SERBIA ACCELERATING INNOVATION AND GROWTH ENTREPRENEURSHIP (SAIGE) PROJECT

Sub-component 1.1: Science Fund of the Republic of Serbia

Program PRISMA

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

ENVIRONMENTAL CATEGORY MODERATE

Reducing the negative impact of invasive crayfish Faxonius limosus in the Danube by smart exploitation of their meat and shells (DANUBEcare)

FINAL DOCUMENT

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ABBREVIATIONS AND ACRONYMS

PIU	Project Implementation Unit
ESMF	Environmental Social Management Framework
ESMP	Environmental Social Management Plan
WB	The World Bank Group
WMP	Waste Management Plan
FINS	Institute of Food Technology; University of Novi Sad, FINS
FINSLab	Laboratory for Food Technology, Quality and Safety - Institute of Food Technology
FONS	Faculty of Technology Novi Sad; University of Novi Sad;
SVINS	Scientific Veterinary Institute Novi Sad;
UNSFS	Faculty of Sciences; University of Novi Sad
SRO	Scientific Research Organization
PI	Principal Investigator
SAIGE	The Serbia Accelerating Innovation and Growth Entrepreneurship Project
SOP	Standard operating procedure
RS	Republic of Serbia
OSH	Occupational safety and health
WP	Work Package
PPE	Personal protective equipment

EXECUTIVE SUMMARY

The environmental and social checklist screening carried out during the evaluation of the project is consistent with the ESMF classification and ranked the project as of moderate risk.

The screening result shows that this project has *low risk* considering and covered by ethics (Ethical approvals obtained from both participating SROs, human volunteers will test the food from meat of the crayfish, no personal data will be collected) and *moderate* considering the environment and social risk.

The purpose of the Environmental and Social Management Plan is to highlight the negative environmental and social impacts and management problems during the preparation and implementation of the research project "Reducing the negative impact of invasive crayfish *Faxonius limosus* in the Danube by smart exploitation of their meat and shells (*DANUBEcare)".* The primary objective is to obtain relevant data to minimize its adverse influence on biodiversity while finding environmentally friendly solutions that could yield positive economic results through the creation and potential commercialization of innovative food and feed products by using crayfish meat and valorisation of shell which is in line with the concept of zero waste.

There are specific environmental risks related activities out of SROs (sampling of the spiny-cheek crayfish and sampling of surface river sediment and water) and work in participating SROs laboratories and facilities:

- working with chemicals,
- waste management
- working at the pilot plant for meat technology
- sampling of the spiny-cheek crayfish, and
- sampling of surface river sediment and water .

There are specific social risks associated with sampling of the spiny-cheek crayfish and sampling of surface river sediment and water - all raised concerns are addressed through mitigation measures.

The key components of the Environmental and Social Management Plan are: Plan for the mitigation of adverse impacts on the environment and Plan for monitoring the impact on the environment.

This ESMP is therefore prepared to set out specific mitigation, monitoring, and institutional measures to be taken during implementation to eliminate adverse environmental and social impacts, offset them or reduce them to acceptable levels.

LEGAL AND ADMINISTRATIVE FRAMEWORK

LEGAL FRAMEWORK

Relevant national legislation

Law on Environmental Protection ("Official Gazette of RS", no. 135/2004, 36/09 and 36/2009, 72/2009, 43/2011, 14/2016, 76/18 and 95/18) (LEP);

Regulation on ecological network ("Official Gazette of RS", No. 102/2010);

Regulation on protection regimes ("Official Gazette of RS", No. 31/2012);

Rulebook on the content and manner of keeping the register of protected natural assets ("Official Gazette of RS", No. 81/2010);

Rulebook on evaluation criteria and the procedure for categorizing protected areas ("Official Gazette of RS", No. 97/2015);

Decree on placing under control the use and circulation of wild flora and fauna ("Official Gazette of RS", Nos. 31/2005, 45/2005, 22/2007, 38/2008, 9/2009, 69/2011 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);

The Law on Environmental Impact Assessment, ("Official Gazette of RS" Nos. 135/2004 and 36/2009);

Regulation (EU) No 1143/2014 of the European parliament and of the council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species;

Regulation (EU) 2016/1141 of 13 July 2016 adopting a list of invasive alien species of Union concern pursuant to Regulation (EU) No 1143/2014 of the European Parliament and of the Council;

Regulation (EU) 2019/1262 of 25 July 2019 amending Implementing Regulation (EU) 2016/1141 to update the list of invasive alien species of Union concern;

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

The Law on Waste Management ("Official Gazette of RS" Nos. 36/2009, 88/2010, 14/2016 and 95/2018);

