SERBIA ACCELERATING INNOVATION AND GROWTH ENTREPRENEURSHIP (SAIGE) PROJECT

Program PRISMA

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

Genetic diversity maintenance and population dynamics in natural populations of endangered plant species:
Flower color polymorphism in *Iris pumila* L.
(IRIS)

DRAFT DOCUMENT

Belgrade,

19/10/2023

ABBREVIATIONS AND ACRONYMS

ESMF - Environmental and Social Management Framework

ESMP - Environmental and Social Management Plan

ESS – World Bank's Environmental and Social Standard

HPLC- High Performance Liquid Chromatography

IBISS – Institute for Biological Research "Siniša Stanković", National Institute of Republic of Serbia, University of Belgrade

SAIGE -Serbia Accelerating Innovation and Growth Entrepreneurship

SF- Science Fund

SRO – Scientific and Research Organization

PI – Principal Investigator

PIU- Project Implementation Unit

TM –Team Member

UAV – Unmanned Aerial Vehicle

UNESCO – The United Nations Educational, Scientific and Cultural Organization,

WP – Working Package

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EXECUTIVE SUMMARY

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 for the project entitled "Genetic diversity maintenance and population dynamics in natural populations of endangered plant species: Flower color polymorphism in *Iris pumila* L." (IRIS) was prepared in accordance with the Environmental and Social Management Framework (ESMF) for the SERBIA ACCELERATING INNOVATION AND GROWTH ENTREPRENEURSHIP (SAIGE) PROJECT. The development objective of the SAIGE project is enhancing Serbia's growth and competitiveness by improving (i) the relevance and quality of scientific research, and (ii) entrepreneurship innovation and growth finance accessibility. The objective of the Environmental and Social Management Plan is to highlight the negative environmental and social impacts during the implementation of the subject project, as well as the necessary mitigation measures. The key components of the Environmental and Social Management Plan are: Plan for the mitigation of adverse impacts on the environment and a Plan for monitoring the effects on the environment. The ESMP with mitigation and monitoring plans was prepared solely on the basis of the authors' knowledge of project activities, their experience of field and laboratory work, taking into account national legislation and regulations of Institute for Biological Research "Siniša Stanković", National Institute of Republic of Serbia, University of Belgrade – IBISS as participating Scientific and Research Organization (SRO).

LEGAL AND ADMINISTRATIVE FRAMEWORK

Relevant framework and standard

The activities under the IRIS project are clasified as a moderate risk project in terms of potential negative environmental and social impacts, and a low ethical risk project according to the World Bank's ESF Environmental and Social Framework). The ESMF document was used as a risk assessment tool. This draft ESMP document was applied to provide guidance for the implementation of the IRIS project, primarily to define environmental and social risks (if

any) and to identify how their impacts can be mitigated in accordance with national laws and regulations, the provisions of the environmental and social standards relevant to the project ES.

All activities under Project IRIS are subject to environmental, social and ethical impact assessments in accordance with the procedures described in the ESMF document that provides guidelines for the risk assessment of projects by the administrative unit of the SAIGE project. The ESMF document is available on the official website of the Science Fund of the Republic of Serbia, https://fondzanauku.gov.rs/vp-content/uploads/2023/03/_SAIGE-ESMF_Updated-March-2023.pdf

In accordance with the content of the ESMP, a detailed analysis of risks to the environment and social setting during project implementation has been prepared. Potential risks are identified, depending on the nature of the risk, along with appropriate measures to mitigate, minimize or avoid them. For each segment of activities during project implementation feildwork and laboratory activites and detailed explanation is provided in the risk mitigation and monitoring plans defined in the ESMP document.

In the ESMP, all relevant certificates, permits and regulations have been addressed in addition to a detailed description of the project activities within the basic components of the project, the environmental medium in which the project takes place, the field and laboratory working environment, the potential impacts on the quality of air, water, and soil, the all types of wastes, the potential impacts on the health and safety of the researchers and the social surrounding and the potential socioeconomic impacts.

Fieldwork in Special Nature Reserve

The Special Nature Reserve “Deliblato Sands” is the largest European continental sandy terrain is located in the south-east part of Serbia, in Banat, and one of the most important centers of biodiversity in Serbia and Europe. This Special Nature Reserve, represents a unique test-field for ecology and evolutionary research without or small anthropogenic activity. The moderate continental climate, absence of surface water courses and sandy soil resulted in unique ecosystems containing species of flora and fauna rare and significant according to international criteria. According to the World Heritage Convention of The United Nations Educational, Scientific and Cultural Organization (UNESCO), the Special Nature Reserve “Deliblato Sands” is on list tentative list (https://whc.unesco.org/en/tentativelists/1695/).

Therefore, work at this site requires all precautions and protection measures, first of all respecting the Law on environmental protection (“Official Gazette of the RS”, No. 135/2004,

36/2009, 36/2009 – other laws, 72/2009 – other laws, 43/2011 – US decision, 14/2016, 76/2018, 95 /2018 – other law and 95/2018 – other law), Rulebook on the internal order and security service of the "Deliblato Sands" Special Reserve 10/2016-109 ("Official Gazette of RS ", No. 10, 08. 02. 2016) and Rulebook on the proclamation and protection of strictly protected and protected wild species of plants, animals and mushrooms ("Official Gazette of RS", no. 5/2010, 47/2011, 32/2016 and 98/2016), while obtaining all the relevant permits necessary for the implementation of the Project IRIS, PRISMA Program.

