ENVIRONMENTAL AND SOCIAL CODE OF PRACTICE (ESCOP) FOR THE PROJECT

Mechanical Performance Evaluation and Design Optimisation of a Novel Composite Support Structure for Large-Capacity Offshore Wind Turbines

under the Call for proposals "Seal of Excellence under the Synergies program"

CALL REFERENCE NUMBER: DIGIT.2.2.01

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Draft Version for Public Consultation

DIGIT
DIGITAL, INNOVATION, AND GREEN TECHNOLOGY PROJECT

REPUBLIKA HRVATSKA
Ministry of Science, Education and Youth

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TABLE OF CONTENT

1 INTRODUCTION

1.1 Purpose of the Environmental and Social Code of Practice (ESCOP)

This Environmental and Social Code of Practice (ESCOP) has been developed to guide the identification, avoidance, mitigation, and management of potential environmental and social (E&S) risks and impacts associated with research activities under the project *"Mechanical Performance Evaluation and Design Optimisation of a Novel Composite Support Structure for Large-Capacity Offshore Wind Turbines"*. It reflects internationally recognized good practices in environmental and social management, including occupational and community health and safety, and promotes the protection of human and environmental well-being.

The ESCOP outlines the procedures and responsibilities that all applicants must follow to ensure compliance with the applicable E&S requirements throughout the research process. It is a binding document and forms an integral part of the contractual agreement between the implementing agency and each applicant.

The ESCOP has been prepared in alignment with the World Bank Environmental and Social Framework (ESF), specifically the Environmental and Social Standards (ESS), and is consistent with relevant national legislation and EU regulatory requirements. It serves as a practical tool to ensure that research-related activities are implemented in an environmentally and socially responsible manner, in line with the World Bank's sustainability objectives.

1.2 Project background

The Digital, Innovation, and Green Technology Project (DIGIT) is a strategic investment operation led by the Ministry of Science, Education, and Youth of the Republic of Croatia, with financial support from the World Bank through a €106 million loan agreement signed in June 2023. The project is designed to strengthen Croatia's institutional capacity for research, development, and innovation (RDI) and to promote its transition toward a digital and green economy. Key objectives include enhancing research infrastructure, increasing the effectiveness of public RDI funding, and fostering stronger linkages between academia, industry, and society.

Under the DIGIT project, the Ministry launched the Seal of Excellence Synergies Program (Call Reference: DIGIT.2.2.01) to provide national co-financing for research proposals that received the European Commission's Seal of Excellence under the Horizon Europe program but were not funded due to budget limitations. This instrument supports high-quality R&D projects that are aligned with EU and national strategic priorities and are expected to generate measurable development impact in Croatia's innovation ecosystem.

Among the awarded proposals is the project entitled "*Mechanical Performance Evaluation and Design Optimisation of a Novel Composite Support Structure for Large-Capacity Offshore Wind Turbines*." This project contributes directly to the DIGIT Project's development objectives by advancing applied research in sustainable energy technologies and enhancing institutional research capacity in Croatia. It focuses on the development and performance assessment of an innovative CFRP-TCFDST composite support structure designed for offshore wind turbine applications.

The research will be implemented by the University of Rijeka, Faculty of Civil Engineering, and integrates both fundamental and applied research in the fields of structural engineering and materials science. The project is expected to contribute to climate resilience and the low-carbon transition by supporting the deployment of advanced infrastructure for renewable energy, consistent with the objectives of Croatia's Smart Specialization Strategy (S3), its National Recovery and Resilience Plan (NRRP), and the World Bank's climate and green growth priorities.

1.3 Timeline

ESCOP for the project "Mechanical Performance Evaluation and Design Optimisation of a Novel Composite Support Structure for Large-Capacity Offshore Wind Turbines" will be developed in following phases:

1. Draft version of ESCOP: end of June 2025;
2. Final version of ESCOP: beginning of July 2025;
3. Implementation, monitoring and reporting: December 2025 – November 2027.

2. PROJECT DESCRIPTION

The project aims to develop and evaluate a novel composite support structure (CFRP-TCFDST) for large-capacity offshore wind turbines, contributing to innovation in sustainable energy infrastructure. The research will be conducted at the University of Rijeka, Faculty of Civil Engineering, and combines applied and fundamental research in structural engineering and materials science.