Serbian Rulebook on Waste Categories, Rulebook on the manner of storage, packaging and labelling of hazardous waste ("Official Gazette of RS", Nos. 92/2010 and 77/2021;

Waste Management Program of the Republic of Serbia for period 2022-2031;

Welfare Law (“Official Gazette of RS” No. 41/2009);

Regulation on welfare of animal intended for experimental purposes (''Official Gazette of RS'', No 39/10);

Rulebook on conditions for entry in the register of animal testing (''Official Gazette of RS'', No 39/10)

Law on Science and Research ("Official Gazette of RS", No. 49/19);

Law on Health Care ("Official Gazette of RS", No. 25/2019);

The Law on Occupational Safety and Health, ("Official Gazette of RS" No. 101/2005, 91/2015 and 113/2017);

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 Records in the Field of Safety and Health at Work ("Official Gazette of RS", No. 62/2007 and 102/2015);

Law on Safety and Health at Work (“Official Gazette of RS”, No. 35/2023);

Rulebook on preventive measures for safe and healthy work at the workplace ("Official Gazette of RS", Nos. 21/20109 and 1/2019);

Fire Safety Law ("Official Gazette of RS", No. 111/2009, 20/2015, 87/2018 and 87/2018);

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);

Law on chemicals ("Official Gazette of the RS" Nos 36/09, 88/10, 92/11, 93/12 and 25/15);

Instructions on determining preventive measures for safe storage, storage, or use of particularly dangerous chemicals ("Official Gazette of RS", Nos. 94/10 and 6/2017).

Low on water (Official Gazette of RS, 30/2010, 93/2012, 101/2016, 95/2018 and 95/2018)

DANUBE*care* project will also follow all institutional acts, rulebooks and procedures.

INSTITUTIONAL FRAMEWORK

FINS Institute of Food Technology, University of Novi Sad, Republic of Serbia

Health and safety

Drafted and adopted Act on risk assessment in written form for all workplaces in accordance with the Law of the Republic of Serbia; FINS, 2012

FINS: SRPS ISO/IEC 17025:2017, accreditation from 19.09.2023 (Provided as supplementary material); FINSLab-PR-18 (2020);

The workplaces of all researchers/participants in the project were systematized and a risk assessment was carried out for them according to internal acts.

All researchers are familiar with the first aid measures in the event of an accident involving gases, which are listed in the safety data sheets, Certified person for first aid. First aid kits are available in all departments within the accredited laboratories.

The complete work related to the Project will be carried out in a safe and disciplined manner, organized in such a way as to prevent accidents and accidental situations, and reduce the possible negative impact on employees and the environment, all in accordance with written instructions of SRPS ISO/IEC 17025:2017 for safe work. All researchers and participants in the Project are familiar with the current Evacuation Plan and the Protection and Rescue Plan and trained in handling fire extinguishers, hydrants and other devices used for extinguishing fires in accordance with:

- Fire Safety Law ("Official Gazette of RS", No. 111/2009, 20/2015, 87/2018 and 87/2018);
- Rulebook on Records in the Field of Safety and Health at Work ("Official Gazette of RS", No. 62/2007 and 102/2015).

All measures related to fire protection, in accordance with the law, must be implemented in all facilities where activities financed by the Project are carried out in accordance with the Fire Law ("Official Gazette of RS", 111/2009, 20/2015, 87/2018 and 87/2018) and there is documented information about it (rules, trainings, etc.): Internal SRO acts; Certified person for fire protection. All other researchers had training and test in May 2019.

Good laboratory practice

In the laboratory where, scientific research tests related to the Project are carried out, the principles of Good Laboratory Practice are respected.

FINS Laboratory is accredited in accordance with SRPS ISO/IEC 17025:2017, 2023.

The laboratory has a list of documented information related to work in the laboratory, with which all researchers/participants in the Project are familiar (instructions for safe work, management of waste, chemicals, hazardous waste, etc.).

Risks associated with laboratory activities are recognized and documented. Risk management measures are defined and documented, that is, the way in which the laboratory manages risks are defined.

Within the laboratory, a catalogue of waste generated is maintained, encompassing both hazardous and non-hazardous waste, and clearly outlining distinct waste streams. The laboratory has successfully addressed the management of packaging waste from chemicals and maintains detailed records of these procedures. The person responsible for waste management was appointed in accordance with the law. The handling of chemicals and other dangerous agents is carried out in accordance with the instructions from the safety data sheets:

FINS: Contracts with company for removing hazardous and non-hazardous waste, responsible person for waste management (environmental protection specialist (Provided as a supplementary material);

If pressurized gases are used in the laboratory, researchers are familiar with certain parameters such as pressure, maximum consumption capacity (flammability, toxicity, flammability limits, compatible). Only gases and quantities of gases that are really needed are in the working space.