The IRIS project activities will be carried out within the Special Nature Reserve "Deliblato Sands" with all required permits and the consent of the public company "Vojvodinašume" Forest Farm "Banat" (application for consent submitted, IBISS authenticated document No. 01-2361, 16.10.2023, file Attachment ESMP 7003 IRIS.pdf pages 26-27). The permit for project implementation for 2024-2026 and used drone in the Special Nature Reserve "Deliblato Sands" was obtained (No. 01-3014/2, 20.10.2023, file Attachment ESMP 7003 IRIS page 28). The work will also be carried out on the ground in accordance with the Rulebook on Internal Regulation and Guarding of the Special Nature Reserve "Deliblato Sands" ("Official Gazette of RS", No. 10/2016).

The area to be explored (Figure 1) covers an area of approximately 4.65 ha (44°57'59.66 "N and 21°2'20.98 "E; 44°57'57.07 "N and 21°2'15.67 "E; 44 °57'48.25 "N and 21°2'32.02 "E; 44°57'51.32 "N and 21°2'34.62 "E).

Figure 1. *The location of the Project IRIS field activities.*

The endangered plant species

The dwarf bearded iris *Iris pumila* L. (Iridaceae) is the endangered small monocot (Figure 2) that occurs in the lowlands of central and eastern Europe and in the protected area to Deliblato Sands in Serbia. These studies are an important basis for future research that could focus on integrative studies, studies of genetic variability maintenance and long-term population studies, as well as on analyses of environmental stress and studies that can lead to practical applications of evolutionary findings for biomonitoring and establish conservation strategies based mostly on long-term population studies. Every year we receive an annual permit from the Ministry of Environmental Protection of the Republic of Serbia for our work on *I. pumila* in Deliblato Sands, and so it will be in 2024, 2025 and 2026, when our work is planned under this project proposal. We possess the valid permit No. 353-01-214/2023-04 for the year 2023 from 09.03.2023 (Attachment ESMP 7003 IRIS.pdf, pages 17-23), issued by the Ministry of Environmental Protection of the Republic of Serbia, in which *I. pumila* in Deliblato Sands is explicitly mentioned, as in all previous years (for all years from 2011-until now). It can be issued upon request, as all other permits issued in previous years. An application has been submitted to the Ministry of Environmental Protection of the Republic of Serbia for the issuance of a permit for scientific research work in the framework of IRIS project activates on the endangered species *I. pumila* in 2024 (IBISS authenticated document No. 01-2102, 12.10.2023). According to Rulebook on the proclamation and protection of strictly protected and protected wild species of plants, animals and mushrooms ("Official Gazette of RS", no. 5/2010, 47/2011, 32/2016 and 98/2016), scientific research on endangered species is considered as the measure of its protection.

Figure 2. *Iris pumila flowers in nature*.

Unmanned Aerial Vehicle – Drone

An analysis of the rules and risk assessments for UAV (Unmanned Aerial Vehicle) use during activities in the Special Nature Reserve "Deliblato Sands" been presented. The activities of team members during research in the field have been defined and relevant permits for work in the nature reserve and work with protected species have been included in accordance with the Rulebook on Internal Regulation and Guarding of the Special Nature Reserve "Deliblato Sands" ("Official Gazette of RS", No. 10/2016).

The use of drones is in accordance with the Regulations for Unmanned Aerial Vehicles („Official Gazette of the RS", no. 1/2020) and the Law on Air Traffic („Official Gazette of the RS", no. 73/2010, 57/2011, 93 /2012, 45/2015 and 66/2015). The drone is used and legally operated by team members holding a license isued by the Directorate of Civil Aviation of the Republic of Serbia, the agency that is the national regulatory and supervisory authority of the Republic of Serbia in aviation (Attachment ESMP 7003 IRIS.pdf, pages 3-6). The drone was used in accordance with Article 5 of the Unmanned Aircraft Regulations („Official Gazette of RS", No. 1/2020).

The drone is registered in the Certificate of Records issued by the Directorate of Civil Aviation of the Republic of Serbia (No.license YU-D0602, 18.10.2023, file Attachment ESMP 7003 IRIS.pdf, page 1) and with the Third-party liability insurance policy (No. 160-00002134 6, 16.10.2023, file Attachment ESMP 7003 IRIS.pdf, page 2). A recording permit is not required because the flight area of the unmanned aircraft is the part of the airspace in which the unmanned aircraft flies over an undeveloped and uninhabited area in which there are no people other than the operator of the UAV (Area I) (Article 2, 6(1) of the Unmanned Aircraft Regulation „Official Gazette of RS", No. 1/2020).

The recording will be carried out in the Special Nature Reserve „Deliblato Sands" with the consents of the public company „Vojvodinašume" Forest Farm „Banat" (IBISS authenticated document No. 01-2361 16.10.2023, file Attachment ESMP 7003 IRIS.pdf page 25-26) and specifically for Project IRIS for in period of 2024-2026 (No. 01-3014/2, 20.10.2023, file Attachment ESMP 7003 IRIS page 28). The provisions of the Law on Confidentiality of Data („Official Gazette of RS", No. 104/2009) will be implemented during the activities under the Project IRIS and the Law on the Protection of Personal Data ('Official Gazette of the RS", No. 87/2018) will be observed, thus avoiding possible negative impacts on social/societal issues when using a drone for recording. The digital photographs taken by drone will be saved on the external disk drive and used in analyses in the framework on the IRIS project. The TM1

is responsible for storing and using digital records (IBISS authenticated document No. 01-2011, 06.10.2022). Taking photographs with UAV (drone) in fact reduces the impact on the environment because researchers spend less time and move much less in Protected Natural Reserves.

