

ENVIRONMENTAL MANAGEMENT PLAN EMP

Version 5.0, July 5, 2021

EMP procedures are in detail described in the IF Environment and Social Management Framework (ESMF). Environmental and Social Management Framework specifies environmental and social procedures for implemented projects to adhere to, including Environmental Management Plan, which are consistent with Serbian national legislation and safeguard policies.

Project IF ID: 50369

I. MITIGATION PLAN

No.	Phase	Issue	Mitigating Measure	Cost of Mitigation (If Substantial)	Responsibility*	Supervision observation and comments (to be filled out during supervision)
1.	Q1: 1. Establishment of management and communication plan	Q1 – 1. During the establishment of management methods and definition of communication plan no impact on environment is expected.	Albeit no impact on environment is expected throughout Project Q1 activities, a special attention is paid to the following matters: - Implementation of an overall project management system,	None	The Grant recipient	

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<p>2.</p>	<p>2. Provision of equipment for modeling</p>	<p>Q1 – 2. During contracting and procurement of Computer-aided Design (CAD) software, PC computers, 3D scanner and 3D printer no impact on environment is expected.</p> <p>Purchased goods would eventually be subject of waste management (and circular economy if applicable), yet it is of a very low probability to happen within this project timeframe.</p>	<ul style="list-style-type: none"> - Meeting with ISO 9001 standard requirements (already certified with), - Fulfilment of ISO 14001 standard requirements (already certified with), - Integration of the EMP into the Plan, - Complying with the existing Waste Management Plan, - Development of Risk management strategy within the Plan, - Regulatory framework (laws and secondary legislation) concerning environmental protection and working environment conditions, 			
<p>3.</p>	<p>3. Realization of proof of concept</p>	<p>Q1 – 3. During development of a kinematic model of a pantograph (with the objective to determine an optimal manpower in the working range) no impact on environment is expected due to the very nature of kinematic modeling.</p>	<ul style="list-style-type: none"> - Purchased equipment quality certificates, technical and performance specifications, and energy efficiency levels 			

