**Annex 5**

**Templates for Mid-Term Evaluation Report**

**(Individual and Consensus)**

**Water Joint Programming Initiative**

**2018 Joint Call**

*Closing the water cycle gap - Sustainable management of water resources*

These Project Management Guidelines will be effective from the date of the National funding decisions and shall remain in force until the last final project report is approved in 2022.

**The Mid-Term Consensus Report will be made available to the Consortium as well as CSC and JPI Water GB.**

**MID-TERM INDIVIDUAL EVALUATION REPORT**

**PROJECT TITLE AND ACRONYM**

Name of Coordinator: Robert J. Forster

Project code: WaterWorks2017-Sense and Purify

Duration of project: 36 months

Start date: 1 April 2019End date:31 March 2022

**DETAILS OF THE EVALUATOR**

Name: Mario Schirmer

Organisation: Eawag, Swiss Federal Institute of Aquatic Science and Technology (CH)

Date of review: 19 April 2021

### **Scientific and technological progress** (*Maximum 250 words)*

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| The Sense and Purify (SPy) project has made excellent progress and achieved the majority of  the time relevant objectives and made significant advances on the others despite the extremely challenging circumstances due to the COVID-19 pandemic. Although a significant number of person months of in lab experiments were lost, the team has made significant accomplishments by working together as an efficient consortium. They remained fully committed to helping to tackle a growing global problem, i.e., the local, efficient and low-cost treatment of wastewater that contains organic pollutants that are very challenging to decompose using existing technologies.  The project team developed new electro-chemiluminescent dyes that generate light when an appropriate potential is applied, and a co-reactant is present. These dyes have been used to create a new antibody based electrochemiluminescent sensor that can detect as few as 100 E. coli bacteria in one millilitre of water which is impressive. Boron Doped Diamond (BDD) electrodes have been explored for the simultaneous detection and destruction of pharmaceuticals, e.g., anti-retro-virals, that are challenging to remove using conventional approaches. They have made significant progress to optimize the composition of the BDD particles in order to maximize the rate at which the hydroxyl radicals are produced which decompose the pollutants. |

### **Collaboration, coordination and mobility within the Consortium** (*Maximum 250 words)*

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| The collaboration within the SPy consortium has deepened during the reporting period and appear very effective at delivering the individual tasks as well as the overall goal of developing a wireless wastewater reactor with integrated sensors/spectroscopy for the destruction of organic pollutants. It can be noted that the vast majority of these tasks involve at least three of the four partners and the success achieved could not be reached without the SPy Consortium.  The specific partner contributions to each individual task have been clearly identified in the report and are well thought through. The primary responsibilities remain as described in the original proposal: DCU: development of the wireless WWT technology and testing of pharmaceutical wastewater; URV: sensor development and nanomaterials; NU: ECL luminophore development and testing using food production waste water; UWC: Electrochemistry, sensor and reactor development.  The Coordination of the individual Co-PIs with their national funding agencies has been very effective with strong local assessment in place. For example, the Irish Environmental Protection Agency carries out a full review, Technical, Impact and Communications Report as well as an in-person presentation and discussion (half-day) in front of a six person Expert Panel every six months. The project continues to meet the transnational nature. |

### **Coordination with other international project funded by WaterWorks2015, or other instruments** (*Maximum 250 words)*

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| The strategy of the SPy team was to give the researcher recruited under an opportunity to undergo training and establish expertise in their home laboratory before spending time in a partner laboratory. Unfortunately, the COVID-19 pandemic and subsequent travel restrictions have meant that researchers have not been able to undertake planned research/mobility visits across the consortium. However, they made strong links with the Break Biofilms (https://www.breakbiofilms.com/, Prof. Carmen del Blanco Lopez, Coordinator) EU funded ITN on the development of sensors for the detection of pathogens. Furthermore, they also collaborated with Prof. Gordon Wallace of the Intelligent Polymer Research Institute, Australia on the development of wireless electrochemical methods for the electrostimulation of biological cells and the development of electroceuticals. |