Core activities include both experimental and numerical investigations to assess the mechanical performance of the proposed structure under combined wind, wave, and seismic loading. Special focus will be given to evaluating the bond durability between carbon-fiber-reinforced polymer (CFRP) and steel in simulated seawater environments, and to analyzing the influence of key design parameters.

Laboratory work will be carried out in a structural engineering laboratory equipped for advanced mechanical and materials testing. Activities will follow recognized safety and sustainability protocols and include mechanical testing of composite elements and long-term bond durability assessments under controlled environmental conditions.

Further research will involve the development of design formulas, constitutive models, and dynamic analysis methods, along with structural optimization to enhance performance and resilience. The ultimate goal is to produce practical design guidelines to support offshore wind turbine applications.

The project presents low environmental and social risks, as it relies primarily on laboratory-based research, computational modelling, and design development. In line with the Marie Skłodowska-Curie Actions (MSCA) Green Charter, environmental impacts will be minimized through sustainable research practices. These include implementation of "Green Lab" and "Green Office" initiatives to reduce energy consumption, minimize waste, and promote sustainable procurement.

To address emissions from travel and logistics, a "Green Mobility" plan will be introduced, including carbon footprint tracking and the use of low-emission transport and accommodation options.

Social risks are also minimal. The project emphasizes public engagement, open science, and responsible research practices through an SDG-aligned Communication Platform. Outreach activities and strict adherence to ethical and safety standards further support the project's commitment to positive societal impact.

Overall, the project is fully aligned with sustainability principles, aiming to advance environmentally responsible engineering solutions and foster societal benefits through innovation in renewable energy infrastructure.

3. ENVIRONMENTAL AND SOCIAL CODE OF PRACTICE (ESCOP)

The Project ESCOP sets out the mitigation measures to be implemented to avoid, minimize, or otherwise manage the environmental and social (E&S) risks and impacts identified through the project's environmental and social screening and risk assessment, in accordance with the World Bank Environmental and Social Standards.

In Croatia, construction laboratories operate within a clearly defined legislative and regulatory framework that ensures safety, environmental protection, and technical quality. The primary legal basis is the Occupational Health and Safety Act (Official Gazette 71/14, 118/14, 94/18, 96/18), which requires a detailed risk assessment for all laboratory activities, particularly those involving the testing of materials such as concrete, steel, asphalt, and reinforcement. Laboratories must ensure the mandatory use of personal protective equipment (PPE), including helmets, safety glasses, gloves, reinforced work boots, and hearing protection. Employees must be regularly trained in safety protocols, and the laboratory must maintain visible hazard signage, evacuation plans, and emergency lighting systems.

If hazardous substances are used (e.g., binders, additives, solvents, or acids for sample preparation), the Chemicals Act (Official Gazette 18/13, 115/18, 37/20), together with the EU REACH Regulation (EC No. 1907/2006), applies. All chemicals must be accompanied by valid Safety Data Sheets (SDS), and appropriate ventilation and chemical storage systems must be in place to reduce exposure risks.

Construction laboratories also fall under the scope of the Waste Management Act (Official Gazette 84/21, 142/23) and Environmental Protection Act (Official Gazette 80/13, 153/13, 78/15, 12/18, 118/18), especially when tests produce construction waste (e.g., broken specimens, surplus concrete) or hazardous waste (e.g., contaminated water or chemical residues). Laboratories are obliged to record and dispose of such waste through authorized waste management operators, in compliance with legal procedures.

Technical operations within the laboratory are guided by relevant standards, most notably HRN EN ISO/IEC 17025, which outlines general requirements for the competence of testing and calibration laboratories. This standard is a prerequisite for laboratory accreditation. Laboratories must also adhere to specific HRN EN standards for testing concrete, reinforcement, and other construction materials, as well as comply with national regulations regarding construction products.

All testing equipment, including compression testing machines, bending machines, ovens, and precision scales, must be regularly maintained and calibrated. Additional attention is required for mechanical hazards, noise, and vibration, with safety barriers and clear demarcation of hazardous testing zones used as standard preventive measures.

Laboratories must maintain comprehensive documentation, including records of employee training, safety protocols for hazardous materials, operating procedures for equipment, and emergency response plans.