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			<p>(including products compliance with Directive EU 2009/125/EC on eco-design requirements for energy-related products and Regulation (EU)2017/1369 on energy labelling – where transposed in national regulatory framework).</p> <p>With its coverage the Plan determines all latter project phases, thus additionally decreases possibility of any significant environmental impact occurrence.</p> <p>Know-how of the consortium team (with recently updated procedure in one partner R&D department) ensure the proof of concept is</p>			
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<p>4.</p>	<p>Q2: 1. Designing aerodynamic profile of the structure</p>	<p>Q2 – 1. In the course of designing of the aerodynamic profile of the structure no impact on environment is expected due to the very nature of a designing process, and because aerodynamic profile is predominantly done in a computational mode.</p>	<p>obtained in timely manner and fully according to project requirements, standards and expectations, and the proof of concept deriving rules.</p> <p>Ensuring approvals are given by all consortium members (their responsible stuff).</p> <p>Applying principles of green designing and green engineering to the highest possible extent, and according to the project innovation concept and drawings. Incorporating environmental innovation green postulates regarding product design, raw material, production processes, and waste treatment.</p>	<p>None</p>	<p>The Grant recipient</p>	
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5.	2. Construction of tools	<p>Q2 – 2. During the construction of tools (basic frame, lower frame, upper frame, pantograph sled, integrated pantograph unit, aerodynamic profile production tools and welding tools) and ongoing construction processes where technologies such as - machining, manual processing and assembly, production and impregnation of rolled elements, thermal treatment, sheet metal processing (punching, cutting, bending, drawing, cutting and trimming), welding, painting, tinning and making special tools - are being used, a certain waste amount may be generated.</p> <p>An improper waste management may bring to some impact on environment.</p>	<p>Fulfilment of ISO 14001 standard requirements.</p> <p>Full implementation of internal Waste Management Plan. Ensuring systematic collection of waste to avoid scattering and allow proper disposal. Trained personnel on waste management. Proper storage and handling of lubricants, paint and solvents. Final waste disposal according to signed service agreements with licensed operators.</p> <p>Certified equipment. Ensuring proper maintenance of equipment. Strict adherence to established and verified internal procedures. Highly skilled working force.</p>	<p>May impose some additional costs (e.g., in case of an equipment failure or a need to reordering or remanufacturing) yet cost of mitigation <i>per se</i> is not significant.</p>	The Grant recipient	
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		<p>Potential, local, limited impact on environment and people from improper maintenance of the equipment.</p> <p>Overuse of resources during manufacturing.</p> <p>Construction phase noise and/or dust are marked by operation of constructional machines and tools.</p> <p>Construction process technology such as welding may lead to a risk of sparking.</p> <p>Lower quality, defect or deformations of raw material, production inputs and/or construction tools may cause different potentially negative impact on production/construction process, quality of the planned outputs, safety</p>	<p>Smart utilization of used resources (in order to avoid their overexploitation).</p> <p>Energy efficiency measures.</p> <p>Exposure to noise from construction operations is limited to the facility interior where internal safety and protection at work procedures are being applied, with no impact on external environment.</p> <p>Ensure internal procedures and regulatory requirements to limit dust (including ventilation systems).</p> <p>Testing of working environment conditions - microclimate and lighting - at the production facility, while all technological</p>			
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		<p>and health of the workers engaged, and environment.</p>	<p>capacities are in motion, are conducted annually by a licensed examiner.</p> <p>Ensuring occupational safety measures – implementation of Rulebook on occupational safety and health, and Act on risk assessment at the workplace and in the work environment.</p> <p>Ensuring fire-protecting measures – implementation of Fire protection rules, and Fire protection training program for employees.</p> <p>Rigorous implementation of the EN 15085 standard - Railway standard: Welding of railway vehicles and components (already certified with). Regular quality and</p>			
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			<p>safety control of the MIG/MAG welding equipment. Trained and skilled welders.</p> <p>Internal quality policy implementation. Quality control (complex and phased) of whole manufacturing process: input control of raw materials, input control of outsourced components, intermediate control of subassemblies and operations, and final control of the units.</p> <p>Use of modern Computer Numerical Control (CNC) equipment for gaining accuracy of products and desired quality.</p> <p>Production and construction operations are done following predefined technical</p>			
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6.	3. Preparation of 3D Model Pantograph	<p>Q2 – 3. Preparation of Welding Procedure Specification (WPS) books/list, technical documentation, Bill of Materials (BOM), Processing technology, and Quality control list, as well as Computer Numerical Control (CNC) programing and purchase of material for prototype are expected to have no impact on environment due to the very nature of these activities.</p>	<p>specifications for interoperability and internal working protocols in a facility equipped exclusively for the production of pantographs.</p> <p>3D Model Pantograph will be developed and prepared fully according to EN 50206-1 (Railway applications, Rolling Stock, Pantographs: Characteristics and tests – Part 1: Pantographs for main line vehicles) and EN 50367 (Railway applications, Fixed installations – Criteria to achieve technical compatibility between pantographs and overhead contact line) standards.</p> <p>Ensuring energy efficiency during the</p>	None	The Grant recipient	
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			<p>preparation of processing technology.</p> <p>Ensuring resources smart-utilization management.</p> <p>All necessary information on needed and purchased materials for prototype will be obtained from the producer(s). Whenever possible, purchase will target more environmentally friendly material or product.</p> <p>Wherever possible, all listing preparation work will be done electronically, i.e., virtually, hence saving paper as much as possible.</p> <p>Quality control. Approvals are given by all consortium members (their</p>			
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7.	<p>Q3:</p> <p>1. Calculations of aerodynamic forces</p>	<p>During calculations of aerodynamic forces, no impact on environment is expected due to the nature of a process of performing calculations.</p>	<p>responsible stuff).</p>			
8.	<p>2. Construction of Air Wings</p>	<p>Construction of air wings may provoke a certain amount of waste and resources overused, as well as noise and dust.</p> <p>An improper waste management may bring to some impact on environment.</p> <p>Potential, local, limited impact on environment and people from improper maintenance of the equipment.</p> <p>Overuse of resources during manufacturing.</p> <p>Air wings construction</p>	<p>Ensuring strict adherence to project design and components interoperability.</p> <p>Construction is done with certified equipment and tools, by skilled professionals specially trained for the project, and at indoor facility.</p> <p>Full implementation of internal Waste Management Plan.</p> <p>Smart utilization of used resources.</p> <p>Energy efficiency measures.</p>	<p>May impose some additional costs (e.g., in case of an equipment failure or a need to reordering or reconstructing) yet cost of mitigation <i>per se</i> is not significant.</p>	<p>The Grant recipient</p>	