FOTNS INSTITUTIONAL FRAMEWORK

Faculty of Technology Novi Sad, University of Novi Sad, Republic of Serbia

Health and safety

FOTNS: Act on risk assessment in accordance with the law of the RS, 2023;

FOTNS: Contract for the provision of services in the field of safety and health at work which includes the act on risk assessment, theoretical and practical training of employees, and the Rulebook on personal protective equipment.2023; FOTNS: Report on the performed inspection and check of work equipment 2023; FOTNS: Fire protection rules 2014; FOTNS: Internal act; FOTNS: Waste management and management and storage of chemicals, responsible person (contract 2022); FOTNS: Internal act; FOTNS: Internal acts, 2022, 2023; FOTNS: Person responsible for first aid, (contract 2023); FOTNS: Internal act; Certified person for fire protection, (certificate from 2023) (provided as a supplementary material).

Good laboratory practice

FOTNS: Internal act 2022.

The laboratory where scientific research tests are performed has a clearly defined legal entity with documented information that is legally responsible for all laboratory activities; FOTNS: Statement, provided as supplementary material);

FOTNS: SRPS ISO/IEC 17025:2017, accreditation 2021. (Provided as a supplementary material);

UNSFS INSTITUTIONAL FRAMEWORK

Faculty of Sciences, University of Novi Sad, Republic of Serbia

Health and safety

UNSFS: Rules on Occupational Safety and Health from 2007.

UNSFS: Regulation on preventive measures for safe and healthy work when using means and equipment for personal protection at work from 2012.

UNSFS: The person responsible for occupational safety and waste management

SVINS INSTITUTIONAL FRAMEWORK

Scientific Veterinary Institute "Novi Sad", Republic of Serbia

All project activities carried out in SVINS will be done in accordance with SRPS ISO 14001:2015. Research activities, specialist affairs in the field of veterinary medicine, laboratory test, quality control of agricultural and food products and their processed products, clinical tests of medicaments, analysis and super-analysis of the animal feed quality and laboratory tests in the field of infectious animal diseases diagnostics and hygienic safety of animal feed and raw materials for their nutrition

SVINS: The person responsible for waste management (contract)

SVINS: The person responsible for occupational safety (contract)

PROJECT DESCRIPTION

Project proposal title: Reducing the negative impact of invasive crayfish *Faxonius limosus* in the Danube by smart exploitation of their meat and shells

Project acronym: ***DANUBEcare***

Participating Scientific and Research Organizations (SROs) and their acronyms:

- Institute of Food Technology; University of Novi Sad, FINS
- Faculty of Technology Novi Sad; University of Novi Sad, FOTNS
- Faculty of Sciences; University of Novi Sad, UNSFS
- Scientific Veterinary Institute Novi Sad, SVINS

Principal Investigator (PI): Ivana Čabarkapa

Due to the rapid spread of the invasive crayfish species *F. limosus* and its detrimental effects on native crayfish like *Astacus astacus* and *Astacus leptodactylus*, it is imperative to take immediate action to prevent further dispersion of this invasive species. The DANUBEcare project is designed to address a current problem - the presence of *F. limosus* in the Danube, which negatively impacts biodiversity, and for which a systematic solution is still lacking. The primary objective is to obtain relevant data to minimize its adverse influence on biodiversity while finding environmentally friendly solutions that could yield positive economic results through the creation and potential

commercialization of innovative food and feed products by using crayfish meat and valorization of shell which is in line with the concept of zero waste (Figure below).

Activities proposed by the DANUBEcare project will comply with the 'do no significant harm' (DNSH) principle according to which the research and innovation activities will not support or perform activities that cause significant harm to any of the six environmental objectives embedded in the 'European Green Deal'. Reducing waste and the efficient use of resources are a key to UN Sustainability Development Goal 12, which focuses on responsible production and consumption.

Sampling of the spiny-cheek crayfish will be performed at the selected localities. A sampling of surface river sediment and water will be conducted in parallel with the sampling of the spiny-cheek crayfish.

Development, quality and safety analysis of new food and feed products with spiny-cheek crayfish meat together with sensory properties and consumer acceptability of novel food products will be conducted.

1) To develop new food (crayfish pate and marinated vacuum-packed crayfish meat) and feed (type of chicken cooked sausage, supplemented with spiny-cheek crayfish meat) products, experiments will be conducted at the Pilot plant for meat technology. Pilot plant for meat technology represents a small-scale plant for meat processing which is located within the Institute of Food Technology.