National Law and Regulations List

The implementation of the project IRIS will be in accordance with all relevant laws and regulations of the Republic of Serbia (laws, regulations, permits, consents, certificates and agreements) (some of them are publicly available, but some internal IBISS documents are available on request, other relevant documents are part of the attached file – Attachment ESMP 7003 IRIS.pdf). In this way, the project implementation will comply with the basic principles that ensure the protection of the environment is in accordance with national and international standards. In addition to laws and regulations, the ESMP includes detailed explanations of legal requirements for environmental protection, pollution prevention and control, and protection of human health and safety. The laws and regulations that are binding on the Project 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)

- Code of practice for fieldwork of IBISS (https://www.ibiss.bg.ac.rs/images/IBISS/Resursi/Pravila_terenskog_rada/Code_of_practice_for_fieldwork_of_IBISS.pdf),

- General and safety code of conduct and practice applied to laboratories at IBISS

(https://www.ibiss.bg.ac.rs/images/IBISS/Resursi/Pravila_rada_u_lab/General_and_safety_code_of_conduct_and_practice_applied_to_laboratories_at_IBISS.pdf),

-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 Nature Protection ("Official Gazette of RS", No. 36/2009, 88/2010, 91/2010, 14/2016, 95/18 and 71/21),

- Law on Science and Research of the Republic of Serbia (“Official Gazette of RS”, No. 49/2019),

-Law about national parks of the Republic of Serbia (“Official Gazette of RS”, No. 84/2015 and 95/2018),

- Law on Science ("Official Gazette of the RS ", br. 116/2007, 88/2009, 88/2009, 104/2009, 10/2015 and 36/2018),

The law on data confidentiality ("Official Gazette of RS", No. 104/2009),

- Law on Protection of Personal Data ("Official Gazette of RS ", No. 87/2018),

- Law of gender equality ("Official Gazette of RS", No. 52/2021)

-Rulebook on the proclamation and protection of strictly protected and protected wild species of plants, animals and mushrooms ("Official Gazette of RS", no. 5/2010, 47/2011, 32/2016 and 98/2016)

- Rulebook on the internal order and security service of the Deliblato Sands Special Reserve 10/2016-109 ("Official Gazette of RS ", No. 10, 08. 02. 2016),

- 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)

-Decree on the Deliblato Sands special nature reserve („Official Gazette of RS", No. 66/91, 83/92, 53/93, 67/93, 48/94, 44/95 and 53/95).

- The Law on Waste Management ("Official Gazette of RS" Nos. 36/2009, 88/2010, 14/2016, 95/2018 and 35/2023)
- The Law on Occupational Safety and Health, ("Official Gazette of RS" No. 35/2023)
- Labor Law, ("Official Gazette of RS", No. 24/2005, 61/2005, 54/2009, 32/2013, 75/2014, 13/2017, 113/2017 and 95/2018)
- Law on Health Insurance, ("Official Gazette of RS", No. 25/2'19)
- Law on the Prohibition of Discrimination, ("Official Gazette of RS", No. 22/2009 and 52/2021),
- Law on the Prevention of Harassment at the Workplace, ("Official Gazette of RS", No. 36/2010),
- Rulebook on Conduct of Employers and Employees in Relation to Prevention and Protection from Harassment at Work, ("Official Gazette of RS", No. 62/2010),
- Law on Protection of Whistle Blowers, ("Official Gazette of RS", No. 128/2014),
- Rulebook on personal protective equipment ("Official Gazette of RS", No. 23/2020),
- Rulebook on preventive measures for safe and healthy work at the workplace ("Official Gazette of RS", Nos. 21/2009 and 1/2019)
- Rulebook on preventive measures for safe and healthy work when exposed to chemical substances ("Official Gazette of RS", Nos. 106/2009, 117/2017, 107/2021),
- Rulebook on the provision of first aid, the type of means and equipment that must be provided at the workplace, the method and deadlines for training employees to provide first aid ("Official Gazette of RS", No.109/2016),
- Rulebook on the provision of signs for safety and health at work ("Official Gazette of RS", Nos. 95/2010 and 108/2017)
- Rulebook on preventive measures for safe and healthy work when using work equipment ("Official Gazette of RS", Nos. 23/2009, 123/2012, 102/2015, 101/2018 and 130/2021),
- Rulebook on the procedure for inspecting and checking work equipment and testing working environment conditions ("Official Gazette of RS", No. 15/2023),

- Rulebook on the manner and procedure of risk assessment at the workplace and in the working environment, ("Official• Gazette of RS", Nos. 72/2006, 84/2006, 30/2010 and 102/2015),
- Rulebook on the manner of storage, packaging and marking of hazardous waste ("Official Gazette of RS", Nos. 92/2010 and 77/2021),
- Rulebook on categories, testing and classification of waste ("Official Gazette of RS", No. 56/2010, 93/2019 and 39/2021),
- Rulebook on organizing fire protection according to the category of fire hazard ("Official Gazette of the RS", No. 6/2021),
- Law on Chemicals ("Official Gazette of RS", Nos. 36/2009, 88/2010, 92/2011, 93/2012 and 25/2015),
- Rulebook on how to keep records on chemicals ("Official Gazette of RS", No. 31/2011),
- Rulebook on the content of the safety data sheet ("Official Gazette of RS", No. 81/10),
- Rulebook on amendments to the Rulebook on classification, packaging, labelling and advertising of chemicals and specific• products by the Globally Harmonized System for Classification and Labeling ("Official Gazette of RS", Nos. 105/2013, 52/2017, 21/2019 and 40/2023),
- Law on Inspection Supervision ("Official Gazette of RS", Nos. 36/2015, 44/2018 and 95/2018).