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<p>9.</p>	<p>Q4: 1. Production of the first pantograph prototype</p>	<p>phase noise and/or dust from operation of constructional machines and tools.</p> <p>Potentially negative impact on construction process, quality of the planned outputs, safety and health of the workers engaged, and environment due to lower quality, defect or deformations of raw material, production inputs and/or construction tools.</p> <p>Q4 – 1. During the production of the first pantograph prototype, a certain waste amount may occur.</p> <p>Noise and dust from the operational machines.</p> <p>Construction process technology such as welding may lead to a risk of sparking.</p>	<p>Ensure internal procedures and regulatory requirements to limit noise and dust.</p> <p>Ensuring occupational safety measures and fire-protecting measures.</p> <p>Quality control - ensuring approvals are obtained by all consortium members.</p> <p>Management and communication plan.</p> <p>EN 15085 standard implementation.</p> <p>Use of modern Computer Numerical Control equipment.</p> <p>Production is done in the facility intended and equipped (certified equipment) exclusively</p>	<p>May impose some additional costs (e.g., in case of an equipment failure or a need to reordering or reproduction) yet cost of mitigation <i>per se</i> is not significant.</p>	<p>The Grant recipient</p>	
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<p>10.</p>	<p>2. Aero tunnel testing of the first pantograph prototype</p>	<p>Q4 – 2. During the aero tunnel testing of the first pantograph prototype no impact on environment is</p>	<p>for the production of pantographs.</p> <p>Resources sustainability management.</p> <p>Full implementation of internal Waste Management Plan.</p> <p>Exposure to noise and dust from construction operations is limited to the facility interior where internal safety and protection at work procedures are being applied, with no impact on external environment.</p> <p>Professional knowledge and experience.</p> <p>Rigorous quality control procedure.</p> <p>Certified equipment.</p> <p>Adequate innovation management – avoiding</p>	<p>None</p>	<p>The Grant recipient</p>	
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<p>11.</p>	<p>Q5 – Q6: Revisions</p>	<p>expected due to aero tunnel testing characteristics.</p> <p>During revisions of the prototype aero testing no new impact on environment is expected.</p>	<p>unnecessary and excessive testing thus save energy and other resources.</p> <p>Testing is performed indoor, in a specialized facility, with no impact on external environment.</p> <p>Using adequate equipment and tools for revision measurement and evaluation processes.</p> <p>Smart innovation management – avoiding unnecessary and excessive revisions, hence saving energy and other resources.</p> <p>Ensure involvement and approval of all consortium members.</p>	<p>None</p>	<p>The Grant recipient</p>	
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<p>12.</p>	<p>Q7.</p> <p>1. Development of the simulation model.</p> <p>2. Simulation of the pantograph prototype behavior</p>	<p>During development of the simulation model and the prototype behavior simulation conducting no new impact on environment is expected.</p>	<p>Simulation model is environmentally friendly.</p> <p>Simulation of the prototype behavior is done in a specialized, properly prepared and equipped surrounding.</p> <p>Applying all necessary measures to avoid or limit noise, dust and other environmental factors – implementation of internal documents.</p> <p>Ensure application of all safety and health protocols – implementation of internal documents.</p> <p>Constant professional surveillance.</p>	<p>None</p>	<p>The Grant recipient</p>	
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<p>13.</p>	<p>Q8.</p> <p>1. Production of the first high reach pantograph for high speed</p>	<p>Q8 - 1. During the production of the first high reach pantograph for high speed, a certain waste amount may be generated. Potential impact on environment is due to noise from the operational machines, improper maintenance and fueling of equipment.</p> <p>Overuse of resources during manufacturing. Construction phase noise and/or dust are marked by operation of constructional machines and tools. Construction process</p>	<p>Quality control approach.</p> <p>Efficient innovation management – avoiding unnecessary and excessive simulations, to save energy and other resources.</p> <p>Management and communication plan.</p> <p>Production plan.</p> <p>Production is done in the facility intended and equipped exclusively for the production of pantographs.</p> <p>Deep expertise of the engaged project team.</p> <p>ISO 9001, ISO 14001, EN 15085 standards implementation.</p> <p>Use of modern Computer Numerical</p>	<p>May impose some additional costs (e.g., in case of an equipment failure or a need to reordering or reproduction) yet cost of mitigation <i>per se</i> is not significant.</p>	<p>The Grant recipient</p>	
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		<p>technology such as welding may lead to a risk of sparking. Lower quality, defect or deformations of raw material, production inputs and/or construction tools may cause different potentially negative impact on production/construction process, quality of the planned outputs, safety and health of the workers engaged, and environment.</p>	<p>Control equipment for gaining accuracy of products and desired quality.</p> <p>Production and construction operations are done following clear internal working protocols all personnel is familiar with.</p> <p>Full implementation of internal Waste Management Plan. Final waste disposal according to signed service agreements with licensed operators.</p> <p>Exposure to noise from construction operations is limited to the facility interior with no impact on external environment.</p> <p>Ensure internal procedures and regulatory requirements to limit</p>			
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14.	2. Preparation of the final documentation	Q8 - 2. During preparation of the final documentation no impact on environment is expected.	<p>dust.</p> <p>Smart utilization of used resources (in order to avoid their overexploitation).</p> <p>Energy efficiency measures.</p> <p>Ensuring occupational safety measures.</p> <p>Ensuring fire-protecting measures.</p> <p>Rigorous final product quality control.</p> <p>Final documentation is prepared according to the recognized innovation project management and international standards.</p> <p>Avoiding unnecessary paper cost.</p>	None	The Grant recipient	
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*Items indicated to be the responsibility of the contractor shall be specified in the bid documents