2) Determination of safety parameters, technological quality, nutritive value and sensory properties of spiny-cheek crayfish meat and finally developed new food and feed product will be conducted in the Laboratory for Food Technology, Quality and Safety (FINSLab) within the Institute of Food Technology accredited according to ISO/IEC 17025:2017 standard.

Adsorption experiments and separation of loaded biosorbents from water sample will be performed in the laboratories of FOTNS. Samples of water filtrates will be delivered to the laboratories of SVINS for further analyses. After the treatment of wastewater containing increased concentrations of heavy metal ions, loaded adsorbent will be treated with the chosen reagents and multiple reuses of treated adsorbent, through adsorption-desorption cycles, will be investigated.

Incineration of saturated biosorbents will be also conducted in laboratories of FOTNS. Ash obtained after incineration will be delivered to EDOS company for further experiments.

Ash and crayfish shells delivered to company of rubber production (support letter for project is a part of the project documentation) will be examined for its use as a filler in rubber production. Samples will be used as a rubber bio-filler by mixing it with caoutchouc, and rheological and mechanical measurement will be carried out to determine whether addition of shells and ash affects the vulcanization process and properties of the final product. There are no potential risks during these tests, no waste is produced during these tests.

Analyses related to efficiency assessment of adsorption will be performed by determination of heavy metals contents in water following the standard method and will be carried out in an accredited laboratory that operates within Scientific Veterinary Institute "Novi Sad" SVINS. The development of active chitosan-based biomaterial from crayfish shell waste will be carried out in the laboratory for packaging and packing accredited according to ISO/IEC 17025:2017 standard that operates within Faculty of Technology Novi Sad FOTNS.

ASSESMENT OF THE POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS OF SPECIFIC TASKS WITHIN THE PROJECT

Potential impact on sampling sites

The realization of this project will not directly impact air, water or soil quality in any way.

Sampling of the spiny-cheek crayfish

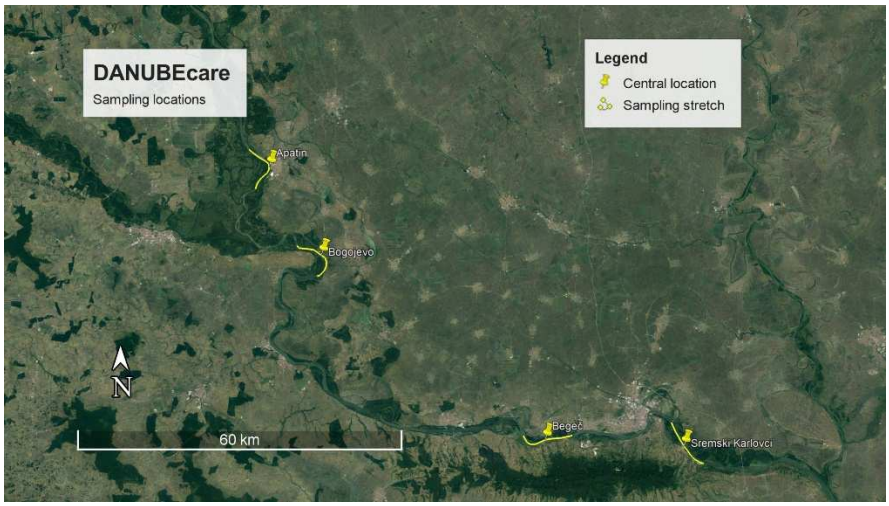
Sampling of the spiny-cheek crayfish will be performed at the selected localities (Apatin, Bogojevo, Begeč, Sremski Karlovci) at accessible places for sampling along the Danube coast. Urban area will be far away from the sampling sites.

Further research will be carried out in the "Laboratory for taxonomy and zoogeography of invertebrates" of the Faculty of Sciences (UNSFS).

Precise sampling site will be chosen based on initial screening of locations and probability of obtaining a viable sample. Sampling sites will be established in a stretch that is 5 km upstream and 5 km downstream of central location (figure below). The coordinates of the central locations from which the sampling stretch extends 5 km upstream and downstream are shown in Table below. A sampling of spiny-cheek crayfish will be done by registered fishermen under the supervision.