Some of the regulations and decrees are kept in internal database regulations in IBISS. That includes the Gender equality plan (IBISS authenticated document, 2021), the Risk management plan (IBISS authenticated document, 2022). The medical waste removal agreement – IBISS authenticated document, 2018 and Waste collection agreement – IBISS authenticated document, 2022.

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	Natural sciences, NS Biological sciences, Evolutionary Biology
Project title	Genetic diversity maintenance and population dynamics in natural populations of endangered plant species: Flower color polymorphism in *Iris pumila* L.
Acronym	IRIS
Principal Investigator (PI)	Danijela Miljković
Contact email address	
Participating Scientific and Research Organization (SRO):	Institute for Biological Research "Siniša Stanković", National Institute of Republic of Serbia, University of Belgrade – IBISS The responsible person: Mirjana Mihailović
The duration of the project:	36 months
Number of researchers:	5 /five/ (PI + 4 researchers)

Project IRIS addresses one of the central problems in evolutionary and conservation biology – maintenance of genetic polymorphism – by jointly applying the set of state-of-the-art approaches on flower color polymorphism in natural populations of *I. pumila* L., endangered species inhabiting the Natural reserve of Deliblato Sands, Serbia.

Genetic polymorphism is crucial for evolution by natural selection, but mechanisms of its maintenance are the subject of considerable debate. Huge flower color polymorphism found in *I. pumila* populations makes it superb object for this type of research. It was already successfully used, but with many important limitations that will be eliminated by proposed innovative approach.

In this approach we will efficiently analyze huge new and existing data sets from several flowering seasons by using drone digital photographs, overcoming previous limitations of much smaller samples restricted to flowering peak. Variability in flower color will now be precisely accessed by reflectance spectroscopy in the field, removing previous subjectivity in visual identification that led to inconsistencies in defining color morphs. This will be followed by HPLC analysis of relevant pigments, providing insights into polymorphism biochemical basis. Microsatellite genetic analyses will immensely supplement previous utilization of flower color in identifying different genotypes in population, as the most cost-efficient method for this purpose.

Expected results will include precise multi-year identification and characterization of *I. pumila* genotypes and assessment of their spatial and temporal patterns in population. This will provide tools for cutting-edge insights into population dynamics and polymorphism maintenance.

Results will have impact on other evolutionary studies, on sustainable within-species biodiversity protection, and on monitoring environmental changes (including climate ones), giving textbook examples for much needed promotion of evolutionary biology.

Participating Scientific and Research organization (SRO) is Institute for Biological Research "Siniša Stanković", National Institute of Republic of Serbia, University of Belgrade – IBISS. The team of IRIS project are PI and four researches, all employed in SRO.

Project methodology and equipment

Population study (Equipment: DJI Mavic Pro Drone)

During the proposed research data collection will be considerably enhanced by the utilization of unmanned aerial vehicle – DJI Mavic Pro drone with Haselblad L1D-20c, a state-of-the-art aerial camera 1/2.3-inch CMOS sensor and a total pixel count of 12.71 M, capturing photos at 4000 x 3000 pixels (Figure 3). This will speed up data collection and leave enough time for simultaneous data collection for reflectance UV enhanced spectroscopy, as well as HPLC and microsatellite analyses. This approach to data collection was already tested and used in the 2021, 2022 and 2023 flowering seasons. Experimental plots are sited in uninhibited location of Deliblato Sands and drone is taking pictures during the daytime (between 8 AM and 3 PM) from attitude of no more than 25 meters above the experimental. The horizontal distance from the operator never exceeds 500 m.

Figure 3. *DJI Mavic Pro Drone flying over experimental plots.*

Reflectance UV enhanced spectroscopy (Equipment: JAZ UV/VIS Portable spectrometer)

JAZ UV/VIS Portable spectrometer with UV enhanced detector (200 -850 nm) with optical resolution of 1.3 nm, Premium reflectance probe and Pulsed-Xenon light source will be used in proposed research (Figure 4). Overcoming subjectivity (quantitative spectrum instead of subjective visual detection), insect vision (UV enhanced instead of human vision spectrum) and variability in light conditions (Xenon light source instead of variable environmental light conditions). Reflectance spectroscopy can be applied efficiently on *I. pumila* flowers under field conditions. UV enhanced reflectance spectroscopy overcomes problems with subjectivity of human vision and variability of environmental lighting. Variability detected on various levels enable extensive population studies with proper statistical analysis.