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II. MONITORING PLAN

No.	Phase	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?	When is the parameter to be monitored- frequency of measurement or continuous?	Monitoring Cost What is the cost of equipment or contractor charges to perform monitoring?	Responsibility	Supervision observation and comments (to be filled out during supervision with reference to adequate measuring reports)
1.	Q1. 1. Establishment of management and communication plan	1. Quality (content, coverage, feasibility, etc.) of the plan Compliance with other relevant plans and standards, and regulatory framework Deadlines set Collaboration within the consortium	In the process of the plan drafting	Through quality check list that will be prepared by the consortium members prior to the plan drafting	Throughout the plan drafting process	None	The Grant recipient	
	2. Provision of	2. Quality of	Through	Through	Prior to	None	The Grant recipient	

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	equipment for modeling	<p>the purchased equipment</p> <p>Ordering, delivery and accompanying logistics management related to act of purchase of equipment</p>	<p>certifications and technical specifications of the equipment</p>	<p>receiving and keeping all certifications and technical specifications of the equipment</p> <p>Reporting to management</p>	procurement			
	3. Realization of proof of concept	<p>3. Objectives of the Proof-of-concept realization approach and methodology set</p> <p>Quality (level of needed qualitative and quantitative data provision) of the developed kinematic model of a pantograph</p>	<p>Through the proof-of-concept realization process</p>	<p>Through realization check list (namely Proof of concept success criteria list) that will be prepared by the consortium members prior to the development of pantograph kinematic model</p>	<p>Throughout the model development process</p>	None	The Grant recipient	

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2.	Q2:			Reporting to management				
	1. Designing aerodynamic profile of the structure	Quality of the structure aerodynamic profile design	In the structure aerodynamic profile design process	Through realization and quality check list that will be prepared by the consortium members prior to the structure aerodynamic profile design	Throughout the structure aerodynamic profile design process	None	The Grant recipient	
	2. Construction of tools	Quality of the constructed tools: Quantity Dimension Tolerance Completeness Functionality Interoperability Static contact	Across the process of tools construction	Reporting to management Through quality check list that will be prepared by the consortium members prior to construction of tools	Prior to, during and after the completion of the process of tools construction	None	The Grant recipient	

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		<p>force Finishing (All relative to the project predefined design, drawings, models and profiles)</p> <p>EN 15085 standard implementation</p>		<p>(Basis for quality check list are ISO 14001 requirements, EN 15085 standard requirements, technical specifications, measurement lists, and test lists)</p> <p>Through checklists for environmental compliance audit</p> <p>Internal work orders</p> <p>Reporting to management</p>	<p>During construction process</p>	<p>Non-significant in case outsourced</p>	<p>Contractor (optional)</p>	
		<p>Waste temporary storage processes and</p>	<p>On the project site</p> <p>Temporary</p>	<p>Waste management plan</p>	<p>Continuously, daily</p>	<p>None</p>	<p>The Grant recipient</p>	