Sampling will be conducted in the spring/summer season (April, May, June, July, August, and September). Sampling will be conducted 12 times per locality (4), in total 48 times during the project. Concurrently with the sampling of the spiny-cheek crayfish, surface river sediment and water sampling will be performed quarterly. Sampling will be conducted eight times per locality (4), in total 32 times during the project. Sampling will start in project month 6 and finish in project month 27. According to Gant chart, WP 1 Distribution and sampling of spiny-cheek crayfish will start in project month 4 and finish in project month 32. The total duration of WP1 is 29 months. The rest of project months the project's engaged researchers will work on the report on the realized environmental study on spiny-cheek crayfish distribution and assessment of their impact on the native crayfish fauna (month 30), the study report on the influences of hydro-meteorological conditions and other environmental factors on the population's abundance of crayfish (month 32),

as well as dissemination activities like Info Day, Danube Day, and other outreach activities (month 36).



DANUBEcare sampling locations

Coordinates of central locations

Name of localities	Coordinates
Apatin	45°40'05.40"N 18°57'57.22"E
Bogojevo	45°31'22.10"N 19°05'25.39"E
Begeč	45°13'07.33"N 19°37'00.11"E
Sremski Karlovci	45°12'25.34"N 19°56'30.21"E

Sampling of surface river sediment and water

A sampling of surface river sediment and water will be conducted in parallel with the sampling of the spiny-cheek crayfish and will be done by researchers engaged in the project. Sampling responsible SRO is UNSFS.

There is low/no of potential impact on the environment and citizens during sampling and sample transport to laboratories.

Potential impact of working with chemicals

During WP2 the following chemicals will be used within project activities. Liquid chemicals: chloroform: 0.4 l; methanol: 1.8 l; boron trifluoride: 0.05 l; isooctane: 0.03 L; hydrochloric acid: 0.6 L; nitric acid: 0.05 L; acetonitrile: 3 L; hexan: 0.1 L; perchloric acid: 0.045 L; acetone: 0.2 L; petroleum ether: 7.5 L; sulfuric acid: 1.25 L; boric acid: 1.75 L; EZ NIN Reagent: 1.6 L; sodium accelerated buffers: 4.8 L; sodium loading buffer: 0.8 L; isopropyl alcohol: 0.4 L; toluene: 0.75 L; dichloromethane: 0.1 L. **Total amount of liquid chemicals**: **25.225 L**. Solid chemicals: sodium hydroxide: 0.3 kg; sodium bicarbonate: 0.015 kg; potassium sulphate: 0.15 kg; copper sulphate: 0.015 kg; quechers tube with extraction salts: 0.65 kg; quechers tube with clean-up chemicals: 0.105 kg. **Total amount of solid chemicals: 1.235 kg**.

Supplementary documentation related to work in SROs labaroratories:

- FINS: Accreditation Certificate SRPS ISO/IEC 17025:2017, from 2023; Certificate of responsible person for waste management (environmental protection specialist from 2006; Contract with authorized company for the removal chemical waste; The employment contract that confirms that for responsible person for Pilot plant for meat technology;

Certificate of responsible person for first aid; Certificate of having passed the professional exam in the field of fire protection.

- FOTNS: Accreditation Certificate SRPS ISO/IEC 17025:2017, from 2021; Statement of the dean FOTNS; Decision on the organization of preventive measures and permanent duty with the required number of persons professionally trained for the implementation of protective measures against fire (2023); Decision on appointing person responsible for waste management (2023); The decision by which the named persons were referred to training for first aid (2023).
- UNSFS: Rules on Occupational Safety and Health from 2007; Regulation on preventive measures for safe and healthy work when using means and equipment for personal protection at work from 2012.
- SVINS: Certificate SRPS ISO 14001:2015; Statement of the director of SVINS.

Potential impact of generated waste and wastewater

Waste generated in the course of laboratory investigations will be sorted, appropriately labeled, and temporarily stored following the waste management guidelines established by the institution.

- Generated waste volume in FINS used chemicals (14 06 02*) – 0.0012t; used chemicals (14 06 03*) – 0.0164; solid waste (14 06 04*) – 0.0005t; solid waste (14 06 05*) – 0.0015t; solid waste-used consumables and empty bottles (15 01 06*) – 0.02t; FOTNS (06 04 05*) – 0.045t; SVINS (06 04 05*) – 0.045t
- Generated waste will be handed over to authorized operators engaged by responsible SRO, (FINS, contract.2022.; FOTNS, statement of the dean; SVINS, contract 2021.).

Project activities related to WP3 will be conducted at FOTNS and SVINS. Both institutions possess Waste management procedures, trained staff, and contracts with authorized companies for the removal of chemical waste.

