants research “Dr Josif Pančić”, Vojvodina Cluster of organic culture, University of Novi Sad - Biosense Institute and Maize Research Institute Zemun Polje.

The entire list of the invitees is as follows:

No.	Name and last name	Organization / occupation	Contact details
1	[REDACTED]	Association for unmanned systems in business/Agrodron team	[REDACTED]
2	[REDACTED]	Agrodron team	[REDACTED]
3	[REDACTED]	Ministry of Agriculture, Forestry and Water Management	[REDACTED]
4	[REDACTED]	Ministry of Environmental Protection	[REDACTED]
5	[REDACTED]	Zemun municipality	[REDACTED]
6	[REDACTED]	Vojvodina cluster of organic culture/Institute for medicinal plants research "Dr Josif Pančić"	[REDACTED]
7	[REDACTED]	University of Novi Sad - Biosense institute	[REDACTED]
8	[REDACTED]	University of Novi Sad - Biosense institute	[REDACTED]
9	[REDACTED]	University of Novi Sad - Biosense Institute/Maize Research Institute Zemun Polje	[REDACTED]
10	[REDACTED]	Deputy Director, Maize Research Institute Zemun Polje	[REDACTED]
11	[REDACTED]	R&D Sector Director, Maize Research Institute Zemun Polje	[REDACTED]
12	[REDACTED]	Plant Breeding Department leader, Maize Research Institute Zemun Polje	[REDACTED]
13	[REDACTED]	Research Department Leader, Maize Research Institute Zemun Polje	[REDACTED]
14	[REDACTED]	Project Management Department leader, Maize Research Institute Zemun Polje	[REDACTED]
15	[REDACTED]	Group for Agroecology and Crop Management leader, Maize Research Institute Zemun Polje	[REDACTED]
16	[REDACTED]	Quality management Department, Maize Research Institute Zemun Polje	[REDACTED]
17	[REDACTED]	Group for Molecular Genetics and Physiology, Maize Research Institute Zemun Polje	[REDACTED]
18	[REDACTED]	Group for Molecular Genetics and Physiology, Maize Research Institute Zemun Polje	[REDACTED]

19	██████████	Group for Phytopathology and Entomology, Maize Research Institute Zemun Polje	██████████
20	██████████	Human resources Department, Maize Research Institute Zemun Polje	██████████
21	██████████	Group for Plant Breeding, Maize Research Institute Zemun Polje	██████████
22	██████████	Group for Plant Breeding, Maize Research Institute Zemun Polje	██████████
23	██████████	Group for Plant Breeding, Maize Research Institute Zemun Polje	██████████
24	██████████	Group for Technology transfer, Maize Research Institute Zemun Polje	██████████
25	██████████	Group for Technology transfer, Maize Research Institute Zemun Polje	██████████

## 5. List of Attendees

The entire list of the attendees is presented in the table below:

No.	Name and last name	Organization / occupation	Contact details
1	██████████	Group for Plant Breeding, Maize Research Institute Zemun Polje/PHENO_Maize PI	██████████
2	██████████	Association for unmanned systems in business/Agrodron team	██████████
3	██████████	Agrodron team	██████████
4	██████████	Vojvodina cluster of organic culture/Institute for medicinal plants research "Dr Josif Pančić"	██████████
5	██████████	University of Novi Sad - Biosense institute	██████████
6	██████████	University of Novi Sad - Biosense institute	██████████
7	██████████	R&D Sector Director, Maize Research Institute Zemun Polje	██████████
8	██████████	Plant Breeding Department leader, Maize Research Institute Zemun Polje	██████████
9	██████████	Group for Agroecology and Crop Management leader, Maize Research Institute Zemun Polje	██████████
10	██████████	Quality management, Maize Research Institute Zemun Polje	██████████



ESMP FOR PHENO\_Maize PROJECT

11	██████████	Group for Phytopathology and Entomology, Maize Research Institute Zemun Polje	████████████████████
12	██████████	Group for Plant Breeding, Maize Research Institute Zemun Polje	████████████████████
13	██████████████████	Group for Plant Breeding, Maize Research Institute Zemun Polje	██████████████████
14	██████████	Group for Plant Breeding, Maize Research Institute Zemun Polje	██████████████████
15	██████████	Group for Technology transfer, Maize Research Institute Zemun Polje	██████████████████
16	██████████████████	Group for Plant Breeding, Maize Research Institute Zemun Polje	████████████████████
17	██████████████████	Group for Technology transfer, Maize Research Institute Zemun Polje/Zemun Polje resident	██████████████████