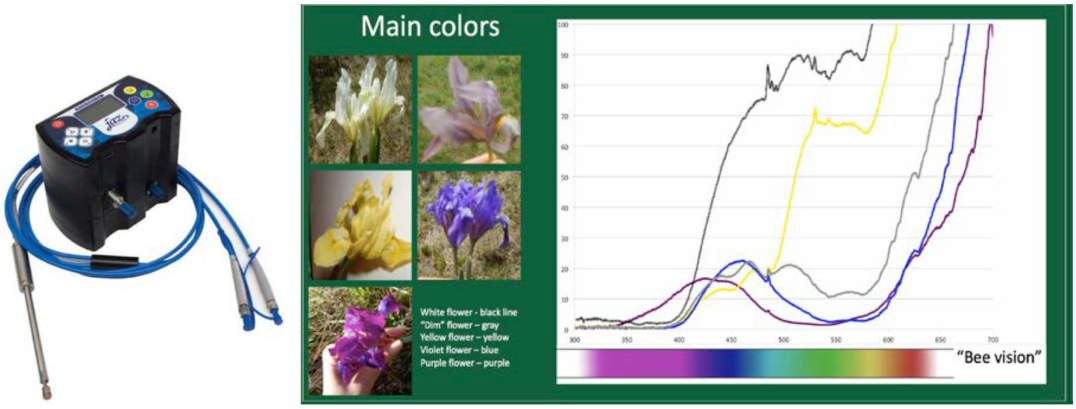

Figure 4. *On the left: JAZ portable UV enhanced spectrometer with probe. On the right: Specters of main colors of I. pumila flowers.*

High performance liquid chromatography (HPLC) of flower pigments (Equipment: HPLC Analysis System)

High performance liquid chromatography (HPLC) is a method suitable for detection of large biological molecules, and will be utilized for detection of various pigments in *I. pumila* (Figure 5). Three groups of pigments are responsible for coloration in plants: flavonoids anthocyanins and carotenoids, flavonoids and anthocyanins being the major contributors to flower color.

Figure 5. *HPLC system in IBISS*

Microsatellite analysis (Equipment: PCR, Sequenator)

Genetic identity of plants within populations will be assessed by microsatellite (SSR - simple sequence repeats) genotyping, as most cost-effective method for this purpose, allowing us to have largest possible suitable sample size under resource limitations. Since for this method primers must be developed for the species in question, after preliminary testing from larger sets of primers chosen on the basis of existing information on EST and EST-SSR marker resources for Iris we already detected five suitable loci (IM 93 FAM, IM 123 VIC, IM 196 VIC, IM200 NED and IM 348 PET) with appropriate level of variation. DNA amplification will be done in Institute for Biological Research "Siniša Stanković" (SRO) by PCR method with strict adherence to best laboratory practices given in IBISS Rulebook, while sequencing will be outsourced in accordance with the law on public procurement of the Republic of Serbia Planned by project budget.

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

The potential impacts and activities of the IRIS project on the environment and social surroundings are the generated waste and its disposal flows, the impact on the health and safety of researchers and the community, and socio-economic impacts. All types of waste are managed in accordance with the valid Waste Management Plan at the SRO level, which is in accordance with local legislation.

In the Project IRIS, which aims at evolutionary ecology research, there is no risk of negative impacts on the environment or society, such as loss of natural habitat, pollution, air, water, soil, involuntary resettlement and violation of human rights. Implementation of the project will not result in involuntary land acquisition, population resettlement or permanent land occupation, encroachment on private property, or impact on income. Activities will not negatively impact local, regional or national cultural heritage. In fact, there will be no negative impacts on the social surrounding, as the research will be solely for the study of genetic diversity and population dynamics in natural populations of endangered plant species in the protected uninhabited nature reserve "Deliblato Sands". Activities are performed in the Natural Reserve with all necessary permits from the Ministry of Environmental Protection, the public company "Vojvodinašume" Forest farm "Banat" as a supervisor of the Special Nature Reserve "Deliblato Sands".

Waste and disposal

Special permits are not required for the chemicals used. During the research, deuterated solvents and dual-purpose substances will not be used: precursors for narcotics, precursors for explosives, ozone pollutants and precursors for chemical weapons agents and for which a special permit is required. Adequate control measures are aligned with safety procedures related to working with chemicals.

The transportation and disposal of hazardous and potentially hazardous chemical waste, electronic waste and medical waste is carried out by licensed companies. Procedures in the SRO for transport and disposal of waste, including potentially hazardous waste, are harmonized in accordance with Serbian legislation. Hazardous and potentially hazardous chemical waste, electronic waste and medical waste are transported and disposed/managed by licensed companies. As part of activities in the laboratory work environment, all chemical wastes that would require special management are disposed of by disposal companies contracted by the

SRO (The medical and hazardous waste disposal agreement - IBISS certified document for 2018 and waste collection agreement - IBISS certified document for 2022. Other vegetative wastes are household wastes and do not require special handling and disposal. No waste will be generated during fieldwork activities during the implementation of the proposed project activities.

Health and safety of researchers

The members of the Project IRIS are familiar with the rules of work in the field and in the laboratory, which they confirmed by signing the statements (file Attachment ESMP 7003 IRIS pdf, pages 6-16). In the document Code of Practice for Fieldwork, from the Institute for Biological Research "Siniša Stanković" - National institute of the Republic of Serbia, University of Belgrade, detailed instructions are given in Annex 4, for actions to be taken in the event of hazards to the safety and health of team members. Detailed descriptions for each phase are provided in the Environmental Mitigation and Monitoring Plan for activities undertaken during project implementation.