Since the project is financed by the World Bank, it is also subject to additional requirements aligned with international best practices. These include the application of the World Bank's Environmental and Social Standards (such as ESS1, ESS2, and ESS4), and the adoption of sustainable research principles under the Green Lab or Sustainable Lab framework. These measures emphasize energy efficiency, reduced environmental impact, and responsible procurement.

The implementation of prescribed mitigation measures will be monitored by Croatian Science Foundation (CSF) and Project Implementation Unit (PIU) during research on a semi-annual basis. Reports will be submitted to the World Bank together with the regular semi-annual reports for DIGIT project (ES compliance reports), with the exception in case of incidents/accidents and establishment of Grievance Redress Mechanism (GRM).

Aspect	Proposed mitigation measures	Responsibility	
		Implementation	Monitoring and reporting
SAFE WORK PROCEDURES			
Laboratory access and authorization	a) Access to testing laboratories shall be limited to trained and authorized personnel. b) All personnel must complete site-specific safety inductions**.** c) Work in high-risk areas (e.g. hydraulic actuator stations, adhesive labs) requires specialized approval from the lab supervisor. d) Ensure that local exhaust ventilation (LEV) is used in areas where cutting, sanding, or grinding occurs to reduce exposure to airborne fibers and fumes.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Pre - operational protocols	e) Equipment condition, functionality and safety will be systematically verified before each use of mechanical testing equipment. f) Calibration and load limit verification will be performed under supervision. g) Test plans will be reviewed and signed off by the head of the lab before commencement.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Handling and use of adhesives and resins	h) All adhesives will be handled in mechanically ventilated workspaces. i) MSDS sheets will be available on-site for all chemicals, and personnel must be trained in interpreting them; they will be diligently applied. j) Disposable nitrile gloves, safety goggles, adequate respiratory protection (masks), and lab coats will be worn at all times during adhesive application. k) Used rags, containers, and disposable gloves will be disposed of as chemical waste in designated bins.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Mechanical testing protocols	l) Specimens will be mounted using standardized procedures to prevent misalignment. m) Protective safety shields or acrylic barriers will be used when applicable to prevent injury from specimen failure. n) A minimum clearance zone will be established around active machines, marked by floor tape, and barriers/fences (if deem needed). o) Testing will only proceed if emergency stop systems are verified to be functioning. p) Two-person rule for all high-load testing to ensure safe oversight and response.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Specimen handling and ergonomics	q) Use of mechanical lifting aids, such as trolleys or hoists, will be mandatory for larger specimens. r) Personnel will receive manual handling training focused on reducing back and joint injuries.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU

Aspect	Proposed mitigation measures	Responsibility	
		Implementation	**Monitoring and reporting**
	s) Work surfaces will be adjustable to accommodate varying task requirements and operator heights.		
Post-experiment clean up and waste disposal	t) All workstations must be cleaned immediately after use. u) Waste streams (chemical, metal, plastic, organic) will be segregated and clearly labelled. v) Sharp objects (e.g., broken specimens) will be disposed of in puncture-proof containers. w) Spill kits will be readily available, and their use will be demonstrated during induction.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
PERSONAL PROTECTIVE EQUIPMENT (PPE)			
Mandatory PPE requirements	a) Safety goggles to protect eyes from potential splashes or flying debris. b) Lab coats or specialized clothing to prevent exposure to harmful substances. c) Gloves to protect hands when handling chemicals or composite materials. d) Hearing protection for workers exposed to high noise levels during mechanical testing. e) Footwear: Closed-toe shoes or boots to prevent injuries from dropped objects. f) Dust Masks or Respirators: To protect against inhaling carbon fiber dust and resin fumes. A half-face respirator with P100 filters or an N95 respirator shall be used during cutting, sanding, or grinding operations to prevent respiratory exposure to fine particles and volatile fumes. g) Face Shields (if applicable): For additional protection against splashes or flying particles during high-risk tasks.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Maintenance and storage	h) PPE will be regularly inspected, cleaned, and replaced as needed to ensure safety and effectiveness. i) PPE will be stored in designated, clean areas, with usage and maintenance tracked in a log. j) Personnel will receive training on proper PPE handling, ensuring compliance with safety standards.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
TRAINING AND PERSONNEL COMPETENCY			