Јавне консултације: План за управљање заштитом животне средине и друштвом		Датум и место: 18.12.2023. Институт за кукуруз „Земун Поље“ и онлајн			
Пројекат: „High-throughput field phenotyping in temperate maize hybrid breeding: how can phenomics improve speed and accuracy of selection?“		Носилац пројекта: Институт за кукуруз „Земун Поље“			
Р.бр.	Име и презиме	Организација	Телефон	е-маил адреса	Потпис
1	[REDACTED]	ИНСТИТУТ ЗА КУКУРУЗ	[REDACTED]	[REDACTED]	[REDACTED]
2	[REDACTED]	— II —	[REDACTED]	[REDACTED]	[REDACTED]
3	[REDACTED]	ИНСТИТУТ ЗА КУКУРУЗ	[REDACTED]	[REDACTED]	[REDACTED]
4	[REDACTED]	ИНСТИТУТ ЗА КУКУРУЗ	[REDACTED]	[REDACTED]	[REDACTED]
5	[REDACTED]	— II —	[REDACTED]	[REDACTED]	[REDACTED]
6	[REDACTED]	ИНСТИТУТ ЗА КУКУРУЗ	[REDACTED]	[REDACTED]	[REDACTED]
7	[REDACTED]	ИНСТИТУТ ЗА КУКУРУЗ	[REDACTED]	[REDACTED]	[REDACTED]
8	[REDACTED]	ИНСТИТУТ ЗА КУКУРУЗ	[REDACTED]	[REDACTED]	[REDACTED]
9	[REDACTED]	— II —	[REDACTED]	[REDACTED]	[REDACTED]
10	[REDACTED]	ИНСТИТУТ ЗА КУКУРУЗ	[REDACTED]	[REDACTED]	[REDACTED]
11	[REDACTED]	— II —	[REDACTED]	[REDACTED]	[REDACTED]
12					
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Picture 3. List of in person attendees at the public consultation

## 6. Meeting Agenda

The agenda of the meeting was attached to the official announcement on the website and the e-mail invitations together with the elements of the ESMP of the PHENO\_Maize project in order to provide participants with detailed information on the identified risks and the planned mitigation measures in advance. The content of the agenda was as follows:

### Agenda

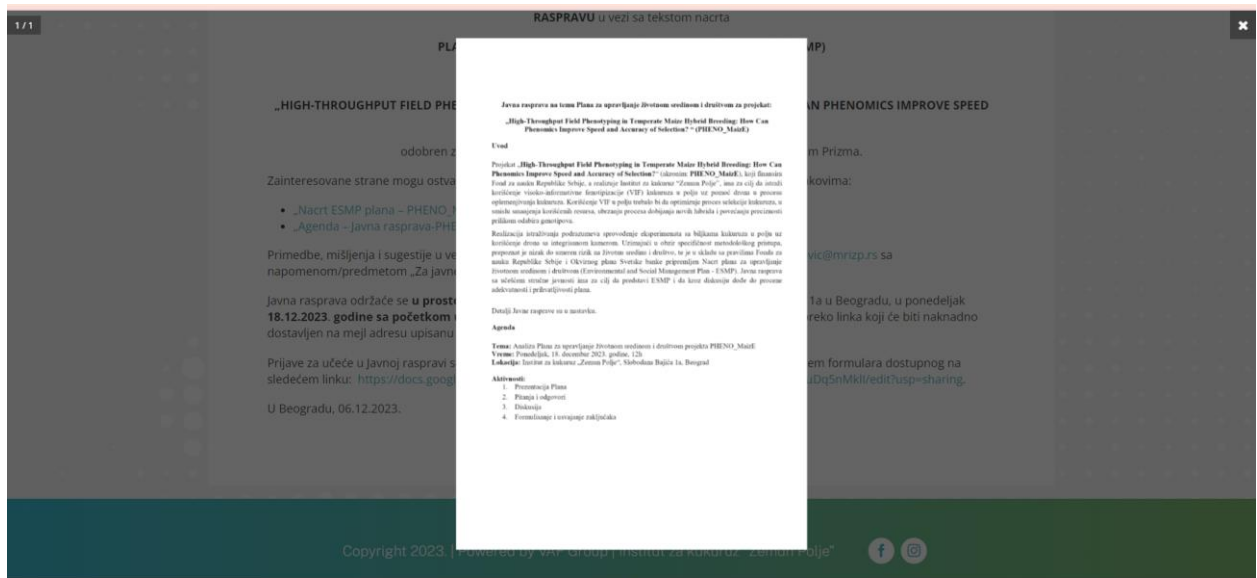
**Tema:** Analiza Plana za upravljanje životnom sredinom i društvom projekta PHENO\_Maize

**Vreme:** Ponedjeljak, 18. decembar 2023. godine, 12h

**Lokacija:** Institut za kukuruz „Zemun Polje“, Slobodana Bajića 1a, Beograd

### Aktivnosti:

1. Prezentacija Plana
2. Pitanja i odgovori
3. Diskusija
4. Formulisanje i usvajanje zaključaka



Picture 4. Public disclosure of ESMP public consultation agenda, MRIZP web site

The public consultation started according to schedule at 12:00 AM.

PHENO\_MaizE principal investigator presented the draft document to the interested attendees. Participants are informed about the purpose of the ESMP document after which relevant PHENO\_MaizE activities were described. Baseline data and potential risks and socio-environmental impacts during the project implementation were explained in more detail, as well as legal and administrative framework. A significant portion of the presentation was dedicated to discussing the Mitigation and Monitoring plans, addressing all the issues listed therein. Special emphasis was placed on the use of unmanned aircraft, highlighting that this technology would be introduced for the first time at the MRIZP. After the presentation, the opportunity was provided for questions and discussions from the interested parties.