Socio-economic impacts

The socio-economic benefits of the IRIS project are mainly focused on the scientific community. However, the positive impact on the scientific community as part of the social surrounding will lead to results that will contribute primarily to the advancement of evolutionary biology and popularization of science. Also, during the project implementation all human rights will be respected according to the regulations (according to the internal documents of SRO IBIS as Gender equality plan created according to the Law on Gender Equality (created according to the list of laws and regulations in IBISS authenticated document No. 01-2139, 13.12.2021) and Risk management plan ("Official Gazette"of RS" no. 52/21., IBISS authenticated document No. 01-2750, 30.12.2022).

CAPACITY ENHANCEMENT AND TRAINING

Every scientific project leads to some level of capacity enhancement in various fields, and it can also lead to capacity enhancement in fields of estimating, mitigating and monitoring environmental and social impacts of research.

Previous projects on the IDEA Program led by the Institute for Biological Research "Siniša Stanković", National Institute of Republic of Serbia, University of Belgrade (IBISS) already lead to improvement of significant parts of SRO regulations, including latest versions of the IBISS Code of Practice for Fieldwork and General and Safety Code of Conduct and Practice Applied to Laboratories.

It is expected that this project will significantly enhance the capacity of the Serbian research community in issues of estimating environmental and social impacts, mitigating measures and monitoring of using drones (and, to a lesser degree, of research in protected natural areas) on Fund of Science research projects and programs.

SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACT

During the preparation and implementation phase, of the scientific research project "Genetic diversity maintenance and population dynamics in natural populations of endangered plant species: Flower color polymorphism in *I. pumila* L." (IRIS) there are certain/potential environmental impacts listed below, together with the intensity of their actions.

Table 1. Review of the impact on the environment that predicted for the duration of the Project IRIS.

INFLUENCE	SIGNIFICANCE	COMMENT
Impacts on land use and settlements	Does not exist	During the realization of the project, there will be no expropriation of land
Ground and surface water	Does not exist	Impact is negligible
Air quality	Does not exist	Impact is negligible
Flora and fauna (protected areas and species)	Low	Under the terms of the Institute for Nature Conservation of Serbia and other conditions in attached.
Monuments	Does not exist	During the realization of the project, no impact on the cultural heritage
Noise	Does not exist	Impact is negligible
Soil management	Does not exist	Impact is negligible
Management of Waste	Low	Ensured in accordance with the existing waste management plan
Management of hazardous materials and chemicals, including hazardous waste	Low	Ensured in accordance with the existing waste management plan
Medical waste management	Does not exist	/
Working in the laboratory, includin Life and Fire Safety	Low	With the application of appropriate protective equipment and training of personnel, the impact is low. Adequate control measures are aligned with safety procedures related to working with chemicals.
Safe management of biohazards	Does not exist	/
Handling of gases under presure (H&S at work and prevention of accidents)	Does not exist	/

INFLUENCE	SIGNIFICANCE	COMMENT
Working in the field	Moderate	During the field work, members of the project team could be exposed to the bites of potentially infected ticks, or other pathogens or animals present in the environment. With the application of appropriate protective equipment and training of personal the impact is deceased.
Use of chemicals	Low	All researchers in the research laboratory are familiar with safety procedures related to working with chemicals and all Safety Data Sheets for Chemicals.
Health&Safety of the local populations (Field activities and drone recording)	Moderate	Ensured through the applied safe sampling procedures during recording.
Cumulative impacts	Moderate/Low	Members of the project team could be exposed to potentially accidental situations during field work.

ESMP Prepared by:

Belgrade, 19.10.2023.

Danijela Miljković, PhD,
Principal Investigator

Aleksej Tarasjev, PhD,
Team Member 1

MITIGATION PLAN

MITIGATION PLAN				
Issue	Mitigating measure	Cost of mitigation	Responsibility	Supervision
Project preparation phase				
General				
Possible grounds for Environmental and Social concerns	Identification of possible concerns as well as concerns from Checklist in Part B of the project proposal Table 1.2	No cost	PI	PIU/SF/IBISS
Field				
Work with protected species is in accordance with existing regulations	Applying for permit	No cost	PI	PIU/SF/Director of IBISS (SRO)
Work in Nature reserve is in accordance with existing regulations	Applying for permit	No cost	PI	PIU/SF/Director of IBISS (SRO)
All participants in field trips are aware of safety regulations and trained to carry out filed works in accordance with OHS measures	All participants get acquainted with IBISS *Code of Practice for Fieldwork* and sign statement	No cost	IBISS (SRO) Head of Department	PIU/SF/IBISS (SRO) Administrative and Legal Service
Drone				
Drone operated only by certified persons	Obtaining certificates from Directorate for Civil Aviation	IBISS (SRO)	TM 1 (leader of WP 1)	PIU/SF/IBISS
Drone registered as required under regulations	Registering Drone at Directorate for Civil Aviation	IBISS (SRO)	Appointed person in IBISS (SRO)	PIU/SF/Director of IBISS (SRO)