### **Coverage of the themes and sub-themes of the call** (Maximum *250 words)*

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| The SPy project contributes to a large range of themes and sub-themes of the call. This research covers Sub-theme 1.1. Promoting adaptive water management for global change and Sub-theme 1.3. Mitigating water stress in urbanized areas. Furthermore, the project strengthens Sub-theme 2.2. The reuse of water Theme 3. Supporting tools for sustainable integrative management of water resources. This theme aims to complement the actions developed under the European Strategy Forum for Research Infrastructures (ESFRI) and other European initiatives. |

1. **Stakeholder/industry engagement** (*Maximum 250 words)*

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| The team has engaged with a major pharmaceutical company to understand the nature of their  wastewater treatment needs, e.g., total organic load, volume, time profile for generation etc.  The provision of actual wastewater samples and the formulation of appropriate test samples has  been extensively discussed. The SPy technology has been presented with a view to refining the  design and performance and to them becoming an advocate for the technology.  The consortium has furthermore engaged with a leading food manufacturer to understand the composition of their wastewater streams, to discuss accessing real world samples for testing and to raise awareness of the SPy technology. They have been especially helpful in identifying performance criteria with respect to sample volume and throughput rates.  The industry interactions have influenced the final operational performance needed from the reactor, e.g., outflow composition, flow rates, volumes etc. Moreover, engaging with diverse industries, pharmaceutical manufacturing and food, help to position the technology  appropriately to maximize commercial impact.  Very good progress has been made on the scientific objectives that have been effectively communicated to key target industries, i.e., pharmaceutical manufacturing and food  production. The team has raised awareness of the technology and sought to reduce the barriers to adoption by ensuring that the technology matches industry needs as closely as possible. |

### **Recommendations for improvements/amendments of the report** (Please complete Table below)

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1. **Recommendations/ problems and risks** (Maximum *250 words)*

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| I do not see any additional risks to the ones which occurred due to the COVID-19 situation. The project team will reach their goals. |

**MID-TERM EVALUATION CONSENSUS REPORT**

**This Consensus Report will be made available to the Consortium as well as CSC and JPI Water GB.**

**PROJECT TITLE AND ACRONYM**

Name of Coordinator:

Project code: WaterWorks2017-CONSORTIUM ACRONYM

Duration of project:

Start date: End date:

**FOLLOW-UP GROUP**

Please include the data of the FG members reviewing the report

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| Name | Organisation | Signature |
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Date:

### **Scientific and technological progress** (Maximum *250 words)*

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| *Please describe the work performed and the results obtained during the lifetime of the project, and the conformity of work progress within the initial schedule. Take into account the following aspects:*   * *Has progress been achieved towards reaching the project objectives according to the original description and milestones?* * *Detailed update on methodology & results* * *How has the progress of the project promoted a multi-disciplinary work?* * *Dissemination of the results (publications, patents, other)* |

### **Collaboration, coordination and mobility within the Consortium** (Maximum *250 words)*

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| *Please evaluate the collaboration, coordination and mobility within the Consortium*  *Take into account the following aspects:*   * *Efficiency on the coordination and organization of the projects* * *Collaboration effective between the partners* * *Mobility of the research between the consortia* * *Does the project meet the transnational nature and its added value?* |

### **Coordination with other international project funded by WaterWorks2017, or other instruments** (Maximum 250 *words)*

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| *Please evaluate the external collaboration of the Consortium*  *Take into account the following aspects:*   * *Collaboration effective with other projects funded under the 2018 Joint Call:* * *Collaboration effective with other projects or consortia.* |

