LOTUS

LOW-COST INNOVATIVE TECHNOLOGY FOR WATER QUALITY MONITORING
AND WATER RESOURCES MANAGEMENT FOR URBAN AND RURAL WATER SYSTEMS IN INDIA

D7.10

Standardisation and certification plan from LOTUS products and integrated solution – Updated version

Lead: IIT Guwahati

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BIS, G.A.C.

Abstract

LOTUS project is expected to deliver both products, and integrated solution for water quality monitoring and decision support system to the following Indian water industries, namely: (i) piped drinking water distribution utilities (ii) pipe less tanker-based distribution entities (iii) piped irrigation water distribution utilities (iv) ground and river water monitoring organization (v) waste water treatment utilities. Standards for pipe water distribution network design is existing, but water quality monitoring is not readily available. As part of this project, LOTUS team will be collaborating with Bureau of Indian Standard (BIS) to formulate the Indian standard specifications, methods of testing, code of practices and terminology for (i) standalone component of WDN such as, sensors, communication modules for IoT), cloud Platform and pipes connection for installation etc. (ii) integrated solution for water distribution network (WDN) for both intermittent water supply network and continuous supply (example ISI mark for water utilities). This doc will provide a plan for formulating standards and certificates by the LOTUS team in collaboration with the BIS team.

Keywords

Indian Standard Specifications, Methods of Testing, Code of Practices, Terminology, LOTUS sensor and solutions, water quality monitoring

Disclaimer

LOTUS has been financed with support from the European Commission and the Indian Government, Ministry of Science and Technology.

The LOTUS Project

LOTUS is a project funded by DG Environment under the European Union Horizon 2020 Research and Innovation Programme and by the Indian Government. It brings together EU and prominent Indian organizations with the aim to co-create, co-design and co-develop innovative, robust, affordable low-cost sensing solutions for enhancing India's water and sanitation challenges in both rural and urban area.

The LOTUS solution is based on an innovative sensor and includes tailor-made decision support to exploit the capabilities of the sensor as well as a specific approach to co-creation. LOTUSES aims to be co-designed and co-produced in India, and have a wide, diverse and lasting impact for the water sector in India due to intense collaborations with commercial and academic partners in India.

Based on the low-cost sensor platform, solutions for the early detection of water quality problems, decision support for countermeasures and optimal management of drinking and irrigation water systems, tailored on the functionalities of the new sensor, will be developed and integrated with the existing monitoring and control systems.

This sensor will be deployed in five different use cases: in a water-network, on ground-water, in irrigation, in an algae-based wastewater treatment plant and water tankers. The packaging of the sensor, as well as the online and offline software tools, will be tailored for each of the use cases. These last will enable us to test the sensors and improve them iteratively.

The project is based on co-creation, co-design and co-production between the different partners. Therefore, an important stakeholder engagement process will be implemented during the project lifetime and involve relevant stakeholders, including local authorities, water users and social communities, and will consider possible gender differences in the use and need of water. Broad outreach activities will take place both in India and in Europe, therefore contributing to LOTUS impact maximization.

The further development and exploitation (beyond the project) of the novel sensor platform will be done in cooperation with the Indian partners. This will create a level playing field for European and Indian industries and SMEs working in the water quality area.

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Acronyms and Definitions

Acronyms	Defined as
As	Arsenic
Fe	Iron
F	Fluoride
EC	Electrical Conductivity
TDS	Total Dissolved Solids
DO	Dissolved Oxygen
ORP	Oxidation Reduction Potential
GMS	Groundwater modeling system
MODFLOW	Modular finite-difference flow model
MT3DMS	Modular three-dimensional transport model

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1 Executive Summary

LOTUS project partnership is committed to provide a low-cost and efficient technology for water quality monitoring and water systems management in urban and rural areas, adapted to Indian environments. LOTUS project activities will be implemented within various use cases, each enabling the development of dedicated exploitation plans for LOTUS outcomes and associated scale up. LOTUS dissemination aims to enable this use and uptake of results.

The LOTUS sensor targets primarily water quality monitoring, but the overall LOTUS solution (sensor and platform with diverse functionalities) enables both water quantity and quality management, at strategic (off-line) and real time (operational) level. The solution offered is smart, modular, expandable, adapted to the local conditions in India and demonstrated in varying Use Cases across the whole value chain of water: water resources (Use Case #4a and #4b), irrigation systems (Use Case #3), drinking water distribution systems (Use Case #1), tanker-based water distribution systems (Use Case #2) and treated water waster (Use Case #5) for energy and nutrient recovery.