FOTNS provided a signed statement by the dean related to waste management procedures, trained staff, and contracts with authorized companies for the removal of chemical waste. The document is provided as supplementary material. In the SVINS has been adopted the Rulebook "Waste Management Procedure" and follows SRPS ISO 9001:2015 and SRPS ISO 14001:2015, which apply to all activities, services, and products carried out in the institute or by its employees and may have an impact on waste generation. This procedure identifies all types of waste generated in the institute and establishes the method of disposal and harmless waste removal. For handling, sorting, and disposal of waste, there is a "Waste Identification Guide" and a "Waste Management and Environmental Protection Service" as a separate organizational unit with one employed and trained person.

SVINS has a contract from 2021, with the company which is in charge of waste removal from the institute. SVINS: SRPS ISO/IEC 17025:2017, accreditation from 2022. (Date of initial accreditation: 2004.), http://www.registar.ats.rs/predmet/120/. Moreover, SVINS has a certificate according to the requirements of standard 14001. Statement of SVINS director related to waste management as well as certificate are provided as a supplementary documentation.

It is estimated that the maximum amount of wastewater that can be produced in adsorption (both batch and fixed-bed) and desorption tests is 15 L for each metal type. A thorough examination of two to three metal species will be chosen based on early findings. Estimated the maximum amount of wastewater involve wastewater generated during the optimization of the experimental

procedures. Generated waste volume in FOTNS is categorizes as waste containing other heavy metals (06 04 05*) – 0.045t;

Potential impact of working at the pilot plant for meat technology

To develop new food (crayfish pate and marinated vacuum-packed crayfish meat) and feed (type of chicken cooked sausage, supplemented with spiny-cheek crayfish meat) products, experiments will be conducted at the Pilot plant for meat technology. Pilot plant for meat technology represents a small-scale plant for meat processing. It is equipped with bowl cutter, meat grinder, vacuum mixer/tumbler, hydraulic piston filler, duplicator, smoking and cooking chamber, drying and ripening chamber, vacuum/map packing machine.

A pilot plant for meat technology already exists at FINS (figures a and b, bellow). See also https://fins.uns.ac.rs/services/pilot-postrojenja/oprema-u-pilot-postrojenju-za-tehnologiju-mesa/.

a

b

FINS has a comprehensive occupational health and safety program in place, ensured working conditions, and trained personnel. Each equipment (appliances) has provided manuals. FINS conducts regular training sessions for employees on safety protocols, emergency procedures, and the proper use of equipment. Standard Operating Procedures (SOP) under which work is carried out at the Pilot Plant for meat technology are aligned with relevant national requirements.

Potential impact on the health and safety

All team members are public employees of accredited SROs obligated to follow national Law on Occupational Health and Safety and other legal documents concordant with occupational safety, including the training of the project team. General work in laboratories are in accordance with legal requirements listed above under subtitle of Legal and Institution Framework. Throughout the various stages of project execution and activities (such as laboratory and pilot work), researchers will undergo training in occupational health and safety. They will be acquainted with precautionary measures outlined in the Safety Data Sheets of chemicals and will be provided with personal protective equipment. FINS: Laboratory is accredited in accordance with SRPS ISO/IEC 17025:2017; FOTNS: Good Laboratory Practice and Laboratory is accredited in accordance with SRPS ISO/IEC 17025:2017 and SVINS: SRPS ISO 14001:2015.

During the realization of this project, several activities may impact the safety of the project team: field work, working with chemicals and/or chemicals waste. All field work will be covered by official SRO policy/guideline documents listed above under subtitle of Legal and Institution Framework.

Each individual participating in the sampling process will receive information, instructions, and procedures regarding the preparation, stay, and work at the sampling sites. This includes guidance

on the use of personal protective equipment. Safety of fishermen during sampling will be the responsibility of the fishermen themselves and will be defined by the contract.

Potential social impact

Only potential social impact is associated with sampling of the spiny-cheek crayfish and sampling of surface river sediment and water - all raised concerns can be readily addressed through mitigation measures.

All other potential social impact is covered by ethics. As project is with low risk as the result of separate ethics screening, no related monitoring is recommended during the project implementation.

SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACT

Review of the impact on the environment that are predicted for the duration of the project is listed below.