### **Coverage of the themes and sub-themes of the call** (Maximum 250 words*)*

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| *Please evaluate relation within the project results and the themes and the sub-themes of the call.*  *Theme 1. Enabling sustainable management of water resources.*  The overall aim for this theme is to develop new governance and knowledge management approaches.   * *Sub-theme 1.1. Promoting adaptive water management for global change:*   The aim of sub-theme 1.1 is to increase knowledge and to develop evidence-based methodologies and technologies for monitoring the cumulative impacts of human activities and climate change on the water cycle, but also to develop management options on the water cycle (considering all cycle compartments) and water / ecosystem services. This knowledge must be applicable for the adaptive management of water resources on a regional scale, while enabling downscaling to address local or catchment situations.   * *Sub-theme 1.2. Integrative management by implementing Natural Water Retention Measures (NWRM) such as Managed Aquifer Recharge (MAR):*   The aim is to increase the knowledge and develop NWRMs such as MAR in a multidisciplinary way, to protect, prolong, sustain and augment freshwater supplies. Evidence of their effectiveness and on the multiple benefits they deliver should be demonstrated.   * *Sub-theme 1.3. Mitigating water stress in coastal zones and urbanized areas:*   The aim is to develop and demonstrate a comprehensive coastal zone management system based on monitoring and modelling to ensure the provision of freshwater security under a range of conditions including saline intrusion, sediment management, storms, floods and droughts, but also specific coastal water uses. Please, refer to H2020 calls on nature-based solutions to propose complementary actions.  *Theme 2. Strengthening socio-economic approaches to water management.*  The overall aim of this theme is envisaging education and communication initiatives to raise social awareness of consumption habits and water scarcity and to increase the levels of social acceptance and use of recycled water.   * *Sub-theme 2.1. Integrating economic and social analyses into decision-making processes:*   The aim is to increase the knowledge the effectiveness and efficiency of existing economic mechanisms and policy instruments related to water management, with a special emphasis on implementation of water policies (such as the EU Water Framework Directive) and development of a circular and green economy. The approach should aim to break boundaries between services valuation including more flexible pricing and charging mechanisms, management tools and institutions, and the employment of economic and social sciences to develop best practice management guidelines for efficient water uses, including under extreme events such as droughts and floods.   * *Sub-theme 2.2. The reuse of water:*   The aim is to develop integrative methods and cost-effective technologies for the implementation of acceptable and sustainable solutions on a large scale for different reuse cycles, spanning from irrigation, via livestock drinking water, to human consumption. Furthermore, goals include assessments of social acceptance for the use of recycled water and the development of integrated approaches combining technological solutions with social-psychological acceptability, economic viability and appropriate governance approaches. Research into the removal of emerging contaminants must consider the cost of the technology vs yield and realistic options for reuse of the recovered water. Please refer to projects funded under previous Water JPI Joint Calls (2013, 2015 and 2016) to avoid any duplication. See Joint Calls on Water JPI website.   * *Sub-theme 2.3. Connecting science to society:*   The aim is to increase understanding of the role of socio-economic approaches to water uses in hydrological cycles. Knowledge building should address stakeholders' and public awareness of water challenges and values, and how perception of policy measures and technological solutions are formed and how stakeholders can be steered towards desirable behaviour. Local and/or regional context (attitude, social norms, cultural context, etc.) should be taken into consideration. The value of improved water stewardship overall should be considered by developing sustainable business models.   * *Sub-theme 2.4. Promoting new governance and knowledge management approaches:*   The aim is to develop innovative water management tools and approaches suitable for decision-making based on an analysis of the limitations of current practices. These approaches should involve the broad participation of stakeholders (including public monitoring, communication and education), multidisciplinary research, and short and long-term water cycle scenarios to support decision-making and the integration of water policy into other policy fields. In effect, governance capacities for implementation of water policies at the local and regional levels should be enhanced.  *Theme 3. Supporting tools for sustainable integrative management of water resources.*  This theme aims to complement the actions developed under the European Strategy Forum for Research Infrastructures (ESFRI) and other European initiatives. Emphasis should be on establishing networks and information sharing among existing research facilities/field labs, analytical methods, monitoring tools and programmes, access to databases and platforms, exploring the use of big data solutions and establishing reliable hydrological standards. Across the globe, there is a large body of knowledge, methodology and data related to hydrology and the water cycle that has the potential of being beneficial for a wide range of the world's regions. The alignment of water-related research and sharing of data and results will serve to avoid duplication of research, support progress based on previous finding, and thus facilitate the establishment of water management policies addressing rapid climatic changes. |

1. **Stakeholder/industry engagement** (*Maximum 250 words)*

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| *Please evaluate the participation of stakeholders/industry on the project and the added value of this participation.* |

### **Recommendations for improvements/amendments of the report** (Please complete Table below)

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1. **General Assessment Comments** (*Maximum 250 words)*

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| *Please include a summary of the key points of this evaluation.*  *Problems identified or specific risks to the projects. As well recommendations/feedback, which could be relevant to the Consortium.* |