LOTUS will create the conditions for EU and Indian partners to hit the market with an innovative and ultra-competitive water quality sensor (cost reduction at least by 10 at the end of LOTUS, then 100 within the next 6 years). The approach is based on creating large demand (including throughout LOTUS use cases) and distribution circuits, in parallel to developing manufacturability, calibration and maintenance strategies (first via LOTUS technical WPs, then via actual contributors to the chain of values). Several industrial partners involved, have a strong interest in the commercial exploitation of the LOTUS solution and intended to commercialise it and take it to the market in India. Several industrial partners involved, have a strong interest in the commercial exploitation of the LOTUS solution and intend to commercialise it and take it to the market in India. Thus, to implement the LOTUS product in India, LOTUS sensor and platform we need to be standardise and certified by competent authority like BIS in India.

This document will provide details for LOTUS team about plan for standardisation and certification of LOTUS products and solutions to Indian water industries.

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2 LOTUS deliverables

The table below lists LOTUS deliverables and date of release and corresponding Indian and EU standard.

Table 1: LOTUS deliverables and corresponding standards

S. No	Tools and sensors	Type	Tentative delivery date (as per the project plan)	Indian Standard reference no	EU stand refer No
1	LOTUS Sensor (Multiparametric chip based sensor)	Product	M12	NEY	EN ISO 15839:2006
2	At line LOTUS sensor installation kit	Product	M18	NEY	NEY
3	Solar- based electro chlorinator	Product	M18	NEY	NEY
4	Software tools for Water quality management for intermittent supply WDN	Product	M18	NEY	NEY
5	LOTUS sensor-based Water quality management solution for intermittent supply WDN	solution	M18	NEY	NEY
6	Online Scheduling platform for tanker based water distribution system	Product	M18	NEY	NEY

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7	Complete solution for tanker water distribution for a given location (multiple Tanker fitted with chlorinator, LOTUS sensor, client module of Online Scheduling platform)	Solution	M18	NEY	NEY
8	Advanced process control solution for the wastewater treatment plant (Only software licence)	Product	M18	NEY	1.EN 12255-12 (2003-09)
9	Water management tools for irrigation network monitoring and operation (software licence)	Product	M10 to M12	NEY	NEY
10	Complete solution for irrigation water management (LOTUS sensor + software tool)	solution	M12	NEY	NEY
11	Software tools for groundwater quality monitoring in cloud platform	Product	M10 to 12	1.IS 15896: 2011 2.IS 13969: Part 11: 2018/Identical	1. ISO 5667-22:2010 2.BS ISO 5667-22:2010 3.ASTM D6771-18 4.ASTM D5875/D5875M-18 5.ASTM D5781/D5781M-18 6.ASTM D5872/D5872M-18 7.ASTM D5784/D5784M-18

					8. ASTM D5782-18 9.ASTM D5783-18 10.ASTM D5876/D5876M-17 11. ASTM D7045-17 12.ASTM D6725/D6725M-16
12	Software tool + LOTUS sensor ground water quality monitoring	solution	M12	NEY	NEY
13	LOTUS solution for wastewater treatment plant and operation	Product	M18	NEY	1.DIN EN 12255-14: 2004-03 2.DIN 19569-11: 2020-10
14	LOTUS integrated platform	Solution	M24	IUDX (India Urban Data Exchange)	ETSI NGSI-LD

Note: 'NEY' is abbreviated as 'Not Exist Yet'

3 Statuts of Exisiting standards

As per Indian standards concern, except the groundwater quality monitoring and sampling, for deliverables standardization is not available. The present Indian and European standards are partially full filling the requirements of LOTUS deliverables. Therefore, there is a need to standardise and certify the LOTUS sensor and other products at first place before implementing on field.

The NGSI-LD specification[1], initiated by the ETSI Industry Specification Group on Context Information management (ISG CIM) is an information model and API for publishing, querying and subscribing to context information. It is meant to facilitate the open exchange and sharing of structured information between different stakeholders. A group of H2020 projects named "Digital Water 2020" and belonging to the European ICT4water cluster initiated the development of NGSI-LD data models for water related

[1] https://en.wikipedia.org/wiki/NGSI-LD

digital systems[2]. Recently, the India Urban Data Exchange[3] selected the NGSI-LD specification for the development of Indian smar cities and became an active contributor to the FIWARE smartdatamodels initiative.

4 Overview of certification Organizations

India's participation in International Standardization (ISO, IEC, and ITU) is at inter-governmental level since standardization is part of government ministries.