Aspect	Proposed mitigation measures	Responsibility	
		Implementation	**Monitoring and reporting**
Researcher and team qualifications	a) All personnel involved have academic or professional experience in materials testing, composite structures, or mechanical systems. b) The lead researcher has a background in engineering and composite materials.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Safety training program	c) The host institution will provide comprehensive laboratory safety training at the project's start. Topics include: d) Fire safety and evacuation e) Chemical handling and storage f) Emergency procedures (chemical spills, power failure, injury response) g) Safe use of high-load testing machines h) Training will include hands-on instruction and formal assessments. i) Attendance is mandatory and documented.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Ongoing supervision and mentoring	j) High-risk tasks will be performed under supervision until competence is demonstrated. k) Regular refreshers and toolbox talks will be conducted, especially after any incident or procedural change.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
COMMUNICATION AND LANGUAGE ACCESSIBILITY			
a) Communication and language accessibility	b) All safety instructions and emergency procedures must be provided in English, as the foreign workers (researcher) understand it. c) Pictograms and color-coded labels must be used to communicate safety instructions clearly, with English as the primary language.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
	d) Safety training must be conducted in English to ensure foreign workers / researcher fully understand the procedures.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
	e) Accessible reporting systems must be in place, with English-language support available for safety concerns.	Faculty of Civil Engineering,	CSF and PIU

Aspect	Proposed mitigation measures	Responsibility	
		Implementation	Monitoring and reporting
		University of Rijeka	
MONITORING, REPORTING, AND CONTINUOUS IMPROVEMENT			
Incident reporting	a) An internal system will be set up to report and track any accidents, near-misses, or unsafe conditions. b) This data will be reviewed periodically to improve safety measures.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Safety inspections	c) Regular safety inspections and audits will be conducted to assess compliance with OHS protocols and identify areas for improvement. d) Inspections will assess the condition of PPE, the maintenance of equipment, the proper storage of hazardous materials, and the general cleanliness and safety of the laboratory or testing environments.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Documentation and recordkeeping	e) Documentation and recordkeeping will track all safety inspections, incident reports, PPE usage, training sessions, equipment maintenance, and emergency drills. f) All records will be securely stored and retained for the required duration, enabling effective monitoring and response to safety issues.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Continuous improvement	g) OHS protocols will be updated regularly based on feedback, emerging risks, and changes in equipment or methodology	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
INTELLECTUAL PROPERTY			
Intellectual property management	a) Intellectual property generated during the project will be managed in accordance with the policies of the University of Rijeka (UNIRI) b) Department for Innovation and Knowledge Valorisation at the University of Rijeka and the Science and Technology Park of Rijeka (STEPRI) will assist in identifying and implementing appropriate protection measures such as copyright registration, trade secrets, or patents, where applicable.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU

Aspect	Proposed mitigation measures	Responsibility	
		Implementation	Monitoring and reporting
Professional guidance	c) The TTO at UNIRI will be actively involved throughout the project, providing professional guidance on IP management and offering training sessions for the researcher on intellectual property rights, licensing and exploitation strategies	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
Innovations	d) All innovations, whether software tools, numerical models, technical reports or design code recommendations, are evaluated for their commercialisation potential	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
STAKEHOLDER ENGAGEMENT			
Dissemination	a) Open science practices will be applied whenever appropriate to support early dissemination and transparency, while ensuring that sensitive or potentially exploitable project outputs are protected prior to release b) Clear licensing terms (e.g., Creative Commons or open-source software licenses) will be applied to those outputs intended for public sharing	Faculty of Civil Engineering, University of Rijeka	CSF and PIU
GRM	c) Grievance Redress Mechanism (GRM) shall be established by providing an publishing on the website e-mail address where the interested public, either groups or individuals, could send complaints, comments and/or suggestions. The e-mail address shall be reported to the DIGIT GRM of the CSF at grmdigit@hrzz.hr d) Information on such received complaints, comments, and suggestions should be archived in a logical framework database and reported to the DIGIT Project GRM of the CSF on monthly bases, together with information on the measures taken following received complaints, comments and/or suggestions.	Faculty of Civil Engineering, University of Rijeka	CSF and PIU