## 7. Summary Meeting Minutes (Comments, Questions and Response by Presenters)

No questions were raised during the discussion, while several comments were made.

**Comment:** The plan comprehensively addressed all potential societal and environmental impacts that could occur during the project's implementation, as well as the measures to mitigate adverse effects. Commenter's opinion is that there is no need to add anything more to the plan.

**Response by presenter:** The presenter expressed gratitude in response to the comments and conveyed optimism that the plan has been sufficiently developed to address all challenges.

**Comment:** From commenter's point of view a significant job has been done in addressing all the issues regarding safe drone operation. Commenter highlighted specific challenges related to the proximity of the experimental site Školsko Dobro to the two airports (Zemun Polje and Nikola Tesla) and emphasized the necessity for special licenses. However, the commenter expressed belief that the comprehensive plan and the outlined steps will facilitate the execution of the project without encountering significant issues. Furthermore, commenter's

opinion is that PHENO\_MaizE will conduct very important and impactful research regarding the exploitation of remote sensing in agriculture.

**Response by presenter:** The presenter agreed with the commenter's assessment of the Školsko Dobro experimental site. The presenter acknowledged the complexity of the situation concerning location-specific drone-operating licenses but expressed confidence that, given the project's well-structured schedule, the necessary licenses would be obtained in a timely manner.

**Comment:** The Institute has already established and effectively implements procedures, internal regulations, and acts regarding all the activities during the Project implementation except the exploitation of unmanned aircraft in agriculture that will be used for the first time at the Institute.

**Response by presenter:** The presenter agreed on the comment.

#### **8. List of decisions reached, and any actions agreed upon with schedules and deadlines and responsibilities**

In accordance with the primary conclusion that the Environmental and Social Management Plan (ESMP) effectively identifies risks and challenges, along with outlining methods and activities for their mitigation, monitoring, and management, the decision has been made to proceed with the planned activities. The intention is to keep interested participants informed about the project dynamics and upcoming activities according to the ESMP. This communication will particularly emphasize any additional risks, potential improvements, and supplementary activities that may be identified.

During the public consultations, there were no environmentally or socially related issues raised that have not already been included in the ESMP. This reinforces the thoroughness of the plan in addressing potential concerns and demonstrates its effectiveness in capturing the key considerations related to the project.

The public discussion ended at 01:00 PM (local time).

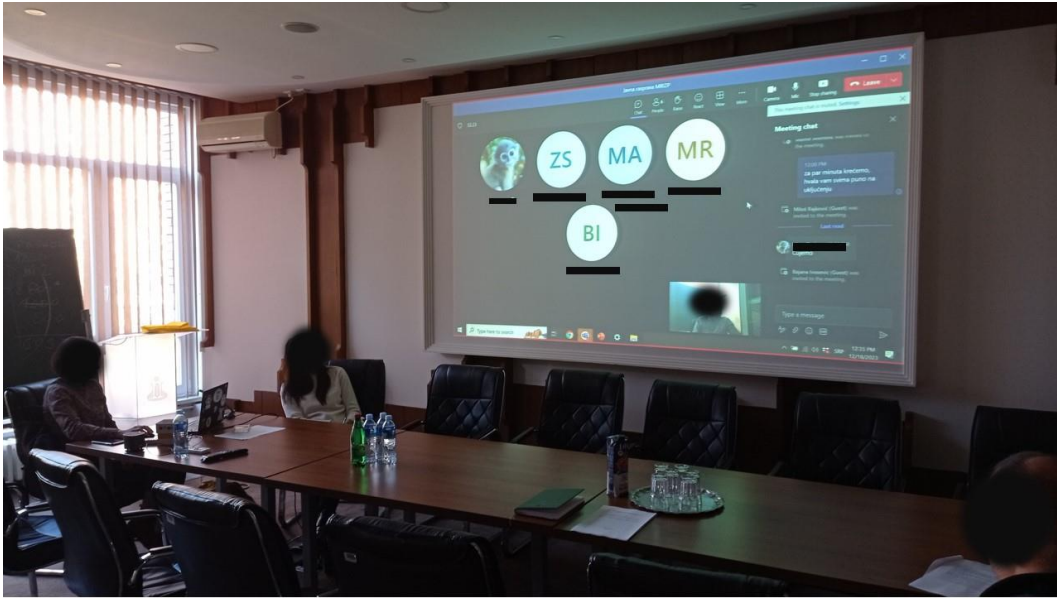
# ESMP FOR PHENO\_Maize PROJECT



Picture 5. Public consultation at MRIZP, 18 December 2023



Picture 6. Public consultation at MRIZP, 18 December 2023



Picture 7. Public consultation at MRIZP, 18 December 2023



Picture 8. Public consultation at MRIZP, 18 December 2023