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	3. Preparation of 3D Model Pantograph	<p>quantities estimation (keeping daily records) of the generated waste</p> <p>Level (quality and quantity) of preparation for 3D modelling</p>	<p>storage of the facility</p> <p>In 3D Model Pantograph preparation process</p>	<p>Visual monitoring</p> <p>Keeping records in accordance with regulations</p> <p>Checking lists</p> <p>Technical documentation book</p> <p>Financial data (input and output invoices)</p> <p>Processing technology preparation and CNC programming protocols</p> <p>Quality control lists</p>	<p>Prior to and during the 3D Model Pantograph preparation</p>	None	The Grant recipient	
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<p>3.</p>	<p>Q3.</p> <p>1. Calculations of aerodynamic forces</p> <p>2. Construction of Air Wings</p>	<p>Quality of the constructed air wings: Quantity Dimension Tolerance Completeness Functionality Interoperability Static contact force Finishing (All relative to the project predefined design, drawings, models and profiles)</p>	<p>Across the process of air wings construction</p>	<p>Internal work orders</p> <p>Reporting to management</p> <p>Through quality check list that will be prepared by the consortium members prior to construction of air wings</p> <p>Through checklists for environmental compliance audit</p> <p>Internal work orders</p>	<p>Prior to, during and after the completion of the process of air wings construction</p>	<p>None</p> <p>Non-significant in case outsourced</p>	<p>The Grant recipient</p> <p>Contractor (optional)</p>	
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<p>4.</p>	<p>Q4.</p> <p>1. Production of the first pantograph prototype</p>	<p>Waste temporary storage processes and quantities estimation (keeping daily records) of the generated waste</p> <p>Quality of the produced pantograph prototype: Dimension Tolerance Completeness Functionality Interoperability Static contact force Finishing (All relative to</p>	<p>On the project site</p> <p>Temporary storage of the facility</p> <p>Across the process of pantograph prototype production</p>	<p>Reporting to management</p> <p>Waste management plan</p> <p>Visual monitoring</p> <p>Keeping records in accordance with regulations</p> <p>Through quality check list that will be prepared by the consortium members prior to production of pantograph prototype (Basis for quality check</p>	<p>Continuously, daily</p> <p>Prior to, during and after the completion of the process of pantograph prototype production</p>	<p>None</p> <p>None</p>	<p>The Grant recipient</p> <p>The Grant recipient</p>	
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		<p>the project predefined design, drawings, models and profiles)</p> <p>EN 15085 standard implementation</p>		<p>list are ISO 14001 requirements, EN 15085 standard requirements, technical specifications, measurement lists, and test lists)</p> <p>Through checklists for environmental compliance audit</p> <p>Internal work orders</p> <p>Reporting to management</p>	<p>During the production</p>	<p>Non-significant in case outsourced</p>	<p>Contractor (optional)</p>	
		<p>Waste temporary storage processes and quantities estimation</p>	<p>On the project site</p> <p>Temporary storage of the facility</p>	<p>Waste management plan</p> <p>Visual monitoring</p>	<p>Continuously, daily</p>	<p>None</p>	<p>The Grant recipient</p>	

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		(keeping daily records) of the generated waste		Keeping records in accordance with regulations				
	2. Aero tunnel testing of the first pantograph prototype	Performance	In a process of aero tunnel testing	Through predefined and prepared performance check list	During the testing	None	The Grant recipient	
5.	Q7. 1. Development of the simulation model. 2. Simulation of the pantograph prototype behavior	Performance	In a process of prototype behavior simulation	Through performance check list Through checklists for environmental compliance audit	During the simulation process	None Non-significant in case outsourced	The Grant recipient Contractor (optional)	

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6.	Q8. 1. Production of the first high reach pantograph for high speed	Quality of the produced high reach pantograph for high speed: Dimension Tolerance Completeness Functionality Interoperability Static contact force Finishing (According to the predefined production design requirements) EN 15085 standard implementation	Across the process of the production of the first high reach pantograph for high speed	Reporting to management Through quality check list that will be prepared by the consortium members prior to production of the first high reach pantograph for high speed Through checklists for environmental compliance audit Internal work orders Reporting to management	Prior to, during and after the completion of the process of production of high reach pantograph for high speed During the production process	None Non-significant in case outsourced	The Grant recipient Contractor (optional)	
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		Waste temporary storage processes and quantities estimation (keeping daily records) of the generated waste	On the project site Temporary storage of the facility	Waste management plan Visual monitoring Keeping records in accordance with regulations	Continuously, daily	None	The Grant recipient	
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III. PUBLIC CONSULTATION DETAILS AND MINUTES OF MEETING FOR THE ENVIRONMENTAL MANAGEMENT PLAN

In a separate document provide details on:

1. Manner in which notification of the consultation was announced: media(s) used, date(s), description or copy of the announcement
2. Date(s) consultation(s) was (were) held
3. Location(s) consultation(s) was (were) held
4. Who was specifically invited (Name, Organization or Occupation, Telephone/Fax/e-mail number/address (home and/or office)?)
5. List of Attendees (Name, organization or occupation, contact details)
6. Meeting Agenda
7. Summary Meeting Minutes (Comments, Questions and Response by Presenters)
8. List of decisions reached, and any actions agreed upon with schedules and deadlines and responsibilities.

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INTERNAL USE:

Form checked and reviewed by the Innovation Fund: External environmental and social management provider (ESMP)	
Date	
Name	
Title	
Signature	