There are four main standards making bodies of India

- Bureau of Indian Standards (BIS)

The erstwhile Indian Standards Institution (now Bureau of Indian Standards) was established in the year 1947 with the objective of harmonious development of standardization activity in India. The Bureau of Indian Standards (BIS) was established under the BIS Act, 1986 for the harmonious development of the activities of standardization, marking and quality certification of goods and for matters connected therewith or incidental thereto. A new Bureau of Indian Standards Act, 2016 which was notified on 22nd March 2016, has been brought into force with effect from 12 October 2017 that reinforces the activities of BIS in respect to standardization and certification of goods, articles, processes, systems, and services. Formulation of Indian Standards is one of the core activities of BIS. The activity is done through 17 Division Councils representing diverse areas of economy and technology,

- Telecom Engineering Centre (TEC)

The 'TEC' nodal agency is Department of Telecommunications, Ministry of Communications, Government of India. They are responsible for drawing up of standards, generic requirements, interface requirements, service requirements and specifications for telecom products, services and networks.

- Telecommunications Standards Development Society of India (TSDSI)

TSDSI is now an SDO that aims at developing and promoting India-specific requirements, standardizing solutions for meeting these requirements and contributing these to international standards, contributing to global standardization in the field of telecommunications, maintaining the technical standards and other deliverables of the organization, safe-guarding the related IPR, helping create manufacturing expertise in the country, providing leadership to the developing countries (such as in

[2] https://github.com/smart-data-models/SmartWater
[3] https://www.smartcitiesworld.net/open-data/data-alliance-formed-to-promote-global-smart-city-standards

South Asia, South East Asia, Africa, Middle East, etc.) in terms of their telecommunications-related standardization needs. Develop standards to support new requirements based on research & innovation in the domain of telecommunications/ICT in India.

- Automotive Research Association of India

ARAI is an autonomous body affiliated to the Ministry of Heavy Industries and Public Enterprises, Government of India. The Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India, has recognized ARAI as a Scientific and Industrial Research Organisation (SIRO).

There are three main European Standardization Organizations in the area of voluntary technical standardization

- European Committee for Standardisation (CEN)

The CEN provides a platform for the development of European Standards and other technical documents in relation to various kinds of products, materials, services and processes.

CEN supports standardization activities in relation to a wide range of fields and sectors including: air and space, chemicals, construction, consumer products, defence and security, energy, the environment, food and feed, health and safety, healthcare, ICT, machinery, materials, pressure equipment, services, smart living, transport and packaging.

- European Committee for Electrotechnical Standardisation (CENELEC)

The CENELEC is the European Committee for Electrotechnical Standardization and is responsible for standardization in the electrotechnical engineering field. CENELEC prepares voluntary standards, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a Single European Market. It work ttogether with ETSI (telecommunications) and CEN (other technical areas).

- European Telecommunication Standards Institute (ETSI)

The ETSI is the officially recognized body with a responsibility for the standardization of Information and Communication Technologies (ICT). In ETSI the standard development process is similar; the main difference is that in ETSI the individual members participating in the respective Technical Committee decide directly on new standardization work, and approve new ETSI standardization deliverables. The final decision is made through vote among all ETSI members.

5 Plan for standards formulation

The table below indicates the plan for making Indian standard specifications, methods of testing, code of practices and terminology for LOTUS products and solution

Table 3 Formulation of standardization and certification for making Indian standard for LOTUS products and solution

S. No	Tools and sensors	Lead Partners	Method/ Code of Practice	Indian Standards
1	LOTUS Sensor (Multiparametric chip-based sensor)	EP, IITG, NEERI	IS 3025, IS 3025 (Part 32), USEPA 508, IS 3025(Part 37 i)	NEY
2	At line LOTUS sensor installation kit	IITG & EP	NEY	NEY
3	Solar- based electro chlorinator	AUT	NEY	NEY
4	Software tools for Water quality management for intermident supply WDN	ABB, IITG	NEY	NEY
5	LOTUS sensor-based Water quality management solution for intermident supply WDN	Hydrocontrol, IITG, IITB, JSPL	NEY	NEY
6	Online Scheduling platform for tanker-based water distribution system	IITG and IITB	NEY	NEY
7	Complete solution for tanker water distribution for a given location (multiple Tanker fitted with chlorinator, LOTUS sensor, client module of Online Scheduling platform)	IITB, IITG, SUY, JP	NEY	NEY
8	Advanced process control solution for the wastewater treatment plant (Only software licence)	TUDO and JISL	NEY	NEY

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9	Water management tools for irrigation network monitoring and operation (software licence)	TUDO, JISL	NEY	NEY
10	Complete solution for irrigation water management (LOTUS sensor + software tool)	TUDO, JISL	NEY	NEY
11	Software tools for groundwater quality monitoring in cloud platform	EFL, IITG, CWC	NEY	NEY
12	Software tool + LOTUS sensor ground water quality monitoring	EFL	NEY	NEY
13	LOTUS solution for wastewater treatment plant and operation	NEERI, TUDO, NITW	NEY	NEY

Note: 'NEY' is abbreviated as 'Not Exist Yet'