- **Population:** Low. Urban area will be far away from sampling sites.
- **Working in the field**: The consequential impact is moderate. and related **Health and Safety**. Appropriate mitigation and monitoring measures during the project implementation are planned.
- **Social**: Low
- **Geology and soil:** Low.
- **Climatic characteristics:** Low
- **Seismology:** Low.
- **Air quality:** Low. Planned experiments do not require a usage of highly volatile chemicals and do not produce any air emissions
- **Working in the laboratory including Life and Fire Safety**: Moderate/Low
- **Waste:** Low, well controled and managed
- **Water resources**: Low. Crayfish sampling is not expected to exert any influence on water resources.
- **Soil:** Low
- **Flora and Fauna:** Low. Sampling procedure is non-invasive and traps do not injure individuals, just preventing their escape.
- **Noise:** The source of noise in laboratory and pilot plants is limited to equipment and mixing devices, and their noise levels remain well below the maximum levels specified in regulations.
- **Cultural heritage:** Low. Project will not have influence on cultural heritage since all activities will be done in laboratories of NIOs and Danube sampling sites far from urban area.

The consequential cumulative environmental and social impact is moderate.

I MITIGATION PLAN

Issue	Mitigating measures	Responsibility	Monitoring
PROJECT PREPARATION			
Life and fire safety (LFS) procedures in laboratory	All researchers/participants are familiar with the current Evacuation Plan and Protection and Rescue Plan; with the dangers of fire and fire protection measures and are trained in handling fire extinguishers, hydrants and other devices used for extinguishing fires by the Law, and with the "Instructions for action in case of fire".	Responsible persons from, FINS, FOTNS, UNSFS, and SVINS.	SF/PIU
Laboratory competence Quality assurance of laboratory involved in the experimental work	Checking quality assurance of involved laboratory in experimental work UNSFS: Good Laboratory Practice and Faculty rules and regulations FINS: Laboratory is accredited in accordance with SRPS ISO/IEC 17025:2017 FOTNS: Good Laboratory Practice and Laboratory is accredited in accordance with SRPS ISO/IEC 17025:2017 SVINS: SRPS ISO 14001:2015	WP1 leader, UNSFS, WP2 leader FINS, WP3 leader, FOTNS, WP4 leader, FOTNS, SVINS. WP leaders responsible for implementing the particular WP should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Sampling – Entrance on sampling sites and sampling without permits	Obtaining permits will be issued yearly, before sampling season by the Ministry of Ministry of Agriculture, Forestry and Water Economy of the Republic of Serbia	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Sampling – engagement of unexperienced fishermen	Engagement of only experienced and registered fishermen through sub-contracting. The responsibilities, including OHS measured, of the fishermen will be clearly defined by the contract	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
PROJECT EXECUTION /OPERATE			

Sampling – (Entrance on sampling sites and sampling without fisheries manager notification)	Before sampling fisheries managers for each sampling site will be notified and they will be present during the sampling	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Sampling (Trapped individuals of other species)	Immediately returning each caught species different than spiny-cheek crayfish unharmed to the natural habitat.	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Sampling – Potential physical hazards for project participants involved in sampling	All project participants involved in the sampling will be provided with the use of means and equipment for personal protection during the sampling. Responsibility for the safety of fishermen during sampling will be the responsibility of the fishermen themselves and will be defined by the contract.	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Cages for catching crayfish can be taken away by water stream during trapping	Cages will be tied up by metal cables.	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
River contamination by boat fuel	Ensuring rapid placement/collection of cages with minimal using of boats, and usage of low powered boat engines	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Potential physical hazards for research staff during development of new food and feed products at the Pilot plant for meat technology	Ensuring that only authorized and trained persons have access to Pilot plant for meat technology	WP2 leader and responsible person for Pilot plant for meat FINS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Safety and quality of newly development food and feed products supplemented with spiny-cheek	Continuous checking of the safety and quality parameters for the newly developed products in Laboratory for Food Technology, Quality and Safety (FINSLab) accredited according to ISO/IEC	WP2 leader, FINS.WP leader should conduct monitoring and notify the PI of the Project which will notify	SF/PIU

crayfish meat	17025:2017 standard.	the SF of the results	
Working with chemicals. Potential negative influence on human health	Prescribed protective equipment will be used during work and all experiments according to the principles of good laboratory practice observing safety measures at work. Experienced researchers and technicians will be performing analysis. Chemicals will be kept in special cabinets with adequate ventilation.	WP2 leader, FINS, WP3 leader, FOTNS, WP4 leader, FOTNS, and responsible person from SVINS. Responsible persons should conduct monitoring and notify the PI of the Project which will notify the SF of the results.	SF/PIU
Working with gasses under a high pressure. Potential negative influence on human health and environment	Engagement of certified persons	WP2 leader and responsible person for handling of gases under pressure FINS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Generation of small amounts of chemical waste during analysis WP2; desorption (development process of bio-sorbent from crayfish shell waste) within WP3; during experiments to determine the content of metals after desorption experiments. And production of active biopolymer material WP4	When removing waste from the Laboratory, the technical associate of laboratory places the waste in designated packaging to a marked location (different type of waste have a different label and stored in marked containers in separate rooms until removal by the company authorised by for the removal chemical waste)	Responsible persons for waste management from FINS, FOTNS, and SVINS. Responsible persons should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU

MITIGATION COST: No any cost of equipment or contractor charges to perform mitigation

II MONITORING PLAN

What parameter isto be monitored?	**Where** Is the parameter to be monitored?	**How** Is the parameter to be monitored?	**When** Is the parameter to be monitored (timing and frequency)?	**Responsibility**	**Supervision**
PROJECT PREPARATION					
Implementation of appropriate procedures related to OHS	In each SRO involved in the project	By checking if there are procedures/instructions for responding to emergency situations and providing training for the research staff	Once, before starting the project	Responsible persons from, FINS, FOTNS, UNSFS, and SVINS.	SF/PIU
Laboratory competence (Quality assurance of laboratory involved in the experimental work)	In each SRO involved in the project	Visual by checking of the certificates	Once, at the beginning of the project	WP1 leader, UNSFS, WP2 leader, FINS, WP3 and WP4 leader FOTNS, and responsible person from SVINS. WP leaders responsible for implementing the particular WP should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Permits for sampling	In the SRO responsible for sampling (UNSFS)	Visual checking of permits	Periodically before sampling season, once a year	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU

Contract for engagement of fishermen	In the SRO responsible for sampling (UNSFS)	Visual checking of contracts	Once before sampling	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
PROJECT EXECUTION /OPERATE					
The evidence of fisheries manager notification	In the SRO responsible for sampling (UNSFS)	Visual inspection and checks of the notification	Regularly during the sampling season	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Trapped spiny – cheek crayfish species during sampling	On-site at sampling locations	Visual inspection of trapped species	On-site, during each sampling	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Created documented information/instruction/procedure related to the preparation, stay and work researchers at sampling sites	In the SRO responsible for sampling (UNSFS)	By visual checking of the documentation before going to the sampling location	Once before going to the sampling location	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Number of set cages for catching crayfish	On-site at sampling locations	Visual inspection of cages and checking sampling documentation	On-site, during the sampling seasons	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Fuel leaks from the boat	On-site at sampling locations	Visual inspection of boat and checking of sampling documentation	On-site, during the sampling seasons	WP1 leader UNSFS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU

Researchers qualification and availability/accessibility procedures/instructions for Pilot plant for meat technology	SRO responsible for WP2 (FINS)	By checking staff qualification (personal card) and places that providing procedures/instructions/ information	Regularly, during the WP2 duration	WP2 leader and responsible person for Pilot plant for meat technology FINS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Quality and safety of the newly developed food and feed products supplemented with spiny-cheek crayfish meat	Laboratory/on-site at the SRO responsible for WP2 (FINS)	By checking safety and quality parameters of raw materials and final products	Regularly, during the WP2 duration	WP2 leader, FINS. WP leader should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Handling and storage of chemicals	At the location/laboratory in SRO that performs activities within WP2, WP3 and WP4 (FINS, FOTNS, SVINS)	Prepared procedures and instructions for handling and storage of chemicals	Periodically, during the implementation of WP2, WP3 and WP4	WP2 leader dr FINS, WP3 and WP4 leader FOTNS, and responsible person from SVINS. WP leaders responsible for implementing the particular WP should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Handling of gases	At the location/laboratory in SRO responsible for WP2 (FINS)	Visual inspection and checking of the documentation	Periodically, during the implementation of WP2	WP2 leader and responsible person for handling of gases under pressure FINS. WP leader should conduct monitoring and notify the	SF/PIU

				PI of the Project which will notify the SF of the results	
Potential hazards to laboratory research staffs	At the location/laboratory in SRO responsible for conducting experiment	Visual inspection and checking of documentation	Periodically, during the implementation of particular WPs	WP2 leader FINS, WP3 leader, and WP4 leader FOTNS. Responsible persons should conduct monitoring and notify the PI of the Project which will notify the SF of the results	SF/PIU
Chemical waste removal generated during WP2 (FINS), WP3 (FOTNS/SVINS), and WP4 (FOTNS)	At the location/laboratory in SRO responsible for particular WP_S	Checking documentation and acting in accordance with WMP which will cover control and waste management, mitigation measures, and monitoring in accordance with the institutional procedure	Periodically, during the implementation of WP2	Responsible persons for waste management, from FINS, FOTNS, and SVINS should notify the PI of the Project which will notify the SF of the results	SF/PIU

Monitoring Cost: No any cost of equipment or contractor charges to perform monitoring

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