Issue	Mitigating measure	Cost of mitigation	Responsibility	Supervision
Protection of people/goods	Drone Insurance, Third-party liability insurance policy (No. 160-00002134 6, 16.10.2023, file Attachment ESMP 7003 IRIS page 2)	IBISS (SRO)	Appointed person in IBISS (SRO)	PIU/SF/IBISS (SRO) Financial Service
Drone maintained according to producer instructions	Appointing person responsible for drone	No cost	IBISS (SRO) Head of Department	PIU/SF/Director of IBISS (SRO)
Privacy protection	All persons that will be operating drone get familiar with regulations	No cost	PI	PIU/SF/Director of IBISS (SRO)
Laboratory				
Participants in lab familiar to good laboratory practice during work	All participants get acquainted with IBISSS *General and safety rules of conduct and work in the laboratories* and sign statement	No cost	IBISS Head of Department	PIU/SF/IBISS (SRO) Administrative and Legal Service
Participants in lab familiar proper chemicals storage	All participants get acquainted with IBISSS Rulebook and sign statement	No cost	IBISS Head of Department	PIU/SF/IBISS (SRO) Administrative and Legal Service
Participants in lab familiar with proper waste deposition	All participants get acquainted with IBISSS Rulebook and sign statement	No cost	Head of IBISS Technical Service (SRO)	PIU/SF/IBISS (SRO) Administrative and Legal Service
Participants adhere to fire protection regulations	All participants complete fire exhaustion drill, complete test and receive certificate	IBISS (SRO)	Head of IBISS Technical Service (SRO)	PIU/SF/IBISS (SRO) Administrative and Legal Service
Project execution phase (Field/Laboratory)				
Field				
Work with protected species in accordance with existing regulations	Applying for yearly permit each year of the project and strictly adhere to conditions given in it	No cost	TM1 and PI	PIU/SF/Director of IBISS (SRO)

Issue	Mitigating measure	Cost of mitigation	Responsibility	Supervision
Work in Nature reserve in accordance with existing regulations	Applying for yearly permit each year of the project and strictly adhere to conditions given in it	No cost	TM1 and PI	PIU/SF/Director of IBISS (SRO)
Risks on the field trip-Dehydration	Prevention and first aid measures from IBISS *Code of Practice for Fieldwork* Appendix 4	No cost	Participants in field trip	PIU/SF/Leader of field trip
Risks on the field trip-Sunburn	Prevention and first aid measures from IBISS *Code of Practice for Fieldwork* Appendix 4	No cost	Participants in field trip	PIU/SF/Leader of field trip
Risks on the field trip-Heat exhaustion or stroke	Prevention and first aid measures from IBISS *Code of Practice for Fieldwork* Appendix 4	No cost	Participants in field trip	PIU/SF/Leader of field trip
Risks on the field trip-Extreme weather conditions	Prevention and first aid measures from IBISS *Code of Practice for Fieldwork* Appendix 4	No cost	Participants in field trip	PIU/SF/Leader of field trip
Risks on the field trip-Traffic accidents	Prevention and first aid measures from IBISS *Code of Practice for Fieldwork* Appendix 4	No cost	Participants in field trip	PIU/SF/Leader of field trip
Risks on the field trip-Attacks	Prevention and first aid measures from IBISS *Code of Practice for Fieldwork* Appendix 4	No cost	Participants in field trip	PIU/SF/Leader of field trip
Risks on the field trip-Hunting	There is no hunting in locality where project will be implemented, and field trips are all to be performed outside regular hunting season. In addition, before entering Special Natural Reserve Deliblato Sands, current situation in that respect will be checked in communication with forestry officer in charge for that section of Deliblato Sands	No cost	Participants in field trip	PIU/SF/Leader of field trip

Issue	Mitigating measure	Cost of mitigation	Responsibility	Supervision
Drone				
Documentation for drone is in order	Checking the documentation before field trip	No cost	Drone operator	PIU/SF/Leader of field trip
Drone in operating condition	Proper drone maintenance according to producer instructions in Operation Manual	No cost	Appointed person in IBISS (SRO)	PIU/SF/Head of IBISS Technical Service (SRO)
Drone operating airspace is not currently dedicated	Checking Airspace Usage Plan (AUP) on Serbia and Montenegro Air Trafficking Services (SMATSA) website on day of field trip (Tables of usage are released on internet one working day prior to the date of operations, by 4 p.m. local time, at the latest)	No cost	TM 1 (leader of WP1)	PIU/SF/IBISS
Drone in operating condition in field	Checking the drone before field trip	No cost	Appointed person in IBISS (SRO)	PIU/SF/Head of IBISS Technical Service (SRO)
Flight safety - operators	Drone operated only by certified persons	No cost	Leader of field trip	PIU/SF/Appointed person in IBISS (SRO)
Flight safety - operation	Drone operated following requirements in documents of Directorate for Civil Aviation	No cost	Drone operator	PIU/SF/Leader of field trip
Laboratory				
Proper laboratory management	The laboratory has a defined laboratory management that has overall responsibility for the work of the laboratory (job descriptions and responsibilities of researchers, responsible person for work in the laboratory, etc.);	No cost	IBISS Head of Department	PIU/SF/Director of IBISS (SRO)

Issue	Mitigating measure	Cost of mitigation	Responsibility	Supervision
Researcher safety	All researchers/participants in the Project are provided with means and equipment for personal protection at work (gloves, masks and respirators, protective glasses, etc., depending on the type of activity), all in accordance with the Rulebook on personal protective equipment	IBISS (SRO)	IBISS Head of Department	PIU/SF/Director of IBISS
Proper handling of chemicals	The handling of chemicals and other dangerous agents is carried out in accordance with the instructions from the safety data sheets;	No cost	responsible person for work in the laboratory	PIU/SF/IBISS Head of Department
Managing equipment failure	There is a documented procedure for what to do in the event of equipment failure, overloading or mishandling, and records are kept about it;	No cost	responsible person for work in the laboratory	PIU/SF/IBISS Head of Department
Safe work in laboratory	The laboratory has a list of documented information related to work in the laboratory, which all researchers/participants in the Project are familiar with (instructions for safe work, management of waste, chemicals, hazardous waste, etc.) according to IBISS *Safety Code of Conduct and Practice Applied to Laboratories*	No cost	responsible person for work in the laboratory	PIU/SF/IBISS Head of Department
Laboratory risk management	IBISS *Act on risk assessment for all workplaces in the working environment*	No cost	Director of IBISS (SRO)	PIU/SF
Waste management	In the Institute there is a Catalog of waste generated with defined waste streams;	IBISS (SRO)	IBISS Technical Service (SRO)	PIU/SF/Director of IBISS (SRO)
Fire protection	Fire-fighting equipment in place, and Instructions for evacuation routes provided according to IBISS *Safety Code of Conduct and Practice Applied to Laboratories*	IBISS (SRO)	Head of IBISS Technical Service (SRO)	PIU/SF/Director of IBISS (SRO)

MONITORING PLAN

MONITORING PLAN					
What	Where	How	When	Who	Supervision
Preparatory phase					
Field					
Needed permits obtained	IBISS (SRO)	Check obtained permits	At start of project field trip season	IBISS (SRO) Head of Department	PIU/SF/Director of IBISS (SRO)
Drone					
Drone is registered	IBISS (SRO)	Check registration document	At start of project field trip season	PI	PIU/SF/IBISS (SRO) Administrative and Legal Service
Drone is insured	IBISS (SRO)	Check insurance policy	At start of project field trip season	PI	PIU/SF/IBISS (SRO) Financial Service
Potential drone operators obtained their certificates	IBISS (SRO)	Check certificates	At start of project field trip season	PI	PIU/SF/Appointed person in IBISS (SRO)
Laboratory					
Statements signed in accordance with IBISS rulebooks	IBISS (SRO)	Check signed statements	At project start	PI	PIU/SF/IBISS (SRO) Administrative and Legal Service
All participants have fire exhaustion certificates	IBISS (SRO)	Check certificates	At project start	PI	PIU/SF/IBISS (SRO) Administrative and Legal Service
What	Where	How	When	Who	Supervision
Project execution phase (Field/Laboratory)					
Field					

Vehicle in working condition	Service	Service	Before every field trip	Service contacted by IBISS (SRO)	PIU/SF/Representative of Technical Service of IBISS (SRO)
Vehicle documentation is in order	IBISS (SRO)	Checking documentation	Before every field trip	Driver	PIU/SF/Leader of field trip
All permits needed for field trip are in order	IBISS (SRO)	Checking documentation	Before every field trip	Leader of field trip	PIU/SF/IBISS (PI)
All safety materials are packed	IBISS (SRO)	Checking baggage	Before every field trip	Leader of field trip	PIU/SF/IBISS (PI)
Field work is done according with the permits	IBISS (SRO)	Informing officer in charge for environmental protection about plan of work in Natural reserve	Before every field trip	TM1	PIU/SF/IBISS (PI)
Adherence to permit conditions	Special Natural Reserve Deliblato Sands	Informing forestry officer in charge of given sector of Special Natural Reserve Deliblato Sands about location, type and exact time of start and end of work	On each entering to Deliblato Sands Natural Reserve	Leader of field trip	PIU/SF/Forestry officer in charge of given sector of Special Natural Reserve Deliblato Sands
Drone					
Appropriate drone condition	IBISS (SRO)	Checking drone condition	Before every field trip	Person in charge of the drone in IBISS (SRO)	PIU/SF/Representative of Technical Service of IBISS (SRO)
Drone operator is certified	IBISS (SRO)	Checking documentation	Before every field trip	Leader of field trip	PIU/SF/Person in charge of the drone in IBISS (SRO)
What	Where	How	When	Who	Supervision
Adherence to drone permit conditions	Special Natural	Informing forestry officer in charge of given sector of Special	On each entering to Special Natural	Leader of field trip	PIU/SF/Forestry officer in charge of given sector

	Reserve Deliblato Sands	Natural Reserve Deliblato Sands about location, type and exact time of start and end of flight	Reserve Deliblato Sands		of Special Natural Reserve Deliblato Sands
Environmental conditions are appropriate for flight	Special Natural Reserve Deliblato Sands	Checking weather forecasts and observing conditions on the spot	On every field trip	Drone operator	PIU/SF/IBISS (Leader of field trip)
Laboratory					
Work conducted according to good laboratory practice described in IBISS Rulebook	IBISS (SRO)	Inspection during work	Periodically	PI	PIU/SF/IBISS (SRO) Head of Department
Participants adhere to fire protection regulations	IBISS (SRO)	Inspection during work	Periodically	IBISS (SRO) Head of Department	PIU/SF/Representative of Technical Service of IBISS (SRO)
Life and fire safety (LFS) procedures in laboratory	IBISS (SRO)	Visual inspections and checks of the documentation	Periodically during the implementation of the project	Responsible person for LFS in IBISS (SRO)	PIU/SF/Representative of Technical Service of IBISS (SRO)
Waste is deposited in accordance with IBISS Rulebook	IBISS (SRO)	Inspection during work	Periodically	IBISS (SRO) Head of Department	PIU/SF/Representative of Technical Service of IBISS (SRO)